



OWNER'S MANUAL

**EverGEN™ Solar Area Lighting System with
RUUD/BETA Fixtures**

SE-10, SE-20, SE-30, SE-50, and SE-80

CONTENTS

- 1.0 Introduction 2**
 - 1.1 Precautions 2
 - 1.2 Patents 2
- 2.0 Standards and Precautions for Solar Panel Installations 3**
- 3.0 Mechanical Specifications 4**
 - 3.1 SE-10, SE-20, and SE-30 Specifications 4
 - 3.2 SE-50 and SE-80 Specifications 5
 - 3.3 Common Specifications 5
 - 3.3.1 *Operating Profiles* 6
- 4.0 Component Identification 8**
- 5.0 How it Works 10**
 - 5.1 Energy Management System (EMS) 10
 - 5.1.1 *EMS Labeling* 11
- 6.0 Product Assembly and Installation 12**
 - 6.1 Recommended Tools 12
 - 6.2 Solar Engine Installation 12
 - 6.2.1 *Solar Engine Orientation* 12
 - 6.2.2 *Mounting the Solar Engine for SE-10, SE-20, and SE-30* 14
 - 6.2.3 *Mounting the Solar Engine for SE-50 and SE-80* 16
 - 6.3 Fixture Installation 17
 - 6.4 Battery Installation 18
 - 6.5 Grounding 19
- 7.0 System Operation 21**
 - 7.1 System Check and Start-up 21
- 8.0 Troubleshooting 22**
- 9.0 Product Care 23**
- 10.0 Service and Additional Products 24**
 - 10.1 Customer Service 24
 - 10.2 Additional Products 24
- Appendix A: EMS Configuration 25**
 - A-1: Accessing the EMS 25
 - A-2: Electrical Wiring Schematic 28

1.0 Introduction

The Carmanah EverGEN™ Solar Area Lighting System is designed to provide ruggedly reliable illumination in the world's most demanding conditions. Compact, self-contained, and easy to install, Carmanah's Solar Area Lighting provides a cost-effective, aesthetic solution that can be installed in even the most remote locations.

With focused light output, superior lumen depreciation, and dynamic output adjustment, the EverGEN™ Solar Area Lighting System features an intelligent operating profile that can be configured to provide illumination during times of peak pedestrian and vehicle traffic.

This Owner's Manual includes specifications for all components of the EverGEN™ Solar Area Lighting System including the EverGEN™ solar engine and system component identification. Also included is detailed information on how the system functions and operates, as well as assembly and installation instructions.

1.1 Precautions



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

Ensure that you do not directly connect the positive and negative terminals of the batteries, as short circuiting these cells can cause extremely high currents and temperatures within the battery, possibly resulting in fire or explosion.

Be cautious around electricity, electrical components, and batteries. Shocks, burns, injury, and even death can occur if an installer comes in contact with electricity.

Electrostatic Discharge (ESD) Precautions and Proper Handling Procedures

1. Dissipate static electricity before handling any system components (Energy Management System, LED lights) by touching a grounded metal object, such as the unpainted metal housing on the system unit.
2. If possible, use antistatic devices, such as wrist straps.
3. Avoid touching the contacts and components on the Energy Management System.
4. Take care when connecting or disconnecting cables. A damaged cable can cause a short in the electrical circuit.
5. Prevent damage to the connectors by aligning connector pins before you connect the cable. Misaligned connector pins can cause damage to system components at power-on.



1.2 Patents

The EverGEN™ solar engines are covered by US Patent 6,573,659.

2.0 Standards and Precautions for Solar Panel Installations

Installation, wiring and grounding must be completed in strict conformance with local building and electrical codes. Non-adherence to code may void the warranty. Qualified, licensed professionals should perform all installation work.

NOTE

This installation manual is provided to assist your installer. As the use of this manual and the conditions or methods of installation, operation, use and maintenance of the equipment are beyond the control of Carmanah Technologies Corporation, Carmanah does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of, or any way connected with, such installation, operation, use, or maintenance.

- ◆ Before lifting any heavy or bulky equipment, ensure the load is secured so moving parts do not shift, and the load can be lifted as far as needed without back strain or loss of grip. It is recommended that two or more persons perform the installation.
- ◆ Batteries are shipped fully charged. Take care to avoid shorting the positive and negative terminals of individual batteries or battery strings. During periods of storage, batteries should be stored in a cool dry place, and be charged every 2 months to maintain voltage levels and reduce sulfation of the battery plates. For a warmer storage temperature, the batteries will need to be charged more frequently.

NOTE

Sulfation can lower battery capacity and damage batteries, causing a system not to function. Ensure that batteries are kept fully charged while in storage.



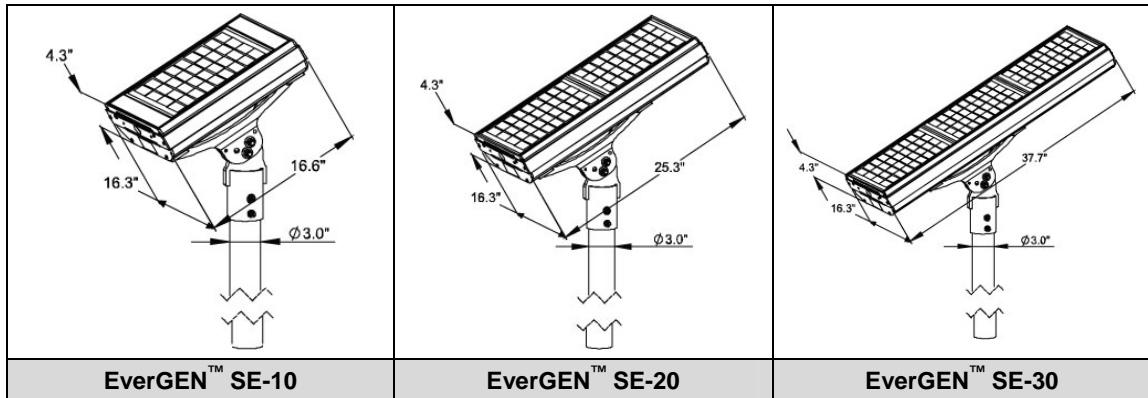
Solar Panel modules produce DC electricity when exposed to light and can, therefore, produce an electrical shock or burn. Modules can be rendered inoperative by removing them from sunlight, or by partially covering their front surface with an opaque material.

- ◆ Remove all jewelry before performing electrical wiring or testing.
- ◆ Install a proper system ground for safety and lightning protection.

3.0 Mechanical Specifications

The specifications for the solar modules and the batteries for all EverGEN™ solar engine series are made at Standard Test Conditions, +/- 10%.

3.1 SE-10, SE-20, and SE-30 Specifications

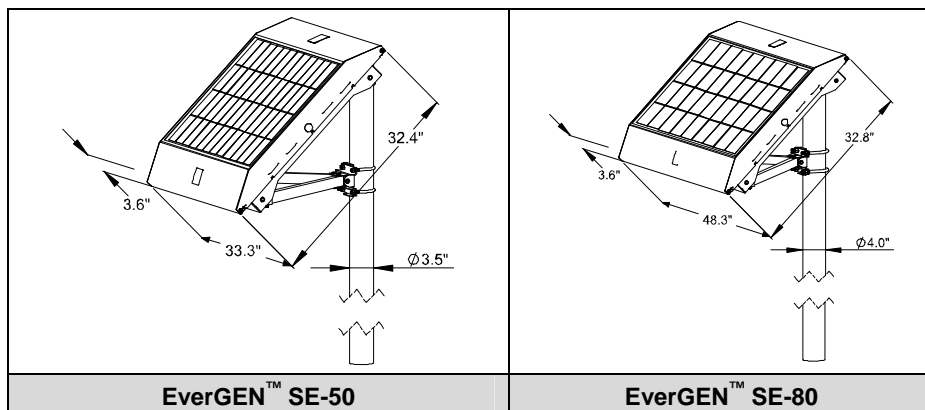


Mechanical			
Housing	Corrosion resistant aluminum		
Support bracket	Hardened steel		
Powder coated finish	White		
Hardware	Stainless steel		
Mounting angles	0°, 15°, 30°, 45°, 60°		
Effective projected area¹	1.67 ft ² (0.16 m ²)	2.5 ft ² (0.23 m ²)	3.72 ft ² (0.35 m ²)
Weight	41 lb (19 kg)	62 lb (28 kg)	84 lb (38 kg)
Mounting pole diameter²	3 in (7.62 cm)		

¹ The effective projected area specification is measured at the steepest mounting angle of each solar engine.

² Pole not included.

3.2 SE-50 and SE-80 Specifications



Mechanical		
Housing	Corrosion resistant aluminum	
Support bracket	Hardened steel	
Powder coated finish	White	
Hardware	Stainless steel	
Mounting angles	45°	
Effective projected area ¹	5.28 ft ² (0.49 m ²)	7.78 ft ² (0.72 m ²)
Weight	121 lb (55 kg)	177 lb (80 kg)
Mounting pole diameter ²	3.5 in (8.75 cm)	4 in (10 cm)

3.3 Common Specifications

Environmental	
Ambient operating temperature	Standard: 23 to 86 °F (–5 to 30 °C) Extended: –4 to 140 °F (–20 to 60 °C)
Ambient storage temperature:	Standard: 5 to 122 °F (–15 to 50 °C) Extended: –40 to 176 °F (–40 to 60 °C)
Wind load	Steady wind speed not to exceed 110 mph (177 km/h) Gust wind speed not to exceed 143 mph (230 km/h)
Shock	10 g's
Vibration	1 Hz, 12" amplitude, 20 years
Solar panel orientation	Direct sunlight required. Panel must face the equator at optimal tilt angle.
Energy Management System	
Operating profile	Configurable (see section 3.3.1 <i>Operating Profiles</i>)

¹ The effective projected area specification is measured at the steepest mounting angle of each solar engine.

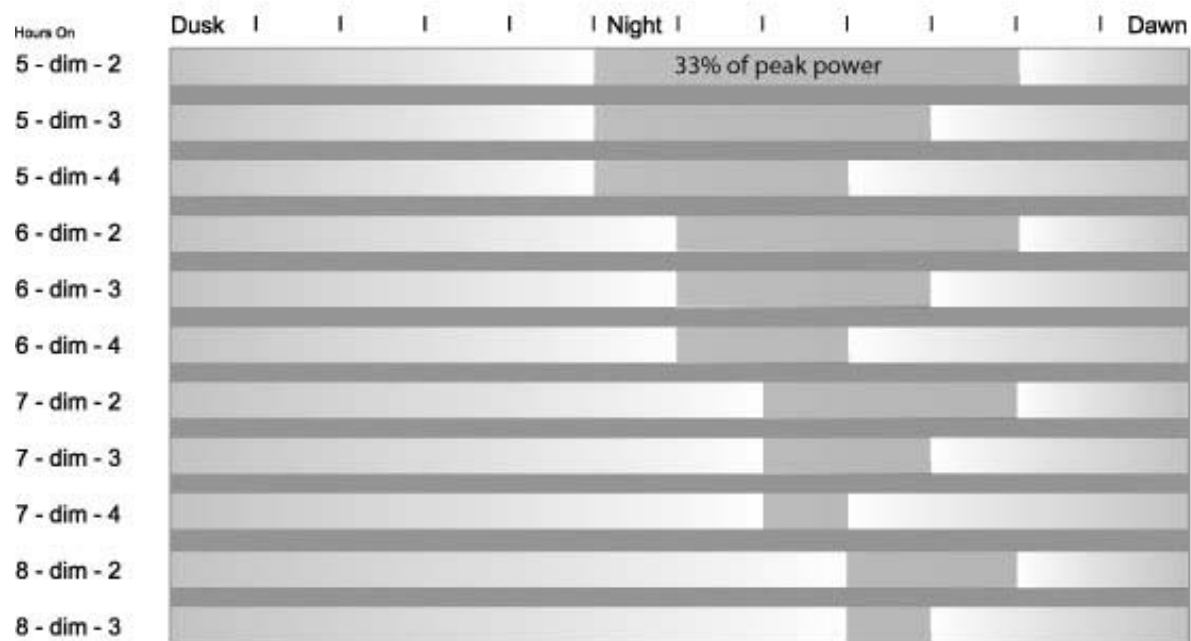
² Pole not included.

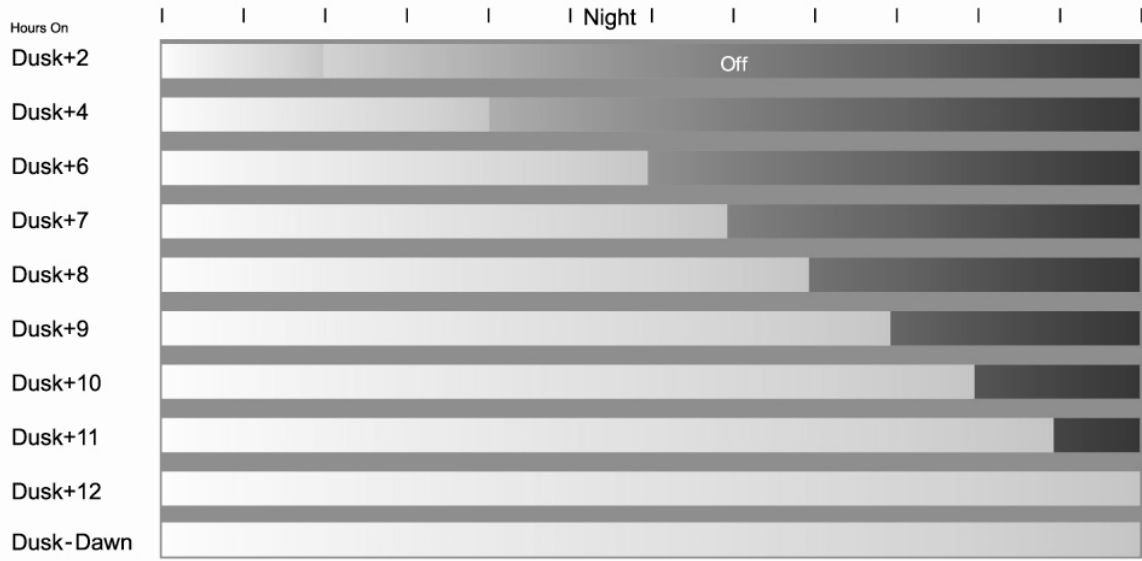
Power management	Microsource® code suite
Autonomy	5 – 15 days typical (location dependent)

3.3.1 Operating Profiles

The **Operating Profile** is the operating schedule for the EverGEN™ solar engine fixture. The three types of operating profiles are as follows:

- All Night:** The fixture remains on from dusk to dawn at a constant light intensity.
- Split Night:** The fixture turns on at dusk at full intensity for a fixed number of hours, is then reduced to 33% of full power for a portion of the night, and then the fixture returns to full intensity for a fixed number of hours before dawn. This is an excellent option to maximize light output when needed most, while still providing lighting throughout the night.
- Fixed Night:** The fixture turns on at dusk for a fixed number of hours and then turns off.





4.0 Component Identification

EverGEN™ Solar Engine (SE-20 shown)

A sleek, self contained solar engine design houses all components in one compact unit

Carmanah energy management system incorporates patented MICROSOURCE technology

A secure enclosure prevents against theft and vandalism

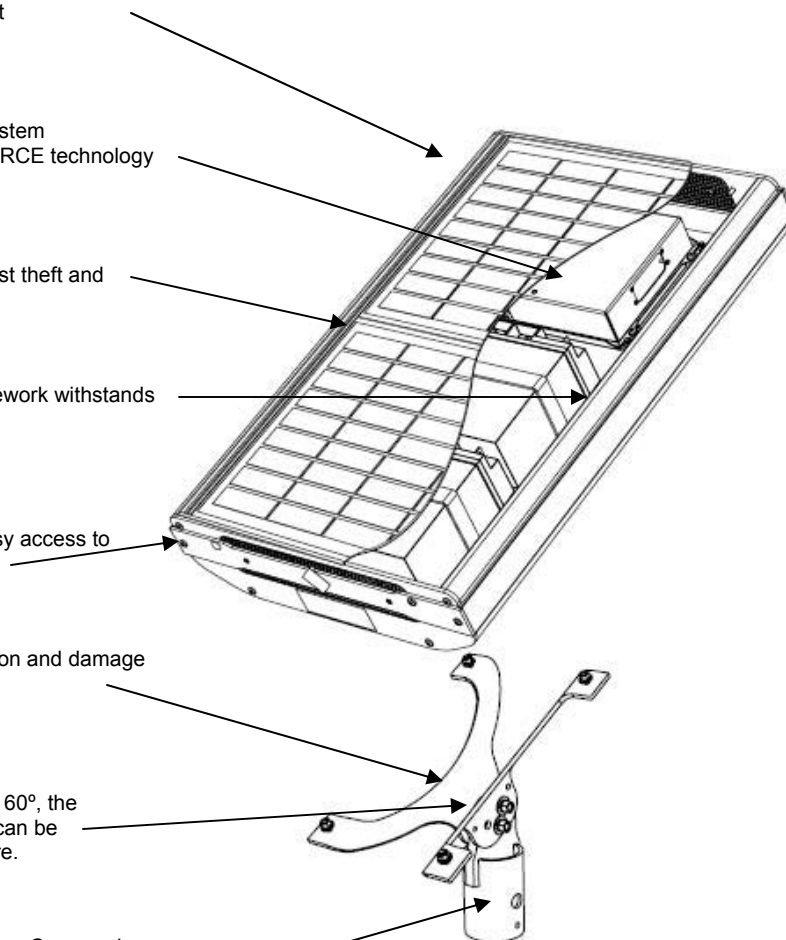
Designed to endure; staunch framework withstands extreme wind loads.

A pivoting top opens to provide easy access to unit compartments.

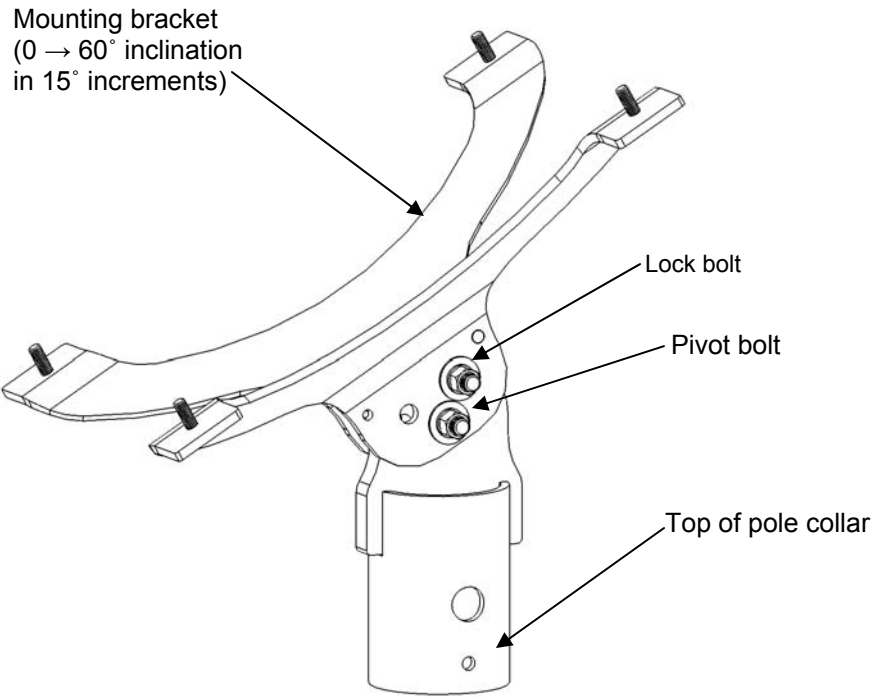
The durable finish prevents corrosion and damage from the elements.

With variable tilt angle from zero to 60°, the Carmanah EverGEN solar engine can be configured to optimize sun exposure.

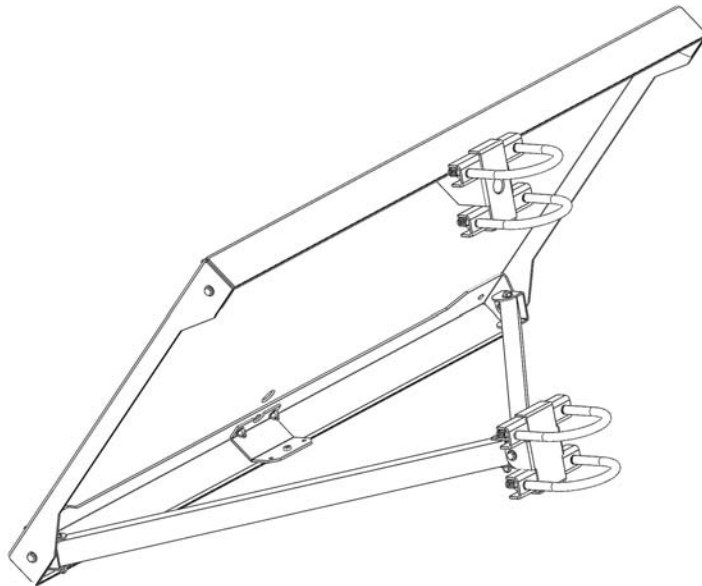
Featuring simple pole-top installation, Carmanah EverGEN 10, 20 & 30 W solar engines slip fit onto a 3" diameter round pole. Carmanah 50 & 80 W solar engines mount easily to the side of a 3.5" or 4" diameter round pole.



SE-10, SE-20, and SE-30 High Strength Pivoting Mount



SE-50 and SE-80 solar engine mounting cradle



5.0 How it Works

The solar engine uses an onboard energy management system to regulate power between the solar panel, batteries and the fixture.

Solar Panel Module: The panel array is connected to the charging circuitry to collect enough solar energy to operate the system throughout the year.

Rechargeable Batteries: The battery bank is composed of up to five 12 V batteries. The batteries are sealed lead-acid, with excellent temperature performance and very long life.

Fixture: The fixture contains best-in-class white LEDs with high efficacy output. The light assembly has superior thermal management that enhances the fixture's lifetime. The LEDs are driven below their maximum power rating for increased efficiency and extended lifetime.

5.1 Energy Management System (EMS)

Carmanah's MICROSOURCE® Energy Management System automatically balances lighting requirements with available energy resources, allowing the solar engine to learn and adapt to its environment. With the MICROSOURCE® EMS, lighting characteristics such as automatic on/off times and default light output levels can also be customized for maximum efficiency, reliability and convenience. Below are the main MICROSOURCE® features:

Automatic Light Control (ALC) monitors the battery bank state of charge and regulates energy delivery to the load. This prevents the battery bank from being damaged and ensures system reliability through periods of poor solar conditions.

Low Battery Shutdown prevents the battery bank from being over-discharged. Discharging the battery bank to less than 10% capacity will cause permanent capacity loss. The fixture blinks¹ once a second when low battery shutdown is engaged. The system will remain in this state until the battery is recharged to at least 50% capacity.

24-Hour Shutdown engages when the system detects 24 hours of darkness. The fixture blinks¹ twice a second when 24-hour shutdown is engaged. The system will remain in this state until it detects 10 seconds of daylight.

Urban Smart monitors the light input received by the solar panel and prevents false dusk to dawn transitions in urban areas where light pollution may cause false transitions.

¹ A blinking fixture indicates that the system requires service. The blinking will continue until either the system is serviced or the batteries are depleted.

5.1.1 EMS Labeling

There are two labels attached to the EMS. The labels contain the following information:

Label #1

- ◆ EMS Model Number
- ◆ Date of Manufacture
- ◆ EMS Serial Number

Label #2

- ◆ Sales Order Number
- ◆ Solar Engine Serial Number
- ◆ Operating Profile
- ◆ Battery Current
- ◆ Fixture Quantity
- ◆ Fixture Model

6.0 Product Assembly and Installation

This section explains recommended tools and how to assemble and mount the solar engine.

6.1 Recommended Tools

Following is a list of recommended tools to complete installation.

- ♦ Digital voltmeter
- ♦ Level
- ♦ Compass
- ♦ Imperial socket set (3/8" → 3/4")
- ♦ Imperial wrench set (3/8" → 3/4")
- ♦ Cordless drill
- ♦ Center punch
- ♦ Tape measure
- ♦ Permanent ink marker
- ♦ 17/64" Drill Bit

6.2 Solar Engine Installation

6.2.1 Solar Engine Orientation

Before beginning the installation read through this section as the information provided is critical to proper installation of the system.

Ensure the solar engine is installed in a location where the solar panels have daily, year-round unrestricted equator-directed sun exposure.

NOTE

Shading even a small portion of the solar panels will significantly reduce its ability to charge the battery bank. Solar panel modules should be installed facing the equator – within 10° of due south in northern latitudes or due north in southern latitudes.

The angle of inclination of the panel is dependent upon the latitude of the site. Refer to Table 1 & 2 and Figure 6-2 for inclination angles and settings. Note that the pivoting mount is adjustable from 0 → 60° in 15° increments for SE-10, SE-20, and SE-30 only. The SE-50 and SE-80 are not adjustable and are angled at 45°.

Table 1: SE Inclination Settings

Site Latitude	Pivoting Mount Angle
0 - 9°	0 - 15°
10 - 20°	15 - 30°
21 - 45°	30 - 45°
46 - 65°	45 - 60°
65 - 90°	60°

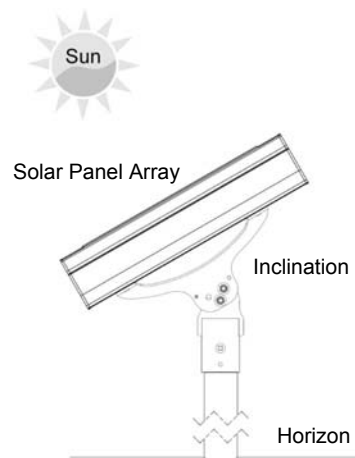


Figure 6-1: SE Inclination with Respect to Horizon

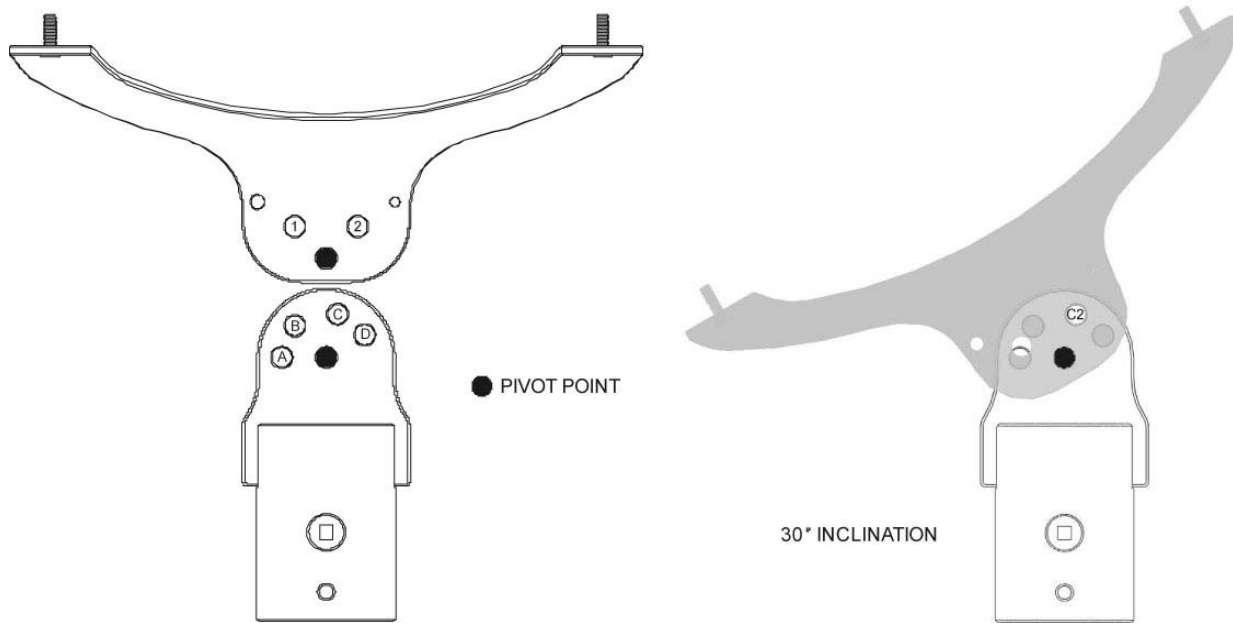


Figure 6-2: Bracket Inclination Settings

Table 2: Bracket Inclination Angles

Angle	Combination	
0°	B	1
15°	D	2
30°	C	2
45°	A	1
60°	C	1

NOTE

An inclination lesser than 15° will require more frequent cleaning of the solar panel modules.

6.2.2 Mounting the Solar Engine for SE-10, SE-20, and SE-30

NOTE

During the installation process use caution to ensure powdercoat does not become chipped or damaged.

Open the Solar Engine

1. Open the solar engine housing by removing the two access screws securing each end of the cover.

Route the fixture harness through the grommet in the base of solar engine to the outside, before installing the brackets.

Attach the mount bracket and post adapter

2. Align and insert the mounting bracket studs with holes in the rear of the solar engine.
3. Place one washer, one lock washer, and one nut onto each stud and tighten.

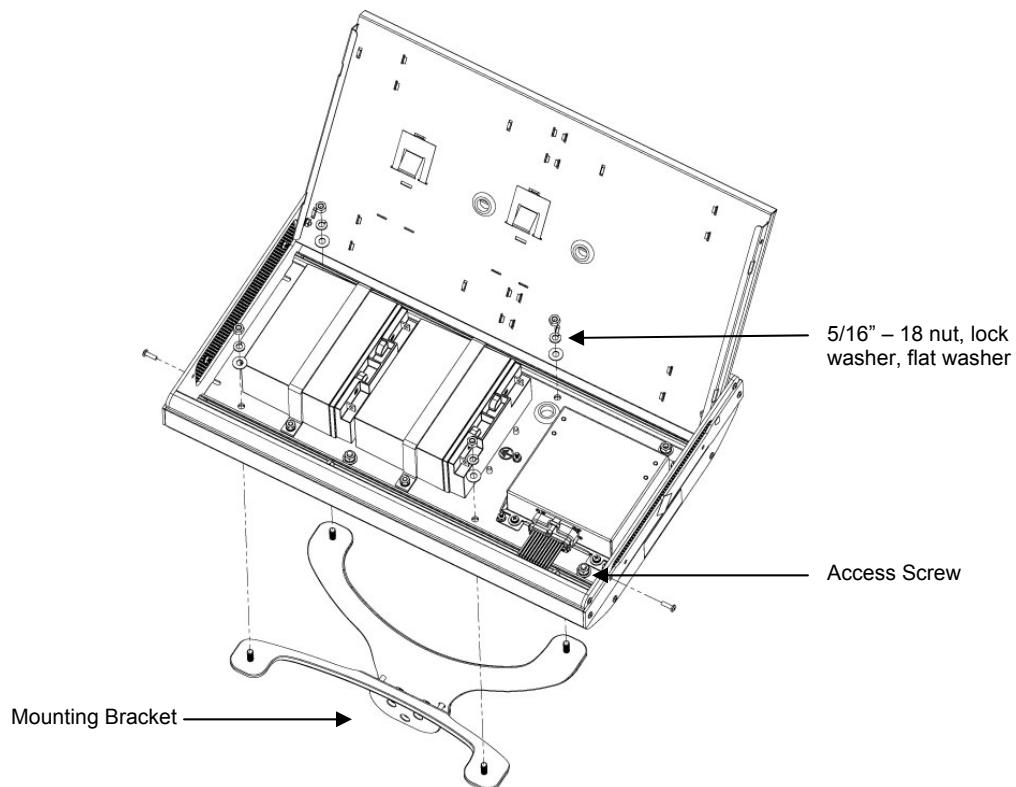


Figure 6-3: Attaching mounting bracket and collar

4. Drill two 9/32" holes in the pole:
 - 4a. Mark the mounting hole position with a permanent marker, using the pole mount as a guide.
 - 4b. Remove pole mount from the pole and drill 9/32" holes.

5. Use figure 6-2 to find the desired angle of inclination then bolt the post adapter to the recommended pivoting mount brackets; see Figure 6-4.

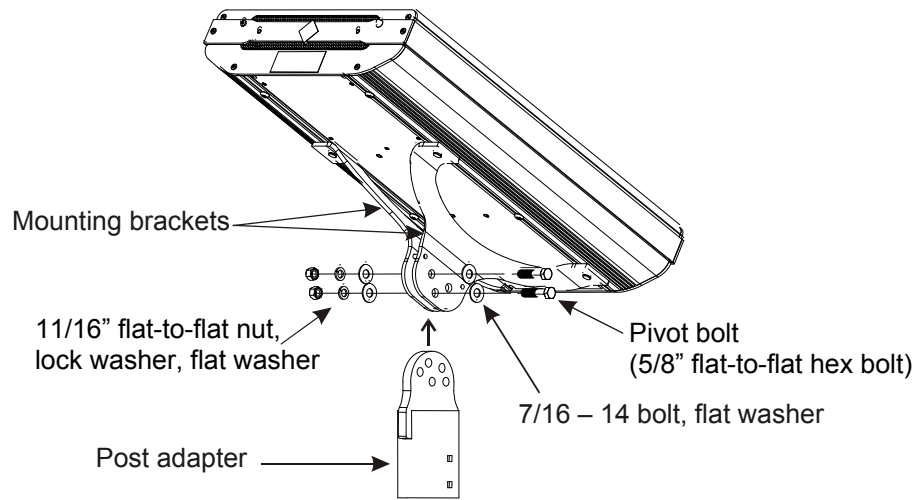


Figure 6-4: Bolting collar to pivoting mount brackets

Secure the solar engine to the pole

6. Set the solar engine on top of the pole and orient in the optimum direction. (See section 6.2.1 *Solar Engine Orientation*).
7. Using the provided hardware, insert the two carriage bolts through the collar and pole.
8. Place one washer, one lock washer, and one nut onto the end of each carriage bolt and tighten.

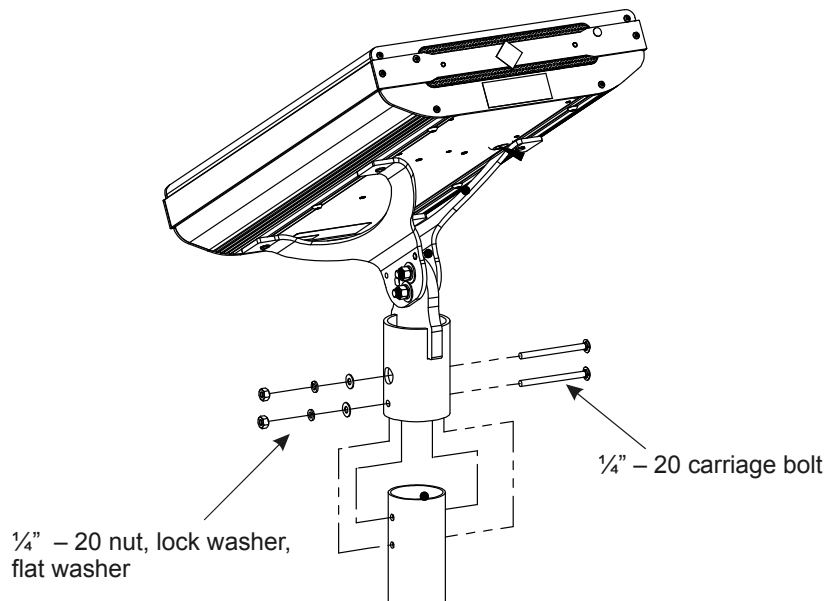


Figure 6-5: Securing the solar engine to a pole

6.2.3 Mounting the Solar Engine for SE-50 and SE-80

1. Fasten the upper mounting bracket to the side of the pole at the desired height using the pole mount hardware kit components; see section 6.2.1 *Solar Engine Orientation* for information on bracket orientation.

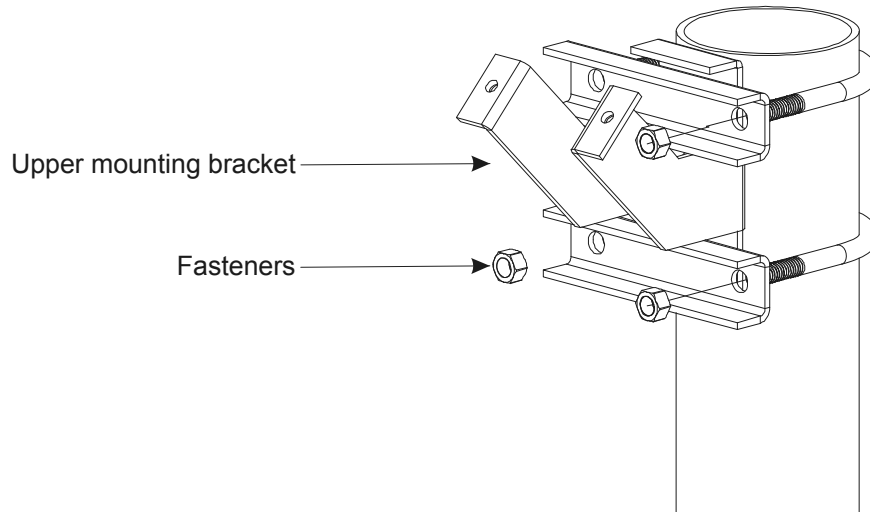


Figure 6-6: Upper mounting bracket attached to the pole

2. Torque the pole mounting hardware to 25 lbf-ft (33.9 N-m).

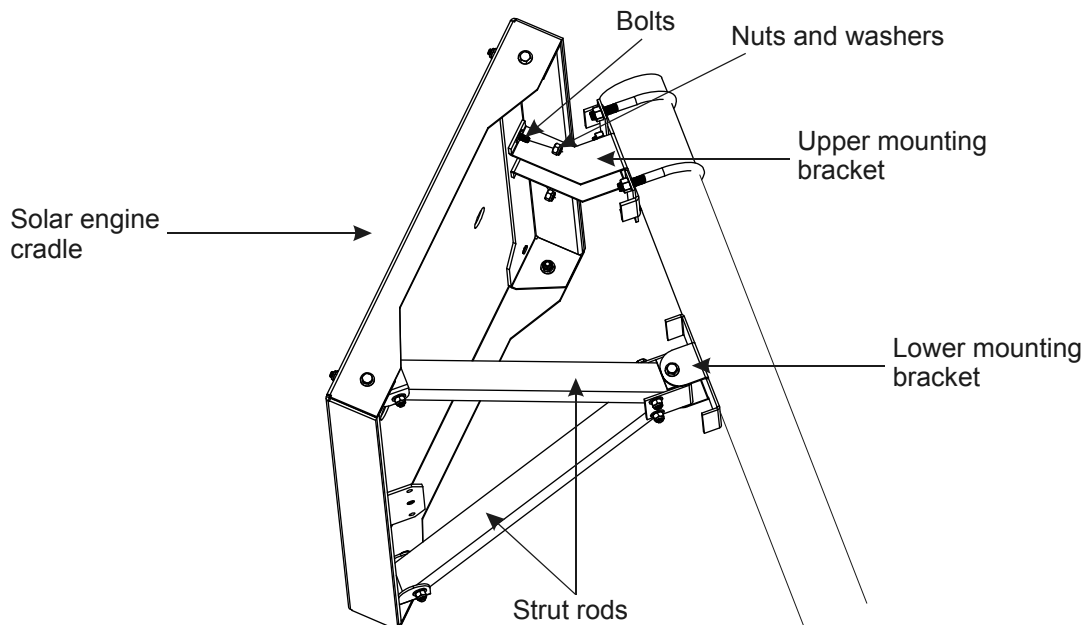


Figure 6-7: Underside of solar engine cradle with strut rods

3. Remove the nuts and washers from the underside of the solar engine cradle.
4. Insert the bolts on the cradle into the holes in the upper bracket mounting; see Figure 6-7.

5. Re-install the previously removed nuts and washers.
6. Swing the strut rods and lower mounting bracket down to contact the pole; see Figure 6-7. The strut rods are pre-attached to the solar engine cradle.

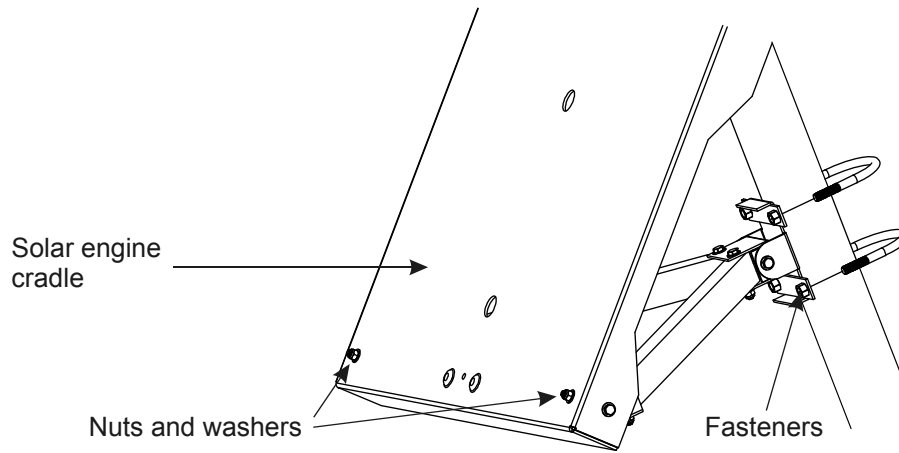


Figure 6-8: Installing the lower mounting bracket

7. Loosen the 7/16" fasteners, then center and align the lower bracket to the pole; see Figure 6-8.
8. Install the hardware mount kit components onto the lower mount bracket.
9. Torque the fasteners to 25 lbf·ft (33.9 N·m).
10. Remove the 7/16" nuts and washers on the top of the cradle, and install the solar engine.

6.3 Fixture Installation

Refer to Mounting Options and Instructions provided with fixture for installation instructions.

6.4 Battery Installation



The red wire from the battery harness must be connected to the positive (red) terminal of the battery and the black wire must be connected to the negative (black) terminal of the battery. If the correct wiring connections are not followed, personal and or equipment damaged may result.

Connect the harnessing to the battery

Two types of batteries are used by the EverGEN™ solar engines. The diagram below shows how to connect the harnessing to each battery.

The EMS battery harness is not connected to the battery during shipping.

1. Remove the battery and harness from the shipping box.
2. Connect the harness as shown in Figure 6-9.

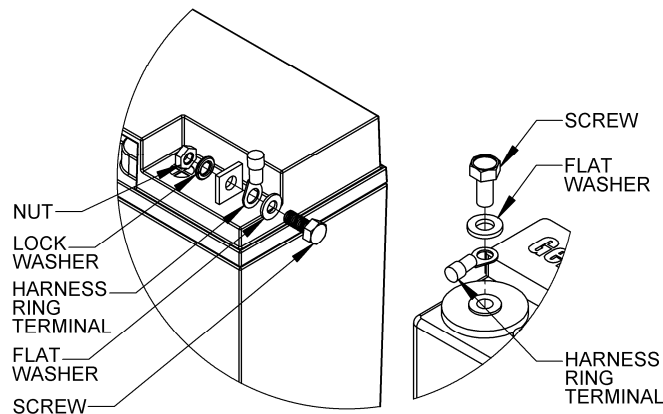


Figure 6-9: Connecting harnessing to the batteries

Install the batteries

1. Check the batteries to ensure that they are at the correct voltage level (above 12 V).
2. Remove the hardware securing the battery brackets to the solar engine.
3. Remove the battery brackets.
4. Insert the batteries into the solar engine with the tops facing toward the EMS; see Figure 6-10, 6-11 and 6-12.
5. Replace battery brackets onto mounting studs, secure with hardware and tighten; see Figure 6-10, 6-11 and 6-12.

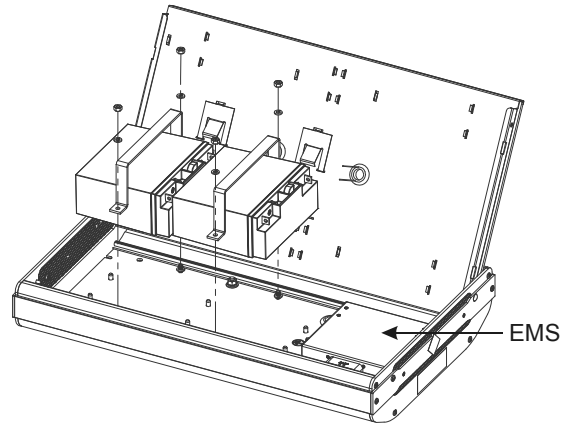


Figure 6-10: SE-20 Battery Installation

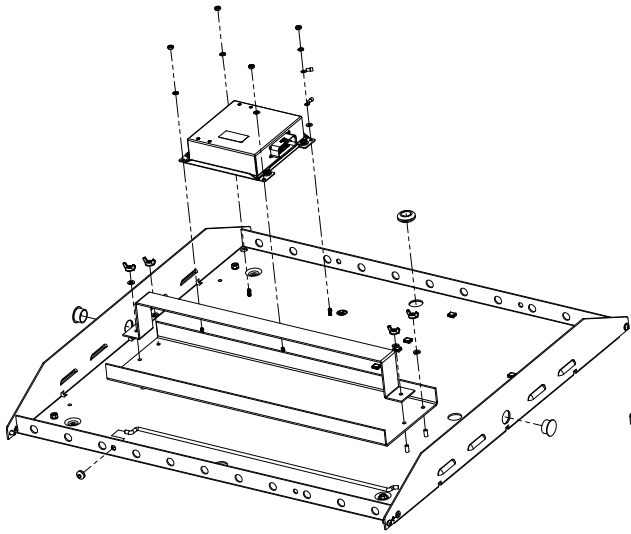


Figure 6-11: SE-50 Battery Installation

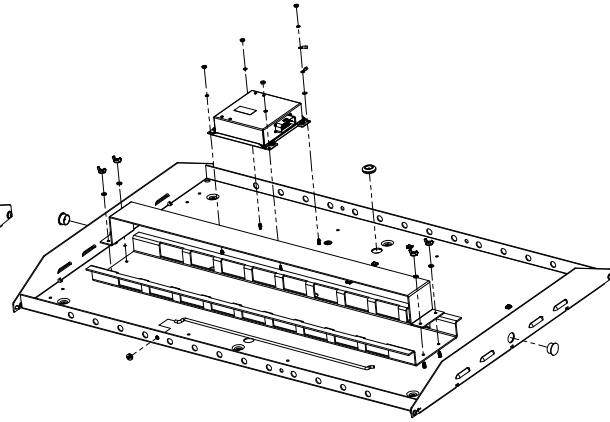


Figure 6-12: SE-80 Battery Installation

See section 7.1 *System Check and Start-up* for final system check and start-up procedures.

6.5 Grounding

The grounding point for the entire system including the fixture is provided inside the solar engine. Figures 6-13, 6-14 and 6-15 show the ground lugs in an SE-20, SE-50 and SE-80 respectively. The extension harness used to connect the fixture and engine has provision for grounding the two at this common point. See Appendix A-2: *Electrical Wiring Schematic*. Follow local electrical code to ground the system for safety and lightning protection.

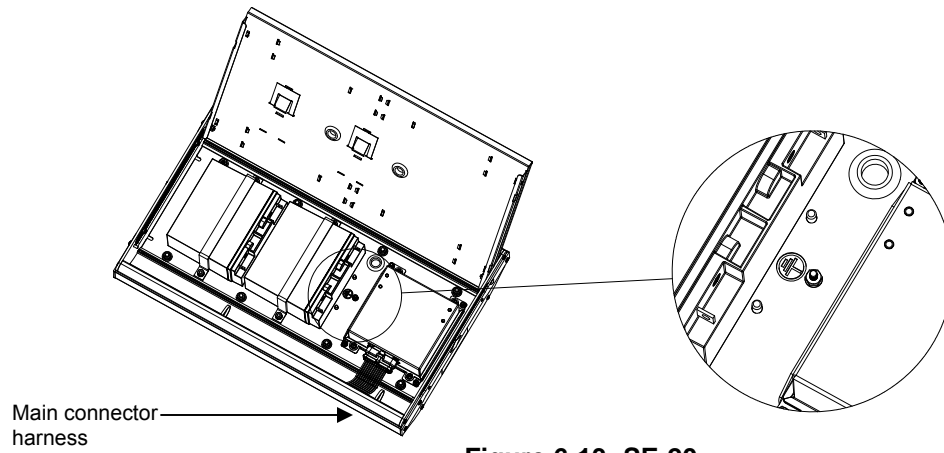


Figure 6-13: SE-20

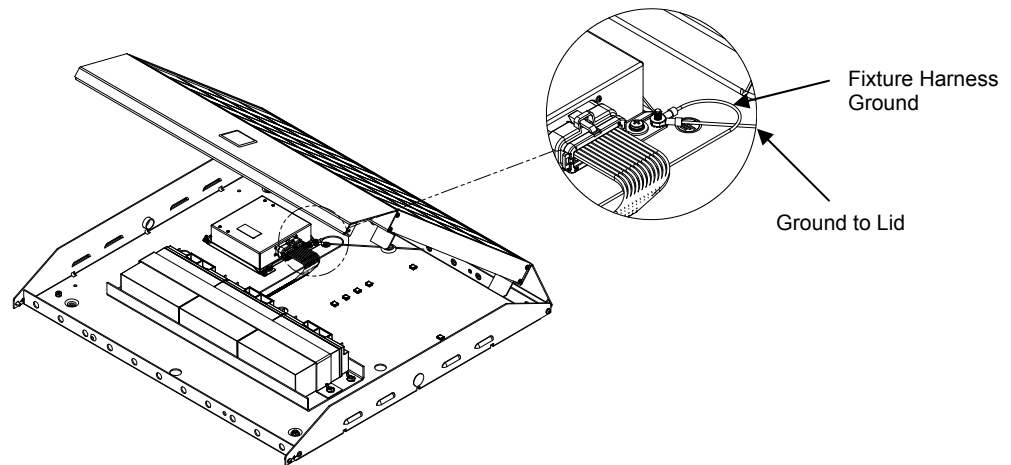


Figure 6-14: SE-50

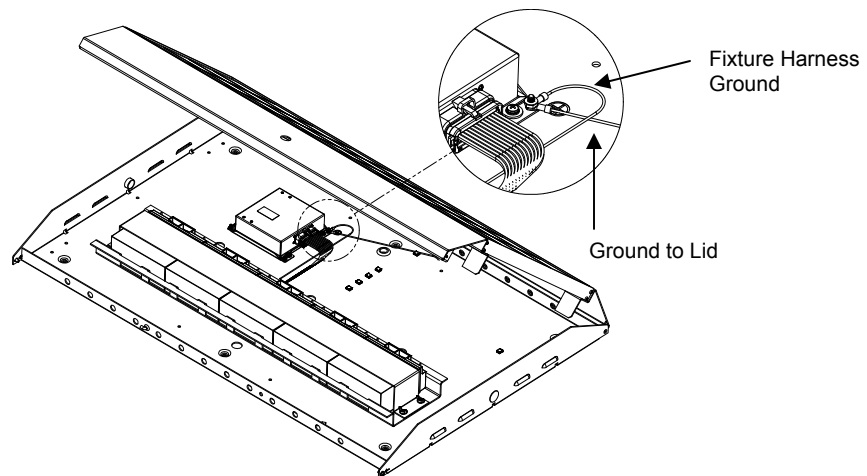


Figure 6-15: SE-80

7.0 System Operation

7.1 System Check and Start-up

Prior to activating the system, first ensure that all wiring and connections are correct, and secure. Next, check that the system and all its components are securely mounted. Check the attachments of the mounting structure and battery enclosure to the pole or mounting surface.



The red wire from the battery harness must be connected to the positive (red) terminal of the battery and the black wire must be connected to the negative (black) terminal of the battery. If the correct wiring connections are not followed, personal and or equipment damaged may result.

Make the electrical connections as outlined in the steps below, referring to the Electrical Wiring Schematic in Appendix A-2: *Electrical Wiring Schematic*.

1. Connect the fixture to the EMS.
Example: SE-10 – connect the fixture extension harness to the connection labeled LED 1 and LED 2.
2. Connect the batteries to the EMS.
Example: SE-10 – connect the battery to the connector labeled Battery 1.

NOTE

The system is powered immediately after the first battery is connected.

3. Confirm the system start-up sequence:
 - a. the fixture will light up within two seconds of the system being connected.
 - b. the fixture will extinguish after initialization.
 - c. the system will enter normal operation until the solar panels are connected.
4. Connect the solar panels to the EMS.
Example: SE-10 – connect the solar panel to the connector labeled Solar Panel 1.

NOTE

During start-up, the EMS confirms whether or not the fixture is connected to each driver; if no fixture is found the driver is turned off to conserve power. Failure to follow the connection sequence may result in a non-operational light. In the event the light does not turn on, reset the system by unplugging the main system connector at the EMS and plugging the connector back in.

8.0 Troubleshooting

If your system does not operate according to its specifications, check:

- ♦ the solar panel is not obscured, shaded, or dirty – all these factors greatly affect charging capacity
- ♦ the solar panel is not being illuminated by an external light source
- ♦ the unit externally for any obvious signs of damage
- ♦ the connection sequence; see section *7.0 System Operation*
- ♦ the battery voltage; if the voltage is less than 12 V contact Carmanah for customer support

If the fixture is blinking once a second (low battery shutdown) or twice a second (24-hour shutdown) ensure that the solar panels are not covered by debris or dirt. If required, remove the debris or clean the solar panel with a soft cloth and water. Wait at least 24 hours for the system to recover. If it does not recover, contact Carmanah for customer support.

The system can be tested during the daytime by covering the solar panel for more than 1 minute – the fixture should turn on. Uncover the solar panel and the fixture should then turn off after approximately 1 minute.

If the unit is still inoperable, contact Carmanah for customer support.

See section *10.0 Service and Additional Products* for information on contacting Carmanah customer support.

Gather the following information prior to contacting Carmanah:

- ♦ Model
- ♦ Serial #
- ♦ New installation. Yes/No
- ♦ Battery voltage
- ♦ Description of problem
- ♦ Location

9.0 Product Care

EverGEN™ solar engines are 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 clean and unobstructed by anything that could prevent the effectiveness of the 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. EverGEN™ solar engines installed with an inclination at or near horizontal will usually require more frequent inspection than solar engines installed at a greater angle. A yearly visual inspection of the EverGEN™ solar engines is typically sufficient.

10.0 Service and Additional Products

10.1 *Customer Service*

Before contacting Carmanah's customer service department, please have available the information listed on the EMS labels (described in section 5.1.1 *EMS Labeling*), a brief description of the problem, as well as all details of the installation.

This product is covered by the Carmanah warranty. Visit www.carmanah.com/content/products/warranty/ for additional information or to register your product online.

To contact Carmanah's Customer Service Department:

Mail: Carmanah Technologies Corp.
Building 4, 203 Harbour Road
Victoria, BC Canada V9A 3S2

Phone: 1.250.380.0052
1.877.722.8877 (Toll Free, U.S. and Canada)

Fax: 1.250.380.0062

Email: customerservice@carmanah.com

Website: carmanah.com

10.2 *Additional Products*

Carmanah offers a variety of solar-powered and energy efficient LED lighting products. For more information, visit carmanah.com.

Appendix A: EMS Configuration

The EMS for the EverGEN™ solar engines is factory configured based on profiles selected at the time of ordering. Should the installation location or situation change, you can adjust these settings.



Contact your Carmanah representative before making any changes to the settings of the EMS. Changing the settings may result in system or battery damage if the procedure is not performed correctly.

A-1: Accessing the EMS

1. Remove a screw on each side of the Solar Engine door to open the housing.
2. Disconnect the main harness from the EMS.
3. Remove the screws and washers from the four corners of the EMS. It can then be lifted from the bottom sealing gasket.

Your EverGEN™ solar engine offers configurable options using a set of switches (SW1) and rotary dials (SW2 and SW3) located on the circuit board within the EMS housing. They allow control of operating profiles and light levels; see Figure 10-1.

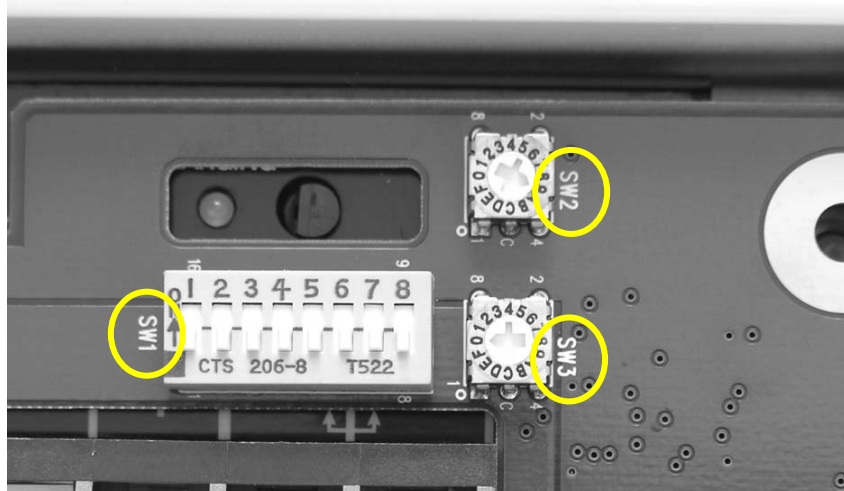


Figure 10-1: EverGEN™ solar engine EMS switches

Table 10-1 and Table 10-2 below describe each switch and rotary dial function.

Table 10-1: SW1 Settings (Switches 7 and 8 not used)

SW1 Switch Positions								Operating Profile
1	2	3	4	5	6	7	8	
0	0	0	0	0	0	0	0	Not applicable
1	0	0	0	0	0	0	0	Dusk to Dawn
0	1	0	0	0	0	0	0	Dusk + 2
1	1	0	0	0	0	0	0	Dusk + 4

SW1 Switch Positions								Operating Profile
1	2	3	4	5	6	7	8	
0	0	1	0	0	0	0	0	Dusk + 6
1	0	1	0	0	0	0	0	Dusk + 7
0	1	1	0	0	0	0	0	Dusk + 8
1	1	1	0	0	0	0	0	Dusk + 9
0	0	0	0	1	0	0	0	Dusk + 10
1	0	0	1	0	0	0	0	Dusk + 11
0	1	0	1	0	0	0	0	Dusk + 12
1	1	0	1	0	0	0	0	Split night, 5-dim-2 ³
0	0	1	1	0	0	0	0	Split night, 5-dim-3 ³
1	0	1	1	0	0	0	0	Split night, 5-dim-4 ³
0	1	1	1	0	0	0	0	Split night, 6-dim-2 ³
1	1	1	1	0	0	0	0	Split night, 6-dim-3 ³
0	0	0	0	1	0	0	0	Split night, 6-dim-4 ³
1	0	0	0	1	0	0	0	Split night, 7-dim-2 ³
0	1	0	0	1	0	0	0	Split night, 7-dim-3 ³
1	1	0	0	1	0	0	0	Split night, 7-dim-4 ³
0	0	1	0	1	0	0	0	Split night, 8-dim-2 ³
1	0	1	0	1	0	0	0	Split night, 8-dim-3 ³
0	1	1	0	1	0	0	0	Split night, 8-dim-4 ³
1	1	1	0	1	0	0	0	Split night, 9-dim-3 ³

Notes:

1. 1 = On
0 = Off
2. All DIP switch settings not shown are not applicable and should not be used.
3. Dim is defined as 33% of peak power.



Set the SW2 and SW3 rotary switch settings to a maximum of 870 mA (SW2 = 8, SW3 = 7). The fixture will be damaged if it is set to more than 870 mA.

Table 10-2: SW2 and SW3 Rotary Switch Settings

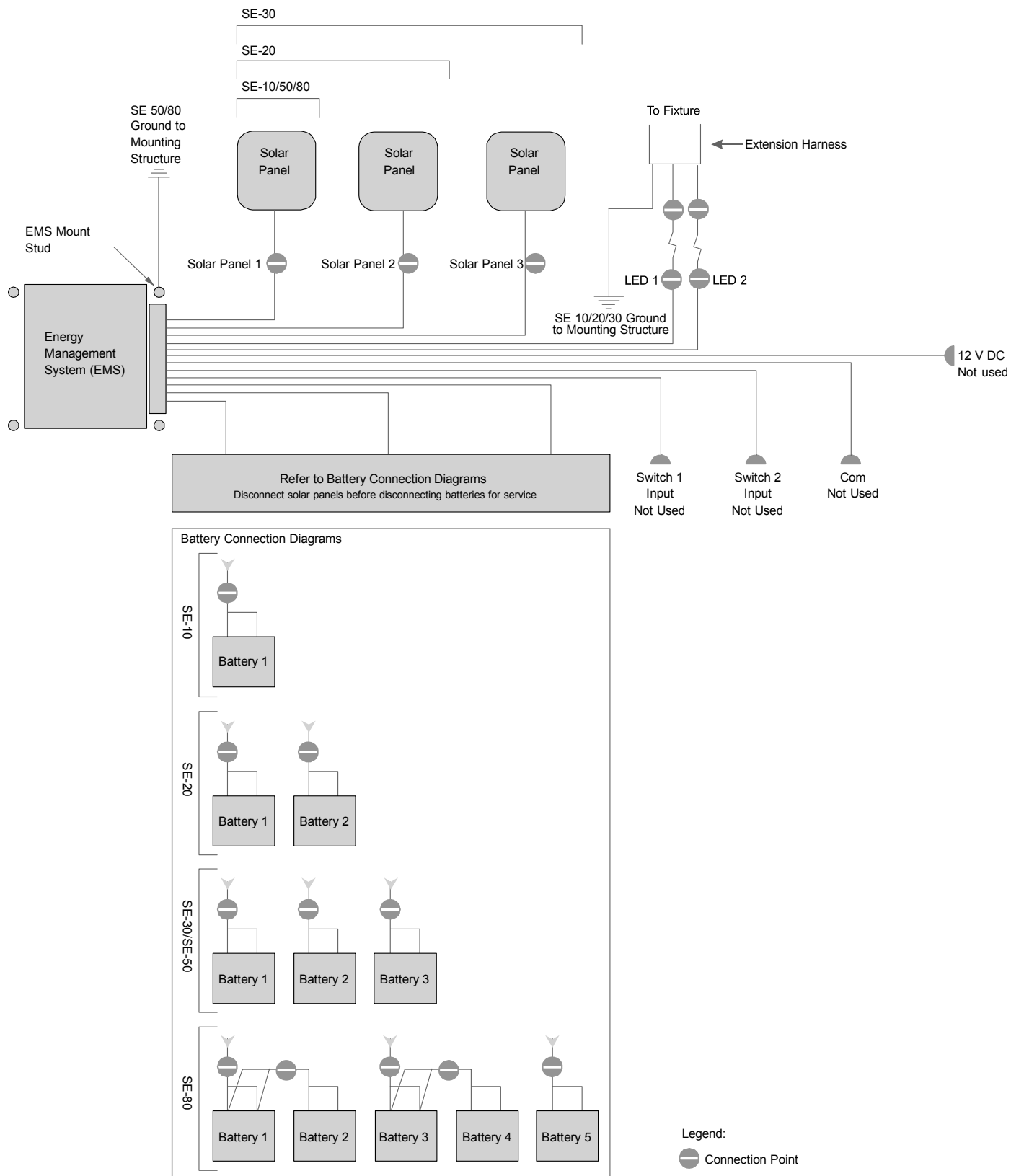
Position	SW2	SW3
	Coarse Current Adjustment	Fine Current Adjustment
0	0 mA	0 mA
1	100 mA	10 mA

Position	SW2	SW3
	Coarse Current Adjustment	Fine Current Adjustment
2	200 mA	20 mA
3	300 mA	30 mA
4	400 mA	40 mA
5	500 mA	50 mA
6	600 mA	60 mA
7	700 mA	70 mA
8	800 mA	80 mA
9	900 mA	90 mA
A	1000 mA	90 mA
B	1100 mA	90 mA
C	1200 mA	90 mA
D	1300 mA	90 mA
E	1400 mA	90 mA
F	N/A ¹	N/A ¹

Note:

1. This switch position is not used.

A-2: Electrical Wiring Schematic





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