MPLAB V6.40

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MPLAB: overview

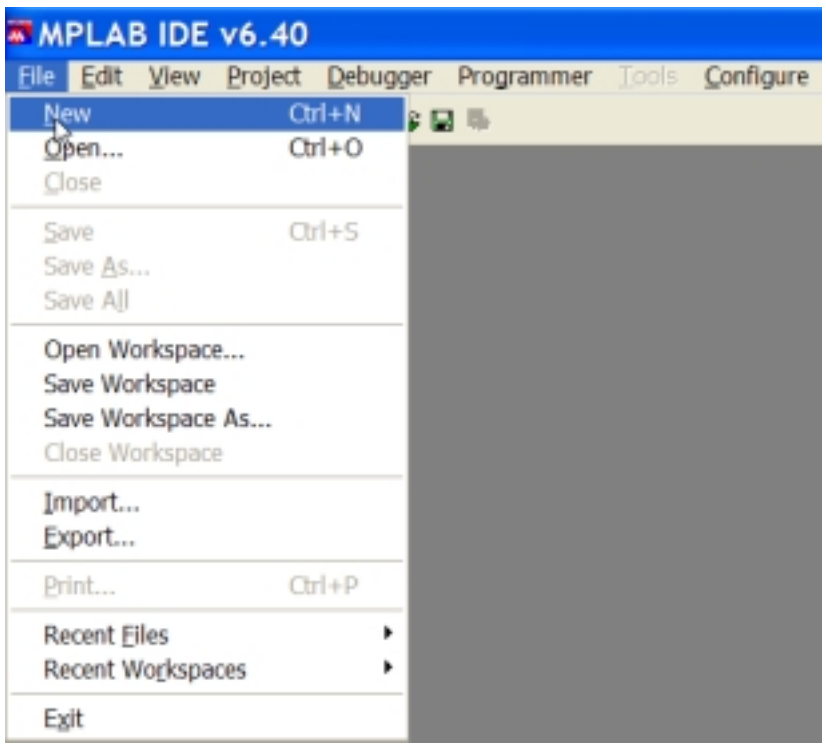
- Windows ® -based Integrated Development Environment (IDE) for the Microchip Technology Incorporated PICmicro microcontroller families
- allows to write, debug, and optimize PICmicro applications for firmware product designs.
- includes a text editor, simulator, and project manager.

MPLAB tools

- Assemble, compile and link source code
- Debug the executable logic by watching program flow with the simulator,
- View variables in watch windows

Starting MPLAB V6.40

- Execute MPLAB.EXE or click on the MPLAB icon to start up the system.
- **File>New** for a new code

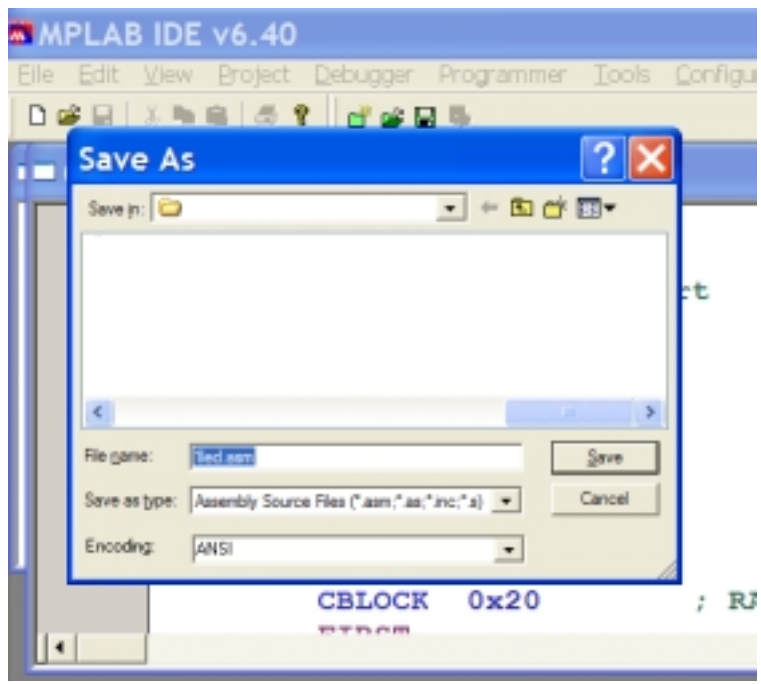


Creation of a New File (program code)

- **Typing a new Code**

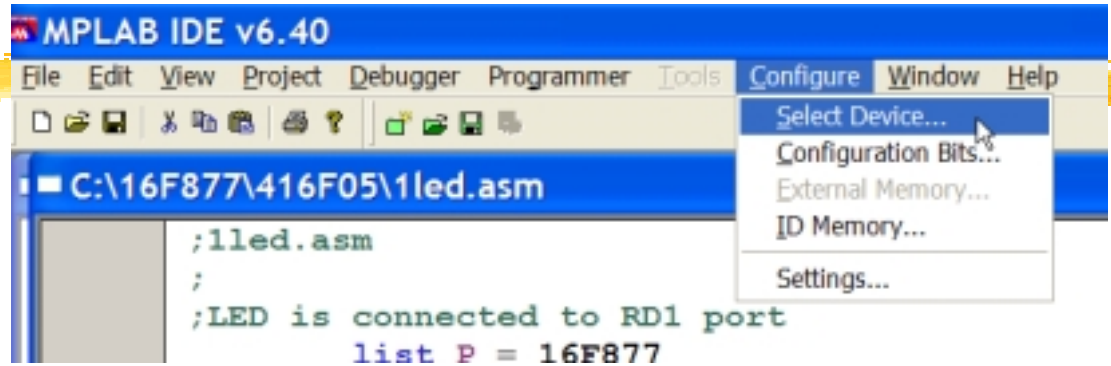
```
;1led.asm
;
;LED is connected to RD1
        list P = 16F877
STATUS  EQU 0x03
PORTD   EQU 0x08
TRISD   EQU 0x88
;P0     EQU 0x05
;P1     EQU 0x06
;LED1   EQU 0x01

        CBLOCK  0x20
```

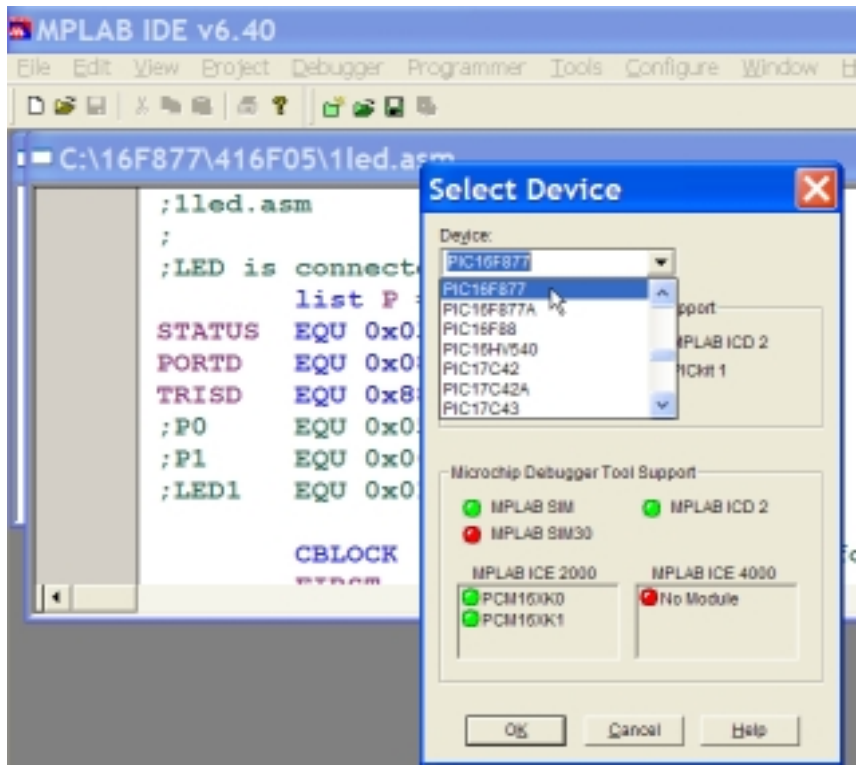
- **File>Save As**



Configuration-Selection of 16F877

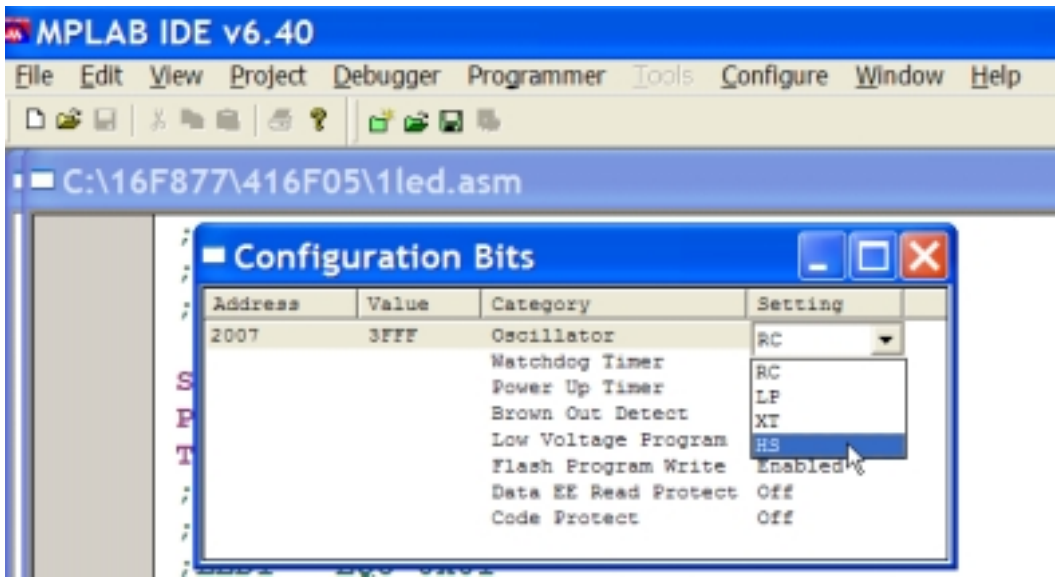
- Section of 16F877



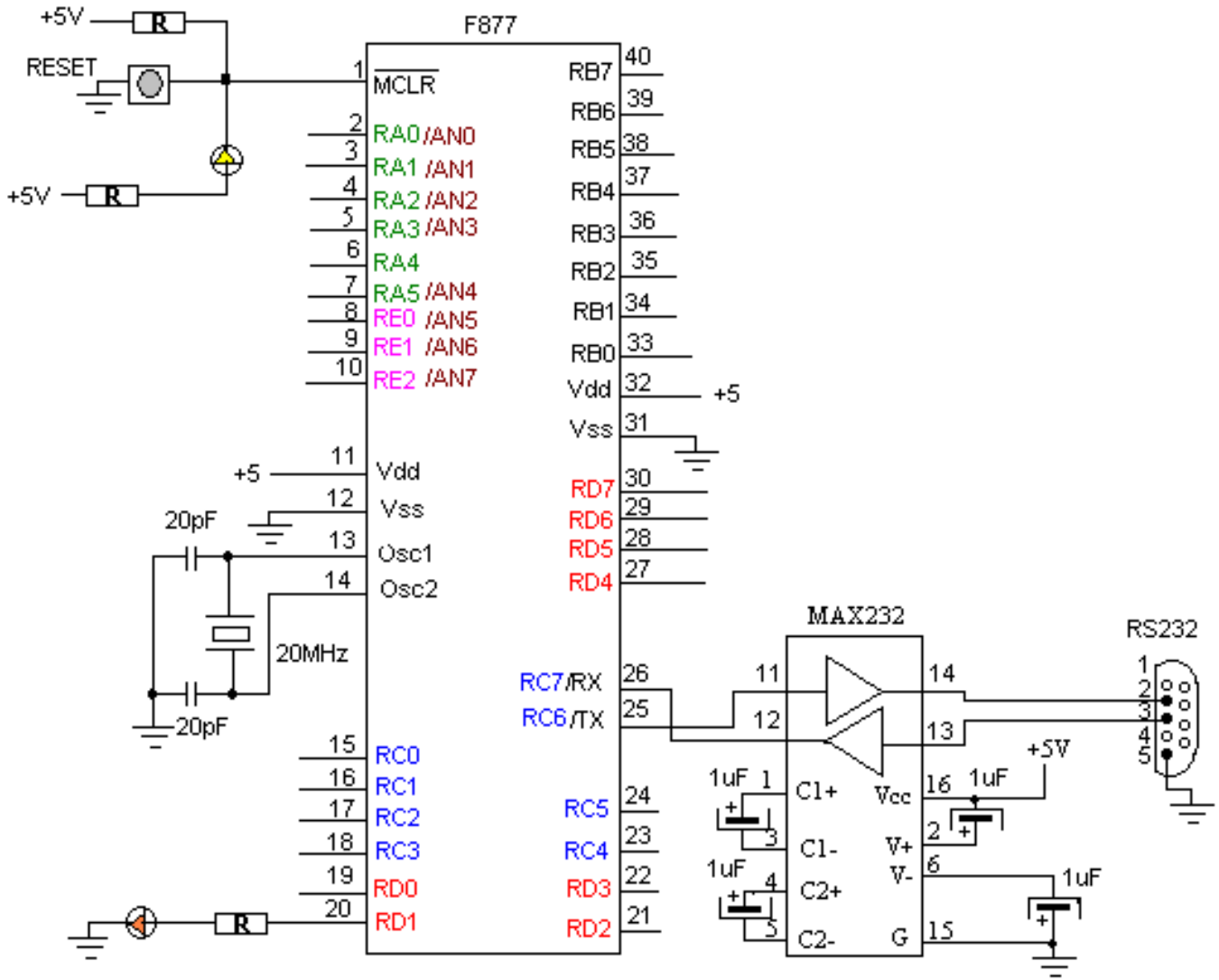


Configuration - Oscillator

- Selection of HS for 20MHz speed.



First Program – LED On/Off



Programming (Case Sensitive!)

```
;First Code
;LED is connected to PORTD<1> or RD1
        list P=16F877
STATUS  EQU     0x03    ;Register declaration
PORTD   EQU     0x08
TRISD   EQU     0x88
P0      EQU     0x05    ;Constant declaration
P1      EQU     0x06
LED     EQU     0x01
;DATA SPACE at RAM
        CBLOCK  0x20    ;starting at 20h
        First           ;Variable declaration
        Second
        Third
        ENDC

        ORG     0x00        ;For bootloader
        GOTO    START

                            ;initial page=0
        ORG     0x05
START   BSF     STATUS, P0  ;move to page 1
        MOVLW   0xC8        ;11001000
        MOVWF   TRISD       ;I/O designation
```

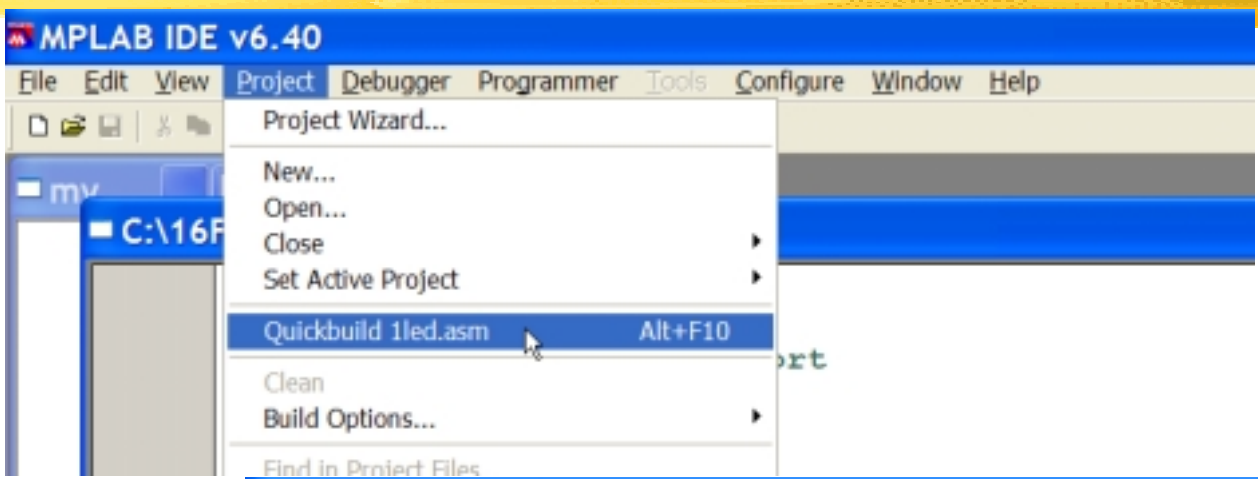
Programming - continued

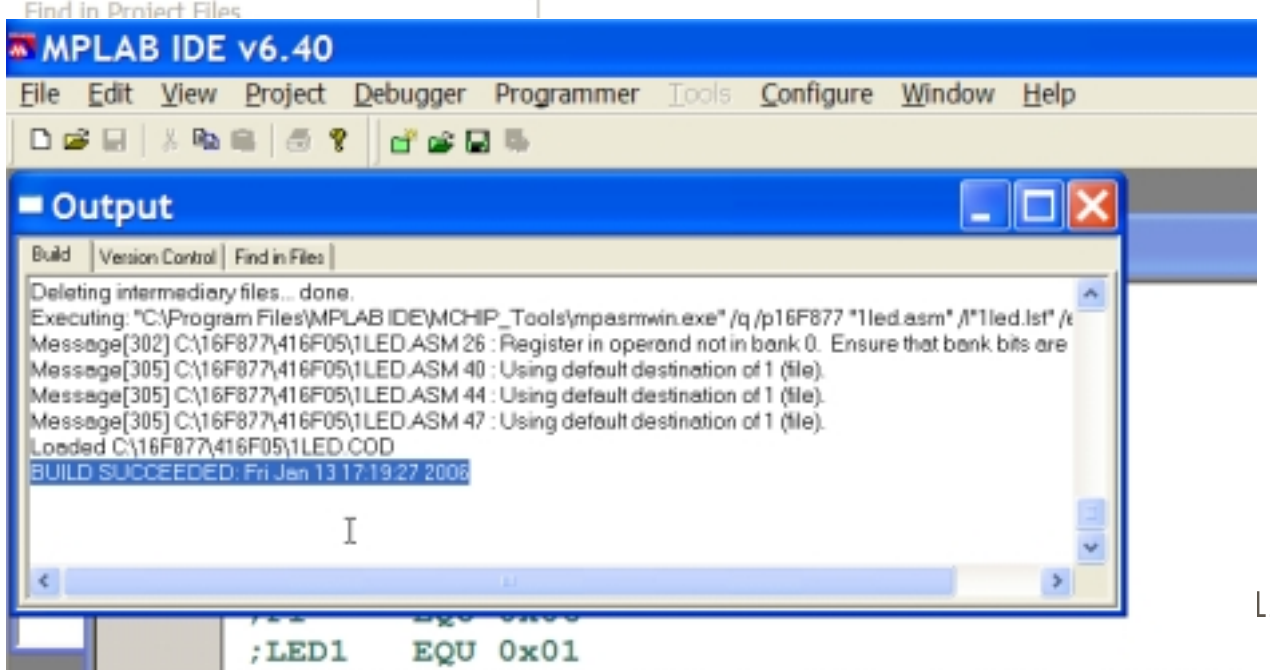
```
        BCF     STATUS, P0   ;move to Page 0
        CLRF    PORTD
LOOP    BSF     PORTD, LED   ;Turn on LED
        CALL    DELAY
        BSF     PORTD, LED   ;Turn off LED
        CALL    DELAY
        GOTO    LOOP
;DELAY subroutine
DELAY   MOVLW   0x50
        MOVWF   FIRST
DLOOP   MOVWF   SECOND
        DECFSZ  FIRST
        GOTO    NEXT1
        GOTO    THEEND
NEXT1   MOVWF   THIRD
        DECFSZ  SECOND
        GOTO    NEXT2
        GOTO    DLOOP
NEXT2   DECFSZ  THIRD
        GOTO    NEXT2
        GOTO    NEXT1
THEEND  RETURN              ;80*80*80=512000 loops
;End of Subroutine
        END                 ;Do not forget this line
```

Now save the file by using the File>Save menu function.

Compiling Source File

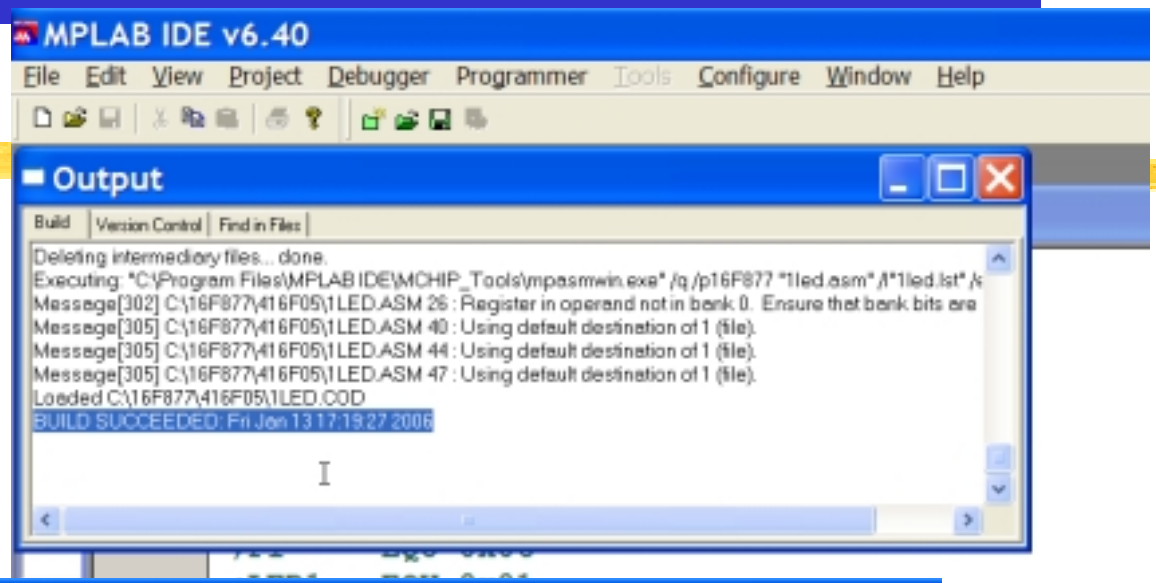
- Project>Quick Node from the menu



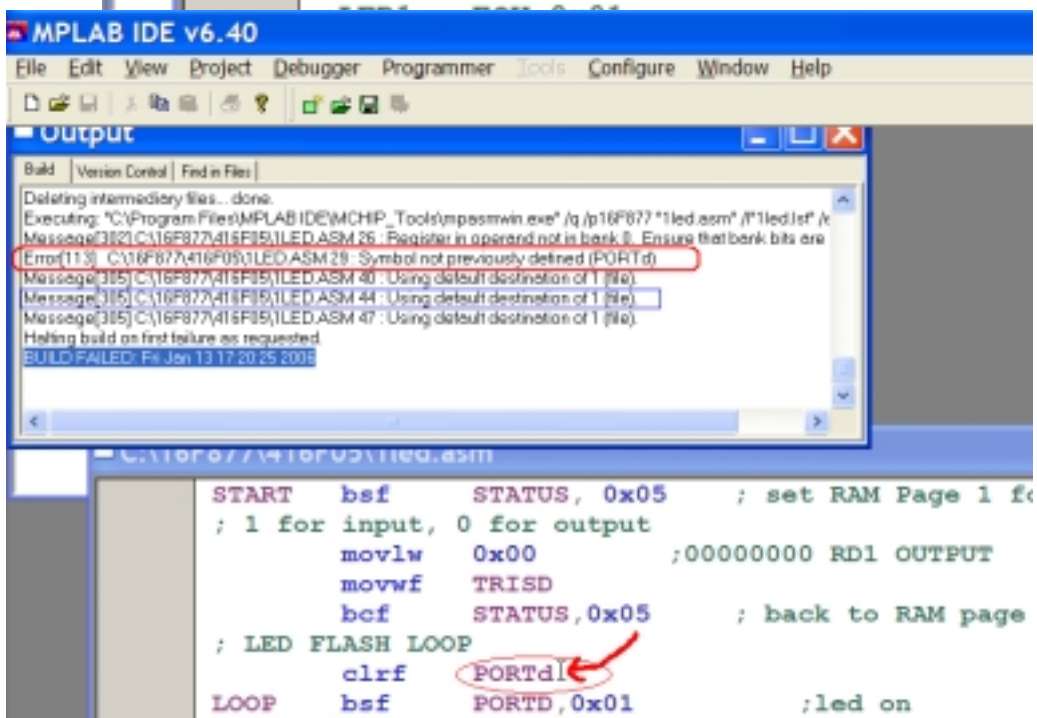


Compiling – Success/Failure

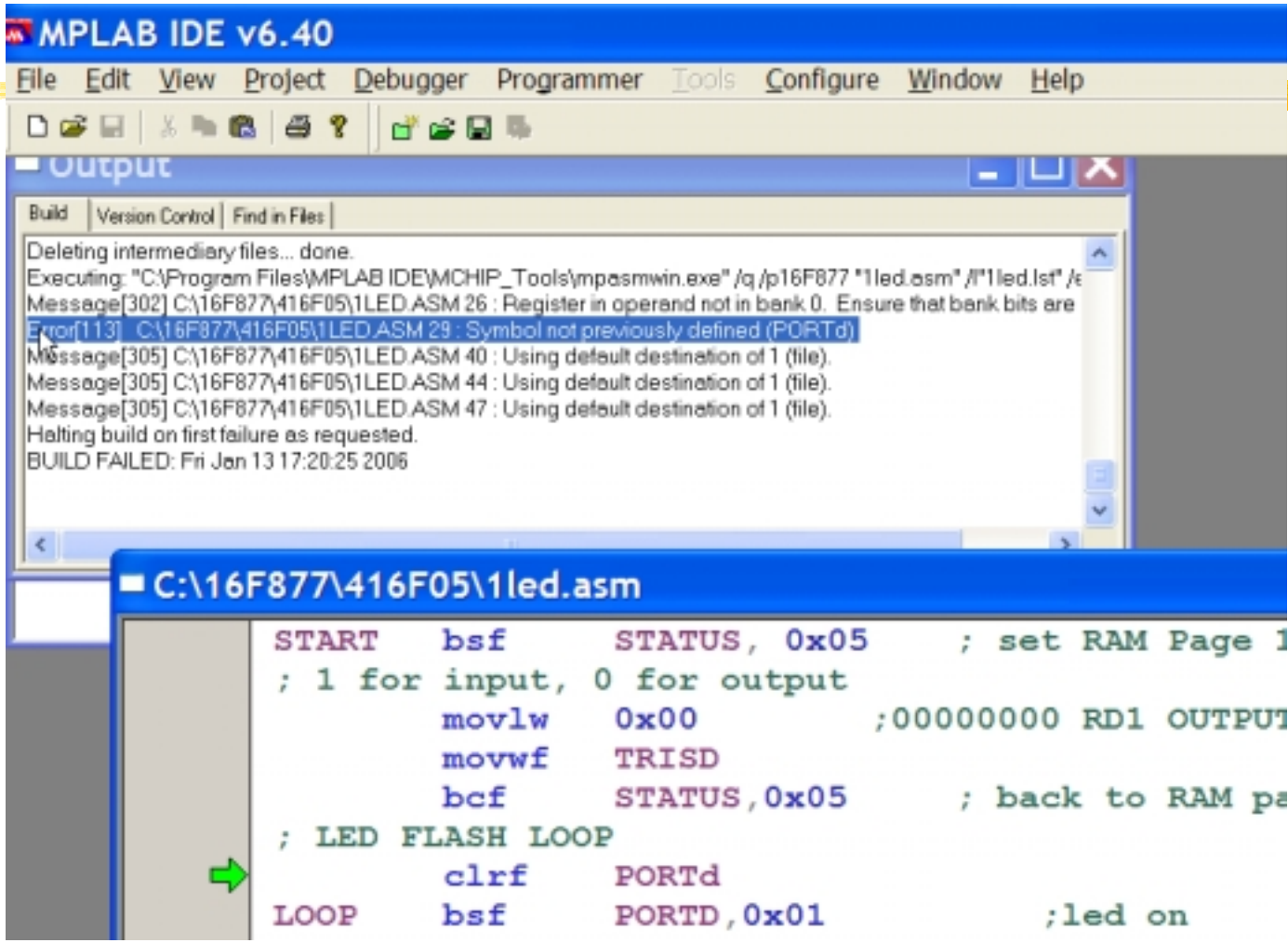
- **Success!**



- **Or Failure.**



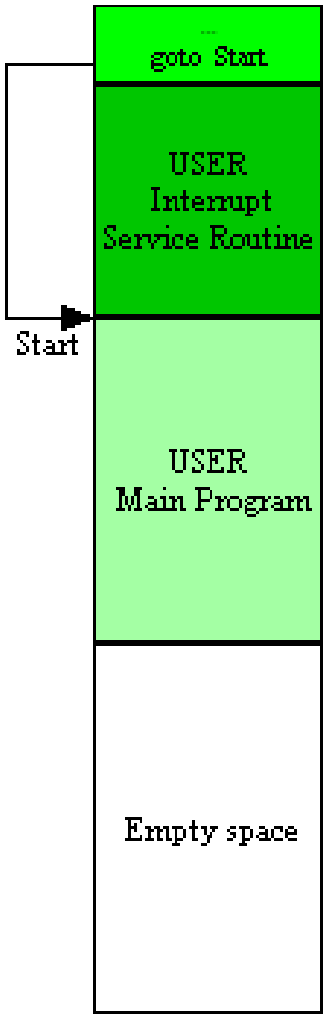
Debugging


MPLAB IDE v6.40
File Edit View Project Debugger Programmer Tools Configure Window Help
Output
Build Version Control Find in Files
Deleting intermediary files... done.
Executing: "C:\Program Files\MPLAB IDE\MCHIP_Tools\mpasmwin.exe" /q /p16F877 "1led.asm" /l"1led.lst" /e
Message[302] C:\16F877\416F05\1LED.ASM 26 : Register in operand not in bank 0. Ensure that bank bits are
Error[113] C:\16F877\416F05\1LED.ASM 29 : Symbol not previously defined (PORTd)
Message[305] C:\16F877\416F05\1LED.ASM 40 : Using default destination of 1 (file).
Message[305] C:\16F877\416F05\1LED.ASM 44 : Using default destination of 1 (file).
Message[305] C:\16F877\416F05\1LED.ASM 47 : Using default destination of 1 (file).
Halting build on first failure as requested.
BUILD FAILED: Fri Jan 13 17:20:25 2006
C:\16F877\416F05\1led.asm
START bsf STATUS, 0x05 ; set RAM Page 1
; 1 for input, 0 for output
movlw 0x00 ;00000000 RD1 OUTPUT
movwf TRISD
bcf STATUS,0x05 ; back to RAM pa
; LED FLASH LOOP
clrf PORTd
LOOP bsf PORTD,0x01 ;led on

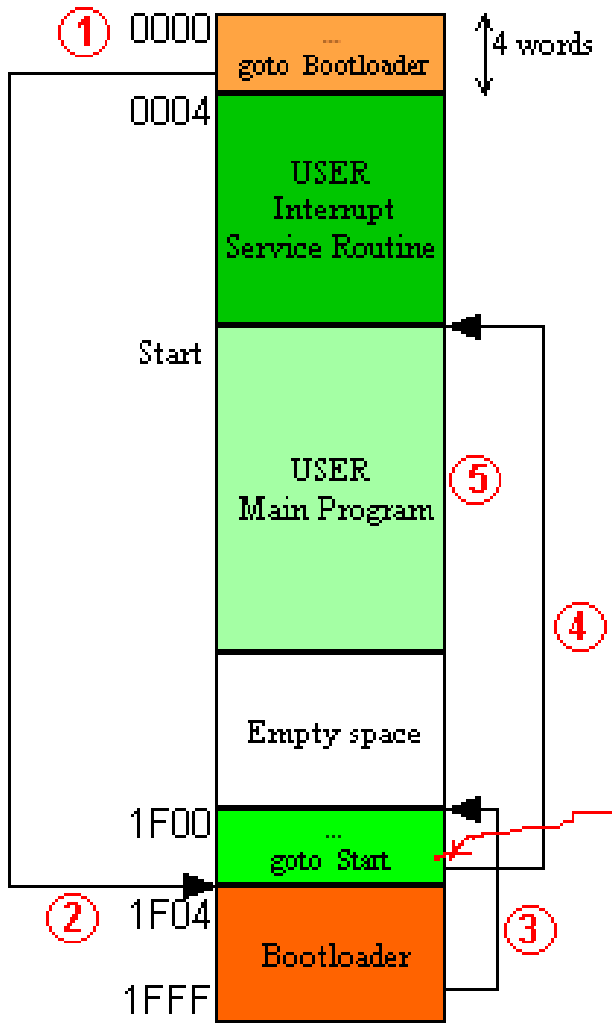
Boot Loader

- A small piece of software (a bootloader) resides on the target microcontroller, which allows user code to be transmitted over a serial cable and written to the device
- How they work:
  - Assembled Boot Loader Software in Hex code
  - Download the boot loader hex code to a target microcontroller using a PIC programmer
- After the Boot loader code download, there is no need of the PIC programmer

16F877 Boot Loader Software



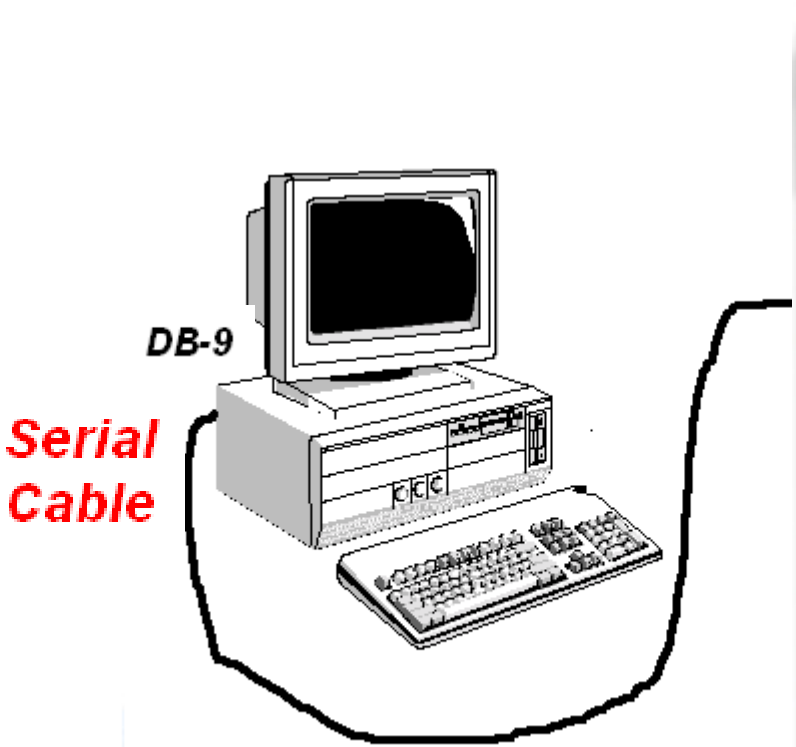
Without Bootloader



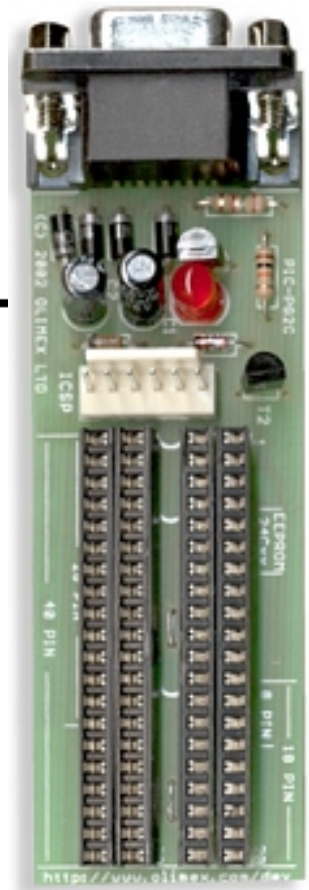
First 4 Words of USER Main Program

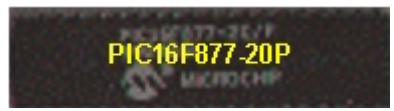
With Bootloader

Downloading your program to PIC -using a PIC burner



Bootloader Hex code





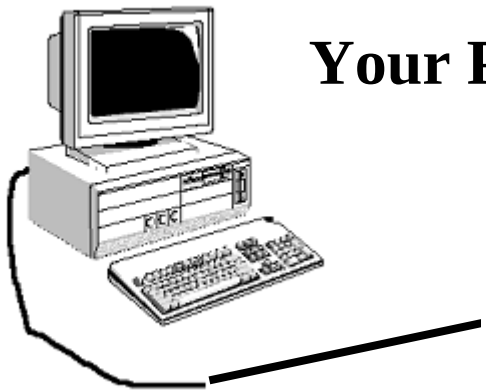
Your Chip

PIC Programmer

Downloading your program to PIC with Bootloader in your PIC chip

Your PC

Serial Port



Run
PICdownloader.exe