Fun with the DSO150 Oscilloscope

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Manufacturer Link: DSO150

I have the most enjoyment in ham radio, and in electronics in general, when I make or acquire devices that give top performance at minimum cost: the most "bang-for-the-buck". The DSO150-shell oscilloscope from jye-tech is one such device. This oscilloscope is available as a kit or as an assembled unit. Current prices range from $20 to $40. You can purchase it from vendors such as Circuit Specialists, Banggood, or Aliexpress. I got mine from Rex Harper, W1REX (QRPme.com), as part of his FDIM 2019 Buildathon project. More on that below.

So, what do you get for $20? It is a fully functioning oscilloscope, useful at lower voltages (<50V) and lower frequencies (<200 kHz). You can't use this scope to examine RF waveforms in your ham radio transceiver, but it works quite nicely at audio frequencies. And if you ever want to learn about oscilloscopes without shelling out hundreds of dollars, this is good way to go.

The user manual for this device is severely lacking. Before using yours I suggest checking out a few online videos. A decent review of the unit, describing its various functions, is here.

There are only 4 switches and a rotary encoder on the front panel, so each button must handle more than one function:

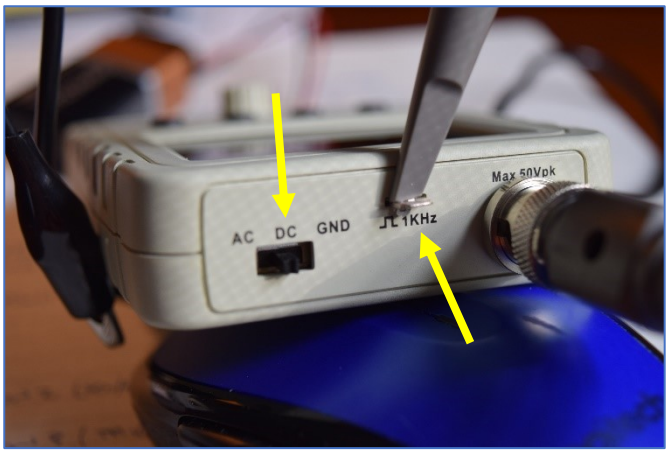
Button	First Press	Second Press	Third Press	Press/Hold
V/Div	Vertical (Voltage) Scale	Vertical (Voltage) Position	x	Voltage (VPos) Calibration
Sec/Div	Horizontal (Time) Scale	Horizontal (Time) Position	x	Center horizontal position
Trigger	Edge Detection: Rising, Falling	Mode Select: Auto, Normal, Single	Manually Set Trigger Level	Automatic Set Trigger Level
OK	Hold/No Hold toggle	Hold/No Hold toggle	x	Measurement Overlay On/Off toggle

It is not clear how to start using this device, especially if you have never used an oscilloscope before! So here are a few suggestions.

1. First, you need a 9V power supply. A 9V battery, clip and barrel jack will do. A clean 9V adapter is best. Two recommendations here: a) if you are using a 9V battery, make sure it is fresh. The oscilloscope will give flaky results if there is not 9V at the input; and b) the specified input voltage is 8V-10V only. Don't hook it up to your 12V power supply and expect good things to happen.

2. Next, attach the probe to the BNC jack, and apply the other end of the probe to the testing lug at the top of the unit. The output from this lug is a 3.3V 1 kHz square wave. We will use this signal source to explore some of the functions of this unit.

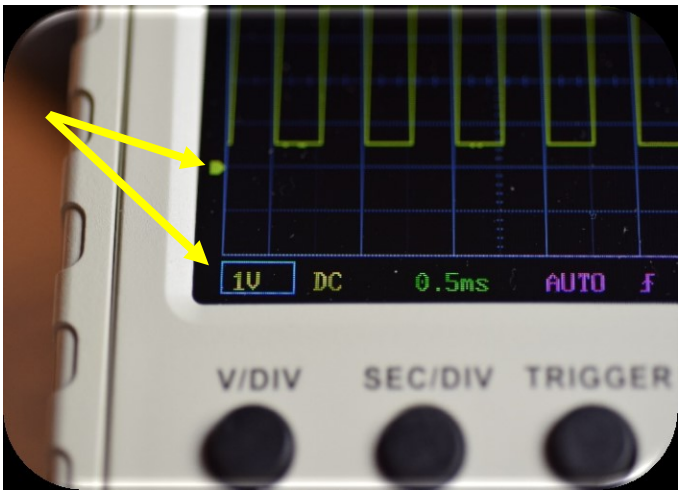
3. Set the signal coupling switch at the top of the unit to 'DC'. This will allow us to see the DC level of our signal.



4. Turn the unit on (switch on bottom of unit). The first thing you should see are a couple of startup screens. If you don't, check your power supply and make sure the polarity is correct

5. After the startup screens, you may or may not see a waveform. It depends on the control settings. The unit appears to save these settings after power is lost.

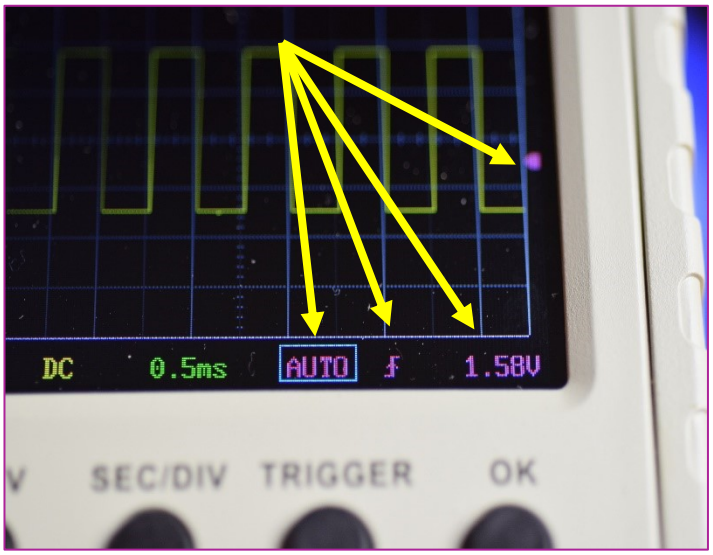
6. The first setting to adjust is the voltage position and scale. Press the V/DIV button and notice that the voltage scale indicator at the bottom left of the display is now outlined in cyan. Press it again and see that the outline is gone and that the horizontal position arrow at the left of the display is now highlighted. Rotate the knob until this arrow is near the bottom of the display. One or two blocks



above the bottom would be perfect. This arrow will mark the 0 volt (ground) level.

7. Press the V/DIV bottom again so that the voltage scale is outlined. What does the number read? Rotate the knob until it reads 1V. This means that each block on the display corresponds to 1 volt. Since our test waveform is 3.3V, we should expect that it will be 3.3 blocks tall. If the scale is 2V, our waveform will only be 3.3/2 = 1.65 blocks tall.

8. Next, adjust the trigger. Press the trigger button and look at the display. The four trigger items in purple: three menu items at the bottom of the screen, and a small arrow on the right of the screen. Press the trigger button several times and notice that the unit will highlighting them in cyan, one at a time. Press the trigger button until the first item is highlighted. It may say AUTO, NORM, or SING. Rotate the knob until AUTO is selected. This puts the scope in auto-triggering mode.



9. Press the trigger button again. The small arrow on the right of the display should now be in cyan. If not, cycle through the trigger items by pressing the trigger button until it is. This is the trigger level adjustment. Rotate the knob and notice that the voltage level displayed at the bottom right changes. Set the trigger level between 1 and 3 volts. If done properly, the top-right display will indicate 'Trigged'. If it says 'Waiting', the device is not triggering. Check the following:
    a. Good probe connection with the test lug.
    b. Probe Source Switch set to DC.
    c. Trigger Mode is set to AUTO
    d. Trigger Level is set between 1-3 volts.

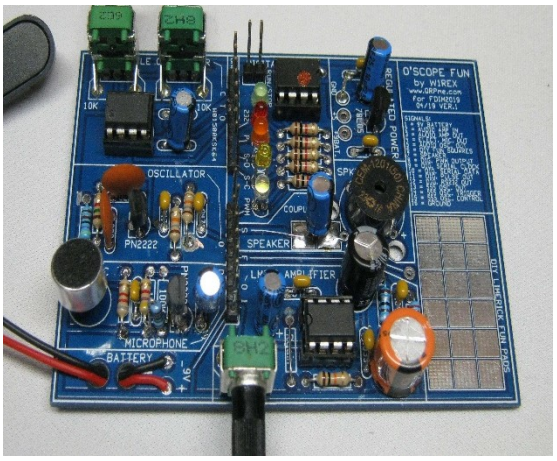
    You should see some sort of waveform display once the unit is triggering. But the waveform might be too spread out or too narrow.

10. Press the SEC/DIV button and notice how the time (horizontal) scale is outlined. What does the number read? Rotate the knob until reads 0.5 mS, which means that each block represents 0.5mS of time. The period of our 1 kHz test frequency is 1 mS, so one cycle should be two blocks wide. Rotate the knob and see how the waveform widens or narrows depending on the time scale: at 0.1 mS, one cycle should be 10 blocks wide; at 2mS it should be half a block wide.

11. Press the OK button. This will hold the display, and allow us to inspect it. We can inspect the 3 full screens of waveform. Press the SEC/DIV button twice, so that the time scale is <u>not</u>

highlighted. Now rotate the knob to go forward and backward through the display. The cyan bar at the top of the display indicates the section you are viewing. Press and hold SEC/DIV to return the displayed waveform to center. Press OK again to release the HOLD.

12. You can see measurements of frequency and voltages by holding down the OK button. Press and hold the OK button again to toggle off the measurements.



Now that you've studied the test signal and understand the oscilloscope controls, it is time to try your hand on some other types of signals. QRPme has a nice little kit for such a purpose! Check out the O*Scope FUN board. It provides more than a dozen useful analog and digital signals that you can use to refine your oscilloscope technique. In addition, you get working 555-timer, audio oscillator, microphone, 5V power, and audio amplifier circuits that you can use for other purposes. Highly recommended. See w8bh.net for a few experiments that you can do with this board.