

VEHICLE SENSOR SYSTEMS

INSTALLATION/OPERATION

MODEL D-475AR

System Description

The Vehicle Sensor Systems use a passive sensor that detects changes in the natural magnetic field caused by moving ferrous metal objects such as cars, trucks or buses. The sensor can be buried in dirt adjacent to a paved roadway or placed in concrete or asphalt directly under the path of the vehicle. The roughly circular detection area depends on the size and speed of the vehicle - larger vehicles and faster speeds result in a larger detection area. The electronic processor is mounted in an ABS watertight enclosure and is powered by two user-replaceable lithium batteries. The Form A reed relay (normally open, closed on alarm) is powered by a user-replaceable 9 Volt battery. The relay can be used to switch voltages or to provide a "dry contact" closure to activate gate operators, transmitters, etc.

I. Installation Considerations

A. General

1. The standard D475AR sensor probe is furnished with 50 feet of direct burial shielded cable attached. If additional cable is required, order a Custom Length Sensor Probe. Splices in the cable should be avoided if at all possible. If a splice is absolutely essential, use a good quality direct burial waterproof splice.

2. In order to avoid possible nuisance tripping of the Sensor System, do not install the sensor or sensor cable within 8 feet of power lines, mercury lights, electric motors or intermittent pumps. It is important to stay as far away as possible from utility lines, transformers or electrical transients.

3. Remember that the mass and speed of vehicles results in a relatively large diameter detection area (See Figure 4). The sensor probe should not be installed closer than about 30 feet from a busy residential road, about 40 feet from truck traffic, and about 100 feet from railroad tracks.

4. It is essential that the waterproof integrity of the sensor probe/direct burial cable assembly is maintained. A nicked or crushed cable jacket may allow moisture to enter the cable or sensor, causing intermittent and unreliable operation. If a splice is essential, use a good quality direct burial, waterproof splice and follow the manufacturers instructions carefully.

5. In order to protect the cable from burrowing critters (moles, etc.), we recommend you run the cable in thick-wall plastic conduit about 18" deep. This will also offer some protection from rototillers and irrigation line trenchers.

If the probe or cable is to be buried in dirt or gravel, the use of plastic conduit will prevent sharp stones from puncturing the cable jacket.

6. The Signal Processor must have a good earth ground in order to provide reliable operation. A metal cold water pipe (street side) or a 5 foot copper rod will provide the best results.

B. Installation Adjacent to a Driveway

1. Determine the optimum placement by laying the probe on the ground, turning the Signal Processor sensitivity ("SENS") all the way down, and driving past the probe at the probable vehicle speed and line of travel (See Figure 4). Gradually increase the sensitivity and/or adjust the probe location for desired results. Keep the sensitivity as low as possible to avoid nuisance tripping. Bury the probe about 6 inches (15cm) deep, parallel to the line of travel of the vehicle.

2. If the sensor probe is put in conduit (1½ inch ID), keep the probe stationary within the conduit with foam, sponge or tape.

C. Installation In a Driveway

1. The sensor probe is placed in the middle of the driveway, perpendicular to the line of travel of the vehicles. It should be about 1 inch under the surface of cement, and about 2 inches under asphalt. It can be positioned properly before the driveway is poured or paved, or an existing driveway can be cut to accommodate the probe and cable.

2. The sensor probe and cable should be enclosed in plastic pipe to facilitate replacement if required. Again, insure the probe is stationary within the pipe.

I. Installation Instructions

CAUTION

THIS PRODUCT CONTAINS LITHIUM BATTERIES. READ THE CAUTION NOTES ON THE RF SHIELD ON THE D475AR AND IN THIS MANUAL.

CAUTION

THE SOLID STATE COMPONENTS IN THIS PRODUCT ARE EXTREMELY SENSITIVE TO VERY SMALL AMOUNTS OF ELECTRICAL ENERGY. DO NOT HANDLE THE CIRCUIT BOARD UNLESS IN A STATIC-FREE WORK STATION. DO NOT KEY A RADIO TRANSMITTER WITHIN 10 FEET OF AN UNPROTECTED CIRCUIT BOARD.

A. Bench Testing

1. The two lithium batteries have been installed at the factory. **Check to be sure they have not loosened during shipment.** Install the 9V battery in the battery holder.
2. Connect the probe to the processor (red or white to SIG+, black or blue to SIG-), and adjust

the "SENS." control CCW (minimum gain).

3. Connect an ohmmeter between the "OUTPUT" + and - terminals. The ohmmeter will indicate an open circuit until the probe is activated, at which time it will read less than 1 ohm.

4. Move the probe at least 4 feet away from the processor. Activate the probe by waving a metal object (screwdriver, wrench, etc.) down its length and about two inches away. Verify activation with the ohmmeter.

B. Field Testing

1. Connect the sensor probe to the processor, and the ohmmeter to the "OUTPUT" + and - terminals.
2. Place the probe on the ground in the desired location. Figure 4 shows the approximate detection radius for a single probe.
4. Set the "SENS." control fully counter-clockwise to minimum gain. Drive past the probe at the slowest probable vehicle speed. Gradually increase sensitivity ("SENS.") until the probe consistently detects vehicle movement as

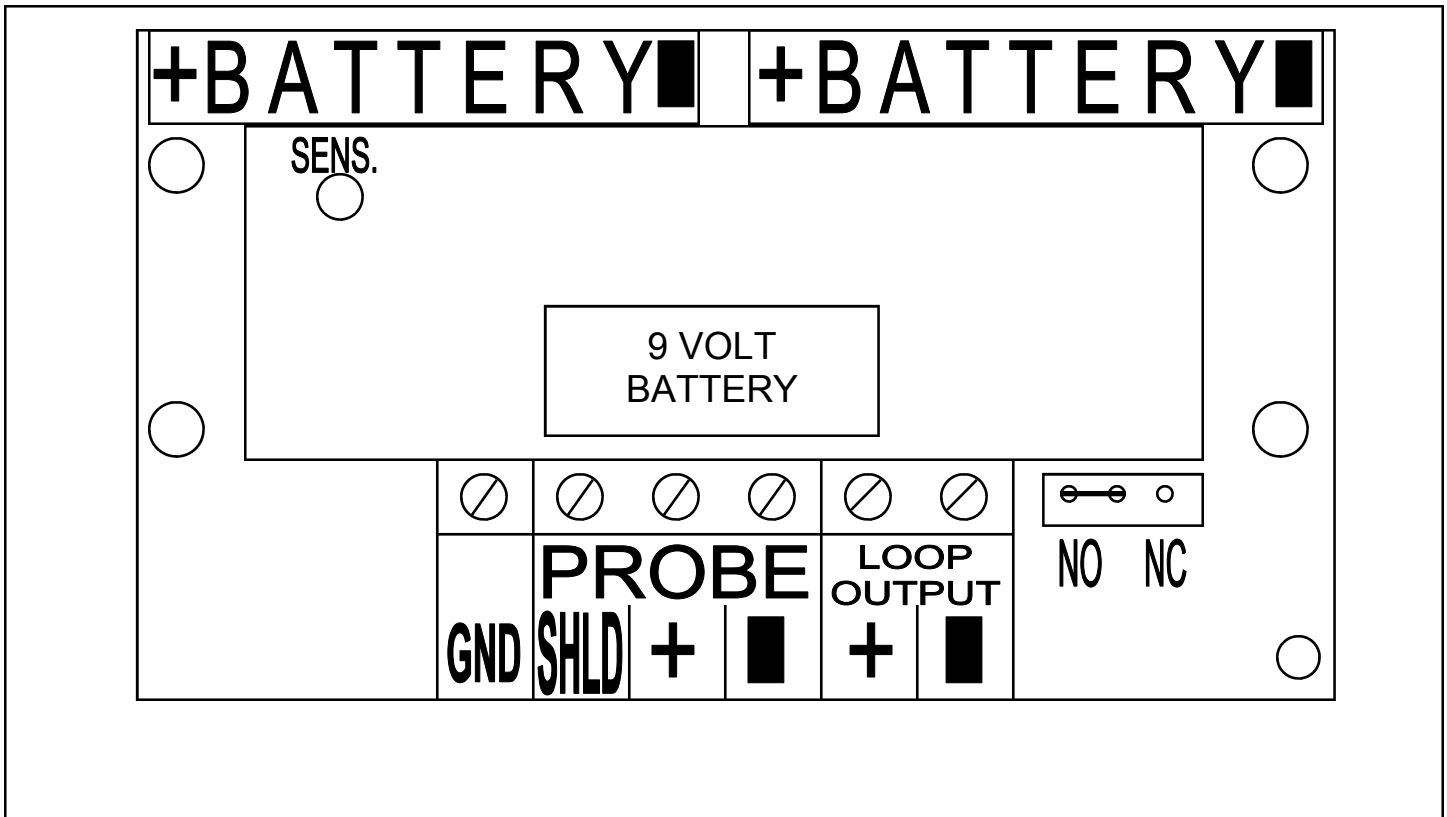


Figure 1 - Model D475AR

indicated by the ohmmeter. Be sure the detection range extends to the furthest edge of the desired protected area. **Do not use more sensitivity than is necessary to insure reliable vehicle detection.** If the detection area is too small, enlarge it by adding another sensor probe in series as shown in Figures 2 and 3. If the detection area is too large, decrease the sensitivity and/or move the sensor farther away from the vehicle path.

C. Mounting a Radio Transmitter

1. The D475AR and an RF transmitter unit may be mounted in the same weatherproof metal enclosure; however, there **must** be metal between the D475AR and the transmitting antenna to properly shield the sensitive D475AR circuit components from the RF energy.

D. Connection to Radio Transmitter

1. Program the transmitter for a normally open circuit.
2. Connect the antenna to the transmitter.

Connect the transmitter "loop" input to the "loop +" and "loop -" terminals on the D475A terminal board.

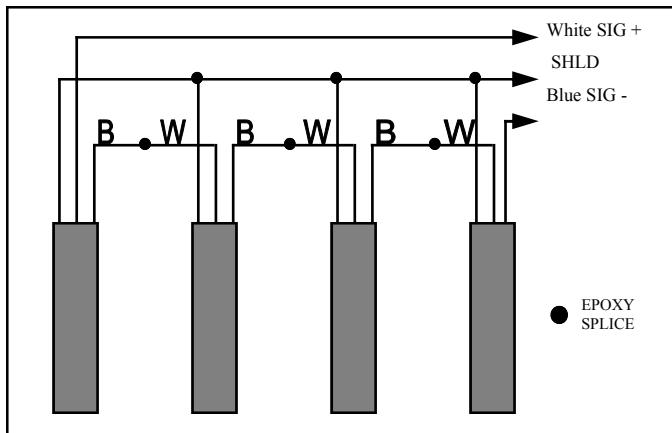


Figure 2-Multiple Probe Connections

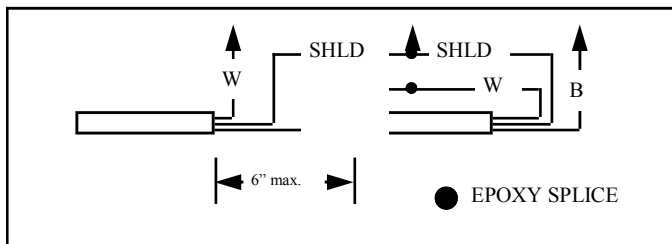


Figure 3-.....ding Probe Range

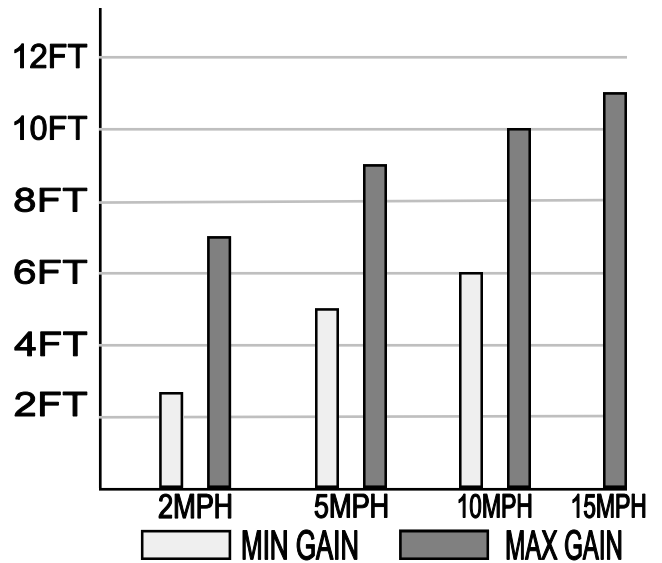


Figure 4 - Approximate Detection Radius

3. Make sure there is metal between the transmitting antenna and the D475A. Connect the transmitter "loop" input to the "loop+" and "loop -" terminals on the D475A terminal board.

4. Activate the sensor with a magnet, wrench or vehicle. Make sure the transmitter transmits.

5. Be sure all the through-holes in the enclosure are watertight.

III. Troubleshooting

In the following discussion, it is assumed that other elements of the system, such as the transmitter, receiver, alarm reporting panel, remote annunciator, gate opener, etc. have been tested and the problem is definitely in the Vehicle Sensor System.

A. False Tripping

1. There are two basic causes for false tripping in the Vehicle Sensor System - those related to the operating environment, and those related to failure of the sensor probe or processor. False tripping related to the operating environment is usually caused by faulty grounding, inadequate RF shielding, power lines or transformers too close to the probe or cable, or detection of fast moving vehicles outside the intended sensing area of the probe. Carefully check these possibilities before assuming probe or processor malfunction.

2. Most false tripping that is caused by the Sensor System is caused by moisture in the sensor probe or cable. This moisture can enter the probe from

a small nick in the cable during installation or during grounds maintenance. This problem is difficult to verify with an ohmmeter. Check the probes and processor by performing the steps below. If the problem is not apparent from these tests, then it is usually safe to assume that the probe and/or cable has moisture in it.

3. Separate sensor problems from processor problems by disconnecting all three sensor wires from the processor. If the processor trips with the sensor disconnected, the problem is with the processor or in the RF shielding. **Disregard any trips that occur while connecting or disconnecting the sensor probe.**

B. Testing the Sensor Probes

1. Disconnect all three probe leads from the processor.

2. Using a good quality ohmmeter on the highest ohms scale (20 Megohms or higher), measure the resistance between the probe shield (bare) wire, and first the probe white wire and then the probe blue wire. The ohmmeter indication should be infinity (totally open) for both measurements. If it is not, the cable either contains moisture or has been partially crushed. **NOTE: Readings taken with an ohmmeter with less than a 20M range may not be valid.**

3. Measure the resistance between the probe white wire and the probe blue wire. It should be

750 ohms \pm 75 ohms. If there are multiple probes wired in series, the ohms reading at the processor end should be the number of probes times 750 \pm 10%. If the resistance is not correct, the sensor probe/cable assembly is faulty.

C. Testing the Processor

1. Disconnect all three sensor probe wires from the processor.

2. Connect an ohmmeter between the "LOOP OUTPUT" terminals.

3. The ohmmeter should indicate an open circuit.

4. Momentarily connect the "PROBE +" terminal to the "SHLD" or "GND" terminal. The ohmmeter should read less than 1 ohm.

5. Measure the lithium battery voltages (directly across the battery) with a high-impedance meter (Digital Multimeter). This voltage across each battery should be about 3.6VDC. If it is significantly less, replace the batteries with Maxell ER6C#5TC or Saft LS14500.

6. Activate the sensor as in step 4 above. Measure the voltage across the 9V battery when the sensor activates; if this voltage is less than 6VDC, replace the battery with a good quality 9V alkaline battery.

Call MFM sensors Inc., 800-500-6367 or 206-589-1912 for further assistance. Do not return equipment without first obtaining a Return Authorization Number and shipping instructions.

LIMITED WARRANTY

All MFM sensor units are warranted against defective materials and workmanship for a period of one (1) year from the date of shipment from MFM sensors factory provided the installation, adjustment and operation are in accordance with MFM sensors instructions. During this period, MFM sensors will repair or replace the equipment returned to the factory which is determined by MFM sensors to be defective. MFM sensors assumes no responsibility for costs incurred in removing, installing or shipping new or defective units. Customer repairs, disassembly, alterations or abusive treatment will void this warranty. MFM sensors does not warrant fuses or batteries. No allowance will be given for repairs or alterations made by others unless made with MFM sensors prior written consent. MFM sensors shall not be held responsible for the work done, apparatus furnished or repairs made by others. MFM sensors reserves the right to make changes in design and additions or improvements in its equipment as shall in the sole judgment of MFM sensors constitute an improvement over former practice, but MFM sensors shall not be obligated to install such designs, additions or improvements in equipment previously manufactured.

LIMITATION OF WARRANTY AND REMEDY

Except as stated above, there are no other warranties, expressed or implied, including the warranties of merchantability or fitness for a particular purpose, applicable to this transaction and Purchaser's sole and exclusive remedy against MFM sensors shall be for the repair or replacement of defective parts as provided for herein and the limited warranty as stated above is in lieu of any other warranty or remedy. In no event, whether due to a breach of any warranty or any other cause arising from the performance or non-performance of the goods sold hereunder, shall MFM sensors be obligated or liable to Purchaser in any manner for consequential or incidental damages, including, but not limited to, lost profits, loss of property due to theft, plant downtime, delays or suits by third parties. If Purchaser resells the product, such sales shall be subject only to the terms of the Seller's Limited Warranty and Purchaser shall make no representations with respect to such products in addition to Seller's Limited Warranty.