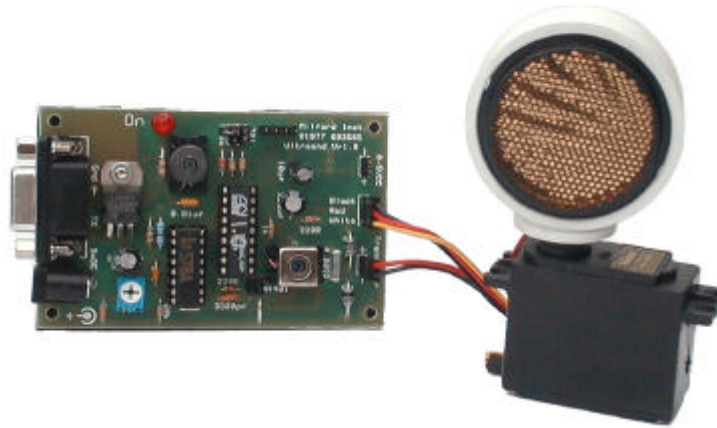


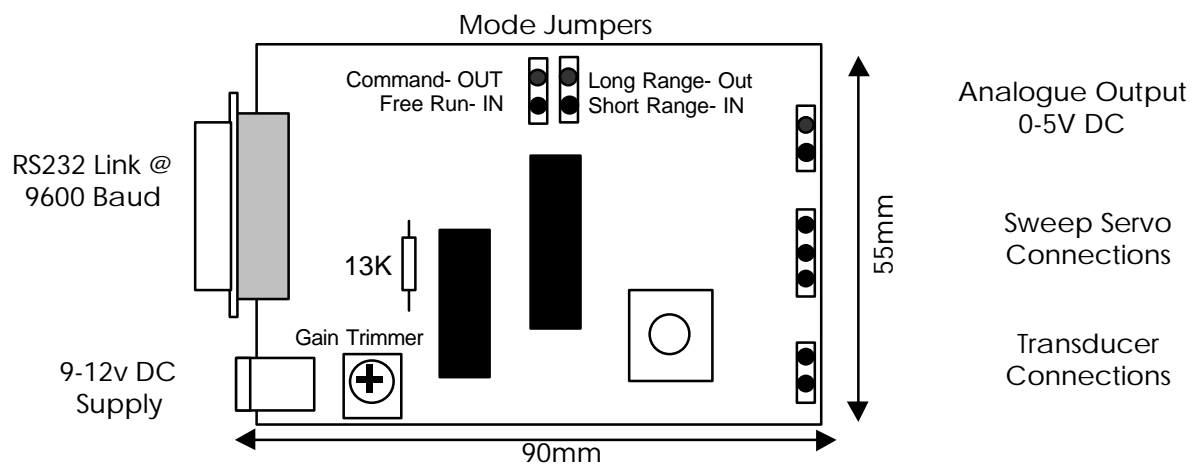
UltraSound Module, Part Number 5-120



Overview

The UltraSound module provides an easy way to incorporate a Polaroid Ultrasonic system into your project. Unlike the standard Polaroid modules, it provides an easy-to use RS232 serial interface making it ideal for use with computers and microprocessors. The maximum range can be set to one of two settings: in short range mode it will measure distances from 0.15m up to 2.6m with a resolution of 10mm, and in long range mode, distances up to 10m with a resolution of 42mm. The module returns distance-measured information both as a 1-byte variable and as an analogue 0-5vDC voltage. Suitable Windows driver software may be downloaded from our web site.

Board Layout and Connections



D-9 Serial Link- connects to your PC serial port or other processor. Receives command data and returns

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results at 9600 baud.

DC Supply Socket- accepts 9-12v DC supplies at 500mA, centre contact positive.

Analogue Output- High Impedance analogue version of measured distance; range 0-5vDc corresponding to a range value of 0-2.6m

Sweep Servo Connections- generates servo sweep signals, typically moving the servo through a 90° arc (may be changed using supplied PC software). Signal, +5vDC and Ground connections.

Transducer Connections- Contact points for the Polaroid Transducer- note that the transducer is polarised and must be connected with the + terminal to the +ve pin.

Mode Jumpers-

JP1: Jumper in for short range (ie up to 2.6m0, out for long range (up to 10m)

JP2: Jumper in for free running mode, jumper out for command mode

Run Modes

The Ultrasound Module will operate in one of two run modes- free-running and command.

Command Mode- the module waits for a 2-byte command string - "T", <servo position>

Servo position may vary between 0 and 255 corresponding to a servo movement of 180°. Note that the default movement is set to 90 ° since most servos are only rated for a 90° sweep. If you intend to drive the servo more than this angle, check it isn't hitting its internal stops otherwise it may be damaged.

Once the command string has been received, the module drives the servo to the required position, takes a distance measurement and returns the result as a one byte number representing the measured distance- in short range, each unit represents 10.5mm, in long range, each unit represents 42mm. The module continues to hold the servo in the last specified position until a new command is received.

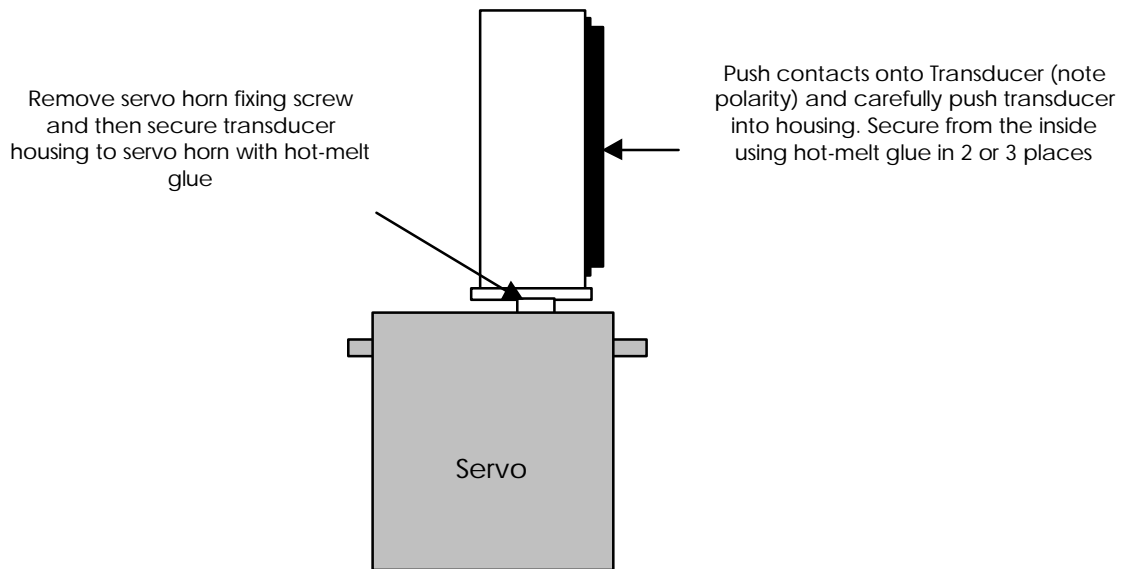
Free-Running Mode- the module continuously scans through 90°, takes distance measurements and returns the result via the serial link.

Long Range Use

The gain of the analogue circuit is set to work best in short range mode. You can improve the long range performance by increasing the overall gain. Do this by changing the 13K (brown-orange-black-red) sited closed to the 5v regulator. Increasing the value (to a maximum of 47K) will increase the long range gain but will also increase the weaker echos from smaller- but nearer objects. We have found 22k to be a good compromise value. The small potentiometer (behind the power socket) may be used to trim the gain- turn clockwise to increase the gain. You may have to experiment to find the best combination for your particular application.

The returned echo signals can be viewed with a 'scope connected to pin11 of the 16F628 chip. The detector circuit acts on the first echo signal it sees greater than 1.8v.

Assembling the Transducer Head



Check the transducer connection polarity - the tab on the centre bar is the +ve connection, the tab on the outer rim the -ve connection.

PC Software- Operation

Download and install the Sonar software from our web site: www.milinst.com.

Run the software and enter the required serial port connection. Connection should be by modem type (ie NOT INVERTED) 9-pin serial cable.

If you elect to write your own PC software bare in mind that you must send a 2-byte command string such as <T><servo position> ie to move the head to position 121 and take a reading you would send <84><121> or in ASCII <T><y>. You would NOT send the 4-bytes: <T><1><2><1>

Under the View heading, it is possible to select either a linear display or radial display. In addition it is possible to select either Normal or Inverse display options depending on which view you think is more appropriate.

In either view, the display shows clear space in front of the transducer- obstructed space is shown in blue colour.

The servo steep size and sweep angle may be selected by dragging the appropriate sliders. Take care not to exceed the servo's physical sweep limits if you elect for a total sweep angle greater than 90°.

The displayed distances are shown based on a velocity of sound of 300m/sec. This value may be adjusted to suit local conditions.

Note that the display may shift slightly between the forward and return sweeps- this is due to the rounding error of dividing the available sweep angle by the selected steps.

Distances less than 150mm will not be displayed- after sending its transmission pulses, the transducer is switched off for a period of time corresponding to a distance to target of 150mm. This is to allow the transducer to cease ringing after the pulses have been sent.

Best results are obtained with reflections from hard objects perpendicular to the transducer. Soft objects (ie

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clothes) may absorb the sound pulses and oblique objects reflect the sound away from the transducer (just like a mirror does to light) thereby creating a false impression of open space in front of the transducer. This is particularly true in the long range mode- the unit will only see a good sized, hard target that has its reflecting surface perpendicular to the incoming sonic pulse.

Beam width information on the transducer is available for download from our web site.

BASIC Stamp2 Control

The included diskette includes specimen code for use with the Parallax BASIC Stamp2 microcontroller.

```
'Ultratest.bs2
'This BS2 programme is used to test ultrasounds
'Milford Instruments- Feb 2000
'Connect pin9 to the RX line (pin 3 on the D-9 connector)
'and pin 10 to the TX line (pin 2 on the D-9)
'Ensure Ultrasound is in command mode.

counter var      byte
echo            var      word
counter2        var      byte
start:
  debug cls                      'clear the PC screen
  for counter=60 to 190 step 2    'rotation of servo
  serout 9,16468,["T",counter]    'command the servo and ping
  serin 10,16468,200,noecho1,[echo] 'get the result into echo

noecho1:
  debug dec counter-60           'display the results
  for counter2= 0 to echo/10     'in the form of a bar graph
  debug "*"
  next
  debug cr
  next

  debug cls                      'and back
  for counter=190 to 60 step 2
  serout 9,16468,["T",counter]
  serin 10,16468,200,noecho2,[echo]
noecho2:
  debug dec counter-60
  for counter2= 0 to echo/10
  debug "*"
  next
  debug cr
  next

  goto start
```

**Keep fingers away from the transducer during operation.
The pulses are at a voltage of 200V and can give a jolt!**