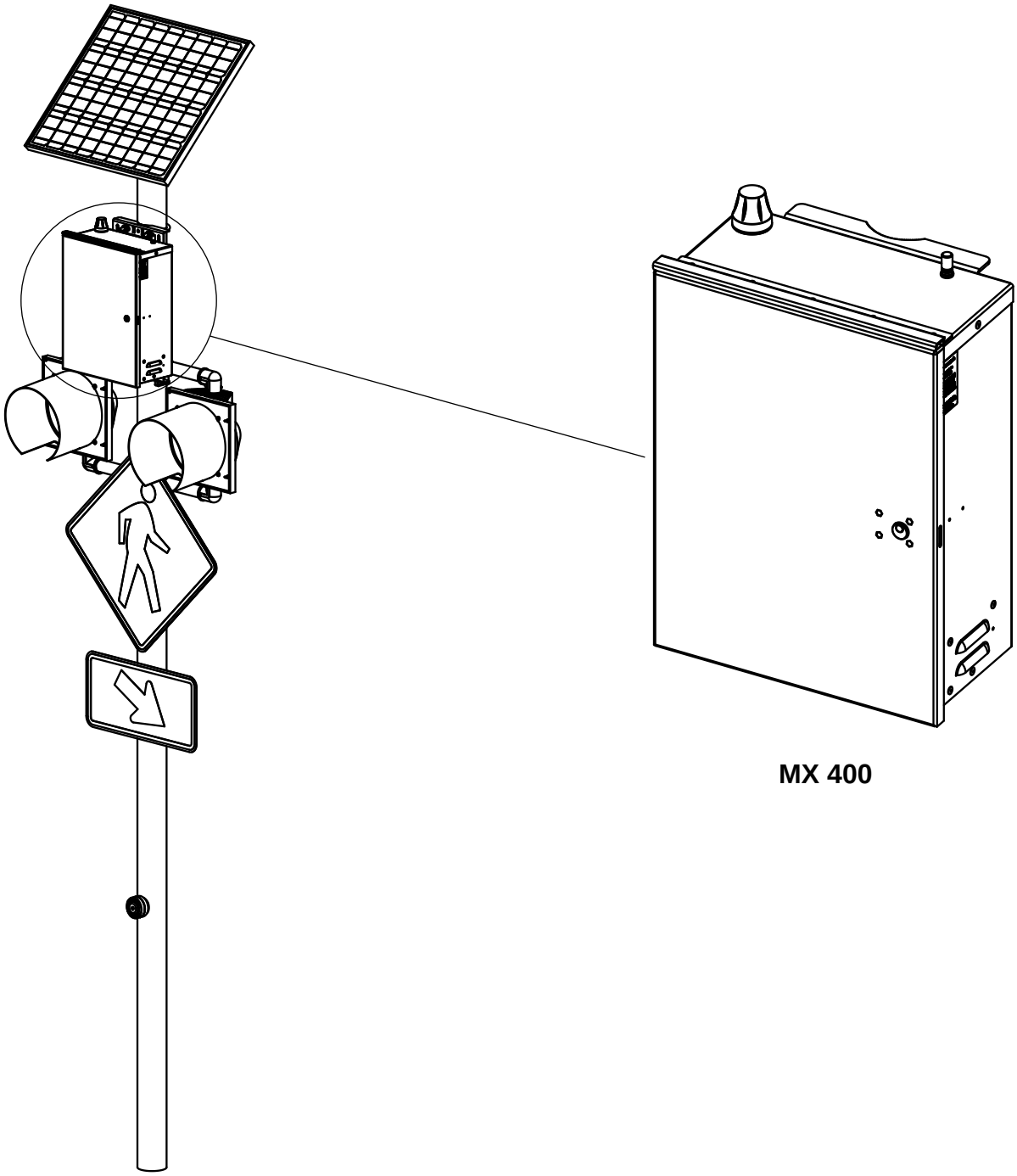
carmanah®
MX Series

MX 400

CABINET MODULE INSTALL GUIDE

LEVEL 2



MX 400

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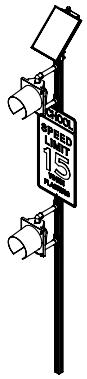
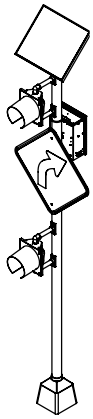
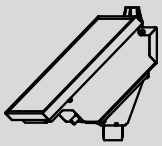
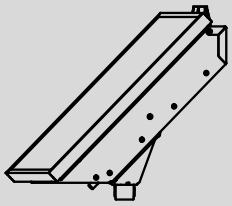
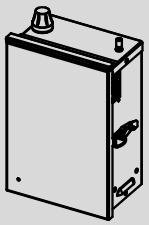
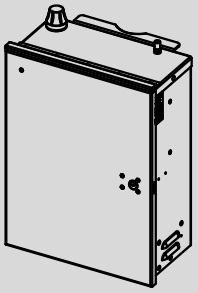
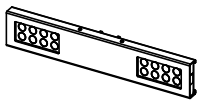
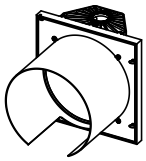
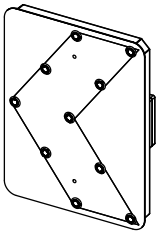
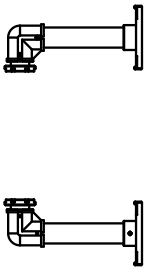
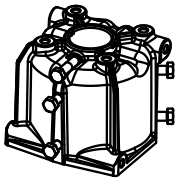
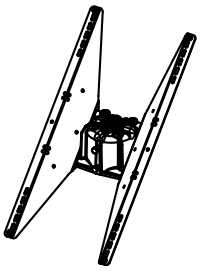
MX Series Product Level Document Overview

LEVEL 1 System Planner	R920-MX 	R829-MX 	R247-MX 	
LEVEL 2 Power Modules	MX 100 	MX 200 	MX 300 	MX 400 
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 400 Cabinet Module is available in Solar and AC versions. Solar versions contain additional solar charge controller circuitry and a battery, while AC versions contain an AC-DC power supply. All versions contain a 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)

First, install the MX 400 Cabinet Module using this guide; then, install any other modules and/or kits, with their included guides, to complete the installation.

Once the system is installed and energized, it will operate 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

For solar versions, ensure the solar panel 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 400 Cabinet 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 it is not possible to locate and orient the MX 400 Cabinet Module for optimal radio performance, antenna extension kits are available—contact Carmanah for more details.

Pole Preparation:

- Mark positions of cabinet, flasher module(s), and any accessories on pole.
- Drill cable exit/entry points as required for equipment listed above.
- Fish harness between cabinet and flasher module(s):
    - run harness to each flasher module as well as MX 400 Cabinet 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).

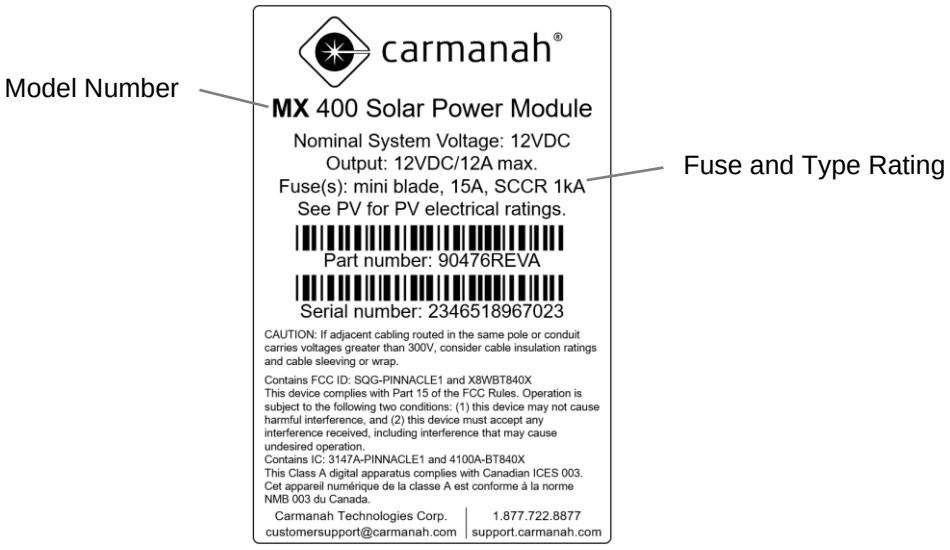
1.3 Tools and Materials Required

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:

MX POWER MODULE INTERFACE

Use MX Field App for programming and diagnostics:
carmanah.com/app
For remote system access, visit MX Cloud: MXcloud.live

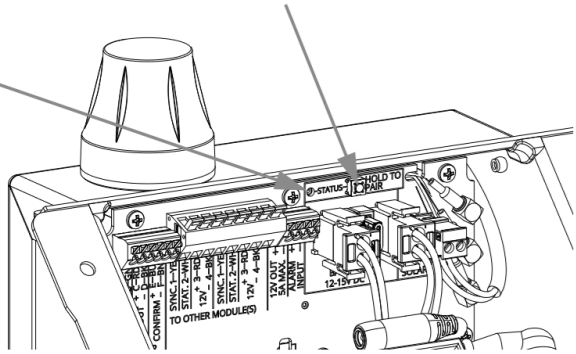
carmanah® MX Series
customersupport@carmanah.com
1.877.722.8877 | support.carmanah.com

Status LED (enable with short button press)

LED color	LED State	Module State
Green	0.1s on, 0.9s off	No faults
	0.9s on, 0.1s off	Charging (solar only)
Red	Flash every 1s	Fault – see MX Field App or MX Cloud
	Flash every 3s	Low battery (solar only)

Notes:
- Only one module state displayed at a time
- See MX Field App for more details

Status/Pairing Button
- Short press (<1s) enables status LED for 60s
- Medium press (1s – 5s) authorizes pairing to device using MX Field App
- Long press (>5s) disconnects any existing device using MX Field App

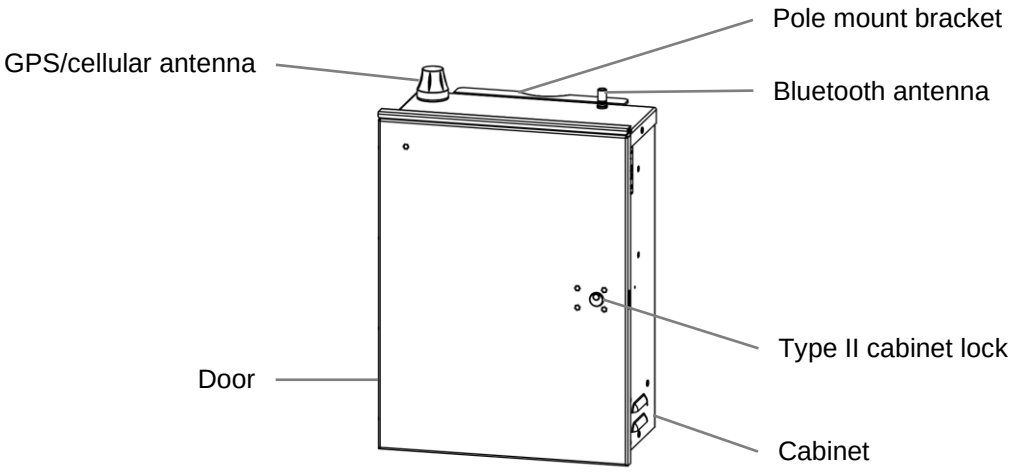


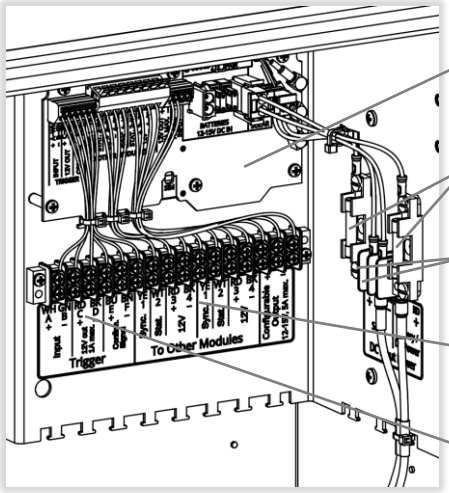
WARNING

Product may have sharp edges. Accidental movement of hinged components can cause injury. Electrical shock and burn hazard: do not let battery terminals contact exposed metal.

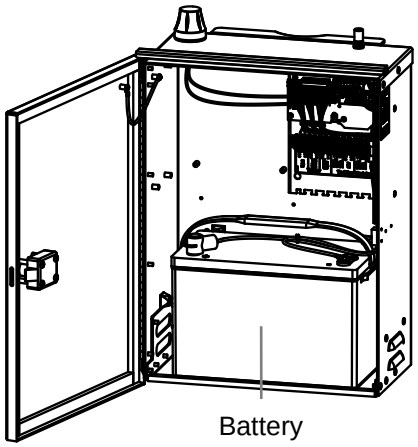
3.1 MX 400 Cabinet Module Overview

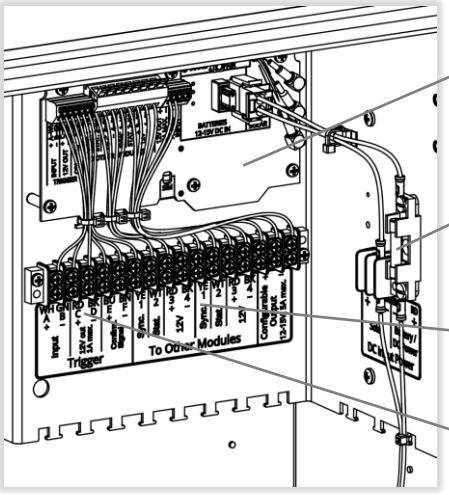
Each Carmanah MX 400 Cabinet Module has the following parts:



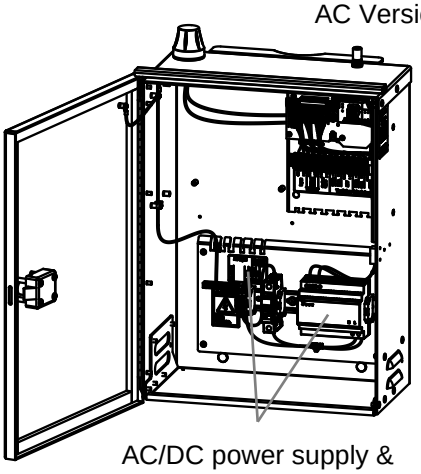


Solar Versions

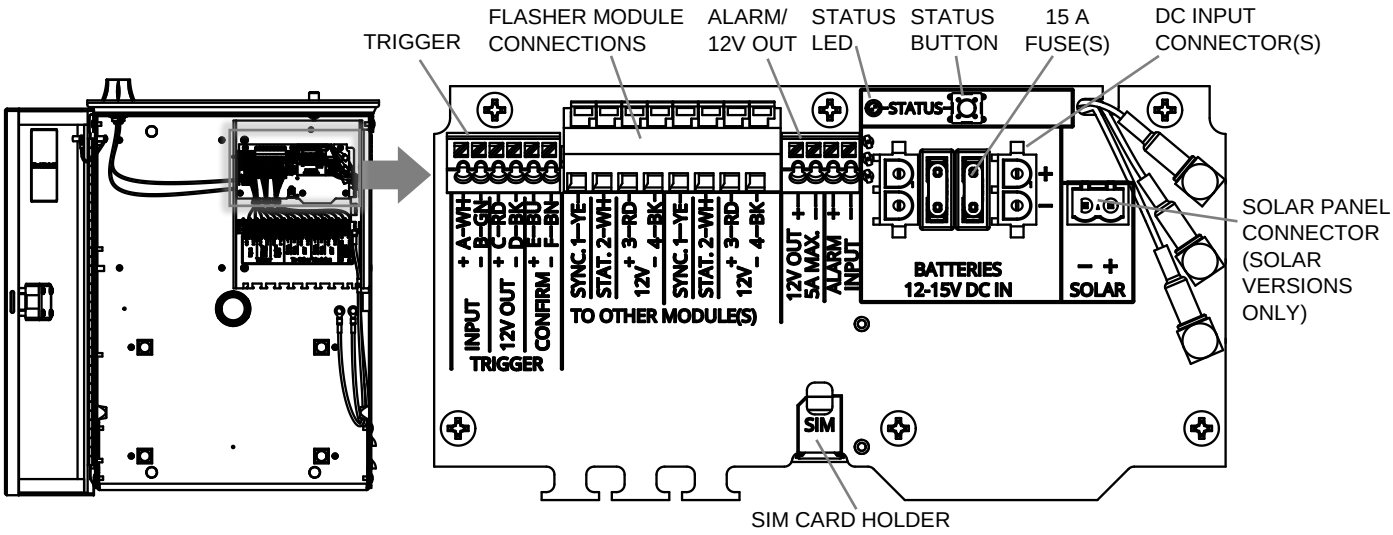




AC Versions



3.2 MX Series Controller Overview

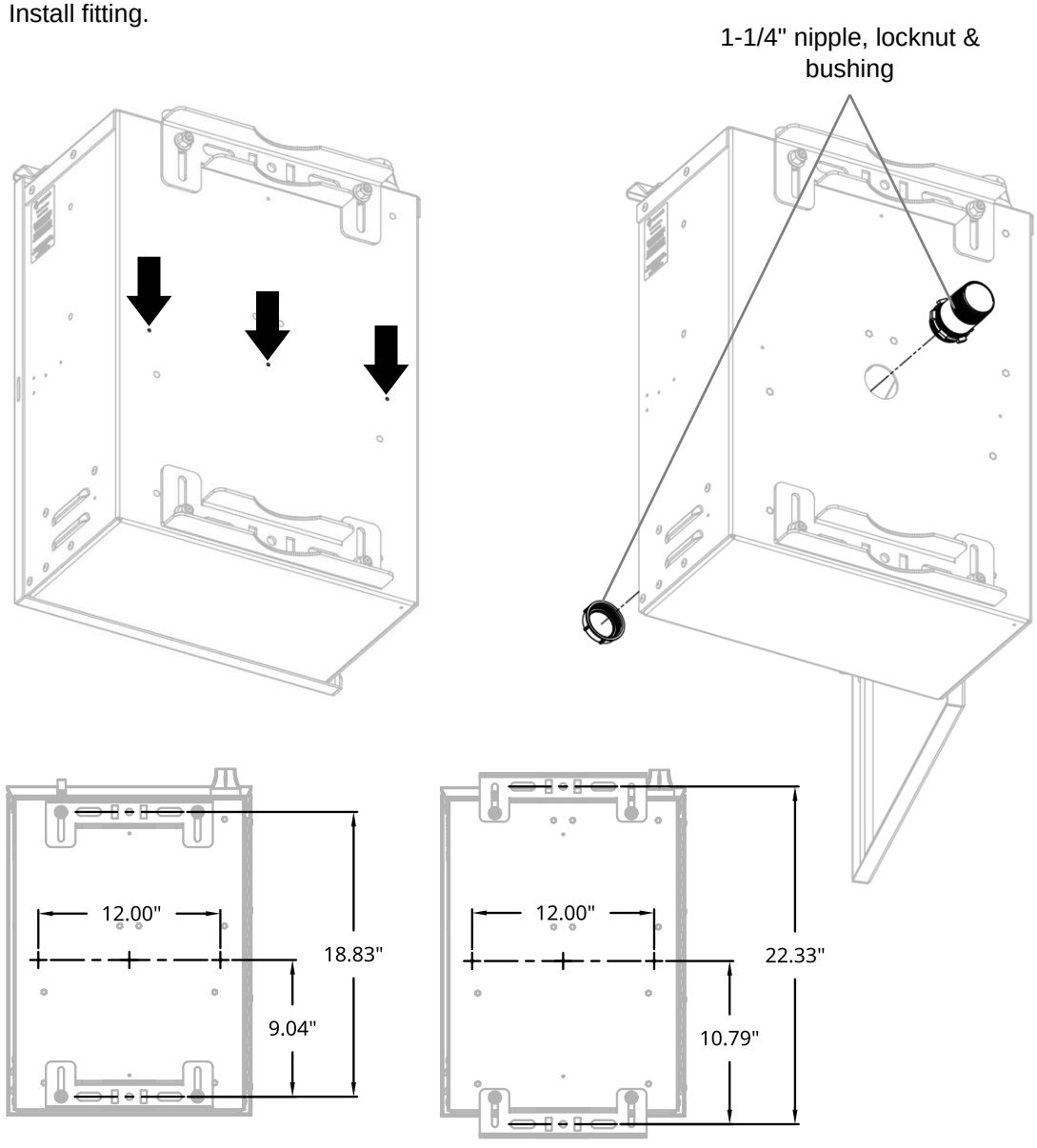


Group	Terminal	Description
Trigger	**INPUT +**	Hardware push button or switch inputs. Multiple connections may be made in parallel. The trigger is not a dry contact type. Until a connected button is pressed, 12-15 V is present between the input terminals, regardless of configuration. Pressing a connected 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. AC cabinet systems have one connector that mates AC/DC power supply harness.
	BATTERY –	

3.3 Installing Nipple and/or Conduit Fitting

The MX 400 cabinet comes without openings for cable routing or conduit fittings. Three drill point indentations are provided on the external rear surface of the cabinet to facilitate drilling in the desired location. Included with the system is a 1-1/4" trade size nipple (OD 1.66"), sealing locknut and bushing for use when cables are to be run inside the pole.

1. Locate desired drill point indentation or other suitable location on cabinet.
2. Drill hole to size needed for fitting.
3. Deburr hole and remove chips.
4. Install fitting.



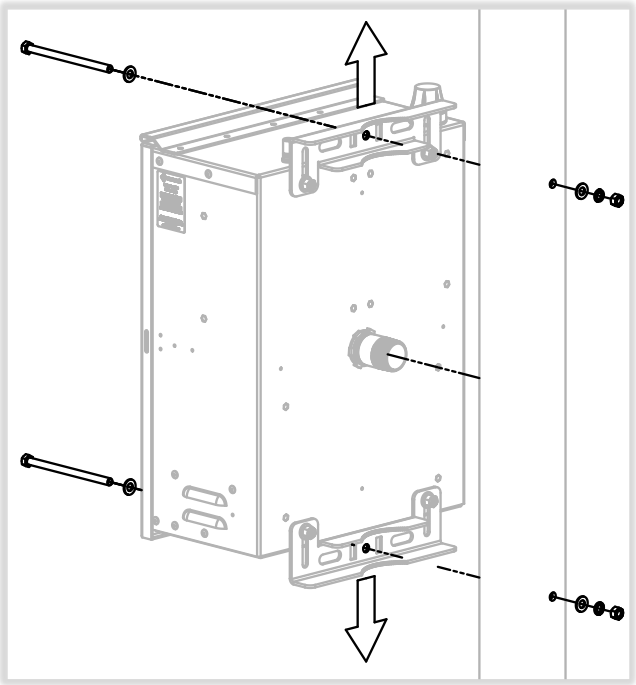
CAUTION

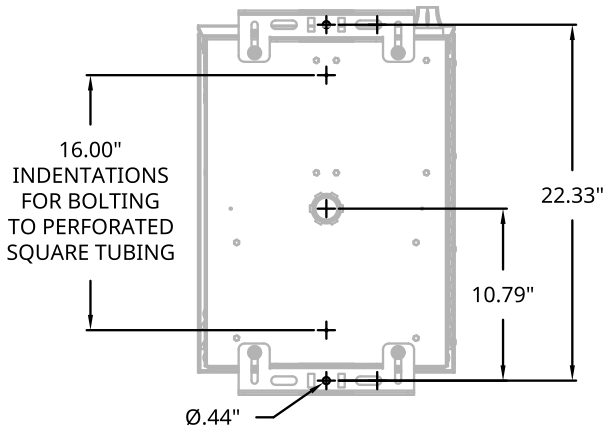
Take care not to damage internal components or cabling when drilling holes. For AC systems ensure all components are covered before drilling.

3.4 Mounting Cabinet with Bolts

To through-bolt the MX 400 cabinet to a pole using the pole mount bracket holes:

1. Drill 1.75" diameter hole in pole for nipple and suitable holes for through-bolts (not included, see reference dimensions below).
2. Deburr nipple hole and fish cables.
3. Loosen pole mount bracket nuts and move brackets outward.
4. Bring cabinet against pole and install bolts, washer and nuts.
5. Apply suitable sealant around nipple.





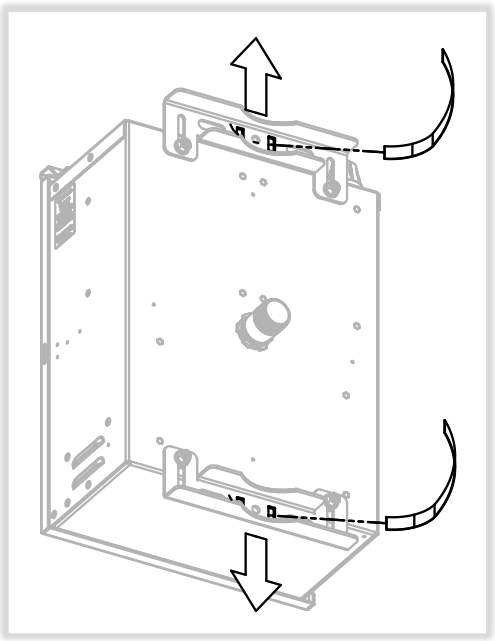
To bolt to perforated square tubing with 1.0" hole spacing:

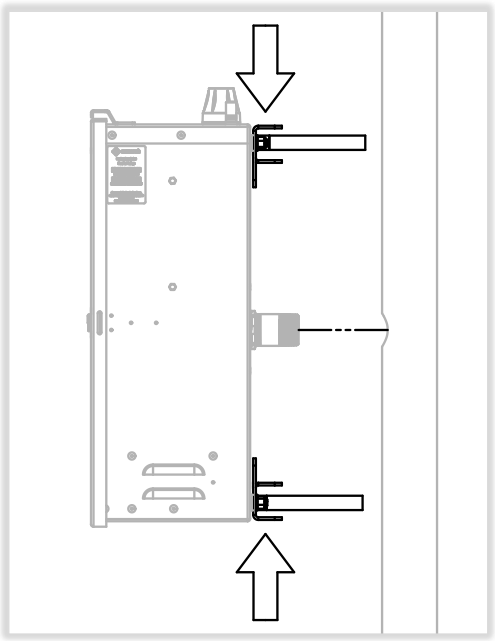
1. Drill suitable bolt holes using provided drill point indentations.
2. Drill a suitable hole for conduit fitting or nipple in cabinet and square tubing.
3. Remove cabinet pole mount bracket nuts, washers and brackets. Reinstall nuts.
4. Bolt cabinet to perforated square tubing.

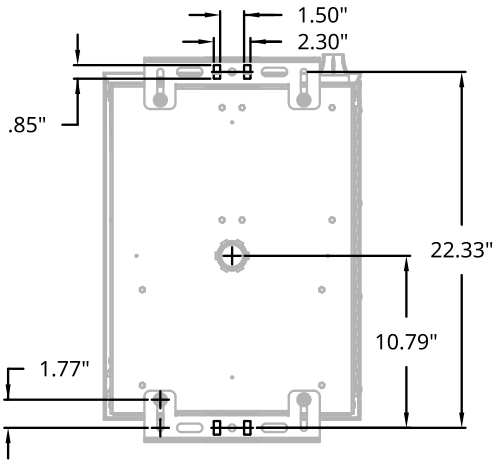
3.5 Mounting Cabinet with Banding

To mount the MX 400 cabinet to a pole with banding (not provided):

1. Drill 1.75" diameter hole in pole for nipple (see reference dimensions below).
2. Deburr hole and fish cables.
3. Loosen pole mount bracket nuts and move brackets outward.
4. Thread banding through bracket slots as shown.
5. Move pole mount brackets inward (if desired) and tighten bracket nuts.
6. Bring cabinet against pole and fixture in place with a strap or similar.
7. Follow banding manufacturer's instructions to band cabinet pole brackets to pole using up to 0.75" wide banding.
8. Apply suitable sealant around nipple.



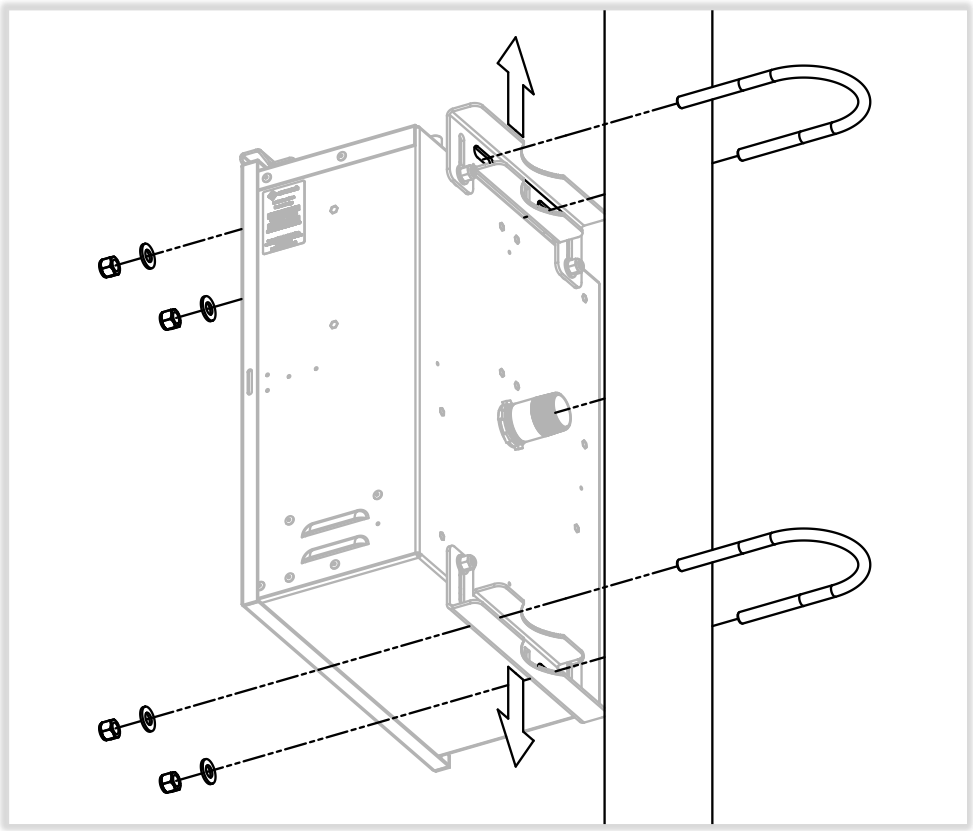


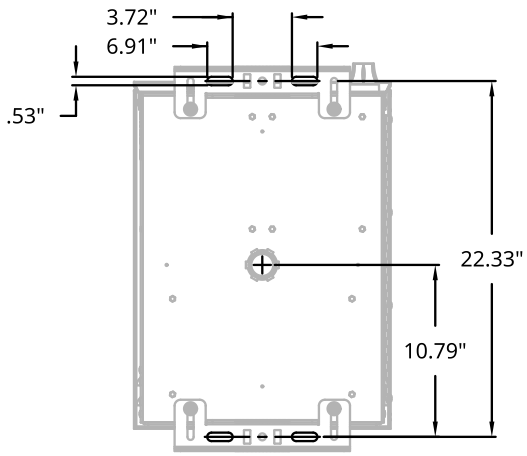


3.6 Mounting Cabinet with U-Bolts

To mount the MX 400 cabinet to a pole with the optional U-bolt kit:

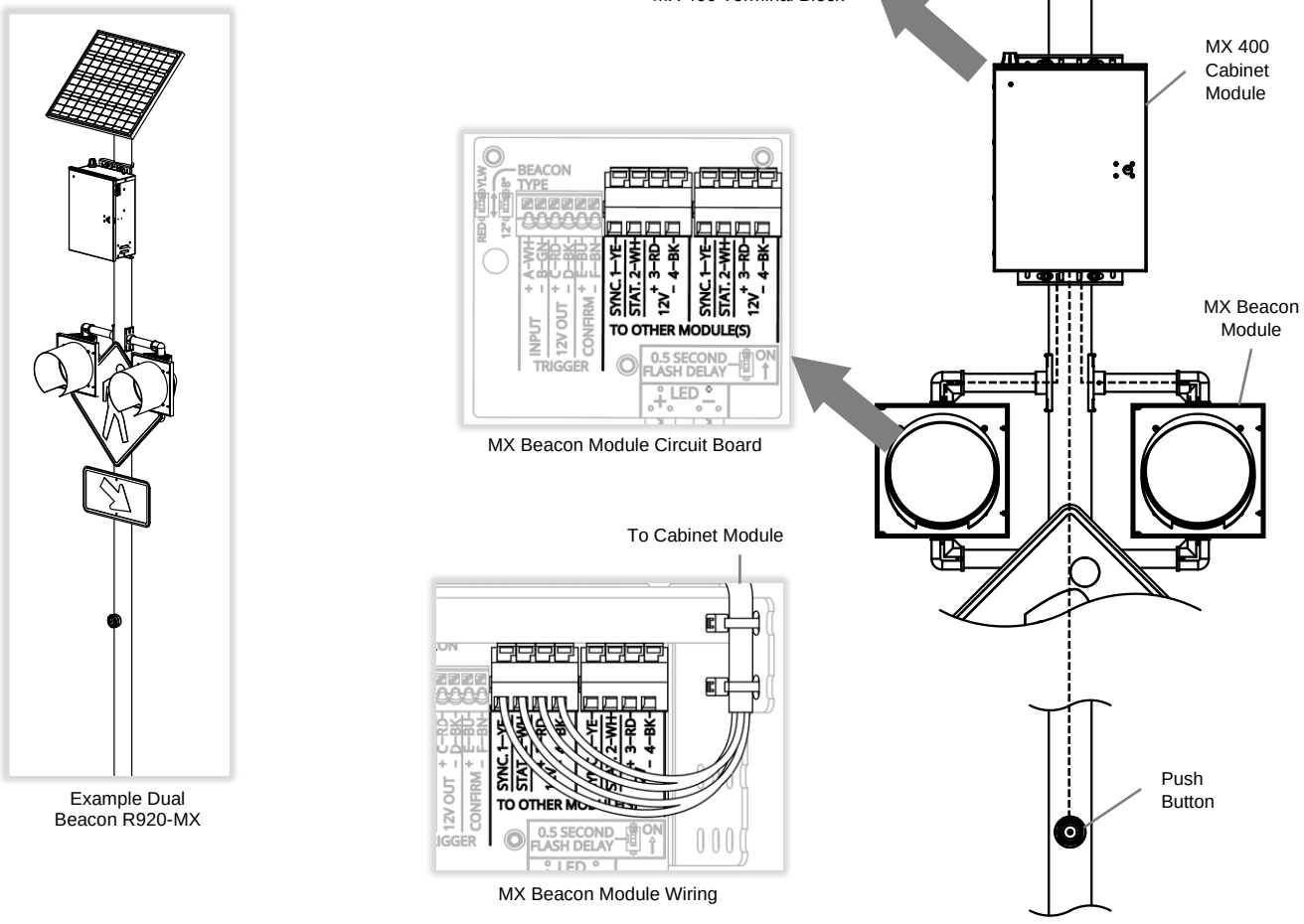
1. Drill 1.75" diameter hole in pole for nipple (see reference dimensions below).
2. Deburr hole and fish cables.
3. Loosen pole mount bracket nuts and move brackets outward.
4. Bring cabinet against pole and fixture in place with a strap or similar.
5. Install U-bolts, washers and nuts as shown. Do not over-tighten nuts.
6. Apply suitable sealant around nipple.





3.7 MX 400 Cabinet Module System Wiring

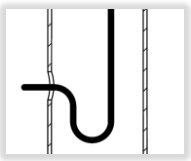
Wiring Modules – Centralized Approach (Recommended)



Example Dual Beacon R920-MX

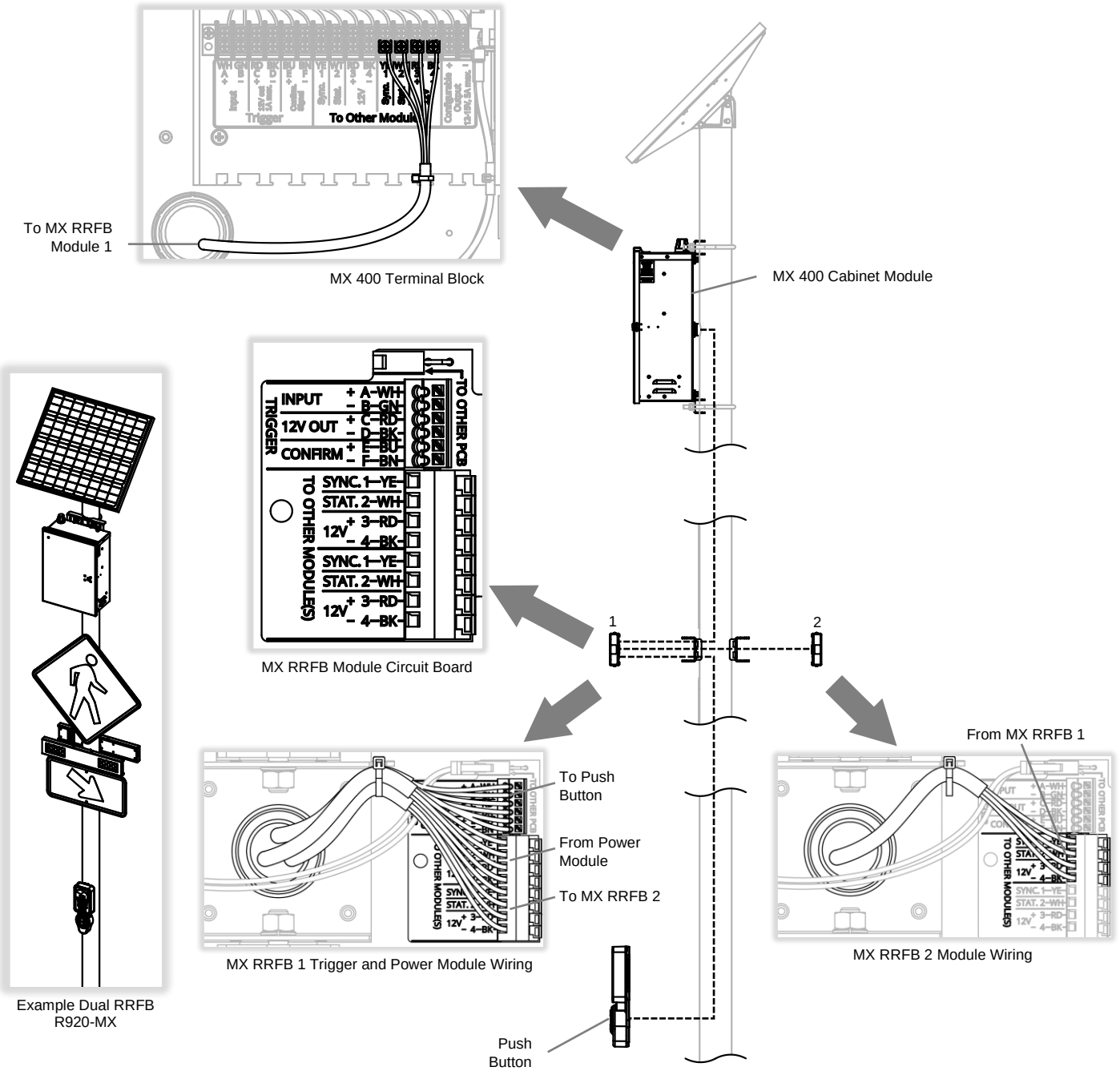
NOTE

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.

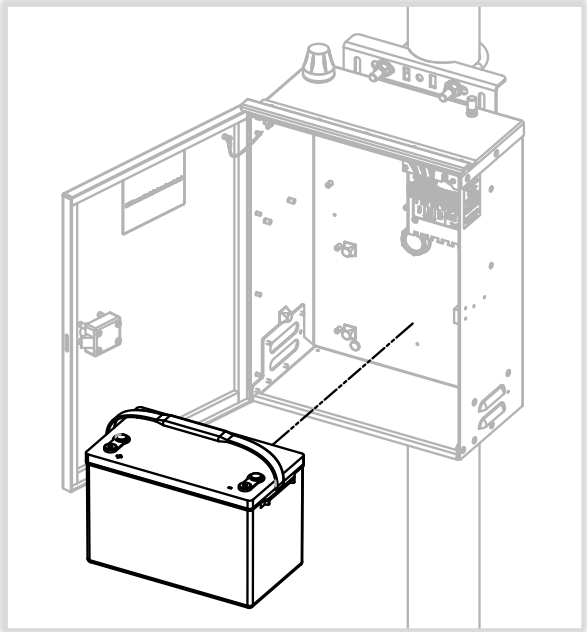
3.8 Solar Panel and Battery Connections

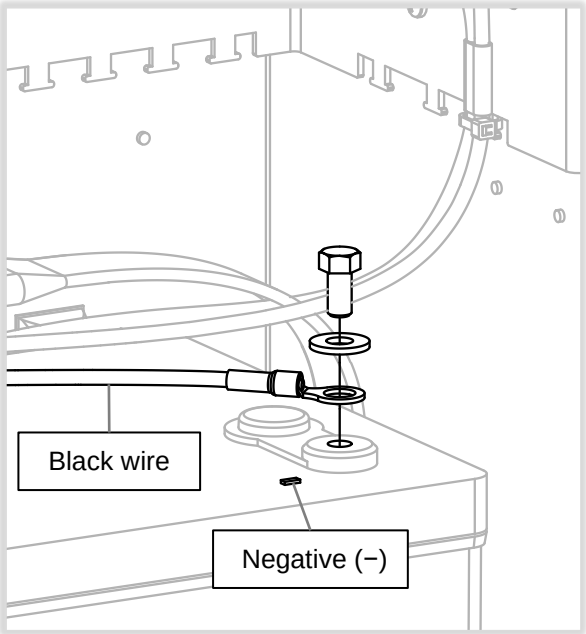
WARNING Batteries are shipped fully charged. Use extreme caution when handling the batteries as they can generate hazardous short-circuit currents. Remove all jewelry (bracelets, metal-strap watches, etc.) before handling the batteries.

1. Install solar panel and mount kit following instructions provided with kit. Route solar cable into cabinet. Do not mate MC4 connectors to solar panel yet.
2. Unpack batteries and terminal hardware (packaged separately from MX 400).
3. Install battery into MX 400 cabinet with terminals toward door.
4. Battery harness comes installed in cabinet. Secure negative battery wire and ring terminal out of the way.

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

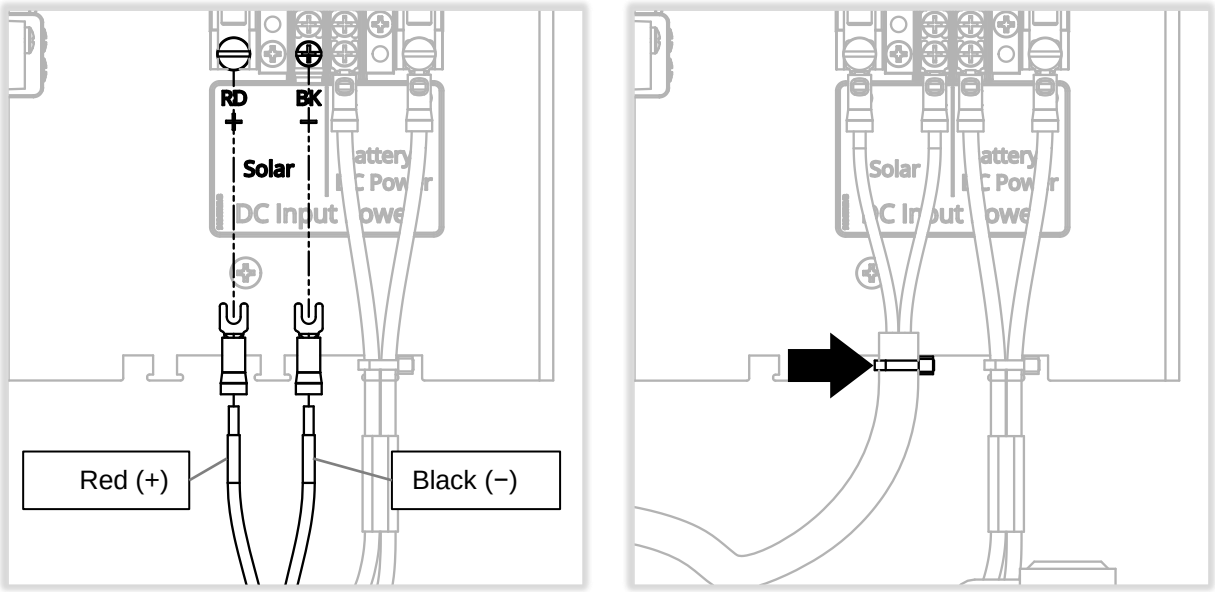
5. Connect battery ring terminals in the following order:
   a. Positive first (not shown): fasten ring terminal on red wire to positive battery terminal with supplied hardware and tighten firmly. Slide red boot over terminal.
   b. Negative last (shown below): fasten black wire ring terminal to negative battery terminal with supplied hardware and tighten firmly.





6. System will energize and operate at factory default settings. See **LEVEL 1** guide for more detail.

7. Prepare solar harness:
    a. Remove pre-installed spade terminals from terminal and fuse blocks
    b. Crimp onto ends of harness using suitable crimping tool
8. Install solar harness onto solar input terminals on right side of cabinet:
    a. Red wire to "RD +" terminal
    b. Black wire to "BK –" terminal
    c. Secure cable jacket with cable tie



9. Follow solar kit instructions to complete solar panel installation and mate MC4 connectors.

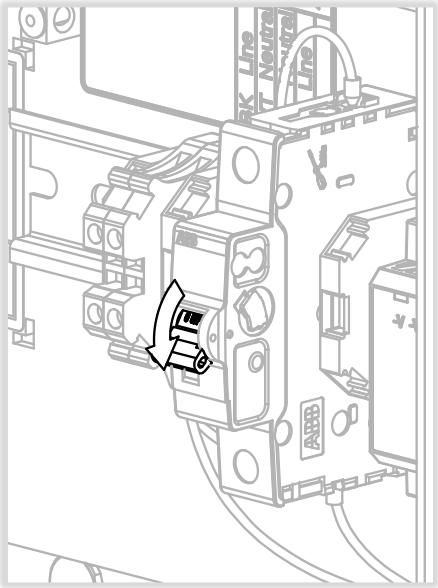
3.9 AC Connections

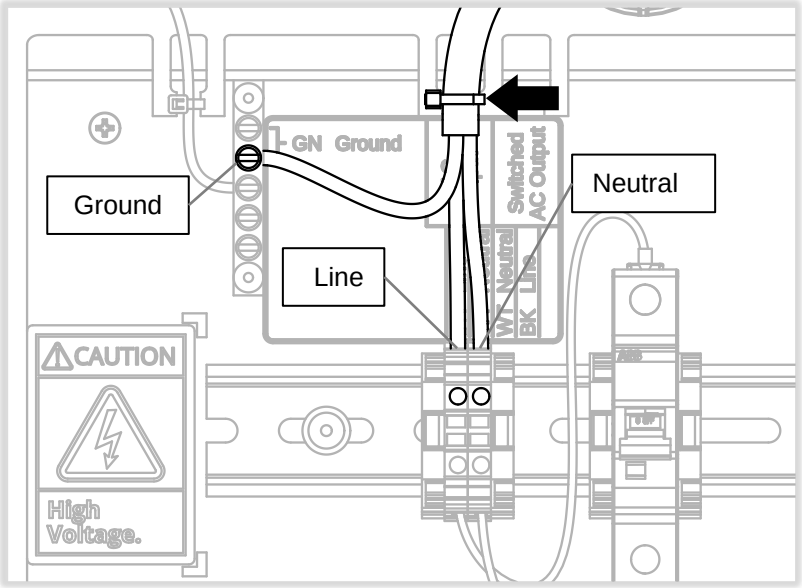
WARNING Ensure all equipment and wiring is de-energized during installation and wiring of the system.

CAUTION Only supplementary overcurrent protection is provided. Ensure branch-rated overcurrent protection is provided when installing.

NOTE The MX 400 AC cabinet accepts nominal input voltages of 120 V or 240 V and is equipped with a 4 A circuit breaker.

1. Ensure breaker is in off position.
2. Strip jacket of incoming AC cable 5 – 6". Strip insulation 0.35 – 0.40" on the three wires.
3. Loosen terminal block and ground bus bar screws and insert wires into terminals as shown. Tighten terminals and pull test wires to ensure they are secure. Install cable tie to incoming cable jacket.



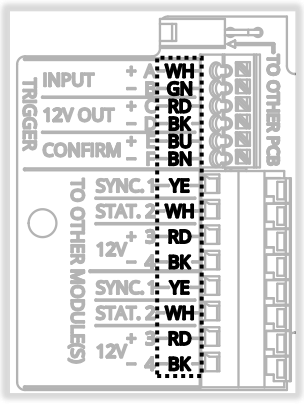


4. Finish other system wiring.
5. When incoming AC cable is powered and breaker is turned back on, system will energize and operate at factory default settings. See **LEVEL 1** guide for more detail.

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

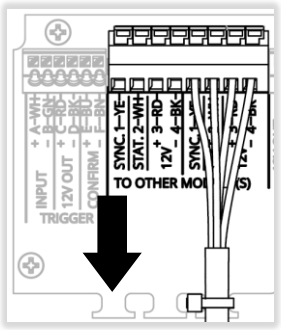
3.10 Wiring Notes

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

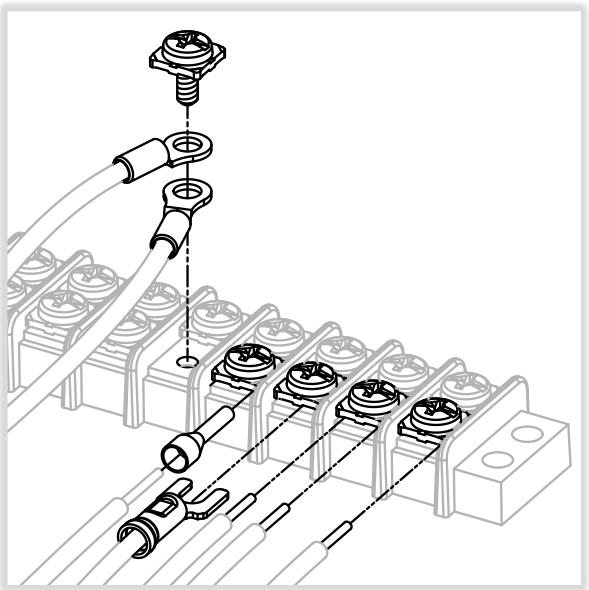
Abbreviation	Color
BK	BLACK
BN	BROWN
BU	BLUE
GN	GREEN
RD	RED
WH	WHITE
YE	YELLOW



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.

4. Connections to other MX modules and peripheral devices are made with a terminal block with clamp washers that accommodates ring terminals, ferrules, spade terminals or bare wires. Terminal screws should be torqued to 8 – 13 in-lb.



3.11 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 400 Cabinet 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.
- ☐ Door is properly latched and locked.

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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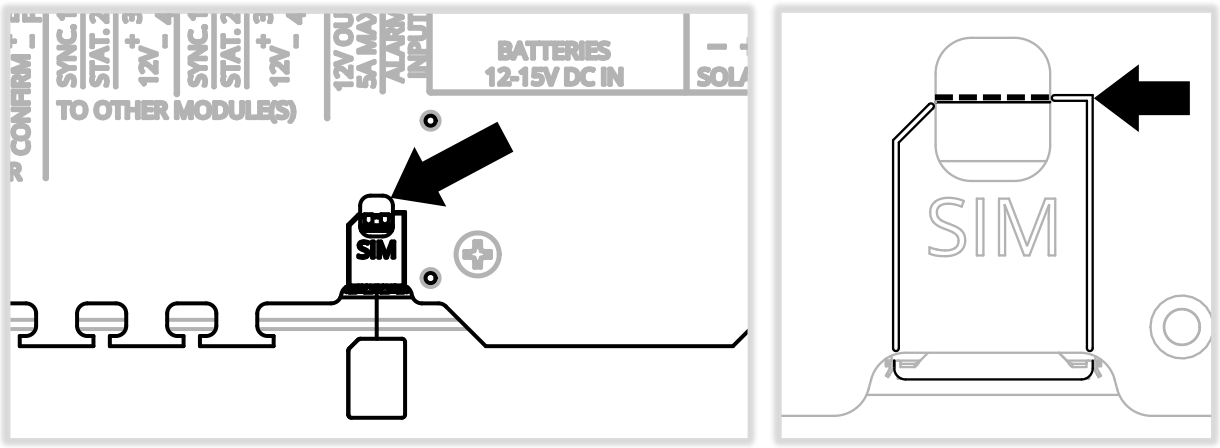
4.1 Replacing SIM Card

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.

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 and breakers. • 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 400 Cabinet 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 15 A automotive mini blade fuses.

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

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MX Series

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Technical Support:

Email: customersupport@carmanah.com
Toll Free: 1.877.722.8877 (US & Canada)
Worldwide: 1.250.380.0052
Fax: 1.250.380.0062
Web: carmanah.com