



TBS2000B Series Oscilloscopes Safety and Installation

Instructions



071-3635-00

Contacting Tektronix

Tektronix, Inc., 14150 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.

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, additional information is provided at the end of this section.

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.

Comply with local and national safety 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.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

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

Use proper power cord. Use only the power cord specified for this product and certified for the country of use.

Do not use the provided power cord for other products.

Ground the product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Do not disable the power cord grounding connection.

Power disconnect. The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to access the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

Connect and disconnect properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by Tektronix to be suitable for the product.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not exceed the Measurement Category (CAT) rating and voltage or current rating of the lowest rated individual component of a product, probe, or accessory. Use caution when using 1:1 test leads because the probe tip voltage is directly transmitted to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do not float the common terminal above the rated voltage for that terminal.

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.

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. To ensure proper cooling, keep the sides and rear of the instrument clear of obstructions. 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 button pads. Be sure your work area meets applicable ergonomic standards.

Probes and test leads

Before connecting probes or test leads, connect the power cord from the power connector to a properly grounded power outlet.

Keep fingers behind the finger guards on the probes.

Remove all probes, test leads and accessories that are not in use.

Use only correct Measurement Category (CAT), voltage, temperature, altitude, and amperage rated probes, test leads, and adapters for any measurement.

Beware of high voltages. Understand the voltage ratings for the probe you are using and do not exceed those ratings. Two ratings are important to know and understand:

- The maximum measurement voltage from the probe tip to the probe reference lead
- The maximum floating voltage from the probe reference lead to earth ground

These two voltage ratings depend on the probe and your application. Refer to the Specifications section of the manual for more information.

WARNING. To prevent electrical shock, do not exceed the maximum measurement or maximum floating voltage for the oscilloscope input BNC connector, probe tip, or probe reference lead.

Connect and disconnect properly. Connect the probe output to the measurement product before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement product.

Connect and disconnect properly. De-energize the circuit under test before connecting or disconnecting the current probe.

Connect the probe reference lead to earth ground only.

Do not connect a current probe to any wire that carries voltages above the current probe voltage rating.

Inspect the probe and accessories. Before each use, inspect probe and accessories for damage (cuts, tears, or defects in the probe body, accessories, or cable jacket). Do not use if damaged.

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 product manuals

These terms may appear in the product manuals:

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.

Symbols and 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.



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 symbol(s) may appear on the product:



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal



Functional
Earth Terminal



Standby

Operating requirements

Environment requirements

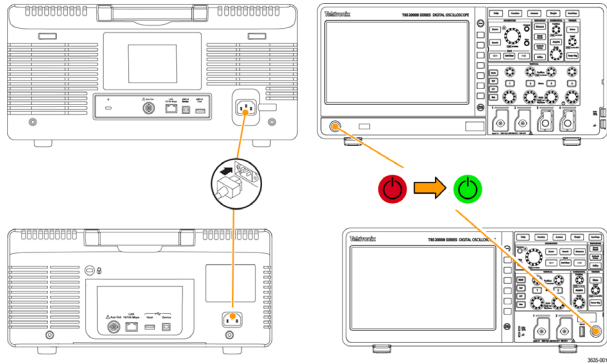
Characteristic	Description
Operating temperature	0 °C to +50 °C, with 5 °C/minute maximum gradient, noncondensing (NC), up to 3000 meter altitude
Operating humidity	5% to 95% relative humidity (% RH) up to +30 °C 5% to 60% RH above +30 °C up to +50 °C, NC
Operating altitude	Up to 3000 meters (9842 feet)

Power requirements

Characteristic	Description
Power source voltage	100 V _{AC} – 240 V _{AC} ±10% RMS, single phase
Power source frequency	50/60 Hz over entire source voltage range 400 Hz (360 Hz to 440 Hz) for 115 V _{AC} (100 V _{AC} – 132 V _{AC}) RMS source voltage range
Power consumption	All models: 80 W maximum

Installation

Power on the unit



Connect the supplied power cord to the rear-panel power connector. Push the front panel power button to power the oscilloscope on and off. To completely remove power from the unit, disconnect the power cord.

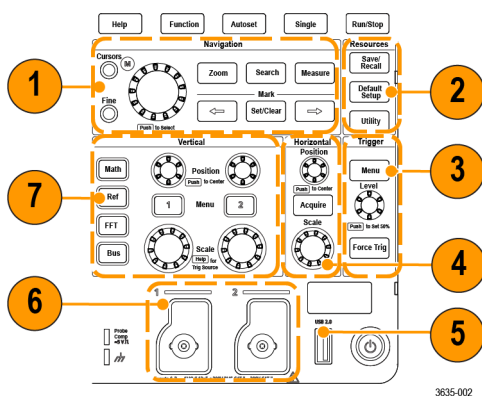
Controls and connections

Read the *TBS2000B Series User Manual* for detailed information about all product controls, the user interface, how to take measurements, and warranty information. The manual is available in the languages listed below.

Language	Tektronix part number
English	077-1525-00
French	077-1526-00
German	077-1527-00
Italian	077-1529-00
Spanish	077-1530-00
Korean	077-1532-00
Japanese	077-1533-00
Simplified Chinese	077-1534-00
Traditional Chinese	077-1535-00
Russian	077-1536-00


Front panel

NOTE. Some control and connector positions are different between the two- and four-channel models, but their functions are the same.



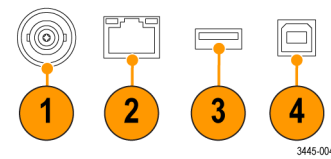
- Use the **Navigation** controls to select menu items, set values, display and move cursors, magnify a section of the waveform and add marks (tags) to a waveform record. The **Mark** functions are not now enabled, but will be available in a future software update.
- Use the **Resource** controls to open menus to select and display automated measurements; save or recall setups, waveforms, and screen images; set UI language, date and time, network and Wi-Fi settings, and more.

- Use the **Trigger** controls to set the trigger type, source channel, trigger signal coupling, the signal's trigger slope (positive or negative), trigger level, and more.
- Use the **Horizontal** controls to set the acquisition mode, waveform record length, horizontal scale (time per major horizontal graticule and samples/second), and more.
- Use the **USB 2.0 Host port** to insert a USB flash drive to save and recall screen images, waveforms, and settings, and install new oscilloscope firmware.
- Use the TekVPI® **probe input** connectors to connect the oscilloscope to the signal. The maximum measurement input voltage is 300 V_{RMS}, CAT II.

A  symbol next to a measurement readout indicates a signal over range condition (clipping). This is often caused by waveforms that extend above or below the screen edge. To get an accurate measurement readout, adjust the vertical scale and/or position knob to show the entire waveform on the screen.

- Use the **Vertical** controls to select a waveform to display, open menus to set signal coupling, bandwidth, probe attenuation and type; move the waveform up or down on the screen; set the vertical scale factor (volts per vertical graticule division); and more.

Rear panel



- Aux Out.** Sends a low to high transition when a trigger occurs, to synchronize other test equipment.
- LAN.** Connects to a 10/100 Base-T local area network for remote access.
- USB (Host).** Connects to the optional Wi-Fi adapter for wireless remote access.
- USB (Device).** Connects to a PC for remote control using USBTMC protocol.

Cleaning

Use a dry, soft cotton cloth to clean the outside of the unit. Do not use any liquid cleaning agents or chemicals that could damage the case, controls, screen, markings or labels, or possibly infiltrate the case.

Compliance

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies. This product is intended for use by professional and trained personnel only; it is not designed for use in households or by children.

Questions about the following compliance information may be directed to the following address:

Tektronix, Inc.
PO Box 500, MS 19-045
Beaverton, OR 97077, USA
www.tek.com

EMC compliance

EC declaration of conformity – EMC

Meets intent of Directive 2014/30/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1, EN 61326-2-1. EMC requirements for electrical equipment for measurement, control, and laboratory use. ^{1 2 3 4 5}

- CISPR 11 (Group 1, Class A)
- IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-5; IEC 61000-4-6; IEC 61000-4-11
- EN 61000-3-2:A1/A2; EN 61000-3-3

- This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.
- Emissions that exceed the levels required by this standard may occur when this equipment is connected to a test object.
- Equipment may not meet the immunity requirements of applicable listed standards when test leads and/or test probes are connected.
- For compliance with the EMC standards listed here, high quality shielded interface cables that incorporate low impedance connection between the cable shield and the connector shell should be used.
- 10 mV/division to 1 V/division: ≤1.0 division waveform displacement or ≤2.0 division increase in peak-to-peak noise is allowed when the instrument is subjected to fields and signals as defined in the IEC 61000-4-3 and IEC 61000-4-6 tests.

Australia / New Zealand declaration of conformity – EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- CISPR 11. Radiated and Conducted Emissions, Group 1, Class A, in accordance with EN 61326-1 and EN 61326-2-1.

FCC – EMC

Emissions are within the limits of FCC 47 CFR, Part 15, Subpart B for Class A equipment.

Russian Federation

This product is approved by the Russian government to carry the GOST mark.

Safety compliance

This section lists the safety standards with which the product complies and other safety compliance information.

EC declaration of conformity – low voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2014/35/EU.

- EN 61010-1; EN 61010-2-030

U.S. nationally recognized testing laboratory listing

- UL 61010-1; UL 61010-2-030

Canadian certification

- CAN/CSA-C22.2 No. 61010-1; CAN/CSA-C22.2 No. 61010-2-030

Additional compliances

- IEC 61010-1; IEC 61010-2-030

Equipment type

Test and measuring equipment.

Safety class

Class 1 - grounded product.

Pollution degree rating

Pollution Degree 2 (as defined in IEC 61010-1). Rated for indoor, dry location use only.

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).

Category II. Circuits directly connected to the building wiring at utilization points (socket outlets and similar points).

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

Mains overvoltage category rating

Overvoltage category II (as defined in IEC 61010-1).

Environmental considerations

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

Restriction of hazardous substances

Complies with RoHS2 Directive 2011/65/EU.

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).