MEASURING A PWM WAVEFORM

Description:

This is a guide on how to set up a Fluke 190-204 Scopemeter to display and measure the PWM output waveform of a VFD for peak voltage and dV/dT rise time. For this demonstration an ACS580 demo drive was used running at a full speed of 50 Hz in Scalar control.

Connecting the Scope Probe:

This is how to connect the scope probe to the output of the motor. We can connect to channel A and then the probe will need to be connected phase to phase as shown.

Scope Settings for Viewing the Output Waveform:

The picture on the left below is a screenshot for some initial settings that you can view/set by pressing the button for channel A. Input A is on, we are using DC coupling and we are set for the 10:1 probe that we are using.

F4 gives some more settings. See the picture below on the right. The attenuator is on Normal and the bandwidth is Full.

We can start by adjusting the Range button to show the height of the voltage waveform to fill the screen. For this demo, since we have a 480V drive, 200V/division is the correct setting. The Time button can be adjusted initially to view approximately one cycle as shown. For this set of conditions, 2mS was a good setting.

Triggering: To trigger the scope, start by pressing the trigger button. Below are some screenshots showing some trigger settings. Set for Auto trigger on A, set the slope for a rising edge and the set for a Manual trigger. The cursor for the trigger will need be near the top of the waveform and placed from 1/4 to 1/2 of the way from left to right. You can move the cursor with the direction arrows.

Once you find a fairly stable positon for the trigger cursor you can begin to expand the waveform out by adjusting the time button. Be sure not to have the Hold/Run button activated when you make changes to the time. You should begin to see the ringing of the voltage waveform at the top of a pulse.   For this demo a setting of 100nS was good.
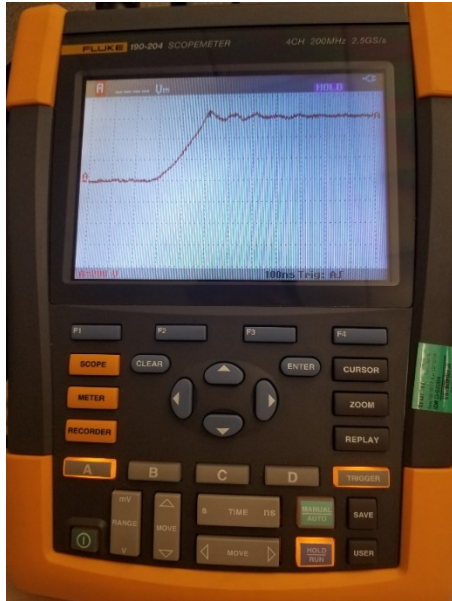
Then you can hit the cursor button and when in manual mode you can set the upper cursor at the steady state voltage at the top of the waveform. The bottom cursor should be placed at the bottom of the waveform. The meter will display the rise time for from 10% to 90 % of the voltage waveform. In the left screenshot below you can see the rise time of 170 nS. Next raise the top cursor to the peak of the waveform. Now you can see the see the peak voltage shown on the right as a High of 688V.

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