

Over Height Vehicle Detection System

Installation, Operation and Maintenance Manual



Models DB-R/IR-3200, DB-IR/IR-3200

Dual Beam

MARCH 2021



ADDENDUM

<u>Power</u>

The Installation, Operation and Maintenance Manual for the Model DB-R/IR-3200 and DB-IR/IR-3200 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 lightening 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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DISCLAIMER

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 EXPRESS 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.



INSTALLATION

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. If the Three Axis are used, add additional distance to account for the mounts.
- 3. Screw in the ¼ inch x 20 socket set screws until about 3/4 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 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.
- 7. The above six 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 1, Alignment.

Trigg Industries, LLC (TI) Telescoping Poles

- 1. Ensure that the poles are vertical.
- 2. Set the pole cap top 5 1/2 inches lower than the intended detection height by adjusting the telescoping pole. If the Three Axis Mounts are used, add additional distance to account for the mounts.
- 3. Screw in the ¼ inch x 20 hex head screws until about 3/4 of an inch protrudes above the surface of the pole cap. If the Three Axis Mounts are used, this step does not apply.
- 4. Place the pole caps on their respective Source and Detector cabinet 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 the horizontal alignment by turning the cabinets manually, and then use the adjusting screws to accomplish the remainder of the alignment in the pitch plane. The opposite cabinet should be seen as centered in the "bore-sight" holes.
- 8. The above seven 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 1, Alignment.

Wiring and Alignment

- 1. Connect 115VAC, 230VAC or 24VDC (depending on model) power to both the Source and Detector. 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 alignment is completed. See Figure 2, Suggested Wiring.
- 2. Both the green LEDs in the Detector should be ON and the Meter should read about 8vdc when the Align Switch is placed in the LE (Lead Eye) or LA (Lag Eye) position. The LE and LA eyes are determined by the Direction Select Switch position. Direction (Left to Right or Right to Left) is defined as viewing the Source from the Detector.
- 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.

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 so as 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

CAUTION

Please review Application Notes, if there is any slope (vertical or horizontal) to the roadway.

4. Repeat step 3 for the opposing side.



- 5. It may be necessary to repeat Steps 3 and 4 if either the Detector or Source required major adjustment from their original 'bore-sight' positions.
- 6. Connect the alarm wiring (if not already connected) and test the system for proper activation by interrupting the beams in the direction selected with an object 2.5 inches (or greater) in diameter, and within the 1mph to 75mph system design. Interrupt the beams in the opposite direction and observe no alarm. For example, if Left to Right was selected as the direction of interest, an interruption of the beams in a Left to Right direction should cause the OHVDS to issue an alarm. An interruption of the beams in a Right to Left direction should not result in an alarm issued.
- 7. 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.
- 8. 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 ¼ inch x 20 bolts from the top front of the eye cones and replacing these bolts with the bird perch denial rods.

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



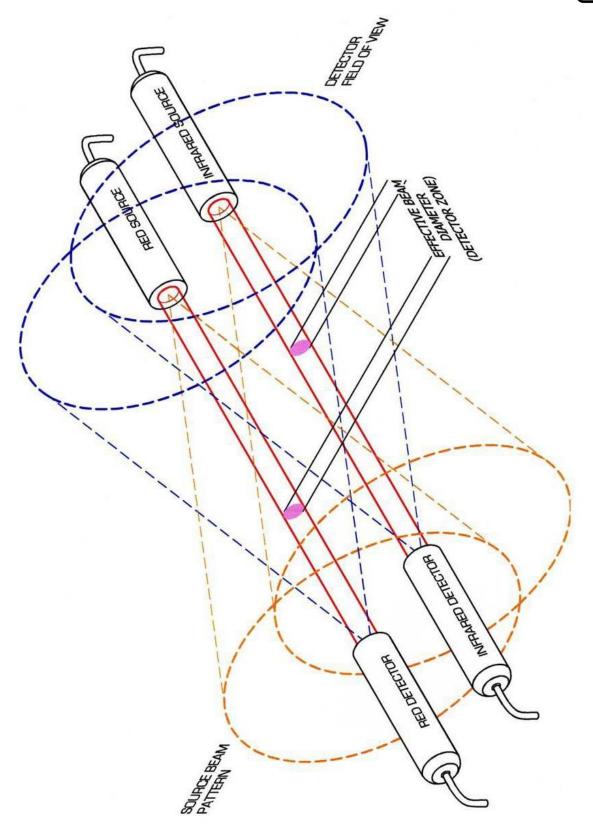
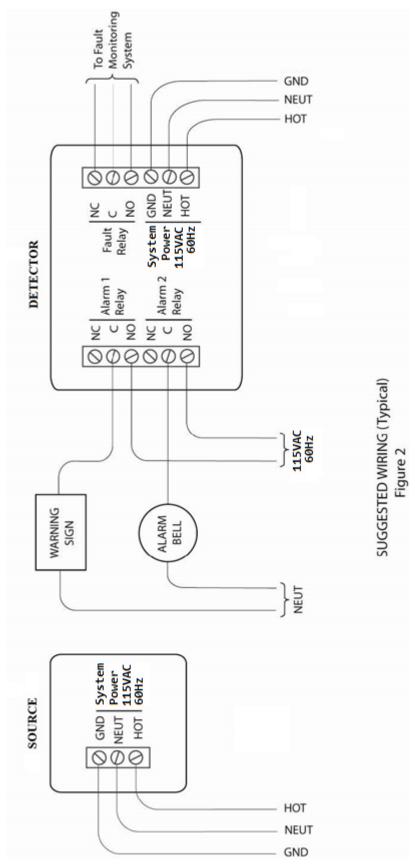


Figure 1: ALIGNMENT







SYSTEM DESIGN

The Trigg Industries, LLC Dual Beam Over Height Vehicle Detection System is comprised of a Source Cabinet and Detector Cabinet. See **Figure 3** for a simplified System Diagram.

Model DB-R/IR-3200 Source contains the Visible Red Source and Infrared Source. Model DB-IR/IR-3200 Source contains the Infrared A Source and Infrared C Source. All sources are pulsed and the detectors in the Detector are designed to respond to their respective pulses.

The output of the detectors in the Detector cabinet are directed to the input electronics by the Direction Select Switch. The input electronics conditions these signals and generates a gate signal which controls the actual detection time. Thus, if a vehicle is traveling in the Direction of Interest between 1mph and 75mph, and has an obstruction 2.5 inches or greater in diameter 1 inch above the height of detection, the Detector will issue an over height alarm. Vehicles traveling opposite the Direction of Interest are ignored. The alarm time is customer adjustable from 1 second to 30 seconds with a 3 second tolerance. Custom times can be provided upon request.

The Alarm Relay provides a Form C dry contact with an 8A circuit breaker for load protection. Fault circuits are incorporated such that if there is one eye lost, either Red or IR, the system will switch to Single Eye Mode and still provide over height detection. However, direction discernment is lost. If there is a loss of power to either the Source or Detector cabinet, the Fault relay will de- energize and activate the associated fault alarm device.

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



Detector Control Panel Functions

TERMINAL STRIP Provides for connecting input power and relay contacts for

load.

COUNTER Indicates how many times unit has activated.

ALIGN-OPERATE SWITCH Connects output of either Detector eye to meter. GO-

NOGO function.

GREEN LED's When ON, indicate received signal level is enough for

normal operation.

METER GO-NOGO function. Reads 8vdc +/-1vdc in GO condition.

L-R DIRECTION SELECT

SWITCH

Selects which direction an over height vehicle must be

traveling to activate the alarm. LEFT-RIGHT is defined

as viewing Source from Detector.

ALARM TIME ADJUST Sets the duration of alarm. It may be set for 1 to 30

seconds. Most common setting used by traffic engineers is between 8 and 14 seconds. If warning signs, etc. are left on longer than necessary, drivers of following trucks may

think that they are also over height. Optional times

available.



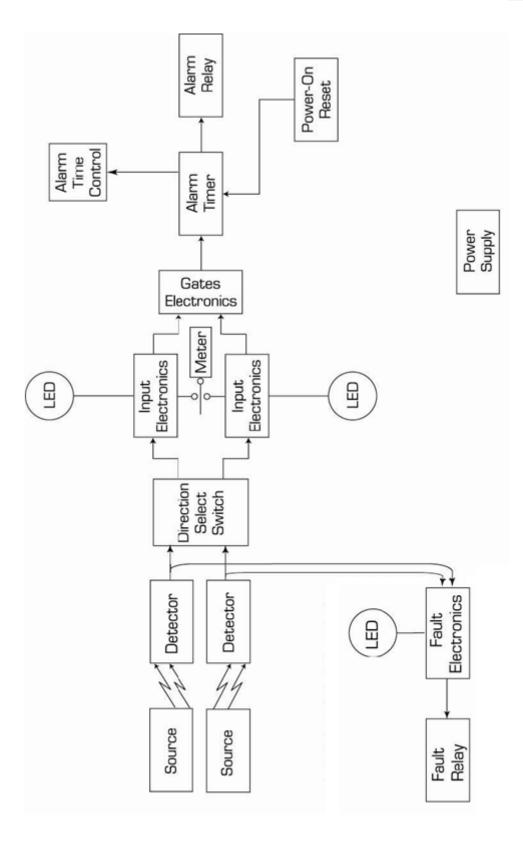


Figure 3: SYSTEM DIAGRAM



OPERATION

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

- 1. Note at the Detector that the LEDs are ON and that the Meter reads 8VDC +/- 1VDC when the Align Switch is placed in the LE or LA position.
- 2. Set the Detector Alarm Time Control for the desired length of time (generally from 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 (i.e. PVC pipe or a two-by-four), interrupt the beams by moving the object slowly (1mph minimum speed simulation) through the plane of the beams in the direction selected for detection and observe the following:
 - **Result** The Counter should increment by one and the alarm (bell, flasher and/or sign) should activate for the Alarm Time +/- 3 seconds.
- 5. Using the same object as in Step 4 above, interrupt the beams by moving the object quickly (75mph maximum speed simulation) through the plane of the beams in the direction selected for detection and observe the following:
 - **Result** The Counter should increment by one and the alarm (bell, flasher and/or sign) should activate for the Alarm Time +/- 3 seconds.
- 6. Using the same object as in Step 4 above, interrupt the beams in the opposite direction of that selected for detection and observe the following:

Result - No alarm is activated.

Once operational, the OHVDS may be periodically tested from the ground using a long pole at least 2.5 inches in diameter and interrupting the beams in the direction selected for detection within the 1mph to 75mph criteria.



MAINTENANCE

1. Preventative Maintenance

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

2. Remedial Maintenance

Problem - All indications appear normal, but no alarm activates when the beams are interrupted in the direction selected for detection with an object 2.5 inches or greater in diameter.

Probable cause - Alarm defective, alarm wiring defective, circuit breaker in Detector tripped, Detector defective.

Action - Interrupt the beams in the direction selected for detection and observe that LEDs go OFF (LE then LA) as object is moved through beams. Observe the Meter goes to 0vdc to match LE or LA position of Align Switch. Observe the Counter increments by one. The Relay should "click" at the end of the Alarm Time. If all criteria is met, problem is external to Detector.

If LEDs go OFF in sequence and Meter goes to 0VDC to match LE and LA position of Align Switch but Counter does not increment, problem is in Detector. Contact Trigg Industries for assistance (757-223-7522).

Problem - LEDs are not ON and Meter reads 0vdc with the Align Switch in either the LE or LA position.

Probable cause - Check for proper "bore sight" alignment of both the Source and Detector. Align as required.

Action - No AC power at Source. Check for appropriate power (115VAC/230VAC/24VDC depending on model) at Source terminal strip. Observe the Red Source eye for high intensity red LED (inside the eye) illumination. This indicates proper operation of the RED Source. Observe a low intensity red led inside the IR eye. This indicates proper operation of the IR Source. Repair as necessary.

No AC power at the Detector. Check for appropriate power (115VAC/230VAC/ 24VDC depending on model) at Detector terminal strip. Observe Detector eyes for low intensity red LEDs' illumination. This indicates reception of transmitted RED and IR energy. Repair as necessary.



SPARE PARTS

For those customers who have qualified electronics service personnel and wish to perform field repair, the following spare parts are suggested:

PART NO.	DESCRIPTION	QUANTITY
TG-351-F/M	PCB Complete / Modified	1
E58-30TS250-HA	RED Source Eye, DB-R/IR-3200 only	1
E58-30TD250-HD	RED Detector Eye, DB-R/IR-3200 only	1
E58-30TSS8122	IR Source Eye, DB-R/IR-3200 only	1
E58-30TDS8122	IR Detector Eye, DB-R/IR-3200 only	1
SMA30-SEL-MHS	IR Source Eye "A", DB-IR/IR-3200 only	1
SM30-SRL-MHS	IR Detector Eye "A", DB-IR/IR-3200 only	1
SMA30-SEL-MHSC	IR Source Eye "C", DB-IR/IR-3200 only	1
SM30-SRL-MHSC	IR Detector Eye "C", DB-IR/IR-3200 only	1
CD4093	IC Gate	1
CD4538	IC Timer	1
LM555	IC Timer	1
2N2222A	Transistor	1
7812ACT	Regulator	1

The above parts starting with 'TG' must be obtained from Trigg Industries, LLC and the remaining items may be obtained from TI or a reputable electronics supply company. It is very important that, due to tolerance and temperature conditions, 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.



APPLICATION NOTES

A typical application is shown in **Figure 4**, Detection Concept. As an over height vehicle approaches a bridge, the OHVDS detects the over height condition and issues an alarm. Both the Bell and flashing Warning Sign are activated at the same time so as to attract the attention of the vehicle driver by both aural and visual means.

There are several items that concern the proper installation of the OHVDS. **Figure 5** depicts a Cross Section of the Roadway. Since there is a crown in most roads, this must be taken into consideration as the beams are straight and do not follow the crown of the road. Therefore, the traffic engineer must make a choice as to what height the OHVDS must be set.

Figure 6 depicts a View Across the Roadway where there is a substantial grade. As shown, the OHVDS must be tilted so that the plane of the Detector eyes matches the grade of the road. If there is a condition such as a road on the side of a mountain where it is possible to have grades in two planes (i.e. down hill and away from the hill), the OHVDS Detector must be mounted to match both grades for optimum over height vehicle detection.

Some experimentation regarding detection height may be required to satisfy the more adverse roadway conditions.





Figure 4: Detection Concept



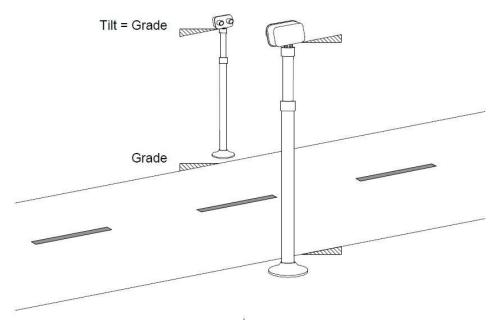


Figure 5: View Across Roadway

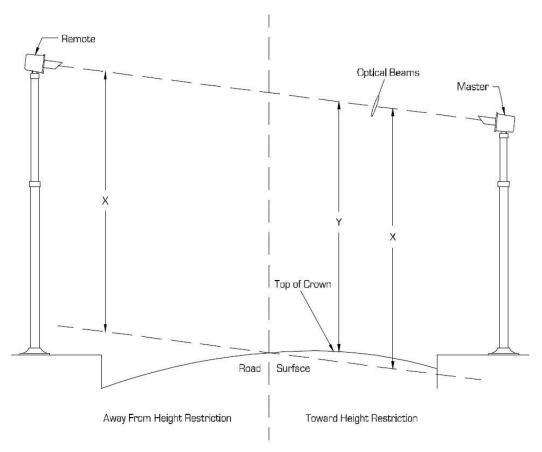


Figure 6: Cross Section of Roadway



SPECIFICATIONS

MODEL # DB-R/IR-3200

DUAL BEAM VISIBLE RED / INFRARED OVER-HEIGHT VEHICLE DETECTION SYSTEM





SOURCE

DETECTOR

MODEL	DB-R/IR-3200	DB-R/IR-3200-230	DB-R/IR-3200-24
OPERATING VOLTAGE	120 VAC, 50/60HZ	240 VAC, 50/60HZ	+24 VDC
CURRENT - SOURCE	0.121A	0.061A	0.390A
CURRENT - DETECTOR	0.390A	0.195A	0.520A
ALARM OUTPUT	Two dry relay contact closures, Form C, contacts rated 115VAC 10A and protected by 8A circuit breakers.		
FAULT OUTPUT	Dry relay contact opening, Form C, contacts rated 115VAC 10A and protected by an 8A circuit breaker.		
ALARM TIME	Adjustable by customer from 1 to 30 seconds. Other options available.		
ELECTRONICS	Sensors are NEMA 6P enclosure rated. Printed circuit board for years of reliable operation.		
EFFECTS OF AMBIENT LIGHT	10,000 Foot Candles for Red Detector.		
MAXIMUM RANGE	800 feet. Suggested maximum range of 200 feet to allow for bad weather and lens contamination.		
DIRECTION SELECTION	Selection switch. No tools or adjustment required.		
ALIGNMENT	Two Green LEDs and GO-NOGO meter provided for alignment. No special tools required.		
REACTION SPEED	1mph to 75mph for a 2.5 inch diameter object 1 inch above the height of detection.		
COUNTER	Records the number of ac	tivations.	



SPECIFICATIONS (CONT'D):

MODEL	DB-R/IR-3200	DB-R/IR-3200-230	DB-R/IR-3200-24
TEMPERATURE RANGE	-40° to +135° F (-40° to +57° C).		
ENVIRONMENTAL	Internal thermostat contro	ls air flow which reduces mo	pisture and maintains
CONTROL	internal temperature durin	g cold weather.	
HOUSINGS		ALMAG casting and sheet a	
	1/8 inch thickness) to mini	mize vandalism and provide	e for rigid mounting.
CONNECTORS	Source Cabinet: One 3/4"	NPT hole accepts cord grip	or conduit fitting.
	Detector Cabinet: One 3/4" NPT hole accepts cord grip or conduit fitting.		
MOUNTING	Pole-mountable using Model # PMB-500 bracket (available separately).		
	Wall-mountable using Model # FSB-500 bracket (available separately).		
	Pole-top mountable when using pole cap on Model # 3701 or 3702 poles.		
	Optional Three-Axis Mour	nt (Model # TGZ-M017) reco	mmended in applications
	with cross slope or comple	ex road profiles.	
DIMENSIONS	Source / Detector Cabinet: 16½ x 12½ x 8¾ inches (42 x 32 x 22 cm).		
SHIPPING WEIGHT	45 lbs (20 kg).		
WARRANTY	Standard 1-Year Full Warranty. Extended Warranty options available.		

OPTIONAL ACCESSORIES:

MODEL#	DESCRIPTION
PMB-500	Pole Mount Bracket
TGZ-M017	Three-Axis Mount
FSB-500	Flat Surface Bracket
USC-1000	Universal System Controller - Provides Logging and Remote Notifications
TG-CAM-1010	Network Camera - Provides Snapshot Images and Video Recordings

Additional accessories and warning devices are available from Trigg Industries LLC. Contact sales@triggindustries.com for details.



SPECIFICATIONS

MODEL # DB-IR/IR-3200

DUAL BEAM INFRARED / INFRARED OVER-HEIGHT VEHICLE DETECTION SYSTEM





SOURCE

DETECTOR

MODEL	DB-IR/IR-3200	DB-IR/IR-3200-230	DB-IR/IR-3200-24
OPERATING VOLTAGE	120 \/AC 50/60H7	240 VAC 50/60H7	+24 VDC
	120 VAC, 50/60HZ	240 VAC, 50/60HZ	
CURRENT - SOURCE	0.121A	0.061A	0.390A
CURRENT - DETECTOR	0.390A	0.195A	0.520A
ALARM OUTPUT	Two dry relay contact clos	sures, Form C, contacts rate	d 115VAC 10A and
	protected by 8A circuit bre	eakers.	
FAULT OUTPUT	Dry relay contact opening	Form C, contacts rated 115	SVAC 10A and protected
	by an 8A circuit breaker.	·	·
ALARM TIME	Adjustable by customer from 1 to 30 seconds. Other options available.		
ELECTRONICS	Sensors are NEMA 6P enclosure rated. Printed circuit board for years of reliable		
	operation.		
EFFECTS OF AMBIENT	Very high noise immunity for IR detector.		
LIGHT			
MAXIMUM RANGE	500 feet. Suggested maxis	mum range of 200 feet to all	ow for bad weather and
	lens contamination.		
DIRECTION SELECTION	Selection switch. No tools or adjustment required.		
ALIGNMENT	Two Green LEDs and GO-NOGO meter provided for alignment. No special tools		
	required.	•	
REACTION SPEED	1mph to 75mph for a 2.5 inch diameter object 1 inch above the height of		
	detection.	•	-
COUNTER	Records the number of activations.		



SPECIFICATIONS (CONT'D):

MODEL	DB-IR/IR-3200	DB-IR/IR-3200-230	DB-IR/IR-3200-24
TEMPERATURE RANGE	-40° to +135° F (-40° to +57° C).		
ENVIRONMENTAL	Internal thermostat contro	Is air flow which reduces mo	pisture and maintains
CONTROL	internal temperature durin	g cold weather.	
HOUSINGS		ALMAG casting and sheet	
	1/8 inch thickness) to mini	imize vandalism and provide	e for rigid mounting.
CONNECTORS		NPT hole accepts cord grip	
	Detector Cabinet: One 3/4	I" NPT hole accepts cord gri	p or conduit fitting.
MOUNTING	Pole-mountable using Model # PMB-500 bracket (available separately).		
	Wall-mountable using Model # FSB-500 bracket (available separately).		
	Pole-top mountable when using pole cap on Model # 3701 or 3702 poles.		
	Optional Three-Axis Mour	nt (Model # TGZ-M017) reco	mmended in applications
	with cross slope or comple	ex road profiles.	
DIMENSIONS	Source / Detector Cabinet: 16½ x 12½ x 8¾ inches (42 x 32 x 22 cm).		2 x 32 x 22 cm).
SHIPPING WEIGHT	45 lbs (20 kg).		
WARRANTY	Standard 1-Year Full Warranty. Extended Warranty options available.		

OPTIONAL ACCESSORIES:

MODEL#	DESCRIPTION
PMB-500	Pole Mount Bracket
TGZ-M017	Three-Axis Mount
FSB-500	Flat Surface Bracket
USC-1000	Universal System Controller - Provides Logging and Remote Notifications
TG-CAM-1010	Network Camera - Provides Snapshot Images and Video Recordings

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