

Multi-Measurement Prober Cable Kit Quick Start Guide

Overview

The Keithley Instruments Model 4210-MMPC-S multi-measurement cable kit (see Figure 1) is a collection of standard and custom connectors and accessories used to take I-V and C-V measurements using a single prober cable setup. It is also used with the Keithley Model 4225-PMU or Model 4200-PIV-A package to perform pulse I-V measurements. This kit has been assembled for use with the Suss Micro Tec PA200/300 prober series.

NOTE For C-V testing, this Quick Start Guide applies to both the Model 4200-CVU card and the new 1 kHz Model 4210-CVU card. For pulse I-V testing, this guide also applies to the Models 4200-PG2, 4205-PG2, 4220-PGU, and 4225-PMU pulse cards.

Prober cable kit contents

Figure 1 shows the cables, adapters, and supplies that are included in the Model 4210-MMPC-S multi-measurement cable kit. Also, note that there is an 8" x 10" bag and two screws in this kit (not shown): M3X12MMSSSOHCBLK.

Figure 1: Model 4210-MMPC-S multi-measurement prober cable kit



Quick Start Guide topics

The guide contains information about the installation and use of this cable kit:

- **Connecting Model 4200** instrumentation to the prober bulkhead: Explains how to make connections from the Model 4200 to the prober bulkhead.
- **Installing the prober cable kits:** Explains how to make connections from the prober bulkhead to the prober pins.
- **Usage scenarios:** Provides the specific prober cable setups:
 - o I-V testing (2-wire and 4-wire)
 - o C-V testing (2-wire and 4-wire)
 - o Pulse I-V measurements using the Keithley Model 4200-PIV-A
 - o Pulse I-V measurements using the Keithley Model 4225-PMU with the 4225-RPM

Related documents

The following documents (in PDF format) are located on the Model 4200 Complete Reference CD:

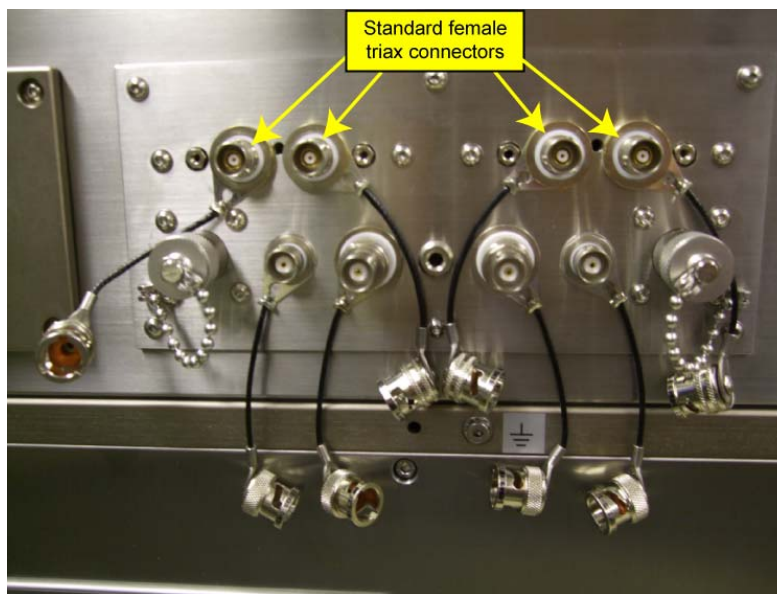
- **PA-993:** This is a one-page packing list for the Model 4210-MMPC-S Multi-Measurement Prober Cable Kit for the Suss Micro Tec PA200/300 series prober. A photo shows all the components of the cable kit.
- **PA-994:** This is a one-page packing list for the Model 4210-MMPC-C Multi-Measurement Prober Cable Kit for the Cascade MicroTech 12000 series prober. A photo shows all the components of the cable kit.
- **Section 16** of the 4200-SCS Reference Manual – The Reference Manual PDF can be found on the main 4200-SCS Complete Reference. Open the Complete Reference web page by double-clicking the Complete Reference icon in the upper-left corner of the 4200 desktop.
- **White Paper** – Labs' Demands for Greater Measurement Flexibility Require Cabling Systems Capable of Accommodating Multiple Measurement Types: This white paper explains the different cabling requirements for I-V, C-V, and pulse I-V testing. It also describes an easy-to-use single multi-measurement cabling system (Model 4210-MMPC-S for the Suss Micro Tec PA200/300 prober).

Connecting Model 4200 instrumentation to the prober bulkhead

WARNING *To prevent injury or death due to electric shock, remove all power from the Model 4200-SCS and shut down the Suss prober before installing the prober cable kit.*

The Model 4200 connects to the female triax connectors on the prober bulkhead. Figure 2 shows the triax connectors on one of the two connection panels of the prober.

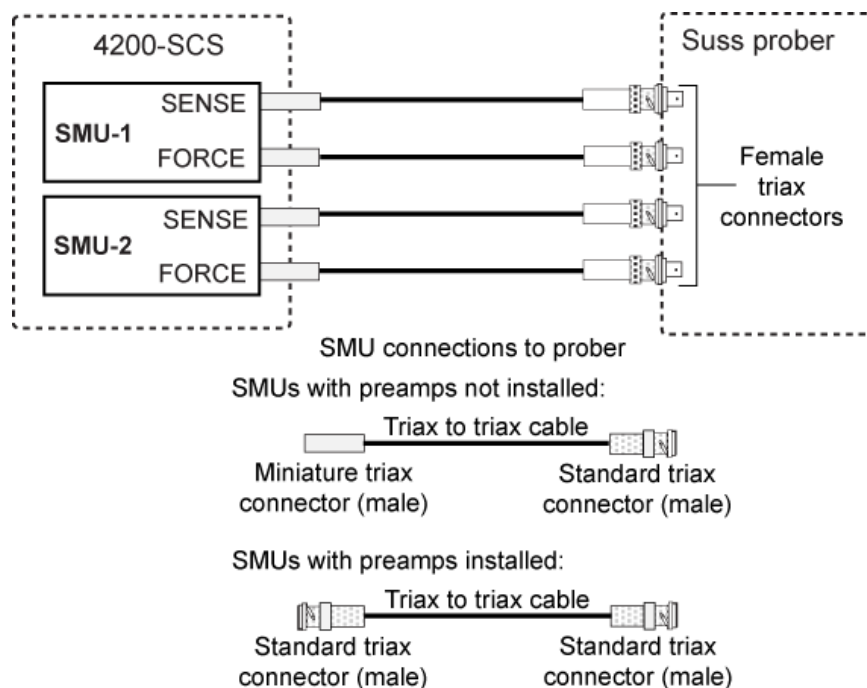
Figure 2: Prober bulkhead female triax connectors



I-V testing

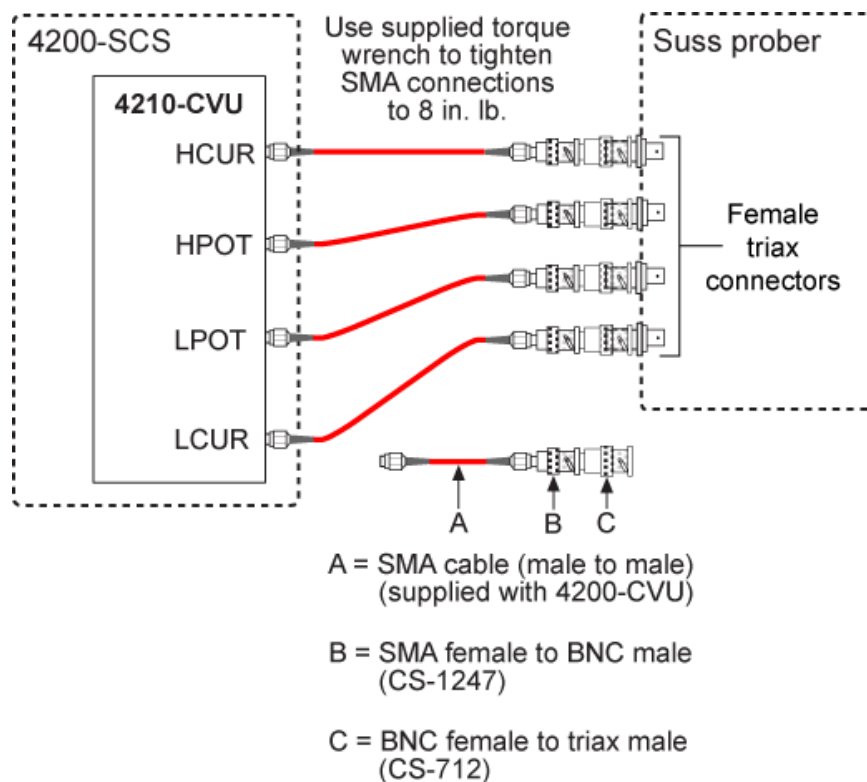
For I-V testing, connect the triax cables of your Model 4200 source-measure units (SMUs) to the standard female triax connectors on the bulkhead of the prober. Figure 3 shows two Model 4200 SMU prober connections.

NOTE Figure 3 shows SMUs that do not use preamps. These SMUs use the supplied triax cables that are terminated with a miniature triax connector on one end and a standard triax connector on the other end. If your SMUs are equipped with preamps, use the supplied cables that are terminated with standard triax connectors on both ends. Figure 3 shows both cables.

Figure 3: Model 4200 SMU connections to the prober

C-V testing

Two prober cable kits include the cable adapters needed to connect the SubMiniature version A (SMA) cables of the Model 4210-CVU to the female triax connectors on the bulkhead of the prober. Figure 4 shows how to make the connections. A torque wrench is supplied with the Model 4210-CVU.

Figure 4: Model 4210-CVU prober connections

Pulse I-V testing using the Keithley Model 4200-PIV-A

Perform 4-pin pulse I-V measurements using four probe cable kits with the Keithley Instruments Model 4200-PIV-A package, which includes a scope card, pulse generator card, software, and other components.

Use the supplied cables and connectors to connect the Model 4200 to the bulkhead of the probe (see Figures 5 and 6).

Figure 5 shows the Model 4200 connections to the prober and the trigger connection between the scope card (Model 4200-SCP2) and pulse generator card (Model 4205-PG2). Figure 6 identifies the cables and adapters used to make the connections.

NOTE Figure 5 shows source-measure units (SMUs) that are not equipped with preamps. These SMUs use the supplied triax cables that are terminated with a miniature triax connector on one end and a standard triax connector on the other end. If your SMUs are equipped with preamps, use the supplied cables that are terminated with standard triax connectors on both ends. Figure 6D shows both cables.

NOTE Four prober cable kits are required for 4-pin, PIV-A pulse I-V testing.

Figure 5: Model 4200-PIV-A instrumentation connections

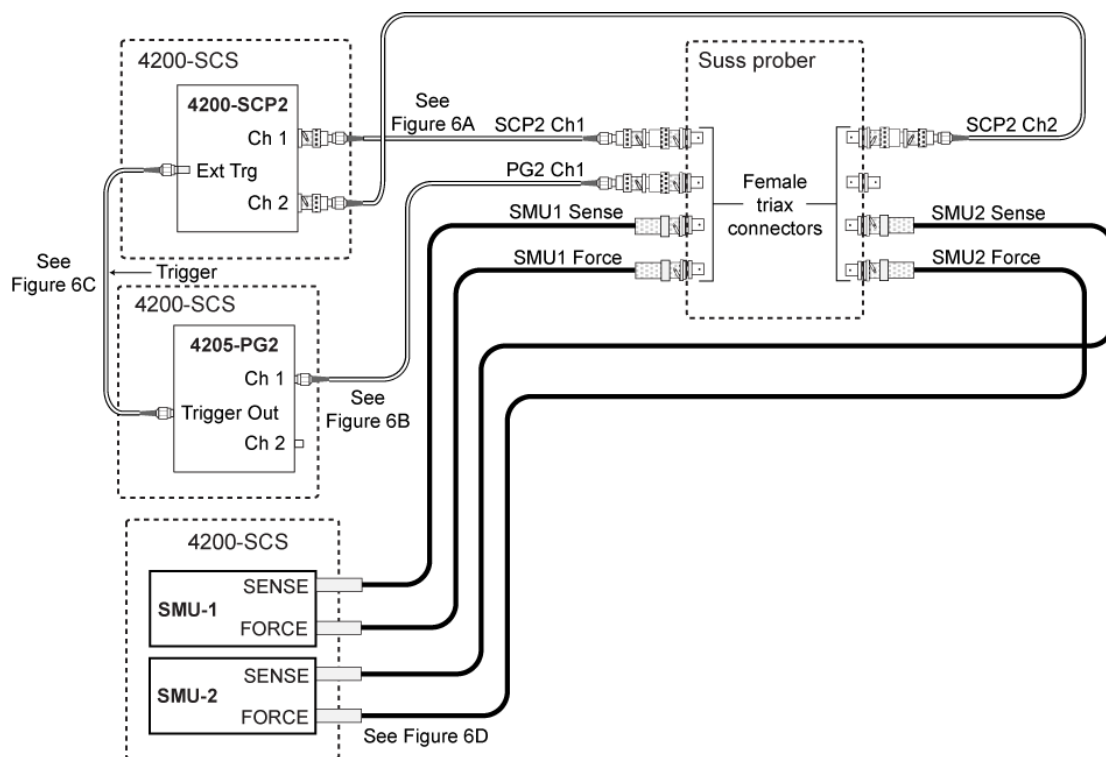
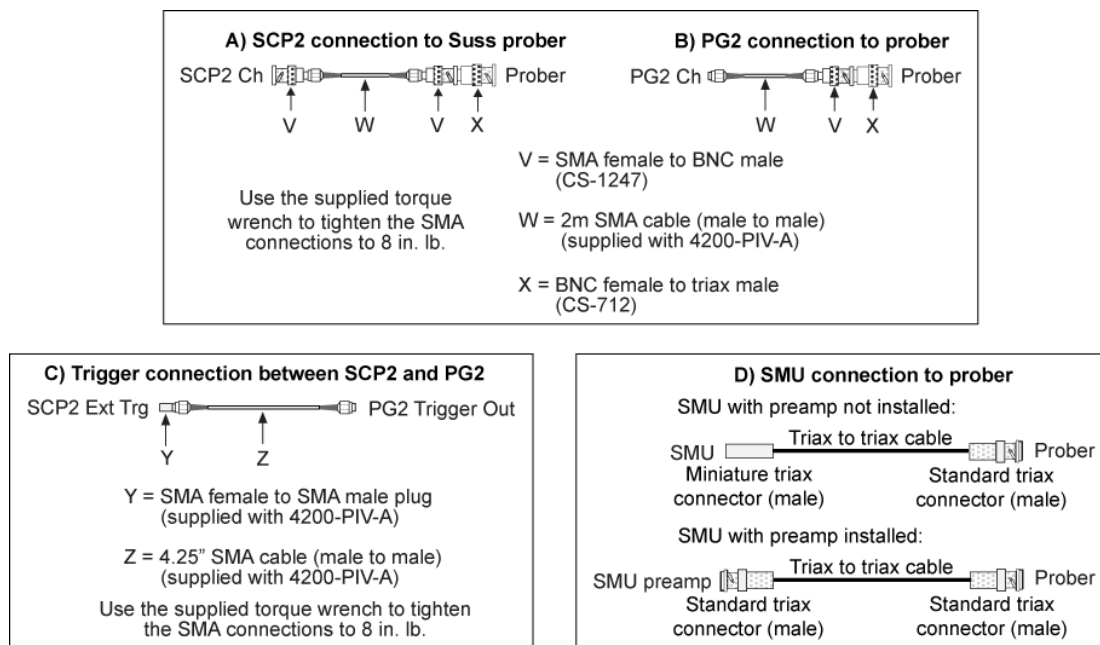
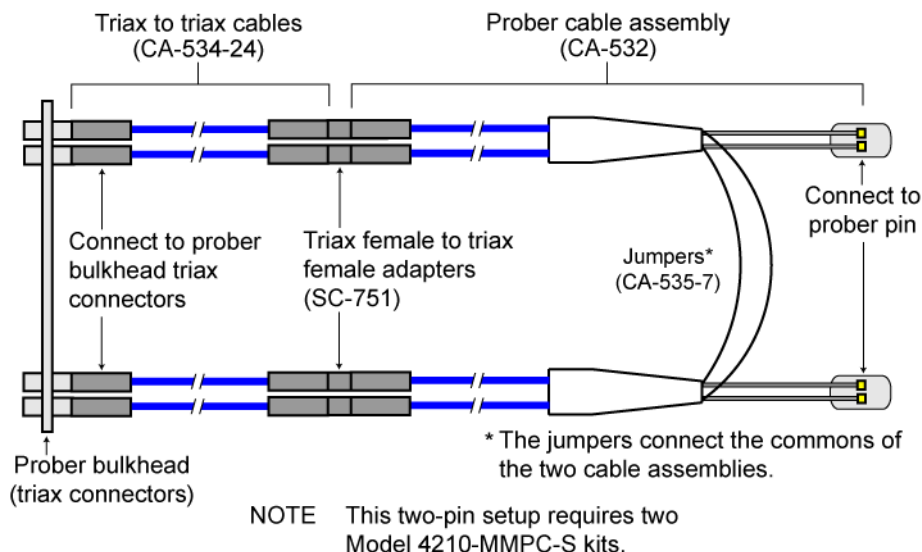


Figure 6: Cables and adapters used for instrumentation connections

Installing the probe cable kits; basic cable setup

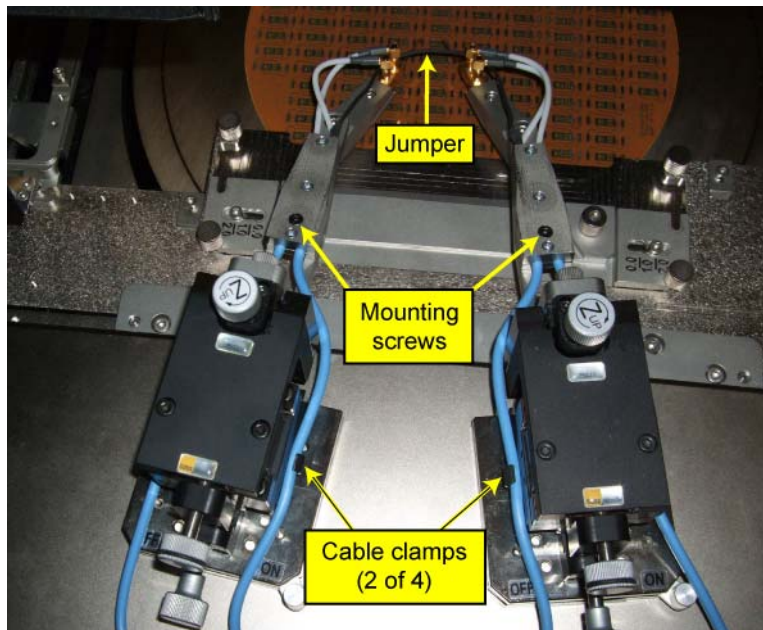
Figure 7 shows the basic cable setup for the 2-pin I-V and C-V testing scenarios described in this guide. The 4-pin I-V and 4-pin C-V testing scenarios require minor setup changes; pulse I-V setup, which is more complex, is described later in this quick start guide.

Figure 7: Basic 2-pin probe cable setup

Installation guidelines

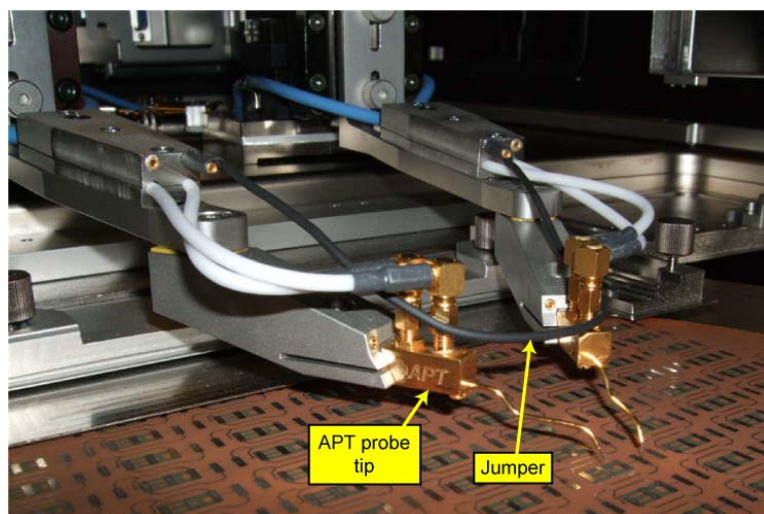
Figure 8 shows the probe cable assemblies of two Model 4200-MMPC-S kits installed in a Suss Micro Tec PA300 probe.

Figure 8: Two probe cable assemblies installed in Suss probe



- Each probe cable assembly is secured to a manipulator by a single mounting screw. Figure 8 shows the location of the mounting screws. Firmly tighten the cable assemblies to the manipulators.
- As shown in Figure 8, route the blue cables along the sides of the manipulators. Use the cable clamps to firmly secure the cables to the manipulators. Make sure the clamps are tight enough to keep the cables from moving.
- Connect a black jumper from one cable assembly to the other. This jumper (shown in Figure 8) connects the commons of the two cable assemblies together. The jumper plugs into the ends of the assembly blocks. It is good practice to install the second jumper. It not only improves the connection, but it is a good place to store the extra jumper. Figure 9 shows another view of the jumper.

Figure 9: Front view of the installed probe cable assemblies



- Connect the cable wires of the cable assemblies to the APT probe tips, as shown in Figure 9.
- Figure 9 shows an example of good routing for the jumper and cable wires. When routing the wires, consider the possible movements of the manipulators.
- Connect the triax to triax cables to the triax connectors on the prober bulkhead (see Figure 7). Connect the other ends of the triax cables to the prober cable assemblies using the supplied triax female to triax female adapters.

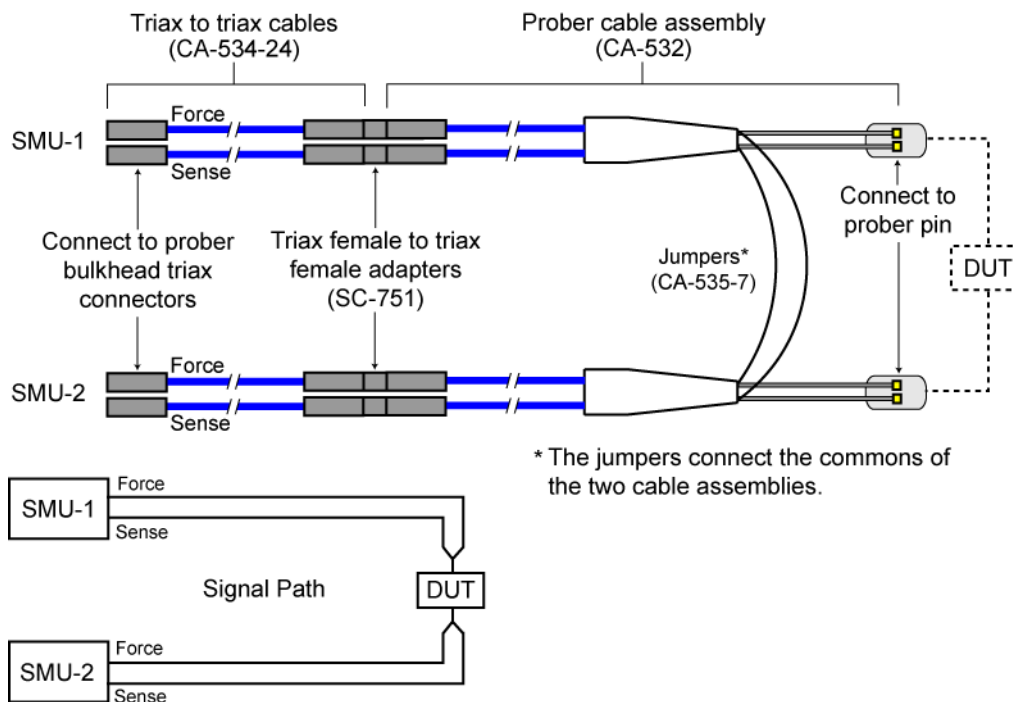
Usage scenarios

I-V testing: 2-pin I-V setup

NOTE The setup for 2-pin I-V testing requires two prober cable kits.

With two Model 4200-SMUs connected to the prober bulkhead, use the fundamental setup shown in Figure 10 to perform 2-pin I-V testing. Figure 3 shows the SMU connections to the outside of the bulkhead.

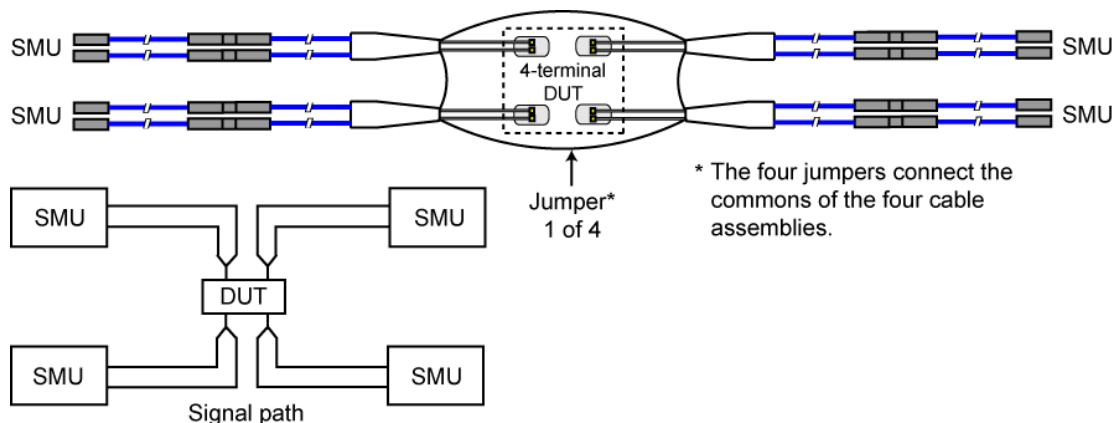
Figure 10: Test setup for 2-pin I-V testing



I-V testing: 4-pin I-V setup

With four Model 4200-SMUs connected to the prober bulkhead, use the setup shown in Figure 11 to perform 4-pin I-V testing. Figure 3 shows two SMUs connected to one of the bulkhead connection panels. Connect two additional SMUs to the other bulkhead connection panel.

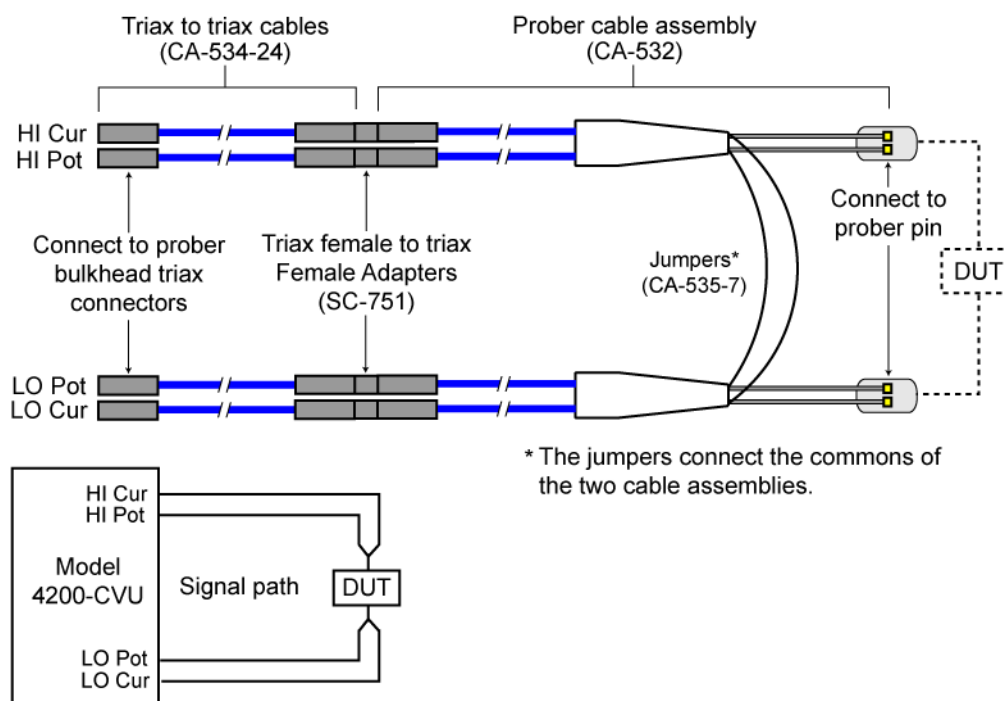
NOTE The setup for 4-pin I-V testing requires four prober cable kits.

Figure 11: Test setup for 4-pin I-V testing


C-V testing: 2-pin C-V setup

NOTE The setup for 2-pin C-V testing requires two probe cable kits.

With a Model 4210-CVU connected to the probe bulkhead, use the fundamental setup shown in Figure 12 to perform 2-pin C-V testing. Figure 4 shows the CVU connections to the outside of the bulkhead.

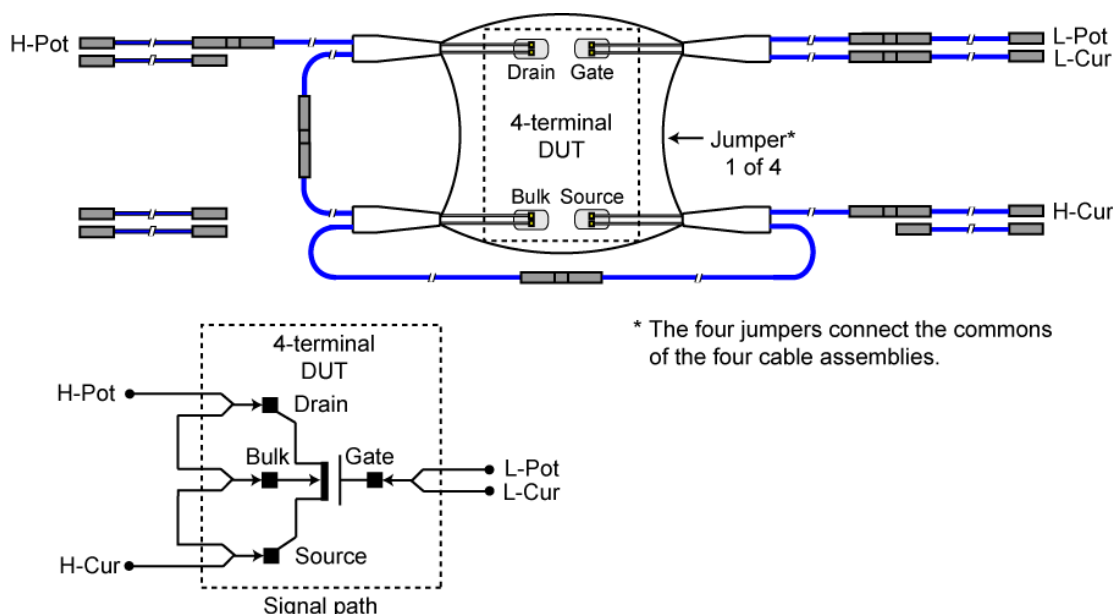
Figure 12: Test setup for 2-pin C-V testing


C-V testing: 4-pin C-V setup

NOTE The setup for 4-pin C-V testing requires four prober cable kits.

A typical test for a field effect transistor (FET) is to connect the drain, bulk, and source together and perform the measurement across the gate. With a Model 4200-CVU connected to the prober bulkhead, use the setup shown in Figure 13 to perform 4-pin C-V testing.

Figure 13: Test setup for 4-pin C-V testing



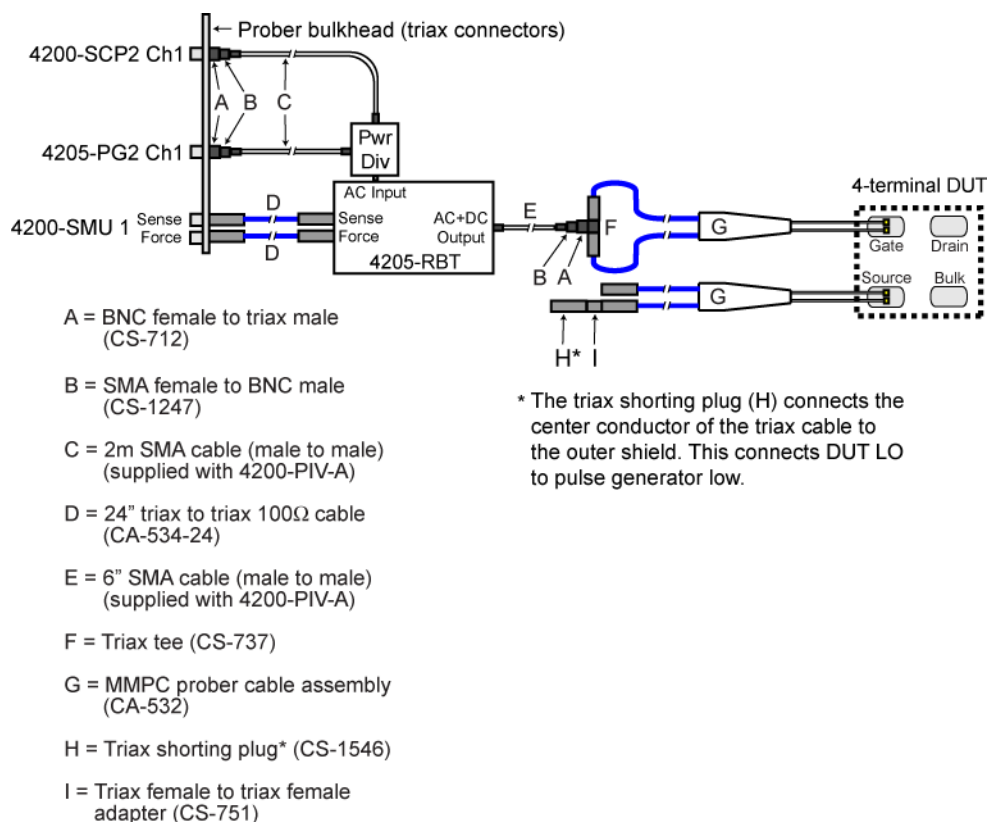
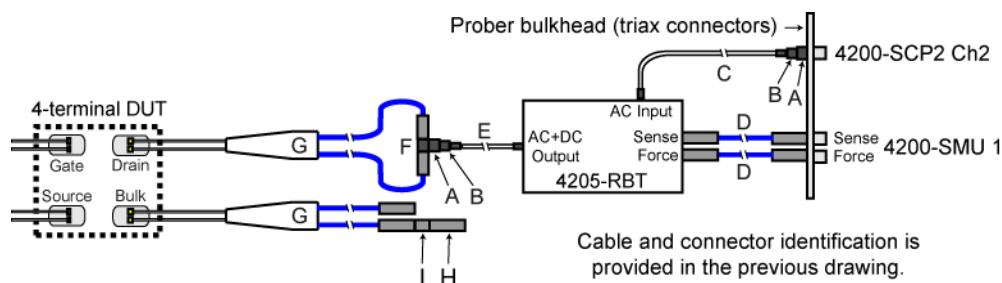
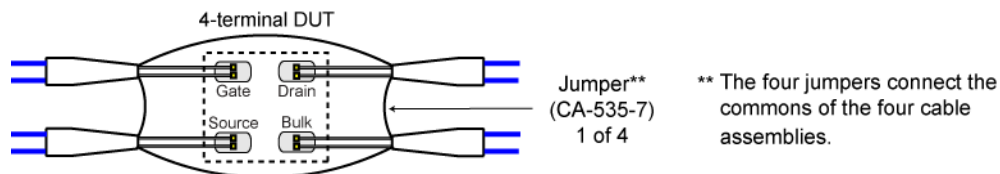
Four-pin pulse I-V test setup using the Keithley Model 4200-PIV-A

NOTE The setup for 4-pin pulse I-V testing requires four prober cable kits.

The Model 4200-PIV-A is a factory-installed package that includes a scope card, pulse generator card, software and other components to perform 4-pin pulse I-V measurements.

The test setup for using the Model 4200-PIV-A is shown in Figures 14, 15, and 16. Figure 14 shows the connections from the prober bulkhead to the gate and source of the 4-terminal device. Figure 15 shows the connections from the bulkhead to the drain and bulk. Figure 16 shows the jumper connections. The four jumpers connect the commons of the cable assemblies together. Figure 5 shows how the Model 4200 connects to the outside of the bulkhead.

NOTE Details on using the Model 4200-PIV-A package are provided in the Model 4200-SCS User's Manual (see *How to use the Model 4200-SCS to perform a pulse I-V test on my device* in Section 3). Figure 3-25 shows the block diagram of the test setup.

Figure 14: Connections to the gate and source of the DUT**Figure 15: Connections to the drain and bulk****Figure 16: Jumper connections**

Setup using the Keithley Model 4225-PMU for pulse I-V measurements

NOTE The setup for four-pin pulse I-V testing requires four probe cable kits.

The Model 4225-PMU is an Ultra Fast I-V Module that is an instrument card for the Model 4200-SCS. The PMU has two channels of voltage pulse source with integrated simultaneous voltage and current measurement.

Figure 17 shows the cable and adapters needed to connect a PMU channel to the probe bulkhead, and Figure 18 shows a typical probe connection setup for testing a four-pin device.

Figure 17: Cable and adapters used to connect PMU channel to probe bulkhead

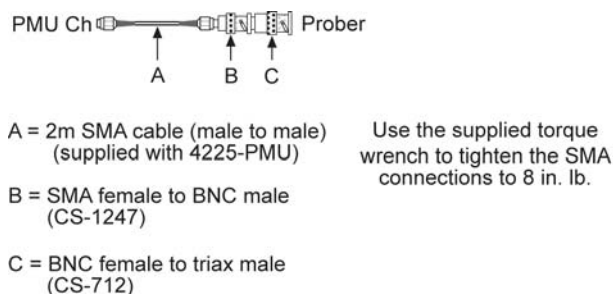
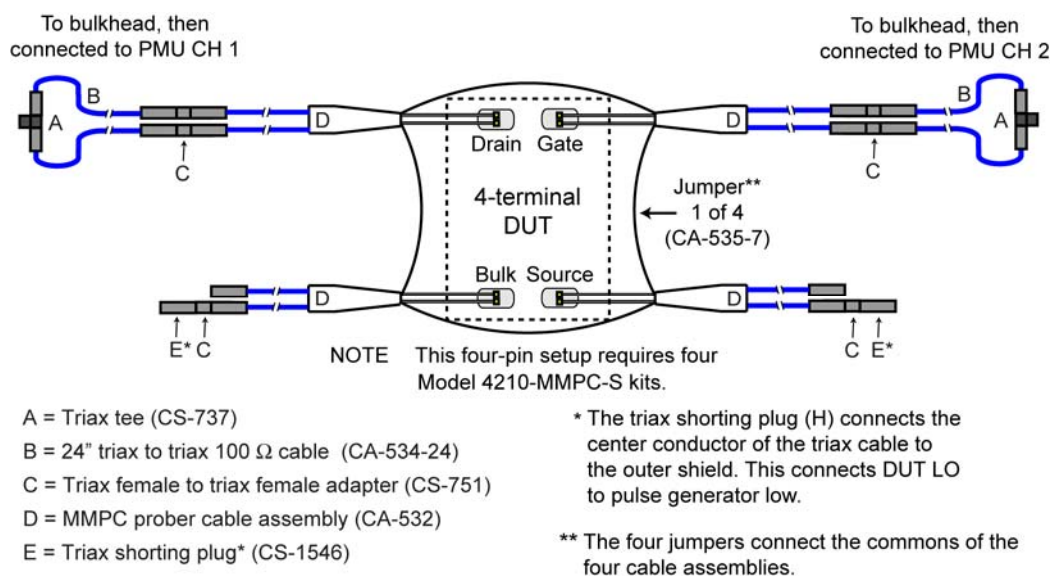


Figure 18: Basic four-pin probe setup for PMU



Setup using the Keithley Model 4225-RPM for I-V, C-V, or pulse I-V measurements

NOTE The setup for three-pin pulse I-V testing requires three probe cable kits. The setups for four-pin testing require four probe cable kits.

The 4225-RPM is a Remote Amplifier/Switch that is an optional item to the Model 4225-PMU. The PMU has two channels, so each PMU instrument card supports two (2) RPMs. The MMPC cables simplify the connection and re-connection between the instruments and the device-under-test. The combination of the MMPC cables with the RPM permits testing I-V, C-V, or pulse I-V automatically, without any manual cable re-connections. When using only two RPMs on a four-terminal device, some re-cabling is required for certain C-V test configurations.

The 4225-RPM has the appropriate connector types at the input and output of the RPM enclosure to eliminate any adapters when connecting cables to the RPM. On the input side, there are two triax connectors for SMU Force and SMU Sense. There are two SMA connectors for CVU POT and CVU CUR. There is also an RPM control connector for the control and power of the RPM from the 4225-PMU. The output of the RPM is a pair of triax cables (Force and Sense), which connect directly to the MMPC cables as shown in the figures below.

See Section 16 of the 4200 Reference Manual for 4225-PMU and 4225-RPM information and how to configure an ITM for a pulse IV test.

2 Channel I-V or Pulse I-V Setup

For most I-V and pulse I-V testing, only two source/measure channels are typically used. The two active signals are connected to the gate and drain, and the source (and bulk, if present) is connected to ground (see Figures 19 and 20). For the C-V test setup shown in Figure 21, all four source/measure channels are used.

Figure 19: Test setup for three-pin device using two-channel I-V and Pulse I-V

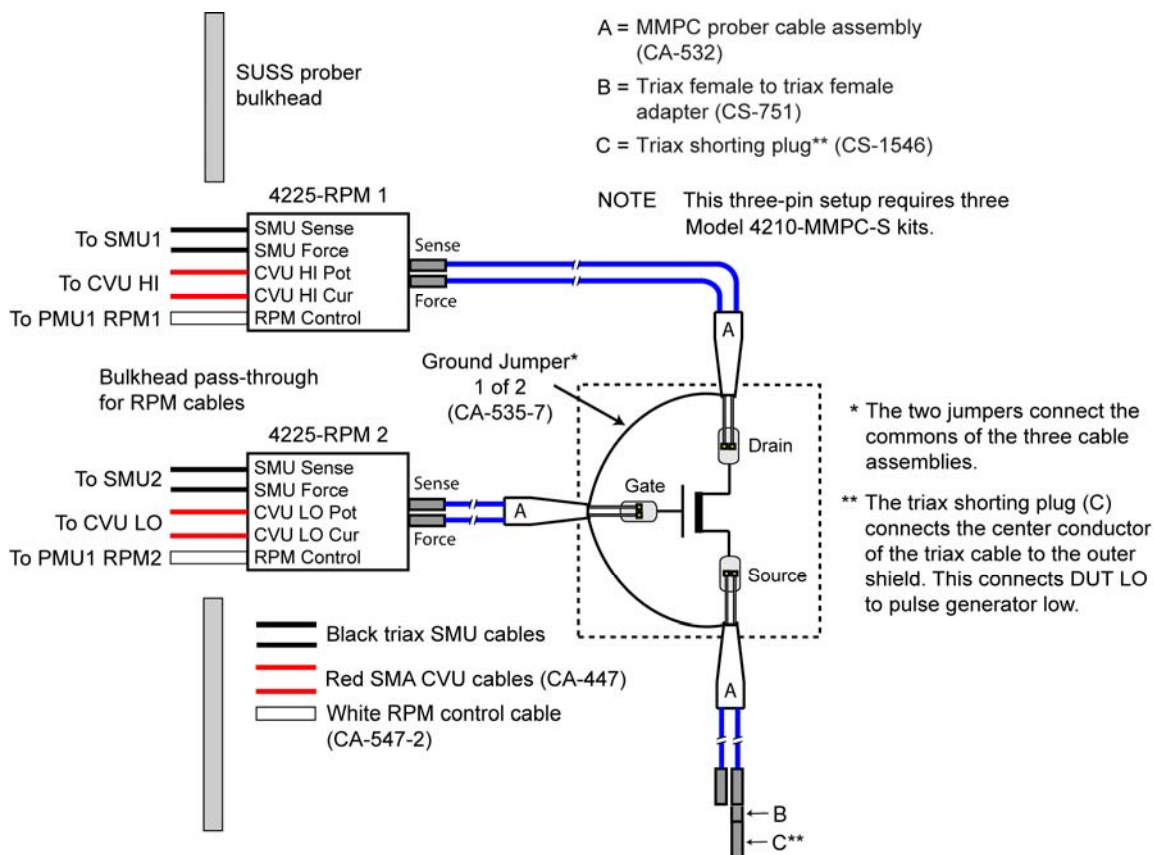


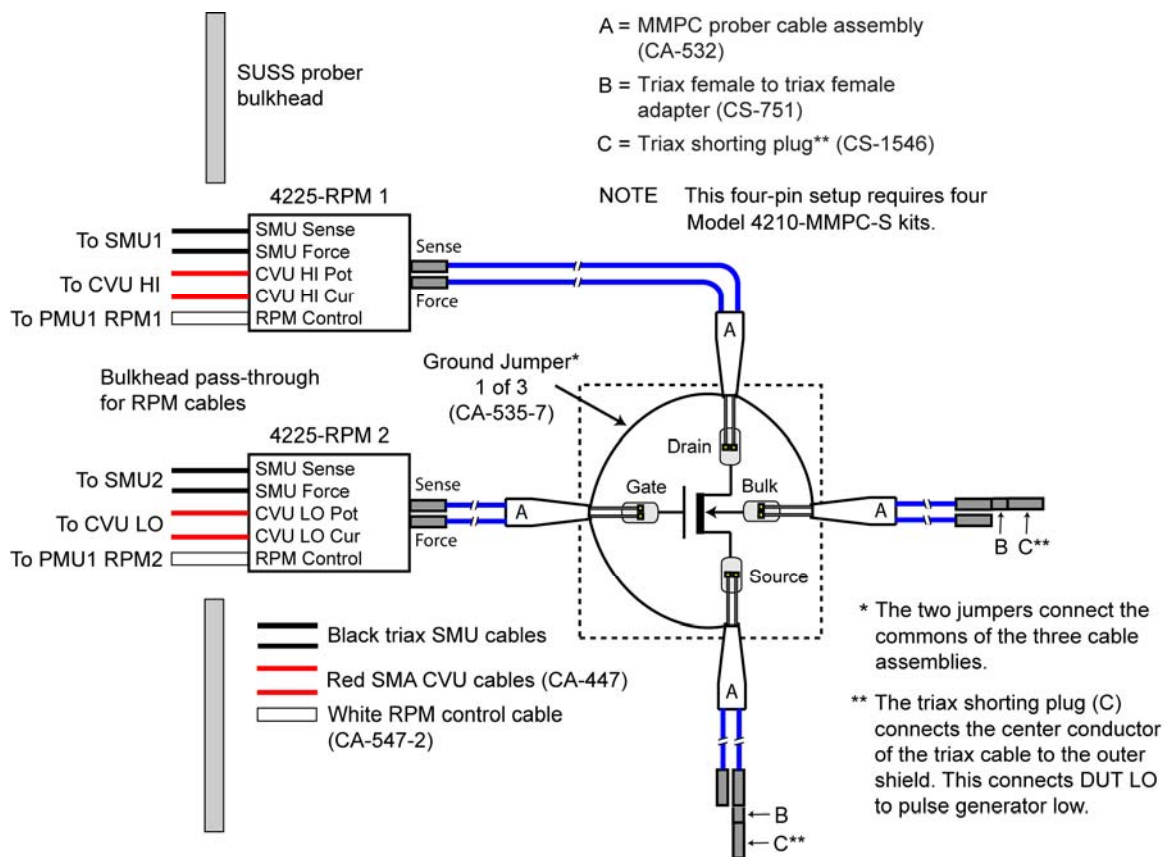
Figure 20: Test setup for four-pin device using two-channel I-V and Pulse I-V


Figure 21: Test setup for four-terminal C-V testing

