

OPERATING INSTRUCTIONS

CarSense 303™

MAGNETORESISTIVE VEHICLE DETECTOR



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Cautions and Warnings



CE REQUIREMENT: Use CE rated power supply for CE compliance providing suppression as specified by EN61000-4-5.

Not to be used in personnel safety applications.

IMPORTANT:

This product is an accessory or part of a system. Always read and follow the manufacturer's instructions for the equipment before connecting this product. Comply with all applicable codes and safety regulations. Failure to do so may result in damage, injury or death.

WARNING:

DO NOT INSTALL THE SENSOR DIRECTLY INTO HOT ASPHALT, see installation section



WARNING:

Always use photoelectric protection when using the CS303 as a closing detector on a parking arm operator to prevent accidental closing on a car.

Product Overview



CS303 Controller



CS303 sensor in probe (top) and flat pack (bottom) configurations



CS303-L Logic Interface

The CarSense 303 features advanced 3-axis, magnetoresistive sensing technology. The sensor measures Earth's magnetic field and responds to disturbances caused by ferrous objects. The CS303 combines this exciting new technology with a field-proven hardware platform to produce a high-sensitivity, compact, cost-effective solution for reliable vehicle detection. Three sensing elements provide magnetic field measurement in the X, Y and Z axes, improving detection sensitivity.

- Three-dimensional presence detection of vehicles
- Select X, Y and/or Z axis independently
- Stand-alone sensor with solid-state output
- Sensor stores ambient background and settings in non-volatile memory
- Remote control module for programming and additional relay contact output
- Fast response for high-speed detection
- Easy, low-cost installation
- ULTRAMETER™ display indicates the sensitivity setting required to detect a vehicle
- Logic Interface available for extended detection, A/B directional logic and more
- Detect-On-Stop (DOS®) feature will allow detection only when a vehicle has come to a complete stop on the sensor. This is a worldwide unique feature to EMX detectors. It is a major advantage if you want to ignore cross traffic in tight spaces.

NOTE: When power is applied to the CS303-C-1 controller and a CS303-DB or FP sensor is connected, the settings on the controller will be sent to the sensor. The sensor stores these settings.

Specifications

	Sensor	Remote
Sensing Technology	3-axis magnetoresistive	
Sensitivity	10 levels: 0-9	
Axis Sensitivity	512 counts/Gauss (typical)	
Environmental Tracking	Automatic compensation	
Local Magnetic Field Calibration	Averages local field signature in any sensor orientation	
Detection Range	5ft (1.5m)	
Response Time	125 ms	
Power/Fault Indicator		Green LED
Detect Indicator		Red LED
Detect-On-Stop (DOS®)	Requires vehicle to stop for a minimum of 1 second (1-2s typical)	
Outputs	NPN (open collector)	SPDT relay NPN (open collector)
Output Ratings	50 mA	Relay: 1A @ 24 VDC...120 VAC NPN: 50 mA (max)
Connection	5 conductor direct burial	10 position screw terminal
Operating Environment	-40° C...82° C (-40° F...180° F) 0...95% relative humidity	
Housing Material	DB: PVC FP: Polyamide	ABS
Environmental Rating	IP69K	IP30
Power Supply	12-30 VDC	12-30 VDC and 24 VAC
Current Draw	10 mA max	40 mA max
Supply Protection Circuitry	Reverse polarity and fuse protected	
Dimensions	DB: 102mm (4.0") x 27mm (1.0") FP: 86mm (3.4") x 21mm (0.9") x 8mm (0.3")	76mm (3.0") x 22mm (0.9") x 70mm (2.75")
Weight	DB: 43g (0.09 lbs.) FP: 23g (0.05 lbs.)	68g (0.15 lbs.)
Certifications	CE	CE

Operation

Power Up

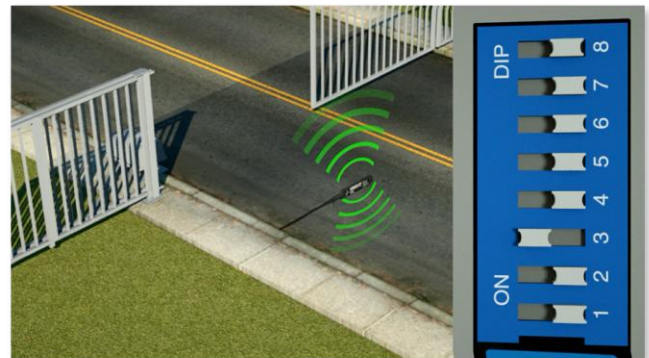
The green LED indicates that the detector is powered and operational. Upon first power-up, the detector will need to be calibrated to the local magnetic field (see [Controls and Indicators](#)).

Axis Settings

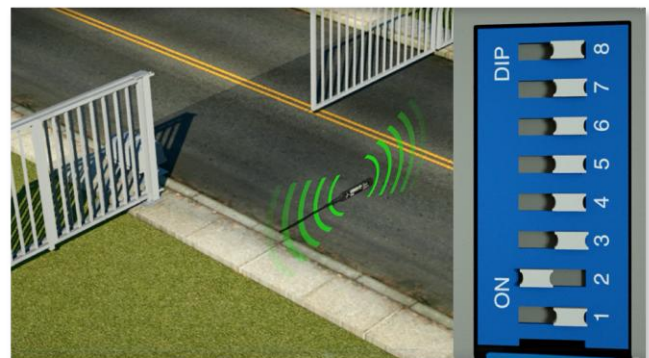
The heart of the CS303 is the 3-axis magnetoresistive sensor. This state-of-the-art technology integrates three separate sensing elements, allowing for individual tailoring of the detector's sensitivity according to its environment.

The sensor can detect disturbances in all 3 axes (X, Y, and Z), and allows you to select any combination required for your unique installation. By "turning off" the axis in the direction of a disturbance, the sensitivity in that direction is reduced, while maintaining the sensitivity of the other two axes.

X Axis Sensitivity



Y Axis Sensitivity



Z Axis Sensitivity



Operation (continued)

The prior illustrations indicate the areas that each axis will be most sensitive to. For most applications, activate all three axes for the greatest sensitivity and maximum detection distance.

For unique installation challenges, such as moving gates or cross traffic that fall within the sensitive directions shown, turn off that axis to minimize the sensitivity from those disturbances.

Note that the flat pack configuration allows for the best implementation of these settings. The only known axis in the *probe configuration* will be the Y, as its orientation does not change as the sensor is rotated about the cable end (see the [vertical installation](#) diagram).

To find the axis most affected by an unwanted disturbance when using the round probe configuration, perform the following procedure:

1. Calibrate the sensor with the disturbance removed.
2. Move the disturbing object into position
3. Select each axis individually, observing the ULTRAMETER™ display for each.
4. Turn off the axis that causes the *lowest* number to appear due to the disturbance.

ULTRAMETER™ Sensitivity Display

The [ULTRAMETER™ sensitivity display](#) simplifies the installation process by displaying the sensitivity setting required to detect a vehicle near the sensor. To use this feature, observe the display while a vehicle is moving into position near the sensor module, note the number displayed, then adjust the sensitivity setting (rotary switch) to the displayed position.

During normal operation, when a vehicle is not on near the sensor, the display is blank. The effects of cross-traffic interference can be observed on the display when the sensing area is vacant.

Sensitivity Setting

The [10-position rotary switch](#) allows for precise adjustment of detection level. The sensitivity level increases from position 0 thru 9 with position 0 being the lowest sensitivity. Typical applications require a setting of 3 or 4. The [ULTRAMETER™ sensitivity display](#) simplifies the installation process by displaying the sensitivity setting required to detect a vehicle near the sensor. To use this feature, observe the display while a vehicle is moving into position near the sensor, note the number displayed, then adjust the sensitivity setting (rotary switch) to the displayed position. This adjustment applies to all axes.

Sensor Calibration/Reset

[Pressing the reset switch](#) calibrates the sensor to the local magnetic field. This must be used whenever the sensor is moved from its position, and may be necessary if the sensor's local magnetic environment has changed ([see troubleshooting](#)).

Operation (continued)

Detect-On-Stop (DOS®)

The [Detect-On-Stop feature](#) requires that a vehicle must come to a complete stop near the sensor for a minimum of 1 second (typical 1-2s) before the output activates.

Presence Output

The [presence setting](#) provides two selections: the output can be set for Infinite Presence or Normal Presence. Infinite Presence causes the output to remain in detect mode as long as the vehicle remains near the sensor. Normal Presence causes the output to reset after 5 minutes. **DO NOT USE THE NORMAL PRESENCE SETTING UNLESS THE OPENING IS PROTECTED BY A SECONDARY SAFETY DEVICE SUCH AS THE EMX IRB-4X PHOTOEYE.**

Pulse Output

When the pulse output mode is selected, the output will be activated for approximately 500ms on vehicle entry or exit (depending on status of [switch 5](#)).

Delay

The delay setting provides a 2 second delay before activating after the sensitivity threshold is met.

Controls and Indicators

PRESENCE

DIP switch position 8	
Normal	on
Infinite	off

DETECT-ON-STOP (DOS®)

DIP switch position 7	
DOS on	on
DOS off	off

OUTPUT

DIP switch position 6	
Pulse	on
Presence	off

PULSE ON ENTRY/EXIT

DIP switch position 5	
Pulse on exit	on
Pulse on entry	off

DELAY

DIP switch position 4	
2 second delay on	on
2 second delay off	off

AXES SETTINGS

DIP switch position			
Axis	3	2	1
X	on		
Y		on	
Z			on

SENSITIVITY SETTING

Position 0.....9	
Sensitivity	low.....high

**Sensitivity applies to all selected axes*

DETECT

Red LED	
Presence detected	on
No presence	off

ULTRAMETER™ SENSITIVITY DISPLAY

Indicates sensitivity setting required to detect vehicle

SENSOR CALIBRATION/RESET

Press to calibrate and reset error status



Connections



Terminal	Description	Sensor Shielded Cable
1	Power (12 – 24 VDC/VAC)	-
2	Power (12 – 24 VDC/VAC)	-
3	Relay - NO	-
4	Relay - COM	-
5	Relay - NC	-
6	Open collector through-put	
7	Open collector through-put	WHITE
8	Sensor communications A	RED
9	Sensor communications B	GREEN
10	V+ (to sensor)	BROWN
11	V- (logic common)	BLUE
	Chassis GND	SHIELD

Operator Connections

Sensor Connections



The shield (bare) wire on the sensor cable should be connected to Chassis ground to ensure noise immunity.

Note: Strip wires $\frac{1}{8}$ " to $\frac{1}{4}$ ", refer to operator instructions for operator connections.



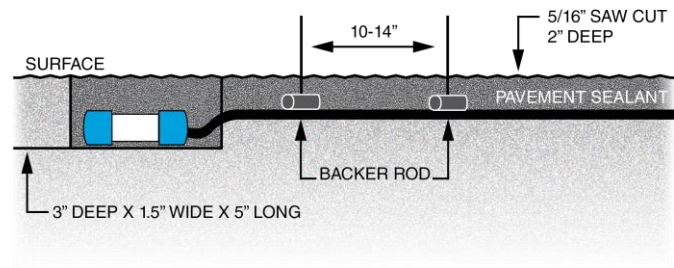
Troubleshooting

Symptom	Possible cause	Solution
Green LED flashes half second on, half second off “E” “1” flashes on display	Communication failure	1. Check communications and power wiring to sensor module 2. Cycle power to remote and sensor module
Green LED flashes, 1 fast	Previous communication failure	Check communications and power wiring to sensor module
No detection	Sensitivity set too low	With vehicle within desired proximity, observe ULTRAMETER™ display to find the minimum sensitivity required for detection
Stuck in detection	Local environmental change	Recalibrate sensor using reset button located underneath ULTRAMETER™ display on CS303-C-1
ULTRAMETER™ Display shows a value when no car is present	Local environmental change	Recalibrate sensor using reset button located underneath ULTRAMETER™ display on CS303-C-1
Green and red LED's flash simultaneously “E” “2” flashes on display	Insufficient supply voltage	Make sure the power supply is working correctly and properly rated according to connections table (see above)

Probe

HORIZONTAL INSTALLATION

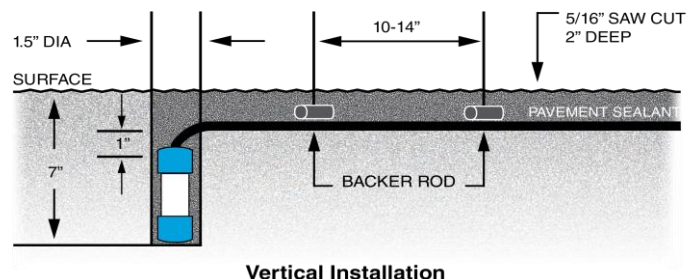
Horizontal installation can be accomplished by cutting out a 3" x 1.5" x 5" area in the pavement, with a 5/16" x 2" deep saw cut exiting the cutout for the communications/power cable. Backer rod should be placed at a minimum of every 10-14". Pavement sealant can then be used to fill the cable and probe cavities.



Horizontal Installation

VERTICAL INSTALLATION

For vertical installation, drill a 7" x 1.5" hole in the surface with a 5/16" x 2" deep saw cut exiting the cutout for the communications/power cable. Backer rod should be placed at a minimum of every 10-14". Pavement sealant can then be used to fill the cable and probe cavities.



Vertical Installation

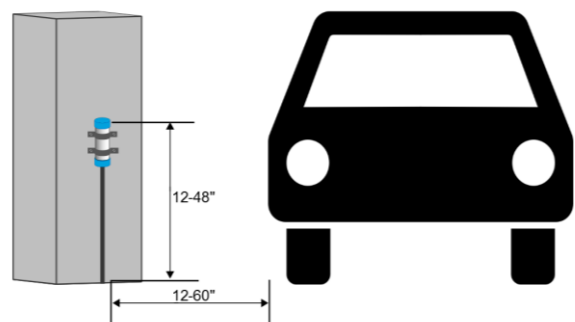
ABOVE-GRADE MOUNTING

When mounting above-grade, make sure that the sensor is placed at a height to maximize the sensitivity of the detector. This typically means installing it at door level to prevent dropouts. The maximum distance maintained between the sensor and the vehicle should be less than five feet (see [CS303 Sensitivity vs. Distance graph](#) on page 13).

The sensor should be secured to the target object to minimize any movement that might provide false detections or dropouts. Securing the probe may be accomplished with at least one 1" ID pipe/conduit strap, such as Cantex part number 5133736. If plastic straps are not available, steel may be used, but should be placed towards the cable-end of the probe to avoid sensitivity related issues. The flat pack can be secured with cable ties and suitable mounts.

The sensor can be installed inside of any non-ferrous architectural structures, such as fiberglass, plastic, aluminum, etc.

Cabling should be enclosed in conduit to minimize environmental degradation.

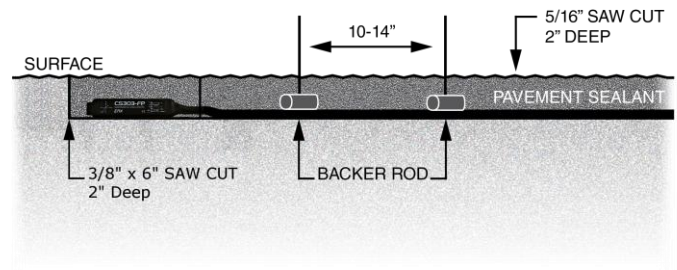


Above-Grade Installation

Flat Pack

HORIZONTAL INSTALLATION

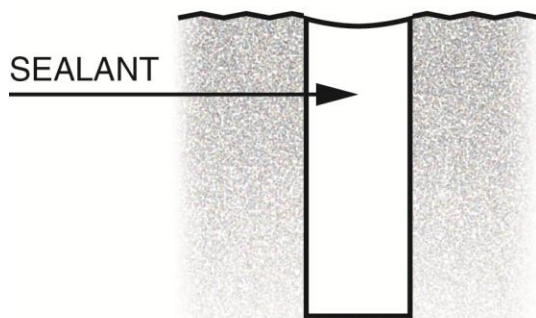
The flat pack requires a 2" x 3/8" x 6" cut in the pavement for the sensor, with a 5/16" x 2" deep saw cut for the cable lead. Backer rod should be placed at a minimum of every 10-14". Pavement sealant can then be used to fill the cable and sensor cavities



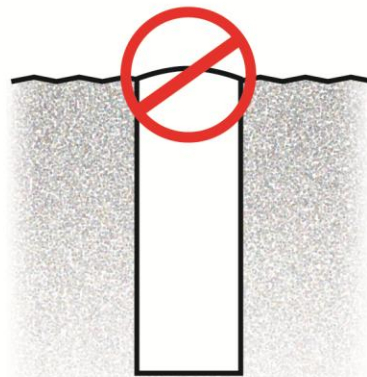
Horizontal Installation

Sealant (Probe & Flat Pack)

Correct sealant fill does not extend above the roadway

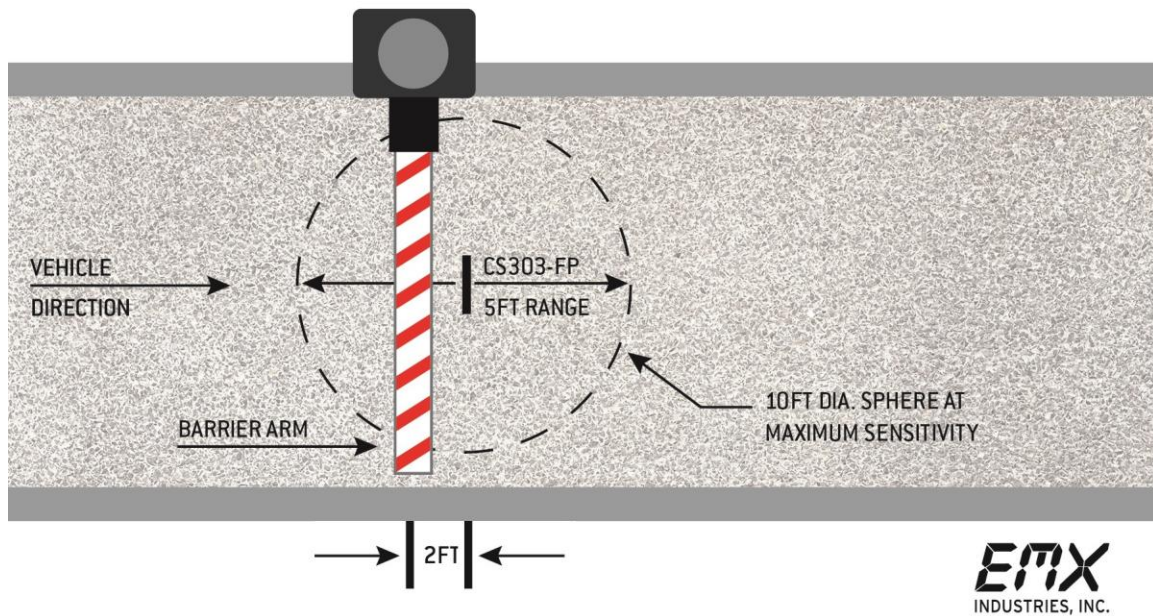


Incorrect fill allows vehicle weight to press on sensor

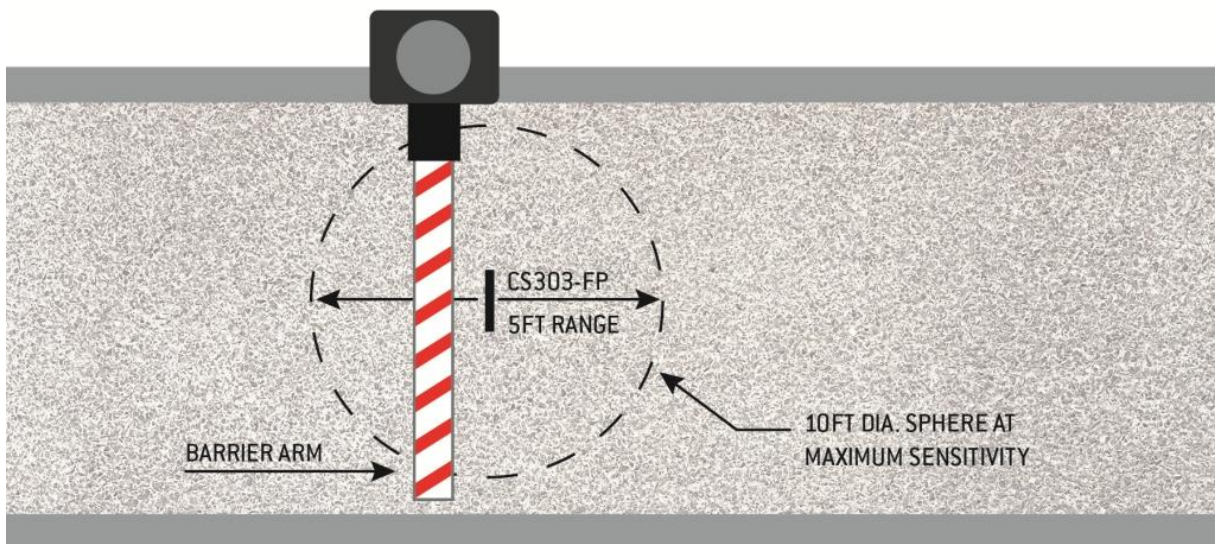


Installation (continued)

CS303 VEHICLE SENSOR Barrier Arm Installation



CS303 VEHICLE SENSOR Loop Detector Replacement



CS303 sensor minimizes the potential of the barrier arm closing when a vehicle is present.
The number of sensors and their placement is dependent on the application.

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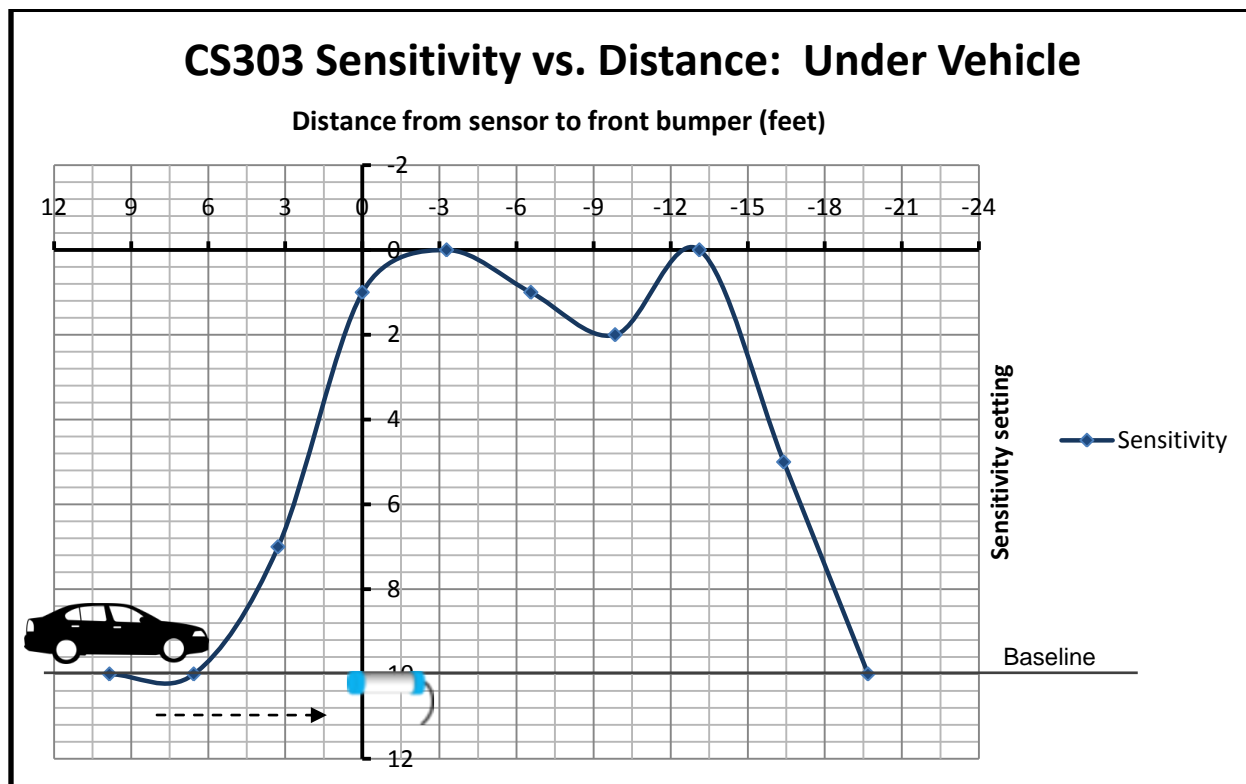


Figure 1 - CS303 Sensitivity Data

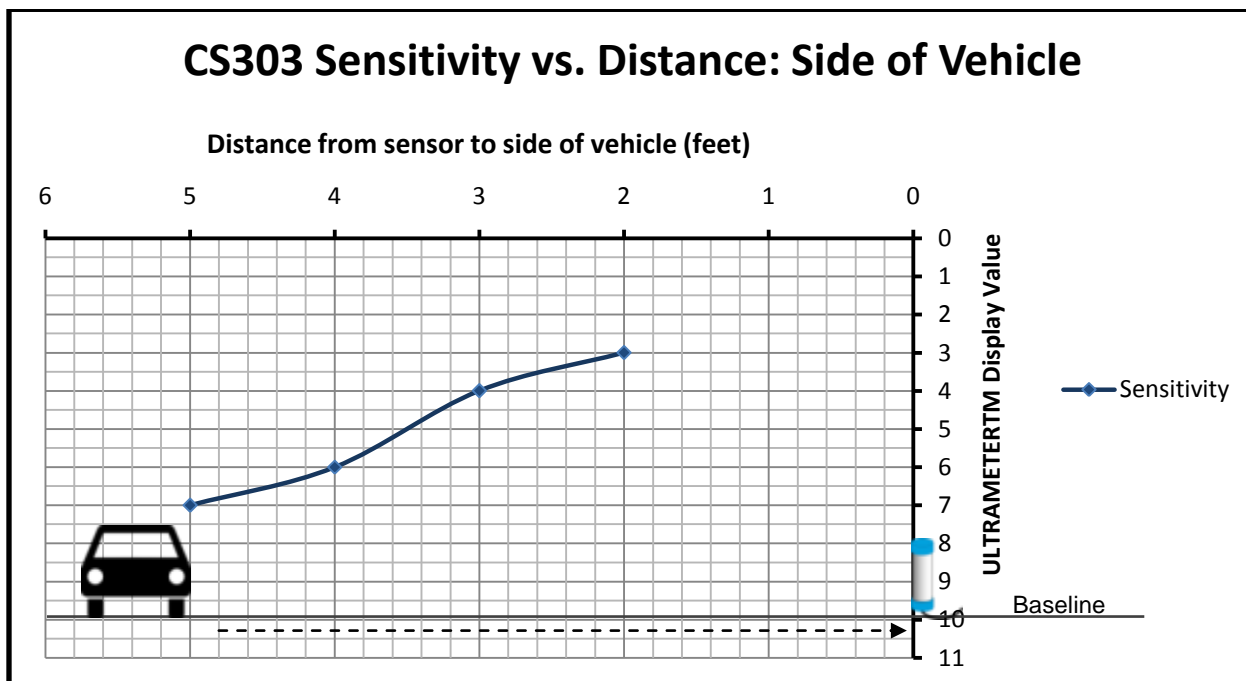


Figure 2 - CS303 Sensitivity Data

Installation (continued)

Sensitive area vs. Sensitivity adjustment

Area (ft.)	Height at the center (ft.)	Sensitivity (adjustment setting)
1x1	1	2
2x2	2	3
3x3	3	4
4x4	4	6
5x5	5	7

Ordering Information

- **CS303-C-1** Control Unit
- **CS303-DB-50** Direct Burial Sensor, Probe, 50'
- **CS303-DB-100** Direct Burial Sensor, Probe, 100'
- **CS303-FP-50** Direct Burial Sensor, Flat Pack, 50'
- **CS303-FP-100** Direct Burial Sensor, Flat Pack, 100'
- **CS303-L** Logic Interface

Warranty

EMX Industries Incorporated warrants all products to be free of defects in materials and workmanship for a period of two years under normal use and service from the date of sale to our customer. This warranty does not cover normal wear and tear, abuse, misuse, overloading, altered products, damage caused by incorrect connections, lightning damage, or use other than intended design.

There is no warranty of merchantability. There are no warranties expressed or implied or any affirmation of fact or representation except as set forth herein.

EMX Industries Inc. sole responsibility and liability, and the purchaser's exclusive remedy shall be limited to the repair or replacement at EMX Industries option of a part or parts found not conforming to the warranty. In no event shall EMX Industries Inc. be liable for damages, including but not limited to damages resulting from non-conformity, defect in material or workmanship.

Effective date: January 1st, 2002





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