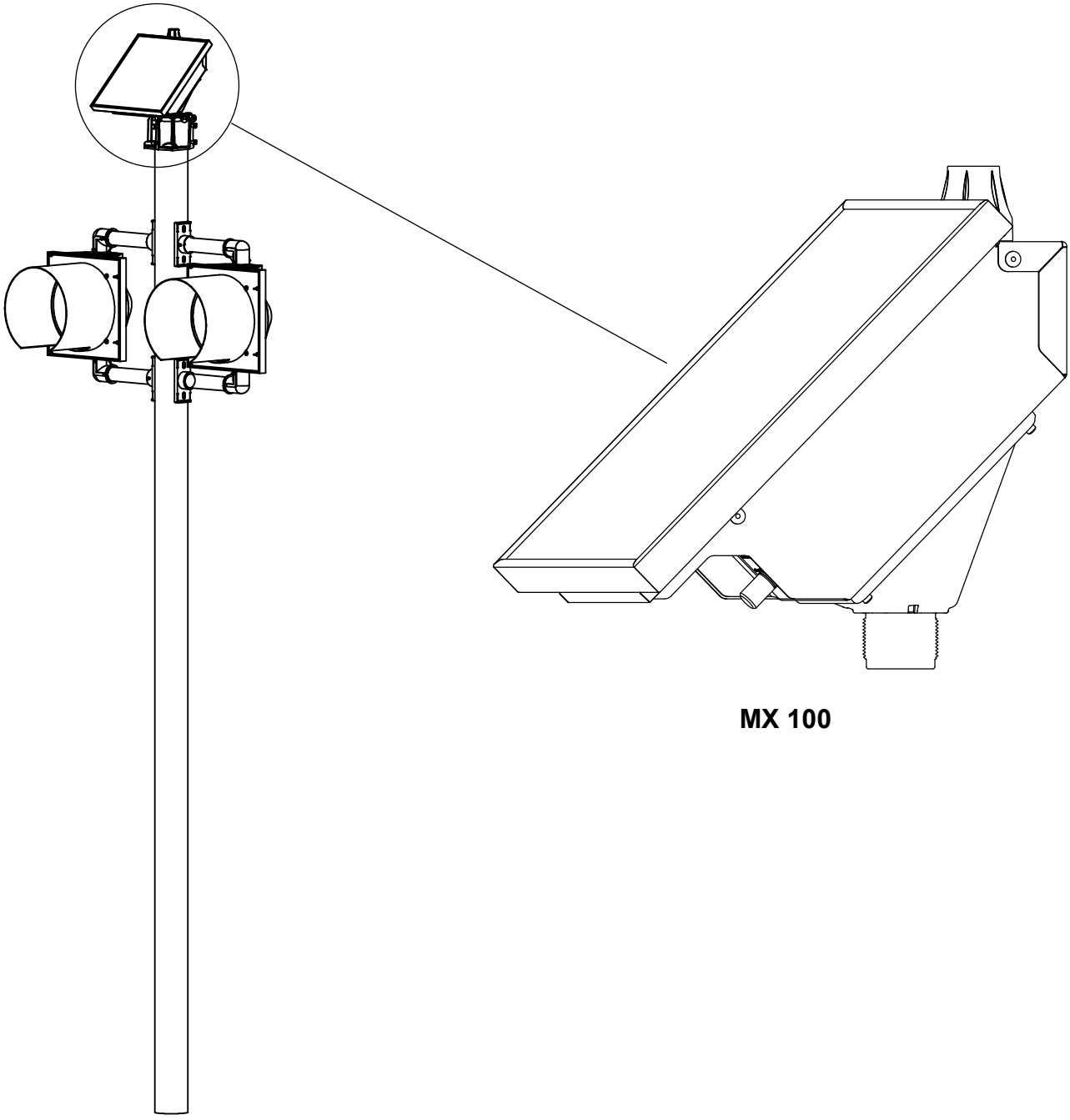
carmanah®
MX Series

MX 100

SOLAR POWER MODULE INSTALL GUIDE

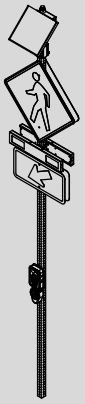
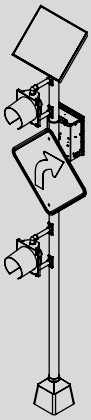
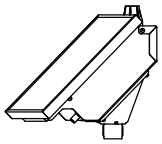
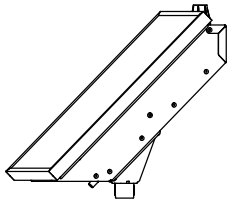
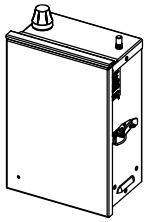
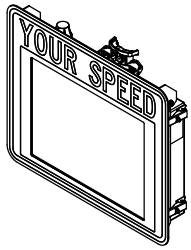
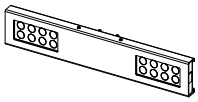
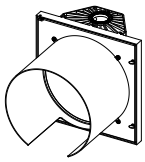
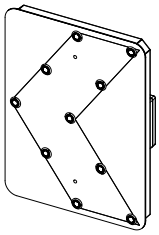
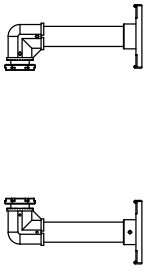
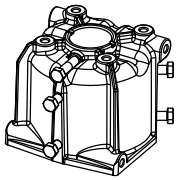
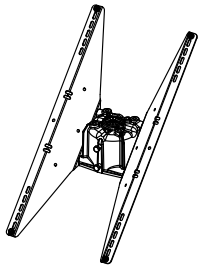
LEVEL 2



MX 100

90695REVD

MX Series Product Level Document Overview

LEVEL 1 System Planner	R920-MX 	R829-MX 	R247-MX 	SPEEDCHECK-MX 
LEVEL 2 Power or SpeedCheck Modules	MX 100 	MX 200 	MX 300/400 	MX SpeedCheck 
LEVEL 3 Flasher Modules	MX RRFB Module 	MX Beacon Module 	MX LED Sign Module 	MX Chevron Sign Module 
LEVEL 4 Kits* *Not all kits shown	Push Button Kit 	Beacon Mount Kit 	Large Top of Pole Mount Kit 	Solar Panel Top of Pole Mount Kit 

1.1 Introduction – READ THIS FIRST

The MX 100 Solar Power Module contains the solar panel, battery(s), solar charge controller, schedule function, day/night determination, radio for wireless synchronization, remote connectivity hardware and system-level settings.

Before installation, thoroughly review the MX Series **LEVEL 1** System Planner which will familiarize you with the features, operation standards and installation procedures of Carmanah's MX Series systems. Failure to comply with the use, storage, maintenance, installation or placement instructions detailed in that document could void the warranty. MX Series documentation is also available online at support.carmanah.com.

After reviewing the **LEVEL 1** System Planner, this document is the next step to installing your MX Series system.

Carmanah power modules provide key system functionality, including:

- Power for connected devices:
  - MX RRFB/Beacon/LED Sign Modules (referred to as flasher modules)
  - Triggers (push buttons, passive detectors, radars)
  - Regulated power output
- Schedule programming
- Wireless connection to other modules, such as an adjacent crosswalk flasher
- Remote connectivity hardware
- System details (name, GPS location, health)

Install the MX 100 Solar Power Module using this guide before installing other modules or kits using the guides supplied with them.

Once the system is installed and energized, it will operate according to its factory default settings which, depending on the application, may include some of the following:

- Flash pattern
- Operation mode
- Night dimming
- Radio operation
- Intensity
- Network settings

TO COMPLETE SETUP: Use MX Field App to program/link modules and change default settings. Download: carmanah.com/app

FOR REMOTE ACCESS: Log into MX Cloud: MXcloud.live

Batteries are shipped fully charged. Use extreme caution when handling batteries as they can generate hazardous short-circuit currents. Remove all jewelry (bracelets, metal-strap watches, etc.) before handling batteries.

Electrical shock hazard. Do not let battery terminals contact any exposed metal. Do not connect battery and solar panel harnesses until all system wiring is completed.

Product warranty begins on the earlier of in-field commissioning or 6 months after the original ship date. (If the system is powered up prior to being installed in the field, the warranty will start.)

1.2 Installation Notes

Ensure the installation location has an unobstructed view of the sun's path. Obstructions such as trees or buildings could significantly reduce the amount of energy collected by the solar panel. All solar panels should face approximately the same direction and be pointed south (in North America). Shade analysis is highly recommended to understand how shadows will change according to the time of year. Contact Carmanah for a detailed solar site assessment and Solar Power Report (SPR) that demonstrates expected system performance over a 12-month period.

To increase the reliability of radio communications, the MX 100 Solar Power Module should be located and oriented to ensure there is direct line-of-sight between the antennas of multiple systems and so structures or sources of interference (large signs, overpasses, powerlines, etc.) are as far away from the communication path as possible. If, when rotating the MX 100 Solar Power Module to optimize radio performance, it becomes no longer possible to have the solar panel face south, antenna extension kits are available—contact Carmanah for more details.

Pole Preparation:

- Mark positions of flasher module(s), any accessories and side of pole mount (if used) on pole.
- Drill cable exit/entry points as required for equipment listed above (if used).
- Fish harness between top of pole (or side of pole mount hole) to flasher module(s) (if used):
    - run harness to each module as well as MX 100 Solar Power Module (recommended), or
    - daisy-chain flasher modules together (distributed approach).
- As much as possible, ensure solar panel is pointing south (if you are in North America).

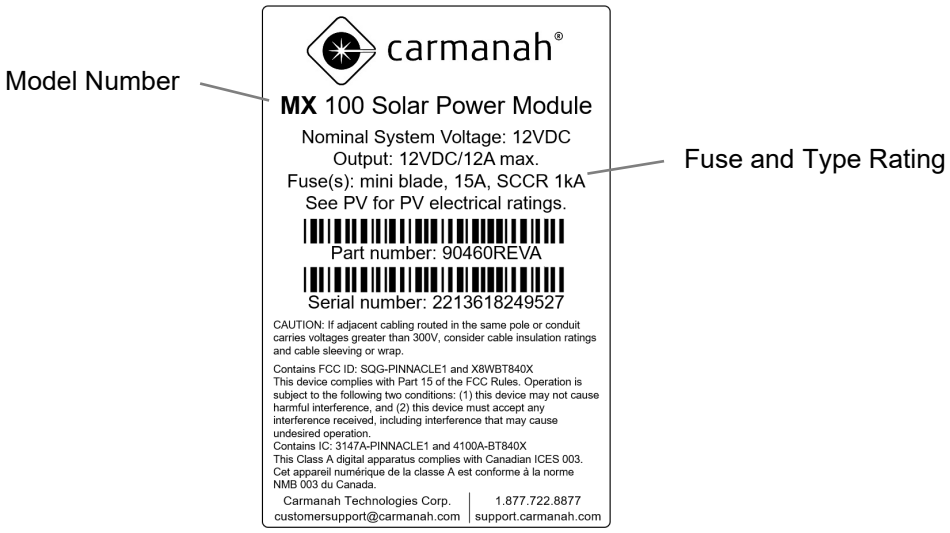
1.3 Tools and Materials Required

The following tools and materials may be required to mount your MX Series system depending on the model and configuration:

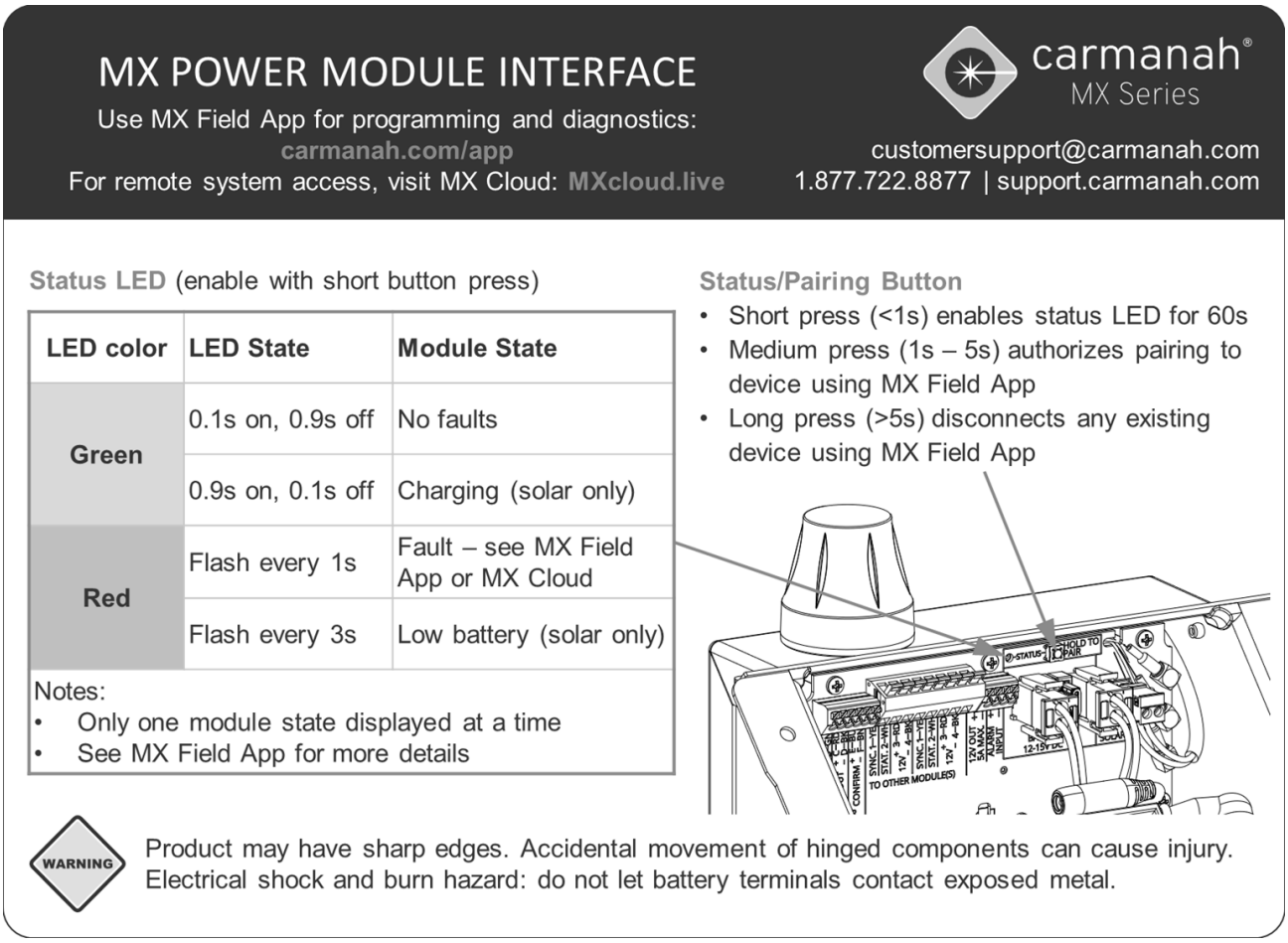
1. Imperial socket set 2. Crescent wrench 3. Tap set 4. Imperial hex key set 5. Fish tape 6. Level 7. Compass or pre-determined equatorial direction 8. Drill, drill bits and hole saws	9. Fine tip felt marker 10. Multi-bit screwdriver 11. 0.138" slotted screwdriver 12. Pelco Roger Wrench (optional) 13. Hook spanner wrench, 1.5" trade size 14. Ladder or lift device 15. Lithium grease 16. Electrical Multimeter (optional)

2.1 Product Labels

The information appearing on the MX Series identification labels is described below:

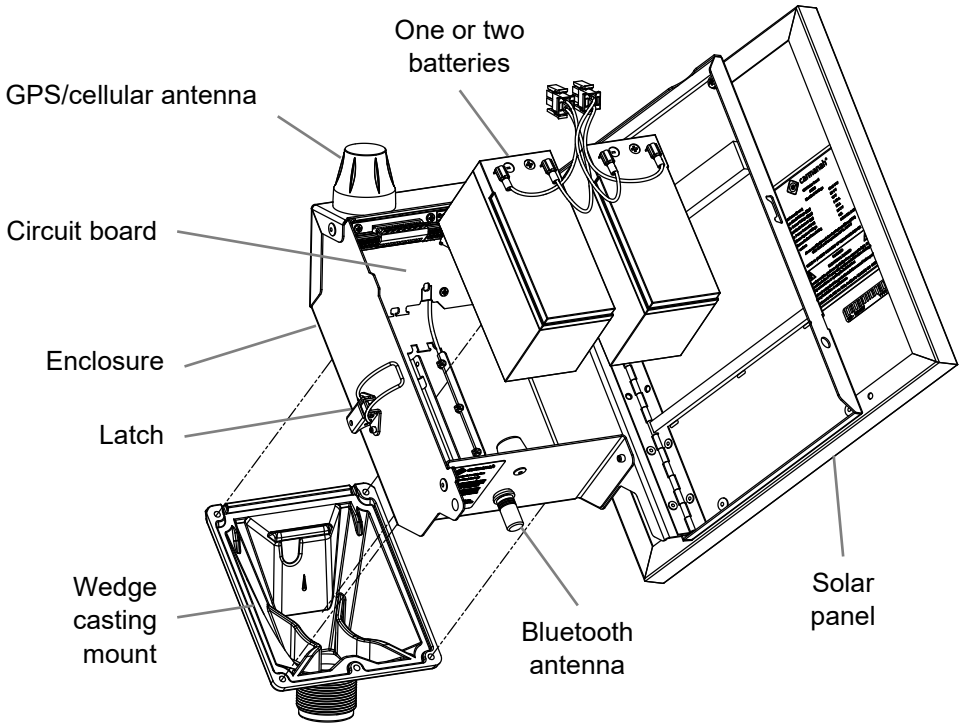


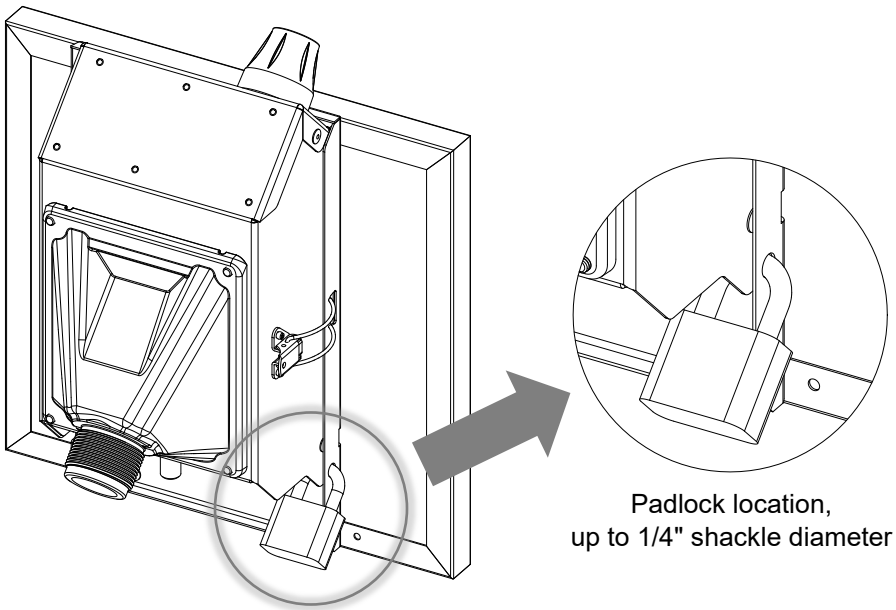
The power module status LED and button operation are described on the label below:



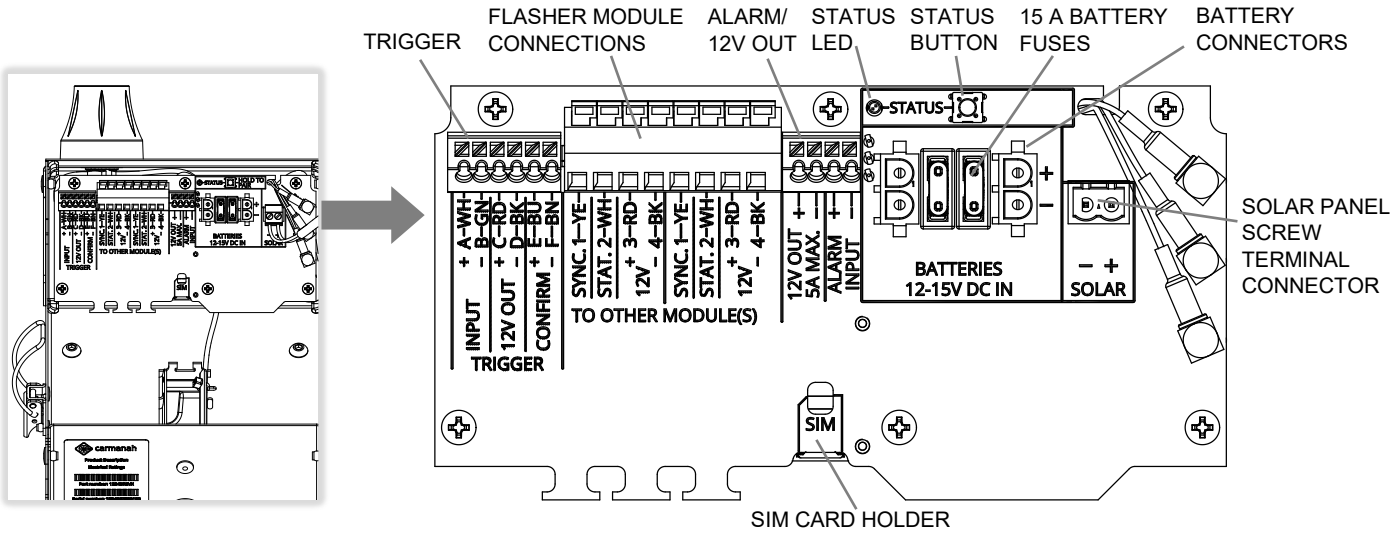
3.1 MX 100 Solar Power Module

Each Carmanah MX 100 Solar Power Module has the following parts:





3.2 MX Series Controller Overview

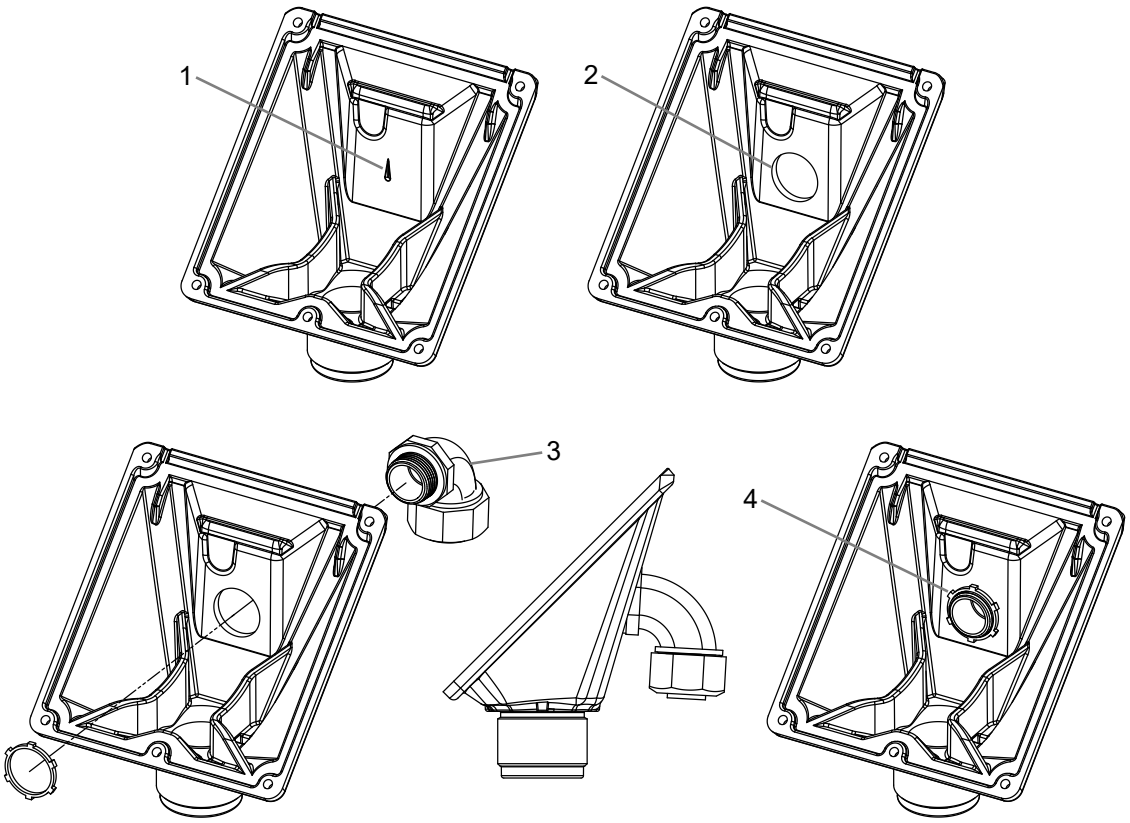


Group	Terminal	Description
Trigger	**INPUT +**	Hardware push button or switch inputs. Multiple connections may be made in parallel. The trigger is not a dry contact type. Until a connected button is pressed, 12-15 V is present between the input terminals, regardless of configuration. Pressing a connected button shorts the terminals and removes the voltage, triggering an activation. Failure to isolate input signals operating at different voltages or connecting devices that are designed to operate in a different voltage range could result in poor performance or equipment damage. Please contact Carmanah for additional support about non-standard input devices.
	INPUT –	
	12V OUT +	Provides 12-15 VDC (maximum 1 A) to power devices such as audible push buttons, low power radars or third-party time switches.
	12V OUT –	
	CONFIRM +	This terminal provides a steady 12-15 VDC signal whenever the system is activated and no faults are detected. Note the voltage across these terminals will drop 1 V for every 1 mA of current drawn. If the system voltage is 12 V and 4 mA is drawn, for example, the voltage will drop by 4 V to 8 V.
	CONFIRM –	
Flasher Module Connections	**SYNC**	Provides synchronization and communication data between power and flasher modules. Can be daisy-chained between flasher modules to simplify wiring.
	STAT	
	12V+	Provides 12-15 VDC to power connected flasher modules. Can be daisy-chained between flasher modules to simply wiring.
	12V –	
Accessory Power and Alarm Connections (Power Module only)	**12V OUT +**	Available for DC-powered accessories, or switched for activated accessories (e.g., overhead lighting) to a maximum of 5 A. Consult with Carmanah before adding loads to the system.
	12V OUT –	
	ALARM +	A normally-closed switch (such as a door switch on cabinet-based devices) can be wired to these terminals to trigger an alarm.
	ALARM –	
Power Source Connections	**SOLAR +**	Solar panel connections routed to the charge controller.
	SOLAR –	
	BATTERY +	Solar systems have two connectors that mate to one or two battery harnesses.
	BATTERY –	

3.3 Installing Conduit Fitting

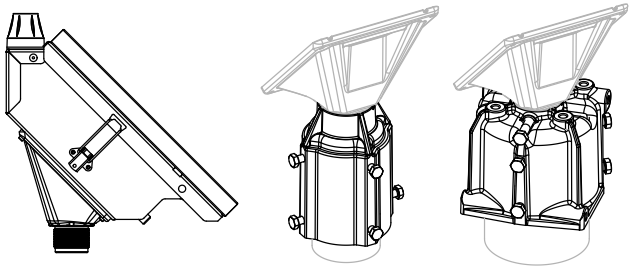
If using liquid tight conduit for external cable routing, a liquid tight fitting (not included) must be installed in the wedge casting.

1. Locate drill point indentation on the casting.
2. Drill out mount to size needed for liquid tight fitting.
3. Install fitting in orientation shown.
4. Tighten fitting nut into place.

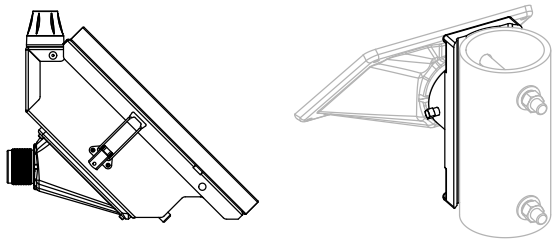


3.4 Installing Wedge Casting Mount

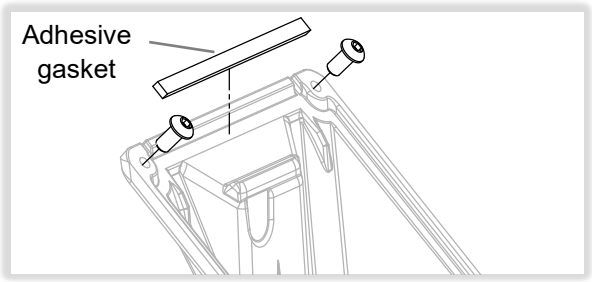
1. Apply adhesive gasket on correct end of casting for either Top of Pole or Side of Pole mounting.
2. Thread top two screws into casting loosely.
3. Align top casting screws with keyholes on housing and slide into place.
4. Install bottom two screws into casting and tighten all four screws.
5. Install onto pole mount with accompanying kit and follow the included kit instructions.

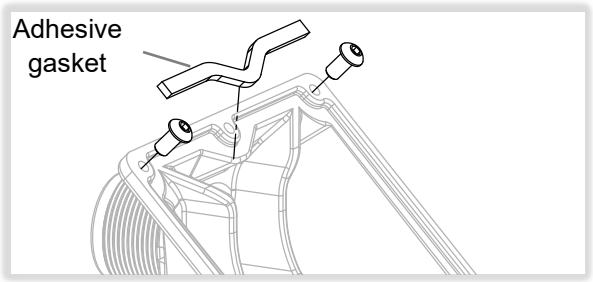


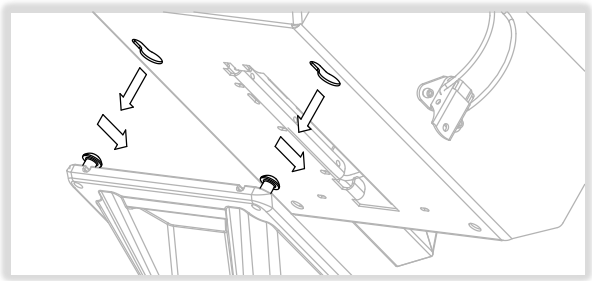
Top of Pole

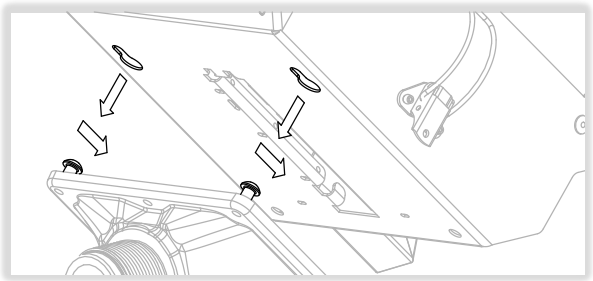


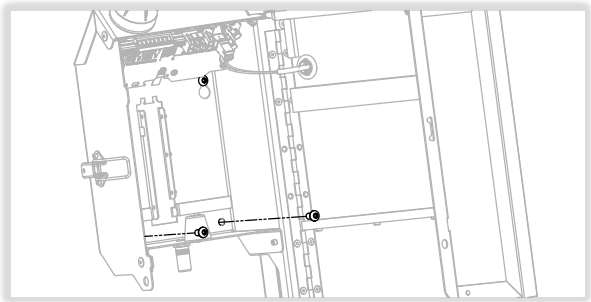
Side of Pole









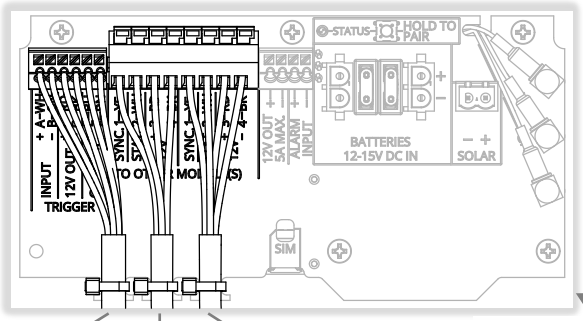


CAUTION

Failure to correctly apply adhesive gasket could result in product damage caused by water entry.

3.5 MX 100 Solar Power Module System Wiring

Wiring Modules – Centralized Approach (Recommended)



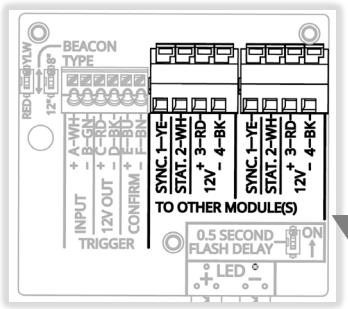
MX 100 Circuit Board

MX 100 Solar Power Module

To Push Button

To MX Beacon Module

To MX Beacon Module

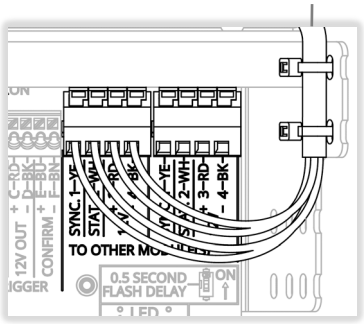


MX Beacon Module Circuit Board

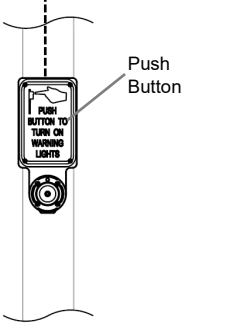
MX Beacon Module

Example Dual Beacon R920-MX

To Power Module



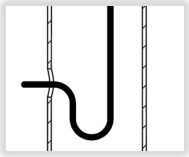
MX Beacon Module Wiring



Push Button

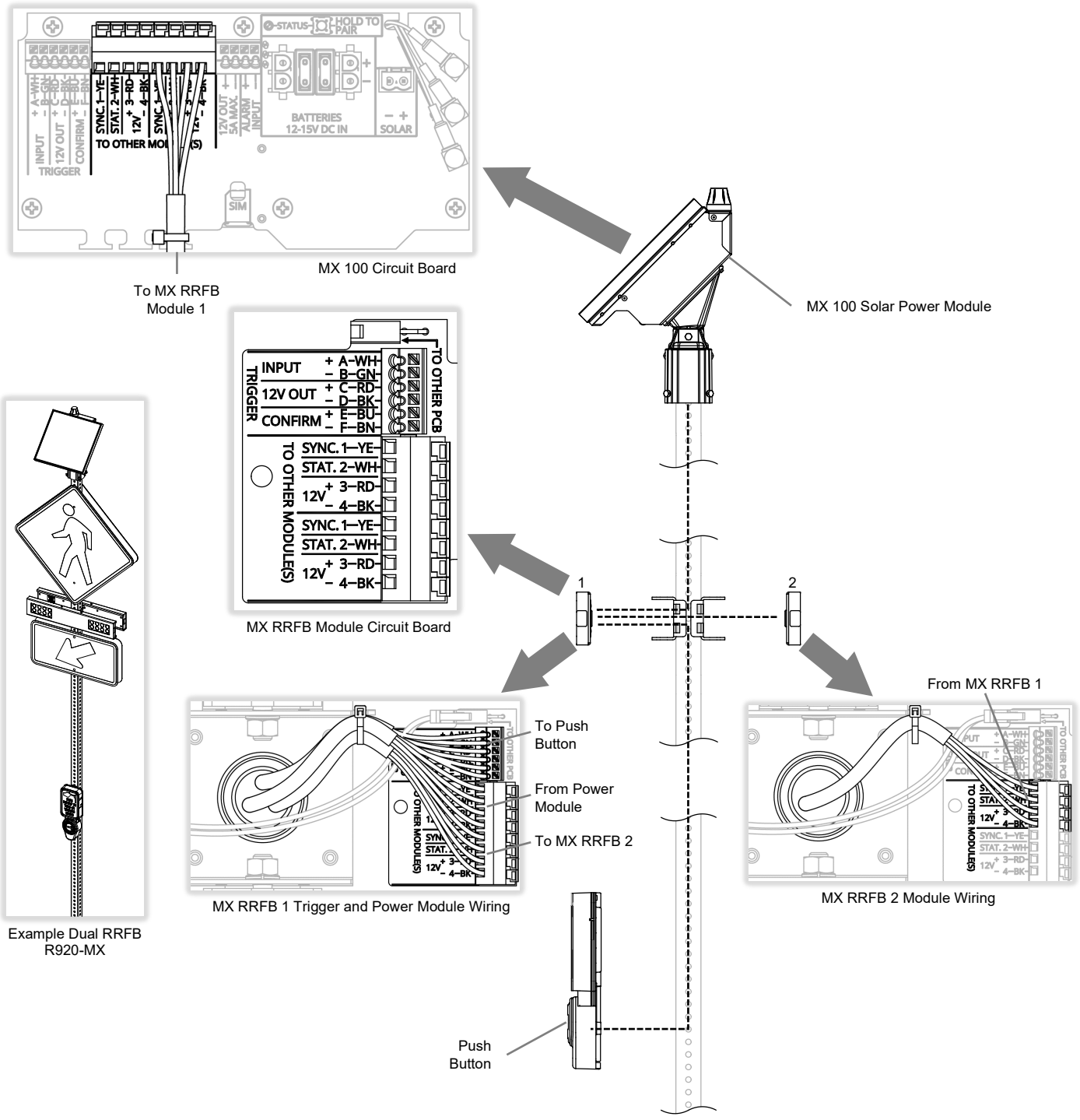
NOTE

System view simplified for illustration. For any point where water may collect on a cable and drip onto module electronics, a drip loop should be used.



Drip Loop Example

Wiring Modules – Distributed Approach



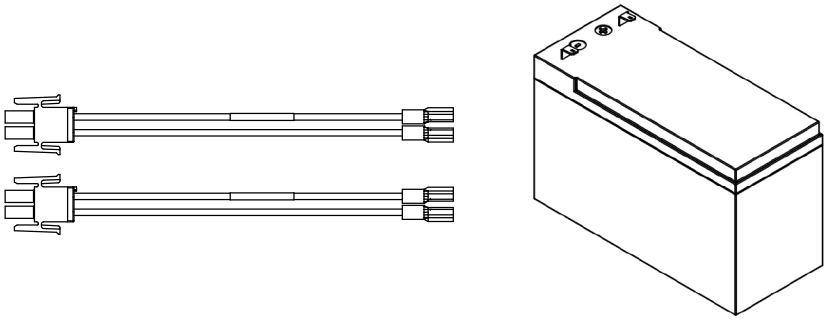
NOTE Prior to using distributed wiring approach, refer to **LEVEL 1** System Planner for guidelines with respect to maximum harness lengths and number of loads.

3.6 MX 100 Power Connections

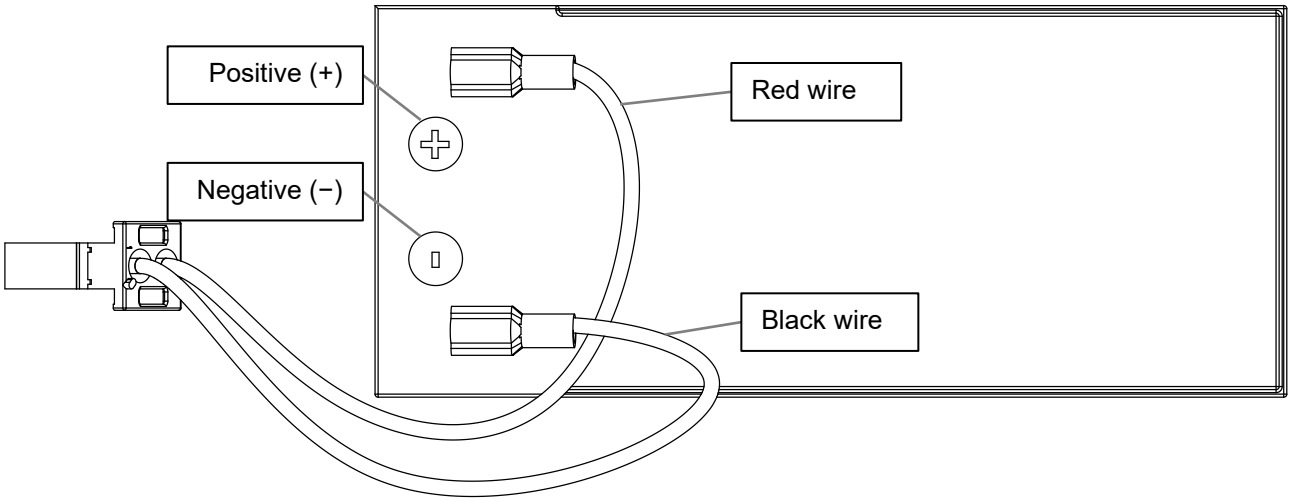
WARNING

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

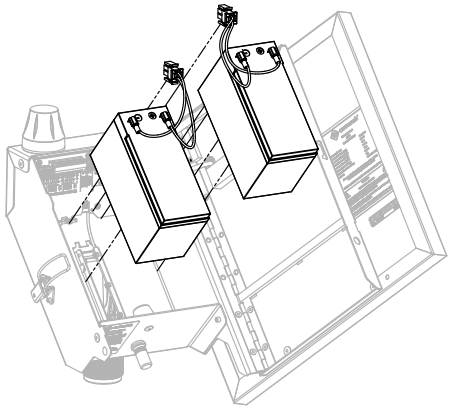
1. Unpack battery(s) and battery harness(es) located in MX 100 Solar Power Module packaging.

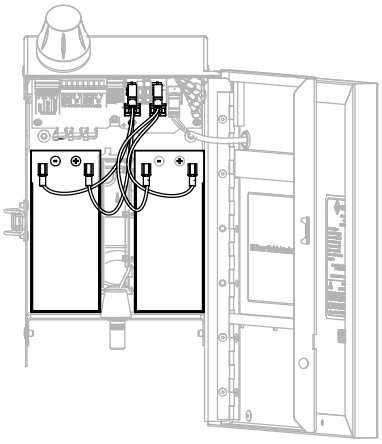


2. Install harness onto each battery as shown:
   a. Red wire to positive battery terminal.
   b. Black wire to negative battery terminal.

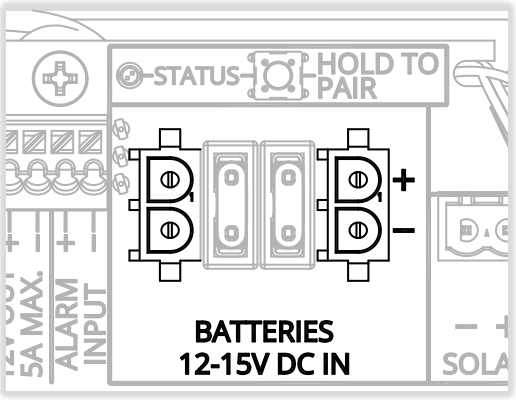


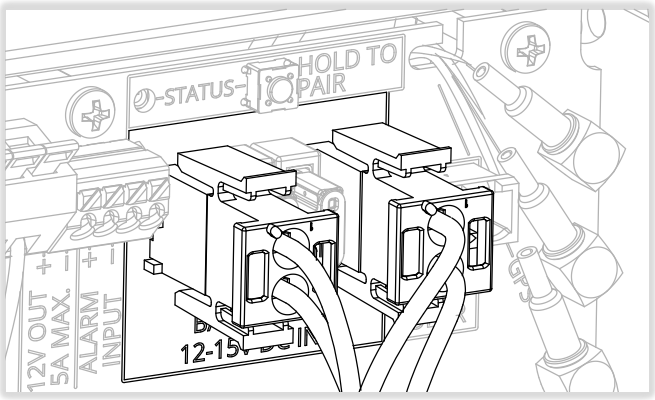
NOTE Finish installation of all modules and kits prior to powering up the system.



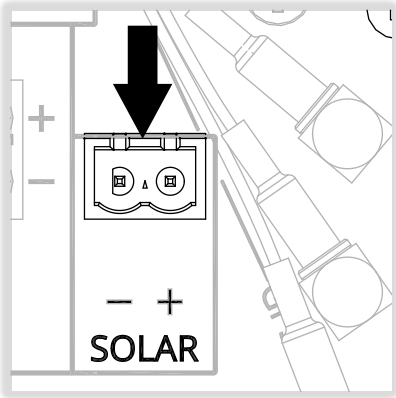


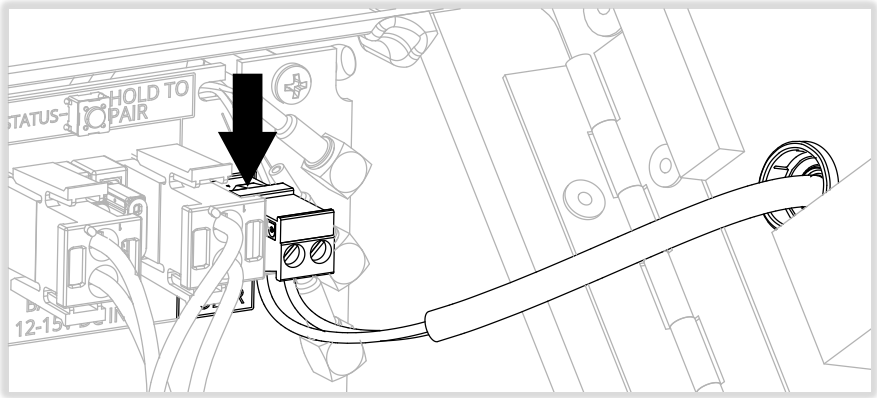
3. When ready to power MX 100 Solar Power Module, plug battery(s) into appropriate connector(s).





4. Install solar panel screw terminal connector as shown.

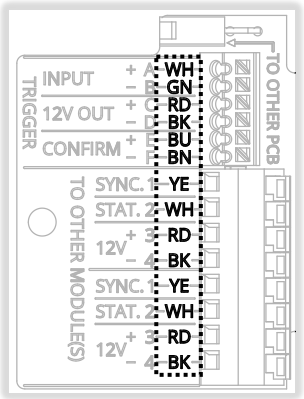




5. System will energize and operate according to its factory default settings. See **LEVEL 1** guide for more detail.
6. Ensure housing is fully closed and latched, otherwise damage may occur.
7. If a higher level of security is desired, install padlock onto housing lock location.

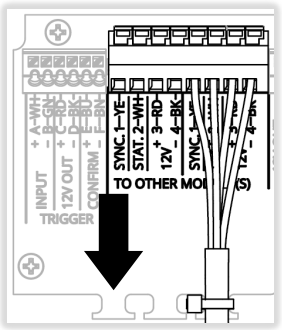
3.7 Wiring Notes

1. MX-specific color-coded harnesses are available from Carmanah with appropriate gauges and ratings for ease of install (recommended approach).
2. Due to the variety of devices that can be connected, color assignments shown may not be correct in all cases. Confirm correct connectivity and polarity for each fixture or device type.
3. Secure cables to "dog bone" features with cable ties.



Module Wire Color Assignments

Abbreviation	Color
BK	BLACK
BN	BROWN
BU	BLUE
GN	GREEN
RD	RED
WH	WHITE
YE	YELLOW



Dog Bone Strain Relief Feature

NOTE Refer to the **LEVEL 1** System Planner for more details on the wire types, colors and in-depth wiring information.

3.8 Commissioning Checklist

After installing and configuring an MX Series product, the following commissioning verification checklist helps ensure that the system is working as intended. Check all that apply:

General

- ☐ All wires and connectors secured with strain relief inside MX 100 Solar Power Module.
- ☐ Wires routed to other modules contain drip loops and are strain-relieved with cable ties.
- ☐ Power module indicator flashing green after status button pressed.
- ☐ Triggered systems only flash when activated (e.g., button press).
- ☐ For scheduled systems (e.g., for school zones), confirm that schedule is correct and enabled. (Set up schedule using MX Field App.)
- ☐ Test-flash system to visually confirm which system/linked system you are currently connected to and that all flasher modules are operational (via MX Field App).
- ☐ No fault messages are present (via MX Field App).

Power Module

- ☐ Solar panel pointed south (or as per specific instructions provided by Carmanah).
- ☐ Note possibility for nearby foliage to grow and eventually shade solar panel at a different time of year; if so, set reminder to inspect later.
- ☐ Battery voltage is above 12 V (use either a multimeter or MX Field App).
- ☐ Solar panel is producing voltage in sunlight (use MX Field App to confirm).
- ☐ Any vents or screens are clear and intact.
- ☐ Sealing gaskets on door/lid are intact.
- ☐ Solar panel door/lid is properly latched and locked, and MX 100 chassis is secured tightly and unable to spin.

Flasher Modules

- ☐ Flasher modules are secured and pointed in correct direction toward oncoming traffic lanes.
- ☐ MX RRFB Module light bar flashing starts with left module first (if applicable), RRFB is in correct orientation and verify the indicator LEDs on ends of light bars are seen by pedestrians across street.
- ☐ Confirm desired MX Beacon Module alternating flash behavior.
- ☐ MX Beacon Modules and MX LED Sign Modules flash when energized (default behavior is 24/7 flashing).
- ☐ All linked systems are turning on and off correctly and are synchronized (if applicable).

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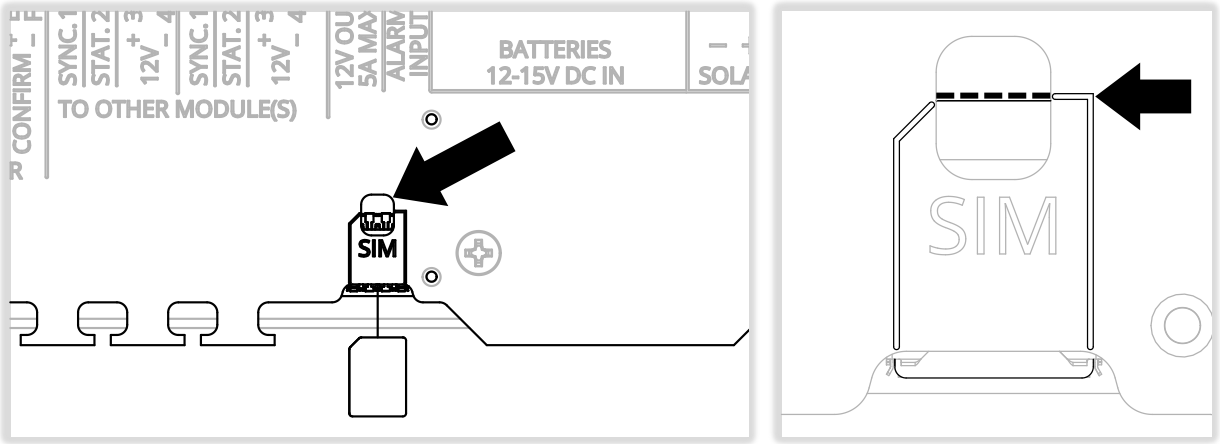
4.1 Replacing SIM Card

1. Though unlikely, if SIM card must be replaced, note its location on circuit board.
2. Disconnect solar panel and batteries to power down system before changing SIM card.
3. Place a rag under SIM card location to catch SIM card to avoid losing it.
4. Using a small spudger, toothpick or similar non-metallic tool inserted into square opening shown, gently slide SIM card down and out of its holder.
5. SIM card should now be sticking out enough to pull it out with your thumb and index finger.
6. Open the new SIM card package. The SIM card is embedded onto a triple-cut adapter. Snap out the SIM card to its smallest form (nano SIM).
7. New SIM card installation is opposite of steps above with the exception that new SIM card should only be inserted far enough to line up with silkscreen SIM card profile. Confirm orientation of new SIM card.

NOTE Only Carmanah-supplied SIM cards can be used with this product.



CAUTION **Use extreme care when inserting the new SIM card. Applying too much force will damage the SIM card holder and prevent network connectivity. The SIM card is fully inserted when its top edge aligns with the white outline printed on the circuit board.**

CAUTION **Use extreme care when handling the SIM card. It is possible to drop it into an irretrievable location within the MX 100 housing or pole.**

5.1 Troubleshooting

For additional troubleshooting information, visit Carmanah's Product Support Center at support.carmanah.com.

Symptom	Possible Cause and What to Check Check for faults via MX Field App or on-board product Status LED.
The circuit board does not activate or have LED status.	• Check if battery voltage is above 12 V. Charge or replace batteries if low. • Check all fuses. • Check connections of batteries and solar panel. • Ensure solar panel is clean, clear of debris and not shaded by buildings or vegetation to allow proper battery charging.
Flasher modules on same pole do not flash properly.	• Ensure wire colors and polarities are correct. Check that electrical connections are secure.
Flasher modules on same pole flash properly, but other linked systems won't also flash.	• Ensure that systems are linked correctly via MX Field App. • Ensure that systems are not too far apart (≤1000 ft unobstructed line of sight). • Check for barriers or obstructions between systems, such as buildings or billboards.
The system does not appear in the MX Field App.	• Check MX 100 Solar Power Module status LED. • Attempt to pair to system again. • Another user or mobile device may be currently connected to system via MX Field App. Press and hold button in power module for >5s to terminate existing connections. • System may have local access restricted from MX Cloud. Contact system owner for access. • Refer to MX Field App guide through link in Support section of App.
Flasher modules are too dim or too bright when flashing.	• Check settings via MX Field App. • Refer to the **LEVEL 1** System Planner for more details on product settings.
Flasher modules flash when no button is pressed.	• Flasher modules (other than MX RRFB Modules) may be operating in factory default mode. • Remove unwanted links to nearby systems using MX Field App. • System is being activated by a non-button trigger, such as passive detection.
Power module will not turn on when batteries are connected.	• Check all fuses and/or breakers. • If required, replace with equivalent fuses.

NOTE Read all other included installation guides prior to product installation.

carmanah®
MX Series

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