

# CarSense 303™

MAGNETORESISTIVE VEHICLE DETECTOR

# Secumatic



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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 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.

## Product Overview



CS303 Controller



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

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
- 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.

## Specifications

	Sensor	Remote
<b>Sensing Technology</b>	3-axis magnetoresistive	
<b>Sensitivity</b>	10 levels: 0-9	
<b>Axis Sensitivity</b>	512 counts/Gauss (typical)	
<b>Environmental Tracking</b>	Automatic compensation	
<b>Local Magnetic Field Calibration</b>	Averages local field signature in any sensor orientation	
<b>Detection Range</b>	1.5 m (5ft)	
<b>Response Time</b>	125 ms	
<b>Power/Fault Indicator</b>		Green LED
<b>Detect Indicator</b>		Red LED
<b>Pulse/Presence</b>	Allows the relay/NPN output to send either a pulse output or have constant presence	
<b>Detect-On-Stop (DOS®)</b>	Requires vehicle to stop for a minimum of 1 second (1-2s typical)	
<b>Outputs</b>	NPN (open collector)	SPDT relay NPN (open collector)
<b>Output Ratings</b>	50 mA	Relay: 1A @ 24 VDC...120 VAC NPN: 50 mA (max)
<b>Connection</b>	5 conductor direct burial	10 position screw terminal
<b>Operating Environment</b>	-40° C...82° C (-40° F...180° F) 0...95% relative humidity	
<b>Housing Material</b>	DB: PVC FP: Polyolefin	ABS
<b>Environmental Rating</b>	IP69K	IP30
<b>Power Supply</b>	12-30 VDC	12-30 VDC and 24 VAC
<b>Current Draw</b>	10 mA max	40 mA max
<b>Supply Protection Circuitry</b>	Reverse polarity and fuse protected	
<b>Dimensions</b>	DB: 102mm (4.0") x 27mm (1.0") FP: 80mm (3.0") x 20mm (0.8") x 9mm (0.35")	76mm (3.0") x 22mm (0.9") x 70mm (2.75")
<b>Weight</b>	DB: 43g (0.09 lbs.) FP: 23g (0.05 lbs.)	68g (0.15 lbs.)

# Operation

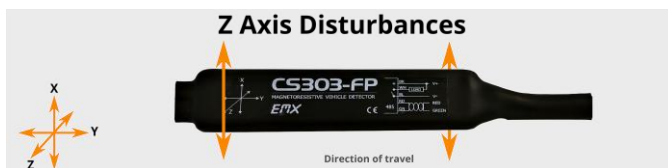
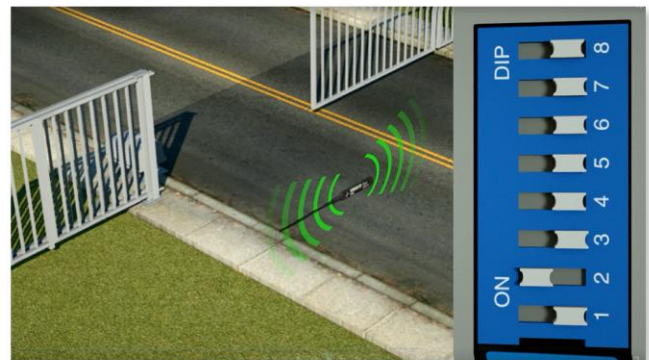
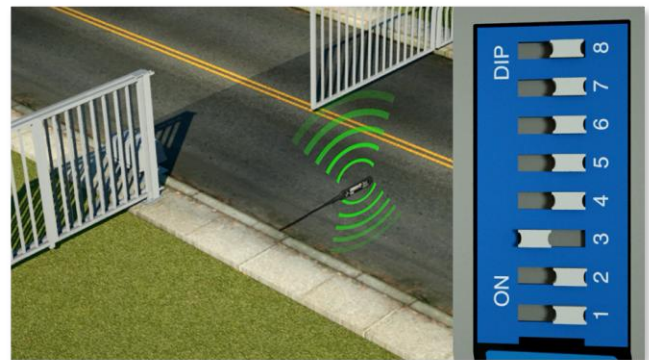
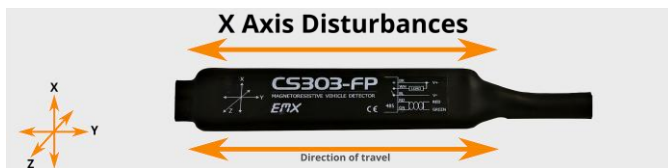
## Power Up

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.



## Operation (continued)

The above illustrations show the direction of travel that will most affect each individual axis. 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 follow any of the directions of travel shown above, 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.

### 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 is exposed to a strong magnetic field.

## 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	X		
Y		X	
Z			X

### SENSITIVITY SETTING

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

### 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	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	WHITE
7	Open collector through-put	
8	Sensor communications A	RED
9	Sensor communications B	GREEN
10	V+ (to sensor)	BROWN
11	V- (logic common)	BLUE



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

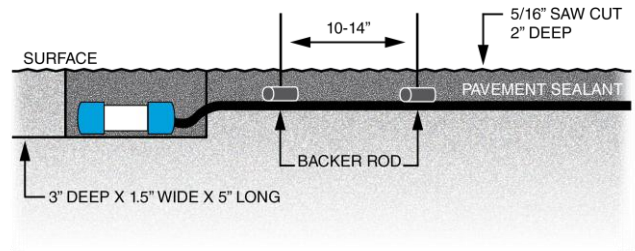
## Troubleshooting

Symptom	Possible cause	Solution
Green LED flashes half second on, half second off	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
Green and red LED's flash simultaneously	Insufficient supply voltage	Make sure the power supply is working correctly and properly rated according to connections table (see above)

## Probe

### HORIZONTAL INSTALLATION

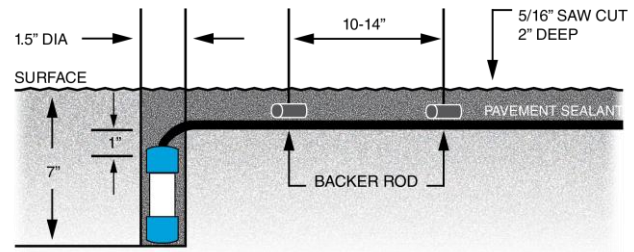
Horizontal installation can be accomplished by cutting out a 3" x 1.5" x 5" area in the pavement, with a 5/16" x 2" deep saw cut exiting the cutout for the communications/power cable. Backer rod should be placed at a minimum of every 10-14". Pavement sealant can then be used to fill the cable and probe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

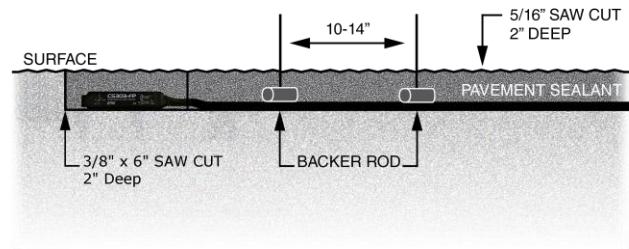


Vertical Installation

## 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



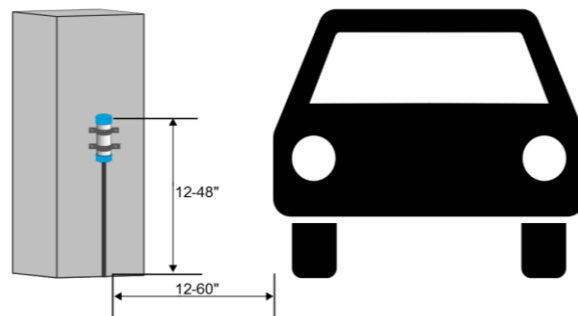
### ABOVE-GRADE MOUNTING

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 the following page).

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

## CS303 Sensitivity vs. Distance: Under Vehicle

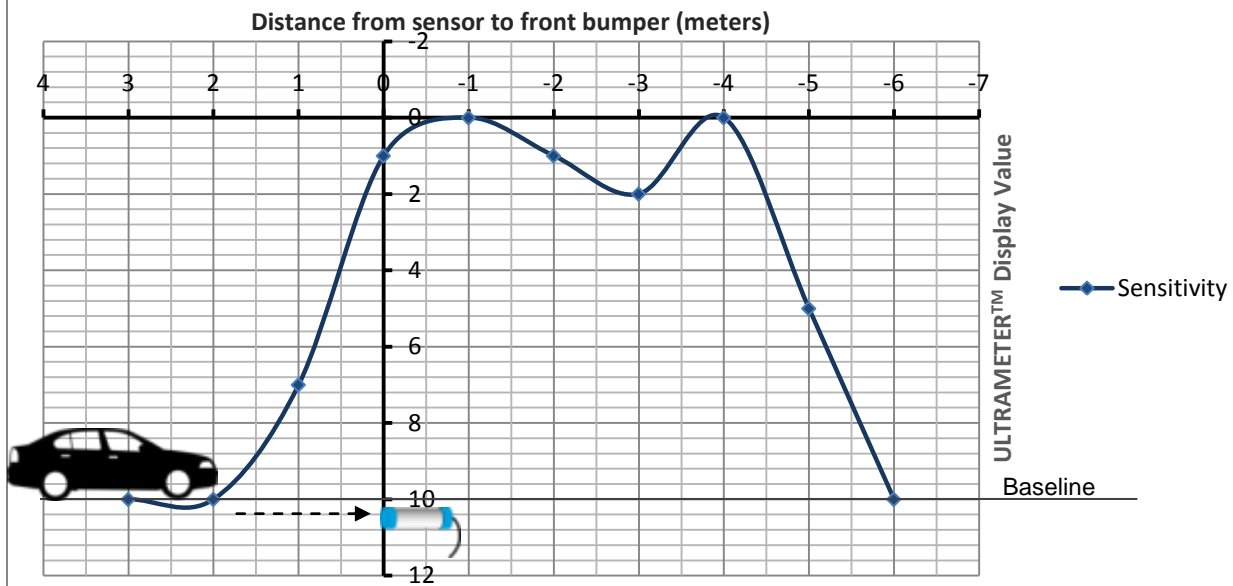


Figure 1 - CS303 Sensitivity Data

## CS303 Sensitivity vs. Distance: Side of Vehicle

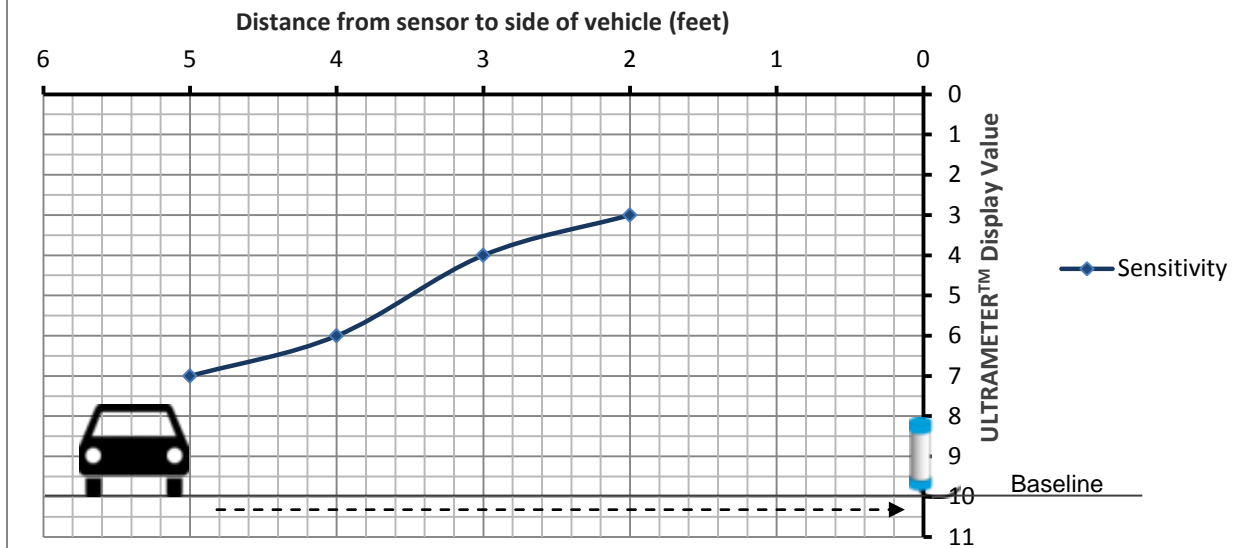


Figure 2 - CS303 Sensitivity Data

## 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'

## 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 1<sup>st</sup>, 2002



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