TEK SERVICE MANUAL

070-6299-00
Product Group 46

2225
OSCILLOSCOPE
SERVICE

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

Please Check for CHANGE INFORMATION at the Rear of This Manual

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Tektronix
COMMITTED TO EXCELLENCE

INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag, or stamped on the chassis. The first number or letter designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B000000	Tektronix, Inc., Beaverton, Oregon, U.S.A.
HK00001	Hong Kong
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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OPERATORS SAFETY SUMMARY

The safety information in this summary is for operating personnel. Warnings and cautions will also be found throughout the manual where they apply.

Terms in this Manual

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

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

Terms as Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the markings, or a hazard to property, including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Symbols in this Manual

⚠ This symbol indicates where applicable cautionary or other information is to be found. For maximum input voltage see Table 1-1.

Symbols as Marked on Equipment

ϟ DANGER—High voltage.

⏚ Protective ground (earth) terminal.

⚠ ATTENTION—Refer to manual.

Power Source

This product is intended to operate from a power source that does not apply more than 250 V rms between the supply conductors or between either supply conductor and ground. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before making any connections to the product input or output terminals. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts, including knobs and controls that may appear to be insulating, can render an electric shock.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see Figure 2-2.

Use the Proper Fuse

To avoid fire hazard, use only a fuse of the correct type, voltage rating and current rating as specified in the parts list for your product.

Do Not Operate in an Explosive Atmosphere

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

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

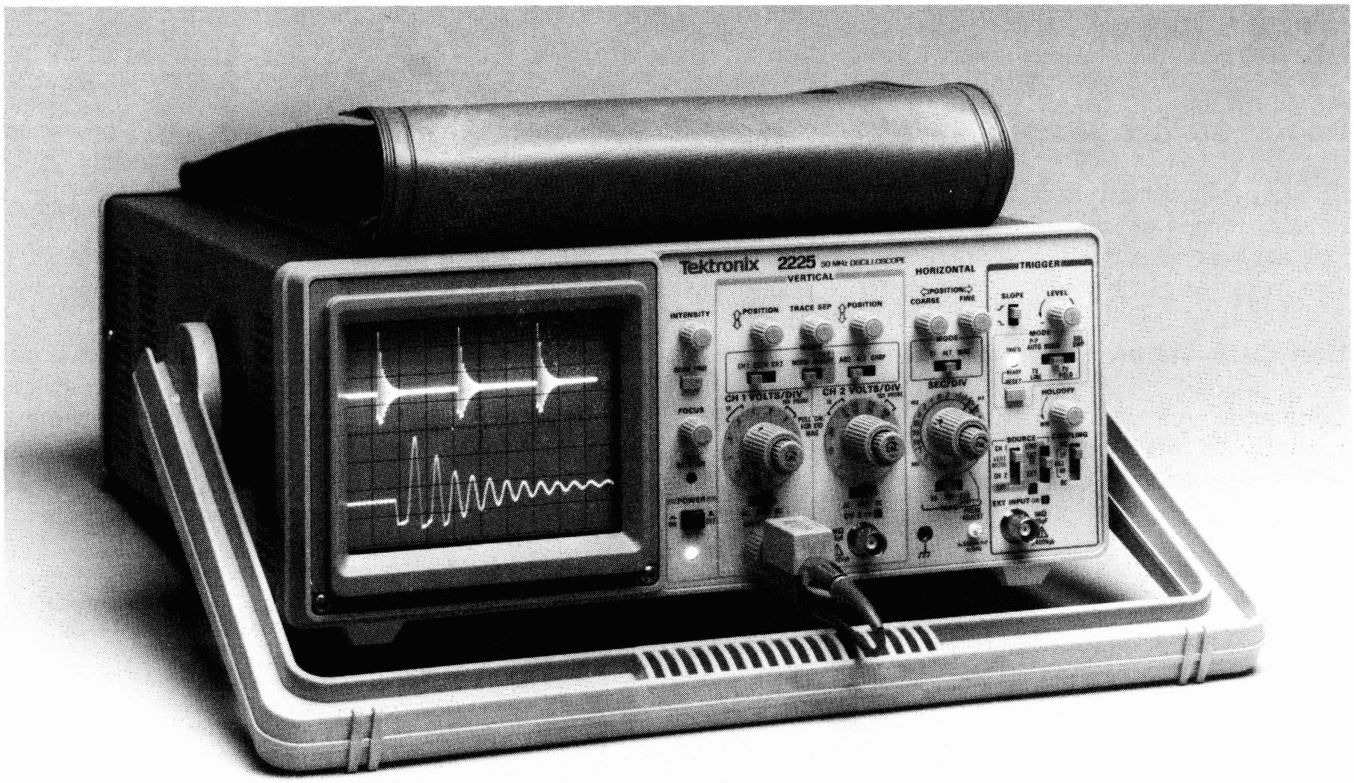
Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections or components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding connetor in the power cord is essential for safe operation.



The 2225 Oscilloscope.

SPECIFICATION

INTRODUCTION

The TEKTRONIX 2225 Oscilloscope is a rugged, lightweight, dual-channel, 50 MHz instrument that features a bright, sharply defined trace on an 80 by 100-mm cathode-ray tube (crt).

The low-noise vertical system of the 2225 has calibrated deflection factors from 5 mV to 5 V per division at full bandwidth. A vertical magnification feature extends the vertical sensitivity to 500 μV per division. This same magnification feature permits independent bandwidth limiting for each channel. With it, a user can limit the bandwidth of one channel to 5 MHz without affecting the bandwidth of the other channel.

Stable triggering is achieved over the full bandwidth of the vertical system. The very flexible trigger system of the 2225 features hands-free triggering with the peak-to-peak automatic mode, independent selection of TV Line and TV Field triggering at any sweep speed, single-sweep triggering, and a variable holdoff control to facilitate triggering on complex waveforms. Along with the standard AC and DC signal coupling methods, the 2225 provides HF REJ and LF REJ trigger coupling. These added coupling features give the user the ability to filter out the high-frequency or low-frequency components of a trigger signal that can interfere with stable triggering. An external trigger signal may be supplied to the trigger system via a front-panel connector. That front-panel connector may also be used to supply an external Z-axis signal for intensity modulation of the displayed signals.

The horizontal system provides calibrated sweep speeds from 0.5 s to 50 ns per division. For greater measurement accuracy, a horizontal magnifier circuit extends the maximum sweep speed to 5 ns per division. Magnification is selected in three levels—X5, X10, and X50—and the magnified trace can be displayed either alone or together with its associated unmagnified trace. Displaying both the magnified and unmagnified traces together—called Alternate Magnification mode—lets the user perform types of timing measurements that previously were only possible on oscilloscopes having dual time bases.

ACCESSORIES

The instrument is shipped with the following accessories: operators manual, two probe kits, a power cord, and a power-cord clamp. The probes supplied with the 2225 have sturdy replaceable tips. Probe compensation is accomplished through a closeable window on the probe body. Part numbers for the standard accessories and for the suggested optional accessories are located in Section 7, Options and Accessories.

FOR MORE INFORMATION

Should you need additional information about your 2225 Oscilloscope or about other Tektronix products, contact the nearest Tektronix Sales Office or Distributor or consult the Tektronix product catalog. In the United States you may call the Tektronix National Marketing Center toll free at 1-800-426-2200.

RECOMMENDED RECALIBRATION SCHEDULE

To ensure accurate measurements, check the performance of this instrument every 2000 hours of operation, or, if used infrequently, once each year. Replacement of components in the instrument may also necessitate readjustment of the affected circuits.

PERFORMANCE CONDITIONS

The electrical characteristics given in Table 1-1 are valid when the instrument has been adjusted at an ambient temperature between +20°C and +30°C, has had a warm-up period of at least 20 minutes, and is operating at an ambient temperature between 0°C and +40°C (unless otherwise noted).

Items listed in the Performance Requirements column are verifiable qualitative or quantitative limits that define the measurement capabilities of the instrument.

Environmental characteristics are given in Table 1-2. This instrument meets the requirements of MIL-T-28800C, paragraphs 4.5.5.1.3, 4.5.5.1.4, and 4.5.5.1.2.2 for Type III, Class 5 equipment, except where noted otherwise.

Physical characteristics of the instrument are listed in Table 1-3.

Table 1-1
Electrical Characteristics

Characteristics	Performance Requirements
VERTICAL DEFLECTION SYSTEM	
Deflection Factor	
Range	5 mV per division to 5 V per division in a 1-2-5 sequence of 10 steps. Sensitivity increases to 500 µV per division with X10 vertical magnification.
Accuracy	
Without vertical magnification	±3%.
With X10 vertical magnification	±5%.
Variable Control Range	Continuously variable between settings. Increases deflection factor by at least 2.5 to 1.
Step Response	Rise time is calculated from: $Tr = \frac{0.35}{BW}$
Rise Time	
+5°C to +35°C	7 ns or less.[a]
0°C to +5°C and +35°C to +40°C	8.8 ns or less.[a]
Aberrations	
5 mV per division	+6%, -6%, 6% p-p.
10 mV per division to 0.2 V per division	+4%, -4%, 4% p-p.
0.5 V per division	+6%, -6%, 6% p-p.
Bandwidth (-3 dB)	
+5°C to +35°C	50 MHz or more.
0°C to +5°C and +35°C to +40°C	40 MHz or more.[a]
X10 Vertical Magnification	5 MHz or more.
Ac Coupled Lower Cutoff Frequency (-3dB)	10 Hz or less.[a]
CHOP Mode Switching Rate	500 kHz ±30%.[a]
Input Characteristics	
Resistance	1 MΩ ±2%.[a]
Capacitance	25 pF ±2 pF.[a]

[a]Performance requirement not checked in manual.

Table 1-1 (cont)

Characteristics	Performance Requirements	
Maximum Safe Input Voltage (DC or AC Coupled)	400 V (dc + peak ac) or 800 V ac p-p at 10 kHz or less.[a] (See Figure 1-1 for frequency derating curve.)	
Common-mode Rejection Ratio (CMRR)		
Without Vertical Magnification	At least 10 to 1 at 10 MHz.	
With X10 Vertical Magnification	At least 10 to 1 at 1 MHz.	
Trace Shift with VOLTS/DIV Switch Rotation	0.75 division or less; VOLTS/DIV Variable control in the CAL detent.[a]	
Trace Shift as the VOLTS/DIV Variable Control is rotated.	1 division or less.[a]	
Trace Shift with CH 2 INVERT	1.5 division or less.[a]	
Trace Shift with X10 Vertical Magnification	2.0 divisions or less.[a]	
Channel Isolation	Greater than 100:1 at 10 MHz.	
Position Control Range	10.5 divisions above and below the center graticule line at 25°C with the cabinet installed.	
Trace Separation Range	At least ±3 divisions.	
TRIGGERING		
Trigger Sensitivity		
P-P AUTO/TV LINE and NORM Modes	**5 MHz**	**50 MHz**
Internal Signal	0.3 div	1.0 div
External Signal	40 mV	200 mV
TV FIELD	1 division of composite sync.[a]	
Lowest Usable Frequency in P-P AUTO Mode	A 1.0 division internal signal or 100 mV external signal of 20 Hz or higher frequency will trigger.	
External Input		
Input Resistance	1 MΩ ±10%.[a]	
Input Capacitance	25 pF ±2.5 pF.[a]	
Maximum Input Voltage	400 V (dc + peak ac) or 800 V ac p-p at 10 kHz or less.[a] (See Figure 1-1 for frequency derating curve.)	
AC Coupled Lower Cutoff Frequency (-3dB)		
Internal Signal	10 Hz or less.[a]	
External Signal	20 Hz or less.[a]	

[a]Performance requirement not checked in manual.

Table 1-1 (cont)

Characteristics	Performance Requirements			
Trigger Level Range				
NORM Mode	Level may be set to any point of trace that can be displayed.			
EXT Source	At least ±1.2 V, 2.4 V p-p.			
EXT/10 Source	At least ±12 V, 24 V p-p.			
Variable Holdoff Range	Increases sweep holdoff time by at least a factor of 8 at maximum holdoff.[a]			
LF REJ Lower 3 dB point	30 kHz ±25%.[a]			
HF REJ 3 dB point	30 kHz ±25%.[a]			
HORIZONTAL DEFLECTION SYSTEM				
Sweep Rates				
Calibrated Range				
Sweep	0.5 s per division to 0.05 μs per division in a 1-2-5 sequence of 22 steps. The X10 magnifier extends maximum sweep speed to 5 ns per division.[a]			
Accuracy	**Unmagnified**	**Magnified**		
	X1	X5	X10	X50
+15°C to +35°C	±3%	±4%	±4%	±5%
0°C to +40°C	±4%[a]	±5%[a]	±5%[a]	±8%[a]
	Sweep accuracy applies over the center eight divisions. Exclude the first 25 ns of the sweep for magnified sweep speeds and anything beyond the 100th magnified division.			
SEC/DIV Variable Range	Continuously variable and uncalibrated between calibrated step settings of the SEC/DIV switch. Decreases calibrated sweep speeds by at least a factor of 2.5.			
Sweep Linearity	**Unmagnified**	**Magnified**		
	X1	X5	X10	X50
	±5%	±7%	±7%	±9%
POSITION Control Range	Start of sweep to 10th division in X1, to 50th division in X5, to 100th in X10, and to 500 division in X50 will position past the center vertical graticule line.			
Registration between Magnified and Unmagnified traces	0.2 division or less (measured when switching from Magnified to Unmagnified), aligned to center vertical graticule line.[a]			
Trace Shift between ALT and MAG Modes	Less than 1 division.[a]			

[a]Performance requirement not checked in manual.

Table 1-1 (cont)

Characteristics	Performance Requirements	
Z-AXIS		
Sensitivity	5 V causes noticeable modulation. Positive-going input decreases intensity.	
Usable frequency range	Dc to 5 MHz.[a]	
Maximum Safe Input Voltage	400 V (dc + peak ac) or 800 V p-p ac at 10 kHz or less.[a] (See Figure 1-1 for frequency derating curve.)	
X-Y OPERATION (X1 MODE)		
Deflection Factors	Same as vertical deflection system with variable controls in the CAL detent.[a]	
Accuracy		
X-Axis	±5%.	
Y-Axis	Same as vertical deflection system.[a]	
Bandwidth (-3 dB)		
X-Axis	Dc to at least 2 MHz.	
Y-Axis	Same as vertical deflection system.[a]	
Phase difference between X-Axis and Y-Axis Amplifiers	±3° from dc to 150 kHz with DC input coupling.[a]	
PROBE ADJUST SIGNAL OUTPUT		
Voltage into 1 MΩ Load	0.5 V ±5%.	
Repetition Rate	1 kHz ±5%.[a]	
POWER SUPPLY		
Line Voltage Ranges		
115 V Setting	95 Vac to 128 Vac.[a]	
230 V Setting	185 Vac to 250 Vac.[a]	
Line Frequency	48 Hz to 440 Hz.[a]	
Maximum Power Consumption	70 watts (80 VA).[a]	
Line Fuse	UL 198.6 3AG (1/4 X 1 1/4 inch)	IEC127 (5 x 20 mm)
115 Setting	1.0 A, Slow.	0.8 A, Slow.
230 Setting	0.5 A, Slow.	0.4 A, Slow.
CATHODE-RAY TUBE		
Display Area	8 X 10 cm.[a]	
Standard Phosphor	GH (P31).[a]	
Nominal Accelerating Voltage	12,600 V ±60 V.[a]	

[a]Performance requirement not checked in manual.

Table 1-2
Environmental Characteristics

Characteristics	Performance Requirements
Temperature	
Operating	0° C to +40° C (+32° F to +104 ° F).[a]
Nonoperating	-55° C to +75° C (-67° F to +167 ° F).[a]
Altitude	
Operating	To 4,570 meters (15,000 feet). Maximum operating temperature decreased 1°C per 300 m (1000 feet) above 1500 m (5,000 feet).[a]
Nonoperating	To 15,250 meters (50,000 feet).[a]
Relative Humidity	
Operating (+30°C to +40°C) Nonoperating (+30°C to +60°C)	5 cycles (120 hours) referenced to MIL-T-28800C para 4.5.5.1.2.2 for type III, Class 5 instruments. Operating and nonoperating at 95% -5% to +0% relatiave humidity.
Vibration	
Operating	15 minutes along each of three major axes at a total displacement of 0.015 inch p-p (2.4 g at 55 Hz) with frequency varied from 10 Hz to 55 Hz to 10 Hz in one minute sweeps. Hold for 10 minutes at 55 Hz in each of three major axes. All major resonances must be above 55 Hz.[a]
Shock	
Operating and Nonoperating	30 g, half-sine, 11-ms duration, three shocks per axis each direction, for a total of 18 shocks.[a]
Radiated and conducted emission requirements	Meets VDE 0871, Class B and FCC Docket 20870, part 15, subpart J.[a]

[a]Performance requirement not checked in manual.

Table 1-3
Physical Characteristics

Characteristics	Description
Weight	
With Power Cord	6.9 kg (15.2 lbs) or less.
Domestic Shipping Weight	9.0 kg (19.8 lbs) or less.
Height	138 mm (5.42 in). (See Figure 1-2 for a dimensional drawing).
Width	
With Handle	385 mm (15.2 in).
Without Handle	327 mm (12.9 in).
Depth	
Without Front Cover	443 mm (17.3 in).
With Handle Extended	511 mm (20.1 in).

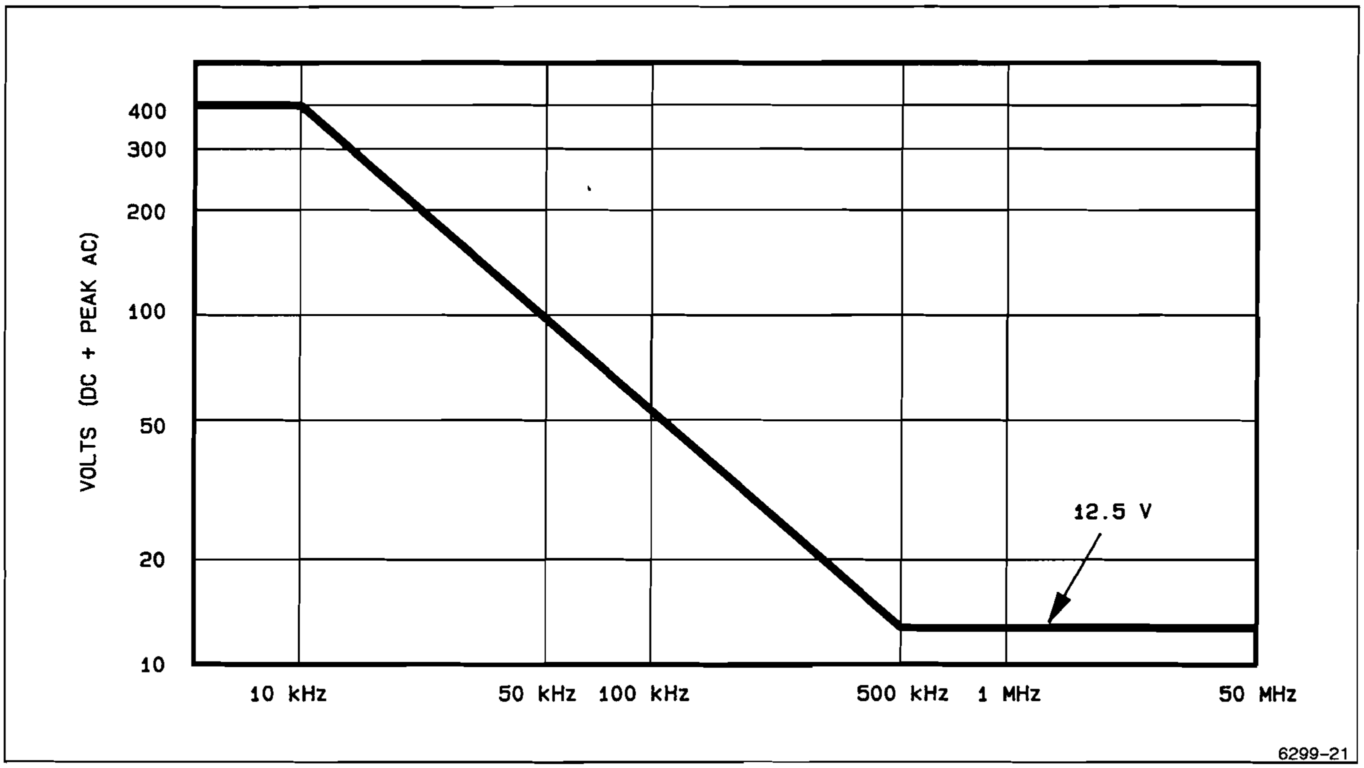


Figure 1-1. Max Input Voltage Vs Frequency Derating Curve.

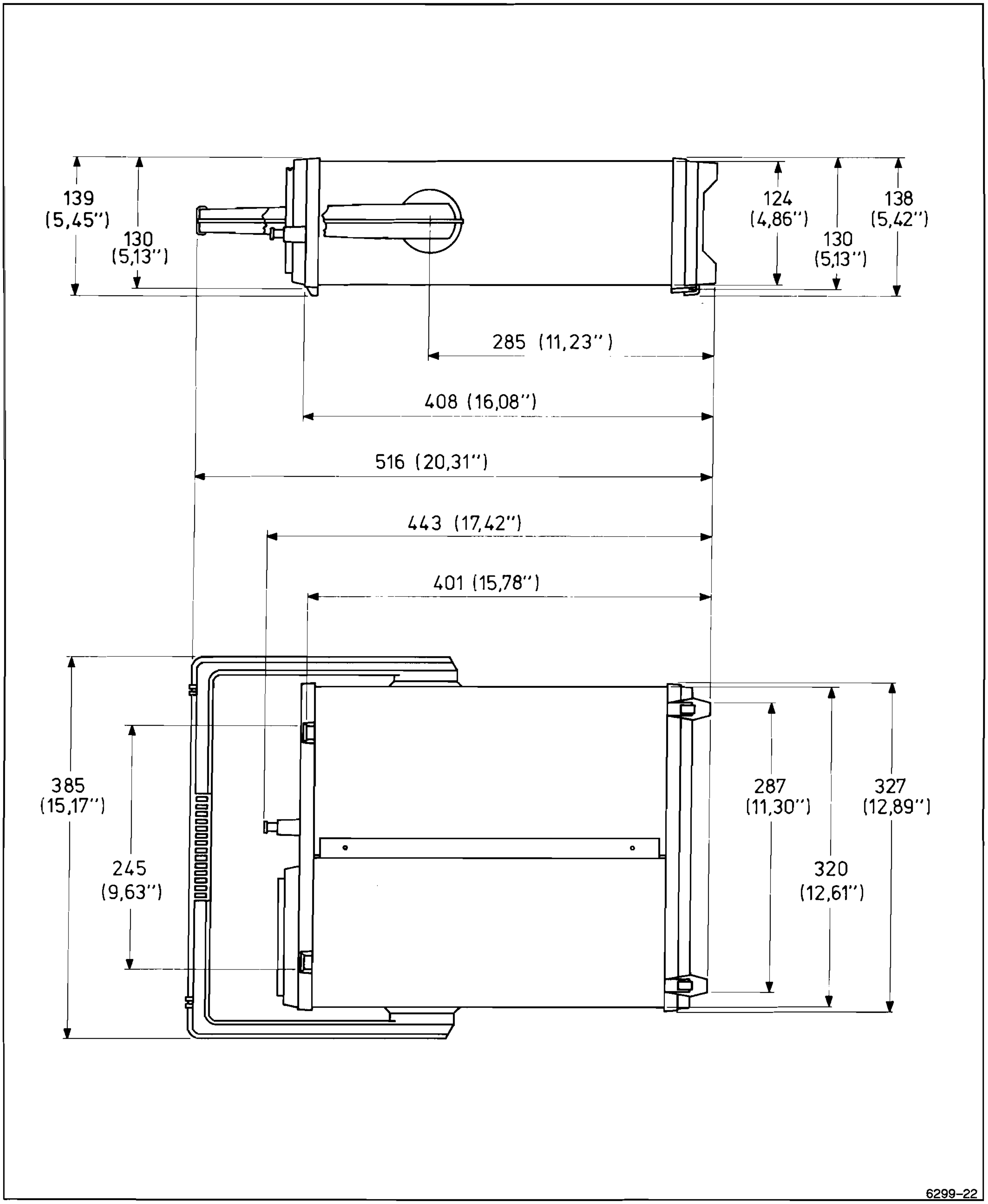


Figure 1-2. Instrument dimensional drawing.

OPERATING INSTRUCTIONS

This section is divided into four subsections. The first subsection, Preparation for Use, provides instructions for the user to follow before turning the instrument on, especially for the first time. Subsection two; Controls, Connectors, and Indicators; provides details on the operation of the front-panel controls. Subsection three, Operating Considerations, provides the user with some of the more general information on measurement techniques. The last subsection, Operators Checks and Adjustments, provides simple checks and adjustments to be made on a routine basis by the user.

PREPARATION FOR USE

SAFETY

This subsection tells how to prepare for and to proceed with the initial start-up of the TEKTRONIX 2225 Oscilloscope.

Refer to the Safety Summary at the front of this manual for power source, grounding, and other safety considerations pertaining to the use of the instrument. Before connecting the oscilloscope to a power source, read both this subsection and the Safety Summary.

CAUTION

This instrument may be damaged if operated with the LINE VOLTAGE SELECTOR switch (on the rear panel) set for the wrong applied ac source voltage or if the wrong fuse is installed.

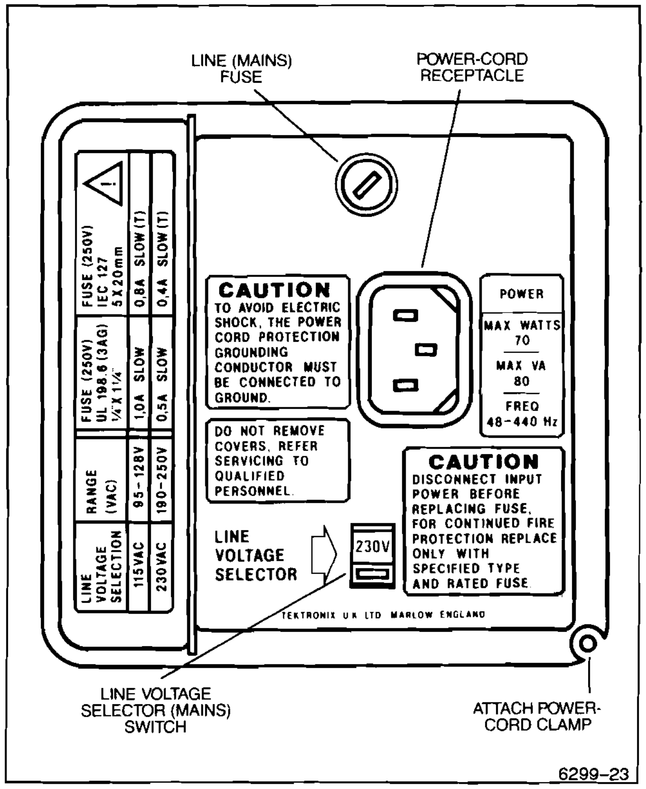


Figure 2-1. Voltage Selector switch, fuse, and power-cord receptacle.

LINE VOLTAGE SELECTION

The oscilloscope operates from either a 115-V or a 230-V nominal ac power line with any frequency from 48 Hz to 440 Hz. Before connecting the power cord to a power source, verify that the LINE VOLTAGE SELECTOR switch, located on the rear panel, is set correctly and that the proper line fuse is installed. Refer to Figure 2-1 and the instrument rear panel.

To convert the 2225 for operation on another line voltage range, set the LINE VOLTAGE SELECTOR switch to the required position and install the appropriate fuse (listed on the rear panel). The detachable power cord may need to be replaced to match the particular power source. Power-cord option numbers are given in Figure 2-1; fuse part numbers are listed in Options and Accessories (Section 7).

LINE FUSE

The instrument fuse holder is located on the rear panel and contains the line (main) fuse. Use the following procedure to verify that the proper fuse is installed or to install a replacement fuse.

1. Unplug the power cord from the power-input source (if plugged in).
2. Press in the fuse-holder cap and release it with a slight counterclockwise rotation.
3. Pull the cap (with the attached fuse inside) out of the fuse holder.

NOTE

The two types of fuses listed on the rear panel are not directly interchangeable; they require different types of fuse caps.

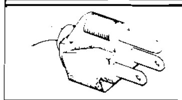
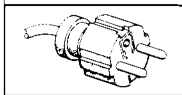
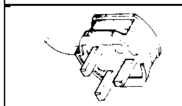
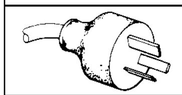
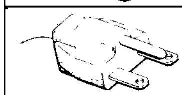
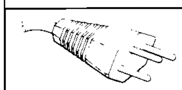
4. Verify that the fuse is the same type listed on the back of the instrument.
5. Reinstall the fuse (or replacement fuse) in the fuse-holder cap.
6. Reinstall the fuse and cap in the fuse holder by pressing in and giving a slight clockwise rotation of the cap.

POWER CORD

A detachable three-wire power cord with a three-contact plug is provided with each instrument for connecting to both the power source and protective ground. The protective-ground connector in the plug connects (through the protective-ground conductor) to the accessible metal parts of the instrument. For electrical-shock protection, insert this plug only into a power-source outlet that has a properly grounded protective-ground contact.

After plugging the power cord into its receptacle, secure it to the rear panel using the plastic clamp, screw, and washer provided.

Instruments are shipped with the power cord ordered by the customer. Available power-cord information is presented in Figure 2-2. Contact your Tektronix representative or local Tektronix Field Office for additional power-cord information.

Plug Configuration	Usage	Line Voltage	Reference Standards	Option Number
	North American 120V/ 15A	120V	ANSI C73.11 NEMA 5-15-P IEC 83	Standard
	Universal Euro 240V/ 10-16A	240V	CEE (7),II,IV,VII IEC 83	A1
	UK 240V/ 13A	240V	BS 1363 IEC 83	A2
	Australian 240V/ 10A	240V	AS C112	A3
	North American 240V/ 15A	240V	ANSI C73.20 NEMA 6-15-P IEC 83	A4
	Switzerland 220V/ 6A	220V	SEV	A5

Abbreviations:
ANSI — American National Standards Institute
AS — Standards Association of Australia
BS — British Standards Institution
CEE — International Commission on Rules for the Approval of Electrical Equipment
IEC — International Electrotechnical Commission
NEMA — National Electrical Manufacturer's Association
SEV — Schweizevischer Elektrotechischer Verein

(2931-21)6083-35

Figure 2-2. Power-cord and line-voltage data.

INSTRUMENT COOLING

To prevent instrument damage from overheated components, adequate internal airflow must be maintained at all times. Before turning on the power, verify that the air-intake holes on the sides and rear panel are free from any obstructions to airflow.

INITIAL START-UP

Up to now, you should have made the following preparations:

1. Read the safety information.
2. Verified that the LINE VOLTAGE SELECTOR switch is set for the source voltage to be used.
3. Verified the fuse for correct type and rating.
4. Attached the power cord.
5. Ensured that there is adequate ventilation around the instrument.

6. Plugged the power cord into the appropriate power-source outlet.

Now turn on your oscilloscope by pressing in the POWER button. Observe that the POWER-ON indicator, located below the button, is lit.

REPACKAGING

If this instrument is shipped by commercial transportation, use the original packaging material. Unpack the instrument carefully from the shipping container to save the carton and packaging material for this purpose.

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

1. Obtain a corrugated cardboard shipping carton having inside dimensions at least six inches greater than the instrument dimensions and having a carton test strength of at least 275 pounds.
2. If the instrument is being shipped to a Tektronix Service Center for repair or calibration, attach a tag to the instrument showing the following: owner of the instrument (with address), the name of a person at your firm who may be contacted if additional information is needed, complete instrument type and serial number, and a description of the service required.
3. Wrap the instrument with polyethylene sheeting or equivalent to protect the outside finish and prevent entry of packing materials into the instrument.
4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing for three inches of padding on each side (including top and bottom).
5. Seal the carton with shipping tape or with an industrial stapler.
6. Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.

CONTROLS, CONNECTORS, AND INDICATORS

The following descriptions are intended to familiarize the operator with the location and function of the instrument's controls, connectors, and indicators.

Refer to Figure 9-14 in the foldout pages for the location of all controls mentioned.

POWER AND DISPLAY

(1) **INTENSITY Control**—Adjusts the brightness of all displayed waveforms.

(2) **BEAM FIND Button**—Compresses the vertical and horizontal deflection to within the graticule area and intensifies the display to aid the user in locating traces that are overscanned or deflected outside of the crt viewing area.

(3) **FOCUS Control**—Adjusts for optimum display definition. Once set, proper focusing is maintained over a wide range of display intensity.

(4) **TRACE ROTATION Control**—Permits alignment of the trace with the horizontal graticule line. This control is a screwdriver adjustment that, once set, should require little attention during normal operation.

(5) **POWER Switch**—Turns instrument power on or off.

(6) **Power On Indicator**—Lights up while instrument is operating.

VERTICAL

(7) **Channel 1 Vertical POSITION Control**—Controls the vertical display position of the Channel 1 signal. In X-Y mode the control is inactive.

(8) **TRACE SEP Control**—Permits the magnified traces that appear in Horizontal MAG Mode to be positioned up to three divisions above the associated Channel 1 or Channel 2 traces. Trace separation between the magnified and unmagnified traces is independent of the Channel POSITION control settings. In other Horizontal modes, the TRACE SEP control is inoperative.

(9) **Channel 2 Vertical POSITION Control**—Controls the vertical display position of the Channel 2 signal. In X-Y mode the control vertically positions the display.

(10) **Vertical MODE Switch CH 1-BOTH-CH 2**—Selects either a single channel for display or the dual-channel display mode.

CH 1—Selects only the Channel 1 input signal for display.

BOTH—Selects a combination of Channel 1 and Channel 2 input signals for display. The CH 1-BOTH-CH 2 switch must be in the BOTH position for ADD, ALT, and CHOP operation.

CH 2—Selects only the Channel 2 input signal for display.

(11) **CH 2 INVERT Switch**—Inverts the Channel 2 display when in the CH 2 INVERT position. With CH 2 inverted, the oscilloscope may be operated as a differential amplifier when the BOTH-ADD vertical mode is selected.

(12) **Vertical MODE Switch ADD-ALT-CHOP**—Sets the dual-channel vertical display mode.

ADD—Displays the sum of Channel 1 and Channel 2 input signals when BOTH is also selected. The difference of the Channel 1 and Channel 2 input signals is displayed when the Channel 2 signal is inverted.

ALT—Alternately displays the Channel 1 and Channel 2 input signals. The alternation occurs during retrace at the end of each sweep. ALT vertical mode is most useful for viewing both channel input signals at sweep rates of 0.5 ms per division and faster.

CHOP—Switches the display between the Channel 1 and Channel 2 vertical input signals during the sweep. The chopped switching rate (CHOP frequency) is approximately 500 kHz.

(13) **CH 1 and CH 2 VOLTS/DIV Switches**—Select the vertical channel deflection factors from 5 mV to 5 V per division in a 1-2-5 sequence.

1X—Front-panel marking that indicates the deflection factor set by the VOLTS/DIV switch when a 1X probe or a coaxial cable is attached to the channel input connector.

10X PROBE—Front-panel marking that indicates the deflection factor set by the VOLTS/DIV switch when a 10X probe is attached to the channel input connector.

(14) **Variable VOLTS/DIV and X10 Vertical Magnification Controls**—Provide continuously variable deflection factors between calibrated positions of the VOLTS/DIV controls and X1 or X10 vertical magnification of the displayed signal. The VOLTS/DIV sensitivity may be reduced by up to at least 2.5 times at the fully counterclockwise rotation of the variable (CAL) knob. A detent position at full clockwise rotation indicates the calibrated VOLTS/DIV position of the variable knob.

X10 vertical magnification of a displayed signal is obtained by pulling the variable (CAL) knob to the out position. A yellow ring is visible on the knob in the X10 Vertical Magnification position.

(15) **AC-GND-DC (Input Coupling) Switches**—Select the method of coupling the input signal from the CH 1 OR X and CH 2 OR Y connectors to the vertical amplifiers.

AC—Capacitively couples the input signal to the vertical deflection system. The dc component of the input signal is blocked. The lower -3 dB bandpass is 10 Hz or less.

GND—Grounds the input of the vertical deflection channel; provides a zero (ground) reference voltage display (does not ground the input signal).

DC—All frequency components of the input signal are coupled to the vertical deflection and signal acquisition systems.

(16) **CH 1 OR X and CH 2 OR Y Input Connectors**—Provide for application of signals to the inputs of the deflection systems.

In X-Y mode, the signal connected to the CH 1 OR X input controls the horizontal deflection, and the signal connected to the CH 2 OR Y input controls the vertical deflection.

HORIZONTAL

(17) **COARSE Horizontal POSITION Control**—Positions all the waveforms horizontally over a one-sweep-length range (for X1, X5, X10, or X50 Magnified).

(18) **FINE Horizontal POSITION Control**—Allows for fine adjustment of the horizontal position of displayed waveforms.

(19) **Horizontal MODE Switch**—Selects the horizontal mode of operation.

X1—This is the normal mode of operation with the waveform being unmagnified horizontally.

ALT—Displays the unmagnified waveform and the horizontally magnified waveform alternately.

MAG—Displays only the horizontally magnified waveform.

The amount of horizontal magnification is set by the Horizontal MAG switch (X5, X10, X50).

(20) **SEC/DIV Switch**—Selects calibrated sweep rates from 0.5 s to 0.05 µs per division in a 1-2-5 sequence of 22 steps. The X-Y position selects the X-Y mode; the CH 1 OR X input signal produces horizontal deflection for X-Y displays, and the CH 2 OR Y input signal produces vertical deflection.

(21) **Variable SEC/DIV Control**—Continuously varies the uncalibrated sweep time per division to at least 2.5 times the calibrated time per division set by the SEC/DIV switch. Full ccw rotation of the variable (CAL) knob increases the slowest sweep time per division to at least two seconds.

(22) **Horizontal MAG Switch**—Sets the amount of horizontal magnification to X5, X10, or X50 when the Horizontal MODE switch is set to either ALT or MAG.

(23) **GND Connector** (⏚)—Provides an auxiliary ground connection directly to the instrument chassis via a banana-tip jack.

(24) **PROBE ADJUST Terminal**—Provides an approximately 0.5-V, negative-going, square-wave signal (at about 1 kHz) for use in compensating voltage probes and checking the vertical deflection system. The PROBE ADJUST output signal is not intended as a reference for checking either the vertical or the horizontal accuracy of the instrument.

TRIGGER

(25) **Trigger SLOPE Switch**—Selects either the positive (_/‾) or negative (‾_) slope of the trigger signal to start the sweep.

(26) **Trigger LEVEL Control**—Selects the amplitude point on the trigger signal that produces triggering.

(27) **TRIG'D/READY Indicator**—A dual-function LED indicator. In P-P AUTO and NORM trigger modes, the indicator is turned on when triggering occurs. In SGL SWP trigger mode, the indicator turns on when the trigger circuit is armed, awaiting a triggering event; it turns off again as soon as the single sweep is triggered.

(28) **Trigger MODE Switch**—Determines the sweep triggering mode.

P-P AUTO—TV LINE—Triggering occurs on trigger signals having adequate amplitude and a repetition rate of about 20 Hz or faster. In the absence of a proper trigger signal, an autotrigger is generated, and the sweep freeruns.

NORM—Permits triggering at all sweep rates (an autotrigger is not generated in the absence of an adequate trigger signal). NORM trigger mode is especially useful for low-frequency and low-repetition-rate signals.

TV FIELD—Permits stable triggering on a television field signal (vertical sync). In the absence of an adequate trigger signal, the sweep freeruns. The instrument otherwise behaves as in P-P AUTO.

SGL SWP—Selects single sweep-operation.

(29) **SGL SWP RESET Button**—Arms the trigger circuit for a single sweep. Triggering requirements are the same as in NORM trigger mode. After the completion of a triggered sweep, pressing in the SGL SWP RESET button rearms the trigger circuitry to accept the next triggering event.

(30) **HOLDOFF Control**—Adjusts the variable holdoff time. Variable holdoff starts at the end of the sweep.

(31) **Trigger SOURCE Switches**—Determine the source of the internal and external trigger signal for the trigger generator circuits.

CH 1—Trigger signal is obtained from the CH 1 OR X input connector.

VERT MODE—Trigger signals are automatically obtained alternately from the CH 1 OR X and CH 2 OR Y input signals in ALT vertical mode. In CHOP vertical mode, the trigger signal source is the sum of the Channel 1 and Channel 2 input signals.

CH 2—Trigger signal is obtained from the CH 2 OR Y input. The CH 2 INVERT switch also inverts the polarity of the internal Channel 2 trigger signal when the Channel 2 display is inverted.

EXT—Selects external trigger source. The actual form these triggers take is selected by the second SOURCE switch.

LINE—Routes a sample of the ac-power-line signal to the trigger circuit.

EXT/10—Divides the external signal applied to the EXT INPUT OR Z connector by a factor of ten before applying it to the trigger circuit.

EXT—Routes an external signal applied to the EXT INPUT OR Z connector to the trigger circuit.

EXT=Z—Routes the signal applied to the EXT INPUT OR Z connector to the z-axis amplifier rather than the trigger circuit.

(32) **COUPLING Switch**—Determines the method of coupling the signal applied to the trigger circuit.

AC—Capacitively couples the input signal; the dc component of the signal is blocked.

HF REJ—Rejects (attenuates) the high-frequency components (above 30 kHz).

LF REJ—Rejects (attenuates) the low-frequency components (below 30 kHz).

DC—Directly couples all frequency components of the external signal to the trigger circuit.

(33) **EXT INPUT OR Z Connector**—Provides for connection of external signals either to the trigger circuit for external triggering or to the z-axis amplifier for intensity modulation of the crt display.

REAR PANEL

(34) **Fuse Holder**—Contains the ac-power-source fuse. See the rear-panel nomenclature for fuse rating and line-voltage range.

(35) **Detachable Power Cord Receptacle**—Provides the connection point for the ac-power source to the instrument.

(36) **Line Voltage Selector (Mains Switch)**—Selects the line voltage operating range of either 115 Vac or 230 Vac.

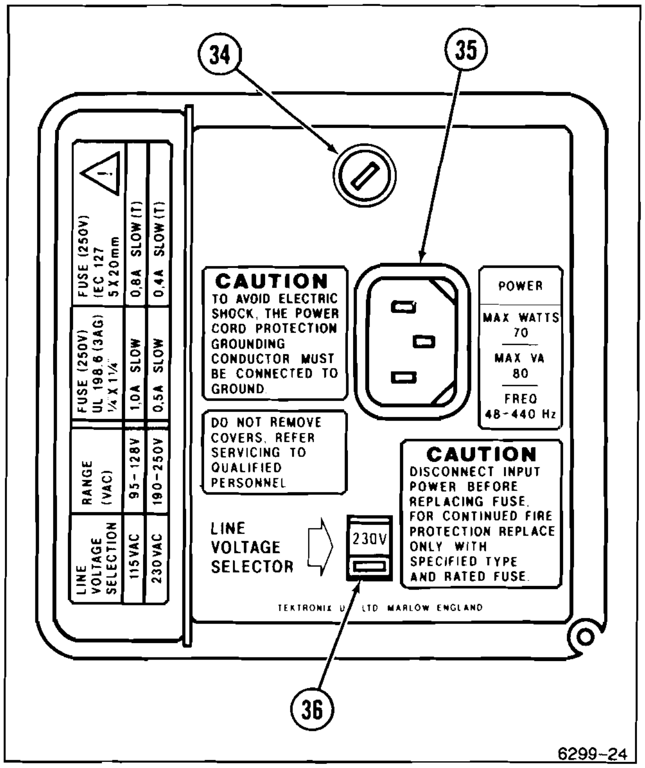


Figure 2-3. Rear Panel.

OPERATING CONSIDERATIONS

This part contains basic operating information and techniques that should be considered before attempting to make any measurements with the instrument.

GRATICULE

The graticule is internally marked on the faceplate of the crt to eliminate parallax-viewing errors and to enable measurements (see Figure 2-4). The graticule is marked with eight vertical and ten horizontal major divisions. In addition, each major division is divided into five subdivisions. The vertical deflection factors and horizontal timing are calibrated to the graticule so that accurate measurements can be made directly from the crt. Also, percentage marks for the measurement of rise and fall times are located on the left side of the graticule.

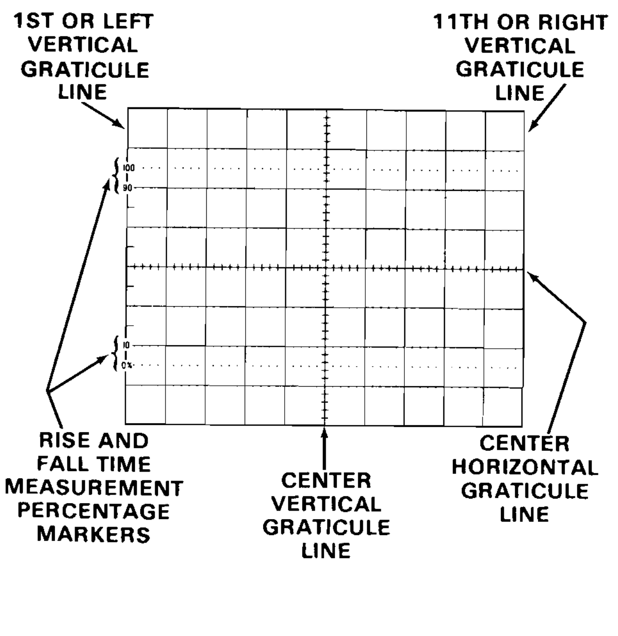


Figure 2-4. Graticule measurement markings.

GROUNDING

The most reliable signal measurements are made when the 2225 and the unit under test are connected by a common reference (ground lead) in addition to the signal lead or probe. The probe's ground lead provides the best grounding method for signal interconnection and ensures the maximum amount of signal-lead shielding in the probe cable. A separate ground lead can also be connected from the unit under test to the ground connector (⏚) located on the oscilloscope's front panel.

SIGNAL CONNECTIONS

Probes

Generally, the accessory probes supplied with the instrument provide the most convenient means of connecting a signal to the vertical inputs of the instrument. The probe and probe lead are shielded to prevent pickup of electromagnetic interference. The 10X attenuation factor of the probe offers a high input impedance that minimizes signal loading in the circuitry under test.

Both the probe itself and the probe accessories should be handled carefully at all times to prevent damage to them. Avoid dropping the probe body. Striking a hard surface can cause damage to both the probe body and the probe tip. Exercise care to prevent the cable from being crushed or kinked. Do not place excessive strain on the cable by pulling.

The standard-accessory probe is a compensated 10X voltage divider. It is a resistive voltage divider for low frequencies and a capacitive voltage divider for high-frequency signal components. Inductance introduced by either a long signal or ground lead forms a series-resonant circuit. This circuit will affect system bandwidth and will ring if driven by a signal containing significant frequency components at or near the circuit's resonant frequency. Oscillations (ringing) can then appear on the oscilloscope waveform display and distort the true signal waveshape. Always keep both the ground lead and the probe signal-input connections as short as possible to maintain the best waveform fidelity.

Misadjustment of probe compensation is a common source of measurement error. Due to variations in oscilloscope input characteristics, probe compensation should be checked and adjusted, if necessary, whenever the probe is moved from one oscilloscope to another or between channels. See the Probe Compensation procedure in Operator's Checks and Adjustments, or consult the instructions supplied with the probe.

Coaxial Cables

Coaxial cables may also be used to connect signals to the vertical input connectors, but they may have considerable effect on the accuracy of a displayed waveform. To maintain the original frequency characteristics of an applied signal, only high-quality, low-loss coaxial cables should be used. Coaxial cables should be terminated at both ends in their characteristic impedance. If this is not possible, use suitable impedance-matching devices.

INPUT-COUPLING CAPACITOR PRECHARGING

When the Input Coupling switch is set to the GND position, the input signal is connected to ground through the input-coupling capacitor and a high value resistance. This series combination forms a precharging circuit that allows the input-coupling capacitor to charge to the average dc voltage level of the signal applied to the input connector. Thus, any large voltage transients that may accidentally be generated are not applied to the vertical amplifier when the input coupling is switched from GND to AC. The precharging network also provides a measure of protection to the external circuitry by reducing the current level that is drawn from the external circuitry while the input-coupling capacitor is charging.

If AC input coupling is in use, the following procedure should be followed whenever the probe tip is connected to a signal source having a different dc level than that previously applied. This procedure becomes especially useful if the dc-level difference is more than ten times the VOLTS/DIV switch setting.

1. Set the AC-GND-DC (input coupling) switch to GND before connecting the probe tip to a signal source.

2. Touch the probe tip to the oscilloscope ground (⏚) connector.

3. Wait several seconds for the input-coupling capacitor to discharge.

4. Connect the probe tip to the signal source.

5. Wait several seconds for the input-coupling capacitor to charge to the dc level of the signal source.

6. Set the AC-GND-DC switch to AC. A signal with a large dc component can now be vertically positioned within the graticule area, and the ac component of the signal can be measured in the normal manner.

OPERATOR'S CHECKS AND ADJUSTMENTS

To verify the operation and basic accuracy of your instrument before making measurements, perform the following checks and adjustment procedures. If adjustments are required beyond the scope of these operator's checks and adjustments, refer the instrument to qualified service personnel.

For new equipment checks, before proceeding with these instructions, refer to Preparation for Use in this manual to prepare the instrument for the initial start-up before applying power.

INITIAL SETUP

1. Verify that the POWER switch is OFF (switch is in the out position), and the Line Voltage Selector switch is set for the correct source voltage. Then plug the power cord into the ac power outlet.

2. Press in the POWER switch (ON) and set the instrument controls to obtain a baseline trace:

Display

INTENSITY	Midrange
FOCUS	Best defined display

Vertical (Both Channels)

VERTICAL MODE	CH 1
POSITION (both)	Midrange
VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	DC
VOLTS/DIV Variable (both)	CAL (in detent)
Magification (both)	X1 (CAL knobs in)

Horizontal

SEC/DIV	0.5 ms
SEC/DIV Variable	CAL (in detent)
POSITION	Midrange
MODE	X1

Trigger

HOLDOFF	MIN (fully counter-clockwise)
SOURCE	VERT MODE
MODE	P-P AUTO
SLOPE	Positive (⌐)
COUPLING	AC
LEVEL	For a stable display (with signal applied)

3. Adjust the INTENSITY and FOCUS controls for the desired display brightness and best focused trace.

4. Adjust the Vertical and Horizontal POSITION controls to position the trace within the graticule area.

5. Allow the instrument to warm up for 20 minutes before commencing the adjustment procedures. Reduce the INTENSITY level during the waiting time.

TRACE ROTATION ADJUSTMENT

NOTE

Normally, the trace will be parallel to the center horizontal graticule line, and TRACE ROTATION adjustment is not required.

1. Preset the instrument controls and obtain a baseline trace as described in Initial Setup.

2. Use the CH 1 POSITION control to move the baseline trace to the center horizontal graticule line.

3. If the baseline trace is not parallel to the center horizontal graticule line, use a small-bladed screwdriver or alignment tool to adjust the TRACE ROTATION control and align the trace with the graticule line.

PROBE COMPENSATION

Misadjustment of probe compensation is a source of measurement error. The attenuator probes are equipped with a compensation adjustment. To ensure optimum measurement accuracy, always check probe compensation before making measurements. Probe compensation is accomplished by the following steps:

1. Preset the instrument controls and obtain a baseline trace as described in the Initial Setup.
2. Connect the two 10X probes (supplied with the instrument) to the CH 1 OR X and CH 2 OR Y input connectors.
3. Connect the Channel 1 probe tip to the PROBE ADJUST terminal.
4. Use the CH 1 POSITION control to vertically center the display. If necessary, adjust the Trigger LEVEL control to obtain a stable display on the positive (_/¯) SLOPE.

NOTE

Refer to the instruction manual supplied with the probe for more complete information on the probe and probe compensation.

5. Check the waveform display for overshoot and rounding (see Figure 2-5); if necessary adjust the probe's compensation. Rotate the sleeve on the probe head to expose the adjustments (see Figure 2-6). Use a low-reactance alignment tool to adjust the LF comp capacitor for a square front corner on the waveform.

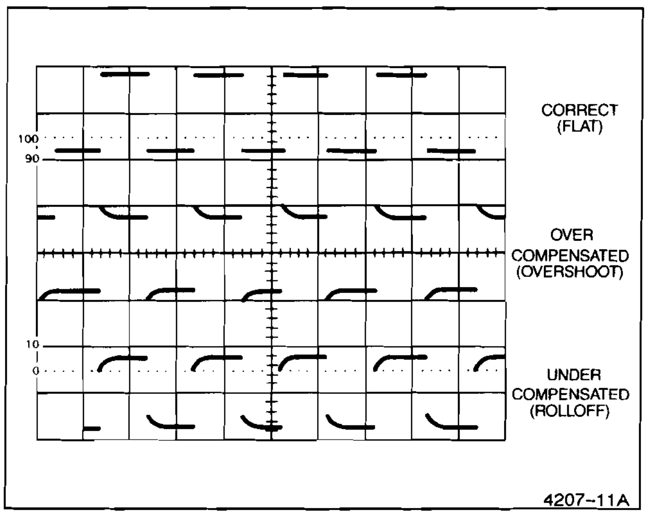


Figure 2-5. Probe compensation.

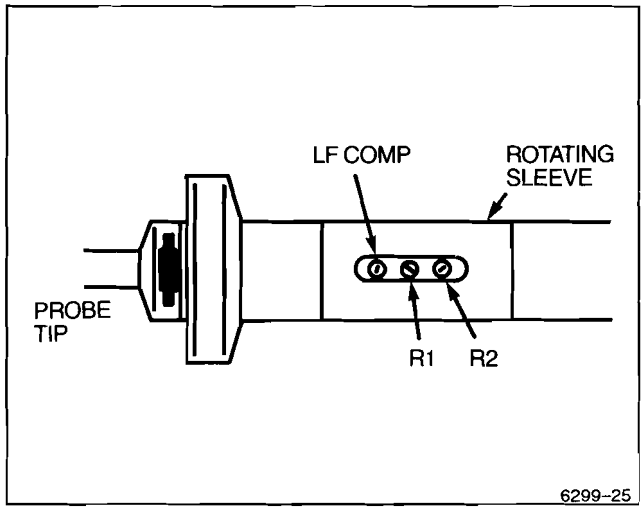


Figure 2-6. Probe compensation locations.

6. Disconnect the Channel 1 probe tip from the PROBE ADJUST terminal.
7. Connect the Channel 2 probe tip to the PROBE ADJUST terminal.
8. Set the Vertical MODE to CH 2.
9. Use the CH 2 POSITION control to vertically center the display.
10. Repeat step 5 for the Channel 2 probe.

THEORY OF OPERATION

SECTION ORGANIZATION

This section of the manual contains a general summary of instrument functions followed by a detailed description of each major circuit. A basic block diagram, (Figure 9-4), and the schematic diagrams are located in the tabbed diagrams section at the back of this manual. They are used to show the interconnections between parts of the circuitry, to indicate circuit components, and to identify interrelationships with the front-panel controls.

The schematic diagram number associated with each description is identified in the text and is shown on the block diagram. For best understanding of the circuit being described, refer to the appropriate schematic diagram and the block diagram.

INTEGRATED CIRCUIT DESCRIPTIONS

Digital Logic Conventions

Digital logic circuits perform many functions within the instrument. Functions and operation of the logic circuits are represented by logic symbology and terminology. Most logic functions are described using the positive-logic convention. Positive logic is a system where the more positive of two levels is the TRUE (or 1) state; the more negative level is the FALSE (or 0) state. In this logic description, the TRUE state is HI, and the FALSE state is LO. The specific voltages which constitute a HI or a LO state vary between specific devices. For specific device characteristics, refer to the manufacturer's data book.

Linear Devices

The operation of individual linear integrated circuit devices in this section use waveforms or other techniques such as voltage measurement and simplified simplified diagrams to illustrate their circuit operation.

GENERAL DESCRIPTION

In the following overall functional description of the 2225 Oscilloscope, refer to the block diagram (Figure 9-4) located in the diagrams section of this manual. In Figure 9-4 the numbered diamond symbol in each major block refers to the appropriate schematic diagram number.

Vertical

Signals to be displayed on the crt (cathode-ray tube) are applied to either or both the CH 1 OR X and the CH 2 OR Y input connectors. The signals may be coupled to the attenuator either directly (DC) or through an input-coupling capacitor (AC). The inputs may also be disconnected, and the input to the attenuators grounded, by switching to the GND position of the input coupling switch. In the GND position, the ac-coupling capacitor is allowed to precharge to the dc level present at the input connector. This precharging prevents large trace shifts of the display when switching from GND to AC coupling. The Attenuators are switched by the front-panel VOLTS/DIV switches and scale the applied signal level to obtain the desired display amplitude.

The output signals from the Attenuators are applied to the Vertical Preamplifiers for amplification. The Channel 2 Preamplifier has additional circuitry, permitting the operator to invert the Channel 2 display on the cathode-ray tube (crt). Trigger pickoffs in each channel supply a trigger signal to the Trigger Amplifier when internal triggering is selected.

Input signals are selected for display by the Channel Switching circuit under control of the front-panel VERTICAL MODE switches. The output signal from the Channel Switching circuit is applied to the Delay-line Driver stage. This stage converts a current input into a voltage output and provides an impedance match for the Delay Line. The Delay Line produces approximately 90 ns of delay in the vertical signal. This delay allows time for the Horizontal circuitry to start the sweep before the vertical signal is applied to the crt, so that the operator can see the signal that triggered the sweep.

Final amplification of the vertical signal is done by the Vertical Output Amplifier. This stage produces the signal levels that vertically deflect the crt electron beam. The upper frequency response of the Amplifier can be reduced by enabling the X10 Gain circuitry. For locating the position of off-screen displays, the dynamic range of the Amplifier can be limited with the Beam Find circuitry. This circuitry also intensifies the trace and limits horizontal deflection.

Triggering

The Trigger circuitry uses either the Internal Trigger signal obtained from the input signal(s), an External Trigger signal, or a Line Trigger signal derived from the ac-power-source to develop trigger signals for the Sweep Generator. The P-P Auto Trigger circuit sets the range of the Trigger Level to conform approximately to the peak-to-peak amplitude of the selected trigger signal when either Auto or TV Field Trigger mode is selected. This allows triggering on most signals without needing to adjust the TRIGGER LEVEL control. In Norm mode, the TRIGGER LEVEL control must be adjusted to the signal level before a sweep will be triggered.

The triggering circuitry contains the TV Field Sync circuit. This circuit provides stable triggering on television vertical-sync pulses when in the TV Field triggering mode. TV Line triggering is possible using P-P AUTO trigger mode.

Sweep

The Sweep Logic circuit controls the sweep generation and Z-Axis unblanking for the Sweep display. When the TRIGGER Mode switches are set to either P-P AUTO or TV FIELD and no trigger signal is present, the Auto Baseline circuit causes the Sweep Logic circuit to produce a sweep for reference purposes. In the NORM setting, the Auto Baseline circuit is disabled and sweeps are not generated until a trigger event occurs. This is useful for triggering on low-repetition rate signals. The SGL SWP (single sweep) trigger mode allows only one sweep to be generated after being reset. Following the single sweep, the Trigger circuit is disabled until the SGL SWP RESET button is pressed again.

The Sweep Logic circuit controls the operation of the Miller Sweep Generator circuit. The Sweep circuit produces a linear sweep with a ramp time that is controlled by the SEC/DIV switch setting. The sweep signal is applied to the Horizontal Preamplifier for initial amplification and then to the Horizontal Output Amplifier to drive the crt horizontal deflection plates.

Horizontal

The Horizontal Preamplifier gain is increased by a factor of 5, 10, or 50 when the Horizontal MAG control is used. Horizontal positioning of the display is accomplished in the Horizontal Preamplifier circuit.

In the X-Y mode of operation, the Channel 1 signal from the internal Trigger circuitry passes through the X-Y Amplifier to the Horizontal Preamplifier. In this operating mode, the Channel 1 Internal Trigger signal supplies the horizontal deflection to the crt, and the Miller Sweep circuit is disabled to inhibit sweep generation.

Z-Axis

The Z-Axis drive from the Sweep Logic circuit is applied to the Z-Axis Amplifier. The output signal from the Z-Axis Amplifier circuit sets the crt intensity. When using Chop Vertical mode, a blanking signal from the Chop Oscillator circuit blanks the crt display while switching between the vertical channels.

The DC Restorer circuit applies the output voltage of the Z-Axis Amplifier between the cathode and grid of the crt. High dc potentials on these elements prohibit direct coupling to the crt.

Power Supply

The Power Supply provides the necessary operating voltages for the instrument. Operating potentials are obtained from a circuit consisting of the Power Transformer, Pre-regulator, Inverter and multi-winding transformer. The voltage produced by the Power Transformer output winding, after rectification, provides 45 Vdc minimum to the 40-kHz Preregulator circuit, which in turn, supplies a nominal 38 Vdc to the 20 kHz Inverter stage. A High Voltage Multiplier circuit produces the accelerating, focus, and cathode potentials used by the crt.

Probe Adjust

A front-panel PROBE ADJUST output is provided for use in adjusting probe compensation. The voltage at the PROBE ADJUST terminal is a negative-going square wave that has a peak-to-peak amplitude of approximately 0.5 V with a repetition rate of approximately 1 kHz.

DETAILED CIRCUIT DESCRIPTION

VERTICAL

Attenuators

The Channel 1 and Channel 2 Attenuator circuits, shown on diagram 1, are identical with the exception of the additional Invert circuitry in the Channel 2 Paraphase Amplifier. Therefore, only the Channel 1 Attenuator is described, with the Invert circuitry of Channel 2 discussed separately.

The Attenuator circuit (see Figure 3-1) provides control of the input coupling, the vertical deflection factor, and the variable volts/division gain. Vertical input signals for display on the crt may be connected to either or both the CH 1 OR X and the CH 2 OR Y input connectors. In the X-Y mode of operation, the signal applied to the CH 1 OR X connector provides horizontal (X-axis) deflection for the display, and the signal applied to the CH 2 OR Y connector provides the vertical (Y-axis) deflection for the display.

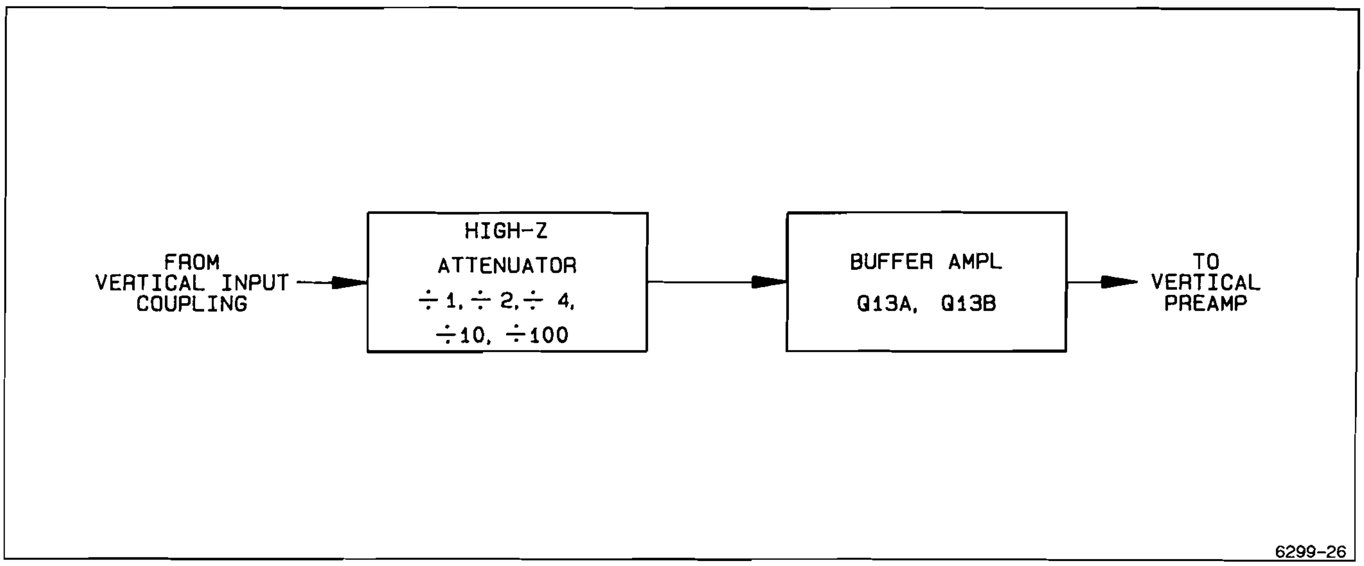


Figure 3-1. Block diagram of the Channel 1 Attenuator circuit.

Input Coupling (AC-GND-DC)

A signal from the CH 1 OR X input connector may be ac or dc coupled to the High-Impedance Attenuator circuit or disconnected completely by the Input Coupling Switch. Signals from the CH 1 OR X input connector are routed through resistor R1 to Input Coupling switch S101. When S101 is set for dc coupling, the Channel 1 signal goes directly to the input of the High-Impedance Attenuator stage. When ac coupled, the input signal passes through dc-blocking capacitor C2. The blocking capacitor stops the dc component of the input signal from reaching the Attenuator circuit. When switched into the signal path, attenuator AT1 attenuates the input signal by factors of 100, 10, 4, or 2. When S101 is set to GND, the direct signal path is opened, and the input of the attenuator is connected to ground. This provides a ground reference without the need to remove the applied signal from the input connector. The coupling capacitor precharges through R4 to prevent large trace shifts when switching from GND to AC.

Input Attenuator

The effective overall deflection factor of each vertical channel is determined by the setting of the Channel VOLTS/DIV switch. The basic deflection factor of the Vertical system is 5 mV/DIV. For VOLT/DIV switch settings above 5 mV/DIV, frequency compensated voltage dividers (attenuators) are switched into the circuit. Each channel has 2X, 4X, 10X, and 100X attenuators that are selected in various combinations to produce the indicated deflection factor. Each attenuator contains an adjustable series capacitor to provide correct attenuation at high frequencies and an adjustable shunt capacitor to provide correct input capacitance.

Source Follower

The Channel 1 signal from the input attenuator is connected to source follower Q13A via R6 and C6. Resistor R5 provides the input resistance. FET Q13B is a constant current source for Q13A. Transistors Q13A and Q13B provide a high input impedance for the attenuator stage and the output drive current needed for Paraphase Amplifier U30 (the first stage of amplification).

In the event that excessive high-amplitude signals are applied to source follower Q13A, the signal will be limited by CR7 and the gate-source junction of Q13A. If an excessive negative-going signal causes CR7 to become forward biased, Q13A gate is clamped to approximately -9.3 V. An excessive positive-going signal will forward bias the gate-source junction of Q13A. As soon as gate current flows, the gate voltage will stop increasing. Gate current is limited by the high resistance of R6.

Paraphase Amplifier

Paraphase Amplifier U30 converts the single-ended signal from Q13 into a differential signal for the Vertical Preamplifier. The signal from Q13B pin 2 goes to the base of one transistor in U30. The other input transistor in U30 is biased by the divider network formed by R30, R31, R32, and R33. Emitter current for the two input transistors is supplied by R22 and R23. Resistor R29 sets the gain for the stage. The network formed by C8 and R9 reduce the substrate capacitance of Q13 at high frequencies. R8 biases the diode substrate of Q13 off. The collector current of the two input transistors serves as emitter current for the differential output transistor pairs. Base bias voltages for the output pairs are developed by the divider network formed by R39, R41, R42, and Variable VOLTS/DIV potentiometer R43. The transistors of U30 have matched characteristics, so the ratio of currents in the two transistors, U83C and U83D, connected as diodes, determines the current ratios in the output transistor pairs of U30.

As Variable VOLTS/DIV potentiometer R43 is rotated from calibrated to uncalibrated, the conduction level of the transistors connected to R35 increases. Since the transistor pairs are cross connected, the increased conduction in one pair of transistors subtracts from the output current produced by the transistor pair connected to R38, and the overall gain of the amplifier decreases. Balance potentiometer R33 is adjusted to balance the amplifier for minimal dc trace shift as the CH 1 Variable VOLTS/DIV control is rotated.

Incorporated in the Channel 2 Paraphase Amplifier is circuitry that allows the user to invert the polarity of the Channel 2 signal. When CH 2 INVERT switch S90 is selected for NORM, the transistor pairs in U80 are biased as they are in U30, and the CH 2 trace is not inverted. For the CH 2 INVERT position of S90, connections to the bases of the output transistor pairs are reversed, reversing the polarity of the output signal to produce an inverted Channel 2 trace. Invert Balance potentiometer R83 is adjusted for minimal dc trace shift in CH 2 INVERT when rotating CH 2 Variable VOLTS/DIV. Balance Potentiometer R84 is switched in with R83 when in NORM; it is adjusted for minimal dc trace shift when rotating CH 2 Variable VOLTS/DIV.

Vertical Preamplifiers

The Channel 1 and Channel 2 Vertical Preamplifiers, shown on diagram 2, are identical in operation. Operation of the Channel 1 amplifier is described. Differential signal current from the Paraphase Amplifier is amplified to produce drive current for the Delay Line Driver. Internal trigger signals for the Trigger circuitry are picked off prior to the Vertical Preamplifier. The Channel Switch circuitry controls channel selection for the crt display.

Common-base transistors Q102 and Q103, which complete the Paraphase Amplifier portion of the circuitry shown on diagram 1, convert differential current from the Paraphase Amplifier into level-shifted voltages that drive the bases of the input transistors of Vertical Preamplifier U130 and the Internal Trigger circuitry.

Common-mode components CR104, CR105, R104, and R105 provide X1 gain. X10 gain is selected by switching in CR111, CR112, R107, R110, R111, R112, and R128. X10 gain is adjusted by R112, and X10 balance is set by R107. C110 limits the bandwidth in X10 mode to about 5.2 MHz to 7.8 MHz.

Emitter current for the input transistors of U130 is supplied by Q114 and Q115. The base bias voltage to Q114 and Q115 is unbalanced through potentiometer R123 (the CH 1 POSITION control) to produce vertical positioning of the Channel 1 trace. The collector current of each input transistor of U130 is the emitter current for two of the differential output transistors. One of the collectors of each output pair is grounded, and the other provides output drive to the Delay Line Driver. The base bias voltages of the transistors with grounded collectors are held at ground potential by R136. The base voltages of the other transistors are controlled by the Channel Switch circuitry.

When Channel 1 is selected to drive the Delay Line Driver, the Q output (pin 9) of U540A is HI. The transistors with the ungrounded collectors are then forward-biased, and the Channel 1 signal is conducted through to the Delay Line Driver. If Channel 1 is not selected, then the Q output of U540A is LO. The transistors with the ungrounded collectors are then reverse-biased, and the output signals will be conducted to ground by the other transistor pair. The gain of the Preamplifier is set by adjusting R145 to control the signal current that is shunted between the two differential outputs.

Channel Switch Logic

The Channel Switch circuitry, shown on diagram 2, utilizes the front-panel VerticaL MODE switches to select the crt display format. See Figure 3-2 for a block diagram of the circuit.

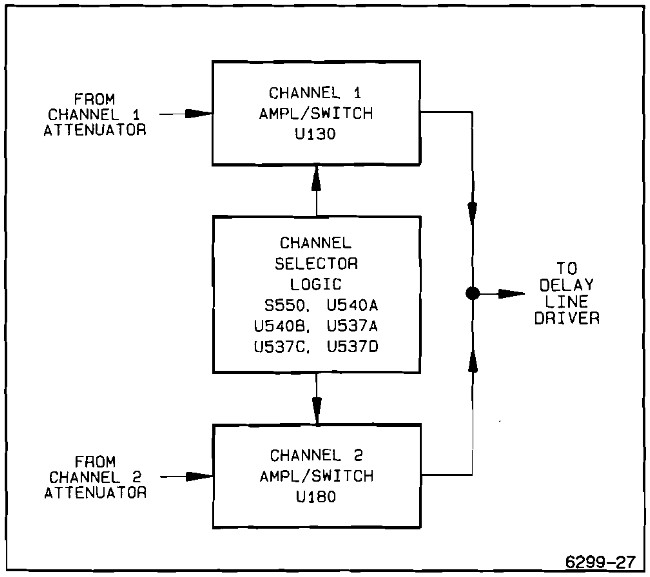


Figure 3-2. Block diagram of the Channel Switching circuit.

When any display mode other than X-Y is selected, the XY line connected to S550 is at ground potential. Vertical MODE switches S545 and S550 control the connection between the XY control line and the SET and RESET inputs of flip-flop U540A (SET and RESET are active LO) to obtain the various display formats described below.

CHANNEL 1 DISPLAY ONLY. The CH 1 position of S550 grounds the SET input of U540A while the RESET input is held HI by pull-up resistor R539. This sets U540A and produces a HI and a LO on the Q and $\overline{Q}$ outputs respectively, and the Channel 1 Preamplifier signal then drives the Delay Line Driver (as described in the Vertical Preamplifier section). The Channel 2 Preamplifier will be disabled.

CHANNEL 2 DISPLAY ONLY. The CH 2 position of S550 holds the RESET input of U540A LO through CR538, and the SET input is held HI by pull-up resistor R538. This resets U540A, making the Q output of U540A LO and the $\overline{Q}$ output HI. The Channel 2 Preamplifier signal is then enabled to drive the Delay Line Driver, while the CH 1 Preamplifier is disabled.

To display the ADD, ALT, or CHOP formats, S550 must be in the BOTH position to ground the A, C, and F pins of S545.

ADD DISPLAY. In the ADD position of S545, both the SET and RESET inputs of U540A are held LO by CR534 and CR537. This forces the Q and $\overline{Q}$ outputs of U540A both HI, and signal currents from the Channel 1 and Channel 2 Preamplifiers add together to drive the Delay Line Driver.

CHOP DISPLAY. In the CHOP position, the $\overline{\text{CHOP ENABLE}}$ line is held LO, keeping the Q output of flip-flop U540B HI. This enables CHOP multivibrator U537D to begin switching. The switching rate is determined primarily by the component values of R544, R545, and C545. The output of U537C (the inverted output of the multivibrator circuit) supplies the CHOP clock to flip-flop U540A via U537A. The output of U537C also drives U537B, the CHOP Blanking Pulse Generator.

Coupling capacitor C547 and resistors R547 and R548 form a differentiating circuit that produces positive-going and negative-going short duration pulses. These pulses are inverted by U537B to generate the Chop Blank signal to the Z-Axis Amplifier. The pulses blank the crt during CHOP switching times.

The Alt Sync signal applied to one input of U537A is HI except during Holdoff. This allows the output of U537C to be inverted by U537A which drives the clock input of U540A. Since the $\overline{Q}$ output of U540A is connected back to the D input, and both the SET and RESET inputs are HI (unasserted), the outputs of U540A toggle (change states) with each clock input. The Delay Line Driver is then driven alternately from the Channel 1 and Channel 2 Preamplifiers at the CHOP rate.

ALTERNATE DISPLAY. In ALT, the $\overline{\text{CHOP ENABLE}}$ line is held HI, disabling CHOP multivibrator U537D. The output of U537C will be HI and the CHOP BLANK signal from U537B will be LO. Input signals to U537A are the HI from U537C and the ALT SYNC signal from the Holdoff circuitry in the Sweep Generator. The output of U537A will then be the inverted ALT SYNC signal that clocks Channel Select flip-flop U540A. This causes the outputs of U540A to toggle at the end of each sweep so that the Channel 1 and Channel 2 Preamplifiers alternately drive the Delay Line Driver.

Delay Line Driver

The Delay Line Driver converts the signal current from the Vertical Preamplifiers into a signal voltage for input into the Delay Line. Transistors Q202, Q203, Q206, and Q207 form a differential shunt feedback amplifier with the gain controlled by R216 and R217. Common-mode dc stabilization of the Delay Line Drive Amplifier is provided by U225. Should the voltage at the junction of R222 and R223 deviate from zero, U225 will sink or source base current to Q202 and Q203 through R202 and R203. This will return the outputs of the Delay Line Driver to an average dc value of zero volts. Delay Line DL224 provides a vertical signal delay of approximately 90 ns so that the Sweep Generator has sufficient time to produce a sweep before the vertical signal that triggered the sweep reaches the vertical deflection plates.

Vertical Output Amplifier

The Vertical Output Amplifier drives the vertical deflection plates of the crt. Signals from the Delay Line go to a differential amplifier formed by Q230 and Q231 with low- and high-frequency compensation provided by the RC networks between the emitters. Thermal compensation is provided by thermistor RT236, and overall circuit gain is set by R233. The output stage of the amplifier is two, compound-shunt transistor pairs, Q254–Q256 and Q255–Q257, that convert the collector currents of Q230 and Q231 to proportional output voltages. Resistors R256 and R257 serve as feedback elements. High-frequency compensation is provided by C256 and C257.

Vertical Beam Find

Beam Find is used to reduce the vertical trace deflection to within the graticule area for locating off-screen and over-scanned traces. BEAM FIND switch S390 adjusts the Delay Line Driver amplifier biasing to limit the voltage swing at the crt plates. When S390 (diagram 6) is in the normal position (not pressed), the BEAM FIND voltage level on R226 is about 0.4 V. When the BEAM FIND switch is pressed, the voltage level on R226 goes to about -8.6 V. This level forces the output of U225 LO and biases Q202 and Q203 such that the amplifier dynamic range is limited.

Alternate Sweep Separation

The circuit consisting of Q283, Q284, Q285, and associated components provides a means of vertically positioning the Alternate (Magnified) sweep, with respect to the X1 mode trace during Alternate Horizontal Mode displays. During the Alternate (Magnified) sweep interval, the $\overline{\text{SEP}}$ signal from the Alternate Display switching circuit is LO, and Q283 is biased off. This allows TRACE SEP potentiometer R280 to affect the bias on one side of a differential current source composed of Q284 and Q285. The potentiometer supplies a dc offset current to the Vertical Output Amplifier that changes the position of the Alternate trace on the screen.

During the X1 Mode sweep interval the $\overline{\text{SEP}}$ signal is HI (unasserted), and Q283 is biased on. The base voltages of Q284 and Q285 are then the same, and equal current is supplied to both sides of the amplifier so that no offset of the trace occurs.

TRIGGER

The Trigger Amplifier, shown on diagram 3, provides signals to the Trigger Generator from either the Vertical Preamplifiers, the EXT INPUT connector, or the power line. The SOURCE switch selects between Channel 1, Channel 2, line, or external trigger sources. The COUPLING switch selects AC, DC, LF REJECT, or HF REJECT trigger-signal coupling.

Internal Trigger

Signals from the Vertical Preamplifiers drive the CH 1 and CH 2 Internal Trigger Amplifier with channel selection determined by the Vertical and Horizontal MODE switches. Trigger pickoff from the Preamplifiers is accomplished by U315B and U315C for Channel 1 and U325A and U325B for Channel 2. The circuitry associated with Channel 2 is the same as Channel 1 except that it does not have a trigger-offset adjustment.

Differential vertical signals from the Channel 1 Preamplifier go to U315B and U315C. These emitter-follower transistors each drive one input transistor in U335. The collectors of the U335 input transistors in turn supply emitter current to two pairs of current-steering transistors. The compensation and biasing network connected between the emitters of the input transistors in U335 is fixed for Channel 2 but not for Channel 1. Potentiometer R338 in the emitter circuit adjusts the bias levels of the two input transistors to match the dc offsets of the Channel 1 and Channel 2 Trigger Amplifiers.

One transistor in each side of the output differential amplifier pairs of U335 has its base bias set to zero volts. The bias voltage of the other transistor in each pair is controlled by the CH 1 TRIG signal from the Trigger Switch circuitry. When the CH 1 TRIG signal is LO, the transistors in each output pair with the collectors connected together are biased on, and the other transistors in the output pairs are off. The collector signal currents of the conducting transistors are equal in magnitude but of opposite polarity, so signal cancellation occurs. When the CH 1 TRIG signal is HI, the other transistors in each pair are biased on, and a differential signal is developed across output load resistors R339 and R340 to drive the Internal Trigger Amplifier.

Internal Trigger Amplifier

Internal trigger channels are chosen by the SOURCE switch being set to CH 1, VERT MODE, or CH 2. The logic function required to generate CH 1 TRIG and CH 2 TRIG is performed by U300, U304, CR300, CR301, and CR302. External Trigger is selected by the SOURCE switches being set to EXT, and EXT=Z or EXT or EXT/10. Line Trigger is selected by the SOURCE switches being set to EXT and LINE.

CHANNEL 1. When the Trigger SOURCE is set to CH 1, Channel 1 is the trigger source whether displayed or not. The Channel 1 signal is also the trigger source under other settings of the Trigger SOURCE and Vertical MODE switches that call for the Channel 1 signal to be displayed. Those conditions are:

Trigger SOURCE set to VERT MODE and the Vertical MODE is set to CH 1, or

Trigger SOURCE set to VERT MODE and the Vertical MODE is set to BOTH and ALT.

CHANNEL 2. When the Trigger SOURCE is set to CH 2, then Channel 2 provides the trigger signal whether Channel 2 is displayed or not. As with Channel 1, other Trigger SOURCE and Vertical MODE settings will call up the Channel 2 as the trigger signal when Channel 2 is displayed. Those conditions are:

Trigger SOURCE set to VERT MODE and the Vertical MODE is set to CH 2, or

Trigger SOURCE set to VERT MODE and the Vertical MODE is set to BOTH and ALT.

VERT MODE. When the SOURCE switch is set to VERT MODE the trigger source selection is determined by the Vertical MODE switch. Vertical MODEs of CH 1, CH 2, and BOTH in ALT are described above. Vertical MODEs of BOTH in ADD or CHOP result in the trigger source being the arithmetic sum of the Channel 1 and Channel 2 input signals.

EXT. When the SOURCE switches are set to EXT, and either EXT=Z or EXT, the trigger source is the signal applied to the EXT INPUT OR Z connector. With EXT and EXT/10 selected, the trigger signal is as above but attenuated by a factor of 10. With EXT and LINE selected, the line-frequency signal, generated in the power supply, is passed to the External Trigger Input Amplifier (shown on diagram 6). In each case, the buffer consisting of Q370A and Q370B, drives differential amplifier U340. This amplifier has the same form as the CH 1 and CH 2 preamplifiers. External offset adjustment is provided by R360. The LO logic signal generated by U308B, $\overline{\text{EXTEN}}$, switches on the external trigger path.

Trigger Amplifier

The Trigger Amplifier converts the differential signals from the vertical and external preamplifiers into a single-ended analog trigger signal that drives the X-Axis amplifier (for X-Y Mode displays) and the Trigger Generator.

Transistors Q363 and Q365 act as a cascade stage to add the signals passed by the preamplifiers to the offset current provided by the coupling control amplifiers on diagram 3. The resulting differential output drives the differential pair Q366 and Q367. The collector load of transistor Q367 is R388. That load is driven via cascode transistor Q368 and "diode-connected" transistor U380D. Transistor Q366 drives current mirror U370D and U370B. Diode CR370 ensures that the collector-base voltage of U370D is not too low, and CR369 compensates for U370C, to equalize the collector potentials of U370B and U370D.

The collector current of U370C is the output of the current mirror and is equal to the collector current of Q366. R388 passes a current equal to the difference in the collectors of Q366 and Q367 (the trigger signal). Transistor U380C acts as an impedance buffer, whose voltage drop is compensated by U380D. The output from the emitter of U380C is the analog trigger signal. In X-Y mode, U380B is biased off, allowing the trigger signal to be passed to the X-Axis Amplifier. U380E is switched off when HF REJECT is selected. This allows C372 to be switched in by U380A, thereby shunting signals of frequencies about 30 kHz and above.

Peak Rectifiers

The analog trigger signal is passed to the positive and negative Peak Rectifier circuits, The Peak Rectifiers generate voltages equal to the positive and negative peaks of the analog trigger waveform in P-P AUTO and TV FIELD modes. In NORM and SGL SWP modes, the Peak Rectifier outputs assume a voltage of about the full peak-to-peak limits of the trigger signal.

The analog trigger signal is applied to the bases of U415B and U435A. In P-P AUTO, C418 charges to the positive peak of the analog trigger signal less the U415B base-emitter drop. The base-emitter drop of U415D compensates so that the output of U425B is equal to the positive peak of the analog trigger signal. In NORM Trigger mode, the base drive to U415A rises to about +3 V, which drives the output of U425A to this level.

In P-P AUTO, C431 charges to the negative peak of the analog trigger signal, and Q435 will only switch on if the base drive to U435 is less than that of U435B. If Q435 switches on, then C431 will discharge to a more negative voltage so the output of U425A will track the negative peak of the analog trigger signal. In NORM mode, U415E switches on, and C431 charges to about -3 V via CR431. Trigger LEVEL control R426 selects a trigger level voltage between the peak rectifier outputs to give trigger operation over a sufficient dynamic range.

Coupling Circuit

The Trigger Amplifier is optimized for bandwidth, not dynamic range. A current is added to the summing stage of Q363 and Q365 (via R397 and R398) to shift the desired switching point on the analog trigger signal to the threshold of the Schmitt Trigger circuit (fixed at zero volts). The selection of current drivers to feed the Trigger Amplifier is achieved by emitter switching of differential pairs U445C and U445D, U445A and U445B, and U435C and U435D. In NORMAL DC coupling, a fixed current proportional to the voltage on the LEVEL control is passed to the summing stage by U445C and U445D. This is enabled by logic signal DC from U308A being HI to bias on Q420.

In NORMAL AC coupling, the dc component of the analog trigger signal is extracted by a low-pass filter circuit R470, C471, C472, and U415C. The dc component is added to the LEVEL voltage, and the result is fed into amplifier U450A. The output of U450A controls differential pair U435C and U435D and completes the feedback loop that adjusts the offset current so that the input of U450A is held at zero volts. This forces the DC component of the analog trigger signal to be equal and opposite to the LEVEL voltage, giving AC coupling with DC shift. LF REJECT operates in exactly the same way, except that the time constant of the low-pass filter is changed by switching off U415C, allowing C473 to dominate the circuit. P-P AUTO operates by establishing a feedback loop with U450B to hold the voltage on LEVEL at zero. Note that P-P AUTO does not distinguish between DC and AC coupling.

Trigger Level Comparator

The Trigger Level Comparator compares the level of trigger signals selected by the Trigger SOURCE switch to a zero voltage level. Positive- or negative-slope triggering is selected by the front-panel Trigger SLOPE switch.

The analog trigger signal drives the base of U460B. The transistors of U460 form a differential amplifier. With the input to U460E grounded, it is effectively a "single-ended" to differential amplifier. The cross-coupled collector outputs can reverse the direction of the signal fed to the succeeding stage depending on the selection by the SLOPE control.

Schmitt Trigger and TV Trigger Circuit

This circuitry generates a signal that drives the Trigger Logic as a function of the Trigger Level Comparator output signal and the Trigger MODE switches.

The output signals from the Trigger Level Comparator drive Q400 and Q401. These transistors are configured as a current mirror that converts the differential output to a single-ended current to drive amplifier U480C. Slope Balance potentiometer R481 corrects for dc offsets between positive and negative slopes. Shunt feedback amplifier U480C converts a current input to a voltage output to drive the input of the Schmitt Trigger, U480D, through R485. Positive feedback for the Schmitt Trigger is provided by Trigger Sensitivity potentiometer R489, and C489 reduces trigger jitter by increasing positive feedback at higher frequencies. The setting of R489 determines the circuit hysteresis.

When TV FIELD is not selected, the $\overline{\text{TVF}}$ signal connected to R487 is HI (unasserted). Transistors Q488 and Q489 are biased off, and a LO is placed on one input of U480A by R492-R493. This LO input will cause U480A to invert the output from U480D. With Q489 off, a LO will be placed on one input of U480B by R495, and U480B will also act as an inverter. The Trigger signal at the output of U480B is therefore the same as the input signal to U480A.

When TV FIELD is selected, the $\overline{\text{TVF}}$ line is LO (asserted). The outputs of U480D will determine the conduction states of Q488 and Q489, and the input of U480A connected to R492 will be HI. The output of U480A will be LO, and U480B will invert the signal at its other input. Signals at the collector of Q489 are filtered by C495, R495 and C496 to reject TV Video information and average the TV horizontal-sync pulses. Setting the trigger-level threshold near the center of the horizontal-sync-pulse swing establishes the untriggered level. When the TV vertical-sync block occurs, the output of the filter applied to U480B pin 7 rises to a level that will cause the Trigger output gate U480B pin 3 to switch. Precise TV field synchronization is obtained as a result of this filtering action. The Trigger signal output will be the inverse of the filtered signal appearing at U480B pin 7.

SWEEP AND SWEEP GENERATOR LOGIC

The Sweep Logic circuitry and the Sweep Generator circuitry, shown on diagrams 4 and 5 respectively, produce a linear voltage ramp that drives the Horizontal Preamplifier. The Sweep Logic circuit also produces signals that are used to generate correct timing of the crt unblanking and intensity levels used for viewing the display. See Figure 3-3 for the block diagram of the Sweep Generator and Logic circuitry.

Miller Sweep Generator

The Miller Sweep Generator (diagram 5) produces a linear voltage ramp that drives the Horizontal Amplifier. It produces the ramp voltage by maintaining a constant current through timing capacitors, causing a linear voltage rise across them as they charge.

Field-effect transistors Q704A and Q704B are matched devices with Q704B acting as the current source for Q704A. Since the gate and source of Q704B are connected together, the source current available to Q704A is just enough so that there is no voltage drop across the gate-source junction of Q704A.

When the sweep is not running, Q701 is biased on, holding the selected timing capacitors in a discharged state. The low impedance of Q701 in the feedback path holds the Miller Sweep output near ground potential. The voltage across Q701, in addition to the base-emitter voltage of Q706, prevents Q706 from becoming saturated.

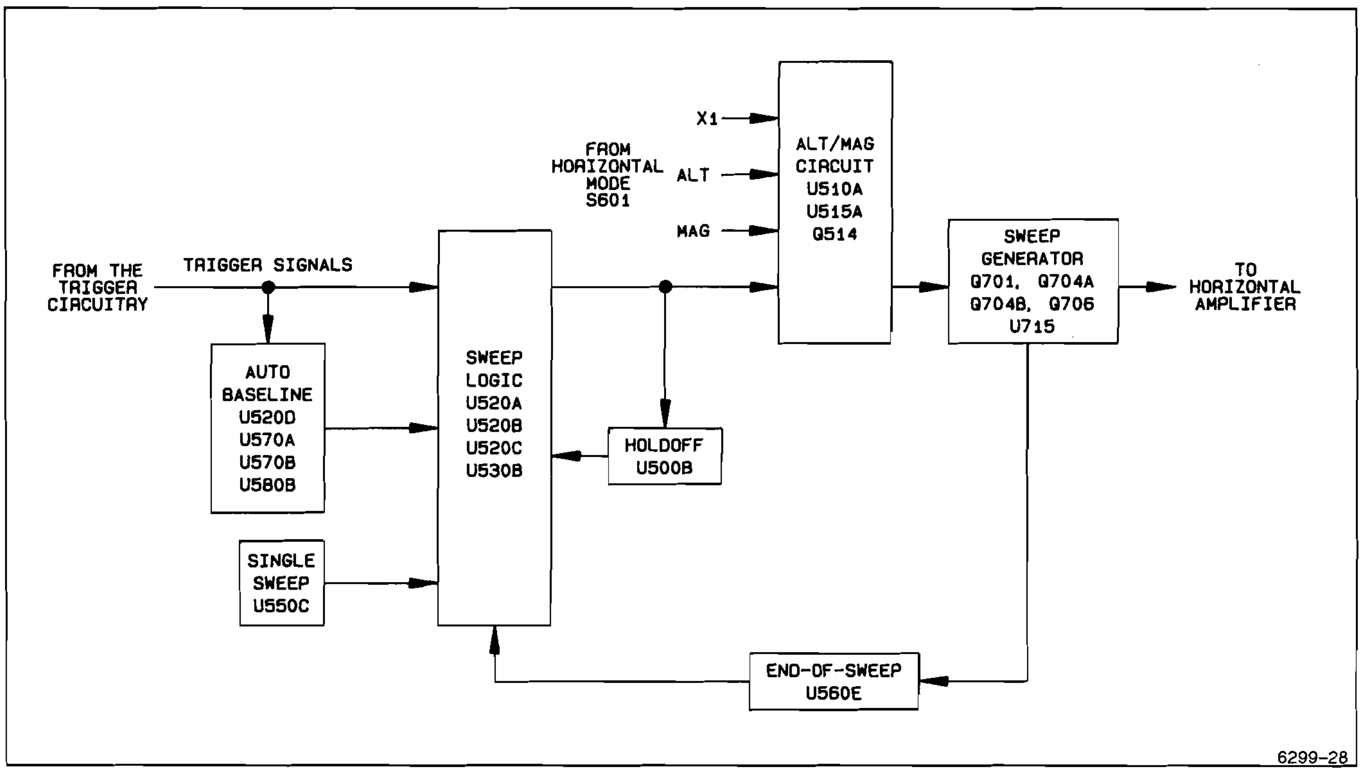


Figure 3-3. Block diagram of the Sweep Generator and Logic circuit.

The sweep ramp is initiated when Q536 (diagram 4) is biased off. The $\overline{\text{GATE}}$ signal going to the base of Q701 from the Sweep Logic circuit turns Q701 off. The timing capacitors then begin charging at a rate set by timing resistors R701, R702, and the position of the SEC/DIV switch S701. One end of timing resistor R701 is connected to the wiper of R721, and the other end is connected to the input of the Miller integrator. Due to feedback from the circuit output through the timing capacitors, the integrator input voltage at the gate of Q704A remains fixed and sets a constant voltage across the timing resistors. This constant voltage produces a constant charging current through the timing capacitors, which results in a linearly increasing voltage ramp at the output of the Miller Sweep circuit.

When the ramp reaches approximately 12 V, the Sweep Logic circuitry will initiate the holdoff period during which Q701 is turned on and the Sweep Generator is reset. This holdoff period is necessary so that the timing capacitors can be fully discharged before another sweep starts. Capacitors C704 and C703 are always in the charging circuit and are used for high sweep speeds. Capacitors C701 and C702 are used for medium sweep speeds; C701 alone is used for slow sweep speeds.

The SEC/DIV Variable circuitry utilizes an operational amplifier to maintain a constant reference voltage at one end of R721 independent of the circuit load. The voltage applied to the timing resistors varies with the setting of R721, the SEC/DIV Variable control. A fixed dc voltage is applied to the noninverting input of the operational amplifier, and feedback resistors R717 and R718 establish double that voltage at the anode of VR719. Resistor R722 is used to adjust the reference voltage when in the 0.5 ms to 10 μs SEC/DIV ranges to correct for mismatch between timing capacitors C701 and C702.

Sweep Logic

The purpose of the Sweep Logic circuit (diagram 4) is to control the sweep start dependent upon the trigger signal and Trigger MODE setting. It also provides the signal for Alternate Channel Switching and Alternate Magnification.

NORM. When NORM trigger is selected, the circuit is ready to start the sweep in response to a trigger signal. U530B has a LO on the SET, RESET, and D input. A trigger pulse received at the CLOCK pin of U530B will clock the LO on the D input to the Q output and enable the sweep to start. The output of the sweep generator is fed back via W701-3 into the potential divider R501 and R502. This divider is arranged so that when the ramp voltage reaches approximately 12 V, U560E is turned on, producing a LO on the input of inverter U520A. The signal from U520B is inverted by U520C to give an overall OR function which is fed to the SET input of U530B. This overrides the CLOCK input and puts a HI on the Q output, resetting the sweep. The sweep reset is also fed to the input of monostable multivibrator U500B, which gives a holdoff time dependent upon the holdoff capacitor selected and the variable holdoff resistor chain. The holdoff pulse from the monostable maintains the HI on the SET input of U530B until the end of the holdoff period. At that time the SET is driven LO, allowing the next trigger pulse to start the sweep.

P–P AUTO. In the P–P AUTO mode, the sweep will free-run in the absence of a trigger signal. Should there be more than 50 ms between trigger pulses, the Auto Baseline circuit, consisting of U580B, U520D, U570A, and U570B, will initiate a sweep. The circuit of U580B is a 20-Hz clock pulse generator. The 20-Hz clock signal is passed through Schmitt trigger U520D to provide a fast rise time. This is to ensure that U570A pin D and U570B pin D switch at the same time.

With no trigger signal, the first clock pulse from U580B resets U570A, putting a HI on the D of U570B. This will then be clocked (giving a LO on TRIGGERED) when the next 50-ms pulse arrives. If the end of sweep has occurred and the holdoff period has elapsed, then the output of U520C will be LO. Because TRIGGERED and P–P AUTO are both LO, the output of U550D will put a LO on one input of U550B. As the other input is also LO, the output of U550B will put a HI on the RESET pin of U530B. That resets the flip-flop, placing a HI on the base of Q536 that turns it off and forces $\overline{\text{GATE}}$ LO at the collector of Q536 to initiate a sweep.

If a trigger occurs, the HI on the D pin of U570A is passed to the Q of U570A, to reset U570B, and put a HI on the TRIGGERED line. The output of U550B will then be LO, allowing U530B to respond to the next trigger signal. When the TRIGGERED line is HI the TRIG'D/READY light is turned on via U550A.

SINGLE SWEEP. When the SGL SWP MODE is selected, the $\overline{\text{SINGLE SWEEP}}$ line is LO, holding the D input of U570A LO. This effectively disables the

Auto Baseline Generator and also puts a LO on the TRIGGERED line. At the end of a sweep, the holdoff pulse is latched by U530A via U520B and U550C, and the D input of U530B is driven HI. Thus the sweep will not start on receipt of a trigger. This condition is cleared by a pulse from single-shot monostable U500A, that clocks the LO on the D input of U530A to the Q output, allowing the next trigger to initiate a sweep. U500A is used as a switch debounce circuit. Timing components R506 and C506 are chosen to give a pulse width of about 30 ns, a pulse that is shorter than the fastest sweep speed. U500A also sets U510B, turning the TRIG'D light on via U550A. When the holdoff period is initiated (and U500A has timed out), U500B will clock a LO back onto the Q output of U510B, allowing the TRIG'D light to be turned off.

Alternate Magnification

The ALT Magnification mode is controlled by S601. In the X1 mode, $\overline{\text{X1}}$ is LO to set flip-flop U510A. The Q output of U510A ($\overline{\text{SEP}}$) is therefore HI. This HI is inverted and level shifted by Q514 to drive the MAG line LO to the Horizontal Amplifier. In MAG mode, the $\overline{\text{MAG}}$ line from S601 is LO, and flip-flop U510A is reset. $\overline{\text{SEP}}$ is therefore LO, driving the MAG line HI to the Horizontal Amplifier. The $\overline{\text{SEP}}$ signal line controls the trace separation circuitry in the Vertical Amplifier. In the ALT mode, U510A divides the ALT SYN signal by two so that on every other sweep the $\overline{\text{SEP}}$ and MAG lines are TRUE.

Alternate Channel Switching

The ALT SYNC signal is provided for the channel switching circuit so that when ALT Vertical MODE is selected, channel switching will be synchronized with the timebase. When ALT MAG is not selected, the alternate switching pulse (ALT SYNC from U515A, pin 3) is supplied at the end of each sweep to the channel switching logic circuit. When ALT MAG is selected, flip-flop U510A divides ALT SYN by two so that the ALT SYNC channel switching pulse is supplied after each second sweep. This produces the following sequence of displays:

CH1 MAG
CH1 X1
CH2 MAG
CH2 X1

When BEAM FIND switch S390 (diagram 6) is pressed, the emitter of Q776 (diagram 5) goes LO to about -8V. That voltage is applied to R510 and C511. Diode CR511 clamps the cathode of CR510 to about -0.6V, so about 0 V is applied to the SET pin of U510A to set that flip-flop. The Q output of U510A is therefore HI, disabling the sweep separation and MAG circuits.

HORIZONTAL

The Horizontal Amplifier circuit, shown on diagram 5, provides the signals that drive the horizontal deflection plates of the crt. Signals applied to the Horizontal Preamplifier may come from either the Miller Sweep Generator (for sweep deflection) or from the X-Y Amplifier (when X-Y display mode is selected). See Figure 3-4 for the block diagram of the Horizontal Amplifier.

The Horizontal POSITION control, X5, X10, X50 Magnifier circuitry, and the horizontal portion of the Beam Find circuitry are also part of the Horizontal Amplifier circuitry. The Horizontal Preamplifiers amplify input signals for application to the Horizontal Output Amplifier.

X1/X5 Horizontal Preamplifier.

The X1/X5 amplifier is a differential stage consisting of Q747, Q748, and associated components. When the X5 MAG line is LO, the X1 gain is set by resistor network R775 and R753, with current supplied through Q750. When X5 MAG is selected (HI), Q750 is switched off, and current is supplied through R730. Potentiometer R730 is adjusted to balance the current through Q747 and Q748. The X5 gain is set by R753, R755, R731, and R749. When in X1 mode, CR747 and CR748 are reverse biased so that the X5 stage has no effect.

X1/X10 Horizontal Preamplifier

The X1/X10 amplifier is a cascode differential amplifier consisting of U745, U755, and associated components. Signals from the X1/X5 Preamplifier are buffered by emitter followers Q759 and Q760 before being applied to the bases of U745C and U745D. When the X10 MAG line is LO (X1 selected), U755B and U755E are biased off, and U755A and U745E are biased on. Diodes CR773 and CR774 are reverse biased. The gain will then be set by R763. When X10 MAG is HI, U755B, U755E, CR773, and CR774 are biased on, and U755A and U745E are biased off. The gain of the X10 stage is set by R763, R767, and R777. Potentiometer R782 balances the currents in the preamplifier so that there is no horizontal trace shift when switching between X1 and X10 modes. Capacitors C773 and C755 damp the high-frequency gain of the preamplifier.

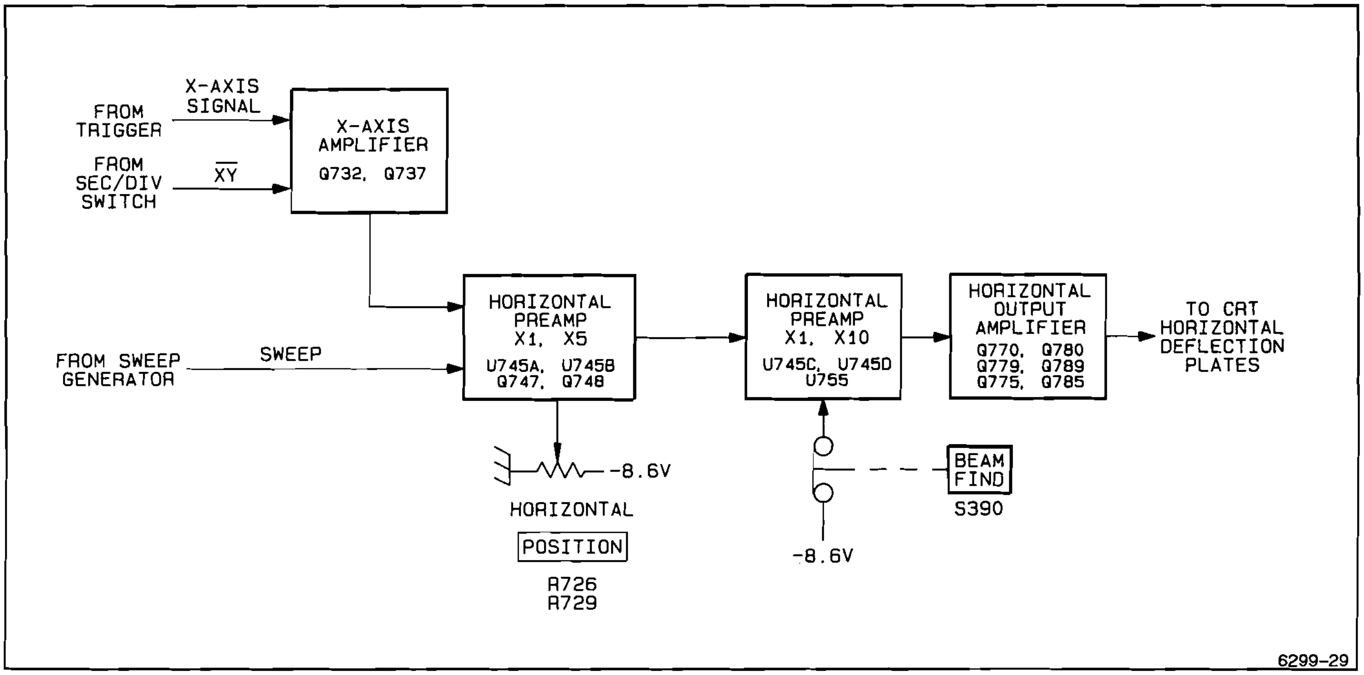


Figure 3-4. Block diagram of the Horizontal Amplifier circuit.

X-Y Amplifier

The X-Y Amplifier amplifies the Channel 1 signal (X-AXIS) from the Internal Trigger circuitry (diagram 3) and passes it to the Horizontal Preamplifier.

In the X-Y mode of operation, the $\overline{XY}$ line is pulled LO by a switch contact on S701 (the SEC/DIV switch). This LO biases Q732 on in the linear region. The circuit of Q732 and Q737 is a transconductance amplifier that changes an input voltage to output current. The input signal is applied through X-Gain adjust potentiometer R395 (diagram 3). The X-Axis Offset adjustment is R736. The signal current out of Q737 is fed into the shunt feedback stage consisting of U745A, U745B, R741, R742, R743, R744, and R745. Resistors R741 and R742 set the gain of the stage. The network consisting of R711, R712, R713, R714, and C714 improves the power supply noise rejection. The output of the shunt feedback stage drives the preamplifiers in all horizontal modes. The sweep is held at a constant low output level when in X-Y mode.

When in the sweep mode, the $\overline{XY}$ line is HI, and Q732 is biased off. This in turn biases Q737 off and disables the X-Y Amplifier.

The $\overline{XY}$ line also turns U380B on (see diagram 3), thereby not allowing the X-AXIS signal to get to the X-Y amplifier. The sweep signal is applied through gain setting resistor R740 to the shunt feedback stage. The output of the shunt feedback stage drives the X1/X5 Preamplifier.

Horizontal Output Amplifier

The Horizontal Output Amplifier provides final amplification of the horizontal signal to drive the horizontal crt deflection plates.

Signals from the (+) and (−) sweep outputs of U755 drive two shunt-feedback amplifiers. Due to the feedback, the input impedance of these amplifiers is low. The base voltages of Q770 and Q780 are biased at nearly the same dc level by the forward-biased diodes (CR781 and CR791) located between the two emitters.

Transistors Q770, Q775, and Q779 form a cascode-feedback amplifier for driving the right crt horizontal deflection plate. Amplifier gain is set by R784, with C784 providing high-frequency compensation. For low-speed signals, Q779 serves as a current source for Q775. At high sweep rates, the deflection signal is coupled through C785 to the emitter of Q779 to provide added pull-up output current to drive the crt. The amplifier formed by Q780, Q785, and Q789 drives the left crt horizontal deflection plate in the same manner as described above, with zener diode VR792 shifting the collector signal level of Q780 to the correct level to drive the emitter Q785.

Horizontal Beam Find

The BEAM FIND switch is buffered by emitter follower Q776. Diodes CR780 and CR790 are normally reverse biased by R776 when BEAM FIND is off. When BEAM FIND is active, Q776 is turned on, and its emitter is driven negative to about -8 V. The voltage on the cathode of VR776 drops to about 5 V, causing CR780 and CR790 to be forward biased. Current through CR780 and CR790 cause the output common-mode voltage of the two shunt-feedback amplifiers to be shifted negative to reduce the available voltage swing at the crt plates. This stops the trace from being deflected off-screen horizontally.

FRONT PANEL

The Front Panel circuitry is shown in diagram 6. Many of the switches and potentiometers are also shown on the other schematic diagrams adjacent to the circuitry controlled. Diagram 6 provides a diagram of the complete Front Panel to aid in servicing that circuit board. The active circuitry on the Front Panel includes the External Trigger buffer Amplifier, Q370B and Q370A, and the Horizontal Position Control current source, Q725. Operation of the FET External Trigger Buffer Amplifier is similar to the Channel 1 and Channel 2 Source Followers described previously.

All mode switching for the Vertical, Horizontal, and Trigger circuitry is done by the Front Panel switches.

Z-AXIS AMPLIFIER

The Z-Axis Amplifier, shown on diagram 7, controls the crt intensity level via several input-signal sources. The effect of these input signals is either to increase or decrease trace intensity or to completely blank portions of the display. The Z-Axis signal current as determined by the Z-Axis switching logic and the input current from the EXT INPUT OR Z connector (if in use), are summed at the emitter of common-base amplifier Q825. The summed current thereby sets the collector current of the stage. The common-base amplifier provides a low-impedance termination for the input signals and isolates the signal sources from the rest of the Z-Axis Amplifier.

Common-base transistor Q829 passes a constant current through R832. This current is divided between Q825 and Q829, with the portion through Q829 driving the shunt-feedback output amplifier formed by Q835, Q840, and Q845. The bias level of Q825 therefore controls the emitter current available to Q829. Feedback-resistor R841 sets the transresistance gain for changing the input current to a proportional output voltage. Emitter-follower Q835 is dc coupled to Q840; and, for low-speed signals, Q845 acts as a current source. Fast transitions couple through C845, providing added current gain through Q845 for fast voltage swings at the output of the amplifier.

External Z-Axis input voltages establish proportional input currents through R823, and amplifier sensitivity is determined by the transresistance gain of the shunt-feedback amplifier. Diode CR823 protects the Z-Axis Amplifier if excessive signal levels are applied to the EXT INPUT OR Z connector.

The INTENSITY potentiometer controls the base voltage of Q804 to set the amount of emitter current that flows through that transistor and, therefore, the level of the Z-Axis signal.

When the sweep is displayed, the emitter of Q817 is LO, causing CR817 to be reverse biased. Diodes CR816, CR821, and CR820 are also reverse biased. This allows the current through R818 to flow through CR818 and turn on the Z-Axis.

When X-Y is displayed, CR817 and CR816 are forward biased, reverse biasing CR821 and CR818. Diode CR819 is reverse biased, allowing the intensity to be set by the current through R820 and CR820.

When ALT MAG is selected, diodes CR816, CR817, CR819, and CR822 are all reverse biased, allowing the intensity to be controlled by the current flowing through R818 and R821. This action therefore increases the intensity of the MAG trace.

When CHOP Vertical MODE is selected, the CHOP BLANK signal is sent to the collector of Q825 through CR824 during the display-switching time. Diode CR825 is reverse biased, and the forward bias of Q829 rises to the blanking level. When blanked, the output of the Z-Axis Amplifier drops to reduce the crt beam current below viewing intensity.

At high beam currents, the crt cathode voltage tends to drop off slightly. To compensate for this, the 2-kV winding is referenced to the emitter of Q804, so that the output of the multiplier (12 kV) is reduced slightly at high intensity levels.

Z-Axis Beam Find

When the BEAM FIND button is pressed, the BEAM FIND line goes to about -8 V. This voltage level will shunt about 1 mA from the Z-Axis Amplifier, overriding any other current combinations to unblank the trace.

DC Restorer and Multiplier

The DC Restorer circuit sets the crt control-grid bias and couples the ac and dc components of the Z-Axis Amplifier output to the crt control grid. Direct coupling of the Z-Axis Amplifier output to the crt control grid is not employed due to the high potential differences involved. Refer to Figure 3-5 during the following discussion.

Ac drive to the DC Restorer circuit is obtained from pin 4 of T902. The drive voltage has an ac peak amplitude of about 100V, at a frequency of about 20 kHz and is coupled into the DC Restorer circuit through C853 and R853. The cathode of CR851 is biased by the wiper voltage of Grid Bias potentiometer R851, and the ac-drive voltage is clamped whenever the positive peaks reach a level that forward biases CR851.

The Z-Axis Amplifier output voltage, varying with display intensity between +10 V and +75 V, is applied to the DC Restorer at the anode of CR853. The ac-drive voltage holds CR853 reverse biased until the voltage falls below the Z-Axis Amplifier output voltage level. At that point, CR853 becomes forward biased and clamps the junction of CR851, CR853, and R854 to the Z-Axis output level. Thus, the ac-drive voltage is clamped at two levels to produce a square-wave signal with a positive dc-offset level.

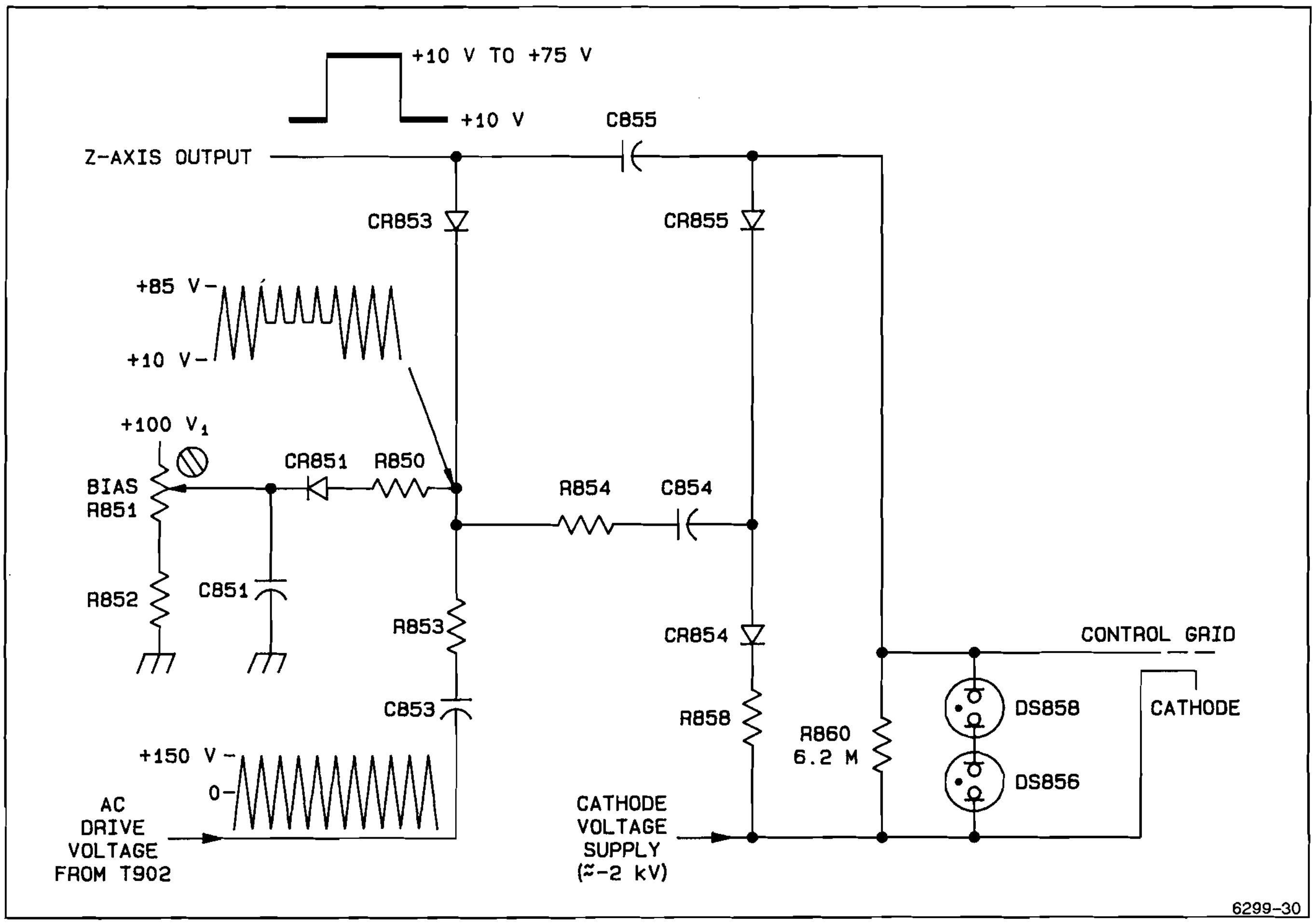


Figure 3-5. Simplified diagram of the DC Restorer circuitry.

The DC Restorer is referenced to the -2-kV crt cathode voltage through R858 and CR854. Initially, both C855 and C854 charge up to a level determined by the difference between the Z-Axis output voltage and the crt cathode voltage. Capacitor C855 charges from the Z-Axis output through R858, CR854, and CR855 to the crt cathode. Capacitor C854 charges through R858, CR854, R854, and CR853 to the crt cathode.

During the positive transitions of the ac drive, from the lower clamped level toward the higher clamped level, the charge on C854 increases due to the rising voltage. The voltage increase across C854 is equal to the amplitude of the positive transition. The negative transition is coupled through C854 to reverse bias CR854 and to forward bias CR855. The increased charge of C854 is then transferred to C855 as C854 discharges toward the Z-Axis output level. Successive cycles of the ac input to the DC Restorer charge C855 to a voltage equal to the initial level plus the amplitude of the clamped square-wave input.

The added charge held by C855 sets the control-grid bias voltage. If more charge is added to that already present on C855, the control grid becomes more negative, and less crt writing-beam current flows. Conversely, if less charge is added, the control-grid voltage level becomes closer to the cathode-voltage level, and more crt writing-beam current flows.

During periods that C854 is charging, the crt control-grid voltage is held constant by the long time-constant discharge path of C855 through R860.

Fast-rise and fast-fall transitions of the Z-Axis output signal are coupled to the crt control grid through C855 to start the crt writing-beam current toward the new intensity level. The DC Restorer output level then follows the Z-Axis output-voltage level to set the new bias voltage for the crt control grid.

Neon lamps DS858 and DS856 protect the crt from excessive grid-to-cathode voltage if the potential on either the control grid or the cathode is lost for any reason.

High-voltage multiplier U975 uses the 2-kV winding of T902 to generate 12 kV to drive the crt anode. An internal half-wave rectifier diode in the multiplier produces -2 kV for the crt cathode. The -2-kV supply is filtered by a low-pass filter formed by R975, C975, C976, R976, R978, and C979. Neon lamp DS870 protects against excessive voltage between the crt heater and crt cathode by conducting if the voltage difference exceeds approximately 75 V.

Focus voltage is also developed from the -2-kV supply by a voltage divider formed by R894, R892, FOCUS potentiometer R893, R891, R890, R889, R888, R886, and Q885. The focus voltage tracks the intensity level through the action of Q885. The emitter voltage of Q804, set by the INTENSITY control, is applied to the emitter of Q885 through R885. When the emitter voltage of Q804 changes, the current through Q885 changes proportionally and alters the voltage at one end of the FOCUS control.

POWER SUPPLY

The Power Supply circuitry (diagram 7) converts the ac-power-line voltage into all the voltages required by the instrument. It comprises the Mains Input Board, Transformer, Preregulator, Series Pass, and Inverter circuits.

Mains Input Board

The power switch (S901) connects the ac-power line to the primary winding of the toroidal wound input transformer, T901, via fuse F901, filter components L901, L902, C903, C904, C905, and VOLTS SELECTOR switch S902. The secondary output is rectified and smoothed by CR901, CR902, CR903, CR904 and C900. With an ac-input voltage of 240 V, there is approximately 60 V between W903-pin 1 and W903-pin 2 at full load.

LINE SYNC. The additional components on the Mains Input Board produce a Line Sync signal for the Trigger circuit. Transistor Q900 is a floating differential amplifier with a dc bias network comprising R905, R904, and R902. Resistors R906 and R903 apply a small line-frequency signal from the secondary of T901 to the base-emitter junction of Q900. The resultant collector current of Q900 is a line-frequency, sine-wave signal that is fed via W903-3 to the Main board.

Preregulator

The 60-V power supply from the Mains Input board, is applied to the Preregulator circuit formed by U910, Q913, and associated components. Zener diode VR910 and R910 reduce the incoming supply for preregulator U910. The Preregulator oscillates at a nominal 39 kHz, as determined by timing components C908 and R908. The square-wave output is level-shifted by Q911, and fed to the Darlington pair circuit formed by Q912 and power transistor Q913. When Q913 is conducting, current ramps up through L910. When Q913 is off, the current ramps down while flowing in through the flywheel diode CR912. Preregulator U910 varies the duty cycle of conduction of Q913, so that the voltage on filter capacitor C914 is a nominal 39.5 V. The network R917, R922, R932, R934, and CR915 monitors the voltage across Q923; and, if that voltage is lower than the nominal 1.4 V, U910 increases the voltage across C914 until Q923 has the correct voltage.

If Q923 is open circuited, CR915 clamps the lower supply voltage to 31 V. The ratio of R932 and R922 across R934 together with R917, is chosen so that if Q923 is short circuited, the maximum voltage across C914 is 41 V. Thus the Preregulator supplies a sensible output under all conditions of the circuitry which it drives except during an overload condition. In this case the voltage developed across the current sense resistor (R907) reaches the offset voltage of 180 mV developed by R910 and R911, and U910 current limits the output to about 900 mA.

Series Pass

The function of Series Pass transistor Q923, is to reject ripple current having a frequency of twice the power-line frequency. The nominal DC voltage across it is only 1.4 V. Base current is supplied to Q923 via R923 and CR923 in the absence of drive from Q921, when the instrument is first switched on. Transistor Q923 is driven by both halves of U920 through Q921. The output at pin 7 of U920 serves to reject hum on the 38-V supply by comparing the output of potential divider R930 and R929, with the reference diode VR931. The output at pin 1 of U920, slightly varies the value of the reference as seen at pin 6 via attenuator resistors R925 and R926. This variation maintains the -8.6-V supply at the value set by the -8.6-V Set potentiometer, R933.

Inverter

Inverter oscillator U940 is driven via Q918 and R946, at the same frequency as U910. U940 supplies two non-overlapping complimentary square-wave outputs to Q930 and Q960. These transistors are in feedback loops, one of which is formed by the filter R953, CR953, reservoir capacitor C953, and level shifter VR939. The feedback is such that the base of Q940 is adjusted to drive Q950 sufficiently hard that the emitter swings to within 3 V of ground, but not hard enough to saturate it. The output voltages of transformer T902 secondary windings are full-wave rectified. The 100-V supply voltage is derived from an auto-transformer winding in series with the primary winding. Resistors R942 and R941 feed a sample of the 38-V supply voltage into the error amplifier connected to pins 1 and 2 of U940. If the 38-V supply should go high, U940 will shut down.

Probe Adjust

The Probe Adjust circuitry, shown on diagram 4, is a square-wave generator and diode switching network that produces a negative-going, square-wave signal at the PROBE ADJUST terminal, J590. Amplifier U580A forms a multivibrator that has an oscillation period set by the time constant of R587 and C587. When the output of the multivibrator is at the positive supply voltage, CR588 is forward biased. This reverse biases CR589, and the PROBE ADJUST signal is held at ground potential by R590. When the multivibrator output switches states, and is at the negative supply voltage level, CR588 is reverse biased. Diode CR589 becomes forward biased, and the circuit output level drops to approximately -0.5 V.

Power Distribution

Power routing from the power supply to the other circuit board is shown in diagram 8. The schematic shows jumpers that may be used to isolate suspected loads from the power supply when troubleshooting power supply problems.

Circuit Board Interconnections

The signal interconnections between circuit boards are shown in diagram 9. This diagram may be used as an aid in signal tracing between the boards. The connectors are also convenient locations to check for the signals between boards when troubleshooting.

PERFORMANCE CHECK PROCEDURE

INTRODUCTION

PURPOSE

The Performance Check Procedure is used to verify the instrument's Performance Requirements statements listed in Table 1-1 and to determine the need for calibration. The performance checks may also be used as an acceptance test or as a preliminary troubleshooting aid.

PERFORMANCE CHECK INTERVAL

To ensure instrument accuracy, check its performance after every 2000 hours of operation, or once each year if used infrequently. A more frequent interval may be necessary if the instrument is subjected to harsh environments or severe usage.

STRUCTURE

The Performance Check Procedure is structured in subsections to permit checking individual sections of the instrument whenever a complete Performance Check is not required. At the beginning of each subsection there is an equipment-required list showing only the test equipment necessary for performing the steps in that subsection. In this list, the Item number that follows each piece of equipment corresponds to the Item number listed in Table 4-1.

Also at the beginning of each subsection is a list of all the front-panel control settings required to prepare the instrument for performing Step 1 in that subsection. Each succeeding step within a particular subsection should then be performed, both in the sequence presented and in its entirety, to ensure that control-setting changes will be correct for ensuing steps.

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 4-1 is a complete list of the equipment required to accomplish both the Performance Check Procedure in this section and the Adjustment Procedure in Section 5. Test equipment specifications described in Table 4-1 are the minimum necessary to provide accurate results. Therefore, equipment used must meet or exceed the listed specifications. Detailed operating instructions for test equipment are not given in this procedure. If more operating information is required, refer to the appropriate test equipment instruction manual.

When equipment other than that recommended is used, control settings of the test setup may need to be altered. If the exact item of equipment given as an example in Table 4-1 is not available, check the Minimum Specification column to determine if any other available test equipment might suffice to perform the check or adjustment.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are valid for an instrument that is operating in and has been previously calibrated in an ambient temperature between +20°C and +30°C. The instrument also must have had at least a 20-minute warm-up period. Refer to Table 1-1 for tolerances applicable to an instrument that is operating outside this temperature range. All tolerances specified are for the instrument only and do not include test-equipment error.

PREPARATION FOR CHECKS

It is not necessary to remove the instrument cover to accomplish any subsection in the "Performance Check Procedure," since all checks are made using operator-accessible front- and rear-panel controls and connectors.

The most accurate display adjustments are made with a stable, well-focused, low-intensity display. Unless otherwise noted, adjust the INTENSITY, FOCUS, and TRIGGER LEVEL controls as needed to view the display.

Table 4-1

Test Equipment Required

Item and Description	Minimum Specification	Purpose	Example of Suitable Test Equipment
1. Calibration Generator	Standard-amplitude signal levels: 5 mV to 50 V. Accuracy: ±0.3%. High-amplitude signal levels: 1 V to 60 V. Repetition rate: 1 kHz. Fast-rise signal level: 1 V. Repetition rate: 1 MHz. Rise time: 1 ns or less. Flatness: ± 0.5%.	Signal source for gain and transient response checks and adjust-ments.	TEKTRONIX PG 506A Calibration Generator.[a]
2. Leveled Sine-Wave Generator	Frequency: 250 kHz to above 50 MHz. Output amplitude: variable from 10 mV to 5 V p.p. Output impedance: 50 Ω. Reference frequency: 50 kHz. Amplitude accuracy: constant within 3% of reference frequency as output frequency changes.	Vertical, horizontal, and triggering checks and adjustments. Display adjustments and Z-Axis check.	TEKTRONIX SG 503 Leveled Sine-Wave Generator.[a]
3. Time-Mark Generator	Marker outputs: 10 ns to 0.5 s. Marker accuracy: ±0.1%. Trig-ger output: 1 ms to 0.1 µs, time-coincident with markers.	Horizontal checks and adjustments. Display adjustment.	TEKTRONIX TG 501A Calibration Generator.[a]
4. Low-Frequency Sine-Wave Generator	Range: 1 kHz to 500 kHz. Out-put amplitude: 300 mV. Output impedance: 600 Ω. Reference frequency: constant within 0.3 dB of reference frequency as output frequency changes.	Low-frequency trigger checks.	TEKTRONIX SG 502 Oscillator.[a]
5. Screwdriver	Length: 3-in. shaft. Bit size: 3/32 in.	Adjust variable resistors.	Xcelite R-3323.
6. Test Oscilloscope with 10X Probes	Bandwidth: dc to 100 MHz. Minimum deflection factor: 5 mV/div. Accuracy: ±3%.	General troubleshoot-ing, holdoff check.	TEKTRONIX 2235A Oscilloscope.
7. Digital Voltmeter (DMM)	Range: 0 to 140 V. Dc voltage accuracy: ±0.15%, 4-1/2 digit display.	Power supply checks and adjustments.	TEKTRONIX DM 504A Digital Multimeter.[a]
8. Coaxial Cable	Impedance: 50 Ω. Length: 42 in. Connectors: BNC.	Signal interconnection.	Tektronix Part Number 012-0057-01.
9. Dual-Input Coupler	Connectors: BNC female-to-dual-BNC male.	Signal interconnection.	Tektronix Part Number 067-0525-01.
10. Termination	Impedance: 50 Ω. Connectors: BNC.	Signal termination.	Tektronix Part Number 011-0049-01.
11. Termination	Impedance: 600 Ω. Connectors: BNC.	Signal termination.	Tektronix Part Number 011-0092-00.

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

Table 4-1, (cont)

Item and Description	Minimum Specification	Purpose	Example of Suitable Test Equipment
12. 10X Attenuator	Ratio: 10X. Impedance: 50 Ω. Connectors: BNC.	Vertical compensation and triggering checks.	Tektronix Part Number 011-0059-02.
13. Adapter	Connectors: BNC male-to-miniature-probe tip.	Signal interconnection.	Tektronix Part Number 013-0084-02.
14. Adapter	Connectors: BNC male-to-tip plug.	Signal interconnection.	Tektronix Part Number 175-1178-00.
15. Low-Reactance Alignment Tool	Length: 1-in. shaft. Bit size: 3/32 in.	Adjust variable capacitors.	J.F.D. Electronics Corp. Adjustment Tool Number 5284.

INDEX TO PERFORMANCE CHECK STEPS

VERTICAL

Equipment Required (See Table 4-1):

Calibration Generator (Item 1)
Leveled Sine-Wave Generator (Item 2)
50-Ω BNC Coaxial Cable (Item 8)
Dual-Input Coupler (Item 9)
50-Ω BNC Termination (Item10)
10X BNC Attenuator (Item 12)
BNC Male-to-Miniature-Probe Tip (Item 13)

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1, NORM
VOLTS/DIV (both)	5 mV
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.5 ms
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (_/‾)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	VERT MODE
COUPLING	DC

PROCEDURE STEPS

1. Check Deflection Accuracy and Variable Range

a. Connect a 20-mV standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

b. CHECK—Deflection accuracy is within the limits given in Table 4-2 for each CH 1 VOLTS/DIV switch setting and corresponding standard-amplitude signal. When at the 20-mV VOLTS/DIV switch setting, rotate the CH 1 VOLTS/DIV Variable control fully counterclockwise and check that the display decreases to two divisions or less. Then return the CH 1 VOLTS/DIV Variable control to the CAL detent and continue with the 50-mV check.

c. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

d. Set the calibration generator to output 20 mV.

e. Repeat Part b using the Channel 2 controls.

f. Set the calibration generator to 0.1 V.

Table 4-2
Deflection Accuracy Limits

VOLTS/DIV Switch Setting	STANDARD Amplitude Signal	ACCURACY Limits (Divisions)
5 mV	20 mV	3.88 to 4.12
10 mV	50 mV	4.85 to 5.15
20 mV	0.1 V	4.85 to 5.15
50 mV	0.2 V	3.88 to 4.12
0.1 V	0.5 V	4.85 to 5.15
0.2 V	1 V	4.85 to 5.15
0.5 V	2 V	3.88 to 4.12
1 V	5 V	4.85 to 5.15
2 V	10 V	4.85 to 5.15
5 V	20 V	3.88 to 4.12

2. Check Position Range

a. SET:

VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	AC
SEC/DIV	0.2 ms

b. Adjust the CH 2 VOLTS/DIV Variable control to produce a 5.25-division display.

c. Set CH 2 VOLTS/DIV to 5 mV.

d. Set the calibration generator to 0.2 V.

e. CHECK—The bottom and top of the trace may be positioned above and below the center horizontal graticule line by rotating the CH 2 POSITION control fully clockwise and counterclockwise respectively.

f. Move the cable from the CH 2 OR Y input connector to the CH 1 OR X input connector.

g. Set the Vertical MODE switch to CH 1.

h. Repeat Parts b through e using the Channel 1 controls.

i. Return both VOLTS/DIV Variable knobs to their detent positions.

j. Disconnect the test equipment from the instrument.

3. Check TRACE SEP Range

a. SET:

SEC/DIV	10 μs
Trigger SOURCE	EXT, EXT

b. Position the trace to the center horizontal graticule line using the Channel 1 POSITION control.

c. Set the Horizontal MODE to ALT.

d. CHECK—That the magnified trace can be positioned three divisions or more above the unmagnified trace.

NOTE

For instruments below serial number 202908, check that the magnified trace can also be positioned three divisions or more below the unmagnified trace.

4. Check High Frequency Compensation

a. SET:

AC-GND-DC (both)	DC
SEC/DIV	0.2 μs
Horizontal MODE	X1
Trigger SOURCE	VERT MODE

b. Connect the positive-going, fast-rise, square-wave output via a 50-Ω BNC coaxial cable, a 10X BNC attenuator, and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 1-MHz, five-division display.

d. Position the bottom of the display to the bottom horizontal graticule line using the CH 1 POSITION control and position the leading edge of a pulse on the center vertical graticule line.

e. Check for aberrations at the top of the waveform of ±6% (0.3 division) or less.

f. Set CH 1 VOLTS/DIV to 10 mV.

g. Set the generator to produce a 1-MHz, five-division display.

h. Check for aberrations of ±4% (0.2 division) or less.

i. Repeat Parts g and h for each of the following CH 1 VOLTS/DIV switch settings: 20 mV through 0.2 V. Adjust the generator output and add or remove the 10X attenuator as necessary to maintain a five-division display at each VOLTS/DIV switch setting.

j. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

k. Repeat Parts c through i for Channel 2.

l. Disconnect the test equipment from the instrument.

5. Check Bandwidth

a. SET:

VOLTS/DIV (both)	5 mV
Vertical MODE	CH 1
SEC/DIV	10 μs

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 50-kHz, six-division display.

d. Increase the signal frequency until a 4.2-division display is obtained.

e. CHECK—That the frequency is greater than 50 MHz.

f. Repeat Parts c through e for all VOLTS/DIV settings from 10 mV to 1 V.

NOTE

For the 1-V-per-division VOLTS/DIV settings, use a five-division display of the 50-kHz reference frequency; use 3.5 divisions peak-to-peak as the -3 dB reference point of the bandwidth.

g. SET:

CH 1 VOLTS/DIV	5 mV
CH 1 Vertical Magnification	X10 (pull CH1 CAL knob out)

h. Set the generator to produce a 50-kHz, six-division display.

i. Increase the signal frequency until a 4.2-division display is obtained.

j. CHECK—That the frequency is greater than 5 MHz.

k. Repeat Parts h through j for all ranges from 10 mV to 0.2 V.

l. Set the CH 1 Vertical Magnification to X1 (push CAL knob in).

m. Set Vertical MODE to CH 2.

n. Repeat Parts b through l for CH 2 using the Channel 2 controls.

6. Check Channel Isolation

a. SET:

CH 1 VOLTS/DIV	0.5 V
CH 2 VOLTS/DIV	1 V
CH 1 AC-GND-DC	GND
SEC/DIV	0.05 μs

b. Set the generator to produce a 10-MHz, five-division display.

c. Set CH 2 VOLTS/DIV switch to 0.5 V for a 10-division display.

d. Set Vertical MODE to CH 1.

e. Check that the CH 1 trace amplitude is less than 0.1 division.

f. Move the test-signal cable from the CH 2 OR Y input connector to the CH 1 OR X input connector.

g. SET:

Vertical MODE	CH 2
CH 1 AC-GND-DC	DC
CH 2 AC-GND-DC	GND

h. Check that the display amplitude is less than 0.1 division.

i. Disconnect the test equipment from the instrument.

7. Check Common Mode-Rejection Ratio

a. SET:

VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	DC

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and dual-input coupler to the CH1 OR X and CH 2 OR Y input connectors.

c. Set the generator to produce a 10-MHz, six-division display.

d. SET:

Vertical MODE	BOTH, CH2 INVERT, and ADD

e. CHECK—That the ADD trace is 0.6 division or less.

f. Disconnect the test equipment from the instrument.

HORIZONTAL

Equipment Required (See Table 4-1):

Calibration Generator (Item 1)	Test Oscilloscope (Item 6)
Leveled Sine-Wave Generator (Item 2)	50-Ω Coaxial Cable (Item 8)
Time-Mark Generator (Item 3)	50-Ω BNC Termination (Item 10)

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1, NORM
VOLTS/DIV (both)	0.5 V
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.05 μs
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (_/‾)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	CH 1
COUPLING	AC

PROCEDURE STEPS

1. Check Timing Accuracy and Linearity

a. Connect 50-ns time markers from the time-mark generator via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

b. Adjust the Trigger LEVEL control for a stable, triggered display.

c. Use the Horizontal POSITION controls to align the second time marker with the second vertical graticule line.

d. CHECK—Timing accuracy is within 3% (0.24 division at the tenth vertical graticule line), and linearity is within 5% (0.10 division over any two of the center eight divisions).

NOTE

For checking the timing accuracy of the SEC/DIV switch settings from 50 ms to 0.5 s, watch the time marker tips only at the second and tenth vertical graticule lines while adjusting the COARSE and FINE Horizontal POSITION controls to line up the time markers.

e. Repeat Parts b through d for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the Normal column.

Table 4-3

Settings for Timing Accuracy Checks

SEC/DIV Switch Setting	Time-Mark Generator Setting			
	Normal	X5 Mag	X10 Mag	X50 Mag
0.05 μs	50 ns	10 ns		
0.1 μs	0.1 μs	20 ns	10 ns	
0.2 μs	0.2 μs	0.1 μs	20 ns	10 ns
0.5 μs	0.5 μs	0.1 μs	50 ns	10 ns
1 μs	1 μs	0.2 μs	0.1 μs	20 ns
2 μs	2 μs	1 μs	0.2 μs	0.1 μs
5 μs	5 μs	1 μs	0.5 μs	0.1 μs
10 μs	10 μs	2 μs	1 μs	0.2 μs
20 μs	20 μs	10 μs	2 μs	1 μs
50 μs	50 μs	10 μs	5 μs	1 μs
0.1 ms	0.1 ms	20 μs	10 μs	2 μs
0.2 ms	0.2 ms	0.1 ms	20 μs	10 μs
0.5 ms	0.5 ms	0.1 ms	50 μs	10 μs
1 ms	1 ms	0.2 ms	0.1 ms	20 μs
2 ms	2 ms	1 ms	0.2 ms	0.1 ms
5 ms	5 ms	1 ms	0.5 ms	0.1 ms
10 ms	10 ms	2 ms	1 ms	0.2 ms
20 ms	20 ms	10 ms	2 ms	1 ms
50 ms	50 ms	10 ms	5 ms	1 ms
0.1 s	0.1 s	20 ms	10 ms	2 ms
0.2 s	0.2 s	0.1 s	20 ms	10 ms
0.5 s	0.5 s	0.1 s	50 ms	10 ms

NOTE

In X5 and X50 magnification in all "2" decade switch settings, the associated time marker settings give only five markers per ten divisions instead of the customary ten. When checking these ranges, position the markers on the second and tenth vertical graticule lines.

f. SET:

SEC/DIV	0.05 μs
Horizontal MODE	MAG
Horizontal MAG	X5

g. Select 10 ns time markers from the time-mark generator.

h. Use the Horizontal POSITION controls to align the first time marker that is 50 ns beyond the start of the sweep with the second vertical graticule line.

i. CHECK—Timing accuracy is within 4% (0.32 division at the tenth vertical graticule line), and linearity is within 7% (0.14 division over any two of the center eight divisions). Exclude any portion of the sweep past the 50th magnified division.

j. Repeat Parts h and i for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the "X5 Magnified" column.

k. SET:

SEC/DIV	0.1 μs
Horizontal MAG	X10

l. Select 10-ns time markers from the time-mark generator.

m. Use the Horizontal POSITION controls to align the first time marker that is 50 ns beyond the start of the sweep with the second vertical graticule line.

n. CHECK—Timing accuracy is within 4% (0.32 division at the tenth vertical graticule line), and linearity is within 7% (0.14 division over any two of the center eight divisions). Exclude any portion of the sweep past the 50th magnified division.

o. Repeat Parts m and n for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the "X10 Magnified" column.

p. SET:

SEC/DIV	0.5 μs
Horizontal MAG	X50

q. Select 10 ns time markers from the time-mark generator.

r. Use the Horizontal POSITION controls to align the first time marker that is 100 ns beyond the start of the sweep with the second vertical graticule line.

s. CHECK—Timing accuracy is within 5% (0.40 division at the tenth vertical graticule line), and linearity is within 9% (0.18 division over any two of the center eight divisions). Exclude any portion of the sweep past the 100th magnified division.

t. Repeat Parts r and s for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the X50 Magnified column.

2. Check Sweep Length

a. SET:

SEC/DIV	0.1 ms
Horizontal MODE	X1

b. Select 0.1 ms time markers from the time-mark generator.

c. Position the start of the sweep at the first vertical graticule line using the Horizontal POSITION controls.

d. CHECK—That the sweep length is between 10.2 and 12 divisions.

3. Check COARSE and FINE Horizontal POSITION Range

a. CHECK—That the start of the sweep can be positioned to the right of the center vertical graticule line by rotating the COARSE Horizontal POSITION control fully clockwise.

b. CHECK—That the tenth time marker can be positioned to the left of the center vertical graticule line by rotating the COARSE Horizontal POSITION control fully counterclockwise.

c. CHECK—That the FINE Horizontal POSITION control can move the trace 0.4 division or more.

4. Check SEC/DIV Variable Range

a. Select 0.5-ms time markers from the time-mark generator.

b. Set the SEC/DIV Variable control fully counterclockwise.

c. CHECK—That the spacing between time markers is two divisions or less.

d. Return the SEC/DIV Variable knob to the CAL detent position.

e. Disconnect the test equipment from the instrument.

5. Check X Gain

a. SET:

VOLTS/DIV (both)	10 mV
SEC/DIV	X–Y (fully ccw)

b. Connect a 50-mV, standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

c. CHECK—That the display is between 4.85 and 5.15 divisions.

d. Disconnect the test equipment from the instrument.

6. Check X Bandwidth

a. Set both channels VOLTS/DIV switches to 50 mV.

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce an eight-division horizontal display at an output frequency of 50 kHz.

d. Increase the output frequency until the X-Axis (horizontal) deflection amplitude is 5.7 divisions.

e. CHECK—That the frequency is 2 MHz or greater.

f. Disconnect the test equipment from the instrument.

TRIGGER

Equipment Required (See Table 4-1):

Leveled Sine-Wave Generator (Item 2)
Low-Frequency Sine-Wave Generator (Item 4)
50-Ω BNC Coaxial Cable (Item 8)
Dual-Input Coupler (Item 9)
50-Ω BNC Termination (Item 10)
600-Ω BNC Termination (Item 11)

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1
CH 1 VOLTS/DIV	0.1 V
CH 2 VOLTS/DIV	1 V
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.2 μs
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (_/¯)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	VERT MODE
COUPLING	DC

PROCEDURE STEPS

1. Check Trigger Sensitivity

a. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

b. Set the generator to produce a three-division display at an output frequency of 5 MHz.

c. Set channel 1 VOLTS/DIV switch to 1 V.

d. CHECK—That a stable display can be obtained by adjusting the Trigger LEVEL control for each switch combination given in Table 4-4 in both positive and negative slope. Ensure that the TRIG'D light comes on when triggered.

Table 4-4
Switch Combinations for Triggering Checks

Trigger MODE	Trigger SLOPE
NORM	Positive _/¯
NORM	Negative ¯_
P-P AUTO	Positive _/¯
P-P AUTO	Negative ¯_

e. Move the test-signal cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

f. Repeat Part d.

g. SET:

SEC/DIV	0.05 μs
Horizontal MODE	MAG

h. Set the generator output to produce a 50-MHz, one-division display.

i. Repeat Part d.

j. Move the test-signal cable from the CH 2 OR X input connector to the CH 1 OR Y input connector. Set the VERTICAL MODE switch to CH 1.

k. Repeat Part d.

l. Disconnect the test equipment from the instrument.

m. SET:

CH 1 VOLTS/DIV	20 mV
SEC/DIV	0.2 μs
Horizontal MODE	X1
Trigger MODE	P-P AUTO
Trigger SOURCE	EXT, EXT

n. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X input connector and EXT INPUT OR Z input connectors.

o. Set the generator to produce a four-division (80 mV) horizontal display at an output frequency of 5 MHz.

p. Repeat Part d.

q. SET:

CH 1 VOLT/DIV	50 mV
SEC/DIV	0.05 μs
Horizontal MODE	MAG

u. Set the generator to produce a five-division (250 mV) horizontal display at an output frequency of 50 MHz.

v. Repeat Part d.

w. Disconnect the test equipment from the instrument.

2. Check LF P-P AUTO Trigger

a. SET:

CH 1 VOLTS/DIV	0.1 V
SEC/DIV	20 ms
Horizontal MODE	X1
Trigger MODE	P-P AUTO
Trigger SOURCE	CH 1
Trigger SLOPE	Positive (_/‾)

b. Connect the low-frequency, sine-wave generator output via a 50-Ω cable and a 600-Ω termination to the CH 1 OR X input connector.

c. Set the low-frequency generator output to produce a 20-Hz, one-division display.

d. CHECK—For stable triggering in both positive and negative slopes. Ensure that the TRIG'D light comes on when triggered.

e. Disconnect the test equipment from the instrument.

3. Check External Trigger Range

a. SET:

CH 1 VOLTS/DIV	0.5 V
SEC/DIV	20 μs
Trigger COUPLING	AC
Trigger SLOPE	Positive (_/‾)

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the EXT INPUT OR Z input connectors.

c. Set the leveled sine-wave generator to produce a 50-kHz, five-division display.

d. Position the waveform equally about the center horizontal graticule line.

e. SET:

Trigger MODE	NORM
Trigger SOURCE	EXT, EXT

f. CHECK—That the display is not triggered at either extreme of rotation of the Trigger LEVEL control.

g. Set the Trigger COUPLING switch to DC.

h. CHECK—That the display can be untriggered at either extreme or rotation of the Trigger LEVEL control.

i. Set the Trigger SOURCE switch to EXT/10.

j. CHECK—That the display can be triggered about the midrange of the Trigger LEVEL control.

k. Set the Trigger SLOPE switch to negative (⌐_) and repeat Part j.

l. Disconnect the test equipment from the instrument.

4. Check Single Sweep Operation

a. SET:

CH 1 VOLTS/DIV	10 mV
SEC/DIV	0.5 ms
Trigger SOURCE	CH 1
Trigger COUPLING	AC
Trigger SLOPE	Positive (_⌐)

b. Connect 50-mV, standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

c. Adjust the Trigger LEVEL control to obtain a stable display.

d. SET:

CH 1 AC-GND-DC	GND
Trigger MODE	SGL SWP

e. Press the SGL SWP RESET button. The READY light should light up and remain on.

f. Set the CH 1 AC-GND-DC switch to DC.

NOTE

The INTENSITY control may require adjustment to observe the single-sweep trace.

g. CHECK-READY light goes out and a single sweep occurs.

h. Press the SGL SWP RESET button several times.

i. CHECK—A single-sweep trace occurs, and the READY light comes on briefly every time the SGL SWP RESET button is pressed.

j. Disconnect the test equipment from the instrument.

EXTERNAL Z-AXIS AND PROBE ADJUST

Equipment Required (See Table 4-1):

Leveled Sine-Wave Generator (Item 2)	50-Ω BNC Termination (Item10)
Two 50-Ω BNC Coaxial Cable (Item 8)	10X Probe (provided with instrument)
Dual-Input Coupler (Item 9)	Low-Reactance Alignment Tool (Item 15)

INITIAL CONTROL SETTINGS

Vertical

CH 1 POSITION	Midrange
MODE	CH 1, NORM
CH 1 VOLTS/DIV	1 V
CH 1 VOLTS/DIV Variable	CAL detent
Magnification	X1 (CH 1 CAL knob in)
Channel 1 AC-GND-DC	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
Horizontal MODE	X1
SEC/DIV	20 μs
SEC/DIV Variable	CAL detent

Trigger

SLOPE	Positive (_/‾)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	EXT, EXT=Z
COUPLING	DC

PROCEDURE STEPS

1. Check External Z-Axis Operation

a. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the EXT INPUT OR Z connectors.

b. Set the generator to produce a 5-V, 50-kHz signal.

NOTE

The INTENSITY level may need adjustment to view the intensity modulation on the displayed waveform.

c. CHECK—For noticeable intensity modulation. The positive part of the sine wave should be of lower intensity than the negative part.

d. Disconnect the test equipment from the instrument.

2. Check Probe Adjust Operation

a. SET:

CH 1 VOLTS/DIV	10 mV
SEC/DIV	0.5 ms
Trigger SOURCE	CH 1

b. Connect the 10X Probe to the CH 1 OR X input connector and clip the probe tip to the PROBE connector on the instrument front panel. If necessary, adjust the probe compensation for a flat-topped square-wave display.

c. CHECK–Display amplitude is 4.75 to 5.25 divisions.

d. Disconnect the probe from the instrument.

ADJUSTMENT PROCEDURE

INTRODUCTION

PURPOSE

The Adjustment Procedure is used to return the instrument to conformance with the Performance Requirement statements listed in Table 1-1. Adjustments contained in this procedure should only be performed after checks from the Performance Check Procedure (Section 4) have indicated a need for readjustment or after repairs have been made to the instrument.

STRUCTURE

This procedure is structured into subsections, each of which can be performed independently to permit adjustment of individual sections of the instrument. For example, if only the Vertical section fails to meet the Performance Requirements or has been repaired, it can be readjusted with little or no effect on other sections of the instrument.

The Power Supply section, however, affects all other sections of the instrument. Therefore, if repairs or readjustments have been made that change the absolute value of any of the supply voltages, the entire Adjustment Procedure should be performed.

At the beginning of each subsection is a list of all the front-panel control settings required to prepare the instrument for performing Step 1 in that subsection. Each succeeding step within a subsection should be performed in sequence and in its entirety to ensure that control settings will be correct for ensuing steps. All steps within a subsection should be completed.

TEST EQUIPMENT REQUIRED

Table 4-1 is a complete list of the test equipment required to accomplish both the Performance Check Procedure in Section 4 and the Adjustment Procedure in this section. To assure accurate measurements, it is important that test equipment used for making these checks meet or exceed the specifications described in Table 4-1. When considering use of equipment other than that recommended, utilize the Minimum Specification column to determine whether available test equipment will suffice.

Detailed operating instructions for test equipment are not given in this procedure. If more operating information is required, refer to the appropriate test equipment instruction manual.

LIMITS AND TOLERANCES

The limits and tolerances stated in this procedure are instrument specifications only if they are listed in the Performance Requirements column of Table 1-1. Tolerances given are applicable only to the instrument undergoing adjustment and do not include test equipment error. Adjustment of the instrument must be accomplished at an ambient temperature between +20°C and +30°C, and the instrument must have had a warm-up period of at least 20 minutes.

ADJUSTMENTS AFFECTED BY REPAIRS

Repairs to a circuit may affect one or more adjustment settings of the instrument. Table 5-1 identifies the adjustment(s) affected due to repairs or replacement of components on a circuit board. Refer to Table 5-1 if a partial procedure is performed or if a circuit requires readjustment due to repairs to a circuit. To use this table, first find, in the leftmost column, the circuit that was repaired. Then move to the right, across that row, until you come to a darkened square, move up the column and check the accuracy of the adjustment found at the heading of that column. Readjust if necessary.

PREPARATION FOR ADJUSTMENT

The instrument cabinet must be removed to perform the Adjustment Procedure. See the Cabinet remove and replace instructions located in the Maintenance section of the manual.

All test equipment items listed in Table 4-1 in the Performance Check section are required to accomplish a complete Adjustment Procedure. At the beginning of each subsection there is an equipment-required list showing only the test equipment necessary for performing the steps in that subsection. In this list, the item number following each piece of equipment corresponds to the item number listed in Table 4-1.

Before performing this procedure, do not preset any internal adjustments and do not change the -8.6 V power-supply adjustment. Altering this adjustment may necessitate a complete readjustment of the instrument, whereas only a partial adjustment might otherwise be required. Only change an internal adjustment setting if a Performance Characteristic cannot be met with the original setting.

Before performing any procedure in this section, set the POWER switch to ON and allow a 20-minute warm-up period.

The most accurate display adjustments are made with a stable, well-focused, low-intensity display. Unless otherwise noted, adjust the INTENSITY, FOCUS, and Trigger LEVEL controls as needed to view the display.

Table 5-1

Adjustments Affected by Repairs

REPAIRS MADE	INTERNAL ADJUSTMENTS AFFECTED																	
	-8.6 V ADJ	GRID BIAS, ASTIG, & GEOM	STEP ATTN BAL	VAR BAL & INVERT BAL	CH 1 & CH 2 GAIN	X1/X10 BALANCE	ATTENUATOR COMP	HF COMP	1 ms TIMING	MAGNIFIER GAIN	MAGNIFIER REGISTRATION	10 μs, 5 μs TIMING	HIGH SPEED TIMING	X-Y GAIN AND OFFSET	TRIGGER BALANCE OFFSET	TRIGGER HYSTERESIS	SLOPE BALANCE - P-P OFFSET	TRIGGER SENSITIVITY
POWER SUPPLIES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VERTICAL ATTENUATORS			X	X	X	X	X	X							X	X	X	X
PREAMPS & CHANNEL SW				X	X	X	X	X							X	X	X	X
VERTICAL OUTPUT				X	X	X	X	X							X	X	X	X
TRIGGER CIRCUIT															X	X	X	X
SWEEP GENERATOR									X	X	X	X	X	X				
HORIZONTAL AMPLIFIER									X	X	X	X	X	X				
CRT		X			X				X			X		X				

INDEX TO ADJUSTMENT PROCEDURE STEPS

POWER SUPPLY AND CRT DISPLAY

Equipment Required (See Table 4-1):

Leveled Sine-Wave Generator (Item 2)	Digital Voltmeter (Item 7)
Time-Mark Generator (Item 3)	50-Ω BNC Coaxial Cable (Item 8)
Screwdriver (Item 5)	50-Ω BNC Termination (Item 10)

See **ADJUSTMENT LOCATIONS** *at the back of this manual for adjustment locations.*

INITIAL CONTROL SETTINGS

INTENSITY	Visible display

Vertical

POSITION (both)	Midrange
MODE	CH 1, NORM
VOLTS/DIV (both)	10 mV
VOLTS/DIV Variable (both)	Cal detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	GND

Horizontal

POSITION (COURSE and FINE)	Midrange
MODE	X1
SEC/DIV	X-Y (fully ccw)
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (_/‾)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	EXT, EXT
COUPLING	AC

PROCEDURE STEPS

1. Check/Adjust Power Supply DC Levels (R933)

NOTE

Review the information at the beginning of the Adjustment Procedure before starting this step.

a. Connect the digital voltmeter low lead to chassis ground and connect the volts lead to the -8.6 V supply (W989).

b. CHECK—Voltmeter reading is -8.56 to -8.64 V. If the reading is within these limits, skip to part d.

c. ADJUST—The -8.6 V Adj potentiometer (R933) for a voltmeter reading of -8.60 V.

d. CHECK—Voltage levels of the remaining power supplies listed in Table 5-2 are within the specified limits.

e. Disconnect the test equipment from the instrument.

Table 5-2

Power Supply Limits

Power Supply	Test Point	Reading (Volts)
-8.6 V	W989	-8.56 to -8.64
+5.1 V	W991	+4.95 to +5.25
+8.7 V	W987	+8.53 to +8.87
+38 V	W972	+36.8 to +39.1
+99 V	W984	+96.0 to +101.0

2. Adjust CRT Grid Bias (R851)

a. Adjust the front-panel FOCUS control to produce a well-defined dot.

b. Rotate the INTENSITY control fully counterclockwise.

c. ADJUST—Grid Bias (R851) for a visible dot, then back off the Grid Bias potentiometer until the dot just disappears.

3. Adjust Astigmatism (R874)

a. SET:

Vertical MODE	CH 1
CH 1 AC-GND-DC	DC
SEC/DIV	5 μs
Trigger SOURCE	CH 1

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 50-kHz, four-division display.

d. ADJUST—Astig (R874) and the front-panel FOCUS control for the best defined waveform.

e. Disconnect the test equipment from the instrument.

4. Adjust Trace Alignment

a. Position the trace to the center horizontal graticule line.

b. ADJUST—The front-panel TRACE ROTATION control for optimum alignment of the trace with the center horizontal graticule line.

5. Adjust Geometry (R870)

a. SET:

CH 1 VOLTS/DIV	50 mV
SEC/DIV	0.1 ms

b. Connect 50-μs time markers from the time-mark generator via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Position the baseline part of the display below the bottom horizontal graticule line using the CH 1 POSITION control.

d. Adjust the SEC/DIV Variable control for five markers per division.

e. ADJUST—Geom (R870) for minimum curvature of the time markers at the left and right edges of the graticule.

f. Set CH 1 AC-GND-DC switch to GND.

g. ADJUST—Geom (R870) for minimum curvature of the baseline trace when positioned at the top and bottom horizontal graticule lines using the CH 1 POSITION control.

h. Set the CH 1 AC-GND-DC switch to DC.

i. Repeat Parts e through h for optimum compromise between the vertical and horizontal displays.

j. Disconnect the test equipment from the instrument.

VERTICAL

Equipment Required (See Table 4-1):

Calibration Generator (Item 1)	50-Ω BNC Termination (Item10)
Leveled Sine-Wave Generator (Item 2)	10X Attenuator (Item 12)
Screwdriver (Item 5)	BNC Male-to-Miniature-Probe Tip (Item 13)
50-Ω BNC Coaxial Cable (Item 8)	Low-Reactance Alignment Tool (Item 15)
Dual-Input Coupler (Item 9)	10X Probe (Provided with instrument)

See **ADJUSTMENT LOCATIONS** *at the back of this manual for adjustment locations.*

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1, NORM
VOLTS/DIV (both)	5 mV
VOLTS/DIV Variable(both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	GND

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.5 ms
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (_/‾)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	EXT, EXT
COUPLING	AC

PROCEDURE STEPS

1. Adjust Channel 1 Variable Balance (R33)

a. Rotate the CH 1 VOLTS/DIV Variable control fully counterclockwise.

b. Position the trace on the center horizontal graticule line using the CH 1 POSITION control.

c. Rotate the CH 1 VOLTS/DIV Variable control clockwise to the CAL detent.

d. ADJUST—Var Bal (R33) to set the trace to the center horizontal graticule line.

e. Repeat Parts a through d until there is no trace shift between the fully clockwise and the fully counterclockwise positions of the CH 1 VOLTS/DIV Variable control.

f. Return the CH 1 VOLTS/DIV Variable control to the CAL detent.

2. Adjust Channel 2 Variable Balance (R84) (SN 202908 and above)

a. Set Vertical Mode to Ch 2.

b. Rotate the CH 2 VOLTS/DIV Variable control fully counterclockwise.

c. Position the trace on the center horizontal graticule line using the CH 2 POSITION control.

d. Rotate the CH 2 VOLTS/DIV Variable control clockwise to the CAL detent.

e. ADJUST—Var Bal (R84), on the front-panel board to set the trace to the center horizontal graticule line.

f. Repeat Parts b through e until there is no trace shift between the fully clockwise and the fully counterclockwise positions of the CH 2 VOLTS/DIV Variable control.

g. Return the CH 2 VOLTS/DIV Variable control to the CAL detent.

3. Adjust Channel 2 Invert Balance (R83)

a. Position the trace on the center horizontal graticule line using the Channel 2 POSITION control.

b. Set Vertical MODE switch to CH 2 INVERT.

c. ADJUST—Invert Bal (R83) to set the trace to the center horizontal graticule line.

d. Set Vertical MODE switch to NORM.

e. Repeat Parts a through d until there is no trace shift when switching from NORM to CH 2 INVERT.

4. Adjust Vertical Gain (R145, R195, R112, and R162)

a. SET:

Vertical MODE	CH 1, NORM
AC-GND-DC (both)	DC
Trigger SOURCE	VERT MODE
Trigger COUPLING	DC

b. Connect a 20-mV, standard-amplitude signal from the calibration generator via a 50-Ω BNC cable to the CH 1 OR X input connector.

c. Center the display within the graticule using the CH 1 POSITION control.

d. ADJUST—CH 1 Gain (R145) for an exact four-division display.

e. Move the test-signal cable from the CH 1 OR X input connector to the CH 2 OR Y input connector.

f. Set the Vertical MODE switch to CH 2.

g. Center the display within the graticule using the CH 2 POSITION control.

h. ADJUST—CH 2 Gain (R195) for an exact four-division display.

i. Repeat Parts b through h until the gain of the two channels is identical. (You must switch the Vertical MODE between CH 1 and CH 2 as needed to view the display.)

j. Change the generator output to 2 mV, and set the CH 1 and CH 2 vertical magnification to X10 (pull CAL knobs out).

k. ADJUST—CH 2 X10 Gain (R162) for an exact four-division display.

l. Move the test-signal cable from the CH 2 OR Y input connector to the CH 1 OR X input connector.

m. Set the Vertical MODE switch to CH 1.

n. ADJUST—CH 1 X10 Gain (R112) for an exact four-division display.

5. Check Deflection Accuracy and VOLTS/DIV Variable Range

a. SET:

VOLTS/DIV Variable (both)	CAL detent
Vertical Magnification (both)	X1 (CAL knobs in)

b. CHECK—Deflection accuracy is within the limits given in Table 5-3 for each CH 1 VOLTS/DIV switch setting and corresponding standard-amplitude signal. When at the 20-mV VOLTS/DIV switch setting, rotate the CH 1 VOLTS/DIV Variable control fully counterclockwise and CHECK that the display decreases to two divisions or less. Then return the CH 1 VOLTS/DIV Variable control to the CAL detent and continue with the 50-mV check.

c. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

d. Repeat Part b using the Channel 2 controls.

Table 5-3
Deflection Accuracy Limits

VOLTS/DIV Switch Setting	STANDARD Amplitude Signal	ACCURACY Limits (Divisions)
5 mV	20 mV	3.88 to 4.12
10 mV	50 mV	4.85 to 5.15
20 mV	0.1 V	4.85 to 5.15
50 mV	0.2 V	3.88 to 4.12
0.1 V	0.5 V	4.85 to 5.15
0.2 V	1 V	4.85 to 5.15
0.5 V	2 V	3.88 to 4.12
1 V	5 V	4.85 to 5.15
2 V	10 V	4.85 to 5.15
5 V	20 V	3.88 to 4.12

6. Check Input Coupling

a. Set the AC-GND-DC switches (both channels) to GND.

b. Position the trace on the center horizontal graticule line using the CH 2 POSITION control.

c. Change the generator output to 50 mV.

d. Set the CH 2 AC-GND-DC switch to AC.

e. CHECK—That the display is centered about the center horizontal graticule line.

f. Set the CH 2 AC-GND-DC switch to DC.

g. CHECK—That the display is ground referenced on the center horizontal graticule line.

h. Move the test-signal cable from the CH 2 OR Y input connector to the CH 1 OR X input connector.

i. Set the Vertical MODE switch to CH 1.

j. Repeat Parts b through g using the Channel 1 controls.

7. Check Position Range

a. SET:

VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	AC
SEC/DIV	0.2 ms Trigger
Trigger COUPLING	AC

b. Set the calibration generator for 0.1 V.

c. Adjust the CH 1 VOLTS/DIV Variable control to produce a 5.25-division display.

d. Set the CH 1 VOLTS/DIV to 5 mV.

e. Set the calibration generator to produce a 0.2 V signal.

f. CHECK—The bottom and top of the trace may be positioned above and below the center horizontal graticule line by rotating the CH 1 POSITION control fully clockwise and counterclockwise respectively.

g. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector.

h. Set the Vertical MODE switch to CH 2.

i. Repeat Parts b through f using the Channel 2 controls.

j. Disconnect the test equipment from the instrument.

8. Adjust X1/X10 Balance

a. SET:

Vertical MODE	CH 1
AC-GND-DC (both)	GND
VOLTS/DIV Variable (both)	CAL detent

b. Position the trace on the center horizontal graticule line using the CH 1 POSITION control.

c. Set CH 1 VOLTS/DIV Variable knob to X10 (pull CAL knob out).

d. ADJUST—X10 BAL (R107) to position the trace on the center horizontal graticule line.

e. Set CH 1 VOLTS/DIV Variable knob to X1 (push CAL knob in).

f. Repeat Parts b through e until there is no trace shift between X1 and X10 positions.

g. Set Vertical MODE to CH 2.

h. Repeat Parts b through f for CH 2, using the Channel 2 X10 BAL adjust (R157) instead of R107 in Part d.

i. Return both VOLTS/DIV Variable controls to their CAL and X1 positions.

9. Adjust Attenuator Compensation

a. SET:

VOLTS/DIV (both)	5 mV
Vertical Magnification (both)	X1 (CAL knobs in
AC–GND–DC (both)	DC

b. Connect the high-amplitude, square-wave output from the calibration generator via a 50-Ω BNC termination, a probe-tip-to-BNC adapter, and the 10X probe to the CH 2 OR Y input connector.

c. Set the generator to produce a 1-kHz, five-division display and compensate the probe using the probe compensation adjustment (see the probe instruction manual).

d. Set the CH 2 VOLTS/DIV switch to 10 mV.

e. Replace the probe and probe-tip-to-BNC adapter with a 50-Ω BNC coaxial cable and 50-Ω BNC termination.

f. Set the generator to produce a five-division display.

g. ADJUST—Trimmer 1 for flattest response on the square wave signal. See figure 5-1 for location of the trimmers.

h. Replace the 50-Ω BNC coaxial cable and 50-Ω BNC termination with the probe and probe-tip-to-BNC adapter.

i. Set the generator to produce a five-division square wave.

j. ADJUST—Trimmer 1N for flattest response on square wave.

k. Set the CH 2 VOLTS/DIV switch to 20 mV.

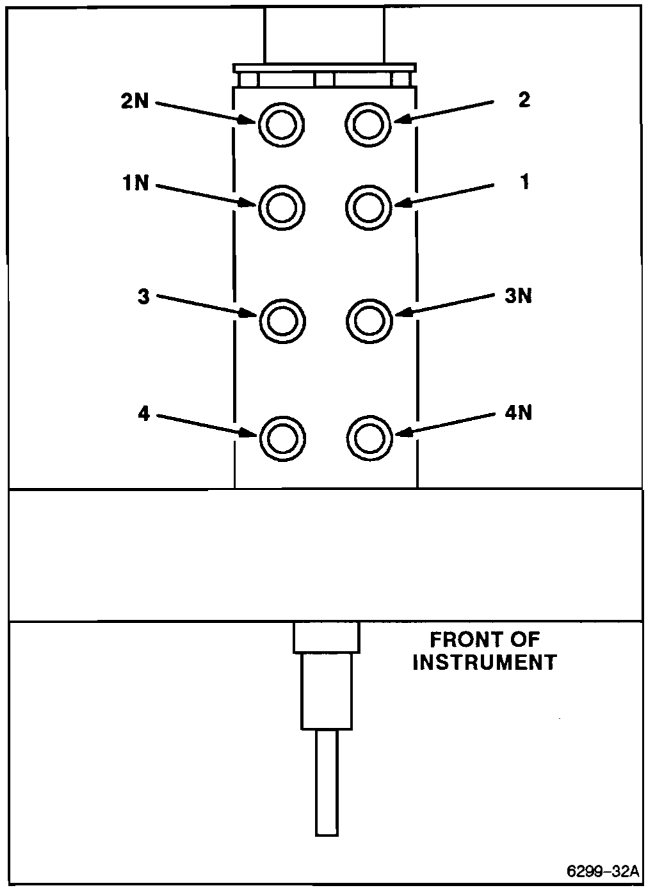


Figure 5-1. Attenuator trimmer adjustments.

l. Repeat Parts e through j except adjust the "2" and "2N" trimmers in Parts g and j respectively.

m. Set the CH 2 VOLTS/DIV switch to 50 mV.

n. Repeat Parts e through j except adjust the "3" and "3N" trimmers in Parts g and j respectively.

o. Set the CH 2 VOLTS/DIV switch to .5 V.

p. Repeat Parts e through j except adjust the "4" and "4N" trimmers in Parts g and j respectively.

q. Set the Vertical MODE switch to CH 1.

r. Repeat Parts b through p for the Channel 1 Attenuators.

s. Disconnect the test equipment from the instrument.

10. Check Vertical ALT Operation

a. SET:

AC-GND-DC (both)	GND
Vertical MODE	BOTH, NORM, and ALT
SEC/DIV	0.1 s
Trigger SOURCE	CH 1

b. Position the Channel 1 and Channel 2 traces about two divisions apart using the CH 1 and CH 2 POSITION controls.

c. CHECK—Channel 1 and Channel 2 traces move across the screen alternately.

11. Check CHOP Operation

NOTE

Chop Switch Balance adjust only applies to the following range of instruments: Serial Numbers 100000 - 100809 and 202908 - 209929 .

a. SET:

Vertical MODE	BOTH, NORM, and CHOP
SEC/DIV	1 μs
Trigger MODE	NORM
Trigger SOURCE	VERT MODE

b. ADJUST—Chop Switch Balance (R140) for no triggering on chop segments when rotating the Trigger LEVEL control.

12. Check TRACE SEP Range

a. SET:

VOLTS/DIV (both)	5 mV
Vertical MODE	CH 1
SEC/DIV	10 μs
Horizontal MODE	ALT
Trigger MODE	P-P AUTO
Trigger SOURCE	EXT, EXT
TRACE SEP	Fully ccw

b. Position the trace on the center horizontal graticule line using the CH 1 POSITION control.

c. CHECK—That the MAG trace can be positioned three divisions or more ABOVE the unmagnified trace using the TRACE SEP control. SN 202908 and above-check for positioning three divisions above and below the unmagnified trace.

13. Check ADD MODE Operation

a. SET:

VOLTS/DIV (both)	20 mV
AC-GND-DC (both)	DC
Vertical MODE	BOTH, NORM, and ALT
SEC/DIV	0.5 ms
Horizontal MODE	X1
Trigger SOURCE	CH 1

b. Position both traces on the center horizontal graticule line using the CH 1 and CH 2 POSITION controls.

c. Set the calibration generator to produce a 50-mV signal.

d. Connect the output of the calibration generator to both the CH 1 OR X input and the CH 2 OR Y input with dual-input coupler.

e. Check that both channels show a 2.5-division display.

f. SET:

Vertical MODE	ADD
AC-GND-DC (both)	DC

g. CHECK—That the resultant display is five divisions ±3% (4.85 to 5.15 divisions).

h. Disconnect the test equipment from the instrument.

14. Adjust High-Frequency Compensation

a. SET:

VOLTS/DIV (both)	10 mV Vertical
MODE	CH 1
SEC/DIV	0.2 μs

b. Connect the positive-going, fast-rise, square-wave output from the calibration generator via a 50-Ω BNC coaxial cable, a 10X BNC attenuator, and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 1-MHz, five-division display.

d. Set the top of the display to the center horizontal graticule line using the CH 1 POSITION control.

e. ADJUST—Compensation (R241, R240, C256, C237 and C257) for flattest response. Repeat adjustments until no further improvements are noted.

NOTE

Check your instrument to see if C180 on the A1 circuit board is adjustable. If it is, perform Parts f, g, and h. If it is not, proceed with part i.

f. Move the test signal to CH 2 and set the Vertical MODE to CH 2.

g. ADJUST—CH 2 compensation capacitor C180 to match the CH 2, 10 mV compensation to the CH 1 10 mV compensation.

h. Move the test signal cable back to CH 1 and set the Vertical MODE to CH 1.

i. Set the CH 1 VOLTS/DIV switch to 5 mV.

j. Set the generator for a five-division signal.

k. Check for aberrations of ±6% (0.3 division) or less.

l. Set the CH 1 VOLTS/DIV switch to 10 mV.

m. Set the generator for a five-division signal.

n. Check for aberrations of ±4% (0.2 division) or less.

o. Repeat Part n for each CH 1 VOLTS/DIV switch settings from 20 mV through 0.2 V. Adjust the generator output and add or remove the 10X attenuator as necessary to maintain a five-division display at each VOLTS/DIV switch setting.

NOTE

Some generators do not produce enough signal amplitude to do parts p through t.

p. Set the CH 1 VOLTS/DIV switch to 0.5 V.

q. Check for aberrations of ±6% (0.3 division) or less.

r. Set the CH 1 VOLTS/DIV switch to 1 V.

s. Check for aberrations of ±12% (0.6 division) or less.

t. Repeat Part s for the 2 V and 5 V CH 1 VOLTS/DIV switch settings. Adjust the generator output and add or remove the 10X attenuator as necessary to maintain a five-division display at each VOLTS/DIV switch setting.

u. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

v. Repeat Parts f through t for Channel 2.

w. Disconnect the test equipment from the instrument.

15. Check Bandwidth

a. SET:

VOLTS/DIV (both)	5 mV
Vertical MODE	CH 1
SEC/DIV	10 µs
Trigger SOURCE	VERT MODE

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 50-kHz, six-division display.

d. Increase the sine-wave frequency until a 4.2-division display is obtained.

e. CHECK—the frequency is greater than 50 MHz.

f. Repeat Parts c through e for all ranges from 10 mV to .2 V.

g. SET:

CH 1 VOLTS/DIV	5 mV
CH 1 VOLTS/DIV Variable	X10 (CAL knob out)

h. Set the generator to produce a 50-kHz, six-division display.

i. Increase the signal frequency until a 4.2-division display is obtained.

j. CHECK—The frequency is greater than 5 MHz.

k. Repeat Parts h through j for all ranges from 10 mV to 0.2 V.

l. Set the CH 1 VOLTS/DIV Variable to X1 (push CAL knob in).

m. Set Vertical MODE to CH 2.

n. Repeat Parts b through l for Channel 2.

16. Check Channel Isolation

a. SET:

CH 1 VOLTS/DIV	1 V
CH 2 VOLTS/DIV	0.5 V
AC-GND-DC (CH 1)	DC
AC-GND-DC (CH 2)	GND
Vertical MODE	CH 1
SEC/DIV	0.05 μs

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set CH 1 VOLTS/DIV switch to 0.5 V for a 10-division display.

d. Set the generator to produce a 10-MHz, 5 V peak-to-peak output.

e. Set Vertical MODE to CH 2 and ALT.

f. CHECK—That the CH 1 trace amplitude is less than 0.1 division.

g. Move the test-signal cable from the CH 1 OR X input connector to the CH 2 OR Y input connector.

h. SET:

Vertical MODE	CH 1
CH 1 AC-GND-DC	GND
CH 2 AC-GND-DC	DC

i. CHECK—That the display amplitude is less than 0.1 division.

j. Disconnect the test equipment from the instrument.

17. Check Common-Mode Rejection Ratio

a. SET:

VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	DC
Vertical MODE	BOTH, NORM, and ALT

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and CH 2 OR Y input connectors.

c. Set the generator to produce a 10-MHz, six-division display.

d. Set Vertical MODE to INV and ADD.

e. CHECK—That the ADD display is less than 0.6 division.

f. Disconnect the test equipment from the instrument.

HORIZONTAL

Equipment Required (See Table 4-1):

Calibration Generator (Item 1)	Test Oscilloscope (Item 6)
Leveled Sine-Wave Generator (Item 2)	50-Ω BNC Termination (Item 10)
Time-Mark Generator (Item3)	Low-Reactance Alignment tool (Item 15)
Screwdriver (Item 5)	50-Ω Coaxial Cable (Item 8)

See **ADJUSTMENT LOCATIONS** *at the back of this manual for adjustment locations.*

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1
VOLTS/DIV (both)	0.5 V
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	DC

Horizontal

POSITION	Midrange
MODE	X1
SEC/DIV	1 ms
SEC/DIV Variable	CAL detent

Trigger

SLOPE	Positive (_/‾)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	CH 1
COUPLING	AC

PROCEDURE STEPS

1. Adjust 1-ms Timing (R775)

a. Connect 1-ms time markers from the time-mark generator via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

b. Align the first time marker with the first (extreme left) vertical graticule line using the Horizontal POSITION control.

NOTE

When making timing measurements, use the tips of the time markers positioned at the center horizontal graticule line as the measurement reference points.

c. ADJUST—X1 Gain (R775) for one marker per division over the center eight divisions.

2. Adjust Magnifier Gain (R731, R777)

a. SET:

Horizontal MODE	MAG
Horizontal MAG	X5

b. Align the first time marker with the first (extreme left) vertical graticule line using the Horizontal POSITION control.

c. ADJUST—X5 Mag Gain (R731) for five divisions between magnified markers.

d. Set Horizontal MAG to X10.

e. ADJUST—X10 Mag Gain (R777) for 10 divisions between magnified markers.

3. Adjust Magnifier Registration (R782, R730)

a. Set the Horizontal MAG to X50.

b. Select 1 ms time-markers from the time-mark generator.

c. Position the first time marker to the center vertical graticule line using the Horizontal POSITION controls.

d. Set the Horizontal MAG to X10.

e. ADJUST—X50 Mag Reg (R730) to bring the first time marker to the center vertical graticule line.

f. Set the Horizontal MAG to X1.

g. ADJUST—X10 Mag Reg (R782) to overlay the first time marker to the center vertical graticule line.

4. Check Sweep Length

a. SET:

SEC/DIV	0.1 ms
Horizontal MODE	X1

b. Select .1-ms time markers from the time-mark generator.

c. Position the start of the sweep at the first vertical graticule line using the Horizontal POSITION control.

d. CHECK—That the sweep length is between 10.2 and 12 divisions.

5. Check Position Range

a. CHECK—That the start of the sweep can be positioned to the right of the center vertical graticule line by rotating the COARSE Horizontal POSITION control fully clockwise.

b. CHECK—That the tenth time marker can be positioned to the left of the center vertical graticule line by rotating the COARSE Horizontal POSITION control fully counterclockwise.

c. CHECK—That the FINE Horizontal POSITION control can move the trace more than 0.4 divisions.

6. Check Variable Range

a. Select 0.5-ms time markers from the time-mark generator.

b. Set the SEC/DIV Variable control knob fully counterclockwise

c. CHECK—That the spacing between time markers is two divisions or less.

d. Return the SEC/DIV Variable knob to the CAL detent.

7. Adjust 10-μs and 5-μs timing (R722, C703)

a. Set the SEC/DIV switch to 10 μs.

b. Select 10-μs time markers from the time-mark generator.

c. ADJUST—10-μs Timing (R722) for one marker per division.

d. Set the SEC/DIV switch to 5 μs.

e. Select 5-μs time markers from the time-mark generator.

f. ADJUST—5-μs Timing (C703) for one marker per division.

8. Adjust High-Speed Timing (C784, C794)

a. SET:

CH 1 VOLTS/DIV	0.1 V
CH 1 AC-GND-DC	AC
SEC/DIV	0.05 μs
Horizontal MODE	MAG
Horizontal MAG	X10
Trigger SOURCE	EXT, EXT

b. Select 10-ns time markers from the time-mark generator.

c. Connect the time-mark generator trigger output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the EXT INPUT OR Z input connector.

d. Adjust the Trigger LEVEL control so that the markers are stably triggered.

e. ADJUST—5-ns Linearity (C784) and 5-ns Timing (C794) for two divisions between each marker.

9. Check Timing Accuracy and Linearity

a. SET:

CH VOLTS/DIV	0.5 V
SEC/DIV	0.05 μs
Horizontal MODE	X1

b. Select 50-ns time markers from the time-mark generator.

c. Adjust the Trigger LEVEL control for a stable, triggered display.

d. Use the Horizontal POSITION control to align the second time marker with the second vertical graticule line.

e. CHECK—Timing accuracy is within 3% (0.24 division at the tenth vertical graticule line), and linearity is within 5% (0.10 division over any two of the center eight divisions).

NOTE

When checking the timing accuracy for SEC/DIV switch settings from 50 ms to 0.5 s, watch the time marker tips only at the second and tenth vertical graticule lines while adjusting the Horizontal POSITION control.

f. Repeat Parts c through e for the remaining SEC/DIV and time-mark-generator setting combinations shown in Table 5-4 under the Normal column.

Table 5-4

Settings for Timing Accuracy Checks

SEC/DIV Switch Setting	Time-Mark Generator Setting			
	Normal	X5 Mag	X10 Mag	X50 Mag
0.05 μs	50 ns	10 ns		
0.1 μs	0.1 μs	20 ns	10 ns	
0.2 μs	0.2 μs	0.1 μs	20 ns	10 ns
0.5 μs	0.5 μs	0.1 μs	50 ns	10 ns
1 μs	1 μs	0.2 μs	0.1 μs	20 ns
2 μs	2 μs	1 μs	0.2 μs	0.1 μs
5 μs	5 μs	1 μs	0.5 μs	0.1 μs
10 μs	10 μs	2 μs	1 μs	0.2 μs
20 μs	20 μs	10 μs	2 μs	1 μs
50 μs	50 μs	10 μs	5 μs	1 μs
0.1 ms	0.1 ms	20 μs	10 μs	2 μs
0.2 ms	0.2 ms	0.1 ms	20 μs	10 μs
0.5 ms	0.5 ms	0.1 ms	50 μs	10 μs
1 ms	1 ms	0.2 ms	0.1 ms	20 μs
2 ms	2 ms	1 ms	0.2 ms	0.1 ms
5 ms	5 ms	1 ms	0.5 ms	0.1 ms
10 ms	10 ms	2 ms	1 ms	0.2 ms
20 ms	20 ms	10 ms	2 ms	1 ms
50 ms	50 ms	10 ms	5 ms	1 ms
0.1 s	0.1 s	20 ms	10 ms	2 ms
0.2 s	0.2 s	0.1 s	20 ms	10 ms
0.5 s	0.5 s	0.1 s	50 ms	10 ms

NOTE

In X5 and X50 magnification in all "2" decade switch settings, the associated time marker settings give only five markers per 10 divisions instead of the customary 10. When checking these ranges, position the markers on the second and tenth vertical graticule lines.

g. Disconnect the test signal from the EXT INPUT OR Z connector.

h. SET:

SEC/DIV	0.05 μs
Horizontal MODE	MAG
Horizontal MAG	X5
Trigger Source	CH 1

i. Select 10-ns time markers from the time-mark generator. Adjust the Trigger LEVEL control to obtain a stable display.

j. Use the Horizontal POSITION control to align the first time marker that is 50 ns beyond the start of the sweep with the second vertical graticule line.

k. CHECK—Timing accuracy is within 4% (0.32 division at the tenth vertical graticule line), and linearity is within 7% (0.14 division over any two of the center eight divisions). Exclude any portion of the sweep past the 50th magnified division.

l. Repeat Parts j and k for the remaining SEC/DIV and time-mark-generator setting combinations shown in Table 5-4 under the X5 Magnified column.

m. SET:

SEC/DIV	0.1 μs
Horizontal MAG	X10

n. Select 10-ns time markers from the time-mark generator.

o. Use the Horizontal POSITION control to align the first time marker that is 50 ns beyond the start of the sweep with the second vertical graticule line.

p. CHECK—Timing accuracy is within 4% (0.32 division at the tenth vertical graticule line), and linearity is within 7% (0.14 division over any two of the center eight divisions). Exclude any portion of the sweep past the 50th magnified division.

q. Repeat Parts o and p for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 5-4 under the X10 Magnified column.

r. SET:

SEC/DIV	0.5 μs
Horizontal MAG	X50

s. Select 10-ns time markers from the time-mark generator.

t. Use the Horizontal POSITION control to align the first time marker that is 100 ns beyond the start of the sweep with the second vertical graticule line.

u. CHECK—Timing accuracy is within 5% (0.40 division at the tenth vertical graticule line), and linearity is within 9% (0.18 division over any two of the center eight divisions). Exclude any portion of the sweep past the 100th magnified division.

v. Repeat Parts t and u for the remaining SEC/DIV and time-mark-generator setting combinations shown in Table 5-4 under the X50 Magnified column.

w. Disconnect the test equipment from the instrument.

10. Adjust X-Y Gain and Offset (R395, R736)

a. SET:

VOLTS/DIV (both)	10 mV
SEC/DIV	X-Y (fully ccw)
Horizontal MODE	X1

b. Connect a 50-mV, standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

c. ADJUST—X Gain (R395) for exactly a five-division display.

d. Center the display within the graticule using the CH 1 POSITION control.

e. SET:

CH 1 AC-GND-DC	GND
SEC/DIV	1 ms

f. Align the start of the trace with the first (extreme left) vertical graticule line using the Horizontal POSITION control.

g. Set the SEC/DIV switch to X-Y (fully counterclockwise).

h. ADJUST—X Centering (R736) to position the spot at the center vertical graticule line.

i. Disconnect the test equipment from the instrument.

11. Check X Bandwidth

a. SET:

VOLTS/DIV (both)	50 mV
AC-GND-DC (both)	DC
Vertical MODE	BOTH, NORM, and ALT
Trigger SOURCE	CH 1

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce an eight-division horizontal display at an output frequency of 50 kHz.

d. Increase the signal frequency until the horizontal deflection (X-axis) is equal to 5.7 divisions in length.

e. CHECK—That the frequency is greater than 2 MHz.

f. Disconnect the test equipment from the instrument.

12. Check Sweep Holdoff

a. SET:

VOLTS/DIV (both)	1 V
AC-GND-DC (both)	GND
Vertical MODE	CH 1
SEC/DIV	1 ms
Trigger SOURCE	EXT, EXT

b. Connect the test oscilloscope's 10X probe tip to the front end of R704 (toward the front panel). R704 is on the Timing circuit board.

c. Set HOLDOFF control fully counterclockwise (MIN setting).

d. Measure the HOLDOFF time.

e. Rotate the HOLDOFF control to the fully clockwise position

f. CHECK—Sweep holdoff time has increased by at least a factor of eight.

g. Repeat Parts c through f for SEC/DIV settings of 0.5 ms and 5 μs.

h. Disconnect the 10X probe from R704.

TRIGGER

Equipment Required (See Table 4-1):

- Leveled Sine-Wave Generator (Item 2)
- Low-Frequency Sine-Wave Generator (Item 4)
- Screwdriver (Item 5)
- 50-Ω BNC Coaxial Cable (Item 8)
- Dual-Input Coupler (Item 9)
- 50-Ω BNC Termination (Item 10)
- 600-Ω BNC Termination (Item 11)

See **ADJUSTMENT LOCATIONS** *at the back of this manual for adjustment locations.*

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	BOTH, NORM, and ALT
VOLTS/DIV (both)	50 mV
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	2 μs
SEC/DIV Variable	CAL detent

Trigger

SLOPE	Positive (⌐)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	VERT MODE
COUPLING	DC

PROCEDURE STEPS

1. Adjust Trigger Offset Channel Balance (R338)

a. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the CH 2 OR Y input connectors.

b. Set the generator to produce a four-division display at an output frequency of 50 kHz.

c. Center the CH 1 and CH 2 traces vertically.

d. Adjust the SEC/DIV Variable control to give one and a half sine-wave periods across the graticule.

e. ADJUST—CH 1/CH 2 Balance (R338) (found under the attenuator board) until the sine waves coincide.

f. Return the SEC/DIV variable control to the detent (CAL) position.

2. Adjust Trigger Sensitivity, Slope Balance, and P-P Offset (R489, R481, and R478)

a. SET:

CH 1 VOLTS/DIV	0.1 V
Vertical MODE	CH 1
SEC/DIV	20 μs
Trigger SOURCE	CH 1

b. Connect the leveled sine-wave generator output via a 50 Ω BNC coaxial cable and a 50 Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 2.2-division display at an output frequency of 50 kHz.

d. SET:

CH 1 VOLTS/DIV	1 V
Trigger MODE	NORM

e. ADJUST—Trigger Sensitivity (R489) and Trigger LEVEL control for minimum sensitivity with a stable trigger.

NOTE

Adjusting Trigger Sensitivity (R489) clockwise decreases trigger sensitivity.

f. ADJUST—Slope Bal (R481) and the Trigger LEVEL control so that a reliable trigger can be maintained when switching the Trigger SLOPE between positive (_/¯) and negative (¯_).

g. Adjust the Trigger LEVEL control for a stable trigger.

h. Set the Trigger MODE to P-P AUTO.

i. ADJUST—P-P Offset (R478) until a stable trigger can be obtained when switching the Trigger SLOPE between positive (_/¯) and negative (¯_).

3. Check Trigger Sensitivity

a. SET:

CH 1 VOLTS/DIV	0.1 V
CH 2 VOLTS/DIV	1 V
AC-GND-DC (both)	AC
Vertical MODE	BOTH, NORM, and ALT
SEC/DIV	0.2 µs

b. Set the generator to produce a three-division display at an output frequency of 5 MHz.

c. Set the CH 1 VOLTS/DIV switch to 1 V.

d. CHECK—A stable display can be obtained by adjusting the Trigger LEVEL control for each switch combination given in Table 5-5. Ensure that the TRIG'D light comes on when triggered.

Table 5-5
Switch Combinations for Triggering Checks

Trigger MODE	Trigger SLOPE
NORM	Positive _/¯
NORM	Negative ¯_
P-P AUTO	Positive _/¯
P-P AUTO	Negative ¯_

e. Move the test-signal cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

f. Repeat part d.

g. SET:

SEC/DIV	0.05 µs
Horizontal MODE	MAG
Horizontal MAG	X5

h. Set the generator to produce a 50-MHz, one-division display.

i. Repeat Part d.

j. Move the test-signal cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 1.

k. Repeat Part d.

l. Disconnect the test equipment from the instrument.

m. SET:

CH 1 VOLTS/DIV	20 mV
Vertical MODE	CH 1
SEC/DIV	0.2 µs
Horizontal MODE	X1
Trigger MODE	P-P AUTO
Trigger SOURCE	EXT, EXT

n. Connect the leveled sine-wave generator output via a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X input connector and EXT INPUT OR Z input connectors.

o. Set the generator to produce a four-division (80 mV) display at an output frequency of 5 MHz.

p. Repeat Part d.

q. SET:

CH 1 VOLT/DIV	50 mV
SEC/DIV	0.05 μs
Horizontal MODE	MAG
Horizontal MAG	X5

r. Set the generator to produce a five-division (250 mV) display at an output frequency of 50 MHz.

s. Repeat Part d.

t. Disconnect the test equipment from the instrument.

4. Check LF P-P AUTO Trigger

a. SET:

CH 1 VOLTS/DIV	0.1 V SEC/DIV
	20 ms
Trigger MODE	P-P AUTO
Trigger SOURCE	CH 1
Trigger SLOPE	Positive (_/¯)

b. Connect the low-frequency sine-wave generator output via a 50-Ω BNC coaxial cable and a 600-Ω BNC termination to the CH 1 OR X input connector.

c. Set the low-frequency sine-wave generator output to produce a 20-Hz, one-division display.

d. CHECK—For stable triggering in both positive (_/¯) and negative (¯_) slope. Ensure that the TRIG'D light comes on when triggered.

5. Adjust External Trigger Offset and Range

a. SET:

CH 1 VOLTS/DIV	0.5 V
CH 1 AC-GND-DC	DC
Vertical MODE	CH 1
SEC/DIV	20 μs
Trigger MODE	P-P AUTO
Trigger SOURCE	CH 1
Trigger COUPLING	AC
Trigger SLOPE	Positive (_/¯)

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the EXT INPUT OR Z input connectors.

c. Set the leveled sine-wave generator to produce a 50-kHz, five-division display.

d. Position the waveform equally about the center horizontal graticule line.

e. SET:

Trigger MODE	NORM
Trigger SOURCE	EXT, EXT

f. ADJUST—Ext Trig Offset (R360) so that the trace is untriggered at either end of the Trigger LEVEL control.

g. Set the Trigger COUPLING switch to DC.

h. CHECK—That the display can be untriggered at either end of the Trigger LEVEL control.

i. Set the Trigger SOURCE switch to $\frac{\text{EXT}}{10}$

j. CHECK—That the display can be triggered about the midrange of the Trigger LEVEL control.

k. Set the Trigger SLOPE switch to negative (¯_) and repeat Part j.

l. Disconnect the test equipment from the instrument.

6. Check Single Sweep Operation

a. SET:

CH 1 VOLTS/DIV	10 mV
CH 1 AC-GND-DC	DC
Vertical MODE	CH 1
SEC/DIV	0.5 ms
Horizontal MODE	X1
Trigger MODE	NORM
Trigger SOURCE	CH 1
Trigger COUPLING	AC
Trigger SLOPE	Positive (_/¯)

b. Connect 50-mV standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

c. Adjust the Trigger LEVEL control to obtain a stable display.

d. SET:

CH 1 AC-GND-DC	GND
Trigger MODE	SGL SWP

e. Press in the SGL SWP button. The READY light should turn on and remain lit.

f. Set the CH 1 AC-GND-DC switch to DC.

NOTE

The INTENSITY control may require adjustment to observe the single-sweep trace.

g. CHECK—READY light goes out and a single sweep occurs.

h. Press the SGL SWP button several times.

i. CHECK—A single-sweep trace occurs and the READY light turns on briefly each time the SGL SWP button is pressed.

j. Disconnect the test equipment from the instrument.

EXTERNAL Z-AXIS AND PROBE ADJUST

Equipment Required (See Table 4-1):

Leveled Sine-Wave Generator (Item 2)	Dual-Input Coupler (Item 9)
Screwdriver (Item 5)	50-Ω BNC Termination (Item 10)
50-Ω BNC Coaxial Cable (Item 8)	10X Probe (Provided with instrument)

INITIAL CONTROL SETTINGS

Vertical

Channel 1 POSITION	Midrange
MODE	CH 1
CH 1 VOLTS/DIV	1 V
CH 1 VOLTS/DIV Variable	CAL detent
Magnification	X1 (CAL knob in)
CH 1 AC-GND-DC	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
HORIZONTAL MODE	X1
SEC/DIV	20 ms
SEC/DIV Variable	CAL detent

Trigger

SLOPE	Positive (_/¯)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	VERT MODE
COUPLING	DC

PROCEDURE STEPS

1. Check External Z-Axis Operation

a. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the EXT INPUT OR Z input connectors.

b. Set the generator to produce a five-division, 50-kHz signal.

c. CHECK—For noticeable intensity modulation. The positive part of the sine wave should be of lower intensity than the negative part.

d. Disconnect the test equipment from the instrument.

2. Check Probe Adjust Operation

a. SET:

CH 1 VOLTS/DIV	10 mV
SEC/DIV	0.5 ms
Trigger SOURCE	CH 1

b. Connect the 10X Probe to the CH 1 OR X input connector and clip the probe tip to the PROBE ADJUST terminal on the instrument front panel. If necessary, adjust the probe compensation for a flat-topped square-wave display (see Probe instruction manual).

c. CHECK—Display amplitude is 4.75 to 5.25 divisions.

d. Disconnect the probe from the instrument.

MAINTENANCE

This section contains information for conducting preventive maintenance, troubleshooting, and corrective maintenance on the instrument. Circuit board removal procedures are included in the corrective maintenance part of this section.

STATIC-SENSITIVE COMPONENTS

The following precautions are applicable when performing any maintenance involving internal access to the instrument.

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. Table 6-1 lists the relative susceptibility of various classes of semiconductors. Static voltages of 1 KV to 30 KV are common in unprotected environments.

When performing maintenance, observe the following precautions to avoid component damage:

1. Minimize handling of static-sensitive components.

2. Transport and store static-sensitive components or assemblies in their original containers or on a metal rail. Label any package that contains static-sensitive components or assemblies.

3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these components. Servicing static-sensitive components or assemblies should be performed only at a static-free work station by qualified service personnel.

4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.

Table 6-1
Relative Susceptibility to Static-Discharge Damage

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFET	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

[a]Voltage equivalent for levels (voltage discharged from a 100-pF capacitor through a resistance of 100 Ω):

1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V (est)
8 = 900 V
9 = 1200 V

5. Keep the component leads shorted together whenever possible.

6. Pick up components by their bodies, never by their leads.

7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only approved antistatic, vacuum-type desoldering tools for component removal.

PREVENTIVE MAINTENANCE

INTRODUCTION

Preventive maintenance consists of cleaning, visual inspection, and checking instrument performance. When performed regularly, it may prevent instrument malfunction and enhance instrument reliability. The severity of the environment in which the instrument is used determines the required frequency of maintenance. An appropriate time to accomplish preventive maintenance is just before instrument adjustment.

GENERAL CARE

The cabinet minimizes accumulation of dust inside the instrument and should normally be in place when operating the oscilloscope.The optional front cover for the instrument provides both dust and damage protection for the front panel and crt. Whenever the instrument is stored or is being transported, the front cover should be used.

CAUTION

Do not use chemical cleaning agents that might damage the plastics used in this instrument. Use a nonresidue-type cleaner, preferably isopropyl alcohol or a solution of 1% mild detergent with 99% water. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

INSPECTION AND CLEANING

The instrument should be visually inspected and cleaned as often as operating conditions require. Accumulation of dust in the instrument can cause overheating and component breakdown. Dust on components acts as an insulating blanket, preventing efficient heat dissipation. It also provides an electrical conduction path that could result in instrument failure, especially under high-humidity conditions.

Exterior

INSPECTION. Inspect the external portions of the instrument for damage, wear, and missing parts; use Table 6-2 as a guide. Instruments that appear to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and performance. Any problems found that could cause personal injury or could lead to further damage to the instrument should be repaired immediately.

CAUTION

Do not allow moisture to get inside the instrument during external cleaning. Use only enough liquid to dampen the cloth or applicator.

CLEANING. Loose dust on the outside of the instrument can be removed with a soft cloth or small soft-bristle brush. The brush is particularly useful for dislodging dirt on and around the controls and connectors. Dirt that remains can be removed with a soft cloth dampened in a mild detergent-and-water solution. Do not use abrasive cleaners.

A plastic light filter is provided with the oscilloscope. Clean the light filter and the crt face with a soft lint-free cloth dampened with either isopropyl alcohol or a mild detergent-and-water solution.

Interior

To gain access to internal portions of the instrument for inspection and cleaning, refer to the Removal and Replacement Instructions in the Corrective Maintenance part of this section.

Table 6–2

External Inspection Checklist

Item	Inspect For	Repair Action
Cabinet and Front Panel	Cracks, scratches, deformations, and damaged hardware or gaskets.	Touch up paint scratches and replace defective parts.
Front-panel controls	Missing, damaged, or loose knobs, buttons, and controls.	Repair or replace missing or defective items.
Connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Replace defective parts. Clean or wash out dirt.
Carrying Handle	Correct operation.	Replace defective parts.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Replace damaged or missing items, frayed cables, and defective parts.

Table 6–3

Internal Inspection Checklist

Item	Inspect For	Repair Action
Circuit Boards	Loose, broken, or corroded solder connections. Burned circuit boards. Burned, broken, or cracked circuit-run plating.	Clean solder corrosion with an eraser and flush with isopropyl alcohol. Resolder defective connections. Determine cause of burned items and repair. Repair defective circuit runs.
Resistors	Burned, cracked, broken, or blistered.	Replace defective resistors. Check for cause of burned component and repair as necessary.
Solder Connections	Cold solder or rosin joints.	Resolder joint and clean with isopropyl alcohol.
Capacitors	Damaged or leaking cases. Corroded solder on leads or terminals.	Replace defective capacitors. Clean solder connections and flush with isopropyl alcohol.
Wiring and Cables	Loose plugs or connectors. Burned, broken, or frayed wiring.	Firmly seat connectors. Repair or replace defective wires or cables.
Chassis	Dents, deformations, and damaged hardware.	Straighten, repair, or replace defective hardware.

INSPECTION. Inspect the internal portions of the instrument for damage and wear, using Table 6–3 as a guide. Deficiencies found should be repaired immediately. 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.

If any electrical component is replaced, conduct a Performance Check for the affected circuit and for other closely related circuits (see Section 4). If repair or replacement work is done on any of the power supplies, conduct a complete Performance Check and, if so indicated, an instrument readjustment (see Sections 4 and 5).

CAUTION

To prevent damage from electrical arcing, ensure that circuit boards and components are dry before applying power to the instrument.

CLEANING. To clean the interior, blow off dust with dry, low-pressure air (approximately 9 psi). Remove any remaining dust with a soft brush or a cloth dampened with a solution of mild detergent and water. A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.

VOLT/DIV And SEC/DIV SWITCHES. These are maintenance free. DO NOT CLEAN.

CAUTION

Most spray-type circuit coolants contain Freon 12 as a propellant. Because many Freons adversely affect switch contacts, do not use spray-type coolants on the switches or attenuators. Carbon based solvents will damage the board material.

LUBRICATION

Most of the potentiometers used in this instrument are permanently sealed and generally do not require periodic lubrication. All switches, both rotary- and lever-type, are installed with proper lubrication applied where necessary and will rarely require any additional lubrication. A regular periodic lubrication program for the instrument is, therefore, not recommended.

SEMICONDUCTOR CHECKS

Periodic checks of the transistors and other semiconductors in the oscilloscope are not recommended. The best check of semiconductor performance is actual operation in the instrument.

PERIODIC READJUSTMENT

To ensure accurate measurements, check the performance of this instrument every 2000 hours of operation, or if used infrequently, once each year. In addition, replacement of components may necessitate readjustment of the affected circuits.

Complete Performance Check and Adjustment instructions are given in Sections 4 and 5. The Performance Check Procedure can also be helpful in localizing certain troubles in the instrument. In some cases, minor problems may be revealed or corrected by readjustment. If only a partial adjustment is performed, see the interaction chart, Table 5-1, for possible adjustment interaction with other circuits.

TROUBLESHOOTING

INTRODUCTION

Preventive maintenance performed on a regular basis should reveal most potential problems before an instrument malfunctions. However, should troubleshooting be required, the following information is provided to facilitate location of a fault. In addition, the material presented in the Theory of Operation and Diagrams sections of this manual may be helpful while troubleshooting.

TROUBLESHOOTING AIDS

Schematic Diagrams

Complete schematic diagrams are located on tabbed foldout pages in the Diagrams section. Portions of circuitry mounted on each circuit board are enclosed by heavy black lines. The assembly number and name of the circuit are shown near either the top or the bottom edge of the enclosed area.

Functional blocks on schematic diagrams are outlined with a wide grey line. Components within the outlined area perform the function designated by the block label. The Theory of Operation uses these functional block names when describing circuit operation as an aid in cross-referencing between the theory and the schematic diagrams.

Component numbers and electrical values of components in this instrument are shown on the schematic diagrams. Refer to the first page of the Diagrams section for the reference designators and symbols used to identify components. Important voltages and waveform reference numbers (enclosed in hexagonal-shaped boxes) are also shown on each diagram. Waveform illustrations are located adjacent to their respective schematic diagram.

Circuit Board Illustrations

Circuit board illustrations showing the physical location of each component are provided for use in conjunction with each schematic diagram. Each board illustration is found in the Diagrams section on the back of a foldout page, preceding the first schematic diagram(s) to which it relates.

The locations of waveform test points are marked on the circuit board illustrations with hexagonal outlined numbers corresponding to the waveform numbers on both the schematic diagram and the waveform illustrations.

Also provided in the Diagrams section is an illustration of the bottom side of the Main circuit board. This illustration aids in troubleshooting by showing the connection pads for the components mounted on the top side of the circuit board. By using this illustration, circuit tracing and probing for voltages and signals that are inaccessible from the top side of the board may be achieved without dismantling portions of the instrument.

Circuit Board Locations

The placement of each circuit board in the instrument is shown in board locator illustrations. These illustrations are located on foldout pages along with the circuit board illustration.

Circuit Board Interconnections

A circuit board interconnection diagram is provided in the Diagrams section to aid in tracing a signal path or power source between boards. All wire, plug, and jack numbers are shown along with their associated wire or pin numbers.

Power Distribution

A Power Distribution diagram is provided to aid in troubleshooting power-supply problems. This diagram shows the service jumper connections used to apply power to the various circuit boards. Excessive loading on a power supply by a circuit board fault may be isolated by disconnecting the appropriate service jumpers.

Grid Coordinate System

Each schematic diagram and circuit board illustration has a grid border along its left and top edges. A table located adjacent to each diagram lists the grid coordinates of each component shown on that diagram. To aid in physically locating components on the circuit board, this table also lists the grid coordinates of each component on the circuit board illustration.

Near each circuit board illustration is an alphanumeric listing of all components mounted on that board. The second column in each listing identifies the schematic diagram in which each component can be found. These component-locator tables are especially useful when more than one schematic diagram is associated with a particular circuit board.

Component Color Coding

Information regarding color codes and markings of resistors and capacitors is located on the color-coding illustration (Figure 9-1) at the beginning of the Diagrams section.

RESISTOR COLOR CODE. Resistors used in this instrument are carbon-film, composition, or precision metal-film types. They are usually color coded with the EIA color code; however, some metal-film type resistors may have the value printed on the body. The color code is interpreted starting with the stripe nearest to one end of the resistor. Composition resistors have four stripes; these represent two significant digits, a multiplier, and a tolerance value. Metal-film resistors have five stripes representing three significant digits, a multiplier, and a tolerance value.

CAPACITOR MARKINGS. Capacitance values of common disc capacitors and small electrolytics are marked on the side of the capacitor body. White ceramic capacitors are color coded in picofarads, using a modified EIA code.

Dipped tantalum capacitors are color coded in microfarads. The color dot indicates both the positive lead and the voltage rating. Since these capacitors are easily destroyed by reversed or excessive voltage, be careful to observe the polarity and voltage rating when replacing them.

DIODE COLOR CODE. The cathode end of each glass-encased diode is indicated by either a stripe, a series of stripes or a dot. For most diodes marked with a series of stripes, the color combination of the stripes identifies three digits of the Tektronix Part Number, using the resistor color-code system. The cathode and anode ends of a metal-encased diode may be identified by the diode symbol marked on its body.

Semiconductor Lead Configurations

Figure 9-2 in the Diagrams section shows the lead configurations for semiconductor devices used in the instrument. These lead configurations and case styles are typical of those used at completion of the instrument design. Vendor changes and performance improvement changes may result in changes of case styles or lead configurations. If the device in question does not appear to match the configuration shown in Figure 9-2, examine the associated circuitry or consult the manufacturer's data sheet.

RIBBON-CABLE CONNECTORS

The multipin connectors of the 2225 are designed to make the interboard connections directly to the ribbon cables. Insert the trimmed ribbon-cable wires into the connector slots (see Figure 6-1 A). Pressing down on the release bar (the top of the connector) with your fingertip will make it easier to push the wires into the connector (see Figure 6-1 C). The cable locks firmly into the connector (Figure 6-1 B) when the pressure is removed from the release bar. To disconnect the ribbon cable from the connector, press down on the release bar and lift the cable out of the connector (see Figure 6-1 C and D). The ribbon cable wire should be evenly trimmed to expose 5 mm of wire (about 1/4 inch) for correct insertion into the connectors.

The ribbon cables are either color coded in the standard color codes or have a striped index wire. Align the index wire with the pin 1 indicator when reinserting a cable into its connector.

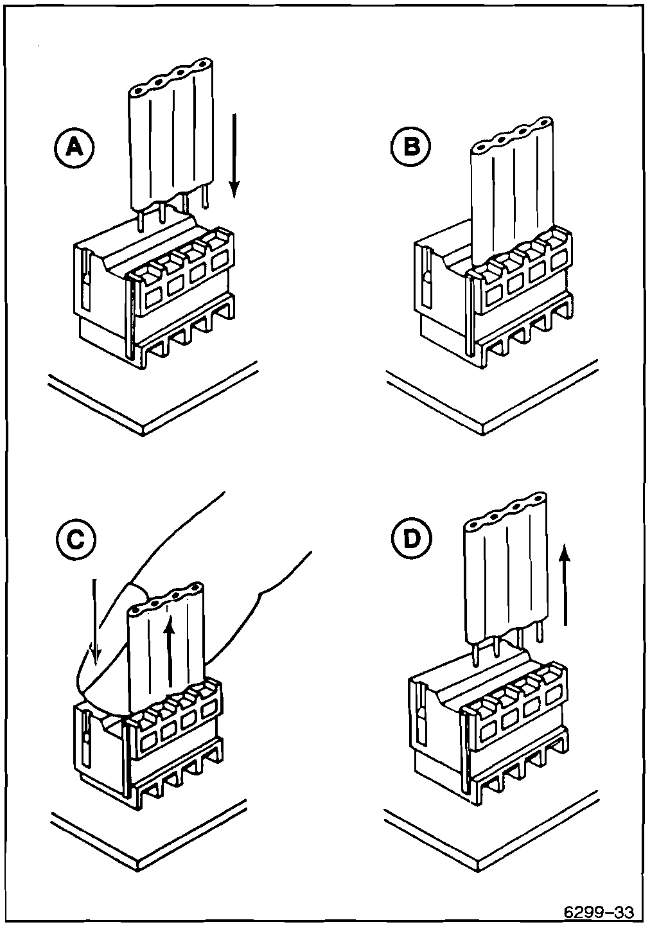


Figure 6-1. Multi-connector operation.

TROUBLESHOOTING EQUIPMENT

The equipment listed in Table 4-1 of this manual, or equivalent equipment, may be useful when troubleshooting this instrument.

TROUBLESHOOTING TECHNIQUES

The following procedure is arranged in an order that enables checking simple trouble possibilities before requiring more extensive troubleshooting. The first four steps ensure proper control settings, connections, operation, and adjustment. If the trouble is not located by these checks, the remaining steps will aid in locating the defective component. When the defective component is located, replace it using the appropriate replacement procedure given under Corrective Maintenance in this section.

CAUTION

Before using any test equipment to make measurements on static-sensitive, current-sensitive, or voltage-sensitive components or assemblies, ensure that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

1. Check Control Settings

Incorrect control settings can give a false indication of instrument malfunction. If there is any question about the correct function or operation of any control, refer to either the Operating Information in Section 2 of this manual or to the Operators Manual.

2. Check Associated Equipment

Before proceeding, ensure that any equipment used with the instrument is operating correctly. Verify that input signals are properly connected and that the interconnecting cables are not defective. Check that the ac-power-source voltage to all equipment is correct.

WARNING

To avoid electrical shock, disconnect the instrument from the ac power source before making a visual inspection of the internal circuitry.

3. Visual Check

Perform a visual inspection. This check may reveal broken connections or wires, damaged components, semiconductors not firmly mounted, damaged circuit boards, or other clues to the cause of an instrument malfunction.

WARNING

Dangerous potentials exist at several points throughout this instrument. If it is operated with the cabinet removed, do not touch exposed connections or components.

4. Check Instrument Performance and Adjustment

Check the performance of either those circuits where trouble appears to exist or the entire instrument. The apparent trouble may be the result of misadjustment. Complete performance check and adjustment instructions are given in Sections 4 and 5 of this manual.

5. Isolate Trouble to a Circuit.

To isolate problems to a particular area, use any symptoms noticed to help locate the trouble. Refer to the troubleshooting charts in the Diagrams section as an aid in locating a faulty circuit.

6. Check Power Supplies.

WARNING

For safety reasons, an isolation transformer must be connected whenever troubleshooting is done in the Preregulator and Inverter Power Supply sections of the instrument.

When trouble symptoms appear in more that one circuit, first check the power supplies; then check the affected circuits by taking voltage and waveform readings. Check first for the correct output voltage of each individual supply. These voltages are measured between the power supply test points and ground (see the associated circuit board illustration and Table 6-5).

Voltage levels may be measured either with a DMM or with an oscilloscope. Voltage ripple amplitudes must be measured using an oscilloscope. Before checking power-supply circuitry, set the INTENSITY control to normal brightness, the SEC/DIV switch to 0.1 ms, the Trigger MODE to P-P AUTO, and the Vertical MODE switch to CH 1.

When measuring ripple, use a 1X probe. The ripple values listed are based on a system limited in bandwidth to 30 kHz. Using a system with wider bandwidth will result in higher readings.

If the power-supply voltages and ripple are within the ranges listed in Table 6-4, the supply can be assumed to be working correctly. If they are outside the range, the supply may be either misadjusted or operating incorrectly. Use the Power Supply and CRT Display subsection in the Adjustment procedure to adjust the -8.6-V supply.

A defective component elsewhere in the instrument can create the appearance of a power-supply problem and may also affect the operation of other circuits.

7. Check Circuit Board Interconnections.

After the trouble has been isolated to a particular circuit, again check for loose or broken connections, improperly seated semiconductors, and heat-damaged components.

8. Check Voltages and Waveforms.

Often the defective component can be located by checking circuit voltages or waveforms. Typical voltages are listed on the schematic diagrams. Waveforms indicated on the schematic diagrams by hexagonal-outlined numbers are shown adjacent to the diagrams. Waveform test points are shown on the circuit board illustrations.

Table 6-4
Power Supply Voltage and Ripple Limits

Power Supply	Test Point	Reading (Volts)	P-P Ripple (mV)
-8.6 V	W989	-8.557 to -8.643	3 mV
+5.1 V	W991	+4.95 to 5.25	4 mV
+8.6 V	W987	+8.526 to 8.874	3 mV
+38 V	W972	+37.24 to 39.14	10 mV
+99 V	W984	+97.02 to 101.97	100 mV

NOTE

Voltages and waveforms indicated on the schematic diagrams are not absolute and may vary slightly between instruments. To establish operating conditions similar to those used to obtain these readings, see the Voltage and Waveform Setup Conditions preceding the waveform illustrations in the Diagrams section. Note the recommended test equipment, front-panel control settings, voltage and waveform conditions, and cable-connection instructions. Any special control settings required to obtain a given waveform are noted under the waveform illustration. Changes to the control settings from the initial setup, other than those noted, are not required.

9. Check Individual Components

WARNING

To avoid electric shock, always disconnect the instrument from the ac power source before removing or replacing components.

The following procedures describe methods of checking individual components. Two-lead components that are soldered in place are most accurately checked by first disconnecting one end from the circuit board. This isolates the measurement from the effects of the surrounding circuitry. See Figure 9-1 for component value identification and Figure 9-2 for semiconductor lead configurations.

CAUTION

When checking semiconductors, observe the static-sensitivity precautions located at the beginning of this section.

TRANSISTORS. A good check of a transistor is actual performance under operating conditions. A transistor can most effectively be checked by substituting a known-good component. 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-type transistor checker for testing. Static-type transistor checkers are not recommended, since they do not check operation under simulated operating conditions.

When troubleshooting transistors in the circuit with a voltmeter, measure both the emitter-to-base and emitter-to-collector voltages to determine whether they are consistent with normal circuit voltages. Voltages across a transistor may vary with the type of device and its circuit function.

Some of these voltages are predictable. The emitter-to-base voltage for a conducting silicon transistor will normally range from 0.6 V to 0.8 V. The emitter-to-collector voltage for a saturated transistor is about 0.2 V. Because these values are small, the best way to check them is by connecting a sensitive voltmeter across the junction rather than comparing two voltages taken with respect to ground. If the former method is used, both leads of the voltmeter must be isolated from ground.

If voltage values measured are less that those just given, either the device is shorted or no current is flowing in the external circuit. If values exceed the emitter-to-base values given, either the junction is reverse biased or the device is defective. Voltages exceeding those given for typical emitter-to-collector values could indicate either a nonsaturated device operating normally or a defective (open-circuited) transistor. If the device is conducting, voltage will be developed across the resistors in series with it; if open, no voltage will be developed across the resistors unless current is being supplied by a parallel path.

CAUTION

When checking emitter-to-base junctions, do not use an ohmmeter range that has a high internal current. High current may damage the transistor. Reverse biasing the emitter-to-base junction with a high current may degrade the current-transfer ratio (Beta) of the transistor.

A transistor emitter-to-base junction also can be checked for an open or shorted condition by measuring the resistance between terminals with an ohmmeter set to a range having a low internal source current, such as the R X 1-kΩ range. The junction resistance should be very high in one direction and much lower when the meter leads are reversed.

When troubleshooting a field-effect transistor (FET), the voltage across its elements can be checked in the same manner as previously described for other transistors. However, remember that in the normal depletion mode of operation, the gate-to-source junction is reverse biased; in the enhanced mode, the junction is forward biased.

INTEGRATED CIRCUITS. An integrated circuit (IC) can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of circuit operation is essential when troubleshooting a circuit having IC components. Use care when checking voltages and waveforms around the IC so that adjacent leads are not shorted together. An IC test clip provides a convenient means of clipping a test probe to an IC.

CAUTION

When checking a diode, do not use an ohmmeter scale that has a high internal current. High current may damage a diode. Checks on diodes can be performed in much the same manner as those on transistor emitter-to-base junctions. Do not check tunnel diodes or back diodes with an ohmmeter; use a dynamic tester, such as the TEKTRONIX 576 Curve Tracer.

DIODES. A diode can be checked for either an open or a shorted condition by measuring the resistance between terminals with an ohmmeter set to a range having a low internal source current, such as the R X

1-kΩ range. The diode resistance should be very high in one direction and much lower when the meter leads are reversed.

Silicon diodes should have 0.6 V to 0.8 V across their junctions when conducting; Schottky diodes about 0.2 V to 0.4 V. Higher readings indicate that they are either reverse biased or defective, depending on polarity.

RESISTORS. Check resistors with an ohmmeter. Refer to the Replaceable Electrical Parts list for the tolerances of resistors used in this instrument. A resistor normally does not require replacement unless its measured value varies widely from its specified value and tolerance.

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.

CAPACITORS. A leaky or shorted capacitor can best be detected by checking resistance with an ohmmeter set to one of the highest ranges. Do not exceed the voltage rating of the capacitor. The resistance reading should be high after the capacitor is charged to the output voltage of the ohmmeter. An open capacitor can be detected with a capacitance meter or by checking whether the capacitor passes ac signals.

10. Repair and Adjust the Circuit

If any defective parts are located, follow the replacement procedures given under Corrective Maintenance in this section. After any electrical component has been replaced, the performance of that circuit and any other closely related circuit should be checked. Since the power supplies affect all circuits, performance of the entire instrument should be checked if work has been done on the power supplies or if the power transformer has been replaced. Readjustment of the affected circuitry may be necessary. Refer to the Performance Check and Adjustment Procedure, Sections 4 and 5 of this manual and to Table 5-1, Adjustments affected by repairs.

CORRECTIVE MAINTENANCE

INTRODUCTION

Corrective maintenance consists of component replacement and instrument repair. This part of the manual describes special techniques and procedures required to replace components in this instrument. If it is necessary to ship your instrument to a Tektronix Service Center for repair or service, refer to the Repackaging information in Section 2 of this manual.

MAINTENANCE PRECAUTIONS

To reduce the possibility of personal injury or instrument damage, observe the following precautions.

1. Disconnect the instrument from the ac-power source before removing or installing components.
2. Verify that the line-rectifier filter capacitor (C900) is discharged prior to performing any servicing.
3. When soldering on circuit boards or small insulated wires, use only a 15-watt, pencil-type soldering iron.

OBTAINING REPLACEMENT PARTS

Most electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can usually be obtained from a local commercial source. Before purchasing or ordering a part from a source other than Tektronix, Inc., please check the Replaceable Electrical Parts list for the proper value, rating, tolerance, and description.

NOTE

Physical size and shape of a component may affect instrument performance, particularly at high frequencies. Always use direct-replacement components, unless it is known that a substitute will not degrade instrument performance.

Special Parts

In addition to the standard electronic components, some special parts are used in the instrument. 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. The various manufacturers can be identified by referring to the Cross Index-Manufacturer's Code number to Manufacturer at the beginning of the Replaceable Electrical Parts list. Most of the mechanical parts used in this instrument were 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., be sure to include all of the following information:

1. Instrument type (include all modification and option numbers).
2. Instrument serial number.
3. A description of the part (if electrical, include its full circuit component number).
4. Tektronix part number.

Selectable Components

Several components in the instrument are selectable to obtain optimum circuit operation. Value selection of these components is done during the initial factory adjustment procedure. Usually, further selection is not necessary for subsequent adjustments unless a component has been changed that affects circuitry for which a selected component has been specifically chosen.

MAINTENANCE AIDS

The maintenance aids listed in Table 6-5 include items required for performing most of the maintenance procedures in this instrument. Equivalent products may be substituted for those given, provided their characteristics are similar.

INTERCONNECTIONS

Interconnections in this instrument are made with wire-trap connectors soldered onto the circuit boards. If any individual wire in the cable is faulty, the entire cable assembly should be replaced. To remove a cable from a wire-trap connector, press down on top of the connector and lift out cable. Reinstallation is the reverse of this procedure. To provide correct orientation of a cable, a number "1" is stamped on the circuit board. The cable is either color-coded, so the index is the brown wire, or the index wire is striped a different color than the rest of the cable. Be sure the index wire is aligned with the "1" when a cable is reinserted into the connector (see Figure 6-1, shown previously).

TRANSISTORS AND INTEGRATED CIRCUITS

Transistors and integrated circuits should not be replaced unless they are actually defective. If removed from their sockets or unsoldered from the circuit board during routine maintenance, return them to their original board locations. Unnecessary replacement or transposing of semiconductor devices may affect the adjustment of the instrument. When a semiconductor is replaced, check the performance of any circuit that may be affected.

Any replacement component should be of the original type or a direct replacement. Bend transistor leads to fit their circuit board holes, and cut the leads to the same length as the original component. See Figure 9-2 in the Diagrams section for lead-configuration illustrations.

Table 6-5
Maintenance Aids

Description	Specification	Usage	Example
1. Soldering Iron	15 to 25 W.	General soldering and unsoldering.	Antex Precision Model C.
2. Torx Screwdriver	Torx tips #T9 and #T15.	Assembly and disassembly.	Tektronix p/n #T9 003-0965-00 #T15 003-0966-00
3. Nutdrivers	1/4 inch, 7/16 inch, and 1/2 inch.	Assembly and disassembly.	Xcelite #8, #14 and #16.
4. Open-end Wrench	5/16 inch and 1/2 inch.	Channel Input, EXT BNC connectors and Transformer.	
5. Hex Wrenches	1/16 inch.	Assembly and disassembly.	Allen wrenches.
6. Long-nose Pliers		Component removal and replacement.	
7. Diagonal Cutters		Component removal and replacement.	
8. Vacuum Solder Extractor.	No Static Charge Retention.	Unsoldering components.	Pace Model PC-10.
9. 1X Probe		Power supply ripple check.	Tektronix P6101 Probe (X1), p/n 010-6101-03.
10. Lubricant	No-Noise.®	Switch lubrication.	Tektronix p/n 006-0442-02.
11. Isolation Transformer		Isolate the instrument from the ac-power-source outlet.	Tektronix Part Number 006-5953-00

Power-supply transistor Q913 is insulated from the chassis by a heat-transferring pad and insulation bushing. Reinstall the pad and bushing when replacing this transistor.

NOTE

After replacing a power transistor, check that the collector is not shorted to the chassis before applying power to the instrument.

To remove socketed, dual-in-line-packaged (DIP) integrated circuits, pull slowly and evenly on both ends of the device. Avoid disengaging one end of the integrated circuit from the socket before the other, since this may damage the pins.

To remove a soldered DIP IC when it is going to be replaced, clip all the leads of the device and remove the leads from the circuit board one at a time. If the device must be removed intact for possible reinstallation, do not heat adjacent conductors consecutively. Apply heat to pins at alternate sides and ends of the IC as solder is removed. Allow a moment for the circuit board to cool before proceeding to the next pin.

SOLDERING TECHNIQUES

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used to remove or replace parts. General soldering techniques, which apply to maintenance of any precision electronic equipment, should be used when working on this instrument.

WARNING

To avoid an electric-shock hazard, observe the following precautions before attempting any soldering: turn the instrument off, disconnect it from the ac power source, and wait at least three minutes for the line-rectifier filter capacitors to discharge.

Use rosin-core wire solder containing 63% tin and 37% lead. Contact your local Tektronix Field Office or representative to obtain the names of approved solder types.

When soldering on circuit boards or small insulated wires, use only a 15-watt, pencil-type soldering iron. A higher wattage soldering iron may cause etched-circuit conductors to separate from the board base material and melt the insulation on small wires. Always keep the soldering-iron tip properly tinned to ensure best heat transfer from the iron tip to the solder joint. Apply only enough solder to make a firm joint. After soldering, clean the area around the solder connection with an approved flux-removing solvent (such as isopropyl alcohol) and allow it to air dry.

CAUTION

Attempts to unsolder, remove, and resolder leads from the component side of a circuit board may cause damage to the reverse side of the circuit board.

The following techniques should be used to replace a component on a circuit board:

1. Touch the vacuum desoldering tool to the lead at the solder connection. Never place the iron directly on the board; doing so may damage the board.

NOTE

Some components are difficult to remove from the circuit board due to a bend placed in the component leads during machine insertion. To make removal of machine-inserted components easier, straighten the component leads on the reverse side of the circuit board.

2. When removing a multipin component, especially an IC, do not heat adjacent pins consecutively. Apply heat to the pins at alternate sides and ends of the IC as solder is removed. Allow a moment for the circuit board to cool before proceeding to the next pin.

CAUTION

Excessive heat can cause the etched-circuit conductors to separate from the circuit board. Never allow the solder extractor tip to remain at one place on the board for more than three seconds. Damage caused by poor soldering techniques can void the instrument warranty.

3. Bend the leads of the replacement component to fit the holes in the circuit board. If the component is replaced while the board is installed in the instrument, cut the leads so they protrude only a small amount through the reverse side of the circuit board. Excess lead length may cause shorting to other conductive parts.

4. Insert the leads into the holes of the board so that the replacement component is positioned the same as the original component. Most components should be firmly seated against the circuit board.

5. Touch the soldering iron to the connection and apply enough solder to make a firm solder joint. Do not move the component while the solder hardens.

6. Cut off any excess lead protruding through the circuit board (if not clipped to the correct length in step 3).

7. Clean the area around the solder connection with an approved flux-removing solvent. Be careful not to remove any of the printed information from the circuit board.

REMOVAL AND REPLACEMENT INSTRUCTIONS

The exploded view drawings in the Replaceable Mechanical Parts list (Section 10) may be helpful during the removal and reinstallation of individual subassemblies or components. Circuit board and component locations are shown in the Diagrams section.

Cabinet

WARNING

To avoid electric shock, disconnect the instrument from the ac-power-input source before removing or replacing any component or assembly.

To remove the instrument cabinet, perform the following steps:

1. Disconnect the power cord from the instrument. For instruments with a power-cord securing clamp, remove the Phillips-head screw holding the power-cord securing clamp before disconnecting the power cord.

2. Remove two screws from the rear panel (located on each side) and remove it from the instrument.

3. Remove four screws, one from the left-rear side and three from the right-rear side of the cabinet.

4. Pull the front panel and attached chassis forward and out of the cabinet.

5. To reinstall the cabinet, perform the reverse of the preceding steps. Ensure that the cabinet is flush with the rear of the chassis and that the cabinet and rear-panel holes are aligned with the screw holes in the chassis frame.

6. Reconnect the power cord.

Cathode-Ray Tube

WARNING

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

The crt can be removed and reinstalled as follows:

1. Unsolder the Trace Rotation wires (J987) from the Front-Panel circuit board (note the connection locations and wire colors for reinstallation reference).

WARNING

The crt anode lead and the High-Voltage Multiplier output lead retain a high-voltage charge after the instrument is turned off. To avoid electrical shock, disconnect the crt anode lead from the High-Voltage Multiplier and ground the lead to the main instrument chassis.

2. Unplug the crt anode lead connector from the High-Voltage Multiplier located on the inner chassis. Discharge the anode lead to chassis ground.

3. Remove two front-panel screws that retain the plastic crt frame and light filter to the front panel. Remove the crt frame and light filter from the instrument.

4. Remove the grounding spring from between the top of the crt funnel and front chassis.

5. With the rear of the instrument facing you, place the fingers of both hands over the front edge of the front subpanel. Then, using both thumbs, press forward gently on the crt funnel near the front of the crt. When the crt base pins disengage from the socket, remove the crt and the crt shield through the instrument front panel. Place the crt in a safe place until it is reinstalled. If the plastic crt corner pads fall out, save them for reinstallation.

NOTE

When installing the crt into the instrument, reinstall any loose plastic crt corner pads that are out of place. Ensure all crt pins are straight and that the indexing keys on the crt base, socket, and shield are aligned. Ensure that the ground clip makes contact only with the outside of the crt shield.

To reinstall the crt, perform the reverse of the preceding steps.

Power Transformer

The Power Transformer (T901) can be removed and reinstalled as follows:

1. Disconnect connector J902 from the Line Filter board. (The J902 connector is not polarized so can be fitted either way). Note the orientation of the connector for proper reinstallation.
2. Note the physical orientation of the Power Transformer. Undo the two locking nuts from the center of the Power Transformer.
3. Supporting the Transformer, withdraw the center bolt (complete with the rear stiffening plate).

To reinstall the Power Transformer, perform the reverse of the preceding steps.

Mains Input Circuit Board

The Mains Input circuit board can be removed and reinstalled as follows:

1. Disconnect connector J902 from the Mains Input board. (The J902 connector is not polarized so can be fitted either way. Note the orientation for correct reinstallation.)
2. Unsolder W903 from Mains Input board.
3. Disengage the Power switch extension shaft from the Mains Power switch (S901).
4. Remove the two screws and nuts that secure the AC Power inlet connector to the rear chassis.
5. Remove the grounding screw and nut that secures the Mains Input board to the inner chassis.

WARNING

The screw and nut which secure the Mains Input circuit board to the chassis provide safety grounding and must be properly replaced when reinstalling the Mains Input circuit board

6. Pull the Mains Input board towards the inner chassis and up out of the instrument.

To reinstall the Mains Input board, perform the reverse of the preceding steps.

Attenuator/Timebase Circuit Board

The Attenuator/Timebase circuit board can be removed and reinstalled as follows:

1. Turn the instrument over (Main circuit board up) and unsolder the two resistors from the CH 1 and CH 2 attenuator switches. Also unsolder the grounding straps connected between the Front Panel and the Attenuator/Timebase boards, noting their respective positions. Turn the instrument over again and continue with the Attenuator/Timebase circuit board procedure.
2. Use a 1/16-inch hex wrench to loosen the set screws on both the CH 1 and CH 2 VOLTS/DIV Variable knobs, and SEC/DIV Variable knob. Remove the knobs. Withdraw the CH 1 and CH 2 VOLTS/DIV knobs and SEC/DIV knob.
3. Remove the two rear screws that secure the Attenuator/Timebase board to the support pillars.
4. Remove the screw that secures the Front Panel brace to the Attenuator/Timebase board. Turn the instrument over (Main circuit board up) and remove the screw that secures the Front Panel brace pillar to the Attenuator/Timebase board.
5. Remove the Focus knob shaft by disengaging it from the Focus pot and pulling the shaft out through the front panel.
6. Disconnect the following cables from the Attenuator/Timebase circuit board, noting their locations for reinstallation reference:
   a. J90, a six-wire cable located at the rear edge of the board.
   b. J755, a four-wire cable located at the rear right-hand corner of the board.
   c. J30, a four-wire cable located to the left of the CH 1 attenuator switch.
   d. J80, a four-wire cable located between the CH 1 and CH 2 attenuator switches.
   e. J7, a six-wire cable located between the CH 2 attenuator switch and the SEC/DIV switch.
   f. J701, a six-wire cable located at the front right-hand corner of the board.

7. Pull the Attenuator/Timebase circuit board straight back from the front of the instrument until the attenuator switches are clear of the Front-Panel circuit board. Then lift out the entire assembly through the top of the instrument.

To reinstall the Attenuator/Timebase circuit board, perform the reverse of the preceding steps.

The Bottom Shield of the Attenuator/Timebase circuit board assembly can be removed by removing the two screws and nuts located at the front edge of the board.

Front-Panel Circuit Board

The Front-Panel circuit board can be removed and reinstalled as follows:

1. Perform the Attenuator/Timebase Circuit Board Assembly removal procedure.

2. Remove the knobs from the following control shafts by pulling them straight out from the front panel:

    a. INTENSITY.

    b. Channel 1 and Channel 2 POSITION.

    c. TRACE SEP.

    d. COARSE and FINE Horizontal POSITION controls.

    e. LEVEL.

    f. HOLDOFF.

3. Unsolder both the resistor (R382) to the EXT INPUT center connector and the wire strap to the EXT INPUT OR Z ground lug.

4. Remove the FOCUS control shaft by pulling it through the front panel.

5. Unsolder the resistors and wire straps to the CH 1 OR X and CH 2 OR Y input connectors.

6. Unsolder the Trace Rotation wires (J987) from the Front-Panel circuit board (note the connection locations and wire colors for reinstallation reference).

7. Remove the Power Switch extension shaft by disengaging from power switch and pulling it out through the Front Panel.

8. Disconnect the following cables from the Front Panel board (these cables also connect to the front edge of the Main circuit board): J1, J2, J3, J4, J5, and J6.

9. Disconnect J7 from the Front Panel board (cable also connects to the Attenuator).

10. Remove the five screws that secure the Front Panel board to the front chassis, noting their respective positions.

11. Withdraw the Front Panel circuit board from the front chassis taking care not to lose the slider switch covers.

To reinstall the Front-Panel circuit board, perform the reverse of the preceding steps.

Main Circuit Board

All components on the Main circuit board are accessible either directly or by removing either the crt, Power Transformer or the Attenuator/Timebase circuit board assembly. Removal of the Main circuit board is required only when it is necessary to replace the circuit board with a new one.

The Main circuit board and inner chassis can be removed and reinstalled together as follows:

WARNING

The crt anode lead and the output terminal to the High-Voltage Multiplier will retain a high-voltage charge after the instrument is turned off. To avoid electrical shock, ground the crt side of the anode lead to the main instrument chassis.

1. Remove the FOCUS conatrol shaft by pulling it out through the front panel.

2. Unsolder W893 from the Main board. The cable is connected to the Focus pot located on the rear of the inner chassis.

3. Unsolder W903 from the rear of the Mains Input board.

4. Disengage the following cables from their respective wire-trap connectors located on the Attenuator/Timebase board:

   a. J755, four-wire cable located at rear right corner of board.

   b. J90, six-wire cable located at center rear edge of board.

   c. J30, four-wire cable located at the left hand side of the CH 1 attenuator switch.

   d. J80, four-wire cable located between the CH 1 and CH 2 attenuator switches.

   e. J701, six-wire cable located at front right corner of board.

5. Turn instrument upside down (bottom of Main board facing up) with the rear of the instrument facing you.

6. Remove the two screws that secure the heatsink for the vertical output transistors (Q256 and Q257) to the rear chassis.

7. Remove the screw that secures the heatsink for the power supply transistors (Q950, Q980, Q923 and Q913) to the rear chassis.

8. With the instrument still upside down, rotate it so that the front is facing you. Unsolder the wire connected to the Probe Adjust terminal from the Main board.

9. Disconnect the following cables from their respective wire-trap connectors located along the front edge of the Main board: J1, J2, J3, J4, J5, and J6.

10. Remove the three screws that secure the Main board to the pillars of the Attenuator/Timebase assembly.

11. Remove the four screws that secure the inner chassis.

12. Remove the grounding nut and screw that secure the inner chassis to the Mains Input circuit board.

WARNING

The screw and nut which secure the Mains Input circuit board to the chassis provide safety grounding and must be properly replaced when reinstalling the Mains Input circuit board

13. Remove the two screws and nuts that secure the Main board to the left hand chassis member.

14. Remove the three screws and nuts that secure the Main board to the right hand chassis member.

15. Lift out Main board and inner chassis.

To reinstall the Main circuit board, perform the reverse of the preceding steps. When installing the Main circuit board, ensure that the circuit board is in the guides at the rear of the chassis.

OPTIONS AND ACCESSORIES

INTRODUCTION

This section lists the standard accessories (including Tektronix part numbers) that are shipped with each insturment. It also briefly describes the options that can be included with the original instrument order. If you wish to obtain any of these options after receibing your insturment, use the accessories lists contained in Tables 7-1 and 7-2. For additional information about instrument options and other optional accessories, consult the current Tektronix Product Catalog or contact your local Tektronix Field Office or distributor.

STANDARD ACCESSORIES

The following standard accessories are provided with each instrument:

Qty	Description	Part Number
1	Power Cord and Fuse	Per option ordered; see Table 7-1
1	Operator's Manual	070-6298-01
1	Power-cord Clamp	343-0003-00
1	Washer	210-0803-00
1	Self-Tapping Screw	213-0882-00
2	Probes,10X, 2 m, with accessories	P6103

OPTIONS

Option 02

This option is intended for users who need added front-panel protection and accessories-carrying ease demanded by frequent travel to remote service sites. It includes a protective front-panel cover and an accessories pouch that attaches to the top of the instrument.

Option 1C

An oscilloscope camera is useful for capturing signle events and documenting measurement results. And it helps communicate results with clrity and credibility. Option 1C provides the Tektronix C-5C Option 04 Low-cost Camera for use with your oscilloscope.

Option 1K

When this option is specified, a K212 Portable Instrument Carty is included in the shipment. The cart provides a stable yet movable platform that is well suited for on-site instrument mobility in a variety of work areas.

Option 1R

When the oscilloscope is ordered with Option 1R, it is shipped in a configuration that permits easy installation into virtually any 19-inch-wide, electronic-equipment rack. All hardware is supplied for mounting the instrument into the rack.

Complete rackmounting instructions are provided in a separate document. These instructions also contain the procedures for converting a standard instrument into the Option 1R configuration by using the separately ordered rackmounting conversion kit.

Option 23

Two P6119 1X-10X Selectable-attenuation Probes are provided in place of the standard P6103 10X Probes.

POWER CORDS

Instruments are shipped with the detachable power-cord and fuse configuration ordered by the customer.

Table 7-1 identifies the Tektronix part numbers for international power cords and associated fuses. Additional information about power-cord options is contained in Section 2, Preparation for Use.

Table 7-1
Power Cords and Fuses

Description	Part Number
Standard (United States)	
Power Cord, 2.5 m	161-0104-00
Fuse, 1.0 A, 250 V, 3AG, 1/4" X 1/4", Slow	159-0019-00
Option A1 (Europe)	
Power Cord, 2.5 m	161-0104-06
Fuse, 0.5 A, 250 V, 3AG, 1/4" X 1/4", Slow	159-0032-00
Option A2 (United Kingdom)	
Power Cord, 2.5 m	161-0104-07
Fuse, 0.5 A, 250 V, 3AG, 1/4" X 1/4", Slow	159-0032-00
Option A3 (Australia)	
Power Cord, 2.5 m	161-0104-05
Fuse, 0.5 A, 250 V, 3AG, 1/4" X 1/4", Slow	159-0032-00
Option A4 (North America)	
Power Cord, 2.5 m	161-0104-08
Fuse, 0.5 A, 250 V, 3AG, 1/4" X 1/4", Slow	159-0032-00
Option A5 (Switzerland)	
Power Cord, 2.5 m	161-0167-00
Fuse, 0.5 A, 250 V, 3AG, 1/4" X 1/4", Slow	159-0032-00

Table 7-2
Optional Accessories

Description	Part Number
Front Panel Protective Cover	200-3397-00
Accessory Pouch	016-0677-02
Front Panel Protective Cover and Accessory Pouch	020-1514-00
Hand Carrying Case	016-0792-01
CRT Light Filter, Clear	337-2775-01
Rack Mount Conversion Kit	016-0819-00
Viewing Hoods	
Collapsible	016-0592-00
Polarised	016-0180-00
Binocular	016-0566-00
Alternative Power Cords	
European	020-0859-00
United Kingdom	020-0860-00
Australian	020-0861-00
North American	020-0862-00
Swiss	020-0863-00
Attenuator Voltage Probes	
10X Standard	P6103
10X Subminiature	P6130
10X Environmental	P6008
1X-10X Selectable	P6119
100X High Voltage	P6009
1000X High Voltage	P6015
Current Probes	P6021, P6022, A6302/AM503, A6303/AM503
Current-Probe Amplifier	134
Active Probe, 10X FET	P6202A
Active-probe Power Supply	1101A
Ground Isolation Monitor	A6901
Isolator (for multiple, independently referenced, differential measurements)	A6902B
DC Inverter	1107
DC Inverter Mounting Kit	016-0785-00
Portable Power Supply	1105
Battery Pack	1106
Oscilloscope Cameras	
Low-cost	C-5C Option 04
Motorized	C-7 Option 03 and Option 30
Portable Instrument Cart	K212
2225 Service Manual	070-6299-00

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.

component number

A23R1234 A23 R1234

Assembly number Circuit number

Read: Resistor 1234 of Assembly 23

Example b.

component number

A23A2R1234 A23 A2 R1234

Assembly number Subassembly number Circuit number

Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

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

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00853	SANGAMO WESTON INC COMPONENTS DIV	SANGAMO RD PO BOX 128	PICKENS SC 29671-9716
01121	ALLEN-BRADLEY CO	1201 S 2ND ST	MILWAUKEE WI 53204-2410
02114	AMPEREX ELECTRONIC CORP FERROXCUBE DIV	5083 KINGS HWY	SAUGERTIES NY 12477
02735	RCA CORP SOLID STATE DIVISION	ROUTE 202	SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04426	ITW SWITCHES DIV OF ILLINOIS TOOL WORKS INC	6615 W IRVING PARK RD	CHICAGO IL 60634-2410
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008-4229
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
07263	FAIRCHILD SEMICONDUCTOR CORP NORTH AMERICAN SALES SUB OF SCHLUMBERGER LTD MS 118	10400 RIDGEVIEW CT	CUPERTINO CA 95014
07716	TRW INC TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
12954	MICROSEMI CORP - SCOTTSDALE	8700 E THOMAS RD P O BOX 1390	SCOTTSDALE AZ 85252
12969	UNITRODE CORP	5 FORBES RD	LEXINGTON MA 02173-7305
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14552	MICROSEMI CORP	2830 S FAIRVIEW ST	SANTA ANA CA 92704-5948
14752	ELECTRO CUBE INC	1710 S DEL MAR AVE	SAN GABRIEL CA 91776-3825
15454	KETMA RODAN DIVISION	2900 BLUE STAR STREET	ANAHEIM CA 92806-2591
18796	MURATA ERIE NORTH AMERICAN INC STATE COLLEGE OPERATIONS	1900 W COLLEGE AVE	STATE COLLEGE PA 16801-2723
19396	ILLINOIS TOOL WORKS INC PAKTRON DIV	1205 MCCONVILLE RD PO BOX 4539	LYNCHBURG VA 24502-4535
19701	MEPCO/CENTRALAB A NORTH AMERICAN PHILIPS CO MINERAL WELLS AIRPORT	PO BOX 760	MINERAL WELLS TX 76067-0760
20932	KYOCERA INTERNATIONAL INC	11620 SORRENTO VALLEY RD PO BOX 81543 PLANT NO 1	SAN DIEGO CA 92121
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701-3737
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051-0606
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344-2224
34899	FAIR-RITE PRODUCTS CORP	1 COMMERCIAL ROW	WALLKILL NY 12589
51406	MURATA ERIE NORTH AMERICA INC HEADQUARTERS AND GEORGIA OPERATIONS	2200 LAKE PARK DR	SMYRNA GA 30080
52763	STETCO INC	3344 SCHIERHORN	FRANKLIN PARK IL 60131
52769	SPRAGUE-GOODMAN ELECTRONICS INC	134 FULTON AVE	GARDEN CITY PARK NY 11040-5352
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY PO BOX 1501	SECAUCUS NJ 07094-2917
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195-4526
56289	SPRAGUE ELECTRIC CO WORLD HEADQUARTERS	92 HAYDEN AVE	LEXINGTON MA 02173-7929
57668	ROHM CORP	8 WHATNEY PO BOX 19515	IRVINE CA 92713
59660	TUSONIX INC	7741 N BUSINESS PARK DR PO BOX 37144	TUCSON AZ 85740-7144
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
75042	IRC ELECTRONIC COMPONENTS PHILADELPHIA DIV TRW FIXED RESISTORS	401 N BROAD ST	PHILADELPHIA PA 19108-1001
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077-0001

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Mfr. Code	Manufacturer	Address	City, State, Zip Code
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601-3632
D5243	ROEDERSTEIN E SPEZIALFABRIK FUER KONDENSATOREN GMBN	LUDMILLASTRASSE 23-25	8300 LANDSHUT GERMANY
K0491	SEALECTRO LTD	WALTON ROAD FARLINGTON	PORTSMOUNT ENGLAND
K1439	STEALITE RODERSTEIN LTD HAGLEY HOUSE	EDGBASTON	BIRMINGHAM 16 ENGLAND
K2504	RS COMPONENTS LTD	PO BOX 99	CORBY NORTHANTS NN17 9RS ENGLAND
K5545	AVEL LINDBERG LTD AVELEY INDUSTRIAL EST.	ARCANY ROAD SOUTH OCKENDON	ESSEX ENGLAND
K5856	RCA LTD BEECH HOUSE	373-399 LONDON ROAD CAMBERLEY	SURREY ENGLAND
K7068	SILICONIX LTD	MORRISTON	SWANSEA WALES
K7779	SIEMENS LTD SIEMENS HOUSE	WINDMILL ROAD SUNBURY-ON-THAMES	MIDDLESEX TW16 7HS ENGLAND
K8788	PIHER INTERNATIONAL LTD	HORTON ROAD WEST DRAYTON	MIDDLESEX ENGLAND
K8996	MULLARD LIMITED	MULLARD HOUSE TORRINGTON PLACE	LONDON WC1 7 HD ENGLAND
S4239	TEIKOKU TSUSHIN CORP	335 KARI YADO NAKAHARA-KU	KAWASKI JAPAN
TK00A	G ENGLISH ELECTRONICS LTD	34 BOWATER ROAD	LONDON SE18 5TF ENGLAND
TK0213	TOPTRON CORP		TOKYO JAPAN
TK0515	ERICSSON COMPONENTS INC	403 INTERNATIONAL PKY PO BOX 853904	RICHARDSON TX 75085-3904
TK0961	NEC ELECTRONICS USA INC ELECTRON DIV	401 ELLIS ST PO BOX 7241	MOUNTAIN VIEW CA 94039
TK0DY	A F BULGIN & CO LTD	BYE PASS ROAD BARKING	ESSEX ENGLAND
TK0DZ	ACROTRONICS	WOOD BURCOTE TRADING EST.	TOWCESTER ENGLAND
TK0EA	ARMON ELECTRONICS HERON HOUSE	109 WEMBLY HILL ROAD WEMBLY	MIDDX ENGLAND
TK0ED	COMPONENTS BUREAU UNIT 4	135 DITTON WAY	CAMBRIDGE ENGLAND
TK0EE	EUREL LTD	2C PRIMROSE LAND ARLESEY	BEDFORDSHIRE ENGLAND
TK0EF	FERRANTI ELECTRONICS	FILEDS NEW ROAD SHADDERTON - OLDHAM	LANCS ENGLAND
TK0EG	G B ELECTRONIC COMPS SPINNEY ESTATE	HODDESDON ROAD	STANSTEAD ABBOTTS ENGLAND
TK0EM	MOLEX ELECTRONICS MOLEX HOUSE	FARNHAM ROAD BORDON	HAMPSHIRE ENGLAND
TK0FD	GB ELECTRONICS PRODUCTS LTD		WARE SG128EJ ENGLAND
TK0FV	EURAL LTD	ARLESEY	BEDS ENGLAND
TK1016	TOSHIBA AMERICA INC ELECTRONIC COMPONENTS DIV BUSINESS SECTOR	2692 DOW AVE	TUSTIN CA 92680
TK1573	WILHELM WESTERMAN	PO BOX 2345 AUGUSTA-ANLAGE 56	6800 MANNHEIM 1 WEST GERMANY
U1395	WELWYN ELECTRIC	BEDLINGTON	NORTHUMBERLAND NE22 7AA ENGLAND
U3771	STANLER COMPONENTS BUSINESS CENTRE	HEY LANE	BRAINTREE ENGLAND
U4144	MURATA ELECTRONICS UK LTD	SOUTHWOOD FARNBOROUGH	HANTS ENGLAND

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-9937-00	200001	202907	CIRCUIT BD ASSY:MAIN	80009	670-9937-00
A1	670-9937-05	202908		CIRCUIT BD ASSY:MAIN	80009	670-9937-05
A2	670-9936-00	200001	202907	CIRCUIT BD ASSY:ATTENUATOR & TIMEBASE	80009	670-9936-00
A2	670-9936-05	202908		CIRCUIT BD ASSY:ATTENUATOR & T/B	80009	670-9936-05
A3	670-9940-00	200001	202907	CIRCUIT BD ASSY:FRONT PANEL	80009	670-9940-00
A3	670-9940-05	202908		CIRCUIT BD ASSY:FRONT PANEL	80009	670-9940-05
A4	670-9939-00	200001	202907	CIRCUIT BD ASSY:MAINS INPUT	80009	670-9939-00
A4	670-9939-05	202908		CIRCUIT BD ASSY:MAIN INLET	80009	670-9939-05
A5	670-9938-00	200001	202907	CIRCUIT BD ASSY:FOCUS CONTROL MOUNTING	80009	670-9938-00
A5	670-9938-05	202908		CIRCUIT BD ASSY:FOCUS CONTROL	80009	670-9938-05

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-9937-00	200001	202907	CIRCUIT BD ASSY:MAIN	80009	670-9937-00
A1	670-9937-05	202908		CIRCUIT BD ASSY:MAIN	80009	670-9937-05
A1C106	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C107	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C110	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A1C111	281-0775-01	200360	201732	CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C111	281-0773-00	201733		CAP,FXD,CER DI:0.01UF,10%,100V (UNITED KINGDOM ONLY)	04222	MA201C103KAA
A1C111	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V (U.S.A. & GUERNSEY)	04222	MA201C103KAA
A1C112	281-0775-01	200360	201732	CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C112	281-0773-00	201733		CAP,FXD,CER DI:0.01UF,10%,100V (UNITED KINGDOM ONLY)	04222	MA201C103KAA
A1C112	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V (U.S.A. & GUERNSEY)	04222	MA201C103KAA
A1C114	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C115	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C116	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C124	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C125	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A1C126	283-0114-02			CAP,FXD,CER DI:1500PF,5%,200V	59660	805-405-Y5D0152J
A1C130	283-0642-00			CAP,FXD,MICA DI:33PF,+/-0.5PF,500V	00853	D105E330G0
A1C133	281-0785-00			CAP,FXD,CER DI:68PF,10%,100V	04222	MA101A680KAA
A1C153	281-0775-01	200360	201732	CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C153	281-0773-00	201733		CAP,FXD,CER DI:0.01UF,10%,100V (UNITED KINGDOM ONLY)	04222	MA201C103KAA
A1C153	281-0773-00	201733		CAP,FXD,CER DI:0.01UF,10%,100V (U.S.A. & GUERNSEY)	04222	MA201C103KAA
A1C156	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C157	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C160	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A1C164	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C165	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C174	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C175	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A1C176	283-0114-02			CAP,FXD,CER DI:1500PF,5%,200V	59660	805-405-Y5D0152J
A1C180	283-0642-00	200001	208109	CAP,FXD,MICA DI:33PF,+/-0.5PF,500V	00853	D105E330G0
A1C180	281-0158-00	208110		CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DISC TOP ADJ (UNITED KINGDOM ONLY)	59660	518-006 G 7-45
A1C180	283-0642-00	B010100	B010699	CAP,FXD,MICA DI:33PF,+/-0.5PF,500V	00853	D105E330G0
A1C180	281-0158-00	B010700		CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DISC TOP ADJ (U.S.A. ONLY)	59660	518-006 G 7-45
A1C180	283-0642-00	100001	100120	CAP,FXD,MICA DI:33PF,+/-0.5PF,500V	00853	D105E330G0
A1C180	281-0158-00	100121		CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DISC TOP ADJ (GUERNSEY ONLY)	59660	518-006 G 7-45
A1C215	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C216	281-0756-00	202908		CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V (UNITED KINGDOM ONLY)	04222	SA102A2R2DAA
A1C216	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V (U.S.A. & GUERNSEY)	04222	SA102A2R2DAA
A1C217	281-0756-00	202908		CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V (UNITED KINGDOM ONLY)	04222	SA102A2R2DAA
A1C217	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V (U.S.A. & GUERNSEY)	04222	SA102A2R2DAA
A1C220	281-0775-01	203972		CAP,FXD,CER DI:0.1UF,20%,50V (UNITED KINGDOM ONLY)	04222	SA105E104MAA
A1C220	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V (U.S.A. & GUERNSEY)	04222	SA105E104MAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1C225	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V (UNITED KINGDOM ONLY) (UNITED KINGDOM ONLY)	04222	MA101C102KAA
A1C225	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY) (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C237	281-0140-00			CAP,VAR,CER DI:5-25PF,100V	59660	518-023A 5-25
A1C239	281-0776-00			CAP,FXD,CER DI:120PF,5%,100V	20932	401E0100AD121J
A1C240	283-0331-00			CAP,FXD,CER DI:43PF,2%,100V	18796	DD106B10NP0430J
A1C241	281-0816-00			CAP,FXD,CER DI:82 PF,5%,100V	04222	MA106A820JAA
A1C242	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A1C250	281-0768-00			CAP,FXD,CER DI:470PF,20%,100V	04222	MA101A471MAA
A1C251	281-0768-00			CAP,FXD,CER DI:470PF,20%,100V	04222	MA101A471MAA
A1C255	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C255	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C255	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C256	281-0214-00			CAP,VAR,CER DI:0.6-3PF,400V	52763	313613-140
A1C257	281-0214-00			CAP,VAR,CER DI:0.6-3PF,400V	52763	313613-140
A1C258	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C262	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C281	281-0775-01	200360	202907	CAP,FXD,CER DI:0.1UF,20%,50V (UNITED KINGDOM ONLY)	04222	SA105E104MAA
A1C292	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A1C304	281-0768-00			CAP,FXD,CER DI:470PF,20%,100V	04222	MA101A471MAA
A1C305	281-0768-00			CAP,FXD,CER DI:470PF,20%,100V	04222	MA101A471MAA
A1C310	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	04222	MA101A270MAA
A1C335	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	04222	MA101A270MAA
A1C340	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	04222	MA101A270MAA
A1C349	285-1385-00			CAP,FXD,PLASTIC:43PF,2.5%,630V	K7779	B31063-A6430-H6
A1C351	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C353	281-0810-00	202908	204242	CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A1C353	281-0812-00	204243	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C353	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C353	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C369	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C372	281-0815-00			CAP,FXD,CER DI:0.027UF,20%,50V	04222	MA205C273MAA
A1C380	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C384	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TKOED	TWSS
A1C387	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	04222	MA101A270MAA
A1C389	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C396	281-0814-00	207212		CAP,FXD,CER DI:100 PF,10%,100V (UNITED KINGDOM ONLY)	04222	MA101A101KAA
A1C396	281-0814-00	100041		CAP,FXD,CER DI:100 PF,10%,100V (GUERNSEY ONLY)	04222	MA101A101KAA
A1C396	281-0814-00	B010463		CAP,FXD,CER DI:100 PF,10%,100V (U.S.A. ONLY)	04222	MA101A101KAA
A1C398	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C400	281-0762-00	200757		CAP,FXD,CER DI:27PF,20%,100V (UNITED KINGDOM ONLY)	04222	MA101A270MAA
A1C400	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V (U.S.A. & GUERNSEY)	04222	MA101A270MAA
A1C401	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C408	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C418	290-1150-00			CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC	K8996	030-25159
A1C430	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C431	290-1150-00			CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC	K8996	030-25159

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1C435	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C439	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C451	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C452	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C455	290-1150-00	202908		CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC (UNITED KINGDOM ONLY)	K8996	030-25159
A1C455	290-1150-00			CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC (U.S.A. & GUERNSEY)	K8996	030-25159
A1C462	290-0743-00			CAP,FXD,ELCTLT:100UF,+50%-20%,16WVDC	54473	ECE-B16V100L
A1C464	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C471	290-1150-00			CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC	K8996	030-25159
A1C472	290-1150-00			CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC	K8996	030-25159
A1C473	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A1C480	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C481	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C489	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A1C495	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C496	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C500	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C501	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A1C503	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A1C504	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C505	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C506	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C510	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C511	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C513	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C514	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C515	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C516	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C516	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C516	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C517	281-0776-00			CAP,FXD,CER DI:120PF,5%,100V	20932	401E0100AD121J
A1C519	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C520	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C525	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	SA102A150MAA
A1C530	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C536	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A1C537	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C538	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C538	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C538	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C539	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C539	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C539	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C540	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A1C545	283-0119-02			CAP,FXD,CER DI:2200PF,5%,200V	59660	855-402-Y5E0222J
A1C547	281-0768-00			CAP,FXD,CER DI:470PF,20%,100V	04222	MA101A471MAA
A1C550	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C554	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C554	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C554	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1C555	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C560	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C561	281-0812-00	200360	205110	CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C561	281-0865-00	205111		CAP,FXD,CER DI:1000PF,5%,100V (UNITED KINGDOM ONLY)	04222	SA201A102JAA
A1C561	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V (U.S.A. & GUERNSEY)	04222	SA201A102JAA
A1C562	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C570	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C571	281-0785-00			CAP,FXD,CER DI:68PF,10%,100V	04222	MA101A680KAA
A1C572	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	SA102A150MAA
A1C584	281-0775-01	200001	208549	CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C584	285-1341-00	208550		CAP,FXD,PLASTIC:0.1UF,20%,100V (UNITED KINGDOM ONLY)	TK1573	MKS2 0.1/100/20
A1C584	281-0775-01	B010100	B011072	CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C584	285-1341-00	B011073		CAP,FXD,PLASTIC:0.1UF,20%,100V (U.S.A. ONLY)	TK1573	MKS2 0.1/100/20
A1C584	281-0775-01	100001	100227	CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C584	285-1341-00	100228		CAP,FXD,PLASTIC:0.1UF,20%,100V (GUERNSEY ONLY)	TK1573	MKS2 0.1/100/20
A1C587	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C776	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C780	281-0771-00			CAP,FXD,CER DI:2200PF,20%,200V	04222	SA106E222MAA
A1C782	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C784	283-0317-00	200360	202907	CAP,FXD,CER DI:1PF,+/-0.1PF,500V	59660	861518C0K0109B
A1C784	281-0214-00	202908		CAP,VAR,CER DI:0.6-3PF,400V (UNITED KINGDOM ONLY)	52763	313613-140
A1C784	281-0214-00			CAP,VAR,CER DI:0.6-3PF,400V (U.S.A. & GUERNSEY)	52763	313613-140
A1C785	285-1101-00			CAP,FXD,PLASTIC:0.022UF,10%,200V	19396	223K02PT485
A1C789	281-0771-00			CAP,FXD,CER DI:2200PF,20%,200V	04222	SA106E222MAA
A1C794	281-0214-00			CAP,VAR,CER DI:0.6-3PF,400V	52763	313613-140
A1C795	285-1101-00			CAP,FXD,PLASTIC:0.022UF,10%,200V	19396	223K02PT485
A1C799	281-0771-00			CAP,FXD,CER DI:2200PF,20%,200V	04222	SA106E222MAA
A1C805	290-1150-00			CAP,FXD,ELCTLT:15UF,+50%-10%,16WVDC	K8996	030-25159
A1C819	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C824	281-0785-00			CAP,FXD,CER DI:68PF,10%,100V	04222	MA101A680KAA
A1C825	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C828	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C832	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C834	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C835	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C845	281-0771-00			CAP,FXD,CER DI:2200PF,20%,200V	04222	SA106E222MAA
A1C847	283-0057-00	200360	200727	CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C847	285-1341-00	200728		CAP,FXD,PLASTIC:0.1UF,20%,100V (UNITED KINGDOM ONLY)	TK1573	MKS2 0.1/100/20
A1C847	285-1341-00			CAP,FXD,PLASTIC:0.1UF,20%,100V (U.S.A. & GUERNSEY)	TK1573	MKS2 0.1/100/20
A1C849	283-0057-00	200360	200727	CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C849	285-1341-00	200728		CAP,FXD,PLASTIC:0.1UF,20%,100V (UNITED KINGDOM ONLY)	TK1573	MKS2 0.1/100/20
A1C849	285-1341-00			CAP,FXD,PLASTIC:0.1UF,20%,100V (U.S.A. & GUERNSEY)	TK1573	MKS2 0.1/100/20
A1C851	283-0057-00	200360	200727	CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C851	285-1341-00	200728		CAP,FXD,PLASTIC:0.1UF,20%,100V (UNITED KINGDOM ONLY)	TK1573	MKS2 0.1/100/20
A1C851	285-1341-00			CAP,FXD,PLASTIC:0.1UF,20%,100V (U.S.A. & GUERNSEY)	TK1573	MKS2 0.1/100/20
A1C853	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C854	283-0279-00			CAP,FXD,CER DI:0.001UF,20%,3000V	51406	DHR12Y5S102M3KV
A1C855	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	56289	430P591

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1C871	283-0057-00	200360	200727	CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C871	285-1341-00	200728		CAP,FXD,PLASTIC:0.1UF,20%,100V (UNITED KINGDOM ONLY)	TK1573	MKS2 0.1/100/20
A1C871	285-1341-00			CAP,FXD,PLASTIC:0.1UF,20%,100V (U.S.A. & GUERNSEY)	TK1573	MKS2 0.1/100/20
A1C875	283-0057-00	200360	200727	CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C875	285-1341-00	200728		CAP,FXD,PLASTIC:0.1UF,20%,100V (UNITED KINGDOM ONLY)	TK1573	MKS2 0.1/100/20
A1C875	285-1341-00			CAP,FXD,PLASTIC:0.1UF,20%,100V (U.S.A. & GUERNSEY)	TK1573	MKS2 0.1/100/20
A1C893	283-0279-00			CAP,FXD,CER DI:0.001UF,20%,3000V	51406	DHR12Y5S102M3KV
A1C901	281-0815-00			CAP,FXD,CER DI:0.027UF,20%,50V	04222	MA205C273MAA
A1C902	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C908	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A1C909	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C910	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C911	283-0057-00			CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C912	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C913	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A1C914	290-1160-00			CAP,FXD,ELCTLT:15UF,20%,63V	K8996	035-58159
A1C915	290-0768-00	202908		CAP,FXD,ELCTLT:10UF,+50-20%,100WVDC (UNITED KINGDOM ONLY)	54473	ECE-A100V10L
A1C915	290-0768-00			CAP,FXD,ELCTLT:10UF,+50-20%,100WVDC (U.S.A. & GUERNSEY)	54473	ECE-A100V10L
A1C924	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C927	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C932	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C933	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C939	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	MA106C331MAA
A1C940	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A1C941	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C942	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C952	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A1C953	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A1C962	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C963	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C970	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A1C971	290-0831-00			CAP,FXD,ELCTLT:470UF,+50-20%,50V	54473	ECE-A1HV471S
A1C972	290-0831-00			CAP,FXD,ELCTLT:470UF,+50-20%,50V	54473	ECE-A1HV471S
A1C975	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	56289	430P591
A1C976	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	56289	430P591
A1C979	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	56289	430P591
A1C982	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A1C983	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A1C984	290-0947-00			CAP,FXD,ELCTLT:33UF,+50-10%,160V W/SLEEVE	55680	UHC2C330TFA
A1C986	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TK0ED	TWSS
A1C987	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TK0ED	TWSS
A1C988	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TK0ED	TWSS
A1C989	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TK0ED	TWSS
A1C990	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TK0ED	TWSS
A1C991	290-1159-00			CAP,FXD,ELCTLT:1000UF,20%,16V	TK0ED	TWSS
A1CR104	152-0141-02	200360	202261	SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR104	152-0322-00	202262		SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (UNITED KINGDOM ONLY)	TK0961	1SS97(2)T
A1CR104	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (U.S.A. & GUERNSEY)	TK0961	1SS97(2)T
A1CR105	152-0141-02	200360	202261	SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR105	152-0322-00	202262		SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (UNITED KINGDOM ONLY)	TK0961	1SS97(2)T

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A1CR105	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (U.S.A. & GUERNSEY)	TK0961	1SS97(2)T
A1CR111	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR112	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR133	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR136	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR139	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR154	152-0141-02	200360	202261	SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR154	152-0322-00	202262		SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (UNITED KINGDOM ONLY)	TK0961	1SS97(2)T
A1CR154	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (U.S.A. & GUERNSEY)	TK0961	1SS97(2)T
A1CR155	152-0141-02	200360	202261	SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR155	152-0322-00	202262		SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (UNITED KINGDOM ONLY)	TK0961	1SS97(2)T
A1CR155	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (U.S.A. & GUERNSEY)	TK0961	1SS97(2)T
A1CR161	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR162	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR183	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR186	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR189	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR300	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR301	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR302	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR319	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR344	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR347	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR348	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR349	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR357	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR369	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR370	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR417	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR420	152-0141-02	202908		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (UNITED KINGDOM ONLY)	03508	DA2527 (1N4152)
A1CR420	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (U.S.A. & GUERNSEY)	03508	DA2527 (1N4152)
A1CR421	152-0141-02	202908		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (UNITED KINGDOM ONLY)	03508	DA2527 (1N4152)
A1CR421	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (U.S.A. & GUERNSEY)	03508	DA2527 (1N4152)
A1CR431	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR432	152-0322-00	202203		SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (UNITED KINGDOM ONLY)	TK0961	1SS97(2)T
A1CR432	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35 (U.S.A. & GUERNSEY)	TK0961	1SS97(2)T
A1CR435	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR438	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR440	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR441	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR442	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR443	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR444	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR445	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR446	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR447	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR510	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR511	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR513	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1CR521	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR530	152-0141-02	201795		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (UNITED KINGDOM ONLY)	03508	DA2527 (1N4152)
A1CR530	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (U.S.A. & GUERNSEY)	03508	DA2527 (1N4152)
A1CR539	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR540	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR571	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR584	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR588	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR589	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR776	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR780	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR781	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR790	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR791	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR816	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR817	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR818	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR819	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR821	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR822	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR823	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR824	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35	TK0961	1SS97(2)T
A1CR825	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR827	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR828	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR829	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR830	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR840	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR845	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR851	152-0242-00			SEMICOND DVC,DI:SIG,SI,225V,0.2A,DO-7	07263	FDH5004
A1CR853	152-0242-00			SEMICOND DVC,DI:SIG,SI,225V,0.2A,DO-7	07263	FDH5004
A1CR854	152-0242-00			SEMICOND DVC,DI:SIG,SI,225V,0.2A,DO-7	07263	FDH5004
A1CR855	152-0242-00			SEMICOND DVC,DI:SIG,SI,225V,0.2A,DO-7	07263	FDH5004
A1CR912	152-0808-00			SEMICOND DVC,DI:RECT,SI,400V,1.5 A,50 NS	80009	152-0808-00
A1CR915	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR923	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR933	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR953	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR983	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR984	152-0413-00	200360	201732	SEMICOND DVC,DI:RECT,SI,400V,1.0A,A59	80009	152-0413-00
A1CR984	152-0414-00	201733		SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (UNITED KINGDOM ONLY)	80009	152-0414-00
A1CR984	152-0414-00			SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (U.S.A. & GUERNSEY)	80009	152-0414-00
A1CR985	152-0413-00	200360	201732	SEMICOND DVC,DI:RECT,SI,400V,1.0A,A59	80009	152-0413-00
A1CR985	152-0414-00	201733		SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (UNITED KINGDOM ONLY)	80009	152-0414-00
A1CR985	152-0414-00			SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (U.S.A. & GUERNSEY)	80009	152-0414-00
A1CR986	152-0413-00	200360	201732	SEMICOND DVC,DI:RECT,SI,400V,1.0A,A59	80009	152-0413-00
A1CR986	152-0414-00	201733		SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (UNITED KINGDOM ONLY)	80009	152-0414-00
A1CR986	152-0414-00			SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (U.S.A. & GUERNSEY)	80009	152-0414-00
A1CR987	152-0413-00	200360	201732	SEMICOND DVC,DI:RECT,SI,400V,1.0A,A59	80009	152-0413-00
A1CR987	152-0414-00	201733		SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (UNITED KINGDOM ONLY)	80009	152-0414-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1CR987	152-0414-00			SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (U.S.A. & GUERNSEY)	80009	152-0414-00
A1CR988	152-0413-00	200360	201732	SEMICOND DVC,DI:RECT,SI,400V,1.0A,A59	80009	152-0413-00
A1CR988	152-0414-00	201733		SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (UNITED KINGDOM ONLY)	80009	152-0414-00
A1CR988	152-0414-00			SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (U.S.A. & GUERNSEY)	80009	152-0414-00
A1CR989	152-0413-00	200360	201732	SEMICOND DVC,DI:RECT,SI,400V,1.0A,A59	80009	152-0413-00
A1CR989	152-0414-00	201733		SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (UNITED KINGDOM ONLY)	80009	152-0414-00
A1CR989	152-0414-00			SEMICOND DVC,DI:RECT,SI,200V,1.0A,TEK A59 (U.S.A. & GUERNSEY)	80009	152-0414-00
A1CR990	152-0601-01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	04713	MUR115RL
A1CR991	152-0601-01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	04713	MUR115RL
A1DS856	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	TK0213	JH005/3011JA
A1DS858	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	TK0213	JH005/3011JA
A1DS870	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	TK0213	JH005/3011JA
A1E102	276-0752-00	203186	203764	CORE,EM:FERRITE	34899	2743001111
A1E102	276-0532-00	203765		SHLD BEAD,ELEK:FERRITE (UNITED KINGDOM ONLY)	02114	56-590-65/4A6
A1E102	276-0532-00			SHLD BEAD,ELEK:FERRITE (U.S.A. & GUERNSEY)	02114	56-590-65/4A6
A1E103	276-0752-00	203186	203764	CORE,EM:FERRITE	34899	2743001111
A1E103	276-0532-00	203765		SHLD BEAD,ELEK:FERRITE (UNITED KINGDOM ONLY)	02114	56-590-65/4A6
A1E103	276-0532-00			SHLD BEAD,ELEK:FERRITE (U.S.A. & GUERNSEY)	02114	56-590-65/4A6
A1E152	276-0752-00	203186	203764	CORE,EM:FERRITE	34899	2743001111
A1E152	276-0532-00	203765		SHLD BEAD,ELEK:FERRITE (UNITED KINGDOM ONLY)	02114	56-590-65/4A6
A1E152	276-0532-00			SHLD BEAD,ELEK:FERRITE (U.S.A. & GUERNSEY)	02114	56-590-65/4A6
A1E153	276-0752-00	203186	203764	CORE,EM:FERRITE	34899	2743001111
A1E153	276-0532-00	203765		SHLD BEAD,ELEK:FERRITE (UNITED KINGDOM ONLY)	02114	56-590-65/4A6
A1E153	276-0532-00			SHLD BEAD,ELEK:FERRITE (U.S.A. & GUERNSEY)	02114	56-590-65/4A6
A1J1	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A1J2	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A1J3	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A1J4	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A1J5	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A1J6	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A1L910	108-1376-00			COIL,RF:FXD,POWER INDUCTOR	TK0EG	ORDER BY DESCR
A1L970	108-1375-00			COIL,RF:FXD,82UH,1A	TK00A	RL-1218-820K-1A
A1L986	108-1375-00			COIL,RF:FXD,82UH,1A	TK00A	RL-1218-820K-1A
A1L988	108-1375-00			COIL,RF:FXD,82UH,1A	TK00A	RL-1218-820K-1A
A1L990	108-1375-00			COIL,RF:FXD,82UH,1A	TK00A	RL-1218-820K-1A
A1P900	198-5589-00	200001	208557	WIRE SET,ELEC:	TK0EE	ORDER BY DESCR
A1P900	198-5589-01	208558		WIRE SET,ELEC:	TK0FV	ORDER BY DESCR
A1Q102	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q103	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q104	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q105	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q114	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q115	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q152	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q153	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q154	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q155	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1Q164	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q165	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q202	151-0471-00	200360	202907	TRANSISTOR:NPN,SI,TO-92	04713	SPS8619
A1Q202	151-0711-02	202908		TRANSISTOR:NPN,SI,TO-92 (UNITED KINGDOM ONLY)	27014	X42094B
A1Q202	151-0711-02			TRANSISTOR:NPN,SI,TO-92 (U.S.A. & GUERNSEY)	27014	X42094B
A1Q203	151-0471-00	200360	202907	TRANSISTOR:NPN,SI,TO-92	04713	SPS8619
A1Q203	151-0711-02	202908		TRANSISTOR:NPN,SI,TO-92 (UNITED KINGDOM ONLY)	27014	X42094B
A1Q203	151-0711-02			TRANSISTOR:NPN,SI,TO-92 (U.S.A. & GUERNSEY)	27014	X42094B
A1Q206	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
A1Q207	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
A1Q230	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
A1Q231	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
A1Q254	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q255	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q256	151-0869-00			TRANSISTOR:NPN,SI,TO-39	TK0EF	2N3866
A1Q257	151-0869-00			TRANSISTOR:NPN,SI,TO-39	TK0EF	2N3866
A1Q283	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A1Q284	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q285	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q363	151-0711-01			TRANSISTOR:NPN,SI,TO-92	04713	SPS8608M
A1Q365	151-0711-01			TRANSISTOR:NPN,SI,TO-92	04713	SPS8608M
A1Q366	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q367	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q368	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q400	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q401	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A1Q415	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q420	151-0190-00	202908		TRANSISTOR:NPN,SI,TO-92 (UNITED KINGDOM ONLY)	80009	151-0190-00
A1Q420	151-0190-00			TRANSISTOR:NPN,SI,TO-92 (U.S.A. & GUERNSEY)	80009	151-0190-00
A1Q435	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q440	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q465	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q487	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q488	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q489	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q514	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q535	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q536	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q770	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q775	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916
A1Q776	151-0350-00			TRANSISTOR:PNP,SI,TO-92	04713	2N5401
A1Q779	151-0350-00			TRANSISTOR:PNP,SI,TO-92	04713	2N5401
A1Q780	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q785	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916
A1Q789	151-0350-00			TRANSISTOR:PNP,SI,TO-92	04713	2N5401
A1Q804	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q817	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1Q825	151-0424-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0424-00
A1Q829	151-0199-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0199-00
A1Q835	151-0199-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0199-00
A1Q840	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916
A1Q845	151-0350-00			TRANSISTOR:PNP,SI,TO-92	04713	2N5401
A1Q885	151-0443-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0443-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1Q911	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916
A1Q912	151-0350-00			TRANSISTOR:PNP,SI,TO-92	04713	2N5401
A1Q913	151-0462-00			TRANSISTOR:PNP,SI,TO-220	80009	151-0462-00
A1Q918	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q921	151-0276-01			TRANSISTOR:PNP,SI,TO-92	TK1016	S1423-TPE2
A1Q923	151-0476-02			TRANSISTOR:SELECTED	80009	151-0476-02
A1Q930	151-0424-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0424-00
A1Q940	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916
A1Q950	151-0462-00			TRANSISTOR:PNP,SI,TO-220	80009	151-0462-00
A1Q960	151-0424-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0424-00
A1Q970	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916
A1Q980	151-0462-00			TRANSISTOR:PNP,SI,TO-220	80009	151-0462-00
A1R100	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R101	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R102	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0	07716	CEAD402R0F
A1R103	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0	07716	CEAD402R0F
A1R104	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R105	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R106	321-0163-00			RES,FXD,FILM:487 OHM,1%,0.125W,TC=T0	07716	CEAD487R0F
A1R107	311-2355-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5W	K8788	TC10-LV10-100R/A
A1R108	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R109	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R110	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A1R111	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A1R112	311-2361-00			RES,VAR,NONWW:TRMR,10K OHM,0.5W	K8788	TC10-LV10-10K/A
A1R114	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R115	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R116	315-0101-00	200360	202907	RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R117	315-0101-00	200360	202907	RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R117	315-0510-00	202908		RES,FXD,FILM:51 OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX51R00J
A1R117	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX51R00J
A1R118	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A1R119	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A1R120	321-0123-00			RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R121	321-0123-00			RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R122	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R124	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R125	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R126	315-0162-00			RES,FXD,FILM:1.6K OHM,5%,0.25W	19701	5043CX1K600J
A1R127	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R128	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A1R130	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R131	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R132	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R133	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R135	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R136	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R139	315-0102-00	B010100	E209928	RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R139	315-0102-00	E209929		RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R139	315-0222-00	G100809		RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R140	311-2364-00	B010100	E209929	RES,VAR,NONWW:TRMR,4.7K OHM,0.5W	K8788	TC10-LV10-4K7/A
A1R142	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R143	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R144	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R145	311-2354-00			RES,VAR,NONWW:TRMR,4.7K OHM,0.5W	K8788	TC10-LH2.5-4K7/A
A1R150	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J

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A1R151	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R152	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0	07716	CEAD402R0F
A1R153	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0	07716	CEAD402R0F
A1R154	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R155	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R156	321-0163-00			RES,FXD,FILM:487 OHM,1%,0.125W,TC=T0	07716	CEAD487R0F
A1R157	311-2355-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5W	K8788	TC10-LV10-100R/A
A1R158	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R159	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R160	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A1R161	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A1R162	311-2361-00			RES,VAR,NONWW:TRMR,10K OHM,0.5W	K8788	TC10-LV10-10K/A
A1R164	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R165	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R166	315-0101-00	200360	202907	RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R167	315-0101-00	200360	202907	RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R167	315-0510-00	202908		RES,FXD,FILM:51 OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX51R00J
A1R167	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX51R00J
A1R168	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A1R169	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A1R170	321-0123-00			RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R171	321-0123-00			RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R172	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R174	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R175	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R176	315-0162-00			RES,FXD,FILM:1.6K OHM,5%,0.25W	19701	5043CX1K600J
A1R177	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R178	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A1R180	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R181	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R182	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R183	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R185	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R186	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R189	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R192	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R193	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R194	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R195	311-2354-00			RES,VAR,NONWW:TRMR,4.7K OHM,0.5W	K8788	TC10-LH2.5-4K7/A
A1R202	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0	07716	CEAD698R0F
A1R203	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0	07716	CEAD698R0F
A1R204	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R206	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A1R207	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A1R212	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R213	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R215	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A1R216	321-0163-00			RES,FXD,FILM:487 OHM,1%,0.125W,TC=T0	07716	CEAD487R0F
A1R217	321-0163-00			RES,FXD,FILM:487 OHM,1%,0.125W,TC=T0	07716	CEAD487R0F
A1R218	321-0109-00			RES,FXD,FILM:133 OHM,1%,0.125W,TC=T0	07716	CEAD133R0F
A1R219	321-0109-00			RES,FXD,FILM:133 OHM,1%,0.125W,TC=T0	07716	CEAD133R0F
A1R222	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R223	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R225	315-0752-00	200360	207594	RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A1R225	321-0255-00	207595		RES,FXD,FILM:4.42K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED4K420F

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R225	321-0255-00			RES,FXD,FILM:4.42K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED4K420F
A1R226	321-0361-00	200360	207594	RES,FXD,FILM:56.2K OHM,1%,0.125W,TC=T0	07716	CEAD56201F
A1R226	321-0337-00	207595		RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD31601F
A1R226	321-0337-00			RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD31601F
A1R230	321-0093-00			RES,FXD,FILM:90.9 OHM,1%,0.125W,TC=T0	19701	5043ED90R90F
A1R231	321-0093-00			RES,FXD,FILM:90.9 OHM,1%,0.125W,TC=T0	19701	5043ED90R90F
A1R233	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R234	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R235	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R236	315-0621-00	200360	205110	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A1R236	321-0172-00	205111		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A1R236	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED604R0F
A1R239	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R240	311-2365-00			RES,VAR,NONWW:TRMR,470 OHM,0.75W	K8788	TC10-LV10-470K/A
A1R241	311-2364-00			RES,VAR,NONWW:TRMR,4.7K OHM,0.5W	K8788	TC10-LV10-4K7/A
A1R242	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	57668	NTR25J-E27K0
A1R244	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	19701	5033ED604R0F
A1R245	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	19701	5033ED604R0F
A1R250	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R251	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R254	321-0109-00			RES,FXD,FILM:133 OHM,1%,0.125W,TC=T0	07716	CEAD133R0F
A1R255	321-0109-00			RES,FXD,FILM:133 OHM,1%,0.125W,TC=T0	07716	CEAD133R0F
A1R256	307-1361-00			RES,FXD,FILM:2.2K OHM,1%,0.5W,TC=15PPM	K1439	MK3
A1R257	307-1361-00			RES,FXD,FILM:2.2K OHM,1%,0.5W,TC=15PPM	K1439	MK3
A1R258	315-0181-00			RES,FXD,FILM:180 OHM,5%,0.25W	57668	NTR25J-E180E
A1R259	315-0181-00			RES,FXD,FILM:180 OHM,5%,0.25W	57668	NTR25J-E180E
A1R261	307-1340-00			RES,FXD,FILM:22 OHM,5%,1W	K1439	5K/5
A1R262	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R266	308-0907-00	B010100	B010139	RES,FXD,WW:330 OHM,5%,4W	K2504	155-469
A1R266	308-0936-00	B010140		RES,FXD,WW:330OHM,5%,7W	U1395	ORDER BY DESCR
A1R267	308-0907-00	B010100	B010139	RES,FXD,WW:330 OHM,5%,4W	K2504	155-469
A1R267	308-0936-00	B010140		RES,FXD,WW:330OHM,5%,7W	U1395	ORDER BY DESCR
A1R268	303-0155-00	B010140		RES,FXD,CMPSN:1.5M OHM,5%,1W	01121	GB1555
A1R272	301-0101-00			RES,FXD,FILM:100 OHM,5%,0.5W	01121	EB1015
A1R273	301-0101-00			RES,FXD,FILM:100 OHM,5%,0.5W	01121	EB1015
A1R279	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A1R281	315-0821-00	200360	202907	RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A1R281	315-0272-00	202908	205110	RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A1R281	321-0233-00	205111		RES,FXD,FILM:2.61K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD26100F
A1R281	321-0233-00			RES,FXD,FILM:2.61K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD26100F
A1R282	315-0302-00	200360	202907	RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A1R282	315-0182-00	202908		RES,FXD,FILM:1.8K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E1K8
A1R282	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E1K8
A1R283	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R284	315-0621-00	200360	205110	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A1R284	321-0172-00	205111		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A1R284	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED604R0F
A1R285	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R286	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F

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A1R287	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R288	315-0431-00	200360	205110	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R288	321-0158-00	205111		RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD432R0F
A1R288	321-0158-00			RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD432R0F
A1R289	315-0431-00	200360	205110	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R289	321-0158-00	205111		RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD432R0F
A1R289	321-0158-00			RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD432R0F
A1R290	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A1R291	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A1R292	321-0182-00			RES,FXD,FILM:768 OHM,1%,0.125W,TC=T0	07716	CEAD768R0F
A1R293	315-0120-00			RES,FXD,FILM:12 OHM,5%,0.25W	57668	NTR25J-R12
A1R294	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	19701	5033ED604R0F
A1R295	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	19701	5033ED604R0F
A1R300	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	57668	NTR25J-E27K0
A1R301	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	57668	NTR25J-E27K0
A1R302	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R303	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R304	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R305	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R306	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R307	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R308	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R309	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R310	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R311	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R312	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R313	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R314	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R315	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R316	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R317	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A1R318	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A1R319	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R320	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R321	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R322	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R323	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R325	321-0068-00	200360	202907	RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R325	315-0101-00	202908		RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R325	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E 100E
A1R326	321-0068-00	200360	202907	RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R326	315-0101-00	202908		RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R326	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E 100E
A1R327	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0	07716	CEAD402R0F
A1R328	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0	07716	CEAD402R0F
A1R329	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R330	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R331	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A1R332	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A1R333	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R334	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R335	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R336	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R337	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R338	311-2365-00			RES,VAR,NONWW:TRMR,470 OHM,0.75W	K8788	TC10-LV10-470K/A
A1R339	321-0068-00	200360	202907	RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R339	315-0101-00	202908		RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R339	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E 100E
A1R340	321-0068-00	200360	202907	RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R340	315-0101-00	202908		RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R340	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E 100E
A1R343	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R344	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R345	321-0068-00	200360	202907	RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R345	315-0101-00	202908		RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R345	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E 100E
A1R346	321-0068-00	200360	202907	RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R346	315-0101-00	202908		RES,FXD,FILM:100 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 100E
A1R346	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E 100E
A1R347	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R348	315-0472-00	200360	203422	RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R348	315-0512-00	203423		RES,FXD,FILM:5.1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E05K1
A1R348	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E05K1
A1R349	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R351	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R352	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R353	315-0182-00	202908		RES,FXD,FILM:1.8K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E1K8
A1R353	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E1K8
A1R354	315-0103-00	200360	202056	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R354	321-0172-00	202057		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A1R354	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED604R0F
A1R355	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R356	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R357	315-0182-00	200360	202056	RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R357	321-0093-00	202057		RES,FXD,FILM:90.9 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5043ED90R90F
A1R357	321-0093-00			RES,FXD,FILM:90.9 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5043ED90R90F
A1R358	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R359	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R360	311-2361-00			RES,VAR,NONWW:TRMR,10K OHM,0.5W	K8788	TC10-LV10-10K/A
A1R361	315-0431-00	200360	200756	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R361	315-0621-00	200757	207594	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A1R361	321-0172-00	207595		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A1R361	315-0621-00	100001	100120	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A1R361	321-0172-00	100121		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (GUERNSEY ONLY)	19701	5033ED604R0F

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R361	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. ONLY)	19701	5033ED604R0F
A1R362	315-0202-00	200360	202907	RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R362	315-0102-00	202908		RES,FXD,FILM:1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25JE01K0
A1R362	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25JE01K0
A1R363	321-0123-00			RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R364	321-0123-00			RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R366	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R367	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A1R368	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A1R369	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R374	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R375	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R380	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R381	315-0103-00	200360	207594	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R381	315-0620-00	207595		RES,FXD,FILM:62 OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX63R00J
A1R381	315-0620-00			RES,FXD,FILM:62 OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX63R00J
A1R384	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R385	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R386	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R387	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R388	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R389	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R390	321-0318-00	200360	207594	RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R390	315-0752-00	207595		RES,FXD,FILM:7.5K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E07K5
A1R390	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E07K5
A1R391	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R392	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R393	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R394	315-0103-00	200360	207211	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R394	315-0202-00	207212		RES,FXD,FILM:2K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E 2K
A1R394	315-0103-00	B010100	B010462	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R394	315-0202-00	B010463		RES,FXD,FILM:2K OHM,5%,0.25W (U.S.A. ONLY)	57668	NTR25J-E 2K
A1R394	315-0103-00	100001	100040	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R394	315-0202-00	100041		RES,FXD,FILM:2K OHM,5%,0.25W (GUERNSEY ONLY)	57668	NTR25J-E 2K
A1R395	311-2363-00			RES,VAR,NONWW:TRMR,1K OHM,0.5W	K8788	TC10-LV10-1K/A
A1R396	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R397	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R398	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R400	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R401	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R402	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R403	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R404	315-0120-00			RES,FXD,FILM:12 OHM,5%,0.25W	57668	NTR25J-R12
A1R405	315-0120-00			RES,FXD,FILM:12 OHM,5%,0.25W	57668	NTR25J-R12
A1R406	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R407	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R408	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R409	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A1R410	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R412	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R413	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A1R414	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R415	315-0120-00			RES,FXD,FILM:12 OHM,5%,0.25W	57668	NTR25J-R12
A1R416	315-0184-00	200360	200756	RES,FXD,FILM:180K OHM,5%,0.25W	19701	5043CX180K0J
A1R416	315-0204-00	200757		RES,FXD,FILM:200K OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX200K0J
A1R416	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX200K0J
A1R417	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A1R418	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R419	315-0104-00	202908		RES,FXD,FILM:100K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E100K
A1R419	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E100K
A1R420	315-0104-00	202908		RES,FXD,FILM:100K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E100K
A1R420	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E100K
A1R421	315-0103-00	202908		RES,FXD,FILM:10K OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX10K00J
A1R421	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX10K00J
A1R422	315-0101-00	200360	200756	RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R422	315-0221-00	200757		RES,FXD,FILM:220 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E220E
A1R422	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E220E
A1R423	315-0101-00	200360	200756	RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R423	315-0221-00	200757		RES,FXD,FILM:220 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E220E
A1R423	315-0221-00	200757		RES,FXD,FILM:220 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E220E
A1R424	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R425	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R427	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R428	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A1R429	315-0221-00	200360	206385	RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R429	315-0510-00	206386		RES,FXD,FILM:51 OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX51R00J
A1R429	315-0221-00	B010100	B010462	RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R429	315-0510-00	B010463		RES,FXD,FILM:51 OHM,5%,0.25W (U.S.A. ONLY)	19701	5043CX51R00J
A1R429	315-0221-00	100001	100010	RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R429	315-0510-00	100011		RES,FXD,FILM:51 OHM,5%,0.25W (GUERNSEY ONLY)	19701	5043CX51R00J
A1R430	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R432	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R433	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A1R434	315-0221-00	200360	200756	RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R434	315-0391-00	200757		RES,FXD,FILM:390 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E390E
A1R434	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E390E
A1R435	321-0123-00	200360	200756	RES,FXD,FILM:187 OHM,1%,0.125W, TC=T0	07716	CEAD187R0F
A1R435	321-0155-00	200757		RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD402R0F
A1R435	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD402R0F
A1R436	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R437	315-0103-00	200360	206385	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R437	315-0752-00	206386		RES,FXD,FILM:7.5K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E07K5

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A1R437	315-0103-00	B010100	B010462	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R437	315-0752-00	B010463		RES,FXD,FILM:7.5K OHM,5%,0.25W (U.S.A. ONLY)	57668	NTR25J-E07K5
A1R438	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R439	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R440	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R441	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R442	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R443	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R444	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R445	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R446	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R447	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R448	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R449	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R450	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R451	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R452	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R453	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R454	321-0361-00			RES,FXD,FILM:56.2K OHM,1%,0.125W,TC=T0	07716	CEAD56201F
A1R455	315-0103-00	202908		RES,FXD,FILM:10K OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX10K00J
A1R455	315-0103-00	202908		RES,FXD,FILM:10K OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX10K00J
A1R456	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R457	315-0103-00	200360	207594	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R457	315-0102-00	207595		RES,FXD,FILM:1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25JE01K0
A1R457	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25JE01K0
A1R458	315-0103-00	200360	207594	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R458	315-0102-00	207595		RES,FXD,FILM:1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25JE01K0
A1R458	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25JE01K0
A1R459	315-0104-00	200360	202907	RES,FXD,FILM:100K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E100K
A1R460	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R461	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R462	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R463	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R464	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R465	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R466	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R467	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R468	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R469	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R470	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R471	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R472	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R473	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R475	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R477	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A1R478	311-2358-00			RES,VAR,NONWW:TRMR,100K OHM,0.5W	K8788	TC10-LV10-100K/A
A1R480	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R481	311-2361-00			RES,VAR,NONWW:TRMR,10K OHM,0.5W	K8788	TC10-LV10-10K/A
A1R482	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A1R483	315-0431-00	200360	205110	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R483	321-0158-00	205111		RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0	07716	CEAD432R0F

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				(UNITED KINGDOM ONLY)		
A1R483	321-0158-00			RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD432R0F
A1R485	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	91637	CMF55116G82R50F
A1R486	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R487	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R488	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R489	311-2352-00			RES,VAR,NONWW:TRMR,220 OHM,0.5W	K8788	TC10LV2.5220R
A1R490	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R491	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R492	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R493	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R495	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A1R496	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A1R497	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R498	315-0431-00	200360	205110	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R498	321-0158-00	205111		RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD432R0F
A1R498	321-0158-00			RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD432R0F
A1R500	315-0120-00	200360	202907	RES,FXD,FILM:12 OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-R12
A1R501	321-0322-00			RES,FXD,FILM:22.1K OHM,0.1%,0.125W,TC=T0	19701	5033ED22K10F
A1R502	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R503	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R504	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R505	315-0334-00			RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A1R506	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A1R508	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R509	315-0102-00	202908		RES,FXD,FILM:1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25JE01K0
A1R509	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25JE01K0
A1R510	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R511	315-0102-00	200360	202907	RES,FXD,FILM:1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25JE01K0
A1R512	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R513	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R514	315-0621-00	200360	205110	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A1R514	321-0172-00	205111		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A1R514	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED604R0F
A1R515	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R516	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R519	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R520	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R521	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R522	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R523	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R524	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R525	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R526	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R530	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R531	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R532	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R533	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R534	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R535	315-0181-00			RES,FXD,FILM:180 OHM,5%,0.25W	57668	NTR25J-E180E

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A1R536	315-0181-00			RES,FXD,FILM:180 OHM,5%,0.25W	57668	NTR25J-E180E
A1R537	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R538	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R539	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R540	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R541	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R542	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R543	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R544	315-0431-00	200360	205110	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R544	321-0158-00	205111		RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD432R0F
A1R544	321-0158-00			RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD432R0F
A1R545	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R547	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R548	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R549	315-0621-00	200360	205110	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A1R549	321-0172-00	205111		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A1R549	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED604R0F
A1R550	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R551	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R552	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R553	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R554	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R555	315-0391-00			RES,FXD.FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R556	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R557	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R560	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A1R561	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R562	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R563	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R564	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R565	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R570	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R571	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R572	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R573	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R574	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R576	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R579	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A1R581	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R582	321-0361-00			RES,FXD,FILM:56.2K OHM,1%,0.125W,TC=T0	07716	CEAD56201F
A1R583	315-0204-00	200360	205963	RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R583	315-0334-00	205964	208549	RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A1R583	315-0204-00	208550		RES,FXD,FILM:200K OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX200K0J
A1R583	315-0334-00	B010100	B011072	RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A1R583	315-0204-00	B011073		RES,FXD,FILM:200K OHM,5%,0.25W (U.S.A. ONLY)	19701	5043CX200K0J
A1R583	315-0334-00	100001	100227	RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A1R583	315-0204-00	100228		RES,FXD,FILM:200K OHM,5%,0.25W (GUERNSEY ONLY)	19701	5043CX200K0J
A1R584	315-0334-00			RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A1R585	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R586	315-0334-00			RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A1R587	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R588	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R589	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R590	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125W,TC=T0	19701	5033ED1K330F
A1R764	315-0471-00	B010100	B010299	RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R764	315-0361-00	B010300		RES,FXD,FILM:360 OHM,5%,0.25W (U.S.A. ONLY)	19701	5043CX360R0J
A1R764	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W (UNITED KINGDOM & GUERNSEY)	57668	NTR25J-E470E
A1R776	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R778	321-0361-00			RES,FXD,FILM:56.2K OHM,1%,0.125W,TC=T0	07716	CEAD56201F
A1R779	321-0263-00			RES,FXD,FILM:5.36K OHM,1%,0.125W,TC=T0	07716	CEAD53600F
A1R780	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R781	321-0109-00			RES,FXD,FILM:133 OHM,1%,0.125W,TC=T0	07716	CEAD133R0F
A1R784	323-0310-00			RES,FXD,FILM:16.5K OHM,1%,0.5W,TC=T0	75042	CECT0-1652F
A1R785	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A1R786	321-0182-00			RES,FXD,FILM:768 OHM,1%,0.125W,TC=T0	07716	CEAD768R0F
A1R787	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R788	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125W,TC=T0	19701	5033ED1K330F
A1R789	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R790	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R791	321-0158-00			RES,FXD,FILM:432 OHM,1%,0.125W,TC=T0	07716	CEAD432R0F
A1R792	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R794	323-0310-00			RES,FXD,FILM:16.5K OHM,1%,0.5W,TC=T0	75042	CECT0-1652F
A1R795	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A1R796	321-0201-00			RES,FXD,FILM:1.21K OHM,1%,0.125W,TC=T0	19701	5043ED1K210F
A1R797	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R798	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125W,TC=T0	19701	5033ED1K330F
A1R799	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R804	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R805	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A1R806	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R818	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A1R819	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R820	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25W	19701	5043CX3K600J
A1R821	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R822	321-0361-00			RES,FXD,FILM:56.2K OHM,1%,0.125W,TC=T0	07716	CEAD56201F
A1R823	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R825	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R828	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R830	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125W,TC=T0	19701	5033ED1K330F
A1R832	321-0223-00			RES,FXD,FILM:2.05K OHM,1%,0.125W,TC=T0	19701	5033ED2K05F
A1R834	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R835	321-0233-00			RES,FXD,FILM:2.61K OHM,1%,0.125W,TC=T0	07716	CEAD26100F
A1R836	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R840	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R841	321-0322-00			RES,FXD,FILM:22.1K OHM,0.1%,0.125W,TC=T0	19701	5033ED22K10F
A1R842	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A1R844	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R845	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R849	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R850	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R851	311-2367-00			RES,VAR,NONWW:TRMR,22K OHM,0.5W	K8788	TC10-LV10-22K/A
A1R852	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R853	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R854	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R858	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A1R860	315-0625-00			RES,FXD,FILM:6.2M OHM,5%,0.25W	01121	CB6255
A1R870	311-2358-00			RES,VAR,NONWW:TRMR,100K OHM,0.5W	K8788	TC10-LV10-100K/A
A1R872	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R873	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R874	311-2358-00			RES,VAR,NONWW:TRMR,100K OHM,0.5W	K8788	TC10-LV10-100K/A
A1R875	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R877	307-0115-00			RES,FXD,CMPSN:7.5 OHM,5%,0.25W	80009	307-0115-00
A1R885	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R886	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R888	301-0105-00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R889	301-0105-00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R890	301-0105-00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R891	301-0105-00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R892	301-0105-00	200360	202061	RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R892	301-0225-00	202062	203058	RES,FXD,FILM:2.2M OHM,5%,0.5W	19701	5053CX2M200J
A1R892	301-0105-00	203059		RES,FXD,FILM:1M OHM,5%,0.50W (UNITED KINGDOM ONLY)	19701	5053CX1M000J
A1R892	301-0105-00			RES,FXD,FILM:1M OHM,5%,0.50W (U.S.A. & GUERNSEY)	19701	5053CX1M000J
A1R894	301-0105-00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R898	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R899	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R900	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A1R901	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R907	308-0843-00			RES,FXD,WW:0.2 OHM,5%,1/0W	91637	RS1A-90-R2J
A1R908	321-0337-00			RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0	07716	CEAD31601F
A1R909	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R910	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A1R911	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A1R912	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A1R913	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R914	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A1R915	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R916	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A1R917	321-0361-00			RES,FXD,FILM:56.2K OHM,1%,0.125W,TC=T0	07716	CEAD56201F
A1R918	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R919	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A1R920	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R921	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R922	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R923	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R924	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R925	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A1R926	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	57668	NTR25J-E27K0
A1R927	321-0322-00			RES,FXD,FILM:22.1K OHM,0.1%,0.125W,TC=T0	19701	5033ED22K10F
A1R928	321-0337-00			RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0	07716	CEAD31601F
A1R929	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R930	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R931	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R932	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A1R933	311-2364-00			RES,VAR,NONWW:TRMR,4.7K OHM,0.5W	K8788	TC10-LV10-4K7/A
A1R934	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R935	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R936	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R937	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R938	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R939	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R940	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R941	321-0253-00			RES,FXD,FILM:4.22K OHM,1%,0.125W,TC=T0	19701	5033ED 4K 220F
A1R942	321-0337-00			RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0	07716	CEAD31601F
A1R943	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A1R944	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9

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A1R945	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R946	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R952	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R953	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R965	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R966	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A1R967	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R968	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R969	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R975	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R976	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R978	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R982	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
A1R983	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1RT236	307-0125-00			RES,THERMAL:500 OHM,10%,NTC	15454	1DB501K-220-EC
A1T902	120-1634-00	200360	207158	TRANSFORMER,RF:SWITCHING,INVERTER	80009	120-1634-00
A1T902	120-1634-01	207159		TRANSFORMER,RF:SWITCHING,INVERTER (UNITED KINGDOM ONLY)	TK0FD	ORDER BY DESCR
A1T902	120-1634-00	100001	100119	TRANSFORMER,RF:SWITCHING,INVERTER	80009	120-1634-00
A1T902	120-1634-01	100120		TRANSFORMER,RF:SWITCHING,INVERTER (GUERNSEY ONLY)	TK0FD	ORDER BY DESCR
A1T902	120-1634-00	B010100	B010462	TRANSFORMER,RF:SWITCHING,INVERTER	80009	120-1634-00
A1T902	120-1634-01	B010463		TRANSFORMER,RF:SWITCHING,INVERTER (U.S.A. ONLY)	TK0FD	ORDER BY DESCR
A1U130	156-0534-00			MICROCKT,LINEAR:DUAL DIFF AMPL	02735	CA3102E-98
A1U180	156-0534-00			MICROCKT,LINEAR:DUAL DIFF AMPL	02735	CA3102E-98
A1U225	156-0067-00			MICROCKT,LINEAR:BIPOLAR,OPNL AMPL	80009	156-0067-00
A1U300	156-0349-00			IC,DIGITAL:CMOS,GATES;QUAD 2-INPUT NOR;4001 ,DIP14.3,TUBE (U.S.A. ONLY)	04713	MC14001UBCL
A1U300	156-2988-00			MICROCKT,DGTL:CMOS,QUAD 2 IP NOR (UNITED KINGDOM & GUERNSEY)	K5856	CD4001BE
A1U304	156-0754-00			MICROCKT,DGTL:DUAL 4-INP NOR GATE (U.S.A. ONLY)	80009	156-0754-00
A1U304	156-2986-00			MICROCKT,DGTL:CMOS,QUAD 4 IP NOR (UNITED KINGDOM & GUERNSEY)	K5856	CD4002BE
A1U308	156-0524-00			IC,DIGITAL:CMOS,GATES;TRIPLE 3-INPUT NAND;4 023B,DIP14.3,TUBE (U.S.A. ONLY)	02735	CD4023BF
A1U308	156-2987-00			MICROCKT,DGTL:CMOS,TRIPLE 3 IP NAND (UNITED KINGDOM & GUERNSEY)	K5856	CD4023BE
A1U310	156-1349-00			MICROCKT,LINEAR:DUAL INDEP DIFF AMPL (U.S.A. ONLY)	80009	156-1349-00
A1U310	156-2956-00			MICROCKT,LINEAR:DUAL,INDEP PIFF AMPL (UNITED KINGDOM & GUERNSEY)	K5856	CA 3054
A1U315	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U315	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U325	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U325	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U335	156-1349-00			MICROCKT,LINEAR:DUAL INDEP DIFF AMPL (U.S.A. ONLY)	80009	156-1349-00
A1U335	156-2956-00			MICROCKT,LINEAR:DUAL,INDEP PIFF AMPL (UNITED KINGDOM & GUERNSEY)	K5856	CA 3054
A1U340	156-1349-00			MICROCKT,LINEAR:DUAL INDEP DIFF AMPL (U.S.A. ONLY)	80009	156-1349-00
A1U340	156-2956-00			MICROCKT,LINEAR:DUAL,INDEP PIFF AMPL (UNITED KINGDOM & GUERNSEY)	K5856	CA 3054

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A1U370	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U370	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U380	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U380	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U415	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U415	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U425	156-0853-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	80009	156-0853-00
A1U435	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U435	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U445	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U445	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U450	156-0853-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	80009	156-0853-00
A1U460	156-1349-00			MICROCKT,LINEAR:DUAL INDEP DIFF AMPL (U.S.A. ONLY)	80009	156-1349-00
A1U460	156-2956-00			MICROCKT,LINEAR:DUAL,INDEP PIFF AMPL (UNITED KINGDOM & GUERNSEY)	K5856	CA 3054
A1U480	156-0205-03			MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	04713	MC10102 L OR P
A1U500	156-1335-00			MICROCKT,DGTL:LSTTL,DUAL RETRIGGERABLE RESETTABLE MONOSTABLE MV,SCRN	80009	156-1335-00
A1U510	156-0388-03			IC,DIGITAL:LSTTL,FLIP FLOP;DUAL D-TYPE;74LS 74,DIP14.3,TUBE,SCRN	80009	156-0388-03
A1U515	156-0382-02			IC,DIGITAL:LSTTL,GATES;QUAD 2-INPUT NAND;74 LS00,DIP14.3,TUBE,BURN-IN	80009	156-0382-02
A1U520	156-0205-03			MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	04713	MC10102 L OR P
A1U530	156-1639-00			IC,DIGITAL:ECL,FLIP FLOP;DUAL MASTER-SLAVE; 10H131,DIP16.3	80009	156-1639-00
A1U537	156-0721-02			MICROCKT,DGTL:QUAD ST 2-INP NAND GATES	80009	156-0721-02
A1U540	156-0388-03			IC,DIGITAL:LSTTL,FLIP FLOP;DUAL D-TYPE;74LS 74,DIP14.3,TUBE,SCRN	80009	156-0388-03
A1U550	156-0205-03			MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	04713	MC10102 L OR P
A1U560	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A1U560	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM & GUERNSEY)	K5856	CA 3046
A1U570	156-1639-00			IC,DIGITAL:ECL,FLIP FLOP;DUAL MASTER-SLAVE; 10H131,DIP16.3	80009	156-1639-00
A1U580	156-0853-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	80009	156-0853-00
A1U910	156-1627-00			MICROCKT,LINEAR:BIPOLAR,PWM PWR SPLY CONT	12969	UC494ACN
A1U920	156-0853-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	80009	156-0853-00
A1U940	156-1627-00			MICROCKT,LINEAR:BIPOLAR,PWM PWR SPLY CONT	12969	UC494ACN
A1U975	152-0806-00	E200000	E210593	SEMICOND DVC,DI:HV MULTR,4KVAC INPUT,12KVDC OUTPUT	80009	152-0806-00
A1U975	152-1046-00	E210594		SEMICOND DVC,DI:HV MULTR,4KVAC INPUT,12KVAC (UNITED KINGDOM ONLY)	U4144	MSL8524
A1U975	152-0806-00	G100000	G100749	SEMICOND DVC,DI:HV MULTR,4KVAC INPUT,12KVDC OUTPUT	80009	152-0806-00
A1U975	152-1046-00	G100750		SEMICOND DVC,DI:HV MULTR,4KVAC INPUT,12KVAC (GUERNSEY ONLY)	U4144	MSL8524
A1VR514	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,400MW,DO-7	80009	152-0166-00
A1VR776	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	04713	1N961B
A1VR792	152-0243-00			SEMICOND DVC,DI:ZEN,SI,15V,5%,0.4W,DO-7	14433	Z5412

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1VR910	152-0147-00			SEMICOND DVC,DI:ZEN,SI,27V,5%,0.4W,DO-7	80009	152-0147-00
A1VR931	152-0317-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-35	04713	1N825
A1VR939	152-0278-00			DIODE,ZENER:,;3V,5%,400MW;1N4372A,DO-7 OR D 0-35,TR	80009	152-0278-00
A1VR942	152-0243-00			SEMICOND DVC,DI:ZEN,SI,15V,5%,0.4W,DO-7	14433	Z5412
A1VR969	152-0278-00			DIODE,ZENER:,;3V,5%,400MW;1N4372A,DO-7 OR D 0-35,TR	80009	152-0278-00
A1W30	174-0640-00			CA ASSY,SP,ELEC:4,26 AWG,135MM L,RIBBON	TK0EM	820265804(135mm)
A1W80	174-0640-00			CA ASSY,SP,ELEC:4,26 AWG,135MM L,RIBBON	TK0EM	820265804(135mm)
A1W90	174-0635-00			CA ASSY,SP,ELEC:6,26 AWG,120MM L,RIBBON	TK0EM	82265806(120mm)
A1W129	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W140	176-0231-00	E209929		WIRE,ELECTRICAL:22 AWG,TINNED	80009	176-0231-00
A1W140	176-0231-00	G100809		WIRE,ELECTRICAL:22 AWG,TINNED	80009	176-0231-00
A1W179	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W500	131-0566-00	202908		BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L (UNITED KINGDOM ONLY)	24546	OMA 07
A1W500	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L (U.S.A. & GUERNSEY)	24546	OMA 07
A1W590	195-3407-00			LEAD,ELECTRICAL:26 AWG,3.0 L,9-3	80009	195-3407-00
A1W701	174-0637-00			CA ASSY,SP,ELEC:6,26 AWG,300MM L,RIBBON	TK0EM	82265806(300mm)
A1W755	174-0640-00			CA ASSY,SP,ELEC:4,26 AWG,135MM L,RIBBON	TK0EM	820265804(135mm)
A1W792	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W893	174-0642-00			CA ASSY,SP,ELEC:3,26 AWG,100MM L,RIBBON	TK0EM	82265803(100mm)
A1W971	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W984	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W985	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W987	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W989	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A1W991	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2	670-9936-00	200001	202907	CIRCUIT BD ASSY:ATTENUATOR & TIMEBASE	80009	670-9936-00
A2	670-9936-05	202908		CIRCUIT BD ASSY:ATTENUATOR & T/B	80009	670-9936-05
A2AT1	260-2345-00			SWITCH ASSEMBLY:DPDT,ATTENUATOR	S4239	NOBLE E773-1019E
A2AT51	260-2345-00			SWITCH ASSEMBLY:DPDT,ATTENUATOR	S4239	NOBLE E773-1019E
A2C6	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
A2C7	281-0214-00	200360	206606	CAP,VAR,CER DI:0.6-3PF,400V (UNITED KINGDOM ONLY)	52763	313613-140
A2C7	281-0214-00	B010100	B010462	CAP,VAR,CER DI:0.6-3PF,400V (U.S.A. ONLY)	52763	313613-140
A2C8	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C13	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C30	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C31	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C32	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2C33	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2C35	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C38	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C56	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
A2C57	281-0214-00	200360	206606	CAP,VAR,CER DI:0.6-3PF,400V (UNITED KINGDOM ONLY)	52763	313613-140
A2C57	281-0214-00	B010100	B010462	CAP,VAR,CER DI:0.6-3PF,400V (U.S.A. ONLY)	52763	313613-140
A2C58	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C59	281-0775-01	100752		CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C59	281-0775-01	210469		CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C63	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C80	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C81	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C82	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2C83	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2C85	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C88	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C93	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A2C94	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C95	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C96	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A2C97	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C98	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C701	285-1409-00			CAP,FXD,MTLZD:1UF,1%,160V,AXIAL,TUB,MI	TK0ED	ORDER BY DESCR
A2C702	285-1408-00			CAP,FXD,MTLZD:10UF,1%,250V,AXIAL,TUB,MI	TK0ED	ORDER BY DESCR
A2C703	281-0207-00			CAP,VAR,PLASTIC:2-18PF,100V	52769	GXA 18000
A2C704	283-0674-00			CAP,FXD,MICA DI:85PF,1%,500V	00853	D155F850F0
A2C705	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A2C706	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C707	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C708	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	SA102A2R2DAA
A2C709	290-0283-00			CAP,FXD,ELCTLT:0.47UF,10%,35V	05397	T320A474K035AS
A2C710	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C712	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A2C713	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A2C714	281-0776-00			CAP,FXD,CER DI:120PF,5%,100V	20932	401E0100AD121J
A2C715	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A2C722	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C723	290-0246-00			CAP,FXD,ELCTLT:3.3UF,10%,15V	12954	D3R3EA15K1
A2C724	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2C732	281-0809-00	207212		CAP,FXD,CER DI:200 PF,5%,100V (UNITED KINGDOM ONLY)	04222	MA101A201JAA
A2C732	281-0809-00	B010463		CAP,FXD,CER DI:200 PF,5%,100V (U.S.A. ONLY)	04222	MA101A201JAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2C732	281-0809-00	100041		CAP,FXD,CER DI:200 PF,5%,100V (GUERNSEY ONLY)	04222	MA101A201JAA
A2C733	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	SA102A150MAA
A2C746	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A2C755	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A2C767	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	MA101A151KAA
A2C773	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A2C774	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A2CR7	152-0324-00			SEMICOND DVC,DI:SW,SI,35V,0.1A,DO-7	14552	MT5128
A2CR57	152-0324-00			SEMICOND DVC,DI:SW,SI,35V,0.1A,DO-7	14552	MT5128
A2CR747	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR748	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR755	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR758	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR761	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR762	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR769	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR773	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR774	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2E90	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A2E91	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A2E92	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A2E93	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A2J7	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A2J29	136-0929-00			SKT,PL-IN ELEK:MICROCIRCUIT,14 PIN (U30)	TK00A	WPT DIR-14
A2J30	204-1033-00			CONN BODY,RCPT:1 X 4,WITH SOLDER TAILS	TK0EM	52011-0410
A2J79	136-0929-00			SKT,PL-IN ELEK:MICROCIRCUIT,14 PIN (U80)	TK00A	WPT DIR-14
A2J80	204-1033-00			CONN BODY,RCPT:1 X 4,WITH SOLDER TAILS	TK0EM	52011-0410
A2J90	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A2J701	204-1034-00			CONN BODY,RCPT:1 X 6,WITH SOLDER TAILS	TK0EM	52011-0610
A2J755	204-1033-00			CONN BODY,RCPT:1 X 4,WITH SOLDER TAILS	TK0EM	52011-0410
A2L93	120-1631-00			COIL,RF:FXD,210UH	TK00A	ORDER BY DESCR
A2L96	120-1631-00			COIL,RF:FXD,210UH	TK00A	ORDER BY DESCR
A2L712	120-1631-00			COIL,RF:FXD,210UH	TK00A	ORDER BY DESCR
A2L713	120-1631-00			COIL,RF:FXD,210UH	TK00A	ORDER BY DESCR
A2Q13	151-1235-00			TRANSISTOR:JFET,N-CHAN,DUAL HYBRID	K7068	2N5911
A2Q63	151-1235-00			TRANSISTOR:JFET,N-CHAN,DUAL HYBRID	K7068	2N5911
A2Q701	151-0424-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0424-00
A2Q702	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2Q704	151-1042-00			SEMICOND DVC SE:FET,SI,TO-92	80009	151-1042-00
A2Q706	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A2Q732	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2Q736	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2Q737	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2Q747	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A2Q748	151-0712-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0712-00
A2Q750	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2Q759	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2Q760	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2R3	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
A2R5	322-0481-00			RES,FXD,FILM:1M OHM,1%,0.25W,TC=TO	75042	CEBTO-1004F
A2R6	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A2R7	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A2R8	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R9	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
A2R13	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2R14	315-0200-00			RES,FXD,FILM:20 OHM,5%,0.25W	19701	5043CX20R00J
A2R15	315-0200-00			RES,FXD,FILM:20 OHM,5%,0.25W	19701	5043CX20R00J
A2R22	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R23	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R29	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A2R30	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R31	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R32	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R33	311-2368-00			RES,VAR,NONWW:TRMR,47K OHM,0.5W	K8788	TC10-LV10-47K/A
A2R35	321-0144-00			RES,FXD,FILM:309 OHM,1%,0.125W,TC=T0	07716	CEAD309R0F
A2R36	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R37	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R38	321-0144-00			RES,FXD,FILM:309 OHM,1%,0.125W,TC=T0	07716	CEAD309R0F
A2R39	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
A2R41	321-0154-00			RES,FXD,FILM:392 OHM,1%,0.125W,TC=T0	07716	CEAD392R0F
A2R42	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	57668	NTR25J-E33K0
A2R53	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
A2R55	322-0481-00			RES,FXD,FILM:1M OHM,1%,0.25W,TC=T0	75042	CEBT0-1004F
A2R56	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A2R57	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A2R58	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R59	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
A2R63	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A2R64	315-0200-00			RES,FXD,FILM:20 OHM,5%,0.25W	19701	5043CX20R00J
A2R65	315-0200-00			RES,FXD,FILM:20 OHM,5%,0.25W	19701	5043CX20R00J
A2R72	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R73	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R78	315-0102-00	202908		RES,FXD,FILM:1K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25JE01K0
A2R78	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25JE01K0
A2R79	321-0068-00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	91637	CMF55116G49R90F
A2R80	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R81	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R82	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R83	311-2368-00			RES,VAR,NONWW:TRMR,47K OHM,0.5W	K8788	TC10-LV10-47K/A
A2R85	321-0144-00			RES,FXD,FILM:309 OHM,1%,0.125W,TC=T0	07716	CEAD309R0F
A2R86	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R87	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R88	321-0144-00			RES,FXD,FILM:309 OHM,1%,0.125W,TC=T0	07716	CEAD309R0F
A2R91	321-0154-00			RES,FXD,FILM:392 OHM,1%,0.125W,TC=T0	07716	CEAD392R0F
A2R92	315-0333-00	202908		RES,FXD,FILM:33K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E33K0
A2R92	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E33K0
A2R94	315-0333-00	202908		RES,FXD,FILM:33K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E33K0
A2R94	315-0333-00	202908		RES,FXD,FILM:33K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E33K0
A2R701	307-0780-01			RES NTWK,FXD,FI:TIMING	80009	307-0780-01
A2R702	322-0519-01			RES,FXD,FILM:2.49M OHM,0.5%,0.25W,TC=T0	07716	CCAD24903D
A2R703	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A2R704	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R705	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A2R706	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A2R707	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R708	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A2R709	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A2R710	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2R711	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A2R712	321-0289-00	200360	202141	RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R712	321-0231-00	202142		RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED2K49F
A2R712	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED2K49F
A2R713	321-0289-00	200360	202141	RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R713	321-0231-00	202142		RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED2K49F
A2R713	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED2K49F
A2R714	321-0293-00	200360	202141	RES,FXD,FILM:11.0K OHM,1%,0.125W,TC=T0	07716	CEAD11001F
A2R714	321-0235-00	202142		RES,FXD,FILM:2.74K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD27400F
A2R714	321-0235-00			RES,FXD,FILM:2.74K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD27400F
A2R715	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0	19701	5033ED2K49F
A2R716	321-0225-00			RES,FXD,FILM:2.15K OHM,1%,0.125W,TC=T0	19701	5033ED2K15F
A2R717	321-0306-00			RES,FXD,FILM:15.0K OHM,1%,0.125W,TC=T0	19701	5033ED15J00F
A2R718	321-0306-00			RES,FXD,FILM:15.0K OHM,1%,0.125W,TC=T0	19701	5033ED15J00F
A2R719	315-0330-00	200360	200756	RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
A2R719	315-0270-00	200757	205763	RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A2R719	315-0330-00	205764		RES,FXD,FILM:33 OHM,5%,0.25W (UNITED KINGDOM ONLY)	19701	5043CX33R00J
A2R719	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25W (U.S.A. & GUERNSEY)	19701	5043CX33R00J
A2R720	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A2R721	311-2356-00			RES,VAR,NONWW:PNL,470 OHM,20%,0.2W	K8996	2322 50190194
A2R722	311-2361-00			RES,VAR,NONWW:TRMR,10K OHM,0.5W	K8788	TC10-LV10-10K/A
A2R723	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R730	311-2365-00			RES,VAR,NONWW:TRMR,470 OHM,0.75W	K8788	TC10-LV10-470K/A
A2R731	311-2355-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5W	K8788	TC10-LV10-100R/A
A2R732	321-0243-00	200360		RES,FXD,FILM:3.32K OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED3K32F
A2R732	321-0243-00			RES,FXD,FILM:3.32K OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED3K32F
A2R733	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0	19701	5033ED2K49F
A2R734	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A2R735	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R736	311-2363-00	200360		RES,VAR,NONWW:TRMR,1K OHM,0.5W (UNITED KINGDOM ONLY)	K8788	TC10-LV10-1K/A
A2R736	311-2363-00			RES,VAR,NONWW:TRMR,1K OHM,0.5W (U.S.A. & GUERNSEY)	K8788	TC10-LV10-1K/A
A2R737	321-0197-00			RES,FXD,FILM:1.10K OHM,1%,0.125W,TC=T0	07716	CEAD11000F
A2R738	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R739	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R740	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125W,TC=T0	19701	5043ED6K980F
A2R741	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R742	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125W,TC=T0	19701	5033ED1K50F
A2R743	321-0177-00			RES,FXD,FILM:681 OHM,1%,0.125W,TC=T0	07716	CEAD681R0F
A2R744	321-0177-00			RES,FXD,FILM:681 OHM,1%,0.125W,TC=T0	07716	CEAD681R0F
A2R745	321-0177-00			RES,FXD,FILM:681 OHM,1%,0.125W,TC=T0	07716	CEAD681R0F
A2R746	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R747	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A2R748	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A2R749	321-0098-00			RES,FXD,FILM:102 OHM,1%,0.125W,TC=T0	07716	CEAD102R0F
A2R750	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A2R751	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0	07716	CEAD698R0F
A2R752	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0	07716	CEAD698R0F
A2R753	321-0197-00	200360	202056	RES,FXD,FILM:1.10K OHM,1%,0.125W,TC=T0	07716	CEAD11000F

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A2R753	321-0178-00	202057		RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	07716	CEAD698R0F
A2R753	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	07716	CEAD698R0F
A2R754	321-0179-00			RES,FXD,FILM:715 OHM,1%,0.125W,TC=T0	07716	CEAD715R0F
A2R755	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25W	57668	NTR25J-E01K3
A2R756	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25W	57668	NTR25J-E01K3
A2R757	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	19701	5033ED604R0F
A2R758	321-0163-00			RES,FXD,FILM:487 OHM,1%,0.125W,TC=T0	07716	CEAD487R0F
A2R759	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A2R760	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A2R761	321-0225-00			RES,FXD,FILM:2.15K OHM,1%,0.125W,TC=T0	19701	5033ED2K15F
A2R762	321-0225-00			RES,FXD,FILM:2.15K OHM,1%,0.125W,TC=T0	19701	5033ED2K15F
A2R763	321-0216-00			RES,FXD,FILM:1.74K OHM,1%,0.125W,TC=T0	07716	CEAD17400F
A2R765	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125W,TC=T0	19701	5043ED6K980F
A2R766	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125W,TC=T0	19701	5043ED6K980F
A2R767	321-0098-00			RES,FXD,FILM:102 OHM,1%,0.125W,TC=T0	07716	CEAD102R0F
A2R768	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125W,TC=T0	19701	5043ED6K980F
A2R769	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A2R770	321-0242-00			RES,FXD,FILM:3.24K OHM,1%,0.125W,TC=T0	19701	5043ED3K240F
A2R771	321-0225-00			RES,FXD,FILM:2.15K OHM,1%,0.125W,TC=T0	19701	5033ED2K15F
A2R772	321-0225-00			RES,FXD,FILM:2.15K OHM,1%,0.125W,TC=T0	19701	5033ED2K15F
A2R773	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0	07716	CEAD698R0F
A2R774	321-0178-00			RES,FXD,FILM:698 OHM,1%,0.125W,TC=T0	07716	CEAD698R0F
A2R775	311-2365-00	200360	202056	RES,VAR,NONWW:TRMR,470 OHM,0.75W	K8788	TC10-LV10-470K/A
A2R775	311-2363-00	202057		RES,VAR,NONWW:TRMR,1K OHM,0.5W (UNITED KINGDOM ONLY)	K8788	TC10-LV10-1K/A
A2R775	311-2363-00			RES,VAR,NONWW:TRMR,1K OHM,0.5W (U.S.A. & GUERNSEY)	K8788	TC10-LV10-1K/A
A2R777	311-2355-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5W	K8788	TC10-LV10-100R/A
A2R782	311-2365-00			RES,VAR,NONWW:TRMR,470 OHM,0.75W	K8788	TC10-LV10-470K/A
A2S701	260-2289-00			SWITCH,ROTARY:TIMEBASE	U3771	685/TEK 23 POS
A2U30	156-0534-00			MICROCKT,LINEAR:DUAL DIFF AMPL	02735	CA3102E-98
A2U80	156-0534-00			MICROCKT,LINEAR:DUAL DIFF AMPL	02735	CA3102E-98
A2U83	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A2U83	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM ONLY)	K5856	CA 3046
A2U715	156-0067-00			MICROCKT,LINEAR:BIPOLAR,OPNL AMPL	80009	156-0067-00
A2U745	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A2U745	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM ONLY)	K5856	CA 3046
A2U755	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY (U.S.A. ONLY)	80009	156-0048-00
A2U755	156-2902-00			MICROCKT,LINEAR: (UNITED KINGDOM ONLY)	K5856	CA 3046
A2VR719	152-0744-00			SEMICOND DVC,DI:ZEN,SI,3.6V,5%,0.4W,DO-7	80009	152-0744-00
A2W711	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3	670-9940-00	200001	202907	CIRCUIT BD ASSY:FRONT PANEL	80009	670-9940-00
A3	670-9940-05	202908		CIRCUIT BD ASSY:FRONT PANEL	80009	670-9940-05
A3C2	285-1106-00			CAP,FXD,PLASTIC:0.022UF,20%,600V	14752	230B1F223
A3C45	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A3C46	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A3C52	285-1106-00			CAP,FXD,PLASTIC:0.022UF,20%,600V	14752	230B1F223
A3C373	285-1385-00			CAP,FXD,PLASTIC:43PF,2.5%,630V	K7779	B31063-A6430-H6
A3C376	285-1387-00			CAP,FXD,PLASTIC:0.01UF,10%,400V	TK0DZ	MKT1-50
A3C377	285-1385-00			CAP,FXD,PLASTIC:43PF,2.5%,630V	K7779	B31063-A6430-H6
A3C378	285-1386-00	B010100	E210418	CAP,FXD,PLASTIC:390PF,2.5%,630V	K7779	B31063-A6391-H6
A3C378	285-1425-00	E210419		CAP,FXD,PLASTIC:390PF,2.5%,160V	K7779	B33063-B1391-H7
A3C378	285-1425-00	G100851		CAP,FXD,PLASTIC:390PF,2.5%,160V	K7779	B33063-B1391-H7
A3C383	285-1385-00			CAP,FXD,PLASTIC:43PF,2.5%,630V	K7779	B31063-A6430-H6
A3C392	281-0815-00			CAP,FXD,CER DI:0.027UF,20%,50V	04222	MA205C273MAA
A3C725	290-1153-00			CAP,FXD,ELCTLT:47UF,+50-10%,10V	K8996	030-24479
A3C726	281-0775-01	200758		CAP,FXD,CER DI:0.1UF,20%,50V (UNITED KINGDOM ONLY)	04222	SA105E104MAA
A3C726	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V (U.S.A. & GUERNSEY)	04222	SA105E104MAA
A3CR381	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR401	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR534	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR537	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR538	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3DS370	150-1187-00			LT EMITTING DIO:GREEN	TK00A	LN31GPHLEXLED5GS
A3DS560	150-1187-00			LT EMITTING DIO:GREEN	TK00A	LN31GPHLEXLED5GS
A3J987	----- -----			2 PIN HEADER STRIP		
A3Q370	151-1042-00			SEMICOND DVC SE:FET,SI,TO-92	80009	151-1042-00
A3Q725	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A3R1	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A3R2	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A3R4	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R45	307-0113-00			RES,FXD,CMPSN:5.1 OHM,5%,0.25W	01121	CB51G5
A3R46	307-0113-00			RES,FXD,CMPSN:5.1 OHM,5%,0.25W	01121	CB51G5
A3R51	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A3R52	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A3R54	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R84	311-2368-00	202908		RES,VAR,NONWW:TRMR,47K OHM,0.5W (UNITED KINGDOM ONLY)	K8788	TC10-LV10-47K/A
A3R84	311-2368-00			RES,VAR,NONWW:TRMR,47K OHM,0.5W (U.S.A. & GUERNSEY)	K8788	TC10-LV10-47K/A
A3R89	315-0242-00	200360	202907	RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
A3R89	315-0222-00	202908		RES,FXD,FILM:2.2K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E02K2
A3R89	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W (U.S.A. & GUERNSEY)	57668	NTR25J-E02K2
A3R92	315-0333-00	200360	202907	RES,FXD,FILM:33K OHM,5%,0.25W (UNITED KINGDOM ONLY)	57668	NTR25J-E33K0
A3R113	321-0251-00			RES,FXD,FILM:4.02K OHM,1%,0.125W,TC=T0	19701	5033ED4K020F
A3R123	311-2366-00			RES,VAR,NONWW:PNL,470 OHM,20%,0.2W	K8996	PP17/000HFAQA234
A3R163	321-0251-00			RES,FXD,FILM:4.02K OHM,1%,0.125W,TC=T0	19701	5033ED4K020F
A3R173	311-2366-00			RES,VAR,NONWW:PNL,470 OHM,20%,0.2W	K8996	PP17/000HFAQA234
A3R280	311-2362-00			RES,VAR,NONWW:PNL,4.7K OHM,20%,0.2W	K8996	PP17/000HFA0A364
A3R365	315-0621-00	200360	205110	RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A3R365	321-0172-00	205111		RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (UNITED KINGDOM ONLY)	19701	5033ED604R0F
A3R365	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0 (U.S.A. & GUERNSEY)	19701	5033ED604R0F
A3R370	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3R371	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A3R372	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A3R373	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A3R376	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A3R377	315-0394-00			RES,FXD,FILM:390K OHM,5%,0.25W	57668	NTR25J-E390K
A3R378	315-0433-00			RES,FXD,FILM:43K OHM,5%,0.25W	19701	5043CX43K00J
A3R379	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A3R382	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A3R383	315-0564-00			RES,FXD,FILM:560K OHM,5%,0.25W	19701	5043CX560K0J
A3R426	311-2362-00			RES,VAR,NONWW:PNL,4.7K OHM,20%,0.2W	K8996	PP17/000HFA0A364
A3R511	311-2360-00			RES,VAR,NONWW:PNL,47K OHM,20%,0.2W	K8996	PP17/000HFA0A494
A3R517	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
A3R518	315-0912-00			RES,FXD,FILM:9.1K OHM,5%,0.25W	57668	NTR25J-E09K1
A3R724	315-0751-00			RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
A3R725	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A3R726	311-2366-00			RES,VAR,NONWW:PNL,470 OHM,20%,0.2W	K8996	PP17/000HFAQA234
A3R727	321-0177-00			RES,FXD,FILM:681 OHM,1%,0.125W,TC=T0	07716	CEAD681R0F
A3R728	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A3R729	311-2362-00			RES,VAR,NONWW:PNL,4.7K OHM,20%,0.2W	K8996	PP17/000HFA0A364
A3R800	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
A3R802	311-2359-00			RES,VAR,NONWW:PNL,10K OHM,20%,0.2W	K8996	PP17000HGA0A4110
A3R986	311-2364-00			RES,VAR,NONWW:TRMR,4.7K OHM,0.5W	K8788	TC10-LV10-4K7/A
A3R987	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A3S90	260-2291-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TK 2 POS
A3S101	260-2293-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 3 POS
A3S201	260-2293-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 3 POS
A3S380	260-2292-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 4 POS
A3S390	260-2290-00			SWITCH,PUSH:1 BUTTON,1 POLE,MOMENTARY	TK0EA	SKECCAA061A
A3S392	260-2292-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 4 POS
A3S401	260-2292-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 4 POS
A3S460	260-2291-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TK 2 POS
A3S505	260-2290-00			SWITCH,PUSH:1 BUTTON,1 POLE,MOMENTARY	TK0EA	SKECCAA061A
A3S545	260-2293-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 3 POS
A3S550	260-2293-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 3 POS
A3S555	260-2292-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 4 POS
A3S601	260-2293-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 3 POS
A3S603	260-2293-00			SWITCH,SLIDE:DPDT,250MA,100VAC	U3771	607/TEK 3 POS
A3W1	174-0639-00			CA ASSY,SP,ELEC:6,26 AWG,110MM L,RIBBON	TK0EM	82026-5806(95mm)
A3W2	174-0638-00			CA ASSY,SP,ELEC:6,26 AWG,165MM L,RIBBON	TK0EM	82265806(165mm)
A3W3	174-0639-00			CA ASSY,SP,ELEC:6,26 AWG,110MM L,RIBBON	TK0EM	82026-5806(95mm)
A3W4	174-0639-00			CA ASSY,SP,ELEC:6,26 AWG,110MM L,RIBBON	TK0EM	82026-5806(95mm)
A3W5	174-0639-00			CA ASSY,SP,ELEC:6,26 AWG,110MM L,RIBBON	TK0EM	82026-5806(95mm)
A3W6	174-0635-00			CA ASSY,SP,ELEC:6,26 AWG,120MM L,RIBBON	TK0EM	82265806(120mm)
A3W7	174-0638-00			CA ASSY,SP,ELEC:6,26 AWG,165MM L,RIBBON	TK0EM	82265806(165mm)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A4	670-9939-00	200001	202907	CIRCUIT BD ASSY:MAINS INPUT	80009	670-9939-00
A4	670-9939-05	202908		CIRCUIT BD ASSY:MAIN INLET	80009	670-9939-05
A4C900	290-1158-00			CAP,FXD,ELCTLT:2200UF,20%,80V	TK0ED	ORDER BY DESCR
A4C903	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A4C904	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A4C905	285-1252-00	202908		CAP,FXD,PLASTIC:0.15UF,10%,250VAC (UNITED KINGDOM ONLY)	D5243	F1772-415-2000
A4C905	285-1252-00			CAP,FXD,PLASTIC:0.15UF,10%,250VAC (U.S.A. & GUERNSEY)	D5243	F1772-415-2000
A4CR901	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR902	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR903	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR904	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4F901	159-0032-00			FUSE,CARTRIDGE:3AG,0.5A,250V,SLOW BLOW	71400	MDL 1/2
A4J901	131-3905-00			CONN,RCPT,ELEC:PWR,250VAC,6A,CKT BD MT	TK0DY	L2157
A4J902	204-1038-00			CONN BODY,PLUG:1 X 8 W/O LOCKING EARS	80009	204-1038-00
A4L901	108-1375-00			COIL,RF:FXD,82UH,1A	TK00A	RL-1218-820K-1A
A4L902	108-1375-00			COIL,RF:FXD,82UH,1A	TK00A	RL-1218-820K-1A
A4Q900	151-0350-00			TRANSISTOR:PNP,SI,TO-92	04713	2N5401
A4R902	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A4R903	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A4R904	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A4R905	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R906	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A4S901	260-1849-05			SWITCH,PUSH:DPDT,4A,250VAC,W/BRACKET	31918	NE-15 SERIES
A4S902	260-2116-00			SWITCH,SLIDE:DPDT,10A,125VAC,LINE SEL	04426	18-000-0019
A4W903	174-0636-00			CA ASSY SP,ELEC:3,26 AWG,150MM L,RIBBON	TK0EM	82265803(150mm)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A5	670-9938-00	200001	202907	CIRCUIT BD ASSY:FOCUS CONTROL MOUNTING	80009	670-9938-00
A5	670-9938-05	202908		CIRCUIT BD ASSY:FOCUS CONTROL	80009	670-9938-05
A5R893	311-2357-00			RES,VAR,NONWW:PNL,2.2M OHM,20%,0.25W	TK0OC	ORDER BY DESCR

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
DL224	119-2611-00			DELAY LINE,ELEC:ASSEMBLY	80009	119-2611-00
J590	131-3898-00			TERM,FEEDTHRU:0.658 M X 0.75 DIA,BRS,AU PL	K0491	001-1401-041140P
T901	120-1633-00			TRANSFORMER,RF:TORIOD	K5545	ORDER BY DESCR
V900	154-0907-00			ELECTRON TUBE:CRT,FINISHED	80009	154-0907-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

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

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

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

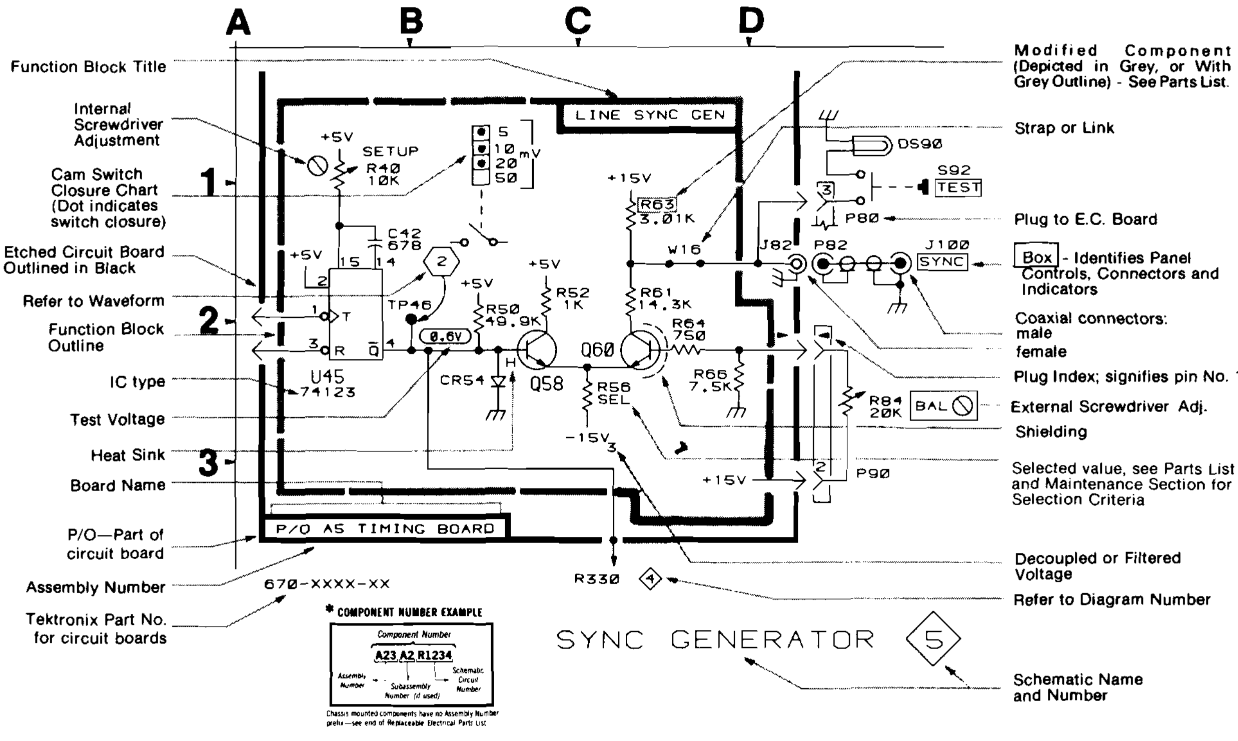
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

The information and special symbols below may appear in this manual.

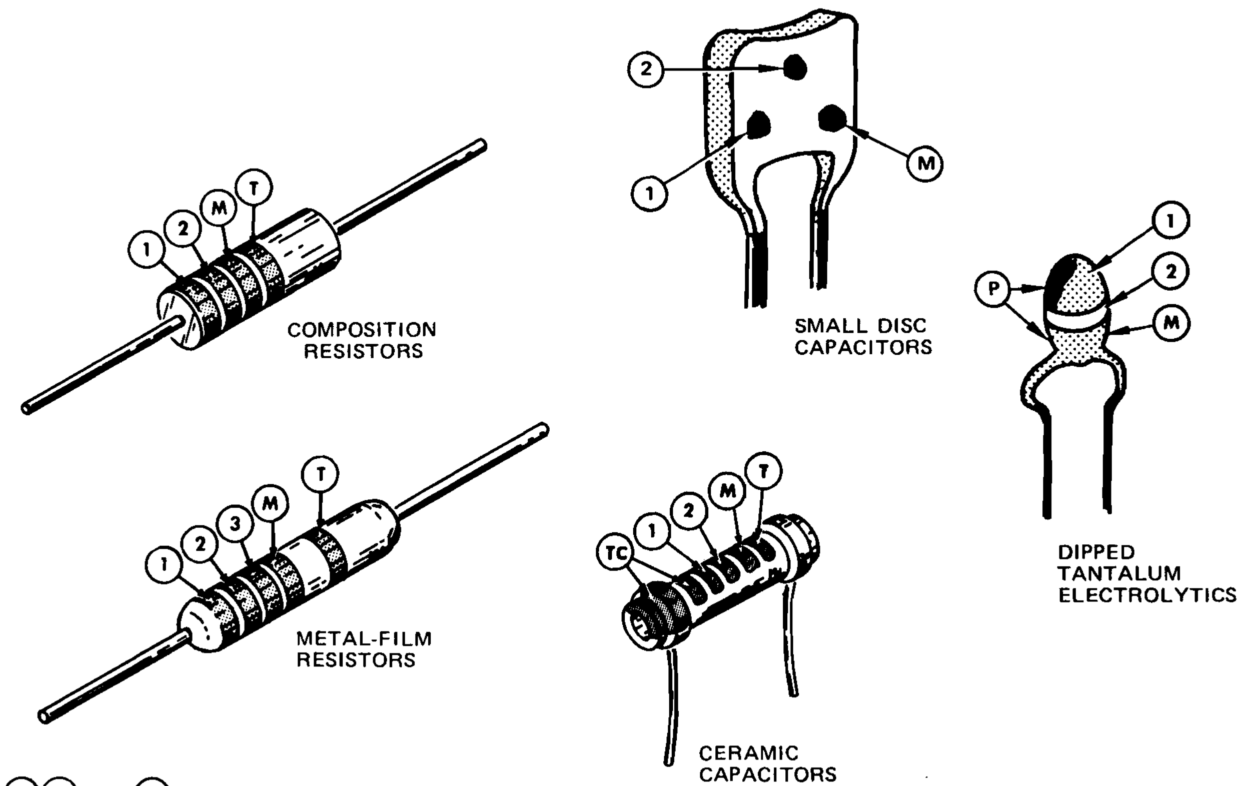
Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.



COLOR CODE



(1)(2) and (3) – 1st, 2nd, and 3rd significant figures

(M) –multiplier (T) –tolerance

(TC) –temperature coefficient

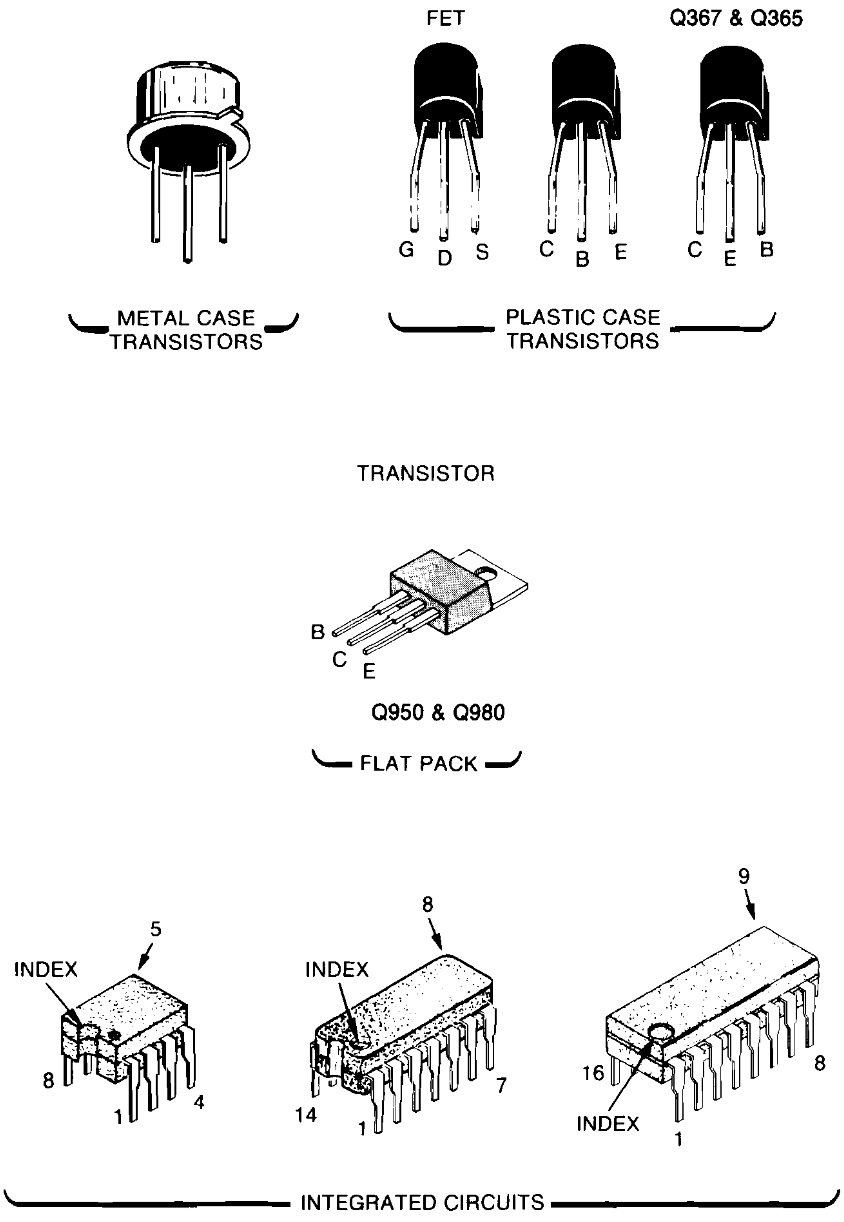
(P) –polarity and voltage rating

(T) and/or (TC) color code may not be present on some capacitors

COLOR	SIGNIFICANT FIGURES	RESISTORS		CAPACITORS			DIPPED TANTALUM VOLTAGE RATING
		MULTIPLIER	TOLERANCE	MULTIPLIER	TOLERANCE		
					over 10 pF	under 10 pF	
BLACK	0	1	---	1	±20%	±2 pF	4 VDC
BROWN	1	10	±1%	10	±1%	±0.1 pF	6 VDC
RED	2	10^2 or 100	±2%	10^2 or 100	±2%	---	10 VDC
ORANGE	3	10^3 or 1 K	±3%	10^3 or 1000	±3%	---	15 VDC
YELLOW	4	10^4 or 10 K	±4%	10^4 or 10,000	+100% –9%	---	20 VDC
GREEN	5	10^5 or 100 K	±½%	10^5 or 100,000	±5%	±0.5 pF	25 VDC
BLUE	6	10^6 or 1 M	±¼%	10^6 or 1,000,000	---	---	35 VDC
VIOLET	7	---	±1/10%	---	---	---	50 VDC
GRAY	8	---	---	10^{-2} or 0.01	+80% –20%	±0.25 pF	---
WHITE	9	---	---	10^{-1} or 0.1	±10%	±1 pF	3 VDC
GOLD	–	10^{-1} or 0.1	±5%	---	---	---	---
SILVER	–	10^{-2} or 0.01	±10%	---	---	---	---
NONE	–	---	±20%	---	±10%	±1 pF	---

(1861-20A) 2662-48

Figure 9-1. Color codes for resistors and capacitors.



LEAD CONFIGURATIONS AND CASE STYLES ARE TYPICAL, BUT MAY VARY DUE TO VENDOR CHANGES OR INSTRUMENT MODIFICATIONS.

Figure 9.2 Semiconductor lead configurations.

To identify any component mounted on a circuit board and to locate that component in the schematic diagram.

1. Locate the Circuit Board Illustration.

   a. Identify the Assembly Number of the circuit board that the component is on by using the Circuit Board location illustration in this section or the mechanical parts exploded views at the rear of this manual.

   b. In the manual, locate the tabbed foldout page that corresponds with the Assembly Number of the circuit board. The circuit board assembly numbers and names are printed on the back side of the tabs (facing the rear of the manual).

2. Determine the Circuit Number and Schematic Diagram.

   a. Compare the circuit board with its illustration. Locate the component you are looking for by area and shape on the illustration to determine its Circuit Number.

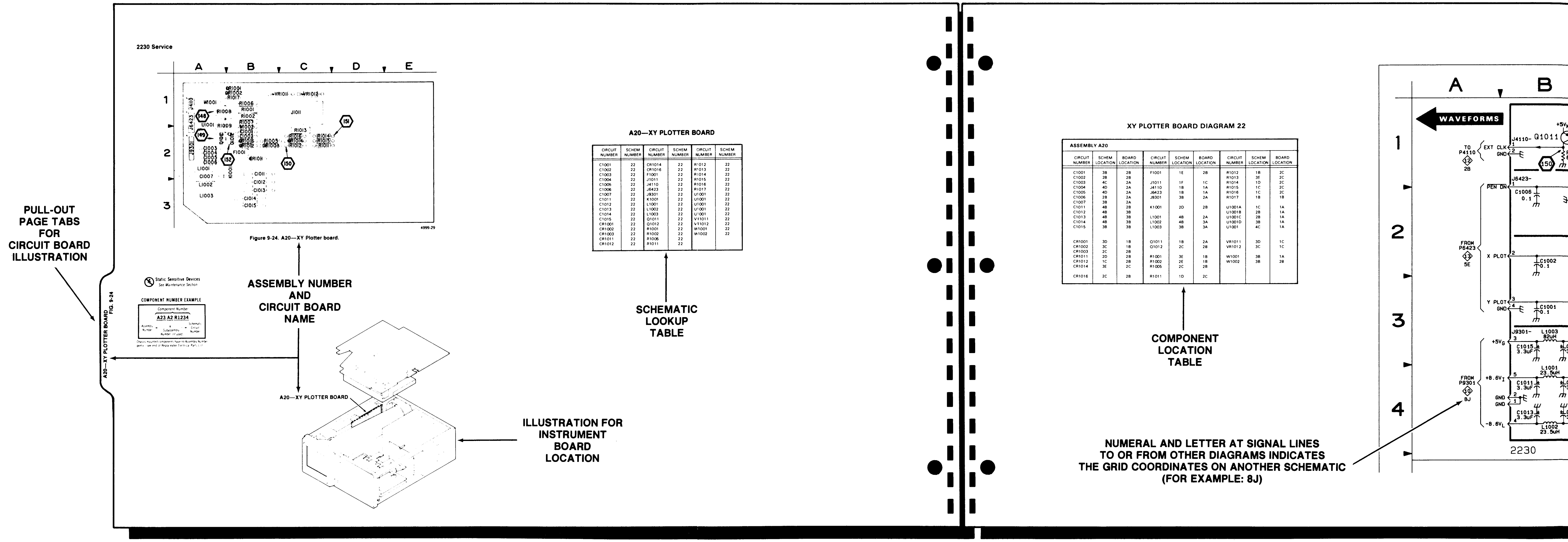
   b. Scan the lookup table next to the Circuit Board illustration to find the Circuit Number of the component.

   c. Read the SCHEM NUMBER column next to the component's circuit number to find the Schematic Diagram number.

3. Locate the Component on the Schematic Diagram.

   a. Locate the tabbed page that corresponds to the Schematic Diagram n ber. Schematic diagram numbers and names are printed on the front of the tabs (facing the front of the manual).

   b. Locate the Assembly Number in the Component Location lookup t next to the schematic diagram. Scan the CIRCUIT NUMBER colum that table to find the Circuit Number of the component you are lookin in the schematic.



To identify any component in a schematic diagram and to locate that component on its respective circuit board.

1. Determine the Circuit Board Illustration and Component Location.

   a. From the schematic diagram, determine the Assembly Number of the circuit board that the component is on. The Assembly Number and Name is boxed and located in a corner of the heavy line marking the circuit board outline in the schematic diagram.

   b. Find the Component Location table for the Assembly Number found on the schematic. Scan the CIRCUIT NUMBER column to find the Circuit Number of the component.

   c. Look in the BOARD LOCATION column next to the component number and read its circuit board grid coordinates.

2. Locate the Component on the Circuit Board.

   a. In the manual, locate the tabbed page that corresponds to Assembly Number the component is on. Assembly numbers and names for circuit boards are on the back side of the tabs.

   b. Using the Circuit Number of the component and its given grid location, find the component in the Circuit Board illustration.

   c. From the small circuit board location illustration shown next to the circuit board, find the circuit board's location in the instrument.

   d. Find the circuit board in the instrument. Compare it with the circuit board illustration in the manual to locate the component on the circuit board itself.

Figure 9-3. Locating components on schematic diagrams and circuit board illustrations.

2. Determine the Circuit Number and Schematic Diagram.

   a. Compare the circuit board with its illustration. Locate the component you are looking for by area and shape on the illustration to determine its Circuit Number.

   b. Scan the lookup table next to the Circuit Board illustration to find the Circuit Number of the component.

   c. Read the SCHEM NUMBER column next to the component's circuit number to find the Schematic Diagram number.

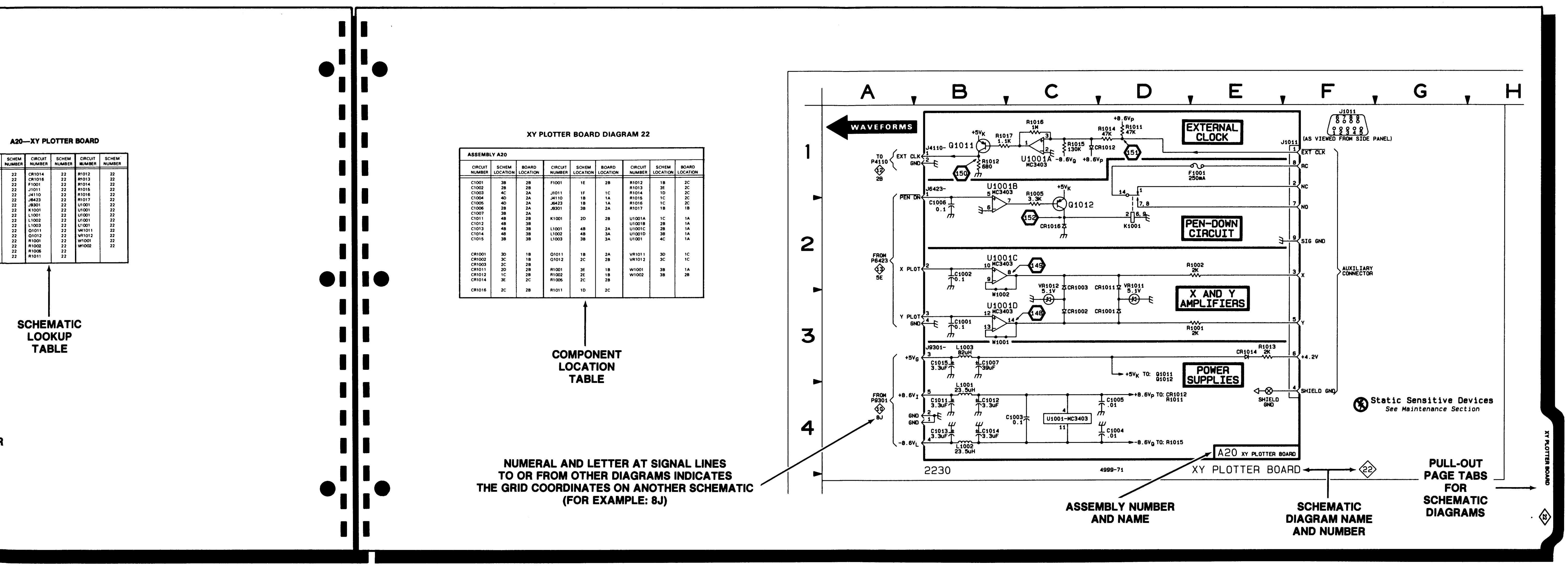
3. Locate the Component on the Schematic Diagram.

   a. Locate the tabbed page that corresponds to the Schematic Diagram number. Schematic diagram numbers and names are printed on the front side of the tabs (facing the front of the manual).

   b. Locate the Assembly Number in the Component Location lookup table next to the schematic diagram. Scan the CIRCUIT NUMBER column of that table to find the Circuit Number of the component you are looking for in the schematic.

   c. In the SCHEM LOCATION column next to the component, read the grid coordinates of the component in the schematic.

   d. Using the grid coordinates given, find the component in the schematic diagram.



2. Locate the Component on the Circuit Board.

   a. In the manual, locate the tabbed page that corresponds to Assembly Number the component is on. Assembly numbers and names for circuit boards are on the back side of the tabs.

   b. Using the Circuit Number of the component and its given grid location, find the component in the Circuit Board illustration.

   c. From the small circuit board location illustration shown next to the circuit board, find the circuit board's location in the instrument.

   d. Find the circuit board in the instrument. Compare it with the circuit board illustration in the manual to locate the component on the circuit board itself.

Figure 9-3. Locating components on schematic diagrams and circuit board illustrations.

6531-08

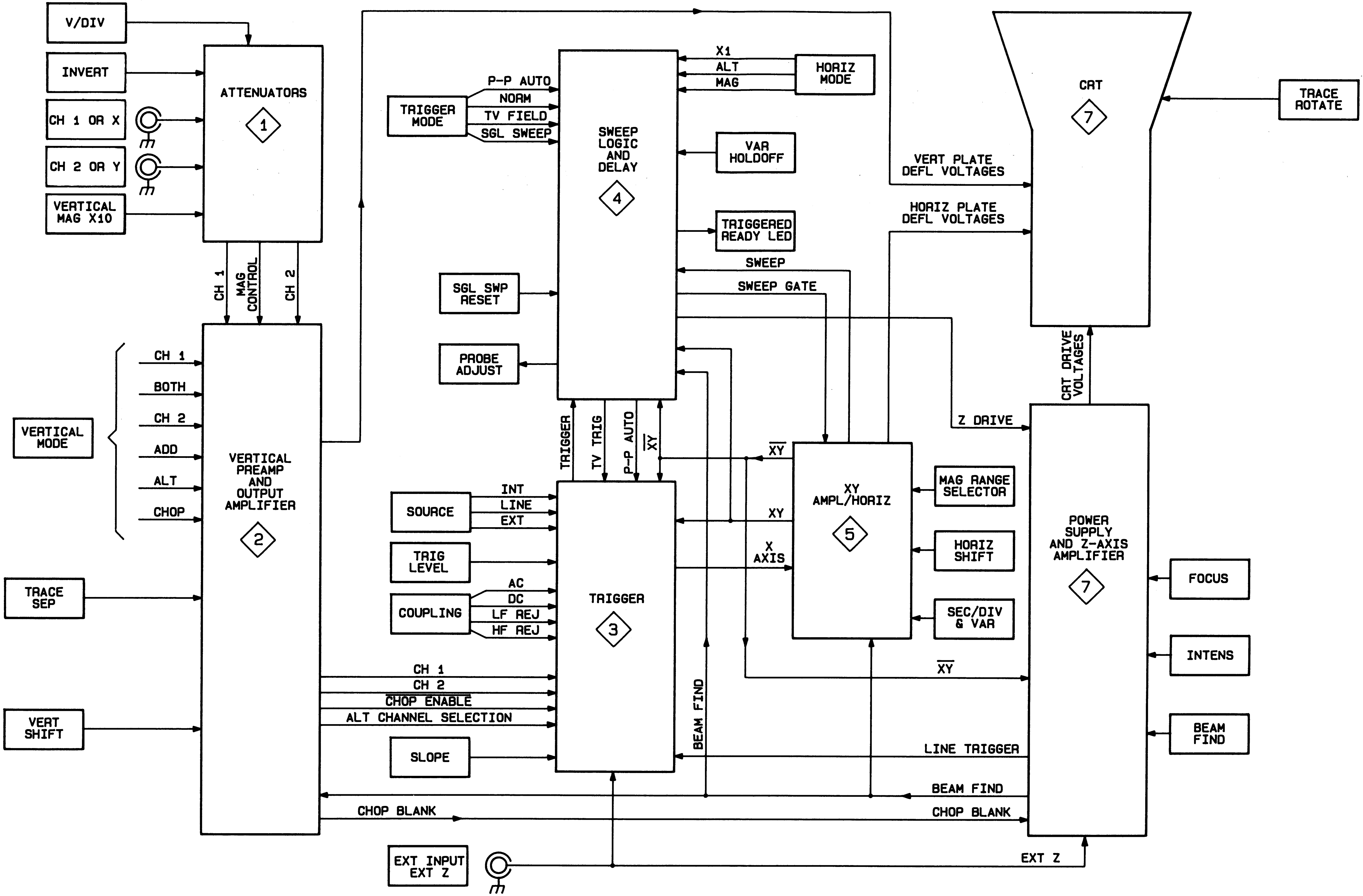


Figure 9-4. 2225 block diagram.

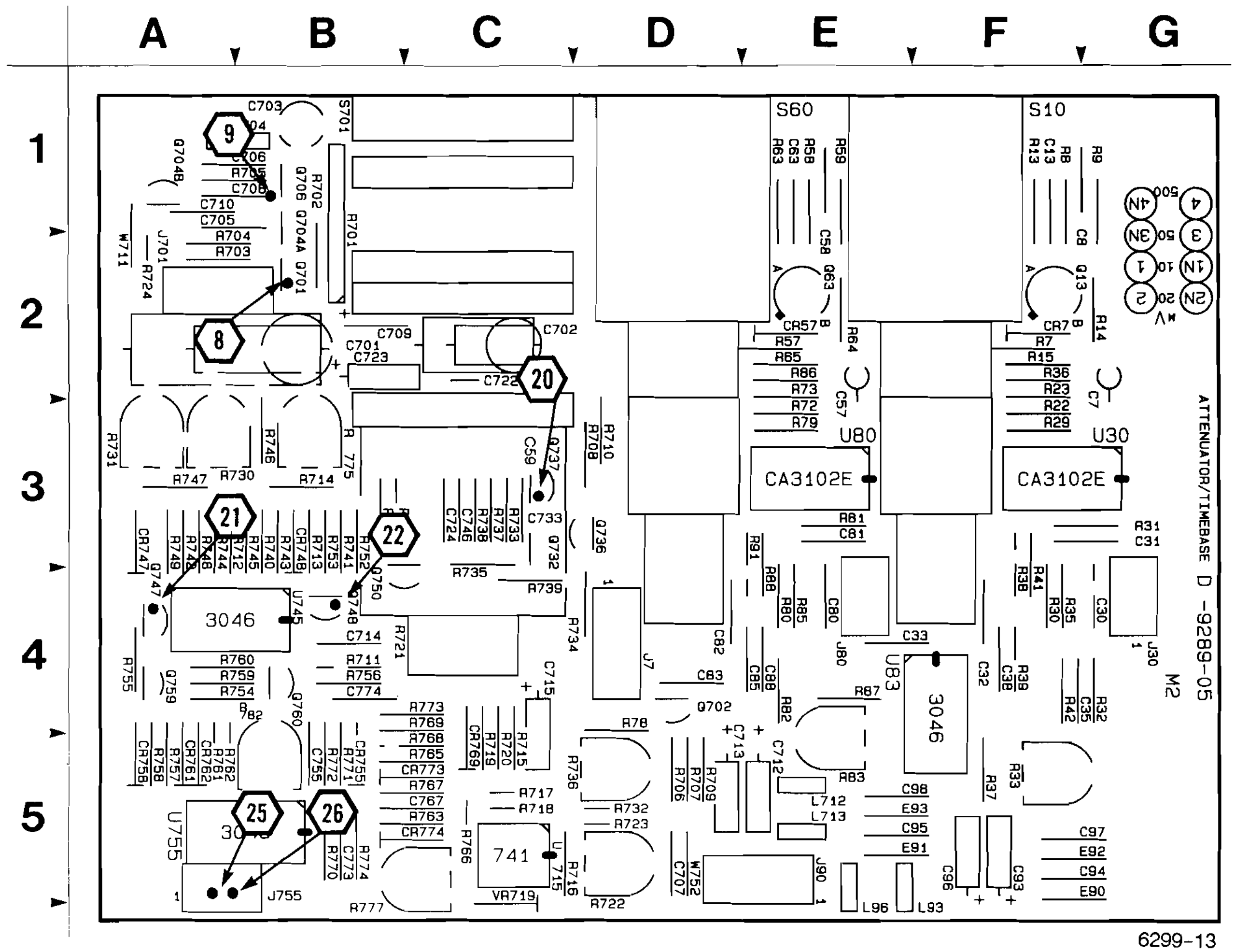
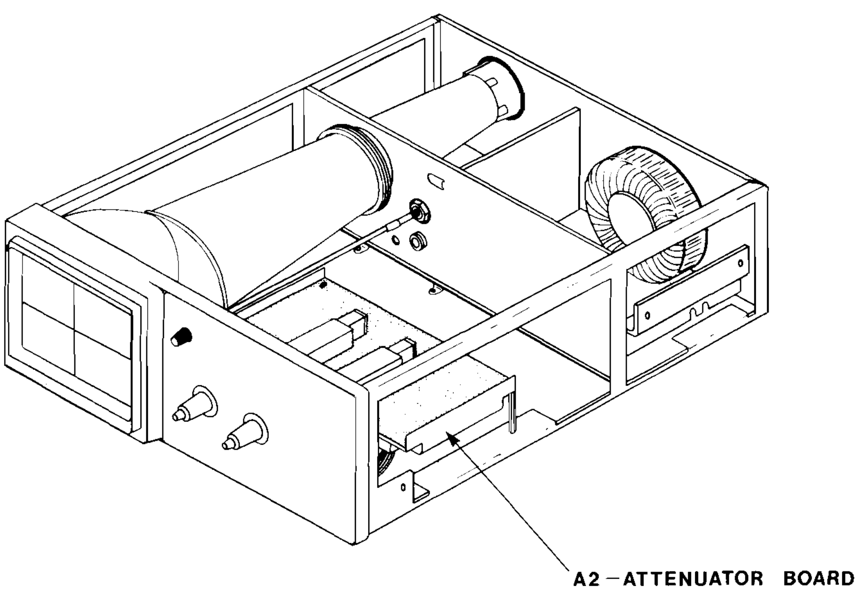
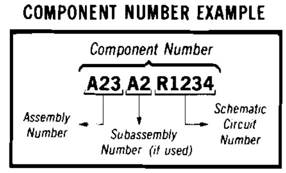


Figure 9-5. A2—Attenuator board.



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

A2 – ATTENUATOR/TIMEBASE BOARD

CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER
AT1	1	C709	5	J80	1	R30	1	R706	5	R751	5
AT1	6	C710	5	J90	1	R31	1	R707	5	R752	5
AT51	1	C712	5	J701	4	R32	1	R708	5	R753	5
AT51	6	C713	5	J701	5	R33	1	R709	5	R754	5
		C714	5	J755	5	R35	1	R710	5	R755	5
C6	1	C715	5			R36	1	R711	5	R756	5
C7	1	C722	5	L93	1	R37	1	R712	5	R757	5
C8	1	C723	5	L96	1	R38	1	R713	5	R758	5
C13	1	C724	5	L712	5	R39	1	R714	5	R759	5
C30	1	C733	5	L713	5	R41	1	R715	5	R760	5
C31	1	C746	5			R42	1	R716	5	R761	5
C32	1	C755	5	Q13	1	R53	1	R717	5	R762	5
C33	1	C767	5	Q63	1	R53	6	R718	5	R763	5
C35	1	C773	5	Q701	5	R55	1	R719	5	R765	5
C38	1	C774	5	Q702	5	R56	1	R720	5	R766	5
C56	1			Q704	5	R57	1	R721	5	R767	5
C57	1	CR7	1	Q706	5	R58	1	R722	5	R768	5
C58	1	CR57	1	Q732	5	R59	1	R723	5	R769	5
C59	1	CR747	5	Q736	5	R63	1	R730	5	R770	5
C63	1	CR748	5	Q737	5	R64	1	R731	5	R771	5
C80	1	CR755	5	Q747	5	R65	1	R732	5	R772	5
C81	1	CR758	5	Q748	5	R72	1	R733	5	R773	5
C82	1	CR761	5	Q750	5	R73	1	R734	5	R774	5
C83	1	CR762	5	Q759	5	R78	1	R735	5	R775	5
C85	1	CR769	5	Q760	5	R79	1	R736	5	R777	5
C88	1	CR773	5			R80	1	R737	5	R782	5
C93	1	CR774	5	R3	1	R81	1	R738	5		
C94	1			R3	6	R82	1	R739	5	S10	1
C95	1	E90	1	R5	1	R83	1	R740	5	S60	1
C96	1	E91	1	R6	1	R85	1	R741	5	S701	5
C97	1	E92	1	R7	1	R86	1	R742	5		
C98	1	E93	1	R8	1	R87	1	R743	5	U30	1
C701	5			R9	1	R88	1	R744	5	U80	1
C702	5	J7	1	R13	1	R91	1	R745	5	U83	1
C703	5	J7	5	R14	1	R701	5	R746	5	U715	5
C704	5	J7	6	R15	1	R702	5	R747	5	U745	5
C705	5	J29	1	R22	1	R703	5	R748	5	U755	5
C706	5	J30	1	R23	1	R704	5	R749	5		
C707	5	J79	1	R29	1	R705	5	R750	5	W711	5
C708	5										

TEST WAVEFORM AND VOLTAGE SETUPS

WAVEFORM MEASUREMENTS

On the left-hand pages preceding the schematic diagrams are test waveform illustrations that are intended to aid in troubleshooting the instrument. To test the instrument for these waveforms, make the initial control settings as follows:

Vertical (Both Channels)

POSITION	Midrange
MODE	CH 1, NORM
VOLTS/DIV	10 mV
VOLTS/DIV Var	In CAL detent
Magnification	X1 (CAL knob in)
Input Coupling	GND

Horizontal

POSITION (both)	Midrange
MODE	X1
SEC/DIV	0.5 ms
SEC/DIV Var	In CAL detent

Trigger

SOURCE	VERT MODE
COUPLING	DC
MODE	P-P AUTO
SLOPE	Positive
HOLDOFF	Min

DC VOLTAGE MEASUREMENTS

Typical voltage measurements located on the schematic diagrams were obtained with the instrument operating under the conditions specified in the Waveform Measurements setup. Control-setting changes required for specific voltages are indicated on each waveform page. Measurements are referenced to the chassis ground.

RECOMMENDED TEST EQUIPMENT

Test equipment in Table 4-1 in the Performance Check Procedure, Section 4, of this manual meets the required specifications for testing this instrument.

POWER SUPPLY ISOLATION PROCEDURE

Each regulated supply has numerous feed points to external loads through the instrument. Diagram 8, power distribution, is used in conjunction with the schematic diagrams to determine the service jumper or component that may be lifted to isolate loads from the power supply.

If a supply comes up after lifting one of the isolating jumpers, it is very probable that short exists in the circuitry on that supply line. By lifting jumpers or other components in the supply line farther down the line, the circuit in which a short exists may be located.

Always set the POWER switch to OFF before soldering or unsoldering service jumpers or other components and before attempting to measure component resistance values.

OTHER PARTS

CIRCUIT NUMBER	SCHEM NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM NUMBER	SCHEM LOCATION
DL224	2	5K	J590	4	3M	R53	6	3K
						R382	6	7M
J100	1	1C	R1	6	1K			
J100	6	1K	R3	6	2K	T901	7	6B
J151	1	5C	R47	1	2B			
J151	6	3K	R51	1	5B	V900	7	2L
J300	6	7M	R51	6	3K			

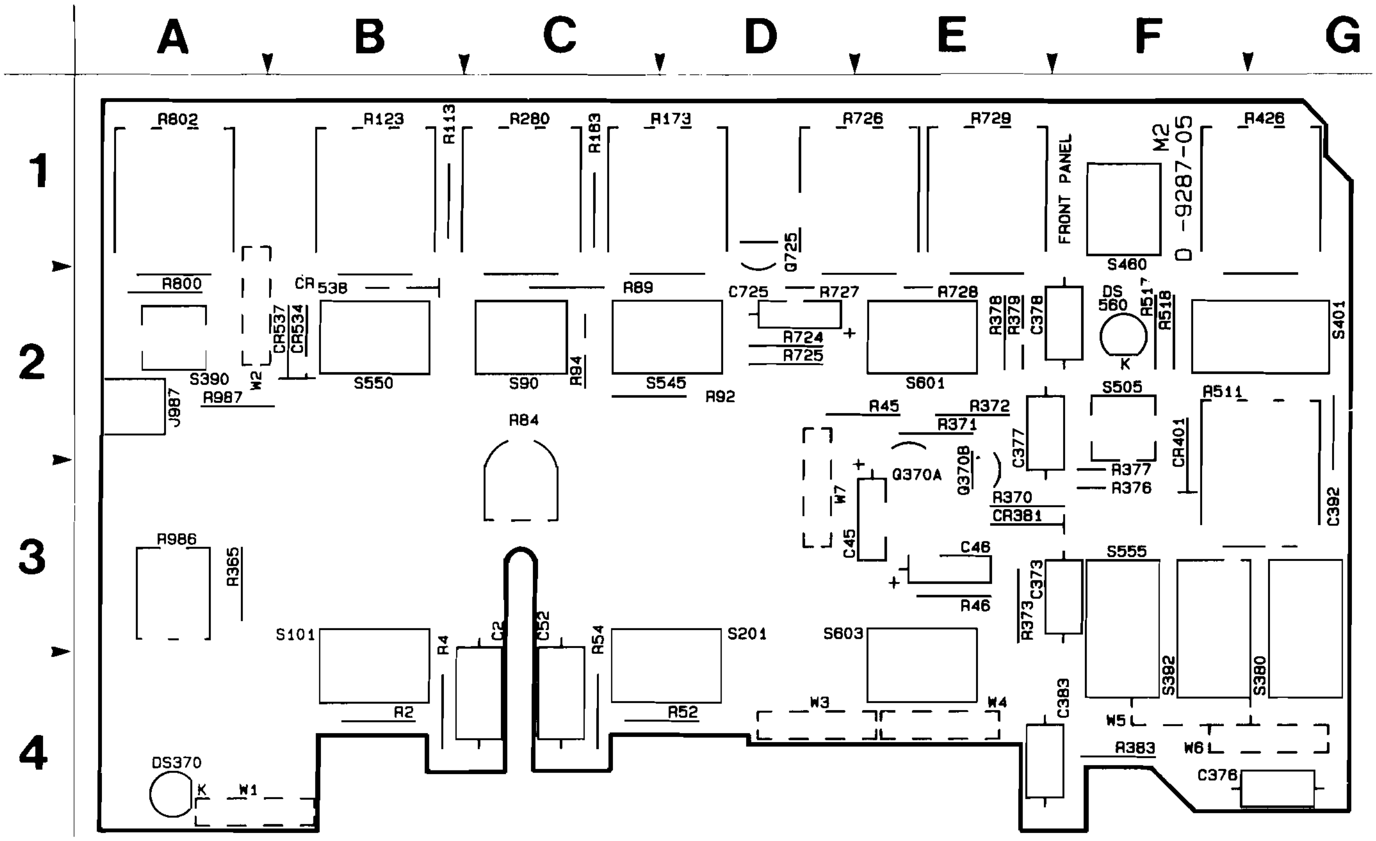


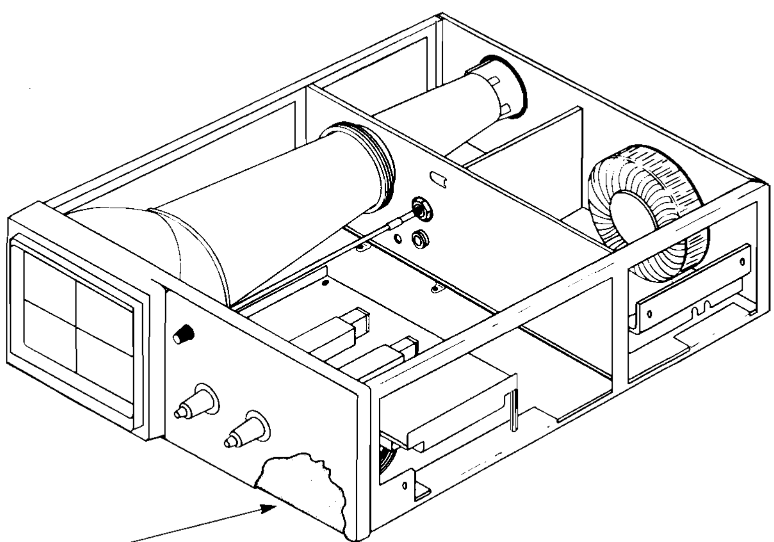
Figure 9-6. A3—Front Panel board.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.



A3—FRONT PANEL BOARD

A3—FRONT PANEL BOARD FIG. 9-6

A3—FRONT PANEL BOARD

CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER
C2	1	R1	6	R377	6	S390	6
C2	6	R2	1	R378	6	S392	6
C45	6	R2	6	R379	6	S401	6
C46	6	R4	1	R382	6	S460	6
C52	1	R4	6	R383	6	S505	4
C52	6	R45	6	R426	3	S505	6
C373	6	R46	6	R426	6	S545	2
C376	6	R51	1	R511	4	S545	6
C377	6	R51	6	R511	6	S550	2
C378	6	R52	1	R517	4	S550	6
C383	6	R52	6	R517	6	S555	6
C392	6	R54	1	R518	4	S601	4
C725	6	R84	1	R518	6	S601	6
C726	6	R84	6	R724	6	S603	6
		R89	1	R725	6		
CR136	2	R89	6	R726	6	W1	2
CR381	6	R92	1	R727	6	W1	4
CR534	2	R92	6	R728	6	W1	6
CR534	6	R94	1	R729	6	W1	7
CR537	2	R94	6	R800	6	W2	2
CR537	6	R113	2	R800	7	W2	6
CR538	2	R113	6	R802	6	W3	3
CR538	6	R123	2	R802	7	W3	6
		R123	6	R986	6	W4	4
DS370	6	R163	2	R986	7	W4	6
DS560	4	R173	2	R987	6	W4	7
DS560	6	R173	6	R987	7	W5	4
		R280	2			W5	6
J987	6	R280	6	S90	1	W6	6
J987	7	R365	6	S90	6	W6	7
		R370	6	S101	1	W7	1
Q370	6	R371	6	S101	6	W7	6
Q725	6	R372	6	S201	1		
		R373	6	S201	6		
R1	1	R376	6	S380	6		

VERTICAL ATTNEUATOR/PREAMP DIAGRAM 1

Assembly A2

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
AT1	1D	1F	C97	9D	5F	R5	2E	1F	R59	6G	1E
AT51	5D	1D	C98	9D	5E	R6	2F	1F	R63	5G	1E
						R7	2F	2F	R64	6G	2E
C6	2F	1F	CR7	2F	2F	R8	1G	1F	R65	7G	2E
C7*	1F	2G	CR57	6F	2E	R9	2G	1G	R72	7G	3E
C8	2G	1G				R13	1G	1F	R73	7G	3E
C13	1G	1F	E90	8C	5F	R14	2G	2G	R78	8E	5D
C30	4F	4G	E91	8C	5E	R15	3G	2F	R79	7H	3E
C31	4G	3G	E92	9C	5F	R22	3G	3F	R80	7F	4E
C32	2L	4F	E93	9C	5E	R23	3G	3F	R81	8H	3E
C33	4L	4E				R29	2H	3F	R82	7F	4E
C35	5H	4F	J7	8G	4D	R30	4F	4F	R83	8E	5E
C38	5J	4F	J29	2H	3F	R31	4H	3G	R85	8H	4E
C56	6F	1D	J30	2L	4G	R32	4F	4G	R86	6H	2E
C57*	5F	2E	J79	6H	3E	R33	4E	5F	R87	7J	4E
C58	6G	1E	J80	6L	4E	R35	4H	4F	R88	8J	4E
C59	5G	2D	J90	8B	5E	R36	1H	2F	R91	9H	4E
C63	5G	1E				R37	3J	5F			
C80	7F	4E	L93	7C	5E	R38	4J	4F	S10	1D	1F
C81	8G	3E	L96	9C	5E	R39	4J	4F	S60	5D	1D
C82	6L	4D				R41	5H	4F			
C83	8L	4D	Q13A	2G	2F	R42	5H	4F	U30	3H	3F
C85	9H	4E	Q13B	3G	2F	R53	6D	1D	U80	7H	3E
C88	9J	4E	Q63A	6G	2E	R55	6E	1D	U83A	7H	4F
C93	8C	5F	Q63B	7G	2E	R56	6F	1D	U83B	7J	4F
C94	8D	5F				R57	6F	2E	U83C	3I	4F
C95	8D	5E	R3	2D	1F	R58	5G	1E	U83D	3J	4F
C96	9C	5F									

Partial A2 also shown on diagrams 4, 5 and 6.

Assembly A3

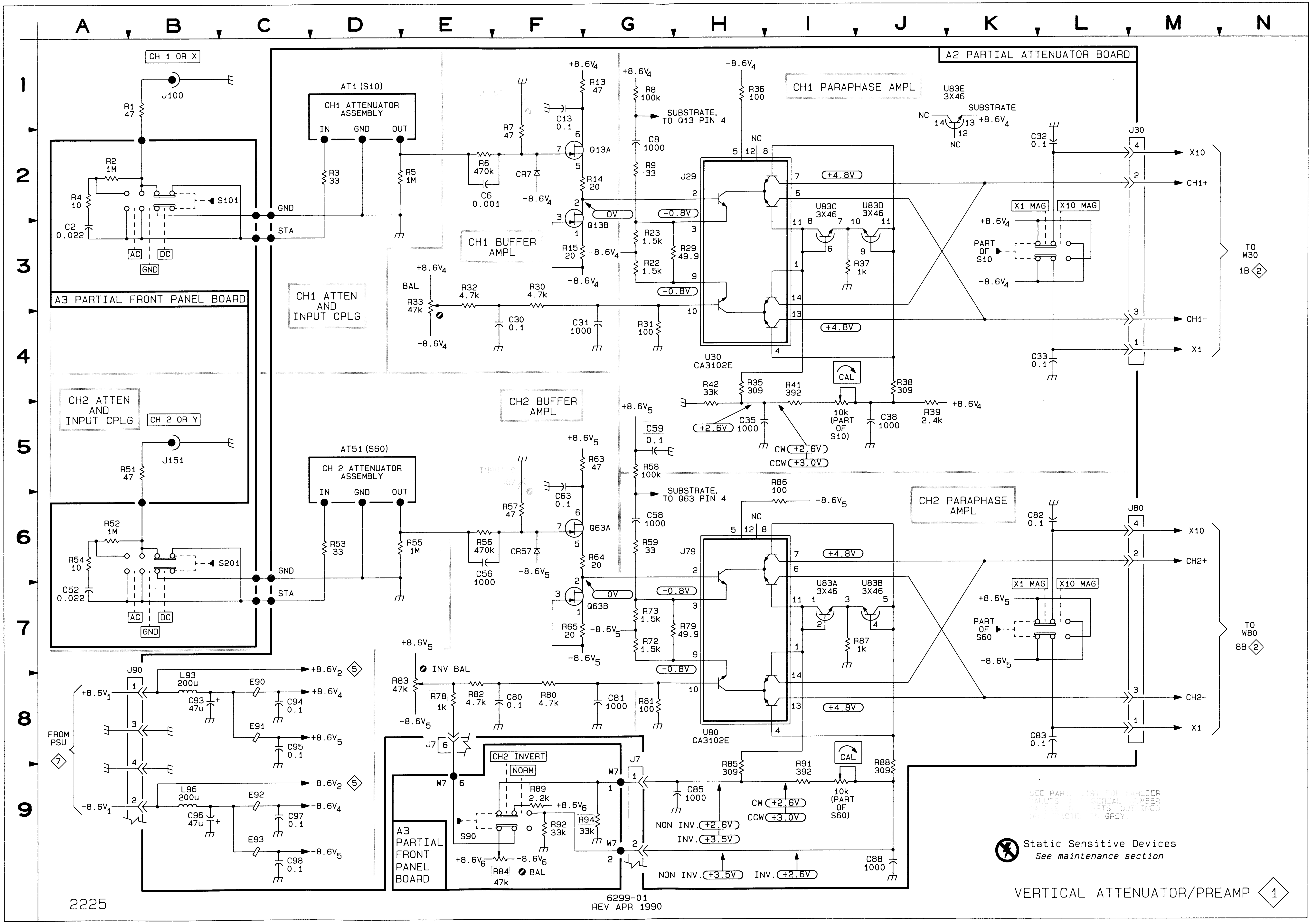
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2	3B	4C	R52	6B	4D	R94	9G	2C			
C52	6B	4C	R54	8B	4C				W7-1	9G	3D
			R84*	9F	3C	S90	9F	2C	W7-2	9G	3D
R2	2B	4B	R89	9F	2C	S101	2B	4B	W7-6	8F	3D
R4	2B	4B	R92	9F	2D	S201	6B	4D			

Partial A3 also shown on diagrams 2, 3, 4, 6 and 7.

OTHER PARTS

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J100	1C	CHASSIS	J151	5C	CHASSIS	R1	1B	CHASSIS	R51	5B	CHASSIS

***See Parts List for serial number ranges.**


A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
A2 PARTIAL ATTENUATOR BOARD
A3 PARTIAL FRONT PANEL BOARD
CH 1 OR X
J100
CH 2 OR Y
J151
AT1 (S10)
CH1 ATTENUATOR ASSEMBLY
IN GND OUT
AT51 (S60)
CH 2 ATTENUATOR ASSEMBLY
CH1 ATTEN AND INPUT CPLG
CH2 ATTEN AND INPUT CPLG
CH1 BUFFER AMPL
CH2 BUFFER AMPL
CH1 PARAPHASE AMPL
CH2 PARAPHASE AMPL
Q13A Q13B Q63A Q63B
SUBSTRATE, TO Q13 PIN 4
SUBSTRATE, TO Q63 PIN 4
U30 CA3102E
U80 CA3102E
U83E 3X46
U83C 3X46
U83D 3X46
U83A 3X46
U83B 3X46
X1 MAG
X10 MAG
PART OF S10
PART OF S60
CAL
J30 J80
X10 CH1+ CH1- X1
X10 CH2+ CH2- X1
TO W30 1B 2
TO W80 8B 2
BAL
INV BAL
CH2 INVERT
NORM
S90
S101 S201
AC DC GND
GND STA
FROM PSU 7
+8.6V2 +8.6V4 +8.6V5 -8.6V2 -8.6V4 -8.6V5
NON INV. INV.
CW CCW
A3 PARTIAL FRONT PANEL BOARD
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
Static Sensitive Devices
See maintenance section
2225
6299-01
REV APR 1990
VERTICAL ATTENUATOR/PREAMP 1

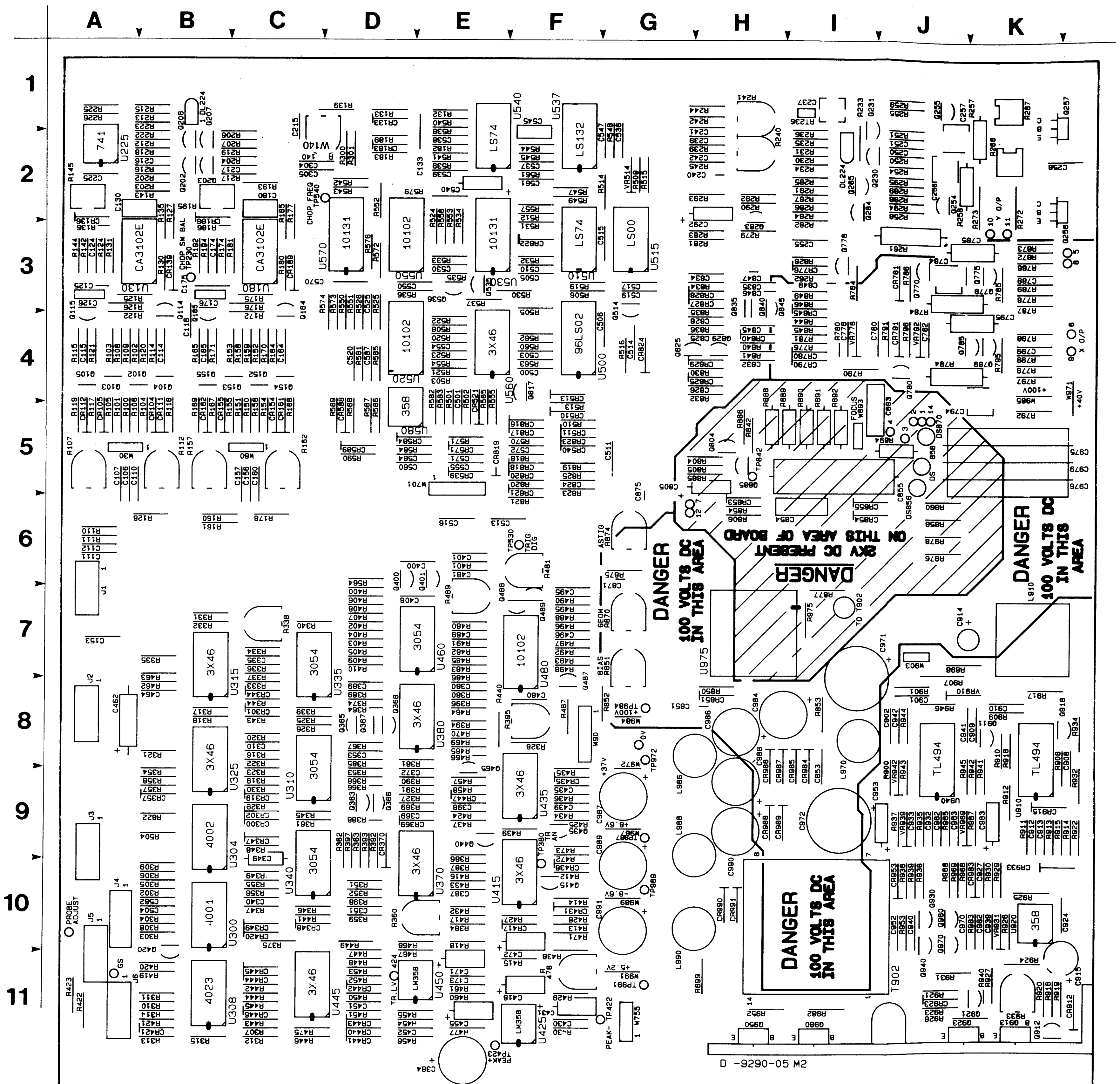
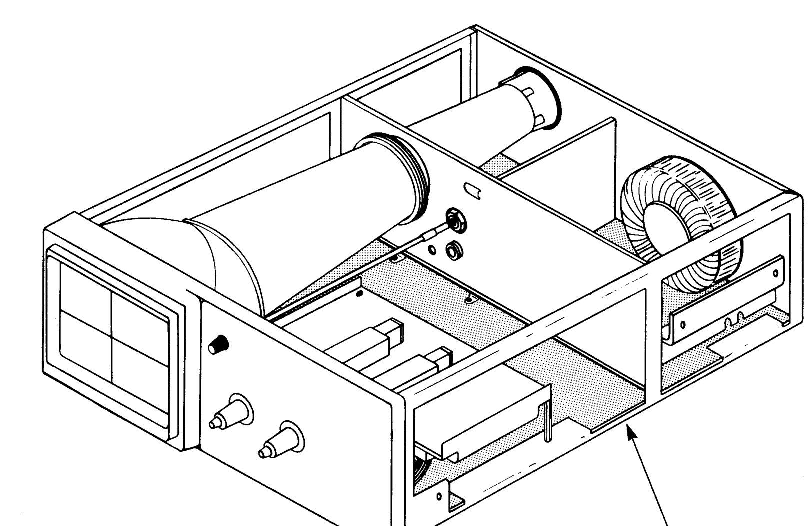


Figure 9-7. A1—Main board component view.

6299-12



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

A1—MAIN BOARD

CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER
C106	2	C504	4	C971	7	CR827	7	Q256	2	R132	2
C107	2	C505	4	C972	7	CR828	7	Q257	2	R133	2
C110	2	C506	4	C975	7	CR829	7	Q283	2	R135	2
C111	2	C510	4	C976	7	CR840	7	Q284	2	R136	2
C112	2	C511	4	C979	7	CR845	7	Q285	2	R139	2
C114	2	C513	4	C982	7	CR851	7	Q363	3	R140	2
C115	2	C514	4	C983	7	CR853	7	Q365	3	R142	2
C116	2	C515	4	C984	7	CR854	7	Q366	3	R143	2
C124	2	C516	4	C986	7	CR855	7	Q367	3	R144	2
C125	2	C517	4	C987	7	CR912	7	Q368	3	R145	2
C126	2	C519	4	C988	7	CR915	7	Q400	3	R150	2
C130	2	C520	4	C989	7	CR923	7	Q401	3	R151	2
C133	2	C525	4	C990	7	CR933	7	Q415	3	R152	2
C153	2	C530	4	C991	7	CR953	7	Q420	3	R153	2
C156	2	C536	2			CR983	7	Q435	3	R154	2
C157	2	C537	2	CR104	2	CR984	7	Q440	3	R155	2
C160	2	C538	2	CR105	2	CR985	7	Q465	3	R156	2
C164	2	C539	2	CR111	2	CR986	7	Q487	3	R157	2
C165	2	C540	2	CR112	2	CR987	7	Q488	3	R158	2
C174	2	C545	2	CR133	2	CR988	7	Q489	3	R159	2
C175	2	C547	2	CR139	2	CR989	7	Q514	4	R160	2
C176	2	C550	4	CR154	2	CR990	7	Q535	4	R161	2
C180	2	C554	4	CR155	2	CR991	7	Q536	4	R162	2
C215	2	C555	4	CR161	2			Q770	5	R164	2
C216	2	C560	4	CR162	2	DS856	7	Q775	5	R165	2
C217	2	C561	2	CR183	2	DS858	7	Q776	5	R166	2
C220	2	C562	3	CR186	2	DS870	7	Q779	5	R167	2
C225	2	C570	4	CR189	2			Q780	5	R168	2
C237	2	C571	4	CR300	3	E102	2	Q785	5	R169	2
C239	2	C572	4	CR301	3	E103	2	Q789	5	R170	2
C240	2	C584	4	CR302	3	E152	2	Q804	7	R171	2
C241	2	C587	4	CR319	3	E153	2	Q817	7	R172	2
C242	2	C776	5	CR344	3			Q825	7	R174	2
C250	2	C780	5	CR347	3	J1	2	Q829	7	R175	2
C251	2	C782	5	CR348	3	J1	4	Q835	7	R176	2
C255	2	C784	5	CR349	3	J1	6	Q840	7	R177	2
C256	2	C785	5	CR357	3	J1	7	Q845	7	R178	2
C257	2	C789	5	CR369	3	J2	2	Q885	7	R180	2
C258	2	C794	5	CR370	3	J2	3	Q911	7	R181	2
C281	2	C795	5	CR417	3	J2	6	Q912	7	R182	2
C292	2	C799	5	CR420	3	J3	3	Q913	7	R183	2
C304	3	C805	7	CR421	3	J3	6	Q918	7	R185	2
C305	3	C824	7	CR431	3	J4	4	Q921	7	R186	2
C310	3	C825	7	CR432	3	J4	6	Q923	7	R189	2
C335	3	C828	7	CR435	3	J4	7	Q930	7	R192	2
C340	3	C832	7	CR438	3	J5	3	Q940	7	R193	2
C349	3	C834	7	CR440	3	J5	4	Q950	7	R194	2
C351	3	C835	7	CR441	3	J5	6	Q960	7	R195	2
C353	3	C845	7	CR442	3	J6	3	Q970	7	R202	2
C369	3	C847	7	CR443	3	J6	6	Q980	7	R203	2
C372	3	C849	7	CR444	3	J6	7			R204	2
C380	3	C851	7	CR445	3			R100	2	R206	2
C384	3	C853	7	CR446	3	L910	7	R101	2	R207	2
C387	3	C854	7	CR447	3	L970	7	R102	2	R212	2
C389	3	C855	7	CR510	4	L986	7	R103	2	R213	2
C396	3	C871	7	CR511	4	L988	7	R104	2	R215	2
C398	3	C875	7	CR513	4	L990	7	R105	2	R216	2
C400	3	C893	7	CR521	4			R106	2	R217	2
C401	3	C901	7	CR530	4	P900	7	R107	2	R218	2
C408	3	C902	7	CR539	2			R108	2	R219	2
C418	3	C908	7	CR540	4	Q102	2	R109	2	R222	2
C430	3	C909	7	CR571	4	Q103	2	R110	2	R223	2
C431	3	C910	7	CR584	4	Q104	2	R111	2	R225	2
C435	3	C912	7	CR588	4	Q105	2	R112	2	R226	2
C439	3	C913	7	CR589	4	Q114	2	R114	2	R230	2
C451	3	C914	7	CR776	5	Q115	2	R115	2	R231	2
C452	3	C915	7	CR780	5	Q152	2	R116	2	R233	2
C455	3	C924	7	CR781	5	Q153	2	R117	2	R234	2
C462	3	C927	7	CR790	5	Q154	2	R118	2	R235	2
C464	3	C932	7	CR791	5	Q155	2	R119	2	R236	2
C471	3	C933	7	CR816	7	Q164	2	R120	2	R239	2
C472	3	C939	7	CR817	7	Q165	2	R121	2	R240	2
C473	3	C940	7	CR818	7	Q202	2	R122	2	R241	2
C480	3	C941	7	CR819	7	Q203	2	R124	2	R242	2
C481	3	C942	7	CR820	7	Q206	2	R125	2	R244	2
C489	3	C952	7	CR821	7	Q207	2	R126	2	R245	2
C495	3	C953	7	CR822	7	Q230	2	R127	2	R250	2
C496	3	C962	7	CR823	7	Q231	2	R128	2	R251	2
C500	4	C963	7	CR824	7	Q254	2	R130	2	R254	2
C501	4	C970	7	CR825	7	Q255	2	R131	2	R255	2
C503	4										

A1—MAIN BOARD (cont)

CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER
				R450	3								
R256	2	R356	3	R451	3	R543	3	R849	7	RT236	2		
R257	2	R357	3	R452	3	R544	2	R850	7				
R258	2	R358	3	R453	3	R545	2	R851	7	T902	7		
R259	2	R359	3	R454	3	R547	2	R852	7				
R261	2	R360	3	R455	3	R548	2	R853	7	TP230	2		
R262	5	R361	3	R456	3	R549	2	R854	7	TP380	3		
R266	2	R362	3	R457	3	R550	4	R858	7	TP422	3		
R267	2	R363	3	R458	3	R551	4	R860	7	TP423	3		
R268	2	R364	3	R459	3	R552	4	R870	7	TP530	4		
R272	2	R366	3	R460	3	R553	4	R872	7	TP540	2		
R273	2	R367	3	R461	3	R554	4	R873	7	TP842	7		
R279	2	R368	3	R462	3	R555	4	R874	7	TP972	7		
R281	2	R369	3	R463	3	R556	4	R875	7	TP984	7		
R282	2	R374	3	R464	3	R557	4	R877	7	TP987	7		
R283	2	R375	3	R465	3	R560	4	R885	7	TP989	7		
R284	2	R380	3	R466	3	R561	2	R886	7	TP991	7		
R285	2	R381	3	R467	3	R562	4	R888	7				
R286	2	R384	3	R468	3	R563	4	R889	7	U130	2		
R287	2	R385	3	R469	3	R564	4	R890	7	U180	2		
R288	2	R386	3	R470	3	R565	4	R891	7	U225	2		
R289	2	R387	3	R471	3	R570	4	R892	7	U300	3		
R290	2	R388	3	R472	3	R571	4	R894	7	U304	3		
R291	2	R389	3	R473	3	R572	4	R898	7	U308	3		
R292	2	R390	3	R475	3	R573	4	R899	7	U310	3		
R293	2	R391	3	R477	3	R574	4	R900	7	U315	3		
R294	2	R392	3	R478	3	R576	4	R901	7	U325	3		
R295	2	R393	3	R480	3	R579	4	R907	7	U335	3		
R300	3	R394	3	R481	3	R581	4	R908	7	U340	3		
R301	3	R395	3	R482	3	R582	4	R909	7	U370	3		
R302	3	R396	3	R483	3	R583	4	R910	7	U380	3		
R303	3	R397	3	R485	3	R584	4	R911	7	U415	3		
R304	3	R398	3	R486	3	R585	4	R912	7	U425	3		
R305	3	R400	3	R487	3	R586	4	R913	7	U435	3		
R306	3	R401	3	R488	3	R587	4	R914	7	U445	3		
R307	3	R402	3	R489	3	R588	4	R915	7	U450	3		
R308	3	R403	3	R490	3	R589	4	R916	7	U460	3		
R309	3	R404	3	R491	3	R590	4	R917	7	U480	3		
R310	3	R405	3	R492	3	R764	5	R918	7	U500	4		
R311	3	R406	3	R493	3	R776	5	R919	7	U510	4		
R312	3	R407	3	R495	3	R778	5	R920	7	U515	4		
R313	3	R408	3	R496	3	R779	5	R921	7	U520	4		
R314	3	R409	3	R497	3	R780	5	R922	7	U530	4		
R315	3	R410	3	R498	3	R781	5	R923	7	U537	2		
R316	3	R412	3	R500	4	R784	5	R924	7	U540	2		
R317	3	R413	3	R501	4	R785	5	R925	7	U550	4		
R318	3	R414	3	R502	4	R786	5	R926	7	U560	4		
R319	3	R415	3	R503	4	R787	5	R927	7	U570	4		
R320	3	R416	3	R504	4	R788	5	R928	7	U580	4		
R321	3	R417	3	R505	4	R789	5	R929	7	U910	7		
R322	3	R418	3	R506	4	R790	5	R930	7	U920	7		
R323	3	R419	3	R508	4	R791	5	R931	7	U940	7		
R325	3	R420	3	R509	4	R792	5	R932	7	U975	7		
R326	3	R421	3	R510	4	R794	5	R933	7				
R327	3	R422	3	R512	4	R795	5	R934	7	VR514	4		
R328	3	R423	3	R513	4	R796	5	R935	7	VR776	5		
R329	3	R424	3	R514	4	R797	5	R936	7	VR792	5		
R330	3	R425	3	R515	4	R798	5	R937	7	VR910	7		
R331	3	R427	3	R516	4	R799	5	R938	7	VR931	7		
R332	3	R428	3	R519	4	R804	7	R939	7	VR939	7		
R333	3	R429	3	R520	4	R805	7	R940	7	VR942	7		
R334	3	R430	3	R521	4	R806	7	R941	7	VR969	7		
R335	3	R432	3	R522	4	R818	7	R942	7				
R336	3	R433	3	R523	4	R819	7	R943	7	W30	2		
R337	3	R434	3	R524	4	R820	7	R944	7	W80	2		
R338	3	R435	3	R525	4	R821	7	R945	7	W90	7		
R339	3	R436	3	R526	4	R822	7	R946	7	W140	2		
R340	3	R437	3	R530	4	R823	7	R952	7	W590	4		
R343	3	R438	3	R531	4	R825	7	R953	7	W701	4		
R344	3	R439	3	R532	4	R828	5	R965	7	W701	7		
R345	3	R440	3	R533	4	R830	7	R966	7	W755	5		
R346	3	R441	3	R534	4	R832	7	R967	7	W893	7		
R347	3	R442	3	R535	4	R834	7	R968	7	W971	7		
R348	3	R443	3	R536	4	R835	7	R969	7	W972	7		
R349	3	R444	3	R537	4	R836	7	R975	7	W984	7		
R351	3	R445	3	R538	2	R840	7	R976	7	W985	7		
R352	3	R446	3	R539	2	R841	7	R978	7	W987	7		
R353	3	R447	3	R540	2	R842	7	R982	7	W989	7		
R354	3	R448	3	R541	2	R844	7	R983	7	W991	7		
R355	3	R449	3	R542	3	R845	7						

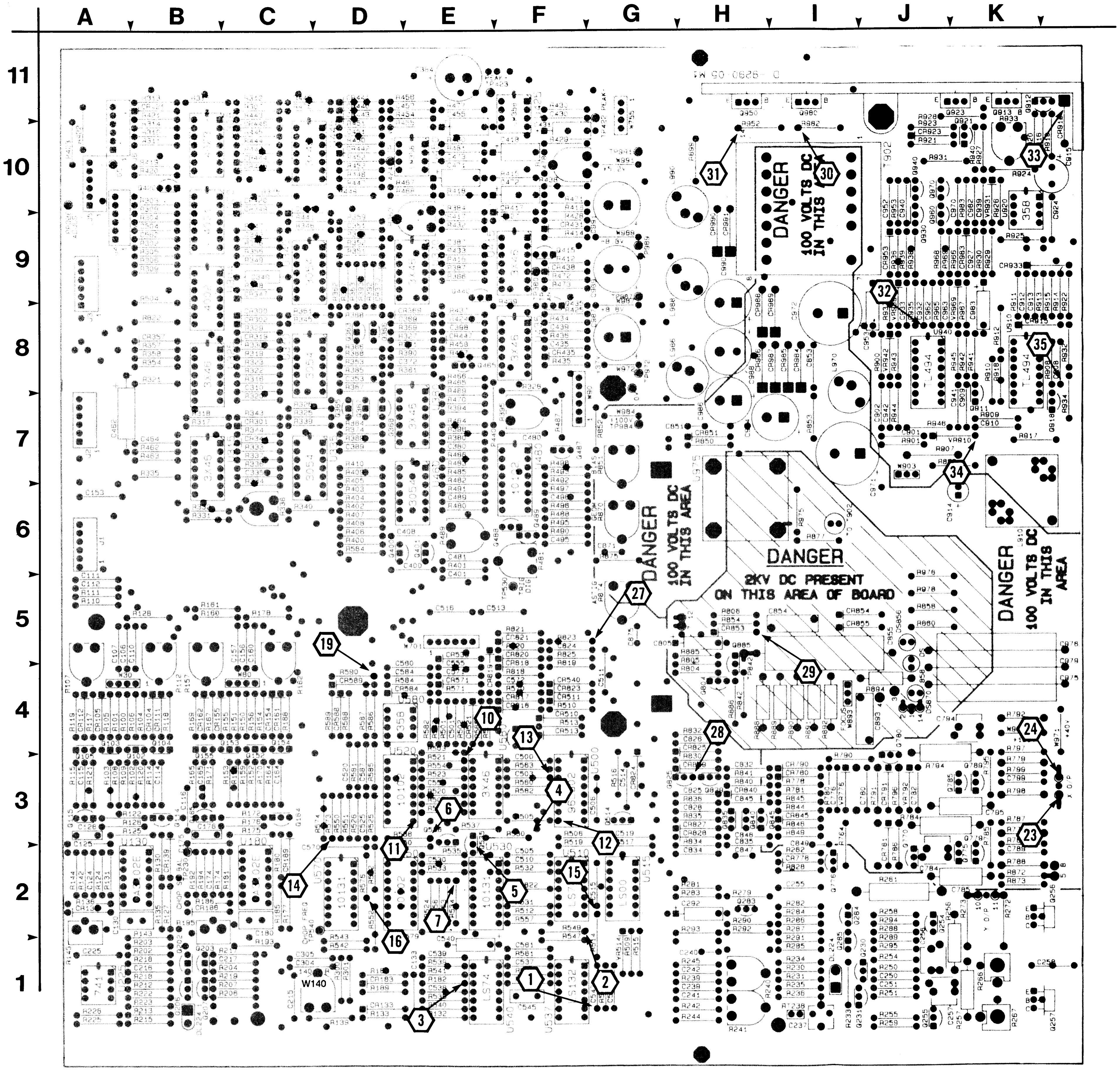


Figure 9-8. A1—Main board circuit view.

VERTICAL PREAMP & OUTPUT AMPLIFIER DIAGRAM 2

ASSEMBLY A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C106	1C	5A
C107	3C	5A
C110	2D	5B
C111*	3E	6A
C112*	2E	6A
C114	1E	4B
C115	3E	4A
C116	2E	3B
C124	3F	3A
C125	2F	3A
C126	3F	3A
C130	2F	2A
C133	6G	1D
C153*	9E	7A
C156	8D	5C
C157	10C	5C
C160	9D	5C
C164	9E	4C
C165	10E	4B
C174	10F	3B
C175	10F	3B
C176	10F	3B
C180	9F	2C
C215	5K	1C
C216*	4K	2B
C217*	7K	2C
C220*	9L	1C
C225*	7K	2A
C237	7P	1H
C239	6P	1G
C240	6P	2G
C241	6P	1G
C242	5P	2G
C250	8P	1I
C251	4N	1I
C255*	4P	2H
C256	9P	2J
C257	3P	1J
C258	7R	2K
C281*	2N	2I
C292	1N	2G
C536	6E	1F
C537	10L	2F
C538*	5F	1E
C539*	7F	2E
C540	10K	2E
C545	6E	1F
C547	5F	1F
C561*	5D	2F
CR111	2C	4B
CR112	3C	4A
CR133	1H	1D
CR136	3G	2A
CR139	3H	3B
CR161	9C	4C
CR162	10C	4B
CR183	8H	1D
CR186	8G	2B
CR189	8H	3C
CR539	7D	5E
J1	2E	6A
J2	2M	6A

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J2	9E	6A
Q102	2B	4B
Q103	3C	4A
Q104	1D	4B
Q105	3D	4A
Q114	1F	3B
Q115	3F	3A
Q152	9B	4C
Q153	10C	4C
Q154	8D	4C
Q155	10D	4B
Q164	8F	3C
Q165	10F	3B
Q206	5L	1B
Q207	6L	1B
Q230	8P	2I
Q231	5N	1I
Q254	9P	2J
Q255	4P	1J
Q256	9P	2K
Q257	4P	1K
Q283	2N	2H
Q284	2N	2I
Q285	2P	2I
R100	2B	4A
R101	3B	4A
R102	2B	4B
R103	3B	4A
R104	2C	4B
R105	3C	4A
R106	2C	4B
R107	2C	5A
R108	2B	4A
R109	3B	4A
R110	2C	5A
R111	2C	5A
R112	3D	5B
R114	1F	4B
R115	3F	4A
R116*	1D	3B
R118	1D	4B
R119	3D	4A
R120	2F	4B
R121	3F	4A
R122	2F	3A
R124	2F	3A
R125	2F	3A
R126	2F	3A
R127	2G	2B
R128	2D	5B
R130	1F	3B
R131	3F	3A
R132	6G	1E
R133	6G	1D
R135	1G	2B
R136	3G	2A
R139	5H	1D
R140*	6H	1C
R142	3H	3A
R143	3H	2B
R144	2H	3A

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R145	2H	2A
R150	9B	4C
R151	10B	4C
R152	9B	4C
R153	10B	4C
R154	9C	4C
R155	10C	4C
R156	9C	4C
R157	9C	5B
R158	9B	4C
R159	10B	4C
R160	9C	5B
R161	10C	5B
R162	10D	5C
R164	9F	4C
R165	10F	4B
R166*	8D	3C
R167*	9D	4B
R168	8D	4C
R169	11D	4B
R170	9F	4C
R171	10F	4B
R172	9F	3C
R174	9F	3B
R175	9F	3C
R176	9F	3C
R177	9G	2C
R178	9D	5C
R180	8F	3C
R181	10F	3C
R182	6G	1E
R183	6H	2D
R185	10G	2C
R186	8G	2B
R189	6H	1D
R192	7J	3B
R193	8H	2C
R194	9H	3B
R195	9J	2B
R202	5K	2B
R203	6K	2B
R204	5K	2C
R206	4K	1C
R207	7K	1C
R212	5L	1B
R213	6L	1B
R215	6L	1B
R216	4K	2B
R217	6K	2C
R218	4L	2B
R219	6L	2C
R222	5L	1B
R223	6L	1B
R225*	7K	1A
R226*	8K	1A
R230	8N	2H
R231	4N	1H
R233	8P	1I
R234	7P	2H
R235	7P	1H
R236*	7P	1H
R239	6P	1G
R240	6P	1H

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R241	6P	1H
R242	5P	1G
R244	5P	1G
R245	5P	2G
R250	8P	1J
R251	4N	1I
R254	4P	2I
R255	4P	1I
R256	9P	2J
R257	3P	1J
R258	9P	2C
R259	4P	1I
R261	4P	2I
R272	9R	2K
R273	4R	2J
R279	3N	2H
R281*	2N	2G
R282*	2N	2H
R283	3M	2G
R284*	3N	2H
R285	1R	2H
R286	1P	2H
R287	1P	2H
R288*	3N	2I
R289*	2P	2I
R290	2N	2H
R291	1P	2H
R292	1N	2H
R293	1N	2G
R294	3N	2I
R295	2R	2I
R538	5G	1E
R539	7E	2E
R540	5G	1E
R541	6G	2E
R544*	6E	1F
R545	6E	2F
R547	5F	2F
R548	5F	1F
R549*	5G	2F
R561	5D	2F
RT236	7P	1H
TP230	6H	2B
TP540	6G	2C
U130	1G	3B
U180	10H	3C
U225	8K	1A
U225	9K	1A
U537A	4F	1F
U537B	6F	1F
U537C	6E	1F
U537D	5E	1F
U537	10K	1F
U540A	6F	1E
U540B	5D	1E
U540	10K	1E
W30	1B	5A
W80	8B	5C
W140*	6H	1C

Partial A1 also shown on diagrams 3,.4, 5, 6 and 7.

***See Parts List for serial number ranges.**

VERTICAL PREAMP & OUTPUT AMPLIFIER DIAGRAM (CONT)

ASSEMBLY A3

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
CR534	6B	2B	R123	2E	1B	S545	5A	2D	W1	2E	4A
CR537	6B	2B	R163	9E	1C	S550	7A	2B	W2	2M	2A
CR538	7B	2B	R173	9E	1D				W2	5C	2A
			R280	2M	1C				W2	9E	2A
R113	2E	1B									

Partial A3 also shown on diagrams 1, 3, 4, 6 and 7.

CHASSIS MOUNTED PARTS

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
DL224	5M	CHASSIS									

WAVEFORMS FOR DIAGRAM 2

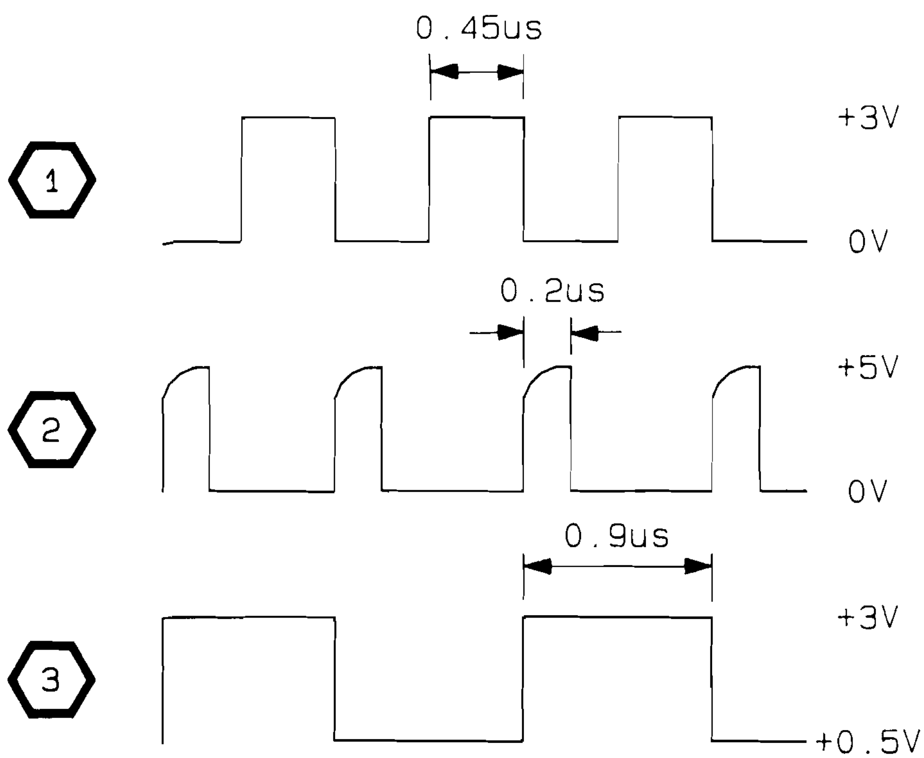
2225 CONTROL SETTINGS

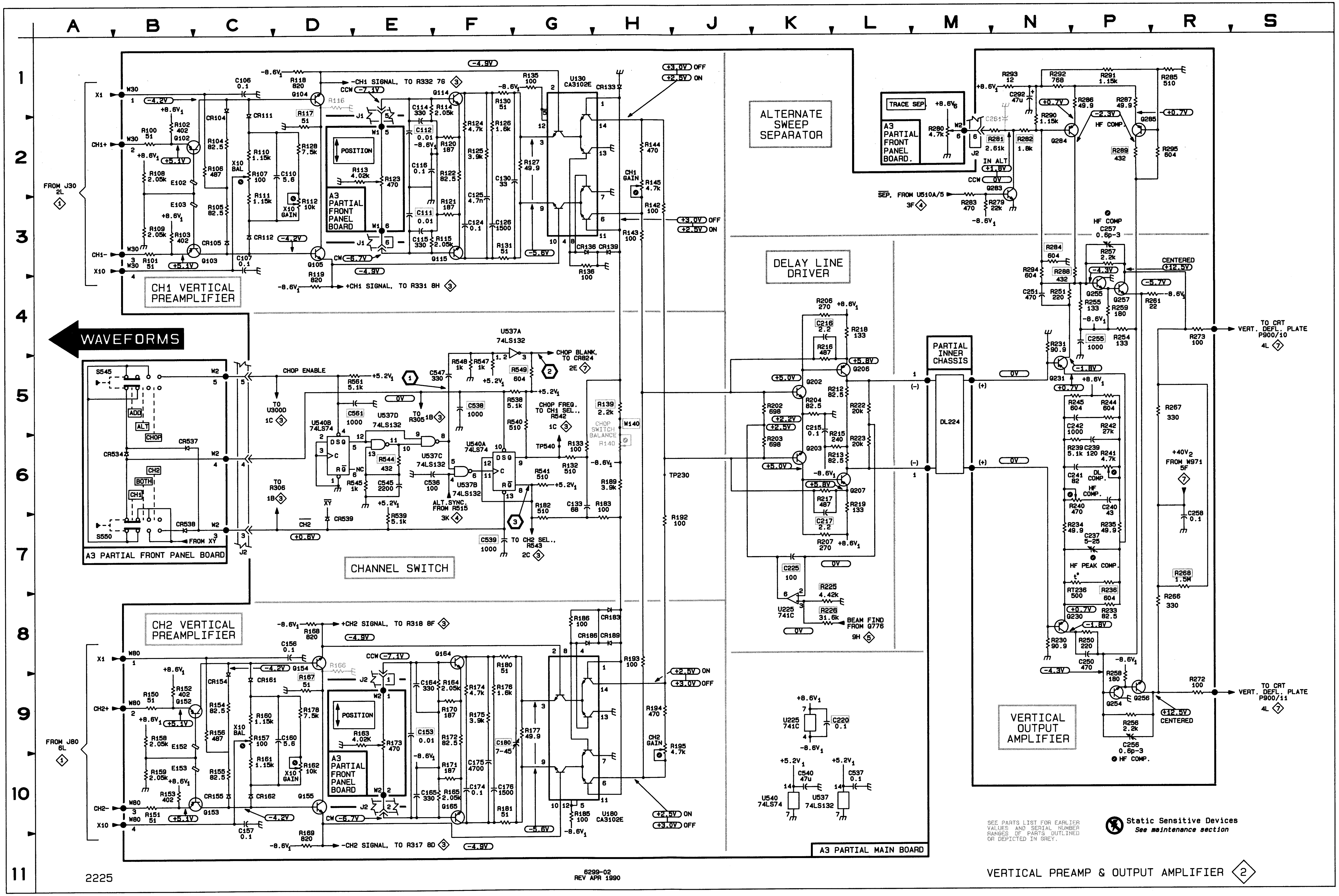
DC VOLTAGES

AC GND DC	GND
VOLTS/DIV (both)	0.1V

AC WAVEFORMS

VERTICAL MODE	BOTH, CHOP
TRIGGER MODE	P-P AUTO





VERTICAL PREAMP & OUTPUT AMPLIFIER 2

TRIGGER DIAGRAM 3

ASSEMBLY A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C304	1C	2C	Q368	4G	7D	R366	3G	8D
C305	3C	2C	Q400	1H	6D	R367	3G	8D
C310	8E	8C	Q401	2H	6E	R368	3G	8D
C335	8H	7C	Q415	3L	9F	R369	5F	8D
C340	8B	9C	Q420*	10K	10B	R374	4G	7D
C349	8A	9C	Q435	5K	8F	R375	10L	10C
C351	8C	9C	Q440	10N	9E	R380	5J	7E
C353*	4G	8D	Q465	6P	8E	R381*	6G	8D
C369	5F	8D	Q487	1M	7F	R384	6G	9E
C372	5G	8D	Q488	2M	6E	R385	6H	8D
C380	6H	7E	Q489	2M	6F	R386	6F	9E
C384	6F	3I				R387	6G	9E
C387	6G	9E	R300	1E	2D	R388	4G	8D
C389	4H	7D	R301	3D	2D	R389	4G	7D
C396*	5H	7E	R302	1B	9B	R390*	5H	8D
C398	7K	8E	R303	2B	10B	R391	5G	8D
C400*	1H	6D	R304	2C	9B	R392	6H	9D
C401	1G	6E	R305	2B	9B	R393	6H	9D
C408	2G	6D	R306	1B	9B	R394	6H	7E
C418	4L	10E	R307	3B	11C	R395	5H	7F
C430	5M	10F	R308	2B	9B	R396	5H	7E
C431	5L	10E	R309	2C	9B	R397	7H	9D
C435	5K	8F	R310	3B	10B	R398	7J	9D
C439	6K	8F	R311	4B	10B	R400	1H	6D
C451	8M	10D	R312	4B	11C	R401	1H	6E
C452	8N	11D	R313	4B	11B	R402	3H	6D
C455*	8P	10E	R314	4B	10B	R403	3J	7D
C462	6S	6A	R315	4C	11B	R404	3H	6D
C464	6R	7B	R316	9E	8C	R405	3H	7D
C471	7R	10E	R317	9D	7B	R406	1G	6D
C472	7R	10E	R318	9F	7B	R407	1G	6D
C473	7R	10E	R319	9E	8C	R408	2G	6D
C480	11G	7F	R320	9F	7C	R409	2H	7D
C481	1J	6E	R321	9E	8B	R410	2H	7D
C489	2M	6E	R322	9E	8C	R412	3L	9F
C495	2N	6F	R323	9F	8C	R413	4K	9F
C496	2N	6F	R325*	7E	7C	R414	3K	9F
C562	1B	2F	R326*	7F	7C	R415	4L	10E
			R327	7H	8D	R416*	4M	9E
CR300	2E	8C	R328	7J	8F	R417	4J	9E
CR301	2E	7C	R329	8F	8C	R418	4L	10E
CR302	2E	8C	R330	8F	8C	R419*	10K	10B
CR319	8E	8C	R331	8G	6B	R420*	11J	10B
CR344	8J	7C	R332	9J	6B	R421*	10K	10B
CR347	7C	9C	R333	9H	7C	R422*	5N	10A
CR348	7C	9C	R334	9J	7C	R423*	3N	10A
CR349	7D	9C	R335	9J	7B	R424	6K	8E
CR357	9B	8B	R336	9H	7C	R425	5K	8F
CR369	5F	8D	R337	9J	7C	R427	5M	9E
CR370	5G	9D	R338	8H	6C	R428	5L	9F
CR417	4K	9E	R339*	7H	7C	R429*	5M	10F
CR420*	10L	10C	R340*	7J	6C	R430	5M	10F
CR421*	10K	11B	R343	8J	7C	R432	5M	9E
CR431	5L	9F	R344	7J	7C	R433	6M	9E
CR432*	10L	11B	R345*	7B	8C	R434*	5J	8F
CR435	5K	8F	R346*	7C	9C	R435*	5K	8F
CR438	5L	9F	R347	8C	9C	R436	5J	10F
CR440	8M	11D	R348*	8B	9C	R437*	6K	8E
CR441	8M	11D	R349	8B	9C	R438	5L	10F
CR442	9M	10D	R351	8C	9D	R439	5K	8E
CR443	8M	10D	R352	8C	9D	R440	10N	7E
CR444	8K	10C	R353*	4G	8D	R441	10N	9C
CR445	8L	10C	R354*	9B	8B	R442	7L	10C
CR446	7L	10C	R355	8B	10C	R443	7L	10C
CR447	6N	8E	R356	8C	9C	R444	7L	10C
			R357*	9B	8B	R445	8L	10C
J2	1B	6A	R358	9C	8B	R446	8L	11C
J3	4R	9A	R359	8C	9D	R447	9M	10D
			R360	8D	9D	R448	9M	10D
Q363	4F	8D	R361*	4E	8C	R449	9M	10D
Q365	4F	7D	R362*	5E	9D	R450	8N	10D
Q366	4F	8H	R363	4F	9D	R451	8N	10D
Q367	4G	7D	R364	4F	7D	R452	9N	10D

***See Parts List for serial number ranges.**

TRIGGER DIAGRAM (CONT)

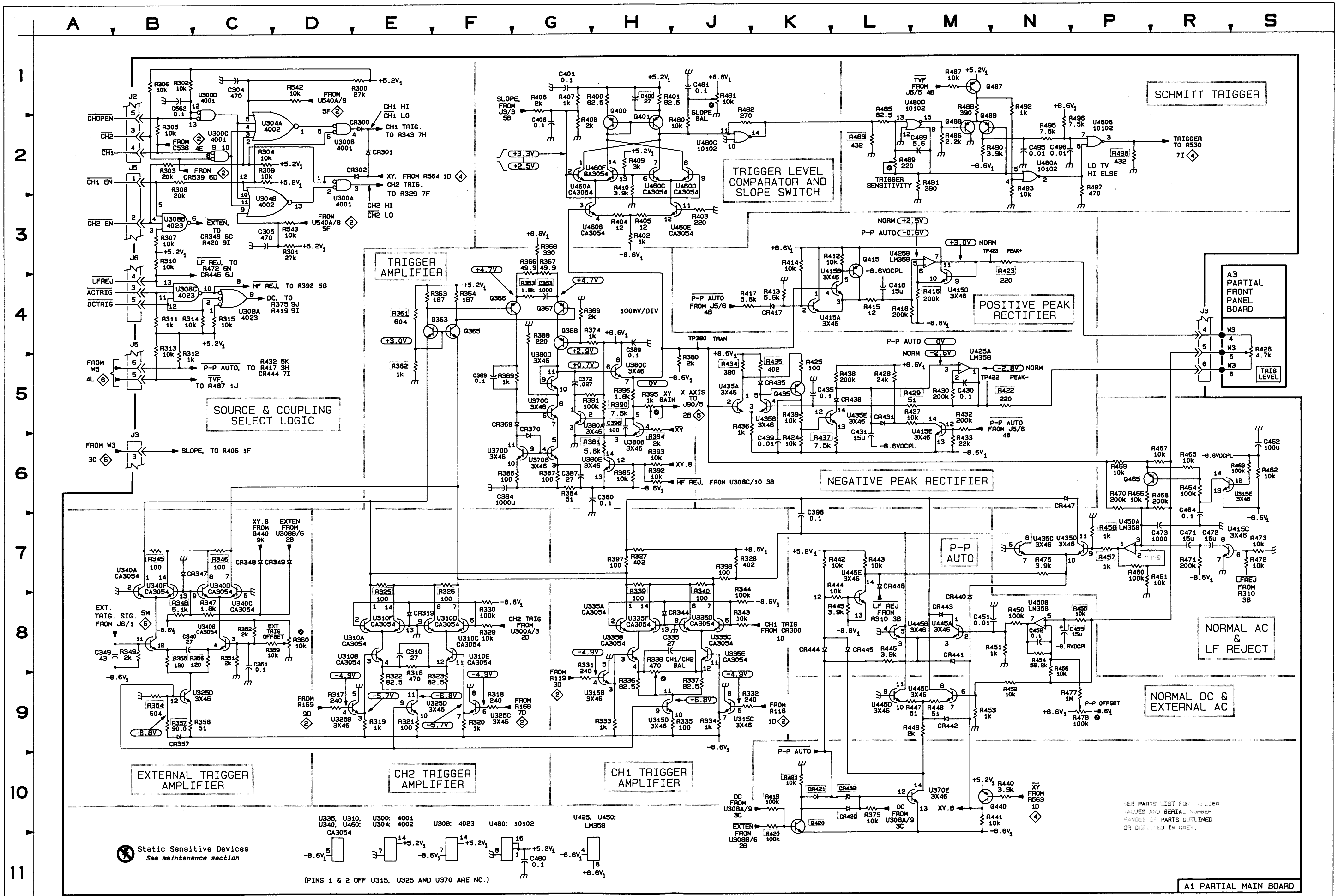
ASSEMBLY A1								
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R453	9M	10D	TP380	4J	9F	U340	10D	9C
R454	8N	11D	TP422	5N	10G	U370B	6G	9D
R455*	8P	10D	TP423	3N	9F	U370C	5G	9D
R456	8N	11D				U370D	6F	9D
R457*	7P	8E	U300A	3D	9B	U370E	10M	9D
R458*	7P	8E	U300B	2D	9B	U380A	5G	7D
R459*	7P		U300C	2C	9B	U380B	6H	7D
R460	7P	10E	U300D	1C	9B	U380C	5H	7D
R461	7R	10E	U300	10E	9B	U380D	5G	7D
R462	6S	7B	U304A	2C	9B	U380E	6G	7D
R463	6S	7B	U304B	3C	9B	U415A	4K	9E
R464	6R	7E	U304	10E	9B	U415B	3L	9E
R465	6R	8E	U308A	4C	10B	U415C	7S	9E
R466	6P	8E	U308B	3B	10B	U415D	4M	9E
R467	6R	10D	U308C	4B	10B	U415E	5M	9E
R468	6R	10D	U308	10F	10B	U425A	4M	10F
R469	6P	8E	U310A	8D	8C	U425B	3L	10F
R470	6P	7E	U310B	8D	8C	U425	10G	10F
R471	7R	10F	U310C	8F	8C	U435A	5J	8E
R472	7S	9F	U310D	8F	8C	U435B	5K	8E
R473	7S	9F	U310E	8F	8C	U435C	7N	8E
R475	7N	11C	U310F	8E	8C	U435D	7N	8E
R477	9N	10E	U310	10D	8C	U435E	5L	8E
R478	9P	10F	U315B	9H	7B	U445A	8M	10C
R480	2J	6E	U315C	9J	7B	U445B	8M	10C
R481	1J	6F	U315D	9H	7B	U445C	9M	10C
R482	1J	7E	U315E	6S	7B	U445D	9L	10C
R483*	2L	7E	U325B	9D	8B	U445E	7L	10C
R485	1L	7E	U325C	9F	8B	U450A	7P	10D
R486	2M	7E	U325D	9C	8B	U450B	8N	10D
R487	1M	7F	U325D	9F	8B	U450	10H	10D
R488	1M	6F	U335A	8H	7C	U460A	2G	7D
R489	2L	6E	U335B	8H	7C	U460B	3G	7D
R490	2N	6F	U335C	8J	7C	U460C	2H	7D
R491	2M	7E	U335D	8J	7C	U460D	2J	7D
R492	1N	7F	U335E	8J	7C	U460E	3J	7D
R493	2N	7F	U335F	8H	7C	U460F	2H	7D
R495	2N	6F	U335	10D	7C	U460	10D	7D
R496	2P	6F	U340A	7B	9C	U480A	2N	7F
R497	2P	7F	U340B	8C	9C	U480B	2P	7F
R498*	2P	7F	U340C	8C	9C	U480C	2J	7F
R542	1D	2D	U340D	7C	9C	U480D	1M	7F
R543	3D	2D	U340F	7B	9C	U480	10F	7F

Partial A1 also shown on diagrams 2, 4, 5, 6 and 7.

ASSEMBLY A3								
R426	4S	1F	W3	4S	4D			

Partial A3 also shown on diagrams 1, 2, 4, 6 and 7.

***See Parts List for serial number ranges.**


SCHMITT TRIGGER
TRIGGER LEVEL COMPARATOR AND SLOPE SWITCH
TRIGGER AMPLIFIER
SOURCE & COUPLING SELECT LOGIC
POSITIVE PEAK RECTIFIER
NEGATIVE PEAK RECTIFIER
P-P AUTO
NORMAL AC & LF REJECT
NORMAL DC & EXTERNAL AC
EXTERNAL TRIGGER AMPLIFIER
CH2 TRIGGER AMPLIFIER
CH1 TRIGGER AMPLIFIER
A3 PARTIAL FRONT PANEL BOARD
A1 PARTIAL MAIN BOARD
Static Sensitive Devices
See maintenance section
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
(PINS 1 & 2 OFF U315, U325 AND U370 ARE NC.)

WAVEFORMS FOR DIAGRAM 4

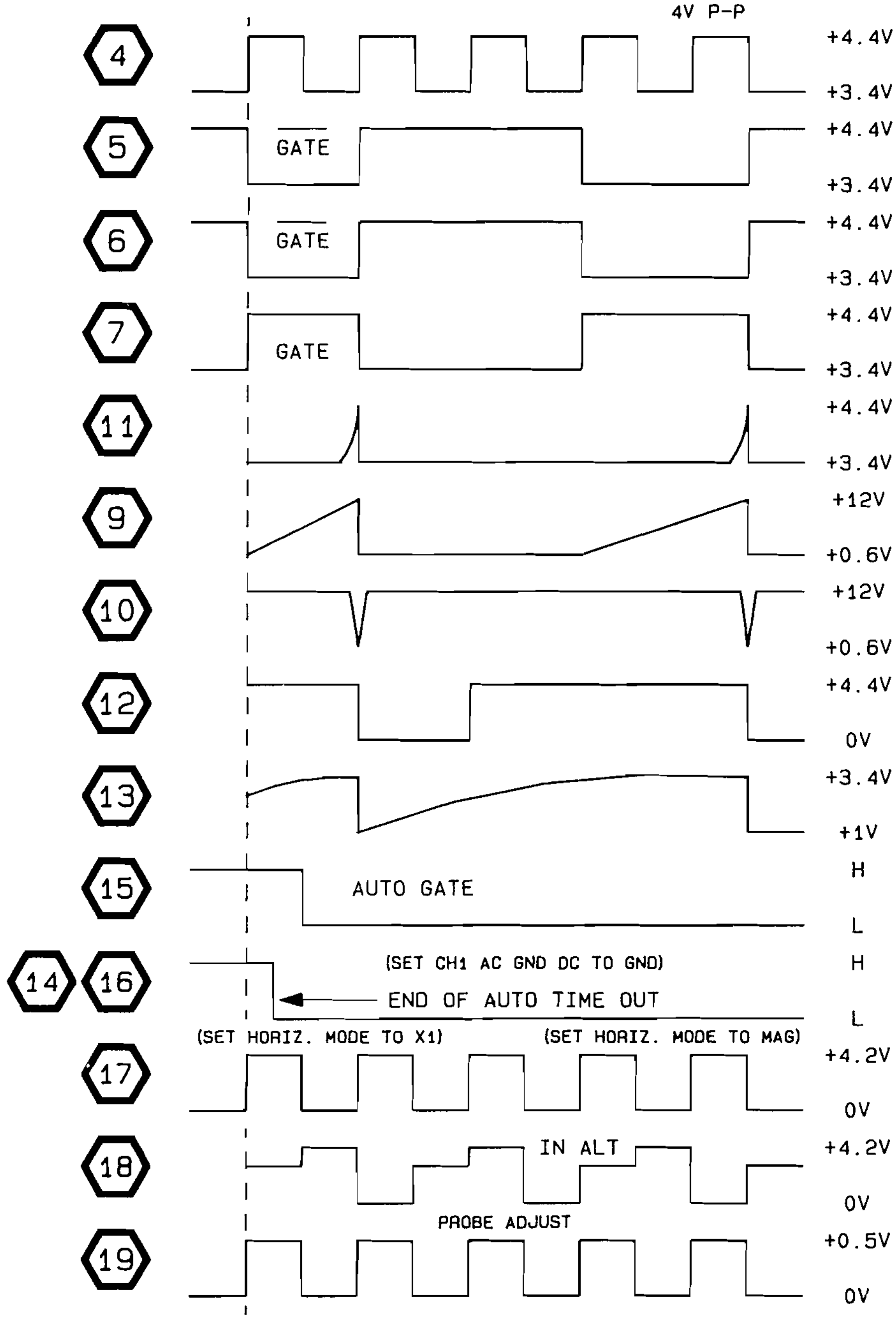
2225 CONTROL SETTINGS

DC VOLTAGES

INTENSITY	midrange
HORIZONTAL MODE	X1
SEC/DIV	0.1mS
TRIGGER MODE	P-P AUTO

AC WAVEFORMS

VERTICAL MODE	CH2 OR Y
CH2 VOLTS/DIV	1V
CH2 AC GND DC	DC
HORIZONTAL MODE	X1
SEC/DIV	0.1mS
MAG	X5
TRIGGER LEVEL	midrange
TRIGGER MODE	P-P AUTO
SOURCE	CH2
TRIGGER COUPLING	AC
CH2 input signal	1 kHz sine wave 4V P-P



SWEEP LOGIC DIAGRAM 4

ASSEMBLY A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C500	1J	4F	J1-4	1C	6A	R531	5F	2F	TP530	7I	5F
C501	7B	4E	J4-1	2C	9A	R532	6H	3F			
C503	7E	4F	J4-2	2C	9A	R533	6J	3E	U500A	5E	3F
C504	4C	10B	J4-3	4M	9A	R534	6K	2E	U500B	8E	3F
C505	3D	3F	J4-4	4C	9A	R535	6K	3E	U510A	3F	2F
C506	5E	3F	J4-5	7M	9A	R536	6K	3D	U510B	5I	2F
C510	1J	3F	J5-3	3C	10A	R537	5K	3E	U515A	4L	2G
C511	2G	5F	J5-4	3C	10A	R550	9I	3D	U515B	3J	2G
C513	3D	5E	J5-6	8M	10A	R551	9H	3D	U515C	3I	2G
C514	3I	4G				R552	8I	2D	U515D	3H	2G
C515	1K	2F	Q514	4I	3G	R553	8I	2E	U520A	6F	3D
C516*	3I	5E	Q535	5J	3E	R554	8K	4E	U520B	6G	3D
C517	4I	3G	Q536	5K	3E	R555	1E	4E	U520C	7H	3D
C519	4E	3G				R556	7H	2E	U520D	9E	3D
C520	1L	4D	R500*	5C	5E	R557	6F	2F	U530A	5G	2E
C525	9D	3D	R501	7C	4E	R560	8K	3F	U530B	6I	2E
C530	1L	3E	R502	7B	4E	R562	8L	3F	U550A	7J	2D
C550	1M	3D	R503	8B	4E	R563	7L	4F	U550B	7I	2D
C554*	1D	3E	R504	5C	9B	R564	1D	6D	U550C	6H	2D
C555	2E	5E	R505	4D	3F	R565	2E	5E	U550D	8I	2D
C560	7L	5D	R506	5E	3F	R570	5L	4E	U560A	7K	3E
C570	1N	3D	R508	8F	3E	R571	6L	4E	U560B	7K	3E
C571	6L	5E	R509*	4H	2G	R572	9F	3D	U560D	1E	3E
C572	6L	5E	R510	3G	4F	R573	8G	3D	U560E	7C	3E
C584	8B	5D	R512	5I	2F	R574	9G	3D	U570A	8G	2D
C587	4J	4D	R513	2D	4F	R576	9H	3D	U570B	8H	2D
			R514*	4G	2F	R579	7H	2E	U580A	4K	4D
CR510	2G	4F	R515	3K	2G	R581	9C	4D	U580B	9B	4D
CR511	2G	4F	R516	4I	4G	R582	9B	4E			
CR513	2D	4F	R519	3E	3F	R583*	9B	4E			
CR521	7D	4E	R520	6C	3E	R584	8C	6D	VR514	4H	2G
CR530*	4D	3F	R521	7C	4E	R585	4J	4D			
CR540	2E	5F	R522	7F	3E	R586	4K	4D	W590	3M	10A
CR571	6L	5E	R523	7G	4E	R587	4K	4D	W701-2	5C	5E
CR584	9C	4D	R524	8H	2E	R588	4L	4D	W701-4	6C	5E
CR588	4L	4D	R525	9D	3D	R589	4L	4D	W701-5	2F	5E
CR589	4L	5D	R526	9C	3D	R590	4L	5D	W701-6	5M	5E
			R530	7I	3E						

Partial A1 also shown on diagrams 2, 3, 5, 6 and 7.

ASSEMBLY A2

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J701-2	5B	2A	J701-4	5B	2A	J701-5	1F	2A	J701-6	5M	2A

Partial A2 also shown on diagrams 1, 5 and 6.

ASSEMBLY A3

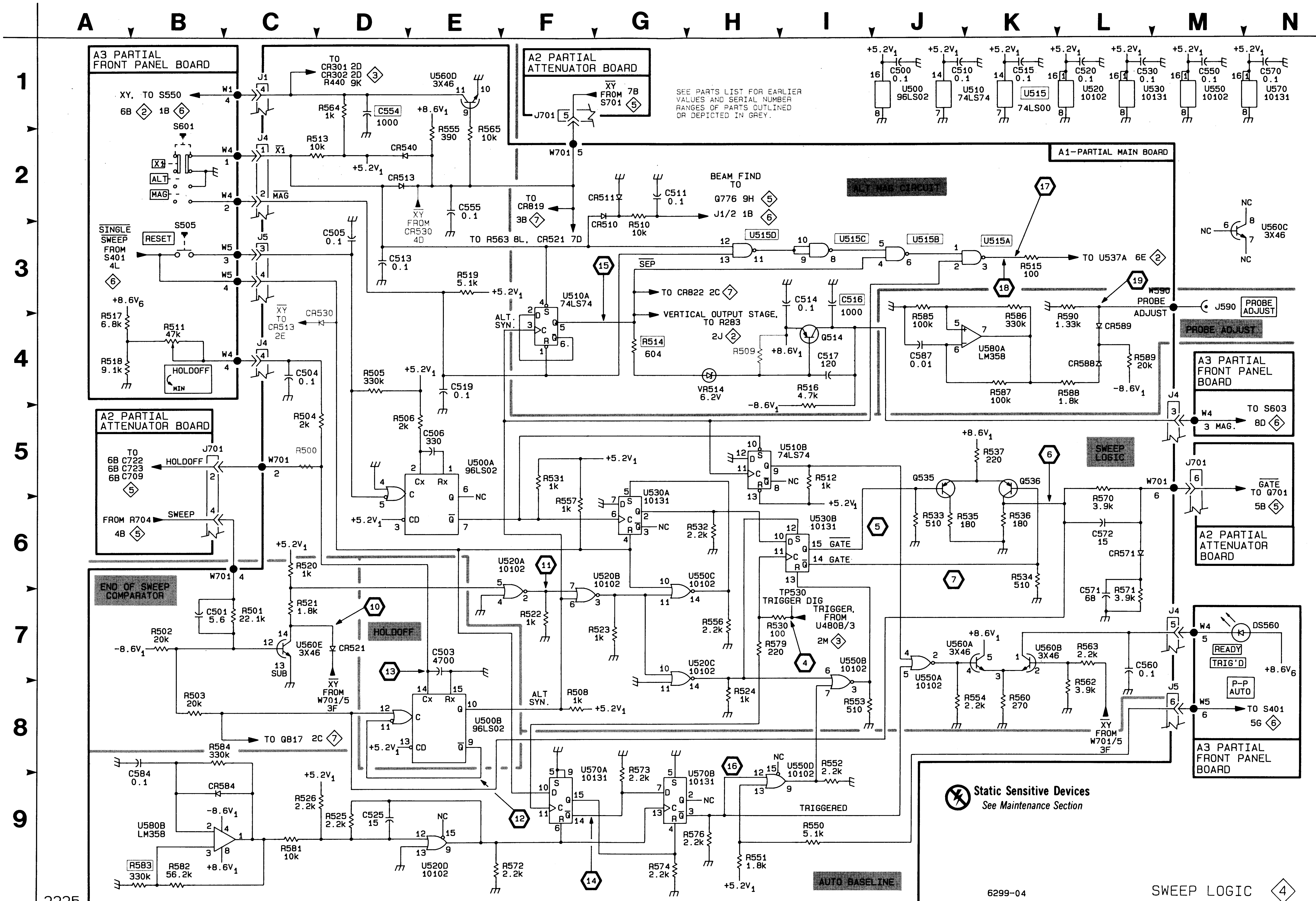
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
DS560	7N	2F	S505	3B	2F	W4-2	2C	4E	W5-4	3C	4F
			S601	1B	2E	W4-3	5M	4E	W5-6	8M	4F
R511	4B	3G				W4-4	4C	4E			
R517	4A	2F	W1-4	1C	4A	W4-5	7M	4E			
R518	4A	2F	W4-1	2C	4E	W5-3	3C	4F			

Partial A3 also shown on diagrams 1, 2, 3, 6 and 7.

CHASSIS MOUNTED PARTS

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J590	3M	CHASSIS									

***See Parts List for serial number ranges.**

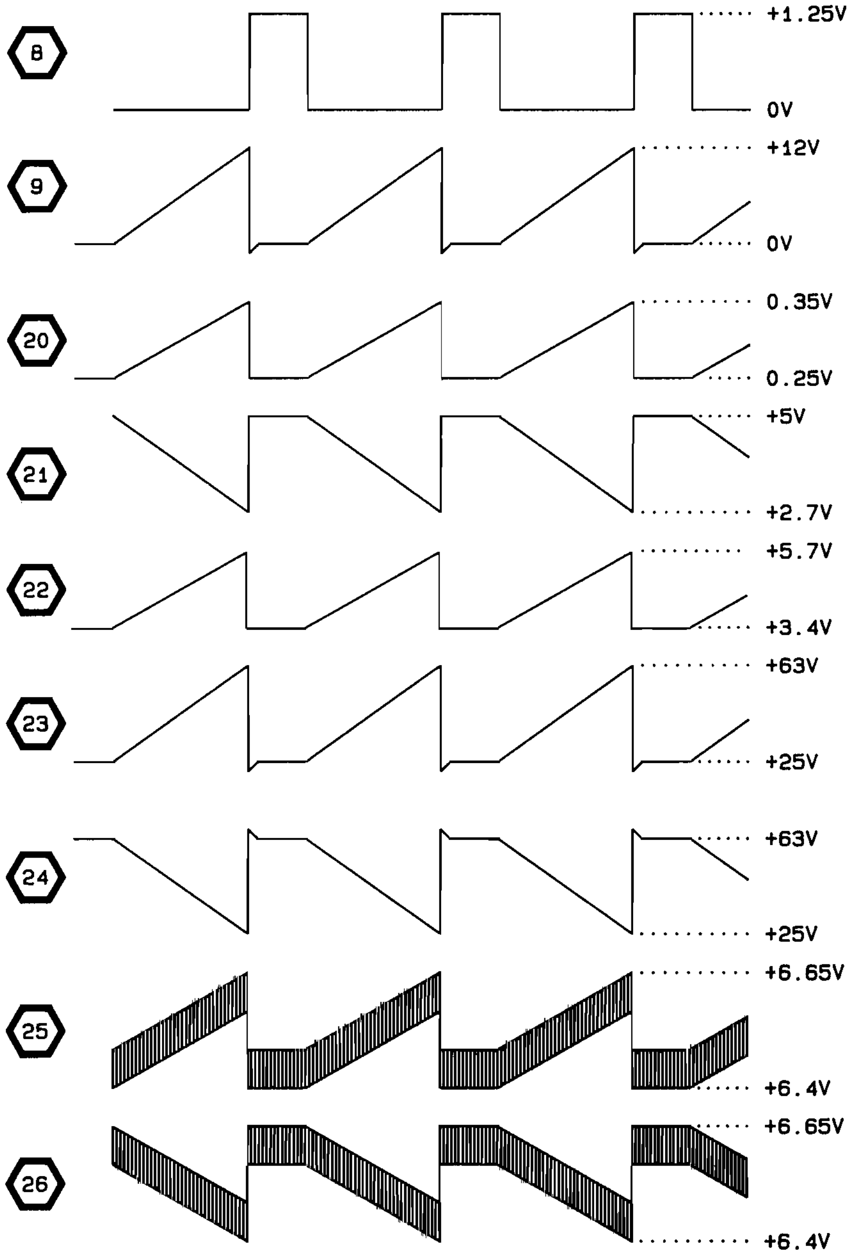

A3 PARTIAL FRONT PANEL BOARD
A2 PARTIAL ATTENUATOR BOARD
A1-PARTIAL MAIN BOARD
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
ALT MAG CIRCUIT
BEAM FIND TO Q776 9H J1/2 1B
PROBE ADJUST
SWEEP LOGIC
END OF SWEEP COMPARATOR
HOLDOFF
AUTO BASELINE
SINGLE SWEEP FROM S401 4L
RESET
TO U537A 6E
TO CR822 2C
VERTICAL OUTPUT STAGE, TO R283 2J
GATE TO Q701 5B
TP530 TRIGGER DIG
TRIGGER, FROM U480B/3 2M
READY
TRIG'D
P-P AUTO
TO S401 5G
TO S603 8D
TO Q817 2C
TRIGGERED
Static Sensitive Devices
See Maintenance Section
2225
6299-04
SWEEP LOGIC 4

SWEEP LOGIC

WAVEFORMS FOR DIAGRAM 5

2225 CONTROL SETTINGS

DC VOLTAGES		AC WAVEFORMS	
INTENSITY	midrange	VERTICAL MODE	CH1
HORIZONTAL MODE	X1	AC-GND-DC (both)	GND
SEC/DIV	0.5ms	HORIZONTAL MODE	X1
TRIGGER MODE	P-P AUTO	HOLDOFF	MIN (fully ccw)
		TRIGGER MODE	P-P AUTO
		TRIGGER LEVEL	midrange
		SEC/DIV	0.5ms
		HORIZONTAL POSITION	midrange



XY AMPLIFIER AND HORIZONTAL DIAGRAM 5

ASSEMBLY A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C776	6G	3I	CR791	6G	3I	R778	7J	3K	R794	7H	4J
C780	6H	3I				R779	6J	4K	R795	7H	4J
C782	7H	3J	Q770	5G	3J	R780	5G	3I	R796	8H	3I
C784*	6H	3J	Q775	6J	3J	R781	5H	3H	R797	8J	4K
C785	5H	3B	Q776	8G	3I	R784	6H	3J	R798	7J	3K
C789	5J	3K	Q779	5J	3J	R785	5H	3J	R799	7J	3K
C794	8H	4J	Q780	7G	4I	R786	6H	3I	R828	8G	3H
C795	7H	3J	Q785	8J	3J	R787	6J	3K			
C799	7J	3K	Q789	7J	3J	R788	5J	3K	VR776	6G	3I
						R789	6J	3K	VR792	7H	3J
CR776	8G	3H	R262	7G	3H	R790	7G	4I			
CR780	5G	4H	R764	7G	3I	R791	6G	3I	W755	5F	10G
CR781	6G	3I	R776	6G	3H	R792	7H	4K	W900	6J	4K
CR790	6G	4H									

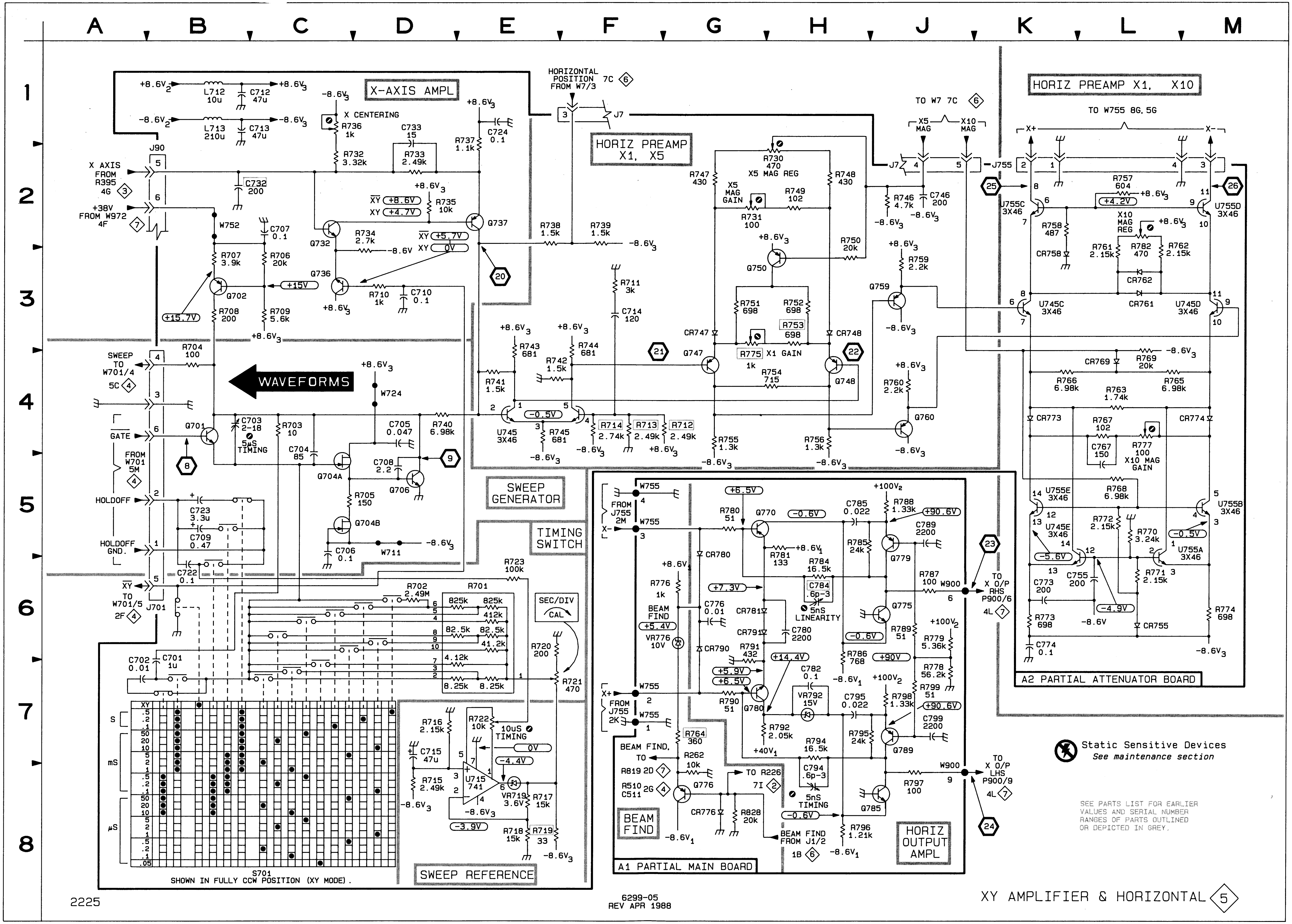
Partial A1 also shown on diagrams 2, 3, 4, 6 and 7.

ASSEMBLY A2

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C701	6B	2A	J90	2B	5E	R717	8E	5C	R760	4J	4A
C702	6A	2C	J701	6B	2A	R718	8E	5C	R761	2L	5A
C703	4C	1B	J755	2K	1A	R719*	8E	5C	R762	2L	5A
C704	4C	1A				R720	6E	5C	R763	4L	5C
C705	4D	1A	L712	1B	5E	R721	7F	4C	R765	4L	5C
C706	5C	1A	L713	1B	5E	R722	7E	5D	R766	4K	5C
C707	2C	5D				R723	6E	5D	R767	4L	5C
C708	5D	1A	Q701	4B	2B	R730	2H	3A	R768	5L	5C
C709	5B	2B	Q702	3B	4D	R731	2G	3A	R769	4L	5C
C710	3D	1A	Q704A	5C	2B	R732*	2C	5D	R770	5L	5B
C712	1C	5E	Q704B	5D	2B	R733	2D	3C	R771	6L	5B
C713	1C	5D	Q706	5D	1B	R734	2D	4D	R772	5L	5B
C714	3F	4B	Q732	2C	3C	R735	2D	4C	R773	6K	4C
C715	7D	5C	Q736	3C	3D	R736*	1C	5D	R774	6M	3A
C722	6B	3C	Q737	2E	3C	R737	1E	3C	R775*	4G	3B
C723	5B	2B	Q747	4G	4A	R738	2E	3C	R777	4L	5C
C724	1E	3C	Q748	4H	4B	R739	2F	4C	R782	2L	5B
C732*	2C	5D	Q750	3G	4B	R740	4D	3B			
C733	1D	3C	Q759	3J	4A	R741	4E	3B	S701	8C	1C
C746	2J	3C	Q760	4J	4B	R742	4E	3A			
C755	6L	5B				R743	3E	3B	U715	8E	5C
C767	4L	5C	R701	6E	1B	R744	3F	3A	U745C	3K	4A
C773	6K	5B	R702	6D	2B	R745	4E	3B	U745D	3M	4A
C774	6K	4B	R703	4C	2A	R746	2J	3B	U745E	5K	4A
			R704	3B	2A	R747	2G	3A	U745	4E	4A
CR747	3G	3A	R705	5D	1A	R748	2H	3A	U755A	5M	5A
CR748	3H	3B	R706	3C	5D	R749	2H	3A	U755B	5M	5A
CR755	6L	5B	R707	3B	5D	R750	2H	3B	U755C	2K	5A
CR758	3K	5A	R708	3B	3D	R751	3G	3B	U755D	2M	5A
CR761	3L	5A	R709	3C	5D	R752	3H	3B	U755E	5K	5A
CR762	3L	5A	R710	3D	3D	R753*	3H	3B			
CR769	4L	4C	R711	3F	4B	R754	4H	4A	VR719	8E	8E
CR773	4K	5C	R712*	4G	3A	R755	4G	4A			
CR774	4M	5C	R713*	4F	3B	R756	4H	4B	W711	5D	2A
			R714*	4F	3B	R757	2L	5A	W724	4D	4D
J7	1F	4D	R715	8D	5C	R758	2K	5A	W752	2B	2B
J7	2J	4D	R716	7D	5C	R759	3J	4A			

Partial A2 also shown on diagrams 1, 4 and 6.

***See Parts List for serial number ranges.**



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XY AMPLIFIER & HORIZONTAL 5

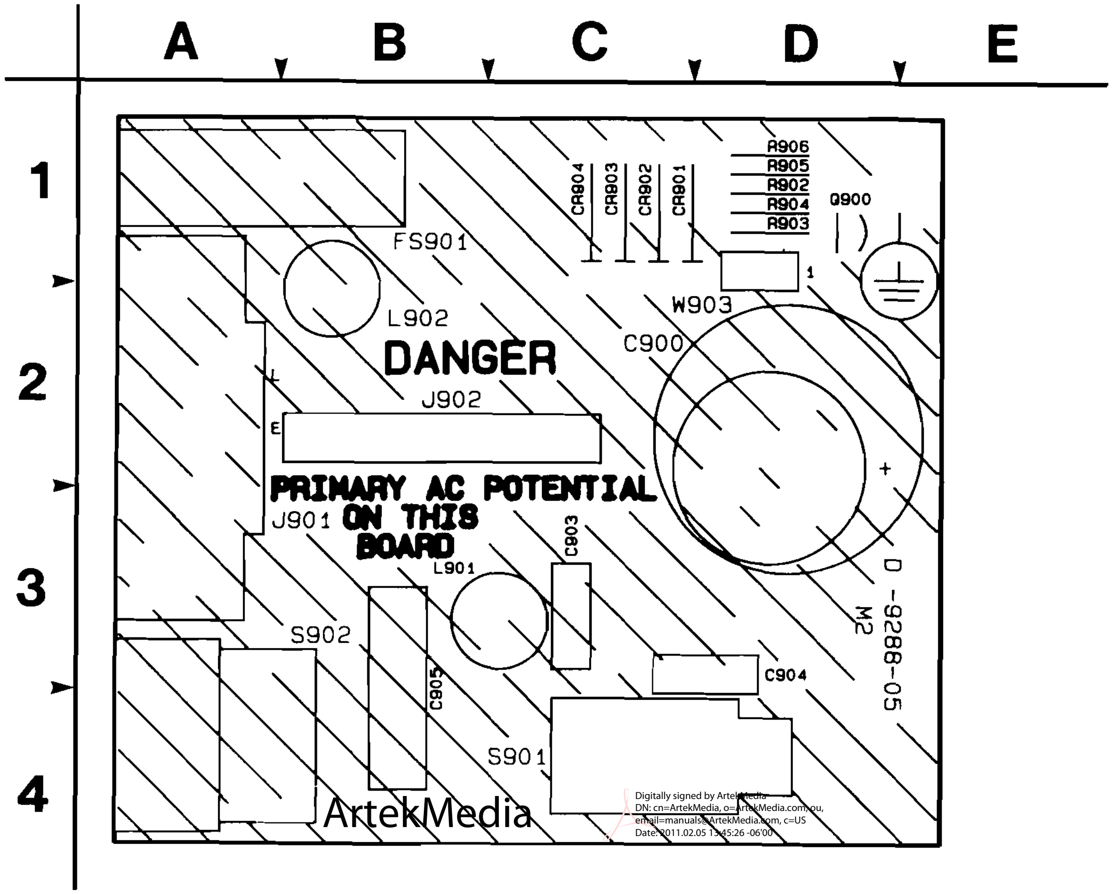


Figure 9-9. A4—Mains Input board.

A4—MAINS INPUT BOARD

CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER	CIRCUIT NUMBER	SCHEM NUMBER
C900	7	CR904	7	L902	7	R906	7
C903	7						
C904	7	F901	7	Q900	7	S901	7
C905	7					S902	7
		J901	7	R902	7		
CR901	7	J902	7	R903	7	W903	7
CR902	7			R904	7		
CR903	7	L901	7	R905	7		

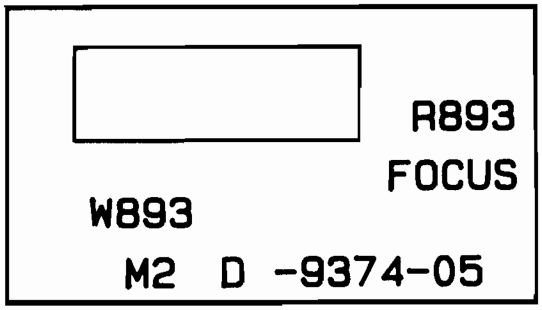
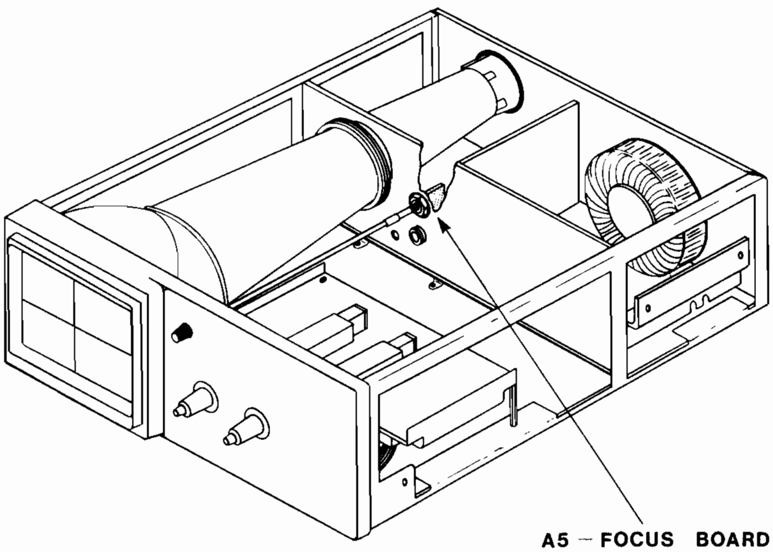
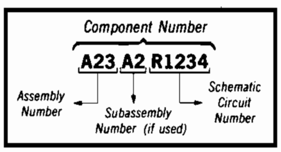


Figure 9-10. A5—Focus Pot board.

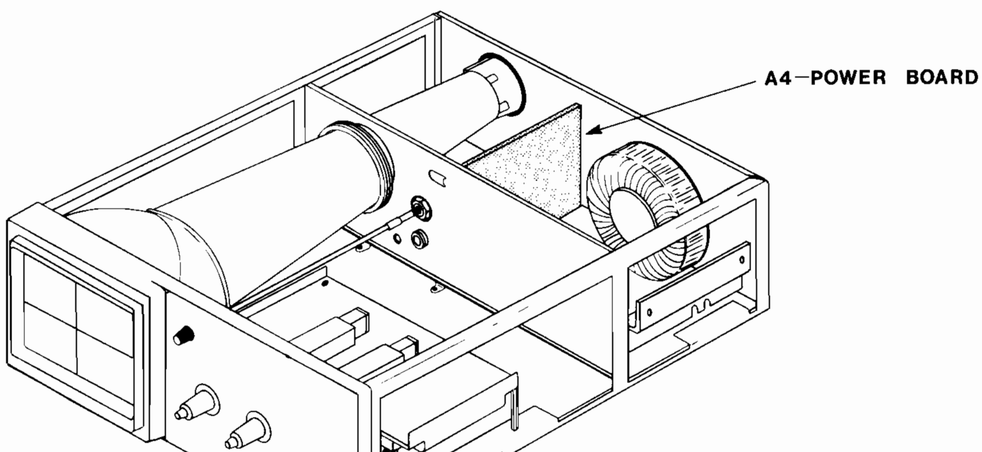


Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



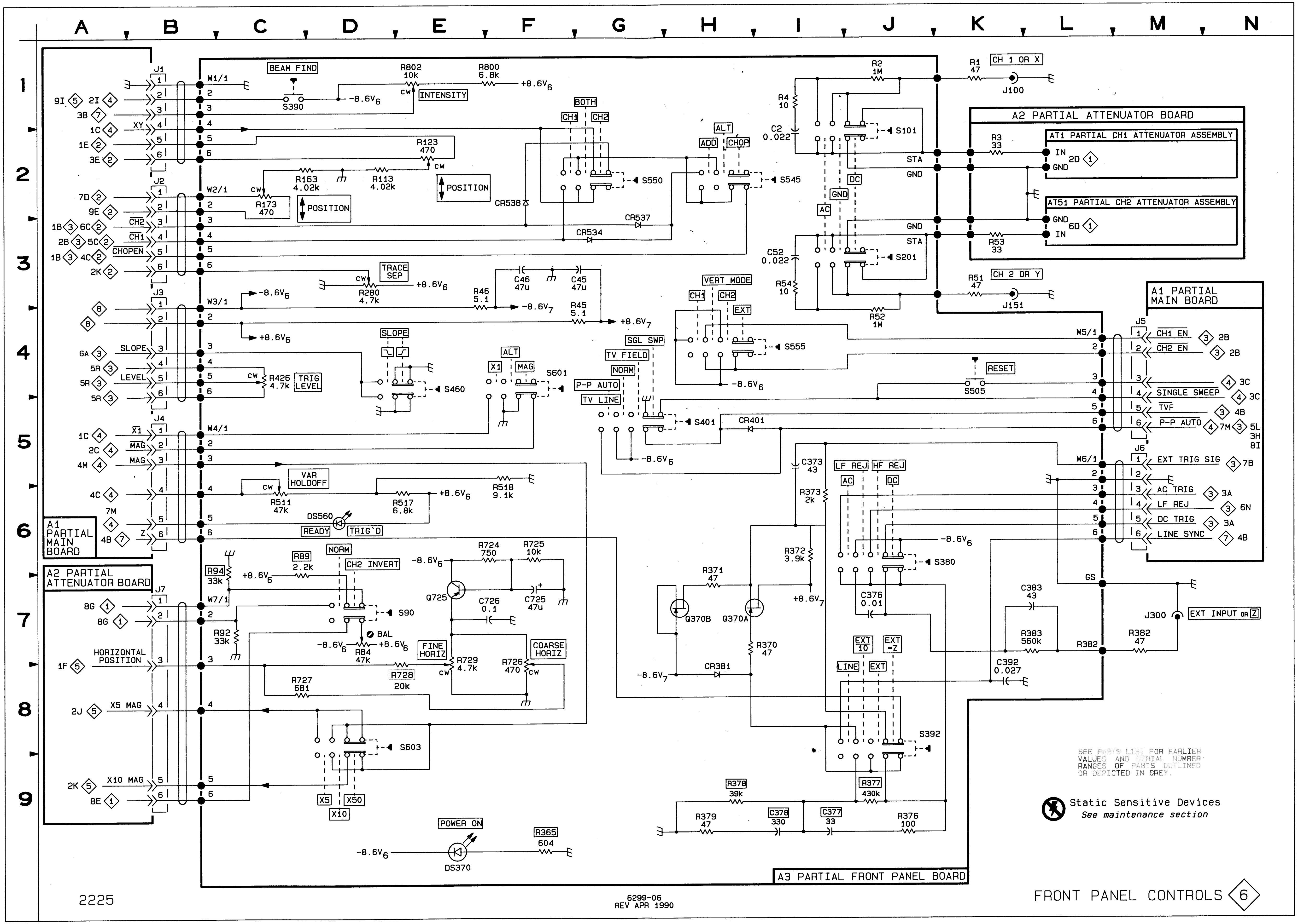
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.



FRONT PANEL DIAGRAM 6

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
Assembly A1											
J1	1B	6A	J3	4B	9A	J5	4M	10A	J6	5M	10A
J2	2B	6A	J4	5B	9A						
Partial A1 also shown on diagrams 2, 3, 4, 5 and 7.											
Assembly A2											
AT1	2L	1F	J7	7B	4D	R3	2K	1F	R53	3K	1D
AT51	2L	1D									
Partial A2 also shown on diagrams 1, 4 and 5.											
Assembly A3											
C2	2I	4C	Q370A	7I	3E	R373	5I	3E	S101	1J	4B
C45	3G	3E	Q370B	7H	3E	R376	9J	3F	S201	3J	4D
C46	3F	3E	Q725	6E	1D	R377	9J	3F	S380	6J	3G
C52	3I	4C				R378	9H	2E	S390	1D	2A
C373	5I	3F	R2	1J	4B	R379	9H	2E	S392	8J	3F
C376	7J	4G	R4	1I	4B	R382	7L	4E	S401	5G	2G
C377	9I	2E	R45	3G	2E	R383	7K	4F	S460	4E	1F
C378	9I	2F	R46	3F	3E	R426	4C	1F	S505	4K	2F
C383	7K	4E	R52	3J	4D	R511	5D	3G	S545	2H	2D
C392	7K	2G	R84*	7C	3C	R517	5E	2F	S550	3G	2B
C725	6F	2D	R89	6D	2C	R518	5F	2F	S555	4H	3F
C726*	7F	1E	R92	7C	2D	R724	6F	2D	S601	4F	2E
			R94	6C	2C	R725	6F	2D	S603	8D	4E
CR381	7H	3E	R113	2E	1B	R726	7F	1E			
CR534	3G	2B	R123	2E	1B	R727	8D	2D	W1	1C	4A
CR537	2G	2B	R173	2C	1D	R728	7E	2E	W2	2C	2A
CR538	2F	2B	R280	3E	1C	R729	7E	1E	W3	3C	4D
			R365*	8G	3A	R800	1F	2A	W4	5C	4E
DS370	8F	4A	R370	7I	3E	R802	1E	1A	W5	4L	4F
DS560	6D	2F	R371	6H	2E				W6	5L	4F
			R372	6I	2E	S90	7C	2C	W7	7C	3D
Partial A3 also shown on diagrams 1, 2, 3, 4 and 7.											
OTHER PARTS											
J100	1K	CHASSIS	J300	7M	CHASSIS	R3	2K	CHASSIS	R53	3K	CHASSIS
J151	3K	CHASSIS	R1	1K	CHASSIS	R51	3K	CHASSIS	R382	7L	CHASSIS

***See Parts List for serial number ranges.**



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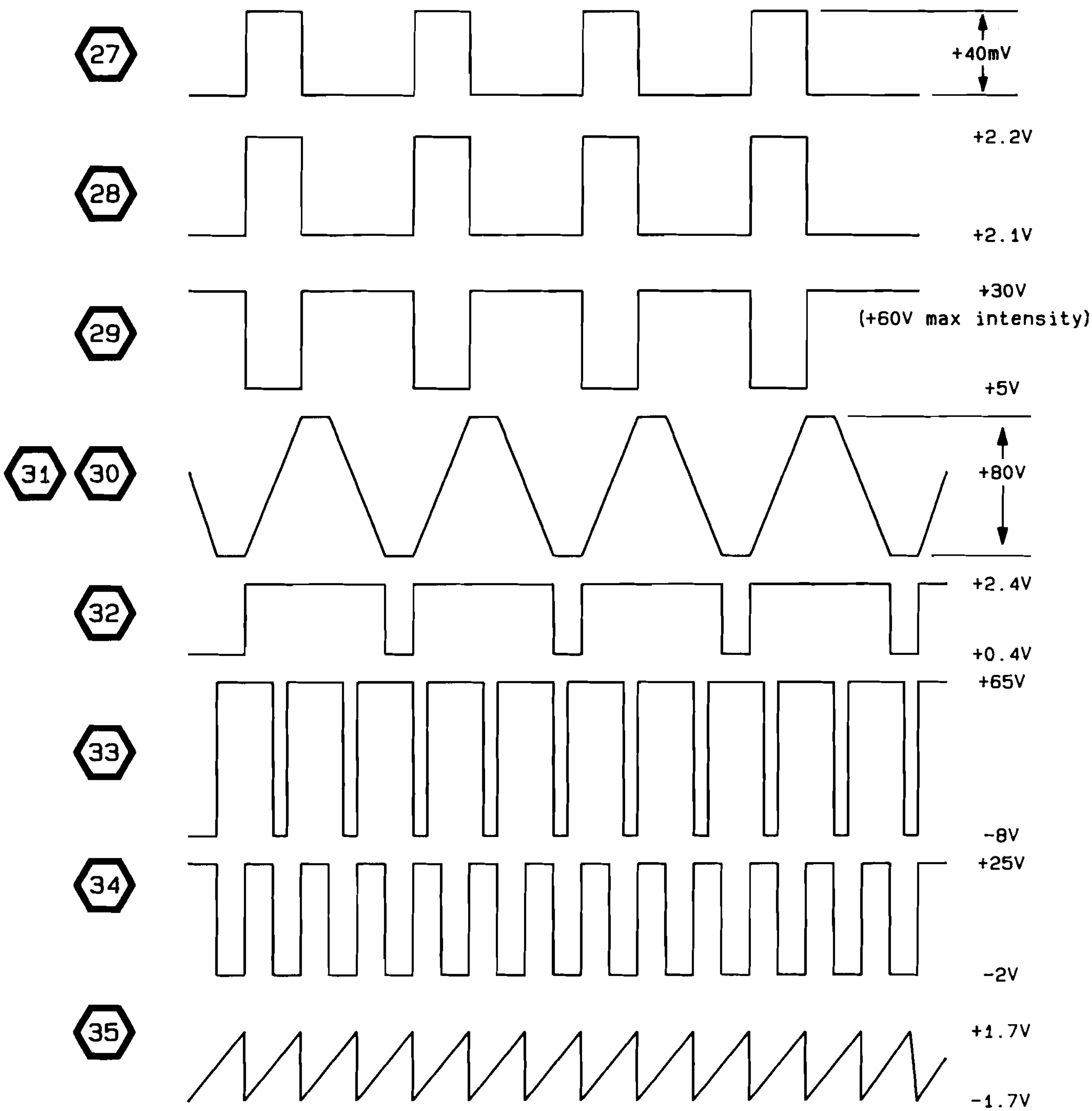
FRONT PANEL CONTROLS 6

WAVEFORMS FOR DIAGRAM 7



POWER SUPPLY, Z-AXIS, & CRT DIAGRAM 7

ASSEMBLY A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C805	5H	5G	CR827	3D	3G	R818	3C	5E	R928	7G	10J
C824	4C	5F	CR828	3D	3G	R819	2D	5F	R929	6F	9K
C825	3D	3G	CR829	3E	4G	R820	4C	5E	R930	6F	9K
C828	4D	3G	CR840	3F	3H	R821	3C	5E	R931	6G	10J
C832	2E	4H	CR845	3F	3H	R822	4D	8B	R932	8E	8K
C834	4F	3G	CR851	4H	7G	R823	4D	5F	R933	7G	9J
C835	4F	3H	CR853	4H	5H	R825	3D	5F	R934	8E	7K
C845	3F	3H	CR854	3I	5I	R830	3E	4G	R935	6H	8J
C847*	3F	3H	CR855	3I	5I	R832	3E	4G	R936	6I	9J
C849*	2F	3H	CR912	5D	10K	R834	4E	3G	R937	6I	8I
C851*	4H	7G	CR915	7E	8K	R835	4E	3G	R938	6I	9J
C853	5I	8I	CR923	8F	10J	R836	4E	3G	R939	6I	9J
C854	4I	5H	CR933	8F	10K	R840	3E	3H	R940	7F	10K
C855	4H	5I	CR953	5I	9I	R841	3E	4H	R941	8G	8J
C871*	3M	6F	CR983	7I	9J	R842	3F	4H	R942	6G	8J
C875*	5M	5G	CR984*	6K	8H	R844	3E	3H	R943	6H	8I
C893	3K	4I	CR985*	7K	8H	R845	3E	3H	R944	8H	7I
C901	5A	7J	CR986*	7K	8H	R849	2F	3I	R945	8H	8J
C902	5A	7I	CR987*	7K	8H	R850	4I	7G	R946	8H	7J
C908	8D	8K	CR988*	8K	8H	R851	4H	7G	R952	6J	10H
C909	6D	7J	CR989*	8K	8H	R852	4H	7F	R953	6J	9I
C910	6D	7J	CR990	8K	9H	R853	4I	7I	R965	8H	8J
C912	6E	8K	CR991	9K	9H	R854	4I	5H	R966	8I	9J
C913	7E	8K				R858	3I	5J	R967	7I	8J
C914	8E	7J	DS856	3H	5J	R860	3H	5J	R968	8I	9J
C915	5D	10K	DS858	3H	5J	R870	3M	6G	R969	8I	9J
C924	8F	9K	DS870	4J	4J	R872	4M	3K	R975	3J	6H
C927	6F	9J				R873	4M	2K	R976	4J	6J
C932	6I	8J	J1-3	4B	6A	R874	5M	5G	R978	4J	5J
C933	6I	8J	J4-6	4B	9A	R875	5M	6F	R982	8I	10I
C939	7F	9K	J6-6	4B	10A	R877	7K	5I	R983	7J	9J
C940	6I	9J				R885	2G	5G			
C941	8H	7J	L910	5E	6K	R886	2I	4H	T902	9K	9I
C942	6H	7I	L970	5E	8I	R888	2I	4H			
C952	6I	9I	L986	7K	8G	R889	2I	4H	TP842	3G	4H
C953	6J	8I	L988	8K	9G	R890	2I	4H	TP972	5F	8G
C962	8I	8J	L990	8K	9G	R891	2J	4I	TP984	6K	7G
C963	8I	8J				R892*	2K	4I	TP987	7L	9G
C970	8I	9J	P900	5K	5J	R894	3K	5I	TP989	8L	9G
C971	5E	7I				R898	6D	7J	TP991	8C	10G
C972	6H	8I	Q804	3B	5H	R899	5B	10G			
C975	3J	5K	Q817	2C	4E	R900	5A	8I	U910	7D	8K
C976	4J	5K	Q825	3D	4G	R901	6A	7J	U920A	7F	9K
C979	4J	5K	Q829	3E	4H	R907	6D	7J	U920B	6F	9K
C982	7I	9J	Q835	4E	3H	R908	8D	8K	U940	7H	8J
C983	7J	8J	Q840	3F	4H	R909	6D	7J	U975	3J	6H
C984	7K	7H	Q845	3F	4H	R910	6D	8J			
C986	7K	8H	Q885	2I	5H	R911	7E	8K	VR910	6D	7J
C987	7L	8F	Q911	6E	7J	R912	6E	8K	VR931	8G	9K
C988	7K	8H	Q912	5E	11K	R913	7E	8K	VR939	6I	8I
C989	8L	9F	Q913	5D	11K	R914	7D	8K	VR942	6H	8I
C990	8K	8H	Q918	8D	7K	R915	7E	8K	VR969	7I	8J
C991	8L	9F	Q921	6E	10J	R916	6E	10K			
			Q923	8F	11J	R917	8E	7K	W90	7M	7G
CR816	3C	4E	Q930	7I	9J	R918	8D	8K	W701-5	2B	5E
CR817	3C	4E	Q940	6J	10J	R919	6D	10K	W893	2L	4I
CR818	3C	5E	Q950	6J	11H	R920	5D	10K	W971	5F	4K
CR819	3C	5E	Q960	8I	9J	R921	6F	10J	W972	5F	8G
CR820	3C	5F	Q970	8J	10J	R922	7E	8K	W984	6K	7G
CR821	3C	5E	Q980	8J	10I	R923	8D	10J	W985	7K	4K
CR822	2C	2F				R924	8F	10K	W987	7L	8G
CR823	3D	4F	R804	4B	5G	R925	7F	9K	W989	8L	9G
CR824	3D	4G	R805	2C	5G	R926	7F	10K	W991	8L	10G
CR825	3E	4G	R806	4E	6H	R927	7G	10K			

Partial A1 also shown on diagrams 2, 3, 4, 5 and 6.

***See Parts List for serial number ranges.**

POWER SUPPLY, Z AXIS, & CRT DIAGRAM 7 (CONT)

ASSEMBLY A3

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J987	2M	2A	R802	4A	1A	W1-3	4A	4A			
			R986	2M	3A	W4-6	4A	4E			
R800	3A	2A	R987	2M	2A	W6-6	5A	4F			

Partial A3 also shown on diagrams 1, 2, 3, 4 and 6.

ASSEMBLY A4

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C900	5C	2D	CR904	6C	1C	L902	8B	2B	R906	6B	1D
C903	8B	3C									
C904	8C	3D	F901	9B	1B	Q900	5C	1D	S901	8C	4C
C905*	8B	4B							S902	7C	4A
			J901	8B	2A	R902	6C	1D			
CR901	6B	1D	J902	6B	2B	R903	5C	1D	W903-1	5C	1D
CR902	6C	1C				R904	5C	1D	W903-2	6C	1D
CR903	6B	1C	L901	8B	3C	R905	6B	1D	W903-3	5B	1D

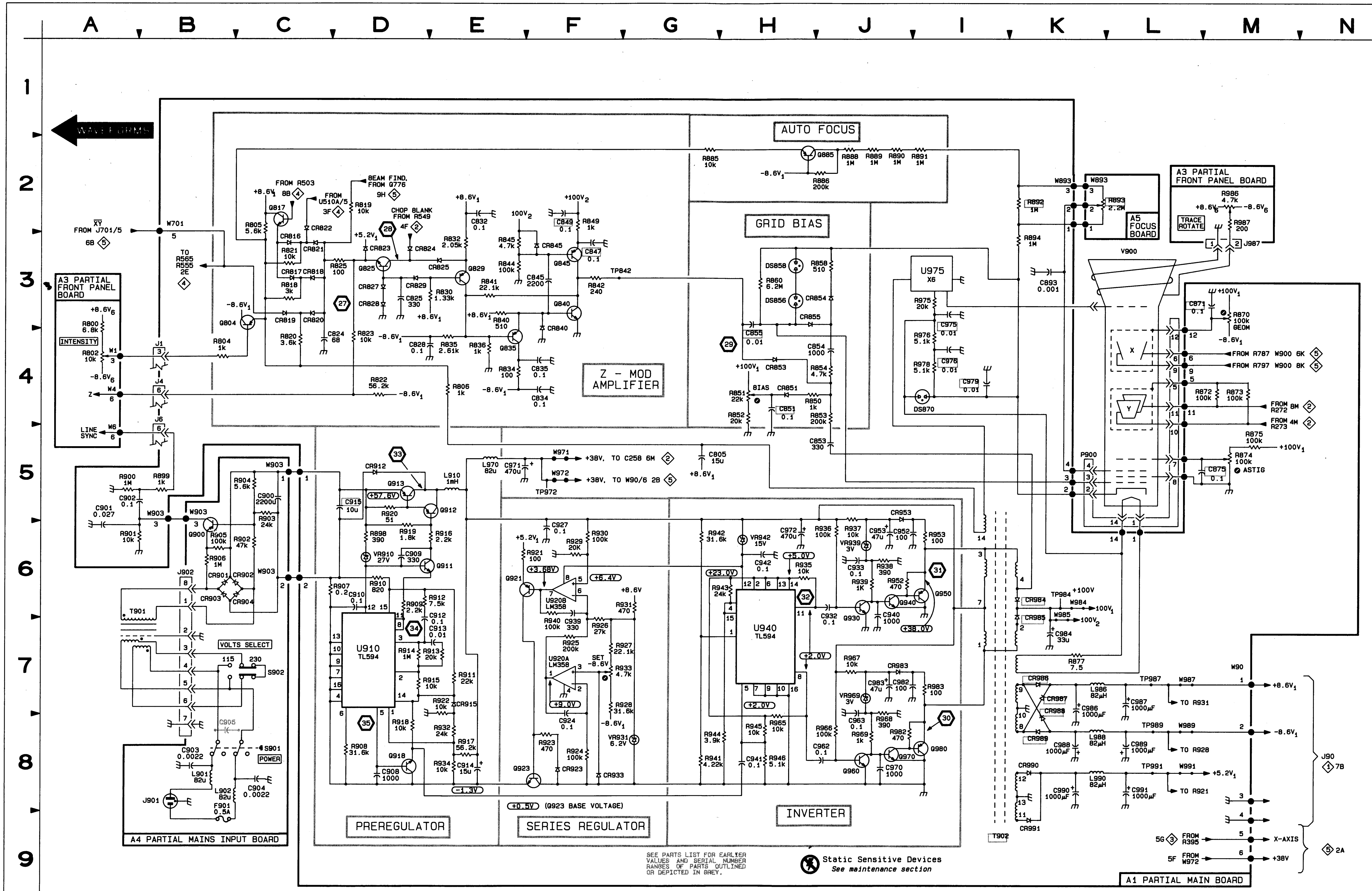
ASSEMBLY A5

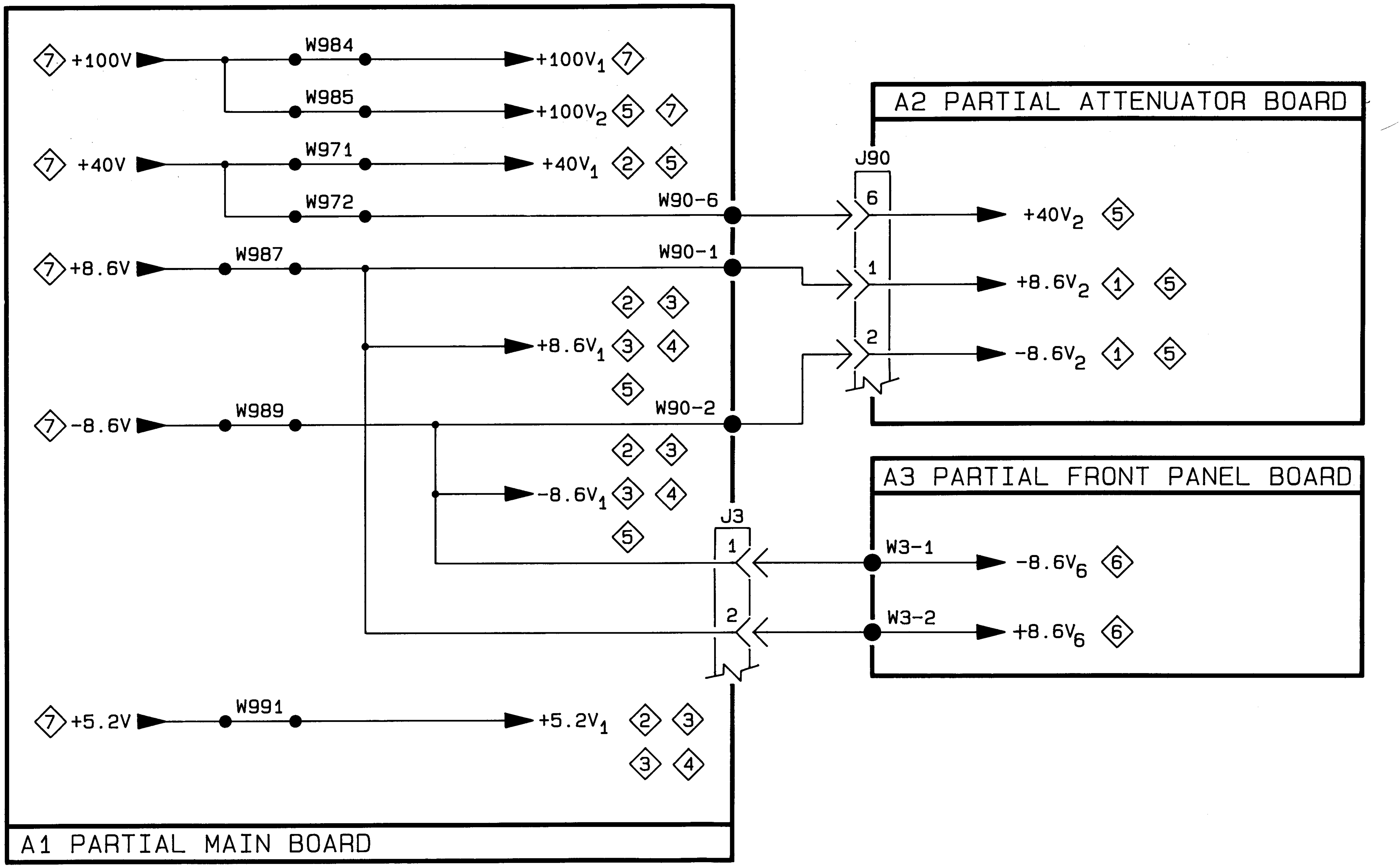
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R893*	2L	1A									

CHASSIS MOUNTED PARTS

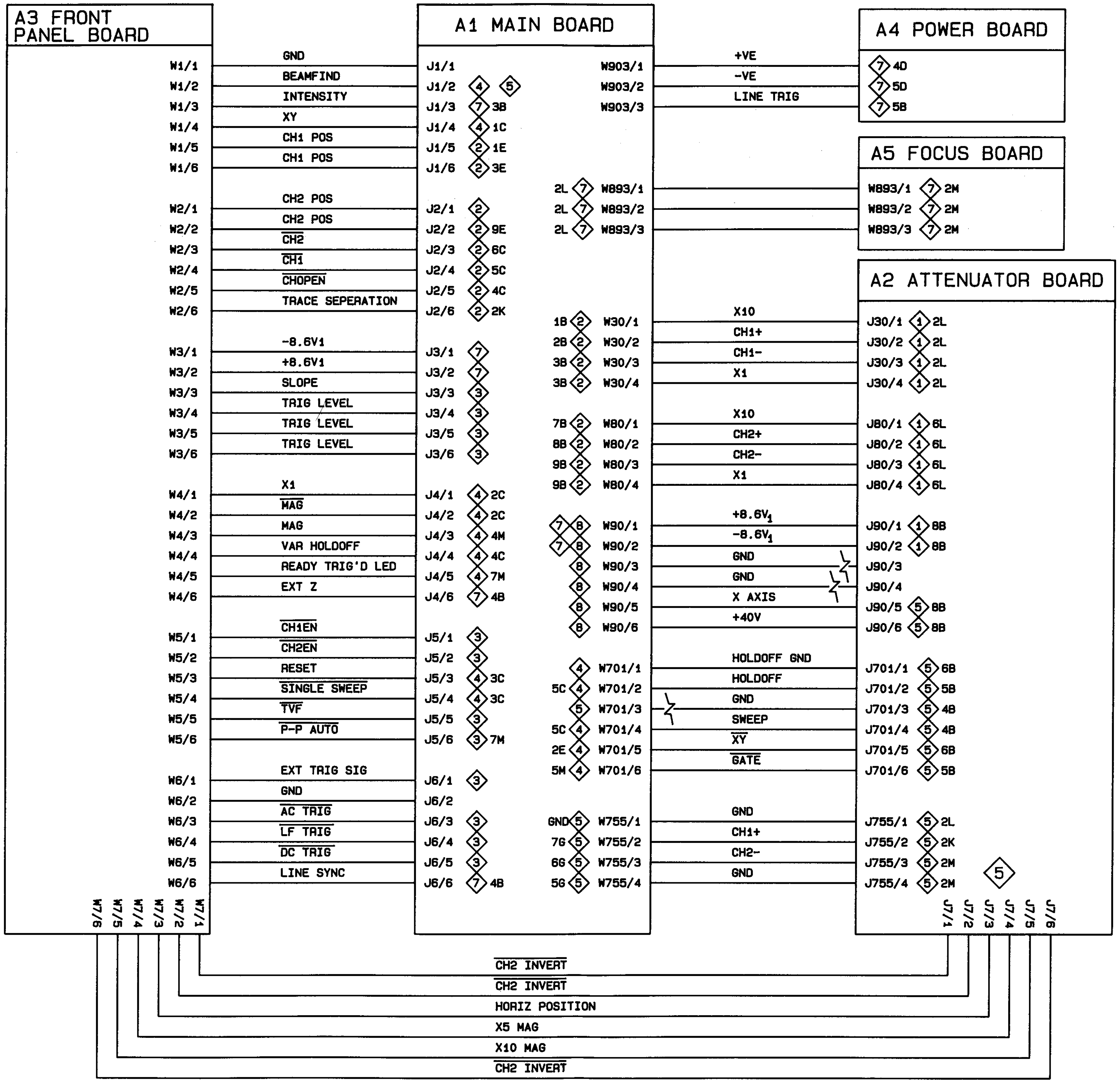
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
T901	6B	CHASSIS	V900	3L	CHASSIS						

***See Parts List for serial number ranges.**


AUTO FOCUS
GRID BIAS
Z - MOD AMPLIFIER
PREREGULATOR
SERIES REGULATOR
INVERTER
A3 PARTIAL FRONT PANEL BOARD
A5 FOCUS BOARD
A4 PARTIAL MAINS INPUT BOARD
A1 PARTIAL MAIN BOARD
VOLTS SELECT
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
Static Sensitive Devices
See maintenance section



+100V
W984
+100V1
W985
+100V2
+40V
W971
+40V1
W972
W90-6
+8.6V
W987
W90-1
+8.6V1
-8.6V
W989
W90-2
-8.6V1
J3
1
2
+5.2V
W991
+5.2V1
A1 PARTIAL MAIN BOARD
A2 PARTIAL ATTENUATOR BOARD
J90
6
+40V2
1
+8.6V2
2
-8.6V2
A3 PARTIAL FRONT PANEL BOARD
W3-1
-8.6V6
W3-2
+8.6V6



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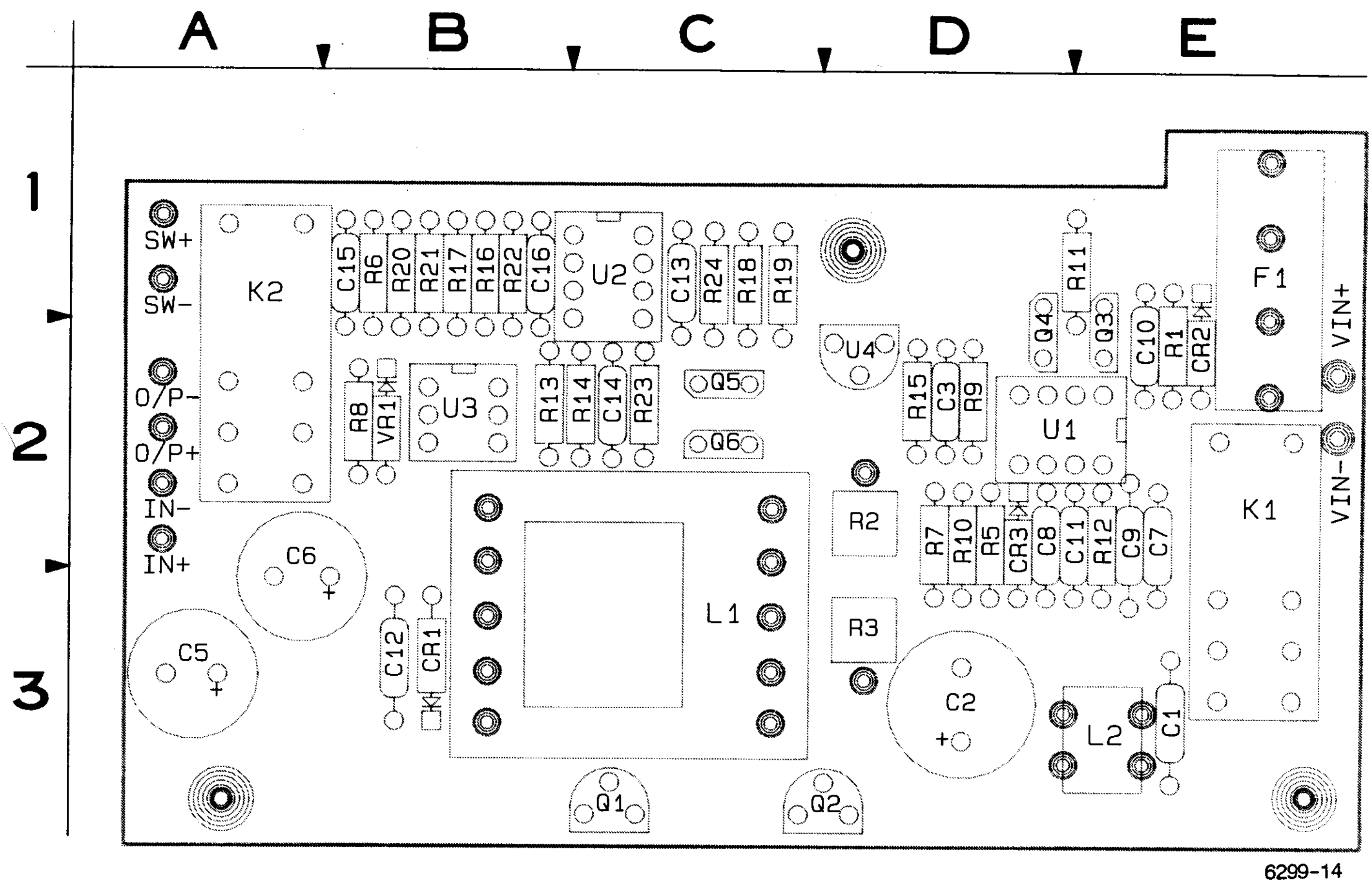


Fig. 9-10. A6—Option 07 Inverter board.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number

A23 A2 R1234

Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

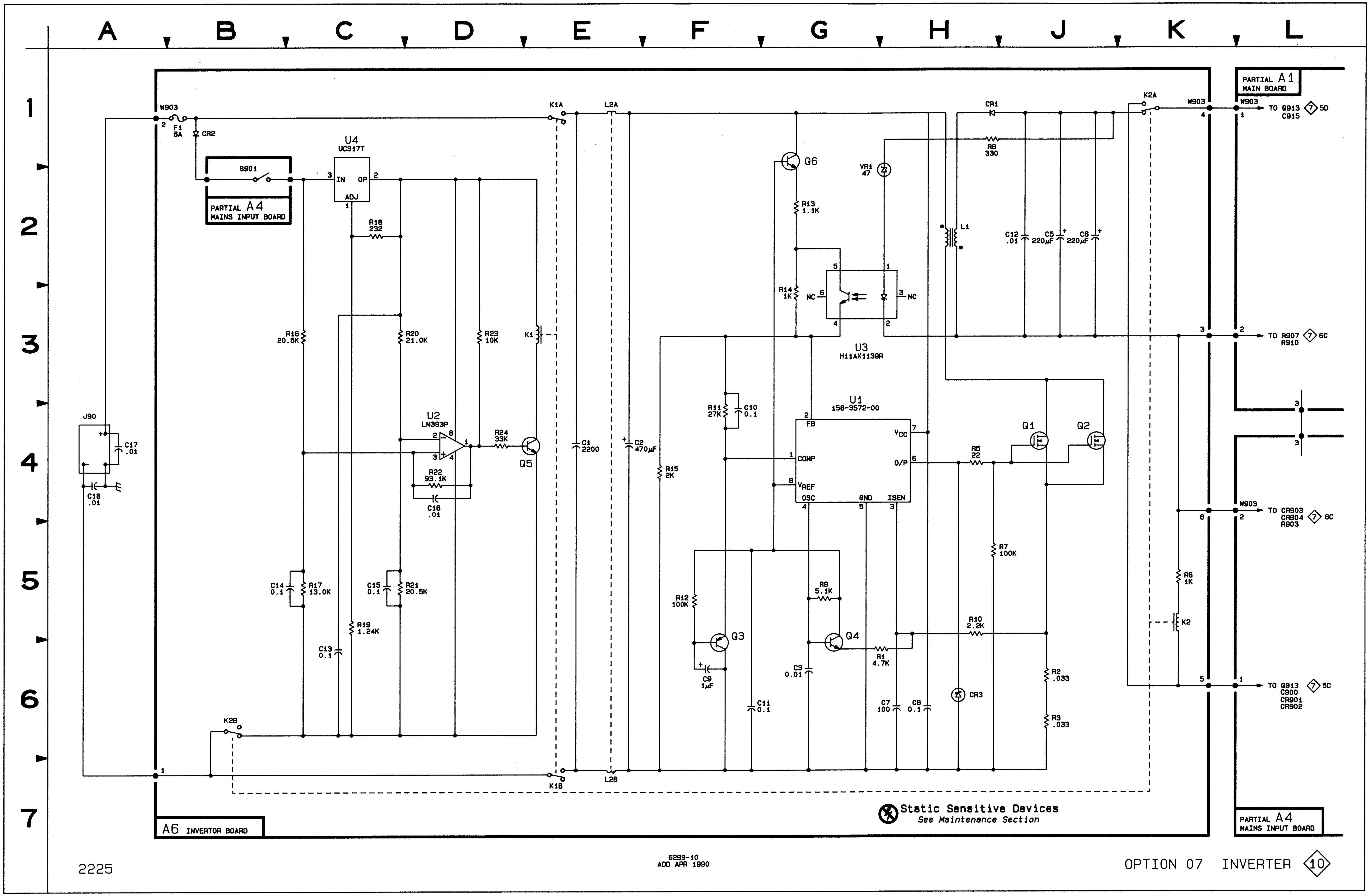
OPTION 07 INVERTER DIAGRAM 10

ASSEMBLY A6

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1	4D	3E				Q5	4D	2C	R17	5B	1B
C2	4E	3D	F1	1B	1E	Q6	1F	2C	R18	3C	1C
C3	6F	2D							R19	5B	1C
C5	2H	3A	K1	3D	2E	R1	6G	2E	R20	3C	1B
C6	2H	2A	K1A	1D	2E	R2	6H	2D	R21	5C	1B
C7	6G	2E	K1B	7D	2E	R3	6H	3D	R22	4C	1B
C8	6G	2D	K2	5J	1A	R5	4H	2D	R23	3D	2C
C9	6F	2E	K2A	1J	1A	R6	5J	1B	R24	4D	1C
C10	4F	2E	K2B	6B	1A	R7	5H	2D			
C11	6F	2E				R8	1G	2B	U1	4F	2D
C12	2H	3B	L1	2G	3C	R9	5F	2D	U2	4C	1C
C13	6C	1C				R10	5H	2D	U3	2G	2B
C14	5B	2C	L2A	1E	3E	R11	4E	1E	U4	2B	2D
C15	5C	1B	L2B	7E	3E	R12	5F	2E			
C16	5C	1B									
			Q1	4H	3C	R13	2F	2B	VR1	2G	2B
CR1	2G	3B	Q2	4H	3C	R14	3F	2C			
CR2	1B	2E	Q3	5E	2E	R15	4E	2D	W903	1B	2A
CR3	6G	2D	Q4	6F	2D	R16	3B	1B	W903	1J	2E

CHASSIS PARTS

C17	4A	CHASSIS	C18	4A	CHASSIS	J90	4A	CHASSIS			



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OPTION 07 INVERTER 10

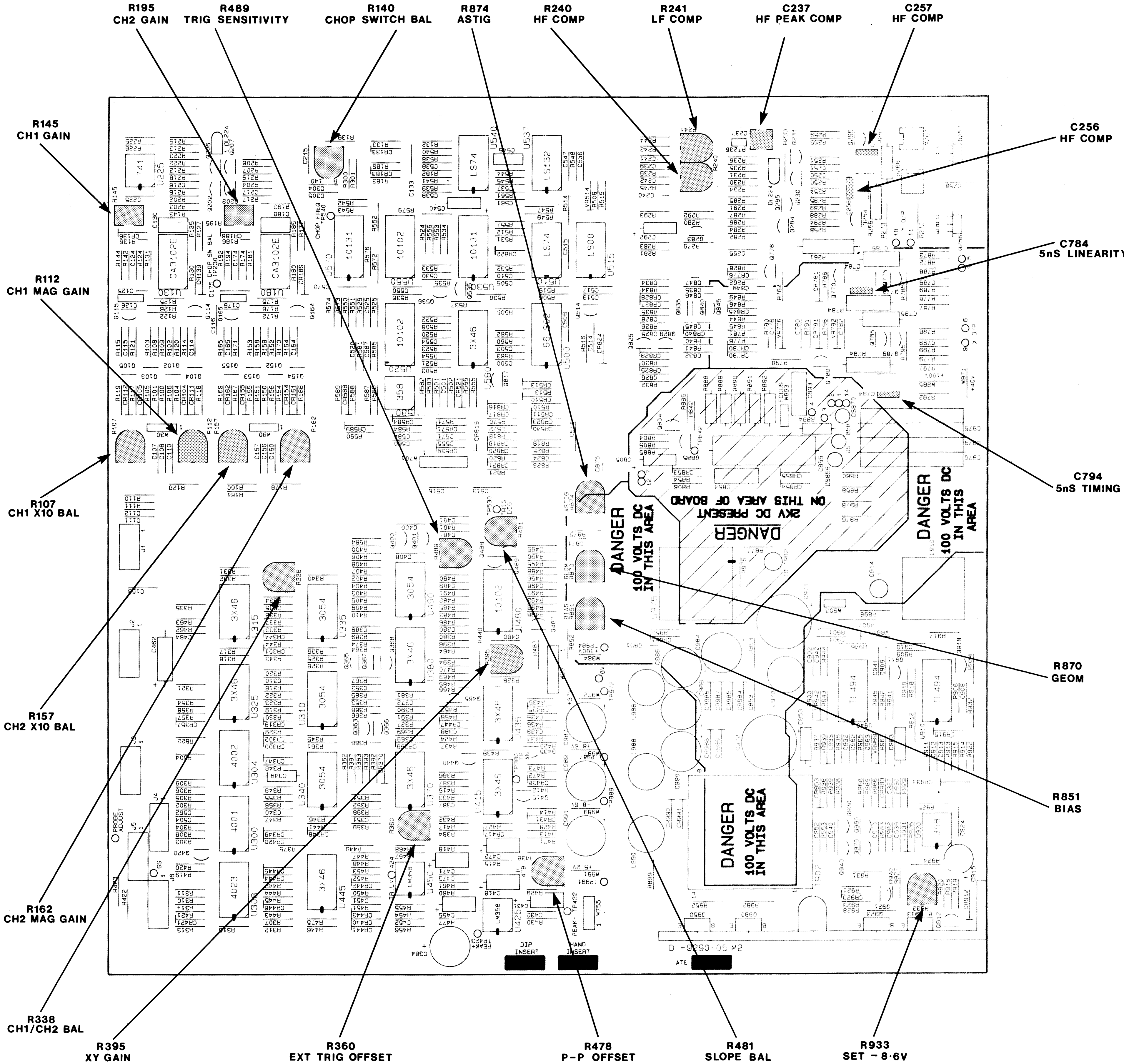

Figure 9-11. A1—Main board adjustment locations.

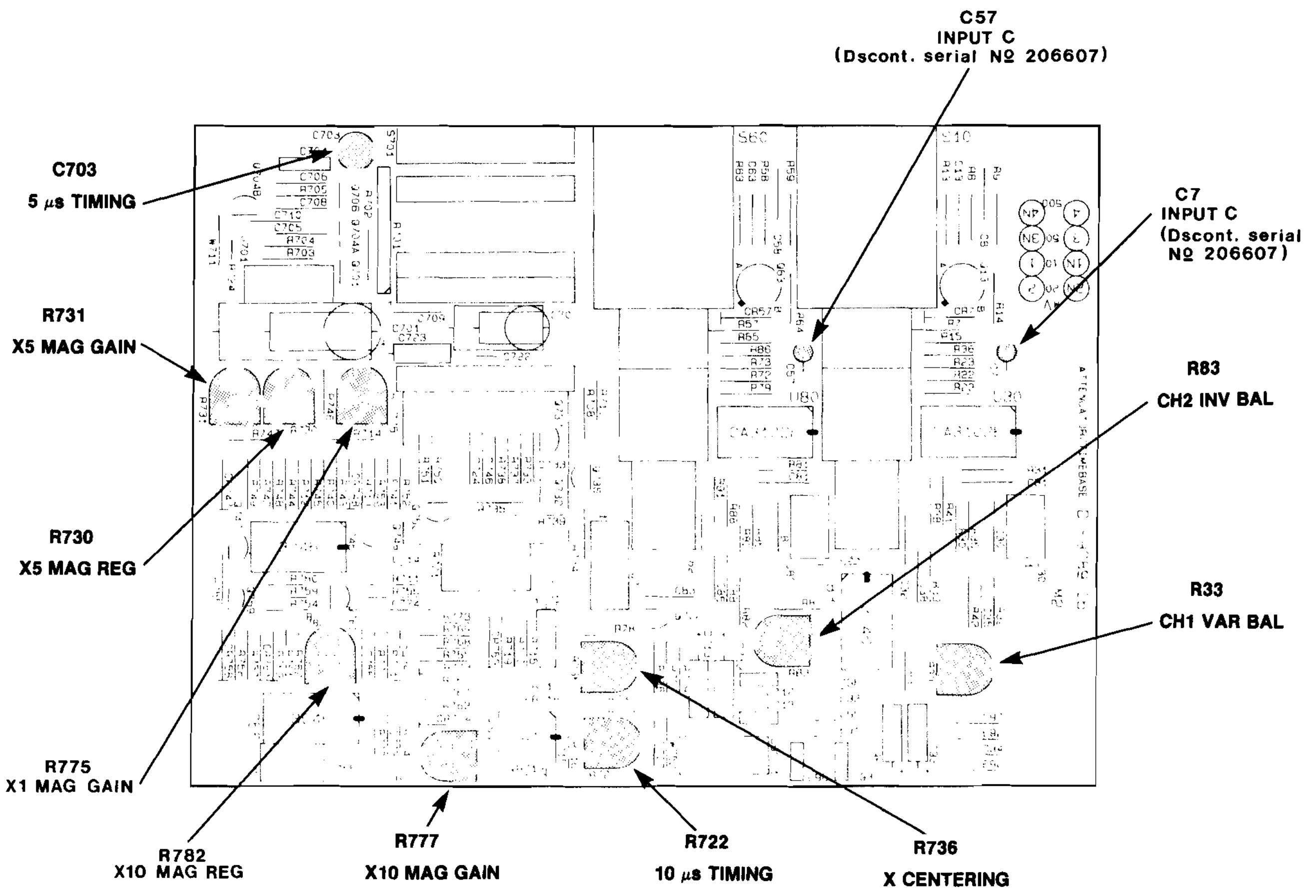

Figure 9-12. A2—Attenuator/time base adjustment locations.

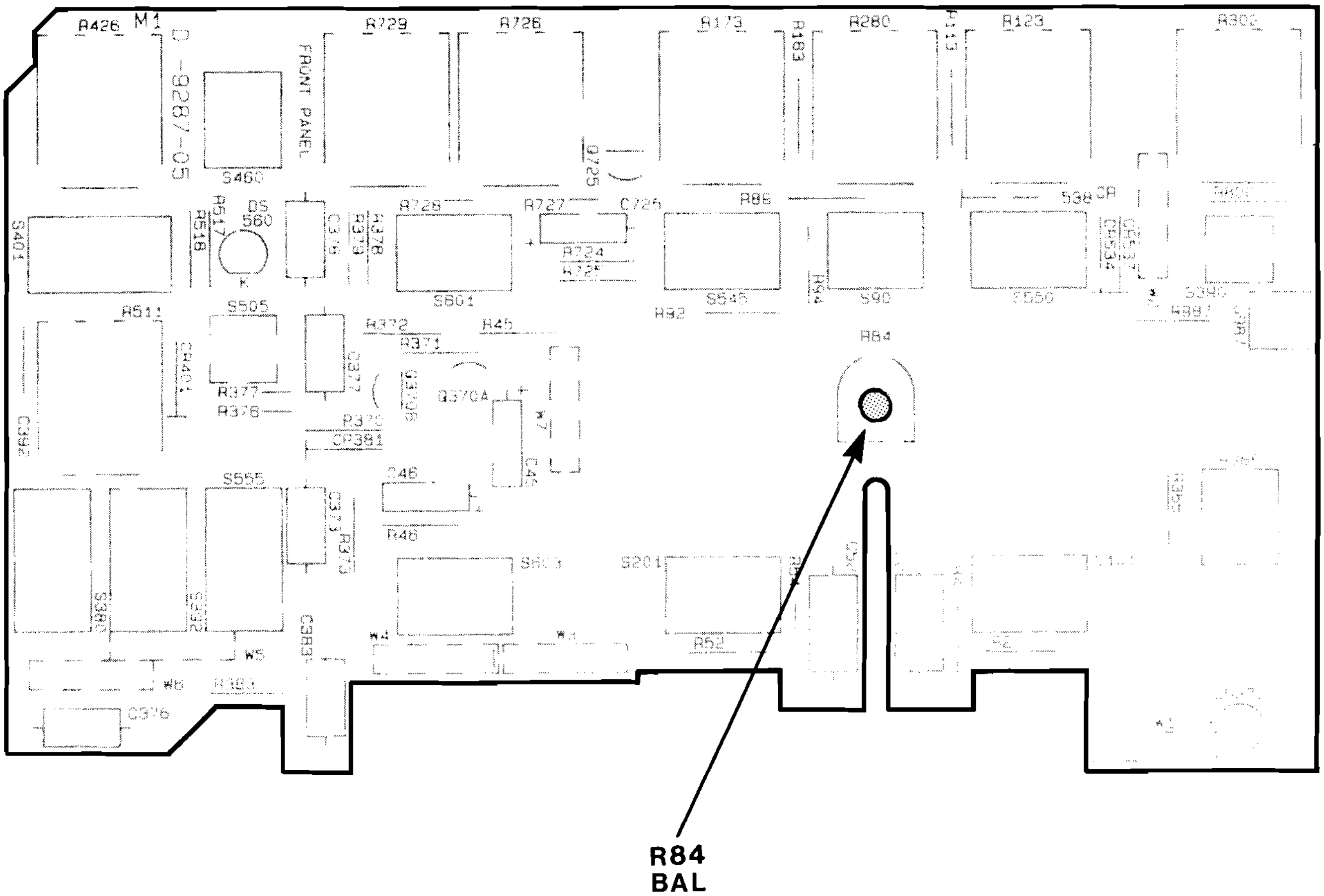

Figure 9-13. A3—Front Panel board adjustment locations.

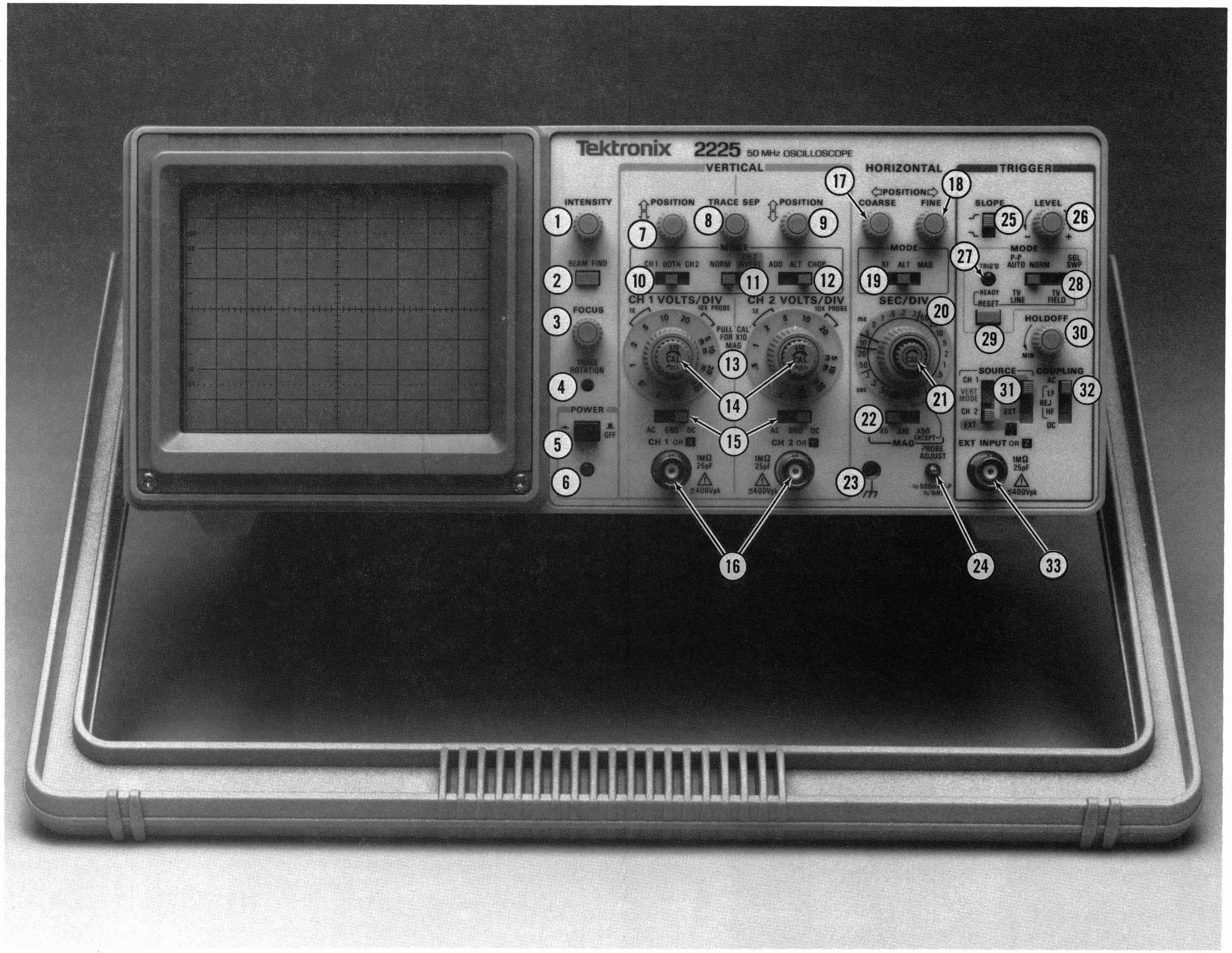

Figure 9-14. 2225 Front panel controls, connectors, and indicators.

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

ITEM NAME

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

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

1 2 3 4 5 *Name & Description*

Assembly and/or Component
Attaching parts for Assembly and/or Component
**** END ATTACHING PARTS ****
  Detail Part of Assembly and/or Component
  Attaching parts for Detail Part
  **** END ATTACHING PARTS ****
    Parts of Detail Part
    Attaching parts for Parts of Detail Part
    **** END ATTACHING PARTS ****

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation.

Attaching parts must be purchased separately, unless otherwise specified.

ABBREVIATIONS

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

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
01536	TEXTRON INC CAMCAR DIV SEMS PRODUCTS UNIT	1818 CHRISTINA ST	ROCKFORD IL 61108
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 07094-2917
06915	RICHCO PLASTIC CO	5825 N TRIPP AVE	CHICAGO IL 60646-6013
07416	NELSON NAME PLATE CO	3191 CASITAS	LOS ANGELES CA 90039-2410
12327	FREEWAY CORP	9301 ALLEN DR	CLEVELAND OH 44125-4632
13511	AMPHENOL CADRE DIV BUNKER RAMO CORP		LOS GATOS CA
16428	COOPER BELDEN ELECTRONIC WIRE AND CA SUB OF COOPER INDUSTRIES INC	NW N ST	RICHMOND IN 47374
22670	G M NAMEPLATE INC	2040 15TH AVE WEST	SEATTLE WA 98119-2728
70903	COOPER BELDEN ELECTRONICS WIRE AND C SUB OF COOPER INDUSTRIES INC	2000 S BATAVIA AVE	GENEVA IL 60134-3325
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077-0001
83385	MICRODOT MFG INC GREER-CENTRAL DIV	3221 W BIG BEAVER RD	TROY MI 48098
83486	ELCO INDUSTRIES INC	1101 SAMUELSON RD	ROCKFORD IL 61101
86113	MICRODOT MFG INC CENTRAL SCREW-KEENE DIV	149 EMERALD ST	KEENE NH 03431-3628
86928	SEASTROM MFG CO INC	701 SONORA AVE	GLENDALE CA 91201-2431
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61108-5181
K2504	RS COMPONENTS LTD	PO BOX 99	CORBY NORTHANTS NN17 9RS ENGLAND
S3109	FELLER	72 Veronica Ave Unit 4	Summerset NJ 08873
S3629	SCHURTER AG H C/O PANEL COMPONENTS CORP	2015 SECOND STREET	BERKELEY CA 94170
TK0174	BADGLEY MFG CO	1620 NE ARGYLE	PORTLAND OR 97211
TK0861	H SCHURTER AG DIST PANEL COMPONENTS	2015 SECOND STREET	BERKELEY CA 94170
TK0DA	MET-ETCH (SELKIRK) LTD		SELKIRK TD75DK SCOTLAND
TK0EB	B D TOOLS	237 BULLSMOOR LAND ENFIELD	MIDDX ENGLAND
TK0EC	CARON ENG. SERVICE	10-11 STATION CLOSE POTTERS BAR	HERTS ENGLAND
TK0EH	HARLOW SPRINGS 1 + 2 ROYDONBURY IND EST THE PINNACLES	HARLOW	ESSEX ENGLAND
TK0EI	HIBBERTS & RICHARDS UNIT A	LANCASTER ROAD NEW BARNET	HERTS ENGLAND
TK0EJ	IMP WORKS	ESSEX ROAD HODDESDON	HERTS ENGLAND
TK0EL	MOLBRY LTD	HOLLAND WAY BLANDFORD	DORSET ENGLAND
TK0EO	PLANET JIG & TOOL	BAKER STREET HIGH WYCOMBE	BUCKS ENGLAND
TK0EP	PRINTLINE ORMOND HOUSE	5-6 HARDWICK STREET	LONDON ENGLAND
TK0ER	REEVITE IND. MOULDINGS	16 MURDOCK ROAD BICESTER	OXFORDSHIRE ENGLAND
TK0ES	SMALL POWER MACHINE CO INDUSTRIAL ESTATE	BATH ROAD CHIPPENHAM	WILTSHIRE ENGLAND
TK0ET	WARTH INTERNATIONAL CHARLWOODS BUSINESS CENTER	CHARLWOODS ROAD	EAST GRINDSTEAD ENGLAND
TK0EX	LUCAS DURALITH LTD STATION APPROACH	VICTORIA ROCHE	CORNWALL PL28 8JU ENGLAND
TK1326	NORTHWEST FOURSLIDE INC	18224 SW 100TH CT	TUALATIN OR 97062
TK1336	PARSONS MFG CORP	1055 OBRIEN	MENLO PARK CA 94025
TK1694	ROSE CITY LABEL CO	7235 SE LABEL LN	PORTLAND OR 97213
TK1723	MAGNETIC SHIELDS LTD	HEADCORD ROAD STAPLEHURST, TONBRIDGE	KENT TN 12 ODS ENGLAND
TK2165	TRIQUEST CORP	3000 LEWIS AND CLARK HWY	VANCOUVER WA 98661-2999

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	334-6879-00			1	MARKER,IDENT:MARKED VOLTAGE/FUSE SELECT	TKODA	ORDER BY DESCR
-2	334-6880-00			1	MARKER,IDENT:MARKED CAUTION	TKODA	ORDER BY DESCR
					(UNITED KINGDOM ONLY)		
	334-7055-00			1	MARKER,IDENT:MKD CAUTION	07416	ORDER BY DESCR
					(U.S.A. ONLY)		
	334-5258-00	B010129		1	MARKER,IDENT:MKD X-RAY WARNING,GERMAN	TK1694	ORDER BY DESCR
					(OPTION A1 & A5 ONLY)		
-3	200-3335-00			1	COVER,REAR:PLASTIC	TKOEJ	ORDER BY DESCR
					(ATTACHING PARTS)		
-4	211-0712-00			2	SCR,ASSEM WSHR:6-32 X 1.25,PNH,STL,TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-5	343-1278-00			2	RTNR,POWER CORD:POLYCARBONATE GRAY	TK2165	ORDER BY DESCR
-6	348-0964-00			2	FOOT,REAR COVER:BLACK,PLASTIC	TKOEJ	ORDER BY DESCR
-7	437-0370-00			1	CABINET,SCOPE:	80009	437-0370-00
					(ATTACHING PARTS)		
-8	213-0882-00			4	SCREW,TPG,TR:6-32 X 0.437 TAPTITE,PNH,STL	83385	ORDER BY DESCR
					(END ATTACHING PARTS)		
-9	367-0356-00			1	HANDLE,CARRYING:	TKOEJ	ORDER BY DESCR
					(ATTACHING PARTS)		
-10	212-0144-00			2	SCREW,TPG,TF:8-16 X 0.562 L,PLASTITE,SPCL HD	93907	225-38131-012
					(END ATTACHING PARTS)		
-11	214-3984-00		200360	2	SPRING,HLCPS:0.71 OD X 12.0MM L,OPEN ENDS	TKOEH	ORDER BY DESCR
-12	426-1765-02			1	FRAME,CRT:POLYCARBONATE,GRAY	TK2165	ORDER BY DESCR
					(ATTACHING PARTS)		
-13	211-0690-01			2	SCREW,MACHINE:6-32 X 0.875 PNH,SST	86113	ORDER BY DESCR
					(END ATTACHING PARTS)		
-14	337-2775-00			1	SHLD,IMPLOSION:FILTER,BLUE 2211/2213/2215	80009	337-2775-00
-15	348-0660-00			4	CUSHION,CRT:POLYURETHANE	80009	348-0660-00
-16	384-1575-00			1	EXTENSION SHAFT:8.805 L,W/KNOB,PLASTIC	80009	384-1575-00
-17	358-0550-00			1	BUSHING,SHAFT:0.15 ID X 0.488 L,PLSTC	TK2165	ORDER BY DESCR
-18	366-1480-03			1	PUSH BUTTON:BLACK,OFF	80009	366-1480-03
-19	384-1364-00			1	EXTENSION SHAFT:10.818 L X 0.187 SQ,NYL,BLK	TK2165	ORDER BY DESCR
-20	366-0641-00			2	KNOB:GY/YL,CAL/X10,11.5MM X 3.08MM X 13MM H	TKOES	ORDER BY DESCR
-21	331-0498-00			2	DIAL,CONTROL:32MM X 3.75MM,MKD 1 THRU 50	TKOEJ	ORDER BY DESCR
-22	366-0640-00			1	KNOB:GRAY,CAL W/ARROW,10MM X 2MM X 12MM H	TKOES	ORDER BY DESCR
-23	210-1436-00			2	WASHER,FLAT:9.4MM ID X 12.5MM OD X 2MM THK, ALUMINUM	TKOEL	ORDER BY DESCR
-24	331-0499-00			1	DIAL,CONTROL:32MM X 3.75MM,MKD 2 X LINES	TKOEJ	ORDER BY DESCR
-25	366-0636-00			8	KNOB:GRAY,10MM X 12MM H	TKOEJ	ORDER BY DESCR
-26	366-0635-00			2	PUSH BUTTON:GRAY,4.45MM X 7.75MM X	TKOEJ	ORDER BY DESCR
-27	----- -----			1	TERM,FEEDTHRU:(SEE J590 REPL)		
-28	131-0955-00			3	CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
-29	210-0255-00			1	TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	12327	ORDER BY DESCR
-30	386-5483-00			1	SUBPANEL,FRONT:	TKOEJ	ORDER BY DESCR
-31	333-3454-00			1	PANEL,FRONT:	TKOEX	ORDER BY DESCR
					(STANDARD ONLY)		
	333-3488-00			1	PANEL,FRONT:FRENCH VERSION OPT 1F	TKOEX	ORDER BY DESCR
					(OPTION 1F ONLY)		

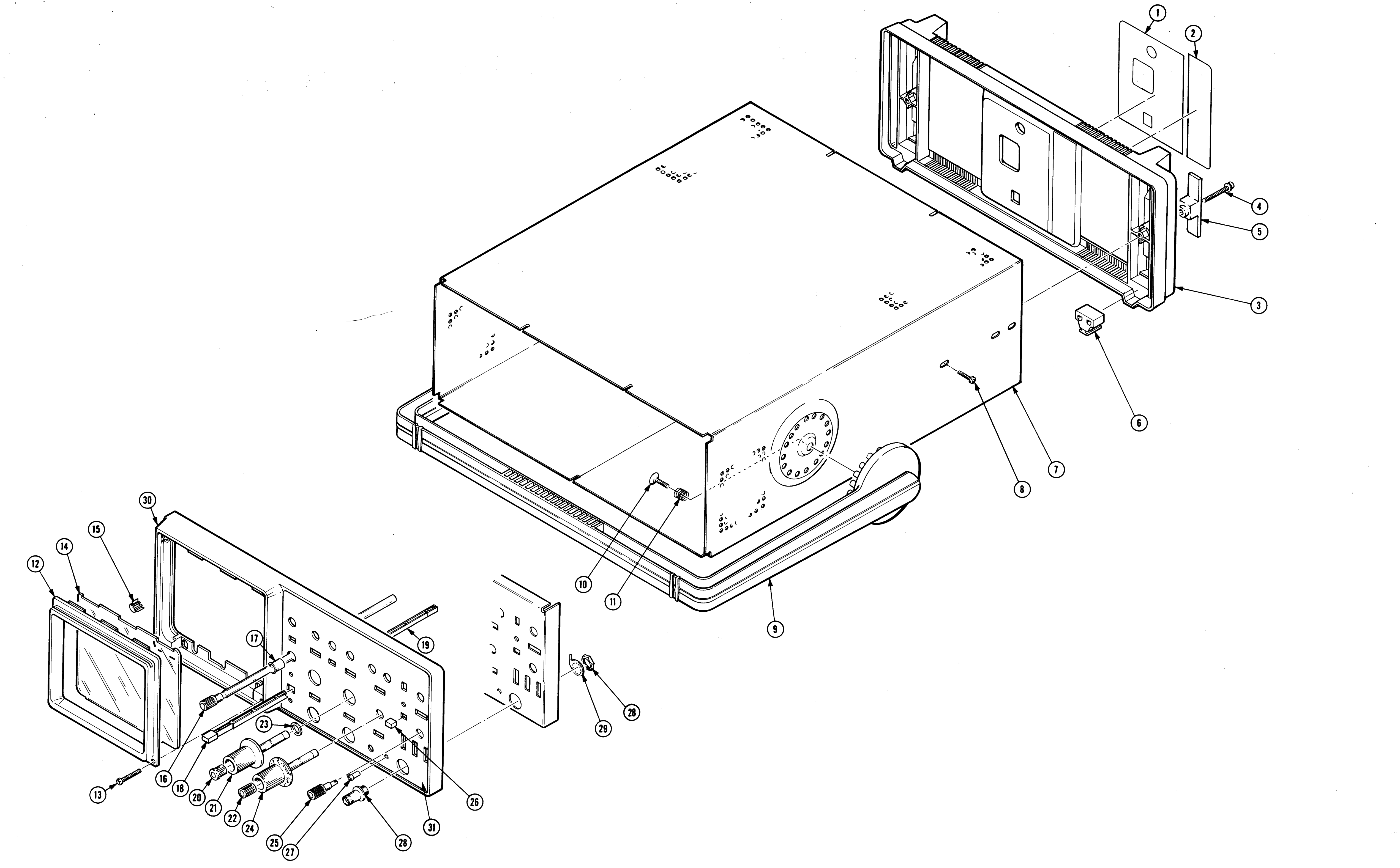

FIG. 1 CABINET

FIG. 2 EXPLODED VIEW

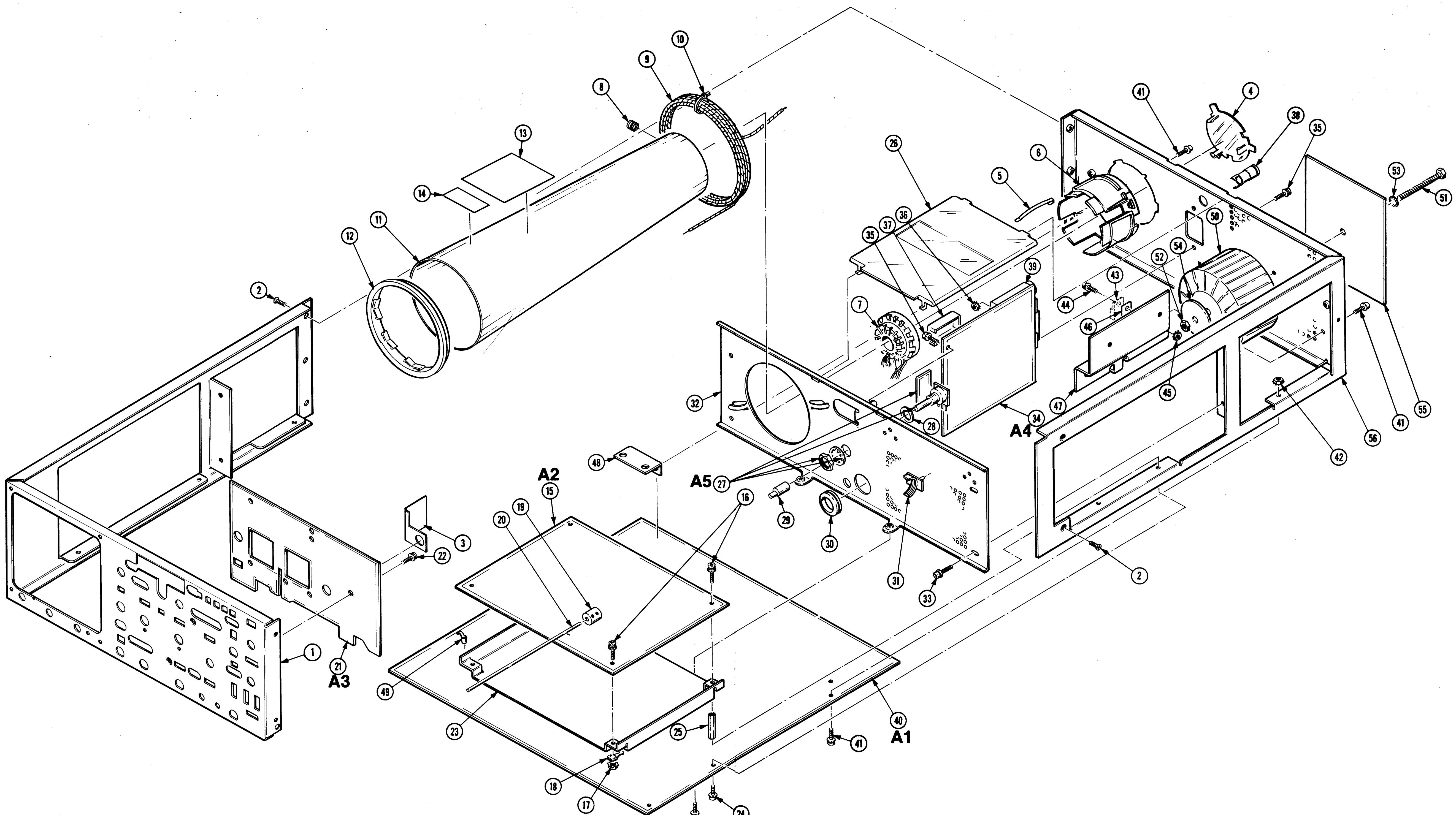

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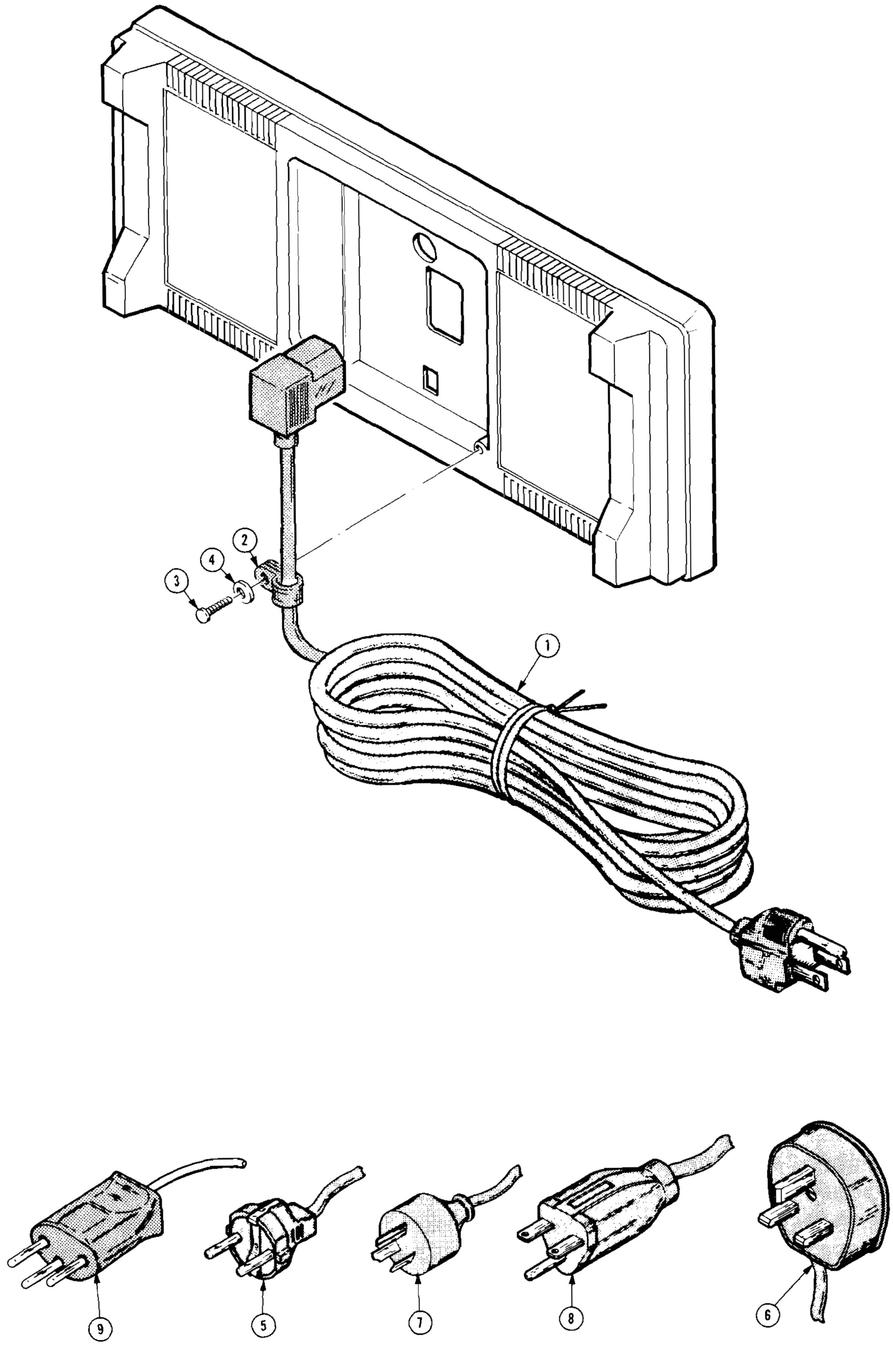
Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-1	441-1752-00			1	CHASSIS,SCOPE:FRONT	TK0E0	ORDER BY DESCR
					(ATTACHING PARTS)		
-2	211-0718-00			4	SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
					(END ATTACHING PARTS)		
-3	337-3397-00			1	SHIELD,ELEC:CH1,CH2 SEPARATION	TK0E0	ORDER BY DESCR
-4	200-2519-00			1	CAP,CRT SOCKET:NATURAL LEXAN	80009	200-2519-00
-5	214-1061-05			1	SPRING,GROUND:PLATED	TK1326	ORDER BY DESCR
-6	426-1766-00			1	MOUNT,RESILIENT:CRT,REAR	80009	426-1766-00
-7	136-0202-04			1	SKT,PL-IN ELEK:ELECTRON TUBE,14 CONTACT	80009	136-0202-04
-8	214-3984-00			2	SPRING,HLCPS:0.71 OD X 12.0MM L,OPEN ENDS	TK0EH	ORDER BY DESCR
-9	----- -----			1	DELAY LINE,ELEC:(SEE DL224 REPL)		
-10	343-0549-00			4	STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL	06383	PLT1M
-11	337-3363-00			1	SHIELD,ELEC:CRT	TK1723	ORDER BY DESCR
-12	386-4443-00			1	SUPPORT,SHIELD:CRT,FRONT,PLASTIC	80009	386-4443-00
-13	334-1951-00	202414		1	MARKER,IDENT:MKD WARNING,CRT VOLTAGES (UNITED KINGDOM ONLY)	22670	ORDER BY DESCR
	334-1951-00			1	MARKER,IDENT:MKD WARNING,CRT VOLTAGES (U.S.A. & GUERNSEY)	22670	ORDER BY DESCR
-14	334-1379-00			1	MARKER,IDENT:MKD HI VACUUM	07416	ORDER BY DESCR
-15	----- -----			1	CIRCUIT BD ASSY:ATTENUATOR & TIMEBASE (SEE A2 REPL)		
					(ATTACHING PARTS)		
-16	211-0721-00	200360	208128	4	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
	211-0730-00	208129		4	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (UNITED KINGDOM ONLY)	80009	211-0730-00
	211-0730-00			4	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (U.S.A. & GUERNSEY)	80009	211-0730-00
-17	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
-18	210-0202-00	200360	200997	1	TERMINAL,LUG:0.146 ID,LOCKING,BRZ TIN PL (UNITED KINGDOM ONLY)	86928	A-373-158-2
					(END ATTACHING PARTS)		
	346-0240-00			2	.STRAP,GROUND:ATTENUATOR .(SOLDER BRACKET ACROSS THE INNER TWO LEADS .FROM THE ATTENUATOR SWITCHES)	TK0E0	ORDER BY DESCR
					(ATTACHING PARTS)		
	211-0325-00			1	.SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,TORX T9	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-19	376-0224-01			1	CPLG,SHAFT,RGD:W/213-0153-00	TK0EC	ORDER BY DESCR
-20	384-1714-00			1	EXTENSION SHAFT:133MM L X 2MM OD,SST	80009	384-1714-00
-21	----- -----			1	CIRCUIT BD ASSY:FRONT PANEL (SEE A3 REPL)		
					(ATTACHING PARTS)		
-22	211-0304-00			6	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL,T9 TORX	01536	ORDER BY DESCR
					(END ATTACHING PAATS)		
-23	337-3365-00			1	SHIELD,ELEC:ATTENUATOR	TK0E0	ORDER BY DESCR
					(ATTACHING PARTS)		
-24	211-0721-00	200360	208128	3	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
	211-0730-00	208129		3	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (UNITED KINGDOM ONLY)	80009	211-0730-00
	211-0730-00			3	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (U.S.A. & GUERNSEY)	80009	211-0730-00
-25	129-1105-00			2	SPACER,POST:23.5MM L,4-40 BOTH ENDS,AL,HEX	TK0EL	ORDER BY DESCR
	129-1106-00			1	SPACER,POST:25.4MM L,W 6-32 THD THRU,BRASS, 6.3MM HEX	TK0EL	ORDER BY DESCR
					(END ATTACHING PARTS)		
-26	337-3364-00			2	SHIELD,ELEC:POWER SUPPLY	TK0EJ	ORDER BY DESCR
-27	----- -----			1	CIRCUIT BD ASSY:FOCUS CONTROL MOUNTING (SEE A5 REPL)		
					(ATTACHING PARTS)		
-28	210-1437-00			1	WASHER,FLAT:0.265 ID X 0.06 THK,STEEL	TK0EI	ORDER BY DESCR
					(END ATTACHING PARTS)		
-29	384-1710-00			1	EXTENSION SHAFT:13MM X 7MM OD,W/STEP,4MM ID	TK0EJ	ORDER BY DESCR
-30	348-0918-00	E200000	E210593	1	GROMMET,PLASTIC:BLACK,RING,0.625 ID (UNITED KINGDOM ONLY)	TK0ER	ORDER BY DESCR

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-	348-0918-00	G100000	G100749	1	GROMMET,PLASTIC:BLACK,RING,0.625 ID (GUERNSEY ONLY)	TK0ER	ORDER BY DESCR
-31	344-0347-00	E200000	E210593	1	CLIP,ELECTRICAL:ANODE,0.72 OD,NYLON	TK2165	ORDER BY DESCR
	343-0003-00	E210594		1	CLAMP,LOOP:0.25 ID,PLASTIC (UNITED KINGDOM ONLY)	06915	E4 CLEAR ROUND
	344-0347-00	G100000	G100749	1	CLIP,ELECTRICAL:ANODE,0.72 OD,NYLON	TK2165	ORDER BY DESCR
	343-0003-00	G100750		1	CLAMP,LOOP:0.25 ID,PLASTIC (GUERNSEY ONLY)	06915	E4 CLEAR ROUND
-31.1	343-0549-00	203965		1	STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL (UNITED KINGDOM ONLY)	06383	PLT1M
	343-0549-00			1	STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL (U.S.A. & GUERNSEY)	06383	PLT1M
-32	441-1751-00	E200000	E210593	1	CHASSIS,SCOPE:INNER	TK0E0	ORDER BY DESCR
	441-1751-02	E210594		1	CHASSIS,SCOPE:INNER (UNITED KINGDOM ONLY)	80009	441-1751-02
	441-1751-00	G100000	G100749	1	CHASSIS,SCOPE:INNER	TK0E0	ORDER BY DESCR
	441-1751-02	G100750		1	CHASSIS,SCOPE:INNER (GUERNSEY ONLY)	80009	441-1751-02
					(ATTACHING PARTS)		
-33	211-0721-00	200360	208128	8	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
	211-0730-00	208129		8	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (UNITED KINGDOM ONLY)	80009	211-0730-00
	211-0730-00			8	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (U.S.A. & GUERNSEY ONLY)	80009	211-0730-00
					(END ATTACHING PARTS)		
-34	----- -----			1	CIRCUIT BD ASSY:POWER (SEE A4 REPL)		
					(ATTACHING PARTS)		
-35	211-0721-00	200360	208128	6	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
	211-0730-00	208129		6	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (UNITED KINGDOM ONLY)	80009	211-0730-00
	211-0730-00			6	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (U.S.A. & GUERNSEY)	80009	211-0730-00
-36	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					(END ATTACHING PARTS)		
-37	200-2735-00			1	COVER,POWER SW:BLACK,POLYCARBONATE	TK2165	ORDER BY DESCR
-38	200-2264-00			1	CAP,FUSEHOLDER:3AG FUSES	S3629	FEK 031 1666
-39	204-0906-00			1	BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES	S3629	TYPEFAU031.3573
-40	----- -----			1	CIRCUIT BD ASSY:MAIN (SEE A1 REPL)		
					(ATTACHING PARTS)		
-41	211-0721-00	200360	208128	8	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
	211-0730-00	208129		8	SCR,ASSEM WSHR:6-32 X 0.375,PNH,STL CD PL, TORX T15 (UNITED KINGDOM ONLY) (U.S.A. & GUERNSEY)	80009	211-0730-00
-42	210-0457-00			5	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					(END ATTACHING PARTS)		
					CIRCUIT BD ASSY INCLUDES:		
-43	----- -----			4	.TRANSISTOR:(SEE A1Q912,Q913,Q950,Q980 REPL)		
					(ATTACHING PARTS)		
-44	211-0305-00			4	.SCR,ASSEM WSHR:4-40 X 0.437,PNH,STL,CD PL	01536	ORDER BY DESCR
-45	210-0586-00			4	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
	342-0829-00	200360	200697	3	.INSULATOR,PLATE:TRANSISTOR,SIL-PAD .(UNITED KINGDOM ONLY)	TK0ET	ORDER BY DESCR
-46	342-0804-00	200360	200697	7	.INSULATOR,WSHR:5.6MM OD X 3.0MM ID X 1.6MM .THK,NYLON	80009	342-0804-00
	342-0804-00	200698		1	.INSULATOR,WSHR:5.6MM OD X 3.0MM ID X 1.6MM .THK,NYLON .(UNITED KINGDOM ONLY)	80009	342-0804-00
	342-0804-00			1	.INSULATOR,WSHR:5.6MM OD X 3.0MM ID X 1.6MM .THK,NYLON .(U.S.A. & GUERNSEY)	80009	342-0804-00
					(END ATTACHING PARTS)		

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-47	407-3539-00			1	.BRACKET,HEAT SK:ALUMINUM	TK0E0	ORDER BY DESCR
-48	361-1435-00			2	.SPACER,XSTR:POLYPROPYLENE,TO-5	K2504	402-175
	407-3579-00			1	.BRACKET,HEAT SK:ALUMINUM	TK0E0	ORDER BY DESCR
-49	343-0088-00			2	.CLAMP,CABLE:0.062 DIA,PLASTIC	80009	343-0088-00
	343-0002-00	200360	200519	1	CLAMP,LOOP:0.187 ID,PLASTIC	06915	E3 CLEAR ROUND
	343-0003-00	200520		1	CLAMP,LOOP:0.25 ID,PLASTIC (UNITED KINGDOM ONLY)	06915	E4 CLEAR ROUND
	343-0003-00			1	CLAMP,LOOP:0.25 ID,PLASTIC (U.S.A. & GUERNSEY)	06915	E4 CLEAR ROUND
-49.1	214-4084-00	B010140		1	HT SK,XSTR ASSY:	80009	214-4084-00
-50	----- -----			1	TRANSFORMER:(SEE T901 REPL) (ATTACHING PARTS)		
-51	213-0993-00			1	SCREW,MACHINE:0.25-20 X 2.5 L,HEX HEAD,STL	TK0EB	ORDER BY DESCR
-52	220-0054-00	200360	200761	1	NUT,PLAIN,HEX:0.25-20 X 0.437 HEX,STL,ZN PL	TK0EB	ORDER BY DESCR
	220-0054-00	200762		2	NUT,PLAIN,HEX:0.25-20 X 0.437 HEX,STL,ZN PL (UNITED KINGDOM ONLY)	TK0EB	ORDER BY DESCR
	220-0054-00			2	NUT,PLAIN,HEX:0.25-20 X 0.437 HEX,STL,ZN PL (U.S.A. & GUERNSEY)	TK0EB	ORDER BY DESCR
-53	210-1026-00	200360	200761	1	WASHER,LOCK:0.26 ID,INTL,0.025 THK,STL (UNITED KINGDOM ONLY)	78189	1114-00
-54	210-1437-00	200360	200761	1	WASHER,FLAT:0.265 ID X 0.06 THK,STEEL (UNITED KINGDOM ONLY)	TK0EI	ORDER BY DESCR
-55	386-5361-00			1	PLATE,REAR:STEEL (END ATTACHING PARTS)	TK0E0	ORDER BY DESCR
-56	441-1753-00			1	CHASSIS,SCOPE:REAR	TK0E0	ORDER BY DESCR

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
3-					STANDARD ACCESSORIES		
	----- -----			1	ACCESSORY PKG:TWO P6103 PROBE,W/ACCESS		
	070-6298-01			1	MANUAL,TECH:OPERATORS,2225	TK0EP	ORDER BY DESCR
-1	161-0104-00			1	CABLE ASSY,PWR,:3 WIRE,98.0 L,W/RTANG CONN (UNITED KINGDOM ONLY)	16428	CH8352, FH-8352
	161-0230-01			1	CABLE ASSY,PWR,:3,18 AWG,92.0 L (U.S.A. ONLY)	80009	161-0230-01
-2	343-0003-00			1	CLAMP,LOOP:0.25 ID,PLASTIC (POWER CORD CLAMP)	06915	E4 CLEAR ROUND
-3	213-0882-00			1	SCREW,TPG,TR:6-32 X 0.437 TAPTITE,PNH,STL	83385	ORDER BY DESCR
-4	210-0803-00			1	WASHER,FLAT:0.15 ID X 0.375 OD X 0.032,STL	12327	ORDER BY DESCR
	020-0859-00			1	COMPONENT KIT:EUROPEAN	80009	020-0859-00
	200-2265-00			1	.CAP,FUSEHOLDER:5 X 20MM FUSES	TK0861	FEK 031.1663
-5	161-0104-06			1	.CABLE ASSY,PWR,:3 X 0.75MM SQ,220V,98.0 L .(OPTION A1 ONLY)	S3109	ORDER BY DESCR
	020-0860-00			1	COMPONENT KIT:UNITED KINGDOM	80009	020-0860-00
	200-2265-00			1	.CAP,FUSEHOLDER:5 X 20MM FUSES	TK0861	FEK 031.1663
-6	161-0104-07			1	.CABLE ASSY,PWR,:3 X 0.75MM SQ,240V,98.0 L .(OPTION A2 ONLY)	80009	161-0104-07
	020-0861-00			1	COMPONENT KIT:AUSTRALIAN	80009	020-0861-00
	200-2265-00			1	.CAP,FUSEHOLDER:5 X 20MM FUSES	TK0861	FEK 031.1663
-7	161-0104-05			1	.CABLE ASSY,PWR,:3,18 AWG,240V,98.0 L .(OPTION A3 ONLY)	S3109	ORDER BY DESCR
	020-0862-00			1	COMPONENT KIT:NORTH AMERICAN	80009	020-0862-00
	200-2265-00			1	.CAP,FUSEHOLDER:5 X 20MM FUSES	TK0861	FEK 031.1663
-8	161-0104-08			1	.CABLE ASSY,PWR,:3,18 AWG,240V,98.0 L .(OPTION A4 ONLY)	70903	ORDER BY DESCR
	020-0863-00			1	COMPONENT KIT:SWISS	80009	020-0863-00
	200-2265-00			1	.CAP,FUSEHOLDER:5 X 20MM FUSES	TK0861	FEK 031.1663
-9	161-0167-00			1	.CABLE ASSY,PWR,:3.0 X 0.75,6A,240V,2.5M L .(OPTION A5 ONLY)	80009	161-0167-00
					OPTIONAL ACCESSORIES		
	016-0180-00			1	VISOR,CRT:FOLDING	TK2165	ORDER BY DESCR
	016-0566-00			1	VISOR,CRT:	TK2165	ORDER BY DESCR
	016-0592-00			1	VISOR,CRT:	TK2165	ORDER BY DESCR
	016-0677-02			1	POUCH,ACCESSORY:W/PLATE	TK0174	016-0677-02
	016-0785-00			1	ACCESSORY KIT:MOUNTING,1107 TO 2200	80009	016-0785-00
	016-0792-01			1	CASE,CARRYING:24.5 X 16.5 X 11.5	TK1336	ORDER BY DESCR
	016-0819-02			1	ADAPTER,RACK:RACKMOUNT	80009	016-0819-02
	016-0921-00			1	ACCESSORY KIT:24 X 1 SIGNAL ADAPTER (OPTION 22 ONLY)	80009	016-0921-00
	020-1514-00			1	ACCESSORY KIT: (OPTION 02)	80009	020-1514-00
	070-6299-00			1	MANUAL,TECH:SERVICE,2225	80009	070-6299-00
	200-3397-00			1	COVER,SCOPE:FRONT	80009	200-3397-00
	337-2775-01			1	SHLD,IMPLOSION:	80009	337-2775-01



1
2
3
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7
8
6

APPENDIX

Table A-1

Magnified Sweep Speeds

SEC/DIV Setting	Magnified Sweep Speed (Time/Division)		
	X5	X10	X50
0.5 s	0.1 s	50 ms	10 ms
0.2 s	40 ms	20 ms	4 ms
0.1 s	20 ms	10 ms	2 ms
50 ms	10 ms	5 ms	1 ms
20 ms	4 ms	2 ms	0.4 ms
10 ms	2 ms	1 ms	0.2 ms
5 ms	1 ms	0.5 ms	0.1 ms
2 ms	0.4 ms	0.2 ms	40 μs
1 ms	0.2 ms	0.1 ms	20 μs
0.5 ms	0.1 ms	50 μs	10 μs
0.2 ms	40 μs	20 μs	4 μs
0.1 ms	20 μs	10 μs	2 μs
50 μs	10 μs	5 μs	1 μs
20 μs	4 μs	2 μs	0.4 μs
10 μs	2 μs	1 μs	0.2 μs
5 μs	0.1 μs	0.5 μs	0.1 μs
2 μs	0.4 μs	0.2 μs	40 ns
1 μs	0.2 μs	0.1 μs	20 ns
0.5 μs	0.1 μs	50 ns	10 ns
0.2 μs	40 ns	20 ns	N/A
0.1 μs	20 ns	10 ns	N/A
.05 μs	10 ns	5 ns	N/A

MANUAL CHANGE INFORMATION

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

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

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

MANUAL CHANGE INFORMATION

Tektronix®
COMMITTED TO EXCELLENCE

Date: 8-1-88
Change Reference: C1/0888
Product: 2225 SERVICE
Manual Part Number: 070-6299-00

DESCRIPTION
Product Group 46

The information contained within the attached pages describe the new Option 07 (dc-to-dc inverter) which is now available for the 2225 instruments.

Product: 2225 SERVICE	Date: 8-1-88	Change Reference: C1/0888

DESCRIPTION

OPTION 07

INTRODUCTION

Option 07 provides a dc-to dc inverter circuit physically located within the power supply compartment of the 2225. The Tektronix Type 2225 Oscilloscope fitted with Option 07 operates from either ac or dc power sources.

The inverter operates from a dc input voltage of +11.8 to +30 volts. A dc voltage monitor circuit continually checks the dc input voltage for proper level. If the input voltage falls below +10.65 volts, the power source will automatically be disconnected. This is to limit the depth of discharge that the battery power source could be subjected to while supplying power to the 2225 Oscilloscope.

SPECIFICATIONS

The 2225 Option 07 instrument meets all electrical and environmental characteristics stated in tables 1-1 and 1-2. Additional electrical and mechanical characteristics which apply to the dc-dc inverter (Option 07) are listed in the following two tables.

ELECTRICAL SPECIFICATIONS

Characteristics	Performance Requirements
Turn-on Range	+11.8 to 30 V.
Battery Protection Shutdown Limit	+10.65 V ±2%.
Rated Inverter Output Power	35 Watts.
Input Protection	Low voltage and reverse polarity.
Output Protection	Short circuit and overload.
Supplu Voltage	Battery Pack or External Supply.
Mains Voltage Operation	Inverter is automatically disconnected from the 2225 preregulator when mains power is applied to the 2225 mains input receptacle.

MECHANICAL SPECIFICATIONS

Characteristics	Performance Requirements
Weight	
2225 with Option 07 and Power Cord	6.75 kg (14.9 lbs).
Domestic Shipping Weight	9.15 kg (20.2 lbs).

DESCRIPTION

OPERATING INSTRUCTIONS

Power Source

Dc Requirement: The Option 07 requires an external dc power source of between +11.0 V and +30 V. Maximum current consumption is 5 Amperes.

Ac Requirement: Operates from 115 volts or 230 volts ac, within the limits specified for the standard 2225 instrument.

Loss of Ground

The 2225 Option 07 is grounded through the dc power cord grounding conductor. Upon loss of the protective ground connection, all accessible conductive parts, including knobs and controls that may appear to be insulated can render electric shock.

CONNECTORS

An additional connector is added to the rear of the Option 07 instrument for use with the supplied dc power cord.

PERFORMANCE CHECK PROCEDURE

This procedure is used to verify proper operation of the dc-to-dc inverter (Option 07) against the requirements listed in the specifications.

Remove the cabinet from the 2225 Oscilloscope. Refer to the cabinet remove and replace instructions located in the Maintenance section of the service manual.

Equipment Required

DC variable power supply with integral ammeter	0 to 30V @ 5A
Voltmeter	0.2% accuracy

a. Set the DC power supply output to 0V and connect it to the DC input of the 2225 Option 07 oscilloscope.

b. Adjust the range of the voltmeter to measure up to 30V and connect across the DC supply (observing proper polarity) to measure the applied voltage.

c. Switch both the 2225 oscilloscope and the DC power supply to on. Increase the DC power supply to 10V. The 2225 oscilloscope should not power up.

e. Slowly increase the DC power supply until the 2225 oscilloscope powers-up.

f. CHECK—voltmeter reads between +11.42V and +11.86V.

g. Disconnect the voltmeter from the DC supply. Using the voltmeter, check that all internal power supply voltages of the 2225 Oscilloscope are within limits. Refer to Table 5-2 located in Section 5 of the service manual for test points and voltages.

h. Increase the DC power supply to 30V.

i. CHECK—that all power supply voltages of the 2225 Oscilloscope remain within their limits.

j. Connect the voltmeter across the DC input of the 2225 Option 07. Slowly reduce the DC power supply to the point that the 2225 Oscilloscope shuts down.

k. CHECK—that the voltmeter reads between +10.44V and +10.86V

l. Adjust the DC power supply to 30V. Note the current being drawn from the supply. Reduce the DC power supply output voltage until the scope shuts down, checking that the current does not exceed 5 Amps at any time. Set the DC power supply to 0V output.

m. Turn the power off on the DC power supply and reverse the polarity of the connections to the DC input of the 2225 Option 07. Switch the DC power supply on again.

n. CHECK—that no current is drawn while increasing the output voltage to 30V.

o. Turn power off on the DC power supply and reconnect the supply to the 2225 Option 07 observing correct polarity.

p. Turn the DC power supply on and set to 12V for operation of the 2225 Oscilloscope.

q. Plug the 2225 Oscilloscope's AC Power Cord into a suitable power outlet noting that the Line Voltage Selection switch of the 2225 Oscilloscope is properly set.

r. Note that the current drawn from the DC power supply now drops to zero.

s. Unplug the 2225's AC Power Cord and check that the scope returns to operation from the DC power supply.

NOTE

There is approximately a 10 second switching delay from an AC power source to the DC power supply.

ADJUSTMENT PROCEDURE

There are no adjustments to be made to the 2225 Option 07 dc-to-dc inverter.

THEORY OF OPERATION

The Option 07 dc-to-dc inverter produces a 48 volt dc output voltage which is applied to the 2225 preregulator circuit. The inverter output voltage is held constant over a Line Input dc voltage range of +11 to +30 volts.

Dc Input—The dc input enters via the rear panel dc input plug. Two disc capacitors, C17 and C18, decouple the input to ground.

Protection—The inverter will only operate if K1 is energized. CR1 protects against reverse connection of the dc supply. U4, R18, and R19 generate a reference voltage of 9 V. This reference is divided by R20 and R21, and compared by U2 with a voltage proportional to the input set by R16 and R17. When the + input of U2 drops below the − input, the comparator output voltage falls to near ground and turns off Q5, deactivating K1 and the inverter. Capacitors C13, C14, C15, and C16 provide noise reduction to prevent unwanted switching.

Inverter Circuit—The primary circuit consists of L1, Q1 and Q2 in parallel, and current sense resistors R2 and R3. With Q1 and Q2 switched on, the primary current increases, building up energy in L1. When Q1 and Q2 switch off, this energy is transferred to the secondary in the form of a large voltage pulse. CR1 rectifies the output and capacitors C5, C6, and C12 smooth it to a dc voltage.

Voltage feedback—R8 and VR1 produce a current through U3 for the voltage feedback loop. VR1 improves sensitivity, regulation, and allows wide input voltage variations. U3 provides isolation to the circuit. The voltage at Q6 follows the Vref voltage at pin 8 of U1 which provides a stable 5 volt reference. This reference voltage is divided by resistors R13, R14, and R15 providing feedback to pin 2 of U1.

Current mode control—This type of feedback regulates the peak inductor current and improves stability. R2 and R3 generate a voltage proportional to the primary current. R1 and R10 form a divider network from the oscillator output, voltage followed by Q4, to the current limit input. This is superimposed on the primary current voltage.

R9 and C3 set the oscillator frequency of U1 to 30KHz.

Soft Start—With the power switch on, C9 charges up through R12. This gradually turns off Q3 which in turn slowly increases the voltage on pin 1 of U1. The resulting gradual increase in the mark space ratio reduces start up surges.

Input filtering—Due to the large variations in the input current, an input filter is fitted, which comprises of coupled inductor L2, low ESR capacitor C2, and C1.

OPTIONS

Option 07 is compatible with all currently available instrument options with the exception of option 1R (rack-mounting).

ACCESSORIES

In addition to the standard accessories supplied with the 2225, Option 07 is shipped with a dc power cord with integral plug. The color coding of the dc power cord is as follows:

RED ....POSITIVE
PURPLE ....NEGATIVE
GREEN/YELLOW ....CHASSIS

OPTIONAL ACCESSORIES

The 1104 Battery Pack is an additional optional accessory available for use with the 2225 Option 07 instrument along with those that can be found in the standard instrument manual.

MAINTENANCE

No additional maintenance is necessary for the 2225 Option 07 instrument other than that specified for the standard 2225 instrument.

Product:	2225 SERVICE	Date:	8-1-88	Change Reference:	C1/0888

DESCRIPTION

REPALCEABLE ELECTRICAL PARTS LIST

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A4DS901	260-2438-00			SWITCH,PUSH:POWER,4A,250VAC	80009	260-2438-00
A6	671-0781-00			CIRCUIT BD ASSY:INVERTER	80009	671-0781-00
A6C1	281-0826-00			CAP,FXD,CER DI:2200PF,10%,100V	20932	401EM100AD222K
A6C2	290-1209-00			CAP,FXD,ELCTLT:470UF,35V,RADIAL LEAD	80009	290-1209-00
A6C3	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A6C5	290-1208-00			CAP,FXD,ELCTLT:220UF,63V,RADIAL LEAD	80009	290-1208-00
A6C6	290-1208-00			CAP,FXD,ELCTLT:220UF,63V,RADIAL LEAD	80009	290-1208-00
A6C7	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A6C8	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A6C9	290-0183-00			CAP,FXD,ELCTLT:1UF,10%,35V	05397	T322B105K035AS
A6C10	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A6C11	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A6C12	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A6C13	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A6C14	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A6C15	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A6C16	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A6CR1	152-0864-00			SEMICOND DVC,DI:RECT,SI,150V,1A	80009	152-0864-00
A6CR2	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A6CR3	152-0951-00			SEMICOND DVC DI:SCHOTTKY,SI,60V,2.25PF	80009	152-0951-00
A6F1	159-0298-00			FUSE,CARTRIDGE:6A,FAST BLOW	80009	159-0298-00
A6K1	148-0217-00			RELAY,SOL STATE:5A,240VAC,12VDC,275 OHM	80009	148-0217-00
A6K2	148-0216-00			RELAY,SOL STATE:5A,240VAC,48VDC,4170 OHM	80009	148-0216-00
A6L1	120-1813-00			TRANSFORMER,RF:POT CORE	80009	120-1813-00
A6L2	120-1814-00			TRANSFORMER,RF:TOROID	80009	120-1814-00
A6Q1	151-1136-00			TRANSISTOR:MOSFE,N-CHANNEL,SI,TO-220AB	04713	IRF530
A6Q2	151-1136-00			TRANSISTOR:MOSFE,N-CHANNEL,SI,TO-220AB	04713	IRF530
A6Q3	151-0342-00			TRANSISTOR:PNP,SI,TO-92	07263	S035928
A6Q4	151-0341-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
A6Q5	151-0341-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
A6Q6	151-0341-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
A6R1	313-1472-00			RES,FXD,FILM:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A6R2	308-0944-00			RES,FXD,WW:0.033 OHM,5%,4W	80009	308-0944-00
A6R3	308-0944-00			RES,FXD,WW:0.033 OHM,5%,4W	80009	308-0944-00
A6R5	313-1220-00			RES,FXD,FILM:22 OHM,5%,0.2W	57668	TR20JE22E
A6R6	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A6R7	313-1104-00			RES,FXD,FILM:100K OHM,5%,0.2W	57668	TR20JE100K
A6R8	313-1331-00			RES,FXD,FILM:330 OHM,5%,0.2W	57668	TR20JE 330E
A6R9	313-1512-00			RES,FXD,FILM:5.1K OHM,5%,0.2W	57668	TR20JE 5K1
A6R10	313-1222-00			RES,FXD,FILM:2.2K OHM,5%,0.2W	57668	TR20JE 02K2
A6R11	313-1273-00			RES,FXD,FILM:27K OHM,5%,0.2W	57668	TR20JE 27K
A6R12	313-1104-00			RES,FXD,FILM:100K OHM,5%,0.2W	57668	TR20JE100K
A6R13	315-0112-00			RES,FXD,FILM:1.1K OHM,5%,0.25W	19701	5043CX1K100J
A6R14	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A6R15	313-1202-00			RES,FXD,FILM:2K OHM,5%,0.2W	57668	TR20JE02K0
A6R16	321-0319-00			RES,FXD,FILM:20.5K OHM,1%,0.125W,TC=T0	19701	5033ED20K50F
A6R17	321-0300-00			RES,FXD,FILM:13.0K OHM,1%,0.125W,TC=T0	07716	CEAD13001F
A6R18	321-0132-00			RES,FXD,FILM:232 OHM,1%,0.125W,TC=T0	19701	5043ED232R0F

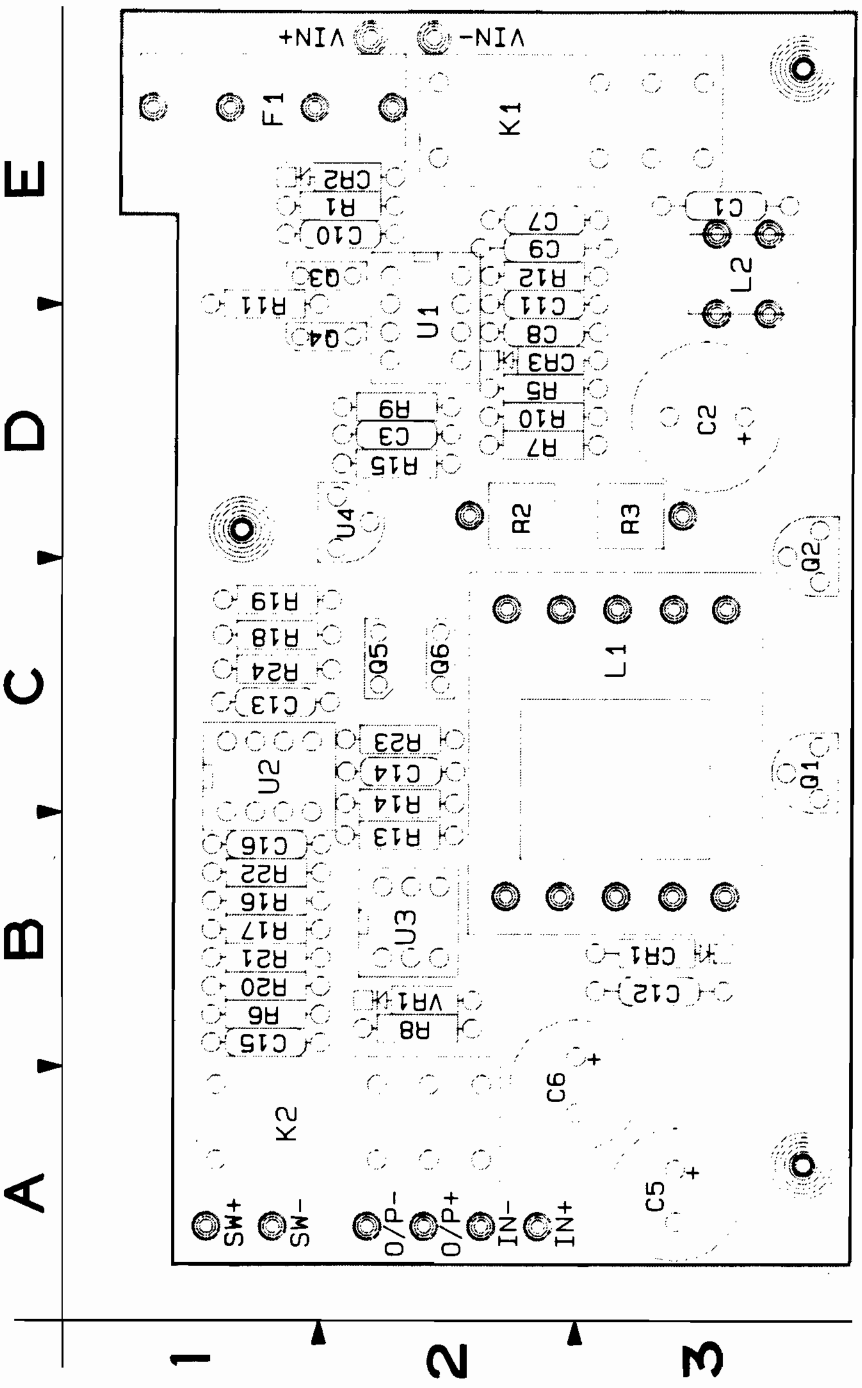
Product: 2225 SERVICE   Date: 8-1-88   Change Reference: C1/0888

DESCRIPTION

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A6R19	321-0202-00			RES,FXD,FILM:1.24K OHM,1%,0.125W,TC=T0	24546	NA55D1241F
A6R20	321-0320-00			RES,FXD,FILM:21.0K OHM,1%,0.125W,TC=T0	19701	5033ED21K00F
A6R21	321-0319-00			RES,FXD,FILM:20.5K OHM,1%,0.125W,TC=T0	19701	5033ED20K50F
A6R22	321-0382-00			RES,FXD,FILM:93.1K OHM,1%,0.125W,TC=T0	07716	CEAD93101F
A6R23	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A6R24	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	57668	NTR25J-E33K0
A6U1	156-3572-00			MICROCKT,DGTL:CONTROLLER,CURRENT MODE,PWM	80009	156-3572-00
A6U2	156-1225-00			MICROCKT,LINEAR:DUAL COMPARATOR	01295	LM393P
A6U3	156-0885-05			CPLR,OPTOELECTR:LED,5KV,ISOLATION	09019	H11AX1139R
A6U4	156-1161-00			MICROCKT,LINEAR:VOLTAGE REGULATOR,POS,ADJ	12969	UC317T
A6VR1	152-0756-00			SEMICOND DVC,DI:ZEN,SI,47V,5%,1W,DO-41	80009	152-0756-00
C17	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCEX
C18	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCEX
J90	131-1333-01			CONN,RCPT,ELEC:PWR,MALE,125VDC,7A	80009	131-1333-01

Product: 2225 SERVICE Date: 8-1-88 Change Reference: C1/0888

DESCRIPTION



2225 OPTION 07 (DC-TO-DC INVERTER)

Product: 2225 SERVICE Date: 8-1-88 Change Reference: C1/0888

DESCRIPTION

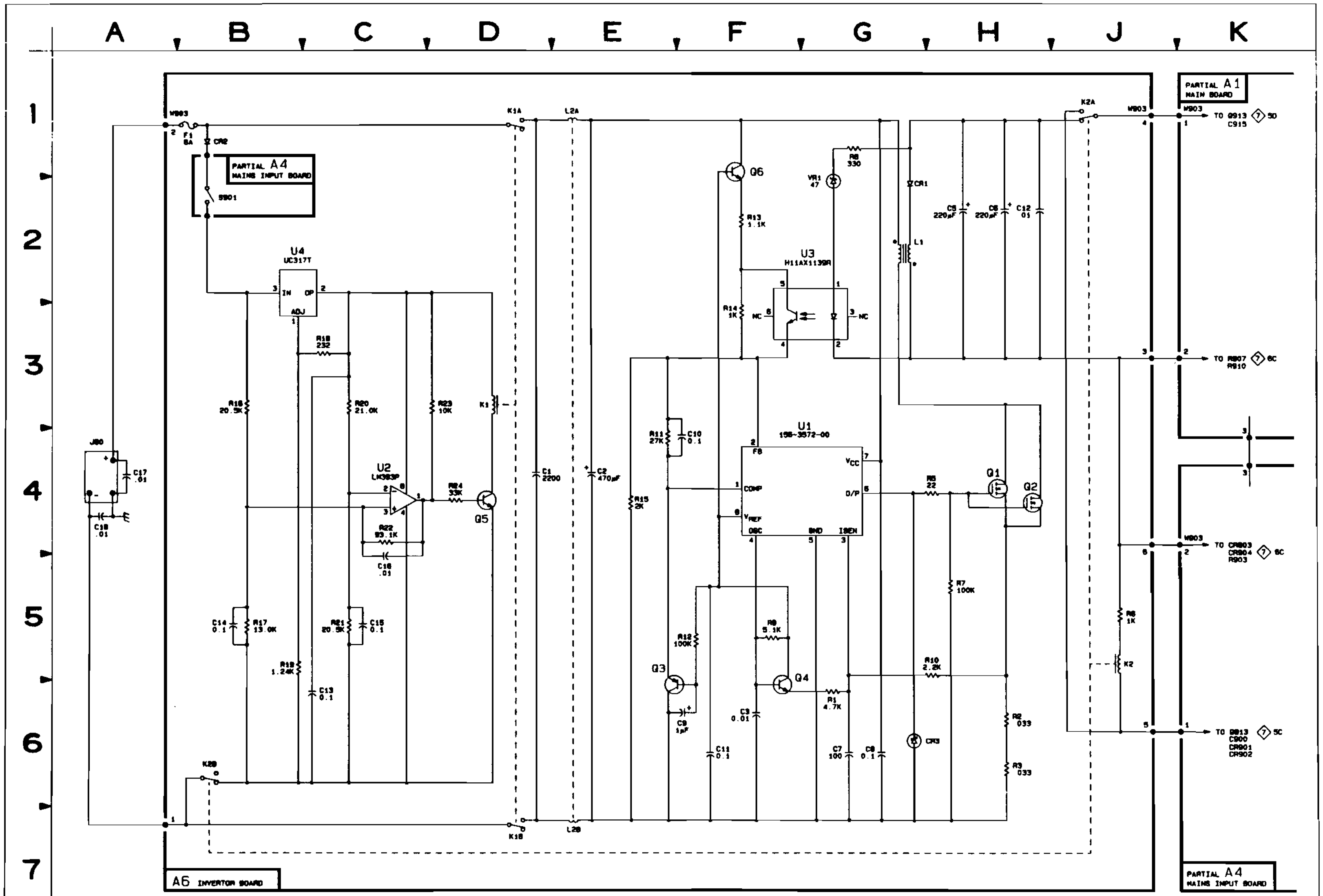
INVERTER OPTION

ASSEMBLY A6

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1	4D	3E	K2	5J	1A	R11	4E	1E
C2	4E	3D	K2A	1J	1A	R12	5F	2E
C3	6F	2D	K2B	6B	1A	R13	2F	2B
C5	2H	3A				R14	3F	2C
C6	2H	2A	L1	2G	3C	R15	4E	2D
C7	6G	2E				R16	3B	1B
C8	6G	2D	L2A	1E	3E	R17	5B	1B
C9	6F	2E	L2B	7E	3E	R18	3C	1C
C10	4F	2E				R19	5B	1C
C11	6F	2E	Q1	4H	3C	R20	3C	1B
C12	2H	3B	Q2	4H	3C	R21	5C	1B
C13	6C	1C	Q3	5E	2E	R22	4C	1B
C14	5B	2C	Q4	6F	2D	R23	3D	2C
C15	5C	1B	Q5	4D	2C	R24	4D	1C
C16	5C	1B	Q6	1F	2C			
						U1	4F	2D
CR1	2G	3B	R1	6G	2E	U2	4C	1C
CR2	1B	2E	R2	6H	2D	U3	2G	2B
CR3	6G	2D	R3	6H	3D	U4	2B	2D
			R5	4H	2D			
F1	1B	1E	R6	5J	1B	VR1	2G	2B
			R7	5H	2D			
K1	3D	2E	R8	1G	2B	W903	1B	2A
K1A	1D	2E	R9	5F	2D	W903	1J	2E
K1B	7D	2E	R10	5H	2D			

CHASSIS PARTS

C17	4A	--	C18	4A	--	J90	4A	--



2225

8299-10

INVERTER OPTION BOARD

Product: 2225 SERVICE

Date: 8-1-88

Change Reference: C1/0888

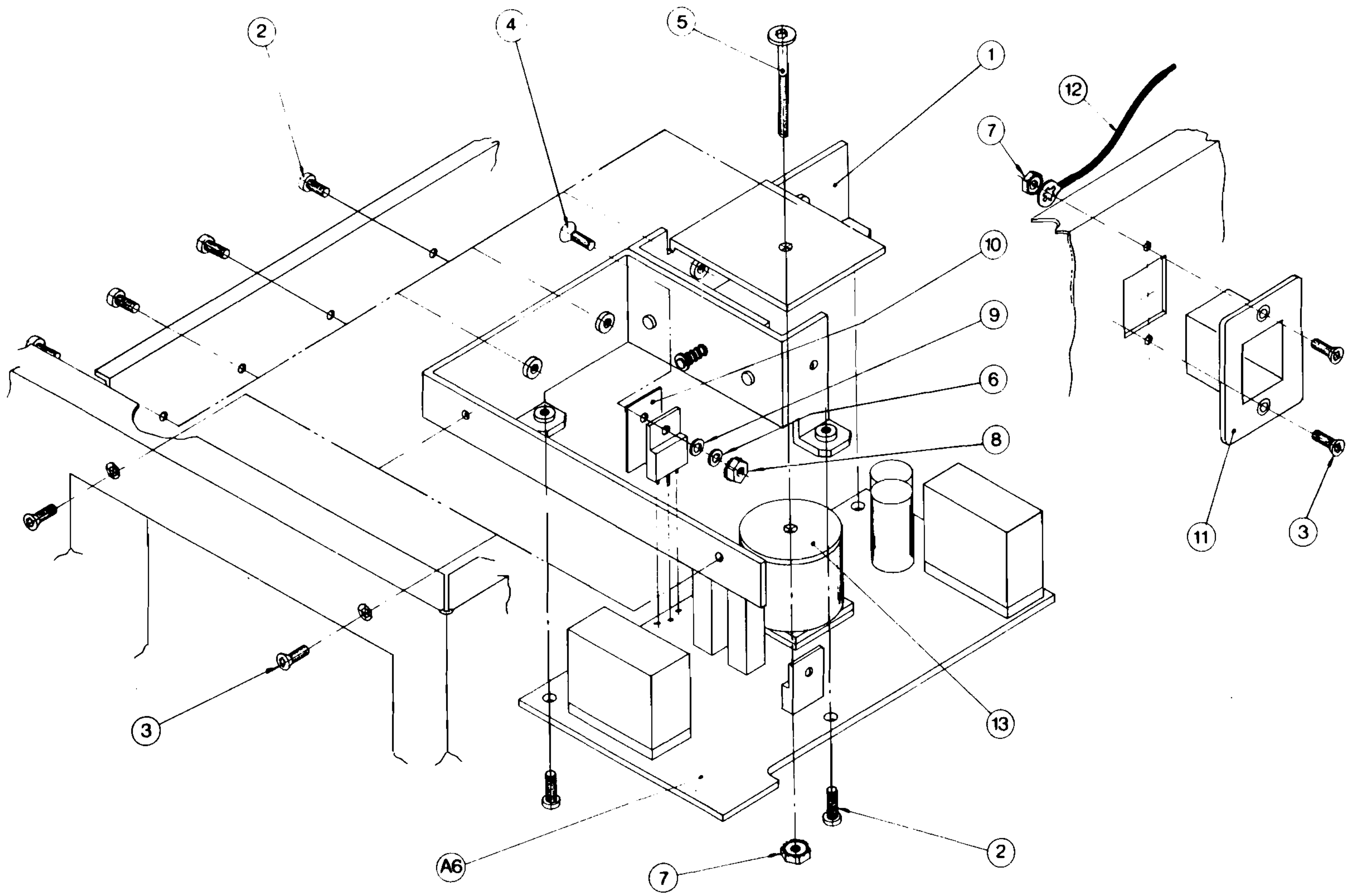
DESCRIPTION

Product: 2225 SERVICE Date: 8-1-88 Change Reference: C1/0888

DESCRIPTION

REPLACEABLE MECHANICAL PARTS LIST

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	214-4187-00			1	HEAR SINK ASSY:INVERTER BOARD	80009	214-4187-00
-2	211-0304-00			8	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL,T9 TORX	01536	ORDER BY DESCR
-3	211-0303-00			4	SCREW,MACHINE:4-40 X 0.25,FLH 100 DEG,STL	TK1543	ORDER BY DESCR
-4	211-0380-00			2	SCREW,MACHINE:4-40 X 0.375,FLH,CD PL,T-9	80009	211-0380-00
-5	211-0712-00			1	SCR,ASSEM WSHR:6-32 X 1.25,PNH,STL,TORX	01536	ORDER BY DESCR
	211-0630-00			4	SCREW,MACHINE:6-32 X 1.12,FLH,100 DEG,STL	TK0435	ORDER BY DESCR
	213-0875-00			1	SCR,ASSEM WSHR:6-32 X 0.5,TAPTITE,PNH,STL (REPLACES 213-0882-00 ON 2225)	83486	ORDER BY DESCR
	211-0529-00			2	SCREW,MACHINE:6-32 X 1.250,PNH,STL (REPLACES 211-712-00 ON 2225)	93907	ORDER BY DESCR
-6	210-0994-00			3	WASHER,FLAT:0.125 ID X 0.25 OD X 0.022,STL	86928	A371-283-20
	210-0802-00			2	WASHER,FLAT:0.15 ID X 0.312 OD X 0.032,STL	12327	ORDER BY DESCR
-7	210-0457-00			1	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
-8	210-0586-00			4	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
	334-7403-00			1	MARKER,IDENT:MARKED CAUTION (REPLACES 334-6880-00)	80009	334-7403-00
	200-3676-00			1	COVER,REAR: (REPLACES STANDARD COVER)	80009	200-3676-00
-9	342-0804-00			3	INSULATOR,WSHR:5.6MM OD X 3.0MM ID X 1.6MM THK,NYLON	80009	342-0804-00
-10	342-0829-00			3	INSULATOR,PLATE:TRANSISTOR,SIL-PAD	TK0ET	ORDER BY DESCR
	384-1099-00			1	EXTENSION SHAFT:1.58 L X 0.187 SQ,PLSTC (REPLACE 384-1575-00 ON 2225)	80009	384-1099-00
	384-1370-00			2	EXTENSION SHAFT:4.68 L,MOLDED PLASTIC (REPALCES 384-1575-00 ON 2225)	80009	384-1370-00
-11	----- -----			1	CONN,RCPT,ELEC:PWR,MALE,125VDC,7A (SEE J90 REPL)		
	174-1316-00			1	CA ASSY,SP,ELEC:INPUT POSITIVE	80009	174-1316-00
	174-1317-00			1	CA ASSY,SP,ELEC:INPUT NEGITIVE	80009	174-1317-00
	174-1318-00			1	CA ASSY,SP,ELEC:RECTIFIED OUTPUT 48V	80009	174-1318-00
	174-1319-00			1	CA ASSY,SP,ELEC:LINE TRIGGER	80009	174-1319-00
	174-1320-00			1	CA ASSY,SP,ELEC:SWITCH	80009	174-1320-00
	174-1321-00			1	CA ASSY,SP,ELEC:UNREGULATED INPUT 11-30V	80009	174-1321-00
-12	195-3990-00			1	LEAD,ELECTRICAL:18 AWG,4.5 L,5-4	80009	195-3990-00
	386-5859-00			1	PLATE,RETAINING:POT CORE	80009	386-5859-00
-13	361-1520-00			1	SPACER,THERMAL:INSULATOR POT CORE	80009	361-1520-00
	361-1521-00			1	SPACER,THERMAL:POT CORE MOUNTING	80009	361-1521-00
	276-0525-00			1	CORE,EM:TOROID,FERRITE	01121	T037C351A
	441-1883-00			1	CHASSIS,SCOPE:INNER (REPLACES 441-1571-02 ON 2225)	80009	441-1883-00
	441-1884-00			1	CHASSIS,REAR: (REPLACES 441-1753-01 ON 2225)	80009	441-1884-00
	407-3765-00			1	BRACKET,HEAT SK:ALUMINUM (REPLACES 407-3539-00 ON 2225)	80009	407-3765-00
	344-0326-00			1	CLIP,ELECTRICAL:FUSE,BRASS (PART OF TO A6F1 REPL)	75915	102071
					ACCESSORIES		
	161-0094-00			1	CABLE ASSY,PWR,:3,18AWG,125V,36.0 L	70903	ORDER BY DESCR



2225 OPTION 07 (DC-TO-DC INVERTER)

Product: 2225 SERVICE
Date: 8-1-88
Change Reference: C1/0888
DESCRIPTION

Tektronix
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MANUAL CHANGE INFORMATION

Date: 02-02-90 Change Reference: C4/0290

Product: 2225 SERVICE Manual Part Number: 070-6299-00

DESCRIPTION Product Group 46

SEE BELOW FOR EFFECTIVE SERIAL NUMBERS

Section 7
Change Option 23 to read as follows:
page 7-1.

Option 23

Two P6119 1X-10X Selectable-attenuation Probes are provided in place of the standard P6103 10X Probes.

Change page 7-3

Table 7-2
Optional Accessories

Description	Part Number
Attenuator Voltage Probes	
10X Standard	P6103
10X Submininature	P6130
10X Environmental	P6008
1X-10X Selectable	P6119
100X High Voltage	P6009
1000X High Voltage	P6015

Tektronix
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MANUAL CHANGE INFORMATION

Date: 6-6-91 Change Reference: M74370

Product: 2225 SERVICE MANUAL Manual Part Number: 070-6299-00

DESCRIPTION Product Group 46

EFFECTIVE SERIAL NUMBER: 704012

REPLACEABLE MECHANICAL PARTS LIST CHANGES

Fig & Index No.	Part No.	Qty	NAME & DESCRIPTION
CHANGE TO:			
2-22	213-1065-00	5	SCREW,TPG,TF:3MM X 8MM, TYPE PLASTIC,PNH,ZINC NI PL,TORX
ADD:			
	210-0994-00	5	WASHER,FLAT:0.125 ID X 0.25 OD X 0.022 STL CD PL