

Models 707B and 708B

Quick Start Guide



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 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 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.


If a  screw is present, connect it to protective earth (safety ground) using the wire recommended in the user documentation.

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 hazards 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. 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 to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call a Keithley office for information.

Unless otherwise noted in product-specific literature, Keithley 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.

Safety

Power and environmental specifications

For indoor use only.

Power supply	100 V _{RMS} to 240 V _{RMS} , 50 Hz to 60 Hz (autosensing)
Maximum VA	707B: 210 VA maximum 708B: 110 VA maximum
Operating altitude	Maximum 2000 m (6562 ft) above sea level
Operating temperature	0 °C to 50 °C, 80% relative humidity up to 35 °C Derate 3% relative humidity/°C, 35 °C to 50 °C
Storage temperature	-25 °C to +65 °C
Pollution category	2

Introduction

The Models 707B and 708B provide outstanding low-current matrix capability and let you control up to 576 matrix crosspoints in real time. Their large matrix format makes them well-suited for large ATE system applications, such as semiconductor device characterization, wafer-level reliability, parallel test, and modeling.

The 707B and 708B documentation includes:

- **Quick Start Guide (this document):** Shows you how to unpack and set up the instrument to determine that the instrument is functional.
- **User's Manual:** Provides an instrument overview and example-based training to familiarize you with the instrument.
- **Reference Manual:** Provides comprehensive information about the instrument, including descriptions of all features and programming commands.

Complete documentation for the 707B and 708B instruments is available for download on the Keithley web page at tek.com/keithley.

Software is also available for download from the Keithley web page at tek.com/keithley. You can search for the specific software you need. Available software includes:

- **Test Script Builder:** Simplifies building test scripts for instruments enabled for Keithley's Test Script Processor (TSP®).
- **IVI-COM Driver:** Works in any development environment that supports COM programming, including Microsoft® Visual Basic, Microsoft Visual C++, and National Instruments LabVIEW™.
- **Keithley I/O layer:** Manages communications between Keithley instrument drivers and software applications and the instrument. Unpack and inspect the instrument

To unpack and inspect the instrument:

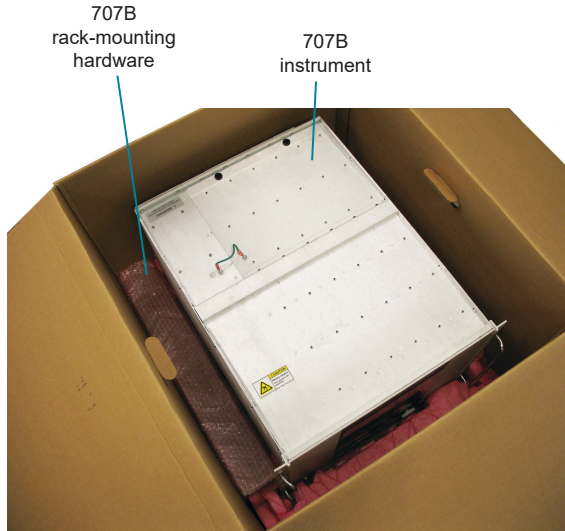
1. Inspect the box for damage.
2. Open the top of the box.
3. Model 707B only: Remove the bag that contains the documentation and accessories.
4. Remove the packaging insert.

⚠ WARNING

With cards installed, the 707B weighs more than 23 kg (51 lb) and requires a two-person lift.



5. Model 707B only: Remove the fixed rack mounting hardware from the box. The parts are next to the instrument in separate packaging.
6. Carefully lift the instrument out of the box.



7. Inspect the instrument for any obvious signs of physical damage. Report any damage to the shipping agent immediately.

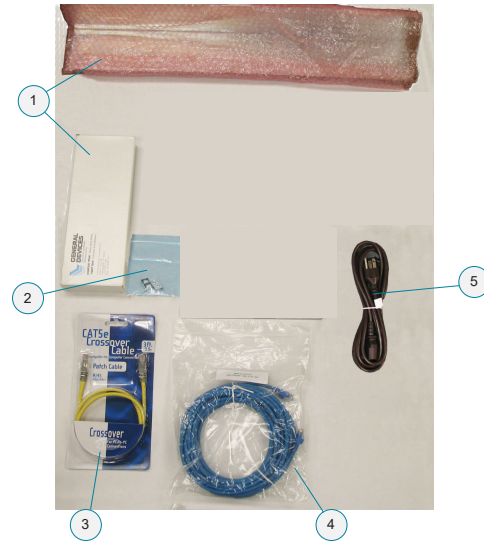


Unpack

You should have received the Model 707B or 708B Switching Matrix with the following accessories:

1. Model 707B only: Fixed rack mounting hardware.
2. Rack-mount hardware (707B and 708B).
3. Ethernet cable.
4. TSP-Link® cable.
5. Power-line cord.
6. Safety Precautions (not shown).
7. *Model 707B and 708B Quick Start Guide* (not shown; this document).

Refer to the packing list for additional items that might have shipped with your instrument.



Connect the instrument

Important test system safety information

This product is sold as a stand-alone instrument that may become part of a system that could contain hazardous voltages and energy sources. It is the responsibility of the test system designer, integrator, installer, maintenance personnel, and service personnel to make sure the system is safe during use and is operating properly.

You must also realize that in many test systems a single fault, such as a software error, may output hazardous signal levels even when the system indicates that there is no hazard present.

It is important that you consider the following factors in your system design and use:

- The international safety standard IEC 61010-1 defines voltages as hazardous if they exceed $30 V_{RMS}$ and $42.4 V_{PEAK}$, or 60 VDC for equipment rated for dry locations. Keithley Instruments products are only rated for dry locations.
- Read and comply with the specifications of all instruments in the system. The overall allowed signal levels may be constrained by the lowest rated instrument in the system. For example, if you are using a 500 V power supply with a 300 VDC rated switch, the maximum allowed voltage in the system is 300 VDC.
- Cover the device under test (DUT) to protect the operator from flying debris in the event of a system or DUT failure.
- Make sure any test fixture connected to the system protects the operator from contact with hazardous voltages, hot surfaces, or sharp objects. This may be accomplished by using shields, barriers, insulation, safety interlocks, and so on.
- Double insulate all electrical connections that an operator can touch. Double insulation ensures the operator is still protected even if one insulation layer fails. Refer to IEC 61010-1 for specific requirements.
- Make sure all connections are behind a locked cabinet door or other barrier. This protects the system operator from accidentally removing a connection by hand and exposing hazardous voltages.
- Use high-reliability fail-safe interlock switches to disconnect power sources when a test fixture cover is opened.

- Where possible, use automatic handlers so that operators are not required to access the DUT or other potentially hazardous areas.
- Provide training to all users of the system so that they understand all potential hazards and know how to protect themselves from injury.
- In many systems, during power up, the outputs may be in an unknown state until they are properly initialized. Make sure the design can tolerate this situation without causing operator injury or hardware damage.

Always read and follow all safety warnings provided with the specific instruments to keep system users safe.

Install and connect a switching card

Users can install a switching card. However, external connections to the switching module must be performed by qualified service personnel.

Equipment needed:

- 707B or 708B Semiconductor Switching Matrix
- Switching card
- Flat-bladed screwdriver

WARNING

To prevent electric shock that could result in injury or death, never handle a switching card that has power applied to it. Before installing or removing a switching card, make sure the 707B or 708B is turned off and disconnected from line power. If the switching card is connected to a DUT, make sure power is removed from all external circuitry. Even when the instrument is powered off, hazardous voltages may be present in signal cables attached to the switch cards. Always disconnect all cables before removing or installing a switching card.

WARNING

If a card slot is unused, you must install slot covers to prevent personal contact with high voltage circuits. Failure to install slot covers could result in personal exposure to hazardous voltages, which could cause personal injury or death if contacted.

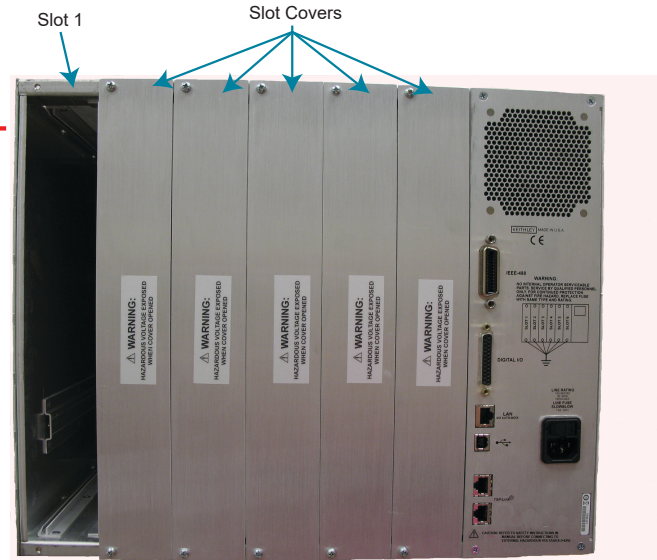
To install a switching card in the Model 707B or 708B:

1. Turn the instrument power off.
2. Position the instrument so that you are facing the rear panel.

⚠ WARNING

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, the Model 707B and 708B switch cards are Installation Category I and must not be connected to mains.

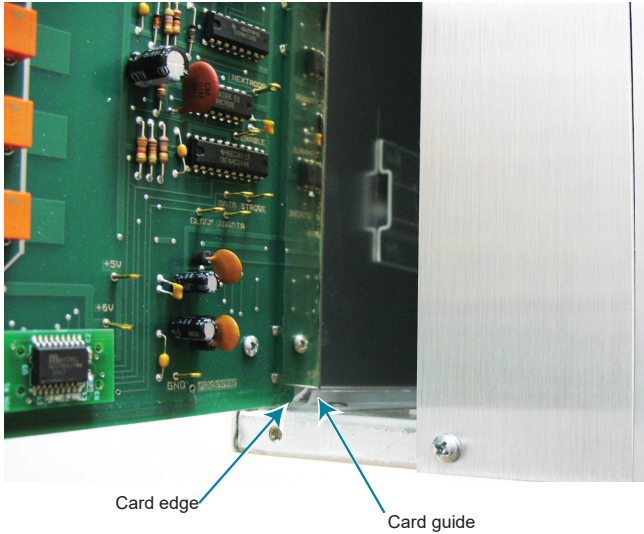
3. Disconnect the power line cord and any other cables connected to the rear panel.
4. Remove the slot cover plate from the mainframe slot (note that Slot 1 does not have a cover plate). Retain the plate and screws for future use.



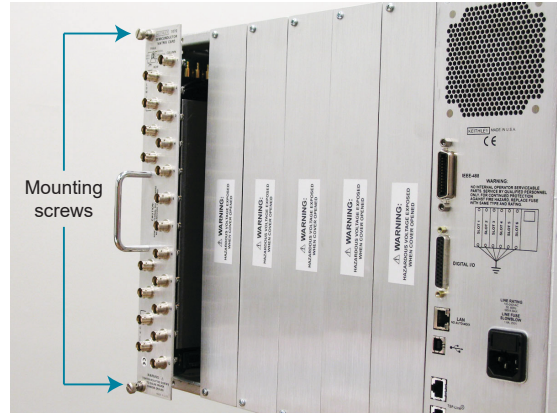
707B rear panel

5. Align the card edge into the card guide of the slot.

707B rear panel slot 1



6. Slide in the card. For approximately the last ¼ inch, press in firmly to mate the card connector to the 707B or 708B connector.
7. On each side of the module, there is a mounting screw. Use the flat-bladed screwdriver to tighten these two screws to secure the module to the mainframe. Do not overtighten.



707B rear panel

All signal wiring to devices and instruments is done through the switch cards. Refer to the switch card documentation for additional information.

Install the instrument

The 707B and 708B are designed for rack mounting. Please see the instructions that came with the rack mount for installation details.

For the 707B, the air intakes for the fan are on the rear panel above the IEEE-488 connector and on the side panel. The space around these areas should be free from obstruction to ensure proper fan operation.

Connect line power

The 707B and 708B operate from a line voltage of 100 V to 240 V at a frequency of 50 Hz or 60 Hz. Line voltage is automatically sensed (there are no switches to set). Make sure the operating voltage in your area is compatible.

CAUTION

Operating the instrument on an incorrect line voltage may cause damage to the instrument, possibly voiding the warranty.

WARNING

The power cord supplied with the 707B or 708B contains a separate protective earth (safety ground) wire for use with grounded outlets. When proper connections are made, the instrument chassis is connected to power-line ground through the ground wire in the power cord. In the event of a failure, not using a properly grounded protective earth and grounded outlet may result in personal injury or death due to electric shock.

Do not replace detachable mains supply cords with inadequately rated cords. Failure to use properly rated cords may result in personal injury or death due to electric shock.

To connect line power:

1. Make sure that the front-panel power switch is in the off (O) position.
2. Connect the socket of the supplied power cord to the power connection (AC receptacle) on the rear panel.



3. Connect the plug of the power cord to a grounded AC outlet.

Turn on the instrument

Turn on the instrument by pressing the front panel POWER switch to the on (I) position.



POWER Switch
ON position

Power-up sequence

When the instrument is turned on, you should see:

- Three dots
- All segments of the displays light
- All LED indicators light
- A brief display showing “KEITHLEY Model 707B” or “KEITHLEY Model 708B”

The entire power-up process takes approximately five seconds to complete. When initialization is complete, the display shows “1A+01” in the center of the display.

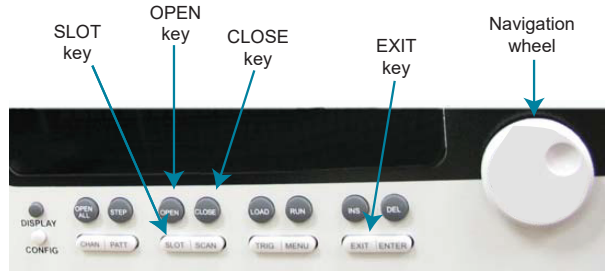
To turn power off, press **POWER** a second time.

After the instrument is powered up, all relays are open.

Test the instrument

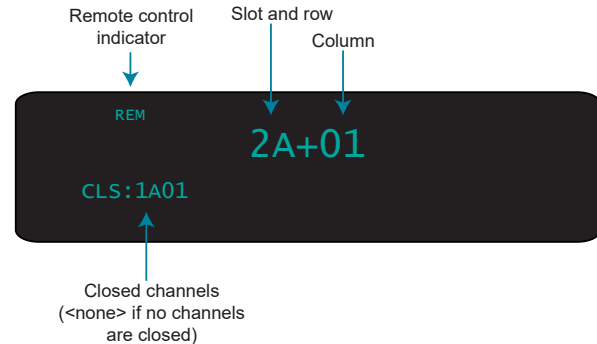
To test the instrument for basic operation:

1. On the front cover of the instrument, press the **SLOT** key. You should see the word "MAIN:" and the model number, description, and the firmware revision for the instrument.



2. Turn the navigation wheel to display the firmware version information for the installed switching cards.
3. Press the EXIT key to return to the operating display.

4. To close a channel, push the navigation wheel to edit the slot and row, then turn the wheel to change the value. Push the navigation wheel to accept the displayed slot and row; this also activates edit mode for the column. Rotate the navigation wheel to change the column value and push the navigation wheel to accept the channel shown on the display.
5. Press **CLOSE** to close the channel. The closure should be indicated on the display.



6. To open the channel, press **OPEN**.

These steps confirm basic functionality of your system.
Please turn your system off now.

The examples in the *Models 707B and 708B User's Manual* demonstrate increasing levels of functionality of your 707B or 708B. We recommend that first-time users complete the appropriate examples from the *User's Manual*.

Test

FAQs

What should I do if I see an error message when I turn the instrument on?

If an error message is displayed, press a front-panel key. The 707B or 708B attempts normal operation.

Where can I find updated drivers?

For the latest drivers and additional support information, see the Keithley Instruments support website.

To see which drivers are available for your instrument:

1. Go to tek.com/keithley.
2. Select **SUPPORT**.
3. Select **Find Software, Manuals, FAQs by Model**.

Next steps

Refer to the Keithley Instruments website, [tek.com/keithley](https://www.tek.com/keithley), for support and additional information about the instrument, including the following documents:

- The *Models 707B and 708B User's Manual* for general information about the instrument and application examples that will help familiarize you with the instrument.
- The *Model 707B and 708B Reference Manual* for detailed information about all features of the instrument

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