
TRAFFIC SAFETY CORPORATION

TS-60S-S Single-Sided / TS-60D-S Double-Sided
Solar-Powered TS60-RRFB LED Systems
Installation, Operation, and Maintenance Manual



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1. Introduction

The Traffic Safety **TS-60S-S and TS-60D-S LED Single-Sided and TS-60D-S Double-Sided Solar-Powered RRFB Systems** are pedestrian warning systems designed to increase driver awareness at marked crosswalks and pedestrian crossing locations. The systems use high-intensity LED RRFB Beacons to draw attention to pedestrian crossings.

This manual provides instructions for the installation, electrical connections, start-up, operation, maintenance, troubleshooting, and component replacement of the **TS-60S-S Single-Sided and TS-60D-S Double-Sided Solar-Powered RRFB Systems**.

Terminology used throughout this manual:

- **TS-60S-S Single-Sided Solar-Powered RRFB System** – The complete crosswalk system consisting of two Single-Sided RRFB Assemblies, one installed on each side of the crosswalk.
- **TS-60D-S Double-Sided Solar-Powered RRFB System** – The complete crosswalk system consisting of two Double-Sided RRFB Assemblies, one installed on each side of the crosswalk.
- **RRFB Assembly** – The equipment associated with one side of the crosswalk, consisting of the RRFB Beacon(s), one Solar Controller, one Battery, one 50 W Solar Panel with, and the applicable pedestrian activation device(s).
- **RRFB Beacon** – The LED warning-light unit. A Single-Sided RRFB Assembly uses one Beacon; a Double-Sided RRFB Assembly uses two Beacons mounted back-to-back.
- **Solar Controller** – One Controller is included in each RRFB Assembly. It controls the Beacon(s), receives input from the local pedestrian activation device(s), manages the solar/battery power system, and communicates wirelessly with the Controller in the opposite Assembly.
- **Battery** – One Battery is used with each Solar Controller. The Battery is shipped uninstalled and is installed by the customer inside the corresponding Solar Controller Enclosure during installation.
- **Solar Panel** – One 50 W Solar Panel with mounting kit is provided for each RRFB Assembly. The Solar Panel supplies power to the corresponding Solar Controller and Battery system and also provides the system input used for automatic day/night RRFB dimming.

This manual covers:

- Mechanical installation
- Electrical installation
- System start-up and operation
- Preventive maintenance
- Replacement components

Read this manual before beginning installation. Proper installation, operation, and maintenance are required to ensure safe and reliable system performance and to maintain warranty coverage.

2. General Information

2.1. Warranty Requirements

The Solar-Powered TS60-RRFB System is covered by the following limited warranties:

- TS60-RRFB System: 5-Year Limited Warranty
- Solar Panel: 2-Year Warranty
- Battery: 1-Year Warranty

To maintain warranty coverage:

1. Install, operate, and maintain the system in accordance with this manual.
2. Use only Traffic Safety Corporation-approved components.
3. Perform all electrical connections in accordance with applicable national, state, and local electrical codes.
4. Do not modify the Solar Controller, RRFB Beacons, Battery system, Solar Panel, solar charging system, wiring, or other major system components without prior written approval from Traffic Safety Corporation.
5. Perform periodic inspection and maintenance as specified in this manual.

Unauthorized components or modifications, improper installation, or failure to perform required maintenance may affect system performance and warranty coverage.

2.2. System Overview

Each complete **TS60-RRFB Solar-Powered System** consists of **two RRFB Assemblies**, one installed on each side of the crosswalk.

Each RRFB Assembly includes the RRFB Beacon(s), one Solar Controller, one Battery, one 50 W Solar Panel with mounting kit, and the applicable pedestrian activation device(s).

The Solar Controller within each RRFB Assembly manages its local Beacon(s) and communicates wirelessly through an RF link with the Controller in the opposite Assembly. When the system is activated by a pedestrian, the RRFB Beacons in both Assemblies flash simultaneously.

The Solar Panel supplies power to the corresponding Solar Controller and Battery system and also provides the system input used for automatic day/night RRFB intensity control.

The system is available as the **TS-60S-S Single-Sided RRFB System** and the **TS-60D-S Double-Sided RRFB System**. The illustration below shows a typical TS-60S-S Single-Sided system; the same operating principle applies to the TS-60D-S Double-Sided system.

Typical TS-60S-S Single-Sided Solar-Powered RRFB System and Operating Principle



2.3. System Configuration and Components

2.3.1. System Configuration

The Solar-Powered TS60-RRFB product family is available under the following part numbers:

- **TS-60S-S – Single-Sided Solar-Powered RRFB System:** Consists of two Single-Sided RRFB Assemblies, one on each side of the crosswalk. Each Assembly includes one 12–24 VDC RRFB Beacon with Confirmation Light, one Solar Controller, one Battery, one 50 W Solar Panel with mounting kit, and the applicable pedestrian activation device(s).
- **TS-60D-S – Double-Sided Solar-Powered RRFB System:** Consists of two Double-Sided RRFB Assemblies, one on each side of the crosswalk. Each Assembly includes two 12–24 VDC RRFB Beacons with Confirmation Light mounted back-to-back, one Solar Controller, one Battery, one 50 W Solar Panel with mounting kit, and the applicable pedestrian activation device(s).

Each Solar Controller has a **12 VDC solar input** and provides **12 VDC output** for system operation.

2.3.2. System Components

Each complete TS60-RRFB Solar-Powered System contains two RRFB Assemblies, one on each side of the crosswalk.

Each RRFB Assembly includes:

- **RRFB Beacon(s)** – one Beacon for TS-60S-S or two back-to-back Beacons for TS-60D-S
- **One Solar Controller**
- **One Battery**
- **One 50 W Solar Panel with mounting kit**
- **Applicable Pedestrian Activation Device(s)** – Push Button(s) and/or Sensor Bollard(s)
- **Mounting Hardware**, as applicable

Each Battery is shipped uninstalled with the Traffic Safety Corporation system shipment and must be installed by the customer inside the corresponding Solar Controller Enclosure.

Each Solar Panel and mounting kit is shipped separately directly to the customer.

Pedestrian activation devices may be supplied with the system or provided separately by the customer. Any customer-supplied activation device must meet Traffic Safety Corporation compatibility requirements for connection to the Solar Controller within the RRFB Assembly.

Some mounting hardware is supplied with the system. Additional site-specific mounting hardware may be required and must be provided by the customer.

2.3.3. Pedestrian Activation Methods

The TS-60S-S and TS-60D-S Systems support the following pedestrian activation methods, depending on project requirements:

- **Push-Button Activation** – Push-button station or standalone push button.
- **Pedestrian Motion Sensor** – MS SEDCO VPR-27 motion sensor for pedestrian detection.
- **Sensor Bollard System** – Sensor Bollards for pedestrian detection.

IMPORTANT:

Use of pedestrian detection Bollards may be subject to local approval, applicable traffic regulations, and requirements of the Authority Having Jurisdiction (AHJ). Confirm that the selected activation method is approved for a specific location before installation.

3. Safety Information

The Solar-Powered TS60-RRFB System contains electrical, electronic, solar, and battery-powered components.

Installation and maintenance shall be performed only by qualified personnel familiar with traffic control equipment, electrical systems, battery systems, and applicable safety requirements.

Failure to follow the instructions and safety precautions in this manual may result in equipment damage, system malfunction, serious injury, or death.

3.1. General Safety Precautions

WARNING

Read and understand this manual before installing, operating, or servicing the TS60-RRFB System.

- Installation and maintenance shall be performed by qualified personnel.
- Follow all applicable federal, state, and local regulations and safety requirements.
- Use appropriate personal protective equipment (PPE) during installation and maintenance.
- Inspect all components for visible damage before installation.
- Verify that all components are securely mounted before placing the system into service.

- Do not modify system components without prior written approval from Traffic Safety Corporation.
- Use only approved replacement parts and accessories.

3.2. Electrical Safety

WARNING

Electrical hazards may be present during installation and maintenance.

- Disconnect the Battery and Solar Panel before installing, servicing, or modifying electrical connections.
- Verify that all electrical connections are properly installed and secured before applying power.
- All wiring shall comply with applicable electrical codes and regulations.
- Use appropriate wire sizes and overcurrent protection as required by applicable codes and system specifications.
- Inspect wiring for damage, abrasion, or loose connections before system start-up.
- Do not energize the system until all electrical installation procedures have been completed.

3.3. Battery Safety

WARNING

Improper handling, installation, or servicing of batteries may result in equipment damage, fire, serious injury, or death.

- Use only batteries approved for use with the TS60-RRFB System.
- Follow all battery manufacturer safety instructions and recommendations.
- Do not short-circuit Battery terminals.
- Do not expose Batteries to open flame, sparks.
- Observe correct polarity when making Battery connections.
- Do not install or use a damaged Battery.
- Disconnect the Battery before servicing electrical components, as applicable.
- Dispose of Batteries in accordance with applicable local regulations.

3.4. Solar Panel Safety

WARNING

Solar Panels generate electrical energy whenever exposed to sunlight or other light sources and may produce hazardous voltage.

- Disconnect the Solar Panel before servicing associated electrical equipment.
- Where practical, cover the Solar Panel to reduce electrical output during installation or service.
- Avoid contact with exposed conductors.
- Verify correct polarity before making electrical connections.
- Ensure the Solar Panel and mounting kit are securely installed before placing the system into service.

3.5. Installation Safety

WARNING

Installation activities may require work near roadways, moving traffic, elevated structures, batteries, and electrical equipment.

- Follow all applicable work-zone safety requirements.
- Use appropriate traffic control measures during installation and maintenance activities.
- Follow approved procedures when working at heights.
- Verify that support structures are capable of supporting all installed equipment and applicable environmental loads.
- Use proper lifting techniques when handling equipment.
- Ensure all mounting hardware is properly tightened before placing the system into service.
- Perform a complete functional verification of the system after installation is complete.

4. System Installation

4.1 Support Structure and System Placement

Proper placement and installation of the TS60-RRFB System are essential for reliable operation, adequate visibility, solar performance, and compliance with applicable requirements.

The support structures for the RRFB Assemblies are not supplied by Traffic Safety Corporation. Selection, structural design, installation, and foundation requirements for the support structures shall comply with the approved project plans and applicable requirements.

Before installation, verify that the installation locations, support structures, and system configuration conform to the approved project plans and the requirements of the Authority Having Jurisdiction (AHJ).

Install one RRFB Assembly on each side of the crosswalk:

- **TS-60S-S Single-Sided RRFB System** – Install one Single-Sided RRFB Assembly on each side of the crosswalk. Each Assembly uses one RRFB Beacon.
- **TS-60D-S Double-Sided RRFB System** – Install one Double-Sided RRFB Assembly on each side of the crosswalk. Each Assembly uses two RRFB Beacons mounted back-to-back and facing opposite directions.

Verify that:

- Support structures are structurally sound and capable of supporting the installed equipment and applicable environmental loads.
- RRFB Beacon(s) are properly positioned and oriented for clear visibility to approaching motorists.
- Pedestrian activation devices are located as specified by the approved project plans and are accessible to users.
- The Solar Controller for each RRFB Assembly is mounted in a location that allows access for inspection, maintenance, and service.
- Each Solar Panel can be installed in the required location and orientation with adequate exposure to sunlight and without significant obstruction or shading.

Before Beginning Installation

- Verify that all required system components have been received and inspect them for visible damage.
- Verify that both Batteries have been received with the Traffic Safety Corporation shipment.
- Verify receipt of the separately shipped Solar Panels and mounting kits.
- Verify that all required mounting hardware is available.
- Review the applicable installation drawings and wiring diagrams.

IMPORTANT:

Do not install damaged or incomplete components. Contact Traffic Safety Corporation if replacement parts or additional components are required.

4.2. RRFB Beacon Installation

The RRFB Beacon is the LED warning-light unit that provides the visual warning signal to approaching motorists. It is part of the RRFB Assembly installed on each side of the crosswalk.

RRFB Beacons are mounted to the support structure using the Shallow Strut Channel attached to the back of the Beacon and customer-supplied Rigid Strut Strap(s).

Before installation, verify the following:

- The RRFB Beacon(s) match the ordered System (TS-60S-S or TS-60D-S).
- The required number of RRFB Beacons is available.
- The Rigid Strut Strap(s) are compatible with the support structure diameter.
- The Beacon cable(s) can be routed through the support structure before securing the Beacon(s).

Do not install damaged components. Verify that all mounting hardware is available before beginning installation.

IMPORTANT:

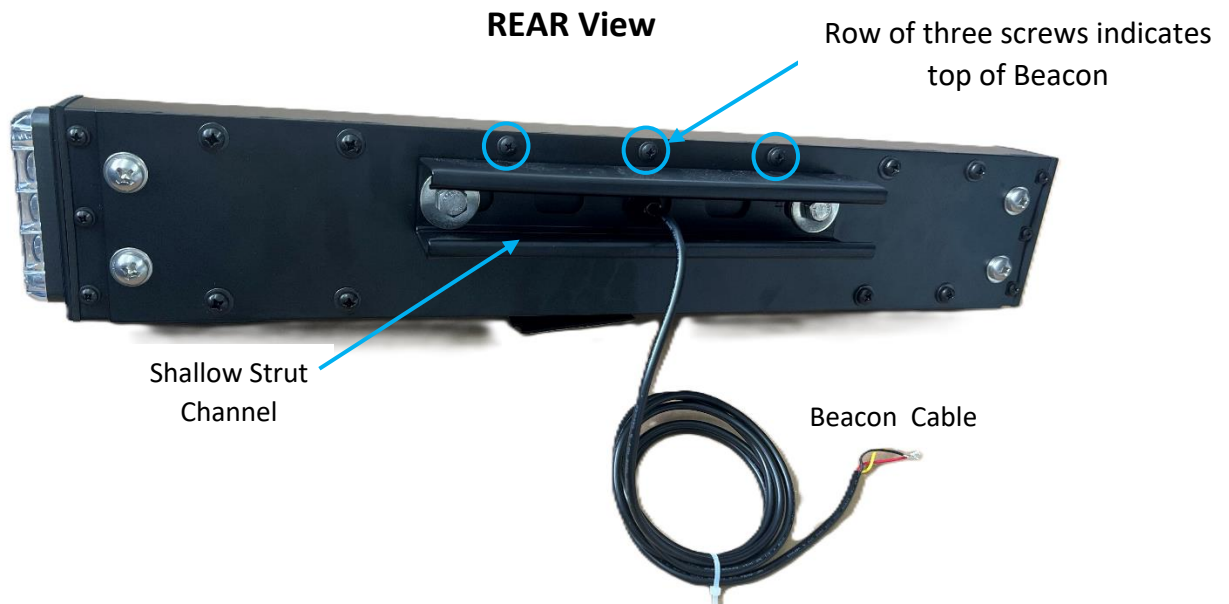
The Rigid Strut Strap(s) are not supplied by Traffic Safety Corporation. Select Rigid Strut Strap(s) compatible with the diameter of the support structure.

Typical RRFB Beacon Components:



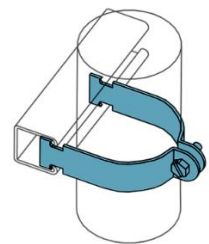
Beacon Orientation

- Position each RRFB Beacon for installation with the **TOP** arrows on both front LED modules pointing upward. The LED face shall be positioned vertically in the vertical plane and oriented toward approaching traffic.
- If the TOP labels are missing or unreadable, use the rear view of the Beacon as an alternate orientation reference. The horizontal row of three screws located above the Shallow Strut Channel identifies the top of the Beacon.



IMPORTANT

The Rigid Strut Strap(s) are not supplied by Traffic Safety Corporation.
Select Rigid Strut Strap(s) compatible with the diameter of the support structure.



4.2.1. Single-Sided RRFB Beacon Installation

For the TS-60S-S Single-Sided RRFB System, each RRFB Assembly uses one RRFB Beacon mounted on its support structure using one 1-5/8" × 13/16" Shallow Strut Channel and one customer-supplied Rigid Strut Strap.



Installation:

1. Route the Beacon cable through the support structure.
2. Position the Beacon at the required installation height and orientation.
3. Verify that the Beacon is installed with the TOP arrows on both front LED modules pointing upward, with the LED face positioned vertically in the vertical plane and oriented toward approaching traffic. If the TOP labels are missing or unreadable, use the rear orientation reference shown in Section 4.2.
4. Position the Shallow Strut Channel against the support structure.
5. Install the Rigid Strut Strap around the support structure and through the Shallow Strut Channel.
6. Tighten the strap securely.
7. Verify that the Beacon is properly aligned, firmly mounted, and at the required height.

Verify the following after installation:

- The Beacon is securely mounted.
- The Beacon face is in the vertical plane and oriented toward approaching traffic.
- The Beacon is properly aligned.
- The Beacon cable is correctly routed and not pinched or damaged.

4.2.2. Double-Sided RRFB Beacon Installation

For the TS-60D-S Double-Sided RRFB System, each RRFB Assembly uses two RRFB Beacons mounted back-to-back on its support structure using 1-5/8" × 1-5/8" Shallow Strut Channels and two customer-supplied Rigid Strut Straps.



Installation:

1. Route both Beacon cables through the support structure.
2. Position both Beacons on the support structure at the required installation height.
3. Verify that both Beacons are installed back-to-back, facing opposite directions, with the TOP arrows on both Front LED modules pointing upward. If the TOP labels are missing or unreadable, use the rear orientation reference shown in Section 4.2.
4. Position the two Beacons at the same height, with their faces oriented in opposite directions. Vertically offset the Shallow Strut Channels so that one Channel is above the other, as shown in the figure.
5. Install the two Rigid Strut Straps around the support structure, one above the other, with each Strap engaging its corresponding Shallow Strut Channel.
6. Tighten both straps securely.
7. Verify that the Beacons are directly back-to-back, parallel, at the same height, properly aligned, and firmly mounted.

Verify the following after installation:

- Both Beacons are securely mounted.
- The Beacons are directly back-to-back, parallel, and at the same height.
- The Beacon faces are positioned vertically in the vertical plane and oriented in opposite directions, with each face visible to approaching traffic from its respective direction. The Shallow Strut Channels and Rigid Strut Straps are positioned one above the other
- Both Beacon cables are correctly routed and not pinched or damaged.

4.3. Solar Controller Installation

Each RRFB Assembly includes one Solar Controller Enclosure; therefore, each complete TS60-RRFB Solar-Powered System has two Controller Enclosures, one on each side of the crosswalk.

Each Solar Controller operates the Beacon(s), receives input from the pedestrian activation device(s) within its RRFB Assembly, manages the solar/battery power system, and communicates wirelessly through its RF antenna with the Controller in the opposite Assembly to synchronize system operation.

The Solar Controller Enclosure is supplied with its internal electrical components installed, is made of PBT/PC blend, and measures 19.17 × 14.64 × 7.85 in and weighs approximately 23 lb with the Battery installed.

It may be mounted to a support structure as specified on the approved project drawings.

The Battery is supplied separately within the Traffic Safety Corporation system shipment and must be installed inside the Controller Enclosure during system installation.

4.3.1. Battery Installation

Each Solar Controller Enclosure is designed to contain one Battery. The Battery is shipped uninstalled and must be installed by the customer before system start-up.

Battery Specifications

- Type: 12 V, 30 Ah LiFePO4 (approximately 384 Wh)
- Weight: 6.17 lb. (2.8 kg)
- Dimensions: 5.98 in × 3.94 in × 5.16 in (L × H × W)
- Battery Monitoring: Bluetooth 5.0-enabled
- Continuous Discharge Capability: Up to 20 A
- Cycle Life: 4,000+ charge/discharge cycles

Battery Operating Conditions

- Do not short-circuit the Battery terminals.
- Do not expose the Battery to open flame or excessive heat.
- Do not charge the Battery below 32°F (0°C), unless otherwise specified by the Battery manufacturer.
- Battery performance may vary under extreme ambient temperature conditions.
- Follow the Battery manufacturer's recommendations for storage and operation.
- Replace the Battery immediately if it is damaged or swollen.

Battery Installation

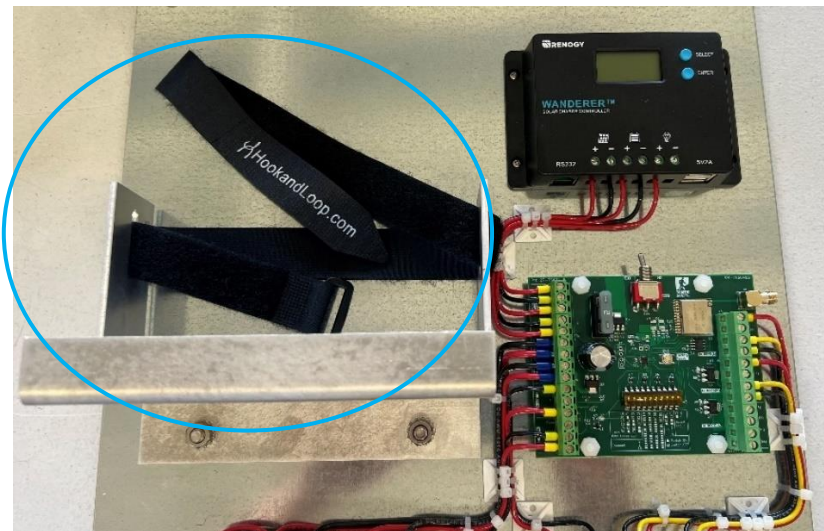
The Controller Enclosure includes a pre-installed Battery mounting bracket and VELCRO® strap for securing the Battery during installation.

1. Remove the Battery from its shipping packaging.
2. Inspect the Battery for visible damage before installation.
3. Open the Controller Enclosure.
4. Position the Battery on the pre-installed mounting bracket within the designated Battery mounting area.
5. Secure the Battery using the pre-installed VELCRO® strap. Ensure the strap is properly positioned around the Battery and the Battery is firmly secured and cannot move within the enclosure.



IMPORTANT:

Do not make Battery electrical connections until instructed in Chapter 5 – Electrical Installation.



4.3.2. Controller Enclosure Installation

For pole-mounted installations, the Solar Controller Enclosure is supplied with two Mounting Channels and associated mounting hardware pre-installed on the enclosure.

Two stainless-steel bands are also supplied for securing the enclosure to the support structure. The customer shall provide the tools required for installation.



Installation:

- Position the Solar Controller Enclosure at the required installation location.
- Verify that the enclosure is positioned to allow the door to be fully opened for inspection and service.
- Position the two Mounting Channels against the support structure.
- Secure the enclosure to the support structure using the two supplied stainless-steel bands.
- Tighten the stainless-steel bands securely using the appropriate tools.
- Verify that the enclosure is firmly mounted, properly oriented, and readily accessible for inspection and maintenance.

4.3.3. Final Mechanical Verification

Before proceeding with electrical installation, verify that:

- The Battery is properly positioned and securely fastened inside the Controller Enclosure.
- The Controller Enclosure is securely mounted to the support structure.
- Both stainless-steel bands and all mounting hardware are properly tightened.
- The enclosure door opens fully without obstruction.
- The enclosure is properly oriented and accessible for service and maintenance.

Electrical connections for the Battery, Solar Panel, Controller, and other system components are described in **Chapter 5 – Electrical Installation**.

4.4. Solar Panel Installation

Each RRFB Assembly includes one 50 W Solar Panel and one Solar Panel Mounting Bracket.

The Solar Panel and mounting bracket are supplied by Ameresco Solar and shipped separately directly to the customer.

The mounting bracket is shipped disassembled. Hardware required to assemble the bracket and attach the Solar Panel to the bracket is supplied with the mounting kit.

The 3/4 in stainless-steel banding used to secure the bracket to the support structure, and the required banding installation tools, are not supplied with the system and shall be provided by the customer.

Proper Solar Panel location, orientation, and tilt are required for reliable Battery charging and automatic day/night RRFB dimming operation.

4.4.1. Solar Panel

The TS60-RRFB Solar-Powered System uses a photovoltaic module designed for outdoor use as part of the Solar-Powered RRFB System.

Solar Panel Specifications

- Model: 50J
- Maximum Power: 50 W
- Nominal Voltage: 12 V
- Dimensions: 33.0 × 21.1 × 2.0 in (839 × 537 × 50 mm)
- Weight: 13.2 lb (6 kg)
- Frame: Silver anodized aluminum
- Junction Box Rating: IP65

The Solar Panel frame includes mounting holes sized for approximately 1/4 in (6 mm) fasteners.



Solar Panel Location and Orientation

Install the Solar Panel in a location with maximum practical exposure to sunlight.

For installations in the Northern Hemisphere, orient the Solar Panel generally toward the South for optimum solar energy production, unless otherwise specified by the approved project drawings.

When selecting the installation location:

- Avoid trees, buildings, overhead power lines, signs, or other objects that may shade the Solar Panel.
- Consider seasonal changes in the sun's position, particularly during winter when the sun is lower in the sky.
- Minimize partial shading, which may reduce solar energy production and affect Battery charging and system operation.
- Use the adjustable mounting bracket to set the required Solar Panel tilt angle for the installation location.



Before installation, verify that:

- The Solar Panel is free from visible damage.
- The frame, glass, and junction box are intact.
- The selected location provides adequate sunlight exposure.
- The Solar Panel cable can be routed to the Solar Controller without being pinched or damaged.

IMPORTANT – Solar Panel Electrical Connection

The Solar Panel provides the system input used for automatic day/night RRFB dimming operation. Electrical connections are described in Chapter 5 – Electrical Installation.

4.4.2. Solar Panel Mounting Bracket

Two Solar Panel mounting bracket configurations are available:

- **HPM50U-BK** – Standard mounting bracket
- **HPM50U-HWS Series** – Reinforced mounting configuration for installations where **increased wind-load resistance** is required by the project design or applicable structural requirements

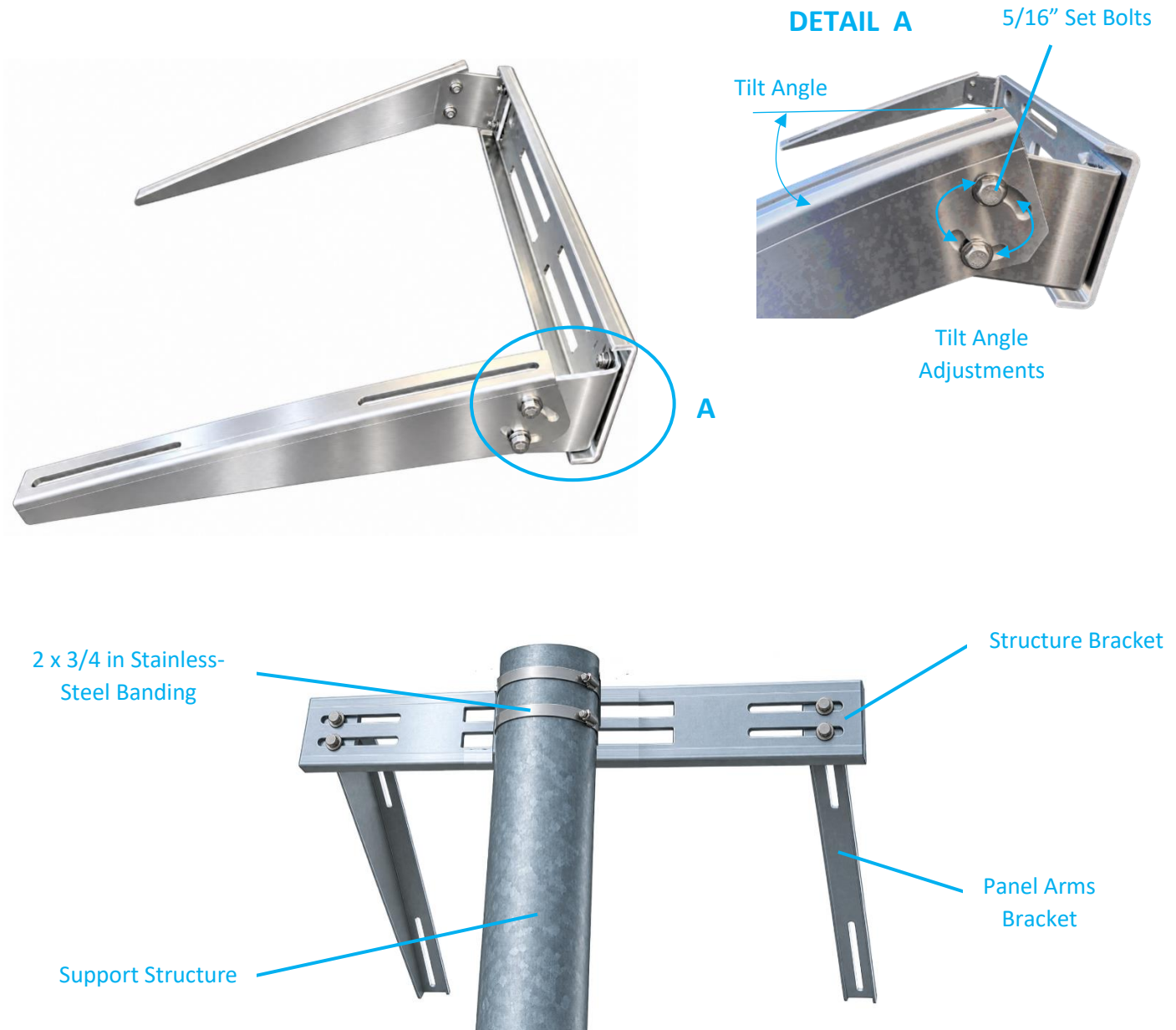
Both configurations are secured to the support structure using **3/4 in stainless-steel banding**.

The standard bracket is an adjustable aluminum dual-arm mounting bracket designed to support the Solar Panel and allow field adjustment of the panel tilt angle.

Mounting Bracket Specifications

- Material: Aluminum
- Overall Dimensions (H × W × D): 26.0 × 4.0 × 3.0 in
- Mounting Style: Side-of-pole
- Adjustment: Field-adjustable panel tilt angle

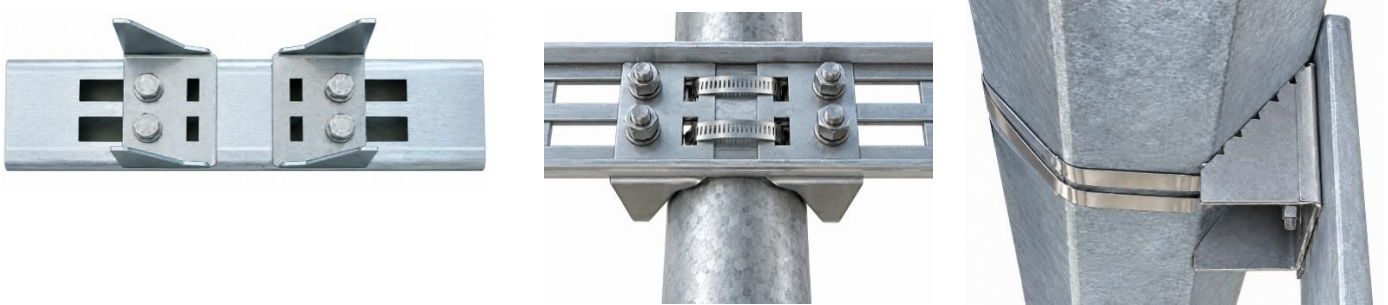
Each Panel Arm Bracket uses two bolts installed through curved adjustment slots, allowing the Solar Panel tilt angle to be adjusted and secured in the required position.



The **HPM50U-HWS Series** includes an Adjustable Saddle Bracket System at the pole attachment area. The saddle brackets provide additional support and can accommodate different pole sizes and configurations, round/tapered poles, while notched saddle brackets are available for octagonal poles.

⚠ IMPORTANT

The 3/4 in stainless-steel banding and banding installation tools are customer-supplied.



4.4.3. Solar Panel and Bracket Installation

1. Assemble the Solar Panel Mounting Bracket using the supplied hardware.
2. Attach the Solar Panel to the Panel Arm Brackets.
3. Position the assembled Solar Panel and bracket on the support structure.
4. Route two 3/4 in stainless-steel bands through the Structure Bracket slots and around the pole.
5. Tighten both bands using the appropriate banding installation tool.
6. Adjust the Solar Panel to the required tilt angle using the Panel Arm Bracket adjustment slots.
7. Tighten all adjustment and mounting hardware securely.
8. Route the Solar Panel cable to the Solar Controller without pinching or damaging the cable.
9. Verify that the Solar Panel is securely mounted, properly oriented, and free from significant shading or obstruction.

5. Electrical Installation

Electrical installation shall be performed by qualified personnel in accordance with applicable electrical codes, approved project drawings, and the wiring diagrams provided in this manual.



WARNING:

Do not place the system into operation until Start Up – Shut Down instructions are followed.

5.1. System Wiring Overview

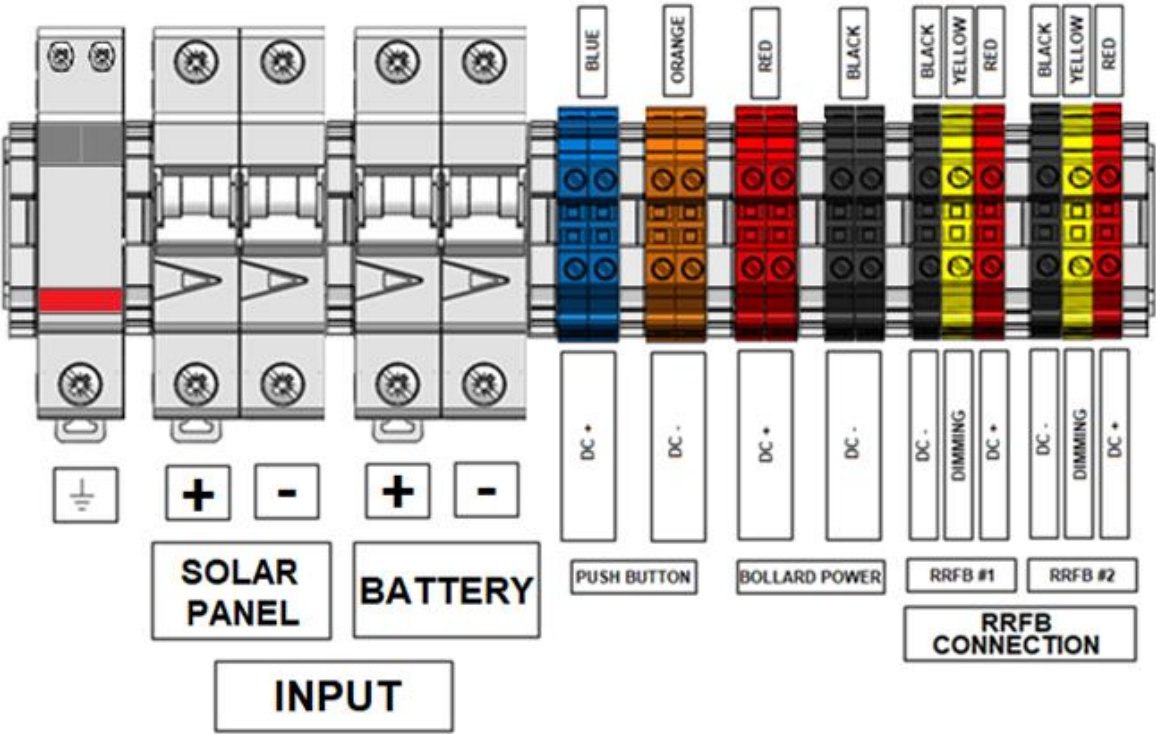
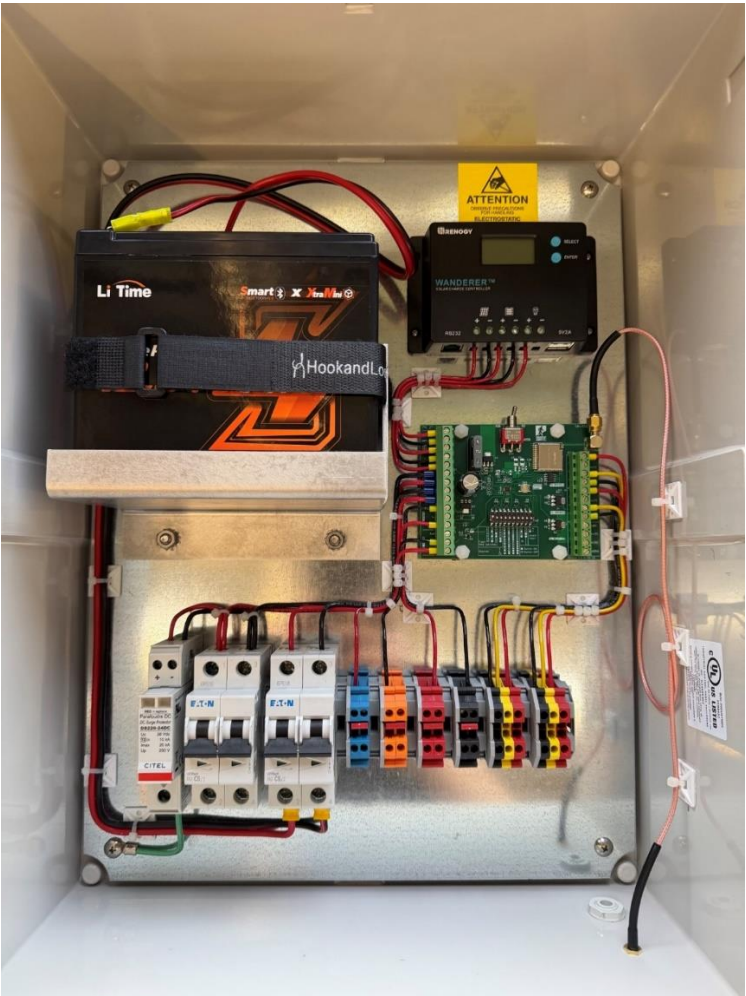
Each RRFB Assembly shall be electrically installed in accordance with the applicable **National Electrical Code (NEC)** requirements for the installation location. The two Solar Controllers communicate wirelessly to synchronize operation across the complete TS60-RRFB Solar-Powered System.

The Solar Controller provides the electrical connections for the Solar Panel, Battery, RRFB Beacon(s), and pedestrian activation device(s), as applicable to the system configuration.

For the **TS-60S-S Single-Sided Solar-Powered System**, each RRFB Assembly has one Beacon cable connected to its local Solar Controller.

For the **TS-60D-S Double-Sided Solar-Powered System**, each RRFB Assembly has two Beacon cables connected to its local Solar Controller.

The following illustrations provide an overview of the Solar Controller and the electrical connections for the complete system. Detailed connection instructions are provided in the following sections.



5.1.1. Solar Panel Electrical Connection

Each RRFB Assembly includes one Solar Panel connected to its local Solar Controller. The Solar Panel provides the solar input required for system operation and automatic day/night RRFB intensity control. Before making the electrical connection, verify that the Solar Panel has been mechanically installed as described in Chapter 4 – Mechanical Installation.

⚠ **WARNING – Solar Panel Electrical Output**

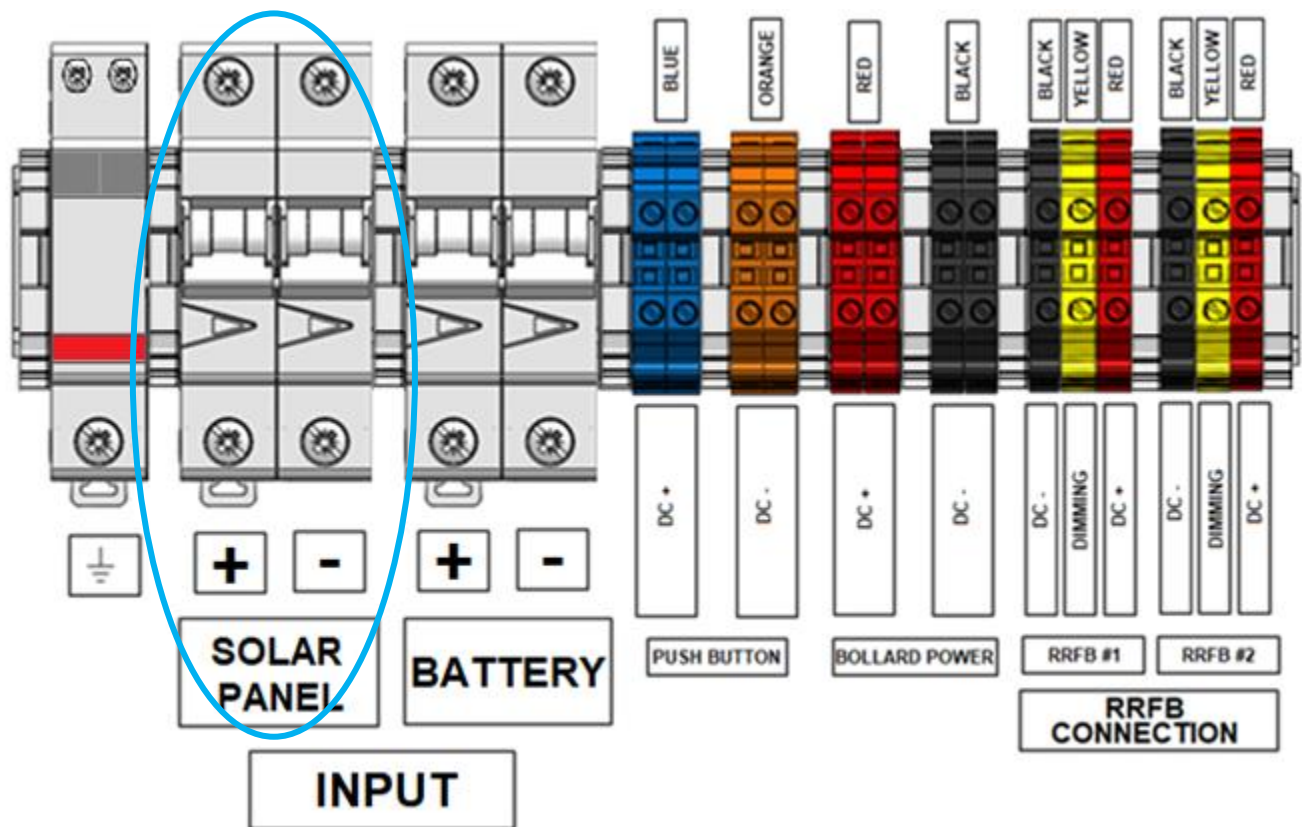
The Solar Panel can generate electrical voltage whenever exposed to sunlight or other light sources. Exercise caution when handling the Solar Panel cable and making electrical connections.

Solar Panel Connection

1. Locate the designated Solar Panel circuit breaker inside the Solar Controller Enclosure.

⚠ **WARNING**

Connect the **12 VDC Solar Panel cable** to the designated Solar Panel input circuit breaker inside the Solar Controller Enclosure, as shown in the wiring diagram below.



Solar Panel Installation Kit

Traffic Safety Corporation provides an optional Solar Panel installation kit for connecting the Solar Panel to the Solar Controller. The kit includes a **10 ft long, 2-conductor, 14 AWG cable** and **two 1/2 in. NPT cable glands**.

The provided installation kit may be used as described below. The installer may use an alternative cable and cable-entry method when required by the installation, such as when a longer cable is needed or when multiple cables are routed through a common cable gland.

⚠ IMPORTANT: Regardless of the cable and cable-entry method selected, ensure that the installation maintains the Solar Controller Enclosure's water-resistant seal and does not compromise the enclosure's protection against water ingress.

2. Using the provided 10 ft long, 2-conductor, 14 AWG cable, connect the Solar Panel to the designated Solar Panel circuit breaker inside the Solar Controller Enclosure.



Solar panel



Solar panel cable



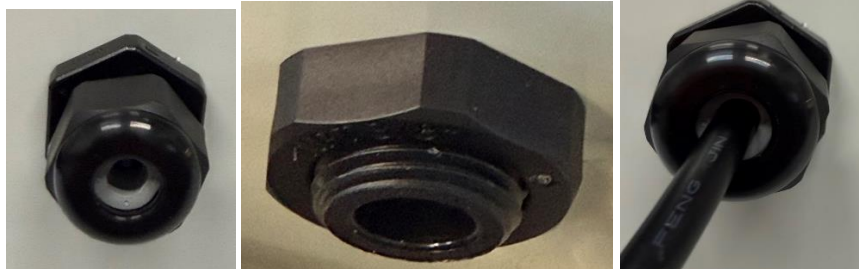
Solar controller enclosure

3. Install the two provided 1/2" NPT cable glands as follows:



- a) Install one cable gland where the cable enters the Solar Controller Enclosure.

IMPORTANT: Whenever practical, install the cable gland at the bottom of the enclosure to minimize the potential for water ingress.



Solar panel cable gland installed

- b)** Install the second cable gland in the ½" knockout hole in the Solar Panel junction box. Follow the Solar Panel manufacturer's instructions and wiring diagram for connecting the cable.



- 4.** Before proceeding to the next step, verify that the Solar Panel cable is properly secured and that both cable glands are correctly installed and tightened.

5.1.2 Battery Electrical Connection

Each RRFB Assembly includes one Battery installed inside the Solar Controller Enclosure. The Battery supplies power to the Solar Controller and associated RRFB components when the system is operating.

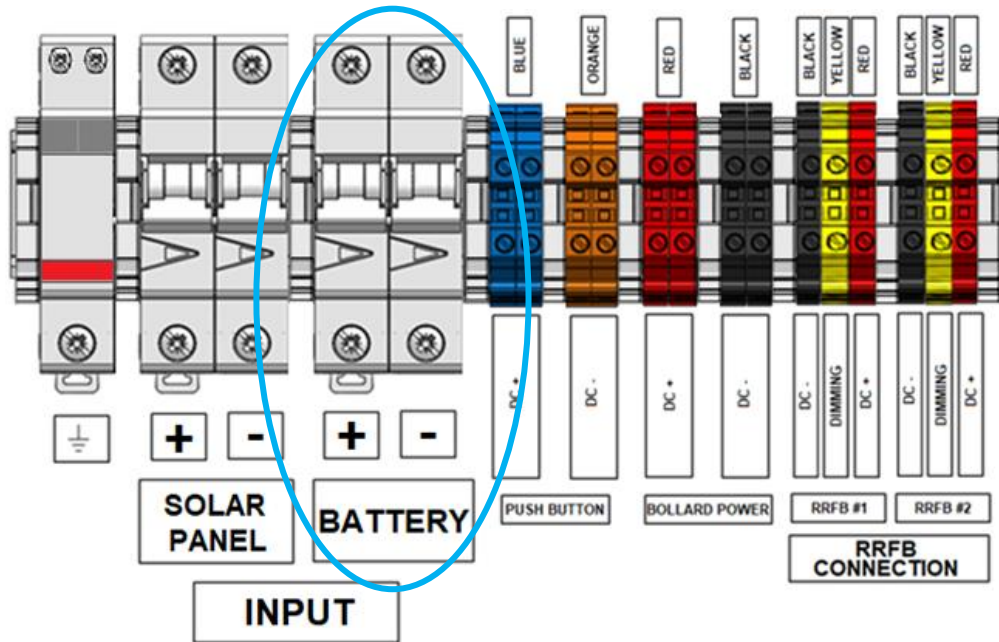
The Battery connection cable is pre-installed and connected to the designated Battery circuit breaker inside the Solar Controller Enclosure. During installation, the customer only needs to connect the free ends of the cable to the Battery terminals and turn ON the Battery.

Before making the Battery electrical connection, verify that the Battery has been properly positioned and secured inside the Solar Controller Enclosure as described in Chapter 4 – Mechanical Installation.



Battery Connection

1. Verify that the Battery connection cable is installed and connected to the designated Battery circuit breaker inside the Solar Controller Enclosure, as shown in the illustration below.



2. Connect the free ends of the Battery connection cable to the corresponding Battery terminals.

IMPORTANT: Connect the Positive (red) and Negative (black) cables to the corresponding Battery terminals. Verify the correct polarity before making the connection.

Turn ON the Battery by pressing and holding the Battery power button for approximately 1 second, until the green LED illuminates.



3. Verify that the Battery connection is secure and that the cable is routed and retained to prevent interference with other components inside the enclosure.

Before proceeding to the next step, verify that the Battery remains firmly secured on the mounting bracket with the VELCRO® strap and that the green Battery LED is illuminated.

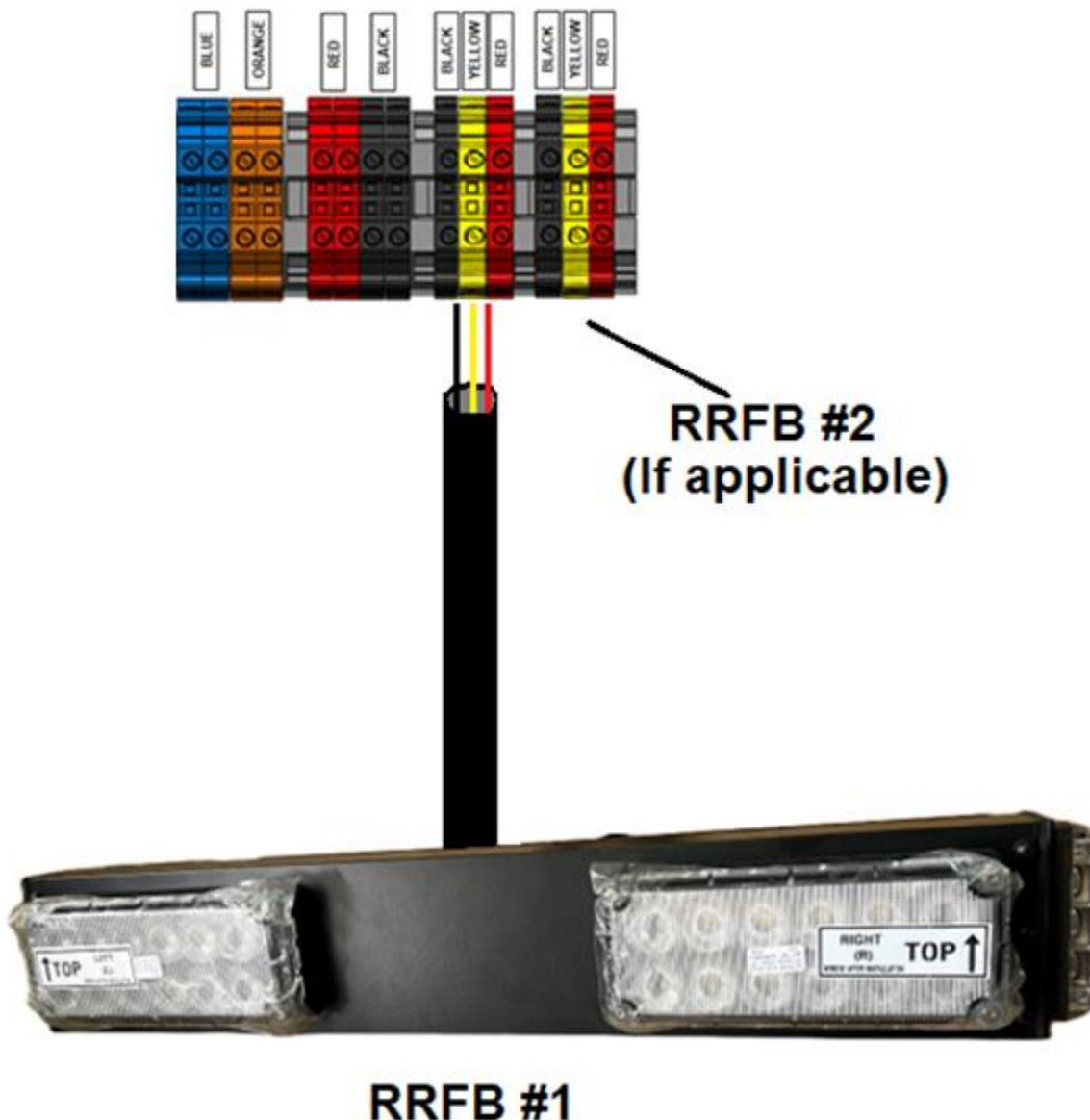
5.2. RRFB Beacon Wiring and Connections

Each RRFB Assembly includes one Solar Controller. The TS-60S-S Single-Sided Solar-Powered System has one Beacon per RRFB Assembly, while the TS-60D-S Double-Sided Solar-Powered System has two Beacons per RRFB Assembly.

Each Beacon is supplied with an attached 7 ft long cable. After installing the Beacon as described in Section 4.2 – RRFB Beacon Installation, connect the free end of the Beacon cable to the corresponding Solar Controller within the same RRFB Assembly.

Beacon Cable Connection

1. Locate the designated Beacon connection terminals inside the Solar Controller Enclosure, as shown in the applicable wiring diagram.



2. Connect the free end of each Beacon cable to the corresponding terminals inside the Solar Controller Enclosure.
For the **TS-60D-S Double-Sided Solar-Powered System**, connect both Beacon cables to the Solar Controller within the same RRFB Assembly.

Beacon Cable Gland Installation

Traffic Safety Corporation provides one 3/8" NPT cable gland for each Beacon cable entering the Solar Controller Enclosure: one cable gland for the TS-60S-S System and two cable glands for the TS-60D-S System. An alternative cable-entry method may be used if preferred, provided that the selected method is suitable for the application and maintains the enclosure's water-resistant seal and protection against water ingress.



3. If using the provided cable glands, install one 3/8" cable gland for each Beacon cable entering the Solar Controller Enclosure.



Solar Panel Cable Gland Installation

⚠ IMPORTANT: Whenever practical, route the Beacon cable(s) into the Solar Controller Enclosure through an opening at the bottom of the enclosure to minimize the potential for water ingress. Regardless of the cable-entry method used, ensure that the installation maintains the enclosure's water-resistant seal and does not compromise its protection against water ingress.

Before proceeding to the next step, verify that all Beacon cables are connected to the correct terminals, properly secured, and routed to prevent interference with other components inside the enclosure.

5.3. Pedestrian Activation System Wiring

The TS-60S-S and TS-60D-S Systems may use Push Buttons or Sensor Bollards, depending on project requirements. The pedestrian activation device(s) associated with each RRFB Assembly connect to the Solar Controller within that Assembly.

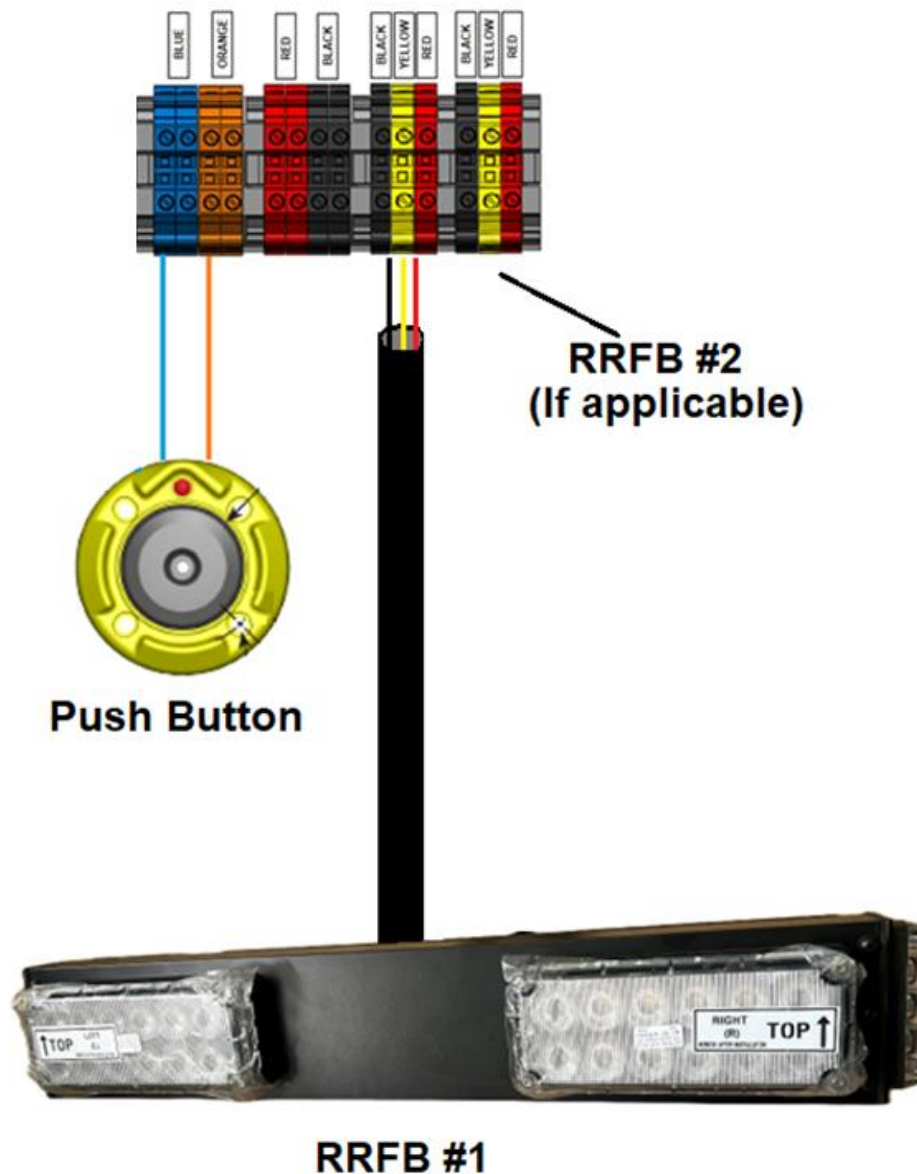
5.3.1. Push Button Activation System

Traffic Safety Corp. provides two Push Button models for use with the TS60-RRFB Solar-Powered System:

1. **Polara Bulldog 3**
2. **PedSafety 4EVR MOAB**

For both Push Button models, the connection to the Solar Controller is made using the same designated terminals:

- **Solar Controller Blue Terminal Block (DC+)**
- **Solar Controller Orange Terminal Block (DC-)**



The connection method at the Push Button depends on the model, as described below:

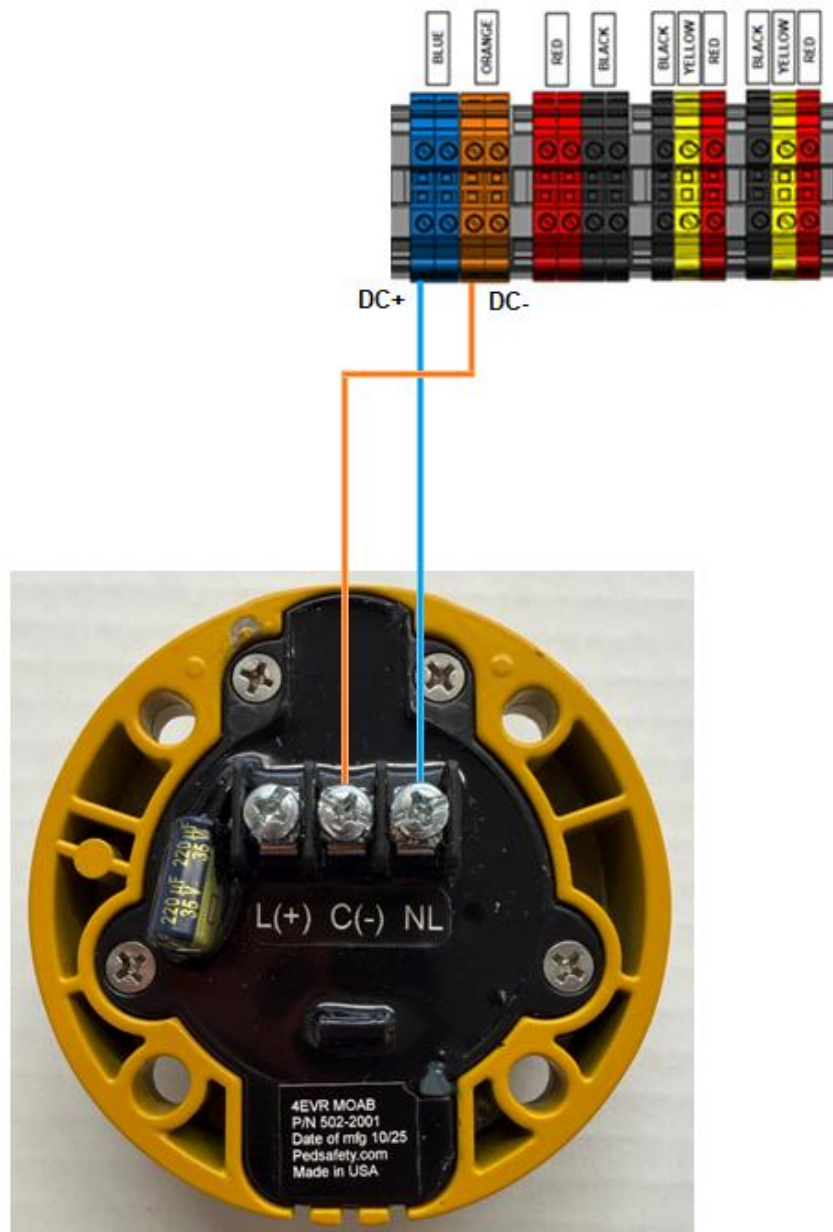
1. Push Button Polara Bulldog 3:

Connect the two wires to the Push Button terminals. The wire polarity at the Push Button is not specific and may be connected to either terminal.

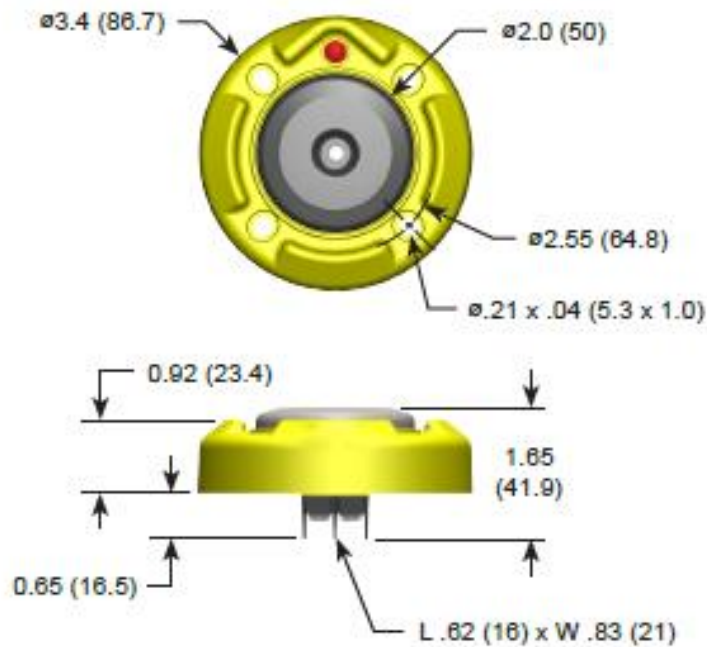
2. Push Button PedSafety 4EVR MOAB:

Connect the Push Button to the Solar Controller as shown in the wiring diagram below:

- **Solar Controller Blue Terminal Block (DC+) → NL terminal on Push Button**
- **Solar Controller Orange Terminal Block (DC-) → C (-) terminal on Push Button**



When the Push Button is activated, an audible beep will sound and the button LED will flash.



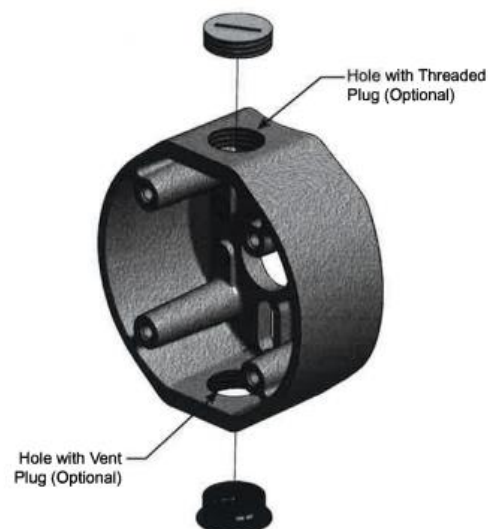
Body Material: Aluminum,
Powder Coated

Button Material: 316 Stainless
Steel

Arrow Button Material:
Anodized 6061 Aluminum, Nickel
Plated Black Powder Coat on area
surrounding arrow

Operation Voltage: 12-36VDC

BDL3 Push Button comes with Aluminum Push Button Cup



5.3.2. Pedestrian Motion Sensor

For the MS SEDCO VPR-27 Pedestrian Motion Sensor model, connect the sensor to the Solar Controller as shown in the wiring diagram below.

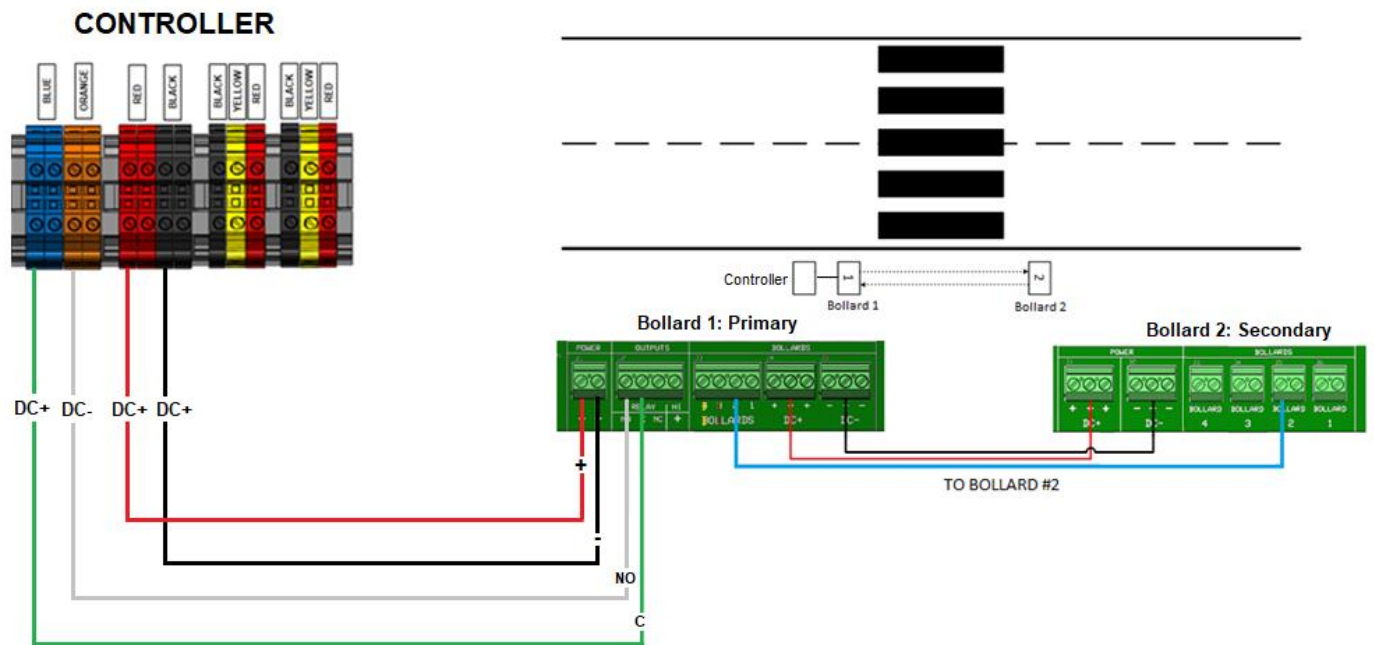
For additional information, including installation instructions and the user manual, visit the manufacturer's website: <https://mssedco.com/products/vpr-27-motion-sensor-vpr-27>



5.3.3. Sensor Bollard Activation System

When Sensor Bollards are used, the complete TS60-RRFB Solar-Powered System uses four Sensor Bollards, two associated with each RRFB Assembly (each RRFB Solar Controller).

Connect the Sensor Bollard wiring to the Solar Controller as shown in the applicable wiring diagram.

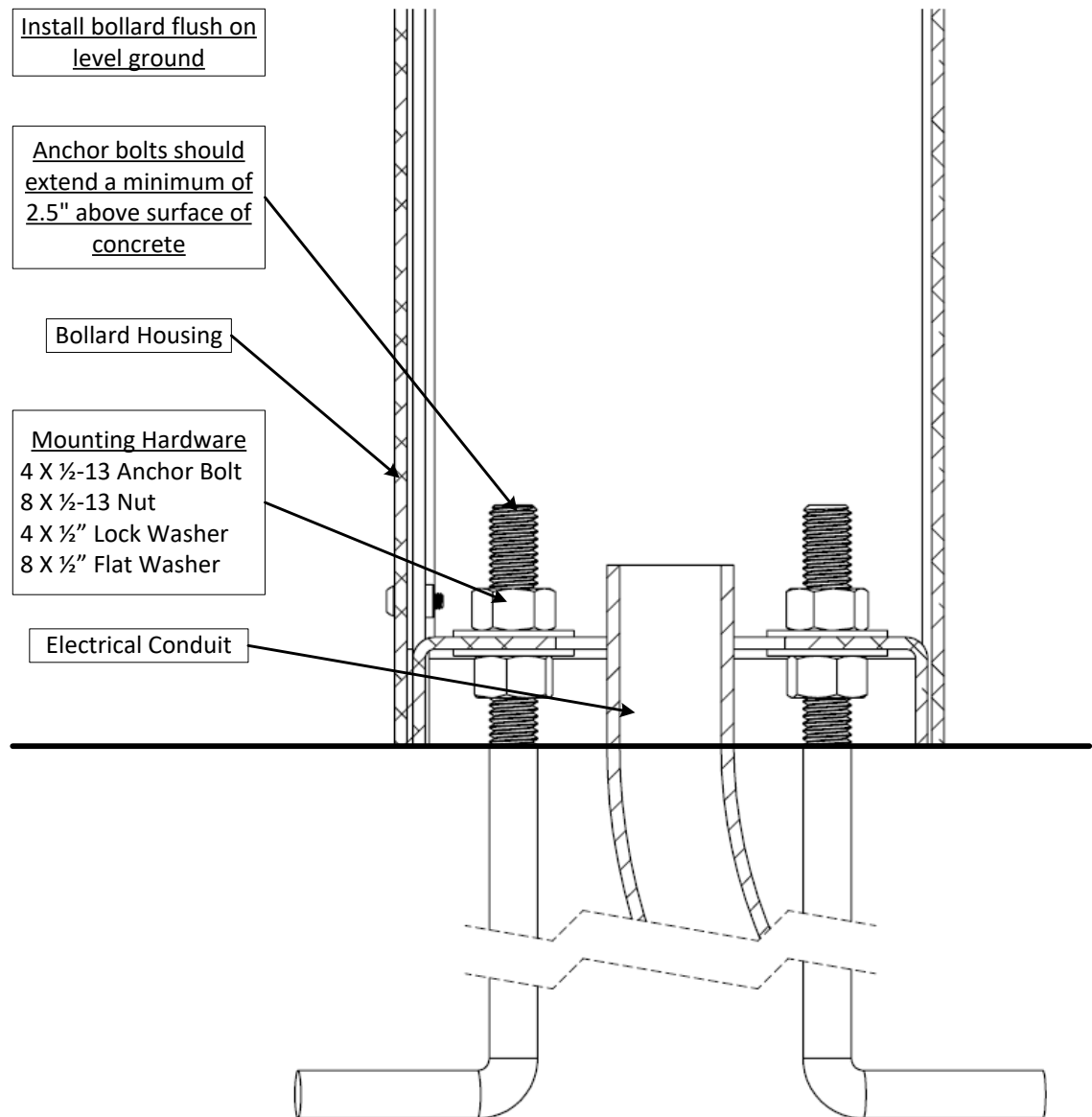


5.3.3.1. Sensor Bollard Installation and Alignment

Install the Sensor Bollards according to the approved project drawings and applicable site requirements. The installation method shall be verified by the site engineer for compliance with local codes.

It is recommended to install the Bollards using $\frac{1}{2}$ " **L-Hook concrete anchors** in newly poured, level concrete. The site engineer shall evaluate the installation method for compliance with applicable local codes.

The front faces of the two Bollards shall be directly aligned with each other and shall not be skewed or offset. Proper installation and positioning are essential for sensor alignment and calibration.



5.3.3.2. Sensor Alignment and Operation

In order for proper operation, the sensors in each bollard must be properly aligned. When the sensors are optimally aligned the green LED and orange LED on the receiver will be illuminated. When the beam is blocked or the sensor is misaligned, the amber LED will be illuminated.

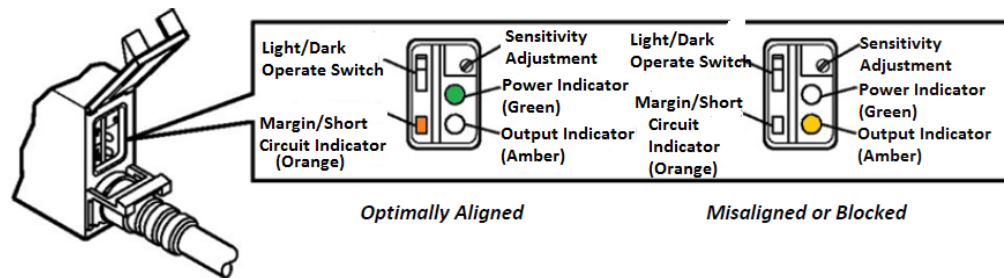
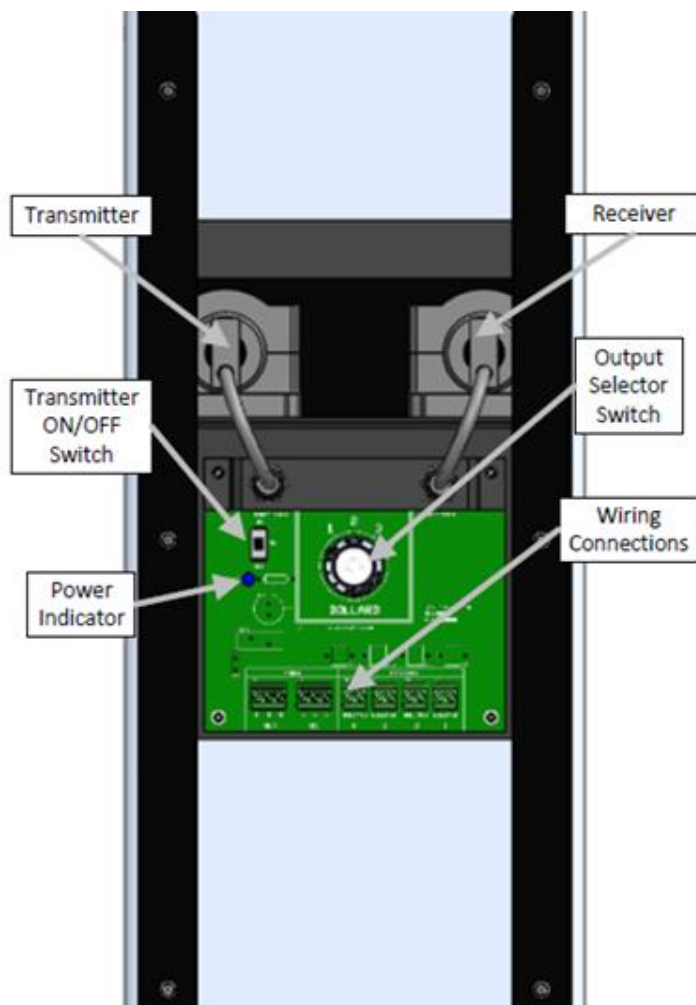


Figure 42: Sensor Status Indicators

When viewing the bollard from the rear, the receiver is on the right-hand side. There is a slide switch located on the circuit board below the transmitter. This switch controls the power to the transmitter. It is best to have the transmitter turned off when aligning the receiver in the same bollard.

Follow the steps below to align each bollard.



- Have one person observe the receiver LEDs at the first Bollard
- Turn off the transmitter at the first Bollard.
- Have a second person at the corresponding Bollard loosen the transmitter swivel-mount screws.
- Make small adjustments to aim the transmitter until the receiver indicates proper alignment.
- Tighten the swivel-mount screws.
- Turn the swivel-mount screws.
- Repeat the procedure as required for the opposite direction.

5.3.4. Pedestrian Activation System Cable Installation

The customer is responsible for providing the cable required to connect the selected pedestrian activation system to the Solar Controller. The cable shall meet the requirements shown in the table below.

Pedestrian Activation System	Cable Outside Diameter	Required Conductors	Conductor Size
Push Button	0.08–0.24 in. (2–6 mm)	2	18–22 AWG
Pedestrian Motion Sensor	0.08–0.24 in. (2–6 mm)	4	18–22 AWG
Sensor Bollard	0.08–0.24 in. (2–6 mm)	4	18–22 AWG

Traffic Safety Corporation provides one 3/8" NPT cable gland for routing the pedestrian activation system cable into the Solar Controller Enclosure.



If using the provided cable glands, install one 3/8" NPT cable gland for each Beacon cable entering the Solar Controller Enclosure.



Solar Panel Cable Gland Installation

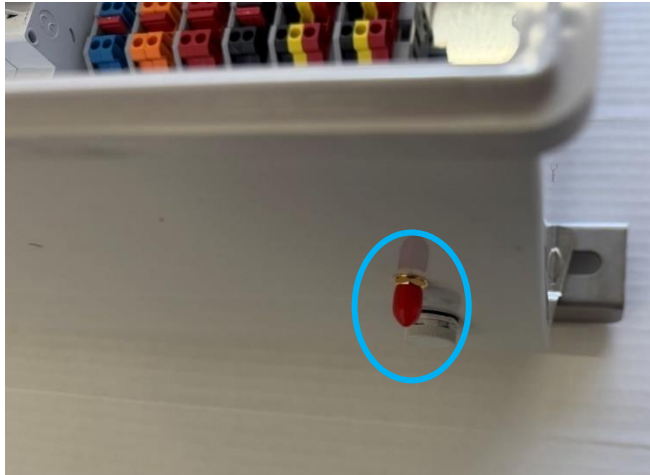
⚠ IMPORTANT: Whenever practical, route the cable into the Solar Controller Enclosure through an opening at the bottom of the enclosure to minimize the potential for water ingress. Regardless of the cable-entry method used, ensure that the installation maintains the enclosure's water-resistant seal and does not compromise its protection against water ingress.

Before proceeding to the next step, verify that the cable is properly secured and routed to prevent interference with other components inside the enclosure.

5.3.5. Antenna Installation

The antenna must be installed on the Solar Controller Enclosure to enable wireless communication between the Solar Controllers. Follow the steps below to install the antenna.

1. Remove the red protective cap from the antenna connector located on the lower right side of the Solar Controller Enclosure.

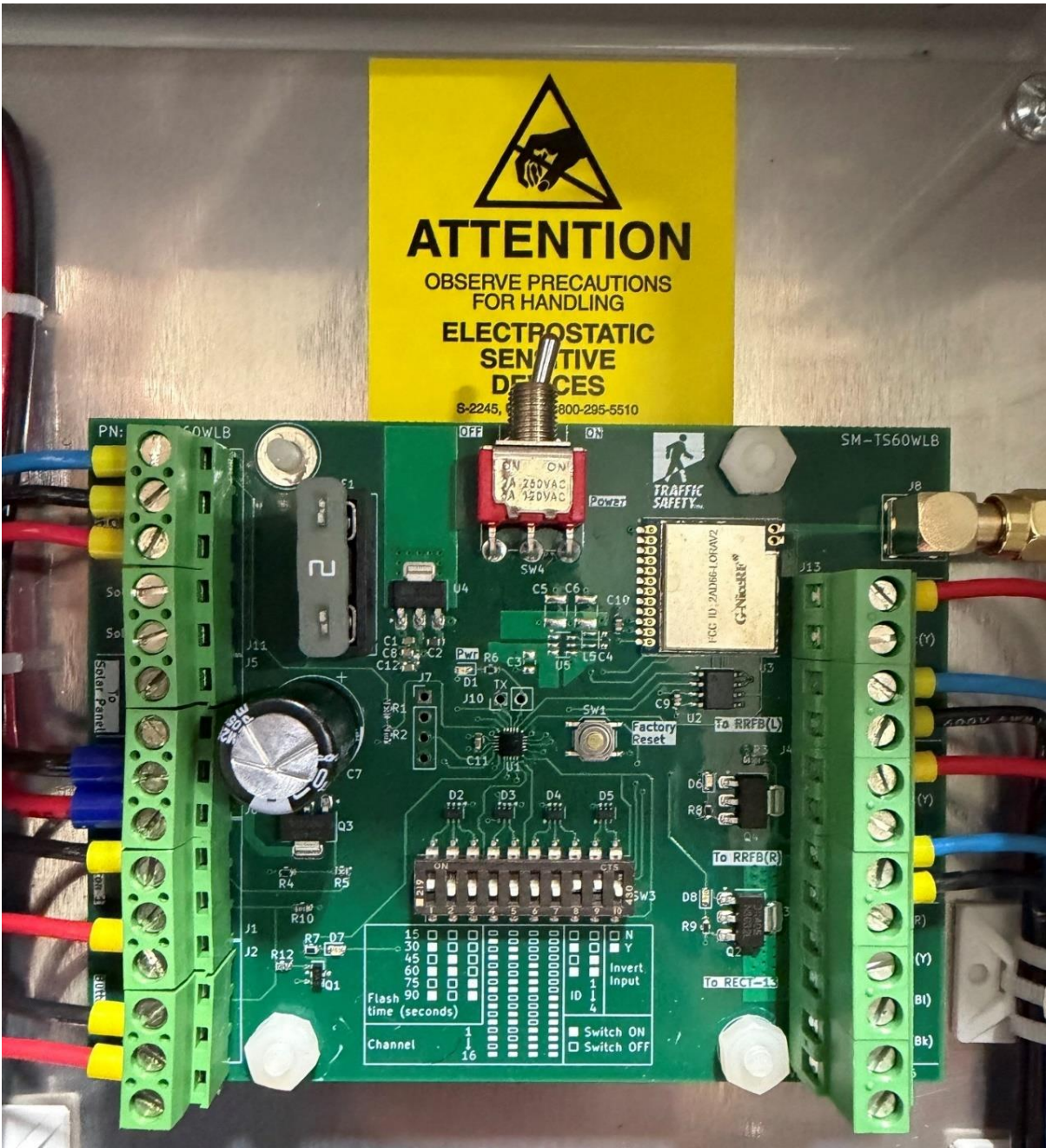


2. Attach the antenna to the antenna connector and tighten securely by hand.



5.4. Solar Controller Radio Board

The Solar Controller includes a Radio Board located inside the Solar Controller Enclosure that provides wireless communication between the Solar Controllers within the complete TS60-RRFB Solar-Powered System. The Radio Board power and DIP switch settings are configured as described below.



5.4.1. Radio Board Switch Settings

The Radio Board includes a power switch (SW4) and a 10-position DIP switch (SW3). Verify the switch settings before placing the system into operation.

⚠ IMPORTANT: Whenever SW3 DIP switch settings are changed or reset, the Radio Board power switch (SW4) must be set to OFF before making the changes and returned to ON after the settings are completed.

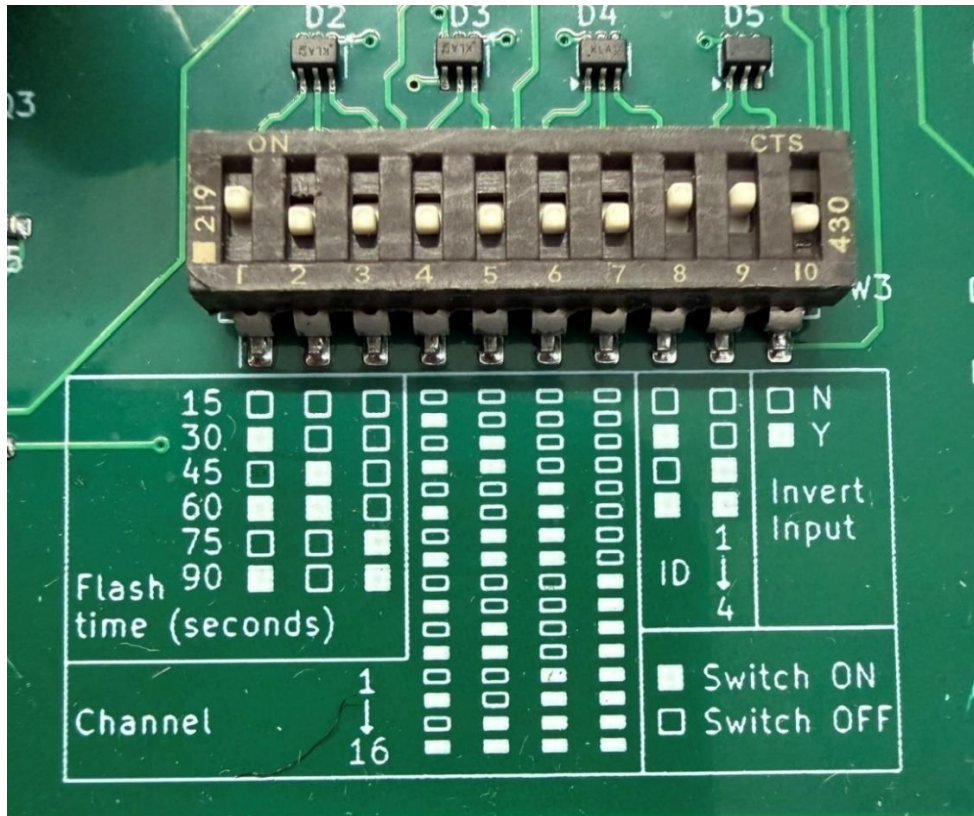
5.4.1.1. Radio Board Power Switch (SW4)

Verify that power switch (SW4) is set to ON.



5.4.1.2. Radio Board DIP Switch (SW3)

The SW3 DIP switch is used to configure the flash duration, RF communication channel, Controller ID, and input configuration.



- **Switches 1–3 (Flash Time – Seconds):** Default from factory, flashing duration is set to **30 seconds**:
 - 1 – **UP**
 - 2 – **DOWN**
 - 3 – **DOWN**
- **Switches 4–7 (Channel Selection):** Set to select the RF communication channel.
 - All Controllers communicating within the same system must be set to the **same RF channel**.
 - Available channels: **16**.
 - Default from factory, Channel is set to 1. All switches set to DOWN.
- **Switches 8–9 (Controller ID):** Switches define the Controller ID within the same system.
 - All Controllers communicating within the same system must be set to **different Controller IDs**.
 - Available Controller IDs: **4**.
 - Default from factory, Controller #1 is set to **ID#1**. All switches set to **DOWN**.
 - Default from factory, Controller #2 is set to **ID#4**. All switches set to **UP**.
- **Switch 10 (Invert Input):** Do not adjust this switch. Set to **DOWN/OFF (N)**, factory default.

The following table provides the required switch positions for the available Radio Board settings:

CONTROLLER #1 – SW3 DIP SWITCH (FACTORY DEFAULT SETTINGS)

Switch Position	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6	SW3-7	SW3-8	SW3-9	SW3-10
UP										
DOWN										

CONTROLLER #2 – SW3 DIP SWITCH (FACTORY DEFAULT SETTINGS)

Switch Position	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6	SW3-7	SW3-8	SW3-9	SW3-10
UP										
DOWN										

6. System Start-Up and Functional Verification

Perform system start-up and functional verification only after all mechanical and electrical installation is complete.

6.1. Pre-Start-Up Inspection

Before placing the system into operation, verify that:

- All electrical connections are complete and secure.
- Both RRFB Assemblies, including their RRFB Beacon(s), Solar Controllers, Batteries, Solar Panels, and pedestrian activation device(s), are securely installed and connected.
- Both Batteries are securely installed inside their respective Solar Controller Enclosures.
- Both Solar Panels are securely mounted, unobstructed, properly oriented, and connected.
- Wiring and connectors are free from visible damage or loose connections.
- Solar Controller Enclosures and electrical covers are properly closed and secured.
- Solar Controller Enclosures and associated components are securely mounted.
- Both Controller Enclosure doors can be fully opened for inspection and service.



WARNING:

Do not place the system into operation until installation and inspection are complete.

6.2. System Start-Up and Functional Verification

Follow the Start-Up and Shutdown Procedures below before placing the system into operation. These procedures are also provided on the label located on the inside of the Solar Controller Enclosure cover and shall be followed whenever the system is started up or shut down

ATTENTION!

Please follow Start Up and Shut Down Instructions listed below:

START UP:

- Start with all circuit breakers in **OFF** position
- Check connections for tightness and correct polarity
- Turn **the Battery circuit breaker ON first**
- Verify voltage for battery
- Turn **the Solar Panel circuit breaker ON second**
- Verify charging amps on charge controller display
- The system should then be turned ON and operating normally

SHUT DOWN:

- Turn **the Solar Panel circuit breaker OFF first**
- Turn **the Battery circuit breaker OFF second**

The system is now de-energized and components may be changed without risk of sparks from the disconnected circuits. Remember however, the battery remains charged and can produce dangerous sparks or arcs if short-circuited. The Battery and charge controller cannot be de-energized; they can only be disconnected.

ATTENTION:

After completing the Start-Up procedure, perform the following functional verification:

1. Allow the system to complete its start-up sequence.
2. Verify that no fault or abnormal indication is present.
3. Verify normal Battery and Solar Panel system status.
4. Activate the system using each installed pedestrian activation method.
5. Verify that the RRFB Beacons in both RRFB Assemblies turn ON and flash simultaneously.
6. Verify that both the LEFT and RIGHT Front LEDs turn ON and flash when the system is activated.
7. For systems equipped with a Confirmation LED, verify that it flashes with the adjacent Front LED.
8. For the TS-60D-S Double-Sided RRFB System, verify that both Beacons in each RRFB Assembly turn ON and flash when the system is activated.
9. Verify that the RRFB Beacons in both Assemblies remain synchronized throughout the activation cycle.
10. Verify that the system completes the programmed flashing cycle and returns to standby after the activation cycle.
11. Verify proper automatic day/night RRFB intensity operation.

If the system does not operate as described above, correct the condition before placing the system into service.

7. System Operation and Maintenance

This chapter provides general guidance for normal operation and preventive maintenance of the TS60-RRFB Solar-Powered System to help ensure reliable and continued system performance.

7.1. Normal Operation

During normal operation, the TS60-RRFB Solar-Powered System remains in standby until activated by a pedestrian activation device.

When activated, the RRFB Beacons in both RRFB Assemblies turn ON and flash simultaneously and remain synchronized via the wireless communication link between the two Solar Controllers. Each Solar Controller controls the RRFB Beacon(s) within its respective RRFB Assembly.

The Beacons operate for the programmed activation period and then return to standby.

The Solar Panels provide energy for system operation and Battery charging.

The Solar-Powered System also uses the Solar Panel input for automatic day/night RRFB intensity control.

7.2. Preventive Maintenance

Periodically inspect the system to ensure reliable operation.

- Inspect RRFB Beacons, Solar Controller Enclosures, mounting hardware, and support connections for damage, corrosion, or looseness.
- Inspect accessible wiring, cables, and connectors for damage or loose connections.
- Verify that pedestrian activation devices are securely mounted and operate correctly.
- Inspect Solar Controller Enclosures for damage, proper closure, or signs of water ingress.
- Inspect Solar Panels for dirt, debris, damage, or obstructions that may affect system operation.
- Clean components as necessary to remove dirt or debris that may affect operation.
- Correct any abnormal condition before returning the system to service.

7.3. Battery Inspection

Periodically inspect each Battery and its associated electrical connections.

- Verify that the Battery is securely mounted and shows no visible signs of damage, swelling, or leakage.
- Inspect Battery terminals and connections for looseness, corrosion, or damage.
- Verify that the Battery is securely retained inside the Solar Controller Enclosure.
- Replace a damaged or defective Battery. Contact Traffic Safety Corporation for assistance if Battery replacement is required.

7.4. Solar Panel Inspection

Periodically inspect each Solar Panel and mounting assembly to ensure reliable Battery charging and day/night dimming operation.

- Inspect the Solar Panel for cracks, damage, excessive dirt, or debris and clean as necessary.
- Verify that the Solar Panel remains securely mounted and properly positioned.
- Inspect the mounting bracket, hardware, wiring, and connectors for looseness, corrosion, or damage.
- Verify that the Solar Panel is not obstructed or significantly shaded.
- Correct any condition that may affect Battery charging, day/night dimming operation, or structural integrity.

8. Replacement Components and Repair

Replacement or repair shall be performed only after the cause of the problem has been identified and, when required, confirmed by Traffic Safety Corporation technical support.

Depending on the diagnosis, components may be replaced or repaired in the field. Equipment that cannot be serviced in the field shall be returned to Traffic Safety Corporation for evaluation and repair.

Replacement components may include:

- **RRFB Beacon Components**
 - Front LED assembly
 - Confirmation LED assembly
 - Other Beacon components, as applicable
- **Solar Controller Components**
 - Internal electrical or electronic components
 - Complete Solar Controller, when required
- **Solar Power Components**
 - Battery
 - Solar Panel
 - Solar Panel mounting components, as applicable
- **Pedestrian Activation Components**
 - Push Button
 - Sensor Bollard
- **Other Traffic Safety Corporation replacement components**, as applicable.

Use only replacement components that are identical to the components originally installed by Traffic Safety Corporation or specifically approved by Traffic Safety Corporation as replacement components.

Unauthorized components or modifications, improper installation, or failure to perform required maintenance may affect system performance and warranty coverage.

Contact Traffic Safety Corporation for technical support and return instructions when a component or assembly must be returned for evaluation or repair.



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