```
'--------------Title-------------

' File......16F877A_sonar1.pbp
' Started....5/4/06
' Microcontroller used:  Microchip Technology 16F877A
'                          microchip.com
' PicBasic Pro Code: micro-Engineering Labs, Inc.
'                     melabs.com

'--------Program Desciption--------

' 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/pic16f877a_sonar1.pdf

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

' sonar1.pbp (the 16F88 program) 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
' 1/20/09  Convert from PIC16F88 to PIC16F877A

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

'       16F877A 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
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'        RB1                 SRF04 Echo
'        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

    PORTB = %00000000            ' Sets all PORTB pins to LOW(0 volts)


'------------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
```