

'-----Title-----'

' File.....adc3.pbp
' Started....1/8/08
' Microcontroller used: Microchip Technology PIC16F88
' microchip.com
' PicBasic Pro Code: micro-Engineering Labs, Inc.
' melabs.com

'-----Program Description-----'

' The program uses one of the analog-to-digital
' converters,(AN4), to measure the voltage
' on the center pin of a potentiometer (an analog signal).
' It then converts the analog voltage into an 10-bit
' digital value and displays the result as a
' voltage (0-5V) on an LCD.

'-----Schematic-----'

' See schematic at:
' http://www.cornerstonerobotics.org/schematics/pic_programming_adc1.pdf

'-----Related Lesson-----'

' adc3.pbp is used in the lesson Resistive Sensors at:
' http://www.cornerstonerobotics.org/curriculum/lessons_year2/erii23_resistive_sensors.pdf

'-----PIC Connections-----'

16F88 Pin	Wiring
RA0	LCD pin 11(DB4)
RA1	LCD pin 12(DB5)
RA2	LCD pin 13(DB6)
RA3	LCD pin 14(DB7)
RA4	Center Lead of Potentiometer
RB4	LCD Register Select(RS)
RB3	LCD Enable(E)

' See schematic for the other usual PIC connections

'-----LCD Connections-----'

LCD Pin	Wiring
1	Ground(Vss)
2	+ 5v(Vdd)
3	Center of 20K Pot(Contrast)
4	RB4(Register Select,RS)
5	Ground(Read/Write,R/W)
6	RB3(Enable)
7	No Connection(DB0)
8	No Connection(DB1)
9	No Connection(DB2)

```

'          10          No Connection(DB3)
'          11          RA0(DB4)
'          12          RA1(DB5)
'          13          RA2(DB6)
'          14          RA3(DB7)

'-----Constants/Defines-----

' To free up AN4 (Pin RA4) for an analog input, the
' default LCD Register Select function must be
' removed from RA4. This is relocated to PORTB.4
' using the LCD DEFINE statements below. All other
' default LCD pins and functions are left unchanged.
' For details see:
' http://www.cornerstonerobotics.
org/curriculum/lessons_year2/erii16_lcd3_pot_command_and_lcd_defines.pdf
' or
' Look around page 97 in the PicBasic Pro Compiler Manual.
' The PicBasic Pro Compiler Manual is on line at:
' http://www.microengineeringlabs.com/resources/index.htm#Manuals

DEFINE LCD_RSREG      PORTB  ' PORTB - RS port for LCD
DEFINE LCD_RSBIT     4       ' Bit 4 - RS bit for LCD
DEFINE ADC_BITS      10      ' Sets the number of bits in
                               ' the result to 10

'-----Variables-----

x          VAR WORD      ' Word (16-bits) for potentiometer input
temp_int   VAR WORD      ' Word for integer
temp_fract VAR WORD      ' Word for fraction

'-----Initialization-----

ANSEL = %00010000          ' Leaves AN4 in analog mode, but
                            ' changes other analog bits to digital.
                            ' See table below.

'
'   Analog Bit      Analog or Digital      PIC16F88 Pin
'   -----
'   AN0             Digital                 RA0
'   AN1             Digital                 RA1
'   AN2             Digital                 RA2
'   AN3             Digital                 RA3
'   AN4             Analog                  RA4
'   AN5             Digital                 RB6
'   AN6             Digital                 RB7

' For the ANSEL Register table, look at the
' PIC16F88 Datasheet. For Microchip PIC DATASHEETS, see:
' http://www.microchip.
com/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=2046
' Select 8-bit PIC Microcontrollers, then the device from the
' drop down menu. Now download the 16F88 Datasheet.

```

' The ANSEL Register is Register 12-1: ANSEL Register,
' look around page 113 in the 16F88 datasheet.

```
ADCON1 = %10000000      ' Right justifies 10-bit value of x
                        ' in 16-bit WORD. Adds "0" in the
                        ' 6 Most Significant bits of the Word,
                        ' shifting the 10-bit value of x to
                        ' the right. This changes the LCD
                        ' values to 0 - 1023.
```

' The ADCON1 Register is Register 12-3: ADCON1 Register,
' look around page 115 in the 16F88 datasheet.

```
OSCCON = $60            ' Sets the internal oscillator in the
                        ' 16F88 to 4 MHz
```

'-----Main Code-----'

```
PAUSE 1000              'Pause to allow LCD to setup
```

loop:

```
ADCIN 4, x              'Read analog voltage on AN4 and
                        'convert to 10-bit digital value
                        'and store as x.
```

```
LCDOUT $FE,1,"POT = ", DEC x 'Clears LCD screen, displays
                        '"POT = " and the 10-bit value of x
```

```
x = x * 49/10
```

```
temp_int = x/1000
```

```
temp_fract = x//1000
```

```
LCDOUT $FE,$c0,"Voltage = ",DEC temp_int, ".", DEC3 temp_fract
```

```
PAUSE 500              'Pause 1/2 second
```

```
GOTO loop              'Go to loop label
```

```
END
```