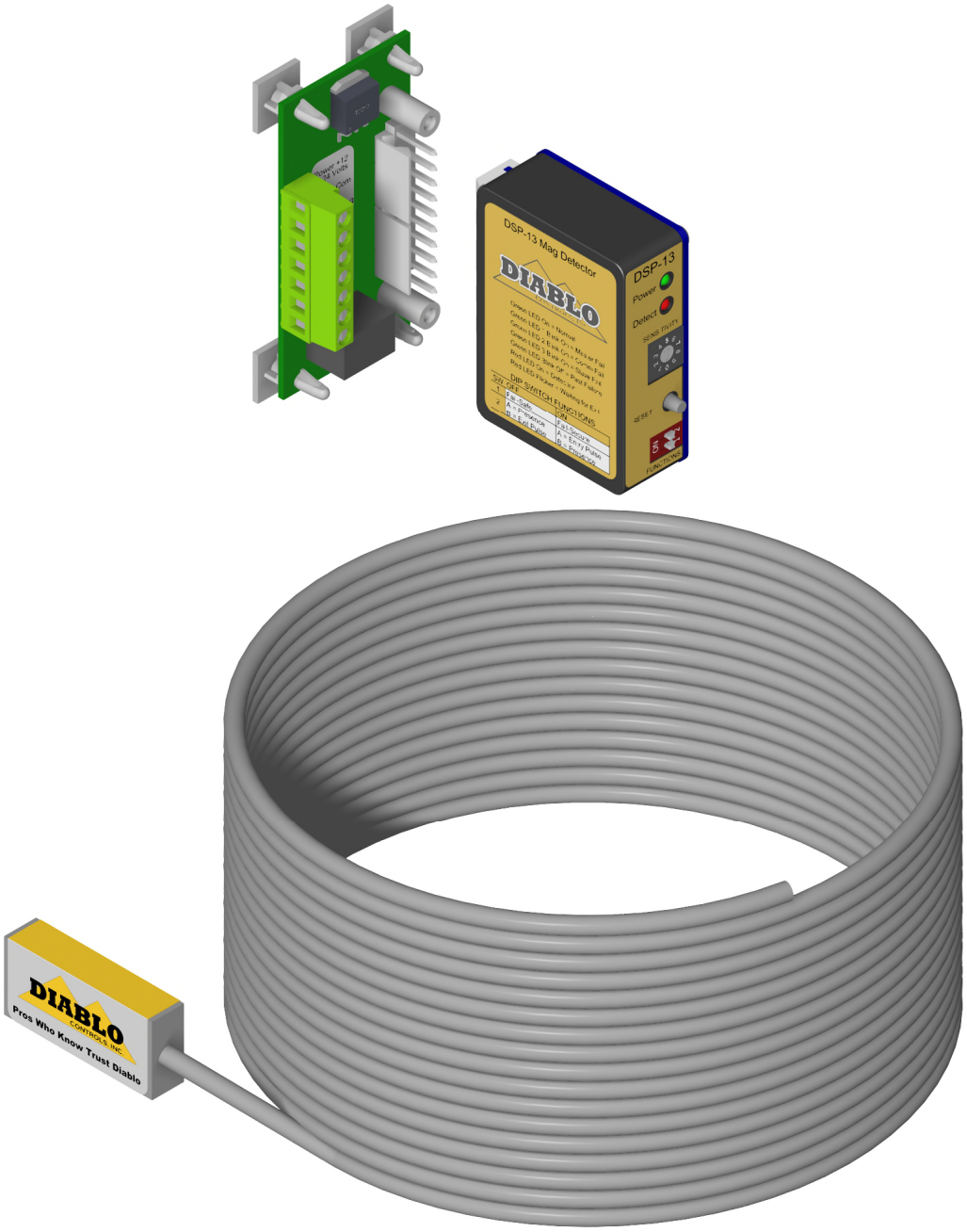
DSP-13

Tri-Axis Detection (TRIAD™) System



Diablo Controls, Inc.

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DIABLO CONTROLS, INC.
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3. Introduction

The DSP-13M and DSP-13S make up the TRI-Axis Detection (TRIAD™) system. The TRIAD system is based on a technology that measures very small changes in the earth's magnetic field in all three axes. This means that the TRIAD system works properly regardless of the orientation of the sensor. With sensor orientation no longer an issue, the installer is able to install the sensor in whatever manner best suits the site. The TRIAD system can be installed using a single saw cut. The sensor is potted in epoxy to provide durability and small enough that it can be placed in a 1" cored hole. It can also be installed up to three feet below the driving surface. This allows the TRAID sensor to be placed below pavers in a driveway or under asphalt or concrete in new construction.

The TRIAD system was specifically developed for access control systems that need reliable vehicle detection for all weather conditions with a minimally invasive installation. The system is comprised of two parts, a master unit (DSP-13M) and a sensor (DSP-13S). The advanced sensor's small size and high sensitivity make it ideally suited to vehicle detection applications.

The detector uses a 10-pin Molex connector for connections. This can be plugged into a Diablo Controls RK-1R or RK-3R rack.

One of the distinguishing features of the TRIAD system is its ability to hold detection indefinitely, even through power interruptions. Even if a vehicle arrives when the unit is without power, when power is restored the TRIAD system will show detect if there is now a vehicle in the detection zone.

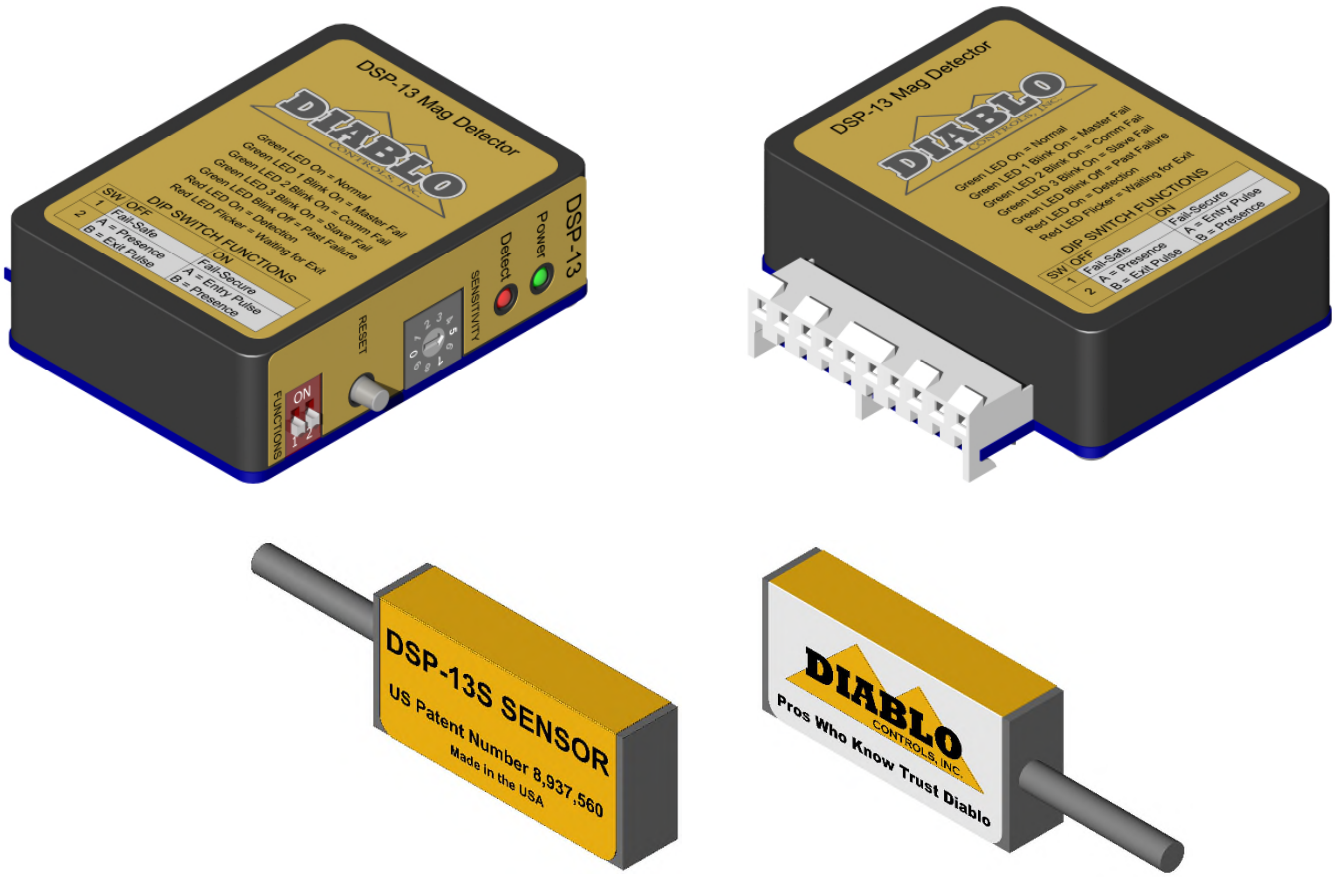

Figure 1: Front and Rear Views

4. Technical Data

Functional Data

Sensitivity:	Ten sensitivities selectable for presence or pulse modes of operation. Level 5 should be sufficient for most applications.
Pulse Output:	250 milliseconds
Response Time:	Activation - 50 milliseconds minimum. 225 milliseconds maximum. Deactivation - 25 milliseconds minimum. 200 milliseconds maximum.
Vehicle Hold Time:	Indefinite, depending on environmental noise conditions.
Detection Range:	The type of vehicle will determine the actual point of detection. Larger vehicles will be sensed further away. The following chart is based on an SUV.

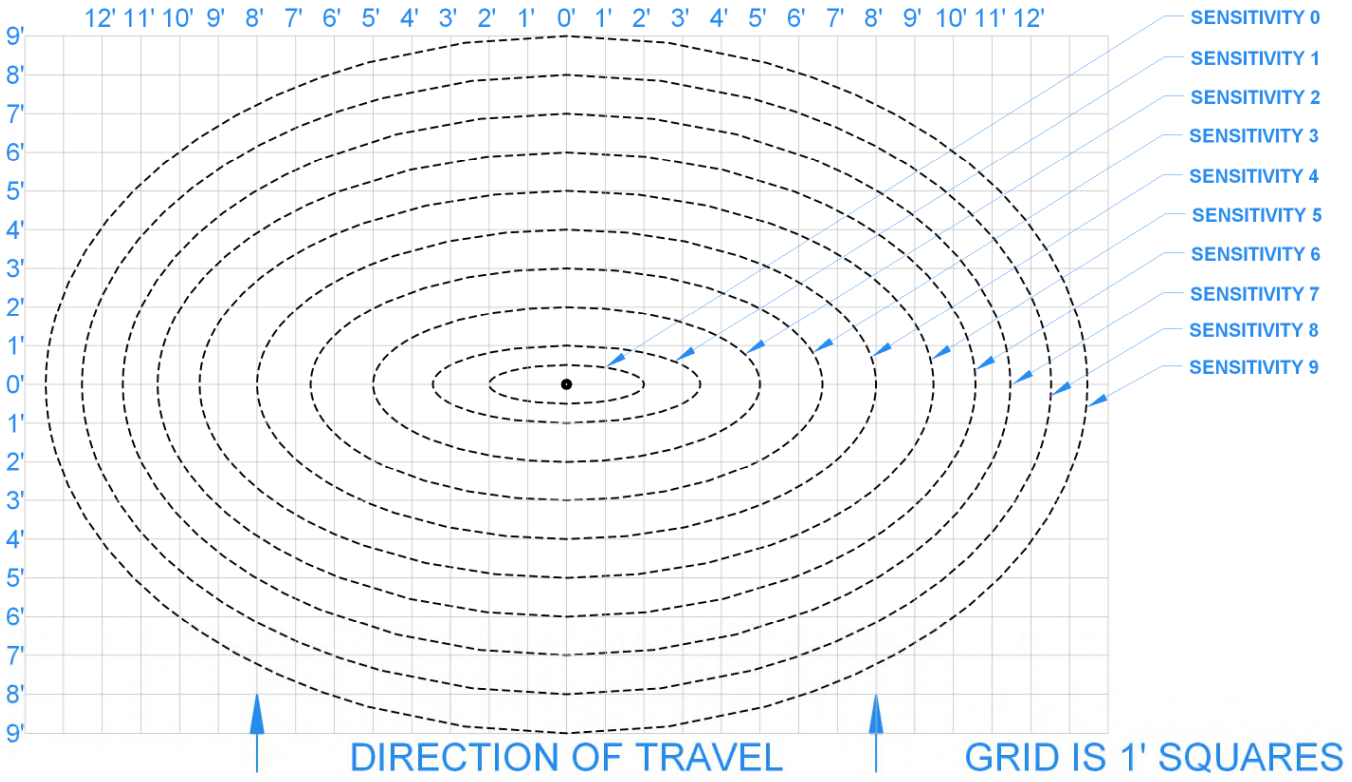

Figure 2: Detection Pattern and Range

Electrical Data

DSP-13M Operating Voltage:	8 volts to 30 volts DC
DSP-13M Operating Current:	60 milliamps maximum and includes all current used by the sensor.
DSP-13M Output Rating:	Both outputs are an open-drain output rated for sinking over 500 milliamps. They are not isolated outputs and are referenced to pin 10 (Common) of the DSP-13M.
Sensor to Sensor Proximity:	The sensors are passive measurement devices and as such will not interfere with other sensors at any distance.

Environmental Data

Operating Temperature:	-35°F to 165°F (-37°C to 74°C)
Storage Temperature:	-40°F to 176°F (-40°C to 80°C)
Humidity:	Up to 95% relative humidity non-condensing

Mechanical Data

DSP-13M Mounting Position:	Any
DSP-13M Housing Material:	ABS Plastic
DSP-13M Size:	2.375 inches (High) x 2.340 inches (Wide) x .860 inches (Deep) 60.36mm (High) x 59.44mm (Wide) x 21.84mm (Deep)

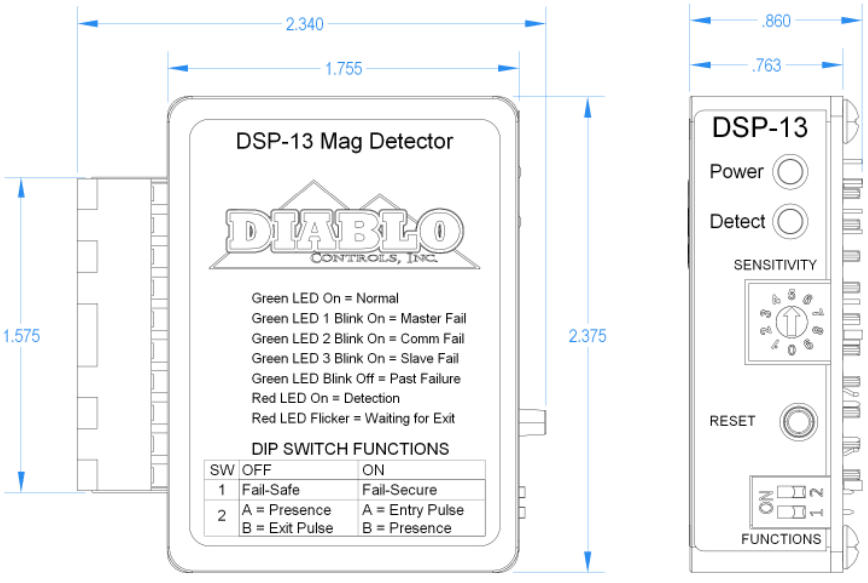

Figure 3: DSP-13M Dimensions

DSP-13S Mounting Position: Any

DSP-13S Housing Material: Epoxy

DSP-13S Size: .800 inches (High) x 1 750 inches (Wide) x .390 inches (Deep)
20.32mm (High) x 44.45mm (Wide) x 9.91mm (Deep)

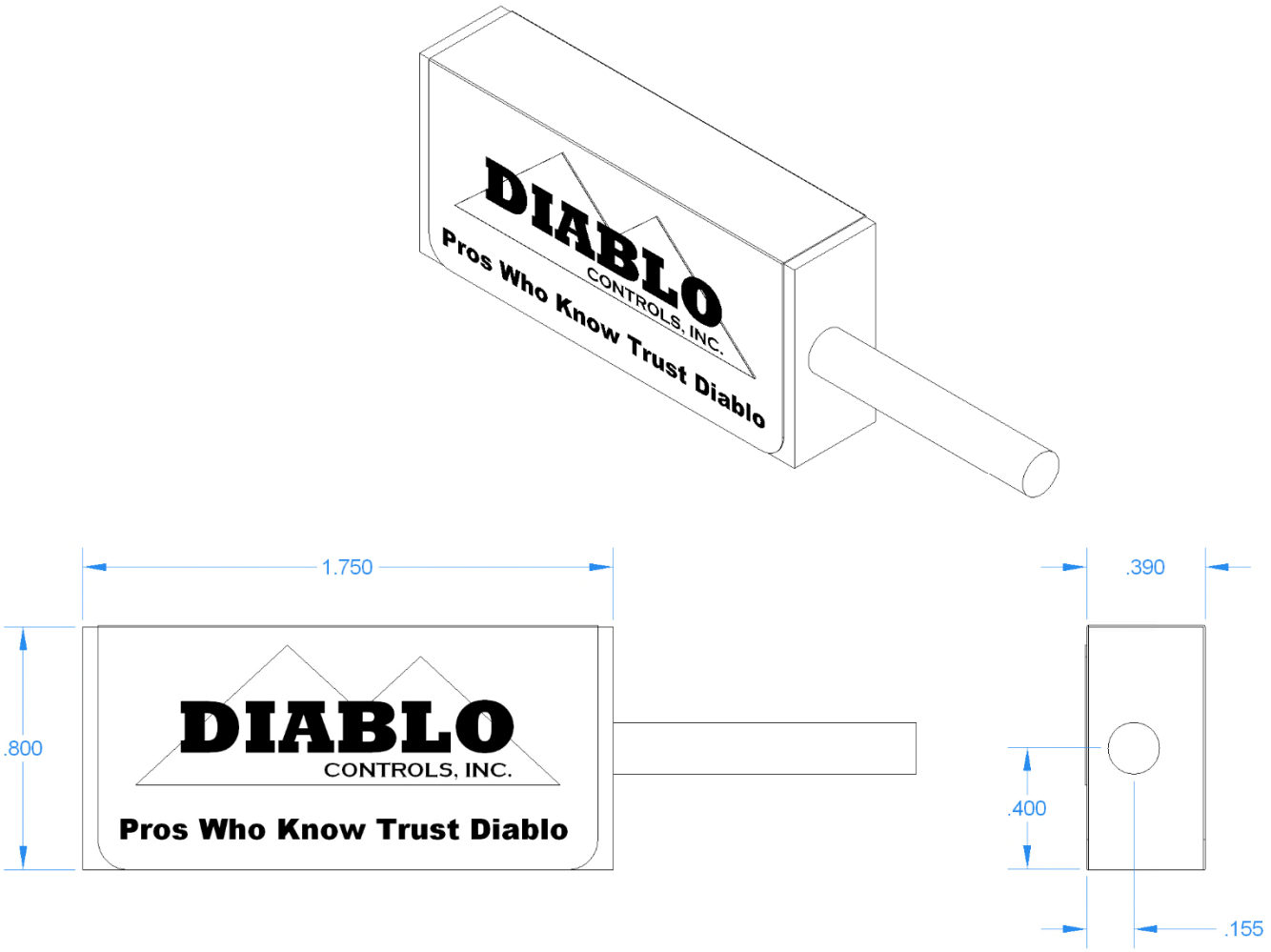

Figure 4: DSP-13S Dimensions

DSP-13S Lead-in Diameter: .175”

DSP-13S Lead-in Length: 75 feet or optional 100 feet available

5. Features and Functions

Two Solid-State Outputs

The DSP-13M has two solid-state, open-drain, outputs. They are identified as Output A and Output B. These two outputs are not isolated and are referenced to power common.

The functions of Output A and Output B are selected with the Pulse / Presence switch (DIP Switch 2). And are summarized in the following table:

Switch 2	Output A Function	Output B Function
OFF	Presence Detection	Pulse on Exit Detection
ON	Pulse on Entry Detection	Presence Detection

NOTE: If using the supplied RK-1-R to plug the detector in to, Output B will not be available. Contact Diablo Controls for the availability of other RK products that do support the use of Output B.

Presence Detection

The output will remain activated as long as a vehicle is sensed in the detection zone. This detector always operates in a permanent presence or infinite presence detection mode. The sensor technology used is capable of remembering vehicles in the detection zone even if the power is interrupted for long periods of time. In fact, it can determine if a vehicle arrived in the detection zone while power was removed and provide the correct presence output on power restoration.

If a sensor failure is detected, this output will look at the Fail-safe / Fail-secure switch to determine what the state of the output should be.

If the output is being used as a safety (also known as obstruction or reversing) input to a gate operator, it must be in the presence detection mode and the failure mode to to fail-safe.

Pulse On Entry Detection

The output will turn on for 250 milliseconds when the vehicle is first detected and will not output again until the detection zone is no longer occupied. After the pulse is sent and the detection zone is still occupied, the detect LED will display a “flicker” indication showing that the pulse has been sent and the zone is still occupied. This type of output is often used for ticket issuance.

If a sensor failure is detected, this output will not provide any output (fail-secure operation).

Pulse On Exit Detection

The output will turn on for 250 milliseconds when a detection has occurred and the detection zone is now vacant. This type of detection is often used to trigger license plate cameras.

If a sensor failure is detected, this output will not provide any output (fail-secure operation).

Fail-Safe vs Fail-Secure

Fail-safe and fail-secure refer to what should happen to the output if the detector knows that it is not functioning correctly (cut lead-in, sensor failure, etc.). Fail-safe and fail-secure only apply to an output in the presence mode of operation. Any pulse mode of operation is always fail-secure.

For most applications, fail-safe is the desired mode of operation as it will usually leave a gate open during a failure. But for those applications where security is paramount, fail-secure is used to keep the gate from openning on a failure.

Fail-Safe

When an output is in the presence mode of operation and a failure is detected, the output will stay activated during the failure. In gate applications this feature is used to automatically open the gate if the detector system fails.

It should be noted that a power failure will always result in a fail-secure operation. Fail-safe operation is only available when a valid input voltage is applied to the detector. Outputs configured for a pulse output will always operate in the fail-secure mode.

Fail-Secure

When an output is in the presence mode of operation and a sensor failure is detected, the output will stay deactivated during the failure. In gate applications, this feature is used to keep the gate closed if a sensor fails.

It should be noted that a power failure will always result in a fail-secure operation. Outputs configured for a pulse output will always operate in the fail-secure mode.

If any output is being used as a safety (also known as obstruction or reversing) input to a gate operator, the fail-safe mode of operation must be used.

Sensitivity

The detector has ten user selectable sensitivity levels. In most situations, the setting of 5 will work effectively. The sensor has hysteresis between the detect and drop thresholds to ensure that the detector output does not chatter during fringe detections.

Detector Reset

When the reset switch is pressed, the master will send a reset command to the connected sensor. If a prior sensor fault was being displayed, it will be cleared.

Care should be taken to ensure that the detector is not reset while any vehicles or objects are in or near the detection zone. These vehicles or objects may cause a permanent offset in the reference readings for the sensor and may impact correct operations of the sensor.

Indicators

The DSP-13M is equipped with two LED indicators: Power (Green) and Detect (Red).

Power LED – The green power LED has four possible states:

OFF	The voltage applied to the detector is less than the minimum display voltage of approximately 3.3 volts. The detector should not be operated below 7 volts DC as unpredictable operation will occur.
RESET IN FAIL-SAFE	When the detector is reset (a reset occurs automatically at power up), the LED will turn on for 500 milliseconds, off for 500 milliseconds, on for 500 milliseconds, off for 500 milliseconds, and then resume its normal display.
RESET IN FAIL-SECURE	When the detector is reset (a reset occurs automatically at power up), the LED will turn on for 500 milliseconds, off for 500 milliseconds, then on for 50 milliseconds, off for 50 milliseconds (10 times), and then resume its normal display.
MASTER FAILURE	When the master unit detects a failure the LED will flash on once for 150 milliseconds every two seconds. This usually indicates that there is no sensor attached or that the cable has been cut.
SENSOR FAILURE	When a sensor unit has identified an internal fault and has sent this information to the master unit the LED will flash on twice for 150 milliseconds every two seconds. If cycling power does not correct the fault, the sensor must be replaced.
COMM FAILURE	When a sensor is detected but cannot reliably communicate with the master unit the LED will flash on three times for 150 milliseconds every two seconds. This usually indicates a shorted cable, loose connections, or electrical interference.
PRIOR MASTER FAILURE	The detector is equipped with the ability to remember prior master faults that have occurred since the last power interruption or reset. The LED will flash off once for 150 milliseconds once every two seconds (one flash) and then repeat the sequence until power is cycled or the detector is reset.
PRIOR SENSOR FAILURE	The detector is equipped with the ability to remember prior sensor faults that have occurred since the last power interruption or reset. The LED will flash off twice for 150 milliseconds once every two seconds (two flashes) and then repeat the sequence until power is cycled or the detector is reset.
PRIOR COMM FAILURE	The detector is equipped with the ability to remember prior communications faults that have occurred since the last power interruption or reset. The LED will flash off three times for 150 milliseconds once every two seconds (three flashes) and then repeat the sequence until power is cycled or the detector is reset.

NORMAL The LED is always on when the detector is in its normal state of operation with no prior failure in memory.

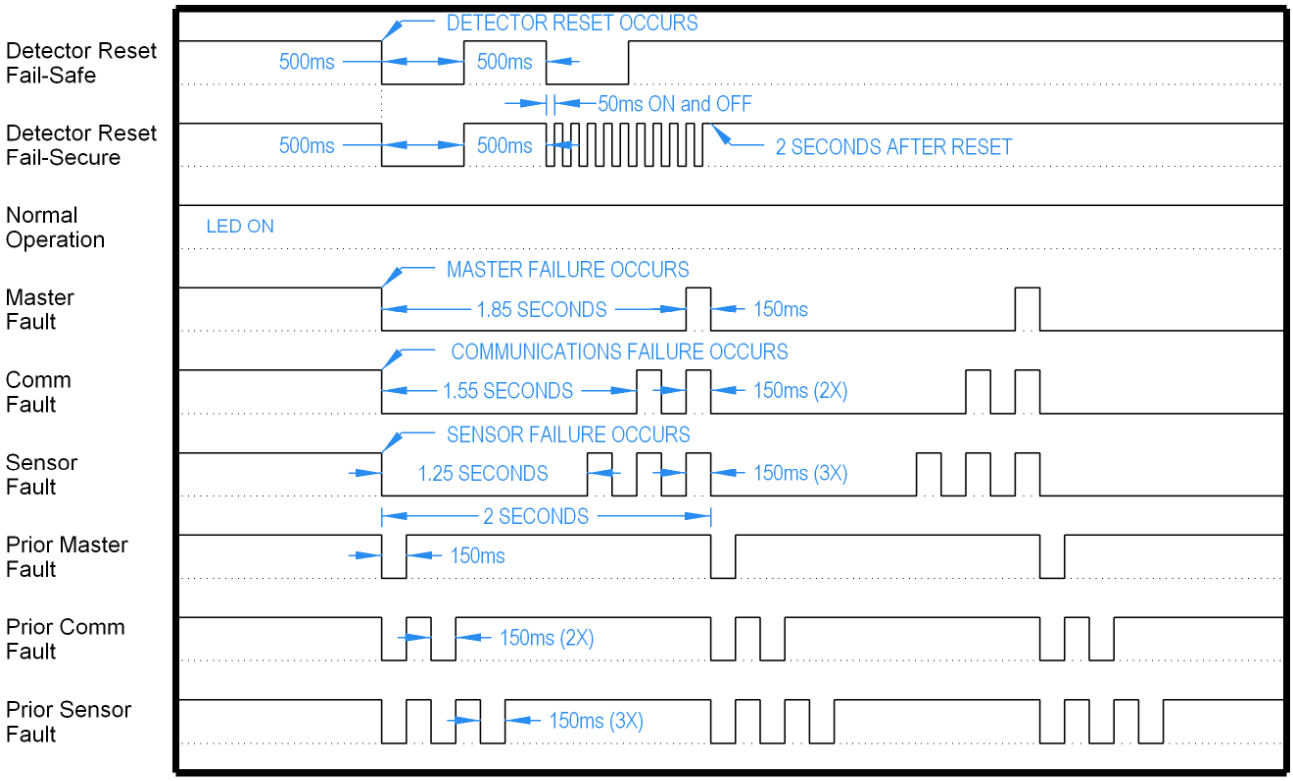

Figure 5: Power LED Displays

Detect LED – The red Detect LED is used to display the status of Output A, the detection zone, and reset information. There are several different statuses that can be displayed on this LED:

RESET IN FAIL-SAFE When the detector is reset (a reset occurs automatically at power up), the LED will turn on for 500 milliseconds, off for 500 milliseconds, on for 500 milliseconds, off for 500 milliseconds, and then resume its normal display.

RESET IN FAIL-SECURE When the detector is reset (a reset occurs automatically at power up), the LED will turn on for 500 milliseconds, off for 500 milliseconds, then on for 50 milliseconds, off for 50 milliseconds (10 times), and then resume its normal display.

FAULT IN FAIL-SAFE When the detector is in a fault mode and in the fail-safe mode of operation, the LED will be on as will the output.

FAULT IN FAIL-SECURE When the detector is in a fault mode and in the fail-secure mode of operation, the LED will be off as will the output.

NORMAL When the detector is functioning normally and is not detecting a vehicle, the LED will be off as will the output.

DETECTION

When Output A is in presence mode the LED will be on while a vehicle is in the detection zone. In the pulse mode the LED will turn on for 250 milliseconds with the output, off for 250 milliseconds, and then show the occupancy display until the vehicle exits.

OCCUPANCY

When Output A is operating in the pulse mode of operation and the detection zone is currently occupied, the LED will be turned on to a dimmer level than normal and the LED will be flashed at a very fast rate that will make it look like it is flickering.

This display is meant to be easily distinguishable from the normal on display. With this additional display mode, the pulse mode of operation can easily be monitored for correct operation.

A look at the following figure will show how this occupancy indication is used to provide additional information during pulse mode operation. In the figure the occupancy display is shown as the gray shaded area.

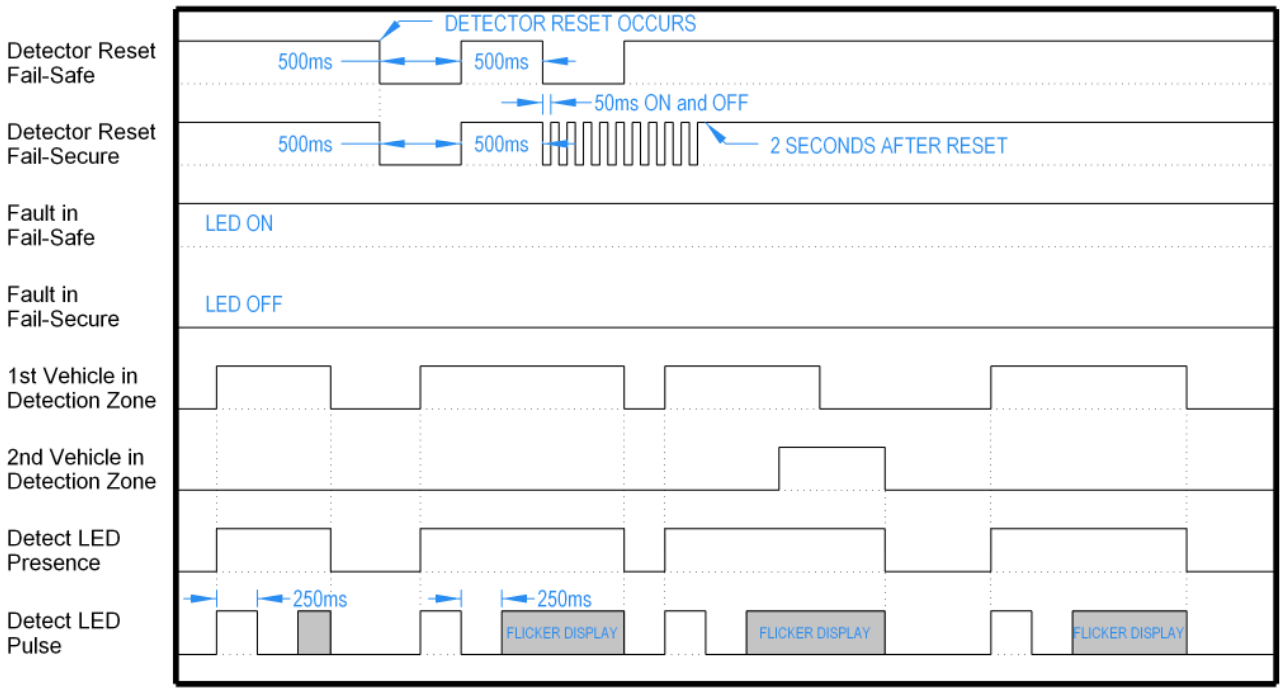

Figure 6: Detect LED Displays

6. Installation

Overview

To ensure a reliable installation, a test should be done on site to determine a sensor installation location that will provide the desired detection area without picking up the gate. This is done by simply temporarily securing the sensor on top of the driving surface (preferably in the center of the driving surface) and connecting it to RK1-R and DSP-13M assembly. The RK-1R and DSP-13M assembly can be temporarily placed anywhere where 12VDC to 24VDC power is available for powering the assembly. Once all wiring connections are complete and the RESET button has been pressed without any vehicles in the area of the gate and sensor, the sensor location can be tested.

Testing consists of cycling the gate several times to ensure that the gate is not detected by the sensor. If the gate is detected, the sensor can be positioned further away from the gate or, if the sensor cannot be moved further away due to other obstructions, the sensitivity can be turned down. Now, a vehicle should be driven toward the sensor to observe where vehicle detection occurs and where it ends to verify your desired detection area. Be aware that larger vehicles will be detected further away than smaller vehicles. There is typically a 2 foot to 3 foot difference between a large SUV and a small car with the sensor being more sensitive to the SUV. Be sure to test a vehicle as far off to the side as possible to ensure vehicles not centered in the driving surface will be reliably detected. If the sensitivity is turned up to get the desired detection area, be sure to go back and check the gate is still not detected.

Once a good sensor location has been identified, mark the location and you are now ready to perform the final install steps. Core drill a 1” or larger hole at the marked location to a depth of at least 4” (6” is recommended).

Failure to locate the sensor at least 4” below the top of the driving surface may result in erractic operation.

Make a single ¼” wide saw cut, a minimum of 2” deep, from the side of the driving surface to the drilled sensor location.

Do not install the sensor directly into the saw slot as this will void the warranty.

Place the sensor at the bottom of the drilled hole and fill the hole with sand to within 1 ½” of the driving surface. Any movement of the sensor after installation may cause false calls or lock ups. Use a sealant to fill the sensor hole and encase the lead-in cable in the saw slot. There should be a minimum of 1 ½” of sealant above the sensor and the lead-in cable. Route the lead-in cable from the edge of the driving surface to the gate operator following local codes.

Finally, install the RK1-R and DSP-13M (some installations may not need the RK1-R) within the operator. Connect the DSP-13S lead-in cable. Terminate the Normally Open (Relay NO) or Normally Closed (Relay NC) and the relay common (Relay COM) to the appropriate points within the operator. Connect power to the RK1-R. Plug in the DSP-13M. Press the reset button on the DSP-13M with no vehicles in the detection area. Test for no detection of gate movement and proper detection of vehicles. Congratulations, you are now ready for operation.

Sensor Installation

The reliability and overall performance of the detector are greatly dependent on the installation of the sensor itself. There are three factors that go into a good sensor installation: sensor location, type of wire used (if additional lead-in is needed), and installation practices.

Sensor Location: The sensor measures changes in the earth's magnetic field. The length of the edge facing the sensor will affect its detection distance. As a vehicle approaches a sensor head on, it presents an edge approximately six foot long. However, if the vehicle drives by the side of the sensor, it presents an edge of typically 12 to 15 feet. Therefore, the sides of a vehicle are easier to detect than the vehicle head on. This causes the detection pattern to be oblong in the driving lane. Usually 25% to 50% wider than it is long.

It is advised that you tape down the sensor on the surface in the approximate location that you plan to install it. The ideal location is in the center of the driving surface and 12 feet away from the gate.

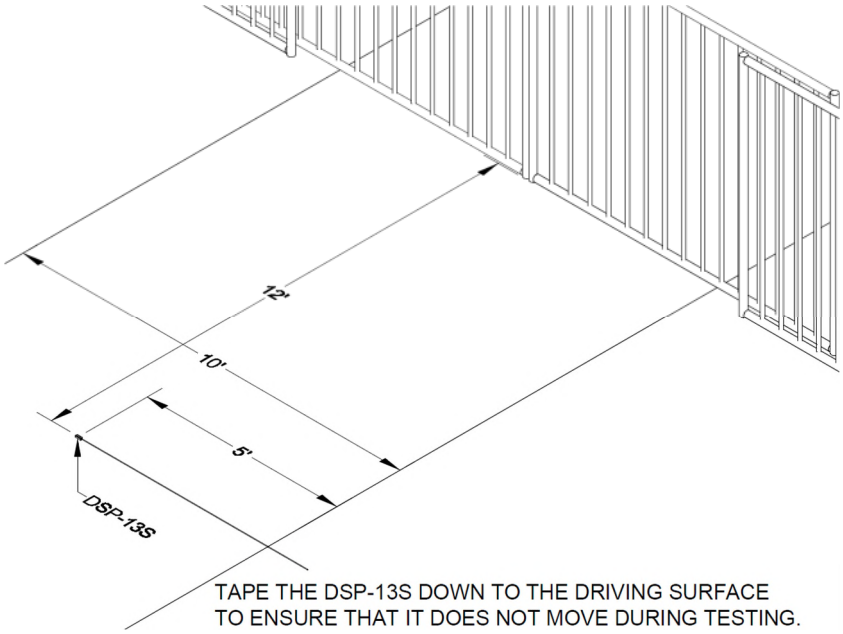

Figure 7: Sensor Placement

Connect power and the DSP-13S lead-in cable to the RK1-R. The DSP-13S is auto polarity sensing, so it does not matter which way the two wires are connected. The shield drain wire for the DSP-13S must be connected to an earth ground for best performance.

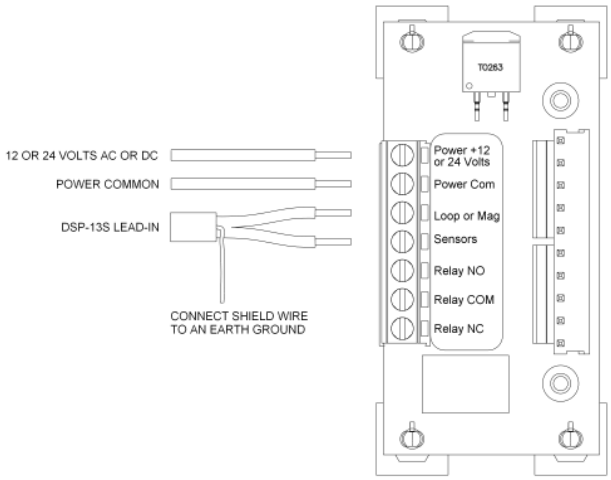

Figure 8: Detector Wiring for Testing

Now verify that detection zone is where you want it to be and that moving objects, such as a gate, are not picked up by the sensor. Use a vehicle to confirm that a vehicle is detected at the desired locations. Be sure to test being as far as possible to both sides for the driving surface. If you need to turn up the sensitivity, retest for gate detection. The RESET button **must** be pressed any time the sensor is moved.

Be careful to ensure that during your testing that vehicle tires do not run over the sensor itself while it is taped down. This may damage the sensor.

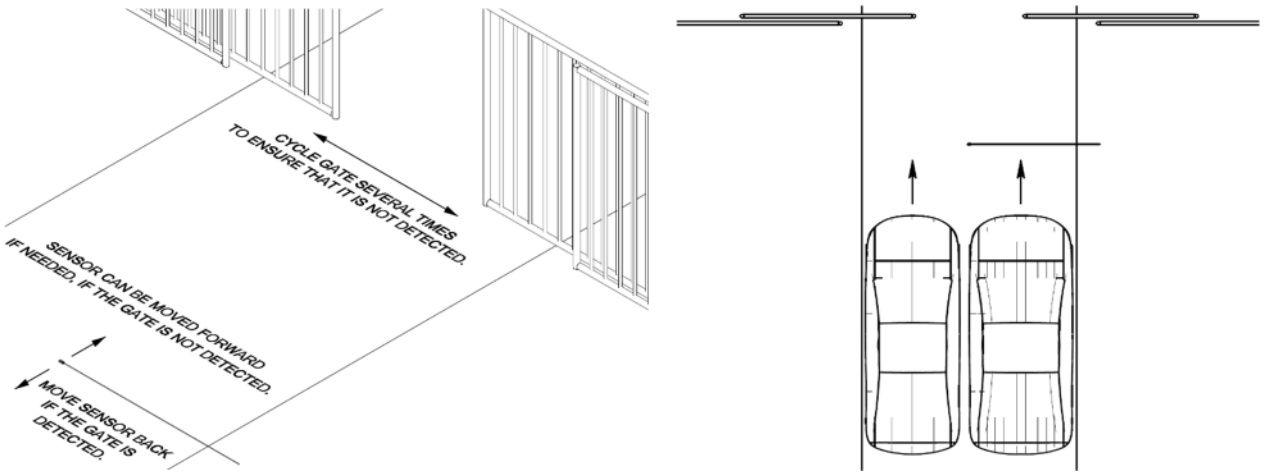

Figure 9: Sensor Placement Testing

Type of Wire Used: The sensors are provided with 75 feet of lead-in cable and this is usually sufficient for most installations. An optional version with 100 feet of lead-in is also available. However, if additional lead-in cable is needed, a two conductor, sheilded twisted pair cable should be used. This cable should have a jacket rated for wet locations as most conduits will eventually fill with water at some point.

The gauge of the wires to use in the lead-in cable depends on distance in cable feet from the sensor to the detector. The gauge of the wires within the cable can be 20AWG as long as the detector is within 100 feet of the

sensor in cable distance. For 100 to 200 feet, use at least 18AWG wires. At greater than 200 feet, use a 16AWG wires at a minimum.

Installation Practices: The sensors can be installed in several different ways depending on the type of driving surface and if the site is new construction or existing.

For existing driving surfaces of asphalt or concrete, a single 1/4" saw slot can be cut to the desired location of the sensor with an appropriate cutting disk for the road surface. The saw slot should be deep enough that the sensor and lead-in cable will have a minimum of ½" of sealant above them in the slot. More is better. Going too deep with the saw cut is also a concern. Deep cuts in a road surface may impact the structural strength of the roadway, especially if any reinforcement material is cut.

Do not install the sensor directly into the saw slot as this will void the warranty.

At the desired sensor location, a 1" to 2" hole at least 4" deep (6" is recommended) should be core drilled into the driving surface.

Failure to locate the sensor at least 4" below the top of the driving surface may result in erractic operation.

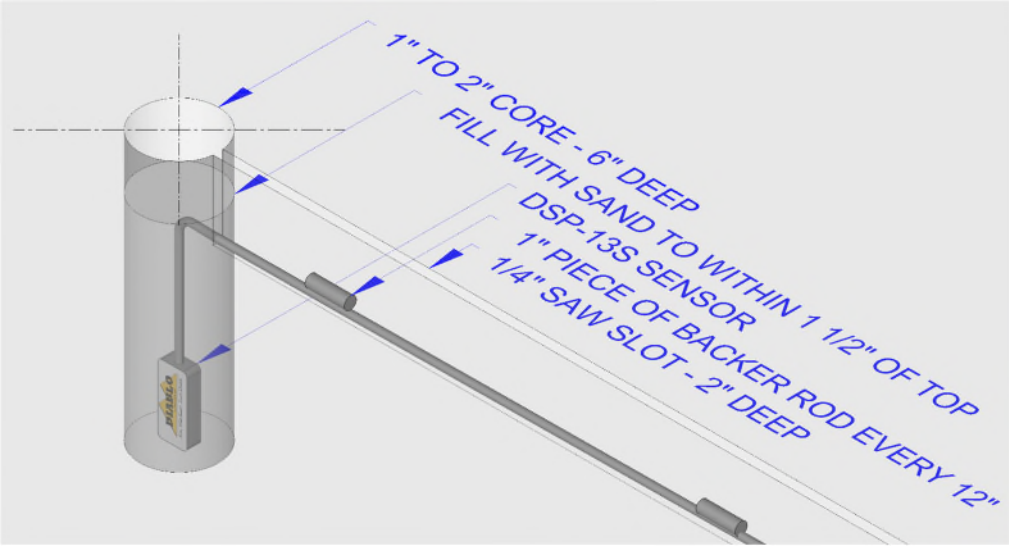

Figure 10: Sensor Installation – Saw Cut & Core

Once the saw slot has been cut, the slot should be cleaned of all loose material. High pressure air should be directed in to the saw slot to remove all debris. This will also help remove dust from the saw cutting operation from the sides of the saw slot. This will allow better adhesion of the sealant to the saw slot.

In order to keep the sensor cable at the bottom of the saw slot, 1" pieces of backer rod should be placed in the saw slot every 1 to 2 feet. The backer rod should be sized such that it fits snugly in the saw slot. Use a blunt object (not a screwdriver) to press the backer rod pieces down into the saw slot as far as they will go. Keeping the sensor cable at the bottom of the saw slot allows the sealant to provide the maximum amount of protection possible from foreign object penetration. Never use a continuous piece of backer rod over the sensor and cable, as this

would prevent the sealant from encapsulating the sensor and cable. NOTE: Backer rod is available at most home improvement stores and in several sizes.

The sealant used should be appropriate for the roadway surface that was cut. Generally, epoxy, urethane, or polyester based sealants are used for concrete surfaces and polyester or urethane based sealants are used for asphalt surfaces. However these are not hard guidelines and specific circumstances will determine which type of sealant should be used.

For existing driving surfaces made of pavers, a line of pavers can be removed to the desired sensor location. The sensor should then be dug down a couple of inches below the pavers and placed in a bed of sand and covered with at least an inch of sand. The lead-in cable should also have a small amount of sand cover over it to protect it from the pavers.

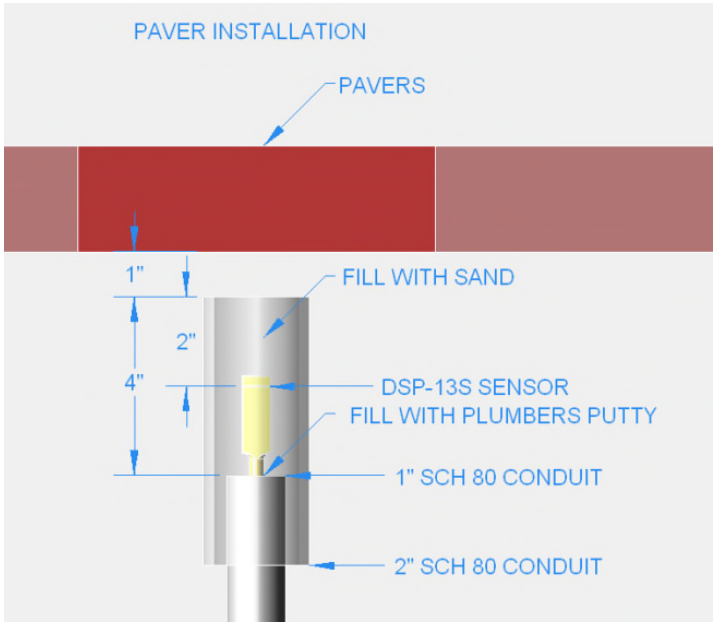

Figure 11: Sensor Installation – Conduit Under Pavers

For new construction sites, the conduit stub up is the preferred installation method. This method is the best installation method when a decorative driving surface will be used and disturbing the driving surface in the future is a concern in the event that a sensor fails. A 1" Schedule 80 conduit can be stubbed up at the desired detection point in the driving surface. This conduit is then sleeved with a 2" Schedule 80 conduit that is used to protect the sensor. It is important that these conduits be PVC and not metallic. The 1" conduit can transition to metallic pipe after the elbow if desired.

Once the sensor cable is pulled through the 1" conduit, the sensor should be held 2" down from the top of the 2" conduit sleeve while the 1" conduit opening is sealed with plumber's putty. This is done to keep the sand used in the next step, from filling the 1" conduit. Now that the 1" conduit is sealed, fill the sleeve with sand (1" from the top if a sealant will be used to cap the sleeve).

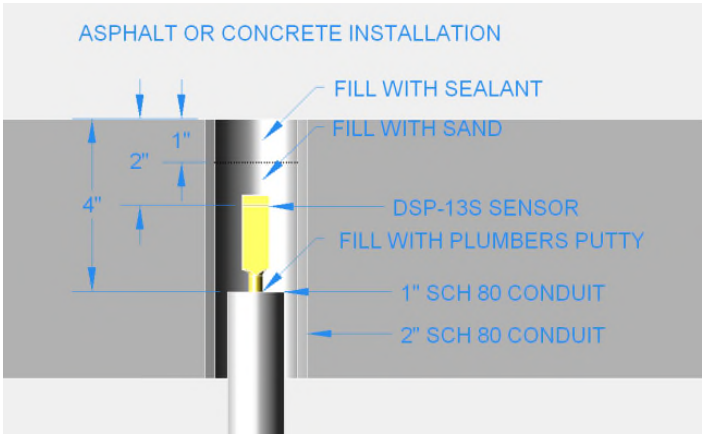

Figure 12: Sensor Installation – Conduit Under Asphalt or Concrete

If the sensor cable needs to be spliced to another cable to get to the detector, the splice should be done in a junction box and the connections should be soldered and weatherproofed.

Detector Installation

Location: The detector should be installed in a weatherproof location that is near the detection zone. Ideally, a technician should be able to see the detection zone and the detector at the same time.

Mounting: The detector will function when mounted in any orientation. When using a rack, it is best to mount the rack such that the front panel of the detector will be easily accessible for configuration and troubleshooting.

Wiring: When the detector is plugged in to a rack, the rack will provide and identify the wiring connection points. This document will discuss using the Diablo Controls RK1-R that ships with the DSP-13.

Connect power and the DSP-13S lead-in cable to the RK1-R. The DSP-13S is auto polarity sensing, so it does not matter which way the two wires are connected. The shield drain wire for the DSP-13S must be connected to an earth ground for best performance.

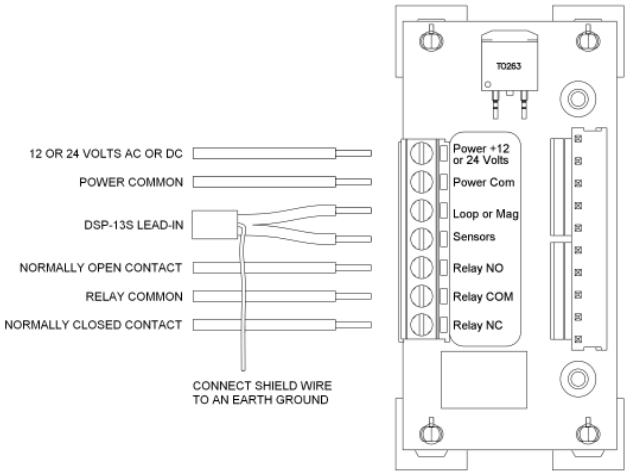

Figure 13: Detector Wiring Using an RK1-R

7. Configuration

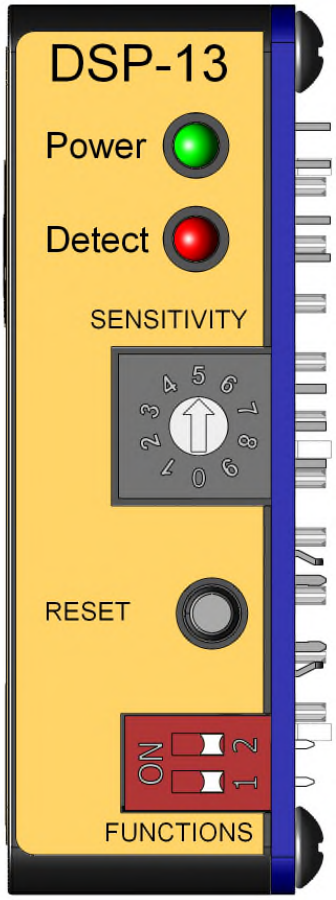

Figure 14: DSP-13 User Interface

Sensitivity

The ten position rotary switch is used to set the sensitivity. For most installations the setting of 5 will work well. If motorcycle detection is required, you may need to use a higher setting.

One second after changing the sensitivity setting, the detector will automatically reset itself to implement the new sensitivity setting.

The technician must make sure that there are no vehicles or other objects over or near the sensor when the reset occurs. If the zone was not clear, simply press the reset button once the zone is clear.

DIP Switches

There are two DIP switches for adjusting the configuration of the TRIAD system. There are no internal DIP switches or jumpers to configure.

When a DIP switch is moved to the left position it is in the ON condition. The right position is OFF.

Pulse / Presence (Switch 2) – This switch determines the functions assigned to each of the outputs. The switch setting takes effect immediately when changed.

Switch 2	Output A Function	Output B Function
OFF	Presence Detection	Pulse on Exit Detection
ON	Pulse on Entry Detection	Presence Detection

Fail Mode (Switch 1) – This switch determines if the output configured for presence detection operates in a fail-safe or fail-secure mode of operation.

Switch 1	Output A Function
OFF	Fail-Safe Mode of Operation
ON	Fail-Secure Mode of Operation

During fail-safe operation, when an output is in the presence mode of operation and a failure is detected, the output will stay activated during the failure. In gate applications, this feature is used to automatically open the gate if a sensor fails.

During fail-secure operation, when an output is in the presence mode of operation and a failure is detected, the output will stay deactivated during the failure. In gate applications, this feature is used to keep the gate closed if a sensor fails.

It should be noted that a power failure will always result in a fail-secure operation. Fail-safe operation is only available when a valid input voltage is applied to the detector. When an output is configured for pulse mode the output will always operate in the fail-secure mode.

If any output is being used as a safety (also known as obstruction or reversing) input to a gate operator, the fail-safe mode of operation must be used.

Pin Out

There is only one version of the DSP13M. The table below shows the pin out for the detector.

Pin	Function
1	Sensor connection
2	Sensor connection
3	Power (10 to 30 volts DC)
4	No connection
5	No connection
6	Output B (Open-Drain)
7	No connection
8	Output A (Open-Drain)
9	Power (10 to 30 volts DC)
10	Power and Output common

8. Troubleshooting

No Power LED

Use a meter to measure the voltage applied to the detector. The voltage must be DC and above 8 volts.

If the correct voltage is applied and the power LED is not on, replace the detector.

Power LED Displaying 1 Flash On Every Two Seconds

This flash count indicates that the sensor cannot be seen by the master. This will happen if the applied DC voltage is below about 6.5 volts or a sensor is not connected. If the voltage is above the required 8 volts for normal operation, either the wiring to the sensor has failed or the sensor itself has failed. Check and tighten all connections and splices in the sensor wiring path.

Connect a known good sensor to the master. If the flashing changes to one flash off every two seconds, or just a solid power LED, then the issue is with the sensor or its wiring.

If the correct voltage is applied and the power LED is still flashing, replace the detector.

Power LED Displaying 2 Flashes On Every Two Seconds

This flash count indicates that the master cannot reliably communicate with the sensor. This usually indicates a shorted cable to the sensors, loose connections, or electrical interference.

Disconnect the sensor and use an ohmmeter to check that resistance of the sensor is above 1000 ohms. If below 1000 ohms, the cable is shorted somewhere or the sensor is bad. Connect a known good sensor to the master. If the flashing changes to three flashes off every two seconds, or just a solid power LED, then the issue is confirmed to be with the sensor or its cable. If there is a splice in the lead-in cable, replace the spliced in cable. If a failure is still displayed, replace the sensor.

Power LED Displaying 3 Flashes On Every Two Seconds

This flash count indicates that the sensor is reporting an internal failure. This will happen if the sensor has identified an internal fault. As the sensor is encapsulated in epoxy, no repairs are possible and the sensor should be replaced.

Connect a known good sensor to the master. If the flashing changes to two flashes off every two seconds, or just a solid power LED, then the issue is confirmed to be with the sensor. Replace the sensor.

Power LED Flashes Off Every Two Seconds

These flashes indicates that the detector has had a failure, but is currently working correctly. There are three types of failures that the detector will remember:

Flashes	Remembered Failure	Possible Corrective Actions
1	DSP13M Failure	Loose connection in circuit to DSP13S. Bad lead-in cable to DSP13S. Replace DSP13M if issue persists.
2	DSP13S Failure	Sensor was exposed to a very large magnet field. Replace DSP13S if issue persists.
3	Communications failure	See text below.

Intermittent communications failures are usually wiring connections. Any splices in the lead-in cable should be redone. If there are any wire nuts used in the circuit, remove them and replace with a crimp connection or preferably, a soldered connection. The fault could also be a fatigued point in the cable. This can occur at locations where the cable crosses an expansion joint in the road surface. Any place where the cable must move, even if only a very tiny amount, can cause wire fatigue. The actual failure point may be very difficult to find. Often the sensor must just be replaced if the issue persists but cannot be found.

Other possible source of fault is a foreign object being embedded in the saw cut and damaging the cable or sensor. Another is that the cable has been damaged where it enters or exits a conduit or junction box, or that a conduit that the cable is in has been damaged (crushed, kinked, bent, cut, etc.).

Detect LED Intermittently Comes On / Stays On Without a Vehicle Present

This type of symptom is usually caused by one of two issues: electrical interference or moving objects in proximity to the sensor.

Electrical Interference – There are several possible sources of electrical interference: power lines and electric motors, just to name a few.

Anything that uses electricity is a possible source for electrical interference depending on its proximity to the sensor and the amount of energy being used. If you believe the sensor is experiencing electrical interference, turn off the device believed to be the source of the interference and see if the problem goes away. Sometimes this is not possible and more technical means are needed to help identify the source. Call Technical Support in this case.

Moving Objects in Proximity to the Loop – Objects that can move and are ferrous, metallic, or somehow electrically conductive, may cause detection issues.

A common issue is movement of a slide gate or gate arm in close proximity to a sensor. The best solution would be to move the detection area further away from the moving gate. We recommend that all sensors should be at least 6 feet from a slide gate. Try lowering the sensitivity one level at a time so that the desired vehicles are still detected, but not the moving gate. NOTE: Do not lower the sensitivity too much or vehicles will no longer be detected.

Another possibility is metal objects in close proximity to the loop. Utility manhole covers are objects that may move slightly when vehicle tires drive over them, especially if the vehicle turns while a tire in on the cover. Most manhole covers can be bolted in place. Contact the owner of the manhole to see what can be done to mitigate the cover movement.

Detect LED Will Not Come On With a Vehicle Present

The first thing to do is verify that the LED in question is still working. This is accomplished by a quick lamp test. Reset the detector by pressing the reset switch. Both LEDs should flash at least once. If the red detect LED does not illuminate, then replace the detector.

If the red LED illuminates, then perhaps the sensitivity setting is too low. In most cases, the sensitivity setting of 5 is the correct setting. However, to compensate for some unusual site geometries, this setting may be inadequate. Adjust the sensitivity by one level higher at a time and recheck the detector for proper detection.

If the sensitivity is set to 9 and the red LED still does not come on, swap the detector between a working detector and the detector with the issue. If the problem follows the sensor, the sensor is the problem. If it stays in the detector, replace the detector.