

Lab B  
Machine Cycles, Loops, Port 1, Atmel Flip

1. Refer to Lab A for instructions on how to create, assemble and save a new project and all the necessary files.
2. Create the following program and add appropriate comments.

```
;** Main body**
      ORG      00H
      AJMP     Main

Main:  ORG      100H
      NOP
      MOV      A,#0FFH      ;load Acc A with 11111111bin
BACK:  MOV      P1,A         ;load contents of Acca A to Port1
      ACALL    DELAY        ;go to subroutine DELAY
      CPL      A             ;complement Acca A 00000000bin
      SJMP     BACK         ;

;** Delay Subroutine**
DELAY: NOP
      MOV      R3,#0FFH     ;load Register 3 with FFH
OUTER: MOV      R2,#0FFH     ;load Register 2 with FFH
INNER: NOP                 ;no operation
      DJNZ     R2,INNER      ;decrement Register 2 - repeat inner loop FFH times
      DJNZ     R3,OUTER      ;decrement Register 3 - repeat outer loop FFH times
      RET                     ;return to main body
      END
```

3. Simulate the program using Debug and using the Port 1 simulator from the Peripherals menu:

```

Debug                               Peripherals
      Run                           I/O Ports
                                   Port 1
```

4. Connect the Lab Pro 51 board to the computer and move the slide switch to the program position.
5. Start Atmel Flip
  - a) Select the Device: AT89C51RD2
  - b) Select the Communication Medium button
    - b.1) Port Com1, Baudrate 9600, Manual Sync
    - b.2) Connect - Reset Lab Pro 51 Board - Sync
    - b.3) Load hex file (from File menu)
    - b.4) Erase, Blank Check, Program, Verify (all in one step using the Run Button)
    - b.5) Start the Application
    - b.6) Return the slide switch to the Run position
6. Observe the Operation
7. Modify the program so that an alternating pattern is created: 4 Leds On - 4 Leds Off
8. Write a report and attach the \*.lst file. The report should contain a description of the project and a conclusion. The conclusion should explain what difficulties and errors were encountered and how these were solved.

New Commands:	ACALL	call a subroutine
	CPL	complement the accumulator or register
	SJMP	short jump
	NOP	no operation
	DJNZ	decrement and jump if not zero
	RET	return from subroutine