

Identifying Issues and Solutions when using MaxBotix Inc., Ultrasonic Sensors

While most users just connect and use our sensors, if a difficulty arises, this paper was written to help. If having trouble getting the sensors to work, first start with only one sensor. If you suspect that your source code might be an issue, please use a voltmeter to read the AN output.

1) First - Start with a single sensor and this simple test. This test can help in two ways. First, it is designed to help verify if the sensor is operating properly. Second, if you are experiencing unstable readings it can help determine the type of noise interference the may be experiencing.

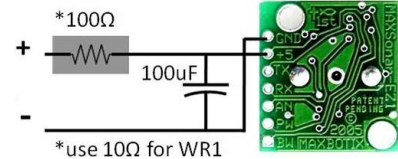
- 1) Turn the sensor off.
- 2) Place a piece of tape over the sensor face. Almost any tape type will work well, but cover the whole front face of the sensor. (See picture)
- 3) Next, power up the sensor.
- 4) Read the AN output with a voltmeter. You should measure a stable voltage about one half the supply voltage (i.e. about 2.5V when powered with a 5V supply, or about 1.6 volts is using a 3.3V supply).



Unstable readings generally indicate an electrical noise issue (or a mechanical vibration issue). If the voltage reading is correct (about one-half the supply voltage) jump to “Third” below and continue.

2) Second - Eliminate Electrical Noise (if any)

Electrical noise on power supply	All outputs	Add filtering to power.
Electrical *interference	All outputs	Add filtering to power.
Outside toggling of sensor pins	All outputs	While ranging do not toggle sensor pins.



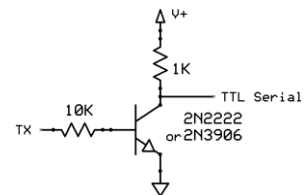
3) Third - Eliminate Mechanical Vibration or Acoustical Noise (if any)

Vibration *from mounting	All outputs	Use foam mounting instead of hard mounting.
Other 35KHz-45KHz acoustical noises*	All outputs	Isolate or remove other acoustical noise sources.

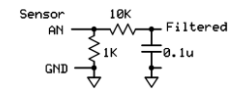
*Some motors can cause both electrical and mechanical noise.

4) Fourth – Get your desired output working. For starters we suggest using a large *hard flat target about 36-inches away, (*not a carpeted floor). **Also please first verify the 1st through 3rd items above!**

Erroneous TX data is output	TX Output	The TX output polarity is RS232, not TTL. Use an inverter; a MAX232 or a simple inverter will convert to TTL polarity.
-----------------------------	-----------	--



Unstable AN data is output	AN Output	Filter the AN output. (Can use up to a 10µF to allow averaging.)
----------------------------	-----------	--



5) Fifth - Optimize Sensor for your Application & Target

Target size too small	All outputs	Possibly use a more sensitive sensor (For example if using an EZ2 switch to an EZ1, or EZ0)
Target is flat and hard, but off axis	All outputs	The specular nature of ultrasonic waves requires that a flat hard target be on axis
Off axis targets are getting ranged	All outputs	Possibly use a less sensitive sensor (For example if using an EZ2 switch to an EZ3, or EZ4)
Target surface is soft	All outputs	Possibly use a more sensitive sensor (For example if using an EZ2 switch to an EZ1, or EZ0)
Target surface is uneven	All outputs	The human body for example can reflect energy from many areas with clothing causing apparent changes in measured distance. An EZ1 or EZ0 (or WR1) is recommended when ranging people.

6) Sixth – Add sensors as or if needed *Please verify the 1st through 4th items above first.*

Readings are unstable	All outputs	Use a recommended chaining method
-----------------------	-------------	-----------------------------------

7) Seventh – We also offer email and phone support for our products, so if this doesn't help, please contact us.