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'-----Title-----
' File.....sonar1.pbp
' Started....5/4/06
' Microcontroller used:  Microchip Technology 16F88
'                          microchip.com
' PicBasic Pro Code:  micro-Engineering Labs, Inc.
'                          melabs.com

'-----Program Description-----
' Using the Devantech SRF04 ultrasonic range finder,
' the distance from the range finder to an object
' is displayed on an LCD screen in inches.

'-----Schematic-----
' See schematic at:
' http://cornerstonerobotics.org/schematics/pic\_programming\_sonar1.pdf

'-----Related Lesson-----
' sonar1.pbp is used in the lesson Ultra Sonic Sensor at:
' http://cornerstonerobotics.org/curriculum/lessons\_year2/erii24\_ultra\_sonic\_sensor.pdf

'-----New PicBasic Pro Commands-----
' The PicBasic Pro Compiler Manual is on line at:
' http://www.microengineeringlabs.com/resources/index.htm#Manuals
' PULSIN Pin,State,Var
' Pulse width is measured on Pin.
' If State = 0, width of low pulse is measured
' and assigned to variable Var.
' Is State = 1, width of high pulse is measured
' and assigned to variable Var.
' Look around page 120 in the PicBasic Pro Compiler Manual

'-----Revision History-----
' 11/25/08 Convert from PIC16F84A to PIC16F88,
' add PIC16F88 oscillator and ANSEL = 0 initializations.

'-----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                LCD Register Select(RS)
'      RB0                SRF04 Emitter
'      RB1                SRF04 Echo
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'          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          RA4(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-----

conv_to_inches  CON 15          ' Assigns the value 15 to the
                               ' constant conv_to_inches

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

emit    VAR PORTB.0          ' Pin RB0 assigned the name emit
echo    VAR PORTB.1          ' Pin RB1 assigned the name echo
dist_raw VAR WORD           ' Defines dist_raw as a WORD
                               ' variable
dist_inch VAR WORD          ' Defines dist_inch as a WORD
                               ' variable

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

TRISB = %00000010          ' Sets PORTB.1 (echo) as input,
                               ' all other PORTB pins as outputs

ANSEL = 0                  ' Configure all pins to digital
                               ' operation since not using ADC
                               ' (Analog to Digital Converter)

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

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

start:                      ' start label
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PULSOUT emit,1           ' Pulse Width:
                          ' Sends a pulse out on pin RB0 (emit)
                          ' for 10 usec. The period,(1) is
                          ' multiplied by the increment for
                          ' a 4 MHz oscillator(10 usec)
                          ' to get a pulse out time of 10 usec.

PULSIN echo,1,dist_raw  ' Measures the pulse width on pin RB1
                          ' (echo) and assigns the reading to the
                          ' variable dist_raw.

dist_inch = (dist_raw/conv_to_inches) ' Converts raw sonar reading
                          ' to inches.

LCDOUT $FE,1,"Dist.in inch." ' Clears LCD screen, displays
                          ' "Dist. in inch."

LCDOUT $FE,$14,#dist_inch  ' Moves cursor over one space,
                          ' displays value of the variable
                          ' dist_inch

PAUSE 10                ' Pause 10 milliseconds

GOTO start

END
```