USB-ProxSonar®-EZ™ Series

High Performance USB Proximity Sensor

MB1414, MB1424, MB1434, MB1444

*The USB-ProxSonar-EZ provides proximity detection of objects out to a set distance, in a small and incredibly easy to use package. The USB-ProxSonar-EZ is the lowest cost USB ultrasonic sensor that features a simultaneous multi-sensor design which allows the sensor to operate even in the presence of other ultrasonic sensors. Users are able to integrate many sensors into one system and experience little to no effect from the sensor to sensor interference that can occur with other ultrasonic sensor solutions. The USB-ProxSonar-EZ features a True/False output and an optional range output. With the USB interface, deploying a network of ultrasonic sensors has never been easier. *Factory calibration and testing is standard.*

Features

- USB interface for simple computer connection and installation.
- USB Micro-B connector matches that used on most modern cell phones
- Simple True/False output and optional range output
- ~2.5 second object acquire time[2] ~1.5 second object release time[2]
- Filtered range output allows ranging and multi-sensor operation.
- Object detection includes zero range objects
- Free run operation continually measures and outputs proximity information
- Continuously variable gain for control and side lobe suppression
- Learns nearby environment once connected or powered-up
- Designed for protected indoor environments
- Sensor operates at 42KHz
- Proximity detection from 1 mm to set trigger distance
- Range information from 6 inches to 125 inches

Benefits

- USB interface for easy integration
- Very low cost USB proximity sensor
- Simultaneously use up to 20 sensors in the same environment*
- Easily deploy network-based IT solutions with integrated ultrasonic sensors
- Lock computers automatically to aid in company security and HIPAA Compliance
- Reliable proximity information
- Sensor is both a rangefinder and a proximity sensor. Detection zone is from 0 foot to preset range of 1 foot to 5 feet
- Sensor dead zone gone
- Quality beam characteristics
- Mounting holes provided
- Excellent for multiple sensors systems
- Outputs allow users to get reliable proximity information at any time
- Fast measurement cycle

Applications and Uses

- Aids in a full solution for HIPAA compliance
- Sensor grids
- Kiosks & booths
- Automated displays & advertising
- Security systems
- Proximity zone detection
- People detection
- Robust ranging sensor
- Autonomous navigation
- Multi-sensor arrays

[1] Depends on sensor model and mounting

[2] Custom acquire and release times available with a nominal NRE charge

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.

USB-ProxSonar®-EZ™ General Description of Operation

The USB-ProxSonar-EZ sensors are a high performance, ultrasonic proximity sensor that doubles as an ultrasonic range finder. The sensor utilizes a USB Micro-B connector for sensor interfacing. The sensor is small in size with holes on the PCB for easy mounting. The USB-ProxSonar-EZ sends serial data to the users operating system which can then be read from the registered COM port (or equivalent) using a terminal program or read directly from the operating system (OS) by using the appropriate software functions.

The USB-ProxSonar-EZ is powered by the USB connection and begins operating after the USB handshaking has occurred. The sensor will calibrate during the first range reading. The range data and proximity information is sent continuously to the users operating system (OS) and is available to be read at any time.

Connection is handled automatically by device drives that are available for most OS's (Windows XP and later, Linux Kernel 2.6 and later, Mac OS X and later.) The steps taken to perform the configuration varies slightly by the target OS however the general operation and the data sent by the sensor remains the same. For users with an older or unsupported OS drivers may be available for your system and can be found at http://www.ftdichip.com/FTDrivers.htm

The recommended operating temperature is 0C to 50C. The recommended storage temperature is –40C to +65C.

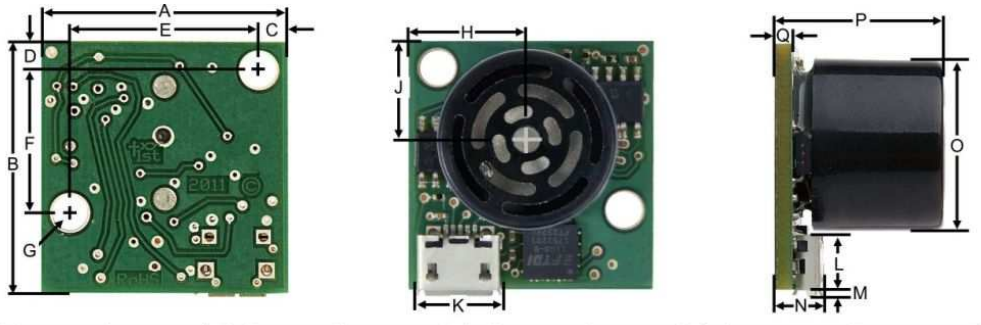
USB-ProxSonar®-EZ™ General Power-Up Instruction

Each time after the USB-ProxSonar-EZ is powered up, it will calibrate during its first read cycle. The sensor uses this stored information to detect close objects. It is important that objects not be close to the sensor during this calibration cycle. The best sensitivity is obtained when it is clear for fourteen inches, but good results are common when clear for at least seven inches. If an object is too close during the calibration cycle, the sensor may ignore objects at that distance.

The USB-ProxSonar-EZ does not use the calibration data to temperature compensate for range, but instead to compensate for the sensor ring down pattern. If the temperature, humidity, or applied voltage changes during operation, the sensor may require recalibration to reacquire the ring down pattern. Unless recalibrated, if the temperature increases, the sensor is more likely to have false close readings. If the temperature decreases, the sensor is more likely to have reduced up close sensitivity.

The sensor will continue to recalibrate to its environment provided the sensor does not detect an object within its detection zone at least once every 30 minutes. To recalibrate the USB-ProxSonar-EZ cycle power, either disconnect and reconnect the device or command the USB-port to sleep.

USB-ProxSonar®-EZ™ Mechanical Dimensions



A	0.863”	21.92 mm
B	0.888”	22.56 mm
C	0.100”	2.54 mm
D	0.100”	2.54 mm

E	0.670”	17.00 mm
F	0.510”	12.6 mm
G	0.124” dia.	3.1 mm dia.
H	0.425”	10.79 mm

J	0.350”	8.89 mm
K	0.317”	8.05 mm
L	0.197”	5.00 mm
M	0.024”	0.62 mm

N	0.167”	4.24 mm
O	0.645”	16.38 mm
P	0.610”	15.49 mm
Q	0.065”	1.65 mm

Weight 4.9 grams

Accessing the USB Serial Output — Quick Setup

A terminal program is the easiest method of reading the sensor output. Software downloads and step by step instructions are available at http://www.maxbotix.com/terminal.htm

Serial Output Format

The sensor output is provided over the COM port (or equivalent) in an ASCII character format. 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 125 inches. This is followed by an ASCII space and the ASCII character "P", followed by one ASCII digit "1 or 0" corresponding to the "True or False" proximity information, followed by a carriage return. A proximity value of "1" signifies that a target is present in the detection zone. A proximity value of "0" signifies that no target has been detected in the detection zone.

When an object is placed in the field of view the sensor will "acquire" the target ~2.5 seconds later by sending the appropriate proximity information.

If the detected object then leaves the field of view the sensor will "release" the target ~1.5 seconds later. Release time can be influenced by other nearby sensors and may appear to be longer in applications with many nearby sensors.

The USB-ProxSonar-EZ also double as an ultrasonic range finder. Range information is provided for reference and may experience noise when a large number of sensors (5+ depending on sensor mounting) are running in the same environment. The range reading will report the range to an object to the maximum range of the sensor of 124 inches. When no object is able to be detected by the sensor, the sensor will report R125.

Sensor Trigger Distance for USB-ProxSonar®-EZ™

Each of the USB-ProxSonar-EZ models 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. Each USB-ProxSonar-EZ is tolerant of a different number of nearby sensors, this data is provided in the chart below for easy comparison.

Part #	Set Distance	# of Sensors that can run in the same space
MB1414	~5 feet (Value of RO59 or lower will cause object detection)	8+ Sensors Simultaneously
MB1424	~3 feet (Value of RO35 or lower will cause object detection)	10+ Sensors Simultaneously
MB1434	~2 feet (Value of RO23 or lower will cause object detection)	13+ Sensors Simultaneously
MB1444	~1 feet (Value of RO11 or lower will cause object detection)	15+ Sensors Simultaneously

Using Multiple Sensors in a Single System

The USB-ProxSonar-EZ is designed to function alongside other ultrasonic sensors operating in the same space, at the same time, on the same frequency. 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 certain number of sensors within a closed space. For users working with large open environments, or environments where sensors point in different directions, it is likely that the published recommended number of sensors can be exceeded with little or no effect on user performance.

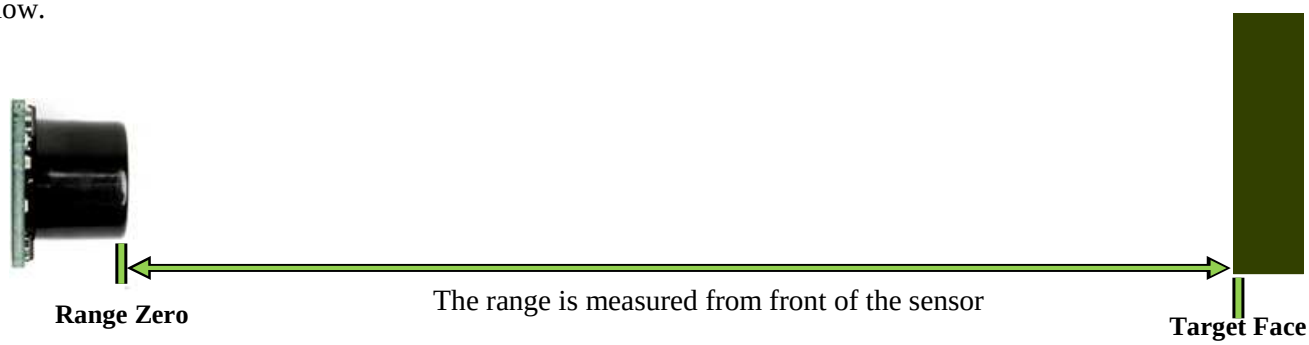
USB-ProxSonar®-EZ™

Sensor Minimum Distance - No Sensor Dead Zone

The proximity information is available from 1mm from the front sensor face to the end of the detection zone. For the range information provided, the sensor minimum reported distance is 6-inches (15.2 cm). The USB-ProxSonar-EZ will range and report targets to the front sensor face. Large targets closer than 6-inches will typically range as 6-inches.

Range "0" Location

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



Target detection has been characterized in the sensor beam patterns.

USB Latency

Computer USB ports have latency and buffer sizes which can change the time between the range readings reported by the USB-ProxSonar-EZ ultrasonic proximity sensors. This time delay can be caused by the USB hardware on the computer's system board, the chipset managing USB communication ports, the age of the computer hardware, the number of devices using USB communication, and by the computers operating system.

When multiple USB connections are working in parallel, such as a mouse, keyboard, and flash-drive, the bandwidth is shared among the devices. When bandwidth is shared between devices, the buffer and latency is increased due to the extra demand of resources from the computer chipset.

Serial Terminal Configuration

Serial port Settings

A simple terminal program is available for download at www.maxbotix.com/terminal.htm

	Value
Baud	57600
Data bits	8
Parity	0 / None
Stop Bit	1
Flow Control	0/None

Serial Terminal Configuration (Cont.)

Windows Configuration

The USB-ProxSonar-EZ inside Windows Operating systems is a plug and play device. When the USB-ProxSonar-EZ ultrasonic proximity sensors is connected to a computer running Windows XP or newer, Windows will automatically install and configure the device drivers. This configuration may take several minutes, but the device configuration will only occur once.

Computers running Windows XP and older, have HyperTerminal included in the operating system. Computers running Windows Vista and newer require that a software is installed that is able to communicate with a communication port.

To configure the USB-ProxSonar-EZ on computer systems running Windows, use the following directions.

1. Download a terminal program. A program is available at the link listed above.
2. Unzip the terminal program to a folder of your choice, if using program that is provided.
3. Connect the USB-ProxSonar-EZ ultrasonic proximity sensor to a computer with a Micro-B USB Cable
4. Allow Windows time to automatically configure USB-ProxSonar-EZ drivers.
5. Run the terminal program of preference. If using the provided program, run the .exe file. The program provided will look for the first available proximity sensor.
6. For users that operate with a different terminal program, set the configuration to the settings provided.

If the provided software does not automatically find the first available USB-ProxSonar-EZ ultrasonic proximity sensor, click the “Settings” option. In the “Serial port settings” window, change the “Port” option to the COM port number assigned to the USB-ProxSonar-EZ ultrasonic proximity sensor.

For multiple sensor operation, use the following instruction set.

1. Open a terminal window
2. Click settings, if using the software provided for the USB-ProxSonar-EZ ultrasonic proximity sensor
3. Change the “Port” menu to match the newest “COM#”
4. Click ok.

Linux Configuration

This was written using Ubuntu 12.10 and MoSerial terminal software.

1. Download and install a terminal program. http://www.maxbotix.com/terminal.htm has a recommended program
2. Configure the USB-ProxSonar-EZ
3. Click “Port Setup”
    a. Set “Device” menu to “/dev/ttyUSB0”
    b. Set “Baud Rate” to 57600
    c. Set “Data Bits” to 8
    d. Set “Stop bits” to 1
    e. Set “Parity” to none
    f. Turn off all “Handshake” options
4. Click OK
5. Click “Connect”
6. Click the tab that says “Received ASCII”

For advanced users, here is a provided instruction set for using the USB-ProxSonar-EZ to low latency operation. While operating in low-latency mode, the USB buffer delay will be reduced to 128mS at most.

Open an xTerm window

Type the following command **$ dmesg | grep FTDI**.

A line tha tlooks like “/dev/ttyUSB#” will be output, # will the the assigned USB number

Enter the command **$ setserial /dev/ttyUSB# -g**.

The # will be the USB port number assigned to the USB-ProxSonar-EZ.

Information will be output that looks like “/dev/ttyUSB#, UART: unk, PORT:0X0000, IRQ:0”.

Enter the command; **$ setserial /dev/ttyUSB# low_latency**.

Linux Configuration (Cont.)

This command will set the USB-ProxSonar-EZ into low-latency mode.
Confirm the configuration by typing the command: **$ Setserial /dev/ttyUSB# -g**.
The low-latency flag should be appended as follows:
"/dev/ttyUSB#, UART: unk, PORT: 0X0000, IRQ: 0, Flags: low_latency"

Apple OS Configuration

To configure the USB-ProxSonar-EZ in Mac OS X operating systems please use the following instruction set. The USB-ProxSonar-EZ VCP is configured within the ZTerm software. This software is a terminal emulator like Terminal.app. The ZTerm application allows you to talk to a serial port, which is used to read the USB-ProxSonar-EZ sensors. To configure ZTerm to read the USB-ProxSonar-EZ sensor output open "Settings", then "Modem Preferences" Finally selected "usbserial0" for the USB-ProxSonar-EZ sensor.

After this has been set, the USB connection will have to be edited. To do this select "Settings" and then "Connections". The "Service Name" option in the new window can be named at the user's preference. The "Phone Number", "Pre-dial init", "Account" and "Password" options are to be left blank. Set "Data Rate" to 57600, "Data Bits" to 8, "Parity" to none, and "Stop Bits" to 1. For "Flow Control" do not select any of the boxes..
The ZTerm software can be downloaded at http://www.macupdate.com/app/mac/6888/zterm-x.

Selecting a USB-ProxSonar®-EZ™ Detection Zone

People Sensing: For users that desire to detect people, the detection area to the 1-inch diameter dowel, in general, represents the area that the sensor will reliably detect people.

Different applications require different sensors. The USB-ProxSonar-EZ product line offers varied detection zones (detection distances) to allow you to select the best sensor to meet your needs. Each sensor is matched 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 plots 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 easy comparison of one ProxSonar sensor to another ProxSonar 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.

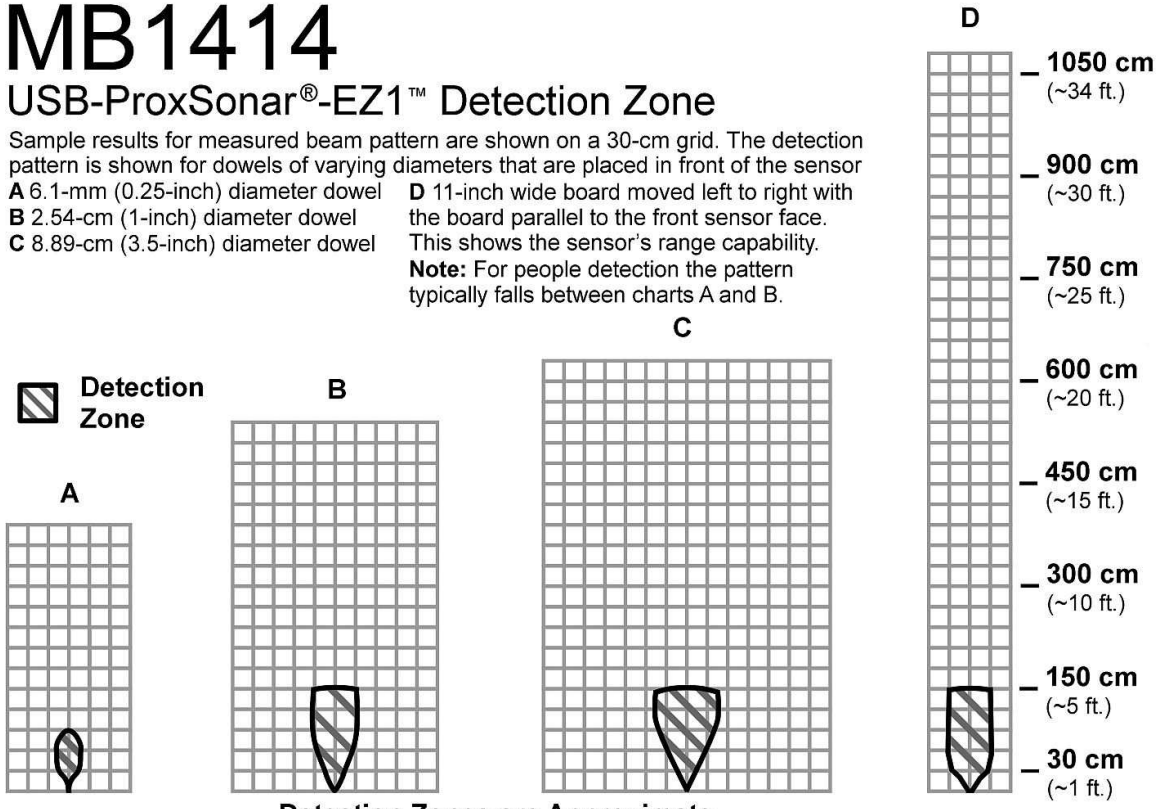
The actual beam angle changes over the full range. Use the detection zone for a specific target at any given distance to calculate the beam angle for that target at the specific distance. Generally, smaller targets are detected over a narrower beam angle and a shorter distance. Larger targets are detected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

MB1414

USB-ProxSonar®-EZ1™ 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

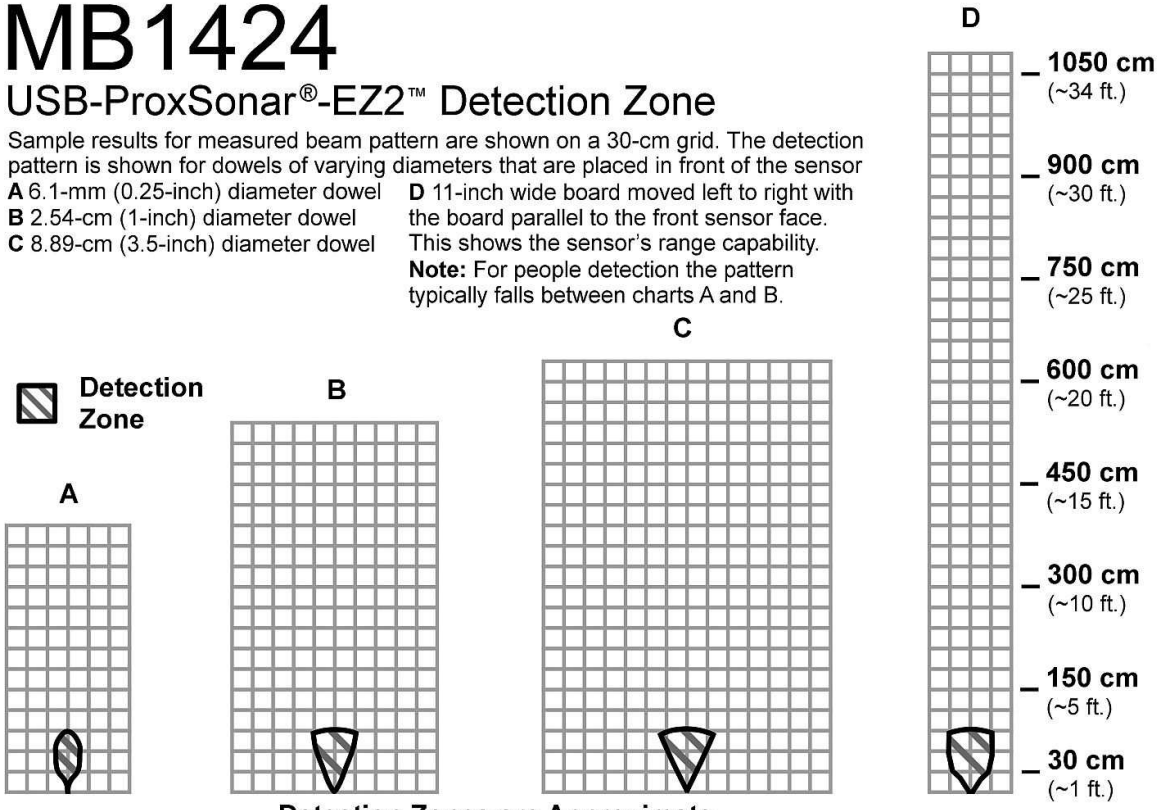
Detection Zone drawn to a 1:95 scale for easy comparison to our other products.

MB1424

USB-ProxSonar®-EZ2™ 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

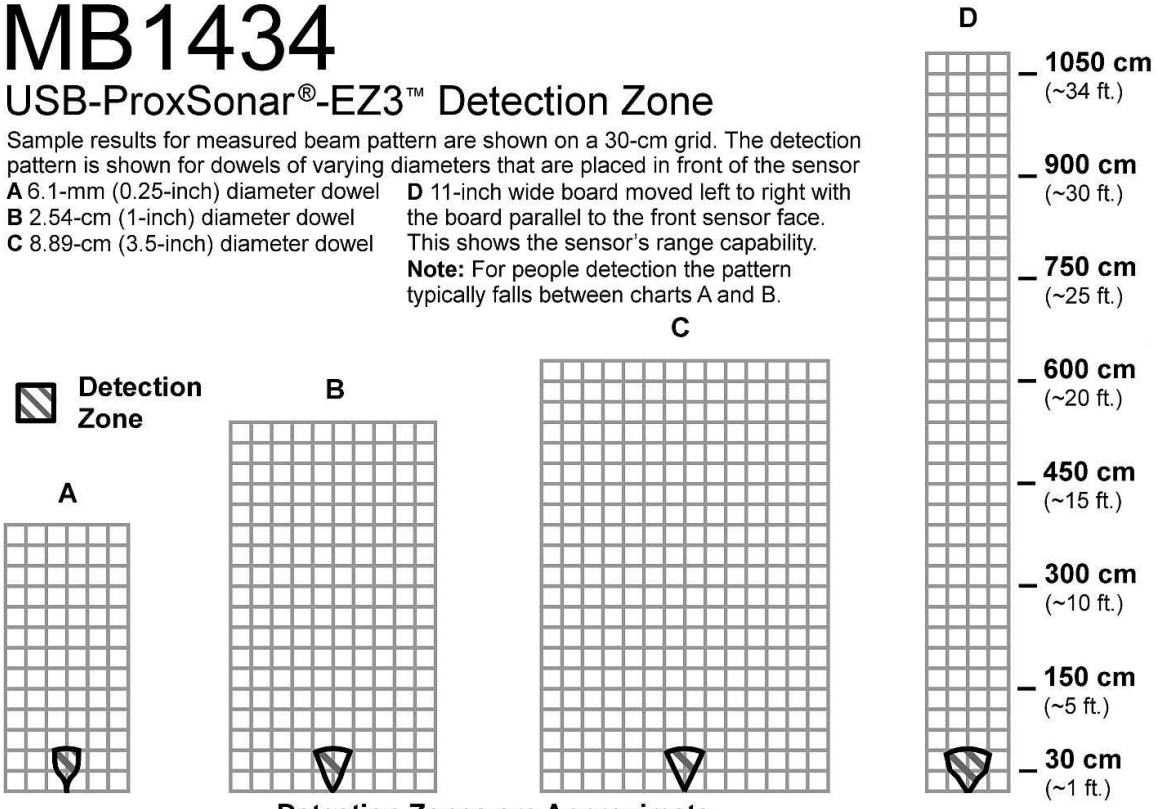
Detection Zone drawn to a 1:95 scale for easy comparison to our other products.

MB1434

USB-ProxSonar®-EZ3™ 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

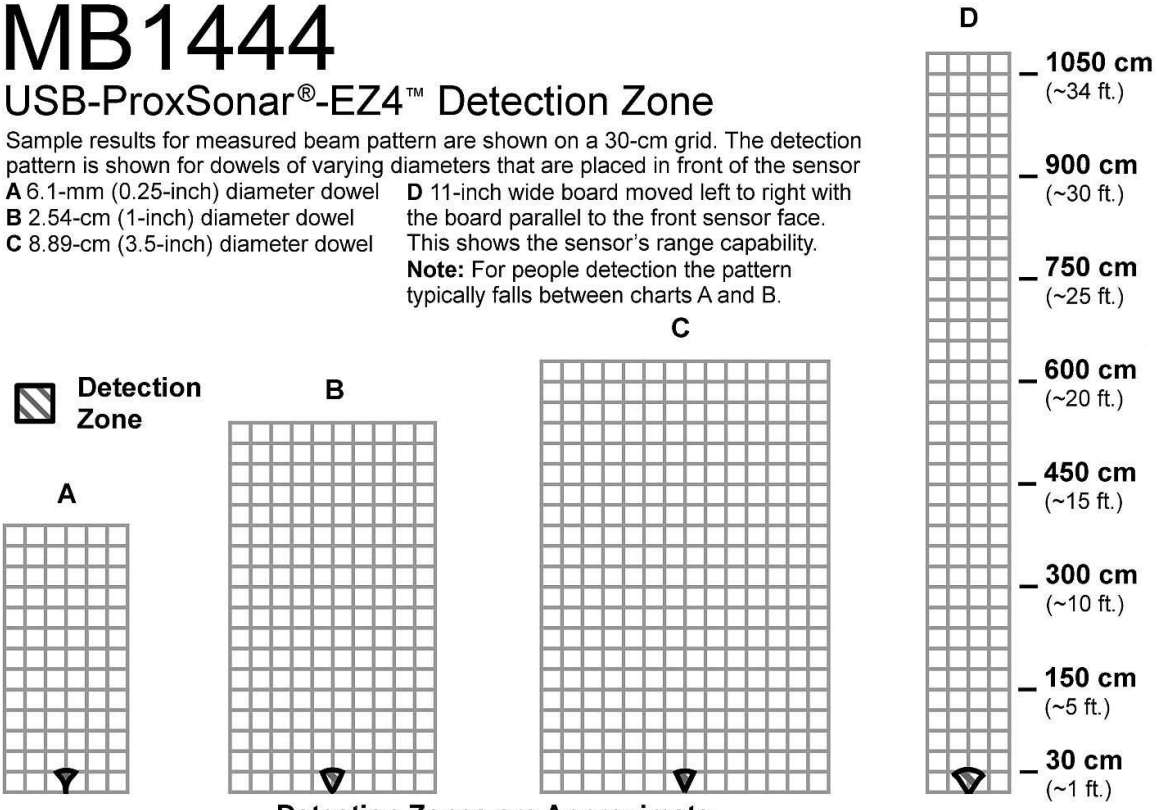
Detection Zone drawn to a 1:95 scale for easy comparison to our other products.

MB1444

USB-ProxSonar®-EZ4™ 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

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

Have the right MaxSonar® for your application?

Check out our MaxSonar® Product Lines

Indoor Use

(or protected environments)

1 mm Resolution
HRLV-MaxSonar-EZ

1 in Resolution
LV-MaxSonar-EZ
LV-ProxSonar-EZ

1 in Resolution
USB-ProxSonar-EZ

1 cm Resolution
XL-MaxSonar-EZ
XL-MaxSonar-AE
XL-MaxSonar-EZL
XL-MaxSonar-AEL
I2CXL-MaxSonar-EZ

Outdoor Use

(or rugged environments) IP67

1 mm Resolution
HRXL-MaxSonar-WR
HRXL-MaxSonar-WRT
HRXL-MaxSonar-WRM
HRXL-MaxSonar-WRMT

1 cm Resolution
XL-MaxSonar-WR
XL-MaxSonar-WRL
XL-MaxSonar-WRA
XL-MaxSonar-WRLA
I2CXL-MaxSonar-WR

F-Option Available for all WR models For additional protection when necessary in hazardous chemical environments.

1 mm Resolution
HRXL-MaxSonar-WRC
HRXL-MaxSonar-WRCT

1 cm Resolution
XL-MaxSonar-WRC
XL-MaxSonar-WRCA
I2CXL-MaxSonar-WRC

Accessories

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. MaxBotix Inc., has successfully tested our sensors at a distance of 1,000 ft using this wire and it was as stable as if it were next to the power supply.

MB7950 -XL-MaxSonar-WR Mounting Hardware

The MB7950 Mounting Hardware is selected for use with our outdoor ultrasonic sensors. The MB7950 Mounting Hardware gives customers easy access to the hardware needed for through hole mounting. 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 / MB7959- MaxTemp

The HR-MaxTemp is an optional accessory for the HR-MaxSonar. The HR-MaxTemp is a temperature sensor that connects to pin 1 and 7 of the HR-MaxSonar for automatic temperature compensation without self heating or temperature gradient effects.

MB7962 / MB7963 / MB7964 / MB7965 - Micro-B USB Connection Cable

The MB7962, MB7963, MB7964, and MB7965 Micro-B USB cables are USB2.0 compliant and backwards compatible with USB 1.0 standards.