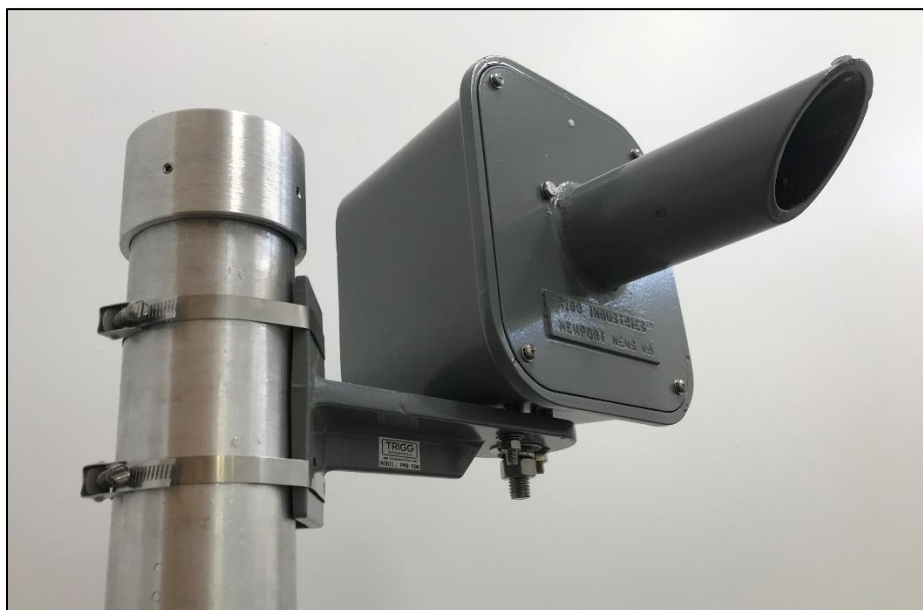


Over Height Vehicle Detection System

Installation, Operation and Maintenance Manual



Models SE-R/3310, SE-R/3310-F, SE-IR/3311, SE-IR/3311-F

Single-Eye

August 2022

ADDENDUM

Power

The Installation, Operation and Maintenance Manual for the Model SE-R/3310 and SE-IR/3311 has been written to provide information based on the system that operates on 115VAC since this is the voltage generally used in the United States.

When using this standard manual, please substitute 24VDC or 230VAC as required, for any reference to System Power, schematic or functional drawings or Alarm Devices and note that any Trigg Industries supplied Alarm devices are designed to operate with the applicable system.

NOTE

If the system is configured to operate on 24VDC, it is important that the polarity of the 24VDC be verified before connecting this power to the system to reduce the possibility of damage. Not all manufacturers use the same color-coding for the wiring supplied with their solar equipment.

Lightning Protection

Lightning and overvoltage transients can cause serious damage to electrical equipment. While there is no product that will guarantee complete lightening protection to equipment, Trigg Industries provides supplemental lightning protection using MOV or SAD technology.

The Metal Oxide Varistor (MOV) is a device designed to limit transient voltage surge and divert surge current to ground. The device tends to self-destruct in an open-circuit mode and then offers no protection. This means that the second time a lightning hit occurs, damage to the equipment is almost certain. 230VAC system devices use MOV lightning protection devices.

The Silicon Avalanche Diode (SAD) is a device designed to limit transient voltage surge and divert surge current to ground. The device tends to self-destruct in a short-circuit mode, which trips the customer supplied AC power over-current protection. The SAD has a very fast response time and can absorb more energy for a given device. 115VAC system devices use SAD lightning protection devices.

To facilitate replacing these devices, they are installed externally on the System Power terminal strip. On older units, these devices were installed internally. Each system includes a spare set of MOV or SAD. Replacement MOV and SAD assemblies are available from Trigg Industries.

To replace a shorted set, disconnect/turn off AC power to the equipment, remove the shorted set from the AC power terminal strip and install the spare set.

WARNING

The orientation of these devices is important. The lug without heat-shrink must be connected to the GND terminal of the System Power terminal strip.

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FORWARD

Every effort has been made to ensure the accuracy of this manual. However, TRIGG INDUSTRIES, LLC WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, EXEMPLARY OR OTHER DIRECT OR INDIRECT EXPENSES, DAMAGES OR OTHER LOSS ARISING FROM THE USE OF THIS MANUAL.

WARRANTY

Equipment manufactured by Trigg Industries, LLC is guaranteed to the original purchaser to be free from defects in material and/or workmanship for one year from the date of shipment when the equipment is used in accordance with operating instructions.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTY, CONDITION OR GUARANTEE BY TRIGG INDUSTRIES, LLC, **INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, OF THE EQUIPMENT LISTED HEREIN. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.**

TRIGG INDUSTRIES, LLC WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, EXEMPLARY OR OTHER LOSS, WHICH MAY BE INCURRED BY THE CUSTOMER AS A RESULT OF FIELD REPAIR, INSTALLATION OR ANY OTHER REASON.

System Overview and Configuration Description

OVERVIEW

This section provides the description of the Over Height Vehicle Detection System (OHVDS) and configuration and its operational characteristics. The Model SE-R/3310 uses a long range (800 feet) Visible RED source-detector pair and the Model SE-IR/3311 uses a long range (700 feet) INFRARED source-detector pair. The recommended maximum range is 200 feet to allow for bad weather and lens contamination.

OHVDSs are active sensing devices installed across roadway sections leading to a tunnel or an overpass to detect over height vehicles and warn its driver of potential damage to his vehicle, the tunnel (or overpass), or both, if appropriate action is not taken. The Single-Eye OHVDS models are designed for monitoring vehicle traffic where direction discernment is not required such as frontage roads and on/off ramps. Upon detection of a valid over height condition, the OHVDS sends a signal to a warning sign (VMS or Blankout) to display warning and instruction messages to the driver of the over height vehicle. Additional warning devices such as bells, klaxons and strobes may be used in conjunction with warning signs.

SYSTEM DESCRIPTION AND CONFIGURATION

The Single-Eye system consists of a narrow Visible RED or INFRARED source and detector, associated power distribution and control electronics.

The source and detectors are typically installed to the desired height using the Trigg Industries pole mount bracket (Model PMB-500), which is adaptable to any size pole or post, or atop the Trigg Industries telescoping pole (Model 3701) where the pole cap serves as the mounting bracket and sighting base.

The electronics are printed circuit boards enclosed in heavy ALMAG castings and sheet aluminum, not less than 1/8" thickness. The SE systems are rated for operations in temperature ranging from -40°F to +135°F. They are designed to withstand harsh environments for applications where direction discernment is not required.

SEQUENCE OF OPERATION

The Trigg Industries Single-Eye Over Height Vehicle Detection System (SEOHVDS) is comprised of a Source cabinet and Detector cabinet. See **Figure 1**, System Diagram, for a simplified system diagram. The Source cabinet contains a source eye, which is pulsed, and the detector in the Detector cabinet is designed to responds to these pulses.

The output of the detector is conditioned by the electronics and applied to the Alarm Timer. If an object blocks the beam 2.5 inches (or greater) in diameter, 1 inch above the line of detection and moving between 1 mph and 75 mph, an Alarm will be issued. The Alarm Time Control can be set for an Alarm Time of 1 to 30 seconds. Custom times can be provided upon request.

The Alarm relay provides a Form C contact with an 8A circuit breaker for load protection.

A power-on reset circuit is utilized so that if power is lost and then reapplied, there is no false alarm issued.

The optional Fault circuits are designed such that the Fault relay is energized if:

- a. The Detector has AC/DC power and
- b. The Detector is operating properly and
- c. The Source is operating properly.

If one of the following occurs, the Fault relay will de-energize:

- a. The Detector loses AC/DC power or
- b. A malfunction occurs in the Detector or
- c. The Source loses AC/DC power or
- d. The Source eye fails or
- e. The Detector eye fails or
- f. The detector eye experiences interferences for 15 +/- 5 seconds or
- g. The beam is blocked for 15 +/- 5 seconds

For those cases where the Detector eye experiences temporary interference or blockage, when the interference or blockage is removed, the system will recover to normal operation in 30 +/- 10 seconds and the Fault relay will become energized.

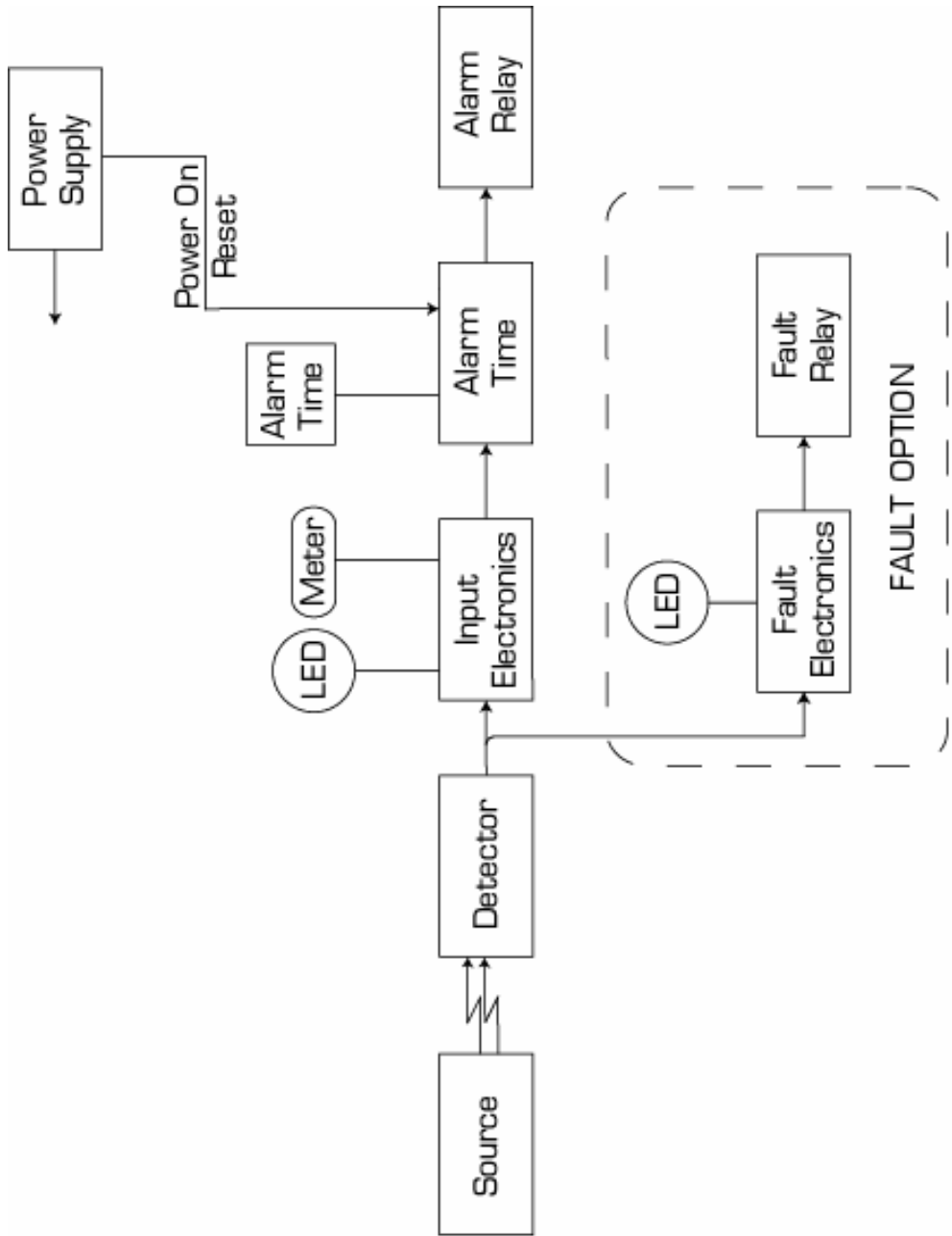


Figure 1: System Diagram

Installation Procedures

MECHANICAL AND COARSE ALIGNMENT

Customer supplied poles or support structure.

1. Ensure that the poles are vertical.
2. Secure the mounting brackets to the poles with the flat top of the mounting bracket 5 ½ inches lower than the intended detection height. Ensure that the mounting brackets are horizontal.
3. Screw in the ¼ inch x 20 socket set screws until about ¾ of an inch protrudes above the surface of the mounting bracket.
4. Place the Source and Detector cabinets on their respective mounting brackets and tighten the 5/8-inch nut lightly with your fingers (no wrench).
5. Open the “bore-sight” holes in the two cabinets by removing the 4-40 screws in the front and back of each cabinet.
6. Establish the horizontal alignment by turning the cabinets manually, and then use the adjusting setscrews to accomplish the remainder of the alignment in the pitch plane. The opposite cabinet should be seen as centered in the “bore-sight holes”.
7. The above six steps establish that the cabinets are pointed at each other but do not ensure the best “center of envelope” aiming of “eye to eye.” See **Figure 3**, Alignment.

Trigg Industries, LLC (TI) telescoping poles.

1. Ensure that the poles are vertical.
2. Set the pole cap top 5 ½ inches lower than the intended detection height by adjusting the telescoping pole.
3. Screw in the ¼ inch x 20 hex head screws until about ¾ of an inch protrudes above the surface of the pole cap.
4. Place the pole caps on their respective Source and Detector cabinets’ bases and lightly tighten the 5/8-inch nut with your fingers (no wrench).
5. Place the complete Source and Detector cabinets (with pole caps attached) on top of their respective poles.
6. Open the “bore-sight” holes in the two cabinets by removing the 4-40 screws in the front and back of each cabinet.
7. Establish alignment by looking through the bore sights and turning the cabinets manually then use the adjusting set screws to accomplish the remainder of the alignment in the vertical plane. The opposite cabinet should be seen as centered in the ‘bore-sight’ holes.
8. The above seven steps establish the best field alignment of the cabinets pointed at each other. Factory alignment ensures the best ‘center of envelope’ aiming of ‘eye to eye’. See **Figure 3**, Alignment.

ELECTRICAL

1. Refer to **Figure 2**, Suggested Wiring, for the following steps.



Exercise caution when making connections to terminal strips with a common screwdriver. Blades more than ¼ inch width may damage the control panel terminal strips. Verify system power variation **before** connecting power.

2. Connect 115VAC 50/60 Hz (230VAC or 24VDC dependent on power variation) power to the Source. The high intensity Visible RED beam (Model 3310) or low intensity red LED indicator (Model 3311) illuminates.
3. Connect 115VAC 50/60 Hz (230VAC or 24VDC dependent on power variation) power to the Detector. If the “coarse alignment” accomplished in the Mechanical installation procedures was successfully accomplished, the green LED on the Detector control panel should be ON.

NOTE: Since the final optical alignment process may cause the Detector to issue a “false alarm,” it may be best to wire the alarm circuits after FINAL ALIGNMENT has been accomplished.

FINAL ALIGNMENT

NOTE: The following steps must be accomplished by two persons. The Fault option LED can be ignored during the alignment procedure.

1. The green EYE LED in the Detector should be ON and the meter reading should be 8VDC +/- 1VDC. Both the EYE LED and meter are used as GO-NOGO indicators to facilitate alignment.
2. While looking through the bore sight obtain final alignment by maneuvering the cabinets manually. The opposite cabinet should be seen as centered in the bore sight holes. Position the opposing system in the middle of the bore sight image. Repeat on opposite side.
3. It may be necessary to repeat step 2 if either the Detector or Source required major adjustment from their original positions. Tighten all hardware. Ensure bore sight image maintained during tightening.

NOTE: The above steps are for in-field alignment. The Factory Optical Alignment procedures must be accomplished to ensure the best "center of envelope" aiming of "eye to eye". The bottom LEDs and meter can be used for alignment purposes to position both the Remote and Master eyes in the "center of envelope." Once the Optical alignment is complete, the Align Switch may be returned to the “Center-Off” position

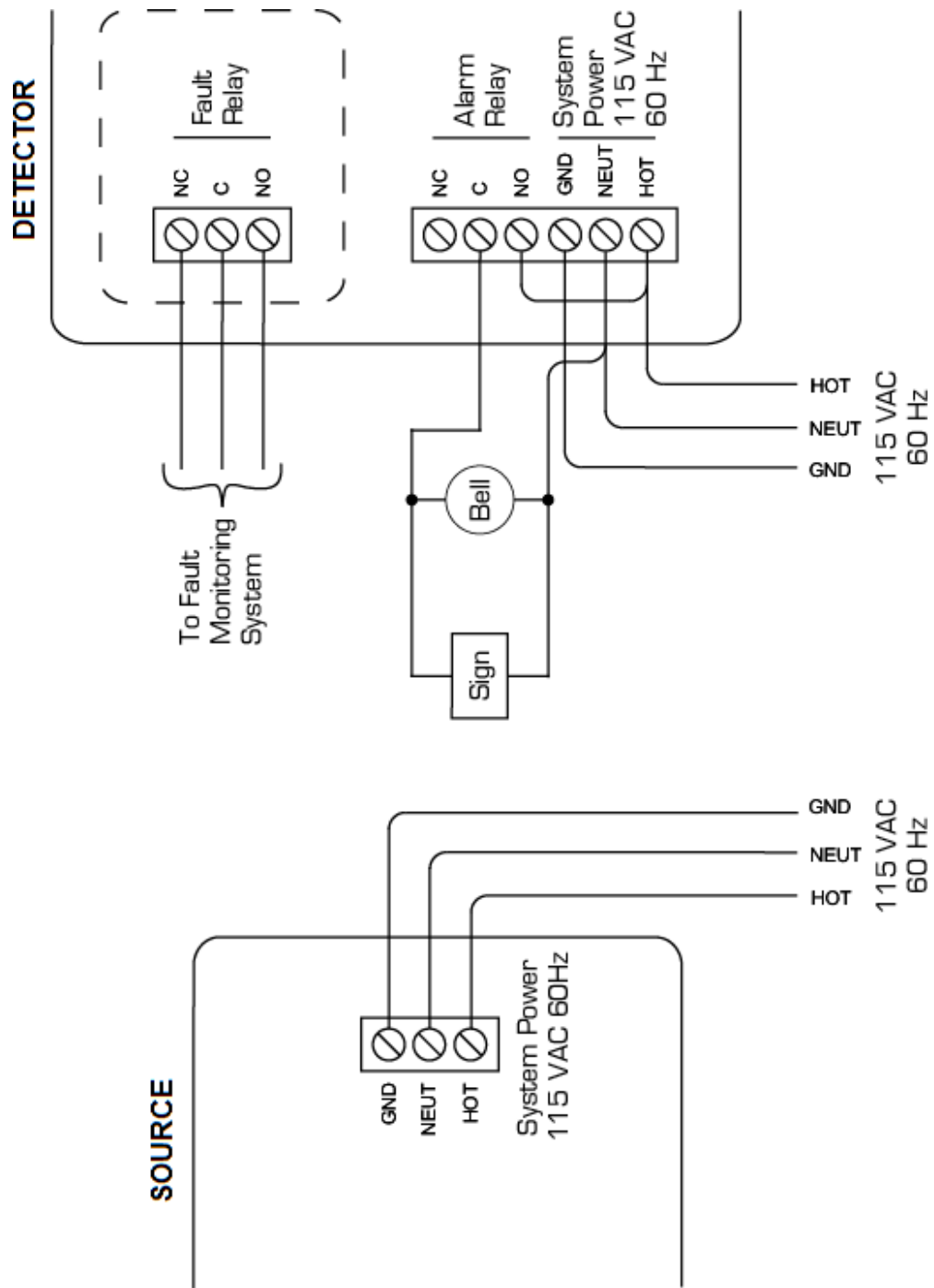


Figure 2 Suggested Wiring

FINAL STEPS

1. Connect alarm and fault option wiring (if not already connected) and test the system for proper activation by interrupting the beam.
2. The Bird Perch Denial Rod (packaged in the shipping carton) is designed to prevent birds from landing on an eye cone and possibly setting off a false alarm by the head or tail of the bird breaking the transmitted beam.
3. It is recommended that these rods be installed on all eye cones to ensure that landing birds cannot cause a false alarm. Install by removing the screws from the top front of the eye cones and replacing these screws with the bird perch denial rods.

NOTE: Based on environmental conditions at each location, it is suggested that both the Source and Detector “eyes” be cleaned with a soft brush to remove airborne contaminants on “as needed” basis.

OPERATION CHECK

The following procedures establish that the OHVDS is operating in a satisfactory manner.

1. Note at the Detector that the EYE LED is ON and the meter reads 8VDC +/- 1 VDC. If the Fault option has been included, the LED near the Fault terminal strip should be ON.
2. Set the Detector Alarm Time Control for the desired length of time (generally 10 to 15 seconds).
3. Note the reading of the counter in the Detector.
4. Using an object at least 2.5 inches in diameter (PVC or two-by-four), interrupt the beam by moving the object slowly (1 mph minimum speed simulation) through the plane of the beam. Observe that the counter increments by one and the alarm (bell and/or sign) activates for the Alarm Time +/- 3 seconds.
5. Using the same object as in Step 4 above, interrupt the beam by moving the object quickly (75 mph maximum speed simulation) through the plane of the beam. Observe that the Counter increments by one and the alarm (bell and/or sign) activates for the Alarm Time +/- 3 seconds.
6. To test the optional Fault detection circuits, completely block the beam and note that after 15 +/- 5 seconds, the LED near the Fault terminal strip goes OFF and the Fault relay de-energizes. Remove the beam blockage and note that after 30 +/- 5 seconds the LED near the Fault terminal strip comes ON and the Fault relay de-energizes.

NOTE: Once operational, the OHVDS may be periodically tested from the ground using a long pole at least 2 inches in diameter and interrupting the beam within the 1 mph to 75 mph criteria.

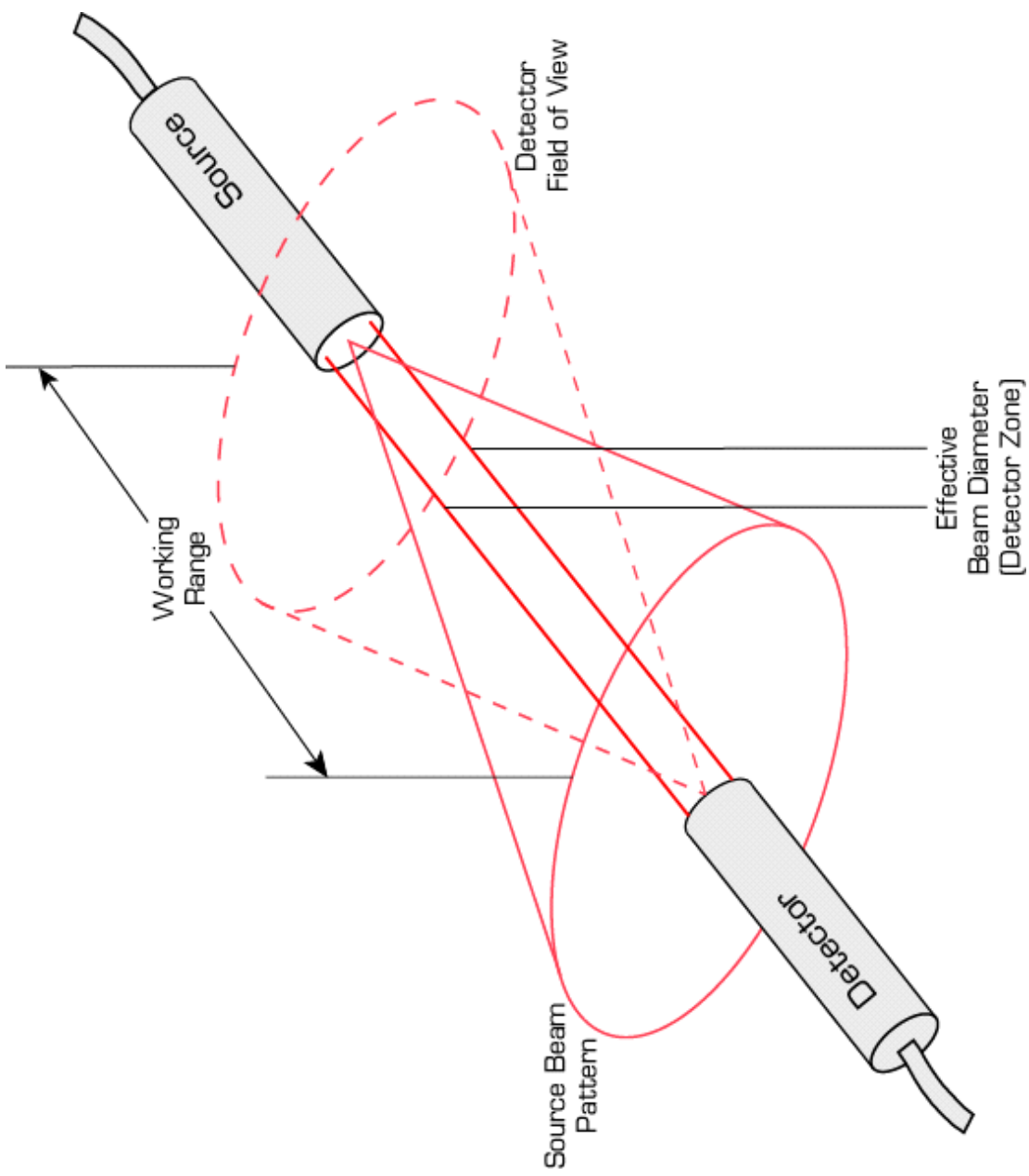


Figure 3 Alignment

Detection Height Test

1. Using a surveyor's rod or pole with the top end having a cross section of at least 2 inches and the rod/pole length the desired detection height, place the bottom of the rod/pole on the roadway where the right side wheels of a vehicle would run when passing through the beam. Move the top of the rod/pole such that the beam should be interrupted (within the speed criteria of the system) and note that an alarm is issued.
2. Move the bottom of the rod/pole to where the left side wheels of a vehicle would run when passing through the beam. Move the top of the rod/pole such that the beam should be interrupted (within the speed criteria of the system) and note that an alarm is issued. It may be necessary to adjust the height and/or slope of the eyes to match that of the roadway surface. If any height adjustment is necessary, ensure the final alignment procedures are again followed.
3. This tests the crown or slope of one lane. If more than one lane is being detected, check each lane per Steps 1 and 2. It may be necessary to adjust the height of either the source or detector eye to establish the "best fit" for the particular application. If any height adjustment is necessary, ensure the final alignment procedures are again followed.

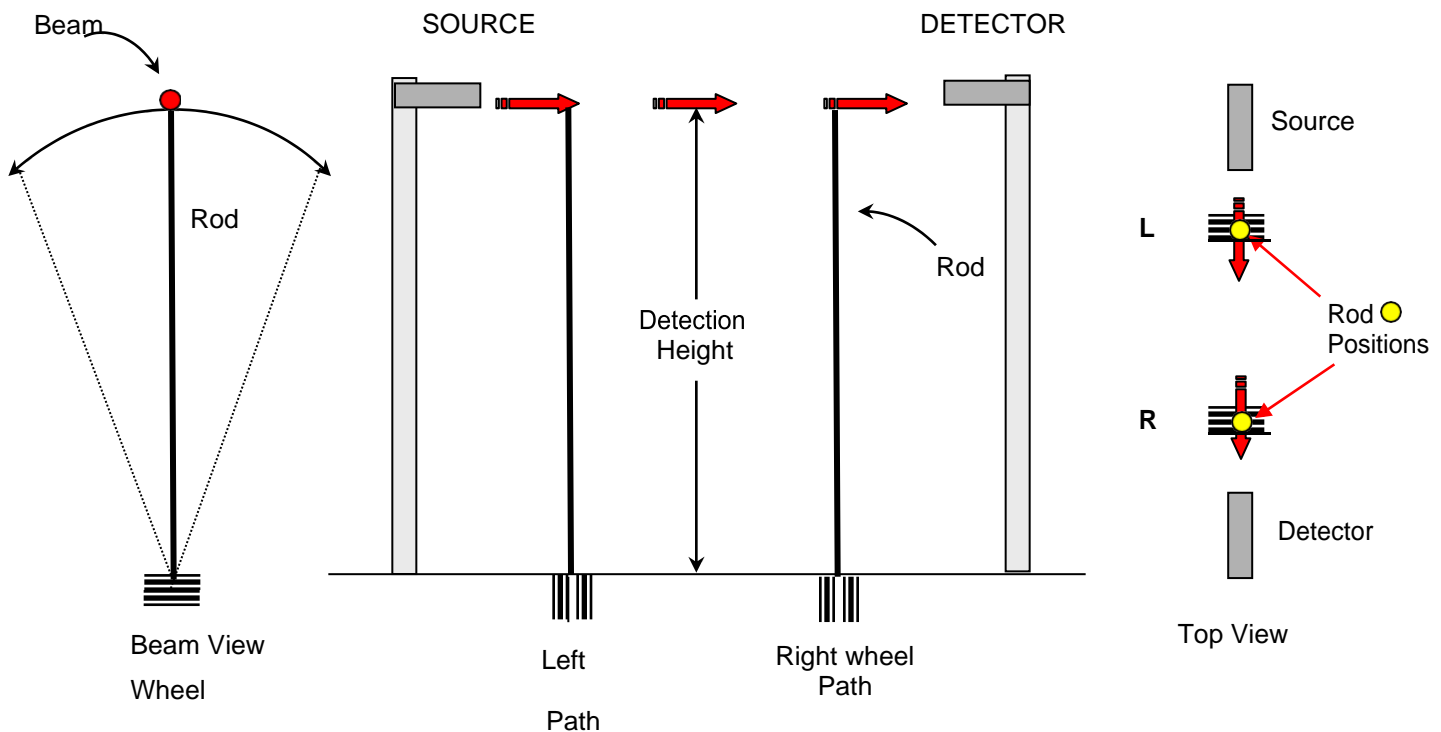


Figure 4: Detection Height Test

REMOVAL PROCEDURES

1. Remove power from the Source and Detector.



Exercise caution when making connections to terminal strips with a common screwdriver. Blades more than ¼ inch width may damage the control panel terminal strips.

2. Disconnect cabling from the Source and Detector control panel terminal strips
3. Remove the Source and Detector from their respective installations.

Maintenance

NOTE: Trigg Industries, LLC Over Height Vehicle Detection systems are covered under warranty for one year from the date of purchase (see Warranty, page 2). Unauthorized maintenance during this time frame will void the warranty.

PREVENTIVE MAINTENANCE

Based on the environmental conditions at each location, it is suggested that both the Source and Detector “eyes” be cleaned with a soft brush to remove airborne contaminants on an “as required” basis.

TROUBLESHOOTING

Normal Operation Indication

When installed and aligned properly, the Detector EYE LED should be illuminated. When the beam is broken, the LED goes OFF and Alarm devices energize for the duration of the selected Alarm Time.

TROUBLE ANALYSIS

The OHVDS is designed for years of trouble-free operation. However, the following procedures are suggested as an approach to troubleshooting the system if correct indications cannot be achieved. These procedures are recommended for use by qualified technicians only. If necessary, contact Trigg Industries, LLC Technical Support at (757) 223-7522.

Table 1: Trouble Analysis

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTIONS
All indications appear normal but no alarm activated when beam is interrupted with an object ≥ 2.5 " diameter.	Alarm defective, alarm wiring defective, circuit breaker in Detector tripped, Detector defective.	<p>Replace/repair defective component and perform Operational Check on page 10.</p> <p>a. Break beam. If the following indications are met, problem is external to OHVDS.</p> <ul style="list-style-type: none"> - LED goes OFF - Meter goes to 0 - Counter increments - Relay clicks at end of alarm time <p>b. If LED goes OFF, Meter goes to 0, but counter does not increment, the problem is in the Detector.</p> <ul style="list-style-type: none"> - Replace ICs 4093, 4538, 555 or relay transistor 2N2222A.
The LED is not ON and the Meter reads 0 VDC.	Misalignment or loss of power at the Source or Detector.	<p>a. Check for proper "bore-sight" alignment (see Installation and Final Alignment). Align as required.</p> <p>b. Check for 120 VAC (230VAC or 24VDC dependent on power variation) at the Source terminal strip. Observe Source Eye for high intensity RED beam (Visible RED) or low intensity red LED (IR) illumination. If missing, the source eye is defective.</p> <ul style="list-style-type: none"> - Replace as necessary. <p>c. Check for 120 VAC (230VAC or 24VDC dependent on power variation) at the Detector terminal strip. Observe Detector eye for low intensity red LED illumination (indicates reception of transmitted energy). If missing, the Detector eye is defective.</p> <ul style="list-style-type: none"> - Replace as necessary.

If you encounter problems with your OHVDS, contact Trigg Industries at (757) 223-7522 for technical support.



Recommended Spare Parts

NOTE: Trigg Industries, LLC Over Height Vehicle Detection systems are covered under warranty for one year from the date of purchase (see Warranty, page 4). Unauthorized maintenance during this time frame will void the warranty.

For those customers that have a qualified technician, and wish to perform field repair, the following parts are available.

Table 2: Recommended Spare Parts

PART #	DESCRIPTION	QTY	SYSTEM
TG-329A	PCB Assembly	1	All
E58-30TS250-HA	RED Source	1	SE-R 3310/SE-R 3310-F
E58-30TD250-HD	RED Detector	1	SE-R 3310/SE-R 3310-F
SM30SRLMHS	IR Source	1	SE-IR 3311/SE-IR 3311-F
SMA30SELMHS	IR Detector	1	SE-IR 3311/SE-IR 3311-F
CD4093	IC Gate	1	All
CD4538	IC Timer	1	All
LM555	IC Timer	1	All
2N2222A	Transistor	1	All
7812ACT	Regulator	1	All

The above parts starting with “TG” must be obtained from Trigg Industries, LLC. The remaining items may be obtained from TI or a reputable electronics supply company. Due to tolerance and temperature conditions, it is very important that correct replacement parts be obtained. Do not substitute low cost parts or “almost the same” parts as performance and long-term reliability may be sacrificed.

