

## '-----Title-----

' File.....signed\_num1.pbp  
' Started....4/25/08  
' Microcontroller used: Microchip Technology PIC16F88  
' microchip.com  
' PBPro Code, micro-Engineering Labs, Inc.  
' melabs.com

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

' This program displays signed numbers in  
' PicBasic Pro in an output range of values -50.0 to +50.0.  
' The input is a 10-bit digital range of 0 to 1023.

## '-----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	Resistive Input
RB3	LCD Enable(E)
RB4	LCD Register Select(RS)

' See schematic for the usual 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 (RS) 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.  
' See Curriculum Year 2, Lesson LCD3, POT Command and

' LCD DEFINES on this web site for more details.

```

DEFINE LCD_RSREG    PORTB    ' PORTB - RS port
DEFINE LCD_RSBIT    4        ' Bit 4 - RS bit

```

```

DEFINE ADC_BITS    10      ' Sets the number of bits in
                               ' the result to 10

```

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

```

x            VAR WORD      ' BYTE for potentiometer input
temp_int     VAR WORD      ' WORD for temporary interger, temp_int
temp_fract   VAR WORD      ' WORD for temporary fraction, temp_fract

```

'-----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

```

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.

```

```

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

```

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

loop:

```

PAUSE 1000          ' 1 second pause to allow LCD to setup

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

```

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LCDOUT $FE,1,DEC x  ' On first line, display 10-bit
                       ' value of x

```

```

x = x * 44/45         ' Begin converting 10-bit input range,
                       ' (0 - 1023), to LCD output range

```

```
      '(-50.0 - 50.0).
      ' Output Range/Input Range = 100/1023
      ' = 0.09775. Must use whole number
      ' numerator for calculation. Numerator
      ' must be less than 65 since
      ' 65 * 1023 > 65535, the limit for WORD
      ' variable. Found that 44/45 = 0.9777
      ' approximates the significand of 0.09775.
      ' The shift in the decimal point is done
      ' in the next formula.

temp_int = x/10 - 50      ' Get integer portion. Divide by 10 to
                        ' shift decimal point from 0.9777 to
                        ' 0.09777. Subtract 50 to shift 0 - 100
                        ' output range to -50.0 - 50.0.

temp_fract = x//10      ' Get the remainder portion

LCDOUT $FE,$c0,SDEC temp_int, ".", DEC1 temp_fract
      ' On the second LCD line, display the integer
      ' portion of x, temp_int, as a signed decimal
      ' (SDEC) and the remainder portion of x,
      ' temp_fract, as a decimal.

PAUSE 250              ' Pause 250 ms

GOTO loop              ' Jump to loop label

END
```