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FEDERAL SIGNAL CORPORATION
Emergency Products

INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR RAYDIAN® LED LIGHTBAR

SAFETY MESSAGE TO INSTALLERS AND USERS

⚠WARNING

People's lives depend on your safe installation of our products. It is important to read, understand and follow all instructions shipped with the products. In addition, listed below are some other important safety instructions and precautions you should follow:

- **To properly install lightbar, you must have a good understanding of automotive systems, along with proficiency in the installation and use of safety warning equipment.**
- **DO NOT install equipment or route wiring in the deployment path of an air bag.**
- **This product contains high intensity LED devices. To prevent permanent eye damage, DO NOT stare into the light beam at close range.**
- **A light system is a high current device. In order for it to function properly, a separate ground connection must be made. If practical, it should be connected to the negative battery terminal. At a minimum, it may be attached to a solid metal body or chassis part that will provide an effective ground path as long as the light system is used.**
- **When drilling into a vehicle structure, be sure that both sides of the surface are clear of anything that could be damaged.**
- **Locate the light system controls so the VEHICLE and CONTROLS can be operated safely under all driving conditions.**
- **The mounting system should be periodically inspected to ensure that it is securely attached to the vehicle.**
- **File these instructions in a safe place and refer to them when maintaining and/or reinstalling the product.**

Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death to you or others.

I. GENERAL.

⚠WARNING

HEAVY OBJECT

Get assistance when lifting or installing. Failure to do so will cause permanent bodily injury.

The Raydian is a LED light bar, with supplemental white halogen area lighting, designed for use with Federal Signal lightbar controllers and/or single switches rated at 2-amperes and above. The base is a two piece extruded aluminum profile with polycarbonate lenses and end domes. The unit is supplied with mounting hardware and an eighteen-foot cable and has an operating temperature of -40°C to +65°C.

II. UNPACKING.

After unpacking the Raydian light assembly, inspect it for damage that may have occurred in transit. If the unit has been damaged, do not attempt to install or operate it. File a claim immediately with the carrier, stating the extent of damage. Carefully check all envelopes, shipping labels, and tags before removing or destroying them.

III. INSTALLATION.

A. *General.*

Before proceeding, ensure that the lightbar has been installed on the vehicle roof in accordance with the instructions packed with the mounting kit. The lightbar is completely wired at the factory and does not require any additional internal wiring. All the conductors necessary for control of any and all basic and optional functions are contained in the cable. The basic light functions of the unit must be controlled by a user-supplied control head.

⚠WARNING

Light system controls must be located so that the VEHICLE and CONTROLS can be operated safely under all driving conditions.

1. Route the control cable into the vehicle and near the eventual location of the user-supplied control head. Route the Power cable into the vehicle and to the battery.

2. For proper light operation, the control cable must be properly terminated inside the user-supplied control head. Using figure 1 and table 1 as a guide, make the appropriate electrical connections. Ensure that the lines are adequately fused as shown and that the switch capacity is adequate for the current requirement.

⚠CAUTION

Reverse polarity may damage any power supply and prevent operation. Ensure that the correct polarity is observed. The positive (+) power lead must be fused at the source for 40 amps.

3. Connect the separate 10 gauge black lead to the vehicle battery ground terminal (-) and the separate 10 gauge red lead to the vehicle battery hot terminal (+).

NOTE

All the lightbar functions can be activated by applying 12VDC to the appropriate control line. The 10 gauge black and red power leads must be connected to their respective battery terminals for a function check.

B. *Function Activation – Excluding SignalMaster™.*

NOTE

Refer to table 1 and figure 1 for proper connections.

NOTE

Powering multiple devices with a common control lead may cause one or more units to briefly remain functional after signal power is removed. For example, due to the high input filter capacitance, a strobe supply can briefly supply the current required to operate a low current device such as a Cuda TriOptic™. If necessary, use a relay to isolate devices with large filter capacitors. See figure 2 for the schematic; all components/wires are user-supplied.

1. Mode Inputs.

There are three prioritized mode of operation available with mode three being the highest priority. Mode 3 (WHT/RED) will override Mode 2 (RED) and Mode 2 will override Mode 1 WHT/ORN). One of the available flash patterns can be programmed to each mode input. Default configuration is Mode 3 Random Flash, Mode 2 Quad Flash and Mode 1 595 Flash. Programming will be covered later in this section. To activate a mode, apply 12VDC to a mode input wire. 12VDC must also be applied to the front cutoff wire (BLK/PNK) for the front of the bar to operate. See figure 1 for proper fusing.

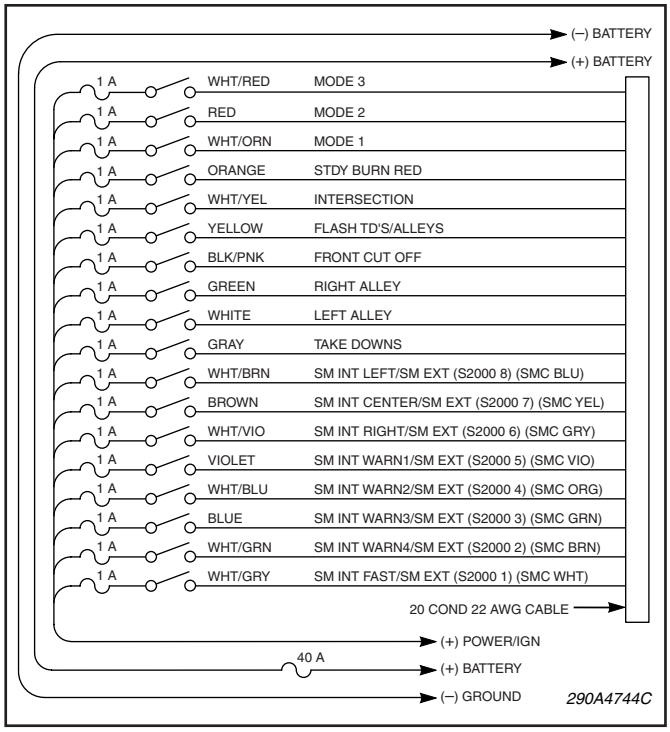

Figure 1.

Table 1

C0NROL CABLE	MAIN FUNCTIONS	SM INTERNAL	SS2000SM*	330132/330102*	331112/331102*
WHT/RED	MODE 3	MODE 3	MODE 3	MODE 3	MODE 3
RED	MODE 2	MODE 2	MODE 2	MODE 2	MODE 2
WHT/ORG	MODE 1	MODE 1	MODE 1	MODE 1	MODE 1
ORG	STEADY RED	STEADY RED	STEADY RED	STEADY RED	STEADY RED
WHT/YEL	INTERSECTION	INTERSECTION	INTERSECTION	INTERSECTION	INTERSECTION
YEL	FLASH A&TD	FLASH A & TD	FLASH A & TD	FLASH A & TD	FLASH A & TD
BLK/PNK	F_ CUT OFF	F_ CUT OFF	F_ CUT OFF	F_ CUT OFF	F_ CUT OFF
BLK	N/C	N/C	N/C	N/C	N/C
WHT/BLK	PROGRAM	PROGRAM	PROGRAM	PROGRAM	PROGRAM
GRN	RIGHT ALLEY	RIGHT ALLEY	RIGHT ALLEY	RIGHT ALLEY	RIGHT ALLEY
WHT	LEFT ALLEY	LEFT ALLEY	LEFT ALLEY	LEFT ALLEY	LEFT ALLEY
GRY	TAKEDOWNS	TAKEDOWNS	TAKEDOWNS	TAKEDOWNS	TAKEDOWNS
WHT/BRN	N/C	LEFT	(8)	BLU	BLU
BRN	N/C	CENTER	(7)	YEL	YEL
WHT/VIO	N/C	RIGHT	(6)	GRY	GRY
VIO	N/C	WARN 1	(5)	VIO	VIO
WHT/BLU	N/C	WARN 2	(4)	ORG	ORG
BLU	N/C	WARN 3	(3)	GRN	GRN
WHT/GRN	N/C	WARN 4	(2)	BRN	BRN
WHT/GRY	N/C	SPEED	(1)	WHT	WHT

* 42” Raydian with 7-head SignalMaster - Use SS2000SM set to 6-head, 330132, or 331112.
54” Raydian with 8-head SignalMaster - Use SS2000SM set to 8-head, 330102, or 331102.

2. Steady Burn Red.

When the Raydian is equipped with a Steady Burn Red led module, applying 12VDC to the Orange wire will cause that module to operate when any mode input is selected.

3. Intersection Mode.

When 12VDC is applied to the WHT/YEL wire, it will cause the flash rate of the selected mode input to double. When 12VDC is removed, the flash rate will return to normal. See paragraph III.B.10 Additional Programming for alternative configurations of this feature.

4. Flash Alley's and Takedowns.

Applying 12VDC to the Flash Alley' & Takedowns (YEL) wire will cause the halogen Alley and Takedown lights to flash when a mode input is selected. See paragraph III.B.10 Additional Programming for alternative configurations of this feature.

5. Front Cut Off.

Applying 12VDC to the Front Cut Off (BLK/PNK) wire will cause the front of the bar to operate, when a mode input is selected. If Front Cut Off is not active only the rear and rear portion of the end cap LED's will function. Additionally if Flash Alley's & Takedowns is active, only the alley's will flash. See paragraph III.B.10 Additional Programming for alternative configurations of this feature.

6. Right Alley.

Applying 12VDC to the Right Alley (Green) wire will cause the Right Alley lights to illuminate.

7. Left Alley.

Applying 12VDC to the Left Alley (White) wire will cause the Left Alley lights to illuminate.

8. Takedowns.

Applying 12VDC to the Takedowns (Gray) wire will cause the Takedowns lights to illuminate.

9. Main Mode Programming.

Each of the three modes of operation can be programmed to operate with one of the fifteen available flash patterns listed below (see figure 3):

- 1 - Random
- 2 - Quad
- 3 - SAE J595 Flash
- 4 - Action
- 5 - Center Sweep
- 6 - Action Center/Sweep
- 7 - Random / End Caps Sweep
- 8 - Modulate
- 9 - Rear Alternating
- 10 - Rear Quad
- 11 - Front Feet Alternating
- 12 - Front Feet & Front Modules Alternating
- 13 - K&O / JJ&PP Alternating 75FPM
- 14 - J / P Alternating 75FPM
- 15 - J, BB, CC, DD, JJ, KK, LL, MM / P, FF, GG, HH, PP, OO, NN Alternating 75FPM

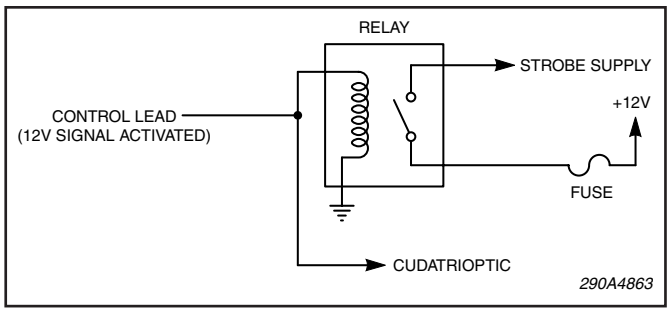

Figure 2.

Programming is accomplished as follows:

a. Apply 12VDC to the mode input to be programmed. The bar will flash the current pattern.

b. Momentarily apply 12VDC to (WHT/BLK) Program wire. The light bar will stop briefly, then the end cap LED's will flash the number of the new flash pattern. The light bar will then begin to flash the newly selected pattern.

c. Repeat step 2 until the desired pattern is selected.

d. To program the other modes, apply 12VDC to the desired mode input and repeat steps 2 and 3.

10. Additional Programming.

The following user programmable features are also available:

a. Front Cut Off .

The Default setting is that the front of the bar is active when 12 VDC is applied to the BLK/PINK control input wire. This configuration can be reversed so that the front of the bar is deactived when 12 VDC is applied to the BLK/PINK control input wire. To change the configuration, perform the following programming steps:

• With all power removed from the 10GA RED power lead and control input wires, apply 12 VDC to the Program (WHT/BLK) and Front Cut Off (BLK/PNK) control input wires.

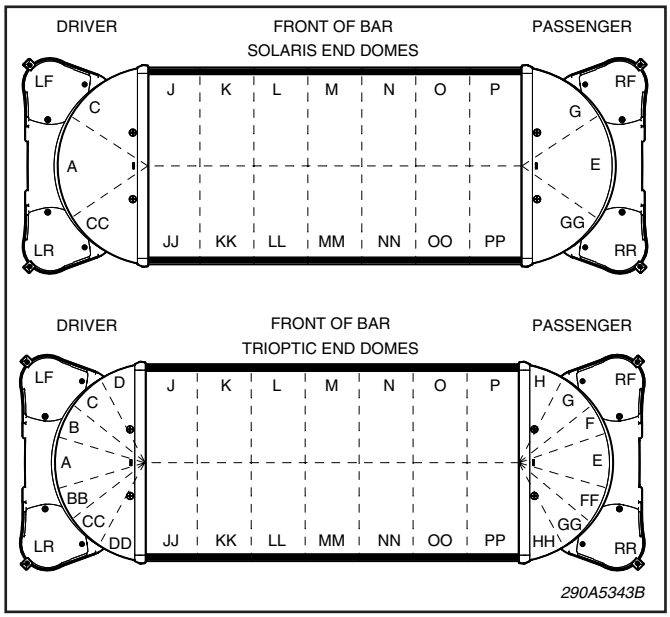

Figure 3.

• Apply 12 VDC to the 10GA RED power lead. One half of the front of the lightbar will light steady to indicate which configuration is selected (driver side - 12 VDC activate / passenger side 12 VDC deactivate).

• To change the configuration, momentarily apply 12 VDC to the Flash Alleys & Takedowns (YEL) control input. The configuration will switch to the opposite mode, and the opposite half of the front of the lightbar will light steady.

• The configuration will change each time 12 VDC is momentarily applied to the YEL control input wire.

• When programming is completed, remove 12 VDC from all circuits. Ensure all leads are properly connected and test for proper operation.

b. Intersection Mode.

The Default setting is that Intersection mode is activated when 12 VDC is applied to the Intersection (WHT/YEL) control input wire, and deactivated when 12 VDC is removed from the WHT/YEL control input wire. This configuration can be changed so that Intersection mode is a TAP II function, where 12 VDC is momentarily applied to the WHT/YEL control input wire to activate Intersection mode, then 12 VDC is again momentarily applied to the WHT/YEL control input wire to deactivate. To change the configuration, perform the following programming steps:

• With all power removed from the 10GA RED power lead and control input wires, apply 12 VDC to Program (WHT/BLK) and Intersection (WHT/YEL) control input wires.

• Apply 12 VDC to the 10GA RED power lead. One of the end caps of the lightbar will light steady to indicate which configuration is selected (passenger side - 12 VDC active / driver side — TAP II).

• To change the configuration, momentarily apply 12 VDC to the Flash Alleys & Takedowns (YEL) control input. The configuration will switch to the opposite mode, and the opposite end cap of the lightbar will light steady.

• The configuration will change each time 12 VDC is momentarily applied to the YEL control input wire.

• When programming is completed, remove 12 VDC from all circuits. Ensure all leads are properly connected and test for proper operation.

c. Flash Alleys & Takedowns - The Default setting is that both Alleys & Takedowns flash when 12VDC is applied to the Flash Alleys & Takedowns (YEL) control input. This configuration can be changed to Flash Takedowns Only when 12VDC is applied to the YEL control input . To change configuration, perform the following programming steps:

• With all power removed from the 10GA RED power lead and control input wires, apply 12 VDC to the Program (WHT/BLK) and Flash Alleys & Takedowns (YEL) control input wires.

• Apply 12 VDC to the 10GA RED power lead. The driver side end cap will light steady if Flash Alleys & Takedowns is selected. The front of the lightbar will light steady if Flash Takedowns Only is selected.

• To change the configuration, momentarily apply 12 VDC to the Steady Red (ORG) control input wire. The configuration will switch to the opposite mode, and the alternate indicator will light steady.

• The configuration will change each time 12 VDC is momentarily applied to the ORG control input wire.

• When programming is completed, remove 12 VDC from all circuits. Ensure all leads are properly connected and test for proper operation.

After all programming is completed, insulate or trim the (WHT/BLK) Program wire and secure it to prevent accidental pattern changes.

C. *Function Activation – SignalMaster.*

NOTE

Jumpers are factory installed for External SignalMaster Controller.

Refer to table 1 and figures 1 and 4 for proper connections.

1. SignalMaster Internal Controller.

a. See figure 5. Ensure that jumpers JP2 & JP7 are installed as indicated

b. When 12VDC is applied to one of the input wires the corresponding SignalMaster function will activate (see table 1). The first seven inputs are prioritized, with “Left” (WHT/BRN) being the highest priority and “Warn 4” (WHT/GRN) being the lowest priority. The highest priority input that has 12VDC applied will override any other input that has 12VDC applied. When using a three position progressive slide switch for “Left”, “Center” and “Right” functions, “Left” is connected to position one “Center” to position two and “Right to position three. The “Fast” (WHT/GRY) input will cause the SignalMaster to operate at twice the normal speed, when 12VDC is applied to the input.

2. SignalMaster External Controller.

a. See figure 6. Ensure that jumpers JP2 & JP7 are installed as indicated.

b. Refer to table 1 and connect the SignalMaster input wires to the corresponding connections of the SignalMaster controller.

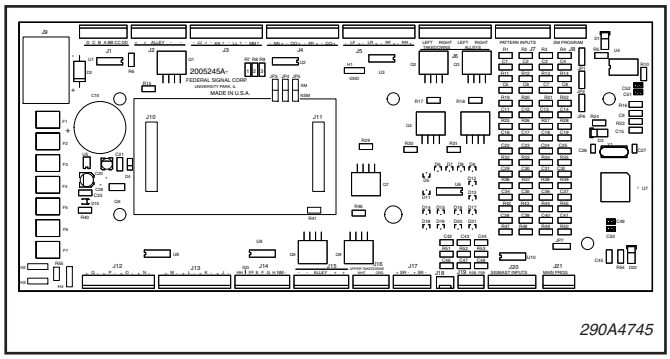

Figure 4.

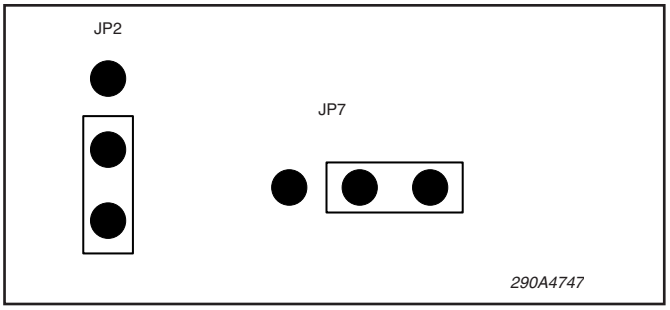

Figure 5.

IV. TESTING.

⚠WARNING

This product contains high output LED devices. To prevent permanent eye damage, do not stare into the light beam at close range.

After Installation, check the entire system to be sure the lights are flashing properly and all light system functions are operating properly.

SAFETY MESSAGE TO OPERATORS

⚠WARNING

People's lives depend on your safe use of our products. Listed below are some important safety instructions and precautions you should follow:

- **Although your warning system is operating properly, it may not be completely effective. People may not see or heed your warning signal. You must recognize this fact and continue driving cautiously.**
- **Also, situations may occur which obstruct your warning signal when natural or man-made objects are between your vehicle and others, such as: raising your hood or trunk lid. If these situations occur, be especially careful.**
- **This product contains high intensity LED devices. To prevent permanent eye damage, DO NOT stare into the light beam at close range.**
- **At the start of your shift, you should ensure that the light is securely attached and operating properly.**

Failure to follow these safety precautions may result in property damage, serious injury, or death to you, to passengers, or to others.

RETAIN AND REFER TO THIS MESSAGE

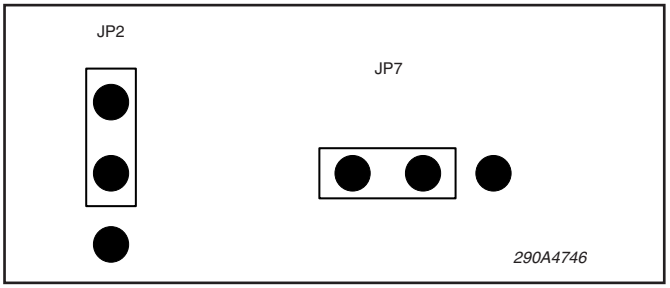

Figure 6.

V. MAINTENANCE.

⚠WARNING

Crazing (cracking) of lenses will cause reduced effectiveness of the light. Do not use cleaning agent (which will cause crazing) such as strong detergents, solvents, or petroleum products. If crazing of lenses does occur, reliability of light for emergency signaling purposes may be reduced until lenses are replaced.

⚠WARNING

High voltages are present inside the lightbar. Wait at least 10 minutes after shutting off the power before servicing the unit. Disconnect ALL power to the lightbar before any maintenance is performed. Failure to do so may result in property damage, serious injury, or death to you or others.

CAUTION

After prolonged operation, the unit gets hot and can cause burns. Do not touch the unit while or shortly after it has been operating. Always allow the unit to cool before handling.

A. *General.*

Ordinary cleaning of the plastic lenses can be accomplished by using mild soap and a soft rag. Should fine scratches or a haze appear on a lens, they can best be removed with a specialty plastic cleaner/polish such as Plexus® and a soft cloth. Alternatively, non-abrasive, high quality, one-step, automotive past cleaner/wax may be used.

B. *Outer Lens Removal (see figure 7).*

Remove the end dome, then starting at one end, pop the bottom of the lens off the lower extrusion. The preferred method is to apply pressure to the center of the lens with the thumb of one hand while the fingers of that hand snap the lens from the extrusion. Alternatively, a small, flat-bladed screwdriver may be used to carefully pry the lens from the extrusion, ensuring that the lens and the underlying o-ring cord are not damaged. Once the end is free, the lens can be peeled off the bar. To install the lens, hook the upper edge into its o-ring groove then snap the lower edge into position. Seal the end of the lens/extrusion joint with RTV as shown.

C. *End Dome Lamp Service (see figure 8).*

1. Removal.

Remove the two 1/4-20 Phillips Flathead screws retaining the dome assembly. Slide the assembly away from the bar and unplug the 15 pin electrical connector. With the end dome removed from the bar, remove the 10-32 Phillips head screw from the bottom of the dome. The lighting units, upper plate, and lower plate are removed from the dome as an assembly. Once free of the dome, the top plate and lighting units lift free of the bottom plate.

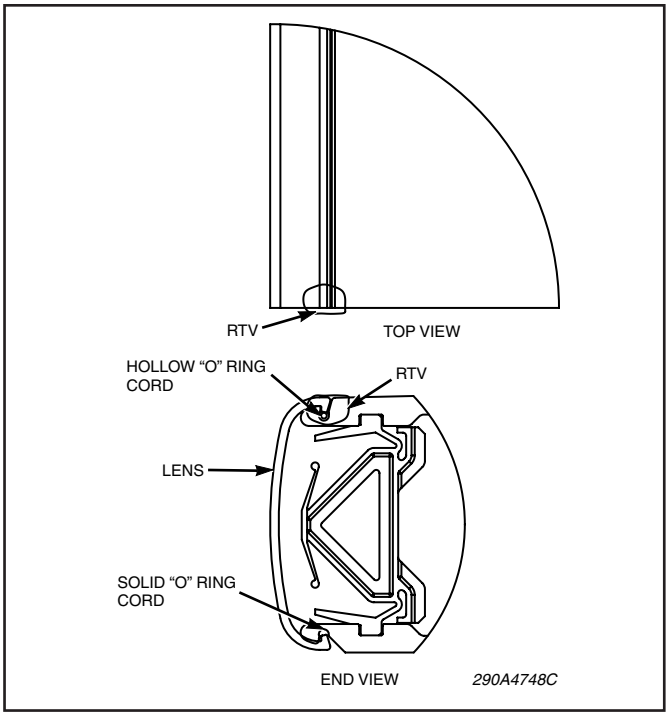

Figure 7.

2. Installation.

Installation is the reverse of disassembly. Inspect the dome seal for cuts or tears, replacing as necessary (see paragraph VI. Replacement Parts). Inspect the self-clinching nuts in the bottom plate to verify that they are not loose in the plate and that the threads are not damaged. If either of these conditions exist, replace the bottom plate (see paragraph VI. Replacement Parts). When installing the lighting units, pay attention to the locating slots, tabs, and bosses. The 10-32 Phillips screw and the two 1/4-20 Phillips Flathead screws are coated at the factory with anti-seize compound to prevent stainless galling. If the screws are cleaned or replaced apply a tiny amount of anti-seize (user-supplied - Bostik Never-Seez© is a commonly available brand) to the first two or three threads. Before securing the Phillips head screw in the bottom of the dome, ensure the holes for the dome mounting screws are properly aligned in the dome, top plate, and bottom plate. The dome seal must be compressed to provide a good seal, thus pressure must be applied to the dome during installation. A 1/4" drift punch (or the 1/4" shank of a #2 Phillips screwdriver) is used to align the holes in the dome, top plate, end bracket, and bottom plate. While keeping slight pressure inward on the dome, align both holes, leaving the drift in the second hole while starting the screw in the first hole. Use due care when starting the screws to prevent cross-threading. Start both screws before securing either. Do not over tighten.

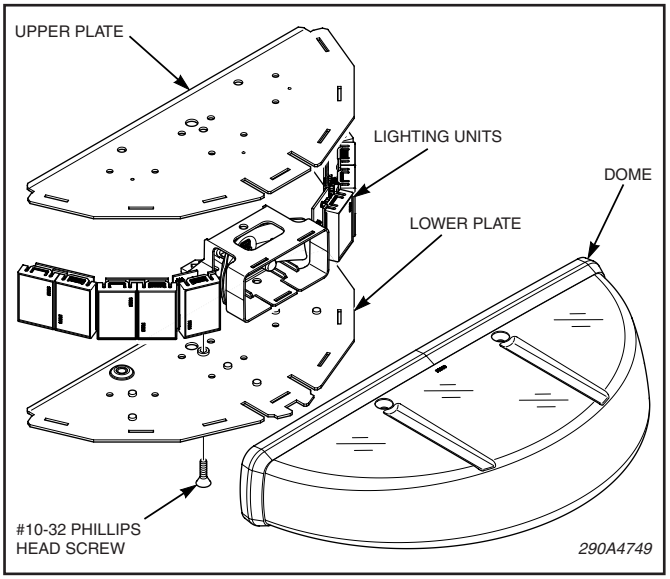

Figure 8.

D. *Halogen Lamp Replacement.*

⚠WARNING

A serious injury may result if the lamp is touched when hot. Always allow lamp to cool before removing. Halogen lamps are pressurized and if broken can result in flying glass. Always wear gloves and eye protection when handling lamps.

⚠CAUTION

Service life of the lamp will be shortened if the glass portion is touched. If the glass has been handled, clean carefully with a grease solvent.

See figure 9. Replace the defective lamp with an exact replacement only (see paragraph VI. Replacement Parts.).

E. *Main Bar Lighting Unit Service (see figures 7 and 10).*

To remove a complete lighting unit from the main bar, first remove the outer lens as detailed above. Remove the retaining clip from both sides of the unit to be removed. Light bars with 9-button Solaris™ reflectors have either one retaining clip at each end of the bar or none at all, depending on configuration. Note quantity and location prior to removal. A small flat-bladed screwdriver may be used to release the tabs on the clip. Slide the unit out of the bar and disconnect the electrical connector. Installation is the reverse; the clips snap into position with an audible click.

F. *Cleaning Reflector Assemblies.*

Use a soft tissue to clean reflectors. Avoid heavy pressure and the use of caustic, abrasive, or petroleum-base cleaners, which will scratch or dull the surface.

G. *PCB Backer Board Assembly Replacement, TriOptic LEDs (see figure 10).*

1. Disconnect the electrical connector from the PCB assembly

2. Gently pry the PCB assembly from the snap-top standoffs on the backplane.

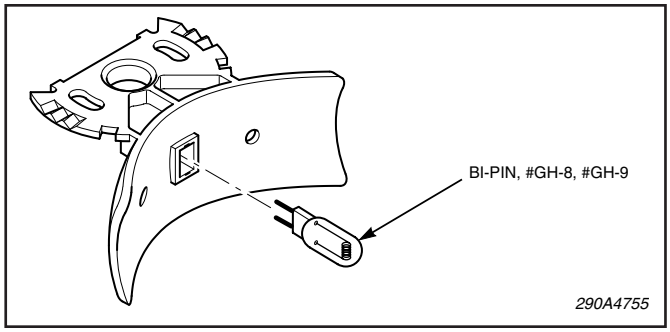

Figure 9.

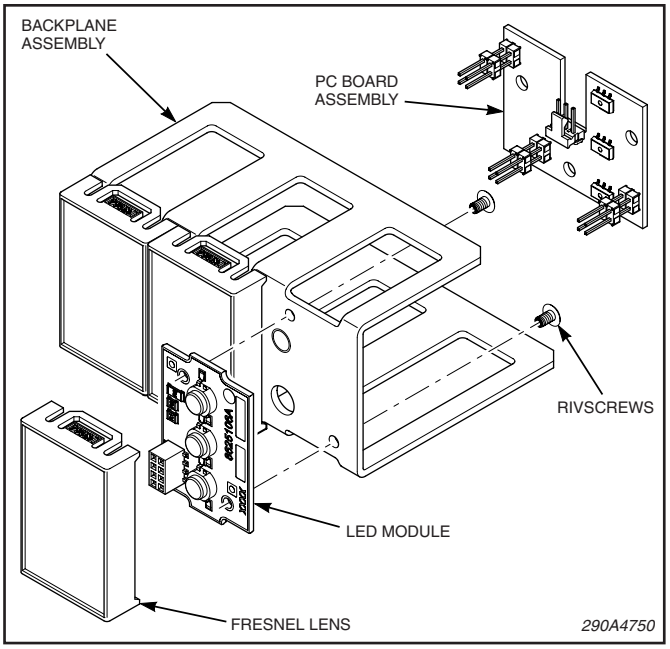

Figure 10.

3. Assembly is the reverse of disassembly. Prior to installation of the PCB assembly, ensure that the LED connector pins on the PCB are not bent or damaged.

H. *PCB Backer Board Assembly Replacement, Solaris LEDs (see figure 11 or 12).*

1. Remove the #6 Phillips head screw retaining the PCB assembly.

2. Slide the PCB assembly up then away from the reflector to disengage the pins from the LED.

3. Assembly is the reverse of disassembly. Prior to installation of the PCB assembly, ensure that the LED connector pins on the PCB are not bent or damaged.

I. *LED Module Replacement, TriOptic LEDs (see figure 10).*

1. Follow steps 1-2 of PCB Assembly Replacement. If necessary, remove the complete light unit for access.

2. Remove and discard the Rivscrews retaining the LED module to the backplane. Remove the module.

3. Unlatch the Fresnel lens from the LED module.

4. Snap the Fresnel lens onto the new module. Make sure the rectangular recess in the lens aligns with the black connector on the new LED module.

5. Position the LED module on the backplane, aligning the black connector on the LED with the large clearance hole in the backplane. Secure the module with the two 6-32 screws provided.

6. Assembly is the reverse of disassembly.

J. *LED Module Replacement, Solaris LEDs (see figure 11 or 12).*

a. Follow steps a-b of PCB Backer Board Assembly Replacement.

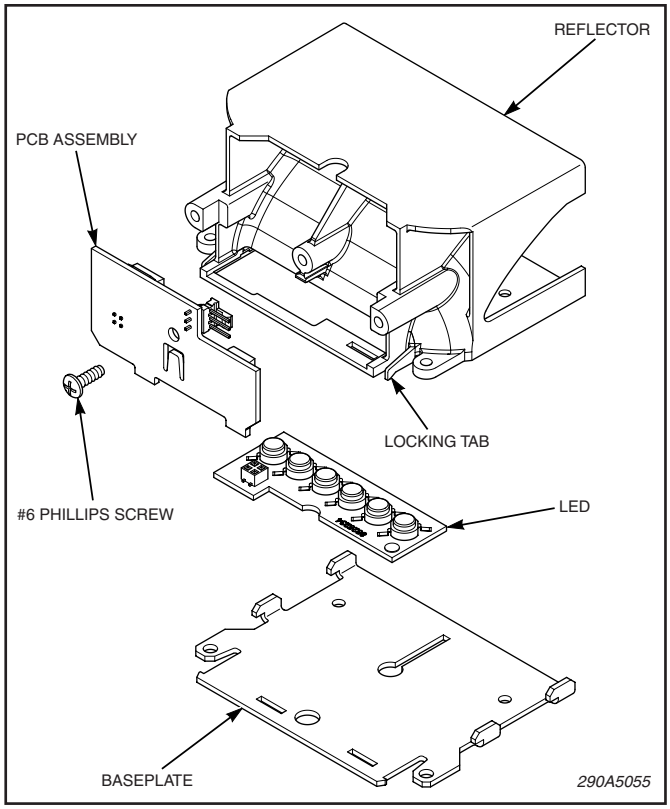

Figure 11.

b. Release the two locking tabs by prying gently while sliding aluminum baseplate forward.

c. Lift baseplate free and remove LED.

d. Assembly is reverse of disassembly.

K. *Fresnel Lens Replacement (see figure 10).*

Unlatch the Fresnel lens from the LED module. Assembly is the reverse.

L. *PCB Motherboard Replacement (see figure 13).*

1. Remove end dome as detailed above.

2. Remove the two 1/4-20 Hex Head screws, lockwashers, washers, and the ground lead. Move end bracket and dome seal aside without removing 15 pin connector from bracket.

3. Slide PCB assembly from extrusion and invert.

4. Disconnect the electrical connectors from the PCB assembly

5. Remove the six 6-32 Phillips screws and lockwashers retaining the PCB. Note location of ground lead.

6. Assembly is the reverse of disassembly. Use care when tucking harnesses into bar to avoid displacing fuses from the motherboard. When installing the dome seal, the two small holes in the face of the seal indicate “UP”. Do not pinch harnesses between extrusion and dome seal or end bracket. Reinstall ground lead.

VI. REPLACEMENT PARTS.

Description	Part No.
PCB Assembly 3 PK Backer Board	Z2005224-N
PCB Assembly 2 PK Backer Board	Z2005223-N
PCB Assembly 1 PK Backer Board	Z2005222-N
PCB Assembly Motherboard (No SignalMaster)	Z8654153-123
PCB Assembly Motherboard (With SignalMaster)	Z8654153-12
LED Module Assembly, Amber	Z8625106-AS
LED Module Assembly, Blue	Z8625106-BS
LED Module Assembly, Red	Z8625106-RS
LED Module Assembly, White	Z8625106-WS
Lens, Fresnel	8625101
Lamp, Halogen, 50W GH-8 Bi-Pin	8107169
Plate, End Dome, Bottom	8654106
Dome Seal	8654180

6 Button Solaris LED Assemblies

PCB Assembly replaced by 2005340-1)	2005272-1 (to be
Reflector Assembly, 6 Button Amber (includes PCB)	8654167-12
Reflector Assembly, 6 ButtonBlue (includes PCB)	8654167-13
Reflector Assembly, 6 Button Red (includes PCB)	8654167-14
Reflector Assembly, 6 Button White (includes PCB)	8654167-15
LED, 6 Button, Amber	8625234-A
LED, 6 Button, Blue	8625234-B
LED, 6 Button, Red	8625234-R
LED, 6 Button, White	8625234-W
Reflector, 6 Button Polyparabolic	8654165

9 Button Solaris LED Assemblies

Description	Part No.
PCB Assembly replaced by 2005341-1)	2005291-1 (to be
Reflector Assembly, 9 Button Amber (includes PCB)	8654183-12
Reflector Assembly, 9 Button Blue (includes PCB)	8654183-13
Reflector Assembly, 9 Button Red (includes PCB)	8654183-14
Reflector Assembly, 9 Button White (includes PCB)	8654183-15
LED, 3 Button, Amber (3 req'd.)	8625106-A
LED, 3 Button, Blue (3 req'd.)	8625106-B
LED, 3 Button, Red (3 req'd.)	8625106-R
LED, 3 Button, White (3 req'd.)	8625106-W
Reflector, 9 Button Polyparabolic	8654175

Manufactured by:
Federal Signal Corporation
Emergency Products Group
2645 Federal Signal Drive
University Park, Illinois 60466

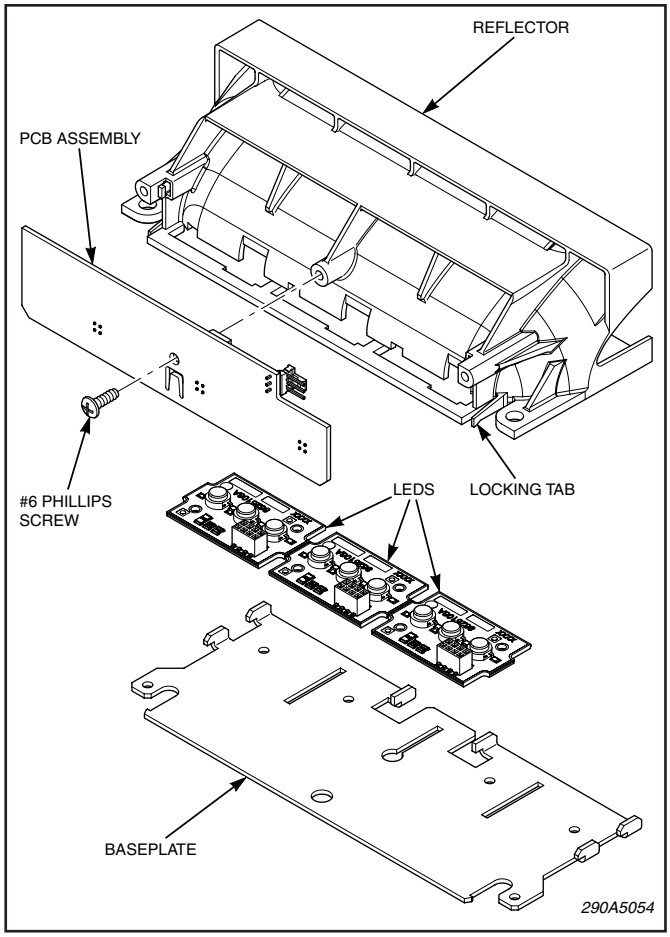

Figure 12.

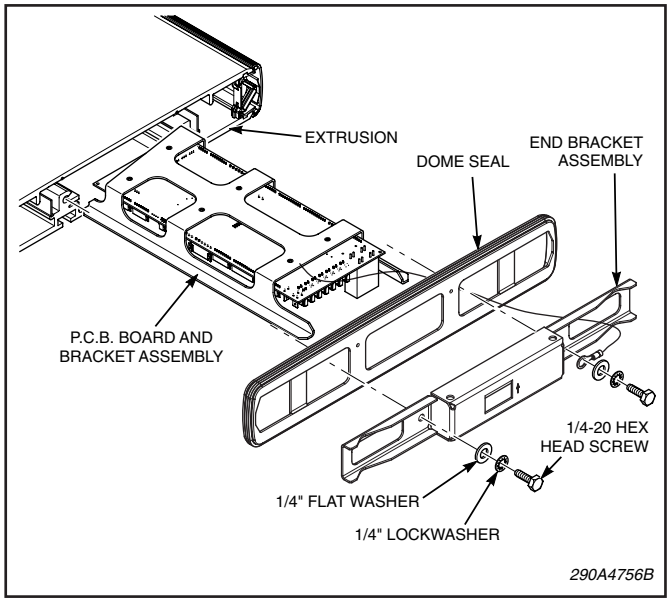

Figure 13.