



# Yale® YK/Shaw-Box® SK Crane Kit LaserGuard Mini Technical Manual



Part Number: 192088726 Rev AA

July 2021

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FAMILY OF BRANDS



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# PREFACE AND SAFETY

## Product Safety Information

Magnetek, Inc. (Magnetek) offers a broad range of radio remote control products, control products, adjustable frequency drives, and industrial braking systems for material handling applications. This manual has been prepared by Magnetek to provide information and recommendations for the installation, use, operation, and service of Magnetek's material handling products and systems. Anyone who uses, operates, maintains, services, installs, or owns Magnetek products should know, understand, and follow the instructions and safety recommendations in this manual for Magnetek Products.

The recommendations in this manual do not take precedence over any of the following requirements related to cranes, hoists, lifting devices, or other material handling equipment which use or include Magnetek Products:

- Instructions, manuals, and safety warnings of the manufacturers of the equipment where the Magnetek Products are used,
- Plant safety rules and procedures of the employers and the owners of the facilities where the Magnetek Products are being used,
- Regulations issued by the Occupational Health and Safety Administration (OSHA),
- Applicable local, state or federal codes, ordinances, standards and requirements, or
- Safety standards and practices for the industries in which Magnetek Products are used.

This manual does not include or address the specific instructions and safety warnings of these manufacturers or any of the other requirements listed above. It is the responsibility of the owners, users and operators of the Magnetek Products to know, understand and follow all of these requirements. It is the responsibility of the employer to make its employees aware of all of the above listed requirements and to make certain that all operators are properly trained. **No one should use Magnetek Products prior to becoming familiar with and being trained in these requirements and the instructions and safety recommendations for this manual.**



## Product Warranty Information

Magnetek, hereafter referred to as Company, assumes no responsibility for improper programming of a drive by untrained personnel. A drive should only be programmed by a trained technician who has read and understands the contents of this manual. Improper programming of a drive can lead to unexpected, undesirable, or unsafe operation or performance of the drive. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such programming. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product.

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FOR INFORMATION ON MAGNETEK'S PRODUCT WARRANTIES BY PRODUCT TYPE, PLEASE VISIT [WWW.MAGNETEK.COM](http://WWW.MAGNETEK.COM).



### **WARNING**

Improper programming of a drive can lead to unexpected, undesirable, or unsafe operation or performance of the drive.

## **DANGER, WARNING, CAUTION and NOTE Statements**

Read and understand this manual before installing, operating, or servicing this product.

The following conventions indicate safety messages in this manual. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.

### **DANGERS, WARNINGS and CAUTIONS**

Throughout this document DANGER, WARNING and CAUTION statements have been deliberately placed to highlight items critical to the protection of personnel and equipment.



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

**NOTE:** A NOTE statement is used to notify people of installation, operation, programming or maintenance information that is important, but not hazard-related.

**DANGERS, WARNINGS and CAUTIONS SHOULD NEVER BE DISREGARDED.**

### **Registered Trademarks**

Trademarks are the property of their respective owners.

## Collision Avoidance Unit Warnings



### **WARNING**

Never disable the range detector electrically or mechanically to be ON or OFF for any crane motion. If the unit is for any reason disengaged or turned off, notify the crane operating personnel immediately, and take proper alternate precautions.



### **WARNING**

Check the crane collision avoidance unit and limit switches, if any, at the beginning of each shift or when a new operator takes control of the crane. When checking the collision avoidance unit and limit switches, ensure that the hoist is centered over an area that is free of personnel and equipment.



### **WARNING**

Never use the collision avoidance unit and limit switches as a regular stopping device. They are intended to be protective devices.

# Table of Contents

1	LaserGuard Mini System Information .....	9
1.1	Collision Avoidance Model Numbers.....	9
1.2	Class 1 Laser Sensor .....	9
1.3	System Description .....	10
1.4	System Specifications .....	11
1.5	Laser Support Unit Assemblies .....	12
2	Electrical Installation .....	14
2.1	Voltage Considerations .....	14
2.2	Wiring Considerations .....	14
2.3	Wiring Instructions.....	14
2.4	Laser Cable and Relay Wiring.....	15
2.5	Wiring .....	16
2.5.1	Crane to Crane Wiring When Integrated to Crane Controls at Factory .....	16
2.5.2	Crane to Crane Wiring Example, Field Integration and Wiring Will Be Necessary .....	17
2.5.3	Trolley to Trolley Wiring When Integrated to Crane Controls at the Factory .....	18
3	Mechanical Installation .....	19
3.1	Mounting Location Considerations .....	19
3.2	Laser Dimensions.....	19
3.3	Mechanical Installation and Alignment .....	20
3.3.1	Crane to Crane Collision Avoidance.....	20
3.3.2	Trolley to Trolley Collision Avoidance .....	25
3.4	Electrical Conduit Installation .....	33
4	Functional Installation .....	34
4.1	Laser Distance Set-Point Adjustment.....	34
4.2	Troubleshooting.....	35

# 1 LaserGuard Mini System Information

## 1.1 Collision Avoidance Model Numbers

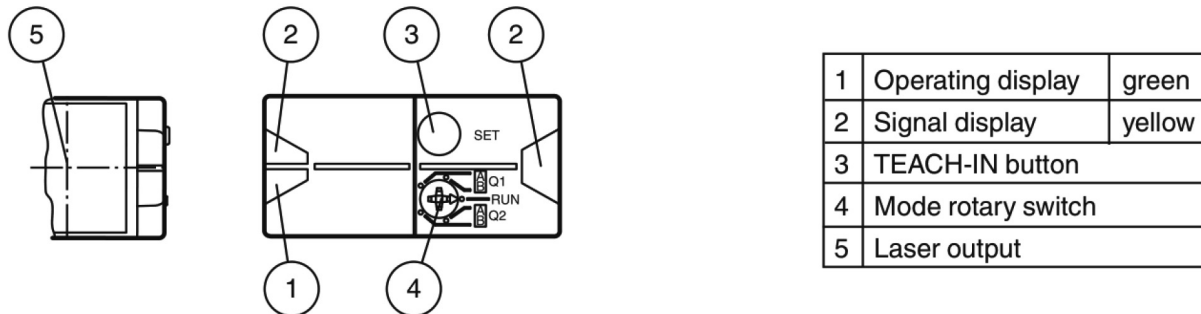
<b>LaserGuard Mini: Crane to Crane or Crane to Wall</b>	<b>Catalog Numbers</b>
LaserGuard Mini System integrated inside bridge controls	Configured on demand
Reflector assembly	CRANE REFLECTOR
Laser cable assembly	LGM-CRANE LASER
LaserGuard Mini System standalone (for use on existing cranes)	LGM-CRANE LSU
<b>LaserGuard Mini: Trolley to Trolley</b>	<b>Catalog Numbers</b>
LaserGuard Mini System integrated inside hoist controls	Configured on demand
Reflector assembly for monorail hoist frames A - C	REFLECTOR M1
Reflector assembly for monorail hoist frames D - E	REFLECTOR M2
Laser cable assembly for monorail hoist frames A - C	LGM-M1 LASER
Laser cable assembly for monorail hoist frames D - E	LGM-M2 LASER
Reflector assembly for top running hoist frames A - D	REFLECTOR TR1
Reflector assembly for top running hoist frames E	REFLECTOR TR2
Laser cable assembly for top running hoist frames A - D	LGM-TR1 LASER
Laser cable assembly for top running hoist frames E	LGM-TR2 LASER

## 1.2 Class 1 Laser Sensor

Magnetek's LaserGuard Mini Collision Avoidance System contains a Class 1 laser with a 660 nm wavelength. Although the laser is safe for eyes, do not look directly into the laser. Do not open the laser sensor enclosure. There are no serviceable parts inside.

## 1.3 System Description

Magnetek's LaserGuard Mini Collision Avoidance System measures the distance between the laser sensor's lens and its companion retro-reflective target by means of pulse-ranging technology. This allows for very accurate measurements and energy efficiency. The laser used in the LaserGuard Mini system measures distances from 8 in. to 164 ft (0.2-50 m). The laser has a visible red light beam, which makes system alignment very easy. Two LEDs (balloon 1 and balloon 2) on the front and top of the laser indicate power and alignment. A steady green light indicates power to the laser. In the event of a laser short circuit, the green LED will flash at 4Hz. A yellow light indicates the target is acquired and reading a signal.



**Figure 1-1: Laser Optical Unit**

The system includes an adjustable mounting bracket and a reflective target. The reflective target is mounted on the wall or other crane that is going to be protected by the collision avoidance system.

The two laser distance set points are adjustable to trip the relays from approximately 8 in. to 164 ft (0.2-50 m). The first distance set point (typically a Slowdown point) signals for the crane to start decelerating. The second distance set point (typically a Stop point) will signal the crane to apply its brakes.

The relationship between these points are as follows:

$$164 \text{ ft (50 m)} \geq \text{Slowdown} > \text{Stop} \geq 8 \text{ in. (0.2 m)}$$

## 1.4 System Specifications

Specification	Laser Sensor	LaserGuard Mini Models	
		LGM-OPEN-x-x	LGM-4X
Operating Ambient Temperature	-20° to 122°F (-30° to 50°C)	-4° to 141°F (-20° to 60°C)	-4° to 122°F (-20° to 50°C)
Detection Range	8 in.-164 ft (0.2-50 m)	-	
Input Voltage	-	85-264VAC or 120-370VDC	
Accuracy	1 in. (25.4 mm)	-	
Hysteresis	Approx. 12 in. (0.3 m)	-	
Control Outputs	-	Two form C relays rated at 6A, 270VAC and 24VDC	
Laser Class	1	-	
Laser Wavelength	660 nm	-	
Ambient Light Limit	50000 Lux	-	
Enclosure (Standard)	Plastic IP65	Open Chassis	Fiberglass NEMA 4X
Dimensions H x W x D	3.5 x 1.0 x 2.2 in. (88 x 26 x 55 mm)	8.75 x 6.75 x 4.25 in. (222 x 171 x 108 mm)	10.5 x 8.5 x 6.25 in. (267 x 216 x 159 mm)
Weight	0.2 lb (0.09 kg)	2.0 lb (0.91 kg)	5.6 lb (2.54 kg)
Reflector Dimensions	-	2 x 2 ft (0.61 x 0.61 m)	
Laser Cable Length	-	32.8 ft (10 m), 82 ft (25 m), 131.2 ft (40 m), or 246 ft (75 m)	

## 1.5 Laser Support Unit Assemblies

ITEM	DESCRIPTION	QTY.
1	PERFORATED DIN RAIL, HIGH	1
2	WASHER, FLAT, #8, ZINC PLT	2
3	SCREW TAPPING 8-32 x 1/2	2
4	POWER SUPPLY, 24V, 1.25A	1 </td
5	RELAY, 115 VAC	2
6	TB, PUSH-IN, 32A GND	1
7	CLIP ON END-STOP	2

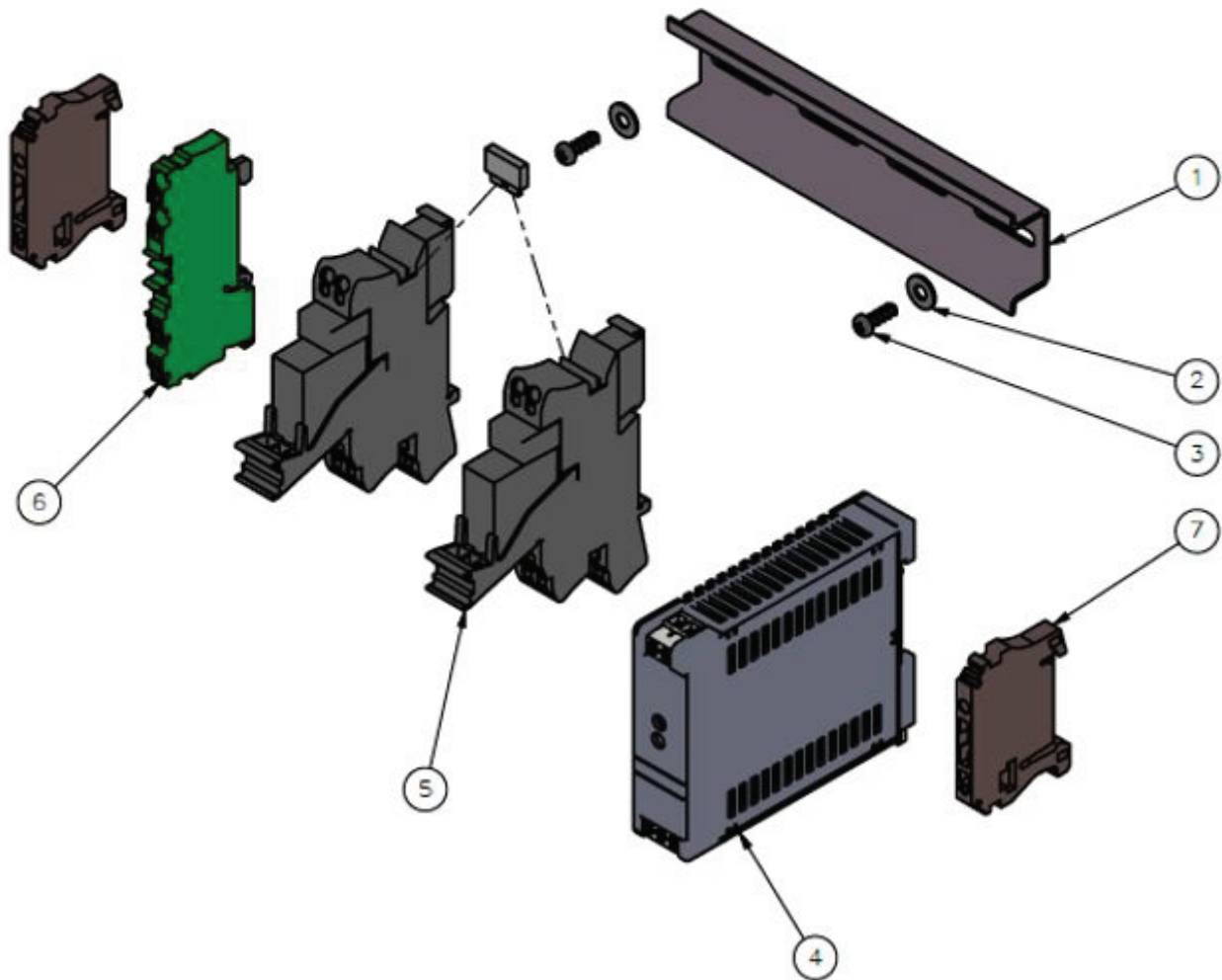
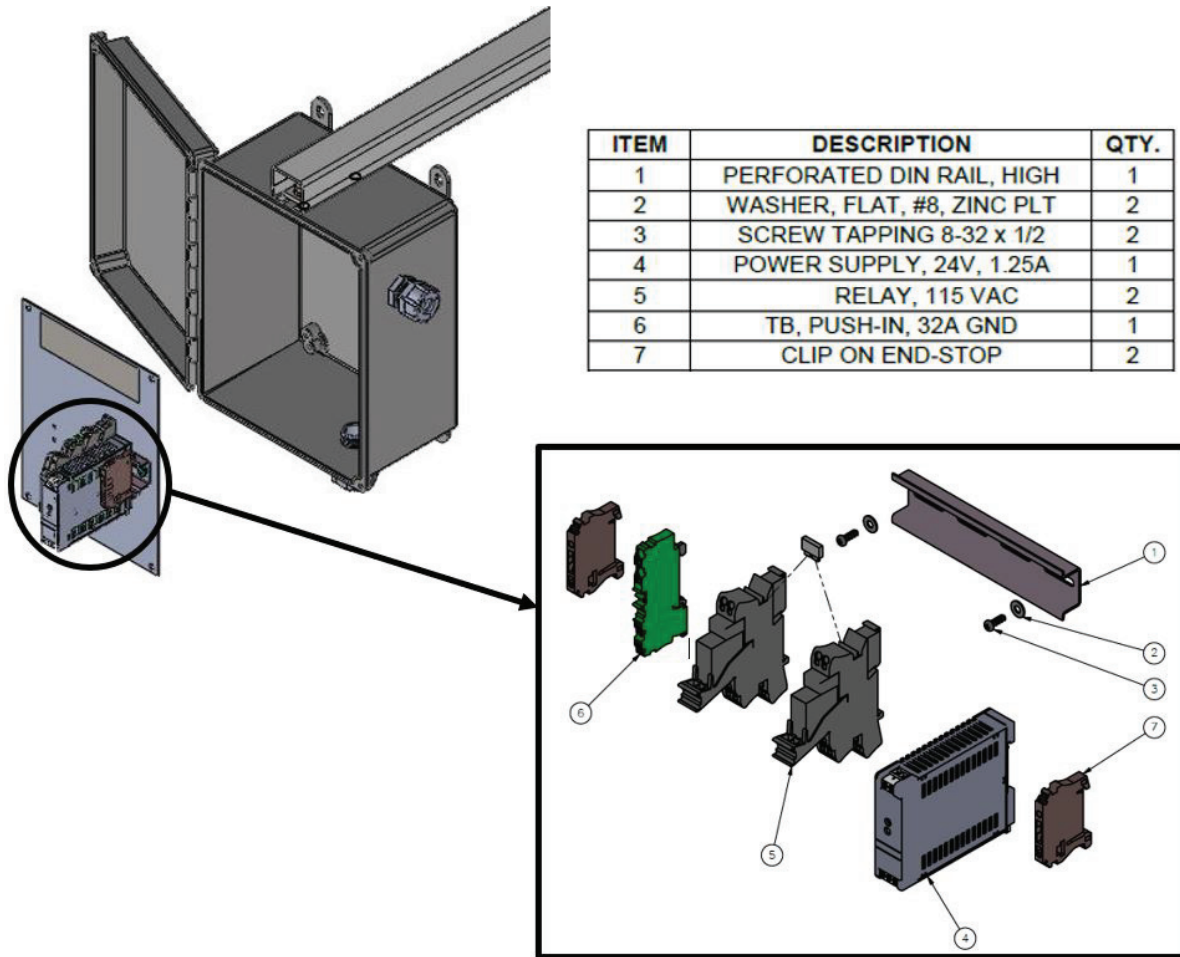


Figure 1-2: Laser Support Unit, When Integrated in Crane Controls





**Figure 1-3: Laser Support Unit Used When not Integrated on Crane Controls**

## 2 Electrical Installation

### 2.1 Voltage Considerations

Check the specification table or system drawings for proper line input voltage and supported relay voltages. If there are any questions, contact Magnetek before applying power to the system.



The unit must be wired to the correct voltage. Failure to do so may damage the system.

***NOTE:** The collision avoidance system should not be connected to lines containing excessive power-up transients or continuous commutator noise. A line conditioner may be necessary in some installations.*

### 2.2 Wiring Considerations

1. Do not connect or disconnect wiring or perform circuit checks while the power is turned on.
2. Keep power supply wiring in a metal conduit and separate from any motor wiring.
3. Keep control wiring in separate conduit and as short as possible.
4. Observe National Electric Code (NEC) when wiring electrical devices.
5. When cutting holes in the cabinet, take care to prevent metal filings from shorting the circuitry. Remove any metal screws, metal filings, and wire clippings from inside of the unit.
6. Inspect to make sure no exposed wire has contact with any other wiring or terminals.
7. If possible, use suppressors on all contactors.

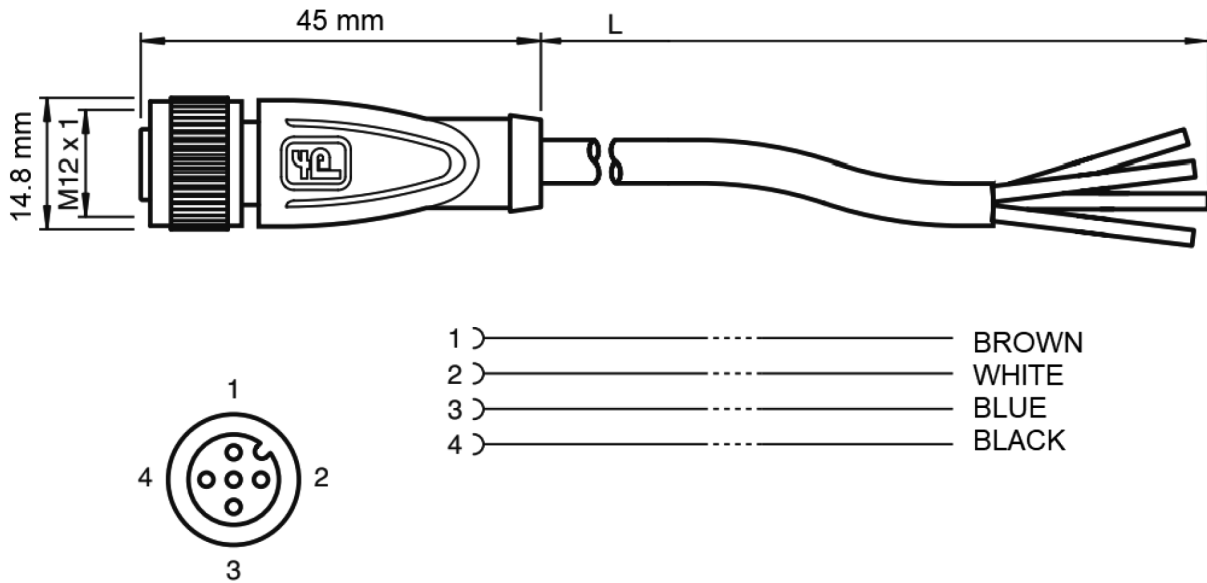
### 2.3 Wiring Instructions

1. Connect power to the power supply (85-264 VAC or 120-370 VDC) terminals “+” and “-.”
2. Wire both relays according to **Figure 2-1** and **Figure 2-2 on page 15**. The acceptable wire size is 24 to 14 AWG.

Please observe National Electrical Code (NEC) guidelines when wiring electrical devices.

3. Connect a ground wire to the dedicated ground terminal block.
4. Turn on the power and verify that the green LED on the laser sensor is on continuously after a few seconds. If that does not occur, turn the power off and recheck all wiring.

## 2.4 Laser Cable and Relay Wiring



Pin No.	Wire Color	Connection Point on Laser Support Unit
1	Brown	"+" Terminal of Power Supply
2	White	"A1+" Terminal of Relay 2
3	Blue	"-" Terminal of Power Supply
4	Black	"A1+" Terminal of Relay 1

Figure 2-1: Laser Cable Wiring Diagram

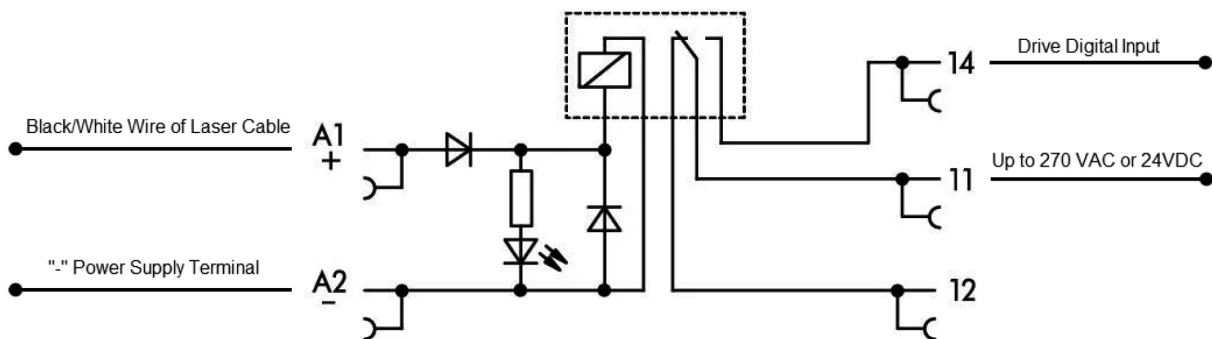
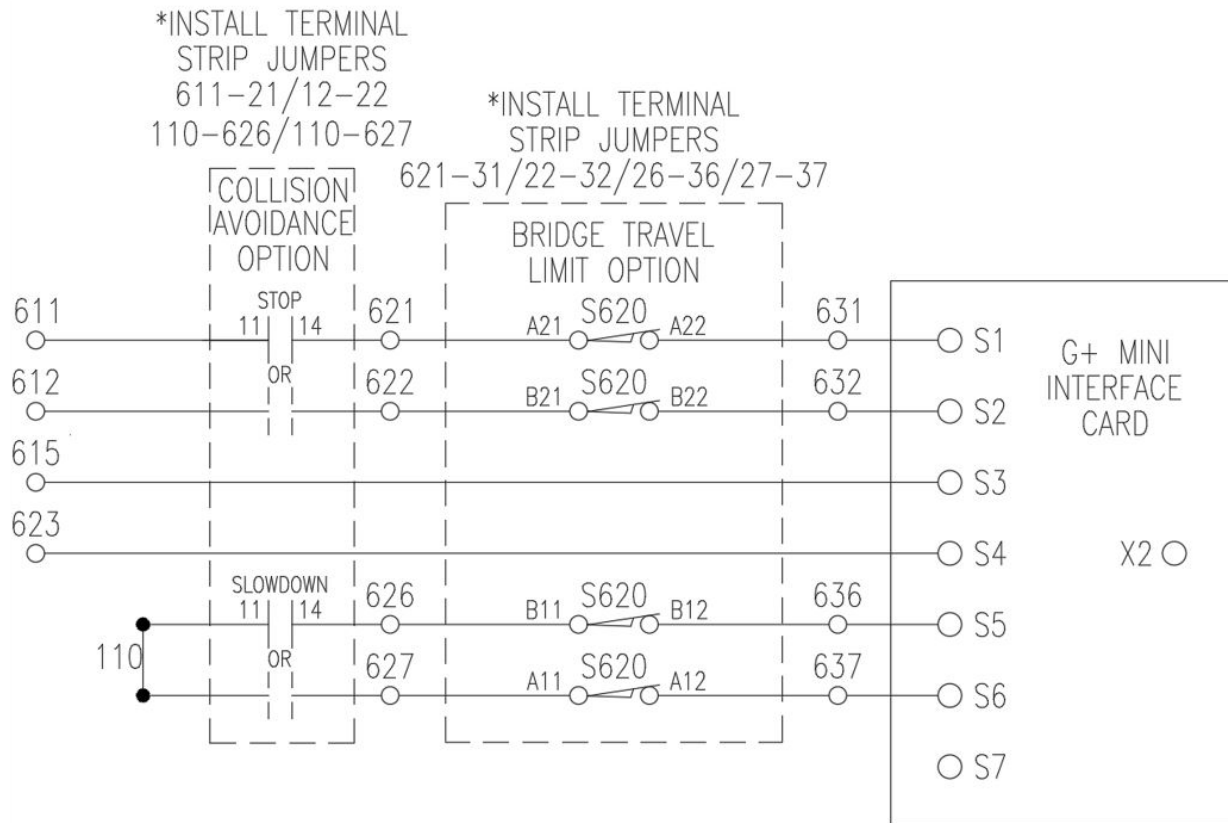


Figure 2-2: Relay Wiring Diagram

## 2.5 Wiring

The LaserGuard Mini is integrated inside the crane controls when ordered from the factory. In the case where an existing crane requires a collision avoidance system, field integration and wiring will be necessary. **See Section 2.5.2 on page 17.**

### 2.5.1 Crane to Crane Wiring When Integrated to Crane Controls at Factory



**Figure 2-3: Crane to Crane; Bridge Control Wiring from Factory**

## 2.5.2 Crane to Crane Wiring Example, Field Integration and Wiring Will Be Necessary

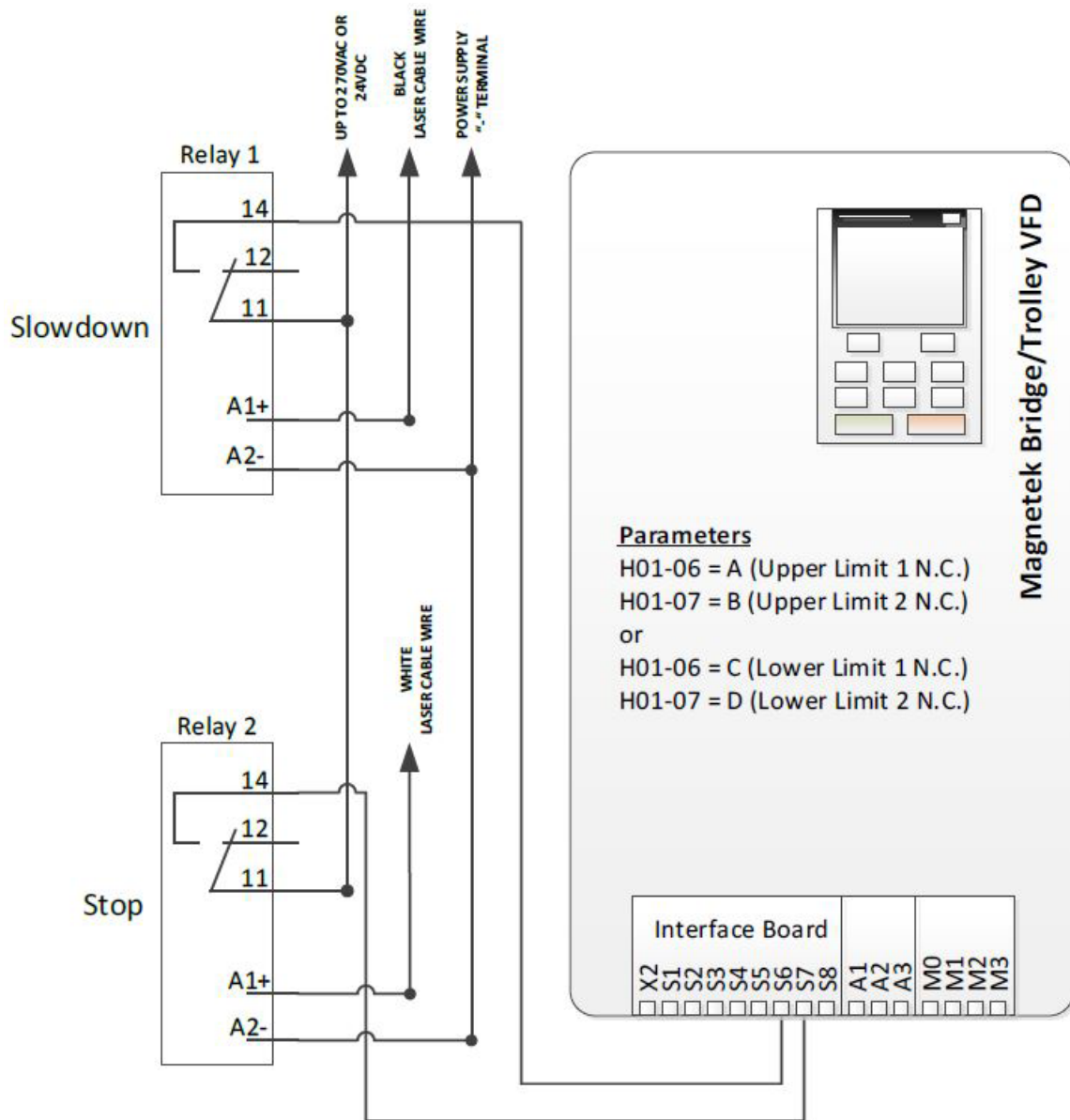


Figure 2-4: Crane to Crane; Bridge Controls Example Wiring

## 2.5.3 Trolley to Trolley Wiring When Integrated to Crane Controls at the Factory

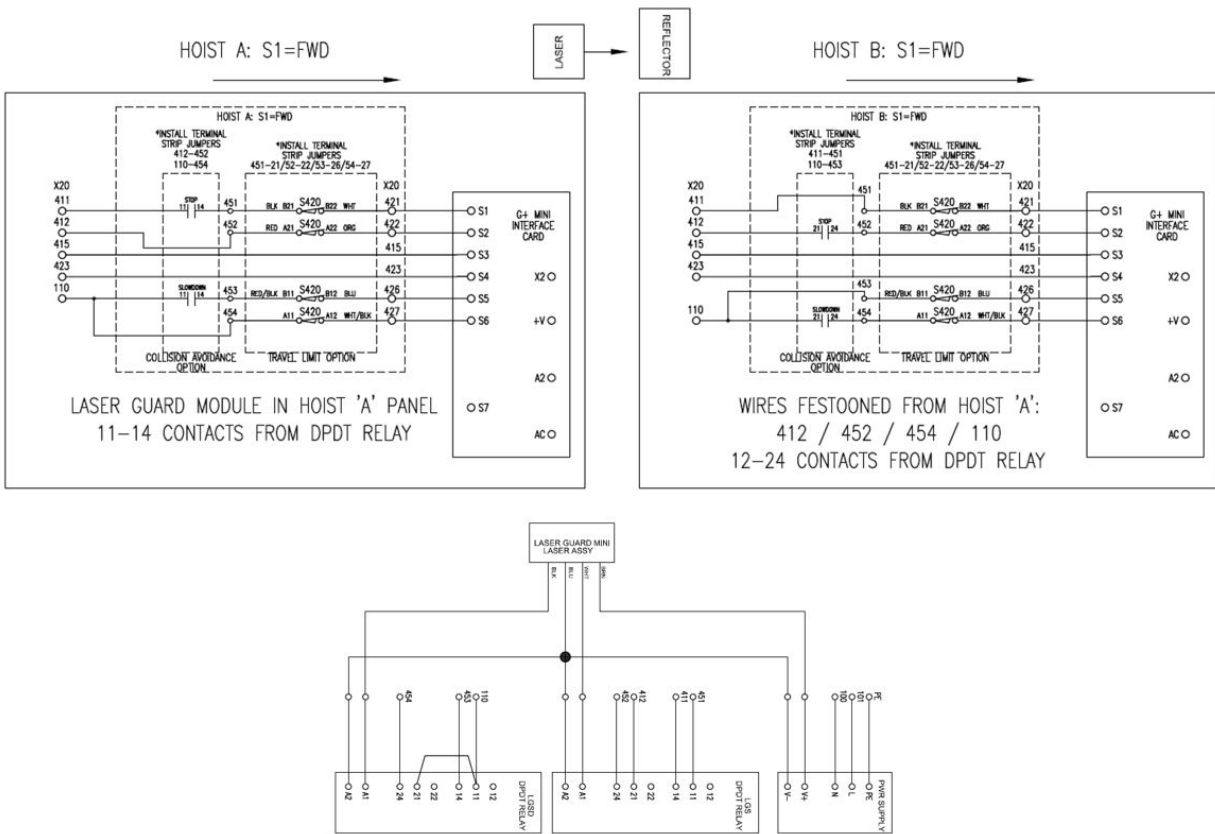


Figure 2-5: Trolley to Trolley; Tandem Hoist Control Wiring from Factory

### 3 Mechanical Installation

**CAUTION**

The LaserGuard Mini Systems are not rated as explosion-proof. Never install the unit in explosive environments unless taking appropriate secondary enclosure measures.

#### 3.1 Mounting Location Considerations

Ensure the mounting location is as far as possible from exposed trolley wires and sources of electromagnetic or radiated noise.

If possible, avoid installation on a surface where high vibration or shock exists. If avoiding high vibration or shock is not possible, use appropriate shock mounts.

#### 3.2 Laser Dimensions

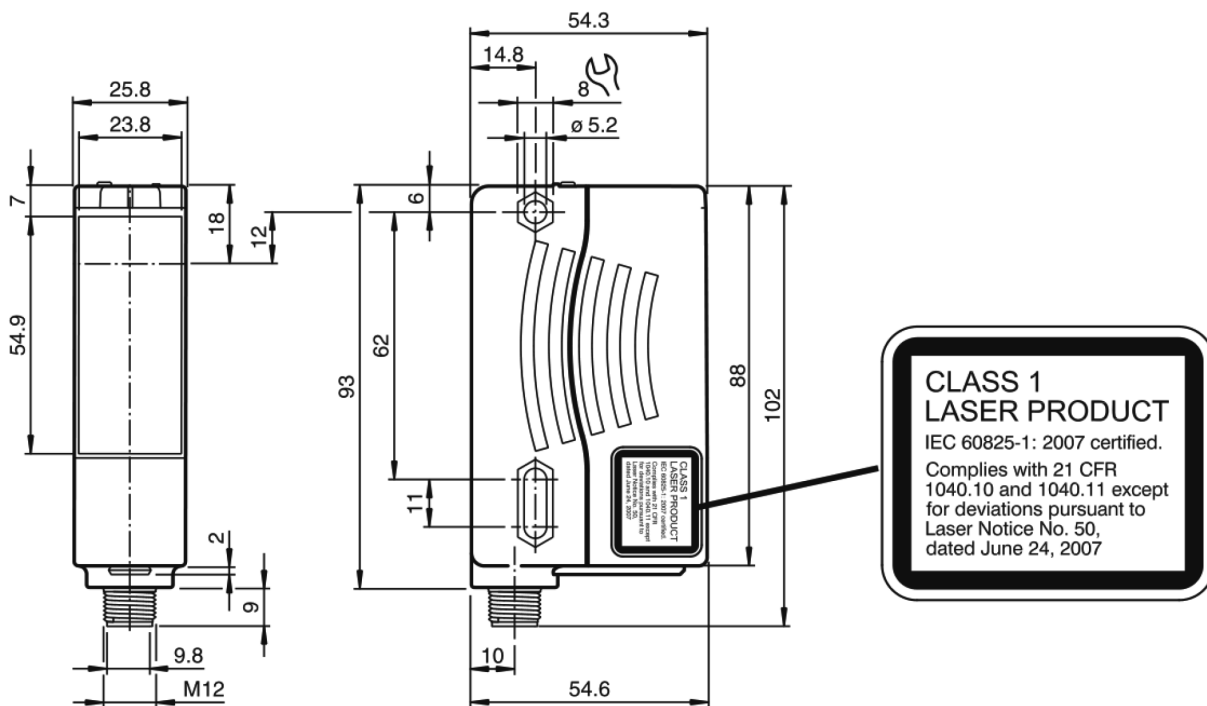


Figure 3-1: Laser Sensor (P/N: LGM-HEAD) Dimensions (mm)

### 3.3 Mechanical Installation and Alignment

The LaserGuard Mini Collision Avoidance System measures the distance between the laser sensor's lens and the reflective target surface.

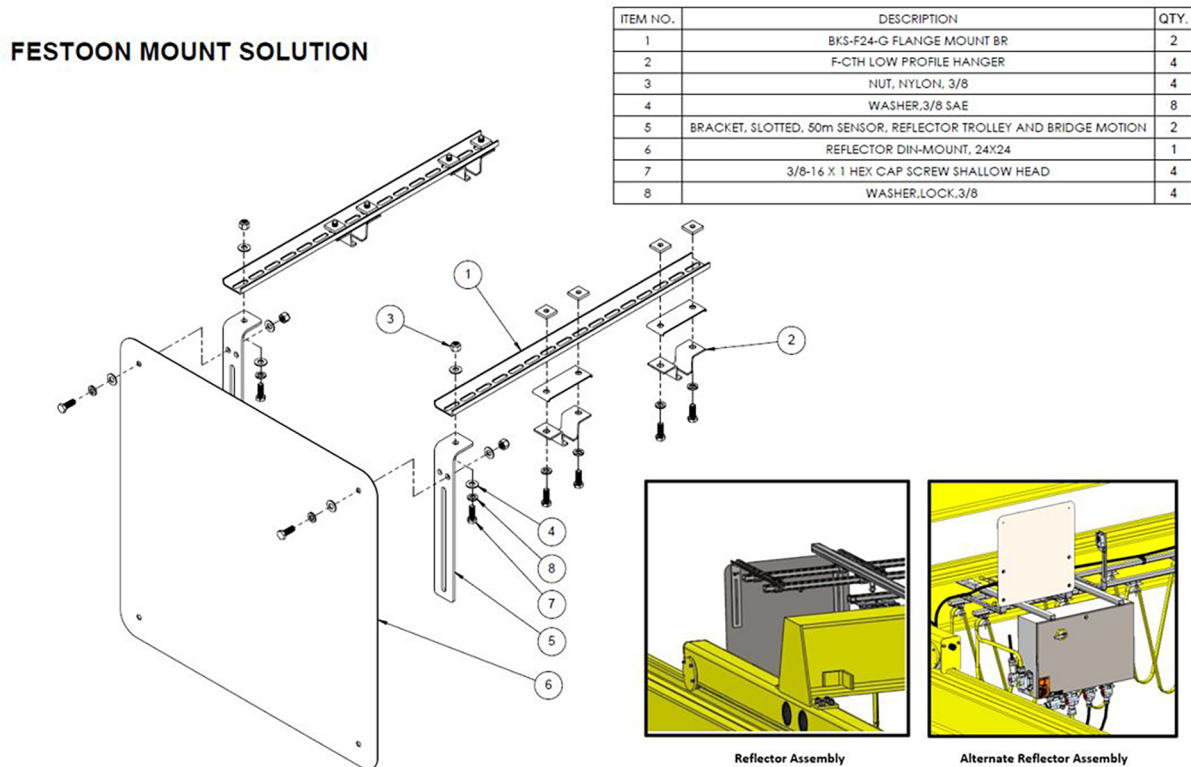
Make sure the laser is mounted so that no obstructions can come between the laser sensor and the reflective target.

Determine the mounting position for the laser and the reflective target so that the visual laser point is centered on the reflective target. Align the laser beam and reflector as perpendicular as possible. This alignment is the most important part of a successful installation since the laser beam must stay on the target for the entire range of 8 in.-164 ft (0.2-50 m).

Refer to the figures in this section for mounting information.

#### 3.3.1 Crane to Crane Collision Avoidance

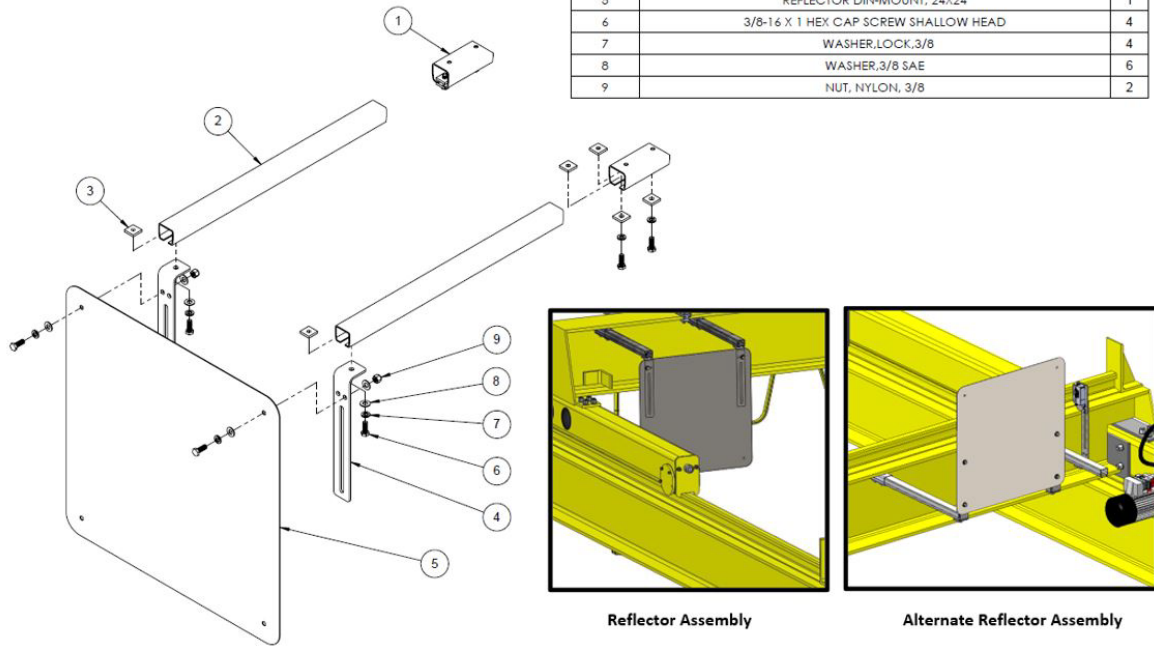
Use the factory-supplied brackets on the festoon side of the crane or on the non-festoon side, depending on your needs. See **Figure 3-2 on page 20** and **Figure 3-3 on page 21** for mounting arrangements.



**Figure 3-2: Reflector Mounting Festoon Side**



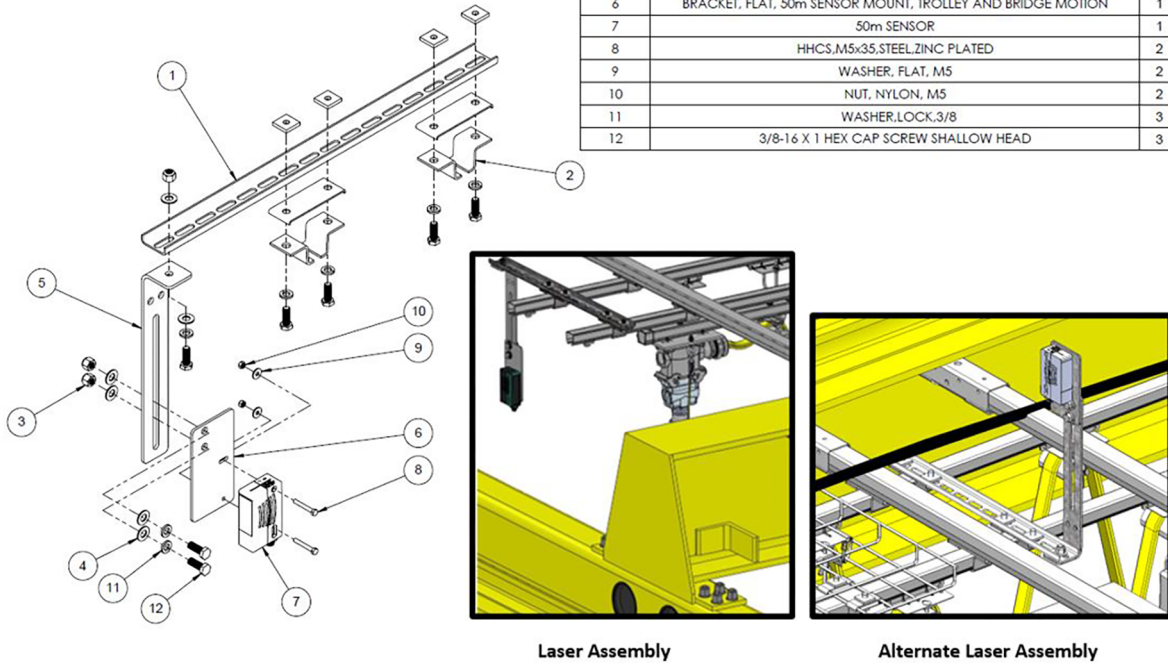
### WELD MOUNT TO BRIDGE SOLUTION



ITEM NO.	DESCRIPTION	QTY.
1	WELD CROSS ARM SOCKET	2
2	F-12CT C-TRACK 12GA	2
3	F-A005C SQ NUT TAPPED	2
4	BRACKET, SLOTTED, 50m SENSOR, REFLECTOR TROLLEY AND BRIDGE MOTION	2
5	REFLECTOR DIN-MOUNT, 24X24	1
6	3/8-16 X 1 HEX CAP SCREW SHALLOW HEAD	4
7	WASHER, LOCK, 3/8	4
8	WASHER, 3/8 SAE	6
9	NUT, NYLON, 3/8	2

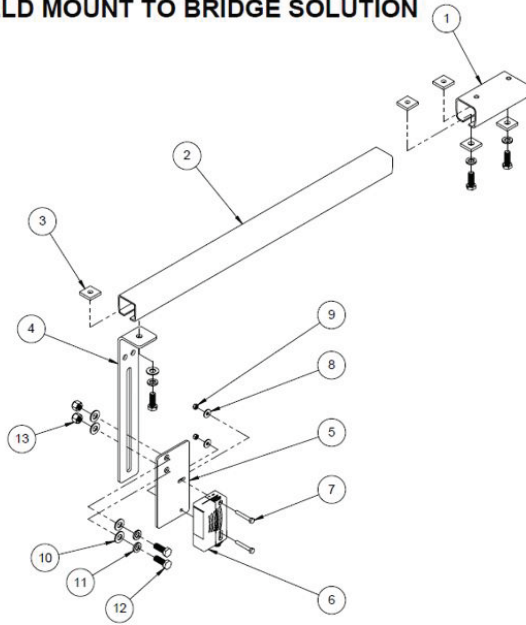
**Figure 3-3: Reflector Mounting Non-Festoon Side**

ITEM NO.	DESCRIPTION	QTY.
1	BKS-F24-G FLANGE MOUNT BR	1
2	F-CTH LOW PROFILE HANGER	2
3	NUT, NYLON, 3/8	3
4	WASHER, 3/8 SAE	6
5	BRACKET, SLOTTED, 50m SENSOR, REFLECTOR TROLLEY AND BRIDGE MOTION	1
6	BRACKET, FLAT, 50m SENSOR MOUNT, TROLLEY AND BRIDGE MOTION	1
7	50m SENSOR	1
8	HHCS, M5x35, STEEL, ZINC PLATED	2
9	WASHER, FLAT, M5	2
10	NUT, NYLON, M5	2
11	WASHER, LOCK, 3/8	3
12	3/8-16 X 1 HEX CAP SCREW SHALLOW HEAD	3

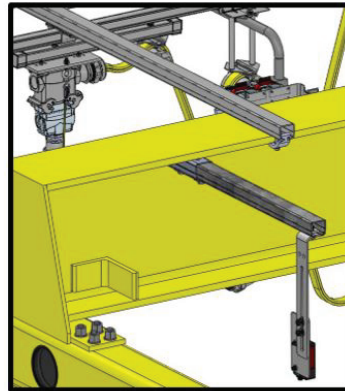


**Figure 3-4: Laser Mounting Festoon Side**

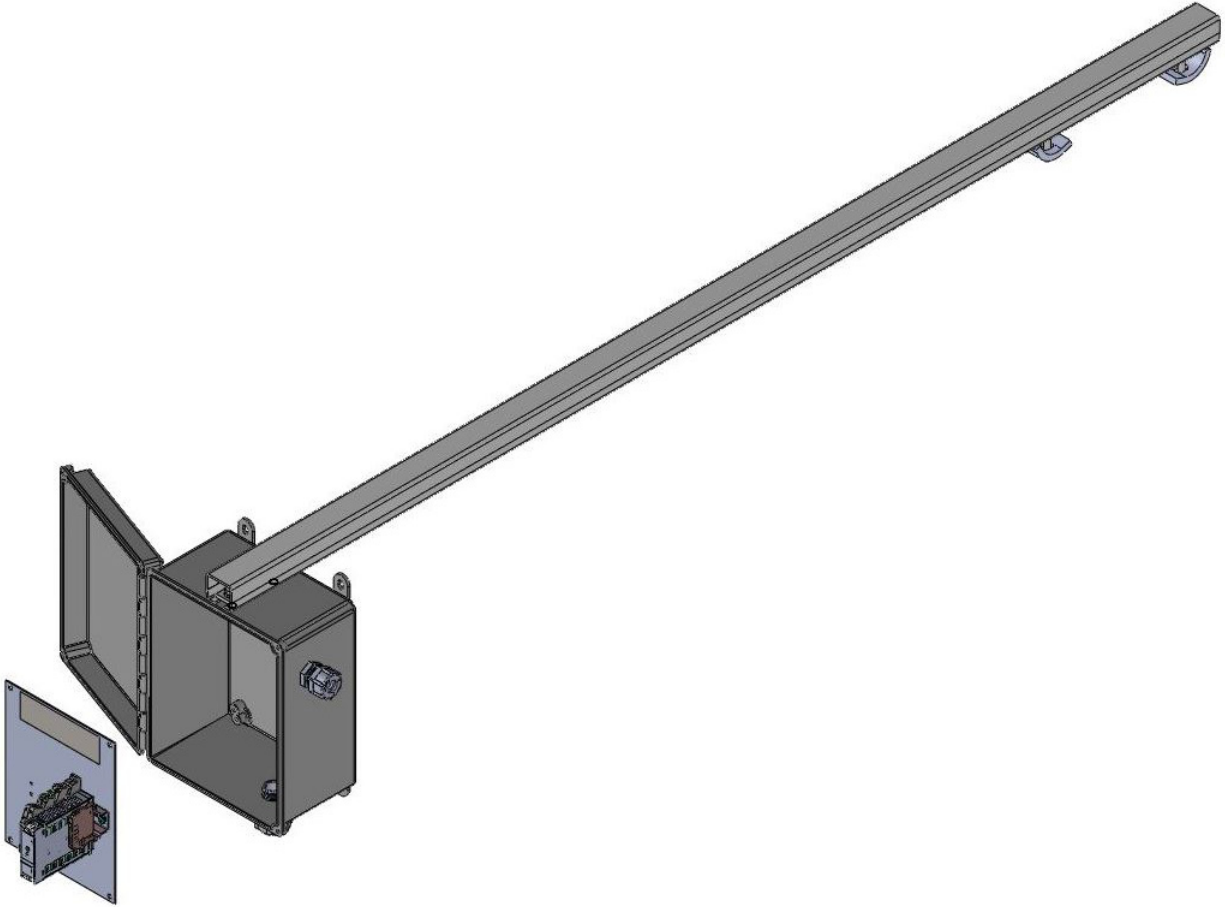
### WELD MOUNT TO BRIDGE SOLUTION



ITEM NO.	DESCRIPTION	QTY.
1	WELD CROSS ARM SOCKET	1
2	F-12CT C-TRACK 12GA	1
3	F-A005C SQ NUT TAPPED	1
4	BRACKET, SLOTTED, 50m SENSOR, REFLECTOR TROLLEY AND BRIDGE MOTION	1
5	BRACKET, FLAT, 50m SENSOR MOUNT, TROLLEY AND BRIDGE MOTION	1
6	50m SENSOR	1
7	HHCS,M5x35,STEEL,ZINC PLATED	2
8	WASHER, FLAT, M5	2
9	NUT, NYLON, M5	2
10	WASHER,3/8 SAE	5
11	WASHER,LOCK,3/8	3
12	3/8-16 X 1 HEX CAP SCREW SHALLOW HEAD	3
13	NUT, NYLON, 3/8	2



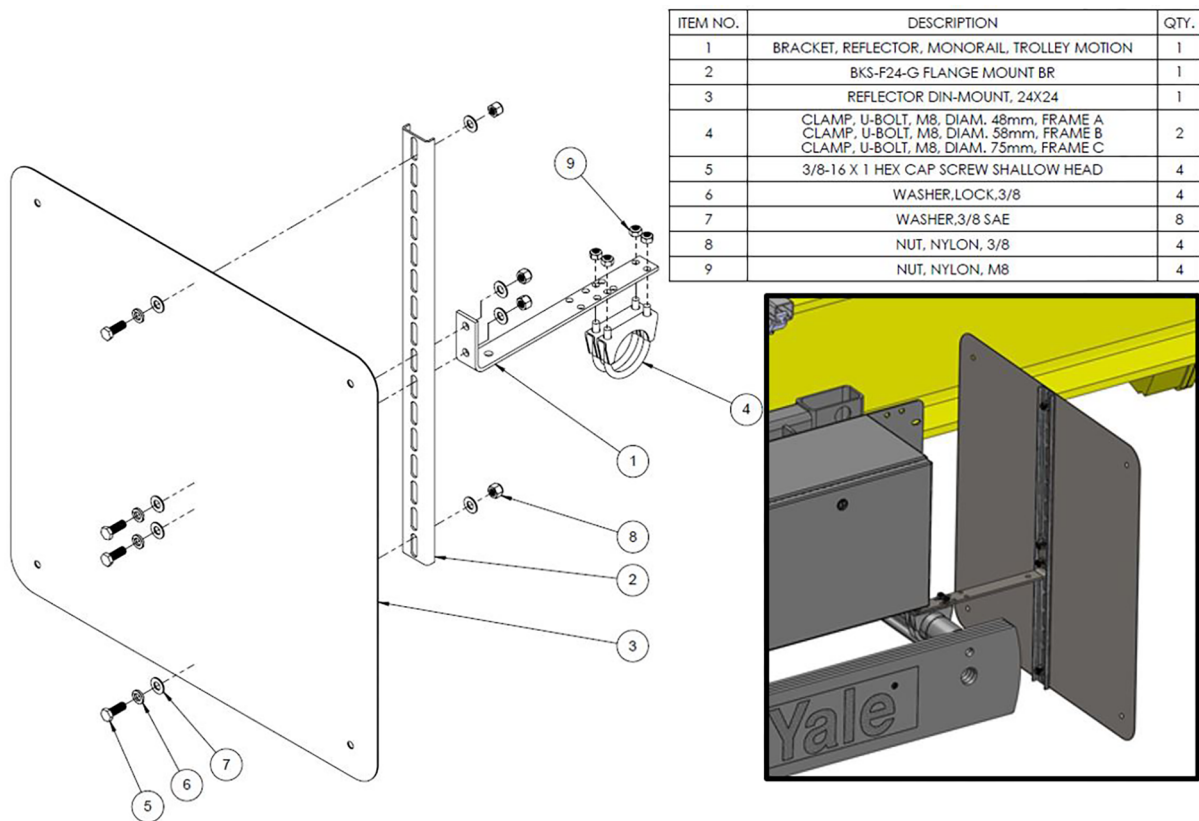
**Figure 3-5: Laser Mounting Non-Festoon Side**



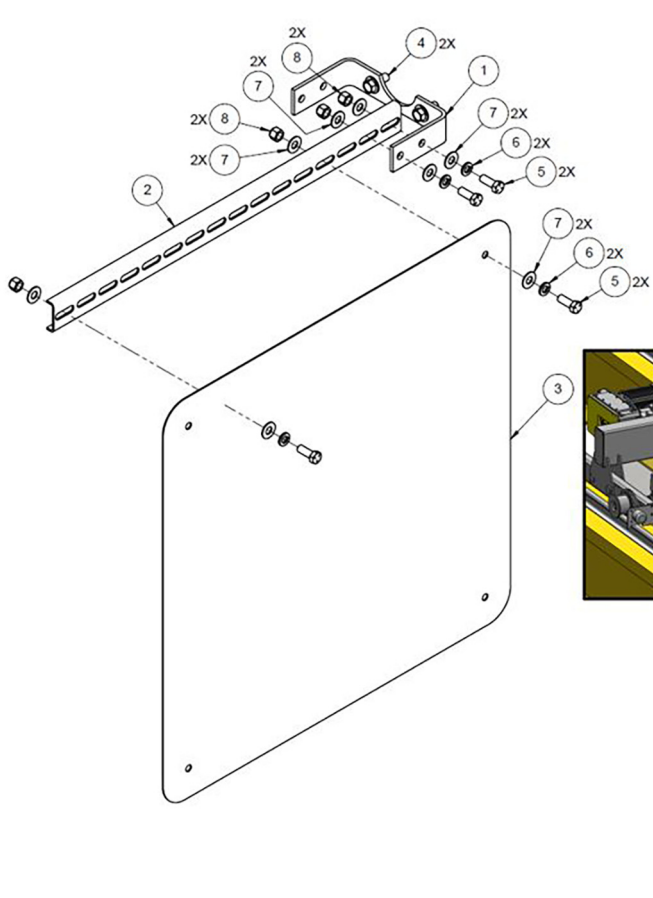
**Figure 3-6: Laser Support Unit Mounting**

### 3.3.2 Trolley to Trolley Collision Avoidance

Tandem hoist cranes where both trolleys share the same girder will only require one of the trolleys to carry the laser and the other to carry the reflector. The communication between each trolley will occur either through the festoons and bridge controls when trolley drives are separated (most single girder cranes), or directly in the cases where both trolley drives are designed in the same panel. The mechanical mounting of the reflector and lasers depends on the hoist frame size. See **Figure 3-7 on page 25** through **Figure 3-11 on page 29** for mounting arrangements.

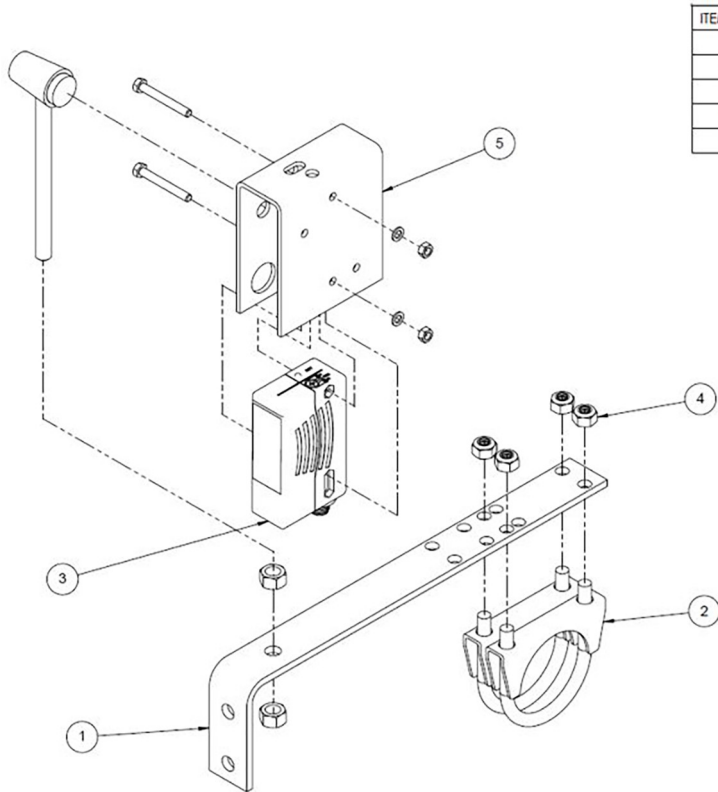


**Figure 3-7: Single Girder Hoist Reflector Mounting**

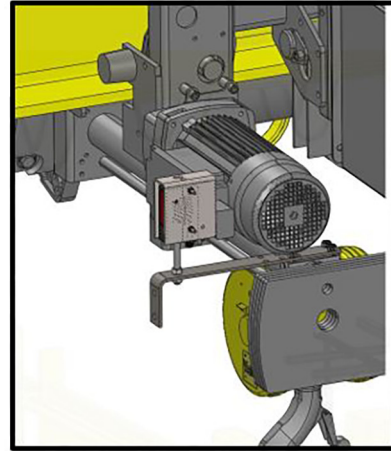


ITEM NO.	DESCRIPTION	QTY.
1	FLAT BRACKET, FRAME A, B, TOP RUNNER U BRACKET, FRAME C, D, TOP RUNNER L BRACKET, FRAME E, TOP RUNNER	1
2	BKS-F24-G FLANGE MOUNT BR	1
3	REFLECTOR DIN-MOUNT, 24X24	1
4	M10 x 1.5 x 25 SERRATED-FLANGE HEX HEAD SCREW	2
5	3/8-16 X 1 HEX CAP SCREW SHALLOW HEAD	4
6	WASHER, LOCK, 3/8	4
7	WASHER, 3/8 SAE	8
8	NUT, NYLON, 3/8	4

**Figure 3-8: Double Girder Hoist Reflector Mounting**

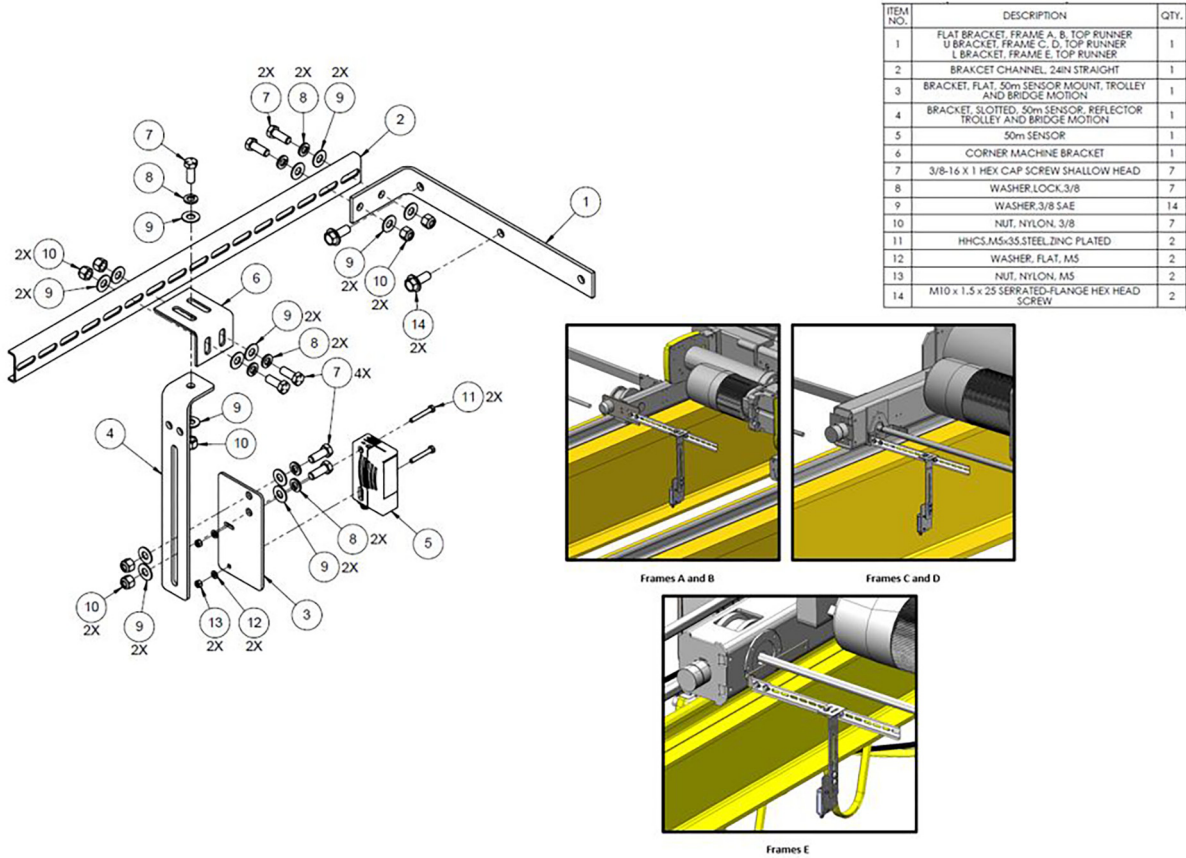


ITEM NO.	DESCRIPTION	QTY.
1	BRACKET, REFLECTOR, MONORAIL, TROLLEY MOTION	1
2	CLAMP, UBOLT, M8, D58	2
3	50m SENSOR	1
4	NUT, NYLON, M8	4
5	SENSOR MOUNTING BRACKET	1



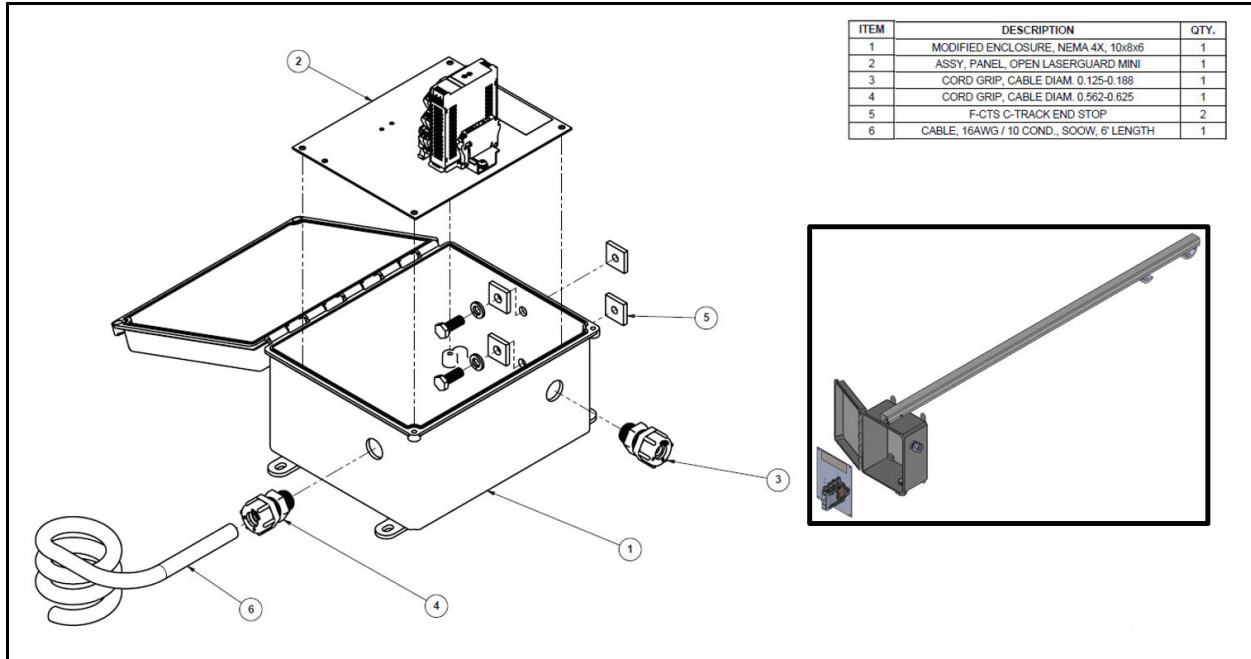
**Figure 3-9: Single Girder Hoist Laser Mounting**





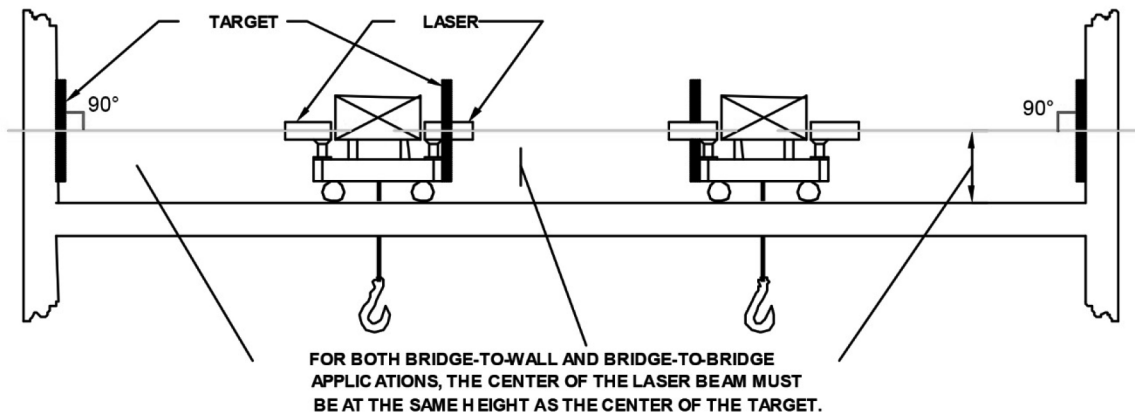
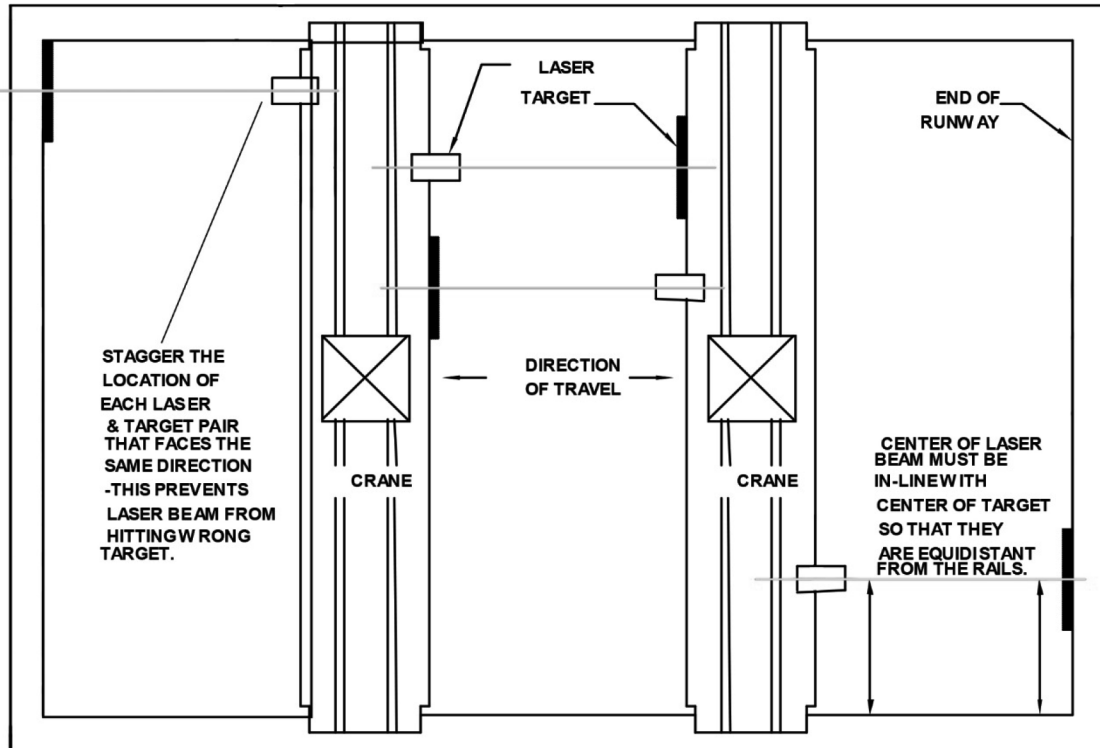
**Figure 3-10: Double Girder Hoist Laser Mounting**





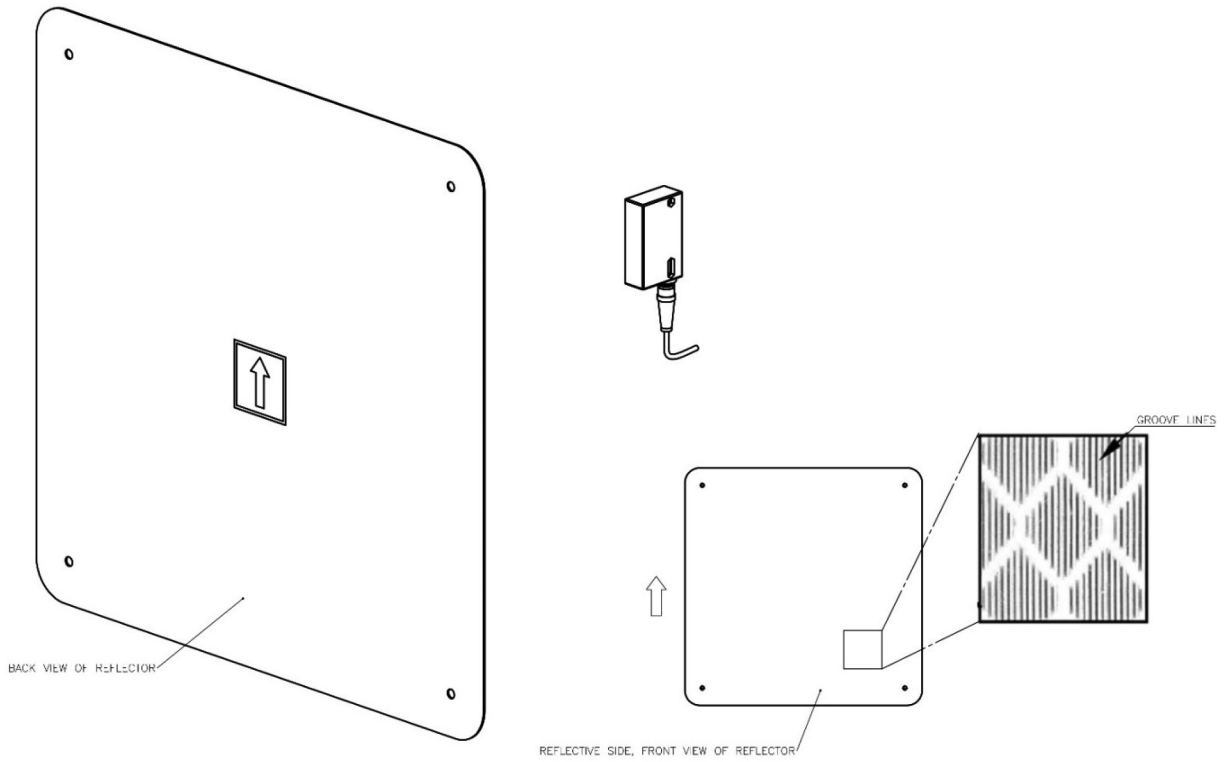
**Figure 3-11: Crane to Crane Enclosure Mounting When not Integrated**

Install the sensor laser and reflective target as shown in **Figure 3-12 on page 30** and **Figure 3-13 on page 31**. Mount the laser sensor securely to a solid surface to minimize vibration so that the crane's load or movement will not affect the laser's alignment. Also mount the laser and laser support unit as close to the control panel as possible to minimize long cable runs.

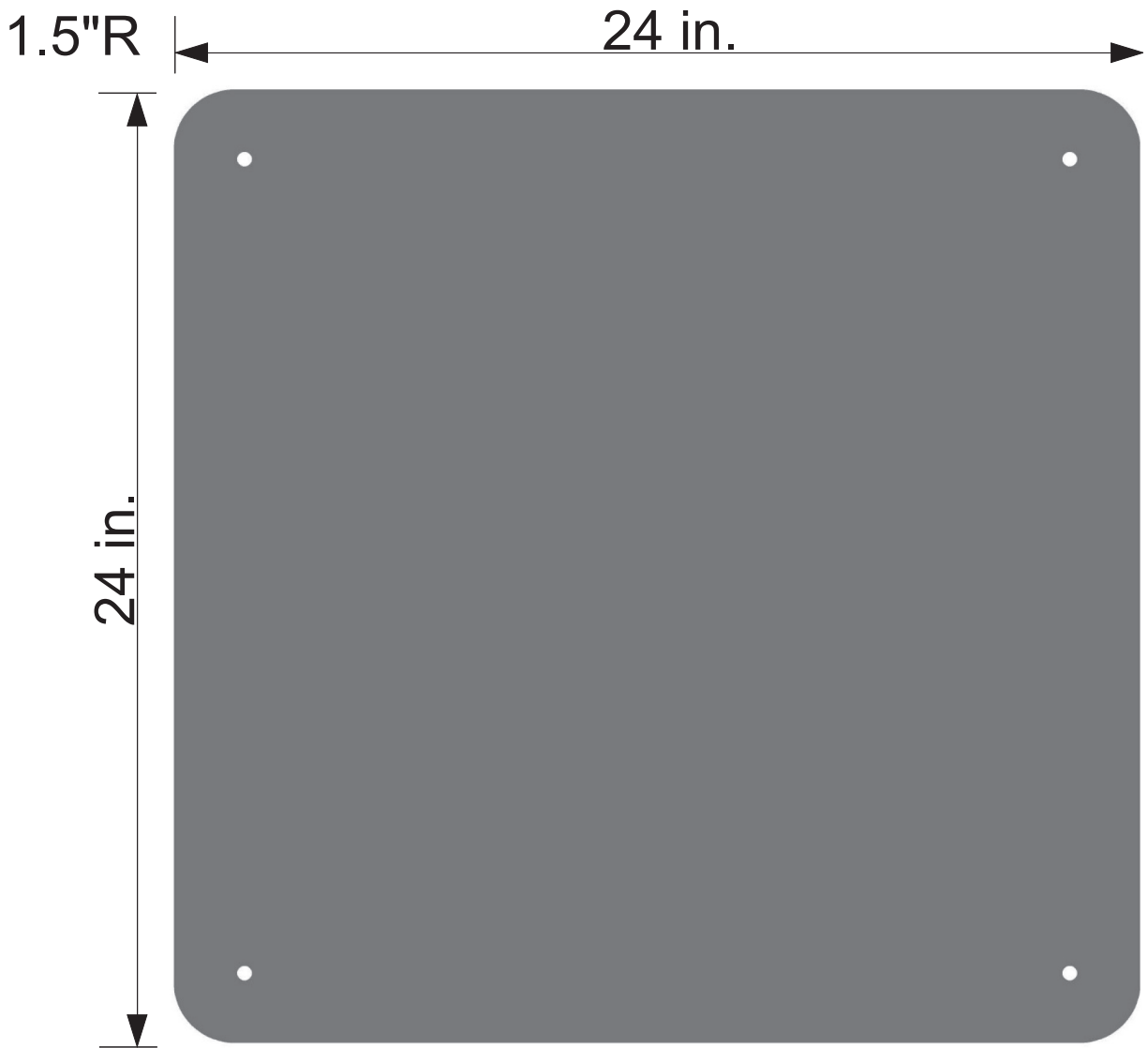


**Figure 3-12: Laser and Target Installation**

For the best reflectivity/laser signal, mount the reflector in the same orientation as the laser so the laser beam is perpendicular to the reflective target. The arrow on the back of the reflector should be the same direction as the laser. **See Figure 3-13 on page 31.**



**Figure 3-13: Laser and Reflective Target Orientation**



24" Square 0.063 - 0.08 gauge, 1.5" Rad  
w/ (4) 3/8" holes 1.75" in on corners

**Figure 3-14: Reflector Target Dimensions (P/N: REFLX-REFLECTOR-DIN)**

### 3.4 Electrical Conduit Installation

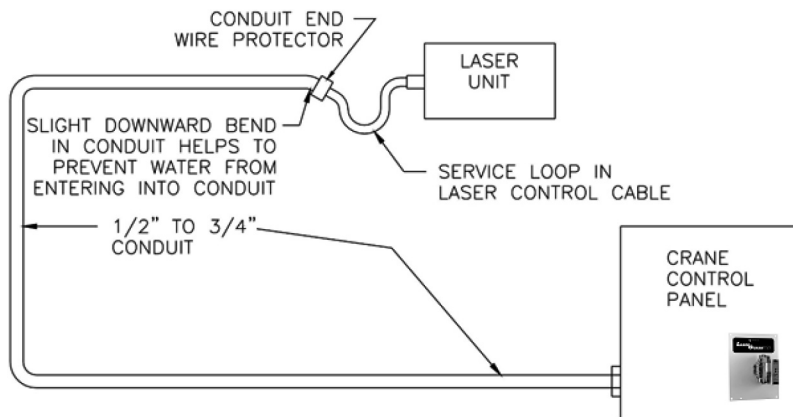
The laser sensor cable and all other wiring should be run in separate 1/2 in. or 3/4 in. conduit. Do not run any other cables in the same conduit as the laser sensor cable.

The installer should provide a suitable disconnect to allow a controlled power-down.

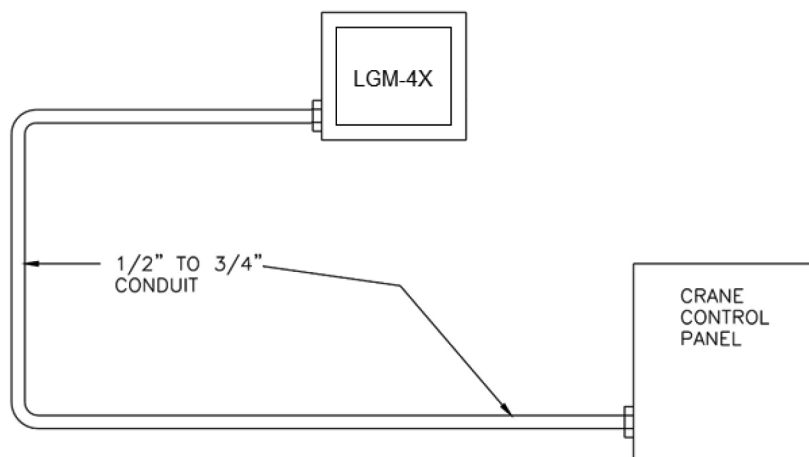
Run conduit between the laser sensor and the crane's control panel. Putting a slight downward bend in the conduit at the laser transceiver will help keep dirt and water out. Place a protective end piece on the open end of the conduit to protect the laser cable from sharp edges.

Locate the supplied laser cable by the end that does not have a connector on it. Pull the cable through the conduit, starting from the opened laser sensor end. Leave enough cable on the laser end so that it is twice as long as the distance between the end of the conduit and the laser unit (about 2 ft to 3 ft [0.6 m to 0.9 m]). This will produce a service loop, which will also help keep dirt and water out of the open end of the conduit. **See Figure 3-15 and Figure 3-16 on page 33.**

This laser cable consists of four wires. **See Figure 2-1 on page 15** for wiring information for this cable. Plug the connector into the laser sensor. The connector is keyed; do not force it.



**Figure 3-15: Conduit Installation (Open Chassis Models)**



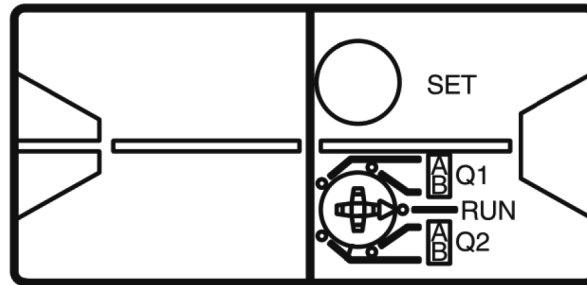
**Figure 3-16: Conduit Installation (NEMA 4X Model)**

## 4 Functional Installation

### 4.1 Laser Distance Set-Point Adjustment

The laser distance set points are defaulted at:

1. Set Point 1 (Slowdown): 4 ft (1219 mm)
2. Set Point 2 (Stop): 2 ft (609 mm)



**Figure 4-1: Laser Sensor Button and Switch Layout**

**NOTE:** Setting the detection points will require movement of the crane to the desired distances.

To set (teach-in) new laser distance set points:

1. Move the crane to the desired **slowdown** point.
2. Set the rotary switch to **Q1 A**.
3. Press and hold the SET button on the laser sensor for 1-2 seconds. When the yellow and green LEDs turn on, release the SET button to set the distance. Verify that the LEDs alternatively blink at 2.5 Hz. This blinking indicates that the teach-in was successful.
4. Move the crane to the desired **stop** point.
5. Set the rotary switch to **Q2 A**.
6. Press and hold the SET button on the laser sensor for 1-2 seconds. When the yellow and green LEDs turn on, release the SET button to set the distance. Verify that the LEDs alternatively blink at 2.5 Hz. This blinking indicates that the teach-in was successful.
7. Return the rotary switch to the **RUN** position.
8. Move the crane away from the target and then back again to verify that the relays are triggered at the correct distances.

## 4.2 Troubleshooting

LED	Color	Function
Laser Head Operating Display	Green	Monitors voltage to the laser head Normally ON
Laser Head Signal	Yellow	Monitors target acquisition. Normally ON when target is acquired. It turns off when the laser is off the target, out of range, or has a dirty lens. Random or rapid flashing of this LED could indicate a weak signal caused by too much of a reflector angle. Make sure the reflector is not bent, and that its orientation is per <b>Figure 3-13 on page 31</b> . Groove lines visible on the reflective material should be in the same direction as the laser sensor orientation.
Laser Distance Teach-In Not Successful	Green & Yellow	The yellow and green signal LEDs flash quickly in alternation (8 Hz). After an unsuccessful teach-in, the sensor continues to operate with the previous valid setting after the relevant visual fault signal is issued.

**Table 1: Laser Diagnostic LED Functions**

**NOTE:** See **Figure 1-1 on page 10** for LED locations.

Yale® YK/Shaw-Box® SK LaserGuard Mini Technical Manual  
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