

# Series 3700 System Switch/Multimeter

## Quick Start Guide

3700S-903-01 Rev. A / August 2007

# WARRANTY

Keithley Instruments, Inc. warrants this product to be free from defects in material and workmanship for a period of one (1) year from date of shipment.

Keithley Instruments, Inc. warrants the following items for 90 days from the date of shipment: probes, cables, software, rechargeable batteries, diskettes, and documentation.

During the warranty period, Keithley Instruments will, at its option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local Keithley Instruments representative, or contact Keithley Instruments headquarters in Cleveland, Ohio. You will be given prompt assistance and return instructions. Send the product, transportation prepaid, to the indicated service facility. Repairs will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

## LIMITATION OF WARRANTY

This warranty does not apply to defects resulting from product modification without Keithley Instruments' express written consent, or misuse of any product or part. This warranty also does not apply to fuses, software, non-rechargeable batteries, damage from battery leakage, or problems arising from normal wear or failure to follow instructions.

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A G R E A T E R M E A S U R E O F C O N F I D E N C E

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Series 3700

System Switch/Multimeter

Quick Start Guide

## Manual Print History

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The print history shown below lists the printing dates of all Revisions and Addenda created for this manual. The Revision Level letter increases alphabetically as the manual undergoes subsequent updates. Addenda, which are released between Revisions, contain important change information that the user should incorporate immediately into the manual. Addenda are numbered sequentially. When a new Revision is created, all Addenda associated with the previous Revision of the manual are incorporated into the new Revision of the manual. Each new Revision includes a revised copy of this print history page.

Document Number: 3700S-903-01 Rev. A .....August 2007

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 non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified 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 rated Measurement Category I and Measurement Category II, as described in the International Electrotechnical Commission (IEC) Standard IEC 60664. Most measurement, control, and data I/O signals are Measurement Category I and must not be directly connected to mains voltage or to voltage sources with high transient over-voltages. Measurement Category II connections require protection for high transient over-voltages often associated with local AC mains connections. Assume all measurement, control, and data I/O connections are for connection to Category I sources unless otherwise marked or described in the user documentation.

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 30V RMS, 42.4V peak, or 60VDC 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 1000V, 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.


The instrument and accessories must be used in accordance with its specifications and operating instructions, or the safety of the equipment may be impaired.


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


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 safety earth 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 safety earth ground using the wire recommended in the user documentation.

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

The  symbol on an instrument shows that it can source or measure 1000V or more, including the combined effect of normal and common mode voltages. 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.

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. 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.

To clean an instrument, use a damp cloth 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.

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# Introduction

If you have any questions after reviewing this information, please contact your local Keithley Instruments representative or call one of our Applications Engineers at 1-888-KEITHLEY (1-888-534-8453). You can also contact us through our website at [www.keithley.com](http://www.keithley.com).

### In this section:

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Overview .....	1-1
Warranty information.....	1-3
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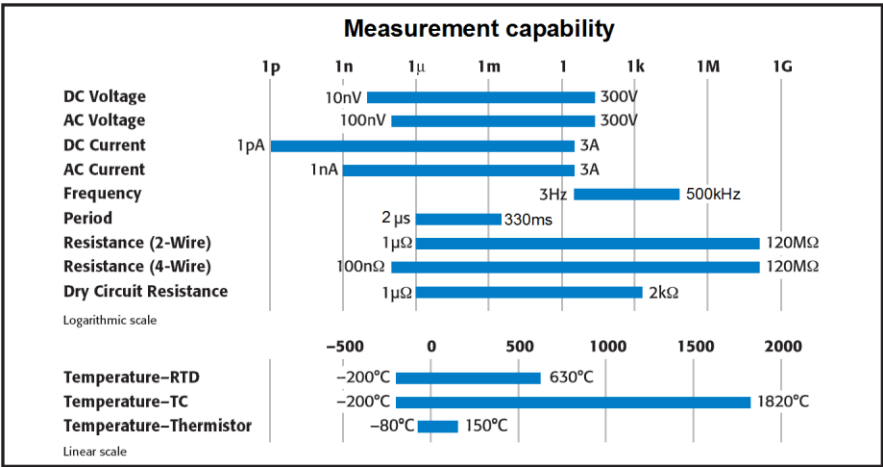
## Overview

The Series 3700 instruments offer scalable, instrument grade switching and multi-channel measurement solutions that are optimized for automated testing of electronic products and components. The Series 3700 includes four versions of the Model 3706 system switch mainframe along with a growing family of plug-in switch and control cards. When the Model 3706 mainframe is ordered with the high performance multimeter, you receive a tightly integrated switch and measurement system that can meet the demanding application requirements in a functional test system or provide the flexibility needed in stand-alone data acquisition and measurement applications.

Measure and switching capabilities

The basic measurement capabilities of Series 3700 systems are summarized in the following figure.

Figure 1-1: DMM measurement capabilities



Introduction

This Quick Start Guide is intended to get a new user familiar with the operation of the instrument. It summarizes operation for basic measurement functions and most features of the Series 3700 instruments as well as provides answers to frequently asked questions.

**NOTE** In this guide, front panel controls are described. Your specific Series 3700 model may or may not be equipped with all front panel controls and indicators shown.

User manual content

Refer to the Series 3700 User's Manual for Series 3700 operations including a listing of applicable Instrument Control Library (ICL) commands. The User's Manual includes important additional information on topics covered in the Quick Start Guide, and full details on topics not covered in this guide.

Details on the switching modules are covered in the Section 9 of the User's Manual.

## Reference manual content

Refer to the Series 3700 Reference Manual for specific listing of advanced operation including:

- Range
- Digits
- Rate Bandwidth
- Filter
- Relative
- Math
- dB
- Buffer
- Scanning
- Calibration

Also included in the reference manual is a detailed listing of the Instrument Control Library (ICL) commands.

## Warranty information

Detailed warranty information is located at the front of this manual. Should your Series 3700 require warranty service, contact the Keithley Instruments representative or authorized repair facility in your area for further information. When returning the instrument for repair, be sure to complete the service form at the back of this manual and give it to the repair facility with all relevant information.

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**NOTE** The service form requires the serial number of the Series 3700. The serial number label is located inside the unit on the bottom panel. The serial number can be viewed by removing the slot covers and/or switching modules from the mainframe.

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**WARNING** *Before removing (or installing) switching modules, make sure you turn off the Series 3700 and disconnect the line cord. Also, remove any other external power connected to the instrument or switching module(s).*

*Failure to remove power before removing (or installing) switching modules may result in personal injury or death due to electric shock.*

## Displaying the unit's serial number

To display the serial number on the front panel:

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**NOTE** If the Series 3700 is in remote mode, press the **EXIT** key once to place the unit in local mode.


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1. When in local mode, press the **MENU** key.
2. Scroll to the SYSTEM-INFO menu and press the **ENTER** key.
3. On the SYSTEM INFORMATION menu, scroll to the SERIAL# and press the **ENTER** key. The Series 3700 serial number will be displayed.

## Safety symbols and terms

The following symbols and terms may be found on the System Switch/Multimeter or used in this manual:

The  symbol indicates that the user should refer to the operating instructions located in the manual.

The  symbol shows that high voltage may be present on the terminal(s). 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 **WARNING** heading used in this manual 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 used in this manual explains hazards that could damage the unit. Such damage may invalidate the warranty.

## Using the Front Panel

### In this section:

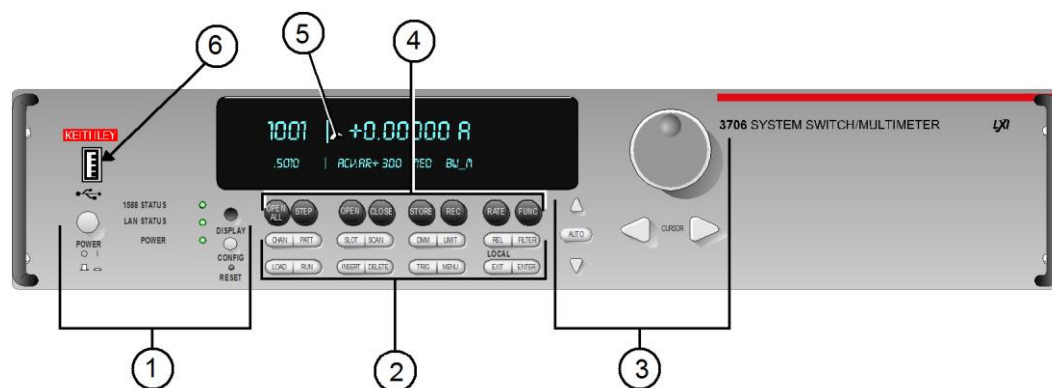
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## Front panel introduction

Typical Series 3700 front panels are shown below.

**NOTE** Not all models will have a DMM installed. All DMM related documentation is not applicable to those models.

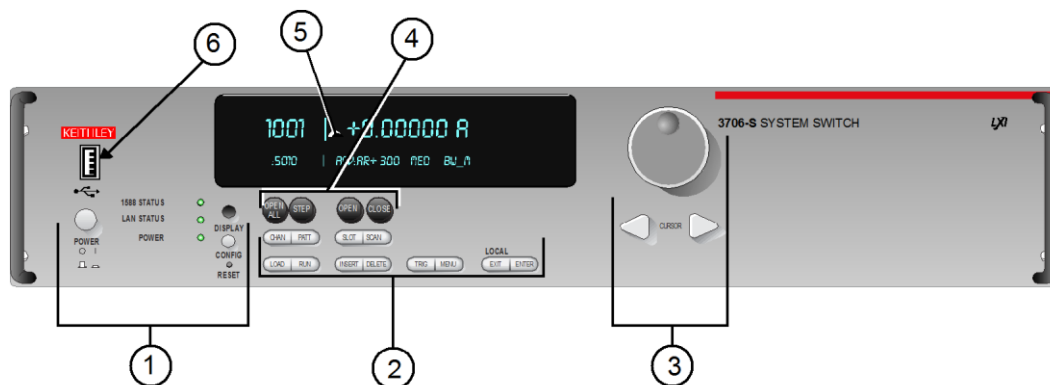
**Figure 2-1: Model 3706 System Switch/Multimeter**



Item	Description
1	<a href="#">Special keys and power switch (quick start guide)</a> (see "Special keys and power switch" on page 2-6)
2	<a href="#">Operation keys (quick start guide)</a> (see "Operation keys" on page 2-7)
3	<a href="#">Range, multifunction keys, and wheel (quick start guide)</a> (see "Range, multifunction keys, and wheel" on page 2-8)
4	<a href="#">Function keys (quick start guide)</a> (see "Function keys" on page 2-8)
5	<a href="#">Display</a> (on page 2-3)
6	<a href="#">USB connector</a> (see "USB connectors" on page 3-4)



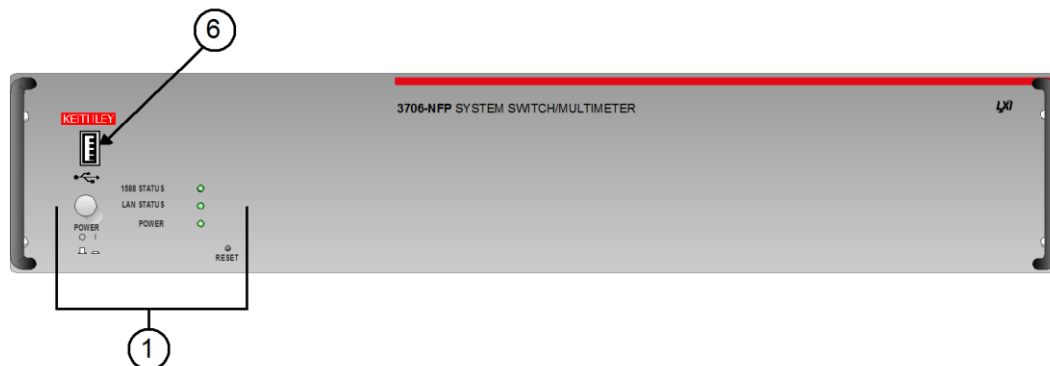
Figure 2-2: Model 3706-S System Switch (no DMM)



**NOTE** If your model does not have a front panel, please refer to the reference manual for information on how to change:

1. GPIB address with `gpib.address` command.
2. LAN configuration using LAN functions. To see current settings for LAN, see the applicable `lan.status.*` commands (for example, to see the present IP address of the Series 3700, send the following command: `lan.status.ipaddress`).

Figure 2-3: Model 3706-NFP System Switch/Multimeter



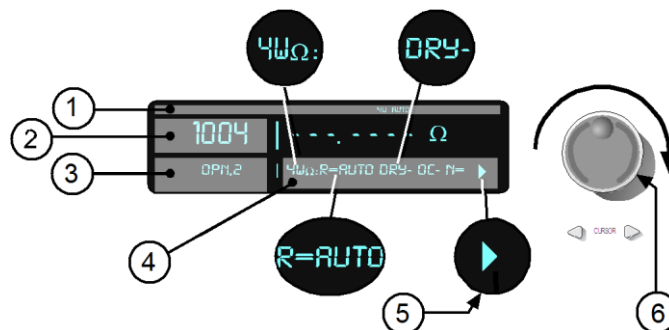
**Figure 2-4: Model 3706-SNFP System Switch (no DMM)**

## Display

The Series 3700 display provides visual information on the present active channel. The display, with the wheel, provides a means to change the active channel or channel ranges, as well as access to view and edit the various menus and menu items.

See the following figure for an active channel example. The display has the  $4W\Omega$  and AUTO range annunciators lit (1). Also, the active channel is 1004 (Slot 1 Channel 004). The present state of the channel is open, and it has two poles (3). The present state of the attributes for this channel (4) are:  $4W\Omega$  function set for AUTO range, dry-circuit ohms disabled (DRY-), offset compensation off (OC-). Other attributes, such as NPLC, are available for this specific active channel (1004) as indicated by arrow (5) being lit. These may be viewed by turning the wheel (6) to scroll through the attribute list.

**NOTE** Attribute lists, as well as menu lists, that are larger than the display, can be accessed by turning the wheel (6). Displayed arrows (5) indicate additional attributes (or menu items, as applicable) are available for access by turning the wheel (6) in the direction the arrow points. If an arrow (5) is not displayed, there are no additional menu choices in that direction.

**Figure 2-5: Active channel display example**

The top line of the display (1) contains the following annunciators:

Annunciator	Description
* (asterisk)	Front panel readings are being stored in the selected reading buffer.
4W	4-wire resistance or RTD temperature reading displayed.
ARM	Unit armed and ready to use.
AUTO	Auto range enabled for the selected DMM function.
EDIT	Unit in edit mode (for front panel).
FILT	Filter enabled for the selected DMM function.
LSTN	Instrument addressed to listen over GPIB.
MATH	mX+b, percent, or reciprocal (1/X) calculation enabled for the selected DMM function.
REL	Relative enabled for selected DMM function.
REM	Instrument in bus remote mode or web control mode (all interfaces, LAN, GPIB, or USB).
SMPL	Flashes whenever the DMM has completed a reading.
SRQ	Service request over GPIB.
TALK	Instrument addressed to talk over GPIB bus.
TRIG	External triggering selected. The TRIG annunciator will blink if taking continuous triggered readings on front panel.

The bottom line of the display (4) contains the attribute symbols. The symbols that appear are dependent on whether the attribute exists for the selected function. If the symbol has also contains a value, the third column in the table indicates the value definition. The following table indicates the DMM attribute symbols that may appear on the front panel.

Front pnel DMM attribute	Symbol	Values
range	R=	AUTO or n, here n equals the range
nplc	N=	n, where n equals the nplc
auto delay	AD	+ for ON, 1 for ONCE, or 0 for OFF
auto zero	AZ	+ for ON or – for OFF
line sync	LS	+ for ON or – for OFF
limit	LIM	+ for a limit enabled or – for limits disabled
detector bandwidth	DBW	3, 30, or 300
threshold	THR=	n, where n indicates the threshold
aperture	A=	n, where n indicates the aperture setting
dry circuit	DRY	+ for ON or – for OFF
offset compensation	OC	+ for ON or – for OFF
thermocouple sensor K	K_T/C	N/A
thermocouple sensor T	T_T/C	N/A

Front pnel DMM atribute	Symbol	Values
thermocouple sensor E	E_T/C	N/A
thermocouple sensor R	R_T/C	N/A
thermocouple sensor S	S_T/C	N/A
thermocouple sensor B	B_T/C	N/A
thermocouple sensor N	N_T/C	N/A
thermistor	THRM	N/A
three-wire RTD	3RTD	N/A
four-wire RTD	4RTD	N/A
simulated reference junction	RJ_SIM	N/A
internal reference junction	RJ_INT	N/A
external reference junction	RJ_EXT	N/A

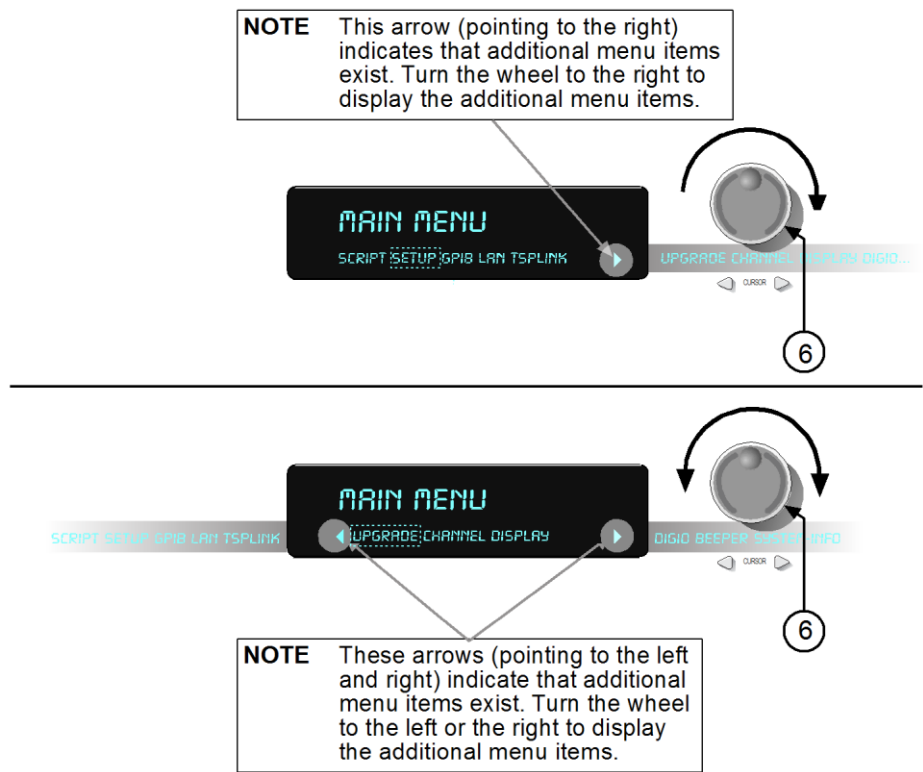
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**NOTE** To access the main menu, press the **MENU** key.

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See the following figure for a menu example. In the example, the MAIN MENU is displayed. Turn the wheel (6) or press the cursor keys, to scroll through the available menu items. In the following figure's first display, there is a right arrow indicator. This indicates there are additional menu items to the right. In figure's second display, both right and left arrows are active indicating there are additional items in both directions. To select the highlighted (flashing) menu item, press the wheel (or press the **ENTER** key).

Figure 2-6: MAIN MENU display



Front panel keys

Special keys and power switch

<b>POWER switch:</b>	Press this switch to turn the Series 3700 on (I); press it again to turn it off (O).
<b>DISPLAY key:</b>	Press this key to toggles between main and user display modes.
<b>CONFIG key:</b>	Use this key to access the an attribute menu that enables you to configure channels, channel patterns, DMM functions, or settings, reading buffer, scans, and other operations. Refer to the user's manual for additional information the <b>CONFIG</b> key.
<b>RESET switch:</b>	Use this switch to restore the Series 3700 factory default LAN settings. Refer to the reference manual LAN functions (lan.config.x, where x represents the specific command) for factory default information.

## Operation keys

<b>CHAN key:</b>	Pressing this key opens the CHANNEL ACTION MENU that contains the following menu items: OPEN, CLOSE EXCLOSE, EXSLOTCLOSE, and RESET.
<b>PATT key:</b>	Pressing this key opens the PATTERN ACTION MENU that contains the following menu items: OPEN, CLOSE, EXCLOSE, EXSLOTCLOSE, CREATE, VIEW, DELETE, and RESET.
<b>SLOT key:</b>	Press this key to display installed card(s) and instrument information, as well as main system information. The information displayed includes firmware revisions of both main and installed components. After pressing this key, scroll through all available instruments, including the internal DMM.
<b>SCAN key:</b>	If a scan list is present, this key opens the SCAN ACTION MENU that contains the following menu items: EXECUTE, CREATE, LIST, CLEAR, and RESET.
<b>DMM key:</b>	Opens the DMM ACTION MENU that contains the following menu items: MEASURE, COUNT, LOAD, SAVE, OPEN, CLOSE, RESETFUNC, RESETALL, and CONNECT.
<b>LIMIT key:</b>	Pressing this key will cycle through the four combinations of limit state settings (Limit1 and Limit2 off, Limit1 on and Limit2 off, Limit1 off and Limit2 on, Limit1 and Limit2 on).
<b>REL key:</b>	Pressing this key enables/disables relative for selected function. Causes REL annunciator to light when enabled. Also see Relative in the reference manual.
<b>FILTER key:</b>	Pressing this key enables/disables filter for selected function. When the filter is enabled, the FILT annunciator will light. Also see Filter in the reference manual.
<b>FUNC key:</b>	Pressing this key selects the active DMM function for the channel. Related ICL command: dmm.func
<b>LOAD key:</b>	Pressing this key loads user-defined scripts, along with Lua chunks added with display.loadmenu.add for execution. This key opens the LOAD TEST menu which contains the following menu items: USER and SCRIPTS.
<b>RUN key:</b>	Pressing this key runs last selected script or load menu item.
<b>INSERT key:</b>	Pressing this key appends the present channel to the scan list.
<b>DELETE key:</b>	Pressing this key deletes the present channel (including function) from the scan list. If the present channel is not contained in the scan list, no error is reported.
<b>TRIG key:</b>	Pressing this key triggers a measurement equivalent to the dmm.measure command.
<b>MENU key:</b>	Pressing this key opens the MAIN MENU that contains the following menu items: SCRIPT, SETUP, GPIB, LAN, TSPLINK, UPGRADE, CHANNEL, DISPLAY, DIGIO, BEEPER, and SYSTEM-INFO.
<b>EXIT key:</b>	Cancels the selection and moves back to the measurement display.
<b>ENTER key:</b>	Pressing this key accepts selection, moves to next choice, or back to measurement display.

## Range, multifunction keys, and wheel

<b>Range keys:</b>	<p>▲ ▼ Selects the next higher/lower measurement range for the selected function when on measurement display.</p> <p>To set the range, use the <b>RANGE</b> keys ▲ or ▼. If the Series 3700 displays the overflow message on a particular range, select a higher range until an on-range reading is displayed. Use the lowest range possible without causing an overflow to ensure best accuracy and resolution. For details see Auto ranging over the front panel in the reference manual.</p>
<b>AUTO key:</b>	Enables or disables autorange for the selected function, and causes the AUTO annunciator to light when enabled.
<b>CURSOR keys</b>	◀ CURSOR ▶ Use the CURSOR arrows in a menu to control cursor position for making selections or changing values.
<b>Wheel</b>	<p>Turn the wheel to scroll to the desired menu option or to change the value of the selected numeric parameter. Also, press the wheel to cause the same function as pressing the <b>ENTER</b> key. Also see ENTER key. Turn the wheel to scroll to the desired digit location to edit, press the wheel to enter edit mode, and then turn the wheel to increase or decrease the value.</p> <p><b>NOTE</b> When changing a multiple character value, such as an IP address or channel pattern name, press the wheel to enter edit mode, rotate the wheel to change the characters value as desired, but do not leave edit mode. Use the cursor keys to scroll to the other characters and use the wheel to change their value as needed. Press the <b>ENTER</b> key when finished changing all the characters.</p>

## Function keys

<b>OPEN ALL key:</b>	Opens all closed channels.
<b>STEP key:</b>	Steps through channels associated with the defined scan list; sends a trigger after each channel.
<b>OPEN key:</b>	Opens selected channels or channel pattern.
<b>CLOSE key:</b>	Closes specified channels or channel pattern.
<b>STORE key:</b>	<p>Opens the RD BUFF ACTION MENU. This menu contains:</p> <p><b>CREATE:</b> Allows creation of a reading buffer, or allows you to select a previously created reading buffer. When a new buffer is created, you can set the number of readings to store and then select the buffer. Related Instrument Control Library (ICL) command: dmm.makebuffer</p> <p><b>SELECT:</b> Allows you to select a previously created reading buffer. Related Instrument Control Library (ICL) command: dmm.measure</p> <p><b>CLEAR:</b> Removes readings from a previously created buffer.</p> <p><b>SAVE:</b> Allows you to save a previously created reading buffer to a USB flash drive (flash drive must be installed and have enough available space).</p>
<b>RECall key:</b>	Displays stored readings and buffer statistics for selected reading buffer. Use the ◀ CURSOR ▶ keys or turn the wheel to navigate through buffer.

<b>RATE key:</b>	Sets measurement speed (fast, medium, or slow) for the active or selected function.
<b>FUNCTION key:</b>	<p>This key select the active function by cycling through the following list as listed. Each press of the <b>FUNC</b> key has the DMM and configured to the next function in the list:</p> <ul style="list-style-type: none"><li>• <b>dcvolts:</b> DC voltage</li><li>• <b>acvolts:</b> AC voltage</li><li>• <b>dccurrent:</b> DC current</li><li>• <b>accurrent:</b> AC current</li><li>• <b>twowireohms:</b> Two-wire ohm (resistance)</li><li>• <b>fourwireohms:</b> Four-wire ohm (resistance)</li><li>• <b>commonsideohms:</b> Common-side ohm (resistance)</li><li>• <b>frequency:</b> Frequency</li><li>• <b>period:</b> Period</li><li>• <b>continuity:</b> Continuity</li><li>• <b>temperature:</b> Temperature</li></ul>





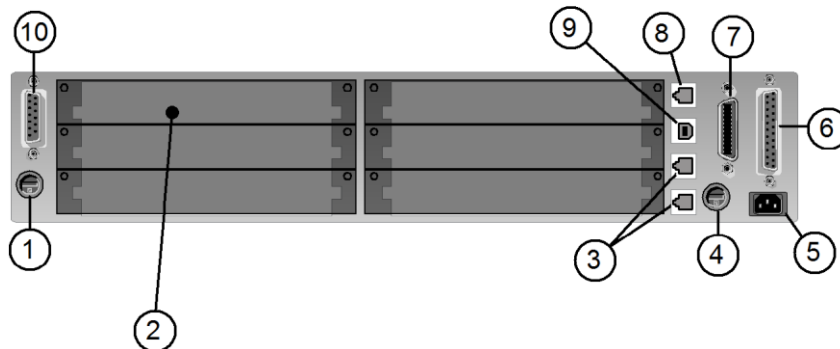
## Rear Panel

### In this section:

Rear panel summary .....	3-1
Rear panel connections .....	3-2
Switching module installation and connections .....	3-6
Module installation .....	3-7
Bus operation .....	3-11
Power-up .....	3-12

## Rear panel summary

Figure 3-1: Rear panel features



Item	Description
1	<a href="#">Analog backplane fuse</a> (see "Analog backplane AMPS fuse" on page 3-2)
2	<a href="#">Slots (6 places)</a> (see "Slots" on page 3-2)
3	<a href="#">TSP-link® connectors (2 places)</a> (see "TSP-Link connector" on page 3-2)
4	<a href="#">Instrument fuse</a> (on page 3-2)
5	<a href="#">Power connector</a> (on page 3-2)
6	<a href="#">Digital I/O port</a> (on page 3-3)
7	<a href="#">GPIB connector</a> (on page 3-4)
8	<a href="#">Ethernet connector</a> (see "Ethernet connector (RJ-45)" on page 3-4)
9	<a href="#">USB connector</a> (see "USB connectors" on page 3-4)
10	<a href="#">Analog backplane connector</a> (on page 3-5)

## Rear panel connections

### Analog backplane AMPS fuse

FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE FUSE WITH SAME TYPE AND RATING (3A / 250V). See Fuse replacement for details.

### Slots

Use any of the six slots of the Keithley Instruments Series 3700 for the switching modules. When a module is not installed, make sure to cover the slot with a slot cover. For additional information on an installed module, press the SLOT key.

### TSP-Link connector

Use with TSP-link cable to expand system.

### Instrument fuse

FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE FUSE WITH SAME TYPE AND RATING (1.25A / 250V). See Fuse replacement for details.

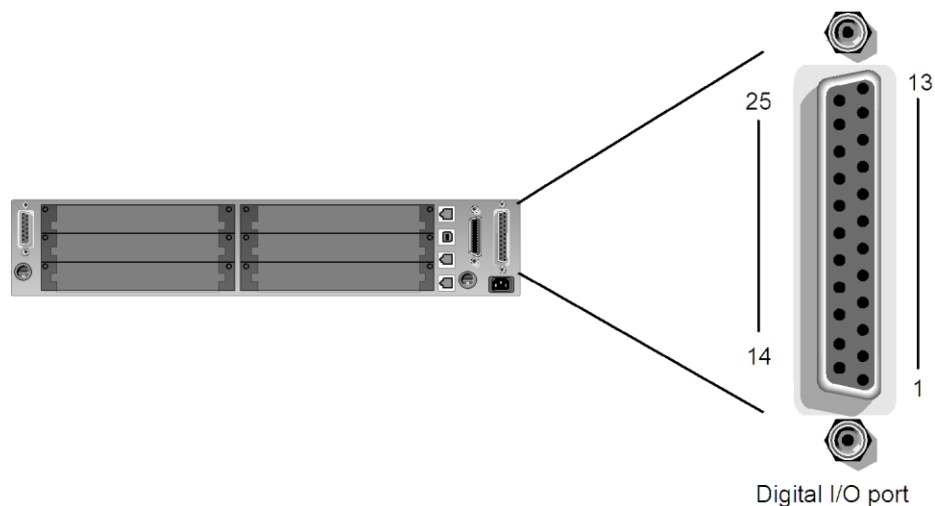
### Power connector

Using the supplied line cord, connect to a grounded AC power outlet. See [Line power connection](#) (on page 3-12) for connection details.

## Digital I/O port

The Series 3700 has a digital input/output port that can be used to control external digital circuitry. For example, a handler that is used to perform binning operations can be used with a Digital I/O port. The Digital I/O port is a standard female DB-25 connector.

**Figure 3-2: Digital I/O port**



Pin	Description
1	Digital I/O #1
...	...
9	Digital I/O #9
10	Digital I/O #10 (High Current Pins see Note)
...	...
14	Digital I/O #14 (High Current Pins see Note)
15-21	Ground
22	V EXT
23	V EXT
24	NC (no connection)
25	V EXT

**NOTE** High Current Pins (10-14) can be used for binning applications or for external relays.

## **Connecting cables**

---

Use a cable equipped with a standard male DB-25 connector (Keithley Instruments part number CA-126-1).

## **Digital I/O lines (pins 1 through 14)**

---

The port provides 14 digital I/O lines. Each output is set high (+5V) or low (0V) and can read high or low logic levels.

## **+5V output (pins 22, 23, and 25)**

---

The Digital I/O Port provides a +5V output that is used to drive external logic circuitry. Maximum current output for this line is 600mA. This line is protected by a self-resetting fuse (one hour recovery time).

## **GPIB connector**

For GPIB communication, connect to GPIB port of computer using an IEEE-488 cable (Keithley Instruments Model 7007).

## **Ethernet connector (RJ-45)**

For Ethernet communication, connect to Ethernet port of a computer, or to a hub or receptacle of an Ethernet system.

To connect the Series 3700 directly to a computer, use an Ethernet cross-over cable (RJ-45, male/male).

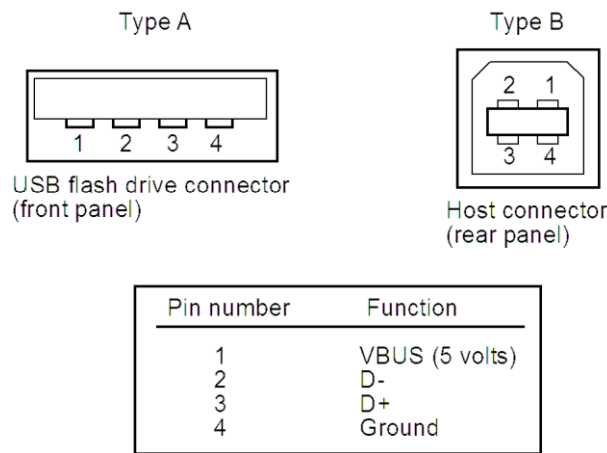
To connect the Series 3700 to an Ethernet system hub or receptacle, use a standard Ethernet cable (RJ-45, male/male).

## **USB connectors**

The downstream USB-2.0 receptacle (Type B) located on the rear panel connects to a host. The front panel has an upstream USB-2.0 connector (Type A) that connects to a user supplied USB flash drive.

Use the rear connector to communicate with the instrument over USB by sending the desired commands. Use the front panel connector to insert a USB flash drive for saving or loading reading buffers, user setups, or scripts. See the Reference Manual for more information on reading buffers, user setups and scripts.

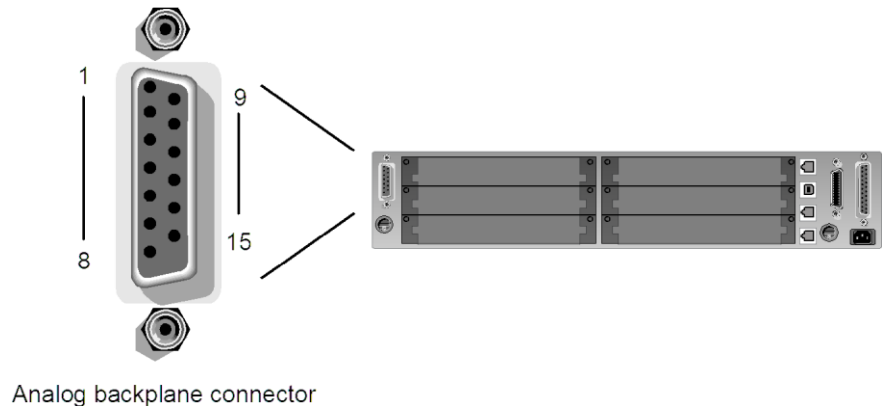
Figure 3-3: USB connectors



Analogue backplane connector

Refer to the following figure for analogue backplane connector information. See [Connections](#) (on page 3-9) before making any connections.

Figure 3-4: Analogue backplane connector



The table below contains pin numbers and descriptions for the analog backplane connector.

Description	Pin
Analog backplane 3-HI	5
Analog backplane 3-LO	6
Analog backplane 4-HI	7
Analog backplane 4-LO	8
Analog backplane 5-HI	12
Analog backplane 5-LO	13
Analog backplane 6-HI	14
Analog backplane 6-LO	15

Description	Pin
DMM-SLO	4
DMM-SHI	3
DMM-LO	2, 9
DMM-HI	1
AMP-LO	2, 9
AMP	10, 11

## Switching module installation and connections

In order to exercise close/open operations explained in this section, a switching module (or pseudocard) must be installed in the mainframe. A switching module can be installed by the user, however external connections to the switching module are only to be performed by qualified service personnel.

### **WARNING**

***To prevent electric shock that could result in injury or death, NEVER handle a switching module that has power applied to it:***

- ***Before installing (or removing) a switching module, make sure the Series 3700 is turned off and disconnected from line power.***
- ***If the switching module is already connected to a device under test (DUT), make sure power is removed from all external circuitry.***

### **NOTE**

For inexperienced users, it is recommended that DUT and external circuitry not be connected to switching modules. This will allow you to exercise safe close/open operations without the dangers associated with live test circuits.

## Module installation

<b>WARNING</b>	<b><i>Slot covers must be installed on unused slots to prevent personal contact with high voltage circuits.</i></b>
----------------	---

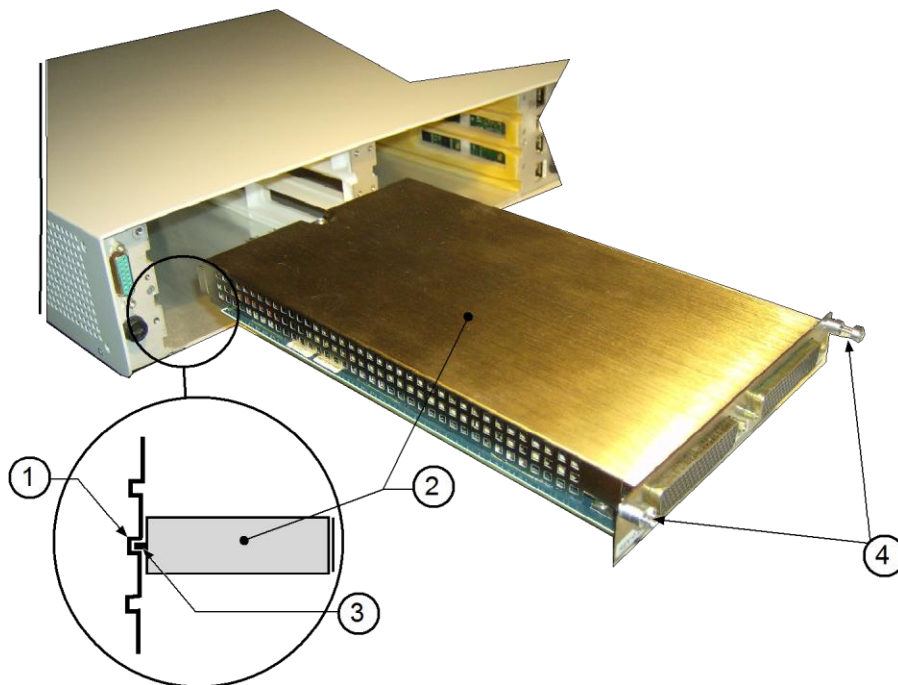
Perform the following steps to install a switching module into the Series 3700 mainframe:

1. Turn the Series 3700 off and disconnect the power line cord and any other cables connected to the rear panel.
2. Position the Series 3700 so that you are facing the rear panel.
3. Remove the slot cover plate from the desired mainframe slot. Retain the plate and screws for future use.
4. With the top cover of the switching module facing up, align the module's card edge into the slot's card guide and slide in the module. For the last ¼ inch or so, press in firmly to mate the module connector to the mainframe connector.
5. On each side of the module, there is a mounting screw. Tighten these two screws to secure the module to the mainframe. Do not overtighten.
6. Reconnect the power line cable and any other cables to the rear panel.



7. Press the **SLOT** key to see the model numbers, description, and the firmware revision of the installed switching module(s), along with the mainframe firmware and DMM (if present).

**Figure 3-5: Typical module installation**



Item	Description
1	Card guide (part of Series 3700)
2	Module
3	Card edge (part of module)
4	Mounting screw (part of module)

## Connections

**WARNING**

*Connection information for switching modules is intended for qualified service personnel. Do not attempt to connect DUT or external circuitry to a switching module unless qualified to do so.*

*To prevent electric shock that could result in serious injury or death, comply with these safety precautions:*

*Before making or breaking any connections to the switching module, make sure the Series 3700 is turned off and power is removed from all external circuitry.*

*Do not connect signals that will exceed the maximum specifications of any installed switching module.*

*If both the rear analog backplane connector of the Series 3700 and the switching module terminals are connected at the same time, the test lead insulation must be rated to the highest voltage that is connected. For example, if 300V is connected to the analog backplane connector, the test lead insulation for the switching module must also be rated for 300V.*

*Dangerous arcs of an explosive nature in a high energy circuit can cause severe personal injury or death. If the multimeter is connected to a high energy circuit when set to a current range, low resistance range, or any other low impedance range, the circuit is virtually shorted.*

*Dangerous arcing can result (even when the multimeter is set to a voltage range) if the minimum voltage spacing is reduced in the external connections. For details about how to safely make high energy measurements, see High-energy circuit safety precautions.*

*As described in the International Electrotechnical Commission (IEC) Standard IEC 664, the Series 3700 is Installation Category I and must not be connected to mains.*

## Pseudocards

You can perform open/close/scan operations and configure your system without having an actual switching module installed in your Series 3700. Using remote programming, you can assign a pseudocard to an empty switching module slot, allowing the Model 3700S to operate as if a switching module were installed.

A pseudocard, which is essentially a "virtual switching module," cannot be installed from the front panel. However, once the remote installation is complete, you can take the Series 3700 out of remote mode and use the front panel. Pressing the **LOCAL** or **EXIT** key takes the Series 3700 out of remote mode.

When the instrument is turned off, the pseudocard will be lost (uninstalled). In order to recall a pseudocard, make it part of a saved setup.

---

**NOTE** A saved setup retains the model number of the module installed in each slot. The model number of a pseudocard is the same as the model number of an actual module. This allows a saved setup to be recalled provided the installed card (or pseudocard) matches the model number for the slot in the saved setup.

---

### Pseudocards programming example

---

Use the following command line to set the pseudocard of Slot 6 for 3720 Dual 1 x 30 Multiplexer card simulation:

```
slot[6].pseudocard = slot.PSEUDO_3720
```

## Channel assignments

Each switching module has a certain number of channels. For example, the Model 3720 switching module has 60 channels (1 through 60). When you encounter a 1 to 3-digit channel number in this manual, the switching module channel is the point of discussion. A four-digit channel number includes the slot followed by the 3-digit channel number.

A switching module can be installed in any of the mainframe's six slots. Therefore, to close, open, or scan a channel, it is necessary to specify the slot location and channel number of the switching module. This is accomplished by using a four-digit channel number for the mainframe. The first digit (1, 2, 3, 4, 5, or 6) indicates the slot number, and the next three digits indicate one of the following:

- The *channel number of a switching module* (see "Mux (multiplexer) channel notation" on page 4-5)
- The *row and column of a matrix card* (see "Matrix card notation" on page 4-5)
- The modules' *backplane relay* (see "Backplane relay notation" on page 4-4)

## Bus operation

The Series 3700 supports bus operation over USB, Ethernet and GPIB. The GPIB settings may be set from the front panel, or once controlled by the bus, over the bus.

1. Viewing or configuration using the front panel:
  - a) Press **MENU** key to bring up the main menu,
  - b) Turn the wheel to scroll to "GPIB" menu item and press the **ENTER** key.
  - c) Select setting to change ADDRESS or ENABLE
2. Viewing or configuration over the bus:
  - a) `gpiib.address` to change the address
  - b) `gpiib.enable` to change the enable setting.  
ON: GPIB will respond to bus commands.  
OFF: GPIB will not respond to bus commands.

USB is always connected and available to send bus commands. There are no unique USB settings. To use USB, make sure have installed the Test Script Builder application. The applicable USB driver is available after installing this software.

---

**NOTE** For your Series 3700 to be recognized by your computer over the USB interface, the proper driver must be installed. Installing the Test Script Builder application also installs the applicable USB driver (it becomes available after installing this software). To complete the USB driver installation, after installing the Test Script Builder application, connect the Series 3700 USB connector (rear panel) to the computer.

---

Ethernet supports various settings. The LAN logical device has options that show the current status under `lan.status` commands while it has pending configuration settings under `lan.config`. The config settings will take effect when `lan.applysettings` is executed. Using the `lan.reset` command is equivalent to doing a `lan.restoredefaults` followed by a `lan.applysettings`. To only restore defaults without resetting to them, use the `lan.restoredefaults` command by itself. Please refer to the LAN ICLs directly for individual settings that may be controlled with the LAN logical device. From the front panel, the LAN (Ethernet) options may be enabled or disabled collectively under MAIN MENU and LAN settings. From the bus, one may enable or disable certain aspects of LAN with:

1. `comm.lan.telnet.enable`
2. `comm.lan.web.enable`
3. `comm.lan.vxi11.enable`
4. `comm.lan.rawsockets.enable`

The following list contains the four LAN default port numbers (along with corresponding ICLs to query for these values):

1. telnet is 23 (ICL: lan.status.port.telnet)
2. rawsocket is 5025 (ICL: lan.status.port.rawsocket)
3. vxi11 is 1024 (ICL: lan.status.port.vxi11)
4. dead socket termination is 5030 (ICL: lan.status.port.dst)

When changing between the various bus interfaces, send the abort command to have that interface become the active one for receiving and processing bus commands. For example, if changing from communicating with instrument over GPIB and to send ICLs with a telnet session (assuming both interfaces are enabled):

1. Connect via telnet.
2. Send abort to leave the GPIB interface and switch over to telnet.
3. Send commands as desired.

Any of the enable settings will take effect the next time the unit powers up. Therefore, after making changes to these settings, power cycle the unit.

## Power-up

### Line power connection

Follow the procedure below to connect the Series 3700 to line power and turn on the instrument. The Series 3700 operates from a line voltage of 100V to 240V at a frequency of 50Hz or 60Hz. Line voltage is automatically sensed. There are no switches to set. Make sure the operating voltage in your area is compatible.

<b>WARNING</b>	<b><i>The power cord supplied with the Series 3700 contains a separate ground wire for use with grounded outlets. When proper connections are made, instrument chassis is connected to power line ground through the ground wire in the power cord. Failure to use a grounded outlet may result in personal injury or death due to electric shock.</i></b>
----------------	--

<b>CAUTION</b>	<b>Operating the instrument on an incorrect line voltage may cause damage to the instrument, possibly voiding the warranty.</b>
----------------	---

1. Before plugging in the power cord, make sure that the front panel power switch is in the off (O) position. See [Rear panel summary](#) (on page 3-1) for connector location.
2. Connect the female end of the supplied power cord to the (5) Power Connector (AC receptacle) on the rear panel. Connect the other end of the power cord to a grounded AC outlet.
3. Turn on the instrument by pressing the front panel power switch to the on (I) position. See Front panel introduction for switch location.

---

## Line frequency

---

**NOTE** Line frequency only applies to models with a DMM installed.

---

The Series 3700 will operate at line frequencies of either 50Hz or 60Hz. The line frequency is auto-detected at startup.

Use the `localnode.linefreq` bus command to see the line frequency. For example:

```
print(localnode.linefreq)
```

---

## Fuse replacement

---

Refer to the Fuse replacement topic contained in the user's manual for fuse replacement information.

## Power-up sequence

On power-up, the Series 3700 performs self-tests on its ROM, NVRAM, and RAM and momentarily lights all segments and annunciators. If a failure is detected, the instrument momentarily displays an error message and the ERR annunciator turns on. (Error messages are listed in Error and status messages contained in the Reference manual.)

---

**NOTE** If a problem develops while the instrument is under warranty, return it to Keithley Instruments, Inc., for repair.

---

Assuming no errors occur, the Series 3700 will power-up as follows:

1. "No Comm Link" is briefly displayed.
2. "Initializing" is displayed for several seconds.
3. Nearing the end of initialization, the 1588 and LAN status LEDs light.
4. All of the display pixels briefly light.

5. The display shows:  
KEITHLEY  
Series 3700
6. Main display appears.

---

## System identification

Serial number, firmware revision, and calibration dates can be displayed by selecting the SYSTEM-INFO item of the main menu (press MENU > SYSTEM-INFO).

Select FIRMWARE, SERIAL#, or CAL as desired.

For remote programming, use the `*IDN?` query to read system information.

---

## Beeper

With the beeper enabled, a beep will be issued to acknowledge the following actions:

- A short beep, emulating a keyclick, is issued when a front panel key is pressed.
- A short beep, emulating a keyclick is also issued when the wheel is turned or pressed.

To control the beeper from the front panel, select MENU > BEEPER > KEYCLICK, then ENABLE or DISABLE the keyclick as desired.

For remote programming, use the `beeper.enable` command to control the beeper. For example, the following enables the beeper:

```
beeper.enable = 1
```

## Frequently Asked Questions

### In this section:

General questions .....	4-1
Questions about web page operation .....	4-12
Questions about remote operation .....	4-15
Questions about Test Script Processor interaction.....	4-24

## General questions

### How do I power up the instrument?

#### Step 1: Connect to line power

<b>CAUTION</b>	Operating the instrument on an incorrect line voltage may cause damage to the instrument, possibly voiding the warranty.
----------------	--

1. Before plugging in the power cord, make sure that the front panel power switch is in the off (O) position.
2. Connect the female end of the supplied power cord to the AC receptacle on the rear panel. Connect the other end of the power cord to a grounded AC outlet.

<b>WARNING</b>	<i>Failure to use a grounded outlet may result in personal injury or death due to electric shock.</i>
----------------	---

#### Step 2: Turn on power

Turn on the instrument by pressing the front panel power switch to the on (I) position. Assuming no errors occur, the Series 3700 will power-up as follows:

- The unit will initialize
- KEITHLEY  
SERIES 3700 will be displayed.

<b>NOTE</b>	The line frequency is automatically sensed at power-up.
-------------	---



## How do I control switches?

---

**NOTE** This paragraph provides information for controlling switches using channel operation (for channel pattern operation, refer to the Channel pattern operation paragraph contained in the User's manual). It contains information on opening and closing all switches from the front panel, as well as over the bus.

---

### Close/open overview

---

**NOTE** This section provides basic close/open information for switching module channels. Operating characteristics unique to a specific Series 3700 switching module are provided in an instruction sheet provided with the specific switching module.

Terminology used throughout this manual is detailed in the applicable sections of the user's and reference manuals.

---

The switching channels of a Series 3700 support a concept of "duality." This means that each channel has specific settings for switching and specific settings for switching with DMM operations. The location of the specific operation request determines the setting that activates. An operation request residing in the channel logical device causes the switching settings to be used (example commands are channel.close, channel.open, channel.exclusiveclose); an operation request residing in the DMM logical device such as dmm.close or dmm.open, causes the DMM settings to be used. Refer to the reference manual for more information on logical devices (TSP section).

Open a Microsoft web-browser and type in the IP address (see [How do I connect to the internal web page?](#) (on page 4-12) located in the Quick Start Guide). The Series 3700 home page will appear. Use this home page to see a visual representation of the present channel status (select the desired slot or model contained under "Cards").

---

**NOTE** Java application may need to be installed.

---

The Series 3700 supports opening and closing channels through either **Channel operation** or through **Channel pattern operation**:

**Channel operation (non-channel pattern operation):** This mode of operation should be used exclusively by most (if not all) users. When you close a channel for a measurement operation, other channels on the switching module close automatically to internally connect it through the backplane to the DMM of the Series 3700. When you close a channel for a switching operation, the channel (and possibly the channel pair) will close but, no backplane relays are closed unless associated with the channel.

**Channel pattern operation:** This mode of operation provides additional flexibility by providing individual control of each switching module and backplane channel. Careless operation in this mode could create a safety hazard and/or damage the switching module and other equipment. Channel pattern operation should only be used by experienced test engineers.

**WARNING** *Careless channel pattern operation could create an electric shock hazard that could result in severe injury or death. Improper operation can also cause damage to the switching modules and external circuitry. Controlling multiple channels using channel patterns should be restricted to experienced test engineers who recognize the dangers associated with multiple channel closures.*

**CAUTION** To prevent damage to a switching module, do not exceed the maximum signal level input for that module. Most switching modules are rated for 300V.

**NOTE** The Series 3700 is capable of scanning switching module channels. Each channel in the scan can have its own unique DMM configuration.

### Close/open bus operation

Use the following commands to control switches over the bus. For detailed information specifying what happens with each of these commands, see the reference manual.

ICL	Description	Usage
channel.close	Function: Closes specified items in ch_list without opening any channels.	<code>channel.close(ch_list)</code> <b>ch_list:</b> string listing the items to close. Items can include channels, backplane relays, and channel patterns.
channel.open	Function: Opens items specified in ch_list.	<code>channel.open(ch_list)</code> <b>ch_list:</b> string listing the items to open. Items can include channels, backplane relays, and channel patterns.
dmm.close	Function: Closes the specified channel or channel pattern in preparation for a DMM measurement.	<code>dmm.close(ch_list)</code> <b>ch_list:</b> string listing the channel or channel pattern to close
dmm.open	Function: Opens the specified channel and/or channel pattern.	<code>dmm.open(ch_list)</code> <b>ch_list:</b> string listing the channel or channel pattern to open

### Close/open key operation

The front panel **CLOSE** and **OPEN** keys operate in the same manner as one of the following:

- channel.close and channel.open commands
- dmm.close and dmm.open commands

The operation of the keys depend on the selected channel or channel patterns function association.

To have the keys work as channel.close and channel.open:

- Make sure the DMM function of the DMM configuration associated with the selected channel or channel pattern is "nofunction."

To have the keys work as dmm.close and dmm.open:

- Make sure the DMM function of the DMM configuration associated with the selected channel or channel pattern is not "nofunction" (for example, DC volts).

### Channel and backplane notation

There are three different notations used to control relays: Backplane relay notation, Mux (multiplexer) channel notation, and Matrix card notation.

#### Backplane relay notation

To control analog backplane relays for slots with analog backplane relay channels, use S9BX where:

S: Slot number

9: Backplane notation designation (always 9 when referencing a backplane relay)

B: Bank number

X: Analog backplane relay number

Analog backplane relays (bank 2 of Slot 1) examples:

Reference	Analog backplane relay
1921	analog backplane relay 1
1922	analog backplane relay 2
1923	analog backplane relay 3
1924	analog backplane relay 4
1925	analog backplane relay 5
1926	analog backplane relay 6

**Mux (multiplexer) channel notation**

To control channels using mux channel notation, use SCCC where:

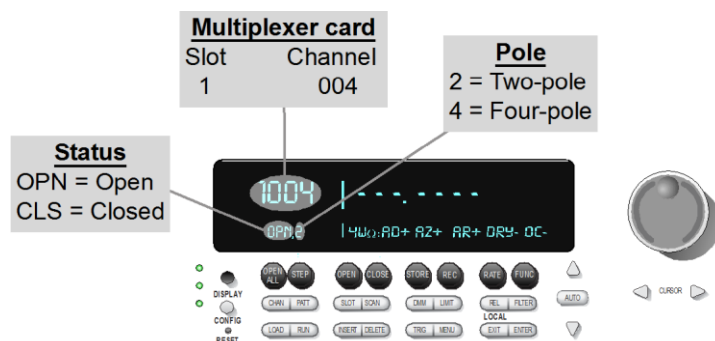
S: Slot number

CCC: Channel number (always use 3 digits)

Multiplexer examples:

Reference	Slot	Channel
1004	1	004
1020	1	020
2100	2	100
3003	3	003

**Figure 4-1: Multiplexer card display**

**Matrix card notation**

To control channels using matrix card notation, use SRCC where:

S: Slot number

R: Row number

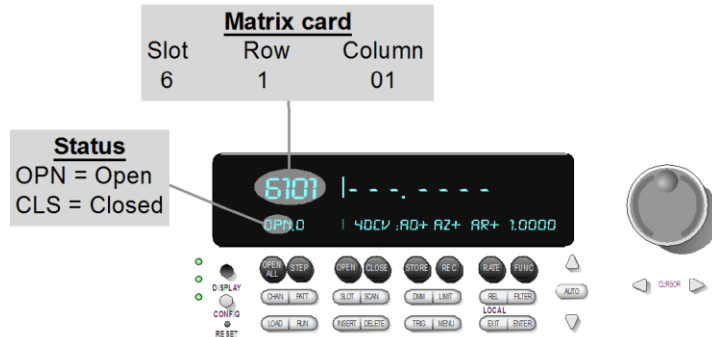
CC: Column number (always use 2 digits)

Matrix channel examples:

Reference	Slot	Row	Column
1104	1	1	04
1203	1	2	03
2305	2	3	05

Reference	Slot	Row	Column
3112	3	1	12
6101	6	1	01

Figure 4-2: Matrix card display



### Channel list parameter <ch\_list>

The channel list parameter <ch\_list>, used when controlling the Series 3700's relays over the bus, is a string-type parameter. An example:

- Channel 1 (of Slot 1) is associated with analog backplane relays 3 and 4, while Channel 3 (of the same slot) has analog backplane relays 5 and 6. The <ch\_list> used in this example is ("1001, 1003"). The response to a `channel.getbackplane("1001, 1003")` will be "1913, 1914;1915,1916". To associate the backplane relays as indicated with Channel 1, the corresponding command would be `channel.setbackplane('1001', '1913, 1914')`.

Therefore, when sending this parameter:

- Enclose the contents of the channel list in either single (') or double (") quotes, but the quote style must match.
- Use a comma or semicolon to separate the channel list or channel patterns.
- The string may contain a single channel, channel pattern or analog backplane relay as well as multiple ones that are indicated by a range or comma separated.
- Use a colon to specify a range of channels. Example:  
`channel.getbackplane("1001:1003")` responds with the range of Slot 1 channels from 1 to 3.

Although a parameter string may be valid, the command that calls it will determine the string's ultimate validity. For example, only channels have a pole setting (channel patterns do not). If a channel pattern is passed to the poles setting command, an error would be generated.

Channel patterns may be included as a <ch\_list> parameter.

**<ch\_list> queries**

For queries that return a channel list parameter, a channel configured for 4-pole operations will indicate the paired channel in parenthesis. For example, Channel 3003 on a 60-channel card is configured for 4-pole, then sending:

```
channel.close('3003')

print(channel.getclose('slot3') → 3003(3033)
```

---

**NOTE** In the above examples output →, the paired channel associated with 3003 is 3033 and is included in parenthesis.

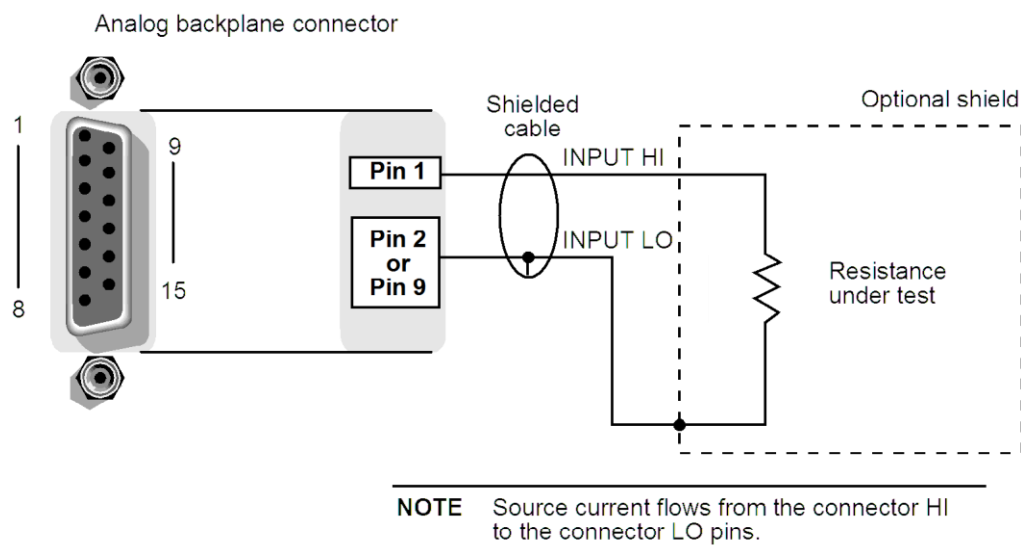
---

## How do I make measurements?

**Step 1: Connect the DUT**

Connect a 10k $\Omega$  resistor to the input terminals as shown.

**Figure 4-3: Two-wire resistance measurements**

**Step 2: Select measurement function and range**

- Select the 2-wire resistance measurement function by pressing the **FUNC** key until **twowireohms** is displayed.
- Select the measurement range with the **RANGE** keys. For the purposes of this example, press **AUTO RANGE**, and note the **AUTO** annunciator turns on. The instrument will automatically select the best range based on the measured value. You can also use manual ranging by pressing the up or down **RANGE** key, but be sure to use the lowest possible range for best accuracy.

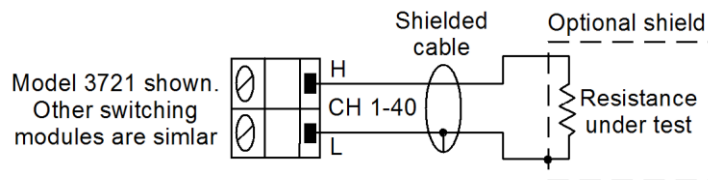
**Step 3: Make measurements**

- Observe the readings on the display. (Press the **TRIG** key if necessary to trigger the unit to begin taking readings.)

**Single channel through switch****Step 1: Connect the DUT**

Connections for the switching module are shown below. As shown, each of the 20 channels can be used to perform  $\Omega$ 2 measurements.

**Figure 4-4: Two-wire switching module resistance connection**

**Step 2: Select measurement function and range**

- Select the 2-wire resistance measurement function by pressing the **FUNC** key until **twowireohms** is displayed.
- Select the measurement range with the **RANGE** keys. For the purposes of this example, press the **AUTO RANGE** key, and note the **AUTO** annunciator turns on. The instrument will automatically select the best range based on the measured value. You can also use manual ranging by pressing the up or down **RANGE** key, but be sure to use the lowest possible range for best accuracy.

**Step 3: Make measurements**

- Observe the readings on the display. (Press **TRIG** if necessary to trigger the unit to begin taking readings.) Press the **TRIG** key once to take a single reading. Hold the **TRIG** key down to put the front panel in continuous trigger operation. Once in continuous trigger operation press any key to stop continuous trigger of readings.

---

## How do I create a scan (with reading buffer)?

---

**NOTE** A reading buffer has to be created and selected before it can be used to store data.

---

To create a scan that sends it's measured readings to a reading buffer:

1. If a reading buffer that you wish to use has not already been created, create a reading buffer:
  - Pressing the **STORE** key. The RD BUF ACTION MENU will be displayed.
  - Highlight CREATE and press the **ENTER** key.
  - Edit the reading buffer name as desired. Press the wheel (or the **ENTER** key) to enter edit mode (the EDIT annunciator will light). Turn the wheel to change the characters values, use the **CURSOR** keys to change the character being edited. Press the **ENTER** key to leave the edit mode.
  - Enter the CAPACITY you would like the buffer to have in number of readings. Press the **ENTER** key to save the capacity.
2. Select the desired reading buffer:
  - Pressing the **STORE** key. The RD BUF ACTION MENU will be displayed. Highlight SELECT and press the **ENTER** key. Highlight the desired buffer and press the **ENTER** key.
3. Add channels and DMM configurations.
  - Use the wheel to configure a channel that you would like added to the scan. Change to any of the available channels and setup that channel with the associated DMM configuration that is desired for the measurement.
  - The first press of the wheel (or **ENTER** key) will select the slot (from 1-6).
  - The second press of the wheel (or **ENTER** key) will select the channel number (card dependent).
  - The third press of the wheel (or **ENTER** key) will select a range (card dependent).
  - The fourth press of the wheel (or **ENTER** key) will select the function (card dependent).
4. Press the **INSERT** key to add the step to the scan. Steps are added in the same order that they have been entered from the front panel.
5. Continue adding steps as desired by repeating steps 3 and 4.
6. When finished adding steps to the scan, press the **SCAN** key. Select EXECUTE or EXECUTE BACKGROUND to run the scan. Press the **TRIG** key to trigger measurements. When finished, press the **REC** key and turn the wheel to view the contents of the reading buffer.



## How do I save data to a USB flash drive?

---

**NOTE** A reading buffer has to be created, selected, and must contain data before it can be saved to a USB flash drive.

---

To save a reading data buffer to an attached USB flash:

1. Select the desired reading buffer by pressing the **STORE** key. The RD BUF ACTION MENU will be displayed. the SELECT menu item is not displayed, you need to create a reading buffer (and place readings in that buffer) before continuing.
2. Turn the wheel to highlight the SAVE menu item.
3. Press the wheel (or the **ENTER** key). SAVE RD BUFFER will be displayed.
4. Press the wheel (or the **ENTER** key) to select USB.
5. Edit the file name as desired.
  - Press the wheel (or the **ENTER** key) to enter edit mode (the EDIT annunciator will light).
  - Turn the wheel to change the characters values, use the **CURSOR** keys to change the character being edited.
6. Press the **ENTER** key to exit edit mode and again to save the buffer to the USB drive. If an error is displayed, check that your reading buffer has readings present. The created file is located in on the root directory of your USB flash drive. the drive may be removed from the Series 3700 after data transfer has completed.

## How can I save/recall setups from the internal memory or USB drive?

### Save a setup (bus operation)

---

Setups are saved over the bus to either internal memory or to a connected USB flash drive. To save a setup, use the following command:

setup.save	Function: Saves the present setup as a user-setup.	<p>To save to the internal memory location, send no parameters with function:</p> <pre>setup.save ()</pre> <p>To save to the USB flash drive:</p> <pre>setup.save (location)</pre> <p><b>location:</b> Setup location to save. Use the format "usb1/&lt;filename&gt;" where &lt;filename&gt; is the name of the desired file contained on a USB flash drive.</p>
------------	--	--

For example: Send the following to save a user setup to a file named KEITHLEY\_3730 on a USB flash drive:

```
setup.save ("/usb1/KEITHLEY_3730")
```

## Recall a setup (bus operation)

Setups are recalled over the bus from either internal memory or from a connected USB flash drive. Recalling a setup also may be used to reset to the factory default setup. To recall a setup over the bus, use the following command:

setup.recall	Function: Recalls settings from a saved setup.	<pre>setup.recall(location)</pre> <p><b>location:</b> Setup number to recall (0, 1, or "/usb1/&lt;filename&gt;").</p> <p>0: Reset setup.</p> <p>1: Internal setup.</p> <p><b>&lt;filename&gt;:</b> Use the name of the desired file contained on a USB flash drive.</p>
--------------	--	---

For example: Send the following to recall a user saved setup stored in a file named KEITHLEY\_3730 on an installed USB flash drive:

```
setup.recall("/usb1/KEITHLEY_3730")
```

## Save/recall/reset setup (front panel)

Using the front panel, you can save the present setup to internal memory (overwriting the existing setup), reset to the factory default settings, or recall an existing setup from internal memory.

To save or recall a setup from the front panel:

---

**NOTE** Press the **EXIT** key to place in local mode if the Series 3700 is in remote mode (being controlled over the bus),

---

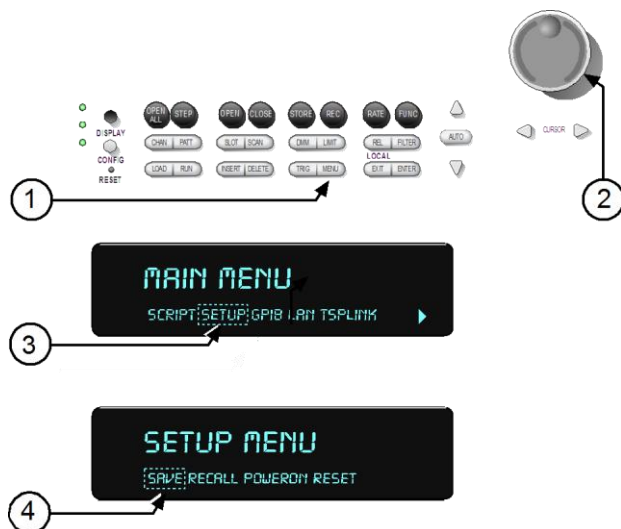
1. Press the **MENU** key (1).
2. Use the wheel (2) to select the "SETUP" menu item and press the **ENTER** key.
3. Use the wheel (2) to select menu item as desired:
  - **SAVE:** Press the **ENTER** key to have the present setup overwrite the existing internal memory setup.
  - **RECALL:** Press the **ENTER** key to have the internal saved setup recalled overwriting the present setup.
  - **RESET:** Press the **ENTER** key to have the factory default setup overwrite the present setup.

---

**NOTE** Setups saved on the USB flash drive cannot be recalled from the front panel (use the bus to recall USB setups).

---

Figure 4-5: Setup menu



## Questions about web page operation

### How do I connect to the internal web page?

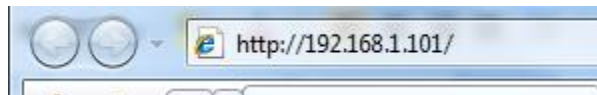
To connect to the Series 3700 web page, open the Series 3700 IP address with a web browser. The IP address can be found by performing the following procedure:

1. Press the **MENU** key.
2. Select LAN and press the **ENTER** key.
3. Select STATUS and press the **ENTER** key.
4. Select IP\_ADDRESS and press the **ENTER** key. If you would like to modify the LAN parameters, see [How do I change the Series 3700 LAN parameters?](#) (on page 4-13).

The present IP address of the Series 3700 will be displayed. To use this IP address, enter the IP as a web address. For example, to open the IP address of 192.168.1.101

1. Enter `http://192.168.1.101` in the address box of a supported web browser
2. Press the enter key on your computer's keyboard.

Figure 4-6: Network address example



### How do I change the Series 3700 LAN parameters?

---

To change the Series 3700 LAN parameters:

1. Press the **MENU** key.
2. Select LAN and press the **ENTER** key.
3. Select CONFIG and press the **ENTER** key.
4. Enter and modify the parameters as needed.
5. When finished with all entries, press the **EXIT** key to move up one level in the menu.
6. Select APPLY press the **ENTER** key for the new LAN settings to take affect. The updated information will be available in the STATUS menu item of the LAN MENU.

### What am I able to do through the web page?

The Series 3700 has a Web interface that complies with LXI class B requirements and offers a convenient way to communicate with the Series 3700 from a PC browser. For more information on LXI compliance, see <http://www.lxistandard.org/home>. The Series 3700 web pages (including LXI class B compliant web pages) include the following features:

- Home page
- DMM control
- Switch cards
- Scan builder
- TSB embedded
- Log
- Admin: Administration (includes password control)
- LXI page (IP configuration, Sync configuration)
- Schedule
- Help

**NOTE** For proper operation of the Web interface after each firmware update, you must change the browser refresh policy. The following procedure is for Internet Explorer (for other browsers, use the procedure as a guideline):

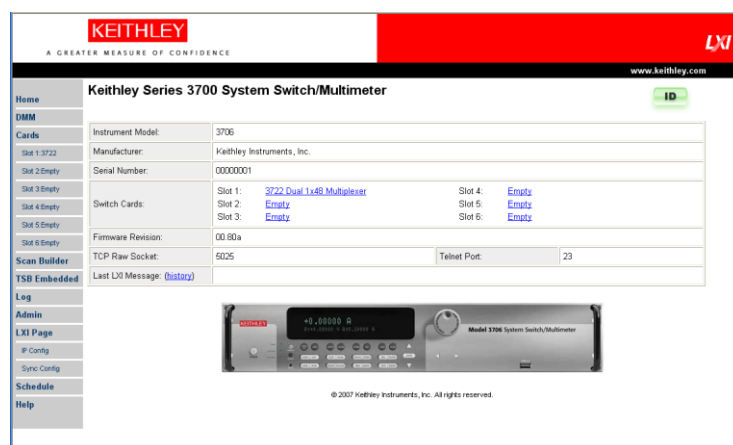
1. In the browser window, click Tools > Internet Options.
2. In the General tab, click Settings.
3. In the Check for newer version of stored pages: section, select Every visit to the page.
4. Click OK.

The Web interface also offers the following features:

- Save readings, TSP scripts locally to PC
- Multiple "view only" access to the instrument
- Print screen capability from Web browser

The LXI Welcome page is shown below:

**Figure 4-7: Home page**



## Home page

This page describes the instrument model and manufacturer, serial number, switch cards, last LXI message, raw socket port and TELNET port.

## LXI Web interface setup

---

To access the instrument and control the operation over the LXI Web interface, you must install a Sun Java Runtime Environment (JRE)(version 1.6 or above) as a web browser plug-in in the computer that is connected to the instrument. The Series 3700 Product Information CD-ROM that accompanied your Keithley Instruments Series 3700 contains a Java Runtime Environment Update. This JRE contains the Java virtual machine, runtime class libraries, and Java applications browser plug-in necessary to run the program that accesses and controls the instrument through the LXI Web interface.

You may download the appropriate JRE from the Sun Microsystems Website:

1. Using your internet browser, type in the following URL:  
<http://java.sun.com/javase/downloads/index.jsp>
2. Find the latest available Java Runtime Environment (JRE) update and download.
3. From this page you are able to download the appropriate executable file.

## Questions about remote operation

### What remote interfaces can I use?

You can automate commonly recurring test procedures by sending remote control commands to the instrument over GPIB, Ethernet (LAN), or USB. You can also access the instrument and control the operation using the LXI Web interface.

#### Step 1: Connect to the interface

To learn about the configuration requirements and programming commands, see the following topics:

[GPIB interface](#) (see "GPIB interface connection" on page 4-16)

[Standard RJ-45 \(Ethernet\) interface](#) (see "Standard RJ-45 (Ethernet) interface connection" on page 4-16)

[USB connection](#) (on page 4-16)

#### Step 2: Select, configure, and then ENABLE the interface

1. Press MENU to open up the Main Menu.
2. Select GPIB or LAN and then press ENTER.
  - GPIB: Set the address (0-30, default is 16) and then ENABLE.
  - LAN: Use LAN MENU to check STATUS, CONFIGure, APPLY, RESET, or ENABLE the LAN settings.

---

## GPIO interface connection

---

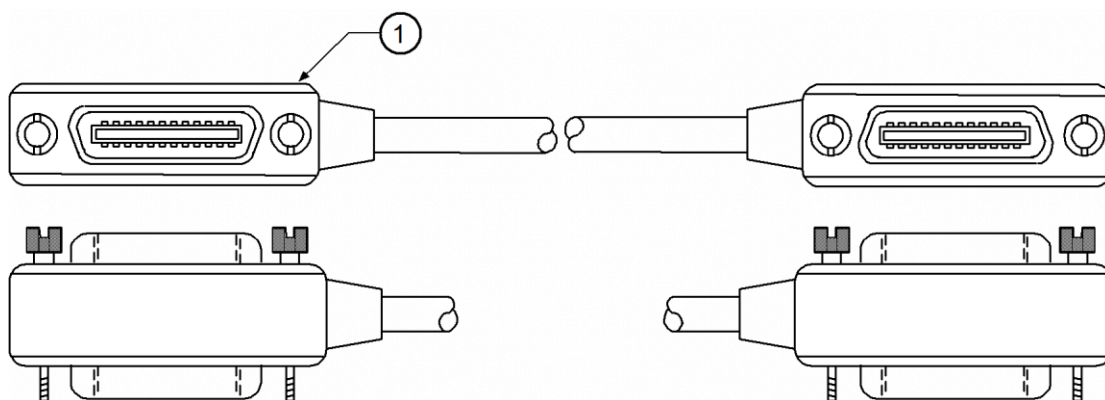
Use a shielded IEEE-488 cable such as the Keithley Instruments Model 7007 to connect the Series 3700 IEEE-488 connector to the GPIO connector on the control computer. Connect one end of the cable to the host computer and the other end to the Series 3700. Both cable connections (see item 1 in the figure titled "GPIO cable") are identical. The GPIO cable connectors are stackable. For additional non-Series 3700 GPIO instruments in the test system, daisy-chain a GPIO cable from one instrument to another.

---

**NOTE** To minimize interference caused by electromagnetic radiation, use only shielded GPIO cables. Available shielded cables from Keithley Instruments are the Model 7006 and Model 7007.

---

**Figure 4-8: GPIO cable**



Refer to [Rear panel summary](#) (on page 3-1) for connector location.

---

## Standard RJ-45 (Ethernet) interface connection

---

The Series 3700 uses a standard Ethernet connection configuration. It is designed for a 10/100BaseTX network using standard RJ-45 connectors. This is an eight wire connector, but only two sets of wire pairs are used: one pair to transmit and one pair to receive data. A 10BaseT network can accommodate transmission speeds up to 10Mbit per second where a 100BaseTX network operates at speeds of up to 100Mbit per second. Both types of networks usually require Ethernet hubs to make connections. The exception is a one-to-one connection using a crossover cable, which may be a 10BaseT or 100BaseTX dependent on the computer's Ethernet interface card and which category of cable is used (the Series 3700 can be directly connected to a computer's NIC card using an Ethernet crossover cable). Refer to [Rear panel summary](#) (on page 3-1) for connector location.

---

## USB connection

---

Connect a computer controller to the Series 3700 rear panel USB (from host) connector (connect USB flash drive devices to the Series 3700 front panel USB). Refer to [Rear panel summary](#) (on page 3-1) for connector location.

---

**NOTE** For your Series 3700 to be recognized by your computer over the USB interface, the proper driver must be installed. Installing the Test Script Builder application also installs the applicable USB driver (it becomes available after installing this software). To complete the USB driver installation, after installing the Test Script Builder application, connect the Series 3700 USB connector (rear panel) to the computer.

---

### How do I communicate via USB using an Application Development Environment?

Use VISA to communicate with the Series 3700 via USB. There are a number of types of VISA available, but National Instruments' VISA Runtime is provided on the software CD with the Series 3700 and is installed with Test Script Builder. The Series 3700 is USB TMC compliant. To find information on the programming syntax for VISA, please refer to the NI VISA User's Manual and NI VISA Programmer's Reference Manual, which may be downloaded from the National Instruments website.

## How do I use Test Script Builder?

---

**NOTE** Before using the Test Script Builder software, it must be installed. Refer to the reference manual topic named Installing the TSP software.

---

Use the following four steps as a guideline for Test Script Builder operation.

### Step 1: Run Test Script Builder

---

Run the Test Script Builder program in the Keithley Instruments folder in the usual manner. The main sections of the screen are contained in [TSB main sections](#) (on page 4-19).

### Step 2: Open and close an instrument resource

---

Before you can send commands or run scripts to control the Series 3700, you must first open the instrument resource as follows:

1. Click on the Open Instrument icon.
2. Choose the desired instrument from the dialog box drop-down menu to select a communications resource:
  - GPIB: At the factory, the GPIB address for the Series 3700 is set to 16. If using the GPIB interface board 0 and address 16, the resource setting should be GPIB0::16::INSTR. Resource settings for other GPIB board numbers and primary addresses are available from the dialog box.
  - LAN: At the factory, the IP address Series 3700 is set to be automatically configured. Specifically, the unit will attempt to configure LAN settings via DHCP (Dynamic Host Configuration Protocol). If this fails, DLLA will be attempted (Dynamic Link Local Addressing). If DLLA fails, manual settings will be used.



- USB: With TSB installed, the USB driver aspects will be installed when USB cable from unit is plugged into PC. Once connected, USB0 option for device will appear in list when select Open Instrument choice. If not there initially, use the instrument console to add one as follows:
  - a) Menu (arrow down icon)
  - b) Select Instrument option.
  - c) Select Configure.
  - d) Select Add operation.
  - e) Select USB instrument on next screen.
  - f) Select USB choice shown.
  - g) Click Finish.
  - h) Go back and open instrument. USB0 will now be in the list.
- 3. If you select the Simulate option, the Instrument Console will become active even though there will be no actual communication with the Series 3700. You can simulate running a script or sending a command, but the Series 3700 will not respond.
- 4. To close the resource, click on the Instrument icon again. The resource will close, and the console window will become inactive.

---

### Step 3: Save and clear console window

---

You can save and clear the console window as follows:

- **Save console:** Click on the Menu arrow, choose Save Console, then choose the folder and filename desired.
- **Clear console:** Click on the Clear Console icon to clear the console window.

---

### Step 4: Select command and language reference views

---

You can access online help for the ICL (Instrument Control Library) and TSL (Test Script Language) as follows:

- **ICL:** Click on the Command Help tab at the top, then click the Maximize icon. You can then quickly get information on all commands in the library.
- **TSL:** Click on the Language Help tab at the top, then click the Maximize icon to quickly access details on the script language.

## TSB main sections

The main sections of the screen are briefly described below.

### TSB menu bar

---

Main menu items include the following:

- **File:** Allows you to control projects and files.
- **Edit:** Performs a number of editing functions on script files.
- **Navigate:** Navigates through projects.
- **Project:** Opens, closes, and builds projects.
- **Run:** Runs scripts.
- **Window:** Selects which window to display.
- **Help:** Provides access to online help files.

### Project navigator pane

---

The window pane on the left side is where the Project Navigator resides. The navigator consists of created project folders and the script files (.tsp) created for each project. Each project folder can have one or more script files.

### Script development pane

---

The script chunk is written in the upper window pane. It is in this area that scripts are written and/or modified. Notice that there is a tab available for each opened script file. A script project is then downloaded to the Series 3700 and run.

### Script interaction pane

---

A number of tabs in the lower window pane provide additional interaction between the Test Script Builder, the Series 3700 and the opened script (the tabs displayed will depend on those selected in the menu).

**Instrument Console:** The Instrument Console is used to send commands to the connected Series 3700. Retrieved data (for example, readings) from commands and scripts appear in the console.

**Problems:** When a script is saved, error checking is performed. If a script error is detected, an "X" will appear in the script at or near the corrupt line of code. The Problems tab in the lower window pane will open automatically and provide a description of the error.

**Tasks:** When writing a script, a double dash (--) is used to designate that the text that follows is a comment and not script code. When using the "--TODO" comment in a script, it will also appear in the Tasks tab, where additional information can be added.

**Command Help:** Provides online help to the Instrument Command Library (ICL).

**Language Help:** Provides online help to the TSL programming language.

## Control icons

---

Control icons include:

1. **Open/Close Instrument:** Opens instrument resource if closed. Closes instrument resource if open.
2. **Clear Console Window:** Clears instrument console window.
3. **Abort Execution:** Halts execution of commands or scripts.
4. **Reset:** Aborts whatever the unit is doing and resets everything to the default state.
5. **Send Software Trigger:** Sends a software trigger to take readings.
6. **Menu:** Accesses the console menu.
7. **Minimize/Maximize:** Minimizes or maximizes the console window.

## How can I use TSB to make measurements?

**Step 1:** Reset instrument.

**Step 2:** Configure the DMM for desired measurements.

**Step 3:** Take the measurements.

The following example will configure the DMM for DC volt readings at 0.5plc on the 10 volt range. The example will take 10 readings and display them in the console window:

Command	Description
<code>reset()</code>	Reset the instrument.
<code>dmm.func = 'dcvolts'</code>	Select DC volts as DMM function.
<code>dmm.nplc = 0.5</code>	Set the NPLC for DC volts.
<code>dmm.range = 10</code>	Set the range for DC volts.
<code>for x = 1,10 do</code> <code>print(dmm.measure())</code> <code>end</code>	Take a reading a display it in console window 10 times.

The next example will configure the DMM the same as the above, except it will create a reading buffer and store the 10 readings in that buffer:

Command	Description
<code>reset()</code>	Reset the instrument.
<code>dmm.func = 'dcvolts'</code>	Select DC volts as DMM function.
<code>dmm.nplc = 0.5</code>	Set the NPLC for DC volts.
<code>dmm.range = 10</code>	Set the range for DC volts.
<code>mybuffer = dmm.makebuffer(1000)</code>	Create a reading buffer for 1000 readings named "mybuffer."
<code>dmm.measurecount = 10</code>	Set DMM to take 10 readings with each measure command.
<code>dmm.measure(mybuffer)</code>	Take 10 readings and store in mybuffer.
<code>printbuffer(1, 10, mybuffer)</code>	Display the 10 readings.

## How do I use other programs?

**NOTE** Also see the LabVIEW® and Visual Basic documentation for details on using those programs.

Test Script Builder is a tool for creating scripts. It includes built in color coding, debugging tools, and error handling. One way to interface with the Series 3700 is to use Test Script Builder to create scripts and store these scripts to non-volatile memory of the instrument. You can then call these scripts using the front panel LOAD menu or use the system test program to call user scripts or the functions these scripts create. Interfacing in this way may work well in situations where the output the only required output from the Series 3700 is digital output. However, in many situations, there is a need to gather some form of data from the Series 3700, whether that data be measurements or status information. Therefore, it is important that we now discuss how to use an external application development environment (ADE) to interface with the Series 3700. The discussion will center on the use of Visual Basic and LabVIEW, two of the most popular choices for ADE in the test and measurement industry. However, the concepts presented may be used in conjunction with other ADE.

### Fundamentals when using other programs

After selecting the communication interface of your choice (GPIB, USB or Ethernet), consult the applicable reference material for the ADE to understand how to send and receive strings to/from the Series 3700 via this interface. For USB, you will need to understand how to send and receive strings using VISA TMC protocol. Please refer to National Instruments VISA User and Reference manuals.

Next, refer to the ICL commands to determine which strings the Series 3700 can interpret. Refer to the ICL commands contained in the Series 3700 reference manual.

---

## Examples

---

Below is an example of how to send a reset command via GPIB in Visual Basic to a Model 3706 at GPIB address 16, using the Keithley/CEC GPIB card driver:

```
dim intStatus as integer

call Send (16, "reset()", intStatus)
```

This same example can be accomplished in LabVIEW using the **GPIB vi**.

Below is an example of how to send a reset command via USB in Visual Basic. The example below also shows the initialization of the VISA resource for clarity:

```
dim status as viStatus

dim vi as ViSession

dim strMsg as String

dim intRetCount as Integer

status = viOpen("USB0::0x05E6:0x3706::1234567::INSTR", VI_NULL,
VI_NULL, vi)

strMsg = "reset()"

status = viWrite(vi, strMsg, Len(strMsg), intRetCount)
```

This same example can be implemented in LabVIEW® using VISA.

---

## Using external programs with a script

---

A script is a simple combination of ICL and TSL commands. Remember that the Series 3700 has its own microprocessor and can compile and execute code. You will gain the greatest throughput using this method of distributed programming.

Test Script Builder (TSB) might be used to create and test scripts because its user interface offers several advantages including color coding, debugging tools, and error handling. However, you might wish for a third party ADE to handle the 'official' storing of scripts to the Series 3700 in a production test system. You can use the ADE of your choice to store debugged scripts to the instrument. To inform the Series 3700 that you are sending a script, you must surround the script with the commands `loadscript` and `endscript`. For more information on sending scripts to the instrument, please refer to the test script builder section contained in the Series 3700 reference manual.

Below is an example of sending scripts to the Series 3700 at GPIB address in Visual Basic using the Keithley Instrument GPIB card:

```
Call Send (16, "loadscript TSPeasyExample", intStatus)

Call Send(16, "channel.close()", intStatus)

Call Send(16, "print(dmm.measure())", intStatus)

Call send(16, "endscript", intStatus)
```

---

## Prompts

TSP prompts provide useful test script processor status information when loading and running scripts. Prompts can indicate when the Series 3700 has received a line of code and is awaiting other code for the script; prompts can also indicate if a script was received or executed successfully and when the script is complete; finally, a different prompt is returned when an error is generated, thus enabling much simpler error handling. If the TSP error prompt is received, the test program can then read the error queue and report back to the user.

It is important to remember, however, that if one desires to use prompts, then these prompts must be handled as soon as they are enabled. To enable prompts send the command `localnode.prompts = 1`. For more information on prompts, refer to the `localnode.prompts` command in the Series 3700 reference manual.

---

## Returning data from the Series 3700

Queries for TSP-based instruments do not end in a question mark as do SCPI instruments. Rather many of the commands can be converted to queries simply by whether or not you're assigning its result to a variable. The `print` statement is used to place the result of any ICL command function in the output queue of the Series 3700. This statement essentially serves as the query function for the Series 3700. The following example demonstrates how to use the Keithley Instruments GPIB card in Visual Basic to initiate and return a DMM measurement:

```
dim intNumBytes as Integer, intStatus as Integer

dim strReading as String

call Send (16, "print(dmm.measure())", intStatus)

call Enter(strReading, 1024, intNumBytes, 16, intStatus)
```

Similarly, any value can be printed at any time to the output queue using the `print` statement. One key advantage of this ability is that the user can set his own flag to indicate completion of a script or of a group of measurements. For instance, if the user wants to know when a script is completed, he can have the Series 3700 print "complete" on the last line of the script, and then the PC test program can poll the instrument until it receives the string "complete." An alternative way of notifying the end of a sweep is to use prompts. Please see prior section for more information.

There is one note of caution about printing results to the output queue. The output queue is limited to 32kB. If the amount of data to be sent to the output queue exceeds 32kB, then the Series 3700 will generate an error. Thus, it is important to remember that when returning large amounts of data from the instrument to do so by repetitively returning small groups of data at a time until all data has been returned. This is especially noteworthy when using the `printbuffer` command.

## Questions about Test Script Processor interaction

### What is a script?

A script is a collection of instrument control commands and programming statements to perform one or more operations or tasks. A script is stored in the Series 3700 and is run by its Test Script Processor (TSP).

#### User scripts

---

A user script is a script created by a user using the Test Script Builder or an external program. The user script is loaded in the Series 3700 and stored in volatile or nonvolatile memory. If stored in nonvolatile memory, the script will not be lost when the instrument is turned off.

Keithley Instruments will be posting approved user scripts donated by registered users on its web site. You will be able to download these user scripts into your Series 3700. Visit [www.keithley.com](http://www.keithley.com) for details.

### How do I run a script from the front panel?

Load tests from the LOAD TEST menu (access this menu by pressing the front panel's **LOAD** key).

From the front panel, a user script may, or may not be interactive. A non-interactive script requires no operator input and will run to completion when it is started.

The USER menu item does not contain scripts, but may contain any executable Lua chunk (Chunk defined). The chunk is sent to TSP. It cannot automatically execute a script. The Lua chunk must be something like "S1()" where "S1" is a script. The menu SCRIPTS snapshots all scripts in volatile memory that can be executed directly.

#### LOAD key

---

Loads scripts, along with Lua chunks added with `display.loadmenu.add` for execution. This key opens the LOAD TEST menu which contains the following menu items:

- **USER:** This menu item provides access to Lua chunks specified by `display.loadmenu.add` (not scripts).
- **SCRIPTS:** This menu item provides access to scripts created by the user. The scripts can be directly executed.

---

### Procedure to run scripts from front panel

---

1. Press the **LOAD** key to display the LOAD TEST menu.
2. Position the blinking cursor on the USER or SCRIPTS menu item and press the **ENTER** key (or the Wheel). Keep in mind that the Series 3700 is shipped with no user scripts loaded.
3. Position the blinking cursor on the test to be run.
4. Press the **RUN** key to start the test.
5. Enter any required test parameters using the front panel controls.

---

**NOTE** Test data can be stored in a buffer if a buffer is created and selected.

---

## How do I interact with scripts from Test Script Builder?

---

### Running a user script

---

#### Remote programming

To run a script using TSB Builder:

1. Enter the script in the script development pane.
2. Execute the script by right clicking on the script in development pane and select run as TSP file.

#### TSB Builder example:

For example, the following script will exclusively close channels 1 to 60 on Slot 4 while printing channels closed on Slot 4:

```
-- script to exclusively close channels 1 to 60 on Slot 4

for x = 4001, 4060 do

    channel.exclusiveclose('' .. x) -- covert the channel number to
string parameter

    print(channel.getclose('slot4')) -- display channel closed on
slot

end
```



**Telnet session example:**

The following is an example from a telnet session that creates a script called **slotquery** that will print out the identification strings of each module installed in a slot:

```
loadscript slotquery

>>>>

for x = 1, 6 do

>>>>

print(slot[x].idn)

>>>>

end

>>>>

endscript

TSP>

slotquery()

Empty Slot

Empty Slot

Empty Slot

3720,Dual 1x30 Multiplexer,00.80a,b9876543

Empty Slot

Empty Slot

TSP>
```

See the reference manual for more information on scripts.

**Front panel operation**

1. Press the **EXIT** key if not in local operation.
2. Press the **LOAD** key.
3. Select the **SCRIPTS** option.
4. Scroll through the list scripts and select (press the **ENTER** key). The script is now loaded for front panel use.
5. Press the **RUN** key to execute.

---

**NOTE** The previous front panel example does not display any print outputs. For example, selecting the previous example (slotquery) to run will appear as nothing happened.

---

**Deleting a user script**

---

A user script can be deleted from non-volatile memory of the Series 3700. The following command will delete the slotquery user script:

```
script.delete("slotquery")
```



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**Model No.** \_\_\_\_\_ **Serial No.** \_\_\_\_\_ **Date** \_\_\_\_\_

**Name and Telephone No.** \_\_\_\_\_

**Company** \_\_\_\_\_

List all control settings, describe problem and check boxes that apply to problem. \_\_\_\_\_

☐ Intermittent ☐ Analog output follows display ☐ Particular range or function bad; specify \_\_\_\_\_

☐ IEEE failure ☐ Obvious problem on power-up ☐ Batteries and fuses are OK

☐ Front panel operational ☐ All ranges or functions are bad ☐ Checked all cables

Display or output (check one)

☐ Drifts ☐ Unable to zero

☐ Unstable ☐ Will not read applied input

☐ Overload

☐ Calibration only ☐ Certificate of calibration required

☐ Data required

(attach any additional sheets as necessary)

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Also, describe signal source.

Where is the measurement being performed? (factory, controlled laboratory, out-of-doors, etc.)

\_\_\_\_\_

What power line voltage is used? \_\_\_\_\_ Ambient temperature?°F \_\_\_\_\_

Relative humidity? \_\_\_\_\_ Other? \_\_\_\_\_

Any additional information. (If special modifications have been made by the user, please describe.)

\_\_\_\_\_

**Be sure to include your name and phone number on this service form.**

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