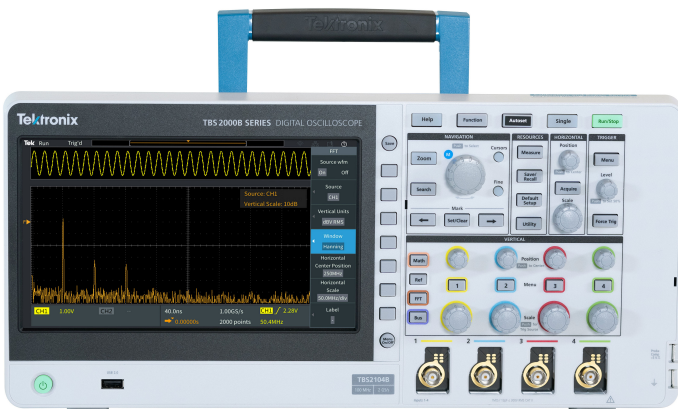


Digital Storage Oscilloscope

TBS2000B Series Datasheet



The TBS2000B Series of Oscilloscopes with a 9-inch WVGA display, 5 million point record length and 2 GS/s sample rate, capture and display significantly more signal to help you debug and validate the designs faster. Easily and confidently analyze your signals with new on-waveform cursor readouts and 32 automated measurements, each with informative tips. The TekVPI® probe interface supports traditional passive BNC probes, but also enables wide application coverage with the latest active voltage probes and current probes.

Key performance specifications

- 2 and 4 analog channel models

- 200 MHz, 100 MHz, and 70 MHz bandwidth models up to 2 GS/s sampling rate
- 5 M record length on all channels
- 5 year warranty

Key features

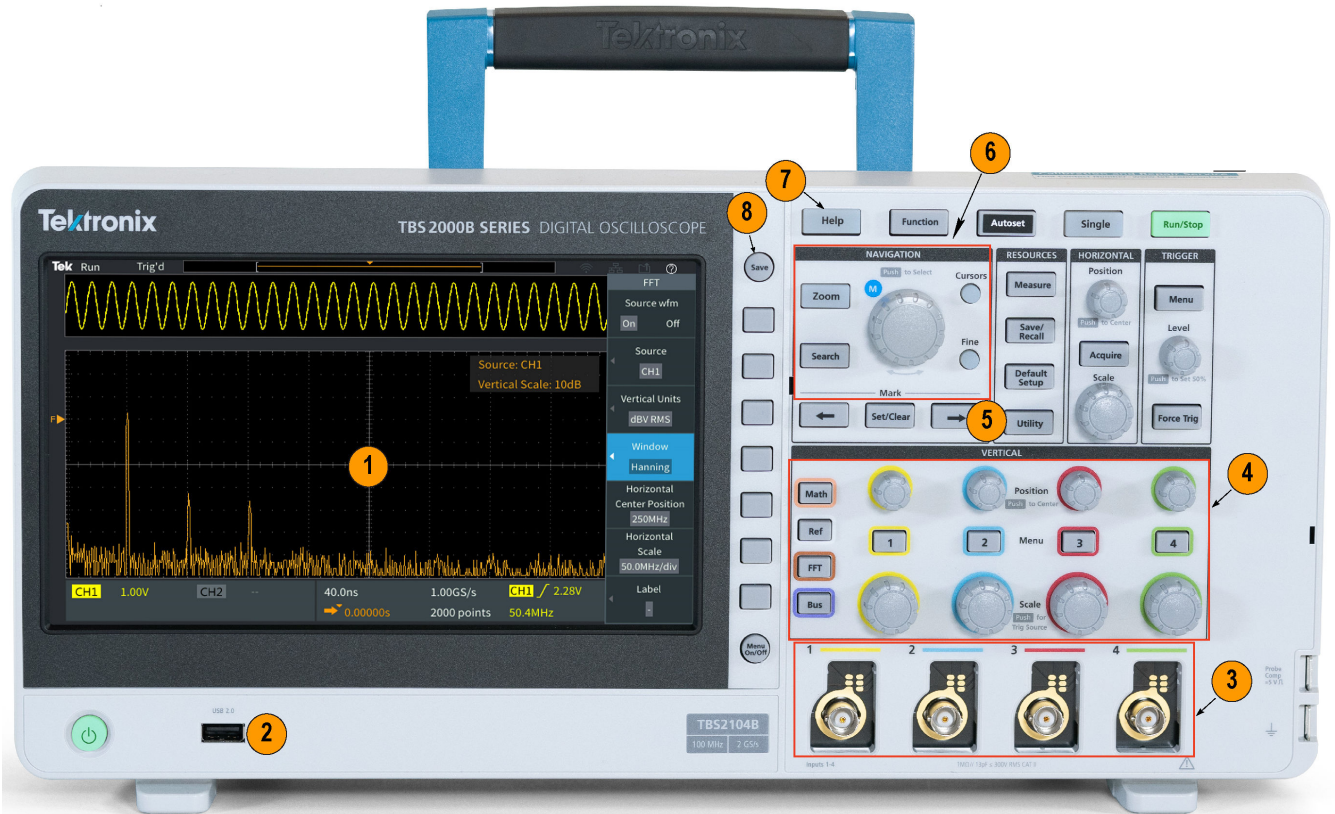
- 9-inch WVGA color display with 15 horizontal grids shows 50% more signal
- TekVPI probe interface supports active, differential, and current probes with automatic scaling and units
- New front-end design enables more accurate measurements
- 32 automated measurements, and FFT function for quick waveform analysis
- Search and Mark features for easy identification of events that occur in the acquired waveform
- HelpEverywhere® provides helpful on-screen tips for new users
- Built-in Scope Intro handbook provides operating instructions and oscilloscope fundamentals
- The instrument user interface and the front panel overlay is translated into 10 languages

Connectivity

- USB 2.0 host port on the front panel for quick and easy data storage
- USB 2.0 device port on rear panel for easy connection to a PC
- 10/100BASE-T Ethernet port for remote control over LAN
- Wi-Fi interface provides wireless communications capability support

Education

- Courseware function presents lab exercise guidance on the display
- Autoset, Cursors, and Automated measurements can be disabled to help educators to teach basic concepts to students



TBS2000B front panel

Image reference	Description
1	Large 9" Display
2	USB port for save / recall
3	TekVPI Probe Interface, for use with passive and active probes
4	Dedicated control knobs per channel

Image reference	Description
5	Search for event for interest
6	Multi purpose knob for navigation, zoom and cursors
7	Help everywhere
8	One-button save



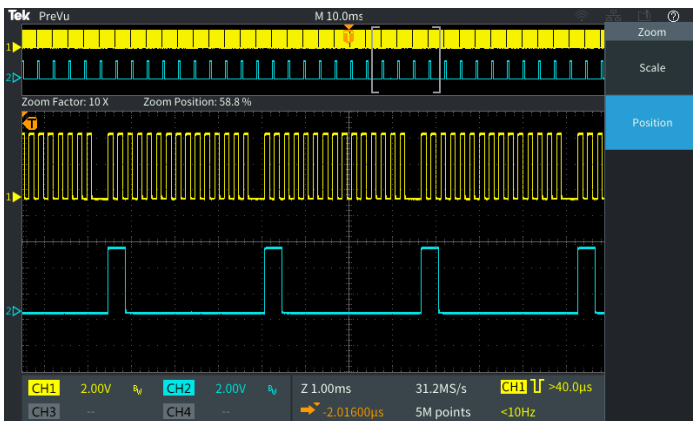
TBS2000B rear panel

Image reference	Description
1	Aux Out signal
2	Ethernet for remote connectivity
3	USB port for WiFi connectivity
4	USB TMC for remote connectivity

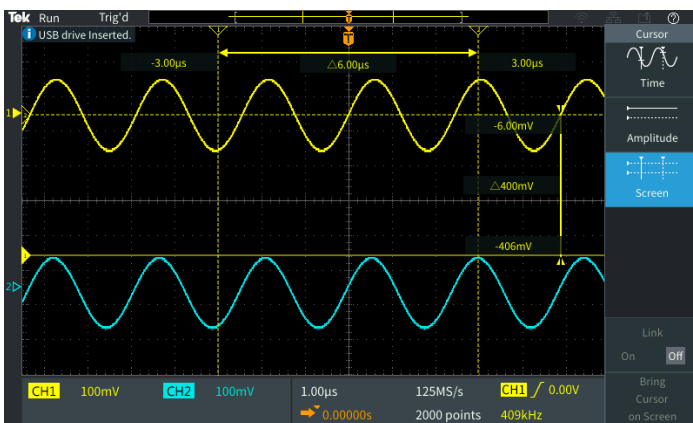
Designed to make your work easier

The TBS2000B Series is designed for easy operation and quick hands-on learning. Dedicated controls provide quick access to important settings, so you can evaluate signals faster. With the TBS2000B you get 10 vertical divisions and 15 horizontal divisions, so you can see more of your signal. The large display also offers more room for measurement results and menu information.

The Zoom function lets you quickly pan through the record and zoom in to see signal details. The new on screen cursors overlay the cursor measurements on the screen making them intuitive to read and understand.



In Zoom mode, an overview of the entire record is shown in the upper part of the display and the lower part displays the detailed Zoomed view.



The cursor readouts are presented on the waveform display. Cursors can be used to measure time and amplitude.

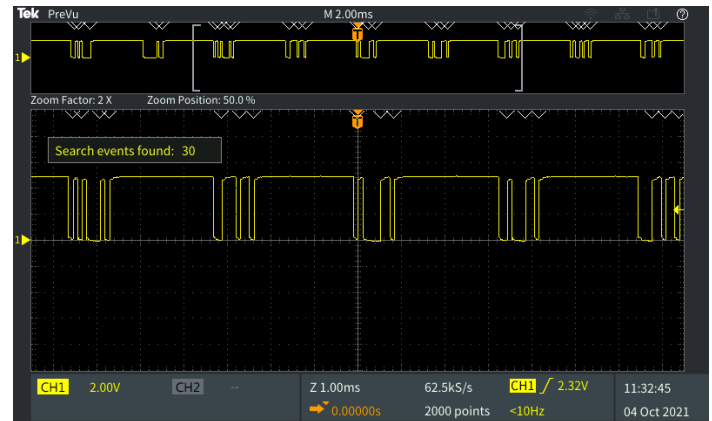
Versatile triggering and acquisition modes

The trigger system is designed for troubleshooting today's mixed signal designs. Beyond a basic edge trigger, it also includes pulse width and runt triggering, which are especially useful for troubleshooting digital sections of your designs. Pulse width triggering is perfect for hunting narrow glitches or timeout conditions. Runt trigger is designed to capture signals that are shorter in amplitude than expected.

The Instrument offers several acquisition modes. The default acquisition mode is Sample Mode which works well for most applications. The Peak Detect Mode is useful for hunting spikes, and Average Mode can help reduce noise on repetitive signals.

Quickly search for events of interest

The search button enables you to quickly setup a search criteria based on trigger settings. All occurrences of the event of interest with the acquisition are highlighted with search marks. Easily navigate to each instance of occurrence with dedicated navigation buttons for closer inspection and analysis.

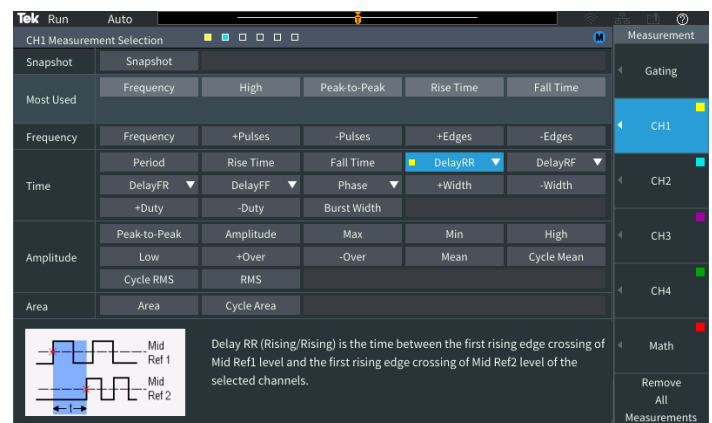


Search and mark

Search through events of interest and mark then through the entire acquisition.

Automated measurements are easier than ever

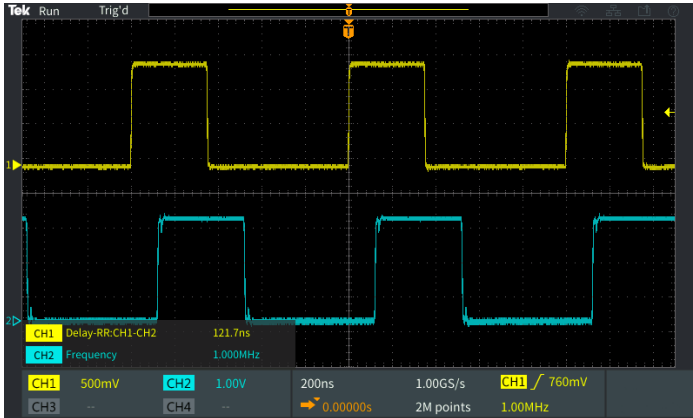
A comprehensive set of automated measurements enable fast and convenient testing of a wide variety of signal conditions for different applications.



Measurements are all listed and selected on a single screen.

The measurements are grouped into four categories: Frequency, time, amplitude, and area. All the measurements are displayed on a single measurement selection screen making it easy to choose from 32 automated measurements, no more hunting through various menus.

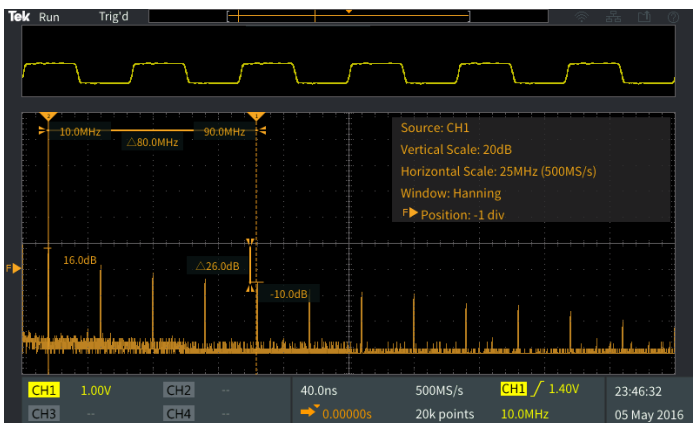
Measurements are color coded by the source, and are presented on a transparent background, so waveforms are not obscured by the readouts. The HelpEverywhere® system provides help texts with graphics to explain how a measurement is performed, making it easier for new users to know which measurement to use and to interpret the results.



Measurements are transparent so waveforms are not obscured.

FFT function

You can understand the frequency content of your signals with the FFT function by pressing the dedicated front-panel FFT button. Display only the FFT, or turn on the source waveform display to see both the frequency and the time domain waveform. A transparent readout shows important settings without blocking the FFT display.



The time domain source waveform can be displayed above the FFT frequency spectrum.

TekVPI® Interface and active probe support

The TekVPI probe interface sets the standard for ease of use in probing. With this interface the TBS2000B Series Oscilloscope supports a wide range of the latest voltage and current probes, providing coverage for many applications. These probes are powered by and communicate with the TBS2000B through the VPI interface. Scale factors and status information, such as error conditions, are sent to the instrument for processing and display. This saves you from having to

manually set scale factors, calculate offsets, or the need to degauss your current probes.

The new front end design with higher 2GS/s sample rate offers lower noise and higher effective bits enabling more accurate measurements.



TekVPI probes communicate scale settings, ranges, and status to the TBS2000B.

First in its class with wireless communications

On the rear of the instrument, you will find several communications ports. The USB device port or LAN port can be used to control the instrument using the fully-documented command set.

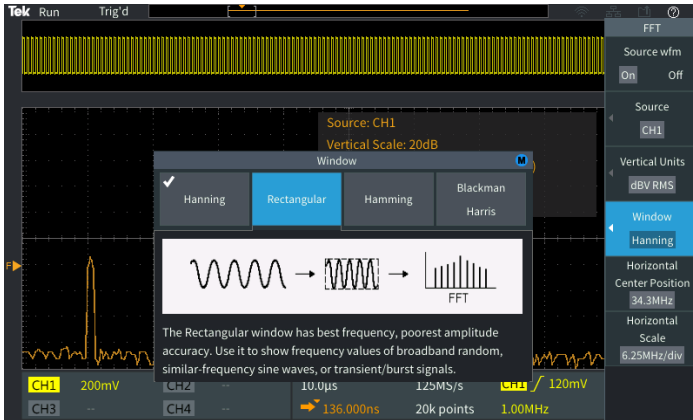


Wi-Fi adapters are configured through integrated setup menus and support seamless wireless communications

The TBS2000B is the first oscilloscope in its class to support wireless communication. Plug a compatible Wi-Fi dongle into the USB host port and setup the interface for Wi-Fi from the front panel.

Built-in tips for faster setup

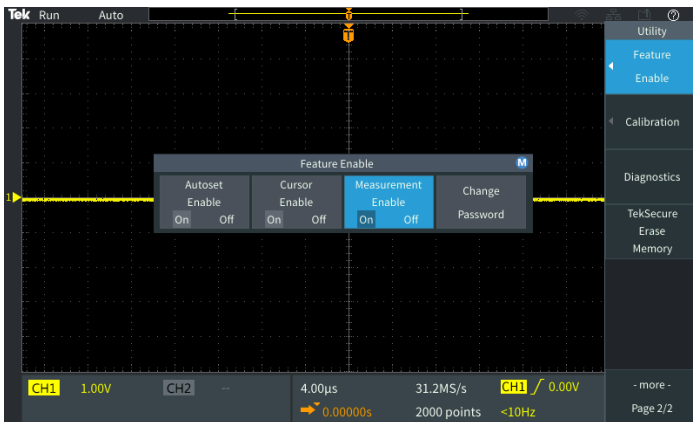
HelpEverywhere® is a unique feature on the TBS2000B. It shows instant help information as you navigate through key menus. The tips include measurement information, application tips, and general guidance in the form of text and graphics. You can selectively turn tips on and off from the HelpEverywhere® menu.



HelpEverywhere® tips explain important settings.

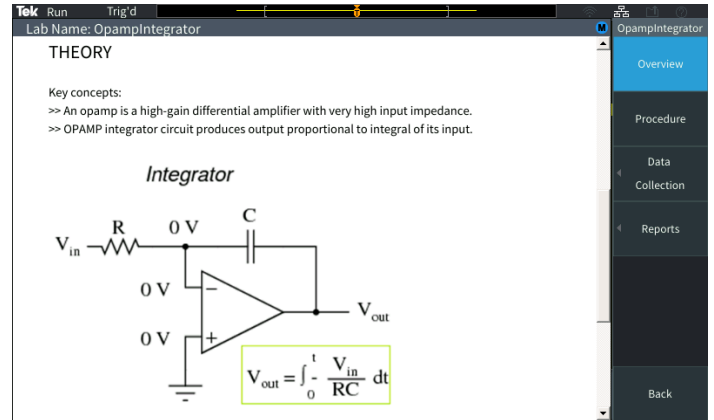
Innovative new education solutions

The TBS2000B offers new ways to enable educators to devote more time to teaching circuit concepts instead of lab setup and management.



Education features

Educators can disable Autoset, Cursors, and automated measurements on the instruments so that they can teach the students on the basic concepts and help them understand how to use the instrument horizontal and vertical controls to get the waveform display, use the graticule to measure time and voltage and manually plot / calculate the signal characteristics.



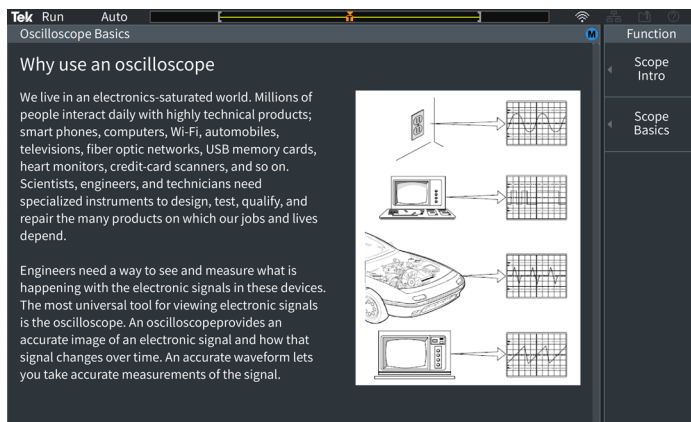
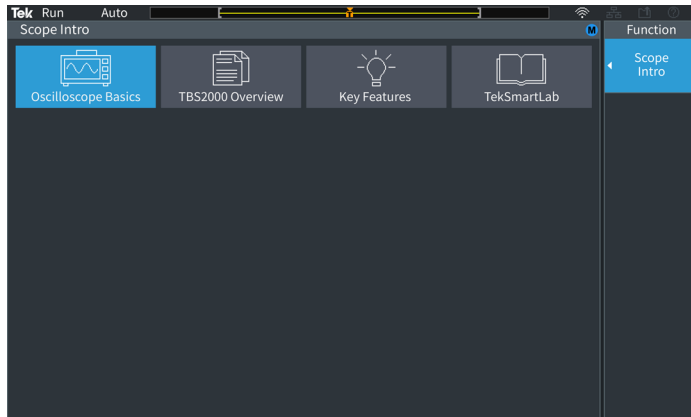
The Courseware function allows students to see lab information on the instrument display.

The integrated Courseware function allows professors to load lab exercises on the instrument to give students guidance at each station and provides a structured framework into which students can capture data to incorporate into their reports. Over 100 sample lab exercises are available for download from the www.tek.com/courseware.



On-screen scope fundamentals

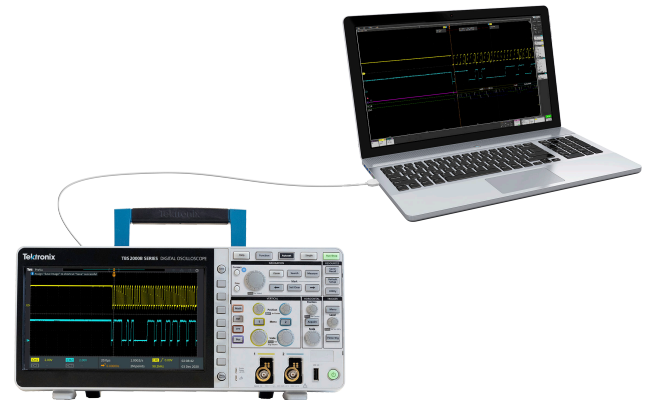
Scope Intro handbook is embedded into the TBS2000B help system. Pressing the front panel Function button gives you access to information on oscilloscope basic operations, as well as an overview of the TBS2000B.



Scope Intro covers basic oscilloscope and TBS2000B usage

TekScope

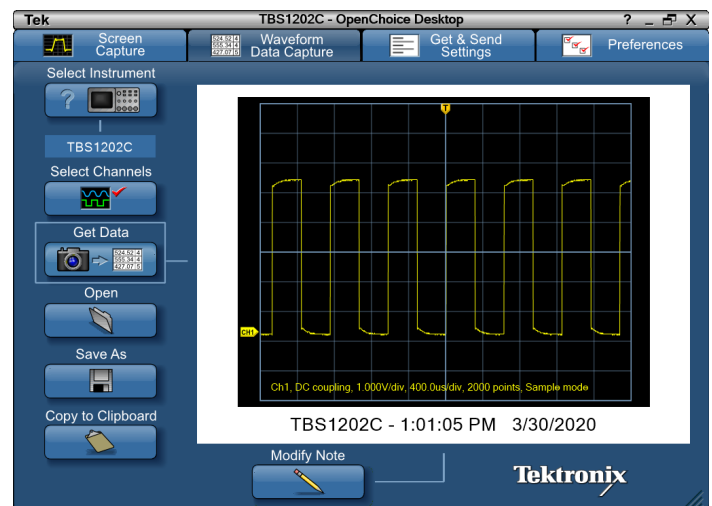
TekScope software expands the capabilities of your instrument by enabling you to easily transfer data directly from your oscilloscope to your PC for offline analysis. With the remote analysis for bench oscilloscopes package, you can run protocol decode on the most common buses (I2C, SPI, CAN, CAN-FD, LIN, and UART), advanced analysis capabilities with unlimited measurement, trends, histograms, search and mark as well as offline waveform analysis all in a user environment that is very similar to our high performance instruments.



Waveform analysis using TekScope on a PC

PC connectivity

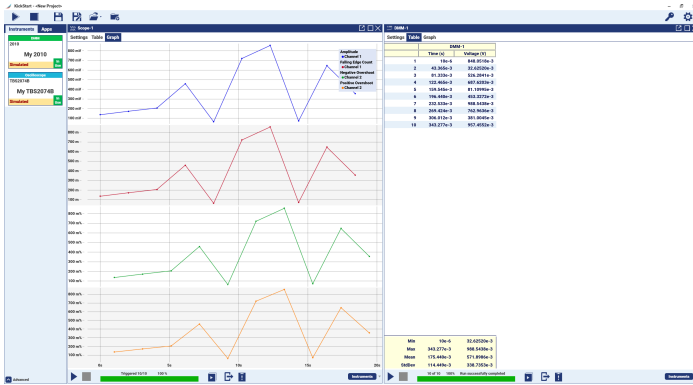
Easily capture, save, and analyze measurement results by connecting to your PC to the USB device port on the rear of the instrument and using the OpenChoice® PC Communications Software available on the Tektronix website. Simply pull screen images and waveform data into the stand-alone desktop application or directly into Microsoft Word and Excel.



OpenChoice desktop

Kickstart

Kickstart software offers bench instrument control, automated data, and measurement logging capability of multiple instruments on a bench. The collected data can be charted to get further insights or exported in multiple formats for further analysis. It supports Oscilloscopes, Digital Multi Meters (DMM), Power supplies, and Source Measure Units (SMU).



Control multiple instruments and perform data logging with Kickstart

Performance you can count on

Tektronix has industry-leading service and support, and every TBS2000B Series Oscilloscope is backed with a standard 5-year warranty.

Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

Model overview

Models	TBS2072B	TBS2074B	TBS2102B	TBS2104B	TBS2202B	TBS2204B
Analog Channels	2	4	2	4	2	4
Bandwidth	70 MHz	70 MHz	100 MHz	100 MHz	200 MHz	200 MHz
Max Sample Rate	2 GS/s - Half Channel	2 GS/s - Half Channel	2 GS/s - Half Channel	2 GS/s - Half Channel	2 GS/s - Half Channel	2 GS/s - Half Channel
	1 GS/s - All Channels	1 GS/s - All Channels	1 GS/s - All Channels	1 GS/s - All Channels	1 GS/s - All Channels	1 GS/s - All Channels
Record length	5 M points	5 M points	5 M points	5 M points	5 M points	5 M points

Vertical system analog channels

Hardware bandwidth limits 20 MHz

Input coupling DC or AC

Input impedance $1\text{ M}\Omega \pm 1\%$, $13\text{ pF} \pm 1.5\text{ pF}$

Input sensitivity range 1mV/div to 10 V/div

Vertical resolution 8 bits

Maximum input voltage, 1 M Ω 300 VRMS, Installation Category II; with peaks $\leq \pm 450\text{ V}$

Acquisition modes

Sample	Acquire sampled values.
Peak Detect	Captures glitches as narrow as 3.5 ns at all sweep speeds.
Average	From 2 to 512 waveforms included in average.
Hi-Res	Averages multiple sample of one acquisition interval into one waveform point.
Roll	Scrolls waveforms right to left across the screen at sweep speeds slower than or equal to 40 ms/div.

Math modes

All units:	Ch 1 - Ch 2
	Ch 2 - Ch 1
	Ch 1 + Ch 2
	Ch 1 X Ch 2
	FFT
4 channel units:	Ch 3 - Ch 4
	Ch 3 + Ch 4
	Ch 4 - Ch 3
	Ch 3 X Ch 4

DC balance $\pm (1 \text{ mV} + 0.1 \text{ div})$

DC gain accuracy, typical $\pm 2\%$ 10 V/div through 5 mV/div
 $\pm 3\%$ 1 mV/div and 2 mV/div

DC voltage measurement accuracy average mode

Average of > 16 waveforms $\pm((\text{DC Gain Accuracy}) \times |\text{reading} - (\text{offset} - \text{position})| + \text{Offset Accuracy} + 0.11 \text{ div} + 1 \text{ mV})$

Delta Volts between any two averages of ≥ 16 waveforms acquired with the same oscilloscope setup and ambient conditions $\pm(\text{DC Gain Accuracy} \times |\text{reading}| + 0.08 \text{ div} + 1.4 \text{ mV})$

Vertical position range ± 5 divisions

Vertical offset ranges, typical

Volts/Div setting	1 M Ω , Input
1 mV/div to 63 mV/div	$\pm 1 \text{ V}$
64 mV/div to 999 mV/div	$\pm 10 \text{ V}$
1 V/div to 10 V/div	$\pm 100 \text{ V}$

Analog bandwidth, DC coupled

200 MHz models: DC to >200 MHz
 100 MHz models: DC to ≥ 100 MHz
 70 MHz models: DC to ≥ 70 MHz

Common mode rejection ratio (CMRR), typical 100:1 at 60 Hz, reducing to 10:1 with 50 MHz sine wave with equal Volts/div and coupling settings on each channel.

Channel-to-channel isolation

TBS2072B, TBS2074B	TBS2102B, TBS2104B	TBS2202B, TBS2204B
$\geq 100:1$ at ≤ 70 MHz	$\geq 100:1$ at ≤ 100 MHz	$\geq 100:1$ at ≤ 200 MHz

Horizontal system analog channels

Maximum duration of time captured 5 ms
 at highest sample rate (all channels)

Time base range TBS220xB, TBS207xB, TBS210xB: 1 ns/div to 100 sec/div

Seconds division range TBS207xB, TBS210xB, TBS220xB: 1 ns/div to 100 sec/div in a 1-2-4 sequence

Time-base delay time range -15 divisions to 5000 s

Deskew range ± 100 ns

Time base accuracy ± 25 ppm over any ≥ 1 ms interval

Trigger system

Trigger modes Auto, Normal, and Single

Trigger holdoff range 20 ns to 8 s

Trigger types

Edge Positive or negative slope on any channel. Coupling includes DC, HF reject, LF reject, and noise reject.

Pulse width Trigger on width of positive or negative pulses that are $>$, $<$, $=$, or \neq a specified period of time.

Runt Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again.

Trigger coupling analog channels DC, Noise Reject, High Freq Reject, Low Freq Reject.

Sensitivity, edge-type trigger, DC coupled

Trigger Source	Sensitivity
Analog inputs	0.4 division from DC to 50 MHz
	0.6 divisions > 50 MHz to 100 MHz
	0.8 divisions > 100 MHz to 200 MHz

Trigger level ranges Input channels: ± 4.90 divisions from center screen

Data storage

Nonvolatile memory retention time, typical No time limit for Front Panel Settings, saved waveforms, setups, and calibration constants.

Real-Time clock A programmable clock providing time in years, months, days, hours, minutes, and seconds.

Waveform measurements

Cursors Time, amplitude, and screen.

Automated measurements 32, of which up to six can be displayed on-screen at any one time. Measurements include: Period, Frequency, Rise Time, Fall Time, Positive Duty Cycle, Negative Duty Cycle, Positive Pulse Width, Negative Pulse Width, Burst Width, Phase, Positive Overshoot, Negative Overshoot, Peak to Peak, Amplitude, High, Low, Max, Min, Mean, Cycle Mean, RMS, Cycle

RMS, Positive Pulse Count, Negative Pulse Count, Rising Edge Count, Falling Edge Count, Area, Cycle Area, Delay FR, Delay FF, Delay FR, and Delay RR.

Gating Isolate the specific occurrence within an acquisition to take measurements on, using either the screen, between waveform cursors or full record length.

Waveform math

Arithmetic Add, subtract, and multiply waveforms.

FFT Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS, and FFT Window to Rectangular, Hamming, Hanning, or Blackman-Harris.

Remote control software

Web page Built-in web page enables remote control of horizontal and vertical scale, trigger settings, and measurements. Allows waveform and image save to USB flash drive.

Display system

Display type 9 inch (228 mm) wide format liquid crystal TFT color display.

Display resolution 800 horizontal by 480 vertical displayed pixels (WVGA).

Waveform styles Vectors, Variable Persistence, and Infinite Persistence.

Graticules Grid, None.

Format YT and XY.

Input output ports

USB 2.0 high-speed host port Supports USB mass storage devices, Wi-Fi dongle, One port available on rear panel and one on front panel.

USB 2.0 high-speed device port

Device port Rear-panel connector allows for communication/control of oscilloscope through USBTMC.

LAN port (Ethernet) RJ-45 connector, supports 10/100BASE-T

Probe compensator

Amplitude 5 V

Frequency 1 kHz

Kensington-style lock Rear-panel security slot connects to standard Kensington-style lock.

Power source

Power source voltage 100 to 240 V_{AC} RMS \pm 10%

Power source frequency 47 Hz to 63 Hz (100 to 240 V)
360 Hz to 440 Hz (100 to 132 V)

Power consumption 80 W maximum

Physical characteristics

Dimensions

TBS2xx2B: Height: 174.9 mm (6.89 in)
Width: 372.4 mm (14.66 in)
Depth: 103.3 mm (4.07 in)

TBS2xx4B: Height: 201.5mm (7.93 in)
Width: 412.8 mm (16.25 in)
Depth: 128.1 mm (5.04 in)

Weight

TBS2xx2B: 2.62 kg (5.8 lbs.), stand-alone instrument.
5.1 kg (11.2 lbs.), when packaged for domestic shipment.

TBS2xx4B: 4.17 kg (9.2 lbs.), stand-alone instrument.
7 kg (15.4 lbs.), when packaged for domestic shipment.

Cooling clearance 50 mm (2 in) required on left side and rear of instrument.

EMC, Environment, and Safety

Temperature

Operating 0 °C to +50 °C (+32 °F to 122 °F)
Nonoperating -40 °C to +71 °C, (-40 °F to 160 °F)

Humidity

Operating 5% to 95% relative humidity (% RH) at up to +30° C
5% to 60% RH above +30° C up to +50° C non-condensing

Nonoperating 5% to 95% RH (Relative Humidity) at up to +30° C
5% to 60% RH above +30° C up to +60° C non-condensing

Altitude

Operating Up to 3,000 meters (9,842 feet).

Non-Operating

Up to 12,000 meters (39,370 feet).

Altitude is limited by possible damage to LCD at higher altitudes. This damage is independent of operation.

Regulatory**Electromagnetic
compatibility**

EC Council Directive 2014/30/EU

Safety

UL61010-1, UL61010-2-030, CAN/CSA-C22.2 No. 61010.1, CAN/CSA-C22.2 No. 61010-2:030; complies with the Low Voltage Directive 2014/35/EU for Product Safety

Ordering information

Product	Supported instruments
TBS2072B	70 MHz bandwidth, 2 GS/s sample rate, 2-channel digital storage oscilloscope, 5 Mpts record length, 5 year warranty. Certificate of Calibration Standard.
TBS2074B	70 MHz bandwidth, 2 GS/s sample rate, 4-channel digital storage oscilloscope, 5 Mpts record length, 5 year warranty. Certificate of Calibration Standard.
TBS2102B	100 MHz bandwidth, 2 GS/s sample rate, 2-channel digital storage oscilloscope, 5 Mpts record length, 5 year warranty. Certificate of Calibration Standard.
TBS2104B	100 MHz bandwidth, 2 GS/s sample rate, 4-channel digital storage oscilloscope, 5 Mpts record length, 5 year warranty. Certificate of Calibration Standard.
TBS2202B	200 MHz bandwidth, 2 GS/s sample rate, 2-channel digital storage oscilloscope, 5 Mpts record length, 5 year warranty. Certificate of Calibration Standard.
TBS2204B	200 MHz bandwidth, 2 GS/s sample rate, 4-channel digital storage oscilloscope, 5 Mpts record length, 5 year warranty. Certificate of Calibration Standard.

Bandwidth upgrade options

You can upgrade the analog bandwidth of the product after your initial purchase. All models can be upgraded to any bandwidth in the field. For instructions on installing an upgrade license, please refer to the user manual.

Options	Supported instruments
SUP2-BW7T102	Upgrade 70 MHz to 100 MHz on 2-channel models of TBS2000B Series oscilloscopes
SUP2-BW7T104	Upgrade 70 MHz to 100 MHz on 4-channel models of TBS2000B Series oscilloscopes
SUP2-BW7T202	Upgrade 70 MHz to 200 MHz on 2-channel models of TBS2000B Series oscilloscopes
SUP2-BW7T204	Upgrade 70 MHz to 200 MHz on 4-channel models of TBS2000B Series oscilloscopes
SUP2-BW10T202	Upgrade 100 MHz to 200 MHz on 2-channel models of TBS2000B Series oscilloscopes
SUP2-BW10T204	Upgrade 100 MHz to 200 MHz on 4-channel models of TBS2000B Series oscilloscopes

Standard accessories

Probes

TPP0200	200 MHz, 10x passive probe (one per analog channel) 100 MHz and 200 MHz models
TPP0100	100 MHz, 10x passive probe (one per analog channel) 70 MHz model

Accessories

071-3635-xx	Compliance and Safety Instructions
077-1149-xx	Programmer manual, available in tek.com
Power cord	-
Calibration certificate	Calibration certificate documenting traceability to National Metrology Institute(s) and ISO9001 quality system registration

Warranty Five-year warranty covering all parts and labor, excluding probes.

Recommended Probes

Tektronix offers over 100 different probes to meet your application needs. For a comprehensive listing of available probes, please visit tek.com/probe-selector.

Accessory	Description
P5100A	2.5 kV, 500 MHz, 100X high-voltage passive probe
TDP0500	500 MHz TekVPI ® differential voltage probe with ± 42 V differential input voltage
THDP0200	± 1.5 kV 200 MHz high-voltage differential probe
THDP0100	± 6 kV 100 MHz high-voltage differential probe
TMDP0200	± 750 V, 200 MHz TekVPI ® high-voltage differential probe
TAP1500	1.5 GHz TekVPI ® active voltage probe
TCP0020	50 MHz TekVPI ® 20 Ampere AC/DC current probe
TCP0030A	120 MHz TekVPI ® 30 Ampere AC/DC current probe
TCP0150	20 MHz TekVPI ® 150 Ampere AC/DC current probe
TCP2020	50 MHz BNC 20 Ampere AC/DC current probe
P5200A	50 MHz, 50X/500X high-voltage differential probe
P5202A ¹	100 MHz, 640 V High Voltage differential probe
P5205A ¹	100 MHz, 1.3 kV High Voltage differential probe
P5210A ¹	50 MHz, 5.6 kV High Voltage differential probe
P6015A	20 kV, 75 MHz high-voltage passive probe

Recommended Accessories

ACD2000	Soft transit case for TBS2000B 2-channel instrument
ACD4000B	Soft transit case, for TBS2000B 4-channel instrument
TPA-BNC	TekVPI ® to TekProbe ® BNC adapter
TEK-DPG	TekVPI ® Deskew pulse generator signal source
067-1686-XX	Power measurement deskew and calibration fixture

Instrument options

Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A4	North America power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 50/60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

¹ Requires the TekVPI adapter TPA-BNC

Opt E1 Universal EURO, United Kingdom, and Switzerland

Language options

Opt. L0	English front panel overlay
Opt. L1	French front panel overlay
Opt. L2	Italian front panel overlay
Opt. L3	German front panel overlay
Opt. L4	Spanish front panel overlay
Opt. L5	Japanese front panel overlay
Opt. L7	Simplified Chinese front panel overlay
Opt. L8	Traditional Chinese front panel overlay
Opt. L9	Korean front panel overlay
Opt. L10	Russian front panel overlay
Opt. L99	No manual

Language options include translated front-panel overlay for the selected language(s).

Service options

Opt. C3	Calibration Service 3 years. Includes traceable calibration or functional verification applicable, for recommended calibrations. Coverage includes the initial calibration plus 2 years calibration coverage.
Opt. C5	Calibration Service 5 years. Includes traceable calibration or functional verification applicable, for recommended calibrations. Coverage includes the initial calibration plus 4 years calibration coverage.
Opt. D1	Calibration Data Report.
Opt. D3	Calibration Data Report 3 years (with Option C3).
Opt. D5	Calibration Data Report 5 years (with Option C5).
Opt. T3	Three Year Total Protection Plan, includes repair or replacement coverage from wear and tear, accidental damage, ESD or EOS plus preventative maintenance. Including a 5 day turnaround time and priority access to customer support.
Opt. T5	Five Year Total Protection Plan, includes repair or replacement coverage from wear and tear, accidental damage, ESD or EOS plus preventative maintenance. Including a 5 day turnaround time and priority access to customer support.

Probes and accessories are not covered by the oscilloscope warranty and Service Offerings. Refer to the datasheet of each probe and accessory model for its unique warranty and calibration terms.



Tektronix is ISO 14001:2015 and ISO 9001:2015 certified by DEKRA.

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 France 00800 2255 4835*
 India 000 800 650 1835
 Luxembourg +41 52 675 3777
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 Portugal 80 08 12370
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