

## Model 8002A High Resistance Test Fixture


### INTRODUCTION

This packing list contains information on using the Model 8002A High Resistance Test Fixture. The Model 8002A allows resistance measurements as high as  $10^{15}\Omega$  using either of two basic operating modes. In the Picoammeter mode, the test fixture is designed to operate in conjunction with a separate voltage source and picoammeter; in the Source-Measure mode, the test fixture is intended to operate with a Model 236/237 Source Measure Unit or similar instrument.

In order to minimize the effects of undesirable leakage currents, the Model 8002A includes a guarded triaxial jack for meter connections. Interlock provisions are also included to ensure safe operation.

### Supplied Accessories

The following accessories are supplied with the Model 8002A:

- Model 6172 2-lug to 3-lug Triaxial Adapter: Allows connections of 3-lug triaxial cables to electrometers with 2-lug triaxial connectors.
- Model 7078-TRX-3 3-foot, 3-slot Triaxial Cable: Connects the fixture Meter jack to a picoammeter, electrometer, or source measure unit equipped with a 3-lug triaxial connector.
- Model 8007-GND-3 Safety Ground Wire: Connects the  terminal of fixture to safety earth ground.
- Lid interlock connector (part number CS-662): Allows connection of the Model 8002A interlock circuit to test instrument using custom wiring.
- Banana to banana cable (part number CA-18-1): Connects V Source binding posts to external voltage source.
- A copy of this packing list.

### Optional Accessories

The optional accessories listed below are recommended for use with the Model 8002A:


- Model 4801 Low-noise Coaxial Cable: Allows connecting picoammeters equipped with a BNC jack to the fixture (requires Model 7078-TRX-BNC triax-to-BNC adapter).
- Model 6171 3-lug to 2-lug Triaxial Adapter: Allows connection of 2-lug triaxial cables to the Meter jack.
- Model 7024-3 3-foot, 2-slot Triaxial Cable: Connects the fixture Meter jack to instruments equipped with 2-lug triaxial connectors (requires Model 6171 adapter).


- Model 7078-TRX-BNC Triax to BNC Adapter: Allows connection of BNC cables to the fixture Meter jack.
- Mating bulkhead interlock connector (part number CS-659): This connector is the mating connector for the supplied CS-662 interlock connector.
- Banana plug patch cord (Pomona B-36): Connects test fixture binding posts to binding posts or banana jacks on instruments (insulated wire may be substituted if instrument is equipped with binding post(s) instead of banana jack(s)).

## SAFETY INFORMATION

### Safety Symbols and Terms


The following terms or symbols are found on the test fixture or used in this packing list:

The  symbol on an instrument indicates that the user should refer to the operating instructions.

The  symbol on an instrument shows that 1000V or more may be present on the terminal(s). Use standard safety precautions to avoid personal contact with these voltages.

A **WARNING** heading indicates hazards that may cause personal injury or death. Always read the indicated information very carefully before performing the indicated procedure.


The **CAUTION** heading explains hazards that could damage the instrument. Such damage may invalidate the warranty.

The  screw must be connected to safety earth ground as outlined below.

### Safety Precautions

#### WARNING

**To avoid possible personal injury or death caused by electric shock, the following safety precautions must be observed when using the Model 8002A Test Fixture:**

1. User-supplied lethal voltages may be present while the test fixture lid is open. Safe operation requires the use of the lid interlock.
2. Before use, connect the fixture  terminal to safety earth ground using #18AWG minimum wire (use the supplied safety ground wire).
3. Do not exceed 200V peak on Vsource or Meter inputs. Do not exceed 28V or 50mA on lid interlock connector.
4. Turn off all sources and discharge all capacitors before connecting or disconnecting wires or cables to the test fixture.

5. Dress all wires to ensure that no conductive surfaces are exposed after making connections to the binding posts.

## FIXTURE CONFIGURATION

Figure 1 shows the top panels and equivalent circuit of the Model 8002A, and Figure 2 shows the front panel of the test fixture. Key aspects of the fixture are outlined below.

**DUT Connection Posts:** These posts allow easy connection of the DUT (device under test). To connect a device lead, simply press down on the post, and insert the device lead into the open slot in the side of the post. Release the spring-loaded post to seat the lead properly.

### NOTE

Be careful not to touch the insulators or the body of the DUT to avoid contamination that could affect your measurements.

**Picoammeter/Source-Measure Switch:** This switch controls the operating mode of the internal interlock switch. The switch must be placed in the Picoammeter position when the fixture is to be used with a separate voltage source and picoammeter, and it must be set to the Source-Measure position when the fixture is to be used with a Model 236/237 Source Measure Unit or similar instrument.

### CAUTION

**Damage to instruments could occur if the switch is in the wrong position.**

**V Source Binding Posts:** These two 5-way binding posts are designed to connect an external voltage source or source measure unit LO to the test fixture. Banana jacks, lugs, or bare wires can be connected to these posts. The red post is HI, and the black post is LO.

**Meter Jack:** The Meter jack is a 3-lug female triaxial connector to be used to connect a picoammeter, electrometer, or source measure unit to the test fixture. Note that the inner ring is automatically driven at guard potential when used with a Model 236/237 Source Measure Unit.

**Lid Interlock Connector:** This connector allows the fixture to be connected to the interlock circuit of a Model 236/237 Source Measure Unit using a Model 236-ILC-3 interlock cable (supplied with the Model 236/237), or to other instruments using custom wiring and the supplied CS-662 interlock connector. Figure 3 shows interlock connector wiring and typical interfacing to other instruments such as those with a digital I/O port.



**Terminal:** This screw terminal must be connected to safety earth ground.

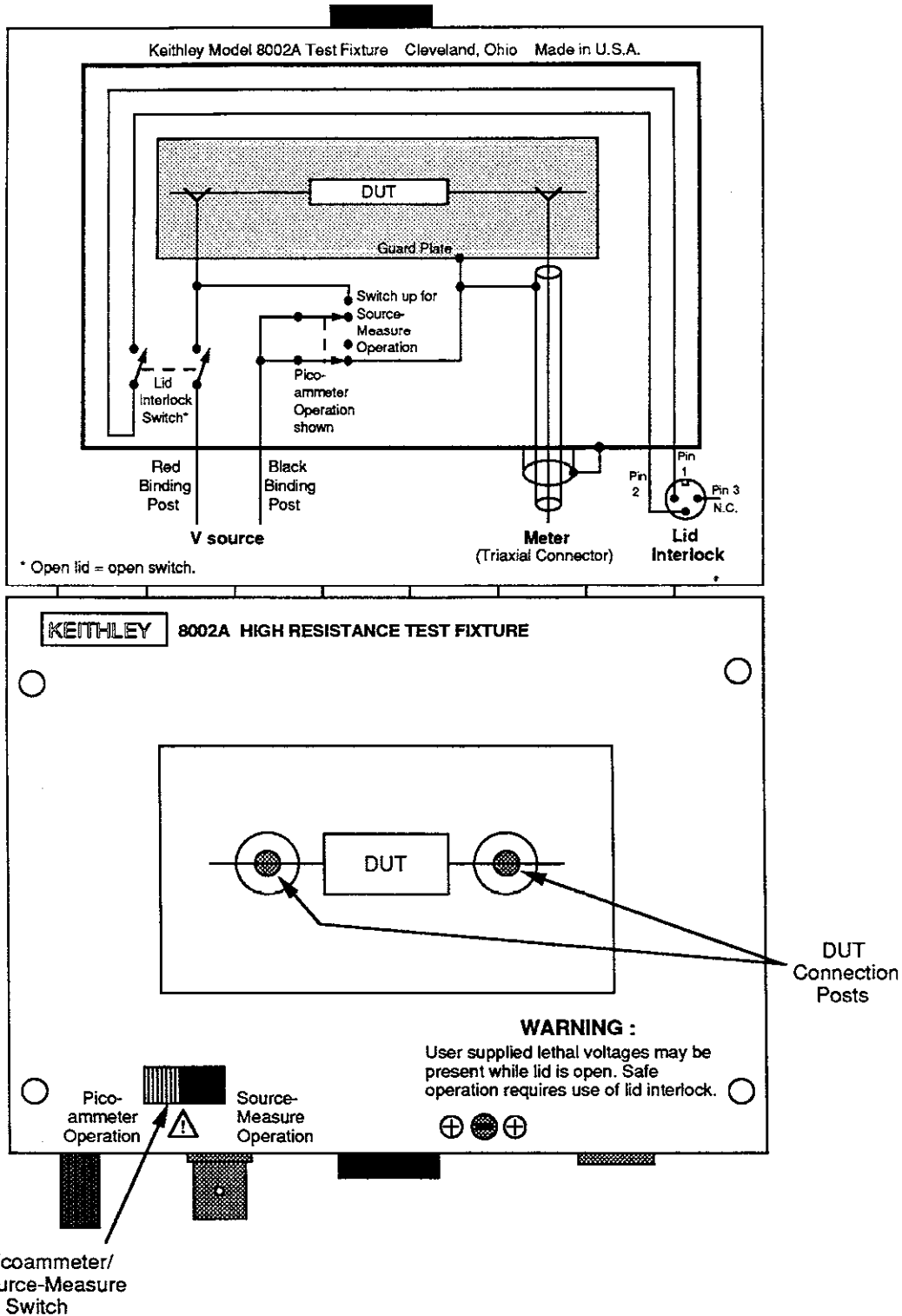


Figure 1. Top Panel

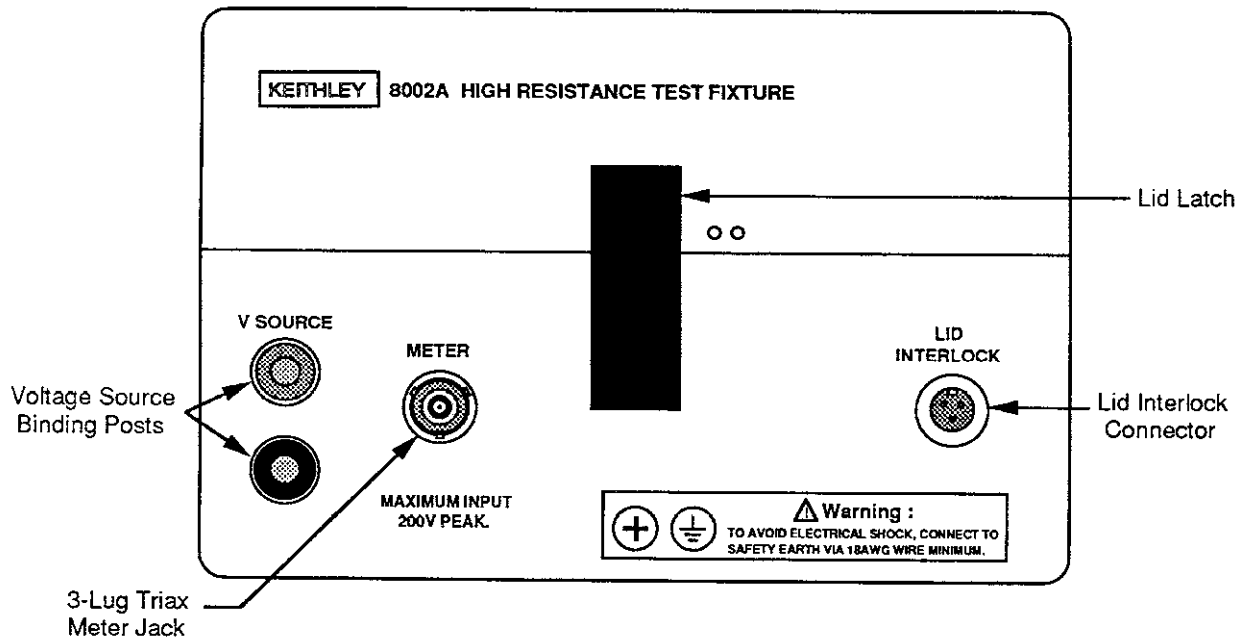


Figure 2. Front Panel

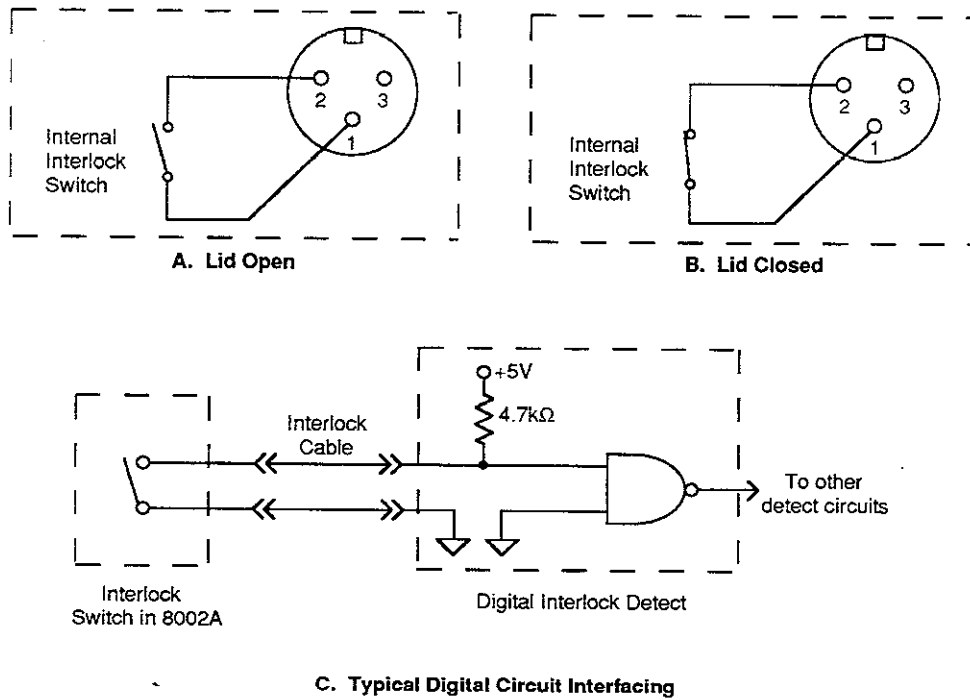


Figure 3. Interlock Circuit Wiring

## PICOAMMETER OPERATION

In the Picoammeter operating mode, the fixture connects to a voltage source and electrometer or picoammeter, as shown in the typical example of Figure 4. In this instance, a Model 617 Electrometer/Source supplies both voltage-sourcing and current-measuring functions. Figure 5 shows connections for a separate Model 230 Voltage Source and Model 485 Picoammeter.

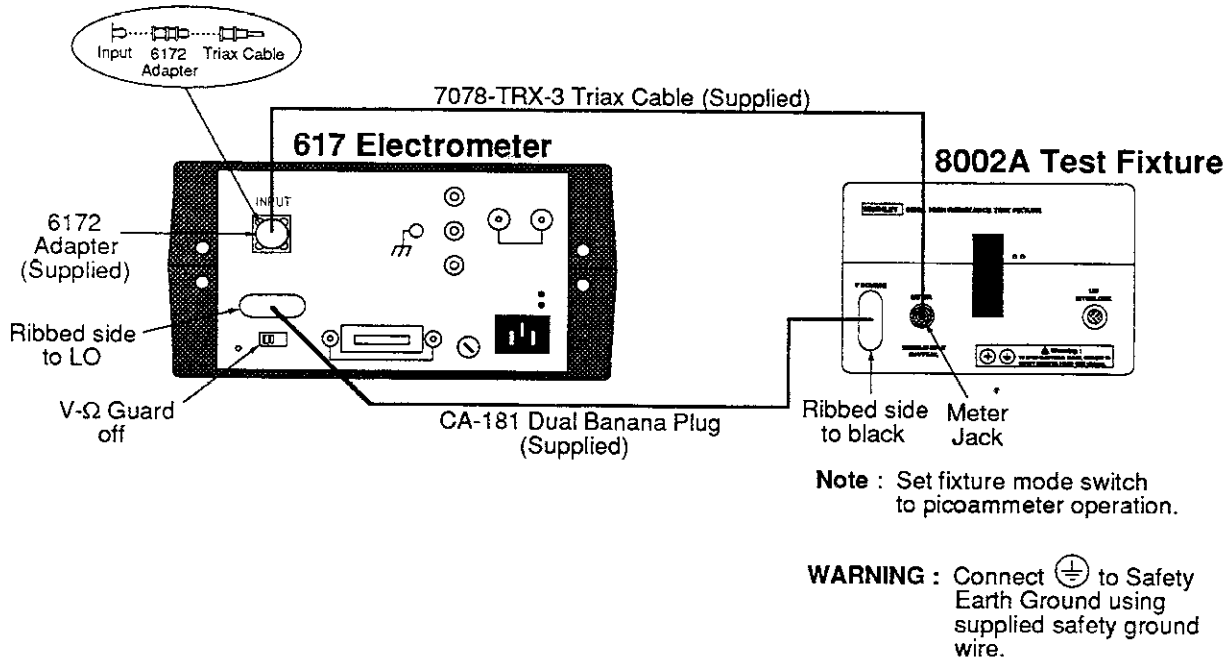


Figure 4. Connecting Electrometer/Source to Fixture

### Operating Notes

- The electrometer should be used in the picoammeter mode only (do not use the normal resistance mode). Select the V/I ohms mode on the Model 617 to directly display resistance.
- The Picoammeter/Source-Measure switch must be set to the Picoammeter position with this configuration.
- The Model 617 V-Ω Guard switch should be placed in the OFF position when measuring current.
- Although the lid interlock switch is operational, it is recommended that you always set the voltage source output to 0V before opening the lid to change DUTs.

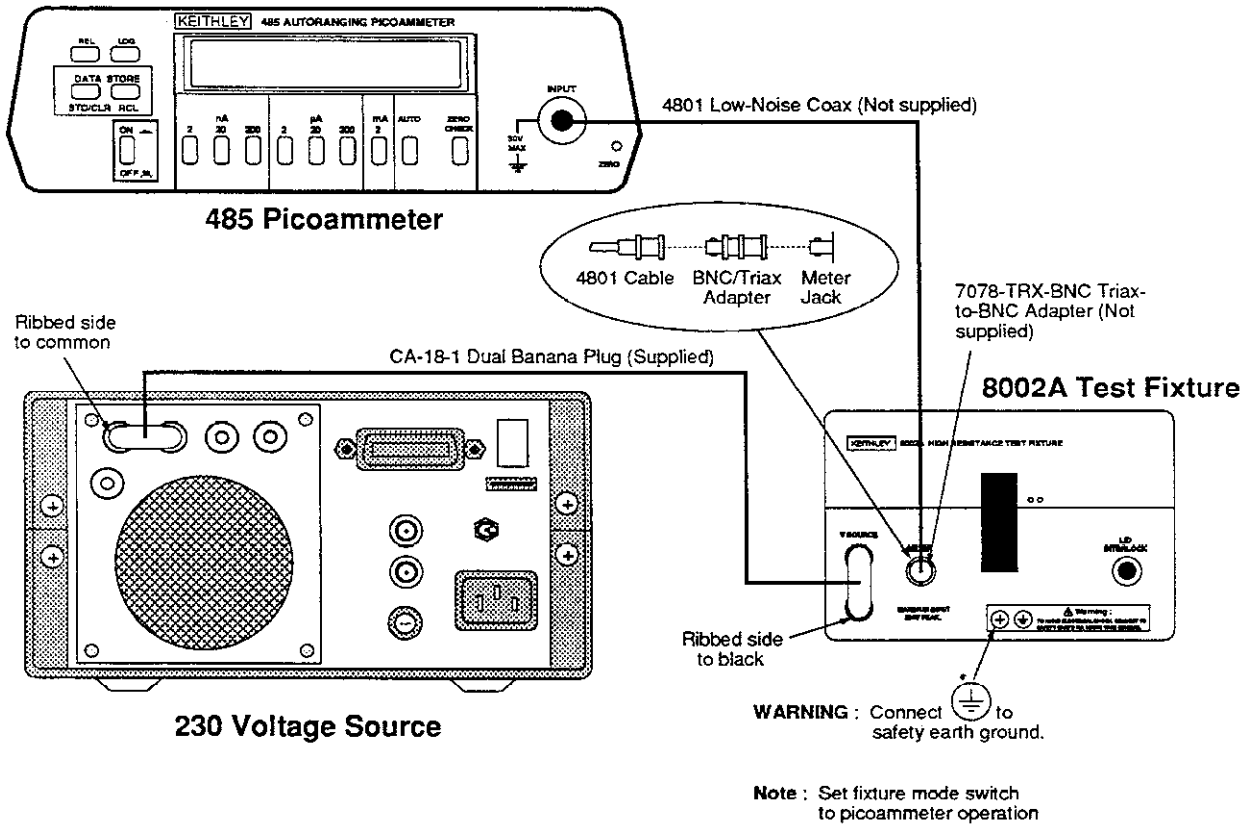


Figure 5. Connecting Voltage Source and Picoammeter to Fixture

## SOURCE MEASURE UNIT OPERATION

Figure 6 shows how to connect the Model 8002A Test Fixture to a Model 236/237 Source Measure Unit using the indicated cables.

### Operating Notes

- Safe operation requires the use of the lid interlock (see safety precautions).
- The Picoammeter/Source-Measure switch must be in the **Source-Measure** position for this configuration.
- The source measure unit must be set for local sensing with the test configuration shown.
- The normal source measure unit operating mode for resistance measurement is source V, measure I. The resistance, of course, is simply  $V/I$ .

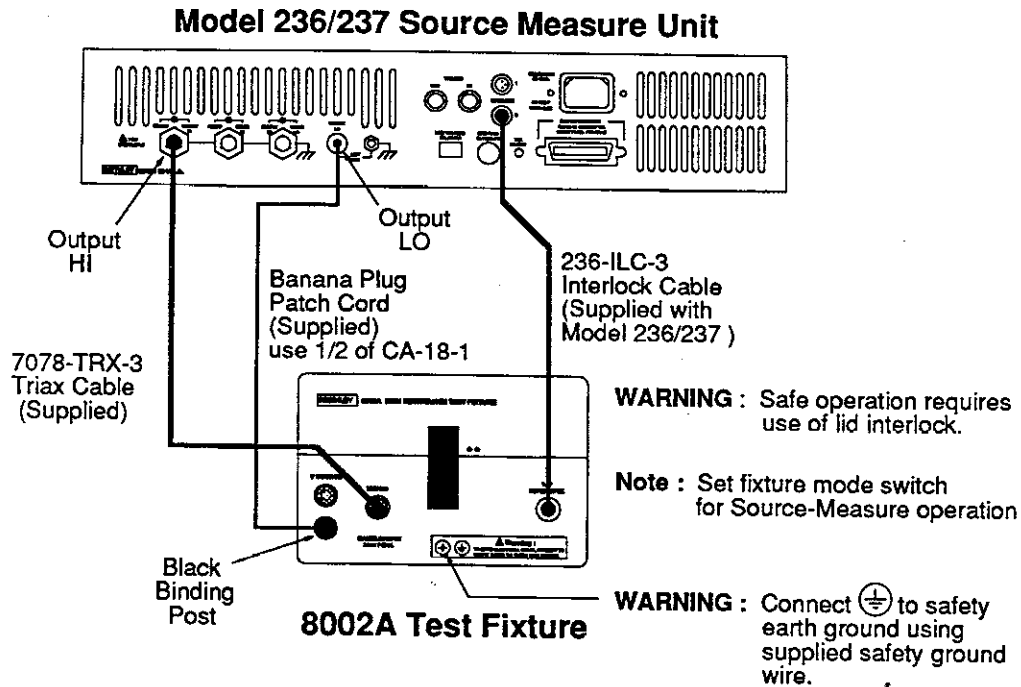


Figure 6. Connecting Test Fixture to Source Measure Unit

## TYPICAL PERFORMANCE

Two key aspects of fixture performance that could affect low-current or high-resistance measurements are the offset current and insulation resistance. The offset current algebraically adds to the DUT current, affecting measurement accuracy. Similarly, the insulation resistance adds a parallel leakage path that shunts some of the current away from the DUT, also affecting measurement accuracy.

Typical performance characteristics of the fixture (23°C, 40% relative humidity, guarded) are:

Offset current: <0.1pA

Insulation resistance: >10<sup>16</sup>Ω

To further reduce the effects of offset current and insulation resistance, use the SUPPRESS or REL feature of the measuring instrument, if available. To suppress offset current, for example, first set the voltage source to 0V, and place the source in operate. With the DUT connected, and the fixture lid closed, set the instrument to its lowest possible current measurement range, then enable suppress after allowing the reading to settle. Set the voltage source to the desired test voltage, then make your measurement as usual.

In a similar manner, the effects of insulation resistance can also be suppressed. To do so, first remove the DUT, close the fixture lid, and program the voltage source to the desired test value. With the instrument measuring current on the lowest range possible, enable suppress after the reading settles completely. Turn off the voltage source, and reinstall the DUT. Next, close the lid, turn on



the voltage source, and then make the measurement in the usual manner. If a Model 617 Electrometer/Source is being used, the instrument can be placed in the V/I ohms mode after the suppression procedure has been completed in order to directly display resistance.

## HANDLING AND CLEANING

In order to maintain high insulation resistance, the DUT connecting posts and triax connector are Teflon® insulated. To maintain this high insulation resistance value, it is important that these areas not become contaminated by skin oils or from air-borne deposits. In order to avoid contamination, do not touch the insulators or operate the fixture in dirty environments.

The most obvious sign of possible contamination is sub-standard insulation resistance, which can be verified by making a standard resistance measurement with the DUT removed. If lower-than-normal resistance is noted, carefully clean the Teflon® insulators and the Meter jack using a clean cotton swab dipped in clean methanol. After cleaning, allow the test fixture to dry for several hours in a 50°C, low-humidity environment before use.

## REPLACEABLE PARTS

Table 1 below summarizes replacement parts that are available for the Model 8002A. These parts can be obtained directly from Keithley Instruments, Inc. When ordering parts, be sure to indicate the Model number (8002A), serial number, and the Keithley part number.

The unit can be returned for factory service, if desired. When returning the fixture, write "ATTENTION REPAIR DEPARTMENT" on the shipping label, and be sure to advise as to the warranty status of the unit, as well as the type of service required.

Table 1. Model 8002A Replacement Parts

Description	Keithley Part Number
V Source Post, Red	BP-11-2
V Source Post, Black	BP-11-0
Meter Jack	CS-630
Lid Interlock Connector	CS-659
Operating Mode Switch	SW-471
Interlock Switch	SW-41
Connecting Post	TE-93



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