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Multi-Measurement Prober Cable Kit Quick Start Guide

Overview

The Keithley Instruments Model 4210-MMPC-C 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 4200-PIV-A package to perform pulse I-V measurements. This kit has been assembled for use with the Cascade Microtech 12000 prober series (manipulator type DCM-200 series).

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-C multi-measurement cable kit. Also, note that there is an 8" x 10" bag and two screws in this kit (not shown): 4-40x3/16CUPSTBK.

Figure 1: Model 4210-MMPC-C 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:

- I-V testing (2-wire and 4-wire)
- C-V testing (2-wire and 4-wire)
- Pulse I-V measurements using the Keithley Model 4200-PIV-A
- 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 MicroTec 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-C for the Cascade Microtech 12000 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 Cascade prober before installing the prober cable kit.*

The Model 4200 connects to the female triax connectors on the prober bulkhead.

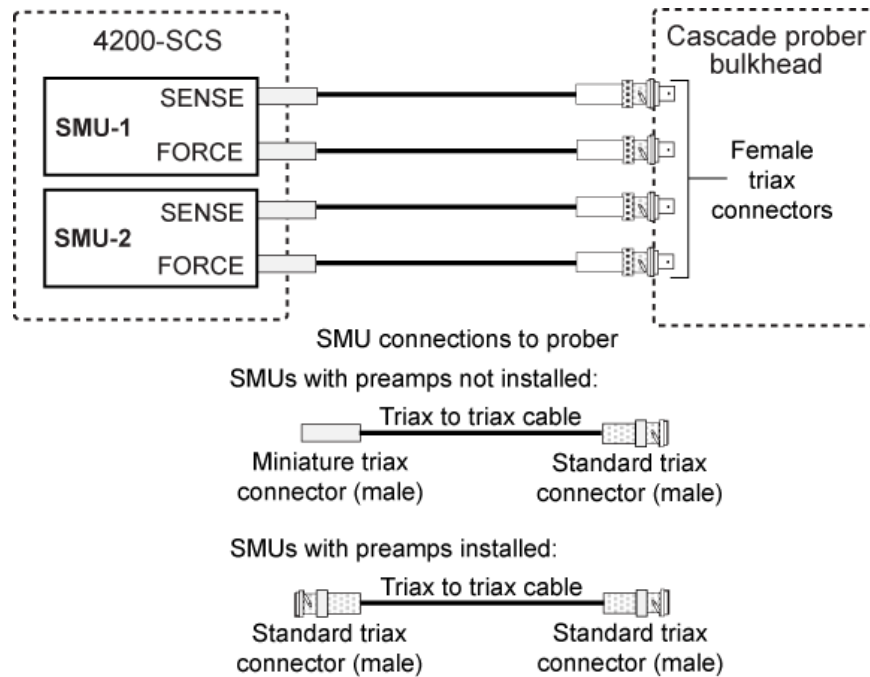
I-V testing

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 2 shows two Model 4200 SMU prober connections.

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NOTE Figure 2 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 2 shows both cables.

Figure 2: Model 4200 SMU connections to the prober



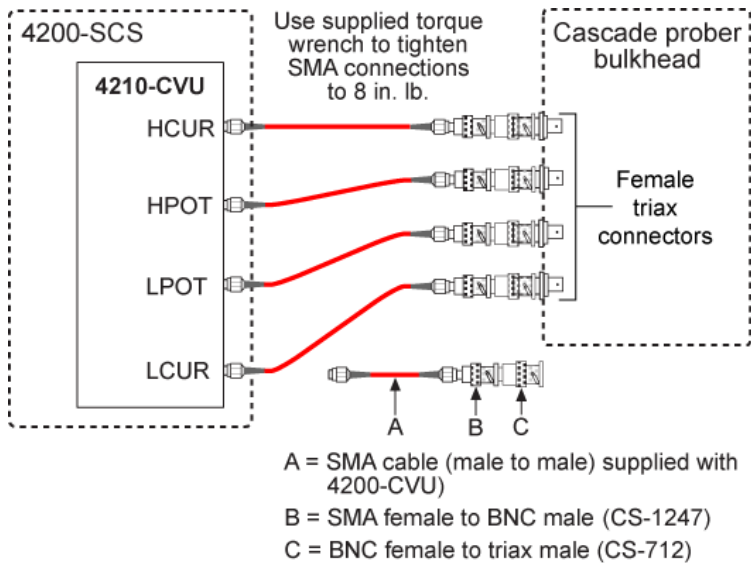
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C-V testing

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 3 shows how to make the connections. A torque wrench is supplied with the Model 4210-CVU.

Figure 3: Model 4210-CVU prober connections



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

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

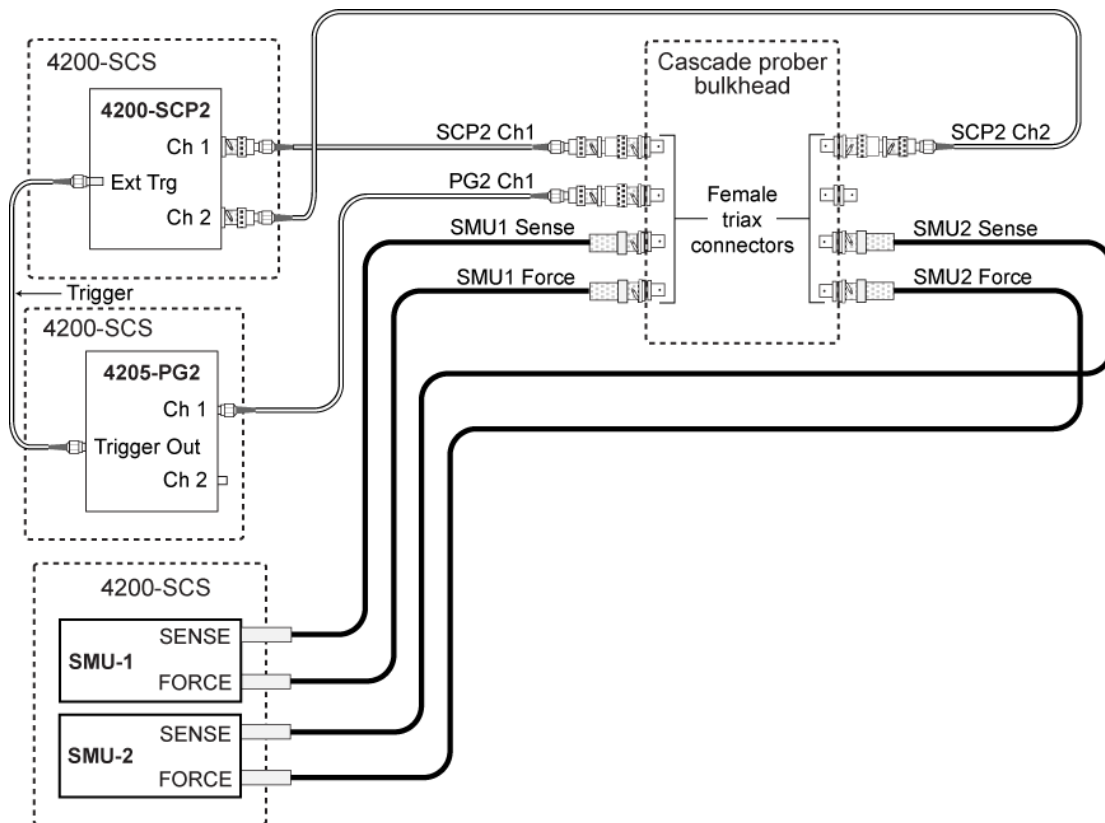
Perform 4-pin pulse I-V measurements using four prober cable kits with the Keithley Instruments Model 4200-PIV-A package, which includes a scope card, pulse generator card, software, and other components.

Use the supplied cables and connectors to connect the Model 4200 to the bulkhead of the prober (see Figures 4 and 5).

Figure 4 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 5 identifies the cables and adapters used to make the connections.

NOTE Figure 4 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 5D shows both cables.

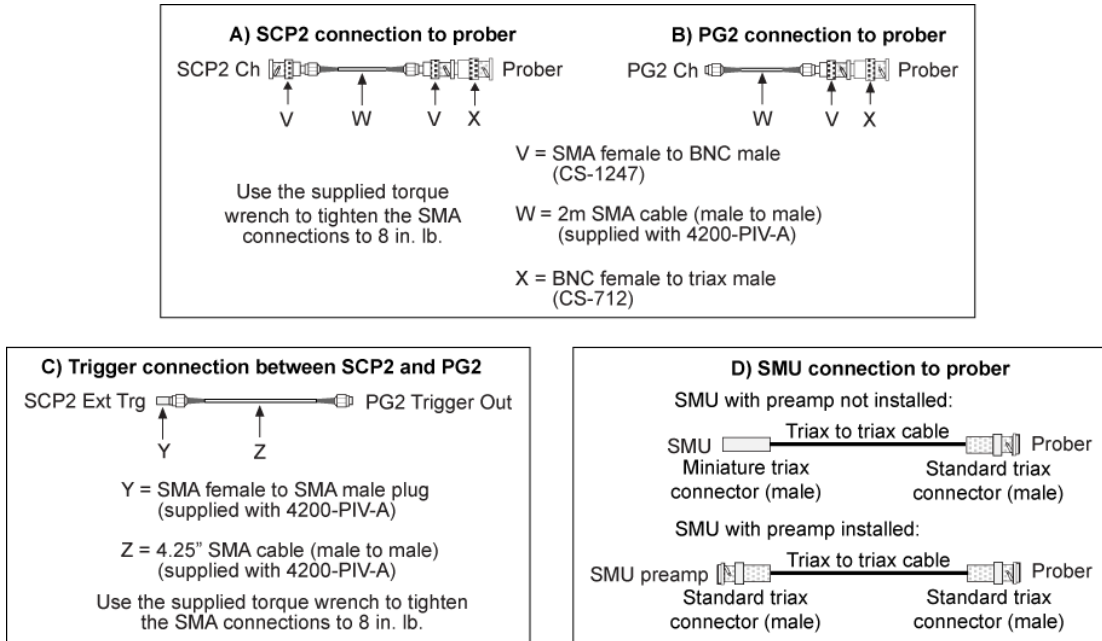
Figure 4: Model 4200-PIV-A instrumentation connections



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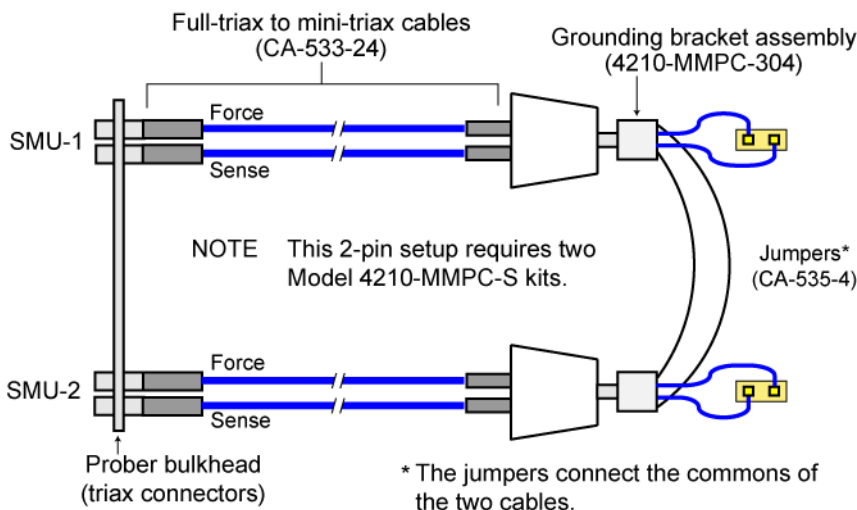
Figure 5: Cables and adapters used for instrumentation connections



Installing the prober cable kits: Basic cable setup

Figure 6 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.

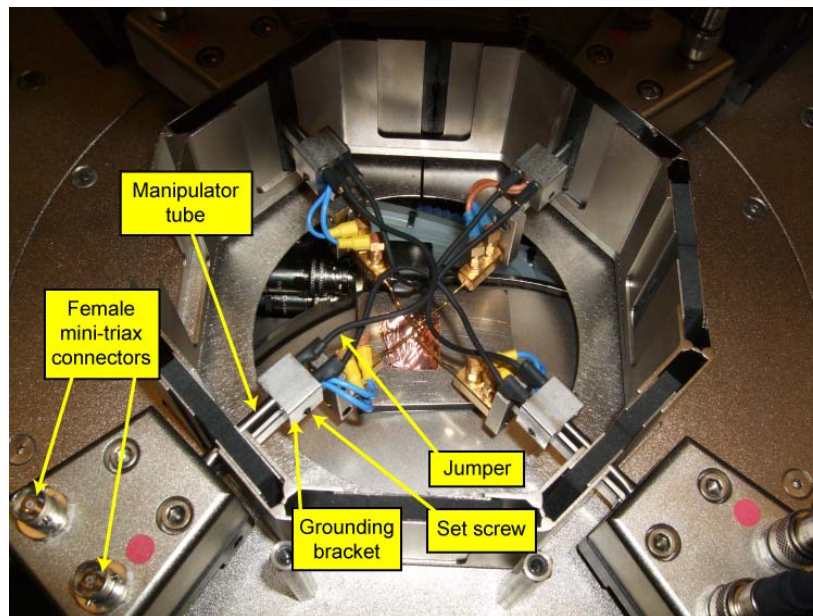
Figure 6: Basic 2-pin prober cable setup



Installation guidelines

Figure 7 shows the prober cable assemblies of four Model 4200-MMPC-C kits installed in a Cascade Microtech 12000 series prober.

Figure 7: Four prober cable assemblies installed in a Cascade prober



To install the Cascade prober kit:

1. Referring to Figure 7, mount each grounding bracket onto the tube of a manipulator.
2. Firmly tighten the set screws to secure the brackets to the tubes.
3. Black jumpers are used to connect the commons of the cable assemblies together. The jumpers plug into the grounding brackets. Referring to Figure 7, connect the jumpers from one grounding bracket to another. For the basic 2-pin setup in Figure 6, 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.

NOTE Figure 7 shows an example of good routing for the jumper wires. When routing the wires, consider the possible movements of the manipulators.

4. Referring to Figure 6, connect the prober manipulators to the prober bulkhead connectors using the supplied triax cables. Each cable is terminated with a full-triax connector on one end and a mini-triax connector on the other end. Figure 7 shows the mini-triax connectors mounted on the manipulators.

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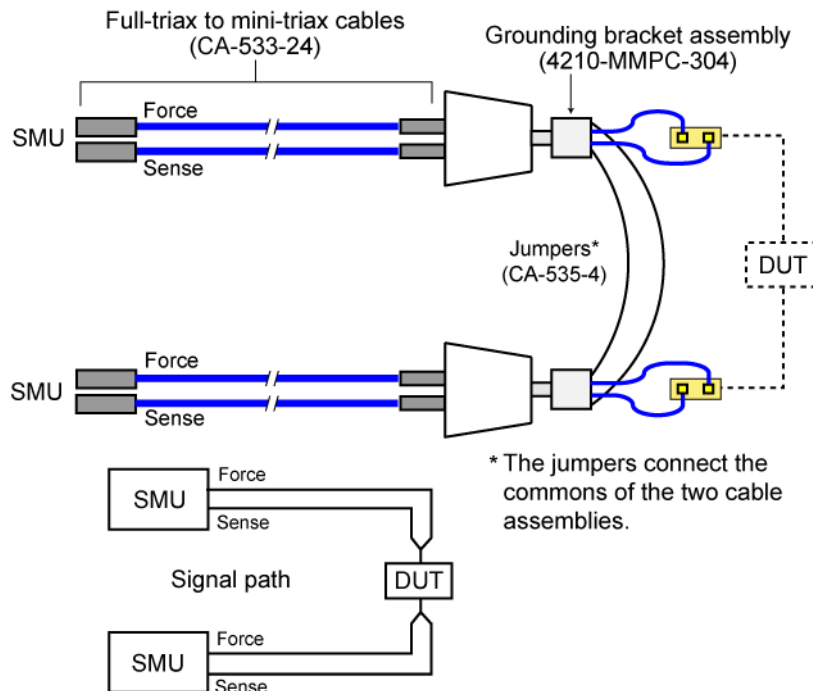
Usage scenarios

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 8 to perform 2-pin I-V testing. Figure 2 shows the SMU connections to the outside of the bulkhead.

Figure 8: Test setup for 2-pin I-V testing



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

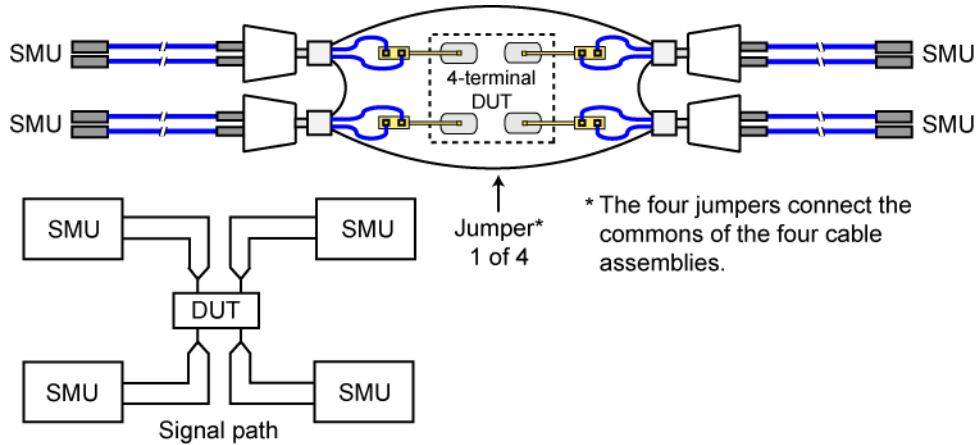
NOTE The setup for 4-pin I-V testing requires four prober cable kits.

With four Model 4200-SMUs connected to the prober bulkhead, use the setup shown in Figure 9 to perform 4-pin I-V testing. Figure 2 shows two SMUs connected to one of the bulkhead connection panels. Connect two additional

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Figure 9: Test setup for 4-pin I-V testing

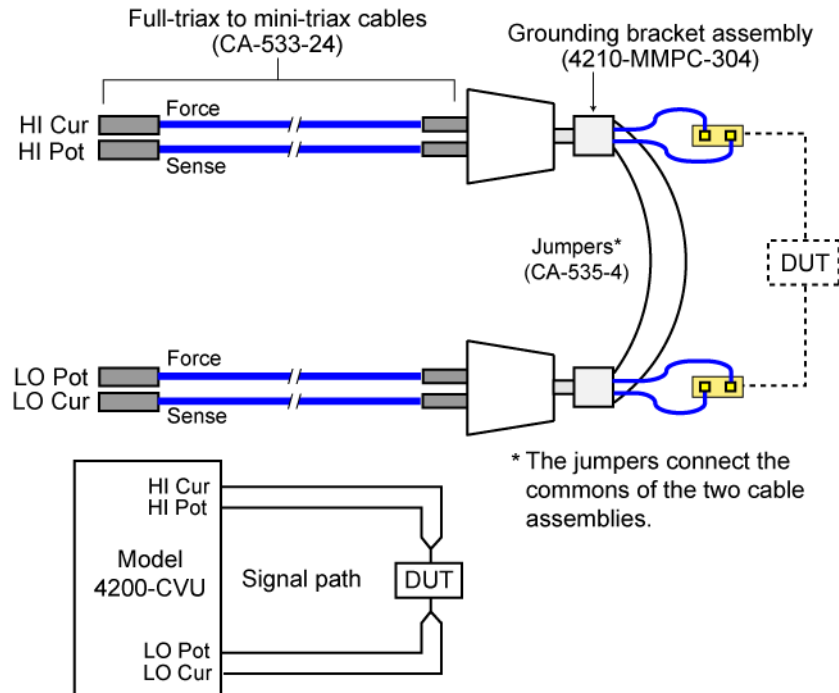


C-V testing: 2-pin C-V setup

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

With a Model 4210-CVU connected to the prober bulkhead, use the fundamental setup shown in Figure 10 to perform 2-pin C-V testing. Figure 4 shows the CVU connections to the outside of the bulkhead.

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



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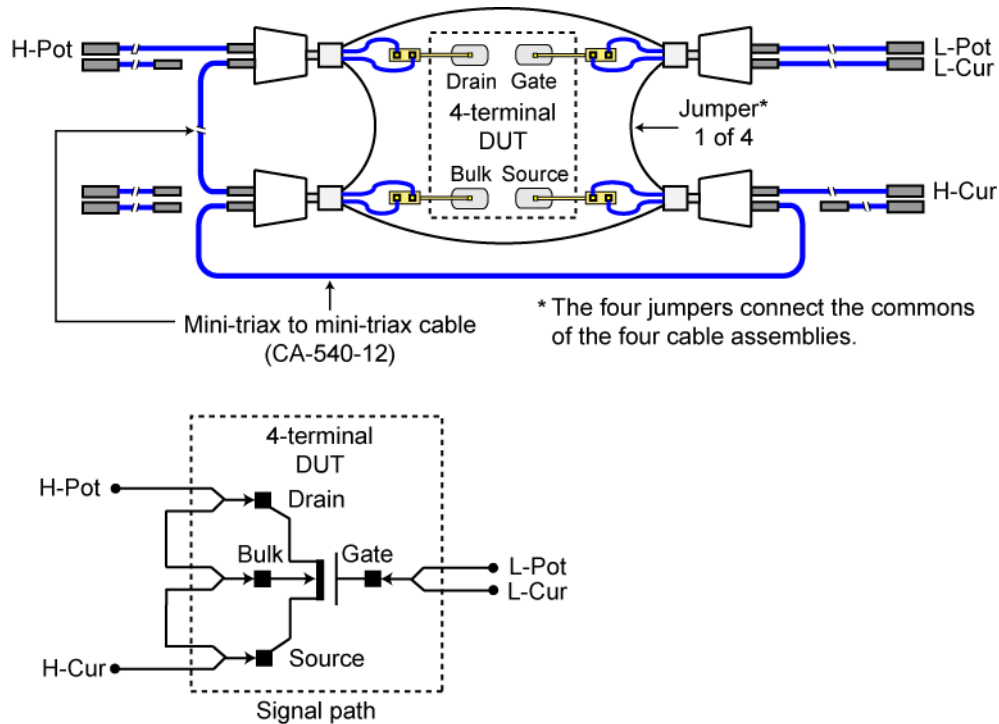
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C-V testing: 4-pin C-V setup

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 11 to perform 4-pin C-V testing.

Figure 11: 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 12, 13, and 14. Figure 12 shows the connections from the prober bulkhead to the gate and source of the 4-terminal device. Figure 13 shows the connections from the bulkhead to the drain and bulk. Figure 14 shows the jumper connections. The four jumpers connect the commons of the cable assemblies together. These four jumper connections are required to complete the test circuit signal path.

Figure 4 shows how the Model 4200 connects to the outside of the bulkhead.

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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 12: Connections to the gate and source of the DUT

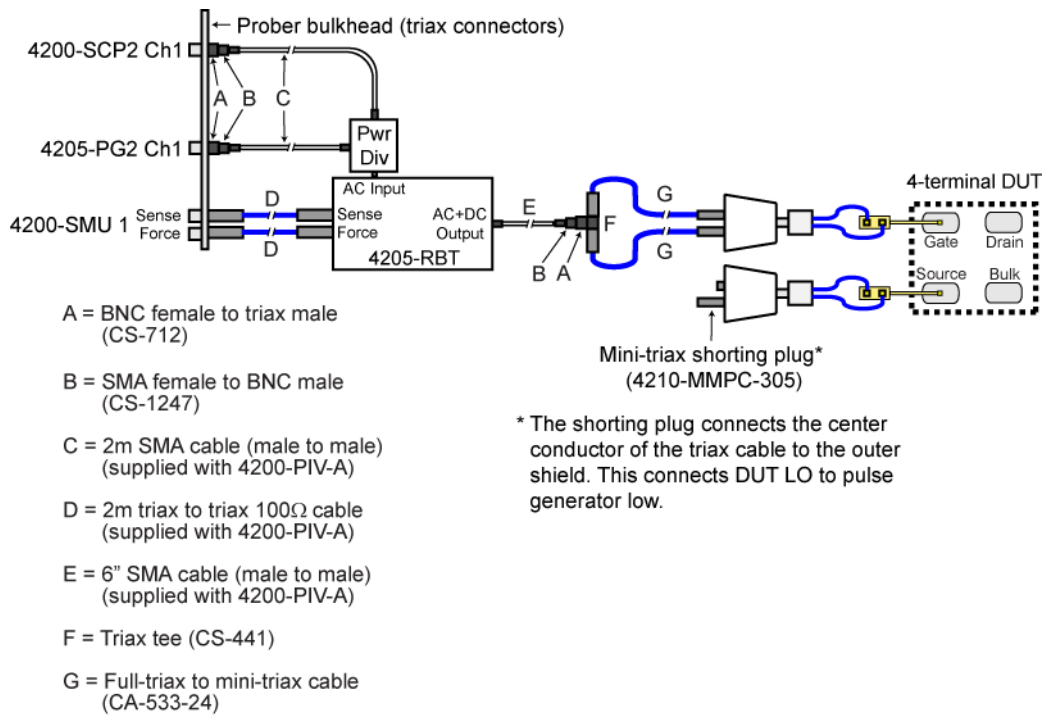


Figure 13: Connections to the drain and bulk

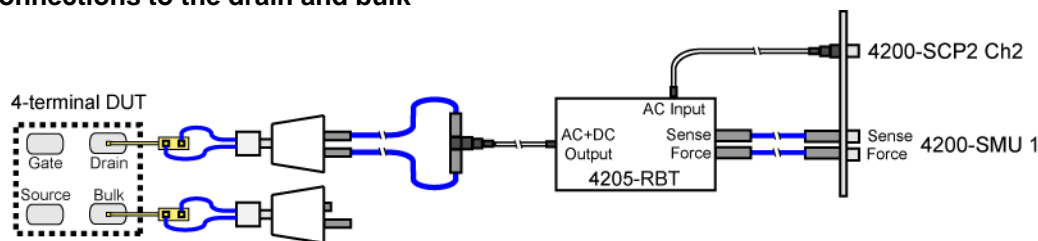
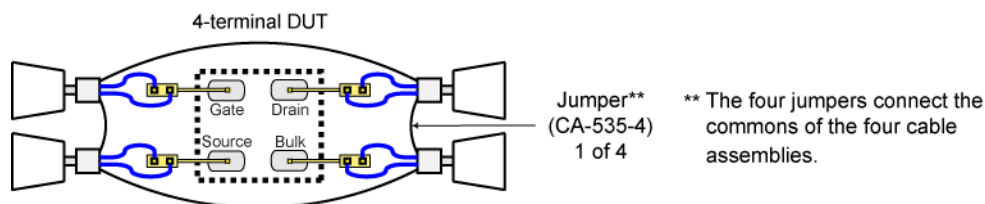


Figure 14: Jumper connections



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

NOTE The setup for four-pin pulse I-V testing requires four prober 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 15 shows the cable and adapters needed to connect a PMU channel to the prober bulkhead and Figure 16 shows a typical prober connection setup for testing a four-pin device. .

Figure 15: Cable and adapters used to connect PMU channel to prober bulkhead

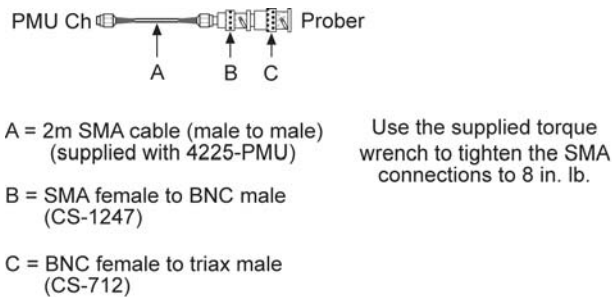
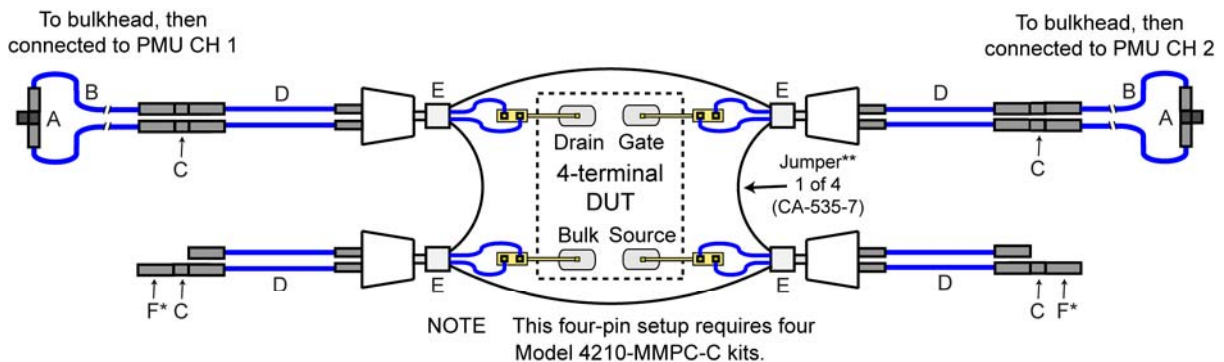


Figure 16: Basic four-pin prober setup for PMU



- A = Triax tee (CS-737)
- B = 24" triax to triax 100 Ω cable (CA-534-24)
- C = Triax female to triax female adapter (CS-751)
- D = Full-triax to mini-triax cable (4210-MMPC-304)
- E = Grounding bracket assembly (4210-MMPC-304)
- F = Triax shoring plug* (CS-1546)

* The triax shoring plug (F) connects the center conductor of the triax cable to the outer shield. This connects DUT LO to pulse generator low.

** The four jumpers connect the commons of the four cable assemblies.

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 prober cable kits. The setups for four-pin testing require four prober 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.

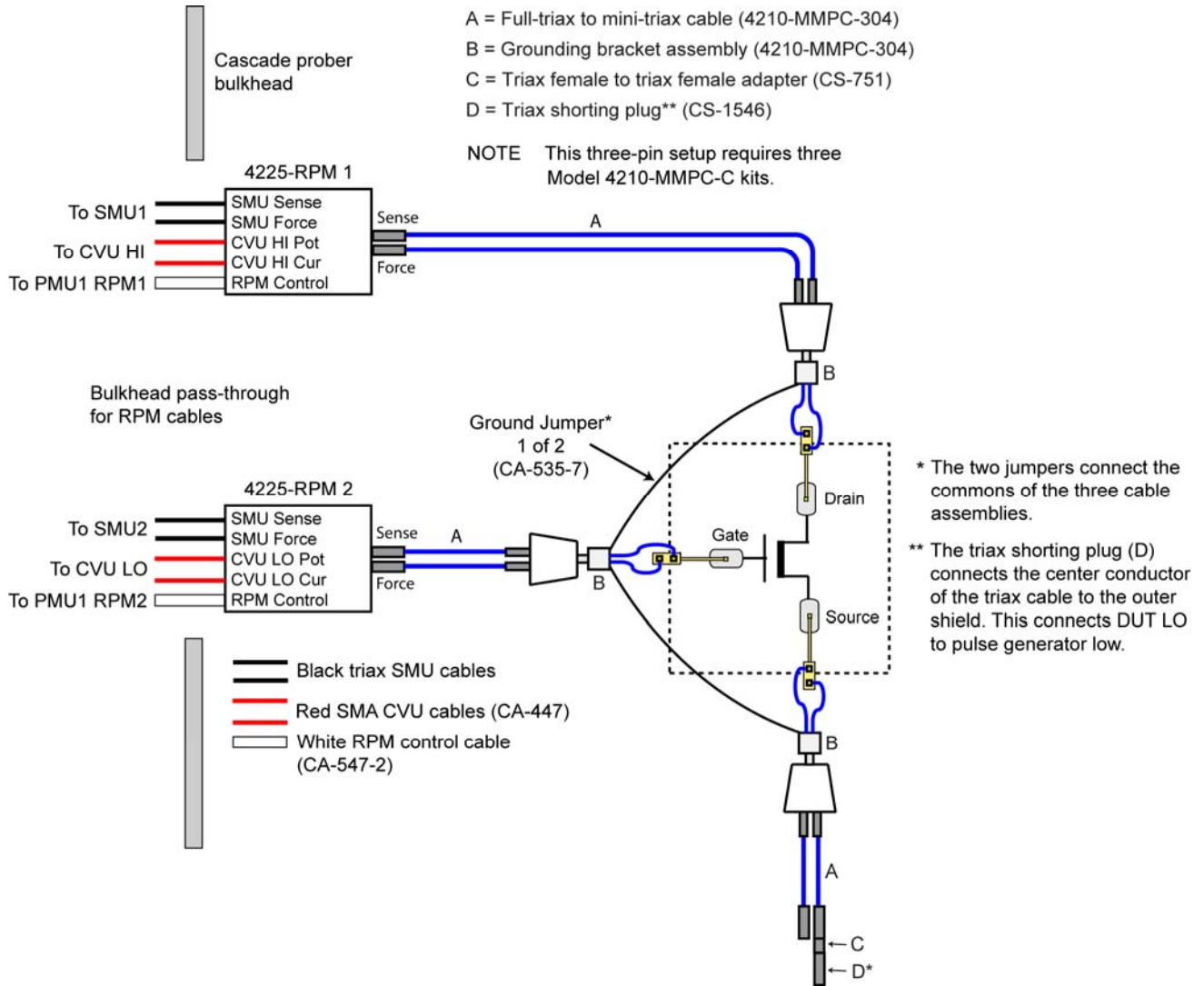
2 Channel I-V or Pulse I-V Setup

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 17 and 18). For the C-V test setup shown in Figure 19, all four source/measure channels are used.

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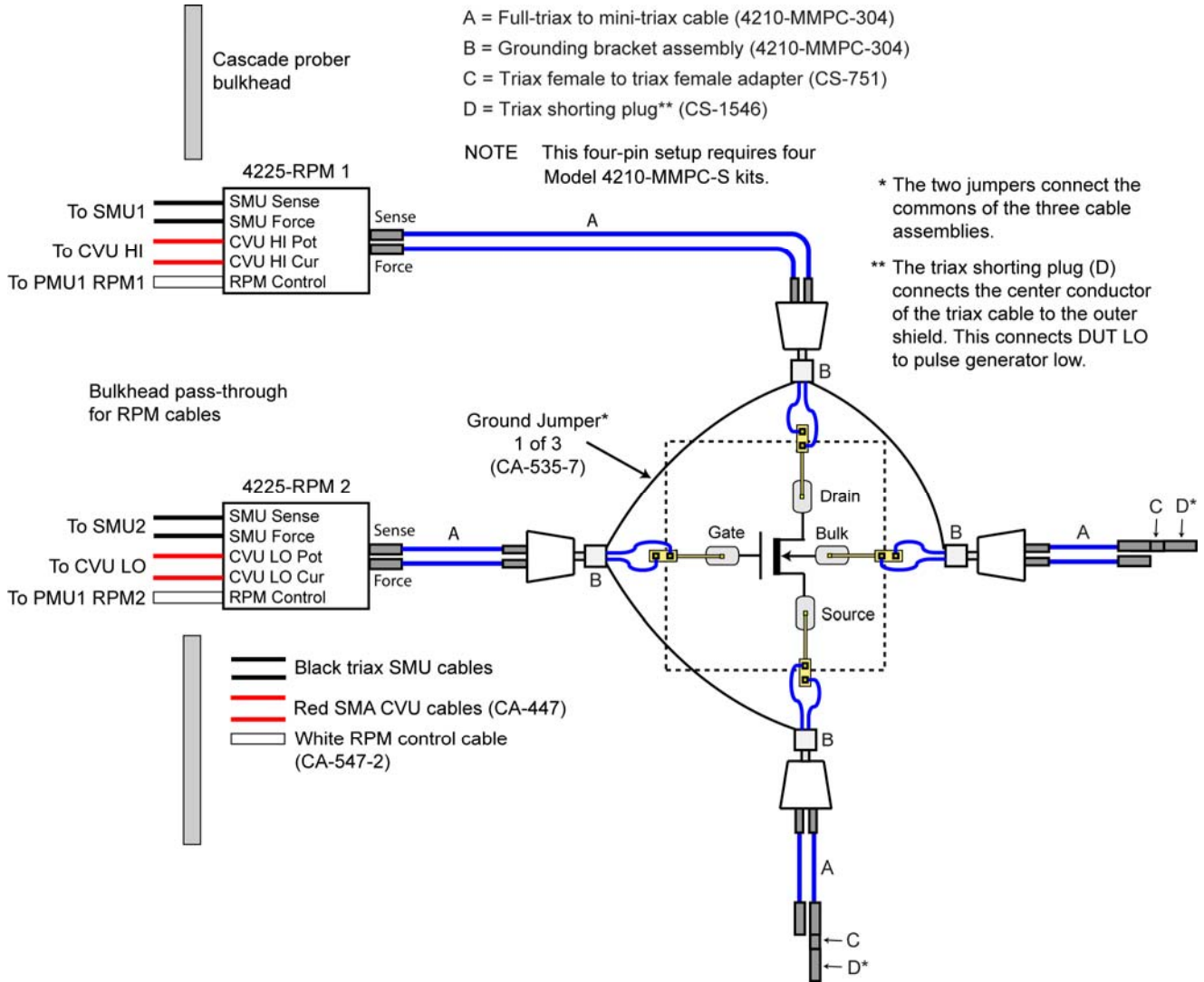
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Figure 17: Test setup for three-pin device using two-channel I-V and Pulse I-V



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Figure 18: Test setup for four-pin device using two-channel I-V and Pulse I-V



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Figure 19: Test setup for four-terminal C-V testing

