

Quick Start Guide

F71 Multi-axis teslameter

F41 Single-axis teslameter



Safety Precautions

Observe these general safety precautions during all phases of instrument operation, service, and repair. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended instrument use. Lake Shore Cryotronics, Inc. assumes no liability for Customer failure to comply with these requirements.

The F71/F41 teslamter protects the operator and surrounding area from electric shock or burn, mechanical hazards, excessive temperature, and spread of fire from the instrument. Environmental conditions outside of the conditions below may pose a hazard to the operator and surrounding area.

- Indoor use
- Altitude to 2000 m
- 23 °C ±5 °C and <70% relative humidity non-condensing at rated accuracy; -20 °C to 70 °C and <90% relative humidity non-condensing at reduced accuracy
- Overvoltage category II
- Pollution degree 2
- Mains fluctuations up to ± 10%

Ground the Instrument

To minimize shock hazard, the instrument is equipped with a 3-conductor AC power cable. Plug the power cable into an approved 3-contact electrical outlet or use a 3-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet Underwriters Laboratories (UL) and International Electrotechnical Commission (IEC) safety standards.

Ventilation

The instrument has ventilation holes in its side covers. Do not block these holes when the instrument is operating.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away from Live Circuits

Operating personnel must not remove instrument covers. Refer component replacement and internal adjustments to qualified maintenance personnel. Do not replace components with power cable connected. To avoid injuries, always disconnect power and discharge circuits before touching them. Do not position the instrument so that it is difficult to disconnect the power cord.

Do Not Substitute Parts or Modify Instrument

Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an authorized Lake Shore Cryotronics, Inc. representative for service and repair to ensure that safety features are maintained. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Cleaning

Do not submerge instrument. Clean only with a damp cloth and mild detergent. Exterior only.

Desktop Installation

When installing the instrument in a desktop environment, ensure it is mounted on a flat, level surface.


Improper Use

If the instrument is used in a manner that is not specified by Lake Shore, the safety protections provided by the instrument are no longer guaranteed, and may be impaired.


Child Safety


This equipment is not suitable for use in locations where children are likely to be present.


 Direct current (power line)

 Alternating current (power line)

 Alternating or direct current (power line)


 Three-phase alternating current (power line)


 Earth (ground) terminal


 Protective conductor terminal


 Frame or chassis terminal

 On (supply)

 Off (supply)

 Equipment protected throughout by double insulation or reinforces insulation (equivalent to Class II of IEC 536—see Annex H)

 CAUTION: High voltages; danger of electric shock; background color: yellow; symbol and outline: black

 CAUTION or WARNING: See instrument documentation; background color: yellow; symbol and outline: black

Key specifications

Power requirement

100 V to 240 V (universal input),
50 Hz or 60 Hz, 30 VA

Size

216 mm wide × 87 mm high × 369 mm deep (8.5 in × 3.4 in × 14.5 in), half rack

Weight 3.2 kg (7 lb)

Approvals

See <https://www.lakeshore.com/compliance>

Operating conditions

- 23 °C ±5 °C and <70% relative humidity non-condensing at rated accuracy; -20 °C to 70 °C and <90% relative humidity non-condensing at reduced accuracy
- Instrument max field exposure: 10 mT (100 G) DC, 1 mT (10 G) RMS

NOTE: Not all specifications are listed. For full specifications, see the Technical Specifications page at <https://www.lakeshore.com/teslameters>.

Introduction

This guide provides basic information for getting started with your Lake Shore F71/F41 teslameter. For further documentation and information, see our website.

Items included with the F71/F41 teslameter:

- F71/F41 teslameter
- 6-pin terminal block, two count
- Line power cord
- USB A to USB-Type C™ adapter

Unpacking

1. Inspect all items for both visible and hidden damage that occurred during shipment. If there is visible damage to the contents, contact the shipping company and Lake Shore immediately.

NOTE: Procedures vary with shipping companies. Keep all damaged shipping materials and contents until instructed to either return or discard them.

2. Keep the container and shipping materials until all contents have been accounted for.
3. Check off each item on the packing list as it is unpacked.

Features

The F71/F41 teslameter includes features such as:

- DC and RMS measurement
- Peak to peak measurement
- Autoranging
- Variable averaging window
- Min/Max hold
- Relative readings
- Temperature compensation
- Frequency measurement of field and filtering
- TruZero™ technology to reduce measurement noise and offset
- TiltView™ touchscreen for improved viewing angles
- Smaller, ultra-thin Hall sensor active areas
- Multiple probe types to suit your application
- Zero warm-up time
- Isolated input and output relays
- Analog Hall voltage output
- 3-year standard warranty
- High-speed data acquisition
- Field control option
- USB and Ethernet connectivity
- GPIB with MR-GPIB-USB adapter
- Pass/fail mode for quality control

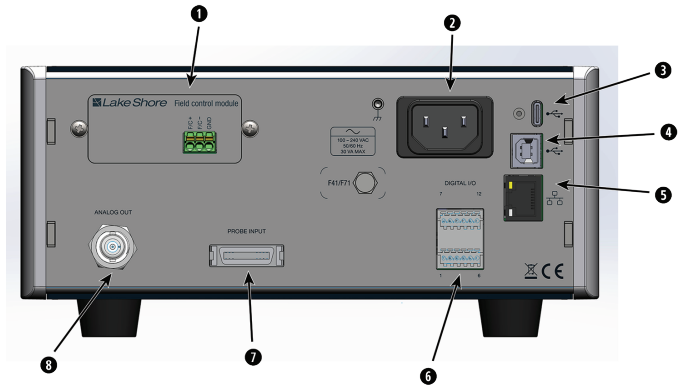
Front panel



The front panel consists of:

1. Power button
2. TiltView™ touchscreen

Rear panel

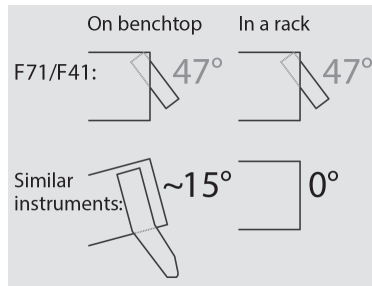
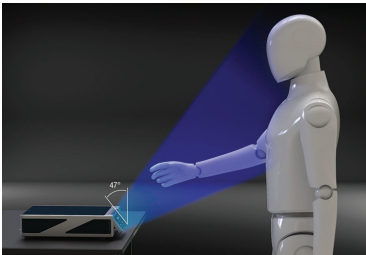


The rear panel consists of:

1. Option card slot
2. Line input assembly
3. USB Type-C™ interface
4. USB serial communications interface
5. RJ-45 Ethernet interface
6. Digital I/O port
7. Probe input connector
8. BNC analog output connector

Placement

The F71/F41 teslameter is an out-of-the-box benchtop instrument with an adjustable TiltView™ screen for an improved viewing angle. The screen adjusts from a 0° to a 47° viewing angle, whether mounted in a rack or on a bench top.



Rack mounting

The teslameter can be installed into a half rack or dual half rack mount using the optional Lake Shore rack mount kits. The kits contain the necessary parts to mount one instrument with the provided blank, or two instruments side by side in a rack mount space, 483 mm (19 in) wide by 88.9 mm (3.5 in) high. See <http://www.lakeshore.com/rack-kit/> for full details.

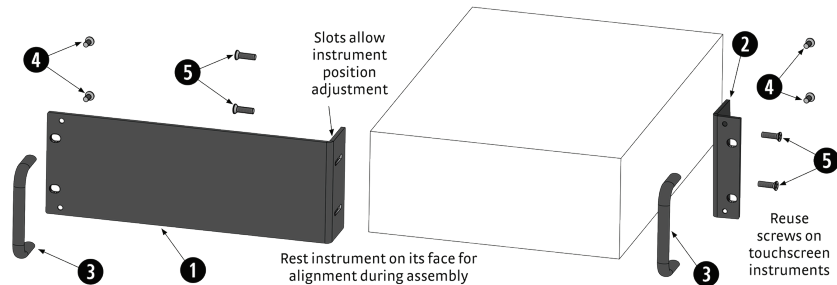
NOTE: Ensure that there is 1 in (25 mm) clearance on both sides of the instrument after rack mounting.

Item	Description	Qty
❶	Rack mount panel	1
❷	Rack mount ear	1
❸	Rack handles	2
❹	Screw, 8-32 × 0.38 in FHM Phillips	4
❺	Screw, M4 × 16 mm FHM Phillips (original touchscreen instrument screws)	4
	--OR--	
	Screw, 6-32 × 0.5 in FHM Phillips	4

1. Remove instrument feet.
2. Attach the rack handles to the rack mount panel ❶ and rack mount ear ❷ using the supplied 8-32 screws ❹.
3. *For dark blue touchscreen instruments:*
Remove the front screws from the side panels and use M4 screws to attach the rack mount ear.

For beige keypad instruments:

- a. Remove the front screws from the sides of the instrument and retain for future use, if the rack kit is ever removed.
- b. Use the 6-32 screws ❺ to attach the rack mount ear.



Connections and Installation

The teslameter includes a 3-conductor power cord that mates with the IEC 320-C14 line cord receptacle on the back of the teslameter.

WARNING: Always plug the power cord into an easily accessible, properly grounded receptacle to ensure safe instrument operation.

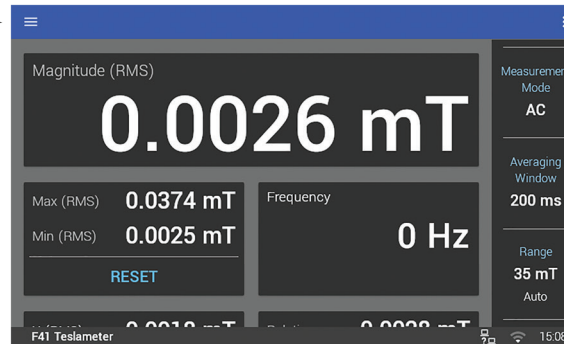
Startup

Connection

Plug in the teslameter using the supplied power cord. The instrument will begin its power-up sequence, after which the Home screen is displayed.

NOTE: The screens you see may differ, depending on your software version. Some screens are scrollable.

Settings menu →



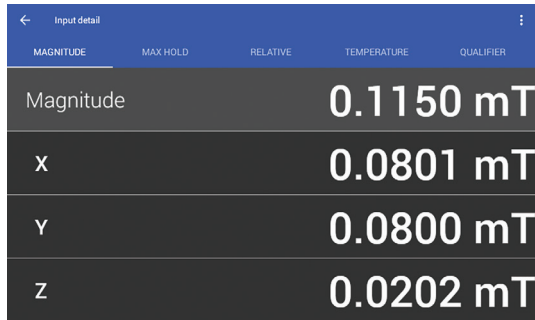
← Status bar

← Quick access settings

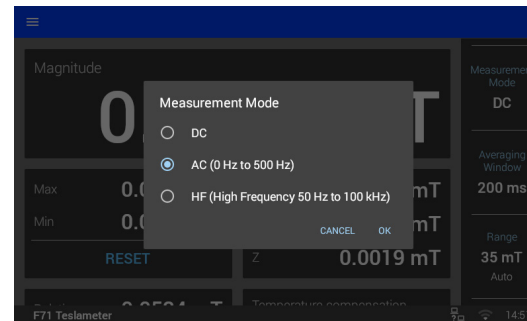
Basic operation

Readings

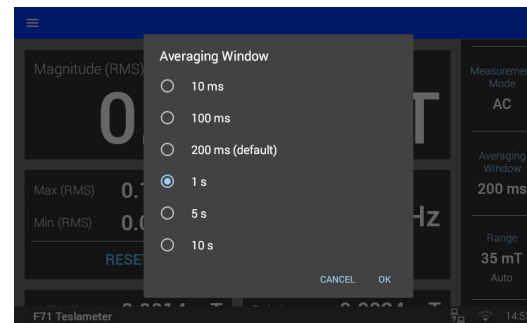
The Home screen displays readings such as magnitude, max hold, relative, XYZ (F71), and frequency. Touch a value to navigate to a detail page containing more information. The Magnitude detail screen for a 3-axis probe measuring Earth field in the DC measurement mode is shown below.



From the quick access sidebar, you may change parameters such as:



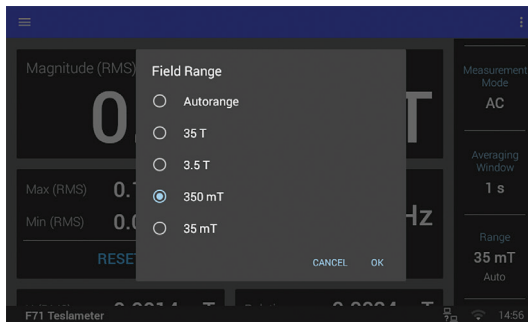
- **Measurement Mode:** On this screen, choose the mode you wish to use, then click **OK**.



- **Averaging Window:** Select a time interval setting, then click **OK**. A longer averaging window will result in more stable readings, but will respond more slowly to field changes.

- Range: Sets the maximum readable field and display resolution. The F71/F41 teslameter is equipped with an autoranging feature that will automatically select the appropriate range for the measured field. Select the range you wish to use, then click **OK**.

NOTE: Autorange is the default setting.



Navigation drawer

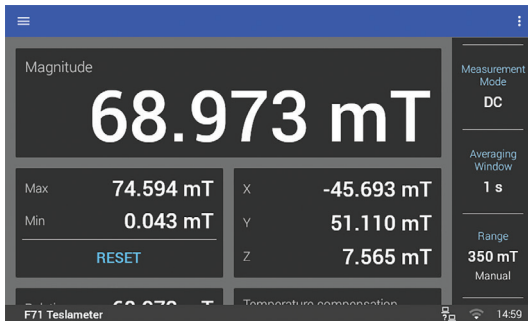
Tap the Settings menu  to go to the navigation drawer to adjust settings.

- Measurement setup: Includes settings for Measurement mode, Averaging window, Range, Units, and Temperature compensation.
- Sensor Information: Provides general information about the probe.
- Analog output: Selects which channel's analog signal is routed to the output.
- Digital I/O: Use this screen to configure the functionality of the inputs and outputs.
- System settings: Use this screen to adjust settings, including display and sound, firmware updates, and privacy

Measurement modes

DC measurement mode

In DC measurement mode, the display shows the measured DC field, the DC max hold, the DC relative measurement.

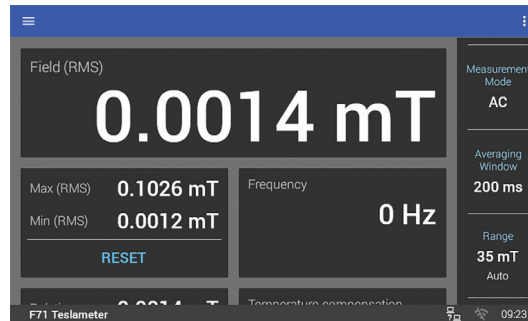


AC measurement modes

In this mode, the display shows the RMS reading as well as the frequency, RMS max hold, and the RMS relative measurement.

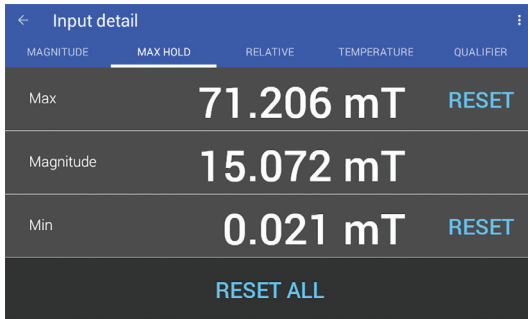
The F71/F41 teslameter offers two AC measurement bands to improve overall AC measurement performance:

- AC mode: has an operating range from DC to 500 Hz, but should be limited to frequencies less than 60 Hz for rated accuracies (reports both AC and DC components, and has improved measurement performance)
- High frequency mode: 50 Hz to 100 kHz (does not display DC component, but can connect an oscilloscope to the analog output to view higher frequency signals, allowing high speed pulse capture)



Max Hold

The maximum and minimum values are displayed on the Home screen. Reset these values by tapping the **Reset** button. Tap the box to see a detail page where the maximum and minimum can be reset independently.

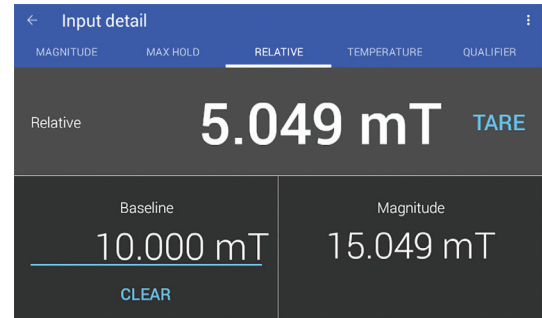


Relative Measurement

The relative measurement allows you to take field measurements relative to a baseline field. The relative reading is equal to the present field value minus the baseline. The relative mode applies to the DC reading in DC mode, and to the RMS reading in the AC and high frequency modes.

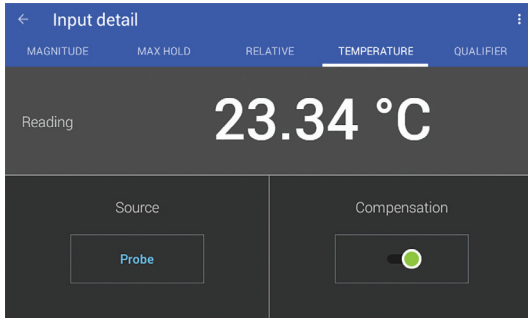
Touch the **Tare** button to capture the present reading as a new baseline. Tap the box to see a detail page where the baseline can be set manually.

TIP: This feature can be used to remove the small amount of TruZero™ residual offset if a 0 reading is desired when the probe is placed in a zero gauss chamber. Measure the residual offset with the probe in a zero gauss chamber and set the relative baseline to the average offset value.



Temperature Measurement

The temperature compensation detail screen displays the current temperature reading for the probe tip temperature sensor. Temperature compensation is on by default but can be turned off for troubleshooting, or set to manual to allow temperature inputs that are outside the standard operating range of the probe temperature sensor (0° to 90° C).



Screen Lock

The screen lock feature prevents accidental changes to parameter values. When the screen is locked, some parameter values may be viewed, but not changed, from the front panel.

To lock the screen:

1. Tap the Action icon (three dots in the top right corner of the screen). A drop-down menu appears.
2. Tap **Lock**. A message indicating that the screen is locked appears in the status bar.

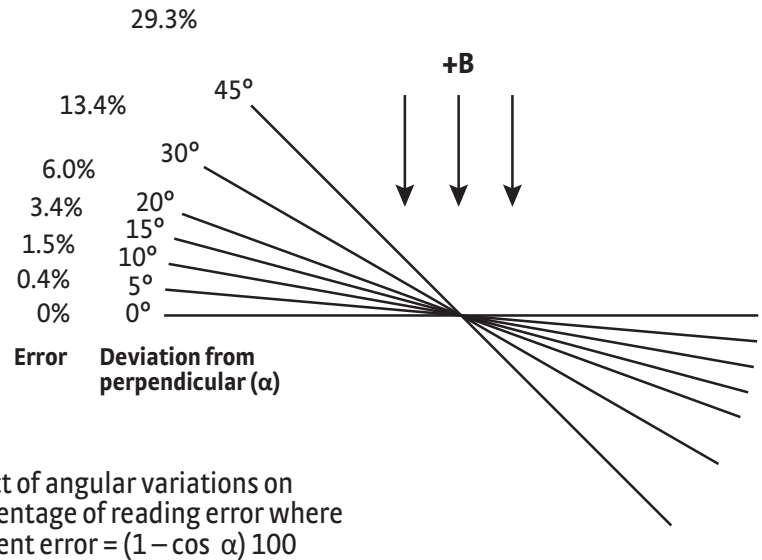
To unlock the screen:

1. Tap the lock icon in the upper right corner of the screen.
2. Tap **UNLOCK** in the status bar. The screen unlocks.

Probe accuracy considerations

The user must consider all the possible contributors to the accuracy of the reading. Both the probe and teslameter have accuracy specifications that may impact the actual reading.

Probe readings are dependent on the angle of the sensor (Hall sensor) in relation to the magnetic field. Maximum output occurs when the flux vector is perpendicular to the plane of the sensor. This is the condition that exists during factory calibration. The greater the deviation from orthogonality (from right angles in either of three axes), the larger the error of the reading. For example, a 5° variance on any one axis causes a 0.4% error, a 10° misalignment induces a 1.5% error, etc.



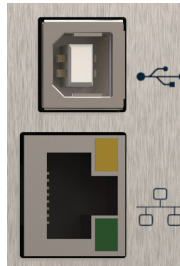
Computer interface connections

If desired, attach the teslameter to your PC using Ethernet or USB.

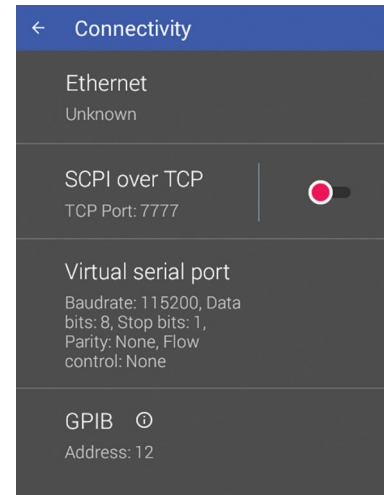
GPIB is also available for remote interface capability via an external adapter, which can be purchased from Lake Shore. See <http://www.lakeshore.com/products/product-detail/measureready/gpib-adapter> for more information.

NOTE: In order to use the adapter, the instrument must have operating system version 2.6.4 (or later) installed.

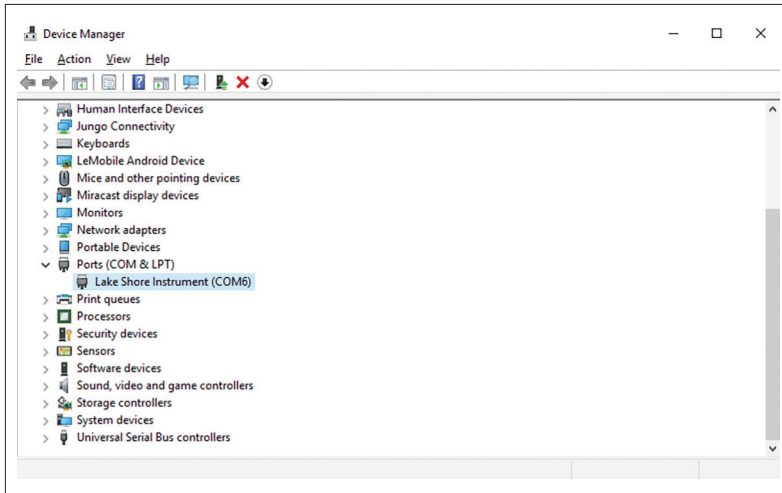
USB Serial port settings	
Baud rate	115,200
Data bits	8
Parity	None
Stop bits	1
Flow control	RTS/CTS



Ethernet settings	
IP address	DHCP or Manual
Port	7777



Use the SCPI command list (see the user's manual) and your favorite serial terminal program (such as PuTTY or Termit) to communicate with the teslameter via the remote interface. The USB connection will be listed as a virtual COM port on your PC. If you are not able to connect, make sure you have the correct COM port selected. You can do this by checking Device Manager:



If you are unable to see the teslameter in this view, you may need to install the USB driver that can be found on the Lake Shore Software web page: <http://www.lakeshore.com/software/>.

Contacting Lake Shore

The Lake Shore Technical Support Department is staffed Monday through Friday between the hours of 8:00 a.m. and 5:00 p.m. EST, excluding holidays and company shut down days: <https://www.lakeshore.com/support/>.

The Lake Shore Forum is also a great place to look for solutions, to post issues, and to share successes: <https://forums.lakeshore.com/>

For further documentation and information, please see <https://www.lakeshore.com/teslameters>.

Lake Shore Technical Support

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