Arquitectura del Computador II

Repaso.
Parte III

- Las características básicas:
- 1) La Unidad de Proceso Central (CPU),
- 2) La Unidad de Memoria (UM),
- 3) La Unidad de Entrada/Salida (UE/S),
- 4) La Unidad de Buses (UB), y
- 5) El Programa Almacenado en UM (PA)

- El 5to elemento, también conocido como Software.

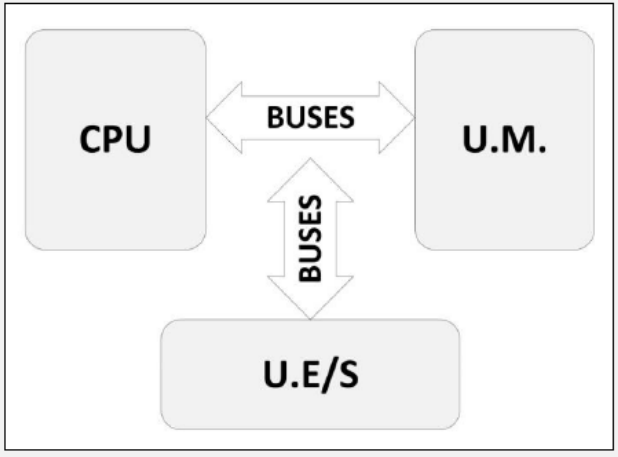
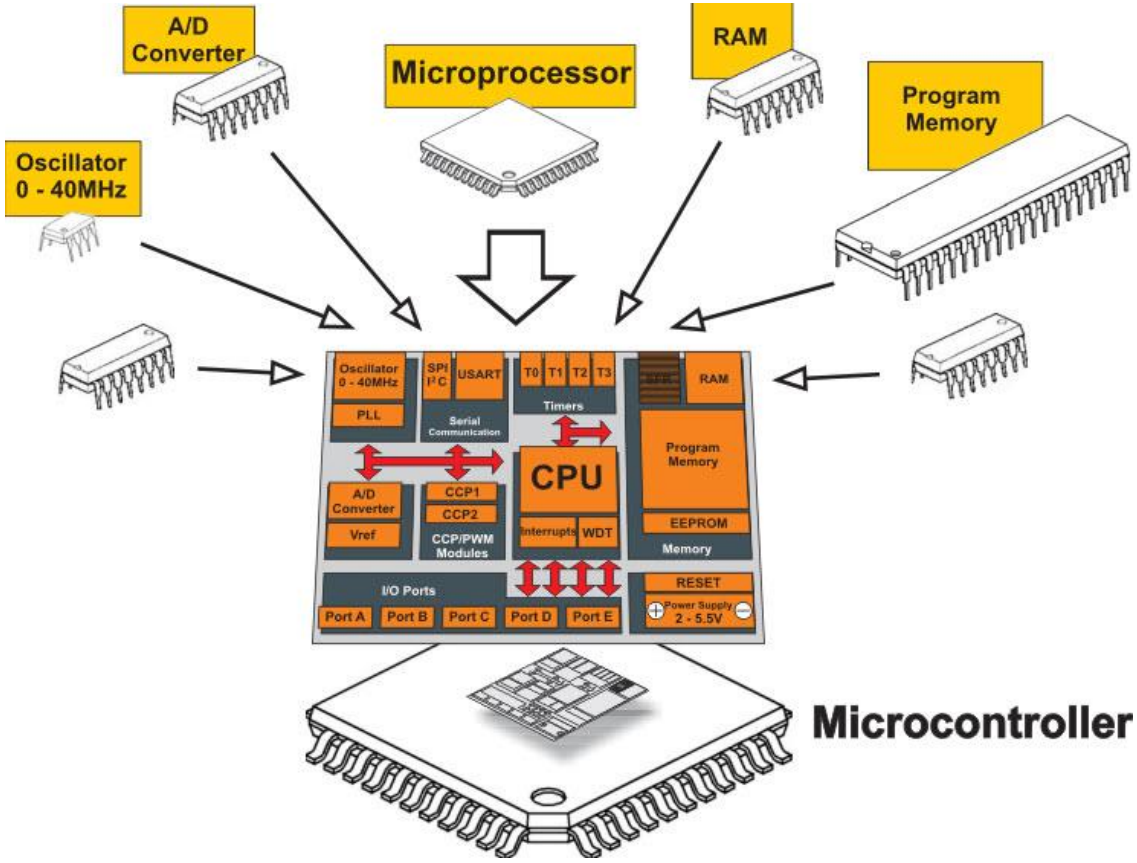
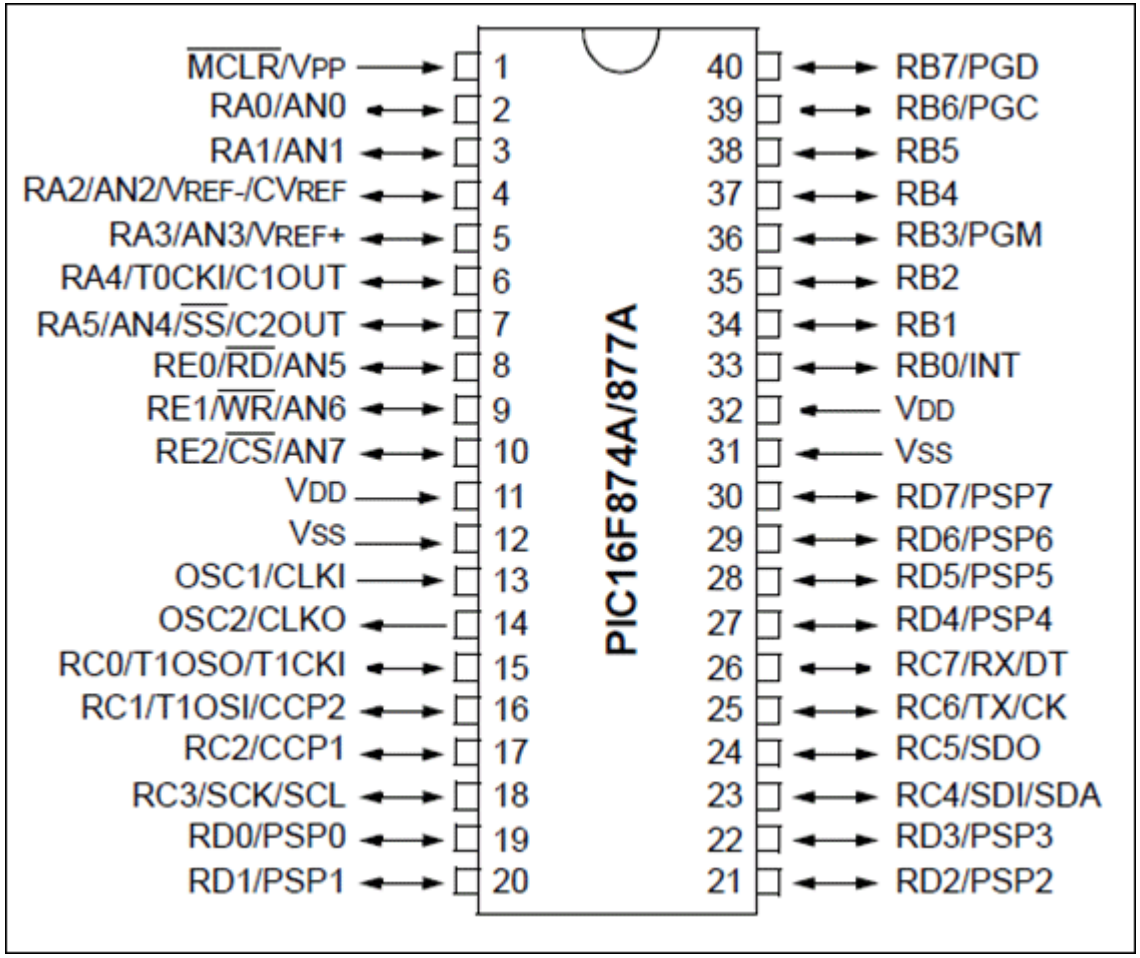
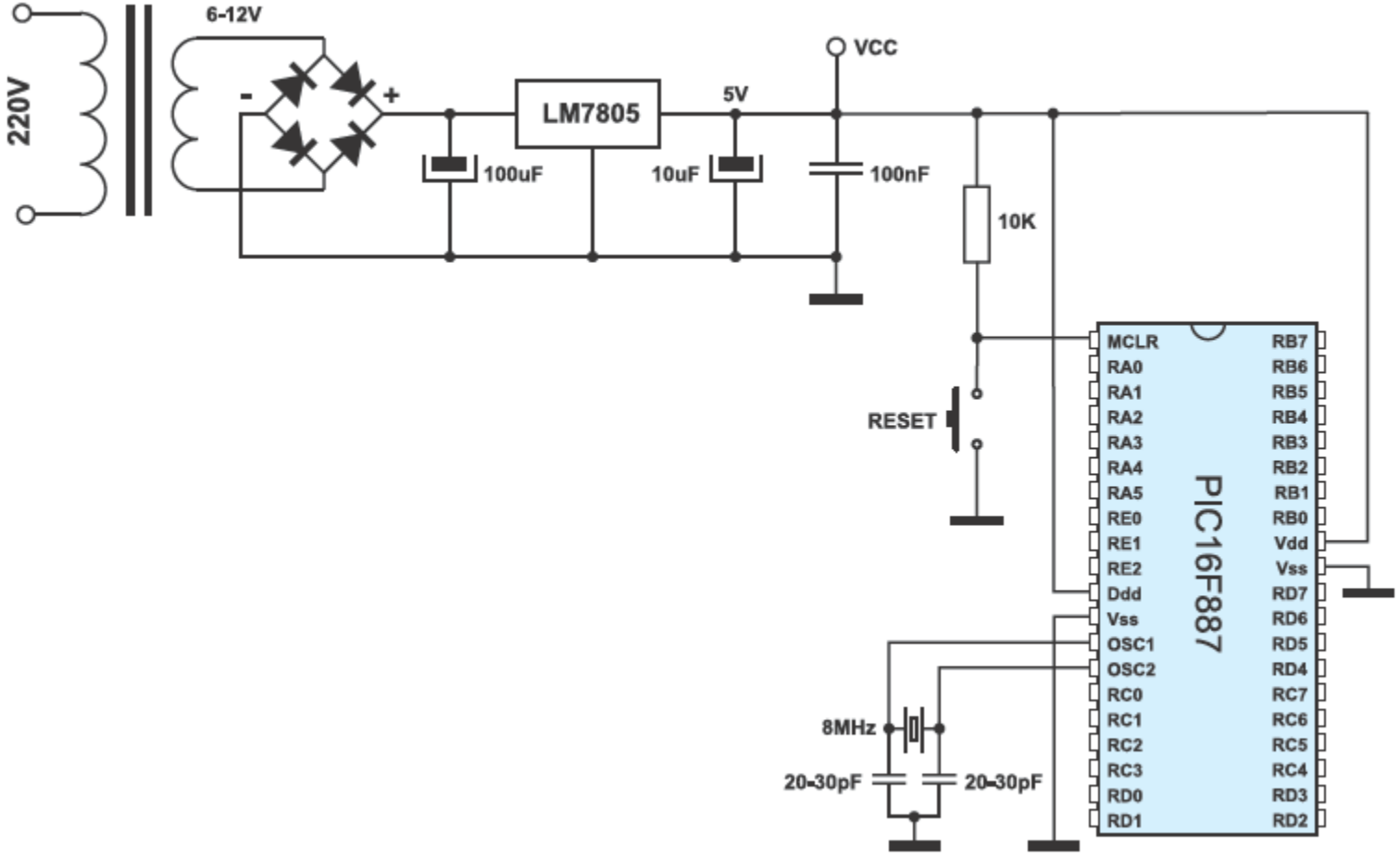


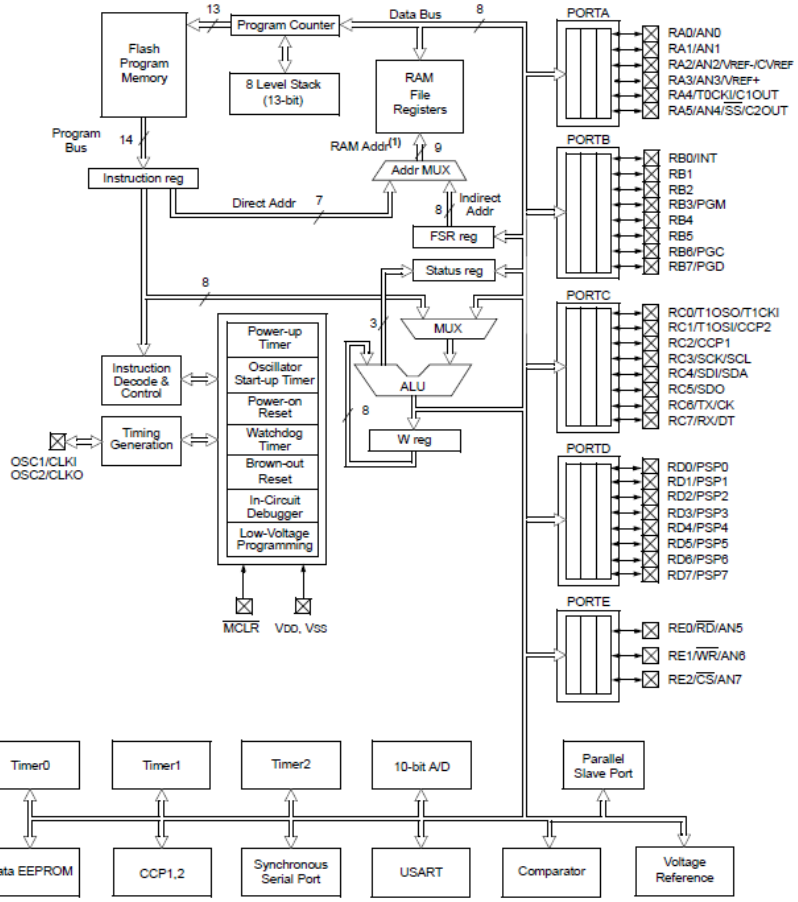
Fig. 7.1. Estructura básica de una computadora.


A/D Converter
Microprocessor
RAM
Program Memory
Oscillator 0 - 40MHz
Oscillator 0 - 40MHz
PLL
SPI I²C
USART
Serial Communication
T0
T1
T2
T3
Timers
RAM
Program Memory
CPU
A/D Converter
Vref
CCP1
CCP2
CCP/PWM Modules
Interrupts
WDT
EEPROM Memory
I/O Ports
Port A
Port B
Port C
Port D
Port E
RESET
Power Supply 2 - 5.5V
Microcontroller

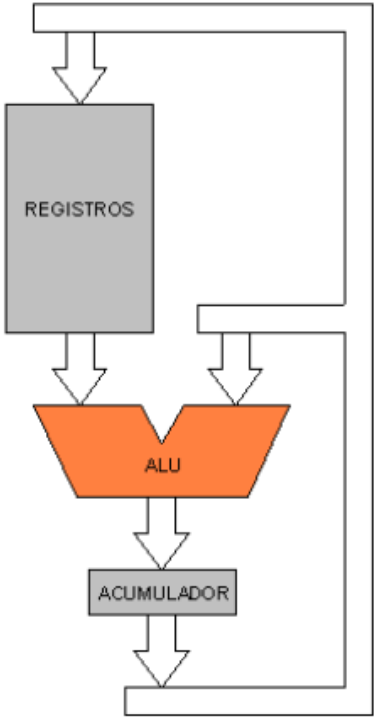
- Las principales características con que cuenta el 16F87X son:
- ▪ Procesador de arquitectura RISC avanzada
- ▪ Juego de 35 instrucciones con 14 bits de longitud. Todas ellas se ejecutan en un ciclo de instrucción menos las de salto que tardan 2.
- ▪ Frecuencia de 20 Mhz
- ▪ Hasta 8K palabras de 14 bits para la memoria de codigo, tipo flash.
- ▪ Hasta 368 bytes de memoria de datos RAM
- ▪ Hasta 256 bytes de memoria de datos EEPROM
- ▪ Hasta 14 fuentes de interrupción internas y externas
- ▪ Pila con 8 niveles
- ▪ Modos de direccionamiento directo, indirecto y relativo
- ▪ Perro guardian (WDT)
- ▪ Código de protección programable
- ▪ Modo Sleep de bajo consumo
- ▪ Programación serie en circuito con 2 patitas
- ▪ Voltaje de alimentación comprendido entre 2 y 5.5 voltios
- ▪ Bajo consumo (menos de 2 mA a 5 V y 5 Mhz)


PIC16F874A/877A
MCLR/VPP 1
RA0/AN0 2
RA1/AN1 3
RA2/AN2/VREF-/CVREF 4
RA3/AN3/VREF+ 5
RA4/T0CKI/C1OUT 6
RA5/AN4/SS/C2OUT 7
RE0/RD/AN5 8
RE1/WR/AN6 9
RE2/CS/AN7 10
VDD 11
VSS 12
OSC1/CLKI 13
OSC2/CLKO 14
RC0/T1OSO/T1CKI 15
RC1/T1OSI/CCP2 16
RC2/CCP1 17
RC3/SCK/SCL 18
RD0/PSP0 19
RD1/PSP1 20
40 RB7/PGD
39 RB6/PGC
38 RB5
37 RB4
36 RB3/PGM
35 RB2
34 RB1
33 RB0/INT
32 VDD
31 VSS
30 RD7/PSP7
29 RD6/PSP6
28 RD5/PSP5
27 RD4/PSP4
26 RC7/RX/DT
25 RC6/TX/CK
24 RC5/SDO
23 RC4/SDI/SDA
22 RD3/PSP3
21 RD2/PSP2

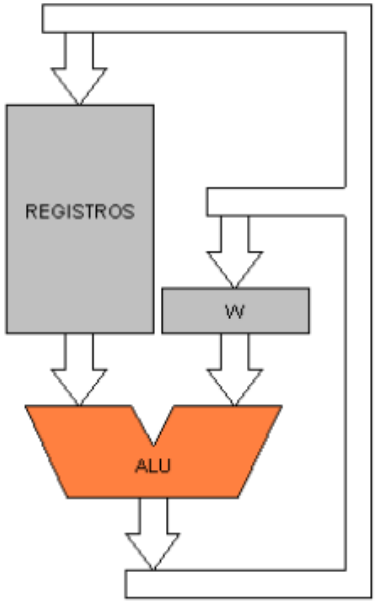

220V
6-12V
-
+
LM7805
5V
VCC
100uF
10uF
100nF
10K
RESET
MCLR
RA0
RA1
RA2
RA3
RA4
RA5
RE0
RE1
RE2
Ddd
Vss
OSC1
OSC2
RC0
RC1
RC2
RC3
RD0
RD1
RB7
RB6
RB5
RB4
RB3
RB2
RB1
RB0
Vdd
Vss
RD7
RD6
RD5
RD4
RC7
RC6
RC5
RC4
RD3
RD2
PIC16F887
8MHz
20-30pF
20-30pF



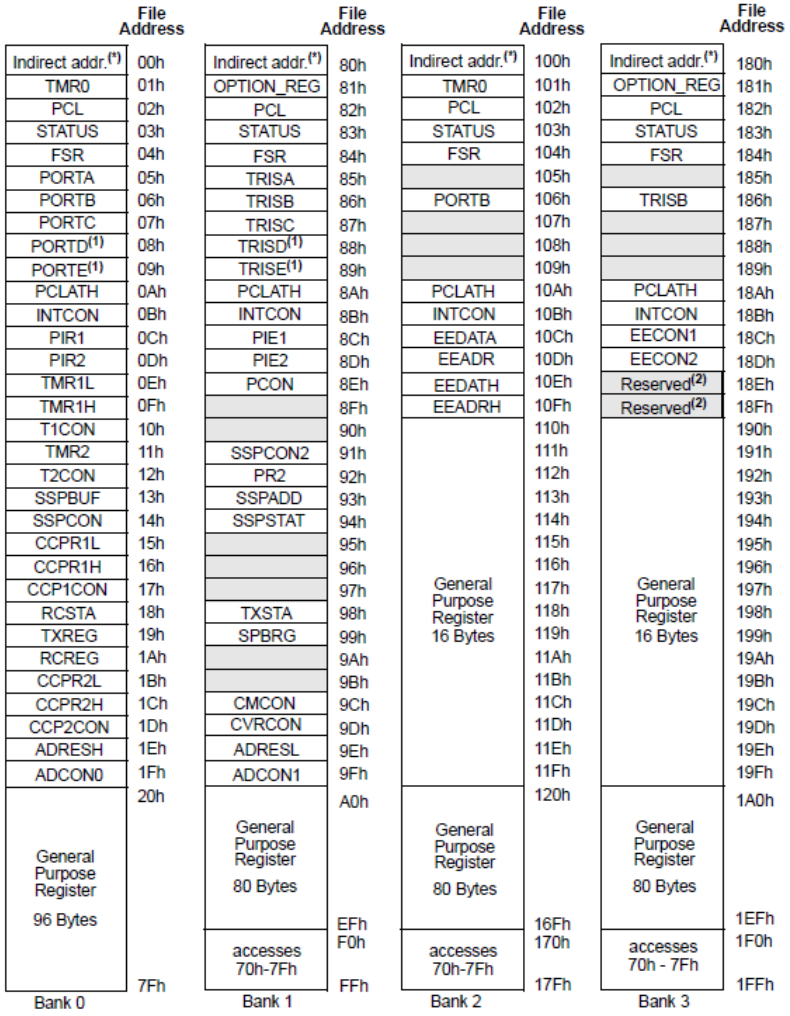
Device	Program Flash	Data Memory	Data EEPROM
PIC16F874A	4K words	192 Bytes	128 Bytes
PIC16F877A	8K words	368 Bytes	256 Bytes



MICROPROCESADOR TRADICIONAL



MICROCONTROLADOR PIC


File Address
Indirect addr.(*) 00h
TMR0 01h
PCL 02h
STATUS 03h
FSR 04h
PORTA 05h
PORTB 06h
PORTC 07h
PORTD(1) 08h
PORTE(1) 09h
PCLATH 0Ah
INTCON 0Bh
PIR1 0Ch
PIR2 0Dh
TMR1L 0Eh
TMR1H 0Fh
T1CON 10h
TMR2 11h
T2CON 12h
SSPBUF 13h
SSPCON 14h
CCPR1L 15h
CCPR1H 16h
CCP1CON 17h
RCSTA 18h
TXREG 19h
RCREG 1Ah
CCPR2L 1Bh
CCPR2H 1Ch
CCP2CON 1Dh
ADRESH 1Eh
ADCON0 1Fh
20h
General Purpose Register
96 Bytes
7Fh
Bank 0
File Address
Indirect addr.(*) 80h
OPTION_REG 81h
PCL 82h
STATUS 83h
FSR 84h
TRISA 85h
TRISB 86h
TRISC 87h
TRISD(1) 88h
TRISE(1) 89h
PCLATH 8Ah
INTCON 8Bh
PIE1 8Ch
PIE2 8Dh
PCON 8Eh
8Fh
90h
SSPCON2 91h
PR2 92h
SSPADD 93h
SSPSTAT 94h
95h
96h
97h
TXSTA 98h
SPBRG 99h
9Ah
9Bh
CMCON 9Ch
CVRCON 9Dh
ADRESL 9Eh
ADCON1 9Fh
A0h
General Purpose Register
80 Bytes
EFh
F0h
accesses 70h-7Fh
FFh
Bank 1
File Address
Indirect addr.(*) 100h
TMR0 101h
PCL 102h
STATUS 103h
FSR 104h
105h
PORTB 106h
107h
108h
109h
PCLATH 10Ah
INTCON 10Bh
EEDATA 10Ch
EEADR 10Dh
EEDATH 10Eh
EEADRH 10Fh
110h
111h
112h
113h
114h
115h
116h
117h
118h
119h
11Ah
11Bh
11Ch
11Dh
11Eh
11Fh
General Purpose Register
16 Bytes
120h
General Purpose Register
80 Bytes
16Fh
170h
accesses 70h-7Fh
17Fh
Bank 2
File Address
Indirect addr.(*) 180h
OPTION_REG 181h
PCL 182h
STATUS 183h
FSR 184h
185h
TRISB 186h
187h
188h
189h
PCLATH 18Ah
INTCON 18Bh
EECON1 18Ch
EECON2 18Dh
Reserved(2) 18Eh
Reserved(2) 18Fh
190h
191h
192h
193h
194h
195h
196h
197h
198h
199h
19Ah
19Bh
19Ch
19Dh
19Eh
19Fh
General Purpose Register
16 Bytes
1A0h
General Purpose Register
80 Bytes
1EFh
1F0h
accesses 70h - 7Fh
1FFh
Bank 3

Posmem	Banco 0	Banco 1	Posmem
	.....	.....	
0x05	PORTA	TRISA	0x85
0x06	PORTB	TRISB	0x86
0x07	PORTC	TRISC	0x87
0x08	PORTD	TRISD	0x88
0x09	PORTE	TRISE	0x89
	.....	.....	
		ADCON1	0x1F

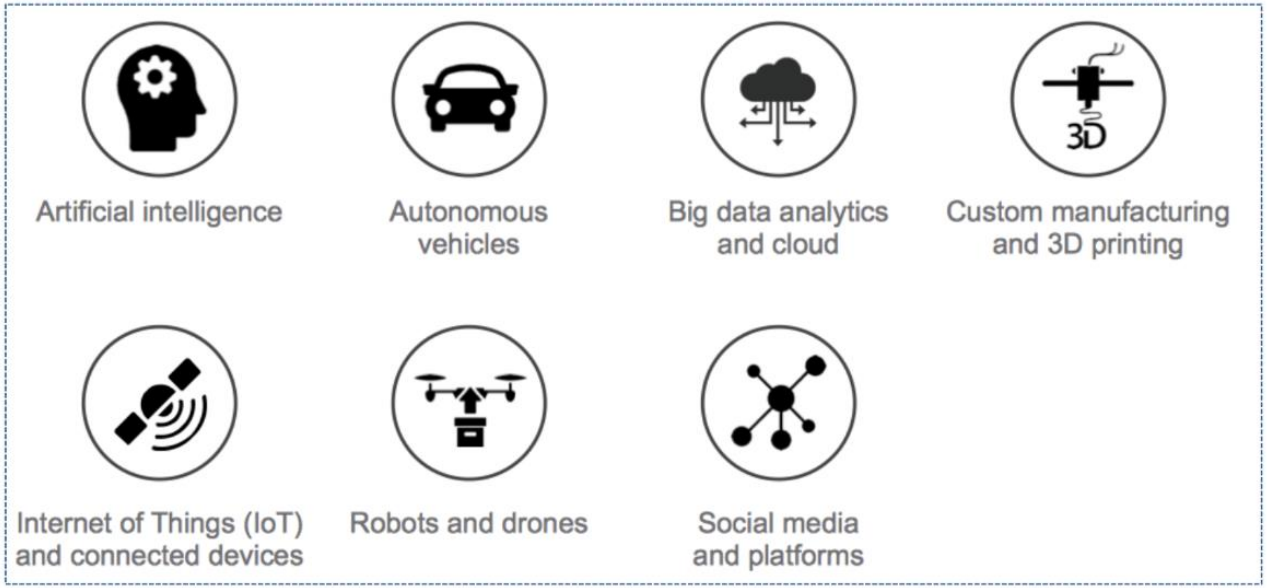
Mnemonic, Operands		Description	Cycles	14-Bit Opcode MSb			LSb	Status Affected	Notes
		BYTE-ORIENTED FILE REGISTER OPERATIONS							
ADDWF	f, d	Add W and f	1	00	0111	dfff	ffff	C,DC,Z	1,2
ANDWF	f, d	AND W with f	1	00	0101	dfff	ffff	Z	1,2
CLRF	f	Clear f	1	00	0001	lfff	ffff	Z	2
CLRW	-	Clear W	1	00	0001	0xxx	xxxx	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		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		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		
NOP	-	No Operation	1	00	0000	0xx0	0000		
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		1,2
XORWF	f, d	Exclusive OR W with f	1	00	0110	dfff	ffff	Z	1,2

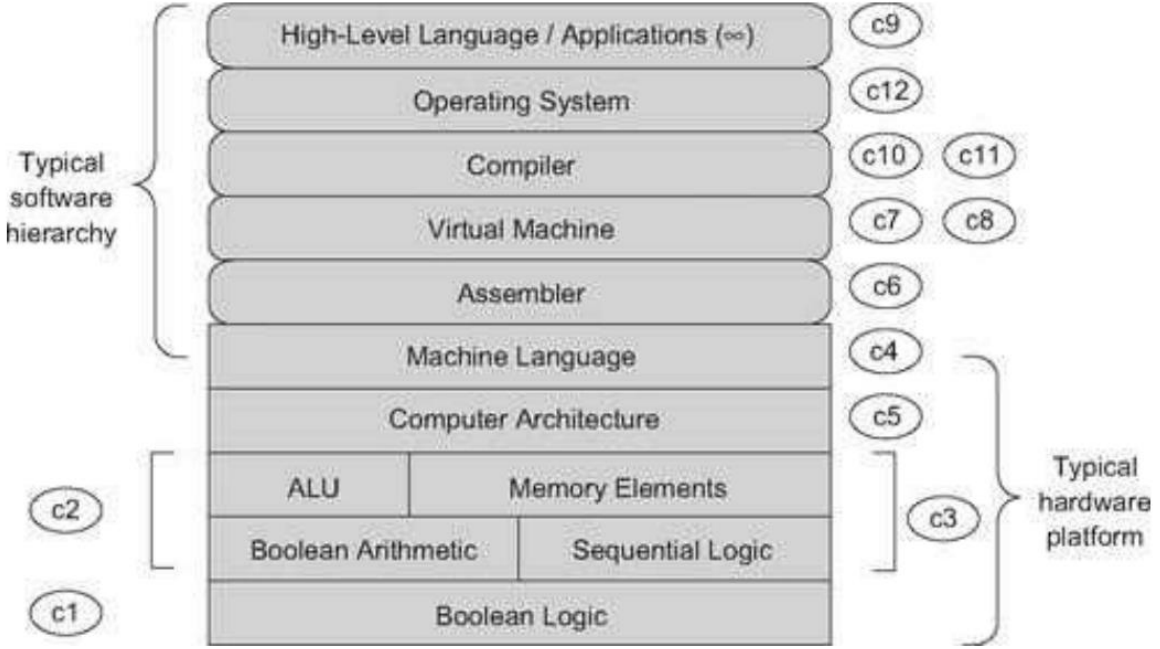
BIT-ORIENTED FILE REGISTER OPERATIONS									
BCF	f, b	Bit Clear f	1	01	00bb	bfff	ffff		1,2
BSF	f, b	Bit Set f	1	01	01bb	bfff	ffff		1,2
BTFSC	f, b	Bit Test f, Skip if Clear	1 (2)	01	10bb	bfff	ffff		3
BTFSS	f, b	Bit Test f, Skip if Set	1 (2)	01	11bb	bfff	ffff		3
LITERAL AND CONTROL OPERATIONS									
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	TO,PD	
GOTO	k	Go to address	2	10	1kkk	kkkk	kkkk		
IORLW	k	Inclusive OR literal with W	1	11	1000	kkkk	kkkk	Z	
MOVLW	k	Move literal to W	1	11	00xx	kkkk	kkkk		
RETFIE	-	Return from interrupt	2	00	0000	0000	1001		
RETLW	k	Return with literal in W	2	11	01xx	kkkk	kkkk		
RETURN	-	Return from Subroutine	2	00	0000	0000	1000		
SLEEP	-	Go into Standby mode	1	00	0000	0110	0011	TO,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	

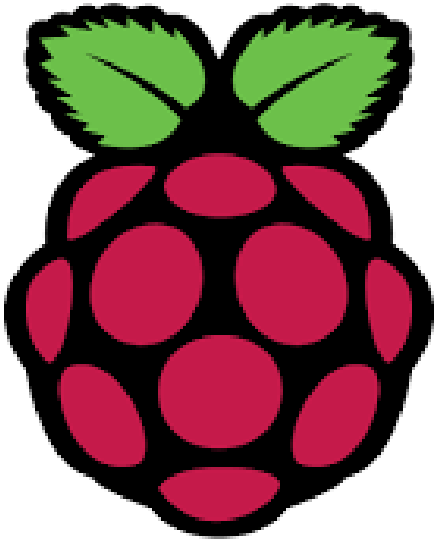
Arquitectura del Computador II

¿Por qué Arqui II?.

Siete tecnologías que están transformando a las industrias




High-Level Language / Applications (∞)
Operating System
Compiler
Virtual Machine
Assembler
Machine Language
Computer Architecture
ALU
Memory Elements
Boolean Arithmetic
Sequential Logic
Boolean Logic
Typical software hierarchy
Typical hardware platform
c1
c2
c3
c4
c5
c6
c7
c8
c9
c10
c11
c12



The Raspberry Pi 3 Model B+ is the final revision in the Raspberry Pi 3 range.

- Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz
- 1GB LPDDR2 SDRAM
- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
- Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
- Extended 40-pin GPIO header
- Full-size HDMI
- 4 USB 2.0 ports
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touchscreen display
- 4-pole stereo output and composite video port
- Micro SD port for loading your operating system and storing data
- 5V/2.5A DC power input
- Power-over-Ethernet (PoE) support (requires separate PoE HAT)

raspberrypi.org/software/

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Got it!

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Raspberry Pi OS

Your Raspberry Pi needs an operating system to work. This is it. Raspberry Pi OS (previously called Raspbian) is our official supported operating system.

Third-party software

Here are some other operating systems you can use with your Raspberry Pi

LibreElec

A Kodi Entertainment Center distribution

Download

Ubuntu Desktop

An open source desktop operating system that's widely used around the world, complete with all the essential applications for home, school, and work

Download

Ubuntu Server

A popular flavour of Linux for cloud and data centre environments

Download

Ubuntu Core

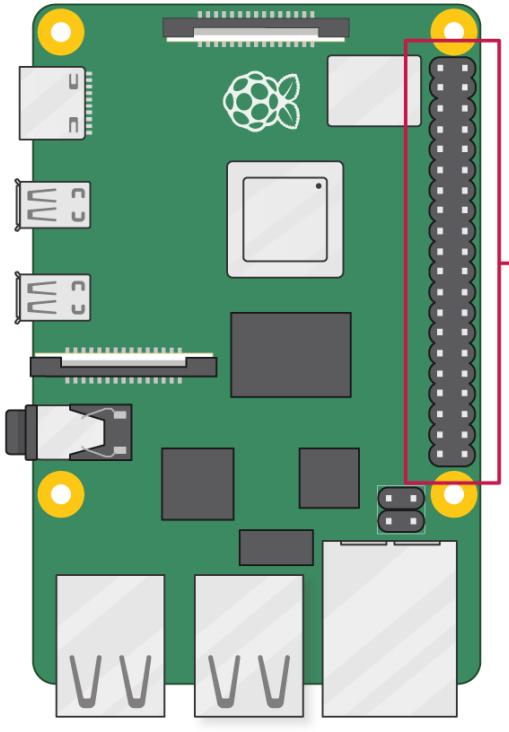
Ubuntu for embedded environments, optimised for security and reliable updates

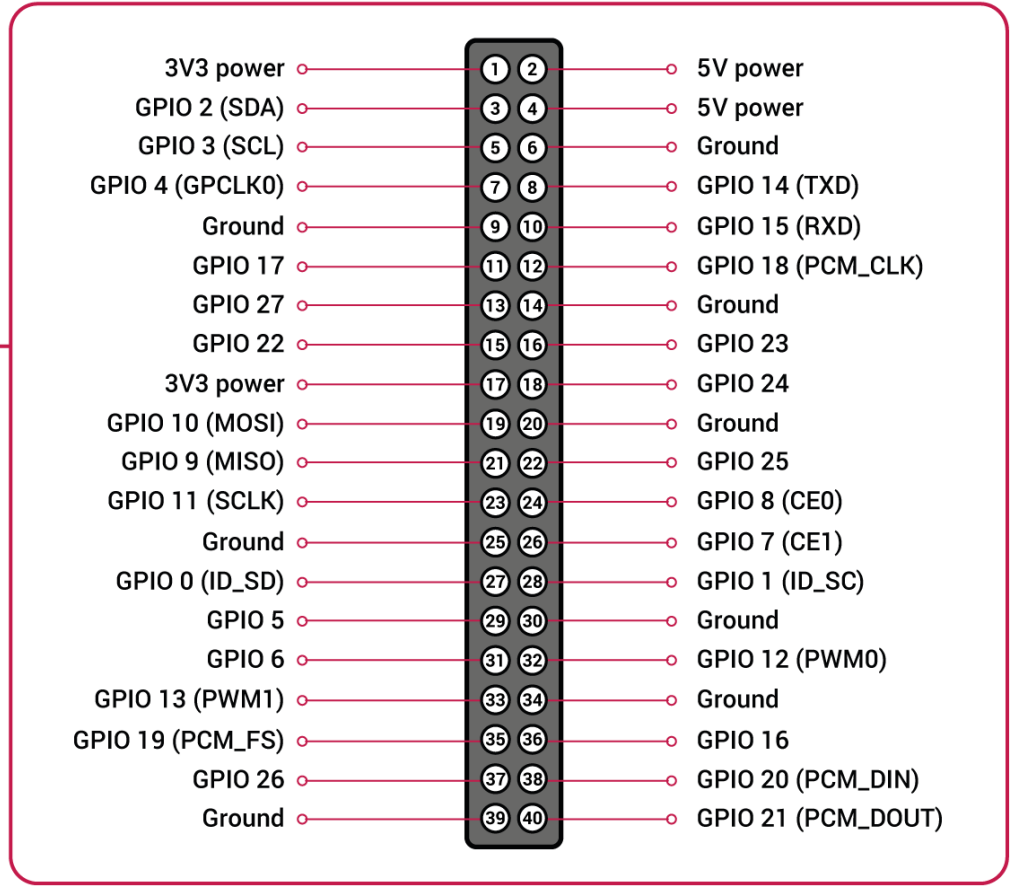
Download

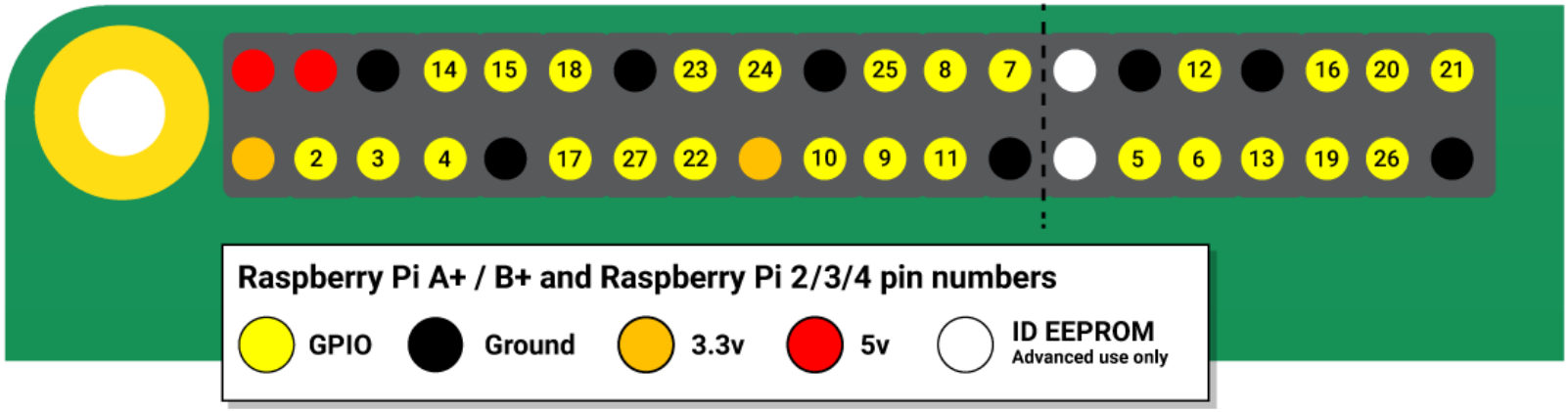
RetroPie

Turn your Raspberry Pi into a retro-gaming machine

Download




3V3 power
GPIO 2 (SDA)
GPIO 3 (SCL)
GPIO 4 (GPCLK0)
Ground
GPIO 17
GPIO 27
GPIO 22
3V3 power
GPIO 10 (MOSI)
GPIO 9 (MISO)
GPIO 11 (SCLK)
Ground
GPIO 0 (ID_SD)
GPIO 5
GPIO 6
GPIO 13 (PWM1)
GPIO 19 (PCM_FS)
GPIO 26
Ground
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
23 24
25 26
27 28
29 30
31 32
33 34
35 36
37 38
39 40
5V power
5V power
Ground
GPIO 14 (TXD)
GPIO 15 (RXD)
GPIO 18 (PCM_CLK)
Ground
GPIO 23
GPIO 24
Ground
GPIO 25
GPIO 8 (CE0)
GPIO 7 (CE1)
GPIO 1 (ID_SC)
Ground
GPIO 12 (PWM0)
Ground
GPIO 16
GPIO 20 (PCM_DIN)
GPIO 21 (PCM_DOUT)



https://www.raspberrypi.org/documentation/usage/gpio/

THANKS!

Any questions?