www.tek.com/keithley

S530 Parametric Test System

Administrative Guide

S530-924-01 Rev. D / September 2017

S530-924-01D

KEITHLEY
A Tektronix Company

S530

Parametric Test System

Administrative Guide

These are the original instructions in English.

Document number: S530-924-01 Rev. D / September 2017

KEITHLEY
A Tektronix Company

Safety precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with nonhazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the user documentation for complete product specifications.

If the product is used in a manner not specified, the protection provided by the product warranty may be impaired.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating properly, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the user documentation. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, perform safe installations, and repair products. Only properly trained service personnel may perform installation and service procedures.

Keithley Instruments products are designed for use with electrical signals that are measurement, control, and data I/O connections, with low transient overvoltages, and must not be directly connected to mains voltage or to voltage sources with high transient overvoltages. Measurement Category II (as referenced in IEC 60664) connections require protection for high transient overvoltages often associated with local AC mains connections. Certain Keithley Instruments measuring instruments may be connected to mains. These instruments will be marked as category II or higher.

Unless explicitly allowed in the specifications, operating manual, and instrument labels, do not connect any instrument to mains.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30 V RMS, 42.4 V peak, or 60 VDC are present. A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 V, no conductive part of the circuit may be exposed.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance-limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, ensure that the line cord is connected to a properly-grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided in close proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

For safety, instruments and accessories must be used in accordance with the operating instructions. If the instruments or accessories are used in a manner not specified in the operating instructions, the protection provided by the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories. Maximum signal levels are defined in the specifications and operating information and shown on the instrument panels, test fixture panels, and switching cards.

When fuses are used in a product, replace with the same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as protective earth (safety ground) connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

The  symbol on an instrument means caution, risk of hazard. The user must refer to the operating instructions located in the user documentation in all cases where the symbol is marked on the instrument.

The  symbol on an instrument means warning, risk of electric shock. Use standard safety precautions to avoid personal contact with these voltages.

The  symbol on an instrument shows that the surface may be hot. Avoid personal contact to prevent burns.

The  symbol indicates a connection terminal to the equipment frame.

If this  symbol is on a product, it indicates that mercury is present in the display lamp. Please note that the lamp must be properly disposed of according to federal, state, and local laws.

The **WARNING** heading in the user documentation explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

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

The **CAUTION** heading with the  symbol in the user documentation explains hazards that could result in moderate or minor injury or damage the instrument. Always read the associated information very carefully before performing the indicated procedure. Damage to the instrument may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits — including the power transformer, test leads, and input jacks — must be purchased from Keithley Instruments. Standard fuses with applicable national safety approvals may be used if the rating and type are the same. The detachable mains power cord provided with the instrument may only be replaced with a similarly rated power cord. Other components that are not safety-related may be purchased from other suppliers as long as they are equivalent to the original component (note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

Unless otherwise noted in product-specific literature, Keithley Instruments instruments are designed to operate indoors only, in the following environment: Altitude at or below 2,000 m (6,562 ft); temperature 0 °C to 50 °C (32 °F to 122 °F); and pollution degree 1 or 2.

To clean an instrument, use a cloth dampened with deionized water or mild, water-based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., a data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

Safety precaution revision as of June 2017.

Table of contents

Section 1

S530 system

In this section:

Introduction

If you have any questions after reviewing this information, please contact your local Keithley Instruments office, sales partner, or distributor. You can also call the corporate headquarters of Keithley Instruments (toll-free inside the U.S. and Canada only) at 1-800-935-5595, or from outside the U.S. at +1-440-248-0400. For worldwide contact numbers, visit the Keithley Instruments website (http://www.tek.com/keithley).

System description

The Keithley Instruments S530 Parametric Test System is a configurable, instrument-based system for semiconductor parametric characterization and testing. There are two different S530 systems available:

- S530 low-current parametric test system
- S530 high-voltage parametric test system

The S530 systems have flexible hardware configurations that allow you to customize them to your specific needs. See the following table for a description of the main system configuration options, and see the following figure for an example of a typical system configuration.

S530 system configuration options

DC source-measure units (SMU)	• 2 to 8 maximum • Maximum number of SMUs depends on other items in the system rack • 2410 high-voltage SMU
6-slot switching matrix	One or two 707Bs with either: • 7072-HV switch card • 7072-HVD switch card • 7530 switch card
Optional capacitance/voltage (C-V)	• 1 channel of C-V • Based on 4200-SCS with CVU card
Optional instruments	• DMM7510 7-1/2 Digit Graphical Sampling Multimeter (quantity: 0 to 1) • Up to three dual-channel pulse cards • Frequency measurement option
Each system contains:	• Computer inside cabinet • External 24-inch flat-panel monitor and keyboard tray mounted on exterior of cabinet • S530 system software – Keithley Test Environment (KTE) or Automated Characterization Suite (ACS) • LO patch panel • Interlock system (high-voltage systems only) • Adjustable cable support arm
Other options:	• Advanced seismic securement kit for additional resistance to seismic forces

NOTE

The LO patch panel and the high-voltage safety interlocks are not visible from the front.

Figure 1: S530 parametric test system configuration example

Optional accessories

Optional items and accessories that may accompany the S530 system:

- Cables to connect to the test fixture or the probe card adapter
- 9139A-PCA (probe card adapter)
- Advanced seismic securement kit

Section 2

S530 site preparation and installation

In this section:

Site preparation checklist

The following table provides a site preparation checklist to help you prepare your site for the S530 system in your facility. If you find that an item listed is not valid for your site, you can indicate it with "N/A."

S530 system preparation checklist

Site	Item
	Is it necessary to have lifting equipment?
	Is the flooring adequate and able to support the weight of the system while moving from receiving to the final destination (see Floor plan (on page 2-20) for specifications)?
	Are all of the corridors and hallways large enough to allow clearance for the system?
	Are stairways adequate for moving the system through?
	Are elevators needed to move the system? Can they support the size and weight of the system?
	Are the doorways wide enough for the system?
	If you are using a Keithley Instruments probe card adapter, you must supply a vacuum connection (50.80 cm Hg / 20 in.).
Floor plan	**Item**
	Did you complete the system layout (see Floor plan (on page 2-20) for specifications)?
	Does your layout show all of the locations for all of the equipment?
	Does your system layout show the locations of all doors and aisles?
	Does your layout allow for the proper clearance of the system for the front, rear, and the keyboard/monitor arm?
	Is there enough space for personnel safety, comfort, and freedom of movement?
	Did you take future expansions into consideration?
	Is there sufficient space for any supplies or manuals?

S530 system preparation checklist

Site	Item
Electrical power	**Item**
	Is adequate and proper electrical power available (see Line power requirements (on page 2-17) for specifications)?
	Is something connected to the same power source that generates noise?
	Is something that requires substantial amounts of current connected to the same power source?
	Did you prepare power outlets for service, testing, or maintenance?

Unpacking the S530 system

The Keithley field service engineer (FSE) is responsible for unpacking the S530 system cabinet and the accessories. However, it is recommended that the customer move the crate and the accessories box to the area where the system is going to be used. Here is a list of tools needed for unpacking:

- Safety glasses
- Gloves
- Standard screwdriver
- Socket wrench
- Socket head: 19 mm (3/4 in.)

The following information will help the FSE unpack the system. The system is shipped in a wooden crate (see the following figure).

Figure 2: S530 system cabinet in shipping crate

Unpacking system components

Inspect the shock sensor on the outside of the shipping box (see the following figure). If the shock sensor indicates a shock condition, conduct a very thorough inspection of all components contained in the system cabinet.

Figure 3: S530 crate shock sensor

Also, check the "TIP N TELL" indicator to ensure that the crate has not been tipped over (see the following figure).

Figure 4: S530 crate tipping indicator

Report any damage to the shipping agent immediately. Carefully remove all system components from the crate. While unpacking, make sure there is no component damage. Please reuse or recycle packaging materials in accordance with your local requirements.

NOTE

You will need at least two people to unpack and move the S530 system cabinet.

To unpack the system components:

1. Remove the crate clamps from the crate using a standard screwdriver.

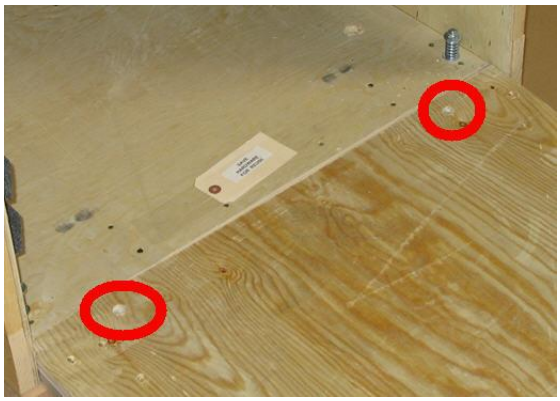
Figure 5: Removing the crate clamps

2. Open the front of the crate. The front is identified by the wooden ramp support attached across the panel (see the following figure).
3. Make sure the ramp support is pulled away from the crate. It is held in place with hook and loop fasteners (such as Velcro®).

Figure 6: Opening the front of the crate

4. Attach the ramp using the two bolts that are attached to the bottom front of the crate.

Figure 7: Front of the crate with ramp down



5. Remove the padding from the front of the S530 system cabinet.

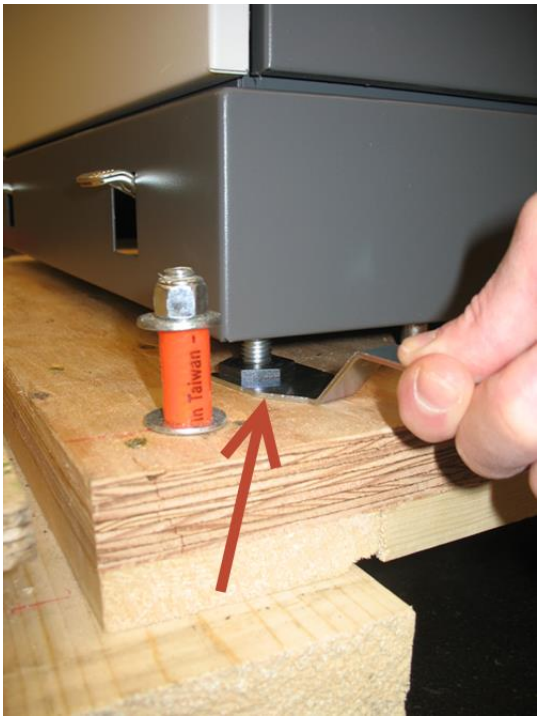
Figure 8: Removing the padding

6. Remove the crate clamps and slide the outer box cover off the crate.

Figure 9: Sliding the outer box off the crate

7. Make sure that you retract the leveling feet on the bottom of the system (next to the casters) to put weight on the casters and prepare the system to be rolled down the ramp.

Figure 10: Leveling feet



8. Remove the four bolts from the bottom of the crate that are attached to the bottom of the S530 system cabinet using a 19 mm socket head on a socket wrench.

Figure 11: System bolted to the crate

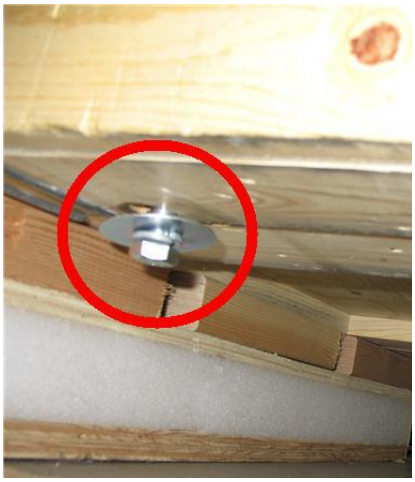


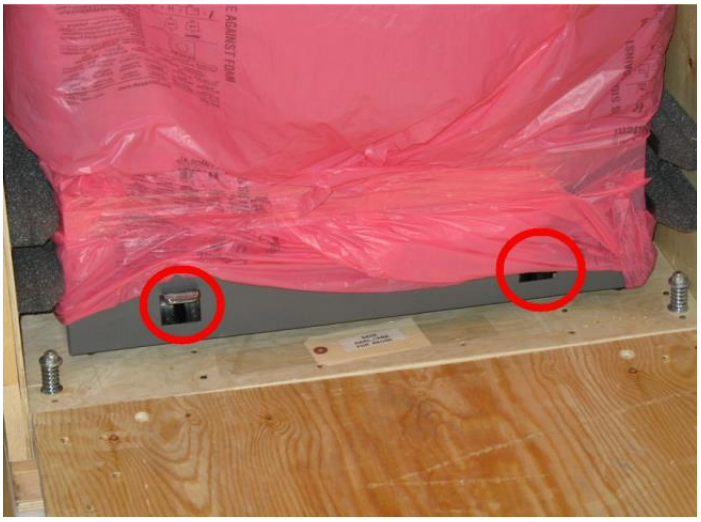
Figure 12: Removing the bolts from the crate

9. Save the hardware (the four bolts and washers) that you remove from the bottom of the crate.

Figure 13: System crate hardware

10. Unlock the two wheels (casters) that are on the front of the S530 system cabinet by moving the locks up.

Figure 14: System caster brakes



11. With two people, slide the S530 system cabinet down the ramp.

Figure 15: Sliding the system down the ramp

12. Remove the tape from the packing material using scissors, taking care not to scratch the S530 system cabinet.

Figure 16: Cutting the wrap off the system

13. Move the S530 system cabinet to its final destination.

The system cabinet is shipped from the factory with all of the instruments installed. Most equipment connections and wiring of instruments in the system cabinet was done at the factory.

Unpacking the S530 system accessories

The accessories are shipped in a separate box (note there may be more than one depending on how many accessories are ordered).

Figure 17: S530 system accessories

The accessories box contains a computer monitor, keyboard, and mouse. It also includes required installation hardware, USB extension cables, cable support arm, connectors for the keyboard and mouse, and any other accessories that may have been ordered with the system (for example, probe card adapter, cables to connect to the test fixture or probe card adapter, or advanced seismic securement kit). You will also find all of the documentation that is shipped with your order. Please reuse or recycle packaging materials in accordance with your local requirements.

NOTE

The following figures are examples of system accessories that may be included in your shipment. What you receive may be different depending on your system configuration.

Figure 18: Typical S530 system accessories

Figure 19: S530 monitor arm accessory

Figure 20: S530 keyboard tray and arm accessory

Figure 21: Cable support arm

Chuck cables for optional probe card adapter

A set of chuck cables is included with the optional PCA-9139A probe card adapter. Model numbers of cables vary based on the prober you are using. For example, the Keithley Field Service Engineer (FSE) will install the cables shown in the following table for Tel P8 probers.

Model	Quantity	Description
CA-63-12	2	12 ft three-lug triaxial cables
237-TRX-T	1	Three-slot male to dual three-lug female triaxial tee adapter
237-BNC-TRX	1	High-voltage two-slot BNC to three-lug female triaxial adapter

NOTE

If a different cable termination scheme is required, a customer-supplied solution can be used.

Optional probe card adapter vacuum requirement

9139A-PCA probe card adapter requirement: A 50.80 cm (20 in.) Hg (which is the same as 40.73 PSI) vacuum supply, with a hose connection of 0.64 cm (1/4 in.) outside diameter and 0.32 cm (1/8 in.) inside diameter.

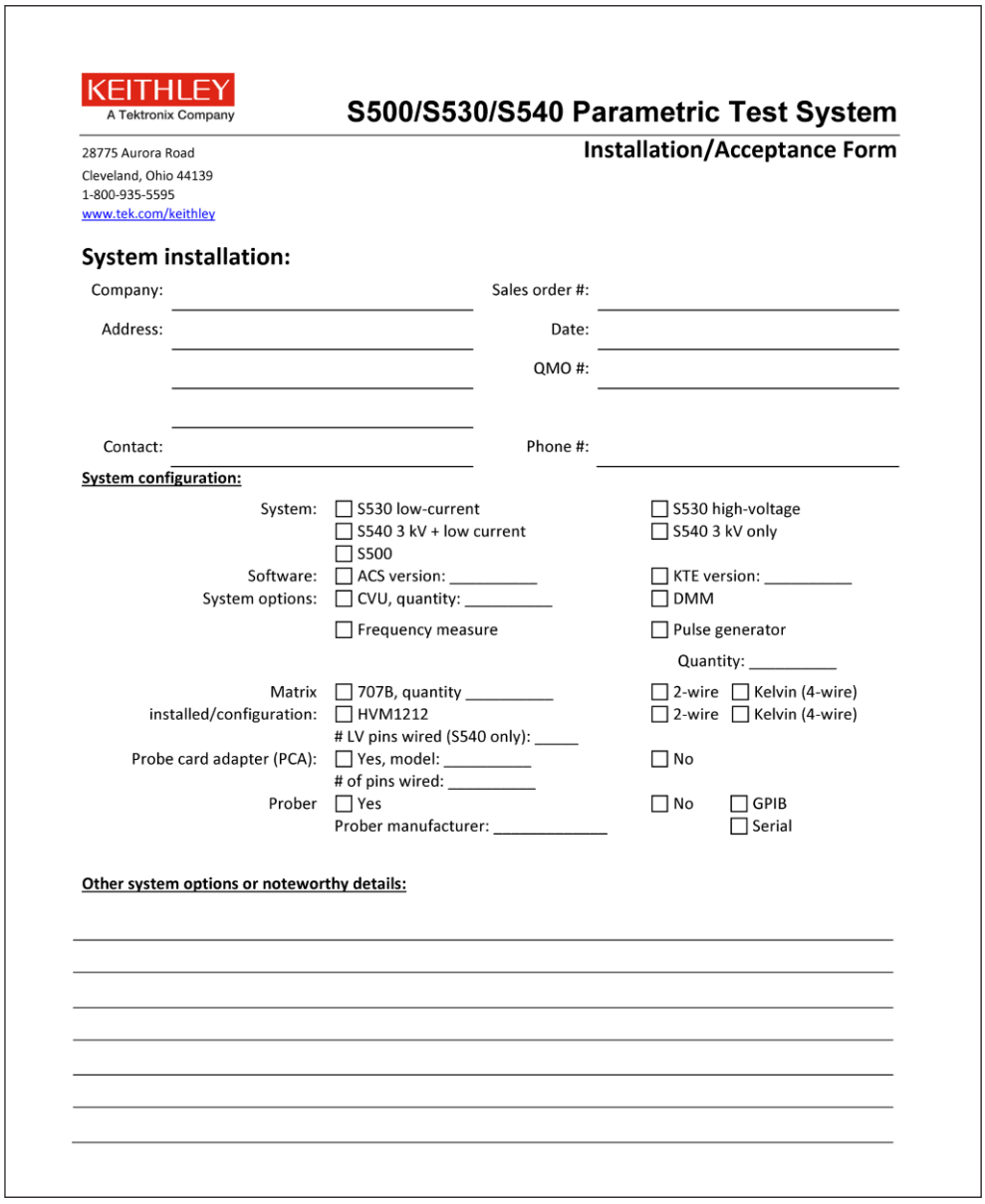
Keithley field service engineer installation tasks

The Keithley field service engineer (FSE) will perform the following tasks:

- Attach the keyboard arm and monitor arm to the system.
- Install the keyboard and the mouse on the keyboard arm, and the monitor on the monitor arm.
- Install the cable support arm to the system.
- Install the probe card assembly (PCA) (if ordered) on the back of the system cabinet, and the 60190-PCA (probe card assembly) to the correct prober plate (customer-supplied from the prober company). The prober plate is attached to the prober.
- Plug in the system to your power facilities (supplied by your facilities department at the final location for the S530 system cabinet) and power up the entire cabinet.
- Verify communications of all instruments and with the properly configured prober.
- Perform diagnostics and system verification tests of the entire S530 system, to include the 60190-PCA (if ordered).
- Record all the information on the System Installation Form (see below for example).

Example S530 System Installation Form

Figure 22: Example S530 System Installation Form page 1



KEITHLEY
A Tektronix Company

S500/S530/S540 Parametric Test System

Installation/Acceptance Form

28775 Aurora Road
Cleveland, Ohio 44139
1-800-935-5595
www.tek.com/keithley

System installation:

Company: _____ Sales order #: _____

Address: _____ Date: _____

_____ QMO #: _____

_____

Contact: _____ Phone #: _____

System configuration:

System: ☐ S530 low-current ☐ S530 high-voltage
☐ S540 3 kV + low current ☐ S540 3 kV only
☐ S500

Software: ☐ ACS version: _____ ☐ KTE version: _____

System options: ☐ CVU, quantity: _____ ☐ DMM
☐ Frequency measure ☐ Pulse generator
Quantity: _____

Matrix installed/configuration: ☐ 707B, quantity _____ ☐ 2-wire ☐ Kelvin (4-wire)
☐ HVM1212 ☐ 2-wire ☐ Kelvin (4-wire)
LV pins wired (S540 only): _____

Probe card adapter (PCA): ☐ Yes, model: _____ ☐ No
# of pins wired: _____

Prober ☐ Yes ☐ No ☐ GPIB
Prober manufacturer: _____ ☐ Serial

Other system options or noteworthy details:

_____

_____

_____

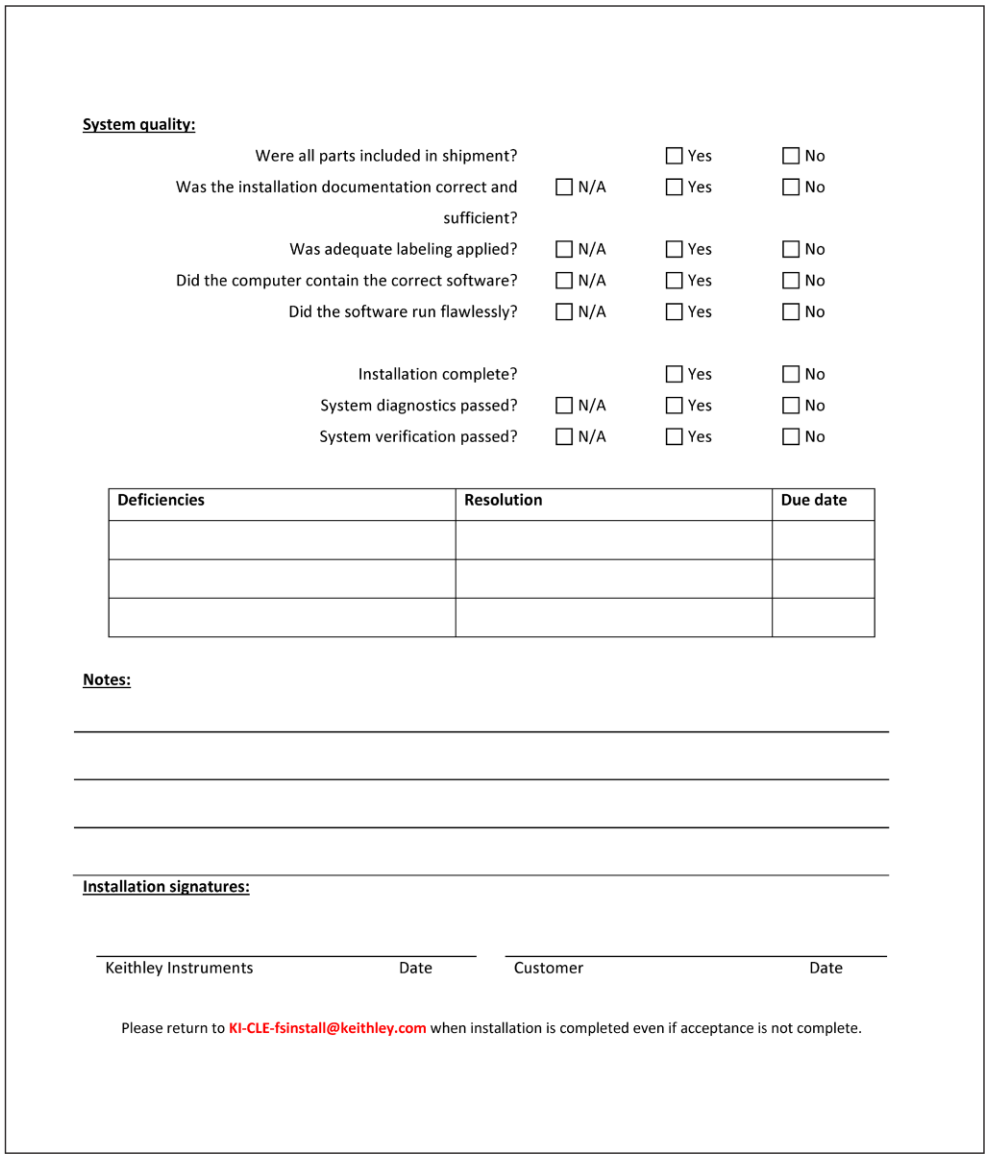
_____

_____

_____

_____

Figure 23: Example S530 System Installation Form page 2



System quality:

Were all parts included in shipment?		☐ Yes	☐ No
Was the installation documentation correct and sufficient?	☐ N/A	☐ Yes	☐ No
Was adequate labeling applied?	☐ N/A	☐ Yes	☐ No
Did the computer contain the correct software?	☐ N/A	☐ Yes	☐ No
Did the software run flawlessly?	☐ N/A	☐ Yes	☐ No
Installation complete?		☐ Yes	☐ No
System diagnostics passed?	☐ N/A	☐ Yes	☐ No
System verification passed?	☐ N/A	☐ Yes	☐ No

Deficiencies	Resolution	Due date

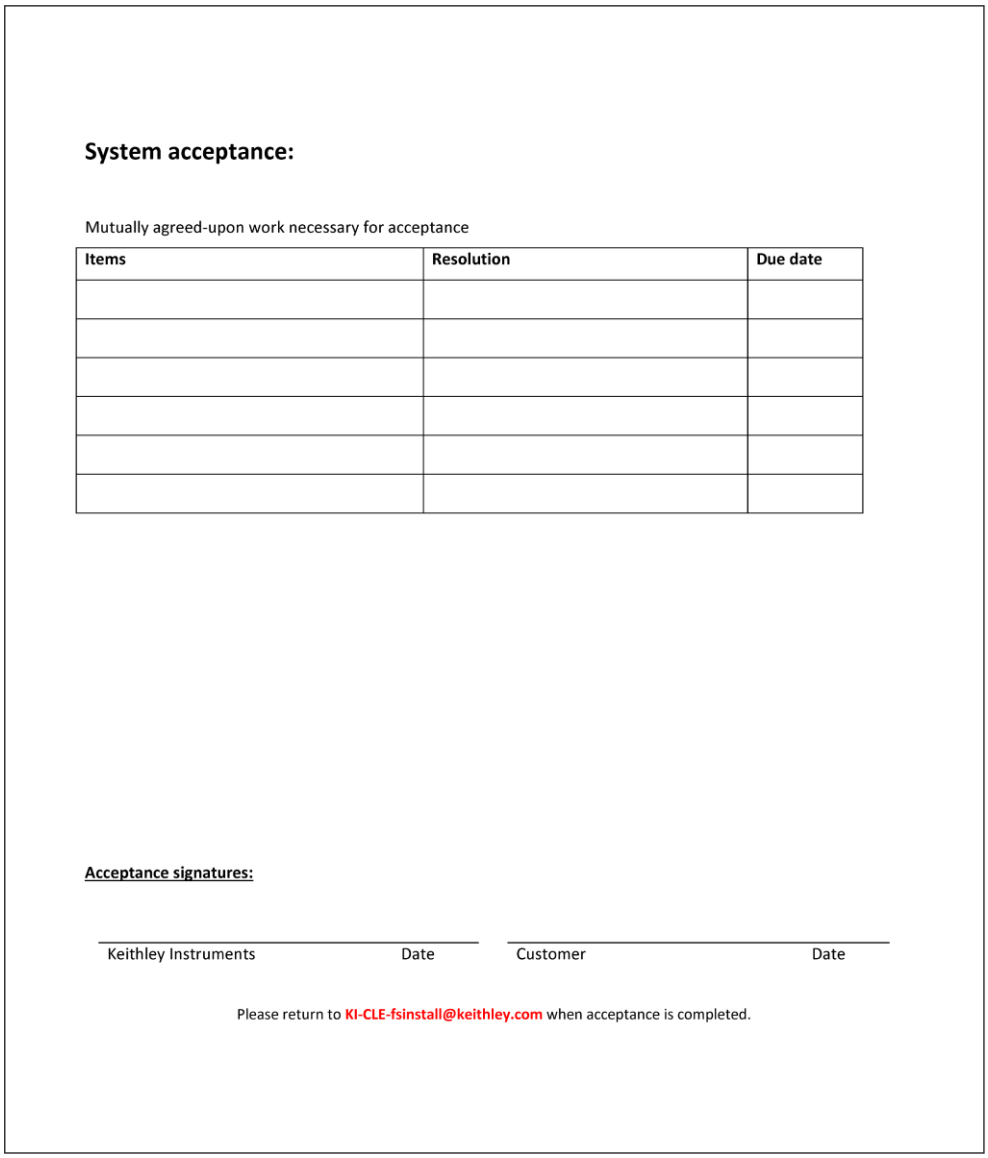
Notes:

Installation signatures:

Keithley Instruments Date Customer Date

Please return to KI-CLE-fsinstall@keithley.com when installation is completed even if acceptance is not complete.

Figure 24: Example S530 System Installation Form page 3



System acceptance:

Mutually agreed-upon work necessary for acceptance

Items	Resolution	Due date

Acceptance signatures:

Keithley Instruments Date Customer Date

Please return to KI-CLE-fsinstall@keithley.com when acceptance is completed.

System cabinet size and weight

The size and weight specifications for the system cabinet are listed in the next table. See Floor plan (on page 2-20) for details about designing a floor plan for the system cabinet.

System cabinet size and weight		
Size (width × depth × height)	**Weight**	
	Minimum configuration	**Maximum configuration**
601.47 mm × 914.40 mm × 1901.00 mm (23.68 in. × 36.00 in. × 74.01 in.)	195.0 kg (430 lb)	285.76 kg (630 lb)

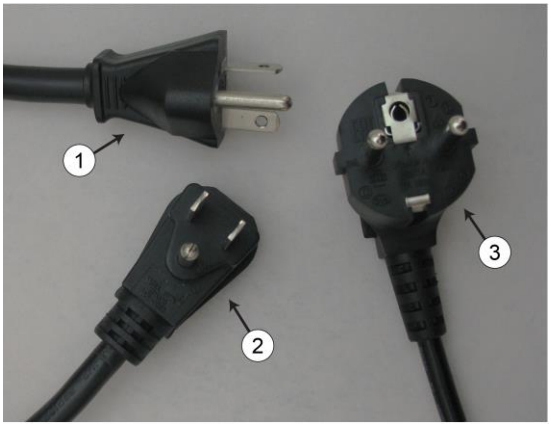
Power and operating conditions

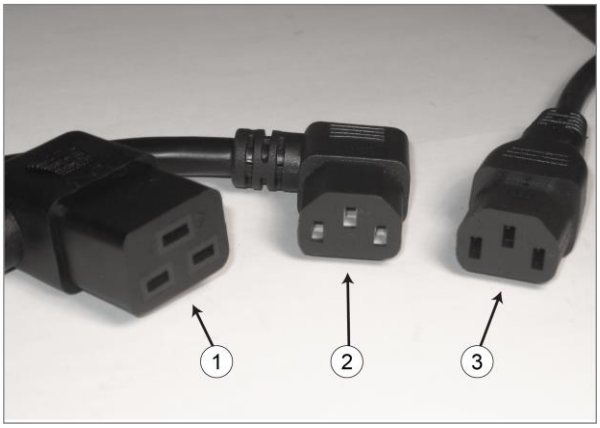
The following topics contain information about power and operating environment conditions.

Supplied power cables

Keithley Instruments provides cables that match the power requirements of the system. The following figure and table describe these cables.

Figure 25: Supplied power cables





Number	Description
1	20 A, 125 V American
2	15 A, 125 V American
3	16 A, 250 V Eurostyle cord

If cables with different cable ends are needed, you must provide those cables.

Line power requirements

Nominal line power: 100 V AC, 115 V AC, 220 V AC, 240 V AC (50 Hz, 60 Hz)

Short-circuit current rating: 5 kA

Power consumption: Rated at 2.4 kVA for the 2 kW power distribution unit

Heat generation: Quiescent heat of 1720 BTU (1815 kJ) to maximum heat of 8191 BTU (8642 kJ).

⚠ WARNING

Severe personal injury or death due to electric shock or electrocution or equipment damage may occur if you do not have the correct circuit amperage.

S530 systems that are configured to operate between 100 V AC and 120 V AC must use a 20 A circuit; systems that are configured to operate between 200 V AC and 240 V AC must use 15 A circuit.

System power dissipation

The total power dissipated by the S530 depends on the type and number of instruments in the test system. The power distribution unit (PDU) limits the incoming power to these instruments. Though the PDU ensures electrical safety and compliance to the required standards, it does not prevent the system from overheating.

When a Series 2600B instrument detects an excessive heat condition, the instrument turns the output off to minimize power dissipation. This safeguard prevents damage to individual Series 2600B instruments, but may result in test instability. For instance, if you continuously source more than 1 A from all the source-measure units (SMUs) for more than 100 seconds, it may trigger a temperature error in one or more of the Series 2600B instruments. However, an average output of less than 1 A for an indefinite period will not cause a temperature error.

For additional information about the Keithley Instruments Series 2600B SourceMeter® instruments, refer to the documentation on the CD-ROM that was shipped with your purchase.

Operating environment conditions

The S530 will not perform within specifications if operated outside of the following environmental conditions.

Temperature: 23 °C ±5 °C (73.4 °F ±9 °F).

Operating humidity: 30% to 60% relative humidity, noncondensing, after a two-hour warm up time.

Vibration: High ambient vibration levels may require isolation pads or the repositioning of equipment.

Air quality: The S530 system is compatible for use in a Class 10 clean room.

Audible system noise: Decibel level is 65 dBA in optimal environmental conditions.

Airflow: The S530 system is configured for top to bottom airflow.

Altitude: Less than 2000 m (6,561 feet) above sea level.

Noise interference: To prevent electrical noise from interfering with measurements, the ambient AC magnetic field must not exceed 2×10^{-3} G (2×10^{-7} T).

- Avoid locating the S530 next to plasma etchers, large motors, magnets, RF transmitters, equipment with flash lamps, and other potential sources of interference.
- Position equipment to avoid routing signal and power cables near sources of electrical noise.

Triaxial connector handling and avoiding contamination

Keep source-measure triaxial cable connectors (if applicable) clean and free of any foreign contaminants. Do not touch the connector pins of the triaxial connectors. Contamination can cause current leakage in the source-measure signal paths to the device under test (DUT), which can significantly degrade the test results.

CAUTION

Do not touch any connector pins or the areas adjacent to the electrical contacts of the triaxial connectors; contamination will degrade the performance of the test system.

Cleaning: Using lint-free swabs, clean contaminated connectors with methanol or isopropyl alcohol, and then blow-dry them with nitrogen gas. After blowing dry, wait several minutes before using.

Lockout and tagout

For maximum safety while power is applied, always perform a lockout and tagout procedure. Remove power from the entire test system and discharge capacitors before connecting or disconnecting cables or any instrument, including the device under test. When you perform lockout and tagout procedures, make sure that you note all warning labels on the cabinet and instruments (see the following figure).

Figure 26: Hazardous warning label

⚠ WARNING

Severe personal injury or death due to electric shock or electrocution may result if power is not removed before working inside the cabinet. Always perform the lockout and tagout procedure before opening the system cabinet. Also, never turn on the system until all connections and safety grounds are installed.

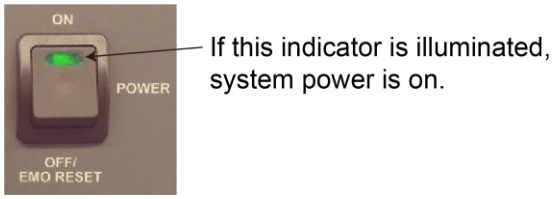
To remove system power:

1. You must shut down the software and remove all power from the computer and the system (see Shut down using ACS (on page 3-4) or Shut down using KTE (on page 3-5)).

⚠ WARNING

Before proceeding, you must make sure the power indicator on the front door is not illuminated. See the following figure for an example of what the indicator looks like when illuminated.

Figure 27: Verifying system power is off



2. Place the breaker for the power distribution unit (PDU) in the OFF position. The location of the PDU is at the back of the cabinet below the rear door.
3. If you are working in the system cabinet, disconnect the system cabinet line cord from the AC line power receptacles.

4. Verify that all power has been removed and discharged from the system cabinet by switching the main power switch (on the front door of the cabinet) to the ON position and verify that the green light does not illuminate. If the light does not come on, the power is off. Turn the main power switch back to the OFF position.
5. With the PDU breaker in the OFF position, lockout and tagout the system source power connection by locking a padlock through the hasp that surrounds the PDU breaker.

Installation and connections

⚠ WARNING

The following installation and connection procedures should be performed by trained site installers who are familiar with the associated physical and electrical hazards. Also, you should never turn on the system until all connections and safety grounds are installed.

Position the system cabinet

The system cabinet contains the controller and instrumentation for the test system. The cabinet is on casters, which allows you to easily roll it on a hard floor surface. The two steering casters in the rear are swivel type, and the two casters at the front are in fixed positions.

To position the system cabinet:

1. Carefully roll the system cabinet to its location next to the prober, allowing a minimum distance of 15 cm (6 in.) up to a maximum distance of 122 cm (48 in.). Allow approximately 60 cm (23.5 in.) (nominal) of clearance between the cabinet and other instrumentation.
2. Lock the casters by pushing down on the caster-locking mechanisms near the front-bottom of the cabinet.
3. Adjust the height of the four legs so that the weight of the cabinet is on the legs and not on the casters. Adjust the legs so that the cabinet is level and does not move (see System securement (on page 2-23)).

⚠ WARNING

Seismic securement is required for safety of the S530 system and for personnel. You must bolt the legs adjacent to the four casters to the floor. See System securement (on page 2-23) for details.

Floor plan

NOTE

The following floor plan information is for the system cabinet only. Refer to the documentation for the prober or other test-fixture equipment to determine its floor space requirements.

The system cabinet requires a floor space of approximately 1.2 m × 2.1 m (4 ft × 7 ft). The following figures show a top view of the floor plan and the typical S530 system cabinet weight distribution and center of gravity. System cabinet size and weight (on page 2-16) lists the dimensions and weight of the system cabinet.

Figure 28: S530 floor plan, top view

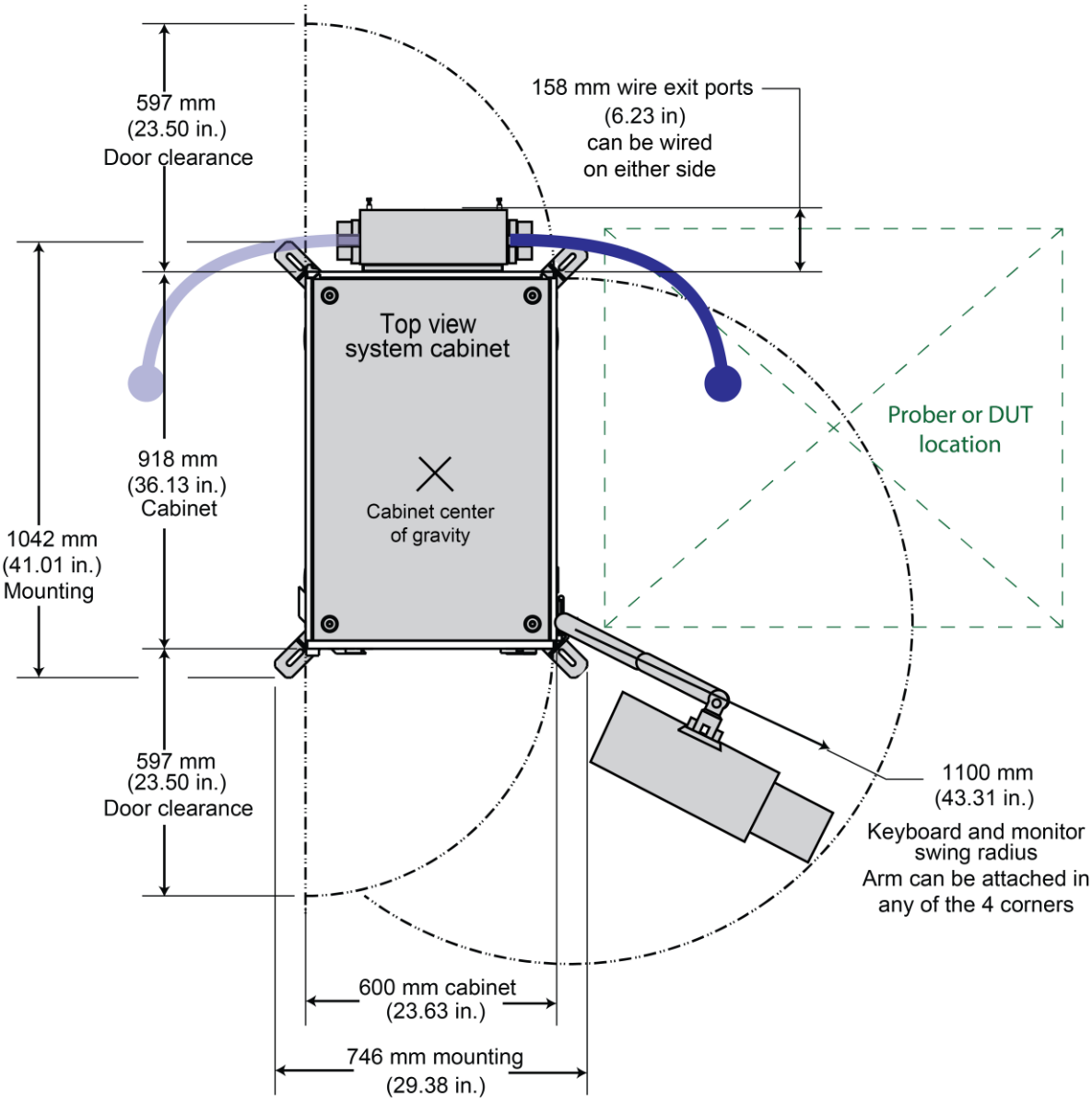
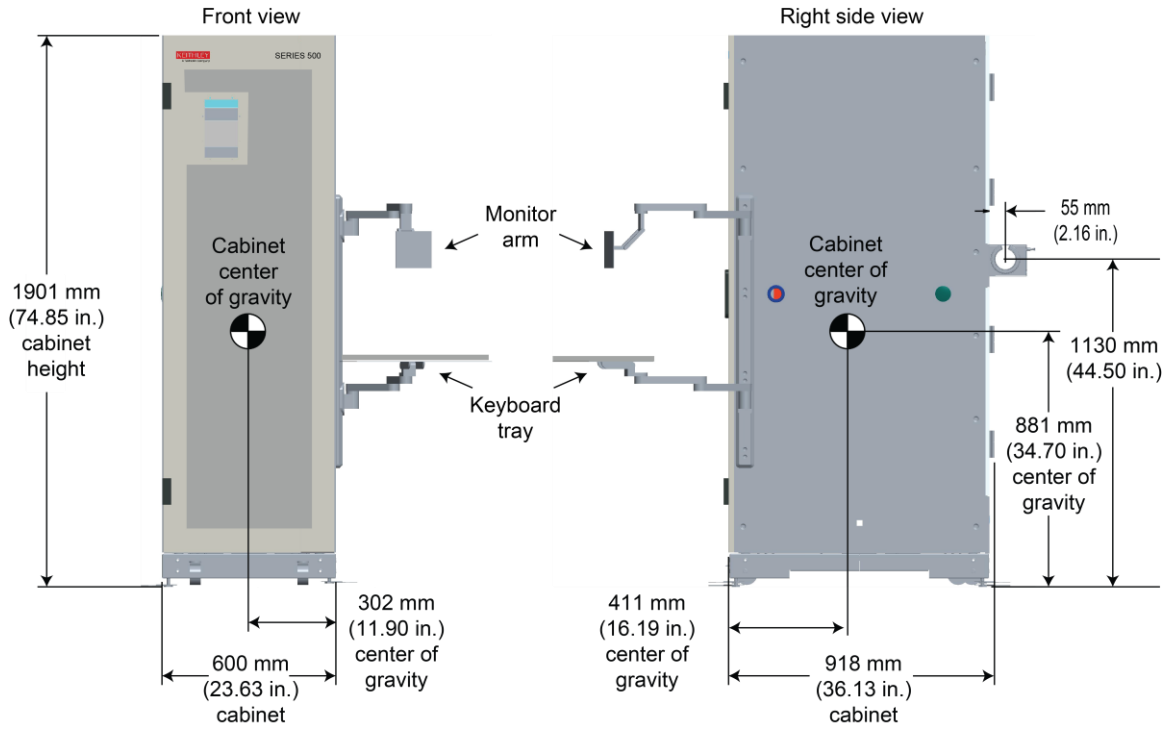


Figure 29: S530 weight distribution and center of gravity

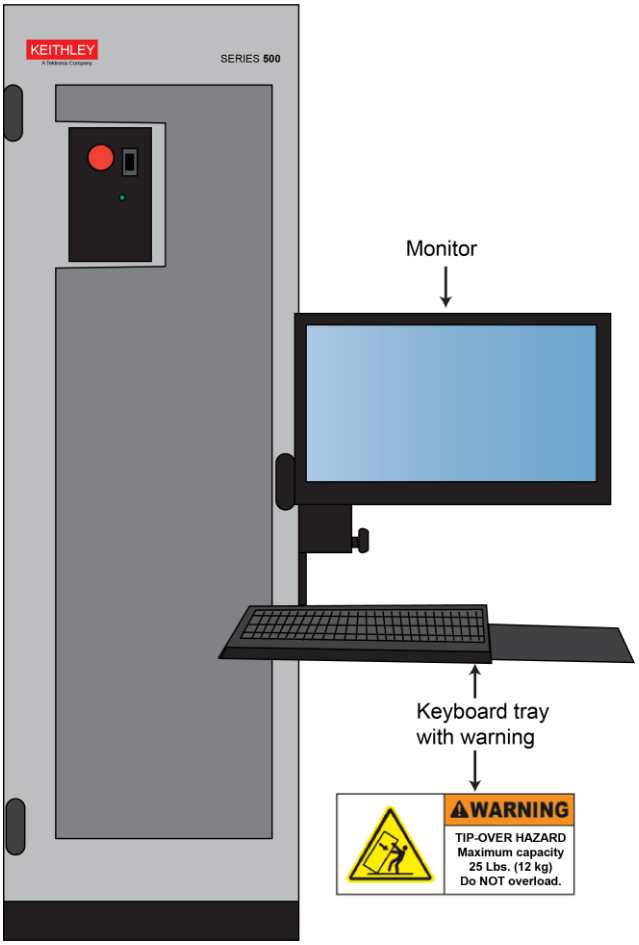


System securement

Securement is required for the S530 system cabinet. You must bolt the system to the floor for safety purposes and to ensure the cabinet will not tip over.

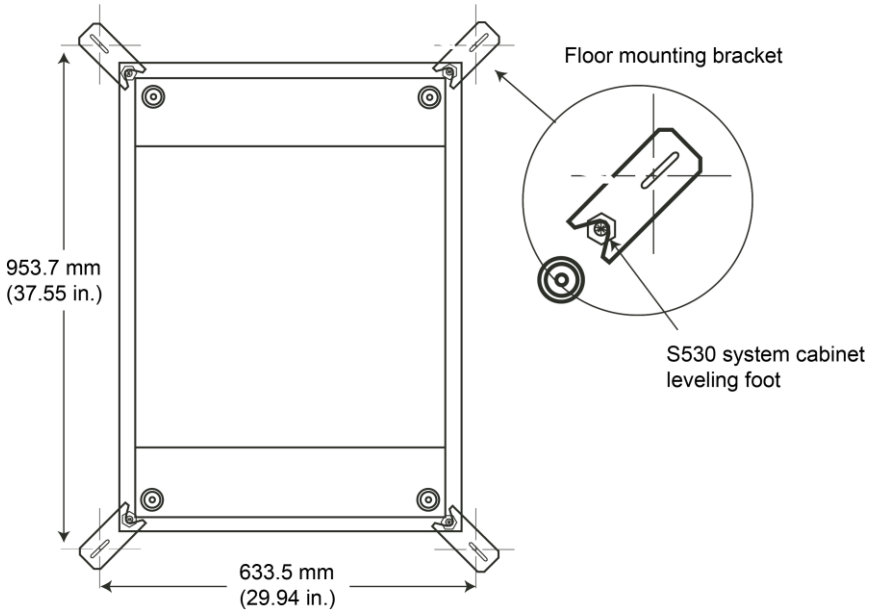
The following figure shows a label on the keyboard tray that indicates a tip-over hazard. The maximum weight capacity for the keyboard tray is 12 kg (25 lb).

Figure 30: S530 tip-over hazard warning label on keyboard tray



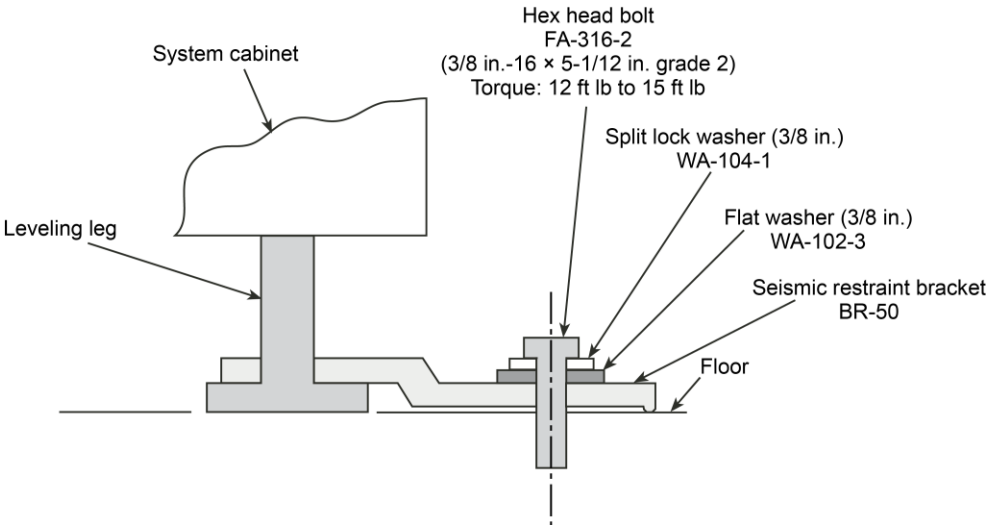
The following figure shows the restraint brackets and bolt installation dimensions for the system cabinet.

Figure 31: S530 system securement dimensions



The following figure shows how a floor-mounting bracket is installed. Keithley part numbers are included for the required hardware.

Figure 32: S530 system cabinet floor mount



Optional advanced seismic securement

If you ordered a system with the advanced seismic fastening option, follow these mounting instructions.

To install advanced seismic securement:

NOTE

You must supply the washers (flat and lock), threaded insert anchors, and mounting bolts that attach the mounting brackets to the floor (16 of each). The bolts should be at least grade-five bolts.

1. Position the cabinet in the desired location on a smooth, level floor.
2. Place the floor mounting brackets at the corners and make sure you have enough room for proper placement.
3. To properly place the mounting brackets, lift the cabinet by the leveling legs.

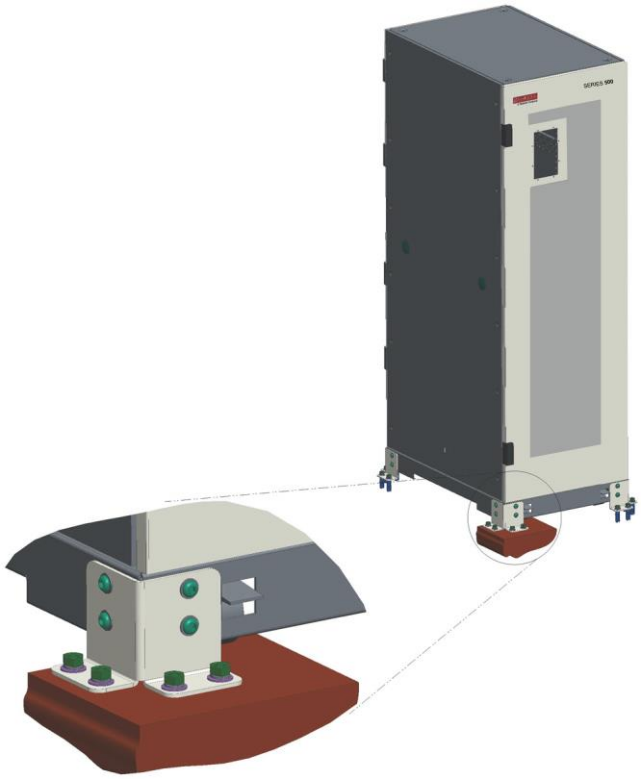
NOTE

Lifting the cabinet will allow the holes in the mounting brackets to line up with the holes in the plinth.

4. Temporarily attach the mounting brackets to each corner with the provided screws.

   The following figure shows the restraint brackets and bolt installation for the system cabinet.

Figure 33: S530 seismic restraints



5. Mark the position of the mounting holes to the floor with a marker.
6. Remove the mounting brackets and also mark the location of the cabinet leveling legs.
7. Lower the cabinet and move as needed for drilling and installing the customer-supplied floor anchors.

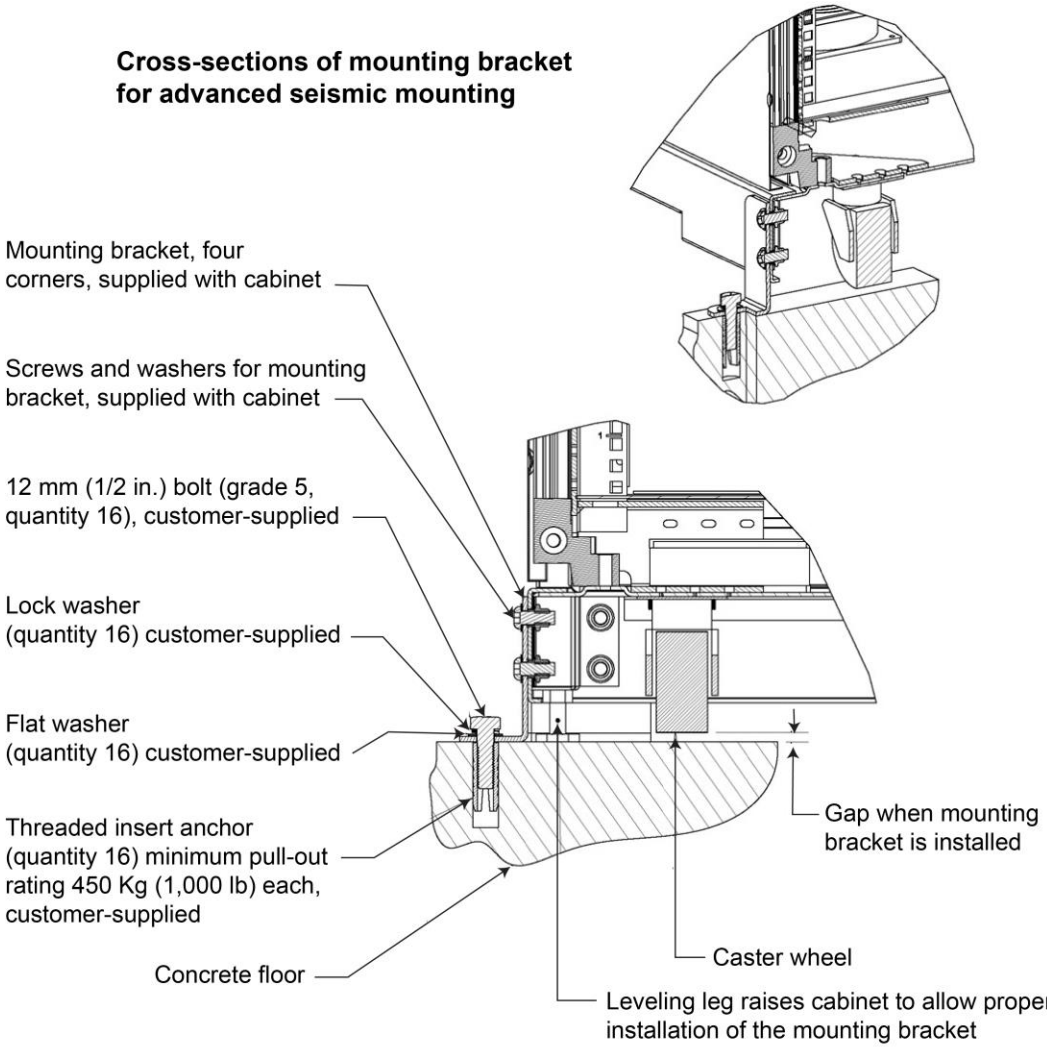
NOTE

Anchors should have a minimum pullout rating of 450 kg (1000 lb) each. Install 16 anchors for maximum protection.

8. Return the cabinet to marked locations on the floor and use the leveling legs to lift the cabinet to the proper height.
9. Attach the mounting brackets to the corners with the mounting hardware provided (16 screws and washers).
10. Fasten brackets to the floor with washers and grade-five (or higher) bolts (you must supply the bolts and washers).

    The following figure shows how a floor-mounting bracket is installed.

Figure 34: S530 advanced cabinet floor mount



Section 3

Equipment startup

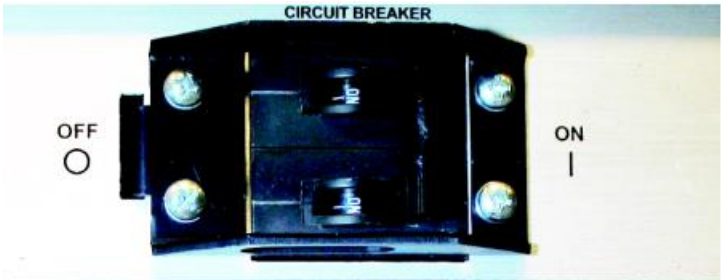
In this section:

Introduction

All of the instruments in the equipment rack are connected to one power distribution unit (PDU), which is in the back of the cabinet.

- Check that all line cords for the system cabinet are connected to AC power line receptacles.
- Make sure the PDU circuit breaker on the back of the cabinet is in the ON position (see the following figure). If the circuit breaker is tripped, turn it OFF and then turn it back ON.

Figure 35: Power distribution unit (PDU) circuit breaker



MODEL	LINE RATING			CIRCUIT BREAKER
42000-PDU	100-120 VAC	50/60 Hz	1.8k WATTS	15 AMP
42000-PDU/E	208-240 VAC	50/60 Hz	1.8k WATTS	7.5 AMP
42000-PDU-2K	100-120 VAC	50/60 Hz	2.4k WATTS	20 AMP
42000-PDU/E-2K	208-240 VAC	50/60 Hz	2.4k WATTS	10 AMP

On the front of the system, turn the POWER switch to the ON position. The POWER switch is on the front door of the cabinet. Make sure the system computer and monitor are also turned on before attempting to use the S530 system and any software.

Initial equipment startup

To begin equipment startup:

1. Check that all line cords for the system cabinet are connected to AC power.
2. Make sure that the circuit breaker on the power distribution unit (PDU) is in the ON position.
3. Press the power/standby button on the computer and monitor.
4. Set the power button on the front door of the system to the ON position.

Figure 36: S530 power ON switch

System startup

To start up the system:

1. Make sure that the power switch on the power distribution unit (PDU) is set to ON.
2. Set the power button on the front door of the system to the ON position.
3. If the computer has not started to boot, open the front cabinet door and press the power/standby switch on the host computer.
4. Wait for all of the instruments to power up.
5. Log onto your computer.

Before starting system software

NOTE

The S530 system includes one of two system software options:

- Automated Characterization Suite (ACS)
- Keithley Test Environment (KTE)

- You must make sure that all of the instruments are connected with the appropriate interface cable and a TSP-Link™ connection between any Series 2600B System SourceMeter® or DMM7510 7-1/2 Digit Graphical Sampling Multimeter instruments.
- Assign GPIB or TCP/IP addresses (as appropriate) and node numbers to the hardware and instruments.
- Make sure that all of the instruments are turned on and self-testing is finished.

For more information about the ACS software setup procedures, refer to the *Automated Characterization Suite (ACS) Reference Manual* (part number ACS-901-01). For more information about the KTE software setup procedures, refer to the *KTE S530/S540 Release Notes* document (part number PA-1036) on the S530/S540 KTE Software CD-ROM (part number S530-850v*, where * is the version number)

NOTE

Make sure that all of the instruments are completely powered up before starting the system software.

CAUTION

To avoid instrument errors, never start the system software until all of the instruments have finished self-testing.

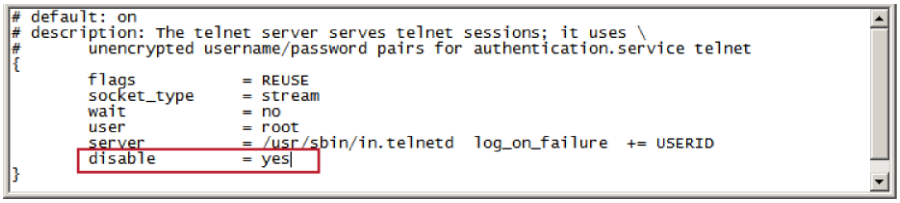
Using Telnet

Telnet is not enabled by default on the S530 system; you must to enable it to use it.

To enable Telnet:

1. From the command prompt (as root user), type `su` and the root password.
2. Type `gedit /etc/xinetd.d/telnet` to open the Telnet server configuration file.
3. In the opened file, change the line that says `disable = yes` to `disable = no` (see the following figure).

Figure 37: Enabling Telnet



4. Save and close the file.
5. From the command prompt (as root user), send the following:

```
service xinetd start
chk config telnet on
chk config xinetd on
```

Start the KTE software

To start the KTE software, first start the instrument controller (IC) process. To start the IC process, log on to the computer and enter the following command:

```
$KIHOME/IC/bin/run_ic.pl
```

NOTE

The IC process must be started manually after you log on.

To stop the IC process, enter the following command:

```
$KIHOME/IC/bin/stop_ic.pl
```

IC process log messages

The `run_ic.pl` script sends any output messages from the IC process to the `$KILOG/ic_<QMO>_YYYYMMDD_HHMM.log` file, where:

- `<QMO>` is the QMO number of the tester.
- `YYYYMMDD_HHMM` is the date and time when the IC process was started.

The IC process by default only outputs `DEBUG` and `ERROR` messages. You can use the `KI_TRACE_LEVEL` environment variable to define the minimum level of messages to display. Valid values of this variable are: `TRACE`, `DEBUG`, and `ERROR`. After changing the environment variable, the IC process must be restarted by executing `$KIHOME/IC/bin/run_ic.pl`.

Start the ACS software

To start the ACS software, log on the computer and double-click the ACS icon.

Shut down using ACS

To shut down using the Automated Characterization Suite (ACS) software:

NOTE

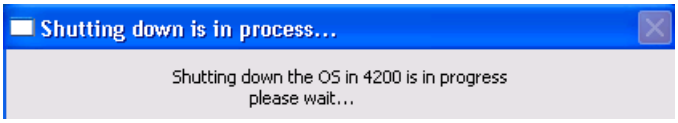
You must have administrator rights in ACS software to shut down the S530 system.

1. Double-click the **Shutdown** icon on the computer desktop.
2. In the dialog box that opens, click **Yes** that you want to shut down the S530 tester.

NOTE

The message in the following figure opens after you click **Yes** to shut down the S530. You must wait until the 4200-SCS and the system computer shut down before you press the power button on the system cabinet. It may take several minutes for the system to shut down.

Figure 38: Shut down the S530



3. Once the ACS host computer has shut down, press the power button on the front door of the system cabinet.

Shut down using KTE

To shut down using the Keithley Test Environment (KTE) software:

1. Close all KTE programs.
2. In the LINUX® terminal, type the following command:
   `$KIBIN/shutdown_S530.pl`
3. Press **Enter** on the keyboard.
4. On the next command line, type the following:
   `sudo $KIBIN/shutdown_S530.pl`
5. Enter the password for the root account.
6. Wait for the system to stop.

NOTE

The IC process stops, the 4200-SCS shuts down, and then the workstation will shut down. The console screen will be blank when it has stopped.

7. Turn off power to the cabinet.

Emergency OFF (EMO) button

An EMERGENCY OFF (EMO) button is on the system cabinet door (see following figure). If you push the EMERGENCY OFF button, it removes power to all of the system instruments. However, it does not remove power to the host computer.

Figure 39: EMERGENCY OFF button

The EMO TRIPPED indicator light (on the cabinet door) turns on when the system has undergone an emergency shut down.

Emergency shut down procedure

Press the red **EMERGENCY OFF** button on the front of the system cabinet. The instruments will power down and the red EMO TRIPPED indicator will illuminate.

The red indicator also illuminates when the system recovers from a sudden power loss.

Recovering from an emergency shut down

To recover after an emergency shut down:

1. Verify that the hazardous condition or emergency situation is no longer present.
2. Rotate the EMERGENCY OFF button to release it.
3. Toggle the power switch from ON to OFF, and then back to ON again. All of the system instruments should power up.
4. Open the front cabinet door and press the power/standby switch on the host computer.

Figure 40: S530 system cabinet front view

Safety interlocks

⚠ WARNING

Failure to make sure that the safety interlock and safety shields and guards are properly installed and arranged as indicated will put personnel in severe danger. Severe personal injury or death due to electric shock or electrocution may result.

For the safety interlock to function properly, the DUT interlock sensor must be installed near the DUT connections and the interlock magnet must be installed on the safety shield. It must be set up so that when the magnet is near the switch (interlock closed) the operator cannot touch voltage-carrying conductors. If not properly installed, it will render the interlock inoperative and place personnel at severe risk.

For operator safety, the S530 has interlocks on both the front and back cabinet doors and at the device under test (DUT). Also, the optional probe card adapter (PCA) has an interlock that provides protection for connections to a prober.

If you open a cabinet door or open the DUT interlock while instruments are sourcing, the interlock activates and disconnects the hazardous voltage from the source-measure instruments, stopping any tests in progress.

An indicator on the front door of the S530 cabinet illuminates, and the ACS or KTE software immediately notifies you of the interlock activation.

Figure 41: Interlock indicator

Once the interlock has been activated, you must clear the cause of the interlock activation.

To clear the interlock activation:

1. Follow the instructions on the computer.
2. Make sure the front and rear doors are closed.
3. Make sure the DUT interlock is properly set for safe operation.
4. Close the DUT safety shield.
5. The software will then need to recover before you can continue normal operation (you may need to rerun your tests).

Prober safety

⚠ WARNING

Hazardous voltages may be present on the probe card adapter, even after you disengage the interlock. Cables can retain charges after the interlock is disengaged, exposing you to live voltages that, if contacted, may cause personal injury or death. Reset the test equipment to put the probe card adapter in a safe state before touching the prober cables or any connected cables.

Never attempt to touch or change a probe card when tests are running. You must be absolutely certain that all tests have stopped before making contact with anything in the vicinity of the probe card adapter. Also, never run tests without a probe card installed.

Network information

- System controller network interface: Ethernet port (10, 100, or 1000 Base-T capable using RJ-45).
- Supplied cables: One ethernet crossover cable (connects the computer to the tester).
- One 10Base-T patch cable (connects to your network).
- IP address is determined by you (the customer).

CAUTION

When setting up the computer for the S530 system, do not change the computer name. Software licenses are tied to the computer name. If you change the computer name, the Keithley Interactive Test Tool (KITT), Keithley Test Execution Engine (KTXE), and other Keithley Test Environment (KTE) tools will not work.

Section 4

Maintenance

In this section:

Hardware replacement

⚠ WARNING

The information in this section is intended only for qualified service personnel. Because some of these procedures may cause exposure to hazardous voltages that could result in personal injury or death, service personnel must wear personal protective equipment (PPE) suitable for voltages greater than 40 V AC. Do not attempt to perform these procedures unless you are qualified to do so.

This section contains information about removal and installation of system cabinet components, and instructions for replacing components determined to be faulty.

Handling and cleaning precautions

CAUTION

Always grasp cards by the side edges and shields to avoid contamination, which will degrade the performance of the components. Do not touch the connectors, the board surfaces, or components. On plugs and receptacles, do not touch areas adjacent to the electrical contacts.

Take care when handling or servicing to prevent possible contamination in high-impedance areas, which could degrade performance. Take the following precautions when servicing any system component:

- Do not store or operate the system in an environment where dust could settle on the components.
- Use dry nitrogen gas to clean dust off the components, if necessary.
- Handle cards only by the side edges and shields.
- Do not touch any board surfaces, components, or connectors.
- Do not touch areas adjacent to electrical contacts.
- Wear clean cotton gloves when servicing any component.

- If necessary, make solder repairs on a circuit board using lead-free solder. Remove the solder from the work areas when the repair is complete. Use pure water and clean cotton swabs or a clean, soft brush to remove the solder. Take care not to spread the solder to other areas of the components. Once the solder is removed, swab only the repaired area with methanol or isopropyl alcohol, then blow-dry the board with dry nitrogen gas.
- After cleaning, place the components in a 50 °C low-humidity environment for several minutes before use.

Special handling of static-sensitive devices

CAUTION

System components can be damaged by electrostatic discharge (ESD). Wear a ground strap and attach the clip lead to the grounding bar in the test head or the system cabinet frame before working on the system. Assume all parts are static sensitive.

High-impedance devices are subject to possible static discharge damage because of the high-impedance levels involved. When handling such devices, assume all parts are static sensitive:

- Static-sensitive components should be transported and handled only in containers designed to prevent or dissipate static buildup. Typically, these components are received in anti-static containers made of plastic or foam. Keep these parts in their original containers until ready for installation or use.
- Remove the components from their protective containers only at a properly grounded workstation. Also, ground yourself with an appropriate wrist strap while working with these components.
- Handle the connectors only by their bodies. Do not touch the boards, pins, or terminals.
- Any printed circuit board into which the device is to be inserted must first be grounded to the bench or table.
- Use only anti-static type desoldering tools and grounded-tip soldering irons.

Electrical hazard tasks

Definitions of electrical hazard tasks (as defined in the SEMI S2-0715a standard) are listed in this section. For S530 systems, Type 3 electrical hazard tasks are typically performed.

For additional information about diagnostics, troubleshooting, or maintenance of specific Keithley instruments, refer to the documentation for that instrument for details before attempting to repair it. Also, refer to the documentation on the CD-ROM that was shipped with your purchase.

Types of electrical hazard tasks

Live circuit type	Description
1	Equipment is fully de-energized.
2	Equipment is energized. Energized circuits are covered or insulated. NOTE 41: Type 2 work includes tasks where the energized circuits are or can be measured by placing probes through suitable openings in the covers or insulators.
3	Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are no greater than 30 V_{RMS}, 42.4 V_{peak}, 60 V DC, or 240 VA in dry locations.
4	Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are greater than 30 V_{RMS}, 42.4 V_{peak}, 60 V DC, or 240 VA in dry locations. Potential exposures to radio-frequency currents, whether induced or via contact, exceed the limits in SEMI S2, Appendix 5, Table A5-1.

Repair and replacement

Keithley Instruments offers a fee-based service agreement with all S530 systems. Under this agreement, a field service engineer will either repair or replace equipment. For more information about this service agreement, contact Keithley Instruments at 1-800-935-5595.

For additional information about specific parts, operations, and maintenance of Keithley instruments, refer to the documentation for the instrument for details before attempting to replace or repair any equipment. Also, refer to the supplied documentation that is on the Keithley Instruments CD-ROM that was shipped with your purchase.

Heavy instrument removal and installation

When installing or removing equipment heavier than 40 pounds, use a mechanical lifting device. If there is an instrument mounted below the heavy instrument, it must be removed to provide clearance for the lifting forks. Refer to the lifting device operating manual for proper usage.

Remove system power

⚠ WARNING

Severe personal injury or death due to electrical shock or electrocution may result if power is not removed before moving, removing, or installing equipment. Do not attempt to perform these procedures unless you are qualified to do so and are wearing personal protective equipment (PPE) suitable for voltages greater than 40 V AC.

Make sure the system and instruments that are being installed, moved, or removed are turned off with all power source/cables unplugged.

To remove system power before performing maintenance or replacement of components:

CAUTION

Follow precautions for removing hazardous voltage from the probe or other types of test fixtures before handling.

1. Close any software that is open on the computer.
2. Shut down the system computer using the instructions in either Shut down using ACS (on page 3-4) or Shut down using KTE (on page 3-5) or Shut down using KTE (on page 3-5) in this guide.
3. Place the system cabinet power switch on the front-panel door in the OFF position.
4. Place the main circuit breaker on the power distribution unit (PDU) (on the back of the cabinet) in the OFF position.
5. Disconnect the source power to the S530 system (power cord on back of PDU).
6. Place the lock and tag on the main circuit breaker of the PDU.
7. Wait five minutes before accessing any high-voltage units.

General replacement procedure

⚠ WARNING

Severe personal injury or death due to electric shock or electrocution may result if power is not removed before working inside the cabinet. Always disconnect the cabinet line cords from the AC line power receptacles before opening the system cabinet. Also, never turn on the system until all connections and safety grounds are installed.

1. Remove power and place the lock and tag on the main circuit breaker of the power distribution unit (PDU) (see Lockout/tagout (on page 2-19)).
2. Disconnect and tag cabling to the unit requiring removal. Do not change cable routing or securement.
3. Properly supporting the unit, remove it from the system cabinet.

Adjustment

Keithley Instruments recommends annual adjustment of the individual instruments in your system and offers this as an on-site service. A field service engineer (FSE) will adjust instrumentation and perform system verification according to the warranted system specifications. For more information about adjustment or other S530 services, contact your local Keithley office.

You can also do system verification as described in the S530 Parametric Test System Diagnostics and Verification Manual.

⚠ WARNING

Hazardous voltages may be present on the probe card adapter, even after you disengage the interlock. Cables can retain charges after the interlock is disengaged, exposing you to live voltages that, if contacted, may cause personal injury or death. Reset the test equipment to put the probe card adapter in a safe state before touching the prober cables or any connected cables.

Never attempt to touch or change a probe card when tests are running. You must be absolutely certain that all tests have stopped before making contact with anything in the vicinity of the probe card adapter. Also, never run tests without a probe card installed.

For information about instrument-level adjustment, refer to documentation for each of the instruments in the system (on the CD-ROM that was shipped with your purchase, or on the web at *www.tek.com/downloads* ()).

Restore system power

Restore system power after properly performing the required maintenance or replacement of components. Make sure that all connections are secure and connected correctly.

To restore system power:

1. Remove the lock and tag placed on the main circuit breaker of the power distribution unit (PDU).
2. Connect the source power to the S530 system (power cord on back of PDU).
3. Place the main circuit breaker on the PDU (on the back of the cabinet) in the ON position.
4. Close the rear cabinet door.
5. Make sure the system computer and all instrument power switches are in the ON position.
6. Close the front cabinet door.

NOTE

With the system cabinet POWER switch in the OFF position, the EMERGENCY OFF (EMO) light should be off. If the EMO light stays on, the power is not restored. To restore power, it may be necessary to push in and hold the Remote EMO Reset switch until power has been restored to all units in the system. The Remote EMO Reset switch is on the PDU panel on the back of the system cabinet.

7. Place the system cabinet POWER switch (on the front-panel door) in the ON position.
8. Make sure the computer is turned on.
9. Start the computer and the system software.

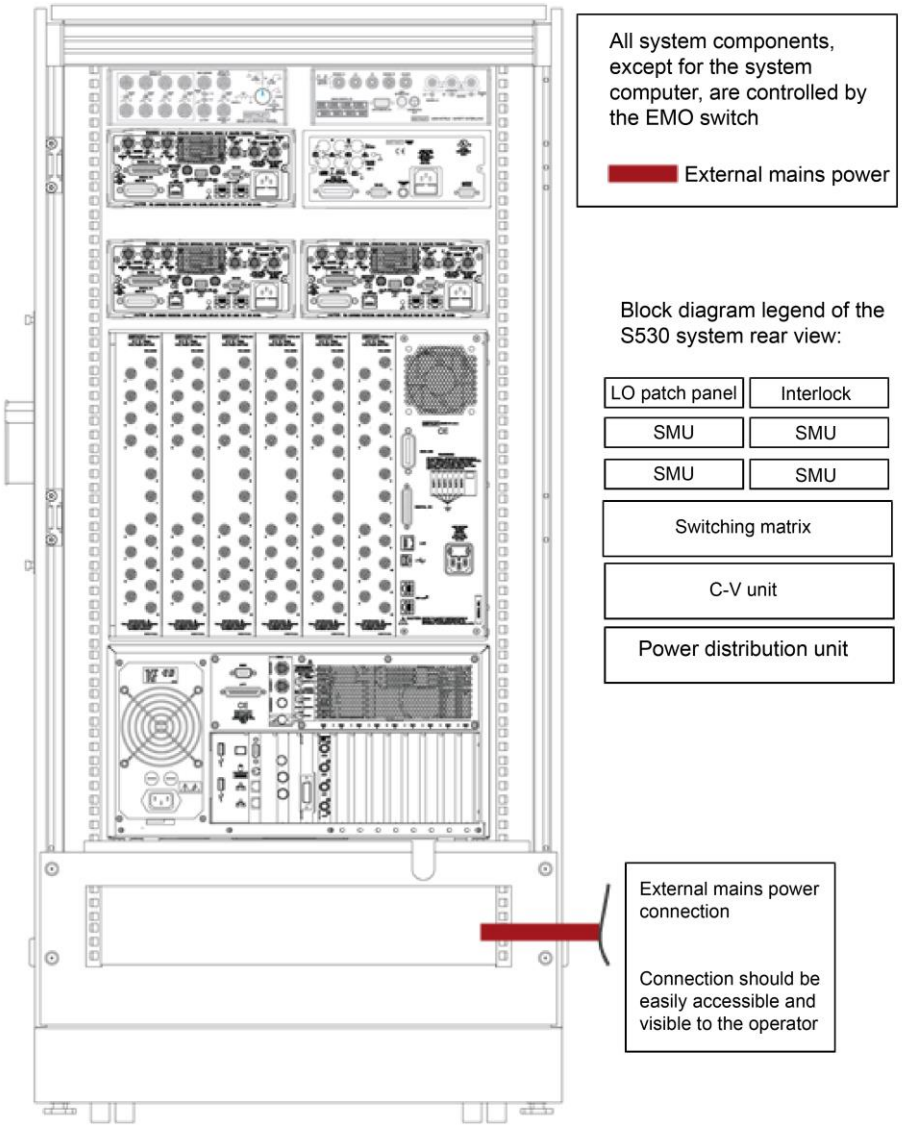
Fuses

Refer to the applicable instrument documentation that is included with the product for fuse replacement.

Power distribution and emergency off

The following figure contains a simplified example layout of various components in the S530 system (the LO patch panel and the interlock are shown for reference only; they are behind the source-measure units (SMUs)).

Figure 42: S530 system cabinet rear view



Power distribution unit connections and power distribution basics

The 42000-PDU consists of:

- 24 V DC output to emergency off (EMO) circuits and cabinet fans with power
- 24 V DC output through banana jacks
- Two specially switched power outlets (factory configuration: Always on)
- Three groups of four switched outlets (off only with EMO condition)
- Control through a 25-pin D-sub connector

⚠ WARNING

Properly lockout and tagout the system before beginning installation or connection. Also, never turn on the system until all connections and safety grounds are installed. Make sure the main circuit breaker on the PDU is placed in the OFF position before making or breaking any connections.

The following table provides a detailed description of the available connections in the 42000-PDU. Information about the EMO circuit's connection and operation is also in the table.

42000-PDU connection descriptions

Connection	Description
Specially switched outlets	Two power outlets on the power distribution unit (PDU) rear panel.
	WARNING: Severe personal injury or death due to electric shock or electrocution may result if power is not removed before working inside the cabinet. Do not use power outlets for accessories (for example, a soldering iron or drill). Use for instruments that do not have hazardous voltages and do not need to have power removed through the EMO circuit (for example, a computer). In the factory default configuration, these outlets have dedicated power and will remain live even if power is removed through the EMO circuit.
	The specific configuration is marked on the PDU rear panel.*

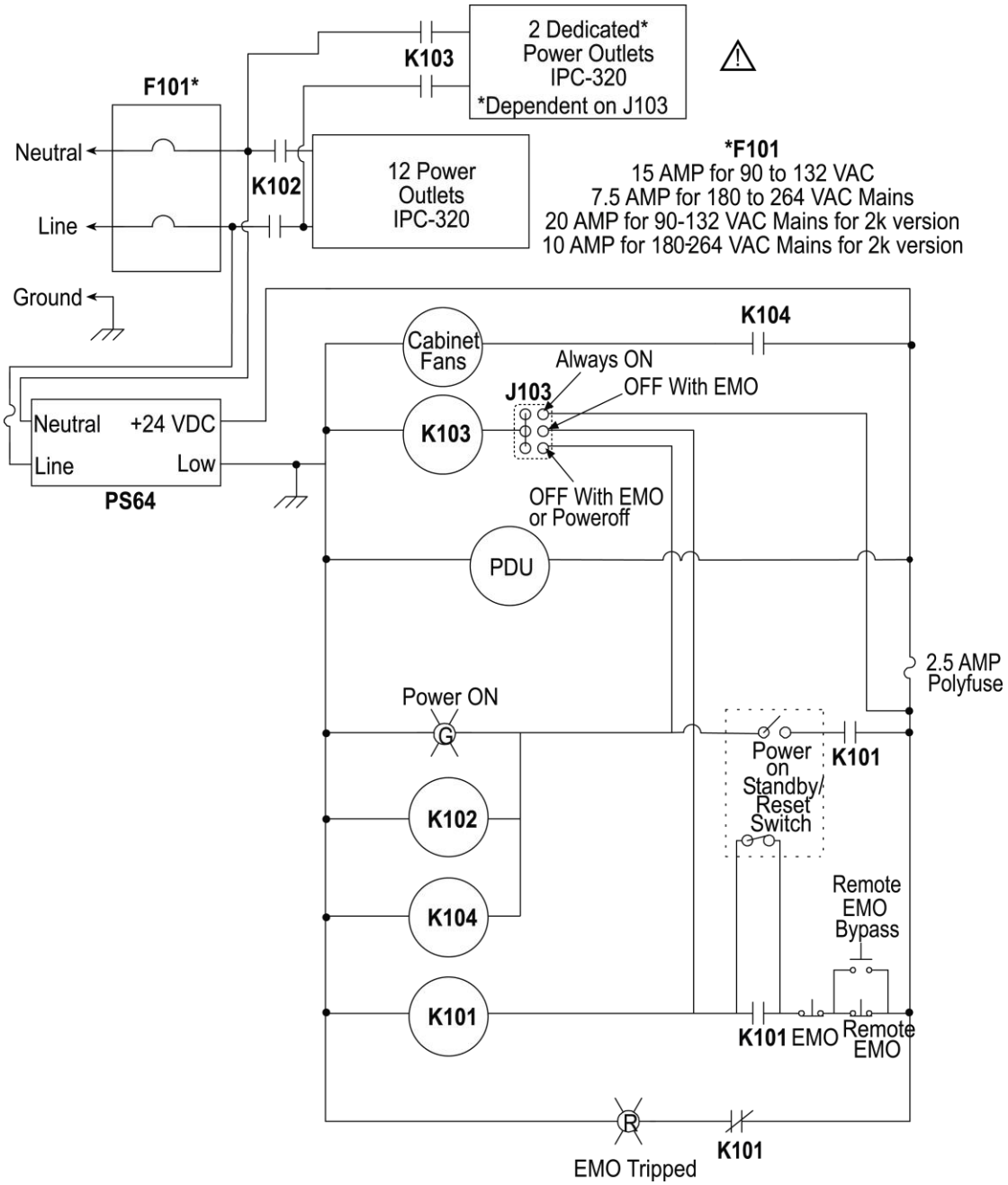
42000-PDU connection descriptions

Connection	Description
To PDU box DB-25 cable connector	Connector providing control of the PDU box. Connect the PDU box to the EMO box with the supplied DB-25 male-to-female cable.
Switched outlets	Twelve power outlets on the PDU rear panel. Do not use power outlets for accessories (for example, soldering iron, drill, and so on). Use for equipment with hazardous voltages that need to be removed with the EMO circuitry.*
Ground connection (optional)	Connect to a quality ground within your facility with 18 AWG wire.
External fan connection	Connector providing 24 V DC to cabinet fans.
External EMO/shorting plug connection	DB-25 providing connection to external EMO devices. Make sure the shorting plug is installed if the system is not configured for external EMO.
To EMO box DB-25 cable connector	Connector providing control of the PDU box. Connect EMO box to the PDU box with the supplied DB-25 male-to-female cable.
24 V DC (-) banana plug	Banana plug providing 24 V DC (-) power connection.
24 V DC (+) banana plug	Banana plug providing 24 V DC (+) power connection.
* Outlet connector description: - Class 1 applications (42000-PDU (PDU/E) (PDU/E-2K) 15 A and 42000-PDU-2K 20 A). - Type: Push-in mount mates with IEC standard 320 C20 (20 A) or the IEC standard 320 C14 (15 A) power cords.	

System emergency off circuit

The following figure shows a simplified schematic of the 42000-PDU power distribution unit (PDU) emergency off (EMO) circuit.

Figure 43: 42000-PDU simplified schematic



Data hub license

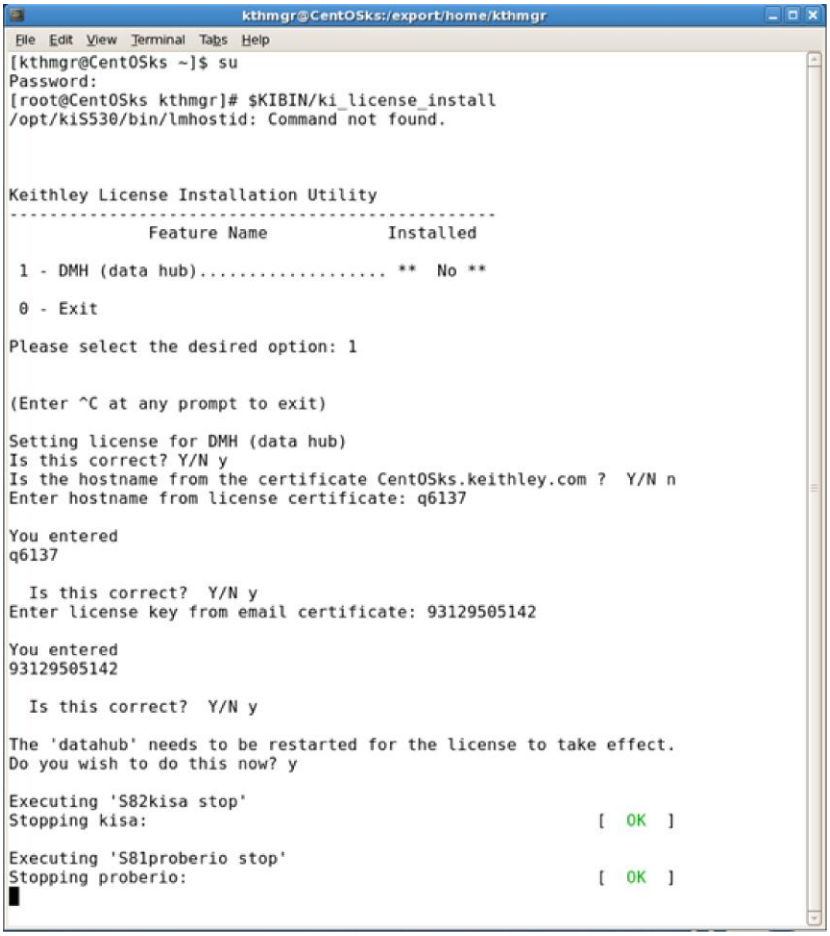
The data hub license allows the Keithley Test Environment (KTE) software to communicate with a prober. This license is installed on all systems when they are shipped.

If you upgrade or reinstall the KTE software, you may need to reinstall the data hub license.

To upgrade systems with KTE versions earlier than version 5.5.0:

1. Open a new Linux® terminal session.
2. Type `su` and press **Enter** to execute the installation as root user.
3. Enter the root password and press **Enter**.
4. Type `$KIBIN/ki_license_install` and press **Enter**. The Keithley License Installation Utility starts.

Figure 44: Keithley License Installation Utility

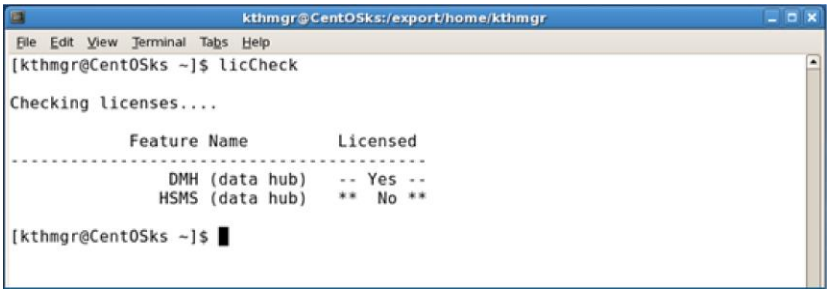


5. At the prompt, enter `1` and press **Enter** to select the DMH (datahub) option.
6. Follow the remaining prompts, and press **Enter** after each response you type.
7. Once the installation has completed, type `$KIBIN/shutdown_S530.pl` and press **Enter** to power down the S530 system.
8. Power up the entire system.
9. Log on as `kthmgr`.

To upgrade systems with KTE version 5.5.0 and later:

1. Open a new Linux® terminal session.
2. Type `licCheck` and press **Enter** to check if the datahub license is installed correctly.

Figure 45: Check datahub license installation



3. If it is not installed correctly, you will need to edit the file at `opt/kiS530/.ki_setup`.
4. Go to line 33 in the file and change it to `setenv COMPUTERNAME q1234` (where `1234` is your QMO number).
5. Go to line 61 in the file and change it to `setenv KI_QMO 1234` (where `1234` is your QMO number).
6. Reboot the computer to reinitialize the datahub.

LO patch panel

The S530 must have a single, direct connection between instrument lows and protective earth (safety ground). Keithley recommends that a high-quality, low-impedance connection between low and protective earth (safety ground) be made at the prober used with the S530. Because this is not always possible, the LO patch panel provides alternative connections. The LO patch panel provides:

- A common reference point for all the instrument low-side connections
- In 4-wire systems, a common connection for the sense low terminals of the source-measure units (SMUs)
- Connections from low to sense low using a 100 kΩ resistor to enable autosensing
- Different ways to tie low to protective earth (safety ground)

NOTE

The LO patch panel is configured by the Keithley Field Service Engineer (FSE).

Decommissioning an S530 test system

The S530 Parametric Test System does not contain any intentionally released substances, but may contain substances that are potentially hazardous to the environment if not properly recycled.

For example, systems produced before July 22, 2017 and shipped into the European Union may contain lead (Pb) as a part of the solder to connect electronic components and system interconnects. A list of possible hazardous substances is in European Union Directive “Restricting the use of hazardous substances in electrical and electronic equipment” (RoHS) Directive 2011/65/EU or later. This list includes:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent chromium (Cr6+)
- Polybrominated biphenyls (PBB)
- Polybrominated diphenyl ether (PBDE)
- Bis (2-ethylhexyl) phthalate (DEHP)
- Butyl benzyl phthalate (BBP)
- Dibutyl phthalate (DBP)
- Diisobutyl phthalate (DIBP)

For more detailed information, see the European Union Directive.

To minimize environmental impact at system end of life, treat the system, cables and connections, and all subassemblies as waste electrical and electronic equipment (WEEE) category 9. Reference the European Union Directive on waste electrical and electronic equipment (WEEE Directive 2012/19/EU or later).

Follow these directives to minimize environmental impact at any location in the world. Always follow all local, state, and country environmental laws; these take priority over other directives.

Take all product and subassemblies to a reputable electronics recycle company for proper recycling. Several approved recyclers are identified on the Tektronix website at www.tek.com (www.tek.com).

Any cleaning solutions used during the life of the system (such as isopropyl alcohol (IPA)) should be disposed of separately and properly.

The S530 system may be used with other equipment such as automatic probers and third-party probe card adapters. Tektronix is not in control of these products and the original equipment manufacturer should always be contacted for proper recycling procedures.

Section 5

Instrument specifications and documentation

In this section:

Introduction

This section contains an overview of the instruments used in S530 parametric test systems and examples of typical connection schemes.

For more specific information about instruments used in the S530 Parametric Test System, refer to the documentation for each specific Keithley Instruments model:

- 4200-SCS Semiconductor Characterization System
- 4210-PGU Pulse Card
- 4220-PGU Pulse Card
- 4200-SCP2HR Dual Channel Scope Card
- 707B Semiconductor Switch Matrix
- 2410 High-Voltage SourceMeter® Instrument
- Series 2600B System SourceMeter® Instrument
- DMM7510 7-1/2 Digit Graphical Sampling Multimeter

Also, refer to the supplied documentation that is on the Keithley Instruments CD-ROM that was shipped with your purchase. You can also visit the Keithley Instruments website at www.tek.com (www.tek.com) to search for updated information by model number.

NOTE

Example wiring diagrams for the S530 test system are shown on the following pages.

Switching

The following components provide the switching capabilities of the S530.

Model 707B Switch Matrix Mainframe

The 707B Semiconductor Switch Matrix Mainframe is a programmable switch for connecting signal paths in a matrix structure. The six-slot mainframe accepts any combination of compatible plug-in matrix cards. Model 7530, Model 7072-HV, and Model 707-HVD matrix cards are used in the 707B in S530 systems.

Figure 46: 707B Semiconductor Switch Matrix Mainframe

Model 7530 High-Speed Low-Current 8 × 12 Matrix Card

Low-current systems use the 7530 8 × 12 matrix card to support up to 60-pin connections to the probe card adaptor (PCA).

Model 7072-HV High-Voltage Semiconductor Matrix Card

High-voltage systems use the 7072-HV matrix card to support up to 24-pin connections to the probe card adaptor (PCA).

NOTE

This card is not available for high-voltage systems with two 707B Semiconductor Switch Matrix Mainframes. This system configuration uses two 7072-HVD matrix cards.

Model 7072-HVD High-Voltage Semiconductor Matrix Card

High-voltage systems may also use 7072-HVD high-voltage matrix cards to support up to 60 pin connections to the probe card adaptor (PCA). The 7072-HVD is identical to the 7072-HV card, except for additional circuitry designed to automatically discharge energy that may be accumulated in the system cables and PCA under certain test conditions.

Sourcing and measuring

The following instruments provide S530 source-measure capabilities

Model 2636B System SourceMeter Instrument

The 2636B Dual-Channel System SourceMeter® Instrument is a 6-1/2 digit, two-channel source-measure unit (SMU) that simultaneously sources and measures voltage and current. You can have up to six 2636B SMUs in the S530 system.

Figure 47: 2636B System SourceMeter Instrument

Features include:

- Maximum current source-measure range: 10 A (pulsed)
- Maximum voltage source-measure range: 200 V
- Measurement resolution: 0.1 fA current, 100 nV voltage
- Power: 200 W

Optional instrumentation

Keithley Test Environment (KTE) version 5.7.0 supports several optional instruments:

- DMM7510 7½ Digit Graphical Sampling Multimeter
- 4220-PGU pulse card
- 4200-SCP2HR card (used for ring oscillator measurement)

The following diagrams show examples of how these instruments can be connected to the matrix.

NOTE

The cards and columns of each instrument connection shown in the following diagrams may differ from your actual system. The flexibility of the S530 configuration allows for various numbers and combinations of instruments. Attempting to show examples of every possible scenario would be prohibitive.
For high-voltage systems with two 707B switch matrices, the high-voltage connections for the second matrix (not shown) are identical to the ones in the diagrams in this manual.

You will see graphics of the following examples:

- S530 low-current using DMM7510
- S530 high-voltage system using DMM7510

NOTE

For systems purchased before September 2015, a 2010 DMM is included instead of the DMM7510. The 2010 DMM is only connected to the force side of the matrix, however, both the force and sense connections need to be configured in the `icconfig_<QMO>.ini` file.

- S530 low-current using 4220-PGU pulse generator card
- S530 high-voltage system using 4220-PGU pulse generator card
- S530 low-current using 4200-SCP2HR scope card
- S530 high-voltage system using 4220-SCP2HR scope card

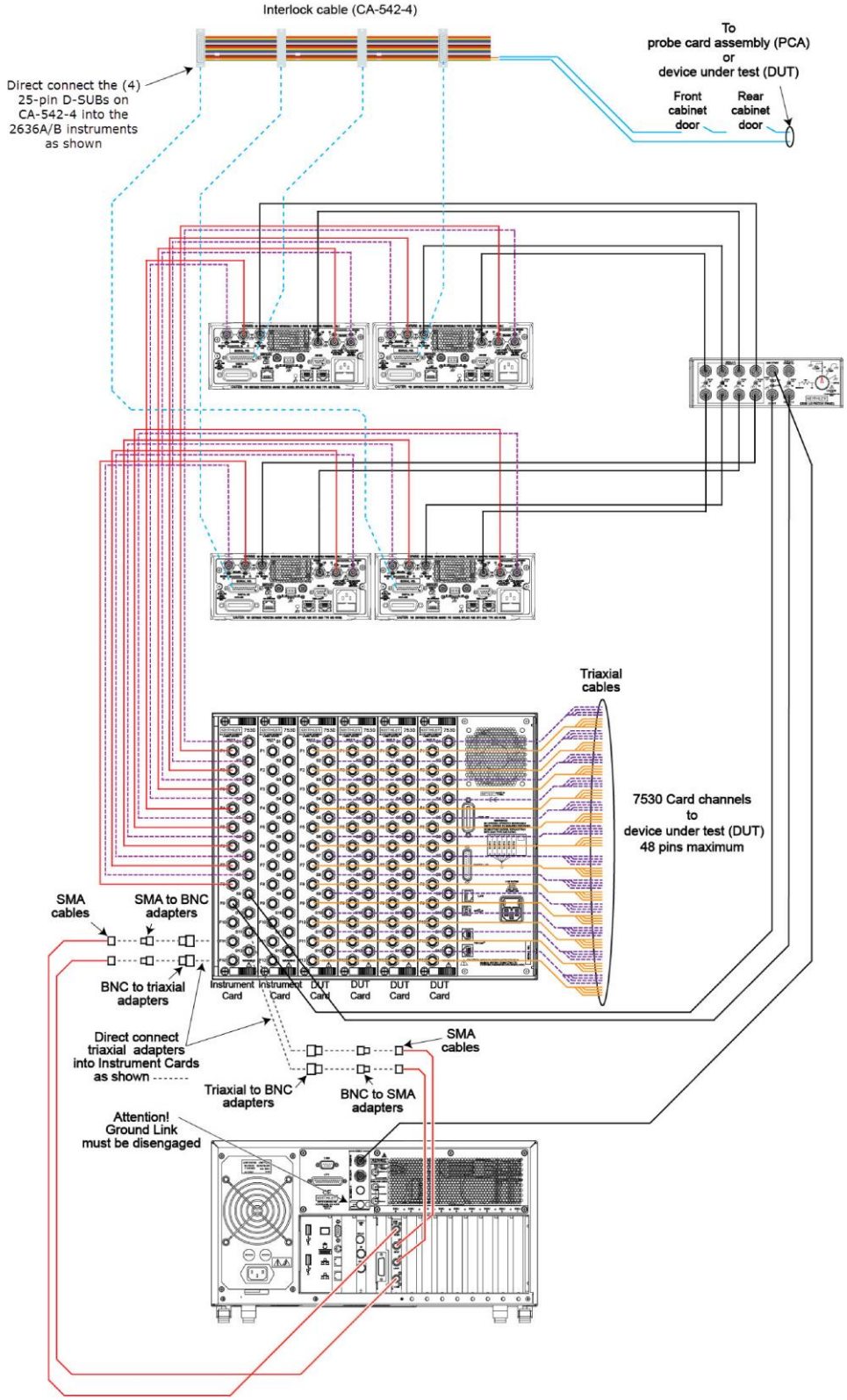
Typical matrix connections

Typical matrix connections for standard instrumentation are shown in the next figure. The first two slots in each 707B Semiconductor Switch Matrix Mainframe are used for instrument cards. The remaining four slots in each 707B can be used for pin cards. This will provide Kelvin connections for 48 instrument terminals and up to 60 pin terminals (with two 707B mainframes).

S530 standard 4-wire low-current on 7530-based system

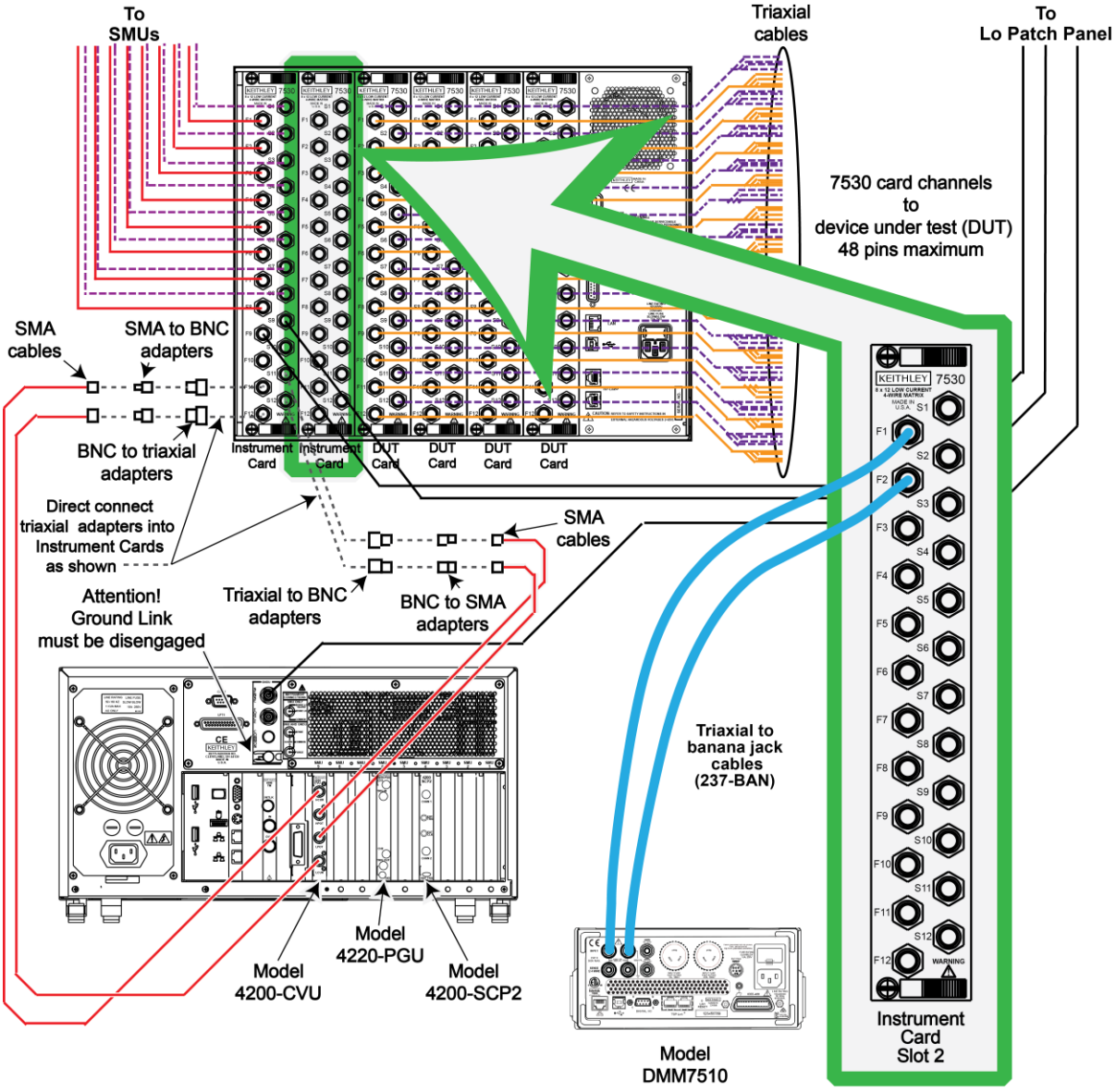
See the connection diagram on the next page.

Figure 48: S530 standard 4-wire low-current



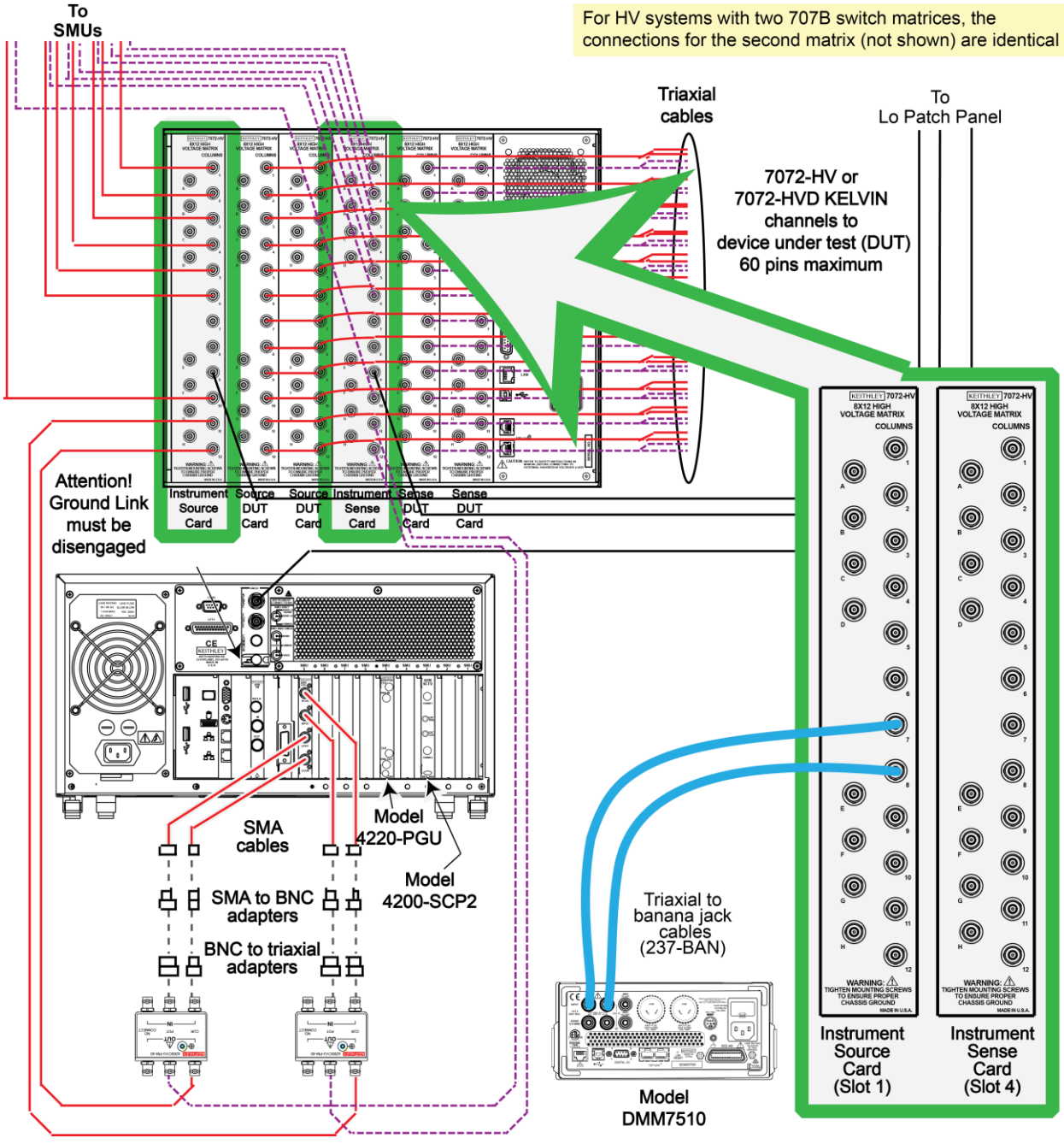
S530 low-current using DMM7510

Figure 49: S530 low-current using Model DMM7510



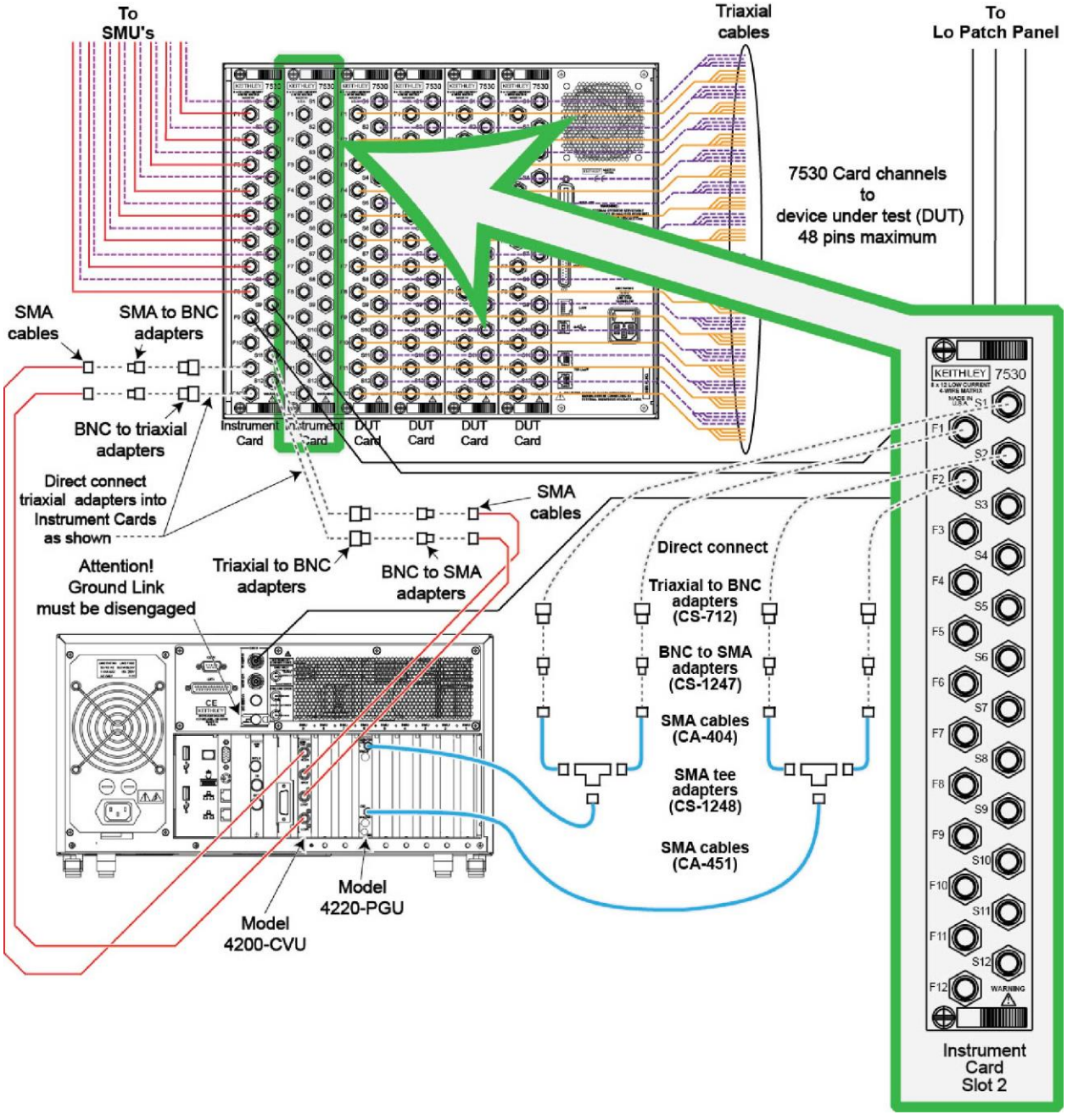
S530 high-voltage system using DMM7510

Figure 50: S530 high-voltage system using Model DMM7510



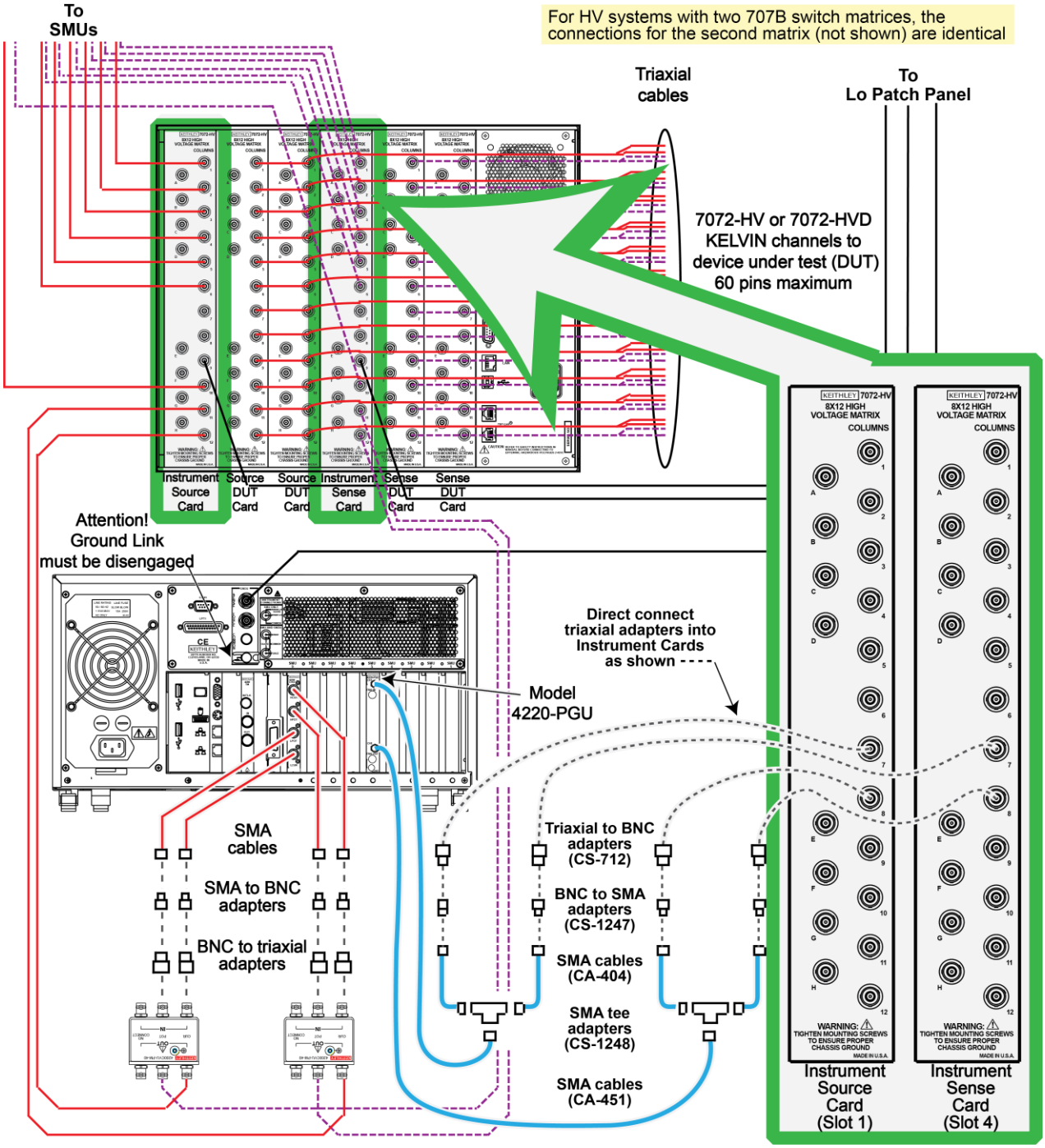
S530 low-current using 4220-PGU pulse generator card

Figure 51: S530 low-current using Model 4220-PGU pulse generator card



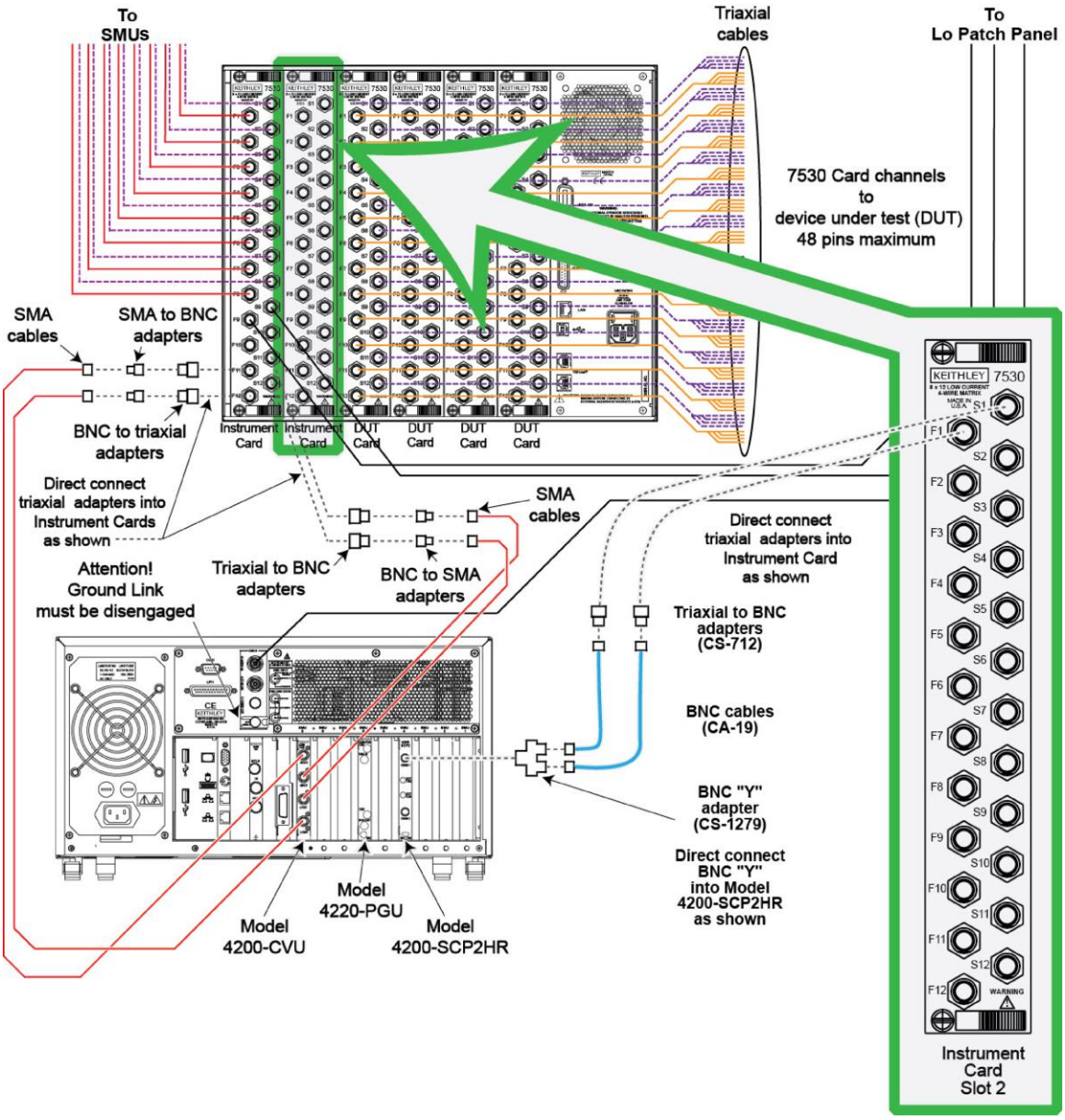
S530 high-voltage system using 4220-PGU pulse card

Figure 52: S530 high-voltage system using Model 4220-PGU pulse generator card



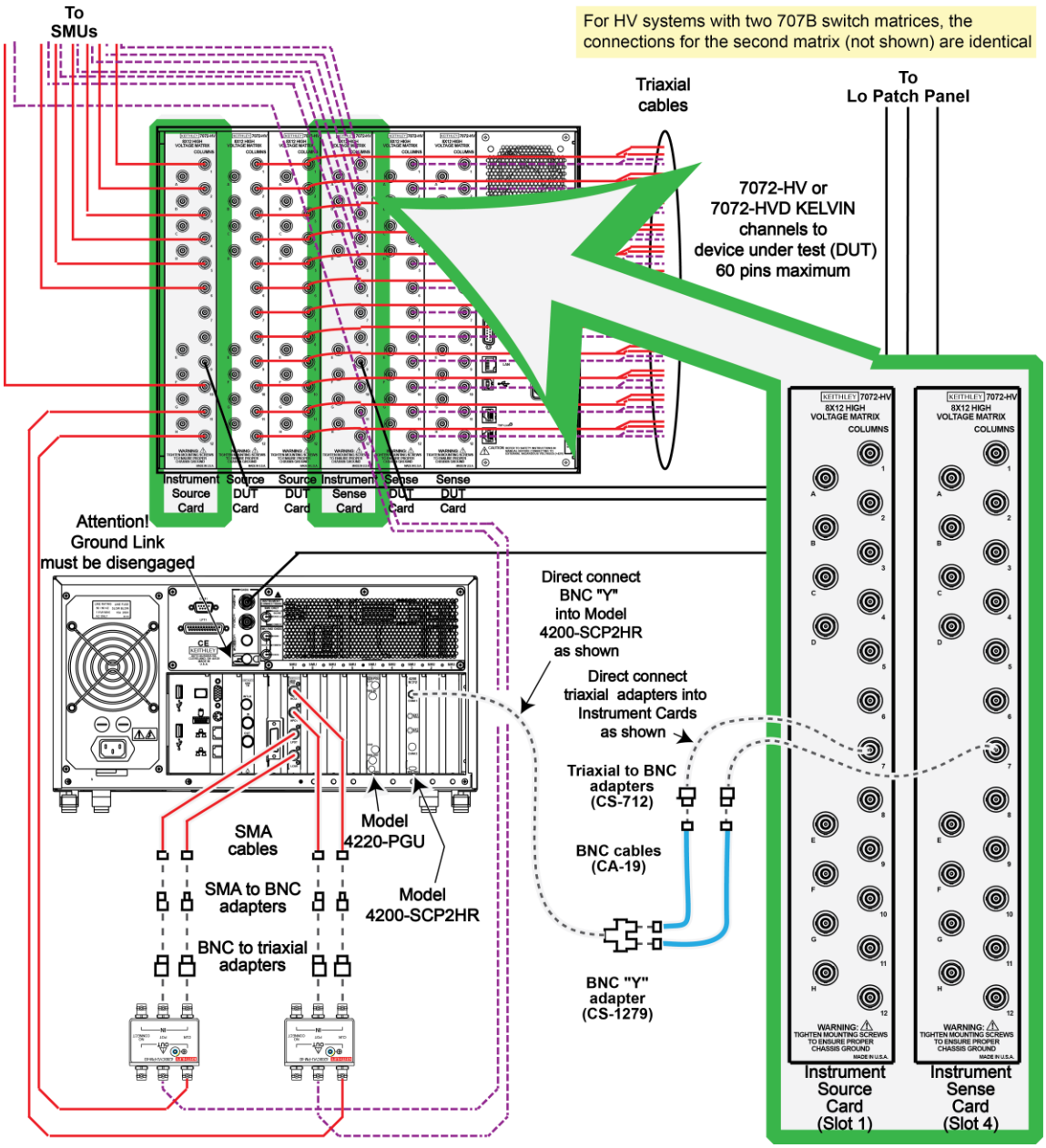
S530 low-current using 4200-SCP2HR scope card

Figure 53: S530 low-current using Model 4200-SCP2HR scope card



S530 high-voltage system using 4200-SCP2HR scope card

Figure 54: S530 high-voltage system using Model 4200-SCP2HR scope card



S530 KTE communications diagrams

The S530 KTE System uses both ethernet and GPIB to communicate with and control the instruments. The diagrams shown in the following figure show how the instruments are connected to each other and what type of communications are used.

NOTE

The following figure shows three and four 2636A/B source-measure units. However, the system only requires one 2636A/B (you can have up to four).

Figure 55: S530 KTE communications diagrams 1 and 2

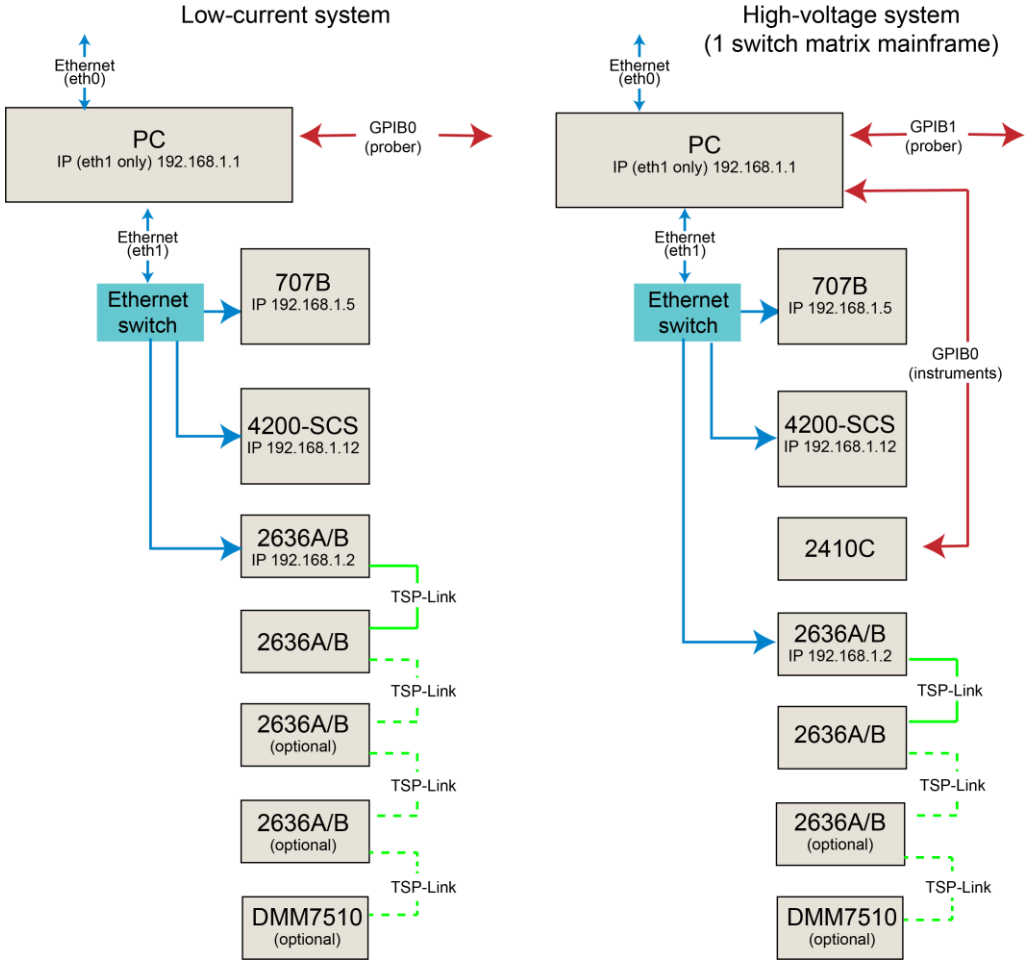
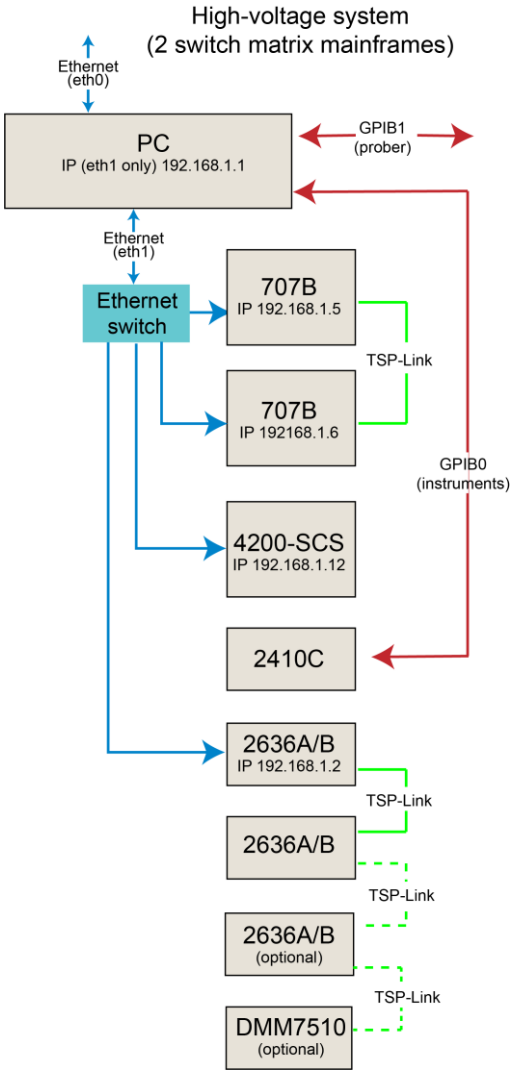


Figure 56: S530 KTE communications diagram 3

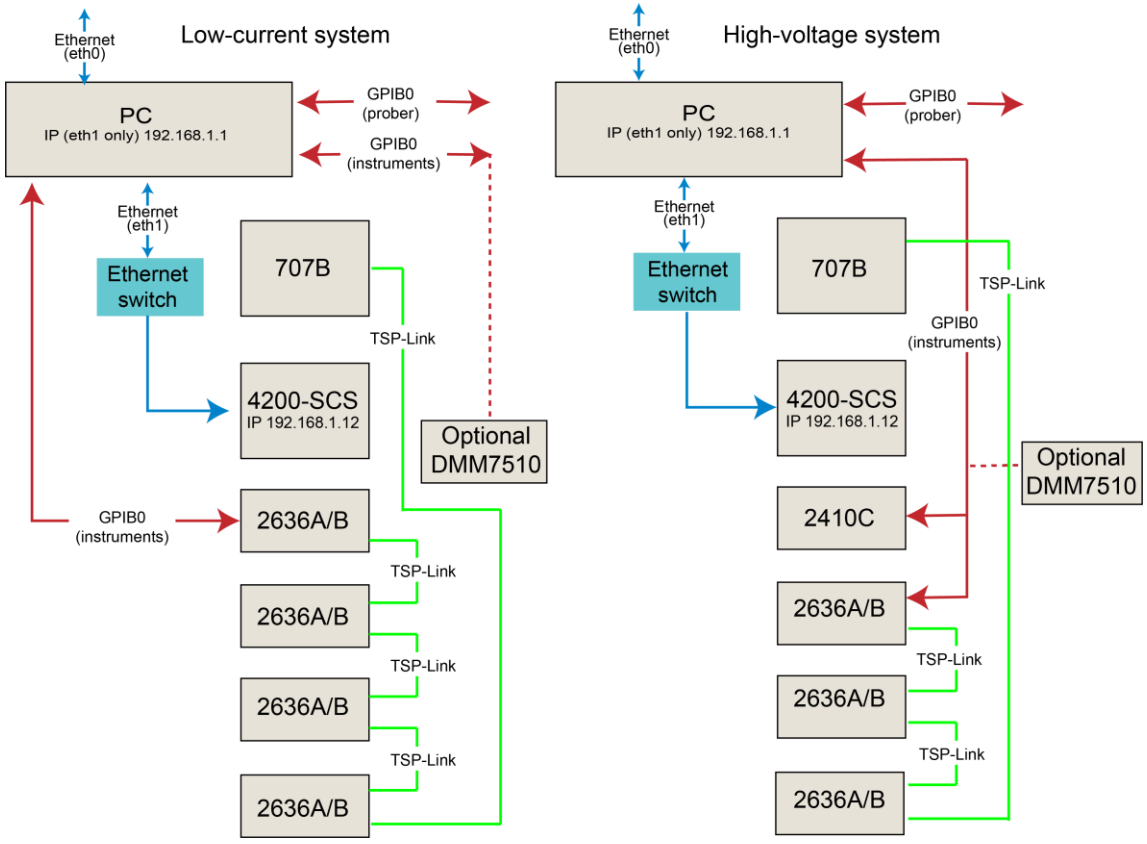


S530 ACS communications diagrams

NOTE

The following figure shows three and four 2636A/B source-measure units. However, the system only requires one 2636A/B (you can have up to four).

Figure 57: S530 ACS communications diagrams



Keithley Instruments
Corporate Headquarters • 28775 Aurora Road • Cleveland, Ohio 44139 • 440-248-0400 • Fax: 440-248-6168 • 1-800-935-5595 • www.tek.com/keithley

KEITHLEY
A Tektronix Company