CEFET-RJ
25 anos

APOSTILA DE LABORATÓRIO

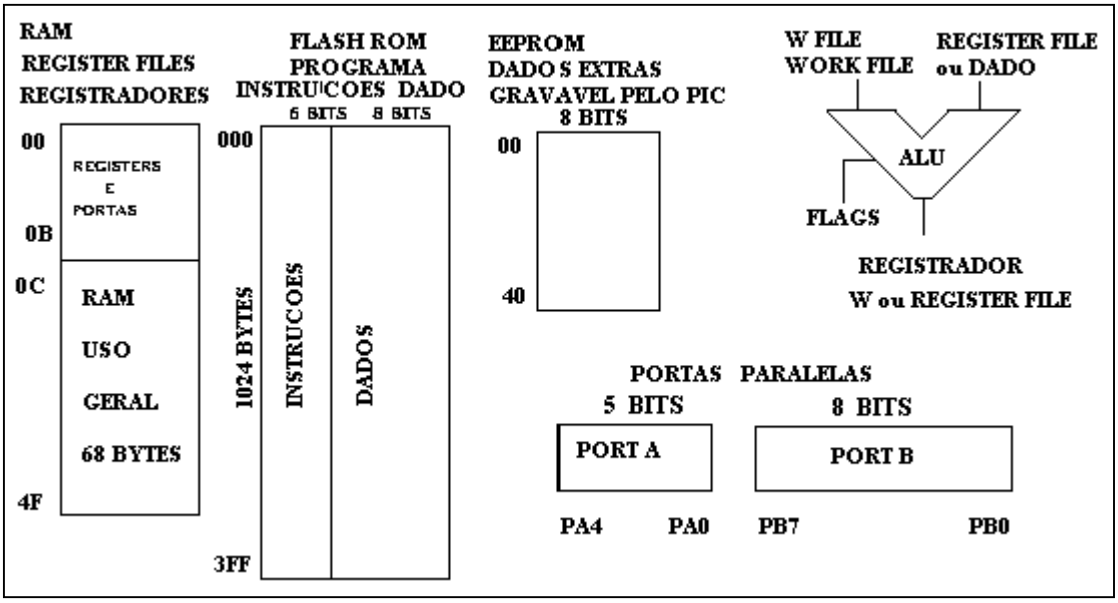
MICROCONTROLADORES PIC 16F84

- **PROGRAMAÇÃO, GRAVAÇÃO E APLICAÇÃO**
- **PORTAS DE SAÍDA DE DADOS**
- **ANÁLISE DE PROGRAMA**
  SUBROTINA DE TEMPO - CÁLCULOS
- **PORTA DE ENTRADA DE DADOS**

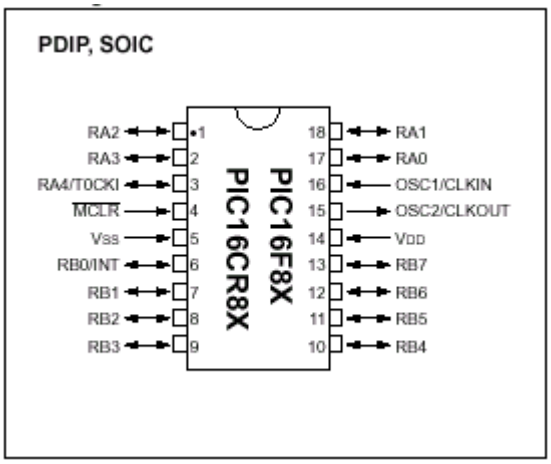
CEFET-RJ - LABORATÓRIO DE ELETRÔNICA - SISTEMAS DIGITAIS
Gravação de microcontrolador Microchip.

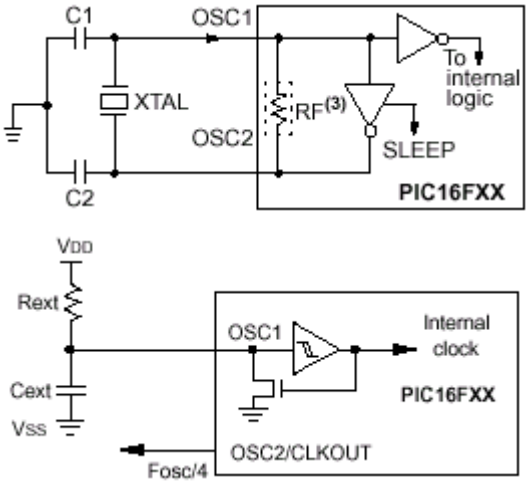
- Escrever um programa
- Compilar um programa
- Gravar um PIC

Estrutura interna do PIC 16F84



Estrutura externa do PIC 16F84. Circuito de Clock. Clock com Cristal, Ressoador Cerâmico, Cristal de Baixa Potência ou Oscilador RC.

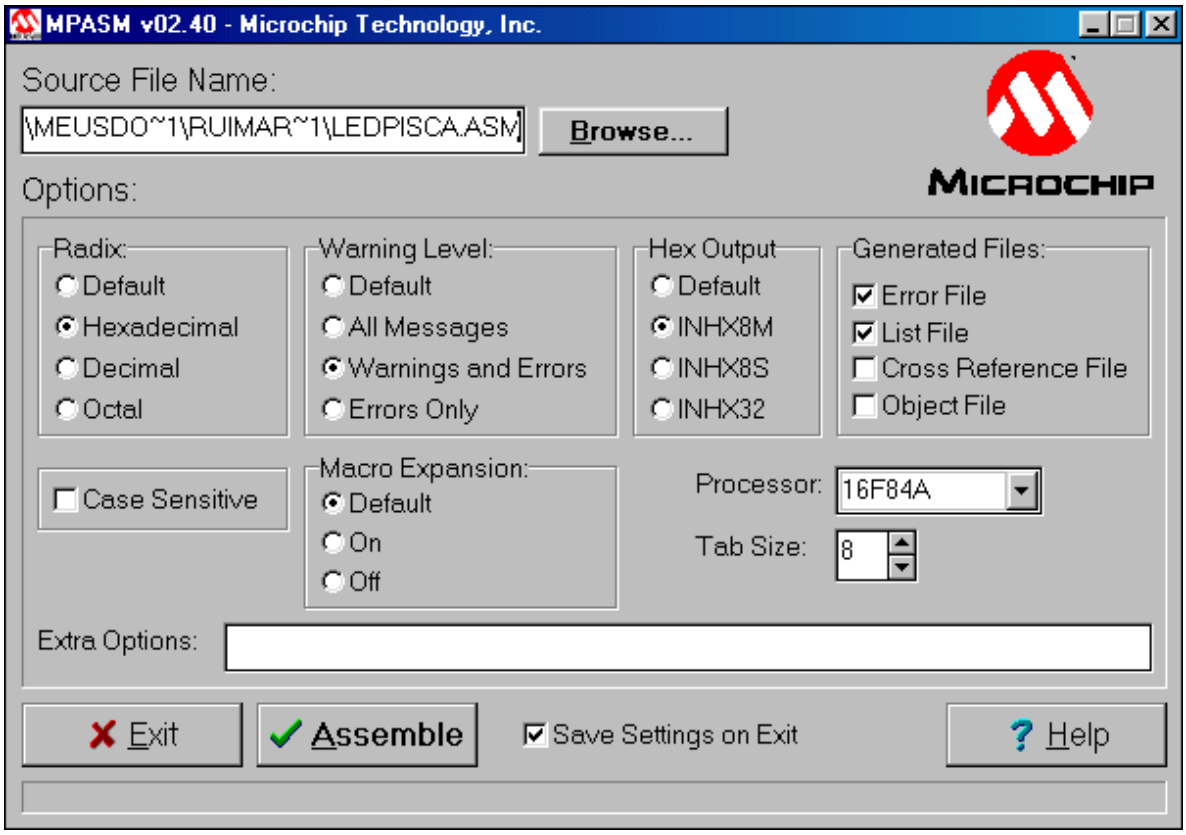




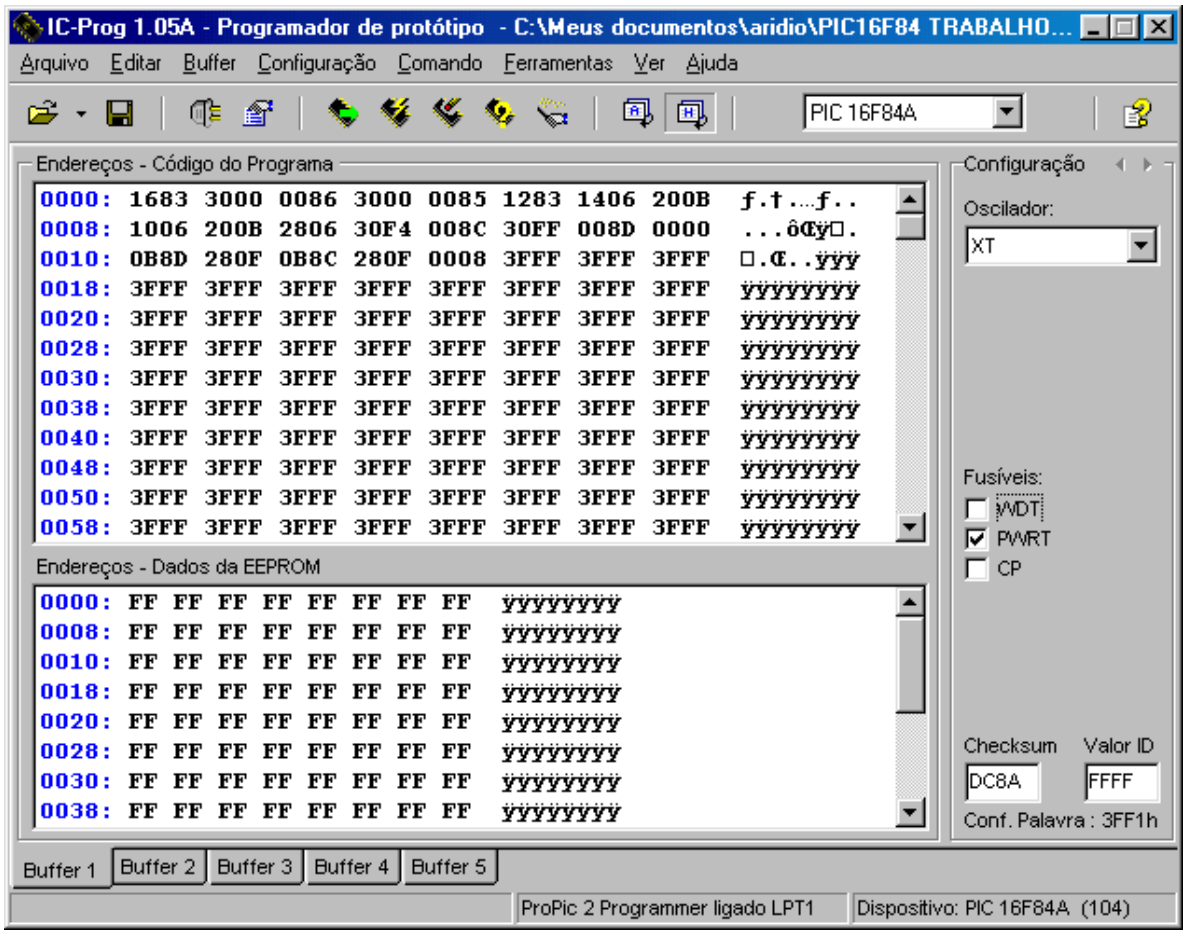
1 - Escrevendo um programa no Bloco de Notas do Windows.
Salvar como .ASM

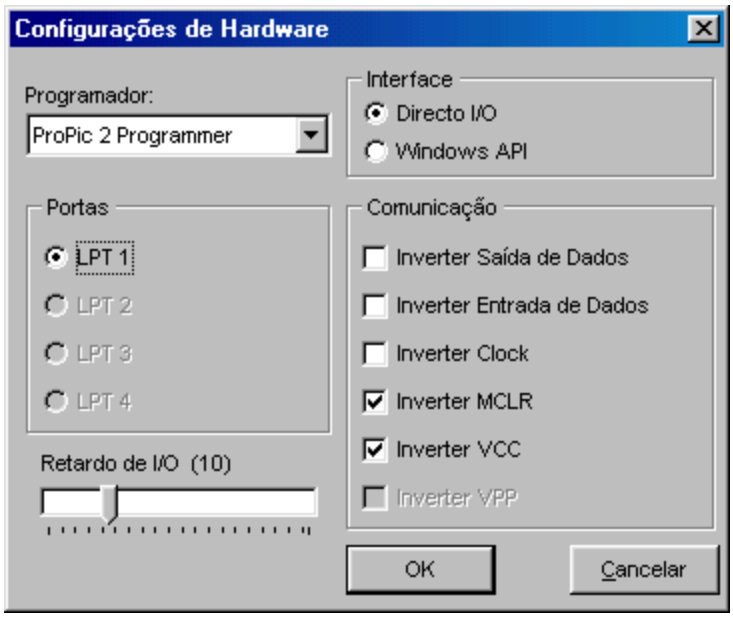
```
;*****************************************************************
        ;LED PISCA-PISCA OUTUBRO 2003
;*****************************************************************
        ;PORTA   B   BIT   0   LED   VERM   COM   R   DE   330   OHMS
;*****************************************************************
        ;CONFIGURACAO PARA GRAVACAO DO CHIP 16F84
;*****************************************************************
        ;LIST P=16F84
        ;F=INHX8M, R=HEX
        ;__CONFIG _CP_OFF & _WDT_OFF & _XT_OSC & _PWRTE_ON
        INCLUDE "P16F84.inc";OU P16F84A.INC
;*****************************************************************
;PROGRAMA AS PORTAS
        ORG   0x000             ;INICIO DA COMPILACAO

        BSF             STATUS, RP0   ;SELECIONA BANK 1
        MOVLW           0X00          ;PROGRAMA TODOS OS BITS PARA OUT (00)
        MOVWF           TRISA         ;NA PORTA A (0X00)
        MOVLW           0X00          ;PROGRAMA TODOS OS BITS PARA OUT (0)
        MOVWF           TRISB         ;NA PORTA B (00)
        BCF             STATUS, RP0   ;VOLTA AO BANK 0
        ;FIM DA CONFIGURACAO ENTRA NO LOOP PRINCIPAL
;*****************************************************************
INICIO
        BSF     PORTB,0
        CALL    RETARDO
        BCF     PORTB,0
        CALL    RETARDO
        GOTO INICIO  ;FIM DO LOOP PRINCIPAL VOLTA AO INICIO
RETARDO
        MOVLW           0XDD
        MOVWF           0X0C
        MOVLW           0XEE
        MOVWF           0X0D
VOLTA
        DECFSZ          0X0C
        GOTO  VOLTA

        MOVLW           0XDD
        MOVWF           0X0C

        DECFSZ          0X0D
        GOTO  VOLTA

        RETURN
        END             ;FIM DA COMPILACAO
```

2 - Compilando um programa no MPASMWIN24.EXE
Cria um arquivo .HEX

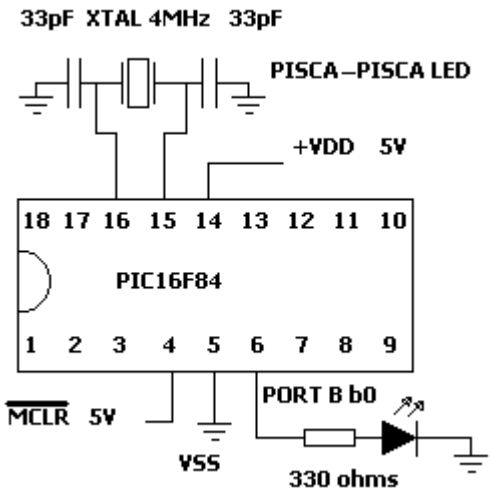


3 - Gravando o PIC com ICPROG.EXE
Grava o arquivo .HEX no microcontrolador.



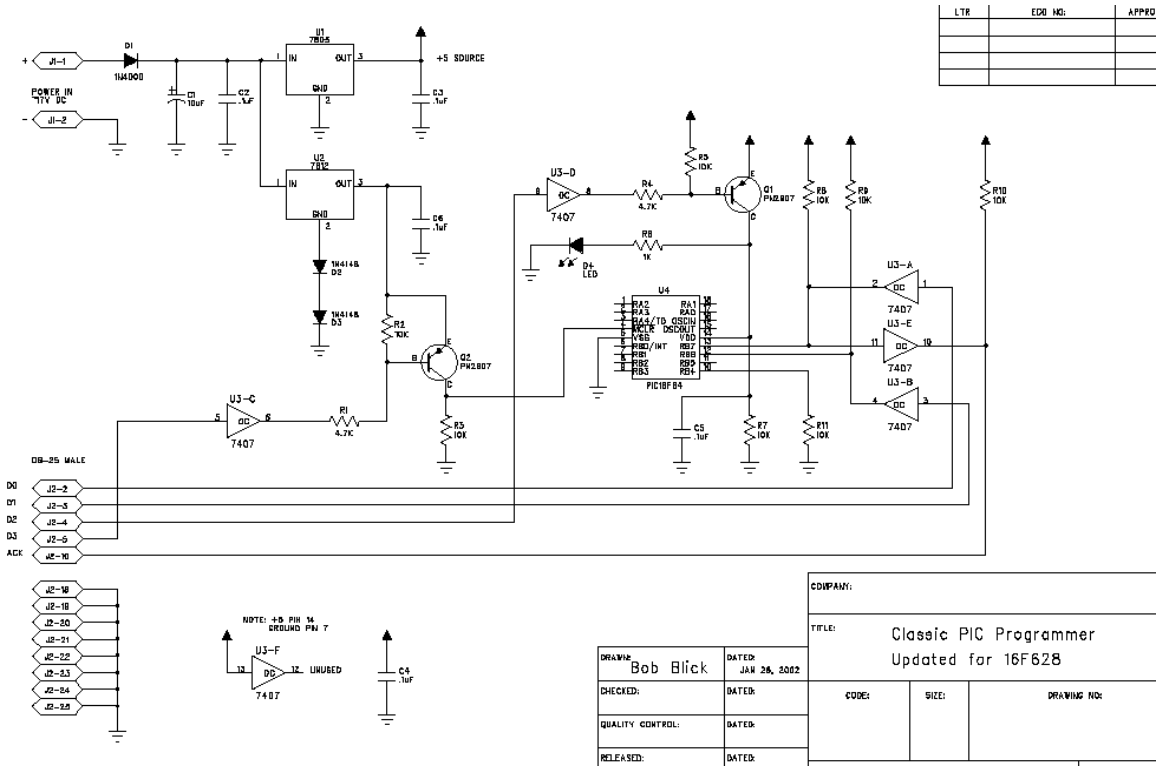


4 – Monte o circuito de teste.



APÊNDICE

Circuito gravador de PIC para porta paralela do PC



Conjunto de Instruções do PIC16F84

Mnemonic, Operands		Description	Cycles	14-Bit Opcode				Status Affected	Notes
				MSb			LSb		
ADDWF	f, d	Add W and f	1	00	0111	dfff	ffff	C,DC,Z	1,2
ANDWF	f, d	AND W with f	1	00	0101	dfff	ffff	Z	1,2
CLRF	f	Clear f	1	00	0001	lfff	ffff	Z	2
CLRW	-	Clear W	1	00	0001	0000	0011	Z	
COMF	f, d	Complement f	1	00	1001	dfff	ffff	Z	1,2
DECF	f, d	Decrement f	1	00	0011	dfff	ffff	Z	1,2
DECFSZ	f, d	Decrement f, Skip if 0	1(2)	00	1011	dfff	ffff	None	1,2,3
INCF	f, d	Increment f	1	00	1010	dfff	ffff	Z	1,2
INCFSZ	f, d	Increment f, Skip if 0	1(2)	00	1111	dfff	ffff	None	1,2,3
IORWF	f, d	Inclusive OR W with f	1	00	0100	dfff	ffff	Z	1,2
MOVF	f, d	Move f	1	00	1000	dfff	ffff	Z	1,2
MOVWF	f	Move W to f	1	00	0000	lfff	ffff	None	
NOP	-	No Operation	1	00	0000	0xx0	0000	None	
RLF	f, d	Rotate left f through carry	1	00	1101	dfff	ffff	C	1,2
RRF	f, d	Rotate right f through carry	1	00	1100	dfff	ffff	C	1,2
SUBWF	f, d	Subtract W from f	1	00	0010	dfff	ffff	C,DC,Z	1,2
SWAPF	f, d	Swap nibbles in f	1	00	1110	dfff	ffff	None	1,2
XORWF	f, d	Exclusive OR W with f	1	00	0110	dfff	ffff	Z	1,2
BIT-ORIENTED FILE REGISTER OPERATIONS									
BCF	f, b	Bit Clear f	1	01	00bb	bfff	ffff	None	1,2
BSF	f, b	Bit Set f	1	01	01bb	bfff	ffff	None	1,2
BTFSC	f, b	Bit Test f, Skip if Clear	1 (2)	01	10bb	bfff	ffff	None	3
BTFSS	f, b	Bit Test f, Skip if Set	1 (2)	01	11bb	bfff	ffff	None	3
ADDLW	k	Add literal and W	1	11	111x	kkkk	kkkk	C,DC,Z	
ANDLW	k	AND literal with W	1	11	1001	kkkk	kkkk	Z	
CALL	k	Call subroutine	2	10	0kkk	kkkk	kkkk		
CLRWDT	-	Clear Watchdog Timer	1	00	0000	0110	0100	$\overline{TO}$,$\overline{PD}$	
GOTO	k	Go to address	2	10	1kkk	kkkk	kkkk	None	
IORLW	k	Inclusive OR literal with W	1	11	1000	kkkk	kkkk	Z	
MOVLW	k	Move literal to W	1	11	00xx	kkkk	kkkk	None	
RETFIE	-	Return from interrupt	2	00	0000	0000	1001	None	
RETLW	k	Return with literal in W	2	11	01xx	kkkk	kkkk	None	
RETURN	-	Return from subroutine	2	00	0000	0000	1000	None	
SLEEP	-	Go into standby mode	1	00	0000	0110	0011	$\overline{TO}$,$\overline{PD}$	
SUBLW	k	Subtract W from literal	1	11	110x	kkkk	kkkk	C,DC,Z	
XORLW	k	Exclusive OR literal with W	1	11	1010	kkkk	kkkk	Z	