Laboratory 5 Introduction to Hardware – The PPI

Last Revised: June 2000

1 Objectives

With the completion of this lab, you should be able to:

- Connect a PPI device to an existing 8088-based system.
- Use software instructions to configure the device.
- Write and modify programs to use designated ports on the device.

2 Introduction

In this first hardware lab, you will interface a Programmable Peripheral Interface (PPI) device (Intel 8255A) to the MUN-88 board. This device is discussed in Section 8.3 of the course text. A link to the PDF version of the data sheet for this device can be found at the Intel website (available on this course's website). Familiarize yourself with the functions and the programming features of this device before you attempt to write any code for this lab.

When you wire this device, take time to wire it **neatly**. Do **not** place the wires in a spaghetti-inspired manner, but flow the wires around ICs. This will allow for easy removal of the devices if they are working incorrectly, as well as testing of pins for correct logic levels. Colour-code the wires according to functionality (and wire availability). Position the devices logically. ***Note that the TAs might refuse to assist you in debugging your circuit if you wired it messily.***

3 Simple I/O Operations

Make sure that the power supplies are switched **OFF** before you make any connections, or before you modify any connections. Before entering the lab, you should have sketched a circuit diagram of this circuit. Show the connections needed for the DIP switches and the LEDs in your diagram.

3-1 Connecting the Hardware

There are 4 IOSELect lines at the 36-pin edge connector of the MUN-88 board.

What are the I/O addresses corresponding to these lines?

Use IOSEL4* as the Chip Select input of the 8255A. Place the 8255A device on the MUN-88 expansion board. Connect DB0-DB7, AB0, AB1, IORD*, IOWR*, and RESET lines to the appropriate pins of 8255A. Obviously, power supply lines must also be connected – tie together multiple ground lines to provide a better grounding for the system.

Connect the DIP switches to Port A and LEDs to Port B. As the output current on the 8255A device is not sufficient to drive the LEDs, use 74LS04 inverting buffers to achieve

the required power. Check the class notes and/or the MUN-88 schematic diagram if you are unsure of the connections.

Have your partner check your connections before turning the power on.

3-2 PPI Configuration

Using monitor commands, configure the 8255A for Mode 0 operation with Port A as input and Port B as output.

What is the appropriate configuration control word? To which port should you send it?

You have to be extra careful while configuring I/O ports. If a port is configured as output, and if an input device is connected to that port, this might result in catastrophe. On the other hand, if a port is configured as input, and if you connect an output device to it, there is no problem. That is the reason why 8255A leaves all the ports configured as input ports upon reset. However, once the configuration is made according to the actual hardware connections, no port operation will spoil the device. Suppose after configuring Port A (to which DIP switches are connected) as input, you attempt to output a byte to that port – the 8255A will just ignore it. Similarly, after configuring Port B (to which LEDs are connected) as an output port, if you attempt to read that port, again no harm will be done.

After configuring the ports appropriately, *read the DIP switches and write to the LEDs using monitor I/O commands*. If everything works as expected, then proceed with the next section.

3-3 Software Usage

Modify the ***RatBash*** program you developed in the lab #3 to use the DIP switches and the LEDs you have wired on the bread-board instead of the ones on MUN-88. The program should configure the PPI. After you get it to work, print off the list file of your modified program, and demonstrate the program to a TA.

If you have deleted your ***RatBash*** program, notify a TA, who will give you an alternate task to complete.

4 Submission

At the end of the lab submit the print-out of your list file. Also include your circuit diagram, answers to all questions in the lab and prelab, and test results.