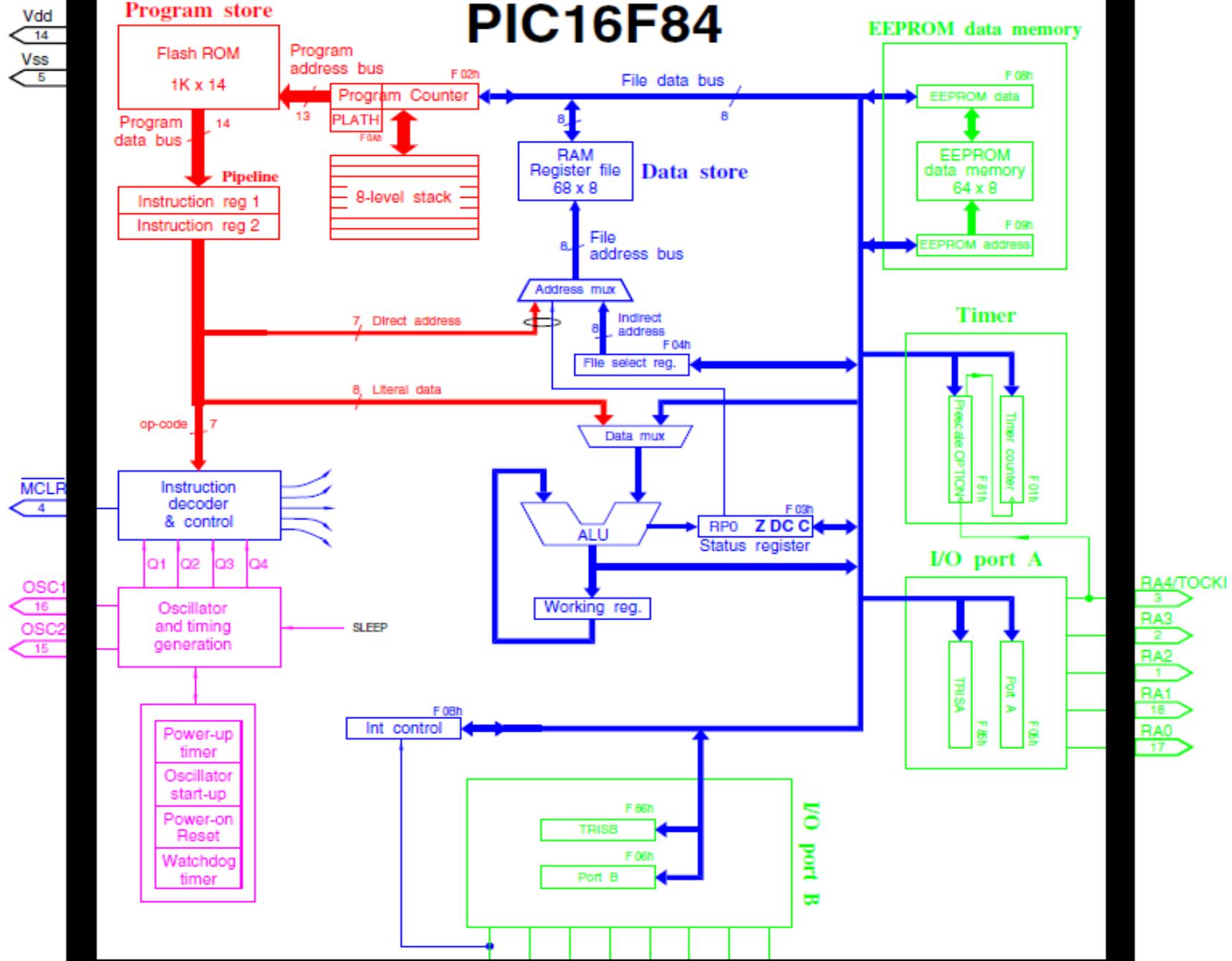


ECE336 – MICROPROCESSORS I

WEEK 13

EEPROM DATA MEMORY



EEPROM DATA MEMORY

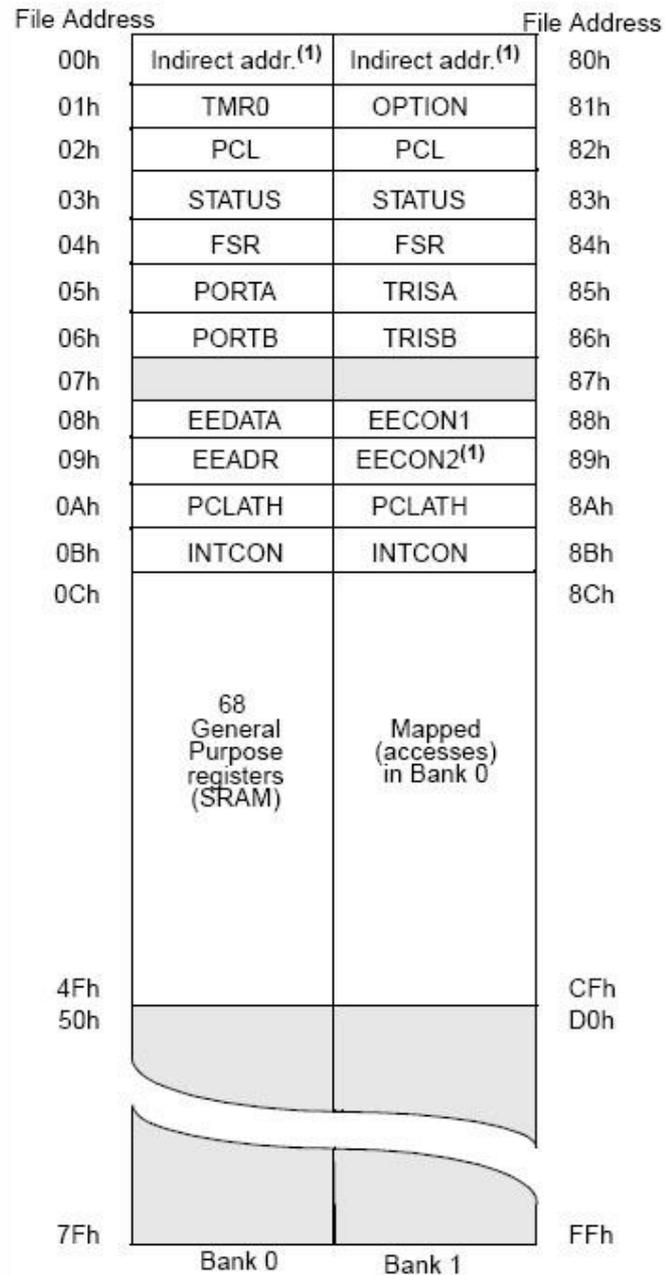
The EEPROM data memory is readable and writable during normal operation. This memory is not directly mapped in the register file space. It is indirectly addressed through the Special Function Registers. There are four SFRs used to read and write this memory. These registers are:

- EECON1
- EECON2 (not a physically implemented register)
- EEDATA
- EEADR

EEDATA holds the 8-bit data for read/write, and EEADR holds the address of the EEPROM location being accessed. EECON1 is used to control read/write operation. EECON2 is used when writing something to EEPROM.

PIC16F84A devices have 64 bytes of data EEPROM with an address range from 00h to 3Fh. The EEPROM data memory allows byte read and write. A byte write automatically erases the location and writes the new data (erase before write).

Ram Memory



□ Unimplemented data memory location; read as '0'.

Note 1: Not a physical register.

EECON1 REGISTER (ADDRESS 88h)



bit 7-5 Unimplemented: Read as '0'

bit 4 **EEIF**:EEPROM Write Operation Interrupt Flag bit

1 = The write operation completed (must be cleared in software)

0 = The write operation is not complete or has not been started

bit 3 **WRERR**: EEPROM Error Flag bit

1= A write operation is prematurely terminated (any MCLR Reset or any WDT Reset during normal operation)

0 = The write operation completed

bit 2 **WREN**: EEPROM Write Enable bit

1= Allows write cycles

0= Inhibits write to the EEPROM

bit 1 **WR**: Write Control bit

1= Initiates a write cycle. The bit is cleared by hardware once write is complete. The WR bit can only be set (not cleared) in software.

0= Write cycle to the EEPROM is complete

bit 0 **RD**: Read Control bit

1= Initiates an EEPROM read RD is cleared in hardware. The RD bit can only be set (not cleared) in software.

0 = Does not initiate an EEPROM read

Reading the EEPROM Data Memory

To read a data memory location, the user must write the address to the EEADR register and then set control bit RD (EECON1<0>). The data is available, in the very next cycle, in the EEDATA register; therefore, it can be read in the next instruction. EEDATA will hold this value until another read or until it is written to by the user (during a write operation).

Exp:

```
BCF          STATUS, RP0          ; Bank 0
MOVLW       CONFIG_ADDR ;
MOVWF       EEADR                ; Address to read
BSF         STATUS, RP0          ; Bank 1
BSF         EECON1, RD           ; EE Read
BCF         STATUS, RP0          ; Bank 0
MOVF        EEDATA, W            ; W = EEDATA
MOVWF      PORTB                 ; PORTB = EEDATA
```

Writing to the EEPROM Data Memory

To write an EEPROM data location, the user must first write the address to the EEADR register and the data to the EEDATA register. Then the user must follow a specific sequence to initiate the write for each byte.

Exp:(Bold part is the required sequence)

```
BSF          STATUS, RP0    ; Bank 1
BCF          INTCON, GIE    ; Disable INTs.
BSF          EECON1, WREN   ; Enable Write
MOVLW      55h ;
MOVWF     EECON2        ; Write 55h
MOVLW     AAh ;
MOVWF     EECON2        ; Write AAh
BSF          EECON1,WR      ; Set WR bit begin write
BSF          INTCON, GIE    ; Enable INTs
```

Additionally, the WREN bit in EECON1 must be set to enable write. This mechanism prevents accidental writes to data EEPROM due to errant (unexpected) code execution (i.e., lost programs). The user should keep the WREN bit clear at all times, except when updating EEPROM. The WREN bit is not cleared by hardware.

At the completion of the write cycle, the WR bit is cleared in hardware and the EE Write Complete Interrupt Flag bit (EEIF) is set. The user can either enable this interrupt or poll this bit. EEIF must be cleared by software.

Exp: Write h'E3' to location 0X03 of EEPROM.

```
MOVLW          0X03
MOVWF          EEADR
MOVLW          h'E3'
MOVWF          EEDATA
BSF            STATUS, RPO          ; Bank 1
BCF            INTCON, GIE         ; Disable INTs.
BSF            EECON1, WREN        ; Enable Write
MOVLW          55h ;
MOVWF          EECON2              ; Write 55h
MOVLW          AAh ;
MOVWF          EECON2              ; Write AAh
BSF            EECON1, WR          ; Set WR bit begin write
BSF            INTCON, GIE         ; Enable INTs
```

Program: If RA1 is pressed, write h'8F' to location 0X01 of EEPROM, If RA2 is pressed, write h'3D' to location 0X01 of EEPROM, If RA4 is pressed, show the data of EEPROM (location 0X01) to PORTB.