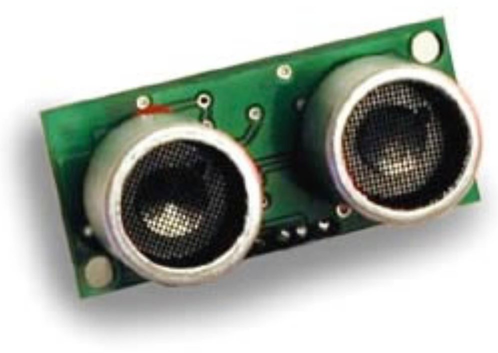
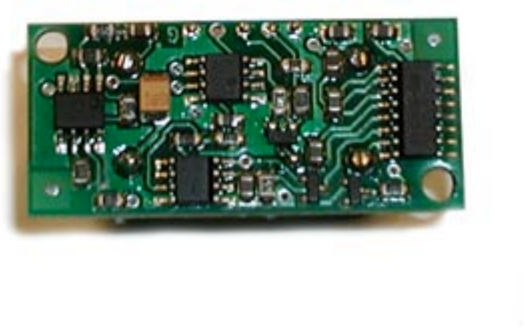
Devantech SRF04 Ultrasonic Ranger





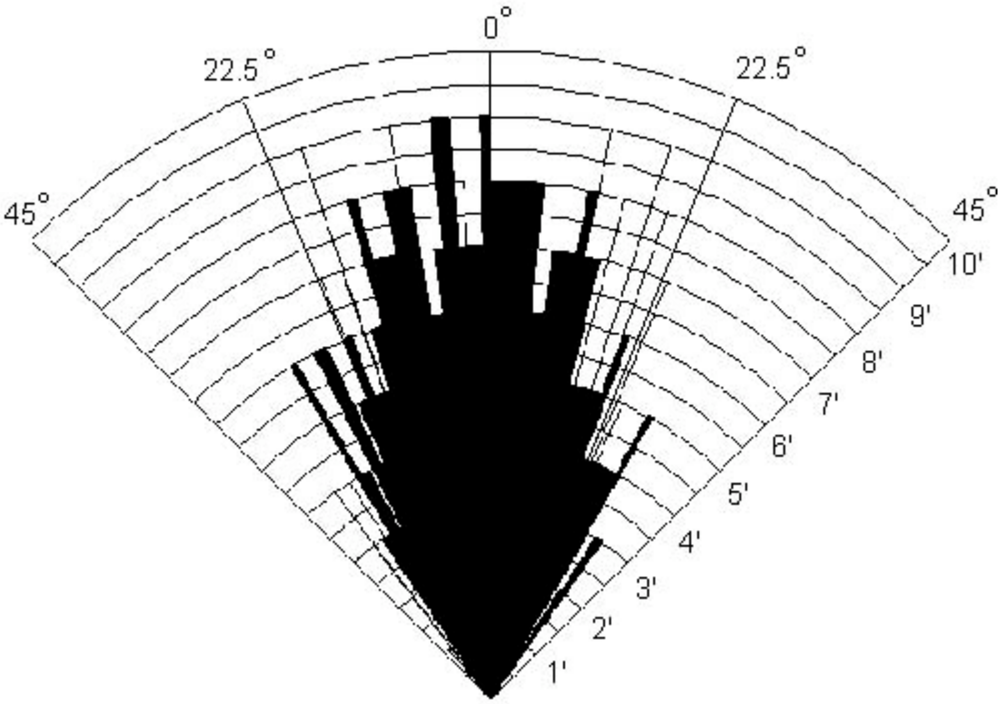
This high performance ultrasonic range finder is compact and measures an amazingly wide range from 3cm to 3m. This ranger is a perfect for your robot or any other projects requiring accurate ranging information.

Specifications

Beam Pattern	see below
Voltage	5v
Current	30mA Typ. 50mA Max
Frequency	40KHz
Maximum Range	3 m
Minimum Range	3 cm
Sensitivity	Detect a 3cm diameter stick at > 2 m
Input Trigger	10uS Min. TTL level pulse
Echo Pulse	Positive TTL level signal, width proportional to range.
Weight	0.4 oz.
Size	1.75" w x 0.625" h x 0.5" d

Specifications subject to change without notice

Beam Pattern



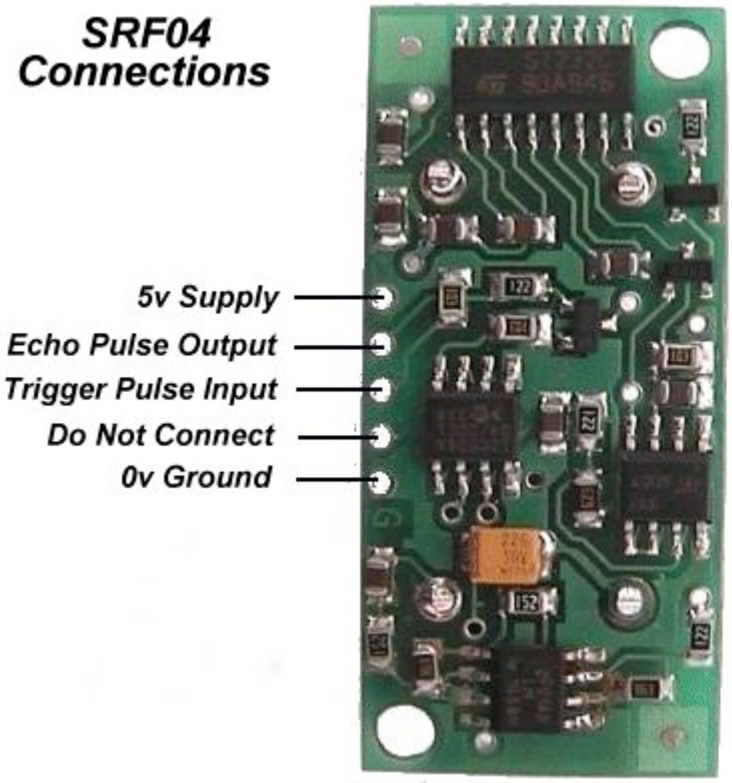
Theory of Operation

The ranger works by transmitting a pulse of sound outside the range of human hearing. This pulse travels at the speed of sound (roughly 0.9 ft/msec) away from the ranger in a cone shape and the sound reflects back to the ranger from any object in the path of this sonic wave. The ranger pauses for a brief interval after the sound is transmitted and then awaits the reflected sound in the form of an echo. The controller driving the ranger then requests a ping, the ranger creates the sound pulse, and waits for the return echo. If received, the ranger reports this echo to the controller and the controller can then compute the distance to the object based on the elapsed time.

Connections

We have many programs using the OOPic with the SRF04 with the Trekker. Also, Devantech has examples using the SRF04 module with a wide range of popular controllers.

Want to know the history of this little module, and even more information?

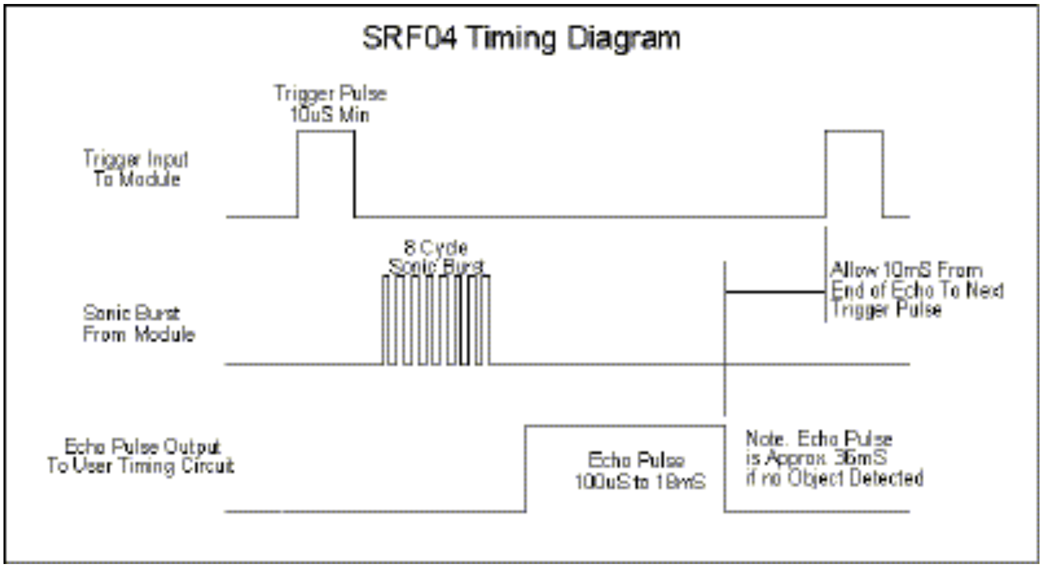


The ranger requires four connections to operate. First are the power and ground lines. The ranger requires a 5V power supply capable of handling roughly 5OmA of continuous output. The remaining two wires are the signal wires. The connections can be made by soldering wire leads to the board or header pins/sockets.

Basic Timing

There are a couple of requirements for the input trigger and output pulse generated by the ranger. The input line should be held low (logic 0) and then brought high for a minimum of 10usec to initiate the sonic pulse. The pulse is generated on the falling edge of this input trigger. The ranger's receive circuitry is held in a short blanking interval of 100usec to avoid noise from the initial ping and then it is enabled to listen for the echo. The echo line is low until the receive circuitry is enabled. Once the receive circuitry is enabled, the falling edge of the echo line signals either an echo detection or the timeout (if no object echo is detected).

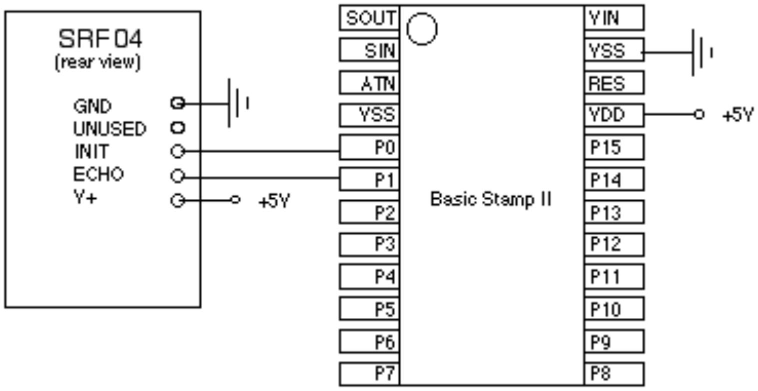
Your controller will want to begin timing the falling edge of your trigger input and end timing on the falling edge of the echo line. This duration determines the distance to the first object the echo is received from.



Interface Example

This example demonstrates the SRFO4 interface to a Basic Stamp II. Interfacing with the OOPic is a lot easier! For an OOPic example follow this link.

This example uses the Basic Stamp II carrier board and debug output capability to take continuous readings from the SRFO4 and display them in the debug console of the Stamp development environment.



Example; Code:

```
' Devantec SRFO4/Basic Stamp II Example
wDist    var    word
INIT     con     1

' CONVERSION FACTORS
' The PULSIN command returns the round-trip
'echo time in 2us units which is equivalent to
' the one-way trip time in 1 us units
' distance = (echo time)/ conversion factor)
' use 74 for inches
' use 29 for centimeters

convfac    con    74     'use inches

main
   gosub sr_sonar
   debug dec wDist,cr
   pause 200
   go to main

sr_sonar:
   pulsout INIT, 5                    '10us pulse
   pulsin ECHO,l,wDist wDist        'measure echo time
   wDist/convfac                      'convert to inches
   pause 10
   return

sr_sonar_2:
   pulsout INIT, 5                     '10us init pulse
   output INT                          'dummy command (delay)
   rctime ECHO,l,wDist                 'measure echo time
   wDist = wDist/convfac             'convert to inches
   pause 10
return
```

The execution time of the pulsin instruction will be slightly different for different pins. If you change the pin assignments, the pulsin command in the sr_sonar subroutine listed above may miss the rising edge of the ECHO input and return some readings of O. Using rctime instead of pulsin may fix this problem. Another trick is to introduce a small delay with a dummy command before measuring the echo time with the rctime command. This is illustrated in the alternate subroutinesr_sonar_2. You may need to experiment to determine the best code for your application. Or just use the OOPic and skip all this mess!