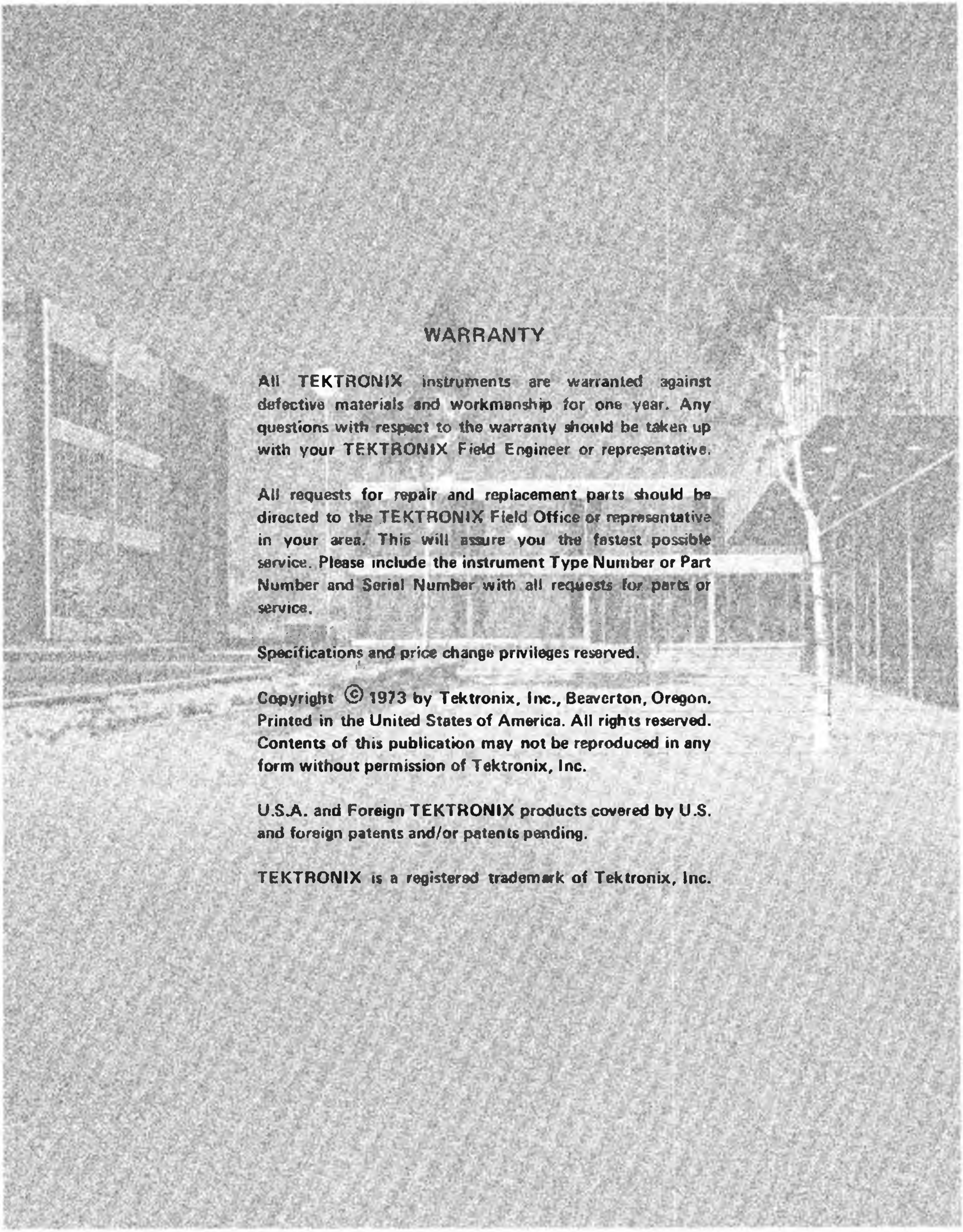
INSTRUCTION MANUAL

7623/R7623

STORAGE OSCILLOSCOPE

SERVICE

MANUFACTURERS OF CATHODE-RAY OSCILLOSCOPES



WARRANTY

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

Specifications and price change privileges reserved.

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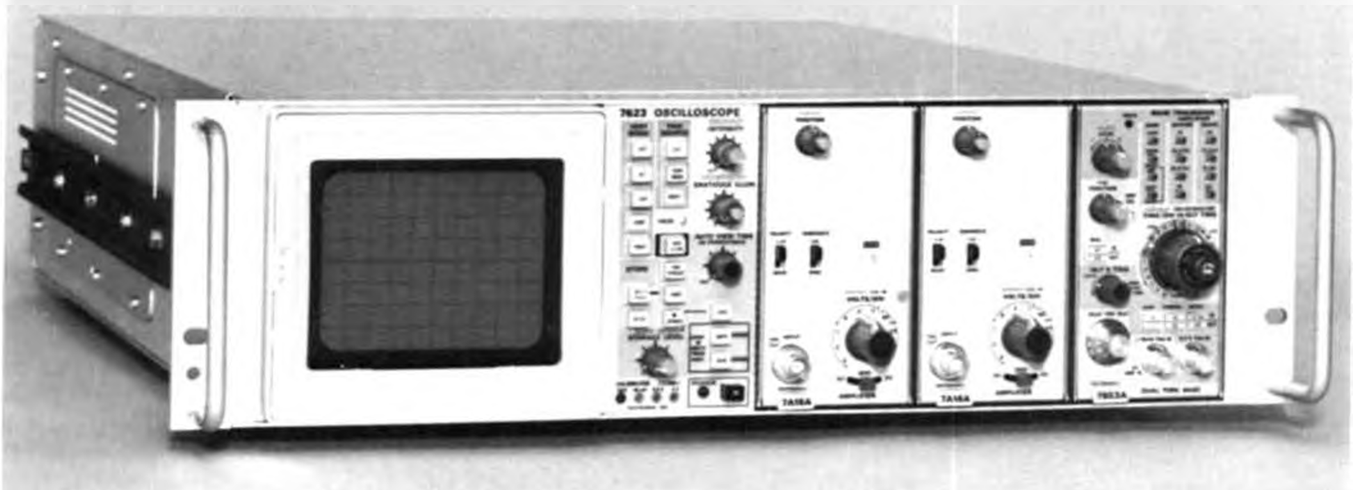
The TEKTRONIX 7623/R7623 Storage Oscilloscope is a solid-state instrument designed for fast writing rate storage applications. The 7623 has four basic modes of operation: Fast, Bi-Stable, Variable Persistence, and Non-Store. The instrument is designed to accept TEKTRONIX 7-Series plug-in units to form a complete measurement system. The flexibility of this plug-in feature and the variety of plug-in units available allow this system to be used for many measurement applications. The 7623 features a large cathode-ray tube (CRT) screen, 8 X 10 divisions, with small spot size, and fast stored writing rate.



OPERATING INFORMATION

Operating Voltage

The 7623/R7623 can be operated from either a 110-volt line or 220-volt line source. In addition, three operating ranges can be selected by a jumper located on the Rectifier board. See Fig. 1-1. Select a range that is centered about the average line voltage to which the instrument is connected. See Table 1-1 for ranges and proper fuses.

Table 1-1

Pins	Regulating Range	
Selected	110-volt nominal	220-volt nominal
Low	90 to 110 volts	180 to 220 volts
Med	99 to 121 volts	198 to 242 volts
Hi	108 to 132 volts	218 to 262 volts
Line Fuse	3.2 A Slow-blow	1.6 A Slow-blow

Operating Temperature

The 7623/R7623 can be operated where the ambient air temperature is between 0°C and +50°C. The 7623 is cooled by air drawn through the instrument. Maintain about two-inches clearance for proper ventilation on all sides and the top. The feet on the bottom of the instrument provide the necessary clearance. The R7623 is cooled by air drawn through the air filter on the rear of the instrument and blown out through the holes on the right side. Maintain two-inches of clearance on the right side for proper ventilation. A thermal cutout switch in the instruments provides thermal protection, and interrupts the power to the instrument if the internal temperature exceeds a safe operating level.

Plug-in Installation and Removal

To install a plug-in unit into one of the plug-in compartments, align the slots in the top and bottom of the plug-in unit with the associated guide rails in the plug-in compartment. Push the plug-in unit firmly into the plug-in compartment until it locks into place. To remove the plug-in unit, pull the release latch on the plug-in unit to disengage it, and pull the unit out of the plug-in compartment. Plug-in units can be removed or installed without turning off the instrument power. Special purpose plug-in units may have specific restrictions regarding the plug-in compartments in which they can be installed. This information will be given in the instruction manual for these plug-in units.

Operation

The following information provides the necessary controls and control settings to obtain a display, which can be used to verify basic operation or calibration without removing the covers or making any internal adjustments. In the NON STORE mode the 7623 functions the same as a conventional oscilloscope. The CALIBRATOR signal is a convenient signal for verifying basic operation and calibration. Use the Operating Set-Up Information as a guide for setting the front panel controls.

Non-Store Operating Set-Up Information

INTENSITY	As desired (midrange)
READOUT	As desired
GRATICULE ILLUM	As desired
FOCUS	Well defined display
TRIG SOURCE	VERT MODE
VERT MODE	Selected for the plug-in compartment with the plug-in unit installed and with signal input to be displayed.
POWER	Pressed in

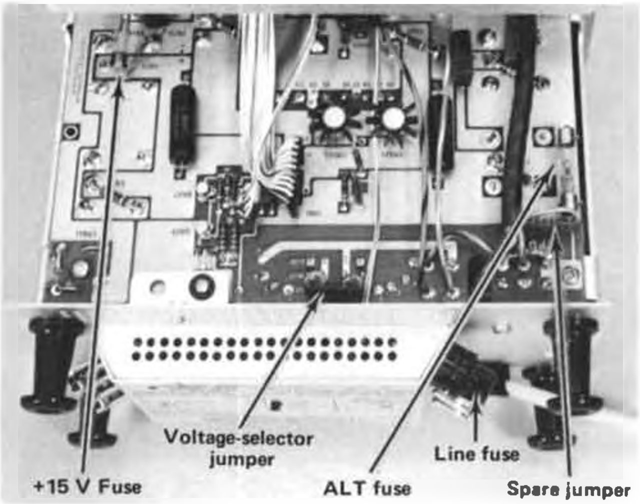
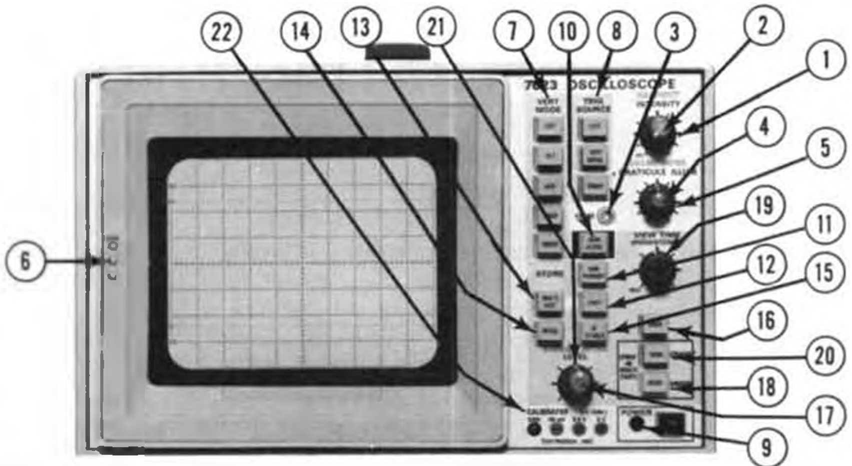


Fig. 1-1. Location of Voltage-selector jumper, spare jumper, and 230 V fuse in power-unit (shown removed).

1. INTENSITY—Controls the brightness of the display.
2. READOUT—Turns on the Readout display, and controls the brightness of the Readout display.
3. FOCUS—Screwdriver adjustment provides adjustment for optimum display definition.
4. GRATICULE ILLUM—Controls graticule illumination.
5. BEAM FINDER—When pressed the display is limited to within the graticule area.
6. Camera Power—Three pin connector on the CRT bezel, (top) +15 volt power source, (middle) receives remote single sweep reset signal from compatible camera system, and (bottom) ground pin.



7. VERT MODE—Selects vertical mode of operations.

   LEFT: Signals from the left plug-in compartment are displayed.

   ALT: Signals from both vertical plug-in compartments are displayed (dual trace). Display is switched from one vertical to the other after each sweep.

   ADD: Signals from both vertical plug-in compartments are algebraically added, and the sum is displayed.

   CHOP: Signals from both vertical compartments are displayed (dual trace). Display switches from the left vertical compartment signal to the right vertical compartment signal at a one megahertz rate.

   RIGHT: Signals from the right plug-in compartment are displayed.
8. TRIG SOURCE—Selects the source of the internal trigger signals for the horizontal compartment.

   LEFT: Trigger signals are from the left vertical plug-in compartment only.

   VERT MODE: Trigger signals are from the vertical compartment being displayed except in the CHOP and ADD modes; then the trigger signal is the algebraic sum of the trigger signals from the left and right plug-in compartments.

   RIGHT: Trigger signals are from the right vertical plug-in compartment only.
9. POWER—Switch and indicator; switch turns on instrument, and the indicator is on when the instrument is connected to a power source and turned on.
10. NON-STORE—Non-store operation.
11. VAR-PERSIST—Variable persistence storage mode. The AUTO VIEW TIME or PERSISTENCE control setting, controls the retention of the stored display.
12. FAST—For storing fast signals.
13. MULTI-TRACE-(MULTI-FAST in early instruments)—For storing multiple fast signals. For each new signal to be stored the ERASE (PREP IN MULTI TRACE FAST) must be pressed.
14. INTEG—For storing very fast repetitive signals.
15. BI-STABLE—For storing slow signals for long periods of time.
16. SAVE—Prevents accidental erasure of the stored display.
17. SAVE INTEN-(STORED INTEN in early instruments)—Controls the brightness of the stored display in the Save Mode.
18. AUTO ERASE—Automatically erases the stored display, AUTO VIEW TIME setting controls the time between erase cycles.
19. AUTO VIEW TIME-(VIEW TIME in early instruments)—Controls the time between erase cycles in the Auto Erase Mode.
20. MAN ERASE—Erases the stored display.
21. STORAGE LEVEL-(LEVEL in early instruments)—Controls the writing rate in the FAST and BI-STABLE storage modes. Controls the writing rate and brightness of the stored display in the Variable persistence Mode.
22. CALIBRATOR—Positive going square wave or DC voltage selected by changing an internal jumper. Output voltage at pin jacks (4 V, 0.4 V and 40 mV).

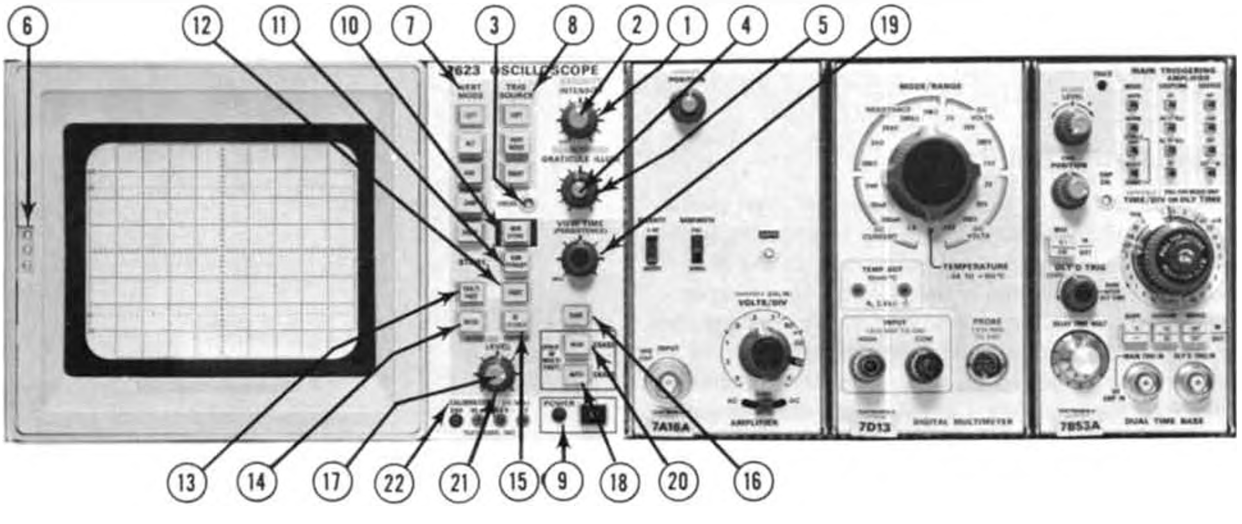
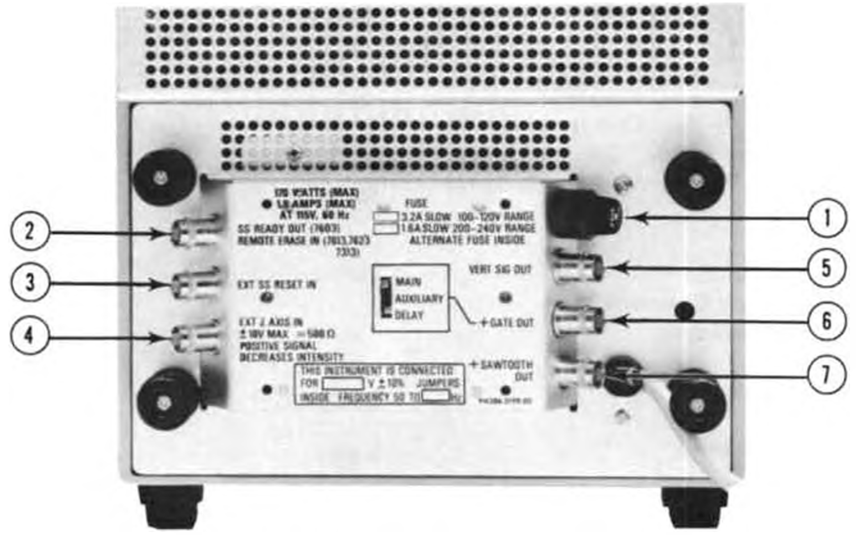


Fig. 1-2. Front Panel Controls and Connectors.



1. FUSE—Line voltage fuse.
2. REMOTE ERASE IN—Provides external connection for remote erase.
3. EXT S S RESET IN—Remote single sweep reset.
4. EXT Z AXIS IN—Input for intensity modulation of the CRT display.
5. VERT SIG OUT—Vertical signal selected by TRIG SOURCE switch (LEFT, RIGHT, ALT and ADD).
6. +GATE OUT—Gate signal selected by gate selector switch (Main, Auxiliary, and Delay).
7. +SAWTOOTH OUT—Positive-going sawtooth from time-base unit.

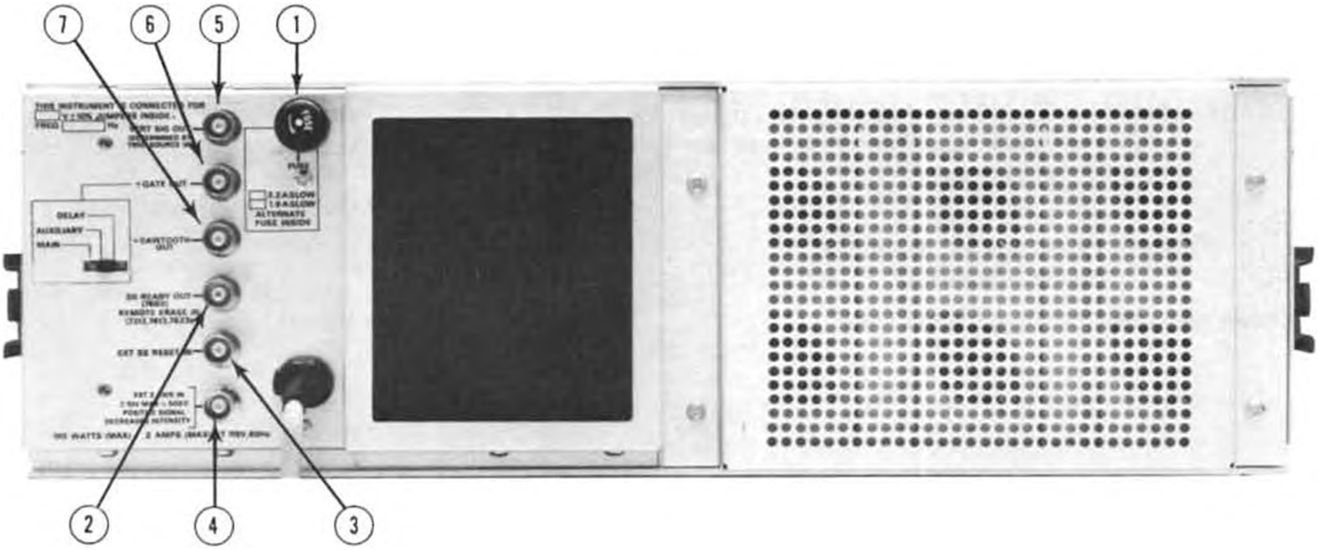


Fig. 1-3. Rear Panel Controls and Connectors.

After obtaining a display in the NON Store mode continue to the Storage modes.

Storage Modes

Set the controls as given in the Operating Set-Up Information for the Non-Store mode. Set the storage controls as given for Variable Persistence, Fast, Bi-Stable and Save mode.

Variable Persistence Operating Set-Up Information

VAR PERSIST	In (Pressed in)
NON STORE	Out (released)
STORAGE LEVEL	As desired (no fading positive of the display)
PERSISTENCE	As desired (counterclockwise in the detent is maximum retention; in the clockwise direction the retention decreases.)
SAVE	Out (released).

FAST Operating Set-Up Information

ERASE	Press ERASE button
FAST	In (pressed in).
VAR PERSIST	Out (Released).
AUTO ERASE	Out. Pressed and released. (Only one sweep is stored. Press the MAN. ERASE button to erase the display, and to start another sweep for storing.)
STORAGE LEVEL	As desired (adjusted so stored display does not fade into the background).

MULTI TRACE FAST Operating Set-Up Information

Obtain one stored display in the fast mode.

MULTI TRACE	In
ERASE	Pressed and released. (Only one sweep is stored, press the ERASE button and another sweep will be stored without erasing the original display.)
SAVE	Out (released).

Bi-Stable Operating Set-Up Information

BI-STABLE	In (pressed in)
FAST	Out (released)
ERASE	Press ERASE button

SAVE Mode Operation Set-Up Information

Obtain a stored display in any storage mode.

SAVE	In (Pressed in)
SAVE INTEN	Turning the SAVE INTEN control clockwise increases the intensity of the stored display. There is no erase signal generated, and all sweep signals are locked-out. Press the SAVE button out (release).
Auto ERASE	Pressed in
Auto VIEW TIME	As desired (counterclockwise position maximum display time before erase cycle starts. Clockwise direction decreases time that a stored display is present before an erase cycle).
AUTO ERASE	Pressed and released (out).

For more detailed operating instructions, see the 7623/R7623 Operators Manual.

CALIBRATION

Calibration Interval

To assure instrument accuracy, check the calibration of the 7623 every 1000 hours of operation, or every six months if used infrequently. Before complete calibration, thoroughly clean and inspect this instrument as outlined in the Maintenance section.

Tektronix Field Service

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

Using This Procedure

General. This section provides several features to facilitate calibration of the 7623. These are:

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

Performance Check. The performance of this instrument can be checked by performing only the √CHECK steps. The √ preceding a step indicates that performing this step checks the instrument against the tolerance listed as a Performance Requirement (see Specification Section in the Operators Manual).

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

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

TEST EQUIPMENT REQUIRED

The test equipment and accessories, or the equivalent, given in the Test Equipment table is required for complete calibration of the 7623. Specifications given for the test equipment are the minimum necessary for accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. All test equipment is assumed to be correctly calibrated and operating within the listed specification. Detailed operating instructions for the test equipment are not given in this procedure. Refer to the instruction manuals for the test equipment for more information.

Special Calibration Fixtures

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

Calibration Equipment Alternatives

All of the listed test equipment is required to completely check and adjust this instrument. This calibration procedure is based on the first item of equipment given as an example of applicable equipment. When other equipment is substituted, control settings or calibration setup may need to be altered slightly to meet the requirements of the substitute equipment. If the exact item of test equipment given as an example in the Test Equipment table is not available, first check the Specifications column carefully to see if any other equipment is available which might suffice. Then check the Usage column to see what this item of test equipment is used for. If used for a check or adjustment which is of little or no importance to your measurement requirements, the item and corresponding step(s) can be deleted.

The following procedure is written to completely check and adjust the 7623 to the limits given in Section 2 of the Operators Manual and to allow interchanging 7000-series plug-in units between 7000-series mainframes without the need to recalibrate the instruments each time. If applications for which you will use the 7623 do not require the full available performance from the 7623 and plug-in units, this procedure and the required equipment list can be shortened accordingly. For example, the basic measurement capabilities of this instrument can be verified by checking vertical deflection accuracy, vertical square-wave response, and basic horizontal timing with 7000-series real-time plug-in units and an accurate square-wave signal. Also, if the 7623 is to be used in a fixed system without the need to interchange plug-in units, all tests can be made by substituting vertical plug-in units and applicable test signals for the 067-0587-01 mainframe standardizer calibration fixture.

TEST EQUIPMENT

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
1. Precision DC Voltmeter	Range, zero to 150 Volts; accuracy, within 0.2%.	Calibrator output accuracy check and adjustment.	a. Tektronix 7D13 Digital Multimeter (test oscilloscope must have Readout System). b. Fluke Model 825A Differential DC Voltmeter.
2. DC Voltmeter (VOM)	Range, zero to 4000 Volts; accuracy, checked to within 1% at 1500 Volts.	High voltage power supply check. Z-Axis DC levels adjustment.	a. Triplett Model 630-NA. b. Simpson Model 262.
3. Time-Mark Generator	Marker outputs, 10 nanoseconds to 0.1 second; marker accuracy, within 0.1%; Trigger output, one millisecond.	CRT geometry check and adjustment. Horizontal timing check and adjustment.	a. Tektronix 2901 Time-Mark Generator. b. Tektronix 184 Time-Mark Generator.
4. Medium frequency constant amplitude signal generator	Frequency, 50 to 100 megahertz; reference frequency, 50 kilohertz; output amplitude, variable from 5 millivolts to 5 Volts peak-to-peak into 50 ohms; amplitude accuracy, constant within 3% of reference as output frequency changes.	External Z-axis operation check. Horizontal and Vertical bandwidth check. Vertical amplifier isolation check and storage writing rate.	a. Tektronix 191 Constant Amplitude Signal Generator. b. General Radio 1215-C with 1263-C Amplitude Regulating Power Supply.
5. Low frequency signal generator	Frequency, 35 kilohertz; output amplitude, variable from 50 to 100 millivolts.	X-Y phase shift check and storage writing rate.	a. General Radio 1310-B Oscillator with a binding post to BNC adapter (274-QBJ General Radio).
6. Test oscilloscope system (dual-trace)	Bandwidth, DC to 50 megahertz; minimum deflection factor, 10 millivolts/div; accuracy, within 3%.	Horizontal limit centering adjustment and +GATE OUT.	a. Tektronix 7503 or 7504 oscilloscope with two 7A15A or 7A16 Amplifier and 7B50 and 7B53A Time Base plug-in units and two P6053 Probes. b. Tektronix 453A oscilloscope with two P6054 Probes.

TEST EQUIPMENT (cont)

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
7. Vertical plug-in unit (two identical units required), and a dual display vertical unit.	Tektronix 7A-series 65 megahertz bandwidth required for complete procedure as written.	Used throughout procedure to provide vertical input to the instrument under calibration. Identical units required for only X-Y phase shift check.	a. Tektronix 7A15A and an 7A18 Amplifier (may be shared with an 7000-series test oscilloscope). b. Any 7A-series plug-in unit (tolerances in some stpes may be limited if low-frequency units used).
8. Time-base plug-in unit	Tektronix 7B-series.	Used through procedure to provide sweep.	a. Tektronix 7B53A or 7B52 Time Base. b. Any 7B-series plug-in unit.
9. Mainframe standardizer calibration fixture	Produces gain-check and pulse-response waveforms.	Used throughout procedure to standardize instrument so plug-in units can be interchanged without complete recalibration.	a. Tektronix Calibration Fixture 067-0587-01. b. Calibrated 7000-series plug-in units with suitable signal sources may be substituted if lower performance is acceptable.
10. 10X passive probe	Compatible with 7B-series external trigger input.	Chopped mode operation check (adjustment procedure).	a. Tektronix P6053 or P6054 Probe (may be shared with test oscilloscope).
11. T connector	Connectors, BNC.	External Z-axis operation check.	a. Tektronix Part No. 103-0030-00.
12. Termination	Impedance, 50-ohms; accuracy, ±2%; connectors, BNC.	Horizontal timing check and adjustment. X-Y phase shift check.	a. Tektronix Part No. 011-0049-01.
13. Dual-input coupler	Connectors, BNC.	Added operation check. X-Y phase shift check.	a. Tektronix Calibration Fixture 067-0525-00.
14. Cable (two required)	Impedance, 50 ohms; type, RF-58/U; length, 18 and 42 inches; connectors, BNC.	Used throughout procedure for signal interconnection.	a. Tektronix Part No. 012-0076-00 (18-inches). Tektronix Part No. 012-0057-01 (42-inches).
15. GR in-line termination	Impedance, 50 ohms; accuracy, ±2%; connectors, GR874 input with BNC male output.	External Z-axis operation check. Vertical bandwidth check. Vertical amplifier isolation check. Horizontal bandwidth check.	a. Tektronix Part No. 017-0083-00.
16. Cable	Impedance, 50 ohms; type RG-213/U; electrical length, five nanoseconds; connectors, GR874.	External Z-axis operation check. Vertical bandwidth check. Vertical amplifier isolation check. Horizontal bandwidth check.	a. Tektronix Part No. 017-0502-00.

TEST EQUIPMENT (cont)

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
17. BNC to pin jack cable	Adapts pin jacks to BNC male connector.	Added operation check. Trigger source operation check. Astigmatism adjustment.	a. Tektronix Part No. 175-1178-00 (one supplied as standard accessory).
18. Screwdriver	Three-inch shaft, 3/32-inch bit.	Used throughout adjustment procedure to adjust variable resistors.	a. Xcelite R-3323.
19. Low-capacitance screwdriver	1 1/2-inch shaft.	Used throughout adjustment procedure to adjust variable capacitors.	a. Tektronix Part No. 003-0000-00.
20. Adapter	Connector, GR to BNC male.	Vertical bandwidth check, Storage writing rate check.	a. Tektronix Part No. 017-0064-00.

NOTE

This instrument should be adjusted at an ambient temperature of +25°C ±5°C for best overall accuracy.

1. Remove the sides and bottom covers from the 7623 or the top cover and side panel from the R7623.

2. Connect the instrument to a power source that meets the voltage and frequency requirements. The applied voltage should be near the center of the voltage range marked on the rear panel (see Section 1 for information on converting this instrument from one operating voltage to another).

NOTE

If correct line voltage is not available, use a variable autotransformer to provide the correct input voltage.

3. Set the controls as given under Preliminary Control Settings. Allow at least 20 minutes warmup before proceeding.

NOTE

Titles for external controls of this instrument are capitalized in this procedure (e.g., INTENSITY). Internal adjustments are initial capitalized only (e.g., CRT Grid Bias).

Preliminary Control Settings

Set the 7623 controls as follows:

INTENSITY	Midrange
FOCUS	Adjusted for well-defined display
BEAM FINDER	Out
GRATICULE ILLUM	As desired
VERT MODE	Left
TRIG SOURCE	VERT MODE
READOUT	Midrange
NON-STORE	In
VAR PERSIST	Out
FAST	Out
BI-STABLE	Out
MULTI FAST	Out
INTEG	Out
SAVE	Out
MANUAL ERASE	Out
AUTO ERASE	Out
STORAGE LEVEL	Counterclockwise
STORED INTEN	Counterclockwise
AUTO VIEW TIME (Persistance)	Counterclockwise in detent
POWER	ON

CALIBRATION PROCEDURE

7623 Serial No. ______________________________

Calibration Date ______________________________

Calibrated By ______________________________

Introduction

The following procedure returns the 7623 to correct calibration. All limits and tolerances given in this procedure are calibration guides, and should not be interpreted as instrument specifications except as listed in Section 2.

Index to Calibration Procedure

Readout Operation

Storage Operation

POWER SUPPLY

Equipment Required	
1. Precision DC voltmeter	2. DC voltmeter (VOM)
	3. Three-inch screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

1. Adjust −50 Volt Power Supply

a. Set the INTENSITY control fully counterclockwise.

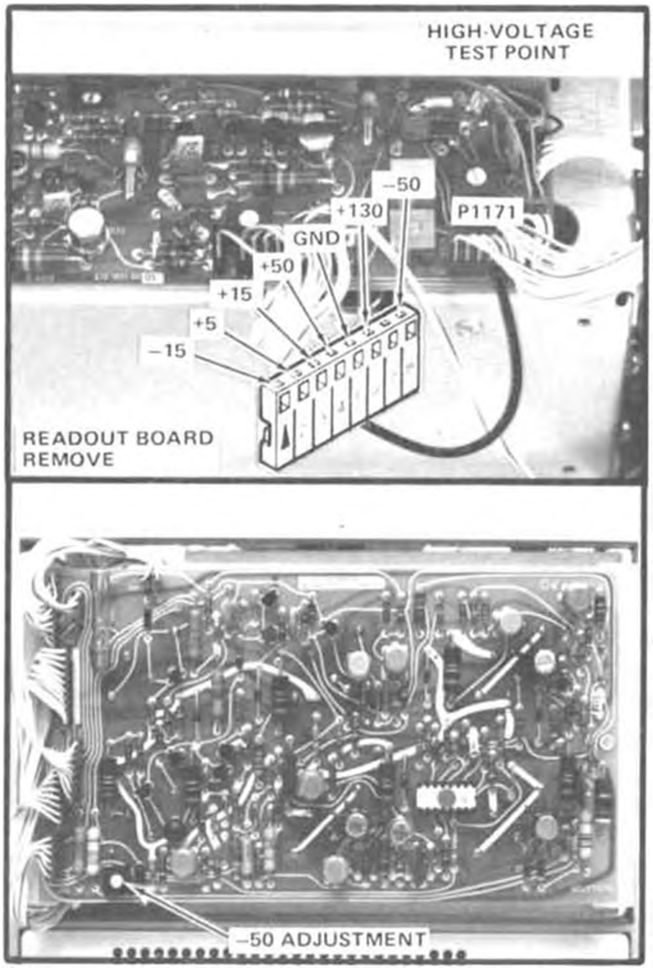


Fig. 2-1. (A) Location of low-voltage and high-voltage test points (right side of instrument) (B) Location of −50 V adjustment (Low Voltage Regulator board).

b. Connect the precision DC voltmeter between TP −50 (see Fig. 2-1A) and chassis ground.

c. CHECK—Meter reading; −50 volts ±0.1 volt.

d. ADJUST— −50 volts adjustment R881 (see Fig. 2-1B) for a meter reading of exactly −50 volts.

e. INTERACTION—Change in setting of R881 may affect the operation of all circuits within the 7623.

2. Check Remaining Power-Supply Voltages

a. CHECK—Table 2-1 lists the low-voltage power supplies in this instrument. Check each supply with the precision DC voltmeter for output voltage within the given tolerance (connect meter ground lead to chassis ground). Power supply test points are shown in Fig. 2-1A.

NOTE

Ripple and regulation of the individual power supplies can be checked using the procedure given under Troubleshooting Techniques in Section 4.

TABLE 2-1

Power Supply Tolerance

Power Supply	Test Point	Output Voltage Tolerance
−50 Volt	Pin 8 P1170	±0.1 Volt
−15 Volt	Pin 7 P1170	±0.1 Volt
+5 Volt	Pin 5 P1170	±0.07 Volt
+15 Volt	Pin 4 P1170	±0.1 Volt
+50 Volt	Pin 3 P1170	±0.3 Volt
+130 Volt	Pin 2 P1170	±5.2 Volt

3. Check High-Voltage Power Supply

a. Push in the power switch (turn off the instrument).

b. Set the DC voltmeter (VOM) to measure at least 1500 volts. Then, connect it between the high-voltage test point (see Fig. 2-1A) and chassis ground.

c. Pull out the power switch (turn on the instrument). Check meter reading; −1475 volts ±45 volts.

d. Push in the power switch (turn off the instrument). Disconnect the DC voltmeter.

e. Pull out the power switch (turn on the instrument).

DISPLAY AND Z AXIS

Equipment Required

1. Mainframe standardizer calibration fixture
2. 7B53A plug-in unit
3. DC Voltmeter (VOM)
4. 7A15A plug-in unit
5. Time-mark generator
6. Medium-frequency generator
7. BNC to pin-jack cable
8. 18-inch 50-ohm BNC cable
9. 42-inch 50-ohm BNC cable
10. Five-nanosecond GR cable
11. 50-ohm GR in-line termination
12. BNC T connector
13. Three-inch screwdriver
14. Low-capacitance screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

4A. Adjust CRT Grid Bias

a. Install the mainframe standardizer calibration fixture (or a vertical plug-in) in the left vertical compartment and depress the LEFT VERT MODE button. Set the fixture for Vert or Horiz + Step Resp, amplitude fully counterclockwise, and Position to midrange.

b. Install the time base plug-in in the horizontal compartment, and set it for 1.0 ms/division. Adjust triggering for a free-running sweep. If a 7B53A Time Base plug-in is to be used with the 7623 (R7623), set it for Intensified sweep.

c. Adjust the fixture Position control to bring the trace on screen, then rotate both the INTENSITY and READOUT INTENSITY controls fully counterclockwise.

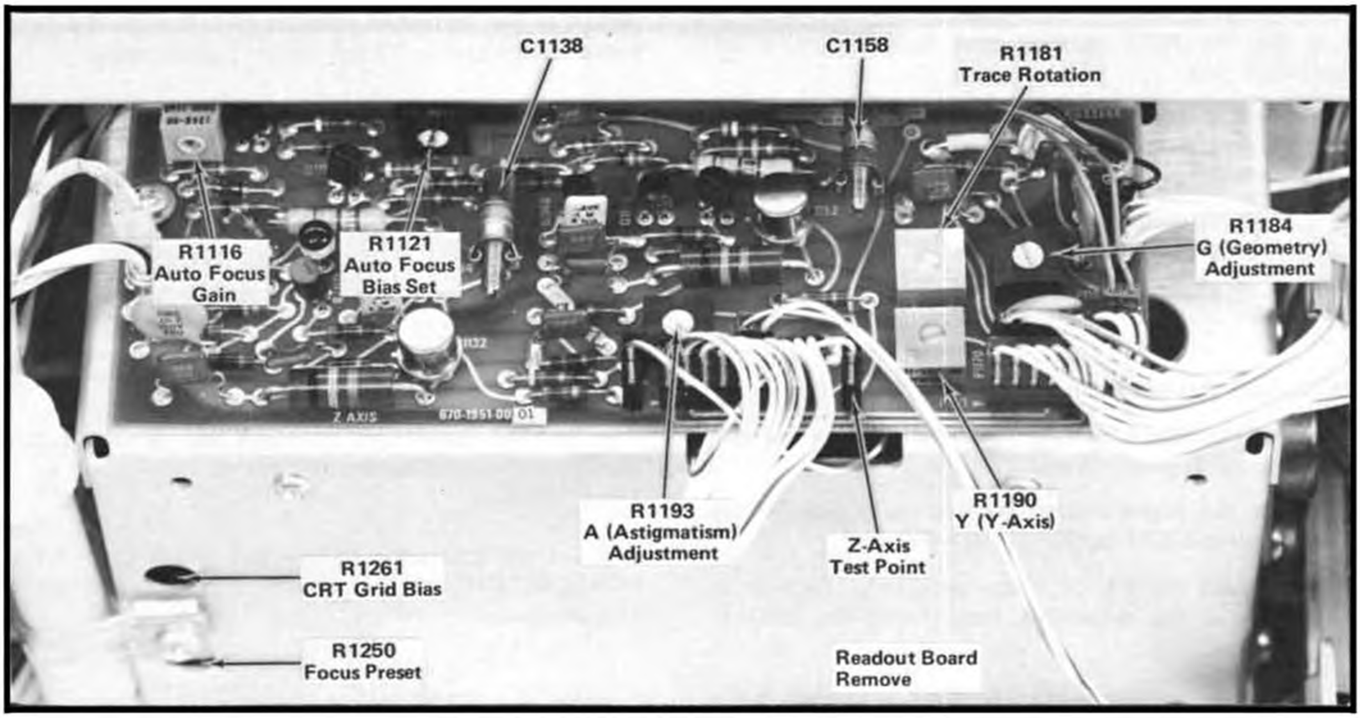


Fig. 2-2. Location of Display and Z Axis adjustments and test points.

d. Connect a 10X probe from the test-oscilloscope to the Z-Axis test point (see Fig. 2-2) and the probe ground lead to chassis ground.

e. Set the test-oscilloscope to DC input and a display of 5 volts/division (including probe attenuation), position the trace to the center graticule line.

f. ADJUST—INTENSITY control for a display amplitude 2 volts above the center graticule line.

g. ADJUST—CRT Grid Bias adjustment R1261 (see Fig. 2-2) until the trace on the 7623 (R7623) is just extinguished. Set INTENSITY for a viewable trace.

4B. Check Z-Axis DC Levels

a. Set the test-oscilloscope for 10 V/division, DC input. Connect its 10X probe to the 7623 (R7623) Z-Axis test point (see Fig. 2-2) and probe ground lead to chassis ground.

b. Set the time base plug-in in the 7623 (R7623) to 50 ms/division not intensified and the test-oscilloscope time base to 1 sec/div.

c. Set the calibration fixture Position control to position the trace vertically off screen, and set the INTENSITY control fully clockwise.

d. CHECK—The test-oscilloscope display amplitude should be at least 58 volts, note this reading.

e. Set the 7623 (R7623) time base plug-in to 0.1 second/division.

f. CHECK—Pulse amplitude deflection on the test-oscilloscope should decrease to between 25 volts to 35 volts less than the amplitude in step d.

g. Disconnect the test oscilloscope 10X probe from the 7623 (R7623) and reduce the INTENSITY setting to a normal intensity. Position the trace within the graticule area.

5. Adjust Astigmatism

a. Set the 7B53A for auto, internal triggering at a sweep rate of one millisecond/division.

b. Set the mainframe standardizer calibration fixture Test switch to VERT or HORIZ AUX IN.

c. Connect the 4 V Calibrator pin-jack to the Aux In connector of the calibration fixture with the BNC to pin-jack cable.

d. Set the calibration fixture Position control for a centered display, and the Amplitude control for about two divisions of vertical deflection.

e. CHECK—CRT display is well defined.

f. ADJUST—FOCUS control and Astigmatism adjustment R1045 (see Fig. 2-2) to obtain best display definition.

g. Disconnect the cable.

√ 6. Adjust Trace Rotation

a. Set the INTENSITY control to midrange.

b. Move the trace to the center horizontal line with the mainframe standardizer Position control.

c. CHECK—Trace aligns with the center horizontal line within 0.1 division.

d. ADJUST—Trace Rotation adjustment R1181 (see Fig. 2-2) to align the trace with the center horizontal line.

√ 7. Adjust Y-Axis Alignment

a. Inter-change the 7B53A and mainframe standardizer plug-in units.

b. Move the trace to the center vertical line with the mainframe standardizer Position control.

c. CHECK—Trace aligns with the center vertical line within 0.1 division.

d. ADJUST—Y-Axis adjustment R1190 (see Fig. 2-2) to align the trace with the center vertical line.

8. Adjust Geometry

a. Remove the mainframe standardizer and install the 7B53A in the horizontal compartment. Replace the mainframe standardizer in the left vertical compartment.

b. Set the VERT MODE switch to LEFT.

c. Connect the marker output of the time-mark generator to the Aux In connector of the calibration fixture with an 18-inch 50-ohm BNC cable.

d. Connect the trigger output of the time-mark generator to the external trigger input connector of the 7B53A with a 42-inch 50-ohm BNC cable.

e. Set the time-mark generator for one-millisecond markers and one-millisecond triggers.

f. Set the calibration fixture Test switch to VERT or HORIZ AUX IN and the Amplitude Step or Aux control fully clockwise.

g. Set the 7B53A for auto triggering from the external source at a sweep rate of 0.5 millisecond/division (magnifier off).

h. Set the time-mark generator for both one- and 0.1-millisecond markers.

i. Position the baseline of the markers as far toward the bottom of the graticule as possible with the calibration fixture Position control.

j. CHECK—Vertical bowing and tilt of the marker display for less than 0.1 division (each 0.1-millisecond marker represents 0.1 division).

k. ADJUST—Geometry adjustment R1184 (see Fig. 2-2) for minimum bowing for time markers. Adjustment may have to be compromised to obtain less than 0.1 division bowing and tilt everywhere within the graticule area.

√ 9. Check External Z-Axis Operation

a. Install the 7A15A in the right vertical compartment.

b. Connect the output of the medium-frequency constant-amplitude signal generator to the input of the 7A15A through the five-nanosecond GR cable, 50-ohm GR in-line termination, and the BNC T connector.

c. Set the 7A15A for a deflection factor of one volt/division.

d. Set the 7B53A for auto, internal triggering at a calibrated sweep rate of 10 microseconds/division.

e. Set the medium-frequency generator for a two-division display at its reference frequency (50 kilohertz).

f. Connect the output of the BNC T connector to the EXT Z-AXIS connector with the 42-inch 50-ohm BNC cable.

√ g. CHECK—Top portion of displayed waveform blanked out.

h. Disconnect cable from external Z-AXIS CONNECTOR.

√ 10. Check Beam Finder

a. Set the 7A15A deflection factor to 20 millivolts/division. Notice that the display exceeds the viewing area.

b. Press the BEAM FINDER switch.

c. CHECK—Display compressed within graticule area.

d. Increase the 7A15A deflection factor until the compressed display is reduced in amplitude.

e. Release the BEAM FINDER switch.

√ f. CHECK—Display remains within graticule area.

g. Disconnect all test equipment and remove the plug-in units.

VERTICAL DEFLECTION SYSTEM

Equipment Required

1. Mainframe standardizer calibration fixture
2. 7B53A plug-in unit
3. High-frequency generator
4. 7A15A plug-in unit (two)
5. 10X probe
6. Five-nanosecond GR cable
7. 50-ohm GR in-line termination
8. BNC to pin-jack cable
9. Dual-input coupler
10. Three-inch screwdriver
11. Low-capacitance screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

11. Adjust Bias Adjustment

a. Install the 7B53A in the horizontal compartment.

b. Set the 7B53A for auto, external triggering at a sweep rate of one millisecond/division.

c. Install the mainframe standardizer calibration fixture in the left vertical compartment. Set the calibration fixture Test switch to VERT or HORIZ Gain and the Rep Rate switch to 250 kHz.

d. ADJUST—Bias R486 for maximum gain. (See Fig. 2-3.)

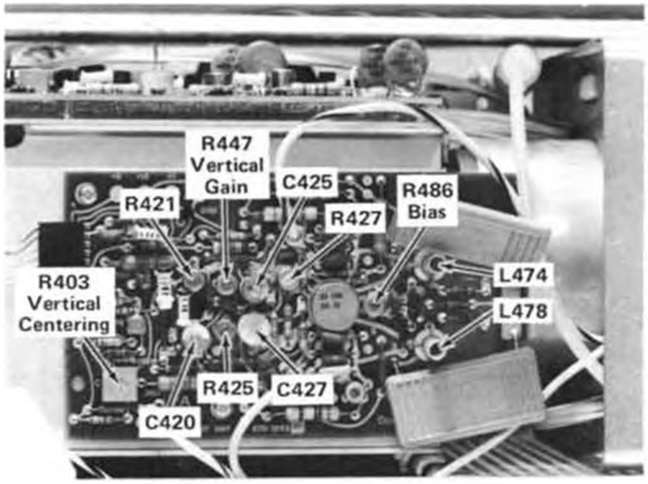


Fig. 2-3. Location of Vertical System adjustments (Vertical Output board).

12. Adjust Vertical Centering

a. Set the calibration fixture Test switch to TRIGGERING GAIN.

b. The trace should be within 0.3 division of the graticule center line.

c. ADJUST—Vertical Centering adjustment R403 (see Fig. 2-3) to position the trace to the center horizontal line.

13. Adjust Vertical Gain

a. Set the calibration fixture Test switch to VERT or HORIZ GAIN.

b. Position the display so that the first and seventh traces are near the top and bottom lines of the graticule.

c. CHECK—Deflection between the second and sixth traces should be six divisions ±0.06 division.

d. ADJUST—Vertical Gain adjustment R447 (see Fig. 2-3) for exactly six divisions of deflection between the second and sixth traces.

e. Remove the calibration fixture from the left vertical compartment and install it in the right vertical compartment.

f. Set the VERT MODE switch to RIGHT.

g. CHECK—Deflection between the second and sixth traces should be the same as part c or d ±1%.

h. ADJUST—Adjustment for R447 for correct tolerance in both parts d and h.

√ 14. Check Vertical Linearity

a. Remove the mainframe standardizer calibration fixture. Install the 7A15A in the left vertical compartment and connect a 0.4 volt square-wave signal from the CALIBRATOR out jacks. Set the VERT MODE switch to left.

b. Set the 7A15A Volts/Div switch to 0.2 volt/division. Adjust the position control to keep the display centered on the graticule and adjust the Variable Volts/Div control for a two division display.

√ c. CHECK—Position the two divisions of display vertically and check for not more than 0.1 division of compression or expansion anywhere within the graticule area. Remove the 7A15A and install the mainframe standardizer calibration fixture.

15. Adjust Vertical High-Frequency Compensation

a. Set the calibration fixture Test switch to VERT or HORIZ +STEP RESP, REP RATE switch to 250 kHz, and adjust the Amplitude control for a six-division display.

b. Set the 7B53A for a calibrated sweep rate of five nanoseconds/division (use X10 magnifier). Set the trigger source switch internal adjust trigger level control and position control for a stable display, centered on the graticule.

c. CHECK—Check for optimum square corner and flat top on displayed pulse with aberrations not to exceed ±0.1 or −0.1 division with total peak-to-peak aberrations not to exceed 0.1 division.

d. Adjust—High-frequency compensation as given in Table 2-2 for optimum square leading corner and flat top with minimum aberrations within limits given in part c. Location of adjustments is shown in Fig. 2-3. Use the low capacitance screwdriver to adjust the variable capacitors. Repeat the complete adjustment procedure several times to obtaim optimum adjustment.

e. Remove the calibration fixture from the left vertical compartment and install it in the right vertical compartment.

TABLE 2-2

High-Frequency Compensation

Adjustment	Primary Area Of Pulse Affected	Best Sweep Rate
C420 and R421	First 50 nanoseconds	50 nanoseconds/ division
C425 and R425	First 20 nanoseconds	20 nanoseconds/ division
C427 and R427	First 5 nanoseconds	20 nanoseconds/ division

f. Set the VERT MODE switch to RIGHT.

g. CHECK—Optimum square leading corner and flat top on the displayed pulse with aberrations not to exceed +0.1 or −0.1 division, with total peak-to-peak aberrations not to exceed 0.1 division.

h. ADJUST—If necessary, compromise the adjustment of C420, R421, C425, C427, and R427 for best response from both the left and right vertical compartments.

i. To verify correct high-frequency compensation, perform the bandwidth check as given in next step.

√ 16. Check Vertical Amplifier Bandwidth

a. Connect the high-frequency constant-amplitude signal generator to the CW In connector of the mainframe standardizer calibration fixture.

b. Set the Test switch of the calibration fixture to VERT or HORIZ FREQ RESP.

c. Set the 7B53A for a sweep rate of 0.2 microsecond/ division.

d. Set the high-frequency generator for six divisions of deflection, centered on the graticule, at a reference frequency of 3 megahertz.

e. Without changing the output amplitude, increase the output frequency of the high-frequency generator until the display is reduced to 4.2 divisions (−3 dB point).

√ f. CHECK–Output frequency must be 100 megahertz or higher.

g. Remove the calibration fixture from the right vertical compartment and install it in the left vertical compartment (leave signal connected).

h. Set the VERT MODE switch to LEFT.

i. Repeat parts d through f. Actual frequency (right vertical), 100 megahertz or higher.

j. Disconnect all test equipment (leave plug-in units installed).

√ 17. Check Vertical Amplifier Isolation

a. Remove the mainframe standardizer calibration fixture from the right vertical compartment and install the 7A15A in this compartment.

b. Set the 7A15A for a deflection factor of 0.1 volt/division.

c. Connect the output of the high-frequency generator to the input of the 7A15A.

d. Set the high-frequency generator for eight divisions of deflection at 100 megahertz.

e. Set the VERT MODE switch to RIGHT.

√ f. CHECK–CRT display for not more than 0.1 division of 100 megahertz signal (channel isolation at least 100:1).

g. Remove the 7A15A from the left vertical compartment and install it in the right vertical compartment (leave signal connected).

h. Set the high-frequency generator for eight divisions of deflection at 100 megahertz.

i. Set the VERT MODE switch to LEFT.

√ j. CHECK–CRT display for not more than 0.1 division of 100 megahertz signal.

k. Disconnect all test equipment.

√ 18. Check ADD Operation

a. Install the other 7A15A in the left vertical compartment.

b. Set both 7A15A units for a deflection factor of 0.2 volt/division.

c. Connect the 0.4 V Calibrator signal to the inputs of the 7A15A units with the BNC to pin-jack cable and dual-input coupler.

d. Set the 7B53A for auto, internal triggering at a sweep rate of 0.5 millisecond/division.

e. Center the display with the left 7A15A Position control and note the vertical deflection.

f. Set the VERT MODE switch to RIGHT.

g. Center the display with the right 7A15A Position control and note the vertical deflection.

h. Set the VERT MODE switch to ADD.

√ i. CHECK–CRT display; vertical deflection should approximately equal the algebraic sum of the deflection noted in parts e and g of this step.

j. Disconnect the BNC to pin-jack cable and dual-input coupler.

√ 19. Check Alternate Operation

a. Set the VERT MODE switch to ALT.

b. Position the traces about two divisions apart.

c. Turn the 7B53A Time/Division switch throughout its range.

√ d. CHECK–Trace alternates between the left and right 7A15A units at all sweep rates. At faster sweep rates, alternations will not be apparent; instead, the display appears as two traces on the screen.

√ 20. Check Vertical Chopped Mode Operation

a. Connect the 10X probe to the external trigger input of the 7B53A.

b. Connect the probe tip to TP67 (see Fig. 2-4).

c. Position the trace several divisions above the center line with the Position control.

d. Set the VERT MODE switch to CHOP.

e. Set the 7B53A for auto, external triggering at a sweep rate of 0.2 microsecond/division.

√ f. CHECK—CRT display for chopped waveform display with duration of the time segment from each channel, including the blanked portion, between two and three divisions. Also, check that the unblanked (visible) portion of the time segment from each channel consists of at least 75% of the duration of the total channel segment.

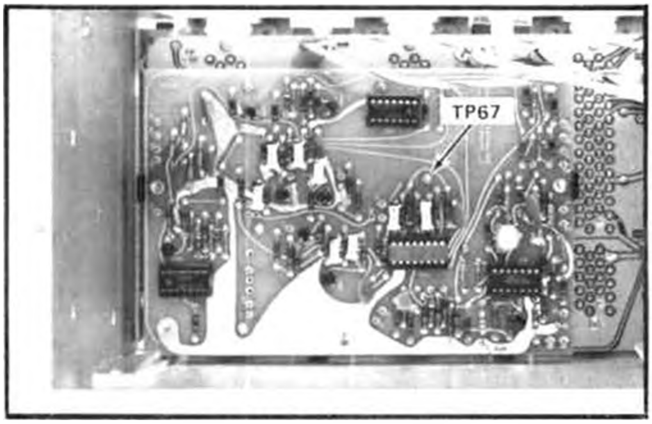


Fig. 2-4. Location of TP67 on Logic board (shown with power unit removed).

g. Disconnect the probe and remove all plug-in units.

TRIGGERING SYSTEM

Equipment Required	
1. Mainframe standardizer calibration fixture	3. 7A15A plug-in unit
2. 7B53A plug-in unit	4. BNC to pin-jack cable

Control Settings

Set the controls as given in the Preliminary Control Settings.

√ 21. Check Trigger Source Operation

a. Install the mainframe standardizer calibration fixture in the right vertical compartment and the 7A15A in the left vertical compartment.

b. Install the 7B53A in the horizontal compartment.

c. Set the 7B53A for auto, internal triggering at a sweep rate of 0.5 millisecond/division.

d. Set the 7A15A for a deflection factor of 0.2 volt/division.

e. Connect the 0.4 V Calibrator pin-jack to the input of the 7A15A with the BNC to pin-jack cable.

f. Position the Calibrator waveform display in the upper half of the graticule area with the 7A15A Position control.

g. Set the VERT MODE switch to RIGHT.

h. Set the calibration fixture Test switch to VERT or HORIZ + STEP RESP, REP RATE switch to 250 Hz, and adjust the Amplitude control for a two-division display. Position the display in the lower half of the graticule area.

i. Set the VERT MODE switch to ALT.

√ j. CHECK—CRT display; both square-wave displays are stable.

k. Set the TRIG SOURCE switch to LEFT.

√ l. CHECK—CRT display; Calibrator display only is stable.

m. Set the TRIG SOURCE switch to RIGHT.

√ n. CHECK—CRT display; only the calibration fixture display is stable.

o. Disconnect the BNC to pin-jack cable and remove the plug-in units.

HORIZONTAL DEFLECTION SYSTEM

Equipment Required

1. 7B53A plug-in unit
2. 7A15A plug-in unit (two)
3. Mainframe standardizer calibration fixture
4. Test-oscilloscope system with two 10X probes
5. Time-mark generator
6. Low-frequency generator
7. Medium-frequency generator
8. Dual-input coupler
9. Five-nanosecond GR cable
10. 50-ohm GR in-line termination
11. 42-inch 50-ohm BNC cable
12. 50-ohm BNC termination
13. Three-inch screwdriver
14. Low-capacitance screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

22. Adjust Horizontal Amplifier Limit Centering

a. Remove the mainframe standardizer calibration fixture and 7B53A. Install the 7B53A in the horizontal compartment.

b. Set the 7B53A for auto, internal triggering at a sweep rate of one millisecond/division with the magnifier on.

c. Connect 10X probes to both inputs of the test oscilloscope. Connect the probe tips to the horizontal deflection plate connectors of the 7623 (be sure probes are compensated).

d. Set both channels of the test oscilloscope for a vertical deflection factor of 0.5 volt/division (five volts/division at probe tip) in the chop dual-trace mode with the input coupling set to ground.

e. Position the ground-reference traces displayed on the test oscilloscope to the center horizontal line of the graticule. Do not change the test-oscilloscope position controls after establishing this ground reference.

f. Set the test oscilloscope for DC input coupling and set the triggering controls so that the test oscilloscope is triggered from the signal on channel 1 only. Set the triggering controls for a stable display at a sweep rate of two milliseconds/division.

g. CHECK—The baseline of both displayed waveforms should be at the same DC level within 0.2 division (see Fig. 2-5).

h. ADJUST—Limit Centering adjustment R535 (see Fig. 2-6) to match the DC levels of both waveforms.

i. INTERACTION—If R535 is adjusted, re-check steps 22 through 25.

j. Disconnect all test equipment.

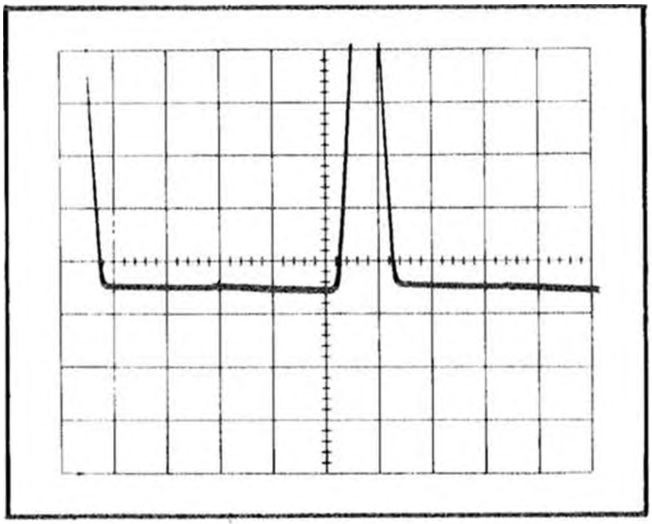


Fig. 2-5. Test oscilloscope waveforms when horizontal limit centering is properly adjusted.

23. Adjust Horizontal Amplifier Centering

a. Set the Test switch on the calibration fixture to TRIGGERING GAIN.

b. CHECK—Vertical trace produced by 7B53A should align with the vertical center line of the graticule within 0.3 division.

c. ADJUST—Horizontal Centering adjustment R525 (see Fig. 2-6) to position the trace to the vertical center line.

d. INTERACTION—If R525 is adjusted, re-check step 22.

√24. Check/Adjust Horizontal Amplifier Gain and Low-Frequency Linearity

a. Install the 7A15A in the horizontal compartment and the 7B53A in the vertical compartment. Set the 7A15A Volts/Div switch to 0.2 volt/division. Connect a 0.4 volt square-wave Calibrator signal to the 7A15A; adjust the Position control to keep the display centered on the graticule and adjust the Variable Volts/Div control, if needed, for two-division display.

√ b. CHECK—Position the two division display horizontally and check for not more than 0.1 division compression or expansion anywhere within the graticule area. Remove the 7A15A and install the mainframe standardizer calibration fixture. Set the Test switch on the calibration fixture to VERT or HORIZ GAIN.

c. Set the 7B53A for auto, external triggering at a sweep rate of one millisecond/division.

d. Position the display so that the first and ninth traces are near the far left and right vertical lines of the graticule.

e. CHECK—Deflection between the second and eighth traces is eight divisions ±0.08 division.

f. ADJUST—Horizontal Gain adjustment R512 (see Fig. 2-5) for exactly eight divisions of deflection between the second and eighth traces.

g. CHECK—With gain set exactly, all nine vertical traces align with their respective graticule lines within 0.05 division.

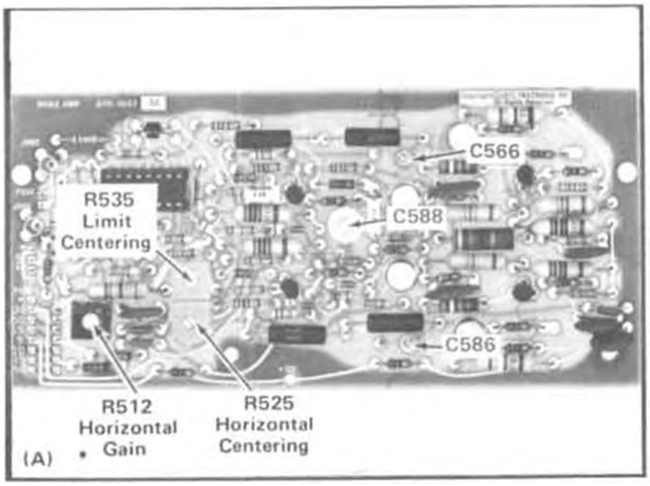


Fig. 2-6. Location of Horizontal System adjustments (Horizontal Amplifier board).

h. INTERACTION—If R512 is adjusted, re-check steps 22 through 25.

√ 25. Adjust High-Frequency Timing

a. Install the 7A15A in the left vertical compartment.

b. Connect the time-mark generator to the input connector of the 7A15A with the 42-inch 50-ohm BNC cable and the 50-ohm BNC termination.

c. Set the time-mark generator for one-millisecond markers. Set the deflection factor of the 7A15A so the markers are at least two divisions in amplitude.

d. Set the 7B53A for auto, internal triggering at a sweep rate of one millisecond/division.

e. Position the first marker to the left vertical line of the graticule.

f. Set the 7B53A Swp Cal adjustment for one marker each major graticule division between the first and ninth lines.

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

h. Set the 7B53A for a sweep rate of 0.05 microsecond/division with the X10 magnifier on; set the deflection factor of the 7A15A so that the markers are about two divisions in amplitude.

√ i. CHECK—CRT display for one marker for each two divisions over the center eight divisions.

j. ADJUST—C566, C586, and C588 (see Fig. 2-6) for one marker each two divisions over the center eight divisions (use low capacitance screwdriver). Set C588 to minimum capacitance and adjust C566 and C586 equally for optimum timing. If necessary readjust C588.

√ 26. Check X-Y Phase Shift

a. Install the 7A15A plug-in units in the left vertical and horizontal compartments.

b. Set both 7A15A units for a deflection factor of 10 millivolts/division with DC input coupling.

c. Connect the low-frequency signal generator to the inputs of both 7A15A plug-in units with the 42-inch 50-ohm BNC cable, 50-ohm BNC termination, and dual-input coupler.

d. Set the low-frequency generator for eight divisions of vertical and horizontal deflection at an output frequency of 35 kilohertz.

√ e. CHECK—CRT lissajous display for an opening at the center vertical line of 0.28 division or less (indicates 2 degrees or less phase shift; see Fig. 2-7).

f. Disconnect all test equipment (leave plug-in units installed).

√ 27. Check Horizontal Bandwidth

a. Install the 7B53A in the right vertical compartment.

b. Set the VERT MODE switch to RIGHT.

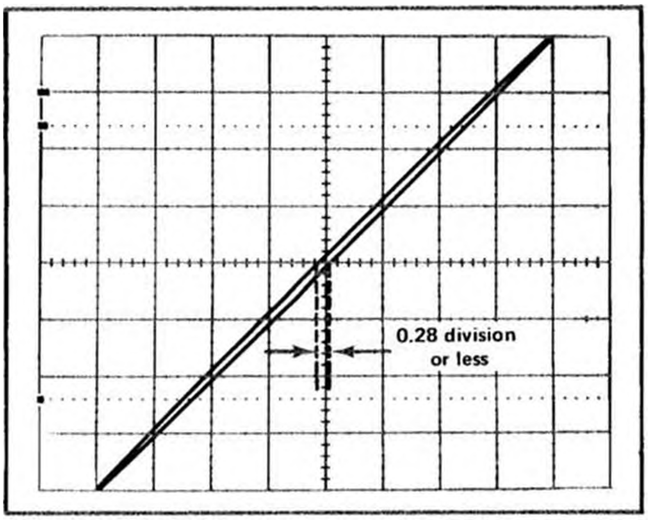


Fig. 2-7. Typical CRT display when checking X-Y phase shift.

c. Set the 7B53A for auto triggering at a sweep rate of one millisecond/division (display will free run).

d. Connect the medium-frequency generator to the input of the 7A15A in the horizontal compartment with the five-nanosecond GR cable and the 50-ohm GR in-line termination.

e. Set the medium-frequency generator for 8 divisions of horizontal deflection at its reference frequency (50 kilohertz).

f. Without changing the output amplitude, increase the output frequency of the generator to 2 megahertz.

√ g. CHECK—For at least 5.6 divisions of signal amplitude.

h. Disconnect all test equipment and remove the plug-in units.

Z-AXIS AND AUTO FOCUS SYSTEM

Equipment Required	
1. 7B53A plug-in unit	4. Medium-frequency generator
2. 7A15A plug-in unit	5. 42-inch 50-ohm BNC cable
3. 10X passive probe	6. 50-ohm BNC termination

28. Adjust Z-Axis Compensation

a. Install the 7A15A in the right vertical compartment.

b. Set the VERT MODE switch to RIGHT.

c. Connect the 10X probe to the input of the 7A15A. Check the probe compensation.

d. Set the 7B53A for a sweep rate of one microsecond/division with the 10X magnifier on.

e. Connect the probe tip to R1157, Z-Axis output and connect the ground clip to the 7623 chassis.

f. Set the 7A15A for a deflection factor of one volt/division (10 volts/division at probe tip).

g. ADJUST—The INTENSITY control for three divisions of vertical deflection on the CRT. Position the display so that the positive leading edge of the waveform is displayed.

h. ADJUST—C1158 for optimum square positive leading corner (use a low capacitance screwdriver to adjust the variable capacitor).

i. Disconnect the probe.

29. Auto Focus Compensation and Operating Levels

a. Connect the probe tip to R1137, Z-Axis output.

b. ADJUST—The INTENSITY control for three divisions of vertical deflection on the CRT. Position the display so the negative leading edge of the waveform is displayed.

c. ADJUST—C1138 for optimum square negative leading corner (use a low capacitance screwdriver to adjust the variable capacitor).

d. Disconnect the probe.

e. Set the 191 constant amplitude signal generator to 50 kHz only.

f. Connect the 191 output to the input of the 7A15A. Adjust the amplitude of the 191 for a two division display.

g. Midrange R1045, the front panel FOCUS control.

h. Reduce the intensity so the display is just visible. Adjust R1250, the Focus Preset control, for optimum focus.

i. Increase the INTENSITY control to midrange and adjust R1121 Auto Focus Bias, set control for optimum focus.

j. Increase the intensity to almost maximum and adjust R1116 Auto Focus Gain for optimum focus

k. Repeat steps m through o. Focus the display for a low intensity display and change the intensity to a brighter display. Check that the focus of the display remains optimized.

l. Disconnect all test equipment.

CALIBRATOR

Equipment Required	
1. Precision DC voltmeter	3. 7B53A plug-in unit
2. 7A15A plug-in unit	4. BNC to pin-jack cable
	5. Three-inch screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

√ 30. Adjust Calibrator Output Voltage

a. Change jumper P1066 (see Fig. 2-8) to the DC position.

b. Connect the precision DC voltmeter between the 4 V and GND pin jacks.

√ c. CHECK—Meter reading; 4 volts ±0.04 volt (within ±0.08 volt if this measurement is made outside the +15°C to +35°C range).

d. ADJUST—4 Volts adjustment R1077 (see Fig. 2-8) for a meter reading of exactly 4 volts.

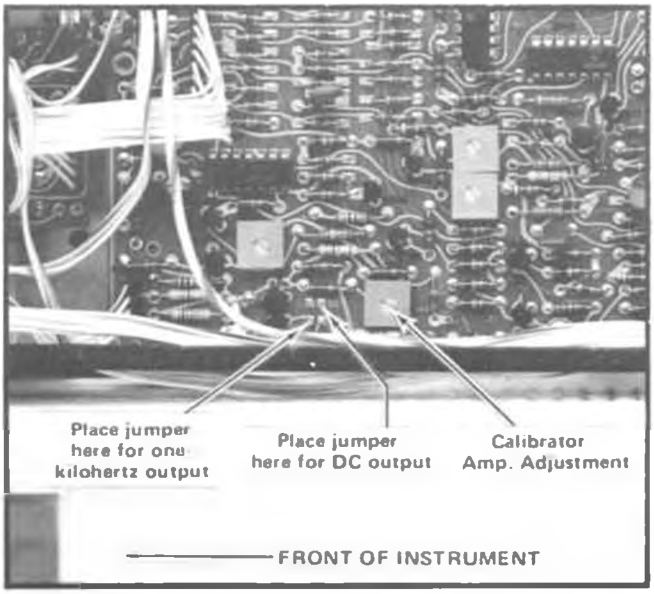


Fig. 2-8. Location of Calibrator adjustments (Cal-Storage board).

e. Connect the precision DC voltmeter between the 0.4 V Calibrator pin-jack and pin-jack ground.

√ f. CHECK—Meter reading; 0.4 volt ±0.004 volt (within 0.008 volt if this measurement is made outside the +15°C to +35°C range).

g. Connect the precision DC voltmeter between the 40 mV Calibrator pin-jack and pin-jack ground.

√ h. CHECK—Meter reading; 40 millivolt ±0.4 millivolt (within 0.8 millivolt if this measurement is made outside the +15°C to +35°C range).

i. Disconnect the precision DC voltmeter.

√ 31. Check Calibrator Repetition Rate

a. Change jumper P1066 (see Fig. 2-8) to the AC position.

b. Install the 7A15A in the left vertical compartment and the 7B53A in the horizontal compartment.

c. Set the 7A15A for a deflection factor of one volt/division.

d. Set the 7B53A for auto, internal triggering at a sweep rate of 0.2 millisecond/division.

e. Connect the 4 V calibrator pin-jack to the input of the 7A15A with the BNC to pin-jack cable.

f. Position the start of the square wave to the left line of the graticule.

√ g. CHECK—CRT display for length of one complete cycle between 4.2 and 6.3 divisions (one kilohertz ±20%).

SIGNALS IN & OUT

Equipment Required	
1. 7A15A plug-in units (two)	4. BNC to pin-jack cable
2. 7B53A plug-in unit	5. Test oscilloscope
3. DC Voltmeter	6. 42-inch 50-ohm BNC cable

√ 32. Check SS READY OUT (REMOTE ERASE)

a. Connect the calibrator signal to the input of the 7A15A. Obtain a triggered display of 2 or more divisions.

b. Press the VAR PERSIST button.

√ c. CHECK—That when the REMOTE ERASE input connector is grounded that an erase cycle is generated.

d. Repeat steps b through c for each storage mode.

√ 33. Check EXT SS RESET IN

a. Set the 7B53A to Single Sweep at a sweep rate of 0.5 second/division.

√ b. CHECK—That when the EXT SS RESET IN input is grounded that the time-base single sweep function is reset.

√ 34. Check VERT SIG OUT

a. Set the 7B53A to Auto and adjust the trigger level for a stable display at 1 microsecond/division.

b. Connect a BNC cable to the VERT SIG OUT connector and to the 7A15A in the right vertical compartment. Set TRIG SOURCE switch to LEFT VERT.

c. Connect the 0.4 V CALIBRATOR signal to the input of 7A15A in the left vertical compartment. Set both vertical amplifiers for a deflection factor of 0.2 volts/division.

√ d. CHECK—That a two division signal is displayed by the left vertical amplifier.

e. Set VERT Mode switch to RIGHT and, check that a signal of about five divisions is displayed by the right vertical amplifier.

f. Interchange the connections to the vertical amplifiers. Set the TRIG SOURCE switch to right.

√ g. CHECK—That a two division signal is displayed by the right vertical amplifier.

h. Set the VERT MODE switch to LEFT and check that a signal of about five divisions is displayed.

i. Install a 50 Ω termination between the cable and the input of the right vertical amplifier.

j. Set the deflection factor of the left vertical to 10 mV/division. Check for a display of about five divisions.

k. Disconnect all cables.

√ 35. Check +SAWTOOTH OUT

a. Connect the +SAWTOOTH OUT to the input of the left vertical amplifier. Set the deflection factor of the left vertical amplifier for 2 volts/division.

√ b. CHECK—For a sawtooth display of about five divisions in amplitude and greater than 10 cm in length.

√ 36. Check + GATE OUT

a. Connect the + GATE OUT to the vertical input of the test oscilloscope and set the deflection factor for 2 volts/division. Set the time/division switch to 1 millisecond/division. Place the GAGE selector switch in the MAIN GATE position.

√ b. CHECK—That displayed signal is about five divisions in amplitude.

√ c. Set the gate selector switch to AUXILIARY. Check that the displayed signal is about five divisions in amplitude.

√ d. Set the GATE selector switch to DELAY.

NOTE

No output will be present with the 7B53A horizontal time-base plug-in. A delay gate signal is present with only a 7B71 or a 7B51 horizontal time-base plug-in unit.

READOUT OPERATION

Equipment Required	1. 7A18 dual display vertical plug-in unit

√ 37. Check READOUT Operation

√ a. Install the 7A18 in the left vertical compartment. Set the 7A18 to a dual trace mode. Push and hold the identify buttons on the 7A18. (Switch S2110 should be in the free position.) Check that the word identify is within the top division and the bottom division of the graticule. Check that the words identify are positioned within the left third of the graticule. Check completeness of characters without over-scanning (over-scanning causes a bright dot where the traces overlap).

b. ADJUST—Vertical Separation R2291 so the channel 1 characters are within the top division, and the channel 2 characters are within the bottom division.

c. ADJUST—Character height size R2273 as needed.

d. ADJUST—Character scan R2128 if characters are over scanned.

√ e. Remove the 7A18 from the left vertical and install it in the right vertical compartment. Push and hold the identify buttons on the 7A18. Check that the words identify are positioned within the center third of the graticule.

f. Remove the 7A18 from the right vertical and install it in the horizontal compartment. Push and hold the identify buttons on the 7A18. Check that the words identify are positioned within the right third of the graticule.

g. If the correct characters are displayed there is no need to adjust the Row Match adjustment R2183 or the Column Match adjustment R2214.

h. ADJUST—Row Match adjustment R2183 and Column Match adjustment R2214 for correct readout display.

i. Remove the dual trace plug-in unit.

READOUT GATE TRIG'D OPERATION

√ 38. Check Readout Gate Trig'd Operation

a. Set switch S2110 to Gate Trig'd position (see Fig. 2-9).

b. Install the time-base unit in the horizontal plug-in compartment. Set sweep rate to 1 second/division.

√ c. CHECK—That during the sweep that there is no readout information displayed, until after the sweep has been displayed. At fast sweep rates, this is not noticeable.

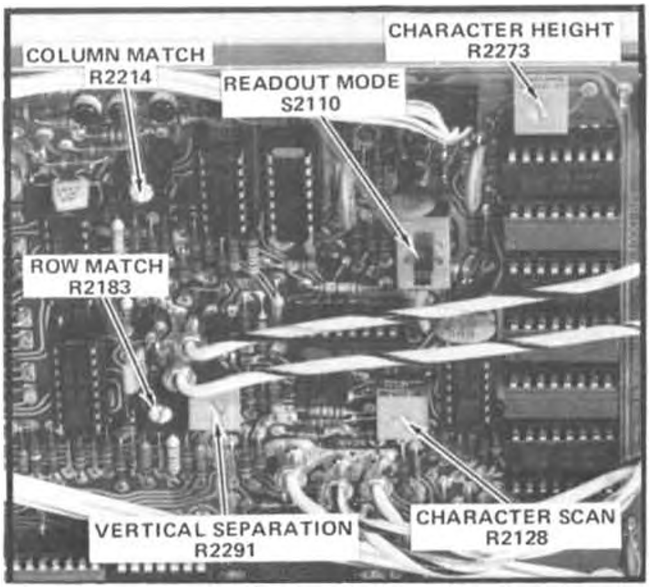


Fig. 2-9. Location of Readout adjustments and switch S2110 (Readout board).

STORAGE OPERATION

Equipment Required

1. 7B53A Horizontal time-base plug-in unit.
2. 7A15A Vertical amplifier plug-in unit.

Control Settings

Set the controls as given in the Preliminary Control Settings.

√ 39. CHECK—Auto Erase Function

a. Press the FAST button (in).

b. Press the AUTO ERASE button (in).

c. Install the Horizontal time-base plug-in unit in the horizontal compartment.

d. Install the Vertical amplifier plug-in unit in the left vertical compartment.

√ e. CHECK—That the stored trace is not erased for greater than 12 seconds.

f. Set the AUTO VIEW TIME control fully clockwise.

√ g. CHECK—That the stored trace is erased in less than one second.

h. Press the BI-STABLE button (in).

i. Repeat steps e through g.

j. Set the Time/Division setting on the horizontal time-base plug-in unit to 1 second/division.

√ k. CHECK—That the erase cycle does not occur until after the first sweep.

l. Press the VAR PERSIST button.

√ m. CHECK—That there is no Auto Erase function in the Variable Persistance Mode. Press the AUTO ERASE button (out).

√ 40. CHECK—SAVE Function

a. Press the SAVE button (in).

b. Press the ERASE button.

√ c. CHECK—That the stored trace cannot be erased.

√ d. CHECK—That the intensity of the stored display increases when the SAVE INTEN is turned clockwise.

e. Press the SAVE button (out).

f. Press the FAST button.

g. Press the SAVE button (in).

h. Press the ERASE button.

√ i. CHECK—That the stored trace cannot be erased.

√ j. CHECK—That the intensity of the stored display decreases when the SAVE INTEN is turned counterclockwise.

k. Press the SAVE button (out).

l. Press the BI-STABLE button.

m. Press the SAVE button (in).

√ n. CHECK—That the intensity of the stored display increases when the SAVE INTEN is turned clockwise.

√ o. CHECK—That the readout display can not be turned on while in the Save mode.

√ 41. CHECK—Readout Storage Operation

a. Press the SAVE button (out).

b. Press the NON-STORE button (in).

c. Set the READOUT control to the desired intensity.

d. Press the VAR PERSIST button.

√ e. CHECK—That the Readout display is stored after the trace display is stored.

f. Press the FAST button.

√ g. CHECK—That the Readout display is stored after the trace display is stored.

h. Press the MULTI TRACE button.

i. Set the TIME/DIV on the horizontal time-base plug-in unit to 2 second/division.

j. Press the ERASE (PREP IN MULTI TRACE FAST) button.

√ k. CHECK—That a new trace is stored, but the Readout display has not changed in value (readout is turned off).

l. Press the MULTI TRACE button (out).

m. Press the BI-STABLE button.

√ n. CHECK—That the Readout display is stored after the first trace after an erase cycle.

o. Press the SAVE button.

p. Press the NON-STORE button.

√ q. CHECK—That the non-store display or the readout display is not affected by the Save function in the non-store mode.

BI-STABLE STORAGE MODE

Equipment Required

1. 7B53A Horizontal time-base plug-in unit
2. 7A15A Vertical amplifier plug-in unit
3. Low-Frequency signal generator
4. 50-ohm BNC cable
5. Test-oscilloscope with 10X probe
6. Three-inch screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

42. Check—Storage Test points (see Fig. 2-10)

a. CHECK—Table 2-3 lists the storage test points and their voltage tolerances. Connect the test oscilloscope 10X probe to each storage test point, in turn, setting the test oscilloscope vertical deflection to 1.0 V, 2.0 V, and 5.0 V as required.

b. Install the vertical amplifier unit in the left vertical compartment.

c. Install the Horizontal time-base unit in the horizontal compartment.

d. Press the NON-STORE button.

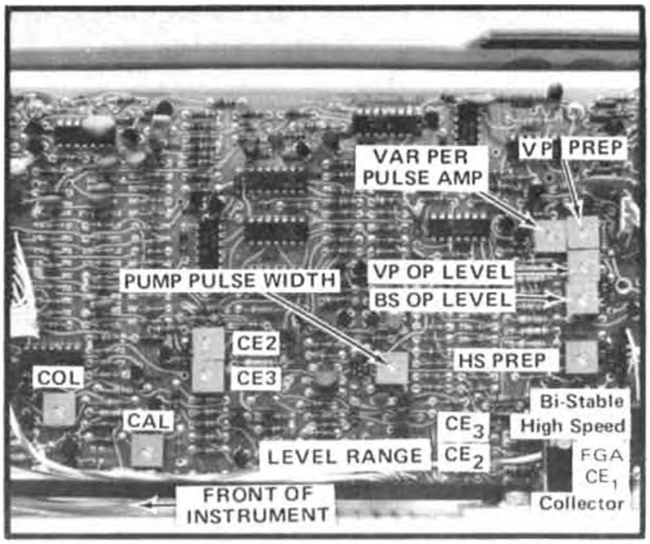


Fig. 2-10. Storage adjustments and storage test points (Cal-Storage board).

TABLE 2-3

Test Point	Tolerance
Bi-Stable	−12.8 V to −15 V
High Speed Mesh	+120 V to +130 V
Collector	+144 V to +156 V
CE_2	+60 V to +80 V
CE_3	+30 V to +50 V
CE_1	+67.2 V to +72.8 V
FGA	+34.5 V to +37.5 V
FGK	Approximately 50 V

e. Press the BI-STABLE button.

f. CHECK—Storage test points (see Fig. 2-10). Table 2-4 lists the Storage test points and their voltage tolerances in the Bi-Stable mode. Connect the test oscilloscope 10X probe to each storage test point, in turn setting the test oscilloscope vertical deflection to 1.0 V, 2.0 V, and 5.0 V as required.

TABLE 2-4

Test Point	Tolerance
High Speed Mesh	+120 V to +130 V
Collector	+144 V to +156 V
CE_3	+81.6 V to +88.4 V
CE_2	+81.6 V to +88.4 V
CE_1	+43.2 V to +46.8 V
FGA	+34.5 V to +37.4 V
FGK	Less than 500 mV

g. ADJUST—Bi-Stable Op level (R1325) for 70 volts.

h. Remove transistor Q1788.

i. Press ERASE button.

j. CHECK—Storage test points (see Fig. 2-10). Table 2-5 lists the storage test points and their voltage tolerance. Connect the test oscilloscope 10X probe to each storage test point, in turn, setting the test oscilloscope vertical deflection to 1.0 V, 2.0 V, and 5.0 V as required.

TABLE 2-5

Test Point	Tolerance
Bi-Stable	Approximately 320 V
CE_1	+81.6 V to +88.4 V
FGA	+86.4 V to +93.6 V

k. Install transistor Q1788.

l. Press the ERASE button.

m. Check that the storage screen erases.

n. Connect the 10X probe to the bi-stable test point. Set test oscilloscope vertical deflection to 5 volts/division at a sweep rate of 0.2 second/division.

o. Press the ERASE button.

p. CHECK—Test oscilloscope display for an erase waveform (see Fig. 2-11).

43. Adjust Bi-Stable Operating Level

a. Connect the low-frequency sine-wave generator to the left vertical amplifier plug-in unit.

b. Set the frequency of the sine-wave generator for a three kilohertz signal at 3.2 divisions of vertical deflection.

c. Set the horizontal time-base plug-in unit for a sweep rate of 0.1 millisecond/division.

d. Press the AUTO ERASE button (in), and turn the AUTO VIEWTIME control fully clockwise.

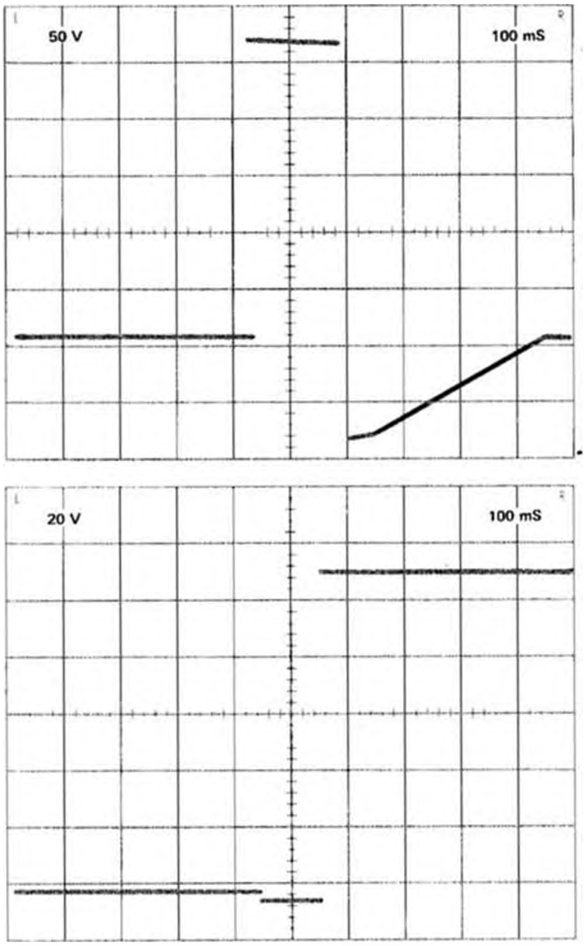


Fig. 2-11(A). Erase waveform (Bi-stable Test Point), (B). Transfer waveform (High speed test point).

e. Find lower writing threshold; adjust R1325 toward the zero volt level until the storage screen starts to go dark (see Fig. 2-10 for location of adjustments).

f. Find upper writing threshold; adjust R1325 until the stored signal level just fades into the background level.

g. Adjust Bi-Stable Op level mid-way between the lower threshold level and the upper threshold level.

h. Connect the test oscilloscope 10X probe to the FGK test point.

i. Press the INTEG button.

j. CHECK—That the FGK voltage increase to approximately +50 volts.

FAST STORAGE MODE

Equipment Required

1. 7B53A Horizontal time-base plug-in unit
2. 7A15A Vertical Amplifier plug-in unit
3. Medium-frequency constant-amplitude signal generator
4. Five-nanosecond GR cable
5. 50-ohm GR in line termination
6. Test-oscilloscope with 10X probe
7. Three-inch screwdriver

Control Settings

Set the controls as given in the Preliminary Control Settings.

√ 44. Check—Fast Storage Mode

a. Install the vertical amplifier unit in the left vertical compartment.

b. Install the horizontal time-base plug-in unit in the horizontal compartment.

c. Set the horizontal time-base unit to single sweep.

d. Connect the medium-frequency generator to the left vertical amplifier plug-in unit.

e. Set the frequency of the medium-frequency generator to five megahertz at 3.2 divisions of vertical deflection.

f. Press the FAST button.

g. Press the ERASE button.

√ h. Press the single sweep reset button on the horizontal time-base plug-in unit. A stored display should be visible.

i. CHECK—Storage test points (see Fig. 2-10). Table 2-6 lists the storage test points and their voltage tolerances. Connect the test oscilloscope 10X probe to each storage test point, in turn, setting the test oscilloscope vertical deflection factor to 1.0 V, 2.0 V, and 5.0 V as required.

TABLE 2-6

Test Points	Tolerance
High Speed Mesh	+120 V to +130 V
Collector	+144 V to +156 V
CE_3	+81.6 V to +88.4 V
CE_2	+81.6 V to +88.4 V
CE_1	+43.2 V to +46.8 V
FGA	+34.5 V to +37.4 V
FGK	Less than 500 mV

j. Disconnect the vertical plug-in units input signal.

k. Press the ERASE button (do not reset sweep or transfer the display to the viewing screen).

l. CHECK—Storage test points (see Fig. 2-10). Table 2-7 lists the storage test points and their voltage tolerances. Connect the test oscilloscope 10X probe to each storage test point, in turn, setting the test oscilloscope vertical deflection factor to 1.0 V, 2.0 V, and 5.0 V as required.

TABLE 2-7

Test Points	Tolerance
Collector	+122 V to +133 V
CE_3	+75 V to +85 V
CE_2	+30 V to +80 V
CE_1	+28 V to +32 V
FGA	+19 V to +21 V
FGK	Less than 500 mV

l. CHECK/ADJUST—Check High Speed Mesh for 13 volts. Adjust R1393 High Speed Mesh adjustment for 13 volts.

m. Press the single sweep reset on the horizontal time-base plug-in unit.

n. Remove the transistor Q1788.

o. Press the ERASE button.

p. CHECK—Storage test points (see Fig. 2-10). Table 2-8 lists the storage test points and their tolerances. Connect the test oscilloscope 10X probe to each test point, in turn, setting the deflection factor to 1.0 V, 2.0 V, and 5.0 V as required.

TABLE 2-8

Test Points	Tolerance
High Speed Mesh	+120 V to +130 V
CE_3	+81 V to +88 V
CE_2	+81 V to +88 V
CE_1	+81 V to +88 V
FGA	+86 V to +93 V
FGK	Less than 500 mV

q. CHECK/ADJUST—Check Collector for 120 volts. Adjust R1439 collector adjustment for +120 volts.

r. Replace transistor Q1788.

√ 45. Check—Erase and Fast Transfer Pulses

a. Connect 10X probe from test oscilloscope to the Bi-Stable test point.

b. Press the ERASE button.

c. CHECK—Test oscilloscope display for erase and transfer waveforms. See Fig. 2-11A and B for typical waveforms.

d. CHECK—Transfer pulse amplitude is greater than +540 volts above ground.

e. CHECK—Erase pulse amplitude is approximately 320 volts above ground.

f. CHECK—That erase ramp is less than 375 ms long, and that the ramp starts at zero volt level or below.

√ 46. Check—High Speed Mesh Pump Pulses

a. Set the test oscilloscope to 5.0 V/division vertical deflection (50 V/divison at probe tip), and a sweep rate of 1.0 microsecond.

b. Connect the test probe to the High Speed Mesh test point.

c. Press ERASE button (do not transfer or store a display).

d. CHECK/ADJUST—Check that the pump pulses are 2.0 μs wide (top of pulse only). Adjust pump pulse width R1559 for 2.0 μs at the top of the pulse.

√ 47. Check Pump Pulse Frequency

a. Set test oscilloscope sweep rate to 5.0 millisecond/division.

b. CHECK—For five pump pulses in eight divisions +1.2 divisions (100 Hertz ±15%).

48. Check/Adjust STORAGE LEVEL Range

a. Set STORAGE LEVEL control fully clockwise.

b. Set AUTO VIEWTIME fully clockwise and press the AUTO ERASE button.

c. Set horizontal time base plug-in unit for 0.1 microsecond.

d. CHECK/ADJUST—Check that only the center of the storage screen saturates during the store time. Adjust STORAGE LEVEL range adjustment R1410 so that only the center screen saturates.

√ 49. Check—FAST Storage Writing Rate

a. Connect a 10 megahertz signal (20 megahertz option 12) to the input connector of the left vertical plug-in unit.

b. Press ERASE button.

c. Press the Single Sweep Reset button on the horizontal time-base plug-in unit.

√ d. CHECK—That the signal is stored over a center four vertical division by five horizontal division display.

50. Check/Adjust—FAST Stability

a. Press the ERASE button.

b. Press the Single Sweep Reset button on the horizontal time-base plug-in unit.

c. CHECK—That the signal is stored and note quality of display.

d. Press the ERASE button and wait one minute.

e. Press the Single Sweep Reset button on the horizontal time-base plug-in unit.

f. CHECK—That the signal is stored; the quality should be the same as in step c.

g. ADJUST—Increase the high speed prep voltage level if step f fades up. Decrease high speed prep voltage level if only part of the signal is stored in step f. If stability cannot be achieved, raise the collector voltage and repeat steps a through g.

√ 51. Check/Adjust Variable Persistence Mode and Voltage Levels

a. Set the STORAGE LEVEL fully clockwise and press the VAR PERSIST button.

b. Set the VIEWTIME/PERSISTENCE control in the counterclockwise detent.

c. Set the horizontal time-base unit for single sweep at a sweep rate of 0.1 microsecond/division.

d. Connect the test oscilloscope 10X probe to the Bi-Stable test point.

e. While erasing, set both the Variable Persistence Op level and the Prep level (at zero voltage difference) to a voltage level where the screen is just dark. Increase both levels until the screen is fully saturated. Increase the Prep level until the corners of the storage screen start to go dark after an erase cycle.

f. Set the STORAGE LEVEL control counterclockwise.

g. CHECK—That the storage screen turns dark.

h. Connect the 50-kilohertz signal from the medium-frequency generator to the input connector of the left vertical plug-in unit.

i. Press the Single Sweep Reset button on the horizontal plug-in unit.

j. CHECK—That the signal is stored across the screen. Adjustment of the STORAGE LEVEL control may be necessary to obtain a stored display.

√ k. CHECK—That the stored display is visible for 15 seconds.

52. Check/Adjust Variable Persistence Pulse Amplitude

(See Fig. 2-10 for location of adjustments.)

a. Set the AUTO VIEWTIME/PERSISTENCE control fully clockwise.

b. Connect test oscilloscope 10X probe to the Bi-Stable test point. Set the test oscilloscope vertical deflection factor to 1.0 volt/division (ten volts/division at probe tip), and set the horizontal time-base unit for 0.5 millisecond.

c. CHECK/ADJUST—Check for a 22 volt variable persistence pulse. Adjust—Variable Persistence pulse amplitude (R1334) for 22 volts.

53. Check/Adjust CE_2 and CE_3 Voltage Levels

a. Press the FAST button (do not transfer or store a display).

b. CHECK—That the screen is uniformly bright over entire storage screen.

c. ADJUST—CE_3 and CE_2 (R1480 and R1470) so that the storage screen is uniformly bright.

This completes the calibration/checkout procedure for the 7623. Disconnect all test equipment and replace the side panels. If the instrument has been completely checked and adjusted to the tolerances given in this procedure, it will meet or exceed the specifications given in Section 1.

CIRCUIT DESCRIPTION

Introduction

This section of the manual contains a description of the circuitry used in the 7623 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 detailed block diagrams to show the interconnections between the stages within each major circuit and the relationship of the external controls and connectors to the individual stages.

A complete block diagram is located in the Diagrams section at the back of this manual. This block diagram shows the overall relationship between all of the circuits. Complete schematics of each circuit are also given in the Diagrams section. Refer to these diagrams throughout the following circuit description for electrical values and relationship.

BLOCK DIAGRAM

The following discussion is provided to aid in understanding the overall concept of the 7623 before the individual circuits are discussed in detail. A basic block diagram of the 7623 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 refers to the complete circuit diagram located at the rear of the manual.

Vertical signals to be displayed on the CRT are applied to the Vertical Interface circuit from both vertical plug-in compartments. The Vertical Interface circuit determines whether the signal from the left and/or right vertical unit is displayed. The selected vertical signal is then amplified by the Vertical Amplifier circuit to bring it to the level necessary to drive the vertical deflection plates of the CRT.

Horizontal signals for display on the CRT are connected to the Horizontal Amplifier circuit from the horizontal plug-in compartment. The Horizontal Amplifier circuit amplifies this signal to provide the horizontal deflection for the CRT.

The internal trigger signals from the vertical plug-in units are connected to the Trigger Selector circuit. This circuit selects the trigger signal which is connected to the horizontal plug-in unit. The Calibrator circuit produces a square-wave output signal with accurate amplitude which can be used to check the calibration of this instrument and the compensation of probes.

The Logic circuit develops control signals for use in other circuits within this instrument and the plug-in units. These output signals automatically determine the correct instrument operation in relation to the plug-ins installed and/or selected, plug-in control settings, and 7623 control settings. The CRT circuit produces the voltages and contains the controls necessary for operation of the cathode-ray tube. It also contains the Z-Axis Amplifier which provides the drive signal to control the intensity level of the CRT display. The storage Logic board produces the timing necessary for the storage output board to control the storage operation of the CRT.

The power necessary for the operation of this instrument is produced by the Low-Voltage Power Supply circuit. These voltages are connected to all circuits within the instrument.

CIRCUIT OPERATION

This section provides a detailed description of the electrical operation and relationship of the circuits in the 7623. The theory of operation for circuits unique to this instrument is described in detail in this discussion. Circuits which are commonly used in the electronics industry are not described in detail. If more information is desired on these commonly used circuits, refer to the following textbooks (also see books under Logic Fundamentals):

Tektronix Circuit Concepts Books (order from your local Tektronix Field Office or representative).

Cathode-Ray Tubes, Tektronix Part No. 062-0852-01.

Horizontal Amplifier Circuits, Tektronix Part No. 062-1144-00.

Oscilloscope Trigger Circuits, Tektronix Part No. 062-1056-00.

Power Supply Circuits, Tektronix Part No. 062-0888-01.

Sweep Generator Circuits, Tektronix Part No. 062-1098-01.

Vertical Amplifier Circuits, Tektronix Part No. 062-1145-00.

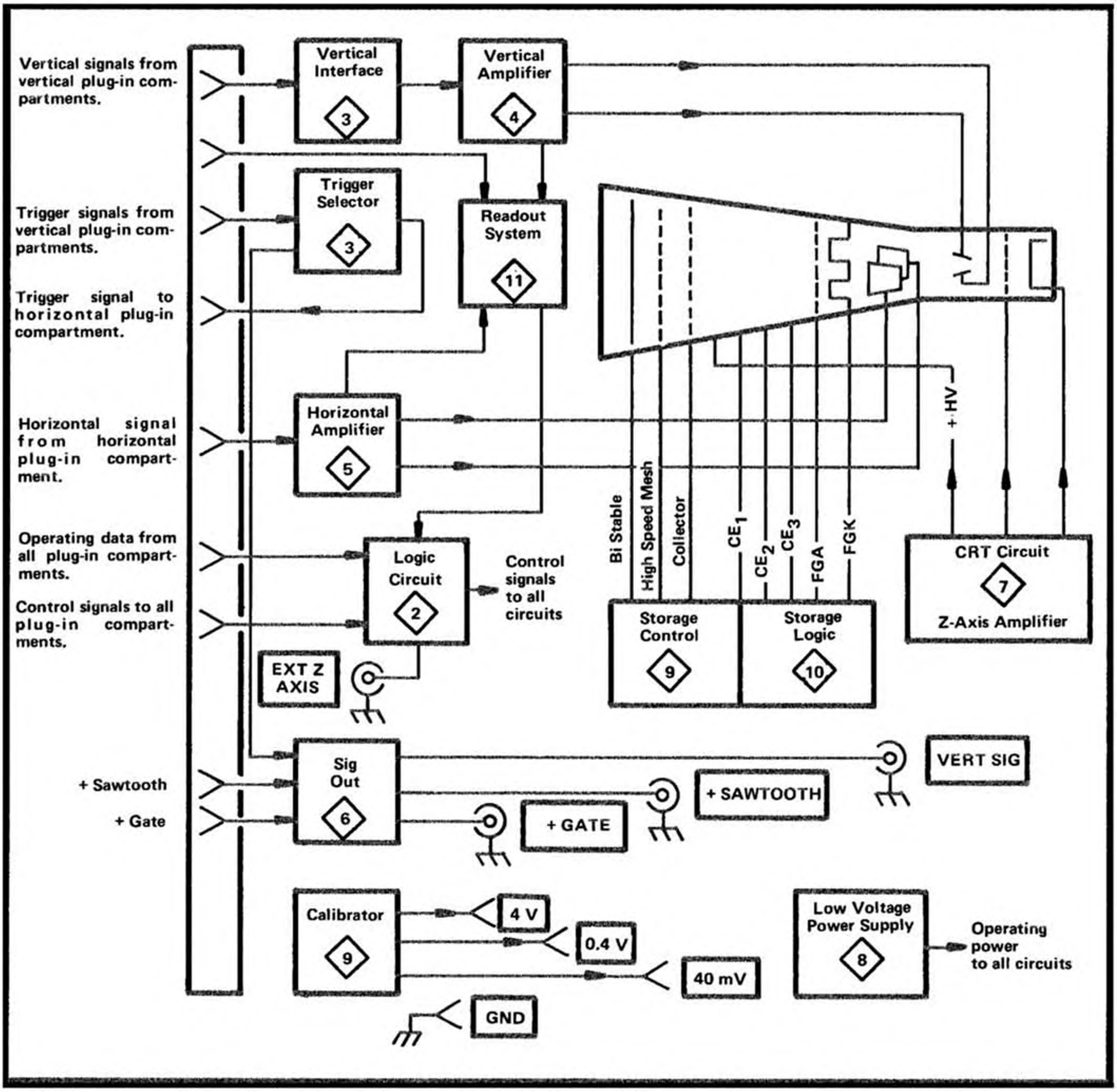


Fig. 3-1. Basic block diagram of 7623 Oscilloscope.

Phillip Cutler, "Semiconductor Circuit Analysis", McGraw-Hill, New York, 1964.

Lloyd P. Hunter (Ed.), "Handbook of Semiconductor Electronics", second edition, McGraw-Hill, New York, 1962.

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

The following circuit analysis is written around the detailed block diagrams which are given for each major circuit. These detailed block diagrams give the names of the individual stages within the major circuits and show how they are connected together to form the major circuit. The block diagrams also show the inputs and outputs for each circuit and the relationship of the external controls and connectors to the individual stages. The circuit diagrams from which the detailed block diagrams are derived are shown in the Diagrams section.

LOGIC FUNDAMENTALS

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

Tektronix Circuit Concepts booklet, "Digital Concepts", Tektronix Part No. 062-1030-00.

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

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

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

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

Symbols

The operation of circuits within the 7623 which use digital techniques is described using the graphic symbols set forth in military standard MIL-STD-806B. Table 3-1 provides a basic logic reference for the logic devices used within this instrument. Any deviations from the standard symbology, or devices not defined by this standard will be described in the circuit description for the applicable device.

TABLE 3-1

Basic Logic Reference

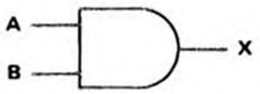
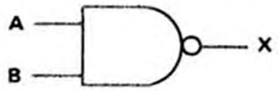
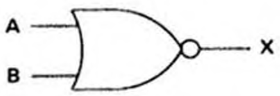
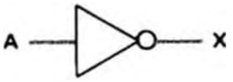
Device	Symbol	Description	Input/Output Table
AND gate		A device with two or more inputs and one output. The output of the AND gate is HI if and only if all of the inputs are at the HI state.	Input / Output A · B · X LO · LO · LO LO · HI · LO HI · LO · LO HI · HI · HI
NAND gate		A device with two or more inputs and one output. The output of the NAND gate is LO if and only if all of the inputs are at the HI state.	Input / Output A · B · X LO · LO · HI LO · HI · HI HI · LO · HI HI · HI · LO
OR gate		A device with two or more inputs and one output. The output of the OR gate is HI if one or more of the inputs are at the HI state.	Input / Output A · B · X LO · LO · LO LO · HI · HI HI · LO · HI HI · HI · HI
NOR gate		A device with two or more inputs and one output The output of the NOR gate is LO if one or more of the inputs are at the HI state.	Input / Output A · B · X LO · LO · HI LO · HI · LO HI · LO · LO HI · HI · LO

TABLE 3-1 (cont)

Basic Logic Reference

<table>
<tr><th>Device</th><th>Symbol</th><th>Description</th><th>Input/Output Table</th></tr>
<tr><td>Inverter</td><td>
</td><td>A device with one input and one output. The output state is always opposite to the input state.</td><td>
<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td>A</td><td>X</td></tr>
<tr><td>LO</td><td>HI</td></tr>
<tr><td>HI</td><td>LO</td></tr>
</table></td></tr>
<tr><td>LO-state indicator</td><td></td><td>A small circle at the input or output of a symbol indicates that the LO state is the significant state. Absence of the circle indicates that the HI state is the significant state. Two examples follow:</td><td></td></tr>
<tr><td></td><td>
</td><td>AND gate with LO-state indicator at the A input.

The output of this gate is HI if and only if the A input is LO and the B input is HI.</td><td>
<table>
<tr><th>Input</th><th></th><th>Output</th></tr>
<tr><td>A</td><td>B</td><td>X</td></tr>
<tr><td>LO</td><td>LO</td><td>LO</td></tr>
<tr><td>LO</td><td>HI</td><td>HI</td></tr>
<tr><td>HI</td><td>LO</td><td>LO</td></tr>
<tr><td>HI</td><td>HI</td><td>LO</td></tr>
</table></td></tr>
<tr><td></td><td>
</td><td>OR gate with LO-state indicator at the A input:

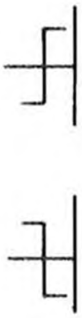
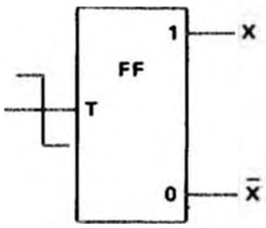
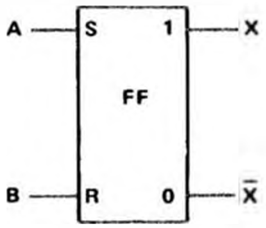
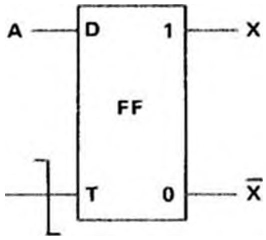
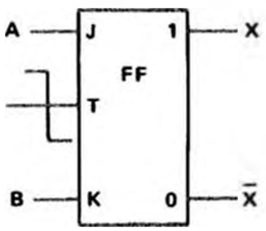
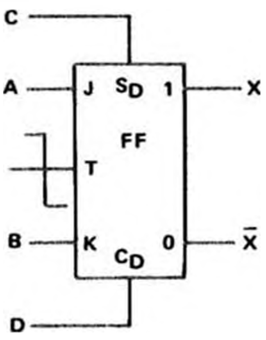
The output of this gate is HI if either the A input is LO or the B input is HI.</td><td>
<table>
<tr><th>Input</th><th></th><th>Output</th></tr>
<tr><td>A</td><td>B</td><td>X</td></tr>
<tr><td>LO</td><td>LO</td><td>HI</td></tr>
<tr><td>LO</td><td>HI</td><td>HI</td></tr>
<tr><td>HI</td><td>LO</td><td>LO</td></tr>
<tr><td>HI</td><td>HI</td><td>HI</td></tr>
</table></td></tr>
<tr><td>Edge symbol</td><td></td><td>Normally superimposed on an input line to a logic symbol. Indicates that this input (usually the trigger input of a flip-flop) responds to the indicated transition of the applied signal.</td><td></td></tr>
<tr><td>Triggered (toggle) Flip-Flop</td><td>
</td><td>A bistable device with one input and two outputs (either or both outputs may be used). When triggered, the outputs change from one stable state to the other stable state with each trigger. The outputs are complementary (i.e., when one output is HI the other is LO). The edge symbol on the trigger (T) input may be of either polarity depending on the device.</td><td>
<table>
<tr><th colspan="2">Input</th><th colspan="2">Output</th></tr>
<tr><td colspan="2">Condition before trigger pulse</td><td colspan="2">Condition after trigger pulse</td></tr>
<tr><td>X</td><td>$\bar{X}$</td><td>X</td><td>$\bar{X}$</td></tr>
<tr><td>LO</td><td>HI</td><td>HI</td><td>LO</td></tr>
<tr><td>HI</td><td>LO</td><td>LO</td><td>HI</td></tr>
</table></td></tr>
</table>

TABLE 3-1 (cont)

Basic Logic Reference

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

NOTE

Logic symbols used on the diagrams depict the logic function and may differ from the manufacturer's data.

Logic Polarity

All logic functions are described using the positive logic. Positive logic is a system of notation where the more positive of two levels (HI) is called the true or 1-state; the more negative level (LO) is called the false or 0-state. The HI-LO method of notation is used in this logic description. The specific voltages which constitute a HI or LO state vary between individual devices.

NOTE

The HI-LO logic notation can be conveniently converted to 1-0 notation by disregarding the first letter of each step. Thus:

HI = 1

LO = 0

Wherever possible, the input and output lines are named to indicate the functions that they perform when at the HI (true) state. For example, the line labeled, "Display B Command" means that the B Time-Base unit will be displayed when this line is HI or true. Likewise, the line labeled "X-Compensation Inhibit" means that the X-Compensation function is inhibited or disabled when this line is HI.

Input/Output Tables

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

Non-Digital Devices

It should be noted that not all of the integrated circuit devices in this instrument are digital logic devices. The function of non-digital devices will be described individually using operating waveforms or other techniques to illustrate their function.

MAIN INTERFACE

Diagram 1 shows the plug-in interface and the interconnections between the plug-in compartments, circuit boards, etc. of this instrument.

LOGIC CIRCUIT

The Logic Circuit develops control signals for use in other circuits within this instrument and in the associated plug-in units. These output signals automatically determine the correct instrument operation in relation to the plug-in installed and/or selected, plug-in control settings, and the 7623 control settings. A schematic of this circuit is shown on diagram 2 at the rear of this manual.

Logic Block Diagram

A block diagram of the Logic Circuit is shown in Fig. 3-2. This diagram shows the source of the input control signals, the output signals produced by this circuit, and the basic interconnections between blocks. The interconnections shown are intended only to indicate inter-relation between blocks and do not indicate a direct connection or that only a single connection is made between the given blocks. Details of the inter-relationship between stages within this circuit are given in the circuit description which follows.

The operation of each of these stages is discussed relating the input signals and/or levels to the output, with consideration given to the various modes of operation that may affect the stage. A logic diagram is also provided where applicable. These diagrams are not discussed in detail, but are provided to aid in relating the function performed by a given stage to standard logic techniques. It should be noted that these logic diagrams are not an exact representation of the circuit but are only a logic diagram of the function performed by the stage. An input/output table is given, where applicable, for use along with this circuit description and logic diagram. These input/output tables document the combination of input conditions which are of importance to perform the prescribed function of an individual stage.

Z-Axis Logic

The Z-Axis Logic stage produces an output current which sets the intensity of the display on the CRT. The level of this output current is determined by the setting of the front-panel INTENSITY control, an external signal from the rear panel EXT Z AXIS input connector, or signals from the plug-in compartments. The Vertical Chopped Blanking from U55 is applied to this stage to blank the CRT display during vertical trace switching. The Intensity Limit input from the horizontal plug-in compartment provides protection for the CRT phosphor at slow sweep rates.

The Z-Axis Logic stage consists of transistor 108, dual-transistor Q90 and integrated circuit U99, which is a five-transistor array. A simplified schematic of the Z-Axis

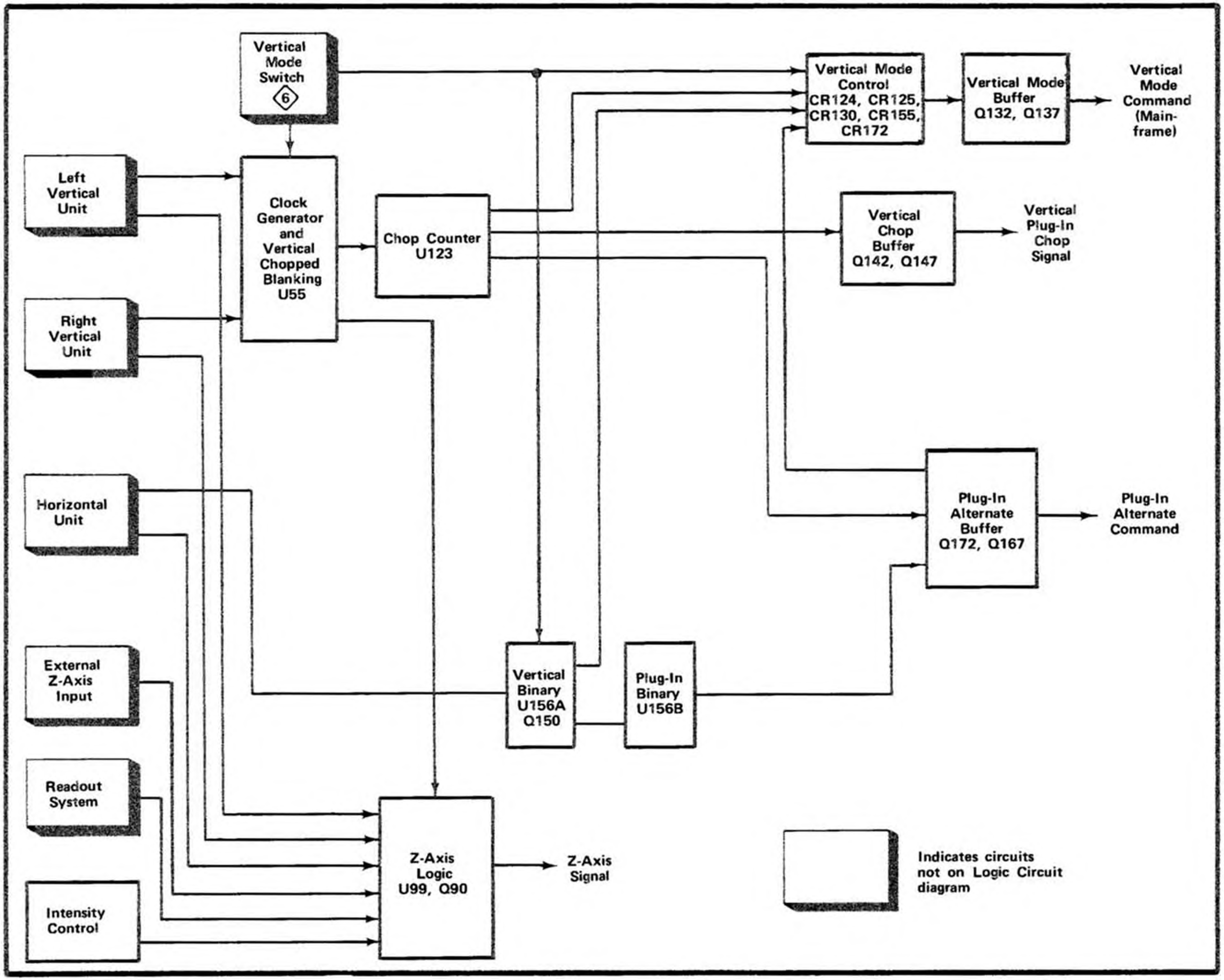


Fig. 3-2. Block diagram of Logic circuit.

Logic stage is shown in Fig. 3-3. Only the components essential to operation of this stage are shown in this simplified schematic.

Transistor U99C is connected in the common-base configuration to provide the output for this stage. The collector load for U99C is provided by the Z-Axis Amplifier in the CRT Circuit. Transistors U99D and U99E provide a current-limiting action for this stage. The collector current of U99D, represented by I_t, is the maximum amount of current that can flow in the circuit. The amount of this current is determined by the relationship between the Intensity Limit and Vertical Chopped Blanking. When both of these inputs are HI the collector current of U99D, I_t, is maximum. This maximum level of I_t is determined by current I_1 in the base circuit of U99D established by networks R76-R77 and R62-R63 into R110 and the collector of U99E. During Vertical Chopped Blanking, the respective input level goes LO. This shunts the current I_1 from the base of U99D so the collector current of U99D, I_t, drops to minimum to blank the CRT display during vertical trace switching.

The Intensity Limit function limits the output current of this stage to protect the CRT phosphor whenever the time-base unit is set to a slow sweep rate. For conditions that do not require limiting, quiescent current is added to I_1 from the +15-volt supply through R76-R77. When the time-base unit is set to a sweep rate which requires intensity

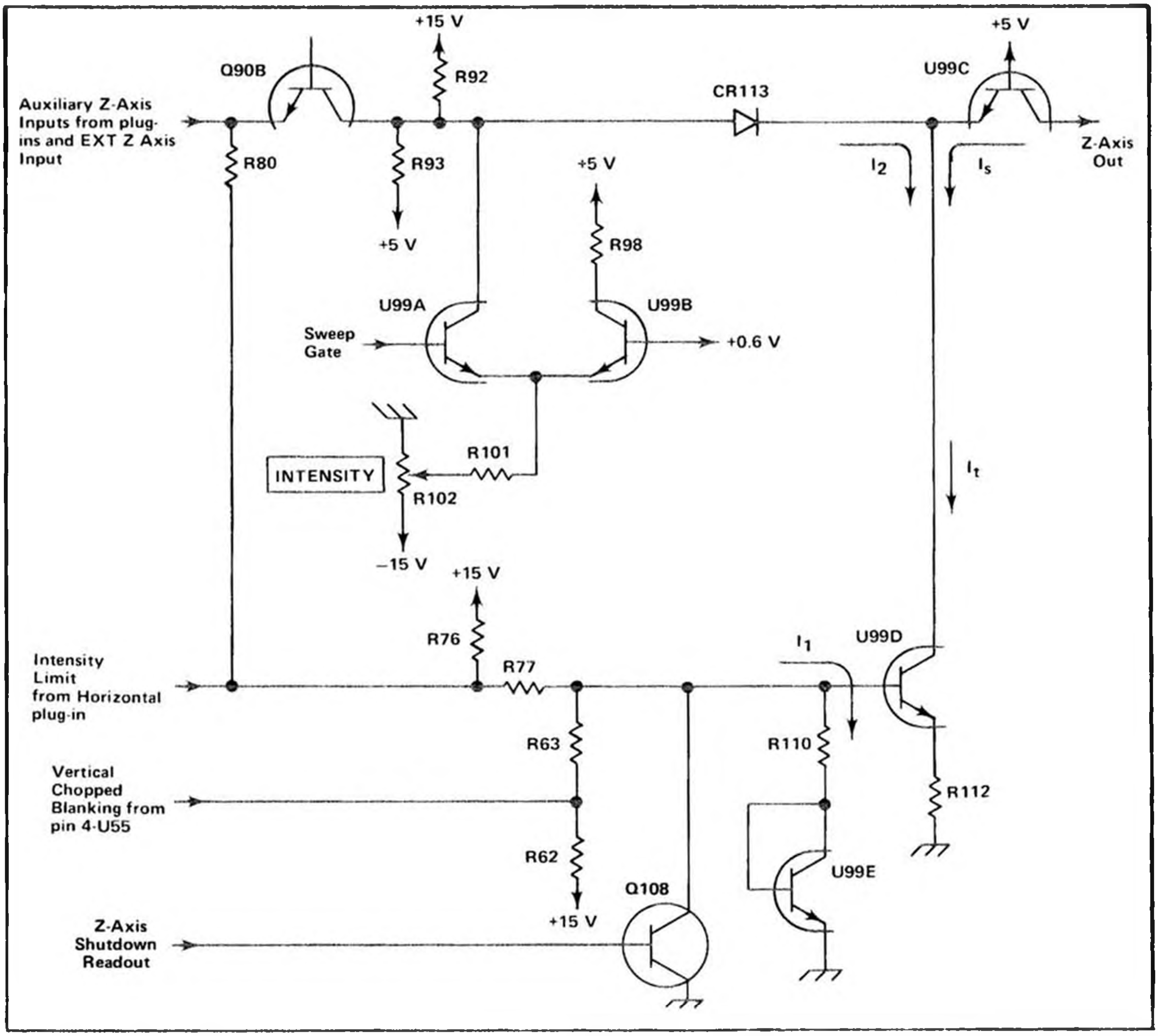


Fig. 3-3. Simplified schematic of Z-Axis Logic stage.

limiting, the Intensity Limit input goes to ground level in the plug-in unit. This reduces the level of I_1 at the base of U99D and therefore reduces I_t and the output current to reduce the intensity of the display. At the same time, the ground level from the Intensity Limit input is connected to the emitter of Q90B through R80. This connection limits the maximum level to which the INTENSITY control can be set to aid in obtaining intensity limiting at slow sweep rates.

The collector current of U99D is made up of two currents; I_s and I_2 is determined by divider R92 and R93. When the Sweep Gate level at the base of U99A is LO (no sweep in progress), I_2 is at its maximum level so that I_s is minimum to provide minimum intensity of the display (I_s + I_2 is always equal to I_t). During sweep time, the Sweep Gate level at the base of U99A as established by INTENSITY control R102 determines the output current. As the INTENSITY control is turned toward maximum, the level of I_2 decreases. This allows I_s to increase to produce a brighter display. The Auxiliary Z-Axis Inputs from the plug-in compartments and the intensity modulating signal from the EXT Z-AXIS input connector are connected to the emitter of Q90B. These signals modulate the level of I_2 to, in turn, modulate the intensity of the display.

When readout information is to be displayed on the CRT, the Z-Axis shutdown goes LO. This forward biases Q180, and it saturates, shunting I_1, through Q108 to ground. This reduces the output current to zero during the readout time.

Clock Generator

One half of integrated circuit U55 along with the external components shown in Fig. 3-4A make up the Clock Generator stage. R1, Q1, Q2, and Q3 represent an equivalent circuit contained within U55A. This circuit along with discrete components C59, R56, R57, and R59 comprise a two-megahertz free-running oscillator to provide a timing signal (clock) for mainframe vertical and plug-in chopping.

The stage operates as follows: Assume that Q2 is conducting and Q1 is off. The collector current of Q2 produces a voltage drop across R1 which holds Q1 off. This negative level at the collector of Q2 is also connected to pin 14 through Q3 (see waveforms in Fig. 3-4B at time T_0). Since there is no current through Q1, C59 begins to charge towards −15 volts through R56-R57. The emitter of Q1 goes negative as C59 charges until it reaches a level about 0.6 volt more negative than the level at its base. Then, Q1 is forward biased and its emitter rapidly rises positive. Since

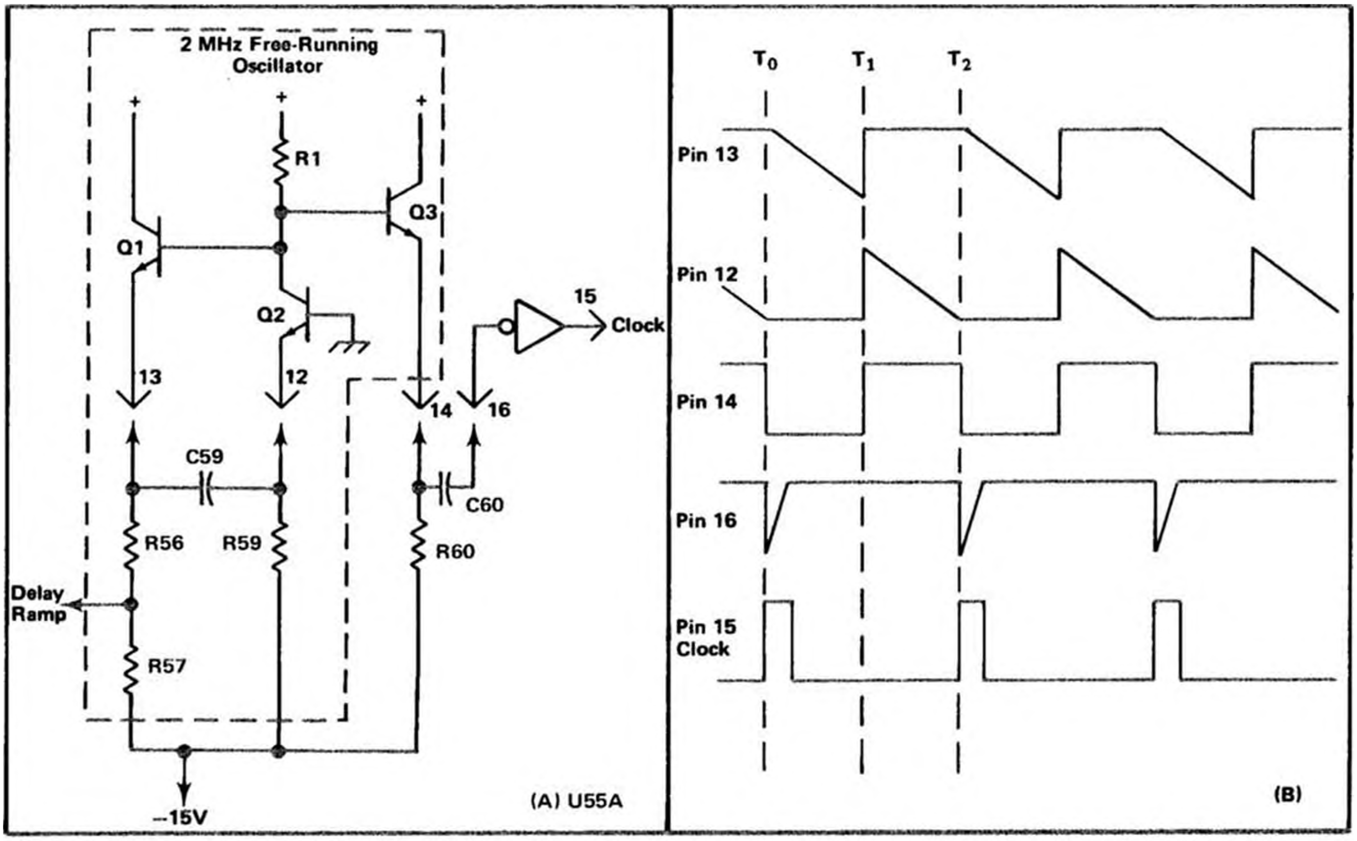


Fig. 3-4. (A) Diagram of Clock Generator stage. (B) Idealized waveforms from Clock Generator stage.

C59 cannot change its charge instantaneously, the sudden change in voltage at the emitter of Q1 pulls the emitter of Q2 positive also, to reverse-bias it. With Q2 reverse biased, its collector rises positive to produce a positive output level at pin 14 (see time T_1 on the waveforms).

Now, conditions are reversed. Since Q2 is reverse biased, there is no current through it. Therefore, C59 can begin to discharge through R59. The emitter level of Q2 follows the discharge of C59 until it reaches a level about 0.6 volt more negative than its base. Then Q2 is forward biased and its collector drops negative to reverse-bias Q1. The level at pin 14 drops negative also, to complete the cycle. Once again, C59 begins to charge through R56-R57 to start the second cycle.

Two outputs are provided from this oscillator. The Delay Ramp signal from the junction of R56-R57 is connected to the Vertical Chopped Blanking stage. This signal has the same waveshape as shown by the waveform at pin 13, with its slope determined by the divider ratio between R56-R57. A square-wave output is provided at pin 14. The frequency of this square wave is determined by the RC relationship between C59 and R1. The duty cycle is determined by the ratio of R56-R57 to R59.

The square wave at pin 14 is connected to pin 16 through C60. C60, along with the internal resistance of U55A, differentiates the square wave at pin 14 to produce a negative-going pulse coincident with the falling edge of the square wave (positive-going pulse coincident with rising edge has no effect on circuit operation). This negative-going pulse is connected to pin 15 through an inverter-shaper which is also part of U55A. The output at pin 15 is a positive-going Clock pulse at a repetition rate of about two megahertz.

Vertical Chopped Blanking

The Vertical Chopped Blanking stage is made up of the remaining half of integrated circuit U55B, Fig. 3-5A. This stage determines if Vertical Chopped Blanking pulses are required, based upon the operating mode of the vertical system or the plug-in units (dual trace units only). Vertical Chopped Blanking pulses are produced if: (1) VERT MODE switch is set to CHOP; (2) dual-trace vertical unit is operating in the chopped mode and that unit is being displayed; (3) dual-trace vertical unit is operating in the chopped mode with the VERT MODE switch set to ADD. The repetition rate of the negative-going Vertical Chopped Blanking pulse output at pin 4 is always two megahertz as determined by the Clock Generator stage.

The Delay Ramp signal from the Clock Generator stage determines the repetition rate and pulse width of the Vertical Chopped Blanking pulses. The Delay Ramp applied to pin 10 starts to go negative from a level of about +1.1 volts coincident with the leading edge of the Clock pulse (see waveforms in Fig. 3-5B). This results in a HI quiescent condition for the Vertical Chopped Blanking pulse. The slope of the negative-going Delay Ramp is determined by the Clock Generator stage. As it reaches a level slightly negative from ground, the Vertical Chopped Blanking pulse output level changes to the LO state. This signal remains LO until the Delay Ramp goes HI again. Notice the delay between the leading edge of the Clock pulse generated by U55A and the leading edge of the Vertical Chopped Blanking pulses (see Fig. 3-5B). The amount of delay between the leading edges of these pulses is determined by the slope of the Delay Ramp applied to pin 10. This delay is necessary due to the delay line in the vertical deflection system. Otherwise, the trace blanking resulting from the Vertical Chopped Blanking pulse would not coincide with the switching between the displayed traces. The duty cycle of the square wave produced in the Clock Generator stage determines the pulse width of the Vertical Chopped Blanking pulses (see Clock Generator discussion for more information).

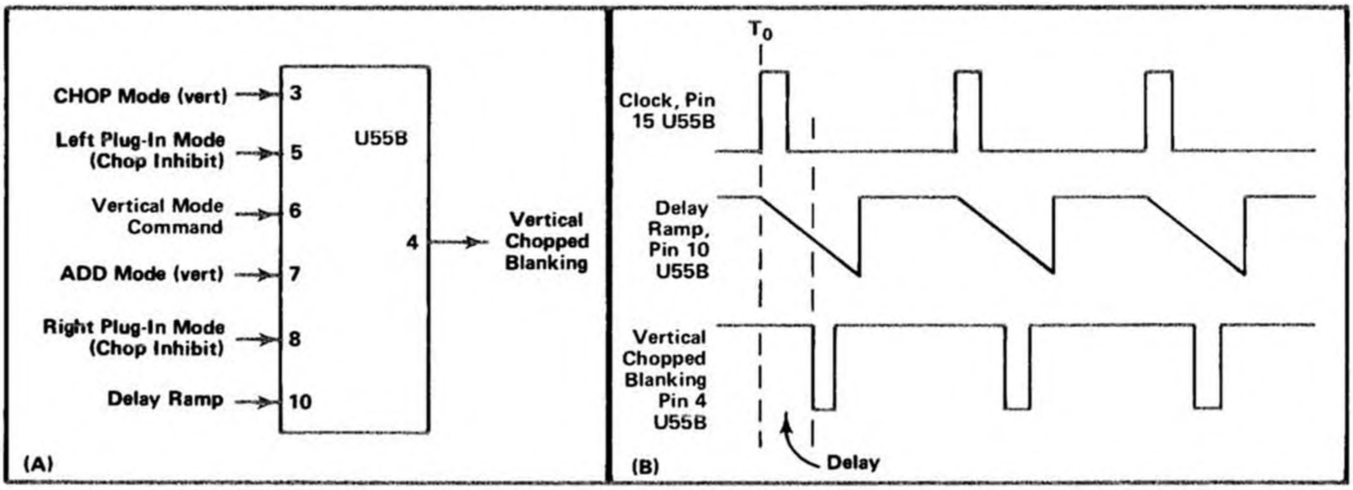


Fig. 3-5. (A) Input and output pins for Vertical Chopped Blanking stage, (B) Idealized waveforms for Vertical Chopped Blanking stage.

Whenever this instrument is turned on, the Vertical Chopped Blanking pulses are being produced at a two-megahertz rate. However, these pulses are available as an output at pin 4 only when the remaining inputs to U55B are at the correct levels. The following discussions give the operating conditions which produce Vertical Chopped Blanking pulses to blank the CRT during vertical trace switching. Fig. 3-5A identifies the functions of the pins of U55B.

1. CHOP VERTICAL MODE

When the VERT MODE switch is set to CHOP, Vertical Chopped Blanking pulses are available at pin 4 at all times. The input conditions necessary are:

PIN 3 HI—VERT MODE switch set to CHOP.

Pin 7 LO—VERT MODE switch set to any position except ADD.

Pin 10 LO—Delay Ramp more negative than about 0 volts.

2. LEFT VERTICAL UNIT SET FOR CHOPPED OPERATION

If the Left Vertical unit is set for chopped operation, the setting of the VERT MODE switch determines whether the Vertical Chopped Blanking pulses are available. If the VERT MODE switch is set to the CHOP position, conditions are as described in No. 1 above. Operation in the ADD position of the VERT MODE switch is given later. For the LEFT position of the VERT MODE switch, or when the left vertical unit is to be displayed in the ALT mode, Vertical Chopped Blanking pulses are available at all times (two-megahertz rate). The input conditions are:

Pin 3 LO—VERT MODE switch set to any position except CHOP.

Pin 5 LO—Left vertical unit set to chopped mode.

Pin 6 LO—Left vertical unit to be displayed (Vertical Mode Command LO).

Pin 7 LO—VERT MODE switch set to any position except ADD.

Pin 10 LO—Delay Ramp more negative than about 0 volts.

Notice that the Vertical Mode Command at pin 6 must be LO for output pulses to be available at pin 4. This means that when the VERT MODE switch is set to ALT, Vertical Chopped Blanking pulses are produced only during the time that the left vertical unit is to be displayed (unless right vertical unit is also set for chopped operation).

3. RIGHT VERTICAL UNIT SET FOR CHOPPED OPERATION

If the right vertical unit is set for chopped mode, operation is the same as described previously for the left vertical unit except that Vertical Chopped Blanking pulses are produced when the VERT MODE switch is set to RIGHT or when the Vertical Mode Command is HI in the ALT mode. The input conditions are:

Pin 3 LO—VERT MODE switch set to any position except CHOP.

Pin 6 HI—Right vertical unit to be displayed (Vertical Mode Command HI).

Pin 7 LO—VERT MODE switch set to any position except ADD.

Pin 8 LO—Right vertical unit set to chopped mode.

Pin 10 LO—Delay Ramp more negative than about 0 volts.

4. ADD VERTICAL MODE

When the VERT MODE switch is in the ADD position and either or both of the vertical units are operating in the chopped mode, Vertical Chopped Blanking pulses must be available to block out the transition between traces of the vertical units. The input conditions are:

Pin 3 LO—VERT MODE switch set to any position except CHOP.

Pin 5 LO—Left vertical unit set to chopped mode (can be HI if pin 8 is LO).

Pin 7 HI—VERT MODE switch set to ADD.

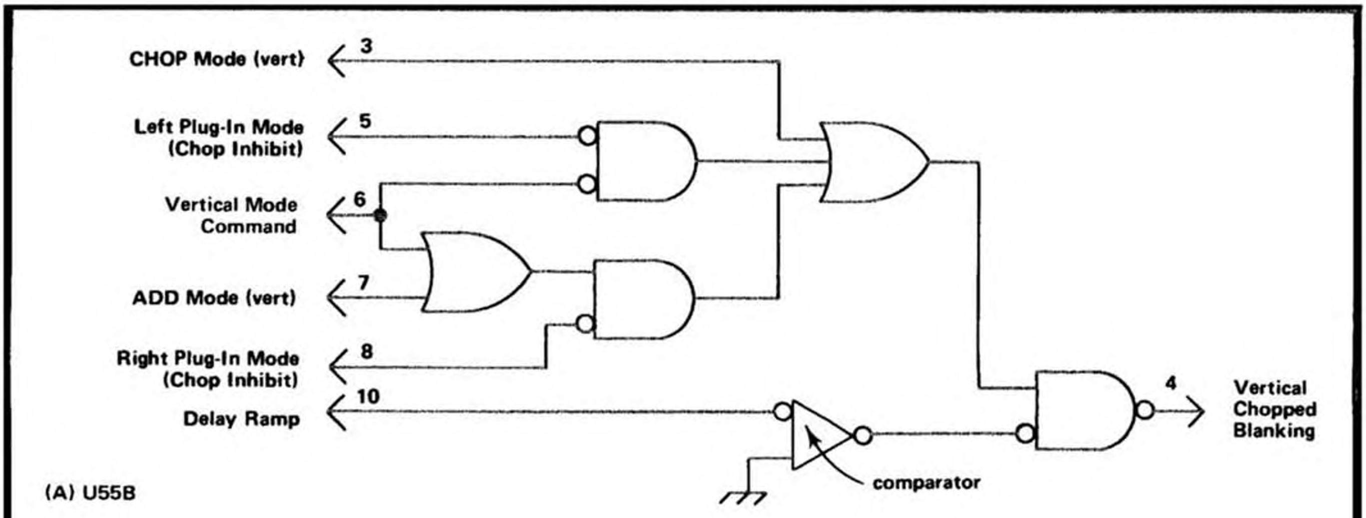
Pin 8 LO—Right vertical unit set to chopped mode (can be HI if pin 5 is LO).

Pin 10 LO—Delay Ramp more negative than about 0 volt.

Fig. 3-6A shows a logic diagram of the Vertical Chopped Blanking stage. Notice the comparator block on this diagram (one input connected to pin 10). The output of this comparator is determined by the relationship between the levels at its inputs. If pin 10 is more positive (HI) than the grounded input, the output is HI also; if it is more negative (LO), the output is LO. An input/output table for this stage is given in Fig. 3-6B.

Chop Counter

The Chop Counter stage produces the Mainframe Chop Signal and the Vertical Plug-In Chop Signal. The Clock



	Input						Output	
	CHOP Mode (vert)	Left Plug-In Mode (Chop Inhibit)	Vertical Mode Command	Add Mode (vert)	Right Plug-In Mode (Chop Inhibit)	Delay Ramp	Vertical Chopped Blanking	
	3	5	6	7	8	10[1]	4[2]	Conditions
	HI	Φ	Φ	LO	Φ	LO	LO	CHOP Mode (vert)
	LO	LO	LO	LO	Φ	LO	LO	Left Plug-in Chopped
	LO	Φ	HI	LO	LO	LO	LO	Right Plug-in Chopped
	LO	LO[3]	Φ	HI	LO[3]	LO	LO	ADD Mode, Left or Right Plug-in Chopped
	All other combinations						HI	No Vertical Chopped Blanking pulses at output.

Φ = Has no effect in this case.

[1] Ramp signal; considered LO when more negative than about zero volts.

[2] Negative-going pulse at two megahertz rate.

[3] Pin 5 can be HI and not affect operation if pin 8 is LO, and vice versa.

(B)

Fig. 3-6. (A) Logic diagram for Vertical Chopped Blanking stage, (B) Table of input/output combinations for Vertical Chopped Blanking stage.

pulse produced by the Clock Generator stage provides the timing signal for this stage. A logic diagram of the Chop Counter, identifying the inputs and outputs, is shown in Fig. 3-7.

The Chop Counter stage consists of integrated circuit U123, a dual D-type flip-flop with direct-set, direct-clear inputs (see Table 3-1 for operation of D-type flip-flop). As connected in this circuit, these D-type flip-flops operate as triggered (toggle) flip-flops.

The two-megahertz clock pulses from the Clock Generator stage are connected to the trigger (T) input of U123B. As connected, U123B changes output states with each positive-going Clock pulse, and the signal at its "1" output is a square wave which switches between the HI and LO levels at a one-megahertz rate. This signal is connected to the Vertical Mode Control stage to provide the Vertical Mainframe Chop Signal. It is also connected to the trigger input of U123A. U123A also changes output states with each positive-going pulse at its trigger input to produce a 500 kilohertz square wave at its "1" output. The output from U123A provides the Vertical Plug-In Chop Signal to

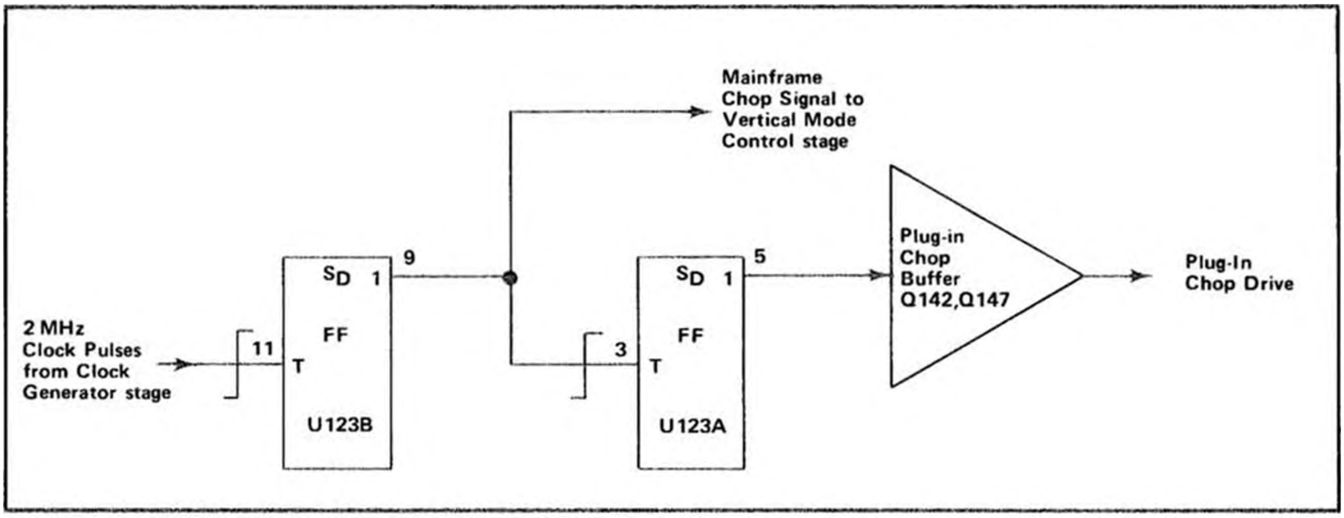


Fig. 3-7. Detailed logic diagram of Chop Counter stage.

the Plug-In Chop Buffer stage. Idealized waveforms showing the timing relationship between the input and output signals for this stage are shown in Fig. 3-8.

Vertical Mode Control

The Vertical Mode Control stage is made up of discrete components CR124-CR125, CR126, CR130-CR155, CR172, and buffer amplifier Q132-Q137. These components develop the Mainframe Vertical Mode Command which is connected to the Main Interface circuit (vertical plug-in compartments and trigger selection circuitry) and the Vertical Interface circuit to indicate which vertical unit is to be displayed. When this output level is HI, the right vertical unit is displayed and when it is LO, the left vertical unit is displayed.

The VERT MODE switch located on diagram 7 provides control levels for this stage. This switch provides a HI level on only one of four output lines to indicate the selected vertical mode; the remaining lines are LO. The fifth mode, LEFT, is indicated when all four output lines are LO. Operation of this stage in all positions of the VERT MODE switch is as follows:

Right. When the VERT MODE switch is set to RIGHT, a HI level is connected to the Buffer Amplifier through R126 and CR126. The LO level at the anodes of diodes CR125 and CR130 holds them reverse biased. The resultant Vertical Mode Command output from the Vertical Mode Buffer Amplifier is a HI level to indicate that the right vertical unit is to be displayed.

Chop. In the CHOP position of the VERT MODE switch, a HI level is applied to the anodes of diodes CR124-CR125 through R125. Both diodes are forward biased so the Vertical Chop Signal from pin 9 of U123B can pass to the emitter of Q132. This signal switches between the HI and LO levels at a one-megahertz rate and it produces a corresponding Mainframe Vertical Mode Command output at the emitter of Q137. When this output is

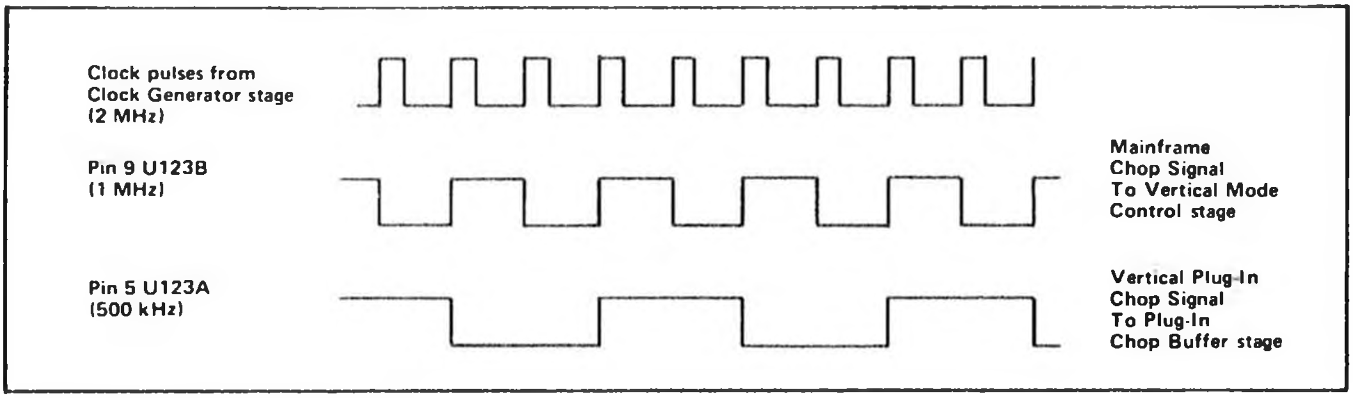


Fig. 3-8. Idealized input and output waveforms for Chop Counter stage.

HI, the right vertical unit is displayed and when it switches to LO, the left vertical unit is displayed.

Alt. In the ALT mode, the VERT MODE switch applies a HI level to the anodes of diodes CR130-CR155 through R130. These diodes are forward biased so the Display Right Command from pin 5 of U156A can pass to the emitter of Q132 to determine the Mainframe Vertical Mode Command level. The Display Right Command switches between its HI and LO levels at a rate determined by the Vertical Binary stage.

Add and Left. The control levels in the ADD and LEFT positions of the VERT MODE switch are not connected to this stage. However, since only the line corresponding to the selected vertical mode can be HI, the RIGHT, CHOP, and ALT lines must remain at their LO level when either LEFT or ADD are selected. Therefore, the emitter of Q132 remains LO to produce a LO Mainframe Vertical Mode Control output level. Final control of LEFT or ADD mode is made by the Vertical Interface circuit.

A logic diagram of the Vertical Mode Control stage is shown in Fig. 3-9. The discrete components which make up each logic function are identified. The gate connected to the input of the Vertical Mode Buffer Amplifier is a phantom-OR gate. A phantom-OR gate performs the OR logic function merely by interconnection of the three inputs.

Vertical Binary

The Vertical Binary stage consists of integrated circuit U156A and transistor Q150. U156A is a D-type flip-flop with direct-set and direct-clear inputs (see Table 3-1 for operating details). The connection between the "0" output and the data (D) input enables this flip-flop to operate in the triggered mode. A logic diagram of the Vertical Binary stage is shown in Fig. 3-10.

The operation of the Vertical Binary stage is controlled by the level of the ALT Mode line from the VERT MODE switch. When this switch is set to ALT, a HI level is connected to the emitter of Q150 through R152. This HI level disables Q150 so its collector remains HI. As a result, Q150 has no effect upon operation of the Vertical Binary stage and the direct-clear input of U156A remains HI so it does not affect the operation of U156A. Therefore, U156A operates as a basic triggered flip-flop which changes output states with each positive-going Sweep Holdoff pulse at the trigger (T) input. The Sweep Holdoff pulse goes positive at the end of each sweep. The signal at the "1" output of U156A switches between the HI and LO level at one-half the rate of the Sweep Holdoff signal from the horizontal plug-in unit. Fig. 3-11 shows the time relationship between the input and output signals for this stage, and gives the resultant display with each signal combination.

For any other position, the emitter of Q150 is pulled LO by the ALT Mode command from the VERT MODE switch. This enables Q150, but it does not change output state unless the level at the "1" output of U156A is HI. Quiescently, the output of Q150 is LO. Therefore, when the positive-going Sweep Hold-off pulse is received at the end of the sweep, the "1" output of U156A goes HI. This activates Q150 and its output goes LO to provide a direct-clear reset to U156A. The "1" output of U156A is reset to its LO level, and Q150 is again disabled so its output returns to the HI level. The stage is now ready for

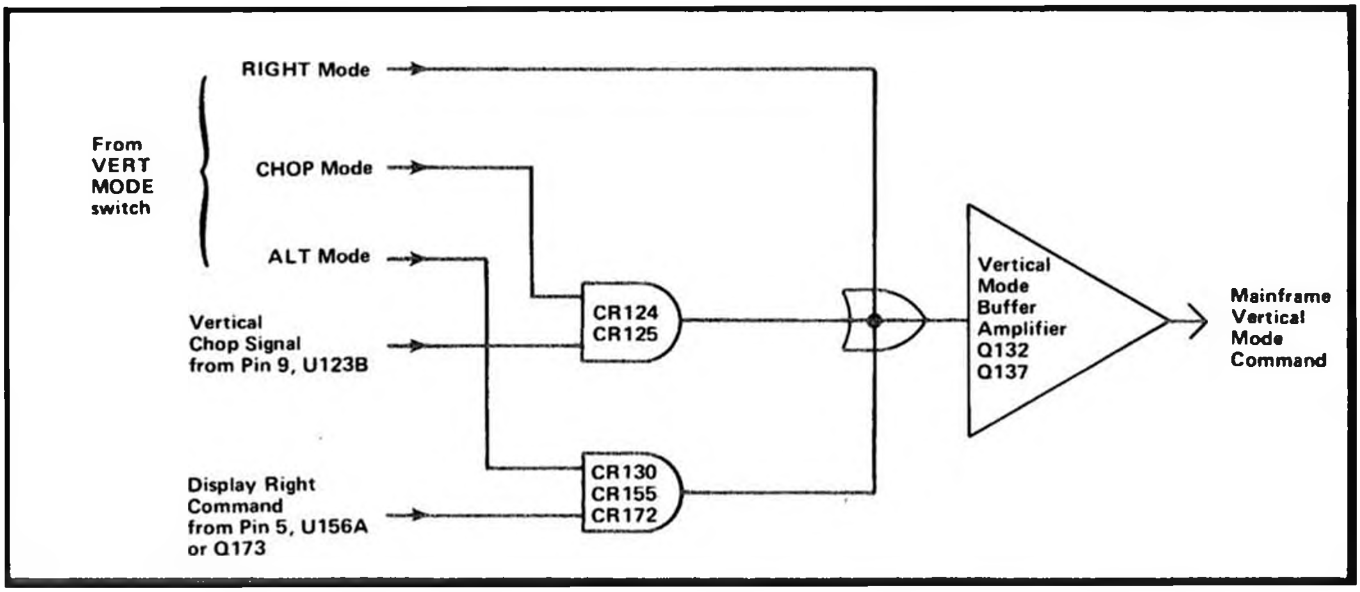


Fig. 3-9. Logic diagram of Vertical Mode Control and Vertical Mode Buffer Amplifier stages.

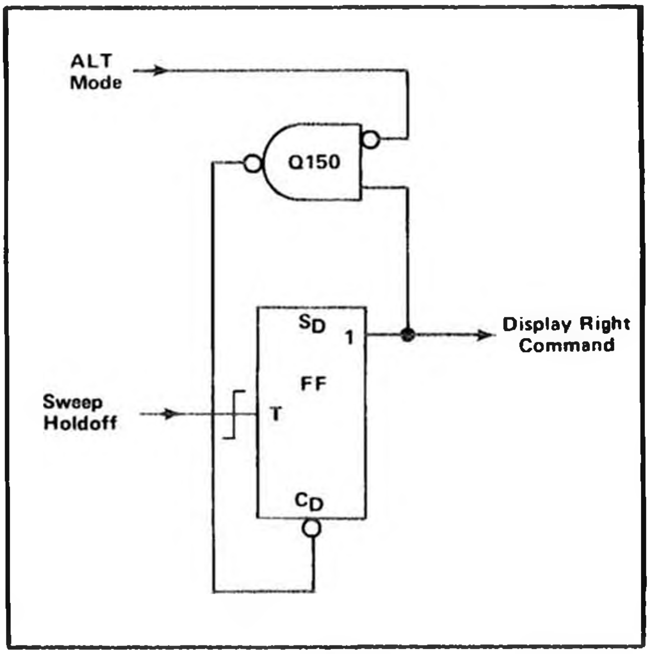


Fig. 3-10. Logic diagram of Vertical Binary stage.

the next positive-going Sweep Hold-off pulse. The action is the same with each pulse, so the signal at the output of this stage is at the same repetition rate as the Sweep Holdoff input. Therefore, this stage is now operating as a divide-by-one counter rather than a divide-by-two counter as described previously. The output under this condition is used only by the Plug-In Binary stage.

Since the Vertical Binary stage can change output states only at the end of each sweep, there will be no Alternate Drive signal for either the mainframe or vertical plug-in units if a sweep is not being produced by the horizontal plug-in unit.

Plug-In Binary

The Plug-In Binary stage consists of U156B, which is connected as a triggered flip-flop with direct-set input. The trigger input for this stage is the Display Right Command from the Vertical Binary stage. When the VERT MODE switch is set to ALT, the repetition rate of the Display Channel 2 Command output of this stage is one-fourth of the Sweep Holdoff input (see waveforms in Fig. 3-11). For any position of the VERT MODE switch except ALT, the repetition rate of the output signal from this stage is one-half of the Sweep Holdoff input. A logic diagram of the Plug-In Binary stage is shown in Fig. 3-12.

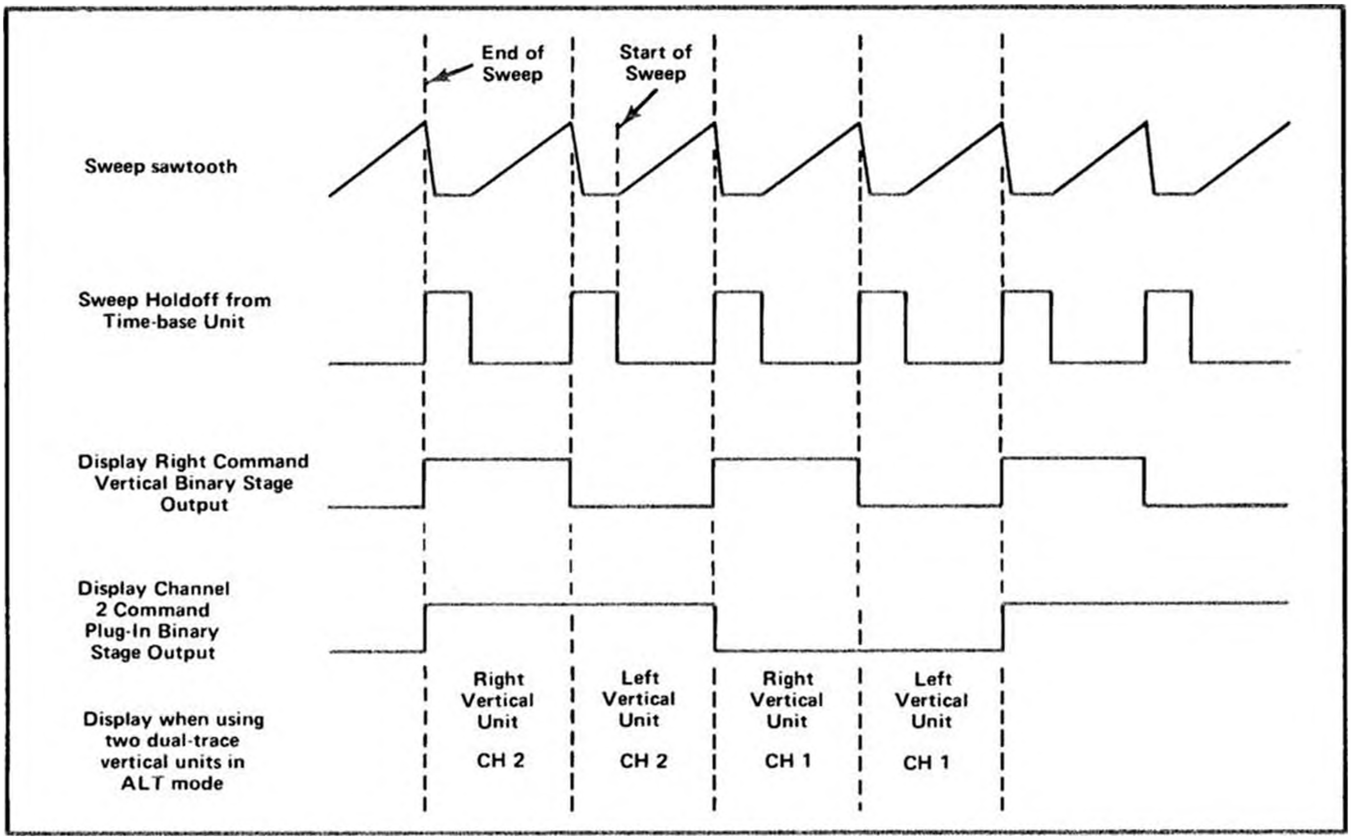


Fig. 3-11. Idealized waveforms showing relationship between input and output waveforms for Vertical Binary and Plug-In Binary stages when operating in ALT mode.

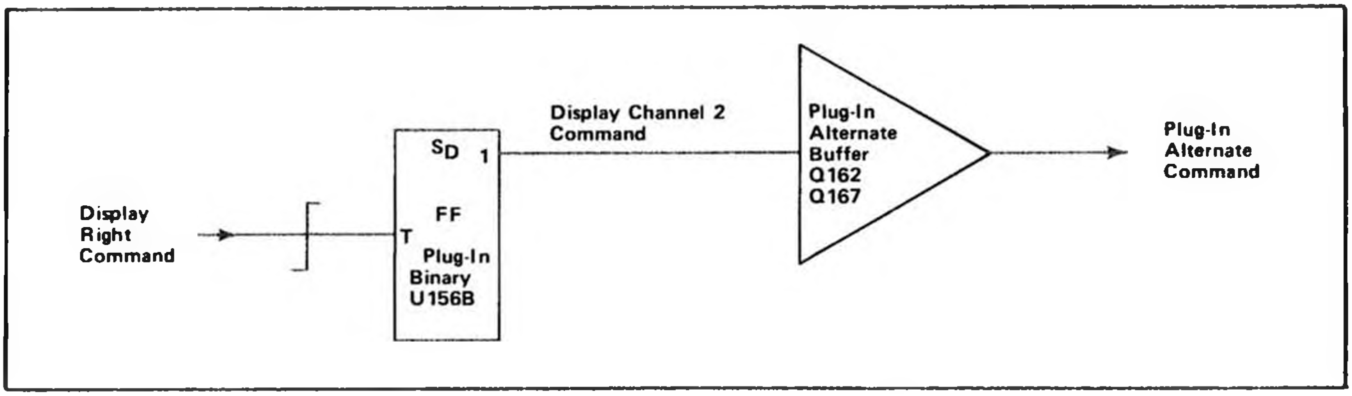


Fig. 3-12. Logic diagram of Plug-In Binary and Plug-In Alternate Buffer stages.

Output Buffers

The output switching commands from the Logic circuit are provided through buffer stages Q142-Q137, Q142-Q147, Q162-Q167, and Q182-Q187. Each of these stages includes a common-base input transistor to provide a low-impedance load for the associated driving stages. The output transistor is connected as an emitter-follower to provide isolation between the Logic circuit and other circuits within this instrument or the plug-in units.

TRIGGER SELECTOR

The Trigger source switch determines which vertical signal is connected to the time-base unit, and which vertical signal, that is provided at VERT SIG/OUT connector on the rear panel. Fig. 3-13 shows a detailed block diagram of the Trigger Selector circuit, along with a simplified diagram of all the circuitry involved in selection of the trigger source. A schematic of the Trigger Selector circuit is shown on diagram 3 at the rear of this manual. Also, see diagrams 6 and 7 for the signal selection circuitry not shown on diagram 3.

Trigger Mode and Add Signals

General. The circuitry shown on the left side of the simplified diagram in Fig. 3-13 determines the operation of the Trigger Channel Switch stage. TRIG SOURCE switch S1011 controls Trigger Channel Switch U324. When the TRIG SOURCE switch is set to the VERT MODE position, the setting of the VERT MODE switch determines the trigger selection. In the LEFT or RIGHT positions, the trigger signal is obtained from the indicated vertical unit. The following discussions give detailed operation in each position of the TRIG SOURCE switch.

Vert Mode. In the VERT MODE position of the TRIG SOURCE switch, the setting of the VERT MODE switch determines the operation of the Trigger Channel Switch stage. In the LEFT position of the VERT MODE switch, the base of Q314 is connected to ground through the ALT and RIGHT sections of S1021, CR1021 and CR1026, and S1011. This holds Q314 reverse biased to provide a LO level to pin 4 of U324 (see Fig. 3-14).

When the VERT MODE switch is set to ALT, +5 volts is applied to the base of Q314 through CR1021 and S1011. Q314 is forward biased and its emitter level is determined by the Mainframe Vertical Mode Command signal from the Logic circuit applied to its collector. This signal switches between the HI level (Right Vertical unit to be displayed) and the LO level (Left Vertical unit to be displayed) at the end of each sweep. When the Mainframe Vertical Mode Command is HI, it provides a positive collector voltage to Q314. Q314 is saturated due to CR1021, and its emitter level is very near the collector level. This provides a HI output level to the Trigger Channel Switch stage. As the Mainframe Vertical Mode Command goes LO, the collector supply for Q314 also goes negative. Q314 remains saturated and the output again follows the collector level to supply a LO output level to U324.

For ADD and CHOP vertical mode operation, +5 volts is connected to pin 14 of U324 through CR1023 or CR1024 and S1011. At the same time, the base of Q314 is held LO by the ground connection through the ALT and RIGHT section of S1021 so the level at pin 4 of U324 is LO also (produces an ADD mode in Trigger Channel Switch; see description of this circuit which follows). In the RIGHT position of the VERT MODE switch, +5 volts is connected to the base of Q314 through CR1026 and S1011 to forward-bias the transistor. The Mainframe Vertical Mode Command signal connected to the collector of Q314 is also HI in this mode, and a HI output level is produced at the emitter of Q314.

Left. When the LEFT trigger source is selected, the VERT MODE switch is disconnected from the trigger selector circuitry. Now the ground connection through the

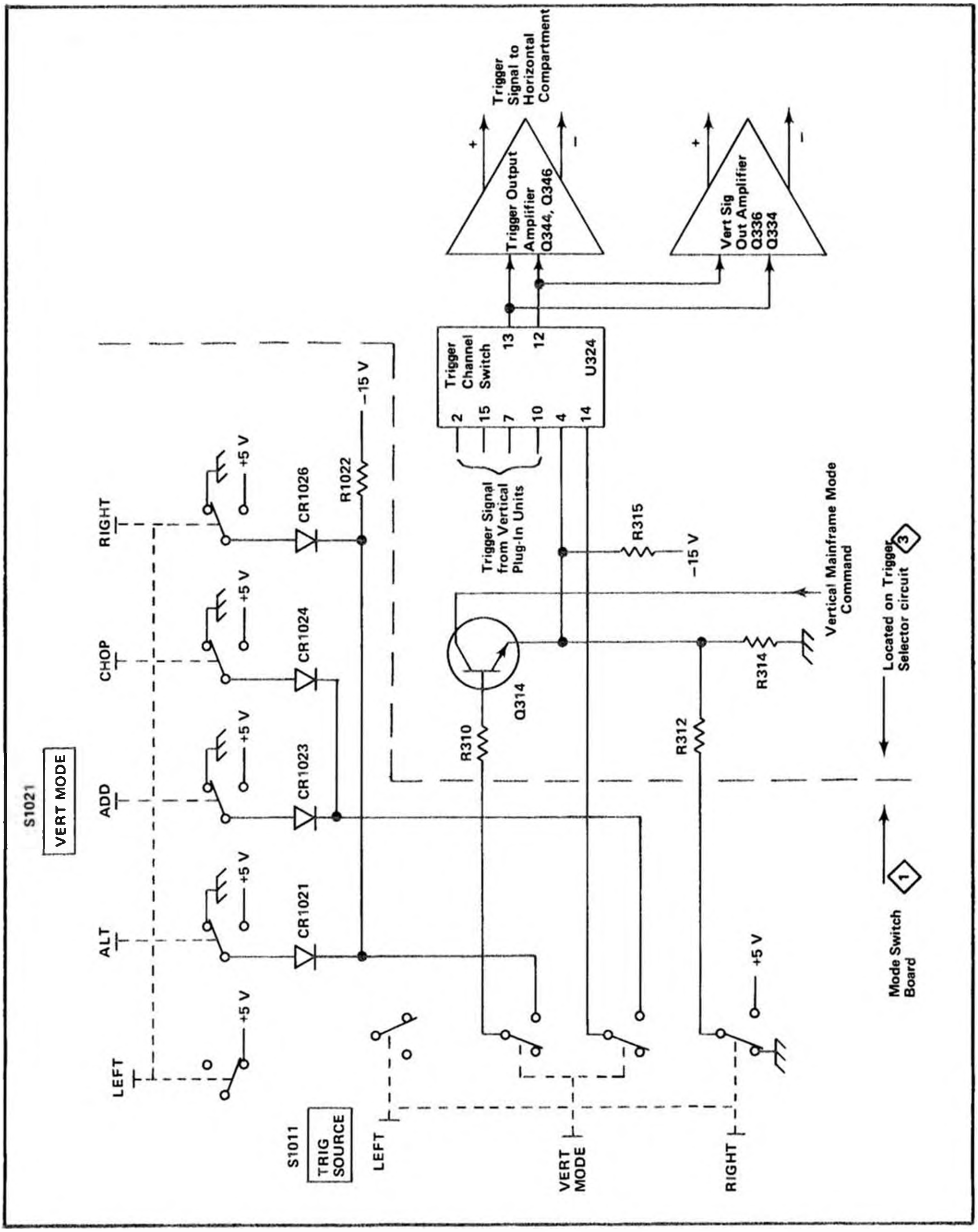


Fig. 3-13. Detailed block diagram of Trigger Selector circuit along with simplified diagram of trigger source selection circuitry.

<table>
<tr><th>VERT MODE switch positions</th><th>TRIG SOURCE switch positions →
VERT MODE</th><th>LEFT</th><th>RIGHT</th></tr>
<tr><td>LEFT</td><td>LO (Left Vertical)</td><td rowspan="5">LO (Left Vertical)</td><td rowspan="5">HI (Right Vertical)</td></tr>
<tr><td>ALT</td><td>Switches from LO to HI, and vice versa, at end of each sweep (both; follows display)</td></tr>
<tr><td>ADD</td><td rowspan="2">LO at pin 4 of U324. HI at pin 14[1] (both; added algebraically)</td></tr>
<tr><td>CHOP</td></tr>
<tr><td>RIGHT</td><td>HI (Right Vertical)</td></tr>
</table>

[1] Pin 14 LO for all other conditions.

Fig. 3-14. Input levels at pin 4 of U324 (source of triggering is shown in parenthesis).

RIGHT section of S1011 establishes a LO output level at the emitter of Q314.

Right. In the RIGHT position of the TRIG SOURCE switch, +5 volts is connected to the emitter of Q314 through S1011 and R312. This produces a HI output level to the Trigger Channel Switch stage.

Trigger Channel Switch

The Trigger Channel Switch stage determines which input signal provides the trigger signal to the horizontal compartment as controlled by the Trigger Mode and ADD signals from the trigger selection circuitry. Refer to diagram 3 during the following discussion.

Resistors R317-R319 establish the input resistance and provide a load for the trigger signal from the right vertical plug-in unit. Resistors R307-R308, located on the Main Interface circuit, provide the input resistance and load for the left vertical plug-in unit. R321-R323-R324 and R326-R327-R328 establish the operating level of the Trigger Channel Switch; R321-R323 and R326-R328 set the current gain for each channel. This stage is made up primarily of integrated circuit U324. An input/output table for U324 is shown in Fig. 3-15. U324 provides a high impedance differential input for the trigger signal from the left vertical unit at pins 2 and 15, and for the trigger signal from the right vertical unit at pins 7 and 10. The output signal at pins 12 and 13 is a differential signal. The sum of the DC current at pins 12 and 13 is always equal to the sum of the DC currents at pins 1, 8, 9, and 16 in all modes. This provides a constant DC bias to the stages which follow as the TRIG SOURCE or the VERT MODE switches are changed.

When the level at pin 4 is LO (see Trigger Mode and ADD Signals discussion and Fig. 3-15), the trigger signal from the left vertical unit passes to the output, while the trigger signal from the right vertical unit is blocked. A HI level at pin 4 connects the trigger signal from the right vertical unit to the output and the trigger signal from the left vertical unit is blocked. For VERT MODE operation in the ALT position of the VERT MODE switch, the level at pin 4 switches between the LO and HI level at a rate determined by the Vertical Binary stage (see Logic circuit description). This action obtains the trigger signal from the left vertical unit when the left vertical unit is being displayed and from the right vertical unit when it is being displayed.

When the level at pin 4 is LO and the level at pin 14 is HI, the trigger signal from both the left and right vertical units passes to the output pins. This condition occurs only when the TRIG SOURCE switch is set to VERT MODE and the VERT MODE switch is set to either ADD or CHOP. Under this operating mode, the trigger output signal is the algebraic sum of the trigger input signals from the left and right vertical units to prevent triggering on the vertical chopping transition, or only on one signal of an added display.

Trigger Output Amplifier

The trigger output at pins 12 and 13 of U324 is connected to the bases of Q344-Q346 to provide the internal trigger signal for the horizontal unit (via the Main Interface circuit). The horizontal unit provides a 50-ohm differential load for this stage. If it is removed from its compartment, the collector load for Q344-Q346 changes and the voltage at their collectors increases. This stage prevents this change from affecting the Vertical Signal to the Output Signal board. CR341 and CR349 clamp the collectors of Q344 and Q346 at about +0.6 volt to prevent these transistors from saturating under this no-load condition.

Vertical Signal Buffer

The trigger output signal at pin 12 and 13 of U324 is also connected to the emitter of a common-base amplifier Q336 and Q334. The output signal at the collector of Q336 and Q334 is connected to the signals out board.

Input: Trigger Mode Signal 4	Input: Trigger ADD 14	Output: Trigger Output Signal 12, 13
LO	LO	Left trigger signal
HI	LO	Right trigger signal
LO	HI	Both (added algebraically)

Fig. 3-15. Input/output table for Trigger Channel Switch stage.

VERTICAL INTERFACE

The Vertical Interface circuit selects the vertical deflection signal from the output of the left vertical and/or the right vertical plug-in unit. Fig. 3-16 shows a detailed block diagram of the Vertical Interface circuit. A schematic of this circuit is shown on diagram 3 at the rear of this manual.

Vertical Channel Switch

The Vertical Channel Switch stage determines which input signal provides the vertical signal to the Delay-Line Driver stage as controlled by the Mainframe Vertical Mode Command from the Logic circuit. Resistors R200-R202 and R204-R206 establish the input resistance of this stage and provide a load for the left and right vertical units. Resistors R209-R211-R212 and R216-R218-R219 establish the operating levels for this stage. R209-R212 and R216-R219 set the current gain for each channel. C208-R208 and C215-R215 provide frequency compensation.

This stage is made up primarily of integrated circuit U214, which is the same type as used for the Trigger Channel Switch. An input/output table for U214 is shown in Fig. 3-17. U214 provides a high impedance differential input for the signal from the left vertical unit at pins 2 and 15, and the signal from the right vertical unit at pins 7 and 10. The output signal at pins 12 and 13 is a differential signal which is connected to the Delay-Line Driver stage through R222-R224. The sum of the DC output currents at

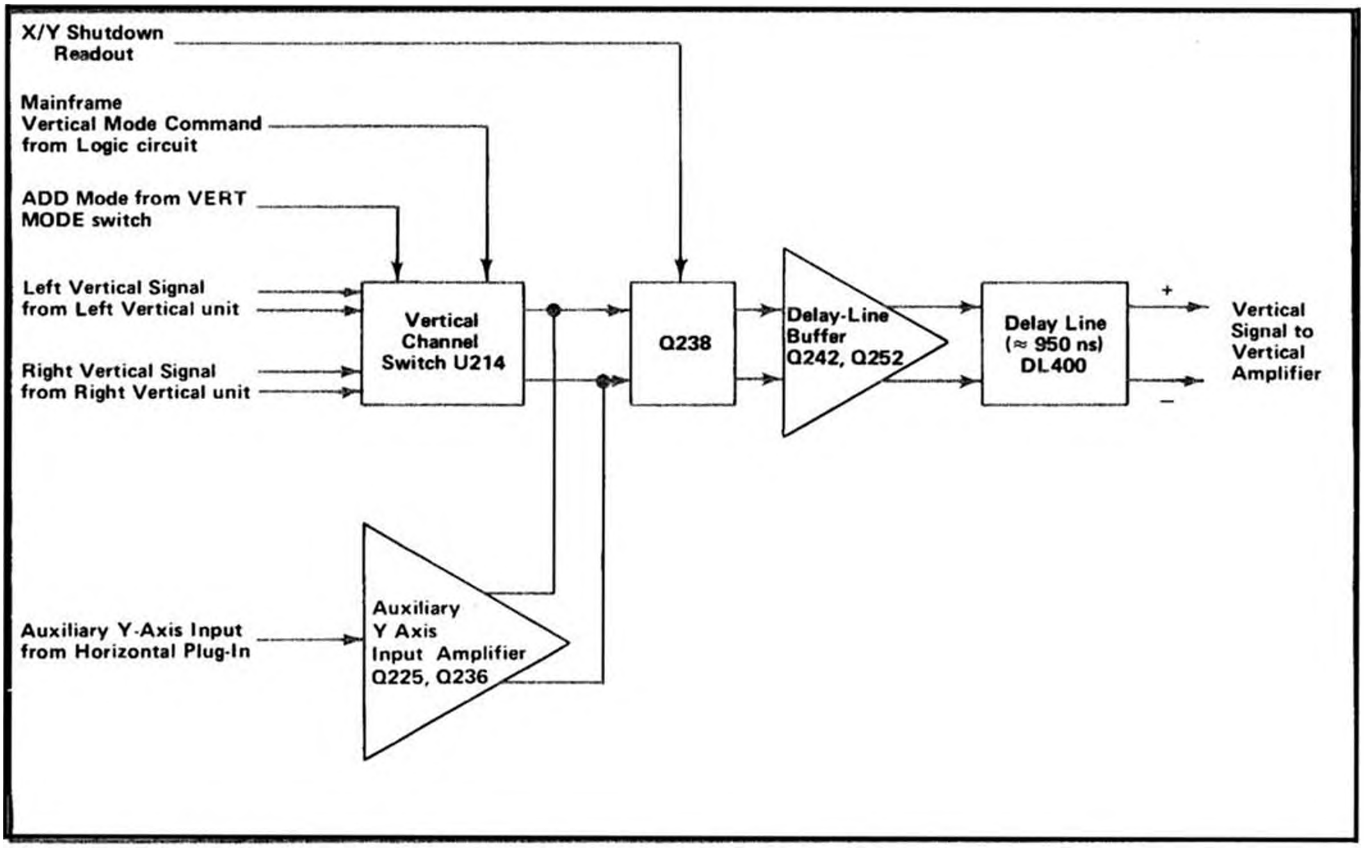


Fig. 3-16. Vertical Interface detailed block diagram.

Input: Mainframe Vertical Mode Command	Input: ADD Mode (Vert)	Output: Output signal
4	14	12, 13
LO	LO	Left vertical signal
HI	LO	Right vertical signal
LO	HI	Both (added algebraically)

Fig. 3-17. Input/output table for Vertical Channel Switch.

pins 12 and 13 is always equal to the sum of the DC input currents at pins 1, 8, 9, and 16 in all modes. This provides a constant DC bias to the following stage as the VERT MODE switch is changed.

When the VERT MODE swich is set to LEFT, the level at pin 4 is LO. This level allows the signal from the left vertical unit to pass to the output while the signal from the right vertical unit is blocked. In the RIGHT position of the VERT MODE switch, the level at pin 4 is HI. Now, the signal from the right vertical unit is connected to the output while the signal from the left vertical unit is blocked.

When the VERT MODE switch is set to either ALT or CHOP, the Mainframe Vertical Mode Command at pin 4 switches between the LO and HI levels at a rate determined by either the Chop Counter or the Vertical Binary stages (see Logic circuit description). This action allows the signal from the left vertical unit to be displayed when the Mainframe Vertical Mode Command is LO and the signal from the right vertical unit is displayed when the Mainframe Vertical Mode Command is HI. When ADD vertical mode operation is selected, a HI level is applied to pin 14 and the level at pin 4 is LO as determined by the Vertical Mode Control stage in the Logic Circuit. This allows both the right and left vertical signals to pass to the output pins. Now, the signal from both vertical units is algebraically added and the resultant signal determines the vertical deflection.

The X/Y Shutdown signal from the Readout system is applied to pin 6 of U214. It has final control over the output signal from U214. Quiescently, the X/Y Shutdown signal is LO and the signal from the selected vertical can pass to the output pins 12 and 13. However, when the Readout system is ready to display Readout information, the level at pin 6 goes HI. This level blocks the signals from both vertical compartments and there is no output from U214 under this condition. Transistor Q238 will conduct and provide about the same current for the output stage as under normal conditions. This limits any change in positioning that would otherwise occur when the X/Y Shutdown signal from the Readout system is applied.

Auxiliary Y-Axis Input Amplifier

The Auxiliary Y-Axis Input Amplifier accepts an input from horizontal plug-in units having compatible features. Normally, this input is a positioning voltage to offset the display. The single-ended signal connected to the input of this stage is converted to a push-pull signal at the collectors of Q225 and Q236. This signal is connected to the Delay-Line Buffer stage along with the output from the Vertical Channel Switch.

Delay-Line Buffer

The output of the Vertical Channel Switch stage, along with any signal from the Auxiliary Y-Axis Input Amplifier, is connected to the emitters of Q242-Q252. These transistors are connected as common-base amplifiers to provide a low-impedance current-summing point. The signal at the collectors of Q242-Q252 is connected to Delay Line DL400. Resistor R260 provides reverse termination for the Delay Line.

Delay Line

Delay Line DL400 provides approximately 150 nanoseconds delay for the vertical signal, to allow the horizontal circuits time to initiate a sweep before the vertical signal reaches the vertical deflection plates of the CRT. This allows the instrument to display the leading edge of the signal originating the trigger pulse when using internal triggering. The delay line used in this instrument has a characteristic impedance of about 50 ohms per side, or about 100 ohms differentially. It is of the coaxial type, which does not produce preshoot or phase distortion in the CRT display.

VERTICAL AMPLIFIER

The Vertical Amplifier circuit provides final amplification for the vertical signal before it is applied to the vertical deflection plates of the CRT. This circuit includes an input from the BEAM FINDER switch to compress an overscanned display within the viewing area of the CRT. Fig. 3-18 shows a detailed block diagram of the Vertical Amplifier circuit. A schematic of this circuit is shown on diagram 4 at the rear of this manual.

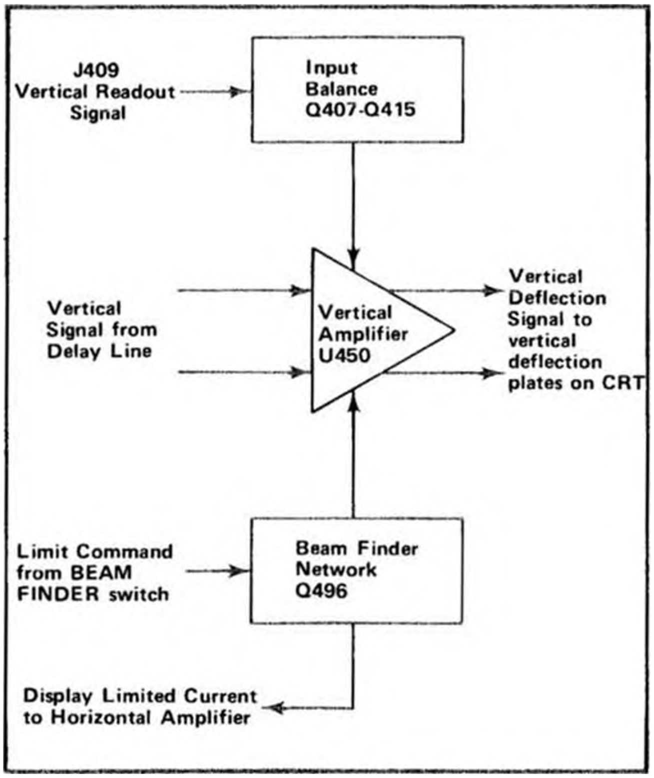


Fig. 3-18. Vertical Amplifier detailed block diagram.

Input Balance

Q407-Q415 comprise a paraphase amplifier to provide input balance for the Vertical Amplifier by changing the DC levels at pins 2 and 4 of U450. Vertical Centering adjustment R403 determines the bias at the base of Q407. As this bias is changed, the levels at the collectors of Q407 and Q415 change due to paraphase action. This DC level is connected to pin 2 of U450 through R408-R423 and to pin 4 through R414-R424. R403 is adjusted so the trace is displayed at the center of the CRT when the inputs to this circuit are at the same potential.

The input to the base of Q407 through J409 is used for Vertical readout signal.

Output Amplifier

Amplification of the vertical signal is accomplished by integrated circuit U450. The circuit shown within the shaded area is a representation of the circuit contained within U450. Notice that the circuit is made up of three similar push-pull stages. Each stage has a pair of common emitter transistors driving a pair of low input impedance common base transistors. Frequency compensation is provided by the networks connected between pins 2 and 4 in the first amplifier stage and pins 7 and 8, 13 and 14 in the third amplifier stage. The resistive network connected to pins 3, 6, and 16 determines the gain of the Vertical Amplifier. Vertical Gain adjustment R447 sets the gain of the second amplifier stage to determine the overall gain of the vertical deflection system and thereby provide a calibrated deflection factor. Bias adjustment R486 sets the voltage level at pin 10 of U450 (nominally 4.3 volts) to balance the third amplifier stage for maximum gain-bandwidth operation.

Beam Finder Network

The Beam Finder Network, consisting of transistor Q496 and associated components, provides a means of locating a display which overscans the graticule area. Under normal operation, −15 volts is connected to the base of Q496 from the BEAM FINDER switch (see diagram 4 and 9) to reverse bias it. Therefore, the normal operating levels for U450 are determined by the resistive network connected to pins 3, 6, and 16. When the BEAM FINDER switch is pressed, the −15 volts is interrupted and the base of Q496 rises positive to turn it on. The resulting change in current of U450 unbalances the second amplifier stage so as to limit its gain. This action compresses the display vertically within the display area.

HORIZONTAL AMPLIFIER

The Horizontal Amplifier circuit amplifies the push-pull horizontal deflection signals from the plug-in unit in the horizontal compartment and connects it to the horizontal deflection plates of the CRT. Fig. 3-19 shows a detailed block diagram of the Horizontal Amplifier circuit. A schematic of this circuit is shown on diagram 5 at the rear of this manual.

Horizontal Channel Switch

The horizontal signals from the plug-in unit in the horizontal compartment are connected to pin 2 and pin 15 of U510. The Readout signal is connected to pin 7 of U510. Integrated circuit U510 determines which input signal will provide the signal for the Horizontal amplifier circuit as controlled by the X/Y Shutdown signal from the Readout system. When the X/Y Shutdown is LO, the signal from horizontal compartment is passed to the output of U510. When the X/Y Shutdown is high, the Readout signal is passed to the output of U510. Resistors R514, R515, R521, and R522 establish the operating levels for this circuit. R512 adjusts the circuit gain. R511 and R513 establish the range for the gain adjustment (see Trigger Channel Switch under TRIGGER SELECTOR in this section).

For normal operation, the gain and current level resistors are connected to the Display Limit Command line. The Display Limit Command is connected to the −15 supply through the BEAM FINDER switch. When the BEAM FINDER switch is actuated, the −15 volt is interrupted to

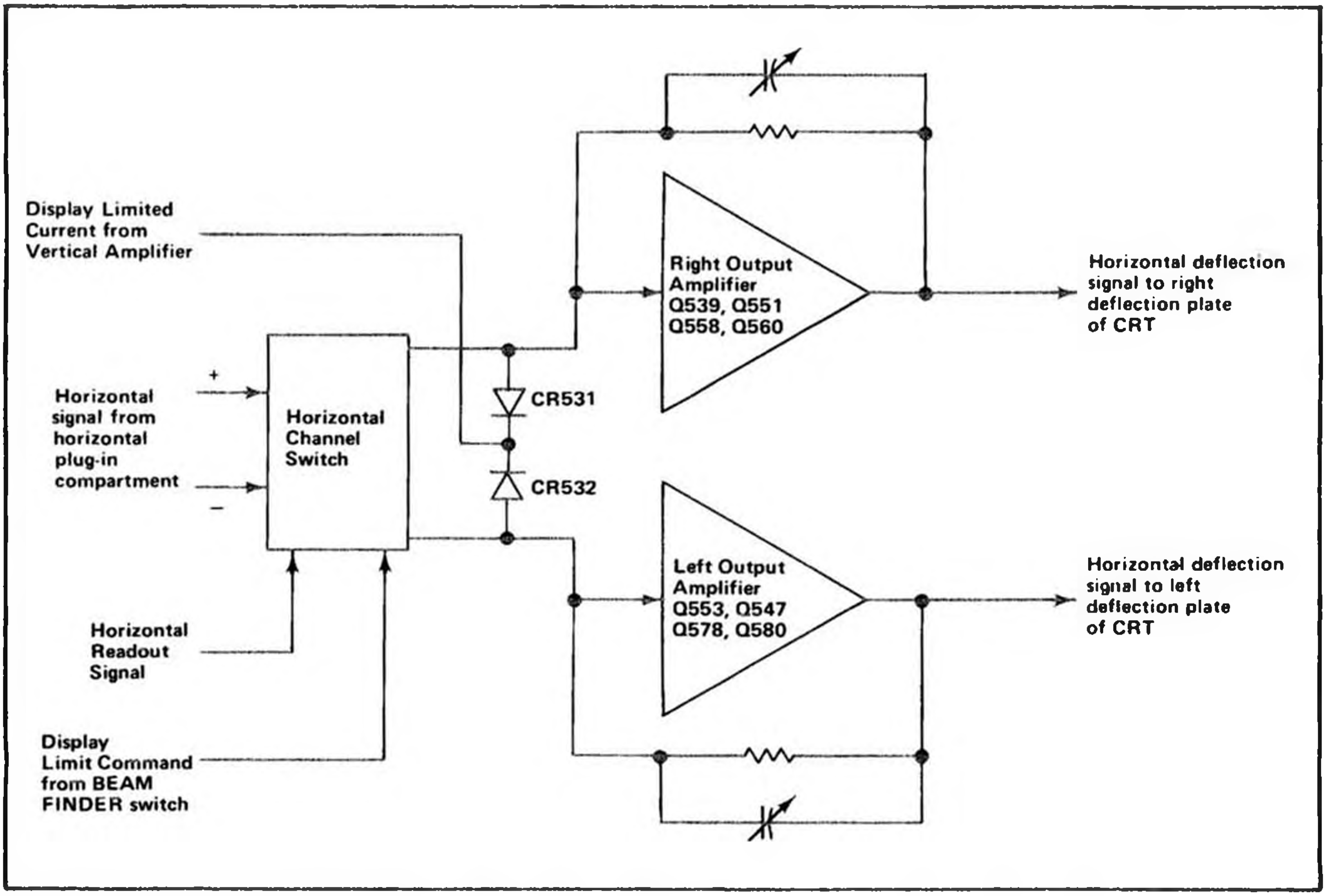


Fig. 3-19. Horizontal Amplifier detailed block diagram.

limit the current to U510. At the same time, current is added through CR531 and CR532 from the display limited current line. This added current maintains about the same DC currents through the output circuit in both positions of the BEAM FINDER switch. The signal at the output is connected to the right and left amplifier inputs. Resistor R525 adjusts the amplifier for center screen deflection in the absence of an input signal to U510.

Output Amplifier

Transistors Q539, Q551, Q558, and Q560 function as a current driven feedback amplifier. The input current is converted to a voltage output signal to drive the right horizontal CRT deflection plate. R558 establishes the quiescent current level for series connected transistors Q558 and Q560.

The CRT deflection plates present a capacitive load to the amplifier, which requires additional current during fast transients. Extra current for positive excursions is provided by Q551 via R555, C555, and Q558; for negative excursions, by Q560 via R563.

Resistor R556 reduces the power dissipation in Q558. Resistors R566, R567, and R569 provide DC feedback and establish low frequency gain. Capacitors C566 and C588 are adjusted for correct gain at fastest sweep rates. C584-R584 provide thermal compensation.

Basic operation of the Left Output Amplifier stage is the same as described for the Right Output Amplifier. C586 and C588 set the gain for the fastest sweep rates (C588 affects both Right and Left Output Amplifiers). The output signal at the collectors of Q578-Q580 connects to the left deflection plate of the CRT through R585.

The series circuit CR549 and R549 stabilize the output amplifier during fast retrace intervals. R535 is adjusted to balance the negative excursions of the right and left sides of the amplifier when the time base plug-in is used in X10 Magnified mode.

CALIBRATOR AND FRONT PANEL SWITCHING

The Calibrator and Front Panel Switching circuit provides output voltage to the front-panel Calibrator pin-jacks and includes the front-panel switches and controls. Fig. 3-20 shows a detailed block diagram of the Calibrator portion of this circuit. A schematic of this circuit is shown on diagram 10 at the rear of this manual.

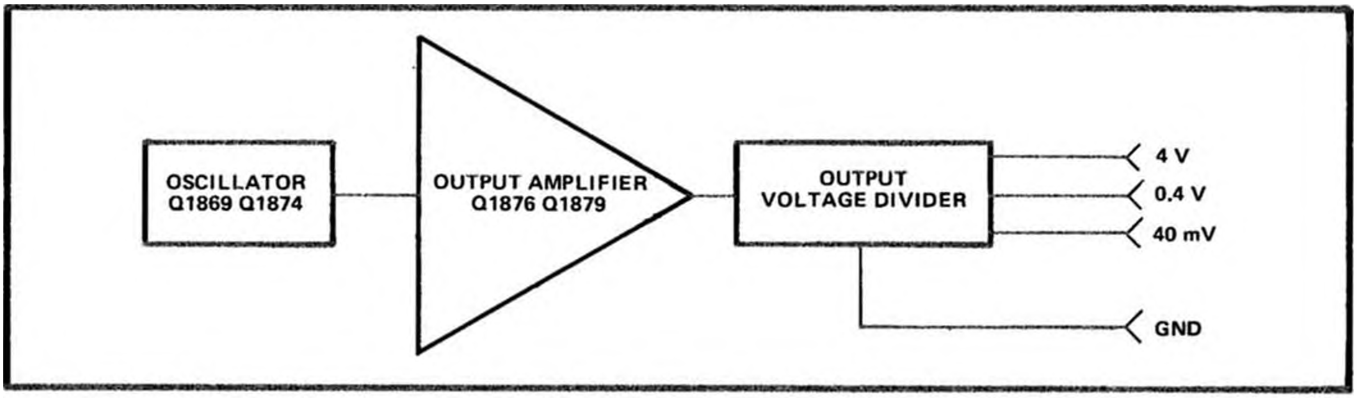


Fig. 3-20. Calibrator detailed block diagram.

Mode Switch Logic

The VERT MODE switch determines the operating mode of the Vertical Interface circuit. The levels established by this switch are also used in various other circuits throughout this instrument. This switch is designed so it is self-cancelling (i.e., only one button can be pressed at a time). Specific operation of this switch is described in connection with the circuits that it controls.

The TRIG SOURCE switch controls the operation of the Trigger Selector circuit. This switch is also self-cancelling so only one of the buttons can be pressed at a time. Operation of this switch is discussed in connection with the Trigger Selector circuit.

Calibrator

General. The Calibrator circuit provides accurate voltage output at the front-panel Calibrator pin-jacks. Repetition rate of the output signal is about one kilohertz.

Oscillator. Q1869 and Q1874 are connected as a square-wave oscillator to determine the repetition rate of the Calibrator circuit. Oscillation occurs as follows: Assume that Q1869 is conducting and Q1874 is off. The collector current of Q1869 through R1869 produces a voltage level which holds the base of Q1874 low. This keeps Q1874 turned off, and since there is no current through it, its collector goes positive to produce the positive portion of the square wave. At the same time, C1871 begins to charge toward −15 volts through R1872. The emitter of Q1874 goes negative also as C1871 charges, until it reaches a level about 0.6 volt more negative than the level at its base. Then, Q1874 is forward biased and its emitter rapidly rises positive. Since C1871 cannot change its charge instantaneously, the sudden change in voltage at the emitter of Q1874 pulls the emitter of Q1869 positive also, to reverse bias it. The current through Q1874 produces a voltage drop at its collector to produce the negative portion of the square wave.

Now, conditions are reversed. Since Q1869 is reverse biased, there is no current through it. Therefore, C1871 can begin to discharge through R1867. The emitter level of Q1869 follows the discharge of C1871 until it reaches about −0.6 volt. Then, Q1869 is forward biased and its collector drops negative to reverse bias Q1874. This interrupts the current through Q1874, and its collector goes positive again to complete the square wave. Once again, C1871 begins to charge through R1872 to start the second cycle. The signal produced at the collector of Q1874 has a repetition rate of about one kilohertz.

The Calibrator output can be changed with the AC-DC jumper. When this jumper is installed in the DC position, it produces a positive DC voltage output to the front-panel Calibrator pin-jacks.

Output Amplifier. Transistors Q1876 and Q1879 form the output amplifier. The 4 Volts adjustment R1884, is set to provide accurate output voltage at the 4 V Calibrator pin-jack.

Output Voltage Divider. The collector current of Q1879 in the Output Amplifier stage is applied across the voltage divider made up of resistors R1888 through R1894. This divider is designed to provide a low output resistance in the

40 mV and 0.4 V positions while providing accurate output voltages. The output resistance at the 4 V pin-jack is about 450 ohms and at the 0.4 V and 40 mV pin-jacks is about 50 ohms.

CRT CIRCUIT

The CRT Circuit produces the high-voltage potentials and provides the control circuits necessary for the operation of the cathode-ray tube (CRT). This circuit also includes the Z-Axis Amplifier stage to set the intensity of the CRT display, and the Auto Focus Amplifier to assure optimum display focus. Fig. 3-21 shows a detailed block diagram of the CRT Circuit. A schematic of this circuit is shown on diagram 7 at the rear of this manual.

Z-Axis Amplifier

The Z-Axis signal from the Logic circuit and the Z-Axis signal from the Readout system are connected to the emitter of Q1107. Transistor Q1107 is a common-base amplifier to establish a low input impedance for the input

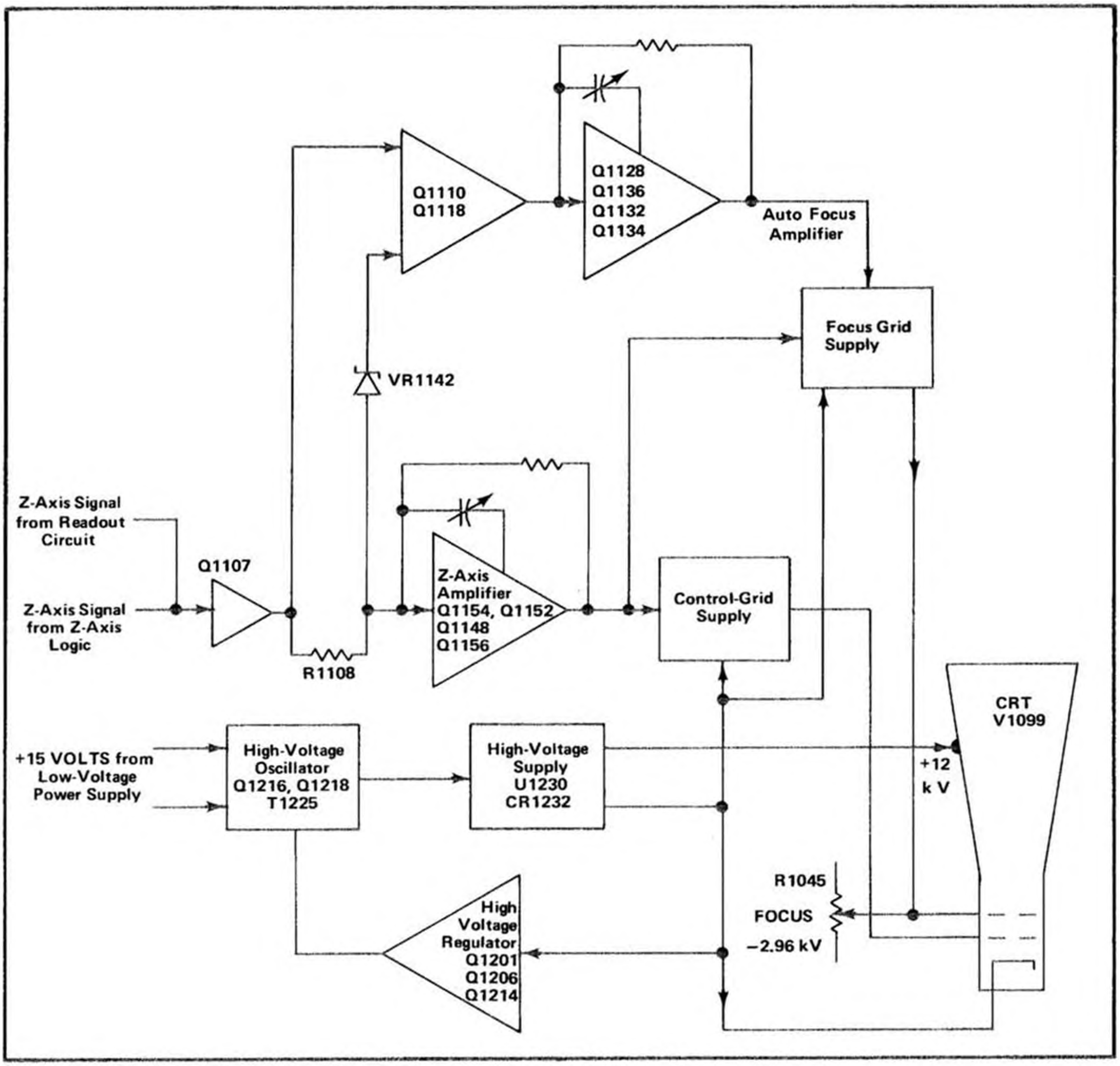


Fig. 3-21. CRT Circuit detailed block diagram.

signals. Transistors Q1148, Q1152, Q1154, and Q1156 form a current driven operational amplifier. The input and output transistors are complementary to provide a fast rise-time and a fast fall-time response. The amplifier input is through resistor R1108. Resistor R1152 establishes a low current in the series connected output transistors. Transistor Q1148 supplies additional current through C1151 for the positive transients, and transistor Q1156 supplies additional current for negative transients. Capacitor C1158 is adjusted for optimum square-wave output, resistors R1158 and R1159 along with capacitor C1158 form the feedback network. Zener diode VR1142 provides the necessary change of voltage from the collector of Q1107 to the base of Q1156.

Auto Focus Amplifier

The voltage developed across R1108 by the Z-Axis amplifier driving current is inverted and amplified nonlinearly by Q1110 and Q1118, to conform to the requirements of the CRT focus electrode. As the base of Q1110 is driven negative CR1115 is forward biased, producing a knee in the amplifier response. The Level where the knee occurs is determined by the adjustment R1121. The operation of the remaining amplifier is identical to the Z-Axis amplifier.

High-Voltage Oscillator

Power for operation of the high-voltage supply is provided from the +15-Volt Supply. At the time of turn-on, CR1215 is reversed biased holding the collector of Q1214 positive. This allows the starting base bias current for the High-Voltage Oscillator to be supplied from the +5-Volt Supply through R1214, Q1214, and the base feedback windings of T1225 while the emitter potential of Q1216-Q1218 is established by the negative side of the +15-Volt Supply. As the output of the high-voltage supply increases to its required output level, the collector of Q1214 goes negative until CR1215 is forward biased. Then the collector level of Q1214 is clamped about 0.6 volt more negative than the negative side of the +15-Volt Supply. This configuration provides a controlled starting current for the High-Voltage Oscillator at turn-on, and at the same time allows the High-Voltage Regulator stage to control the current for the High-Voltage Oscillator after the stage reaches operating potentials to provide a regulated high-voltage output.

Q1216-Q1218 and the associated circuitry comprise an oscillator to drive high-voltage transformer T1225. When the instrument is turned on, assume that Q1216 comes into conduction first. The collector current of Q1216 produces a corresponding current increase in the base-feedback winding of T1225 to further increase the conducivity of Q1216. At the same time, the voltage developed across the base-feedback winding connected to Q1216 holds Q1218 reverse biased.

As long as the collector current of Q1216 continues to increase, voltage is induced into the base-feedback windings of T1225 which holds Q1216 forward biased and Q1218 reverse biased. However, when the collector current of Q1216 stabilizes, the magnetic field built up in T1225 begins to collapse. This induces an opposite current into the base windings which reverse biases Q1216, but forward biases Q1218. When the induced voltage at the base of Q1218 exceeds the bias set by the High-Voltage Regulator, Q1218 conducts and the amplified current at its collector adds to the current flowing through T1225 due to the collapsing field. Then, as the current through T1225 stabilizes again, the magnetic field around it once more begins to collapse. This reverses the conditions to start another cycle.

The signal produced across the primary of T1225 is a sine wave at a frequency of 35 to 45 kilohertz. The amplitude of the oscillations in the primary of T1225 is controlled by the High-Voltage Regulator to set the total accelerating potential for the CRT. Filter network C1222-L1222 decouples high peak operating current from the +15-Volt Supply.

High-Voltage Regulator

A sample of the secondary voltage from T1225 is connected to the High-Voltage Regulator stage through divider R1245A-R1245B. Q1201 and Q1206 are connected as an error amplifier to sense any change in the voltage level at the base of Q1201. The ground connected to the emitter of Q1201 through R1202, provides the reference level for this stage. The output voltage is set by the fixed values of the components in this circuit.

Regulation occurs as follows: If the output voltage at the −1475 V test point starts to go positive (less negative), a sample of this positive-going change is connected to the base of Q1201 through R1245B. Both Q1201 and Q1206 are forward biased by this positive change, which in turn increases the conduction of Q1214. This results in a greater bias current delivered to the bases of Q1216-Q1218 through Q1214. Now, the bases of both Q1216 and Q1218 are biased closer to their conduction level so the feedback voltage induced into their base-feedback windings produces a larger collector current. This results in a larger induced voltage in the secondary of T1225 to produce a more negative level at the −1475 V test point to correct the original error. In a similar manner, the circuit compensates for output changes in a negative direction. Since the amplitude of the voltage induced into the secondary of T1225 also determines the output level of the positive High-Voltage Supply and the Control-Grid Supply, the total high-voltage output is regulated by sampling the output of the negative High-Voltage Supply.

High-Voltage Supplies

High-voltage transformer T1225 has two output windings. One winding provides filament voltage for the cathode-ray tube. The other winding provides the negative and positive accelerating potential for the CRT and the bias voltage for the control grid. All of these voltages are regulated by the High-Voltage Regulator stage to maintain a constant output voltage as previously described.

Positive accelerating potential for the CRT anode is supplied by the voltage doubler. The applied voltage from the secondary of T1225 is about 3.5 kilovolts peak-to-peak. This results in an output voltage of about +7 kilovolts at the CRT anode. The negative accelerating potential for the CRT cathode is also obtained from this same secondary winding. Half-wave rectifier CR1232 provides an output voltage of about −1.475 kilovolts which is connected to the CRT cathode through R1234. The cathode and filament are connected together through R1275 to prevent cathode-to-filament breakdown due to a large difference in potential between these CRT elements. A sample of the negative accelerating voltage is connected to the High-Voltage Regulator to maintain a regulated high-voltage output.

The network consisting of diodes CR1269-CR1268-CR1270-CR1264-VR1264 provides the negative voltage for the control grid of the CRT. Output level of this supply is set by CRT Grid Bias adjustment R1261. Approximately 600 volts peak-to-peak from the secondary of T1225 is connected to the Control-Grid Supply through C1266 and R1266. Diodes CR1268 and CR1264 clip this signal to determine the operating level at the control grid. CR1268 limits the negative excursion of the signal; quiescently when the CRT is blanked, the anode of CR1268 is set at about +15 volts by the Z-Axis Amplifier stage. The positive clipping level at the cathode of CR1264 is set by CRT Grid Bias adjustment R1261. R1261 is adjusted to bias the control grid of the CRT just enough negative so the trace is blanked between sweeps. Under normal conditions, this biases the control grid about 80 volts more negative than the cathode.

The negative level at the CRT cathode is connected to the cathode of CR1270. This level is held constant by the High-Voltage Regulator as described previously. The clipped voltage developed by diodes CR1264 and CR1268 is peak to peak rectified by diodes CR1269 and CR1270 and super-imposed on this negative voltage to result in a level at the grid of the CRT which is more negative than the CRT cathode level. C1269 acts as a filter to provide a constant voltage output level. The unblanking gate level developed by the Z-Axis Amplifier stage is applied to the anode of CR1268 through R1157. The fast rising and falling portions of this signal are coupled directly to the output through C1269. The overall effect of the unblanking gate is to further clip the negative excursions thereby reducing the voltage difference between grid and cathode of the CRT. This allows the cathode current of the CRT to pass to the anode so the display can be viewed.

CRT Control Circuits

The focus of the display is determined by the FOCUS control R1045. This control and the Auto Focus amplifier maintains a well-defined display for fast changes in the intensity of the display. The network consisting of CR1255, CR1254, CR1253, CR1258, and VR1258 provide the negative voltage for the focus grid of the CRT. Approximately 600 volts peak to peak from the secondary of T1225 is connected to the focus grid supply through C1257 and R1257. The positive clipping level at the anode of CR1258 is set by the FOCUS control setting. This determines the operating level at the focus grid. Under normal operating conditions the voltage applied to the focus grid is more positive (less negative) than the control grid or the cathode of the CRT. The signal developed by the Auto Focus amplifier is coupled to the focus grid by C1254. When there is a sudden change in intensity levels the focus grid level will change to maintain a well-defined display. Astigmatism adjustment R1193, which is used in conjunction with the FOCUS control to obtain a well-defined display, varies the positive level on the astigmatism grid. Geometry adjustment R1184 varies the positive level on the horizontal deflection-plate shield to control the overall geometry of the display.

Two adjustments control the trace alignment by varying the magnetic field induced by coils around the CRT. Y-Axis Alignment R1190 controls the current through L1098, which affects the CRT beam after vertical deflection, but before horizontal deflection. Therefore, it affects only the vertical (Y) components of the display. Beam Rotation adjustment R1181 controls the current through L1099 and affects both the vertical and horizontal rotation of the display.

LOW-VOLTAGE POWER SUPPLY

The Low-Voltage Power Supply circuit provides the operating power for this instrument from six regulated supplies. Electronic regulation is used to provide stable, low-ripple output voltages. Each supply (except the +130 V supply, which is fused) contains a short-protection circuit to prevent instrument damage if a supply is inadvertently over-loaded or shorted to ground. Fig. 3-22 shows a detailed block diagram of the Low-Voltage Power Supply circuit. A schematic of this circuit is shown on diagram 8 at the rear of this manual.

Power Input

Power is applied to the primary of transformer T801 through line fuse F1000, thermal cutout S1000, and POWER switch S1001. The Voltage-Selector Jumper, P1001, connects the two halves of the primary of T801 in parallel for 110-volt (nominal) operation. Voltage-Selector Jumper P1002 connects the two halves of the primary in series for 220-volt (nominal) operation. The line fuse, F1000, must be changed to provide the correct protection for 220-volt nominal operation.

Each half of the primary of T801 has taps above and below the 110-volt (220-volt) nominal point. When the Voltage Selector Jumper is moved from LOW to MED to HI, more turns are effectively added to the primary winding and the turns ratio is decreased to compensate for the increased primary voltage. This configuration extends the regulating range of the 7623.

For the R7623, a fan provides forced-air cooling. The fan is connected in parallel with one half of the primary winding of T801. Therefore, it always has the same voltage applied regardless of the position of the Voltage-Selector Jumper.

Thermal cutout S1000 provides thermal protection for this instrument. If the internal temperature of the instrument exceeds a safe operating level, S1000 opens to interrupt the applied power. When the temperature returns to a safe level, S1000 automatically closes to re-apply the power.

−50-Volt Supply

The following discussion includes the description of the 50 V Rectifier, −50 V Series Regulator, −50 V Feedback Amplifier, −50 V Reference, and −50 V Current Limiting stages. Since these stages are closely related in the operation of the −50-volt regulated output, their performance is most easily understood when discussed as a unit.

The 50 V Rectifier assembly CR808 rectifies the output at the secondary of T801 to provide the unregulated voltage source for both the −50- and +50-volt supplies. CR808 is connected as a bridge rectifier and its output is filtered by C808-C809. Transistors Q886, Q896, Q900 operate as a feedback-stabilized regulator circuit to maintain a constant −50-volt output level. Q886 is connected as a differential amplifier to compare the feedback voltage at the base of Q886B against the reference voltage at the base of Q886A. The error output at the collector of Q886B reflects the difference, if any, between these two inputs. The change in error-output level at the collector of Q886B is always opposite in direction to the change in the feedback input at the base of Q886B (out of phase).

Zener diode VR890 sets a reference level of about −9 volts at the base of Q886A. A feedback sample of the output voltage from this supply is connected to the base of Q886B through divider R880-R881-R882. R881 in this divider is adjustable to set the output level of this supply. Notice that the feedback voltage to this divider is obtained from a line labeled −50 V Sense. Fig. 3-23 illustrates the reason for this configuration. The inherent resistance of the interconnecting wire between the output of the −50-Volt Supply and the load produces a voltage drop which is equal to the output current multiplied by the resistance of the interconnecting wire. Even though the resistance of the wire is small, it results in a substantial voltage drop due to the high output current of this supply. Therefore, if the feedback voltage were obtained ahead of this drop, the voltage at the load might not maintain close regulation. However, the −50 V Sense feedback configuration overcomes this problem since it obtains the feedback voltage from a point as close as practical to the load. Since the current in the −50 V Sense line is small and constant, the feedback voltage is an accurate sample of the voltage applied to the load.

Regulation occurs as follows: If the output level of this supply decreases (less negative) due to an increase in load, or a decrease in input voltage (as a result of line voltage changes or ripple), the voltage across divider R880-R881-R882 decreases also. This results in a more positive feedback level at the base of Q886B than that established by the −50 V Reference stage at the base of Q886A. Since the transistor with the more positive base controls the conduction of the differential amplifier, the output current at the collector of Q886B increases. This increase in output from Q886B allows more current to flow through Q896 and Q900 to result in increased conduction of −50 V Series Regulator Q903. The load current increases and the output voltage of this supply also increases (more negative). As a result, the feedback voltage from the −50 V Sense line increases and the base of Q886B returns to the same level as the base of Q886A. Similarly, if the output level of this supply increases (more negative), the output current of Q886B decreases. The feedback through Q896 and Q900 reduces the conduction of the −50 V Series Regulator to decrease the output voltage of this supply.

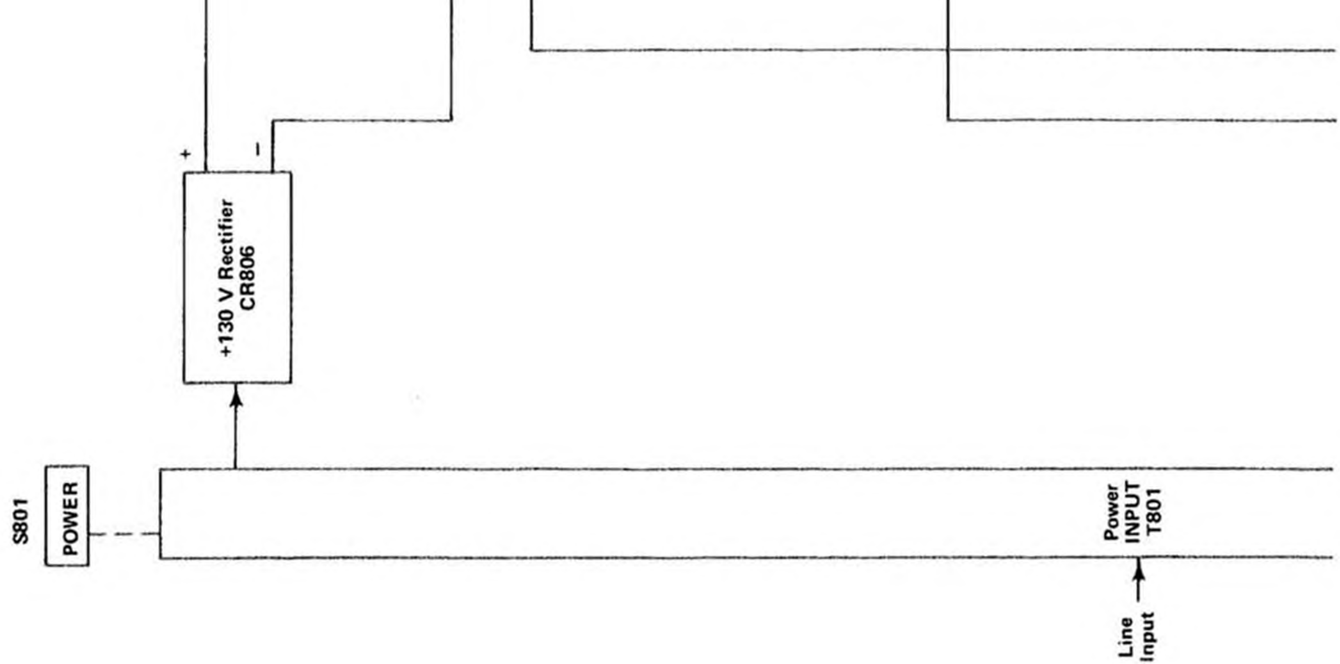
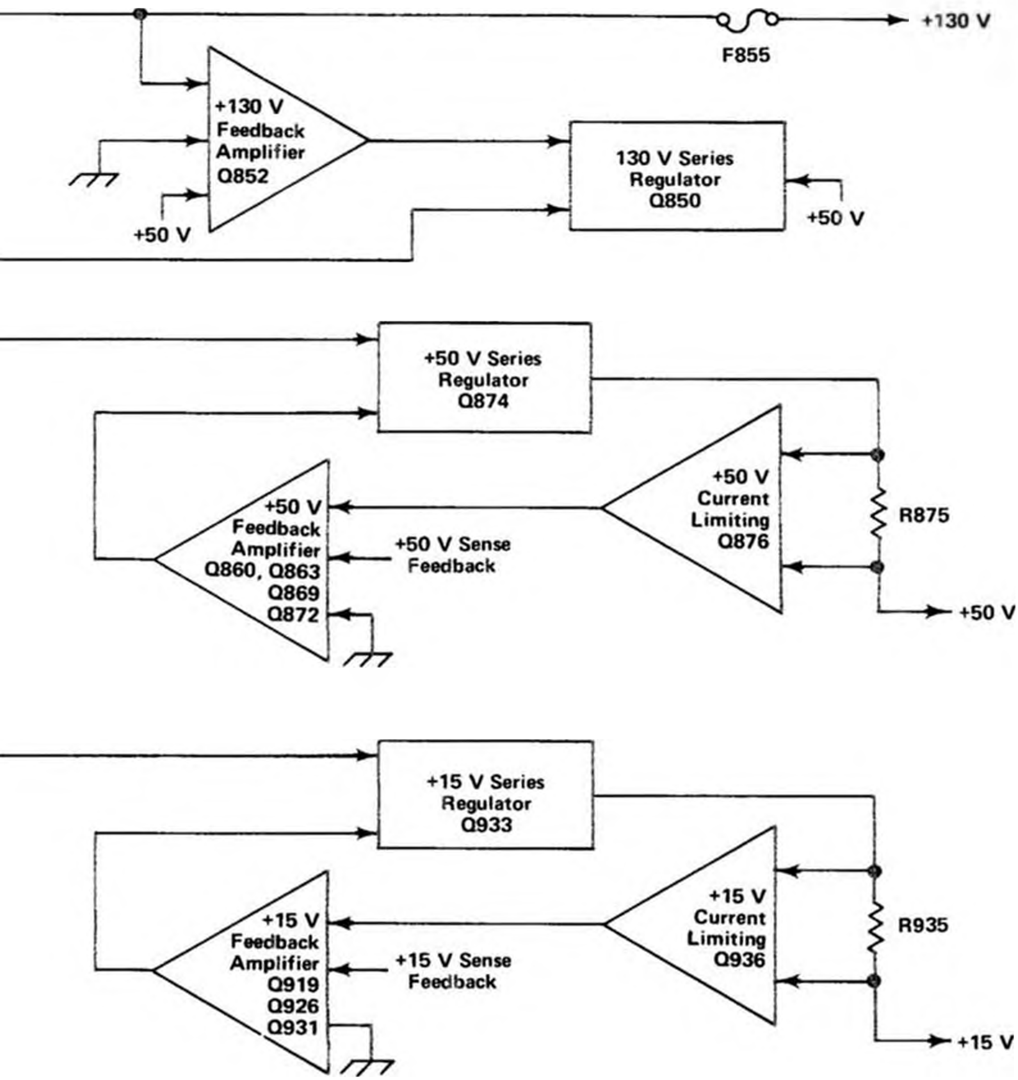


Fig. 3-22. Low-Voltage Power Supply detailed block diagram.


+130 V
F855
+130 V
Feedback
Amplifier
Q852
+50 V
130 V Series
Regulator
Q850
+50 V
+50 V Series
Regulator
Q874
+50 V
Current
Limiting
Q876
R875
+50 V
Feedback
Amplifier
Q860, Q863
Q869
Q872
+50 V Sense
Feedback
+50 V
+15 V Series
Regulator
Q933
+15 V
Current
Limiting
Q936
R935
+15 V
Feedback
Amplifier
Q919
Q926
Q931
+15 V Sense
Feedback
+15 V

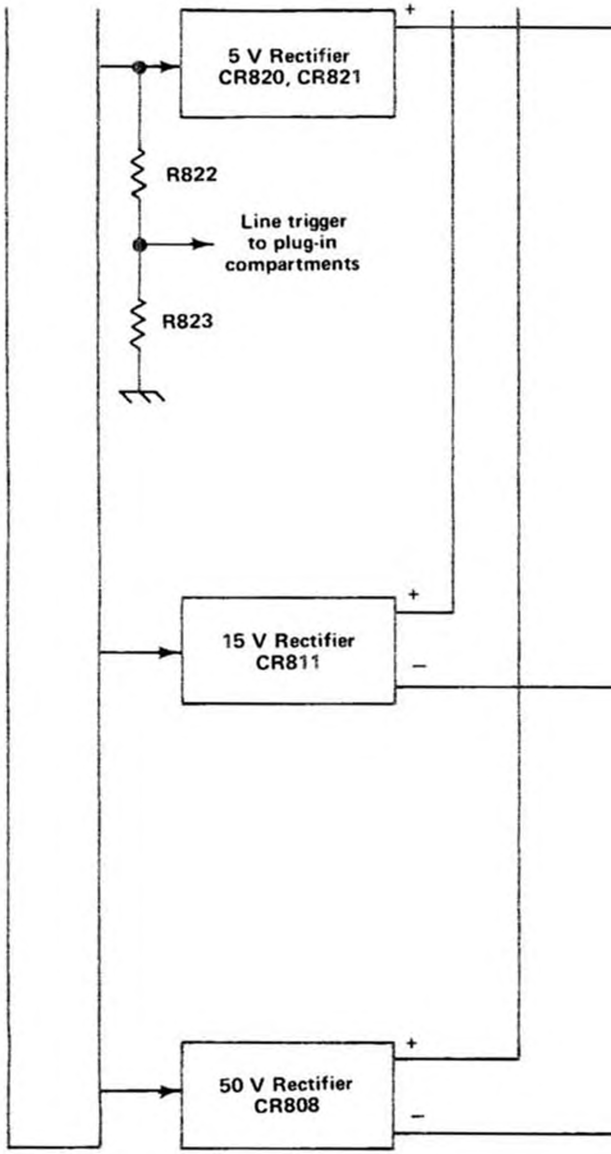
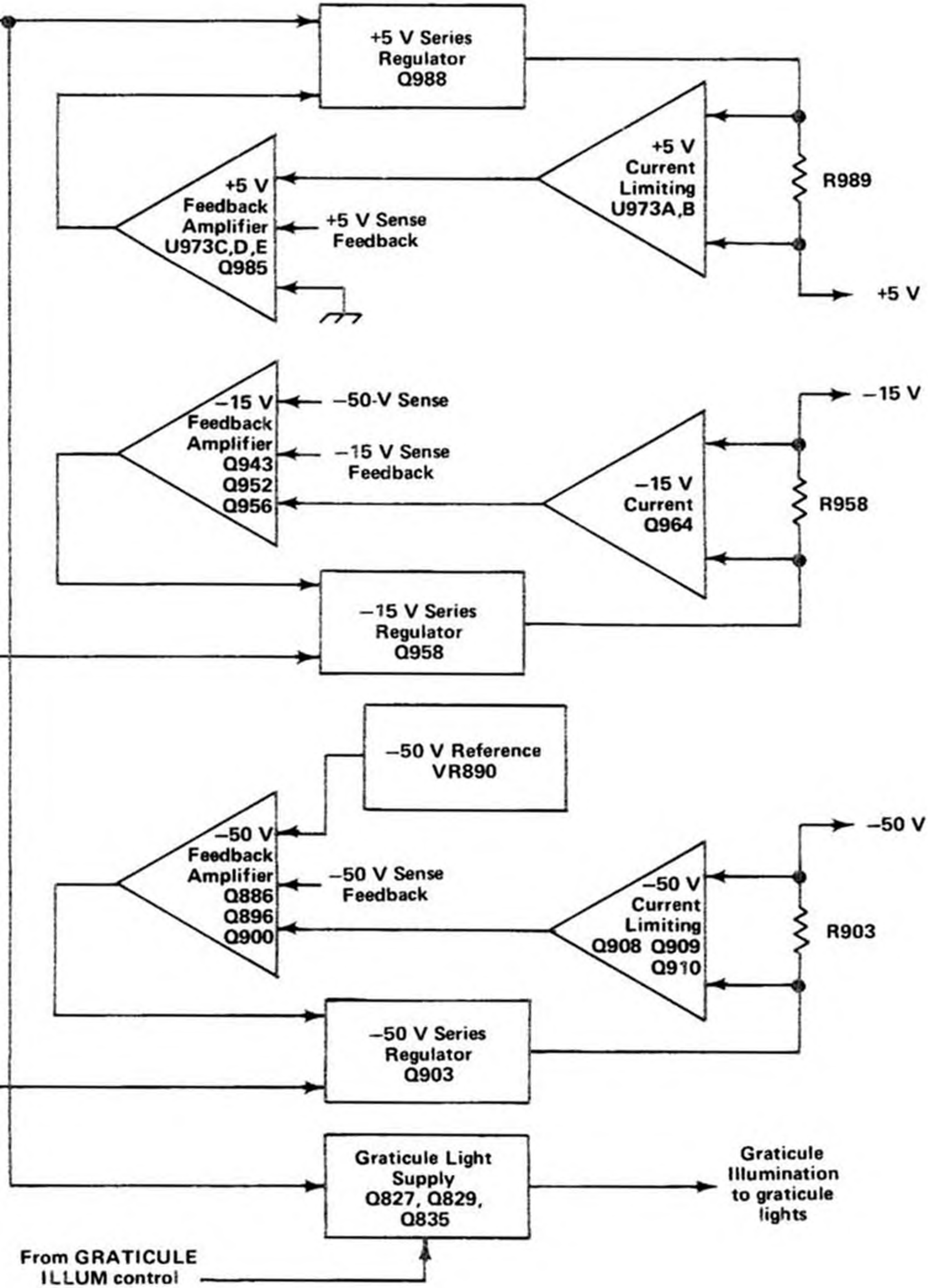


Fig. 3-22. Low-Voltage Power Supply detailed block diagram (cont).



+5 V Series Regulator Q988
+5 V Current Limiting U973A,B
R989
+5 V Feedback Amplifier U973C,D,E Q985
+5 V Sense Feedback
+5 V
−15 V Feedback Amplifier Q943 Q952 Q956
−50-V Sense
−15 V Sense Feedback
−15 V
−15 V Current Q964
R958
−15 V Series Regulator Q958
−50 V Reference VR890
−50 V Feedback Amplifier Q886 Q896 Q900
−50 V Sense Feedback
−50 V
−50 V Current Limiting Q908 Q909 Q910
R903
−50 V Series Regulator Q903
Graticule Light Supply Q827, Q829, Q835
Graticule Illumination to graticule lights
From GRATICULE ILLUM control

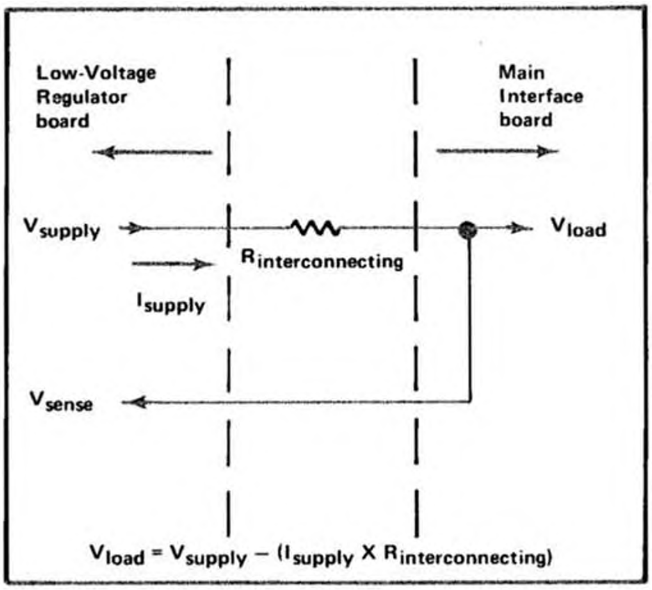


Fig. 3-23. Schematic illustrating voltage drop between power supply output and load due to resistance of interconnecting wire.

−50 Volts adjustment R881 determines the divider ratio to the base of Q886B and thereby determines the feedback voltage. This adjustment sets the output level of the supply in the following manner: If R881 is adjusted so the voltage at its variable arm goes less negative (closer to ground), this appears as an error signal at the base of Q886B. In the same manner as described previously, this positive-going change at the feedback input of the differential amplifier increases the conduction of the −50 V Series Regulator to produce more current to the load, and thereby increase the output voltage of this supply. This places more voltage across divider R880-R881-R882 and the divider action returns the base of Q886B to about −9 volts. Notice that the feedback action of this supply forces a change in the output level which always returns the base of Q886B to the same level as the base of Q886A. In this manner, the output level of the −50-Volt Supply can be set to exactly −50 volts by correct adjustment of R881.

The −50 V Current Limiting stage Q908-Q909-Q910 protects the −50-Volt Supply if excess current is demanded from this supply. All of the output current from the −50-Volt Supply flows through R903. Transistor Q908 senses the voltage at the collector of the −50 V Series Regulator Q903 and compares it against the −50 V output level at the base of Q909 which is obtained from the other side of R903. Under normal operation, Q908 is held in conduction and Q909 is off. However, when excess current is demanded from the −50 V Series Regulator due to a short circuit or similar malfunction at the output of this supply, the voltage drop across R903 increases until the base of Q908 goes more negative than the level at the base of Q909. Then Q909 takes over conduction of the comparator. The collector current of Q909 increases the voltage drop across R896 to reduce the conduction of Q896 in the −50 V Feedback Amplifier and limit the conduction of Q903. Q910 is connected as a constant-current source for Q908-Q909.

−15-Volt Supply

Basic operation of all stages in the −15-V Supply is the same as for the −50-Volt Supply. Reference level for this supply is established by divider R945-R946 between ground and the −50 V Sense voltage. The divider ratio of R945-R946 sets a level of −15 volts at the base of Q943A. The level on the −50 V Sense line is held stable by the −50-Volt Supply as described previously. The −15 V Sense voltage is connected to the base of Q943B through R940. Any change at the output of the −15-Volt Supply appears at the base of Q943B as an error signal. The output voltage is regulated in the same manner as described for the −50-Volt Supply.

+5-Volt Supply

Basic operation of the +5-Volt Supply is the same as described for the previous supplies. The +5 V Current Limiting and +5 V Feedback Amplifier (except for Q985) is made up of a five-transistor array U973. Notice that both U973C and Q985 in the +5 V Feedback Amplifier are connected as emitter followers, since inversion is not necessary in the feedback path for positive output voltages. Reference voltage for the +5 V Feedback Amplifier stage is established by divider R970-R971 between the +5 V Sense and −50 V Sense feedback voltages. This divider establishes a quiescent level of about 0 volt at the base of U973E.

+15-Volt Supply

The +15-Volt Supply operates in the same manner as described for the previous supplies. The unregulated +15-Volt Supply provides the source voltage for the High-Voltage Oscillator stage in the CRT circuit through fuse F814 and P870.

+50-Volt Supply

Operation of the +50-Volt Supply is the same as described for the previous supplies. The unregulated +50 volts, from 50 V Rectifier CR808, is used to provide a positive starting voltage for the −50-Volt Supply.

+130-Volt Supply

The +130-V Rectifier CR806 provides the rectified voltage for the +130-Volt Supply. However, this secondary winding of T801 does not supply the full potential necessary to obtain the +130-volt output level. To provide the required output level, the +50-Volt Supply is connected in series with this supply through Q850. Basic regulation of the output voltage is provided by +130 V Feedback Amplifier Q852, and +130 V Series Regulator Q850.

The output voltage of this supply is connected across divider R855-R856. This divider provides a quiescent level of about +50 volts at the base of Q852. The reference level for this supply is provided by the +50-Volt Supply connected to the emitter of Q852. If the output of this supply changes, this change is sensed by Q852 and an amplified error signal is connected to the base of Q850. This error signal changes the conduction of the +130 V Series Regulator Q850 to correct the output error. Fuse F855 protects this supply if the output is shorted. However, since the response time of F855 is slow to a shorted condition, VR851 provides additional current to the base of Q850 to protect it from damage due to over voltage. Diode CR852 limits the reverse bias on Q852 to about 0.6 volt when F855 is blown.

Graticule Light Supply

Power for the graticule lights is supplied by the Graticule Light Supply. Rectified voltage for this supply is provided by 5 V Rectifier CR820-CR821. Q835 operates as a series regulator transistor. Emitter follower Q829 determines the conduction of this series regulator as controlled by front panel GRATICULE ILLUM Control R1095. Current-limiting to protect this supply is provided by Q827. Under normal operation, divider R830-R831-R833 sets the base of Q827 below its conduction level. However, if excess current is demanded from this supply, the voltage drop across R837-R838 increases until Q827 comes into conduction. The collector of Q827 then limits the conduction of this supply to limit its output current.

Divider R822-R823 provides a sample of the line voltage in the secondary of T801 to the plug-in unit. This provides a line-frequency reference to the plug-in units for internal triggering at line frequency or for other applications.

SIGNAL OUT BOARD

VERT SIG OUT

The vertical signal is selected by the TRIG SOURCE switch. The vertical signal selected is applied to the bases of a differential amplifier Q606 and Q618. A single-ended signal is taken off the collector of Q618 and connected to an output buffer Q620. CR621 and CR622 provide protection against a high voltage inadvertently applied to the output connector.

+ GATE OUT

The gate signal is connected to a comparator circuit Q662 and Q666 through resistor R660. From the comparator the gate signal is connected to the emitter of an output buffer Q672. Gate Selector switch connects one of the gate signals to R660, the input of the Gate Amplifier. Possible gate signals are MAIN gate and, with a dual-sweep time-base unit, a DELAY or an AUXILIARY gate signal can be selected. CR674 and CR676 provide protection against a high voltage inadvertently applied to the output connector.

+ SAWTOOTH OUT

The sawtooth signal is connected to the Sawtooth Amplifier through R36. Q631, Q634, and Q640 comprise a negative feedback amplifier with a gain of two, determined by the ratio of feedback resistor R645 to the combined input resistance of R630 and R63. CR635 and CR676 provide protection against a high voltage inadvertently applied to the output connector.

READOUT SYSTEM

The Readout System in this instrument provides alphanumeric display of information encoded by the plug-in units. This display is presented on the CRT and is written by the CRT beam on a time-shared basis. Schematics for the total Readout System are shown on diagrams at the rear of this manual.

The definitions of several terms must be clearly understood to follow this description of the Readout System. These are:

Character—A character is a single number, letter, or symbol which is displayed on the CRT, either alone or in combination with other characters.

Word—A word is made up of a related group of characters. In this Readout System, a word can consist of up to ten characters.

Frame—A frame is a display of words for a given operating mode and plug-in combination. Up to six words can be displayed in one frame. Fig. 3-24 shows one complete frame (simulated readout) and the position at which each of the six words is displayed.

Column—One of the vertical lines in the Character Selection Matrix (see Fig. 3-25). Columns C-0 (column zero) to C-10 (column 10) can be addressed in the 7623 system.

Row—One of the horizontal lines in the Character Selection Matrix (Fig. 3-25). Rows R-1 (row 1) to R-10 (row 10) can be addressed in this system.

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

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

Display Format. Up to six words of readout information can be displayed on the CRT. The position of each word is fixed and is directly related to the plug-in unit from which it originated. Fig. 3-24 shows the area of the graticule where the readout from each plug-in unit is displayed. Notice that channel 1 of each plug-in unit is displayed within the top division of the CRT and channel 2 is displayed directly below within the bottom division. Fig. 3-26 shows a typical display.

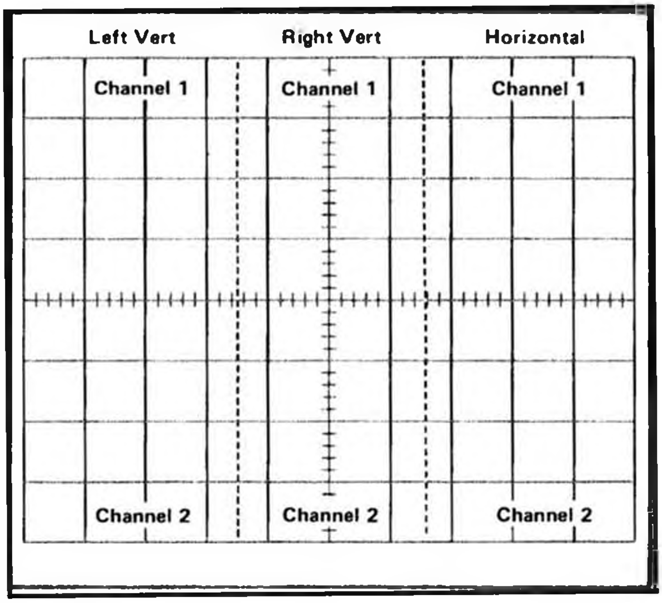


Fig. 3-24. Location of readout words on the CRT identifying the originating plug-in unit and channel (one complete frame shown, simulated readout).

Each word in the readout display can contain up to 10 characters, although the typical display will contain between two and seven characters per word. The characters are selected from the Character Selection Matrix shown in Fig. 3-25. Any one of the 50 separate characters can be addressed and displayed on the CRT. In addition, 12 operational addresses are provided for special instructions to the Readout System. The unused locations in the Matrix (shaded areas) are available for future expansion of the Readout System. The method of addressing the locations in the Character Selection Matrix is described in the following discussion.

Developing the Display. The following basic description of the Readout System uses the block diagram shown in Fig. 3-27. This description is intended to relate the basic function of each stage to the operation of the overall Readout System. Detailed information on circuit operation is given later.

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

Two output lines, row and column, are connected from each channel of the plug-in units back to the Readout System. Data is encoded on these output lines by connecting resistors between them and the time-slot input lines. The resultant output is a sequence of ten analog current levels which range from zero to one milliampere (100 microamperes/step) on the row and column output lines. This row and column correspond to the row and

Row Number ↓	Column Number → / Current (Milli-amperes)	C-0	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	≥1.0
R-1	0	SKIP*	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
R-2	0.1		⁄	<	*I*	/	+	–	+	*C*	Δ	>
R-3	0.2		Add* one zero	Add* two zeros	Reduce* prefix	Reduce* prefix and add one zero						*IDENTIFY**
R-4	0.3		*m*	*µ*	*n*	*p*	*X*	*K*	*M*	*G*	*T*	*R*
R-5	0.4		*S*	*V*	*A*	*W*	*H*	*d*	*B*	*c*	Ω	*E*
R-6	0.5		*U*	*N*	*L*	*Z*	*Y*	*P*	*F*	*J*	*Q*	*D*
R-7	0.6				Decimal* point location No. 3	Decimal* point location No. 4	Decimal* point location No. 5	Decimal* point location No. 6	Decimal* point location No. 7			
R-8	0.7											
R-9	0.8											
R-10	0.9	Add Space In Display*										

(shaded box) Unused locations. Available for future expansion of Readout System

* Operational address.

Fig. 3-25. Character Selection Matrix for 7623 Readout System.

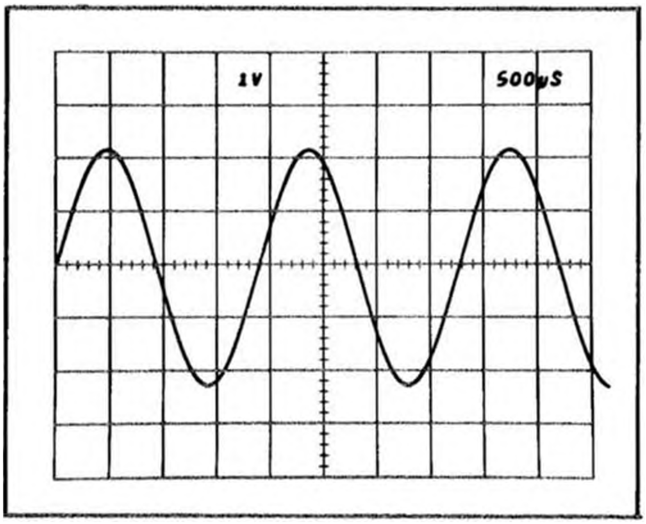


Fig. 3-26. Typical readout display where only channel 1 of the Right Vertical and Horizontal unit is displayed.

column of the Character Selection Matrix in Fig. 3-25. The standard format in which information is encoded onto the output lines is given in Table 3-2 (special purpose plug-in units may have their own format for readout; these special formats will be defined in the manuals for these units).

The encoded column and row data from the plug-in units is selected by the Column Data Switch and Row Data Switch stages respectively. These stages take the analog currents from the six data lines (two channels from each of the three plug-in compartments) and produce a single time-multiplexed analog voltage output which contains all of the column or row information from the plug-ins. The Column Data Switch and Row Data Switch are sequenced by the binary Channel Address code from the Channel Counter.

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

The analog outputs of the Column Data Switch and Row Data Switch are connected to the Column Decoder and Row Decoder stages respectively. These stages sense the magnitude of the analog voltage input and produce an output current on one of ten lines. The outputs of the Column Decoder stage are identified as C-1 to C-10 (column 1 to 10) which correspond to the column information encoded by the plug-in unit. Likewise, the outputs of the Row Decoder stage are identified as R-1 to R-10 (row 1 to 10) which correspond to the row information encoded by the plug-in unit. The primary function of the row and column outputs is to select a character from the Character Selection Matrix to be produced by the Character Generator stage. However, these outputs are also used at other points within the system to indicate when certain information has been encoded. One such stage is the Zeros Logic and Memory. During time-slot 1 (TS-1), this stage checks if zero-adding or prefix-shifting information has been encoded by the plug-in unit and stores it in memory until time-slots 5, 6, or 8. After storing this information, it triggers the Display-Skip Generator stage so there is no display during this time slot (as defined by Standard Readout Format; see Table 3-2). When time-slots 5, 6, and 8 occur, the memory is addressed and any information stored there during time-slot 1 is transferred out and connected to the input of the Column Decoder stage to modify the analog data during the applicable time-slot.

TABLE 3-2

Standard Readout Format

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

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

The Character Generator stage produces the characters which are displayed on the CRT. Any of the 50 characters shown on the Character Selection Matrix of Fig. 3-24 can be addressed by proper selection of the column and row current. Only one character is addressable in any one time-slot; a space can be added into the displayed word by the Decimal Point Logic and Character Position Counter stage when encoded by the plug-in. The latter stage counts how many characters have been generated and produces an output current to step the display one character position to the right for each character. In addition, the character position is advanced once during each of time-slots 1, 2, and 3 whether a character is generated during these time-slots or not. This action fixes the starting point of the standard-format display such that the first digit of the scaling factor always starts at the same point within each word regardless of the information encoded in time-slot 2 (normal/invert) or time-slot 3 (cal/uncal) which precedes this digit. Also, by encoding row 10 and column 0 during any time-slot, a blank space can be added to the display. Decimal points can be added to the display at any time by addressing row 7 and columns 3 through 7 (see Character Selection Matrix for location of these decimal points). The Decimal Point Logic and Character Position Counter stage is reset after each word by the Word Trigger pulse.

The Format Generator stage provides the output signals to the vertical and horizontal deflection systems of the instrument to produce the character display. The binary Channel Address No. 2 code from the Channel Counter stage is connected to this stage so that the display from each channel is positioned to the area of the CRT which is associated with the plug-in and channel originating the word (see Fig. 3-24). The positioning current or decimal point location current generated by the Decimal Point Logic and Character Position Counter stage is added to the horizontal (X) signal at the input to the Format Generator stage to provide horizontal positioning of the characters within each word. The X- and Y-output signals are connected to the Horizontal Amplifier and Vertical Amplifier through the Horizontal Output and Vertical Output stages respectively.

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

The Single-Shot Lockout stage allows the display sequence of the Readout System to be changed. Normally, the Readout System operates in a free-running mode so the waveform display is interrupted randomly to display characters. However, under certain conditions (such as single-shot photography), it is desirable that the Readout System operate in a triggered mode where the readout portion of the display is normally blanked out but can be presented on command. The Readout Mode switch determines the operating mode of the readout system.

Circuit Analysis of Readout System

The following analysis of the Readout System describes the operation of each stage in detail. Complete schematics of the Readout System are shown on diagram 10 at the read of this manual.

Timer

Timer U2126 establishes the timing sequence for all circuits within the Readout System This stage produces seven time-related output waveforms (see Fig. 3-28). The triangle waveform produced at pin 6 forms the basis for the remaining signals. The basic period of this triangle waveform is about 250 microseconds as controlled by RC network C1214-R1214. The triangle waveform is clipped and amplified by U1210 to form the trapezoidal output signal at pin 10. The amplitude of this output signal is exactly 15 volts as determined by V2126 (exact amplitude necessary to accurately encode data in plug-in units; see Encoding the Data). The Trigger output at pin 5 provides the switching signal for the Time-Slot Counter and Word Trigger stages.

The signals at pins 12, 13, 14, and 16 are produced only when the triangle waveform is on its negative slope and the trapezoidal waveform has reached the lower level. The timing sequence of these waveforms is very important to the correct operation of the Readout System (see expanded waveforms in Fig. 3-29). The Z-Axis Logic OFF Command at pin 14 is produced first. This negative-going signal provides a blanking pulse to the Z-Axis Logic stage (see diagram 2) to blank the CRT before the display is switched to the Readout System. It also produces the Strobe pulse through R2137, Q2138, and CR2142 to signal other stages within the Readout System to begin the sequence necessary

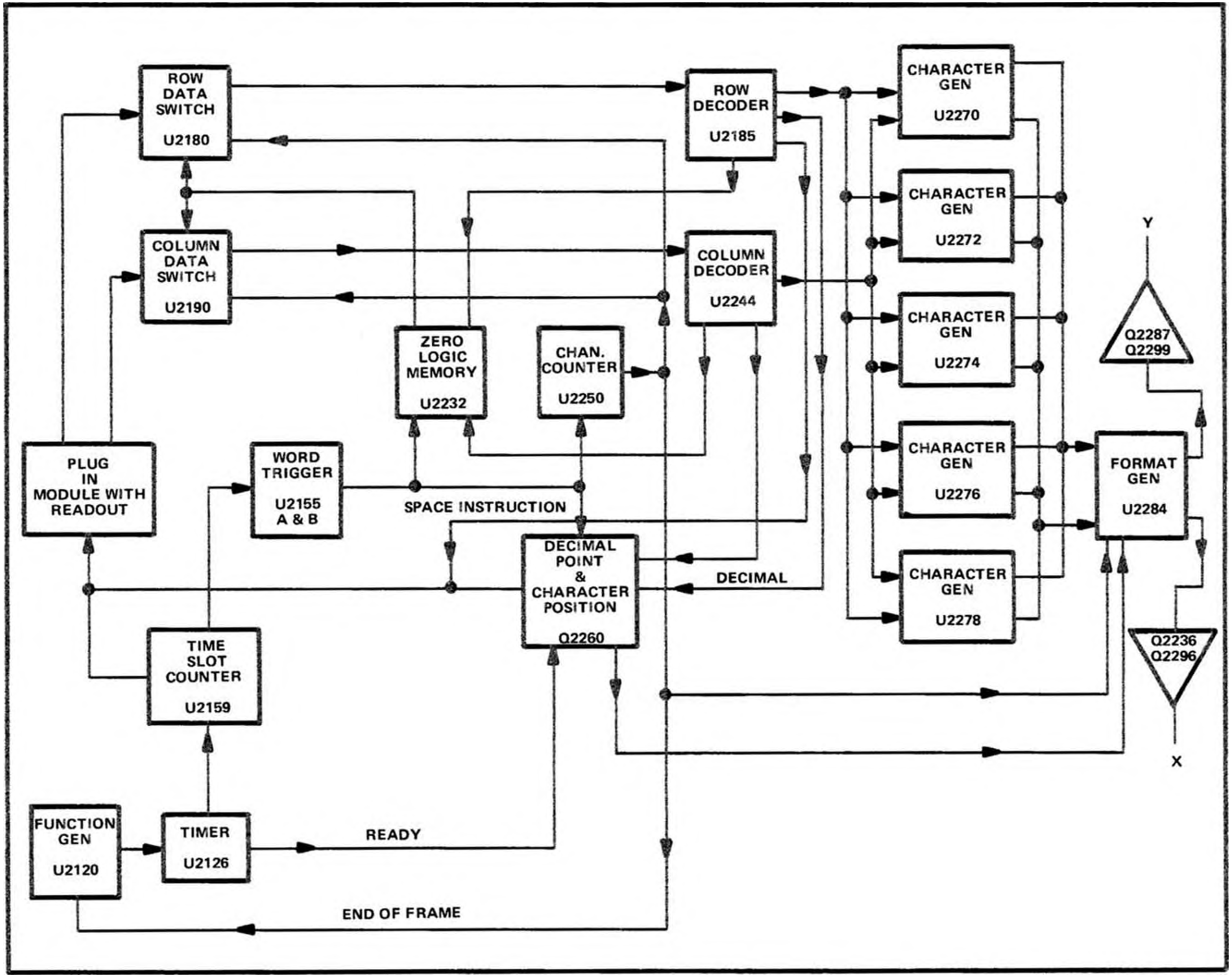
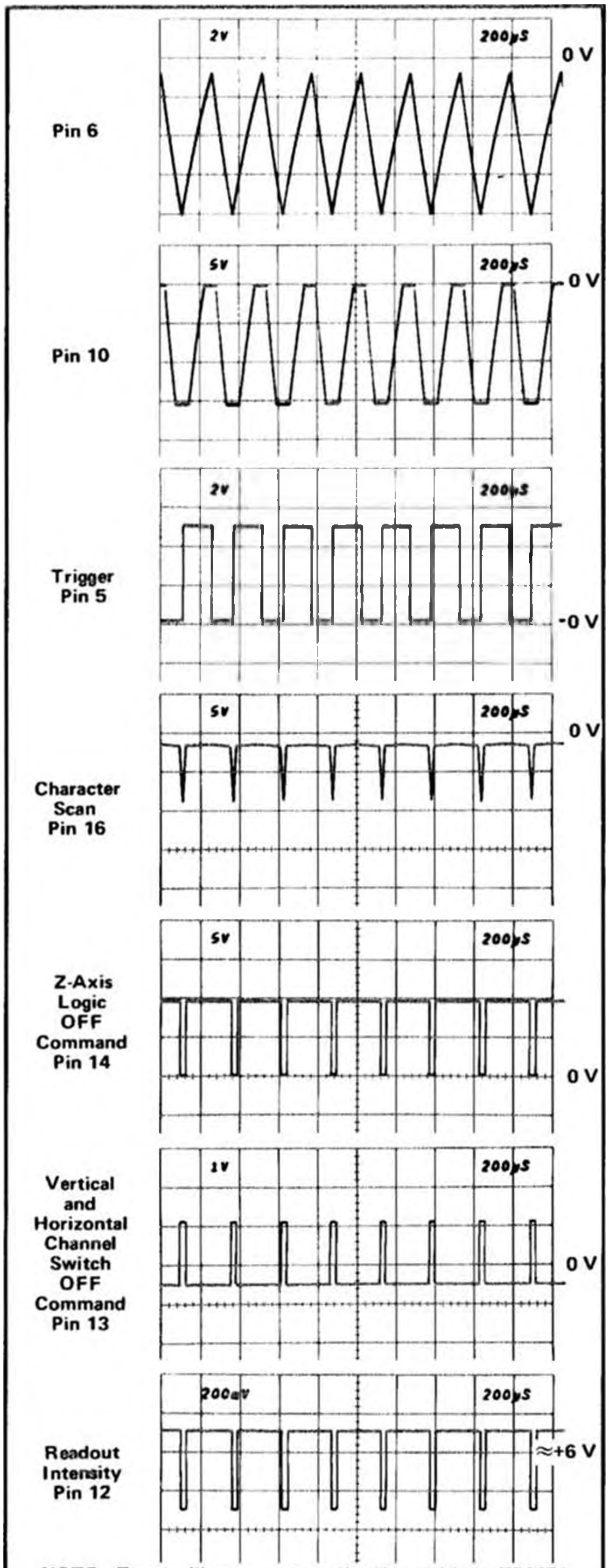
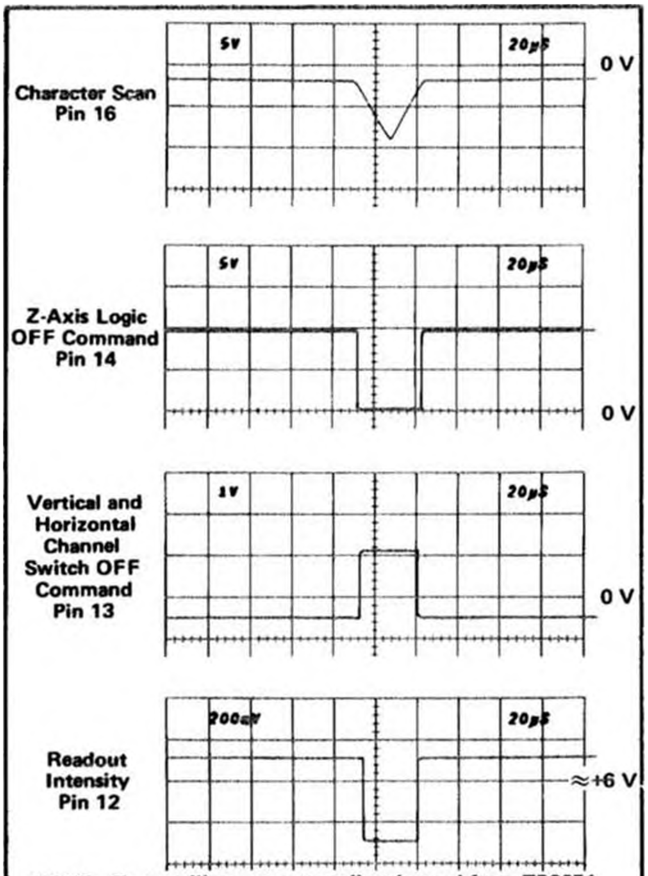


Fig. 3-27. Detailed block diagram of Readout System.



NOTE: Test oscilloscope externally triggered from TP2251.

Fig. 3-28. Output waveforms of Timing stage.



NOTE: Test oscilloscope externally triggered from TP2251.

Fig. 3-29. Detail of outputs at pins 12, 13, 14, and 16 of U2126.

to produce a character. The collector of Q2138 is also connected to Character Generator No. 2, U2272 through C2140, CR2140. This activated U2272 during the quiescent period of the Strobe pulse (collector of Q2138 negative) and diverts the output current of Row Decoder U2185 to row 2. The purpose of this configuration is to prevent the Zeros Logic and Memory stage U2232 from storing incorrect data during the quiescent period of the Strobe pulse. When the Strobe pulse goes positive, CR2140 is reverse biased to disconnect Q2138 from U2272 and allow the Row Decoder stage to operate in the normal manner.

The next signal to be produced is the Vertical/Horizontal Channel Switch OFF Command at pin 13. This positive-going signal disconnects the plug-in signals in the vertical and horizontal deflection systems so the plug-in units do not control the position of the CRT beam during the readout display. The Ready signal derived from this output is connected to the Decimal Point Logic and Character Position Counter stage and the Format Generator stage (see diagram 10). The Readout Intensity output at pin 12 is produced next. This current is connected to the CRT Circuit to unblank the CRT to the intensity level determined by READOUT intensity control R2124. The Character Scan ramp at pin 16 started to go negative as this timing sequence began. However, character-generation does not start until the readout intensity level has been established. The triangular Character Scan ramp runs negatively from about −2 volts to about −8.5 volts and then returns back to the original level. This waveform provides the scanning signal for the Character Generator stages (see diagram 10). The Full Character Scan adjustment R2128 sets the DC level of the Character Scan ramp to provide complete characters on the display.

The Timer stage operates in one of two modes as controlled by the Display-Skip level at pin 4. The basic mode just described is a condition which does not occur unless all ten characters of each word (60 characters total) are displayed on the CRT. Under typical conditions only a few characters are displayed in each word. The Display-Skip level at pin 4 determines the period of the Timer output signal. When a character is to be generated, pin 4 is LO and the circuit operates as just described. However, when a character is not to be displayed, a HI level is applied to pin 4 of U2126 through CR2125 from the Display-Skip Generator stage. This signal causes the Timer to shorten its period of operation to about 210 microseconds. The waveforms shown in Fig. 3-30 show the operation of the Timer stage when the Display-Skip condition occurs for all positions in a word. Notice that there is no output at pin 12, 13, 14, and 16 under this condition. This means that the CRT display is not interrupted to display characters. Also notice that the triangle waveform at pin 6 does not go as far negative and that the negative portion of the trapezoidal waveform at pin 10 is shorter. Complete details on operation of the Display-Skip Generator are given later.

The Single-Shot Lockout level at pin 2 determines the operating mode of U2126. If this level is LO, the Timer operates as just described. However, if the Single-Shot Lockout stage sets a HI level at this pin, the Timer stage is locked out and can not produce any output signals (see Single-Shot Lockout description for further information).

The READOUT intensity control R2124 sets the intensity of the readout display independently of the INTENSITY control. The READOUT intensity control also provides a means of turning the Readout System off when a readout display is not desired. When R2124 is turned fully counterclockwise, switch S102 opens. The current to pin 11 of U2126 is interrupted and at the same time a positive voltage is applied to pin 4 through R2122 and CR2124. This positive voltage switches the stage to the same conditions as were present under the Display-Skip condition. Therefore, the CRT display is not interrupted to present characters. However, time-slot pulse continue to be generated.

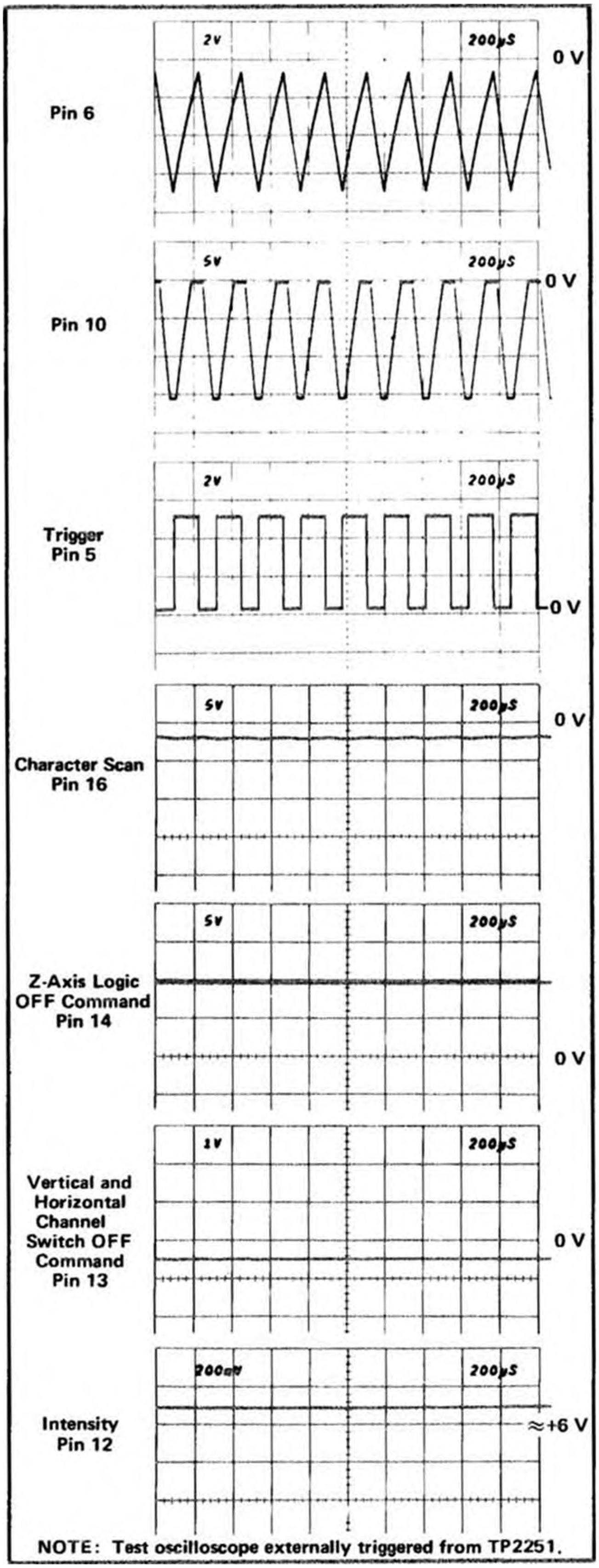


Fig. 3-30. Timer stage operation when Display-Skip condition occurs.

Time-Slot Counter

Time-Slot Counter U2126 is a sequential switch which directs the trapezoidal waveform input at pin 8 to one of its 10 output lines. These time-slot pulses are used to interrogate the plug-in units to obtain data for the Readout System. The Trigger pulse at pin 15 switches the Time-Slot Counter to the next output line; the output signal is sequenced consecutively from time-slot 1 through time-slot 10. Fig. 3-31 shows the time-relationship of the time-slot pulses. Notice that only one of the lines carries a time-slot pulse at any given time. When time-slot 10 is completed, a negative-going End-of-Word pulse is produced at pin 2. The End-of-Word pulse provides a drive pulse for the Word Trigger stage and also provides an enabling level to the Display-Skip Generator during time-slot 1 only.

Pin 16 is a reset input for the Time-Slot Counter. When this pin is held LO, the Time-Slot Counter resets to time-slot 1. The Time-Slot Counter can be reset in this manner only when a Jump signal is received by U2155C (see following discussion).

Word Trigger

The Word Trigger stage is made up of the 4 two-input NOR gates contained in U2155. Quiescently, pin 2 of U2155A is LO as established by the operating conditions of U2155D and U2155C. Therefore, the LO End-of-Word pulse produced by the Time-Slot Counter results in a HI level at pin 1 of U2155A. This level is inverted by U2155B to provide a negative-going advance pulse to the Channel Counter.

An advance pulse is also produced by U2155A when a Jump signal is received at pin 8 of U2155C. This condition can occur during any time-slot (see Row Decoder for further information on origin of the Jump signal). U2155D and U2155C are connected as a bistable flip-flop. The positive-going Jump signal at pin 8 of U2155C produces a LO at pin 10. This LO is inverted by U2155D to produce a HI at pin 13, which allows pin 9 of U2155C to be pulled HI through R2155. The flip-flop has now been set and it remains in this condition until reset, even though the Jump signal at pin 8 returns to its LO level. The HI output level at pin 13 turns on Q2159 through R2158 to pull pin 16 of the Time-Slot Counter LO. This resets the Time-Slot Counter to time-slot 1 and holds it there until U2155C is reset. At the same time, a HI level is applied to pin 4 of the Timer through CR2125 and CR2124. This HI level causes the Timer to operate in the display-skip mode so that a character is not generated.

The next Trigger pulse is not recognized by the Time-Slot Counter since U2159 is locked in time-slot 1 by U2155. However, this Trigger pulse resets the Word Trigger

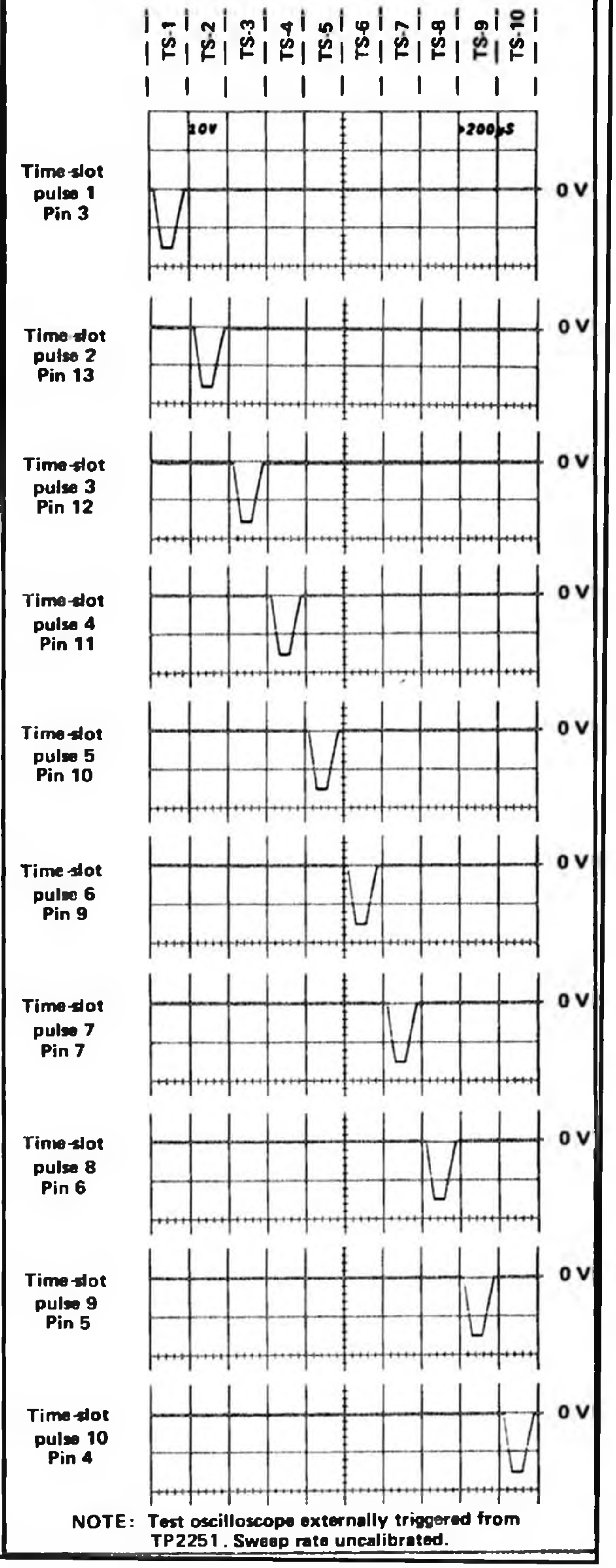


Fig. 3-31. Time relationship of the time-slot (TS) pulses produced by U2126.

stage through C2155. Pin 13 of U2155D goes LO to enable the Time-Slot Counter and Timer stages for the next time-slot pulse. At the same time, the negative-going edge produced at U2155D switches output states which is connected to pin 3 of U2155D. This results in a negative-going Word Trigger output at pin 4 of U2155B to advance the Channel Counter to the next word. When the next Trigger pulse is received at pin 15, the Time-Slot Counter returns to the normal sequence of operation and produces an output on the time-slot 1 line.

Channel Counter

The Channel Counter, made up of integrated circuit U2250 is a binary counter which produces the Channel Address code for the Column and Row Decoder stages and the Format Generator stage. This code instructs these stages to sequentially select and display the six channels of data from the plug-in units. The input channel which is displayed with each combination of the Channel Address code is given in the discussion of the applicable stages.

Single-Shot Lockout

Q2108, Q2117, and U2120 makes up the Single-Shot Lockout stage. This stage allows a single readout frame (Six complete words) to be displayed on the CRT, after which the Readout System is locked out so further readout displays are not presented until the circuit is reset. U2120C and U2120B are connected to form a bistable flip-flop. For normal operation, pin 3 of U2120 is pulled HI through R2108. This activates U2120C to result in a LO output level at pin 10. This level enables the Timer stage so it can operate in the free-running manner as described previously. The LO at pin 10 of U2120C is also applied to pin 5 of U2120B. Since pin 6 of U2120A is LO, U2120B is disabled and its output goes HI.

The output of this stage remains LO to allow U2126 to operate in the free-running mode until a LO is received at pin 8 of U2120C. When this occurs, the output level at pin 10 of U2120C does not change immediately. However, the Readout System is now enabled as far as the single-shot lockout function is concerned. If the Channel Counter has not completed word six (Channel 2 of the Horizontal unit), the Readout System continues to operate in the normal manner. However, when word six is completed, a positive-going End-of-Frame pulse is produced at pin 9 of U2120B as the Channel Counter shifts to the code necessary to display word one. This pulse is coupled to pin 3 of U2120A and pin 12 of U2120D. The momentary HI at pin 3 activates U2120B and its output goes LO to disable U2120C (pin 3 already LO). The output of U2120C goes HI to disable the Timer so it operates in the display-skip mode. The HI at pin 10 of U2120C also holds U2120B enabled so it maintains control of the flip-flop.

The Single-Shot Lockout stage remains in this condition until a positive-going trigger pulse is applied to pin 8 of U2120C. This trigger pulse produces a LO at pin 10 of U2120C which enables U2120B and disables U2120C. Now, the Timer can operate in the normal manner for another complete frame. When word six is completed, the Channel Counter produces another End-of-Frame pulse to again lock out the Timer stage.

Encoding the Data

Data is conveyed from the plug-in units to the Readout System in the form of an analog code having up to 11 current levels (from zero to one milliampere in 100 microampere steps). The characters which can be selected by the encoded data are shown on the Character Selection Matrix (see Fig. 3-25). Each character requires two currents to define it; these currents are identified as the column current and the row current which correspond to the column and row of the matrix. The column and row data is encoded by resistive programming in the plug-in units. Fig. 3-32 shows a typical encoding scheme for a voltage-sensing amplifier plug-in unit. Notice that the 10 time-slot (TS) pulses produced by the Time-Slot Counter stage are connected to the plug-in unit. However, time-slots 5, 6, 7, and 10 are not used by the plug-in unit to encode data when using the Standard Readout Format (see Table 3-2 for Standard Readout Format). The amplitude of the time-slot pulses is exactly −15 volts as determined by the Timer stage. Therefore, the resultant output current from the plug-in units can be accurately controlled by the programming resistors in the plug-in units.

For example, in Fig. 3-32, resistors R10 through R90 control the row analog data which is connected back to the Readout System. These resistors are of fixed value and define the format in which the information will be presented by the Readout System. Fig. 3-33A shows an idealized output current waveform of row analog data which results from the 10 time-slot pulses. Each of the steps of current shown in these waveforms corresponds to 100 microamperes of current. The row numbers on the left-hand side of the waveform correspond to the rows in the Character Selection Matrix shown in Fig. 3-35. The row analog data is connected back to the Readout System via terminal B37 of the plug-in interface.

The Column analog data is defined by resistors R110 through R190. The program resistors are connected to the time-slot lines by switch closures to encode the desired data. The data as encoded by the circuit shown in Fig. 3-32 indicates a 100 microvolt sensitivity with the display inverted and calibrated vertical deflection factors. This results in the idealized output current waveforms shown in Fig. 3-33B at the column analog data output, terminal A37 of the plug-in interface. Resistor R111, connected between time-slot 1 and the column analog data output, encodes two units of current during time-slot 1. Referring to the

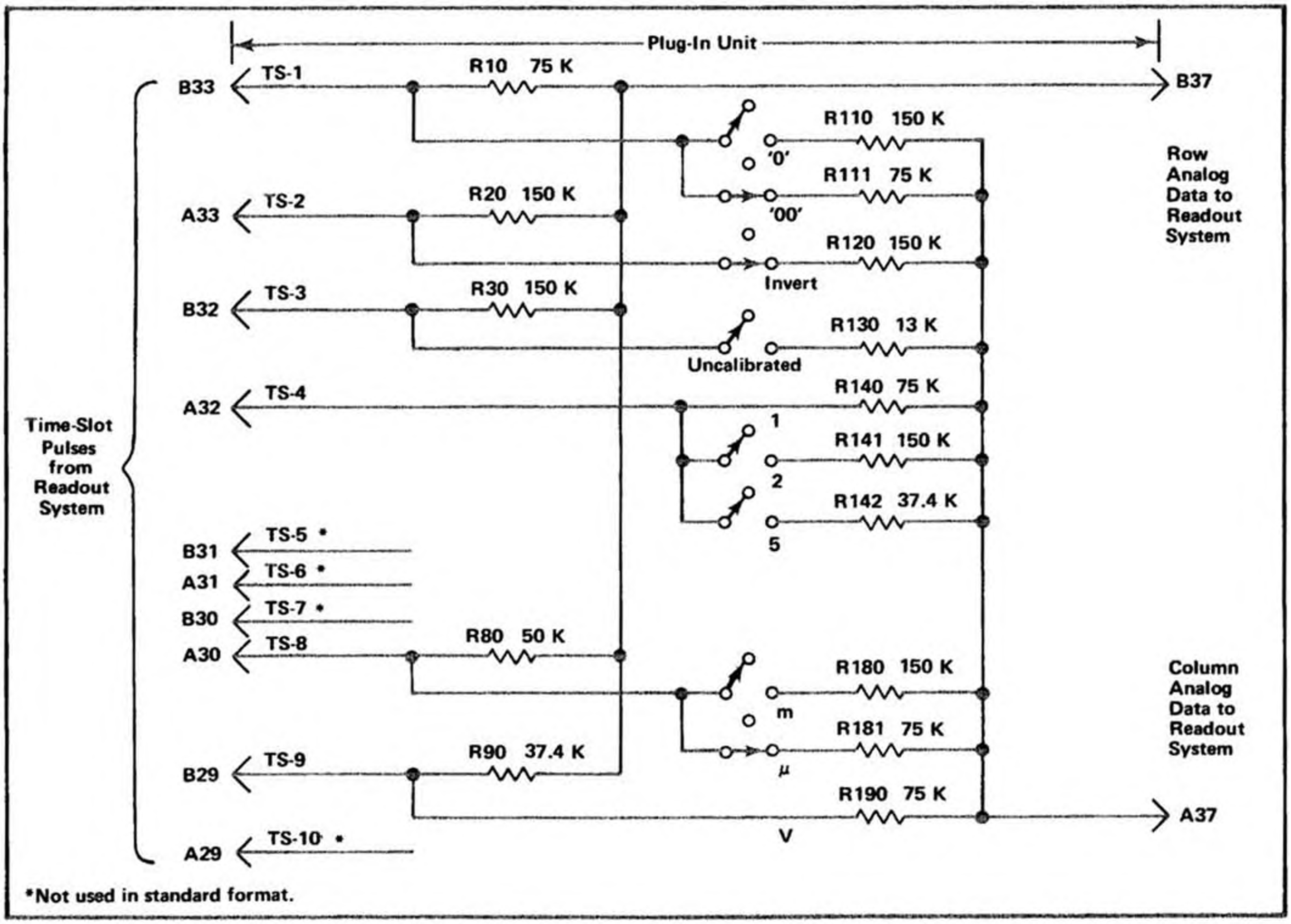


Fig. 3-32. Typical encoding scheme for voltage-sensing amplifier plug-in unit. Coding shown for deflection factor of 100 microvolts.

Character Selection Matrix, two units of column current along with the two units of row current encoded by R10 (row 3) indicates that two zeros should be added to the display. Resistor R120 adds one unit of column current during time-slot 2 and along with the one unit of current from the row output, the Readout System is instructed to add an invert arrow to the display. R130 is not connected to the time-slot 3 line since the vertical deflection factors are calibrated. Therefore, there is no column current output during this time-slot and there is no display on the CRT (see Display-Skip Generator for further information). During time-slot 4, two units of column current are encoded by R140. There is no row current encoded during this time-slot and this results in the numeral 1 being displayed on the CRT. Neither row nor column analog data is encoded during time-slots 5, 6, and 7 as defined by the Standard Readout Format. During time-slot 8, two units of column current and three units of row current are encoded by resistors R181 and R80 respectively. This addresses the μ prefix in the Character Selection Matrix. The final data output is provided from time-slot 9 by R190 connected to the column output and R90 to the row output. These resistors encode three units of column current and four units of row current to cause a V (volts) to be displayed. Time-slot 10 is not encoded in accordance with the Standard Readout Format. The resultant CRT readout will be ↓ 100 μV.

In the above example, the row analog data was programmed to define which row of the Character Selection Matrix was addressed to obtain information in each time-slot. The column data changes to encode the applicable readout data as the operating conditions change. For example, if the variable control of the plug-in unit was activated, R130 would be connected between time-slot 3 and the column analog data output lines. This encodes 10 units of column current (see shaded area in time-slot 3 of the waveform shown in Fig. 3-33B). Since one unit of row current is also encoded during this time-slot by R30, a $>$ symbol is added to the display. The CRT readout will now say ↓ $>$100 μV. In a similar manner, the other switches can change the encoded data for the column output and thereby change the readout display. See the descriptions which follow for decoding this information.

The column analog data encoded by the plug-in can be modified by attenuator probes connected to the input

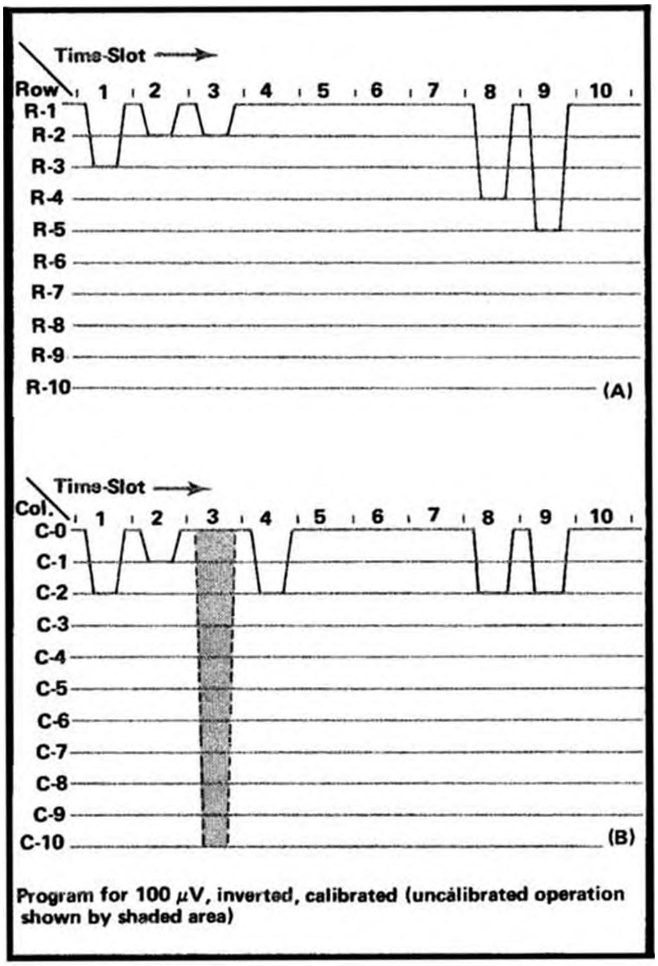


Fig. 3-33. Idealized current waveforms of: (A) Row analog data, (B) Column analog data.

connectors of vertical plug-in units. A special coding ring around the input connector of the plug-in unit senses the attenuation ratio of the probe (with readout-coded probes only). The probe contains a resistor which results in additional column current. For example, if a 10X attenuator probe is connected to a plug-in with the coding for 100 microvolts as shown in Fig. 3-32, an additional unit of current is added to the column analog data during time-slot 1. Since two units of current were encoded by R111 (see Fig. 3-32), this additional current results in a total of three units of column analog current during this time-slot. Referring to the Character Selection Matrix, three units of column current along with the two units of row current encoded by R10 indicates that the prefix should be reduced. Since this instruction occurs in the same time-slot which previously indicated that two zeros should be added to the display and only one instruction can be encoded during a time-slot, the zeros do not appear in the display. The CRT readout will now be changed to 1 mV (readout) program produced by plug-in same as for previous example.

Likewise, if a 100X readout-coded probe is connected to the input of the plug-in unit, the column current during time-slot 1 will be increased two units for a total of four units of column current. This addresses an instruction in the Character Selection Matrix which reduces the prefix and adds one zero to the display. The resultant CRT readout with the previous program is 10 mV.

Three other lines of information are connected from the plug-in compartments to the Readout System. The column and row analog data from channel 2 of a dual-channel plug-in are connected to the Readout System through terminals A38 and B38 of the plug-in interface, respectively. Force readout information is encoded on terminal A35; function of this input is described under Column and Row Data Switches.

The preceding information gave a typical example of encoding data from an amplifier plug-in unit. Specific encoding data and circuitry is shown in the individual plug-in unit manual.

Column and Row Data Switches

The readout data from the plug-in units is connected to the Column and Row Data Switch stages in the Readout System. A column-data line and a row-data line convey analog data from each of the eight data sources (two channels from each of the four plug-in compartments).

TABLE 3-3

Channel Address

Pin 1 U2232 "Identify" Command	Pin 11 U2250	Pin 8 U2250	Pin 9 U2250	Channel Selected
HI	HI	HI	HI	Channel 1 Left Vertical
HI	HI	HI	LO	Channel 2 Left Vertical
HI	HI	LO	HI	Channel 1 Right Vertical
HI	HI	LO	LO	Channel 2 Right Vertical
HI	LO	HI	HI	Channel 1 Horizontal
HI	LO	HI	LO	Channel 2 Horizontal

The Column Data Switch U2190 and the Row Data Switch U2180 receive the Channel Address No. 1 code from the Channel Counter. This binary code directs the Column Data Switch and the Row Data Switch as to which channel should be the source of the readout data. Table 3-3 gives the eight combinations of the Channel Address No. 1 code and the resultant channel which is selected with each combination. These stages have nine inputs and provide a single time-multiplexed output at pin 7 which includes the information from all of the input channels. Eight of the nine inputs to each stage originate in the plug-in units; the ninth input comes from a special data-encoding network composed of resistors R2201 through R2209 and R2191 through R2199 (see Zeros Logic and Memory description for further information on ninth channel).

In addition to the data inputs from the plug-in units, channel-inhibit inputs are provided from each of the plug-in units. The channel inhibit lines are LO only when the associated plug-in unit has been selected for display. When a plug-in unit is not selected, the respective line is HI which forward biases the associated diode CR2162, CR2163, CR2167, CR2166, CR2171, CR2170, CR2175, or CR1174 to by-pass the encoded data from this plug-in. However, since it may be desired to display information from special-purpose plug-ins even though they do not produce a normal waveform display on the CRT, a feature is provided to over-ride the channel inhibit. This is done by applying a LO to the associated forcing over-ride input. The LO level diverts the HI channel inhibit current and allows the data from this plug-in unit to reach the Column Data Switch, even though it has not been selected for display by the mode switches.

Display-Skip Generator

The Display-Skip Generator, Q2215, Q2223, Q2229, and Q2225 monitors the time-multiplexed column data at the output of the Column Data Switch during each time-slot to determine if the information at this point is valid data which should result in a CRT display. The voltage at the base of Q2215B is set by divider R2219, R2220, and R2221. Quiescently, there is about 100 microamperes of current flowing through R2213 and R2214 from Q2240 and the Zeros Logic and Memory stage (purpose of this quiescent current will be discussed in connection with the Zeros Logic and Memory stage). This current biases Q2215A so its base is about 0.2 volt more positive than the base of Q2215B in the absence of column data. Therefore, since Q2215A and Q2215B are connected as a comparator, Q2215A will remain on unless its base is pulled more negative than the base of Q2215B. The analog data output from the Column Data Switch produces a 0.5 volt change at the base of Q2215A for each unit of column current that has been encoded by the plug-in unit. Therefore, whenever any information appears at the output of the Column Data Switch, the base of Q2215A is pulled more negative than the base of Q2215B resulting in a negative (LO) Display-Skip output to the Timer stage through Q2225. Recall that a LO was necessary at the skip input of the Timer so it could perform the complete sequence necessary to display a character.

Q2223-Q2229 also provide display-skip action. The End-of-Word level connected to their emitters through R2229 is LO only during time-slot 1. This means that Q2223-Q2229 are enabled only during time-slot. These transistors allow the Zeros Logic and Memory stage to generate a display-skip signal during time-slot 1 when information has been stored in memory which is not to be displayed on the CRT (further information given under Zeros Logic and Memory discussion).

Column and Row Decoder

The Column Decoder U2244 and Row Decoder U2185 sense the magnitude of the analog voltages at their inputs and produce a binary output on one of ten lines corresponding to the column or row data which was encoded by the plug-in. These outputs provide the Column Digital Data and Row Digital Data which is used by the Character Generator stages to select the desired character for display on the CRT. The column and row data is also used throughout the Readout System to perform other functions. The input current at pin 9 of the Column Decoder stage is steered to only one of the ten Column Digital Data outputs. The size of the character which will be displayed on the CRT is determined by the value of R2227. When a display-skip signal is present (collector of Q2225 is HI), pin 9 is pulled HI through CR2226. This ensures that no current is connected to the Character Generator stage under this condition. Notice the corresponding input on the Row Decoder. This input is connected to ground and causes only one of the ten row outputs to saturate to ground.

The network at the input of the Row Decoder, made up of Q2153 and its associated components, is a Row 13 detector which produces the Jump command. This row current is encoded by special-purpose plug-ins to cause all or part of a word to be jumped. Whenever row 13 (thirteen units of row current; 1.3 milliamperes) is encoded, the base of Q2153 is pulled negative enough so that this transistor is reverse biased to produce a HI Jump output at its collector. This Jump command is connected to the Word Trigger stage (diagram 10) to advance the Channel Counter stage to the next word and to reset the Time-Slot Counter to time-slot 1.

Zeros Logic and Memory

The Zeros Logic and Memory stage U2232 stores data encoded by the plug-in units to provide zeros-adding and prefix-shifting logic for the Readout System. The Strobe pulse at pin 15 goes positive when the data has stabilized and can be inspected. This activates the Zeros Logic and Memory stage so it can store the encoded data. A block representation of the memory sequence is shown in Fig. 3-34. Typical output waveforms for the five possible input conditions that can occur are shown in Fig. 3-35. When time-slot 1 occurs, a store command is given to all of the

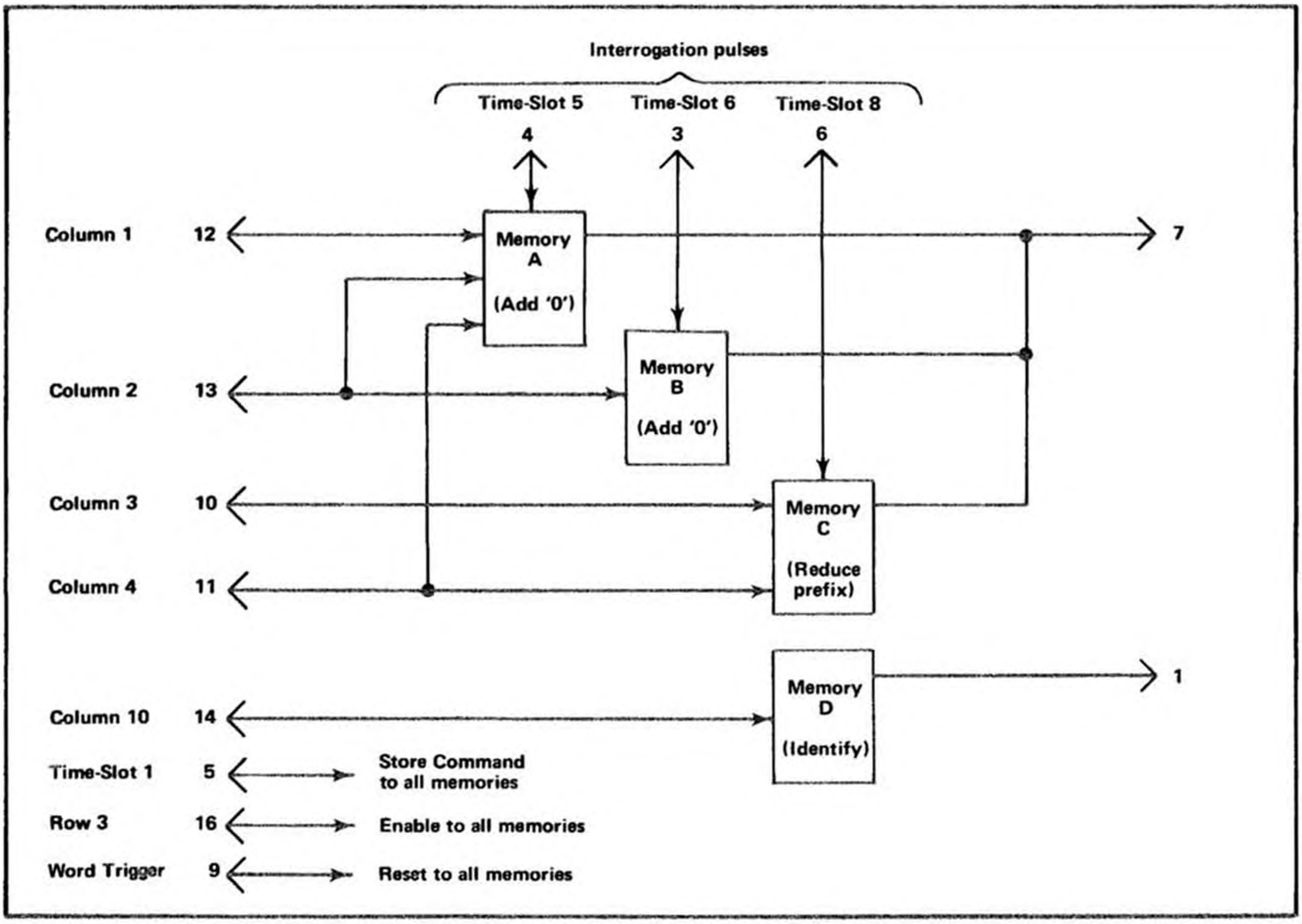


Fig. 3-34. Block representation of memory sequence in U2232.

memories. If the plug-in unit encoded data for column 1, 2, 3, 4, or 10 during time-slot 1, the appropriate memory (or memories) is set. Notice that row 3 information from the Row Decoder must also be present at pin 16 for data to be stored in the memory of U2232. If data was encoded during time-slot 1, a negative-going output is produced at pin 7 as the memories are being set. This negative-going pulse is connected to the base of Q2229 in the Display-Skip Generator to produce a Display-Skip output. Since the information that was encoded during time-slot 1 was only provided to set the memories and was not intended to be displayed on the CRT at this time, the display-skip output prevents a readout display during this time-slot.

During time-slot 5, memory A is interrogated. If information was stored in this memory, a positive-going output is produced at pin 7. This pulse is connected to pin 10 of the Column Decoder through Q2240 to add one unit of current at the input of the Column Decoder. This produces a zero after the character displayed on the CRT during time-slot 4. During time-slot 6, memory B is interrogated to see if another zero should be added. If another zero is necessary, a second positive output is produced at pin 7 which again results in a column 1 output from the Column Decoder and a second zero in the CRT display.

Finally, memory C is interrogated during time-slot 8 to obtain information on whether the prefix should be reduced or left at the value which was encoded. If data has been encoded which calls for a reduction in prefix, a negative-going output level is produced at pin 7. This negative level subtracts one unit of column current from the data at the input to the Column Decoder. Notice on the Character Selection Matrix of Fig. 3-24 that a reduction of one column when row 4 is programmed results in a one unit reduction of the prefix. For example, with the 100 μV program shown in Fig. 3-31, if the data received from the plug-in called for a reduction in prefix, the CRT readout would be changed to 1 mV (zeros deleted by program; see Encoding the Data).

The 100 microamperes of quiescent current through R2213 and R2214 that was provided by Q2240 (see Display-Skip Generator) allows the prefix to be reduced

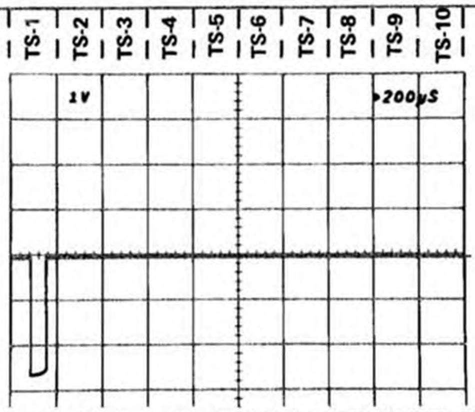
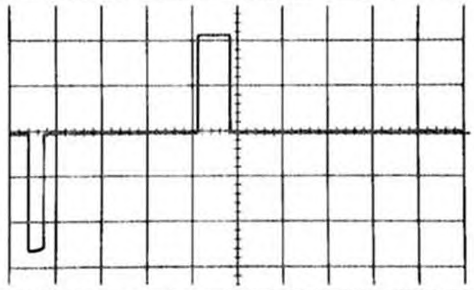
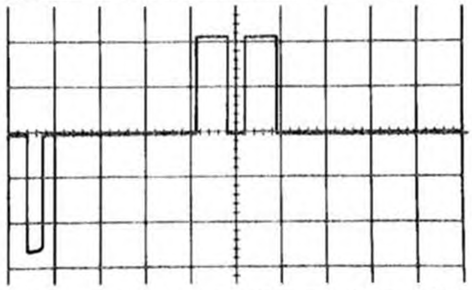
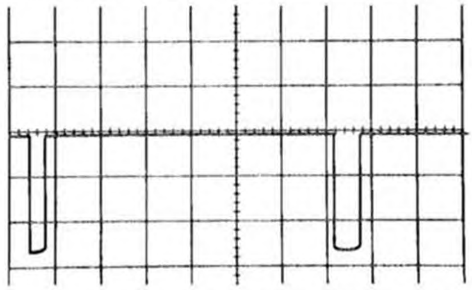
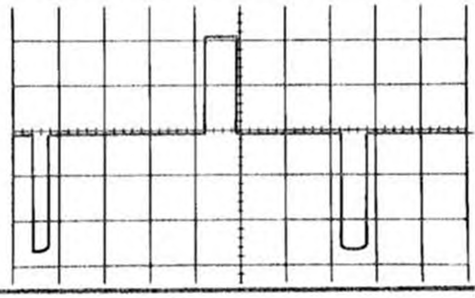
Input Pins of Zeros Logic & Memory	Command	Time Slot
14	IDENTIFY	 0 V
12	Add one zero	 0 V
13	Add two zeros	 0 V
10	Decrease prefix	 0 V
11	Decrease prefix and add one zero	 0 V

Fig. 3-35. Typical output waveforms for Zeros Logic and Memory stage operation (at pin 7 of U2232).

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

A further feature of the Zeros Logic and Memory is the Identify function. If 10 units of column current are encoded by the plug-in unit along with row 3 during time-slot 1, the Zeros Logic and Memory produces a negative-going output pulse at pin 1 which switches the Column Data Switch and Row Data Switch to the ninth channel. Then, time-slot pulses 2 through 9 encode an output current through resistors R2191-R2199 for column data and R2201-R2209 for row data. This provides the currents necessary to display the word IDENTIFY on the CRT in the word position allotted to the channel which originated the Identify command. After completion of this word, the Column Data Switch and Row Data Switch continue with the next word in the sequence.

The Word Trigger signal from the Word Trigger stage is connected to pin 9 of U2232 through C2242. At the end of each word of readout information, this pulse goes LO. This erases the four memories in the Zeros Logic and Memory in preparation for the data to be received from the next channel.

Character Generators

The Character Generator stage consists of five similar integrated circuits U2270, U2272, U2274, U2276, and U2278, which generate the X (horizontal) and Y (vertical) outputs at pins 16 and 1 respectively to produce the character displayed on the CRT. Each integrated circuit can produce 10 individual characters. U2270, which is designated as the "Numerals" Character Generator, can produce the numerals 0 through 9 shown in row 1 of the Character Selection Matrix (Fig. 3-24). U2272 can produce the symbols shown in row 2 of the Character Selection Matrix and U2274 produces the prefixes and some letters of the alphabet which are used as prefixes in row 4. U2276 and U2278 produce the remaining letters of the alphabet shown in rows 5 and 6 of the Character Selection Matrix. All of the stages receive the column digital data from Column Decoder U2244 in parallel. However, only one of the character generators receives row data at a particular time; only the stage which receives both row and column data is activated. For example, if column 2 is encoded by a plug-in unit, the five Character Generators are enabled so that either a 1, <, μ, V, or an N can be produced. However, if at the same time row 4 has also been encoded by the plug-in unit, only the Prefix Character Generator U2274 will produce an output to result in a μ displayed on the screen. This integrated circuit provides current outputs to the Format Generator which produce the selected character on the CRT. In a similar manner, any of the 50 characters shown in the Character Selection Matrix can be displayed by correct addressing of the row and column.

Decimal Point Logic and Character Position Counter

The Decimal Point Logic and Character Position Counter stage U2260 performs two functions. The first function is to produce a staircase current which is added to the X (horizontal) signal to space the characters horizontally on the CRT. After each character is generated, the negative-going edge of the Ready signal at pin 5 advances the Character Position Counter. This produces a current step output at pin 3 which, when added to the X signal, causes the next character to be produced one character space to the right. This stage can also be advanced when a Space instruction is encoded by the plug-in unit so that a space is left between the displayed characters on the CRT. Row 10 information from the Row Decoder is connected to pin 4 of U2260 through R2265. When row 10 and column 0 are encoded, the output of this stage advances one step to move the next character another space to the right. However, under this condition, no display is produced on the CRT during this time-slot.

Time-slot pulses 1, 2, and 3 are also connected to pin 4 of U2260 through VR2262, VR2263, and VR2264 respectively and R2262-R2265. This configuration adds a space to the displayed word during time-slots 1, 2, and 3 even if information is not encoded for display during these time-slots. With this feature, the information which is displayed during time-slot 4 (1-2-5 data) always starts in the fourth character position whether data has been displayed in the previous time-slots or not. Therefore, the resultant CRT display does not shift position as normal/invert or cal/uncal information is encoded by the plug-in. The Word Trigger pulse connected to pin 8 of U2260 through C2255 resets the Character Position Counter to the first character position at the end of each word.

The Decimal Point Logic portion of this stage allows decimal points to be added to the CRT display as encoded by the plug-in units. When row 7 is encoded in coincidence with columns 3 through 7 (usually encoded during time-slot 1), a decimal point is placed at one of the five locations on the CRT identified in row 7 of the Character Selection Matrix (Fig. 3-24). This instruction refers to the decimal point location in relation to the total number of characters that can be displayed on the CRT (see Fig. 3-36). For example, if column 3 and row 7 are encoded during time-slot 1, the system is instructed to place a decimal point in location No. 3. As shown in Fig. 3-36, this displays a decimal point before the third character that can be displayed on the CRT (first three time-slots produce a space whether data is encoded or not; see previous paragraph). The simultaneous application of row 7 data to the Y-input

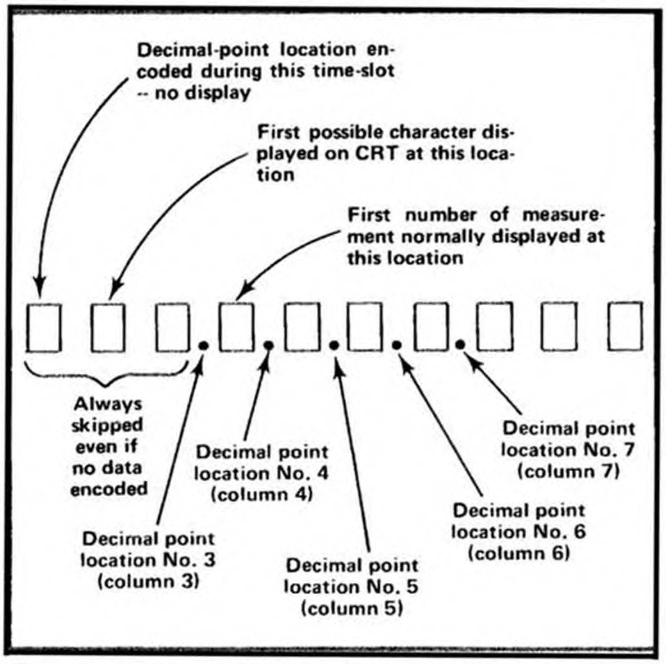


Fig. 3-36. Readout word relating 10 possible character locations to the decimal-point instructions that can be encoded and the resulting display.

of the Format Generator through R2280 raises the decimal point so it appears between the displayed characters.

When decimal-point data is encoded, the CRT is unblanked so a readout display is presented. However, since row 7 does not activate any of the five Character Generators, the CRT beam is not deflected but instead remains in a fixed position to display a decimal point between the characters along the bottom line of the readout word. After the decimal point is produced in the addressed location, the CRT beam returns to the location indicated by the Character Position Counter to produce the remainder of the display.

Format Generator

The X- and Y-deflection signals produced by the Character Generator stage, are connected to pins 2 and 7 respectively of Format Generator U2284. The Channel Address No. 2 code from the Channel Counter is also connected to pins 1, 8, and 15 of this stage. The Channel Address No. 2 code directs the Format Generator to add current to the X and Y signals to deflect the CRT beam to the area of the CRT which is associated with the plug-in channel that originated the information (see Fig. 3-24). The Channel Address Code and the resultant word positions are shown in Table 3-4. In addition, the character position current from the Decimal Point Logic and Character Position stage is added to the X (horizontal) input signal to space the characters horizontally on the CRT (see previous discussion). The Ready signal at pin 13 activates this stage when a character is to be displayed on the CRT.

TABLE 3-4

Channel Address Code

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

Y-Output Amplifiers

The Y-output signal at pin 6 of U2284 is connected to the Y-Output Amplifier Q2287-Q2299. This stage provides a low impedance load for the Format Generator while providing isolation between the Readout System and the Vertical Amplifier. Vertical Separation adjustment R2291 changes the gain of this stage to control the vertical separation between the readout words displayed at the top and bottom of the graticule area.

X-Output Amplifier

The X-Output Amplifier Q2286-Q2296 operates similarly to the Y-Output Amplifier to provide the horizontal deflection from the readout signal available at pin 4 of U2284. The gain of this stage is fixed by the values of the resistors in the circuit.

Display Sequence

Fig. 3-37 shows a flow chart for the Readout System. This chart illustrates the sequence of events which occurs in the Readout System each time a character is generated and displayed on the CRT.

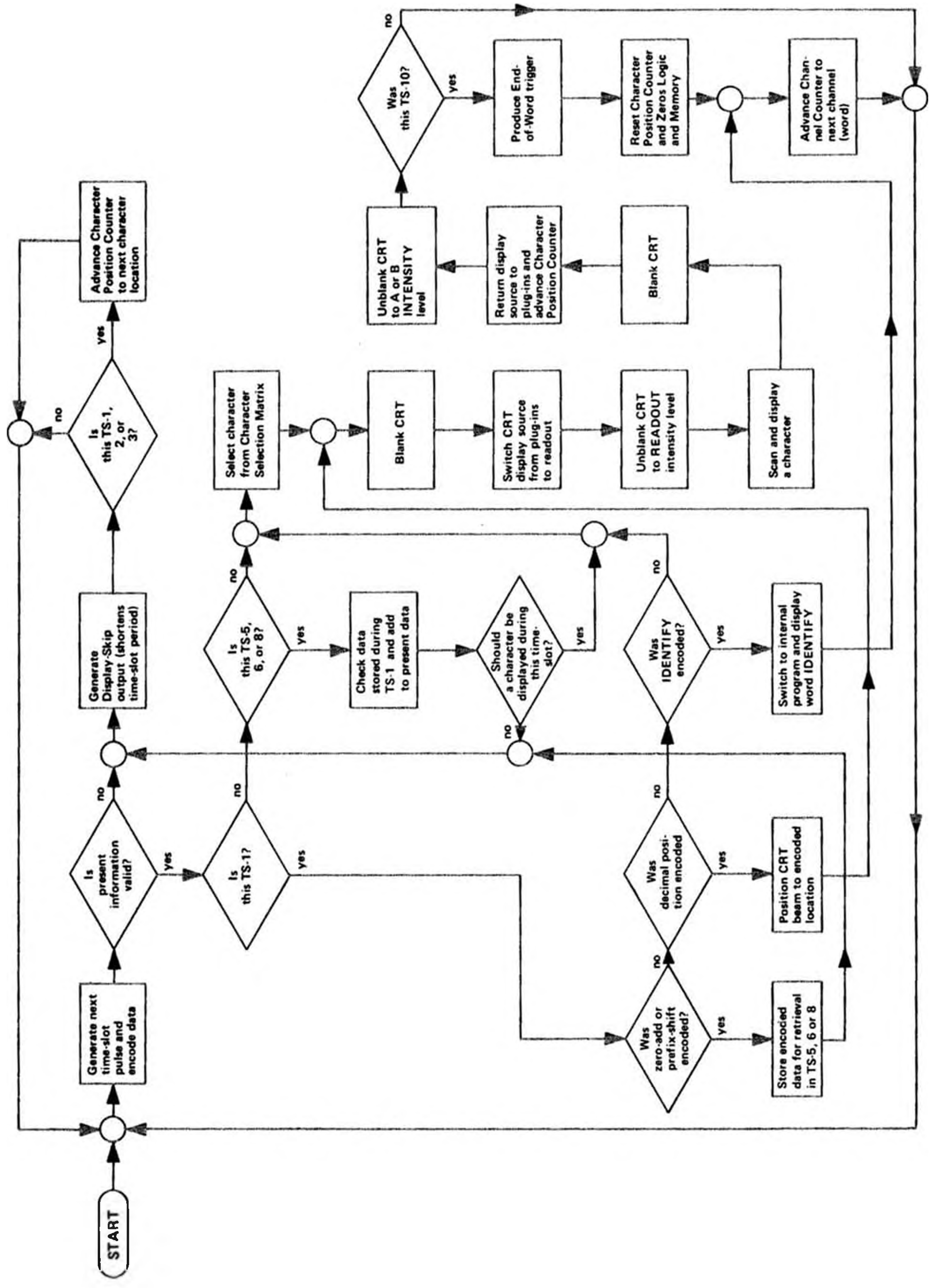


Fig. 3-37. Flow chart of character generation sequence by the Readout System.

STORAGE CIRCUITRY

The Cathode-Ray tube of the 7623 is an image transfer storage tube. In the FAST mode, the display is first stored on a high speed mesh (target). The information is then transferred to the direct viewing screen. The FAST mode of storage is capable of writing rates greater than 50 divisions/μs for long periods of time. The store circuitry for the high speed mesh is adjusted for fastest writing speed; the direct viewing screen circuitry is adjusted for longest retention and best display.

The storage circuitry is located on two boards (Storage Logic and Storage Output). The Storage Logic board has the switch and diode matrix and develops the timing pulses needed for the different storage modes. The calibrator signal voltage divider network and the AC to DC jumper are also located on the storage logic board. The Storage Output board provides the CRT with the required voltage levels for proper storage operation. Most of the output circuits are high voltage gated operational amplifiers.

The switch and diode matrix provides several different command output lines per switch function. See Table 3-5 for the list of outputs for each switch position. A ground closure by the switch forward-biases several diodes at different output lines. In this manner, one switch can control several output lines.

Erase and Timing Circuits

Manual erase is accomplished by pressing the MAN ERASE button or grounding the remote erase connector on the rear panel. This grounds the junction of resistor R1770, R1767, and R1771. Voltage divider R1767-R1761 provides programmable unijunction Q1777 with a gate voltage slightly lower than the anode voltage. This causes Q1774 to become forward biased, and capacitor C1773 is allowed to discharge through Q1774. This produces a positive pulse at the base of Q1777, which inverts the pulse and triggers RS flip-flop U1780A and U1780C for a $\overline{C}_L$ pulse and a Q_B pulse. When $\overline{C}_L$ is high, transistor Q1769 turns on to prevent C1773 from recharging and discharging. When $\overline{C}_L$ is at a high level, transistor Q1784 is turned off, allowing the timing capacitor C1785 to charge through resistor R1785. When the anode voltage level increases to about the same voltage level as the gate voltage level, the programmable unijunction transistor will turn on, producing a positive pulse. Programmable unijunction transistor Q1788 provides the clock pulses for U1790, a high-speed ripple-through counter. The counter develops the sequential pulses used to set and reset the RS flip-flops. See Fig. 3-38 for basic block diagram storage circuit. See Fig. 3-39 for output pulses.

The first output from pin 11 section D resets the $\overline{C}_L$ flip-flop, stopping the clock pulses from the ripple counter, and resets the sweep lockout flip-flop so that a sweep can occur.

Sweep Lockout Circuit

The holdoff gate signal from the horizontal time base plug-in unit is connected to a monstable multivibrator to generate QT and $\overline{QT}$ pulses. The pulses are developed after the sweep, and are about 100 ms long. The $\overline{QT}$ pulse resets the sweep lockout flip-flop so that no sweep can occur until an erase cycle has been generated in the Fast Storage mode only. In the Non-Store mode, the sweep lockout function is prevented from locking out any sweeps. See Fig. 3-40, basic block diagram, for storage timing circuits. In the Save mode, the sweep lockout is on so that no sweeps can occur. In the Integ mode, when the INTEG button is pressed, the sweep lockout is off to provide a repetitive sweep.

Auto Erase Circuit

The auto erase circuit uses a programmable unijunction transistor for a variable pulse generator. The setting of the AUTO VIEW TIME determines the charge rate of timing capacitor C1749. When the anode voltage level increases to where the gate voltage level turns on the programmable unijunction transistor (p.u.t.), a positive pulse is generated. This signal is connected to the base of transistor Q1759, turning it on. When transistor Q1759 is turned on, the gate voltage level of Q1774 will decrease and start an erase and timing cycle. The sweep lockout flip-flop controls one input to the auto erase flip-flop, preventing an auto erase cycle from occurring before the sweep has occurred. If pin 3 of U1745A (the auto erase flip-flop) is high (one state), transistor Q1747 is turned on, and the timing capacitor cannot charge. When the sweep gate flip-flop has been reset by a sweep, pulse QT resets the auto erase flip-flop, so that pin 3 of U1745A is low and turns transistor Q1747 off. This allows the timing capacitor to charge, which starts an erase cycle and timing pulses.

When the VAR PERSIST, FAST or BI-STABLE buttons are pressed, an erase cycle should be generated. Transistor Q1757 is turned on by the discharging of capacitors C1669, C1678, or C1693, depending on the switch buttons pressed. When transistor Q1757 is turned on, transistor Q1759 is also turned on, lowering the gate voltage level on Q1774 to where it can turn on, initiating an erase cycle. See Fig. 3-40 basic block diagram for the storage timing circuit.

TABLE 3-5

Input Output Table For The Switch And Diode Matrix

MODE	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20	Z21	Z22
NON-STORE		X	X				X				X			X	X			X			X	
VAR PERSIST							X	X	X			X					X				X	
FAST					X			X											X			
BISTABLE							X			X	X								X			
MULTI TRACE													X					X				
INTEG	X														X							X
SAVE		X		X												X				X		
MANUAL																						
AUTO																						

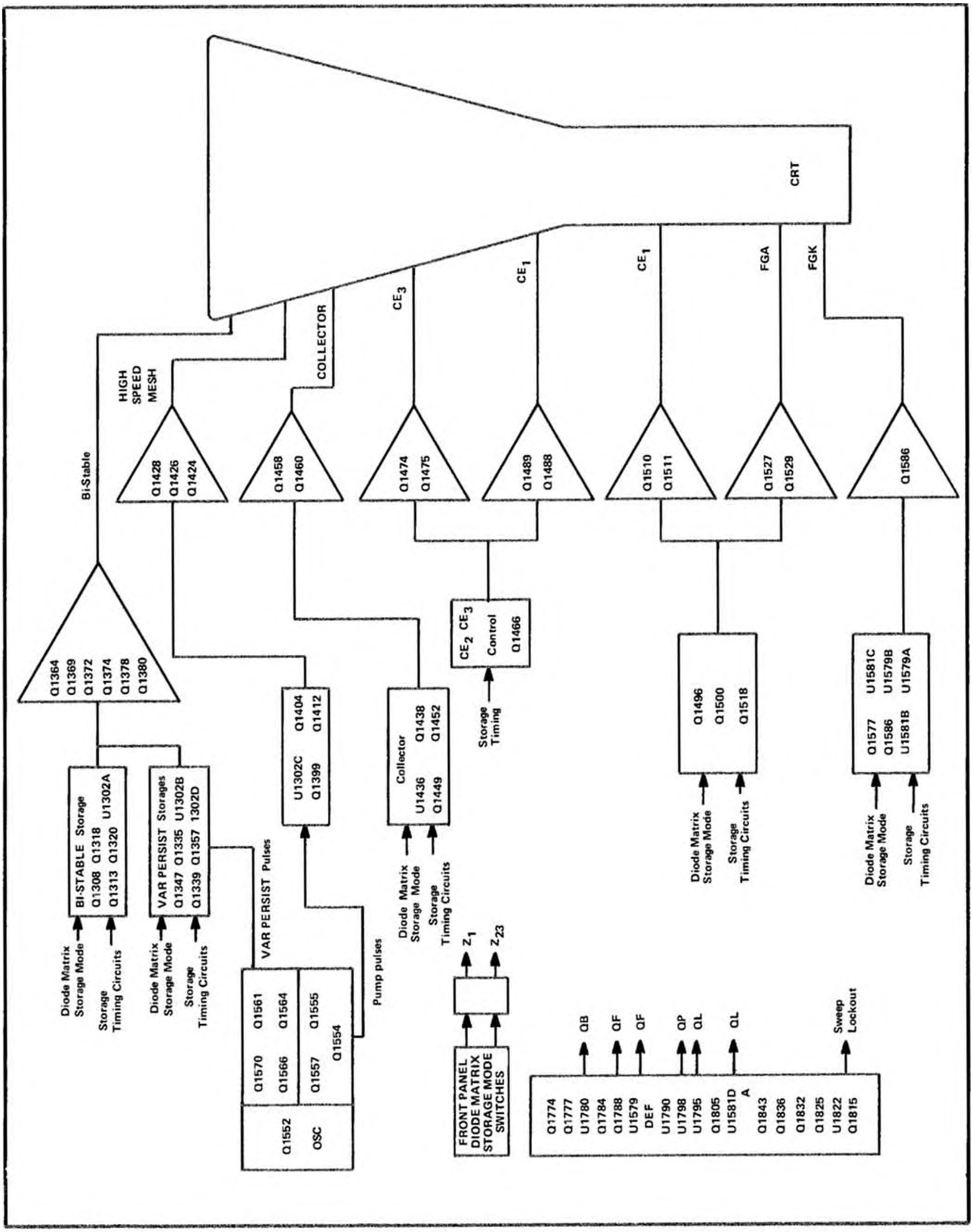


Fig. 3-38. Basic Block Diagram of the Storage Circuits.

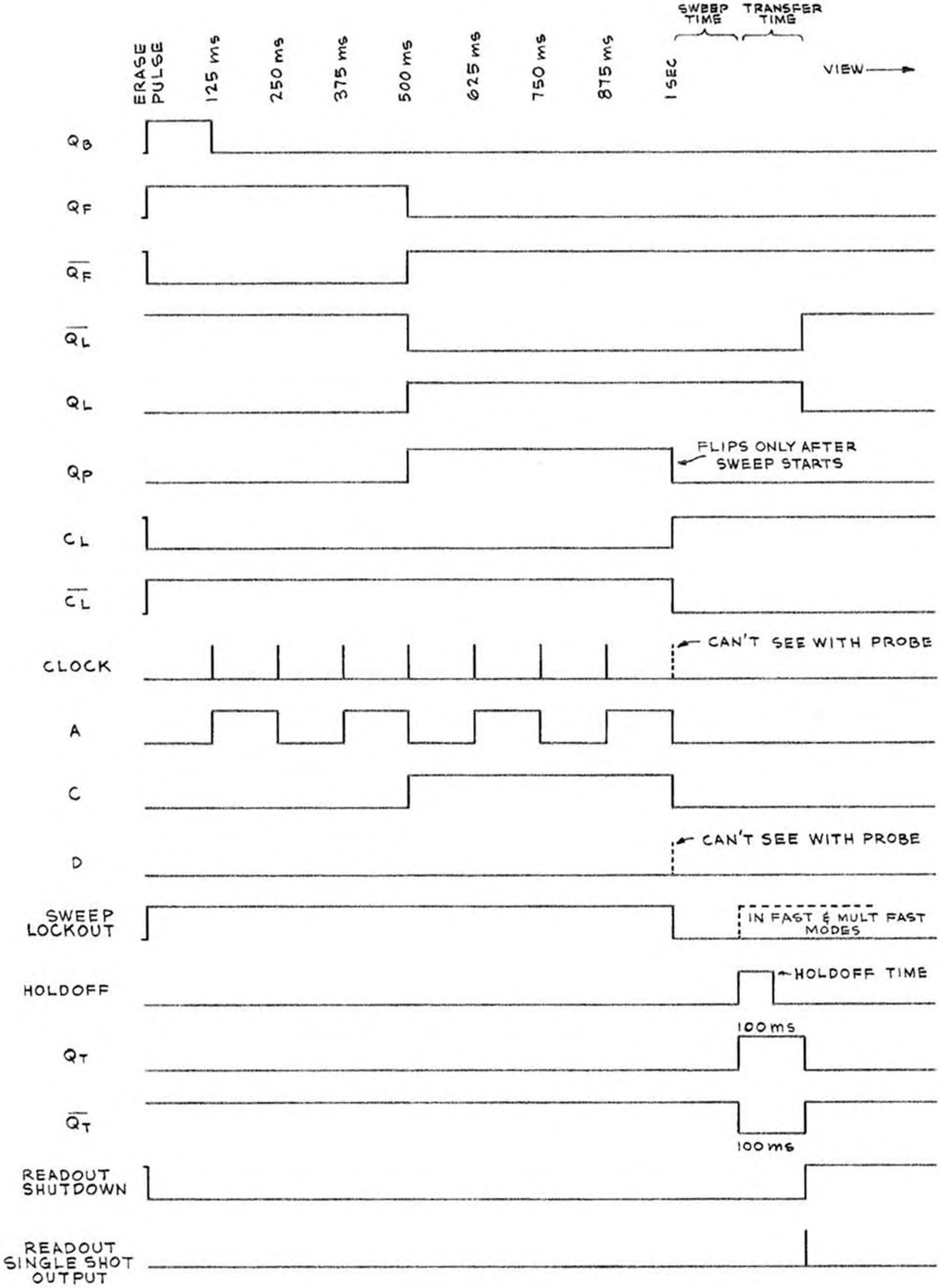


Fig. 3-39. Output Pulses for the Storage Circuits.

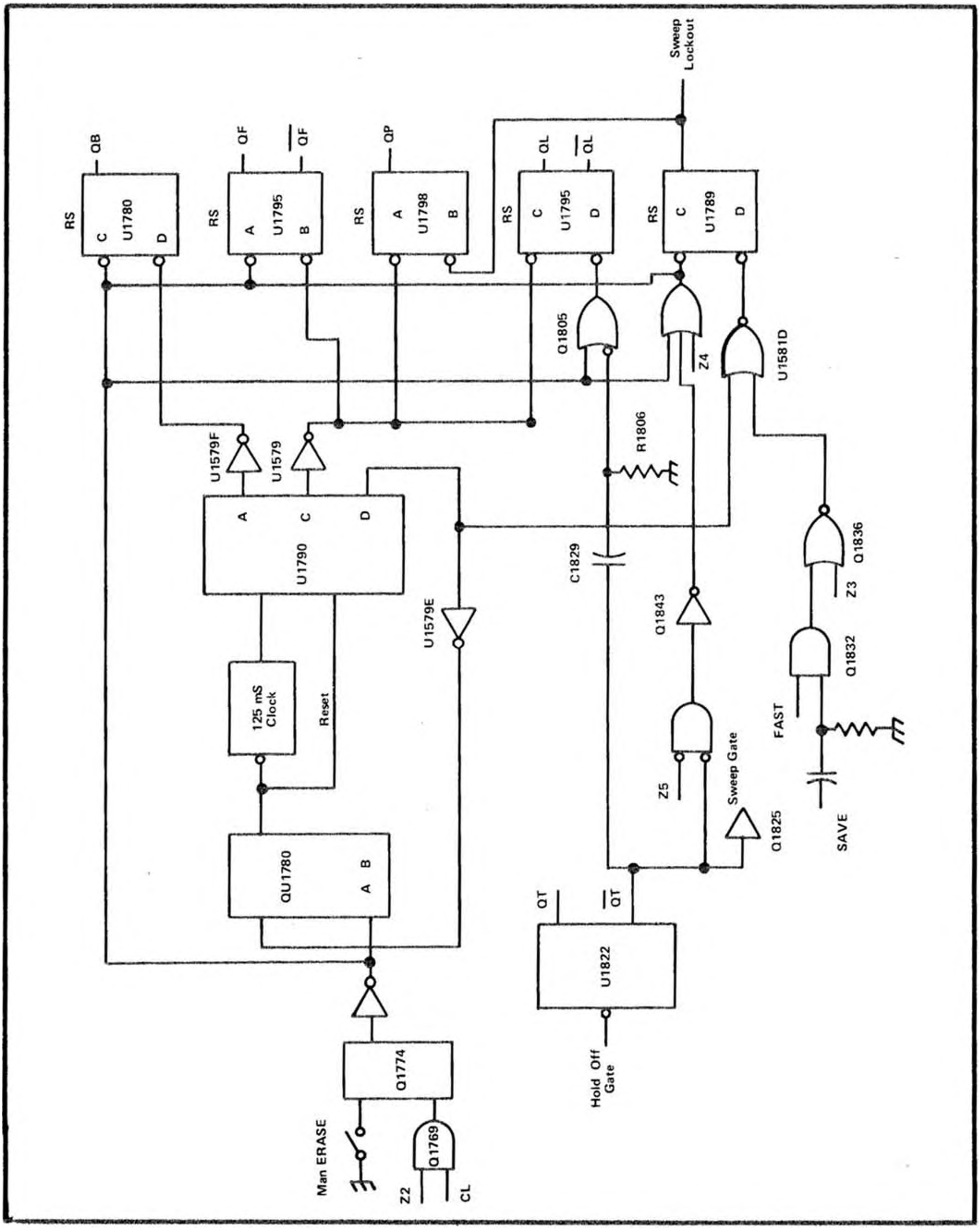


Fig. 3-40. Basic Block Diagram of the Storage Timing.

Readout Shut Down Circuit

The readout intensity is controlled by R120B (READOUT). The readout intensity control is in the collector circuit of Q1724; when Q1724 is on, the control will affect the readout display intensity. The readout is not turned on until $\overline{QT}$ time or after the sweep. The readout display is turned off when an erase cycle is started by pulse QF. If the SAVE, INTEG, or MULTI-TRACE button is pressed, the collector circuit of Q1724 is interrupted, and no current goes to the readout circuit. See Fig. 3-41 Basic block diagram of the Readout Shut Down circuit.

Persistence Pulse and Pump Pulse Generator Circuits

The oscillator is Q1552, a programmable unijunction transistor. The timing components are resistor R1551 and capacitor C1551. The pulses are connected to the base of transistor Q1555 and Q1557 to form a comparator circuit. The setting of the pump pulse-width adjustment determines when Q1555 will turn on with an incoming pulse. At QT time, transistor Q1554 is turned on, shorting the pump pulses to ground.

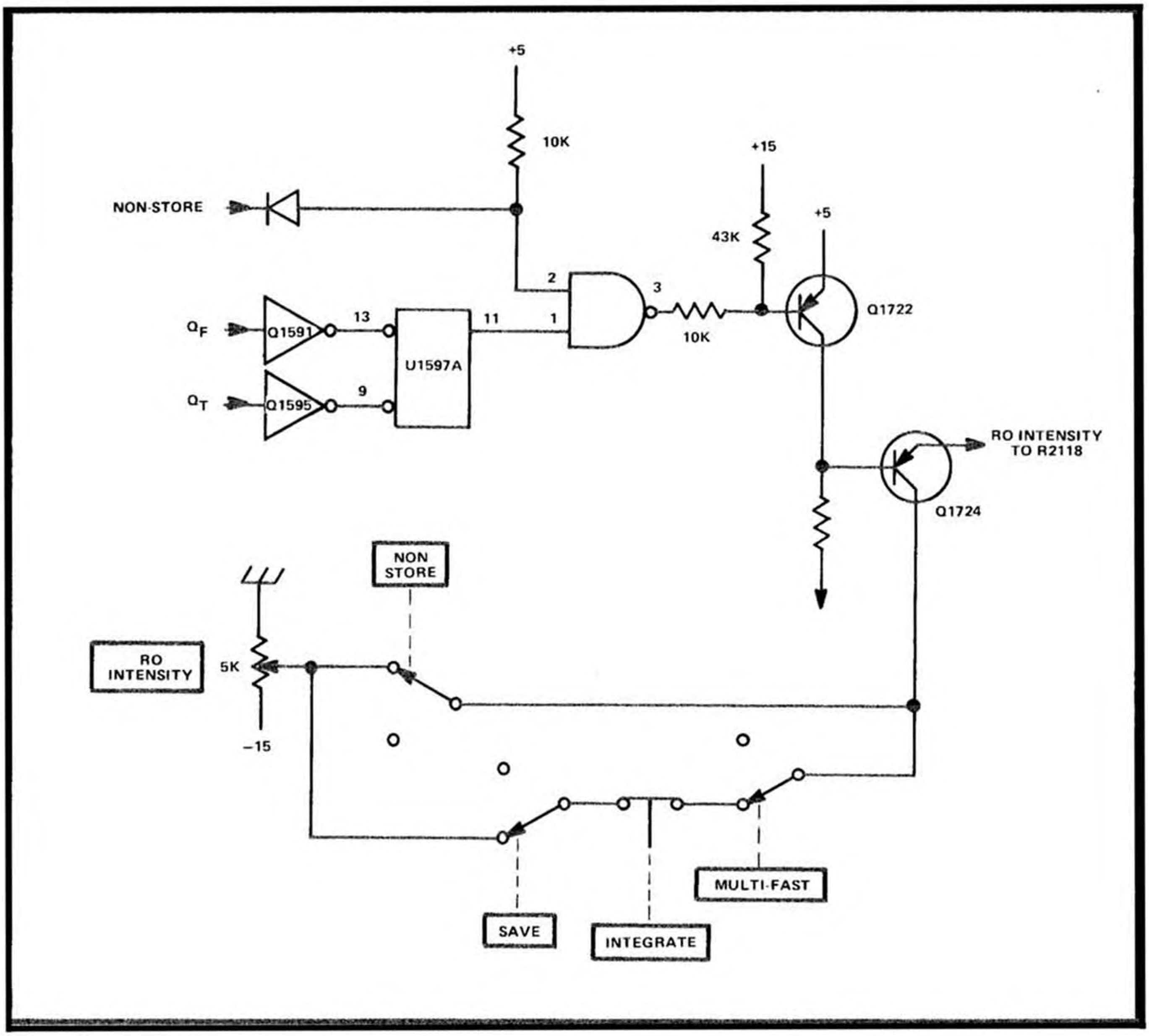


Fig. 3-41. Basic Block Diagram of the Readout Shut Down Circuit.

The variable persistence pulses are differentiated by capacitor C1560. The negative pulses are connected to the base of transistor Q1561 and the collector of transistor Q1546. When the SAVE button is not pressed in, transistor Q1533 is on and Q1540 is off. The collector load for Q1533 is the PERSISTENCE control. The voltage level at Q1546 is determined by either the collector of Q1533 (Variable Persistence Mode) or Q1540 (Save Mode). The pulse width at Q1546 is directly proportional to Q1546 collector current. When the STORED INTEN control is in the Save Mode, it has the same effect on the pulse width as the PERSISTENCE control. In the Variable Persistence Mode, the pulses are connected to the Bi-Stable target. In the Save Mode, the pulses are connected to the flood gun cathode.

Flood Gun Anode and CE Circuits

The basic circuit is a two-transistor high-speed operation amplifier. The gain of each amplifier stage is changed by gating different input resistors into the input circuit at different times for different modes. The control circuit is transistor Q1500 and Q1518. When transistor Q1500 is turned on, resistors R1503 and R1523 become part of the input resistance to their amplifiers. When transistor Q1518 is turned on by pulse QF, resistor R1520 is removed from the input circuit and resistor R1522 is added to the input of the FGA amplifier. See Fig. 3-42 for the basic block diagram of the FGA and CE_1 circuits.

CE_3 and CE_2 Circuits

The basic circuit is a two-transistor operational amplifier. The gain of each stage is controlled by the input resistance to the amplifier. At $\overline{QT}$ time, CE_3 Prep adjustment with resistor R1468 and CE_2 Prep adjustment with resistor R1482 are added to each amplifier stage. After $\overline{QT}$ time the input resistors are R1471 and R1486. In the Bi-Stable mode, Z10 prevents the CE_3 and CE_2 adjustments from having any control over the circuit.

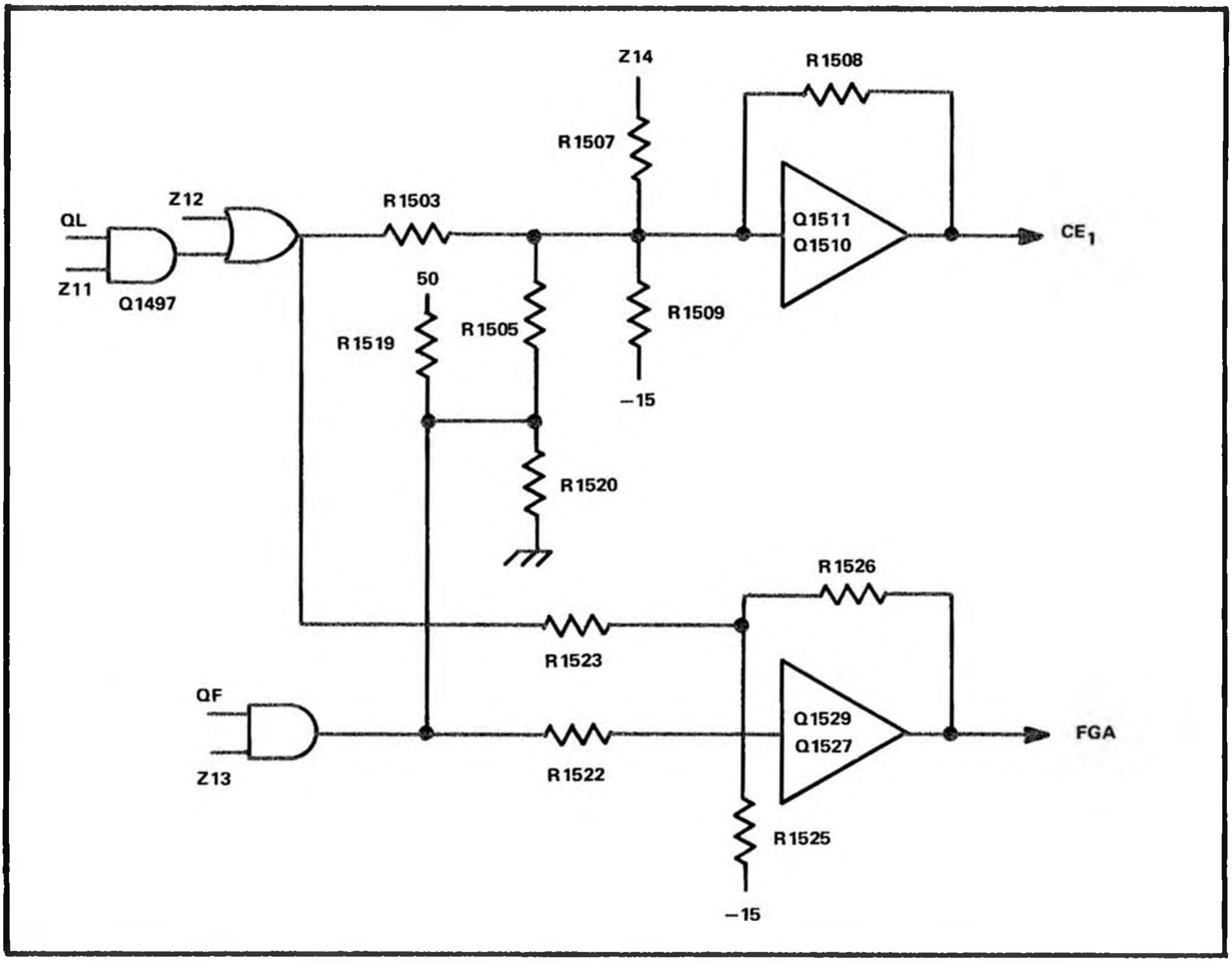


Fig. 3-42. Basic Block Diagram of the FGA and CE Circuits.

Collector Circuit

The basic circuit is a two-transistor high-speed, high-voltage operational amplifier with gate-selected input resistors. The control transistors are Q1438, Q1449, and Q1452. When these transistors are turned on, their collector load resistors are added to the amplifier input resistance. In the FAST mode at QF time, transistor Q1438 is turned on, allowing Cal adjustment R1439 and R1441 to be added to the amplifier input resistance. When Z7 is at a ground level, transistor Q1438 cannot be turned on. Transistor Q1452 works the same way as Q1438, but only at QL time. Transistor Q1449 is turned on when Z9 is not grounded and when the $\overline{QF}$ pulse and the $\overline{QL}$ pulse are both at a "high" state in the FAST and VAR PERSIST modes (Z_8). See Fig. 3-43 Basic Collector Circuit.

High Speed Mesh Circuit

The basic circuit is a three-transistor operational amplifier with gate-selected input resistors. Transistors Q1412, Q1404, and Q1399 control which resistors are gated into the amplifier input circuit. When transistor Q1412 is on, diode CR1399 is reversed biased, and the LEVEL control and range adjustment network are not added to the amplifiers input resistance. When transistor Q1399 is turned on, CR1398 and CR1396 are forward biased. This removes the LEVEL control and range adjustment, the pump pulses and the HS Prep adjustment from the input of the amplifier. When diodes CR1396 and CR1398 are reversed biased, the pump pulses and the HS Prep adjustment are added to the input resistance of the amplifier. In all modes except VAR PERSIST, transistor Q1347 is on, forward biasing diodes CR1390, CR1348, CR1353, and CR1341. This allows the FAST adjustment and control circuits to control the High Speed Mesh. The inputs to U1302C control the time at which CR1409 or CR1408 are forward biased. When the U1302C output (pin 8) is high, diode CR1409 is forward biased and CR1408 is reversed biased. When Z7 is high (at QT) the output of U1302C will be low. This turns off transistor Q1412, allowing a transfer pulse to be generated by the high-speed mesh operational amplifier. It also forward-biases diode CR1408 so that resistor R1408 is added to the Bi-Stable operational amplifier. In the FAST mode Transistors Q1612 and Q1617 reduce the high voltage output so that the stored information on the High Speed Mesh has the same vertical and horizontal sensitivity (High Speed Mesh is closer to the writing gun than the Bi-Stable Mesh). Transistor Q1601 forms a monostable multivibrator and transistor Q1606 is an inverter stage. When the NON STORE button is pressed, capacitor C1600 is allowed to discharge into the base of transistor Q1601, turning it off. This turns transistor Q1606 on, removing resistor R1607 from the Bi-Stable Mesh Amplifier input circuit. A high level pulse is generated at the Bi-Stable Mesh and ground level at the FGK.

Bi-Stable Mesh Circuitry

The basic circuit is a five-transistor, high-speed, high-voltage operational amplifier. The Variable Persistence

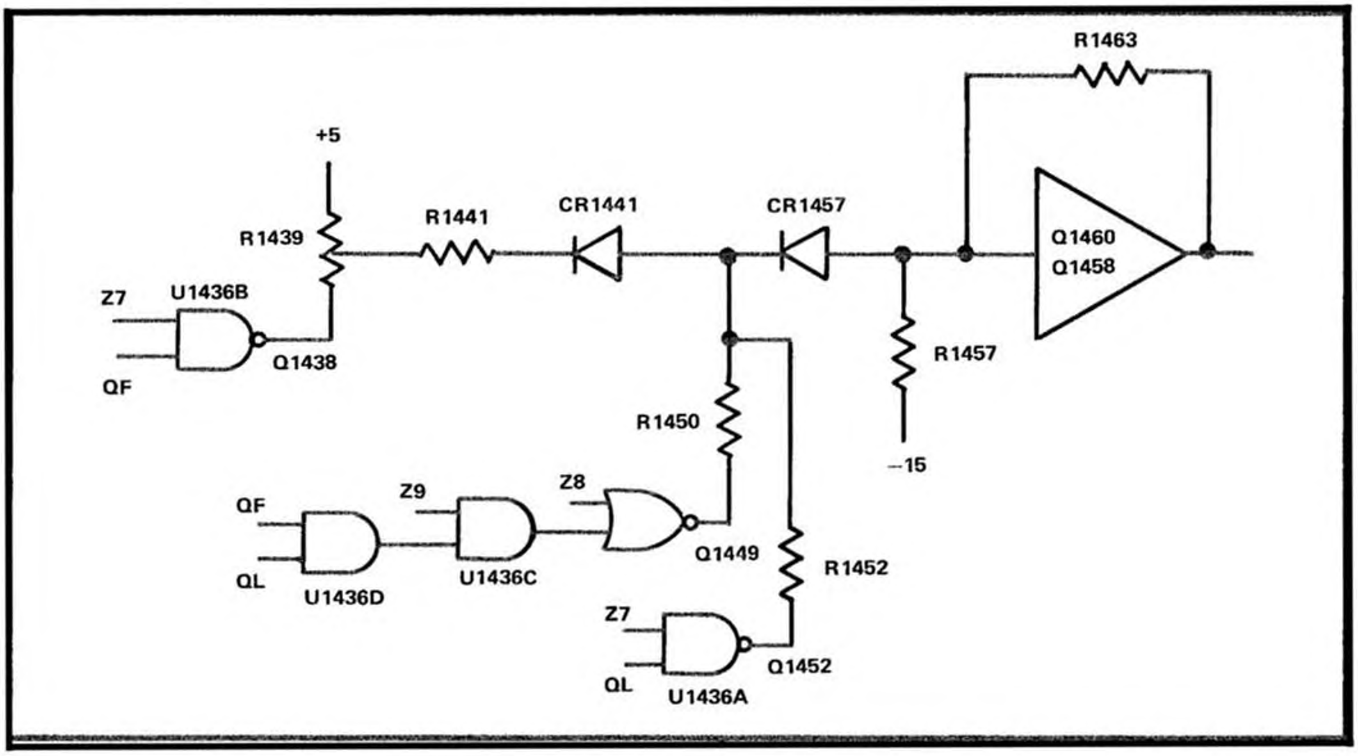


Fig. 3-43. Basic Collector Circuit.

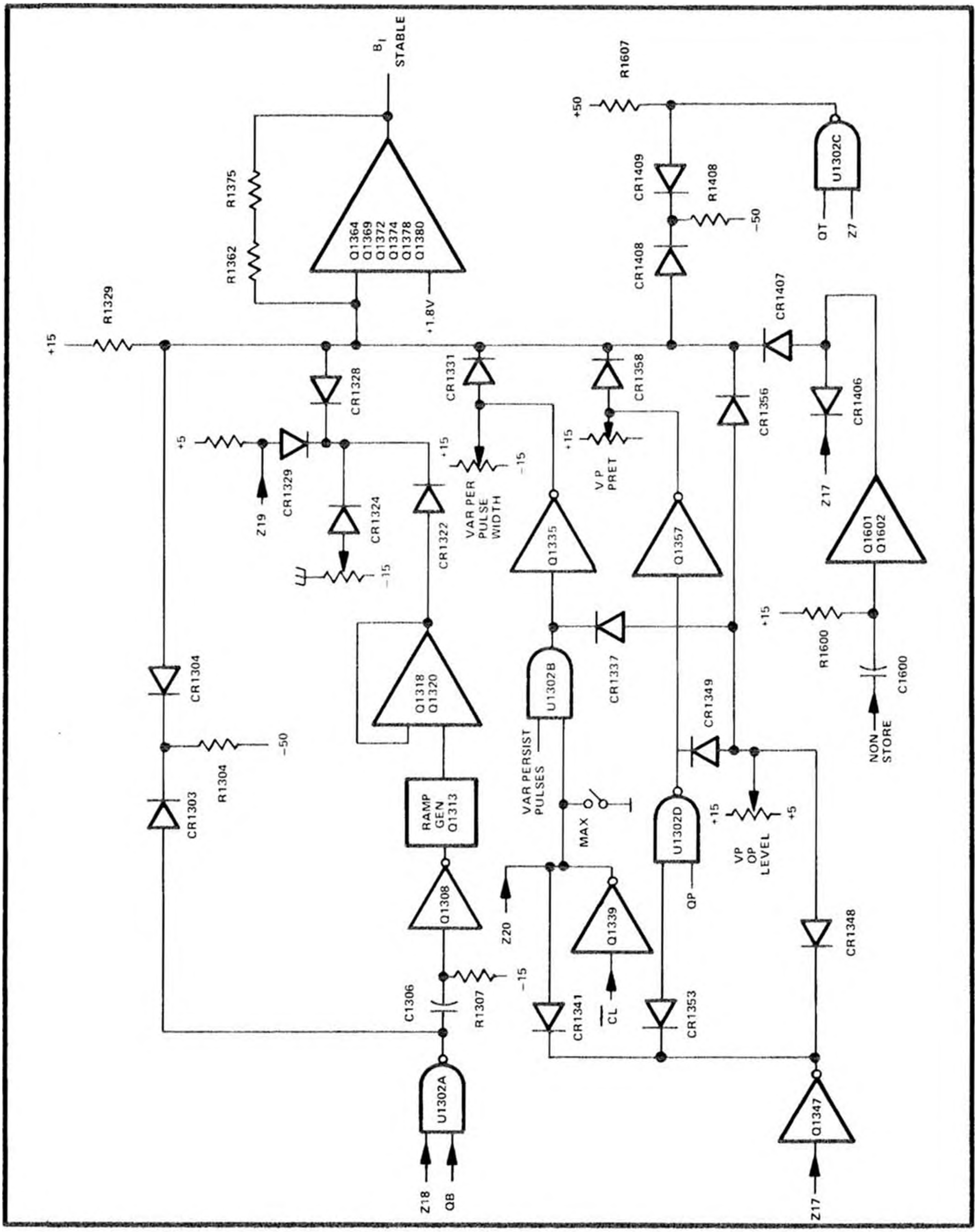


Fig. 3-44. Basic Bi-Stable Mesh Circuit.

circuitry or the Bi-Stable circuitry controls the Bi-Stable Mesh Amplifier. In the VAR PERSIST mode, Z17 is low, allowing transistor Q1347 to turn off. This reverse-biases diodes CR1348, CR1353, CR1341, CR1328, and CR1390, allowing the VAR PERSIST controls and control circuits to control the Bi-Stable amplifier. In the Bi-Stable mode, transistor Q1347 is never turned off, so diodes CR1390, CR1341, CR1353, CR1348 are forward biased, preventing the Variable Persistence control circuits from influencing the Bi-Stable Mesh Amplifier. The Bi-Stable circuit controls the Bi-Stable Mesh when diodes CR1304 and CR1328 are forwarded biased by Z19 at the junction of resistors R1328 and diode CR1327. In the Bi-Stable mode at QB pulse time, the output of pin 3 of U1302A is low, reverse-biasing diode CR1303, and forward biasing CR1304. This changes the input resistance of the Bi-Stable amplifier, causing a high positive voltage level at the output of the Bi-Stable Mesh Amplifier. Capacitor C1306 is allowed to turn on transistor Q1308, which lowers the gate voltage level on Q1313, enabling it to develop a ramp pulse. The ramp is generated until it reaches the BS Op level, then the BS Op level adjustment controls the circuit. See Fig. 3-44, the basic block diagram of the Bi-Stable Mesh circuit, which is located on the following page.

MAINTENANCE

This section of the manual contains maintenance information for use in preventive maintenance, corrective maintenance, or troubleshooting of the 7623.

Panel Removal

WARNING

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

Cabinet Model. The side panels of the 7623 are held in place by spring-action of the panels themselves. To remove the panels, push the panel toward the top of the instrument until the bottom of the panel is clear of the slot along the bottom rail of the instrument. Then, pull the panel out at the bottom and lift away from the instrument. The bottom panel is held in place with eight screws. The panels protect this instrument from dust in the interior, and also provide protection to personnel from the operating potentials present. They also reduce the EMI radiation from this instrument or EMI interference to the display due to other equipment.

Rack Model. The top cover is held in place with six screws. To remove the cover, the screws need only be loosened slightly to slide the cover out of the slots.

A panel on the left side of the instrument, held in place with six screws, allows access to the vertical amplifier circuit board.

A cover on the rear of the instrument, held in place with four screws, allows access to the power supply regulating transistors. It also allows access to three of the five screws holding the regulating circuit board assembly in the instrument.

Power-Unit Removal

The power unit can be slid out of the back of the 7623 to gain access to the Logic and Rectifier circuit boards and for power-unit maintenance. The power unit can be left connected to the rest of the instrument so that it can be operated in this position for troubleshooting. To remove the power unit, use the following procedure:

1. Remove the side panels (top panel for R7623).

2. Remove the six screws which secure the power unit to the sides of the instrument (see Fig. 4-1 for locations of screws on R7623).

3. Slide the power unit out of the rear of the instrument until it can be set down on the work surface (guide the interconnecting cables so they do not catch on other parts of the instrument).

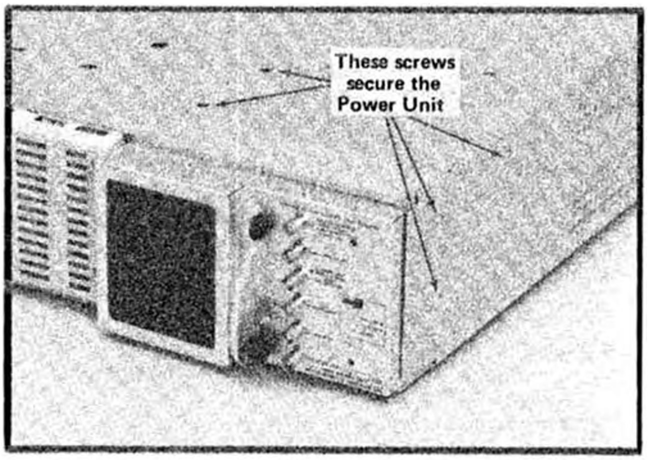


Fig. 4-1. Power Unit removal for the R7623.

PREVENTIVE MAINTENANCE

General

Preventive maintenance consists of cleaning, visual inspection, lubrication, etc. Preventive maintenance performed on a regular basis may prevent instrument breakdown and will improve the reliability of this instrument. The severity of the environment to which the 7623 is subjected determines the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Cleaning

The 7623 should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation. It also provides an electrical conduction path which may result in instrument failure. The side panels provide protection against dust in the interior of the instrument. Operation without the panels in place necessitates more frequent cleaning.

CAUTION

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

Exterior. Loose dust accumulated on the outside of the 7623 can be removed with a soft cloth or small brush. The brush is particularly useful for dislodging dirt on and around the front-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

CRT. Clean the plastic light filter, faceplate protector, and the CRT face with a soft, lint-free cloth dampened with denatured alcohol.

The optional CRT mesh filter can be cleaned in the following manner:

1. Hold the mesh filter in a vertical position and brush lightly with a soft No. 7 water-color brush to remove light coatings of dust or lint.

2. Greasy residues or dried-on dirt can be removed with a solution of warm water and a neutral-pH liquid detergent. Use the brush to lightly scrub the filter.

3. Rinse the filter thoroughly in clean water and allow to air dry.

4. If any lint or dirt remains, use clean low-pressure air to remove it. Do not use tweezers or other hard cleaning tools on the filter, as the special finish may be damaged.

5. When not in use, store the mesh filter in a lint-free, dust-proof container such as a plastic bag.

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

The high-voltage circuits, particularly parts located in the high-voltage compartment and the area surrounding the post-deflection anode lead, should receive special attention. Excessive dirt in these areas may cause high-voltage arcing and result in improper instrument operation.

Air Filter (For Rackmount Versions only). The air filter should be visually checked every few weeks and cleaned or replaced if dirty. More frequent inspections are required under severe operating conditions. If the filter is to be replaced, order new filters from your local Tektronix Field Office or representative; order by Tektronix Part No. 378-0041-01. The following procedure is suggested for cleaning the filter.

1. Remove the filter by pulling it out of the retaining frame on the rear panel. Be careful not to drop any of the accumulated dirt into the instrument.

2. Flush the loose dirt from the filter with a stream of hot water.

3. Place the filter in a solution of mild detergent and hot water and let soak for several minutes.

4. Squeeze the filter to wash out any dirt which remains.

5. Rinse the filter in clean water and let dry.

6. Coat the dry filter with an air-filter coating (available from air conditioner suppliers or order Tektronix Part No. 006-0580-00).

7. Let the filter thoroughly dry.

8. Re-install the filter in the retaining frame.

Lubrication

The reliability of potentiometers, switches, and other moving parts can be maintained if they are kept properly lubricated. However, over-lubrication is as detrimental as too little lubrication. A lubrication kit containing necessary lubricants and instructions is available from Tektronix, Inc. Order Part No. 003-0342-01.

Visual Inspection

The 7623 should be inspected occasionally for such defects as broken connections, improperly seated semiconductors, damaged or improperly installed circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged 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 7623 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 assure accurate measurements, check the calibration of this instrument after each 1000 hours of operation or every six months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. The calibration procedure can also be helpful in localizing certain troubles in the instrument. In some cases, minor troubles may be revealed and/or corrected by recalibration.

TROUBLESHOOTING

Introduction

The following information is provided to facilitate troubleshooting of the 7623. Information contained in other sections of this manual should be used along with the following information to aid in locating the defective component. An understanding of the circuit operation is very helpful in locating troubles, particularly where integrated circuits are used. See the Circuit Description section for complete information.

Troubleshooting Aids

Diagrams. Complete circuit diagrams are given on fold-out pages in the Diagrams section. The component number and electrical value of each component in this instrument are shown on these diagrams. Each main circuit is assigned a series of component numbers. Table 4-1 lists the main circuits in the 7623 and the series of component numbers assigned to each. Important voltages and waveforms are also shown on the diagrams. The portions of the circuit mounted on circuit boards are enclosed with blue lines.

Circuit Boards. Fig. 4-2 shows the location of the circuit boards within the 7623; Fig. 4-3 shows the location of circuit boards in the R7623. Pictures of these circuit boards are shown in Figs. 6-1 through 6-11. These pictures are located in the Diagrams section on the back of the page opposite the circuit diagram, to aid the cross-referencing between the diagrams and the circuit-board components. Each electrical component on the boards is identified by its circuit number. The color and location of the inter-connecting connectors are also shown. The circuit boards are also outlined on the diagrams with a blue line to show which portions of the circuit are located on a circuit board.

TABLE 4-1

Component Numbers

Component numbers on diagrams	Diagram numbers	Circuit
1-49	1	Main Interface
50-199	2	Logic Circuit
300-399	3	Trigger Selector
200-299	3	Vertical Interface
400-499	4	Vertical Amplifier
500-599	5	Horizontal Amplifier
600-699	6	Output Signals
1000-1099	7	CRT Circuit
1100-1299	8	LV Power Supply
800-999	9	Storage Output
1300-1499	10	Storage Logic
2100-2299	11	Readout System

Multi-Pin Connector Color-Code. The multi-pin connectors used for interconnection between circuit boards are color-coded to aid in circuit tracing. The color of the connector body matches the resistor color-code for the last digit of the circuit number; e.g., P601 is brown, P603 is orange, etc.

Wiring Color-Code. All insulated wire and cable used in the 7623 is color-coded to facilitate circuit tracing.

NOTE

Color code of the AC power cord is as follows (in accordance with National Electrical Code):

Black	*Line*
White	*Neutral*
Green with yellow stripe	*Safety earth (ground)*

Resistor Color-Code. In addition to the brown composition resistors, some metal-film resistors and some wire-wound resistors are used in the 7623. The resistance values of wire-wound resistors are usually printed on the body of the component. The resistance values of composition resistors and metal-film resistors are color-coded on the components with EIA color-code (some metal-film resistors may have the value printed on the body). The color-code is read starting with the stripe nearest the end of the resistor. Composition resistors have four stripes which consist of two significant figures, a multiplier, and a tolerance value (see Fig. 4-2). Metal-film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

Capacitor Marking. The capacitance values of common disc capacitors and small electrolytics are marked on the side of the component body. The white ceramic capacitors used in the 7623 are color-coded in picofarads using a modified EIA code (see Fig. 4-4).

Diode Color-Code. The cathode end of each glass-encased diode is indicated by a stripe, a series of stripes, or a dot. For most silicon or germanium diodes with a series of stripes, the color-code identifies the three significant digits of the TEKTRONIX Part Number using the resistor color-code system (e.g., a diode color-coded pink- or blue-, brown-gray-green indicates TEKTRONIX Part No. 152-0185-00). The cathode and anode ends of metal-encased diodes can be identified by the diode symbol marked on the body.

Semiconductor Lead Configuration. Fig. 4-5 shows the lead configuration for the semiconductors used in this instrument. This view is as seen from the bottom of the semiconductors.

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 7623.

1. Transistor Tester

Description: TEKTRONIX Type 576 Transistor-Curve Tracer or equivalent.

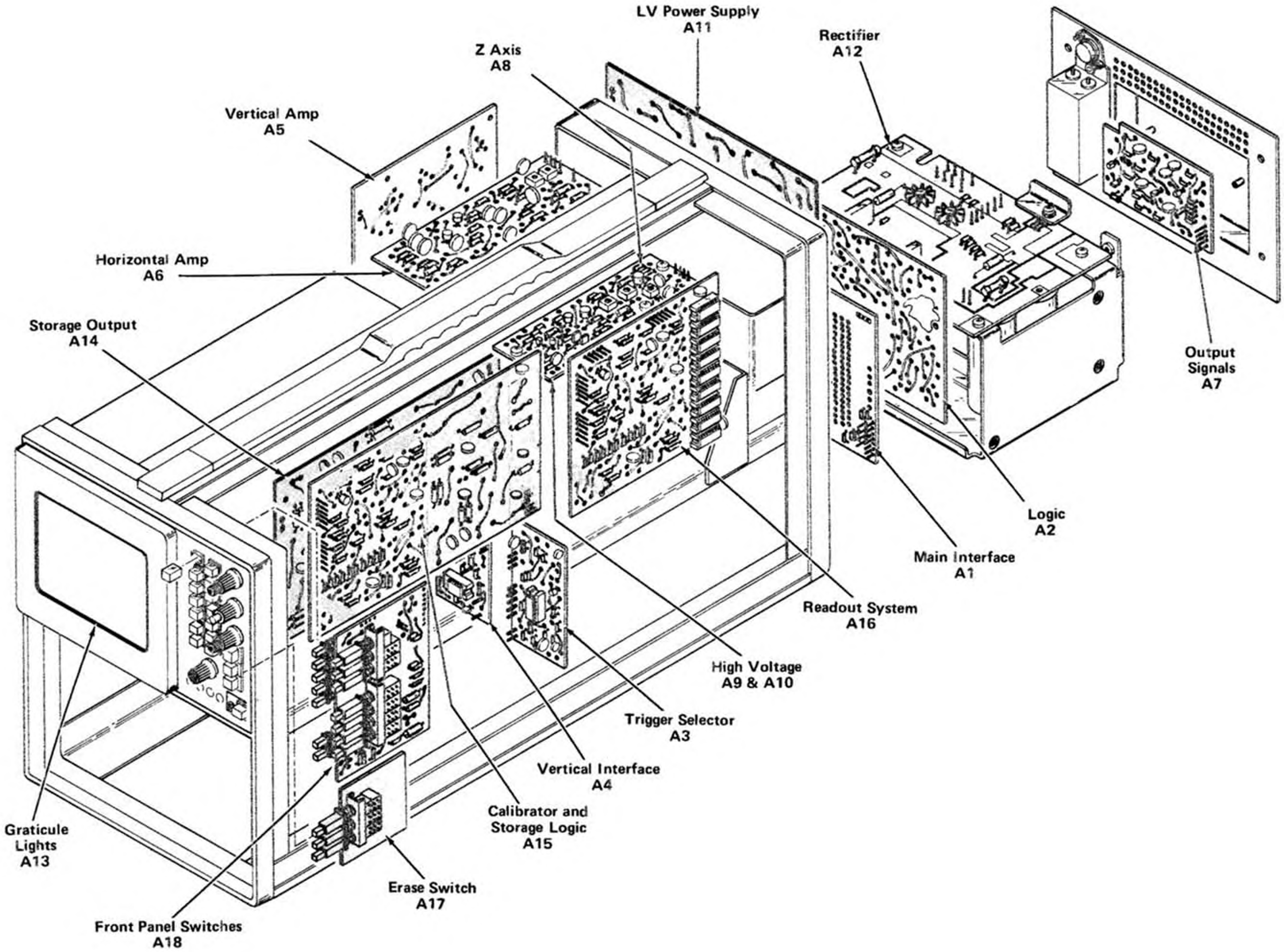


Fig. 4-2. Location of circuit boards in the 7623.

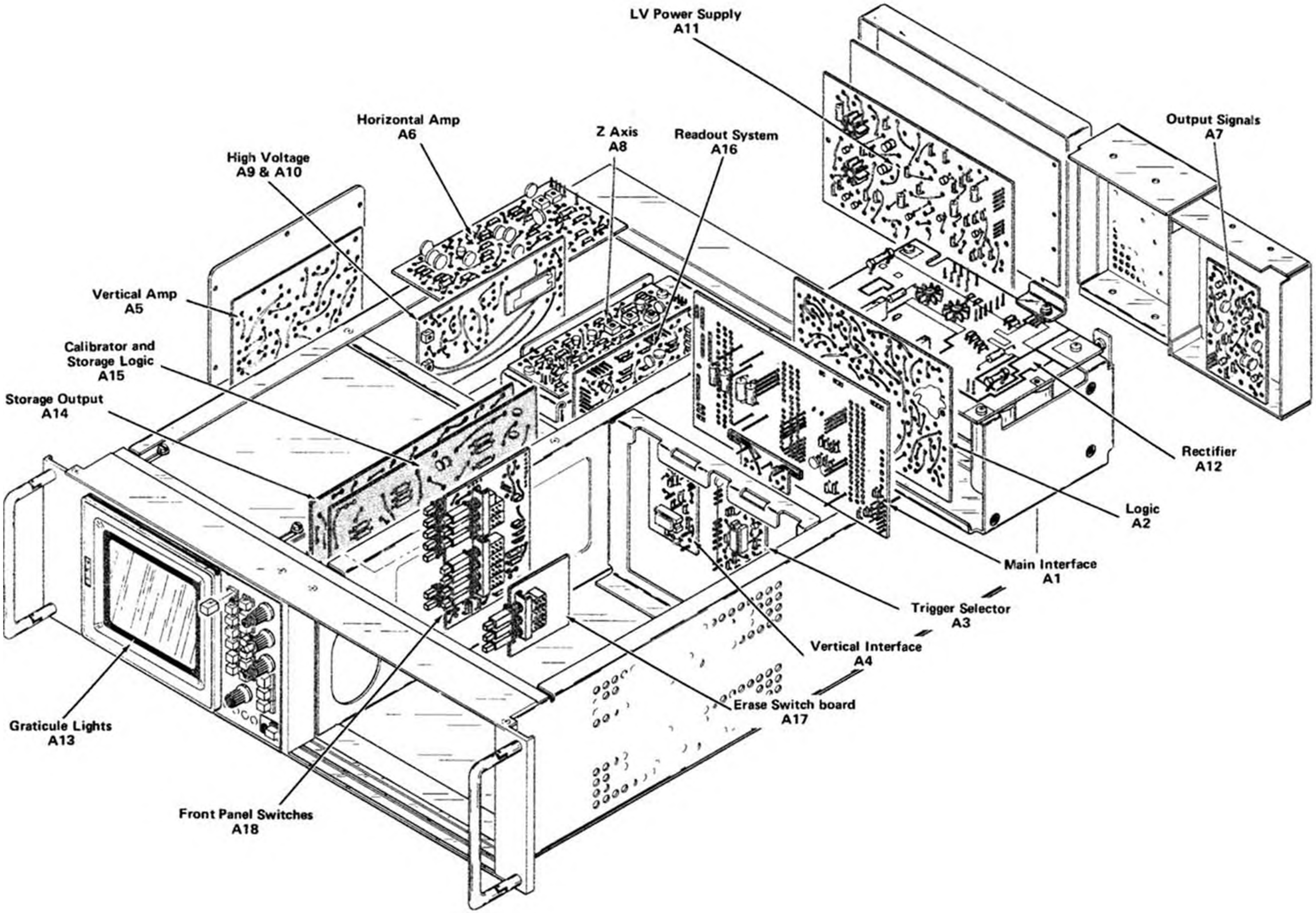
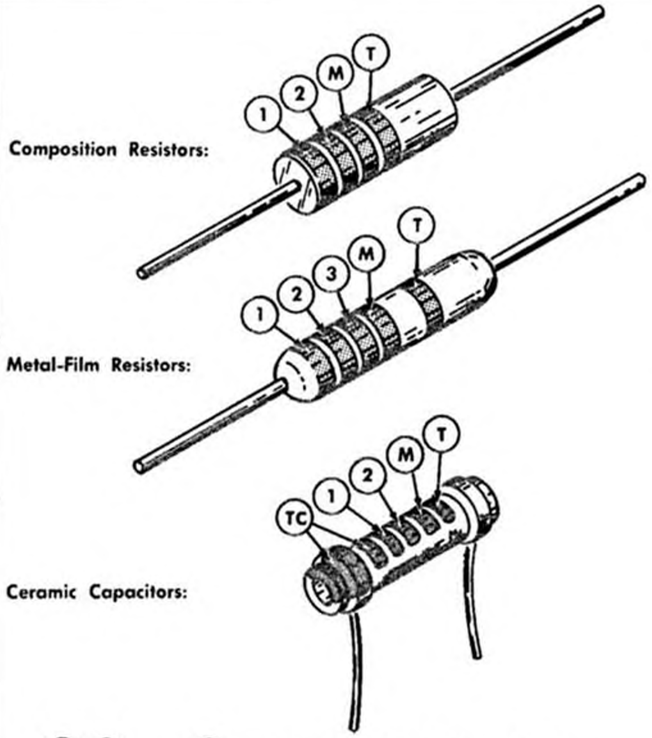


Fig. 4-3. Location of circuit boards in the R7623.



1 2 and 3 —1st, 2nd and 3rd significant figures;
M —multiplier; T —tolerance;
TC —temperature coefficient.

Resistor and Capacitor Color Code

Color	Significant Figures	Multiplier		Tolerance	
		Resistors	Capacitors	Resistors	Capacitors
Silver	---	10^{-2}	---	±10%	---
Gold	---	10^{-1}	---	±5%	---
Black	0	1	1	---	±20% or 2 pF*
Brown	1	10	10	±1%	±1% or 0.1 pF*
Red	2	10^{2}	10^{2}	±2%	±2%
Orange	3	10^{3}	10^{3}	±3%	±3%
Yellow	4	10^{4}	10^{4}	±4%	+100% −0%
Green	5	10^{5}	10^{5}	±0.5%	±5% or 0.5 pF*
Blue	6	10^{6}	10^{6}	---	---
Violet	7	---	---	---	---
Gray	8	---	10^{-2}	---	+80% −20% or 0.25 pF*
White	9	---	10^{-1}	---	±10% or 1 pF*
(none)	---	---	---	±20%	±10% or 1 pF*

***For capacitance of 10 pF or less.**

NOTE: T and/or TC color code for capacitors depends upon manufacturer and capacitor type. May not be present in some cases.

Fig. 4-4. Color code for resistors and ceramic capacitors.

Purpose: To test the semiconductors used in this instrument.

2. Multimeters

Description: Digital voltmeter, 10 megohm input impedance and 0 to 500 volts range; ohmmeter, 0 to 2 megohms. Accuracy, within 1%. Test probes must be insulated to prevent accidental shorting.

Purpose: To check voltages and for general troubleshooting in this instrument.

NOTE

A 20,000 ohms/volt VOM can be used to check the voltages in this instrument if allowances are made for the circuit loading of the VOM at high-impedance points.

3. Test Oscilloscope

Description: Frequency response, DC to 50 megahertz; deflection factor, 50 volts/division. A 10X probe should be used to reduce circuit loading.

Purpose: To check operating waveforms in this instrument.

Troubleshooting Techniques

This troubleshooting procedure is arranged in an order which checks the simple trouble possibilities before proceeding with extensive troubleshooting. The first few checks assure proper connection, operation, and calibration. If the trouble is not located by these checks, the remaining steps aid in locating the defective component. When the defective component is located, it should be replaced following the replacement procedures given under corrective maintenance.

1. Check Control Settings. Incorrect control settings can indicate a trouble that does not exist. If there is any question about the correct function or operation of any control, see the Operating Instructions section.

2. Check Associated Equipment. Before proceeding with troubleshooting of the 7623, check that the equipment used with this instrument is operating correctly.

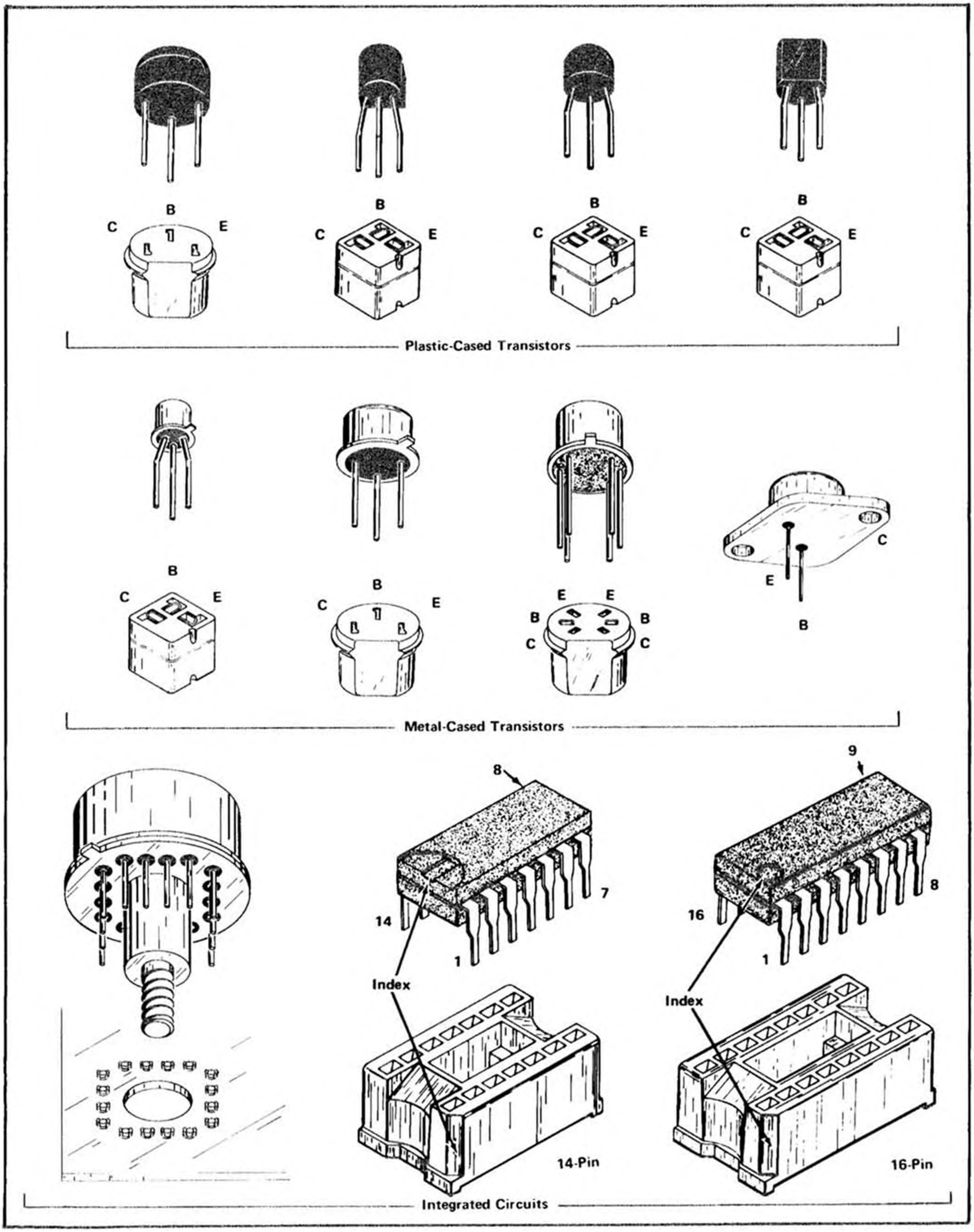


Fig. 4-5. Electrode configuration for semiconductors used in this instrument.

Check that the signal is properly connected and that the interconnecting cables are not defective. Also, check the power source. The associated plug-in units can be checked for proper operation by substituting other units which are known to be operating properly (preferably of the same types). If the trouble persists after substitution, the 7623 is probably at fault.

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

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

5. Isolate Trouble To a Circuit. To isolate trouble to a particular circuit, note the trouble symptom. The symptom often identifies the circuit in which the trouble is located. For example, poor focus indicates that the CRT circuit (includes high-voltage supplies) is probably at fault. When trouble symptoms appear in more than one circuit, check affected circuits by taking voltage and waveform readings. Typical voltages and waveforms are given on the schematics in the Diagrams section.

Incorrect operation of all circuits often indicates trouble in the power supply. Check first for correct voltage of the individual supplies. A defective component elsewhere in the instrument can appear as a power-supply trouble and may also affect the operation of other circuits. Table 4-2 lists the tolerances of the power supplies in this instrument. These voltages are measured between the power-supply test points (see Section 2 for test-point location) and ground. If a power-supply voltage is within the listed tolerance, the supply can be assumed to be working correctly. If outside the tolerance, the supply may be misadjusted or operating incorrectly. Use the procedure given in the Calibration section to adjust the power supplies.

Fig. 4-6 provides a guide for locating a defective circuit. This chart does not include checks for all possible defects; use steps 6 and 7 in such cases. Start from the top of the chart and perform the given checks on the left side of the page until a step is found which does not produce the indicated results. Further checks and/or the circuit in which the trouble is probably located are listed to the right of this step.

TABLE 4-2

Power Supply Tolerance and Ripple

Power Supply	Test Point	Output Voltage Tolerance	Maximum ripple (peak-to-peak)
−50 Volt	TP−50 (back of Main Interface board) on P1170-Pin 1	±0.1 volt	5 mV
−15 Volt	P1170-Pin 8	±0.3 volt	2 mV
+5 Volt	P1170-Pin 6	±0.15 volt	2 mV
+15 Volt	P1170-Pin 5	±0.3 volt	2 mV
+50 Volt	P1170-Pin 4	±0.6 volt	5 mV
+130 Volt	P1170-Pin 3	±5.2 volts	300 mV

If incorrect operation of the power supplies is suspected, connect the 7623 to a variable autotransformer. Then, check for correct regulation with a DC voltmeter (0.1% accuracy) and correct ripple with a test oscilloscope while varying the autotransformer throughout the regulating range of this instrument.

After the defective circuit has been located, proceed with steps 6 and 7 to locate the defective component(s).

6. Check Voltages and Waveforms. Often the defective component can be located by checking for the correct voltage or waveform in the circuit. Typical voltages and waveforms are given on the diagrams.

NOTE

Voltages and waveforms given on the diagrams are not absolute and may vary slightly between instruments. To obtain operating conditions similar to those used to take these readings, see the first diagram page.

7. Check Individual Components. The following procedures describe methods of checking individual components in the 7623. Components which are soldered in place are best checked by first disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

A. SEMICONDUCTORS.

CAUTION

Power switch must be turned off before removing or replacing semiconductors.

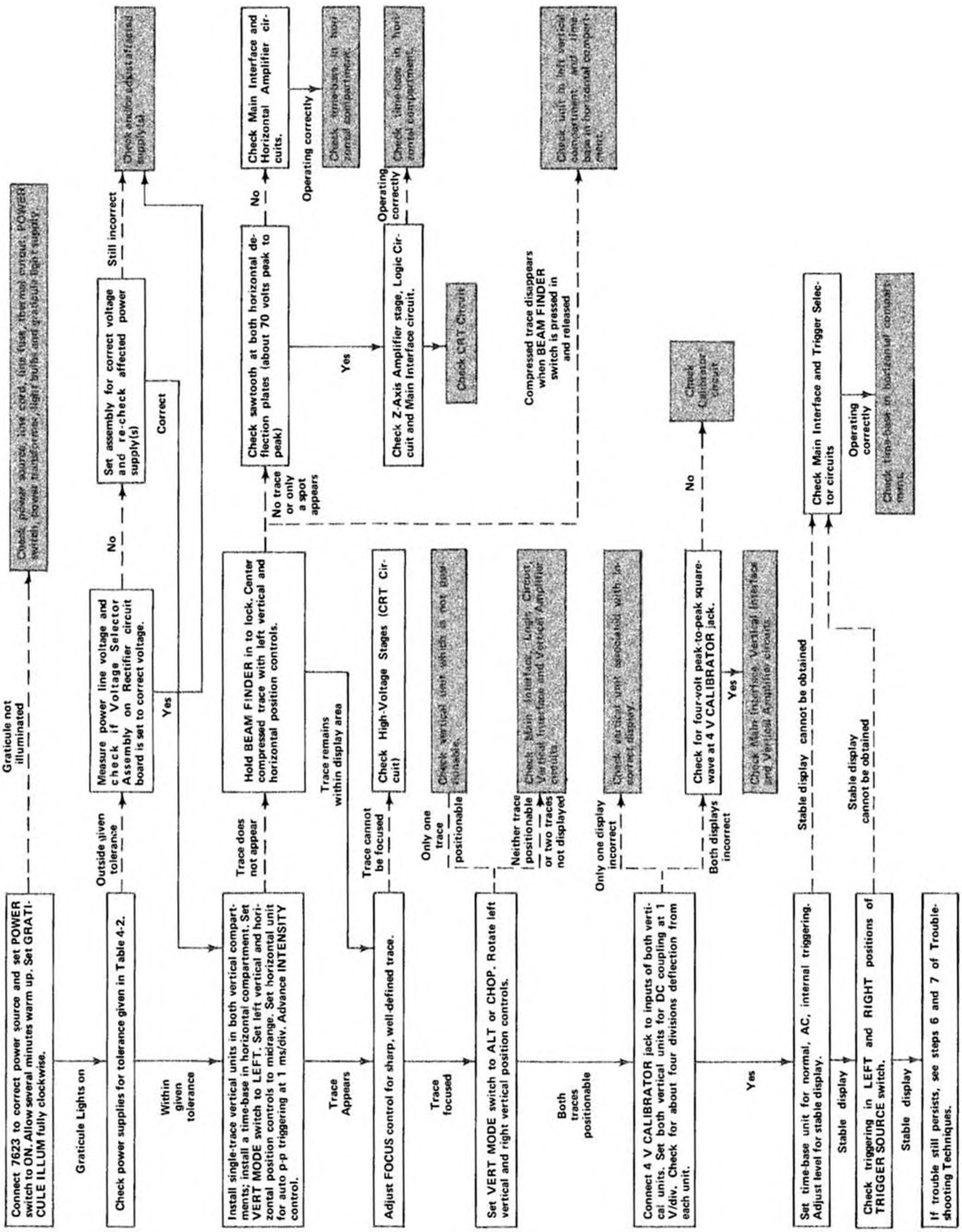


Fig. 4-6. Circuit Isolation Troubleshooting Chart.

A good check of transistor operation is actual performance under operating conditions. A transistor can most effectively be checked by substituting a new component for it (or one which has been checked previously). However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions.

Integrated circuits can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of the circuit operation is essential to troubleshooting circuits using integrated circuits. In addition, operating waveforms, logic levels, and other operating information for the integrated circuits are given in the Circuit Description section. Use care when checking voltages and waveforms around the integrated circuits so adjacent leads are not shorted together. A convenient means of clipping a test probe to the 14- and 16-pin integrated circuits is with an integrated-circuit test clip. This device also doubles as an integrated-circuit extraction tool.

B. DIODES.

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

CAUTION

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

C. RESISTORS.

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

D. INDUCTORS.

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

E. CAPACITORS.

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

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

CORRECTIVE MAINTENANCE

General

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

Obtaining Replacement Parts

Standard Parts. All electrical and mechanical part replacements for the 7623 can be obtained through your local TEKTRONIX Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating, and description.

NOTE

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

Special Parts. In addition to the standard electronic components, some special components are used in the 7623. These components are manufactured or selected by Tektronix, Inc. to meet specific performance requirements, or are manufactured for Tektronix, Inc. in accordance with our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local TEKTRONIX Field Office or representative.

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

1. Instrument type.

2. Instrument serial number.

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

4. TEKTRONIX part number.

Soldering Techniques

WARNING

Disconnect the instrument from the power source before soldering.

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used when repairing or replacing parts. General soldering techniques which apply to maintenance of any precision electronic equipment should be used when working on this instrument. Use only 60/40 rosin-core electronic-grade solder. The choice of soldering iron is determined by the repair to be made. When soldering on circuit boards, use a 35- to 40-watt pencil-type soldering iron with a 1/8-inch wide, wedge-shaped tip. Keep the tip properly tinned for best heat transfer to the solder joint. A higher wattage soldering iron may separate the wiring from the base material. Avoid excessive heat; apply only enough heat to remove the component or to make a good solder joint. Also, apply only enough solder to make a firm solder joint; do not apply too much solder.

For metal terminals (e.g., switch terminals, potentiometers, etc.) a higher wattage-rating soldering iron may be required. Match the soldering iron to the work being done. For example, if the component is connected to the chassis or other large heat-radiating surface, it will require a 75-watt or larger soldering iron. The pencil-type soldering iron used on the circuit board can be used for soldering to switch terminals, potentiometers, or metal terminals mounted in plastic holders.

After soldering is completed, clean the area around the solder connection with a flux-remover solvent. Be careful not to remove any information printed in the area.

Component Replacement

WARNING

Disconnect the instrument from the power source before replacing components.

General. The exploded-view drawings associated with the Mechanical Parts List (located at rear of manual) may be helpful in the removal or disassembly of individual components or sub-assemblies.

Circuit Board Replacement. If a circuit board is damaged beyond repair, the entire assembly including all soldered-on components, can be replaced. Part numbers are given in the Mechanical Parts List.

NOTE

Even though unwired boards are available without components, use of the completely wired replacement board is recommended due to the large number of components mounted on most of the boards.

Most of the circuit boards in this instrument are mounted on the chassis; pin connectors are used for interconnection with other circuits. Use the following procedure to remove the chassis-mounted circuit boards (removal instructions for the exceptions will be given later).

A. CHASSIS-MOUNTED BOARDS.

1. Disconnect any pin connectors on the board or connected to other portions of the instrument. Note the order of these connectors so they can be correctly replaced.

2. Remove the securing screws.

3. Remove the board.

4. To replace the board, reverse the order of removal. Match the arrows on the multi-pin connectors to the arrows on the board. Correct location of the pin connectors is shown in the circuit board illustrations in the Diagrams section.

B. TRIGGER SELECTOR AND VERTICAL INTERFACE CIRCUIT BOARD REPLACEMENT.

The Trigger Selector and Vertical Interface circuit boards plug onto the front of the Main Interface circuit board. Use the following procedure to replace either board.

1. Remove the securing screws.

2. Pull out on the edges of the board until the board clears the interconnecting terminals. Hold the board parallel to the Main Interface board until the board is free, so as not to bend the interconnecting terminals.

3. To replace the circuit board, position it so the interconnecting pins and sockets mate properly.

4. Gently press the circuit board against the mounting surface. Be sure that all the interconnecting pins and sockets mate properly.

5. Replace the securing screws.

C. LOGIC CIRCUIT BOARD REPLACEMENT.

1. Slide out the power unit as described previously.

2. Disengage the plastic snaps which secure the sides of the board.

3. Pull out on the edges of the board until the board clears the interconnecting terminals. Hold the board parallel to the Main Interface board until the board is free, so as not to bend the interconnecting terminals.

4. To replace the Logic board, position it so the guide holes in the board mate with the guide posts. Check that all the interconnecting pins and sockets mate properly.

5. Gently press the board against the Main Interface board until the plastic snaps secure the board.

D. MAIN INTERFACE CIRCUIT BOARD REPLACEMENT.

1. Slide out the power unit as described previously.

2. Remove all of the plug-on circuit boards from the Main Interface board (remove plug-in units to gain access to plug-on boards on front of Main Interface board).

3. Disconnect the multi-pin connectors from the rear of the Main Interface board. Note the order of these connectors so they can be correctly replaced.

4. Remove the three screws from inside each plug-in compartment which hold the plug-in interface connectors to the chassis (total of nine screws). Also remove the hexagonal posts which secure the ground straps to the Main Interface board.

5. Remove the Main Interface board assembly through the rear of the instrument.

6. To replace the Main Interface board, reverse the order of removal. Match the arrows on the multi-pin connectors to the arrows on the board. Correct location of the pin connectors is shown in the circuit board illustration in the Diagrams section.

E. LOW-VOLTAGE REGULATOR CIRCUIT BOARD REPLACEMENT.

1. Remove the four screws which secure the heat radiator to the rear frame of the instrument.

2. Slide the heat radiator out of the rear of the instrument and disconnect the pin connectors. Remove the heat radiator from the instrument.

3. Remove the four screws which secure the plastic protective cover to the heat radiator.

4. Remove the power transistors from the back of the heat radiator. Note the location of each power transistor.

5. To replace the Low-Voltage Regulator board, reverse the order of removal.

NOTE

After replacing the power transistors, check that the transistor cases are not shorted to the heat radiator before applying power.

F. RECTIFIER BOARD REPLACEMENT.

To replace the Rectifier board, proceed as follows:

1. Slide out the power unit as described previously.

2. Disconnect the pin connectors from the board.

3. Disconnect the wires soldered to the top of the board.

4. Unsolder all of the power transformer wires connected to the top of the board. Use a vacuum-type desoldering tool to remove the solder from the hole in the circuit board.

5. Remove the screws holding each corner of the board to the chassis.

6. To replace the Rectifier board, reverse the order of removal. Be sure that all of the transformer wires are properly placed before resoldering. Match the arrows on the multi-pin connectors to the arrows on the board. Correct location of the pin connectors and the wire color code is shown on the circuit board illustration in the Diagrams section.

G. CALIBRATOR BOARD REPLACEMENT.

1. Unsolder power on/off indicator.

2. Remove FOCUS, INTENSITY, BEAM FINDER and GRATICULE ILLUM knobs.

3. Remove securing nut which holds INTENSITY and GRATICULE ILLUM control to front panel.

4. Disengage the power switch actuating rod from the coupler. Remove the rod and plastic bushing through the front of the instrument.

5. Remove two screws holding the VERT MODE switch to the front sub-panel.

6. Remove the screw holding the calibrator board to the support on the CRT shield.

7. Pull the Calibrator board out far enough to allow the multi-pin connectors and wire leads to be disconnected from the Calibrator board (note the wire color code).

8. Remove the board.

9. To replace the circuit board, reverse the removal procedure. Match the arrows on the multi-pin connectors to the arrows on the circuit board.

Plug-In Interface Connectors. The individual contacts of the plug-in interface connectors can be replaced. However, it is recommended that the entire Main Interface board be replaced if a large number of the contacts are damaged. An alternative solution is to refer the maintenance of the damaged Main Interface board to your local TEKTRONIX Field Office or representative. Use the following procedure to replace an individual contact of the plug-in interface connector.

1. Remove the Main Interface circuit board from the instrument as described previously.

2. Snap the connector cover (white plastic) off the side of the plug-in interface connector which needs repair.

3. Unsolder and remove the damaged contact.

4. Install the replacement contact. Carefully form it to the required shape to fit against the connector body.

5. Snap the connector cover back onto the plug-in interface connector. Check that the contact which was replaced is aligned with the other contacts.

6. Replace the Main Interface board.

Access To The Fan Motor

1. Remove the four screws holding the Low-Voltage Regulator sub-assembly to the main chassis (see Fig. 4-7).

2. Pull the Low-Voltage regulator sub-assembly out through the rear of the instrument as far as cables will permit.

3. Remove the two screws holding the motor to the bracket; be careful not to lose the spacers between the motor and the bracket.

4. To replace the motor, reverse the order of removal.

Access To The Fan Motor For The R7623

1. Remove the eight screws holding the Signals-Out rear panel to the chassis. Pull rear panel out as far as cables will permit (see Fig. 4-8).

2. Remove the four corner bolts securing the motor to the chassis.

3. To replace the motor, reverse the order of removal.

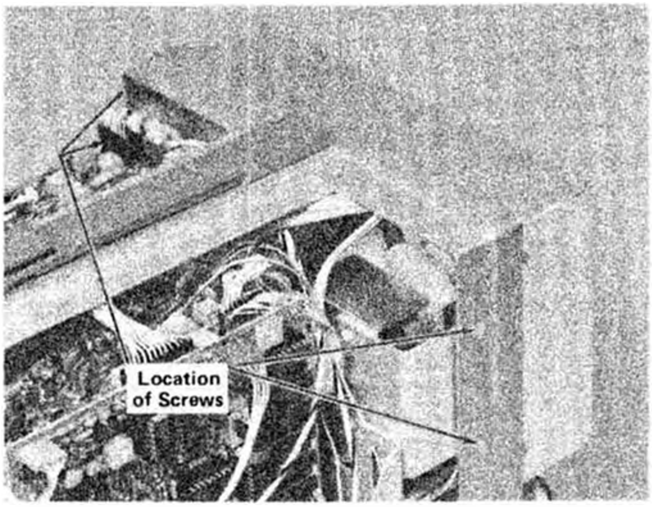


Fig. 4-7. Location of screws holding Low Voltage sub-chassis.

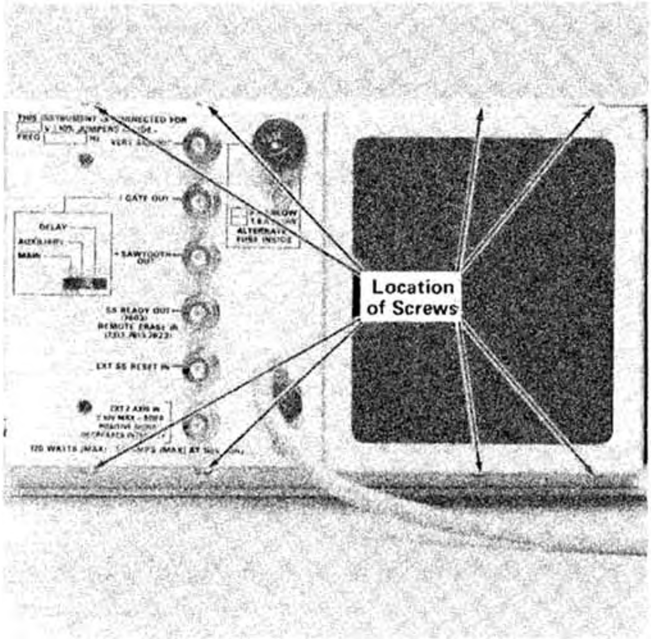


Fig. 4-8. Location of screws holding Signals Out rear panel.

Semiconductor Replacement. Semiconductors should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement of semiconductors may affect the calibration of this instrument. When semiconductors are replaced, check the operation of the part of the instrument which may be affected.

CAUTION

POWER switch must be turned off before removing or replacing semiconductors.

Replacement semiconductors should be of the original type or a direct replacement. Fig. 4-5 shows the lead configuration of the semiconductors used in this instrument. Some plastic case transistors have lead configurations which do not agree with those shown here. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram for correct basing. All transistor sockets in this instrument are wired for the standard basing as used for metal-cased transistors. Transistors which have heat radiators or are mounted on the chassis use silicone grease to increase heat transfer. Replace the silicone grease when replacing these transistors.

WARNING

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

An extracting tool should be used to remove the 14- and 16-pin integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc. Order TEKTRONIX Part No. 003-0619-00. If an extracting tool is not available when removing one of these integrated circuits, pull slowly and evenly on both ends of the device. Try to avoid having one end of the integrated circuit disengage from the socket before the other, as this may damage the pins.

Access to Power Transistors. The power transistors associated with the Low-Voltage Power Supply are mounted on the heat radiator at the rear of the instrument. To gain access to these transistors, remove the screws which secure the plastic protective cover to the heat radiator. The transistors are mounted in sockets so they can be removed from the rear by taking out the two screws in the mounting tabs (cases elevated above chassis; be sure power is off). To replace the sockets, refer to the procedure for removal of the Low-Voltage Regulator circuit board.

NOTE

After replacing a power transistor, check that the collector is not shorted to ground before applying power.

Interconnecting Pin Replacement. Interconnecting pins are used to interconnect many of the circuit boards in the 7623. Two types of mating connectors are used for these interconnecting pins. If the mating connector is mounted on a plug-on circuit board, a special socket is soldered into the board. If the mating connector is on the end of a lead, an end-lead pin connector is used which mates with the interconnecting pin. The following information provides the replacement procedure for the various types of interconnecting methods.

A. CIRCUIT-BOARD PINS.

NOTE

A circuit-board pin replacement kit including necessary tools, instructions and replacement pins is available from Tektronix, Inc. Order TEKTRONIX Part No. 040-0542-00.

To replace a pin which is mounted on a circuit board, first disconnect the pin connectors. Then, unsolder the damaged pin and pull it out of the circuit board with a pair of pliers. Be careful not to damage the wiring on the board with too much heat. Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the hole in the circuit board. Position the pin in the same manner as the old pin. Then, solder the pin on both sides of the circuit board. If the old pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

B. CIRCUIT-BOARD PIN SOCKETS.

The pin sockets on the circuit boards are soldered to the rear of the board. To replace one of these sockets, first unsolder the pin (use a vacuum-type desoldering tool to remove excess solder). Then straighten the tabs on the socket and remove it from the hole in the circuit board. Place the new socket in the circuit board hole and press the tabs down against the board. Solder the tabs of the socket to the circuit board; be careful not to get solder into the socket.

NOTE

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

C. END-LEAD PIN CONNECTORS.

The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the associated leads. To replace damaged end-lead pin connectors, remove the old pin connector from the end of the lead and clamp the replacement connector to the lead.

Some of the pin connectors are grouped together and mounted in a plastic holder; the overall result is that these connectors are removed and installed as a multi-pin connector. To provide correct orientation of this multi-pin connector when it is replaced, an arrow is stamped on the circuit board and a matching arrow is molded into the plastic housing of the multi-pin connector. Be sure these arrows are aligned as the multi-pin connector is replaced. If the individual end-lead pin connectors are removed from the plastic holder, note the color of the individual wires for replacement.

Cathode-Ray Tube Replacement. To replace the cathode-ray tube, proceed as follows:

WARNING

Use care when handling a CRT. Protective clothing and safety glasses should be worn. Avoid striking it on any object which might cause it to crack or implode. When storing a CRT, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate to protect it from scratches.

A. REMOVAL.

1. Remove the heat radiator/Low-Voltage Regulator circuit board assembly as described previously.

2. Remove the CRT base socket from the rear of the CRT.

3. Loosen the two screws located on each side of the CRT socket until the tension of the springs on these screws is released. Then, press in on the screws to be sure that the CRT clamp is loose.

4. Disconnect the deflection-plate connectors. Be careful not to bend these pins.

5. Disconnect the CRT anode plug from the jack located on the front of the high-voltage compartment. Ground this lead to the chassis to dissipate any stored charge.

6. Remove the two screws securing the CRT bezel to the front panel. Remove the plastic faceplate protector and light filter.

7. Hold one hand on the CRT faceplate and push forward on the CRT base with the other. As the CRT starts out of the shield, grasp it firmly. Guide the anode lead through the cutout in the CRT shield as the CRT is removed.

B. REPLACEMENT.

1. Loosen clamp blocks located at each corner of CRT shield. Insert the CRT into the shield. Guide the anode lead through the hole in the CRT shield.

2. Clean the CRT faceplate, plastic faceplate protector, and the light filter with denatured alcohol.

3. Re-install the CRT bezel, faceplate protector, and light filter. Firmly tighten the two screws.

4. Push forward on the CRT base to be certain that the CRT is as far forward as possible. Then tighten the two screws beside the CRT base until the springs on the screws are fully compressed.

5. Reposition and tighten down clamp blocks to hold the faceplate of the CRT tightly against the implosion shield. The clamps are located at each corner of the CRT shield.

6. Replace the CRT base socket.

7. Reconnect the CRT anode plug.

8. Re-install the heat radiator/Low-Voltage Regulator circuit board assembly.

9. Carefully reconnect the deflection plate connectors. After each connector is installed, lightly pull on its lead to be sure that it will remain in its socket.

10. Check the calibration of the complete instrument. Calibration procedure is given in Section 2.

Switch Replacement. The pushbutton switches used in the 7623 are not repairable and should be replaced as a unit if defective.

Graticule-Bulb Replacement. To remove a graticule bulb, first remove the two screws securing the CRT bezel to the front panel. Remove the plastic light shield and retaining spring. Now, firmly grasp the defective bulb and pull straight out. Push the replacement bulb straight into the socket as far as it will go. Replace the retaining spring, light shield, and CRT bezel.

Power Transformer Replacement. Replace the power transformer only with a direct replacement transformer. When removing the transformer, tag the leads with the corresponding terminal numbers to aid in connecting the new transformer. After the transformer has been replaced, check the performance of the complete instrument using the procedure given in the Calibration section.

High-Voltage Compartment. The components located in the high-voltage compartment can be reached for maintenance or replacement by using the following procedure. Diagram 6 shows the location of the components in the high-voltage compartment and color-coding of the wires.

NOTE

All solder joints in the high-voltage compartment should have smooth surfaces. Any protrusions may cause high-voltage arcing at high altitudes.

1. Remove the heat radiator/Low-Voltage Regulator assembly as described previously.

2. Disconnect the CRT base socket.

3. Disconnect the CRT anode plug and discharge it to the chassis. Using an insulated probe or wire, discharge the jack portion of the CRT anode connector to chassis ground.

4. Disconnect the multi-pin connectors on the Z-Axis Amplifier board.

5. Remove the screw on the bottom of the high-voltage compartment and the two screws located at the top.

6. Guide the high-voltage compartment away from the instrument chassis. Be careful not to damage any of the components or the pin connectors on the High-Voltage or Z-Axis Amplifier circuit boards. Disconnect the multi-pin connectors on the High-Voltage board.

7. Using an insulated shorting strap, discharge the exposed connections to chassis ground.

8. Remove the two power transistors and the four screws which secure the High-Voltage board to the high-voltage compartment. Now, all of the circuitry in the high-voltage box can be reached for maintenance or replacement except those in the encapsulated assembly.

9. To replace the encapsulated assembly, remove the four screws located on the bottom of the High-Voltage circuit board (remove board to reach screws).

10. To replace the high-voltage compartment, reverse the above procedure. Be careful not to pinch any of the interconnecting wires when re-attaching the high-voltage compartment to the chassis.

Fuse Replacement. Table 4-3 gives the rating, location, and function of the fuses used in this instrument.

TABLE 4-3

Fuse Rating

Circuit Number	Rating	Location	Function
F1000	3.2 A Slow	Rear panel	110-volt line
F1000	1.6 A Slow	Rectifier board	220-volt line
F814	2 A Fast	Rectifier board	High voltage
F855	0.15 A Fast	Low-Voltage Regulator board	+130 volts

Recalibration After Repair

After any electrical component has been replaced, the calibration of that particular circuit should be checked, as well as the calibration of other closely related circuits.

Since the low-voltage supply affects all circuits, calibration of the entire instrument should be checked if work has been done in the low-voltage supply or if the power transformer has been replaced.

Instrument Repackaging

If the 7623 is to be shipped for long distances by commercial means of transportation, it is recommended that it be repackaged in the original manner for maximum protection. The original shipping carton can be saved and used for this purpose. The repackaging illustration in the Mechanical Parts List shows how to repackage the 7623 and gives the part number for the packaging components. New shipping cartons can be obtained from Tektronix, Inc. Contract your local TEKTRONIX Field Office or representative.

NOTE

The packaging material is not designed to protect the plug-ins if shipped installed in the plug-in compartments. The plug-ins should be shipped in their own shipping cartons.

ELECTRICAL PARTS LIST

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

ABBREVIATIONS AND REFERENCE DESIGNATORS

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

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLIES				
A1	670-1956-00			MAIN INTERFACE Circuit Board Assembly
A2	670-1370-02			LOGIC Circuit Board Assembly
A3	670-1371-05			TRIGGER SELECT Circuit Board Assembly
A4	670-1373-06			VERTICAL INTERFACE Circuit Board Assembly
A5	670-1958-00			VERTICAL AMPLIFIER Circuit Board Assembly
A6	670-1957-00	B010100	B019999	HORIZONTAL AMPLIFIER Circuit Board Assembly
A6	670-1957-01	B020000	B079999	HORIZONTAL AMPLIFIER Circuit Board Assembly
A6	670-1957-02	B080000		HORIZONTAL AMPLIFIER Circuit Board Assembly
A7	670-1961-00			OUTPUT SIGNALS Circuit Board Assembly
A8	670-1951-00			Z AXIS Circuit Board Assembly
A9	670-1952-00			HIGH VOLTAGE #1 Circuit Board Assembly
A10	670-1953-00			HIGH VOLTAGE #2 Circuit Board Assembly
A11	670-1376-10			LOW VOLTAGE REGULATOR Circuit Board Assembly
A12	670-1382-05			RECTIFIER Circuit Board Assembly
A13	670-0702-03			GRATICULE LIGHTS Circuit Board Assembly
A14	670-1955-00			STORAGE Circuit Board Assembly
A15	670-1954-00			CAL & STORAGE Circuit Board Assembly
A16	670-1900-01			READOUT SYSTEM Circuit Board Assembly
A17	670-2602-00			ERASE SWITCH Circuit Board Assembly
A18	670-1959-00			MODE SWITCH Circuit Board Assembly
MOTOR				
B1001	147-0008-00			Motor, Barber Colman type YAA 707-6

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS				
C1	290-0271-00			9 µF, Elect., 125 V, +20%-15%
C3	290-0302-00			100 µF, Elect., 20 V, 10%
C5	290-0302-00			100 µF, Elect., 20 V, 10%
C7	290-0302-00			100 µF, Elect., 20 V, 10%
C9	290-0271-00			9 µF, Elect., 125 V, +20%-15%
C16	283-0068-00			0.01 µF, Cer, 500 V, +100%-0%
C18	283-0068-00			0.01 µF, Cer, 500 V, +100%-0%
C44	283-0068-00			0.01 µF, Cer, 500 V, +100%-0%
C47	281-0638-00			240 pF, Cer, 500 V, 5%
C48	283-0068-00			0.01 µF, Cer, 500 V, +100%-0%
C55	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C58	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C59	283-0672-00			200 pF, Mica, 500 V, 1%
C60	281-0564-00			24 pF, Cer, 500 V, 5%
C67	281-0605-00			200 pF, Cer, 500 V
C76	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C89	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C136	281-0547-00			2.7 pF, Cer, 500 V, 10%
C137	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C138	281-0503-00			8 pF, Cer, 500 V, ±0.5 pF
C146	281-0547-00			2.7 Cer, 500 V, 10%
C148	281-0503-00			8 pF, Cer, 500 V, ±0.5 pF
C149	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C152	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C166	281-0547-00			2.7 pF, Cer, 500 V, 10%
C168	281-0503-00			8 pF, Cer, 500 V, ±0.5 pF
C193	283-0026-00			0.2 µF, Cer, 25 V, +80%-20%
C195	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C196	283-0026-00			0.2 µF, Cer, 25 V, +80%-20%
C198	283-0026-00			0.2 µF, Cer, 25 V, +80%-20%
C207	281-0538-00			1 pF, Cer, 500 V, 20%
C208	281-0528-00			82 pF, Cer, 500 V, 10%
C215	281-0589-00			170 pF, Cer, 500 V, 5%
C217	281-0537-00			0.68 pF, Cer, 500 V, 20%
C220	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C227	281-0503-00			8 pF, Cer, 500 V, ±0.5 pF
C260	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C301	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C305	283-0004-00			0.02 µF, Cer, 150 V
C322	281-0572-00			6.8 pF, Cer, 500 V, ±0.5 pF

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C329	281-0572-00			6.8 pF, Cer, 500 V, ± 0.5 pF
C342	283-0000-00			0.001 μF, Cer, 500 V, + 100%-0%
C348	283-0000-00			0.001 μF, Cer, 500 V, + 100%-0%
C401	290-0522-00			1 μF, Elect., 50 V, 20%
C418	281-0629-00			33 pF, Cer, 600 V, 5%
C420	281-0153-00			1.7-10 pF, Var, Air, 250 V
C421	281-0504-00			10 pF, Cer, 500 V, 10%
C425	281-0153-00			1.7-10 pF, Var, Air, 250 V
C427	281-0160-00			7-25 pF, Var, Cer, 350 V
C433	290-0522-00			1 μF, Elect., 50 V, 20%
C455	283-0187-00	B010100	B039999	0.047 μF, Cer, 400 V, 10%
C455	283-0341-00	B040000		0.047 μF, Cer, 100 V, 10%
C456	283-0119-00			2200 pF, Cer, 200 V, 5%
C458	283-0116-00			820 pF, Cer, 500 V, 5%
C459	290-0522-00			1 μF, Elect., 50 V, 20%
C465	283-0211-00			0.1 μF, Cer, 200 V, 10%
C466	283-0100-00			0.0047 μF, Cer, 200 V, 10%
C468	283-0005-00			0.01 μF, Cer, 250 V, + 100%-0%
C480	290-0522-00			1 μF, Elect., 50 V, 20%
C486	283-0000-00			0.001 μF, Cer, 500 V, + 100%-0%
C491	283-0110-00	XB040000		0.005 μF, Cer, 150 V
C494	283-0000-00			0.001 μF, Cer, 500 V, + 100%-0%
C496	281-0523-00			100 pF, Cer, 350 V, 20%
C521[1]		B010100	B029999X	
C522[1]		B010100	B029999X	
C527	281-0504-00	B010100	B019999X	10 pF, Cer, 500 V, 10%
C545	281-0550-00			120 pF, Cer, 500 V, 10%
C552	283-0002-00			0.01 μF, Cer, 500 V
C555	283-0083-00			0.0047 μF, Cer, 500 V, 20%
C566	281-0095-00	XB020000	B079999	0.2-1.5 pF, Var, Teflon
C566	281-0064-00	B080000		0.25-1.5 pF, Var, Plastic
C567	281-0557-00	B010100	B019999X	1.8 pF, Cer, 500 V
C568	281-0097-00	B010100	B019999	9-35 pF, Var, Cer
C568	281-0089-00	B020000	B079999X	2-8 pF, Var, Cer
C569	281-0579-00	B010100	B019999X	21 pF, Cer, 500 V, 5%
C571	283-0002-00			0.01 μF, Cer, 500 V
C574	283-0002-00			0.01 μF, Cer, 500 V
C575	283-0083-00			0.0047 μF, Cer, 500 V, 20%
C584	281-0546-00	XB080000		330 pF, Cer, 500 V, 10%
C586	281-0095-00	XB020000	B079999	0.2-1.5 pF, Var, Teflon
C586	281-0064-00	B080000		0.25-1.5 pF, Var, Plastic
C587	281-0557-00	B010100	B019999X	1.8 pF, Cer, 500 V
C588	281-0092-00	B010100	B019999	9-35 pF, Var, Cer
C588	281-0091-00	B020000		2-8 pF, Var, Cer
C589	281-0579-00	B010100	B019999X	21 pF, Cer, 500 V, 5%
C591	283-0002-00			0.01 μF, Cer, 500 V
C593	283-0002-00			0.01 μF, Cer, 500 V
C595	283-0081-00	B010100	B069999	0.1 μF, Cer, 25 V, +80%-20%
C595	283-0024-00	B070000		0.1 μF, Cer, 30 V, +80%-20%
C597	283-0081-00	B010100	B069999	0.1 μF, Cer, 25 V, +80%-20%
C597	283-0024-00	B070000		0.1 μF, Cer, 30 V, +80%-20%
C599	283-0081-00	B010100	B069999	0.1 μF, Cer, 25 V, +80%-20%
C599	283-0024-00	B070000		0.1 μF, Cer, 30 V, +80%-20%
C605	281-0612-00			5.6 pF, Cer, 200 V, ± 0.5 pF

[1]Added if necessary.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C610	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C615	281-0513-00			27 pF, Cer, 500 V, 20%
C619	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C622	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C637	281-0510-00			22 pF, Cer, 500 V, 20%
C639	283-0111-00			0.1 µF, Cer, 50 V
C643	283-0111-00			0.1 µF, Cer, 50 V
C662	283-0080-00			0.022 µF, Cer, 25 V, +80%-20%
C667	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C669	283-0111-00			0.1 µF, Cer, 50 V
C679	283-0111-00			0.1 µF, Cer, 50 V
C806	290-0468-00			250 µF, Elect., 150 V, +75%-10%
C808	290-0507-00			1800 µF, Elect., 75 V, +75%-10%
C809	290-0507-00			1800 µF, Elect., 75 V, +75%-10%
C810	285-0555-00			0.1 µF, Plastic, 100 V, 20%
C811	290-0581-00			1400 µF, Elect., 25 V, +75%-10%
C813	290-0506-00			9600 µF, Elect., 25 V, +100%-10%
C814	290-0506-00			9600 µF, Elect., 25 V, +100%-10%
C820	285-0555-00			0.1 µF, Plastic, 100 V, 20%
C821	290-0508-00			1800 µF, Elect., 15 V, +100%-1%
C823	283-0004-00			0.02 µF, Cer, 150 V
C827	283-0077-00	XB090000		330 pF, Cer, 500 V, 5%
C858	283-0078-00			0.001 µF, Cer, 500 V, 20%
C866	283-0078-00			0.001 µF, Cer, 500 V, 20%
C876	283-0328-00	XB080000		0.03 µF, Cer, 200 V, +80%-20%
C880	283-0638-00			130 pF, Mica, 100 V, 1%
C889	290-0415-00			5.6 µF, Elect., 35 V, 10%
C923	281-0591-00			5600 pF, Cer, 200 V, 20%
C936	283-0178-00	XB080000		0.1 µF, Cer, 100 V, +80%-20%
C943	283-0078-00	XB100000		0.001 µF, Cer, 500 V, 20%
C950	283-0083-00			0.0047 µF, Cer, 500 V, 20%
C975	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C979	281-0591-00			5600 pF, Cer, 200 V, 20%
C985	283-0083-00			0.0047 µF, Cer, 500 V, 20%
C1105	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C1124	283-0004-00			0.02 µF, Cer, 150 V
C1126	283-0004-00			0.02 µF, Cer, 150 V
C1128	283-0111-00			0.1 µF, Cer, 50 V
C1131	283-0004-00			0.02 µF, Cer, 150 V
C1138	281-0053-00			0.35-1.37 pF, Var
C1141	283-0004-00			0.02 µF, Cer, 150 V
C1144	283-0004-00			0.02 µF, Cer, 150 V
C1146	283-0004-00			0.02 µF, Cer, 150 V
C1148	283-0111-00			0.1 µF, Cer, 50 V

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C1151	283-0004-00			0.02 µF, Cer, 150 V
C1158	281-0053-00			0.35-1.37 pF, Var
C1184	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C1188	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C1193	283-0003-00			0.01 µF, Cer, 150 V, +80%-20%
C1196	283-0004-00			0.02 µF, Cer, 150 V
C1215	285-0629-00			0.047 µF, PTM, 100 V, 20%
C1222	290-0272-00			47 µF, Elect., 50 V, 20%
C1226	283-0300-00			0.001 µF, Cer, 10,000 V, +80%-20%
C1228	283-0300-00			0.001 µF, Cer, 10,000 V, +80%-20%
C1229	283-0300-00			0.001 µF, Cer, 10,000 V, +80%-20%
C1232	283-0105-00			0.01 µF, Cer, 2,000 V, +80%-20%
C1234	283-0105-00			0.01 µF, Cer, 2,000 V, +80%-20%
C1236	283-0335-00			0.1 µF, Cer, 600 V, 20%
C1238	283-0335-00			0.1 µF, Cer, 600 V, 20%
C1240	290-0391-00			15 µF, Elect., 30 V, 10%
C1241	283-0203-00			0.47 µF, Cer, 50 V, 20%
C1247	283-0044-00			0.001 µF, Cer, 3,000 V
C1250	283-0105-00			0.01 µF, Cer, 2,000 V, +80%-20%
C1254	283-0044-00			0.001 µF, Cer, 3,000 V
C1255	283-0044-00			0.001 µF, Cer, 3,000 V
C1257	281-0513-00			27 pF, Cer, 500 V, 20%
C1258	290-0164-00			1 µF, Elect., 150 V
C1264	290-0164-00			1 µF, Elect., 150 V
C1266	281-0513-00			27 pF, Cer, 500 V, 20%
C1268	283-0044-00			0.001 µF, Cer, 3,000 V
C1269	283-0013-00			0.01 µF, Cer, 1,000 V
C1275	281-0543-00			270 pF, Cer, 500 V, 10%
C1276	283-0044-00			0.001 µF, Cer, 3,000 V
C1306	283-0111-00			0.1 µF, Cer, 50 V
C1313	290-0525-00			4.7 µF, Elect., 50 V, 20%
C1345	283-0183-00			0.045 µF, Cer, 500 V, 20%
C1362	281-0501-00			4.7 pF, Cer, 500 V, ±1 pF
C1375	281-0501-00			4.7 pF, Cer, 500 V, ±1 pF
C1381	283-0013-00			0.01 µF, Cer, 1,000 V
C1382	281-0510-00			22 pF, Cer, 500 V, 20%
C1383	281-0518-00			47 pF, Cer, 500 V, 20%
C1384	283-0008-00			0.1 µF, Cer, 500 V
C1403	290-0522-00			1 µF, Elect., 50 V, 20%
C1421	281-0537-00			0.68 pF, Cer, 500 V, 20%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C1429	283-0092-00			0.03 μF, Cer, 200 V, +80%-20%
C1432	281-0525-00			470 pF, Cer, 500 V, 20%
C1461	283-0057-00			0.1 μF, Cer, 200 V, +80%-20%
C1551	283-0058-00			0.027 μF, Cer, 100 V, 10%
C1560	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1584	283-0111-00	XB040000		0.1 μF, Cer, 50 V
C1586	283-0032-00	B010100	B039999X	470 pF, Cer, 500 V, 5%
C1591	283-0068-00			0.01 μF, Cer, 500 V, +100%-0%
C1600	290-0246-00	B010100	B049999	3.3 μF, Elect., 15 V, 10%
C1600	290-0527-00	B050000		15 μF, Elect., 20 V, 20%
C1631	283-0111-00			0.1 μF, Cer, 50 V
C1633	283-0111-00			0.1 μF, Cer, 50 V
C1635	290-0531-00			100 μF, Elect., 10 V, 20%
C1637	283-0111-00			0.1 μF, Cer, 50 V
C1639	283-0111-00			0.1 μF, Cer, 50 V
C1641	283-0092-00			0.03 μF, Cer, 200 V, +80%-20%
C1669	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1678	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1693	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1701	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1731	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1749	290-0574-00			47 μF. Elect., 20 V, 10%
C1758	283-0080-00			0.022 μF, Cer, 25 V, +80%-20%
C1760	283-0177-00			1 μF, Cer, 25 V, +80%-20%
C1765	283-0068-00			0.01 μF, Cer, 500 V, +100%-0%
C1773	283-0198-00			0.22 μF, Cer, 50 V, 20%
C1785	290-0573-00			2.7 μF, Elect., 50 V, 20%
C1810	283-0111-00			0.1 μF, Cer, 50 V
C1820	283-0177-00	B010100	B029999X	1 μF, Cer, 25 V, +80%-20%
C1821	283-0177-00			1 μF, Cer, 25 V, +80%-20%
C1822	290-0536-00			10 μF, Elect., 25 V, 20%
C1829	283-0000-00			0.001 μF, Cer, 500 V, +100%-0%
C1830	283-0068-00			0.01 μF, Cer, 500 V, +100%-0%
C1871	285-0703-00			0.1 μF, PTM, 100 V, 5%
C1877	281-0605-00			200 pF, Cer, 500 V
C2101	283-0004-00			0.02 μF, Cer, 150 V
C2109	283-0003-00			0.01 μF, Cer, 150 V, +80%-20%
C2112	283-0077-00			330 pF, Cer, 500 V, 5%
C2115	290-0534-00			1 μF, Elect., 35 V, 20%
C2117	290-0534-00			1 μF, Elect., 35 V, 20%
C2119	290-0534-00			1 μF, Elect., 35 V, 20%
C2121	283-0594-00			0.001 μF, Mica, 100 V, 1%
C2135	285-0698-00			0.0082 μF, PTM, 100 V, 5%
C2140	283-0103-00			180 pF, Cer, 500 V, 5%
C2144	281-0544-00			5.6 pF, Cer, 500 V, 10%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C2145	290-0534-00			1 µF, Elect., 35 V, 20%
C2155	283-0103-00			180 pF, Cer, 500 V, 5%
C2183	283-0032-00			470 pF, Cer, 500 V, 5%
C2185	283-0004-00			0.02 µF, Cer, 150 V
C2214	283-0032-00			470 pF, Cer, 500 V, 5%
C2242	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C2244	283-0004-00			0.02 µF, Cer, 150 V
C2255	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
DIODES				
CR26	152-0141-02			Silicon, 1N4152
CR27	152-0141-02			Silicon, 1N4152
CR33	152-0141-02			Silicon, 1N4152
CR42	152-0141-02			Silicon, 1N4152
CR84	152-0333-00			Silicon, FDH6012
CR85	152-0333-00			Silicon, FDH6012
CR93	152-0141-02			Silicon, 1N4152
CR124	152-0141-02			Silicon, 1N4152
CR125	152-0141-02			Silicon, 1N4152
CR126	152-0141-02			Silicon, 1N4152
CR130	152-0141-02			Silicon, 1N4152
CR140	152-0141-02			Silicon, 1N4152
CR155	152-0141-02			Silicon, 1N4152
CR160	152-0141-02			Silicon, 1N4152
CR238	152-0141-02			Silicon, 1N4152
CR341	152-0141-02			Silicon, 1N4152
CR349	152-0141-02			Silicon, 1N4152
CR460	152-0269-00			Silicon, Volt. var. cap., 1N3182
CR461	152-0269-00			Silicon, Volt. var. cap., 1N3182
CR496	152-0141-02			Silicon, 1N4152
CR530	152-0153-00			Silicon, FD7003 or CD5574
CR531	152-0141-02			Silicon, 1N4152
CR532	152-0141-02			Silicon, 1N4152
CR533	152-0153-00			Silicon, FD7003 or CD5574
CR543	152-0141-02			Silicon, 1N4152
CR544	152-0141-02			Silicon, 1N4152
CR549	152-0153-00			Silicon, FD7003 or CD5574
CR621	152-0141-02			Silicon, 1N4152
CR622	152-0141-02			Silicon, 1N4152
CR635	152-0141-02			Silicon, 1N4152
CR641	152-0141-02			Silicon, 1N4152

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR672	152-0141-02			Silicon, 1N4152
CR674	152-0141-02			Silicon, 1N4152
CR676	152-0141-02			Silicon, 1N4152
CR806	152-0488-00			Silicon, full wave bridge, 200 V, 1.5A
CR808	152-0488-00			Silicon, full wave bridge, 200 V, 1.5A
CR811	152-0406-00			Silicon, full wave bridge, 250 V, 3A
CR820	152-0423-00			Silicon, MR1033B
CR821	152-0423-00			Silicon, MR1033B
CR852	152-0141-02			Silicon, 1N4152
CR861	152-0141-02			Silicon, 1N4152
CR867	152-0061-00			Silicon, CD8393 or FDH2161
CR868	152-0061-00			Silicon, CD8393 or FDH2161
CR875	152-0066-00			Silicon, diffused, selected from 1N3194
CR883	152-0141-02			Silicon, 1N4152
CR885	152-0141-02			Silicon, 1N4152
CR888	152-0141-02			Silicon, 1N4152
CR891	152-0141-02			Silicon, 1N4152
CR894	152-0141-02			Silicon, 1N4152
CR896	152-0141-02			Silicon, 1N4152
CR903	152-0066-00			SIlicon, diffused, selected from 1N3194
CR920	152-0141-02			Silicon, 1N4152
CR924	152-0061-00			Silicon, CD8393 or FDH2161
CR925	152-0061-00			Silicon, CD8393 or FDH2161
CR935	152-0066-00			Silicon, diffused, selected from 1N3194
CR941	152-0141-02			Silicon, 1N4152
CR950	152-0141-02			Silicon, 1N4152
CR951	152-0141-02			Silicon, 1N4152
CR952	152-0141-02			Silicon, 1N4152
CR958	152-0066-00			Silicon, diffused, selected from 1N3194
CR961	152-0141-02			Silicon, 1N4152
CR973	152-0061-00	XB070000		Silicon, CD8393 or FDH2161
CR980	152-0141-02			Silicon, 1N4152
CR981	152-0141-02			Silicon, 1N4152
CR989	152-0066-00			Silicon, diffused, selected from 1N3194
CR1021	152-0141-02			Silicon, 1N4152
CR1023	152-0141-02			Silicon, 1N4152
CR1024	152-0141-02			Silicon, 1N4152
CR1026	152-0141-02			Silicon, 1N4152
CR1028	152-0141-02			Silicon, 1N4152
CR1115	152-0153-00			Silicon, FD7003 or CD5574
CR1215	152-0141-02			Silicon, 1N4152

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR1226	152-0409-00			Silicon, VG-12X
CR1228	152-0409-00			Silicon, VG-12X
CR1232	152-0409-00			Silicon, VG-12X
CR1236	152-0408-00			Silicon, VF5-12X
CR1238	152-0409-00			Silicon, VG-12X
CR1244	152-0141-02			Silicon, 1N4152
CR1253	152-0242-00			Silicon, selected from1N486A
CR1254	152-0242-00			Silicon, selected from 1N486A
CR1255	152-0242-00			Silicon, selected from 1N486A
CR1258	152-0242-00			Silicon, selected from 1N486A
CR1264	152-0242-00			Silicon, selected from 1N486A
CR1268	152-0242-00			Silicon, selected from 1N486A
CR1269	152-0242-00			Silicon, selected from 1N486A
CR1270	152-0242-00			Silicon, selected from 1N486A
CR1303	152-0141-02			Silicon, 1N4152
CR1304	152-0141-02			Silicon, 1N4152
CR1306	152-0141-02	XB0500000		Silicon, 1N4152
CR1315	152-0141-02			Silicon, 1N4152
CR1322	152-0141-02			Silicon, 1N4152
CR1324	152-0141-02			Silicon, 1N4152
CR1327	152-0141-02			Silicon, 1N4152
CR1328	152-0141-02			Silicon, 1N4152
CR1331	152-0141-02			Silicon, 1N4152
CR1337	152-0141-02			Silicon, 1N4152
CR1341	152-0141-02			Silicon, 1N4152
CR1348	152-0141-02			Silicon, 1N4152
CR1349	152-0141-02			Silicon, 1N4152
CR1353	152-0141-02			Silicon, 1N4152
CR1356	152-0141-02			Silicon, 1N4152
CR1358	152-0141-02			Silicon, 1N4152
CR1371	152-0185-00			Silicon, similar to 1N4152
CR1377	152-0141-02			Silicon, 1N4152
CR1379	152-0141-02			Silicon, 1N4152
CR1390	152-0141-02			Silicon, 1N4152
CR1391	152-0141-02			Silicon, 1N4152
CR1395	152-0141-02			Silicon, 1N4152
CR1396	152-0141-02			Silicon, 1N4152
CR1397	152-0141-02			Silicon, 1N4152
CR1398	152-0141-02			Silicon, 1N4152
CR1406	152-0141-02			Silicon, 1N4152
CR1407	152-0141-02			Silicon, 1N4152
CR1408	152-0141-02			Silicon, 1N4152

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR1409	152-0141-02			Silicon, 1N4152
CR1420	152-0141-02			Silicon, 1N4152
CR1428	152-0141-02			Silicon, 1N4152
CR1441	152-0141-02			Silicon, 1N4152
CR1448	152-0141-02			Silicon, 1N4152
CR1457	152-0141-02			Silicon, 1N4152
CR1460	152-0141-02			Silicon, 1N4152
CR1466	152-0141-02	XB050000		Silicon, 1N4152
CR1468	152-0141-02			Silicon, 1N4152
CR1471	152-0141-02			Silicon, 1N4152
CR1475	152-0141-02			Silicon, 1N4152
CR1483	152-0141-02			Silicon, 1N4152
CR1484	152-0141-02			Silicon, 1N4152
CR1489	152-0141-02			Silicon, 1N4152
CR1503	152-0141-02			Silicon, 1N4152
CR1505	152-0141-02			Silicon, 1N4152
CR1511	152-0141-02			Silicon, 1N4152
CR1522	152-0141-02			Silicon, 1N4152
CR1523	152-0141-02			Silicon, 1N4152
CR1528	152-0141-02			Silicon, 1N4152
CR1535	152-0141-02			Silicon, 1N4152
CR1536	152-0141-02			Silicon, 1N4152
CR1542	152-0141-02			Silicon, 1N4152
CR1547	152-0141-02			Silicon, 1N4152
CR1560	152-0141-02			Silicon, 1N4152
CR1562	152-0141-02			Silicon, 1N4152
CR1573	152-0141-02			Silicon, 1N4152
CR1597	152-0141-02			Silicon, 1N4152
CR1599	152-0141-02			Silicon, 1N4152
CR1650	152-0141-02			Silicon, 1N4152
CR1651	152-0141-02			Silicon, 1N4152
CR1652	152-0141-02			Silicon, 1N4152
CR1654	152-0141-02			Silicon, 1N4152
CR1656	152-0141-02			Silicon, 1N4152
CR1657	152-0141-02			Silicon, 1N4152
CR1659	152-0141-02			Silicon, 1N4152
CR1661	152-0141-02			Silicon, 1N4152
CR1663	152-0141-02			Silicon, 1N4152
CR1664	152-0141-02			Silicon, 1N4152
CR1667	152-0141-02			Silicon, 1N4152
CR1670	152-0141-02			Silicon, 1N4152
CR1671	152-0141-02			Silicon, 1N4152

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR1673	152-0141-02			Silicon, 1N4152
CR1675	152-0141-02			Silicon, 1N4152
CR1679	152-0141-02			Silicon, 1N4152
CR1681	152-0141-02			Silicon, 1N4152
CR1685	152-0141-02			Silicon, 1N4152
CR1689	152-0141-02			Silicon, 1N4152
CR1691	152-0141-02			Silicon, 1N4152
CR1695	152-0141-02			Silicon, 1N4152
CR1697	152-0141-02			Silicon, 1N4152
CR1699	152-0141-02			Silicon, 1N4152
CR1701	152-0141-02			Silicon, 1N4152
CR1702	152-0141-02			Silicon, 1N4152
CR1704	152-0141-02			Silicon, 1N4152
CR1706	152-0141-02			Silicon, 1N4152
CR1709	152-0141-02			Silicon, 1N4152
CR1711	152-0141-02			Silicon, 1N4152
CR1713	152-0141-02			Silicon, 1N4152
CR1715	152-0141-02			Silicon, 1N4152
CR1731	152-0141-02			Silicon, 1N4152
CR1732	152-0141-02			Silicon, 1N4152
CR1738	152-0141-02			Silicon, 1N4152
CR1739	152-0141-02			Silicon, 1N4152
CR1752	152-0141-02			Silicon, 1N4152
CR1766	152-0141-02			Silicon, 1N4152
CR1767	152-0141-02			Silicon, 1N4152
CR1773	152-0141-02			Silicon, 1N4152
CR1804	152-0141-02			Silicon, 1N4152
CR1807	152-0141-02			Silicon, 1N4152
CR1810	152-0141-02	XB040000		Silicon, 1N4152
CR1830	152-0141-02			Silicon, 1N4152
CR2124	152-0141-02			Silicon, 1N4152
CR2125	152-0141-02			Silicon, 1N4152
CR2127	152-0141-02			Silicon, 1N4152
CR2140	152-0141-02			Silicon, 1N4152
CR2141	152-0141-02			Silicon, 1N4152
CR2142	152-0141-02			Silicon, 1N4152
CR2145	152-0141-02			Silicon, 1N4152
CR2146	152-0141-02			Silicon, 1N4152
CR2156	152-0141-02			Silicon, 1N4152
CR2157	152-0141-02			Silicon, 1N4152
CR2162	152-0141-02			Silicon, 1N4152

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR2163	152-0141-02			Silicon, 1N4152
CR2166	152-0141-02			Silicon, 1N4152
CR2167	152-0141-02			Silicon, 1N4152
CR2170	152-0141-02			Silicon, 1N4152
CR2171	152-0141-02			Silicon, 1N4152
CR2174	152-0141-02			Silicon, 1N4152
CR2175	152-0141-02			Silicon, 1N4152
CR2192	152-0141-02			Silicon, 1N4152
CR2193	152-0141-02			Silicon; 1N4152
CR2196	152-0141-02			Silicon, 1N4152
CR2198	152-0141-02			Silicon, 1N4152
CR2226	152-0141-02			Silicon, 1N4152
DELAY LINE				
DL400	119-0368-00			Delay line
BULBS				
DS1001	150-0121-02			Incandescent, green, 60 mA
DS1090	150-0029-00			Incandescent, GE349
DS1091	150-0029-00			Incandescent, GE349
DS1092	150-0029-00			Incandescent, GE349
FUSES				
F814	159-0021-00			Cartridge, 2A, 3AG, fast-blo
F855	159-0083-00			Cartridge, 0.15A, 3AG, fast-blo
F1000	159-0026-00			Cartridge, 3.2A, 3AG, slo-blo
CONNECTORS				
J1	131-0767-02	B010100	B059999	Receptacle, electrical, 76 contact
J1	131-0767-08	B060000		Receptacle, electrical, 76 contact
J2	131-0767-02	B010100	B059999	Receptacle, electrical, 76 contact
J2	131-0767-08	B060000		Receptacle, electrical, 76 contact
J3	131-0767-00	B010100	B059999	Receptacle, electrical, 76 contact
J3	131-0767-07	B060000		Receptacle, electrical, 76 contact
J26	131-1003-00			Receptacle, coaxial cable
J27	131-1003-00			Receptacle, coaxial cable
J401	131-1003-00			Receptacle, coaxial cable
J409	131-1003-00			Receptacle, coaxial cable
J431	131-1003-00			Receptacle, coaxial cable
J503	131-1003-00			Receptacle, coaxial cable
J508	131-1003-00			Receptacle, coaxial cable
J601	131-1003-00			Receptacle, coaxial cable
J603	131-1003-00			Receptacle, coaxial cable
J629	131-0955-00			Receptacle, electrical, BNC, female
J649	131-0955-00			Receptacle, electrical, BNC, female

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CONNECTORS (cont)				
J679	131-0955-00			Receptacle, electrical, BNC, female
J1047	131-0955-00			Receptacle, electrical, BNC, female
J1049	131-0955-00			Receptacle, electrical, BNC, female
J1050	131-0955-00			Receptacle, electrical, BNC, female
J1132	131-1003-00			Receptacle, coaxial cable
J1763	131-0955-00			Receptacle, electrical, BNC, female
J2132	131-1003-00			Receptacle, coaxial cable
J2138	131-1003-00			Receptacle, coaxial cable
J2139	131-1003-00			Receptacle, coaxial cable
J2192	131-1003-00			Receptacle, coaxial cable
J2296	131-1003-00			Receptacle, coaxial cable
J2299	131-1003-00			Receptacle, coaxial cable
P1245	131-0608-00			Terminal, pin
INDUCTORS				
L425	108-0707-00			150 nH
L474	114-0330-00			0.8-2 μH, Var
L478	114-0330-00			0.8-2 μH, Var
L1098	108-0605-00			Y axis alignment
L1099[1]	108-0721-00			Trace rotation
L1895	276-0535-00			Core, toroid
L1222	108-0646-00			80 μH
L1635	120-0407-00			Toroid, 5 turns, single
L2283	108-0331-00			0.75 μH
LR193	108-0604-00			3.2 μH
LR195	108-0604-00			3.2 μH
LR198	108-0604-00			3.2 μH
LR482	108-0331-00			0.75 μH
TRANSISTORS				
Q90A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q108	151-0199-00			Silicon, PNP, MPS3640
Q132	151-0199-00			Silicon, PNP, MPS3640
Q137	151-0223-00			Silicon, NPN, 2N4275
Q142	151-0199-00			Silicon, PNP, MPS3640
Q147	151-0223-00			Silicon, NPN, 2N4275
Q150	151-0223-00			Silicon, NPN, 2N4275
Q162	151-0199-00			Silicon, PNP, MPS3640
Q167	151-0223-00			Silicon, NPN, 2N4275
Q236A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q238	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q242	151-0221-00			Silicon, PNP, 2N4258
Q252	151-0221-00			Silicon, PNP, 2N4258

[1]Furnished as a unit with DL400.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q314	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q334	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q336	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q344	151-0221-00			Silicon, PNP, 2N4258
Q346	151-0221-00			Silicon, PNP, 2N4258
Q407	151-0301-00			Silicon, PNP, 2N2907
Q415	151-0301-00			Silicon, PNP, 2N2907
Q496	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q539	151-0220-00			Silicon, PNP, 2N4122
Q547	151-0220-00			Silicon, PNP, 2N4122
Q551	151-0103-00			Silicon, NPN, 2N2219
Q553	151-0103-00			Silicon, NPN, 2N2219
Q558	151-0270-00	B010100	B019999	Silicon, PNP, selected from 2N3495
Q558	151-0406-00	B020000		Silicon, PNP, Tek Spec
Q560	151-0347-00			Silicon, NPN, 2N5551
Q578	151-0270-00	B010100	B019999	Silicon, PNP, selected from 2N3495
Q578	151-0406-00	B020000		Silicon, PNP, Tek Spec
Q580	151-0347-00			Silicon, NPN, 2N5551
Q606	151-0221-00			Silicon, PNP, 2N4258
Q618	151-0221-00			Silicon, PNP, 2N4258
Q620	151-0220-00			Silicon, PNP, 2N4122
Q631	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q634	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q640	151-0220-00			Silicon, PNP, 2N4122
Q662	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q666	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q672	151-0188-00			Silicon, PNP, 2N3906
Q827	151-0223-00			Silicon, NPN, 2N4275
Q829	151-0223-00			Silicon, NPN, 2N4275
Q835	151-0334-00			Silicon, NPN, MJE520
Q850	151-0337-00			Silicon, NPN, replaceable by 2N3055
Q852	151-0276-00			Silicon, PNP, 2N5087
Q860	151-0347-00			Silicon, NPN, 2N5551
Q863	151-0347-00			Silicon, NPN, 2N5551
Q869	151-0347-00			Silicon, NPN, 2N5551
Q872	151-0279-00			Silicon, NPN, SE7056
Q874	151-0336-00			Silicon, NPN, replaceable by 2N3055
Q876A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q886A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q896	151-0228-00			Silicon, PNP, selected from 2N4888
Q900	151-0347-00			Silicon, NPN, 2N5551
Q903	151-0336-00			Silicon, NPN, replaceable by 2N3055

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q908	151-0292-00			Silicon, NPN, A5T5058
Q909	151-0292-00			Silicon, NPN, A5T5058
Q910	151-0292-00			Silicon, NPN, A5T5058
Q919A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q926	151-0347-00			Silicon, NPN, 2N5551
Q931	151-0260-02			Silicon, NPN, 2N5859
Q933	151-0337-00			Silicon, NPN, replaceable by SN3055
Q936A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q943A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q952	151-0134-00			Silicon, PNP, 2N905A
Q956	151-0260-02			Silicon, NPN, 2N5859
Q958	151-0337-00			Silicon, NPN, replaceable by 2N3055
Q964A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q985	151-0136-00			Silicon, NPN, 2N3053
Q988	151-0337-00			Silicon, NPN, replaceable by 2N3055
Q1107	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1110	151-0188-00			Silicon, PNP, 2N3906
Q1118	151-0188-00			Silicon, PNP, 2N3906
Q1128	151-0188-00			Silicon, PNP, 2N3906
Q1132	151-0270-00	B010100	B019999	Silicon, NPN, selected from 2N3495
Q1132	151-0406-00	B020000		Silicon, PNP, Tek Spec
Q1134	151-0250-00	B010100	B019999	Silicon, NPN, replaceable by FPS5551M
Q1134	151-0347-00	B020000		Silicon, NPN, 2N5551
Q1136	151-0223-00			Silicon, NPN, 2N4375
Q1148	151-0188-00			Silicon, PNP, 2N3906
Q1152	151-0270-00	B010100	B019999	Silicon, PNP, selected from 2N3495
Q1152	151-0406-00	B020000		Silicon, PNP, Tek Spec
Q1154	151-0250-00	B010100	B019999	Silicon, NPN, replaceable by FPS5551M
Q1154	151-0347-00	B020000		Silicon, NPN, 2N5551
Q1156	151-0223-00			Silicon, NPN, 2N4275
Q1201	151-0126-00			Silicon, NPN, 2N2484
Q1206	151-0188-00			Silicon, PNP, 2N3906
Q1214	151-0136-00			Silicon, NPN, 2N3053
Q1216	151-0140-00	B010100	B099999	Silicon, NPN, selected from 2N3055
Q1216	151-0140-01	B100000		Silicon, NPN, selected from 2N3055
Q1218	151-0140-00	B010100	B099999	Silicon, NPN, selected from 2N3055
Q1218	151-0140-01	B100000		Silicon, NPN, selected from 2N3055
Q1308	151-0188-00			Silicon, PNP, 2N3906
Q1313	151-0508-00			Silicon, programmable unijuction, 2N6027
Q1318	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1320	151-0188-00			Silicon, PNP, 2N3906
Q1335	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1339	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1347	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1357	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1364	151-0276-00			Silicon, PNP, 2N5087
Q1369	151-0350-00			Silicon, PNP, 2N5401

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q1372	151-0169-00			Silicon, NPN, 2N3439
Q1374	151-0169-00			Silicon, NPN, 2N3439
Q1378	151-0169-00			Silicon, NPN, 2N3439
Q1380	151-0169-00			Silicon, NPN, 2N3439
Q1399	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1404	151-0188-00			Silicon, PNP, 2N3906
Q1412	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1424	151-0219-00			Silicon, PNP, 2N4250
Q1426	151-0292-00			Silicon, NPN, A5T5058
Q1428	151-0292-00			Silicon, NPN, A5T5058
Q1438	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1449	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1452	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1458	151-0347-00			Silicon, NPN, 2N5551
Q1460	151-0347-00			Silicon, NPN, 2N5551
Q1466	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1474	151-0347-00			Silicon, NPN, 2N5551
Q1475	151-0347-00			Silicon, NPN, 2N5551
Q1488	151-0347-00			Silicon, NPN, 2N5551
Q1489	151-0347-00			Silicon, NPN, 2N5551
Q1496	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1500	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1510	151-0347-00			Silicon, NPN, 2N5551
Q1511	151-0347-00			Silicon, NPN, 2N5551
Q1518	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1527	151-0347-00			Silicon, NPN, 2N5551
Q1529	151-0347-00			Silicon, NPN, 2N5551
Q1533	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1540	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1546	151-0188-00			Silicon, PNP, 2N3906
Q1552	151-0508-00			Silicon, programmable unijunction, 2N6027
Q1554	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1555	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1557	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1561	151-0126-00			Silicon, NPN, 2N2484
Q1564	151-0188-00			Silicon, PNP, 2N3906
Q1566	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1570	151-0188-00			Silicon, PNP, 2N3906
Q1577	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1586	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1591	151-0190-00			Silicon, NPN, 2N3904 or TE3904

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q1595	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1601	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1606	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1612	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1617	151-0188-00			Silicon, PNP, 2N3906
Q1722	151-0188-00			Silicon, PNP, 2N3906
Q1724	151-0188-00			Silicon, PNP, 2N3906
Q1736	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1747	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1752	151-0508-00			Silicon, programmable unijunction, 2N6027
Q1757	151-0188-00			Silicon, PNP, 2N3906
Q1759	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1769	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1774	151-0508-00			Silicon, programmable unijunction, 2N6027
Q1777	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1784	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1788	151-0508-00			Silicon, programmable unijunction, 2N6027
Q1805	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1815	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1832	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1836	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1843	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1869	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1874	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q1876	151-0220-00			Silicon, PNP, 2N4122
Q1879	151-0220-00			Silicon, PNP, 2N4122
Q2108	151-0223-00			Silicon, NPN, 2N4275
Q2112	151-0221-00			Silicon, PNP, 2N4258
Q2138	151-0188-00			Silicon, PNP, 2N3906
Q2153	151-0192-00			Silicon, NPN, selected from MPS6521
Q2159	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q2215A,B	151-0232-00			Silicon, NPN, replaceable by 2N2919, dual
Q2223	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q2225	151-0188-00			Silicon, PNP, 2N3906
Q2229	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q2240	151-0190-00			Silicon, NPN, 2N3904 or TE3904
Q2286	151-0188-00			Silicon, PNP, 2N3906
Q2287	151-0188-00			Silicon, PNP, 2N3906
Q2296	151-0188-00			Silicon, PNP, 2N3906
Q2299	151-0188-00			Silicon, PNP, 2N3906

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS				
R12	321-0260-00			4.99 kΩ, 1/8 W, 1%
R14	321-0260-00			4.99 kΩ, 1/8 W, 1%
R20	315-0103-00			10 kΩ, 1/4 W, 5%
R21	315-0103-00			10 kΩ, 1/4 W, 5%
R28	315-0510-00			51 Ω, 1/4 W, 5%
R29	315-0510-00			51 Ω, 1/4 W, 5%
R31	315-0122-00			1.2 kΩ, 1/4 W, 5%
R33	315-0682-00			6.8 kΩ, 1/4 W, 5%
R34	315-0122-00			1.2 kΩ, 1/4 W, 5%
R35	315-0122-00			1.2 kΩ, 1/4 W, 5%
R36	321-0231-00			2.49 kΩ, 1/8 W, 1%
R38	315-0152-00			1.5 kΩ, 1/4 W, 5%
R39	315-0152-00			1.5 kΩ, 1/4 W, 5%
R42	315-0105-00			1 MΩ, 1/4 W, 5%
R44	315-0334-00			330 kΩ, 1/4 W, 5%
R46	315-0151-00			150 Ω, 1/4 W, 5%
R47	315-0683-00			68 kΩ, 1/4 W, 5%
R48	315-0334-00			330 kΩ, 1/4 W, 5%
R49	315-0105-00			1 MΩ, 1/4 W, 5%
R50	315-0223-00			22 kΩ, 1/4 W, 5%
R51	321-0193-00			1 kΩ, 1/8 W, 1%
R53	315-0223-00			22 kΩ, 1/4 W, 5%
R54	321-0193-00			1 kΩ, 1/8 W, 1%
R55	315-0470-00			47 Ω, 1/4 W, 5%
R56	315-0471-00			470 Ω, 1/4 W, 5%
R57	315-0682-00			6.8 kΩ, 1/4 W, 5%
R58	315-0101-00			100 Ω, 1/4 W, 5%
R59	315-0103-00			10 kΩ, 1/4 W, 5%
R61	315-0512-00			5.1 kΩ, 1/4 W, 5%
R62	315-0103-00			10 kΩ, 1/4 W, 5%
R63	315-0102-00			1 kΩ, 1/4 W, 5%
R67	315-0512-00			5.1 kΩ, 1/4 W, 5%
R74	315-0510-00			51 Ω, 1/4 W, 5%
R76	315-0222-00			2.2 kΩ, 1/4 W, 5%
R77	315-0392-00			3.9 kΩ, 1/4 W, 5%
R78	315-0392-00			3.9 kΩ, 1/4 W, 5%
R80	321-0258-00			4.75 kΩ, 1/8 W, 1%
R82	315-0510-00			51 Ω, 1/4 W, 5%
R83	315-0510-00			51 Ω, 1/4 W, 5%
R84	315-0510-00			51 Ω, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R85	315-0471-00			470 Ω, 1/4 W, 5%
R86	315-0100-00			10 Ω, 1/4 W, 5%
R88	321-0230-00			2.43 kΩ, 1/8 W, 1%
R89	315-0910-00			91 Ω, 1/4 W, 5%
R90	315-0362-00			3.6 kΩ, 1/4 W, 5%
R92	321-0202-00			1.24 kΩ, 1/8 W, 1%
R93	315-0102-00			1 kΩ, 1/4 W, 5%
R95	315-0152-00			1.5 kΩ, 1/4 W, 5%
R96	315-0511-00			510 Ω, 1/4 W, 5%
R98	315-0511-00			510 Ω, 1/4 W, 5%
R99	315-0221-00			220 Ω, 1/4 W, 5%
R101	315-0302-00			3 kΩ, 1/4 W, 5%
R102A,B[1]	311-1404-00			5 kΩ x 5 kΩ, Var
R104	315-0103-00			10 kΩ, 1/4 W, 5%
R105	315-0472-00			4.7 kΩ, 1/4 W, 5%
R106	315-0273-00			27 kΩ, 1/4 W, 5%
R109	321-0243-00			3.32 kΩ, 1/8 W, 1%
R110	321-0097-00			100 Ω, 1/8 W, 1%
R112	321-0097-00			100 Ω, 1/8 W, 1%
R123	315-0102-00			1 kΩ, 1/4 W, 5%
R124	315-0511-00			510 Ω, 1/4 W, 5%
R125	315-0102-00			1 kΩ, 1/4 W, 5%
R126	315-0102-00			1 kΩ, 1/4 W, 5%
R130	315-0102-00			1 kΩ, 1/4 W, 5%
R132	315-0222-00			2.2 kΩ, 1/4 W, 5%
R133	315-0102-00			1 kΩ, 1/4 W, 5%
R134	315-0821-00			820 Ω, 1/4 W, 5%
R135	315-0123-00			12 kΩ, 1/4 W, 5%
R136	315-0681-00			680 Ω, 1/4 W, 5%
R137	315-0221-00			220 Ω, 1/4 W, 5%
R138	315-0472-00			4.7 kΩ, 1/4 W, 5%
R140	315-0391-00			390 Ω, 1/4 W, 5%
R141	315-0122-00			1.2 kΩ, 1/4 W, 5%
R142	315-0222-00			2.2 kΩ, 1/4 W, 5%
R143	315-0102-00			1 kΩ, 1/4 W, 5%
R144	315-0821-00			820 Ω, 1/4 W, 5%
R145	315-0123-00			12 kΩ, 1/4 W, 5%
R146	315-0681-00			680 Ω, 1/4 W, 5%
R147	315-0181-00			180 Ω, 1/4 W, 5%
R148	315-0472-00			4.7 kΩ, 1/4 W, 5%

[1]Furnished as a unit with S102.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R149	315-0100-00			10 Ω, 1/4 W, 5%
R150	315-0103-00			10 kΩ, 1/4 W, 5%
R152	315-0101-00			100 Ω, 1/4 W, 5%
R154	315-0223-00			22 kΩ, 1/4 W, 5%
R155	315-0391-00			390 Ω, 1/4 W, 5%
R157	315-0102-00			1 kΩ, 1/4 W, 5%
R159	315-0510-00			51 Ω, 1/4 W, 5%
R160	315-0391-00			390 Ω, 1/4 W, 5%
R161	315-0122-00			1.2 kΩ, 1/4 W, 5%
R162	315-0222-00			2.2 kΩ, 1/4 W, 5%
R163	315-0102-00			1 kΩ, 1/4 W, 5%
R164	315-0821-00			820 Ω, 1/4 W, 5%
R165	315-0123-00			12 kΩ, 1/4 W, 5%
R166	315-0681-00			680 Ω, 1/4 W, 5%
R168	315-0472-00			4.7 kΩ, 1/4 W, 5%
R200	321-1068-02			50.5 Ω, 1/8 W, 1/2%
R202	321-1068-02			50.5 Ω, 1/8 W, 1/2%
R204	321-1068-02			50.5 Ω, 1/8 W, 1/2%
R206	321-1068-02			50.5 Ω, 1/8 W, 1/2%
R208	315-0393-00			39 kΩ, 1/4 W, 5%
R209	321-0741-02			40.9 Ω, 1/8 W, 1/2%
R211	322-0197-00			1.1 kΩ, 1/4 W, 1%
R212	321-0741-02			40.9 Ω, 1/8 W, 1/2%
R214	322-0212-00			1.58 kΩ, 1/4 W, 1%
R215	315-0393-00			39 kΩ, 1/4 W, 5%
R216	321-0741-02			40.9 Ω, 1/8 W, 1/2%
R218	322-0197-00			1.1 kΩ, 1/4 W, 1%
R219	321-0741-02			40.9 Ω, 1/8 W, 1/2%
R222	315-0330-00			33 Ω, 1/4 W, 5%
R224	315-0330-00			33 Ω, 1/4 W, 5%
R225	315-0911-00			910 Ω, 1/4 W, 5%
R226	321-0069-00			51.1 Ω, 1/8 W, 1%
R228	321-0060-00			41.2 Ω, 1/8 W, 1%
R230	321-0236-00			2.8 kΩ, 1/8 W, 1%
R232	321-0060-00			41.2 Ω, 1/8 W, 1%
R234	321-0069-00			51.1 Ω, 1/8 W, 1%
R236	315-0911-00			910 Ω, 1/4 W, 5%
R238	315-0912-00			9.1 kΩ, 1/4 W, 5%
R240	323-0149-00			348 Ω, 1/2 W, 1%
R241	321-0212-00			1.58 kΩ, 1/8 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R246	315-0331-00			330 Ω, 1/4 W, 5%
R250	323-0149-00			348 Ω, 1/2 W, 1%
R251	321-0212-00			1.58 kΩ, 1/8 W, 1%
R259	321-0069-00			51.1 Ω, 1/8 W, 1%
R261	321-0069-00			51.1 Ω, 1/8 W, 1%
R301	307-0106-00			4.7 Ω, 1/4 W, 5%
R303	307-0106-00			4.7 Ω, 1/4 W, 5%
R305	307-0103-00			2.7 Ω, 1/4 W, 5%
R307	321-0069-00			51.1 Ω, 1/8 W, 1%
R308	321-0069-00			51.1 Ω, 1/8 W, 1%
R310	315-0103-00			10 kΩ, 1/4 W, 5%
R312	315-0562-00			5.6 kΩ, 1/4 W, 5%
R314	315-0103-00			10 kΩ, 1/4 W, 5%
R315	315-0513-00			51 kΩ, 1/4 W, 5%
R317	321-0069-00			51.1 Ω, 1/8 W, 1%
R319	321-0069-00			51.1 Ω, 1/8 W, 1%
R320	321-0218-00			1.82 kΩ, 1/8 W, 1%
R321	321-0061-00			42.2 Ω, 1/8 W, 1%
R322	315-0101-00			100 Ω, 1/4 W, 5%
R323	321-0061-00			42.2 Ω, 1/8 W, 1%
R324	322-0184-00			806 Ω, 1/4 W, 1%
R326	321-0061-00			42.2 Ω, 1/8 W, 1%
R327	322-0184-00			806 Ω, 1/4 W, 1%
R328	321-0061-00			42.2 Ω, 1/8 W, 1%
R329	315-0101-00			100 Ω, 1/4 W, 5%
R330	321-0049-00			31.6 Ω, 1/8 W, 1%
R332	321-0220-00			1.91 kΩ, 1/8 W, 1%
R333	321-0143-00			301 Ω, 1/8 W, 1%
R334	321-0082-00			69.8 Ω, 1/8 W, 1%
R335	321-0049-00			31.6 Ω, 1/8 W, 1%
R336	321-0129-00			215 Ω, 1/8 W, 1%
R337	321-0129-00			215 Ω, 1/8 W, 1%
R338	321-0069-00			51.1 Ω, 1/8 W, 1%
R339	321-0069-00			51.1 Ω, 1/8 W, 1%
R340	321-0214-00			1.65 kΩ, 1/8 W, 1%
R341	315-0680-00			68 Ω, 1/4 W, 5%
R342	315-0331-00			330 Ω, 1/4 W, 5%
R344	321-0040-00			25.5 Ω, 1/8 W, 1%
R345	315-0561-00			560 Ω, 1/4 W, 5%
R346	321-0040-00			25.5 Ω, 1/8 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R348	315-0331-00			330 Ω, 1/4 W, 5%
R349	315-0680-00			68 Ω, 1/4 W, 5%
R350	321-0214-00			1.65 kΩ, 1/8 W, 1%
R352	315-0430-00			43 Ω, 1/4 W, 5%
R401	321-0068-00			49.9 Ω, 1/8 W, 1%
R403	311-1228-00			10 kΩ, Var
R404	321-0326-00			24.3 kΩ, 1/8 W, 1%
R405	321-0322-00			22.1 kΩ, 1/8 W, 1%
R407	321-0306-00			15 kΩ, 1/8 W, 1%
R408	321-0230-00			2.43 kΩ, 1/8 W, 1%
R409	323-0237-00			2.87 kΩ, 1/2 W, 1%
R411	321-0236-00			2.8 kΩ, 1/8 W, 1%
R413	323-0237-00			2.87 kΩ, 1/2 W, 1%
R414	321-0230-00			2.43 kΩ, 1/8 W, 1%
R415	315-0153-00			15 kΩ, 1/4 W, 5%
R416	315-0911-00			910 Ω, 1/4 W, 5%
R417	315-0301-00			300 Ω, 1/4 W, 5%
RT417	307-0125-00			500 Ω, Thermal
R418	315-0751-00			750 Ω, 1/4 W, 5%
R420	315-0271-00			270 Ω, 1/4 W, 5%
R421	311-1261-00			500 Ω, Var
R423	317-0470-00			47 Ω, 1/8 W, 5%
R424	317-0470-00			47 Ω, 1/8 W, 5%
R425	311-1260-00			250 Ω, Var
R427	311-1007-00			20 Ω, Var
R429	321-0114-00			150 Ω, 1/8 W, 1%
R433	321-0068-00			49.9 Ω, 1/8 W, 1%
R440	321-0181-00			750 Ω, 1/8 W, 1%
R442	321-0092-00			88.7 Ω, 1/8 W, 1%
R443	321-0201-00			1.21 kΩ, 1/8 W, 1%
R444	321-0092-00			88.7 Ω, 1/8 W, 1%
R446	321-0097-00			100 Ω, (nominal value), selected
R447	311-1260-00			250 Ω, Var
R448	321-0097-00			100 Ω, (nominal value), selected
R450	321-0181-00			750 Ω, 1/8 W, 1%
R452	323-0148-00			340 Ω, 1/2 W, 1%
R453	323-0148-00			340 Ω, 1/2 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R455	311-0635-00			1 kΩ, Var
R456	315-0181-00	B010100	B019999	180 Ω, 1/4 W, 5%
R456	315-0181-00	B020000		180 Ω, (nominal value), selected
R458	315-0161-00	B010100	B019999	160 Ω, 1/4 W, 5%
R458	315-0161-00	B020000		160 Ω, (nominal value), selected
R459	301-0471-00			470 Ω, 1/2 W, 5%
R460	315-0510-00			51 Ω, 1/4 W, 5%
R461	315-0824-00			820 kΩ, 1/4 W, 5%
RT461	307-0181-00			100 kΩ, Thermal
R462	323-0148-00			340 Ω, 1/2 W, 1%
R463	323-0148-00			340 Ω, 1/2 W, 1%
R465	311-0635-00			1 kΩ, Var
R466	315-0271-00	B010100	B019999	270 Ω, 1/4 W, 5%
R466	315-0271-00	B020000		270 Ω, (nominal value), selected
R468	315-0301-00	B010100	B019999	300 Ω, 1/4 W, 5%
R468	315-0301-00	B020000		300 Ω, (nominal value), selected
R473	315-0820-00			82 Ω, 1/4 W, 5%
R474	310-0701-00			430 Ω, 8 W, WW, 1%
R477	315-0820-00			82 Ω, 1/4 W, 5%
R478	310-0701-00			430 Ω, 8 W, WW, 1%
R480	307-0103-00			2.7 Ω, 1/4 W, 5%
R484	321-0197-00			1.1 kΩ, 1/8 W, 1%
R486	311-1260-00			250 Ω, Var
R488	323-0054-00			35.7 Ω, 1/2 W, 1%
R490	307-0103-00			2.7 Ω, 1/4 W, 5%
R491	315-0100-00			10 Ω, 1/4 W, 5%
R495	315-0822-00			8.2 kΩ, 1/4 W, 5%
R501	321-1068-01			50.5 Ω, 1/8 W, 1/2%
R502	315-0100-00			10 Ω, 1/4 W, 5%
R503	321-1068-01			50.5 Ω, 1/8 W, 1/2%
R505	321-0297-00			12.1 kΩ, 1/8 W, 1%
R506	321-0069-00			51.1 Ω, 1/8 W, 1%
R508	321-0184-00			806 Ω, 1/8 W, 1%
R509	321-0069-00			51.1 Ω, 1/8 W, 1%
R511	321-0155-00			402 Ω, 1/8 W, 1%
R512	311-1224-00			500 Ω, Var
R513	321-0136-00			255 Ω, 1/8 W, 1%
R514	323-0219-00			1.87 kΩ, 1/2 W, 1%
R515	323-0219-00			1.87 kΩ, 1/2 W, 1%
R517	321-0212-00			1.58 kΩ, 1/8 W, 1%
R519	321-0108-00	B010100	B039999	130 Ω, 1/8 W, 1%
R519	321-0108-00	B040000		130 Ω, (nominal value), selected
R520[1]		B010100	B029999X	
R521	321-0261-00			5.11 kΩ, 1/8 W, 1%
R522	321-0261-00			5.11 kΩ, 1/8 W, 1%
R524	321-0202-00			1.24 kΩ, 1/8 W, 1%

[1]Added if necessary.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R525	311-1222-00			100 Ω, Var
R526	321-0202-00			1.24 kΩ, 1/8 W, 1%
R527	315-0222-00	B010100	B019999X	2.2 kΩ, 1/4 W, 5%
R529	315-0473-00			47 kΩ, 1/4 W, 5%
R531	323-0222-00			2 kΩ, 1/2 W, 1%
R532	323-0222-00			2 kΩ, 1/2 W, 1%
R534	321-0269-00			6.19 kΩ, 1/8 W, 1%
R535	311-1225-00			1 kΩ, Var
R536	321-0269-00			6.19 kΩ, 1/8 W, 1%
R538	321-0320-00			21 kΩ, 1/8 W, 1%
R540	321-0225-00			2.15 kΩ, 1/8 W, 1%
R542	315-0300-00			30 Ω, 1/4 W, 5%
R543	321-0193-00			1 kΩ, 1/8 W, 1%
R544	315-0300-00			30 Ω, 1/4 W, 5%
R546	321-0320-00			21 kΩ, 1/8 W, 1%
R548	321-0225-00			2.15 kΩ, 1/8 W, 1%
R549	315-0102-00			1 kΩ, 1/4 W, 5%
R551	303-0470-00			47 Ω, 1 W, 5%
R555	315-0470-00			47 Ω, 1/4 W, 5%
R556	301-0393-00			39 kΩ, 1/2 W, 5%
R558	323-0231-00			2.49 kΩ, 1/2 W, 1%
R559	315-0100-00			10 Ω, 1/4 W, 5%
R561	315-0100-00			10 Ω, 1/4 W, 5%
R562	323-0097-00			100 Ω, 1/2 W, 1%
R563	323-0066-00			47.5 Ω, 1/2 W, 1%
R565	315-0101-00			100 Ω, 1/4 W, 5%
R566	323-0287-00			9.53 kΩ, 1/2 W, 1%
R567	323-0287-00			9.53 kΩ, 1/2 W, 1%
R568	315-0471-00	B010100	B019999X	470 Ω, 1/4 W, 5%
R569	321-0189-00			909 Ω, 1/8 W, 1%
R570	321-0251-00			4.02 kΩ, 1/8 W, 1%
R571	321-0830-03			2.41 kΩ, 1/8 W, 1/4%
R573	321-0273-00			6.81 kΩ, 1/8 W, 1%
R574	323-0352-00			45.3 kΩ, 1/2 W, 1%
R575	315-0470-00			47 Ω, 1/4 W, 5%
R576	301-0393-00			39 kΩ, 1/2 W, 5%
R578	323-0231-00			2.49 kΩ, 1/2 W, 1%
R579	315-0100-00			10 Ω, 1/4 W, 5%
R581	315-0100-00			10 Ω, 1/4 W, 5%
R582	323-0097-00			100 Ω, 1/2 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R583	323-0066-00			47.5 Ω, 1/2 W, 1%
R584	315-0185-00	XB080000		1.8 MΩ, 1/8 W, 5%
R585	315-0101-00			100 Ω, 1/4 W, 5%
R586	323-0287-00			9.53 kΩ, 1/2 W, 1%
R587	323-0287-00			9.53 kΩ, 1/2 W, 1%
R588	315-0471-00	B010100	B019999X	470 Ω, 1/4 W, 5%
R589	321-0189-00			909 Ω, 1/8 W, 1%
R593	315-0100-00			10 Ω, 1/4 W, 5%
R595	307-0106-00			4.7 Ω, 1/4 W, 5%
R597	315-0100-00			10 Ω, 1/4 W, 5%
R599	307-0103-00			2.7 Ω, 1/4 W, 5%
R602	315-0101-00			100 Ω, 1/4 W, 5%
R605	315-0561-00			560 Ω, 1/4 W, 5%
R607	321-0020-00			15.8 Ω, 1/8 W, 1%
R608	321-0089-00			82.5 Ω, 1/8 W, 1%
R610	307-0106-00			4.7 Ω, 1/4 W, 5%
R612	321-0193-00			1 kΩ, 1/8 W, 1%
R613	321-0222-00			2 kΩ, 1/8 W, 1%
R615	315-0240-00			24 Ω, 1/4 W, 5%
R617	321-0020-00			15.8 Ω, 1/8 W, 1%
R619	315-0101-00			100 Ω, 1/4 W, 5%
R622	321-0208-00			1.43 kΩ, 1/8 W, 1%
R623	307-0106-00			4.7 Ω, 1/4 W, 5%
R625	321-0224-00			2.1 kΩ, 1/8 W, 1%
R627	315-0101-00			100 Ω, 1/4 W, 5%
R630	315-0101-00			100 Ω, 1/4 W, 5%
R633	315-0222-00			2.2 kΩ, 1/4 W, 5%
R636	315-0241-00			240 Ω, 1/4 W, 5%
R637	315-0152-00			1.5 kΩ, 1/4 W, 5%
R639	315-0101-00			100 Ω, 1/4 W, 5%
R641	315-0272-00			2.7 kΩ, 1/4 W, 5%
R643	315-0220-00			22 Ω, 1/4 W, 5%
R645	321-0260-00			4.99 kΩ, 1/8 W, 1%
R647	321-0190-00			931 Ω, 1/8 W, 1%
R651	315-0201-00			200 Ω, 1/4 W, 5%
R652	315-0123-00			12 kΩ, 1/4 W, 5%
R654	315-0201-00			200 Ω, 1/4 W, 5%
R655	315-0123-00			12 kΩ, 1/4 W, 5%
R657	315-0201-00			200 Ω, 1/4 W, 5%
R658	315-0123-00			12 kΩ, 1/4 W, 5%
R660	315-0101-00			100 Ω, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R662	315-0821-00			820 Ω, 1/4 W, 5%
R663	321-0193-00			1 kΩ, 1/8 W, 1%
R667	315-0561-00			560 Ω, 1/4 W, 5%
R669	307-0106-00			4.7 Ω, 1/4 W, 5%
R670	321-0143-00			301 Ω, 1/8 W, 1%
R672	321-0180-00			732 Ω, 1/8 W, 1%
R673	321-0226-00			2.21 kΩ, 1/8 W, 1%
R675	321-0189-00			909 Ω, 1/8 W, 1%
R677	315-0390-00			39 Ω, 1/4 W, 5%
R679	307-0106-00			4.7 Ω, 1/4 W, 5%
R805	307-0113-00			5.1 Ω, 1/4 W, 5%
R806	302-0473-00			47 kΩ, 1/2 W, 10%
R808	302-0223-00			22 kΩ, 1/2 W, 10%
R809	302-0223-00			22 kΩ, 1/2 W, 10%
R811	302-0472-00			4.7 kΩ, 1/2 W, 10%
R814	302-0472-00			4.7 kΩ, 1/2 W, 10%
R821	302-0472-00			4.7 kΩ, 1/2 W, 10%
R822	315-0102-00			1 kΩ, 1/4 W, 5%
R823	315-0151-00			150 Ω, 1/4 W, 5%
R824	315-0470-00			47 Ω, 1/4 W, 5%
R826	315-0302-00			3 kΩ, 1/4 W, 5%
R827	315-0472-00			4.7 kΩ, 1/4 W, 5%
R830	315-0911-00			910 Ω, 1/4 W, 5%
R831	315-0392-00			3.9 kΩ, 1/4 W, 5%
R833	315-0683-00			68 kΩ, 1/4 W, 5%
R837	307-0054-00			3.6 Ω, 1/2 W, 5%
R838	307-0054-00			3.6 Ω, 1/2 W, 5%
R853	315-0473-00			47 kΩ, 1/4 W, 5%
R855	323-0309-00			16.2 kΩ, 1/2 W, 1%
R856	323-0289-00			10 kΩ, 1/2 W, 1%
R858	321-0924-07			40 kΩ, 1/8 W, 1/10%
R859	321-0924-07			40 kΩ, 1/8 W, 1/10%
R860	315-0684-00			680 kΩ, 1/4 W, 5%
R862	315-0204-00			200 kΩ, 1/4 W, 5%
R864	315-0203-00			20 kΩ, 1/4 W, 5%
R866	315-0332-00			3.3 kΩ, 1/4 W, 5%
R867	315-0824-00			820 kΩ, 1/4 W, 5%
R870	315-0122-00			1.2 kΩ, 1/4 W, 5%
R872	315-0151-00			150 Ω, 1/4 W, 5%
R875	308-0677-00			1 Ω, 2 W, WW, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R876	315-0154-00			150 kΩ, 1/4 W, 5%
R877	315-0511-00			510 Ω, 1/4 W, 5%
R878	315-0104-00			100 kΩ, 1/4 W, 5%
R879	315-0124-00			120 kΩ, 1/4 W, 5%
R880	323-0272-00			6.65 kΩ, 1/2 W, 1%
R881	311-1223-00			250 Ω, Var
R882	323-0206-00			1.37 kΩ, 1/2 W, 1%
R883	321-0223-00			2.05 kΩ, 1/8 W, 1%
R884	323-0306-00			15 kΩ, 1/2 W, 1%
R886	315-0224-00			220 kΩ, 1/4 W, 5%
R889	315-0911-00			910 Ω, 1/4 W, 5%
R890	323-0264-00			5.49 kΩ, 1/2 W, 1%
R891	315-0473-00			47 kΩ, 1/4 W, 5%
R892	315-0682-00			6.8 kΩ, 1/4 W, 5%
R894	315-0245-00			2.4 MΩ, 1/4 W, 5%
R896	301-0363-00			36 kΩ, 1/2 W, 5%
R898	315-0182-00			1.8 kΩ, 1/4 W, 5%
R901	315-0151-00			150 Ω, 1/4 W, 5%
R903	308-0677-00			1 Ω, 2 W, WW, 5%
R904	308-0679-00			0.51 Ω, 2 W, WW, 5%
R906	315-0304-00			300 kΩ, 1/4 W, 5%
R907	315-0104-00			100 kΩ, 1/4 W, 5%
R908	315-0431-00			430 Ω, 1/4 W, 5%
R910	315-0681-00			680 Ω, 1/4 W, 5%
R911	315-0563-00			56 kΩ, 1/4 W,5%
R912	315-0182-00			1.8 kΩ, 1/4 W, 5%
R915	321-1296-07			12 kΩ, 1/8 W, 1/10%
R916	321-0924-07			40 kΩ, 1/8 W, 1/10%
R918	301-0683-00			68 kΩ, 1/2 W, 5%
R921	315-0912-00			9.1 kΩ, 1/4 W, 5%
R922	315-0623-00			62 kΩ, 1/4 W, 5%
R923	315-0512-00			5.1 kΩ, 1/4 W, 5%
R924	315-0623-00			62 kΩ, 1/4 W, 5%
R927	315-0472-00			4.7 kΩ, 1/4 W, 5%
R932	315-0182-00			1.8 kΩ, 1/4 W, 5%
R935	308-0678-00			0.1 Ω, 2 W, WW, 5%
R936	301-0273-00			27 kΩ, 1/2 W, 5%
R937	315-0361-00	B010100	B109999	360 Ω, 1/4 W, 5%
R937	321-0151-00	B110000		365 Ω, 1/8 W, 1%
R938	315-0303-00	B010100	B109999	30 kΩ, 1/4 W, 5%
R938	321-0330-00	B110000		26.7 kΩ, 1/8 W, 1%
R939	315-0184-00	B010100	B109999	180 kΩ, 1/4 W, 5%
R939	321-0409-00	B110000		178 kΩ, 1/8 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R940	315-0822-00			8.2 kΩ, 1/4 W, 5%
R942	315-0154-00			150 kΩ, 1/4 W, 5%
R945	321-0332-07			28 kΩ, 1/8 W, 1/10%
R946	321-1296-07			12 kΩ, 1/8 W, 1/10%
R948	315-0914-00			910 kΩ, 1/4 W, 5%
R950	315-0681-00			680 Ω, 1/4 W, 5%
R952	301-0303-00			30 kΩ, 1/2 W, 5%
R954	315-0472-00			4.7 kΩ, 1/4 W, 5%
R956	307-0103-00			2.7 Ω, 1/4 W, 5%
R957	315-0151-00			150 Ω, 1/4 W, 5%
R958	308-0678-00			0.1 Ω, 2 W, WW, 5%
R959	308-0680-00			0.045 Ω, 3 W, WW, 10%
R961	315-0221-00			220 Ω, 1/4 W, 5%
R963	315-0682-00			6.8 kΩ, 1/4 W, 5%
R966	315-0123-00			12 kΩ, 1/4 W, 5%
R967	315-0364-00			360 kΩ, 1/4 W, 5%
R970	321-0926-07			4 kΩ, 1/8 W, 1/10%
R971	321-0924-07			40 kΩ, 1/8 W, 1/10%
R973	315-0104-00	B010100	B069999	100 kΩ, 1/4 W, 5%
R973	315-0683-00	B070000		68 kΩ, 1/4 W, 5%
R974	315-0303-00	XB070000		30 kΩ, 1/4 W, 5%
R975	315-0362-00			3.6 kΩ, 1/4 W, 5%
R977	315-0184-00			180 kΩ, 1/4 W, 5%
R979	315-0822-00			8.2 kΩ, 1/4 W, 5%
R980	315-0164-00			160 kΩ, 1/4 W, 5%
R983	315-0472-00			4.7 kΩ, 1/4 W, 5%
R985	304-0470-00			47 Ω, 1 W, 10%
R986	315-0122-00			1.2 kΩ, 1/4 W, 5%
R989	308-0678-00			0.1 Ω, 2 W, WW, 5%
R991	315-0753-00			75 kΩ, 1/4 W, 5%
R993	315-0241-00			240 Ω, 1/4 W, 5%
R994	315-0124-00			120 kΩ, 1/4 W, 5%
R995	315-0562-00			5.6 kΩ, 1/4 W, 5%
R1018	315-0102-00			1 kΩ, 1/4 W, 5%
R1019	315-0102-00			1 kΩ, 1/4 W, 5%
R1022	315-0303-00			30 kΩ, 1/4 W, 5%
R1045	311-0125-00	B010100	B059999	50 kΩ, Var
R1045	311-1530-00	B060000		50 kΩ, Var
R1095[1]	311-1055-00			5 kΩ, Var
R1101	315-0470-00			47 Ω, 1/4 W, 5%
R1103	315-0471-00			470 Ω, 1/4 W, 5%
R1105	315-0103-00			10 kΩ, 1/4 W, 5%
R1106	315-0123-00			12 kΩ, 1/4 W, 5%

[1]Furnished as a unit with S1625.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1108	315-0471-00			470 Ω, 1/4 W, 5%
R1111	321-0233-00			2.61 kΩ, 1/8 W, 1%
R1113	315-0102-00			1 kΩ, 1/4 W, 5%
R1114	315-0511-00			510 Ω, 1/4 W, 5%
R1115	315-0121-00			120 Ω, 1/4 W, 5%
R1116	311-1248-00			500 Ω, Var
R1119	315-0102-00			1 kΩ, 1/4 W, 5%
R1120	301-0563-00			56 kΩ, 1/2 W, 5%
R1121	311-1237-00			1 kΩ, Var
R1122	315-0912-00			9.1 kΩ, 1/4 W, 5%
R1124	315-0562-00			5.6 kΩ, 1/4 W, 5%
R1126	303-0203-00			20 kΩ, 1 W, 5%
R1128	315-0102-00			1 kΩ, 1/4 W, 5%
R1129	315-0102-00			1 kΩ, 1/4 W, 5%
R1131	315-0100-00			10 Ω, 1/4 W, 5%
R1132	315-0392-00			3.9 kΩ, 1/4 W, 5%
R1135	315-0103-00			10 kΩ, 1/4 W, 5%
R1137	315-0121-00			120 Ω, 1/4 W, 5%
R1138	315-0682-00			6.8 kΩ, 1/4 W, 5%
R1139	323-0312-00			17.4 kΩ, 1/2 W, 1%
R1141	315-0912-00			9.1 kΩ, 1/4 W, 5%
R1144	315-0562-00			5.6 kΩ, 1/4 W, 5%
R1146	303-0203-00			20 kΩ, 1 W, 5%
R1148	315-0102-00			1 kΩ, 1/4 W, 5%
R1149	315-0102-00			1 kΩ, 1/4 W, 5%
R1151	315-0100-00			10 Ω, 1/4 W, 5%
R1152	315-0392-00			3.9 kΩ, 1/4 W, 5%
R1155	315-0103-00			10 kΩ, 1/4 W, 5%
R1157	315-0121-00			120 Ω, 1/4 W, 5%
R1158	315-0392-00			3.9 kΩ, 1/4 W, 5%
R1159	323-0312-00			17.4 kΩ, 1/2 W, 1%
R1181	311-1227-00			5 kΩ, Var
R1184	311-1235-00			100 kΩ, Var
R1187	315-0363-00			36 kΩ, 1/4 W, 5%
R1188	315-0822-00			8.2 kΩ, 1/4 W, 5%
R1190	311-1227-00			5 kΩ, Var
R1193	311-1235-00			100 kΩ, Var
R1195	315-0183-00	B010100	B099999	18 kΩ, 1/4 W, 5%
R1195	315-0362-00	B100000		3.6 kΩ, 1/4 W, 5%
R1196	315-0183-00	B010100	B099999	18 kΩ, 1/4 W, 5%
R1196	315-0362-00	B100000		3. K kΩ, 1/4 W, 5%
R1202	315-0102-00			1 kΩ, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1204	315-0474-00			470 kΩ, 1/4 W, 5%
R1207	315-0102-00			1 kΩ, 1/4 W, 5%
R1208	315-0104-00			100 kΩ, 1/4 W, 5%
R1210	315-0562-00	B010100	B099999X	5.6 kΩ, 1/4 W, 5%
R1211	315-0562-00			5.6 kΩ, 1/4 W, 5%
R1214	315-0102-00			1 kΩ, 1/4 W, 5%
R1227	301-0305-00			3 MΩ, 1/2 W, 5%
R1228	301-0305-00			3 MΩ, 1/2 W, 5%
R1229	301-0305-00			3 MΩ, 1/2 W, 5%
R1230	301-0305-00			3 MΩ, 1/2 W, 5%
R1231	301-0305-00			3 MΩ, 1/2 W, 5%
R1234	315-0203-00			20 kΩ, 1/4 W, 5%
R1241	315-0562-00			5.6 kΩ, 1/4 W, 5%
R1242	315-0101-00			100 Ω, 1/4 W, 5%
R1243	315-0434-00			430 kΩ, 1/4 W, 5%
R1245A	307-0386-01			250 kΩ, Thick film
R1245B				24.5 MΩ,
R1245C				20.4 MΩ,
R1245D				7.15 MΩ,
R1247	315-0475-00			4.7 MΩ, 1/4 W, 5%
R1248	315-0105-00			1 MΩ, 1/4 W, 5%
R1250	311-1257-00			5 MΩ, Var
R1252	315-0915-00			9.1 MΩ, 1/4 W, 5%
R1253	315-0103-00			10 kΩ, 1/4 W, 5%
R1257	315-0105-00			1 MΩ, 1/4 W, 5%
R1258	315-0103-00			10 kΩ, 1/4 W, 5%
R1259	315-0103-00			10 kΩ, 1/4 W, 5%
R1261	311-1232-00			50 kΩ, Var
R1263	315-0103-00			10 kΩ, 1/4 W, 5%
R1264	315-0103-00			10 kΩ, 1/4 W, 5%
R1266	315-0105-00			1 MΩ, 1/4 W, 5%
R1270	315-0103-00			10 kΩ, 1/4 W, 5%
R1271	315-0915-00			9.1 MΩ, 1/4 W, 5%
R1274	315-0104-00			100 kΩ, 1/4 W, 5%
R1275	315-0474-00			470 kΩ,1/4 W, 5%
R1301	315-0223-00			22 kΩ, 1/4 W, 5%
R1303	315-0102-00			1 kΩ, 1/4 W, 5%
R1304	321-0460-00			604 kΩ, 1/8 W, 1%
R1306	315-0102-00	XB050000		1 kΩ, 1/4 W, 5%
R1307	315-0473-00			47 kΩ, 1/4 W, 5%
R1309	315-0103-00			10 kΩ, 1/4 W, 5%
R1310	315-0103-00			10 kΩ, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1312	315-0103-00			10 kΩ, 1/4 W, 5%
R1313	315-0202-00			2 kΩ, 1/4 W, 5%
R1315	315-0680-00			68 Ω, 1/4 W, 5%
R1316	321-0433-00			316 kΩ, 1/8 W, 1%
R1318	315-0103-00			10 kΩ, 1/4 W, 5%
R1321	321-0335-00			30.1 kΩ, 1/8 W, 1%
R1323	321-0418-00			221 kΩ, 1/8 W, 1%
R1325	311-1228-00			10 kΩ, Var
R1327	321-0435-00			332 kΩ, 1/8 W, 1%
R1328	315-0103-00			10 kΩ, 1/4 W, 5%
R1329	321-0375-00			78.7 kΩ, 1/8 W, 1%
R1332	321-0421-00			237 kΩ, 1/8 W, 1%
R1334	311-1228-00			10 kΩ, Var
R1337	315-0223-00			22 kΩ, 1/4 W, 5%
R1339	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1341	315-0223-00			22 kΩ, 1/4 W, 5%
R1343	315-0223-00			22 kΩ, 1/4 W, 5%
R1344	315-0103-00			10 kΩ, 1/4 W, 5%
R1345	315-0103-00			10 kΩ, 1/4 W, 5%
R1346	315-0103-00			10 kΩ, 1/4 W, 5%
R1349	321-0445-00			422 kΩ, 1/8 W, 1%
R1350	311-1228-00			10 kΩ, Var
R1351	315-0103-00			10 kΩ, 1/4 W, 5%
R1353	315-0223-00			22 kΩ, 1/4 W, 5%
R1355	315-0223-00			22 kΩ, 1/4 W, 5%
R1357	321-0481-00			1 MΩ, 1/8 W, 1%
R1358	321-0466-00			698 kΩ, 1/8 W, 1%
R1360	311-1232-00			50 kΩ, Var
R1361	315-0412-00			4.7 kΩ, 1/4 W, 5%
R1362	301-0155-00			1.5 MΩ, 1/2 W, 5%
R1365	321-0231-00			2.49 kΩ, 1/8 W, 1%
R1366	321-0164-00			499 Ω, 1/8 W, 1%
R1367	321-0410-00			182 kΩ, 1/8 W, 1%
R1369	315-0103-00			10 kΩ, 1/4 W, 5%
R1370	315-0564-00			560 kΩ, 1/4 W, 5%
R1375	301-0155-00			1.5 MΩ, 1/2 W, 5%
R1381	301-0470-00			47 Ω, 1/2 W, 5%
R1382	301-0305-00			3 MΩ, 1/2 W, 5%
R1383	301-0155-00			1.5 MΩ, 1/2 W, 5%
R1385	301-0155-00			1.5 MΩ, 1/2 W, 5%
R1390	321-0380-00			88.7 kΩ, 1/8 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1393	311-1232-00			50 kΩ, Var
R1394	321-0393-00			121 kΩ, 1/8 W, 1%
R1399	315-0473-00			47 kΩ, 1/4 W, 5%
R1401	321-0418-00			221 kΩ, 1/8 W, 1%
R1402	315-0223-00			22 kΩ, 1/4 W, 5%
R1403	315-0102-00			1 kΩ, 1/4 W, 5%
R1404	315-0103-00			10 kΩ, 1/4 W, 5%
R1408	321-0423-00			249 kΩ, 1/8 W, 1%
R1409	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1410	311-1257-00			5 MΩ, Var
R1412	315-0105-00			1 MΩ, 1/4 W, 5%
R1413	315-0245-00			2.4 MΩ, 1/4 W, 5%
R1415	315-0335-00			3.3 MΩ, 1/4 W, 5%
R1417[1]	311-1162-00			10 kΩ, Var
R1420	321-0374-00			76.8 kΩ, 1/8 W, 1%
R1421	321-0423-00			249 kΩ, 1/8 W, 1%
R1423	321-0356-00			49.9 kΩ, 1/8 W, 1%
R1425	315-0272-00			2.7 kΩ, 1/4 W, 5%
R1429	315-0102-00			1 kΩ, 1/4 W, 5%
R1431	315-0103-00			10 kΩ, 1/4 W, 5%
R1432	315-0203-00			20 kΩ, 1/4 W, 5%
R1435	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1437	315-0223-00			22 kΩ, 1/4 W, 5%
R1439	311-1232-00			50 kΩ, Var
R1441	321-0396-00			130 kΩ, 1/8 W, 1%
R1444	315-0223-00			22 kΩ, 1/4 W, 5%
R1446	315-0223-00			22 kΩ, 1/4 W, 5%
R1447	315-0223-00			22 kΩ, 1/4 W, 5%
R1448	315-0103-00			10 kΩ, 1/4 W, 5%
R1450	321-0373-00			75 kΩ, 1/8 W, 1%
R1452	321-0394-00			124 kΩ, 1/8 W, 1%
R1454	315-0223-00			22 kΩ, 1/4 W, 5%
R1457	321-0382-00			93.1 kΩ, 1/8 W, 1%
R1459	321-0423-00			249 kΩ, 1/8 W, 1%
R1460	303-0823-00			82 kΩ, 1 W, 5%
R1461	303-0823-00			82 kΩ, 1 W, 5%
R1463	321-0385-00			100 kΩ, 1/8 W, 1%
R1465	315-0223-00			22 kΩ, 1/4 W, 5%
R1467	315-0473-00			47 kΩ, 1/4 W, 5%
R1468	321-0380-00			88.7 kΩ, 1/8 W, 1%
R1470	311-1228-00			10 kΩ, Var

[1]Furnished as a unit with R1542.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1471	321-0367-00			64.9 kΩ, 1/8 W, 1%
R1472	321-0423-00			249 kΩ, 1/8 W, 1%
R1477	321-0414-00			200 kΩ, 1/8 W, 1%
R1480	311-1228-00			10 kΩ, Var
R1482	321-0389-00			110 kΩ, 1/8 W, 1%
R1483	321-0363-00			59 kΩ, 1/8 W, 1%
R1485	321-0423-00			249 kΩ, 1/8 W, 1%
R1486	321-0367-00			64.9 kΩ, 1/8 W, 1%
R1490	321-0414-00			200 kΩ, 1/8 W, 1%
R1492	315-0103-00			10 kΩ, 1/4 W, 5%
R1493	315-0103-00			10 kΩ, 1/4 W, 5%
R1494	315-0103-00			10 kΩ, 1/4 W, 5%
R1497	315-0103-00			10 kΩ, 1/4 W, 5%
R1498	315-0103-00			10 kΩ, 1/4 W, 5%
R1499	315-0103-00			10 kΩ, 1/4 W, 5%
R1501	315-0105-00			1 MΩ, 1/4 W, 5%
R1503	321-0414-00			200 kΩ, 1/8 W, 1%
R1505	321-0373-00			75 kΩ, 1/8 W, 1%
R1507	321-0393-00			121 kΩ, 1/8 W, 1%
R1508	321-0414-00			200 kΩ, 1/8 W, 1%
R1509	321-0449-00			464 kΩ, 1/8 W, 1%
R1513	321-0393-00			121 kΩ, 1/8 W, 1%
R1515	315-0103-00			10 kΩ, 1/4 W, 5%
R1516	315-0103-00			10 kΩ, 1/4 W, 5%
R1517	315-0103-00			10 kΩ, 1/4 W, 5%
R1519	315-0105-00			1 MΩ, 1/4 W, 5%
R1520	315-0684-00			680 kΩ, 1/4 W, 5%
R1522	321-0319-00			20.5 kΩ, 1/8 W, 1%
R1523	321-0369-00			68.1 kΩ, 1/8 W, 1%
R1524	315-0684-00			680 kΩ, 1/4 W, 5%
R1525	321-0458-00			576 kΩ, 1/8 W, 1%
R1526	321-0373-00			75 kΩ, 1/8 W, 1%
R1529	321-0414-00			200 kΩ, 1/8 W, 1%
R1531	315-0103-00			10 kΩ, 1/4 W, 5%
R1532	315-0103-00			10 kΩ, 1/4 W, 5%
R1534	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1535	315-0103-00			10 kΩ, 1/4 W, 5%
R1536A}[1] R1536B	311-1407-00			10 kΩ, 500 kΩ, Var
R1537	315-0132-00			1.3 kΩ, 1/4 W, 5%

[1]Furnished as a unit with S1536.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1539	315-0104-00			100 kΩ, 1/4 W, 5%
R1540	315-0432-00			4.3 kΩ, 1/4 W, 5%
R1541	315-0683-00			68 kΩ, 1/4 W, 5%
R1542[1]	311-1162-00			10 kΩ, Var
R1543	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1544	315-0103-00			10 kΩ, 1/4 W, 5%
R1546	315-0683-00			68 kΩ, 1/4 W, 5%
R1547	315-0153-00			15 kΩ, 1/4 W, 5%
R1549	315-0223-00			22 kΩ, 1/4 W, 5%
R1550	315-0223-00			22 kΩ, 1/4 W, 5%
R1551	321-0451-00			487 kΩ, 1/8 W, 1%
R1552	315-0101-00			100 Ω, 1/4 W, 5%
R1553	315-0102-00			1 kΩ, 1/4 W, 5%
R1554	315-0183-00			18 kΩ, 1/4 W, 5%
R1555	321-0325-00			23.7 kΩ, 1/8 W, 1%
R1556	315-0223-00			22 kΩ, 1/4 W, 5%
R1558	315-0102-00			1 kΩ, 1/4 W, 5%
R1559	311-1225-00			1 kΩ, Var
R1561	315-0223-00			22 kΩ, 1/4 W, 5%
R1562	315-0154-00			150 kΩ, 1/4 W, 5%
R1565	315-0473-00			47 kΩ, 1/4 W, 5%
R1567	315-0223-00			22 kΩ, 1/4 W, 5%
R1568	315-0223-00			22 kΩ, 1/4 W, 5%
R1570	315-0471-00			470 Ω, 1/4 W, 5%
R1572	315-0102-00			1 kΩ, 1/4 W, 5%
R1573	315-0102-00			1 kΩ, 1/4 W, 5%
R1576	315-0102-00			1 kΩ, 1/4 W, 5%
R1578	315-0103-00			10 kΩ, 1/4 W, 5%
R1582	315-0103-00			10 kΩ, 1/4 W, 5%
R1583	315-0103-00			10 kΩ, 1/4 W, 5%
R1585	315-0103-00			10 kΩ, 1/4 W, 5%
R1587	315-0473-00			47 kΩ, 1/4 W, 5%
R1590	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1591	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1592	315-0103-00			10 kΩ, 1/4 W, 5%
R1593	315-0103-00			10 kΩ, 1/4 W, 5%
R1594	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1595	315-0390-00			39 Ω, 1/4 W, 5%
R1596	315-0103-00			10 kΩ, 1/4 W, 5%
R1599	315-0103-00			10 kΩ, 1/4 W, 5%

[1]Furnished as a unit with R1417.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1600	315-0563-00			56 kΩ, 1/4 W, 5%
R1602	315-0102-00			1 kΩ, 1/4 W, 5%
R1603	315-0223-00			22 kΩ, 1/4 W, 5%
R1605	315-0223-00			22 kΩ, 1/4 W, 5%
R1607	315-0155-00			1.5 MΩ, 1/4 W, 5%
R1610	315-0103-00			10 kΩ, 1/4 W, 5%
R1611	315-0103-00			10 kΩ, 1/4 W, 5%
R1614	315-0223-00			22 kΩ, 1/4 W, 5%
R1616	315-0103-00			10 kΩ, 1/4 W, 5%
R1618	315-0392-00			3.9 kΩ, 1/4 W, 5%
R1619	315-0301-00			300 Ω, 1/4 W, 5%
R1622	308-0290-00			8 Ω, 1 W, WW, 5%
R1631	307-0104-00			3.3 Ω, 1/4 W, 5%
R1633	307-0103-00			2.7 Ω, 1/4 W, 5%
R1634	315-0221-00			220 Ω, 1/4 W, 5%
R1637	307-0103-00			2.7 Ω, 1/4 W, 5%
R1639	315-0100-00			10 Ω, 1/4 W, 5%
R1641	307-0106-00			4.7 Ω, 1/4 W, 5%
R1650	315-0563-00			56 kΩ, 1/4 W, 5%
R1651	315-0473-00			47 kΩ, 1/4 W, 5%
R1663	315-0473-00			47 kΩ, 1/4 W, 5%
R1669	315-0473-00			47 kΩ, 1/4 W, 5%
R1678	315-0473-00			47 kΩ, 1/4 W, 5%
R1687	315-0473-00			47 kΩ, 1/4 W, 5%
R1693	315-0473-00			47 kΩ, 1/4 W, 5%
R1701	315-0473-00			47 kΩ, 1/4 W, 5%
R1702	315-0105-00			1 MΩ, 1/4 W, 5%
R1708	315-0103-00			10 kΩ, 1/4 W, 5%
R1720	315-0103-00			10 kΩ, 1/ 4W, 5%
R1721	315-0433-00			43 kΩ, 1/4 W, 5%
R1723	315-0474-00			470 kΩ, 1/4 W, 5%
R1725	315-0150-00			15 Ω, 1/4 W, 5%
R1730	315-0105-00			1 MΩ, 1/4 W, 5%
R1731	315-0473-00			47 kΩ, 1/4 W, 5%
R1732	315-0472-00			4.7 kΩ, 1/4 W, 5%
R1733	315-0102-00			10 kΩ, 1/4 W, 5%
R1734	315-0102-00			10 kΩ, 1/4 W, 5%
R1735	315-0102-00			10 kΩ, 1/4 W, 5%
R1737	315-0103-00			10 kΩ, 1/4 W, 5%
R1746	315-0223-00			22 kΩ, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1748	315-0334-00			330 kΩ, 1/4 W, 5%
R1749	315-0473-00			47 kΩ, 1/4 W, 5%
R1750	315-0103-00			10 kΩ, 1/4 W, 5%
R1751	315-0102-00			1 kΩ, 1/4 W, 5%
R1752	315-0392-00			3.9 kΩ, 1/4 W, 5%
R1753	315-0102-00			1 kΩ, 1/4 W, 5%
R1754	315-0102-00			1 kΩ, 1/4 W, 5%
R1756	315-0682-00			6.8 kΩ, 1/4 W, 5%
R1757	315-0101-00			100 Ω, 1/4 W, 5%
R1758	315-0332-00			3.3 kΩ, 1/4 W, 5%
R1760	315-0122-00			1.2 kΩ, 1/4 W, 5%
R1761	315-0223-00			22 kΩ, 1/4 W, 5%
R1765	315-0473-00			47 kΩ, 1/4 W, 5%
R1767	315-0222-00			2.2 kΩ, 1/4 W, 5%
R1768	315-0223-00			22 kΩ, 1/4 W, 5%
R1770	315-0103-00			10 kΩ, 1/4 W, 5%
R1771	315-0104-00			100 kΩ, 1/4 W, 5%
R1772	315-0102-00			1 kΩ, 1/4 W, 5%
R1774	315-0102-00			1 kΩ, 1/4 W, 5%
R1775	315-0102-00			1 kΩ, 1/4 W, 5%
R1778	315-0392-00			3.9 kΩ, 1/4 W, 5%
R1780	315-0102-00			1 kΩ, 1/4 W, 5%
R1783	315-0223-00			22 kΩ, 1/4 W, 5%
R1785	321-0393-00			121 kΩ, 1/8 W, 1%
R1786	315-0102-00			1 kΩ, 1/4 W, 5%
R1787	315-0102-00			1 kΩ, 1/4 W, 5%
R1789	315-0241-00			240 Ω, 1/4 W, 5%
R1800	315-0102-00			1 kΩ, 1/4 W, 5%
R1802	315-0102-00			1 kΩ, 1/4 W, 5%
R1804	315-0223-00			22 kΩ, 1/4 W, 5%
R1806	315-0103-00			10 kΩ, 1/4 W, 5%
R1810	315-0472-00	B010100	B029999	4.7 kΩ, 1/4 W, 5%
R1810	315-0562-00	B030000		5.6 kΩ, 1/4 W, 5%
R1812	315-0683-00	B010100	B029999	68 kΩ, 1/4 W, 5%
R1812	315-0823-00	B030000		82 kΩ, 1/4 W, 5%
R1814	315-0103-00	B010100	B029999	10 kΩ, 1/4 W, 5%
R1814	315-0562-00	B030000		5.6 kΩ, 1/4 W, 5%
R1816	315-0682-00			6.8 kΩ, 1/4 W, 5%
R1818	315-0103-00			10 kΩ, 1/4 W, 5%
R1819	315-0223-00			22 kΩ, 1/4 W, 5%
R1820	315-0181-00	B010100	B029999X	180 Ω, 1/4 W, 5%
R1822	321-0304-00			14.3 kΩ, 1/8 W, 1%
R1824	315-0182-00			1.8 kΩ, 1/4 W, 5%
R1826	315-0223-00			22 kΩ, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R1828	315-0102-00			1 kΩ, 1/4 W, 5%
R1829	315-0103-00			10 kΩ, 1/4 W, 5%
R1831	315-0103-00			10 kΩ, 1/4 W, 5%
R1832	315-0103-00			10 kΩ, 1/4 W, 5%
R1833	315-0103-00			10 kΩ, 1/4 W, 5%
R1834	315-0103-00			10 kΩ, 1/4 W, 5%
R1835	315-0103-00			10 kΩ, 1/4 W, 5%
R1837	315-0223-00			22 kΩ, 1/4 W, 5%
R1840	315-0222-00			2.2 kΩ, 1/4 W, 5%
R1842	315-0223-00			22 kΩ, 1/4 W, 5%
R1844	315-0223-00			22 kΩ, 1/4 W, 5%
R1847	315-0102-00			1 kΩ, 1/4 W, 5%
R1848	315-0561-00			560 Ω, 1/4 W, 5%
R1849	315-0203-00			20 kΩ, 1/4 W, 5%
R1867	315-0433-00			43 kΩ, 1/4 W, 5%
R1869	315-0223-00			22 kΩ, 1/4 W, 5%
R1870	315-0362-00			3.6 kΩ, 1/4 W, 5%
R1872	315-0433-00			43 kΩ, 1/4 W, 5%
R1873	315-0390-00			39 Ω, 1/4 W, 5%
R1874	315-0183-00			18 kΩ, 1/4 W, 5%
R1875	315-0513-00			51 kΩ, 1/4 W, 5%
R1878	323-0260-00			4.99 kΩ, 1/2 W, 1%
R1880	315-0102-00			1 kΩ, 1/4 W, 5%
R1881	315-0222-00			2.2 kΩ, 1/4 W, 5%
R1882	315-0752-00			7.5 kΩ, 1/4 W, 5%
R1884	311-1227-00			5 kΩ, Var
R1886	308-0679-00			0.51 Ω, 2 W, WW, 5%
R1888	321-0318-00			20 kΩ, 1/8 W, 1%
R1890	321-0812-07			455 Ω, 1/8 W, 1/10%
R1891	321-0825-03			50.8 Ω, 1/8 W, 1/4%
R1893	321-0816-07			5 kΩ, 1/8 W, 1/10%
R1894	321-1068-07			50.5 Ω, 1/8 W, 1/10%
R2101	315-0682-00			6.8 kΩ, 1/4 W, 5%
R2102	315-0103-00			10 kΩ, 1/4 W, 5%
R2104	315-0333-00			33 kΩ, 1/4 W, 5%
R2105	315-0153-00			15 kΩ, 1/4 W, 5%
R2107	315-0510-00			51 Ω, 1/4 W, 5%
R2108	315-0512-00			5.1 kΩ, 1/4 W, 5%
R2109	315-0221-00			220 Ω, 1/4 W, 5%
R2112	315-0102-00			1 kΩ, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R2113	315-0301-00			300 Ω, 1/4 W, 5%
R2122	315-0432-00			4.3 kΩ, 1/4 W, 5%
R2123	315-0683-00			68 kΩ, 1/4 W, 5%
R2127	315-0302-00			3 kΩ, 1/4 W, 5%
R2128	311-1225-00			1 kΩ, Var
R2129	315-0183-00			18 kΩ, 1/4 W, 5%
R2135	315-0393-00			39 kΩ, 1/4 W, 5%
R2137	315-0752-00			7.5 kΩ, 1/4 W, 5%
R2139	315-0242-00			2.4 kΩ, 1/4 W, 5%
R2144	315-0104-00			100 kΩ, 1/4 W, 5%
R2146	315-0152-00			1.5 kΩ, 1/4 W, 5%
R2148	315-0103-00			10 kΩ, 1/4 W, 5%
R2150	321-0403-00			154 kΩ, 1/8 W, 1%
R2151	321-0372-00			73.2 kΩ, 1/8 W, 1%
R2153	315-0103-00			10 kΩ, 1/4 W, 5%
R2155	315-0512-00			5.1 kΩ, 1/4 W, 5%
R2158	315-0152-00			1.5 kΩ, 1/4 W, 5%
R2161	315-0102-00			1 kΩ, 1/4 W, 5%
R2162	315-0751-00			750 Ω, 1/4 W, 5%
R2163	315-0751-00			750 Ω, 1/4 W, 5%
R2165	315-0102-00			1 kΩ, 1/4 W, 5%
R2166	315-0751-00			750 Ω, 1/4 W, 5%
R2167	315-0751-00			750 Ω, 1/4 W, 5%
R2169	315-0102-00			1 kΩ, 1/4 W, 5%
R2170	315-0751-00			750 Ω, 1/4 W, 5%
R2171	315-0751-00			750 Ω, 1/4 W, 5%
R2173	315-0102-00			1 kΩ, 1/4 W, 5%
R2174	315-0751-00			750 Ω, 1/4 W, 5%
R2175	315-0751-00			750 Ω, 1/4 W, 5%
R2177	315-0511-00			510 Ω, 1/4 W, 5%
R2178	315-0511-00			510 Ω, 1/4 W, 5%
R2179	315-0511-00			510 Ω, 1/4 W, 5%
R2182	321-0262-00			5.23 kΩ, 1/8 W, 1%
R2183	311-1224-00			500 Ω, Var
R2191	315-0513-00			51 kΩ, 1/4 W, 5%
R2192	315-0133-00			13 kΩ, 1/4 W, 5%
R2193	315-0133-00			13 kΩ, 1/4 W, 5%
R2194	315-0753-00			75 kΩ, 1/4 W, 5%
R2196	321-0308-00			15.8 kΩ, 1/8 W, 1%
R2197	315-0513-00			51 kΩ, 1/4 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R2198	321-0319-00			20.5 kΩ, 1/8 W, 1%
R2199	321-0335-00			30.1 kΩ, 1/8 W, 1%
R2201	315-0154-00			150 kΩ, 1/4 W, 5%
R2202	321-0335-00			30.1 kΩ, 1/8 W, 1%
R2203	321-0344-00			37.4 kΩ, 1/8 W, 1%
R2204	321-0335-00			30.1 kΩ, 1/8 W, 1%
R2206	315-0513-00			51 kΩ, 1/4 W, 5%
R2207	315-0154-00			150 kΩ, 1/4 W, 5%
R2208	321-0335-00			30.1 kΩ, 1/8 W, 1%
R2209	321-0335-00			30.1 kΩ, 1/8 W, 1%
R2211	315-0752-00			7.5 kΩ, 1/4 W, 5%
R2213	321-0259-00			4.87 kΩ, 1/8 W, 1%
R2214	311-1224-00			500 Ω, Var
R2215	315-0133-00			13 kΩ, 1/4 W, 5%
R2217	315-0124-00			120 kΩ, 1/4 W, 5%
R2219	315-0751-00			750 Ω, 1/4 W, 5%
R2220	321-0299-00			12.7 kΩ, 1/8 W, 1%
R2221	321-0212-00			1.58 kΩ, 1/8 W, 1%
R2226	315-0222-00			2.2 kΩ, 1/4 W, 5%
R2227	321-0268-00			6.04 kΩ, 1/8 W, 1%
R2229	321-0210-00			1.5 kΩ, 1/8 W, 1%
R2231	315-0303-00			30 kΩ, 1/4 W, 5%
R2235	315-0203-00			20 kΩ, 1/4 W, 5%
R2236	315-0203-00			20 kΩ, 1/4 W, 5%
R2237	315-0203-00			20 kΩ, 1/4 W, 5%
R2238	315-0203-00			20 kΩ, 1/4 W, 5%
R2241	321-0326-00			24.3 kΩ, 1/8 W, 1%
R2251	315-0102-00			1 kΩ, 1/4 W, 5%
R2252	315-0102-00			1 kΩ, 1/4 W, 5%
R2253	315-0102-00			1 kΩ, 1/4 W, 5%
R2261	315-0272-00			2.7 kΩ, 1/4 W, 5%
R2262	315-0102-00			1 kΩ, 1/4 W, 5%
R2265	315-0512-00			5.1 kΩ, 1/4 W, 5%
R2266	315-0912-00			9.1 kΩ, 1/4 W, 5%
R2268	321-0296-00			11.8 kΩ, 1/8 W, 1%
R2273	311-1226-00			2.5 kΩ, Var
R2274	321-0153-00			383 Ω, 1/8 W, 1%
R2275	321-0170-00			576 Ω, 1/8 W, 1%
R2276	315-0223-00			22 kΩ, 1/4 W, 5%
R2277	321-0250-00			3.92 kΩ, 1/8 W, 1%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R2279	321-0222-00			2 kΩ, 1/8 W, 1%
R2280	315-0823-00			82 kΩ, 1/4 W, 5%
R2282	315-0332-00			3.3 kΩ, 1/4 W, 5%
R2284	321-0216-00			1.74 kΩ, 1/8 W, 1%
R2285	321-0245-00			3.48 kΩ, 1/8 W, 1%
R2286	321-0209-00			1.47 kΩ, 1/8 W, 1%
R2287	321-0199-00			1.15 kΩ, 1/8 W, 1%
R2288	321-0273-00			6.81 kΩ, 1/8 W, 1%
R2289	321-0193-00			1 kΩ, 1/8 W, 1%
R2291	311-1225-00			1 kΩ, Var
R2292	315-0132-00			1.3 kΩ, 1/4 W, 5%
R2293	321-0245-00			3.48 kΩ, 1/8 W, 1%
R2294	321-0255-00			4.42 kΩ, 1/8 W, 1%
R2295	321-0241-00			3.16 kΩ, 1/8 W, 1%
R2297	315-0102-00	B010100	B069999	1 kΩ, 1/4 W, 5%
R2297	315-0152-00	B070000		1.5 kΩ, 1/4 W, 5%
R2298	315-0102-00			1 kΩ, 1/4 W, 5%
R2299	315-0511-00			510 Ω, 1/4 W, 5%
SWITCHES				
S102[1]				OFF
S659	260-0984-00			Slide, GATE SELECTOR
S1000	260-0724-00			Thermostatic, open 83.3°C, close 66.7°C
S1001[2]				Push, POWER
S1011	260-1379-00			Push, TRIG SOURCE
S1021	260-1378-00			Push, VERT MODE
S1536[3]				MAX
S1625[4]				BEAM FINDER
S1718	260-1381-00			Push, STORAGE MODE
S1719	260-1380-00			Push, MULTIFAST/INTEG
S1728	260-1382-00			Push, SAVE/ERASE
S2110	260-0723-00			Slide, READOUT MODE
TRANSFORMERS				
T523	120-0546-00	XB030000		Toroid, 4 turns, bifilar
T801	120-0708-00			LV Power
T1225	120-0810-00			HV Power

[1] Furnished as a unit with R102A,B.
[2] See Mechanical Parts List page 7-4 for replacement parts.
[3] Furnished as a unit with R1536A,B.
[4] Furnished as a unit with R1095.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
INTEGRATED CIRCUITS				
U55	155-0011-00			Monolithic, clock & chop blanking
U99	156-0048-00			Five NPN transistor array, CA3046
U123	156-0041-00			Dual 15 MHz D-type pos-edge-trig flip-flop, SN7474N
U156	156-0041-00			Dual 15 MHz D-type pos-edge-trig flip-flop, SN7474N
U214	155-0022-00			Monolithic, channel switch
U324	155-0022-00			Monolithic, channel switch
U450	155-0080-00			Hybrid, H-125 vert out amp.
U510	155-0022-00			Monolithic, channel switch
U973	156-0065-00			Five NPN, transistor array, CA3045
U1302	156-0030-00			Quad 2-input positive nand gate, SN7400N
U1436	156-0129-00			Quad 2-input positive and gate, SN7408N
U1579	156-0058-00			Hex., inverter, SN7404N
U1581	156-0043-00			Quad 2-input positive nor gate, SN7402N
U1597	156-0030-00			Quad 2-input positive nand gate, SN7400N
U1780	156-0030-00			Quad 2-input positive nand gate, SN7400N
U1790	156-0032-00			Single 10 MHz 1-&-3-bit binary ripple counter, SN7493N
U1795	156-0030-00			Quad 2-input positive nand gate, SN7400N
U1798	156-0030-00			Quad 2-input positive nand gate, SN7400N
U1882	156-0072-00			Single monostable multivibrator-one shot, SN74121N
U2120	156-0043-00			Quad 2-input positive nor gate, SN7402N
U2126	155-0021-00			Monolithic, timing generator
U2155	156-0043-00			Quad 2-input positive nor gate, SN7402N
U2159	155-0017-00			Monolithic, 5 MHz decade counter
U2180	155-0015-01			Monolithic, analog data switch
U2185	155-0014-01			Monolithic, analog to decimal converter
U2190	155-0015-01			Monolithic, analog data switch
U2232	155-0018-00			Monolithic, zeros logic
U2244	155-0014-01			Monolithic, analog to decimal converter
U2250	156-0032-00			Single 10 MHz 1-&-3-bit binary ripple counter, SN7493N
U2260	155-0019-00			Monolithic, decimal point and spacing
U2270	155-0023-00			Monolithic, character generator
U2272	155-0024-00			Monolithic, character generator
U2274	155-0025-00			Monolithic, character generator
U2276	155-0026-00			Monolithic, character generator
U2278	155-0027-00			Monolithic, character generator
U2284	155-0020-00			Monolithic, channel switching output assembly

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ELECTRON TUBE				
V1099	154-0659-00	B010100	B010144	CRT
V1099	154-0659-10	B010145		CRT
DIODES, ZENER				
VR244	152-0243-00			Zener, 1N965B, 0.4 W, 15 V, 5%
VR254	152-0243-00			Zener, 1N965B, 0.4 W, 15 V, 5%
VR851	152-0283-00			Zener, 1N976B, 0.4 W, 43 V, 5%
VR890	152-0124-00			Zener, 1N938A, 0.5 W, 9 V, 5%
VR1142	152-0055-00			Zener, 1N962B, 0.4 W, 11 V, 5%
VR1258	152-0282-00			Zener, 1N972B, 0.4 W, 30 V, 5%
VR1264	152-0149-00			Zener, 1N961B, 0.4 W, 10 V, 5%
VR1429	152-0195-00			Zener, selected from 1N751A, 5.1 V
VR1461	152-0289-00			Zener, 1N991B, 0.4 W, 180 V, 5%
VR2262	152-0405-00			Zener, 1N5567B, 1 W, 15 V, 5%
VR2263	152-0405-00			Zener, 1N5567B, 1 W, 15 V, 5%
VR2264	152-0405-00			Zener, 1N5567B, 1 W, 15 V, 5%

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

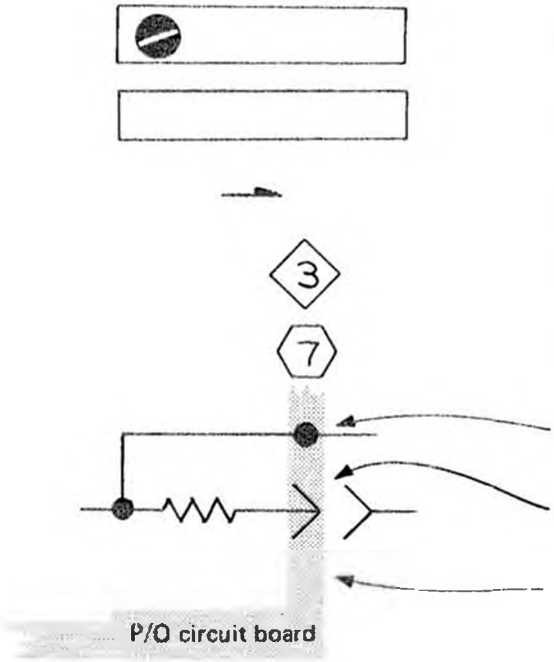
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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

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

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

The following special symbols are used on the diagrams:



External Screwdriver adjustment.

External control or connector.

Clockwise control rotation in direction of arrow.

Refer to diagram number indicated in diamond.

Refer to waveform number indicated in hexagon.

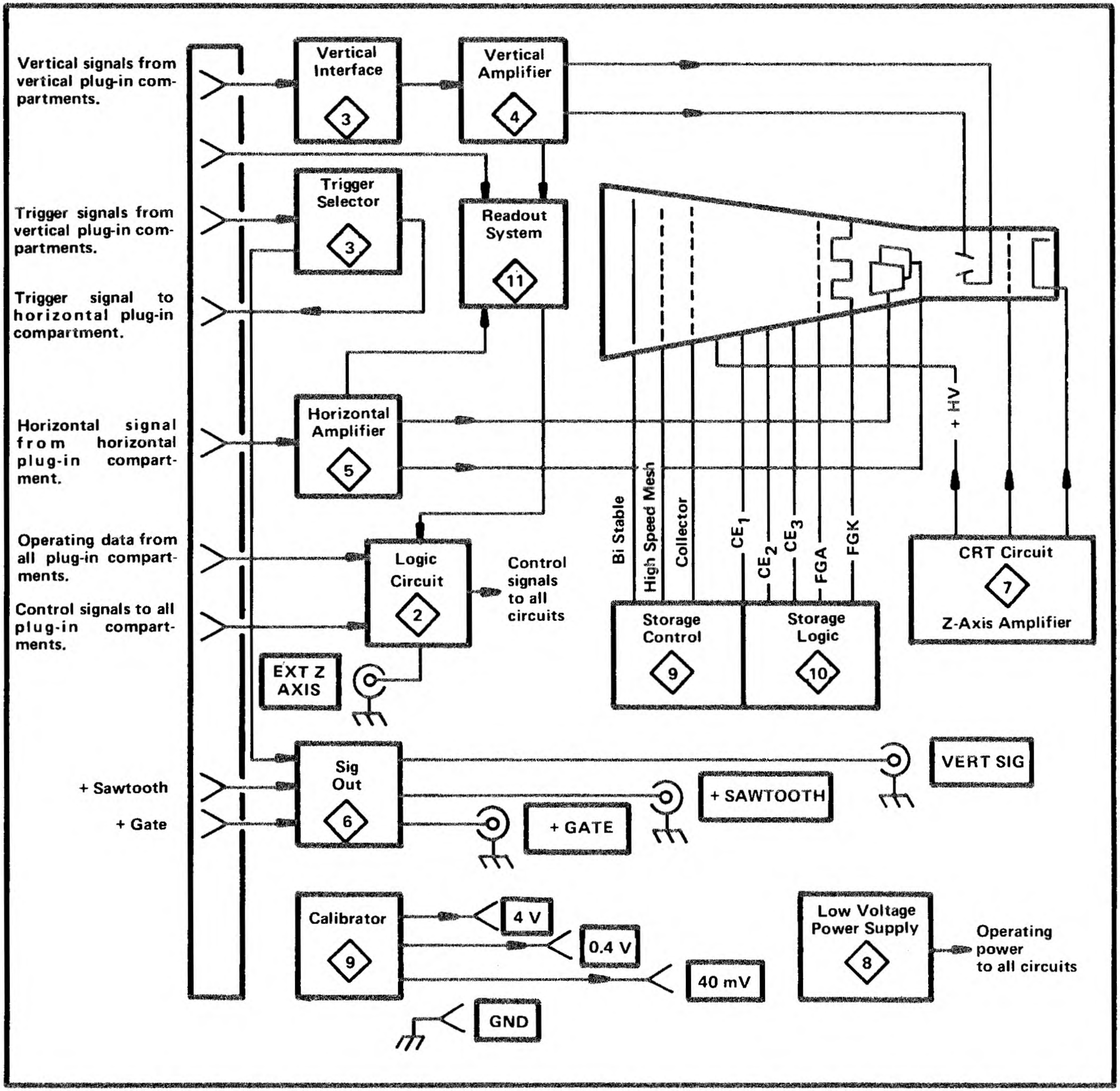
Connection soldered to circuit board.

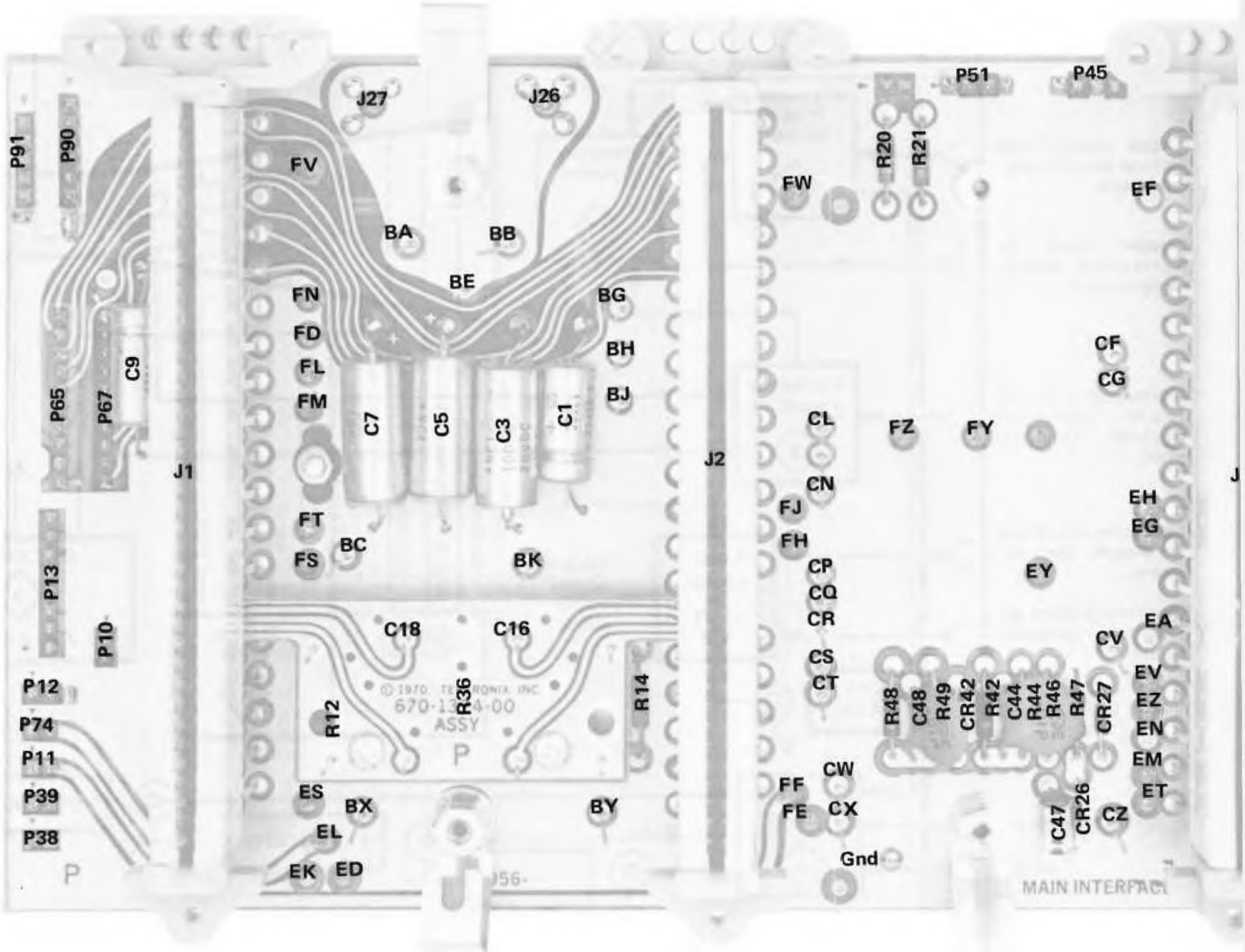
Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

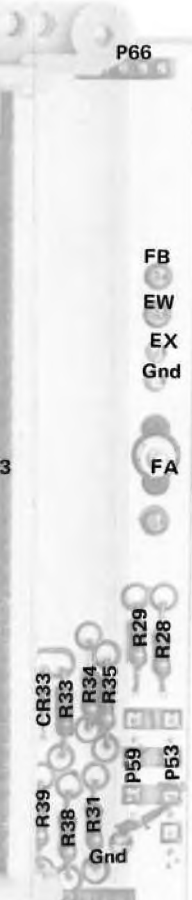
The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

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


Vertical signals from vertical plug-in compartments.
Trigger signals from vertical plug-in compartments.
Trigger signal to horizontal plug-in compartment.
Horizontal signal from horizontal plug-in compartment.
Operating data from all plug-in compartments.
Control signals to all plug-in compartments.
+ Sawtooth
+ Gate
Vertical Interface 3
Vertical Amplifier 4
Trigger Selector 3
Readout System 11
Horizontal Amplifier 5
Logic Circuit 2
Control signals to all circuits
EXT Z AXIS
Bi Stable
High Speed Mesh
Collector
CE1
CE2
CE3
FGA
FGK
+ HV
Storage Control 9
Storage Logic 10
CRT Circuit 7 Z-Axis Amplifier
Sig Out 6
VERT SIG
+ SAWTOOTH
+ GATE
Calibrator 9
4 V
0.4 V
40 mV
GND
Low Voltage Power Supply 8
Operating power to all circuits



Front of Board



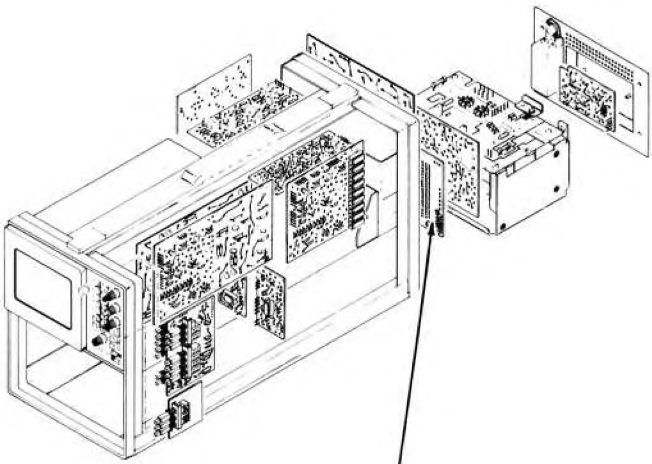
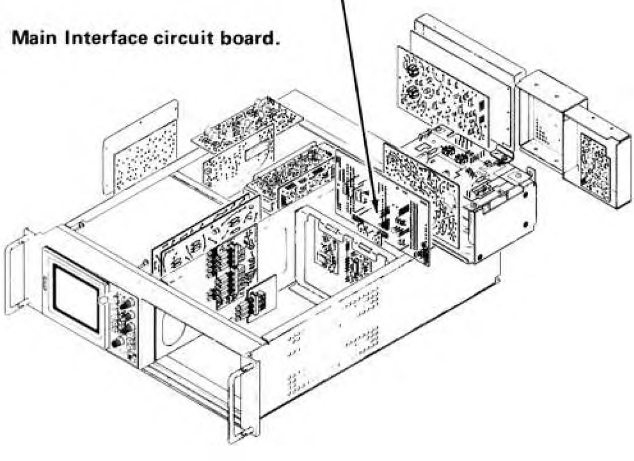
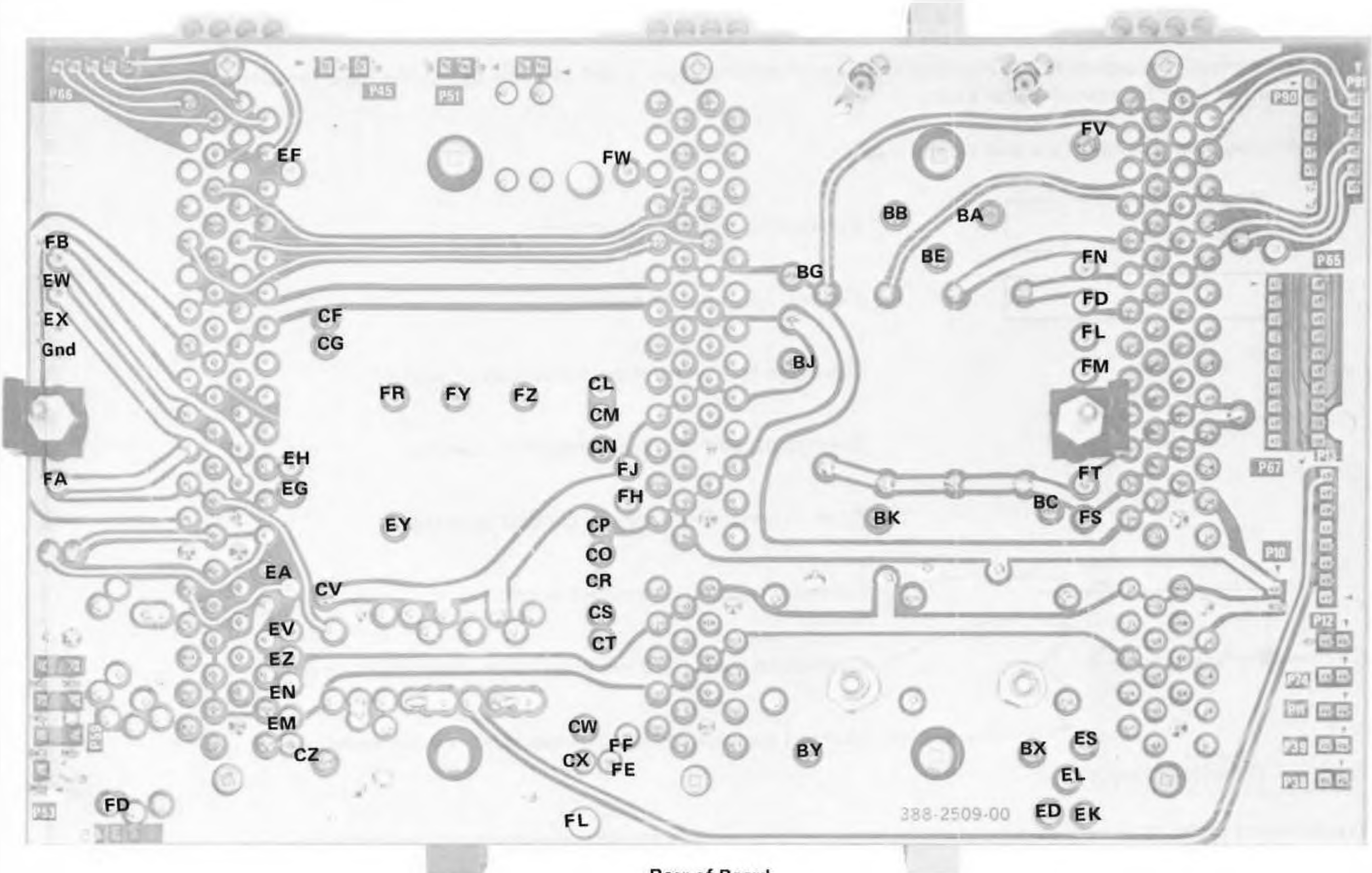
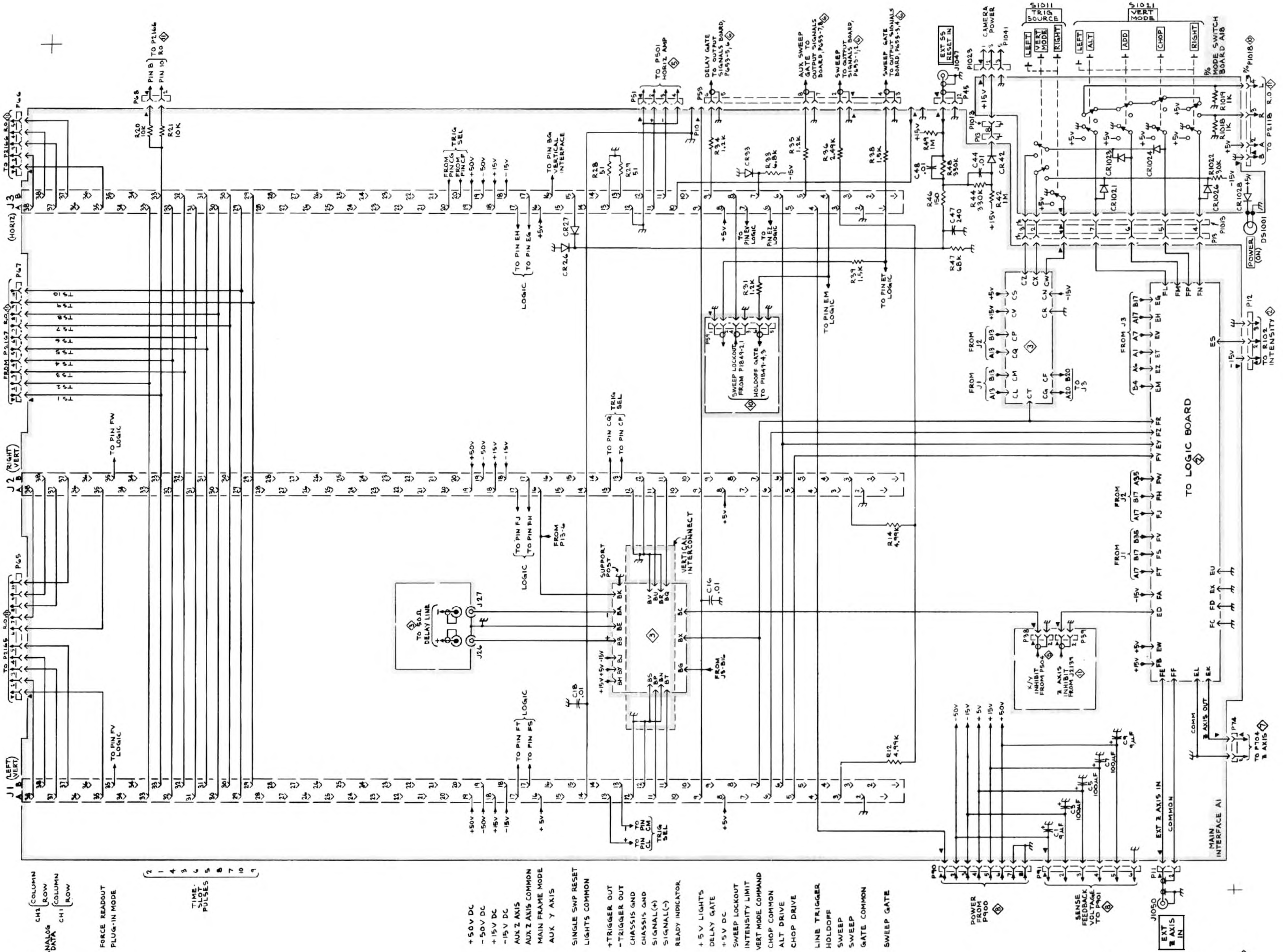


Fig. 6-1. A1 Main Interface circuit board.





Rear of Board



7623

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MAIN INTERFACE ①

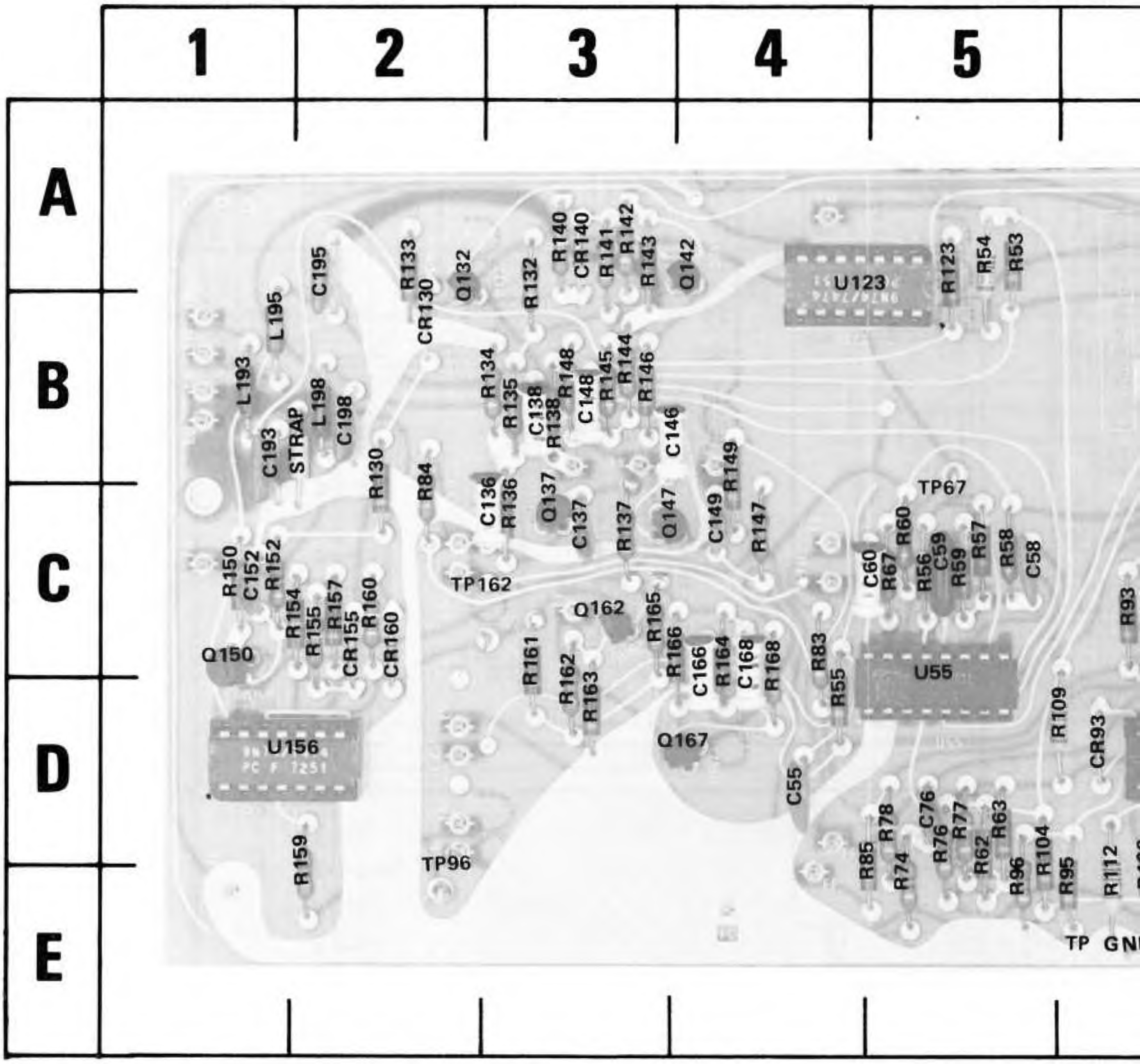
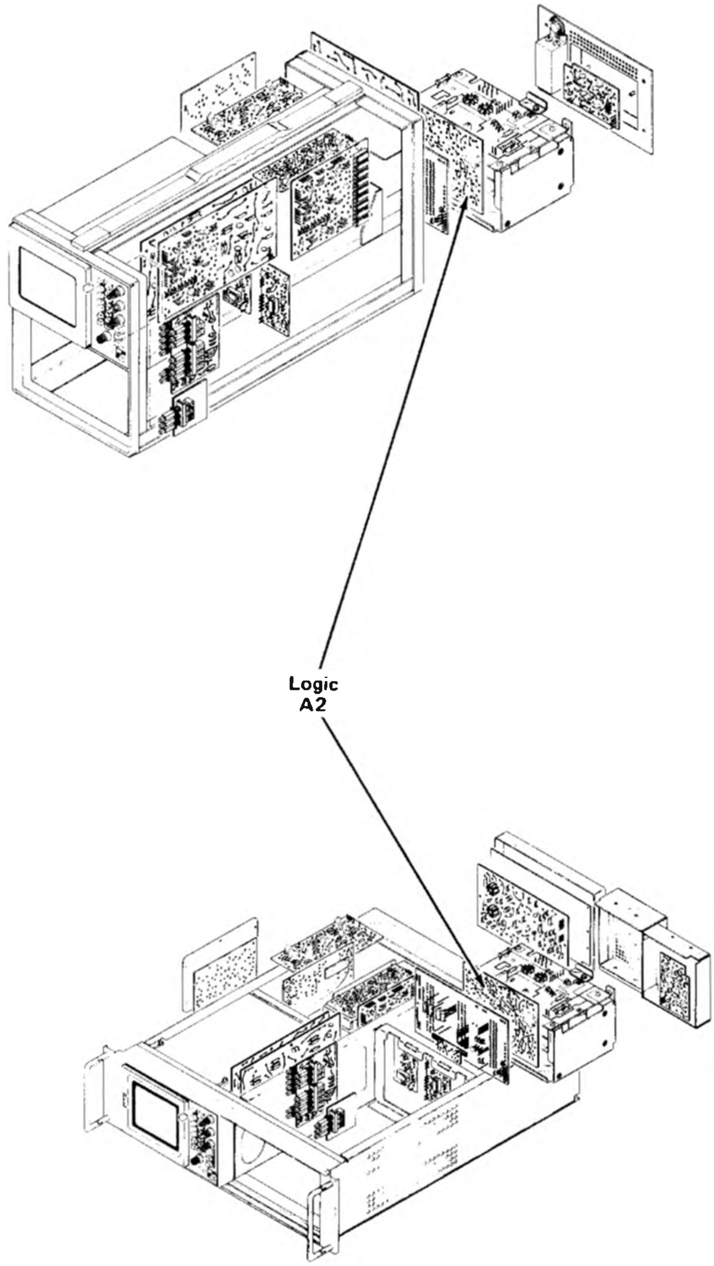


Fig. 6-2. A2 Logic circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C55	4D	C195	2A	L198	2B	R55	4D	R84	2B	R110	7E
C58	5C	C196	7C			R56	5C	R85	4D	R112	6E
C59	5C	C198	2B	Q90	6C	R57	5C	R86	7D	R123	5A
C60	4C			Q108	6E	R58	5C	R88	6C	R124	6B
C76	5D	CR84	7C	Q132	2A	R59	5C	R89	6C	R125	7B
C89	6C	CR85	6C	Q137	3C	R60	5C	R90	6C	R126	7A
C136	3C	CR93	6D	Q142	4A	R62	5D	R92	6C	R130	2B
C137	3C	CR124	6B	Q147	3C	R63	5D	R93	6C	R132	3A
C138	3B	CR125	7B	Q150	1C	R67	5C	R95	6E	R133	2A
C146	3B	CR126	7A	Q162	3C	R74	5D	R96	5E	R134	3B
C148	3B	CR130	2B	Q167	4D	R76	5D	R98	7D	R135	3B
C149	4C	CR155	2C			R77	5D	R99	7D	R136	3C
C152	1C	CR160	2C	R50	6A	R78	5D	R101	7D	R137	3C
C166	4C			R51	6A	R80	7C	R104	5D	R138	3B
C168	4C	L193	1B	R53	5A	R82	7C	R105	6E	R140	3A
C193	1B	L195	1B	R54	5A	R83	4C	R106	6E	R141	3A
								R109	5D		

6	7



CKT NO	GRID LOC	CKT NO	GRID LOC
R142	3A	R162	3C
R143	3A	R163	3D
R144	3B	R164	4C
R145	3B	R165	3C
R146	3B	R166	3C
R147	4C	R168	4C
R148	3B		
R149	4B	TP67	5B
R150	1C	TP96	2D
R152	1C	TP162	2C
R154	1C		
R155	2C	U55	5C
R157	2C	U99	6D
R159	2D	U123	4A
R160	2C	U156	2D
R161	3C		

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VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

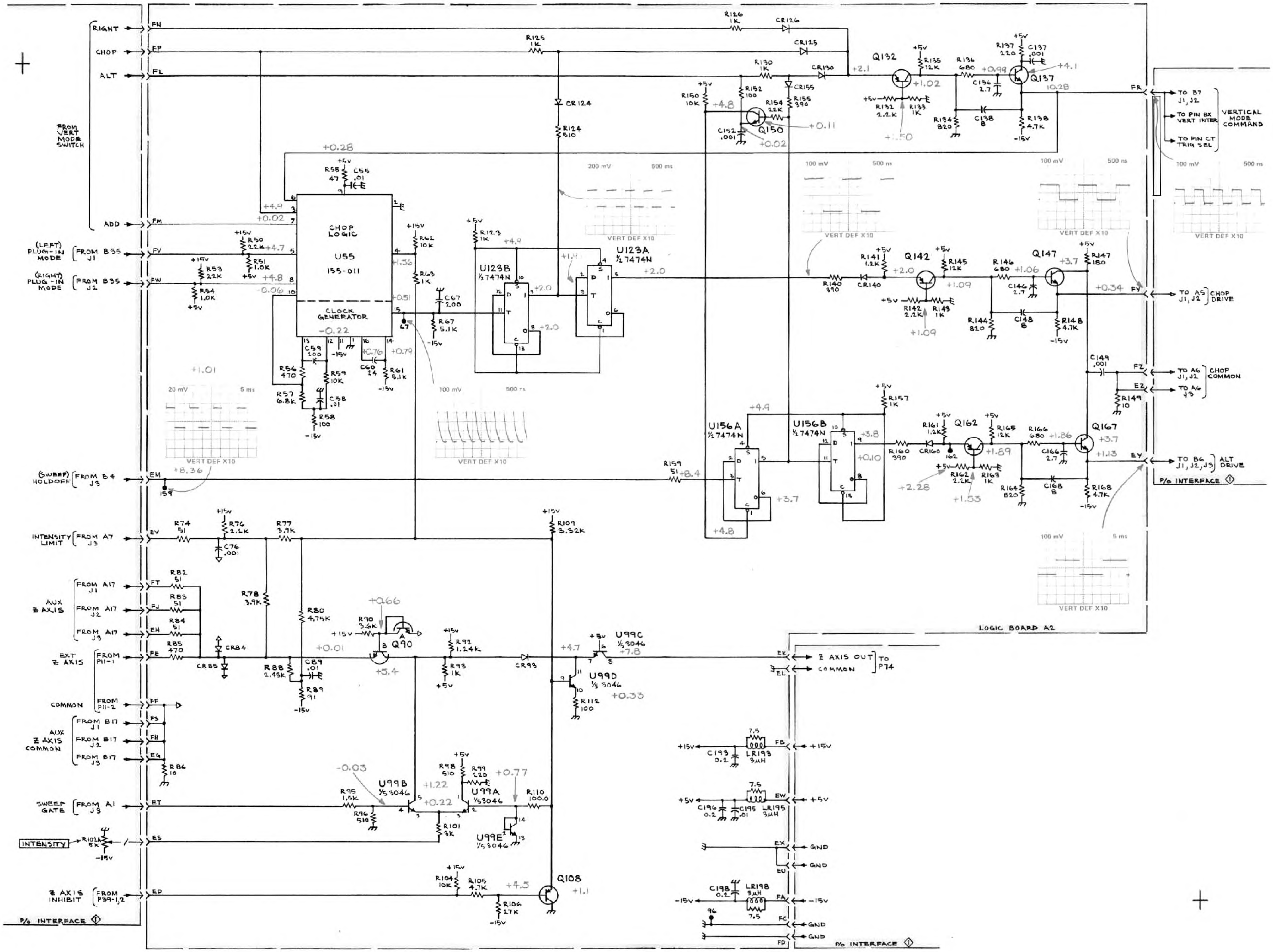
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The test oscilloscope 4 Volts calibration signal is applied to the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep, 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is externally triggered from the +GATE OUT (MAIN) of the 7623 mainframe under test. The test oscilloscope is AC coupled.

Tolerances of voltages and waveforms shown are 20%.



RIGHT
CHOP
ALT
FROM VERT MODE SWITCH
ADD
(LEFT) PLUG-IN MODE FROM B35 J1
(RIGHT) PLUG-IN MODE FROM B35 J2
(SWEEP) HOLDOFF FROM B4 J3
INTENSITY LIMIT FROM A7 J3
AUX Z AXIS FROM A17 J1 FROM A17 J2 FROM A17 J3
EXT Z AXIS FROM P11-1
COMMON FROM P11-2
AUX Z AXIS COMMON FROM B17 J1 FROM B17 J2 FROM B17 J3
SWEEP GATE FROM A1 J3
INTENSITY
Z AXIS INHIBIT FROM P39-1,2
P/o INTERFACE 1
CHOP LOGIC U55 155-011
CLOCK GENERATOR
U123B 1/2 7474N
U123A 1/2 7474N
U156A 1/2 7474N
U156B 1/2 7474N
Q132
Q137
Q150
Q142
Q147
Q162
Q167
Q90
Q108
U99A 1/5 3046
U99B 1/5 3046
U99C 1/5 3046
U99D 1/5 3046
U99E 1/5 3046
TO B7 J1, J2
TO PIN BX VERT INTER
TO PIN CT TRIG SEL
VERTICAL MODE COMMAND
TO A5 J1, J2 CHOP DRIVE
TO A6 J1, J2 CHOP COMMON
TO A6 J3
TO B6 J1, J2, J3 ALT DRIVE
P/o INTERFACE 1
LOGIC BOARD A2
Z AXIS OUT
COMMON
TO P74
+15V
+5V
GND
-15V
P/o INTERFACE 1
VERT DEF X10

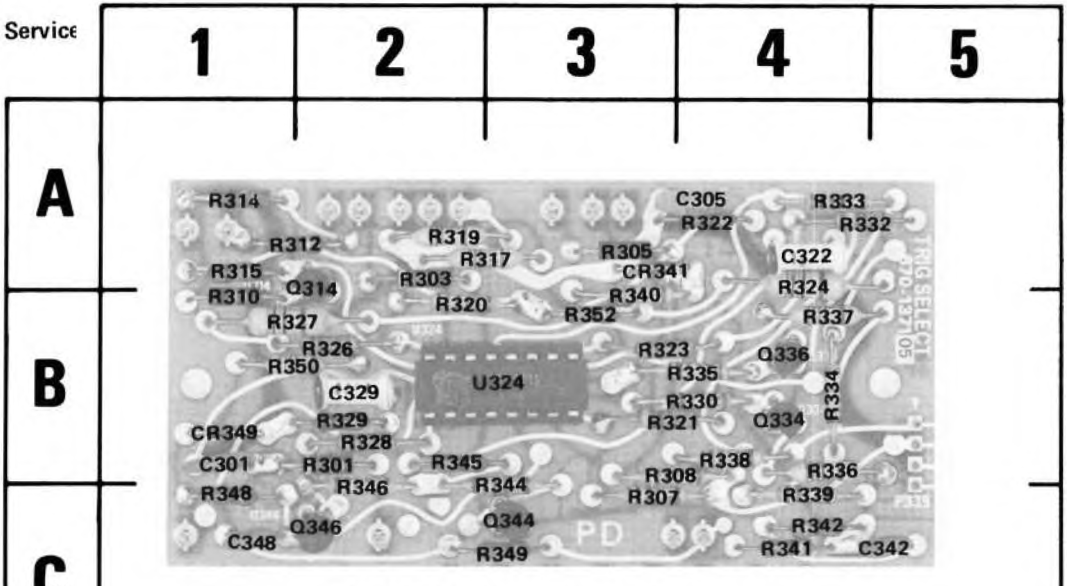
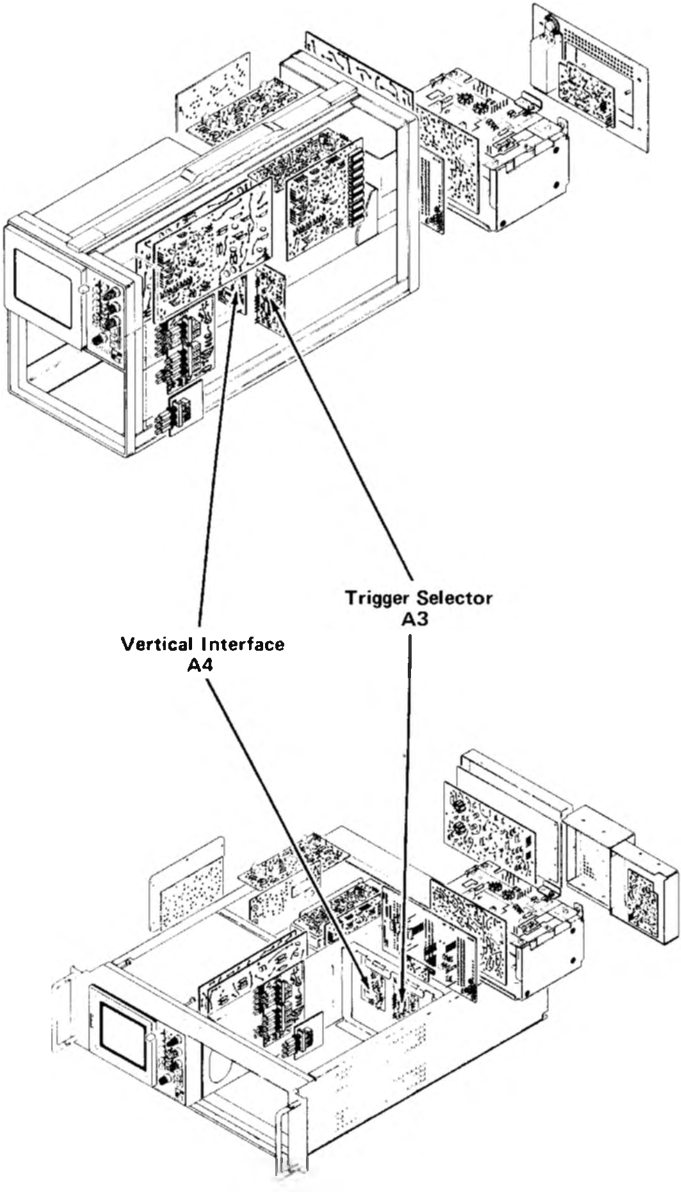


Fig. 6-3. A3 Trigger Select circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C301	1B	Q346	2C	R320	2B	R333	4A	R345	2B
C305	4A			R322	4A	R334	4B	R346	2C
C329	2B	R303	2A	R324	4A	R335	4B	R348	1C
C332	4A	R305	3A	R326	2B	R336	4B	R349	3C
C342	5C	R307	3C	R327	1B	R337	4B	R350	1B
C348	1C	R308	3B	R328	2B	R338	4B	R352	3B
		R310	1B	R329	2B	R339	4C		
CR341	3A	R312	2A	R301	2B	R340	3B	U324	3B
CR349	1B	R314	1A	R321	3B	R341	4C		
		R315	1A	R323	3B	R342	4C		
Q334	4B	R317	2A	R330	4B	R344	3C		
Q336	4B	R319	2A	R332	4A				
Q344	3C								


Trigger Selector
A3
Vertical Interface
A4

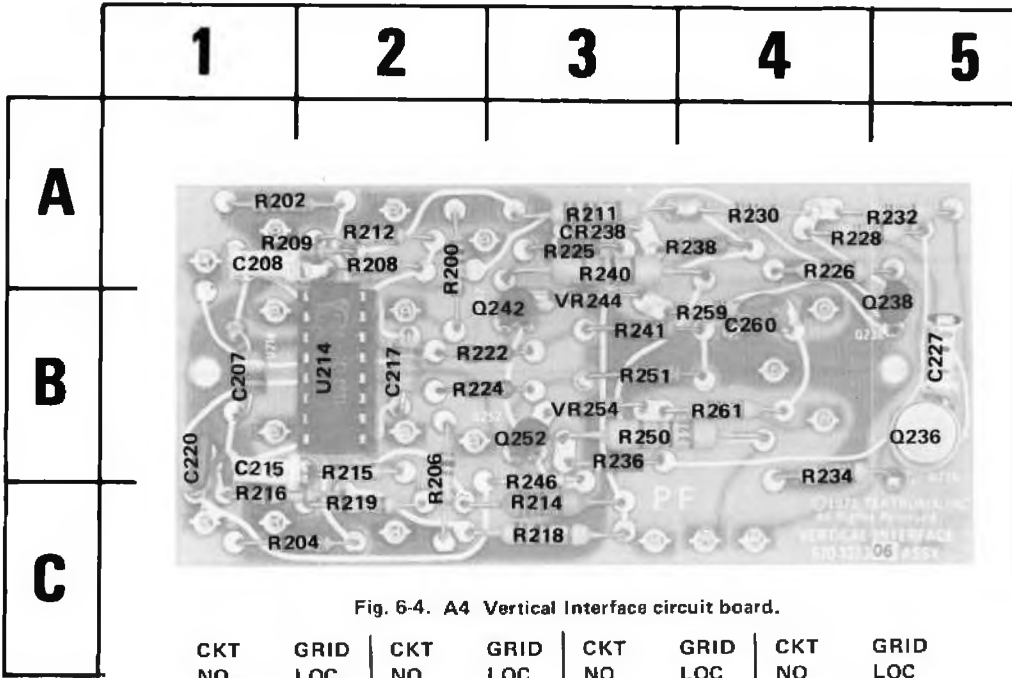


Fig. 6-4. A4 Vertical Interface circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C207	1B	Q242	3B	R215	2B	R236	3B
C208	1A	Q252	3B	R216	1C	R238	4A
C215	1B			R218	3C	R240	3A
C217	2B	R200	2A	R219	2C	R241	3B
C220	1B	R202	1A	R222	2B	R246	3B
C227	5B	R204	1C	R224	2B	R250	3B
C260	4B	R206	2B	R225	3A	R251	3B
		R208	2A	R228	4A	R259	4B
CR238	3A	R209	1A	R226	4A	R261	4B
		R211	3A	R230	4A		
Q236	5B	R212	2A	R232	5A	U214	2B
Q238	5B	R214	3C	R234	4B		
						VR244	3B
						VR254	3B

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS		RECOMMENDED TYPE
Oscilloscope	Frequency response Deflection factor Input impedance Sweep rate	DC to 65 MHz 5 mV to 5 V/Div 10 MΩ, 20 pF 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.		Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance Range	10 MΩ 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

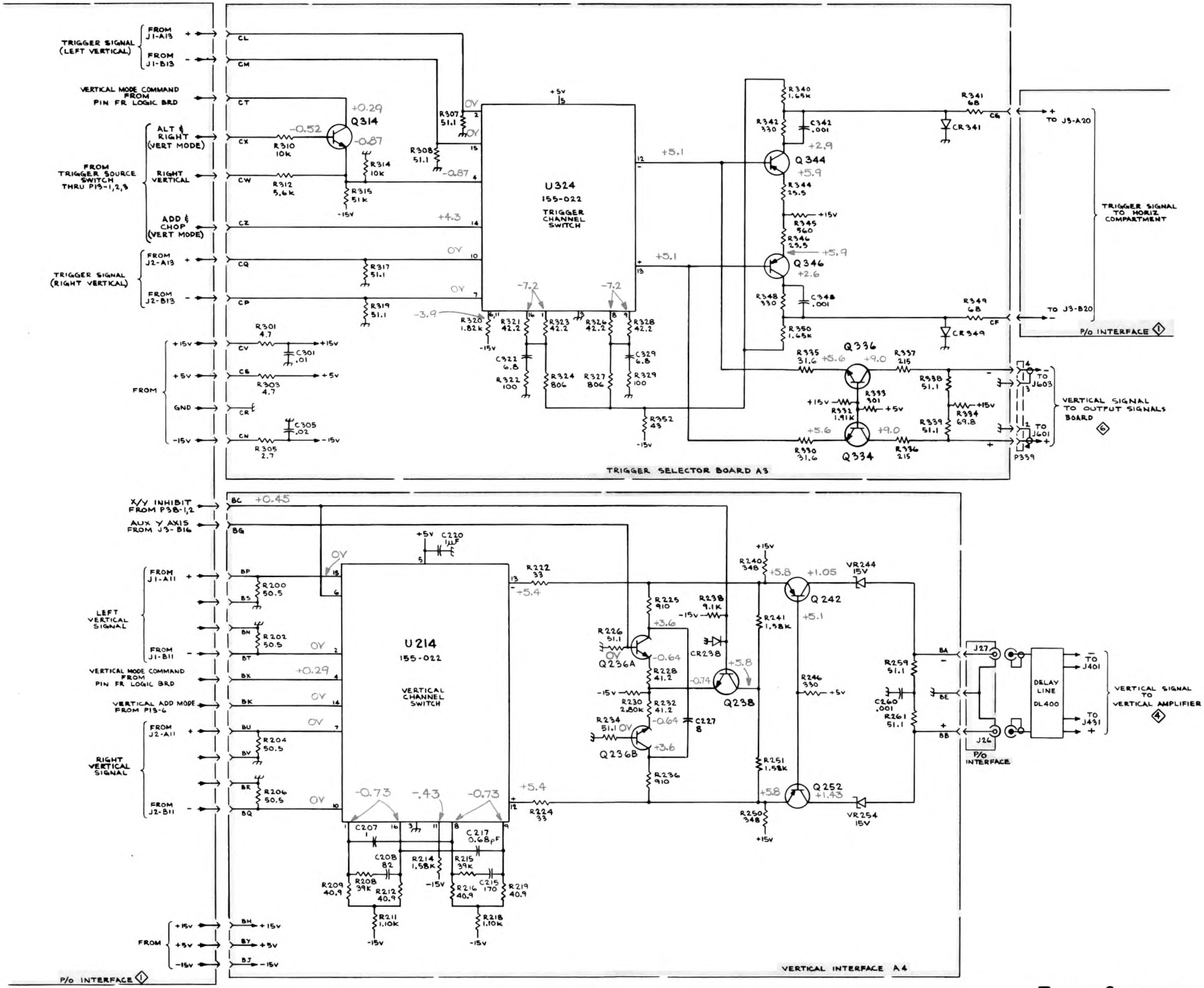
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The test oscilloscope 4 Volts calibration signal is applied to the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep, 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is externally triggered from the +GATE OUT (MAIN) of the 7623 mainframe under test. The test oscilloscope is AC coupled.

Tolerances of voltages and waveforms shown are 20%.



7623

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TRIGGER SELECTOR & VERTICAL INTERFACE ③

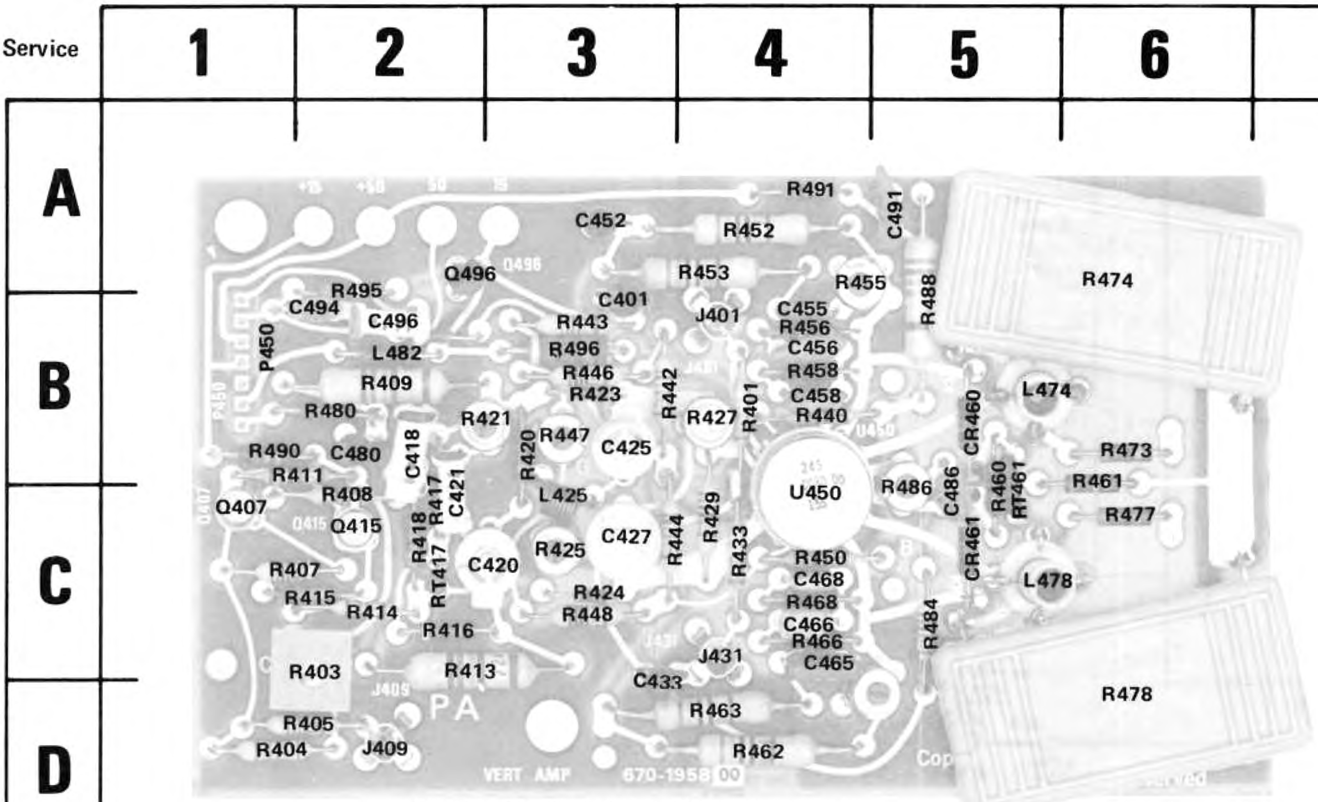
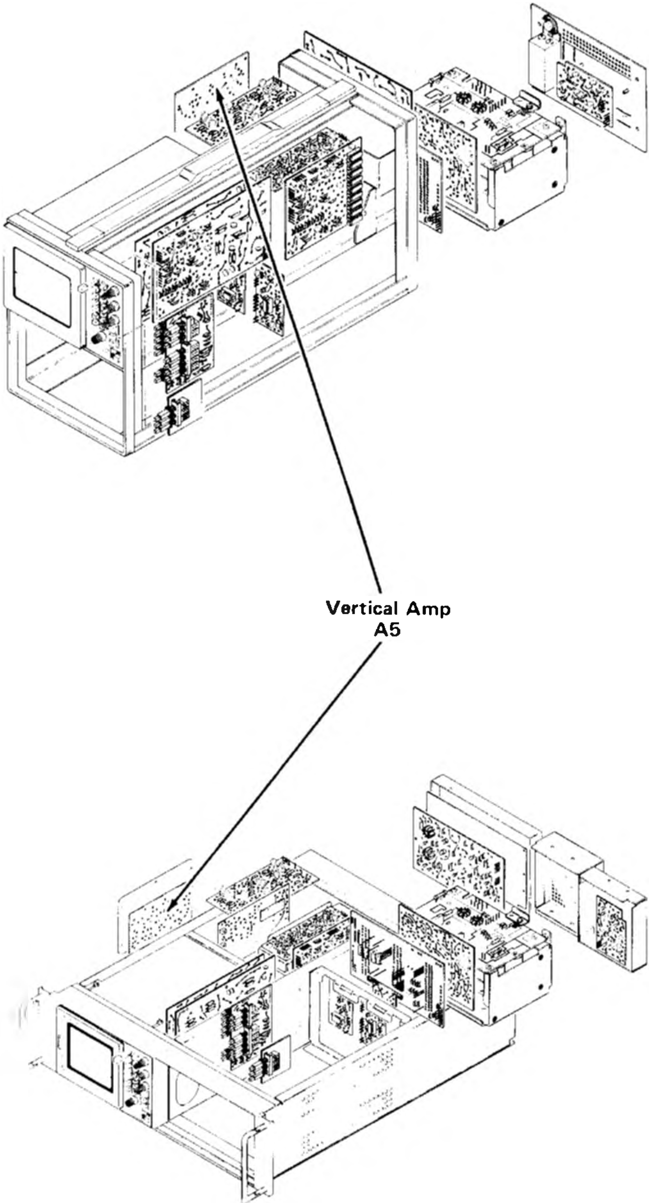


Fig. 6-5. A5 Vertical Amplifier circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C401	3B	CR460	5B	R403	2C	R425	3C	R461	6B
C418	2B	CR461	5C	R404	1D	R427	4B	R462	4D
C420	2C			R405	2D	R429	4C	R463	4D
C421	2C	J401	4B	R407	2C	R433	4C	R466	4C
C425	3B	J409	2D	R408	2C	R440	4B	R468	4C
C427	3C	J431	4C	R409	2B	R442	3B	R473	6B
C433	3D			R411	2B	R443	3B	R474	6A
C452	3A	L425	3C	R413	2C	R444	3C	R477	6C
C455	4B	L474	5B	R414	2C	R446	3B	R478	6D
C456	4B	L478	5C	R415	2C	R447	3B	R480	2B
C458	4B	L482	2B	R416	2C	R448	3C	R484	5C
C465	4C			R417	2C	R450	5C	R486	5C
C466	4C	Q407	1C	R418	2C	R452	4A	R488	5B
C468	4C	Q415	2C	R420	3B	R453	4A	R490	1B
C486	5C	Q496	2A	R421	2B	R455	4A	R492	4A
C494	2B			R423	3B	R456	4B	R495	2A
C496	2B	R401	4B	R424	3C	R458	4B	R496	3B
								RT417	2C
								U450	4C


Vertical Amp
A5

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS		RECOMMENDED TYPE
Oscilloscope	Frequency response Deflection factor Input impedance Sweep rate	DC to 65 MHz 5 mV to 5 V/Div 10 MΩ, 20 pF 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.		Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance Range	10 MΩ 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

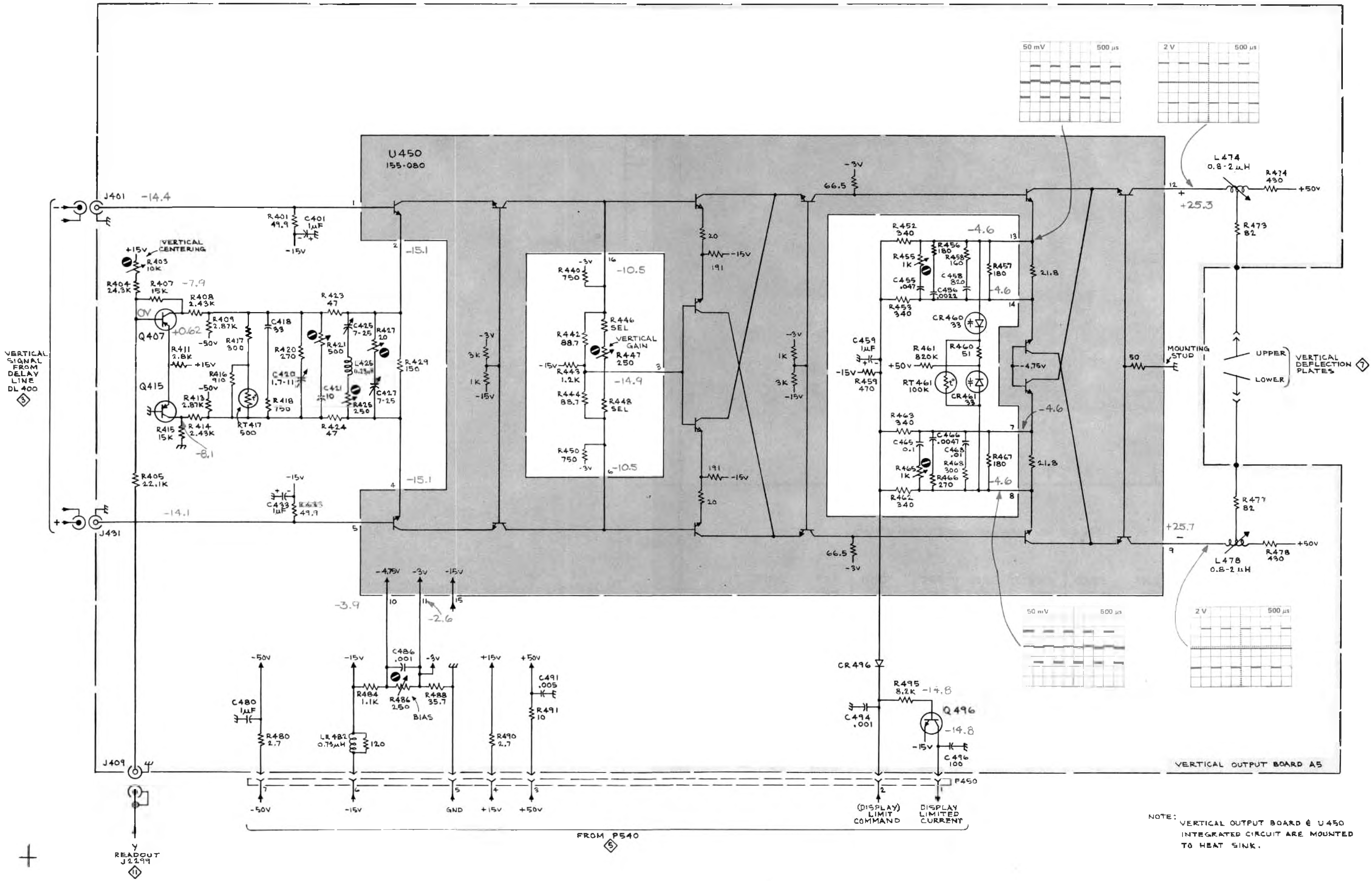
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The test oscilloscope 4 Volts calibration signal is applied to the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep, 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is externally triggered from the +GATE OUT (MAIN) of the 7623 mainframe under test. The test oscilloscope is AC coupled.

Tolerances of voltages and waveforms shown are 20%.



U450
155-080
VERTICAL SIGNAL FROM DELAY LINE DL 400
J401
J431
J409
Y READOUT J2299
VERTICAL CENTERING
R403 10K
R404 24.3K
R407 15K
R408 2.43K
R409 2.87K
R411 2.8K
R413 2.87K
R414 2.43K
R415 15K
R405 22.1K
Q407
Q415
R416 910
R417 300
RT417 500
C418 33
R418 750
R420 270
C420 1.7-11
R421 500
C421 10
R423 47
R424 47
C425 7-25
R425 250
L426 0.25μH
R427 20
C427 7-25
R429 150
R401 49.9
C401 1μF
C433 1μF
R433 49.9
R440 750
R442 88.7
R443 1.2K
R444 88.7
R446 SEL
R447 250
VERTICAL GAIN
R448 SEL
R450 750
R452 340
R453 340
R455 1K
C455 .047
R456 180
R458 160
C458 820
C456 .0022
R457 180
CR460 33
R460 51
R461 820K
C459 1μF
R459 470
RT461 100K
CR461 33
R463 340
C465 0.1
C466 .0047
C468 .01
R465 1K
R468 300
R466 270
R467 180
R462 340
MOUNTING STUD
L474 0.8-2μH
R474 430
R473 82
R477 82
L478 0.8-2μH
R478 430
UPPER
LOWER
VERTICAL DEFLECTION PLATES
C480 1μF
R480 2.7
R484 1.1K
C486 .001
R486 250
BIAS
R488 35.7
LR482 0.75μH
R490 2.7
C491 .005
R491 10
CR496
R495 8.2K
C494 .001
Q496
C496 100
P450
FROM P540
(DISPLAY) LIMIT COMMAND
DISPLAY LIMITED CURRENT
VERTICAL OUTPUT BOARD A5
NOTE: VERTICAL OUTPUT BOARD & U450 INTEGRATED CIRCUIT ARE MOUNTED TO HEAT SINK.
50 mV 500 μs
2 V 500 μs

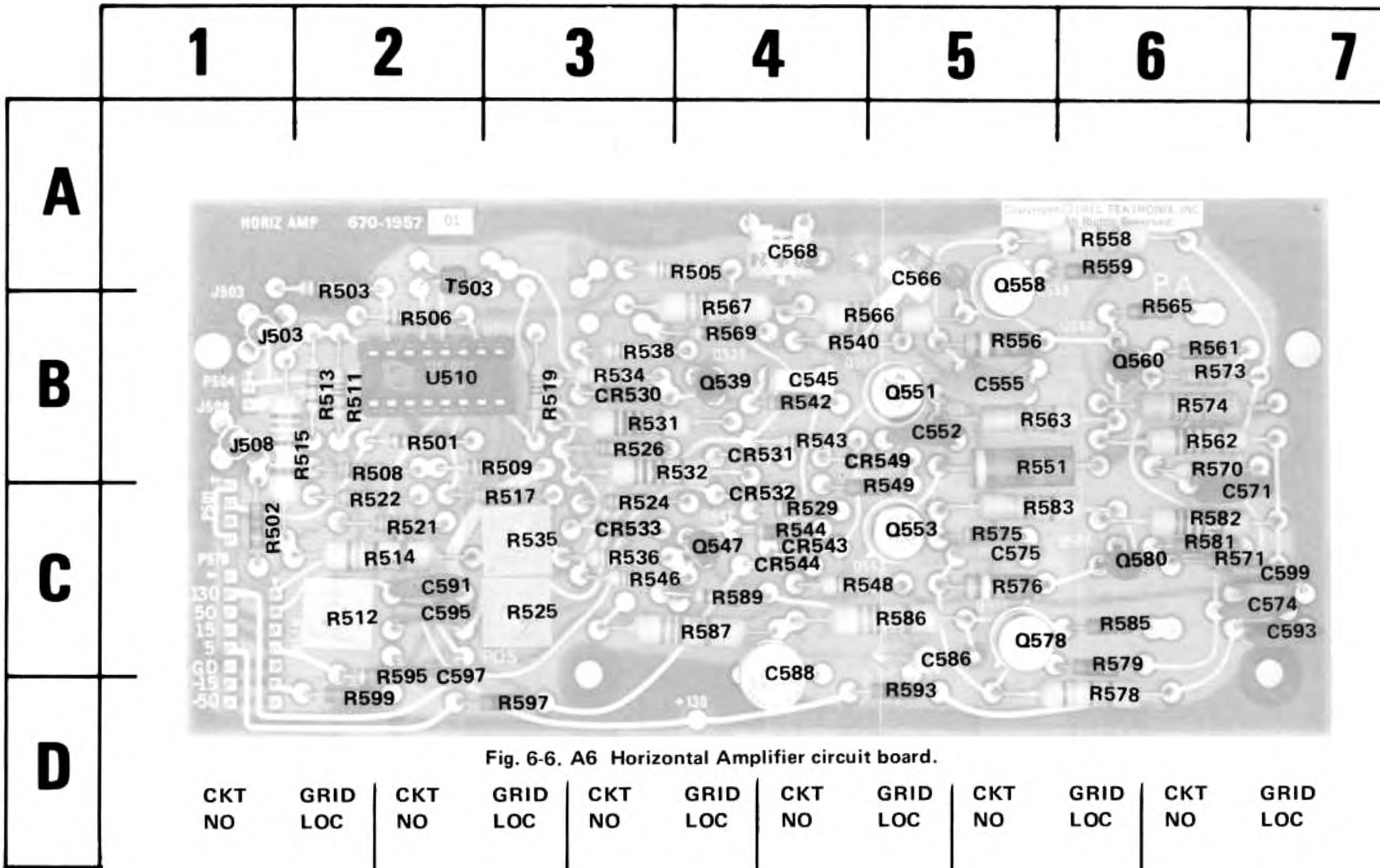
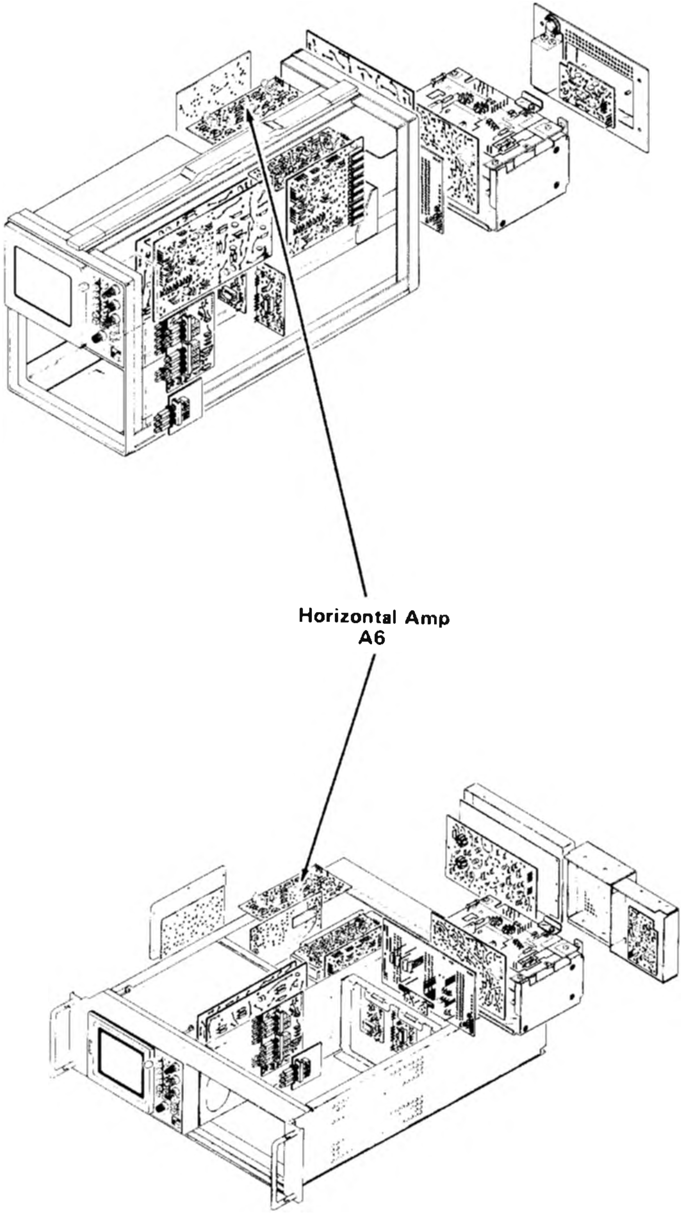


Fig. 6-6. A6 Horizontal Amplifier circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C545	4B	CR531	4B	R501	2B	R525	3C	R556	5B	R579	6C
C552	5B	CR532	4C	R502	1C	R526	3B	R558	6A	R581	6C
C555	5B	CR533	3C	R503	2A	R529	4C	R559	6A	R582	6C
C566	5A	CR543	4C	R505	4A	R531	3B	R561	6B	R583	5C
C568	4A	CR544	4C	R506	2B	R532	4B	R562	6B	R585	6C
C571	7C	CR549	5B	R508	2B	R534	3B	R563	5B	R586	5C
C574	2C			R509	3B	R535	3C	R565	6B	R587	4C
C575	5C	J503	1B	R511	2B	R536	3C	R566	4B	R589	4C
C586	5C	J508	1B	R512	2C	R538	3B	R567	4B	R593	5D
C588	4C			R513	2B	R540	4B	R569	4B	R595	2C
C591	2C	Q539	4B	R514	2C	R542	4B	R570	6B	R597	3D
C593	7C	Q547	4C	R515	2B	R543	4B	R571	6C	R599	2D
C595	2C	Q551	5B	R517	3C	R544	4C	R573	6B		
C597	2C	Q553	5C	R519	3B	R546	3C	R574	6B	U510	2B
C599	7C	Q558	5A	R521	2C	R548	5C	R575	5C		
		Q560	6B	R522	2C	R549	5B	R576	5C		
CR530	3B	Q578	5C	R524	3C	R551	5B	R578	6D		
		Q580	6C								


Horizontal Amp
A6

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS		RECOMMENDED TYPE
Oscilloscope	Frequency response Deflection factor Input impedance Sweep rate	DC to 65 MHz 5 mV to 5 V/Div 10 MΩ, 20 pF 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.		Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance Range	10 MΩ 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

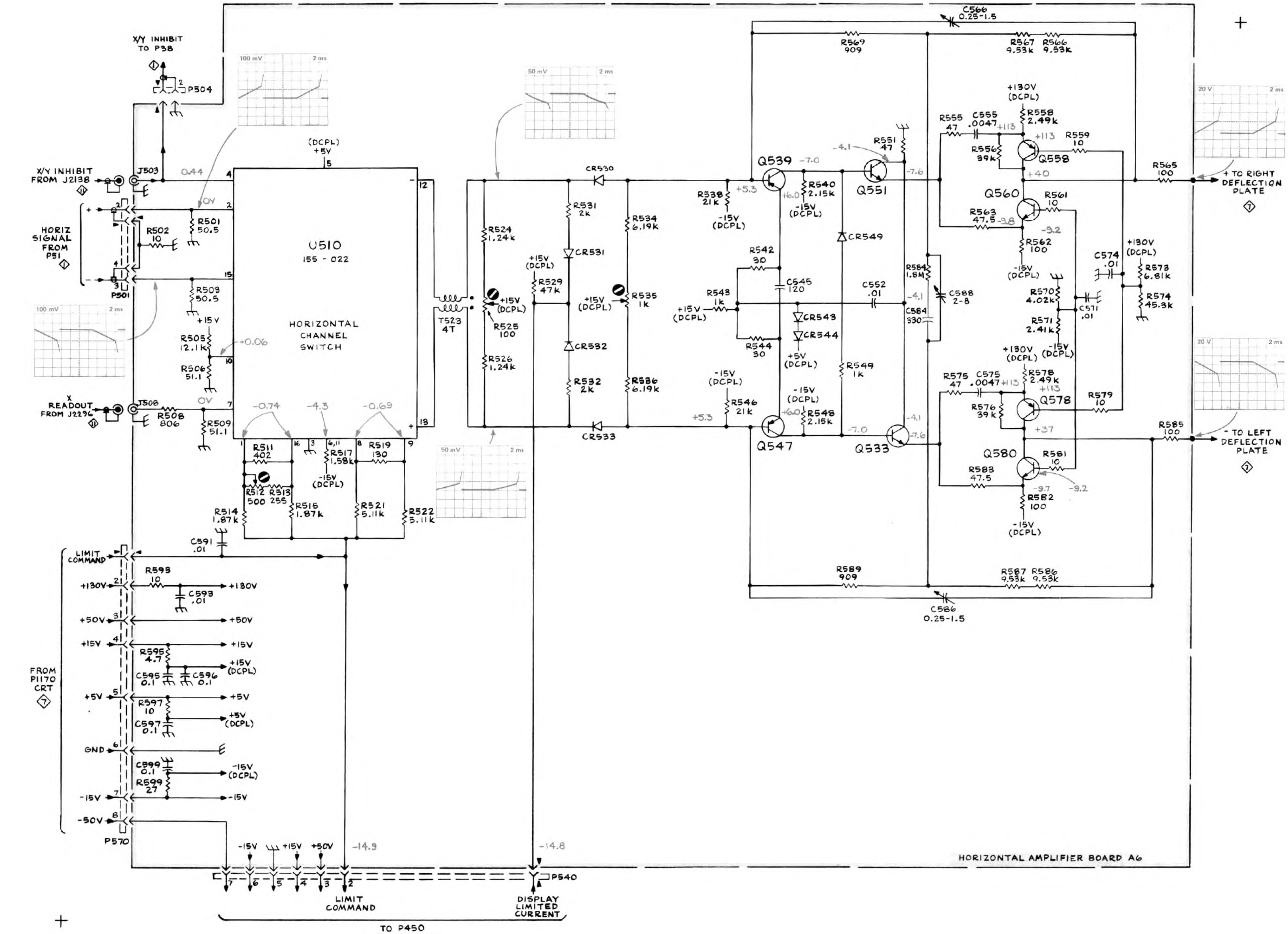
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The test oscilloscope 4 Volts calibration signal is applied to the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep, 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is externally triggered from the +GATE OUT (MAIN) of the 7623 mainframe under test. The test oscilloscope is AC coupled.

Tolerances of voltages and waveforms shown are 20%.



HORIZONTAL AMPLIFIER ⑤

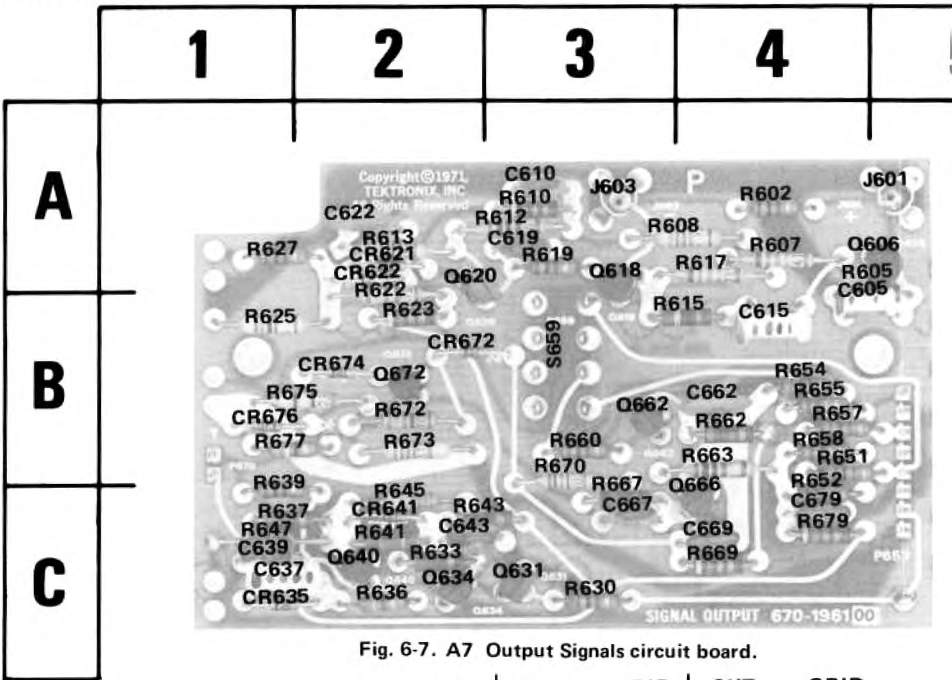
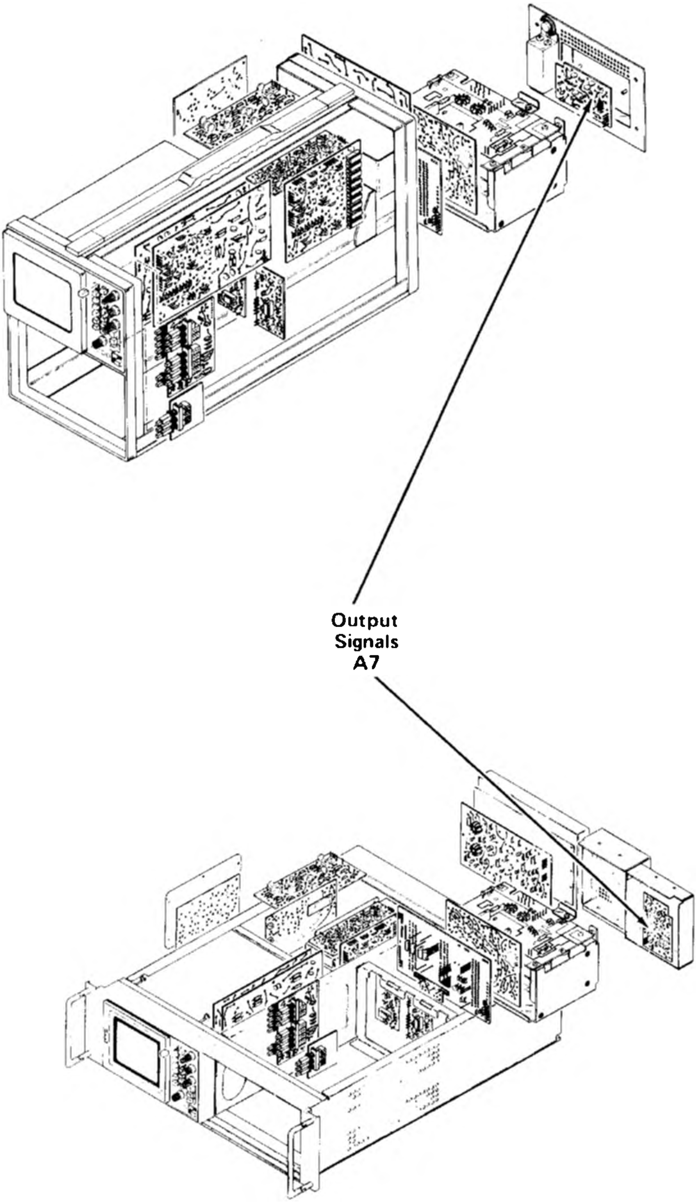


Fig. 6-7. A7 Output Signals circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C605	4A	Q606	5A	R636	2C
C610	3A	Q618	3A	R637	1C
C615	4B	Q620	2A	R639	1B
C619	3A	Q631	3C	R641	2C
C622	2A	Q634	2C	R643	2C
C637	1C	Q640	2C	R645	2C
C639	1C	Q662	3B	R647	1C
C643	2C	Q666	4B	R651	4B
C667	3C	Q672	2B	R652	4B
C669	4C			R654	4B
C679	4C	R602	4A	R655	4B
C682	4B	R605	5A	R657	4B
		R607	4A	R658	4B
CR621	2A	R610	3A	R660	3B
CR622	2A	R612	3A	R662	4B
CR635	1C	R613	2A	R663	4B
CR641	2C	R615	3B	R667	3B
CR672	2A	R617	4A	R669	4C
CR674	2B	R619	3A	R670	3B
CR676	1B	R622	2A	R672	2B
		R623	2B	R673	2B
J601	5A	R625	1B	R675	1B
J603	3A	R627	1A	R677	1B
		R630	3C	R679	4C
		R633	2C	R688	3A
				S659	3B


Output
Signals
A7

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

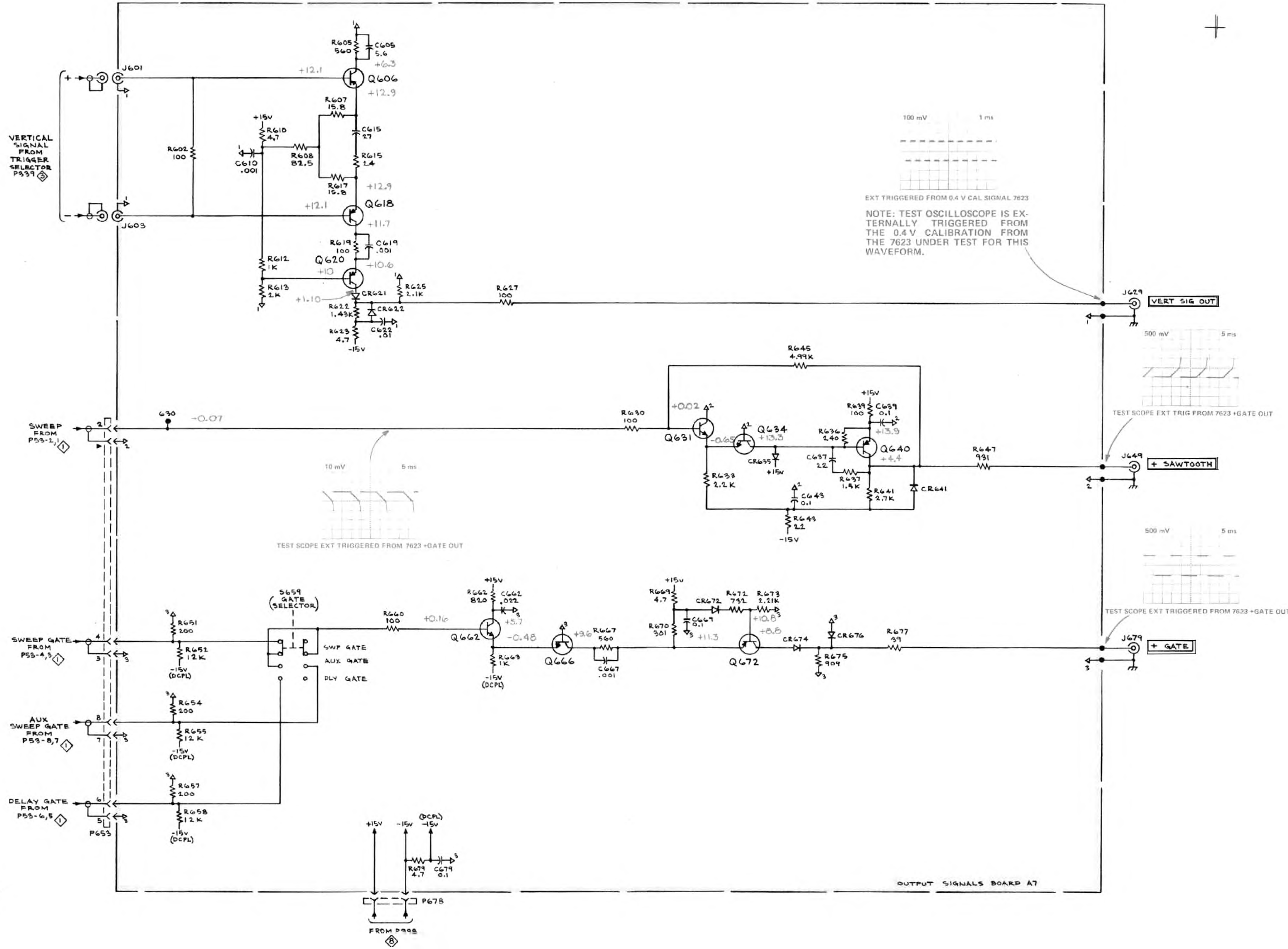
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The test oscilloscope 4 Volts calibration signal is applied to the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep, 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is externally triggered from the +GATE OUT (MAIN) of the 7623 mainframe under test. The test oscilloscope is AC coupled.

Tolerances of voltages and waveforms shown are 20%.


VERTICAL SIGNAL FROM TRIGGER SELECTOR P339 3
J601
J603
R602 100
R605 560
C605 5.6
Q606
R607 15.8
R610 4.7
C610 .001
R608 82.5
C615 27
R615 24
R617 15.8
Q618
R619 100
C619 .001
R612 1K
R613 2K
Q620
CR621
R622 1.43K
CR622
R623 4.7
C622 .01
R625 2.1K
R627 100
J629
VERT SIG OUT
EXT TRIGGERED FROM 0.4 V CAL SIGNAL 7623
NOTE: TEST OSCILLOSCOPE IS EXTERNALLY TRIGGERED FROM THE 0.4 V CALIBRATION FROM THE 7623 UNDER TEST FOR THIS WAVEFORM.
SWEEP FROM P53-2,1 1
630
R630 100
R645 4.99K
Q631
Q634
CR635
R636 240
R639 100
C639 0.1
Q640
C637 22
R637 1.5K
R638 2.2K
C643 0.1
R643 22
R641 2.7K
CR641
R647 931
J649
+ SAWTOOTH
TEST SCOPE EXT TRIG FROM 7623 +GATE OUT
TEST SCOPE EXT TRIGGERED FROM 7623 +GATE OUT
SWEEP GATE FROM P53-4,3 1
AUX SWEEP GATE FROM P53-8,7 1
DELAY GATE FROM P53-6,5 1
P653
R651 200
R652 12K
R654 200
R655 12K
R657 200
R658 12K
S659 GATE SELECTOR
SWP GATE
AUX GATE
DLY GATE
R660 100
R662 820
C662 .022
Q662
R663 1K
Q666
R667 560
C667 .001
R669 4.7
R670 301
C669 0.1
CR672
R672 732
R673 2.21K
Q672
CR674
CR676
R675 909
R677 39
J679
+ GATE
TEST SCOPE EXT TRIGGERED FROM 7623 +GATE OUT
R679 4.7
C679 0.1
P678
FROM P999 8
OUTPUT SIGNALS BOARD A7

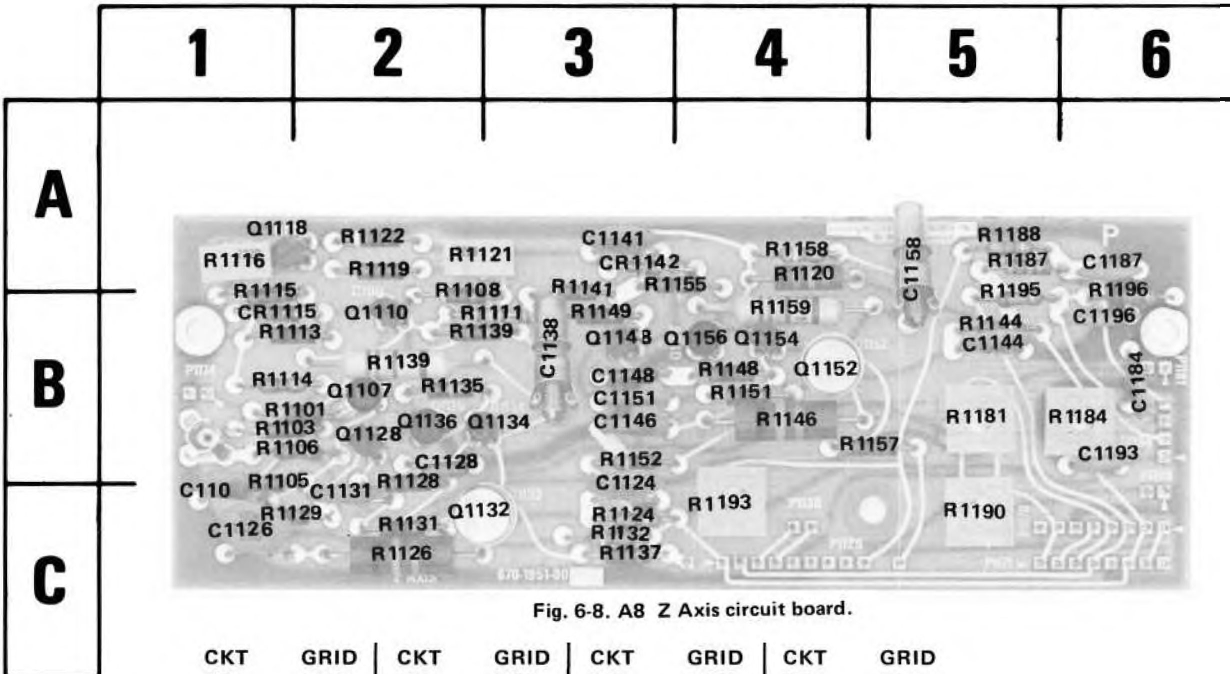


Fig. 6-8. A8 Z Axis circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C1124	3B	Q1107	2B	R1111	2B	R1135	2B
C1126	1C	Q1110	2B	R1113	1B	R1137	3C
C1128	2B	Q1128	2B	R1114	1B	R1139	2B
C1131	2C	Q1132	2C	R1115	1A	R1141	3A
C1138	3B	Q1134	3B	R1116	1A	R1144	5B
C1141	3A	Q1136	2B	R1119	2A	R1146	4B
C1144	5B	Q1148	3B	R1120	4A	R1148	4B
C1146	3B	Q1152	4B	R1121	2A	R1149	3B
C1148	3B	Q1154	4B	R1122	2A	R1151	4B
C1151	3B	Q1156	4B	R1124	3C	R1152	3B
C1158	5A			R1126	2C	R1155	3A
C1184	6B	R1101	1B	R1128	2C	R1157	4B
C1187	6A	R1103	1B	R1129	1C	R1158	4A
C1193	6C	R1105	1B	R1131	2C	R1159	4B
C1196	6B	R1106	1B	R1132	3C	R1181	5B
		R1108	2A			R1184	6B
CR1115	1B					R1187	5A
CR1142	3A					R1188	5A
						R1190	5C
						R1193	4C
						R1195	5B
						R1196	6B

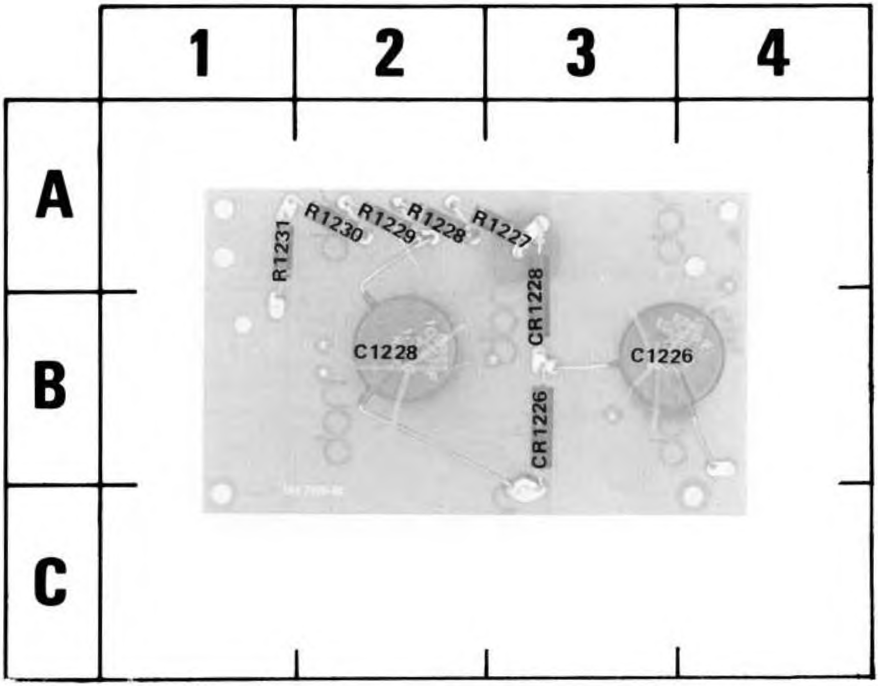


Fig. 6-9. A9 High Voltage No. 1 circuit board.

CKT NO	GRID LOC
C1226	3B
C1228	2B
CR1226	3B
CR1228	3B
R1227	3A
R1228	2A
R1229	2A
R1230	2A
R1231	1A

Ⓐ

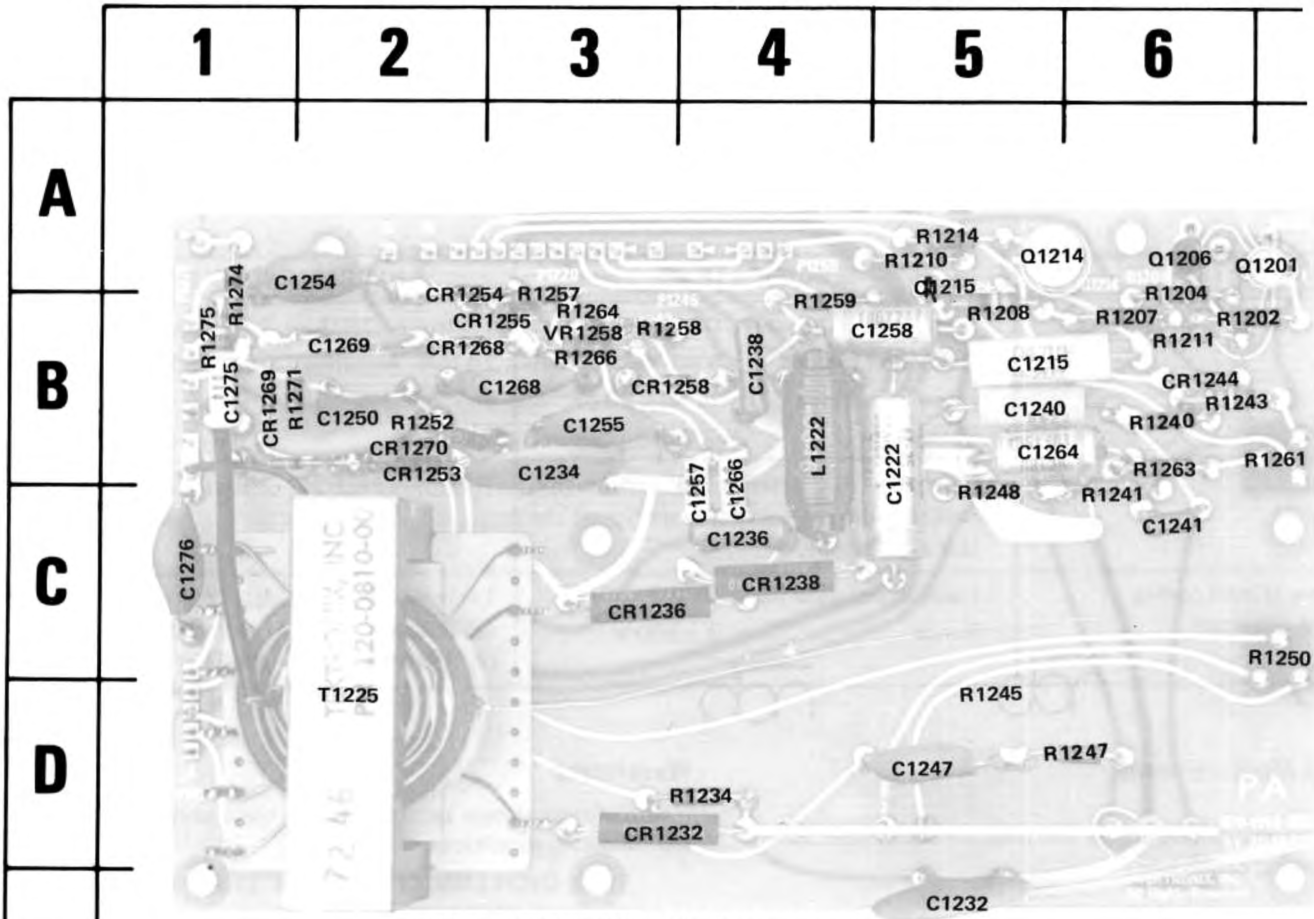


Fig. 6-10. A10 High Voltage No. 2 circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C1215	5A	C1258	5B	CR1255	3B	R1207	6B	R1257	3B
C1222	5B	C1264	5B	CR1258	4B	R1208	5B	R1259	4B
C1232	5E	C1266	4B	CR1268	2B	R1210	5A	R1261	7B
C1234	3B	C1268	3B	CR1269	1B	R1211	6B	R1263	6B
C1236	4C	C1269	2B	CR1270	2B	R1214	5A	R1264	3B
C1238	4B	C1275	1B			R1234	4D	R1266	3B
C1240	5B	C1276	1C	L1222	4B	R1241	6C	R1271	2B
C1241	6C					R1243	6B	R1274	1B
C1247	5D	CR1232	3D	Q1201	7A	R1245	5D	R1275	1B
C1250	2B	CR1236	3C	Q1206	6A	R1247	6D		
C1254	2A	CR1238	4C	Q1214	5A	R1248	5C	T1225	2D
C1255	3B	CR1244	6B			R1250	7C		
C1257	4B	CR1253	2B	R1202	6B	R1252	2B	VR1258	3B
		CR1254	2A	R1204	6A				

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

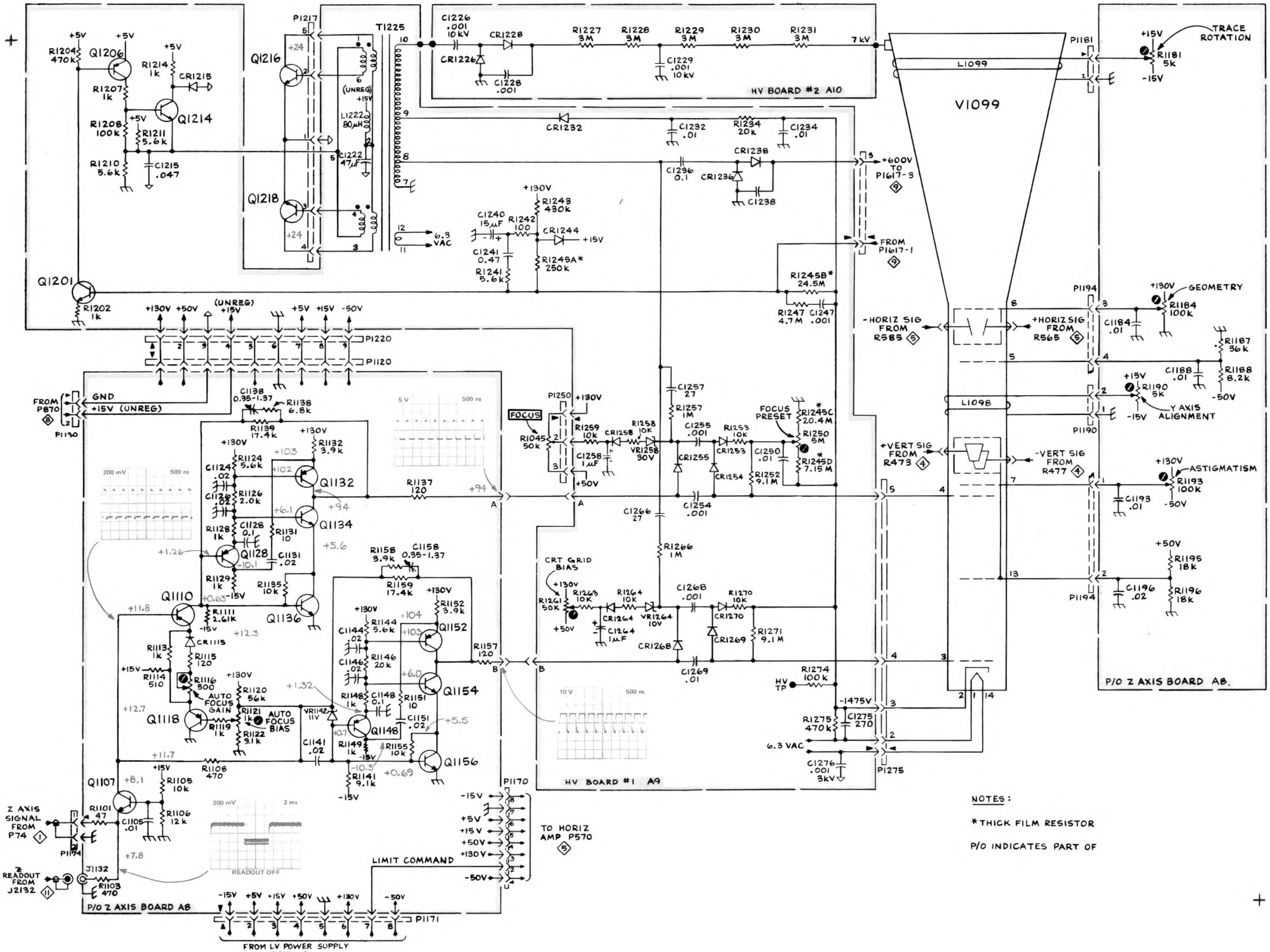
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The test oscilloscope 4 Volts calibration signal is applied to the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep, 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is externally triggered from the +GATE OUT (MAIN) of the 7623 mainframe under test. The test oscilloscope is AC coupled.

Tolerances of voltages and waveforms shown are 20%.



NOTES:

*THICK FILM RESISTOR

P/O INDICATES PART OF

7623

CRT CIRCUIT ⑦

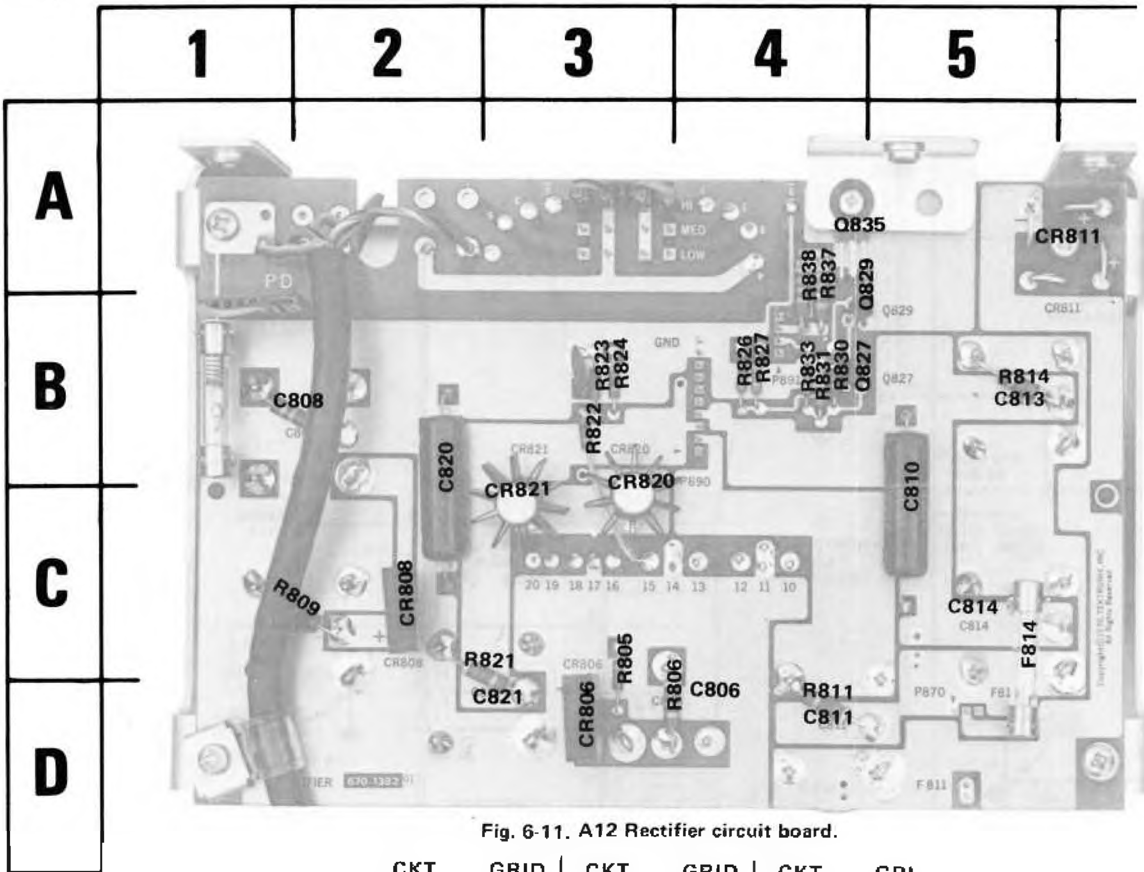
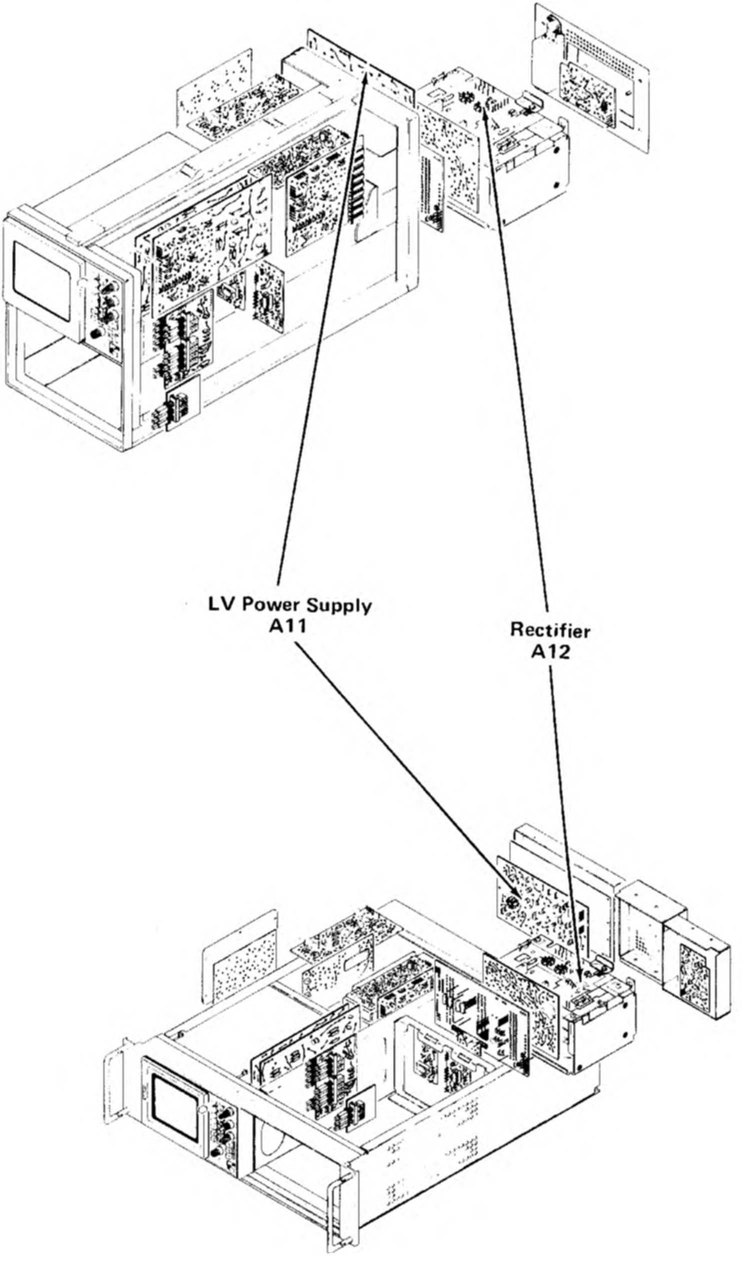


Fig. 6-11. A12 Rectifier circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRI LOC
C806	4D	CR821	3C	R826	4B
C808	2B			R827	4B
C810	5B	F814	5C	R830	4B
C811	4D			R831	4B
C813	5B	R805	3C	R833	4B
C814	5C	R806	3D	R837	4A
C820	2B	R811	4D	R838	4A
C821	3D	R814	5B		
		R821	3C	Q827	4B
CR808	2C	R822	3B	Q829	4A
CR811	6A	R823	3B	Q835	4A
CR820	3B	R824	3B		


LV Power Supply
A11
Rectifier
A12

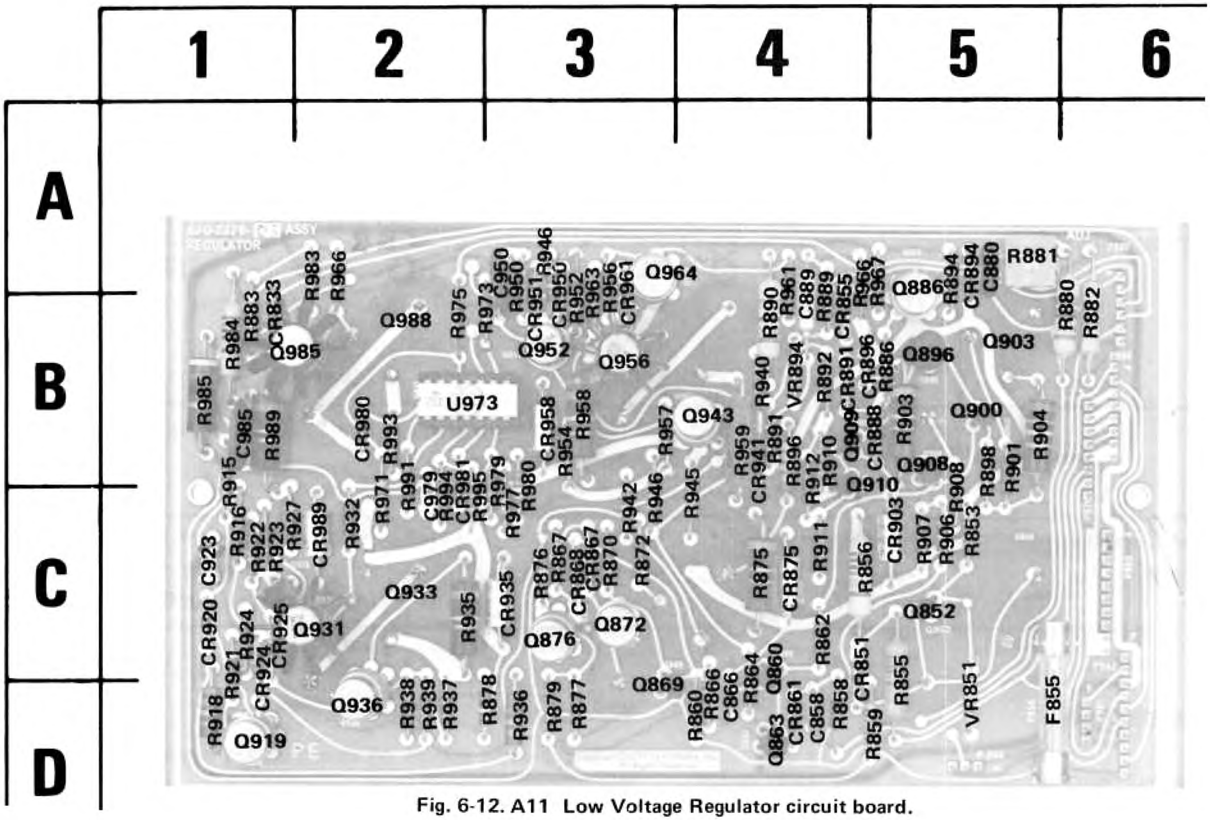


Fig. 6-12. A11 Low Voltage Regulator circuit board.

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
C866	4D	CR941	4B	Q908	5B	R864	4C	R898	5B	R938	2D	R980	3C
C880	5A	CR950	3B	Q909	4B	R866	4D	R901	5B	R939	2D	R979	3C
C889	4B	CR951	3B	Q910	4C	R867	3C	R903	5B	R940	4B	R983	2A
C923	1C	CR958	3B	Q919	1D	R870	3C	R904	5B	R942	3C	R984	1B
C950	3A	CR961	3B	Q931	2C	R872	3C	R906	5C	R945	4C	R985	1B
C979	2C	CR980	2B	Q933	2C	R875	4C	R907	5C	R946	3A	R989	1B
C985	1B	CR981	2C	Q936	2D	R876	3C	R910	4B	R950	3A	R966	2A
		CR989	2C	Q943	4B	R877	3D	R911	4C	R952	3B	R991	2C
CR833	1B			Q952	3B	R878	3D	R912	4B	R954	3B	R993	2B
CR851	4C	F855	5D	Q956	3B	R879	3D	R915	1B	R956	3B	R994	2C
CR855	4B			Q964	3A	R880	6B	R916	1C	R957	3B	R995	2C
CR861	4D	Q852	5C	Q985	1B	R881	5A	R918	1D	R958	3B		
CR867	3C	Q860	4C	Q988	2B	R882	6B	R921	1C	R959	4B	U973	2B
CR868	3C	Q863	4D			R883	1B	R922	1C	R961	4B		
CR875	4C	Q869		R853	5C	R886	5B	R923	1C	R963	3B	VR894	4B
CR888	4B	Q872	3C	R855	5D	R889	4B	R924	1C	R966	4B	VR851	5D
CR891	4B	Q876	3C	R856	4C	R890	4B	R927	1C	R967	5A		
CR894	5A	Q886	5A	R858	4D	R891	4B	R932	2C	R971	2C		
CR896	4B	Q896	5B	R859	5D	R892	4B	R935	2C	R975	2B		
CR903	5C	Q900	5B	R860	4D	R894	5A	R936	3D	R977	3C		
CR924	1C	Q903	5B	R862	4C	R896	4B	R937	2D	R978	2B		
CR925	1C												
CR935	3C												

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS		RECOMMENDED TYPE
Oscilloscope	Frequency response Deflection factor Input impedance Sweep rate	DC to 65 MHz 5 mV to 5 V/Div 10 MΩ, 20 pF 500 ns	Tektronix 7603 or 7613 equipped with 7A22 Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.		Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance Range	10 MΩ 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.
Calibration Fixture	Used for loading power supply for ripple waveforms.		Tektronix Signal Standardizer, Tektronix Part Number 067-0587-01, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set knob type front panel controls (except READOUT) to mid-range.

Turn READOUT to off.

Set VERT MODE for CHOP.

Set for NON STORE condition.

Set TRIG SOURCE for VERT MODE.

No plug-ins are installed.

Voltmeter common is connected to chassis ground.

Waveforms

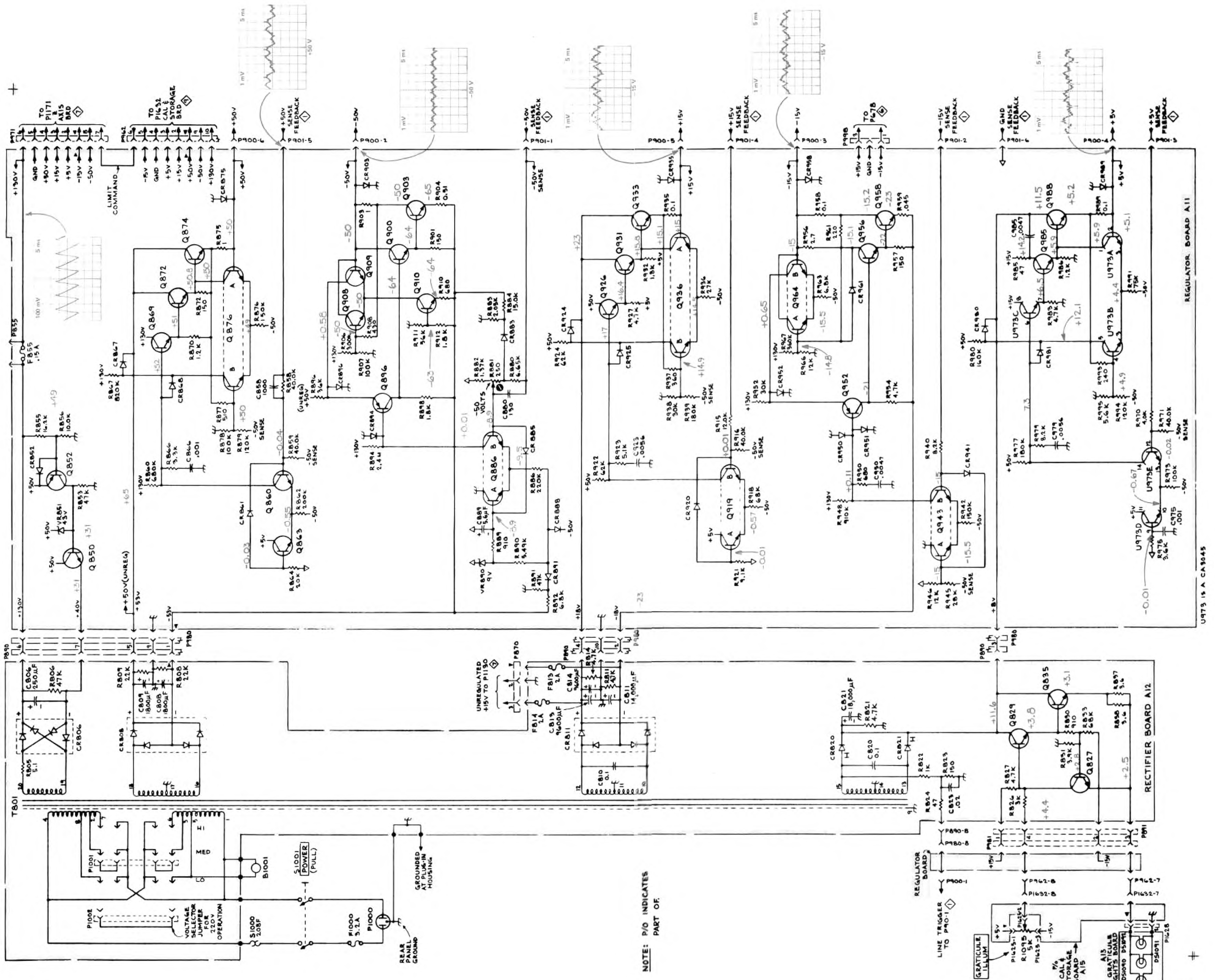
Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A signal standardizer plug-in unit is installed in the vertical plug-in position and a 7B53AN Time Base unit in a horizontal position. The signal standardizer plug-in unit is used for power supply loading and is set for AUX IN with a REP RATE of 100 Hz. No signal is applied. The 7B53AN is set for free running sweep of 1 ms/Division.

TEST OSCILLOSCOPE. The test oscilloscope is AC coupled and set for LINE trigger. A 7A22 Vertical plug-in unit is installed and set as follows:

HF –3 dB POINT	30 kHz
LF –3 dB POINT	DC
+INPUT	AC
–INPUT	GND

Tolerances of voltages and waveforms shown are 20%.



7623

Ⓐ

LV Power Supply

⑧

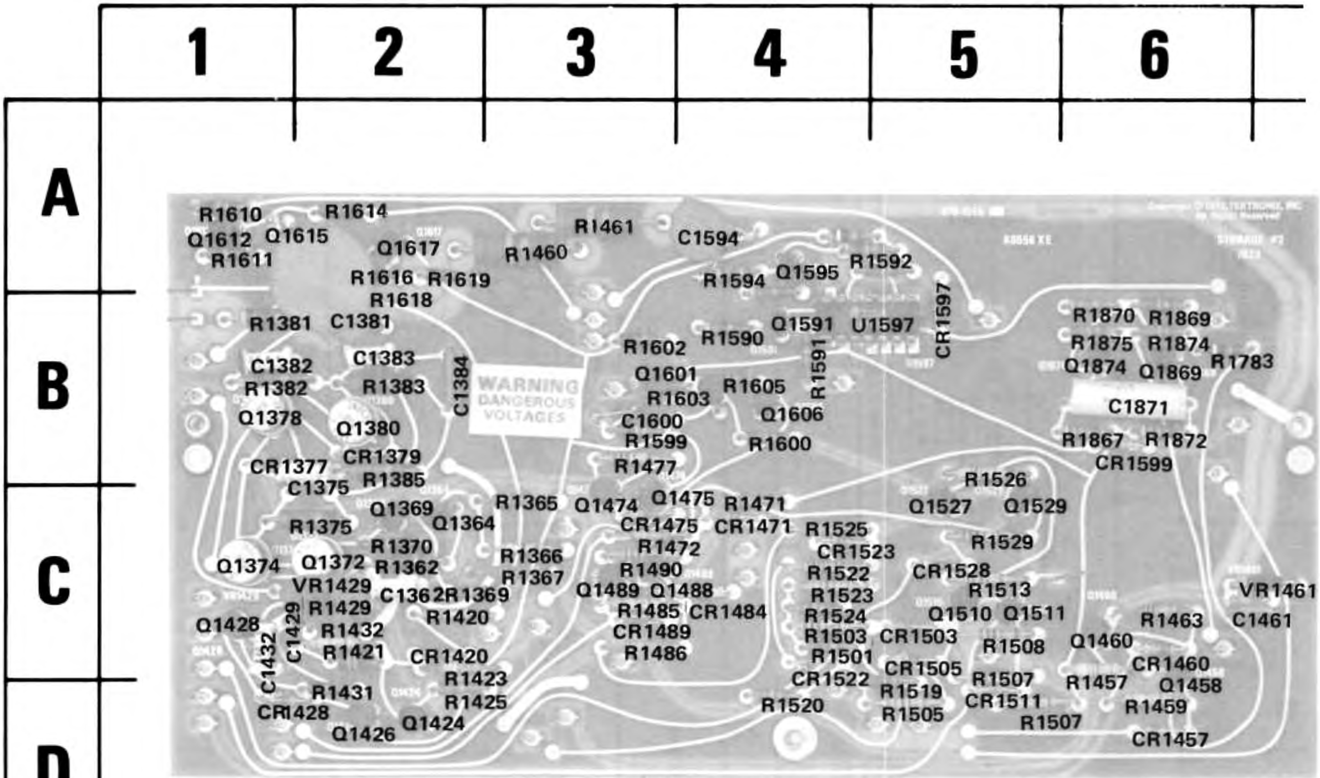
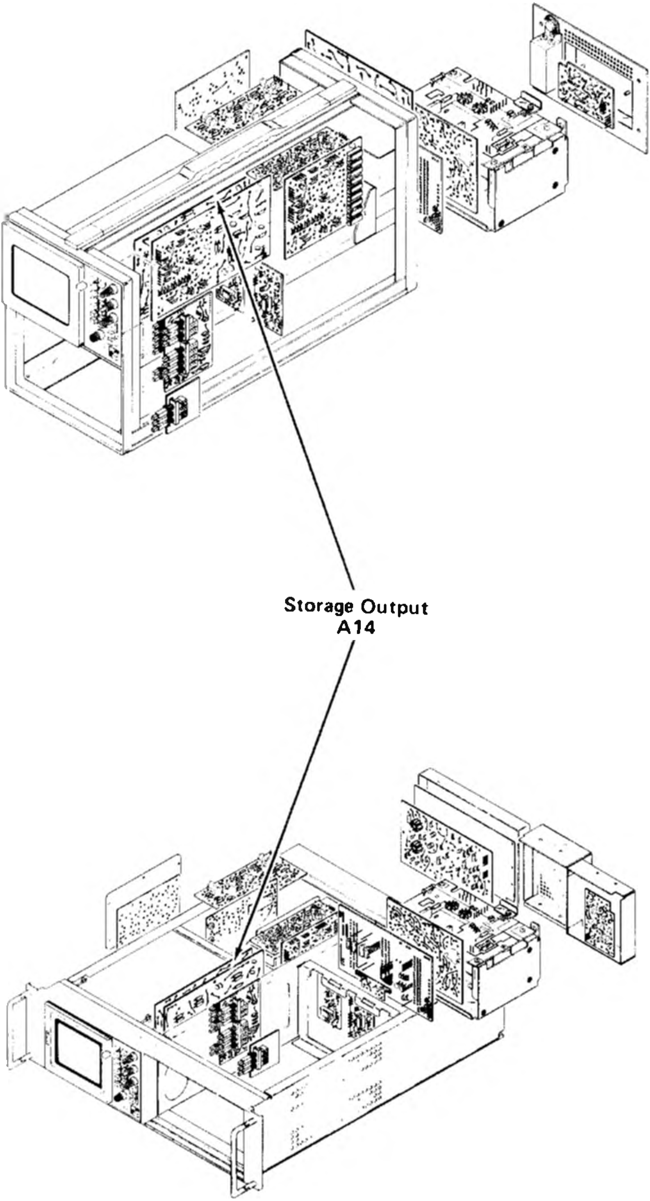


Fig. 6-13. A14 Storage circuit board.

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
C1362	2C	CR1475	3C	Q1424	2D	Q1606	4B	R1421	2C	R1507	5D	R1605	4B
C1375	2C	CR1484	4C	Q1426	2D	Q1612	1A	R1423	2C	R1508	5C	R1610	1A
C1381	2B	CR1489	3C	Q1428	1C	Q1615	1A	R1425	2D	R1513	5C	R1611	1A
C1382	1B	CR1503	5C	Q1429	1C	Q1617	2A	R1429	2C	R1519	5D	R1614	2A
C1383	2B	CR1505	5C	Q1432	1C	Q1869	6B	R1431	2D	R1520	4D	R1616	2A
C1384	2B	CR1511	5D	Q1458	6D	Q1874	6B	R1432	2C	R1522	4C	R1618	2B
C1461	7C	CR1522	4C	Q1460	6C			R1457	6C	R1523	4C	R1619	2A
C1594	4A	CR1523	4C	Q1474	3C	R1362	2C	R1459	6D	R1524	4C	R1867	6B
C1600	3B	CR1528	5C	Q1475	4C	R1365	3C	R1463	6C	R1525	4C	R1869	6B
C1871	6B	CR1597	5B	Q1488	3C	R1366	3C	R1471	4C	R1526	5B	R1870	6B
		CR1599	6B	Q1489	3C	R1367	3C	R1472	3C	R1529	5C	R1872	6B
CR1377	1B			Q1510	5C	R1370	2C	R1477	3B	R1590	4B	R1874	6B
CR1379	2B	Q1364	2C	Q1511	5C	R1375	2C	R1485	3C	R1591	4B	R1875	6B
CR1420	2C	Q1369	2C	Q1527	5C	R1381	1B	R1486	3C	R1592	5A		
CR1428	2D	Q1372	2C	Q1529	5C	R1382	1B	R1490	3C	R1594	4A	U1597	5B
CR1457	6D	Q1374	1C	Q1595	4A	R1383	2B	R1501	4C	R1599	3B		
CR1460	6C	Q1378	1B	Q1591	4B	R1385	2B	R1503	4C	R1600	4B	VR1429	2C
CR1471	4C	Q1380	2B	Q1602	3B	R1420	2C	R1505	5D	R1602	3B	VR1461	7C
										R1603	3B		


Storage Output
A14

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON-STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

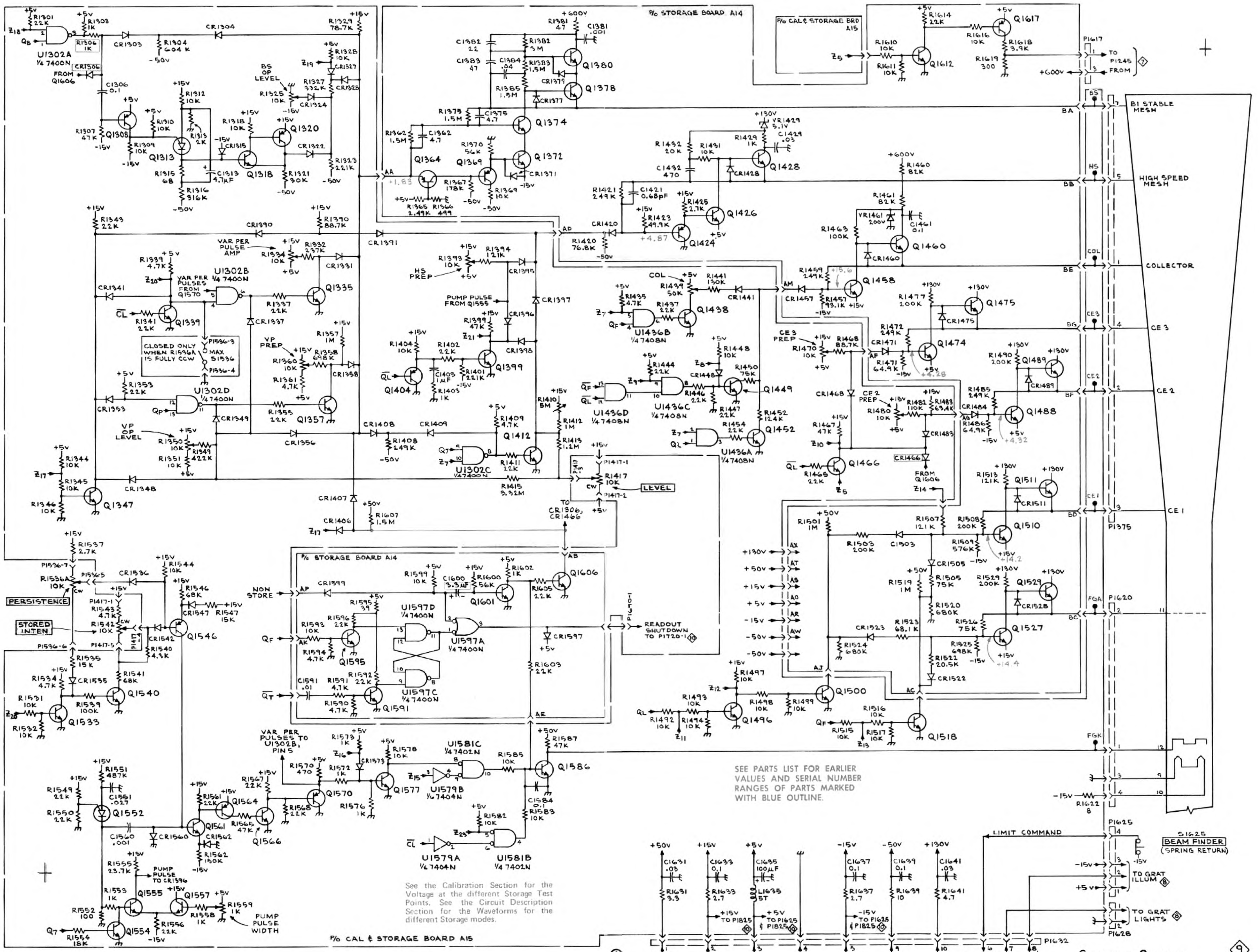
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The 4 Volt Calibration signal from the mainframe under test isconnected to the input of the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep; 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is AC coupled and internally triggered.

Tolerances of voltages and waveforms shown are 20%.



7623

STORAGE OUTPUT

9

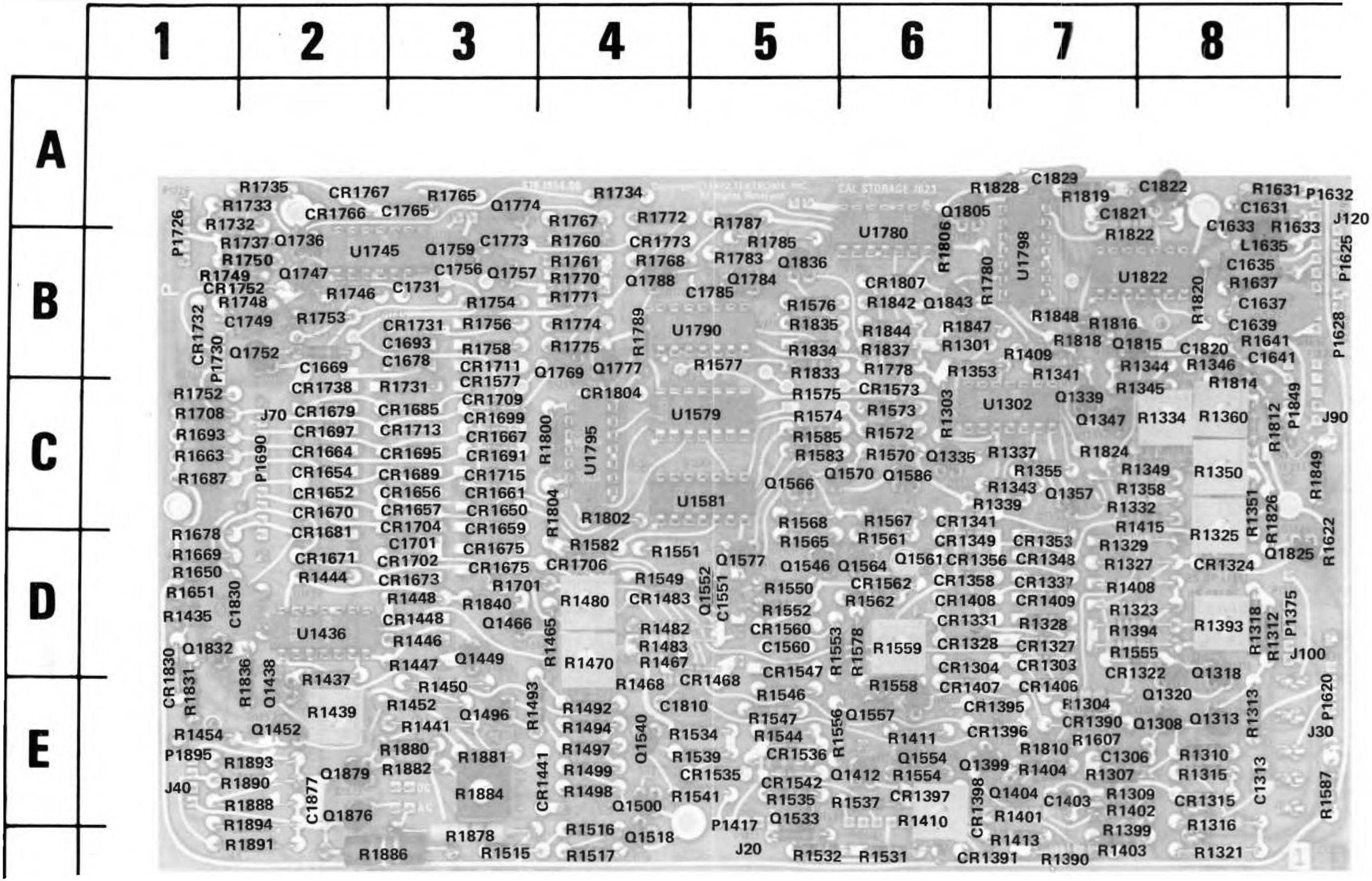


Fig. 6-14. A15 Cal & Storage circuit board.

CKT NO	GRID LOC
C1306	7E
C1313	8E
C1551	5D
C1560	5D
C1631	8A
C1633	8A
C1635	8B
C1637	8B
C1639	8B
C1641	8B
C1669	2B
C1678	3B
C1693	3B
C1701	3D
C1731	3B
C1749	2B
C1756	3B
C1765	3A
C1773	3B
C1785	5B
C1810	5E
C1820	8B
C1821	7A
C1822	8A
C1829	7A
C1830	1D
C1877	2E
CR1303	7D
CR1304	6D
CR1315	8E
CR1322	7D
CR1324	8D
CR1327	7D
CR1328	6D
CR1331	6D
CR1337	7D
CR1341	6C
CR1348	7D
CR1349	6D
CR1353	7D
CR1356	6D
CR1358	6D
CR1390	7E
CR1391	7F
CR1395	7E
CR1396	7E
CR1397	6E
CR1398	6E
CR1403	7E
CR1406	7E
CR1407	6E
CR1408	6D

CKT NO	GRID LOC
CR1409	7D
CR1441	4E
CR1448	3D
CR1483	4D
CR1488	5D
CR1535	5E
CR1536	5E
CR1542	5E
CR1547	5D
CR1560	5D
CR1562	6D
CR1573	6C
CR1577	3C
CR1650	3C
CR1652	2C
CR1654	2C
CR1656	3C
CR1657	3C
CR1659	3C
CR1661	3C
CR1664	2C
CR1667	3C
CR1670	2C
CR1671	2D
CR1673	3D
CR1675	3D
CR1679	2C
CR1681	2C
CR1685	3C
CR1689	3C
CR1691	3C
CR1695	3C
CR1697	2C
CR1699	3C
CR1702	3D
CR1704	3C
CR1706	4D
CR1709	3C
CR1711	3B
CR1713	3C
CR1715	3C
CR1731	3B
CR1732	1B
CR1738	2C
CR1766	2A
CR1767	2A
CR1773	4B
CR1804	4C
CR1807	6B
CR1830	1D
J20	5F
J30	9E
J40	1E

CKT NO	GRID LOC
J70	2C
J90	9C
J100	9D
J120	9A
L1635	8B
P1375	9D
P1417	5E
P1620	9E
P1625	9B
P1628	9B
P1632	9A
P1690	2C
P1726	1B
P1730	1B
P1849	9C
P1895	1E
Q1308	8E
Q1313	8E
Q1318	8D
Q1320	8E
Q1335	6C
Q1339	7C
Q1347	7C
Q1357	7C
Q1399	6E
Q1404	7E
Q1412	6E
Q1438	2E
Q1452	2E
Q1466	3D
Q1449	3D
Q1450	4E
Q1496	3E
Q1500	4E
Q1518	4F
Q1533	5E
Q1546	5D
Q1552	5D
Q1554	6E
Q1557	6E
Q1561	6D
Q1564	6D
Q1566	5C
Q1570	6C
Q1577	5D
Q1586	6C
Q1736	2B
Q1747	2B
Q1752	2B
Q1757	3B
Q1759	3B

CKT NO	GRID LOC
Q1769	4B
Q1774	3A
Q1777	4B
Q1784	5B
Q1788	4B
Q1805	6A
Q1815	8B
Q1825	9D
Q1832	1D
Q1836	5B
Q1843	6B
Q1876	2E
Q1879	2E
R1301	6B
R1303	6C
R1304	7E
R1307	7E
R1309	7E
R1310	8E
R1312	8D
R1313	8E
R1315	8E
R1318	8D
R1316	8E
R1321	8F
R1323	7D
R1325	8C
R1328	7D
R1327	7D
R1329	7D
R1332	8C
R1334	8C
R1337	7C
R1339	7E
R1341	7B
R1343	7C
R1344	8B
R1345	8C
R1346	8B
R1349	8C
R1350	8C
R1351	8C
R1353	6B
R1355	7C
R1358	8C
R1360	8C
R1381	1E
R1340	7F
R1393	8D
R1394	7D
R1401	7E
R1402	7E
R1403	7F
R1404	7E
R1408	7D
R1409	7B

CKT NO	GRID LOC
R1411	6E
R1413	7F
R1415	8C
R1435	1D
R1437	2E
R1439	2E
R1441	3E
R1444	2D
R1446	3D
R1447	3D
R1448	3D
R1450	3E
R1452	3E
R1454	1E
R1465	4D
R1467	4D
R1468	4E
R1470	4D
R1480	4D
R1482	4B
R1483	4D
R1492	4E
R1493	4E
R1494	4E
R1497	4E
R1498	4E
R1499	4E
R1515	3F
R1516	4E
R1517	4F
R1531	6F
R1532	5F
R1534	5E
R1535	5E
R1537	6E
R1539	5E
R1541	5E
R1544	5E
R1546	5E
R1547	5E
R1549	4D
R1550	5D
R1551	4D
R1552	5D
R1553	5D
R1554	6E
R1555	7D
R1557	7E
R1556	6E
R1558	6E
R1559	6D
R1561	6D
R1562	6D
R1565	5D

CKT NO	GRID LOC
R1567	6C
R1568	5C
R1570	6C
R1572	6C
R1573	6C
R1574	5C
R1575	5C
R1576	5B
R1577	5B
R1578	6D
R1582	4D
R1583	5C
R1585	5C
R1587	9E
R1607	7E
R1622	9D
R1633	9A
R1637	8B
R1641	8B
R1650	4D
R1651	1D
R1663	1C
R1669	1D
R1678	1D
R1681	8A
R1687	1C
R1693	1C
R1701	3D
R1708	1C
R1731	3C
R1732	1A
R1733	2A
R1734	4A
R1735	2A
R1737	2B
R1746	2B
R1748	2B
R1752	1C
R1753	2B
R1754	3B
R1756	3B
R1758	3B
R1760	4B
R1761	4B
R1765	3A
R1767	4A
R1768	4B
R1770	4B
R1771	4B
R1772	4A
R1774	4B
R1775	4B
R1778	6B

CKT NO	GRID LOC
R1780	6B
R1783	5B
R1785	5B
R1787	5A
R1789	4B
R1800	4C
R1802	4C
R1804	4C
R1810	7E
R1812	8C
R1814	8B
R1816	7B
R1818	7B
R1819	7A
R1820	8B
R1822	7B
R1824	7C
R1826	8C
R1828	7A
R1833	5B
R1834	5B
R1835	5B
R1836	2E
R1837	6B
R1840	3D
R1842	6B
R1844	6B
R1847	6B
R1848	7B
R1849	9C
R1878	3F
R1880	3E
R1881	3E
R1882	3E
R1886	3F
R1884	3C
R1888	2E
R1890	2E
R1891	2F
R1893	2E
R1894	2E
U1302	7C
U1436	2D
U1579	5C
U1581	5C
U1745	2B
U1780	6B
U1790	5B
U1795	4C
U1798	7B
U1822	8B

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS		RECOMMENDED TYPE
Oscilloscope	Frequency response Deflection factor Input impedance Sweep rate	DC to 65 MHz 5 mV to 5 V/Div 10 MΩ, 20 pF 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.		Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance Range	10 MΩ 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

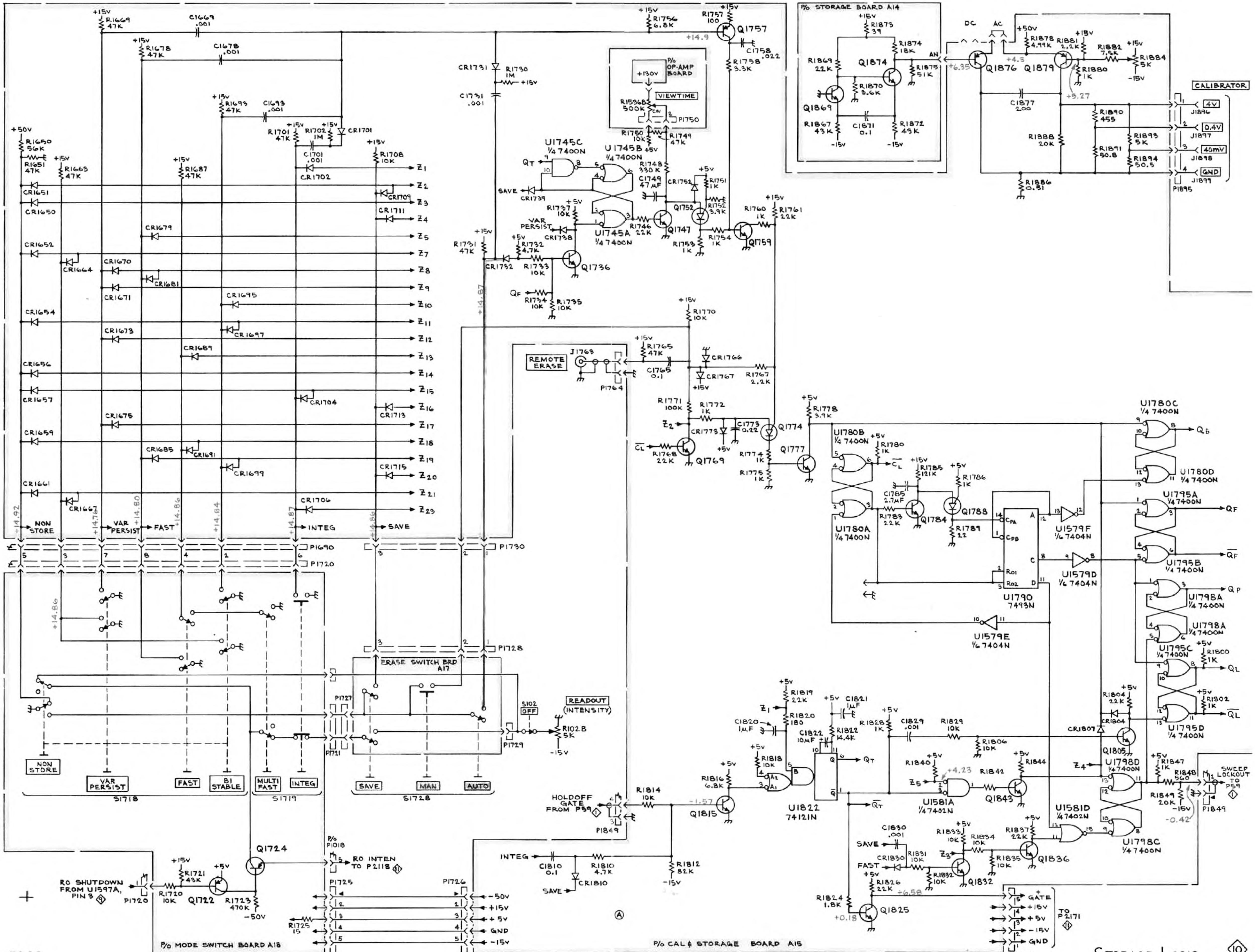
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. A 7A15AN Vertical plug-in unit and a 7B53AN Time Base unit are installed in the mainframe under test. The 4 Volt Calibration signal from the mainframe under test isconnected to the input of the vertical amplifier. The vertical amplifier is set for 1 V/Division deflection centered on the CRT. The 7B53AN is set for free running sweep; 1 ms/Division sweep rate.

TEST OSCILLOSCOPE. The test oscilloscope is AC coupled and internally triggered.

Tolerances of voltages and waveforms shown are 20%.



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STORAGE LOGIC

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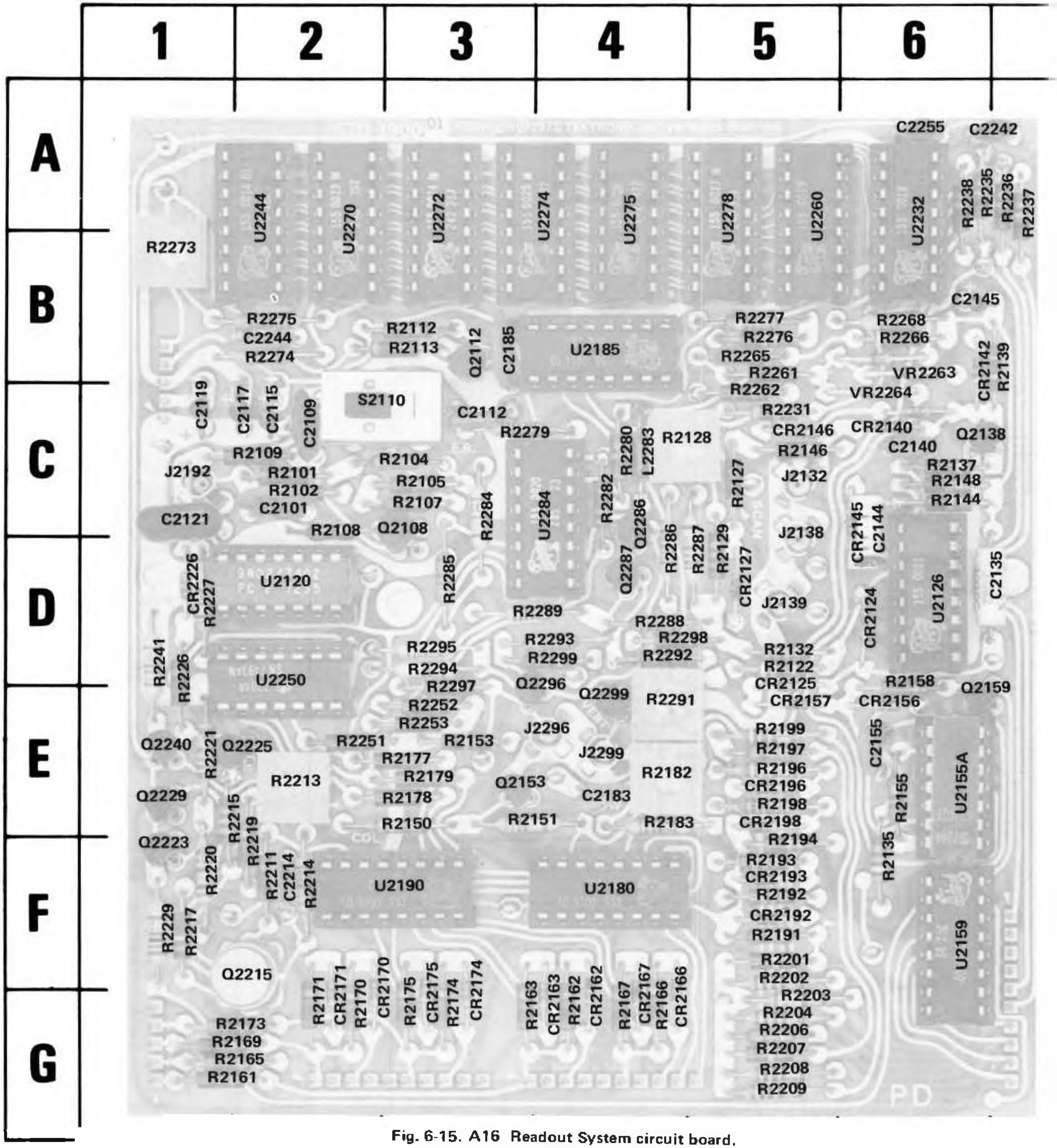


Fig. 6-15. A16 Readout System circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C2101	2C	CR2175	3G	R2104	3C	R2174	3G	R2231	5C	R2297	3D
C2109	2C	CR2192	5F	R2105	3C	R2175	3G	R2235	6A	R2298	4D
C2112	3C	CR2193	5F	R2107	3C	R2177	3E	R2236	7A	R2299	4D
C2115	2C	CR2196	5E	R2108	2C	R2179	3E	R2237	7A		
C2117	2C	CR2198	5E	R2109	2C	R2178	3E	R2238	6A	S2110	2C
C2119	1C	CR2214	2F	R2112	3B	R2182	4E	R2241	1D		
C2121	1C	CR2226	1D	R2113	3B	R2183	4E	R2251	2E	U2120	2D
C2135	7D			R2122	5D	R2191	5F	R2252	3E	U2126	6D
C2140	6C	J2132	5C	R2127	5C	R2192	5F	R2253	3E	U2155A	6E
C2144	6C	J2138	5C	R2128	4C	R2193	5F	R2261	5B	U2159	6F
C2145	6B	J2139	5D	R2129	5D	R2194	5E	R2262	5C	U2180	4F
C2155	6E	J2192	1C	R2132	5D	R2197	5E	R2265	5B	U2185	4B
C2183	4E	J2296	4E	R2135	6F	R2198	5E	R2266	6B	U2190	3F
C2185	3B	J2299	4E	R2137	6C	R2199	5E	R2268	6B	U2232	6A
C2242	7A			R2139	7B	R2201	5F	R2273	1B	U2244	2A
C2244	2B	L2283	4C	R2144	6C	R2202	5F	R2274	2B	U2250	2E
C2255	6A			R2146	5C	R2203	5G	R2275	2B	U2260	5A
		Q2108	3C	R2148	6C	R2204	5G	R2276	5B	U2270	2A
CR2124	6D	Q2112	3B	R2150	3E	R2206	5G	R2277	5B	U2272	3A
CR2125	5D	Q2138	6C	R2151	3E	R2207	5G	R2279	3C	U2274	4A
CR2127	5D	Q2153	3E	R2153	3E	R2208	5G	R2280	4C	U2275	4A
CR2140	6C	Q2159	6D	R2155	6E	R2209	5G	R2282	4C	U2278	5A
CR2142	6B	Q2215	2F	R2158	6D	R2211	2F	R2284	3C	U2284	4C
CR2145	6C	Q2223	1F	R2161	2G	R2213	2E	R2285	3D		
CR2146	5C	Q2225	2E	R2162	4G	R2214	2F	R2286	4D	VR2263	6B
CR2156	6E	Q2229	1E	R2163	4G	R2215	2E	R2287	5D	VR2264	6C
CR2157	5E	Q2240	1E	R2165	2G	R2217	1F	R2288	4D		
CR2162	4G	Q2286	4C	R2166	4G	R2219	2F	R2289	4D		
CR2163	4G	Q2287	4D	R2167	4G	R2220	1F	R2291	4E		
CR2166	4G	Q2296	4D	R2169	2G	R2221	1E	R2292	4D		
CR2167	4G	Q2299	4E	R2170	2G	R2226	1D	R2293	4D		
CR2170	2G	R2101	2C	R2171	2G	R2227	1D	R2294	3D		
CR2171	2G	R2102	2C	R2173	2G	R2229	1F	R2295	3D		

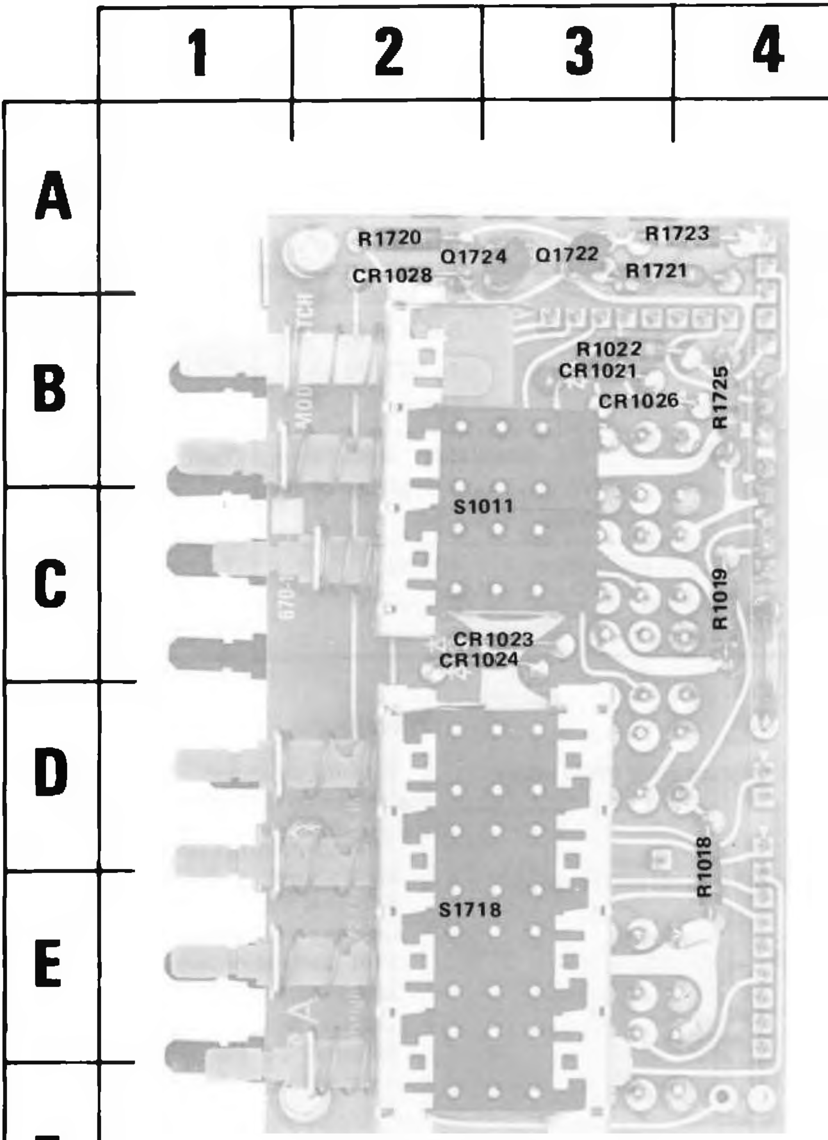


Fig. 6-16. A18 Mode Switch circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC
CR1021	3B	R1018	4E
CR1023	3C	R1019	4C
CR1024	2C	R1022	3B
CR1026	3B	R1720	2A
CR1028	2A	R1721	3A
		R1723	4A
Q1722	3A		
Q1724	2A	S1011	2C
		S1718	2E

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-Loading Digital Multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.

Voltage Measurements

Voltage measurements on this diagram were made under the following conditions:

Set front panel controls (knob type) to mid-range.

Set VERT MODE for CHOP

Set TRIG SOURCE for VERT MODE

Set for NON STORE condition

No plug-in units are installed.

Voltmeter common is connected to chassis ground.

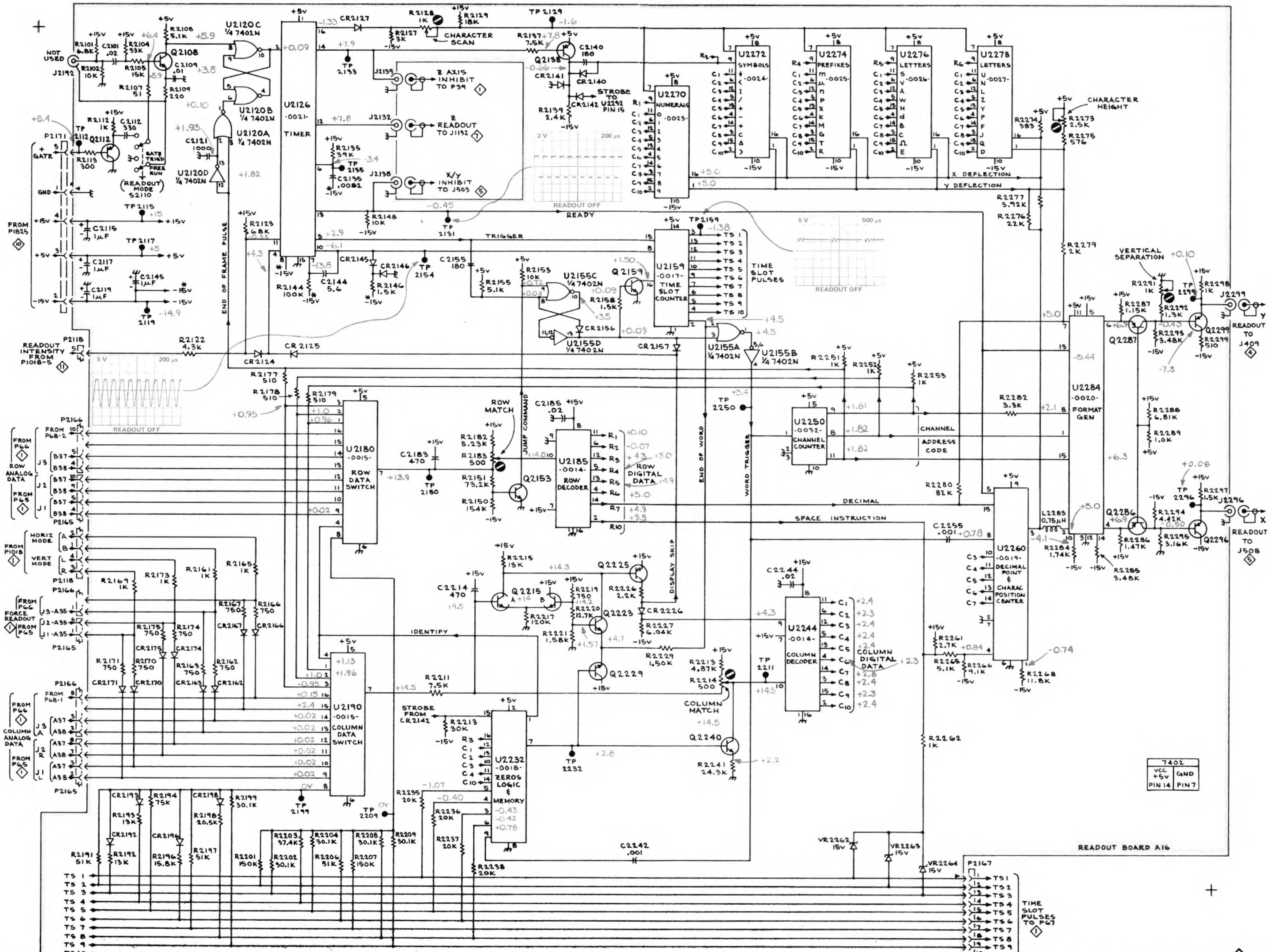
Waveforms

Waveforms shown on this diagram were obtained under the following conditions:

7623 OSCILLOSCOPE UNDER TEST. Front panel controls are set the same as for voltage measurements. No plug-ins are installed.

TEST OSCILLOSCOPE. The test oscilloscope is AC coupled and internally triggered.

Tolerances of voltages and waveforms shown are 20%.



7623

READOUT SYSTEM ⟨11⟩

MECHANICAL PARTS LIST

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

ABBREVIATIONS

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

FIGURE 1 7623 FRONT & FRAME

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
1-1	426-0514-00			1	FRAME, mask
-2	378-0625-08			1	FILTER, light, CRT
-3	331-0258-03			1	MASK, graticule
-4	200-0939-01			1	BEZEL, CRT
					(ATTACHING PARTS)
-5	212-0023-00			4	SCREW, 8-32 x 0.375 inch, PHS
					- - - * - - -
-6	337-1159-00			1	SHIELD, implosion
-7	331-0245-00			1	MASK, CRT
-8	333-1691-00			1	PANEL
-9	386-1884-03			1	SUPPORT, CRT
	- - - - - -			-	support includes:
-10	386-1517-00			4	SUPPORT, CRT front
					(ATTACHING PARTS)
-11	212-0040-00			2	SCREW, 8-32 x 0.375 inch, 100 deg. csk, FHS
-12	211-0510-00			2	SCREW, 6-32 x 0.375 inch, PHS
					- - - * - - -
-13	204-0380-00			1	BODY, terminal
-14	131-0765-00			3	TERMINAL, feedthru
-15	348-0031-00			1	GROMMET, plastic, 0.156 inch diameter
-16	- - - - - -			1	CIRCUIT BOARD ASSY--GRATICULE LIGHT (See A13
	- - - - - -			-	Electrical List)
	- - - - - -			-	circuit board assembly includes:
-17	378-0614-00			1	REFLECTOR, light
-18	344-0179-00			2	CLIP, reflector
-19	211-0062-00			2	SCREW, 2-56 x 0.312 inch, RHS
-20	366-1391-00			2	KNOB, gray--READOUT & SAVE ITEN
	- - - - - -			-	each knob includes:
	213-0140-00			1	SETSCREW, 2-56 x 0.094 inch, HSS

FIGURE 1 7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
1-21	366-1077-00			2	KNOB, charcoal--INTENSITY & STORAGE LEVEL
	- - - - - -			-	each knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS
-22	366-1059-00			1	KNOB, gray--BEAMFINDER
-23	366-1215-00			1	KNOB, charcoal--GRATICULE ILLUM
	- - - - - -			-	knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS
-24	366-0494-00			1	KNOB, charcoal--AUTO VIEW TIME
	- - - - - -			-	knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS
-25	366-1402-02			2	PUSHBUTTON--LEFT
-26	366-1402-03			1	PUSHBUTTON--ALT
-27	366-1402-04			1	PUSHBUTTON--ADD
-28	366-1257-31			1	PUSHBUTTON--CHOP
-29	366-1402-06			2	PUSHBUTTON--RIGHT
-30	366-1402-10			1	PUSHBUTTON--MULTI TRACE
-31	366-1402-11			1	PUSHBUTTON--INTEG
-32	366-1402-07			1	PUSHBUTTON--VERT MODE
-33	366-1402-08			1	PUSHBUTTON--NON STORE
-34	366-1402-25			1	PUSHBUTTON--VAR PERSIST
-35	366-1402-12			1	PUSHBUTTON--FAST
-36	366-1402-13			1	PUSHBUTTON--BI STABLE
-37	366-1402-21			1	PUSHBUTTON--SAVE
-38	366-1402-76			1	PUSHBUTTON--AUTO
-39	366-1402-14			1	PUSHBUTTON--MAN
-40	426-0681-00			18	FRAME, pushbutton
-41	366-1480-01			1	PUSHBUTTON--ON
-42	- - - - - -			4	RESISTOR, variable
					(ATTACHING PARTS FOR EACH)
-43	210-0583-00			1	NUT, hex., 0.25-32 x 0.312 inch
	210-0940-00			1	WASHER, flat, 0.25 ID x 0.375 inch OD
-44	210-0046-00			1	WASHER, lock, internal, 0.261 ID x 0.40
	- - - - - -			-	inch OD
					- - - * - - -
-45	358-0378-00			1	BUSHING, sleeve
-46	333-1508-00			1	PANEL, front
-47	- - - - - -			1	CIRCUIT BOARD ASSY--MODE (See A18 Electrical
	- - - - - -			-	List)
	- - - - - -			-	circuit board assembly includes:
-48	131-0608-00			33	TERMINAL, pin, 0.365 inch long
-49	136-0252-04			6	SOCKET, pin connector
-50	260-1378-00			1	SWITCH, push--VERT MODE
-51	260-1379-00			1	SWITCH, push--TRIGGER SOURCE
-52	260-1380-00			1	SWITCH, push--STORE (2 button)
-53	260-1381-00			1	SWITCH, push--STORE (4 button)
-54	361-0411-00			20	SPACER, push switch
-55	- - - - - -			1	RESISTOR, variable
					(ATTACHING PARTS)
-56	210-0583-00			1	NUT, hex., 0.25-32 x 0.312 inch
	210-0046-00			1	WASHER, lock, internal, 0.261 ID x 0.40 inch OD
-57	386-2285-00			1	PLATE
					- - - * - - -

FIGURE 1 7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
1-58	220-0455-00			2	NUT BLOCK
					(ATTACHING PARTS FOR EACH)
-59	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					(ATTACHING PARTS)
-60	211-0105-00			2	SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
					- - - * - - -
	376-0150-00	B010100	B059999X	1	COUPLING, shaft (focus)
	384-1112-02	B010100	B059999X	1	SHAFT, extension (focus)
-61	136-0387-01			1	JACK, tip, black
-62	136-0387-00			3	JACK, tip, gray
-63	384-1136-00			7	SHAFT, extension
-64	- - - - - -			1	CIRCUIT BOARD ASSY--ERASE (See A17
	- - - - - -			-	Electrical List)
	- - - - - -			-	circuit board assembly includes:
-65	131-0608-00			6	TERMINAL, pin, 0.365 inch long
-66	260-1382-00			1	SWITCH, push--ERASE/SAVE
-67	361-0411-00			4	SPACER, switch
-68	220-0637-00			1	NUT BLOCK
					(ATTACHING PARTS)
-69	211-0062-00			2	SCREW, 2-56 x 0.312 inch, PHS
					(ATTACHING PARTS)
-70	211-0105-00			2	SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
					- - - * - - -
-71	386-2119-00			1	SUBPANEL, front
					(ATTACHING PARTS)
-72	211-0538-00			4	SCREW, 6-32 x 0.375 inch, 100 deg. csk, FHS
	211-0589-00			2	SCREW, 6-32 x 0.312 inch, PHB
					- - - * - - -
-73	352-0084-02	XB040000		1	BUSHING, TRACE ROTATION
	390-0345-00	B010100	B039999	2	CABINET SIDE
-74	390-0345-00	B040000		1	CABINET SIDE, left
-75	390-0345-01	B040000		1	CABINET SIDE, right
	- - - - - -			-	each cabinet side includes:
	214-0816-00			2	LATCH ASSEMBLY
	- - - - - -			-	each latch assembly includes:
-76	386-1151-00			1	PLATE, locking
-77	386-0227-00			1	PLATE, index
-78	214-0604-00			1	SPRING, latch
-79	214-0603-01			1	PIN, securing
-80	390-0204-00			1	CABINET BOTTOM
					(ATTACHING PARTS)
-81	211-0503-00			2	SCREW, 6-32 x 0.188 inch, PHS
					- - - * - - -
-82	343-0256-00			2	RETAINER BLOCK, plastic
					(ATTACHING PARTS FOR EACH)
-83	211-0578-00			2	SCREW, 6-32 x 0.438 inch, PHS
					- - - * - - -
-84	348-0274-00			2	FOOT, bail limiting, right front & left rear
					(ATTACHING PARTS FOR EACH)
-85	211-0532-00			2	SCREW, 6-32 x 0.75 inch, Fil HS
					- - - * - - -

FIGURE 1 7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
1-86	348-0073-00			2	FOOT, bail limiting, left front & right rear
					(ATTACHING PARTS FOR EACH)
-87	211-0532-00			2	SCREW, 6-32 x 0.75 inch, Fil HS
					- - - * - - -
-88	377-0119-00			4	INSERT, foot, plastic
-89	351-0295-00			3	GUIDE, slide
					(ATTACHING PARTS FOR EACH)
-90	213-0088-00			1	SCREW, thread forming, 4-24 x 0.25 inch, PHS
					- - - * - - -
-91	384-1058-00			1	SHAFT, extension
-92	131-0930-00			2	CONTACT, electrical, plug-in ground
					(ATTACHING PARTS FOR EACH)
-93	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
-94	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-95	131-0799-00			2	CONTACT, electrical, plug-in ground, upper
					(ATTACHING PARTS FOR EACH)
-96	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
-97	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-98	348-0278-00			2	SHIELDING GASKET, electronic
-99	131-1018-00			4	CONTACT, electrical, plug-in ground
					(ATTACHING PARTS FOR EACH)
-100	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
-101	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-102	200-0728-00			2	COVER, handle
-103	367-0108-00			1	HANDLE, carrying
					(ATTACHING PARTS)
-104	212-0597-00			4	SCREW, shouldered, 10-32 x 0.355 inch
-105	386-1624-00			2	PLATE, handle retaining
-106	358-0485-00			4	BUSHING
-107	386-1283-03			2	PLATE, handle mounting, plastic
					- - - * - - -
	644-0437-01			1	POWER SWITCH ASSEMBLY
	- - - - - - -			-	power switch assembly includes:
-108	337-1760-00			1	SHIELD, switch
-109	211-0020-00	B010100	B060759	2	SCREW, 4-40 x 1.125 inches, PHS
	211-0021-00	B060760		2	SCREW, 4-40 x 1.25 inch, PHS
-110	220-0665-00			2	NUT, self-locking, 4-40 x 0.25 inch
-111	260-1368-01			2	SWITCH
-112	214-1226-01			1	SPRING, helical compression
-113	214-1689-00			1	ACTUATOR, switch
-114	200-1318-00			1	COVER, switch
					(ATTACHING PARTS)
-115	211-0559-00			2	SCREW, 6-32 x 0.375 inch, 100 deg. csk, FHS
-116	210-0202-00			1	TERMINAL, lug, SE #6
-117	210-0457-00			4	NUT, keps, 6-32 x 0.312 inch
-118	407-1124-00			1	BRACKET, power switch
-119	211-0538-00			2	SCREW, 6-32 x 0.312 inch, 100 deg. csk, FHS
					- - - * - - -

FIGURE 1 7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
1-120	351-0179-01			1	GUIDE
					(ATTACHING PARTS)
-121	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -
-122	343-0004-00			1	CLAMP, cable, 0.312 inch diameter
					(ATTACHING PARTS)
-123	211-0538-00			1	SCREW, 6-32 x 0.312 inch, 100 deg. csk, FHS
-124	210-0863-00			1	WASHER, cable clamp
-125	210-0457-00			1	NUT, keps, 6-32 x 0.312 inch
					- - - * - - -
-126	- - - - - - -			1	CIRCUIT BOARD ASSY--LOGIC (See A2 Electrical
	- - - - - - -			-	List)
	- - - - - - -			-	circuit board assembly includes:
-127	131-0566-00			1	LINK, terminal connecting
-128	136-0252-04			24	SOCKET, pin connector
-129	136-0235-00			1	SOCKET, transistor, 6 pin
-130	136-0260-01			1	SOCKET, integrated circuit, 16 pin
-131	136-0269-00			3	SOCKET, integrated circuit, 14 pin
-132	136-0263-03			33	SOCKET, pin terminal
-133	214-0579-00			4	TERMINAL, test point
-134	- - - - - - -			1	CIRCUIT BOARD ASSY--INTERFACE (See A1
	- - - - - - -			-	Electrical List)
	- - - - - - -			-	circuit board assembly includes:
-135	131-0608-00			85	TERMINAL, pin, 0.365 inch long
	131-0592-00			26	TERMINAL, pin, 0.855 inch long
	131-0591-00			32	TERMINAL, pin, 0.835 inch long
-136	131-0804-00			1	LINK, terminal connecting, 1.17 inches long
-137	129-0308-00			4	POST, hex., 4-40 x 0.188 x 0.465 inch long
					(ATTACHING PARTS FOR EACH)
-138	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-139	131-1003-00			2	CONNECTOR, receptacle, coaxial
-140	136-0252-01			2	SOCKET, pin connector
-141	214-1568-00			2	PIN, guide
					(ATTACHING PARTS FOR EACH)
-142	210-0406-00			1	NUT, hex., 4-40 x 0.188 inch
-143	210-0054-00			1	WASHER, lock, split, 0.118 ID x 0.212
	- - - - - - -			-	inch OD
-144	344-0147-00			1	CLIP, plastic
					- - - * - - -
-145	131-0805-00			2	LINK, terminal connecting, 0.90 inch long
-146	670-1374-00			1	CIRCUIT BOARD ASSY--VERTICAL INTERCONNECT
	- - - - - - -			-	circuit board assembly includes:
-147	131-0787-00			8	TERMINAL, pin, 0.64 inch long
					(ATTACHING PARTS)
-148	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-149	351-0213-00			2	GUIDE-POST, lock, 4-40 x 0.285 inch long
					- - - * - - -

FIGURE 1 7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	Description 1 2 3 4 5
1-150	386-1558-00			2	SUPPORT, circuit board
	131-0767-00	B010100	B059999	1	CONNECTOR, receptacle
	131-0767-07	B060000		1	CONNECTOR, receptacle
	- - - - - -			-	connector includes:
-151	200-0950-00			2	COVER, plastic
-152	131-0726-00	B010100	B059999	38	CONTACT, straight
	131-0726-00	B060000		35	CONTACT, straight
-153	131-0727-00	B010100	B059999	38	CONTACT, offset
	131-0727-00	B060000		35	CONTACT, offset
-154	204-0365-02			1	BODY, plastic
					(ATTACHING PARTS)
-155	213-0232-00			2	SCREW, thread forming, 2-56 x 0.312 inch,
	- - - - - -			-	PHS
-156	210-0906-00			1	WASHER, fiber 0.125 ID x 0.203 inch OD
					- - - * - - -
	131-0767-02	B010100	B059999	2	CONNECTOR, receptacle
	131-0767-08	B060000		2	CONNECTOR, receptacle
	- - - - - -			-	each connector includes:
-157	200-0950-00			2	COVER, plastic
-158	131-0726-00	B010100	B059999	36	CONTACT, straight
	131-0726-00	B060000		33	CONTACT, straight
-159	131-0727-00	B010100	B059999	36	CONTACT, offset
	131-0727-00	B060000		33	CONTACT, offset
	131-0899-00			4	CONTACT, short tail
-160	204-0365-00			1	BODY, plastic
					(ATTACHING PARTS FOR EACH)
-161	213-0232-00			2	SCREW, thread forming, 2-56 x 0.312 inch,
	- - - - - -			-	PHS
					(ATTACHING PARTS)
-162	213-0034-00			9	SCREW, thread forming, 4-40 x 0.312 inch, PHS
					- - - * - - -
-163	- - - - - -			1	CIRCUIT BOARD ASSY--TRIGGER SELECTOR (See
	- - - - - -			-	A3 Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-164	131-0589-00			4	TERMINAL, pin, 0.46 inch long
-165	136-0252-04			15	SOCKET, pin connector
-166	136-0260-01			1	SOCKET, integrated circuit, 16 pin
-167	136-0263-03			16	SOCKET, pin terminal
					(ATTACHING PARTS)
-168	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-169	- - - - - -			1	CIRCUIT BOARD ASSY--VERTICAL INTERFACE (See
	- - - - - -			-	A4 Electrical List)
	- - - - - -			-	circuit board assembly includes:
-170	136-0252-04			15	SOCKET, pin connector
-171	136-0263-03			18	SOCKET, pin terminal
-172	136-0260-01			1	SOCKET, integrated circuit, 16 pin
					(ATTACHING PARTS)
-173	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -

FIGURE 1 7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
1-	426-1042-00			1	FRAME ASSEMBLY
	- - - - - -			-	frame assembly includes:
-174	426-0741-06			1	FRAME SECTION, front
					(ATTACHING PARTS)
-175	210-0782-00			8	RIVET, solid, 0.125 OD x 0.25 inch long
					- - - * - - -
-176	426-0741-03			1	FRAME SECTION, rear
					(ATTACHING PARTS)
-177	210-0782-00			8	RIVET, solid, 0.125 OD x 0.25 inch long
					- - - * - - -
-178	426-0753-00			1	FRAME SECTION, top center
-179	380-0238-00			1	HOUSING, plug-in
					(ATTACHING PARTS)
-180	210-0782-00			2	RIVET, solid, 0.125 OD x 0.25 inch long
					- - - * - - -
-181	426-0857-00			1	FRAME SECTION, bottom right
-182	426-0858-00			1	FRAME SECTION, bottom left
-183	348-0282-00			1	FLIP-STAND, cabinet
-184	210-0202-00			1	TERMINAL, lug, SE #6
					(ATTACHING PARTS)
-185	211-0504-00			1	SCREW, 6-32 x 0.25 inch, PHS
-186	210-0407-00			1	NUT, hex., 6-32 x 0.25 inch
					- - - * - - -
-187	175-0825-00			in	WIRE, electrical, 2 wire ribbon, 15.50 inch
	- - - - - -			-	long
-188	175-0826-00			in	WIRE, electrical, 3 wire ribbon, 39 inches
	- - - - - -			-	long
-189	175-0827-00			in	WIRE, electrical, 4 wire ribbon, 24.50 inches
	- - - - - -			-	long
-190	175-0828-00			in	WIRE, electrical, 5 wire ribbon, 22.50 inches
	- - - - - -			-	long
-191	175-0832-00			in	WIRE, electrical, 9 wire ribbon, 9.50 inches
	- - - - - -			-	long
-192	352-0171-00			6	HOLDER, terminal connector, 1 wire (black)
-193	352-0169-00			1	HOLDER, terminal connector, 2 wire (black)
	352-0169-07			2	HOLDER, terminal connector, 2 wire (violet)
-194	352-0161-00			1	HOLDER, terminal connector, 3 wire (black)
	352-0161-08			2	HOLDER, terminal connector, 3 wire (gray)
-195	352-0162-05			2	HOLDER, terminal connector, 4 wire (green)
-196	352-0163-06			3	HOLDER, terminal connector, 5 wire (blue)
	352-0163-07			1	HOLDER, terminal connector, 5 wire (violet)
-197	352-0167-00			2	HOLDER, terminal connector, 9 wire (black)
-198	131-0707-00			63	CONNECTOR, terminal

FIGURE 2 7623 CHASSIS

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
2-1	- - - - - - -			1	CIRCUIT BRD ASSY--VERTICAL AMP (SEE A5
	- - - - - - -			-	Electrical Parts List)
	- - - - - - -			-	circuit board assembly includes:
-2	131-0566-00			1	LINK, terminal connecting
-3	131-0589-00			7	TERMINAL, pin, 0.46 inch long
-4	131-1003-00			3	CONNECTOR, receptacle, coaxial
-5	131-1303-00			1	CONTACT, integrated circuit ground
-6	136-0252-04			25	SOCKET, pin connector, 0.181 inch long
	136-0252-01			3	SOCKET, pin connector. 0.178 inch
					(ATTACHING PARTS)
-7	211-0014-00			2	SCREW, 4-40 x 0.50 inch, PHS
-8	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-9	214-1652-00			1	HEATSINK, vertical amplifier
-10	214-1757-00			1	HEATSINK
-11	361-0477-00			2	SPACER, sleeve, 0.228 ID x 0.50 inch OD
-12	131-0472-01			4	CONNECTOR, pin, female
-13	- - - - - - -			1	CIRCUIT BOARD ASSY--HORIZ AMP (SEE A6
	- - - - - - -			-	Electrical Parts List)
	- - - - - - -			-	circuit board assembly includes:
-14	131-0608-00			21	TERMINAL, pin, 0.365 inch long
-15	131-1003-00			2	CONNECTOR, receptacle, coaxial
-16	136-0252-04			25	SOCKET, pin connector
-17	136-0252-01			1	SOCKET, integrated circuit, 16 pin
-18	129-0075-00	XB020000		1	INSULATOR, standoff
-19	361-0007-00	XB020000		1	SPACER, plastic
					(ATTACHING PARTS)
-20	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
	- - - - - - -			1	COIL, y-axis
					(ATTACHING PARTS)
-21	213-0138-00			2	SCREW, thread forming, 4-24 x 0.188 inch, PHS
-22	343-0217-00			1	CLAMP, plastic
					- - - * - - -
-23	119-0368-00			1	DELAY LINE ASSEMBLY
					(ATTACHING PARTS)
-24	213-0034-00			2	SCREW, thread cutting, 4-40 x 0.312 inch, PHS
					- - - * - - -
-25	348-0064-00			1	GROMMET, plastic, 0.625 inch diameter
-26	386-2416-00			1	SUPPORT, chassis
					(ATTACHING PARTS)
	211-0541-00			4	SCREW, 6-32 x 0.25 inch, 100 deg. csk, FHS
	210-0457-00			4	NUT, keps, 6-32 x 0.312 inch
-27	211-0510-00			1	SCREW, 6-32 x 0.375 inch, PHS
-28	210-0993-00			1	WASHER, flat, 0.141 ID x 0.75 inch OD
					- - - * - - -
-29	407-1002-00			1	BRACKET, support
					(ATTACHING PARTS)
	211-0538-00			2	SCREW, 6-32 x 0.312 inch, PHS
	210-0457-00			2	NUT, keps, 6-32 x 0.312 inch
-30	211-0510-00			1	SCREW, 6-32 x 0.375 inch, PHS
-31	210-0993-00			1	WASHER, flat, 0.141 ID x 0.75 inch OD
					- - - * - - -

FIGURE 2 7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
2-32	407-1001-00			1	BRACKET, CRT shield front
					(ATTACHING PARTS)
-33	211-0589-00			2	SCREW, 6-32 x 0.375 inch, PHS
-34	210-0457-00			2	NUT, keps, 6-32 x 0.312 inch
	211-0538-00			2	SCREW, 6-32 x 0.312 inch, 100 deg. csk, FHS
					- - - * - - -
-35	255-0334-00			in	PLASTIC CHANNEL, 3.75 inches long
-36	- - - - - -			1	CIRCUIT BRD ASSY--CAL/STORAGE (SEE A15
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-37	131-0592-00			27	TERMINAL, pin, 0.885 inch long
-38	131-0608-00			78	TERMINAL, pin, 0.365 inch long
-39	136-0252-04			284	SOCKET, pin connector
-40	214-0579-00			8	TERMINAL, test point
					(ATTACHING PARTS)
-41	211-0008-00			5	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-42	- - - - - -			1	CIRCUIT BRD ASSY--STORAGE (See A14
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-43	131-0589-00			3	TERMINAL, pin, 0.46 inch long
-44	136-0252-04			95	SOCKET, pin connector
-45	136-0263-03			30	SOCKET, pin terminal
-46	351-0213-00			3	GUIDE-POST, lock
-47	441-1048-00			1	CHASSIS
					(ATTACHING PARTS)
	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-48	351-0087-00			2	GUIDE, circuit board
	621-0466-00			1	HIGH VOLTAGE ASSEMBLY
	- - - - - -			-	high voltage assembly includes:
-49	- - - - - -			1	CIRCUIT BRD ASSY--HIGH VOLTAGE #2 (See A10
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-50	131-0608-00			1	TERMINAL, pin, 0.365 inch long
-51	343-0088-00			1	CLAMP, retaining
-52	346-0032-00	B010100	B039999	2	STRAP, mousetail
	253-0011-00	B040000		ft	CORD, lacing, 0.833 foot long
					(ATTACHING PARTS)
-53	211-0040-00			4	SCREW, plastic, 4-40 x 0.25 inch, PH
-54	129-0251-00			4	POST, 0.25 OD x 1.125 inches long
-55	211-0008-00			4	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-56	- - - - - -			1	CIRCUIT BRD ASSY--HIGH VOLTAGE #1 (See A9
	- - - - - -			-	Electrical Parts List)
	- - - - - -				circuit board assembly includes:
-57	131-0589-00			5	TERMINAL, pin, 0.46 inch long
	131-0608-00			19	TERMINAL, pin, 0.365 inch long
-58	136-0252-04			9	SOCKET, pin terminal
-59	214-0579-00			1	TERMINAL, test point
-60	166-0292-00			2	SLEEVE, support, 0.155 OD x 0.65 inch long
					(ATTACHING PARTS)
-61	211-0008-00			3	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -

FIGURE 2 7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
2-62	129-0143-00			3	POST, 0.312 OD x 0.406 inch long
					(ATTACHING PARTS FOR EACH)
-63	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-64	129-0236-00			1	POST, hex., 0.188 x 0.375 inch long
					(ATTACHING PARTS)
	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-65	136-0506-00			1	WIRING HARNESS, CRT socket
	- - - - - - -			-	wiring harness includes:
-66	136-0304-02			1	SOCKET, CRT
-67	200-0917-01			1	COVER, CRT socket
-68	367-0117-00			1	HANDLE, CRT socket
-69	343-0235-00			1	CLAMP, CRT socket
-70	- - - - - - -			1	CIRCUIT BRD ASSY--Z AXIS (See A8
	- - - - - - -			-	Electrical Parts List)
	- - - - - - -			-	circuit board assembly includes:
-71	131-0608-00			36	TERMINAL, pin, 0.365 inch long
-72	131-1003-00			1	CONNECTOR, receptacle, coaxial
-73	136-0252-04			35	SOCKET, pin connector
	136-0252-01			1	SOCKET, pin connector
					(ATTACHING PARTS)
-74	211-0008-00			3	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-75	348-0063-00			1	GROMMET, plastic, 0.50 inch diameter
-76	- - - - - - -			2	TRANSISTOR
					(ATTACHING PARTS FOR EACH)
-77	213-0149-00			2	SCREW, thread forming, 6-20 x 0.375 inch, PHS
-78	386-0978-00			1	PLATE, mica, 1.17 x 1.70 inches
					- - - * - - -
-79	136-0280-00			2	SOCKET, transistor
					(ATTACHING PARTS FOR EACH)
-80	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
-81	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-82	255-0334-00	B010100	B040274	ft	PLASTIC CHANNEL, 3.50 inches
	348-0012-00	B040275		1	GROMMET, rubber, 0.625 inch diameter
-83	351-0324-00			2	GUIDE, circuit card
-84	131-0773-00			1	CONNECTOR, receptacle, anode lead
-85	337-1538-00			1	SHIELD, electrical high voltage
					(ATTACHING PARTS)
-86	211-0504-00			3	SCREW, 6-32 x 0.25 inch, PHS
					- - - * - - -
-87	- - - - - - -			1	CIRCUIT BRD ASSY--READOUT (See A16
	- - - - - - -			-	Electrical Parts List)
	- - - - - - -			-	circuit board assembly includes:
-88	131-0608-00			42	TERMINAL, pin, 0.365 inch long
-89	131-1003-00			6	CONNECTOR, receptacle, coaxial
-90	136-0252-04			39	SOCKET, pin connector
	136-0252-01			6	SOCKET, pin connector
-91	136-0235-00			1	SOCKET, transistor, 6 pin
-92	136-0260-01			14	SOCKET, integrated circuit, 16 pin
-93	136-0269-00			3	SOCKET, integrated circuit, 14 pin
-94	214-0579-00			19	TERMINAL, test point
-95	260-0723-00			1	SWITCH, slide
					(ATTACHING PARTS)
-96	211-0205-00			1	SCREW, 4-40 x 0.42 inch, PHS
-97	361-0527-00			1	SPACER
					- - - * - - -

FIGURE 2 7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
2-	614-0077-05			1	POWER SUPPLY
	- - - - - -			-	power supply includes:
-98	- - - - - -			1	CIRCUIT BRD ASSY--RECTIFIER (See A12
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-99	131-0608-00			28	TERMINAL, pin, 0.365 inch long
-100	136-0252-04			6	SOCKET, pin connector
-101	214-1292-00			2	HEATSINK, transistor
-102	214-1731-00	B010100	B059999	1	HEATSINK, transistor
	214-1731-01	B060000		1	HEATSINK, transistor
					(ATTACHING PARTS)
-103	211-0012-00			1	SCREW, 4-40 x 0.375 inch, PHS
-104	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
-105	210-0935-00			1	WASHER, fiber, 0.14 ID x 0.375 inch OD
					- - - * - - -
-106	344-0154-00			4	CLIP, electrical, fuse
					(ATTACHING PARTS)
-107	211-0507-00			2	SCREW, 6-32 x 0.312 inch, PHS
-108	210-0202-00			1	TERMINAL, lug, solder, SE #6
-109	211-0511-00			1	SCREW, 6-32 x 0.50 inch, PHS
-110	343-0004-00			1	CLAMP, cable, plastic, 0.312 inch diameter
-111	211-0510-00			1	SCREW, 6-32 x 0.375 inch, PHS
-112	210-0863-00			1	WASHER, cable clamp
	211-0008-00	XB060000		1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-113	- - - - - -			1	TRANSFORMER
					(ATTACHING PARTS)
-114	212-0522-00			2	SCREW, 10-32 x 2.50 inches, HHS
	210-0812-00			2	WASHER, fiber, 0.188 ID x 0.375 inch OD
-115	166-0457-00			2	TUBE, insulating, 1.875 inches long
-116	212-0023-00			2	SCREW, 8-32 x 0.375 inch, PHS
	210-0804-00	XB020554		2	WASHER, flat, 0.17 ID x 0.375 inch OD
-117	407-0921-00			1	BRACKET, angle
					- - - * - - -
-118	- - - - - -			1	SWITCH, thermostatic
					(ATTACHING PARTS)
-119	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-120	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-121	441-0993-01			1	CHASSIS, power supply
					(ATTACHING PARTS)
	212-0040-00			6	SCREW, 8-32 x 0.375 inch, 100 deg. csk, FHS
					- - - * - - -
	614-0104-00			1	SUBPANEL ASSEMBLY, rear
	- - - - - -			-	subpanel assembly includes:
-122	352-0076-00			1	FUSEHOLDER ASSEMBLY, w/hardware
-123	200-1388-00			1	COVER, fuseholder
-124	131-0955-00			6	CONNECTOR, receptacle, BNC, w/hardware
					(ATTACHING PARTS FOR EACH)
-125	210-0255-00			1	TERMINAL, lug, SE, 0.391 inch diameter
					- - - * - - -

FIGURE 2 7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
2-126	210-0202-00			1	TERMINAL, lug, SE #6
					(ATTACHING PARTS)
-127	211-0504-00			1	SCREW, 6-32 x 0.25 inch
-128	210-0407-00			1	NUT, hex., 6-32 x 0.25 inch
					- - - * - - -
-129	161-0033-09			1	CABLE ASSEMBLY, power
-130	358-0323-00			1	BUSHING, strain relief
-131	210-0201-00			1	TERMINAL, lug, SE #4
					(ATTACHING PARTS)
-132	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-133	385-0149-00			1	POST, 4-40 x 0.25 OD x 0.625 inch long
					- - - * - - -
-134	- - - - - -			1	CIRCUIT BRD ASSY--SIGNAL OUT (See A7
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-135	131-0608-00			11	TERMINAL, pin, 0.365 inch long
-136	131-1003-00			2	CONNECTOR, receptacle, coaxial
-137	136-0252-04			27	SOCKET, pin connector
	136-0252-01			2	SOCKET, pin connector
-138	260-0984-00			1	SWITCH, slide
-139	214-0579-00			1	TERMINAL, test point
					(ATTACHING PARTS)
-140	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-141	386-2199-00			1	PANEL, rear
					(ATTACHING PARTS)
-142	211-0529-00			4	SCREW, 6-32 x 1.125 inches, PHS
-143	348-0191-00			4	FOOT, cabinet
					- - - * - - -
-144	147-0008-00			1	MOTOR, AC
					(ATTACHING PARTS)
-145	212-0577-00			2	SCREW, 10-32 x 0.50 inch, RHS
-146	337-1756-00			1	SHIELD, fan motor
-147	210-1112-00			2	WASHER, flat, plastic, 0.228 ID x 0.375 inch OD
					- - - * - - -
-148	369-0037-00			1	FAN, plastic
-149	378-0811-00			1	BAFFLE, air
					(ATTACHING PARTS)
-150	211-0008-00			4	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-151	337-1757-00			1	SHIELD, electrical
					(ATTACHING PARTS)
-152	211-0097-00			4	SCREW, 4-40 x 0.312 inch, PHS
					- - - * - - -
-153	- - - - - -			1	CIRCUIT BRD ASSY--REGULATOR (See A11
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-154	131-0608-00			45	TERMINAL, pin, 0.365 inch long
-155	131-0847-00			12	TERMINAL, post, 0.435 inch long
-156	136-0183-00			3	SOCKET, transistor, 3 pin

FIGURE 2 7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
2-157	136-0235-00			6	SOCKET, transistor, 6 pin
-158	136-0252-04			36	SOCKET, pin connector
	136-0384-00			12	SOCKET, pin connector
-159	136-0269-00			1	SOCKET, integrated circuit, 14 pin
-160	136-0361-00			6	SOCKET, transistor
-161	214-1291-00			3	HEATSINK, transistor
-162	344-0154-00			2	CLIP, fuse
-163	- - - - - -			6	TRANSISTOR
					(ATTACHING PARTS FOR EACH)
-164	211-0511-00			2	SCREW, 6-32 x 0.50 inch, PHS
-165	386-0978-00			1	PLATE, mica
					- - - * - - -
-166	441-1129-00			1	CHASSIS
					(ATTACHING PARTS)
	211-0538-00			4	SCREW, 6-32 x 0.312 inch, 100 deg. csk, FHS
					- - - * - - -
-167	- - - - - -			1	SHIELD CHASSIS ASSEMBLY
					(ATTACHING PARTS)
	211-0589-00			2	SCREW, 6-32 x 0.312 inch, PHB
					- - - * - - -
-168	352-0171-00			5	HOLDER, terminal connector, 1 wire (black)
-169	352-0169-00			4	HOLDER, terminal connector, 2 wire (black)
	352-0169-01			3	HOLDER, terminal connector, 2 wire (brown)
	352-0169-03			2	HOLDER, terminal connector, 2 wire (orange)
	352-0169-04			2	HOLDER, terminal connector, 2 wire (yellow)
	352-0169-08			2	HOLDER, terminal connector, 2 wire (gray)
	352-0169-09			2	HOLDER, terminal connector, 2 wire (white)
-170	352-0161-00			4	HOLDER, terminal connector, 3 wire (black)
	352-0161-02			3	HOLDER, terminal connector, 3 wire (red)
	352-0161-07			2	HOLDER, terminal connector, 3 wire (violet)
	352-0161-09			2	HOLDER, terminal connector, 3 wire (white)
-171	352-0162-01			4	HOLDER, terminal connector, 4 wire (brown)
	352-0162-04			1	HOLDER, terminal connector, 4 wire (yellow)
	352-0162-05			4	HOLDER, terminal connector, 4 wire (green)
	352-0162-09			2	HOLDER, terminal connector, 4 wire (white)
-172	352-0163-00			1	HOLDER, terminal connector, 5 wire (black)
	352-0163-01			4	HOLDER, terminal connector, 5 wire (brown)
	352-0163-02			1	HOLDER, terminal connector, 5 wire (red)
	352-0163-05			5	HOLDER, terminal connector, 5 wire (green)
	352-0163-06			2	HOLDER, terminal connector, 5 wire (blue)
-173	352-0164-01			2	HOLDER, terminal connector, 6 wire (brown)
-174	352-0165-00			2	HOLDER, terminal connector, 7 wire (black)
-175	352-0166-00			4	HOLDER, terminal connector, 8 wire (black)
	352-0166-01			2	HOLDER, terminal connector, 8 wire (brown)
	352-0166-02			2	HOLDER, terminal connector, 8 wire (red)
	352-0166-03			2	HOLDER, terminal connector, 8 wire (orange)
	352-0167-00			2	HOLDER, terminal connector, 9 wire (black)
-176	352-0168-00			2	HOLDER, terminal connector, 10 wire (black)
	352-0168-02			2	HOLDER, terminal connector, 10 wire (red)
	352-0168-05			4	HOLDER, terminal connector, 10 wire (green)

FIGURE 2 7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
2-	352-0168-07			4	HOLDER, terminal connector, 10 wire (violet)
-177	131-0707-00			337	CONNECTOR, terminal
	131-0708-00			14	CONNECTOR, terminal
-178	210-0775-00			9	EYELET, 0.126 OD x 0.23 inch long
-179	210-0774-00			9	EYELET, 0.152 x 0.245 inch long
-180	175-0825-00			in	WIRE, electrical, 2 wire ribbon, 22 inches
-181	175-0826-00			in	WIRE, electrical, 3 wire ribbon, 80 inches
-182	175-0827-00			in	WIRE, electrical, 4 wire ribbon, 21 inches
-183	175-0828-00			in	WIRE, electrical, 5 wire ribbon, 41 inches
-184	175-0829-00			in	WIRE, electrical, 6 wire ribbon, 15 inches
-185	175-0830-00			in	WIRE, electrical, 7 wire ribbon, 7 inches
-186	175-0831-00			in	WIRE, electrical, 8 wire ribbon, 98 inches
-187	175-0833-00			in	WIRE, electrical, 10 wire ribbon, 67 inches
-188	200-1075-00			4	COVER, terminal, plastic
-189	131-0861-00			4	CONNECTOR, quick disconnect

FIGURE 3 R7623 FRONT & FRAME

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
3-1	426-0514-00			1	FRAME, mask
-2	378-0625-08			1	FILTER, light, CRT
-3	331-0258-03			1	MASK, graticule
-4	200-0939-01			1	BEZEL, CRT
					(ATTACHING PARTS)
-5	212-0023-00			4	SCREW, 8-32 x 0.375 inch, PHS
					- - - * - - -
-6	337-1159-00			1	SHIELD, implosion
-7	331-0245-00			1	MASK, CRT
-8	333-1691-00			1	PANEL
-9	386-1884-03			1	SUPPORT, CRT front
	- - - - - -			-	support includes:
-10	386-1517-00			4	SUPPORT, CRT front
					(ATTACHING PARTS)
-11	212-0040-00			2	SCREW, 8-32 x 0.375 inch, 100 deg. csk, FHS
-12	211-0510-00			2	SCREW, 6-32 x 0.375 icnh, PHS
					- - - * - - -
-13	204-0380-00			1	BODY, terminal
-14	131-0765-00			3	TERMINAL, feedthru
-15	348-0031-00			1	GROMMET, plastic, 0.156 inch OD
-16	- - - - - -			1	CIRCUIT BOARD ASSY--GRATICULE LIGHT (See A13
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-17	378-0614-00			1	REFLECTOR, light
-18	344-0179-00			2	CLIP, reflector
-19	211-0062-00			2	SCREW, 2-56 x 0.312 inch, RHS
-20	366-1391-00			2	KNOB, gray--READOUT & SAVE INTEN
	- - - - - -			-	each knob includes:
	213-0140-00			1	SETSCREW, 2-56 x 0.094 inch, HSS
-21	366-1077-00			2	KNOB, charcoal--INTENSITY & STORAGE LEVEL
	- - - - - -			-	each knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS
-22	366-1059-00			1	KNOB, gray--BEAMFINDER
-23	366-1215-00			1	KNOB, charcoal--GRATICULE ILLUM
	- - - - - -			-	knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS
-24	366-0494-00			1	KNOB, charcoal--AUTO VIEW TIME
	- - - - - -			-	knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS
-25	366-1402-02			2	PUSHBUTTON--LEFT
-26	366-1402-03			1	PUSHBUTTON--ALT
-27	366-1402-04			1	PUSHBUTTON--ADD
-28	366-1257-31			1	PUSHBUTTON--CHOP
-29	366-1402-06			2	PUSHBUTTON--RIGHT
-30	366-1402-10			1	PUSHBUTTON--MULTI TRACE
-31	366-1402-11			1	PUSHBUTTON--INTEG
-32	366-1402-07			1	PUSHBUTTON--VERT MODE
-33	366-1402-08			1	PUSHBUTTON--NON STORE
-34	366-1402-25			1	PUSHBUTTON--VAR PERSIST
-35	366-1402-12			1	PUSHBUTTON--FAST

FIGURE 3 R7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
3-36	366-1402-13			1	PUSHBUTTON--BI STABLE
-37	366-1402-21			1	PUSHBUTTON--SAVE
-38	366-1402-76			1	PUSHBUTTON--AUTO
-39	366-1402-14			1	PUSHBUTTON--MAN
-40	426-0681-00			18	FRAME, pushbutton
-41	366-1480-01			1	PUSHBUTTON--ON
-42	- - - - - -			4	RESISTOR, variable
					(ATTACHING PARTS FOR EACH)
-43	210-0583-00			1	NUT, hex., 0.25-32 x 0.312 inch
	210-0940-00			1	WASHER, flat, 0.25 ID x 0.375 inch OD
-44	210-0046-00			1	WASHER, lock, internal, 0.261 ID x 0.40
	- - - - - -			-	inch OD
					- - - * - - -
-45	358-0378-00			1	BUSHING, sleeve
-46	333-1508-00			1	PANEL, front
-47	- - - - - -			1	CIRCUIT BOARD ASSY--MODE (See A18
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-48	131-0608-00			33	TERMINAL, pin, 0.365 inch long
-49	136-0252-04			6	SOCKET, pin connector
-50	260-1378-00			1	SWITCH, push--VERT MODE
-51	260-1379-00			1	SWITCH, push--TRIGGER SOURCE
-52	260-1380-00			1	SWITCH, push--STORE (2 button)
-53	260-1381-00			1	SWITCH, push--STORE (4 button)
-54	361-0411-00			20	SPACER, push switch
-55	- - - - - -			-	RESISTOR, variable
					(ATTACHING PARTS)
-56	210-0583-00			1	NUT, hex., 0.25-32 x 0.312 inch
	210-0046-00			1	WASHER, lock, internal, 0.261 ID x 0.40
	- - - - - -			-	inch OD
-57	386-2285-00			1	PLATE
					- - - * - - -
-58	220-0455-00			2	NUT BLOCK
					(ATTACHING PARTS FOR EACH)
-59	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					(ATTACHING PARTS)
-60	211-0105-00			2	SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
					- - - * - - -
	376-0150-00	B010100	B059999X	1	COUPLING, shaft (focus)
	384-1112-02	B010100	B059999X	1	SHAFT, extension (focus)
-61	136-0387-01			1	JACK, tip, black
-62	136-0387-00			3	JACK, tip, gray
-63	384-1136-00			7	SHAFT, extension
-64	- - - - - -			1	CIRCUIT BOARD ASSY--ERASE (See A17 Electrical
	- - - - - -			-	Parts List)
	- - - - - -			-	circuit board assembly includes:
-65	131-0608-00			6	TERMINAL, pin, 0.365 inch long
-66	260-1382-00			1	SWITCH, push--ERASE/SAVE
-67	361-0411-00			4	SPACER, switch
-68	220-0637-00			1	NUT BLOCK
					(ATTACHING PARTS)
-69	211-0062-00			2	SCREW, 2-56 x 0.312 inch, PHS
					(ATTACHING PARTS)
-70	211-0105-00			2	SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
					- - - * - - -

FIGURE 3 R7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
3-71	386-2119-00			1	SUBPANEL, front
					(ATTACHING PARTS)
-72	211-0538-00			4	SCREW, 6-32 x 0.375 inch, 100 deg. csk, FHS
	211-0589-00			2	SCREW, 6-32 x 0.312 inch, PHB
					- - -* - - -
	352-0084-02	XB040000		1	BUSHING, trace rot
-73	390-0229-00	B010100	B039999	1	CABINET TOP
	390-0229-01	B040000		1	CABINET TOP, w/trace rotation access
					(ATTACHING PARTS)
-74	211-0008-00			6	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-75	386-2412-00			1	SUPPORT, CRT
					(ATTACHING PARTS)
	211-0538-00			2	SCREW, 6-32 x 0.312 inch, 100 deg. csk, FHS
	210-0457-00			3	NUT, keps, 6-32 x 0.312 inch
	211-0507-00			1	SCREW, 6-32 x 0.312 inch, PHS
					- - - * - - -
-76	343-0004-00			1	CLAMP, cable, 0.312 inch diameter
					(ATTACHING PARTS)
-77	211-0507-00			1	SCREW, 6-32 x 0.312 inch, PHS
-78	210-0863-00			1	WASHER, cable clamp
-79	210-0457-00			1	NUT, keps, 6-32 x 0.312 inch
					- - - * - - -
	644-0437-01			1	POWER SWITCH ASSEMBLY
	- - - - - - -			-	power switch assembly includes:
-80	337-1760-00			1	SHIELD, switch
-81	211-0020-00			2	SCREW, 4-40 x 1.125 inch, PHS
-82	220-0665-00			2	NUT, self-locking, 4-40 x 0.25 inch
-83	260-1368-01			2	SWITCH
-84	214-1226-01			1	SPRING, helical compression
-85	214-1689-00			1	ACTUATOR, switch
-86	200-1318-00			1	COVER, switch
					(ATTACHING PARTS)
-87	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
-88	210-0201-00			1	TERMINAL, lug, SE #4
					- - - * - - -
-89	384-1183-00			1	SHAFT, extenion
-90	351-0295-02			3	GUIDE, slide
					(ATTACHING PARTS FOR EACH)
-91	211-0105-00			1	SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
	211-0101-00			1	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -
-92	200-1401-00			1	COVER, access, readout
					(ATTACHING PARTS)
-93	211-0101-00			5	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -
-94	351-0305-01			3	GUIDE, plug-in
					(ATTACHING PARTS FOR EACH)
-95	211-0105-00			1	SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
					- - - * - - -
	129-0441-00	XB060000		2	POST, 2-56 x 5.045 inches long
					(ATTACHING PARTS FOR EACH)
	211-0087-01	XB060000		1	SCREW, 2-56 x 0.188 inch, 82 deg. csk, FHS
					- - - * - - -

FIGURE 3 R7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
3-96	367-0138-00			2	HANDLE ASSEMBLY
					(ATTACHING PARTS FOR EACH)
-97	212-0518-00			2	SCREW, 10-32 x 0.312 inch, PHS
					- - - * - - -
	355-0131-00	XB080760		1	STUD, binding post
					(ATTACHING PARTS)
	212-0023-00	XB080760		1	SCREW, 8-32 x 0.375 inch, PHS
	210-0008-00	XB080760		1	WASHER, lock, internal, 0.172 ID x 0.331 inch OD
					- - - * - - -
	200-0103-00	XB080760		1	NUT, knurled
-98	386-2054-00			1	SUPPORT, power supply
					(ATTACHING PARTS)
-99	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -
-100	200-1448-00			1	COVER, access, vertical
					(ATTACHING PARTS)
-101	211-0101-00			6	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -
-102	351-0313-00			1	GUIDE, rackmount, 19.218 inches long (pair)
					(ATTACHING PARTS)
-103	210-0458-00			9	NUT, keps, 8-32 x 0.344 inch
					- - - * - - -
-104	- - - - - -			1	CIRCUIT BOARD ASSY--REGULATOR (See All
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-105	131-0608-00			45	TERMINAL, pin, 0.365 inch long
-106	131-0847-00			12	TERMINAL, post, 0.435 inch long
-107	136-0183-00			3	SOCKET, transistor, 3 pin
-108	136-0235-00			6	SOCKET, transistor, 6 pin
-109	136-0252-04			36	SOCKET, pin connector
	136-0384-00			12	SOCKET, pin connector
-110	136-0269-00			1	SOCKET, integrated circuit, 14 pin
-111	136-0361-00			6	SOCKET, transistor
-112	214-1291-00			3	HEATSINK, transistor
-113	344-0154-00			2	CLIP, electrical, fuse
-114	441-1060-01			1	CHASSIS, heatsink
					(ATTACHING PARTS)
-115	211-0538-00			1	SCREW, 6-32 x 0.312 inch, 100 deg. csk, FHS
-116	211-0507-00			2	SCREW, 6-32 x 0.25 inch, PHS
-117	211-0025-00			2	SCREW, 4-40 x 0.375 inch, 100 deg. csk, FHS
					- - - * - - -
-118	- - - - - -			6	TRANSISTOR
					(ATTACHING PARTS FOR EACH)
-119	211-0511-00			2	SCREW, 6-32 x 0.50 inch, PHS
-120	386-0978-00			1	PLATE, mica
					- - - * - - -
-121	337-1731-00			1	SHIELD, electrical
					(ATTACHING PARTS)
-122	211-0507-00			4	SCREW, 6-32 x 0.25 inch, PHS
					- - - * - - -
-123	407-1145-02			1	BRACKET, heatsink
					(ATTACHING PARTS)
-124	211-0504-00			2	SCREW, 6-32 x 0.25 inch, PHS
					- - - * - - -
-125	220-0614-00			1	NUT BLOCK
					(ATTACHING PARTS)
-126	211-0507-00			2	SCREW, 6-32 x 0.312 inch, PHS
					- - - * - - -

FIGURE 3 R7623 FRONT & FRAME (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
3-127	437-0143-00			1	CABINET
	- - - - - -			-	cabinet includes:
-128	210-0632-00			6	EYELET, 0.089 OD x 0.125 inch long
-129	348-0274-00			2	SHIELDING GASKET, electronic
-130	343-0004-00			1	CLAMP, cable, 0.312 inch diameter
					(ATTACHING PARTS)
-131	211-0511-00			1	SCREW, 6-32 x 0.50 inch, PHS
-132	210-0863-00			1	WASHER, cable clamp
-133	210-0202-00			1	TERMINAL, lug, SE #6
-134	210-0457-00			1	NUT, keps, 6-32 x 0.312 inch
					- - - * - - -
-135	343-0004-00			1	CLAMP, cable
					(ATTACHING PARTS)
-136	211-0507-00			1	SCREW, 6-32 x 0.312 inch, PHS
-137	210-0863-00			1	WASHER, cable clamp
					- - - * - - -
-138	175-0825-00			in	WIRE, electrical, 2 wire ribbon, 15.50
	- - - - - -			-	inches long
-139	175-0826-00			in	WIRE, electrical, 3 wire ribbon, 39 inches
	- - - - - -			-	long
-140	175-0827-00			in	WIRE, electrical, 4 wire ribbon, 24.50
	- - - - - -			-	inches long
-141	175-0828-00			in	WIRE, electrical, 5 wire ribbon, 22.50
	- - - - - -			-	inches long
-142	175-0832-00			in	WIRE, electrical, 9 wire ribbon, 9.50
	- - - - - -			-	inches long
-143	352-0171-00			6	HOLDER, terminal connector, 1 wire (black)
-144	352-0169-00			1	HOLDER, terminal connector, 2 wire (black)
	352-0169-07			2	HOLDER, terminal connector, 2 wire (violet)
-145	352-0161-00			1	HOLDER, terminal connector, 3 wire (black)
	352-0161-08			2	HOLDER, terminal connector, 3 wire (gray)
-146	352-0162-05			2	HOLDER, terminal connector, 4 wire (green)
-147	352-0163-06			3	HOLDER, terminal connector, 5 wire (blue)
	352-0163-07			1	HOLDER, terminal connector, 5 wire (violet)
-148	352-0167-00			2	HOLDER, terminal connecotr, 9 wire (black)
-149	131-0707-00			63	CONNECTOR, terminal

FIGURE 4 R7623 CHASSIS

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
4-1	------			1	CIRCUIT BRD ASSY--VERTICAL AMP (See A5
	------			-	Electrical List)
	------			-	circuit board assembly includes:
-2	131-0566-00			1	LINK, terminal, connector
-3	131-0589-00			7	TERMINAL, pin, 0.46 inch long
-4	131-1003-00			3	CONNECTOR, receptacle, coaxial
-5	131-1303-00			1	CONTACT, integrated circuit ground
-6	136-0252-04			25	SOCKET, pin connector
	136-0252-01			3	SOCKET, pin connector
					(ATTACHING PARTS)
-7	211-0014-00			2	SCREW, 4-40 x 0.50 inch, PHS
-8	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-9	214-1652-00			1	HEATSINK, vertical amplifier
-10	214-1757-00			1	HEATSINK
-11	361-0477-00			2	SPACER, sleeve, 0.228 ID x 0.50 inch OD
-12	351-0087-00			2	GUIDE, circuit board
-13	131-0472-01			4	CONNECTOR, pin, female
-14	------			1	CIRCUIT BRD ASSY--HORIZ AMP (See A6
	------			-	Electrical Parts List)
	------			-	circuit board assembly includes:
-15	131-0608-00			21	TERMINAL, pin, 0.365 inch long
-16	131-1003-00			2	CONNECTOR, receptacle, coaxial
-17	136-0252-04			25	SOCKET, pin connector
	136-0252-01			2	SOCKET, pin connector
-18	136-0260-01			1	SOCKET, integrated circuit, 16 pin
-19	129-0075-00	XB020000		1	INSULATOR, standoff
-20	361-0007-00	XB020000		1	SPACER, plastic
					(ATTACHING PARTS)
-21	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-22	------			1	COIL, y-axis
					(ATTACHING PARTS)
-23	213-0138-00			2	SCREW, thread forming, 4-24 x 0.188 inch, PHS
-24	343-0217-00			1	CLAMP, plastic
					- - - * - - -
-25	119-0368-00			1	DELAY LINE ASSEMBLY
					(ATTACHING PARTS)
-26	213-0034-00			2	SCREW, thread cutting, 4-40 x 0.312 inch, PHS
					- - - * - - -
-27	348-0064-00			1	GROMMET, plastic, 0.625 inch diameter
-28	407-1186-00			1	BRACKET, mounting
					(ATTACHING PARTS)
	211-0507-00			3	SCREW, 6-32 x 0.312 inch, PHS
	210-0457-00			3	NUT, keps, 6-32 x 0.312 inch
-29	211-0510-00			2	SCREW, 6-32 x 0.375 inch, PHS
-30	210-0995-00			2	WASHER, flat, 0.141 ID x 0.75 inch OD
					- - - * - - -
-31	------			1	SHIELD CHASSIS ASSEMBLY
					(ATTACHING PARTS)
	211-0541-00			2	SCREW, 6-32 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -

FIGURE 4 R7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
4-32	255-0334-00			in	PLASTIC CHANNEL, 3.75 inches long
-33	------			1	CIRCUIT BRD ASSY--CAL/STORAGE (See A15
	------			-	Electrical Parts List)
	------			-	circuit board assembly includes:
-34	131-0592-00			27	TERMINAL, pin, 0.885 inch long
-35	131-0608-00			78	TERMINAL, pin, 0.365 inch long
-36	136-0252-04			284	SOCKET, pin connector
-37	214-0579-00			8	TERMINAL, test point
					(ATTACHING PARTS)
-38	211-0008-00			5	SCREW, 4-40 x 0.25 inch, PHS
					---*---
-39	------			1	CIRCUIT BRD ASSY--STORAGE (See A14
	------			-	Electrical Parts List)
	------			-	circuit board assembly includes:
-40	131-0589-00			3	TERMINAL, pin, 0.46 inch long
-41	136-0252-04			95	SOCKET, pin connector
-42	136-0263-03			30	SOCKET, pin terminal
-43	351-0213-00			3	GUIDE-POST, lock
-44	441-1048-00			1	CHASSIS
					(ATTACHING PARTS)
	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					---*---
-45	351-0179-01			1	GUIDE
					(ATTACHING PARTS)
	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					---*---
	621-0466-00			1	HIGH VOLTAGE ASSEMBLY
	------			-	high voltage assembly includes:
-46	------			1	CIRCUIT BRD ASSY--HIGH VOLTAGE #2 (See
	------			-	A10 Electrical Parts List)
	------			-	circuit board assembly includes:
-47	131-0608-00			1	TERMINAL, pin, 0.365 inch long
-48	343-0088-00			1	CLAMP, retaining
-49	346-0032-00	B010100	B039999	2	STRAP, mousetail
	253-0011-00	B040000		ft	CORD, lacing, 0.833 foot long
					(ATTACHING PARTS)
-50	211-0040-00			4	SCREW, plastic, 4-40 x 0.25 inch, PH
-51	129-0251-00			4	POST, 0.25 OD x 1.125 inches long
-52	211-0008-00			4	SCREW, 4-40 x 0.25 inch, PHS
					---*---
-53	------			1	CIRCUIT BRD ASSY--HIGH VOLTAGE #1 (See
	------			-	A9 Electrical Parts List)
	------			-	circuit board assembly includes:
-54	131-0589-00			5	TERMINAL, pin, 0.46 inch long
	131-0608-00			19	TERMINAL, pin, 0.365 inch long
-55	136-0252-04			9	SOCKET, pin terminal
-56	214-0579-00			1	TERMINAL, test point
-57	166-0292-00			2	SLEEVE, support, 0.155 OD x 0.65 inch
	------			-	long
					(ATTACHING PARTS)
-58	211-0008-00			3	SCREW, 4-40 x 0.25 inch, PHS
					---*---

FIGURE 4 R7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
4-59	129-0143-00			3	POST, 0.312 OD x 0.406 inch long
					(ATTACHING PARTS FOR EACH)
-60	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-61	129-0236-00			1	POST, hex., 0.188 x 0.375 inch long
					(ATTACHING PARTS)
	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-62	136-0506-00			1	WIRING HARNESS, CRT socket
	- - - - - -			-	wiring harness includes:
-63	136-0304-02			1	SOCKET, CRT
-64	200-0917-01			1	COVER, CRT socket
-65	367-0117-00			1	HANDLE, CRT socket
-66	343-0235-00			1	CLAMP, CRT socket
-67	- - - - - -			1	CIRCUIT BRD ASSY--Z AXIS (See A8
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-68	131-0608-00			36	TERMINAL, pin, 0.365 inch long
-69	131-1003-00			1	CONNECTOR, receptacle, coaxial
-70	136-0252-04			35	SOCKET, pin connector
	136-0252-01			1	SOCKET, pin connector
					(ATTACHING PARTS)
-71	211-0008-00			3	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-72	348-0063-00			1	GROMMET, plastic, 0.50 inch diameter
-73	- - - - - -			2	TRANSISTOR
					(ATTACHING PARTS FOR EACH)
-74	213-0146-00			2	SCREW, thread forming, 6-20 x 0.312 inch,
	- - - - - -			-	PHS
-75	386-0978-00			1	PLATE, mica, 1.17 x 1.70 inches
					- - - * - - -
-76	136-0280-00			2	SOCKET, transistor
					(ATTACHING PARTS FOR EACH)
	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-77	255-0334-00	B010100	B040274	in	PLASTIC CHANNEL, 3.50 inches
	348-0012-00	B040275		1	GROMMET, rubber, 0.625 inch diameter
-78	351-0324-00			2	GUIDE, circuit board
-79	131-0773-00			1	CONNECTOR, receptacle, anode lead
-80	337-1538-00			1	SHIELD, electrical, high voltage
					(ATTACHING PARTS)
-81	211-0504-00			3	SCREW, 6-32 x 0.25 inch, PHS
					- - - * - - -
-82	- - - - - -			1	CIRCUIT BRD ASSY--READOUT (See A16
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-83	131-0608-00			42	TERMINAL, pin, 0.365 inch long
-84	131-1003-00			6	CONNECTOR, receptacle, coaxial
-85	136-0252-04			39	SOCKET, pin connector
	136-0252-01			6	SOCKET, pin connector

FIGURE 4 R7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
4-86	136-0235-00			1	SOCKET, transistor, 6 pin
-87	136-0260-01			14	SOCKET, integrated circuit, 16 pin
-88	136-0269-00			3	SOCKET, integrated circuit, 14 pin
-89	214-0579-00			19	TERMINAL, test point
-90	260-0723-00			1	SWITCH, slide
					(ATTACHING PARTS)
-91	211-0205-00			1	SCREW, 4-40 x 0.42 inch, PHS
-92	361-0527-00			1	SPACER
					- - - * - - -
	614-0077-05			1	POWER SUPPLY
	- - - - - - -			-	power supply includes:
-93	- - - - - - -			1	CIRCUIT BRD ASSY--RECETIFIER (See A12
	- - - - - - -			-	Electrical Parts List)
	- - - - - - -			-	circuit board assembly includes:
-94	131-0608-00			28	TERMINAL, pin, 0.365 inch long
-95	136-0252-04			6	SOCKET, pin connector
-96	214-1292-00			2	HEATSINK, transistor
-97	214-1731-00			1	HEATSINK, transistor
					(ATTACHING PARTS)
-98	211-0012-00			1	SCREW, 4-40 x 0.375 inch, PHS
-99	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
-100	210-0935-00			1	WASHER, fiber, 0.14 ID x 0.375 inch OD
					- - - * - - -
-101	344-0154-00			4	CLIP, electrical, fuse
					(ATTACHING PARTS)
-102	211-0507-00			2	SCREW, 6-32 x 0.312 inch, PHS
-103	210-0202-00			1	TERMINAL, lug, solder, SE #6
-104	211-0511-00			1	SCREW, 6-32 x 0.50 inch, PHS
-105	343-0004-00			1	CLAMP, cable, plastic, 0.312 inch diameter
-106	211-0510-00			1	SCREW, 6-32 x 0.375 inch, PHS
-107	210-0863-00			1	WASHER, cable clamp
					- - - * - - -
-108	- - - - - - -			1	TRANSFORMER
					(ATTACHING PARTS)
-109	212-0522-00			2	SCREW, 10-32 x 2.50 inches, HHS
	210-0812-00			2	WASHER, fiber, 0.188 ID x 0.375 inch OD
-110	166-0457-00			2	TUBE, insulating, 1.875 inches long
-111	212-0023-00			2	SCREW, 8-32 x 0.375 inch, PHS
	210-0804-00	XB020554		2	WASHER, flat, 0.17 ID x 0.375 inch OD
-112	407-0921-00			1	BRACKET, angle
					- - - * - - -
-113	- - - - - - -			1	SWITCH, thermostatic
					(ATTACHING PARTS)
-114	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-115	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -

FIGURE 4 R7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
4-116	441-0993-01			1	CHASSIS, power supply
					(ATTACHING PARTS)
	212-0004-00			6	SCREW, 8-32 x 0.312 inch, PHS
					- - - * - - -
	614-0074-02			1	SUBPANEL ASSEMBLY, rear
	- - - - - - -			-	subpanel assembly includes:
-117	131-0955-00			6	CONNECTOR, receptacle, BNC, w/hardware
					(ATTACHING PARTS FOR EACH)
-118	210-0255-00			1	TERMINAL, lug, SE, 0.391 inch diameter
					- - - * - - -
-119	161-0033-09			1	CABLE ASSEMBLY, power
-120	358-0025-00	B010100	B079999	1	BUSHING, strain relief
	358-0161-00	B080000		1	BUSHING, strain relief
-121	352-0076-00			1	FUSEHOLDER, w/hardware
-122	200-1388-00			1	COVER, fuseholder
-123	346-0077-00			1	STRAP, power cord
-124	210-0201-00			1	TERMINAL, lug, SE #4
					(ATTACHING PARTS)
-125	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-126	385-0149-00			1	POST, 4-40 x 0.25 OD x 0.625 inch long
					- - - * - - -
-127	210-0202-00			1	TERMINAL, lug, SE #6
					(ATTACHING PARTS)
-128	211-0504-00			1	SCREW, 6-32 x 0.25 inch, PHS
-129	210-0407-00			1	NUT, hex., 6-32 x 0.25 inch
					- - - * - - -
-130	- - - - - - -			1	CIRCUIT BOARD ASSY--SIGNAL OUT (See A7 Electrical Parts List)
	- - - - - - -			-	circuit board assembly includes:
-131	131-0608-00			11	TERMINAL, pin, 0.365 inch long
-132	131-1003-00			2	CONNECTOR, receptacle, coaxial
-133	136-0252-04			27	SOCKET, pin connector
	136-0252-01			2	SOCKET, pin connector
-134	260-0984-00			1	SWITCH, slide
-135	214-0579-00			1	TERMINAL, test point
					(ATTACHING PARTS)
-136	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -
-137	386-2410-00	B010100	B079999	1	SUBPANEL, rear
	386-2410-01	B080000		1	SUBPANEL, rear
					(ATTACHING PARTS)
-138	211-0565-00			4	SCREW, 6-32 x 0.25 inch, THS
					- - - * - - -
-139	119-0390-00			1	FAN, axial
					(ATTACHING PARTS)
	210-0457-00			4	NUT, keps, 6-32 x 0.312 inch
					- - - * - - -
-140	386-2401-00	B010100	B079999	1	PANEL, rear
	386-2401-02	B080000		1	PANEL, rear
					(ATTACHING PARTS)
	211-0008-00	B010100	B079999	8	SCREW, 4-40 x 0.25 inch, PHS
	211-0008-00	B080000		4	SCREW, 4-40 x 0.25 inch, PHS
	211-0101-00	B080000		4	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
					- - - * - - -

FIGURE 4 R7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	Description 1 2 3 4 5
4-141	407-0973-00			1	BRACKET, connector
					(ATTACHING PARTS)
	211-0507-00			4	SCREW, 6-32 x 0.312 inch, PHS
					- - - * - - -
-142	131-0930-00			2	CONTACT, plug-in ground
					(ATTACHING PARTS FOR EACH)
-143	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
-144	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-145	131-0799-00			2	CONTACT, plug-in ground, upper
					(ATTACHING PARTS FOR EACH)
-146	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
-147	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-148	131-0800-00			2	CONTACT, plug-in ground
					(ATTACHING PARTS FOR EACH)
-149	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-150	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
					- - - * - - -
-151	- - - - - -			1	CIRCUIT BOARD ASSY--LOGIC (See A2
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-152	131-0566-00			1	LINK, terminal connecting
-153	136-0235-00			1	SOCKET, transistor, 6 pin
-154	136-0252-04			24	SOCKET, pin connector
-155	136-0260-01			1	SOCKET, integrated circuit, 16 pin
-156	136-0263-03			33	SOCKET, pin terminal
-157	136-0269-00			3	SOCKET integrated circuit, 14 pin
-158	214-0579-00			1	TERMINAL, test point
-159	- - - - - -			1	CIRCUIT BRD ASSY--INTERFACE (See A1
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-160	670-1374-00			1	CIRCUIT BRD ASSY--VERTICAL INTERCONNECT
	- - - - - -			-	circuit board assembly includes:
-161	131-0787-00			8	TERMINAL, pin, 0.64 inch long
					(ATTACHING PARTS)
-162	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-163	351-0213-00			2	GUIDE-POST, lock
					- - - * - - -
-164	386-1558-00			2	SUPPORT, circuit board
-165	131-0592-00			26	TERMINAL, pin, 0.855 inch long
	131-0591-00			32	TERMINAL, pin, 0.835 inch long
-166	131-0608-00			85	TERMINAL, pin, 0.365 inch long
-167	129-0308-00			4	POST, hex., 4-40 x 0.188 x 0.465 inch
	- - - - - -			-	long
					(ATTACHING PART FOR EACH)
-168	211-0008-00			1	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -

FIGURE 4 R7623 CHASSIS (cont)

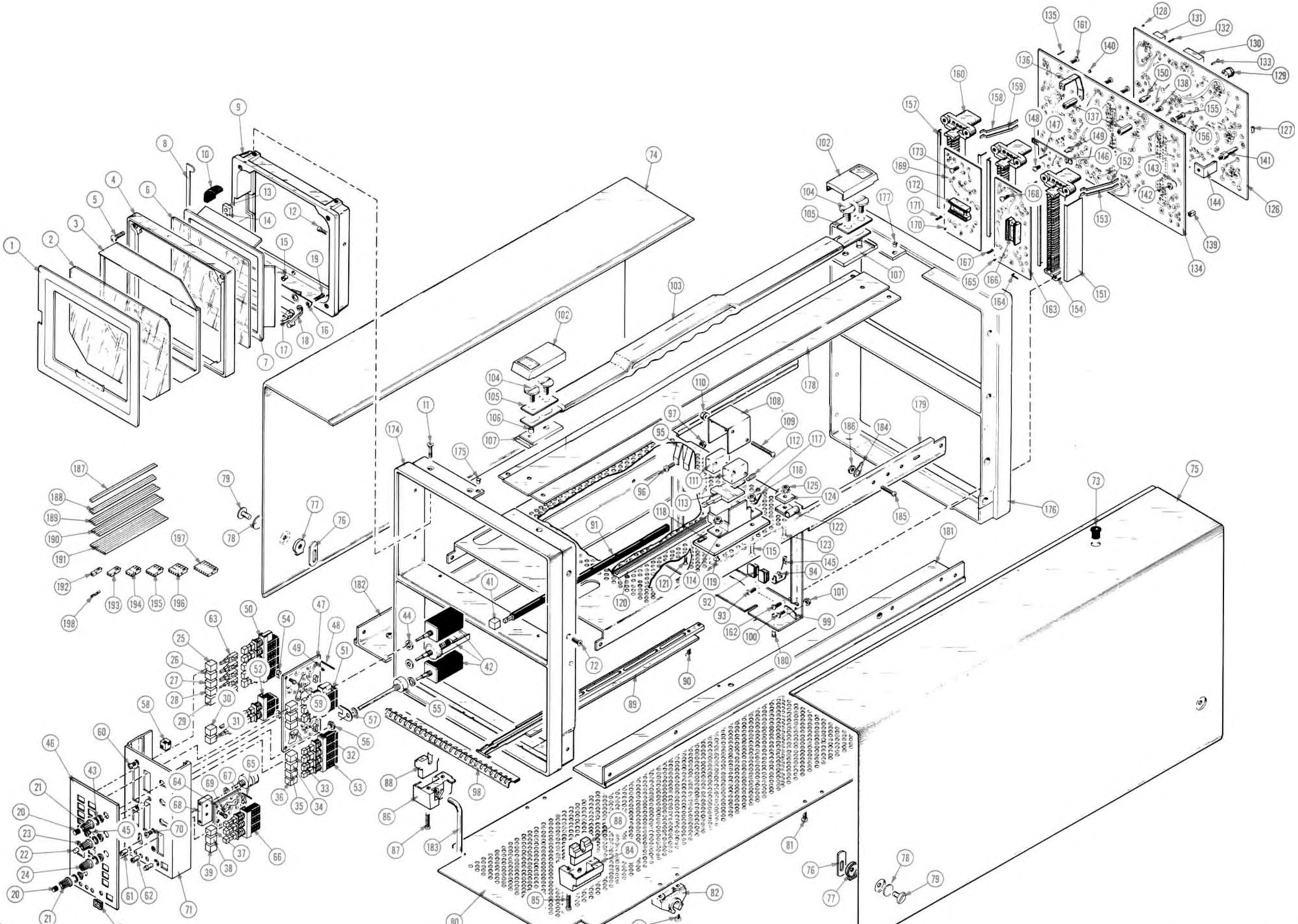
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
4-169	131-1003-00			2	CONNECTOR, receptacle, coaxial
	131-0767-02	B010100	B059999	2	CONNECTOR, receptacle
	131-0767-08	B060000		2	CONNECTOR, receptacle
	- - - - - -			-	each connector includes:
-170	200-0950-00			2	COVER, plastic
-171	204-0365-02			1	BODY, plastic
	131-0726-00	B010100	B059999	36	CONTACT, straight
	131-0726-00	B060000		33	CONTACT, straight
	131-0727-00	B010100	B059999	36	CONTACT, offset
	131-0727-00	B060000		33	CONTACT, offset
	131-0899-00			4	CONTACT, short tail
					(ATTACHING PARTS FOR EACH)
-172	213-0232-00			2	SCREW, thread forming, 2-56 x 0.312 inch,
	- - - - - -			-	PHS
					- - - * - - -
	131-0767-00	B010100	B059999	1	CONNECTOR, receptacle
	131-0767-07	B060000		1	CONNECTOR, receptacle
	- - - - - -			-	connector includes:
-173	131-0726-00	B010100	B059999	38	CONTACT, straight
	131-0726-00	B060000		35	CONTACT, straight
-174	131-0727-00	B010100	B059999	38	CONTACT, offset
	131-0727-00	B060000		35	CONTACT, offset
-175	200-0950-00			2	COVER, plastic
-176	204-0365-00			1	BODY, plastic
					(ATTACHING PARTS)
-177	213-0232-00			2	SCREW, thread forming, 2-56 x 0.312 inch,
	- - - - - -			-	PHS
	210-0906-00			1	WASHER, fiber, 0.125 ID x 0.203 inch OD
					- - - * - - -
-178	131-0804-00			1	LINK, terminal connecting, 1.17 inches long
-179	131-0805-00			2	LINK, terminal connecting, 0.90 inch long
-180	214-1568-00			2	PIN, guide
					(ATTACHING PARTS FOR EACH)
-181	210-0406-00			1	NUT, hex., 4-40 x 0.188 inch
-182	210-0054-00			1	WASHER, lock, split, 0.118 inch ID x 0.212
	- - - - - -			-	inch OD
-183	344-0147-00			1	CLIP, plastic
					(ATTACHING PARTS)
-184	213-0034-00			9	SCREW, thread forming, 4-40 x 0.312 inch, PHS
					- - - * - - -
-185	- - - - - -			1	CIRCUIT BRD ASSY-VERTICAL INTERFACE (See A4
	- - - - - -			-	Electrical Parts List)
	- - - - - -			-	circuit board assembly includes:
-186	136-0252-04			15	SOCKET, pin connector
-187	136-0263-03			18	SOCKET, pin terminal
-188	136-0260-01			1	SOCKET, integrated circuit, 16 pin
					(ATTACHING PARTS)
-189	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					- - - * - - -

FIGURE 4 R7623 CHASSIS (cont)

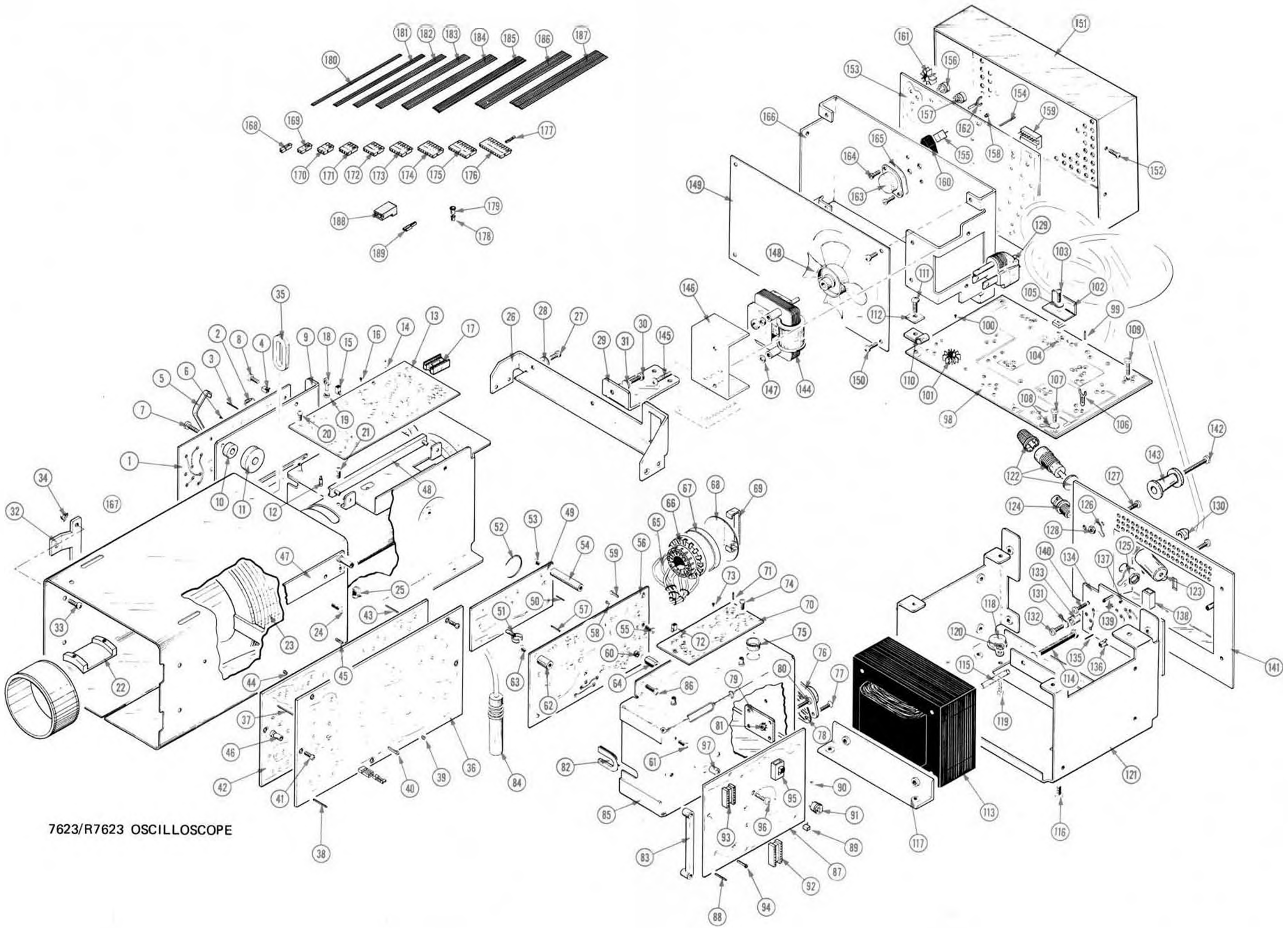
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
4-190	-------			1	CIRCUIT BRD ASSY--TRIGGER SELECTOR (See A3
	-------			-	Electrical Parts List)
	-------			-	circuit board assembly includes:
-191	131-0589-00			4	TERMINAL, pin, 0.46 inch long
-192	136-0252-04			15	SOCKET, pin connector
-193	136-0260-01			1	SOCKET, integrated circuit, 16 pin
-194	136-0263-03			16	SOCKET, pin terminal
					(ATTACHING PARTS)
-195	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
					---*---
-196	131-0707-00			324	CONNECTOR, terminal
	131-0708-00			14	CONNECTOR, terminal
-197	352-0171-00			5	HOLDER, terminal connector, 1 wire (black)
-198	352-0169-00			2	HOLDER, terminal connector, 2 wire (black)
	352-0169-01			4	HOLDER, terminal connector, 2 wire (brown)
	352-0169-04			2	HOLDER, terminal connector, 2 wire (yellow)
	352-0169-08			4	HOLDER, terminal connector, 2 wire (gray)
	352-0169-09			1	HOLDER, terminal connector, 2 wire (white)
-199	352-0161-00			1	HOLDER, terminal connector, 3 wire (black)
	352-0161-02			2	HOLDER, terminal connector, 3 wire (red)
	352-0161-03			1	HOLDER, terminal connector, 3 wire (orange)
	352-0161-04			2	HOLDER, terminal connector, 3 wire (yellow)
	352-0161-07			2	HOLDER, terminal connector, 3 wire (violet)
	352-0161-08			2	HOLDER, terminal connector, 3 wire (gray)
-200	352-0162-01			4	HOLDER, terminal connector, 4 wire (brown)
	352-0162-05			1	HOLDER, terminal connector, 4 wire (green)
	352-0162-09			1	HOLDER, terminal connector, 4 wire (white)
-201	352-0163-00			1	HOLDER, terminal connector, 5 wire (black)
	352-0163-01			2	HOLDER, terminal connector, 5 wire (brown)
	352-0163-06			2	HOLDER, terminal connector, 5 wire (blue)
	352-0163-08			2	HOLDER, terminal connector, 5 wire (gray)
-202	352-0164-01			2	HOLDER, terminal connector, 6 wire (brown)
	352-0164-05			1	HOLDER, terminal connector, 6 wire (green)
	352-0164-09			1	HOLDER, terminal connector, 6 wire (white)
-203	352-0165-00			2	HOLDER, terminal connector, 7 wire (black)
-204	352-0166-00			4	HOLDER, terminal connector, 8 wire (black)
	352-0166-01			3	HOLDER, terminal connector, 8 wire (brown)
	352-0166-02			3	HOLDER, terminal connector, 8 wire (red)
	352-0166-03			2	HOLDER, terminal connector, 8 wire (orange)
	352-0167-00			2	HOLDER, terminal connector, 9 wire (black)
-205	352-0168-00			2	HOLDER, terminal connector, 10 wire (black)
	352-0168-02			2	HOLDER, terminal connector, 10 wire (red)
	352-0168-05			2	HOLDER, terminal connector, 10 wire (green)
	352-0168-07			2	HOLDER, terminal connector, 10 wire (violet)
-206	210-0775-00			9	EYELET, 0.126 OD x 0.23 inch long
-207	210-0774-00			9	EYELET, 0.152 OD x 0.245 inch long
-208	200-1075-00			4	COVER, terminal, plastic
-209	131-0861-00			4	CONNECTOR, quick disconnect
-210	175-0825-00			in	WIRE, electrical, 2 wire ribbon, 22 inches
	-------			-	long

FIGURE 4 R7623 CHASSIS (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
4-211	175-0826-00			in	WIRE, electrical, 3 wire ribbon, 80 inches
	- - - - - -			-	long
-212	175-0828-00			in	WIRE, electrical, 4 wire ribbon, 21 inches
	- - - - - -			-	long
-213	175-0829-00			in	WIRE, electrical, 5 wire ribbon, 41 inches
	- - - - - -			-	long
-214	175-0830-00			in	WIRE, electrical, 6 wire ribbon, 15 inches
	- - - - - -			-	long
-215	175-0831-00			in	WIRE, electrical, 7 wire ribbon, 7 inches
	- - - - - -			-	long
-216	175-0833-00			in	WIRE, electrical, 8 wire ribbon, 98 inches
	- - - - - -			-	long
-217	175-0855-00			in	WIRE, electrical, 10 wire ribbon, 67 inches
	- - - - - -			-	long
-218	179-1825-00			1	WIRIING HARNESS, vertical signal
	- - - - - -			-	wiring harness includes:
	131-0707-00			3	CONNECTOR, terminal
	131-0708-00			1	CONNECTOR, terminal
	352-0162-00			1	HOLDER, terminal connector, 4 wire (black)
	210-0774-00			2	EYELET, 0.152 OD x 0.245 inch long
	210-0775-00			2	EYELET, 0.126 OD x 0.23 inch long
	179-1826-00			1	WIRING HARNESS, sweep gate
	- - - - - -			-	wiring harness includes:
	131-0707-00			8	CONNECTOR, terminal
	131-0708-00			8	CONNECTOR, terminal
	352-0166-03			2	HOLDER, terminal connector, 8 wire (orange)
-219	378-0041-01			1	FILTER, air
-220	255-0334-00			in	PLASTIC CHANNEL, 6.25 inches long



7623/R7623 OSCILLOSCOPE



7623/R7623 OSCILLOSCOPE

7623 REPACKAGING

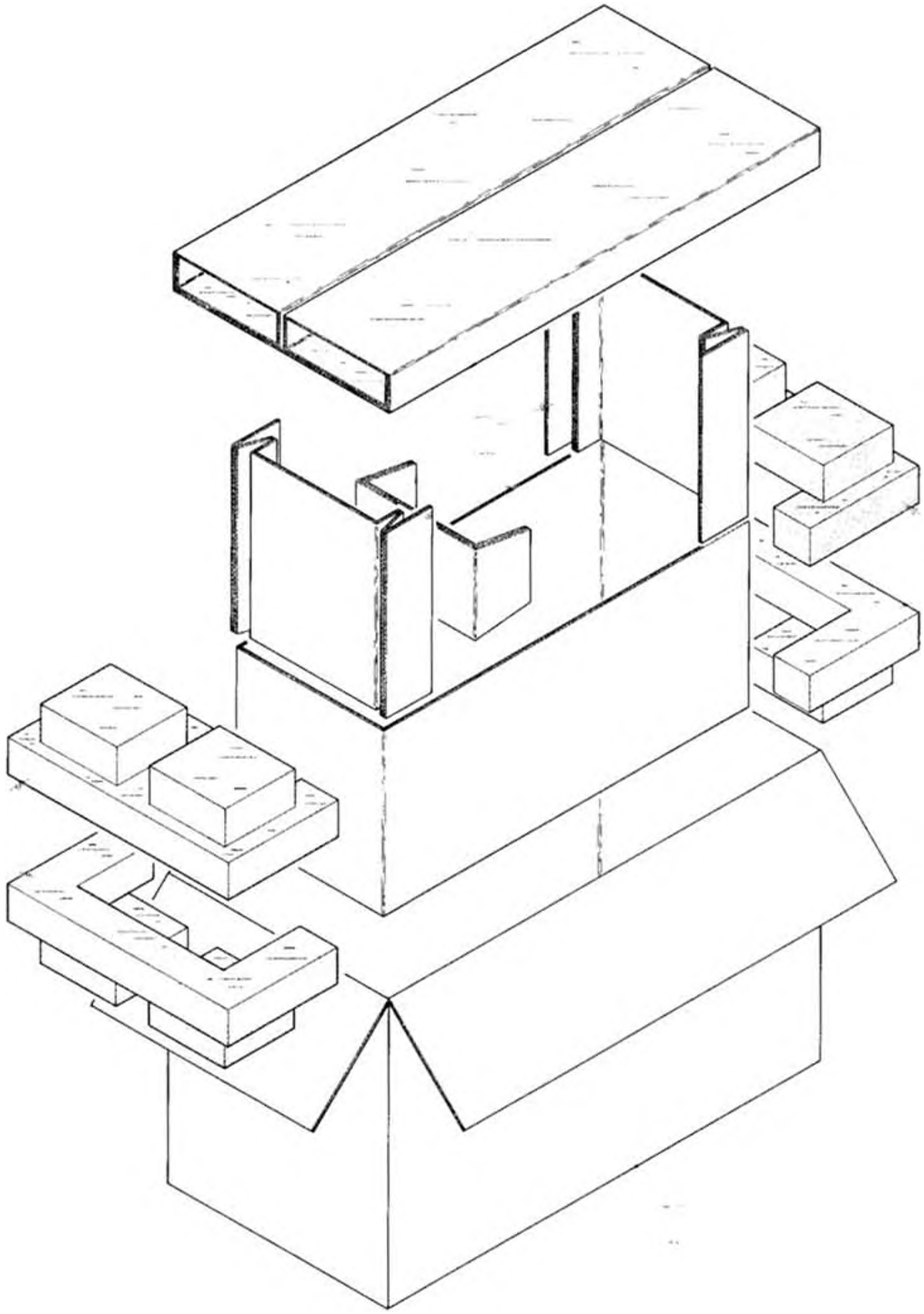


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
8-	065-0154-00			1	CARTON ASSEMBLY
	- - - - - - - - - -			-	carton assembly includes:
-1	004-0281-00			2	FRAME
-2	004-1092-00			1	PAD SET, 5 piece
-3	004-0766-00			1	CARTON

R7623 REPACKAGING

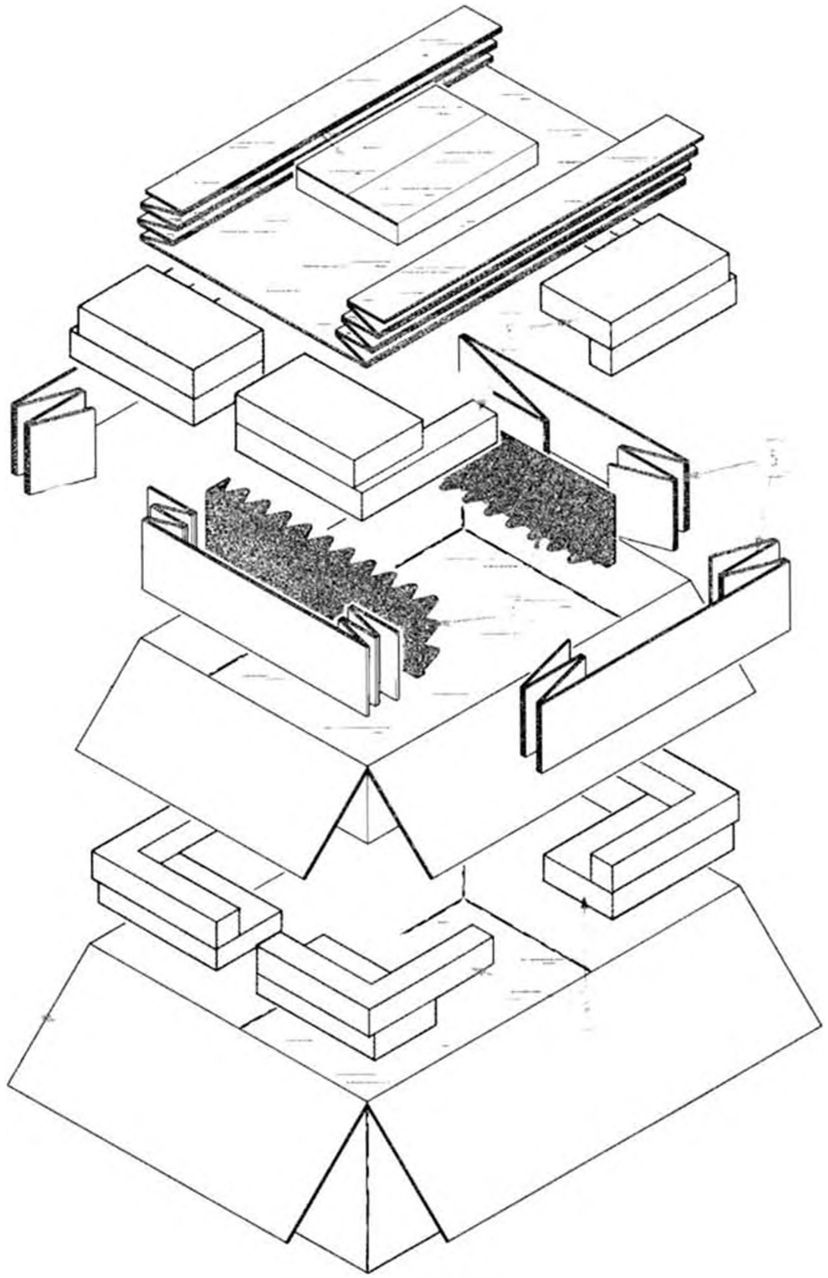
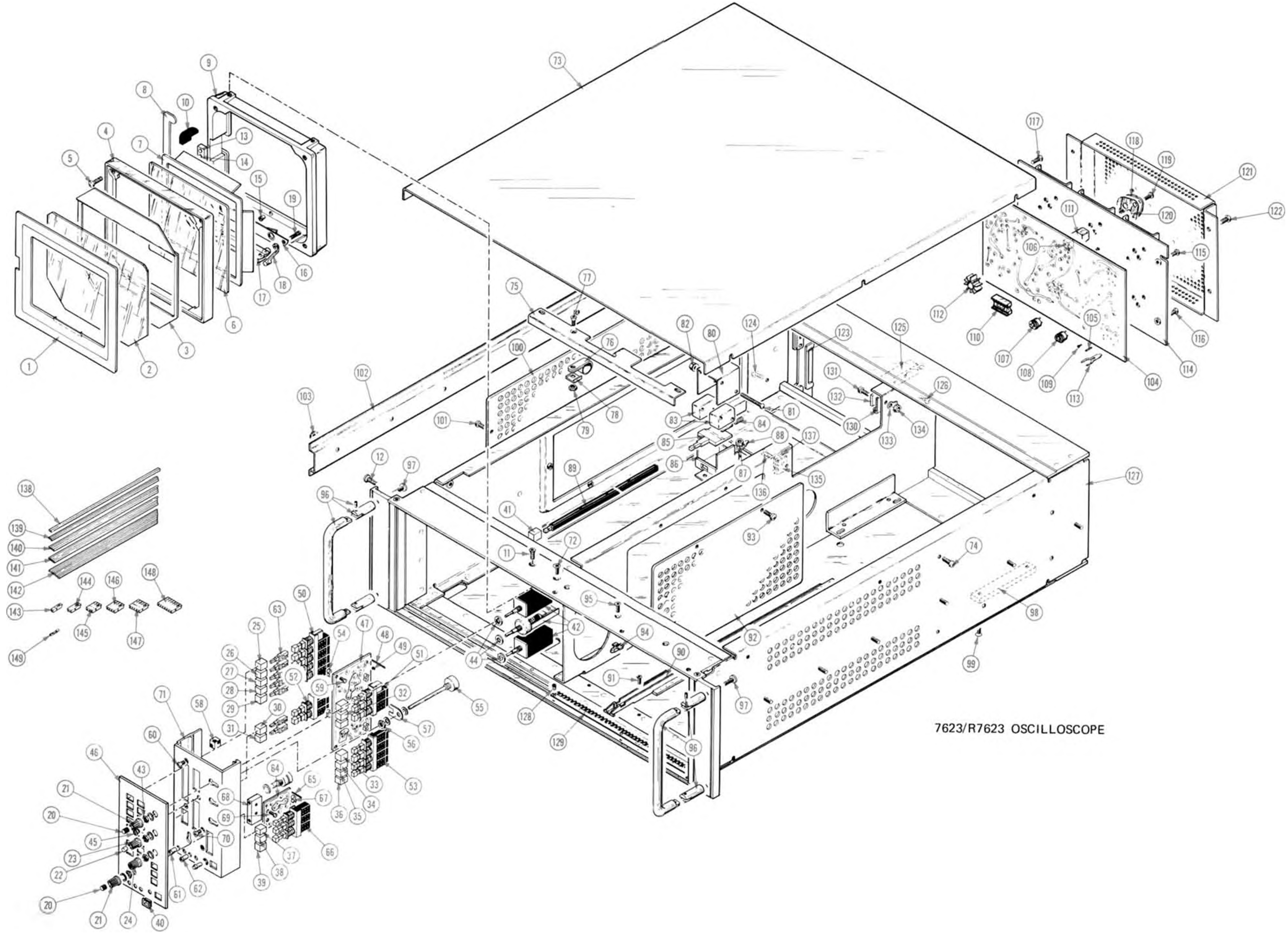
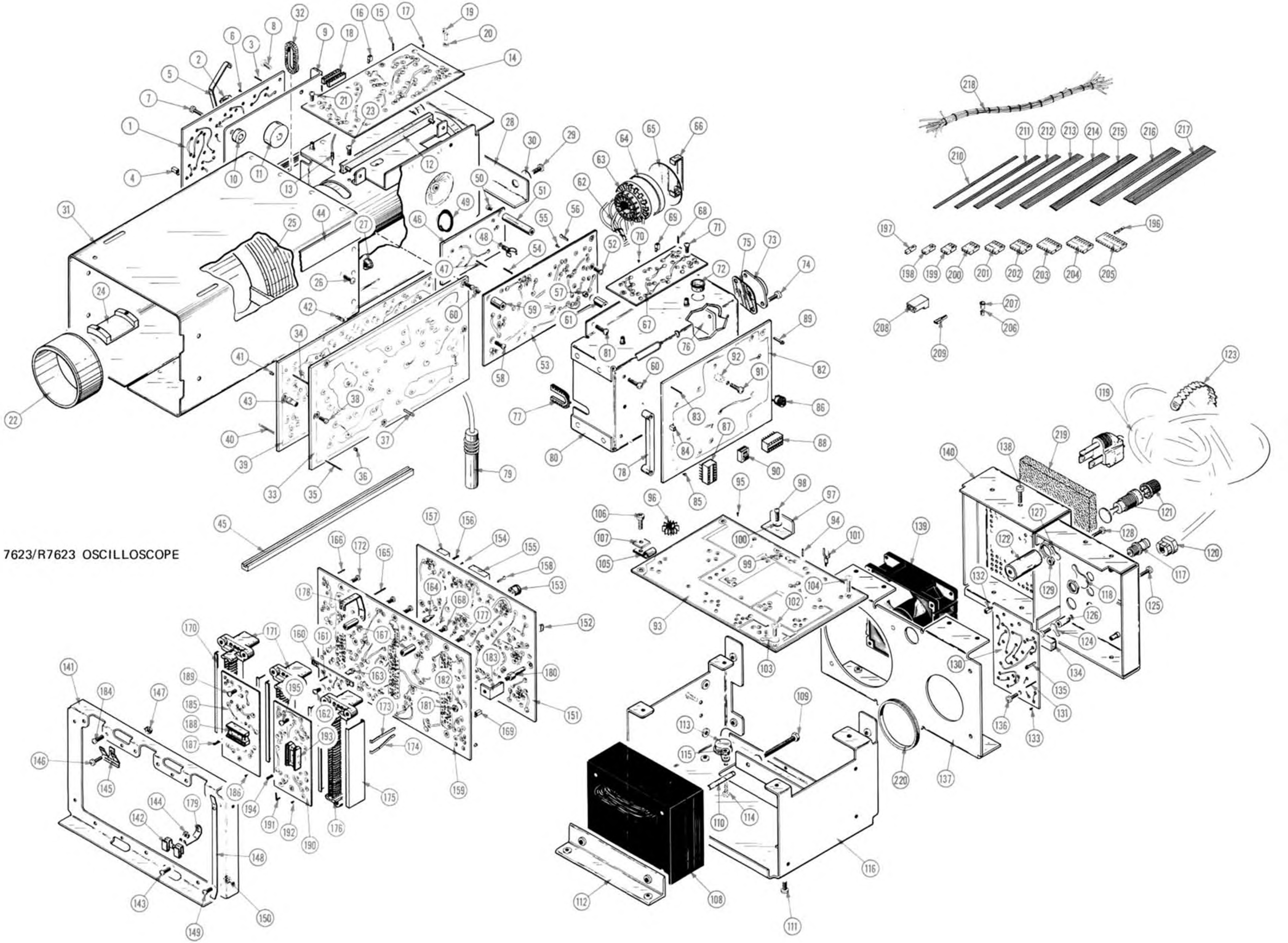


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
8-	065-0181-00			1	CARTON ASSEMBLY
	- - - - - - - - - -			-	carton assembly includes:
-4	004-0462-00			1	CARTON, accessory
-5	004-1160-00			1	PAD SET
-6	004-0853-00			1	CARTON, inner
-7	004-1210-00			1	PAD SET
-8	004-0276-00			2	FRAME
-9	004-0852-00			1	CARTON, outer



7623/R7623 OSCILLOSCOPE



7623/R7623 OSCILLOSCOPE

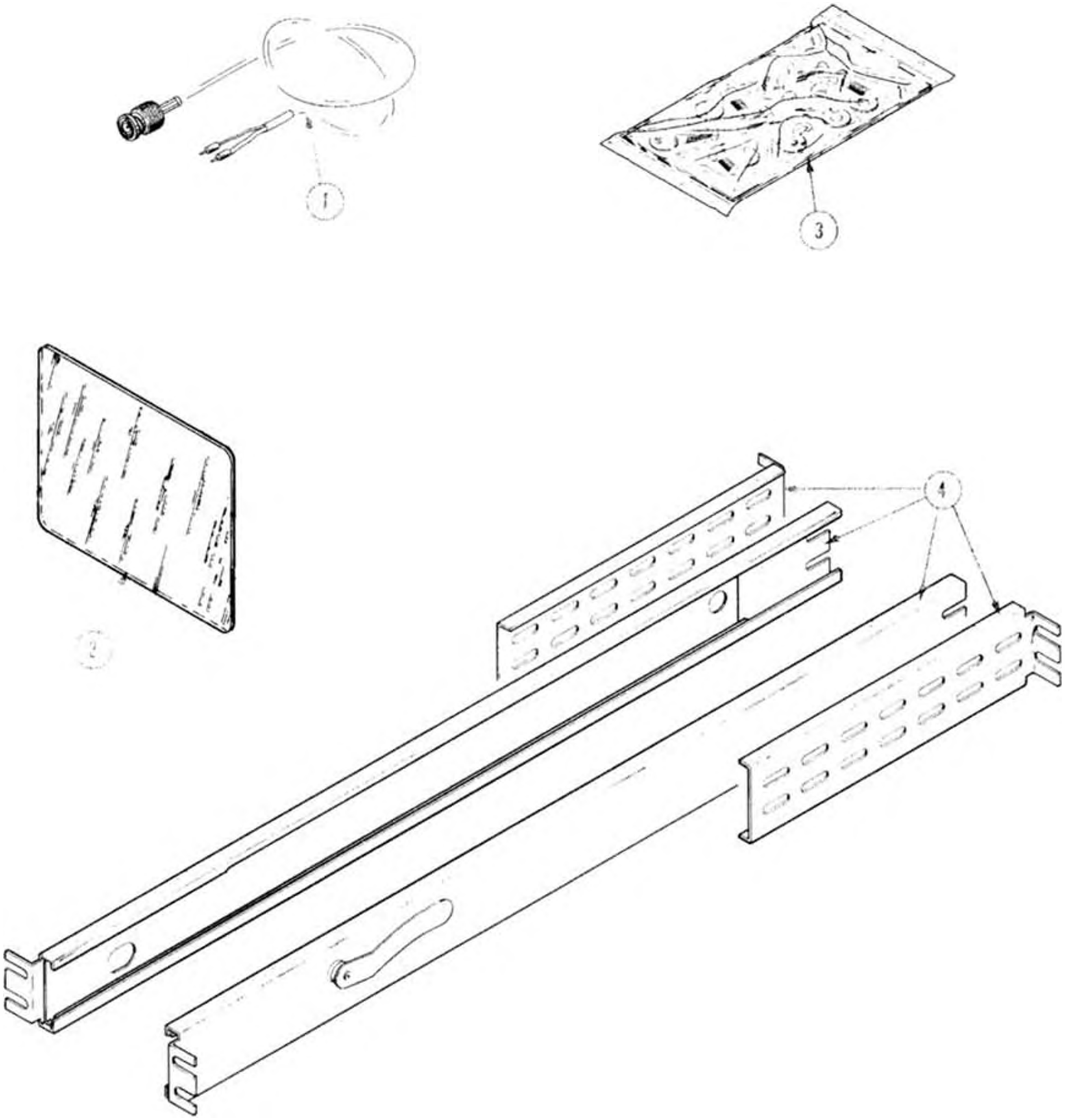


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
5-1	175-1178-00			1	CABLE, special purpose, RF
-2	378-0625-02			1	FILTER, light, CRT, gray
-3	016-0131-00			1	HARDWARE KIT (R7623 ONLY)
-4	351-0314-00			1	SLIDE-GUIDE, 19.25 inches long (R7623 ONLY)
	070-1366-00			1	MANUAL, instruction, operators (not shown)
	070-1465-00			1	MANUAL, instruction, service (not shown)

REPLACEABLE PARTS FOR FACTORY INSTALLED OPTIONS

OPTION 7 Without Signals Out

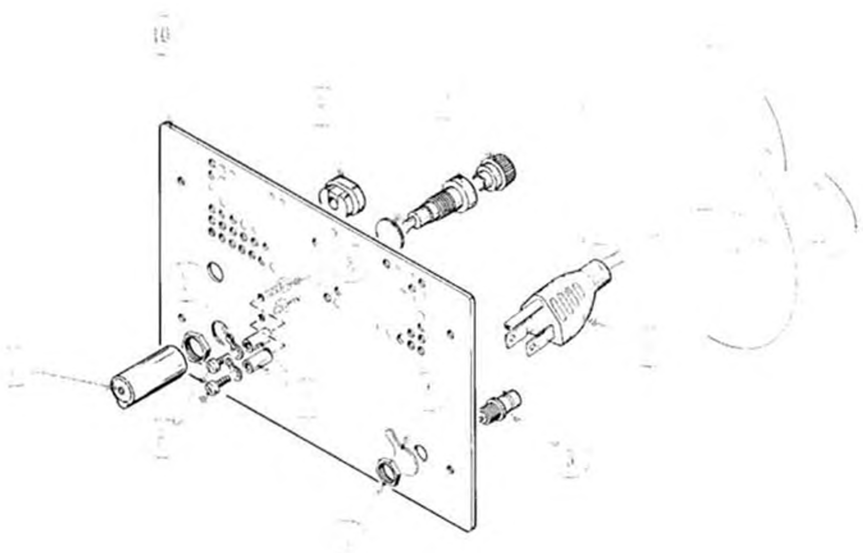


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
7-1	352-0076-00			1	FUSEHOLDER ASSEMBLY, w/hardware
-2	200-1388-00			1	COVER, fuseholder
-3	131-0955-00			1	CONNECTOR, receptacle, BNC, w/hardware
-4	210-0255-00			1	TERMINAL, lug, 0.391 inch diameter, SE
-5	210-0201-00			2	TERMINAL, lug, 0.12 inch diameter, SE
-6	211-0008-00			4	SCREW, 4-40 X 0.25 inch, PHS
-7	385-0149-00			2	POST, 0.25 OD X 0.625 inch long
-8	161-0033-09			1	CABLE ASSEMBLY, power
-9	358-0323-00			1	BUSHING, strain relief
-10	386-2329-00			1	PANEL, rear

OPTION 3 Electromagnetic Interference (EMI)

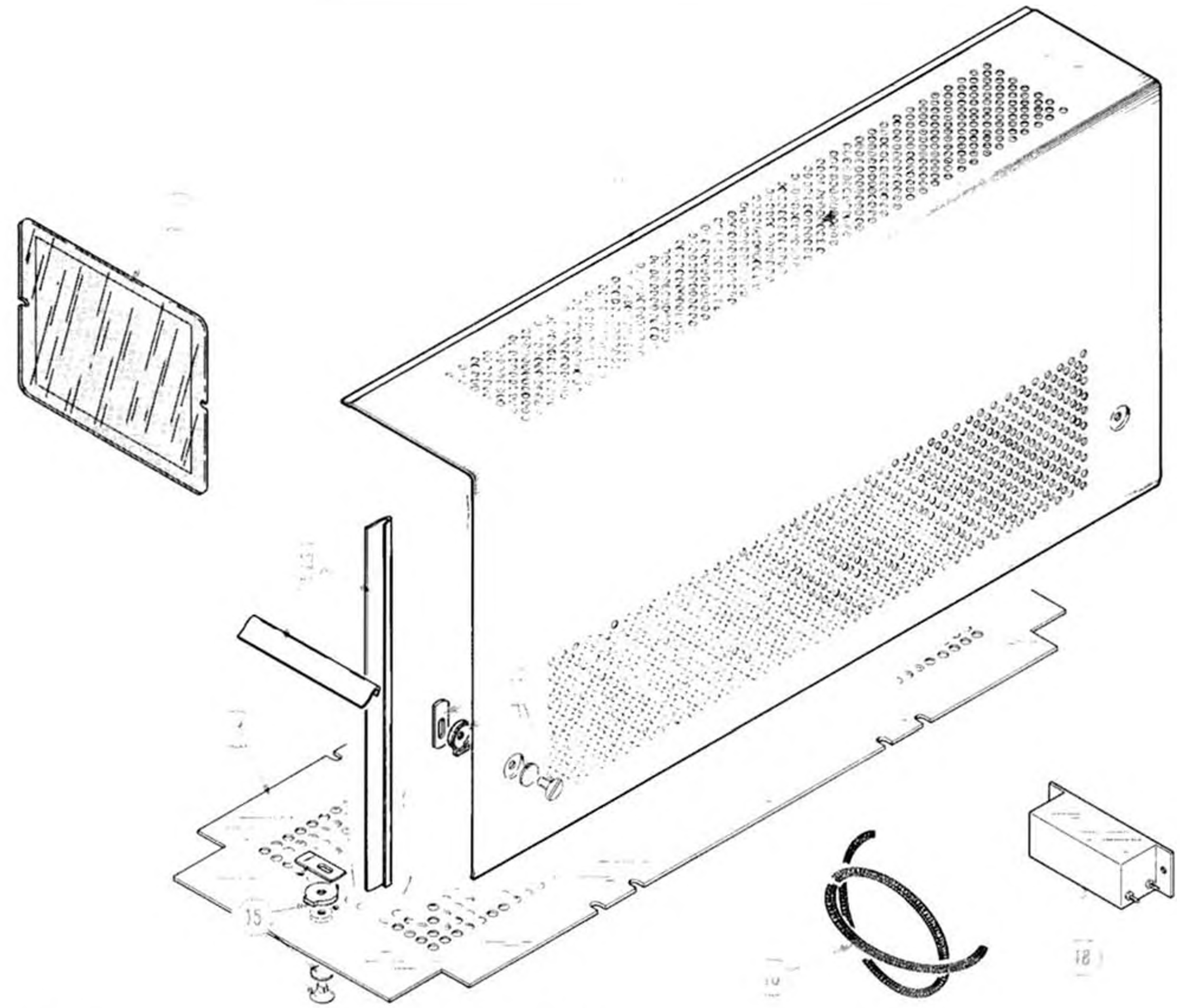


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5 Description
7-11	390-0297-00			2	CABINET SIDE
	- - - - - - - - - -			-	each cabinet side includes:
-12	214-0816-00			6	LATCH ASSEMBLY
-13	348-0274-00			4	SHIELDING GASKET, electronic, 48 inches long
-14	390-0355-00			1	CABINET BOTTOM
	- - - - - - - - - -			-	cabinet bottom includes:
-15	214-0816-00			2	LATCH ASSEMBLY
-16	348-0234-00			1	SHIELDING GASKET, electronic, 39.50 inches long
-17	378-0603-00			1	FILTER, mesh, CRT
-18	119-0113-05			1	FILTER, radio interference

OPTIONAL ACCESSORY

	016-0155-00			1	PLUG-IN PANEL, blank (not shown)

MANUAL CHANGE INFORMATION

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

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

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

TEKTRONIX®
committed to technical excellence

MANUAL CHANGE INFORMATION

PRODUCT 7623/R7623 Service	CHANGE REFERENCE C6/474
	DATE 4-1-74

CHANGE:	DESCRIPTION

EFF ALL Serial Numbers — TEXT CORRECTIONS

Page 2-18 — Step 25 parts h through j

REPLACE WITH: The following new parts h through m

h. Set the 7B53A for a sweep rate of 0.1 microsecond/division with the X10 magnifier on; set the deflection factor of the 7A15A as necessary so the markers are about two divisions in amplitude for the rest of step 25.

i. CHECK-CRT display for one marker each division over the center eight divisions.

j. ADJUST-For SN B080000-up-C588 for one marker each division (For SN below B080000, adjust C568 and C588 for one marker each division while maintaining approximately equal capacitances). Use low capacitance adjustment tool for all adjustments in this step.

k. Set the 7B53A for a sweep rate of 0.05 microsecond/division with X10 magnifier on.

l. ADJUST-For SN B080000-up-C566 and C586 for one marker each two divisions while maintaining approximately equal capacitances. (For SN below B080000, readjust C568 and C588 for best compromise between 5 nanosecond and 10 nanosecond timing).

m. Repeat parts j,k, and l to achieve the best compromise for 5 nanosecond and 10 nanosecond timing over the center 8 horizontal divisions.

R7403N Manual

7603/R7603 Operators Manual and Service Manual

7613/R7613 Operators Manual

7623/R7623 Operators Manual and Service Manual

R7903 Operators Manual

ADD TO:

Operating Instructions, Plug-In Installation

NOTE

Later Production of Rackmount Oscilloscopes are provided with support posts between the individual plug-in compartments. A post or posts must be removed if a multi-width Plug-In is to be installed. To remove a post, unfasten the screws that secure it at the top and bottom of the plug-in housing.

7403N & R7403N EFF SN B130000-up

7313/R EFF SN B060000-up

7623/R EFF SN B100000-up

7613/R EFF SN B090000-up

7603/R EFF SN B090000-up

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGE

ADD:

C943	283-0078-00	0.001 μF, Cer, 500 V, 20%

C943 is added between the base of Q943A and ground located on the L. V. Power Supply schematic.

7313/R EFF SN B060000-up

7403N/R EFF SN B100000-up

7603/R EFF SN B070000-up

7613/R EFF SN B080000-up

7623/R EFF SN B090000-up

ELECTRICAL PARTS LIST AND SCHEMATIC CORRECTION

ADD:

C827	283-0077-00	330 pF, Cer, 500 V, 5%

Add C827 between the collector and base of Q827 located on the Low Voltage Power Supply diagram.

7603/R EFF SN B080000-up

7613/R EFF SN B090000-up

7623/R EFF SN B100000-up

ELECTRICAL PARTS LIST AND SCHEMATIC CORRECTIONS

CHANGE TO:

R1195	315-0362-00	3.6 kΩ, 1/4 W, 5%
R1196	315-0362-00	3.6 kΩ, 1/4 W, 5%

M20,418/673

7403N EFF SN B090000-up

R7403N EFF SN B090000-up

7603/R7603 EFF SN B060000-up

7613/R7613 EFF SN B070000-up

7623/R7623 EFF SN B080000-up

ELECTRICAL PARTS LIST AND SCHEMATIC CORRECTION

ADD:

C876	283-0328-00	0.03 μF, Cer, 200 V
C936	283-0178-00	0.1 μF, Cer, 100 V

Add C876 between the base and emitter of Q876A. Add C936 between the base and emitter of Q936A. Both capacitors are located on diagram ⟨9⟩ in the 7603, R7603, 7613 and diagram ⟨8⟩ in the 7403N, R7403N, and 7623.

M20,507/473
Rev./1273

7313/R7313 EFF. SN B080000
7603/R7603 EFF. SN B120000
7403N/R7403N EFF. SN B170000
7613/R7613 EFF. SN B190000
7623/R7623 EFF. SN B110000

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

R937	321-0151-00	365 Ω, 1/8 W, 1%
R938	321-0330-00	26.7 kΩ, 1/8 W, 1%
R939	321-0409-00	178 kΩ, 1/8 W, 1%

These resistors are located on the L.V. Power Supply schematic in the Diagrams section, and the LOW-VOLTAGE REGULATOR Circuit Board assembly. Replacement part number for this board is 670-1376-06 for R7403N, 670-1376-09 for 7313/R7313, and 670-1376-10 for the rest of the instruments listed.

7613/R EFF SN B090000-up

7623/R EFF SN B100000-up

ELECTRICAL PARTS LIST AND SCHEMATIC CORRECTION

CHANGE TO:

Q1216	151-0140-01	Silicon, NPN, selected from 2N3055
Q1218	151-0140-01	Silicon, NPN, selected from 2N3055

REMOVE:

R1210	315-0562-00	5.6 kΩ, 1/4 W, 5%

7613 and 7623 OPTION 5

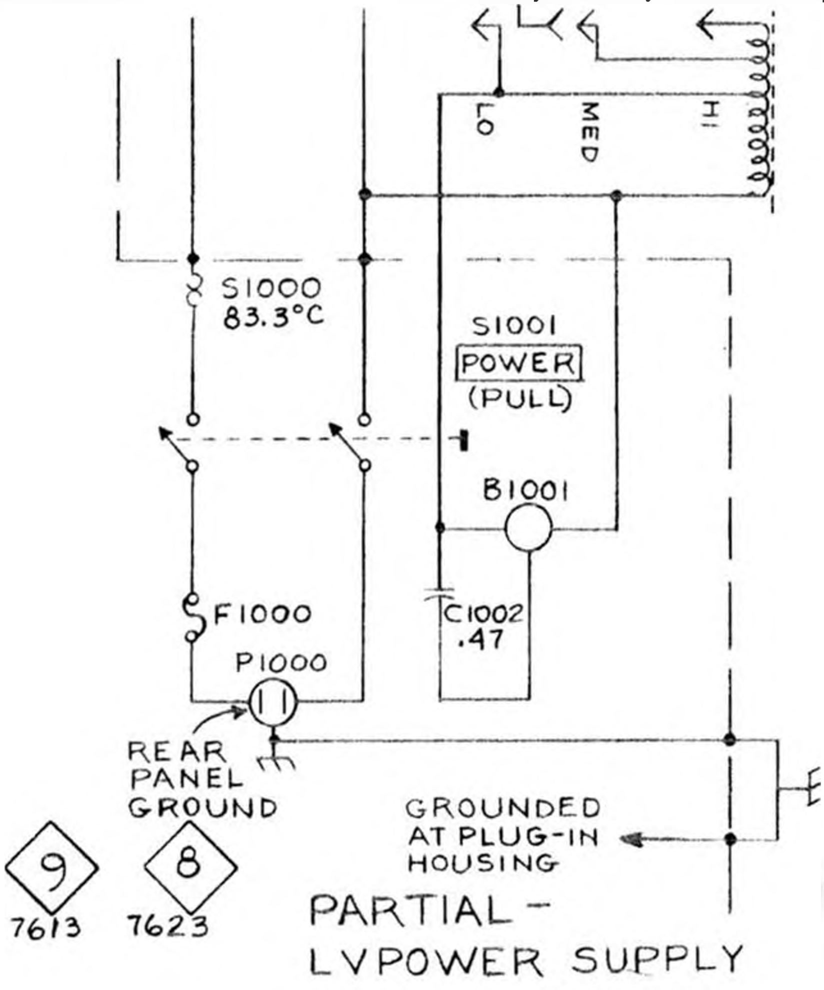
Instruments containing OPTION 5 are designed to operate on any power Line Frequency from 50 Hz to 400 Hz. If your instrument was ordered with OPTION 5 it will differ from the basic instrument to the extent described in this option supplement. Refer to the main portion of this manual or the change section at the back for all other information concerning your instrument.

ELECTRICAL PARTS LIST

B1001	119-0396-00	FAN, Axial, 50-400 Hz, 115 V
C1002	285-0562-00	0.47 μF, Cer, 400 V

MECHANICAL PARTS LIST

441-1201-00	1	CHASSIS, oscilloscope
378-0050-00	1	BAFFLE, air
211-0530-00	4	SCREW, 6-32 x 1.750
344-0116-00	1	CLIP, capacitor mounting
131-0761-00	3	TERMINAL POST, screw mounting
211-0504-00	3	SCREW, 6-32 x .250
211-0008-00	1	SCREW, 4-40 x .250
211-0507-00	4	SCREW, 6-32 x .312
119-0396-00	1	FAN, axial, 50-400 Hz, 115 V



M20,879/1173

TEXT CORRECTIONS

Page 2-7 Fig. 2-1A

ADD: Arrow from HIGH-VOLTAGE TEST POINT label to the hole just right of P1171

Page 2-10 Step 5f

CHANGE second line to read:

....ment R1193 (see Fig. 2-2) to obtain best display definition.

Page 2-12 Step 12b

CHANGE second line to read:

....graticule center line without readout or 0.5 division with readout.

Page 2-23 Step 36

CHANGE fourth line of step 36a to read:

....division. Place the GATE selector switch in the MAIN....

DELETE all of steps 36c, 36d and NOTE. (Displays in AUXILIARY and DELAY are dependent on,and in some cases won't be present with, individual time-base plug-in).

Page 2-27 Step 42, TABLES 2-3 & 2-4 and Fig. 2-10

CHANGE Step 42d and 42e to read:

d. Press the NON STORE button.

e. Press the BI STABLE button.

ADD: Title for tables 2-3 and 2-4

TABLE 2-3

NON STORE VOLTAGE LEVELS

TABLE 2-4

BI STABLE VOLTAGE LEVELS

Page 2-27

CHANGE Fig. 2-10 as follows:

The CE_3 and CE_2 labels at right of LEVEL RANGE should read: "CE_3 Test Point" and "CE_2 Test Point". The 5 labels at the lower right corner should all have "Test Point" added. The CE_1 and FGA labels should be interchanged. Add FGK Test Point at right of new FGA Test Point label location.

Page 2-29 Tables 2-6 & 2-7

CHANGE portions of these tables as underlined below:

TABLE 2-6

FAST MODE BI STABLE VOLTAGE LEVELS

TABLE 2-7

FAST MODE PREP VOLTAGE LEVELS

CE_3 (adjustable)	+50 V to +80 V
CE_2 (adjustable)	+30 V to +50 V

Page 2-30 Table 2-8

CHANGE the table heading as follows:

TABLE 2-8

FAST MODE ERASE VOLTAGE TRANSITION LEVELS

Page 2-31 after Step 52c

ADD Step 52d as follows:

d. If preceding step 51 and 52 adjustments do not respond properly, check Variable Persistence Mode Voltage Levels; repeat step 51a,b, and c. Connect the test oscilloscope 10X probe to each test point listed in Table 2-9 (see Fig. 2-10) set the deflection factor as required and check for voltages within tolerances listed in Table 2-9.

ADD: Table 2-9 as follows:

TABLE 2-9

VARIABLE PERSISTENCE MODE VOLTAGE LEVELS

Test Points	Tolerance
Bi Stable Mesh (adjustable by Variable Persistence OP LEVEL R1350)	-12 V to +8 V
High Speed Mesh	Approximately +100 V
Collector Mesh	Approximately +100 V
FGA	.5s duration pulse rising from a level of approximately +20 V to approximately +74 V

Page 3-19 Fig. 3-16

REPLACE: Q225 and Q236 labels with Q236A and Q236B.

Page 3-24 Fig. 3-21

CHANGE: CRT anode voltage from +12 kV to +7 kV

CHANGE: CRT cathode voltage from -2.96 kV to -1.475 kV.

ELECTRICAL PARTS LIST CORRECTIONS

ADD: CR1663 152-0141-02 Silicon, 1N4152

CHANGE: L425 value to read: nanohenry

ADD: R1634 315-0221-00 220 Ω, 1/4 W, 5%

CHANGE: U1822 circuit number to U1882 (board is marked U1882)

SCHEMATIC DIAGRAM AND BOARD PHOTO CORRECTIONS

Diagram 4

CHANGE: L426 value to 150 nH

Diagram 5

CHANGE: Q533 to Q553

Fig. 6-9	Back of Diagram 6
CHANGE:	Title of photo to read:
	Fig. 6-9. A10 High Voltage No. 2 circuit board
Fig. 6-10	Back of Diagram 6
CHANGE:	Title of photo to read:
	Fig. 6-10. A9 High Voltage No. 1 circuit board.
CHANGE:	R1240 to read R1242
CHANGE:	C1215 above R1208 to read CR1215
CHANGE:	CR1255 to read VR1264
CHANGE:	CR1254 to read CR1255
ADD:	CR1264 above R1258
ADD:	CR1254 between C1250 and top of T1225
MOVE:	R1245 down to the right of CR1232
Diagram 7	Refer to Electrical Parts List for correct values or removal of the following: R1195, R1196, R1126, R1210
CHANGE	Terminal numbering for P1170 (top to bottom) to read as follows: 7,6,5,4,3,2,1,8 (one is the index).
Fig. 6-11	Back of Diagram 7
	C827 is located below R833 for some serial numbers, see insert for M20,382. In later production C827, R806, R808, R809, R811, R814, R821, R822, C811, C813 and C821 are relocated on the board, electrical connections remain as shown on diagram 8 or as stated on inserts in your manual.
Fig. 6-12	Back of Diagram 7
CHANGE:	The R966 next to R983 to read R986
ADD:	C975 at left of Q952
NOTES:	R973 is located on back of board for some SN. C876 and C936 (added at SN B080000)were located on back of board.

Fig. 6-12 Back of Diagram 7

The following parts were located on the back of board for early SN, their later locations are:

CR973 at right of R980

R974 below R980

C943 right of R945

C936 above Q936

C876 between R879 and R877

Diagram 8

ADD: C876 (.03) between base and emitter of Q876A per M20,507 SN B080000.

ADD: C936 (.1) between base and emitter of Q936A per M20,507 SN B080000.

ADD: C943 (.001) from base of Q943A to ground per M20,185 SN B100000.

ADD: C827 (330) from collector to base of Q827 per M20,382 SN B090000.

Fig. 6-13 Back of Diagram 8

CHANGE: C1594 label to C1591

R1591 label to R1593

R1590 label to R1594

R1594 label to R1591

ADD: R1590 label to resistor above Q1591

R1596 label to resistor below R1592

R1595 label to resistor above R1592

Diagram 9

CHANGE: C1384 value to 0.1, C1631 value to 0.1

R1370 value to 560 K

R1393 value to 50 K, R1537 value to 1.3 K

R1360 value to 50 K, R1535 value to 10 K

R1596 value to 10 K, R1592 value to 10 K

VR1461 value to 180 V, R1509 value to 464 K

R1525 value to 576 K, R1413 value to 2.4 M

CHANGE: Q1424 collector connects to -15 V instead of ground
R1410 and R1412 positions are interchanged (R1412 connects to +15 V)
CR1523 and R1523 positions are interchanged (CR1523 anode connects to R1522-R1525-R1526-Q1527 base).
Connector at top terminal of S1536 is P1536-1 (not P1536-3)
Connector at bottom terminal of S1536 is P1536-2 (not P1536-4)
Connector at top of R1536A is P1536-5 (not P1536-7)
Connector at R1536A wiper is P1536-3 (not P1536-5)
Connector at top of R1535 is P1536-4 (not P1536-6)

ADD: R1634 (220 Ω), one end to +15 V at R1633-C1633 junction and label the other end "to P1417-1 (top of R1543 and top of R1417)". Relabel source for both P1417-1 terminals to read "to R1634" (not +15 V).

INTERCHANGE: Q1591 and Q1595 circuit numbers (Q1591 base connects to R1593-R1594).

INTERCHANGE: All of the following circuit numbers:
CR1471 with CR1484, R1471 with R1486, R1472 with R1485, Q1474 with Q1488, R1477 with R1490, CR1475 with CR1489, Q1475 with Q1489.

Fig. 6-14 Back of Diagram 9

CHANGE: U1822 label to U1882 (Board is marked U1882)

CHANGE: R1787 label to R1786

ADD: Q1555 label right of Q1557

R1634 label above R1532

R1540 label between CR1536 and CR1542

REMOVE: Top CR1675 and move all labels from CR1577 down to CR1659 down slightly.

NOTE: CR1663 and C1760 are located on back of A15 board.

Diagram 10

ADD: CR1663; anode to CR1664-CR1652 anode junction, and cathode to +5 V supply (this diode is located on back of A15 board).

ADD: To P1690 and P1720 a terminal 9 with leads connecting ground on A18 board to ground on A15 board.

CHANGE: S1728 SAVE switch movable contact on A17 board to normally closed (connect S1719 through P1729-S102 to R102B when in down position)

CHANGE: P1730 pin 2 lead to connect to P1728 pin 1 and P1730 pin 1 lead to connect to P1728 pin 2.
R1760 value to 1.2 K, R1789 value to 240 Ω, C1765 value to .01, R1810 value to 5.6 K (SN B030000-up).
R1814 value to 5.6 K (SN B030000-up), R1822 value to 14.3 K, R1840 value to 2.2 K, R1842 value to 22 K, R1844 value to 22K, U1822 circuit number to U1882 (Board is marked U1882).

REMOVE: R1820 and replace with a conductor (SN B030000-up)

REMOVE: C1820 (SN B030000-up)

ADD: C1760 (1 μF) parallel with R1760 (+ at R1761 end)

Fig. 6-15 Back of Diagram 10

CHANGE: R2132 label to R2123