

Tutorial for Tektronix TDS2012B Oscilloscopes

EEL 4712 Lab

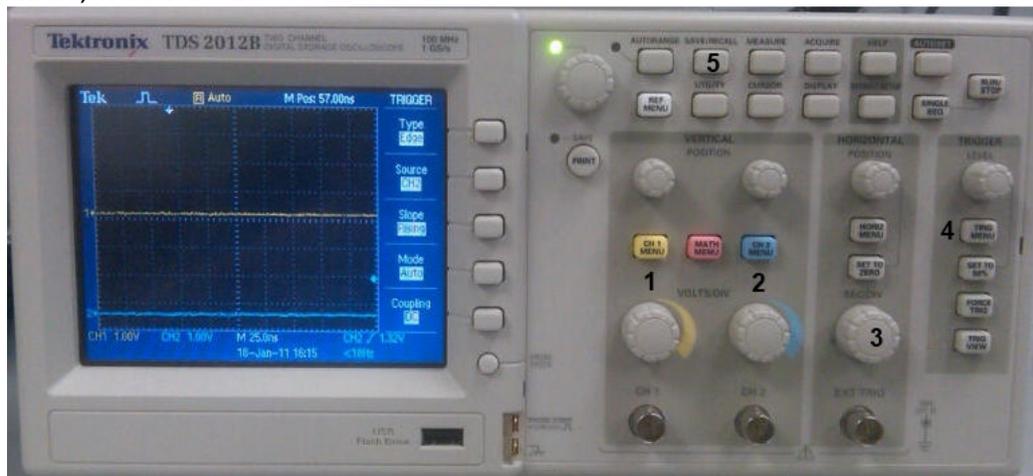
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Dr. Stitt - Spring 2011

The oscilloscope is a great tool for monitoring actual signals coming out of your board and may be very helpful to you in the future when debugging any type of hardware for this course or otherwise.

Starting Note: Program your 8-bit counter from Prelab 1 into your 4712 board. All output bits (Q0:Q7, RCO) should be assigned correctly.

Step 1

First, familiarize yourself with the oscilloscope. I have labeled a few important buttons and knobs, which are described below.



1 – Channel 1 Menu button / Channel 1 Volts/Div knob – The Channel 1 Menu button can be used to access the options menu for the channel, but most commonly, **it is used to turn on/off that channel**. The Volts/Div knob is used to adjust the amount of voltage measured by one box on the grid. Essentially, **adjusting this knob will stretch the signal vertically**.

2 – Channel 2 Menu button / Channel 2 Volts/Div knob – Same as 1) but for Channel 2

3 – Seconds/Division Knob – This knob is used to adjust the amount of time measured by one box on the grid. Essentially, **adjusting this knob will stretch the signal horizontally**.

4 – Trigger Menu – This button is used to access the options associated with triggering the scope.

5 – Save/Recall Button – This button accesses the options associated with saving a screenshot onto a USB flash drive.

Step 2

Choose the correct probes for monitoring the signals from your board. This is important because we are often measuring high frequency signals and some cables will not work for this. Your probe should have a side wire with a clip for grounding and a hook tip for holding on to the pin you are testing. See on the figure to the right that there is a setting for 1x, 10x or REF.

Make sure your probe is set to 1x.



Plug in your cables, turn on the scope and you are ready to begin.

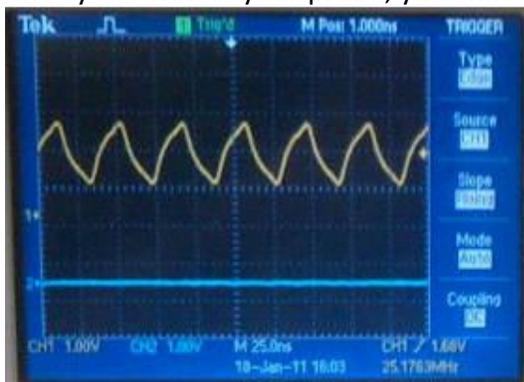
Step 3

You will need to adjust some of your settings with the knobs and buttons mentioned earlier. To start with, make sure Channel 1 and Channel 2 are on. If they are not on, press the Channel 1 and Channel 2 Menu buttons to turn them on. Now adjust the Seconds/Div knob to display 25.0ns. Also adjust the Channel 1 and Channel 2 Volts/Div knob to 1.00V.

To trigger the signal properly, you will have to press the Trigger Menu button. The settings should be as follows: Type – Edge, Source – CH1, Slope – Rising, Mode – Auto, Coupling – DC.

Find the clock signal and monitor it with your Channel 1 probe. **MAKE SURE YOU ALWAYS CONNECT THE GROUND WIRE TO GROUND.** On your 4712 board, the pin you should be monitoring will be the left-most pin on the row of Clock Headers.

Once you connect your probe, you should be seeing the following on the screen:

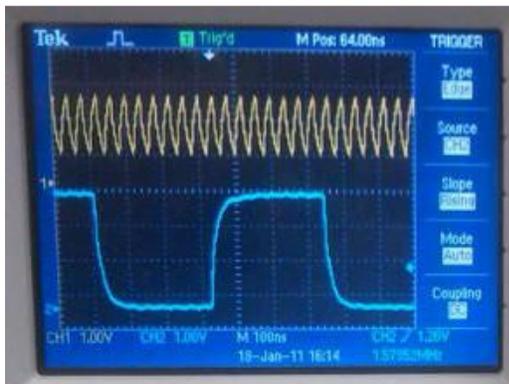


Step 4

You will now monitor one the output pins of your counter. Lets choose Q[3] (assuming Q[7..0] is your output bus).

Attach the probe connected to Channel 2 to your Q[3] pin. If you don't know which pin this is, look it up in the Board Manual. Again, BE SURE TO CONNECT THE GROUND PIN.

You will probably see a signal flickering across the screen. To fix this, you need to change a few options. Adjust the Seconds/Div knob to display 100ns. Now press the Trigger Menu button and change Source to CH2. You should now be seeing a signal like the one below.



To get a feel for how the scope works, try adjusting the Seconds/Div knob and the Channel 1 and Channel 2 Volts/Div knobs to see how each one affects the display. Your TA may ask you to show a different output (e.g. Q[7]).