Cyperbolic Reflector Manual
Revision 2, 10/23/10

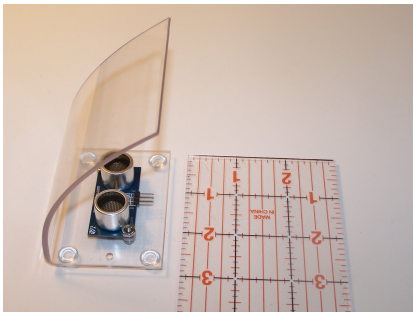
Purpose

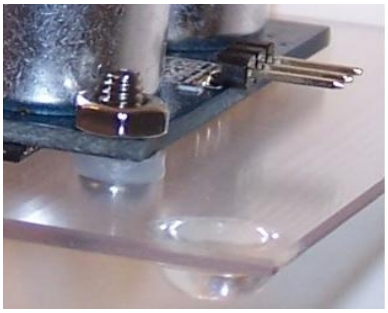
The unique Cyperbolic Reflector enhances the performance of acoustic distance sensors by focusing the sound coming to and from the sensor in the one dimension. This has the combined effect of increasing the amount of sound hitting the target as well as gathering more of the reflected sound onto the sensor.

Included Hardware

2 4-40x 3/8 machine screws
2 4-40 nuts
2 plastic washers
4 soft plastic stick on bumper feet

Assembly with a PING))) Sensor (sold seperately)





A PING))) sensor can be mounted to the reflector using the provided screws, nuts and plastic washers via the 2 inner holes in the reflector base.

(Remove blue protective film from back of reflector before assembly)

Standalone Assembly

1) Place the screws through inner screw holes from the bottom of the reflector base.
2) Put the plastic washer on the screws on the top side of the base. This provides the space needed for the components on the back side of the PING))).
3) Mount the PING))) onto the screws using its corner mounting holes.
4) Place a nut on each screw and tighten by turning the screw. This is easier than turning the nut.
5) Optional - Place the plastic bumper feet in each corner on the bottom of the reflector base.
6) Optional – Mount the reflector/PING))) using the 2 remaining holes in the reflector base.

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Combined PING)))/Reflector Mounting (not shown)
Another option is to fasten the reflector and PING))) to another object by placing screws through the PING))) and the reflector and into the object. You will still need the washers to space the PING))) from the reflector. This technique will generally require longer screws (not supplied). The plastic feet are not needed for this option.

Theory of Operation

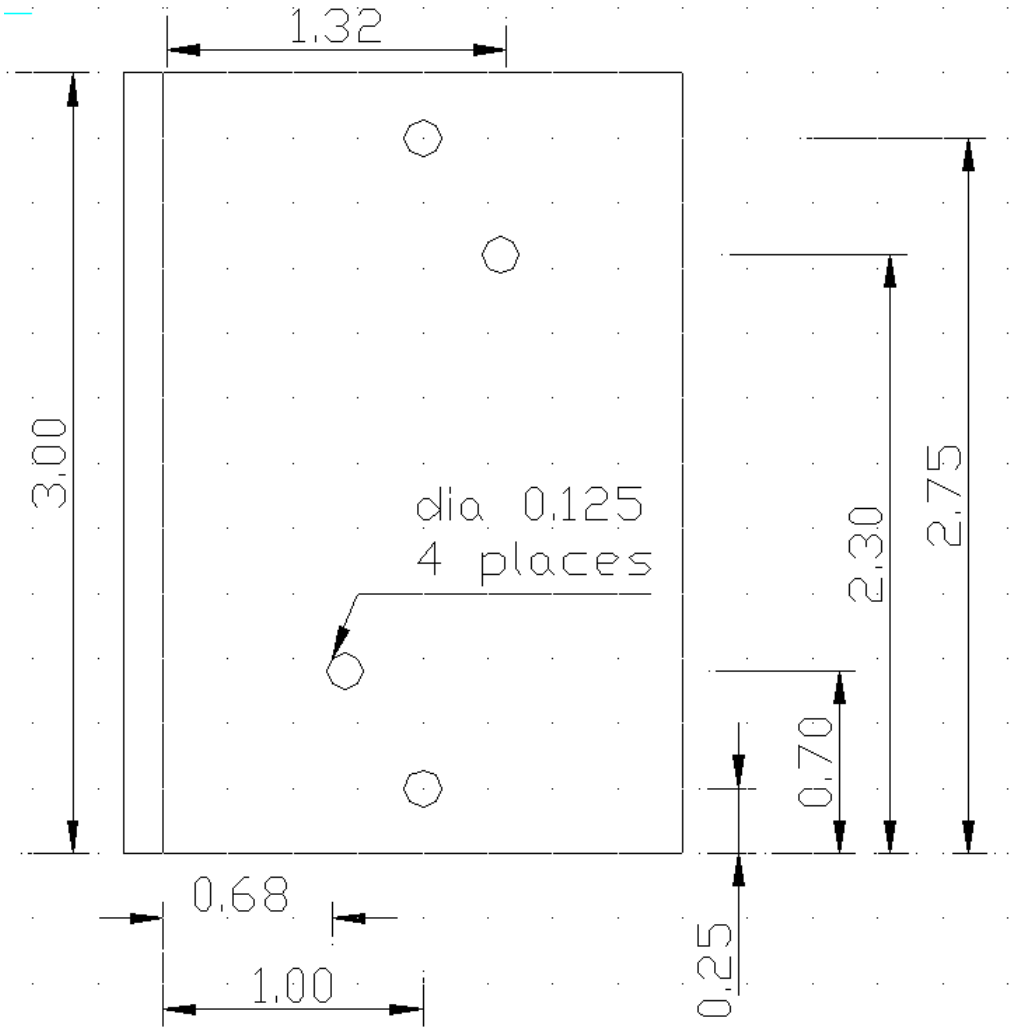
The Cyperbolic Reflector is formed in the shape of a cylindrical parabola. This shape is flat in the horizontal direction and parabolic in the vertical direction. This shape has a focus that is a line instead of the point of a circular parabolic reflector. This feature allows the separate transmitter and receiver of the PING))) to both be at the focus of the reflector. This would not be possible if the focus were a point.

With the PING))) placed at the focus of the parabola the sound transmitted from the PING))), which is rapidly spreading out, hits the reflector and is reflected parallel to the reflector base, no matter where it hits the reflector. This concentrates the acoustic beam in front of the reflector by greatly reducing how fast the beam spreads out vertically. This delivers more sound onto targets that are at the same level as the reflector.

In a similar way, sound returning to reflector traveling parallel to the base hits the reflector and is reflected to the focus line where the PING))) sensor is located. This greatly increases the amount of reflected sound that hits the receiving sensor. Being flat horizontally the reflector does not change the spread of the acoustic beam in that direction. This allows the sensor to still detect objects that are off to the sides of the reflector.

To make best use of the PING))) transmitter and receiver, which both have maximum performance on their central axis, the Cyperbolic Reflector was designed with the PING))) not pointing down the axis of the parabola as is often done with microphone reflectors. By avoiding this configuration the PING))) does not block itself from using the optimal part of it's receiver and transmitter. In addition the receiver does not get any direct reflections of the transmitter off of the reflector which would cause consistent false triggers.

PING))) is a trademark of Parallax Inc



Base Dimensions