

# Derail Sensor Manual

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**None**

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# 1. Home

## 1.1 Introduction

Welcome to the TXRX Derail Light. This manual is intended for machine operators, maintenance technicians, and field engineers. It provides step-by-step instructions to safely and effectively operate and maintain this equipment.

### Warning

This manual does not replace proper hands-on training. Only qualified personnel should operate or maintain this equipment.

### 1.1.1 How to Use This Manual

This manual is organized into clearly labeled sections for quick reference:

### Note

If you're looking for a specific topic, refer to the Table of Contents or use the search function (for digital versions).

- **Safety Information** – Read this first. Covers required precautions and emergency procedures.
- **System Overview** – Understand the machine's components and technical limits.
- **Setup** – Step-by-step guidance for correct installation.
- **Operation** – Learn how to safely use the device and interpret status lights.
- **Maintenance** – Outlines regular tasks to ensure long-term performance.
- **Troubleshooting** – Helps diagnose and correct common issues.
- **Appendices** – Include wiring diagrams, part numbers, and calibration logs.

## 1.2 Safety Information

The safety instructions included at this point are general safety instructions. You will find particular safety instructions at the beginning of each chapter or at the appropriate point in the text.

### Warning

Safety instructions are emphasized by a brightly shaded triangle and block quotes.

Be sure to read all safety instructions before proceeding.

- Observing all safety instructions will help you to avoid accidents and prevent damage to equipment.
- Always comply with the safety instructions, even in scenarios where you are under time pressure.
- Once accidents happen, they cannot be undone.

### 1.2.1 Safety Warning

#### **IMPORTANT SAFETY INFORMATION – READ BEFORE OPERATING**

This equipment is intended only for use by trained and authorized personnel. All users must read, understand, and follow the instructions in this manual before installing, operating, or servicing the equipment.

Failure to comply with the instructions and safety precautions in this manual can result in serious injury, equipment damage, or death.

- Always follow lockout/tagout procedures before performing maintenance.
  - Disconnect power supply before servicing.
  - Do not bypass, disable, or modify any safety features.
  - Use only manufacturer-approved accessories and replacement parts.
- 

## 1.2.2 Safety Disclaimer

### Equip Proper PPE

ANSI-rated Personal Protective Equipment (PPE) must be worn at all times, including safety glasses, gloves, hard hat, and protective footwear.

The manufacturer assumes no liability for damage or injury resulting from:

- Improper installation or operation.
- Unauthorized modifications.
- Use outside of intended application.
- Neglect of routine maintenance.

By operating this equipment, the user agrees to accept all responsibility for its safe use. If there is any uncertainty regarding safe operation, contact the manufacturer or a qualified supervisor before proceeding.

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## 1.3 Tools and Equipment

- Measuring Tape
- Tamping Pick or Pickaxe
- Multimeter
- Metric Allen Key Set
- Adjustable Wrench x2
- 1/8" Slotted Screwdriver
- Utility Knife
- Cordless Drill + Drill Bits
- Ratchet and Socket Set
- Fish Tape or Pulling Rods
- Level (Bubble or Digital)
- Personal Protective Equipment (PPE): As required

## 2. System Overview

### 2.1 Controller Assembly



Figure 1: Controller

#### 2.1.1 Controller Stand

- Electronics enclosure is pre-installed to controller bracket.
- Includes two sets of mounting studs for the solar panel and light assembly.

### 2.1.2 Leveling Feet

- Support and stabilize the controller.
- Protect the underside of the main bracket from rock chips.

### 2.2 Solar Panel Assembly



Figure 2: Derail Solar Panel

### 2.2.1 Solar Panel Spider Bracket

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- Attaches the solar panel to the mast.

### 2.2.2 Solar Panel Mast

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- Supports the solar panel.
  - Allows for rotation and tilt adjustment.
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## 2.3 Light Assembly

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- Communicates whether the derail device is open or closed



Figure 3: Derail Solar Panel

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## 2.4 Sensor Assembly



Figure 4: Derail Sensor

#### 2.4.1 Mounting Bracket, Flip-Style

- For installations on flip-style derail devices.
- May be cut to size if necessary, welding required for installation.

#### 2.4.2 Mounting Bracket, Swing-Style

- For installations on swing-style derail devices.

#### 2.4.3 Sensor Riser

- Supplied by Marmon for use with swing-style derail devices.

#### 2.4.4 Sensor Module

- Monitors the opening and closing of the derail by detecting the presence of the metal plate.

#### 2.4.5 Liquid-Tight Tubing

- Protects the sensor wires.

#### 2.4.6 Tubing Cover Bracket

- Secures the liquid-tight tubing to the tie.
- Protects the tubing from damage.

## 3. Setup

### 3.1 Safety

#### Disclaimer

Always ensure you have the correct tools and training before beginning installation.

Attempting installation without the specified tools may result in improper assembly, equipment damage, or injury.

Before beginning installation, confirm that all required tools and components are available.

Site preparation must be completed before installing the derail system.

### 3.2 Tools and Equipment

- Measuring Tape
- Tamping Pick or Pickaxe
- Multimeter
- Metric Allen Key Set
- Adjustable Wrench x2
- 1/8" Slotted Screwdriver
- Utility Knife
- Cordless Drill + Drill Bits
- Ratchet and Socket Set
- Fish Tape or Pulling Rods
- Level (Bubble or Digital)
- Personal Protective Equipment (PPE): As required

### 3.3 Site Preparation

The derail sensor requires a level installation surface and a clear zone around the device.

Ensure that the following clearance dimensions are present before proceeding.

#### Step 1: Measure Site Clearance

#### Clearance Warning

Installation at sites not meeting the clearance requirements listed below is prohibited.

Use a measuring tape to ensure that the site meets the following minimum dimensions:

- Distance to rail: **42 in.**
- Vertical clearance: **27 in.**
- Horizontal clearance: **22 in.**

### Step 2: Check that Site is Level

Use a level to measure the elevation of the ground from front to back.

From the edge of the rail to a point **42 in.** straight back, the elevation must be level **±6 in.**

#### 3.3.1 Solar Panel Preparation

For proper operation, the solar panel must receive direct sunlight from **10:00 AM to 3:00 PM** without obstruction from structures, railcars, or vegetation.

For installations north of the Equator, the solar panel should face **south** for optimal efficiency.

- Observe the site and ensure that the solar panel will receive sun once installed.
- Two locations with **1/4"-20** threaded stud patterns are provided for mounting the solar panel and light assemblies.
- The solar panel must be mounted on the stud pattern closest to the side of the device that will receive the most sunlight.

### Step 1: Measure Tilt Angle

The optimal tilt angle for solar panel efficiency depends on the latitude of the installation site.

- Use a maps or GPS app to measure the site latitude.
- Set the tilt angle equal to the latitude.

#### Example

Latitude 38.2° → Tilt angle **38.2°**

### Step 2: Seasonal adjustments:

- Winter: **Latitude + 15°**
- Summer: **Latitude - 15°**
- Spring/Fall: **Latitude only**

#### Example

Spring/Fall tilt angle = **38.2°**

Winter tilt angle =  $38.2 + 15 = \mathbf{53.2^\circ}$

Summer tilt angle =  $38.2 - 15 = \mathbf{23.2^\circ}$

#### 3.3.2 Excavation

#### Warning

Ensure to remove additional ballast around the tie to allow access during installation



Figure 1: Derail Sensor

Use a ballast pick or pickaxe to remove ballast under the rail and around the ties.

Clear space for:

- Liquid-tight tubing path from derail to controller
- Controller stand

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### 3.4 Assembly



Figure 2: A correctly installed controller stand.

### 3.4.1 Mounting the Controller Stand

#### Step 1. Position the Controller Stand Bracket

- Place the controller stand bracket on the center of the selected tie.
- Slide the bracket toward the rail as far as possible while keeping it centered.

**Step 2. Secure the Bracket to the Tie**

- Using a power drill or impact driver, install a minimum of four (4) **0.5 in. x 3 in.** galvanized lag bolts with washers.
- Ensure bolts penetrate fully into solid wood.
- Tighten each bolt firmly to prevent movement.
- Confirm the assembly is:
- Centered on the tie
- Square (perpendicular) to the rail

**Step 3. Install Leveling Feet**

- Locate the pre-drilled holes at the bottom of the bracket.
- Thread each leveling foot into its hole and tighten by hand.
- Once threaded, use a wrench to snug each foot.

**Step 4. Pre-Load the Leveling Feet**

- Adjust the leveling feet so that they press firmly against the ballast.
- Apply slight downward pressure to "pre-load" the feet.
- The stand should be held in tension between the tie bracket and ballast.
- Verify that the stand does not rock or shift when pushed.

**Step 5. Final Check**

- Confirm all bolts are tightened.
- Verify that the stand is stable, centered, and level.
- Re-adjust leveling feet if necessary.

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**3.4.2 Mounting the Light Assembly****Step 1: Locate the Light**

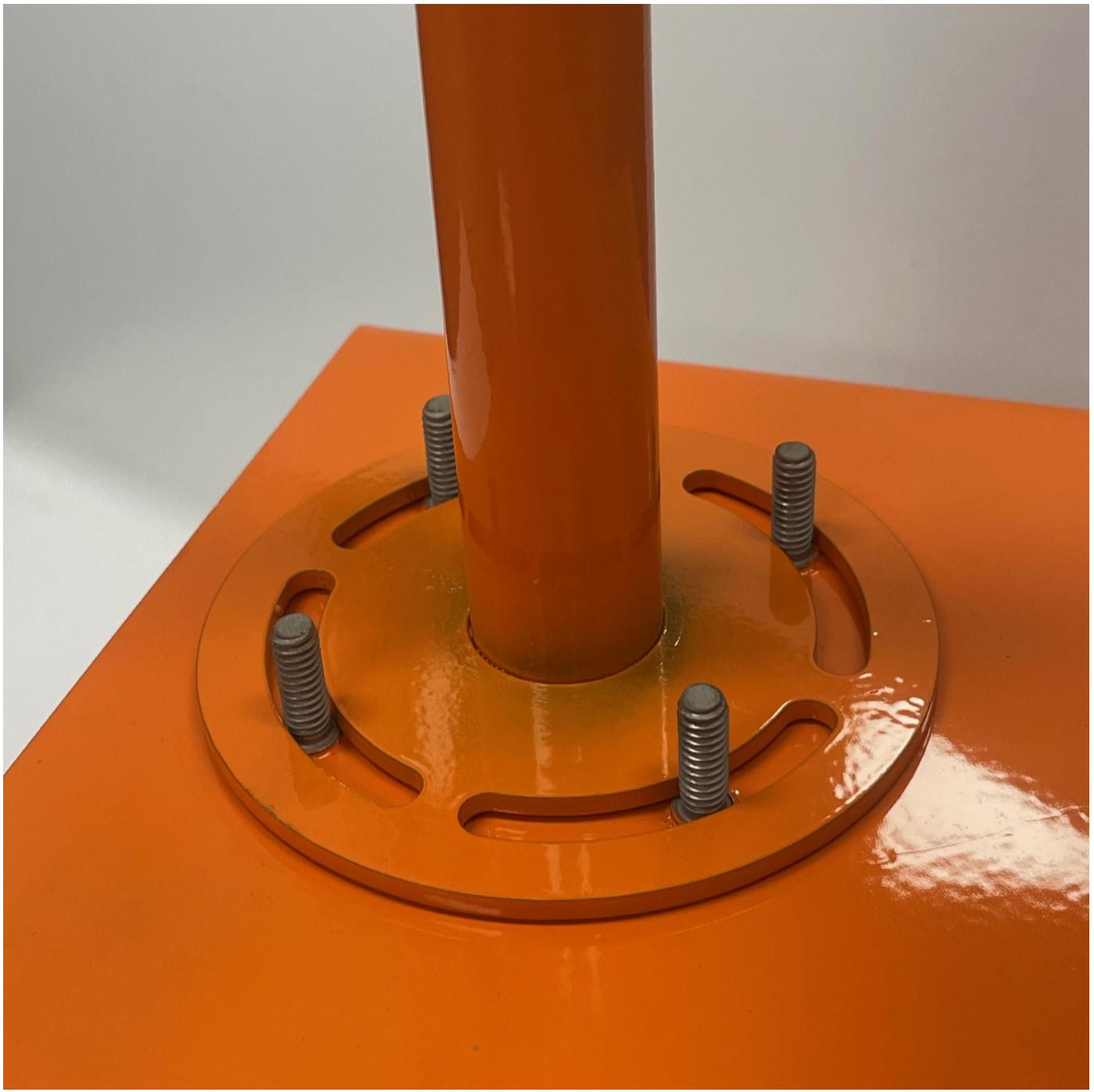


Figure 3: Light base positioned on studs.

- Place the slotted base of the light assembly onto the threaded stud pattern provided on the controller stand.

**Step 2: Secure the Assembly**

- Install **1/4 in.** flat washers and **1/4"-20** hex nuts onto the studs.
- Tighten the nuts evenly until the light is firmly secured.
- Do not overtighten, as this may damage the light housing.

**Step 3: Route the Wires**

- Feed the light assembly wires through the cable glands and into the controller enclosure.
- Ensure the cable glands are tightened to maintain a weatherproof seal.

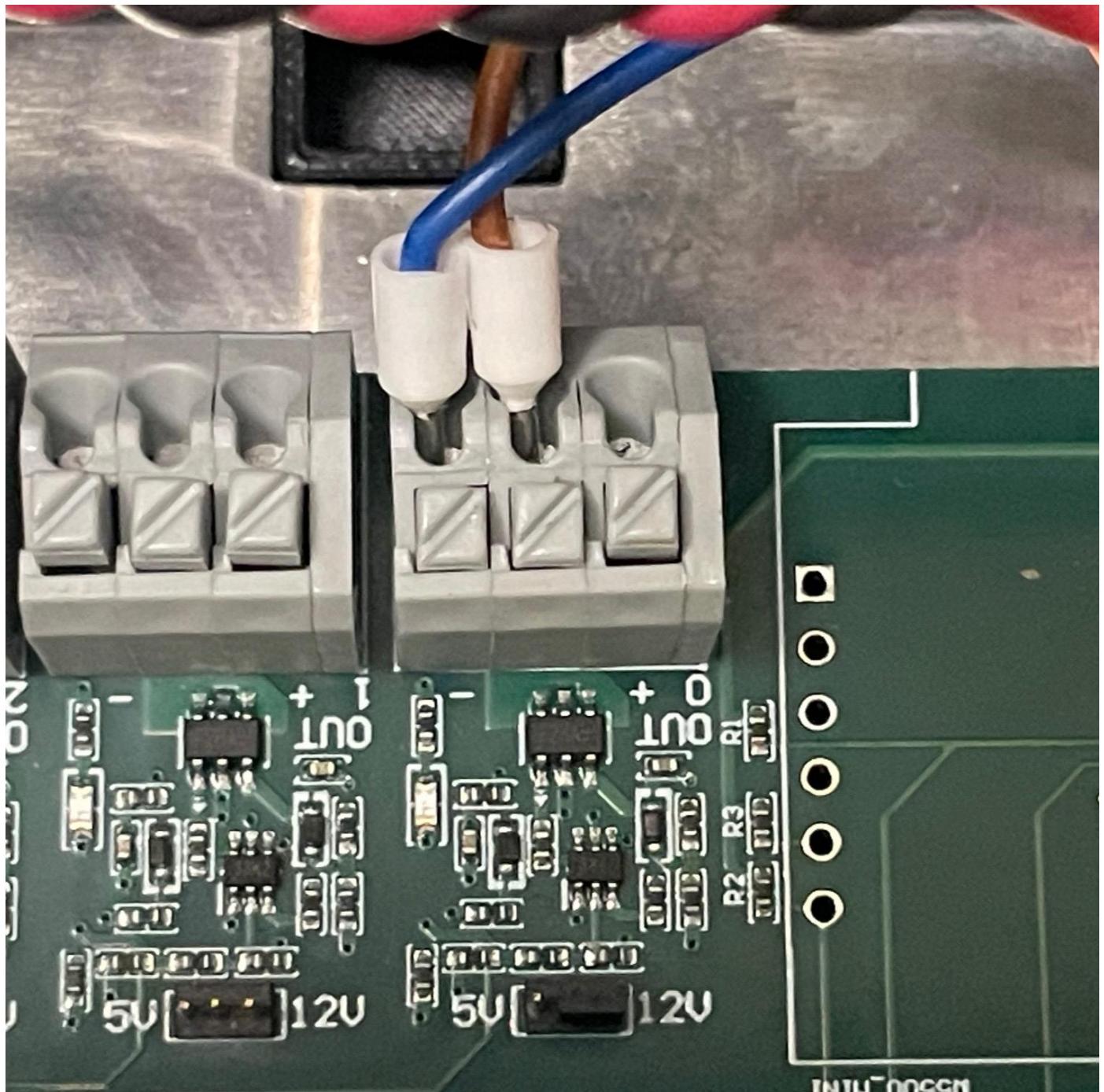
**Step 4: Connect the Light Wires**

Figure 4: Solar panel terminal connections.

- Insert the light wires into the **OUT 0** terminals on the controller board, following the wiring diagram.
- Ensure proper polarity (match positive and negative leads).
- Ensure terminals are secure to prevent loose connections.

**Step 5: Test the Connection**

- Use a multimeter to verify proper voltage at the light terminals.
- Confirm that the light activates when commanded by the controller.
- If the light does not function, re-check jumper placement and wiring.

**3.4.3 Mounting the Solar Panel Assembly**** Damage to Equipment**

Do not connect the battery wire until all installation steps are complete. Failure to follow this instruction may result in equipment damage.

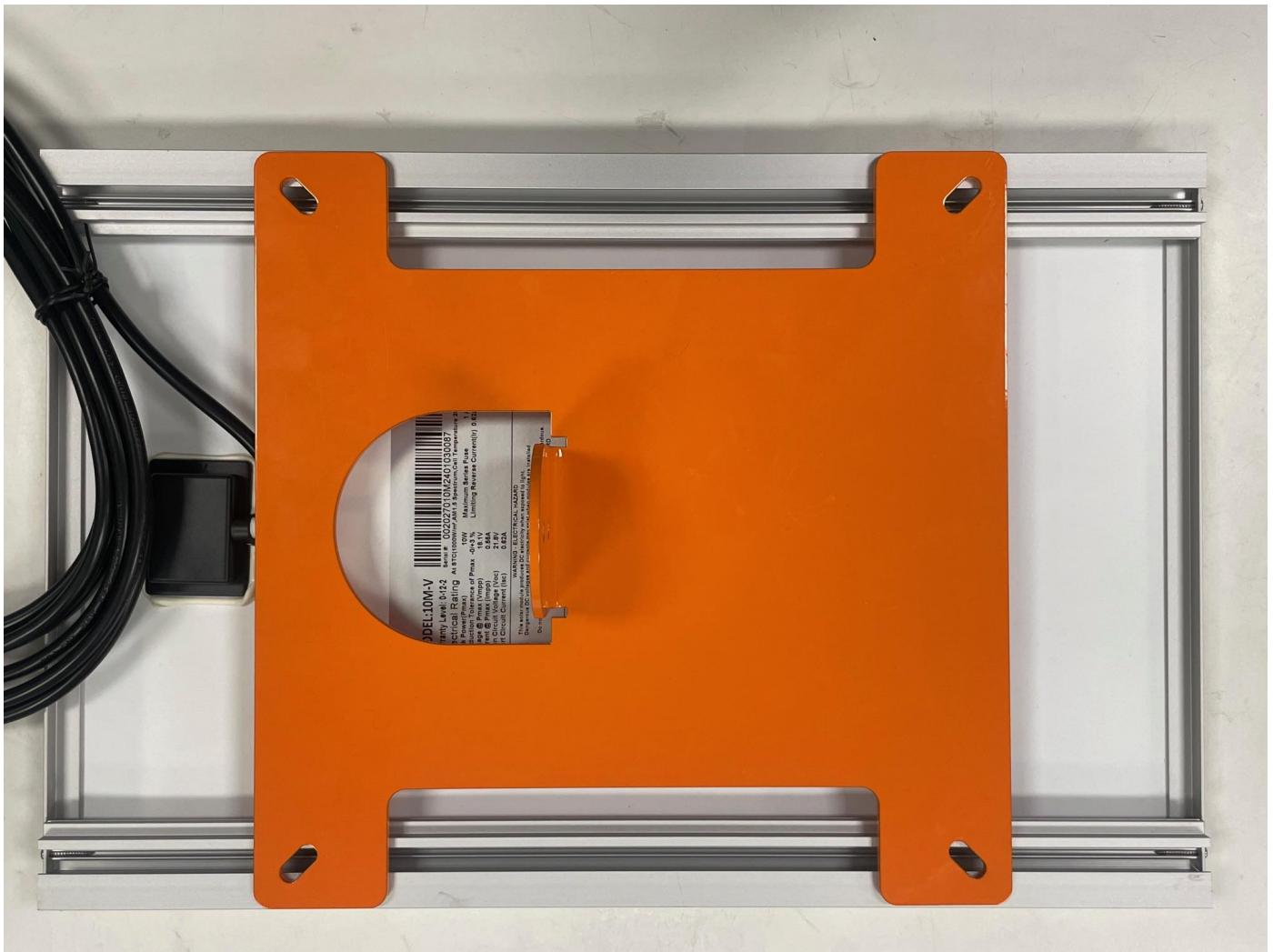
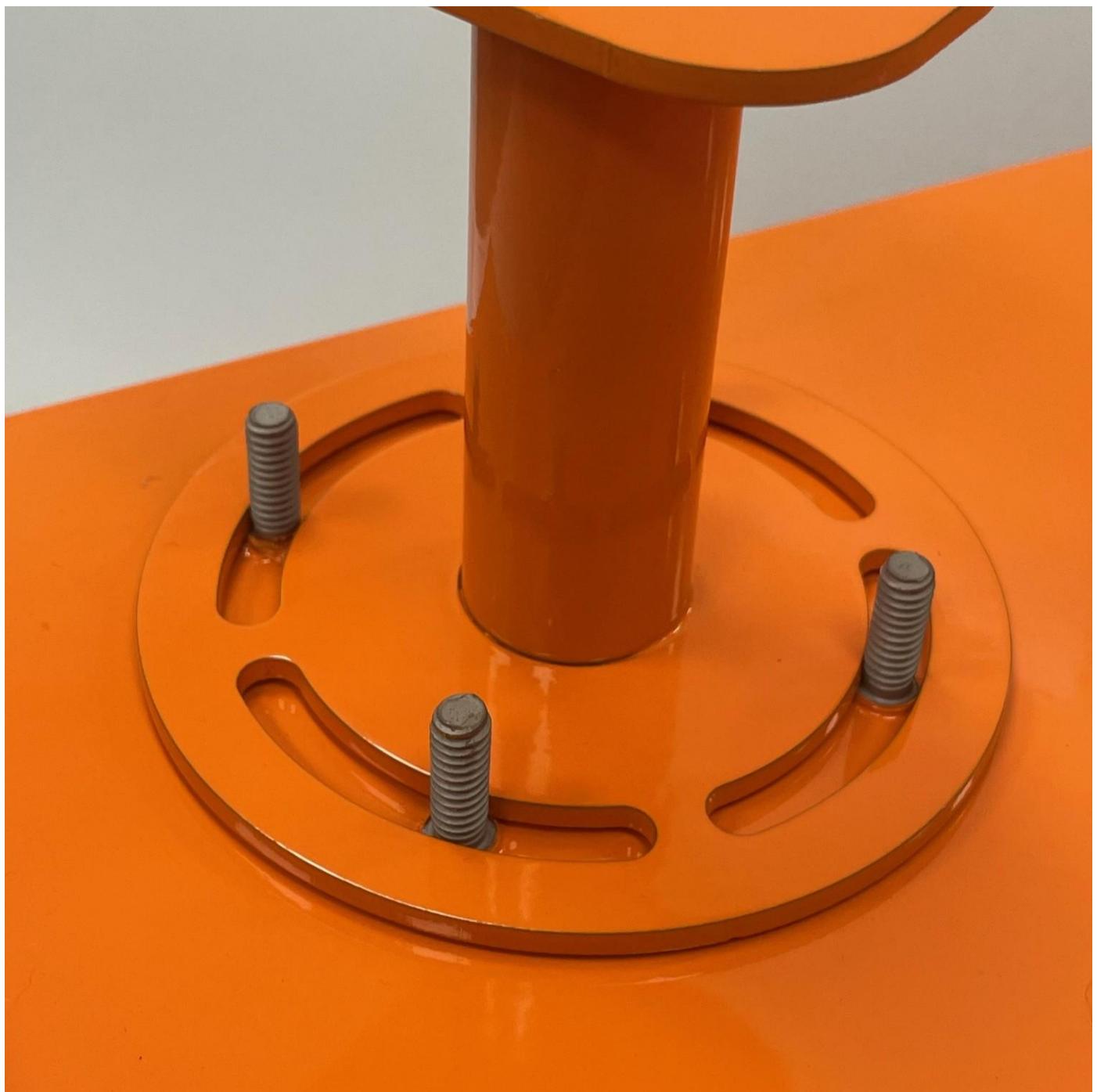


Figure 5: Solar panel installed on controller stand.

**Step 1: Attach Solar Panel to Spider Bracket**

- Center the solar panel on the spider bracket.
- Fasten using the provided **M6** cage nuts, flat washers, and machine screws.
- Tighten screws securely, but do not overtighten.



*Figure 6: Solar panel centered on spider bracket.*

**Step 2: Mount Spider Bracket to Mast**

- Position the spider bracket (with solar panel attached) onto the mast.
- Bolt the bracket securely in place.



Figure 7: Spider bracket properly bolted to mast.

#### Step 3: Mount Solar Panel Assembly to Device

- Place the slotted base of the solar panel assembly onto the threaded stud pattern located on the side of the device that receives the most direct sunlight.
- Adjust the panel's rotation so that it faces the desired direction.
- Verify that the device light does not cast a shadow on the solar panel.
- Install **1/4 in.** flat washers and **1/4"-20** hex nuts onto the base studs and tighten evenly.

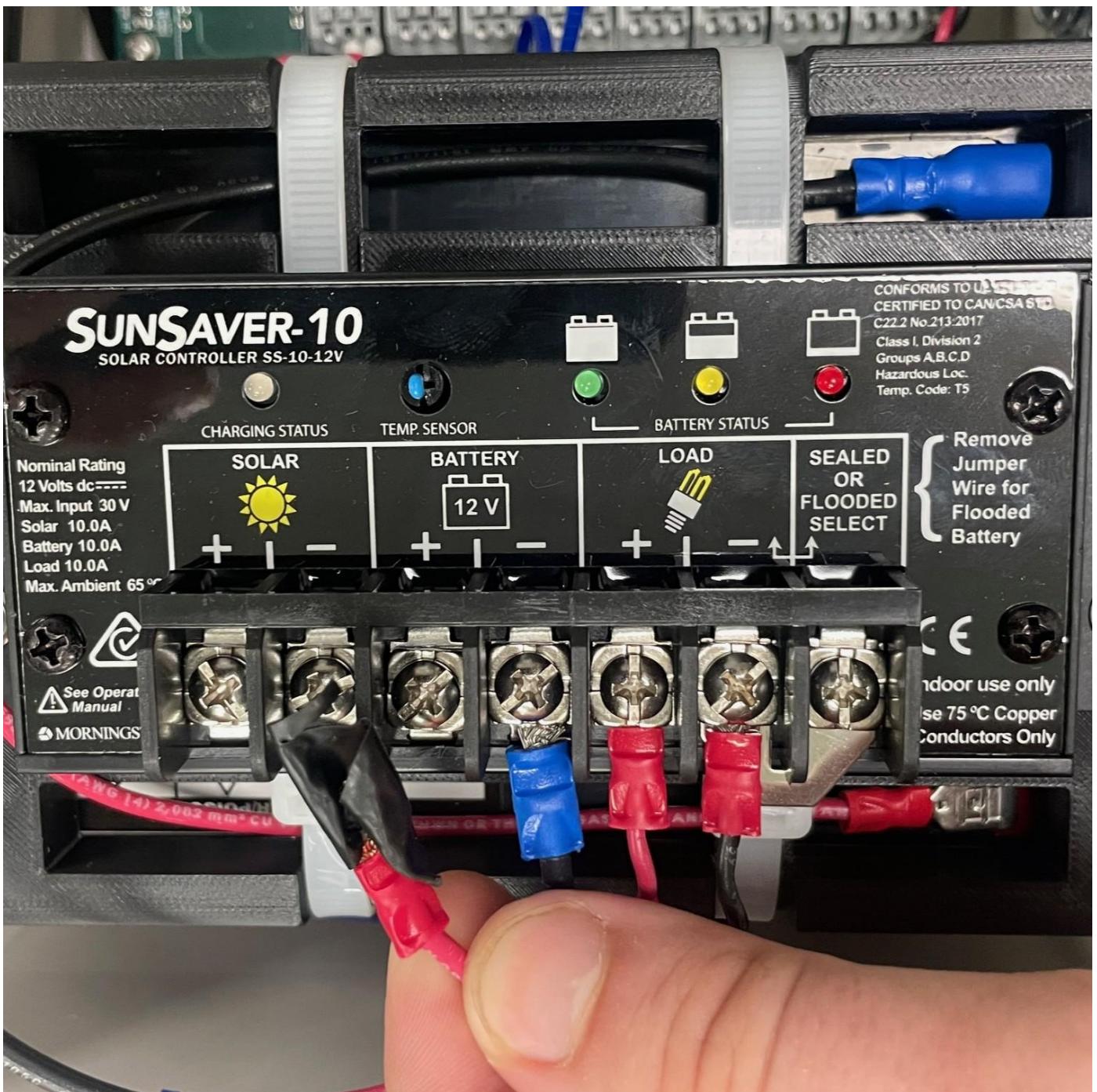


Figure 8: Derail Solar Panel Wire

**Step 4: Adjust Solar Panel Tilt**

- Loosen the tilt bolts, set the solar panel to the required tilt angle, and re-tighten the bolts.
- Refer to the [Site Preparation](#) section for recommended tilt angle (latitude  $\pm$  seasonal adjustment).

**Step 5: Route Solar Panel Wires**

- Feed the solar panel wires through the cable glands and into the controller enclosure.
- Ensure cable glands are tightened to maintain a weatherproof seal.

**Step 6: Connect Solar Panel Wires**

**⚠ Warning**

Only connect the solar panel wires. Do not connect the battery wire until all installation steps are complete. Failure to follow this instruction may result in equipment damage.

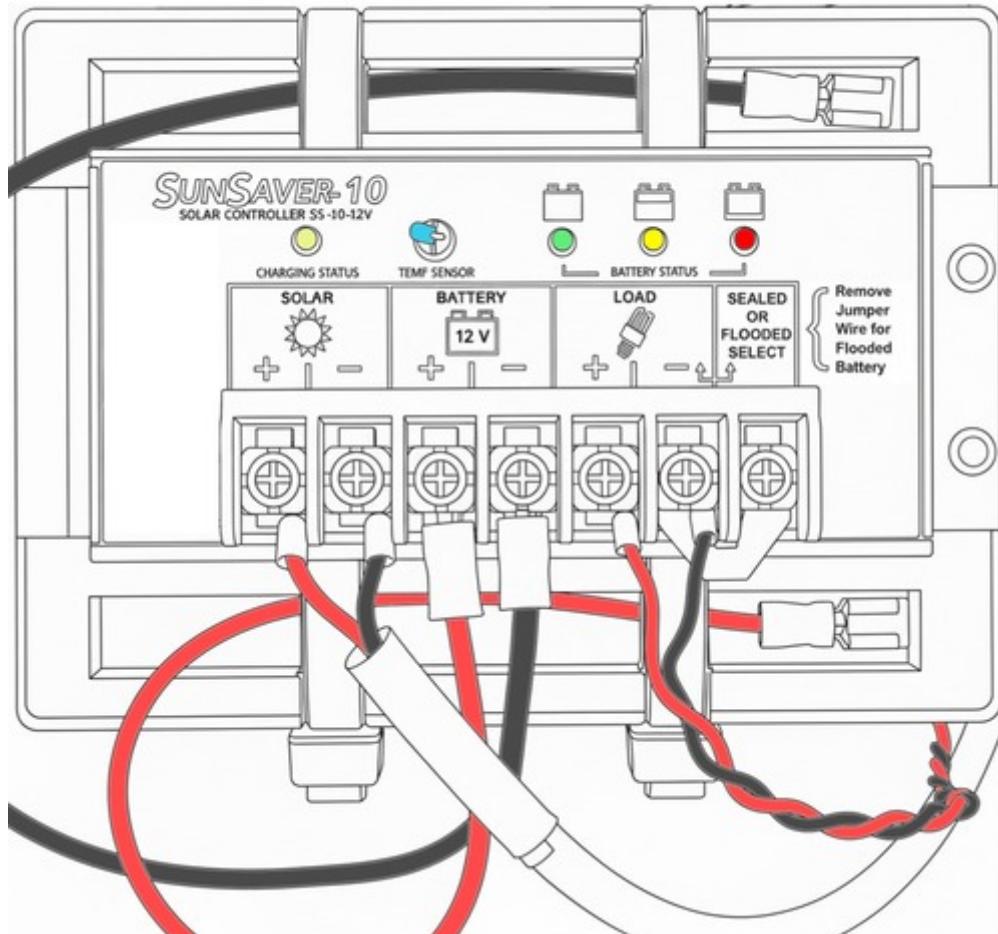


Figure 9: Derail Sensor

- Connect the solar panel positive (+, red wire) and negative (−, black wire) leads to the Solar Panel + and Solar Panel − terminals on the controller board, as shown in the wiring diagram.
- Tighten terminal screws securely.

#### Step 7: Test the Connection

- Use a multimeter to confirm correct polarity and voltage at the solar panel terminals.
- Verify that power is being delivered to the controller.

### 3.4.4 Satellite Antenna Installation

#### Step 1: Attach Satellite Antenna to Solar Panel



Figure 10: Derail Sensor

- Orient the satellite antenna assembly with the metal bracket and plastic housing pointing upwards.
- Center the satellite antenna assembly on the top rail of the solar panel, between the arms of the spider bracket.
- Fasten using the provided M6 cage nuts and machine screws.

#### Step 2: Connect Satellite Antenna to Controller Enclosure



*Figure 11: Derail Sensor*

- Locate the RF SMA connectors on the bottom of the controller enclosure.
- Route wires neatly from satellite antenna to controller enclosure.
- Hand-tighten the satellite RF connectors until fully threaded and snug.

## 3.5 Sensor Installation

### 3.5.1 For Flip-Style Derail

#### Damage to Equipment

Verify sensor clearance before welding. Improper placement may cause interference with moving parts or rolling stock.

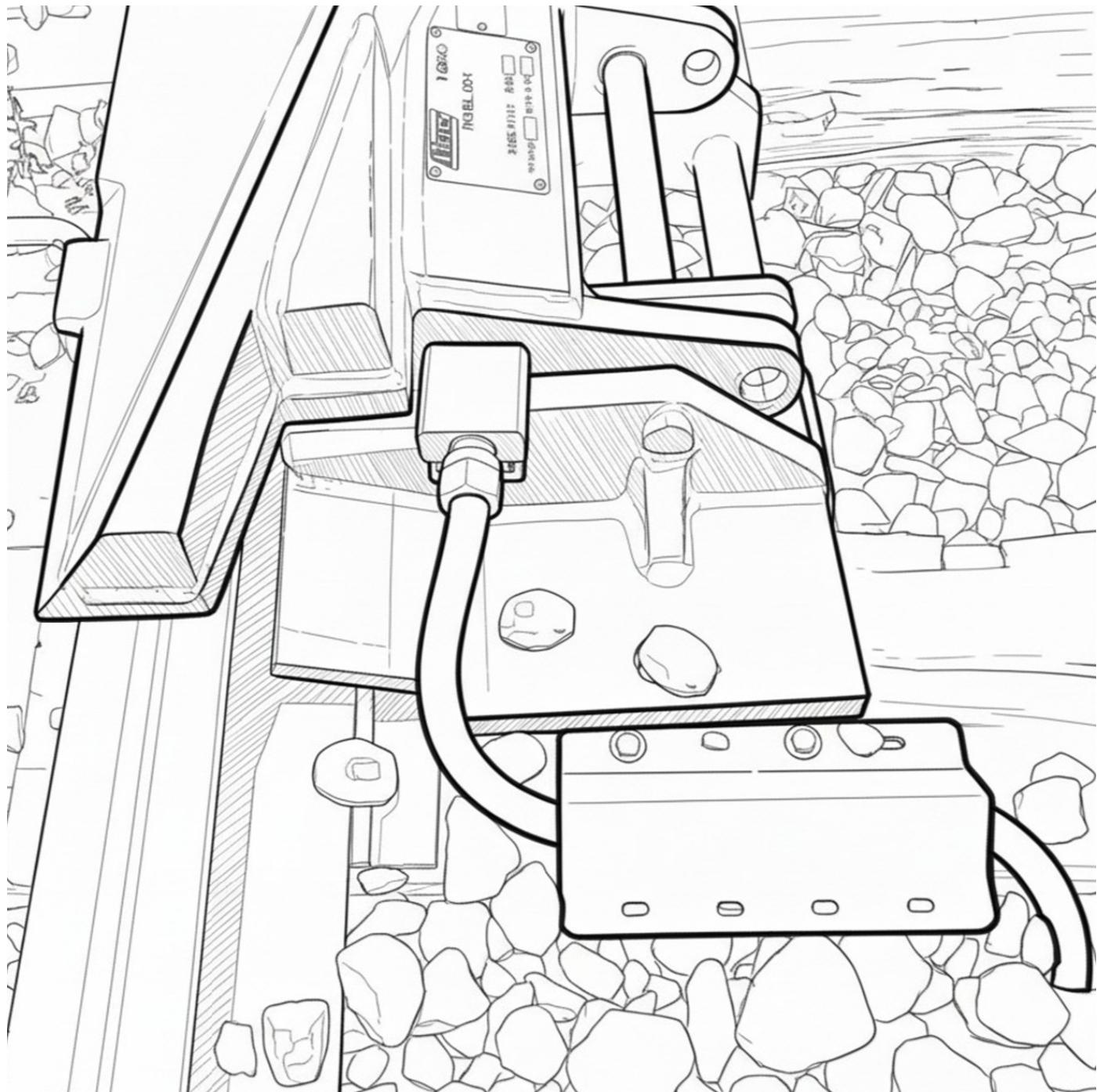


Figure 12: Sensor installation on flip-style derail.

**Step 1: Locate Bracket**

- Place the sensor mounting bracket on the side of the derail.

**Step 2: Check Clearance**

- Move the derail arm from side to side, through its full range of motion. Confirm the sensor and bracket are clear of all moving parts.
- Verify that the sensor will remain clear of train wheels in both engaged and disengaged positions.

**Step 3: Prepare Metal**

- Grind paint off the mating face of the sensor bracket to ensure a proper weld.

**Step 4: Mount Sensor Block**

- Mount the sensor to the bracket using the provided screws. Tighten securely.

**Step 5: Check Positioning**

- Confirm that:
- The sensor is clear of moving parts and wheels.
- The sensor face is square to the rail.
- The reader face is parallel to the derail's metal plate.

**Step 6: Weld Bracket**

- Weld the sensor and bracket assembly to the derail as shown in the installation drawing.

**3.5.2 For Swing-Style Derail****Note**

Stand for swing-style derail sensor provided by Marmon

**Step 1: Locate Bracket**

- Place the sensor bracket on the provided stand.

**Step 2: Install Hardware**

- Verify that the sensor block is secured to the sensor bracket and that the liquid-tight tubing nut is fully tightened to the sensor.
- Add the #10-32 x 3/4" screws, #10 flat washers, and #10-32 nuts.
- Tighten hardware until the sensor doesn't move.

**Step 3: Check Positioning**

- Verify alignment of the bracket before proceeding.

**3.5.3 Liquid-Tight tubing****Note**

Liquid tight tubing provided by Marmon

**Step 1: Measure and Cut Tubing**

- Measure the required length of tubing from the sensor to the controller enclosure.
- Add at least **12 in.** of slack for routing and future adjustments.
- Cut the tubing cleanly with a utility knife or tubing cutter. Avoid jagged edges.

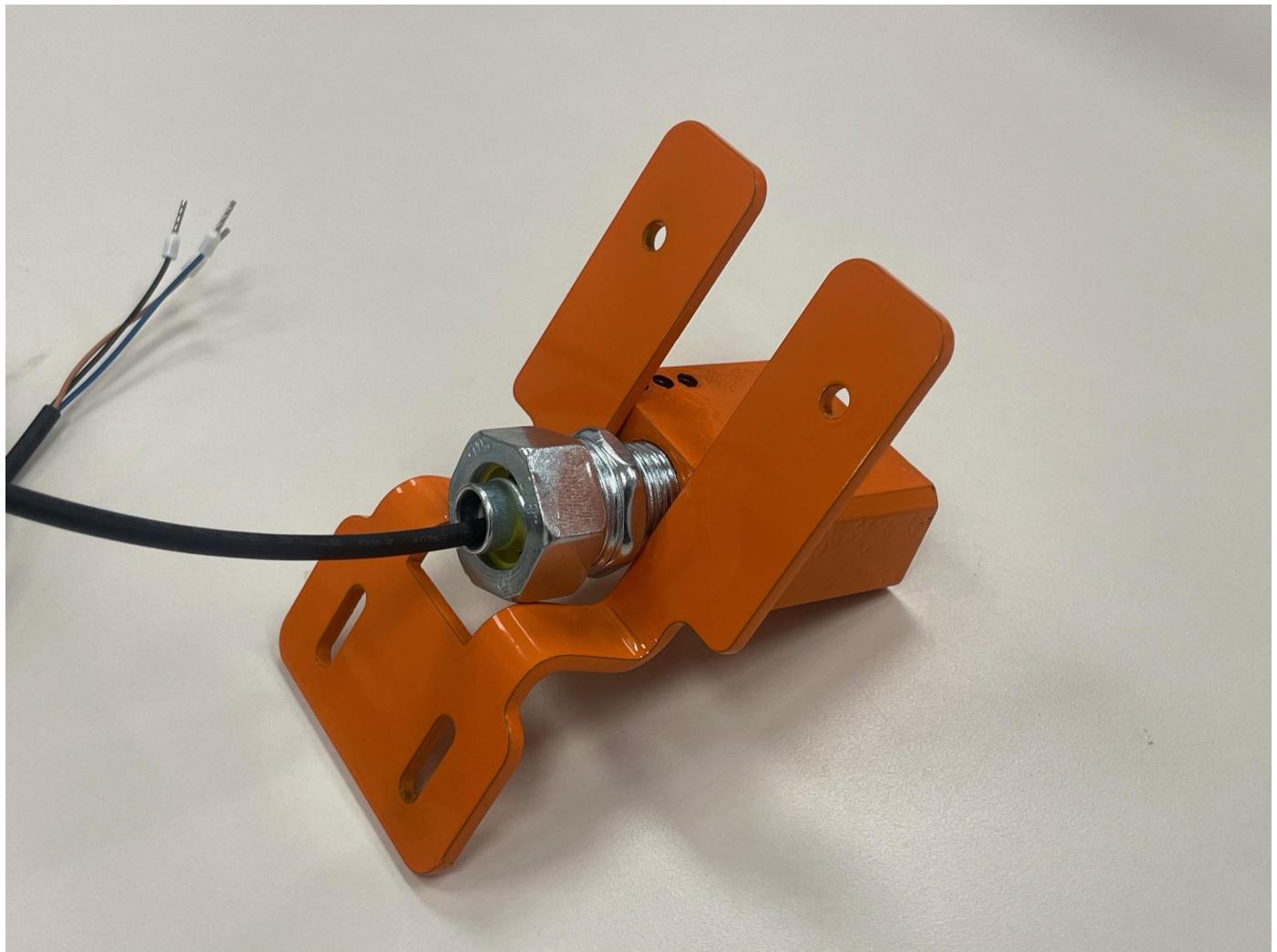


Figure 13: Tubing nut installed on swing-style derail bracket.

**Step 2: Prepare Cable for Installation**

- Inspect the sensor cable for nicks, cuts, or damage before running it.
- If pulling long runs, attach a pull string or fish tape to the cable using electrical tape. Wrap smoothly to avoid snags.

**Step 3: Insert Cable into Tubing**

- Feed the sensor cable through the tubing slowly and evenly.
- Support the tubing while feeding to prevent kinking.
- Avoid sharp bends — the tubing bend radius must not be tighter than 6 in.

**Step 4: Route Tubing to Controller Enclosure**

- Route tubing through cutout on enclosure side of controller stand.
- Position tubing along a straight, supported path wherever possible.
- Ensure tubing will not interfere with derail movement or be crushed by ballast.
- If crossing under rail or ties, secure tubing to prevent chafing.

**Step 5: Install Cable Gland at Controller Enclosure**

- Loosen the gland cap and insert the tubing with cable into the gland body.
- Slide the cable through carefully – do not force or twist.
- Ensure the cable jacket, not the conductor insulation, is gripped by the gland seal.

**Step 6: Tighten the Cable Gland**

- Hand-tighten the gland cap, then snug with a wrench until resistance is firm.
- Do not overtighten; overtightening may crack the gland or cut into the cable jacket.
- Check that the gland provides a secure, weatherproof seal.

**Step 7: Terminate Cable at Controller**

- Route the sensor wire inside the enclosure neatly, avoiding sharp bends.

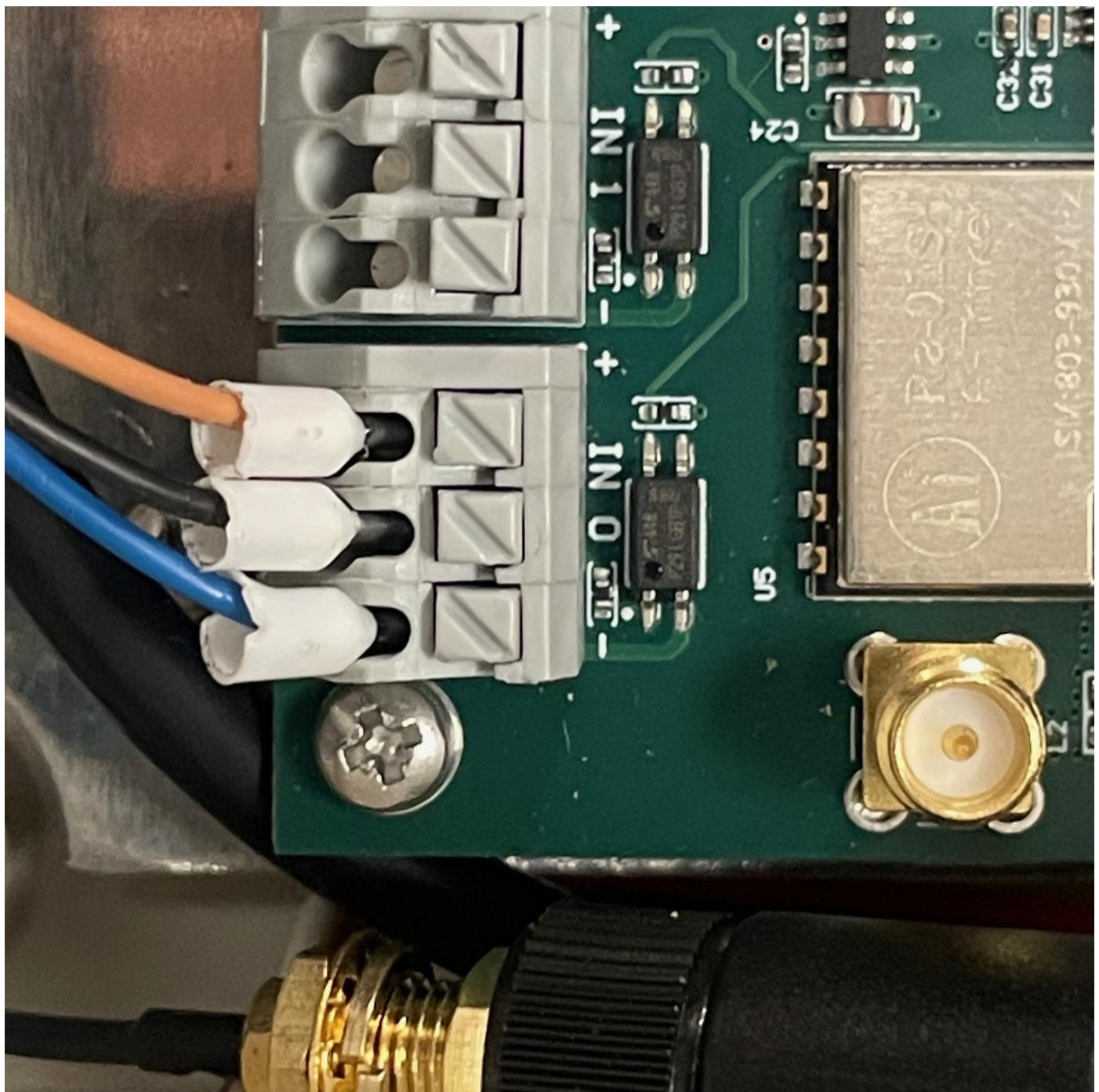


Figure 14: Derail sensor wire properly installed in enclosure.

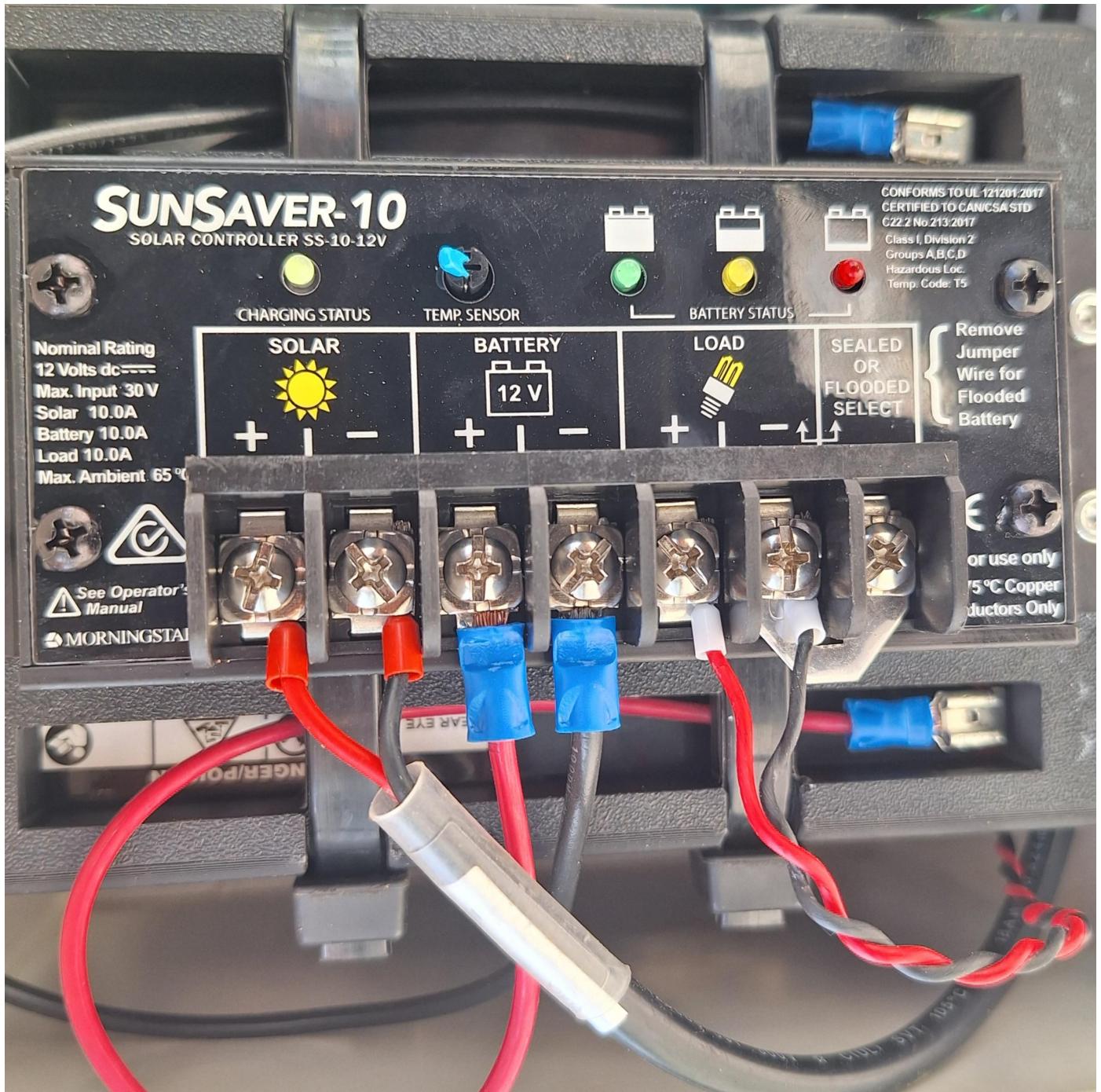
- Connect the wires to the IN 0 terminals on the controller board, observing polarity.

#### Step 8: Verify Cable Protection

- Straighten the tubing path and confirm it is free of kinks.
- Bolt the liquid-tight tubing cover plate to the tie, perpendicular to the rail as shown in the installation drawing.
- Cover tubing with ballast to shield from UV, impact, and debris.

**Step 9: Final Test**

- Use a multimeter to verify continuity and voltage.
- Confirm the sensor operates correctly before completing site backfill.

**3.6 Turning on the System***Figure 15: Derail Charger Connected***Step 1: Battery Connection**

**A Polarity Matters**

Reversing battery polarity (red to – or black to +) can permanently damage the controller and board and is not covered by warranty. Use a multimeter to pre-check the battery's voltage and polarity at the terminals before attaching any leads.

**Step 2: Confirm Readiness**

- Taking care not to cut the wire or touch the spade terminal to any metal, cut the zip tie restraining the battery positive (+) wire.
- Identify terminals and leads:
- Battery positive (+) terminal.
- System leads: red = positive (+)

**Step 3: Connect the Positive Lead****A Loose Connection Hazard**

A wire that is not fully secured can cause overheating, arcing, or system failure.

- Insert the spade connector fully into the screw terminal.
- Ensure that no bare conductor is exposed outside the terminal housing.
- The insulation should come right up to the terminal opening.
- Turn the screw clockwise until the wire is firmly clamped in place.
- The wire should not shift or pull out with gentle tugging.
- Do **not** overtighten—this may damage the screw or deform the wire.
- Verify by gently pulling on the wire. If it moves, retighten the screw.
- Confirm that no bare wire is exposed.

**Step 4: Verify Power Indicators**

- Look for the indicator lights on the charge controller and on the main board to confirm the sensor is receiving power.
- If indicators do not light:
- Recheck polarity and terminal tightness

**Step 5: Support**

- If the system still does not power on, stop and contact TXRX support for assistance. Do not modify wiring beyond the procedures in this manual.

## 4. Operation

The derail light is mounted to a Western-Cullen-Hayes (WCH) derail device. Always follow WCH's official documentation for derail device operation. This section explains how the integrated derail light indicates system status.

### 4.1 Derail Operation

#### Safety Precaution

Do **not** operate the derail device without clearance from the site supervisor. Unauthorized use may result in equipment damage or personnel injury.

1. Obtain clearance from the site supervisor.
2. Follow WCH derail device operating procedures to engage or disengage the derail.
3. Observe the status light to confirm correct operational status.

#### Tip

Always visually confirm the derail position in addition to checking the status light.

## 4.2 Status Light



The derail light provides a clear visual indication of derail status:

- **Blinking Blue** → The derail device is **engaged** (track blocked).
- **Light Off** → The derail device is **disengaged** (track clear).

 **Note**

Lighting patterns may vary slightly depending on site-specific configuration. Refer to your project documentation for customized behavior.

## 5. Maintenance

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### 5.1 Routine Maintenance

Perform these checks **every other month**.

1. Verify that the sensor is properly aligned in its mounting position.
2. Confirm that the sensor bracket is securely attached and free of movement.
3. Inspect the sensor cable for any signs of wear, abrasion, or loose connections.



Tip

Wipe dust or debris from the sensor face using a clean, dry cloth. Do **not** use solvents or abrasive materials.

### 5.2 Occasional Maintenance

Perform these checks **every 6–12 months**, or after severe weather events:



Electrical Hazard

Always disconnect the battery before tightening or servicing electrical connections. Use insulated tools and protective eyewear.

#### Step 1: Measure the Battery Voltage with a Digital Multimeter

- Typical operating range: **12.0–14.4 VDC**.
- Recharge or replace the battery if readings fall below the recommended range.

#### Step 2: Inspect the Solar Panel Connections

- Ensure all terminals are tight and corrosion-free.
- Clean terminals with a dry brush if necessary.
- Confirm wiring polarity matches system labels (+ / -).

#### Step 3: Visually Inspect the Solar Panel Surface for Dirt, Shading, or Damage

- Clean with mild soap and water if necessary.

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### 5.3 Verification

#### After Maintenance

- Ensure the system powers on normally.
- Confirm that status LEDs on the controller and sensor indicate proper operation.
- Record maintenance actions in your service log.

## 6. Troubleshooting

This section lists common mechanical and electrical issues that may occur during operation, and suggested checks and fixes.

### 6.1 Mechanical Issues



#### Tip

Clean solar panels using mild soap, water, and a soft cloth. Avoid harsh chemicals or abrasive pads.

#### Sensor positioning issues

- Check that the sensor is correctly aligned with the target area.
- Ensure the mounting bracket is firmly attached and not vibrating.
- Verify that no debris or obstacles are blocking the sensor's field of view.

#### Solar panel issues

- Inspect for dirt, dust, or shading that may reduce efficiency.
- Confirm the solar panel is securely mounted and angled toward the sun.
- Check for cracks, water damage, or loose framing hardware.

### 6.2 Electrical Issues



#### Electrical Hazard

Disconnect the battery before performing electrical checks. Use insulated tools and avoid shorting terminals.

#### Device

- Measure battery voltage with a digital multimeter.
- Confirm that the solar panel output is within expected range (typically **12.0-14.4 VDC**).
- Confirm that the solar panel output is within expected range (typically **17-21 V**).
- Inspect fuses and replace if blown.

#### 2. Connection issues

- Ensure all screw terminals are fully tightened (see [Terminal Wiring](#)).
- Check for corrosion on connectors; clean with a dry brush if necessary.
- Verify correct polarity (+ to +, - to -).

#### 3. Sensor issues

- Confirm power is reaching the sensor (LED indicators active, if applicable).
- Inspect the sensor cable for cuts, kinks, or wear.
- Re-seat the connector firmly at both ends.

## 6.3 Next Steps

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- If the issue persists after following these checks, contact **TXRX Technical Support** with your system serial number and maintenance log.
- See [Maintenance](#) for preventive care guidelines.