# ParkSonar®-EZ Sensor Series

## High Performance Ultrasonic Proximity Parking Sensor

**MB1001, MB1002, MB1005, MB1006, MB1007, MB1008, MB1009**

The ParkSonar-EZ sensor is a high performance ultrasonic proximity sensor designed for parking garage car detection that allows for simultaneous operation of multiple sensors in one environment. The ParkSonar-EZ sensor, with 2.5V to 5.5V power, provides proximity detection of objects out to a set distance, in an incredibly small package. The ParkSonar-EZ sensor allows users to integrate several sensors into one system and experience little to no effect from the sensor interference than can occur with other ultrasonic sensor solutions. ParkSonar-EZ sensor features an easy to use logic level (high/low) output, and RS232 format serial output. *Factory calibration and testing is standard.*

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Proximity vehicle detection</td>
<td>• Very low-cost proximity sensor</td>
<td><strong>1</strong> Depends on sensor mounting. (For example hundreds can be on the same floor of a parking garage.)</td>
</tr>
<tr>
<td>• Simultaneously runs along side other nearby sensors</td>
<td>• Simultaneously use up to 14+ sensors in the same environment</td>
<td><strong>2</strong> Contact sales at <a href="mailto:info@maxbotix.com">info@maxbotix.com</a></td>
</tr>
<tr>
<td>• ~10 second object acquire time</td>
<td>• Reliable proximity information</td>
<td></td>
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<tr>
<td>• ~5 second object release time</td>
<td>• Sensor doubles as a rangefinder (reports range information over serial)</td>
<td></td>
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<tr>
<td>• Range information available on Pin 5 to 254 inches</td>
<td>• Very low power proximity sensor, excellent for multiple sensor or battery based systems</td>
<td></td>
</tr>
<tr>
<td>• 2.5V to 5.5V supply with 2mA typical current draw</td>
<td>• Continuously gives output which frees up user processors</td>
<td></td>
</tr>
<tr>
<td>• Interfaces are simultaneously active</td>
<td>• User can choose either of the two sensor outputs</td>
<td></td>
</tr>
<tr>
<td>• Serial, 0 to Vcc, 9600 Baud, 81N</td>
<td>• Runs automatically or can be triggered externally</td>
<td></td>
</tr>
<tr>
<td>• Digital logic High/Low (True/False) output</td>
<td>• Fast measurement cycle</td>
<td></td>
</tr>
<tr>
<td>• Continuously variable gain for side lobe suppression</td>
<td>• Quality beam characteristics</td>
<td></td>
</tr>
<tr>
<td>• Free run operation continually measures and outputs proximity information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sensor operates at 42KHz</td>
<td></td>
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</tbody>
</table>

## About Ultrasonic Sensors

Our ultrasonic sensors are in air, non-contact object detection and ranging sensors that detect objects within an area. These sensors are not affected by the color or other visual characteristics of the detected object. Ultrasonic sensors use high frequency sound to detect and localize objects in a variety of environments. Ultrasonic sensors measure the time of flight for sound that has been transmitted to and reflected back from nearby objects. Based upon the time of flight, the sensor then outputs a range reading.

## Close Range Operation

Applications requiring 100% reading-to-reading reliability should not use MaxSonar sensors at a distance closer than 6 inches. Although most users find MaxSonar sensors to work reliably from 0 to 6 inches for detecting objects in many applications, MaxBotix Inc., does not guarantee operational reliability for objects closer than the minimum reported distance. Because of ultrasonic physics, these sensors are unable to achieve 100% reliability at close distances.

## Warning: Personal Safety Applications

We do not recommend or endorse this product be used as a component in any personal safety applications. This product is not designed, intended or authorized for such use. These sensors and controls do not include the self-checking redundant circuitry needed for such use. Such unauthorized use may create a failure of the MaxBotix Inc. product which may result in personal injury or death. MaxBotix Inc., will not be held liable for unauthorized use of this component.
ParkSonar-EZ Pin Out

**Pin 1-BW** - Unused, leave disconnected or connect to circuit common ground.

**Pin 2-PW** - Digital Proximity Logic, outputs a High/Low logic voltage level depending on proximity detection. High means an object has been detected in the detection zone. Low means no object is present. There is a ~10 second delay on acquiring targets and a ~5 second delay for releasing a target once detected. This hysteresis improves sensor reliability.

**Pin 3-AN** - Unused, leave disconnected or connect to circuit common ground.

**Pin 4-RX** - This pin is internally pulled high. Leave the pin disconnected or hold the pin high for proximity information. Hold low to stop all sensor activity. Upon returning to a high state, the sensor will begin ranging normally and reinitiate the 10-second delay for acquiring targets.

**Pin 5-TX** - The TX output delivers asynchronous serial with an RS232 format, except voltages are 0-Vcc. If a target is detected at 8 inches the output appears as follows: “R008 P1<carriage return>”. The output is an ASCII capital “R”, followed by three ASCII character digits representing the range in inches up to a maximum of 255, followed by an ASCII space and the ASCII character “P”, followed by one ASCII digit “1 or 0” corresponding to the proximity information, followed by a carriage return. Range information is provided for reference. Although the voltage of 0-Vcc is outside the RS232 standard, most RS232 devices have sufficient margin to read 0-Vcc serial data. If standard voltage level RS232 is desired, invert, and connect an RS232 converter such as a MAX232.

**Pin 6 - +5V- Vcc** – Operates on 2.5V - 5.5V. Recommended current capability of 3mA for 5V, and 2mA for 3V.

**Pin 7 - GND** - Return for the DC power supply. GND (& Vcc) must be ripple and noise free for best operation.

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**Mechanical Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.785&quot; 19.9 mm</td>
</tr>
<tr>
<td>B</td>
<td>0.870&quot; 22.1 mm</td>
</tr>
<tr>
<td>C</td>
<td>0.100&quot; 2.54 mm</td>
</tr>
<tr>
<td>D</td>
<td>0.100&quot; 2.54 mm</td>
</tr>
<tr>
<td>E</td>
<td>0.870&quot; 17.0 mm</td>
</tr>
<tr>
<td>F</td>
<td>0.510&quot; 12.6 mm</td>
</tr>
<tr>
<td>G</td>
<td>0.124&quot; 3.1 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>0.100&quot; 2.54 mm</td>
</tr>
<tr>
<td>J</td>
<td>0.610&quot; 15.5 mm</td>
</tr>
<tr>
<td>K</td>
<td>0.645&quot; 16.4 mm</td>
</tr>
<tr>
<td>L</td>
<td>0.735&quot; 18.7 mm</td>
</tr>
<tr>
<td>M</td>
<td>0.065&quot; 1.7 mm</td>
</tr>
<tr>
<td>N</td>
<td>0.038&quot; 1.0 mm</td>
</tr>
</tbody>
</table>

**Sensor Minimum Distance**

The minimum reported distance is 6 inches (15.2 cm) for the range information provided on the serial output of the sensor.

**Range “0” Location**

The ParkSonar-EZ sensor reports the range to distant targets from the front of the sensor as shown in the diagram below.

The range is measured from front of the sensor.

Target detection has been characterized in the sensor beam patterns.
Using Multiple Sensors in a Single System

The ParkSonar-EZ sensor is designed to function alongside other ultrasonic sensors operating in the same space, at the same time, on the same frequency. Each ParkSonar-EZ sensor is tolerant of approximately 14 or more nearby sensors, depending on sensor mounting and environment. Our industry leading firmware allows users to connect multiple sensors across a single space without worrying about sensor interference (cross-talk). Each sensor is rated to work alongside a number of sensors within a closed space. For users working with large open environments or environments where sensors point in different directions, or are spaced every 8 – 10 feet the recommended number of sensors will have little or no effect on user performance. For densely placed sensors, user testing for sensor interference is recommended.

ParkSonar-EZ Trigger Distance

Each of the ParkSonar-EZ sensors has a set trigger distance. Objects closer than this distance that fall within the sensor detection zone can be detected and reported to the end user. The detection zone of each sensor is provided in the chart below for easy comparison.

The chart below shows the value of the trigger distance of the full serial output. Reference Pin 5 description on page 2 of this datasheet.

<table>
<thead>
<tr>
<th>Part #</th>
<th>Set Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB1001</td>
<td>~6 feet (Value of R072*)</td>
</tr>
<tr>
<td>MB1002</td>
<td>~7 feet (Value of R084*)</td>
</tr>
<tr>
<td>MB1005</td>
<td>~8 feet (Value of R096*)</td>
</tr>
<tr>
<td>MB1006</td>
<td>~9 feet (Value of R108*)</td>
</tr>
<tr>
<td>MB1007</td>
<td>~10 feet (Value of R120*)</td>
</tr>
<tr>
<td>MB1008</td>
<td>~11 feet (Value of R133*)</td>
</tr>
<tr>
<td>MB1009</td>
<td>~12 feet (Value of R144*)</td>
</tr>
</tbody>
</table>

Note: *Lower value will cause object detection

Range Information Filtering

Range information sent to the user is filtered and will only respond to slow moving or stationary targets (less than 2 inches per second or 5 cm per second).
Timing Description

The ParkSonar-EZ sensor is ready to accept the RX command 250mS after power-up. If the RX pin is left open or held high, the sensor will first run a calibration cycle (49mS) and then it will take a range reading (49mS). After the power up delay, the first reading will take an additional ~100mS. Subsequent readings will continue to occur every 50ms to ~1 second.

When an object is placed in the sensor detection zone, the sensor will “acquire” the target in ~10 seconds and begin sending the appropriate serial output and set the PW pin high.

If the detected object then leaves the sensor detection zone the sensor will “release” the target ~5 seconds later. At this time, the PW pin will be set low. Release time can be influenced by other nearby sensors and may appear to be longer in applications with many nearby sensors.

Selecting a Detection Zone

Different applications require different sensors. The ParkSonar-EZ sensor product line offers varied detection zones (detection distances) to allow you to select the best sensor to meet your needs. Each sensor is calibrated to provide the approximate detection zone shown in this datasheet. This allows end users to select the part number that matches their given sensing application. Each part number has a consistent field of detection so additional units of the same part number will have similar detection zones. The beam patterns are provided to help identify an estimated detection zone for an application based on the acoustic properties of a target versus the plotted beam patterns.

Each detection zone is a 2D representation of the detection area of the sensor. The detection zone is actually shaped like a 3D cone (having the same detection pattern both vertically and horizontally). Detection patterns for dowels are used to show the detection zone of each sensor. Dowels are long cylindered targets of a given diameter. The dowels provide consistent target detection characteristics for a given size target which allows for easy comparison of one ParkSonar-EZ sensor to another ParkSonar-EZ sensor.

For each part number, the four patterns (A, B, C and D) represent the detection zone for a given target size. Each beam pattern shown is determined by the sensor’s part number and target size.

The actual beam angle changes over the full range. Use the detection zone for a specific target at any given distance to calculate the beam angle for that target at the specific distance. Generally, smaller targets are detected over a narrower beam angle and a shorter distance. Larger targets are detected over a wider beam angle and a longer range.
**MB1001**

**ParkSonar®-EZ-72 Detection Zone**

Sample results for measured beam pattern are shown 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
D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.

**Note:** For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate

Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.

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**MB1002**

**ParkSonar®-EZ-84 Detection Zone**

Sample results for measured beam pattern are shown 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
D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.

**Note:** For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate

Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.
MB1005
ParkSonar®-EZ-96 Detection Zone
Sample results for measured beam pattern are shown 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
D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.
Note: For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate
Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.

MB1006
ParkSonar®-EZ-108 Detection Zone
Sample results for measured beam pattern are shown 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
D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.
Note: For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate
Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.
MB1007
ParkSonar®-EZ-120 Detection Zone
Sample results for measured beam pattern are shown 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
D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.

Note: For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate
Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.

MB1008
ParkSonar®-EZ-132 Detection Zone
Sample results for measured beam pattern are shown 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
D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.

Note: For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate
Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.
MB1009
ParkSonar®-EZ-144 Detection Zone

Sample results for measured beam pattern are shown 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
- D 11-inch wide board moved left to right with the board parallel to the front sensor face. This shows the sensor’s range capability.

**Note:** For people detection the pattern typically falls between charts A and B.

Detection Zones are Approximate

Beam Patterns drawn to a 1:95 scale for easy comparison to our other products.
Ranging Information

Although the ParkSonar-EZ sensor is primarily a proximity sensor, the sensor provides a range data output. If more than one ultrasonic sensor is operating in the same area the user must use the RX pin to allow only one sensor to operate at the same time. The range output is available only on the TX serial output. The full TX pin output description can be seen on page 2 of this datasheet.

The beam pattern of the ParkSonar-EZ sensor when used for ranging is shown below.
Have the right sensor for your application?
Select from this product list for Protected and Non-Protected Environments.

**Protected Environments**

- **1 mm Resolution**
  - HRLV-MaxSonar-EZ
- **1 cm Resolution**
  - XL-MaxSonar-EZ
  - XL-MaxSonar-AE
  - XL-MaxSonar-EZL
  - XL-MaxSonar-AEL

**Non-Protected Environments**

- **1 mm Resolution**
  - HRXL-MaxSonar-WR
  - HRXL-MaxSonar-WRS
  - HRXL-MaxSonar-WRT
  - HRXL-MaxSonar-WRM
  - HRXL-MaxSonar-WRMT
  - HRXL-MaxSonar-WRL
  - HRXL-MaxSonar-WRLT
  - HRXL-MaxSonar-WRLS
  - HRXL-MaxSonar-WRLST
  - SCXL-MaxSonar-WR
  - SCXL-MaxSonar-WRS
  - SCXL-MaxSonar-WRT
  - SCXL-MaxSonar-WRM
  - SCXL-MaxSonar-WRMT
  - SCXL-MaxSonar-WRL
  - SCXL-MaxSonar-WRLT
  - SCXL-MaxSonar-WRLS
  - SCXL-MaxSonar-WRLST
  - 4-20HR-MaxSonar-WR

**Accessories — More information is online.**

**MB7954 — Shielded Cable**
The MaxSonar Connection Wire is used to reduce interference caused by electrical noise on the lines. This cable is a great solution to use when running the sensors at a long distance or in an area with a lot of EMI and electrical noise.

**MB7950 — XL-MaxSonar-WR Mounting Hardware**
The MB7950 Mounting Hardware is selected for use with our outdoor ultrasonic sensors. The mounting hardware includes a steel lock nut and two O-ring (Buna-N and Neoprene) each optimal for different applications.

**MB7955 / MB7956 / MB7957 / MB7958 / MB7972 — HR-MaxTemp**
The HR-MaxTemp is an optional accessory for the HR-MaxSonar. The HR-MaxTemp connects to the HR-MaxSonar for automatic temperature compensation without self heating.

**MB7961 — Power Supply Filter**
The power supply filter is recommended for applications with unclean power or electrical noise.

**MB7962 / MB7963 / MB7964 / MB7965 — Micro-B USB Connection Cable**
The MB7962, MB7963, MB7964 and MB7965 Micro-B USB cables are USB 2.0 compliant and backwards compatible with USB 1.0 standards. Varying lengths.

**MB7973 — CE Lightning/Surge Protector**
The MB7973 adds protection required to meet the Lightning/Surge IEC61000-4-5 specification.

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