

**Module Name: Microprocessor Systems Laboratory**

**Module Code: ELCE333**

**Laboratory Experiment No. 3**

**Experiment Title:**

**HCS12 Input and Output Ports**

**Pre-lab Report**

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**Spring 2015**

1. **Summary:**

This experiment goal is to study the communication between the input and ouptut and introduce how data is read and written from the input and output ports. Also to familiarize with the input and output ports of the board, B,J,P and H. the pre lab task purpose is to understand the I/O functionality of Dragon12-Plus board and the time cycles needed to execute a code.

**2. Introduction:**

An important feature of any microcontroller is a number of input/output pins utilized for connection with peripherals. for the MC9S12DP256B micro controller it has seven 8 bit ports, that can be used for simple parallel I/O if they aren't being used. Parallel I/O is when transmitted binary data of information are exchanged in the meantime over particular wires.. The processor has the data at the register which then show up at the port pins during parallel output.

On the Dragon12-Plus boards,port B is used as a parallel output port for the LED display and port H is used as a parallel input port for the DIP switches. When used as an 8 bit parallel port,the pins of each port are programmed as both input or output pins. The port direction can be changed at any time. The PTI*X* register is used to read data of an input port, while the PT*X* register is the data register used to write data to an output port

### ***Aim:***

This pre lab aim is to be familiar with how data is written and read from the input and output ports on a Dragon12+ Board. Also being familiar with its features.

### ***Objectives:***

1. Recognize the input and output ports of a microcontroller.
2. identifying the ports B,J,P and H connection
3. learning about 6 board features
4. Observing how many cycles a loop program takes and for how long.

**3. Pre-Lab Questions:**

1. **list of the Dragon12-Plus board features.**

* Eight LEDs connected to port B
* An 8-position DIP switch connected to port H
* Logic probe with LED indicator
* 4-digit, 7-segment display module for learning multiplexing technique
* Logic probe with LED indicator
* Super fast bus speed up to 25 MHz

**2.**

B port Address: 0x0000001

J port Address: 0x00000268

P port Address: 0x0000025F

H port Address: 0x00000267

**3.**

ldab #100 // LDAB src load accumulator B

loop1: ldx #10000 // LDX src load index register X

loop2: dex // DEX decrement index register X

 bne loop2 // BNE dest branch if not equal to zero

 decb // DECB decrement B

bne loop1// BNE dest branch if not equal to zero

the first line (load accumulator B) will execute once, and then into the loop which is nested. the first loop will execute 10000, where each line will execute 3 cycles , that gives 100003, since its nested and loop2 will execute 100 , the total is:

1+1000\*100