Lab II

Interfacing PIC using PPI

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Objective

To get familiar with using 8255A PPI to interface the PIC18F4550 microcontroller

Tools

PIC18F4550 Microcontroller, 8255A PPI, MPLAB software

Theory

Programmable Peripheral Interface (PPI)

The Intel 8255A is a 40 pin integrated circuit (IC), designed to perform a variety of interface functions in a computer environment. 8255A is a general purpose programmable I/O device which is designed for use with all Intel and most other microprocessors. It provides three 8-bit ports called: port A, port B, and port C. These ports are the equivalent of three 8-bit data latches; and thus provide you with up to 24 bits of parallel output. If desired, the output of these latches can be disabled and each of the ports can be turned into input ports. Thus, you can choose whether a port is to be an input or an output port.

Each half of Port C can be chosen to be input or output, independent of the other half. Included in the PPI is the control logic for determining whether you are writing or reading the PPI; these are the WR` and RD` input pins. The 8255A can only be accessed if its CS` (Chip Select) signal is low. A high on RESET input clears the control register and all ports (A, B, C) are set to the input mode. The 8255 PPI requires four device address codes (2-bit address bus: A0 and A1) in order to access all of its locations. Three addresses allow you to read from or write to the three ports, portA, portB, and portC. A fourth address is used to access a control register.
The 8255A is a very versatile device. It can be programmed to operate in three modes:

1. **Basic I/O (mode 0):** Three simple I/O ports
2. **Strobed I/O (mode 1):** Two handshaking I/O ports
3. **Bi-directional bus (mode 2):** One bidirectional port with 5 handshaking signals

In our experiment we will use mode 0; i.e. Basic I/O

### 8255A Pin Description

- **D0 - D7:** These are the data input/output lines for the device. All information read from and written to the 8255 occurs via these 8 data lines.
- **CS (Chip Select Input):** If this line is a logical 0, the microprocessor can read and write to the 8255.
- **RD:** A "low" on this input pin enables 8255 to send the data or status information to the CPU on the data bus. In essence, it allows the CPU to "read from" the 8255.
- **WR:** A "low" on this input pin enables the CPU to write data or control words into the 8255.
- **A0 - A1 (Address Inputs):** The logical combination of these two input lines determines which internal register of the 8255 data is written to or read from.
- **RESET:** The 8255 is placed into its reset state if this input line is a logical 1. All peripheral ports are set to the input mode.
- **PA0 - PA7, PB0 - PB7, PC0 - PC7:** These signal lines are used as 8-bit I/O ports. They can be connected to peripheral devices. The 8255 has three 8 bit I/O ports and each one can be connected to the physical lines of an external device. These lines are labeled PA0-PA7, PB0-PB7, and PC0-PC7. The groups of the signals are divided into three different I/O ports labeled port A (PA), port B (PB), and port C (PC).
PPI Control Register

Writing an 8-bit byte into this register defines which ports are to be used as input or output and in which mode. The format of this control word is shown.

If bit 7 of the control word is a logical 1 then the 8255 will be ACTIVE and can be configured.

If bit 7 of the control word is a logical 0 then PPI within the **Bit Set/Reset operation** where each bit of the port C can be set or reset.

In our experiment we use the PPI in the Active operation.

**Steps to configure 8255A**

1. Set the write pin (WR) high
2. Put the control word on the data bus (selects the Mode)
3. Set A0 and A1 pins high
4. Set the write pin (WR) low for a very short duration, keeping A0 & A1 high
5. Set the write pin (WR) high again

When step five happens, it causes the chip to "take note" of the data bus and pins A0 & A1. When both of the Ax pins are high, the 8255 knows that the data present on the data bus is a control word and from that data, it goes into the appropriate mode. You only have to do the above five steps once (on power up), unless one wishes to reset the chip during operation.

**Steps to write to 8255A**

1. set A0 & A1 to what 8255 port (A, B, or C) you want to work with
2. Make the data bus look like what you want the 8255 port you're working with to look like (higs and lows)
3. Set the write pin (WR) low for a very short duration
4. Set the write pin (WR) high again
5. Go back to step one
### Procedure

#### Part 1

1. Connect the circuit shown in the Figure below on Proteus ISIS program.
2. Write an assembly language program for the PIC that will output 0xc5 to PORTC of the PPI.

#### Part 2

- Write an assembly program that check continuously the value of a switch connected to RC5 of PC18F4550..
  - If it is closed → Display “on” on 7-segments connected to the PPI ports
  - Else → Display “OFF”.
- Connect the circuit on Proteus ISIS program, and show the corresponding output.