

IET WINTER 2016

Embedded Systems Design

LAB 2

Objective:

At completion of the lab, student will be able to:

1. Work with software tools for AVR microcontroller programming
2. Recognize and program I/O ports of Atmega 16/32.

Components Required for the Lab:

1. Development Board from MikroElektronika
2. USB cable for programming Atmega 16
3. Breadboard
4. LEDs
5. Resistors
6. Switches
7. Assorted wires
8. Connectors (for development board to breadboard connections)

Resources Available

General Resources:

1. Setup files mikroC pro for AVR (We will be using this software in all the labs.)
2. MikroBootloader for ATMEGA16
3. Atmega 16 datasheet
4. Atmega 32 Datasheet
5. Ready for AVR – Development Board Manual (For initial labs)
6. Easy AVR 7 Manual (For later labs)

LAB -3 Resources:

1. Basic understanding of Atmega I/O ports
2. Basics for Pull –Up and Pull – Down.
3. Example code (Pilot.c)

Some useful Registers for this lab:

DDRx	– Data Direction Register
PORTx	– Port Driver Register
PINx	– Port Pins Register

You can find more information about this registers in Atmega16 datasheet and Lab-3 resources.

Lab Assignment:

Write and test following programs:

1. Program*:

- a. Turn ON LEDs at pins 7-4 of PORTA.
- b. Turn ON LEDs at pins 0,2,4,6 of PORTB.

Hardware:

Connect LED through resistor to respective pins of PORTA and PORTB.

2. Program:

Blink LED at pins 0,2,4,6 of PORTA. Use software delay for blinking. **

Hardware:

Connect LED through resistor to respective pins of PORTA.

3. Program:

Design a program that takes input from PORTA.0,2,4,6 and displays the value on PORTA.1,3,5,7 respectively. (i.e. State of PORTA.0 will be displayed at PORTA.1, State of PORTA.2 will be displayed at PORTA.3 and so on.)

Hardware:

Output: Connect LED through resistor to pins 1, 3, 5 & 7 of PORTA

Input: Make resistor wire assembly for switching at pins 0, 2, 4 & 6 of PORTA.

4. Program:

4 – Bit LED display

LED display starts by turning on a switch. It shall display binary 0 – 15 with 1 second of delay. Once it reaches to 15, the display will roll-back to 0.

By turning off the switch, LED display should be immediately turned off. When the switch is again turned on, display shall start again from 0.

Hardware:

Use as required.

* Please write necessary comments in the program.

** For this lab you can use software delays. Since they are inaccurate, please do not use them in future labs. This may lead to having inaccurate delays and bad grades .