



# TBS1000C Demonstration Guide

26 JUNE 2020 - VERSION 1.0

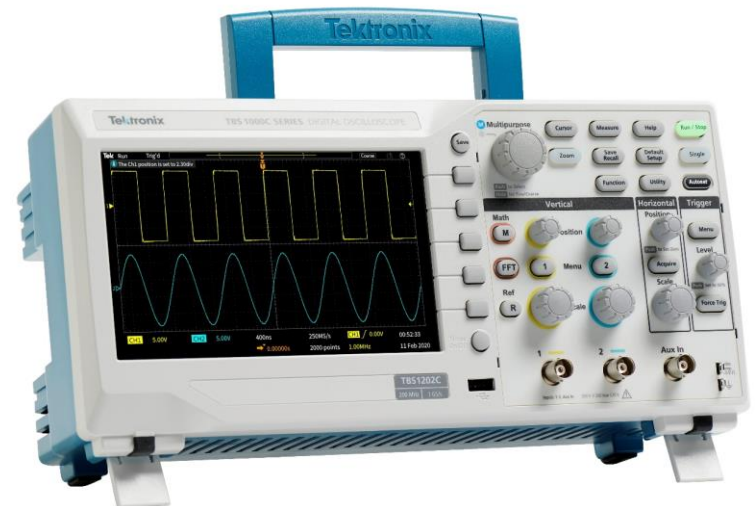
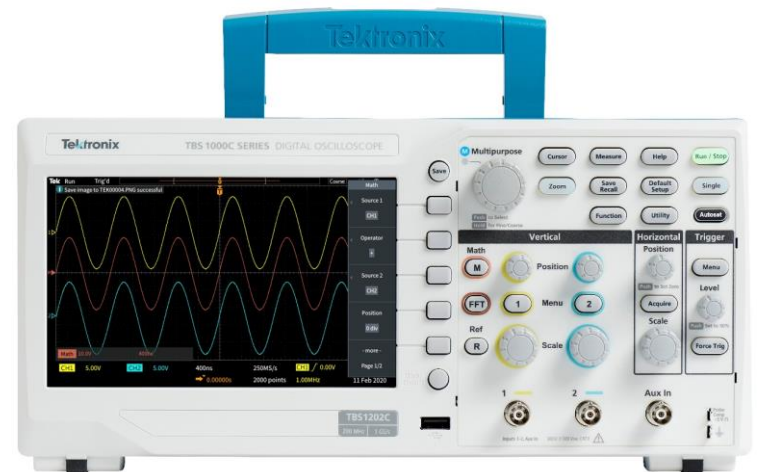


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# TBS1000C Specification and Feature Highlights

	TBS1052C	TBS1072C	TBS1102C	TBS1202C
Bandwidth	50 MHz	70 MHz	100 MHz	200 MHz
Analog Channels	2			
Sample Rate	1GS/s (All)			
Record Length	20k points			
Vertical Resolution	8 Bit, 1mV/div to 10V/div			
Probe Interface	Passive BNC probes, Current and Power probes			
Trigger	Edge, Pulse Width, Runt			
Analysis	32 Automated Measurements, Math, Ref, Cursors, FFT, Zoom, Autoset			
Display Size	7 in WVGA			
I/O	USB Host, USB Device, Aux In			
Security	Kensington Lock			
Software	Courseware, OpenChoice Desktop, TekBench			
Warranty	5 years			

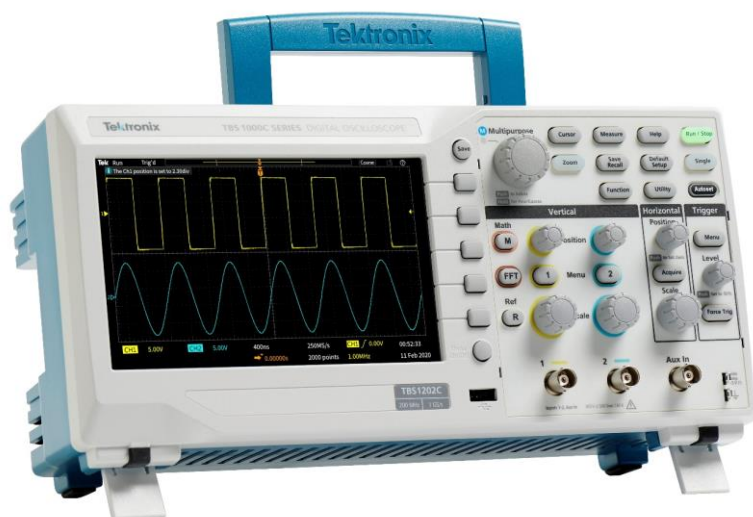


# About This Guide

Begin by exploring the controls and display of the TBS1000C Series. Then move on to a series of hands-on exercises. Acquire waveforms, learn about triggering, take measurements, and learn how to save data. Get an introduction to the TBS1000C's connectivity and remote control capabilities, and tools for education.

In order to perform the demo procedure, you will need the following equipment and accessories:

- TBS1000C series oscilloscope
- The passive voltage probes (TPP0100 or TPP0200) that come with the unit
- Power cord
- USB flash drive (for data export exercise)
- External PC with VISA software installed (for remote control exercise) – for the latest TekVISA, please search by the keyword TekVISA on [www.tek.com](http://www.tek.com)



# Before Starting a Demonstration

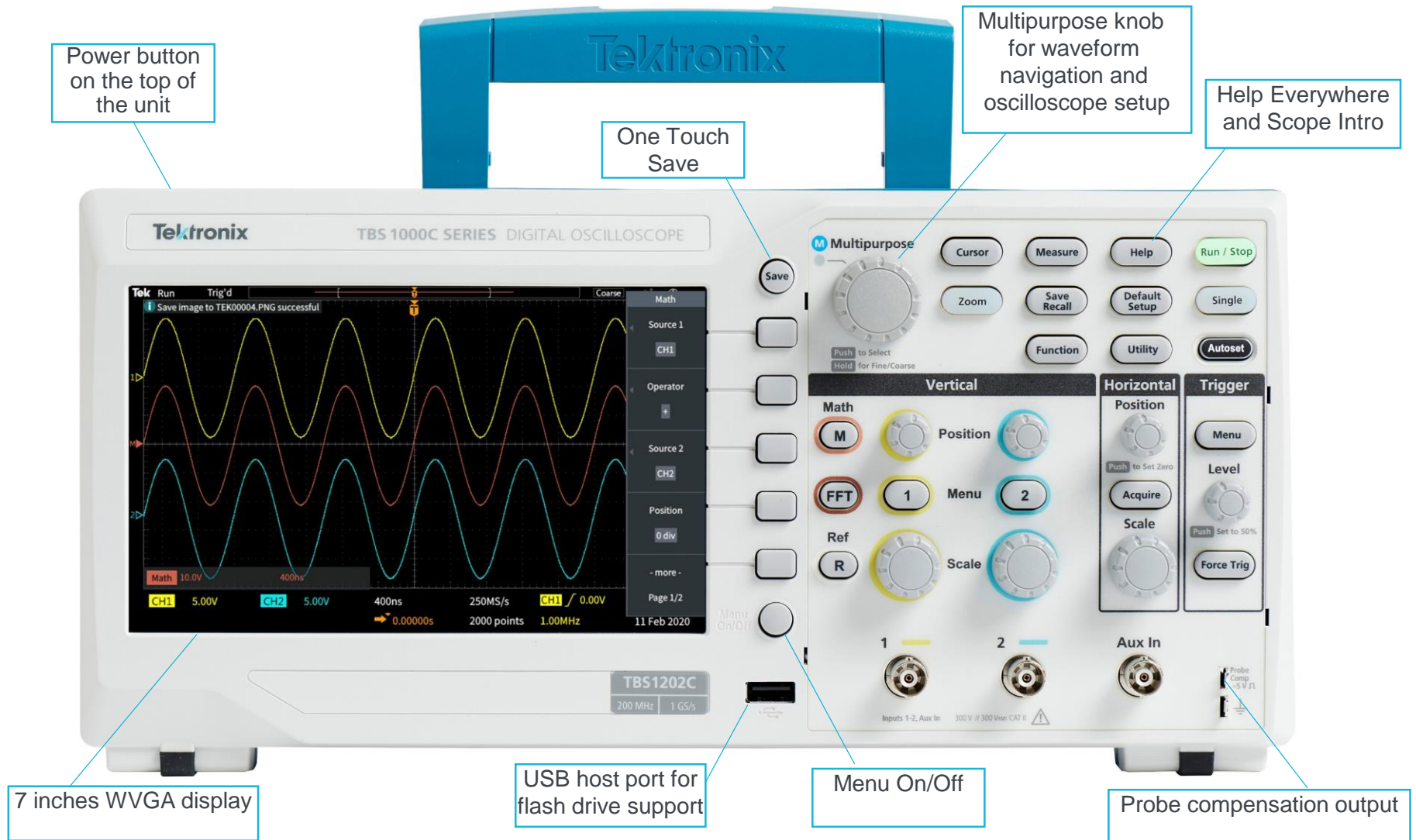
- **Power up the instrument**

1. Plug in the power cord of your region
2. Press the button to turn on the instrument. Allows the instrument to complete the power on self tests
3. Connect probes to the channel inputs

- **Check on firmware version** – it is recommended to get the latest firmware for the instrument to optimize the product performance.

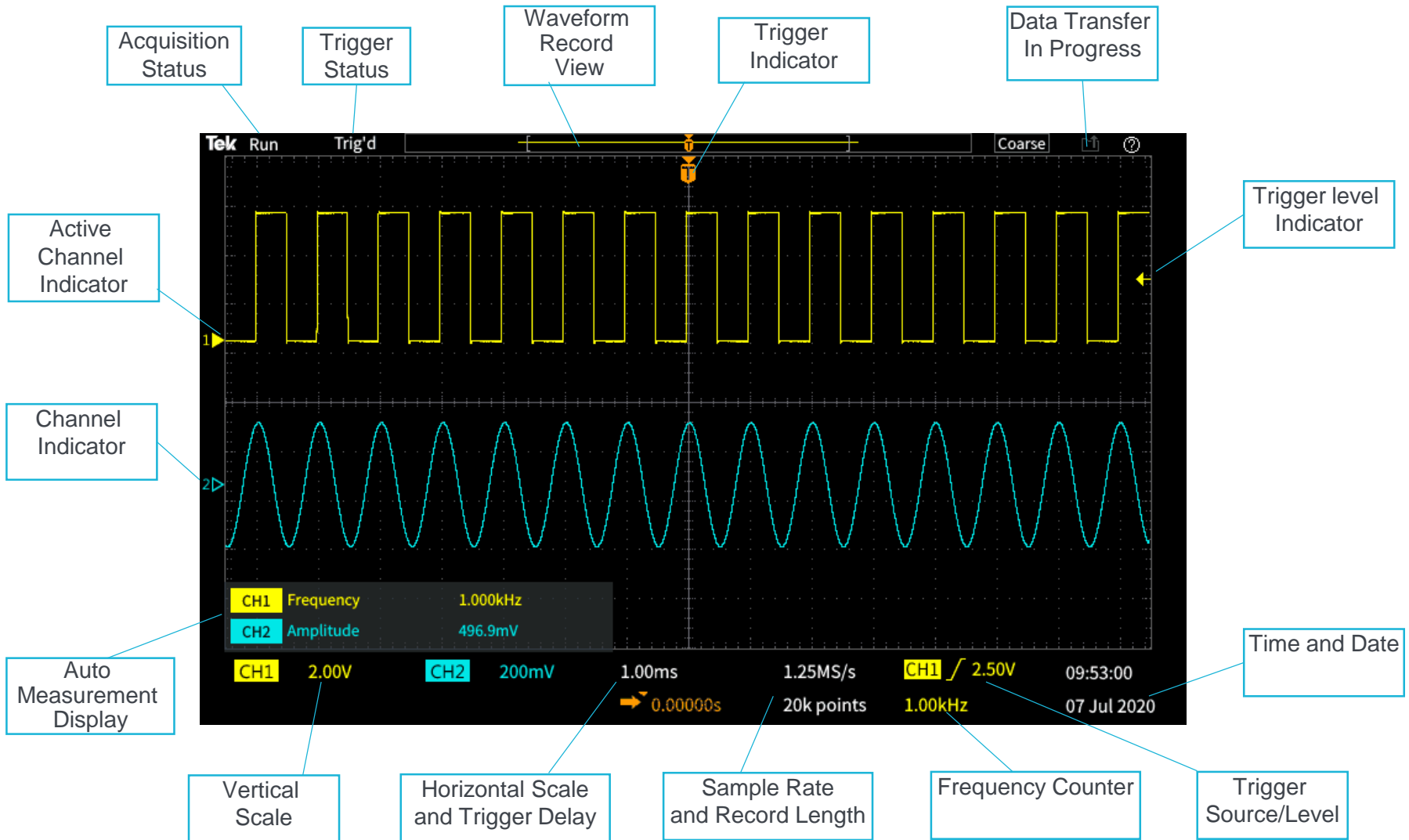
1. Press **Utility** button
2. Select **Config**
3. Using the **Multipurpose** knob to highlight **System Status** and press the **Multipurpose** knob to enter System Status menu
4. Review the firmware version. Visit [www.tek.com](http://www.tek.com) for the latest firmware

# Front Panel Overview





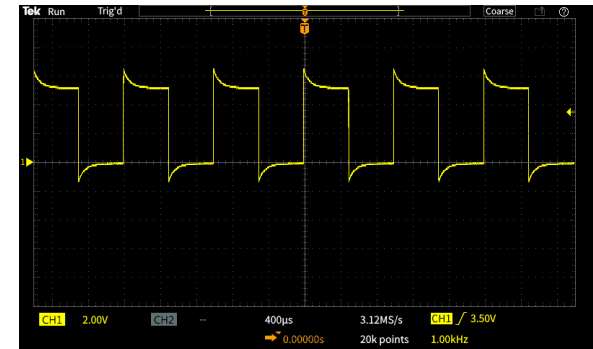
# Getting Acquainted with the User Interface



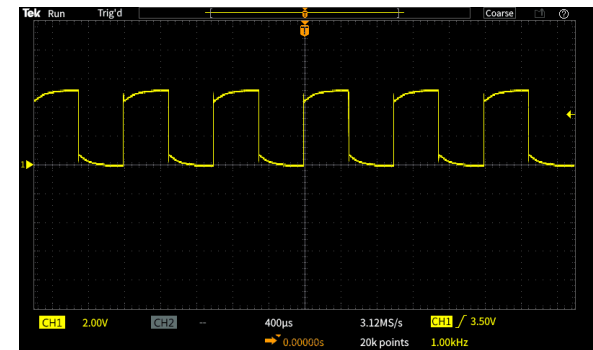
# Before You Start

- **User calibration – Signal Path Compensation (SPC)** is designed to correct any DC inaccuracy in the system due to temperature changes or long term drift
  1. Disconnect any probes or cables from the channel inputs and Aux in
  2. Make sure to warm up the instrument for around 15 to 20 minutes before to running SPC.
  3. Press **Utility** button
  4. Select **Calibration & Diagnostics**
  5. Using the **Multipurpose** knob to select for **Signal Path**
  6. Press the bezel button next to **Compensate Signal Paths** to initialize the SPC

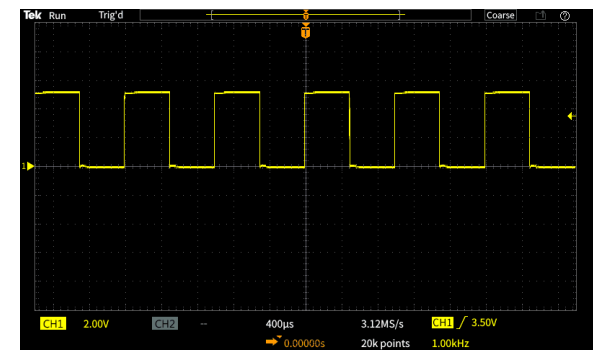
Note: SPC can take up to 20 minutes to run.
- **Compensate the passive voltage probe**
  1. Connect the passive probe (TPP0100 or TPP0200) to ch1/ch2 and the probe compensation output
  2. Press **Autoset** button to auto scale the signal on display
  3. Use the compensation adjustment tool that comes with the probe to adjust any overshoot or undershoot of the probe compensation signal until you see a perfect square wave



*Probe compensation signal with overshoot*



*Probe compensation signal with undershoot*



*Probe compensation signal after compensation adjustment*



# About Help Everywhere

*While you're learning your way around the scope, Help Everywhere provides helpful tips. Once you become proficient, you can turn the tips off if you wish.*

- Enabling Help Everywhere
  1. Press **Help** button on the front panel
  2. Select **Help Everywhere** from the bezel button (Figure 1)
  3. Select on specific topic or all using the **Multipurpose Knob (MPK)**
  4. When you use the Trigger, Measure, or Cursor function later on, you'll see Help Everywhere tips that explain trigger modes, measurements, and cursor types (Figure 2)

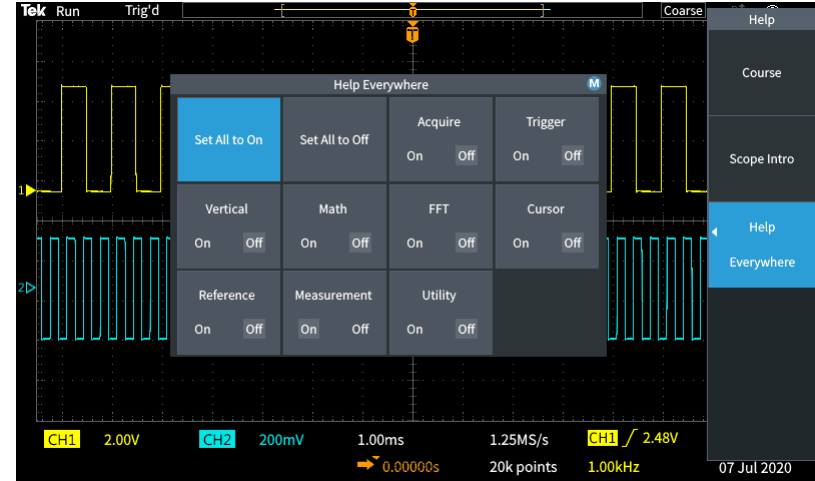


Figure 1. Enabling Help Everywhere

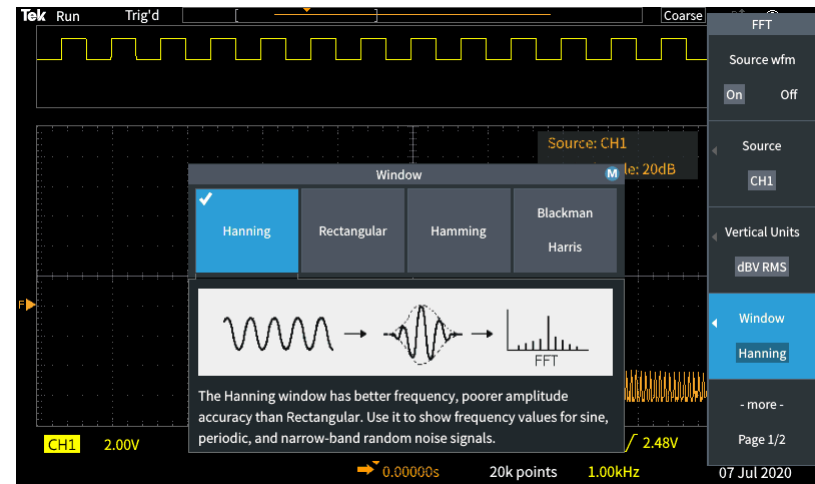


Figure 2. Helpful tip to provide more details regarding the FFT window

# Using the Scope Intro Built-in Handbook

*If you get stuck, or want to know more about a particular control, Scope Intro provides a built-in, handy reference.*

1. Press **Help** button on the front panel
2. Press **Scope Intro** bezel button (Figure 3)
3. Select **Oscilloscope Basic** with the **Multipurpose Knob (MPK)**
4. Select **Why use an oscilloscope**
5. Use the MPK to scroll through the content (Figure 4)
6. Press **Scope Intro** again to go back to the top menu, and explore the other topics. **TBS1000C Overview** gives good explanation of the instrument's controls and menus.
7. Press **Menu On/Off** to exit **Scope Intro** when you are finished exploring.

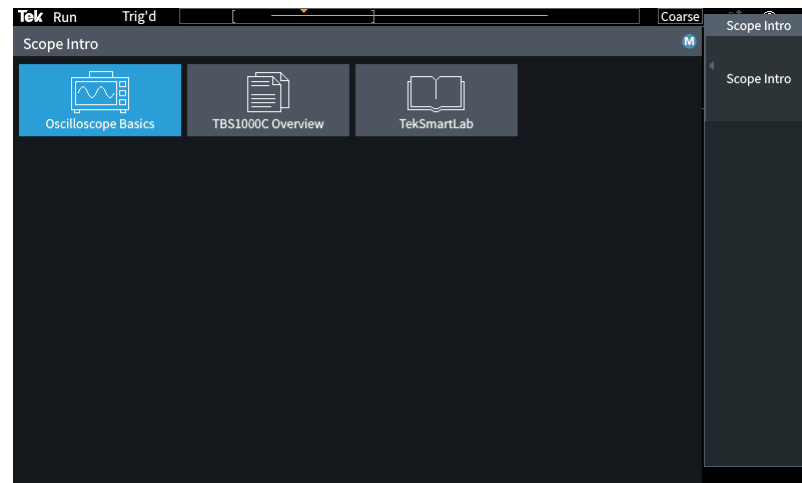


Figure 3. Selecting Oscilloscope Basics

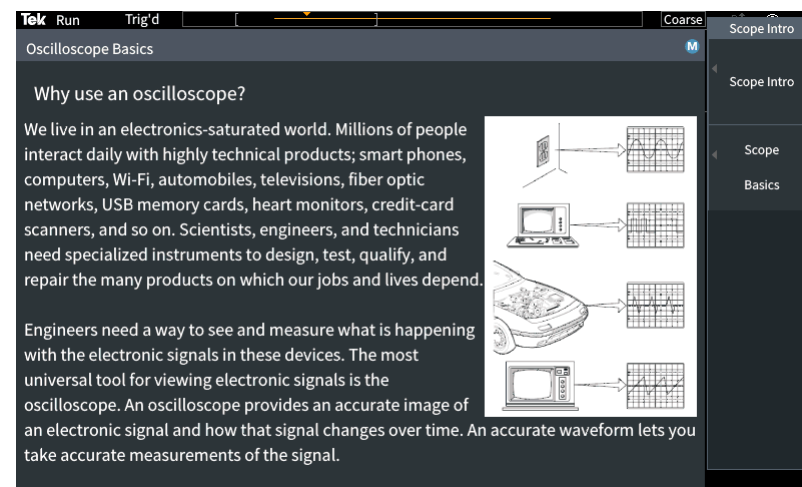


Figure 4. Using MPK to scroll through the content

# Using Autoset to Acquire a Waveform

- Autoset is a common feature on the oscilloscope to assist the user to setup the unit for capture.
  - Autoset is designed to auto scale the incoming signal around 80% of the display area. That allows the user to view the signal and avoid clipping.
  - After the user is able to view the signal on the screen, it will be easier to adjust the vertical scale to optimize the digitizer for the most accurate result.
1. Attach the TPP0100 or TPP0200 probe to the Channel 1 input.
  2. Connect the probe's hook tip to the Probe Comp output. Clip the ground clip to the Probe Comp ground terminal.
  3. Press **Default Setup** to recall the factory default setup.
  4. Press **Autoset** button to auto scale the signal on screen similar to the Figure 5.

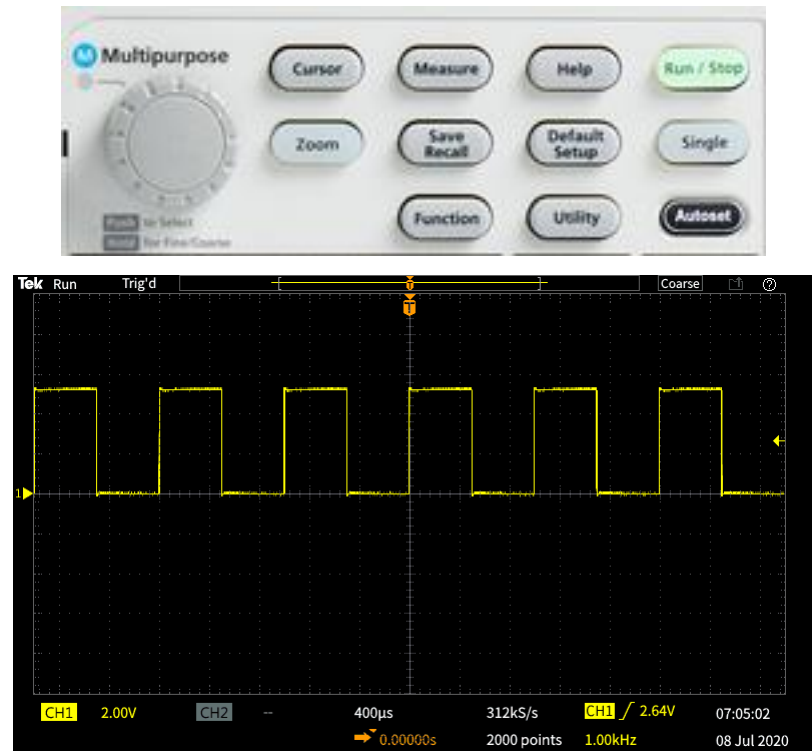


Figure 5. Probe Comp Signal display after Autoset

# Setting up the Trigger for Data Capture

- Real time oscilloscope is a trigger machine. Setting up the trigger is important to capture the signal/event of your interest.
- On the TBS1000C, it offers three different trigger types: Edge, Pulse Width or Runt.

# Setting up the Pulse Width Trigger 1/2

Autoset exercise automatically uses Edge trigger. The following exercise will be using Pulse Width trigger as demonstration purposes..

1. Keep Channel 1 connected to Probe Comp output.
2. Press **Default Setup**.
3. Adjust **Vertical Scale** on Channel 1 to **2.00V**.
4. The default trigger type is Edge with a rising slope. The default level is 0V. This is shown in yellow in the lower right of the display.
5. Adjust the **Trigger Level** toward the center of the waveform. The trigger level indicator appears during the adjustment.
6. Press **Menu** in the Trigger section. Press the **Type** side-bezel button (Figure 6). Note that the LED next to the multipurpose knob (MPK) is lighted, prompting for a selection.
7. Scroll the **MPK** to highlight the **Pulse Width** trigger type, and press the **MPK** to select it.

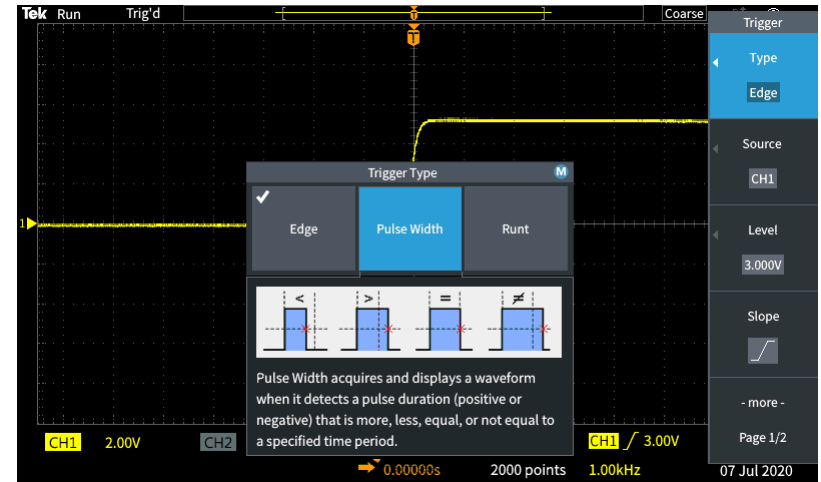


Figure 6. Trigger selection using MPK to select

# Setting up the Pulse Width Trigger 2/2

8. Note that the **Source** is CH1 and the **Polarity** is Positive.
9. Press – more – **Page 1/2** for more selection.
10. Press **Trigger When**, and use the MPK to select **Pulse Width >**. Change the pulse duration to > 10ns. Since the pulse width is much greater than 10 ns, the waveform triggers (Figure 7).
11. Press Menu On/Off button below the display to exit the menu.

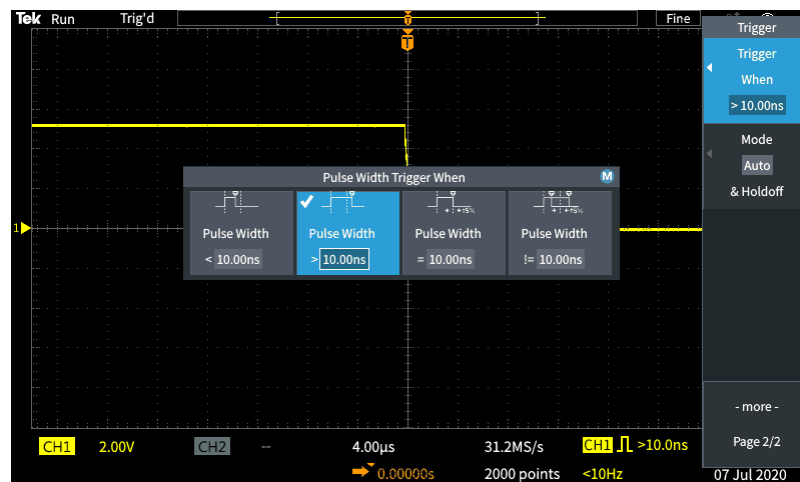


Figure 7. Setting pulse width trigger parameters



# Using Pan and Zoom 1/2

Sometime it is nice to view the whole waveform without trading off the details.  
The zoom feature allows the user to look into the details for the long record

1. Press the **Acquire** button on the front panel. Notice that the Multipurpose Knob LED is on, which means it can be used to make a selection.
2. Set **Record Length** to **20K** by turning the **Multipurpose Knob (MPK)** and press the knob to make the selection.
3. Change the horizontal scale to 10ms/div with the **Horizontal Scale** knob.
4. Press the **Zoom** button. The button lights to show that Zoom is active.
5. Turn the **MPK** to change the zoom scale factor from **1X** to **100X**. See the details of the trigger edge (Figure 8).

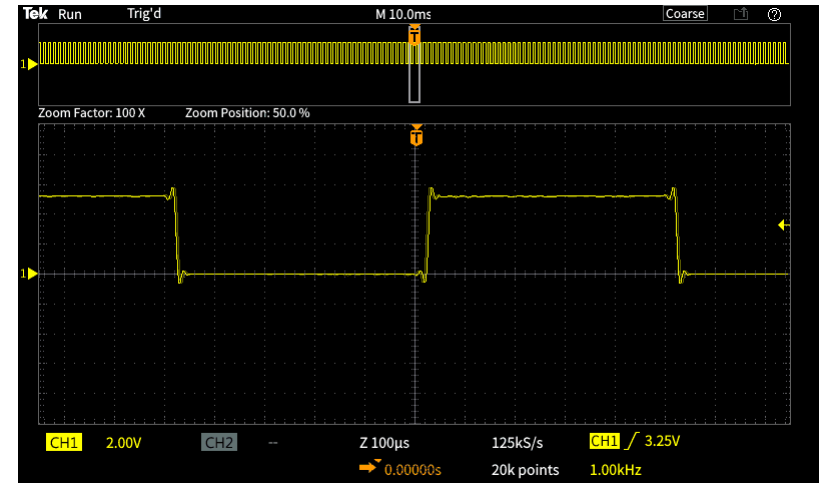


Figure 8. 100x zoom in

# Using Pan and Zoom 2/2

6. Set the zoom factor back to 100X. Press the **Position** bezel button. Turn the **MPK** to position a falling edge in the center of the zoom area.
7. Adjust the Horizontal **Scale** knob to 200us, and use the **MPK** to zoom in on the falling edge detail. Adjust position if needed (Figure 9).

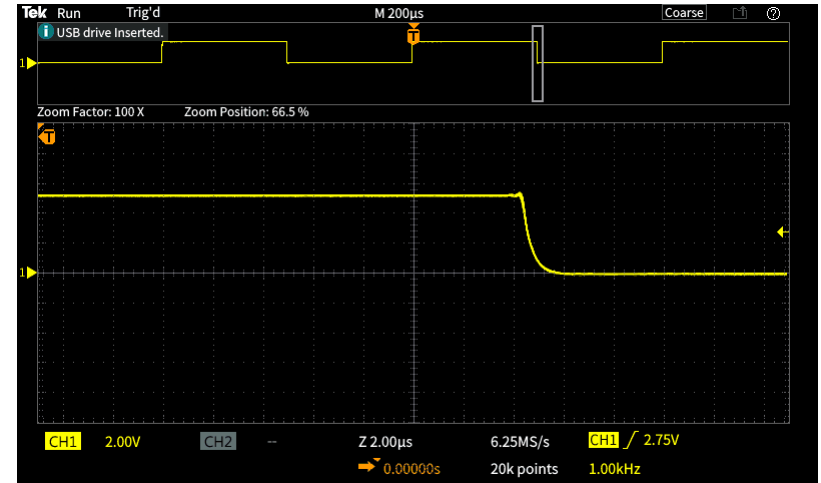


Figure 9. Zoom in details on the falling edge

# Making Delta Measurement using Cursors

## 1/2

Cursors is the flexible measurement tool to assist user to make any delta time or delta amplitude measurement

1. Press **Default Setup**. Press **Autoset**.
2. Press the **Cursor** button beside the MPK (Figure 10).
3. Press the **Screen** bezel button to select independent control of both amplitude and time cursors.
4. Turn the **MPK** to move the left time cursor close to the position you would like to measure.
5. To position the cursor more precisely, press and hold the **MPK** to select the **Fine** scale. Now turn the **MPK** to left cursor exactly on a rising edge of the signal.
6. Press the **MPK** to change control to the right time cursor. Turn the **MPK** and use **Fine** to position the cursor on the next rising edge.



Figure 10. Cursor button next to the multipurpose knob (MPK)

# Making Delta Measurement using Cursors

## 2/2

7. Note the delta time readout between the cursors and the time position for each bar.
8. Press **MPK** again to change control to the upper cursor for amplitude measurements. Move the cursor to the top of the signal and note the delta readout (Figure 11).

*In the next section, you'll use automated measurements to get similar results.*

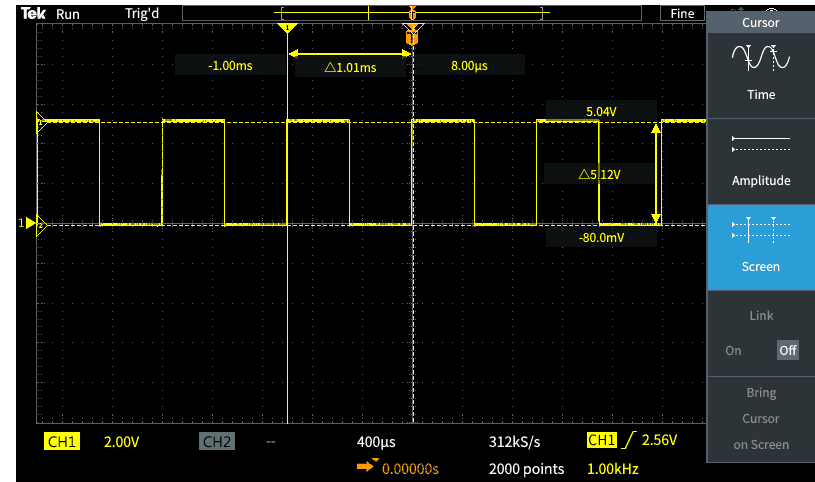


Figure 11. Using cursors to measure period and amplitude of the probe comp. signal

# Using Built-in Automatic Measurements 1/2

*Automated measurements use the processing power of the scope to provide a frequency, time, amplitude, and area measurements.*

1. Connect passive probes to Channel 1 and Channel 2. Connect both probe tips to Probe Comp and both ground clips to Probe Comp ground.
2. Press **Autoset**.
3. Press the **Measure** button in the resource section of the front panel.
4. Notice, from top to bottom(Figure 12):
  - Measurement selection indicator bar
  - Snapshot button
  - Most Used measurement list
  - Measurements grouped by Frequency, Time, Amplitude, Area

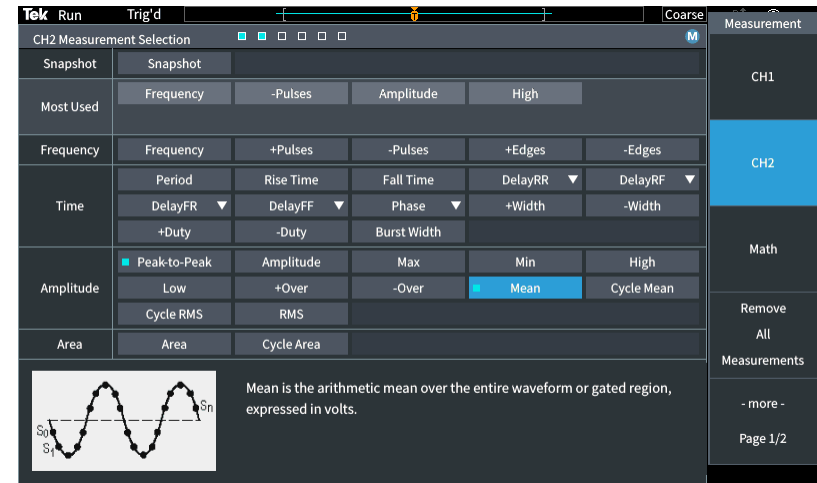


Figure 12. Auto Measurement selection menu

# Using Built-in Automatic Measurements 2/2

5. Press the **CH1 bezel button**. Scroll and press **MPK** to select **Frequency** and **+Duty** for Channel 1.
6. Press the **CH2 bezel button**. Scroll and press **MPK** to select **Peak-Peak** and **Mean** for Channel 2. (Figure 13)
7. Press **Menu On/Off** to return to the waveform window.
8. Note the measurement readout (Figure 14).
9. Press **Menu On/Off** a couple of times to hide and recall the measurement readout panel .

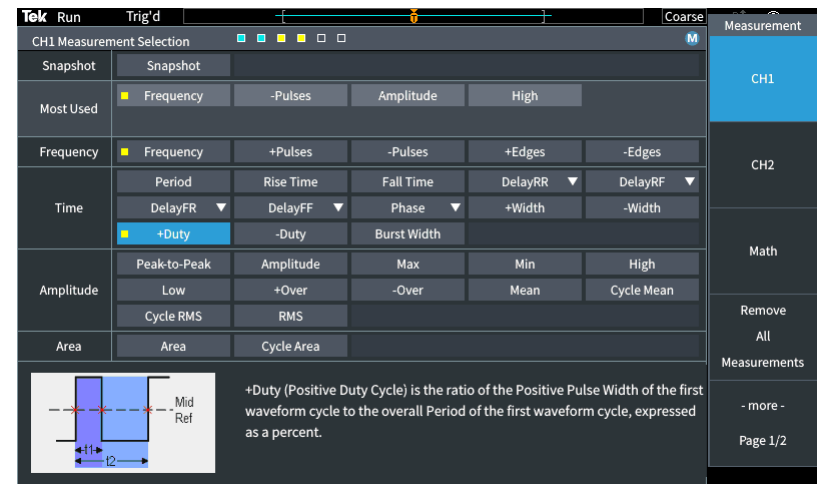


Figure 13. Adding Auto Measurement for Ch1 and Ch2

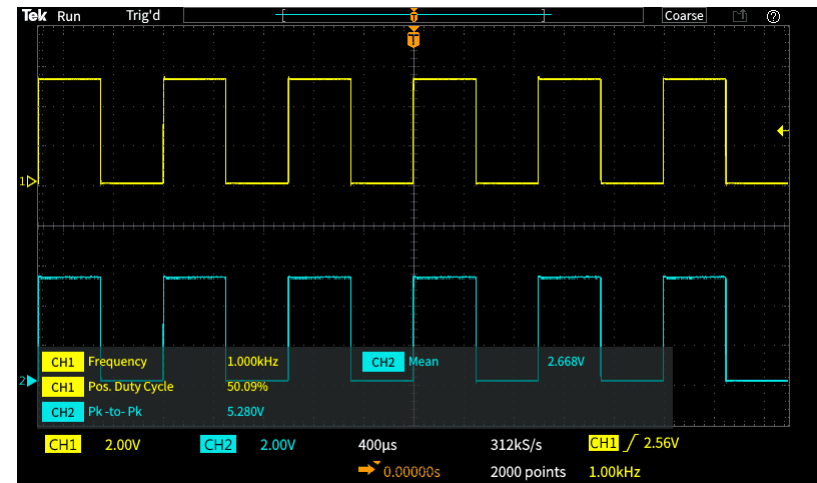


Figure 14. Transparent readouts let the signal show through



# Using FFT for Spectrum Analysis 1/2

*The FFT function calculates the frequency input of the source waveform.  
Cursors make it easy to measure frequency and amplitude in the spectrum.*

1. Keep the TPP0100 passive probe connected to Channel 1 and the Probe Comp output.
2. Press **Default Setup**. Press **Autoset**.
3. Press the **FFT** button for FFT function on the front panel (Figure 15).
4. By default, the source waveform is on. Turn it off by pressing the **Source wfm** bezel button.
5. Source Channel, Vertical Units, Window Type, Horizontal Center Position and Scale may be adjusted by selecting the corresponding **bezel button** and adjusting with the **MPK**.
6. The FFT readout panel in the top right corner of the waveform display shows important settings.
7. The default FFT window is Hanning. Use the **Window** bezel button and MPK to switch to the Rectangular window and note the result.

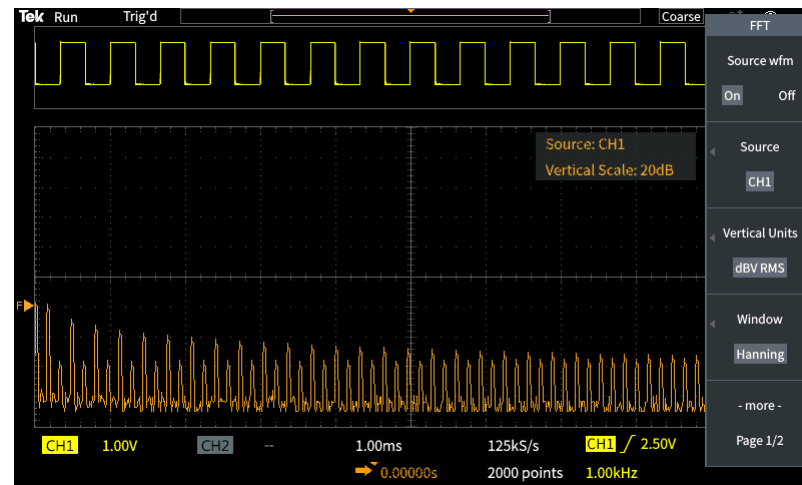


Figure 15. FFT Menu

# Using FFT for Spectrum Analysis 2/2

8. The default FFT window is Hanning. Use the **Window** bezel button and MPK to switch to the Rectangular window and note the result.
9. Press the Horizontal Scale bezel button and use the MPK to adjust the horizontal scale to 1.56 kHz/div.
10. Press the **Cursor** button and position the cursors on the third and fifth harmonic frequencies (Figure 16).
11. The delta between third harmonic and fifth harmonic frequency should be 2 kHz, which is consistent with the 1 kHz fundamental frequency of the Probe Comp output.

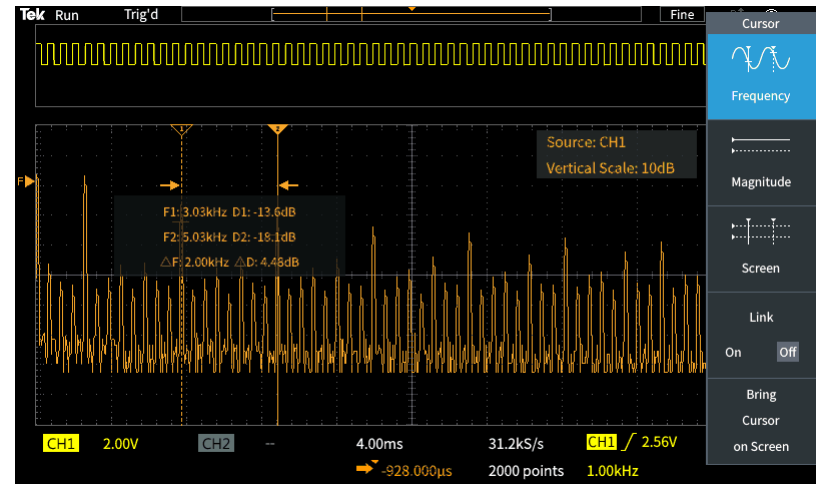


Figure 16. Delta frequency between the 3rd and the 5<sup>th</sup> harmonic is around 2kHz

# Exporting Data – Saving Screen Image 1/2

*TBS1000C series allows user to export data to a USB flash drive or via the USB device port to a computer. The data that could be exported include the screen image, setup or waveform.*

1. Press **Default Setup**. Press **Autoset**.
2. Plug a USB flash drive into the USB host port on the oscilloscope's front panel.
3. Press **Save/Recall** in the Resource section of the front panel.
4. Use the side bezel button to set the **Action** to **Save Image**. (Figure 17)
5. Set the **Save As** to JPG.
6. You could also assign to save image every time when pressing the **Save/Print** button.
7. Press **Save/Recall** button. Select **Settings**. Press the bezel button next to the **Assign Save Button To Image**.
8. Press the bezel button next to Change Folder and then press **New Folder**. Use the **MPK** to set up a new folder named "DEMO".

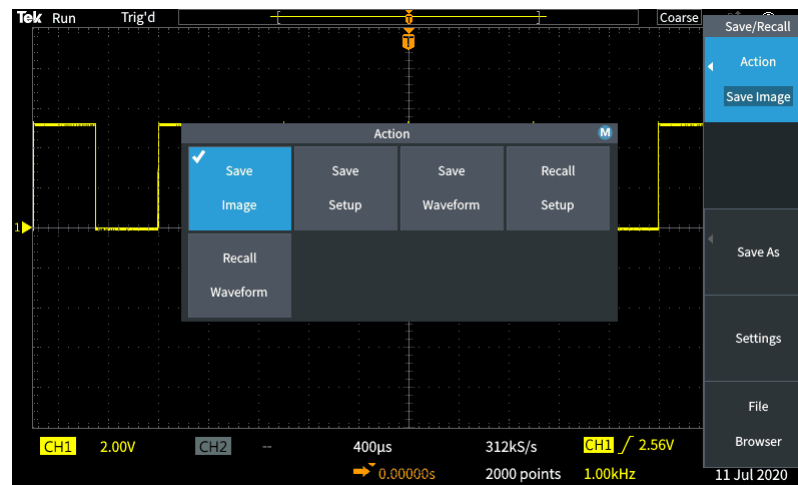


Figure 17. Selecting to save as Image

# Exporting Data – Saving Screen Image 2/2

8. Press **Back**.
9. Highlight and select the new DEMO folder with the **MPK**.
10. Press the **Save** button outside the right top corner of the display(Figure 18) to save an image into the DEMO GUIDE folder on the USB thumb. The hint line should say that the image was successfully saved(Figure 18).
11. Take the flash drive to a PC equipped with a USB host port. You can now open the screenshot image as you would to any image file.



Figure 18. Save button next to the MPK

# Remote Control Interface 1/2

TBS1000C equipped with USB device port on the rear panel for PC connectivity. It is using USBTMC with VISA software for communication. The following exercise step you through the setup for remote control

1. Make sure you have the VISA software installed on the remote PC.
2. To download TekVISA, please go to [www.tek.com](http://www.tek.com) and search for keyword “TekVISA” (Figure 19). NI-VISA is also compatible with the TBS1000C if you prefer to use NI-VISA.
3. The VISA software provides the USBTMC (USB Test and Measurement Class) device driver for the PC to recognize the TBS1000C oscilloscope.
4. After the VISA software is installed, connect the TBS1000C scope to the PC using the USB device port on the rear panel.
5. If you are having issue to detect the scope on the PC, please check in the device manager and see if the USB driver is installed correctly. If not, try manually install the driver by going to the **Driver** tab to **Update Driver**.

*Note. If the driver is installed correctly, it listed as USB Test and Measurement Device (IVI) (Figure 20)*

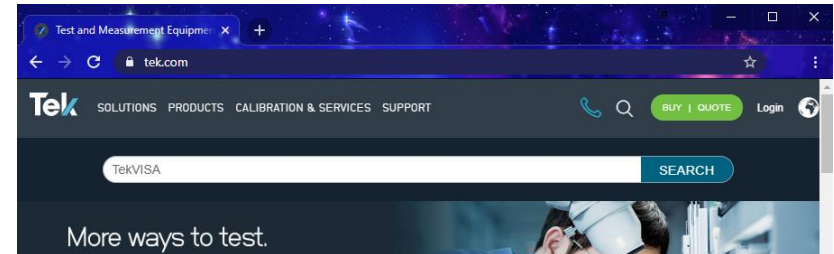


Figure 19. Search for TekVISA from [www.tek.com](http://www.tek.com)

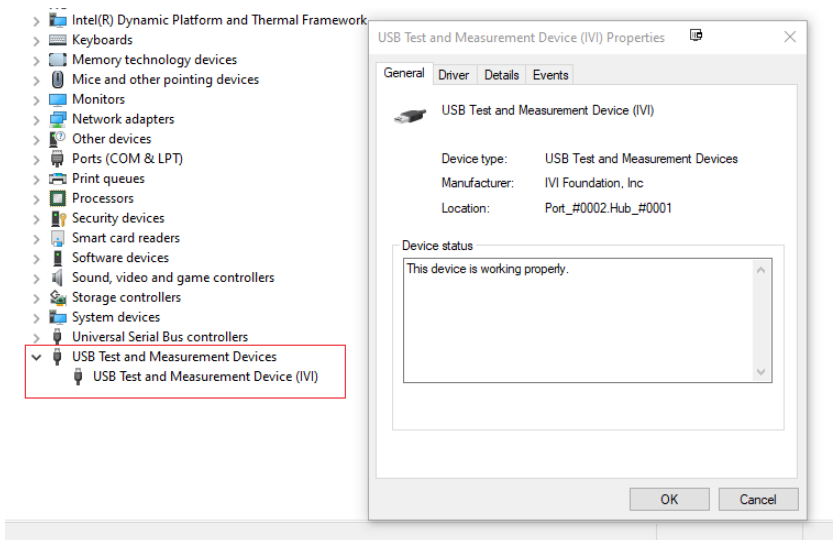


Figure 20. USB device listed in the device manager

# Remote Control Interface 2/2

6. To confirm the connectivity, right click on TekVISA icon (Figure 21) and bring up the **Instrument Manager...**
7. The TBS1000C will be listed in the Instruments list (Figure 22)
8. Double click on OpenChoice Talker Listener to bring the command prompt
9. Try with the \*IDN? Command. If you query the \*IDN? Command, it will return the scope's serial number and firmware version. (Figure 23)
10. You could also use the command "SELECT:CH2 ON" to turn on channel 2 on the display

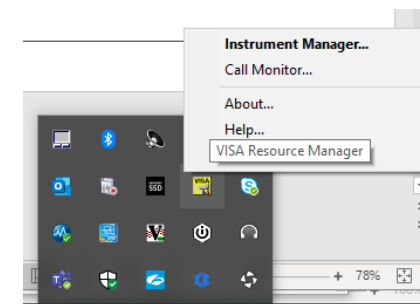


Figure 21. Open TekVISA instrument manager

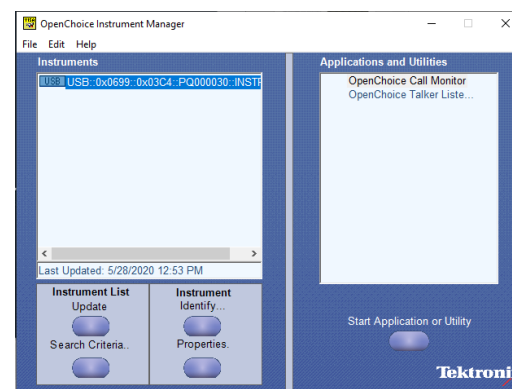


Figure 22. Look for the USB item in the Instrument list

*Note: OpenChoice Desktop, TekBench are some of the optional software to export data from the TBS1000C to the PC.*

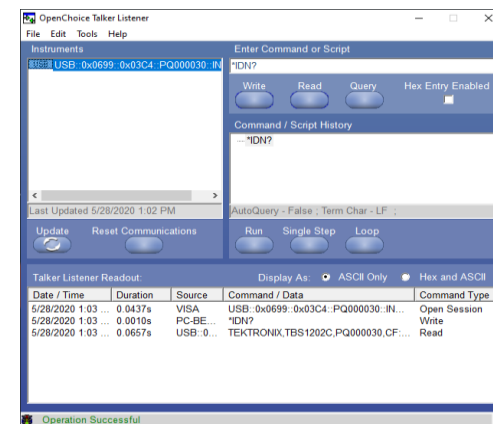


Figure 23. Sending \*IDN? In the command prompt



## Bonus Demo: Create and load custom courseware (1/3)

The PC Courseware Editor helps you create lab descriptions and instructions on a PC and then upload the material directly onto a TBS1000C oscilloscope. You can modify existing labs with content that directly supports recent lectures or incorporates ideas discovered in class discussions. Your students can perform their lab work directly on the oscilloscope and can even automatically generate an HTML formatted lab report for submission and grading directly from the instrument.

1. After installing an opening PC Courseware Editor V2.0 on your computer click the **Create** button under the **Lab** section(Figure 24).
2. Next give your lab a name and click **OK**.
3. Select the lab you just created and select the **Edit** button (Figure 25).

Addition equipment needed:

- PC Courseware Editor Tool V2.0
- USB drive

*Bonus  
Demo*

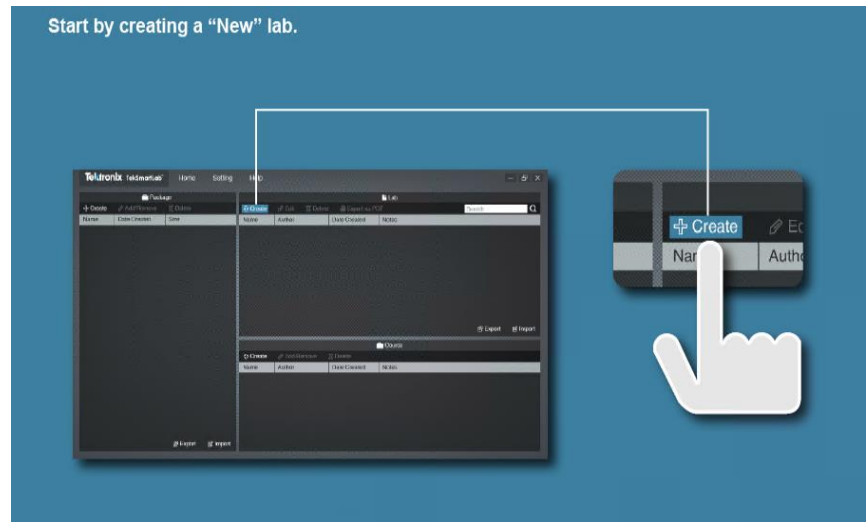


Figure 24. Creating a new lab in PC Courseware Editor V2.0

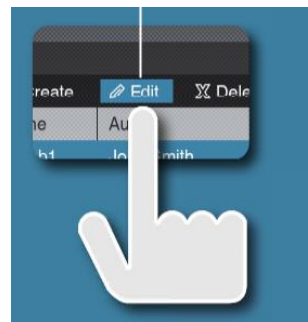


Figure 25. Selecting a lab to edit in PC Courseware Editor V2.0

## Create and load custom courseware (2/3)

The PC Courseware Editor helps you create lab descriptions and instructions on a PC and then upload the material directly onto a TBS1000C oscilloscope. You can modify existing labs with content that directly supports recent lectures or incorporates ideas discovered in class discussions. Your students can perform their lab work directly on the oscilloscope and can even automatically generate an HTML formatted lab report for submission and grading directly from the instrument.



Figure 26. Creating a lab objective for students to read before starting the lab

- Now use the editor page on the **Objective** tab to describe the main objective of the lab. Feel free to use pictures, graphs, and tables. (Figure 26).
- Now click on the **Procedure** tab describe the main procedure of the lab.
- Click **Save** and **Quit** once finished figure (Figure 27).



Figure 27. Creating a lab procedure for students to follow

## Create and load custom courseware (3/3)

7. Follow the steps in **Figure 28** to create a package that can be loaded on the TBS1000C
8. Select the package and **export** it to a **USB** thumbdrive.
9. Click **Save** and **Quit** once finished figure (Figure 27).
10. Plug the USB drive into the scope and press the **Utility** button.
11. Press the **–more – Page 1/2** and then **Update Course** button to upload the course the instrument (Figure 29).
12. Confirm that the course is loaded by pressing the **Help** button and then pressing **Courses**.



Figure 28. Creating a lab objective for students to read before starting the lab

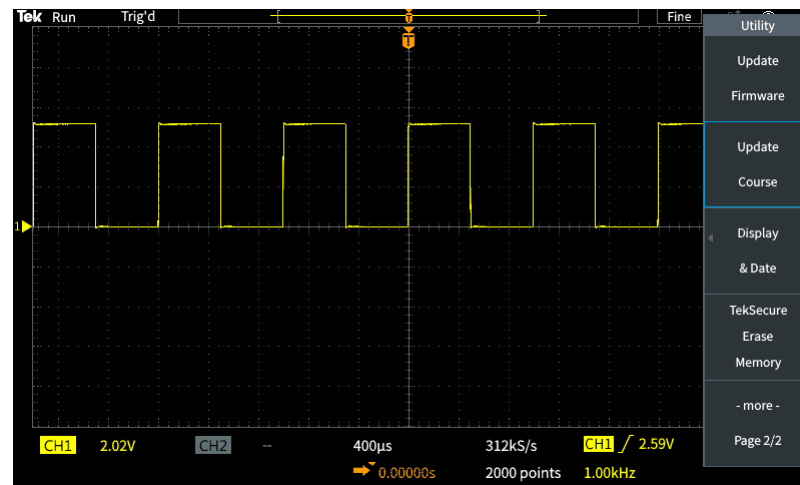
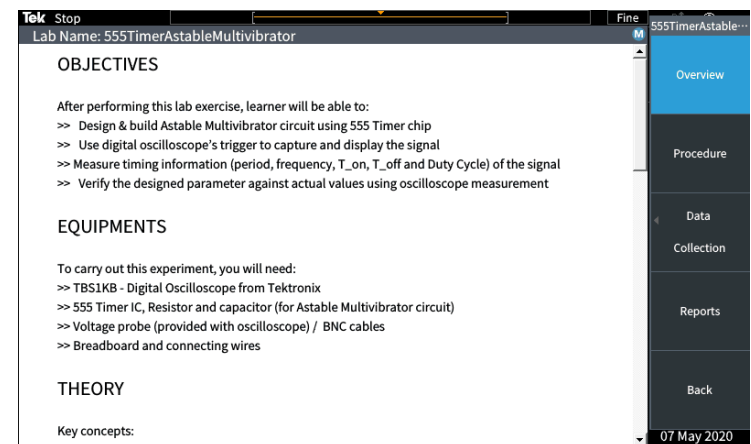


Figure 29. Creating a lab objective for students to read before starting the lab

# TBS1000C Education Features

- Education features are now standard to the TBS1000C series.
- Password protected Enable / Disable:
  - Autoset
  - Cursors
  - Measurement
- Enables Educators to teach:
  - How to operate the instrument
  - Basic concepts of signal capture and analysis
- Courseware
  - Easy access to built-in lab exercise
  - Add additional lab exercises



**Telxtronic®**

Find more valuable resources at [TEK.COM](https://www.tek.com)

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