Lab 2 – Appendix A
The Logic Analyzer

Introduction

In previous lab courses you've used an oscilloscope to measure and display analog signals as voltage versus time. The corresponding instrument for measuring digital logic circuits is called a *logic analyzer*. The logic analyzer displays the values of logic signals as a function of time. This appendix describes how to operate the PC-based logic analyzer that is available in the lab. You can use this instrument to view the signals on the interconnect board and this may help you debug your circuit.

Logic analyzers connect to digital circuits through sampling "pods" that contain buffers. The logic analyzer in the lab has one pod with 24 one-bit inputs. Each input is connected through a short, colour-coded wire to your circuit. The 24 inputs are labelled with a letter and a number (A7 to A0, B7 to B0, and C7 to C0). The colour codes for the wires are the same as the resistor colour codes. The white wire on each pod should be hooked up to ground.

The logic analyzer can treat groups of signals as buses and display the values of the bus signals in hexadecimal.

The logic analyzer does not sample continuously. Instead, you define a "trigger condition" and press the "run" button. The logic analyzer waits until the trigger condition is true and then takes 32k samples of the 24 input signals at a rate of up to 50 MHz.

To run the logic analyzer select the PC's "bi2450P" program menu item. Unfortunately, the logic analyzer software is a DOS program that can only run in full-screen mode. Press alt-Tab to switch between the logic analyzer and other Windows programs.

Connect Probes

Connect the probe wires to the signals you want to monitor by putting a short jumper into the connector on the end of the probe wire and connecting the other end of the jumper to the appropriate row on the interconnect board.

If you open the probe assignment dialog box (see next section) while making the connections you will be able to see the current signal level (H(igh), L(ow) or changing) on that signal.

Assigning Channels

Select the menu item `Setup|Probes` to bring up a dialog box where you can assign probes to signals. For each signal you want to observe, type in a signal name, the radix to use when displaying the signal value, and click on the probes to be assigned to that signal. The leftmost probe is taken to be the most-significant bit of a bus. Click on `Done`.

Trigger Conditions

Select the menu item `Setup|Trigger Words` to bring up a trigger word dialog box. In the trigger word "A" fields enter the signal values corresponding to the event that you want the logic analyzer to capture. Use 'X' as a "don't care" value.

For example, if you wanted to observe all write cycles to a particular memory location, you would put the desired address as the value in the address signal field, and the asserted value as the value of the write strobe signal while leaving the data bus value set to 'X's (the logic analyzer will actually capture data before and after that particular condition). Click on `Done`.

Sample Rate

Click on `Timebase` in the main display window and set the sample rate to 50 MHz.

Save Settings

Select the menu item `Setup|Save Setup` and select a file name (in the `max2work` diretory) to save your settings in case you need to re-load them later.

Capture Signals

Press the `Run` button to start the logic analyzer. When the inputs match the trigger words the logic analyzer will display the signals on the main display window.

The logic analyzer has many more features, some of which will be introduced as necessary.

Select the menu item `File|Quit` to exit the program.