Tektronix MDO3000 series Oscilloscopes

UTA Quick Guide

Table of Contents

Basic Controls

6. Horizontal / Time

7. Wave Inspector

5. Trigger

1. Power On / Off

2. Default Setup

3. Two or four channels
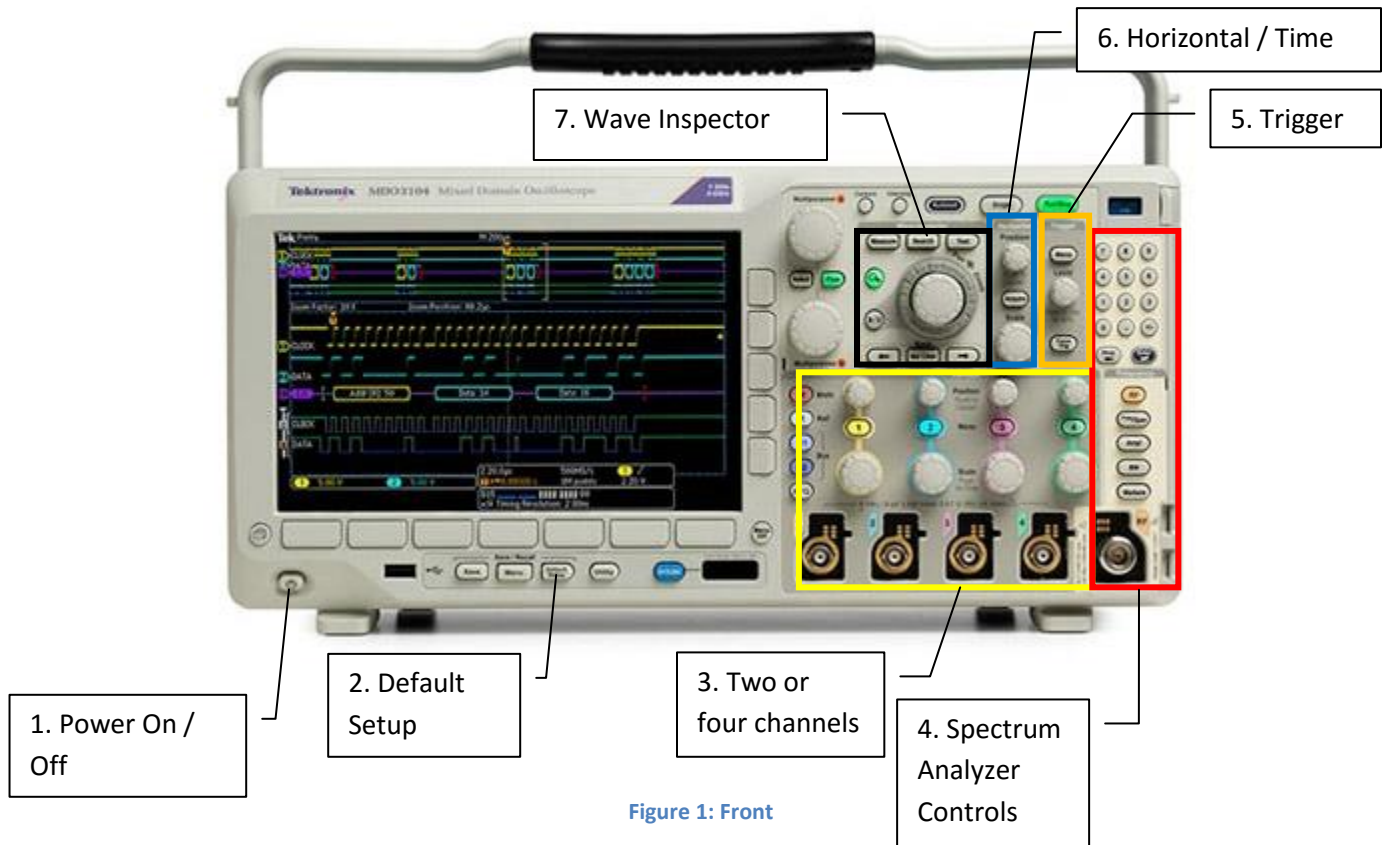
4. Spectrum Analyzer Controls

Figure 1: Front

1. Press to turn the MDO3000 on or off.
2. Press *default setup* to return the Oscilloscope to a known "default" state.
3. Depending on your model number, you will have a 2 channel or a 4 channel oscilloscope. Pressing the channel number button will turn on/off the channel. The vertical position button is located above the channel button. You may push this button to center your signal. The volts per division or scale knob is located below the channel button.
4. Spectrum Analyzer controls – The spectrum analyzer shows the power vs. frequency domain.
5. Trigger menu – Press the trigger Level knob to place the trigger at the 50% mark of the signal.
6. Horizontal / Time – The time per division, or scale knob is at the bottom of the menu. The horizontal position knob is at the top. You can press this knob to center the signal. Center is based on the slope of the trigger menu.
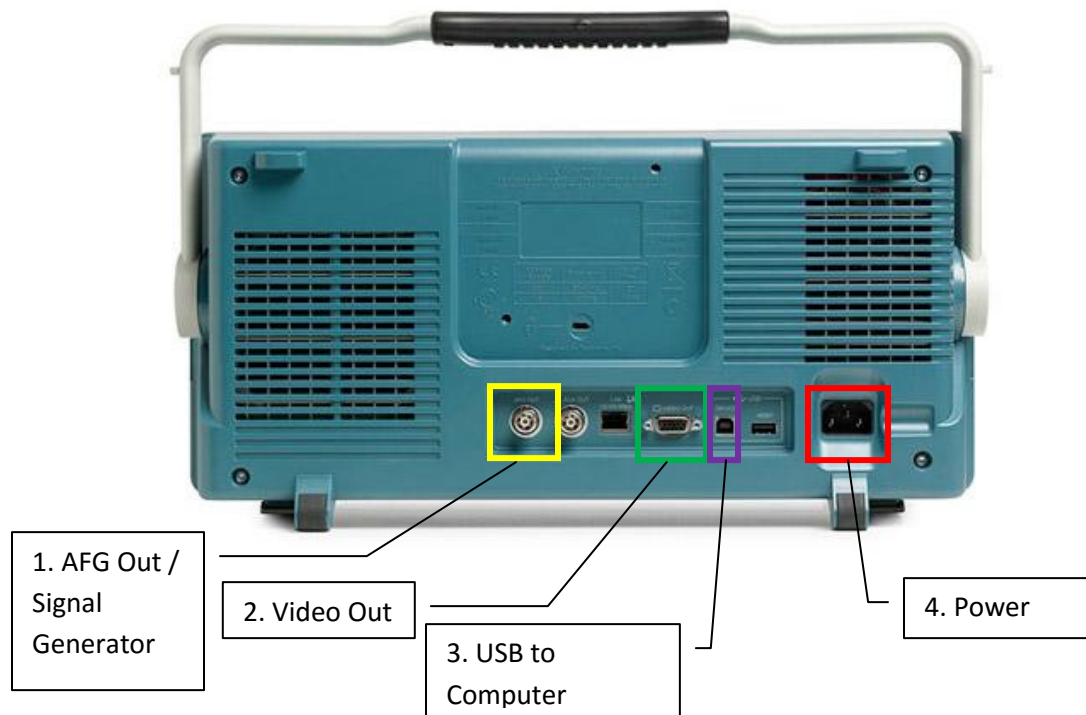7. Wave Inspector – Used to zoom in on a particular part of a signal.

1. AFG Out / Signal Generator

2. Video Out

3. USB to Computer

4. Power

Figure 2: Rear

1. AFG Out – If your oscilloscope contains the License MDO03AFG , you will have access to a built in signal generator. Press *Utility -> About -> Instrument Options* to verify if the oscilloscope has the license MDO03AFG.
2. Video Out – Use a standard VGA cable to connect the MDO3000 to a monitor or an overhead projector.
3. USB to Computer – The Tektronix MDO3000 series oscilloscopes comes with software, Open Choice Desktop, that enables you to capture and save screen shots of the oscilloscope to your computer. To download the software, go to http://www.tek.com/oscilloscope/tds210-software or contact the lab manager to obtain the installation CD. You may also use a USB drive on the front or rear of the oscilloscope to save screenshots.
4. Power – A standard 90 degree power cord is recommended.

Probes

Figure 3: Passive Probe

NOTE:

The **TPP500B** is for use with the **MDO3052** or MDO3054 **500 MHz oscilloscopes**.

The **TPP1000** is for use with the **MDO3102** or MDO 3104 **1GHz oscilloscopes**.

Probe Calibration

The Tektronix probes can be calibrated for each probe and oscilloscope port pair. When calibrating each oscilloscope probe, be sure to use the included colored bands (see figure 3) to identify which probe is calibrated to which input port. Each input channel must be calibrated separately.

1. Insert the Tektronix TPP500B or the TPP1000 for the MDO3052 or 3102 respectively. To connect/disconnect the Tektronix TPP Probes, **press the button** on the probe **and plug straight in/out**. **Do not twist** the TPP probes.
2. Connect the TPP Probe to the probe compensation output as shown in **Figure 4**.
3. Press *Autoset*.
4. Press the channel number of the probe you are calibrating (1, 2, 3 or 4).
5. Press *More* repeatedly until Probe Setup is selected.
6. Press Compensate Probe for the channel you are calibrating. (See figure 5)
7. Press *OK Compensate Probe*.
8. Mark the probe with the color band that corresponds to the color of the channel.
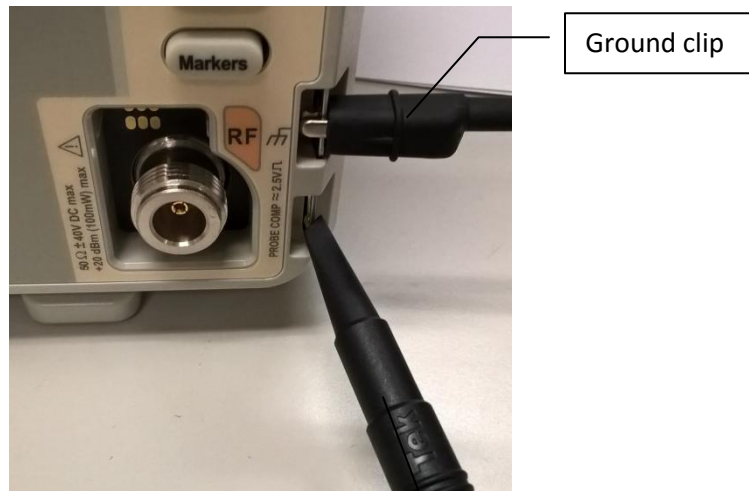9. The Compensation Status on the Probe Setup menu should now read *Compensated*.
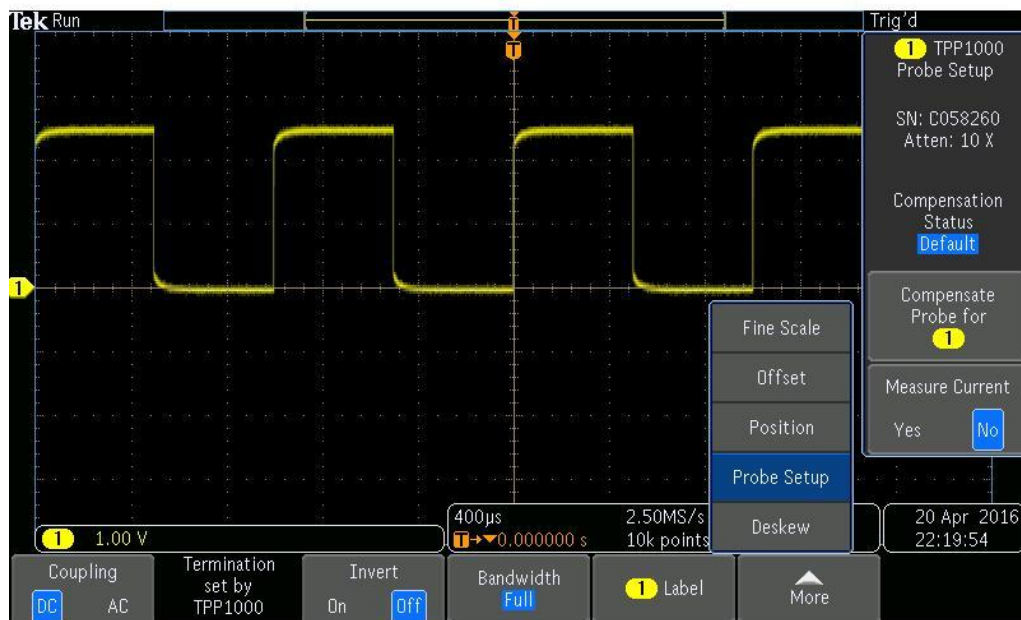
Ground clip

Probe Tip

Figure 4

Figure 5: Calibrating a Probe for channel 1. Compensation status reads default; hence the probe is not calibrated.

Channel Labels

It is useful to name signals especially if you plan to copy the screen to present in a report or lecture.

1. Press the channel number of the signal you wish to name.
2. Press *Label*.
3. Either use the multipurpose wheel *A* to select a character and press Enter Character or use the multipurpose wheel *B* to select from preset labels and press *Insert Preset Label*.
4. Press the Menu Off button to clear the screen. Your channel should now be labeled.

Firmware

Firmware in most test equipment controls the entire device, much like the operating system of a computer. Firmware is programmed into permanent memory of the device, like an EEPROM. Many times test equipment manufacturers will update their firmware to fix bug or add new features to a product. It is important to know the firmware of all your test equipment and keep track of new versions of firmware for your test equipment. The current version of firmware for the Tektronix MDO3000 series oscilloscope is v1.20 as of 4/22/2016.

Checking the firmware

1. Press Utility Button on the front panel.
2. Press *About* on the lower and right soft key menus.
3. The firmware is listed and the website to check for updates is listed also.
4. If new firmware is available, **DO NOT INSTALL FIRMWARE YOURSELF**. Contact lab personnel and we will update the Tektronix oscilloscope for you.

Cursors

To obtain manual measurements use the cursors button near the Multipurpose A wheel. Usually you will only need to access the vertical and horizontal cursors.

1. Press and hold the cursors button to access the cursors menu.
2. Change cursors from *waveform* to *screen*.
3. Select *Horizontal* to measure voltage measurements and *vertical* to make time measurements.
4. Use the multipurpose wheels A and B to place the cursors into desired position.

Measurements

The Tektronix MDO3000 oscilloscope makes a wide variety of automated measurements.

1. In the Wave Inspector section – select *Measure*.
2. Select Add Measurement.
3. If using more than one channel, Press *Source* and select the channel to measure using the Multipurpose wheel *A*.
4. Use the Multipurpose wheel *B* to select a measurement item and press OK Add Measurement. You may select up to four measurements at a time, except for snapshot that measures everything but only at the instance when you press *OK Snapshot All Measurements*.
5. To remove a measurement press *Measurement* and remove measurements from the right side soft keys.

DMM and Frequency Counter

The measurements menu (see above) also contains a DMM and frequency counter up to 10MHz.

1. Press *Measure* from the Wave Inspector section if not already selected.
2. Press *DVM*, then use the Multipurpose wheel A to select a measurement.
3. Use Multipurpose wheel *B* to select the channel.

Wave Inspector

The Wave Inspector is a powerful measurement tool on the Tektronix MDO3000 series oscilloscopes. We will cover the basics here. Please refer to the user manual for more information on the capabilities of the Wave Inspector.

AFG / Signal Generator

AFG Out – If your oscilloscope contains the License MDO03AFG , you will have access to a built in signal generator. Press Utility -> About -> Instrument Options to verify if the oscilloscope has the license MDO03AFG.

How to use the signal generator

1. Connect a BNC to BNC connector from the AFC Out connector from the back of the oscilloscope to your needed signal input. (In this example, we'll plug the other end of the BNC into channel 1 of the oscilloscope).
2. Press the *AFG* button directly above the channel 1 input port.
3. Press *Waveform* and use Multipurpose wheel *A* to select a waveform. (See figure 6)
4. Select Sine for this example.
5. Press Waveform settings to access frequency, amplitude and levels. (See figure 7)
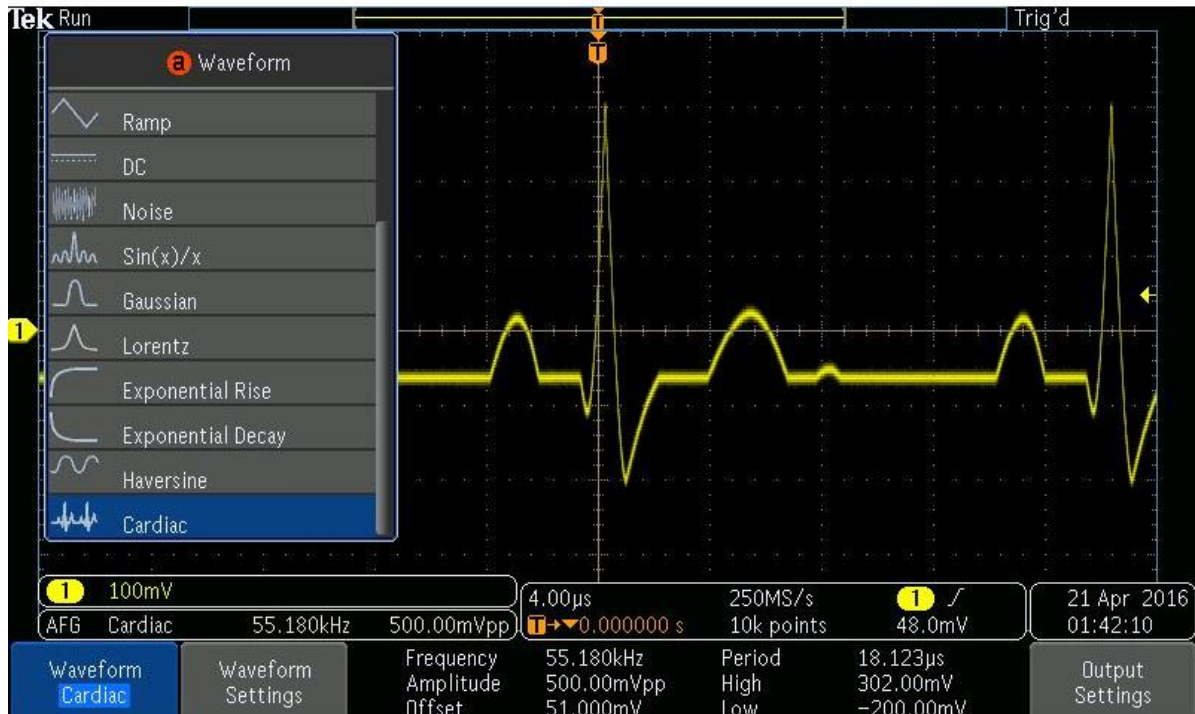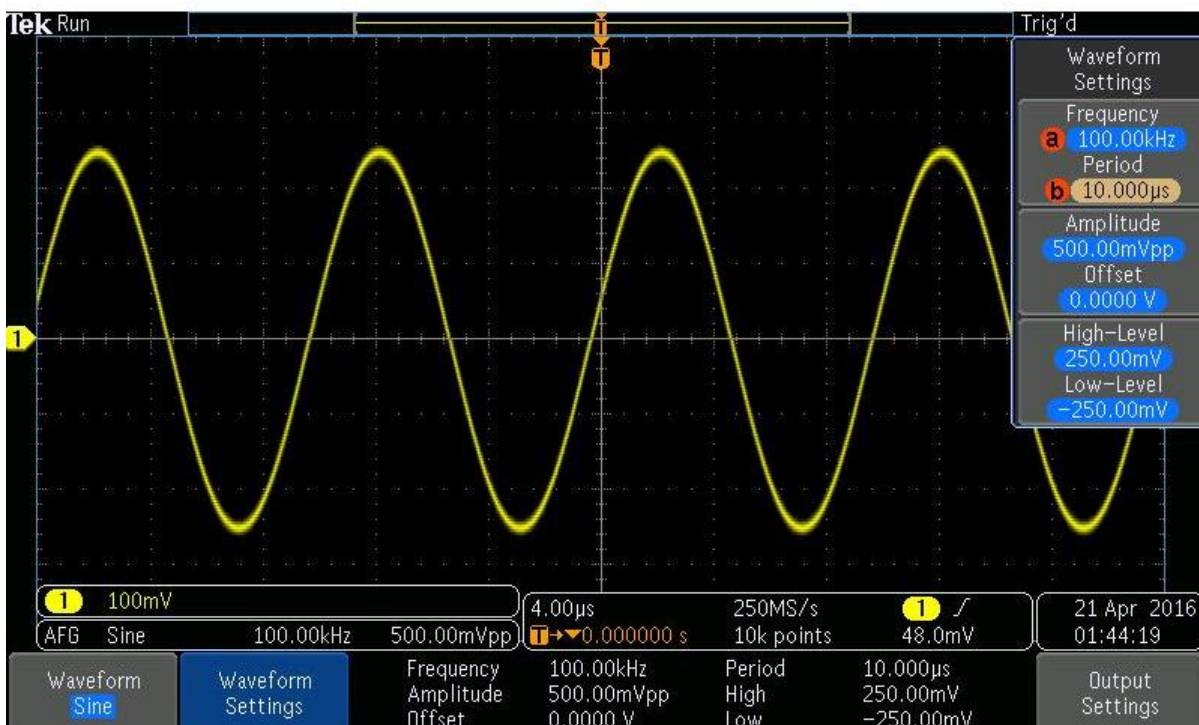6. Press Output Settings to change load impedance and add noise to your signal.

Figure 6

Figure 7

Spectrum analyzer

The MDO3000 series oscilloscope contain a spectrum analyzer or "spec. k". To use the Spectrum Analyzer you will need the N-type male to BNC female adapter. (See Figure 8)

Figure 8: N-type male to BNC Female or "N to BNC" adapter

Basic Controls

1. Connect the N-Type to BNC connector to the RF input.
2. Connect a probe to the BNC connector. NOTE: Without a proper RF probe, the signal will be severely attenuated. OR…
3. Connect a BNC male to BNC Male cable from the AFG out connector in the back of the oscilloscope to the RF in then turn on the frequency generator to your favorite frequency.
4. Press the *RF* button.
5. Press the *Freq/Span* button and enter the frequency you selected using the numeric keypad then selecting the appropriate multiplier or use Multipurpose wheel A to select your frequency.
6. Select the Span Option and enter a span of about $1/10^{th}$ of the measured frequency using the keypad or Multipurpose wheel B.
7. If you wish to select a particular bandwidth, you can select a Start and Stop frequency in the Freq/Span menu as well.
8. Press the AMPL button and rotate Multipurpose wheel A until your signal is near the top of the screen but not above the screen. You can also select *Auto Level*.
9. RF signals are automatically measured above a certain threshold. If you have a signal on the screen and it is not being measured, Press *Markers* then select *Threshold* and use Multipurpose wheel A to move the threshold line below your signal.

The Markers menu also contains Manual Markers that let you use multipurpose wheels A and B to measure two different frequencies. Select Delta to measure the difference (Magnitude and Frequency) between the two frequencies.