

NOTE

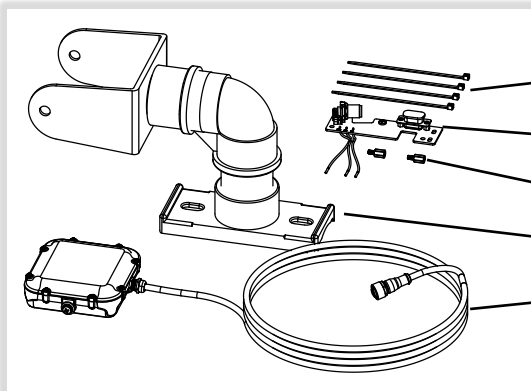
The MUTCD states that an RRFB shall only be installed to function as a pedestrian-actuated conspicuity enhancement. The MX Radar Detection Kit is meant to trigger MX systems to flash when a vehicle is detected.

1.0 MX Radar Detection Kit Components

The MX Radar Detection Kit is used to activate Carmanah MX systems when a moving vehicle is detected. Applications include wrong-way driver systems, LED stop signs, railroad crossing beacons and intersection conflict warning beacons.

When ordered with the Advanced Statistics option, the radar module collects and saves vehicle traffic data that can be downloaded and analyzed. For instructions on the use of this option, see the associated user manual included with the system.

The MX Radar Detection Kit components are shown and described below.



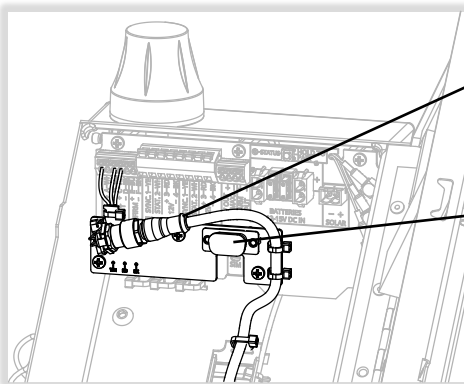
Cable ties (4)

MX radar interface PCB assembly

Interface PCB mount standoffs (2)

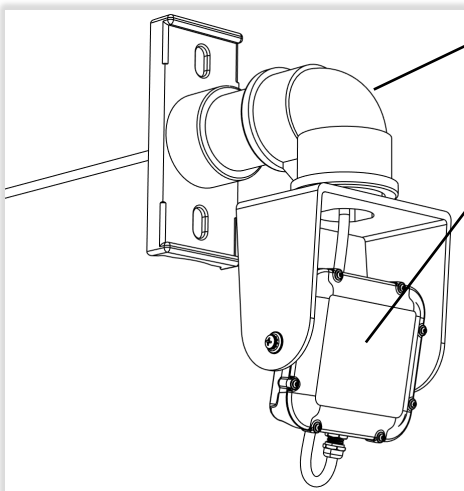
Radar mount assembly

Radar module & cable assembly (includes hardware to fasten to mount)



Radar module to interface PCB connection: provides power to radar module and passes activation and programming signals.

Programming interface: connects to supplied Programming Kit to allow adjustment of radar module settings if required. Also used with Advanced Statistics option to download traffic data.



Radar mount: side of pole mount for radar module. Can be through-bolted or banded to pole.

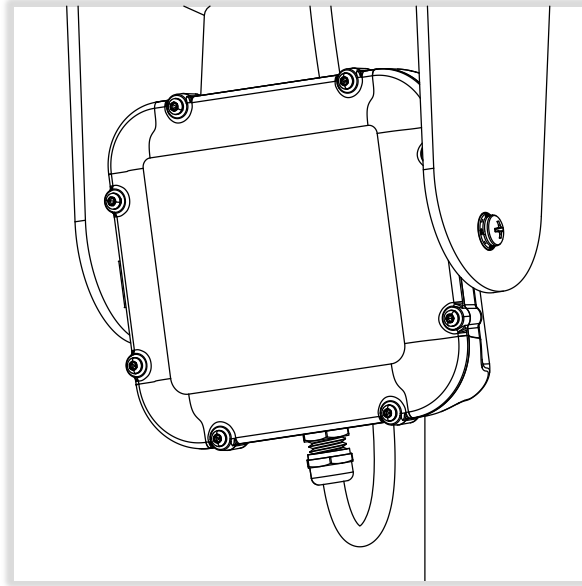
Radar module: detects oncoming vehicles and activates Carmanah MX system(s).

Programming Kit (not shown): allows adjustment of radar module settings. With the Advanced Statistics option, allows for downloading of traffic data. Includes a communications adapter and PC USB interface cable. One kit can service any number of systems equipped with the Radar Detection Kit.

2.0 Operation

When used with a single Carmanah MX system¹, the Radar Detection Kit triggers that system's flasher module(s) (MX RRFB Module, MX Beacon Module, and/or MX LED Sign Module). When installed with multiple linked² Carmanah MX systems, one or more Radar Detection Kits will activate all linked systems' flasher modules.

The radar module used in the Radar Detection Kit is the Houston Radar DR600. The radar operates in the 24 - 24.25 GHz band and is configured using PC-based software.



Whenever the radar module detects the motion of a vehicle, it shorts the connected MX power module's input terminals to ground, activating the flasher modules of that system and those of any linked systems. The radar module is configured by default to trigger an activation of the MX system(s) whenever it detects a vehicle approaching at 5 – 206 mph. These and other radar settings can be changed using the Programming Kit, see [Section 4](#) for details.

When the radar module stops detecting a vehicle's motion, either because the vehicle has stopped or has moved out of the detection zone, it stops shorting the trigger input terminals. The connected MX system and any linked systems will then continue to flash according to each system's Duration setting, which is set separately for each MX system.

NOTE

Beacons and LED sign modules will flash continuously by default using the Always On operating mode. To flash only when triggered by the radar, set the operating mode to Trigger using the MX Field App. (RRFB modules operate only in Trigger mode.)

NOTE

To make all linked MX systems flash for the same length of time, set the systems' Duration setting to be the same. The default Duration setting is 20 seconds; it can be set to a variety of preset values between 5 and 3600 seconds.

¹ An MX system is defined as a power module wired to at least one flasher module or trigger kit. The elements of one system are typically mounted on a single pole.

² Linking two or more MX systems allows any trigger activation to activate the flasher modules of all linked systems and synchronizes their flashing. See the MX Level 1 Planner and MX Field App Guide for details.

3.0 Installation

The following is a summary of the installation sequence of the Radar Detection Kit:

1. Determine installation location on pole for Radar Detection Kit.
2. Install Carmanah MX system on pole per supplied instructions.
3. Install MX radar interface PCBA into MX power module.
4. Drill holes for radar cable and bolts, if required.
5. Fish radar cable, install radar and mount to pole.
6. Aim radar module.
7. Connect and configure radar module, if required.
8. Test system.

3.1 Determine Installation Location on Pole

The radar module should be mounted on the pole so that its front surface directly faces and has an unobstructed view of oncoming traffic. The radar module cable is 9.8 ft long; to allow sufficient cable slack, the vertical distance between the radar mount and the MX system should be at most 7 ft.

For optimal radar performance:

- Mount radar at least 6 ft above the ground (for maximum range).
- Minimize the angle between target traffic and the radar module.

NOTE

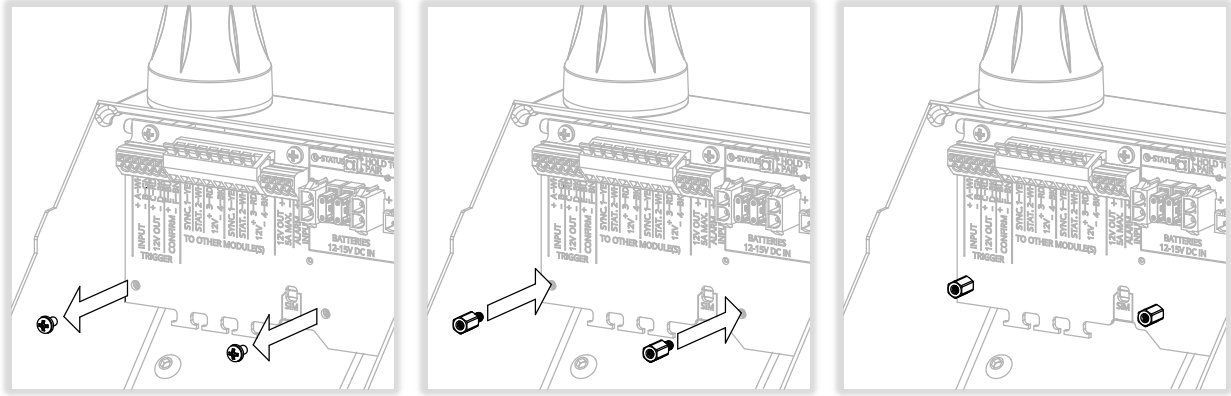
If the radar module can't be located near the side of the road, it may need to be pointed further up the road to detect vehicles effectively.

3.2 Install Carmanah MX system on Pole

Use the instructions supplied with your system to install the Carmanah MX system onto the pole.

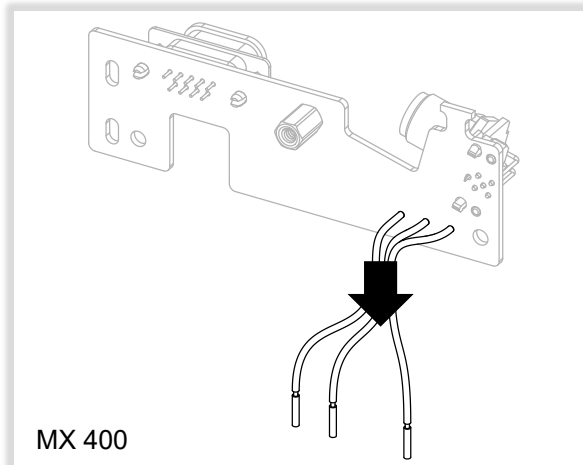
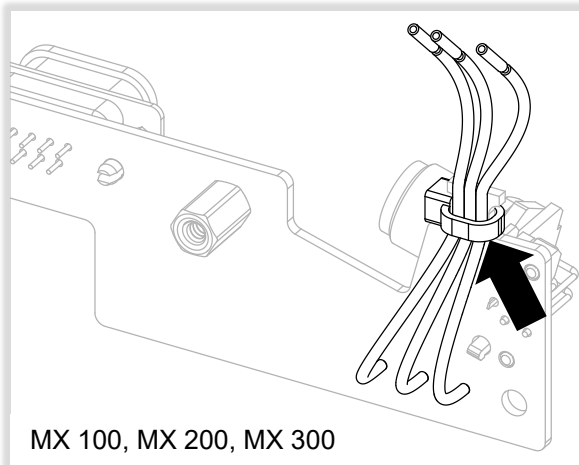
3.3 Install Radar Detection PCBA into MX Power Module

1. Open the MX power module lid or door and remove and set aside the two screws indicated from the Power Module PCBA. Thread the two provided standoffs into the holes and tighten firmly.



If the standoffs are difficult to thread in, temporarily loosen the other four power module screws to improve fastener alignment and prevent cross-threading.

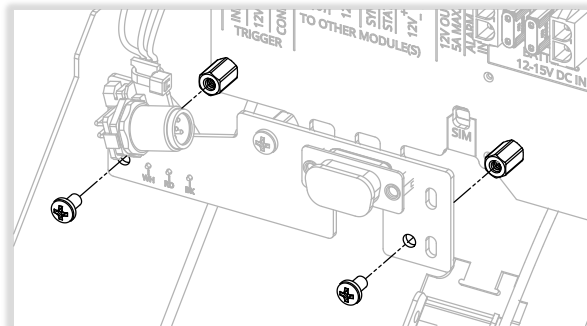
2. For MX 100, 200 and 300, use one of the provided cable ties to fasten the wires to the interface PCB feature shown. For MX 400, route the three wires away from the interface PCB as shown.



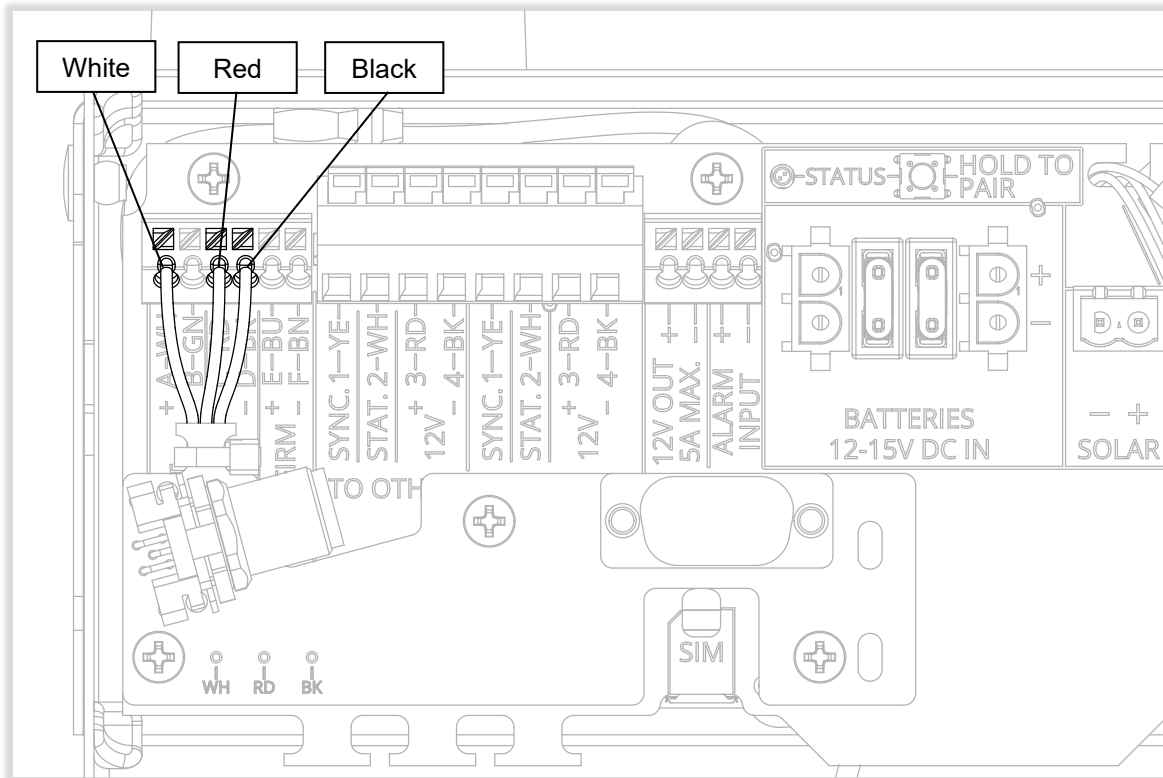
3. Use the two screws removed earlier to fasten the interface PCB assembly to the standoffs.



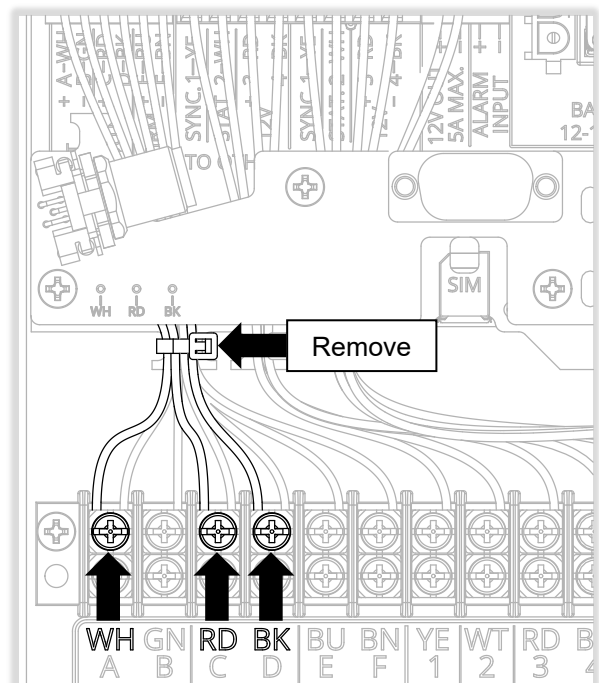
For MX 400, avoid pinching the existing trigger and module wires when tightening the interface PCB screws.



4. Remove the insulation on the ends of the three wires.
5. For MX 100, MX 200 and MX 300: depress the terminal buttons with a small tool and insert the stripped wires into the terminal positions shown. Take care to avoid any stray wire strands.

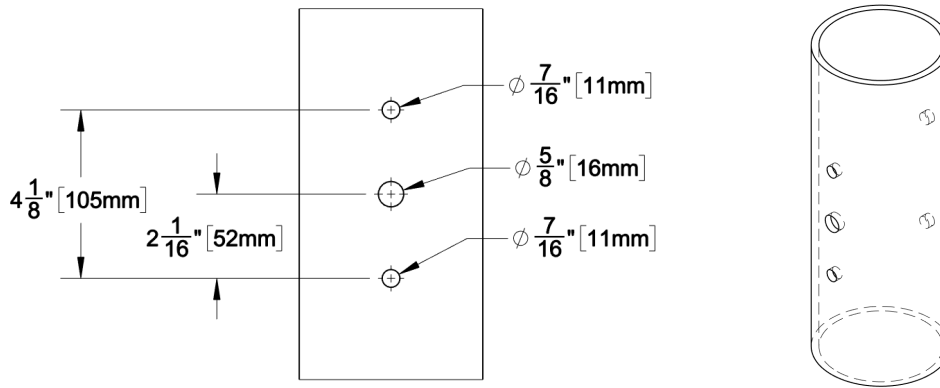


6. For MX 400:
 - Remove the left-most cable tie shown.
 - Loosen the three terminal screws shown.
 - Match the white, red and black wire colors with the codes on the label under the terminal block as shown.
 - Insert the stripped wires under the terminal plates.
 - Re-tighten the terminal screws firmly.
 - Replace the removed cable tie with one of those provided.



3.4 Drill Holes for Radar Cable and Mount Through Bolts

If routing the radar cable inside the pole, drill a 5/8" hole in the center of where the radar mount will attach to the pole. If through-bolting the radar mount, drill two 7/16" holes above and below as shown, through both sides of the pole.

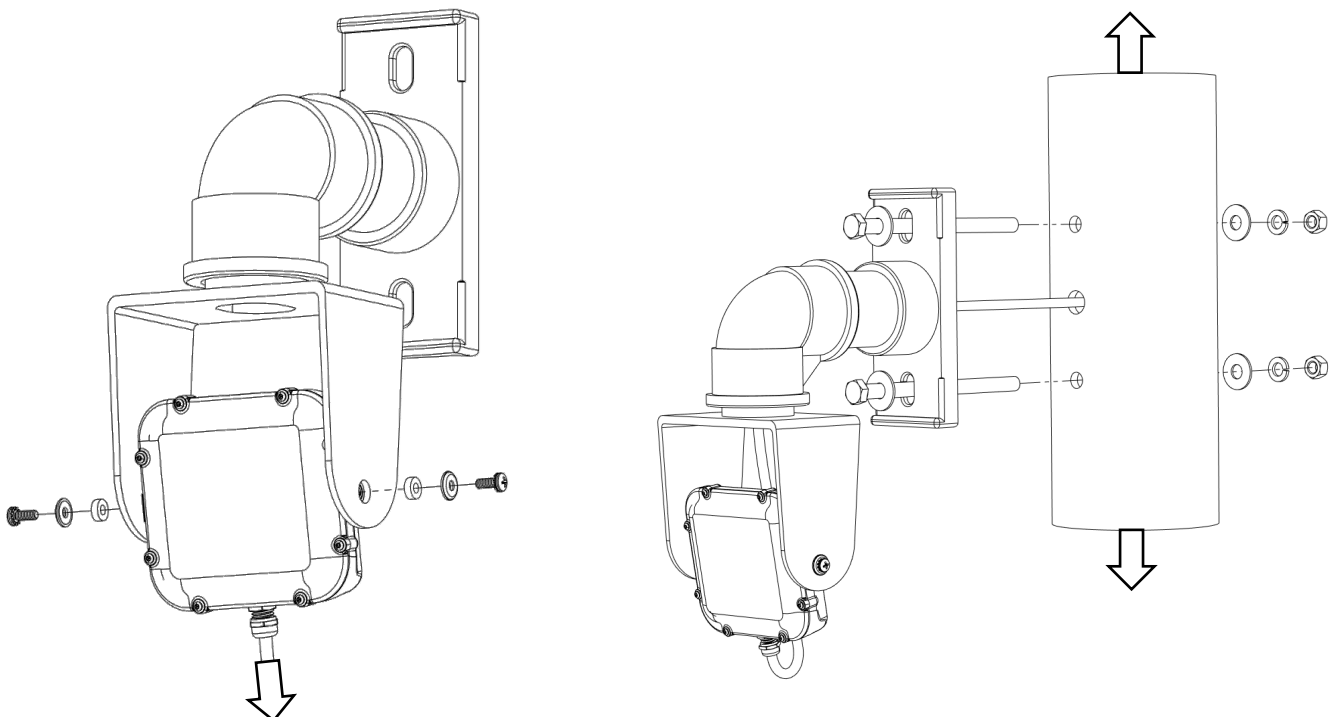


3.5 Fish Radar Cable, Install Radar & Mount to Pole

Install the radar module into the mount saddle with the cable facing down and fasten with the supplied spacers, washers and screws as shown. Fish the radar cable through the mount, into the pole and up or down to the Carmanah MX system. Bolt or band the radar mount to the pole.

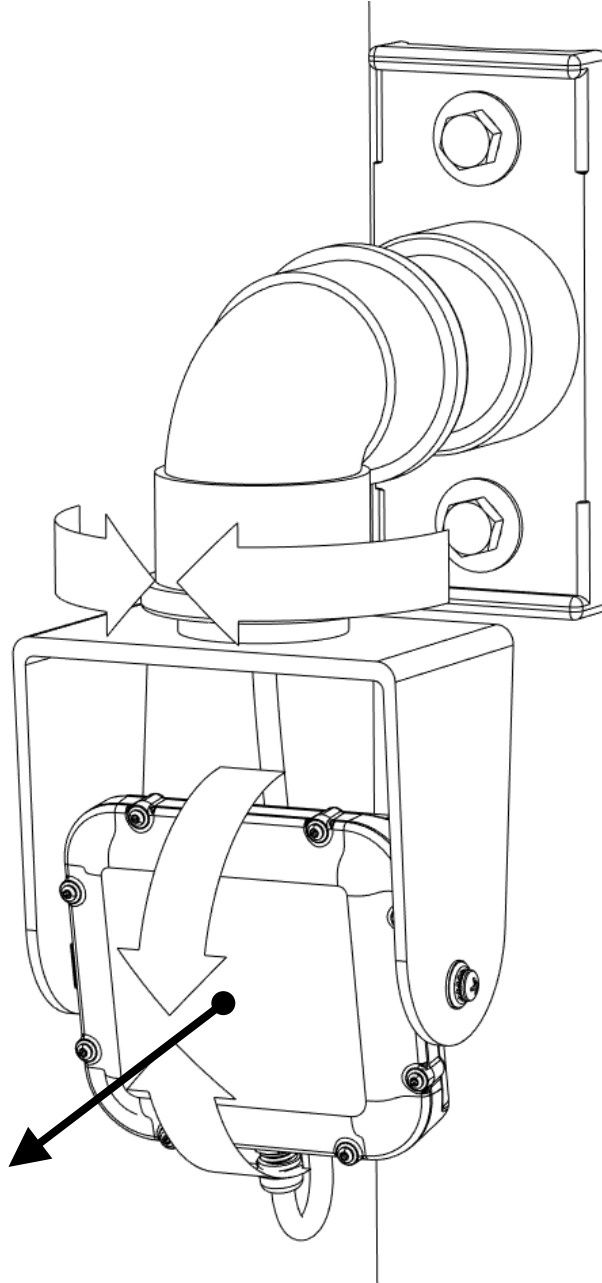
NOTE Install the radar module with its cable facing down to optimize both detection range and resistance to water ingress.

NOTE Pole mount to pole hardware not supplied.



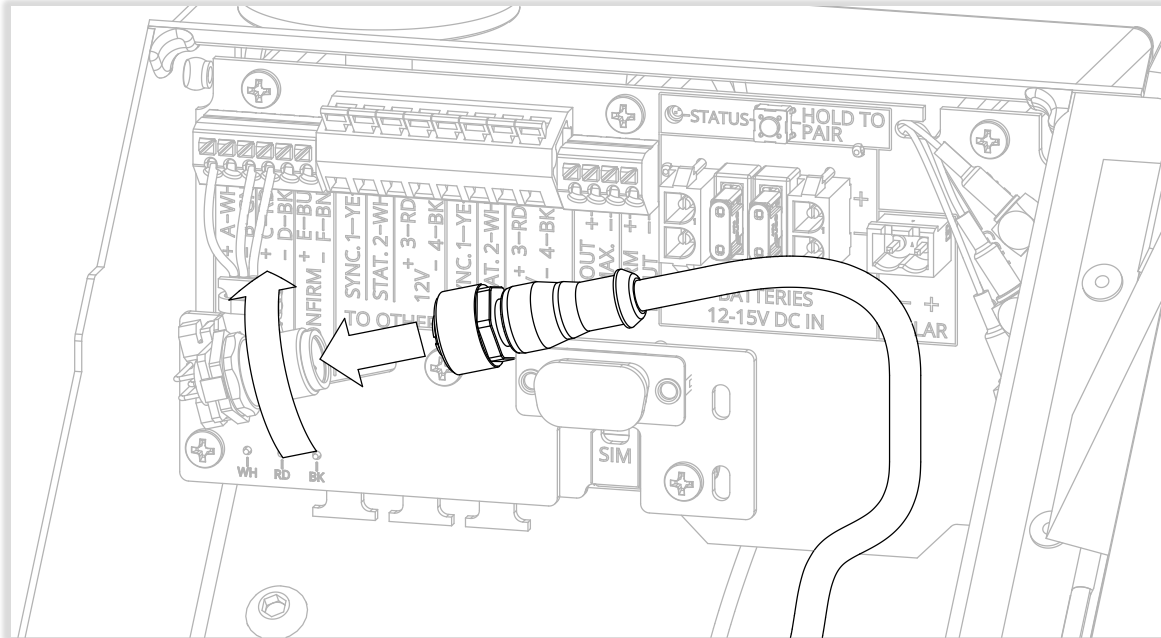
3.6 Aim Radar Module

Adjust the radar tilt and pan so its front face points directly at oncoming traffic. Tighten the hardware firmly to lock it in place.

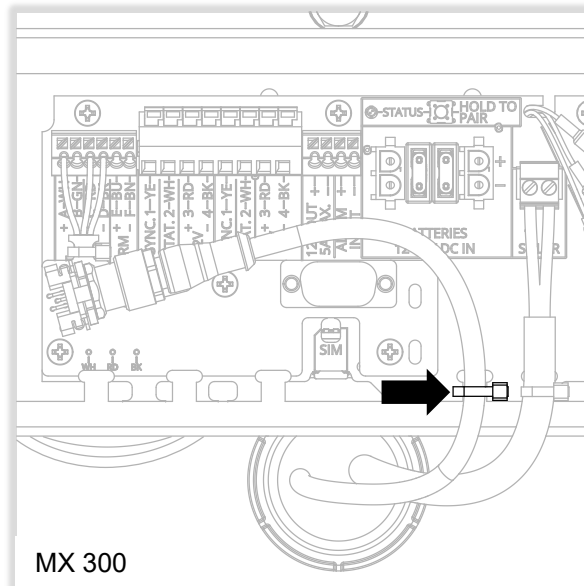


3.7 Connect and Configure Radar Module

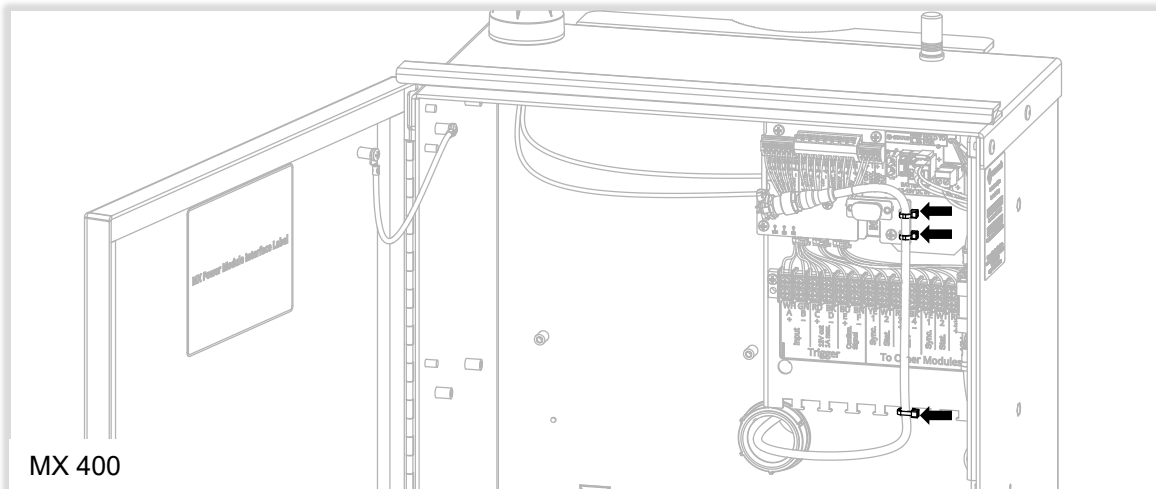
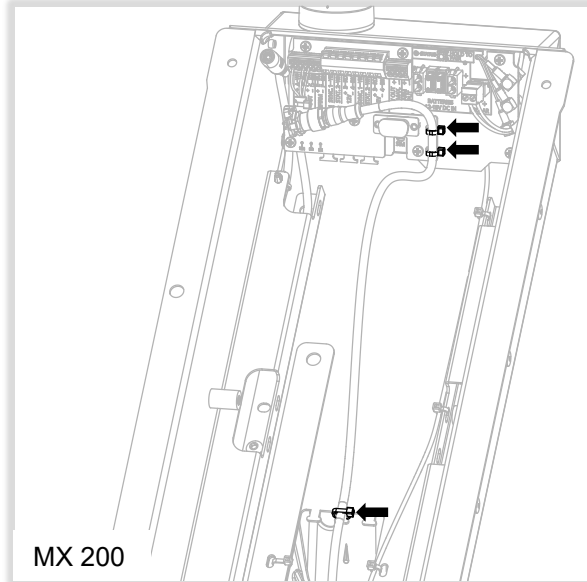
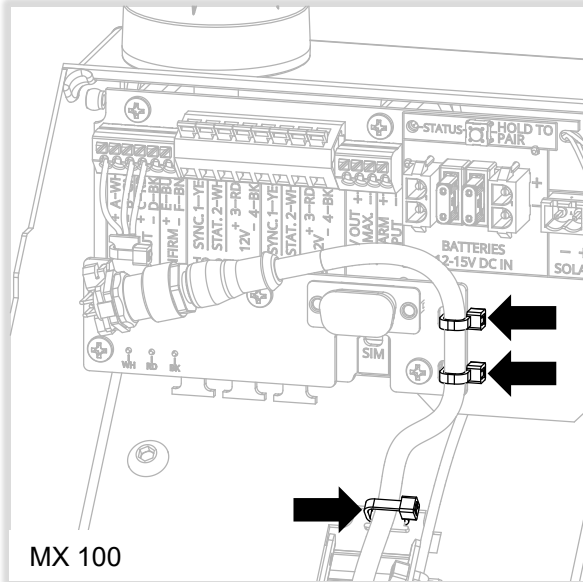
Plug the radar cable connector onto its mate on the interface PCB within the MX power module. Turn the barrel firmly clockwise to lock the connectors together.



For MX 300, fasten the radar cable to one of the features on the power module chassis with a cable tie.



For MX 100, MX 200 and MX 400, fasten the radar cable to the two slots on the interface PCB and again to a strain relief feature on the enclosure as shown.



The radar module is configured from the factory to trigger an activation whenever an oncoming vehicle is detected approaching at a speed of at least 5 mph. Changes from the default settings are often unnecessary. Reasons for changing the radar's configuration include:

- To change the detection speed limits (the minimum and maximum speeds that will trigger an activation)
- To increase or decrease the sensitivity of the radar module
- You've ordered the Advanced Statistics option and wish to configure data logging options or read traffic statistics from the radar module
- To configure the radar module for a less common application (e.g., a radar-activated minimum speed sign)

If it is necessary to configure the radar module, see [Section 4](#).

3.8 Test System

Ensure that the Carmanah MX system to which the radar kit is connected is powered up. See the Carmanah MX user documentation at support.carmanah.com for details.

Test that the system activates as desired when vehicles approach the radar module. If the LED loads fail to turn on, check the following:

- The green LED on the back of the radar module flashes every few seconds (see image at right).
- Nothing is obstructing the radar module's view of oncoming traffic.
- The radar module is aimed directly at oncoming vehicles.
- Test the LED loads with the Identify System (light bulb) button in the MX Field App (see the MX Field App Guide for details).



See the Troubleshooting section if the loads still fail to activate.

4.0 Radar Module Connection & Settings

To change the system's activation behavior, configuration adjustments can be made to the radar module. Before making radar module configuration changes, please note the following:

- The detection range with factory default settings is typically at least 200 ft.
- Aiming the radar module downwards and/or toward the road slightly can result in later activation.
- Aiming the radar module upwards and/or farther up the road slightly can result in earlier activation.

To make configuration changes, the following components are required:

- Windows 7, 10 or 11 PC (32-or 64-bit versions are supported) running the Houston Radar Advanced Stats Analyzer program (free download from <https://www.houston-radar.com>)
- An available USB-A port on the PC
- Radar Detection Programming Kit, consisting of USB-to-Serial adapter and active USB extension cable
- Powered-up Carmanah MX system with Radar Detection Kit installed and radar module connected

NOTE

The radar module is powered by the Carmanah MX system to which it is connected. To be configured using the Programming Kit, the radar module must be connected to an operating Carmanah MX system.



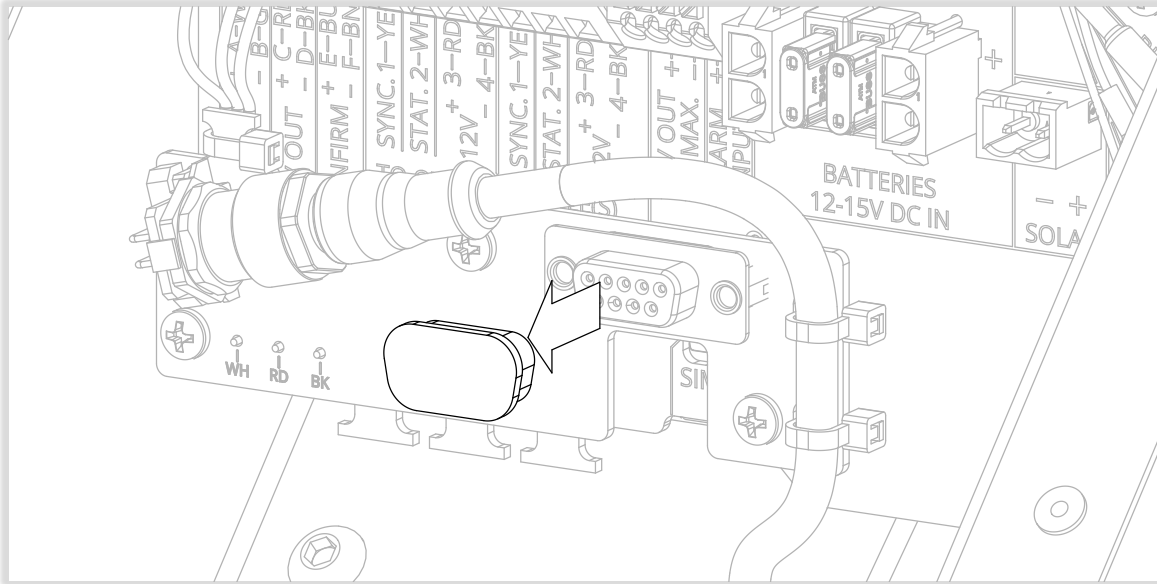
More information about radar module settings can be found in the Houston Radar DR600 User Manual available at <https://www.houston-radar.com>. To avoid unintended operation and/or excessive power consumption, configuration changes should be limited to those discussed in this section. Other settings should be left at their default values.

NOTE

Contact Carmanah for assistance with any configuration settings not discussed in this manual.

4.1 Connecting to the Radar Module

1. Remove the dust cap from the interface PCB's DB9 connector within the Carmanah MX power module.



2. Plug the USB-to-Serial adapter into the DB9 connector within the MX power module.
3. Plug one end of the USB extension into the USB-to-Serial adapter, and the other end into the USB port of the PC.
4. Start the Advanced Stats Analyzer program.
5. Select the “Connect to Radar” option from the top banner.
6. Click the “Connect to Radar” button. (Software scans ports until radar found.)
7. Ensure you see a “Radar Found on...” message.
8. Click “OK”.

NOTE

The radar module is powered by the Carmanah MX system to which it is connected. To be configured using the programming kit, the radar module must be connected to an operating Carmanah MX system.

CAUTION

More information about radar module settings can be found in the Houston Radar DR600 User Manual, available at <https://www.houston-radar.com>. To avoid unintended operation and/or excessive power consumption, configuration changes should be limited to those discussed in this section. Other settings should be left at their default values.

CAUTION

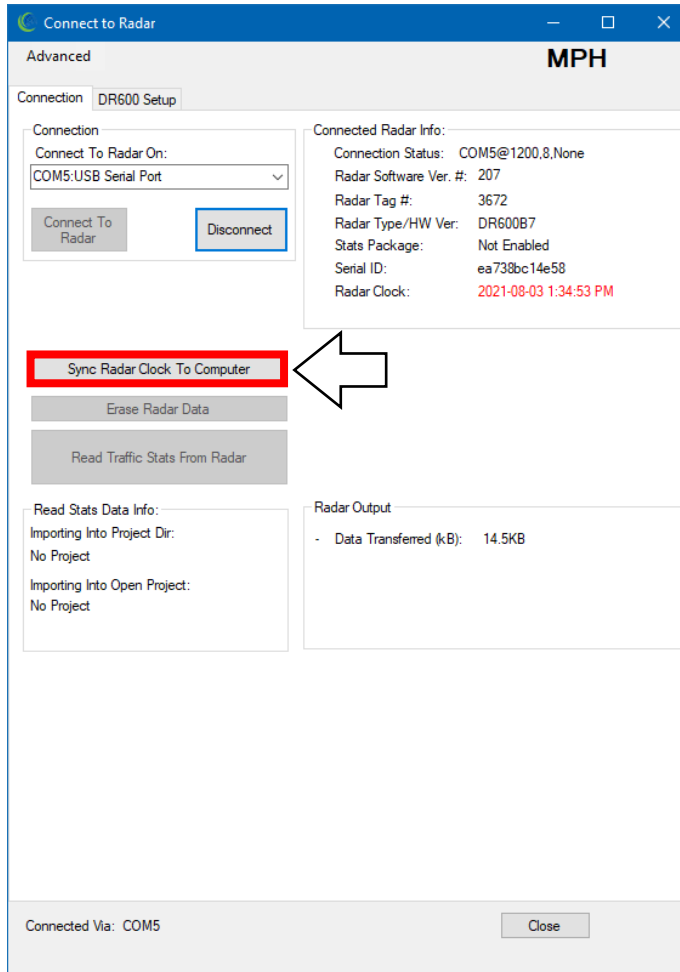
Adjusting settings not outlined in this section may adversely affect radar detection performance.

NOTE

Contact Carmanah for assistance with any configuration settings not discussed in this manual.

4.2 Syncing Radar Clock to Computer

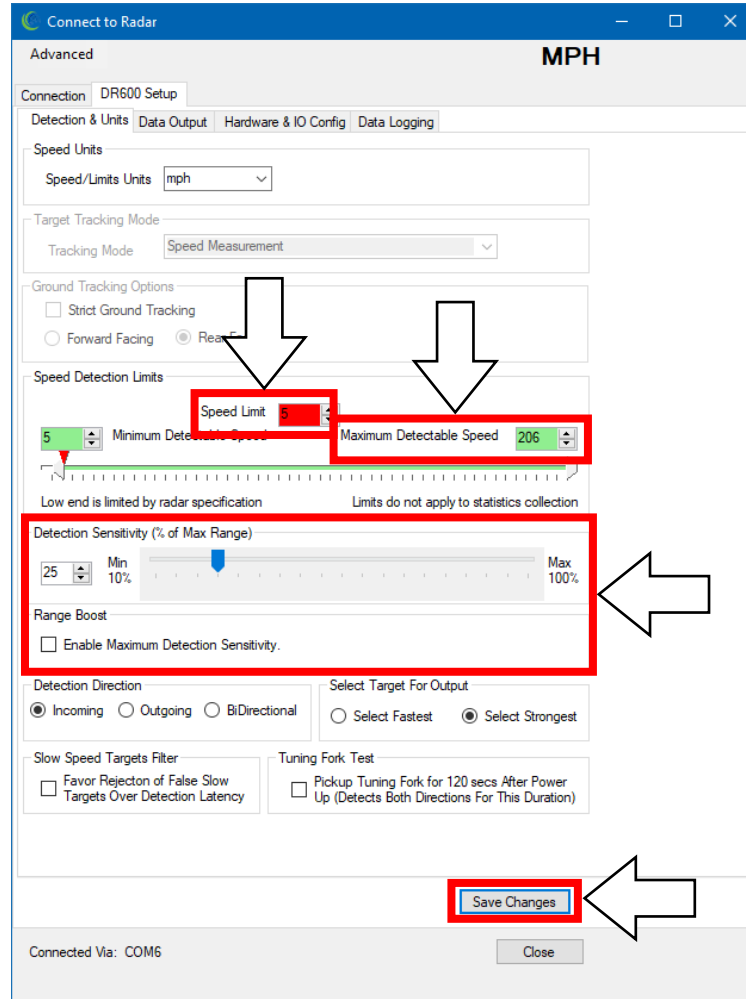
It is recommended that you click the “Sync Radar Clock to Computer” whenever you connect to a radar module. This is done by clicking the button from the Connection tab of the Connect to Radar window:



After a few moments, the Radar Clock listed will match the computer’s clock.

4.3 Adjusting Speed Detection Limits and Sensitivity

Under the “DR600 Setup,” the “Detection & Units” tab are speed settings that influence the system’s activation behavior:



Speed Limit: vehicles travelling above or below this speed (depending on the “Trigger Event” setting) will trigger an activation of the connected Carmanah MX system. Default setting is 5 mph.

Maximum Detectable Speed: vehicles travelling above this speed will not trigger an activation of the connected Carmanah MX system. Default setting is 206 mph.

Detection Sensitivity: the sensitivity of the radar can be tuned with this setting. This can be helpful if the system is being triggered by vehicles other than those targeted, or if you wish the system to activate when vehicles are a greater distance away. Default setting is 25%.

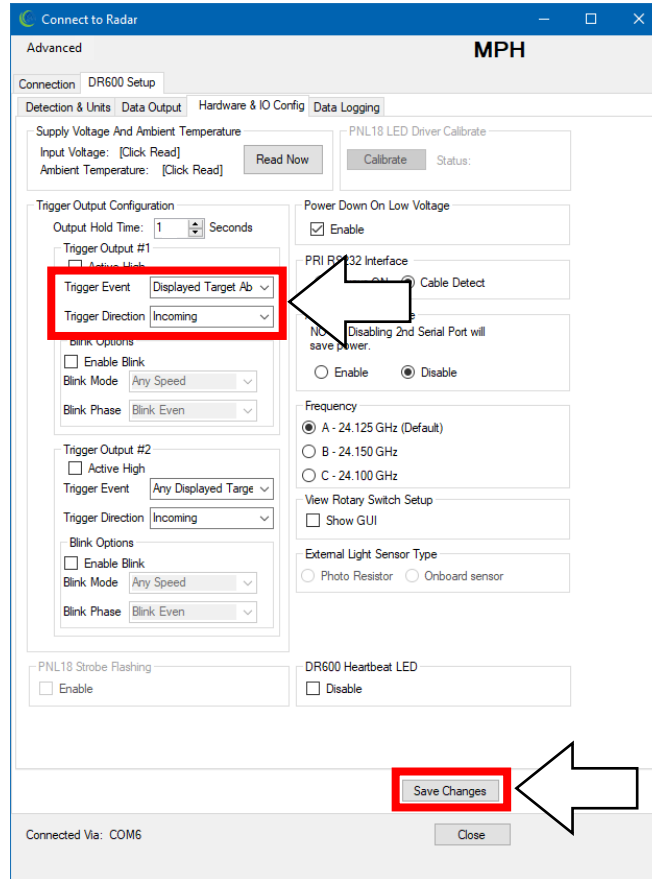
Range Boost: increases the distance at which vehicles are detected. Undesired detection of vehicles may result from enabling Range Boost. Default is off.

NOTE

Click on “Save Changes” to save the changes to the radar module, or “Close” to disconnect from the radar module without saving.

4.4 Adjusting Trigger Output Configuration

Under the “DR600 Setup,” “Hardware & IO Config” tab are settings that control the system’s activation behavior:



Trigger Event: this setting changes the conditions under which an activation of the connected Carmanah MX system occurs:

- **None:** no activations will occur.
- **Default: Displayed Target Above Speed Limit (default setting):** Carmanah MX system activated when vehicle detected above configured Speed Limit on “Detection & Units” tab.
- **Displayed Target Below Speed Limit:** Carmanah MX system activated when vehicle detected below configured Speed Limit on “Detection & Units” tab.
- **Any Displayed Target:** Carmanah MX system activated whenever a vehicle is detected, regardless of speed.

Trigger Direction: this setting changes whether incoming vehicles, outgoing vehicles, or both will trigger the connected Carmanah MX system. Default setting is Incoming.

NOTE

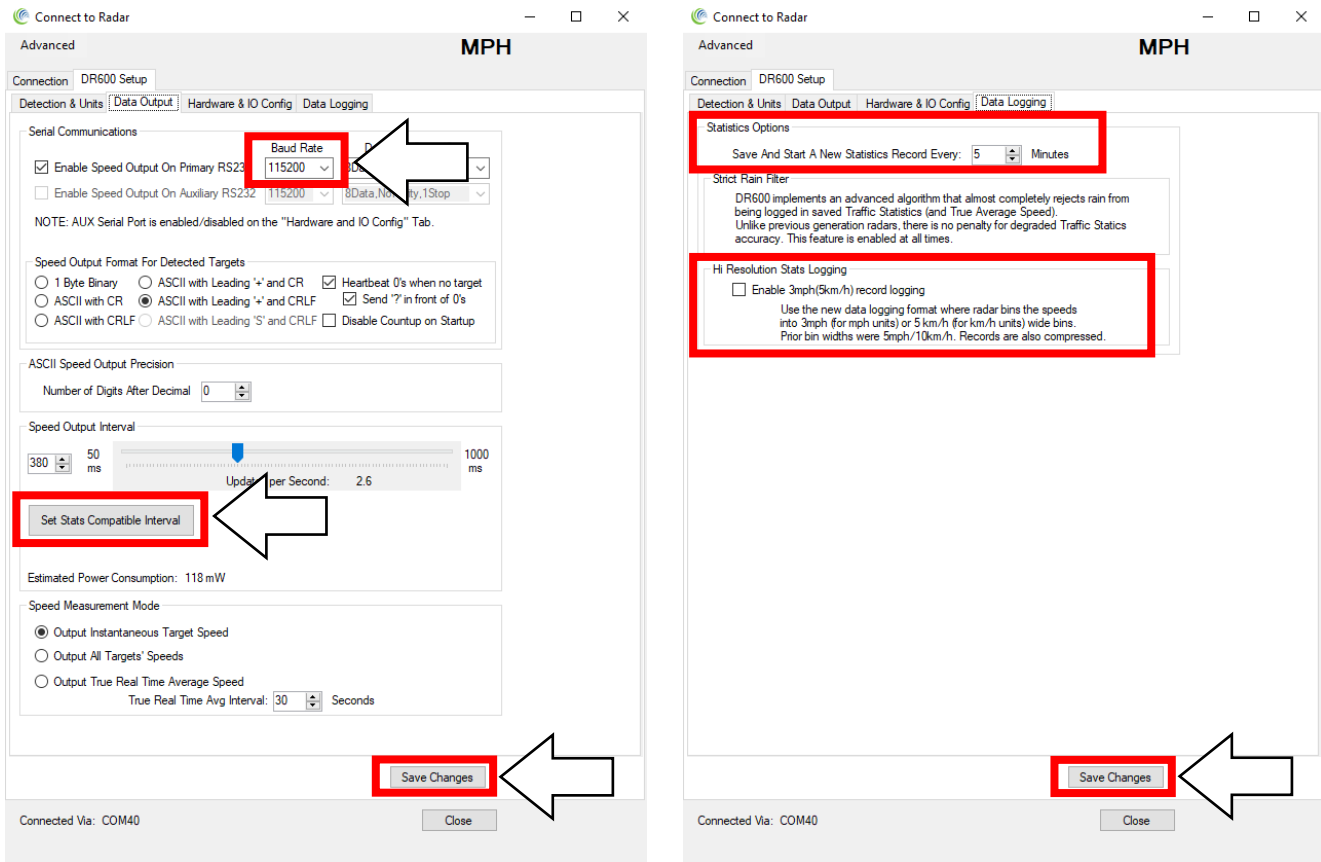
Click on “Save Changes” to save the changes to the radar module, or “Close” to disconnect from the radar module without saving.

4.5 Advanced Statistics (Optional)

The optional Advanced Statistics package allows for download and analysis of traffic data using the Houston Radar Advanced Stats Analyzer program (<https://www.houston-radar.com>).

For full instructions, please see the Advanced Stats Analyzer user manual.

Settings



Baud Rate: Set to 115200 for maximum data transmission speed if not factory set. Will require a reset of the radar after changes are saved.

Speed Output Interval: Must be set to 380 ms. Click on the “Set Stats Compatible Interval” button to automatically assign this value if not factory set.

Statistics Options: Sets how long the radar will collect data in “speed bins” before it saves to memory and starts a new record. Records are only able to hold up to 255 vehicles. Default setting is 5 minutes.

Hi Resolution Stats Logging: Sets the resolution of speed bins; 3 MPH or 5 MPH. Default setting is disabled or 5 MPH.

NOTE

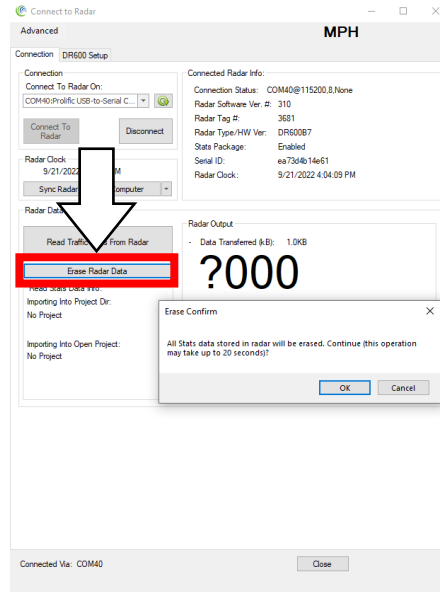
Click on “Save Changes” to save the changes to the radar module, or “Close” to disconnect from the radar module without saving.

NOTE

Up to 12 days of data can be recorded before it is rolled over when stats records are collected every one minute. When set to every five minutes it is up to 60 days of data.

Collecting Data

Once you have the radar settings configured and the system is deployed it is recommended to erase any collected data. Click on “Erase Radar Data” and then “OK.”

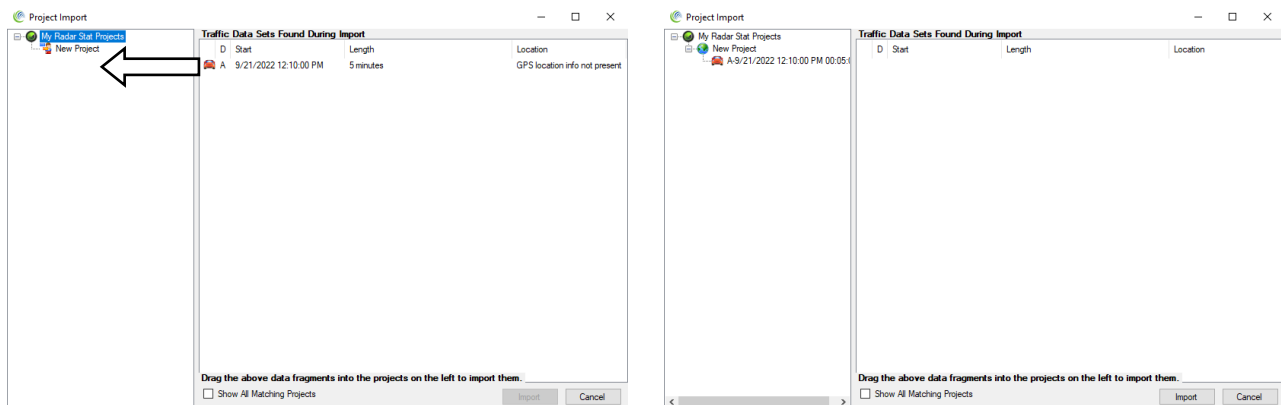


Allow the system to collect data for a minimum of five minutes, or the time value set for the stats interval. This is when you can test the system by driving through the wrong-way zone. The longer the collection time, the richer the data will become.

Retrieving Data

Once you have enough runtime on the system, connect to the radar as in [Section 4.1](#).

1. Click on Read Traffic Stats From Radar to download the data. Click on Save and then Yes to save into a project.
2. Create a new project on the left-hand side and drag over the data into the project and then click Import.



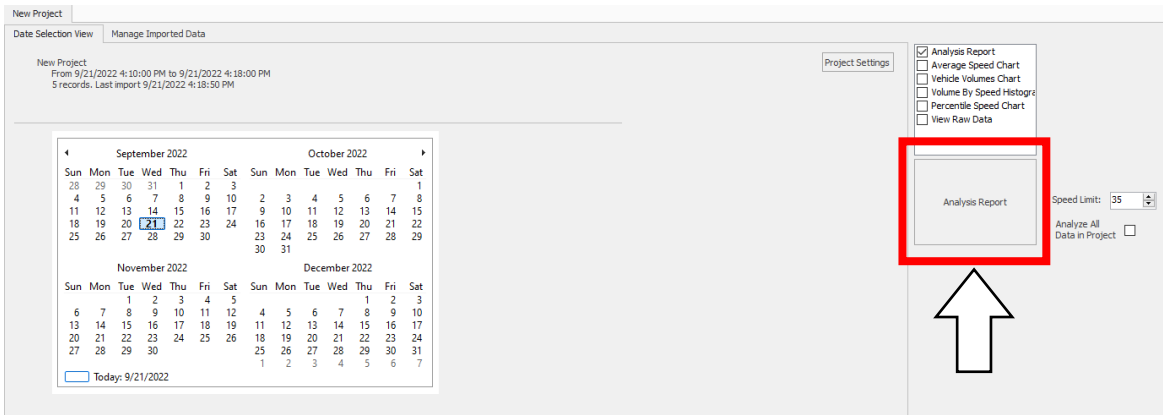
NOTE

If you have successfully downloaded the data you can click on “Erase Radar Data” to start collecting new data.

Analyzing Data

Once you have the data imported into a project you can analyze the data.

1. Go to the project you created on the main screen of the Stats Analyzer screen and click Open.
2. Ensure your data set is imported under the “Manage Imported Data” tab.
3. Navigate back to “Date Selection View” and select the dates you wish to filter the data from.
4. Set your Speed Limit on the right-hand side of the screen.
5. Click on all report checkboxes you wish to apply to the report.
6. Click on “Analysis Report.”



NOTE

If there are no vehicles detected/logged in the data you will be warned after clicking Analysis Report.

TRAFFIC ANALYSIS REPORT

For Project: New Project
 Projects Notes/Address:
 Location/Name: Incoming
 Report Generated: 10/12/2022 01:09:04 PM
 Speed Intervals = 5 MPH
 Time Intervals = Instant

Traffic Report From 9/26/2022 03:00:00 PM through 9/26/2022 03:59:59 PM

85th Percentile Speed = 25.0 MPH
 85th Percentile Vehicles = 20 counts
 Max Speed = 30.0 MPH on 9/26/2022 3:10:00 PM
 Total Vehicles =23 counts
 AADT: 552.2

Volumes - weekly vehicle counts

Average Daily	Time	5 Day	7 Day
		23	23
AM Peak	00:00 to 01:00	N/A	N/A
PM Peak	03:00 to 04:00	23	23

Speed

Speed Limit: 25 MPH
 85th Percentile Speed: 25.0 MPH
 50th Percentile Speed: 19.1 MPH
 10 MPH Pace Interval: 15.0 MPH to 25.0 MPH
 Average Speed: 19.2 MPH

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	3	N/A	N/A	N/A	N/A	N/A	N/A
% over limit	13.0	N/A	N/A	N/A	N/A	N/A	N/A
Avg Speeder	27.5	N/A	N/A	N/A	N/A	N/A	N/A

5.0 Troubleshooting

Symptom	Possible Cause and What to Check
LED fixtures fail to turn on when a vehicle approaches.	<ol style="list-style-type: none"> Object obstructing radar path: <ul style="list-style-type: none"> Ensure nothing obstructs radar module's view of target traffic. Radar not aimed correctly: <ul style="list-style-type: none"> Ensure radar module pointing directly at target traffic. Radar module not connected properly: <ul style="list-style-type: none"> Ensure green LED on back of radar module flashes every few seconds. Ensure circular connector fully mated in Carmanah MX power module and barrel firmly tightened. Problem with connected Carmanah MX system: <ul style="list-style-type: none"> Confirm connected Carmanah MX system powered and operating correctly; test LED loads with Identify System (light bulb) button in MX Field App (see MX Field App Guide for details). Radar module improperly configured: <ul style="list-style-type: none"> Connect to radar module and check settings (see Section 5). Incorrect operation mode selected on MX power module: <ul style="list-style-type: none"> Set operation mode to Trigger in MX Field App (see MX Field App Guide for details).
LED fixtures turn on when there is no traffic approaching.	<ol style="list-style-type: none"> Radar being triggered by unintended object movement: <ul style="list-style-type: none"> Ensure there are no fans or other moving objects in direction radar is pointed. Other linked Carmanah MX system causing unwanted activation: <ul style="list-style-type: none"> Isolate systems as required by creating a new link for each system to be isolated using MX Field App (see MX Field App Guide for details).
LED fixtures turn on too early (when vehicle too far away).	<ol style="list-style-type: none"> Radar aimed too high and/or too far up road: <ul style="list-style-type: none"> Aim radar module toward oncoming traffic. Radar sensitivity set too high: <ul style="list-style-type: none"> Reduce radar sensitivity setting (see Section 4.3). Disable Maximum Detection Sensitivity setting (see Section 4.3).
LED fixtures turn on too late (when vehicle too close).	<ol style="list-style-type: none"> Radar module dirty or obstructed: <ul style="list-style-type: none"> Ensure radar module is clean and nothing obstructs its view of traffic. Radar aimed too low and/or too far in toward road: <ul style="list-style-type: none"> Aim radar module toward oncoming traffic. Radar sensitivity set too low: <ul style="list-style-type: none"> Increase radar sensitivity setting (see Section 4.3).

Symptom	Possible Cause and What to Check
LED fixtures on for too long/short a duration after vehicle detected.	1. Adjust Duration setting on MX system(s): <ul style="list-style-type: none"> Duration is set separately for each MX system. See MX Field App Guide for details.
LED fixtures triggered by outgoing vehicles.	1. Radar module configured to detect outgoing vehicles: <ul style="list-style-type: none"> Ensure “Trigger Direction” setting on radar module is configured correctly (see Section 4.4).
All LED fixtures (local system and linked systems) activating inconsistently.	1. Radar module dirty or obstructed: <ul style="list-style-type: none"> Ensure radar module is clean and nothing obstructs its view of traffic. 2. Radar sensitivity set too low: <ul style="list-style-type: none"> Increase radar sensitivity setting (see Section 4.3). 3. Radar “Speed Limit” set incorrectly: <ul style="list-style-type: none"> Adjust “Speed Limit” setting (see Section 4.3). 4. Radar “Trigger Event” set incorrectly: <ul style="list-style-type: none"> Adjust “Trigger Event” setting (see Section 4.4).
Remote wireless systems do not activate; local system activates when a vehicle approaches.	1. MX systems not linked: <ul style="list-style-type: none"> Link desired MX systems with MX Field App. 2. Linked MX systems too far apart: <ul style="list-style-type: none"> Ensure units are not too far apart: ideal, 500 ft (152 m); maximum, 1,000 ft (305 m) unobstructed line of sight. 3. Objects obstructing wireless communication between units: <ul style="list-style-type: none"> Check for barriers or obstructions between systems such as buildings or billboards.