

**TBS1000 Series
Digital Storage Oscilloscopes
Installation and Safety Manual**



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www.valuetronics.com

Tektronix

**TBS1000 Series
Digital Storage Oscilloscopes
Installation and Safety Manual**

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USA

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

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

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.

Connect and Disconnect Properly. Connect the probe output to the measurement instrument 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 instrument.

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.

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.

Connect the probe reference lead to earth ground only.

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

Power Disconnect. The power switch disconnects the product from the power source. See instructions for the location. Do not block the power switch; it must remain accessible to the user at all times.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Suspected Failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

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.*

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.

The following symbol(s) may appear on the product:



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal



Earth Terminal



Chassis Ground



Mains Disconnected
OFF (Power)



Mains Connected
ON (Power)



On



Off

Compliance Information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

EMC Compliance

EC Declaration of Conformity – EMC

Meets intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1:2006, EN 61326-2-1:2006. EMC requirements for electrical equipment for measurement, control, and laboratory use. ^{1 2 3}

- CISPR 11:2003. Radiated and conducted emissions, Group 1, Class A
- IEC 61000-4-2:2001. Electrostatic discharge immunity
- IEC 61000-4-3:2002. RF electromagnetic field immunity ⁴
- IEC 61000-4-4:2004. Electrical fast transient/burst immunity
- IEC 61000-4-5:2001. Power line surge immunity
- IEC 61000-4-6:2003. Conducted RF immunity ⁵
- IEC 61000-4-11:2004. Voltage dips and interruptions immunity ⁶

EN 61000-3-2:2006. AC power line harmonic emissions

EN 61000-3-3:1995. Voltage changes, fluctuations, and flicker

European Contact.

Tektronix UK, Ltd.
Western Peninsula
Western Road
Bracknell, RG12 1RF
United Kingdom

- ¹ This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.
- ² Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.
- ³ To ensure compliance with the EMC standards listed here, high quality shielded interface cables should be used.
- ⁴ The instrument will exhibit ≤ 1.0 division waveform displacement and ≤ 2.0 division increase in peak-to-peak noise when subjected to radiated interference per IEC 61000-4-3.
- ⁵ The instrument will exhibit ≤ 0.5 division waveform displacement and ≤ 1.0 division increase in peak-to-peak noise when subjected to conducted interference per IEC 61000-4-6.
- ⁶ Performance Criterion C applied at the 70%/25 cycle Voltage-Dip and the 0%/250 cycle Voltage-Interruption test levels (IEC 61000-4-11). If the instrument powers down upon a voltage dip or interruption, it will take longer than ten seconds to return to the previous operating state.

**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 11:2003. Radiated and Conducted Emissions, Group 1, Class A, in accordance with EN 61326-1:2006 and EN 61326-2-1:2006.

Safety Compliance

EC Declaration of Conformity – Low Voltage

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

Low Voltage Directive 2006/95/EC.

- EN 61010-1: 2001. Safety requirements for electrical equipment for measurement control and laboratory use.

U.S. Nationally Recognized Testing Laboratory Listing

- UL 61010-1:2004, 2nd Edition. Standard for electrical measuring and test equipment.

Canadian Certification

- CAN/CSA-C22.2 No. 61010-1:2004. Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1.

Additional Compliances

- IEC 61010-1: 2001. Safety requirements for electrical equipment for measurement, control, and laboratory use.

Equipment Type

Test and measuring equipment.

Safety Class

Class 1 – grounded product.

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.

Installation (Overvoltage) Category Descriptions

Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:

- Measurement Category IV. For measurements performed at the source of low-voltage installation.
- Measurement Category III. For measurements performed in the building installation.
- Measurement Category II. For measurements performed on circuits directly connected to the low-voltage installation.
- Measurement Category I. For measurements performed on circuits not directly connected to MAINS.

Overvoltage Category

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

Environmental Considerations

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. In order 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 2002/96/EC and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Restriction of Hazardous Substances

This product is classified as an industrial monitoring and control instrument, and is not required to comply with the substance restrictions of the recast RoHS Directive 2011/65/EU until July 22, 2017.

Getting Started

TBS1000 Series Digital Storage Oscilloscopes are small, lightweight, benchtop instruments, which you can use to take ground-referenced measurements.

Model	Channels	Bandwidth	Sample rate	Display
TBS1022	2	25 MHz	500 MS/s	Color
TBS1042	2	40 MHz	500 MS/s	Color
TBS1062	2	60 MHz	1 GS/s	Color
TBS1102	2	100 MHz	1 GS/s	Color
TBS1152	2	150 MHz	1 GS/s	Color

NOTE. You can select a language to display on the screen when you power on the oscilloscope. At any time, you can also access the **Utility ► Language** option to select a language.

Installation

Power Cord

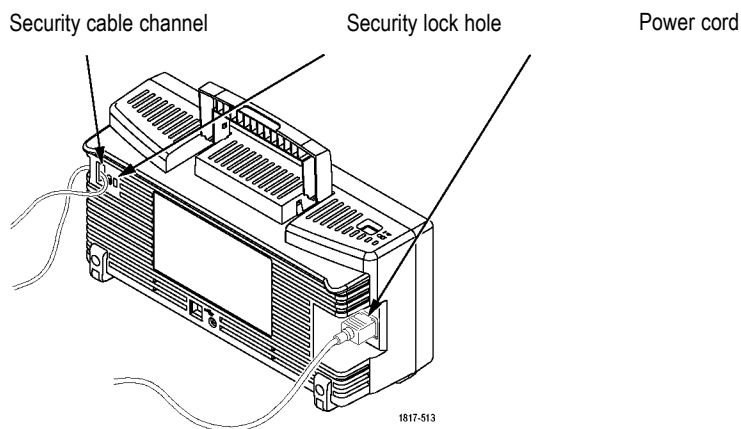
Use only the power cord provided with your oscilloscope. *Appendix B: Accessories* lists the standard and the optional accessories.

Power Source

Use a power source that delivers 90 to 264 VAC_{RMS}, 45 to 66 Hz. If you have a 400 Hz power source, it must deliver 90 to 132 VAC_{RMS}, 360 to 440 Hz.

Security Loop

Use a standard laptop computer security lock, or thread a security cable through the built-in cable channel to secure your oscilloscope to your location.



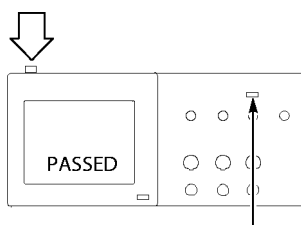
Ventilation

NOTE. The oscilloscope cools by convection. Keep two inches clear on the sides and top of the product to allow adequate air flow.

Functional Check

Perform this functional check to verify that your oscilloscope is operating correctly.

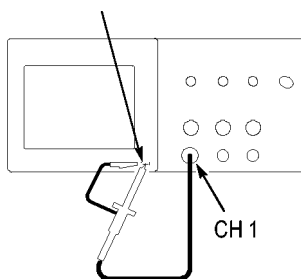
ON/OFF button



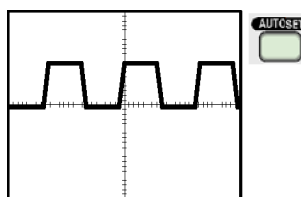
Default Setup button

1. Power on the oscilloscope.
Push the **Default Setup** button.
The default Probe option attenuation setting is 10X.

PROBE COMP



2. Connect the TPP0101/TP0201 probe to channel 1 on the oscilloscope. To do this, align the slot in the probe connector with the key on the CH 1 BNC, push to connect, and twist to the right to lock the probe in place.
Connect the probe tip and reference lead to the PROBE COMP terminals.

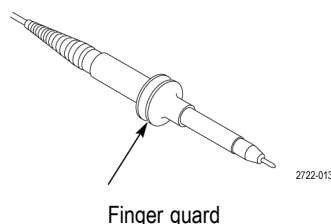


3. Push the **AutoSet** button. Within a few seconds, you should see a square wave in the display of about 5V peak-to-peak at 1 kHz.
Push the **1** channel 1 menu button on the front panel twice to remove channel 1, push the **2** channel 2 menu button to display channel 2, and repeat steps 2 and 3.

Probe Safety

Check and observe probe ratings before using probes.

A guard around the TPP0101/TPP0201 probe body provides a finger barrier for protection from electric shock.



WARNING. To avoid electric shock when using the probe, keep fingers behind the guard on the probe body.

To avoid electric shock while using the probe, do not touch metallic portions of the probe head while it is connected to a voltage source.

Connect the probe to the oscilloscope, and connect the ground terminal to ground before you take any measurements.

Voltage Probe Check Wizard

You can use the Probe Check Wizard to verify that a voltage probe is operating properly. The wizard does not support current probes.

The wizard helps you adjust the compensation for voltage probes (usually with a screw on the probe body or probe connector) and set the factor for the Attenuation option for each channel, such as in the **1 ► Probe ► Voltage ► Attenuation** option.

You should use the Probe Check Wizard each time you connect a voltage probe to an input channel.

To use the Probe Check Wizard, push the **PROBE CHECK** button. If the voltage probe is connected properly, compensated properly, and the Attenuation option in the oscilloscope Vertical menu is set to match the probe, the oscilloscope displays a PASSED message at the bottom of the screen. Otherwise, the oscilloscope displays directions on the screen to guide you in correcting these problems.

NOTE. *The Probe Check Wizard is useful for 1X, 10X, 20X, 50X, and 100X probes. It is not useful for 500X or 1000X probes, or for probes connected to the Ext Trig BNC.*

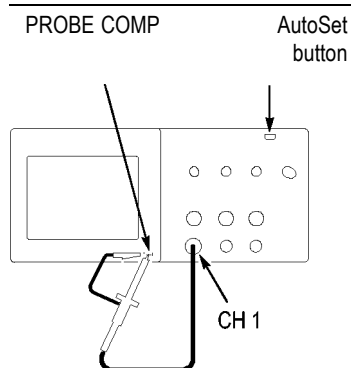
NOTE. *When the process is complete, the Probe Check Wizard restores the oscilloscope settings (other than the Probe option) to what they were before you pushed the PROBE CHECK button.*

To compensate a probe that you plan to use with the Ext Trig input, follow these steps:

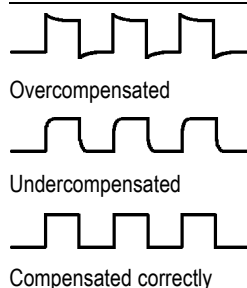
1. Connect the probe to any input channel BNC, such as to channel **1**.
2. Push the **PROBE CHECK** button and follow the directions on the screen.
3. After you verify that the probe functions and is compensated properly, connect the probe to the Ext Trig BNC.

Manual Probe Compensation

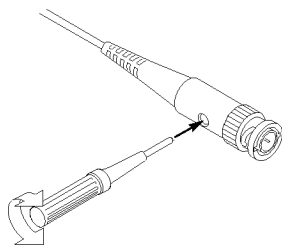
As an alternative method to the Probe Check Wizard, you can manually perform this adjustment to match your probe to the input channel.



1. Push the **1 ► Probe ► Voltage ► Attenuation** option and select **10X**. Connect the TPP0101/TPP0201 probe to channel 1 on the oscilloscope. If you use the probe hook-tip, ensure a proper connection by firmly inserting the tip onto the probe.
2. Attach the probe tip to the PROBE COMP ~5V@1kHz terminal and the reference lead to the PROBE COMP chassis terminal. Display the channel, and then push the **AutoSet** button.
3. Check the shape of the displayed waveform.



4. If necessary, adjust your probe. Repeat as necessary.



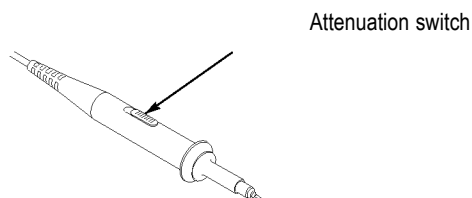
Probe Attenuation Setting

Probes are available with various attenuation factors which affect the vertical scale of the signal. The Probe Check Wizard verifies that the attenuation factor in the oscilloscope matches the probe.

As an alternative method to Probe Check, you can manually select the factor that matches the attenuation of your probe. For example, to match a probe set to 10X connected to CH 1, push the **1 ► Probe ► Voltage ► Attenuation** option, and select **10X**.

NOTE. The default setting for the Attenuation option is 10X.

If you change the Attenuation switch on a P2220 probe, you also need to change the oscilloscope Attenuation option to match. Switch settings are 1X and 10X.



NOTE. When the Attenuation switch is set to 1X, the P2220 probe limits the bandwidth of the oscilloscope to 6 MHz. To use the full bandwidth of the oscilloscope, be sure to set the switch to 10X.

Current Probe Scaling

Current probes provide a voltage signal proportional to the current. You need to set the oscilloscope to match the scale of your current probe. The default scale is 10 A/V.

For example, to set the scale for a current probe connected to CH 1, push the **1 ► Probe ► Current ► Scale** option, and select an appropriate value.

Self Calibration

The self calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. You can run the routine at any time but you should always run the routine if the ambient temperature changes by 5 °C (9 °F) or more. The routine takes about two minutes.

For accurate calibration, power on the oscilloscope and wait twenty minutes to ensure it is warmed up.

To compensate the signal path, disconnect any probes or cables from the input connectors. Then, access the **Utility ► Do Self Cal** option, and follow the directions on the screen.

Firmware Updates Through the Internet

If a newer version of firmware becomes available, you can use the Internet and a USB flash drive to update your oscilloscope. If you do not have access to the Internet, contact Tektronix for information on update procedures.

To update the firmware from the Internet, follow these steps:

1. Push the **Utility ► System Status** option, and write down the firmware version number of the oscilloscope.
2. From your computer, access the www.tektronix.com web site and check if a newer version of oscilloscope firmware is available.
3. If there is a newer version of firmware, download the firmware file from the web page.

You may need to unzip the downloaded file.

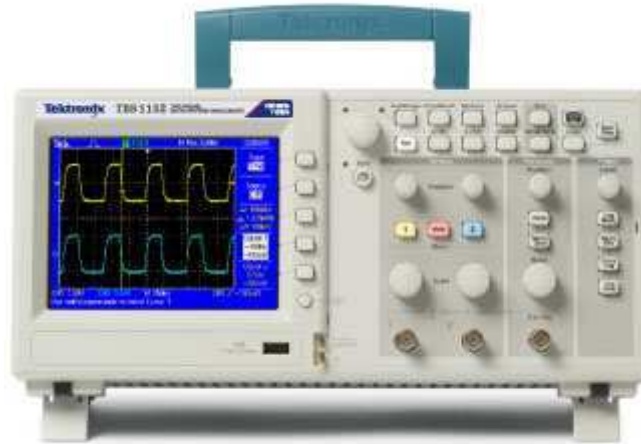
4. Copy the firmware file to the root folder of a USB flash drive.
5. Insert the USB flash drive into the USB Flash Drive port on the front of the oscilloscope.
6. From your oscilloscope, push the **Utility ► File Utilities ► - more - page 2 of 2 ► Update Firmware** option button.

It takes several minutes to update the firmware.

Your oscilloscope will prompt you to press a button when the firmware update is complete. You must not remove the USB flash drive, or power off the oscilloscope until the firmware update is complete.

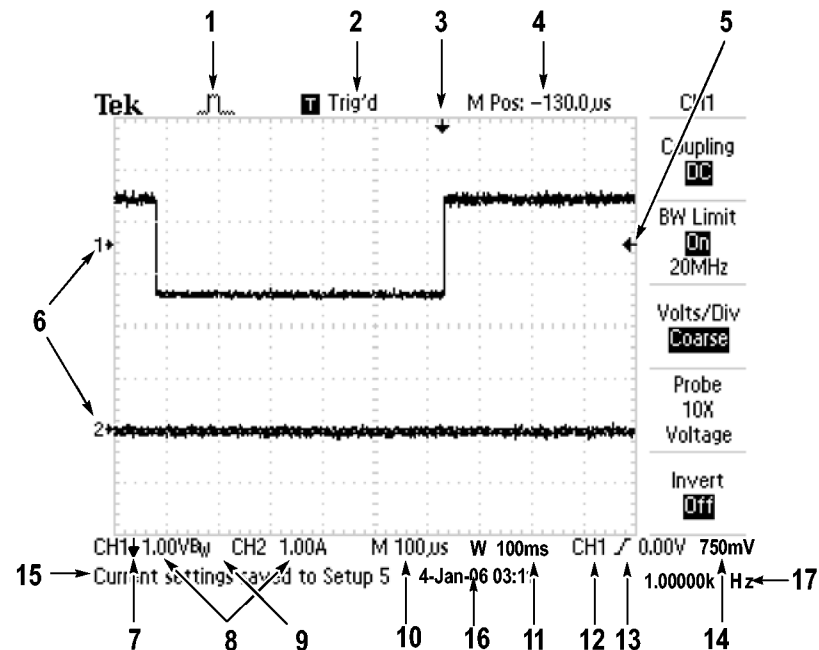
Operating Basics

The front panel is divided into easy-to-use functional areas. This chapter provides you with a quick overview of the controls and the information displayed on the screen.



Display Area

In addition to displaying waveforms, the display is filled with many details about the waveform and the oscilloscope control settings.



1. Icon display shows acquisition mode.



Sample mode



Peak detect mode



Average mode

2. Trigger status indicates the following:

☐ Armed.

The oscilloscope is acquiring pretrigger data. All triggers are ignored in this state.

☒ Ready.

All pretrigger data has been acquired and the oscilloscope is ready to accept a trigger.

☒ Trig'd.

The oscilloscope has seen a trigger and is acquiring the posttrigger data.

☒ Stop.

The oscilloscope has stopped acquiring waveform data.

☒ Acq. Complete

The oscilloscope has completed a Single Sequence acquisition.

☒ Auto.

The oscilloscope is in auto mode and is acquiring waveforms in the absence of triggers.

☐ Scan.

The oscilloscope is acquiring and displaying waveform data continuously in scan mode.

3. Marker shows horizontal trigger position. Turn the **Horizontal Position** knob to adjust the position of the marker.

4. Readout shows the time at the center graticule. The trigger time is zero.

5. Marker shows Edge or Pulse Width trigger level.

6. On-screen markers show the ground reference points of the displayed waveforms. If there is no marker, the channel is not displayed.

7. An arrow icon indicates that the waveform is inverted.

8. Readouts show the vertical scale factors of the channels.

9. A B_w icon indicates that the channel is bandwidth limited.

10. Readout shows main time base setting.

11. Readout shows window time base setting if it is in use.

12. Readout shows trigger source used for triggering.

13. Icon shows selected trigger type as follows:



Edge trigger for the rising edge.



Edge trigger for the falling edge.



Video trigger for line sync.



Video trigger for field sync.



Pulse Width trigger, positive polarity.



Pulse Width trigger, negative polarity.

14. Readout shows Edge or Pulse Width trigger level.
15. Display area shows helpful messages; some messages display for only three seconds.

If you recall a saved waveform, readout shows information about the reference waveform, such as RefA 1.00V 500 μ s.
16. Readout shows date and time.
17. Readout shows trigger frequency.

Message Area

The oscilloscope displays a message area (item number 15 in the previous figure) at the bottom of the screen that conveys the following types of helpful information:

- Directions to access another menu, such as when you push the **Trig Menu** button:

For TRIGGER HOLDOFF, go to HORIZONTAL MENU
- Suggestion of what you might want to do next, such as when you push the **Measure** button:

Push an option button to change its measurement
- Information about the action the oscilloscope performed, such as when you push the **Default Setup** button:

Default setup recalled
- Information about the waveform, such as when you push the AutoSet button:

Square wave or pulse detected on CH1

Using the Menu System

The user interface of the oscilloscopes was designed for easy access to specialized functions through the menu structure.

When you push a front-panel button, the oscilloscope displays the corresponding menu on the right side of the screen. The menu shows the options that are available when you push the unlabeled option buttons directly to the right of the screen.

The oscilloscope uses several methods to display menu options:

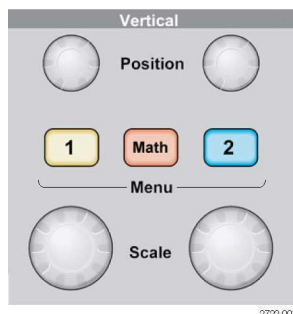
- **Page (Submenu) Selection:** For some menus, you can use the top option button to choose two or three submenus. Each time you push the top button, the options change. For example, when you push the top button in the Trigger Menu, the oscilloscope cycles through the Edge, Video, and Pulse Width trigger submenus.
- **Circular List:** The oscilloscope sets the parameter to a different value each time you push the option button. For example, you can push the 1 (channel 1 menu) button and then push the top option button to cycle through the Vertical (channel) Coupling options.

In some lists, you can use the multipurpose knob to select an option. A hint line tells you when the multipurpose knob can be used, and an LED by the multipurpose knob lights when the knob is active. (See page 21, *Menu and Control Buttons*.)

- **Action:** The oscilloscope displays the type of action that will immediately occur when you push an Action option button. For example, when the Help Index is visible, and you push the Page Down option button, the oscilloscope immediately displays the next page of index entries.
- **Radio:** The oscilloscope uses a different button for each option. The currently-selected option is highlighted. For example, the oscilloscope displays various acquisition mode options when you push the Acquire Menu button. To select an option, push the corresponding button.

Page Selection	Circular List	Action	Radio											
<table><tr><td>TRIGGER</td></tr><tr><td>Type Edge</td></tr></table>	TRIGGER	Type Edge	<table><tr><td>CH1</td></tr><tr><td>Coupling DC</td></tr></table>	CH1	Coupling DC	<table><tr><td>HELP</td></tr><tr><td>Page Up</td></tr><tr><td>Page Down</td></tr></table>	HELP	Page Up	Page Down	<table><tr><td>ACQUIRE</td></tr><tr><td> Sample</td></tr><tr><td> Peak Detect</td></tr><tr><td> Average</td></tr></table>	ACQUIRE	 Sample	 Peak Detect	 Average
TRIGGER														
Type Edge														
CH1														
Coupling DC														
HELP														
Page Up														
Page Down														
ACQUIRE														
 Sample														
 Peak Detect														
 Average														
or	or													
<table><tr><td>TRIGGER</td></tr><tr><td>Type Video</td></tr></table>	TRIGGER	Type Video	<table><tr><td>CH1</td></tr><tr><td>Coupling AC</td></tr></table>	CH1	Coupling AC									
TRIGGER														
Type Video														
CH1														
Coupling AC														
or	or													
<table><tr><td>TRIGGER</td></tr><tr><td>Type Pulse</td></tr></table>	TRIGGER	Type Pulse	<table><tr><td>CH1</td></tr><tr><td>Coupling Ground</td></tr></table>	CH1	Coupling Ground									
TRIGGER														
Type Pulse														
CH1														
Coupling Ground														

Vertical Controls



Vertical Measurement Overrange (Clipping). A display of ? in the measurement readout indicates an invalid value. This may be due to waveforms that extend beyond the screen (overrange). Adjust the vertical scaling to ensure the readout is valid.

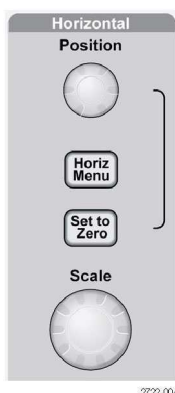
Position (1 & 2). Positions a waveform vertically.

1 & 2 Menu. Displays the Vertical menu selections and toggles the display of the channel waveform on and off.

Scale (1 & 2). Selects vertical scale factors.

Math. Displays waveform math operations menu and toggles the display of the math waveform on and off.

Horizontal Controls



Position. Adjusts the horizontal position of all channel and math waveforms. The resolution of this control varies with the time base setting.

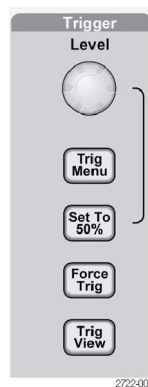
NOTE. To make a large adjustment to the horizontal position, turn the **Horizontal Scale** knob to a larger value, change the horizontal position, and then turn the **Horizontal Scale** knob back to the previous value.

Horiz. Displays the Horizontal Menu.

Set to Zero. Sets the horizontal position to zero.

Scale. Selects the horizontal time/division (scale factor) for the main or the window time base. When Window Zone is enabled, it changes the width of the window zone by changing the window time base.

Trigger Controls



Level. When you use an Edge or Pulse trigger, the **Level** knob sets the amplitude level that the signal must cross to acquire a waveform.

Trig Menu. Displays the Trigger Menu.

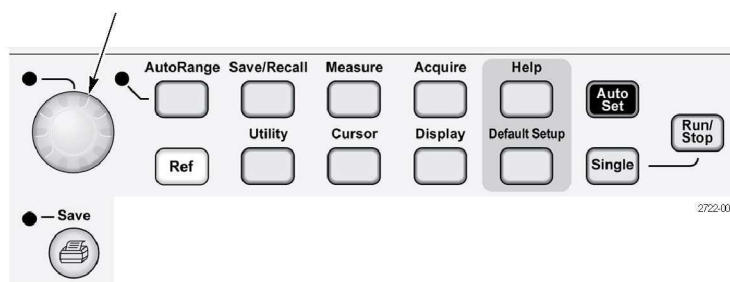
Set To 50%. The trigger level is set to the vertical midpoint between the peaks of the trigger signal.

Force Trig. Completes an acquisition regardless of an adequate trigger signal. This button has no effect if the acquisition is already stopped.

Trig View. Displays the trigger waveform in place of the channel waveform while you hold down the **Trig View** button. Use this to see how the trigger settings affect the trigger signal, such as trigger coupling.

Menu and Control Buttons

Multipurpose knob



Refer to the *Reference* chapter for detailed information on the menu and button controls.

Multipurpose Knob. The function is determined by the displayed menu or selected menu option. When active, the adjacent LED lights. The next table lists the functions.

Active menu or option	Knob function	Description
Cursor	Cursor 1 or Cursor 2	Positions the selected cursor
Help	Scroll	Selects entries in the Index; selects links in a topic; displays the next or previous page for a topic
Horizontal	Holdoff	Sets the amount of time before another trigger event can be accepted;
Math	Position	Positions the Math waveform
	Vertical Scale	Changes the scale of the Math waveform
Measure	Type	Selects the type of automatic measurement for each source
Save/Recall	Action	Sets the transaction as save or recall for setup files, waveform files, and screen images
	File selection	Selects setup, waveform, or image files to save, or selects setup or waveform files to recall
Trigger	Source	Selects the source when the Trigger Type option is set to Edge
	Video line number	Sets the oscilloscope to a specific line number when the Trigger Type option is set to Video and the Sync option is set to Line Number
	Pulse width	Sets the width of the pulse when the Trigger Type option is set to Pulse

Active menu or option	Knob function	Description
Utility ► File Utilities	File selection	Selects files to rename or delete;
	Name entry	Renames the file or folder;
Utility ► Options ► GPIB Setup ► Address	Value entry	Sets the GPIB address for the TEK-USB-488 adapter
Utility ► Options ► Set Date and Time	Value entry	Sets the value for the date and time;
Vertical ► Probe ► Voltage ► Attenuation	Value entry	For a channel menu (such as the CH 1 menu), sets the attenuation factor in the oscilloscope
Vertical ► Probe ► Current ► Scale	Value entry	For a of channel menu (such as the CH 1 menu), sets the scale in the oscilloscope

AutoRange. Displays the Autorange Menu, and activates or deactivates the autoranging function. When autoranging is active, the adjacent LED lights.

Save/Recall. Displays the Save/Recall Menu for setups and waveforms.

Measure. Displays the automated measurements menu.

Acquire. Displays the Acquire Menu.

Ref. Displays the Reference Menu to quickly display and hide reference waveforms stored in the oscilloscope non-volatile memory.

Utility. Displays the Utility Menu.

Cursor. Displays the Cursor Menu. Cursors remain visible (unless the Type option is set to Off) after you leave the Cursor Menu but are not adjustable.

Display. Displays the Display Menu.

Help. Displays the Help Menu.

Default Setup. Recalls the factory setup.

AutoSet. Automatically sets the oscilloscope controls to produce a usable display of the input signals.

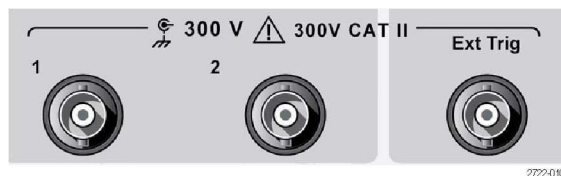
Single. (Single sequence) Acquires a single waveform and then stops.

Run/Stop. Continuously acquires waveforms or stops the acquisition.

 Starts the print operation to a PictBridge compatible printer, or performs the Save function to the USB flash drive.

Save. An LED indicates when the print button is configured to save data to the USB flash drive.

Input Connectors



1 & 2. Input connectors for waveform display.

Ext Trig. Input connector for an external trigger source. Use the Trigger Menu to select the Ext, or Ext/5 trigger source. Push and hold the **Trig View** button to see how the trigger settings affect the trigger signal, such as trigger coupling.

Other Front-Panel Items



USB Flash Drive port

USB Flash Drive Port. Insert a USB flash drive for data storage or retrieval. The oscilloscope displays a clock symbol to indicate when the flash drive is active. After a file is saved or retrieved, the oscilloscope removes the clock, and displays a hint line to notify you that the save or recall operation is complete.

For flash drives with an LED, the LED blinks when saving data to or retrieving data from the drive. Wait until the LED stops to remove the drive.

PROBE COMP. Probe compensation output and chassis reference. Use to electrically match a voltage probe to the oscilloscope input circuit. (See page 11, *Manual Probe Compensation*.)

Installing the PC Communications Software on a PC

Before you connect the oscilloscope to a PC with Tektronix OpenChoice PC Communications Software, download that software from www.tektronix.com/software and install it on your PC.



CAUTION. *If you connect the oscilloscope to your PC before you install the software, the PC will not recognize the oscilloscope. The PC will label the oscilloscope as an Unknown Device and not communicate with the oscilloscope. To avoid this, install the software on your PC before you connect the oscilloscope to your PC.*

NOTE. *Be sure you have installed the latest version of PC Communications software.*

Software for your oscilloscope is available through the Software finder on the Tektronix web site.

To install the PC Communications software, follow these steps:

1. Run the OpenChoice Desktop software on the PC. The InstallShield wizard appears on the screen.
2. Follow the on-screen directions.
3. Exit the InstallShield wizard.

Connecting to a PC

After you install the software on your PC, you can connect the oscilloscope to the PC.

(See page 24, *Installing the PC Communications Software on a PC.*)

NOTE. *You must install the software before you connect the oscilloscope to the PC. (See page 24, *Installing the PC Communications Software on a PC.*)*

To connect the oscilloscope to the PC, follow these steps:

1. Power on the oscilloscope.
2. Insert one end of a USB cable into the USB Device port on the back of the oscilloscope.
3. Power on the PC.
4. Insert the other end of the cable into the desired USB port on a PC.

5. If a Found New Hardware message appears, follow the on-screen directions for the Found New Hardware wizard.

Do NOT search for the hardware to install on the web.

6. For a Windows XP systems, follow these steps:
 - a. If you see the Tektronix PictBridge Device dialog box, click Cancel.
 - b. When prompted, select the option that tells Windows NOT to connect to Windows Update, and click Next.
 - c. In the next window, you should see that you are installing software for a USB Test and Measurement Device. If you do not see USB Test and Measurement Device software, the OpenChoice Desktop software is not properly installed.
 - d. Select the option that installs the software automatically (the recommended option) and click Next.

Windows will install the driver for your oscilloscope.

- e. If you do not see the USB Test and Measurement Device in step c, or if Windows cannot find the software driver, the OpenChoice Desktop software is not properly installed.

In these situations, click Cancel to exit the Found New Hardware wizard. Do NOT allow the wizard to finish.

Unplug the USB cable from your oscilloscope and install the OpenChoice Desktop software.

Reconnect your oscilloscope to the PC and follow steps 6a, 6b, 6c, and 6d.

- f. Click Finish.
 - g. If a dialog labeled Test and Measurement Device appears, select what you would like Windows to do, and click OK.

7. For Windows 2000 systems:
 - a. When prompted, select the option that tells Windows to display a list of known drivers and click Next.
 - b. In the next window, select USB Test and Measurement Device. If you do not see a USB Test and Measurement Device selection, the OpenChoice Desktop software is not properly installed.
 - c. In the next window, click Next to allow Windows to install the driver for your oscilloscope.

Windows will install the driver for your oscilloscope.

- d. If you do not see the USB Test and Measurement Device in step b, or if Windows cannot find the software driver, the software is not properly installed.

In these situations, click Cancel to exit the Found New Hardware wizard. Do NOT allow the wizard to finish.

Unplug the USB cable from your oscilloscope, and install the software.

Reconnect your oscilloscope to the PC and follow steps 7a, 7b, and 7c.

8. When prompted, click Finish.
9. If Windows asks you to insert a CD, click Cancel.
10. Run the PC Communications software on your PC.
11. If the oscilloscope and PC do not communicate, refer to the PC Communications online help and documentation.

Specifications

All specifications apply to the TBS1000 series models. TPP0101 and TPP0201 probe specifications appear in Appendix B. To verify that the oscilloscope meets specifications, the oscilloscope must first meet the following conditions:

- The oscilloscope must have been operating continuously for twenty minutes within the specified operating temperature.
- You must perform the Do Self Cal operation, accessible through the Utility menu, if the operating temperature changes by more than 5 °C (9 °F).
- The oscilloscope must be within the factory calibration interval.

All specifications are guaranteed unless noted “typical.”

Oscilloscope Specifications

Table 1: Input Specifications

Characteristic	Description
Maximum Input Voltage	At front panel connector, 300 V RMS, Installation Category II; derate at 20 dB/decade above 100 kHz to 13 V peak AC at 3 MHz and above. Based upon sinusoidal or DC input signal. Maximum viewable signal while DC coupled is ± 50 V offset ± 5 V/division at 4 divisions, or 70 V. AC coupling allows measuring signals on a DC level up to 300 V. For non-sinusoidal waveforms, peak value must be less than 450 V. Excursion above 300 V should be less than 100 ms duration and the duty factor is limited to < 44%. RMS signal level must be limited to 300 V. If these values are exceeded, damage to the instrument may result.

Table 2: General Specifications

Characteristic	Description
Probe Compensator Output	
Probe Compensator, Output Voltage and Frequency, typical	Characteristics are as follows: Output voltage 5.0 V $\pm 10\%$ into 1 Meg Ω load Frequency 1 kHz
Power Source	
Source Voltage	Full Range: 100 to 240 VAC RMS $\pm 10\%$, Installation Category II (Covers range of 90 to 264 VAC); 50/60 Hz. 115 VAC RMS $\pm 10\%$; 400 Hz.
Power Consumption	Less than 30 W at 90 to 264 VAC input.
Environmental	
Temperature	Operating 0° C to +50° C, with 5° C/minute maximum gradient, non-condensing, up to 3000m altitude
	Nonoperating -40° C to +71° C, with 5° C/minute maximum gradient
Cooling Method	Convection cooled

Table 2: General Specifications, (cont.)

Characteristic	Description	
Humidity: Operating and Non-Operating	Operating:	5% to 85% relative humidity (% RH) at up to +40° C 5% to 45% RH above +40° C up to +50° C, non-condensing, and as limited by a Maximum Wet-Bulb Temperature of +37° C (derates relative humidity to 45 % RH at +50° C)
	Non-Operating:	5% to 85% RH (Relative Humidity) at up to +40° C, 5% to 45% RH above +40° C up to +50° C, non-condensing. Above +50° C limited by a Maximum Wet-Bulb Temperature of +37° C (derates relative humidity to 12% RH at +71° C)
Altitude: Operating and Non-Operating	Operating:	Up to 3000 meters (10,000 feet)
	Non-Operating:	Up to 3000 meters (10,000 feet). Altitude is limited by possible damage to LCD at higher altitudes. This damage is independent of operation
Mechanical		
Overall Dimensions	Requirements that follow are nominal:	
	Height	158.0 mm (6.22 in.)
	Width	326.3 mm (12.85 in)
	Depth	124.1 mm (4.88 in)
Weight	Requirements that follow are nominal:	
	Stand alone instrument	2.0 kg (4.4 lbs)
	With accessories	2.2 kg (4.9 lbs)
	When packaged for domestic shipment	3.6 kg (8 lbs)

TPP0101 and TPP0201 Series 10X Passive Probes Information

The TPP0101 & TPP0201 Series 10X Passive Probes are high impedance, passive probes with 10X attenuation. They are designed for use with TBS1000 oscilloscopes. These oscilloscopes have 20 pF of input capacitance.

The compensation range of these probes is 15–25 pF.

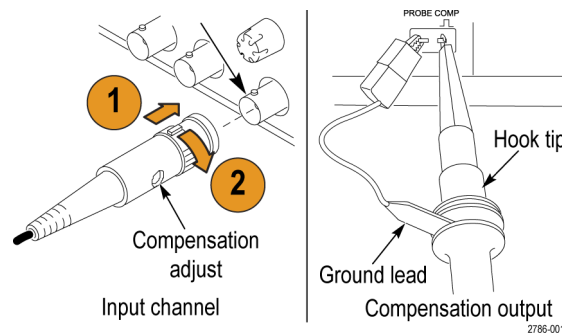
The probes have no user- or Tektronix-serviceable parts.



WARNING. Do not float the TPP0101 and TPP0201 probes on any oscilloscope.

Connecting the Probe to the Oscilloscope

Connect the probe as shown in the illustrations below.



Compensating the Probe

Due to variations in oscilloscope input characteristics, the low-frequency compensation of the probe may need adjustment after moving the probe from one oscilloscope channel to another.

If a 1 kHz calibrated square wave displayed at 1 ms/division shows significant differences between the leading and trailing edges, perform the following steps to optimize low-frequency compensation:

1. Connect the probe to the oscilloscope channel that you plan to use for your measurements.
2. Connect the probe to the probe compensation output terminals on the oscilloscope front panel.

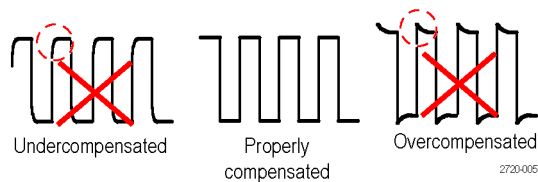


WARNING. To avoid electric shock, only connect to the Probe Comp signal on the oscilloscope when making this adjustment.

3. Push **Autoset** or otherwise adjust your oscilloscope to display a stable waveform.
4. Adjust the trimmer in the probe until you see a perfectly flat-top square wave on the display. (See illustration.)



WARNING. To avoid electric shock, only use the insulated adjustment tool when making compensation adjustments.



Connecting the Probe to the Circuit

Use the standard accessories included with the probe to connect to your circuit.

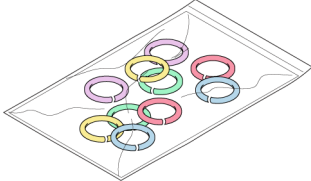
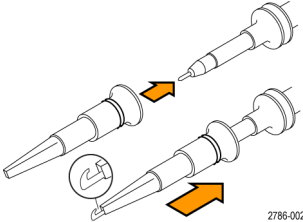
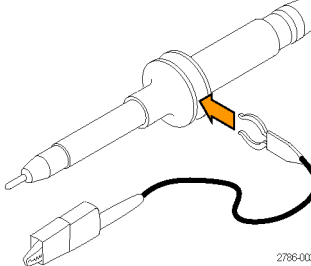
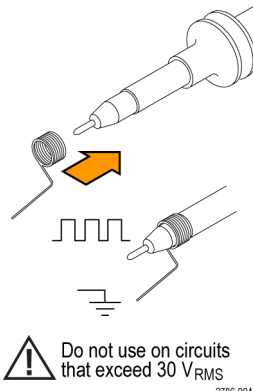
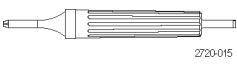


WARNING. To avoid electric shock when using the probe or accessories, keep fingers behind the finger guard of the probe body and accessories.

To reduce risk of shock, ensure the ground lead and ground spring are fully mated before connecting the probe to the circuit under test.

Standard Accessories

The accessories included with the probe are shown below.

Item	Description
	Color bands Use these bands to identify the oscilloscope channel at the probe head. Reorder Tektronix part number 016-0633-xx (5 pairs)
	Hook tip Press the hook tip onto probe tip and then clamp the hook onto the circuit. Reorder Tektronix part number 013-0362-xx
	Ground lead, with alligator clip Secure the lead to the probe head ground and then to your circuit ground. Reorder Tektronix part number 196-3521-xx
 Do not use on circuits that exceed 30 V_{RMS}	Ground spring The ground spring minimizes aberrations on high-frequency signals caused by the inductance of the ground path, giving you measurements with good signal fidelity. Attach the spring to the ground band on the probe tip. You can bend the spring out to ~0.75 in. away from the signal test point. Reorder Tektronix part number 016-2028-xx (2 ea.)
	Adjustment tool Reorder Tektronix part number 003-1433-xx

Optional Accessories

You can order the following accessories for your probe.

Accessory	Part number
Alligator Ground Lead, 12 in	196-3512-xx
6" Clip-on Ground Lead	196-3198-xx
Ground Spring, Short, 2 ea.	016-2034-xx
MicroCKT Test Tip	206-0569-xx
Micro Hook Tip	013-0363-xx
Universal IC Cap	013-0366-xx
Circuit Board Test Point/PCB Adapter	016-2016-xx
Wire, spool, 32 AWG	020-3045-xx

Specifications

Table 3: Electrical and mechanical specifications

Characteristic	TPP0101	TPP0201
Bandwidth (–3 dB)	DC to 100 MHz	DC to 200 MHz
System attenuation accuracy	10:1 $\pm 3.2\%$	10:1 $\pm 3.2\%$
Compensation range	TPP0101: 15 pF – 25 pF	TPP0201: 15 pF – 25 pF
System input resistance @ DC	10 M Ω $\pm 1.5\%$	10 M Ω $\pm 1.5\%$
System input capacitance	<12 pF	<12 pF
System rise time (typical)	<3.5 ns	<2.3 ns
Propagation delay	~6.1 ns	~6.1 ns
Maximum input voltage	300 V _{RMS} CAT II	300 V _{RMS} CAT II
Cable length	1.3 m	1.3 m

Table 4: Environmental specifications

Characteristics	Description
Temperature	
Operating	–10 °C to +55 °C (14 °F to +131 °F)
Nonoperating	–51 °C to +71 °C (–60 °F to +160 °F)
Humidity	
Operating and Non-Operating	5% to 95% relative humidity (%RH) up to +30 °C (86 °F), 5% to 65% RH above +30 °C up to +55 °C (131 °F)
Altitude	
Operating	3.0 km (10,000 ft) maximum
Nonoperating	12.2 km (40,000 ft) maximum

Performance Graphs

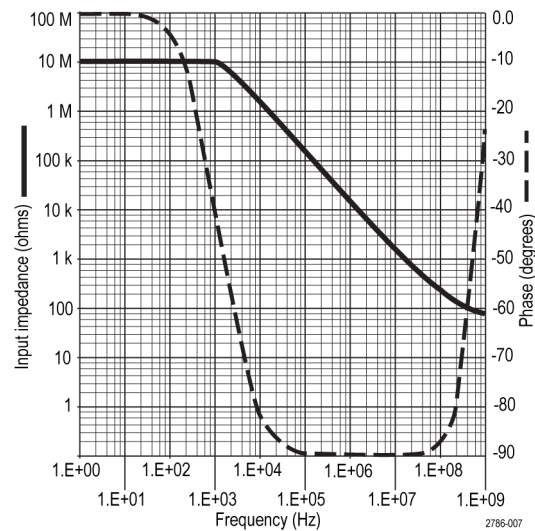
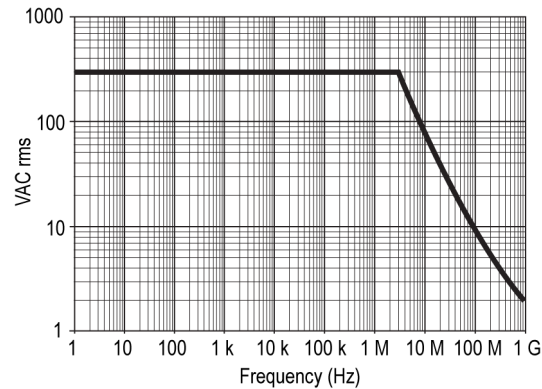


Table 5: Certifications and compliances

Characteristics	Description
EC Declaration of Conformity	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 2006/95/EC: EN61010-031: 2002
Safety Standards	UL61010-031:2007 CAN/CSA C22.2 No. 61010-031-07 IEC61010-031; IEC 61010-031/A1:2008

Table 5: Certifications and compliances, (cont.)

Characteristics	Description	
Measurement Category Descriptions	<i>Category</i>	<i>Examples of Products in this Category</i>
	CAT III	Distribution-level mains, fixed installation
	CAT II	Local-level mains, appliances, portable equipment
	CAT I	Circuits not directly connected to mains.
Pollution Degree 2	Do not operate in environments where cond- uctive pollutants may be present (as defined in IEC 61010-1). Rated for indoor use only.	



Equipment Recycling. This product complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). For more information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. Using the probe or accessories in a manner not specified could result in a shock or fire hazard.

To Avoid Fire or Personal Injury

Ground-Referenced Oscilloscope Use. Do not float the reference lead of this probe when using with ground referenced oscilloscopes (for example, TBS series oscilloscopes). The reference lead must be connected to earth potential (0 V).

Connect and Disconnect Properly. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement instrument.

Avoid Electric Shock. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

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.

Avoid Electric Shock. When using probe accessories, never exceed the lowest rating of the probe or its accessory, whichever is less, including the measurement category and voltage rating.

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Safety Terms and Symbols 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.*

Symbols on the Product. These symbols may appear on the product:



Caution
Refer to Manual



Earth Terminal

Accessories

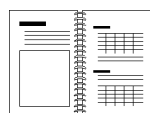
All accessories (standard and optional) are available by contacting your local Tektronix field office.

Standard Accessories

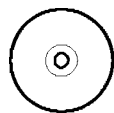


TPP0101 or TPP0201, 10X Passive Voltage Probe. The TPP0101 probes have a system bandwidth of DC to 100 MHz at -3 dB and ship standard with TBS1000 oscilloscope models that have bandwidths up to 100 MHz.

The TPP0201 probes have a system bandwidth of DC to 200 MHz at -3 dB and ship standard with TBS1000 oscilloscope models that have bandwidths of greater than 100 MHz.



TBS1000 Series Oscilloscope Installation and Safety Manual. A single printed manual is included (071-3099-XX). Refer to the Optional Accessories for a list of electronically available manuals.

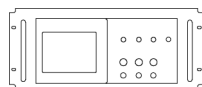


Customer Documentation Browser CD-ROM. This CD offers additional product information (063-4479-XX).

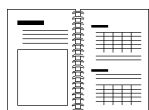
Optional Accessories



P6101B 1X Passive Voltage Probe. The P6101B probe has a 15 MHz bandwidth with a rating of 300 V_{RMS} CAT II.



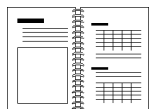
RM2000B Rackmount Kit. The RM2000B Rackmount Kit lets you install a TBS1000 series oscilloscope into an industry-standard 19 inch rack. The rackmount kit requires seven inches (18 cm) of vertical rack space. You can turn the oscilloscope power on or off from the front of the rackmount kit. The rackmount kit does not have slide-out capability.



TBS1000, TDS2000C and TPS2000 Series Digital Oscilloscopes Programmer Manual. The programmer manual (077-0444-XX, English) provides command and syntax information.



TBS1000 Series Digital Storage Oscilloscope Service Manual. The service manual (077-0772-XX, English) provides module-level repair information.



TBS1000 Series Digital Storage Oscilloscope User Manuals. The user manual is available in these languages:

English, 077-0760-XX

French, 077-0761-XX

Italian, 077-0762-XX

German, 077-0763-XX

Spanish, 07X-0764-XX

Japanese, 077-0765-XX

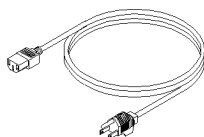
Portuguese, 077-0766-XX

Simplified Chinese, 077-0767-XX

Traditional Chinese, 077-0768-XX

Korean, 077-0769-XX

Russian, 077-0770-XX



International Power Cords. In addition to the power cord shipped with your oscilloscope, you can obtain the following cords:

Option A0, North American 120 V, 60 Hz, 161-0066-00

Option A1, European 230 V, 50 Hz, 161-0066-09

Option A2, United Kingdom 230 V, 50 Hz, 161-0066-10

Option A3, Australian 240 V, 50 Hz, 161-0066-13

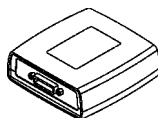
Option A5, Switzerland 230 V, 50 Hz, 161-0154-00

Option A6, Japan 100 V, 50/60 Hz, 161-0342-00

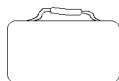
Option A10, China 220 V, 50 Hz, 161-0304-00

Option A11, India 230 V, 50 Hz, 161-0400-00

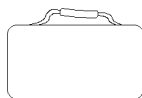
Option A12, Brazil 127/220 V, 60 Hz, 161-0357-00



TEK-USB-488 Adapter. The GPIB adapter allows you to connect your oscilloscope to a GPIB controller.



Soft Case. The soft case (AC2100) protects the oscilloscope from damage and provides space for probes, a power cord, and manuals.



Transit Case. The transit case (HCTEK4321) provides shock, vibration, impact and moisture protection for the oscilloscope when you transport it from one place to another. The required soft case fits inside the transit case.

Cleaning

General Care

Do not store or leave the oscilloscope where the LCD display will be exposed to direct sunlight for long periods of time.



CAUTION. *To avoid damage to the oscilloscope or probes, do not expose them to sprays, liquids, or solvents.*

Cleaning

Inspect the oscilloscope and probes as often as operating conditions require. To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the oscilloscope and probes with a lint-free cloth. Use care to avoid scratching the clear glass display filter.
2. Use a soft cloth dampened with water to clean the oscilloscope. Use an aqueous solution of 75% isopropyl alcohol for more efficient cleaning.



CAUTION. *To avoid damage to the surface of the oscilloscope or probes, do not use any abrasive or chemical cleaning agents.*

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