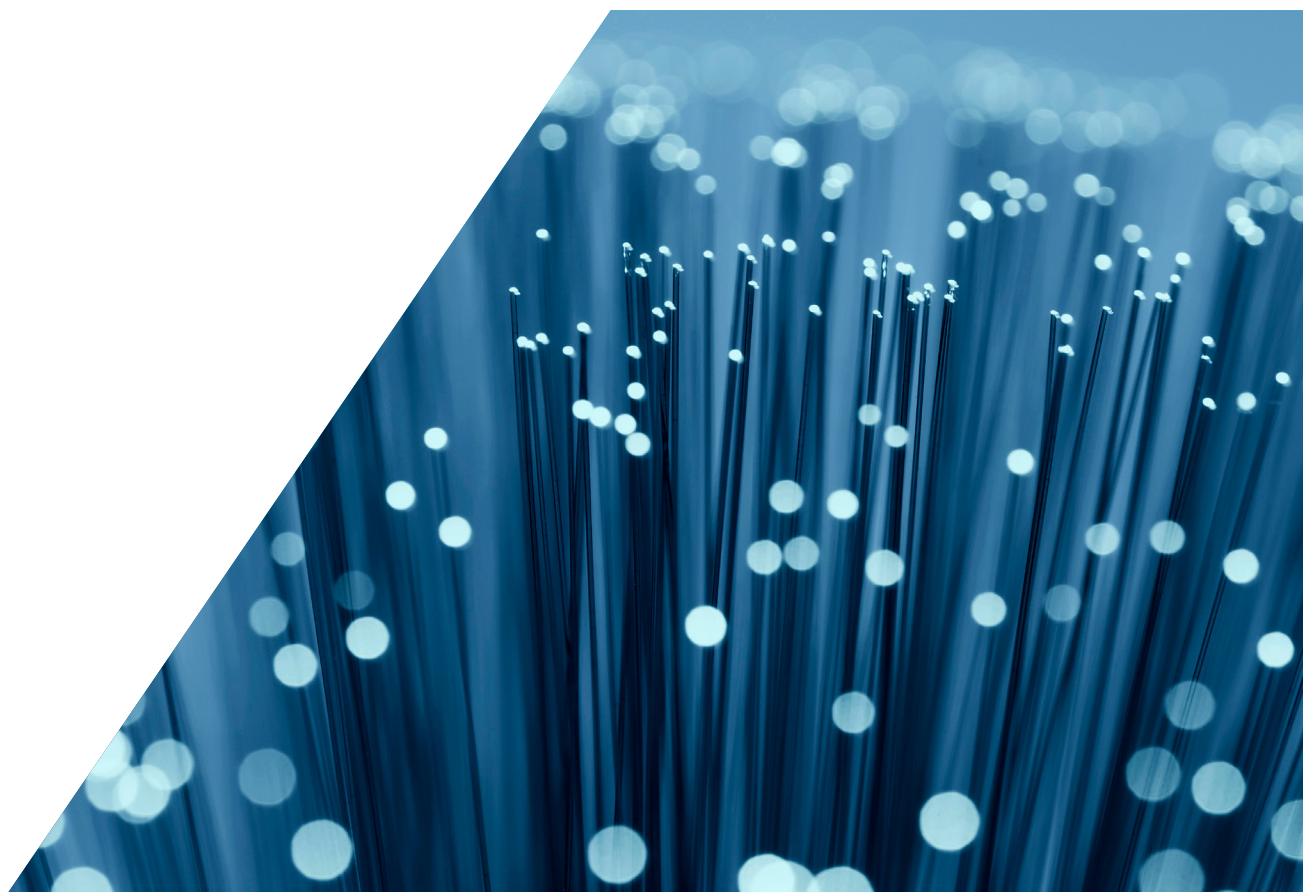




MP5103

Mainframe

REFERENCE MANUAL



MP5103 Mainframe

Reference Manual

Register now!

Click the following link to protect your product.

www.tek.com/register



077-1925-02 July 2026

Copyright © 2026, Tektronix, Inc. All rights reserved. Licensed software products are owned by Tektronix or its subsidiaries or suppliers, and are protected by national copyright laws and international treaty provisions. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specifications and price change privileges reserved.

TEKTRONIX and TEK are registered trademarks of Tektronix, Inc.

This document may contain computer-aided design (CAD) graphics that are intended for illustrative purposes only.

The Lua 5.0 software and associated documentation files are copyright © 2003 - 2004, Lua.org, PUC-Rio. You can access terms of license for the Lua software and associated documentation at the Lua licensing site (<https://www.lua.org/license.html>).

These are the original instructions in English.

Go to www.tek.com/en/eula to read the Tektronix End User License Agreement.



Contacting Tektronix

Tektronix, Inc.
13725 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

For product information, sales, service, and technical support:

In North America, call 1-800-833-9200.

Worldwide, visit www.tek.com to find contacts in your area.

Contents

Safety precautions	5
Introduction	7
Welcome	7
Extended warranty	7
Contact information	7
Product documentation	7
Instrument description	8
MP5103 front panel	8
MP5103 rear panel	9
Identify the serial number	9
Installation	10
MP5103 installation	10
Handling precautions	10
Mainframe and module weights	10
Dimensions	10
MP5103 dimensions front view	10
MP5103 dimensions top view	11
Rack mount considerations	11
Mount the mainframe	12
Airflow	12
Rack power distribution	12
Supply connection and grounding requirements	12
Interlock installation	13
Line frequency and voltage	14
Install or remove a module with the mainframe powered off	14
Install or remove a module with the mainframe powered on	16
Start a module manually	19
Module status display descriptions	19
Slot covers	20
Turn the instrument on or off	20
Warmup period	21
Configure remote communications	22
Remote communications interfaces	22
LAN	22
Connect the LAN cable	22
Set up LAN communications on the instrument	23
Set up LAN communications on the computer	25

LAN interface protocols	25
Reset LAN settings	26
LAN troubleshooting suggestions.	26
USB.	27
Connect to USB.	27
Communicate with mainframe through USB.	28
Enable remote communications.	28
Set the mainframe password.	28
Enable and disable LAN communications.	29
Log in to the MP5103.	33
Log out of the MP5103.	34
Communications troubleshooting.	34
Web interface.	35
Disable and enable the web interface.	38
TSP-Link.	39
TSP-Net.	40
Configure triggering.	42
Digital I/O.	42
Maintenance and troubleshooting.	44
Introduction.	44
Update the firmware.	44
Prepare to update.	44
Update the firmware from the front panel.	44
Update the firmware with TSP Toolkit.	45
Update the firmware using TSP.	46
Update the firmware using the web interface.	47
Update drivers.	47
Clean the front-panel mainframe display.	48
Event log.	48
Factory service.	49
Identify the mainframe.	49
License information.	49

Safety precautions

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

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

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

The types of product users are:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The  symbol indicates a connection terminal to the equipment frame.

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

Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



The  symbol indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Tektronix Web site (www.tek.com/productrecycling).

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

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

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

Instrumentation and accessories shall not be connected to humans.

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

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

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

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

This product may contain a small installed lithium metal button cell. Please properly dispose of or recycle the cell at its end of life according to local government regulations.

This product may contain one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling. See <http://www.dtsc.ca.gov/hazardouswaste/perchlorate> for additional information.

If present, the small lithium primary button cell contained in this equipment does not exceed 1 gram of lithium metal content per cell, and the cell type has been shown by the manufacturer to comply with the applicable requirements of the UN Manual of Tests and Criteria Part III, Sub-section 38.3. Consult your carrier to determine which lithium battery transportation requirements are applicable to your configuration, including to its re-packaging and re-labeling, prior to reshipment of the product by any mode of transport.

Introduction

Welcome

Thank you for choosing a Tektronix product.

The MP5103 mainframe is a high-density, low-profile (1U), rack-mounted mainframe instrument suitable for production test, measurement, and power supply applications.

The MP5103 has three module slots for multichannel source-measure units (SMUs) and power supply units (PSUs), allowing you to easily add and remove instruments to meet dynamic test configurations.

The test system can be used in a variety of test applications, including validation and automated production workflow for semiconductor and optoelectronics, as well as LED and chipset characterization in military, government, and consumer settings.

Extended warranty

Additional years of warranty coverage are available on many products. These valuable contracts protect you from unbudgeted service expenses and provide additional years of protection at a fraction of the price of a repair. Extended warranties are available on new and existing products. Contact your local Tektronix office, sales partner, or distributor for details.

Contact information

If you have any questions after you review the information in this documentation, please contact your local Tektronix office, sales partner, or distributor. You can also call the Tektronix corporate headquarters (toll-free inside the U.S. and Canada only) at 1-800-833-9200. For worldwide contact numbers, visit [tek.com/contact-tek](https://www.tek.com/contact-tek).

Product documentation

The MP5000 Series Modules documentation is available for download as PDFs from [tek.com](https://www.tek.com). The documentation includes:

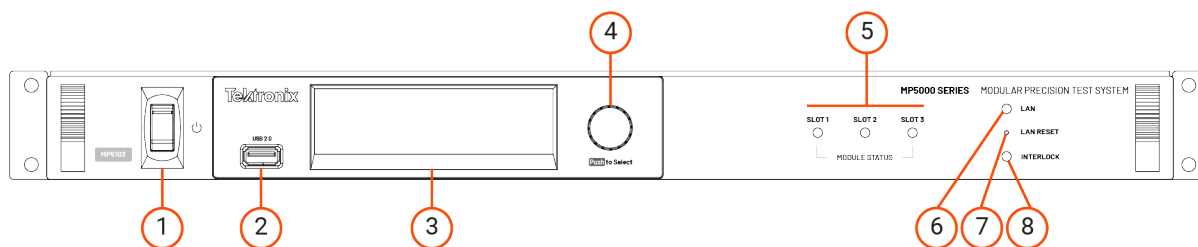
- **User Manual:** Provides descriptions of installation, the front and rear panels, basic operating information, and maintenance.
- **Reference Manual:** Provides advanced operation topics.
- **Programmer Manual:** Provides measurement configuration, trigger model, reading buffer, TSP-Link, TSP-Net, and status model information. It also includes descriptions for all mainframe and module TSP commands.
- **Additional product information:** Product product datasheets, product specifications, and accessory information.

Additional drivers and software are available for download from [Datasheets, Manuals, and Software Downloads](#), including TSP Toolkit, an open source scripting tool. TSP Toolkit is a Visual Studio Code (VS Code) extension used to develop TSP™ (Test Script Processor) test scripts.

Instrument description

MP5103 front panel

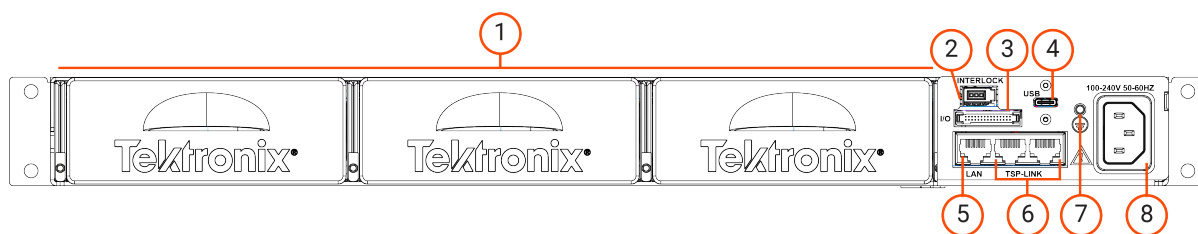
The front panel of the MP5103 is shown in the following figure. The description of the controls, USB port, and indicators follow the figure.



1	Power/reset switch	The power switch turns the instrument on or off. The indicator is illuminated when the instrument is on. The power switch powers all modules.
2	USB-A port	USB Type A connection. You can use this connection to update the firmware or load scripts from a USB flash drive.
3	Display	The MP5103 has a touchscreen display. By default, the screen turns off after 10 minutes of inactivity.
4	Navigation wheel	Turn the navigation wheel to scroll and highlight a value or menu option on the display. Press the wheel to select the highlighted choice or edit the selected field.
5	Module status indicators	The module status indicators display the status of the module slots. When viewed from the front panel of the mainframe, the order of indicators matches the order of slots.
6	LAN indicator	Illuminates when the instrument is connected to a local area network (LAN).
7	LAN RESET	Reverts the LAN settings and the instrument password to default values. Insert a straightened paper clip or a similar thin rigid object to reset the LAN.
8	INTERLOCK indicator	Illuminates when the interlock circuit is asserted, which means that instrument outputs can be turned on and measurements can be made.

MP5103 rear panel

The rear panel of the MP5103 is shown in the following figure. The description of the connectors and other panel details follow the figure.



1	Slots (shown with slot covers)	You can install a module into any of the three slots. When you are facing the rear panel of the mainframe, the slots are numbered from right to left, with slot 1 nearest to the interlock, digital I/O, and LAN connectors. Each slot has two rows of 140-pin differential signal connectors and 4-pin power connectors to interface with modules.
2	Interlock connector	5 V system safety interlock connection.
3	I/O connector	30-pin connector. Includes eighteen digital input or output pins.
4	USB-C port	USB 3.0 Type C connection with optional panel-mount screw connectors for security. You can use this connection for communication, control, and data transfer.
5	LAN connector	1 GB LAN port.
6	TSP-Link connectors	TSP-Link™ system expansion interface ports.
7	Grounding screw	Connects to protective earth (safety ground).
8	Power connector	Connect the line cord to the power receptacle and a grounded AC power outlet.

Identify the serial number

The MP5103 mainframe and each of the modules have individual serial numbers. The serial numbers are in the following places:

- **A sticker on the housing:** On the modules, this sticker is on the top panel of the housing. On the mainframe, the sticker is on the side, near the rear of the unit.
- **From the front-panel display:** On the Home screen, select the information icon, then use the navigation wheel to scroll.
- **On the virtual web interface:** See [Web interface](#) (on page 35) to view the information.
- **Using remote commands:** Send the `localnode.serialno` command for the mainframe or the `slot[Z].serialno` command for the modules. See *MP5000 Series Programmer Manual* for command descriptions.

Installation

MP5103 installation

The MP5103 is intended to be mounted in a rack only. For detailed instructions, refer to the documentation for the Model 4299-15 Fixed Rack-Mount Kit, available from tek.com.

Any other rack-mount kits or methods do not guarantee or provide the presumption of a safe installation.

WARNING: Rack mounting the MP5103 requires two people. Failure to recognize and observe standard safety precautions could result in personal injury.

Handling precautions

Make sure to handle instruments carefully. Do not touch connectors or electrical contacts. Contamination from foreign materials such as dirt, dust, and body oils can substantially lower leakage resistances, which will degrade instrument performance.

WARNING: The information in this section is intended only for qualified personnel. Do not perform these procedures unless you are qualified. Failure to recognize and observe standard safety precautions could result in personal injury or death due to electric shock.

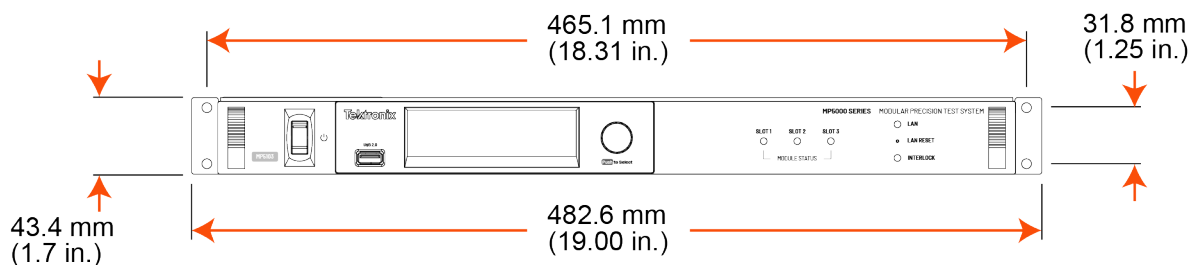
Mainframe and module weights

- **Mainframe:** 12.8 kg (28 lb)
- **Module, average:** 1.25 kg (2.75 lb)

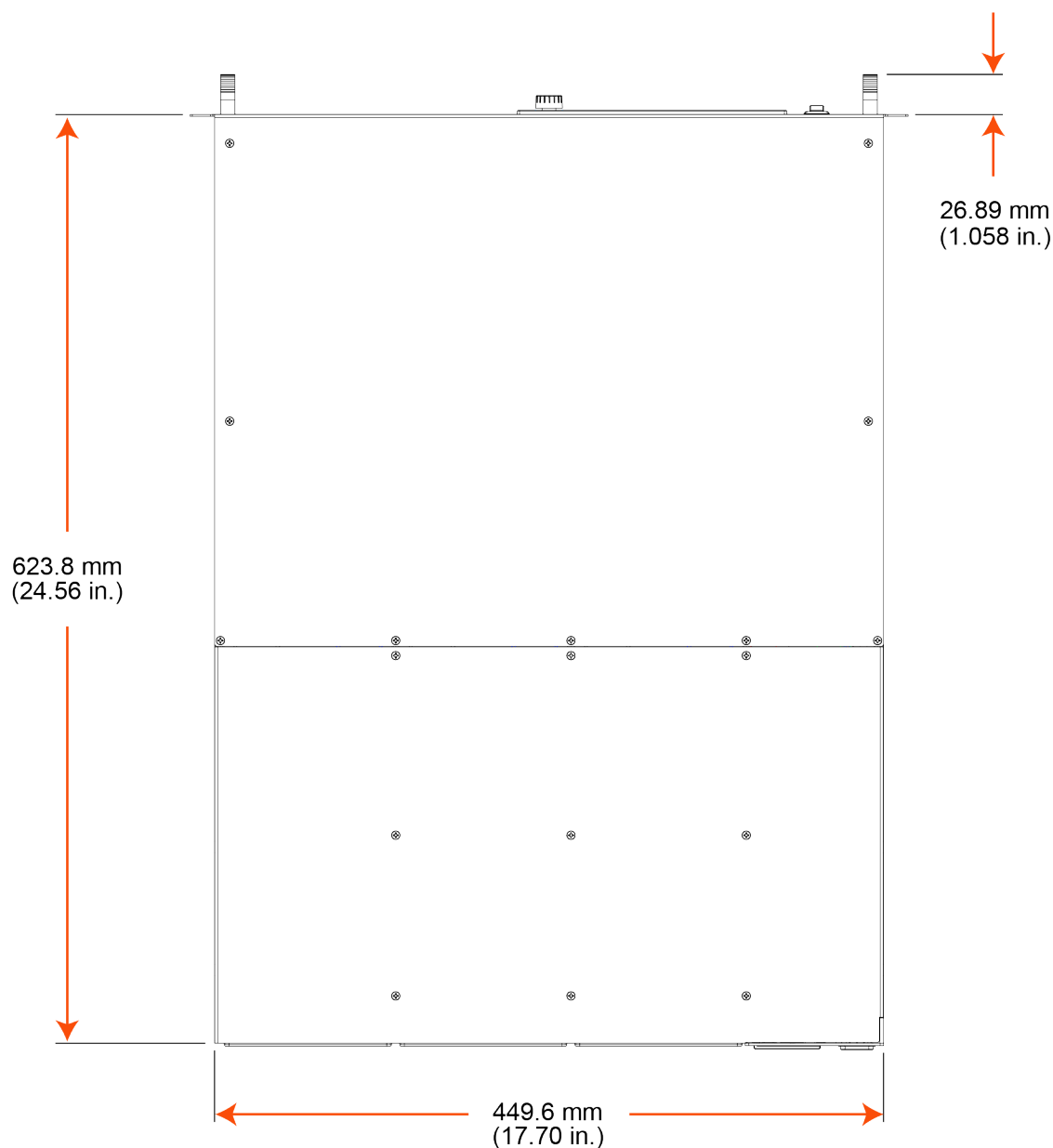
Dimensions

The following figures show the MP5103 and module dimensions.

MP5103 dimensions front view



MP5103 dimensions top view



Rack mount considerations

NOTE: The cabinet used to house the MP5103 must meet specific structural requirements for safe operation as described here.

The MP5103 is designed to fit in a standard 482.6 mm (19 in.) test instrumentation rack. The rack must have the following dimensions:

- **Minimum depth:** 787.4 mm (31 in.) with 152.4 mm (6 in.) of clear space for cabling and ventilation.
- **Width:** At least 12.7 mm (0.5 in.) of unrestricted space next to the side air vents.
- **Vertical Spacing:** No space is required between MP5103 mainframes. They can be stacked.

Mount the mainframe

The MP5103 is provided with the 4299-15 Fixed Rack-Mount Kit. The rack may use either a fixed installation or a shelf mount. If using a shelf mount, the instrument may require more than 1U of vertical space to install. Allow for additional vertical space as needed to accommodate the instrument.

When choosing a location in the rack to mount the MP5103, consider cabling to devices under test (DUTs), cooling, and access to the front panel.

Airflow

The MP5103 has side air intakes and rear and side exhaust vents. All sides must be unobstructed to allow for airflow and to dissipate heat.

Excessive heat could damage the MP5103 and degrade its performance. Only operate the MP5103 in an environment where the ambient temperature does not exceed 50 °C.

CAUTION: To prevent damaging heat build-up and ensure specified performance, use the following guidelines.

- The side vents and rear and side outlet fans must be unobstructed to properly dissipate heat. Even partial blockage could impair proper cooling.
 - Do not position any devices adjacent to the MP5103 that force air (heated or unheated) toward it.
 - When rack mounting the MP5103, make sure there is adequate airflow around all sides of the instrument to ensure proper cooling. Adequate airflow enables air temperatures within approximately 25.4 mm (1 in.) of the MP5103 surfaces to remain within specified limits under all operating conditions.
 - The right side of the MP5103 has a cool air intake. It is recommended that there is 18 °C to 28 °C air available at the left and right sides of the instrument. The rear and left sides of the MP5103 also contain exhaust outlets.
 - If you rack mount high power-dissipation equipment next to the MP5103, it could cause excessive heating. To produce specified MP5103 accuracies, maintain the specified ambient temperature around the intake vents of the MP5103. In rack configurations with convection cooling only (not recommended), place the hottest, nonprecision equipment in the rack as far above the MP5103 as practical.
 - If the MP5103 is installed in a closed cabinet, the cabinet should have forced-air cooling provided at no less than 730 CFM.
 - There must be at least 152.4 mm (6 in.) of space for exhaust vents at rear of mainframe.
-

Rack power distribution

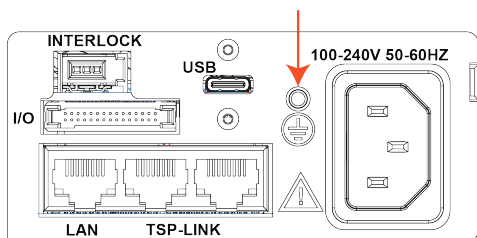
The MP5103 is rated for 1000 VA. Power distribution units must be able to supply enough power for any mainframes and other installed instrumentation.

Supply connection and grounding requirements

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

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

Your MP5103 includes a grounding cable for connection to protective earth (safety ground). Connect one lugged end of this cable to the grounding screw on the rear panel of your MP5103, as shown in the following figure.



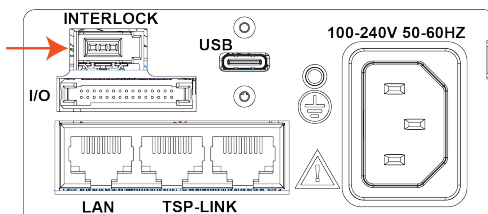
Interlock installation

The MP5103 provides an interlock circuit. This circuit includes a switch that is normally open and must be asserted (closed) to enable the outputs or make measurements with installed modules.

When the interlock is asserted, the green front-panel INTERLOCK indicator is illuminated.

WARNING: The MP5103 interlock circuit must be positively activated to enable the output of installed modules. The interlock helps facilitate safe operation of the equipment in a test system. Bypassing the interlock could expose the operator to hazardous voltages that could result in personal injury or death.

The switch circuit can be installed on the lid of a test fixture, the enclosure of a semiconductor prober or device handler, or on the door or doors of a test equipment rack. The circuit opens when an access door is opened and closes when the door is closed.



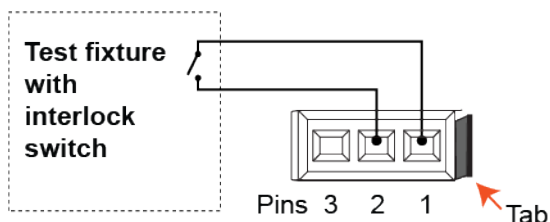
You can use the interlock connector supplied with your MP5103 to make the interlock connection, though you must supply the connection wire. The recommended wire is:

- 20 AWG to 24 AWG copper alloy
- 7 to 19 bare and tinned strands
- 0.25 mm² to 0.50 mm²
- Flexible vinyl, semi-flexible vinyl, polyethylene, x-linked polyethylene, or PTFE

To ensure proper interlock operation, the combined resistance of the external interlock switch and connection wires must be less than 10 Ω when the switch is closed.

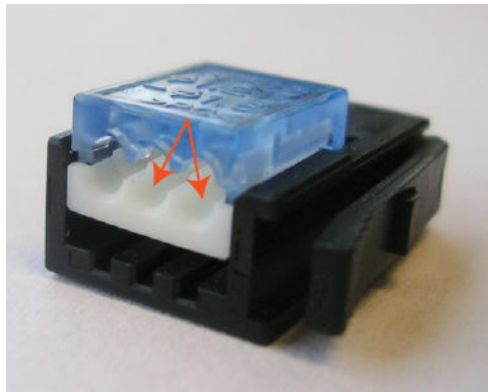
The interlock pin locations and connections are shown in the following figure. The pins are:

- Pin 3: Earth and chassis ground
- Pin 2: Interlock
- Pin 1 (next to tab): +6 V DC out (current limited)



To assemble the interlock:

1. Insert the wires into the connector at the locations shown in the following graphic.



2. Use a pair of pliers to squeeze the connector sections together.

You cannot disassemble the connector and reuse it. The replacement part is Tektronix part number CS-1616-3, Safety Interlock Mating Connector, or 3M part number 37103-A165-00E MB.

Line frequency and voltage

The MP5103 requires a line voltage of 100 V AC to 240 V AC ($\pm 10\%$) and a line frequency of 50 Hz or 60 Hz.

By default, the instrument detects the power line frequency at start up.

All modules use the power line frequency value to calculate the measure rate.

NOTE: The mainframe may display a line frequency detector error in certain operating environments. This is often caused by power mains electrical noise. In these cases, you can set the line frequency to 50 Hz or 60 Hz with the `localnode.linefreq` TSP command attribute. Consider using a power line conditioner or locate the instrument in an area with better line power quality to provide a low-noise signal to the mainframe. See the *MP5000 Series Modular Precision Test System Programmer Manual* for more information.

Install or remove a module with the mainframe powered off

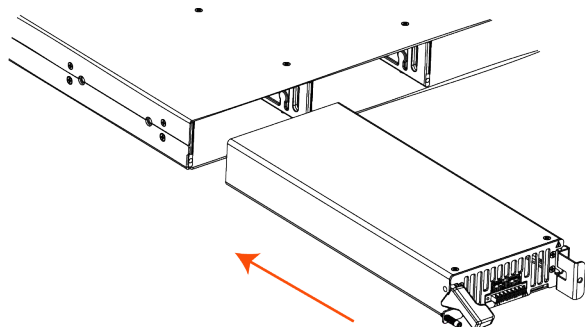
You can install or remove a module with the mainframe powered off and with the modules disconnected from any devices under test (DUTs).

After installation and powering the mainframe, if your module does not start automatically, you may need to manually issue a command to start it. See [Start a module manually](#) (on page 19) or see the `slot.start()`, `slot.stop()`, `slot.autorestart()`, and `slot.autostart` commands in the *MP5000 Series Programmer Manual*, available from tek.com.

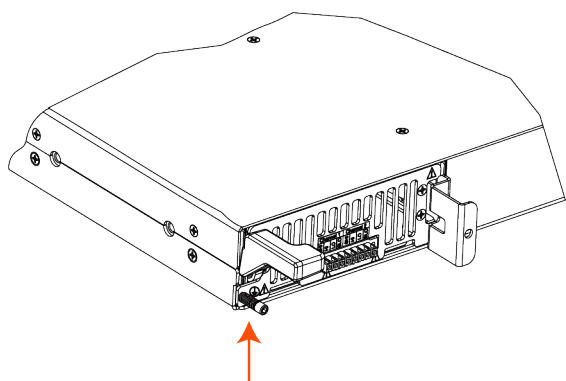
WARNING: Hazardous voltages may be present on the output and guard terminals. To prevent electrical shock that could cause injury or death, NEVER make or break connections to the MP5103 modules while the slot is powered on. Power down the slot before handling cables connected to the outputs. Verify that there is no voltage on the module's terminals before making connections between the module and the DUT. Placing the output in standby mode does not guarantee that the outputs are not powered if a hardware or software fault occurs. For the safest operation, power down the MP5103 mainframe before making or breaking connections to the MP5103 modules.

To install a module:

1. Remove the slot cover, if necessary.
2. Place the module into an empty slot, then push inward until the module is seated.



3. Use a tool that matches the screw head type to fasten the module retention screw to 0.45 N-m (4 in. lb).



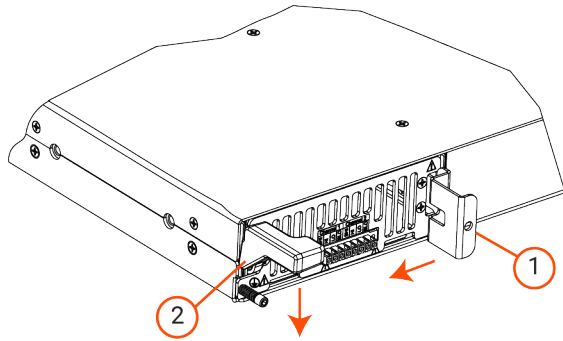
WARNING: The module retention screw must be securely fastened to provide proper safety ground for the module. All modules must be secured in the mainframe with this screw to prevent death or serious injury due to electric shock.

When you turn on the instrument, the LED indicator for the module slot on the front of the mainframe should be solid green.

To remove a module:

1. Make sure that the mainframe is powered off.
2. Loosen the module retention screw.

3. While pressing inward on the spring bracket on the right of the module, press down on the release lever.



1	Spring bracket
2	Release lever

4. Slide the module out and away from the mainframe.
5. If you are not installing another module in its place, install a cover over the empty module slot. See [Slot covers](#) (on page 20) for more information.

Install or remove a module with the mainframe powered on

You can install or remove a module with the mainframe powered on. The power to the slot that contains the module must be powered down before removal. Modules must be disconnected from any DUTs.

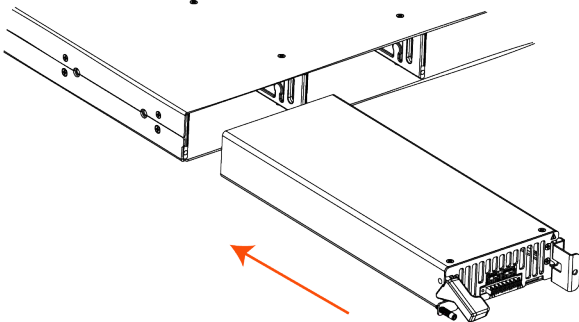
If your module does not start automatically, you may need to manually start it. See [Start a module manually](#) (on page 19) or see the `slot.start()`, `slot.stop()`, `slot.autorestart()`, and `slot.autostart` commands in the *MP5000 Series Programmer Manual*, available from tek.com.

WARNING: Hazardous voltages may be present on the output and guard terminals. To prevent electrical shock that could cause injury or death, NEVER make or break connections to the MP5103 modules while the slot is powered on. Power down the slot before handling cables connected to the outputs. Verify that there is no voltage on the module's terminals before making connections between the module and the DUT. Placing the output in standby mode does not guarantee that the outputs are not powered if a hardware or software fault occurs. For the safest operation, power down the MP5103 mainframe before making or breaking connections to the MP5103 modules.

CAUTION: Failure to power down the slot properly before module removal may result in damage to the module.

To install a module:

1. Remove the slot cover, if necessary.
2. Place the module into an empty slot, then push inward until the module is seated. If `slot.autostart` is set to enable, the module starts automatically.

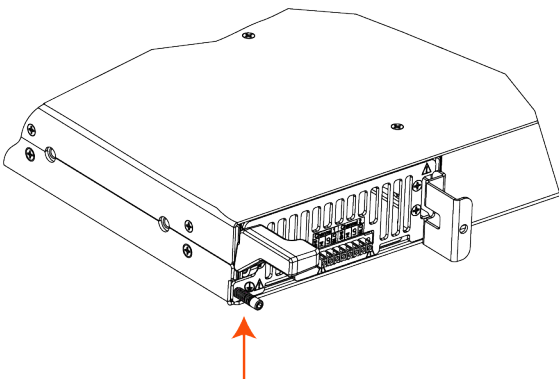


3. Verify that the Module Status indicator on the front panel of the mainframe turns solid green.

NOTE: If the Module Status indicator light remains solid amber, see [Start a module manually](#) (on page 19) and [Module status display descriptions](#) (on page 19).

4. Use a tool that matches the screw head type to fasten the module ground screws to 0.45 N-m (4 in. lb).

WARNING: The module ground screw must be fastened securely to provide proper safety ground for the module. All modules must be secured in the mainframe with this screw to prevent death or serious injury due to electric shock.

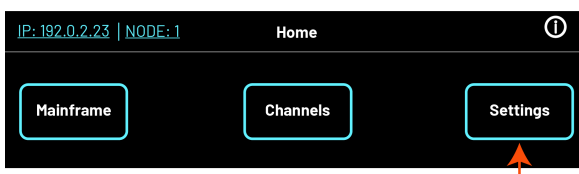


NOTE: The module shown in the graphics is for reference only. Your module may appear different than pictured.

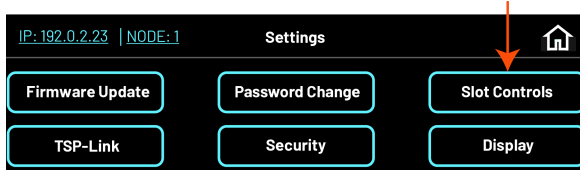
To remove a module:

NOTE: The following procedure powers down the module from the front panel. Alternatively, you can send `slot.stop(slot)`, where `slot` is the number of the slot to power down.

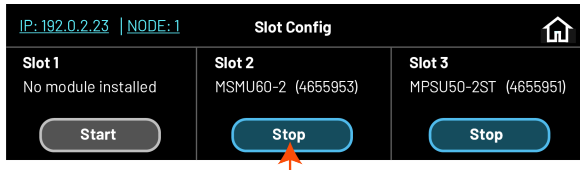
1. From the Home screen, select **Settings**.



2. Select **Slot Controls**.



3. Select **Stop** on the control button for the slot to remove power.



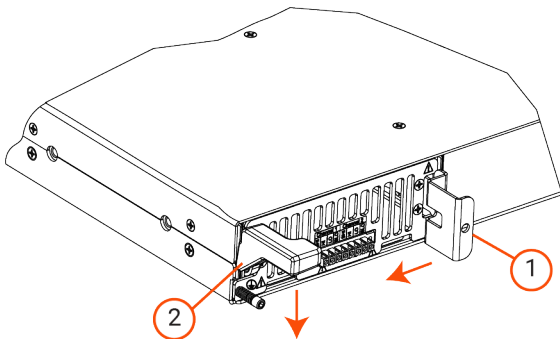
4. Select **OK** when prompted to confirm powering down the slot.

5. The display indicates Module Stopped. The front panel Module Status slot LED turns solid amber, indicating that the module is safe to remove.



CAUTION: If the module does not power down properly, turn the entire mainframe off before removing a module.

6. Use a tool that matches the screw head type to loosen the module ground screw at the lower-left of the module frame.
7. While pressing inward on the spring bracket on the right of the module, press down on the release lever.



8. Slide the module out and away from the mainframe.
9. If you are not installing another module in its place, install a cover over the empty module slot. See [Slot covers](#) (on page 20) for more information.

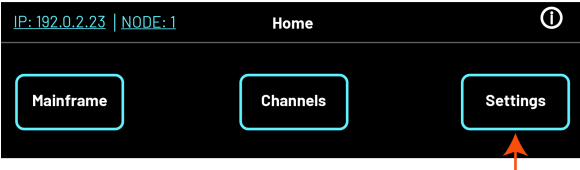
Start a module manually

If your module does not start automatically, you may need to manually start it.

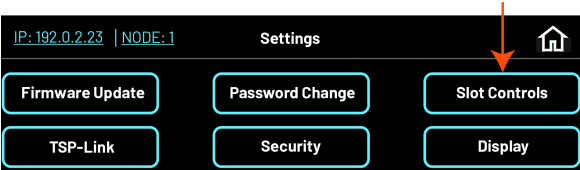
To start a module:

NOTE: The below procedure powers up the module from the front panel. Alternatively, you can either send `slot.start(slot)`, where `slot` is the number of the slot to power up, or use the web interface to power up or down a module by navigating to **Settings > Slot Controls**.

1. From the Home screen, select **Settings**.



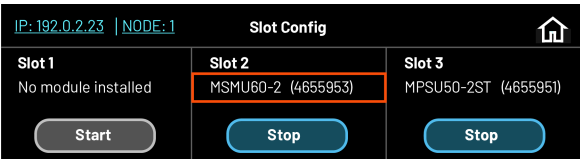
2. Select **Slot Controls**.



3. Select **Start** on the control button of the stopped slot. A message is displayed that states that the module is starting and the front panel Module Status LED flashes amber.



4. The module information is displayed. The front-panel Module Status slot LED turns solid green, indicating that the module has started.



Module status display descriptions

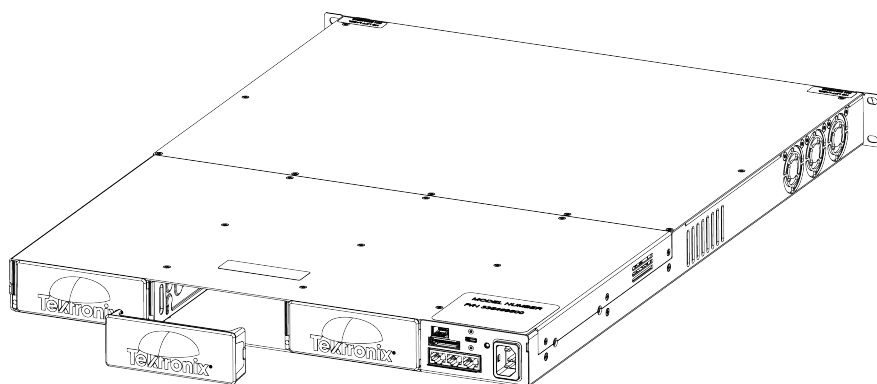
The module status LED indicators are on the front panel of the MP5103 mainframe. They show the status of modules installed in the mainframe.

LED color	Description
Off	There is no module in the slot.
Solid green	The module is running and all outputs are off.

LED color	Description
Solid blue	The module is running and some outputs are on.
Flashing amber	The module is powering up or powering down.
Solid amber	The module powered down in a known good condition. The module is safe to remove.
Flashing red	The module encountered a fatal condition and the module is powering down.
Solid red	The module encountered a fatal condition and it is powered off. The module is safe to remove.
Alternating red and green	The module is in a temporary unusable condition such as thermal shutdown or during a firmware update. In this state, the module is powered up and the outputs are off, but the outputs cannot be turned on until the condition is resolved.

Slot covers

Install slot covers over unused module slots to maintain proper instrument ventilation and operating temperatures and to prevent foreign objects from contaminating the slots.



Turn the instrument on or off

WARNING: The power cord supplied with the MP5103 contains a separate protective earth (safety ground) wire for use with grounded outlets. When proper connections are made, the instrument chassis is connected to power-line ground through the ground wire in the power cord. In addition, a chassis ground connection is provided through a screw on the rear panel. This terminal should be connected to a known protective earth. In the event of a failure, not using a properly grounded protective earth and grounded outlet may result in personal injury or death due to electric shock.

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

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

NOTE: On some sensitive or easily damaged devices under test (DUTs), the instrument power-up and power-down sequence can apply transient signals to the DUT that may affect or damage it. When testing this type of DUT, it is recommended that you do not make final connections to the DUT until the instrument has completed its power-up sequence and is in a known operating state. Disconnect the DUT from the instrument before turning the instrument off. Only qualified personnel, as identified by the responsible body, should make these connections.

WARNING: To prevent any human contact with a live conductor, connections to the DUT must be fully insulated and the final connections to the DUT must only use safety-rated safety-jack-socket connectors that do not allow bodily contact.

Follow the procedure below to connect the MP5103 to line power and turn on the instrument.

To turn the MP5103 on or off:

1. Before you plug in the power cord, make sure that the front-panel **POWER** switch is in the off (O) position.
2. Connect the socket end of the supplied power cord to the AC receptacle on the rear panel.
3. Connect the other end of the power cord to a grounded AC outlet.
4. Press the front-panel **POWER** switch to place it in the on (I) position.
5. To turn your instrument off, press the front-panel **POWER** switch to place it in the off (O) position.

Warmup period

The MP5103 and any installed modules should be turned on and allowed to warm up for at least 30 minutes.

Configure remote communications

Remote communications interfaces

The MP5103 supports the following remote interfaces:

- **LAN:** Ethernet local area network communications.
- **USB:** Type C USB port.
- **TSP-Link:** A high-speed trigger synchronization and communications bus that test system builders can use to connect multiple TSP-enabled instruments in a primary-and-subordinate configuration. Test Script Processor (TSP) is an instrument automation command set and programming language.
- **TSP-Net:** A simple socket-like programming interface to instruments enabled for Test Script Processor (TSP) that can also control ethernet-enabled devices directly through its LAN port.
- **Web interface:** If you are connected to the MP5103 using LAN communications, you can use an internet browser to connect to the instrument.

LAN

You can communicate with the instrument using a local area network (LAN). The LAN interface can be used to build flexible test systems that include web access and feature TSP Toolkit. This section provides an overview of LAN communications for the MP5103.

When you connect using a LAN, you can also use a web browser to access the internal web page of the instrument and change some of the instrument settings.

The MP5103 is a version 1.6 LXI Device Specification 2023 compliant instrument that supports TCP/IP and complies with IEEE Std 802.3 (ethernet LAN). There is one LAN port on the rear panel of the instrument that supports full connectivity on a 10 Mbps, 100 Mbps, or 1000 Mbps network. The MP5103 automatically detects the speed.

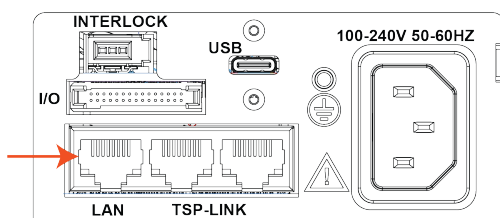
The MP5103 also supports Multicast DNS (mDNS) and DNS Service Discovery (DNS-SD), which are useful on a LAN with no central administration.

NOTE: Contact your network administrator to confirm your specific network requirements before setting up a LAN connection. If you have problems setting up the LAN, refer to [LAN troubleshooting suggestions](#) (on page 26).

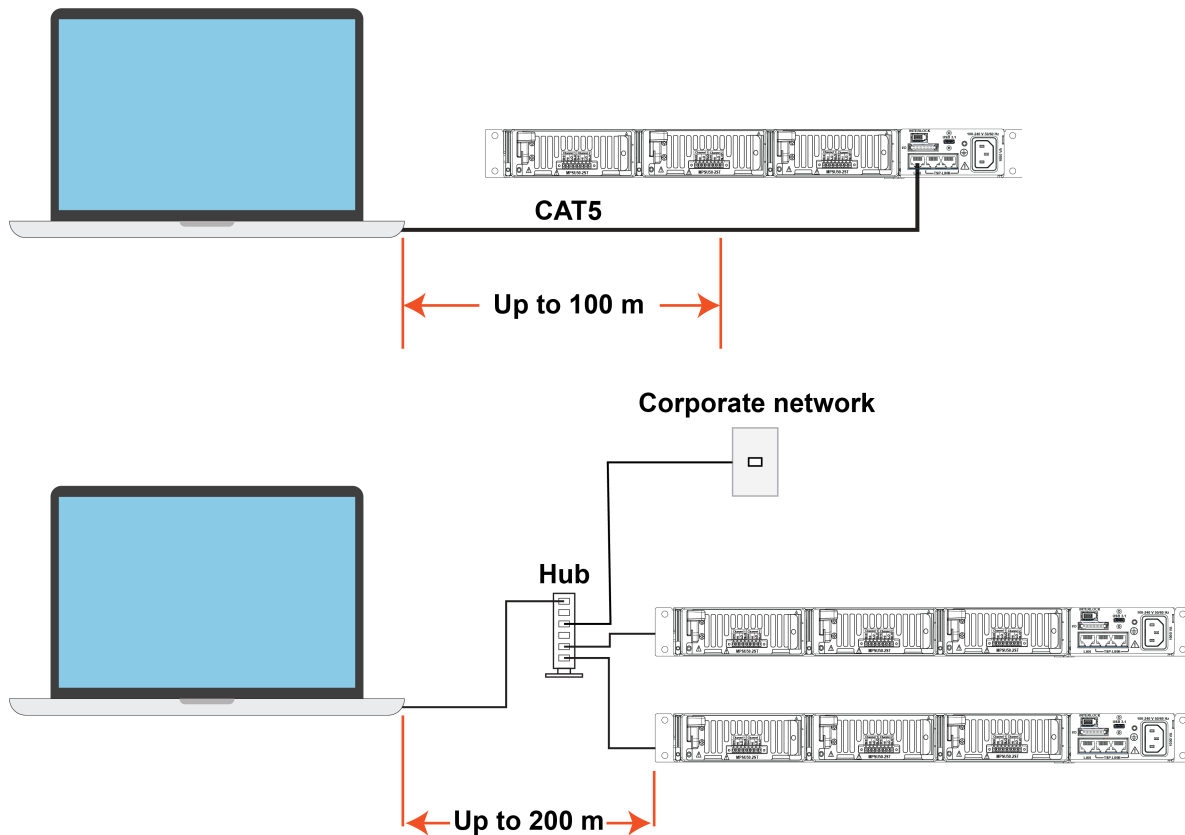
Connect the LAN cable

The MP5103 includes an RJ-45 LAN cable. You can use this cable for the TSP-Link network or LAN communications.

The following figure shows the location of the LAN port on the rear panel of the instrument. Connect the LAN cable between this connection and the LAN port on your computer.



You can connect the instrument to the LAN in a one-to-one, one-to-many, two network card, or enterprise configuration, as described in the following topics.



Set up LAN communications on the instrument

This section describes how to set up manual or automatic LAN communications on the instrument.

NOTE: You can check LAN settings remotely with TSP commands or with the web interface. See [Web Interface](#) (on page 35) and the *MP5000 Series Programmer Manual* for more information.

Check communications settings

Before configuring the LAN, you can check the communications settings on the instrument without making any changes.

To check communications settings from the front-panel display:

1. From the Home screen, select the IP address of the instrument. If you have not connected a LAN cable, the address is 0.0.0.0.
2. Use the navigation wheel to scroll through the LAN settings.

Set up automatic LAN configuration

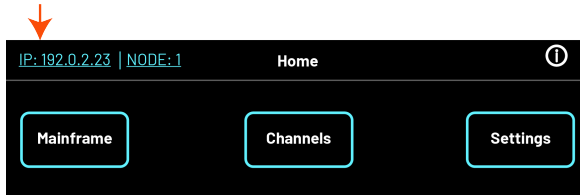
If you are connecting to a LAN that has a DHCP server or if you have a direct connection between the instrument and a host computer, you can use automatic IP address selection.

If you select Auto, the instrument attempts to get an IP address from a DHCP server. If this fails, it reverts to an IP address in the range of 169.254.1.0 through 169.254.254.255.

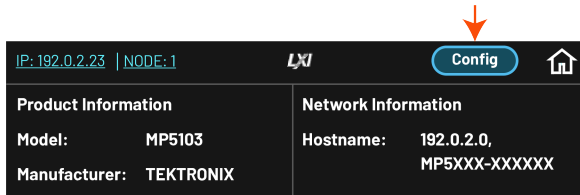
NOTE: Both the host computer and the instrument should be set to use automatic LAN configuration. Though it is possible to have one set to manual configuration, it is more complicated to set up.

To set up automatic IP address selection from the front-panel display:

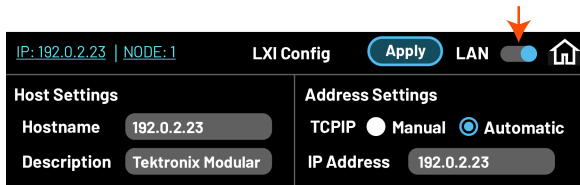
1. From the Home screen, select the IP address of the instrument.



2. Select **Config**.



3. Select the **LAN** slider to enable LAN if it is not enabled.



4. Next to Address Settings > TCPIP, select **Automatic**.
5. Select **Submit** to save your settings.

Set up manual LAN configuration

If necessary, you can set the IP address on the instrument manually.

You can also enable or disable the DNS settings and assign a host name to the DNS server.

NOTE: Contact your corporate information technology (IT) department to secure a valid IP address for the instrument when placing the instrument on a corporate network.

To set up manual IP address selection on the instrument:

1. From the Home screen, select the IP address of the instrument.
2. Select **Config**.
3. Select the **LAN** slider to enable LAN.
4. Next to **Address Settings > TCPIP**, select **Manual**.
5. Enter the manual IP address details.
6. Select **Submit** to save your settings.

Set up LAN communications on the computer

NOTE: Do not change your IP address without consulting your system administrator. If you enter an incorrect IP address, it can prevent your computer from connecting to your corporate network or it may cause interference with another networked computer.

Record all network configurations before modifying any existing network configuration information on the network interface card. Once the network configuration settings are updated, the previous information is lost. This may cause a problem reconnecting the host computer to a corporate network, particularly if DHCP is disabled.

Be sure to return all settings to their original configuration before reconnecting the host computer to a corporate network. Contact your system administrator for more information.

Verify the LAN connection on the MP5103

Make sure that your MP5103 mainframe is connected to the network by confirming that your instrument was assigned an IP address.

- To verify the LAN connection from the Home screen, confirm that an IP address has been assigned to the mainframe.
- A green LAN status indicator on the mainframe front panel confirms that your mainframe was assigned an IP address.
- You can verify communications with the controlling computer by sending a network ping request.

NOTE: If ping requests are disabled using the `lan.ping.enable` command or from the mainframe front panel, the instrument ignores all ping requests regardless of connection status.

To send a network ping request in a Microsoft Windows operating environment, open a command prompt. Type the command `ping` and the IP address of your MP5103. If the MP5103 is connected, the ping requests return successfully.

LAN interface protocols

You can use one of following LAN protocols to communicate with the MP5103:

- Raw socket
- Telnet
- HiSLIP
- Dead socket

You can also use a dead socket termination port to troubleshoot communications problems.

NOTE: You can only use one remote interface at a time. Although multiple ethernet connections to the instrument can be opened, only one can be used to control the MP5103.

The port numbers for the LAN protocols and dead socket termination are listed in the following table.

Protocol	Port number
Raw socket	5025
Telnet	23
HiSLIP	4880
Dead socket	5030

Raw socket connection

You can connect to the TCP/IP port on the instrument and send and receive commands. A programmer can communicate with the instrument using the Winsock API on computers with the Microsoft Windows operating system or using the Berkeley Sockets API on Linux™ or Apple™ computers.

Telnet connection

The telnet protocol is similar to raw socket and can be used when you need to interact directly with the instrument. Telnet is often used for debugging and troubleshooting. You need a separate telnet program to use this protocol, such as PuTTY.

You can use the telnet protocol over a TCP/IP connection to send commands to the instrument and interact with scripts.

HiSLIP connection

The High-Speed LAN Instrument Protocol (HiSLIP) is based on TCP/IP and is intended to replace the GPIB and VXI-11 protocols.

Dead socket connection

The dead socket termination (DST) port is used to terminate all existing ethernet connections. A dead socket is a socket that is held open by the instrument because it has not been properly closed. This often happens when the host computer is turned off or restarted without first closing the socket. This port cannot be used for command and control functions.

Use the dead socket termination port to manually disconnect a dead session on any open socket. All existing ethernet connections are terminated and closed when the connection to the dead socket termination port is closed.

Reset LAN settings

You can reset the password and the LAN settings from the front panel by inserting a straightened paper clip or a similar thin, rigid object into the hole next to LAN RESET.

LAN troubleshooting suggestions

If you are unable to connect to the instrument, check the following items:

- The network cable is in the LAN port on the rear panel of the instrument, not one of the TSP-Link ports.
- The network cable is in the correct port on the computer. The LAN port of a laptop may be disabled when the laptop is in a docking station.
- The network port of the computer is enabled.
- The IP address of the instrument is compatible with the IP address on the computer. If the instrument is not connected directly to the computer, the first three digits of the IP addresses should match.
- The subnet mask address of the instrument is the same as the subnet mask address of the computer.
- LAN communications are enabled.
- The access state of the LAN protocol you are using. If disabled, enable it. If protected, ensure you are logging into the unit with the correct password. See [Log into the MP5103](#) (on page 33) for more information.

You can also try restarting the computer and the instrument.

To restart the instrument and set up LAN communications:

1. Turn the power to the instrument off, and then on.
2. Wait at least 60 seconds for the network configuration to be completed.
3. From the Home screen, select the IP address.
4. Select **Config**.

5. Select the LAN slider to enable LAN, if not enabled.
6. Under **Address Settings**, verify the settings.
7. Select **Submit** to save your settings.

If the above actions do not correct the problem, contact your system administrator.

USB

To use the rear-panel USB port, you must have the Virtual Instrument Software Architecture (VISA) layer on the host computer.

VISA contains a USB-class driver for the USB Test and Measurement Class (USBTMC) protocol that, once installed, allows the Microsoft Windows operating system to recognize the instrument.

When you connect a USB instrument that implements the USBTMC or USBTMC-USB488 protocol to the computer, the VISA driver automatically detects the device. Note that the VISA driver only automatically recognizes USBTMC and USBTMC-USB488 devices. It does not recognize other USB devices, such as printers, scanners, and storage devices.

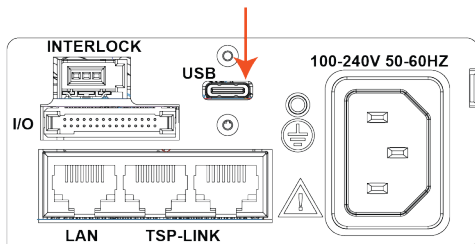
In this section, "USB instruments" refers to devices that implement the USBTMC or USBTMC-USB488 protocol.

To communicate from a computer to the instrument, you need a USB cable with a USB Type C connector end and a USB Type A connector end. You need a separate USB cable for each instrument you plan to connect to the computer at the same time using the USB interface.

Connect to USB

To connect an instrument to a computer using USB:

1. Connect the appropriate USB connector to the computer.
2. Connect the Type C end of the cable to the instrument. The following figure shows the location of the USB port on the rear panel of the instrument.



3. Turn on the instrument power. When the computer detects the new USB connection, the Found New Hardware Wizard starts.
4. If the "Can Windows connect to Windows Update to search for software?" dialog opens, select **No**, and then select **Next**.
5. On the "USB Test and Measurement device" dialog, select **Next**, and then select **Finish**.

Communicate with mainframe through USB

For the MP5103 to communicate with the USB device, you must use NI-VISA™. VISA requires a resource string in the following format to connect to the correct USB instrument:

```
USB0::0x0699::0x5103::[serial number]::INSTR
```

Where:

- 0x0699: The Tektronix vendor ID
- 0x5103: The instrument model number
- [serial number]: The mainframe serial number of the instrument (the serial number is also on the top cover above the power module)
- INSTR: The USBTMC protocol

Enable remote communications

The MP5103 provides the following features for securing remote communications:

- Communications protocol disable and enable
- Optional password requirement for remote access

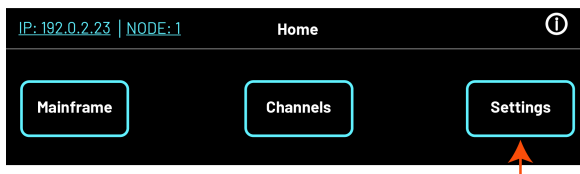
Set the mainframe password

Passwords must be 1 to 20 characters long. Only alphanumeric characters and the special characters ! @ # \$ % ^ & * are permitted.

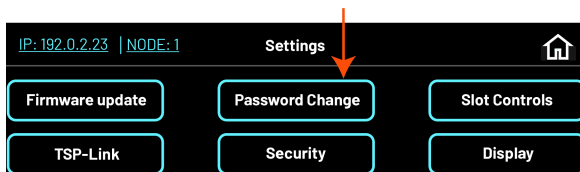
The default, fixed user name is `admin`.

To set the password from the front panel of the mainframe:

1. From the Home screen, select **Settings**.



2. Select **Password Change**.



3. Enter and confirm the new password using the on-screen keyboard.

 A screenshot of the password change form. It has a dark background with white text. The 'User Name' field is pre-filled with 'admin'. Below it are two rows for password entry. The first row is 'New Password' with a text input field containing 'New password' and a 'SHOW' button. The second row is 'Confirm Password' with a text input field containing 'Confirm password' and a 'SHOW' button. At the bottom right are 'Submit' and 'Cancel' buttons.

4. Select **Submit**.

To set the password using remote commands:

Send the following command:

```
user.password.change("newpassword")
```

Where *newpassword* is your new password.

Enable and disable LAN communications

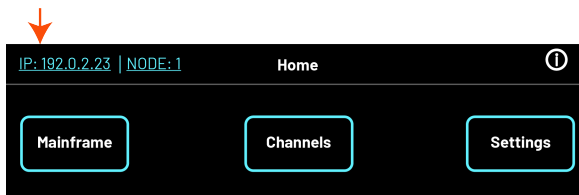
You can enable or disable a protocol. When you disable a protocol, external users are prevented from establishing a connection and communications through a specified interface or port.

Password protection can be enabled for LAN protocols. When password protection is enabled, a user must log in to the mainframe with the set password before the connection is accepted.

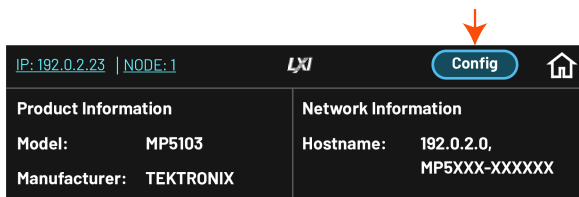
NOTE: By default, all LAN protocols are disabled. To enable LAN protocols, use the primary LAN access attribute `lan.enable` or the setting from the front panel. LAN must be enabled before individual protocols can be disabled.

To enable the LAN protocol from the front panel:

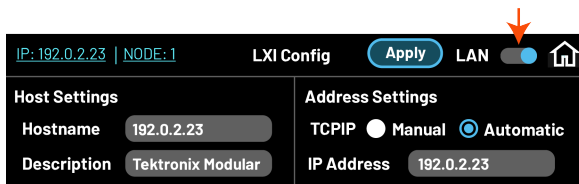
1. From the Home screen, select the IP address of your instrument.



2. Select **Config**.



3. Enable LAN with the slider. You can also configure additional LAN settings.



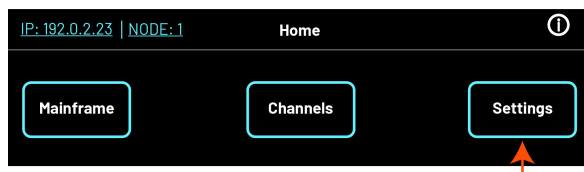
4. Select **Submit** to apply the settings.

Adjust LAN protocol and access settings

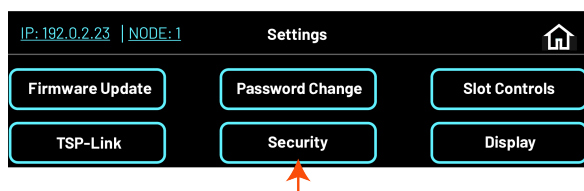
After enabling LAN communications, you can enable, disable, or password-protect LAN protocols.

To adjust protocol settings from the front panel:

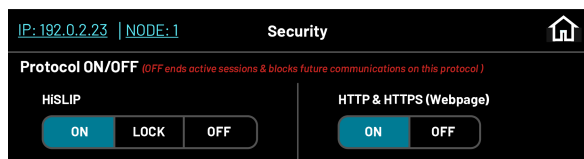
1. From the Home screen, select **Settings**.



2. Select **Security**.

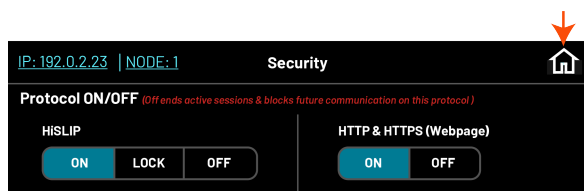


3. Available protocols and options are displayed. Turn a protocol on, off, or select **LOCK** to enable password protection.



NOTE: When password protection is enabled for a protocol, authorization using the `login` command is required before communications are accepted.

4. Select **Home** to exit.



To adjust LAN protocol settings with remote commands:

You can use the following TSP command attributes to enable, disable, or protect a protocol or access:

- **Enable:** Permit communications without a password
- **Disable:** Turn off communications
- **Protect:** Require authorization using the `login` command before communications are accepted

Protocol / Access	Attribute	Options
LAN (All)	<code>lan.enable</code>	<code>localnode.ENABLE</code> <code>localnode.DISABLE</code>
HiSLIP	<code>lan.hislip.access</code>	<code>localnode.ENABLE</code> <code>localnode.PROTECT</code> <code>localnode.DISABLE</code>
Raw sockets	<code>lan.rawsocket.access</code>	<code>localnode.ENABLE</code> <code>localnode.PROTECT</code> <code>localnode.DISABLE</code>
Telnet	<code>lan.telnet.access</code>	<code>localnode.ENABLE</code> <code>localnode.PROTECT</code> <code>localnode.DISABLE</code>
Network ping request	<code>lan.ping.enable</code>	<code>localnode.ENABLE</code> <code>localnode.DISABLE</code>
Multicast DNS	<code>lan.mdns.enable</code>	<code>localnode.ENABLE</code> <code>localnode.DISABLE</code>
Webpage	<code>lan.web.enable</code>	<code>localnode.ENABLE</code> <code>localnode.DISABLE</code>

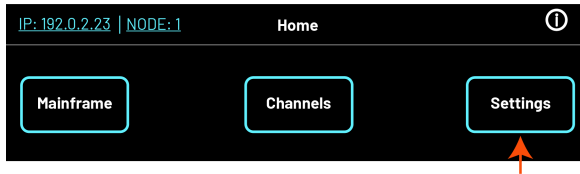
To adjust LAN protocol settings from the web interface:

1. Select **Settings**.
2. Select **Security**.
3. Available protocols and options are displayed. Turn a protocol on, off, or select **LOCK** to enable password protection.

Example: Enable HiSLIP with password protection

To enable HiSLIP with password protection from the front panel:

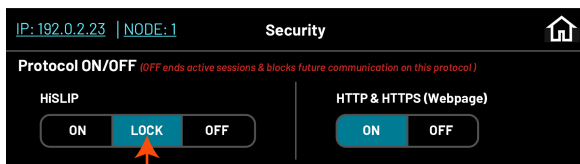
1. Select **Settings**.



2. Select **Security**.



3. Available protocols and options are displayed. Select **LOCK** for the HiSLIP protocol.



To enable HiSLIP with password protection with remote commands:

Send the following:

```
lan.enable = localnode.ENABLE  
lan.hislip.access = localnode.PROTECT
```

To enable HiSLIP with password protection with the web interface:

1. Select **Settings**.
2. Select **Security**.
3. Select **LOCK** for the HiSLIP protocol.

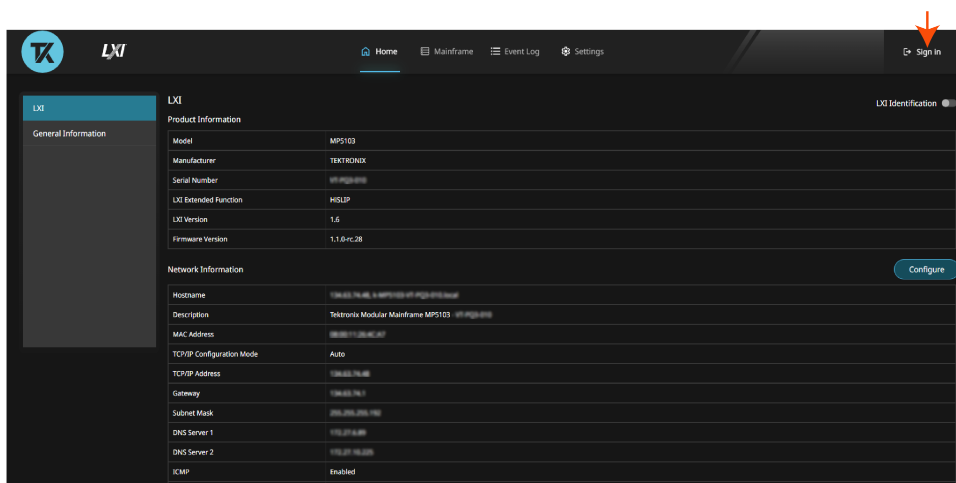
Log in to the MP5103

If the protocol you want to use is password-protected, you must log in before communicating with the MP5103.

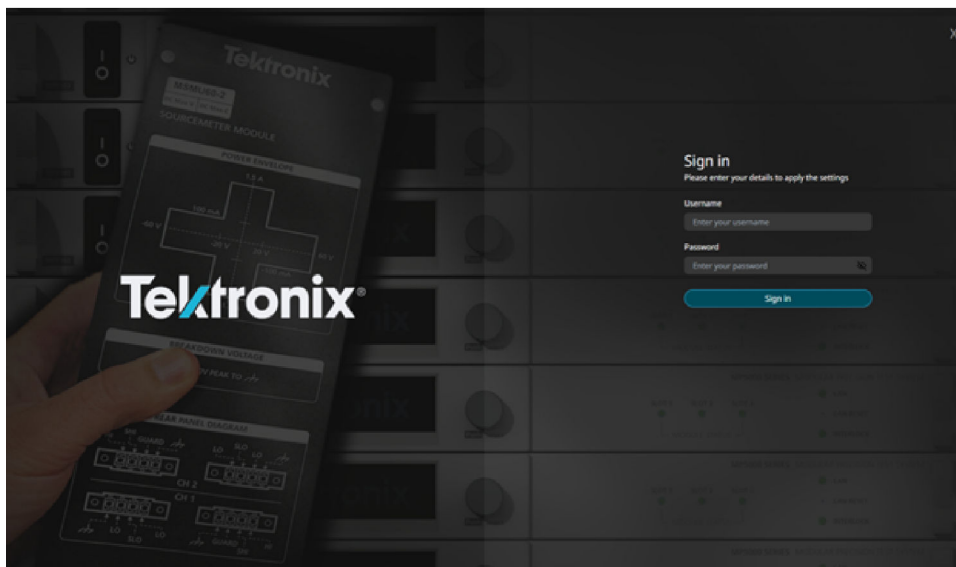
NOTE: The web interface for the MP5103 always requires a password.

To log in to the web browser interface:

1. Enter the IP address of your instrument into a web browser.
2. Select **Sign in** on the top-right of the browser window.



3. Enter your username and password, then select **Sign in**.



To log in using remote commands:

Send

```
login password
```

Where *password* is your LAN access password.

Log out of the MP5103

To log out of the MP5103 using the web interface, close your browser.

To log out of the MP5103 using remote commands, send:

```
logout
```

Communications troubleshooting

The following topics can help to diagnose communications issues. A password may be enabled for the communications protocol you are using or another user may be communicating with the mainframe.

The password can be cleared or reset from the front panel or with a remote command.

Query the LAN password authentication state

To determine if a password is enabled for the communications protocol you are using, send

```
login?
```

Responses indicate whether password authorization is required before the mainframe responds to remote input.

Authenticated	A password has been set and the user is logged in. Communications are enabled for the selected protocol.
Unauthenticated	The protocol is password-protected and the user is not logged in. Send <code>login password</code> , where <code>password</code> is your access password.

This command is useful for diagnosing communications issues when the mainframe does not respond to remote input, such as TSP commands. Sending `login?` can eliminate password protection as a cause for timeouts.

Query the mainframe communication status

Only one communication protocol can be used at a time. Before using a new protocol, the previous one must be closed by sending `abort`. Most communication libraries do this when the connection is terminated.

To determine if another protocol is in use on the mainframe:

1. Connect using an interface.
2. Send the `remote?` command. Responses indicate whether your command interface is allowed to control the mainframe:

Allowed	The mainframe is in remote mode and ready to receive commands on the selected protocol. Other protocols are ignored.
Disallowed	Another protocol is in use. Commands on this connection are ignored.
Local	The mainframe is in local mode. All remote connections are terminated.

This command is useful for diagnosing issues if the mainframe does not respond to commands. If the mainframe does not respond, it may be because another user is connected through a different protocol or actively using the same protocol. Communications are not allowed until the other connection is closed by sending the `abort` command.

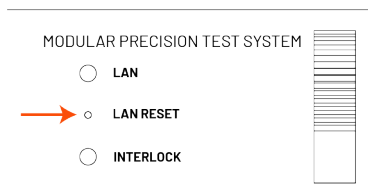
Clear or reset the password

NOTE: These procedures reset the password and disable LAN communications.

After clearing or resetting the password, follow the instructions in [Set the mainframe password](#) (on page 28) and [Enable and disable LAN communications](#) (on page 29).

To reset the LAN password from the front panel of the MP5103:

Using a straightened paper clip or a similar thin, rigid object, press and release the **LAN Reset** button on the front of the MP5103.



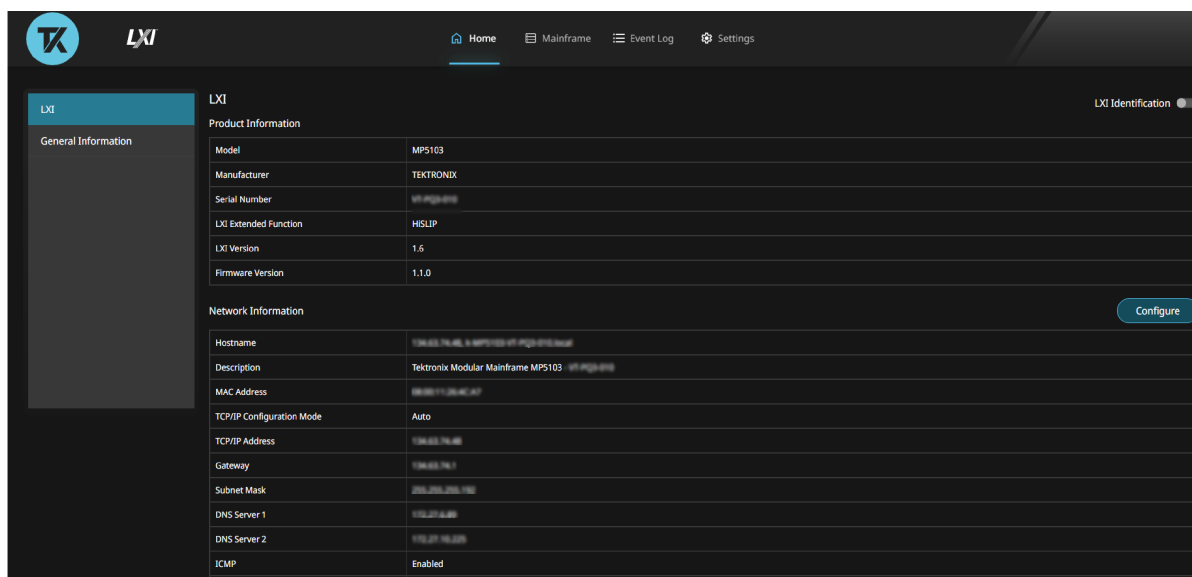
To reset the LAN password using a remote command:

Send:

```
lan.reset()
```

Web interface

If you are connected to the MP5103 using LAN communications, you can use an internet browser to connect to the instrument through the MP5103 web interface.



The LXI web interface allows you to change settings and control your instrument through the web interface. The web interface includes:

- The instrument status, model, serial number, firmware revision, and the last LXI message.
- Administrative options, LAN information, and LXI information.
- Access to basic instrument settings and measurement readback.

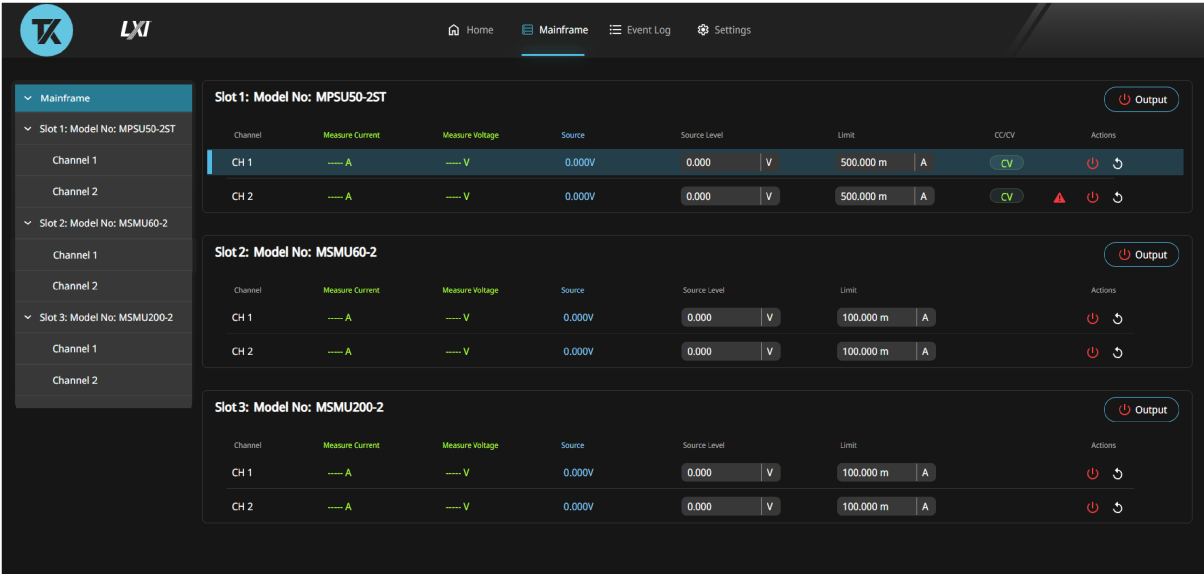
The web interface resides in the firmware of the instrument. Changes you make through the web interface are immediately made in the instrument.

You must log in to make changes on the web interface. To access the web interface, see [Log into the MP5103](#) (on page 33).

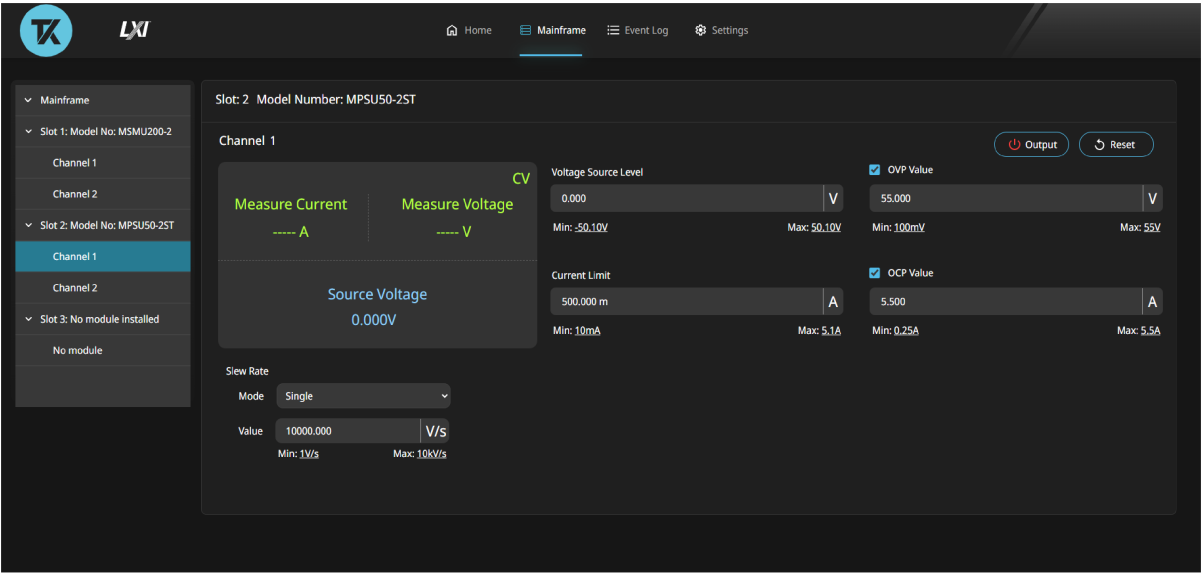
The web interface opens to the home screen, which displays product and network information. The LAN settings can be configured from this page.

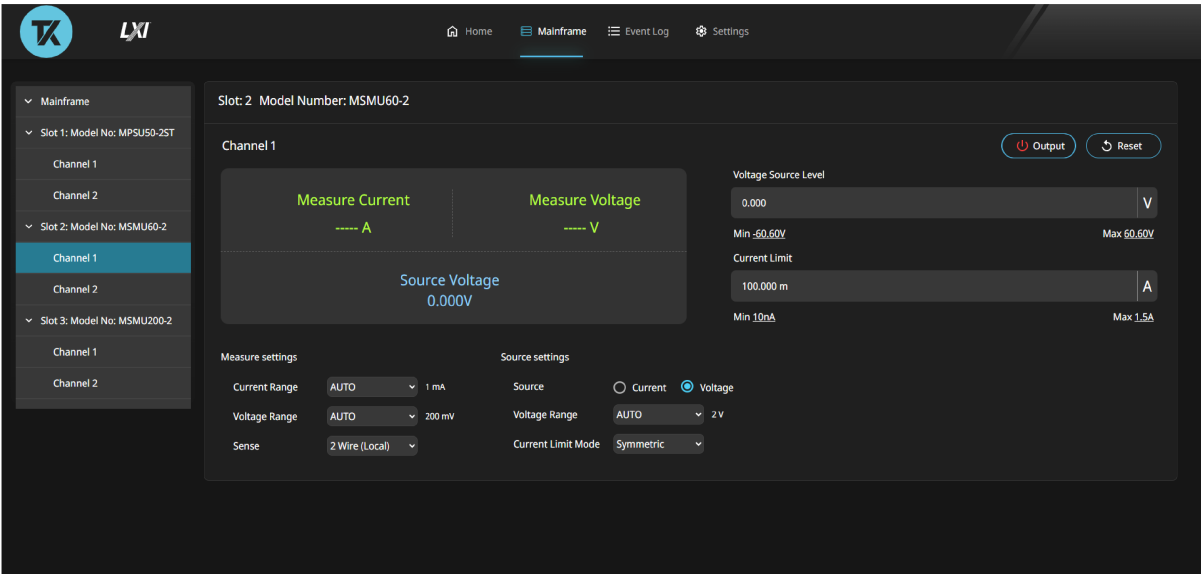
NOTE: If the LAN settings are changed to an invalid configuration or if access to the web interface has been disabled, your connection to the web page is lost and a message is displayed. Check that your instrument is powered on and verify the LAN and access settings before you refresh the page.

The Mainframe tab displays a general overview of the present module settings.



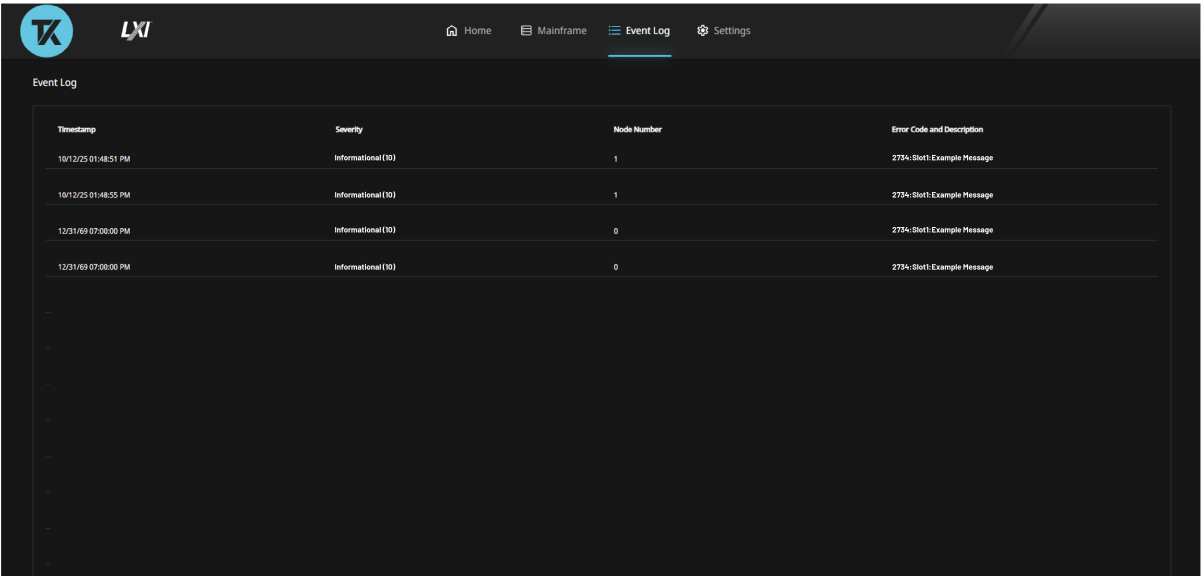
To access additional module settings, on the left side of the web interface, select a channel. The following figures show typical configuration screens for supported modules.





Select **Output** to turn the output of a channel on or off. The settings displayed reflect the settings applied to the modules in the mainframe.

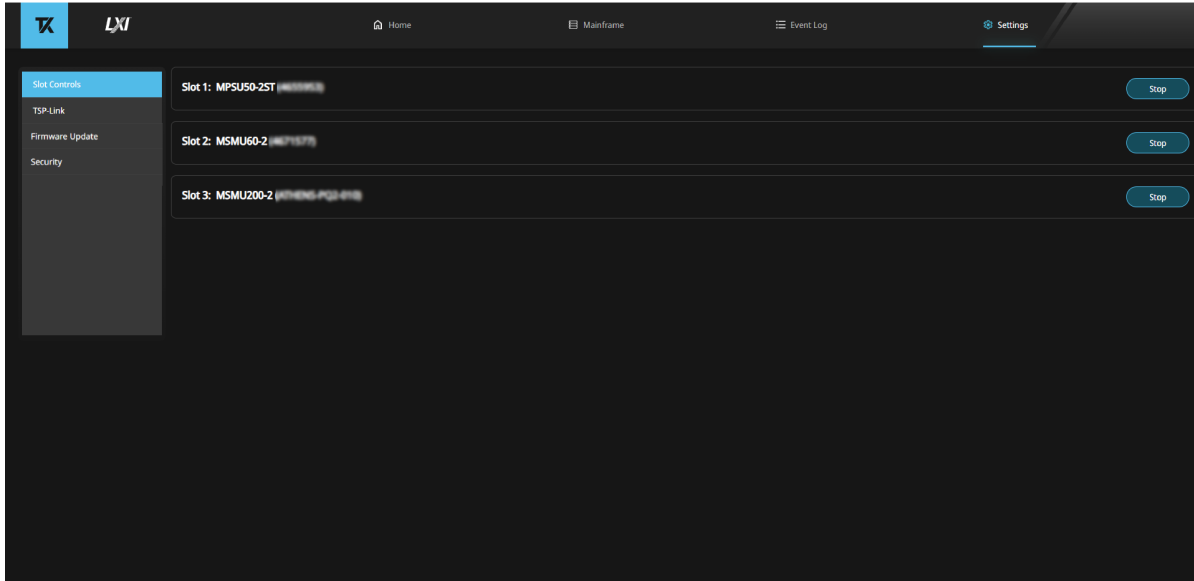
The Event Log tab displays all event messages presently in the queue.



If an event is removed from the log using a remote command, it is not displayed here.

From the **Settings** page, you can select one of the following:

- **Slot Controls:** Start or stop a module
- **TSP-Link:** Set a TSP-Link node number and initialize a TSP-Link network
- **Firmware Update:** Update the firmware for the mainframe or modules
- **Security:** Adjust network protocol settings



To log out of the web interface, close the browser window.

Disable and enable the web interface

The mainframe web interface is enabled by default. You can enable or disable the web interface using remote commands or from the front panel.

To disable or enable the web interface using remote commands, send:

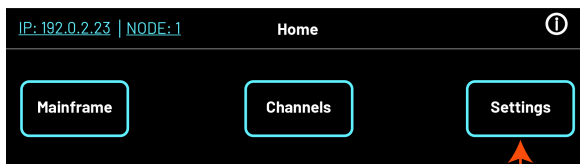
```
lan.web.enable = localnode.DISABLE
```

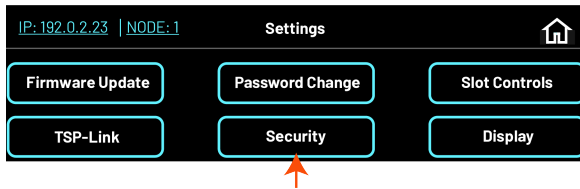
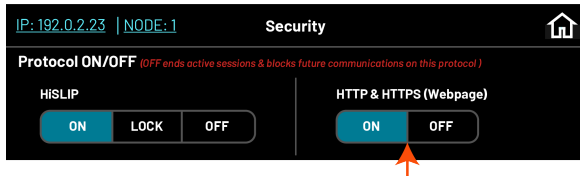
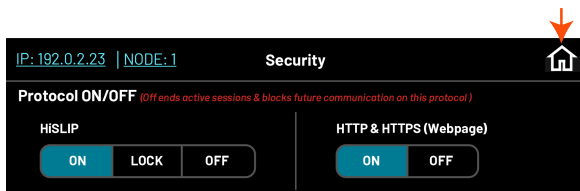
or

```
lan.web.enable = localnode.ENABLE
```

To disable or enable the web interface from the front panel:

1. From the Home screen, select **Settings**.



2. Select **Security**.3. Select **ON** or **OFF** for HTTP & HTTPS (Webpage).4. Select **Yes** when prompted.5. Select **Home** to exit.

TSP-Link

TSP-Link is a high-speed trigger synchronization and communications bus that test-system builders can use to connect multiple instruments in a master and subordinate configuration. Once connected, all the instruments that are equipped with TSP-Link in a system can be programmed and operated under the control of the master instrument or instruments. This allows the instruments to run tests more quickly because they can be decoupled from frequent computer interaction. The test system can have multiple master and subordinate groups, which can be used to handle multidevice testing in parallel. Combining TSP-Link with a flexible programmable trigger model ensures speed.

Using TSP-Link, multiple instruments are connected and can be used as if they are part of the same physical unit for simultaneous multichannel testing. The test system can be expanded to include up to 32 TSP-Link-enabled instruments.

Each instrument or enclosure attached to the TSP-Link expansion interface is called a node. Each node must be identified with a unique node number. This identification is called a TSP-Link node number.

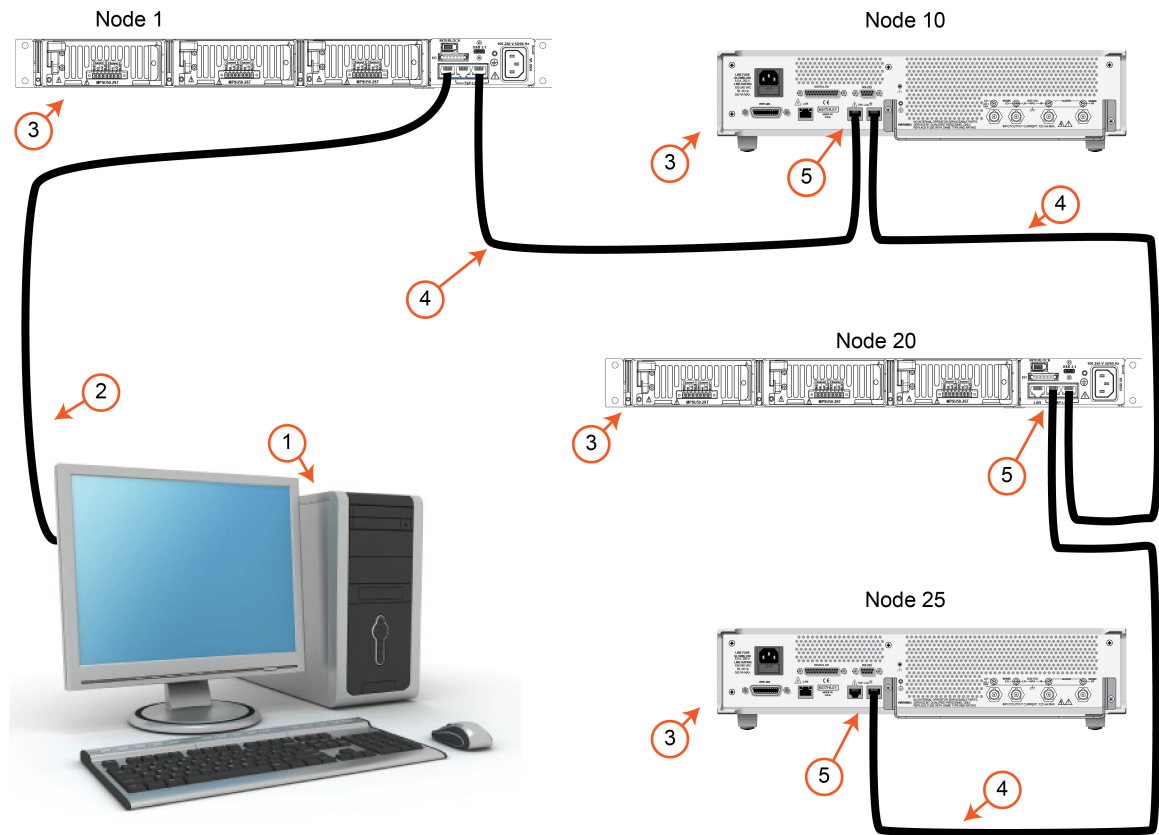
NOTE: The MP5103 mainframe must be the master of the system. To configure the nodes and trigger lines for operation, see the *MP5000 Series Programmer Manual*.

TSP-Link connection details

TSP-Link connections are made to each of the TSP-Link connectors on the instruments. Connections must be made using a type 5e category or higher LAN crossover cable.

One connection is made from the controller to the TSP-Link master. The MP5103 must be the master.

Each TSP-link enabled instrument has two TSP-Link connectors. You can make the connection to either connector.



Item	Description	Notes
1	Controller	A computer that is connected to one of the instruments.
2	Communications connection	Connection from the controller to the master node through LAN or USB.
3	Nodes	You can have up to 32 nodes on the TSP-Link system. Each node must have a unique node number from 1 to 64.
4	LAN crossover cable	Type 5e category or higher; 3 meters (9.8 feet) maximum between nodes.
5	TSP-Link connections	Each instrument has two TSP-Link connectors.

TSP-Net

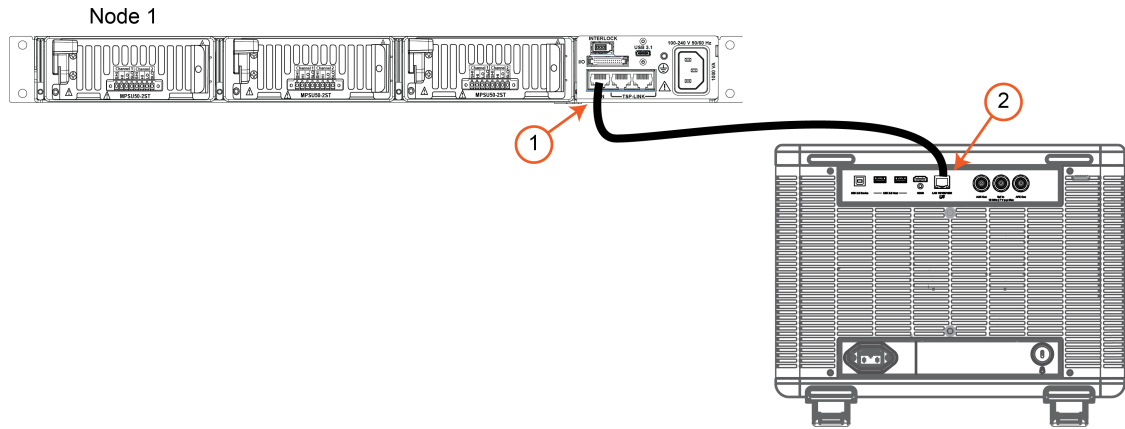
TSP-Net provides a simple socket-like programming interface to instruments enabled for Test Script Processor (TSP). Using the TSP-Net library, the MP5103 can control ethernet-enabled devices directly through its LAN port. This enables the MP5103 to communicate directly with a device that is not TSP-enabled without the use of a controlling computer.

Using TSP-Net library methods, you can transfer string data to and from a remote instrument, transfer and format data into Lua variables, and clear input buffers. The TSP-Net library is only accessible using commands from a remote command interface.

While you can use TSP-Net commands to communicate with any ethernet-enabled instrument, specific TSP-Net commands exist for TSP-enabled instruments to allow for support of features unique to the TSP scripting engine. These features include script downloads, reading buffer access, wait completion, and handling of TSP scripting engine prompts.

Using TSP-Net commands with TSP-enabled instruments, a MP5103 can download a script to another TSP-enabled instrument and have both instruments run scripts independently. The MP5103 can read the data from the remote instrument and either manipulate the data or send the data to a different remote instrument on the LAN.

The MP5103 LAN port auto senses the connection (Auto-MDIX), so you can use either a LAN crossover cable or a LAN straight-through cable to connect directly from the MP5103 to another ethernet device, to a hub, or to a corporate network that connects to other instrumentation. For example, the following figure shows the MP5103 connected to an oscilloscope.



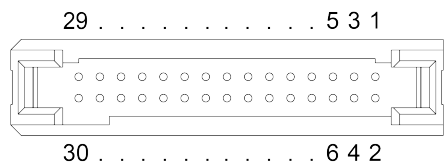
1	LAN connection on the MP5103 (Auto-MDIX)
2	LAN connector on another ethernet device

To set up communications with a connected instrument, see the *MP5000 Series Programmer Manual*.

Configure triggering

Digital I/O

The mainframe has a digital input/output (I/O) port on the rear panel that can be used to control external digital circuitry.



The port uses a 30-pin female terminal connector that provides pinouts for power supply lines, ground, and other functions, as shown in the following table. The maximum rating of each power supply line is 600 mA at > 4 V, protected by a solid-state fuse.

Hardware pin	Function	Hardware pin	Function
1	V _{EXT}	16	5 V
2	Digital I/O 1, Bidirectional I/O	17	Digital I/O 11, Bidirectional I/O
3	Ground	18	Digital I/O 12, Bidirectional I/O
4	Ground	19	Ground
5	Digital I/O 3, Bidirectional I/O	20	Digital I/O 13, Bidirectional I/O
6	Digital I/O 2, Bidirectional I/O	21	Digital I/O 15, Bidirectional I/O
7	Digital I/O 4, Bidirectional I/O	22	Digital I/O 14, Bidirectional I/O
8	5 V	23	Digital I/O 16, Bidirectional I/O
9	Digital I/O 5, Bidirectional I/O	24	5 V
10	Digital I/O 6, Bidirectional I/O	25	Digital I/O 17, Bidirectional I/O
11	Ground	26	Digital I/O 18, Bidirectional I/O
12	Digital I/O 7, Bidirectional I/O	27	Ground
13	Digital I/O 9, Bidirectional I/O	28	Ground
14	Digital I/O 8, Bidirectional I/O	29	Reserved
15	Digital I/O 10, Bidirectional I/O	30	Reserved

The I/O line electrical specifications are shown in the following table.

I_{SINK}, maximum per pin	250 mA
I_{SOURCE}, maximum per pin	2.0 mA
Absolute VIN	5.25 V to -0.25 V V_{EXT} 5 V to 33 V
VIH minimum	3.7 V
VIL maximum	0.7 V
VOL maximum at 5 mA I_{SINK}	0.7 V
VOL maximum at I_{SINK} maximum	2.7 V
VOH minimum, 0.4 mA source	2.4 V

NOTE: The digital I/O lines are protected by solid-state fuses. Exceeding the input or output limits causes the fuse to trip, resulting in inaccurate or unwanted readings. When the overload condition is corrected, the fuse resets approximately one hour after the fault is removed.

NOTE: A 30-position connector to unterminated wire cable assembly is provided for connections to digital I/O. To configure digital I/O lines for use, see the *MP5000 Series Programmer Manual*.

Maintenance and troubleshooting

Introduction

This section describes routine maintenance of the instrument that an operator can perform.

Update the firmware

You can load a newer or older version of firmware to the mainframe or modules. The process takes about ten minutes. You can use the front panel, TSP commands, TSP Toolkit, or the web interface to update.

The mainframe and modules are updated separately, but the process is similar for both. You can update modules without upgrading the mainframe. Check the release notes for compatibility of mainframe and module firmware.

During the mainframe update, the front panel displays an update message. During a module update, the front panel is blank and the Module Status indicator for the slot blinks red and green.

Prepare to update

If you are using TSP commands or the front panel to update, you need to copy the firmware files to a USB flash drive. Verify that the flash drive is formatted with FAT32 or exFAT. In Microsoft™ Windows™, you can check the file system by checking the properties of the USB flash drive.

CAUTION: Do not remove the USB drive, turn off the instrument power, or otherwise interrupt the firmware update process. Your instrument may become unresponsive and require factory service.

To download firmware for your instrument:

1. To get the update file, go to [Datasheets, Manuals, and Software Downloads](#).
2. Enter the model number of your instrument.
3. Select **Software** from the filter list.
4. Select **Firmware** from the filter list.
5. Download the firmware.
6. Unzip the files. The firmware file has the extension .x.
7. Review the release notes.

Update the firmware from the front panel

You can use a USB flash drive to update the firmware from the front panel for the mainframe and modules. The latest firmware is available from tek.com.

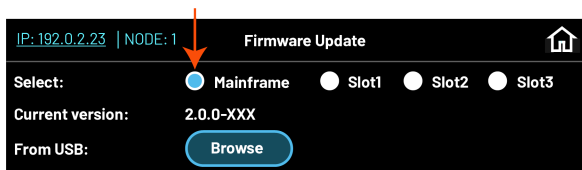
Make sure that the firmware is loaded onto your USB flash drive, then insert it into the USB port on the front of the mainframe. The update process is the same for the mainframe as it is for the modules.

CAUTION: Do not remove the USB drive, turn off the instrument power, or otherwise interrupt the firmware update process. Your instrument may become unresponsive and require factory service.

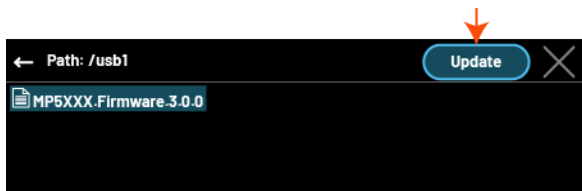
The following procedure updates a mainframe with firmware V1.0.1 or newer installed. If you need to update from an older version, replace the first two steps in the following procedure by selecting **General info** from the home page and then selecting the firmware download icon.

To update the mainframe firmware (V1.0.1 and newer):

1. Select **Settings** from the mainframe home page.
2. Select **Firmware Update**.
3. Select **Mainframe**.



4. Select **Browse** to locate the new firmware file on your USB flash drive, then select it.
5. Select **Update**. The firmware may take several minutes to load. Your instrument returns to the Home screen after the update.



6. To confirm that the update was successful, select the information icon from the Home screen, then scroll to the Mainframe section to verify the firmware version.

Mainframe	
Manufacturer	TEKTRONIX
Model Number	MP5XXX
Serial Number	MP-XXX-000
Firmware Version	MP5XXX.Firmware.3.0.0

To update the module firmware:

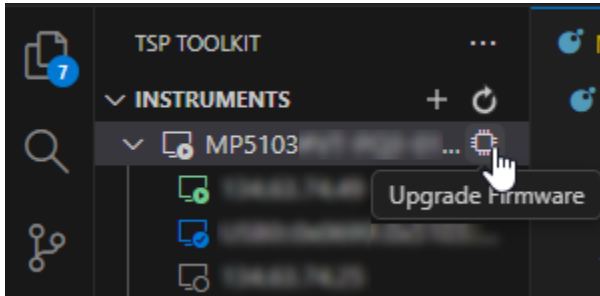
Select the slot instead of the mainframe. The slot indicator on the front panel blinks red and green while the update is in progress. A message is displayed when the update is complete.

Update the firmware with TSP Toolkit

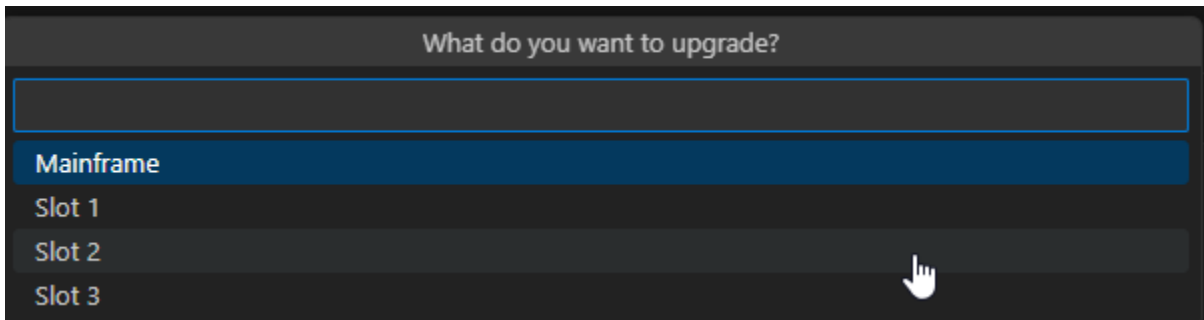
To update the firmware with TSP Toolkit:

1. Place the update file in a location that can be accessed by TSP Toolkit.
2. Open Visual Studio Code with TSP Toolkit extension installed.
3. Connect to the mainframe.
4. Select the **TSP Toolkit** icon. The mainframe is displayed in the Primary Sidebar.

5. Select the **Upgrade Firmware** icon to the right of the mainframe name.



6. Select the mainframe or slot number from the list. The Select Firmware File dialog is displayed.



7. Select the update file.
8. Select **Upgrade**.
9. Wait until the update process is complete:
 - **Mainframe:** Monitor the front panel for update status. TSP Toolkit is disconnected during the update process.
 - **Module:** The message "Module upgrade complete" is displayed in the TSP Toolkit terminal.

Update the firmware using TSP

To update firmware using TSP, you need to load the firmware file to the mainframe and then run the file.

NOTE: You can check the current firmware version of a mainframe with `print(localnode.revision)` and `print(slot[Z].revision)` for a module.

To update the firmware using TSP commands over a remote interface:

1. Copy the firmware file to a USB flash drive.
2. Insert the flash drive into the USB port on the front panel of the instrument.
3. Load the firmware. Send

```
firmware.image.load("/usb1/filename")
```

 Where *filename* is the directory and file name for the firmware.
4. Start the firmware update.
 For the mainframe, send

```
firmware.update()
```


 For a module, send

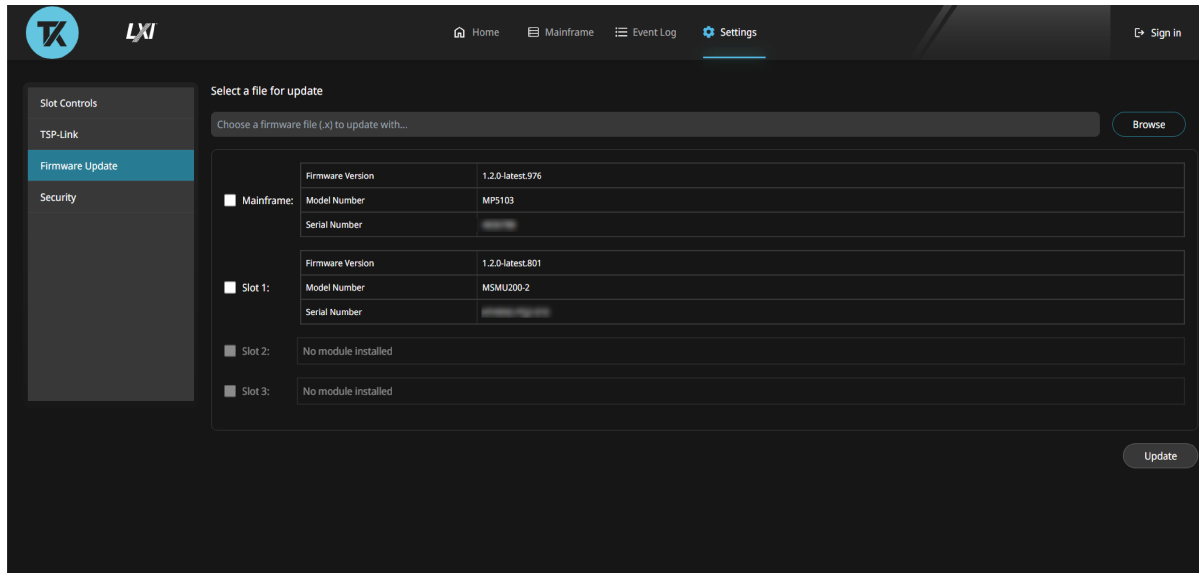
```
slot[Z].firmware.update()
```

 Where *Z* is the slot number.
5. Wait for the update to complete.

During a mainframe update, the front panel and module lights go dark for a few seconds, then the front panel displays an update message. The mainframe is restarted. During the module update, the Module Status light blinks red and green.

Update the firmware using the web interface

To update the firmware using the web interface:



1. Make sure that you are connected to the mainframe and logged in. See [Log in to the MP5103](#) (on page 33).
2. Place the upgrade file in a location that can be accessed by the web browser.
3. Select **Settings**.
4. Select **Firmware Update**.
5. Select the mainframe or a module slot to be updated. You can only update one instrument at a time.
6. Select **Browse**.
7. Select the firmware update file.
8. Select **Update**.
9. Wait until the update process is complete:
 - **Mainframe:** Monitor the web page for update status. The connection will be interrupted during the update. Refresh the web page after several minutes to verify that the update has been installed. If your instrument is set to use automatic IP address assignment, check the mainframe front panel display to verify the IP address, then connect to the mainframe again.
 - **Module:** Monitor the web page for update status.

Update drivers

Tektronix provides drivers for the MP5103 modules.

To download drivers for your instrument:

1. Go to [Datasheets, Manuals, and Software Downloads](#).
2. Enter the model number of your instrument.
3. Select **Software** from the filter list.
4. Select **Driver** from the filter list.

Clean the front-panel mainframe display

Clean the front-panel mainframe display with a soft, lint-free cloth. If more thorough cleaning is required, wipe the display with a 70% isopropyl alcohol solution. Do not use sprays directly on the display.

Event log

The event log records errors, warnings, and information reported by the instrument. Events are logged in a first-in, first-out queue. Event messages include the event code, event message, severity, TSP-Link node, and the time of the event.

Events are assigned to one of the following levels.

Number	Event level	Description
0	NO_SEVERITY	The message is information only. This level is used when the event queue is empty.
10	INFORMATIONAL	The message is information only. This level is used to indicate status changes.
15	WARNING	This message indicates that a change occurred that could affect operation.
20	RECOVERABLE	The event was caused by improper use of the instrument or by conditions that can be corrected. This message indicates that an error occurred. The instrument is still operating normally.
30	SERIOUS	There is a condition that prevents the instrument from functioning properly. The message indicates that the instrument is presently operating in an error condition. If the condition is corrected, the instrument returns to normal operation.
40	FATAL	There is a condition that cannot be corrected that prevents the instrument from functioning properly. Disconnect the DUT and turn the power off and then on again. If the error is a hardware fault that persists after cycling the power, the instrument must be repaired.

Most events do not abort a running script. The only time a script is aborted is when a Lua runtime error (event code –286, "TSP runtime error") is detected. Runtime errors are caused by actions such as trying to index into a variable that is not a table.

Execution of scripts or commands is prevented if there is a syntax error (event code –285, "Program syntax") in the script or command.

You can retrieve events from the event log by using the commands in the following table.

Command	Description
<code>eventlog.clear()</code>	Clear event log of all errors
<code>print(eventlog.count)</code>	Number of messages in the event log
<code>print(eventlog.next())</code>	Read and return the oldest unread event message from the log and remove the event message from the log

For example, the following command requests an event log message:

```
print(eventlog.next())
```

If there are no events in the event log, the return is similar to:

```
0.000000e+00 Queue Is Empty 0.000000e+00 1.000000e+00 0.000000e+00 0.000000e+00
```

Factory service

When repacking the instrument for shipment, use the original packaging. If the packaging is not available or unfit for use, contact your local Tektronix representative to obtain new packaging.

To return your MP5103 for repair or calibration, call 1-800-438-8165 or complete the form at tek.com/services/repair/rma-request. When you request service, you need the serial number and firmware or software version of the instrument.

To see the service status of your instrument or to create an on-demand price estimate, go to tek.com/service-quote.

Identify the mainframe

Mainframe identification information is available on the mainframe and through remote commands.

The manufacturer, model number, serial number, and firmware revision are available:

- **From the front panel:** Select **Home**, then select the information icon. The information is listed in the table.
- **From the web page:** From **Home**, in the left navigation, select **General Information**. The information is listed in the table.

You can also access the mainframe information by using the following remote commands:

- `print(localnode.manufacturer):` Returns TEKTRONIX.
- `print(localnode.model):` Returns the model number of the mainframe.
- `print(localnode.serialno):` Returns the serial number of the mainframe.
- `print(localnode.revision):` Returns the firmware version number of the module in the specified slot.

The serial number is also on a label on the mainframe. The label is on the top of the mainframe above the power module.

License information

To review the license information for the mainframe, send the command:

```
print(localnode.license)
```