



# CS101™

## CarSense Vehicle Motion Detector



# Operating Instructions

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## CAUTIONS AND WARNINGS

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- **Never use the CS101™ as a safety reversing or presence detection system. The CS101™ requires that a vehicle be moving for detection. This product is an accessory or part of a system. Always read and follow the manufacturer's instructions of 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.**
- **DO NOT INSTALL PROBE IN HOT ASPHALT**
- **PROVIDE AN EARTH GROUND CONNECTION USING GROUND ROD PER INSTALLATION INSTRUCTIONS**
- **DO NOT EXCEED POWER SUPPLY VOLTAGE RATING 41VDC or 29VAC**
- **ALLOW 3 MINUTES AFTER POWER UP FOR STABILIZATION**
- **CS101 is sensitive to metal objects that move through its field, including bicycles, horses, small vehicles or metal in shoes. Reduce the sensitivity as required to eliminate detection. In areas with high pedestrian traffic, the probe may be buried up to 24" deep to prevent triggering the detector by the metal in shoes.**

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## PRODUCT OVERVIEW

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The CS101™ is a compact vehicle motion detector that operates by detecting changes in the earth's magnetic field that occur near the probe. These changes are produced by the movement of ferrous materials such as cars or trucks within the probe's range. The CS101 uses the CS101 series direct burial probes placed adjacent to a roadway or buried in a concrete or asphalt roadway.

The probe features a 12ft. detection range that is dependent on the speed and size of the vehicle. The probe is available in a wide variety of cable lengths.

The CS101 features adjustable sensitivity and output "on" time. A green LED indicates that power is applied to the unit while a red LED indicates detection. The output consists of form C relay contacts (N.O., N.C., C).

The CS101 may be used as a free exit sensor in both commercial and residential applications. ***The detector is not for use as a presence detector.*** When presence detection is needed, use the Ultra II DTEK and inductive loop.

## Specifications

|                              |  |
|------------------------------|--|
| Range sensitivity            | 12 ft. @ 5mph min. speed                               |
| Sensitivity adjustment       | Dependent on mass and speed                            |
| Output on time adjustment    | 0.5..6 seconds   |
| Surge protection             | Probe input circuitry protected by surge suppressors   |
| Relay output configuration   | Form C (SPDT)  |
| Relay contact rating         | 1A @ 24VDC, 1A @ 120VAC                                |
| Detect indicator             | Red LED  |
| Power indicator              | Green LED  |
| Power                        | 9..41VDC or 6..29VAC and 110VAC Model                  |
| Standby current              | 2.5mA  |
| Detection current            | 50mA   |
| Operating temperature        | -40°C..82°C (-40°F..180°F)<br>0..95% relative humidity |
| CS101 housing material       | Polycarbonate  |
| CS101 dimensions (L x W x H) | 3.35"(84mm) x 1.6"(41mm) x 2.2"(55mm)                  |
| CS101 weight                 | 0.25 lbs. (113g)                                       |
| Probe housing material       | PVC water-tight  |
| Probe dimensions (L x Dia.)  | 17" (432mm) x 1" (25mm)                                |
| Probe cable                  | 3-wire, shielded, direct burial                        |

## OPERATION

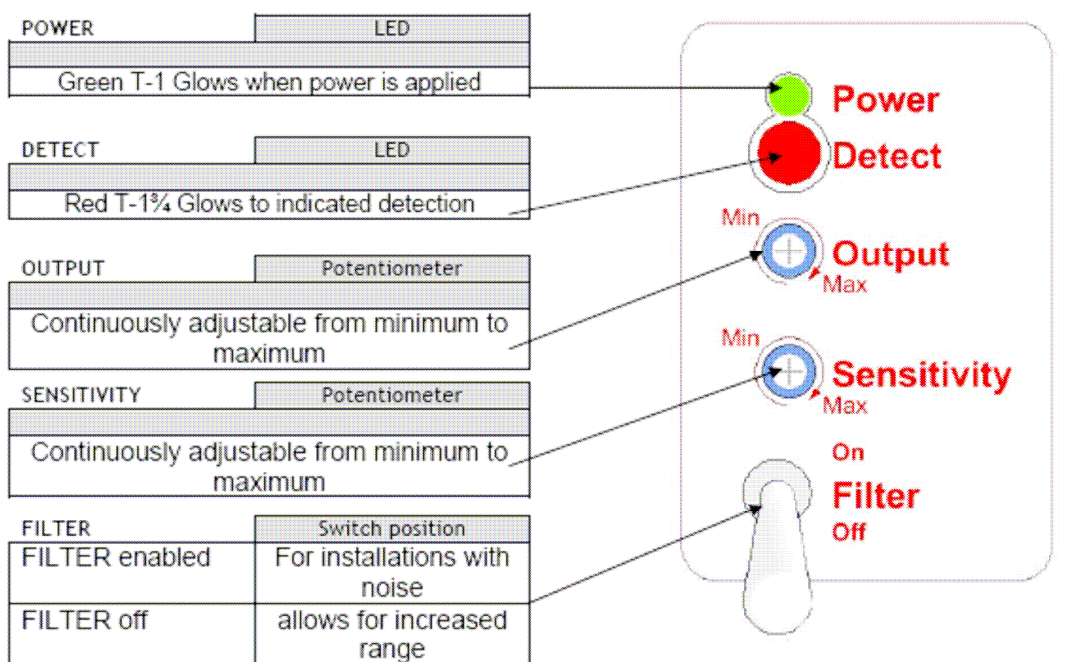
After allowing a 3-minute stabilization time the CS101 is ready for use. It is possible that the detector will cycle during the power up stabilization period, this is normal. The CS101 relay contacts provide the means of indicating to the gate operator or other external equipment, that a vehicle has been detected. Since the CS101 is designed to detect motion it is not suitable for use as a presence detector.

The green LED on the CS101 front panel indicates that power is applied to the unit and should always be on. The red LED on the front panel indicates detection and the activation of the output relay.

The sensitivity adjustment allows the installer to set the system sensitivity for reliable operation. Rotate the adjustment counter-clockwise for minimum sensitivity and clockwise for maximum sensitivity. The output delay adjustment controls how long the output remains activated upon detection; minimum is approximately ½ second while maximum is approximately 6 seconds.

***Sensitivity is a function of speed and mass; the slower a vehicle is moving, the closer the vehicle must pass the probe to trigger the detector.***

## CONTROLS AND INDICATORS



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# INSTALLATION GUIDELINES

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## POWER SUPPLY

- ***Do not exceed 41VDC or 29VAC.*** Power requirements are 9...41 VDC or 6...29 VAC

## PROBE

- **STANDARD INSTALLATION - BURY PROBE 8" - 12" DEEP**
- **HIGH PEDESTRIAN TRAFFIC - BURY PROBE 24" DEEP**  
CS101 is sensitive to metal objects that move through its field, including bicycles, horses, small vehicles or metal in shoes. Reduce the sensitivity as required to eliminate detection. In areas with high pedestrian traffic, the probe may be buried up to 24" deep to prevent triggering the detector by the metal in shoes.
- Do not install the Probe or lead wire near or parallel to:
  - Low voltage lighting wires
  - Telephone lines or intercom systems
  - Electric motors or control relays
  - Overhead power lines and transformers or underground power lines
  - Cell phone towers, TV towers or communications links
  - Moving metal flagpoles, fences, gates or horses with metal shoes
  - Do not mount on any moving surface such as bridges or walkways may vibrate under traffic
  - Underground water lines
- Probes are available in various cable lengths, when possible select the appropriate cable length for the installation. If it is necessary to extend the cable length, use a high quality lead-in cable suitable for direct burial, and a high quality, watertight cable splice to prevent moisture from entering the cable causing false triggering. A splice kit (Part no. 3M SPLICE KIT) and lead-in wire is available from EMX. *All splices must be waterproof.*
- When there is a high incidence of damage from burrowing animals or other potential damaging activities, it is recommended that the cable be placed in plastic conduit (1 ½" I.D.) to prevent damage to the cable. Damage to the cable jacket may allow moisture to enter the cable causing false triggering. When placing the probe in plastic conduit, use foam or tape to assure that the probe does not move or vibrate. It is recommended that the conduit be sealed to prevent water from collecting in the conduit.
- The probe must always be installed in such a way that it remains completely motionless. Any movement will cause the probe to trigger.

## CS101 module

- The detector is sensitive to minute changes in the magnetic field around the probe. Power lines, transformers, and other electrical devices located in the vicinity of the probe that produce transients could cause disturbances in the magnetic field that may result in triggering the detector. Avoid installation of the probe near these devices.
- The detector sensitivity is a function of mass and speed. A larger, fast moving vehicle will be detected at a greater distance than a smaller, slow moving vehicle. With this in mind, consider the distance of the probe to normal residential traffic, truck traffic, railroad, etc. As a general rule, probe distance to a road way should be a minimum of 40' while probe distance to a railway should be a minimum of 100'.

### **IMPORTANT: EARTH GROUND CONNECTION**

The CS101 contains transient protection devices to guard the sensitive electronic circuitry from damage and false triggering due to electrical transients caused by lightening or other sources. Always provide a good earth ground. A 5ft copper rod or cold water pipe provides a sufficient earth ground connection. Both the probe shield and PIN 6 of the CS101 must be connected to this earth ground.

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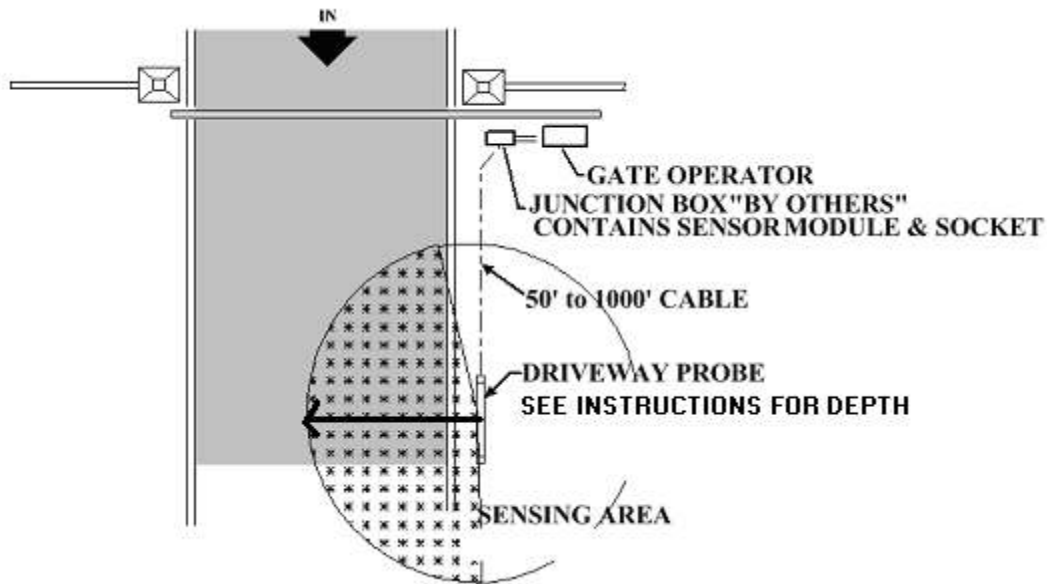
## **PROBE INSTALLATION ADJACENT TO ROADWAY**

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**Please read INSTALLATION GUIDELINES prior to installation.**

When the detector is set to maximum sensitivity (full clock-wise on the sensitivity adjustment) detection distance is approximately 12ft at a speed of 5mph. At higher speeds, 10-15mph, detection distance can exceed 12ft.

1. Prior to permanent installation adjacent to the roadway, place the probe in the desired location; connect the probe to the CS101 and power, output contact and earth ground to the intended equipment. Both the probe shield and PIN 6 of the CS101 must be connected to the earth ground (reference EARTH GROUND CONNECTION in the INSTALLATION GUIDELINES section).
2. Place the probe parallel to the roadway (driveway) in the desired location.
3. Apply power and allow 3 minutes warm-up for system stabilization.
4. Set sensitivity to minimum and delay to maximum.
5. Drive the vehicle past the probe at a typical speed and to the far side of the roadway.
6. Repeat this step while gradually increase the sensitivity until the system detects the vehicle.
7. Bury the probe approximately 8-12" deep or 24" deep (see INSTALLATION GUIDELINES) at this location and repeat the previous sensitivity check (step 2 -5), adjust the sensitivity as necessary to detect the vehicle. A higher sensitivity setting than required to detect the vehicle makes the system more vulnerable to triggering from unintended sources such as movement of other objects in the sensitive area or other electrical disturbances.



Typical Installation

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## PROBE INSTALLATION IN A ROADWAY

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Please read **INSTALLATION GUIDELINES** prior to installation.  
**DO NOT INSTALL IN HOT ASPHALT**

When the detector is set to maximum sensitivity (full clock-wise on the sensitivity adjustment) detection distance is approximately 12ft at a speed of 5mph. At higher speeds, 10-15mph, detection distance can exceed 12ft.

1. The probe should be positioned in the center of the roadway, perpendicular to the direction of traffic. Place the probe in plastic conduit to prevent damage to probe and cable. Probe should be located at approximately 2" depth in concrete or asphalt. The probe may be located prior to paving, or a cut may be made in the pavement for installation. No rebar should be above the probe.
2. Once the probe is installed, connect the probe to the CS101 and power, output contact and earth ground to the intended equipment. Both the probe shield and PIN 6 of the CS101 must be connected to the earth ground (reference **EARTH GROUND CONNECTION** in the **INSTALLATION GUIDELINES** section).
3. Apply power and allow 3 minutes warm-up for system stabilization.
4. Set sensitivity to minimum and output delay to maximum (approximately 6 seconds).
5. Drive the vehicle over the probe at a typical speed and each side of the roadway.
6. Repeat this step while gradually increase the sensitivity until the system detects the vehicle. A higher sensitivity setting than required to detect the vehicle makes the system more vulnerable to triggering from unintended sources such as movement of other objects in the sensitive area or other electrical disturbances.

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## Troubleshooting

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| Symptom          | Possible cause                      |
|------------------|-------------------------------------|
| False triggering | Electrical disturbances             |
|                  | Damaged probe cable                 |
|                  | Moisture in the probe cable         |
|                  | Movement in the probe's environment |

### Possible solutions

1. Verify that the earth ground connection to the CS101 and the probe shield is secure. If the connection is not secure, reconnect to the earth ground and retest the system.
2. Inspect the area around the probe for any metal object that may move such as signs or fences.
3. Disconnect the probe wires and see if the false triggering continues. If the false triggering stops, check the probe as outlined below. If the false triggering continues, disconnect the power and temporarily connect a 9V battery to the CS101 and reconnect the probe. Wait 3 minutes for the system to stabilize. If the false triggering stops, consider using a separate power supply for the CS101 such as a 120VAC to 12V power converter (min. 100ma). Re-connect the probe and test the system.
4. If the false triggering continues, inspect the area around the probe to see if any metallic objects may be subject to any movement. These may include fences, flagpoles, signs, etc. Other possible causes are electrical power lines, electric motors and high power lighting.

### Checking the probe

If the false triggering stops when the probe is disconnected and other possible causes have been ruled out, then the likely cause is damage to the probe cable.

A gross check may be performed on the probe as follows:

1. Disconnect the probe wires from the CS101.
2. Using a DVM set to measure ohms, verify that the resistance is 950 ohms +/- 10% the black and red wires. If not, then the probe/cable is defective.
3. Set the DVM to measure a minimum of 20 megohms and check the resistance between the red wire and the shield wire. Verify that the meter indicates open (infinity). Repeat this measurement on the black wire to the probe shield wire. If either measures a value, then there is moisture or damage to the probe and it must be replaced.

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| Symptom                                     | Possible cause |
|---|----------------|
| No output (but red LED indicates detection) | Bad connection |
|   | Failed relay   |

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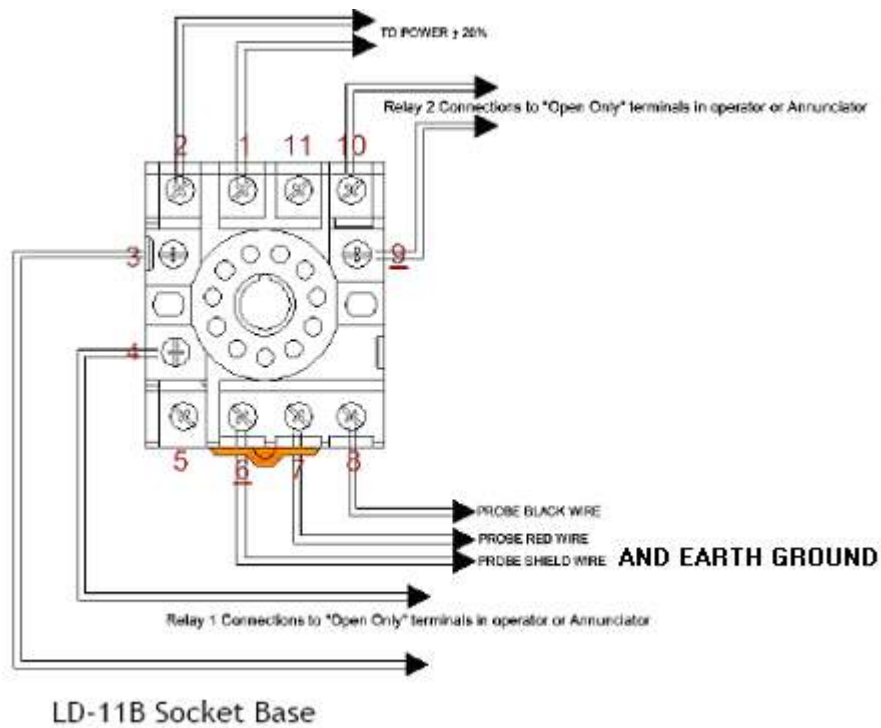
### Checking the CS101 output contacts

1. Disconnect the output contacts from the operator.
2. Connect a DVM, set to read ohms, to the COM and N.O. contacts.
3. The DVM should read open (infinity). Move a metal tool over the length of the probe, verify that the red LED turns on and that the DVM reads less than 10 ohms.

| Symptom      | Possible cause          |
|--------------|-------------------------|
| No detection | Minimum 5 mph           |
|              | Bad connection          |
|              | Faulty power connection |
|              | Failed relay            |

1. Check to see if the detection LED turns on, if so, check the relay output and related connections.
2. Verify that the green LED is on, if not, check the supply voltage using a DVM. Verify the voltage is 9 - 41VDC or 6-29 VAC.

## Wiring diagram



| Pin no. | Description   |
|---------|---|
| 1       | Power + (9 to 41VDC or 6-29VAC) or 110 VAC model  |
| 2       | Power ground (9...41VDC common or 6-29VAC) or 110 VAC model   |
| 3       | RELAY 1 - N.O. (relay, normally open contact)   |
| 4       | RELAY 1 - Common (relay common contact)   |
| 5       | RELAY 1 - N.C. (relay, normally closed contact)   |
| 6       | Probe shield wire<br>Earth ground (provides connection for transient and noise suppression devices)<br>(reference EARTH GROUND CONNECTION in the INSTALLATION GUIDELINES section) |
| 7       | Probe (red wire)  |
| 8       | Probe (black wire)  |
| 9       | RELAY 2 - N.O. (relay, normally open contact)   |
| 10      | RELAY 2 - Common (relay common contact)   |
| 11      | RELAY 2 - N.C. (relay, normally closed contact)   |

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## Ordering information

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XC101-LV      CarSense Vehicle motion detector, 9...41VDC and 6...29 VAC  
 XC101-110      CarSense Vehicle motion detector, 110 VAC

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## Accessories

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LD-11B      Socket base, black, 11-pin, DIN rail mount (1 included)  
 LD-11      Socket base, gray, 11-pin, DIN rail mount  
 HAR-11      Connector, 11-pin, free-hanging with 36" wire harness  
 240-56857      Power convertor, 110VAC to 12VDC

PROBE-50      CS 101 direct burial probe, 50 ft. lead-in wire  
 PROBE-100      CS 101 direct burial probe, 100 ft. lead-in wire  
 PROBE-150      CS 101 direct burial probe, 150 ft. lead-in wire  
 PROBE-XXX      CS 101 direct burial probe, enter required lead-in wire length (ft.)



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## Warranty

### **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 of any nature, including incidental or consequential damages, including but not limited to damages resulting from non-conformity, defect in material or workmanship.

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