

2-BP Battery Pack Instructions

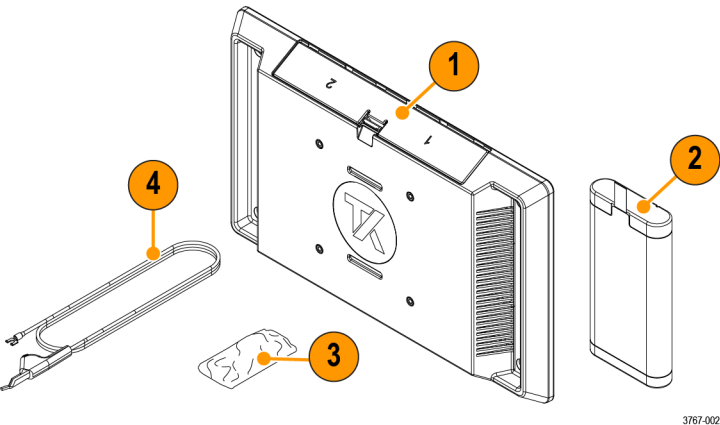
Battery pack information

The battery pack allows you to perform measurements without relying on AC power. All 2 Series MSO instruments support the installation of the battery pack.

You can operate the instrument continuously for approximately three hours with one battery and six hours with two batteries in the battery pack. The instrument turns off automatically when the batteries run out of power. An on-screen icon and battery status menu indicates the remaining battery power.

Parts list

Item	Part Number	Description
1	2-BP	2 Series MSO Battery Pack with two battery slots; ordered separate from instrument purchase.
	2-BATPK	2 Series MSO Battery Pack with two battery slots; option ordered with instrument purchase.
2	TEKBAT-XX	Battery; lithium-ion, rechargeable, SMBUS, recessed terminals, UL, safety controlled
3	211-1722-XX	Pack of 4 screws, M4X.7X12MM
4	174-7369-XX	Ground cable, safety controlled



Recommended installation tools

Use a screwdriver handle with No. 2 Phillips screw tip or a No. 2 Phillips screwdriver to install the battery pack onto your instrument.

Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, see the *Service safety summary* that follows the *General safety summary*.

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

This product shall be used in accordance with local and national codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Do not operate without covers

Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry

Do not touch exposed connections and components when power is present.

Do not operate with suspected failures.

If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Replace batteries properly

Replace batteries only with the specified type and rating.

Recharge batteries for the recommended charge cycle only.

Wear eye protection

Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do not operate in wet/damp conditions

Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere**Keep product surfaces clean and dry**

Remove the input signals before you clean the product.

Provide proper ventilation.

Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment

Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use only the Tektronix rackmount hardware specified for this product.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock

Do not touch exposed connections.

Do not service alone

Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power

To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on

Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair

Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in this manual

These terms may appear in this manual:



WARNING: Warning statements identify conditions or practices that could result in injury or loss of life.



CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

Symbols on the product



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbols(s) may appear on the product.



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal



Chassis Ground



WARNING
High Voltage



Standby



Functional
Earth Terminal



Breakable.
Do not drop.

Compliance information

This section lists the safety and environmental standards with which the instrument complies. This product is intended for use by professionals and trained personnel only; it is not designed for use in households or by children.

Compliance questions may be directed to the following address:

Tektronix, Inc.

PO Box 500, MS 19-045

Beaverton, OR 97077, USA

tek.com

Safety compliance

This section lists other safety compliance information.

Equipment type

Test and measuring equipment.

Pollution degree description

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution Degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution Degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
- Pollution Degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution Degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution degree rating

Pollution Degree 2 (as defined in IEC 61010-1)

Measurement and overvoltage category descriptions

Measurement terminals on this product may be rated for measuring mains voltages from one or more of the following categories (see specific ratings marked on the product and in the manual).

- Measurement Category II. For measurements performed on circuits directly connected to the low-voltage installation.
- Measurement Category III. For measurements performed in the building installation.
- Measurement Category IV. For measurements performed at the source of low-voltage installation.



Note: Only mains power supply circuits have an overvoltage category rating. Only measurement circuits have a measurement category rating. Other circuits within the product do not have either rating.

Mains overvoltage category rating

Overvoltage Category I (as defined in IEC 61010-1)

Instrument label accessibility

Installation of the battery pack covers the back instrument label. The label displays important information like the instrument model number, serial number, and CSA mark. To view label, uninstall the battery pack. The model and serial number is also accessible through the instrument user interface.

Environmental compliance

This section provides information about the environmental impact of the product.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling

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.



This 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).

Battery recycling

This product (2 Series MSO Battery Pack) is packed with a lithium-ion rechargeable battery pack. Please dispose of or recycle the battery pack at its end of life according to local government regulations.

This lithium-ion rechargeable battery pack must be recycled or disposed of properly at its end of life.

- Lithium-ion batteries are subject to disposal and recycling regulations that vary by country and region. Always check and follow your applicable regulations before disposing of any battery. Contact Rechargeable Battery Recycling Corporation (www.rbrc.org) for U.S.A. and Canada, or your local battery recycling organization.
- Many countries prohibit the disposal of waste batteries in standard waste receptacles.
- Place only discharged batteries in a battery collection container. Use electrical tape or other approved covering over the battery connection points to prevent short circuits.

Transporting batteries

The small lithium-ion rechargeable battery that is packed with this product does not exceed a capacity of 100 Wh per battery or 20 Wh per component cell. Each battery type has been shown by the manufacturer to comply with the applicable requirements of the UN Manual of Tests and Criteria Part III, Subsection 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.

Operating requirements

Use the instrument within the required operating temperature, power, altitude, and signal input voltage ranges to provide the most accurate measurements and safe instrument operation.

Table 1: Environment requirements

Characteristic	Description
Temperature	Operating instrument: 0°C to +50°C (+32°F to 120°F), with 5 °C/minute maximum gradient, noncondensing (NC)
	Operating with battery: 0 °C to 45 °C (+32 °F to 113 °F)
	For proper cooling, keep the rear of the instrument clear of obstructions for 2 inches (51 mm).
Operating humidity	5% to 90% relative humidity at temperatures up to +30°C, 5% to 60% relative humidity at temperatures greater than +30°C and up to +50°C.
Operating altitude	Up to 3000 meters (9842 feet)
Battery power	Requires 2-BATPK battery pack with 2 slots for batteries to be ordered with instrument or 2-BP battery pack with 2 slots for batteries to be ordered post instrument purchase
	Supports up to 2 TEKBAT-XX Li-Ion rechargeable batteries. Operating time; Up to 3 hours single battery and up to 6 hours dual batteries.
	Tektronix recommends using the TEKCHG-XX external battery charger to charge the TEKBAT-XX batteries in ambient environments greater than +30°C.

Table 2: Power requirements

Characteristic	Description
Power source voltage	24 V DC
Power source current	2.5 A

Operating safely with battery power

For safe operation, the instrument chassis should always remain at earth ground potential.



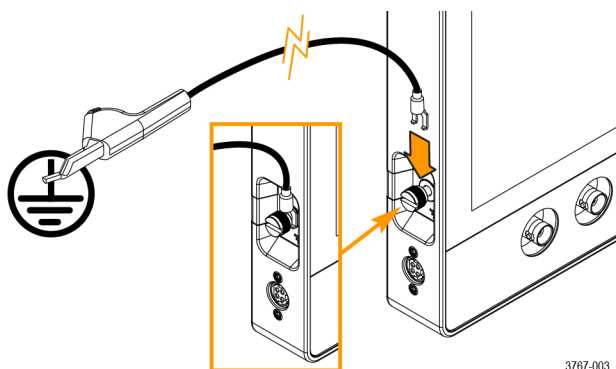
WARNING: To avoid electric shock, always use the Tektronix-provided grounding cable when the oscilloscope is operating on battery power and not connected to the external power supply. The Tektronix-provided grounding cable is not for permanent usage.

Without a connection between the chassis and earth ground, you may receive a shock from exposed metal on the chassis if you connect an input to a hazardous voltage ($>30 V_{RMS}$, $>42 V_{pk}$). To protect yourself against possible shock, attach the Tektronix-provided grounding cable.

The grounding cable is necessary to provide protective bonding between the oscilloscope and a dedicated earthing terminal, in accordance with the NEC, CEC, and local codes. Consider having a qualified electrician to approve the installation.

The grounding cable shall be connected before powering on the oscilloscope and before attaching the probes to any circuit. Connect the grounding cable from the ground lug terminal on the side panel of the instrument to a dedicated earthing terminal. Make sure the teeth of the alligator clip makes good electrical contact and is secured against slipping.

The alligator clip on the grounding cable must be connected to a dedicated earthing terminal, an earthing terminal bar, or identified equipment grounding points (a rack cabinet for example). Make sure you have a good electrical connection to an appropriate grounding device that is identified with a Protective Earth symbol, or the word **GROUND/GND**, or the color green (green ground screw/conductor). If none of these are present, assume the connection is not earthed.



Always verify that the grounding cable is making good electrical contact by using an ohmmeter or continuity meter between the dedicated earthing terminal and the ground lug terminal on the side panel of the oscilloscope. Verify again anytime the oscilloscope has been left unattended.

Make sure the dedicated earthing terminal is located in close proximity to the circuit under test. Keep the grounding cable clear of heat sources and mechanical hazards such as; sharp edges, screw threads, moving parts, and closing doors/covers. Inspect the cable, insulation, and terminal ends for damage before use. Do not use a damaged grounding cable. Contact Tektronix for a replacement.

If you choose not to attach the grounding cable, you are not protected against electric shock if you connect the oscilloscope to a hazardous voltage. You can still use the oscilloscope if you do not connect a signal greater than $30 V_{RMS}$ ($42 V_{pk}$) to the probe tip, the BNC connector center, or the common lead. Make sure all probe common leads are connected to the same voltage.



WARNING: Hazardous voltages may exist in unexpected places due to faulty circuitry in the device under test.



CAUTION: When operating the instrument on battery power do not connect a grounded device, such as a printer or computer, to the oscilloscope unless the instrument grounding cable is connected to the earth ground.

Battery pack installation

Install the battery pack to the back of your instrument.

Before you begin

The battery pack must be empty during the installation procedure. After installation, insert one or two batteries into the battery pack before you turn on the instrument.

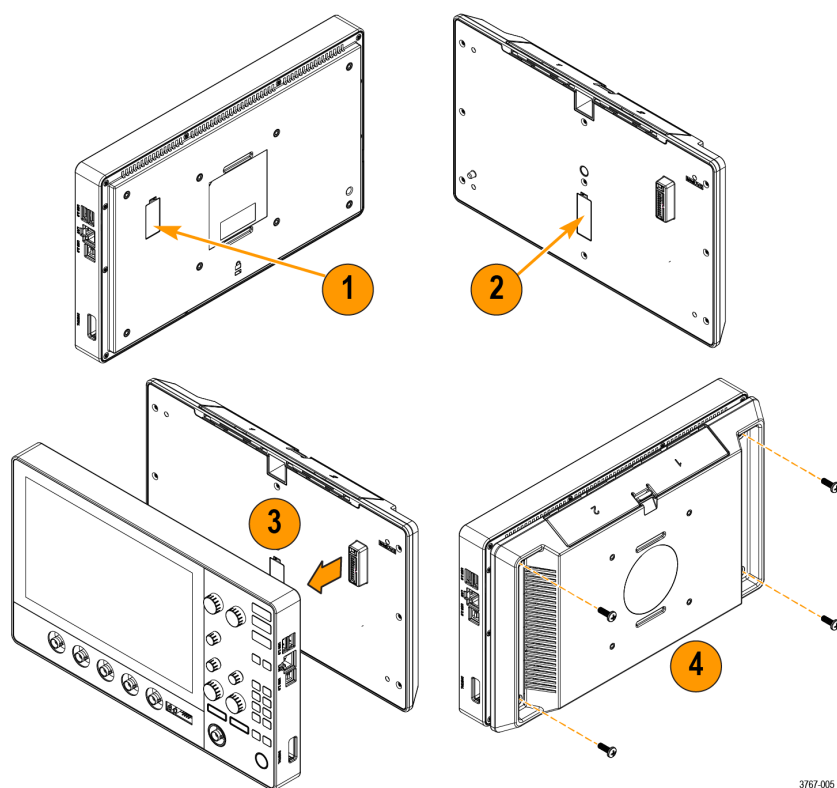


CAUTION: The battery interface connector is susceptible to Electrostatic Discharge (ESD). Use ESD precautions with installing or removing the battery pack.



WARNING: Before operating the instrument with the battery pack connected without an AC power source, always connect the ground cable.

Procedure



3767-005

1. Remove cover from battery interface connector on the back of your instrument.
2. Attach the battery interface cover to the cover slot in the middle of the battery pack.
Use this slot to save the cover for the battery interface connector when the battery pack is installed.
3. Align the connector on your battery pack with the battery interface connector on your instrument and connect the battery pack to your instrument.
There is a hole on the opposite side of the connector on the instrument and a peg on the battery pack to help with alignment.
4. Install the four provided screws into the corner screw mounts on the battery pack.



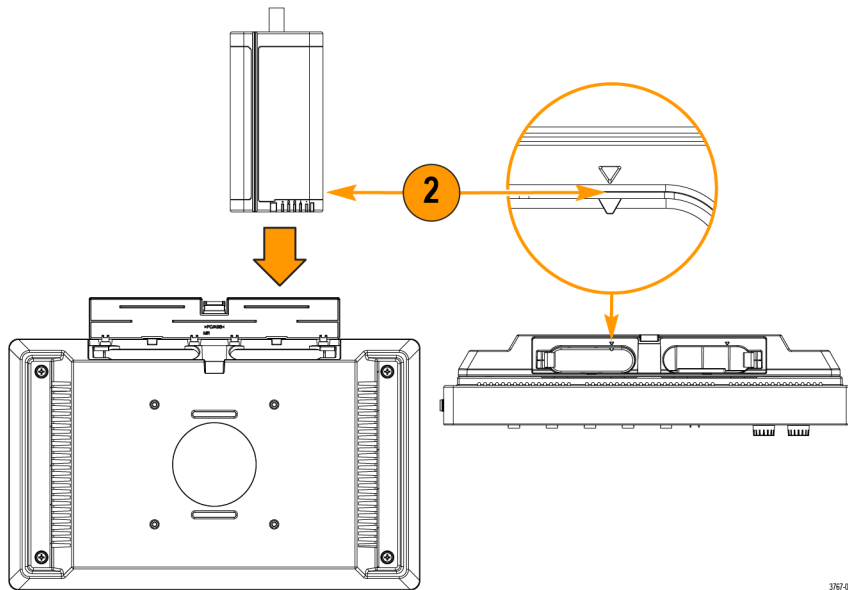
CAUTION: The recommended torque is 3.6 N·m (32 inch-lbf). Failure to fully tighten the screws makes the battery pack more susceptible to fall damage.

To remove the battery pack, reverse this procedure.

Rechargeable battery installation

The battery pack has 2 battery slots and supports hot swapping of the batteries during operation to extend the battery run time. The batteries are charged when the instrument is connected to an AC power source or charge each battery separately using the Tektronix external battery charger (TEKCHG-XX).

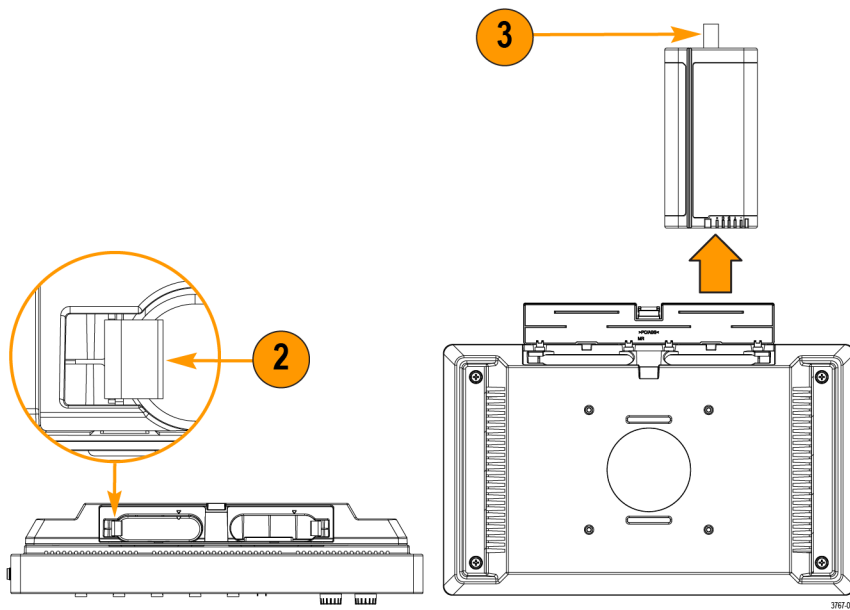
Procedure



1. Use your fingers to push on the battery door latch and open the door upward.
The battery door is made to easily detach from the hinges. The battery pack will still operate with the door open or removed.
2. Use the triangle alignment keys on top of the battery and battery pack slot to place the rechargeable battery into slot one or two.
The pull tab will be on the opposite side of the alignment key. A latch secures the battery in place when inserted into the battery pack.
3. Close and latch the battery pack door.

Rechargeable battery removal

Procedure



1. Use your fingers to push on the door latch and open the door upward.
2. Open the battery latch to release the battery from the slot.
3. Use the battery pull tab to remove the battery from the slot.
4. Close and latch the battery pack door.

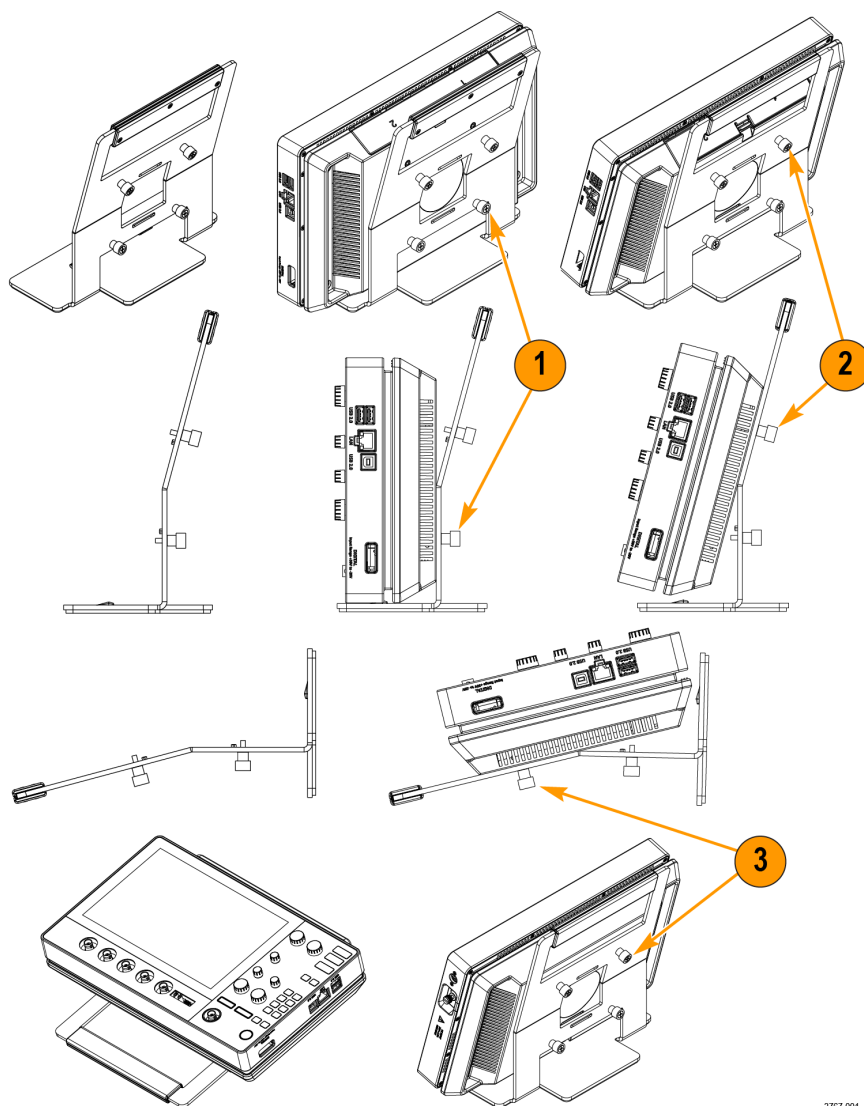
Instrument stand to battery pack installation

Mount your instrument to the provided stand in three configurations.

Before you begin

Align the stand with the four VESA screw mounts (closest to the label) on the back of the battery pack.

Procedure



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1. Hand tighten the bottom two screws on the stand to the bottom two VESA screw mounts. The instrument is now secured to the stand straight up and down.
2. Hand tighten the top two screws on the stand to the top two VESA screw mounts. The instrument is now secured to the stand at a fifteen degree angle.
3. Turn the instrument upside-down and hand tighten the top two screws on the stand to the bottom two VESA screw mounts. The instrument is now secured to the stand at a seventy-five degree angle when the stand is laying flat.

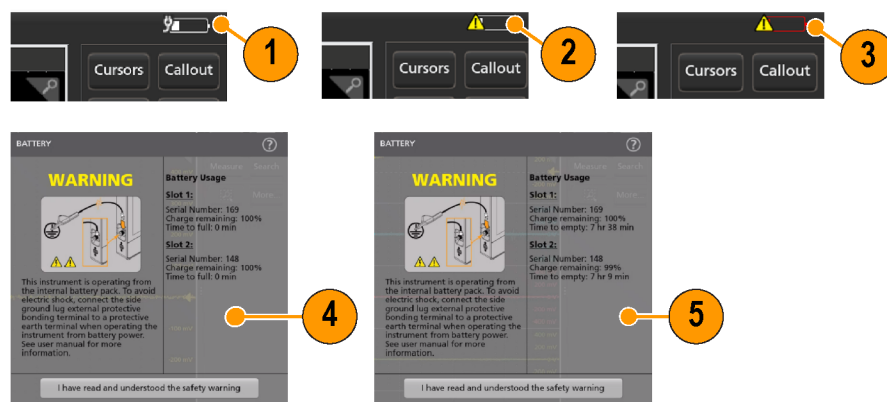
Battery status

When the battery pack is installed and a battery is inserted, an icon and battery menu indicates the battery status.

The battery icon is displayed in the upper right corner of the screen. Double tapping the icon opens the battery menu. The battery menu indicates whether a battery has been inserted in slot 1 or 2, the battery serial number, a remaining charge percentage, and the battery time to full or empty.

A safety warning message automatically displays in the battery menu when an instrument is turned on with battery power only or when the power cord is removed from an instrument operating on battery power. You must tap the safety warning acknowledgement button to close the battery menu.

The following table and images describe the different icon states, **Time to full**, and **Time to empty**.



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Item	Description
1	The battery icon displays a power cord when connected to an AC power source. This indicates that the battery is charging in the battery pack.
2	The battery icon and a warning symbol when operating on a battery power alone.
3	The battery icon turns red when less than ten percent of the battery charge is remaining.
4	Time to full displays the time it takes for the battery fully charge when connected to an AC power source.
5	Time to empty displays the remaining time until the battery is empty. It is only displayed when operating on battery power alone.

When the batteries in the 2-BP battery pack on your instrument have a low battery charge and the power cord is not connected, the power button will blink twice and then your instrument will turn off.

When two batteries are inserted into the 2-BP battery pack, the battery with the lowest battery life will begin charging first. The battery with the higher battery life displays a long **Time to Full** when it is not actively charging. The two batteries actively charge at the same rate when they reach a similar battery life. When both batteries are actively charging the **Time to Full** display accurately.