Wrong-Way Vehicle Detection and Warning System

91463_MANUAL_WW200_RevA

Table of Contents

1.0 Warnings and Precautions

The following symbols indicate important safety warnings and precautions throughout this manual:

WARNING indicates that serious bodily harm or death may result from failure to adhere to the precautions.

CAUTION indicates that damage to equipment may result if the instructions are not followed.

NOTE suggests optimal conditions and provides additional information.

1.1   Warranty Disclaimer

This manual will familiarize you with the features, operation standards and installation of Carmanah's WW200 Wrong-Way Vehicle Detection and Warning System. Failure to comply with the use, storage, maintenance, installation or placement instructions detailed in this manual could void the warranty.

1.2   Standards

Perform all installation, wiring, grounding and maintenance in conformance with local building and electrical codes. Adherence to the National Electrical Code (NEC) is mandatory to comply with any certification markings. Non-adherence to code may void the warranty.

1.3   Safety and Usage Precautions

Ensure the equipment is not powered during installation and wiring of the system. Recheck all completed wiring for proper polarity prior to energizing the system.

Perform all installation, wiring, grounding, and maintenance in conformance with local building and electrical codes. Adherence to the National Electrical Code (NEC) is mandatory to comply with any certification markings. Non-adherence to code may void the warranty.

Changes or modifications to Carmanah equipment not expressly approved by Carmanah could void both the user's authority to operate the equipment and the warranty.

1.4   System Overview and Components

The WW200 system actively monitors the roadway for wrong-way traffic. The system is comprised of the following components:

- One self-contained solar engine comprising of the solar panel, batteries and control circuitry
- One or more R5-1a LED Enhanced Sign (red LED)
- Externally mounted radar module
- Optional wireless add-on kit to trigger additional beacon systems, such as the WW100
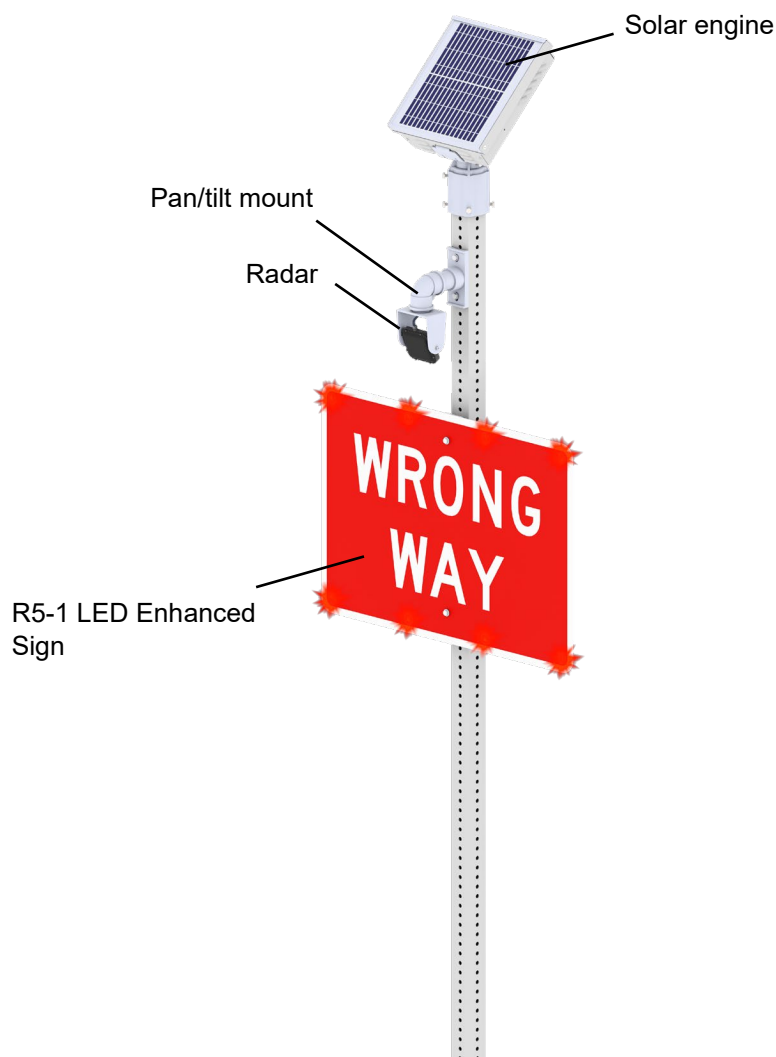
2.0 Introduction
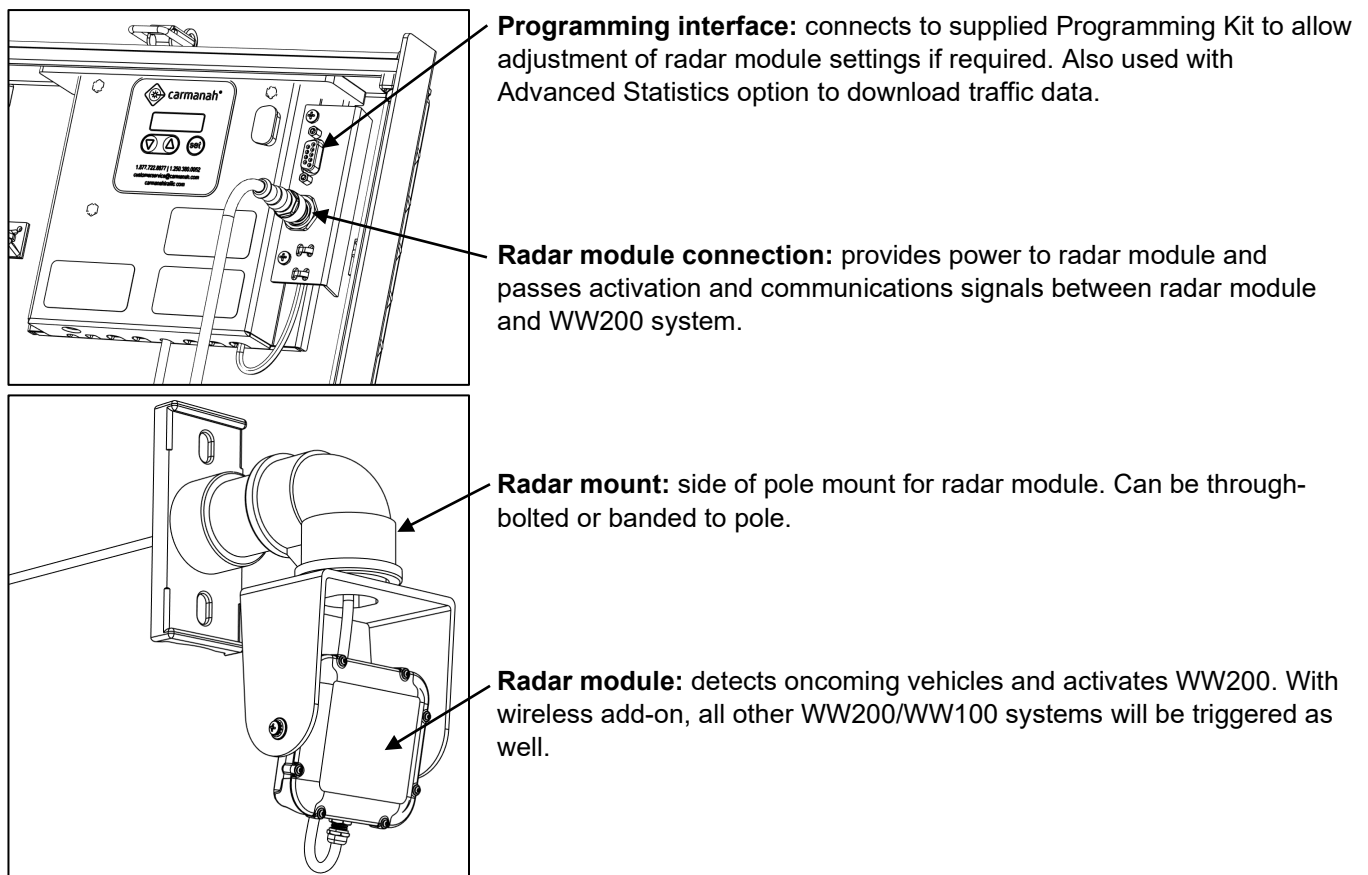
The WW200 uses an external radar module to detect wrong-way events. Once a vehicle has been detected, it will activate the system's LEDs to warn the driver of their error and encourage self-correction. Radar positioning, sensitivity, range and detection speed can be adjusted so only wrong-way events trigger the system. A WW200 can be paired with multiple WW200 or WW100 flashing warning signs if equipped with the wireless add-on.

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 or see Section 6.5.

The WW200 radar components are shown and described below:

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 module connection: provides power to radar module and passes activation and communications signals between radar module and WW200 system.

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

Radar module: detects oncoming vehicles and activates WW200. With wireless add-on, all other WW200/WW100 systems will be triggered as well.

Programming Kit: allows adjustment of radar module settings. With the Advanced Statistics option, allows for download of traffic data. Includes a communications adapter and PC USB interface cable. One kit can service any number of WW200 systems; one typically provided per order.

2.1   Radar Module

The WW200 system uses the Houston Radar DR600 radar. The radar detects wrong way vehicles and activates the system.

The radar operates in the 24 - 24.25 GHz band and is configured using PC-based software.

2.2   LED Fixture

Each WW200 will be equipped with one or more LED Enhanced Signs.

3.0 Operation

When the WW200 is triggered, it will flash for a pre-set field-adjustable duration (see Output Hold Time setting, Section 6.4). When installed with additional WW200 or WW100 systems with the wireless add-on, the WW200 can activate all systems' LED Enhanced Signs.

3.1   Radar Module Operation

When the radar module detects the motion of a wrong-way vehicle, it shorts the button input terminals of the Carmanah Energy Management System (EMS) to which it is connected. Once the radar module stops detecting the vehicle's motion, either because the vehicle has stopped or has moved out of the detection zone, it continues to hold the button input shorted for the duration programmed in the module's Output Hold Time setting (Section 6.4). The default setting is 10 seconds.

NOTE	The EMS in any WW200 or WW100 system in a grouped installation is configured to turn on the system's LED load whenever its button input is shorted (EMS Input Type set to "⊓⊓⊏", normally open).

3.2   Wireless Operation (Optional)

When equipped with the wireless add-on and upon detection of a wrong-way vehicle, the EMS broadcasts a signal to flash any remote wireless equipped WW200 or WW100 systems. Once the radar-equipped wireless system stops flashing, its EMS broadcasts another signal to immediately extinguish the flashing of the remote systems.

The wireless Carmanah EMS can operate on 14 different Radio Channels. Wireless WW200 systems will only communicate with other WW200/WW100 systems if they're on the same Radio Channel. The Radio Channel is by default set to Channel 5 and can be changed using the on-board user interface (see the E/F Series user manual for details). Radio Channels can be used to create groups of WW200/WW100 that flash together but don't activate nearby systems set to a different Radio Channel.

NOTE	The default EMS Radio Channel setting is Channel 5.

4.0 Installation

NOTE	For solar engine and LED load installation, please use the E/F Series user manual at support.carmanah.com. This will also be included with your WW200 system.

The following is a summary of the installation sequence of the WW200:

1. Determine installation location on pole for the external radar and LED load
2. Install WW200 solar engine and LED load on pole per included E/F Series user manual
3. Drill holes for radar cable and bolts, if required
4. Fish radar cable, install radar & mount to pole
5. Aim radar module
6. Connect and configure radar module
7. Test system

4.1 Determine Installation Location on Pole

The radar module should be mounted on the pole so that its front face directly faces and has an unobstructed view of oncoming wrong-way traffic. The radar module cable is 9.8 ft (3.0 m) long. To allow sufficient cable slack, the vertical distance between the radar mount and the WW200 system should be at most 7 ft (2.1 m).

For optimal radar performance:

- For maximum range, mount radar at least 6 ft (1.9 m) above the ground
- Minimize the angle between target wrong-way 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.

4.2 Install WW200 System on Pole

Use the E/F Series user manual supplied with your system to install the WW200 system onto the pole.

4.3 Drill Holes for Radar Cable and Mount Through Bolts

If routing the radar cable inside the pole, drill a 5/8" hole (16 mm) in the center of where the radar mount will attach to the pole. If through-bolting the radar mount, drill two 7/16" (11 mm) holes above and below as shown, through both sides of the pole.
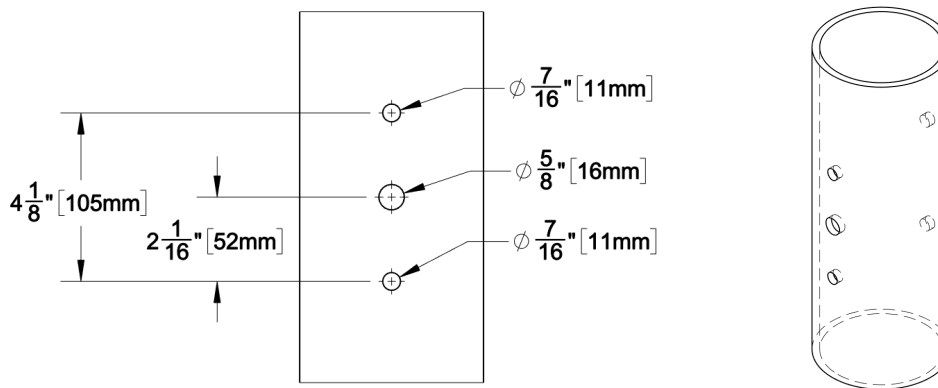
## 4.4 Fish Radar Cable, Install Radar & Mount to Pole

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 WW200 system. Bolt or band the radar mount to the pole.

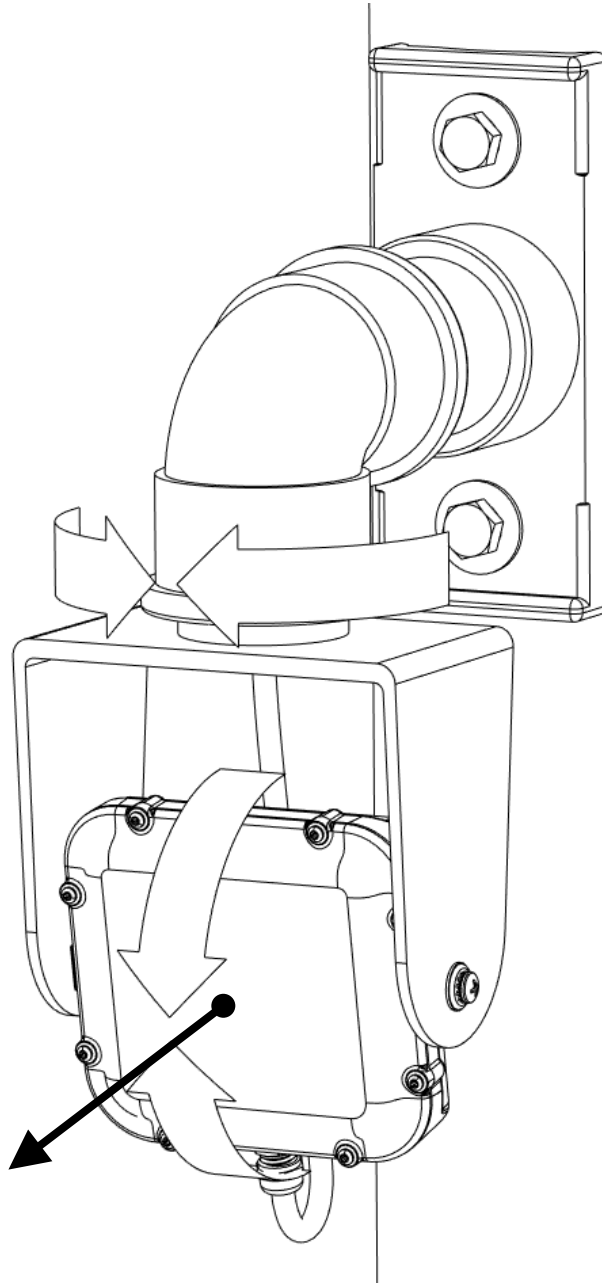| NOTE | Install the radar module with its cable facing down to optimize both detection range and resistance to water ingress. |

| NOTE | Pole mount through bolts shown not supplied. |
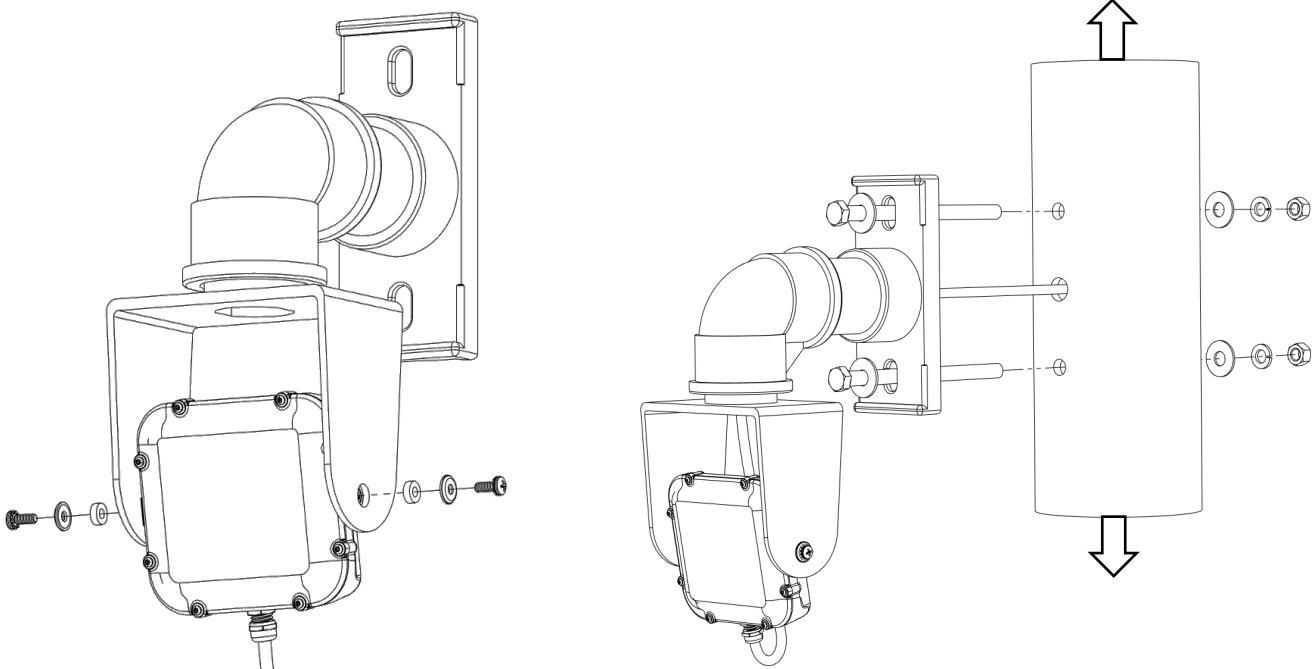
4.5 Aim Radar Module

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

NOTE   Tilting the radar downwards will progressively decrease detection range. This can be useful to fine tune when wrong-way vehicles enter the detection zone.

4.6   Connect and Configure Radar Module

Plug the radar cable connector onto its mate on the radar PCBA within the WW200 system. Turn the barrel firmly clockwise to lock the connectors together.
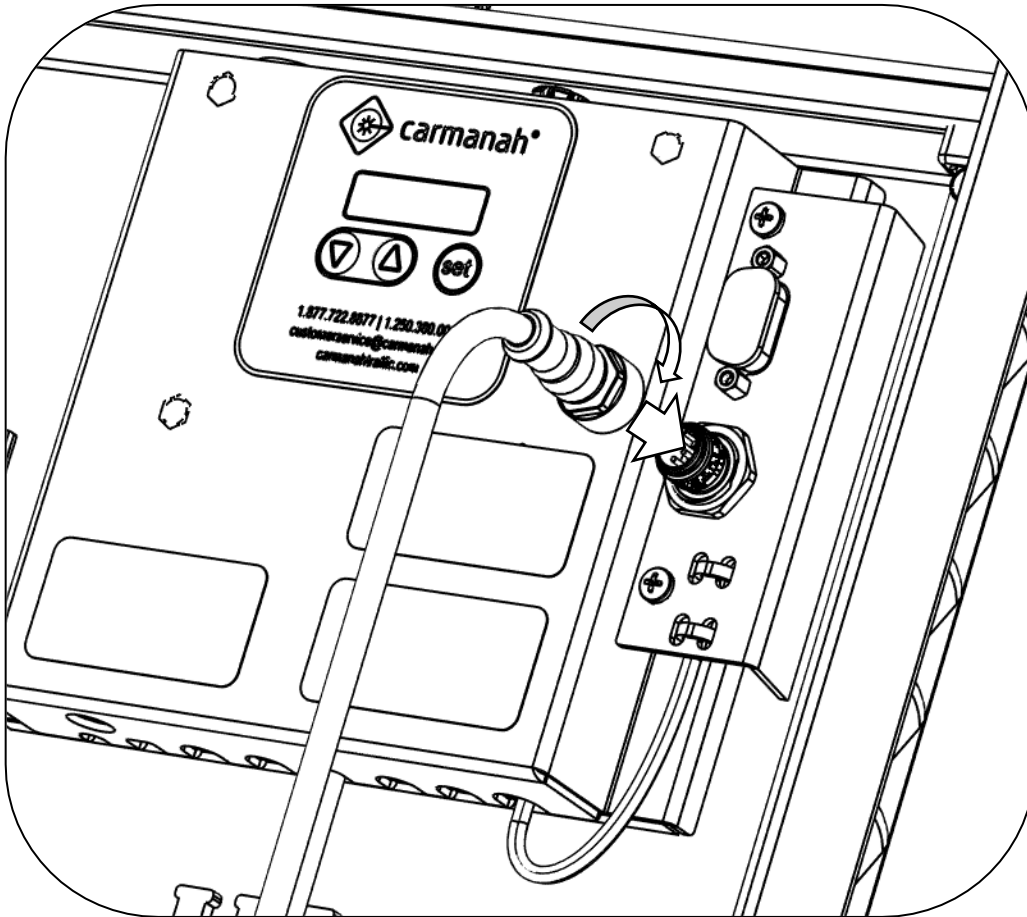
| NOTE | The radar module is configured from the factory to trigger an activation whenever an oncoming wrong-way vehicle is detected approaching at a speed of at least 5 mph (8 km/h). |

Changes from the default settings are often necessary. Reasons for changing the radar's configuration include:

- To change the duration the LEDs flash following the last wrong-way vehicle activation
- 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, see Section 6.0 Radar Module Connection & Settings.

4.7   Test System

Ensure that the WW200 system is connected and powered up. See the Carmanah E/F Series user manual at support.carmanah.com for details.

Test that the system activates as wrong-way vehicles approach the desired trigger zone. If the LED loads fail to turn on, check the following:

- Nothing is obstructing the radar module's view of oncoming wrong-way vehicles
- The radar module is aimed directly at oncoming wrong-way vehicles
- The LED load turns on for five seconds when an LED Fixture Test is performed (see below)

Typical WW200 layout and detection zone:
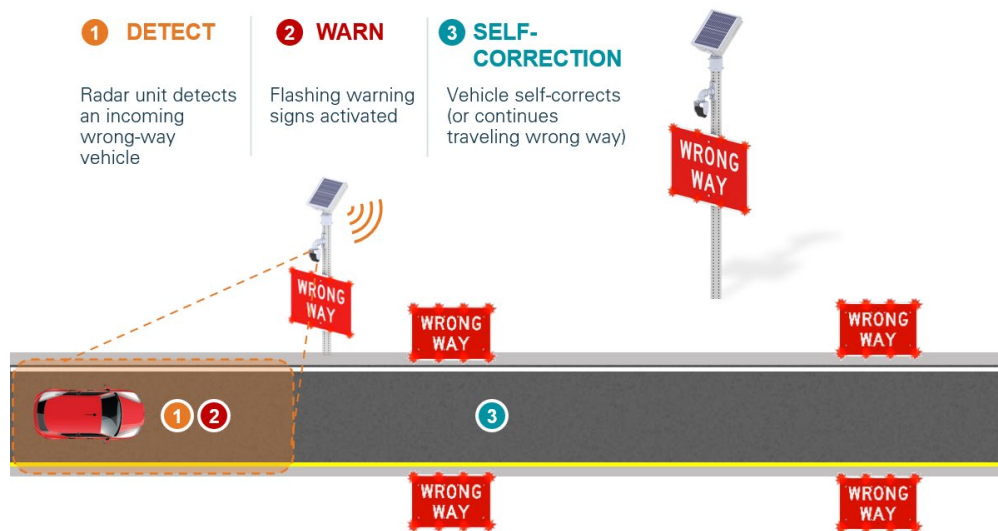
See Section 7 (Troubleshooting) if the loads still fail to activate.

NOTE

To perform the LED Fixture Test on the Carmanah EMS:

- Use the up/down buttons on the EMS until "tESt" is displayed
- Press and hold the "set" button until "no" flashes
- Press up or down once so that "YES" flashes
- Press and hold set; fixture should turn on for 5 seconds

NOTE

When the radar module detects a wrong-way vehicle, it shorts the button input terminals on the Carmanah EMS, turning on any connected LED loads. Once the vehicle motion is no longer detected, the radar module continues to short the EMS button input for its Output Hold Time setting, see Section 6.4. This keeps the local LEDs and any remote wireless LEDs flashing for this duration after the vehicle stops being detected.

NOTE

Any WW200 or WW100 EMS should be left at Input Type "no" (normally open).

NOTE

Detection zone size will vary based on your installation. Fine tuning the range, sensitivity and radar tilt will be required. Departing or outgoing traffic will not be detected.

5.0 Maintenance and Product Care

The WW200 is designed to operate reliably for years with virtually no need for maintenance. Carmanah recommends routine inspections to ensure that the radar module and the WW200 system is unobstructed by anything that may prevent effective performance, including:

- Dirt and dust
- Snow
- Leaves
- Debris
- Shade that may have developed after installation due to adjacent plant growth.

The frequency of the inspections depends on location and local weather patterns. A yearly visual inspection of the system is typically enough. The system is designed to be maintenance free, but maximum system performance is achieved when the LED lenses and solar panels are clean. When inspecting the interior of the WW200 system, ensure that the vent screens are undamaged and that the vents are clear and allow airflow.

6.0 Radar Module Connection & Settings

To change the WW200's activation behavior, configuration adjustments can be made to the radar module. Before making radar module configuration changes, please note the following:

- Detection range with factory default settings is typically at least 200 ft (60m). This can be reduced further by aiming the radar and reducing the radar sensitivity (see Section 6.3).
- 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, 8, 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 Programming Kit (provided), consisting of USB-to-Serial adapter and active USB extension cable
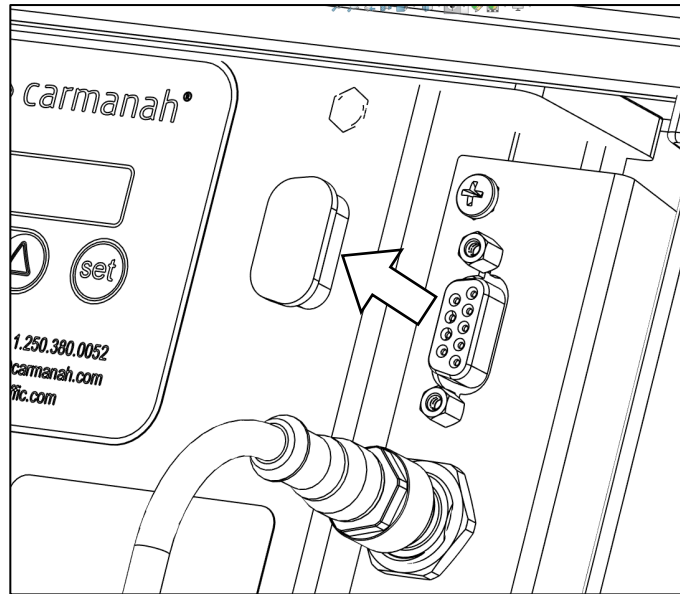- Powered-up WW200 system with radar module installed and connected

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.

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

6.1   Connecting to the Radar Module

1. Remove the dust cap from the DB9 connector within the WW200 system.

2. Plug the USB-to-Serial adapter into the DB9 connector within the WW200 system.

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."

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.

6.2   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:
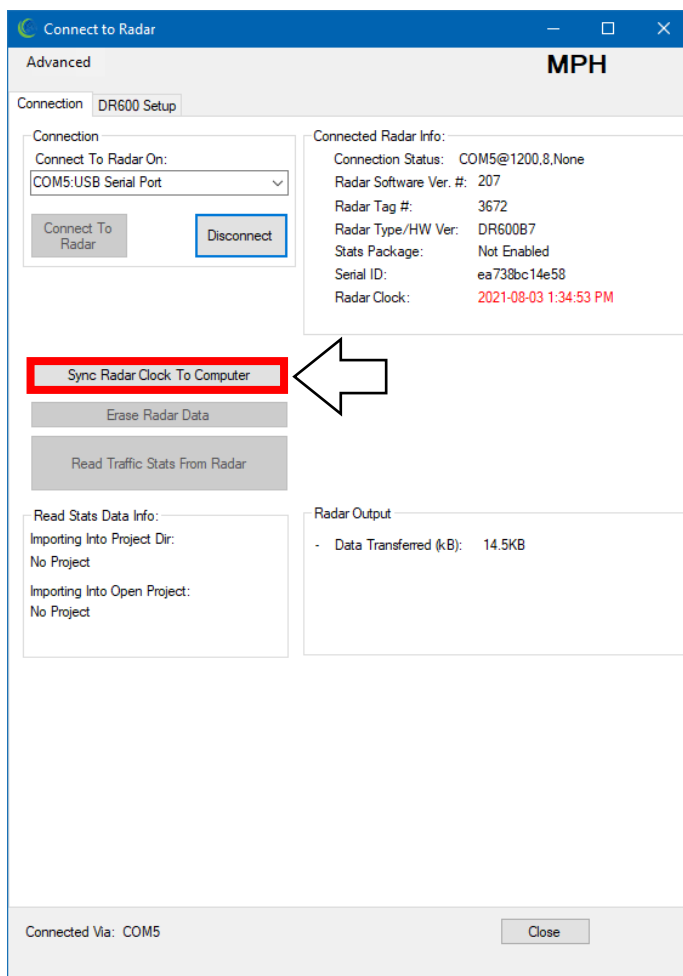
After a few moments, the Radar Clock listed will match the computer's clock.

6.3   Adjusting Speed Units, Detection Limits and Sensitivity

Under the "DR600 Setup," the "Detection & Units" tab are speed settings that influence the system's activation behavior:
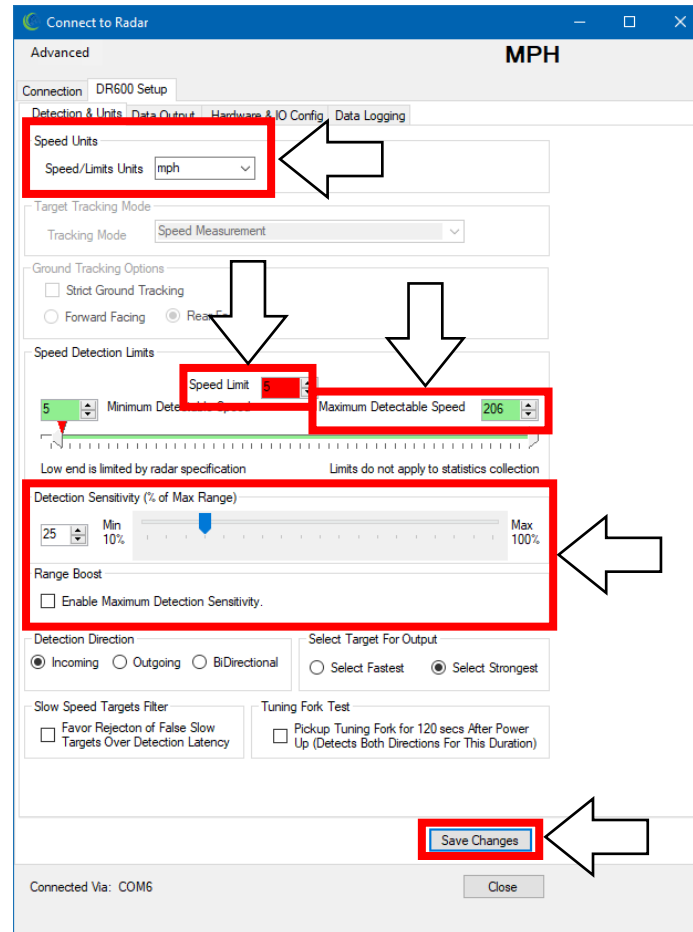
Speed Units: set to mph or km/h depending on your location.

Speed Limit: wrong-way vehicles travelling above or below this speed (depending on the "Trigger Event" setting) will trigger an activation of the connected WW200 system. Default setting is 5 mph.

Maximum Detectable Speed: vehicles travelling above this speed will not trigger an activation of the connected WW200 system. Default setting is 206 mph.

Detection Sensitivity: the sensitivity of the radar can be tuned with this setting. This is used to set the distance you wish wrong-way vehicles to be detected at. Manipulating this value and testing the detection range is required for wrong-way vehicles to self-adjust in time while not picking up undesired vehicles in the distance. 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.

6.4   Adjusting Trigger Output Configuration

Under the "DR600 Setup," "Hardware & IO Config" tab are settings that control the system's activation behavior:
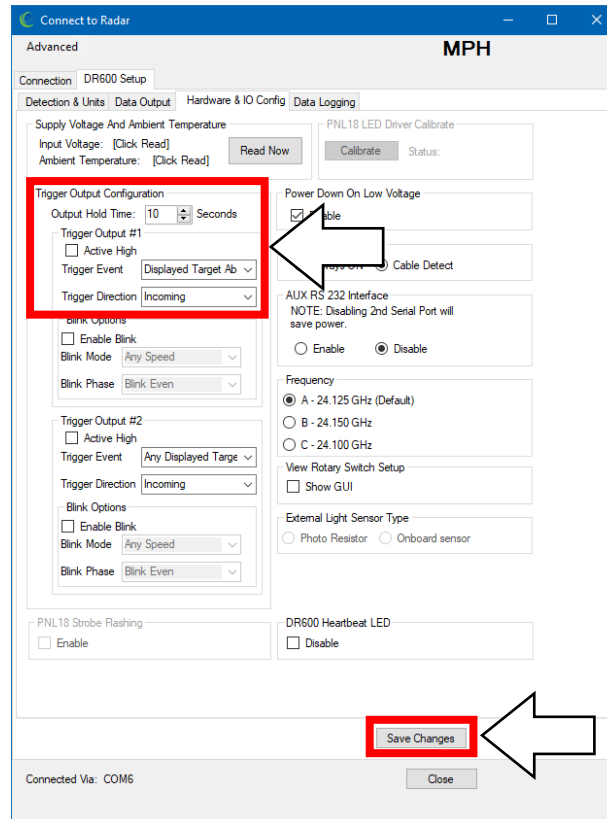
Output Hold Time: this setting controls how long the local (and any remote wirelessly-connected) WW200 and WW100 system(s) continue to flash after the radar module stops sensing wrong-way vehicle motion. Default is 10 seconds.

Trigger Event: this setting changes the conditions under which an activation of the WW200 system is triggered:

- **None:** no activations will occur.
- **Default: Displayed Target Above Speed Limit (default setting):** WW200 system activated when vehicle detected above configured Speed Limit on "Detection & Units" tab.
- **Displayed Target Below Speed Limit:** WW200 system activated when vehicle detected below configured Speed Limit on "Detection & Units" tab. This event type is not used for a wrong-way detection application.
- **Any Displayed Target:** WW200 system activated whenever a vehicle is detected, regardless of speed. This is an alternative setting to the default event type.

Trigger Direction: this setting changes whether wrong-way vehicles incoming, outgoing or both will trigger the WW200 system. Default setting is Incoming and should be left at this value.
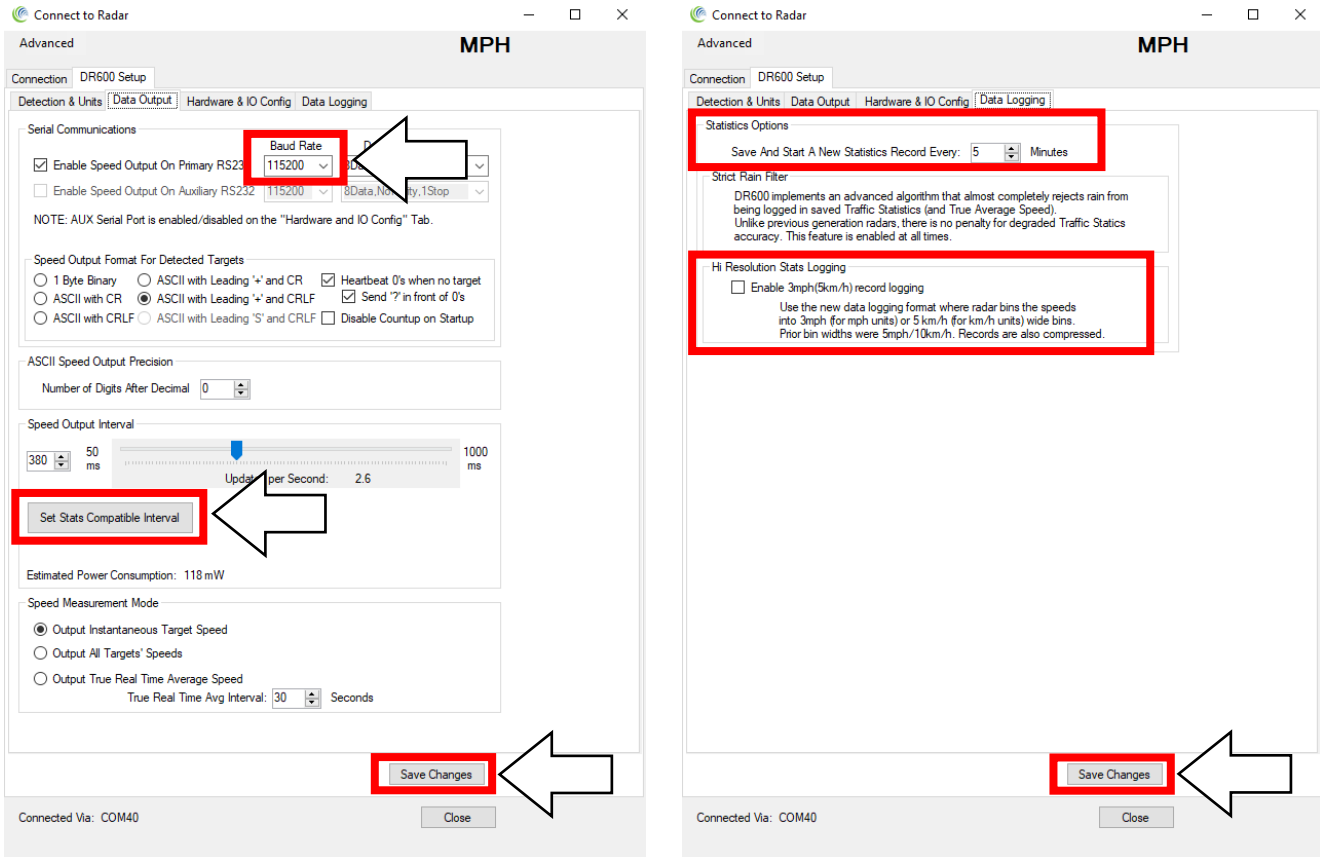
NOTE   Click on "Save Changes" to save the changes to the radar module, or "Close" to disconnect from the radar module without saving.

6.5 Advanced Statistics (Optional)

The WW200 can be optioned with the Advanced Statistics package. This 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."
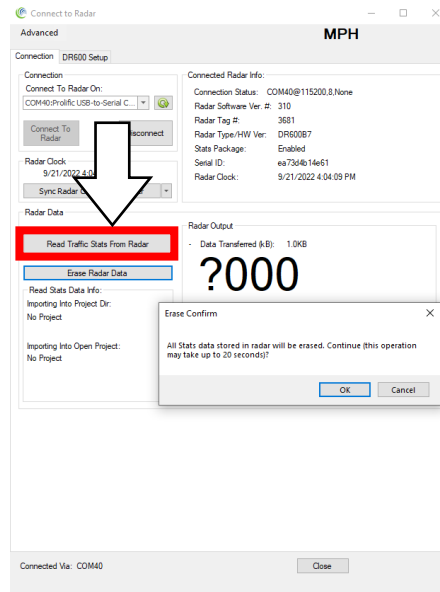

Allow the system to collect data for a minimum of five minutes, or the time value set for the stats interval. This is when you can test the system by driving through the wrong-way zone. The longer the collection time the richer the data will become.

Retrieving Data

Once you have enough runtime on the system connect to the radar as in Section 6.1.

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.
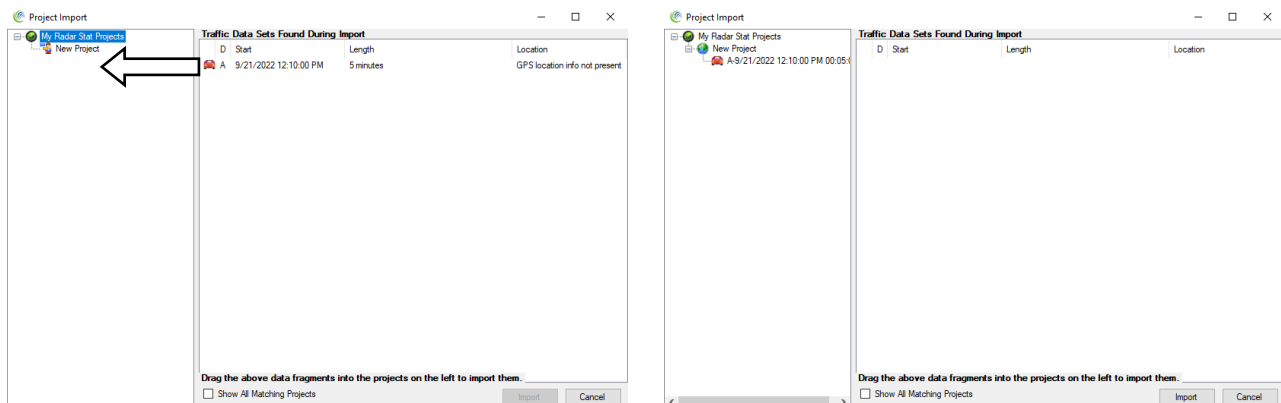

NOTE   If you have successfully downloaded the data you can click on "Erase Radar Data" to start collecting new data.

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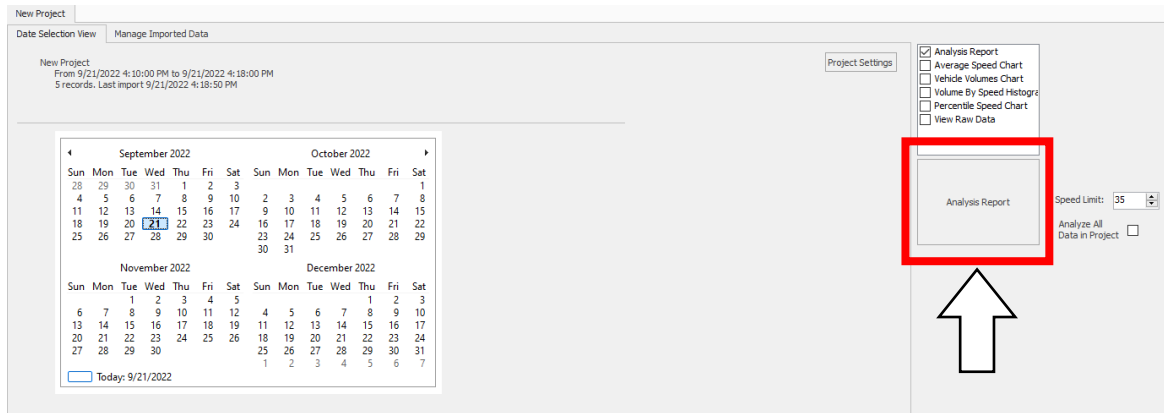
NOTE   If there are no vehicles detected/logged in the data you will be warned after clicking Analysis Report.

```
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
                         Time              5 Day           7 Day
Average Daily                             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    3         N/A        N/A         N/A        N/A       N/A        N/A
limit
% 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
```

7.0 Troubleshooting

Symptom	Possible Cause and What to Check
LED fixture(s) fail to turn on when a wrong-way vehicle approaches.	1. Object obstructing radar path: • Ensure nothing is obstructing the radar module's view of target wrong-way traffic. 2. Radar not aimed correctly: • Ensure radar module is pointing directly at target wrong-way traffic. 3. Radar module not connected properly: • Ensure circular connector is mated in WW200 system and barrel is firmly tightened. 4. Problem with connected WW200 system: • Confirm WW200 system is powered up and operating correctly; perform LED fixture test and see E/F Series user manual for more information. 5. Radar module improperly configured: • Connect to radar module and check settings (see Section 6.0).
LED fixture(s) turn on when there is no wrong-way traffic approaching.	1. Radar being triggered by unintended object movement: • Ensure there are no fans or other moving objects in direction radar is pointed. 2. Other Carmanah E/F/G system causing activation: • Ensure nearby systems in a different group are set to a different channel (see Carmanah E/F Series user manual). 3. Radar requires tilt or sensitivity adjustments: • See Section 6.0 and Section 6.3 respectively.
LED fixture(s) turn on too early (when wrong-way vehicle too far away).	1. Radar aimed too high and/or too far up road: • Aim radar module down and/or more toward road. 2. Radar sensitivity set too high: • Reduce radar sensitivity setting (see Section 6.3). • Disable Maximum Detection Sensitivity setting (see Section 6.3).
LED fixture(s) turn on too late (when wrong-way vehicle too close).	1. Radar module dirty or obstructed: • Ensure radar module is clean and that nothing is obstructing its view of traffic. 2. Radar aimed too low and/or too far in toward road: • Aim radar up and/or farther up the road toward oncoming traffic. 3. Radar sensitivity set too low: • Increase radar sensitivity setting (see Section 6.3).
LED fixture(s) on for too long/short a duration after wrong-way vehicle detected.	1. Output Hold Time setting needs to be adjusted on radar module: • Adjust "Output Hold Time" setting on radar module (see Section 6.4).
LED fixture(s) triggered by outgoing wrong-way vehicles.	1. Radar module configured to detect outgoing vehicles: • Ensure "Trigger Direction" setting on radar module is configured correctly (see Section 6.4).

Symptom	Possible Cause and What to Check
LED fixture(s) activating inconsistently.	1. Radar module dirty or obstructed: • Ensure radar module is clean and that nothing is obstructing its view of traffic. 2. Radar sensitivity set too low: • Increase radar sensitivity setting (see Section 6.3). 3. Radar "Speed Limit" set incorrectly: • Adjust "Speed Limit" setting (see Section 6.3). 4. Radar "Trigger Event" set incorrectly: • Adjust "Trigger Event" setting (see Section 6.4).
Remote wireless systems do not activate; local system activates when a wrong-way vehicle approaches.	1. Wireless systems set to different channels: • Ensure all units are set to same Radio Channel using OBUI. See EMS Programming and Testing section of Carmanah E/F Series user manual. 2. Wireless systems too far apart: • Ensure all grouped WW200/WW100 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: • Check for barriers or obstructions between systems such as buildings or billboards.
LED fixture(s) not flashing in desired manner.	1. WW200 system configuration needs adjustment: • Adjust WW200 flash pattern to have desired flash behavior using the OBUI. See EMS Programming and Testing section of Carmanah E/F Series user manual.

© 2022 Carmanah Technologies Corporation

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