
SOLAR LED RRFB USER MANUAL
COVERS MODELS SC315 AND SB435HP



Warnings and Precautions

The following symbols indicate important safety warnings and precautions throughout this manual. They are defined as follows:



WARNING indicates that serious bodily harm or death may result from failure to adhere to the precautions.



CAUTION indicates that damage to equipment may result if the instructions are not followed.



NOTE suggests optimal conditions under which the equipment will operate effectively and safely, or provides additional information to the reader.

Warranty Disclaimer

This manual will familiarize you with the features, operation standards, and installation of Carmanah's SC315 Rectangular Rapid Flasher Beacon series. Failure to comply with the use, storage, maintenance, installation or placement instructions detailed in this manual could void the warranty.

Standards

Perform all installation, wiring and maintenance in conformance with local building and electrical codes. Adherence to the National Electrical Code (NEC) is mandatory to comply with any certification markings. Non-adherence to code may void the warranty.

Safety and Usage Precautions



Batteries are shipped fully-charged. Use extreme caution when handling the batteries as they are capable of generating hazardous short-circuit currents. Remove all jewelry (bracelets, metal-strap watches, etc.) before attempting to handle the batteries.

Solar panels produce DC electricity when exposed to light and can, therefore, produce an electrical shock or burn. To render solar panels inoperative, remove them from sunlight, or fully cover their front surface with an opaque material.

Before lifting any heavy or bulky equipment, ensure that the load is secured so that moving parts do not shift and it can be lifted as far as needed without back strain or loss of grip. Installation may require more than one person.

Ensure the equipment is not powered during installation and wiring of the system.

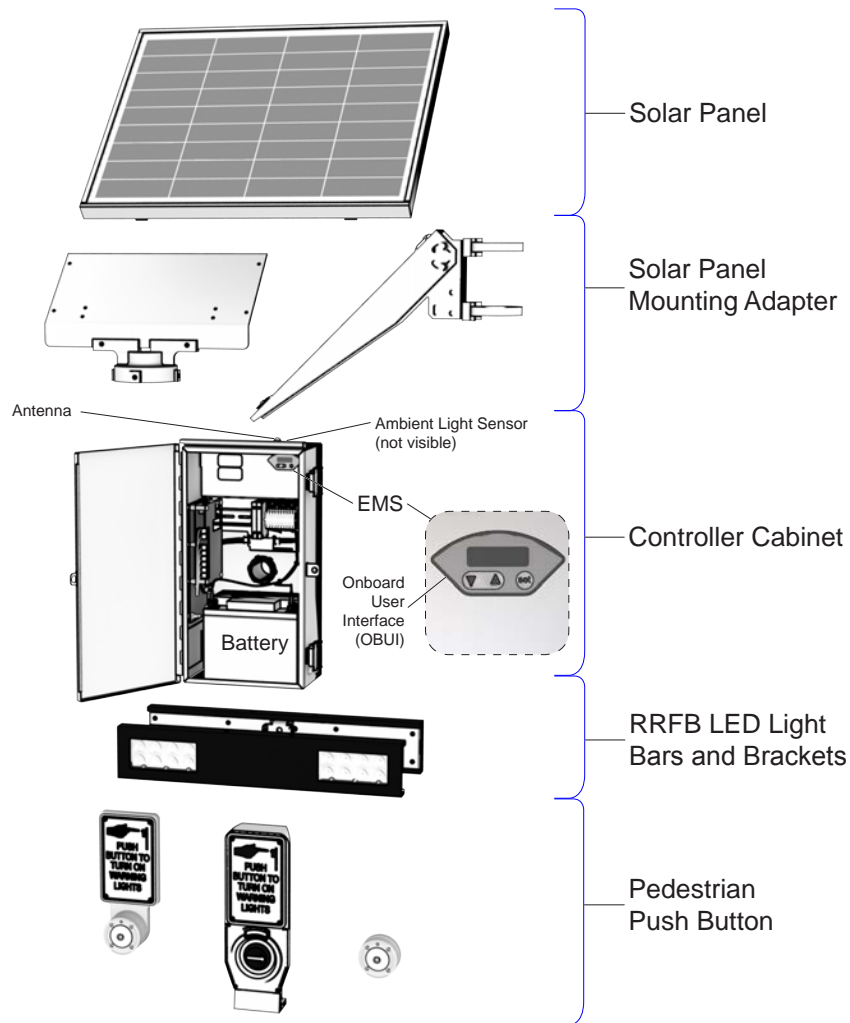
Re-check all completed wiring for proper polarity prior to energizing the system.



Changes or modifications to Carmanah equipment not expressly approved by Carmanah could void the user's authority to operate the equipment.

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SC315 with
single Light Bar
and Push Button
(Uni-directional)

SC315 with dual
Light Bars and
Push Button
(Bi-directional)



SC315 with
single Light Bar
and no Push
Button
(Uni-directional)

Introduction

SC315 series solar LED Rectangular Rapid Flashing Beacon products are ideal for pedestrian activated crosswalk applications.

System Components

The SC315 series can be configured to meet a variety of crosswalk requirements. The following components make up each of these configurations:

- Control Cabinet, consisting of:
 - Energy Management System (EMS)
 - Connection Bar
 - Battery
- Solar Panel
- Mounting Adapter for Solar Panel
- Flashing LED Light Bar(s)
- Universal Light Bar Bracket(s)
- Pedestrian Push Button(s)

The solar panel and EMS work together to charge the battery during the day. The EMS controls the flow of power from the battery to the Flashing LED Light Bar(s).

System Configurations

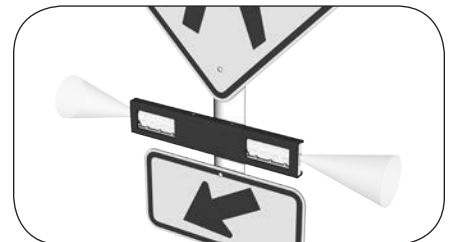
The SC315 series configurations are combined to create a complete crosswalk set. Each SC315 in the set is radio controlled, and synchronizes with the other units in the set.

Pedestrian Confirmation LED Options

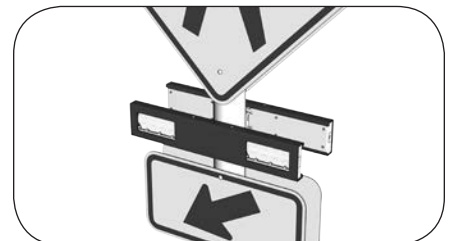
Single Light Bar,
No Confirmation
Light



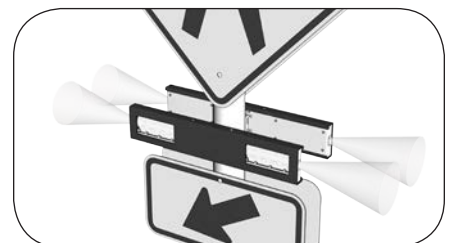
Single Light Bar,
Dual
Confirmation
Light



Dual Light Bar,
No Confirmation
Light

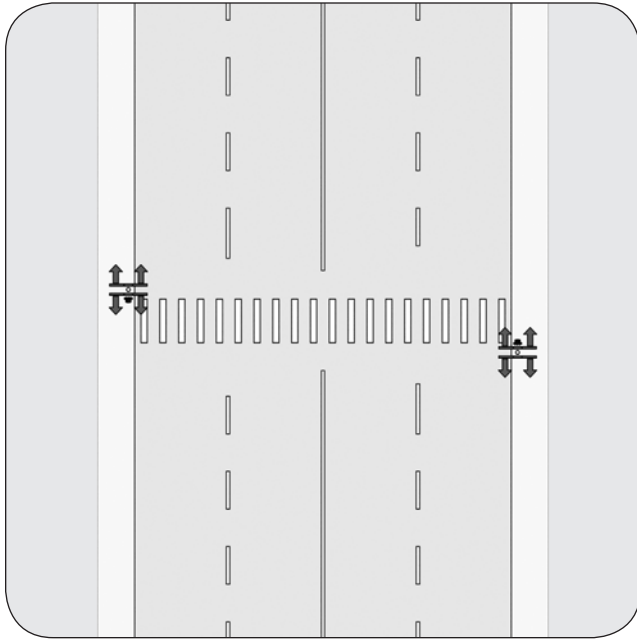


Dual Light Bar,
Dual
Confirmation
Light

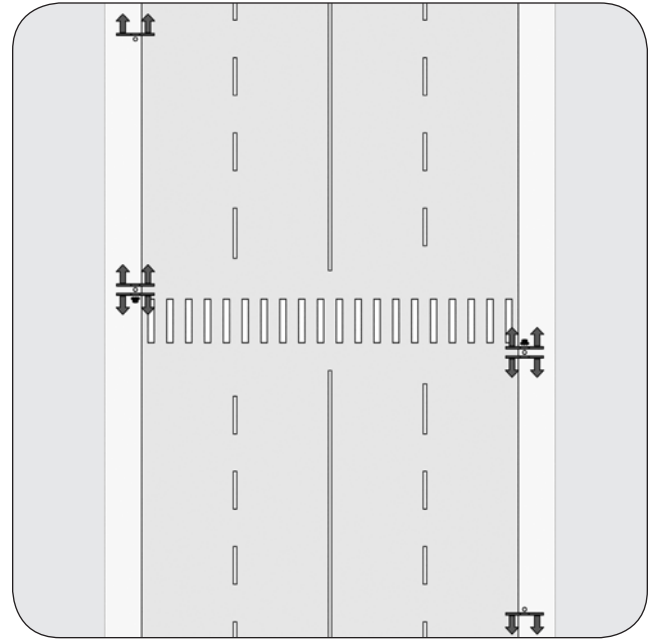


Typical Installations

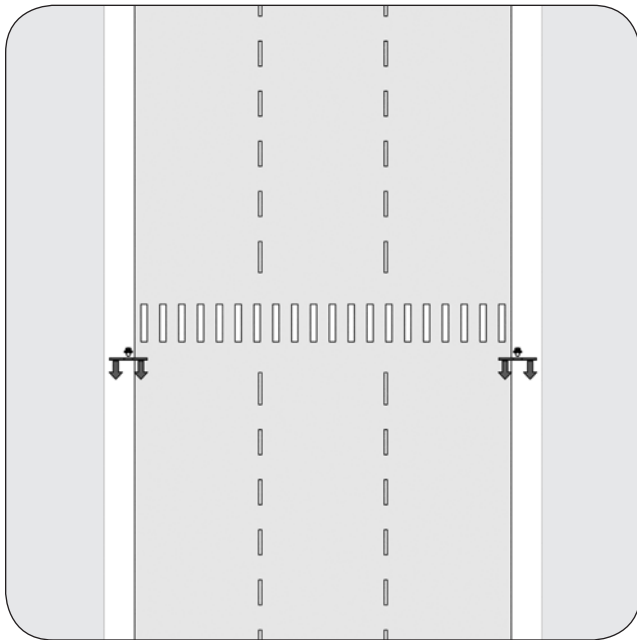
Standard - Two-way Roadway



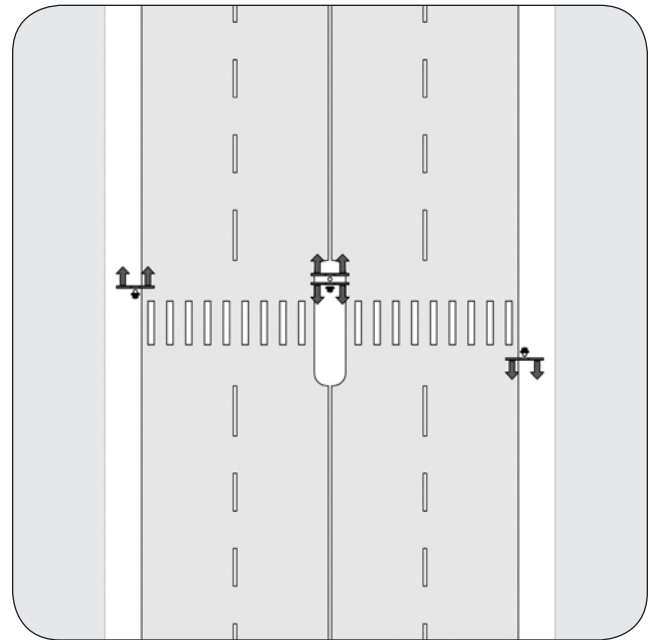
Advance - Two-way Roadway



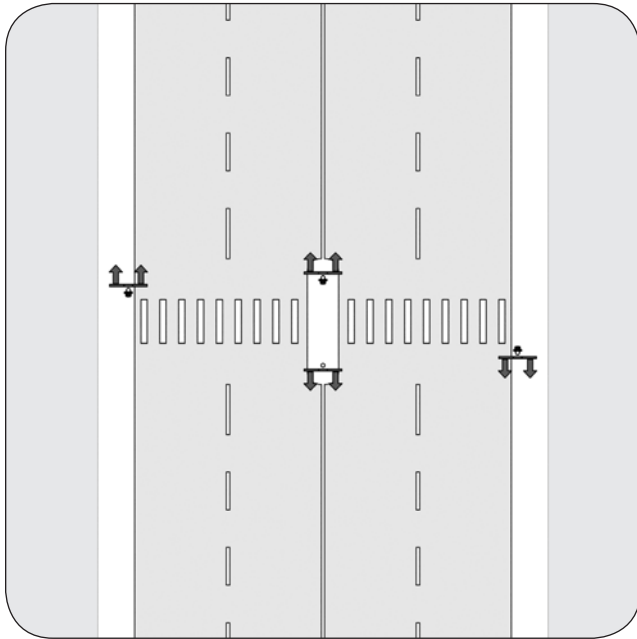
Standard - One-way Roadway



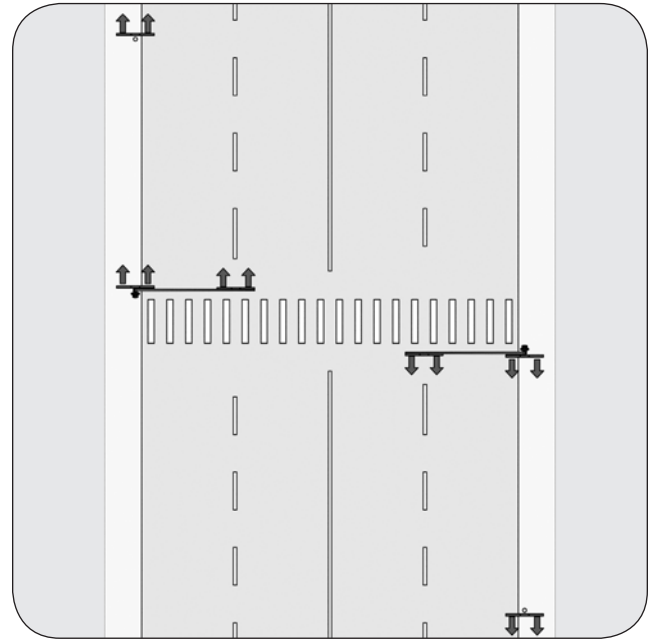
Single Pole Median - Two-way Roadway



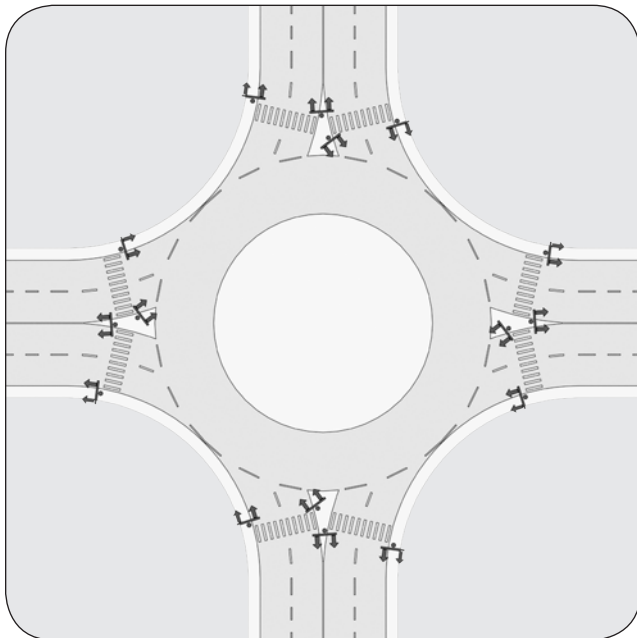
Two Pole Median - Two-way Roadway



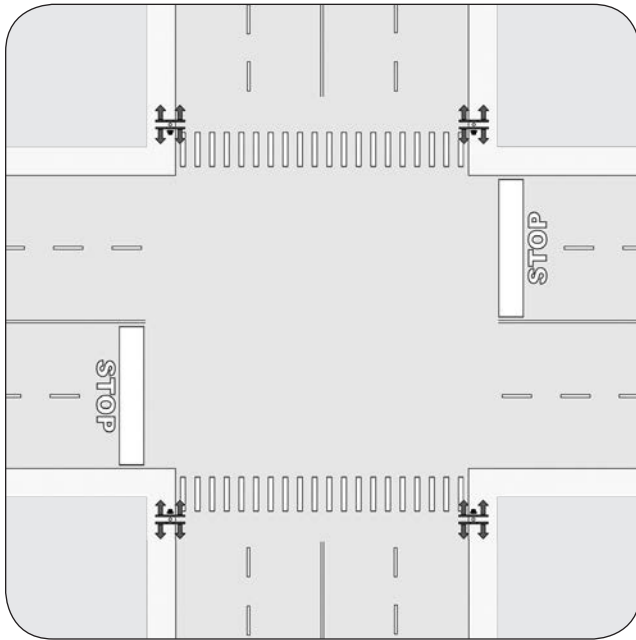
Overhead - Two-way Roadway



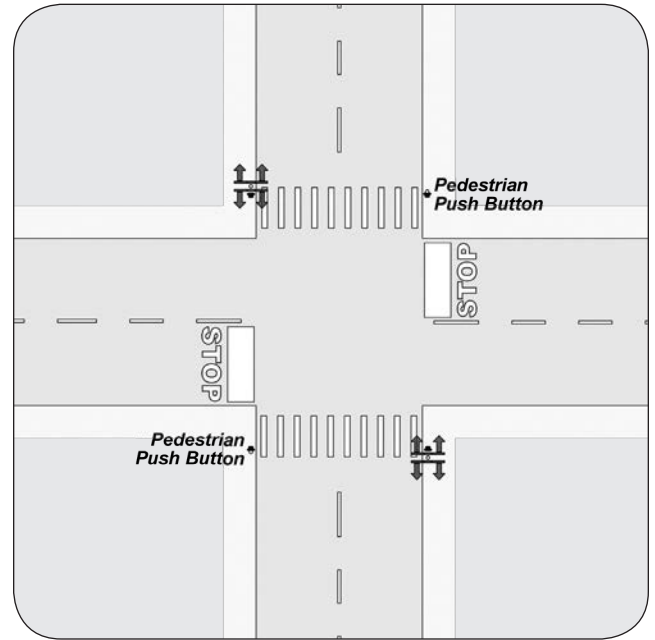
Roundabout



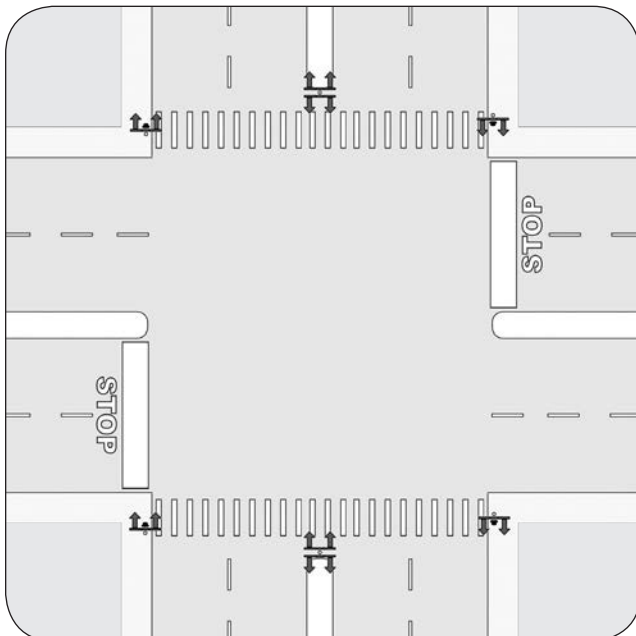
Four Pole - Parallel Crosswalks



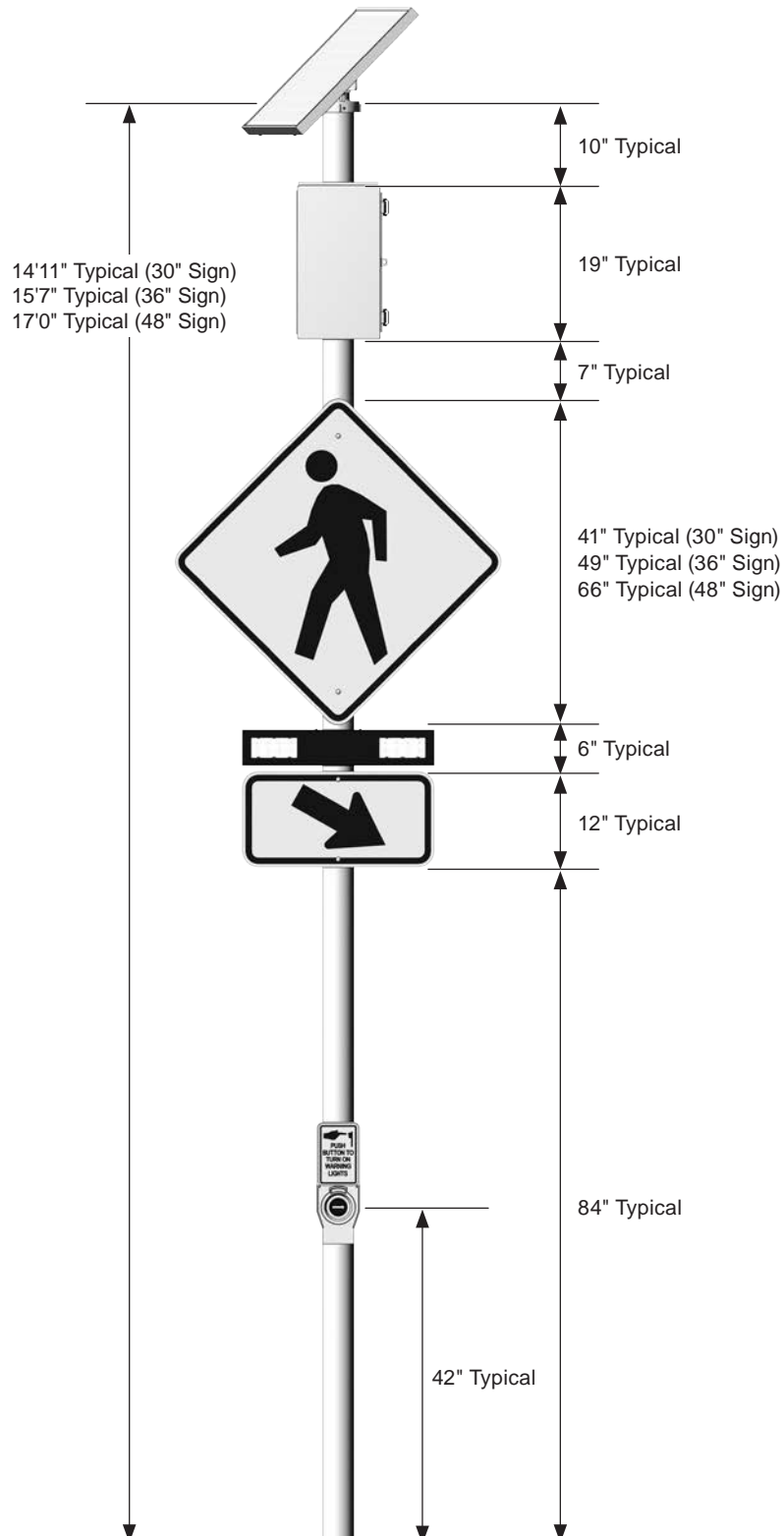
Two Pole, Staggered - Parallel Crosswalks



Four Pole with Median - Parallel Crosswalks



Typical Pole and Sign Configuration



Installation

Summary

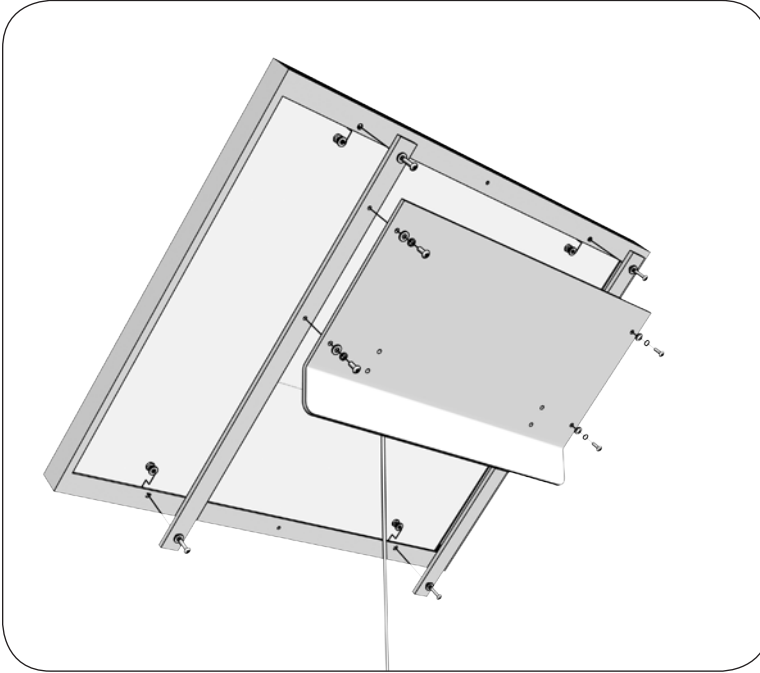
Basic steps to install a SC315 Solar LED RRFB:

1. Mount the solar panel to pole, feeding the panel cable down the pole.
2. Mount the controller cabinet with the EMS to the pole, feeding the light bar and push button cables down the pole.
3. Mount the LED light bar universal bracket(s) to the pole.
4. Mount the LED light bar(s) to the universal bracket(s), pulling the cables through the light bar and connect the wires to the LED's.
5. Aim the LED light bars to the traffic.
6. Mount the pedestrian push button to the pole, pulling the cable through the push button mount and connect the wires to the push button.
7. Place the battery into the cabinet, connecting the battery harness.
8. Configure the EMS as required using the onboard user interface.
9. Close the cabinet and ensure the solar panel is facing the equator (pointing south if you are in the northern hemisphere).

Step by Step Instructions

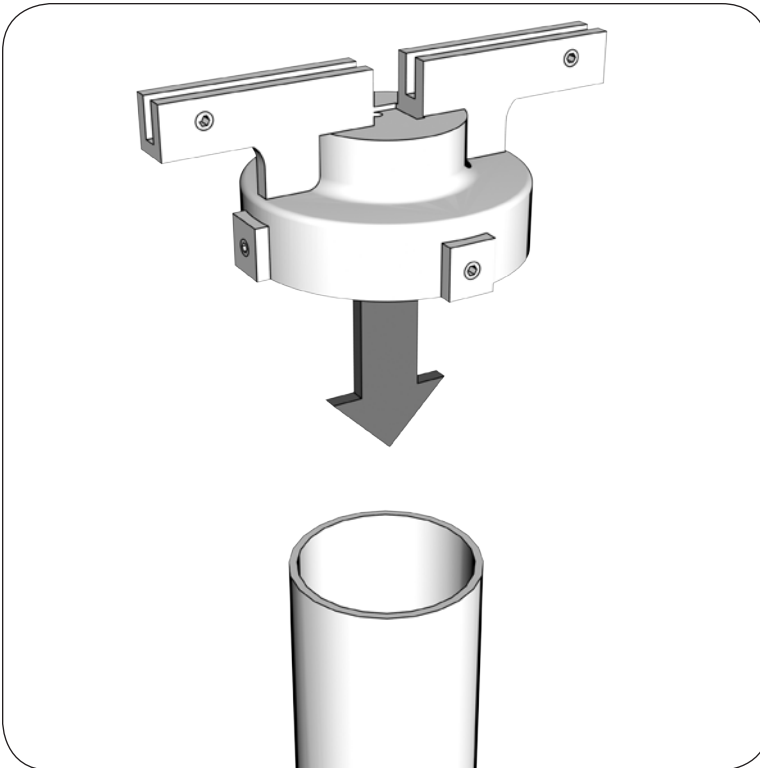
1

For top pole mount, attach the solar panel rails and mounting adapter plate. For side pole solar panel mount, see step 7 in this manual.



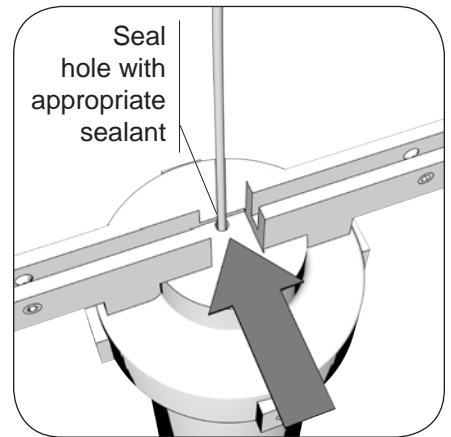
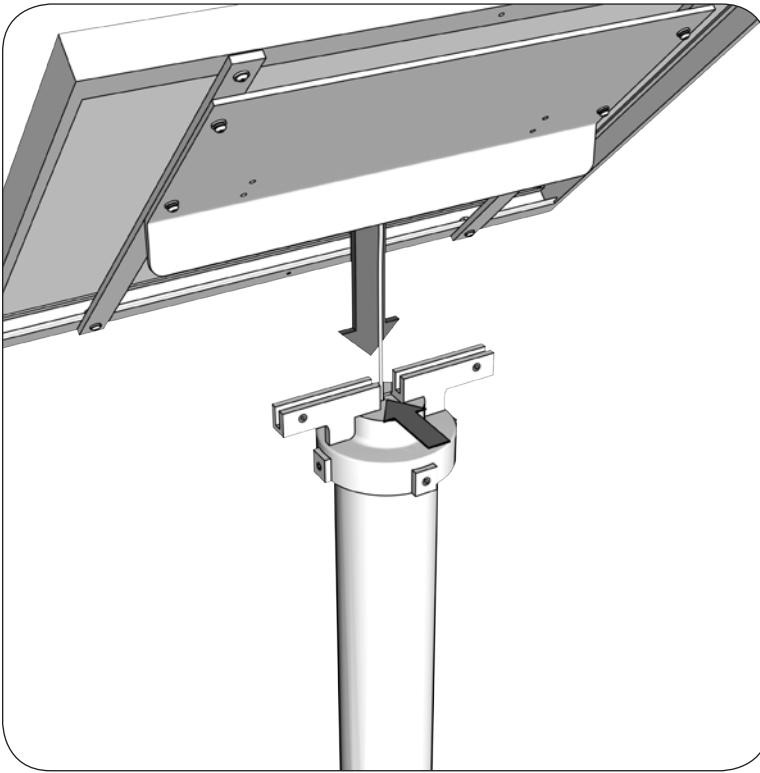
2

Attach the solar panel pole adapter to the pole.



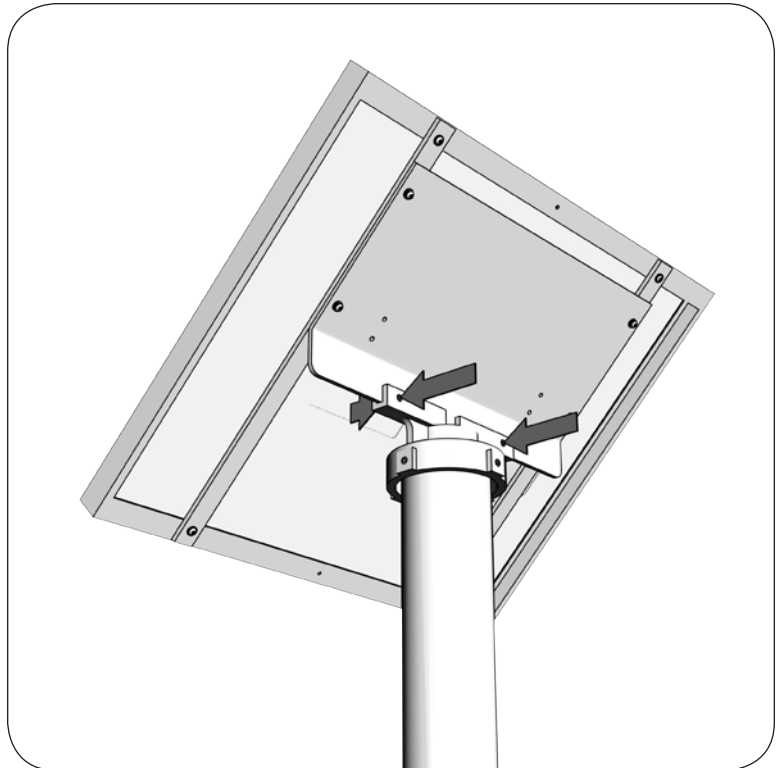
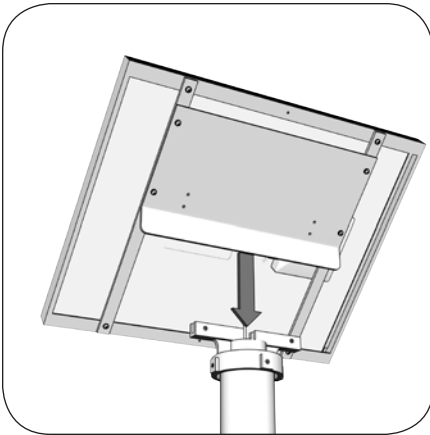
3

Feed the solar panel cable through the post adapter and down the post. Note the orientation of the hole for the cable in the pole adapter. Seal the hole in the pole adapter with appropriate sealant.



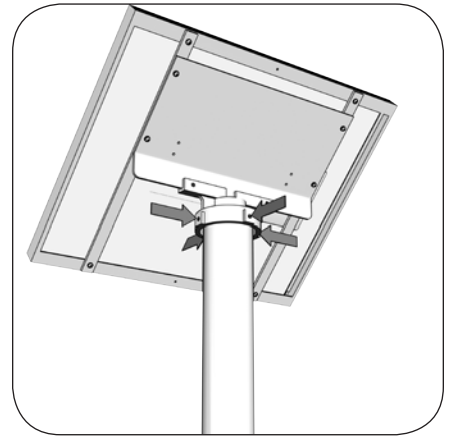
4

Lower the solar panel onto the pole adapter, and secure the pole mount set screws.



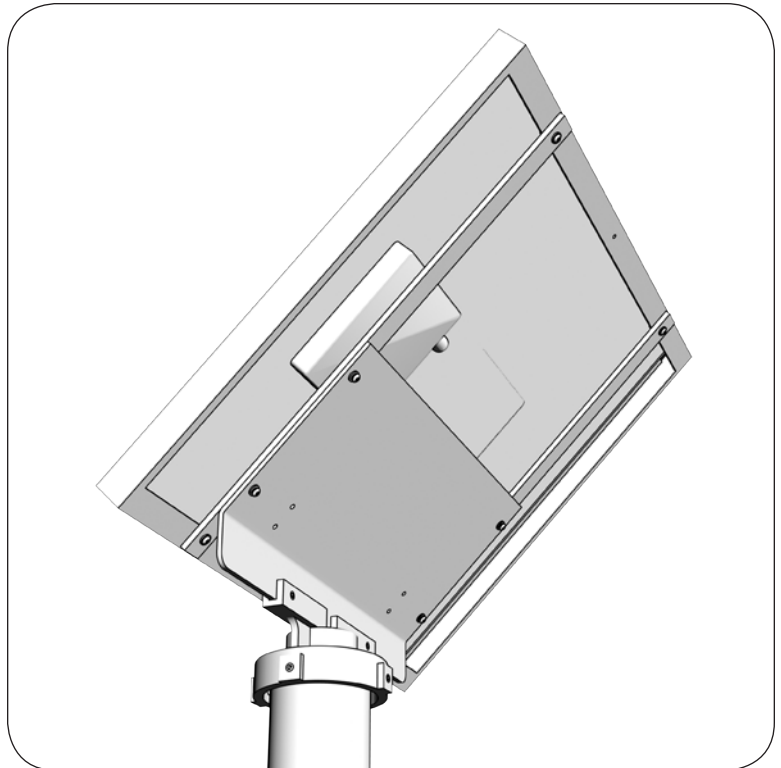
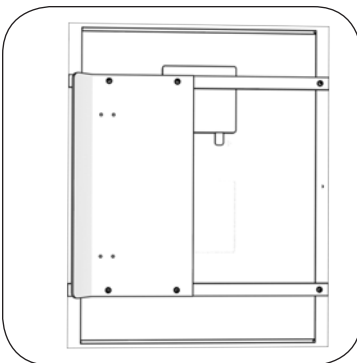
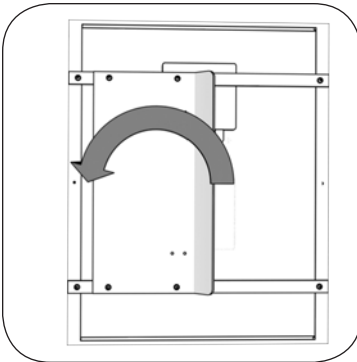
5

Orient the solar panel so it is facing the equator (pointing south if you are in the northern hemisphere).
Secure the pole adapter setscrews.



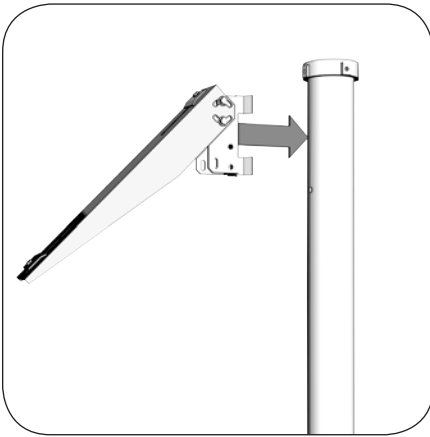
6

If required, the panel may be mounted higher on the pole by rotating the adapter plate. Note this orientation is not recommended in high wind zone areas.

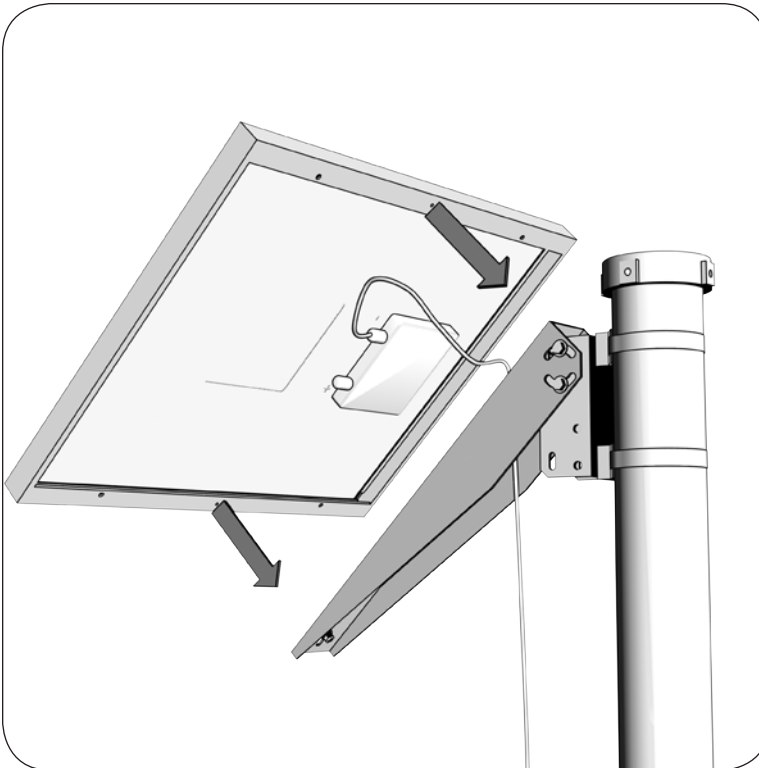


7

For the optional side pole solar mount, orientate the mount so it is facing the equator (pointing south if you are in the northern hemisphere). Secure the mount to the pole using stainless steel banding.

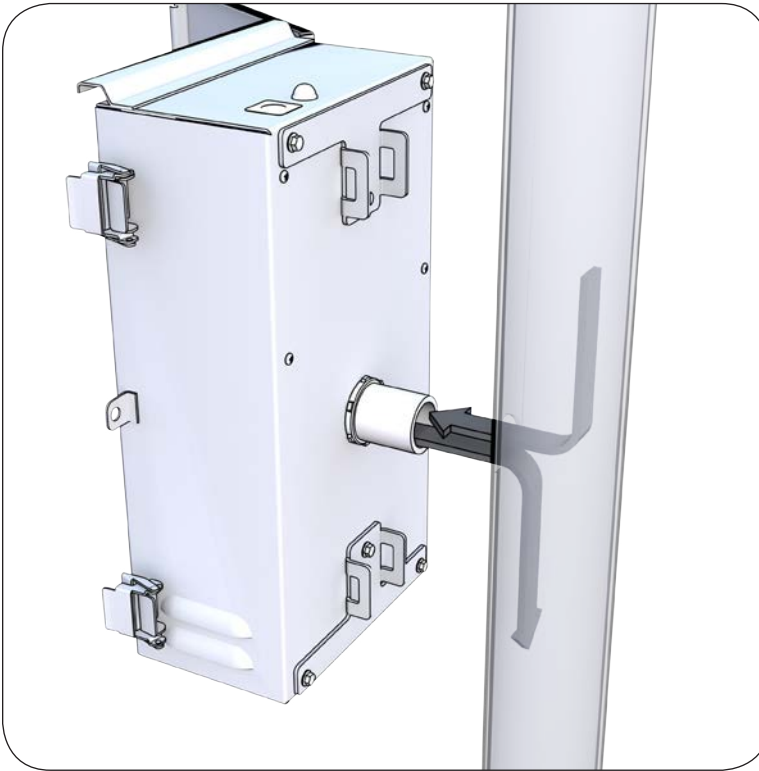


Attach the solar panel to the mount and feed the cable down the pole. Seal the hole in the pole with appropriate sealant.



8

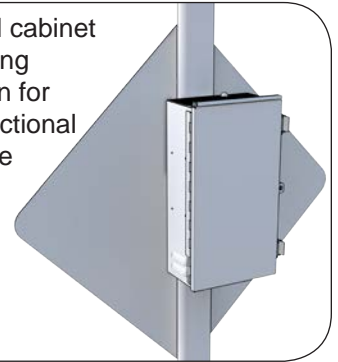
Feed the solar panel cable into the cabinet and feed the light bar cable(s) and push button cable(s) from the cabinet down the pole.



Typical cabinet
mounting location
for bidirectional
signage



Typical cabinet
mounting
location for
unidirectional
signage

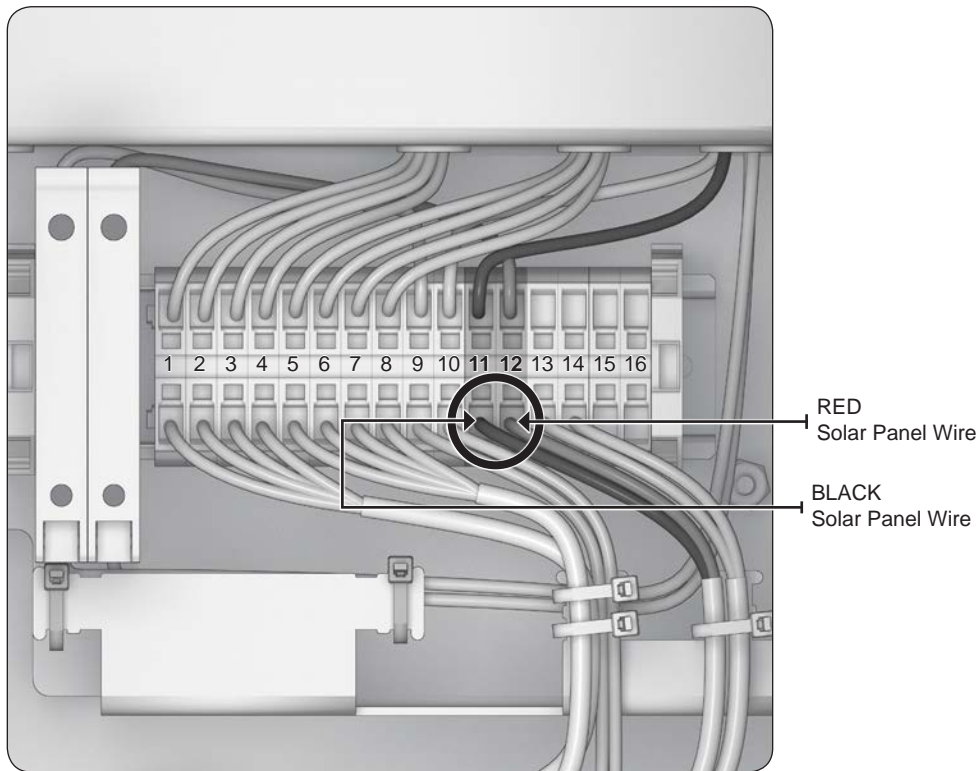


9

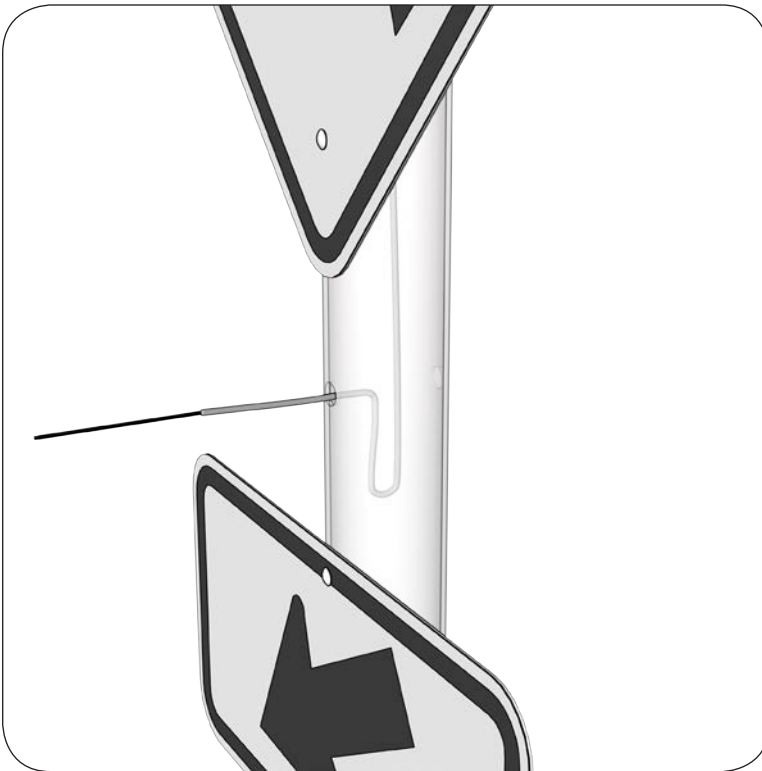
Secure the controller cabinet to the pole using appropriate stainless steel banding. Banding not supplied.



- 10 Connect the solar panel wires to the terminal block, ensuring the correct polarity.



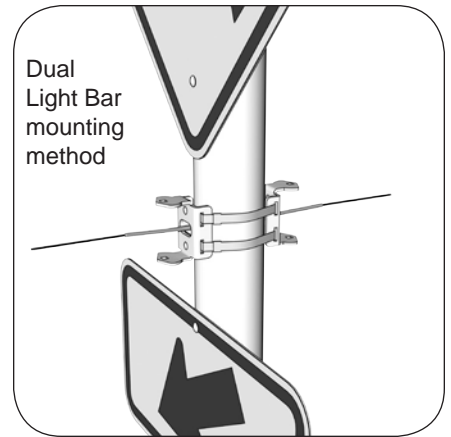
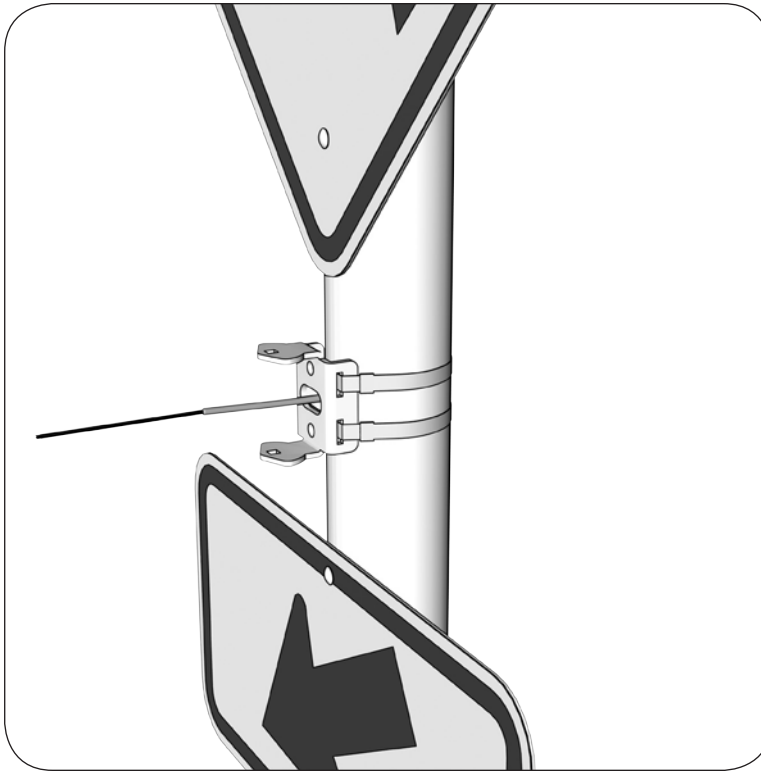
- 11 Feed the push button wires through the pole, creating a drip loop to prevent water ingress into the button.





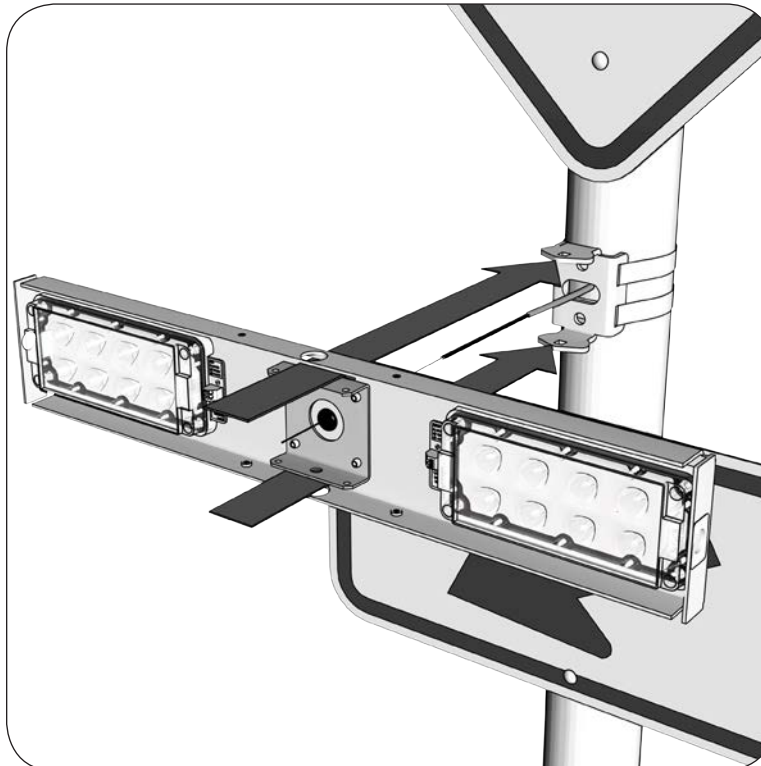
12

Mount the light bar universal bracket(s), feeding the light bar cable through the center of the bracket. Banding not supplied.



13

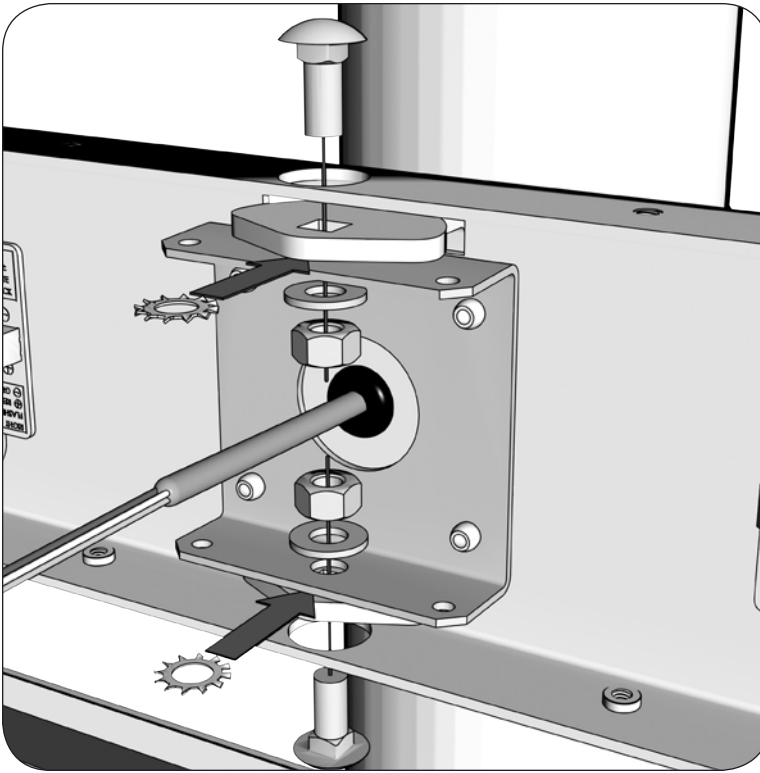
Mount the light bar(s) onto the universal bracket(s), feeding the light bar cable through the grommet in the housing.





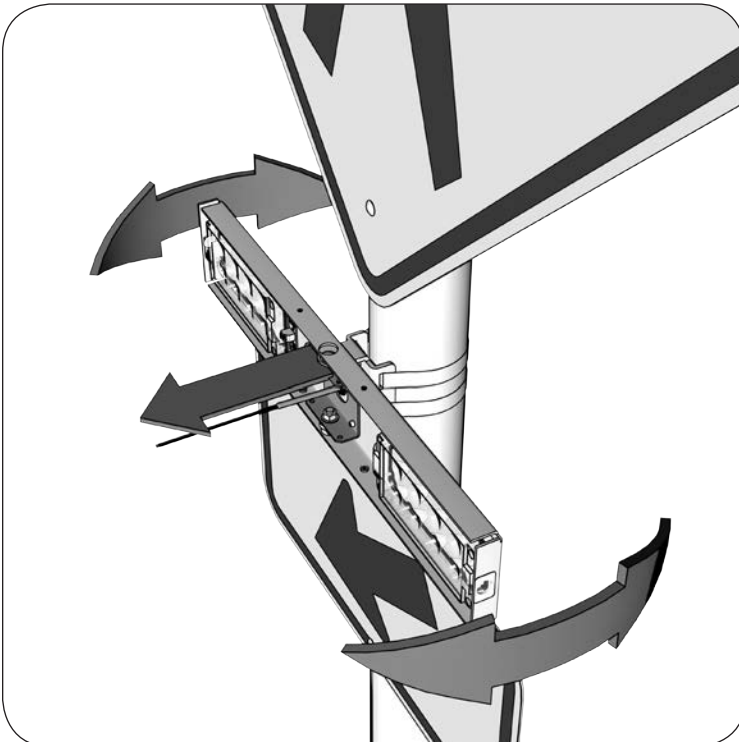
14

Bolt the light bar to the universal bracket, ensuring the star washers are inserted between the brackets.

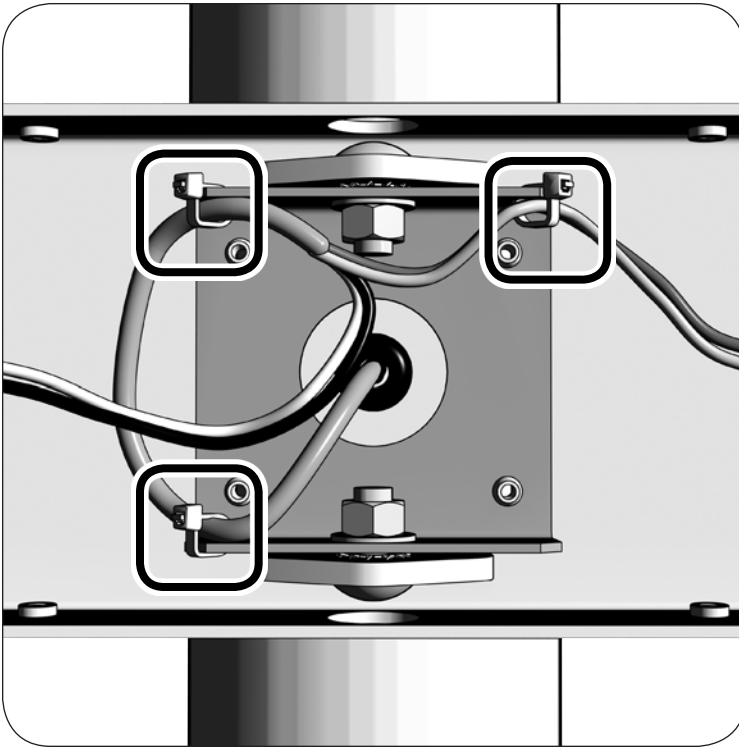


15

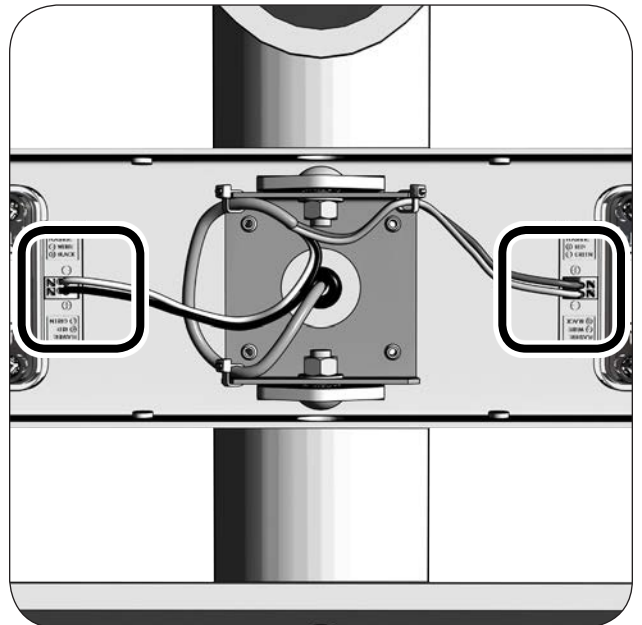
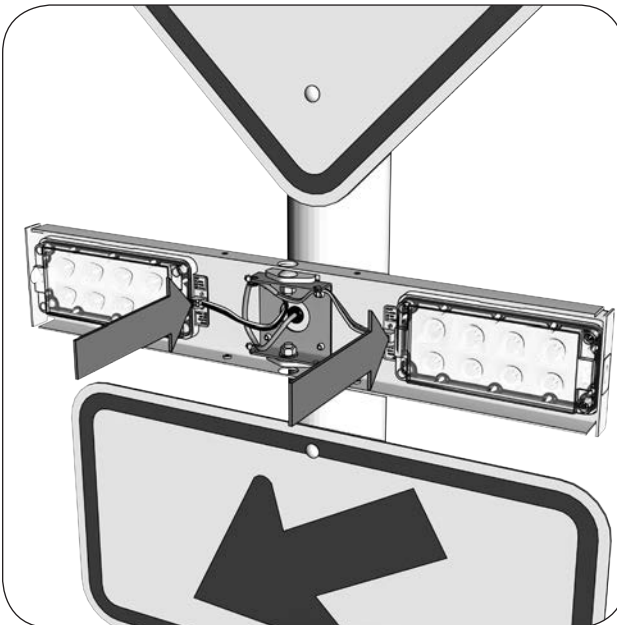
Align the light bar toward the traffic as required, and tighten mounting nuts to lock in place.



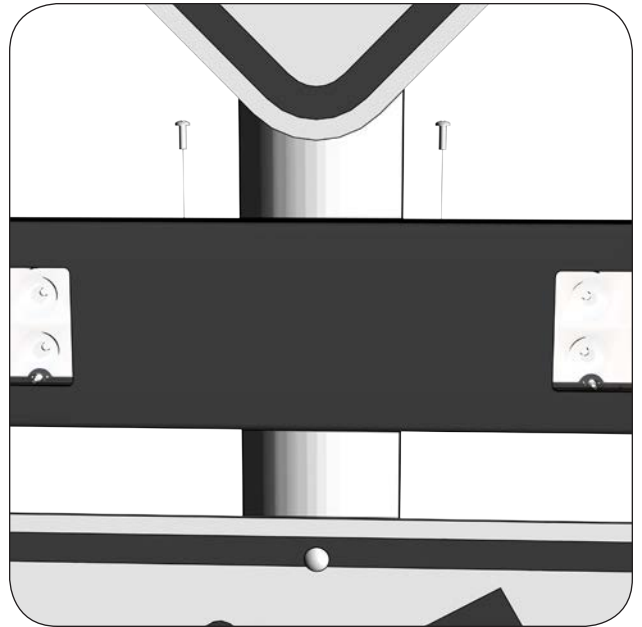
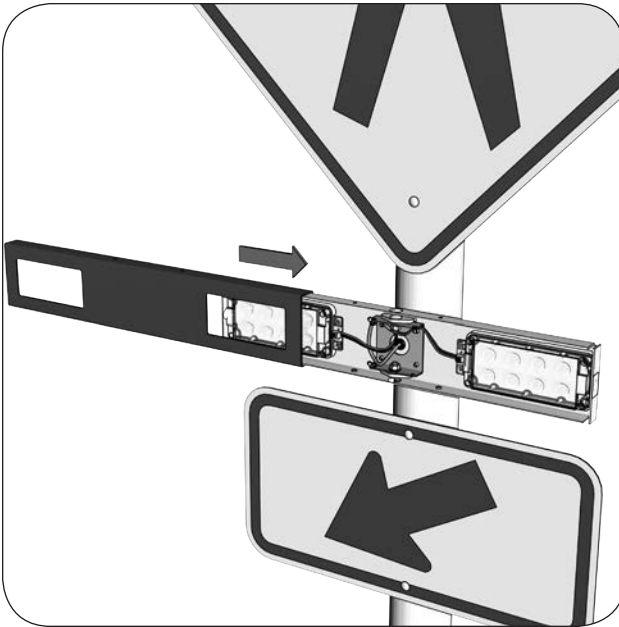
- 16 Secure the light bar cable using supplied cable ties as shown.



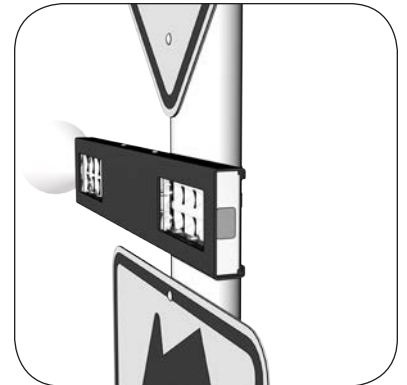
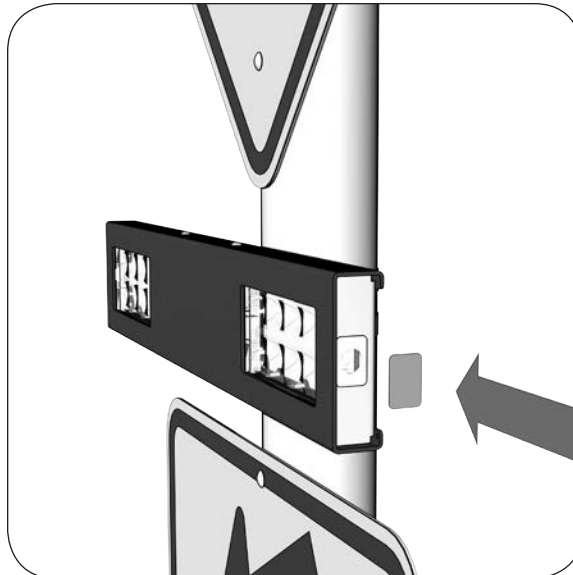
- 17 Push the light bar wires into the light bar connectors, following the color scheme as noted on LED.



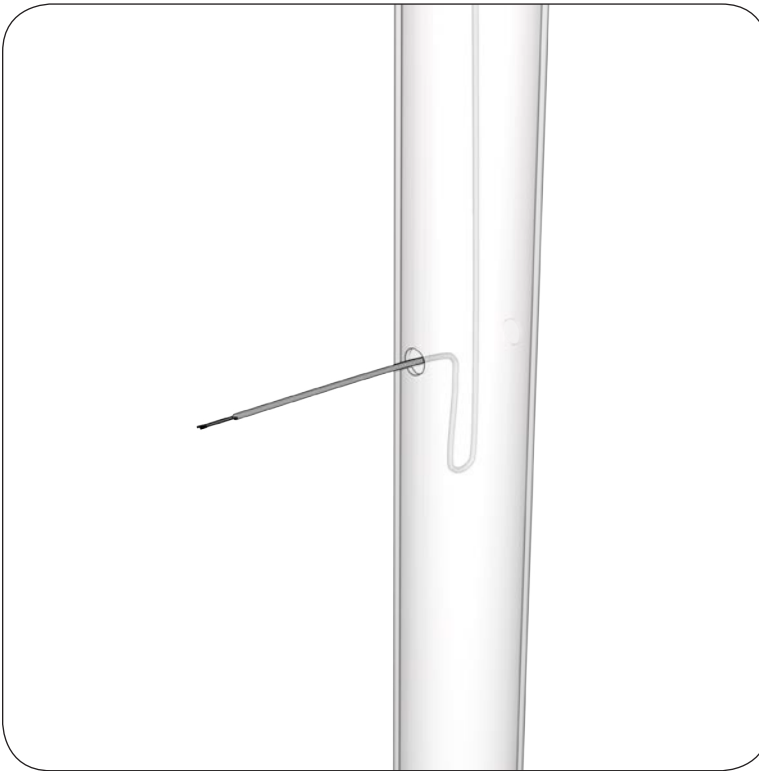
- 18 Slide on light bar cover and secure with provided screws.



- 19 If the pedestrian confirmation light is not required in one direction, use the supplied opaque label to cover the indicator light.

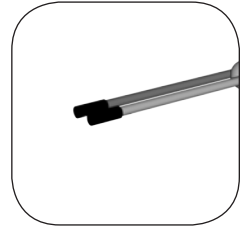


- 20 Feed the push button cable through the post, creating a drip loop.

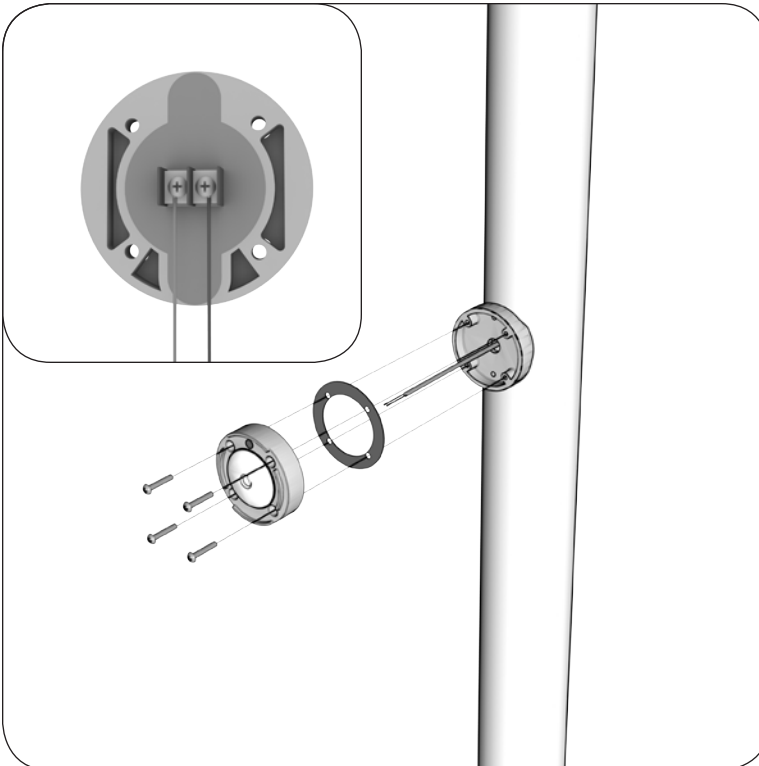


NOTE

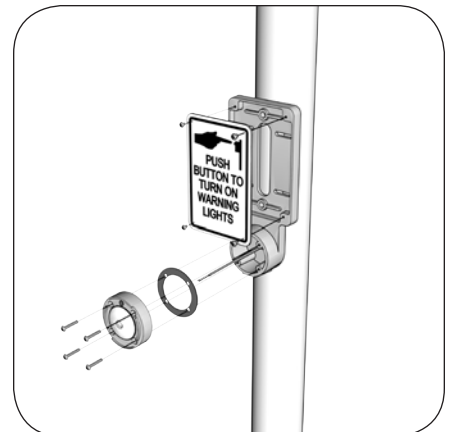
If there is no push button on the pole (such as an advance RRFB) then insulate the ends and secure the wires.



- 21 Attach the button mounting adapter to the pole, connect the button cable to the button and attach the button to the mounting adapter.



Optional push button with sign and sign mount



22

If the optional audible push button was ordered, there will be an additional controller card in the cabinet and the audible push button(s) will be included in the shipping box.

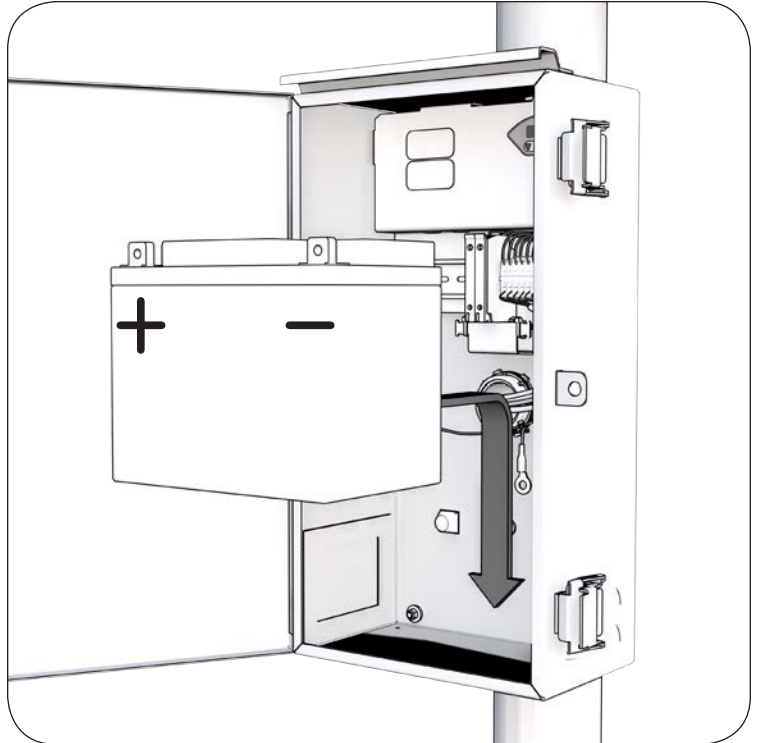


Install audible push button, running the cable from the pole, down the back of the button and into the compartment at the bottom of the button. Replace the button connection compartment cover.



23

Install the Battery, connecting each battery terminal to the correct polarity.

**ELECTRICAL
SHOCK
HAZARD****NOTE**Battery should be
installed with the
terminals facing outward.

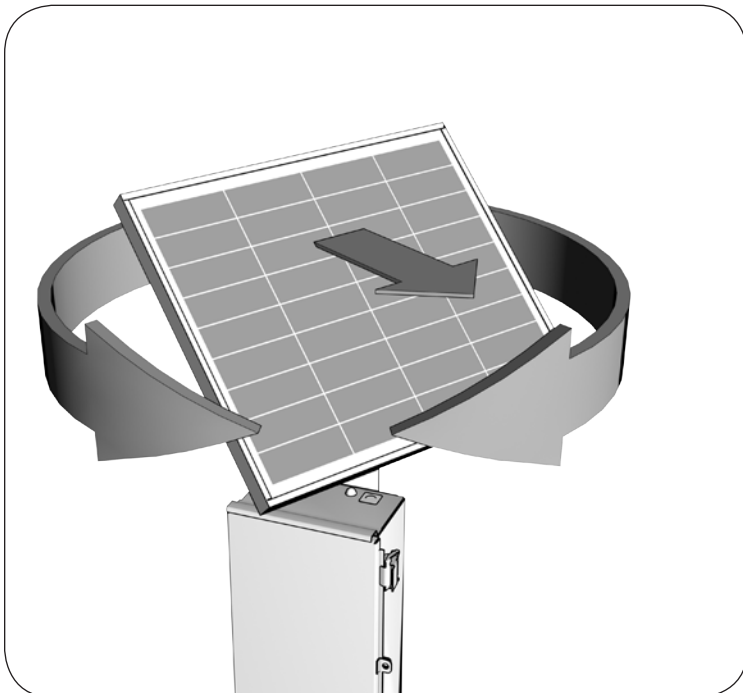
24

The system is factory programmed to operate and communicate to other units without configuration once the battery is connected. See 'EMS Programming and Testing' section to adjust default settings and to perform system testing. Close and secure cabinet door.



25

Ensure the solar panel is facing the equator (pointing south if you are in the northern hemisphere).



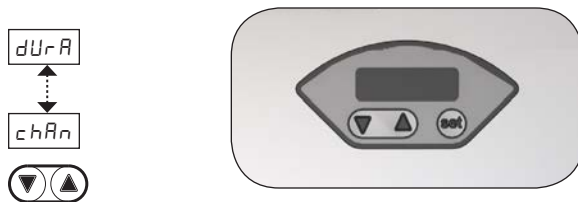
EMS Programming and Testing

The Energy Management System (EMS) has several programming functions and settings. These are accessed through the Onboard User Interface (OBUI). This section discusses the various functions, settings and operation.

EMS Onboard User Interface Operation

The EMS OBUI has three buttons to navigate and change settings and activate functions as required. The up button, down button and set button are used to scroll through menus, access and change settings, and accept new settings.

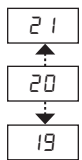
Use the up and down buttons to scroll through the menu.



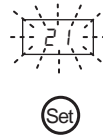
Press and hold the set button to edit a setting. The display will blink when the setting is ready to edit.



Use the up and down buttons to adjust the setting when in edit mode.



Press and hold the set button to accept the new setting. The display will flash 3 times to indicate the setting has been accepted.



Functions and Settings

The functions and settings are accessed through the OBUI via a menu system. On the next page is the menu hierarchy and a description of the function or setting.

NOTE

Only these items in the menu system are adjustable settings: dUrA*, chAn, nltE*, AAA*, tEst, bArS, blSt

*Networked settings. Changes to these settings will affect all systems on the same radio channel.

<p>ALERT!</p> <p>LED</p> <p>SHrt</p> <p>oPEn</p>	<p>LEd: LED flasher fault alert. This alert only appears if there is a problem with the LED flasher(s). Use the tESt function or press the pedestrian push button to clear the alert once the problem has been resolved</p> <p>SHrt: LED flasher is shorted. Correct the short to return to normal operation.</p> <p>oPEn: LED flasher has an open circuit. Check the LED wiring, correct the problem to return to normal operation.</p>
<p>bAtt</p> <p>good</p> <p>chAr</p> <p>Lo</p> <p>bAd</p> <p>00.00</p>	<p>bAtt: Battery status and voltage. When the batteries are first connected, the system will display this item, if no faults are present.</p> <p>good: Batteries are charged.</p> <p>chAr: Batteries require charging. This indicates that the batteries are not at full charge, but the battery is still healthy.</p> <p>Lo: Batteries have very low voltage. The batteries are not recharging enough or may be faulty. This can affect proper operation.</p> <p>bAd: Battery needs replacing. The batteries can not retain a charge or have been depleted beyond recovery.</p> <p>00.00: Battery voltage, displayed in volts. Normal battery voltage should be above 12.0 V.</p>
<p>SoLr</p> <p>nl tE</p> <p>dAY</p> <p>00.00</p>	<p>SoLr: Solar sensor status.</p> <p>nl tE: Solar sensor is not detecting light (nighttime). This can be simulated by covering the ambient light sensor on top of the engine.</p> <p>dAY: Solar sensor is detecting light (daytime).</p> <p>00.00: Solar panel voltage. This voltage can range depending on the current solar conditions.</p>
<p>dUrA</p> <p>20</p>	<p>dUrA: Duration of the flash. The system will flash for the set number of seconds after a pedestrian push button has been pressed.</p> <p>20: Duration in seconds, ranging from 10 to 60 seconds, in 1 second increments.</p>
<p>chAn</p> <p>5</p>	<p>chAn: Radio channel for synchronized systems. This channel must be the same on all systems in order for them to synchronize.</p> <p>5: Selected channel, range from 1 to 16. Factory default is 5.</p>
<p>nl tE</p> <p>30</p>	<p>nl tE: Nighttime dimming level. During the darkness of night, the system will dim to this level as full brightness is not required.</p> <p>30: Percent of daytime level, from 10 to 50%.</p>
<p>AAA</p> <p>on</p> <p>oFF</p> <p>10</p>	<p>AAA: Ambient light auto-adjust settings. The system will automatically adjust to the surrounding light conditions when the AAA is on.</p> <p>on: Ambient light auto-adjust is on.</p> <p>oFF: Ambient light auto-adjust is off.</p> <p>10: Ambient light auto-adjust dim level. Reports what the current adjustment level is, ranging from 1 to 10.</p>
<p>ALC</p> <p>100</p>	<p>ALC: Automatic light control energy savings level.</p> <p>100: Percentage of normal energy output. Ranges from 25% to 100%. 100% would indicate normal operation.</p>
<p>tESt</p> <p>YES</p> <p>no</p>	<p>tESt: Test the system and clear any fault warnings.</p> <p>YES: Tests the system by activating the LED flashers.</p> <p>no: Skips the test, does not clear any warnings.</p>
<p>btttn</p> <p>no</p> <p>dEt</p> <p>Shrt</p>	<p>btttn: Button press detection status. If a button was recently pressed, it will display dEt to help troubleshoot and test the system.</p> <p>no: No button press detected.</p> <p>dEt: Button press was detected.</p> <p>Shrt: Short detected in button or harness.</p>
<p>rAdo</p> <p>dEt</p> <p>no</p>	<p>rAdo: Radio installed status. If the system is able to find and activate a radio, it will display dEt.</p> <p>dEt: Radio is installed.</p> <p>no: No radio was detected.</p>
<p>Act</p> <p>0</p>	<p>Act: Activation count. Counts the number of activations and averages the last 90 days.</p> <p>0: Average daily activations over last 90 days.</p>
<p>bArS</p> <p>2</p>	<p>bArS: Number of LED flasher bars connected. Set this to match the number of LED flasher bars connected to the Solar Engine.</p> <p>2: The number of LED flasher bars, 1 or 2.</p>
<p>blSt</p> <p>YES</p> <p>no</p>	<p>blSt: Built in system test.</p> <p>YES: Activates the built-in system test.</p> <p>no: Skips the built-in system test.</p>
<p>vEr</p> <p>0.0.0.0</p>	<p>vEr: Firmware version number.</p> <p>0.0.0.0: The firmware version number.</p>

System Testing

Testing the LED Flashers

The OBUI has a test function (tESt, see previous section) that activates the flashers independently of a physical push button test. Activating this function through the OBUI, as described in the previous section, will operate the flashers for the set period of time. If this activates the flashers properly, and the flashers will not operate with the pedestrian push button, then there may be a fault with the push button or the wiring to the button.

Built-in System Test

The OBUI has a built-in system test function (bISt, see previous section). Activating this function through the OBUI, as described in the previous section, performs the system test. After the test completes, it will display any errors or 'PASS' if no error is detected.

Possible errors include:

Code	Error
0002	Severe temperature detected
0004	Onboard processor has failed
0008	Battery issue detected
0010	There is a problem with the supply voltage
0020	Keypad failure detected
0040	Internal communication failure
0080	There is a problem with the ambient brightness sensor
0100	There is a problem with the charging circuit
0200	There is a problem with the flashing light bars

LED Fault Message

The EMS performs an internal test during start up to check for any shorts or open circuits in the LED flashers and the associated wiring. This message is displayed on the OBUI before any other menu item. Use the tESt function or press the pedestrian push button to clear the alert once the problem has been resolved.

Setting the Radio Channel

In order for the entire crosswalk set to operate when a pedestrian push button is activated, the SC315 utilizes an on board radio to communicate to the other units that make up the crosswalk set. The radio channel for all of the units must be set to the same radio channel. Adverse behavior will result if the same radio channel is not set on all of the units in a crosswalk set.



If there are two crosswalks set in close proximity to each other, but are intended to operate independently, then a different radio channel for each set will be required. The factory default for the radio channel is 5.

Radio Network Settings

Some of the EMS settings are synchronized across the units in a crosswalk set on the same channel.

Once the networked setting is changed on one system, the networked settings will be transmitted and synchronized with the system that was just updated.



If there are two crosswalks sets in close proximity to each other and on the same radio channel, the networked settings may be transmitted and synchronized with the system that was just updated.

These settings are synchronized across the crosswalk set: dUrA, nItE, AAA. See the Functions and Settings section for an explanation on these settings.

NOTE

Changes to the networked settings can be made from any one of the units in a crosswalk set.

Maintenance & Product Care

The SC315 solar engine is designed to operate reliably for years with virtually no need for maintenance. Carmanah recommends routine inspections of the solar panel to ensure that they are unobstructed by anything that may prevent effective solar charging, including:

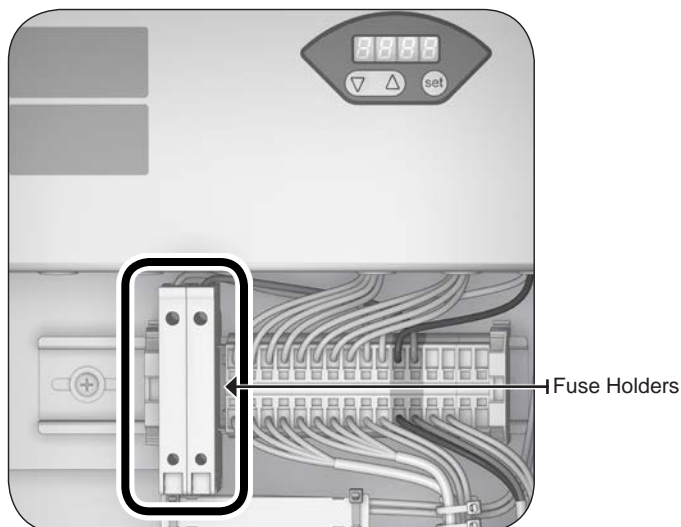
- dirt and dust
- snow
- leaves
- debris
- shade that may have developed after installation due to adjacent plant growth.

The frequency of the inspections depends on location and local weather patterns. A yearly visual inspection of the SC315 is typically sufficient. The SC315 is designed to be maintenance free, however maximum system performance will be achieved when the LED lenses and solar panels are clean.

Fuse Replacement

A wiring fault during installation or maintenance can sometimes cause the battery fuses to blow. To replace the fuse:

1. Make sure you're not wearing any metal jewelry, or holding any tools or other conductive objects.
2. Disconnect the batteries.



3. Check all wiring for any faults that may have caused the fuse to blow.
4. Open the fuse holder apart and check the fuse.
5. Replace a blown fuse with an identical fuse - 7A, Littlefuse 031201.5.HXP, Carmanah part # 71800.

Battery Replacement

When the SC315 system's battery requires replacement, it is recommended that the original SC315 Battery be used (Carmanah part # 70774). If there is more than one controller at the installation site, it is recommended to replace all the batteries at the same time.



Battery replacement procedure should not be carried out in windy conditions. In all cases, the area at the base of the pole must be roped off to prevent people from being injured or killed by falling pieces.

EMS Recycling

Production of the EMS required the extraction and use of natural resources. The EMS may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle the EMS in an appropriate way that will ensure most of the materials are reused or recycled appropriately. Check your local municipality for electronics recyclers.

Troubleshooting

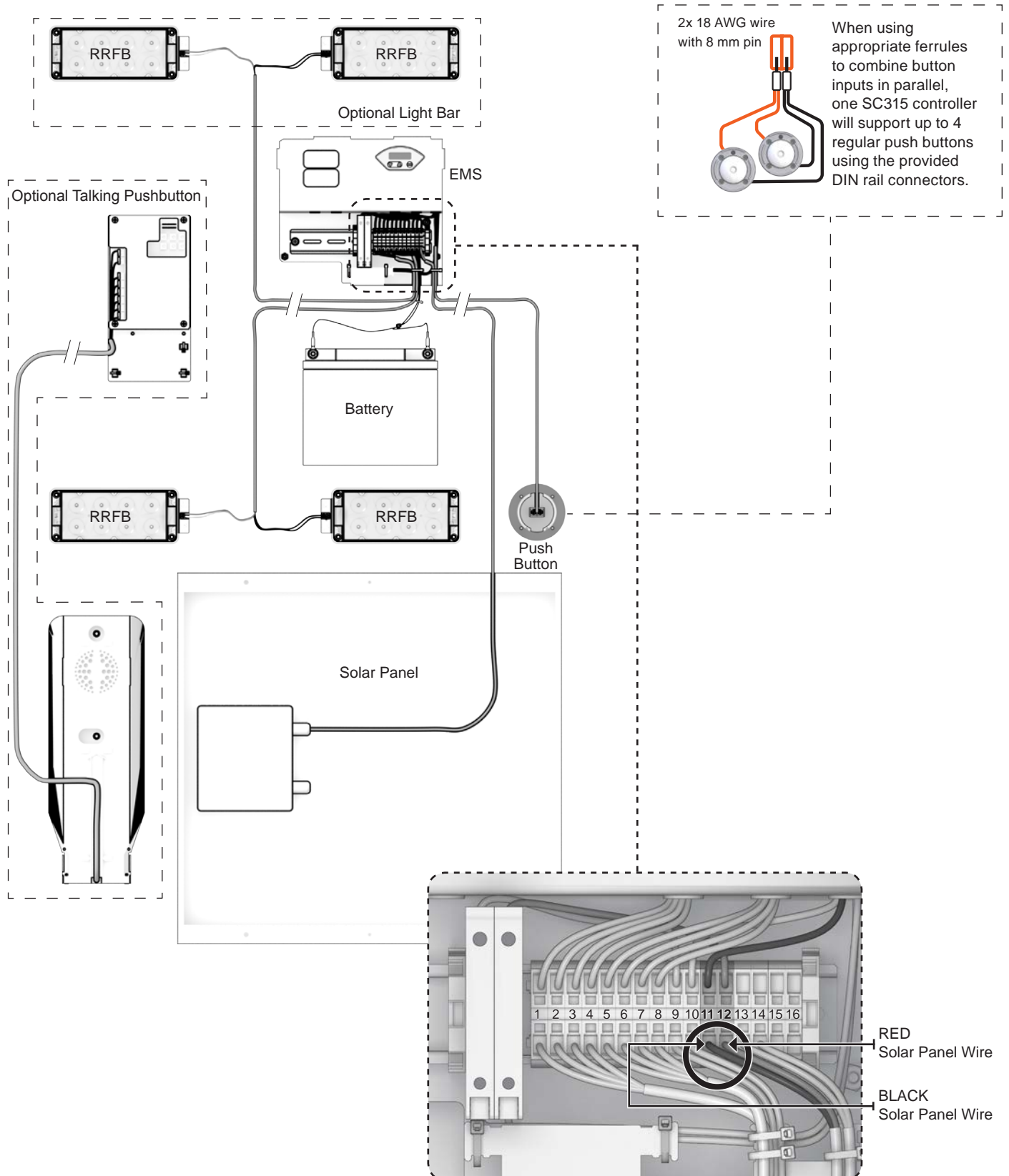
Symptom	Possible Cause - What to Check
The EMS does not activate, does not display any information, or the system does not activate.	<p>This is typically caused by low or no voltage from the batteries.</p> <p>Check both of the fuses. See the maintenance section of this manual for fuse information.</p> <p>Using a volt meter, measure the battery voltage. It should have a reading of 12.0 V or greater. If the voltage is very low, charge or replace the batteries and monitor the system for proper operation. Ensure that the solar panel is clean, clear of debris, and is not shaded by buildings or vegetation. If the solar panel is covered or shaded, this will prevent proper battery charging. Once the batteries have proper voltage, check the EMS for error codes and run the 'bSt' function. See the EMS Programming and Testing section of this manual.</p>
LEDs won't flash when button on same post is pressed	<p>This can be caused by either button failure, a wiring issue, low battery voltage, or the unlikely event of an EMS failure.</p> <p>Check to insure that the button is functioning and it is providing the typical feedback. If the button has an LED or audio feedback, ensure that these are working.</p> <p>Check the wiring to the button for continuity and make sure the wires are not pinched anywhere along their length.</p> <p>Check the wiring to the LED Light Bars for continuity and make sure the wires are not pinched anywhere along their length.</p> <p>Check that the wiring pattern (polarity) is correct on the LED Light Bars.</p> <p>Check the battery voltage, either through the OBUI or with a voltmeter (see item above)</p> <p>Check the OBUI for errors. See the EMS Programming and Testing section of this manual.</p> <p>Test the system using the OBUI 'tEst' function. See the EMS programming and testing section of this manual. If the LEDs flash using the OBUI functions, then the problem is in the button or wiring to the button.</p>
LEDs on same post flash, but other systems in the crosswalk set won't flash	<p>The SC315 communicate via a radio. If one system is activated, but the other systems in the crosswalk set are not coming on, this points to a radio issue.</p> <p>Ensure that all of the units in a crosswalk set are set to the same radio channel using the OBUI. See the EMS Programming and Testing section of this manual.</p> <p>Ensure that the units in a crosswalk set are not too far apart. The maximum distance for proper radio communication is 500 unobstructed feet. There can be no barriers or obstructions between systems, such as buildings or billboards.</p>
One Light Bar flashes, but the other Light Bar on the same post does not flash	<p>This is likely caused by improper wiring of the light bars.</p> <p>Ensure that the wire colors match the instructions on the Rectangular Flashers and in this manual. If they do not match then one light bar may not activate.</p>
One Rectangular Flasher flashes, but the other Rectangular Flasher on the same light bar does not flash	<p>This is likely caused by incorrect wiring on the LED Light Bars.</p> <p>Check each of the connections at the Rectangular Flashers to ensure correct wiring pattern (polarity).</p> <p>For a Dual Light Bar system with Single Pedestrian Confirmation Lights, ensure that both confirmation lights are pointing in opposite directions and that the wiring pattern is followed.</p>

Symptom	Possible Cause - What to Check
The LEDs are dim when flashing	<p>The battery voltage may be too low for proper operation and the system has activated the Automatic Light Control (ALC). Check the OBUI for ALC status and battery voltage. See the EMS programming and testing section of this manual. Ensure that the solar panel is clean, clear of debris, and is not shaded by buildings or vegetation. If the solar panel is covered or shaded, this will prevent proper battery charging and drive the system into ALC.</p> <p>Check for debris covering the Ambient Light Sensor on top of the Solar Engine.</p> <p>Set the number of light bars to the correct value on the OBUI. See the EMS Programming and Testing section of this manual.</p> <p>Check the Ambient light Auto-Adjust (AAA) setting on the OBUI. Turn off the AAA to see if this corrects the dim LEDs. See the EMS programming and testing section of this manual.</p>
The LEDs appear too bright when flashing	<p>Settings on the EMS can affect the apparent brightness of the LEDs.</p> <p>Set the number of light bars to the correct value on the OBUI. See the EMS Programming and Testing section of this manual.</p>
Lights flash when no button is pressed	<p>This is likely caused by another nearby system on the same radio channel activating this system.</p> <p>Ensure that all of the units in a crosswalk set are set to the correct radio channel using the OBUI, ensuring that nearby systems at a different location are using a different channel. See the EMS Programming and Testing section of this manual.</p>

Specifications

Mechanical Specifications	
Cabinet Dimensions	
Width	10.5" (267 mm)
Depth (not including mount)	6.5" (165 mm)
Height	19.5" (495 mm)
Weight	39.6 lbs (18 kg)
Solar Panel Dimensions	
Height, Width, Depth	26.2" x 21.1" x 1.38" (665 mm x 536 mm x 35 mm)
Tilt Angle	45 degrees (Top of pole mount)
Electrical Specifications	
System	
System voltage	12V (nominal)
System capacity	13 Ah
Overcurrent Protection	
Fuse	2 x 7 A
Type	Littlefuse 031201.5.HXP, Carmanah part # 71800
Solar Charge Controller	
Type	Maximum power point tracking 3 stage temperature compensated
Battery	
Quantity	1
Voltage	12 V (nominal)
Capacity	35 Ah
Solar Panel	
Power	45 W
Voc	22.2 V
Vmp	18.3 V
Imp	2.52 A
Isc	2.69 A
LED Driver	
Type	Constant current, buck - boost
Max output voltage	33 Vdc
Max output current	200 mA
Environmental	
Maximum wind zone deployment	110 mph
Operating temperature range	5 to 122° F (-15 to 50° C)

Wiring Layout



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Warranty

This product is covered by the Carmanah warranty.
Visit www.carmanah.com for additional information or
contact the customer service department.

Before contacting Carmanah's customer service
department, please have the serial number of your
system available, a brief description of the problem,
as well as all details of the installation.

To contact Carmanah's Customer Service
Department:

Mail: Carmanah Technologies Corporation
250 Bay Street
Victoria, BC Canada V9A 3K5

Phone: 1.250.380.0052
877.722.8877 (Toll Free in U.S. and Canada)

Fax: 1.250.380.0062

Email: customerservice@carmanah.com

Website: carmanah.com