

Practice 6. Parallel Ports (GPIOs)

Objectives

he student will become familiar with the basic instructions to configure and operate the Microcontroller input/output ports.

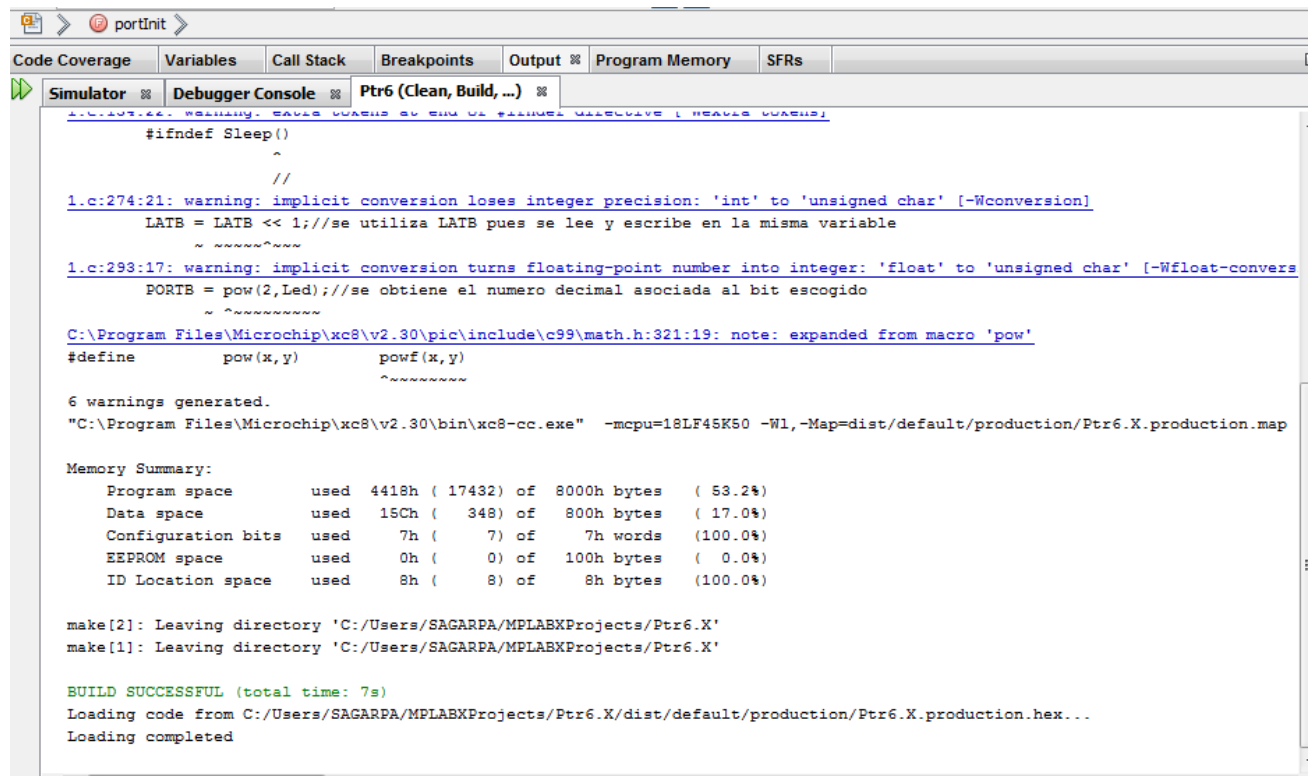
Introduction

Microcontrollers are all around the world. Each day, Microcontrollers, are more present in the many aspects of our lives: in our work, inside our houses, and in more. We can find them controlling small devices like cellphones, microwaves, washing machines, and televisions.

A microcontroller is one device or chip that is used to govern one or more processes. For example, the controller that regulates the room temperature of an air conditioner; it has a sensor that continuously measures the internal temperature and, when the preset limits are exceeded, it generates the necessary signals to adjust the temperature.

Results

Image of the Build successful:



```
portInit >
Code Coverage  Variables  Call Stack  Breakpoints  Output  Program Memory  SFRs
Simulator  Debugger Console  Ptr6 (Clean, Build, ...)
1.c:274:21: warning: implicit conversion loses integer precision: 'int' to 'unsigned char' [-Wconversion]
LATB = LATB << 1; //se utiliza LATB pues se lee y escribe en la misma variable
1.c:293:17: warning: implicit conversion turns floating-point number into integer: 'float' to 'unsigned char' [-Wfloat-convers
PORTB = pow(2,Led); //se obtiene el numero decimal asociada al bit escogido
C:\Program Files\Microchip\xc8\v2.30\pic\include\c99\math.h:321:19: note: expanded from macro 'pow'
#define pow(x,y) powf(x,y)
6 warnings generated.
"C:\Program Files\Microchip\xc8\v2.30\bin\xc8-cc.exe" -mcpu=18LF45K50 -Wl,-Map=dist/default/production/Ptr6.X.production.map

Memory Summary:
Program space      used 4418h ( 17432) of 8000h bytes ( 53.2%)
Data space        used 15Ch ( 348) of 800h bytes ( 17.0%)
Configuration bits used 7h ( 7) of 7h words (100.0%)
EEPROM space      used 0h ( 0) of 100h bytes ( 0.0%)
ID Location space  used 8h ( 8) of 8h bytes (100.0%)

make[2]: Leaving directory 'C:/Users/SAGARPA/MPLABXProjects/Ptr6.X'
make[1]: Leaving directory 'C:/Users/SAGARPA/MPLABXProjects/Ptr6.X'

BUILD SUCCESSFUL (total time: 7s)
Loading code from C:/Users/SAGARPA/MPLABXProjects/Ptr6.X/dist/default/production/Ptr6.X.production.hex...
Loading completed
```

Image of Registers Modifications:

The screenshot shows an IDE with the following C code for the `portInit` function:

```
254 void larsenDisplay(void);  
255  
256 void portInit(void) {  
257     ANSELB = 0;  
     ANSELD = 0;  
     ANSELA = 0;  
     TRISB = 0;  
     TRISD = 255;  
     TRISA = 0;  
264  
265  
266 }
```

Below the code is a table showing the state of various registers:

Address	Name	Hex	Decimal	Binary	Char
	TMR3_Prescale	0x00	0	00000000	','
F57	SRCON1	0x00	0	00000000	','
F58	SRCON0	0x00	0	00000000	','
F59	CCPTMRS	0x00	0	00000000	','
F5B	ANSELA	0x2F	47	00101111	','
F5C	ANSELB	0x3F	63	00111111	','
F5D	ANSELC	0xC4	196	11000100	','
F5E	ANSELD	0xFF	255	11111111	','
F5F	ANSELE	0x07	7	00000111	','
F60	UCON	0x00	0	00000000	','
F61	USTAT	0x00	0	00000000	','
F62	UCFG	0x00	0	00000000	','

The screenshot shows the same IDE with the `portInit` function. A search for `portInit` has been performed, and the results are highlighted in the code. Below the code is a table showing the state of various registers:

```
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256 void portInit(void) {  
257     ANSELB = 0;  
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ANSELB = 0;  
ANSELD = 0;  
ANSELA = 0;  
TRISB = 0;  
TRISD = 255;  
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```

Address	Name	Hex	Decimal	Binary
	TMR3_Prescale	0x00	0	00000000
7	SRCON1	0x00	0	00000000
8	SRCON0	0x00	0	00000000
9	CCPTMRS	0x00	0	00000000
B	ANSELA	0x2F	47	00101111
C	ANSELB	0x00	0	00000000
D	ANSELC	0xC4	196	11000100
E	ANSELD	0x00	0	00000000

```

ANSELB = 0;
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```

portInit

Variable	Variables	Call Stack	Breakpoints	Output
Address /	Name	Hex	Decimal	Binary
	TMR3_Prescale	0x00	0	00000000
	SRCON1	0x00	0	00000000
	SRCON0	0x00	0	00000000
	CCPTMRS	0x00	0	00000000
	ANSELA	0x00	0	00000000

portInit

Variable	Variables	Call Stack	Breakpoints	Output
Address /	Name	Hex	Decimal	Binary
	CCPR2H	0x00	0	00000000
	TRISA	0xFF	255	11111111
	TRISB	0x00	0	00000000

```

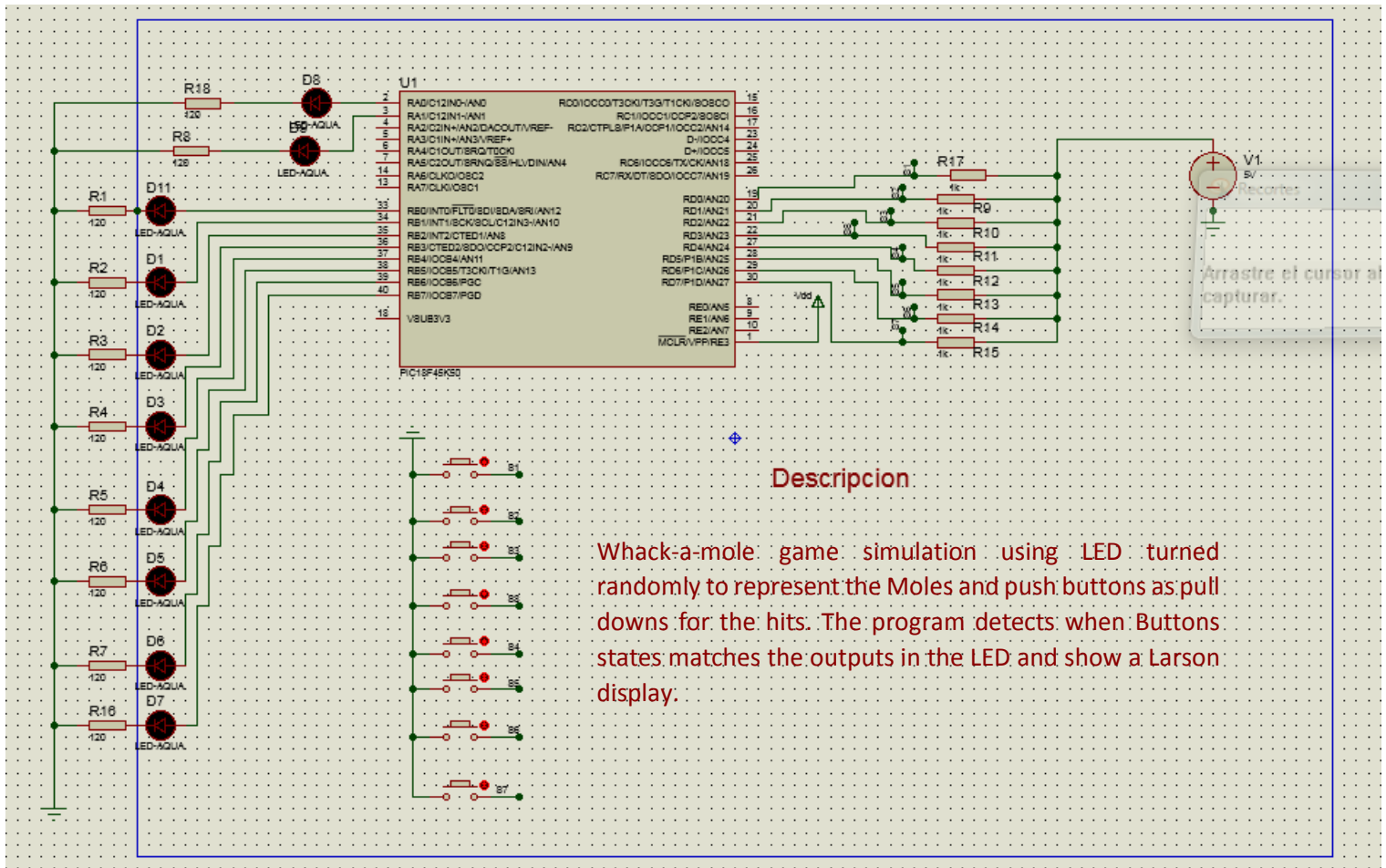
ANSELB = 0;
ANSELD = 0;
ANSELA = 0;
TRISB = 0;
TRISD = 255;
TRISA = 0;

```

main while(1)

Variable	Variables	Call Stack	Breakpoints	Output
Address /	Name	Hex	Decimal	Binary
	CCPR2H	0x00	0	00000000
	TRISA	0x00	0	00000000

Connections made in Proteus with the curiosity Device and minimum card system:



Link to demonstration: <https://youtu.be/LQMtwo2DGqU>

Conclusions:

Despite the low difficulty of the problem, in comparison, it help to understand how ports can be programmed from mlab to manage external devices where it is possible to read information in about them state in time, in order to take a response where certain events are presented, comprehending it as the way the microcontroller communicates whit its environment . Furthermore it is more clear know the difference between PORT and LAT having a better perspective of what process is followed when reading or writing a port.