MaxBotix®
High Performance Ultrasonic Range Finders

MaxSonar Quick-Start Guide

This is provided to serve as an easy to use set-up guide for the LV-MaxSonar-EZ family of ultrasonic sensors. This sensor uses sound to measure the distance to nearby objects, and then reports the information through one of the three sensor outputs.

MaxBotix Inc., is excited to provide this guide which is designed to assist you in using your MaxSonar sensor for the first time!

This quick start guide was created using the LV-MaxSonar-EZ1 MB1010 sensor.

List of Commonly Used Equipment:

1. Power Supply
2. Multimeter
3. Wires
4. LV-MaxSonar-EZ1 (or one of the other MaxSonar products)
5. Large flat target – such as a box

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Determine the Power and Ground Inputs & Outputs

The following chart is provided as an easy reference guide for connecting our MaxSonar products.

Usually Found On...	Ground	Power
LV-MaxSonar-EZ1 (MB1010)	GND	+5
Power Source / Multimeter	" – " symbol	" + " symbol
Wires	Black Wires (typically)	Red Wires (typically)

Supply Power to the Sensor

1. Disconnect the power supply from any equipment.
2. Turn ON the power supply; set the voltage to 5.0V DC (Volts Direct Current).
3. Turn OFF the power supply.
4. Connect the ground from your power supply to the GND pin on the LV-MaxSonar-EZ1.
5. Connect your power supply to +5 pin on the LV-MaxSonar-EZ1.
6. Turn ON the power supply; verify that the voltage is between +2.5V and +5.5V.

The LV-MaxSonar-EZ1 input power should be +5V DC. This system can operate from +2.5V to +5.5V. The current input should read ~3mA for +5V DC and ~2mA for +3.3V DC.

Connect to the AN Output

Connect the AN pin (Analog Voltage) to a multimeter by doing the following:

1. Switch the multimeter to read DC voltage.

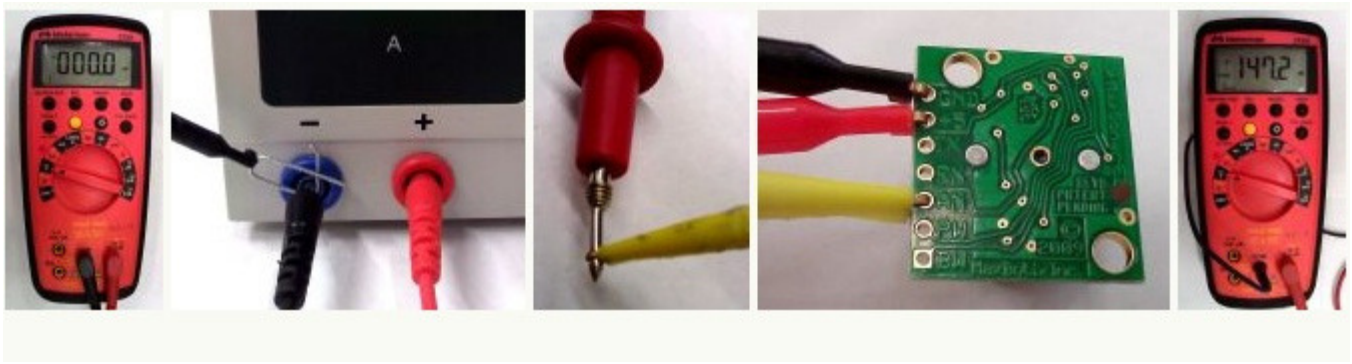
2a. Connect the ground lead of the multimeter to the ground on your power supply.

or

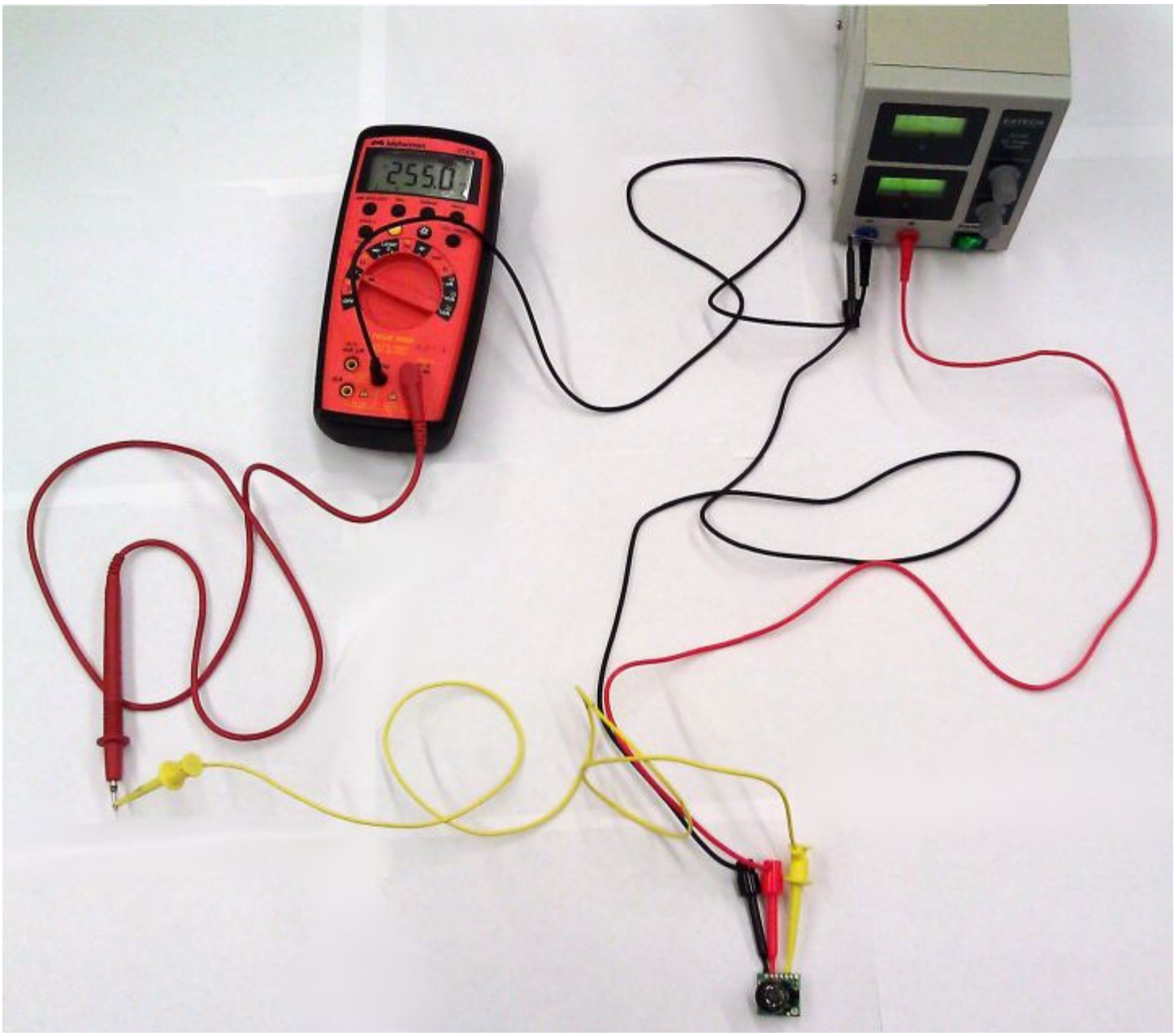
2b. Connect the ground lead of the multimeter to the GND pin of the LV-MaxSonar-EZ1. (To do this we used a paperclip attached to the ground of our power supply).

3. Connect the power lead of the multimeter to the pin labeled AN on the LV-MaxSonar-EZ1. (To do this we used the yellow banana clips to run from the AN pin to the multimeter probe).

4. The display should read the voltage output of the LV-MaxSonar-EZ1.



A Picture of Our Setup



Read the AN Output Using a Multimeter

A Brief Description of the AN pin.

The analog voltage pin outputs a voltage which corresponds to the distance. The further away an object is from the sensor the higher the output voltage becomes which in turn will be measured by the multimeter. The sensor is designed to report the range to the closest detectable object.

Calculating the Voltage Scaling

Because the LV-MaxSonar-EZ1 output is scaled to the input power that is provided to the sensor, it is important to know the voltage scaling before calculating the range.

The formula for the voltage scaling on an LV-MaxSonar-EZ1 is:
[(Vcc/512) = Vi]
Vcc = Supplied Voltage
Vi = Volts per inch (Scaling)

Example 1: Say you have an input voltage of +5.0V the formula would read:
[(5.0V/512) = 0.009766V per inch = 9.766mV per inch]

Calculating the Range

Once you know the voltage scaling it is easy to properly calculate the range.

The range formula is:
[(Vm/Vi) = Ri]
Vm = Measured Voltage
Vi = Volts per Inch (Scaling)
Ri = Range in inches

Example 2: To get comfortable with this equation use a known distance by using a ruler. Say the multimeter shows 292.98mV then you use the calculations as follows:
[(292.98mV/9.766mV) = 30 inches]

Example 3: To work backward and verify your calculation is correct use the inverse formula:
[(Ri x Vi) = Vm] [(30 x 9.766) = 292.98]

Additional Considerations

Please note that if you are using a sensor from the HR-MaxSonar, XL-MaxSonar-EZ, XL-MaxSonar-AE, XL-MaxSonar-WR, or XL-MaxSonar-WRC series the voltage scaling will not match that of the LV-MaxSonar sensors. To find the voltage scaling of your sensor reference the product datasheet.

Analog Voltage scaling for all of our product lines can be seen in our Using Analog Voltage (Pin 3) tutorial. This tutorial also includes examples for using the Analog Voltage output, as well as integrating with a 10-bit Analog Digital Converter.

Please note the sensor resolution, for the LV-MaxSonar-EZ1 the resolution is one inch.

The LV-MaxSonar-EZ will, in general, range objects from 0 to 6 inches as 6 inches. Which corresponds to 58.6mV when powered at +5V DC.

The LV-MaxSonar-EZ provides range for objects up to 254 inches away. Sensor will report the closest detectable reflection from an object as defined by the sensor beam pattern. You may view the beam pattern for the LV-MaxSonar-EZ here.

Connect the LV-MaxSonar-EZ to a Microcontroller

1. It is recommended that you first connect the LV-MaxSonar-EZ to either an oscilloscope or a multimeter before you connect the LV-MaxSonar-EZ to a microcontroller for the first time.

2. Connect the microcontroller input pin to the desired LV-MaxSonar-EZ sensor output pin.
3. For the AN pin, the following code example is provided for reference: BasicX Code Example

Read the AN pin (Analog Voltage) with a Microcontroller

1. Ensure proper microcontroller voltage scaling.
2. Ensure proper voltage scaling of the LV-MaxSonar-EZ.
3. Use the proper formula for calculating the distance from the voltage that is read. Reference the sensor datasheet.

Please note: If you are using a microcontroller to read the AN output there is a strong possibility that the microcontroller has internal voltage scaling.