ParkSonar®-EZ Sensor Series

High Performance Ultrasonic Proximity Parking Sensor

MB1001, MB1002, MB1005, MB1006, MB1007, MB1008, MB1009[4]

*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.*

Features

- Proximity vehicle detection
- Simultaneously runs along side other nearby sensors
- ~10 second object acquire time
- ~5 second object release time
- Range information available on Pin 5 to 254 inches
- 2.5V to 5.5V supply with 2mA typical current draw
- Interfaces are simultaneously active
- Serial, 0 to Vcc, 9600 Baud, 81N
- Digital logic High/Low (True/False) output
- Continuously variable gain for side lobe suppression
- Free run operation continually measures and outputs proximity information
- Sensor operates at 42KHz
- Actual operating temperature range from –40°C to +65°C, Recommended operating temperature range from 0°C to +60°C [3]

Benefits

- Very low-cost proximity sensor
- Simultaneously use up to 14+ sensors in the same environment[1]
- Reliable proximity information
- Sensor doubles as a rangefinder (reports range information over serial)
- Mounting holes provided on the circuit board (or can be grommet mounted)
- Very low power proximity sensor, excellent for multiple sensor or battery based systems
- Continuously gives output which frees up user processors
- User can choose either of the two sensor outputs
- Runs automatically or can be triggered externally
- Fast measurement cycle
- Quality beam characteristics
- Custom object acquire and release times available for a nominal NRE charge
- Lowest power proximity sensor

Applications & Uses

- Parked car detection
- Proximity zone detection
- Sheltered drive thru's
- Non-condensing environments only
- Designed for protected indoor environments
- Other weather resistant models available[2]

Notes:

[1] Depends on sensor mounting. (For example hundreds can be on the same floor of a parking garage.)

[2] Contact sales at info@maxbotix.com

[3] Please reference page 4 for minimum operating voltage verses temperature information.

[4] Please reference page 11 for part number key.

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.

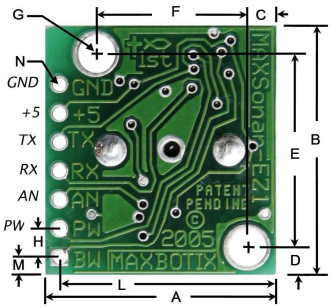
Pin 3-AN - Unused, leave disconnected or connect to circuit common ground.

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", follow 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.

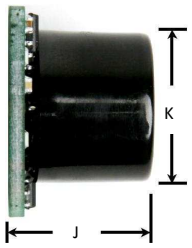
Pin 6 - +5V- Vcc – Operates on 2.5V - 5.5V. Recommended current capability of 3mA for 5V, and 2mA for 3V. Please reference page 4 for minimum operating voltage verses temperature information.

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



A	0.785"	19.9 mm
B	0.870"	22.1 mm
C	0.100"	2.54 mm
D	0.100"	2.54 mm
E	0.670"	17.0 mm
F	0.510"	12.6 mm
G	0.124" dia.	3.1 mm dia.

H	0.100"	2.54 mm
J	0.610"	15.5 mm
K	0.645"	16.4 mm
L	0.735"	18.7 mm
M	0.065"	1.7 mm
N	0.038" dia.	1.0 mm dia.
weight, 4.3 grams		



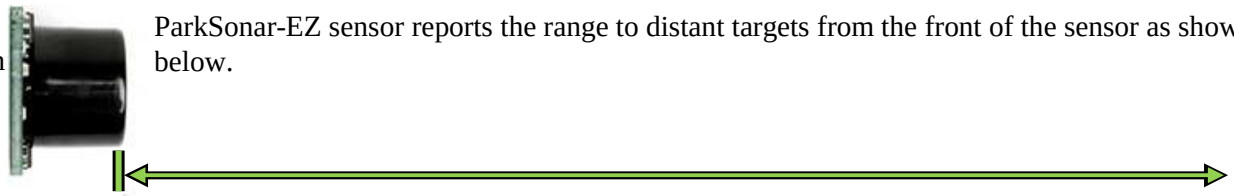
Mechanical Dimensions

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



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.

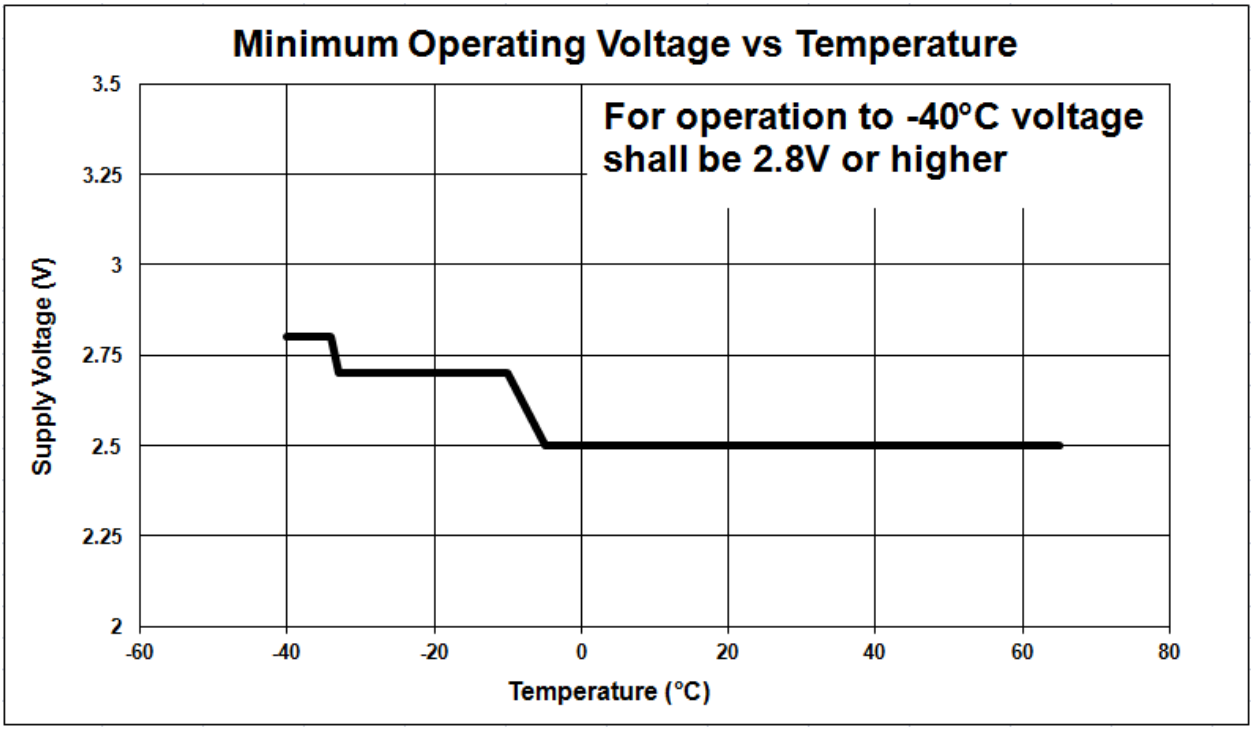
Part #	Set Distance
MB1001	~6 feet (Value of R072*)
MB1002	~7 feet (Value of R084*)
MB1005	~8 feet (Value of R096*)
MB1006	~9 feet (Value of R108*)
MB1007	~10 feet (Value of R120*)
MB1008	~11 feet (Value of R132*)
MB1009	~12 feet (Value of R144*)
Note: *Lower value will cause object detection	

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).

Voltage vs Temperature

The graph below shows minimum operating voltage of the sensor verses temperature.

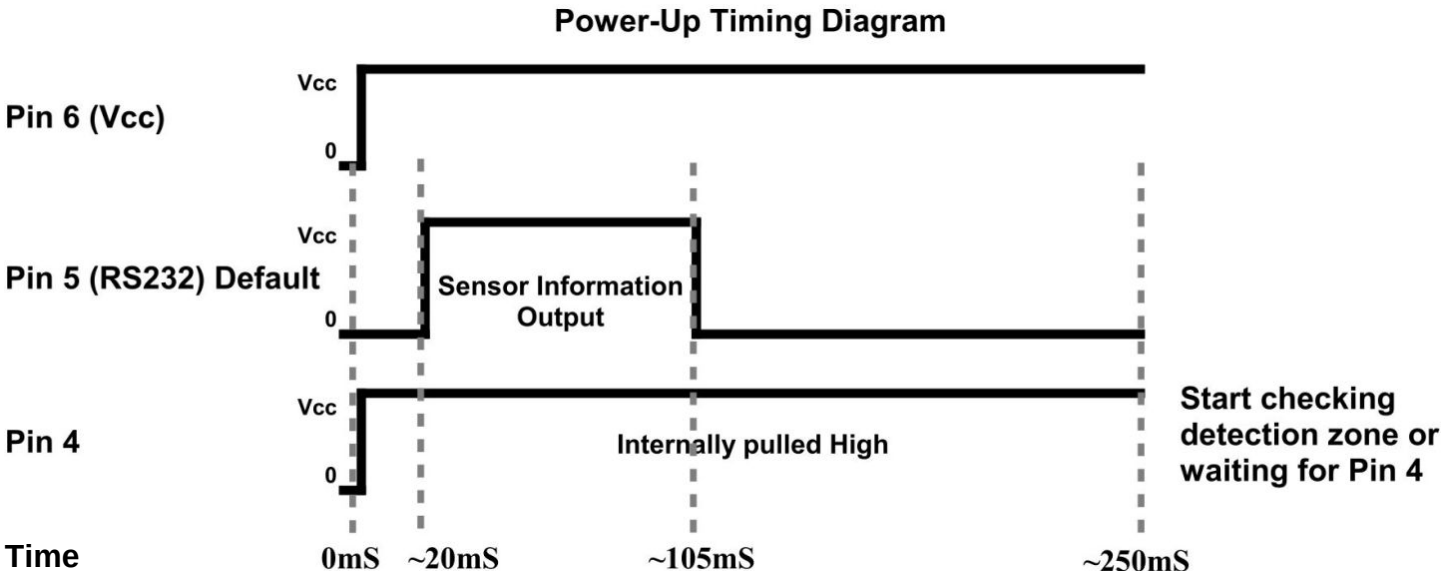


Timing Description

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.

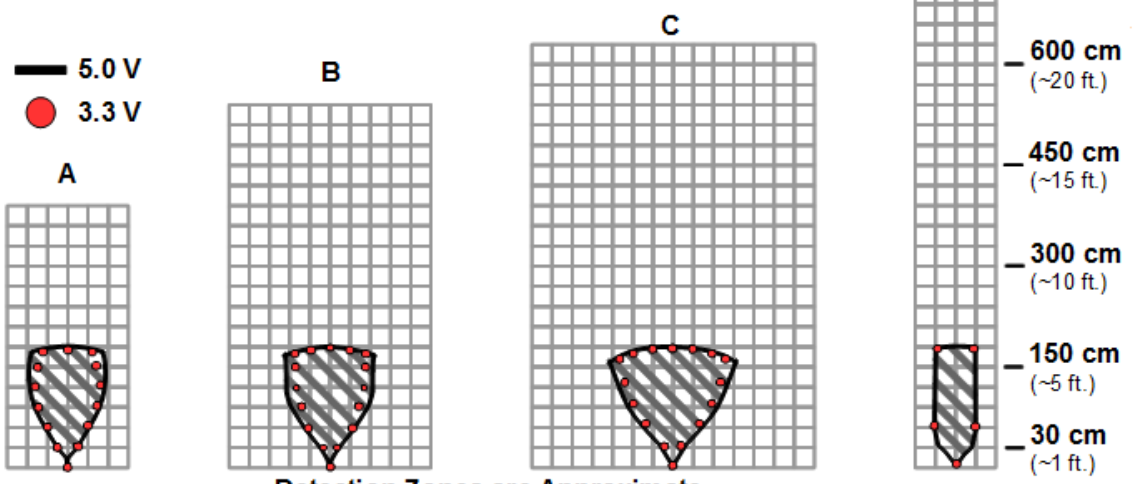
The actual beam angle changes over the full range. Use the detection zone for a specific target at any given distance to calculate the beam angle for that target at the specific distance. Generally, smaller targets are detected over a narrower beam angle and a shorter distance. Larger targets are detected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

MB1001-000 MB1001-040

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

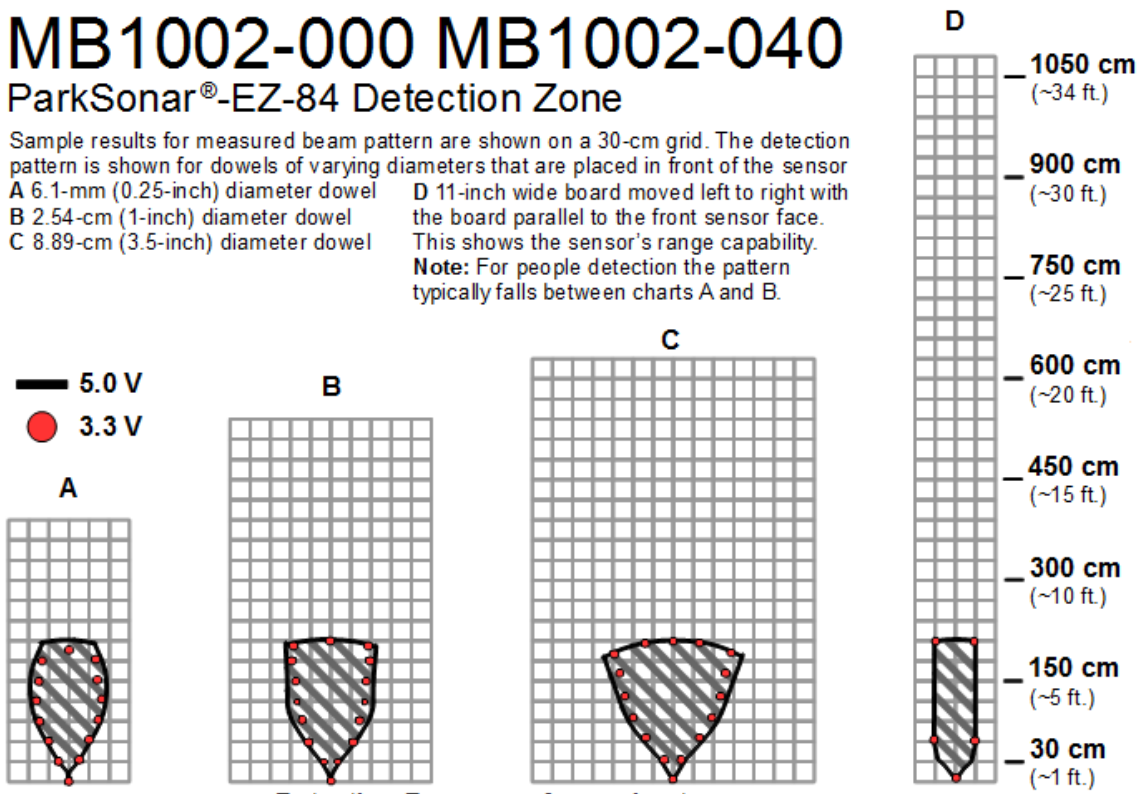
Beam Pattern drawn to a 1:95 scale for easy comparison to our other products.

MB1002-000 MB1002-040

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

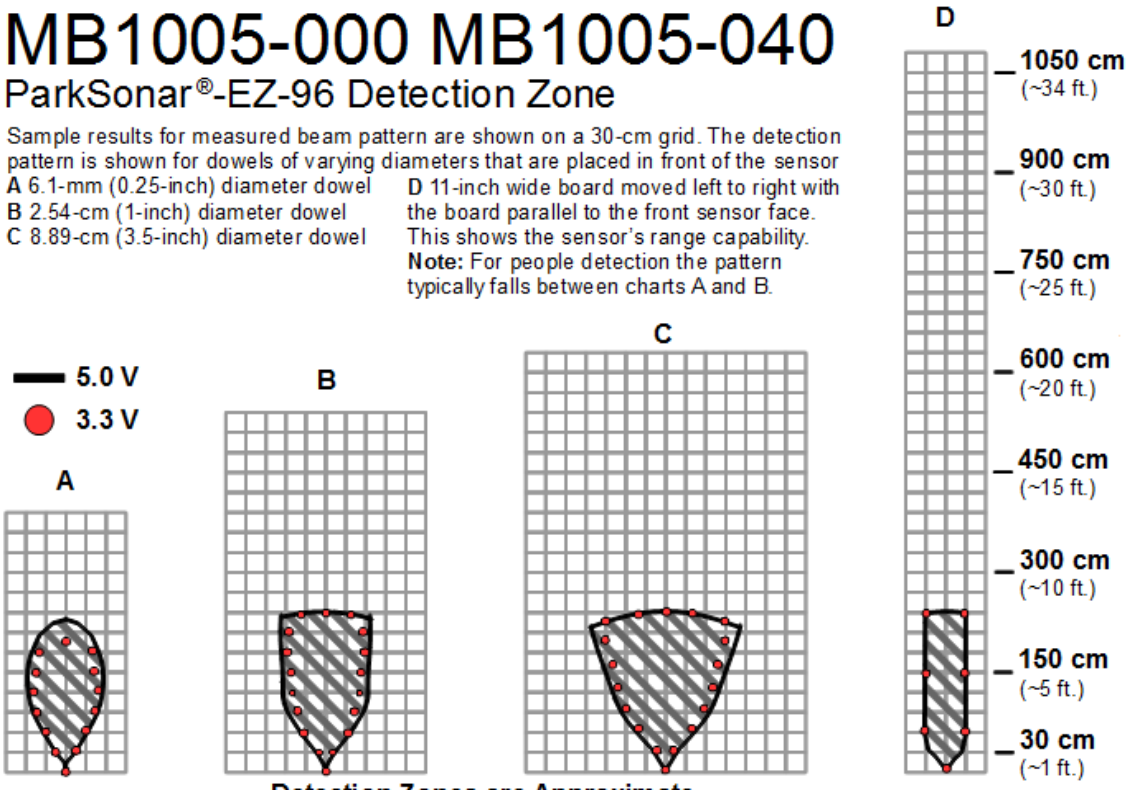
Beam Pattern drawn to a 1:95 scale for easy comparison to our other products.

MB1005-000 MB1005-040

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

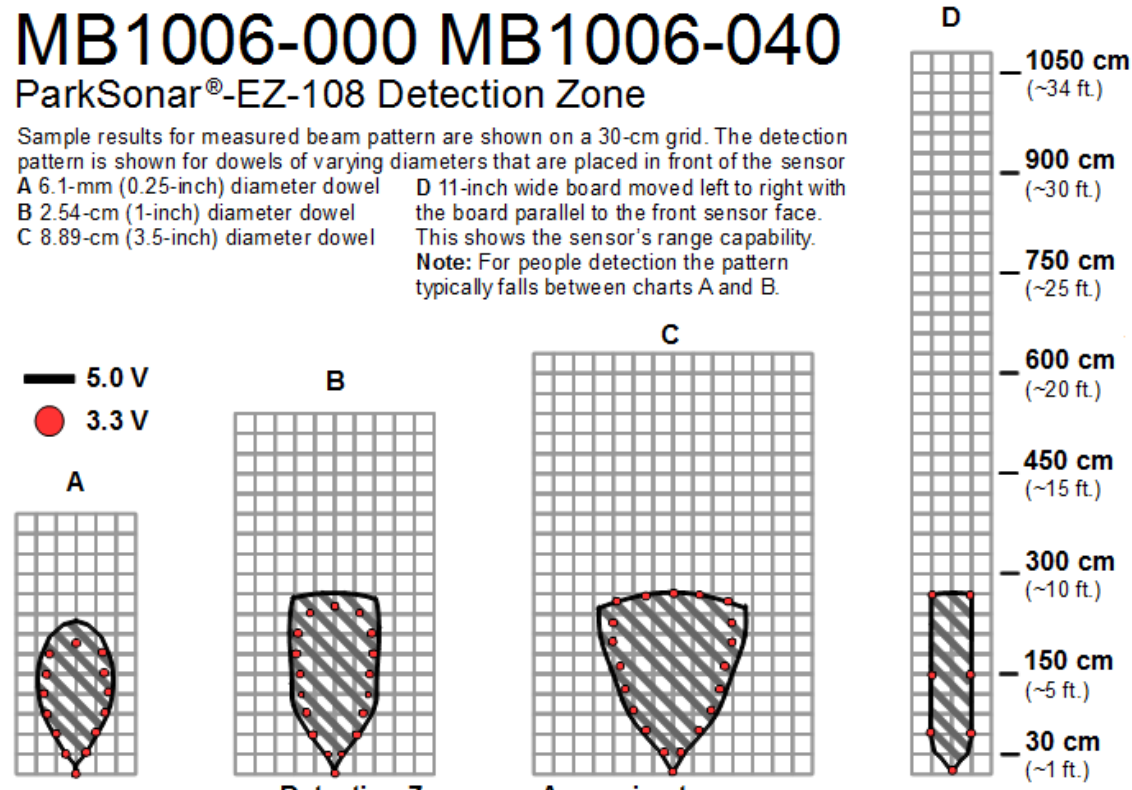
Beam Pattern drawn to a 1:95 scale for easy comparison to our other products.

MB1006-000 MB1006-040

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

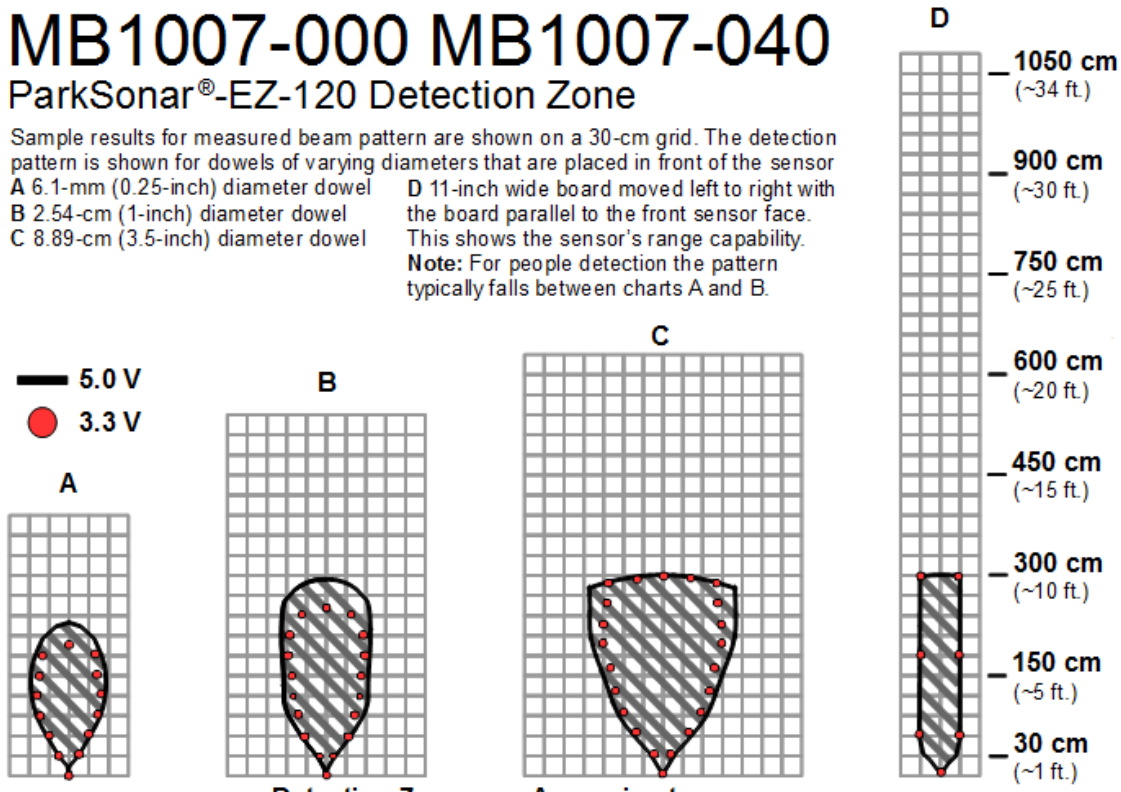
MB1007-000 MB1007-040

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

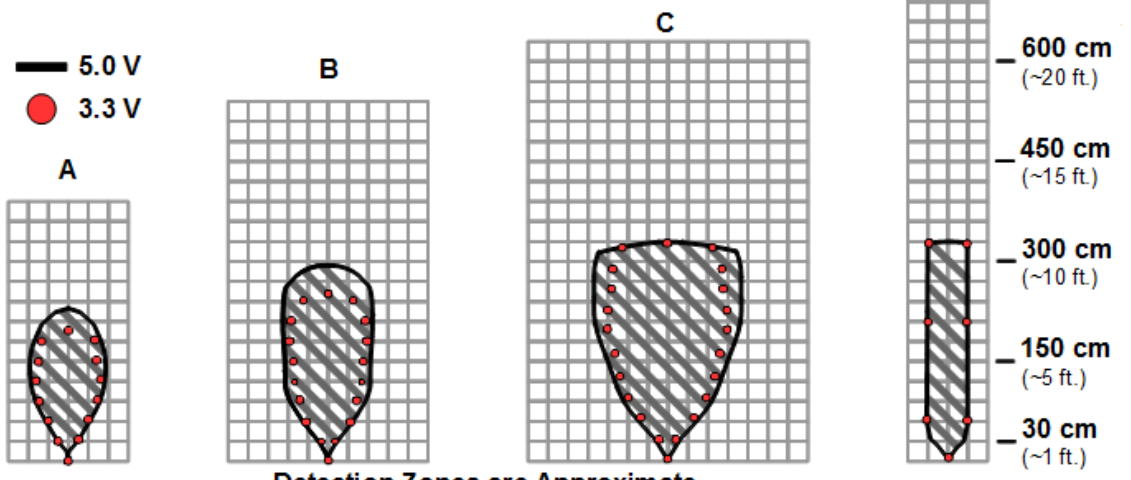
MB1008-000 MB1008-040

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

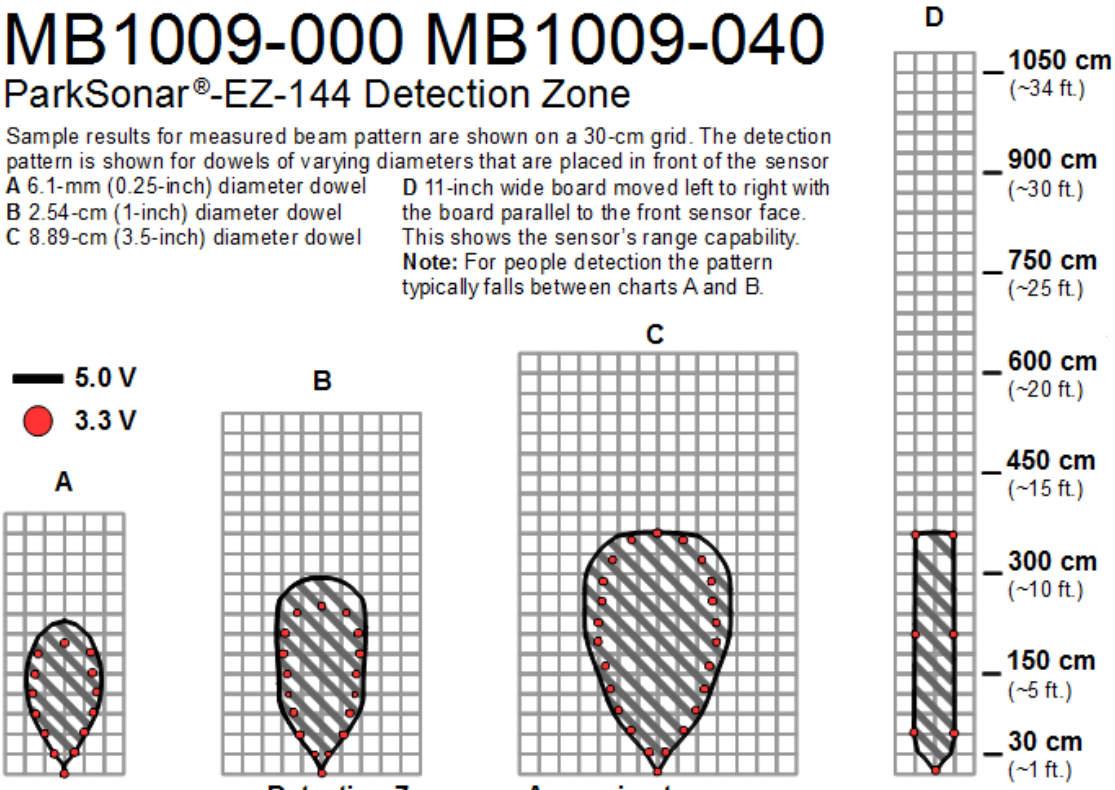
MB1009-000 MB1009-040

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.



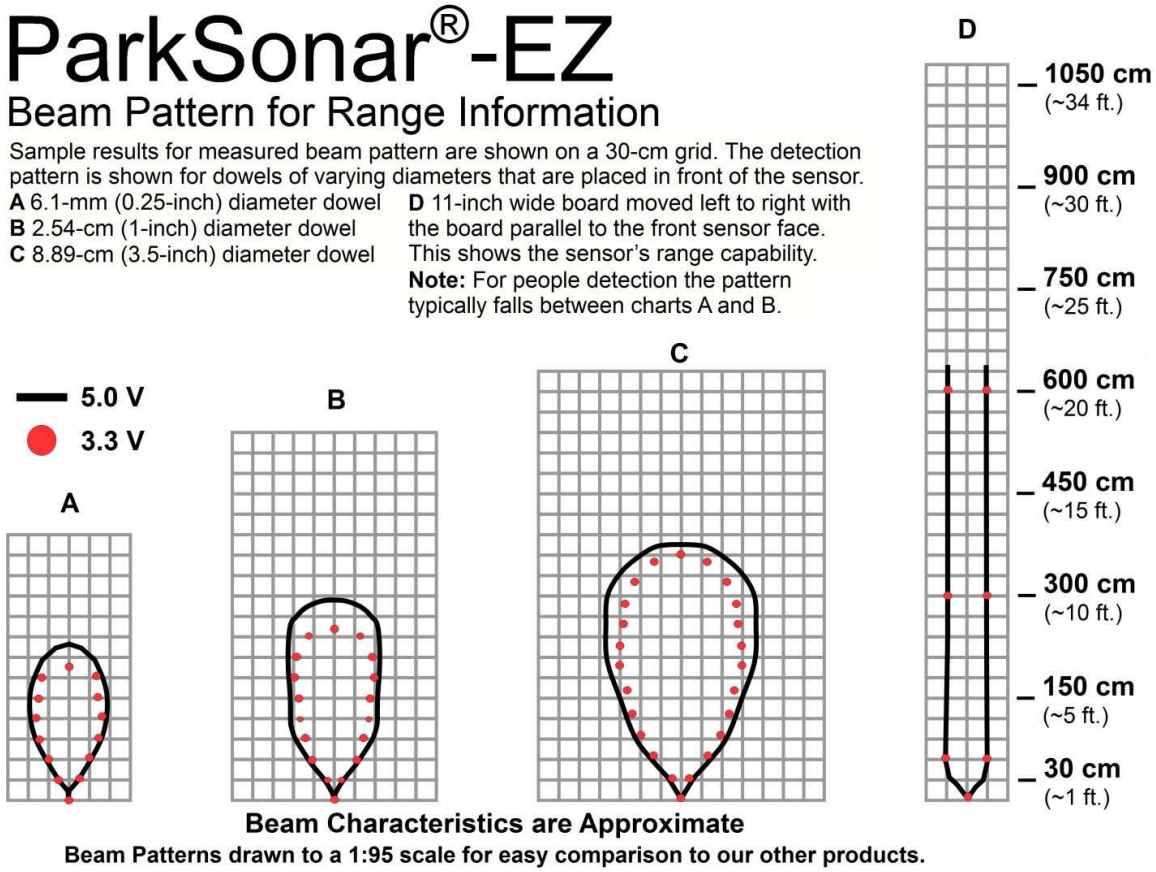
Detection Zones are Approximate

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

Ranging Information

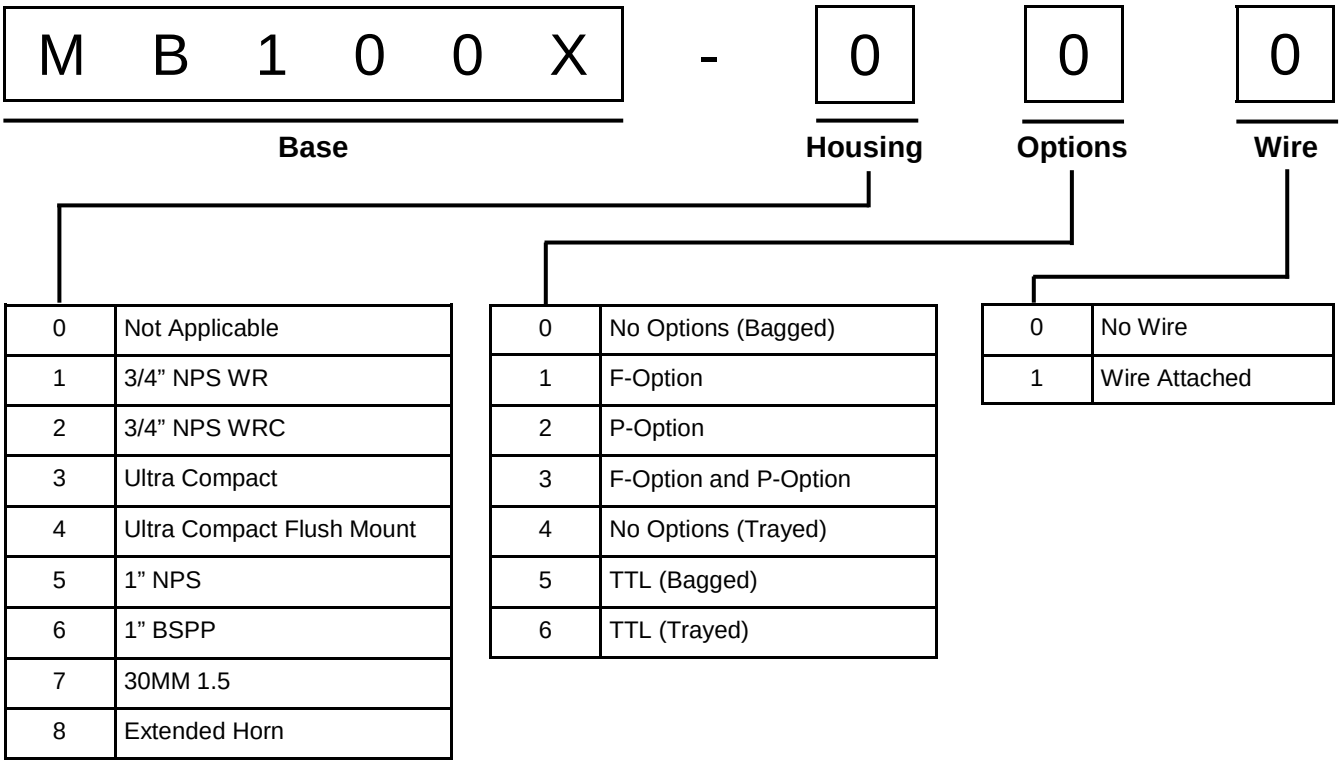
Although the ParkSonar-EZ sensor is primarily a proximity sensor, the sensor provides a range data output. If more than one ultrasonic sensor is operating in the same area the user must use the RX pin to allow only one sensor to operate at the same time. The range output is available only on the TX serial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



Part Numbers

All part numbers are a combination of a six-character base followed by a dash and a three-digit product code. Please review the following table for more information on the three-digit product code.



0	Not Applicable
1	3/4” NPS WR
2	3/4” NPS WRC
3	Ultra Compact
4	Ultra Compact Flush Mount
5	1” NPS
6	1” BSPP
7	30MM 1.5
8	Extended Horn

0	No Options (Bagged)
1	F-Option
2	P-Option
3	F-Option and P-Option
4	No Options (Trayed)
5	TTL (Bagged)
6	TTL (Trayed)

0	No Wire
1	Wire Attached

The following table displays all of the active and valid part numbers for this product.

Active Part Numbers for MB1001, MB1002, MB1005, MB1006, MB1007, MB1008 and MB1009						
MB1001-000	MB1002-000	MB1005-000	MB1006-000	MB1007-000	MB1008-000	MB1009-000
MB1001-040	MB1002-040	MB1005-040	MB1006-040	MB1007-040	MB1008-040	MB1009-040