carmanah®

R920

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 R920 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.
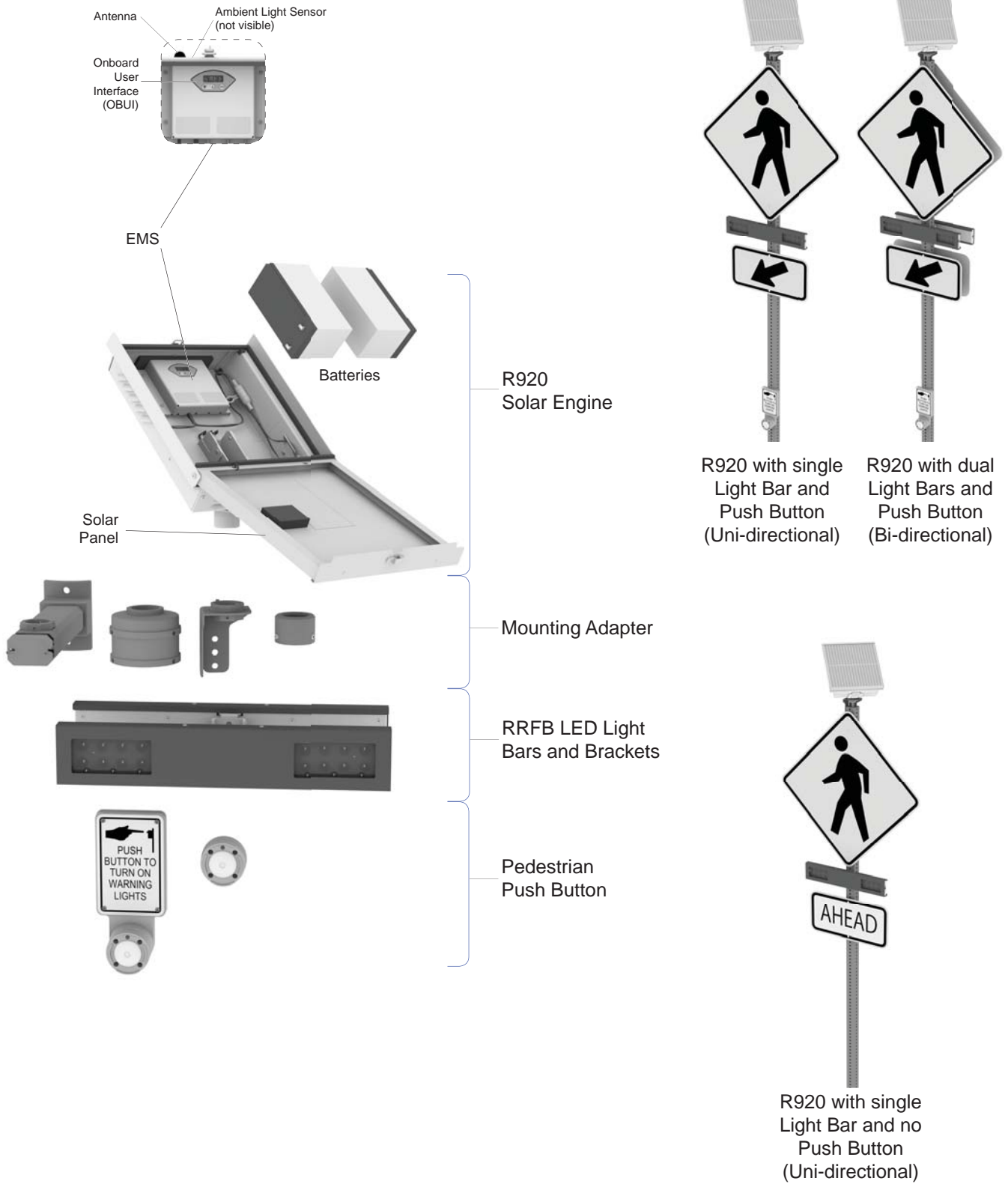
System must not be operated on one battery.

NOTE 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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Ambient Light Sensor
(not visible)

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(OBUI)

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RRFB LED Light
Bars and Brackets

PUSH
BUTTON TO
TURN ON
WARNING
LIGHTS

Pedestrian
Push Button

R920 with single
Light Bar and
Push Button
(Uni-directional)

R920 with dual
Light Bars and
Push Button
(Bi-directional)

AHEAD

R920 with single
Light Bar and no
Push Button
(Uni-directional)

Introduction

R920 series solar LED Rectangular Rapid Flashing Beacon products are ideal for pedestrian activated crosswalk applications.

System Components

The R920 series can be configured to meet a variety of crosswalk requirements. The following components make up each of these configurations:

- R920 Solar Engine, consisting of:
  - Energy Management System (EMS)
  - Chassis Assembly
  - Solar Panel
  - Batteries (2)
- Mounting Adapters for Various Post Size Options
- Flashing LED Light Bar(s)
- Universal Light Bar Bracket(s)
- Pedestrian Push Button(s)

The solar panels and EMS work together to charge the batteries during the day. The EMS controls the flow of power from the batteries to the flashing LED light bar(s).

System Configurations

The R920 series configurations are combined to create a complete crosswalk set. Each R920 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

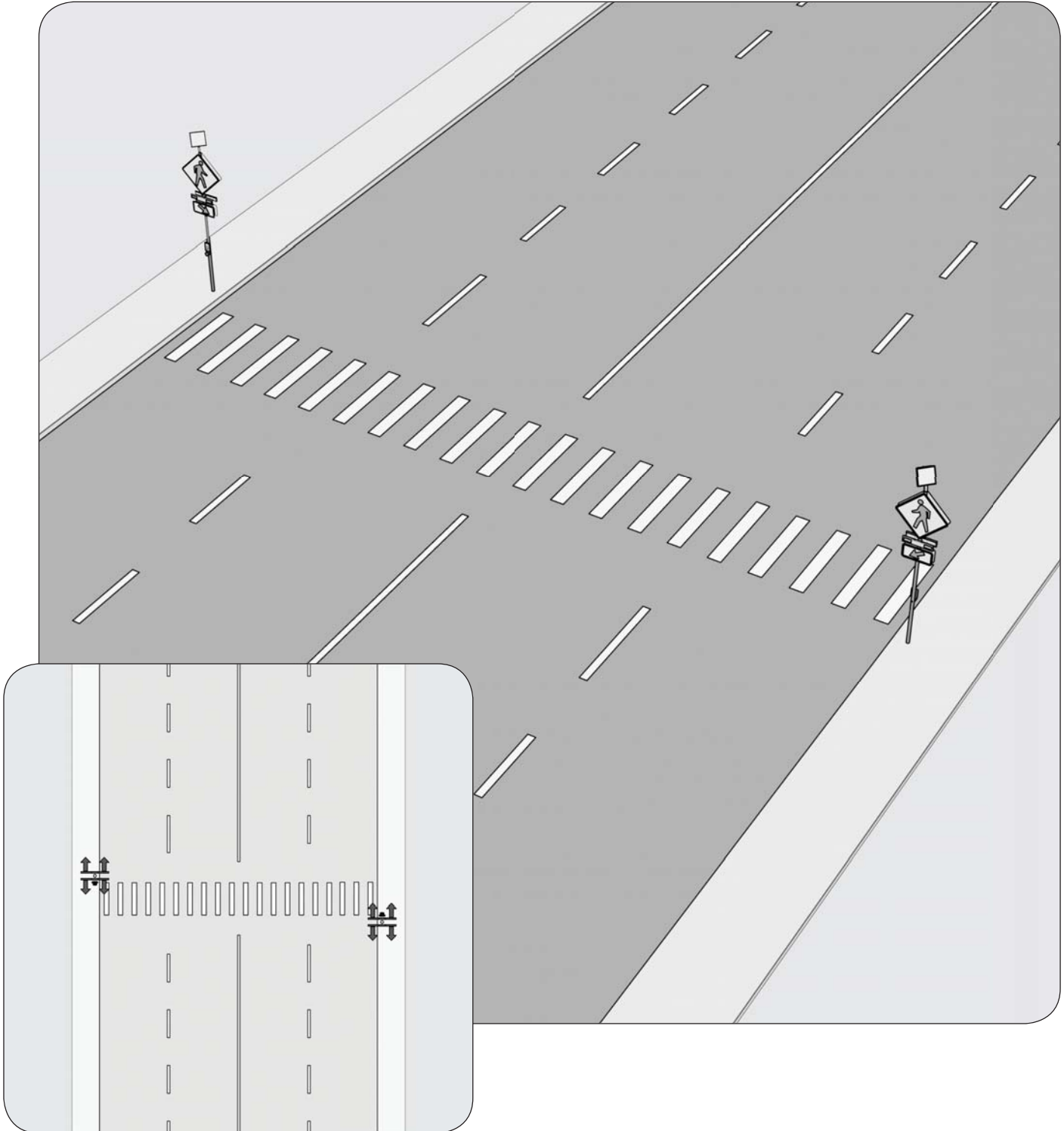Dual Light Bar, No Confirmation Light
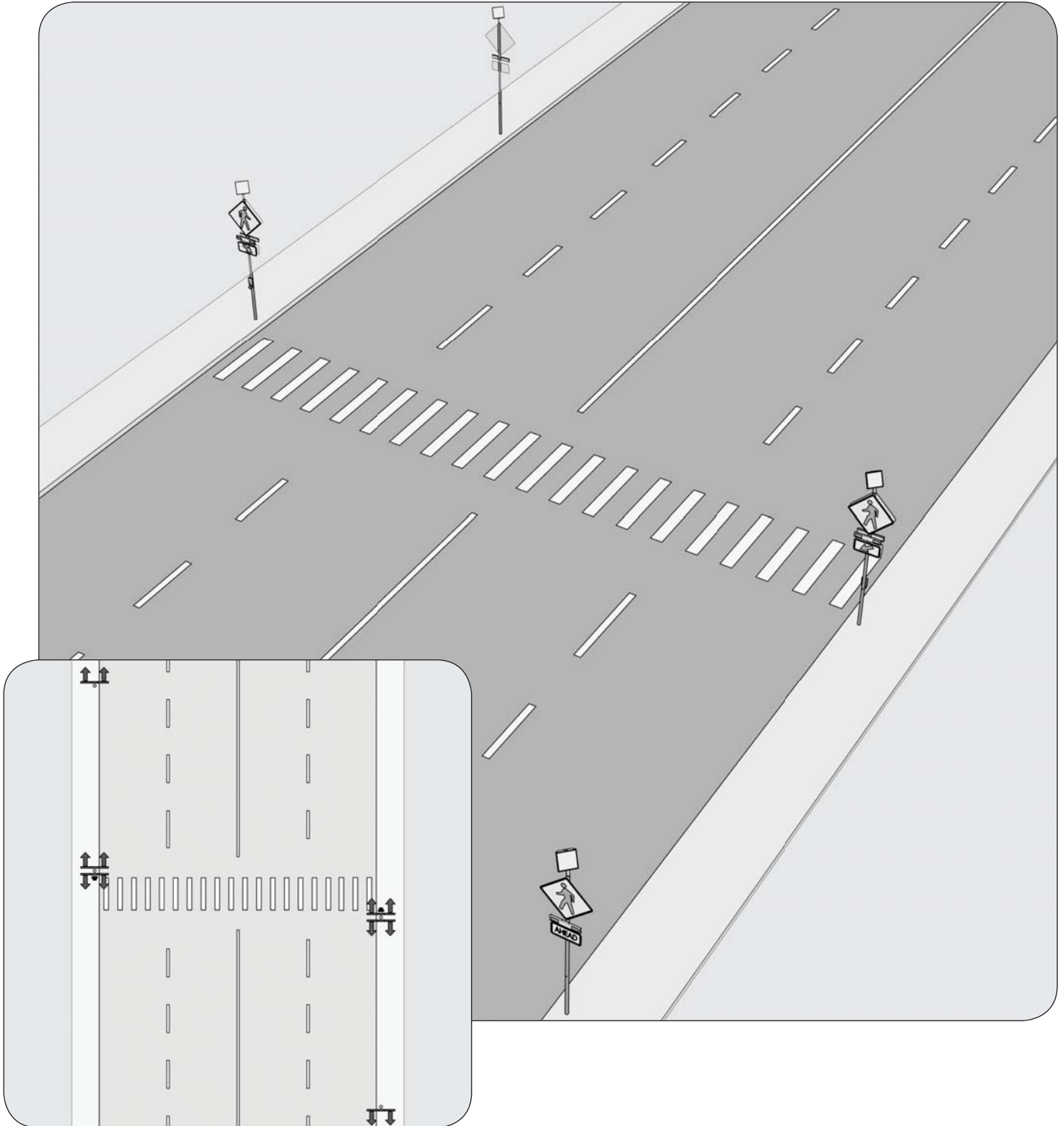

Dual Light Bar, Dual Confirmation Light
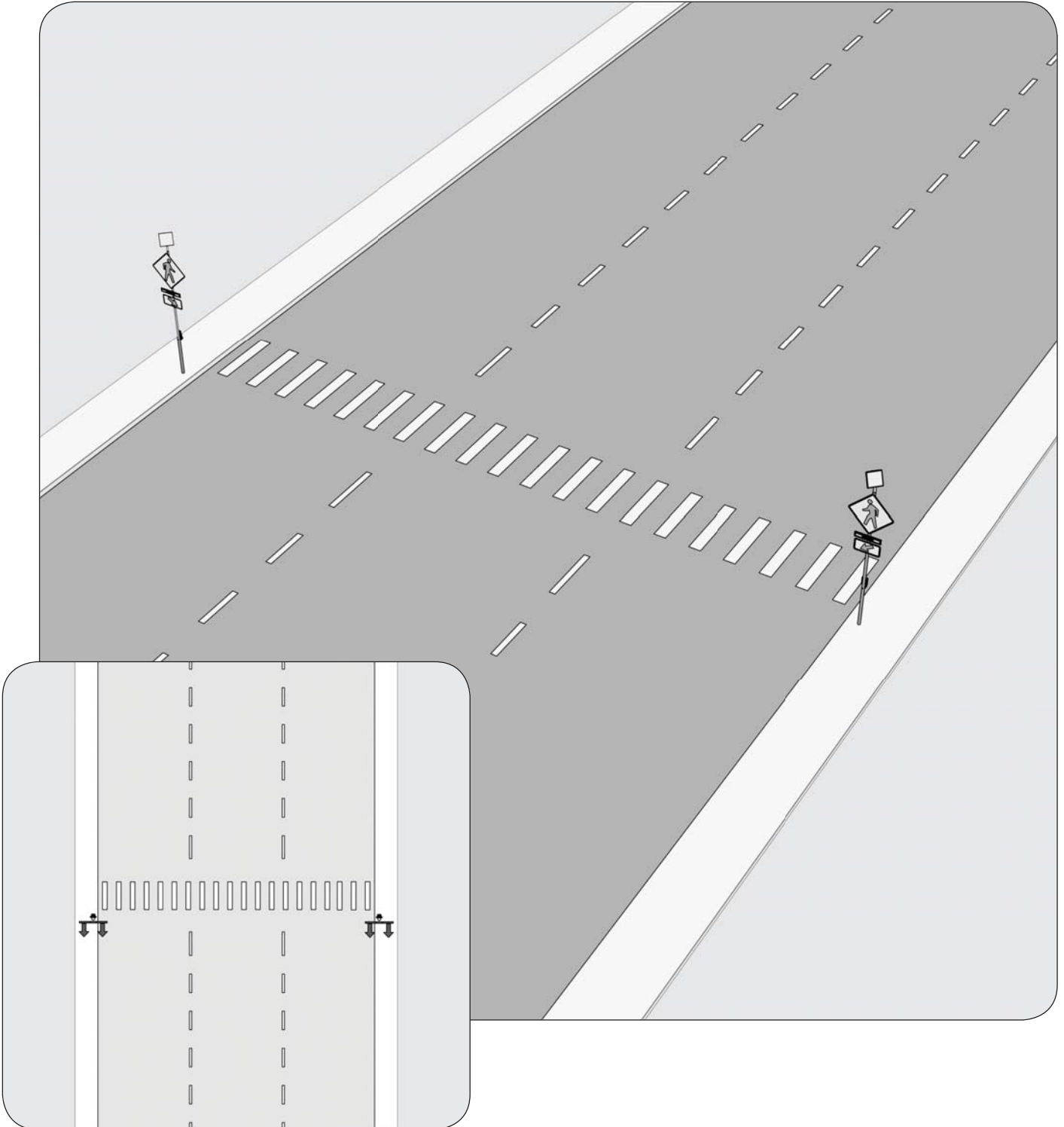
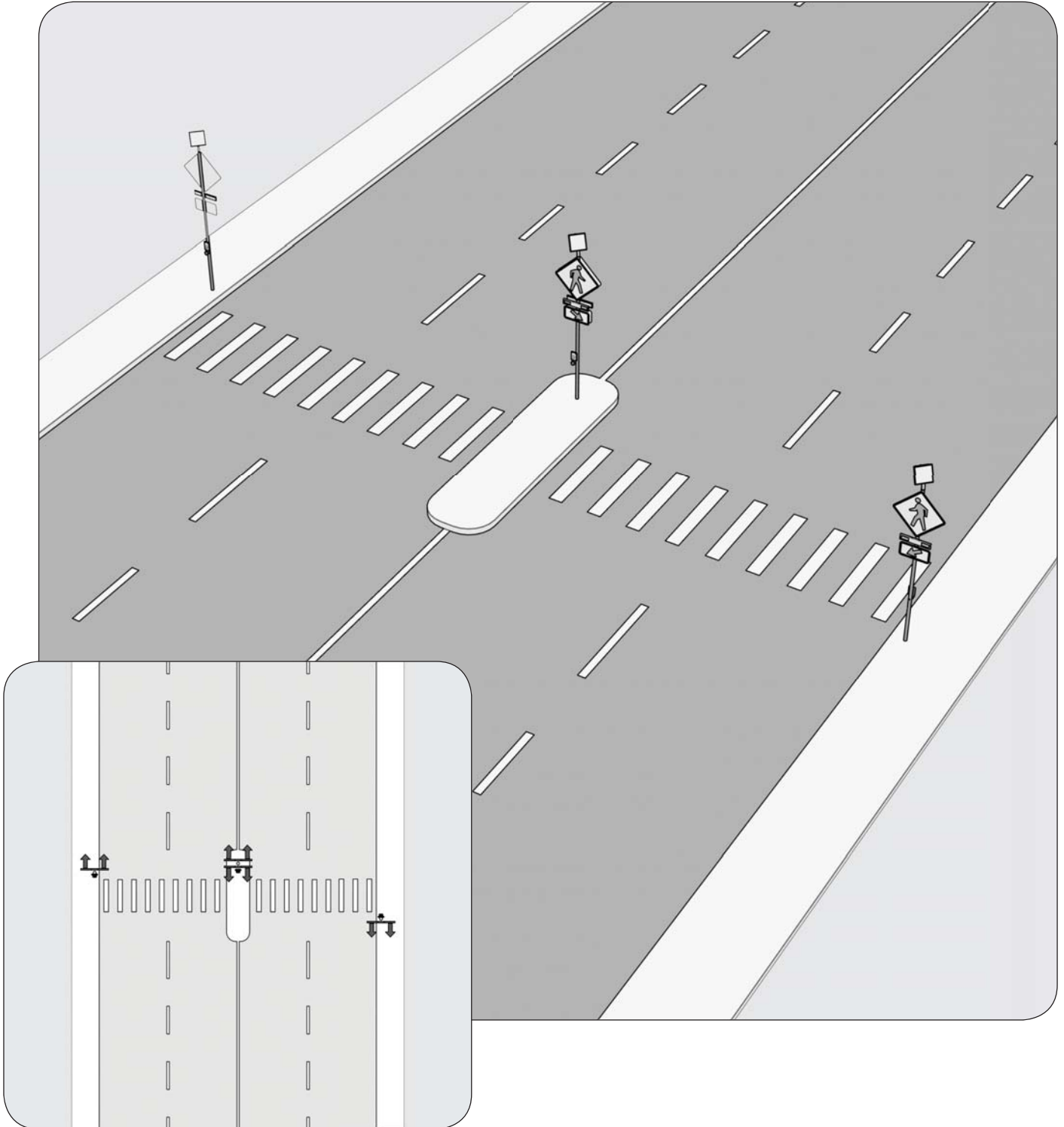## Typical Installations

Standard - Two-way Roadway
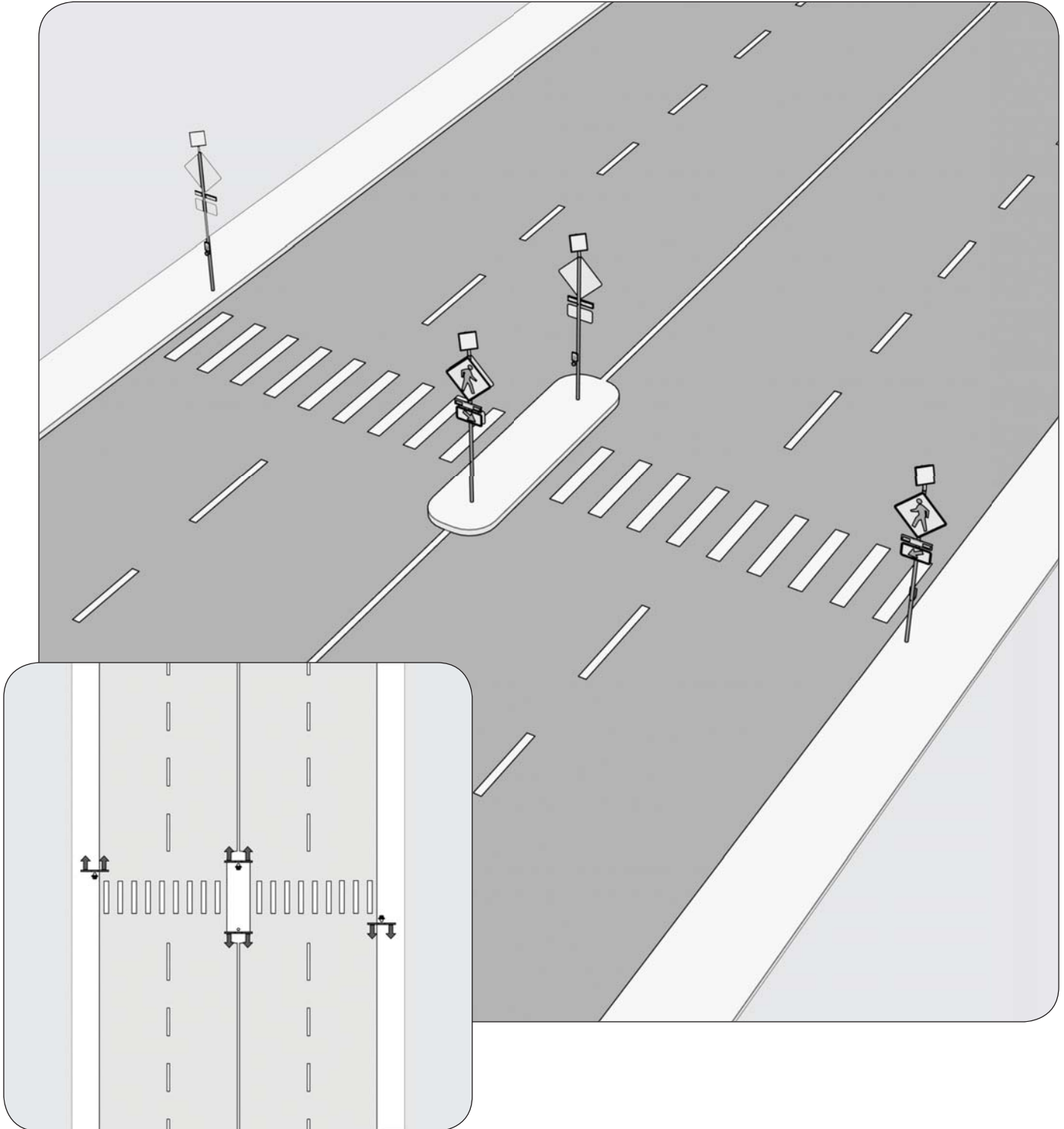
Advance - Two-way Roadway

Standard - One-way Roadway
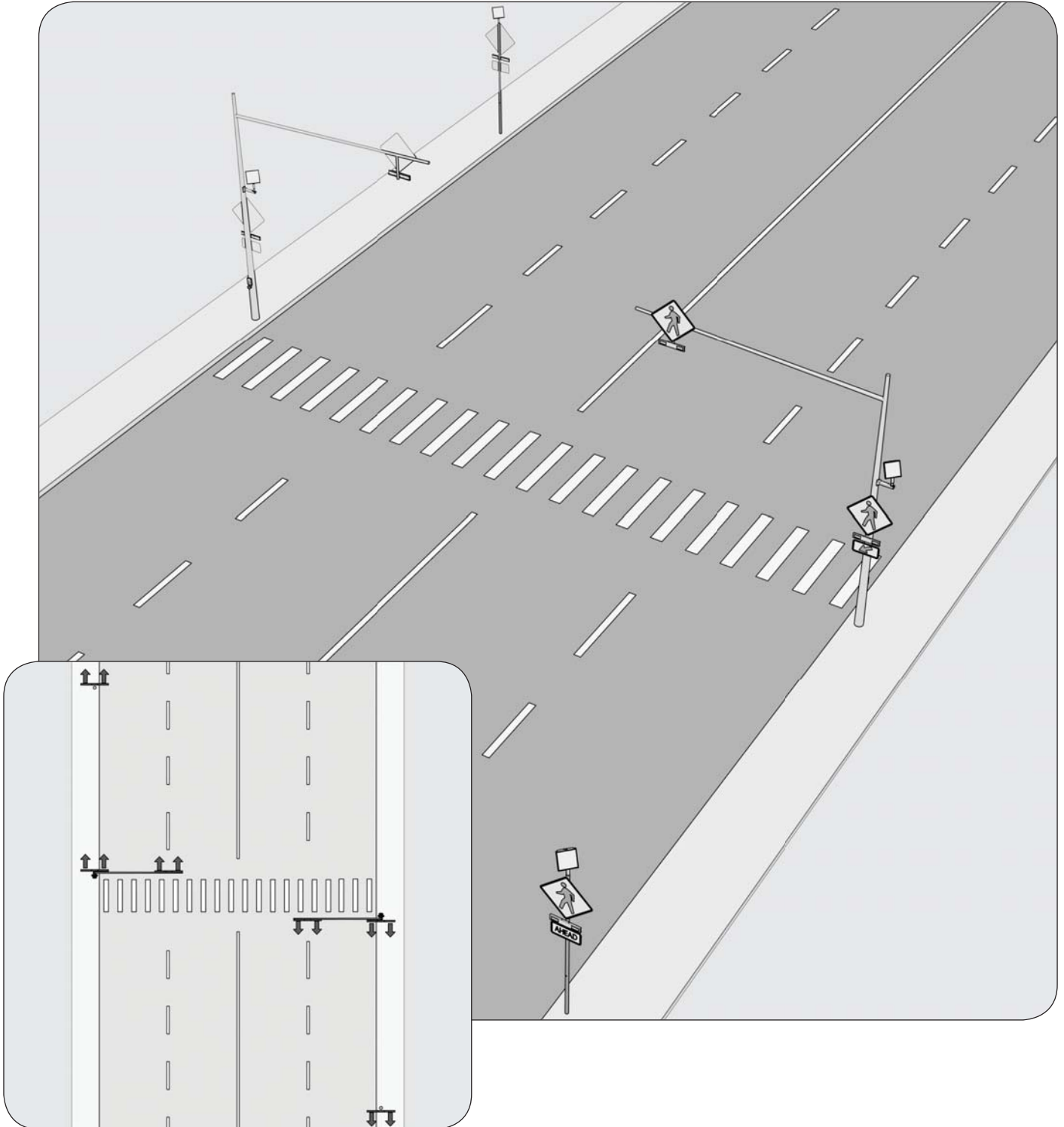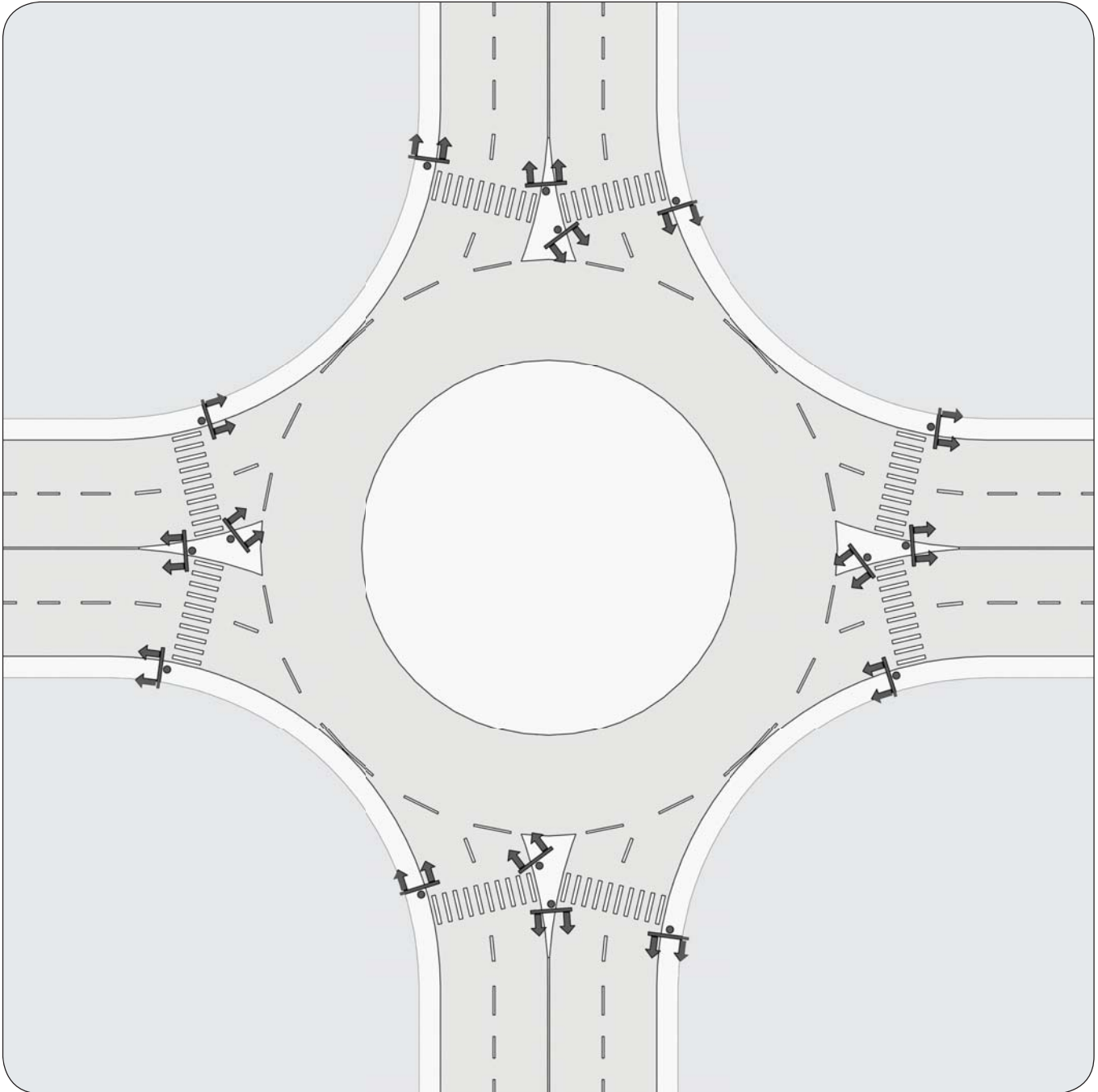
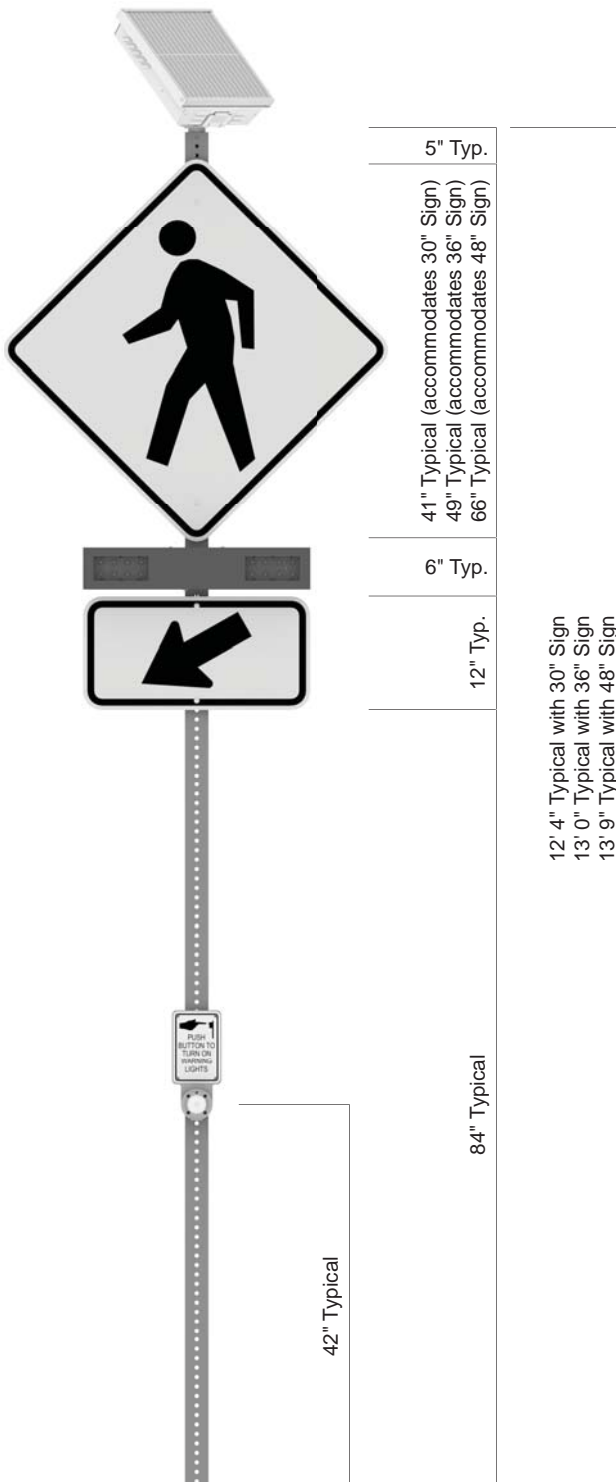Median - Two-way Roadway

Two Pole Median - Two-way Roadway

Overhead - Two-way Roadway

Roundabout

Typical Pole and Sign Configuration

5" Typ.

41" Typical (accommodates 30" Sign)
49" Typical (accommodates 36" Sign)
66" Typical (accommodates 48" Sign)

6" Typ.

12" Typ.

12' 4" Typical with 30" Sign
13' 0" Typical with 36" Sign
13' 9" Typical with 48" Sign

84" Typical

42" Typical

Installation

Summary

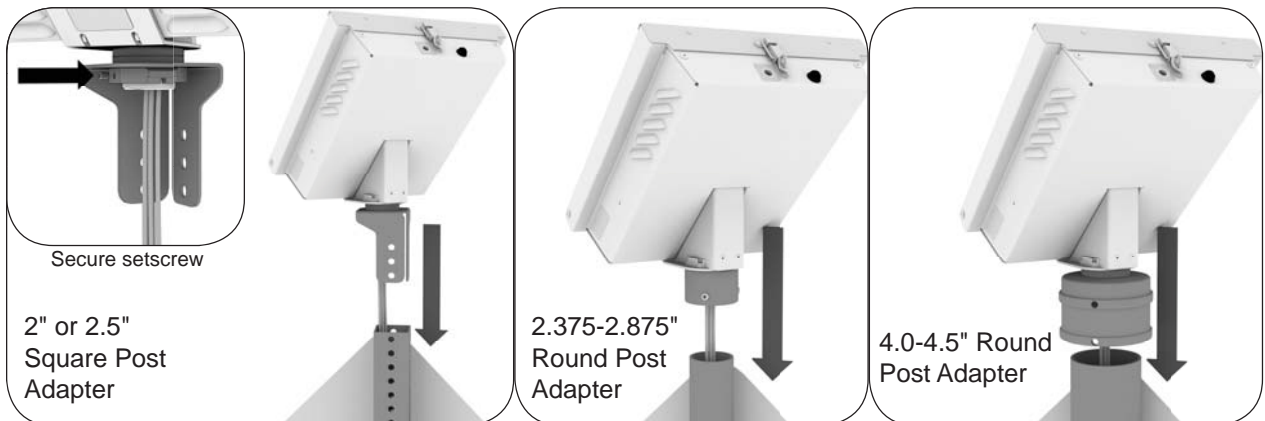Basic steps to install a R920 Solar LED RRFB:

1. Connect the mounting adapter to the solar engine.

2. Mount the solar engine on the post, feeding the cables down the post.

3. Mount the LED light bar universal bracket(s) to the post.

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. Mount the pedestrian push button to the post, pulling the cable through the push button mount and connect the wires to the push button.

6. Place the batteries into the solar engine, connecting them to the battery harness.

7. Configure the EMS as required using the onboard user interface.

8. Close the solar engine and ensure the solar panel is facing the equator (pointing south if you are in the northern hemisphere).
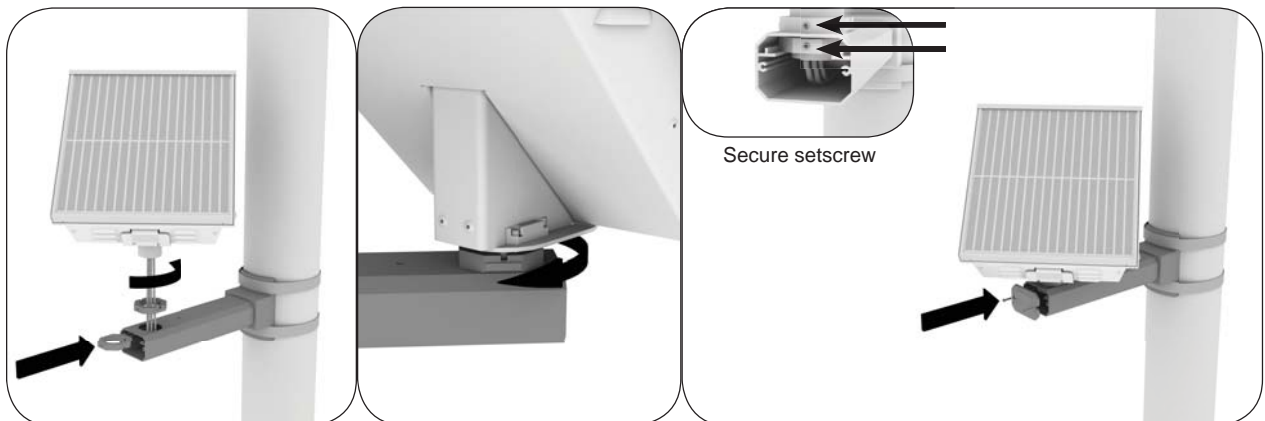
Step by Step Instructions

1 Attach the post adapter to the solar engine.

2" or 2.5" Square Post Adapter

2.375-2.875" Round Post Adapter

4.0-4.5" Round Post Adapter

2 Lower the solar engine onto the post, feeding the cables down the post.

Secure setscrew

2" or 2.5" Square Post Adapter

2.375-2.875" Round Post Adapter

4.0-4.5" Round Post Adapter

3 For a side mount, attach the solar engine to the retaining nut.

Secure setscrew

4) For a 2" or 2.5" perforated square post, secure the adapter to the post using appropriate fasteners.

2" Square Post = Adapter on outside

2.5" Square Post = Adapter on inside
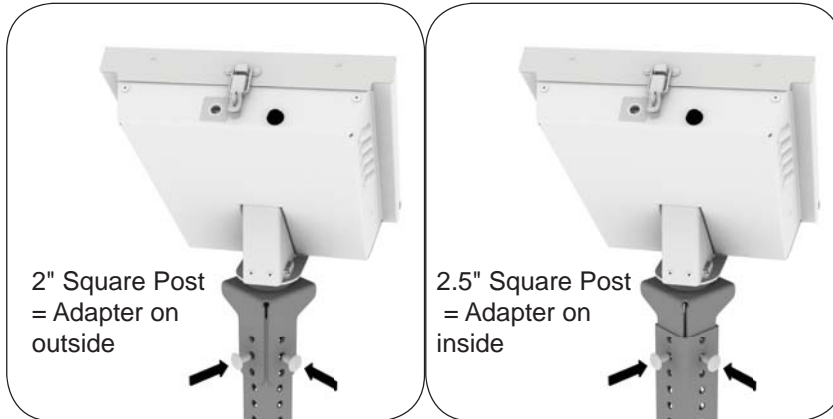
5) Feed the light bar cable(s) through the post, creating a drip loop.

Create drip loop for Light Bar cable
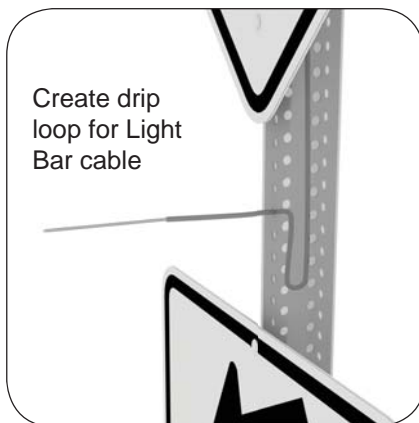
6) Mount the light bar universal bracket(s), feeding the light bar cable through the center of the bracket. Bolts and banding not supplied.

Single Light Bar on a 2.5" Square Post

Dual Light Bar on a 2.5" Square Post

Dual Light Bar on a 2" Square Post

Dual Light Bar on a 4" Round Post
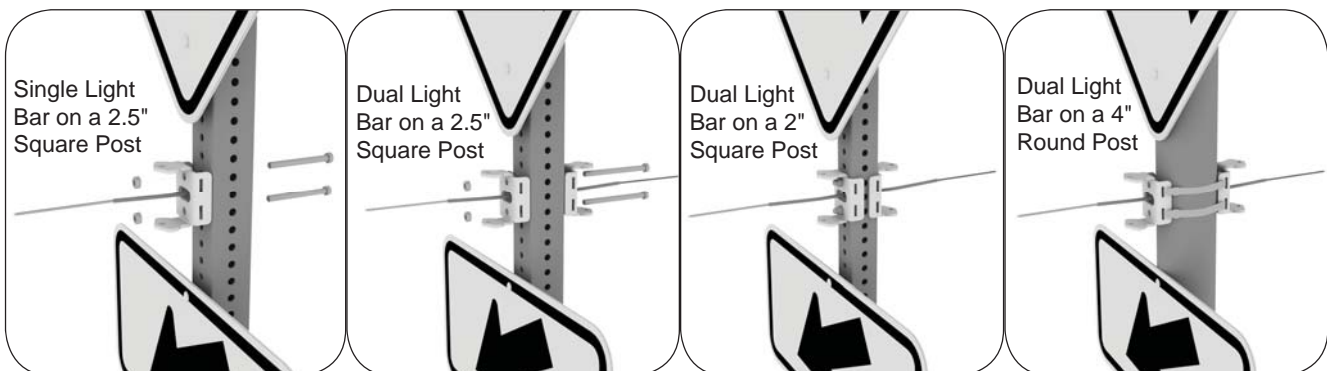
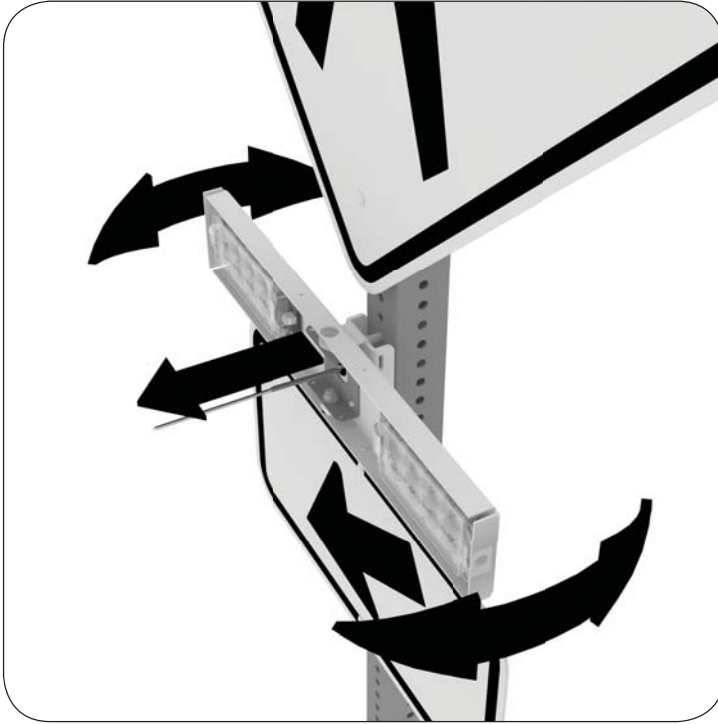7 Mount the light bar(s) onto the universal bracket(s), feeding the light bar cable through the housing.
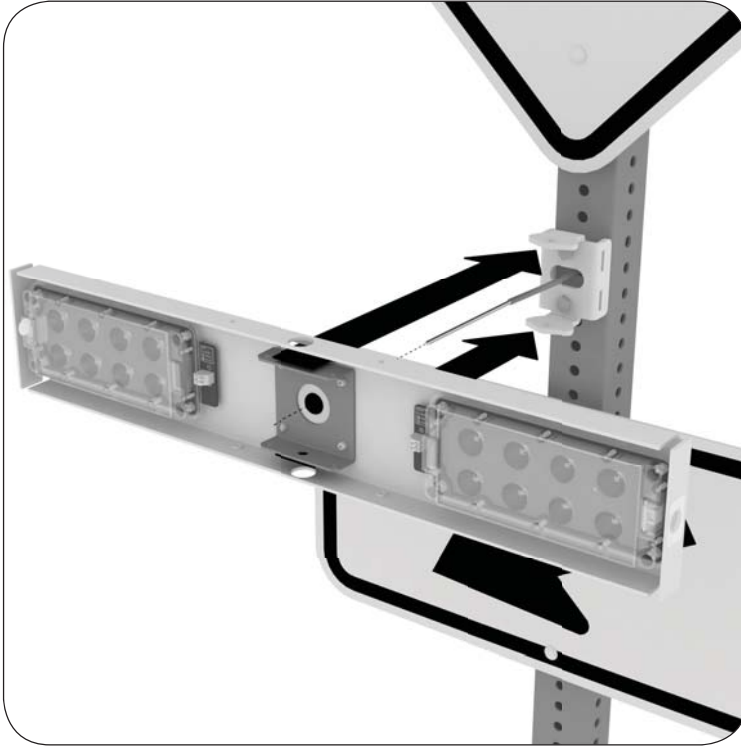
8 Bolt the light bar to the universal bracket, ensuring the star washers are inserted between the brackets.
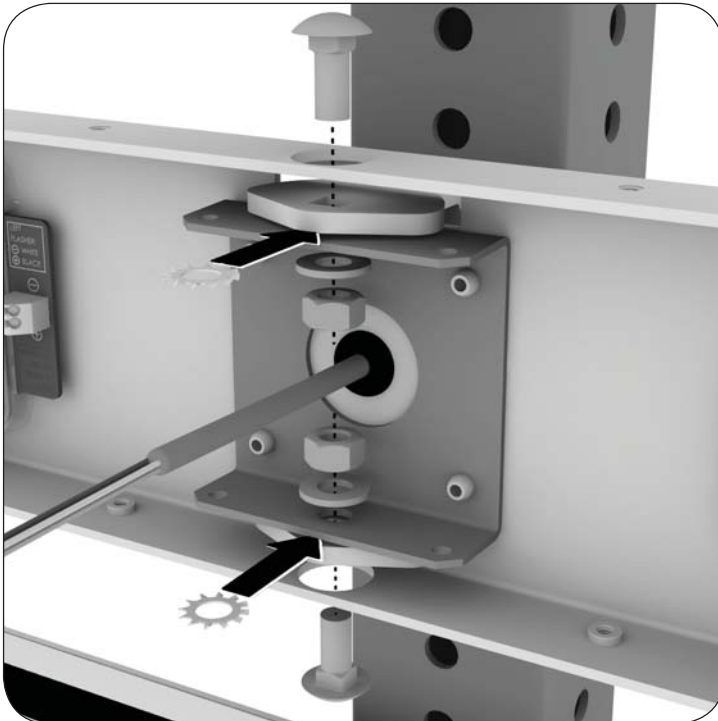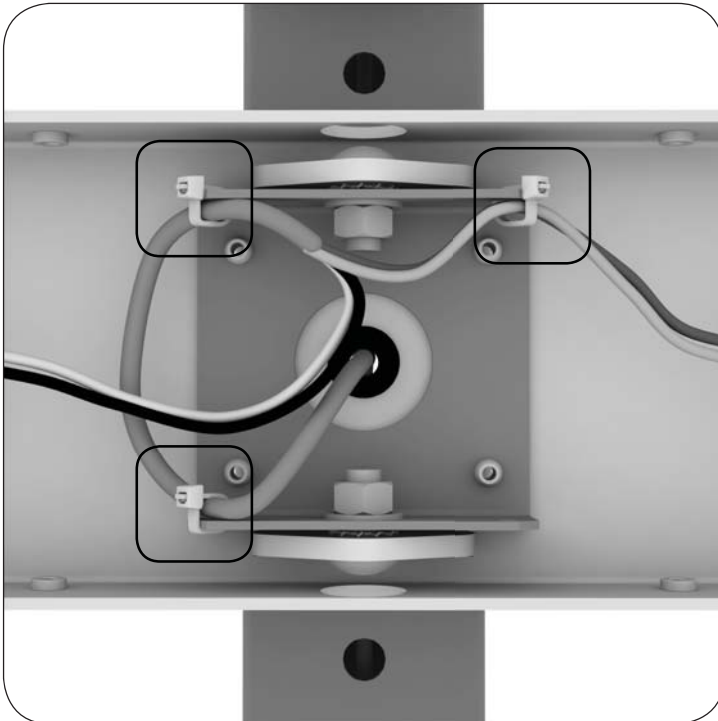
9 Align the light bar toward the traffic as required, and tighten mounting nuts to lock in place.

10 Secure the light bar cable using supplied cable ties as shown.

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11 Push the light bar wires into the light bar connectors, following the color scheme as noted on LED.
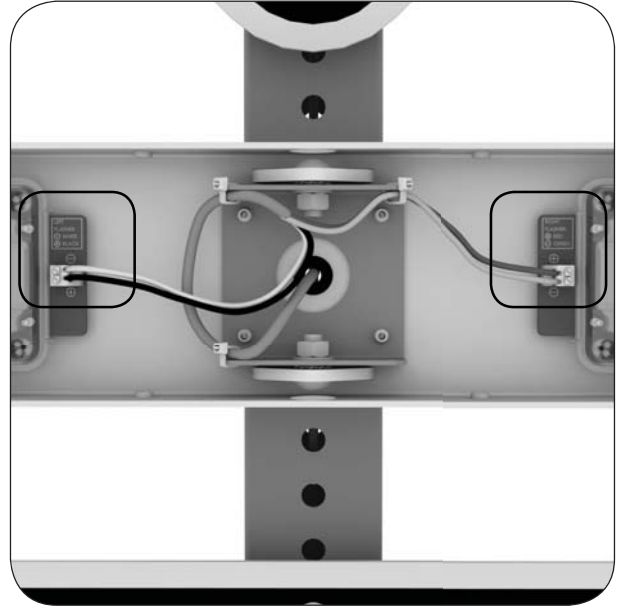
12 Slide on light bar cover and secure with provided screws.
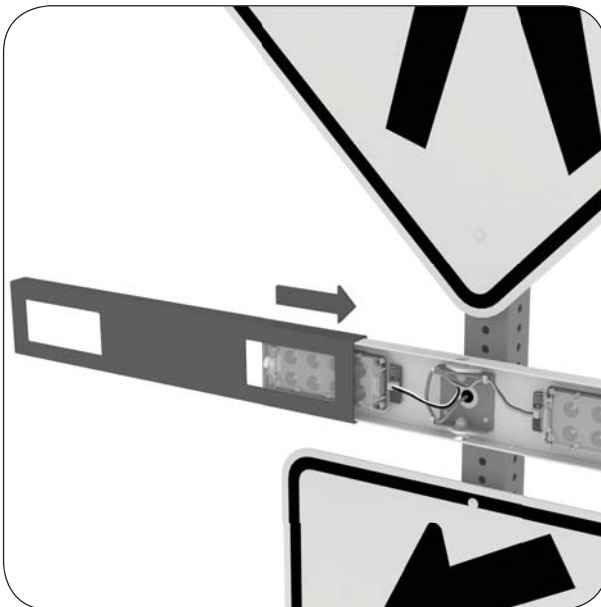
13 If the pedestrian confirmation light is not required in one direction, use the supplied opaque label to cover the indicator light
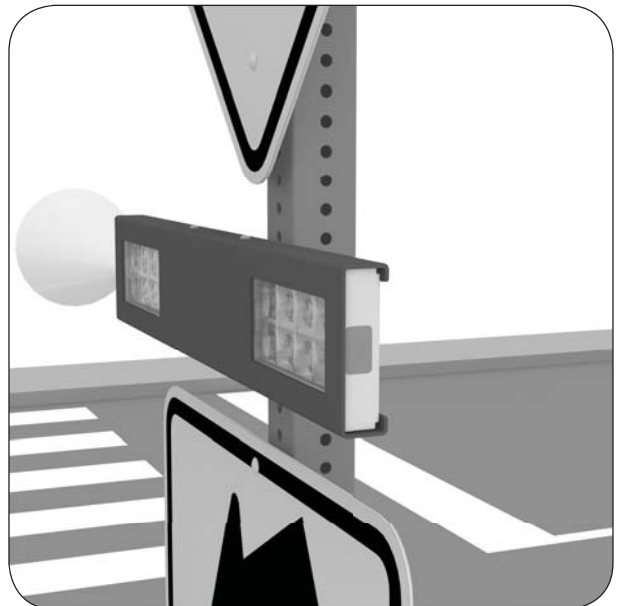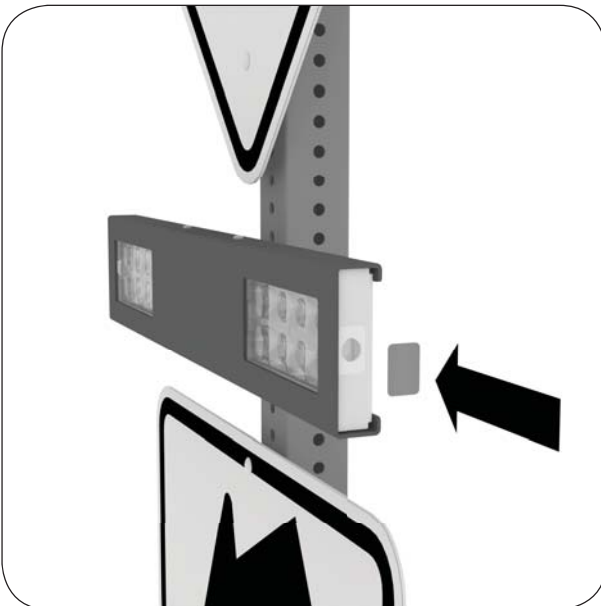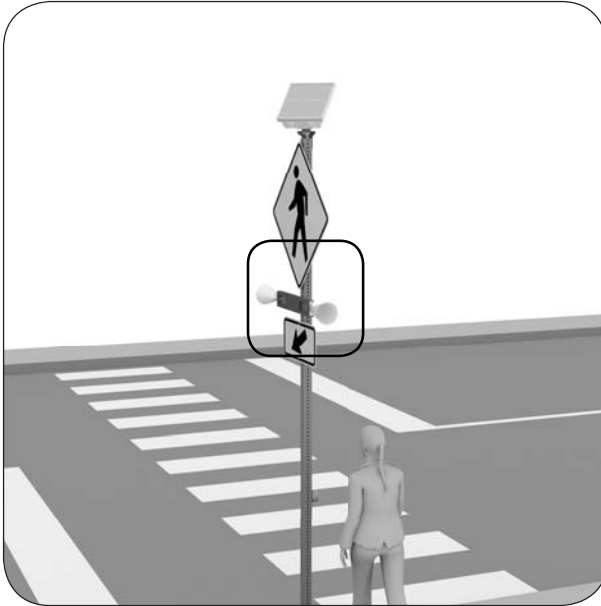
14 | Feed the push button cable through the post, creating a drip loop.

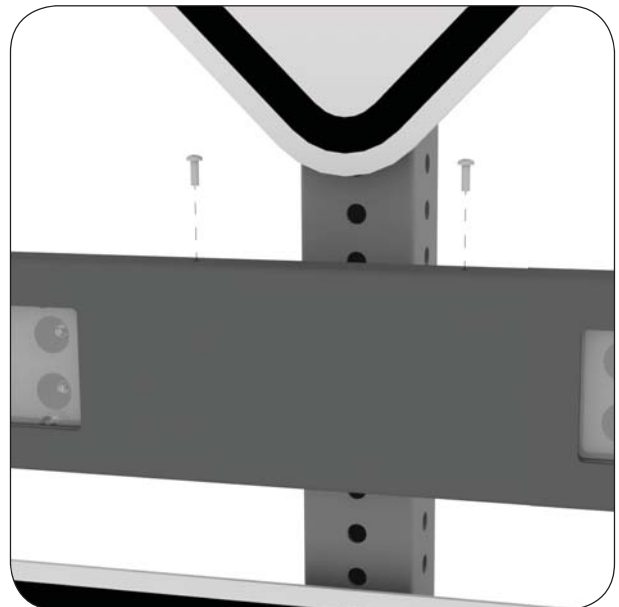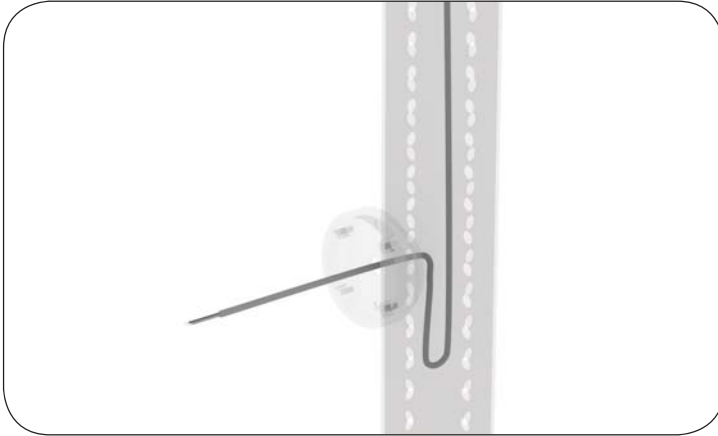NOTE

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

15 | Mount the push button to the post, connecting the wires to the push button.
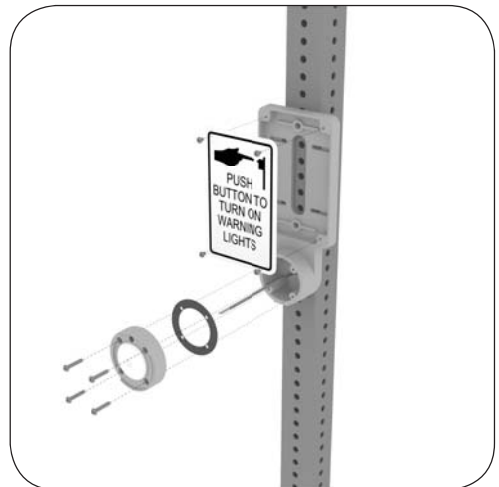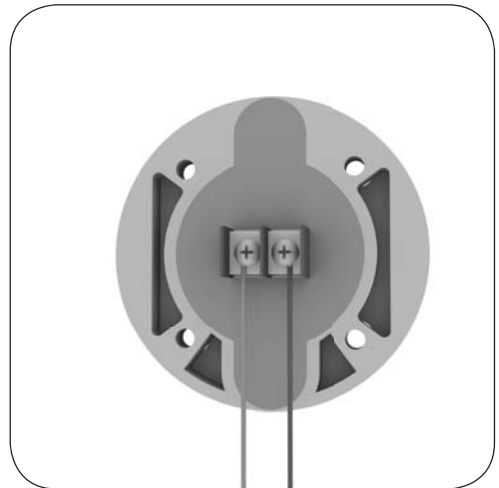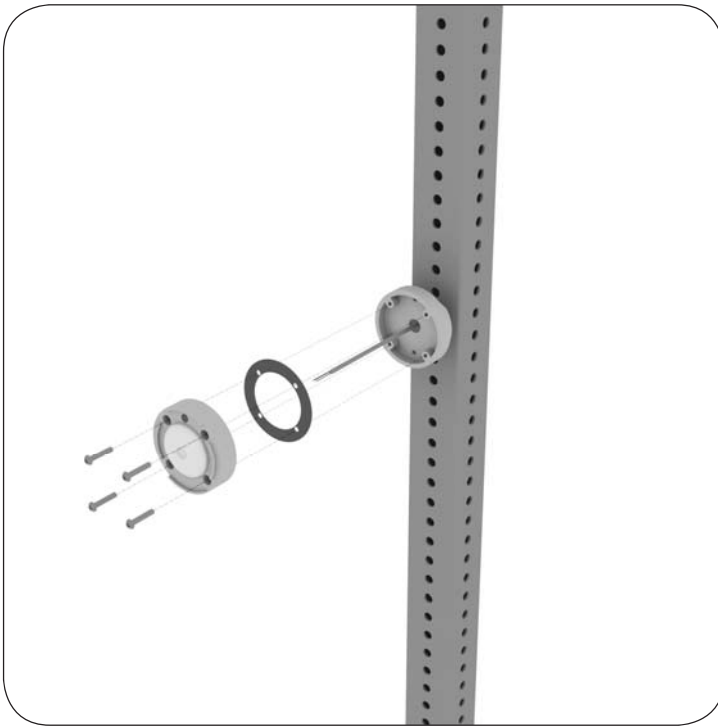
Optional push button with sign and sign mount.

16　Open the solar engine and install the batteries, connecting each battery using the correct polarity.
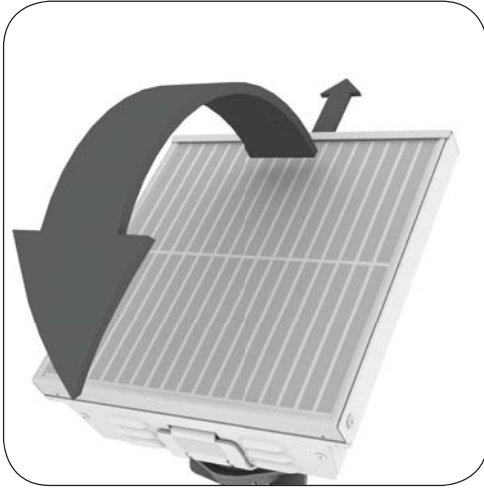
NOTE

Batteries must be install with the terminals facing outward.

CAUTION

ELECTRICAL
SHOCK
HAZARD

CAUTION

ELECTRICAL
SHOCK
HAZARD
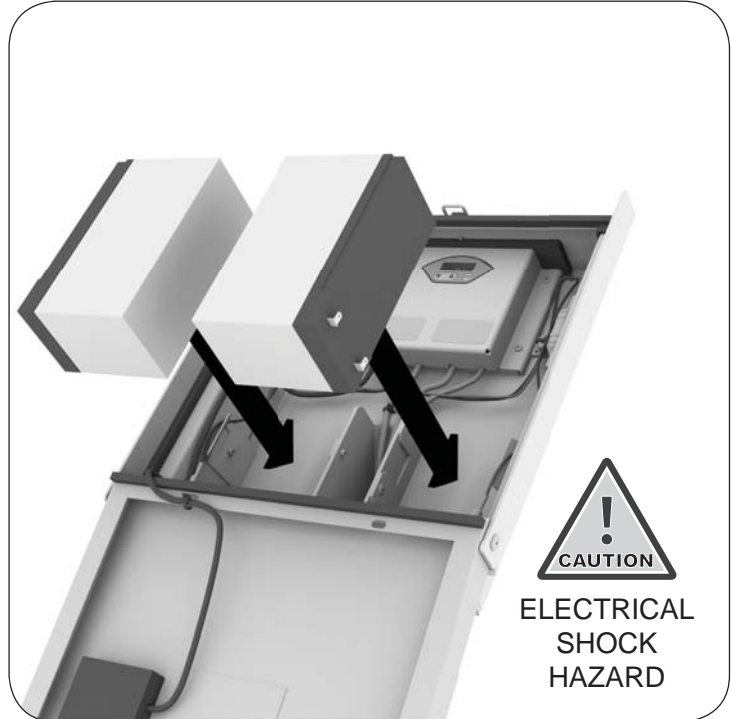
17 Secure batteries with battery strap, note proper routing.

Battery strap is tightened over the two batteries inside the solar engine.

18   The system will operate and communicate to other units without configuration once the batteries are connected. See 'EMS Programming and Testing' section to adjust default settings and to perform system testing. Close and secure panel to complete installation.
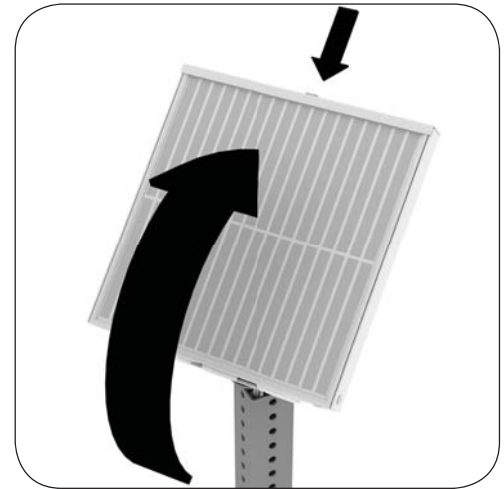
19   Ensure the solar panel is facing the equator (pointing south if you are in the northern hemisphere).
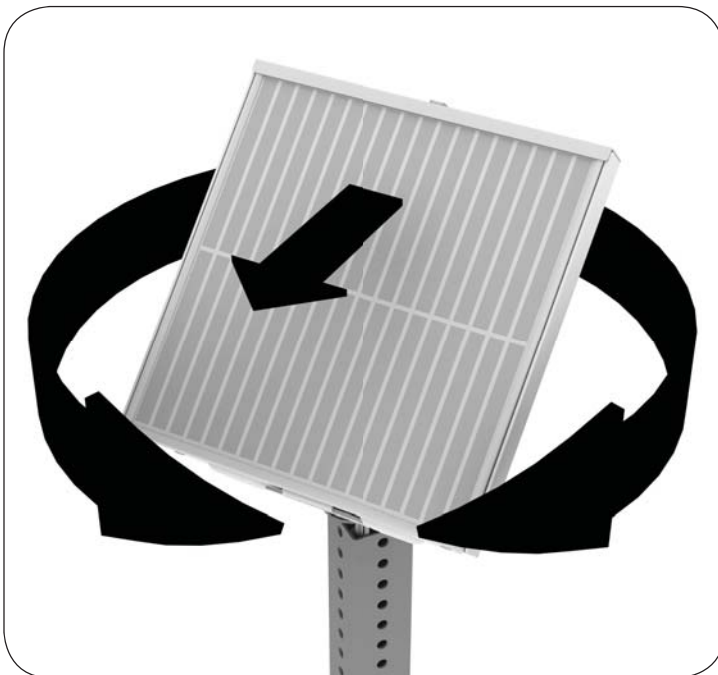
EMS Programming and Testing

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 arrow, down arrow and SET button are used to scroll through menus, access and change settings, and accept new settings.

Use the up and down arrow buttons to scroll through the menu.
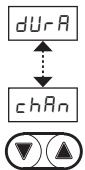
Press and hold the SET button to edit a setting. The display will blink when the setting is ready to edit.
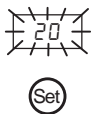
Use the up and down arrow buttons to adjust the setting when in edit mode.
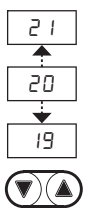
Press and hold the SET button to accept the new setting. The display will flash 3 times to indicate the setting has been accepted.
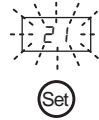
Functions and Settings
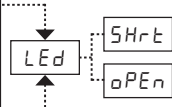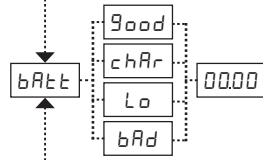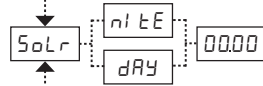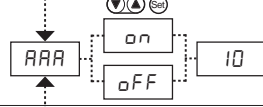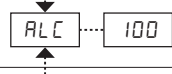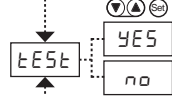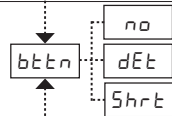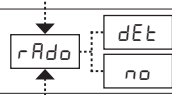
The functions and settings are accessed through the OBUI via a menu system. On the next page is the menu hierarchy and a description of the function or setting.

NOTE

Only these items in the menu system are adjustable settings: dUrA*, chAn, nItE*, AAA*, tESt, bArS, bISt.

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

— ALERT! —

LEd | SHrt | oPEn

LEd: LED flasher fault alert. This alert only appears if there is a problem with the LED flasher(s). Disconnect the batteries, correct the issue, then reconnect the batteries.
SHrt: LED flasher is shorted. Correct the short to return to normal operation.
oPEn: LED flasher has an open circuit. Check the LED wiring, correct the problem to return to normal operation.

---

bAtt | good | chAr | Lo | bAd | 00.00

bAtt: Battery status and voltage. When the batteries are first connected, the system will display this item, if no faults are present.
good: Batteries are charged.
chAr: Batteries require charging. This indicates that the batteries are not at full charge, but the battery is still healthy.
Lo: Batteries have very low voltage. The batteries are not recharging enough or may be faulty. This can affect proper operation.
bAd: Battery needs replacing. The batteries can not retain a charge or have been depleted beyond recovery.
00.00: Battery voltage, displayed in volts. Normal battery voltage should be above 12.0 V.

SoLr | nItE | dAY | 00.00

SoLr: Solar sensor status.
nItE: Solar sensor is not detecting light (nighttime). This can be simulated by covering the ambient light sensor on top of the engine.
dAY: Solar sensor is detecting light (daytime).
00.00: Solar panel voltage. This voltage can range depending on the current solar conditions.

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dUrA | 20

dUrA: Duration of the flash. The system will flash for the set number of seconds after a pedestrian push button has been pressed.
20: Duration in seconds, ranging from 10 to 60 seconds, in 1 second increments.

---

chAn | 5

chAn: Radio channel for synchronized systems. This channel must be the same on all systems in order for them to synchronize.
5: Selected channel, range from 1 to 16. Factory default is 5.

---

nItE | 30

nItE: Nighttime dimming level. During the darkness of night, the system will dim to this level as full brightness is not required.
30: Percent of daytime level, from 10 to 50%.

AAA | on | oFF | 10

AAA: Ambient light auto-adjust settings. The system will automatically adjust to the surrounding light conditions when the AAA is on.
on: Ambient light auto-adjust is on.
oFF: Ambient light auto-adjust is off.
10: Ambient light auto-adjust dim level. Reports what the current adjustment level is, ranging from 1 to 10.

ALC | 100

ALC: Automatic light control energy savings level.
100: Percentage of normal energy output. Ranges from 25% to 100%. 100% would indicate normal operation.

---

tESt | YES | no

tESt: Test the system and clear any fault warnings.
YES: Tests the system by activating the LED flashers.
no: Skips the test, does not clear any warnings.

---

bttn | no | dEt | Shrt

bttn: Button press detection status. If a button was recently pressed, it will display dEt to help troubleshoot and test the system.
no: No button press detected.
dEt: Button press was detected.
Shrt: Short detected in button or harness.

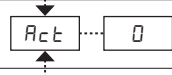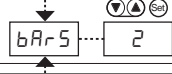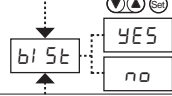---

rAdo | dEt | no

rAdo: Radio installed status. If the system is able to find and activate a radio, it will display dEt.
dEt: Radio is installed.
no: No radio was detected.

Act | 0

Act: Activation count. Counts the number of activations and averages the last 90 days.
0: Average daily activations over last 90 days.

---

bArS | 2

bArS: Number of LED flasher bars connected. Set this to match the number of LED flasher bars connected to the Solar Engine.
2: The number of LED flasher bars, 1 or 2.

---

bISt | YES | no

bISt: Built in system test.
YES: Activates the built-in system test.
no: Skips the built-in system test.

---

uEr | 0.0.0.0

vEr: Firmware version number.
0.0.0.0: The firmware version number.

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 R920 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.

WARNING 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.

WARNING 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 previous 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 R920 solar engine is designed to operate reliably for years with virtually no need for maintenance. Carmanah recommends routine inspections of the solar panels 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 R920 solar engine is typically sufficient. The R920 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.
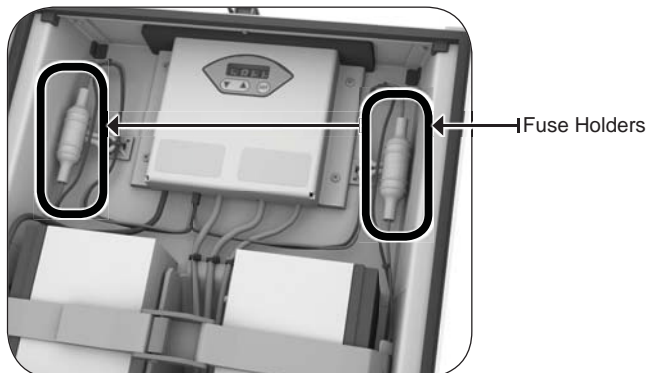
Fuse Holders

4. Pull the fuse holder apart and check the fuse.

5. Replace a blown fuse with an identical fuse - 1.5A Fuse, Littelfuse 0312002.HXP Part # 68372.

Battery Replacement

When the R920 system's batteries require replacement, it is recommended that the original R920 Battery be used (Carmanah part # 67620). You should replace both batteries at the same time.

WARNING Battery replacement procedure should not be carried out in windy conditions. In all cases, the area at the base of the post 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

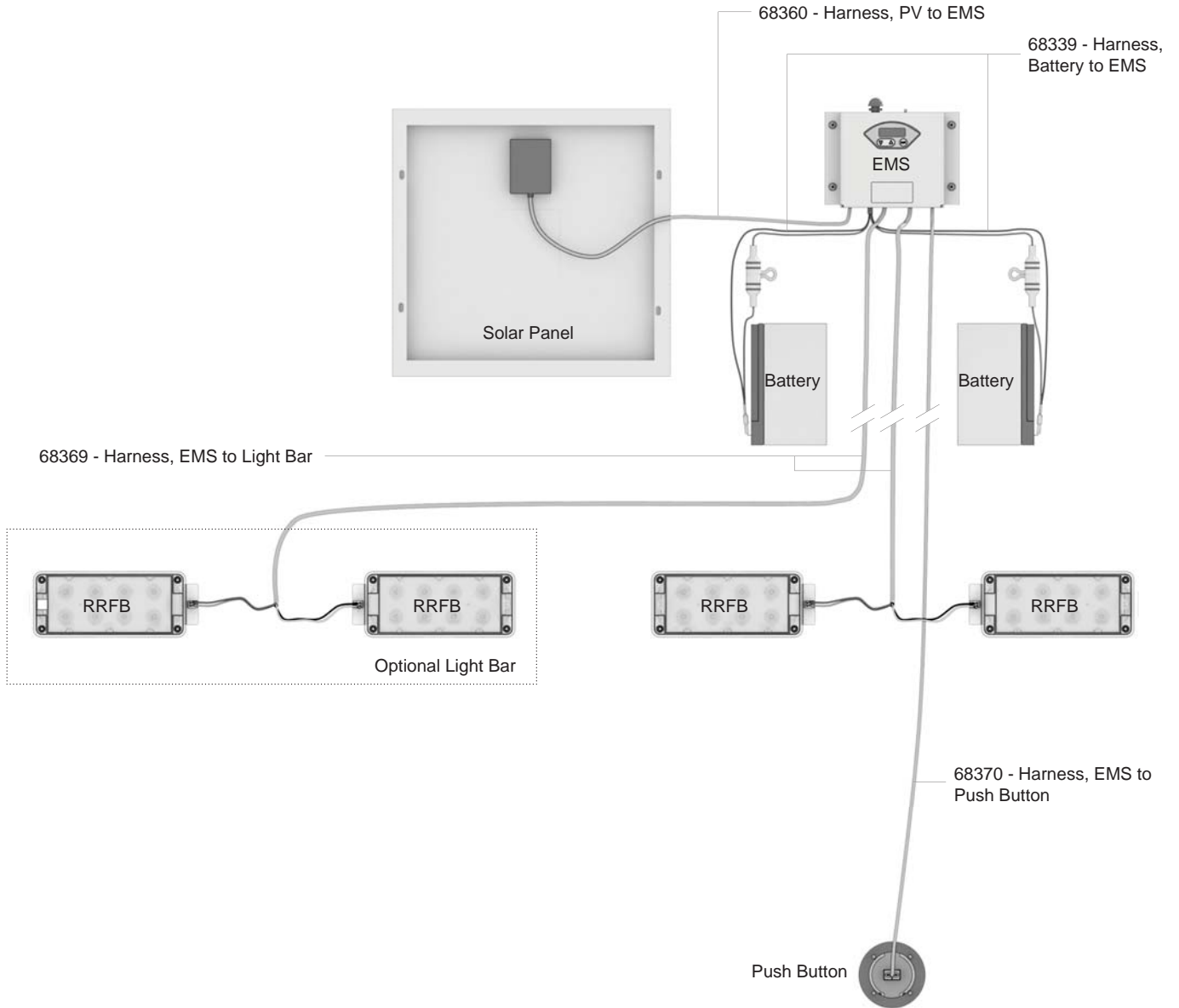| Symptom	Possible Cause - What to Check
The EMS does not activate, does not display any information, or the system does not activate.	This is typically caused by low or no voltage from the batteries.
	Check both of the fuses. See the maintenance section of this manual for fuse information.
	Using a volt meter, measure the battery voltage. It should have a reading of 12.0 volts or greater. If the voltage is very low, charge or replace the batteries and monitor the system for proper operation. Ensure that the R920 solar engine 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 'bISt' function. See the EMS Programming and Testing section of this manual.
LEDs won't flash when button on same post is pressed	This can be caused by either button failure, a wiring issue, low battery voltage, or the unlikely event of an EMS failure.
	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.
	Check the wiring to the button for continuity and make sure the wires are not pinched anywhere along their length.
	Check the wiring to the LED light bars for continuity and make sure the wires are not pinched anywhere along their length.
	Check that the wiring pattern (polarity) is correct on the LED light bars.
	Check the battery voltage, either through the OBUI or with a voltmeter (see item above)
	Check the OBUI for errors. See the EMS Programming and Testing section of this manual.
	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.
LEDs on same post flash, but other systems in the crosswalk set won't flash	The R920s 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.
	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.
	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.
One Light Bar flashes, but the other Light Bar on the same post does not flash	This is likely caused by improper wiring of the light bars.
	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.

Symptom	Possible Cause - What to Check
One rectangular flasher flashes, but the other rectangular flasher on the same light bar does not flash	This is likely caused by incorrect wiring on the LED light bars. Check each of the connections at the rectangular flashers to ensure correct wiring pattern (polarity). 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.
The LEDs are dim when flashing	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 R920 solar engine 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. Check for debris covering the ambient light sensor on top of the solar engine. Set the number of light bars to the correct value on the OBUI. See the EMS Programming and Testing section of this manual. 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.
The LEDs appear too bright when flashing	Settings on the EMS can affect the apparent brightness of the LEDs. Set the number of light bars to the correct value on the OBUI. See the EMS Programming and Testing section of this manual.
Lights flash when no button is pressed	This is likely caused by another nearby system on the same radio channel activating this system. 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.

Specifications

Mechanical Specifications	
Solar Engine	
Width	13.6" (345 mm)
Depth (not including mount)	3.6" (91 mm)
Tilt angle	45 degrees
Height (above top of post)	20.75" (527 mm) Round Post, 17.25" (438 mm) Square Post
Weight (Solar engine only)	19.8 lbs (9kg)
Electrical Specifications	
System	
System voltage	12V (nominal)
System capacity	14 Ah
Overcurrent Protection	
Fuse	2 x 1.5 A
Type	Littelfuse 0312002.HXP
Solar Charge Controller	
Type	Maximum power point tracking 3 stage temperature compensated
Battery	
Quantity	2
Voltage	12 V (nominal)
Capacity	7 Ah
Solar Panel	
Power	10 W
Voc	21.6 V
Vmp	17.5 V
Imp	0.57 A
Isc	0.62 A
LED Driver	
Type	Constant current, buck - boost
Max output voltage	33 Vdc
Max output current	160 mA
Wire Gauges	
Pedestrian Push Button	2 Conductor, 18 AWG, UV and Wet Rated, 300V Min, 75°C Min
Light Bar	4 Conductor, 18 AWG, UV and Wet Rated, 300V Min, 75°C Min
Environmental	
Maximum wind zone deployment	110 mph
Operating temperature range	Standard batteries: 5 to 122˚ F (-15 to 50˚ C)
	Extended temperature batteries: -40 to 122˚ F (-40 to 50˚ C)

Wiring Layout

68360 - Harness, PV to EMS

68339 - Harness, Battery to EMS

EMS

Solar Panel

Battery

Battery

68369 - Harness, EMS to Light Bar

RRFB

RRFB

RRFB

RRFB

Optional Light Bar

68370 - Harness, EMS to Push Button

Push Button

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
1.877.722.8877 (Toll Free in U.S. and Canada)

Fax: 1.250.380.0062

Email: customerservice@carmanah.com

Website: carmanah.com