TEK SERVICE MANUAL

Part No. 070-4642-00
Product Group 60

A6902A ISOLATOR

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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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, USA
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 general safety information in this summary is for both operating personnel and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply and do not appear in this summary.

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.

As Marked on Equipment

CAUTION indicates either a personal injury hazard not immediately accessible as you read the marking or a hazard to property including the equipment itself.

DANGER or WARNING—HIGH VOLTAGE indicates a personal injury hazard immediately accessible as you read the marking.

SYMBOLS

As Marked on Equipment

DANGER – High voltage.

Protective ground (earth) terminal.

PRECAUTIONS

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 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 connecting 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.

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 2-1 in this manual.

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 Explosive Atmospheres

To avoid explosion, do not operate this product 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 conductor in the power cord is essential for safe operation.

4642-01

The A6902A Isolator.

SPECIFICATION

INTRODUCTION

The TEKTRONIX A6902A Isolator is a two-channel instrument which will permit safe floating measurements for voltages up to 1500 V (dc + peak ac) above or below ground. It substitutes for the vertical amplifier of an oscilloscope when either high-voltage signals or small signals at a high voltage level are to be measured. These signals are isolated from the oscilloscope by a combination of optical and transformer coupling. This type of isolation, together with the all-plastic construction of the external controls, protects the operator from exposure to high voltage levels when making control settings on the A6902A front panel.

Voltage to be measured is applied between the A6902A input probe tip and its common lead. Two pairs of input probes are provided, each having a different size and rating. With the larger probes, if both channels are used simultaneously, the maximum differential voltage between channels is 3000 V (dc + peak ac). When using the smaller probes simultaneously on both channels, the maximum differential voltage between channels is 1000 V (dc + peak ac). All measurements must be made with an oscilloscope having a 1 MΩ input resistance, an input capacitance of up to 47 pF, and a vertical deflection factor of 10 mV per division. If necessary, the A6902A output may be terminated by 50Ω and used with the oscilloscope sensitivity set to 5 mV/div.

The A6902A features include:

- Two probe sizes and ratings (1500 V and 500 V) which are interchangeable via a quick-disconnect connector.
- Dc to 20 MHz bandwidth.
- Insulating case and controls to provide a wide margin of operator safety.
- Two pairs of input probes and two output cables stored in removable side pouches.
- Floating inputs that meet the requirements of UL1244, IEC 348, CSA Electronic Bulletin No. 556B, and VDE 0411.
- Two isolated channels that may be used simultaneously, either at different points in the same circuit or on separate circuits.

ACCESSORIES

Standard accessories provided with the A6902A include two pairs of input probes and 2-meter coaxial cables for connecting the isolator output to oscilloscope inputs. For more information on accessories used with the A6902A, refer to the tabbed "Accessories" page near the rear of this manual.

PERFORMANCE CONDITIONS

The electrical specifications listed in Table 1-1 are valid under the following conditions: The A6902A Isolator was adjusted at an ambient temperature between +20°C and +30°C. The ambient operating temperature is between 0°C and +50°C with a warm-up period of at least 30 minutes.

Environmental characteristics are presented in Table 1-2, and the physical characteristics in Table 1-3.

Table 1-1

Electrical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Deflection Factor		
Sensitivity	20 mV/div to 200 V/div in a 1, 2, 5 sequence with oscilloscope set to 10 mV/div.	
Accuracy	≤ ± 5% of indicated VOLTS/DIV switch setting.	
Maximum Working Voltage		
Large Probe (1500 V)		
Probe Center Tip to Earth Ground	1500 V (dc + peak ac).	
Probe Center Tip to Probe Common	1500 V (dc + peak ac) to 900 kHz.	For above 900 kHz, see Figure 1-1.
Probe Common to Earth Ground	1500 V (dc + peak ac) to 440 kHz.	For above 440 kHz, see Figure 1-2.
Small Probe (500 V)		
Probe Center Tip to Earth Ground	500 V (dc + peak ac).	
Probe Center Tip to Probe Common	500 V (dc + peak ac) to 3 MHz.	For above 3 MHz, see Figure 1-1.
Probe Common to Earth Ground	500 V (dc + peak ac) to 6 MHz.	For above 6 MHz, see Figure 1-2.
Bandwidth (– 3 dB)		
DC Coupled	DC to ≥ 20 MHz.	
AC Coupled	≤5 Hz to ≥ 20 MHz.	
Rise Time	≤ 17.5 ns.	
Aberrations		
20 mV/div to 2 V/div	± 5%, 8% p-p. ± 0.3%/°C from 25°C.	
5 V/div to 200 V/div	± 8%, 12% p-p. ± 0.3%/°C from 25°C.	

Characteristic	Performance Requirement	Supplemental Information
Input Impedance		
Resistance	10 MΩ ±3%.	
Capacitance		
Large Probe (1500 V)	Approximately 19 pF.	
Small Probe (500 V)	Approximately 19 pF.	
Output Impedance	50 Ω ± 5%.	
Common-Mode Capacitance	Approximately 200 pF from probe common to earth ground.	
Tangential Noise	≤ 2.0 mV.	
DC Drift Temperature Coefficient	≤ 1 mV/°C or 0.1 div/°C at output.	
Range of OUTPUT DC LEVEL Control	≥ + and − 5 divisions from center screen with oscilloscope set to 10 mV/div vertical deflection factor.	
Channel Isolation		
Maximum Voltage		
Using Two 1500-V Probes	3000 V (dc + peak ac).	
Using Two 500-V Probes	1000 V (dc + peak ac).	
Overdrive Recovery	≤ 0.5 μs to recover to within 1 division of initial location after removing overdrive signal the equivalent of up to ±25 divisions, regardless of the duration of the overdrive signal.	
Delay Difference Between Two Channels	≤ 4 ns from probe input to output BNC; when used with an oscilloscope having a 1-MΩ input resistance and up to 47 pF input capacitance and when both probes are same type and properly compensated.	
Common-Lead Signal Feedthrough	− 110 dB (dc to 500 Hz) from probe input to output BNC; when used with an oscilloscope having a 1-MΩ input resistance and up to 47 pF input capacitance.	For above 500 Hz, see Figure 1-3. Measured with VOLTS/DIV switch set to 20 mV and AC-COMMON-DC switch set in common position.

Table 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
Line Voltage Ranges (rms)		
Low	90 to 132 V.	
High	180 to 250 V.	
Line Frequency Range	48 to 440 Hz.	
Power Consumption, Maximum	15 W at 115 V, 60 Hz.	Typical power consumption is 11 W.
Fuses for Line Voltage	0.15 A T/SB, 250 V, (90-132 V range). 0.10 A T/SB, 250 V, (180-250 V range).	
Internal Power Supply Voltages		Ripple ≤ 1 mV p-p for all power supplies.
Ground Referenced Supply	+ 5 V ±0.5 V. − 5 V ±0.5 V.	
Floating Supplies	+ 5 V ±0.5 V. − 5 V ±0.5 V.	

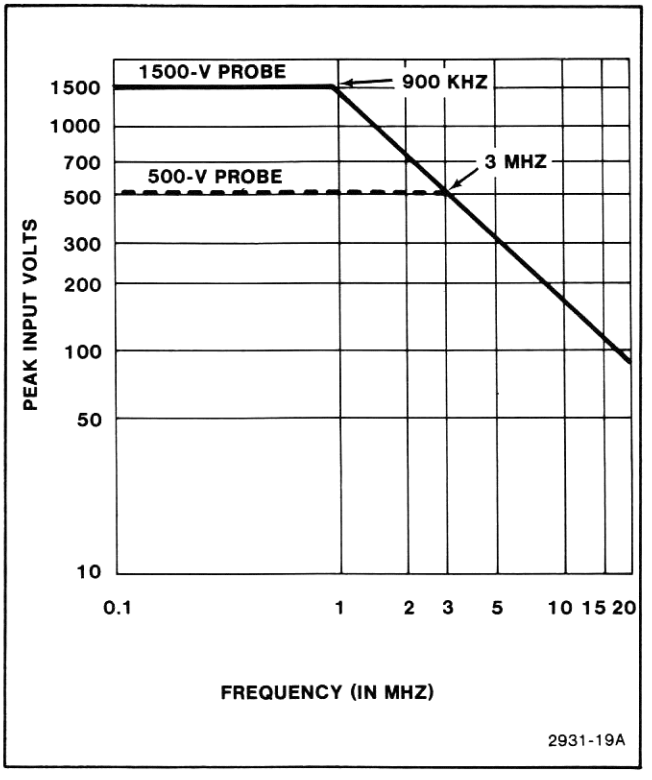


Figure 1-1. Maximum working voltage between probe input and probe common (all temperature).

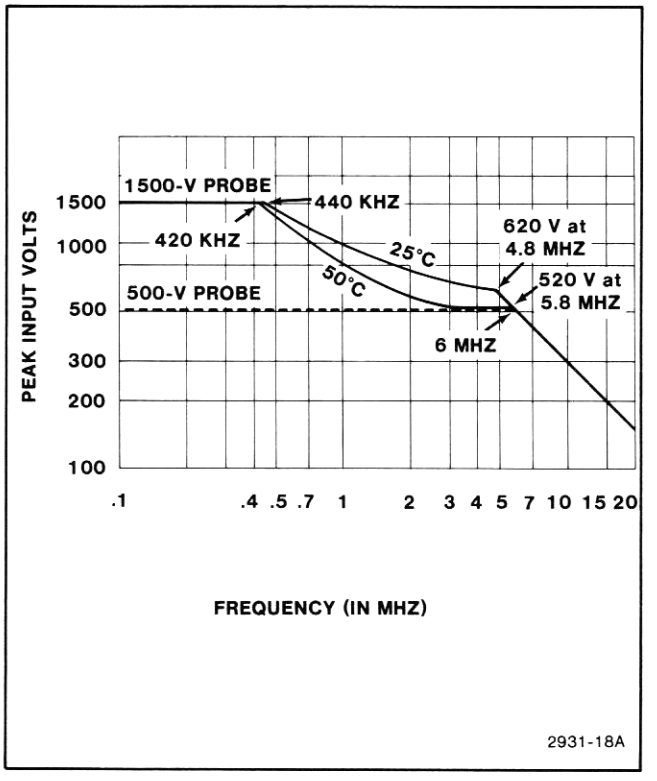


Figure 1-2. Maximum working voltage between probe common and earth ground.

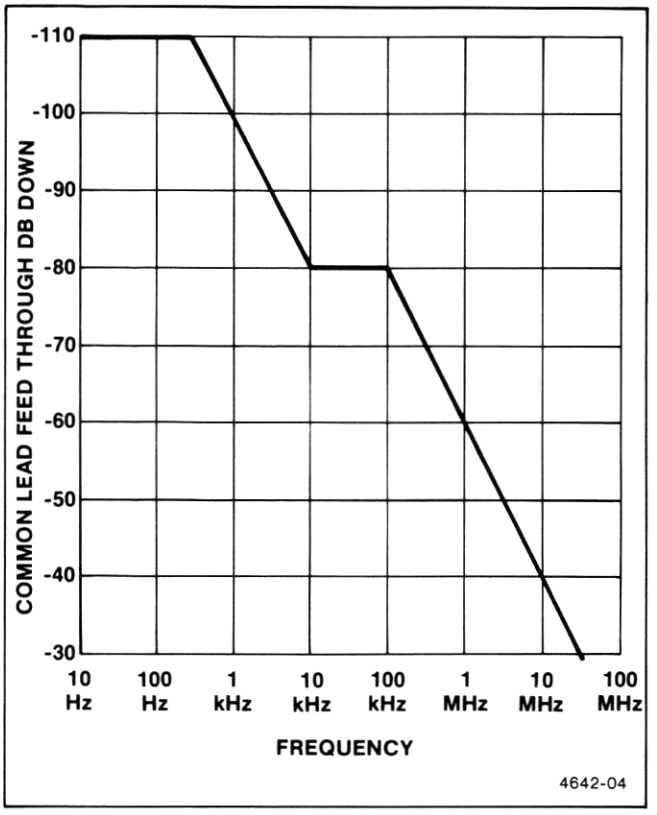


Figure 1-3. Common-lead feedthrough.

Table 1-2
Environmental Characteristics

Characteristic	Description
Temperature	
Operating	0°C. to + 50°C.
Nonoperating (Storage)	−55°C to +75°C.
Altitude	
Operating	To 4.5 km (15,000 ft).
Nonoperating (Storage)	To 15 km (50,000 ft).
Humidity (Operating and Nonoperating)	Five cycles (120 hr total) with equipment tested operating and nonoperating to MIL-STD-810C, method 507.1, procedure IV, ELECTRICAL measurements performed at 50°C, 45% Relative Humidity and 30°C, 90—95% Relative Humidity. Meets and exceeds requirements as modified in MIL-T-28800B paragraph 4.5.5.1.1.2.
Vibration (Operating)	0.64 mm (0.025 in) p-p, 10 to 55 Hz sine wave. Total time of test, 75 minutes.
Shock	50 g, half-sine, 11-ms duration, for a total of 18 shocks.
Bench Handling	Instrument will withstand a drop from approximately 100 mm (3.9 in) at an angle of 45°.
Package Transportation	
Vibration	25 mm (1 in) at 270 vpm.
Drop	Package will withstand 10 drops from a height of 1 m (3.3 ft).

Table 1-3

Physical Characteristics

Characteristic	Description
Weight, With Accessories	6.2 kg (13.7 lb).
Shipping Weight	8.0 kg (17.7 lb).
Dimensions	See Figure 1-4.
Isolator	
Height	136 mm (5.4 in).
Width	394 mm (15.5 in).
Length	344 mm (13.5 in).
Large Probe (1500 V)	
Probe Cable Length	1.7 m (5.5 ft).
Probe Head Length	200 mm (7.9 in).
Probe Common Lead Length	300 mm (11.8 in).
Small Probe (500 V)	
Probe Cable Length	2 m (6.6 ft).
Probe Head Length	64 mm (2.5 in).
Probe Common Lead Length	300 mm (11.8 in).
Power Cable Length	3 m (9.8 ft).
Output Cable Length	2 m (6.6 ft).

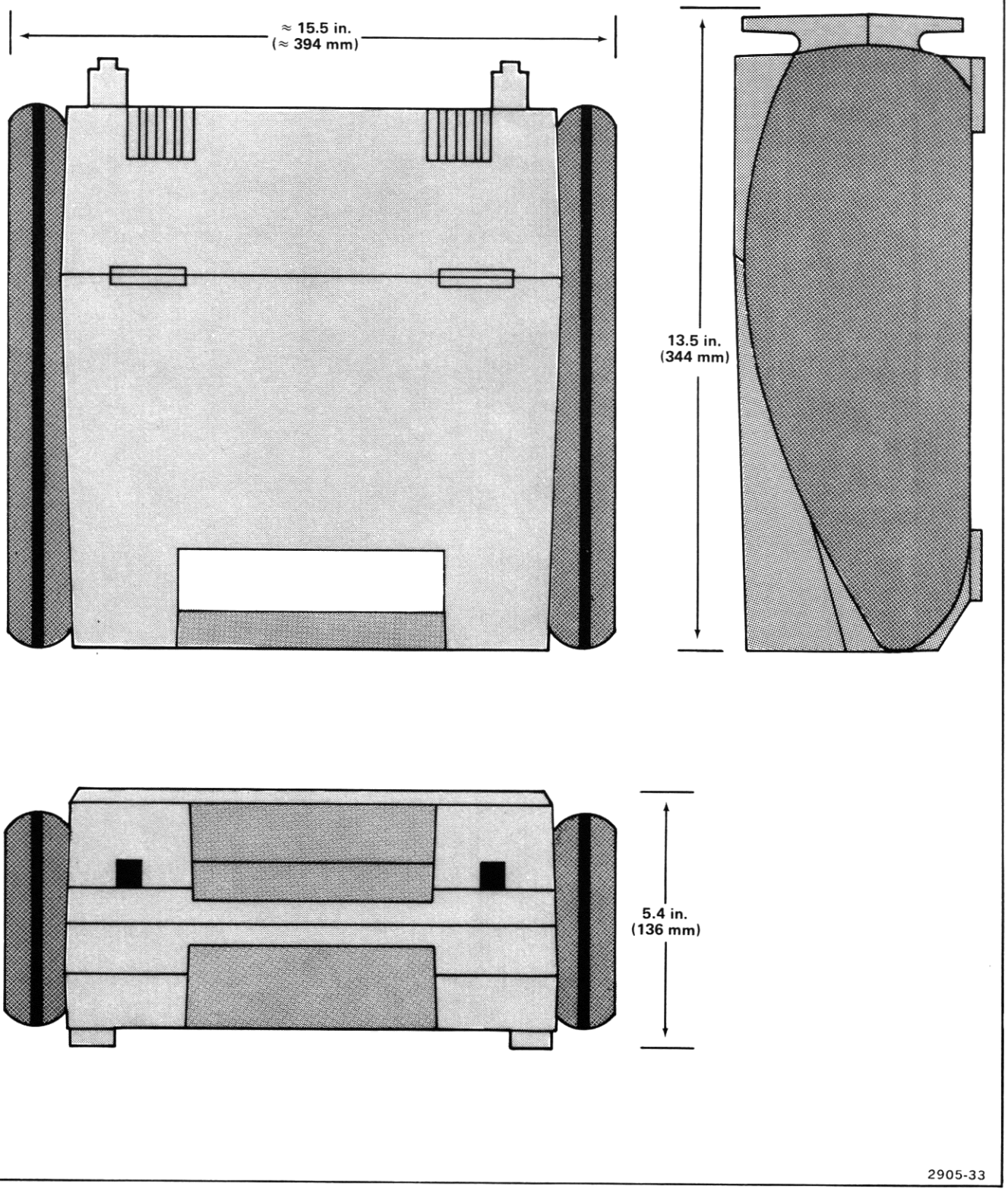


Figure 1-4. A6902A dimensional drawing.

OPERATING INSTRUCTIONS

This section of the manual provides information on installation and power requirements. The functions of controls, connectors, and indicators are also described.

PREPARATION FOR USE

INSTALLATION

Installation of the A6902A consists of verifying the proper power cord, performing the "Line Voltage Selection" procedure, connecting the input probe(s) to the circuit under test, and connecting the output BNC connector(s) to an oscilloscope.

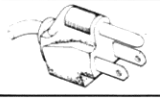
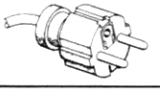
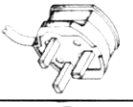
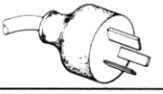
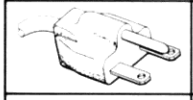
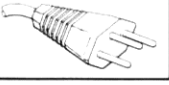
POWER CORDS

The A6902A has a detachable three-wire power cord with a three-terminal, polarized plug for connection to a power source. The grounding terminal of the plug is connected directly to the instrument frame as recommended by national and international safety codes. For electrical shock protection, this plug should only be inserted into a power-source socket that had a securely grounded protective ground contact. Qualified service personnel should verify the protective-ground system.

The power cord is detachable and when not in use should be wrapped around the feet of the A6902A. Instruments are factory equipped with a standard 120-V power cord unless otherwise ordered. Other power cords that can be used with the A6902A are shown in Figure 2-1. Part numbers for the power cords are listed in "Accessories" (Section 6). For more information on power cords, contact your Tektronix representative or your local Tektronix Field Office.

POWER REQUIREMENTS

The A6902A is designed to be used with a three-wire ac power system. It operates from either a 120-V or a 240-V nominal power source from 48 to 440 Hz. Before connecting the instrument to a power source, verify that the Line Voltage Selector is set for the line voltage being used, that the proper fuse is installed, and that the line cord matches the power source to be used. This procedure is described in the next paragraph and must be performed before operating the A6902A. Refer to the Safety Summary in the front of this manual for power source, grounding, and other safety considerations pertaining to the use of this instrument.

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

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Figure 2-1. Optional power cords and plugs.

LINE VOLTAGE SELECTION

CAUTION

This instrument may be damaged if operated with the Line Voltage Selection switch set for the wrong voltage or if the wrong line fuse is used.

The power-input module located on the rear panel of the instrument houses a Line Voltage Selector, a line-fuse and a power cord connector. The present line voltage setting is indicated on the selector. If it is necessary to convert the instrument for operation with a different line voltage range, perform the following procedure (refer to Figure 2-2).

1. Ensure that the power cord is disconnected from both the power source and the instrument and that both of the input probes and their common leads are disconnected from any electrical source.

2. Using a flat-bladed screwdriver, unsnap and open the cover on the fuse holder/voltage selector (refer to Figure 2-2).

3. From Table 2-1, determine the range for your average line voltage. Opposite that range, read the correct Line Voltage Selector position.

Table 2-1

Line Voltage Ranges

Line Voltage Range	Voltage Selector Switch Setting	Fuse Size
90 to 132 V	115 Vac	0.15A T/SB, 250V
180 to 250 V	230 Vac	0.10A T/SB, 250V

4. Turn the selector to its proper value. There are two positions for each voltage. Either position will work.

5. After changing the Line Voltage Selector position, it is necessary to change the fuse to match the new line voltage. Refer to Table 2-1 for the correct fuse value. To change the fuse, pull out the fuse holder, remove the fuse, and replace it with the proper fuse.

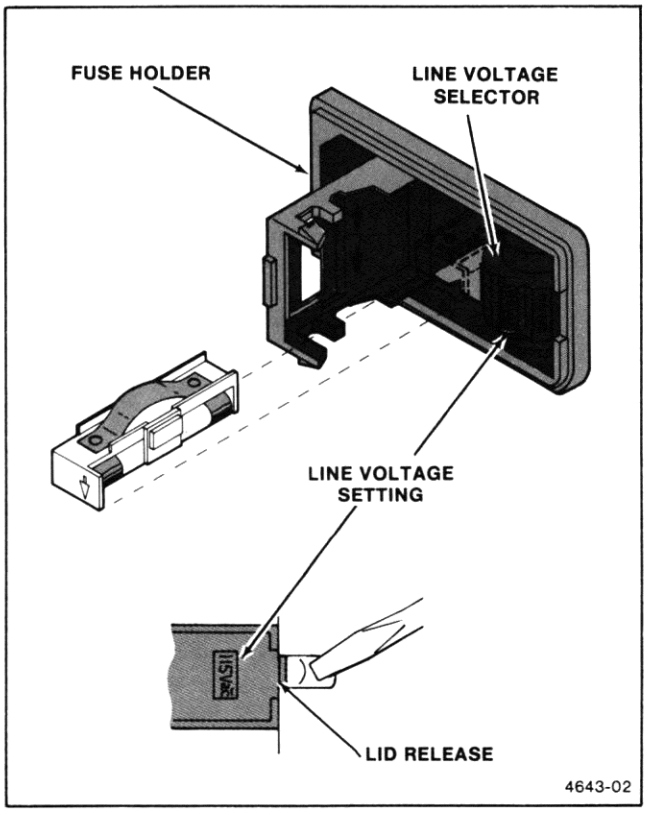

Figure 2-2. Fuse holder/line voltage selector.

6. Insert the fuse holder into the selector module and snap the cover shut.

7. Verify that you can read the proper voltage on the Line Voltage Selector.

WARNING

This instrument is designed for operation from a power-input source with its neutral at or very near earth (ground) potential with a separate safety-earth conductor.

8. *Verify that your power cord matches the power source being used (see Figure 2-1).*

9. *Set the POWER switch to OFF and connect the receptacle end of the power cord to the power-input module.*

CONNECTING THE A6902A ISOLATOR

WARNING

Before connecting any A6902A input probe(s) to a circuit under test, ensure that the Maximum Working Voltage limits and the Channel Isolation Maximum Voltage limits will not exceed those values listed in the Specification (Table 1-1).

Figure 2-3 shows an example of how to connect an A6902A input probe. Although this illustration shows the 1500-V probe, it is equally applicable for the 500-V probe.

The common lead of the probe should always be connected to the lowest impedance point (usually circuit common) in the circuit under test (relative to the probe tip) to obtain the most accurate waveform.

Whenever the type of input probe is changed (for example, changing from the 1500-V probe to the 500-V probe), a compensation adjustment must be made. Refer to the "Gain and Probe Compensation" procedure in "Operators Checks and Adjustmentrs" (Section4).

Figure 2-4 shows how the output BNC connectors are connected to an oscilloscope using the coaxial cables.

NOTE

If both outputs of the A6902A are to be used at the same time, both cables should be of the same length and impedance. Cable length should not exceed two meters and should be of 50-Ω impedance.

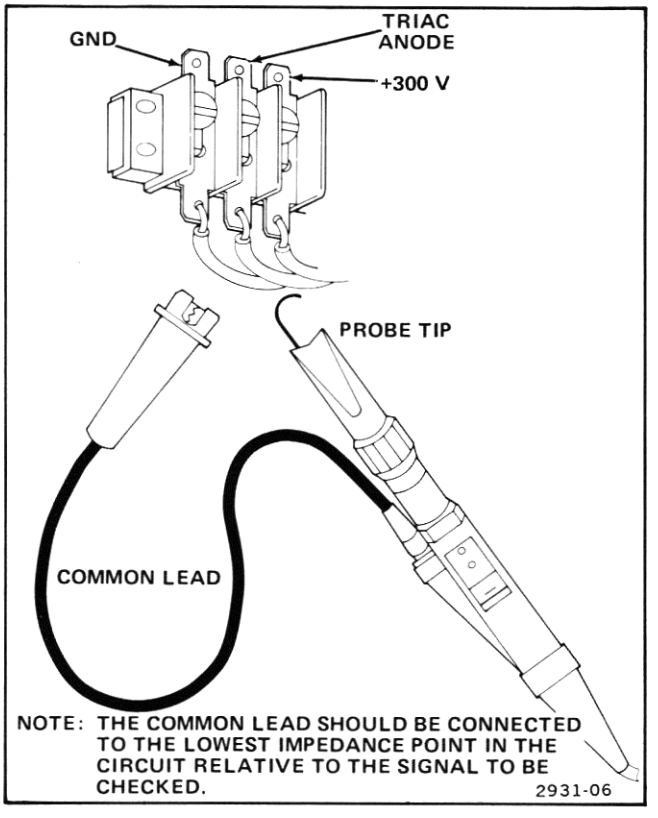

Figure 2-3. Example of connecting an input probe.

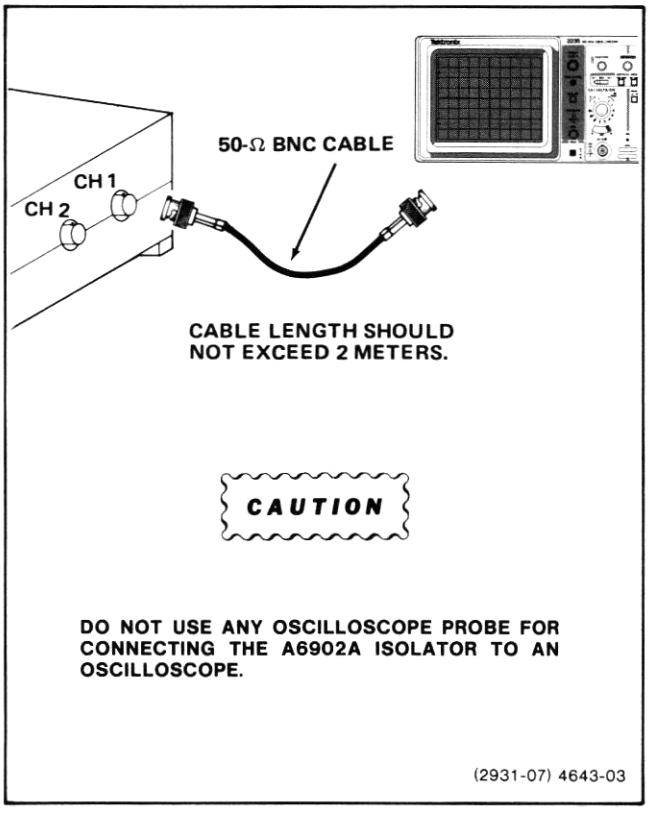

Figure 2-4. Connecting the A6902A outputs to an Oscilloscope.

CONTROLS, CONNECTORS AND INDICATORS

FRONT PANEL

Refer to Figure 2-5 for the location of items 1 through 5.

NOTE

Only CHANNEL 2 controls (items 2 through 5) and the POWER indicator (item 1) are shown. CHANNEL 1 controls are identical to CHANNEL 2.

(1) **POWER** indicator is on whenever the Isolator is energized.

(2) **VOLTS/DIV** switches establish the sensitivity of the oscilloscope/Isolator system. The sensitivity is adjustable from 20 mV/division to 200 V/division in 1, 2, and 5 sequence.

(3) **OUTPUT DC LEVEL** controls are used for vertically positioning the waveform display on the screen of the oscilloscope's crt.

(4) **AC-COMMON-DC** switches select the coupling between the input probe and the input stage of the Isolator. In DC, the input is directly coupled; in AC the input is connected to the isolator through a capacitor; and in COMMON the input is connected to the electronic circuitry Common terminal within the Isolator. (COMMON is comparable to the GND position on a conventional oscilloscope. It connects the input to a reference level so the operator can set the position control).

(5) **PROBE COMP** controls are used to compensate the input stages for the particular type of input probe being used (either 1500-V or 500-V).

REAR PANEL

Refer to Figure 2-6 for the location of items 6 through 9.

(6) **POWER SWITCH** controls application of ac power to the Isolator. An indicator light on the front panel is actuated when the power switch is in its "on" position (1).

(7) **POWER CONNECTOR/VOLTAGE SELECTOR** allows the connection of the ac power cord to the Isolator. The connector is an IEC connector, and includes the Voltage Selector/Indicator for alternative line voltage, (fully discussed in the "Preparation For Use" section of this manual.)

(8) **OUTPUT VOLTAGE** connectors make available the output of Isolator Channels 1 and 2.

(9) **CAUTION** label provides fuse replacement and line voltage information.

BOTTOM PANEL

(10) **CAUTION** label warns operators not to open the A6902A case.

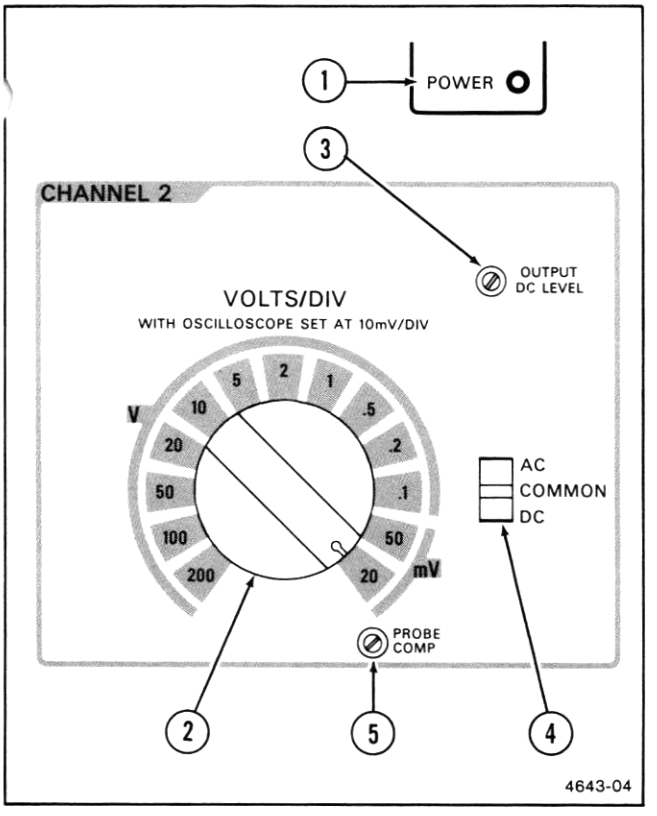

Figure 2-5. Front-panel controls and indicator.

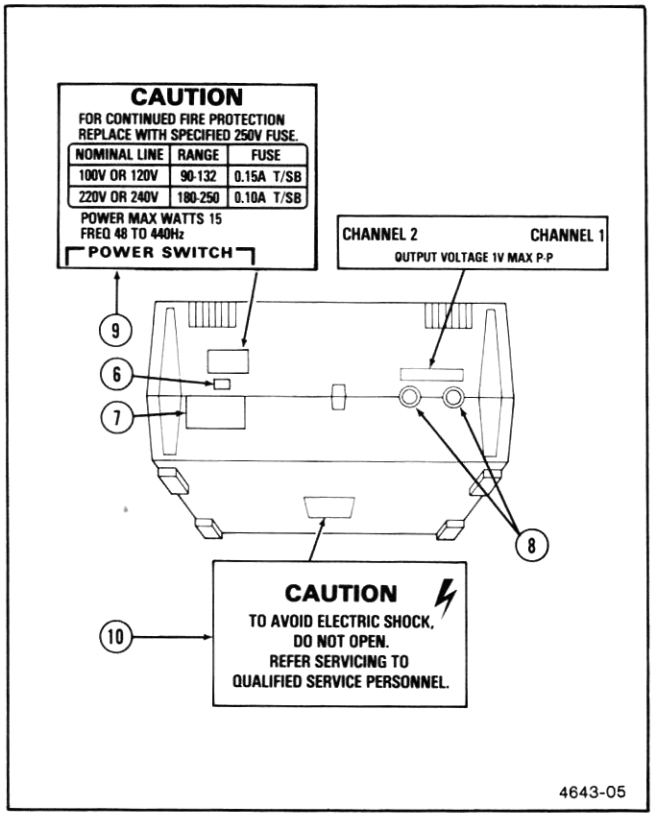

Figure 2-6. Rear- and bottom-panel controls, connectors, and labels.

INPUT PROBES

SETTING PROBE-TIP ANGLES

The angle of the 500-V probe tip is continuously variable and may be rotated to any desired position.

The angle of the 1500-V probe tip may be rotated in 90° increments, if necessary, to make it easier to attach the probe to the circuit under test. To change the probe tip angle, refer to Figure 2-7 and perform the following steps:

1. Hold the probe with one hand, placing your forefinger and thumb behind the slide to maintain the slide in the forward position.

2. Loosen the collar by rotating it in the direction shown until it disengages from the probe body.

3. While holding the probe tip, pull back on the slide until the indexing guides on the shaft of the probe tip disengage from the guide slots in the probe body (approximately one-fourth inch).

4. Rotate the probe tip to the desired position (0°, 90°, 180°, or 270°).

5. Move the slide forward to the position shown Figure 2-7 and verify that there is approximately one-eighth inch clearance between the indexing guides on the shaft of the probe tip and the threaded portion of the probe body. If necessary, loosen the probe tip to achieve the correct clearance.

6. Thread the collar onto the probe body until the collar is snugly seated.

7. The probe is now ready to be used.

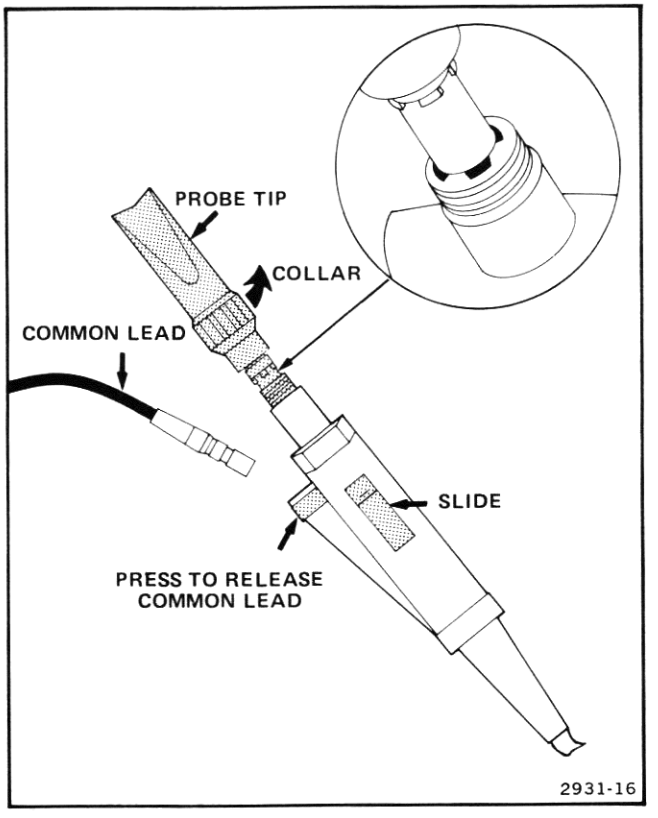

Figure 2-7. Setting the 1500-V probe tip angle and replacing the common lead.

CHANGING INPUT PROBES

The input probes are attached to the instrument via coaxial connectors located inside the zippered pouch. To remove an input probe, grasp each connector (one attached to the probe cable and one attached to the instrument cable) and carefully disconnect them by pulling apart. To install another input probe (either 500-V or 1500-V as required), align the two connectors and press them together until they snap into place and are firmly seated.

Whenever an input probe is changed, the PROBE COMP control must be adjusted. For these instructions, refer to the "Gain Check and Probe Compensation" procedure in the "Operator's Checks and Adjustments" part of this section.

To replace the common lead on the 1500-V Probe, press and hold the release point shown in Figure 2-7. Pull the lead out of the probe body and remove pressure from the release point. Install the new common lead by pushing the lead end into the probe body until an audible click is heard.

REPLACING COMMON LEADS

To replace the common lead on the 500-V Probe, grasp the end closest to the probe and pull straight away from the probe body. Install the new common lead by inserting the round end into the connector on the probe body.

REPLACING THE 1500-V PROBE TIP

To replace the 1500-V Probe tip with a new one, refer to Figure 2-8 and perform the following steps:

1. Loosen the collar by rotating it in the direction shown until it disengages from the probe body.

2. Retract the slide to the position shown in Figure 2-8. The slide will stay in this position, and the spring inside the probe tip should cause the probe tip to return to its original position. If this does not occur, hold the slide in the retracted position and pull the probe tip away from the probe body until it reaches its original position.

3. Hold the probe body with one hand and rotate the probe tip in the direction shown until the probe tip completely disengages from the probe body.

4. To install a new probe tip, hold the probe body with the slide in the retracted position and insert the new probe tip into the probe body as far as it will easily go.

5. Thread the probe tip into the probe body until it seats snugly.
6. Move the slide forward to the position shown in Figure 12 and verify that there is approximately one-eighth inch clearance between the indexing guides on the shaft of the probe tip and the threaded portion of the probe body. If necessary, loosen the probe tip to achieve the correct clearance.
7. While holding the slide in the forward position, align the indexing guides with the guide slots in the probe body for the desired probe tip angle. Press the probe tip into the probe body until the indexing guides completely engage the guide slots.
8. Thread the collar onto the probe body until the collar is snugly seated.
9. The probe is now ready for use.

REMOVING THE SIDE POUCHES

Where space is a consideration, (such as installing the A6902A on a scope cart) the side pouches may be removed.

To remove the side pouches, first follow the procedure given in "Changing Input Probes" to remove the probes. The pouches may then be removed by unsnapping the four snaps holding them on the side of the instrument. The probes should then be reinstalled on their original channel inputs to avoid the need to readjust PROBE COMP.

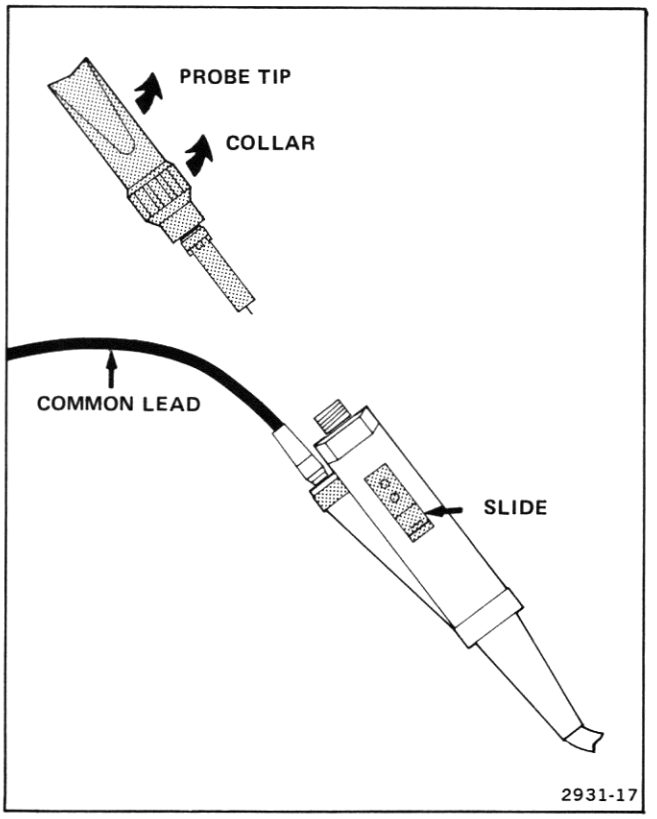

Figure 2-8. Replacing the 1500-V probe tip.

OPERATOR'S CHECKS AND ADJUSTMENTS

INTRODUCTION

By using the calibrator output of an oscilloscope, the gain and probe compensation of each channel can be checked, and the probe compensation may be adjusted if necessary.

The equipment needed to make these checks includes:

1. An oscilloscope with a vertical deflection of 10 mV/division, an input impedance of 1 MΩ , an input capacitance of less than 47 pF, and a frequency response from dc to 100 MHz (for example, the TEKTRONIX 2235).

2. A coaxial cable with a 50-Ω impedance and BNC connectors on both ends (provided as a Standard Accessory with the A6902A).

NOTE:

An oscilloscope with a deflection factor of 5mV/division may be used in conjunction with a 50-Ω termination.

Detailed instructions for operating test equipment are not provided in this procedure. Refer to the appropriate test equipment instruction manual if more information is needed.

GAIN CHECK AND PROBE COMPENSATION

1. Perform the "Line Voltage Selection" procedure.

2. Connect the A6902A to the power input source, press the POWER SWITCH to ON, and allow 30 minutes for the A6902A to stabilize.

3. Set the A6902A CHANNEL 1 AC-COMMON- DC switch to COMMON and the CHANNEL 1 VOLTS/DIV switch to 0.1 V.

4. Set the oscilloscope controls as follows:

VOLTS/DIV	.1 V
AC-GND-DC	DC
Vertical	Channel 1
Triggering Mode	Auto
Coupling	DC
Source	Channel 1
Slope	+
Level	Midrange
POWER	On

5. Connect the PROBE ADJUST output to the oscilloscope Channel 1 input and set the oscilloscope Channel 1 Volts/Division variable for exactly 5 divisions.

6. Set the oscilloscope Channel 1 Volts/Division to 10 mV, and set the trace vertically on the center graticule with the Position control.

7. Connect the A6902A CHANNEL 1 output BNC connector to the oscilloscope Channel 1 input BNC connector using the 50-Ω cable.

8. Use the A6902A OUTPUT DC LEVEL control to position the oscilloscope trace on the center graticule line.

9. Set the A6902A AC-COMMON-DC switch to DC.

10. Connect the A6902A CHANNEL 1 input probe tip to the oscilloscope PROBE ADJUST output and connect the common lead clip to the oscilloscope ground.

11. Adjust the PROBE COMP control for the best flat-top square-wave.

12. CHECK - That the oscilloscope display is 5 major divisions ±1.5 minor divisions (±3%) at approximately 1 kHz. (A6902A accuracy of ±5% minus 2235 attenuator accuracy of ±2%.)

NOTE

This display is based on the PROBE ADJUST output of the TEKTRONIX 2235 Oscilloscope (500 mV at approximately 1 kHz) with the A6902A VOLTS/DIV control set for 0.1 V/DIV. If a different calibrator output voltage is used, set the controls to maintain the same input/output ratio and measure for ±5% accuracy.

13. Repeat parts 3 through 12 for CHANNEL 2 of the A6902A.

THEORY OF OPERATION

This section of the manual contains a functional description of the circuitry used in the A6902A Isolator. It is divided into two parts: General System Description and Detailed Circuit Description. A block diagram is included in the General System Description Section. Detailed schematics are located in the tabbed "Diagrams" section at the rear of this manual. Schematic diagrams are keyed to respective text in the Detailed Circuit Description by numbered diamond symbols on the tab of each schematic. The schematics are also sub-divided into blocks which correspond to the blocks in the block diagram and the sub-sections of the detailed description.

Both channels of the A6902A are identical in operation and are electrically isolated. In the following discussion, any references to the operation of Channel 1 also apply to Channel 2.

GENERAL SYSTEM DESCRIPTION

Please refer to the block diagram (Figure 3-1). The A6902A consists of two separate amplifiers and a power supply. The block diagram shows one of these amplifiers and the power supply. The other amplifier is identical to the one shown. Each amplifier is divided by an Isolation Barrier which electrically isolates the Isolator inputs and input circuitry from the rest of the instrument. The power supply has three separate dc-outputs; one for the amplifier cicuitry on the output side of the Isolation Barrier, the other two are one each for the input side of the two separate Channels.

Each amplifier consists of a Preamplifier and a Main Amplifier. The Preamplifier amplifies the signal from the Input Probes and feeds it to the Main Amplifier. The Preamplifier also contains the Attenuators and circuitry which compensates for minor electrical differences in the input probes. The Main Amplifier splits the signal into a low-frequency path and a high-frequency path. The low-frequency signal goes through a LF Driver to the Opto-Isolator where it crosses the Isolation Barrier. The high-frequency signal goes through an HF Buffer, HF Driver, and Group Envelope Delay (where its delay is matched to that of the low-frequency signal), to the HF Transformer where it crosses the Isolation Barrier. On the other side of the Isolation Barrier, the low-frequency signal goes through the LF Receiver to the Output Mixer, where it joins up with the high-frequency signal. At this point, a common-mode error signal from the common on the input side of the Isolation Barrier is subtracted from the combined signal to improve the common-mode rejection ratio. The combined signal is then fed to the output through the Output Filter.

DETAILED CIRCUIT DESCRIPTION

INTRODUCTION

The following discussion provides a detailed description of the A6902A Isolator circuitry. While reading this section, refer to the schematics in the "Diagrams" section at the rear of this manual. Channel 2 is identical to Channel 1 unless noted. Channel 1 is described. Unless noted on the schematic, Channel 2 circuit designator numbers on the main board are 0500 higher than the corresponding circuit numbers for Channel 1. The Preamplifier boards for both channels are identical and have identical circuit designator numbers.

PREAMPLIFIER

For the following discussion, refer to Figure 3-1 (block diagram) and Diagram 1 (Preamplifier schematic).

Input Probes

The Input Probes (1500 V and 500 V) are passive 10X probes that are detachable from the A6902A. The 1500-V probe is of heavy-duty construction for use in high-voltage circuits. The 500-V Probe is similar to conventional oscilloscope probes. Both probes attenuate the input signal by 10X and provide a high-impedance input for the test signal.

AC/DC/COMMON Switch

The input signal is ac-coupled to the attenuator through capacitor C4040. In the DC position, the input is dc-coupled by resistor R2045. In the COMMON position, the input is connected to the floating common. R3043 and R3040 limit the current for C4030 and the input FET and associated diode protection. R3040 (adjustment "C") controls high-frequency peaking.

Input Attenuator

The input attenuator provides signal division by 10, 100, and 1,000 by way of hybrid R3030. C2040, C2041, and C3040 control "front corner" compensation for divide by 10, 100 and 1,000 settings respectively. R1030 (adjustment "E"), provides compensation control for a one-microsecond droop for upper attenuator settings.

Switch Board, FET Compensation, and Input Compensation

When the input attenuator is in the straight-through position (20 mV/Div, 50 mV/Div, and 100 mV/Div), C4030 is paralleled by the input capacitance of the FET input (Q3010 and CR2010). When the input attenuator is in any position other than the straight-through position, C3031 (adjustment "D") and the switch board provide the equivalent capacitance of the FET input across C4030. C4030 (adjustment "B") is adjusted for flat response for the probe in use.

FET Input

The FET input stage (Q3010 A & B, R3010, R4011, and R4010), provide a unity-gain, high-impedance buffer. Q3010B provides a constant-current load to Q3010A. R4010 (adjustment "A"), adjusts the constant-current load for zero volts output when the input is zero volts.

Buffer and 1, 2, 5 Attenuator

U4020 A & B is a differential amplifier with U4020C providing a constant-current load. U4020D and U4020E is an emitter follower having a direct output to the 1, 2, and 5 attenuator, and an output divided by R3021 and R4030 feedback to the negative input of the differential amplifier. R4032 and C4032 balance the amplifier for high frequencies. Buffer U4020 may be viewed as an operational amplifier with the negative input connected to the output through R3021 and to ground through R4030. The buffer gain would then be 1 + R3021/R4030 or approximately 5.5. However, since the voltage gain of U4020 is not infinite, the actual amplification of the buffer is approximately 4.

The 1, 2, and 5 attenuator (R4031, R2022, R2023 and R2030) divides the buffer output signal by factors of 1, 2, or 5. The 1, 2, and 5 attenuator also provides a divide by 10 factor for the 200 V/Div range. TP1 is the preamp output test point.

AMPLIFIER (CHANNEL 1)

For the following discussion, refer to Figure 3-1 (Block Diagram) and Diagram 2 (Main Board schematic).

LF Driver and Opto-Isolator

The signal from the preamp board is amplified by U2121B (gain approximately 4), and coupled to the opto-isolators U2147 and U2153 through U2121A and Q2138 (gain approximately 1). U2147 provides low-frequency and thermal feedback to U2121A. R2124 and R2164 provide dc loads for the opto-isolator transistors.

LF Receiver, Output Mixer, and Common Mode Adjust

U2168A amplifies the signal (gain approximately 3) from the opto-isolator U2153. C2765 limits the lf-bandwidth to approximately 2.5 KHz. C2149 and C2161 form a voltage divider for ground difference signals, and with R2068 and R2069, allow for difference signal cancellation in U2278. U2168B is a unity-gain inverter. The outputs from U2168 are divided (gain approximately 1/200) by R2175 and R2176, and by R2275 and R2277 and coupled to the input of U2278.

HF Buffer, HF Driver, and HF Group Envelope Delay

U2317 provides a gain of 5 and a differential output to HF Driver Q2334 and Q2335. The HF Driver couples the signal to the HF Transformer T2250 (gain approximately 1/400) through the HF Group Envelope Delay (L2441, R2342 and R2343). The Group Envelope Delay elements provide a low-Q bandpass filter whose purpose is to provide a time delay to the hf-signal to approximate the time delay through the lf circuitry.

HF Transformer and Load

R2267, R2268 and R2272, with the inductance of transformer T2250, provide a bandpass filter whose low-frequency cutoff point is adjusted to the lf crossover frequency.

Output Filter and Output Load

The hf signal is connected to the X100 gain-set inputs of U2278, and is combined with the lf and common-mode signals from the normal inputs of U2278. The output is connected to the low-pass output filter (R2188, C2188, L2284, R2284, C2195 and R2292), and is connected to the output J2230 through Q2292 and voltage divider R2285 and R2286 (gain approximately 0.2), which provides an approximate 50-Ω output impedance. Output load U2471 provides a dc level shift to the signal from U2278.

POWER SUPPLY

For the following discussion, refer to Diagram 2 (Main Board schematic).

The primary windings of the power transformer are connected in parallel (for 120-V operation) or in series (for 240-V operation) by the Line Voltage Selector switch. The secondaries are high-isolation, high-voltage-insulated windings which feed three separate pairs of ± 5-volt supplies. The circuitry on the signal-input side of the Isolation Barrier is powered by a separate ± 5-volt supply for each channel. The third ± 5-volt supply powers the circuitry on the output side of the Isolation Barrier. Each supply consists of a full-wave bridge rectifier (CR2243, CR2743, CR2993), + and − three-terminal 5-volt regulators (U2118, U2218, U2618, U2718, U2891, U2871), and the associated filter capacitors and protection zener diodes.

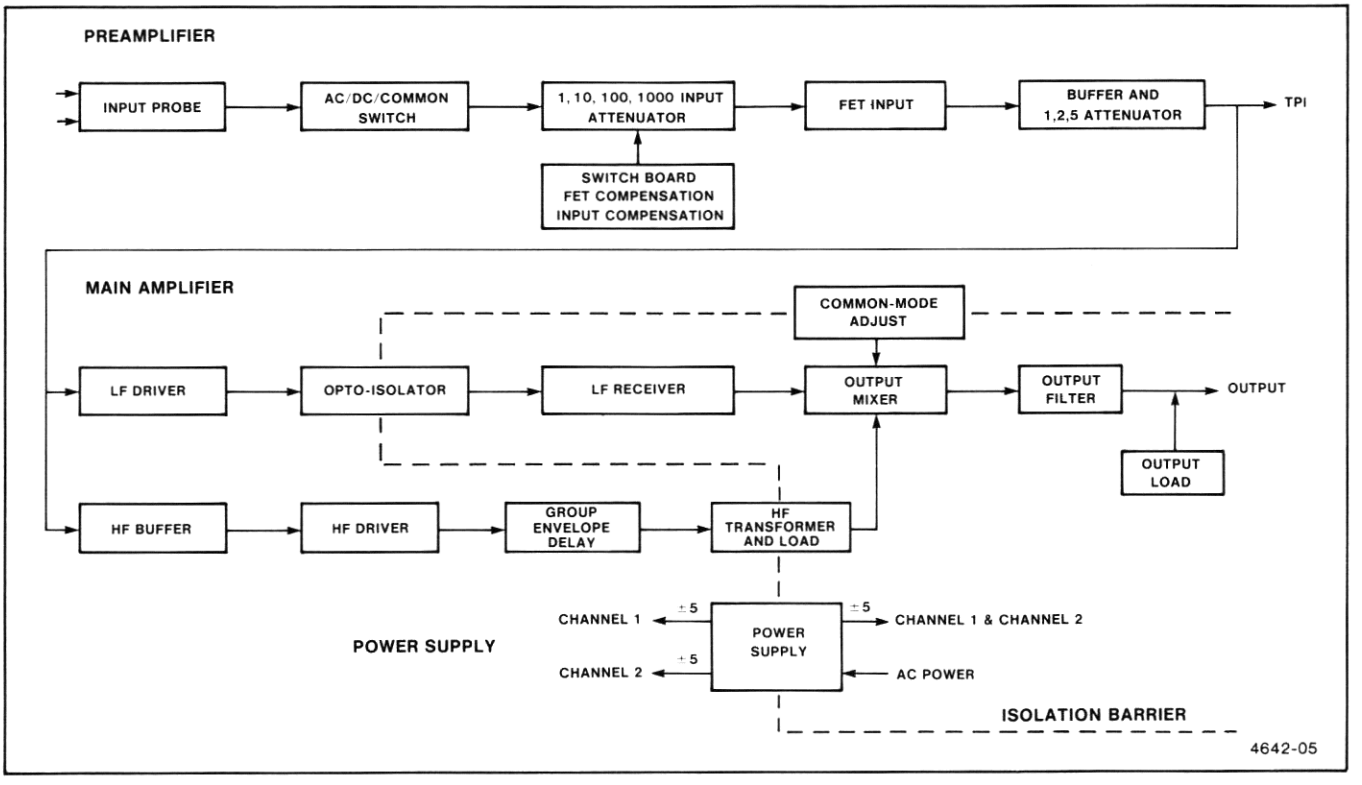

Figure 3-1. A6902A block diagram.

PERFORMANCE CHECK PROCEDURE

INTRODUCTION

This procedure does not check every facet of the instrument; rather, it is concerned with those portions of the A6902A that are essential to measurement accuracy and correct operation. Removing the instrument's cover is not necessary to perform this procedure. All checks are made using the operator-accessible front- and rear-panel controls and connectors.

TEST EQUIPMENT REQUIRED

The test equipment given in Table 4-1 is a complete list of equipment required to accomplish both the "Performance Check Procedure" in this section and the "Adjustment Procedure" in Section 5 of this manual. Specific equipment required to perform each individual step in this procedure is listed at the beginning of each step. The item number shown in parenthesis with each piece of equipment refers to the equipment item number presented in Table 4-1.

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 or test setups may need to be altered. If the exact item of equipment given as an example in Table 4-1 is not available, first check the "Minimum Specification" column carefully to determine whether any other equipment might suffice. Then check the "Use" column for the purpose of the item. If a particular check is of little or no importance to your measurement requirement(s), the test equipment item and corresponding step(s) may be omitted.

PERFORMANCE-CHECK INTERVAL

To ensure instrument accuracy, check its performance every 1000 hours of operation or every six months, if used infrequently.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are valid only if the instrument has been adjusted at an ambient temperature between +20°C and +30°C, it is operating at an ambient temperature between 0°C and +50°C (unless otherwise noted), and it has had a warmup period of 30 minutes.

Limits and tolerances stated in this procedure are instrument specifications only if they are listed in the "Performance Requirements" column of "Specification" (Section 1). Tolerances given are applicable only to the A6902A and do not include test equipment error.

INPUT PROBES

Some checks in this procedure are described and illustrated using the 500-V Input Probe. The 1500-V Probe may also be used in any of the check steps when the proper adapters are used.

PREPARATION

Before performing this procedure, ensure that the Line Voltage Selector, located at the rear of the A6902A, is set to the proper range for the voltage source being used and that the correct fuse is installed (see " Preparation for Use" in the "Operating Instructions" section of this manual). Connect the test equipment and instrument to be checked to an appropriate ac power source.

INDEX OF PERFORMANCE-CHECK STEPS

Table 4-1

Test Equipment Required

Item Number and Description	Minimum Specification	Purpose	Example of Suitable Test Equipment
1. Oscilloscope	100 MHz bandwidth (5 mV and above)	Check bandpass and transient response.	TEKTRONIX 2235.
2. Calibration Generator	0.5 ns rise time. Repetition rate: 1 kHz to 100 kHz. Output: 0.1 V to 100 V ± 0.25%.	Signal source for gain and transient response.	TEKTRONIX PG 506.[a]
3. Leveled Sine-Wave Generator	Repetition rate: to 25 MHz Output: 0 to 5 V.	Check bandpass.	TEKTRONIX SG 503.[a]
4. Power Module		Provide operating voltages for TEKTRONIX TM 500-series test equipment.	TEKTRONIX TM 503 or TM 506.
5. Adapter	Probe tip-to-BNC male for 500-V input probes.	Signal interconnection.	Tektronix Part Number 013-0084-02[b]
6. Termination	Impedance: 50 Ω. Connectors: BNC.	Signal interconnection.	Tektronix Part Number 011-0049-01.
7. Cable (2 required)	Impedance: 50 Ω. Connectors: BNC Length: 42 inches	Signal Interconnection.	Tektronix Part Number 012-0057-01.
8. High-Voltage Amplifier	2 kV P-P sinewave.	Check common-lead feedthrough.	Fluke 5205A.
9. Function Generator	Repetition rate: 1kHz to 1 MHz. Output: 10 V p-p.	Check common-lead feedthrough.	TEKTRONIX FG 501A[a]

[a] **Requires a TM 500-series power module (item 4).**

[b] **Fits the 500-V probes only.**

PERFORMANCE CHECK STEPS

Each numbered step in this procedure is written so that it can be individually performed. The alphabetical parts in each step must be performed in the sequence presented. For steps 2 and 3, use properly compensated input probes.

1. Check Gain and Probe Compensation

Equipment Required (see Table 4-1)

Oscilloscope (Item 1)
Calibration Generator (Item 2)
Probe Adapter (Item 5)

a. Set the instrument controls as follows:

A6902A Isolator

VOLTS/DIV (both)	20 mV
AC-COMMON-DC (both)	COMMON
POWER	ON

Oscilloscope

Volts/Division (Channel 1)	10 mV
AC-GND-DC (both)	GND
Position (Channel 1)	Midrange
Vertical Mode	Channel 1
Time/Division	200 μs
Trigger Mode	Auto
Source	Channel 1
Coupling	AC
Slope	+ (plus)
Level	Midrange
Power	On

Calibration Generator

Standard Amplitude (No termination)	.1 V

b. Allow 30 minutes for the A6902A and test equipment to stabilize.

c. Connect the A6902A Channel 1 output BNC connector to the oscilloscope BNC connector through a 50-Ω BNC cable. Connect the Calibration Generator Standard Amplitude output to the A6902A Channel 1 input through the 500-V Probe and probe adapter (refer to Figure 4-1).

d. Use the oscilloscope Channel 1 Position control to center the trace 2 major divisions below the horizontal center graticule line.

e. Set the oscilloscope Channel 1 AC-GND-DC switch to DC.

f. Use the A6902A OUTPUT DC LEVEL control to position the trace 2 major divisions below the horizontal center graticule line.

g. Set the A6902A CHANNEL 1 AC-COMMON-DC switch to DC.

h. CHECK - for a flat-top waveform display within ±0.25 minor divisions, (adjustment, if necessary, is described in the "Operators" section of this manual). Refer to Figure 4-1 test waveforms.

i. CHECK - that the amplitude of the waveform is 5 divisions ±1.25 minor divisions.

j. Step through all A6902A VOLTS/DIV positions, varying the Calibration Generator Standard Amplitude output to display 4 or 5 divisions of display. Verify that gain error is ≤5% (1.25 minor div. for 5 div. displays, 1 minor div. for 4 div. displays, .5 minor div. for 2 div. at 100 VOLTS/DIV., and .25 minor div. for 1 div. at 100 and 200 VOLTS/DIV. Use an oscilloscope setting of 5 mV/div. for the 200 VOLTS/DIV check).

NOTE

This display is based on the STD AMPL output of the TEKTRONIX PG 506 Calibration Generator. If a different calibration signal source is used, set the controls to maintain the same input/output ratio and measure for ± 5% accuracy.

k. Repeat parts d through j, using the A6902A CHANNEL 2 controls and connectors.

l. If no other checks are to be performed, set the POWER switch to OFF and disconnect the test setup.

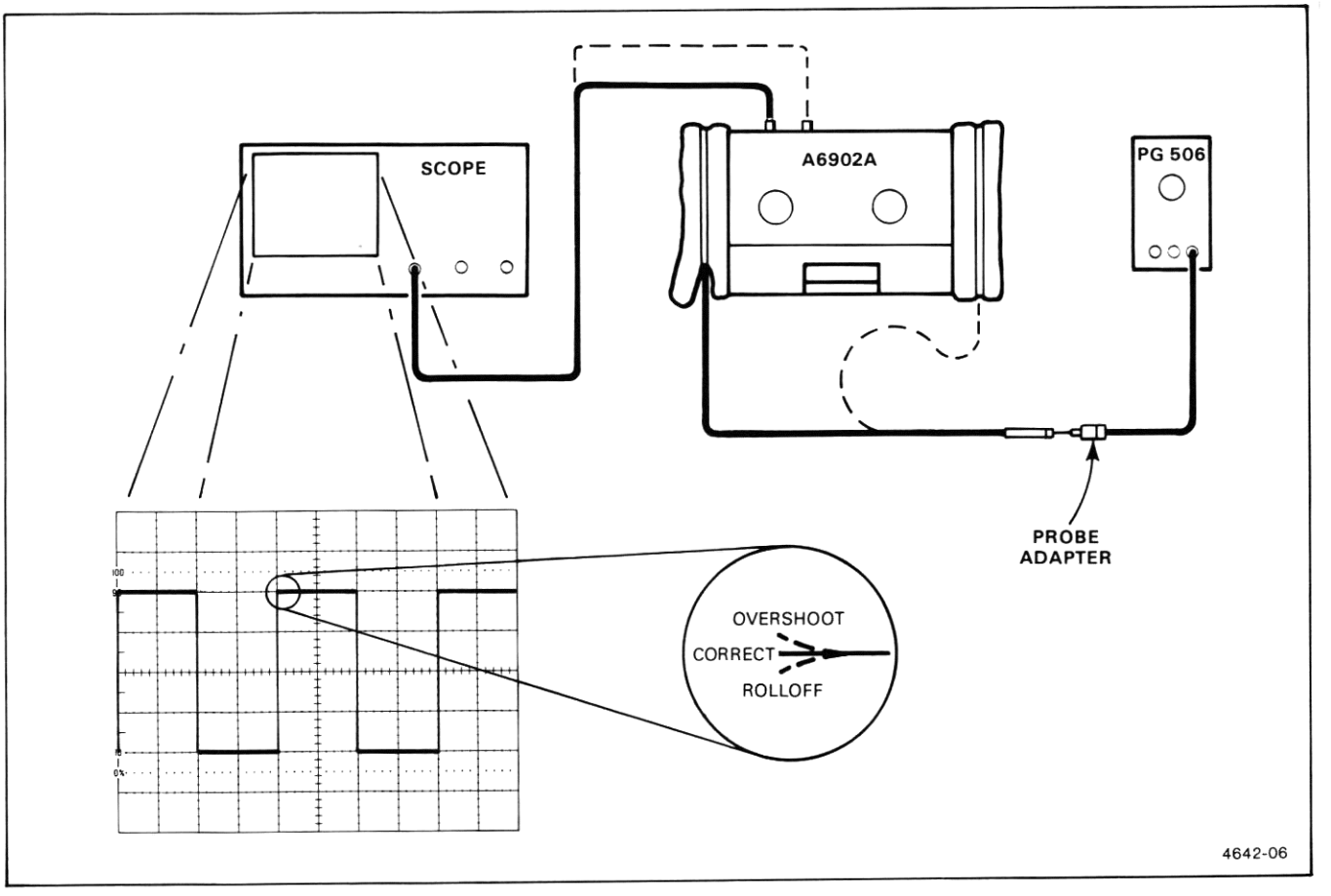

Figure 4-1. Gain and probe compensation test setup.

2. Check Bandpass

Equipment Required (see Table 4-1)

Oscilloscope (Item 1)
Leveled Sine-Wave Generator (Item 3)
Probe Adapter (Item 5)
50 Ω-Termination (Item 6)
Cable (Item 7)

a.Set the instrument controls as follows:

A6902A Isolator

VOLTS/DIV (both)	100 mV
AC-COMMON-DC (both)	DC
OUTPUT DC LEVEL (both)	Midrange
POWER	ON

Oscilloscope

Volts/Division (Channel 1)	10 mV
AC-GND-DC (both)	DC
Position (Channel 1)	Midrange
Vertical Mode	Channel 1
Time/Division	10 μs
Trigger Mode	Auto
Source	Channel 1
Coupling	AC
Slope	+ (plus)
Level	Midrange
Bandwidth Limit	Off
Power	On

Leveled Sine-Wave Generator

Amplitude Multiplier	X1
Output Amplitude	0.6 Volts p-p
Frequency Range (MHz)	REF (50 kHz)

a. Allow 30 minutes for the A6902A and test instruments to stabilize.

b. Connect the test setup as shown in Figure 4-2, using the A6902A CHANNEL 1 connectors and 500-V Probes.

c. Adjust the Output Amplitude control of the leveled sine-wave generator for six divisions of display on the oscilloscope.

d. Set the Frequency Range control of the generator to the 10-to 25-MHz position.

e. Use the Variable Frequency control of the generator to increase the frequency until the oscilloscope display decreases to 4.2 divisions (adjust the oscilloscope Time/Div control as needed).

f. CHECK - that the output frequency of the generator is 20 MHz or greater.

g. Repeat parts b through f using the A6902A CHANNEL 2 controls and connectors, starting with the generator controls reset at 50 kHz.

h. If either A6902A channel does not meet specification, refer to the "Gain Adjustment" portion of the "Adjustment Procedure" section of this manual for a readjustment method.

i. If no other checks are to be performed, set POWER to OFF and disconnect the test setup.

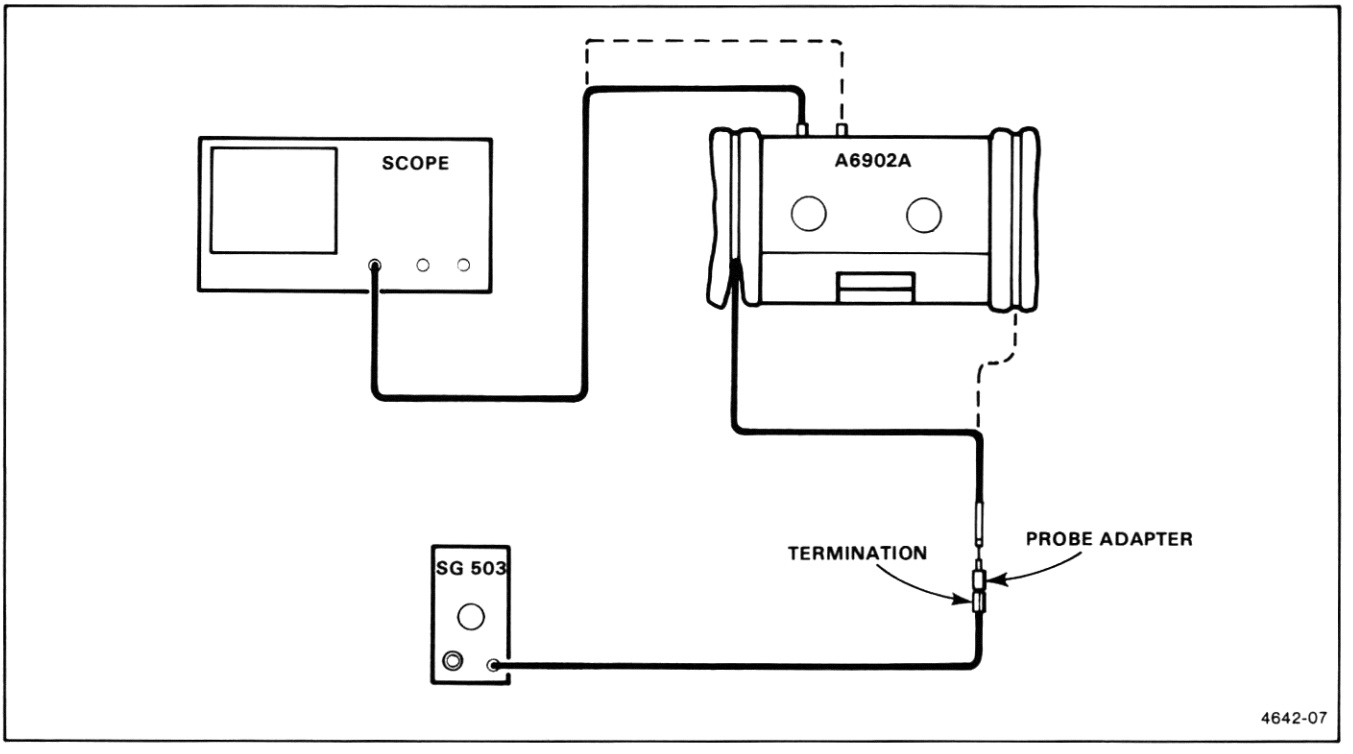

Figure 4-2. Bandpass check test setup.

3. Common-Lead Signal Feedthrough

Equipment Required (see Table 4-1)

Oscilloscope (Item 1)
Cable (4 required Item 7)
High-Voltage Amplifier (Item 8)
Function Generator (Item 9)
Connector Shield (See "Preparation" and Fig. 4-3)
Special Connector (See "Preparation" and Fig. 4-3)

a. Set the instrument controls as follows:

A6902A Isolator

NOTE

The A6902A Isolator MUST *be used with the 1500-V Probes installed for this check.*

VOLTS/DIV (both)	20 mV
AC-COMMON-DC (both)	COMMON
POWER	OFF

Oscilloscope

VOLTS/DIV(BOTH)	10 mV
AC-GND-DC (both)	DC
Vertical Mode	Chop
A and B SEC/DIV	200 μs
A Trigger Mode	P-P Auto
Source	Ext
Coupling	AC
Slope	+ (plus)
Level	Midrange
Power	OFF

Function Generator

FREQUENCY (Hz)	4 (sinewave)
Var Symm	Off (out)
MULTIPLIER	10^3
Var	Centered
Ampl	Set for 20 V P-P
Offset	OFF
Trig (var)	0 (centered)
Free run	Cont. (in)
Attenuation	0dB

High Voltage Amplifier

WARNING

Lethal voltages are present during the use of this instrument. DO NOT APPLY POWER TO THIS INSTRUMENT UNTIL SPECIFICALLY INSTRUCTED TO DO SO!

Power	OFF
Control	Local
Mode	Stby

b. Preparation

WARNING

Unless shielded from personnel, the test connection between the A6902A 1500-V Probes and the High-Voltage Amplifier can be hazardous. The following connection fixture is recommended (Refer to Figure 4-3):

- Insure that the High-Voltage Amplifier POWER is OFF.

- Solder a "probe connection loop" (approx. 1"x 4" with size 18 gauge or larger solid wire), onto the end of a binding post (Tektronix part number 129-0064-01 or similar).

- Connect the completed loop/binding post connector to the + (non-polarity-ribbed side) banana connector inside of the High-Voltage Amplifier High Voltage output connector.

- Surround the entire connection setup with a non-conductive box of sufficient size and material to shield personnel from possible contact (such as a box constructed from 1/2" polystyrene or equivalent).

- Connect both A6902A 1500-V probes (input AND common leads) to the connection loop.

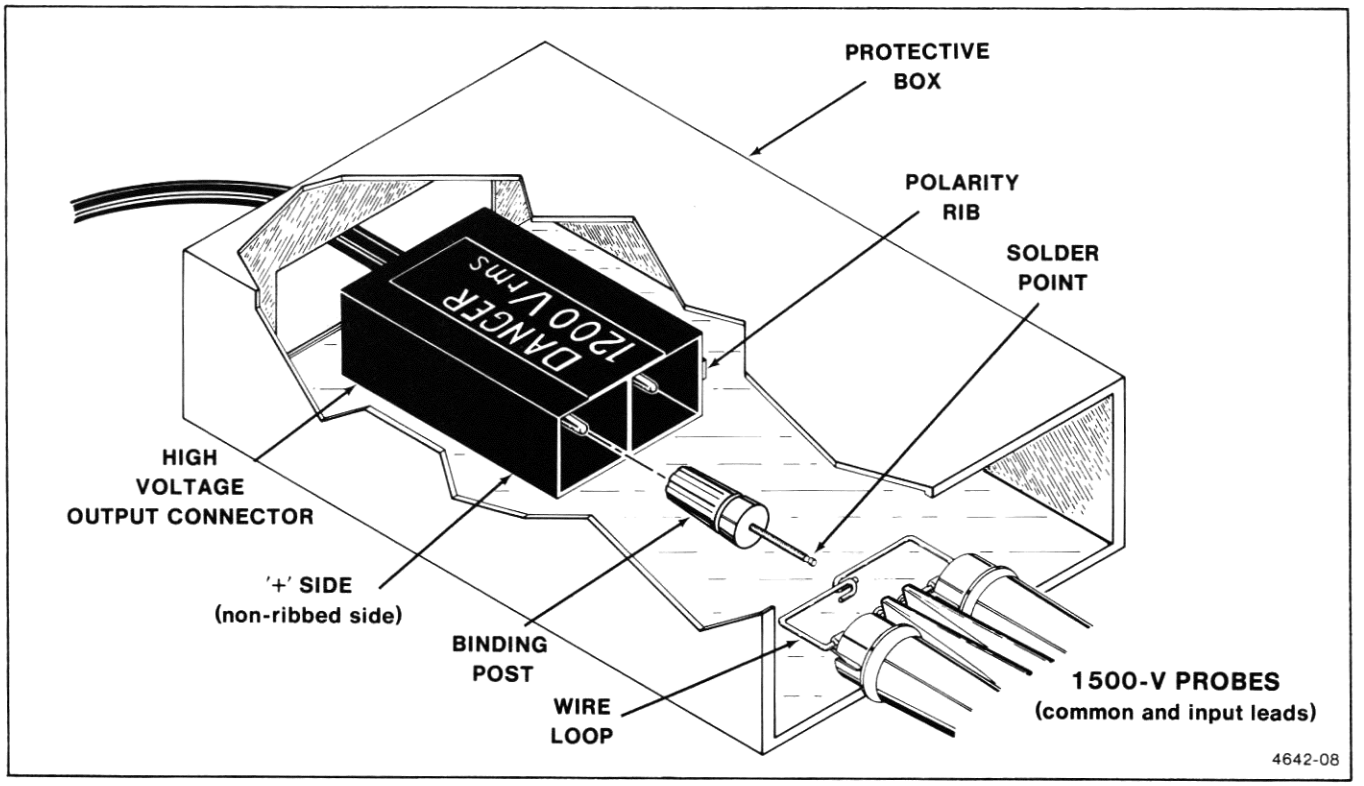

Figure 4-3. High-voltage connection fixture.

WARNING

LETHAL VOLTAGES ARE PRESENT ON THE PROBE CABLES AND ISOLATED COMMONS DURING THIS CHECK.

Read and follow all instructions in the High-Voltage Amplifier operators manual, particularly the HAZARD and FIRST AID procedures.
Insure that all shields are in place.
Insure that non-conductive tools are used.
Insure that all connections are isolated and shielded from instruments, tools, conductive objects, and personnel.

c. Connect the test setup as shown in Figure 4-4 and following the recommendations described under "Preparation" and Figure 4-3. Make certain that BOTH common AND input leads of the A6902A 1500 V probes are connected to the High-Voltage Amplifier output "probe connection loop."

d. Turn on the A6902A and all other test equipment EXCEPT for the High-Voltage Amplifier, and allow 30 minutes to stabilize.

e. ONLY AFTER COMPLETING THE STEPS under "Preparation," check the High Voltage Amplifier presets and set the POWER switch to ON on the High Voltage Amplifier.

f. Set the High-Voltage Amplifier to OPERATE when the warmup light goes out.

g. CHECK - that common-lead signal feedthrough is less than 20 mV p-p (typically 2 mV).

h. Repeat step "g" with the Function Generator frequency set for 100 Hz (6 mV), 1 kHz (14 mV), 10 kHz (141 mV), and 100 kHz (282 mv).

i. If common-lead signal feedthrough does not meet specification, refer to the "Adjustment Procedure" section of this manual.

j. If no other checks are to be performed, set the High-Voltage Amplifier to STANDBY and then set all power switches to OFF.

k. Disconnect the test setup.

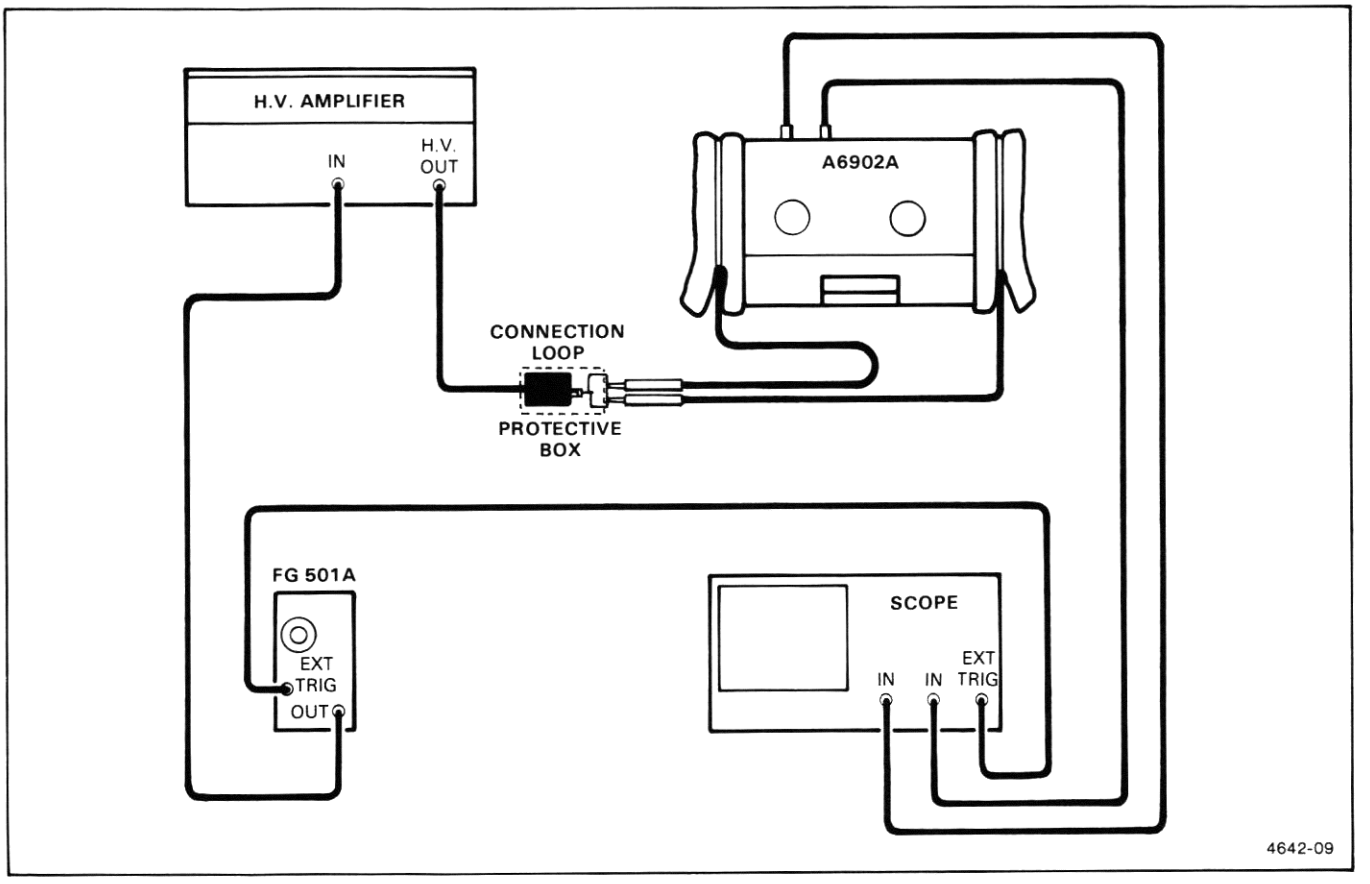

Figure 4-4. Common-lead signal feedthrough test setup.

ADJUSTMENT PROCEDURE

The "Adjustment Procedure" is used to return the instrument to conformation with its "Performance Requirements" as listed in the "Specification" (Section 1). These adjustments should be performed only after the checks in the "Performance Check Procedure" (Section 4) have indicated a need for adjustment of the instrument.

INTRODUCTION

IMPORTANT - PLEASE READ BEFORE USING THIS PROCEDURE

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 5-1 is a complete list of the equipment required to accomplish the "Adjustment Procedure." Specific equipment required to perform each individual step in this procedure is listed at the beginning of each step.

Test equipment specifications described in Table 5-1 are the minimum necessary to provide accurate results. Therefore, equipment used must meet or exceed the listed specifications. This procedure is based on using the first item of equipment list in the "Equipment" column of Table 5-1. When other equipment is substituted, the control settings or the calibration setups may need to be altered. 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 given in this procedure are for the A6902A under test only. Test-equipment error is not included except as noted.

INPUT PROBES

Either the 1500-V probe or the 500-V probe may be used in any of the steps in this procedure, provided that the voltage rating of the 500-V probe is not exceeded.

ADJUSTMENT SEQUENCE

Because of adjustment interaction, the adjustment steps must be performed in the order given.

At the beginning of each adjustment step is a list of all the front-panel control settings for part a of that step. Each succeeding part within the step should be performed in sequence to ensure that any control-setting changes will be correct for the ensuing parts.

ADJUSTMENT LOCATIONS

Adjustable component locations are shown in Figure 5-1. Only the adjustable components are shown in this figure. The adjustable parts and test points on the preamplifier circuit boards also have letter designators that are printed on the circuit board to aid identification. These designators are given in the procedure enclosed in quotation marks (e.g. "A").

PREPARATION FOR ADJUSTMENT

Before performing this procedure, ensure that the proper line voltage has been selected and that the correct fuse is installed (see "Preparation for Use" in the "Operating Instructions" section of this manual.)

It is necessary to remove the top cabinet half, top main shield half, and the top of the preamplifier shield to perform the Adjustment Procedure. See the removal instructions in the "Maintenance" section of this manual.

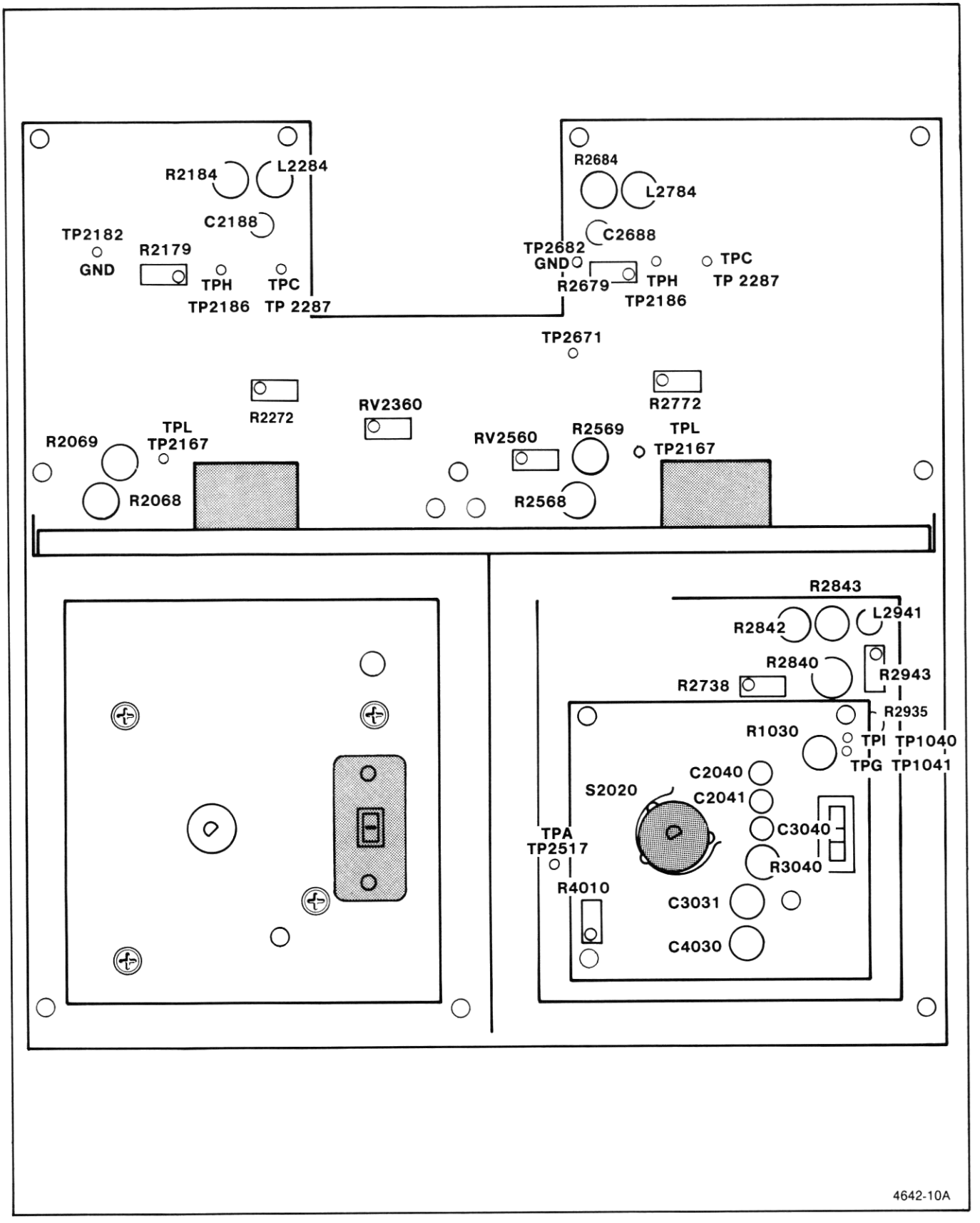

Figure 5-1. A6902A adjustment locations.

Adjustment of the instrument must be accomplished at an ambient temperature between + 20°C and + 30°C.

The A6902A must be allowed a warmup period of at least 4 hours before performing this procedure. The top cover of the A6902A should be set over the instrument while it is warming up.

INDEX OF ADJUSTMENTS

Table 5-1

Test Equipment Required

Item Number and Description	Minimum Specification	Purpose	Example of Suitable Test Equipment
1. Digital Multimeter	DC volts range to ±20 V. Accuracy: 1%	DC adjustment.	TEKTRONIX DM 501A.[a,b]
2. Oscilloscope	100 MHz bandwidth (5 mV and above)	All adjustments.	TEKTRONIX 2235.
3. Calibration Generator	0.5 ns rise time. Repetition rate: 1 kHz to 100 kHz. Output: 0.1 V to 100 V ±0.25%.	Preamplifier and gain adjustments.	TEKTRONIX PG 506.[a]
4. Power Module		Provide operating voltages for TEKTRONIX TM 500-series test equipment.	TEKTRONIX TM 503 or TM 506.
5. Termination	Impedance: 50 Ω. Connectors:BNC.	Signal interconnection.	Tektronix Part Number 011-0049-01.
6. Cable	Impedance: 50 Ω. Connectors: BNC Length: 42 inches	Signal Interconnection.	Tektronix Part Number 012-0057-01.
7. Alignment Tool	Bit size: 3/32 inch.	Adjust variable resistors and capacitors.	Tektronix Part Number 003-0675-00.
8. High-Voltage Amplifier	2 kV p-p sinewave.	Common-lead signal feedthrough.	Fluke 5205A.
9. Function Generator	Repetition rate: 1kHz to 1 MHz. Output: 10 V p-p.	Common-lead signal feedthrough.	TEKTRONIX FG 501A[a]
10. Probe	X1-X10, 100 MHz.	General purpose.	TEKTRONIX P6062B.
11. Probe Adapter	Probe-tip-to-BNC male	Signal interconnection. for 500 V probes.	Tektronix Part Number 013-0084-02
12. Alignment Tool	Bit: Hexagonal.	Adjust coils.	Tektronix Part Number 003-0310-00.
13. Probe Adapter	Probe-to-harmonica.	Preamp calibration.	Tektronix Part Number 015-0325-00

[a] **Requires a TM 500-series power module (item 4).**

[b] **The 2236 with DMM option is an acceptable replacement for item 1.**

[c] **Fits the 1500-V probes only.**

ADJUSTMENT PROCEDURE STEPS

NOTE

In the following procedure, all test points and component numbers are given first for Channel 1, followed by the corresponding number for Channel 2 in parenthesis, followed by the letter designator in quotation marks. The preamplifier circuit boards are identical, so the component and test points that are located on these boards have only one component number that refers to both channels. The procedure steps should be done first for Channel 1 and then repeated for Channel 2.

1. DC Adjustment

NOTE

When adjusting 20-turn variable resistors, lightly tap them to center the backlash.

Equipment Required (see Table 5-1):

Digital Multimeter (Item 1)
Oscilloscope (Item 2)
Power Module (Item 4)
Alignment Tool (Item 7)

a. Set the instrument controls as follows:

Multimeter

DC Volts	2 V

Oscilloscope

Volts/Division	5 mV
Position	Midrange
Vertical Mode	Channel 1
Time/Division	200 μs
Trigger Mode	Auto

A6902A

VOLTS/DIV	20 mV
AC-COMMON-DC	AC

b. Connect the multimeter HIGH lead to "TPI" and the LOW lead to "TPG" (floating common).

c. ADJUST - R4010 "A" for the same multimeter reading (±3 mV) while switching the Isolator VOLTS/DIVISION Switch between 100 mV and 200 mV.

d. Connect the multimeter HIGH lead to the side of R2340 (R2840) nearest the OUTPUT DC LEVEL Control and set the OUTPUT DC LEVEL Control for a multimeter reading of 0 V (±3 mV).

e. Connect the multimeter HIGH lead to TP2186 (TP2686), "TPH". Connect the multimeter LOW lead to TP2287 (TP2787), "TPC".

f. ADJUST - R2179 (R2679) for a 0-volt (±3 mV) indication. Disconnect the multimeter.

g. Connect the A6902A output to the oscilloscope vertical input.

h. Set the oscilloscope Input Coupling to GND and center the trace on the screen.

i. Set the oscilloscope Input Coupling to DC.

j. ADJUST - R2360 (R2560) to re-center the trace on the screen.

2. Preamplifier Calibration

Equipment Required (see Table 5-1):

Oscilloscope (Item 2)
Calibration Generator (Item 3)
Power Module (Item 4)
Termination (Item 5)
Alignment Tool (Item 7)
Probe (Item 10)
Probe Adapter (Item 11)
Probe Adapter (Item 13)

a. Set the instrument controls as follows:

Calibration Generator

Mode	Fast Rise
Period	1 ms (1 kHz)

Oscilloscope

Volts/Division	10 mV
Position	Midrange
Vertical Mode	Channel 1
Time/Division	200 μs
Trigger Mode	Auto

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VOLTS/DIV	100 mV
AC-COMMON-DC	AC

b. Using the oscilloscope probe and the probe-tip-to-harmonica adapter, connect the oscilloscope to TP1040, "TPI," and TP1041, "GND."

c. Install the 50-Ω termination on the positive-going, fast-rise output of the calibration generator. Using the probe-tip-to-BNC adapter, connect the A6902A probe to the termination.

d. Set the oscilloscope triggering controls for a Stable display and center the display on the screen.

e. ADJUST - C4030, "B," for the squarest wave-form front corner. (Disregard ac line noise if present. Using the BW limit on the oscilloscope may be helpful.)

f. ADJUST - R3040, "C," to its center-point.

g. Set the A6902A VOLTS/DIV to 500 mV/div.

h. ADJUST - C2105, "D," for best flat-top display. Ignore any aberrations present during the first 40 μs of the pulse (one minor division).

i. Set the calibration generator Period to 10 μs (100 kHz), and the oscilloscope Time/Division to 2 μs.

j. ADJUST - R1030, "E," for best flat-top display.

k. Set the calibration generator Period to 1 ms (1 kHz), and the oscilloscope Time/Division to 200 μs.

l. ADJUST - C2040, "F," for best flat-top display.

m. Set the calibration generator Mode switch to High Amplitude and set its Pulse Amplitude control to its minimum setting. Set the A6902A VOLTS/DIV to 5 V.

n. Connect the A6902A probe to the calibration generator standard output using the probe-tip-to-BNC adapter. (Do not use the 50-Ω termination.)

o. Set the calibration generator Pulse Amplitude for a 5-division display.

p. ADJUST - C2041, "G," for the squarest wave-form front corner.

q. Set the A6902A VOLTS/DIVISION to 20 V. Set the calibration generator Pulse Amplitude for maximum output.

r. ADJUST - C3040, "H," for squarest wave-form front corner.

s. Disconnect the oscilloscope from the preamplifier test points.

3. Gain Adjustment

NOTE

When adjusting 20-turn variable resistors, lightly tap them to center the backlash.

Equipment Required (see Table 5-1):

Oscilloscope (Item 2)
Calibration Generator (Item 3)
Power Module (Item 4)
Termination (Item 5)
Alignment Tool (Item 7)
Probe Adapter (Item 11)
Alignment Tool (Item 12)

a. Set the instrument controls as follows:

Oscilloscope

Volts/Division	10 mV
Position	Midrange
Vertical Mode	Channel 1
Time/Division	200 μs
Trigger Mode	Auto

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VOLTS/DIV	100 mV
AC-COMMON-DC	AC

Calibration Generator

Mode	Standard Amplitude
Amplitude	0.5 V
Period	1 ms (1 kHz)

b. Connect the A6902A output to the oscilloscope vertical input.

c. Using the probe-tip-to-BNC adapter, connect the A6902A probe to the Standard Amplitude output of the calibration generator.

d. Set the oscilloscope triggering controls for a stable display and center the display on the screen.

e. ADJUST - R2238 (R2738) for an exact five-division display referenced to the trailing portion of the square wave (see Figure 5-2).

f. Set the calibration generator Mode switch to Fast Rise, and the Pulse Amplitude to Minimum.

g. Install the 50-Ω termination on the positive-going, fast-rise output of the calibration generator. Using the probe-tip-to-BNC adapter, connect the A6902A probe to the termination.

h. Set the calibration generator Pulse Amplitude for an exact 5-division display (referenced to the trailing edge of the square wave). Change the oscilloscope Time/Div to 50 μs.

NOTE

The adjustments in parts i and j interact and should be repeated until the best over-all response is achieved.

i. ADJUST - R2443 (R2943) and R2272 (R2772) for a flat-topped square wave. R2443 (R2943) affects the first 50 μs of the pulse, R2272 (R2772) affects the first 25 μs. See Figure 5-3.

j. ADJUST - R2342 (R2842), R2343 (R2843) and L2441 (L2941) for squarest wave-form front corner. R2342 (R2842) affects the first 40 μs, R2343 (R2843) affects the first 20 μs, and L2441 (L2941) affects the bottom of the dip at 30 μs. See Figure 5-3.

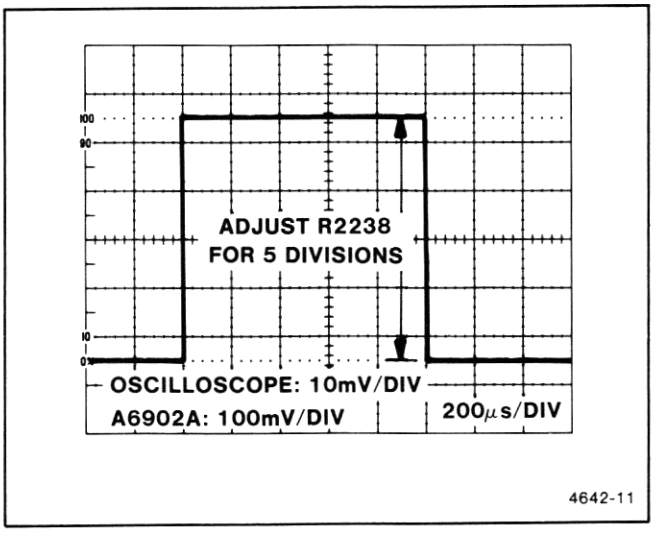

Figure 5-2. Gain adjustment - R2238 (R2738).

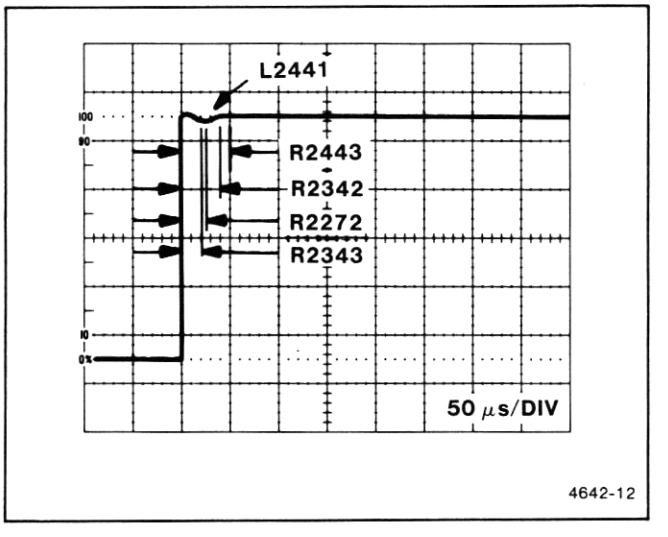

Figure 5-3. Portions of waveform affected by mid-frequency adjustments.

k. Set the calibration generator Period to 1 μs (1 MHz), and the oscilloscope Time/Division to 100 ns.

l. ADJUST - R2435 (R2935), L2284 (L2784), R2284 (R2784), and C2188 (C2688) for best front-corner response. Refer to Figure 5-4 for identification of the waveform affected by each adjustment.

NOTE

If adjustment L2284 (L2784) runs out of range, R4040 (which was center adjusted in step 2f) may be adjusted off center.

m. Set the oscilloscope Time/Div to 10 ns (10X horizontal sweep magnifier required).

n. CHECK - Pulse rise time should be less than or equal to 17.5 ns. If the rise time is excessive, repeat parts i through l. If the rise time meets specification, proceed with part o.

o. CHECK - The signal delay difference between the two channels should be less than or equal to 4 ns. (See Figure 5-5.) If the delay difference is excessive proceed with part p, if the delay difference is within specification proceed with step 4.

p. ADJUST - R4040 and L2284 (of the slowest channel first) till the signal delay difference is less than 4 ns. Repeat parts l through o.

4. Common-Lead Signal Feedthrough Adjustment

WARNING

Lethal voltages (2000 V p-p) are present on probe cables and the preamplifier shields during this adjustment. The preamplifier shields and the top main shield half MUST be installed before performing this adjustment.

Only non-conductive adjustment tools should be used in this adjustment.

The 1500-V probes MUST be used for this adjustment.

Equipment Required (see Table 5-1):

Oscilloscope (Item 2)
Power Module (Item 4)
Cable (Item 6)
Alignment Tool (Item 7)
High-Voltage Amplifier (Item 8)
Function Generator (Item 9)
Probe (Item 10)
High Voltage Connector Shield (Figure 4-3)

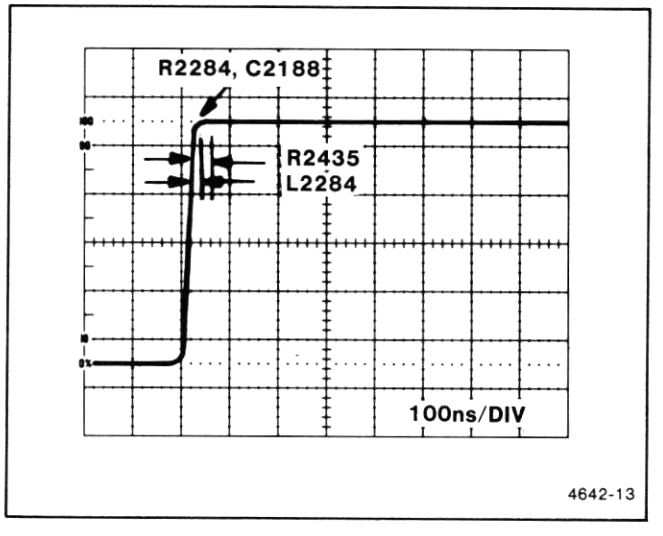

Figure 5-4. Portions of waveform affected by high-frequency adjustments.

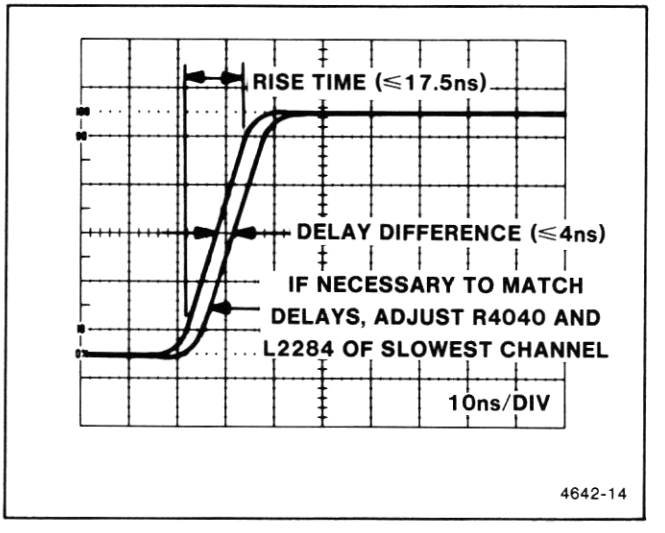

Figure 5-5. Rise time and signal delay difference.

a. Set the instrument controls as follows:

Oscilloscope

Volts/Division (CH 1)	0.5 V
Volts/Division (CH 2)	10 mV
Position	Midrange
Vertical Mode	Alternate
Time/Division	200 μs
Trigger Mode	Auto

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VOLTS/DIV	20 mV
AC-COMMON-DC	COMMON

Function Generator

Frequency	4 kHz
Waveform	Sinewave
Amplitude	0 dB (20 V)
Offset	Off

High-Voltage Amplifier

Power	Off

b. Install the oscilloscope probe on the oscilloscope Channel 1 vertical input and touch the probe tip to the function generator output.

c. Set the function generator Variable Amplitude for a 4-division (20 V p-p) display on the oscilloscope. Disconnect the oscilloscope probe and change the Channel 1 Volts/Div to 10 mV.

d. Using a 50-Ω cable, connect the output of the function generator to the input of the high-voltage amplifier. Using another 50-Ω cable, connect the function generator trigger output to the oscilloscope external trigger input. Connect the A6902A outputs to the oscilloscope vertical inputs (Channel 1 to Channel 1 and Channel 2 to Channel 2). Connect the high-voltage amplifier output to both the A6902A 1500-V probe inputs AND common leads. It is highly recommended that a high-voltage connector shield be constructed as described in Section 4 of this manual. See Figure 5-6 for test setup.

e. Set the high-voltage amplifier Power switch to On. The amplifier should be in Standby mode.

WARNING

LETHAL VOLTAGES ARE PRESENT ON THE PROBE CABLES AND ISOLATED COMMONS DURING THE REMAINDER OF THIS ADJUSTMENT.

f. When the warmup light goes out, set the high-voltage amplifier Mode to Operate.

g. ADJUST - R2069 (R2569) and R2068 (R2568) for minimum vertical display on the oscilloscope. Display must be less than 20 mV p-p (it will typically be less than 2 mV).

h. CHECK - Set the Frequency control of the function generator to 100 Hz, 1 kHz, 10 kHz, and 100 kHz and confirm that the vertical display does not exceed 6 mV, 14 mV, 141 mV, and 282 mV respectively.

i. If the response is out of specifications, repeat steps g through h.

NOTE

If, for a particular measurement, it is desired to minimize the common-lead signal feedthrough at a particular frequency, it may be done at this time by setting the function generator to the desired frequency and adjusting R2069 (R2569) and R2068 (R2568) for minimum display. This may make the feedthrough exceed specifications at other frequencies and should be corrected when no longer desired.

j. Set the High-Voltage Amplifier to STANDBY and then set all power switches to OFF.

k. Disconnect the test setup.

MAINTENANCE

This section of the manual contains information for conducting preventative maintenance, troubleshooting, and corrective maintenance on your A6902A Isolator.

STATIC-SENSITIVE COMPONENTS

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

PRECAUTIONS

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 kilovolt to 30 kilovolts are common in unprotected environments.

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

1. Minimize handling of static-sensitive components.

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

3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components 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.

5. Keep the component leads shorted together whenever possible.

6. Pick up components by the body, never by the leads.

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:**

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

(Voltage discharged from a 100-pF capacitor through a resistance of 100 ohms.)

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

Preventive maintenance consists of cleaning and visual inspection. Preventive maintenance performed regularly may prevent instrument malfunction and enhance instrument reliability. The severity of the environment in which the instrument is used determines the frequency of maintenance. An appropriate time to accomplish preventive maintenance is just before adjustment.

CLEANING

The A6902A should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket, preventing efficient heat dissipation. It also provides an electrical conduction path that could result in instrument failure, especially under high humidity conditions.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use a nonresidue-type cleaner, preferably isopropyl alcohol. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

WARNING

Water or moisture inside the A6902A can be very hazardous to personnel and damaging to the instrument. To avoid this possibility, use only a MODERATELY DAMP cloth or swab for external cleaning.

Exterior

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

Interior

To clean the interior, blow off dust with dry, low-pressure air. Remove any remaining dust with a soft brush or cloth dampened with a solution of mild detergent and water. Use a cotton swab for cleaning in narrow spaces. Do not use a cotton swab on switch contacts since they tend to snag, possibly causing damage. Strands of cotton caught by the contacts can also cause intermittent electrical contact. If these methods do not remove all the dust or dirt, the instrument may be spray washed using a 5% solution of water and mild detergent as follows:

1. Access the interior parts to be cleaned (refer to "Removal and Replacement Instructions").

2. Remove easily accessible shields and covers.

3. Spray wash and thoroughly rinse the parts.

4. Dry all parts with low-pressure air.

5. Spray all switch contacts with isopropyl alcohol, wait for 60 seconds, and dry with low-velocity air.

6. Dry all components in an oven or compartment using low-temperature (125° or 150° F) circulating air.

VISUAL INSPECTION

CAUTION

Instruments that appear to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and adjustment.

External

Table 6-2 lists external items that should be inspected for damage or wear. Items that could cause injury to personnel or further damage to the instrument should be repaired immediately.

Internal

Inspect the instrument for internal damage or wear as outlined in Table 6-3.

Table 6-2

External Inspection Checklist

Item	Inspect For	Repair Action
Cabinet, front-panel cover, front panel	Cracks, deformations and damaged hardware.	Replace defective parts.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, damaged connectors.	Repair frayed cables and defective parts. Replace damaged or missing items.
Front-panel controls	Missing, damaged, or loose control knobs.	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.
Side pouches	Tears, broken snaps, and broken zippers.	Replace damaged pouch.

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.
Chassis	Dents, deformation, and damaged hardware.	Straighten, repair, or replace defective hardware.
Resistors	Burned, cracked, broken, or blistered.	Replace defective resistors.
Solder connections	Cold solder or rosin joints.	Resolder joint and clean 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.
Capacitors	Damaged or leaking cases. Corroded solder on terminals or leads.	Replace defective capacitors. Clean solder connections and flush with isopropyl alcohol.

TROUBLESHOOTING

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 assist with problem finding. In addition, the technical material and troubleshooting charts located in the "Theory of Operation" and "Diagrams" sections of this manual may be helpful for troubleshooting.

TROUBLESHOOTING AIDS

Schematic Diagrams

Complete schematic diagrams are contained on tabbed foldout pages in the "Diagrams" section. The portions of circuitry that are mounted on each circuit board are enclosed within heavy black lines. Also within the black lines, near either the top or bottom edge, is the assembly number and name of the circuit board.

The component number and electrical value of each component in this instrument are shown on the schematic diagrams. See the first page of the "Diagrams" section for definition of the reference designators and symbols used to identify components.

Troubleshooting Charts

The troubleshooting charts located in the "Diagrams" section may be an aid to quick diagnosis of a problem. Although not intended to be an extensive circuit diagnosis tool, it provides a step-by-step procedure for areas of probable concern.

Circuit Board Illustrations

Circuit board illustrations are provided for use in conjunction with each schematic diagram. These illustrations are found in the "Diagrams" section near the schematic diagram to which it relates.

Each component shown on a schematic diagram is identified on the circuit board illustration by its component number.

Circuit Board Location

The location of each circuit board within the instrument is illustrated in the "Diagrams" section.

Grid Coordinate System

Each schematic diagram and circuit board illustration has a grid border. A table located adjacent to each schematic diagram lists the grid coordinates of each component shown on that diagram. To aid in cross-referencing component location, this table also lists the grid coordinates of the component on the circuit board illustration.

Component Color Coding

Information regarding color codes and markings of resistors and capactiors is located in Figure 9-1 in the "Diagrams" section.

RESISTOR COLOR CODE. Resistors used in this instrument are either composition or precision metal-film resistors. They are color-coded with the EIA color code (some metal-film resistors may have the value printed on the body). The color code is read starting with the stripe nearest the end of the resistor. Composition resistors have four stripes which consist of two significant figures, a multiplier, and a tolerance value. Metal-film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

CAPACITOR MARKINGS. The capacitance values of common disc capacitors and small electrolytics are marked on the side of the component body. White ceramic capacitors are color-coded in picofarads, using a modified EIA code.

The dipped tantalum capacitors are color-coded in microfarads. The color dot indicates the positive lead and the voltage rating.

Since capacitors are easily destroyed by reversed or excessive voltages, be careful to observe the polarity and voltage ratings.

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

Semiconductor Lead Configurations

Figure 9-2 in the Diagrams section shows the lead configurations of semiconductor devices used in the A6902A.

Multi-Connector Holders

Multi-connector holders are keyed with two index triangles, one on the holder and one on the circuit board. Slot numbers are usually molded into the holder. When a connection is made perpendicular to a circuit board surface, ensure that the triangle on the holder and the triangle on the circuit board are aligned pointing toward each other (see Figure 6-1).

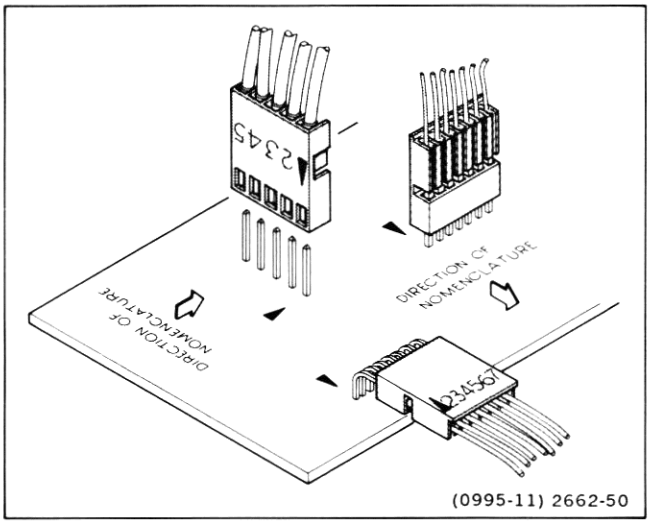


Figure 6-1. Multiconnector holder orientation.

TROUBLESHOOTING EQUIPMENT

CAUTION

Before using any test equipment to make measurements on static-sensitive components or assemblies, be sure that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

The following equipment, or equivalent equipment, may be useful when troubleshooting the A6902A.

Oscilloscope

Description:	Frequency response: dc to 150 MHz. Deflection factor: 5 mV to 5 V/div. A 10X, 10 MΩ probe should be used to reduce circuit loading.
Purpose:	Check waveforms.
Equipment Example:	TEKTRONIX 2235 Oscilloscope.

Digital Multimeter

Description:	Voltmeter: Input impedance of 10 MΩ. Range from 0 to 20 V dc. Accuracy within 0.15%. Display at least 3 1/2 digits. Ohmmeter: Range from 0 to 20 MΩ. The probes should be insulated to prevent accidental shorting.
Purpose:	To measure voltages and resistances.
Equipment Example:	TEKTRONIX DM 501A Digital Multimeter.

Pulse Generator

Description:	Repetition rate: 10 Hz to 1 MHz. Risetime: 1 ns or less. Output amplitude: 0 to 100 V.
Purpose:	Signal source.
Equipment Example:	TEKTRONIX PG506 Calibration Generator

Variable Autotransformer

Description:	Variable ac output from 0 to 140 V, 1.2 A. Equipped with three-wire power cord, plug, and receptacle.
Purpose:	Vary input line voltage when troubleshooting the power supply.
Equipment Example:	General Radio W8MT3VM or W10MT3W Metered Variac Autotransformer.

TROUBLESHOOTING TECHNIQUES

The following checklist is arranged in an order that enables checking simple trouble possibilities before more extensive troubleshooting is required. The first four checks ensure proper control settings, connection, 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.

1. Check Control Settings

Incorrect control settings can give a false indication of an instrument malfunction. If there is any question about the correct function or operation of any control, refer to either the Operating Instructions (Section 2) in this manual or the A6902A Operators Manual.

2. Check Associated Equipment

Before proceeding, ensure that any equipment used with the A6902A is operating correctly. Verify that input signals are properly connected and that the interconnecting cables are not defective. Check the power source voltages.

3. Visual Check

Perform a visual inspection. This check may reveal broken connections, damaged components, semiconductors not firmly mounted, damaged circuit boards, or other clues.

4. Check Instrument Adjustment

Check the adjustment of either the entire instrument, or of the affected circuit, if the trouble exists in one circuit. The apparent trouble may only be a result of misadjustment. Complete adjustment instructions are given in the "Adjustment Procedure" section of this manual.

5. Isolate Trouble to a Circuit

To isolate trouble to a particular circuit note the trouble symptom; the sympton often identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, first check the power supplies, then check the affected circuits by taking voltage and waveform readings (refer to the troubleshooting charts in the "Diagrams" section).

Incorrect operation of all circuits often indicates trouble in the power supplies. Check first for the correct output voltage of the individual supplies. A defective component elsewhere in the instrument can appear as a power-supply trouble and may also affect the operation of other circuits. These voltages are measured between the power-supply test points and ground or circuit return (see the schematic diagrams and circuit board illustrations in the "Diagrams" section for test-point locations). If power-supply voltages and ripple are within the listed ranges, the supply can be assumed to be working correctly. If they are outside the range, the supply may be operating incorrectly. Troubleshoot the supply, replace any defective components, and recheck the supply voltage and ripple.

6. Check Circuit Board Interconnections

After the trouble has been isolated to a particular circuit, again check for loose or broken connections, improperly seated transistors, and heat-damaged components.

7. Check Voltages and Waveforms

Often the defective component can be located by checking for the correct voltage or waveform in the circuit. Typical voltages are listed on the schematic diagrams. Test waveforms are also located near the schematics.

NOTE

Voltages and waveforms given on schematic diagrams are not absolute and may vary slightly between instruments. To obtain operating conditions similar to those used to take these readings, see the voltage and waveform setup procedures in the "Diagrams" section for the preliminary equipment setup. Note the recommended test equipment, front-panel control settings, voltage and waveform conditions, and test equipment cable-connection instructions. Oscilloscope control settings required to obtain the given waveforms and voltages are located next to the waveform diagrams. Changes to the control settings from the preliminary setup, other than those given, are usually not required.

8. Check Individual 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. This isolates the measurement from the effects of surrounding circuitry.

WARNING

To avoid electrical shock, always disconnect the A6902A from the power source before removing or replacing components.

CAUTION

When checking semiconductors, observe the static-sensitivity precautions located at the beginning of this section.

TRANSISTORS. A good check of transistor operation is actual performance under operating conditions. A transistor can be most effectively checked by substituting a new component (or one which has been checked previously). However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions.

When troubleshooting transistors in the circuit with a voltmeter, measure the emitter-to-base and emitter-to-collector voltages to determine whether the voltages are consistent with normal circuit voltages. Voltages across a transistor vary with the type of device and its circuit function. Some of these voltages are predictable. The emitter-to-base voltages of a conducting silicon transistor will normally be from 0.6 to 0.8 volt. The emitter-to-collector voltage of a saturated transistor is about 0.2 volt.

Because these values are small, the best way to check them is by connecting a sensitive voltmeter across the junction rather than by comparing two voltages taken with respect to ground (both leads of the voltmeter must be isolated from ground if this method is used).

If values less than these are obtained, either the device is short-circuited or no current is flowing in the circuit. If values exceed the base-emitter values given, the junction is either back biased or the device is defective. Voltages exceeding those given for typical emitter-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 resistances in series with it; if it is open, no voltage will be developed across resistances in series with it, unless current is being supplied by a parallel path.

When troubleshooting a field-effect transistor, 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. Integrated circuits (IC) can be checked either with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of circuit operation is essential to troubleshooting a circuit having an IC. Use care when checking voltages and waveforms around the IC so that adjacent leads are not shorted together. Typical semiconductor lead configurations are shown in Figure 9-2 in the "Diagrams" section.

CAUTION

When checking diodes, do not use an ohmmeter scale that has a high internal current. High current can damage the diode. Do not measure tunnel diodes with an ohmmeter; use a dynamic tester (such as a TEKTRONIX Type 576 Transistor-Curve Tracer). Checks on diodes can be performed in much the same manner as on transistor emitter-to-base junctions. Silicon diodes should have 0.6 to 0.8 V across the junction when conducting. Higher readings indicate that they are either back biased or defective, depending on polarity.

DIODES. A diode can be checked for an open or a shorted condition by measuring the resistance between terminals with an ohmmeter set on a scale having a low internal source current, such as the R X 1k scale. The diode resistance should be very high in one direction and very low when the meter leads are reversed. Do not check tunnel diodes or back diodes with an ohmmeter.

RESISTORS. Check resistors with an ohmmeter. Refer to the "Replaceable Electrical Parts" for tolerances of resistors used in this instrument. A resistor normally does not require replacement unless its measured value exceeds 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 on the highest scale. Do not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can be detected with a capacitance meter or by checking whether the capacitor passes ac signals.

9. Repair and Readjust the Circuit

If any defective parts are located, follow the replacement procedures given under "Corrective Maintenance" in this section. Check the performance of any circuit that was repaired or that had any electrical component replaced. Readjustment of the affected circuit may be necessary. Refer to the "Performance Check" and "Adjustment Procedure" (sections 4 and 5).

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques and procedures required to replace components in the A6902A are described in this part of the manual. If it is necessary to ship your instrument to a Tektronix Service Center for repair or service, refer to the repackaging instructions at the end of this section.

OBTAINING REPLACEMENT PARTS

Most electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, you should be able to obtain many of the standard electronic components from a local commercial source in your area. Before you purchase or order 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.

In addition to the standard electronic components, some special parts are used in the A6902A. 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 (see "Cross Index-Manufacturers Code Number to Manufacturer" in the Replaceable Electrical Parts" list for code numbers). Most of the mechanical parts 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 in your order to ensure receiving the proper parts.

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include the circuit number).
4. Tektronix part number.

MAINTENANCE AIDS

The maintenance aids listed in Table 6-4 include items required for some of the maintenance procedures in this instrument. Equivalent products may be substituted for the examples given, provided the characteristics are similar.

SOLDERING TECHNIQUES

WARNING

Before soldering, always turn the instrument off and disconnect it from the power source.

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used to remove or replace parts.

Use rosin-core wire solder containing 63% tin and 37% lead. Contact your local Tektronix, Inc. 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 (600° maximum) soldering iron. A higher wattage soldering iron can cause etched circuit conductors to separate from the board base material and melt the insulation on small wires. Always keep the soldering-iron tip prop-

erly tinned to ensure the best heat transfer from the iron tip to the solder joint. To protect heat sensitive components, either hold the component lead with a pair of long-nose pliers, or place a heat block between the component body and the solder joint.

Circuit boards in this instrument have as many as four conductive layers. Conductive paths between the top and bottom board layers may connect one or more of the inner layers. If any inner-layer conductive path becomes broken due to poor soldering practices, the circuit board becomes unusable and must be replaced. Damage of this nature can void the instrument warranty.

Table 6-4

Maintenance Aids

Description	Specifications	Usage	Example
1. Desoldering Tool	No Static Retention.	Unsoldering static-sensitive devices and components.	Soldapullit® AS196.
2. Diagonal Cutters		Disassembly.	Diamond MS54.
3. Nut Driver	3/16, 9/32, 5/16	Assembly and disassembly.	Xcelite® No. 6, 9, and 10.
4. Screwdriver	Magnetic holding.	Assembly and disassembly.	Magna Products 37033-4.
5. Bits, Screwdriver	Posidriv® No. 1 and 2. Torx® No. 9, 10 and 15.	Assembly and disassembly.	Tektronix Part Number: (No. 1) 003-0443-00 (No. 2) 003-0444-00 (No. 9) 003-0965-00 (No. 10) 003-0814-00 (No. 15) 003-0966-00
6. Screwdriver	1/8-inch flat bit.	Assembly and disassembly.	Xcelite® R-182
7. Soldering Iron	15 Watt (600° max.).	General soldering.	Weller Model WTCPN (Tip: PTA6)
8. Open-end Wrench	1/2-inch.	Assembly and disassembly.	
9. Isopropyl Alcohol		Cleaning.	

Desoldering and removing parts from multilayer circuit boards is especially critical and should be done only with a vacuum-type solder extractor. Many of the integrated circuits are static sensitive and can be damaged by a static charge that may be generated by some types of solder extractors. Use only an antistatic vacuum-type of solder extractor approved by a Tektronix, Inc. Service Center for work involving static-sensitive devices.

CAUTION

Attempts to unsolder, remove and resolder leads from the component side of the circuit board may cause damage to the reverse side of the circuit board.

CAUTION

Follow precautions for static-sensitive components. Be sure that voltage or current supplied by equipment or tools does not exceed component limits.

The following technique should be used to replace a component on any of the circuit boards:

1. Touch the vacuum desoldering tool to the lead at the solder connection. Never place the iron directly on the board; doing this may damage the board.

NOTE

Some components are difficult to remove from the circuit board due to a bend placed in each lead during machine insertion of the component. The purpose of the bent leads is to hold the component in position during a flow-solder manufacturing process that solders all the components at once. To make removal of machine-inserted components easier, straighten the component leads on the reverse side of the circuit board with a small screwdriver or pliers. It may be necessary to remove the circuit board to gain access to the component leads on the reverse side of the circuit boards. Circuit-board removal and reinstallation procedures are discussed later in this section.

2. When removing a multipin component, especially an IC, 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.

CAUTION

Excessive heat can cause the etched circuit conductors to separate from the circuit board. Never allow the solder extractor tip to remain in one place on the board for more than three seconds. Solder wick, spring-actuated or squeeze-bulb solder suckers, and heat blocks (for desoldering multipin components) must not be used. 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 only just protrude 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.

CAUTION

Do not allow solder or solder flux to flow beneath etched circuit board switches. The etched switch contacts on the circuit board are an integral part of the switch, and intermittent operation can occur if the contacts become contaminated.

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 leads protruding through the circuit board (if not clipped to size 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.

If it becomes necessary to solder in the general area of any of the high-frequency contacts in the instrument, clean the contacts immediately upon completion of the soldering.

REMOVAL AND REPLACEMENT INSTRUCTIONS

WARNING

To avoid electric shock, disconnect the instrument from the power source before removing or replacing any component or assembly.

Read these instructions completely and carefully before attempting any corrective maintenance.

These instructions are for disassembly only. To reassemble, reverse the procedures as given.

Front Panel Lid

To remove the Front Panel Lid, proceed as follows (Refer to Figure 6-2):

1. Press in the two Latch-Releasing Buttons on the Front Panel Lid and swing the lid open.

2. Use a 1/8-inch flat-blade screwdriver to carefully pry the four hinge corner tabs up and out of their locking recesses.

3. Pull the lid away from the hinge center tabs.

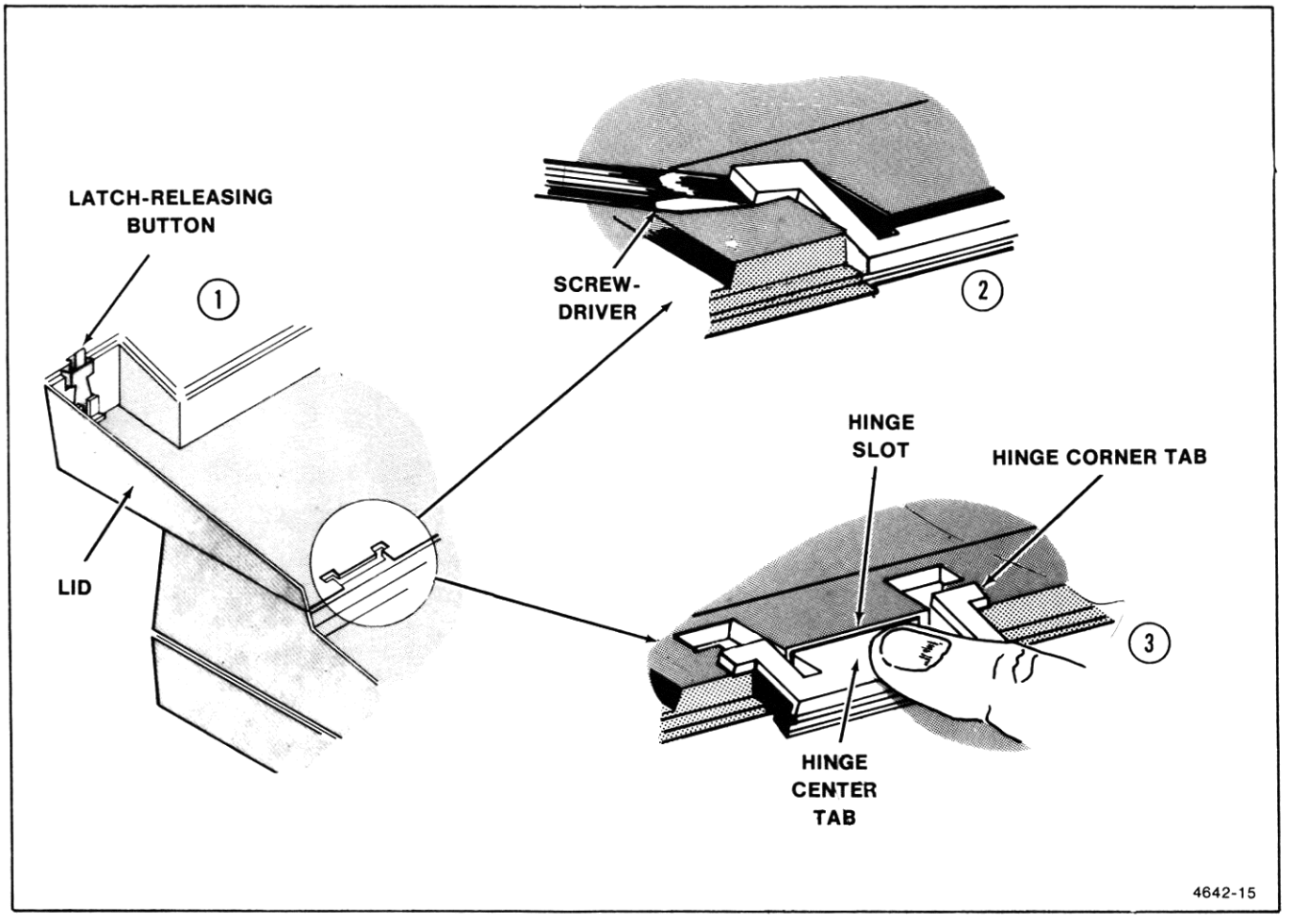


Figure 6-2. Front panel lid removal.

Side Pouches and Top Cabinet Half

To remove the Side Pouches and Top Cabinet Half (including the Front Panel Lid), proceed as follows (refer to Figure 6-3):

1. Disconnect and remove the Probes. Unsnap the four snap fasteners on each Pouch (located at each end of the Pouch near the top and bottom edges). Carefully pull the Pouch away from the cabinet until free of the input probe lead.

2. Place the A6902A on its feet as shown in Figure 6-3 and remove six Torx® screws as shown.

3. Return the A6902A to a horizontal position and lift the Top Cabinet Half from the instrument.

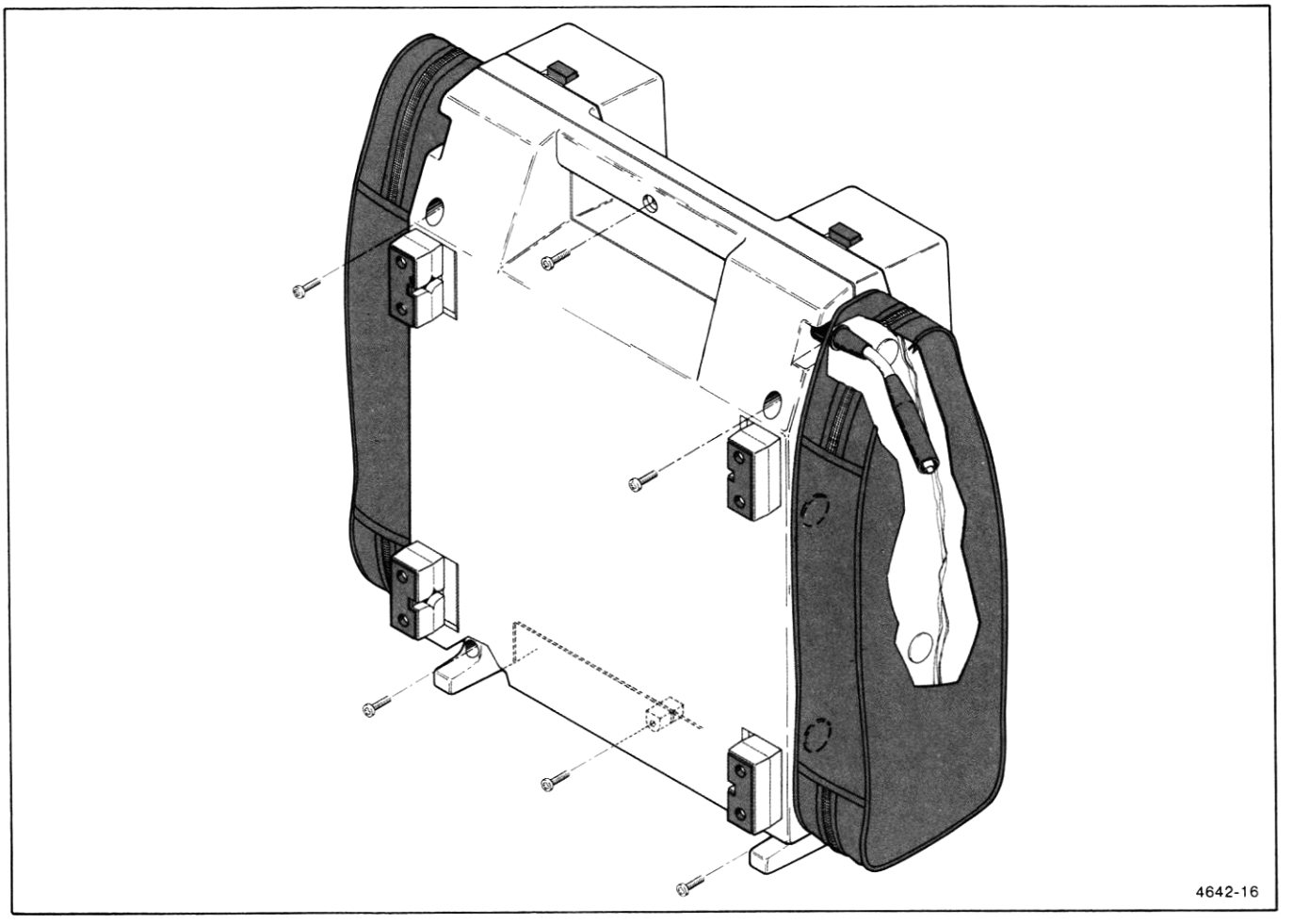


Figure 6-3. Top cabinet half removal.

Top Main Shield and Front Panel

NOTE

The Front Panel is a permanent part of the Top Main Shield and is not separately customer-available or replaceable.

To remove the Top Main Shield/Front Panel assembly, proceed as follows (refer to Figure 6-4):

1. Remove the Top Cabinet Half (see above).

2. Remove the two VOLTS/DIV knobs by gently pulling them away from the Front Panel.

3. Loosen the two Torx® screws (labeled "A") on each side of the Bottom Main Shield.

4. Remove the six Posidriv® screws (labeled "B") from around the perimeter of the top of the Front Panel, partially lift the panel and disconnect the indicator lamp, then lift the shield clear of the instrument. (During reassembly, make certain that all control shafts are properly located before attempting to seat the Main Shield/Front Panel Assembly.)

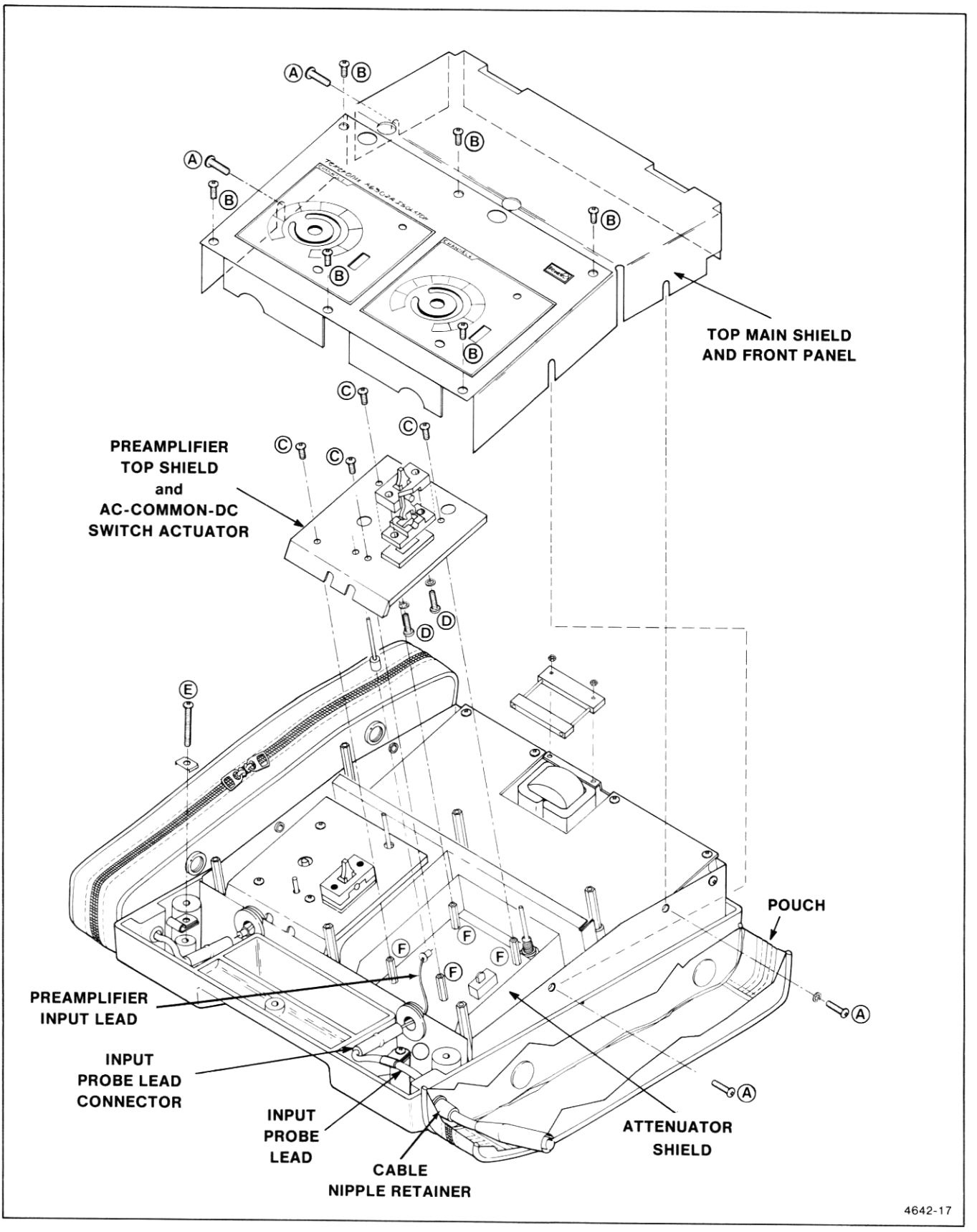


Figure 6-4. Removal of shield and preamplifier assembly.

Preamplifier Top Shield and AC-COMMON-DC Switch Actuator

1. The Preamplifier Top Shield can be removed by removing the four screws (labeled "C", Figure 6-4) from the top of the shield.

2. The AC-COMMON-DC Switch Actuator Assembly can be removed by removing the two black plastic screws and associated lock washers (Figure 6-4, labeled "D"), and lifting the Actuator Assembly from the cover.

Input Probe/Preamplifier Input Leads

1. Remove the Probe, Pouch, Top Cabinet Half, Top Main Shield and the appropriate Preamplifier Top Shield (see instructions above).

2. Remove the Torx® screw and the cable clamp (Figure 6-4, labeled "E"). Note the position of the cable clamp as reference for reinstallation.

3. Carefully disconnect the Preamplifier Input Lead from the Preamplifier Circuit Board by gently pulling straight up.

4. Thread the Preamplifier Input Lead with small rubber grommet through the large shield and grommet (during reinstallation, make certain that the grommets are properly installed to prevent damage to the cable assembly).

5. Firmly grasp the Cable Nipple Retainer (through which the lead assembly passes) and pull it through until it disengages from the cabinet half.

6. Separate the Input Probe Lead from the Preamplifier Input Lead by pulling them straight away from each other.

Preamplifier Circuit Board and Rotary-Switch Assembly

The Preamplifier Circuit Boards, including a Rotary-Switch Assembly on each board, are mounted on the Main Circuit Board, and can be removed independent of the Main Circuit Board, (if removal of the Main Circuit Board becomes necessary, the removal procedure appears later in this section).

To remove the Preamplifier Circuit Board Assembly:

1. Remove the Top Cabinet Half, Top Main Shield and the Preamplifier Top Shield.

2. Remove the four hexagonal stand-off posts (Figure 6-4, labeled "F"). (During reinstallation, torque the stand-off posts to 4 inch-pounds maximum.)

3. Remove the Preamplifier Circuit Board from the Main Circuit Board by carefully pulling straight up. (During reassembly, make certain that the long square-pins are properly aligned before attempting to seat the Preamplifier Circuit Board.)

To remove the Rotary Switch Assembly from the Preamplifier Circuit Board, proceed as follows:

NOTE

There are three sets of electrical contacts that mate with the circuit boards (one on each side of the Preamplifier Circuit Board and one on the Switch Board). There are also other small parts such as housings, the Detent Roller and Spring, and push-on nuts. While disassembling the Rotary Switch, exercise care not to drop, lose or damage any parts. Note the position of all parts as reference to reassembly.

4. Use diagonal cutters (WITH CAUTION TO AVOID CUTTING OFF THE SWITCH MOUNTING POST), or a similar tool to carefully pry off the three plastic push-on nuts which hold the Bottom Housing to the Switch Circuit Board (Figure 6-5).

5. Gently remove the Bottom Housing and Bottom Contact Rotor, Switch Circuit Board, and the Middle Housing and Middle Contact Rotor.

6. Note the position of the Top Housing relative to the top of the Preamplifier Circuit Board (for reference during reassembly), and carefully remove the Top Housing, Top Rotor, and the Rotary Shaft from the Preamplifier Circuit Board.

7. Set aside the Detent Roller and remove the Detent Spring from the Top Housing. (The Detent Roller and the Detent Spring should be replaced only AFTER the switch assembly is reassembled and remounted on the Preamplifier board. Check and make certain of the proper position of the Rotary Shaft (shaft flat facing the Preamplifier Circuit Board top), Top Contact Rotor, and the Middle and Bottom Contact Rotors before reinstallation of the Detent Roller and Spring.) Clean the Switch Circuit Board and rotor contact areas on the Preamplifier Switch Board with isopropyl alcohol before reassembly.

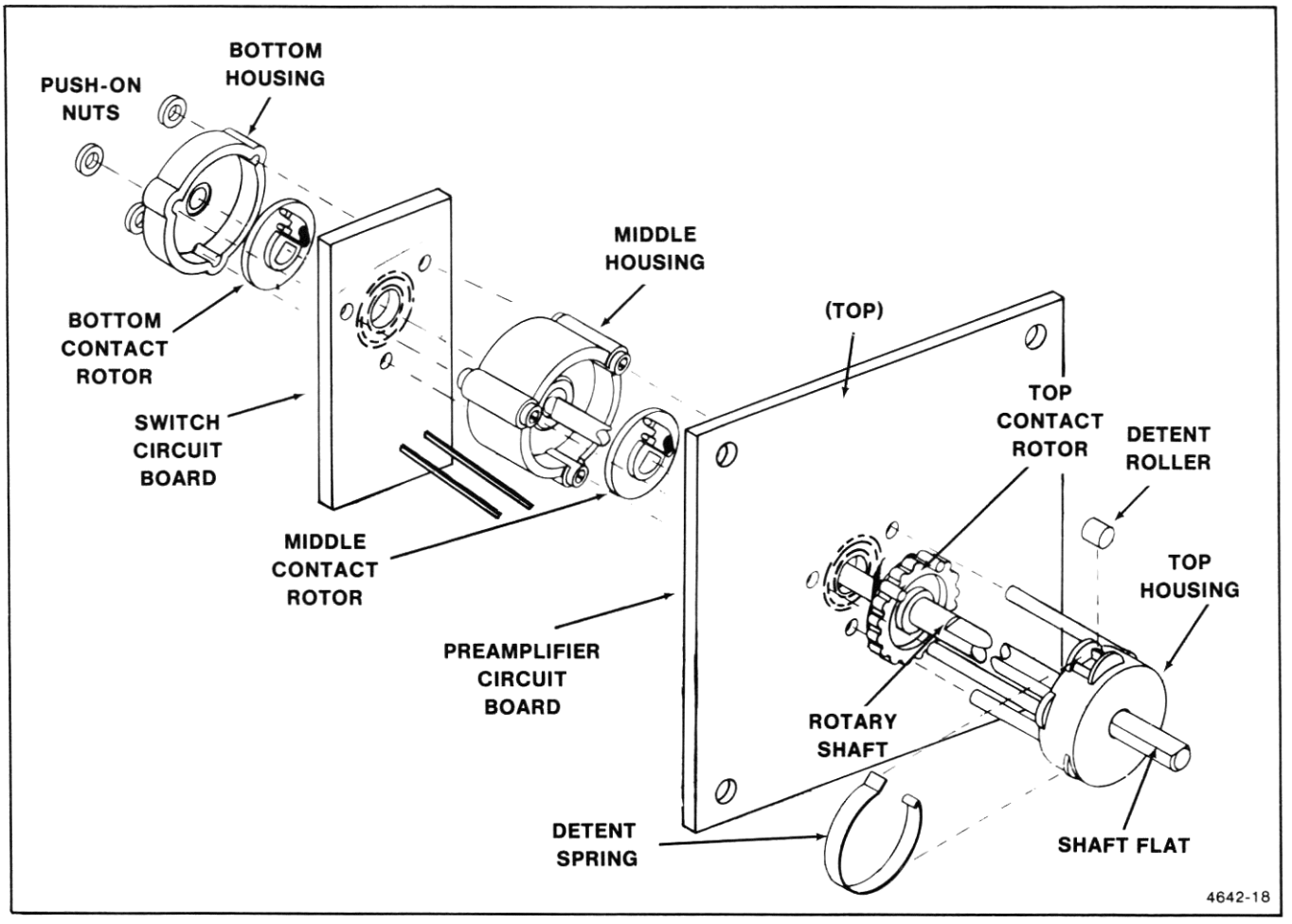


Figure 6-5. Preamplifier rotary switch assembly.

Main Circuit-Board/Rear Panel and Transformer Assembly

The Main Circuit Board/Rear Panel and Transformer Assembly may be removed as a single unit (including Preamplifier Circuit Boards and Rotary Switch Assemblies), and can make bench-top trouble shooting more efficient. After removing the assembly, the power cord can be connected and the unit operated on an insulated surface. BEFORE ANY FURTHER DISASSEMBLY, MAKE CERTAIN THAT THE POWER IS DISCONNECTED FROM THE MAIN CIRCUIT-BOARD/ REAR PANEL ASSEMBLY!

WARNING

To prevent electric shock when the Main circuit-board assembly is removed from the instrument cabinet, ensure that the Main circuit-board assembly is placed on a safely insulated surface before connecting the input power source.

To remove the Main Circuit-Board Assembly:

1. Remove the Top Cabinet Half and the Top Main Shield (see the above procedures. Should it become necessary to remove other parts or assemblies, refer to the appropriate procedure).

2. Disconnect the Preamplifier Input Leads from the Input Probe Leads by gently pulling them straight away from each other (refer to Figure 6-4).

3. Remove the six screws; two Torx® screws on the Main Circuit-Board, and two Posidriv® screws each on the side panel and rear panel (labeled "A" in Figure 6-6).

4. Remove the six hexagonal spacers (labeled "B" in Figure 6-6) using a 9/32-inch nut driver or wrench. During reinstallation, torque the spacers to 4 inch-pounds maximum.

5. Grasp the Top Transformer Clamp and lift the Main Circuit-Board/Back Panel Assembly from the Bottom Main Shield, taking care not to damage connectors, panels or other components.

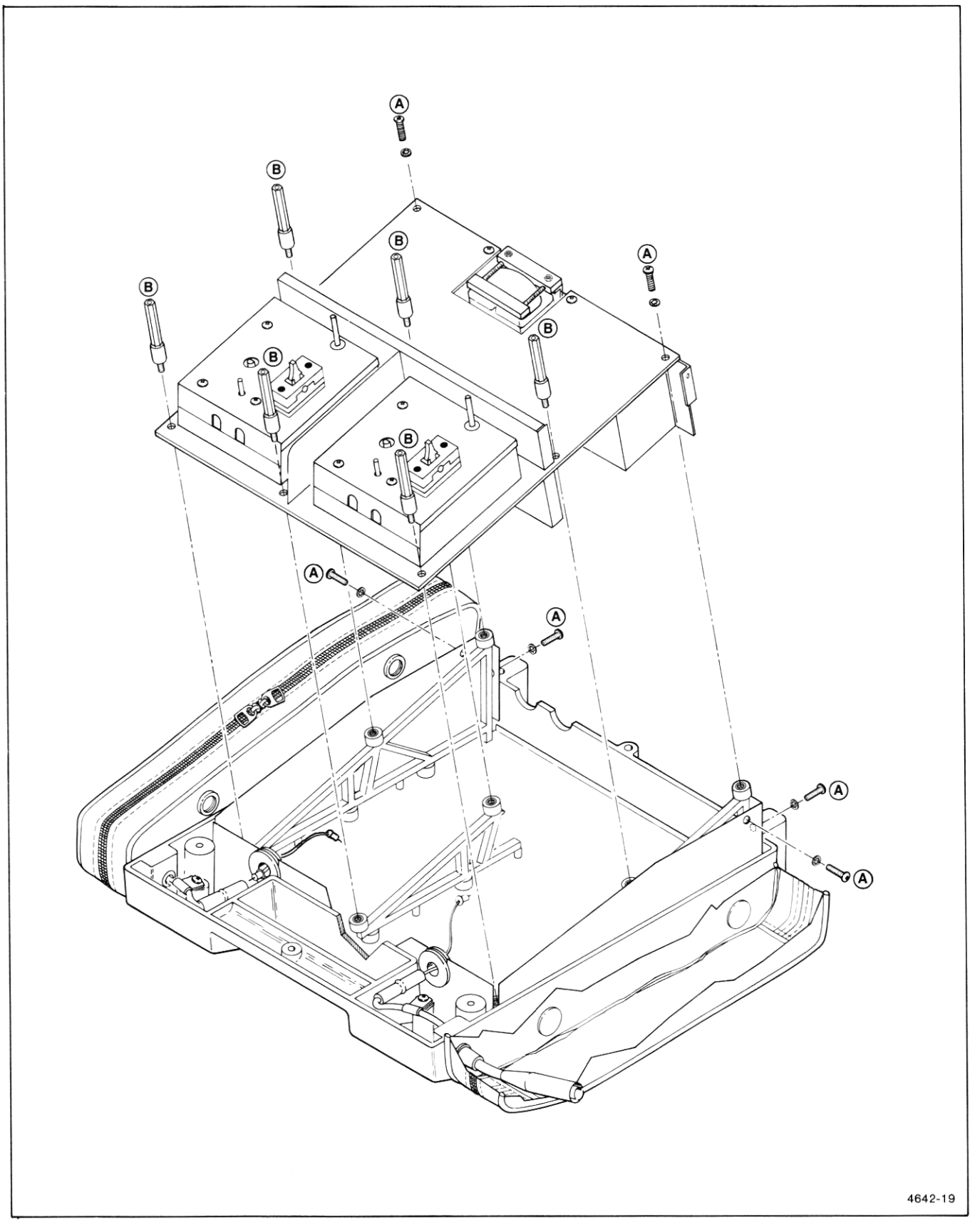


Figure 6-6. Removal of main circuit board/back subpanel assembly.

Preamplifier Section Bottom Covers

The Preamplifier Section Bottom Shields are part of the Main Circuit-Board Assembly. No components are located under these covers. If it becomes necessary to remove these shields to access transformer connections or connections of components mounted to the top of the Main Circuit Board, the four Posidriv® screws holding each cover (not illustrated), are accessible after removing the Main Circuit-Board Assembly (see the above procedure).

Rear Panel Assembly

The Rear Panel Assembly is a subpart of the Main Circuit-Board Assembly. The procedures for disassembly of the Rear Panel and its components assumes that the above procedure for the Main Circuit-Board removal has been followed. As in the above procedures, reinstallation and assembly can be achieved by reversing the disassembly steps.

To separate the Rear Panel Assembly from the Main Circuit-Board:

1. Remove the two Posidriv® self-tapping screws (labeled "A" in Figure 6-7).

2. For access to the Rear Panel components, disconnect the shortest blue Peltola Cable (2.5-inches) from the Main Circuit-Board to the Rear Panel BNC connector, and rotate the Panel and components 90°.

To remove a defective Power Rocker-Switch or Fuse Holder/Line Selector Module:

3. Remove the four Torx® screws and carefully lift the Power Module Shield (labeled "B", Figure 6-7) straight up and clear of the wiring.

NOTE

Carefully note the position of all wires to be unsoldered to insure that they are properly located during reinstallation. Failure to do so may cause serious damage to the A6902A (refer to Figure 6-8 during reinstallation).

4. Carefully unsolder the leads from ONLY the component to be replaced.

5. The Power Switch may be removed from the Back Panel by removing two Torx® screws. The Fuse Holder/Line Selector Module may removed by pressing the four retainers on the side of the module toward the module body while pushing the module through toward the front of the Back Panel.

To remove the transformer:

6. Carefully note the position of all transformer leads for use during reassembly.

7. Carefully unsolder the wires to each Preamplifier section and to the Fuse Holder/Line Selector Module and Power Switch.

8. Loosen the two long Posi-Drive-head screws which tighten and hold the lower Transformer Clamp to the Back Panel.

9. Loosen the two long Posi-Drive-head screws which tighten the upper Transformer Bracket.

10. Remove the two Keps-Nuts which hold the upper Transformer Bracket to the top of the Back Panel.

11. Remove the upper Transformer Clamp and the Transformer.

To remove a BNC Output Connector (procedure applies to both):

12. Disconnect the coaxial lead from the connector by carefully pulling it straight out of the threaded end.

13. Use a 1/2-inch wrench to remove the retaining nut.

14. Pull the BNC connector out of the Rear Panel Retainer and solder lug.

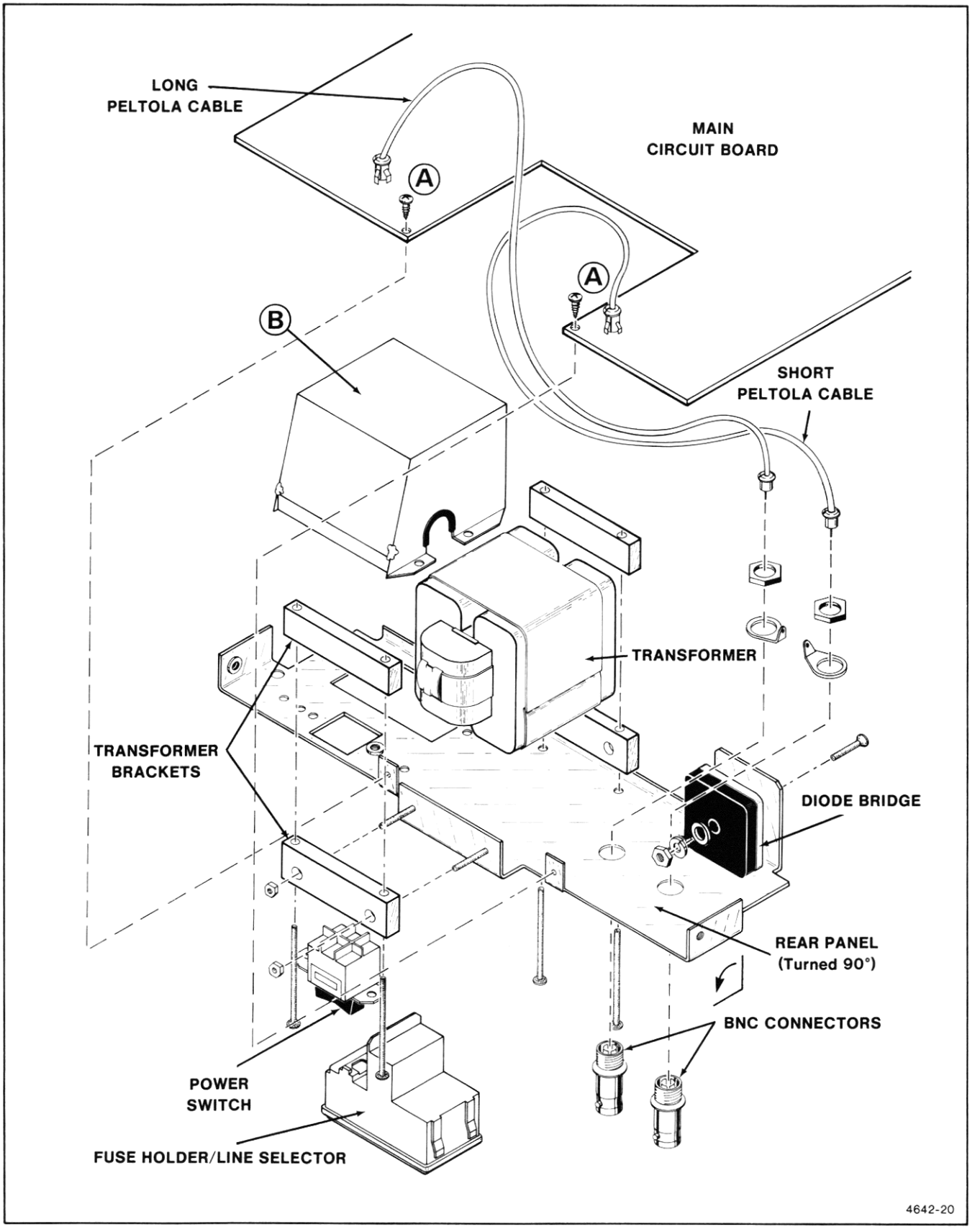


Figure 6-7. Rear subpanel disassembly.

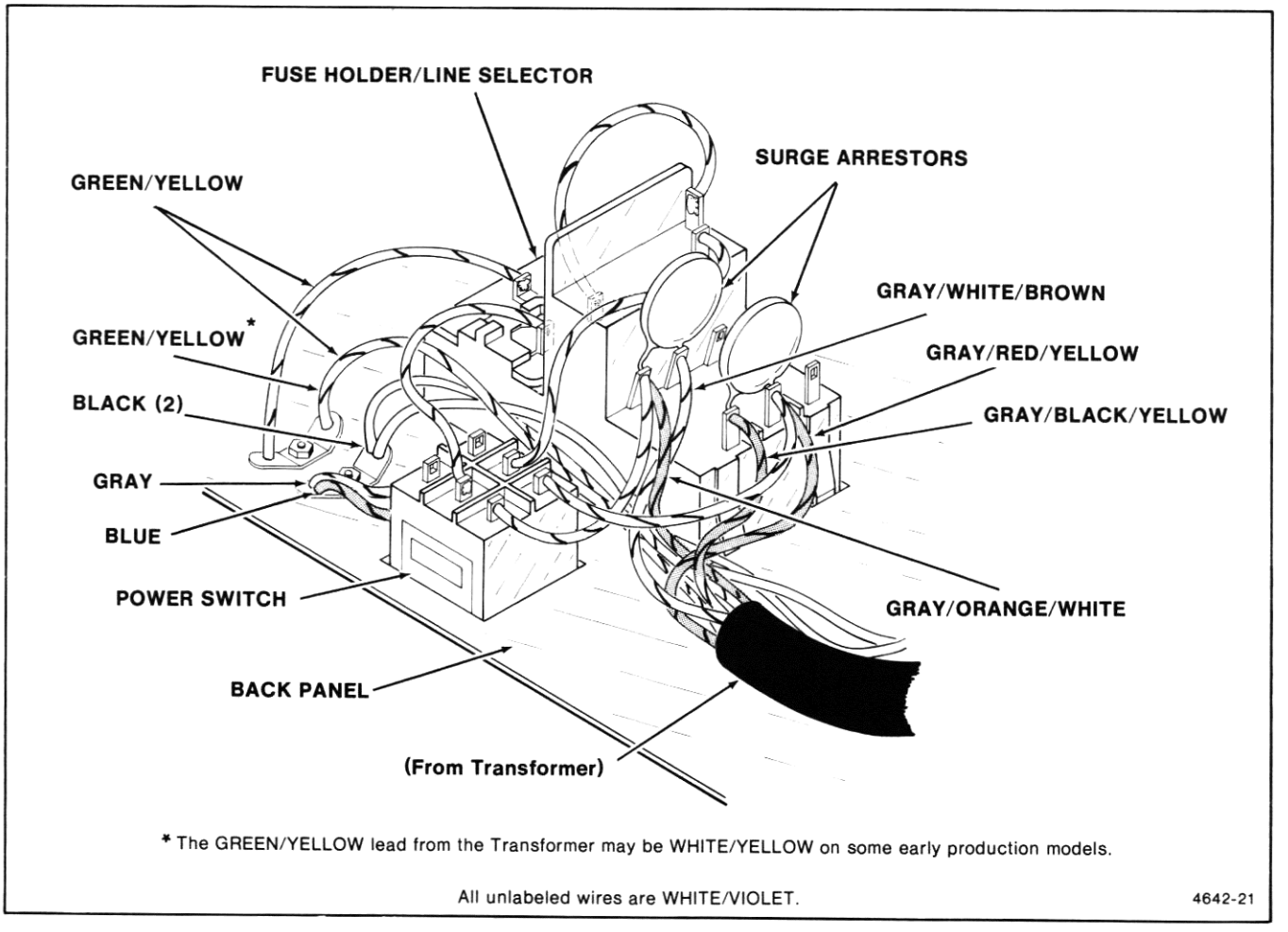


Figure 6-8. Power module wiring detail.

Bottom Main Shield and Circuit Board Brackets

To remove the Bottom Main Shield:

1. Remove the 7 Torx® screws and 1 Posidrive® screw which hold the Bottom Main Shield to the Lower Body Half.

2. Lift the Bottom Main Shield straight up and out of the Lower Body Half.

To remove the Circuit Board Brackets:

3. Remove the Torx® screws (which hold each Circuit Board Bracket), from the bottom of the Bottom Main Shield.

4. Remove each bracket by pushing the guide pins through the bottom of the Bottom Main Shield.

1500-V Input Probe Tip and Special BNC-to-Probe-Tip Adapter

The 1500-V Input Probe tip may be replaced either with a new tip or with the special BNC-to-probe-tip adapter, which should be used ONLY for testing and adjustment. Refer to Figure 6-9 and perform the following steps:

WARNING

The special BNC-to-probe-tip adapter is designed to fit only the 1500-V Input Probe bodies and should be used only when testing or adjusting the A6902A. To prevent an electrical shock hazard and equipment damage, do not use the adapter with voltages greater than 500 V (dc + peak ac).

1. Loosen the collar by rotating it in the direction shown until it disengages from the probe body.

2. Retract the slide to the position shown in Figure 6-9. The slide should stay in this position, and the spring inside the probe tip should cause the probe tip to return to its original position. If this does not occur, hold the slide in the retracted position and pull the probe tip away from the probe body until it reaches its original position.

3. Hold the probe body with one hand and rotate the probe tip in the direction shown until the probe tip completely disengages from the probe body. Proceed to step 4 if a new probe tip is to be installed; proceed to step 9 if the special BNC-to-probe-tip adapter is to be installed.

4. To install a new probe tip, hold the probe body, with the slide in the retracted position, and insert the new probe tip into the body as far as it will easily go.

5. Thread the probe tip onto the probe body until it seats snugly.

6. Move the slide completely forward and verify that there is approximately 1/8-inch clearance between the indexing guides on the probe tip shaft and the threaded portion of the probe body. If necessary, loosen the probe tip to achieve correct clearance.

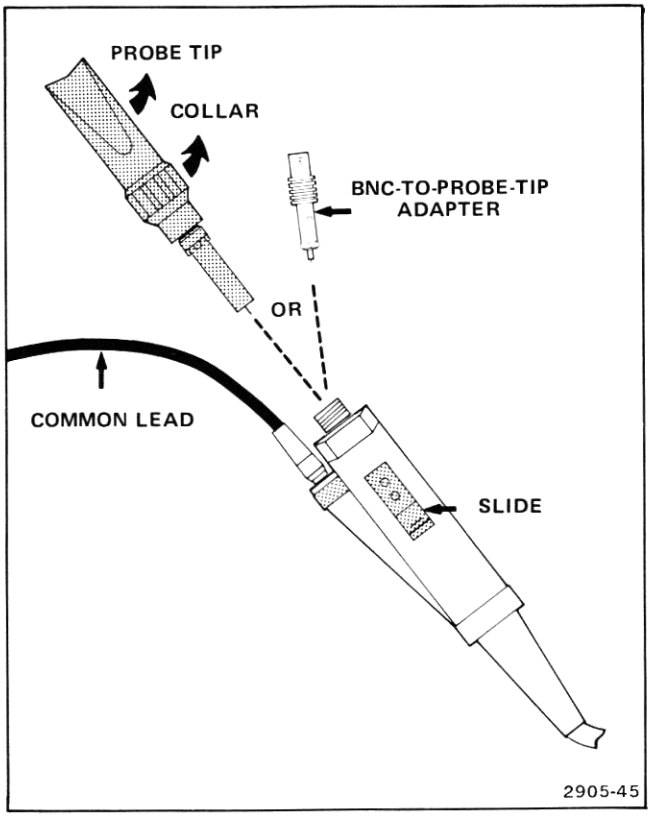


Figure 6-9. 1500-V probe tip adapter.

7. While holding the slide in the forward position, align the indexing guides (on the probe tip) with the guide slots (in the probe body) for the desired angular relationship. Press the probe tip into the probe body until the indexing guides completely engage the guide slots.

8. Thread the collar onto the probe body until the collar is snugly seated.

9. To install the special BNC-to-probe-tip adapter, hold the slide in the retracted position and insert the adapter into the probe body.

10. While holding the probe body with one hand and the BNC-to-probe-tip adapter in the other, move the slide completely forward, engaging the adapter and leaving only the ribbed area and the BNC connector part of the adapter exposed.

To remove the special adapter, use the following steps:

11. While holding the probe body with one hand and the bnc-to-probe-tip adapter in the other, retract and hold the slide to the position shown in Figure 6-9.

12. Pull the adapter from the probe body.

INSTRUMENT REPACKAGING

Should reshipment become necessary, reuse the original carton in which your instrument was shipped. If original packaging is unfit for use or is not available, repackage the instrument as follows:

1. Obtain a corrugated cardboard carton having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Use a carton having a test strength of at least 200 pounds.

2. If the instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag containing the following information:

a. Owner's name and address, with the name of an individual at your firm that can be contacted.

b. Complete instrument serial number.

c. Description of the services required.

3. Surround the instrument with protective polyethylene sheeting.

4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.

5. Seal carton with shipping tape or industrial stapler.

OPTIONS

Your instrument may be equipped with one or more options. A brief description of each option is given below. For further information on instrument options, see your Tektronix Catalog or contact your Tektronix Field Office.

POWER CORD OPTIONS

Descriptions of the various power cord options may be found in Figure 2-1.

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.

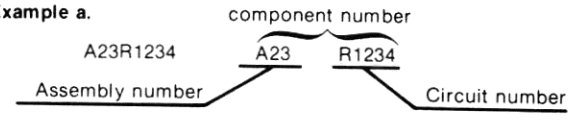
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

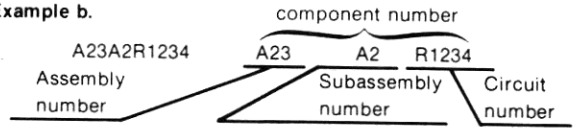
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



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
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC. SEMICONDUCTOR GROUP	P.O. BOX 5012	DALLAS, TX 75222
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
03911	CLAIREX ELECTRONICS, DIVISION OF CLAIREX CORPORATION	560 S THIRD AVENUE	MT. VERNON, NY 10050
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600,600 W. JOHN ST.	HICKSVILLE, NY 11802
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
51406	MURATA CORPORATION OF AMERICA	2 WESTCHESTER PLAZA	ELMSFORD, NY 10523
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
57668	R-OHM CORP.	16931 MILLIKEN AVE.	IRVINE, CA 92713
59660	TUSONIX INC.	2155 N FORBES BLVD	TUCSON, AZ 85705
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
73899	JFD ELECTRONICS COMPONENTS CORP.	PINETREE ROAD	OXFORD, NC 27565
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
79727	C-W INDUSTRIES	550 DAVISVILLE RD.,P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80031	ELECTRA-MIDLAND CORP., MEPCO DIV.	22 COLUMBIA ROAD	MORRISTOWN, NJ 07960
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
T0510	PANASONIC COMPANY DIVISION OF MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY	SECAUCUS, NJ 07094

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	672-0083-XX			CKT BOARD ASSY:SWITCH 670-8277-XX		
A1	----- -----			AND 670-2909-XX		
A1A1	----- -----			CKT BOARD ASSY:PREAMPLIFIER		
A1A1	----- -----			(AVAIL AT 672-0083-XX ONLY.TWO PER INSTR)		
A1A1C1030	283-0363-00			CAP.,FXD,CER DI:2.2PF,0.25%,2KV	72982	838-000C0K229C
A1A1C2010	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A1A1C2030	283-0186-00			CAP.,FXD,CER DI:27PF,5%,50V	59660	811A058C0G0270J
A1A1C2040	281-0178-00			CAP.,VAR,PLSTC:1-3.5PF,500V	80031	2805D013R5BH02F0
A1A1C2041	281-0178-00			CAP.,VAR,PLSTC:1-3.5PF,500V	80031	2805D013R5BH02F0
A1A1C3010	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A1A1C3011	281-0893-00			CAP.,FXD,CER DI:4.7PF,+/-0.5PF,100V	04222	MA101A4R7DAA
A1A1C3020	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A1A1C3031	281-0187-00			CAP.,VAR,PLSTC:4-40PF,250V	72982	538-011D9-45
A1A1C3040	281-0178-00			CAP.,VAR,PLSTC:1-3.5PF,500V	80031	2805D013R5BH02F0
A1A1C4011	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A1A1C4030	283-0187-00			CAP.,FXD,CER DI:0.047UF,10%,400V	72982	8131N401X5R0473K
A1A1C4032	283-0331-00			CAP.,FXD,CER DI:43PF,2%,100V	59660	0805536C0G0-430G
A1A1C4040	285-0697-00			CAP.,FXD,PLSTC:	80009	285-0697-00
A1A1CR2010	152-0323-01			SEMICOND DEVICE:SILICON,35V,0.1A	03508	DE101
A1A1J3020	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A1A1J4030	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1A1J4031	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A1A1P1010	131-0592-00			CONTACT,ELEC:0.885 INCH LONG	22526	47353
A1A1P1040	131-0592-00			CONTACT,ELEC:0.885 INCH LONG	22526	47353
A1A1Q3010	151-0190-02			TRANSISTOR:SILICON,NPN	04713	SM7706
A1A1R1030	311-1555-00			RES.,VAR,NONWIR:TRMR,100K OHM,0.5W	32997	3352T-1-104
A1A1R2020	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1A1R2022	321-0751-06			RES.,FXD,FILM:50 OHM,0.25%,0.125W	91637	CMF55116C50RR00C
A1A1R2023	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A1A1R2030	321-0808-07			RES.,FXD,FILM:300 OHM,0.1%,0.125W	24546	NE55E3000B
A1A1R2031	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A1A1R2045	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1A1R3010	321-0030-00			RES.,FXD,FILM:20 OHM,1%,0.125W	91637	CMF55116G20R00F
A1A1R3011	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A1A1R3020	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1A1R3021	321-0143-00			RES.,FXD,FILM:301 OHM,1%,0.125W	91637	MFF1816G301R0F
A1A1R3030	307-0307-01			NTWK,HYB CKT:	80009	307-0307-01
A1A1R3040	311-1567-00			RES.,VAR,NONWIR:TRMR,100 OHM,0.50W	73138	91-89-0
A1A1R3043	301-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.5W	57668	R50J 120 OHM
A1A1R4010	311-1639-00			RES.,VAR,NONWW:TRMR,20OHM,10%,0.5W	32997	3299W
A1A1R4011	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A1A1R4012	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	57668	NTR25J-E330E
A1A1R4020	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A1A1R4021	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A1A1R4022	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A1A1R4030	321-0080-00			RES.,FXD,FILM:66.5 OHM,1%,0.125W	91637	MFF1816G66R50F
A1A1R4031	321-0751-06			RES.,FXD,FILM:50 OHM,0.25%,0.125W	91637	CMF55116C50RR00C
A1A1R4032	321-0282-00			RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
A1A1S2040	260-0984-01			SWITCH,SLIDE:DP3T W/PLASTIC PLATE	79727	G128 S 0034
A1A1TP1040	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A1A1TP1041	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A1A1U4020	156-1294-00			MICROCIRCUIT,LI:FIVE NPN TRANSISTOR ARRAY	02735	CA3127E-98

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2	670-7806-01			CKT BOARD ASSY:MAIN		
A2C2031	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2117	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2133	283-0210-00			CAP.,FXD,CER DI:0.0056UF,20%,50V	56289	273C9
A2C2134	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2138	290-0919-00			CAP.,FXD,ELCTLT:470UF,+50-10%,35V	T0510	ECEA1BB471SC
A2C2149	283-0291-00			CAP.,FXD,CER DI:25PF,10%,6000V	51406	DHR23NPO25OKGKV
A2C2161	283-0100-00			CAP.,FXD,CER DI:0.0047UF,10%,200V	56289	2C20C0G472K200B
A2C2165	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2175	285-0901-00			CAP.,FXD,PLSTC:0.047UF,5%,50V	56289	LP66A1AA73J
A2C2178	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2188	281-0158-00			CAP.,VAR,CER D1:7-45PF,25V	73899	DVJ-5006
A2C2195	283-0363-00			CAP.,FXD,CER DI:2.2PF,0.25%,2KV	72982	838-000C0K229C
A2C2213	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2214	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2233	290-0929-00			CAP.,FXD,ELCTLT:6600UF,+100-10%,12V	56289	674D668H012JL5A
A2C2241	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2278	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2287	290-0524-00			CAP.,FXD,ELCTLT:4.7UF,20%,10V	90201	TDC475M010EL
A2C2317	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2327	290-0134-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	150D226X0015B2
A2C2334	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2358	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2417	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2421	290-0134-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	150D226X0015B2
A2C2430	283-0197-00			CAP.,FXD,CER DI:470PF,5%,100V	72982	8121N075C0G0471J
A2C2531	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2617	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2633	283-0210-00			CAP.,FXD,CER DI:0.0056UF,20%,50V	56289	273C9
A2C2634	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2638	290-0919-00			CAP.,FXD,ELCTLT:470UF,+50-10%,35V	T0510	ECEA1BB471SC
A2C2649	283-0291-00			CAP.,FXD,CER DI:25PF,10%,6000V	51406	DHR23NPO25OKGKV
A2C2661	283-0100-00			CAP.,FXD,CER DI:0.0047UF,10%,200V	56289	2C20C0G472K200B
A2C2665	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2675	285-0901-00			CAP.,FXD,PLSTC:0.047UF,5%,50V	56289	LP66A1AA73J
A2C2678	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2688	281-0158-00			CAP.,VAR,CER D1:7-45PF,25V	73899	DVJ-5006
A2C2695	283-0363-00			CAP.,FXD,CER DI:2.2PF,0.25%,2KV	72982	838-000C0K229C
A2C2713	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2714	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2733	290-0919-00			CAP.,FXD,ELCTLT:470UF,+50-10%,35V	T0510	ECEA1BB471SC
A2C2741	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2778	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2787	290-0524-00			CAP.,FXD,ELCTLT:4.7UF,20%,10V	90201	TDC475M010EL
A2C2817	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2827	290-0134-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	150D226X0015B2
A2C2834	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2879	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2889	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2917	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	04222	5R305SE474MAA
A2C2921	290-0134-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	150D226X0015B2
A2C2930	283-0197-00			CAP.,FXD,CER DI:470PF,5%,100V	72982	8121N075C0G0471J
A2C2977	290-0919-00			CAP.,FXD,ELCTLT:470UF,+50-10%,35V	T0510	ECEA1BB471SC
A2C2981	290-0919-00			CAP.,FXD,ELCTLT:470UF,+50-10%,35V	T0510	ECEA1BB471SC

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2CR1	152-0713-00			SEMICOND DEVICE:RECT BRIDGE,SI,400V,35A	04713	SDA10388K
A2CR2243	152-0585-00			SEMICOND DEVICE:SILICON,BRIDGE,200V,1A	14936	W02M-30
A2CR2743	152-0585-00			SEMICOND DEVICE:SILICON,BRIDGE,200V,1A	14936	W02M-30
A2CR2993	152-0585-00			SEMICOND DEVICE:SILICON,BRIDGE,200V,1A	14936	W02M-30
A2J2131	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2132	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2280	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A2J2331	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2332	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2631	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2632	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2780	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A2J2831	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2J2832	136-0263-04			SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
A2L2284	114-0222-00			COIL,RF:2-6UH,CORE 276-0568-00	80009	114-0222-00
A2L2441	114-0343-00			COIL,RF:200-400UH,CORE 276-0568-00	80009	114-0343-00
A2L2784	114-0222-00			COIL,RF:2-6UH,CORE 276-0568-00	80009	114-0222-00
A2L2941	114-0343-00			COIL,RF:200-400UH,CORE 276-0568-00	80009	114-0343-00
A2P2215	131-0592-00			CONTACT,ELEC:0.885 INCH LONG	22526	47353
A2P2715	131-0592-00			CONTACT,ELEC:0.885 INCH LONG	22526	47353
A2P2893	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2Q2138	151-0190-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS7969
A2Q2292	151-0190-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS7969
A2Q2334	151-0447-00			TRANSISTOR:SILICON,NPN	04713	SRF502-1
A2Q2335	151-0447-00			TRANSISTOR:SILICON,NPN	04713	SRF502-1
A2Q2638	151-0190-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS7969
A2Q2792	151-0190-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS7969
A2Q2834	151-0447-00			TRANSISTOR:SILICON,NPN	04713	SRF502-1
A2Q2835	151-0447-00			TRANSISTOR:SILICON,NPN	04713	SRF502-1
A2R2037	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	57668	NTR25J-E 160E
A2R2068	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A2R2069	311-1555-00			RES.,VAR,NONWIR:TRMR,100K OHM,0.5W	32997	3352T-1-104
A2R2116	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A2R2124	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A2R2125	321-0147-00			RES.,FXD,FILM:332 OHM,1%,0.125W	91637	MFF1816G332R0F
A2R2133	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R2135	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
A2R2162	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2164	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A2R2165	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	01121	ORD BY DESCR
A2R2166	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2172	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A2R2176	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	CMF55116G51R10F
A2R2177	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2179	311-1943-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	68WR10K-10A
A2R2184	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91-83-0
A2R2185	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A2R2188	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	57668	NTR25J-E75E0
A2R2231	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A2R2238	311-1943-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	68WR10K-10A
A2R2267	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2268	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2272	311-2197-00			RES.,VAR,NONWW:TRMR,10 OHM,10%,0.5W LINEAR		
A2R2275	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2R2277	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	CMF55116G51R10F
A2R2283	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A2R2284	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R2285	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
A2R2286	321-0078-00			RES.,FXD,FILM:63.4 OHM,1%,0.125W	91637	MFF1816G63R40F
A2R2292	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	57668	NTR25J-E220E
A2R2317	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
A2R2318	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2323	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2327	321-0111-00			RES.,FXD,FILM:140 OHM,1%,0.125W	91637	MFF1816G140R0F
A2R2328	321-0111-00			RES.,FXD,FILM:140 OHM,1%,0.125W	91637	MFF1816G140R0F
A2R2332	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A2R2333	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A2R2340	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R2342	311-1567-00			RES.,VAR,NONWIR:TRMR,100 OHM,0.50W	73138	91-89-0
A2R2343	311-1568-00			RES.,VAR,NONWIR:50 OHM,20%,0.50W	73138	91-90-0
A2R2360	311-1944-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3299W-R27-102
A2R2374	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
A2R2376	321-0259-00			RES.,FXD,FILM:4.87K OHM,1%,0.125W	91637	MFF1816G48700F
A2R2424	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2435	311-0643-00			RES.,VAR,NONWIR:50 OHM,10%,0.50W	73138	82-33-2
A2R2440	311-1637-00			RES.,VAR,NONWIR:PNL,10K OHM,20%,0.5W	12697	MODEL 382
A2R2443	311-1175-00			RES.,VAR,NONWIR:100 OHM 0.50W	32997	3299W-R27-101
A2R2460	321-0259-00			RES.,FXD,FILM:4.87K OHM,1%,0.125W	91637	MFF1816G48700F
A2R2465	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2472	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2537	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	57668	NTR25J-E 160E
A2R2560	311-1944-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3299W-R27-102
A2R2565	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2568	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A2R2569	311-1555-00			RES.,VAR,NONWIR:TRMR,100K OHM,0.5W	32997	3352T-1-104
A2R2572	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2574	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
A2R2616	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A2R2624	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A2R2625	321-0147-00			RES.,FXD,FILM:332 OHM,1%,0.125W	91637	MFF1816G332R0F
A2R2633	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R2635	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
A2R2662	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2664	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A2R2665	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	01121	ORD BY DESCR
A2R2666	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2672	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A2R2675	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2676	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	CMF55116G51R10F
A2R2677	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2679	311-1943-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	68WR10K-10A
A2R2684	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91-83-0
A2R2685	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A2R2688	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	57668	NTR25J-E75E0
A2R2692	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	57668	NTR25J-E220E
A2R2722	311-2197-00			RES.,VAR,NONWW:TRMR,10 OHM,10%,0.5W LINEAR		
A2R2731	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A2R2738	311-1943-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	68WR10K-10A

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2R2767	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2768	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	57668	NTR25J-E 10E0
A2R2775	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A2R2777	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	CMF55116G51R10F
A2R2783	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A2R2784	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A2R2785	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
A2R2786	321-0078-00			RES.,FXD,FILM:63.4 OHM,1%,0.125W	91637	MFF1816G63R40F
A2R2817	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
A2R2818	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2823	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2827	321-0111-00			RES.,FXD,FILM:140 OHM,1%,0.125W	91637	MFF1816G140R0F
A2R2828	321-0111-00			RES.,FXD,FILM:140 OHM,1%,0.125W	91637	MFF1816G140R0F
A2R2832	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A2R2833	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A2R2840	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R2842	311-1567-00			RES.,VAR,NONWIR:TRMR,100 OHM,0.50W	73138	91-89-0
A2R2843	311-1568-00			RES.,VAR,NONWIR:50 OHM,20%,0.50W	73138	91-90-0
A2R2884	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	57668	NTR25J-E220E
A2R2885	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	57668	NTR25J-E220E
A2R2924	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2935	311-0643-00			RES.,VAR,NONWIR:50 OHM,10%,0.50W	73138	82-33-2
A2R2940	311-1637-00			RES.,VAR,NONWIR:PNL,10K OHM,20%,0.5W	12697	MODEL 382
A2R2943	311-1175-00			RES.,VAR,NONWIR:100 OHM 0.50W	32997	3299W-R27-101
A2T2250	120-1478-00			TRANSFORMER,RF:TOROID	80009	120-1478-00
A2T2750	120-1478-00			TRANSFORMER,RF:TOROID	80009	120-1478-00
A2TP2017	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2167	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2182	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2186	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2187	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2517	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2667	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2682	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2686	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2TP2787	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
A2U2118	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	MICROA7805UC
A2U2121	156-1191-00			MICROCIRCUIT,LI:BI-FET OPNL AMPL	01295	TL072ACP
A2U2147	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K	03911	C1A605A
A2U2147	----- -----			(MATCHED PAIR W/U2647)		
A2U2153	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K	03911	C1A605A
A2U2153	----- -----			(MATCHED PAIR W/U2653)		
A2U2168	156-1191-00			MICROCIRCUIT,LI:BI-FET OPNL AMPL	01295	TL072ACP
A2U2218	156-0846-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	04713	MC7905CT
A2U2278	153-0077-00			SEMICOND DVC,SE:MATCHED PAIR	80009	153-0077-00
A2U2278	----- -----			(MATCHED PAIR W/U2778)		
A2U2317	153-0077-00			SEMICOND DVC,SE:MATCHED PAIR	80009	153-0077-00
A2U2317	----- -----			(MATCHED PAIR W/U2817)		
A2U2471	156-0495-00			MICROCIRCUIT,LI:OPNL AMPL	27014	LM324N
A2U2618	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	MICROA7805UC
A2U2621	156-1191-00			MICROCIRCUIT,LI:BI-FET OPNL AMPL	01295	TL072ACP
A2U2647	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K	03911	C1A605A
A2U2647	----- -----			(MATCHED PAIR W/U2147)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2U2653	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K	03911	C1A605A
A2U2653	----- -----			(MATCHED PAIR W/U2153)		
A2U2668	156-1191-00			MICROCIRCUIT,LI:BI-FET OPNL AMPL	01295	TL072ACP
A2U2718	156-0846-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	04713	MC7905CT
A2U2778	153-0077-00			SEMICOND DVC,SE:MATCHED PAIR	80009	153-0077-00
A2U2778	----- -----			(MATCHED PAIR W/U2278)		
A2U2817	153-0077-00			SEMICOND DVC,SE:MATCHED PAIR	80009	153-0077-00
A2U2817	----- -----			(MATCHED PAIR W/U2317)		
A2U2871	156-0846-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	04713	MC7905CT
A2U2891	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	MICROA7805UC
A2VR2115	152-0757-00			SEMICOND DEVICE:ZENER,SI,6.2V,5%,1W	04713	1N4735A
A2VR2215	152-0757-00			SEMICOND DEVICE:ZENER,SI,6.2V,5%,1W	04713	1N4735A
A2VR2615	152-0757-00			SEMICOND DEVICE:ZENER,SI,6.2V,5%,1W	04713	1N4735A
A2VR2715	152-0757-00			SEMICOND DEVICE:ZENER,SI,6.2V,5%,1W	04713	1N4735A
A2VR2885	152-0757-00			SEMICOND DEVICE:ZENER,SI,6.2V,5%,1W	04713	1N4735A
A2VR2985	152-0757-00			SEMICOND DEVICE:ZENER,SI,6.2V,5%,1W	04713	1N4735A
.						
.						
A3	670-8277-00			CKT BOARD ASSY:SWITCH(NOT SHOWN)	80009	670-8277-00
A3	----- -----			(NO ELECTRICAL PARTS) (TWO PER INST)		
.						
.						
				CHASSIS PARTS		
.						
D1	150-1054-05			LT EMITTING,DIO:GRN 56 OHM,40MA,W/CONN	80009	150-1054-05

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:

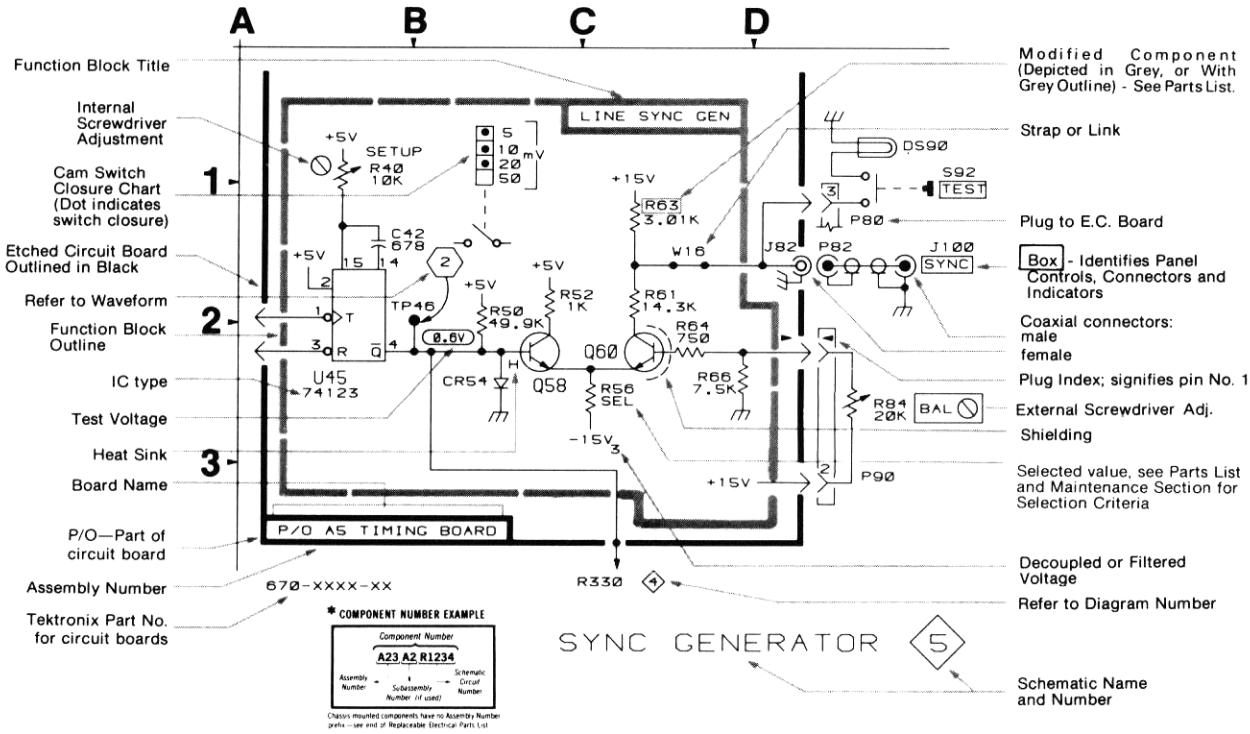
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

The information and special symbols below may appear in this manual.

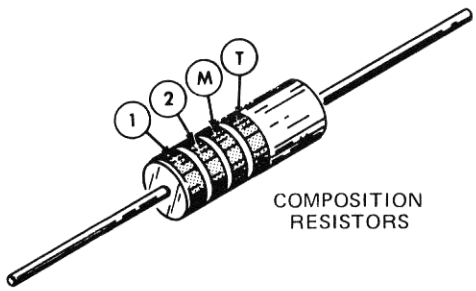
Assembly Numbers and Grid Coordinates

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).

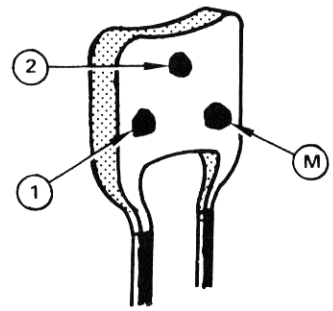
The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used 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.



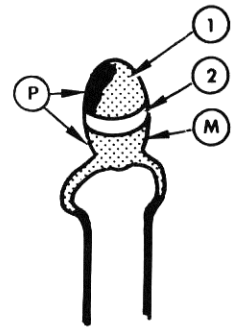
COLOR CODE



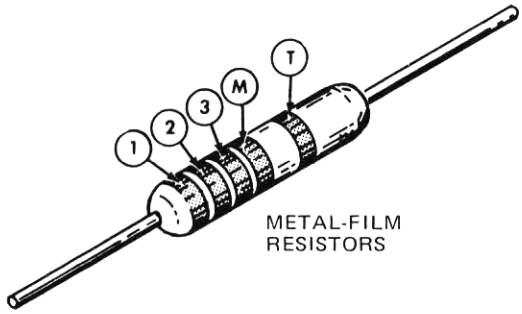
COMPOSITION RESISTORS



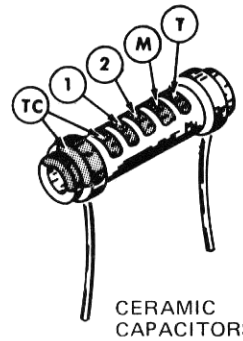
SMALL DISC CAPACITORS



DIPPED TANTALUM ELECTROLYTICS



METAL-FILM RESISTORS



CERAMIC CAPACITORS

(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. Typical capacitor and resistor color codes.

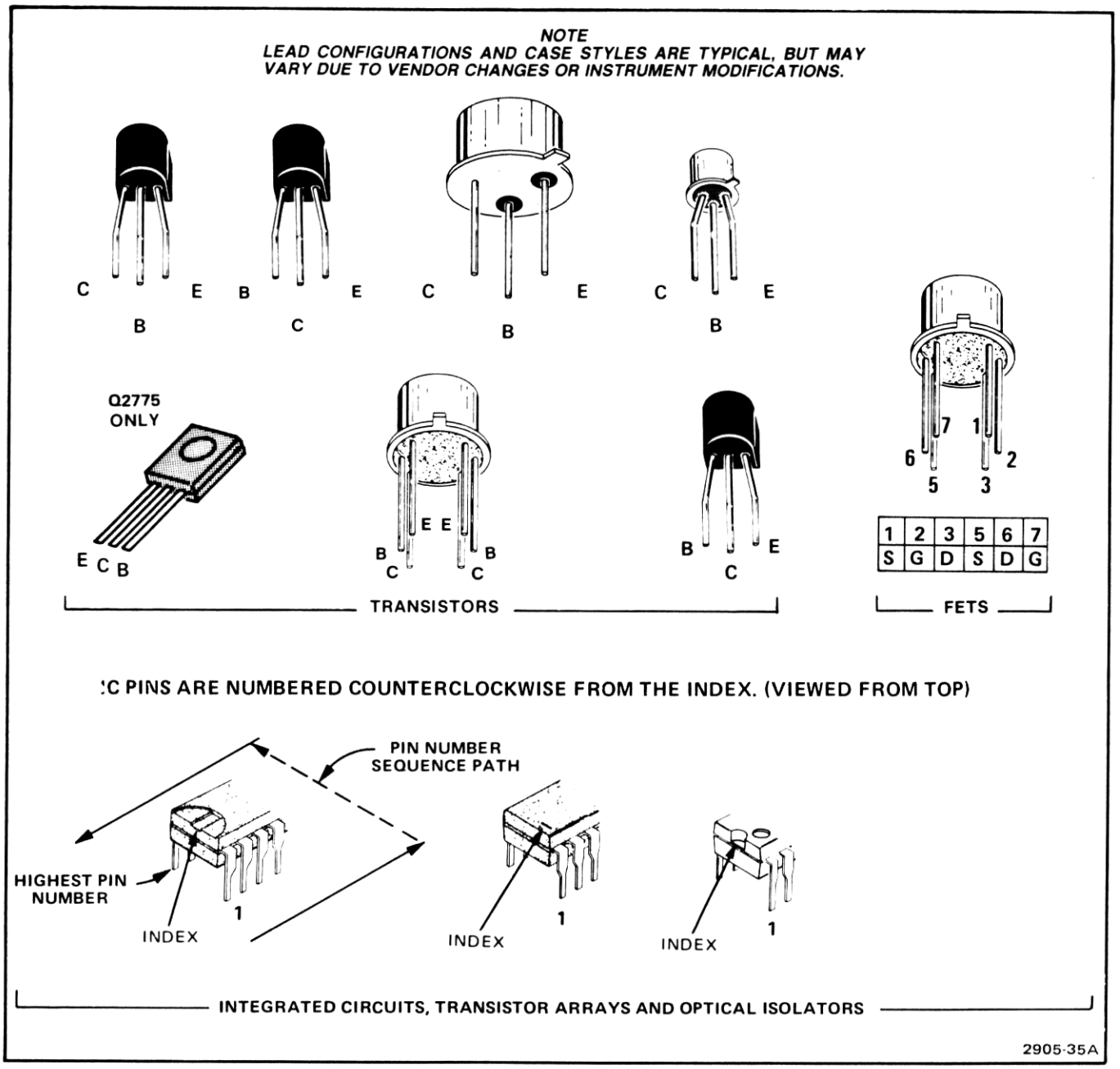
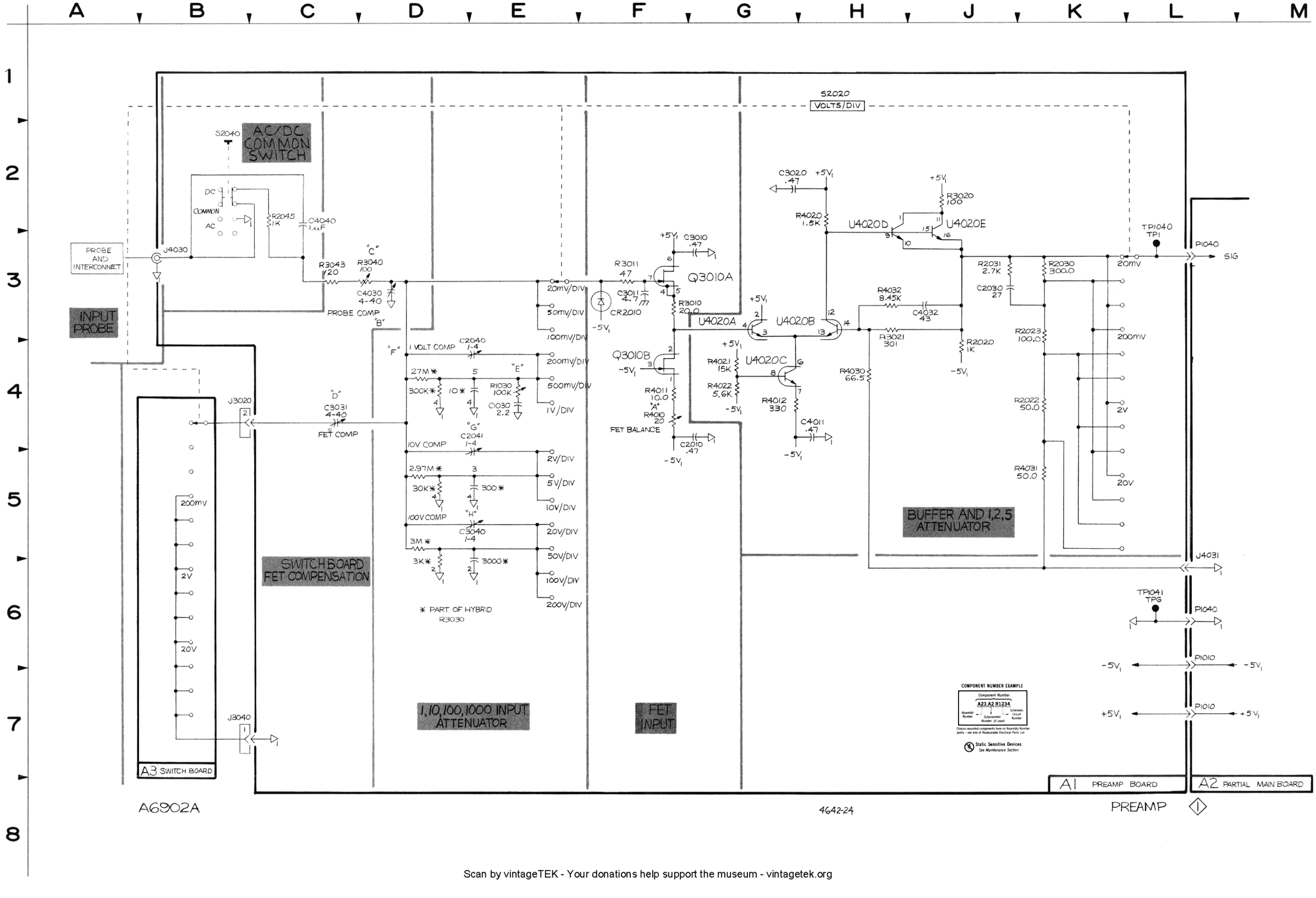


Figure 9-2. Semiconductor lead configurations.



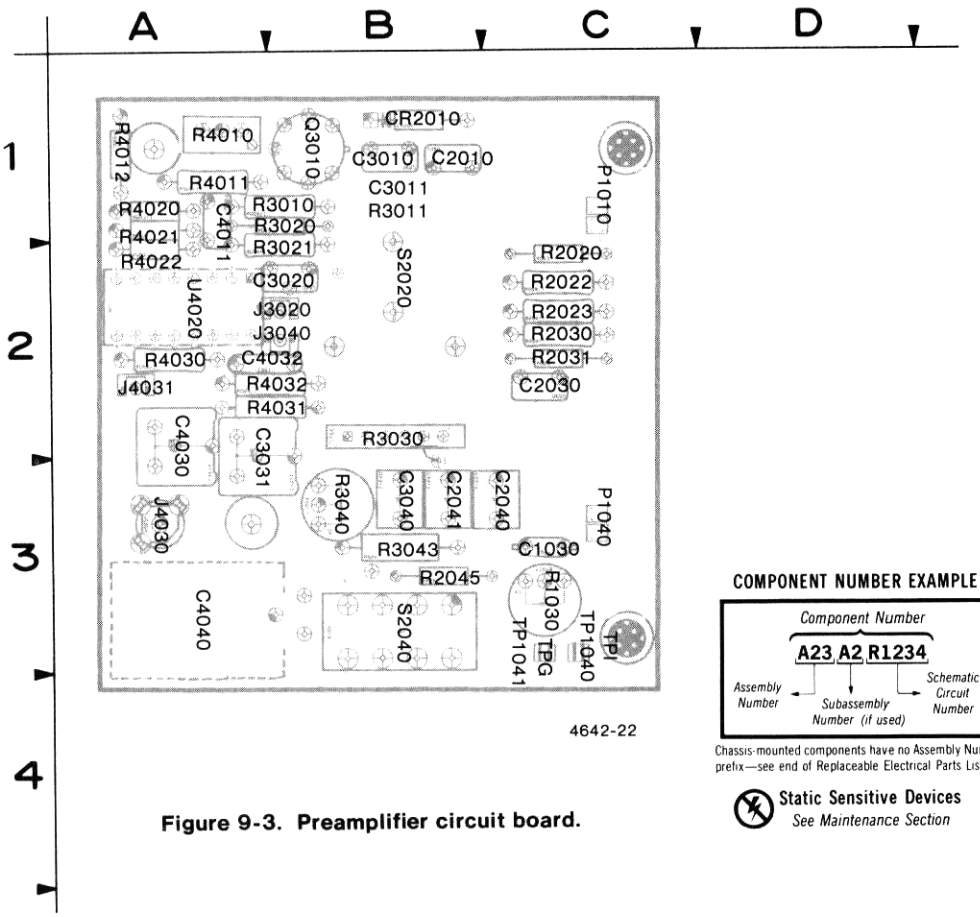


Figure 9-3. Preamplifier circuit board.

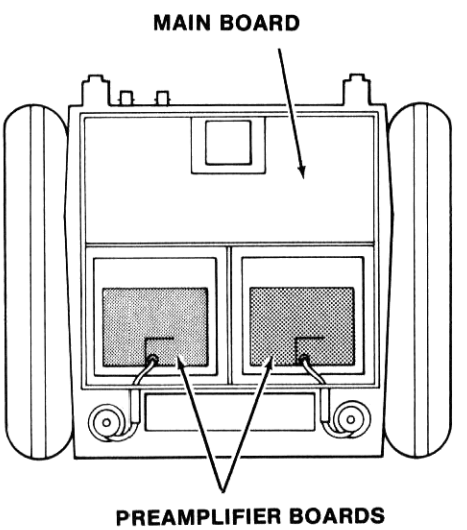
COMPONENT NUMBER EXAMPLE

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

PREAMPLIFIER BOARD DIAGRAM 1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1030	4E	3C	R2031	3J	3C
C2010	4G	1B	R2045	2C	3B
C2030	3J	3C	R3010	3F	1B
C2040	3E	3C	R3011	3F	1B
C2041	4E	3B	R3020	2J	1B
C3010	3F	1B	R3021	3H	2A
C3011	3F	1B	R3030	6D	2B
C3020	2G	2A	R3040	3D	3B
C3031	4C	2A	R3043	3C	3B
C3040	5E	3B	R4010	4F	1A
C4011	4H	1A	R4011	4F	1A
C4030	3D	2A	R4012	4G	1A
C4032	3J	2A	R4020	2H	1A
C4040	2C	3A	R4021	4G	1A
			R4022	4G	2A
CR2010	3F	1B	R4030	4H	2A
			R4031	5K	2A
J3020	4B	2A	R4032	3H	2A
J3040	7B	2A			
J4030	3B	3A	S2020	1H	2B
J4031	5L	2A	S2040	2B	3B
P1010	6L	1C	TP1040	3L	3C
P1040	6L	3C	TP1041	6L	3C
			TPG	6L	3C
Q3010A	3F	1B	TPI	3L	3C
Q3010B	4F	1B			
			U4020A	3G	2A
R1030	4E	3C	U4020B	3G	2A
R2020	3J	3C	U4020C	4G	2A
R2022	4K	3C	U4020D	2H	2A
R2023	3k	3C	U4020E	2H	2A
R2030	3K	3C			



MAIN BOARD SCHEMATIC (POWER SUPPLY AND MAIN AMPLIFIER)

POWER SUPPLY

S0001 POWER

LINE VOLTAGE SELECTOR

F0001
0.15ASB-115V
0.1ASB-230V

R0001 130VAC (8-04)
R0002 130VAC (8-19)
(8-24) (8-39)

T0001

CR2243 U2118 -0227 C2138 470µF C2213 .47 VR2115 -0757 +5V1
TO MAIN AMPLIFIER CH1 (INPUT SIDE OF ISOLATION BARRIER) & PREAMPLIFIER CH1
C2233 470µF C2214 .47µF VR2215 -0757 -5V1
U2218 -0846

CR2743 U2618 -0227 C2638 470µF C2713 .47µF VR2615 -0757 +5V2
TO MAIN AMPLIFIER CH2 (INPUT SIDE OF ISOLATION BARRIER) & PREAMPLIFIER CH2
C2733 470µF C2714 .47µF VR2715 -0757 -5V2
U2718 -0846

CR2993 U2891 -0227 C2981 470µF C2889 .47µF VR2985 -0757 +5V
TO MAIN AMPLIFIER (OUTSIDE OF ISOLATION BARRIER) CH1 & CH2
C2971 470µF C2879 .47µF VR2885 -0757 -5V
U2871 -0846

(9-2) (9-2) (7,2) (5-4,0,0,8,6)

NOTES TO POWER SUPPLY:
1. NUMBERS IN PARENTHESIS ARE TRANSFORMER WIRE COLOR CODE.
2. CAPITAL LETTERS ARE INPUT CONNECTOR PINS.
3. SMALL LETTERS ARE INPUT CONNECTOR SWITCH CONTACTS.

VOLTAGE	CONTACTS
115	a,c,e
115	b,c,e
230	a,d
230	b,d

CR0001

LF DRIVER

OUTPUT DC LEVEL
R2440 10K
+5V1 R2340 100K 5%
-5V1
R2116 4.99K
TP2017 TPA
U2121B
R2231 249
R2238 LF GAIN 10K

OPTO-ISLATOR

U2121A
R2125 332
R2133 100 5%
Q2138
R2037 160 5%
C2133 .0056
U2153
U2147
R2124 2.49K
R2135 270 5%

LF RECEIVER

R2172 2.49K
R2179 10K
R2165 1K
C2175 .047µF
U2168A
R2164 2.49K
R2162 10K
TP2167 TPL
R2166 10K
U2168B
R2175 10K
R2176 51.1

ISOLATION BARRIER

R2317 2.4K 5%
+5V1 R2332 100.0
C2327 22µF
Q2334
R2323 1K 5%
R2327 140.0
-5V
HF GAIN
MICROTILT
R2435 10 (50nS)
R2443 100 (50µS)
C2430 470
R2328 140.0
-5V1
R2424 1K 5%
C2421 22µF
Q2335
HF TILT R2342 100 (10uS)
L2441 200-400 (5µS) HF DELAY
R2343 50 (2µS) HF CORNER TILT
R2333 100.0
+5V1

HF BUFFER

P4031 FROM PREAMP
P2215
J2332
P1040
J2331
J2132
P1010
J2131
U2317
R2318 1K 5%

HF DRIVER

GROUP ENVELOPE DELAY

T2250

C2149 25 6KV
C2164 4700
R2068 100K CMLOAD
R2068 50K CMADJ
R2177 10K
R2275 10K
R2277 51.1
U2278

COMMON-MODE ADJUST

OUTPUT MIXER

TP2186 TPH
HF FILTER (30nS) L2284 2.6µH
HF FILTER TILT (15nS)
TP2287 TPC
R2184 2.5K
R2188 75 5%
C2186 7-45 HF BOOST (10nS)
R2283 249
C2195 2.2
R2292 220 5%
Q2292
R2284 100 5%
R2185 249
R2285 232
R2286 63.4
OUTPUT J2280

R2267 10
R2268 10
R2272 10 (2.5uS) HF TRANSFORMER LOAD

HF TRANSFORMER AND LOAD

OUTPUT FILTER

ISOLATION BARRIER
(R2885) 220 5% PILOT LAMP
+5
(P2893)
-5
(R2884) 220 5%

U2471
R2376 4.87K (R2460)
R2360 1K (R2560)
OUTPUT LOAD
R2374 3.92K (R2574)
R2465 10 5% (R2565)
R2472 10 5% (R2572)
C2287 4.7µF
TP2182

OUTPUT LOAD

NOTES:
1. ALL RESISTORS 1% UNLESS NOTED.
2. U2147 & U2153 MATCHED PAIR
3. CHANNEL ONE SHOWN, CHANNEL TWO CIRCUIT NUMBERS ARE 0500 HIGHER OR NOTED IN PARENTHESIS.
4. TIMES IN PARENTHESIS ARE PORTION OF WAVEFORM AFFECTED BY ADJUSTMENT.
5. CH1=A CH2=B
6. BYPASS CAPACITORS (0.47µF) C2081, C2117, C2317, C2417, C2778, C2278, C2324, C2241, C2134 & C2165.

COMPONENT NUMBER EXAMPLE
Component Number A23 A2 R1234
Assembly Number / Subassembly Number (if used) / Schematic Circuit Number
Static Sensitive Devices See Maintenance Section

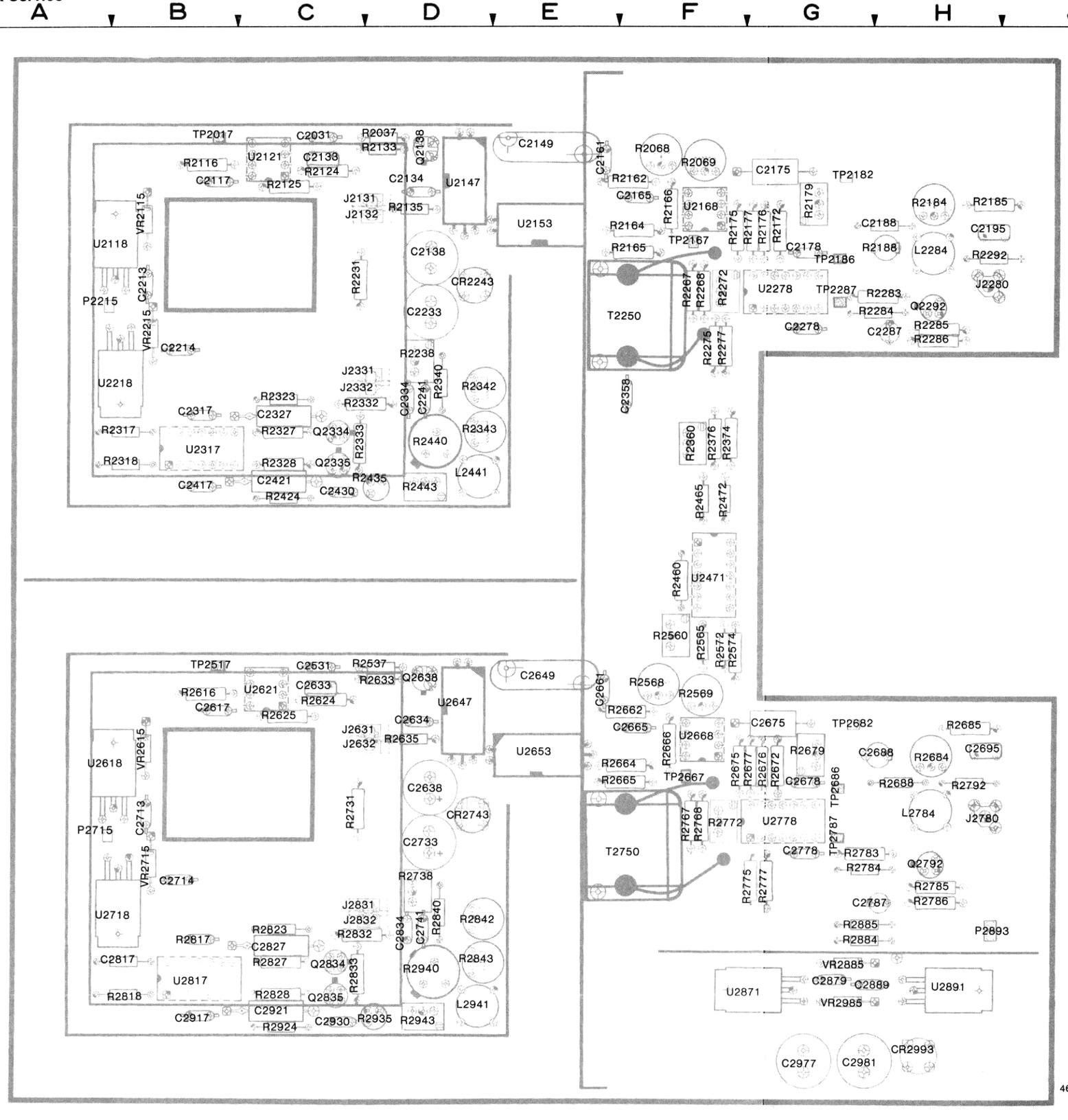
A2 MAIN BOARD

4642-25

A6902A

MAIN BOARD 2

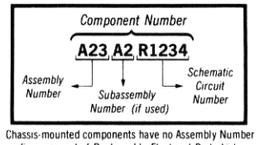
MAIN BOARD



4642-23

CHASSIS MOUNTED PARTS		
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
CR0001	7B	
F0001	3B	
J2280	6S	
J4031	5G	
P1010	6G	
P1040	6G	
R0001	2B	
R0002	3B	
S0001	1A	
T0001	1C	

COMPONENT NUMBER EXAMPLE

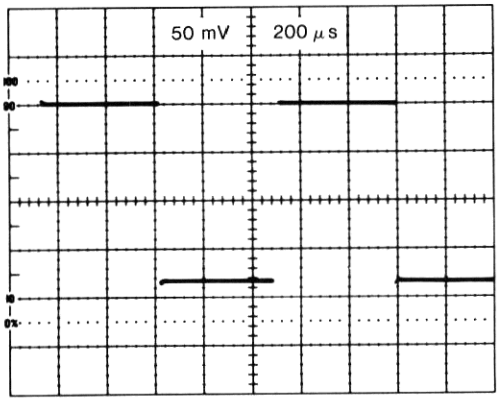


Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

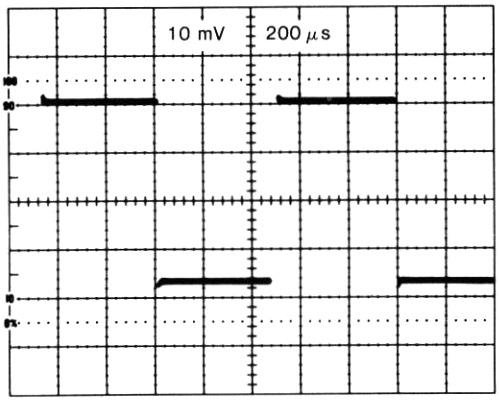
Static Sensitive Devices
See Maintenance Section

Figure 9-4. Main circuit board.

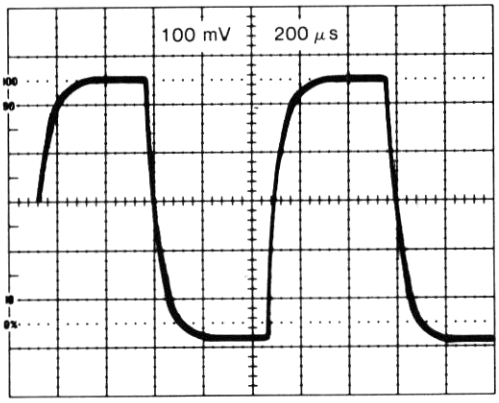
TEST WAVEFORMS



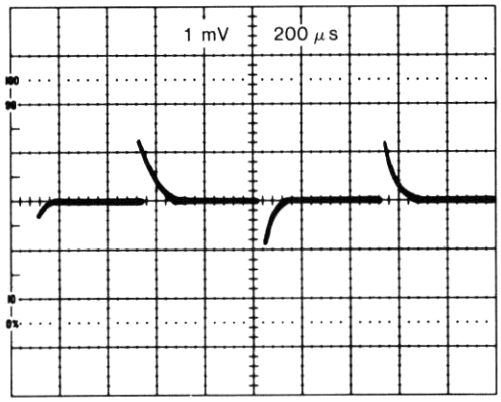
TPA



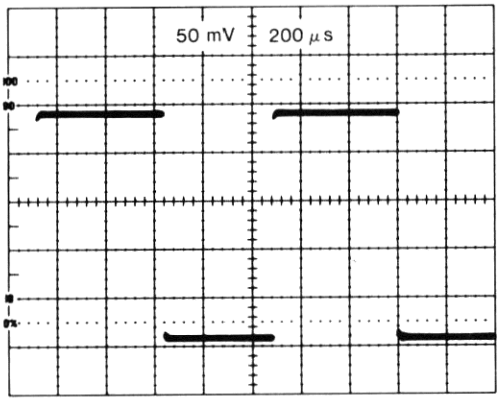
TPI (With 1x Probe)



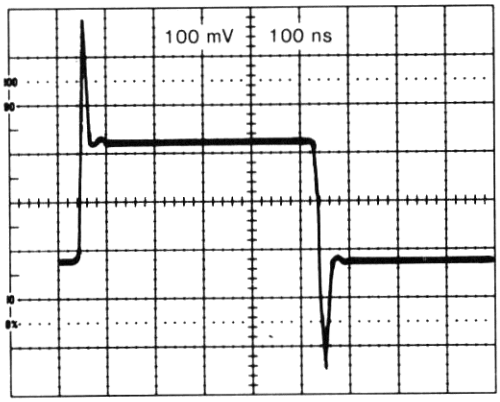
TPL



HIGH-FREQUENCY TRANSFORMER ORANGE LEAD
(With P6021 Current Probe)



TPH or TPC (Inverted)



TPH
(Calibration Generator Period Set to 1 μs)

4642-26

Figure 9-5. Test waveforms.

AC WAVEFORMS

This section briefly describes the recommended equipment, control settings, and setup to obtain the troubleshooting waveforms illustrated adjacent to the schematic diagrams.

RECOMMENDED TEST EQUIPMENT

The recommended test equipment consists of a dc-to-100 MHz oscilloscope (ex. TEKTRONIX 2236), a calibration generator (ex. TEKTRONIX PG 506), and a general purpose 1X-10X probe (ex. TEKTRONIX P6062B). This equipment is listed in Table 5-1 as items 2, 3, and 10.

CONTROL SETTINGS

Set the instrument controls as follows:

Oscilloscope

Volts/Division (CH 1)	10 mV
AC-GND-DC	AC
Position	Midrange
Vertical Mode	Channel 1
Time/Division	200 μs
Trigger Mode	External

A6902A

VOLTS/DIV	20 mV
AC-COMMON-DC	AC

Calibration Generator

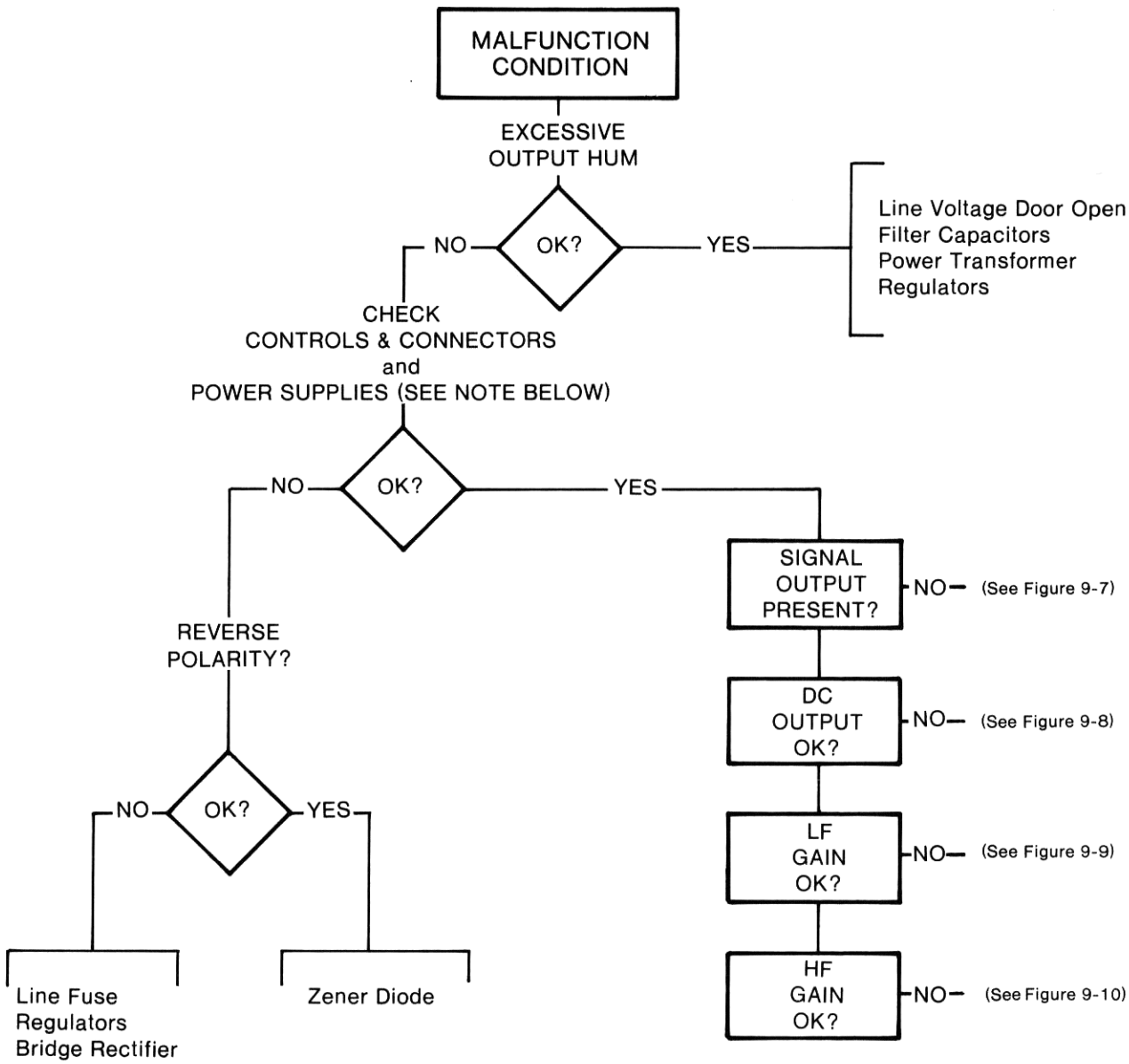
Mode	Fast Rise
Period	1 ms
Amplitude	0.5 V

TEST SETUP

Connect the positive-going fast-rise signal from the calibration generator to the input probe of the A6902A channel to be tested. Connect the 1X-10X probe to the Channel 1 input connector of the oscilloscope. Use a 50-Ω cable to connect the trigger signal from the generator to the External Trigger input of the oscilloscope.

When using the probe to check the test-point waveforms, always use the common associated with the part of the circuit being probed for the probe ground connection.

Changes from the initial control settings may be necessary when viewing the different test points. Timing and amplitude settings are noted on the waveform drawings.



NOTE

Use the appropriate common when checking power supplies. Power supplies are + and − 5 V ± 0.25 V.

OUTPUT SUPPLY:

Test Point: Input (front) side of pilot light resistors (220Ω) R2773 & R2774.

Ground: GND (on Main Board)

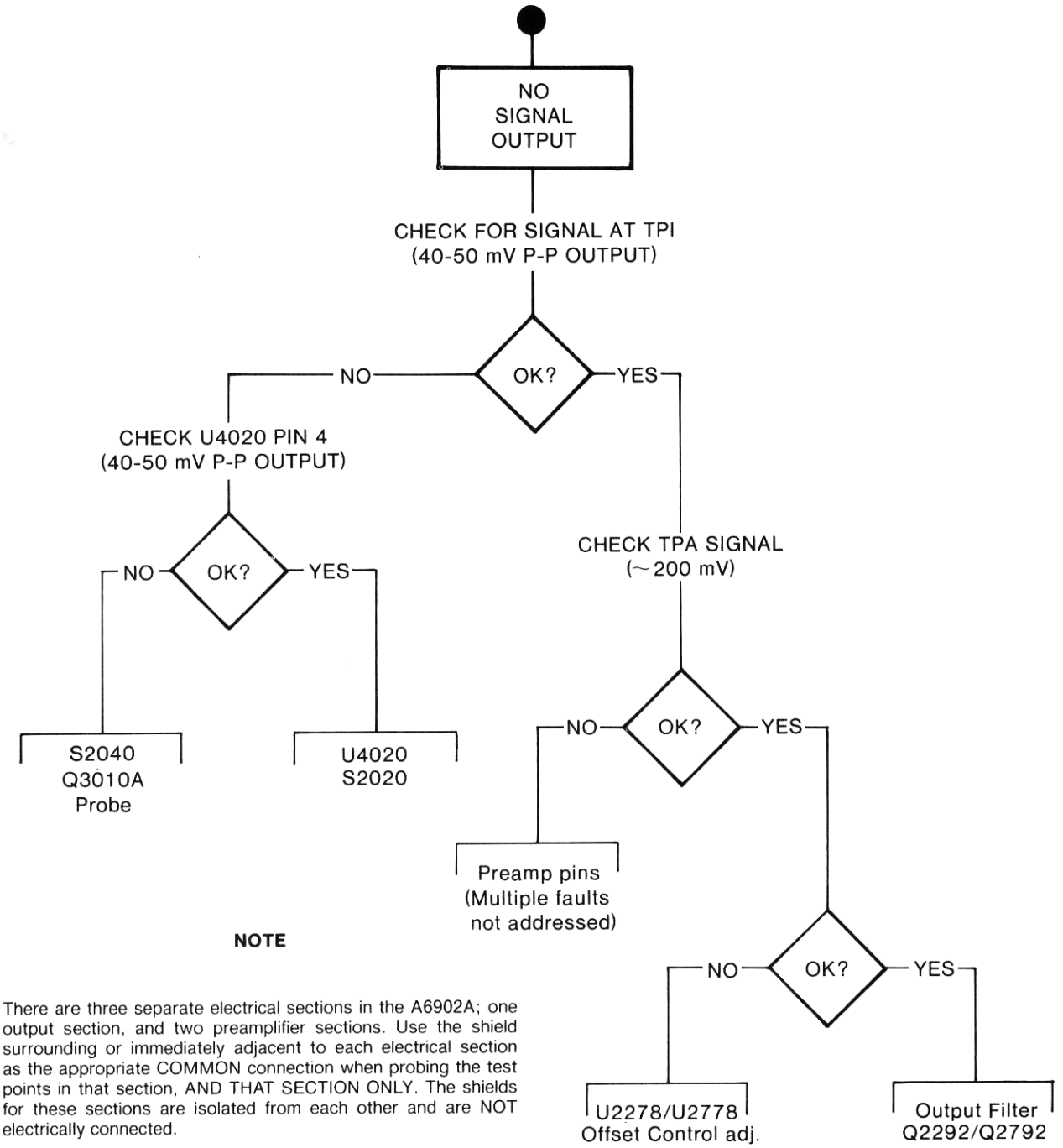
PREAMP SUPPLIES:

Test Point: P1010 (both boards)

Common: TPG (both boards)

4642-27

Figure 9-6. Troubleshooting chart.



NOTE

There are three separate electrical sections in the A6902A; one output section, and two preamplifier sections. Use the shield surrounding or immediately adjacent to each electrical section as the appropriate COMMON connection when probing the test points in that section, AND THAT SECTION ONLY. The shields for these sections are isolated from each other and are NOT electrically connected.

This procedure assumes that all previous checks are OK (see main chart), that the A6902A VOLTS/DIV is set at 100 mV/DIV, and that the signal generator is supplying 0.5 V p-p at 1 kHz.

4642-28A

Figure 9-7. Troubleshooting chart.

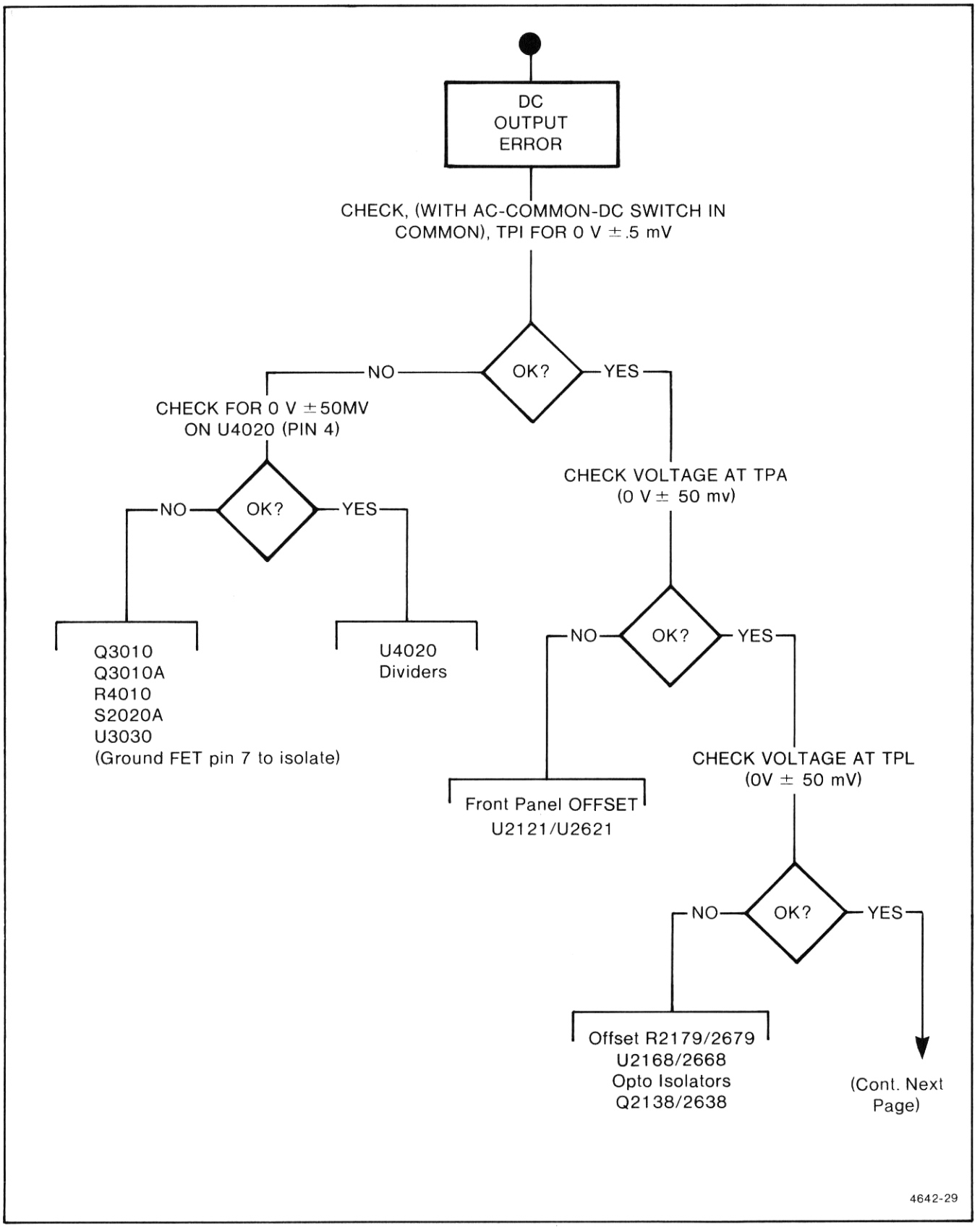
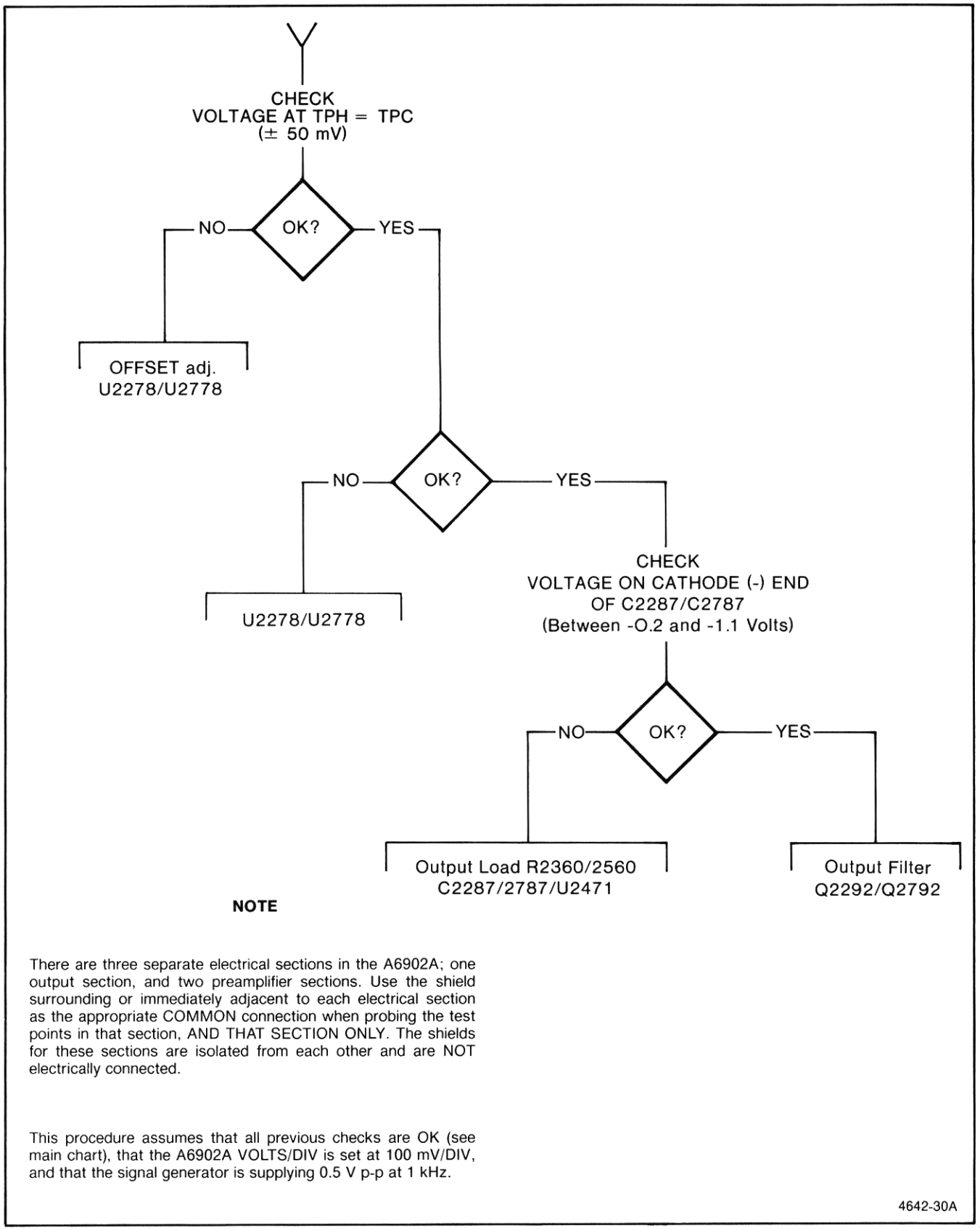


Figure 9-8. Troubleshooting chart.



NOTE

There are three separate electrical sections in the A6902A; one output section, and two preamplifier sections. Use the shield surrounding or immediately adjacent to each electrical section as the appropriate COMMON connection when probing the test points in that section, AND THAT SECTION ONLY. The shields for these sections are isolated from each other and are NOT electrically connected.

This procedure assumes that all previous checks are OK (see main chart), that the A6902A VOLTS/DIV is set at 100 mV/DIV, and that the signal generator is supplying 0.5 V p-p at 1 kHz.

4642-30A

Figure 9-8. Troubleshooting chart (cont).

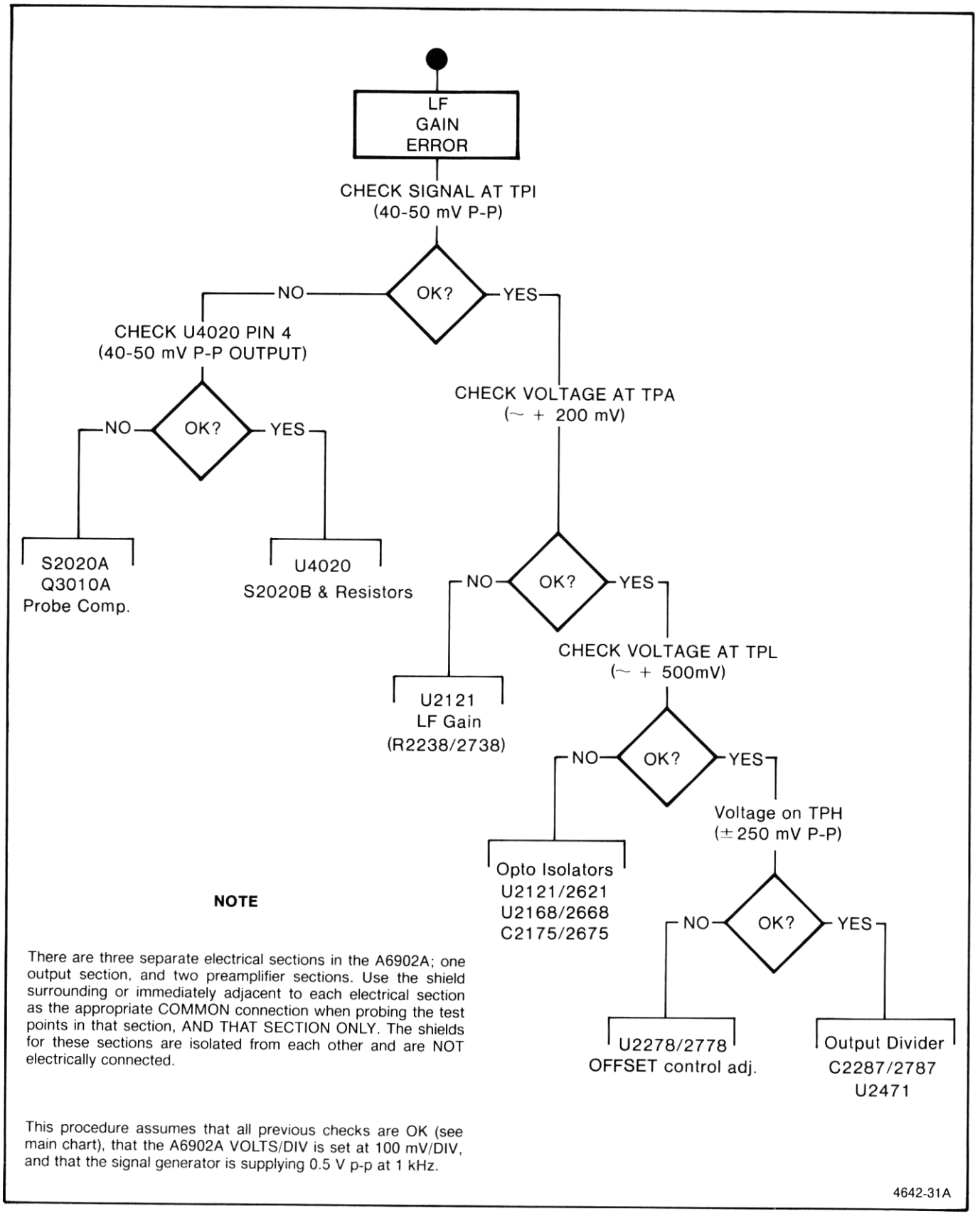


Figure 9-9. Troubleshooting chart.

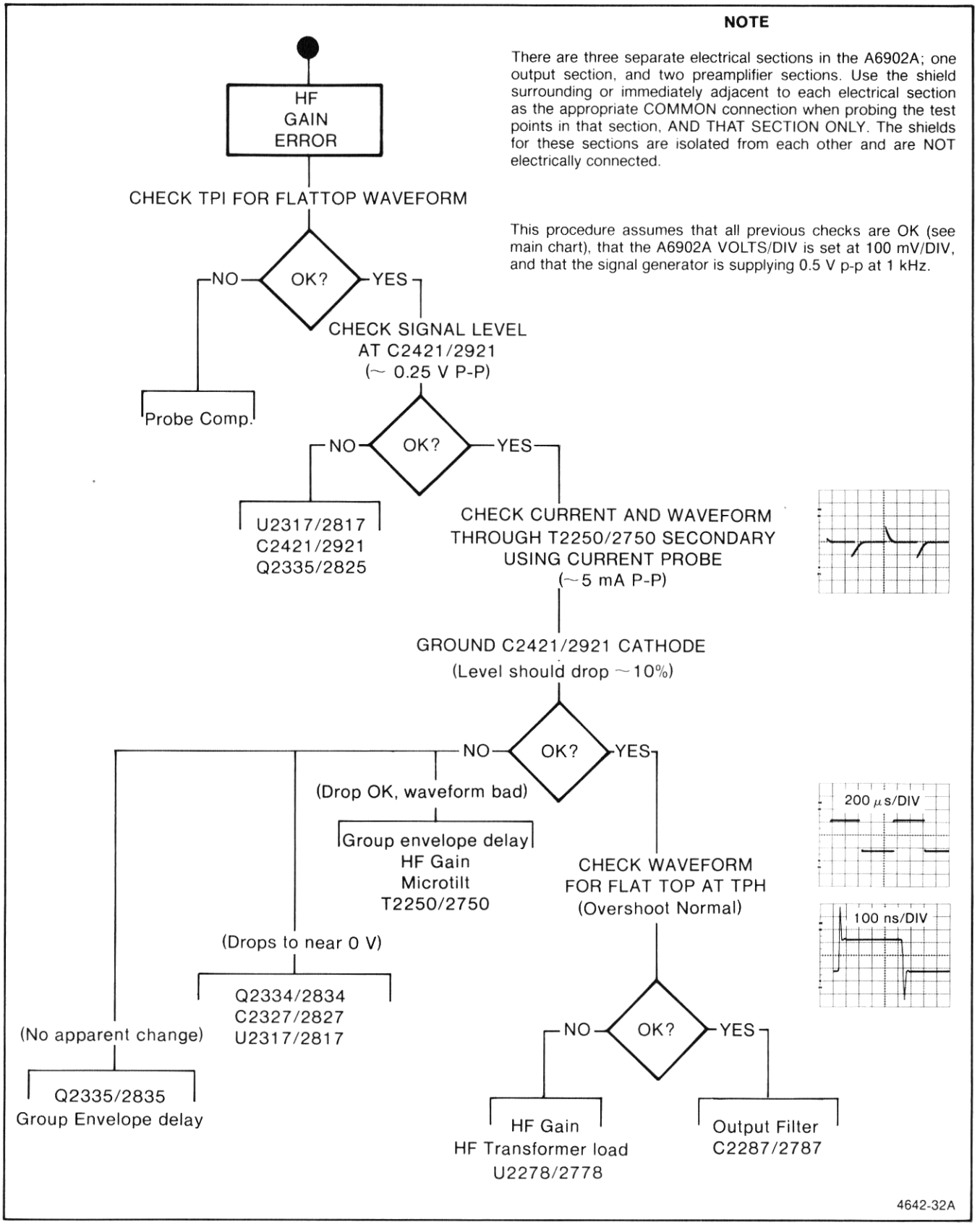


Figure 9-10. Troubleshooting chart.

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

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

Attaching parts must be purchased separately, unless otherwise specified.

ABBREVIATIONS

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

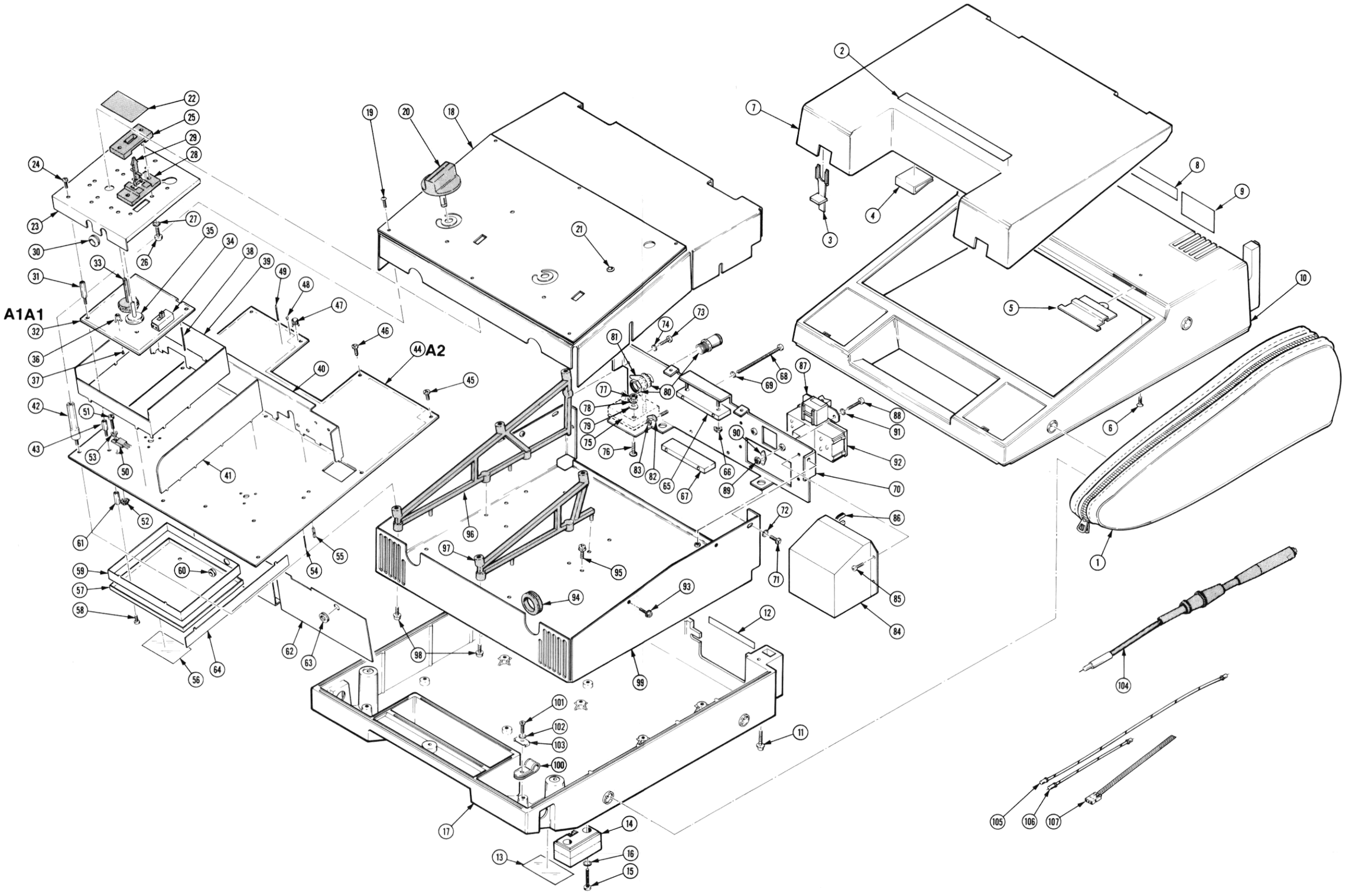
Mfr. Code	Manufacturer	Address	City, State, Zip
000EL	PORTLAND SCREW CO.	6520 N. BASIN AVE.	PORTLAND, OR 97217
000HC	PANEL COMPONENT CORP.	335 TESCONI CIRCLE	SANTA ROSA, CA 95401
000JA	J. PHILLIP INDUSTRIES INC.	5713 NORTHWEST HIGHWAY	CHICAGO, ILL 60646
01536	CAMCAR DIV OF TEXTRON INC. SEMS PRODUCTS UNIT	1818 CHRISTINA ST.	ROCKFORD, IL 61108
07416	NELSON NAME PLATE CO.	3191 CASITAS	LOS ANGELES, CA 90039
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
16428	BELDEN CORP.	P. O. BOX 1331	RICHMOND, IN 47374
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
22670	G.M. NAMEPLATE, INC.	2040 15TH AVENUE WEST	SEATTLE, WA 98119
24931	SPECIALITY CONNECTOR CO., INC.	2620 ENDRESS PLACE	GREENWOOD, IN 46142
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
83486	ELCO INDUSTRIES, INC.	1103 SAMUELSON ROAD	ROCKFORD, IL 61101
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
93907	TEXTRON INC. CAMCAR DIV	600 18TH AVE	ROCKFORD, IL 61101
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
S3109	C/O PANEL COMPONENTS CORP.	P.O. BOX 6626	SANTA ROSA, CA 95406
T0860	LABEL GRAPHICS	14270 N.W. SCIENCE PARK DR	PORTLAND,OR 97229

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	016-0453-01			1		POUCH,ACCESSORY:RIGHT		
	016-0454-01			1		POUCH,ACCESSORY:LEFT		
-2	334-3768-01			1		MARKER,IDENT:MKD TEKTRONIX A6902A	22670	ORD BY DESCR
-3	105-0838-01			2		LATCH,LID,ISLTR:ACETE;.SLATE GRAY	80009	105-0838-01
-4	343-0775-01			2		CLIP,SPR TNSN:CABLE,PVC		
-5	214-2743-03			2		HINGE,COVER:SMOKE GRAY POLYCARBONATE	80009	214-2743-03
						**********(ATTACHING PARTS)**********		
-6	211-0718-00			2		SCREW,MACHINE:6-32 X 0.312,FLH,DEG TORX	83486	ORD BY DESCR
						**********(END ATTACHING PARTS)**********		
-7	200-2375-01			1		LID,ISOLATOR:SMOKE GRAY POLYCARBONATAE	80009	200-2375-01
-8	334-3749-01			1		MARKER,IDENT:MKD CHNNEL 1/CHANNEL 2	22670	ORD BY DESCR
-9	334-3746-02			1		MARKER,IDENT:MKD CAUTION	07416	ORD BY DESCR
-10	390-0722-01			1		CAB-TOP,ISLTR:SMOKE TAN,POLYCARBONATE	80009	390-0722-01
-11	211-0720-00			6		SCR,ASSEM WSHR:6-32 X 0.50 PNH,TORX	01536	ORD BY DESCR
-12	334-3747-01	B010100	B010199	1		MARKER,IDENT:MKD 1500 VOLTS PEAK MAX	22670	ORD BY DESCR
	334-3747-02	B010200		1		MARKER,IDENT:MKD 1500 VOLTS PEAK MAX	T0860	ORD BY DESCR
-13	334-3748-00			1		MARKER,IDENT:MARKED CAUTION SHOCK	80009	334-3748-00
-14	348-0627-02			8		FOOT,CABINET:SMOKE GRAY,POLYCARBONATE	80009	348-0627-02
						**********(ATTACHING PARTS)**********		
-15	211-0514-00			8		SCREW,MACHINE:6-32 X 0.750 INCH,PNH STL	83385	ORD BY DESCR
-16	210-0006-00			8		WASHER,LOCK:#6 INTL,0.018 THK,STL CD PL	78189	1206-00-00-0541C
						**********(END ATTACHING PARTS)**********		
-17	390-0723-01			1		CAB.BOT,ISLTR:	80009	390-0723-00
-18	337-2695-02			1		SHIELD,ELEC:CIRCUIT BOARD	80009	337-2695-02
	333-2619-02			1		PANEL ASSY,FRONT:	80009	333-2619-02
						**********(ATTACHING PARTS)**********		
-19	211-0214-00			6		SCREW,MACHINE:4-40 X 0.25 INCH,TRH STL	83385	ORD BY DESCR
						**********(END ATTACHING PARTS)**********		
-20	366-1815-02			2		KNOB:DOVE GRAY,0.122ID X 1.5DIA	80009	366-1815-02
-21	358-0378-00			4		BUSHING,SLEEVE:0.131 ID X 0.125 L	80009	358-0378-00
-22	334-3750-00			2		MARKER,IDENT:MKD DANGER	80009	334-3750-00
-23	337-2647-01			2		SHIELD,ELEC:ATTENUATOR	80009	337-2647-01
	----- -----			-		(SUBPART OF A2 CIRCUIT BOARD)		
						**********(ATTACHING PARTS)**********		
-24	211-0324-00			8		SCR,ASSEM WSHR:4-40 X 0.188 L,PNH,TORX,MCH	01536	ORD BY DESCR
						**********(END ATTACHING PARTS)**********		
-25	380-0609-01			2		HSG HALF,ACTR:TOP,POLYCARBONATE	80009	380-0609-01
						**********(ATTACHING PARTS)**********		
-26	212-0066-00			4		SCREW,MACHINE:8-32 X 0.500,ROH,NYL,SLOT	95987	ORD BY DESCR
-27	210-0008-00			4		WASHER,LOCK:INTL,0.02 THK	78189	1208-00-00-0541C
						**********(END ATTACHING PARTS)**********		
-28	380-0610-01			2		HSG HALF,ACTR:BOTTOM POLYCARBONATE	80009	380-0610-01
-29	376-0194-01			2		ADPTR SW ACTR:SLIDE,DOVE GRAY,POLYCRBNT	80009	376-0194-01
-30	348-0003-00			2		GROMMET,RUBBER:0.312 INCH DIAMETER	70485	1411B6040
-31	129-0456-02			8		SPACER,POST:0.67L,W/4-40 THD ONE END,	80009	129-0456-02
-32	----- -----			2		CKT BD ASSY:PREAMP(SEE A1A1 REPL)		
-33	384-1550-02			2		.SHAFT,ROTARY SW:2.09L X 0.154OD W/DETENT	80009	384-1550-02
-34	----- -----			2		.SWITCH,SLIDE:DP3T W/PLASTIC PLATE		
	----- -----			-		.(SEE A1S2040 REPL)		
-35	384-1627-03			2		.EXTENSION SHAFT:POT ADJUSTMENT,SLATE GRAY	80009	384-1627-03
	----- -----			-		(NOT A SUBPART OF A1 CIRCUIT BOARD)		
-36	131-1003-00			2		.CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-37	136-0252-07			2		.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
	----- -----			2		.CKT BD ASSY:SWITCH (SEE REPL)		
-38	131-0592-00			2		.CONTACT,ELEC:0.885 INCH LONG	22526	47353
-39	337-2646-01			2		.SHIELD,ELEC:ATTENUATOR	80009	337-2646-01
	----- -----			-		.(SUBPART OF A2)		
-40	337-2660-02			2		.SHIELD,ELEC:POWER SUPPLY	80009	337-2660-01
	----- -----			-		.(SUBPART OF A2)		
-41	337-2659-01			1		.SHIELD,ELEC:ATTENUATOR	80009	337-2659-01
	----- -----			-		.(SUBPART OF A2)		
-42	129-0788-00			6		.SPACER,POST:1.71 L,0.312 DIA	80009	129-0788-00
-43	129-0791-00			8		.SPACER,POST:0.64 L,0.188 HEX	80009	129-0791-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-44	----- -----			1		CKT BOARD ASSY:MAIN(SEE A2 REPL)		
						**********(ATTACHING PARTS)**********		
-45	211-0711-00			2		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
-46	213-0124-00			2		SCR,TPG,THD FOR:6-20 X 0.250 INCH,PNH STL	83385	ORD BY DESCR
						**********(END ATTACHING PARTS)*********		
	----- -----			-		CKT BOARD ASSY INCLUDES:		
	210-0204-00			2		.TERMINAL,LUG:0.146 INCH DIA DE,45 DEG BE	78189	2157-06-01-2520N
	210-0006-00			4		.WASHER,LOCK:#6 INTL,0.018 THK,STL CD PL	78189	1206-00-00-0541C
	204-0613-00			1		.CONN BODY,RCPT:LINE SELECTOR		
	195-0373-00			1		.LEAD,ELECTRICAL:18 AWG,3.0 L	80009	195-0373-00
	131-1315-01			2		.CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
-47	131-1003-00			2		.CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-48	136-0252-07			2		.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-49	131-0608-00			12		.TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	48283-036
-50	----- -----			6		.DIODES:(SEE A2VR2115,VR2215,VR2615,VR2715		
	----- -----			-		.VR2885,VR2985 REPL)		
						.**********(ATTACHING PARTS)**********		
-51	211-0008-00			6		.SCREW,MACHINE:4-40 X 0.250,PNH,STL,POZ	83385	ORD BY DESCR
-52	210-0406-00			6		.NUT,PLAIN,HEX:4-40 X 0.188,BRS,CD PL	73743	12161-50
-53	210-0054-00			6		.WASHER,LOCK:#4 SPLIT,0.025 THK STL CD P	83385	ORD BY DESCR
						.**********(END ATTACHING PARTS)*********		
	129-0791-00			8		.SPACER,POST:0.64 L,0.188 HEX	80009	129-0791-00
-54	131-0592-00			2		.CONTACT,ELEC:0.885 INCH LONG	22526	47353
-55	136-0263-04			8		.SOCKET,PIN TERM:FOR 0.025 INCH SQ PIN	22526	75377-001
-56	334-3750-00			2		.MARKER,IDENT:MKD DANGER	80009	334-3750-00
-57	337-2651-01			2		.SHIELD,ELEC:ATTENUATOR	80009	337-2651-01
						.**********(ATTACHING PARTS)**********		
	211-0324-00	B010100	B010199	8		.SCR,ASSEM WSHR:4-40 X 0.188 L,PNH,TORX,MC	01536	ORD BY DESCR
	211-0324-00	B010200		6		.SCR,ASSEM WSHR:4-40 X 0.188 L,PNH,TORX,MC	01536	ORD BY DESCR
-58	211-0028-00	B010200		2		.SCREW,MACHINE:4-40 X 0.188 " BDGH,NYL,SLO	95987	ORD BY DESCR
						.**********(END ATTACHING PARTS)*********		
-59	337-2650-01			2		.SHIELD,ELEC:ATTENUATOR	80009	337-2650-01
-60	348-0031-00			4		.GROMMET,PLASTIC:0.127 ID,GRAY ACETAL	80009	348-0031-00
-61	220-0449-00			8		.NUT,SLEEVE:4-40 X 0.188 X 0.50" LONG	80009	220-0449-00
-62	337-2878-01			1		.SHIELD,ELEC:LOWER POWER SUPPLY	80009	337-2878-01
-63	348-0093-00			6		.GROMMET,RUBBER:0.375 INCH	70485	MOLDCM6368
-64	337-2661-01			1		.SHIELD,ELEC:ATTENUATOR	80009	337-2661-01
-65	343-0862-01			1		.CLAMP,XFMR:2.162 L,ALUM	80009	343-0862-01
						.**********(ATTACHING PARTS)**********		
-66	210-0457-00			2		.NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	83385	ORD BY DESCR
						.**********(END ATTACHING PARTS)*********		
-67	343-0863-01			2		CLAMP,XFMR:2.162,ALUM	80009	343-0863-01
	343-0862-01			1		CLAMP,XFMR:2.162 L,ALUM	80009	343-0862-01
						**********(ATTACHING PARTS)**********		
-68	211-0623-00			4		SCREW,MACHINE:6-32 X 2.25 INCHES,PNH,STL	83385	ORD BY DESCR
-69	210-0054-00			4		WASHER,LOCK:#4 SPLIT,0.025 THK STL CD P	83385	ORD BY DESCR
						**********(END ATTACHING PARTS)*********		
-70	407-2402-01			1		BRACKET,CMPNT:ALUMINUM	80009	407-2402-01
						**********(ATTACHING PARTS)**********		
-71	211-0711-00			2		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
-72	210-0054-00			2		WASHER,LOCK:#4 SPLIT,0.025 THK STL CD P	83385	ORD BY DESCR
-73	211-0711-00			2		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
-74	210-0006-00			2		WASHER,LOCK:#6 INTL,0.018 THK,STL CD PL	78189	1206-00-00-0541C
						**********(END ATTACHING PARTS)*********		
-75	----- -----			1		SEMICOND DVC,DI:RECT BRIDGE,SI,400V,35A		
	----- -----			-		(SEE A2CR1 REPL)		
						**********(ATTACHING PARTS)**********		
-76	212-0071-00	B010100	B010199	1		SCREW,MACHINE:8-32 X 1.000,FILH,STL,CD PL	83385	ORD BY DESCR
	212-0011-00	B010200		1		SCREW,MACHINE:8-32 X 0.750 INCH,FLH STL	80009	212-0011-00
-77	220-0555-00			2		NUT,PLAIN,HEX.:8-32 X 0.25 INCH STL	000EL	ORD BY DESCR
-78	210-0804-00			1		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	ORD BY DESCR
-79	210-0069-00			1		WASHER,LOCK:0.168 ID X 0.293 " OD,SPLIT	83385	ORD BY DESCR
						**********(END ATTACHING PARTS)*********		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-80	131-1315-01			2		CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
	342-0117-00			4		INSULATOR,BSHG:0.375 ID X 0.065 L,DELRIN	80009	342-0117-00
-81	210-0255-00			2		TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	80009	210-0255-00
-82	210-0205-00			1		TERMINAL,LUG:SE #8	86928	5442-7
						**********(ATTACHING PARTS)**********		
-83	220-0555-00			1		NUT,PLAIN,HEX.:8-32 X 0.25 INCH STL	000EL	ORD BY DESCR
						**********(END ATTACHING PARTS)*********		
-84	337-1926-00			1		SHIELD,ELEC:POWER	80009	337-1926-00
						**********(ATTACHING PARTS)**********		
-85	211-0721-00			4		SCREW,MACHINE:6-32 X 0.375,PNH,TORX	93907	ORD BY DESCR
						**********(END ATTACHING PARTS)*********		
-86	358-0281-00			1		GROMMET,PLASTIC:BLACK,U-SHAPED,0.375ID	80009	358-0281-00
-87	352-0724-00			1		FUSE HOLDER:3 AG		
						**********(ATTACHING PARTS)**********		
-88	211-0304-00			1		SCREW,MACHINE:4-40 X 0.312,PNH	01536	ORD BY DESCR
	211-0325-00			1		SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,TORX	01536	ORD BY DESCR
-89	210-0407-00			2		NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-90	210-0204-00			2		TERMINAL,LUG:0.146 INCH DIA DE,45 DEG BE	78189	2157-06-01-2520N
-91	210-0255-00			2		TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	80009	210-0255-00
						**********(END ATTACHING PARTS)*********		
-92	204-0613-00			1		CONN BODY,RCPT:LINE SELECTOR		
	105-0548-00			-		DRUM,LINE SEL:		
	----- -----			-		(SUBPART OF A2)		
	352-0724-00			1		FUSE HOLDER:3 AG		
	----- -----			-		(SUBPART OF A2)		
-93	211-0711-00			2		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
-94	348-0019-00			2		GROMMET,RUBBER:BLACK,ROUND,0.469ID	70485	ORD BY DESCR
-95	211-0711-00	B010100	B010199	8		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
	211-0711-00	B010200		4		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
	211-0502-00	B010200		4		SCREW,MACHINE:6-32 X 0.188,FLH,100 DEG,ST	83385	ORD BY DESCR
-96	407-2404-02			2		BRACKET,CKT BD:OUTER,POLYAMIDE	80009	407-2404-02
-97	407-2404-03			1		BRACKET,CKT BD:INNER,POLYAMIDE	80009	407-2404-03
						**********(ATTACHING PARTS)**********		
-98	211-0711-00			8		SCR,ASSEM WSHR:6-32 X 0.25 L,PNH,TORX	01536	ORD BY DESCR
						**********(END ATTACHING PARTS)*********		
-99	337-2696-01			1		SHIELD,ELEC:CIRCUIT BOARD	80009	337-2696-01
-100	343-0003-00			2		CLAMP,LOOP:0.25 ID,PLASTIC	95987	1-4-6B
						**********(ATTACHING PARTS)**********		
-101	211-0721-00			2		SCREW,MACHINE:6-32 X 0.375,PNH,TORX	93907	ORD BY DESCR
-102	210-0006-00			2		WASHER,LOCK:#6 INTL,0.018 THK,STL CD PL	78189	1206-00-00-0541C
-103	210-0863-00			2		WSHR,LOOP CLAMP:0.187 ID U/W 0.5 W CLP,STL	95987	C191
						**********(END ATTACHING PARTS)*********		
-104	175-3777-02	B010100	B010199	2		CABLE ASSY,RF:39 OHM COAX,9.125L,SLATE	80009	175-3777-02
	175-3777-04	B010200		2		CABLE ASSY,RF:39 OHM COAX,9.125L	80009	175-3777-04
-105	175-3739-00			1		CABLE ASSY,RF:50 OHM COAX	80009	175-3739-00
	----- -----			-		(SUBPART OF A2)		
-106	175-3738-00			1		CABLE ASSY,RF:50 OHM COAX	80009	175-3738-00
	----- -----			-		(SUBPART OF A2)		
-107	175-3103-00			1		CA ASSY,SP,ELEC:3,26 AWG,7.0 L,RIBBON	80009	175-3103-00

FIG. 1 EXPLODED VIEW



REV NOV 1984

A6902A ISOLATOR

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
						STANDARD ACCESSORIES		
2-	070-4642-00			1		MANUAL,TECH:SERVICE,A6902A ISOLATOR	80009	070-4642-00
	070-4643-00			1		MANUAL,TECH:OPERATORS,A6902A	80009	070-4643-00
	010-0411-11			2		PROBE,ISOLATOR:500V W/ACCESSORIES	80009	010-0411-11
-1	195-1870-00			2		.LEAD,ELECTRICAL:26 AWG,8.812 L	80009	195-1870-00
-2	175-3766-01			2		.CABLE ASSY,RF:70 OHM COAX,71.05 L,GRAY	80009	175-3766-01
-3	206-0295-00			2		.TIP,PROBE:A6092A,W/HYBRID	80009	206-0295-00
	010-0409-01			2		PROBE,ISOLATOR:1500V	80009	010-0409-01
-4	195-0511-01	B010100	B010199	2		.LEAD,ELECTRICAL:18 AWG,12.75L,4-N	80009	195-0511-01
	195-0511-02	B010200		2		.LEAD,ELECTRICAL:18 AWG,12.75L,4-N	80009	195-0511-02
-5	013-0024-00			2		.TIP,PROBE:RETRACTABLE	80009	013-0024-00
-6	015-0442-01			1		PROBE ASSEMBLY:W/O TIP	80009	015-0442-01
-7	159-0054-00			1		FUSE,CARTRIDGE:3AG,0.15A,250V,SLOW-BLOW	71400	MDL 15/100
	----- -----			-		(STANDARD,OPTION A4 ONLY)		
	159-0048-00			1		FUSE,CARTRIDGE:3AG,0.1A,250V,27 SEC	71400	MDL 1/10
	----- -----			-		(OPTION A1,A2,A3,A5 ONLY)		
-8	012-0204-00			2		CABLE ASSY,RF:50 OHM,BNC,6 FEET LONG	80009	012-0204-00
	013-0107-05			2		TIP,PROBE:RETRACTABLE HOOK ASSY	80009	013-0107-05
	166-0404-01			2		COVER,GROUND:	80009	166-0404-01
-9	161-0117-00			1		CABLE ASSY,PWR,:3,18 AWG,125V,120.0 L	16428	KH 8673
						(ALSO AVAILABLE)		
-10	161-0132-00			-		CABLE ASSY,PWR:220V,3.05M LONG	S3109	ORD BY DESCR
	----- -----			-		OPTION A1,EUROPEAN		
-11	161-0133-00			-		CABLE ASSY,PWR:240V,3.05M LONG	000HC	ORD BY DESCR
	----- -----			-		OPTION A2,UNITED KINGDOM		
-12	161-0135-00			-		CABLE ASSY,PWR:240V,3.05M LONG	S3109	ORD BY DESCR
	----- -----			-		OPTION A3,AUSTRALIA		
-13	161-0134-00			-		CABLE ASSY,PWR:240V,3.05M LONG	000HC	ORD BY DESCR
	----- -----			-		OPTION A4,N.AMERICAN		
-14	161-0154-00			-		CABLE ASSY,PWR:3,0.75MM SQ,240V,6A,2.5M L	000JA	A25SW
	----- -----			-		OPTION A5,SWITZERLAND		
						OPTIONAL ACCESSORIES		
	013-0084-02					ADAPTER,CONN:PROBE TO BNC	24931	28P230
	015-0405-00					ADPTR,PROBE TIP:	24931	ORD BY DESCR
	334-2794-01					BAND,MARKER:0.371 DIA,WHITE,PLASTIC,5.0	80009	334-2794-01
	334-2794-07					BAND,MARKER:0.371 DIA,GREEN,PLASTIC	80009	334-2794-07

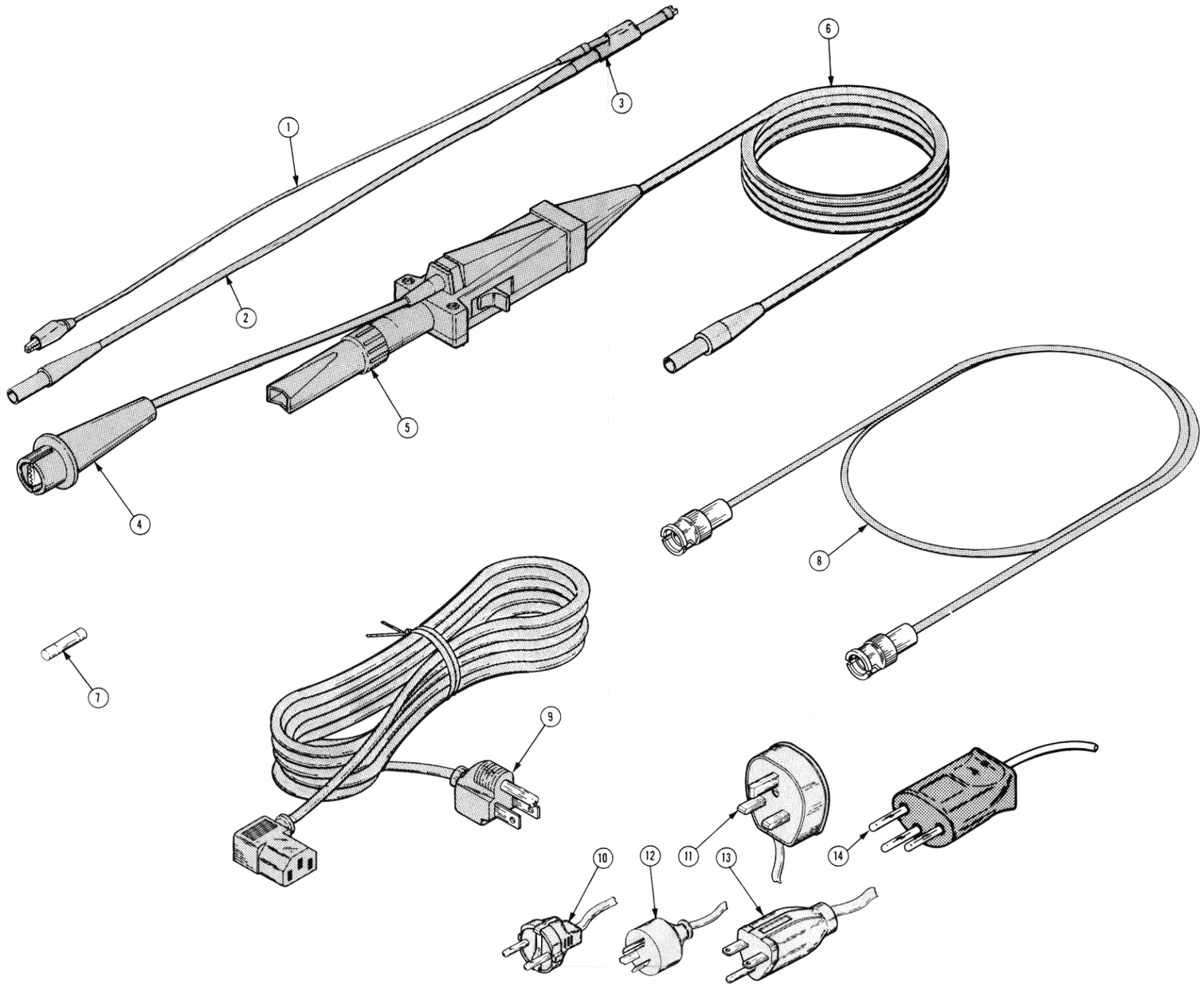


FIG. 2 ACCESSORIES

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.

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MANUAL CHANGE INFORMATION

Date: 1-23-85 **Change Reference:** C2/0185

Product: A6902A Isolator **Manual Part No.:** 070-4642-00

DESCRIPTION PG 60

Replaceable Electrical Parts List Correction

CHANGE TO:

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description
A2U2147	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K
A2U2147	----- -----			(MATCHED PAIR W/U2153)
A2U2153	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K
A2U2153	----- -----			(MATCHED PAIR W/U2147)
A2U2647	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K
A2U2647	----- -----			(MATCHED PAIR W/U2653)
A2U2653	156-1977-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR,7K
A2U2653	----- -----			(MATCHED PAIR W/U2647)