Applications and Uses

- UAV blimps, micro planes, and some helicopters
- Bin level measurement
- Proximity zone detection
- People detection
- Robot ranging sensor
- Autonomous navigation
- Environments with acoustic and electrical noise
- Multi-sensor arrays
- Distance measuring
- Long range object detection
- Wide beam sensitivity
- Users who prefer to process the analog voltage envelope (MB1300)

The MB1200 and MB1300 have a new high power output along with real-time auto calibration for changing conditions (temperature, voltage and acoustic or electrical noise) that ensure you receive the most reliable (in air) ranging data for every reading taken. The MB1200 and MB1300 low power 3.3V to 5V operation provides very short to long-range detection and ranging, in a tiny and compact form factor. The MB1200 and MB1300 detect objects from 0-cm* to 765-cm (25.1 feet) and provides sonar range information from 20-cm out to 765-cm with 1-cm resolution. Objects from 0-cm* to 20-cm typically range as 20-cm. (*Objects from 0-mm to 1-mm may not be detected.) The interface output formats included are pulse width output (MB1200), real-time analog voltage envelope (MB1300), analog voltage output, and serial digital output.

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<tr>
<th>Features</th>
<th>Benefits</th>
<th>Applications and Uses</th>
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<tr>
<td>High acoustic power output</td>
<td>Acoustic and electrical noise resistance</td>
<td>UAV blimps, micro planes, and some helicopters</td>
</tr>
<tr>
<td>Real-time auto calibration and noise rejection for every ranging cycle</td>
<td>Reliable and stable range data</td>
<td>Bin level measurement</td>
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<tr>
<td>Calibrated beam angle</td>
<td>Sensor dead zone virtually gone</td>
<td>Proximity zone detection</td>
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<td>Continuously variable gain</td>
<td>Low cost</td>
<td>People detection</td>
</tr>
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<td>Object detection as close as 1-mm from the sensor</td>
<td>Quality controlled beam characteristics</td>
<td>Robot ranging sensor</td>
</tr>
<tr>
<td>3.3V to 5V supply with very low average current draw</td>
<td>Very low power range finder suited for multiple sensor or battery based systems</td>
<td>Autonomous navigation</td>
</tr>
<tr>
<td>Readings can occur up to every 100mS, (10-Hz rate)</td>
<td>Ranging can be triggered externally or internally</td>
<td>Environments with acoustic and electrical noise</td>
</tr>
<tr>
<td>Free run operation can continually measure and output range information</td>
<td>Sensor reports the range reading directly, frees up user processor</td>
<td>Multi-sensor arrays</td>
</tr>
<tr>
<td>Triggered operation provides the range reading as desired</td>
<td>Fast measurement cycle</td>
<td>Distance measuring</td>
</tr>
<tr>
<td>All interfaces are active simultaneously</td>
<td>User can choose any of the sensor outputs</td>
<td>Long range object detection</td>
</tr>
<tr>
<td>Serial, 0 to Vcc, 9600Baud, 81N</td>
<td>No power up calibration is required</td>
<td>Wide beam sensitivity</td>
</tr>
<tr>
<td>Analog, (Vcc/1024) / cm</td>
<td>Perfect for when objects may be directly in front of the sensor during power up</td>
<td>Users who prefer to process the analog voltage envelope (MB1300)</td>
</tr>
<tr>
<td>Pulse Width (MB1200)</td>
<td>Easy mounting</td>
<td>-40°C to +65°C operation (+85°C limited operation)</td>
</tr>
<tr>
<td>Real-time analog envelope (MB1300)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor operates at 42KHz</td>
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</table>
175mS after power-up, the XL-MaxSonar® is ready to begin ranging. If Pin-4 is left open or held high (20μS or greater), the sensor will take a range reading. The XL-MaxSonar® checks Pin-4 at the end of every cycle. Range data can be acquired once every 99mS. Each 99mS period starts by Pin-4 being high or open, after which the XL-MaxSonar® calibrates and calculates for 20.5mS, and after which, thirteen 42KHz waves are sent.

Then for the MB1200, the pulse width (PW) Pin-2 is set high. When an object is detected the PW pin is set low. If no target is detected the PW pin will be held high for up to 44.4mS (i.e. 58μS * 765cm) (For the most accurate range data, use the PW output of the MB1200 product.)

For the MB1300 with analog envelop output, Pin-2 will show the real-time signal return information of the acoustic waveform. For both parts, the remainder of the 99mS time (less 4.7mS) is spent adjusting the analog voltage to the correct level, (and allowing the high acoustic power to dissipate). During the last 4.7mS, the serial data is sent.

Each time before the XL-MaxSonar® takes a range reading it calibrates itself. The sensor then uses this data to range objects. If the temperature, humidity, or applied voltage changes during sensor operation, the sensor will continue to function normally. The sensor does not apply compensation for the speed of sound change versus temperature to any range readings.
MB1200 & MB1300 Real-time Noise Rejection

While the XL-MaxSonar® is designed to operate in the presence of noise, best operation is obtained when noise strength is low and desired signal strength is high. Hence, the user is encouraged to mount the sensor in such a way that minimizes outside acoustic noise pickup. In addition, keep the DC power to the sensor free of noise. This will let the sensor deal with noise issues outside of the users direct control (in general, the sensor will still function well even if these things are ignored). Users are encouraged to test the sensor in their application to verify usability.

For every ranging cycle, individual filtering for that specific cycle is applied. In general, noise from regularly occurring periodic noise sources such as motors, fans, vibration, etc., will not falsely be detected as an object. This holds true even if the periodic noise increases or decreases (such as might occur in engine throttling or an increase/decrease of wind movement over the sensor). Even so, it is possible for sharp non-periodic noise sources to cause false target detection. In addition, *(because of dynamic range and signal to noise physics,) as the noise level increases, at first only small targets might be missed, but if noise increases to very high levels, it is likely that even large targets will be missed.

*In high noise environments, if needed, use 5V power to keep acoustic signal power high. In addition, a high acoustic noise environment may use some of the dynamic range of the sensor, so consider a part with less gain such as the MB1210/MB1310, MB1220/MB1320 MB1230/MB1330 or MB1240/MB1340. For applications with large targets, consider a part with ultra clutter rejection like the MB7092.

MB1200 & MB1300 Beam Characteristics

The MB1200 and MB1300 have a wide and long sensitive beam that offers excellent detection of objects and people. The MB1200 and MB1300 balances the detection of objects and people with minimal side-lobes. Sample results for measured beam patterns are shown to the right on a 30-cm grid. The detection pattern is shown for dowels of varying diameters that are placed in front of the sensor:
(A) 6.1-mm (0.25-inch) diameter dowel,
(B) 2.54-cm (1-inch) diameter dowel,
(C) 8.89-cm (3.5-inch) diameter dowel,

MB1200 & MB1300 Mechanical Dimensions

<table>
<thead>
<tr>
<th>A</th>
<th>0.785&quot;</th>
<th>19.9mm</th>
<th>L</th>
<th>0.735&quot;</th>
<th>18.7mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0.870&quot;</td>
<td>22.1mm</td>
<td>M</td>
<td>0.065&quot;</td>
<td>1.7mm</td>
</tr>
<tr>
<td>C</td>
<td>0.100&quot;</td>
<td>2.54mm</td>
<td>N</td>
<td>0.038&quot;</td>
<td>0.9mm</td>
</tr>
<tr>
<td>D</td>
<td>0.100&quot;</td>
<td>2.54mm</td>
<td>P</td>
<td>0.537&quot;</td>
<td>13.64mm</td>
</tr>
<tr>
<td>E</td>
<td>0.670&quot;</td>
<td>17.0mm</td>
<td>Q</td>
<td>0.304&quot;</td>
<td>7.72mm</td>
</tr>
<tr>
<td>F</td>
<td>0.610&quot;</td>
<td>15.5mm</td>
<td>R</td>
<td>0.351&quot;</td>
<td>8.92mm</td>
</tr>
<tr>
<td>G</td>
<td>0.124&quot;</td>
<td>3.1mm</td>
<td>S</td>
<td>0.413&quot;</td>
<td>10.5mm</td>
</tr>
<tr>
<td>H</td>
<td>0.100&quot;</td>
<td>2.54mm</td>
<td>T</td>
<td>0.063&quot;</td>
<td>1.6mm</td>
</tr>
<tr>
<td>J</td>
<td>0.989&quot;</td>
<td>25.11mm</td>
<td>U</td>
<td>0.368&quot;</td>
<td>9.36mm</td>
</tr>
<tr>
<td>K</td>
<td>0.645&quot;</td>
<td>16.4mm</td>
<td>V</td>
<td>0.492&quot;</td>
<td>12.5mm</td>
</tr>
</tbody>
</table>

values are nominal
Weight, 5.9 grams
Typical Performance to Targets

**Analog Envelope Output (Dowels, 5V)**

- **Transmit Burst**
- **Targets**
- **TA = 20°C, Vcc = 5V**
- Real-time on Pin 2 of MB1300 (or MB1200 internal)
- Targets = 0.6cm dia. at 66cm, 2.5cm dia. at 111cm, 8.9cm dia. at 189cm, and a 1m by 2m flat panel at 704cm
- First target ranges at ~66cm.
- Conditions = acoustic test chamber

**Analog Envelope Output (Dowels, 3.3V)**

- **Transmit Burst**
- **Targets**
- **TA = 20°C, Vcc = 3.3V**
- Real-time on Pin 2 of MB1300 (or MB1200 internal)
- Targets = 0.6cm dia. at 66cm, 2.5cm dia. at 111cm, 8.9cm dia. at 189cm, and a 1m by 2m flat panel at 704cm
- First target ranges at ~66cm.
- Conditions = acoustic test chamber

**Typical Performance in Clutter**

**Analog Envelope Output (Clutter, 5V)**

- **Transmit Burst**
- **Target**
- **TA = 20°C, Vcc = 5V**
- Real-time on Pin 2 of MB1300 (or MB1200 internal)
- Target = 30cm sq. at 2 meters.
- Conditions = 1.5 meter wide hallway with cluttered sides.
- Clutter ranges at ~100cm.
- Object clutter from many objects at the sides of the 1.5 meter wide hallway. (Side clutter is detected.)

**Analog Envelope Output (Clutter, 3.3V)**

- **Transmit Burst**
- **Target**
- **TA = 20°C, Vcc = 3.3V**
- Real-time on Pin 2 of MB1300 (or MB1200 internal)
- Target = 30cm sq. at 2 meters.
- Conditions = 1.5 meter wide hallway with cluttered sides.
- Clutter ranges at ~100cm.
- Object clutter from many objects at the sides of the 1.5 meter wide hallway. (Side clutter is detected.)

Product / specifications subject to change without notice. For more info visit www.maxbotix.com