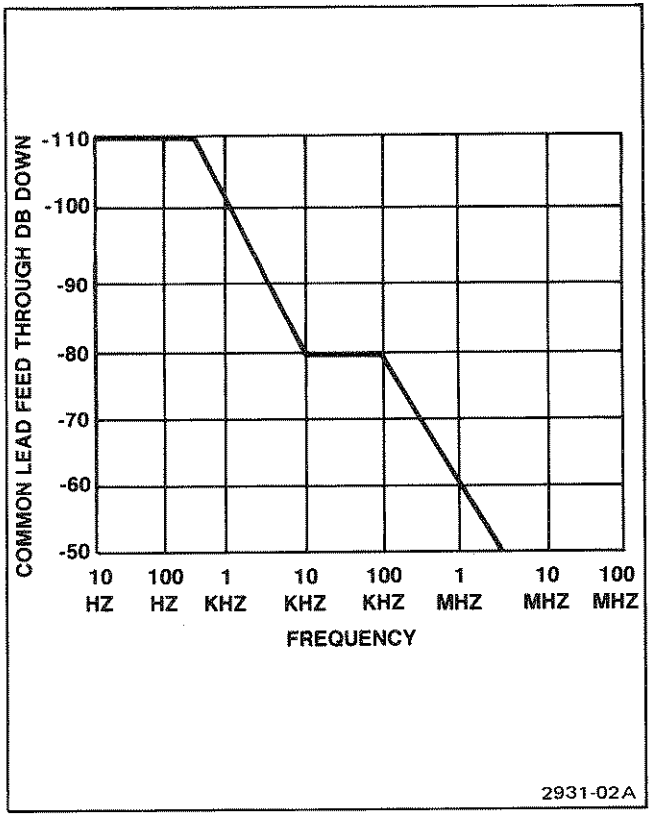


Figure 1-3. Common-lead feedthrough characteristics.

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).	

Table 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
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 Supply	+ 5 V ±0.5 V. − 5 V ±0.5 V.	

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 nonoperating to MIL-STD-810C, Method 507.1, at 90% to 95% Relative Humidity and at 30°C to 60°C.
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 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	1.9 m (6.2 ft).
Probe Head Length	200 mm (7.9 in).
Probe Common Lead Length	300 mm (11.8 in).

Table 1-3 (cont)

Characteristic	Description
Dimensions (cont)	
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).

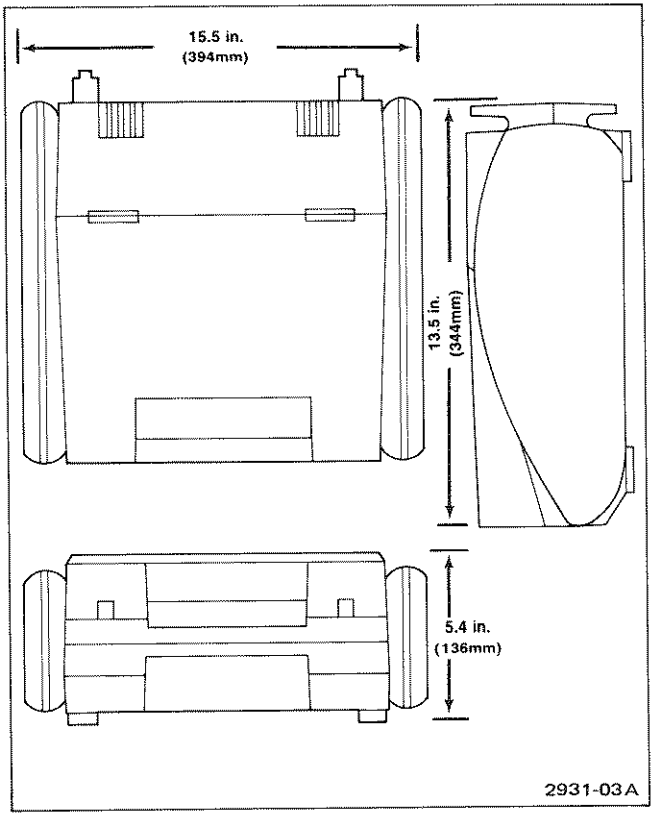


Figure 1-4. A6902A dimensional drawing.

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.

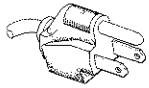
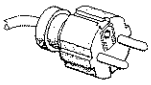
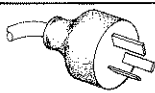
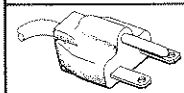
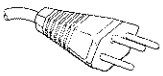
POWER CORDS

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

2931-21

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.

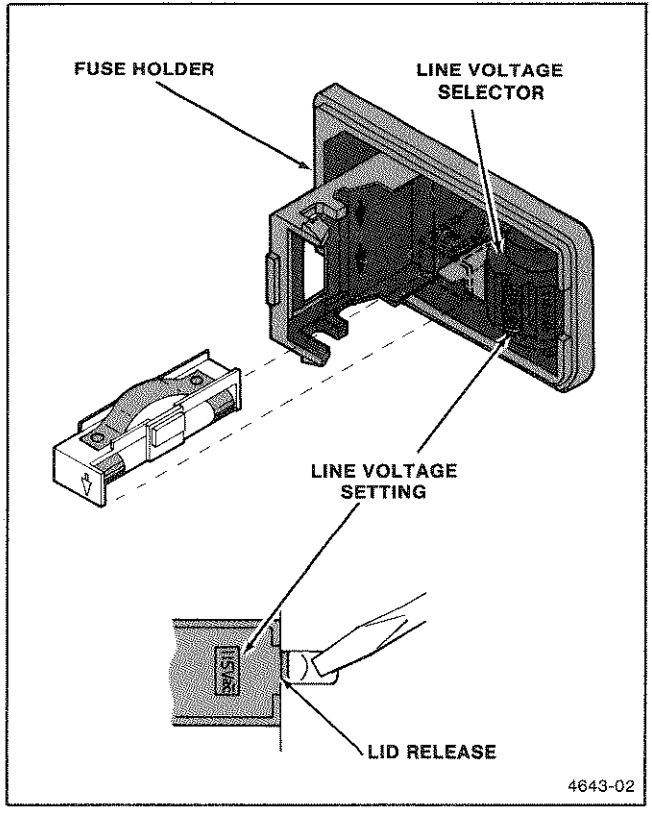


Figure 2-2. Fuse holder/line voltage selector.

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.

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.

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.

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.

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.

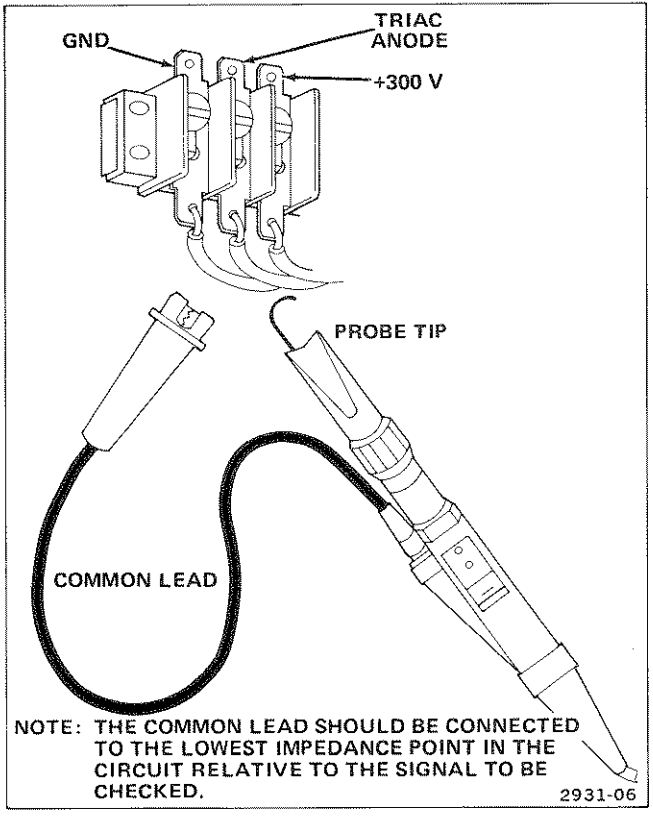


Figure 2-3. Example of connecting an input probe.

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 'Operator's Checks and Adjustments" (Section 4).

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 the same length and impedance. Cable length should not exceed two meters and should be of 50-Ω impedance.

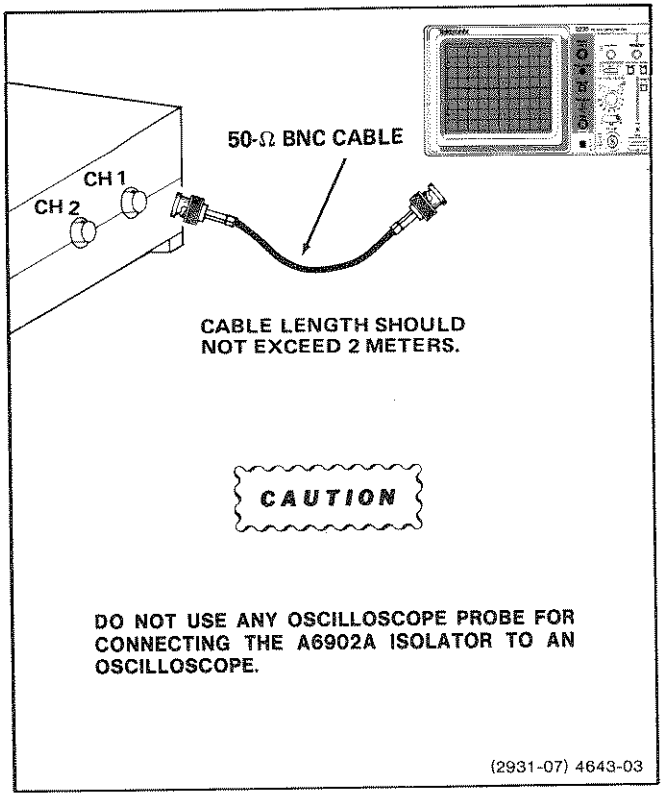


Figure 2-4. Connecting the A6902A outputs to an oscilloscope.

CONTROLS, CONNECTORS AND INDICATORS

FRONT PANEL

Refer to Figure 3-1 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).

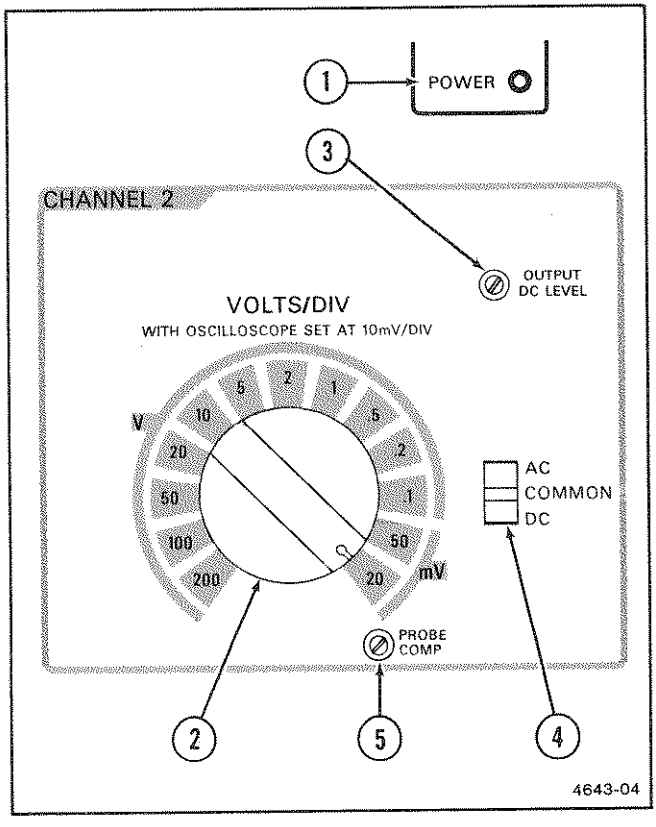


Figure 3-1. Front-panel controls and indicator.

REAR PANEL

Refer to Figure 3-2 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.

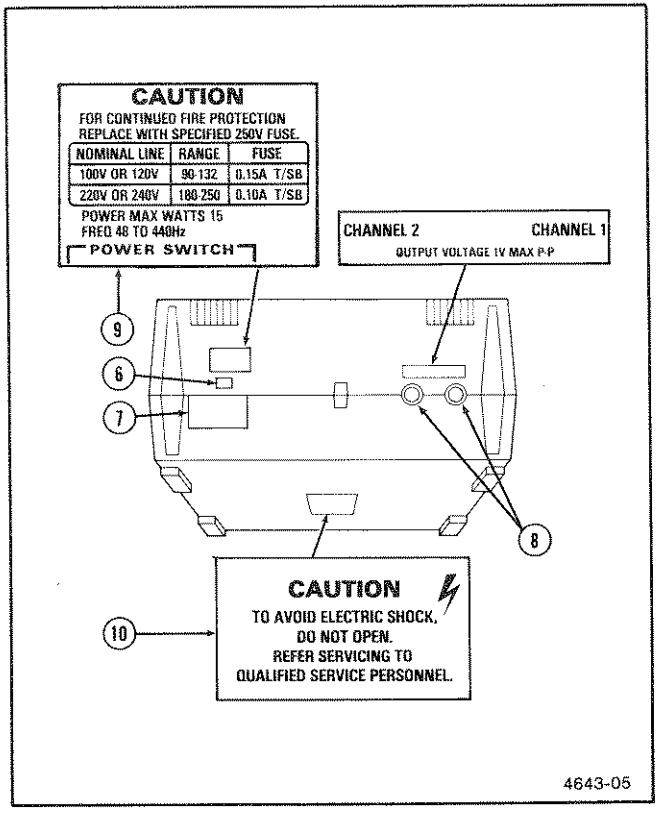


Figure 3-2. Rear- and bottom-panel controls, connectors, and labels.

BOTTOM PANEL

Refer to Figure 3-2 for the location of item 10.

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

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 3-3 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. Match the indexing guides with the corresponding guide slots for the position chosen and push the slide forward until the indexing guides completely engage the probe slots.

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

7. The probe is now ready to be used.

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

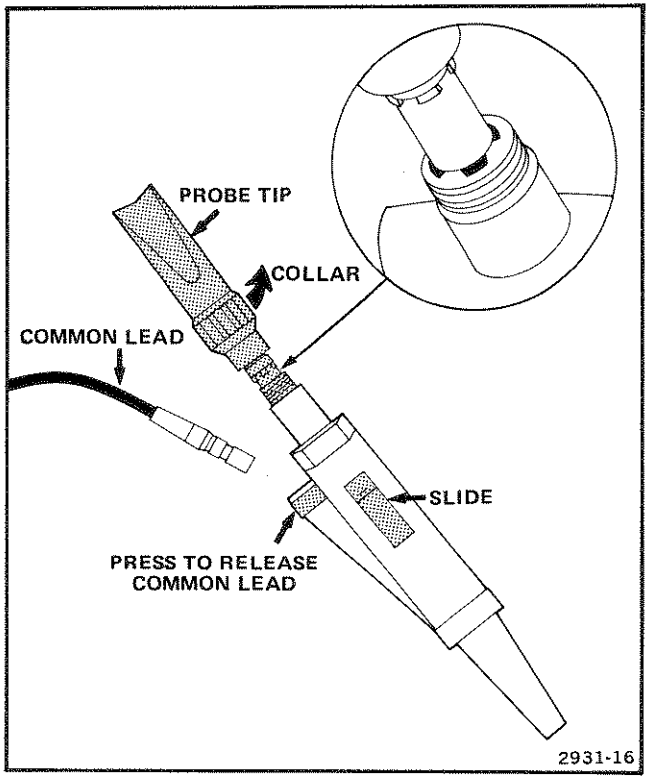


Figure 3-3. Setting the 1500-V probe tip angle and replacing the common lead.

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 manual.

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.

To replace the common lead on the 1500-V Probe, press and hold the release point shown in Figure 3-3. 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 THE 1500-V PROBE TIP

To replace the 1500-V Probe tip with a new one, refer to Figure 3-4 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 3-4. 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.

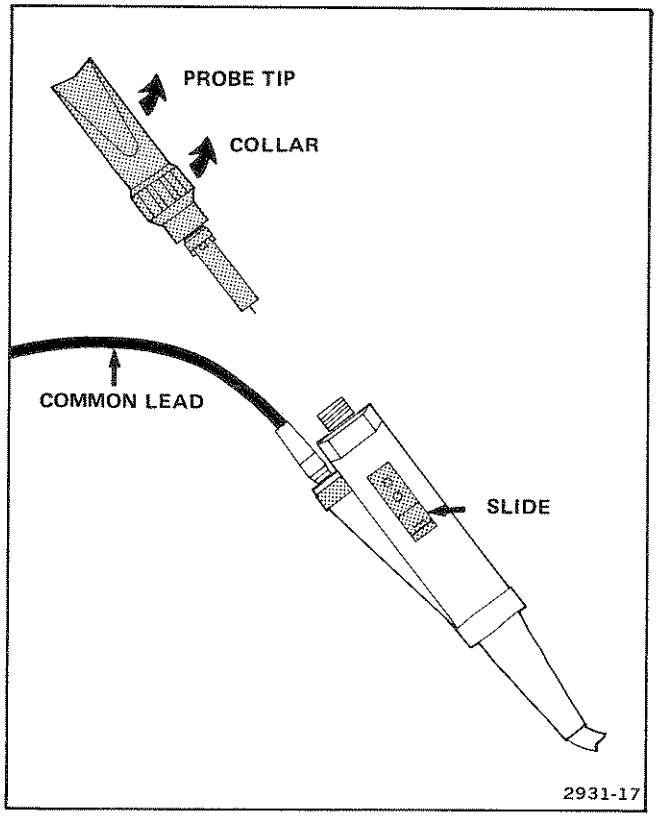


Figure 3-4. Replacing the 1500-V probe tip.

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

6. Move the slide forward to the position shown in Figure 3-3 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.

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.

APPLICATION EXAMPLE

INTRODUCTION

The following is an example of one of the ways the TEKTRONIX A6902A Isolator might be used to look at high-voltage signals or signals that are elevated to a high-voltage level.

EXAMPLE

The test circuit shown in Figure 5-1 is a simplified diagram of a motor controller. A variable RC network is used to trigger a diac which in turn triggers the gate of a triac. In this example, both channels of the A6902A may be used to compare the phase relationships of the gate signal to the motor-voltage waveform and to the triac waveform.

For best performance, probe common leads should always be connected to the lowest possible impedance point relative to the probe tip. In this case, Channel 1 common lead would be connected to point A and Channel 1 input to point B to monitor the motor drive voltage. The Channel 2 common lead should be connected to point C and the input to point D to monitor the triac gate waveform. A typical waveform comparison is illustrated in Figure 5-2.

Figures 5-2 and 5-3 show representative phase relationships of gate drive and motor conduction for various motor-control settings. This type of measurement could not be made without the capability of floating the signal commons with the A6902A system.

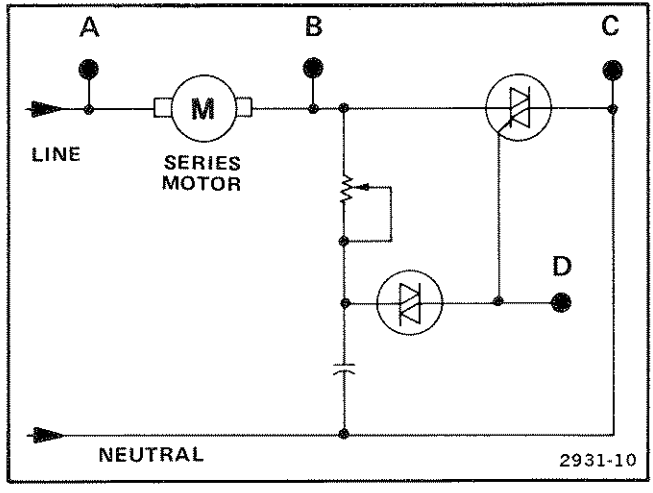


Figure 5-1. Application example test circuit.

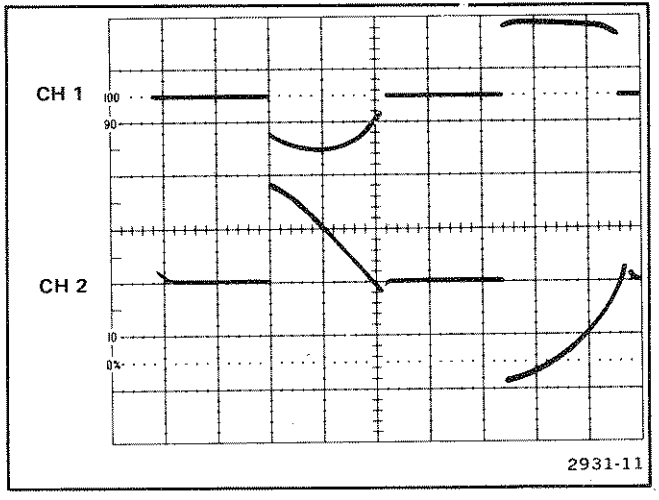


Figure 5-2. Motor and gate waveforms at approximately 180° conduction.

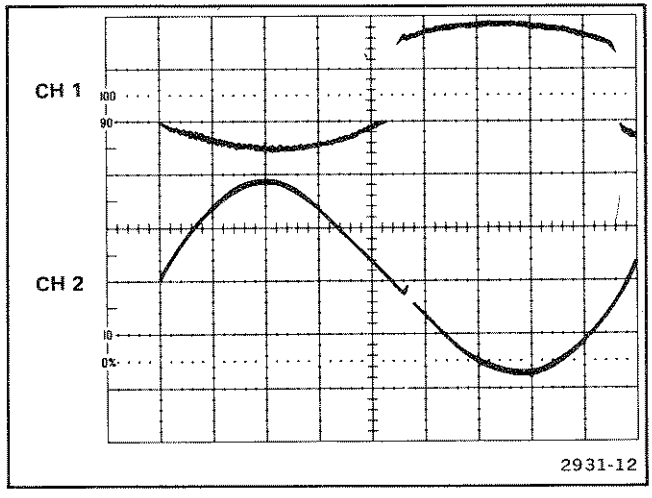


Figure 5-3. Motor and gate waveforms at approximately 360° conduction.

ACCESSORIES

STANDARD ACCESSORIES

2 Probes, input, 500 V	010-0411-10
2 Probes, input, 1500 V	010-0409-01
2 Tips, hook	013-0107-04
2 Sleeve, ground cover	166-0404-01
2 Lead, ground	195-1870-00
1 Fuse 0.15 A T/SB (Standard)	159-0054-00
1 Fuse 0.1A T/SB (Options A1 to A5)	159-0048-00
1 Operator Manual	070-4643-00
1 Service Manual	070-4642-00
2 Cables, output, 50 Ω, 2 meters	012-0204-00
1 Cable assembly, power	161-0117-00

OPTIONAL POWER CORDS

Option A1, Universal European, 3 meters	161-0132-00
Option A2, United Kingdom, 3 meters	161-0133-00
Option A3, Australia, 3 meters	161-0135-00
Option A4, N. American (240 V), 3 meters	161-0134-00
Option A5, Switzerland, 3 meters	161-0154-00

OPTIONAL ACCESSORIES

BNC-to-probe-tip Adapter (for 1500-V probe)	015-0405-00
BNC-to-probe-tip Adapter (for 500-V probe)	013-0084-02
Cable-Marker Band (White)	334-2794-01
Cable-Marker Band (Green)	334-2794-07