RTMS

Echo
Echo + Camera
(Optional Configuration)

User Guide

PN A900-1280-1 Rev G

Copyright

Record of Revisions

Revision	Date	Affected Pages	Description
A	01/2020		Initial release.
B	10/2020	All	Updated for version 1.1.
C	04/2021	3-10	Changes to auto zone finder.
D	05/2021	1-2	Added GPS radio frequencies.
E	10/2021	1-3, 3-5, 3-6, 4-11, 4-12, 4-45, 4-46, 4-56, 4-61, Chapter 6: All pages	Updated for version 2.0.
F	08/2022	Chapter 5: All pages	Added iPro Camera Install (Echo + Camera optional configuration).
G	12/2022	page 2-15, page 3-7, page 4-7, page 4-11	Updated for version 2.2.

Preface

Federal Communication Commission (FCC) Notices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by Image Sensing Systems, Inc. could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement:

This transmitter complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

This transmitter should be installed and operated with a minimum distance of 30 centimeters (12 inches) between the radiator and your body.

Per FCC 15.19(a)(3) and (a)(4) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada (IC) Notices

English

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) the user of the device must accept any interference suffered, even if the interference is likely to lead to undesired operation.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Francais

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil est conforme aux normes RSS exempts de licence d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences pouvant entraîner un fonctionnement indésirable de l'appareil.

FCC and IC ID Numbers

Echo:

- FCC ID: J7TRTMSECHO
- IC ID: 1868A-RTMSECHO

Contains Transmitter Module:

- FCC ID: UAY-W8997-M1216
- IC: 6549A-W8997M1216

The FCC and IC IDs can also be found on the label affixed to the outside of the RTMS Echo.

CE and UKCA Certification

Certified for the RTMS Echo.

Table of Contents

Chapter 1: Introduction

General

The RTMS Echo is a side fire radar mounted on the roadside. Simultaneously, the sensor provides per vehicle data including volume, occupancy, speed and classification information in up to 12 detection zones. The installation of RTMS has never been easier with built-in aiming guidance, auto configuration of the sensor, and wireless configuration via mobile device or tablet. The data collected by the RTMS Echo is highly accurate and can be formatted to fit the needs of your organization or agency's objectives.

The RTMS technology provides meaningful and reliable data that maximizes the full potential of existing infrastructure and optimizes the safety and efficiency of every city.

Features/Benefits

Some of the features and benefits of the RTMS Echo include:

- Fast, safe installation on existing road-side poles with no traffic disruptions.
- Radar transceiver designed for traffic data collection.
- Built-in aiming guidance and auto configuration for easy installation and set up.
- Wireless configuration and management of sensor.
- Configurable using a mobile device or tablet eliminating the need to carry a computer or install complicated software.
- Single RJ-45 connection for TCP/IP communications and power.
- Data storage of up to one million per-vehicle records and ten thousand interval records.

RTMS Echo Technical Specifications

Table 1-1: Radar Frequency - Radar

Country	Bottom Frequency	Top Frequency	Power
USA/RUS	24.075 GHZ	24.175 GHZ	20 dBm max
FR/Other Europe	24.145 GHZ	24.245 GHZ	20 dBm max
UK*	24.145 GHZ	24.245 GHZ	20 dBm max

*RTMS Echo meets the requirements of the minimum sweep rate as specified by ERC recommendation (70-03) as specified in IR2030/12/9 2014/88/UK June 2014.

Table 1-2: Wi-Fi Frequencies

Country	Channels	Bottom Frequency	Top Frequency	Power
North America	1 - 11	2412 MHZ	2462 MHZ	20 dBm max
Europe	1 - 13	2412 MHZ	2472 MHZ	20 dBm max

Table 1-3: GPS Frequencies

Country	Bottom Frequency	Top Frequency	Power
Worldwide	1563 MHz	1587 MHz	N/A

Table 1-4: Specifications

Measurement	Dimensions
Mechanical	Width: 12.5 in. (32 cm) Height: 7.25 in. (19 cm) Depth: 2.5 in. (7 cm) Weight: 4.5 lbs (1.5 kg) with bracket
Electrical	Voltage: 12-24 V DC Power: Max = 7.9 Watts; Avg = 7.3 Watts

Table 1-4: Specifications (Cont'd)

Measurement	Dimensions
Temperature Range	-40 to +165°F (-40 to 74C°)
Humidity	Up to 95% Relative Humidity
Ingress Protection	IP67
Vibration	Resonance: Tested per NEMA TS2 2.2.8.3 Endurance: Tested per NEMA TS2 2.2.8.4 Shock: Tested per NEMA TS2 2.2.9.3
Frequency Bands	K band; operates in the 24 GHZ band
Field of View	Elevation angle: 57 degrees Azimuth: 17 degrees Range: 0 to 250 ft (0 to 76 m)
Regulatory	FCC 15.107:2019, FCC 15.109:2019, FCC 15.109(g):2019, FCC 15.207:2019, FCC 15.245:2019 RSS-210:2016 +A1:2017 ICES-003:2016 updated April 2017 EN 50293:2012 Radio Equipment Directive (2014/53/EU) EN 300 440 V2.2.1:2018, EN 301 489-51 V2.1.0:2017, EN 300 328 V2.1.1:2016, EN 301 489-17 V3.1.1:2017, EN 303 413 V1.1.1:2017, EN 301 489-19 V2.1.0:2017 RoHS (2011/65/EU) UKCA EN 300 440 V2.2.1 (2018-07), EN 300 328 V2.2.2 (2019-07), EN 303 413 V1.1.1 (2017-06) Update CE EN 300 328 V2.1.1:2016 -> EN 300 328 V2.2.2 (2019-07)

Electromagnetic Interference

Certified under US FCC Rule part 15 Class B; Canadian CSA C108.8 M1983 Class A; CE. For additional information, see "Preface" on page iii.

Firmware Upgrade Capability

User upgrades of firmware is available through the same web interface used to set up and configure the RTMS Echo (see "Install Firmware" on page 4-43).

Online Help

Online help for the RTMS Echo can be found at the following location.

http://imagesensingsystems.com/echo-help/

Chapter 2: Pre-Installation Considerations

General

The following information on power, cabling, communications and placement should be taken into consideration prior to installing the RTMS Echo.

Safety Information

Please review the following information before installation.

- Read all instructions before using.
- Heed all warnings in these instructions.
- Save these instructions for future reference.
- RTMS Echo units must be installed and adjusted in accordance with the installation instructions contained in this manual.
- Use the RTMS Echo only for its intended purposes as described in this manual. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
- Consult Technical Support before using the RTMS Echo or other RTMS Echo-related products for any purpose not expressly described in this manual or any other RTMS Echo product manual. Do not use the RTMS Echo to control or operate a gate-opening mechanism. Use of the RTMS Echo for any unauthorized purpose may cause injury to personnel or damage to equipment.
- For optimal accuracy, it is strongly recommended that only trained personnel survey the sites and install all RTMS Echo-related products.
- For more information about our installation, surveying, and training programs, contact your RTMS Echo sales representative.

Power Considerations

The RTMS Echo is a constant power device that requires in its basic configuration a maximum of 8 watts of power. Electrical power has two components, voltage and current; both must be available in the correct ranges to operate the RTMS Echo. The voltage must be between 12 and 24 volts DC with the voltage level read at the RTMS Echo. Voltages below 12 volts will be insufficient to power the RTMS Echo. Voltages above 30 volts could cause damage to the sensor. Losses in the cable must be addressed in setting the voltage to be supplied to the unit.

Current in sufficient quantity must be available: at 12 volts, the RTMS Echo will draw roughly 660 mA of current; at 24 volts roughly 330 mA. Using an adaptor that provides 12 volts and 100 mA of current means that the total power to the RTMS Echo will be 12*0.1 = 1.2 watts, or roughly 15% of the power needed to turn on the RTMS Echo.

On power up, there will be an inrush current that will be several times higher than the operating current. The power supply must be able to handle this temporary current flow. If the power supply is unregulated (such as a simple step-down supply from 120 VAC to 24 volts DC), the output voltage may be higher than specified when the current draw is less than maximum available from the supply. This may cause the RTMS Echo to sense an overvoltage condition and shut down to protect itself.

NOTE: If using a 12 volt power supply, it is recommended that the cable length from the power supply to the Echo sensor be no more than 50 ft (15.24m) in length.

Cabling Considerations

The RTMS Echo uses an outdoor rated Cat5e or Cat6 cable that provides both power and Ethernet communications.

ISS Provided Cable

ISS provides a cable with each RTMS Echo sensor. The cable has the following features:

- Cat5e rating
- Polyethylene jacket for moisture, water and UV protection
- Foil shield to protect from EMI/RFI interference
- 23AWG solid connectors fit for PoE applications
- Ground wire
- 50 ft (15.24 m) in length and comes with an 8-pin RJ-45 connector on the end that connects into the RTMS Echo

NOTE: If using a 12 volt power supply it is recommended that the cable length from the power supply to the Echo sensor be no more than 50 ft (15.24m) in length.

The connector also contains an element to which the ground wire is attached. The other end of the cable is what needs to be connected to power, communications and ground in the breakout box. Cable pinout is a combination of standard Ethernet and custom. The green and orange pair are wired like standard Ethernet for 100Mbits per second data transfer. The wiring and pinouts for the connector are shown in Figure 2-1 below.

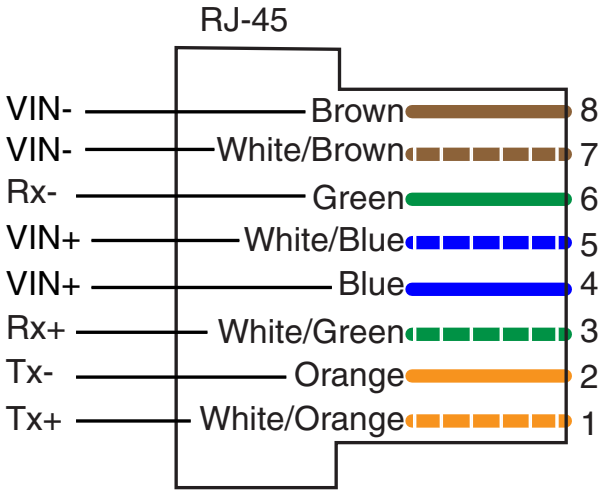


Figure 2-1: RJ-45 Connector Pinouts

The non-colored wire in the cable must be connected to Earth ground in the breakout box if the cable is not terminated with an RJ-45 connector. If it is terminated with an RJ-45 connector, the connector must have an element to which the ground wire can be connected, such as with the Conec 391J00039X connector.

Customer Provided Cable

If the ISS provided cable is not to be used, a customer-provided cable can be used. The cable must be a Cat5e or better and must be outdoor rated and must have a drain wire (avoid cables without drain wires). The recommended connector used to plug into the Echo sensor is a CONEC Industrial Ethernet Circular Sealed RJ-45 Connector, part number 17-101794.

The length of the cable is dependent on the power supply. If the power supply is 12VDC the cable should not exceed 50 ft (15.24 m) in length. Longer cables can be used when the power supply is 24VDC.

The outer diameter of the cable must be compatible with the preferred CONEC connector, which is supplied as a kit, and comes with a shielded RJ-45 plug shell. This shell can accept cable diameters ranging from 0.2 in. (5.08mm) to 0.26 in. (6.73mm).

Hard cable jackets, like the ones used for outdoor cables, are restricted to the lower end of this range. When choosing a cable, be aware that cable manufacturers often specify a nominal overall cable diameter, rather than a maximum. Choosing a cable that has a nominal diameter that is close to the limit may result in a very tight fit, or no fit at all. The RJ-45 plug is compatible with stranded or solid wires.

The cable must be properly shielded. If the cable is not shielded, or if it has inadequate shielding, the Echo may be permanently damaged if subjected to a surge on the data or power lines. If a foil shield is used, it should have a drain wire. The foil, by itself, may not provide enough protection during voltage surge events. The best methods for shielding are listed below in order of effectiveness:

- Copper braid with, or without, drain wire
- Foil shield with drain wire
- Foil shield with no drain wire (avoid, if possible)

Make sure that the cable shield is securely connected to the metal shell of the RJ-45. Shielding of the twisted pairs within the cable is not required; only an overall cable shield is required.

For information on installing the CONEC connector on the cable, download the IP67 RJ-45 assembly instructions at:

https://conec.com/en/downloads/montageanleitungen/

NOTE: The instructions indicate that the cable fitting should be torqued up to 20 inch-lbs. This amount of torque may cause the rubber cable gland to be over-compressed and bulge out the back side of the cable fitting. Use an amount of torque that allows for a snug fit between the cable and the cable gland, without causing the rubber to bulge.

Breakout Boxes

The design of an RTMS Echo installation should include a breakout box close to the RTMS Echo that can be used for setup and maintenance purposes, and can include surge suppression circuitry and external communications devices as required. Reference designs are available. The breakout box should be no more than 50 ft (15.24 m) from the RTMS Echo sensor (see Figure 2-2).

Figure 2-2: Typical Breakout Box Installation

Each breakout box should contain a manufacturers approved surge suppression package, filters, power supply and communications equipment.

Surge Suppression

ISS strongly recommends the use of a surge suppressor for both power and communications. The recommended suppressors are the CITEL MJ8-POE-B for single line, power over Ethernet connection and the CITEL MSP-VM24/RI which has separate connections for power and communications.

Figure 2-3: CITEL MJ8-POE-B

Figure 2-4: CITEL MSP-VM24/RI

Power Filtering

If the power source in the breakout box is solar or if the source provides power to other equipment in addition to the Echo sensor, a filter, such as the COSEL SNR-10-23-DT line noise filter, is recommended.

Figure 2-5: COSEL SNR-10-23-DT

Connecting Power and Communications

After the RTMS Echo has been mounted to the pole, the connections for power and data communications must be made. For cable pinouts, see "Cabling Considerations" on page 2-2.

A 50 ft (15.24m) Cat5e cable containing wires for both power and communications is included with the RTMS Echo sensor. It is strongly recommended that surge suppression be provided for both power and communications (see "Surge Suppression" on page 2-6). In addition, if the power source in the breakout box is solar, or if the source provides power to other equipment in addition to the Echo sensor, a filter is recommended (see "Power Filtering" on page 2-6).

Figure 2-6 below shows a block diagram of the connections if separate surge suppressors are used for power and communications. Figure 2-7 shows the same diagram if a single surge suppressor is used.

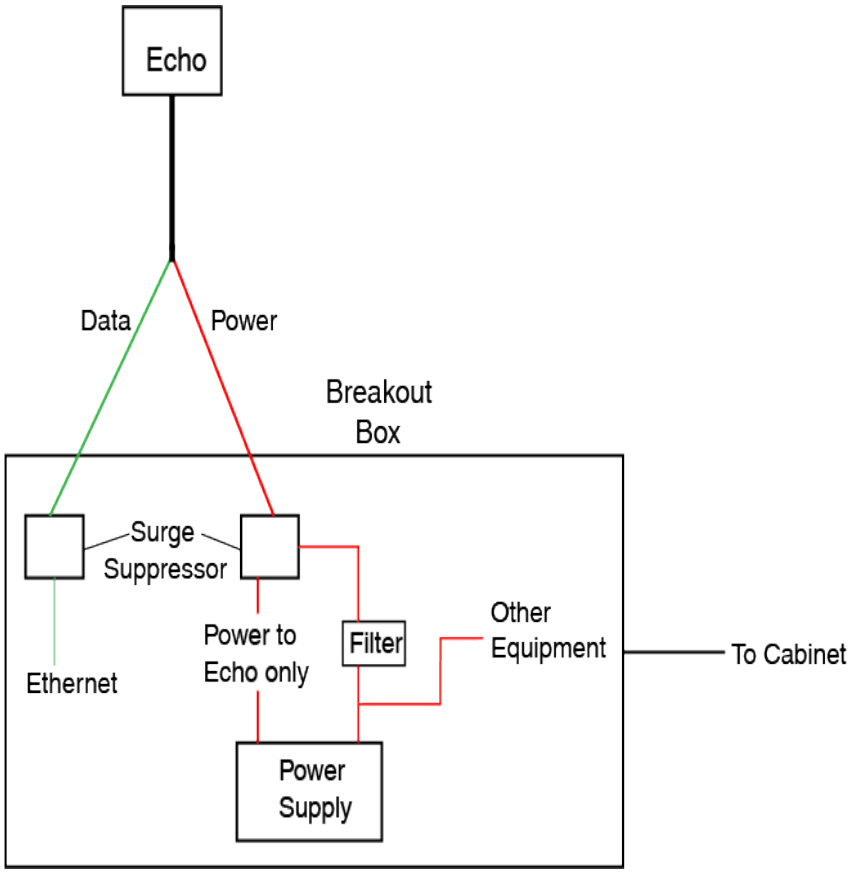


Figure 2-6: Separate Surge Suppressors

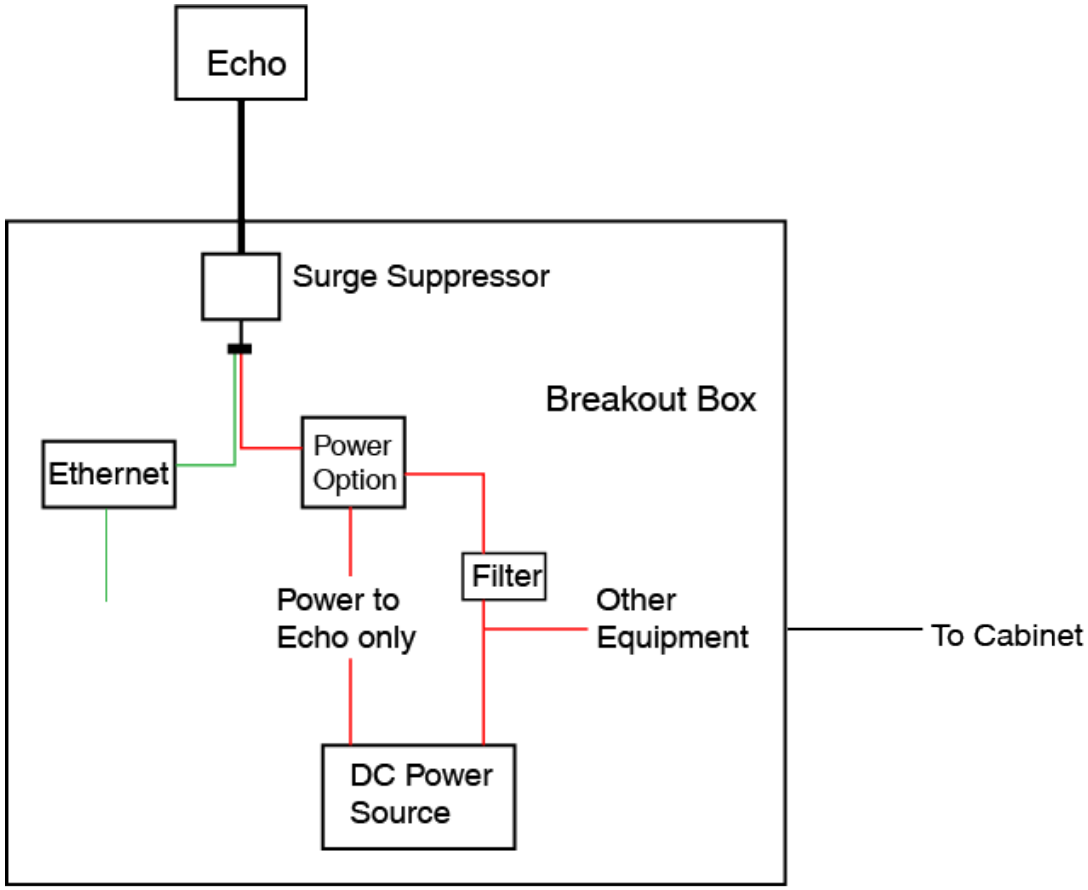


Figure 2-7: Single Surge Suppressor

Providing a Proper Ground

Providing a low resistance earth ground connection is essential to achieving effective surge protection. Total resistance from the protected circuit to the earth should be <5 ohms.

A grounding rod (see Figure 2-8) should be at least 1.83 m (6 ft) in length and placed as close as possible to the base of the RTMS Echo mounting pole. The grounding conductor should be flexible copper braid or copper wire 12AWG or larger.

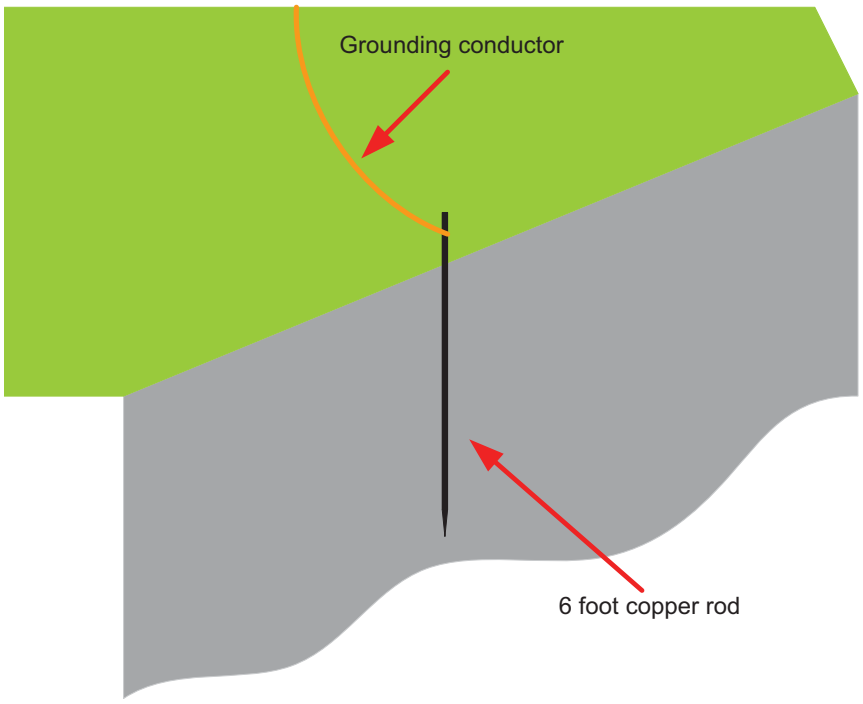


Figure 2-8: Earth Ground Connection

The earth grounding rod, together with proper ground of the breakout box, and surge protecting devices installed in close proximity of the mounting pole, create a barrier or 'sink hole' for any charges and surges coming towards the sensor from the surrounding area (see Figure 2-9). These charges and surges may be caused by industrial noise, power surges, or lightning.

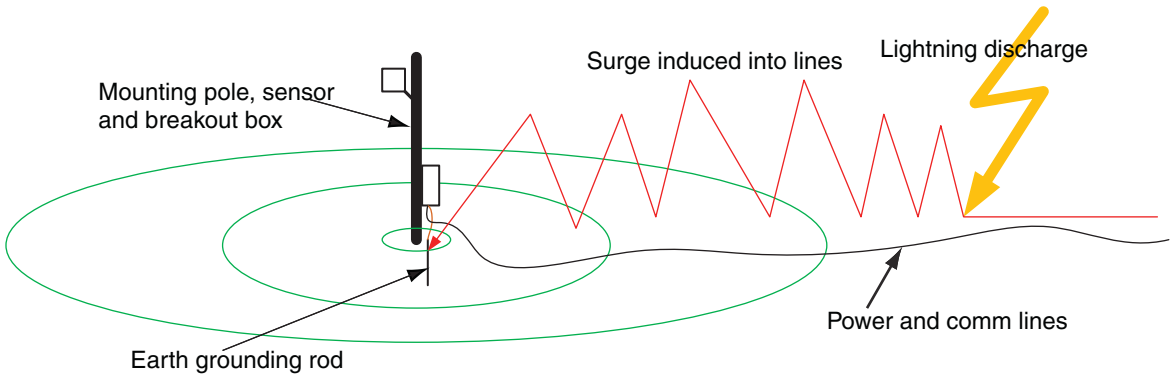


Figure 2-9: Surge Channeled into Earth Ground

Thunderstorm lightning is in its own class of destructive forces to sensors. Typically, it can generate 30 to 300 kA of current, far beyond the capabilities of any surge protecting devices. Therefore, a direct or near direct lightning hit may cause equipment damage even in the presence of surge/transient protecting devices.

Because lightning is a major influence on power line surge, it is important to understand the exposure to thunderstorms in the area where the RTMS Echo sensor is being installed. In areas that are exposed to large number of thunderstorms, protecting sensors will be more challenging.

Serial Communications Using Sx-300 Protocol

A serial connection to the Echo sensor can be made using the Sx-300 protocol and a serial terminal server. The terminal server converts the Sx-300 protocol from TCP to serial.

NOTES:

- Sx-300 protocol data can only be collected via Ethernet or serial, not both concurrently.
- If Ethernet TCP is required concurrently, an Ethernet switch must be used (see Figure 2-10).
- Before connecting the terminal server to the data collection device, do the following.
  - Confirm the pinout of the terminal server and the required serial protocol (RS-232, RS-485 4 wire, RS-485 2 wire).
  - Confirm the pinout of the serial endpoint.
  - Verify the pins are appropriately mapped to ensure communications.

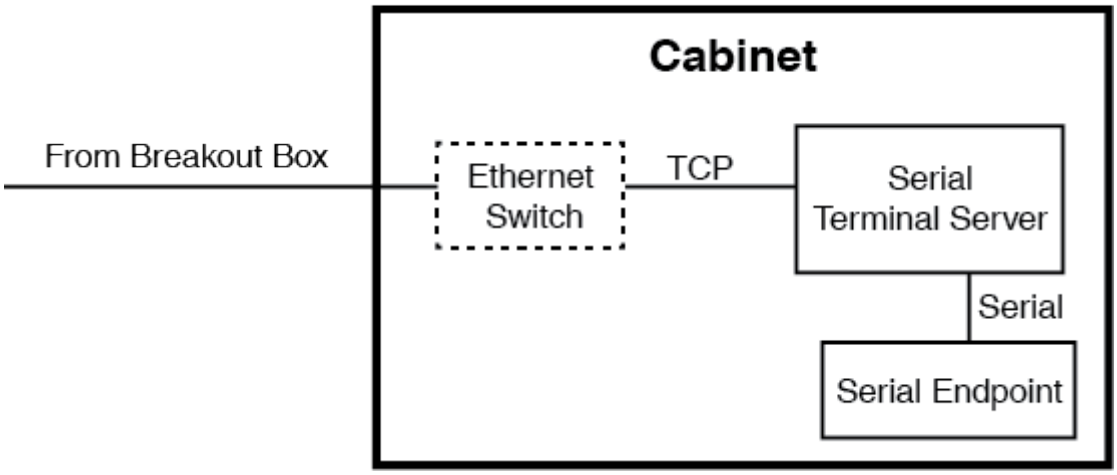


Figure 2-10: Serial Communications Hardware Connections

See Table 2-1 for wiring instructions for the serial cable between the terminal server and endpoint.

Table 2-1: Serial Cable Wiring

TCP to:	From Serial Terminal Server	To Serial Endpoint
RS-422/RS-485 4-Wire	RX- RX+ TX- TX+ GND	TX- TX+ RX- RX+ GND
RS-485 2-Wire	RX/TX+ RX/TX- GND	RX/TX+ RX/TX- GND
RS-232	RX TX RTS* CTS* GND	TX RX CTS* RTS* GND

Besides the hardware connections, both the terminal server and the Echo sensor must be configured.

Configure the Serial Terminal Server

1. Change the default IP address to work with your desired network (a static IP address is recommended). Most applications require the IP address to be on the same subnet as the Echo sensor; however, it may not be required depending on how verbose the network is.

   This is the IP address that will be used in the Echo set up.

2. Set the local port for the Endpoint configuration. This is the port that will be used in the Echo set up.

3. Set the desired serial settings based on the application (protocol, baud rate, data bits, flow control, parity, stop bits). Defaults should be sufficient for most applications.

Configure the Echo Sensor

In the Legacy protocols section of the Settings page, Sx-300 protocol must be selected and the IP address and port number from the terminal server configuration must be entered for the Serial server field. For complete information, see "Sx-300 Protocol" on page 4-52.

Placement in Side-Fired Highway Configuration

RTMS Echo is designed to mount on existing poles and road structures. Figure 2-11 shows typical cases of RTMS Echo side-fired/highway sites. The design considerations for each case are:

- **Case 1** — Maximal utilization of the RTMS Echo zone capability. Limitations are as follows:
  - A 12-zone coverage may require a larger setback (the distance to the first lane) mounting height and/or greater tilt setting (see "Height, Setback, Tilt Requirements" on page 2-15).
  - In almost all cases, the RTMS Echo can resolve the barrier return signal from that of the vehicles in the lane immediately behind it as long as 50% of vehicle can be seen (see "Guardrails and Barriers" on page 2-16).
- **Case 2 —** Overpass installations: Do not mount the RTMS Echo on a perpendicular overpass. Instead, use poles located at least 5 m (17 ft) from the overpass to avoid multi-path. Multi-path is a situation in which the reflected signals from vehicles can also reach the RTMS Echo by a secondary reflection from a large flat surface (such as a sign or overpass).
- **Case 3 —** Using median poles to mount two RTMS Echo sensors, one per direction may save poles but the designer should verify available set-back (see "Height, Setback, Tilt Requirements" on page 2-15).
- **Case 4** — Sign-structure installations (see "Installing RTMS Echo on Sign Structures" on page 2-18).
- **Case 5** — Typical ramp metering site.

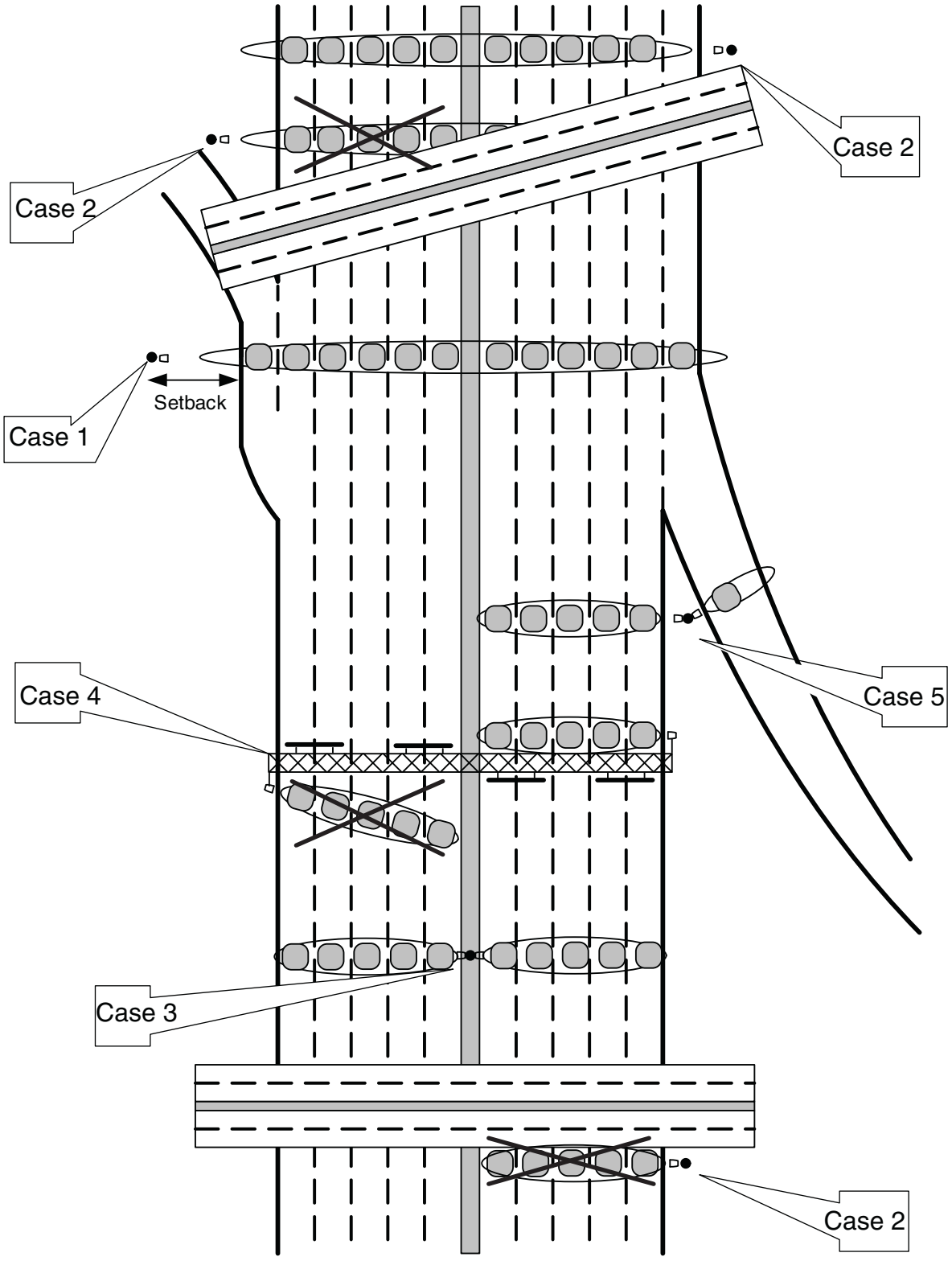


Figure 2-11: RTMS Echo Side-Fired Highway Sites

Height, Setback, Tilt Requirements

The RTMS Echo has a detection area of 250 ft (76 m), and is able to detect up to 12 lanes of traffic within that distance. ISS recommends mounting the Echo sensor between 15 and 35 ft (4.6 and 10.7 m) from the ground. The height is based on the distances from the closest and furthest zones. The mounting height and zone distances determine the angle (tilt) at which the sensor should be set.

The following table shows the recommended mounting height and tilt settings based on the zone closest to the where the sensor is mounted.

Closest Zone (ft / m)	Recommended Mounting Height (ft / m)	Recommended Tilt (degrees)	Maximum Recommended Detection Distance* (ft / m)
0 / 0	Contact ISS for recommendations based on site geometry.		
5 / 1.5			
10 / 3.1	15 - 26 / 4.6 - 7.9	-16 to -20	120 - 140 / 36.6 - 42.7
15 / 4.6	15 - 28 / 4.6 - 8.5	-12 to -17	150 - 160 / 45.7 - 48.8
20 / 6.1	20 - 31 / 6.1 - 9.4	-12 to -16	180 - 190 / 54.9 - 57.9
25 / 7.6	23 - 34 / 7.0 - 10.4	-11 to -15	210 - 220 / 64 - 67.1
30 / 9.1	26 - 35 / 7.9 - 10.7	-11 to -13	240 - 250 / 73.2 - 76.2
35 / 10.7	28 - 35 / 8.5 - 10.7	-10 to -12	250 / 76.2
40 / 12.2	31 - 35 / 9.4 - 10.7	-10 to -11	250 / 76.2
45 / 13.7	33 - 35 / 10.1 - 10.7	-10	250 / 76.2
50 / 15.2	35 / 10.7	-10	250 / 76.2
55 / 16.8	35 / 10.7	-9	250 / 76.2
60 / 18.3	35 / 10.7	-8	250 / 76.2

*Contact ISS Support for recommendations if outside these boundaries.

NOTE: Mounting the sensor higher when there are more lanes reduces the impact of occlusion on detection performance.

Guardrails and Barriers

In almost all cases, median guard-rails or barriers do not interfere with traffic detection. In the few cases in which such interference may occur, e.g., large metal barrier, very tall barriers or movable metal fences, a good solution is to use a second sensor on the other side of the road. Each of the sensors can monitor lanes on its side of the barrier, requiring a smaller setback to cover fewer lanes, as shown below.

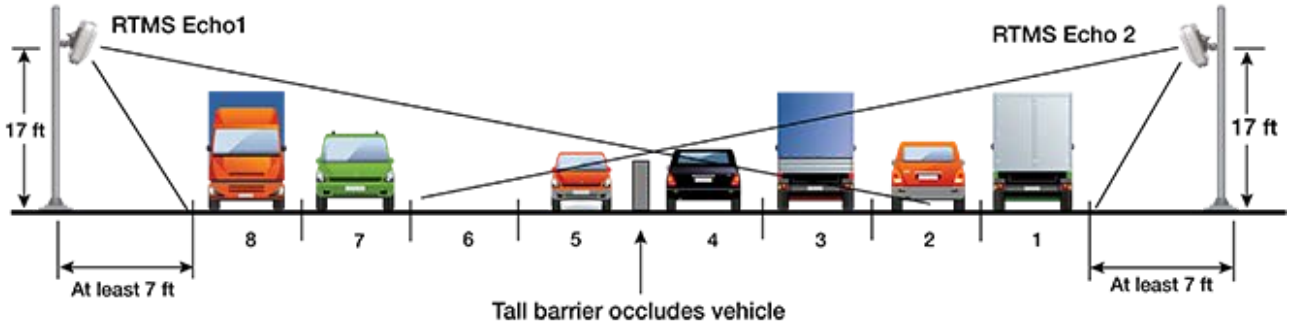


Figure 2-12: Two-Sided Placement

Sunken Road and Roadside Walls

When vertical surfaces reflecting microwaves (e.g., dense chain link fences or retaining walls of a sunken roadway) are present, multi-path reflections from large vehicles in close lanes cause additional false (ghost) detection in farther detection zones.

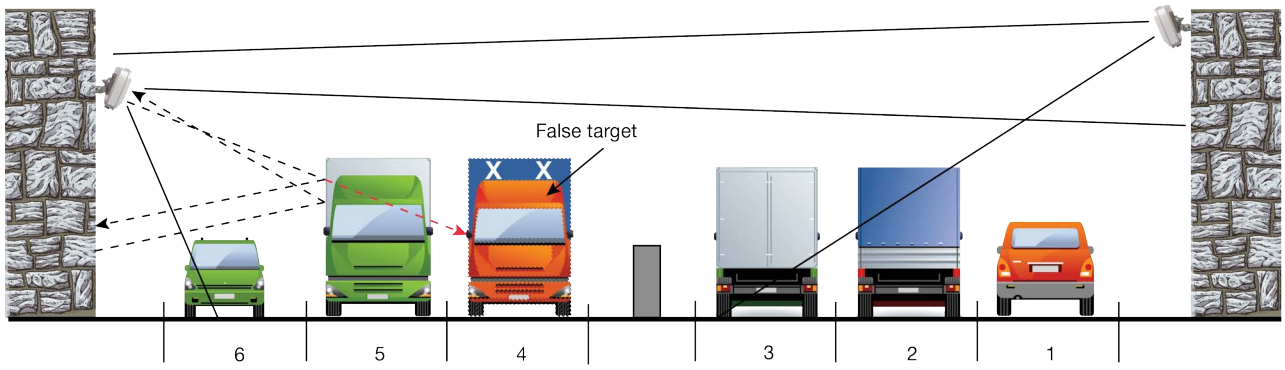


Figure 2-13: False Target Generated by Fence Or Wall

To avoid this problem, install the RTMS Echo higher and increase the elevation angle to detect the far lanes of traffic excluding the nearest lanes, as shown on the right in Figure 2-13.

Elevated Roadway

On elevated or sunken roadways with insufficient outside shoulders, it may be an impossible job for a single sensor. Two RTMS Echo units, configured as shown by Figure 2-14, will cover all lanes if detection zones are defined as shown in Figure 2-14.

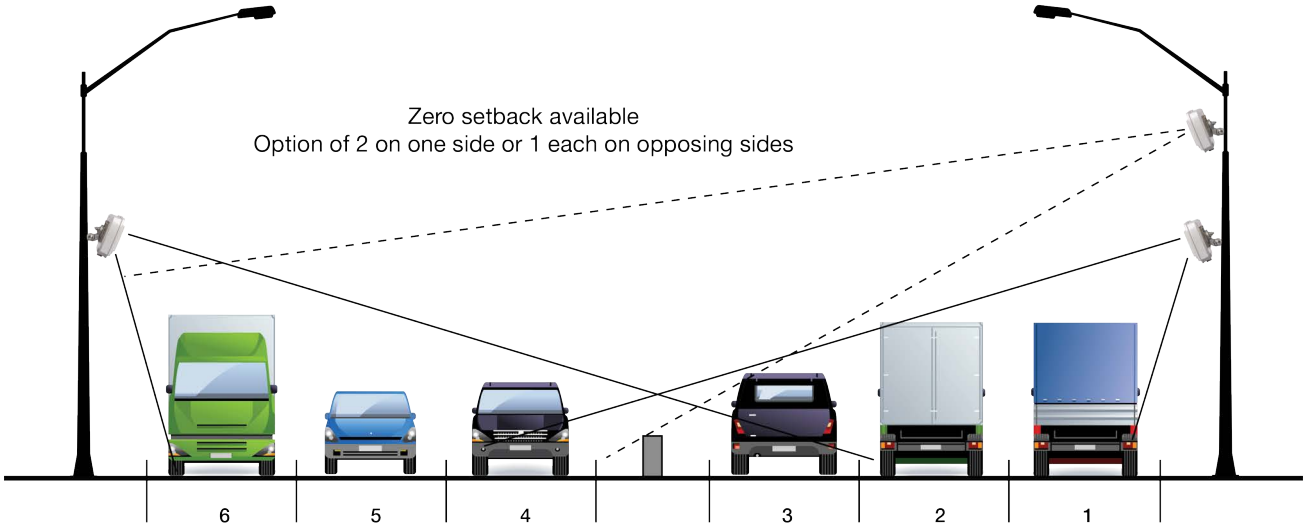


Figure 2-14: RTMS Echo on Elevated Roadway

RTMS Echo can also monitor elevated highways from tall poles erected on the lower level. However, in this case the setback should be less than 8 m (26 ft), to avoid the strong reflection from the side of the structure.

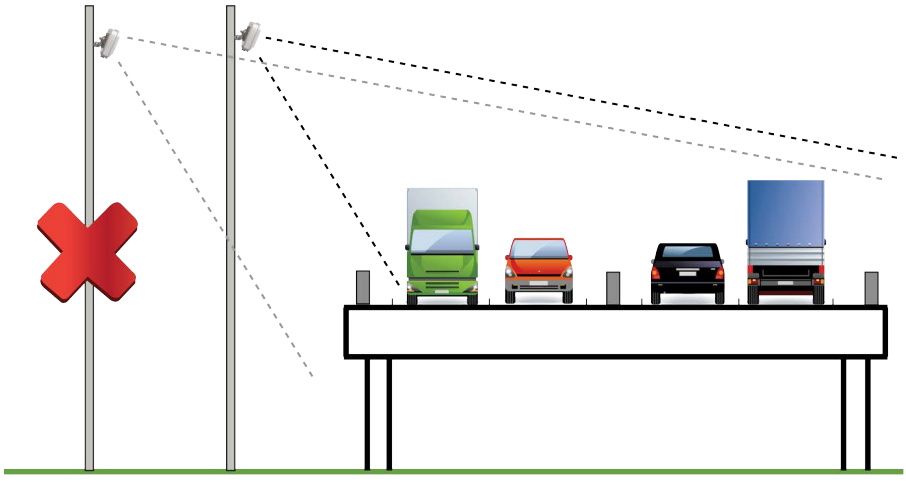


Figure 2-15: Pole Location for an Elevated Roadway

Installing RTMS Echo on Sign Structures

The installation of the RTMS Echo on Message Sign structures is acceptable only if the RTMS Echo is mounted to be offset from the overhead span of the structure. Structures can reflect the microwave signal and distort the accuracy of detection. Some structures such as DMS units have very wide, flat metal bottoms to the structure that are similar in nature to bridges. These types can cause more interference than other lattice work type structures and may require consultation with RTMS Echo Technical Support.

The best way to mount the RTMS Echo is to place a horizontal mast arm or pipe approximately 1.3 m (4 ft) away from the structure (1.8-2.4 m [6-8 ft] if DMS), ideally on the back of the structure away from any lighting or signs. Ensure the detector is aimed perpendicular to the traffic flow.

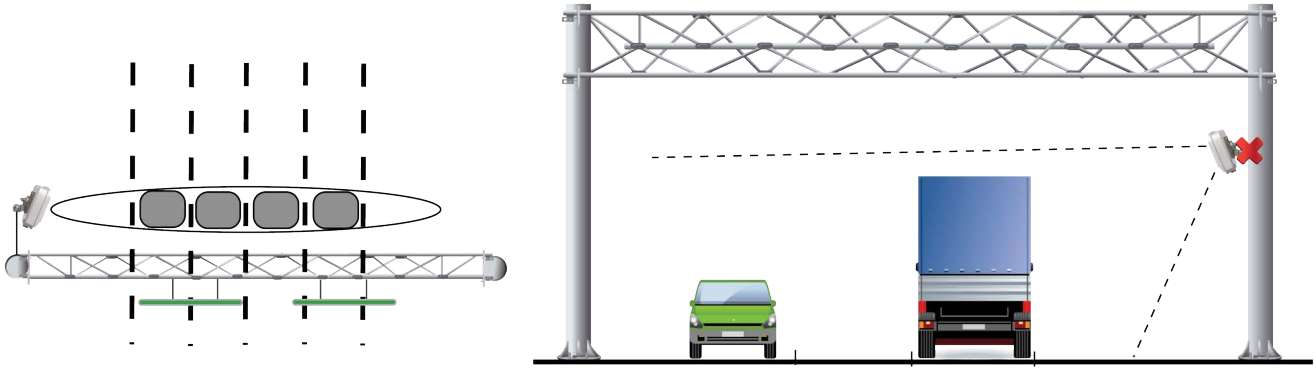


Figure 2-16: RTMS Echo on Sign Structures

Grade Differentials

When grade differences are small, a single unit on the high side may work, provided all lanes are within range.

Figure 2-17: Small Grade Differentials

When the grade differential is large enough to put a part of the lower level in a "shadow", two RTMS Echo units are required as shown by the following.

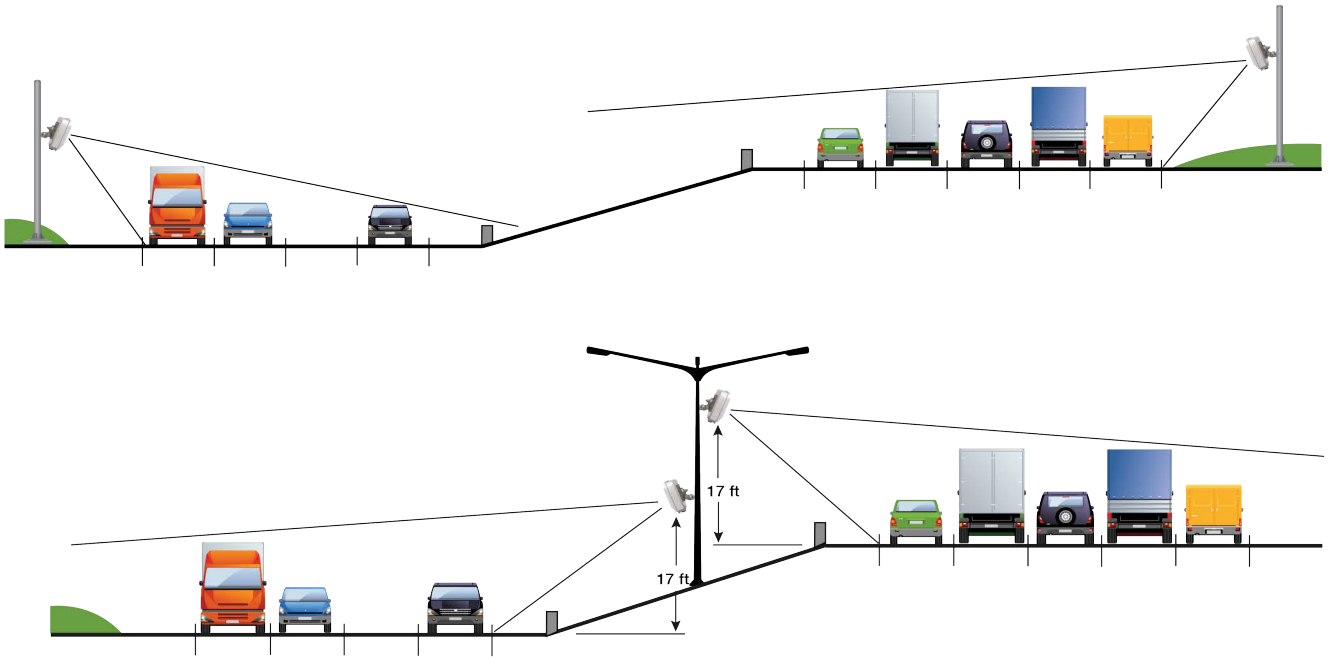


Figure 2-18: Large Grade Differential

Trees

Trees and bushes in the path of the microwave beam (in the setback or in medians) must be avoided. RTMS Echo units must be relocated or a gap in vegetation maintained in the path of the beam.

Chapter 3: Sensor Installation & Setup

General

This chapter describes the procedure for installing and setting up the RTMS Echo sensor.

Safety Information

Please review the following information before installation.

- Read all instructions before using.
- Heed all warnings in these instructions.
- Save these instructions for future reference.
- RTMS Echo units must be installed and adjusted in accordance with the installation instructions contained in this manual.
- Use the RTMS Echo only for its intended purposes as described in this manual. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
- Consult Technical Support before using the RTMS Echo or other RTMS Echo-related products for any purpose not expressly described in this manual or any other RTMS Echo product manual. Do not use the RTMS Echo to control or operate a gate-opening mechanism. Use of the RTMS Echo for any unauthorized purpose may cause injury to personnel or damage to equipment.
- For optimal accuracy, it is strongly recommended that only trained personnel survey the sites and install all RTMS Echo-related products.
- For more information about our installation, surveying, and training programs, contact your RTMS Echo sales representative.

Installing the Sensor

Warning

Installation of RTMS Echo hardware may require that you work above the ground on a ladder or bucket truck. Please make sure you have all the required equipment and are aware of potential safety issues before starting any installation. DO NOT install any RTMS Echo hardware if you are unsure how to complete the installation or lack appropriate safety equipment. It is recommended that you do NOT install this hardware during inclement weather.

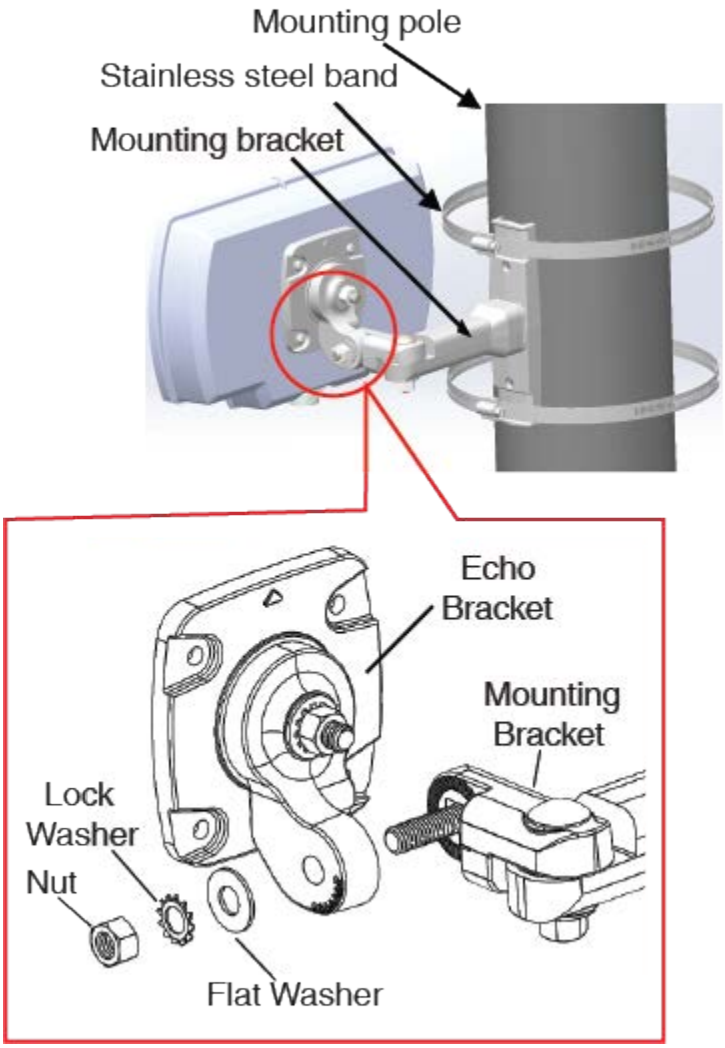
The following equipment is required to install the RTMS Echo sensor.

- Provided: RTMS Echo unit, bracket, washers, nut and bolts and 50 ft (15.24 m) cable.
- Not Provided:
  - Bolts or stainless steel banding to mount to a pole. The bolt specifications depend on the mounting requirements: for example, different bolts may be required when the RTMS Echo unit is mounted on a wooden pole than when the RTMS Echo unit is mounted on a concrete wall. 7/16" wrench, 1/2" wrench, assorted tools to be determined by mounting specifications.
  - Surge suppressors, noise filters, power supplies, etc.

The recommended mounting height for the RTMS Echo sensor is between 15 and 35 feet (4.6 and 10.7 meters) from the ground. For installations with a setback less than 6 feet (1.8 meters) to the nearest zone, a mounting height of 15 feet (4.6 meters) is recommended. For all other installations, a height of 20 to 35 feet (6.1 to 10.7 meters) is recommended. For installations with more than 8 lanes of traffic, the recommended height is 30 to 35 feet (9.1 to 10.7 meters). Additionally, the angle at which the sensor is tilted is determined by mounting height and distances from the closest and farthest zones. For a complete height and tilt angle mounting chart, see "Height, Setback, Tilt Requirements" on page 2-15.

NOTE: Always follow local wiring codes and local standards that apply to the location in which the RTMS Echo is being installed.

1. Attach the bracket to the roadside pole (or another specified location) using bolts or stainless steel banding.



2. Secure the RTMS Echo to the mounting bracket using the 9/16" bolt, flat washer, lock washer and nut.

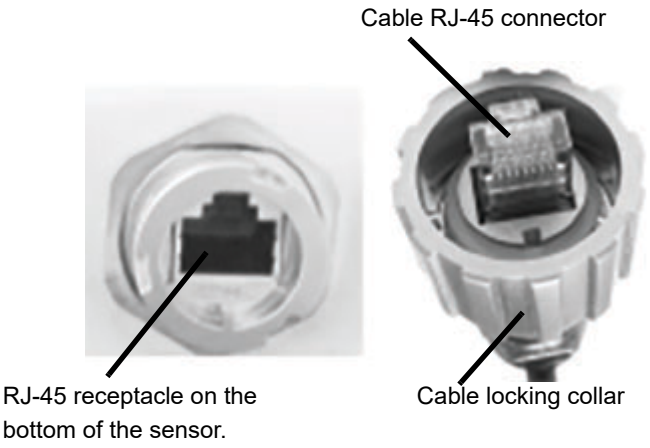
   NOTE: Make sure that the cable connector is on the bottom of the unit when it is mounted.

3. Adjust the RTMS Echo to be perpendicular to the travel lanes and level side to side.
4. Tilt the RTMS Echo so that the top of the sensor is aimed at the farthest monitored zone.

NOTE: Steps 3 and 4 are general guidelines. Actual mounting and tilt may need to be adjusted based on multiple factors such as obstacles and number of lanes.

5. Secure the position by hand tightening the nuts. Once the aiming process has been completed, the nuts can then be securely tightened.

6. Undo the protective cap on the sensor's connector.
7. Insert the RJ-45 connector from the cable to the RJ-45 receptacle on the bottom of the sensor.



8. Tighten the cable's locking collar by turning it a quarter turn to the right.

Warning

Make sure the mains are turned off prior to connecting wires from the Echo cable to the breakout box.

9. Connect the other end of the cable to power and communications in the breakout box (see "Connecting Power and Communications" on page 2-7).

Setting Up the Sensor

The set up process consists of the following:

- Logging in to the sensor for the first time
- Aiming the sensor
- Detecting zones
- Verifying vehicle counts
- Configuring the settings

The following equipment and personnel will be needed in order to perform the configuration process.

- At least two persons
- A hand-held tally counter
- Light Detecting and Ranging (LIDAR) radar gun
- Stop watch

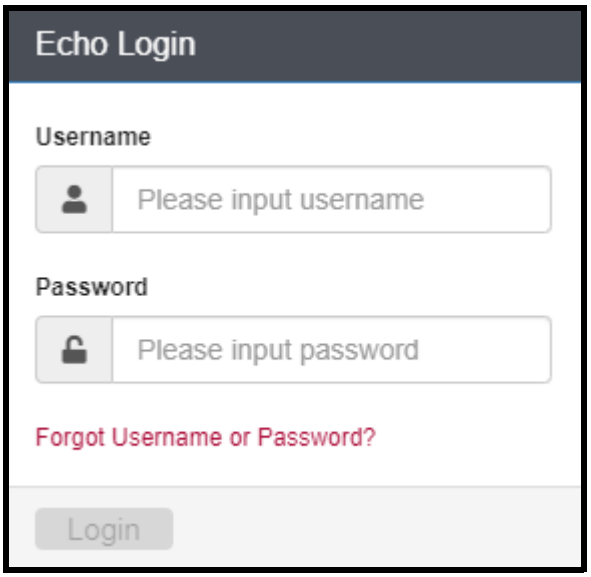
Logging in to the Sensor

NOTE: Users can log in to the Echo application from any device running an HTML5 compatible browser, such as Google Chrome. Browsers such as Firefox and Edge are partially HTML5 compatible and users may experience some differences when using them.

1. Start your Internet browser.
2. In the address field, type the IP address of the RTMS Echo.

   The default is **192.168.0.10**.
3. Press **Enter**.

   The RTMS Echo login window appears.

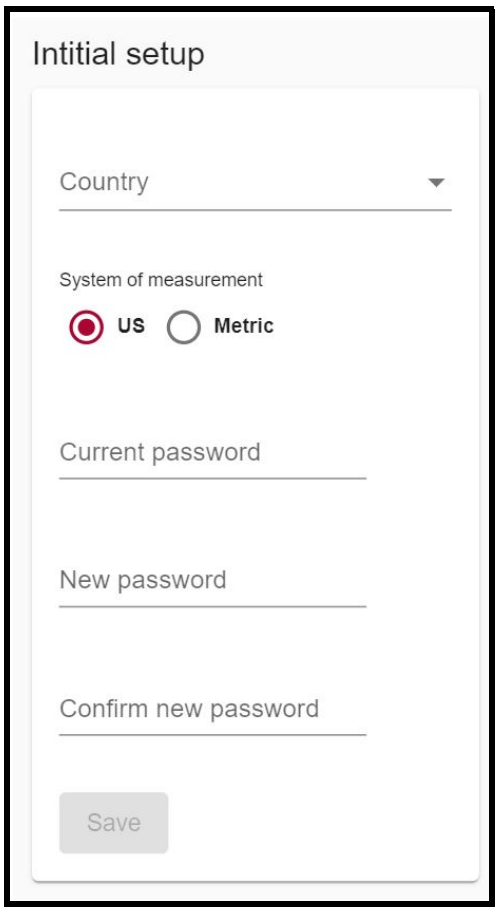


4. Is this your first time logging in to the RTMS Echo?

Yes	No
Continue with the next step.	Proceed with your login credentials and disregard the following steps in this section.

5. Enter the Username and Password. If the firmware was upgraded from a previous version, the login credentials are the same as before. If this is a new installation, the defaults are:
   - Username: **admin**
   - Password: **rtmsecho**
6. Click **Login**.

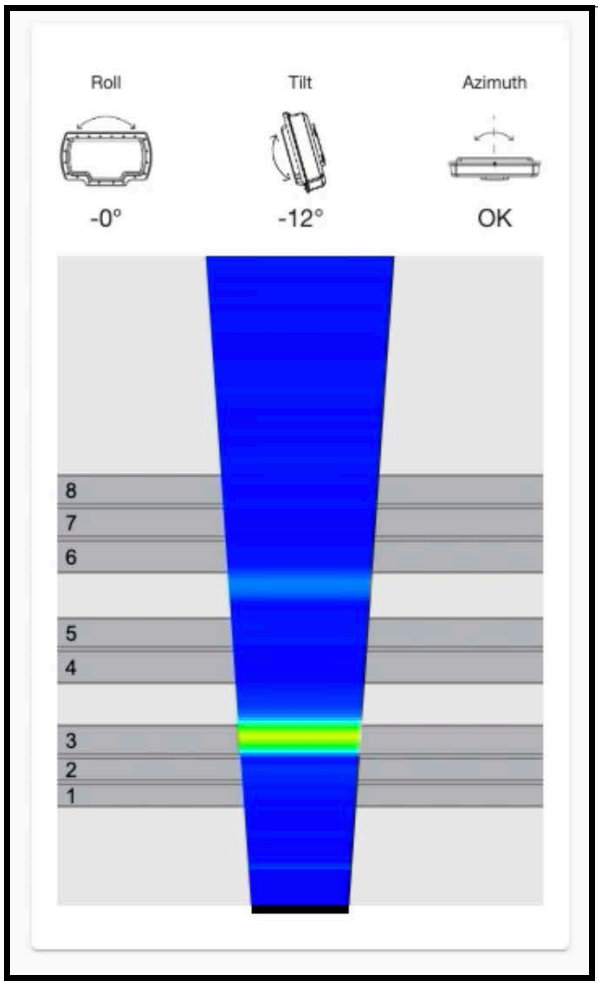
The following appears. A password change is required during the initial setup.



7. Use the drop-down to select the country where the Echo sensor is installed.
8. Select one of the following.
   - **US** – speed and lengths are shown in mph and feet.
   - **Metric** – speed and lengths are shown in kph and meters.
9. Enter the current password: **rtmsecho.**
10. Enter the new password.
11. Re-enter the new password.
12. Click **Save**.

Aiming the Sensor

1. Log in to the sensor.
2. Select the **Aim** tab.



Activity will be shown in relation to the zone.

3. Move the left/right side of the sensor up or down to adjust the roll according to the slant of the road.

   For a level road, the roll should be set to -0.

4. Tilt the sensor forward or back to adjust the tilt to match the specifications in "Height, Setback, Tilt Requirements" on page 2-15.
5. Swivel the sensor left or right to adjust the azimuth until it shows **OK**.

   After each azimuth adjustment, wait for about 20 vehicles to pass the sensor.

6. Tighten the nuts securing the sensor to the mounting bracket.
7. Detect and adjust zones.

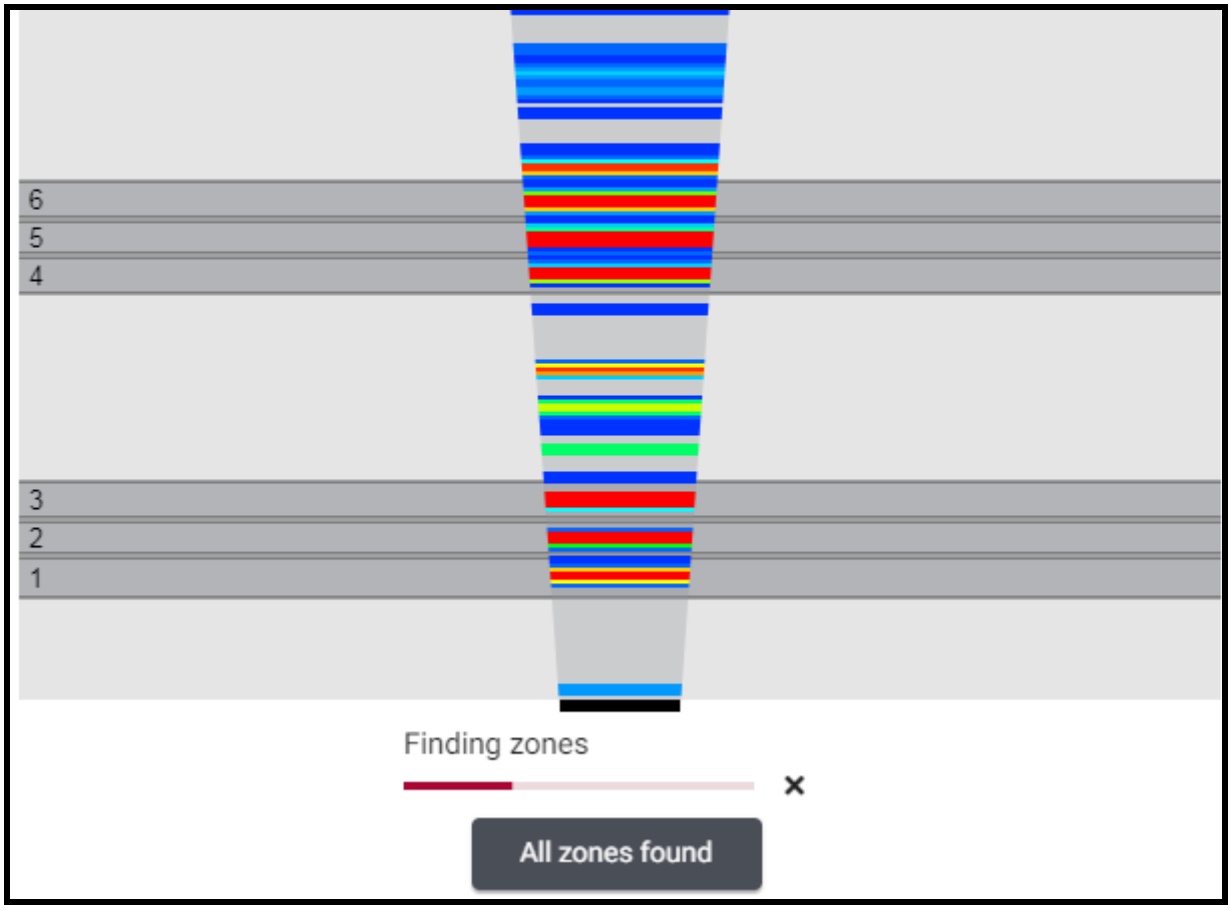
Detect and Adjust Zones

NOTE: Even though RTMS Echo supports up to 12 zones, the Wavetronix® Z1 protocol only supports a maximum of 10 zones. Therefore, if Wavetronix® Z1 is selected for "Legacy Protocols" in the "Settings Tab", only 10 zones should be configured in the system.

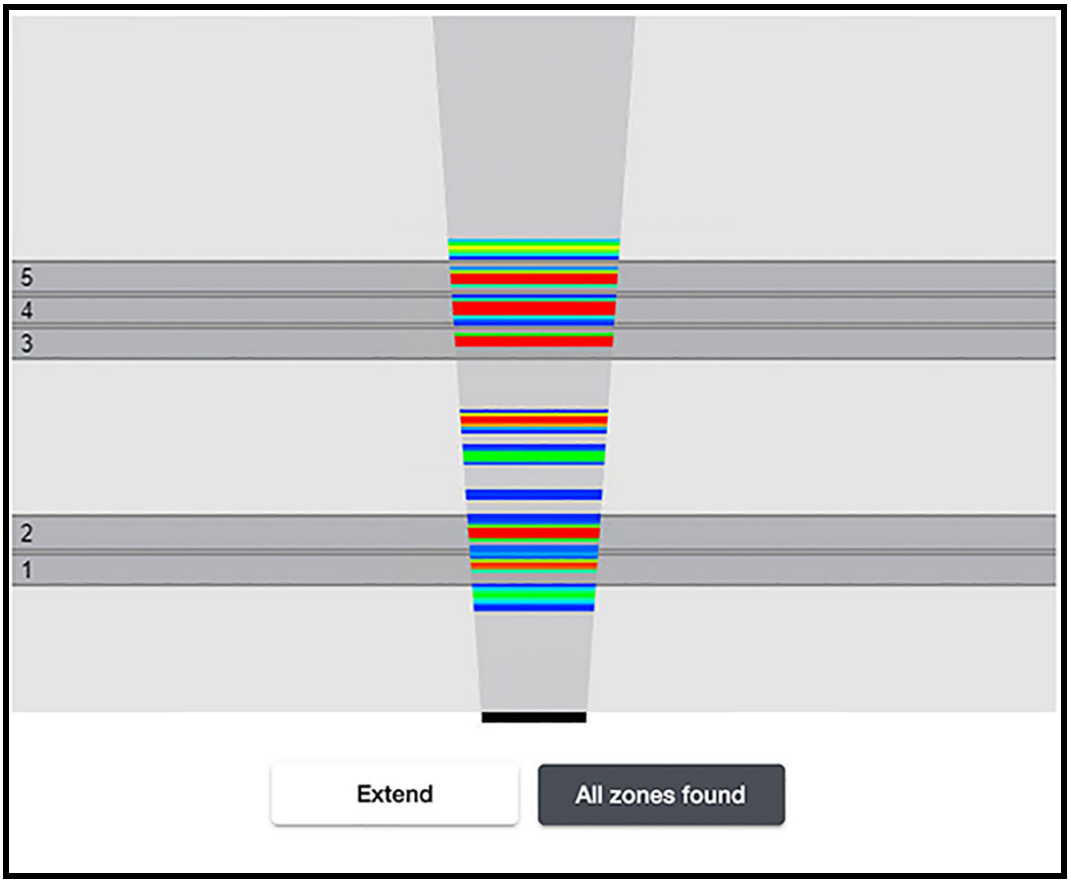
The auto zone finder process scans the range of the RTMS Echo beam and positions up to 12 detection zones, representing lanes where vehicles are detected. The process requires free flowing traffic in all lanes of interest and is dependent on traffic volume being present. Approximately 20 vehicles are needed to fully define the lane boundaries for each zone. The auto zone finder will time out after eight and a half minutes even if 20 vehicles have not been detected per zone. If all zones are discovered prior to the eight and a half minutes, you can select All zones found to complete the process.

IMPORTANT: If the auto detect function is run after a zone configuration has already been established (auto detect was run once before), a new set of internal zone identifiers are established. The data associated with the previous zones is no longer available through the queries on the Data tab. However, the data can still be retrieved through use of the Echo API if the zone identifiers of the previous zones are known (see the Zones Identifier query in the *RTMS Echo API Guide*).

1. Select the **Zones** tab.
2. Click **Auto detect zones**.

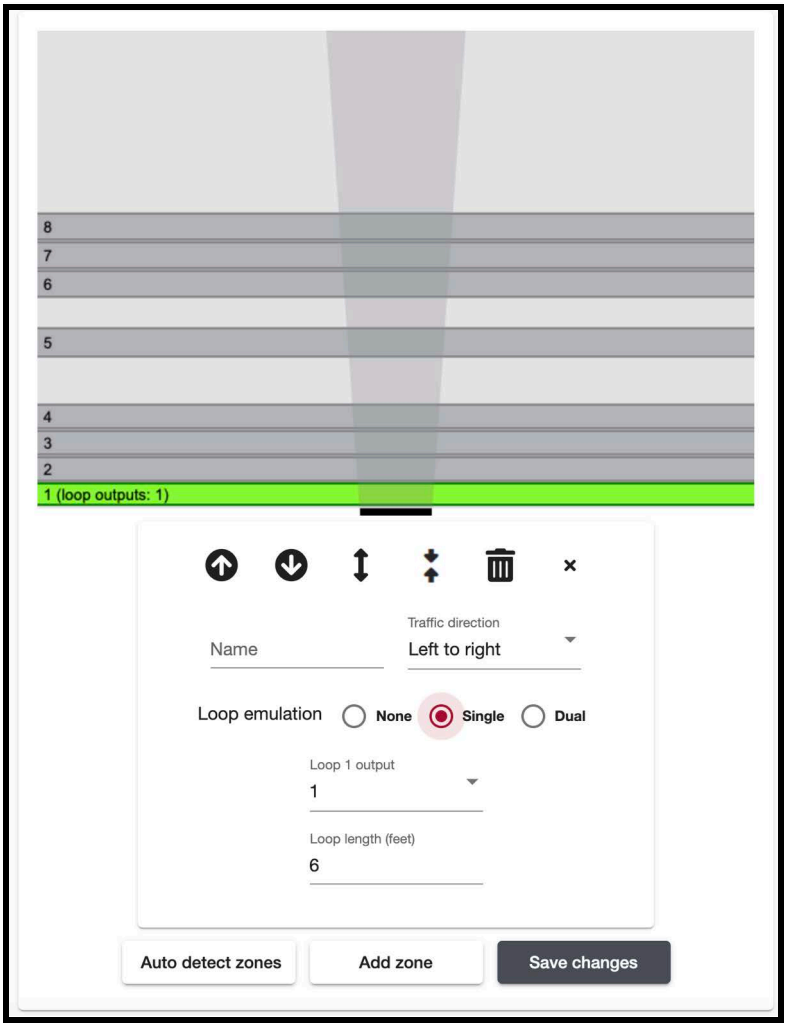


There will be about one and half minutes of prep time before detection begins. As objects are detected, the detection heat map appears in the radar beam image. Zones will appear when the system has determined that the detected objects are vehicles instead of stationary objects (i.e., barriers, etc.). The full process, including prep time, takes approximately eight and a half minutes; however, if all zones in the detection area appear, you can click **All zones found** to stop the process.



After the eight and a half minutes, the process has timed out and an extend button appears. The purpose to extend is if the required number of vehicles have not gone through the zone(s) needed.

3. Click on the first zone.



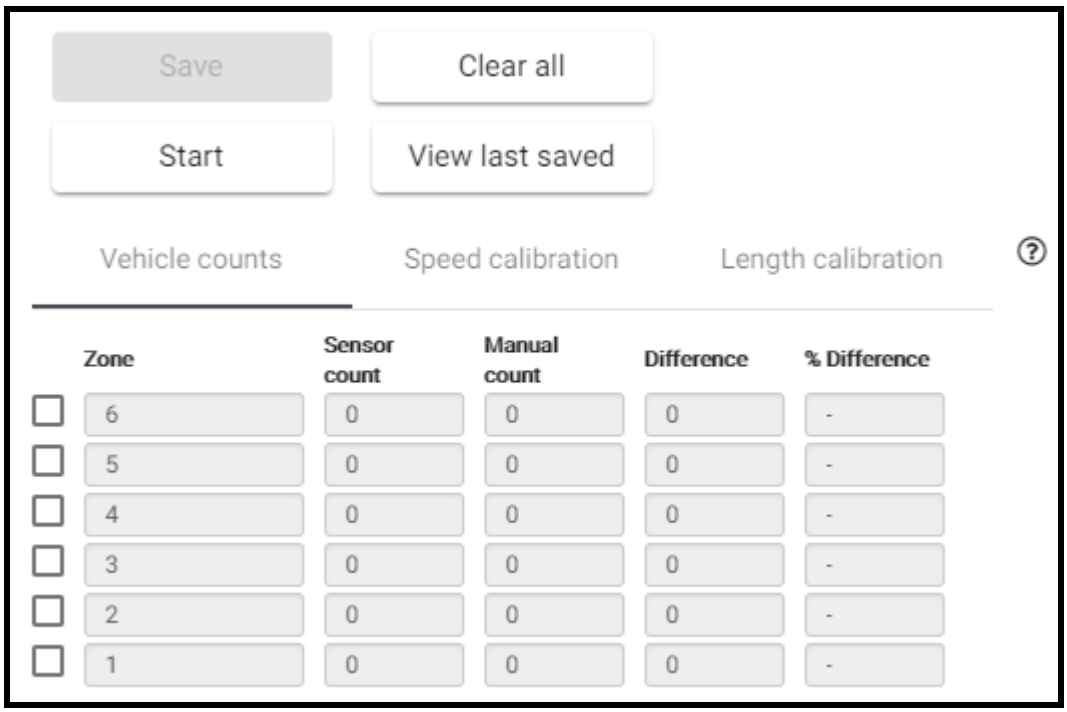
4. Enter a name for the zone. A maximum of 25 characters can be entered.
5. Click the drop-down under **Traffic direction** and select the direction of traffic in the zone.
6. Repeat Steps 3-5 for the remaining zones.
7. To widen, shorten, or adjust zone positions, use the controls provided on the tab.
8. When complete, click **Save changes.**
9. Verify vehicle counts.

Verifying Vehicle Counts

The vehicle count verification of a successful zone setup is an essential part of the installation. During the process you will compare RTMS Echo volume counts over a period of time to a manual (visual) count for the same interval. Use of a hand-held tally counter is recommended.

IMPORTANT: The recommended and most accurate method of verifying vehicle counts is to perform the verification individually on each zone. However, if a sufficient number of personnel are available, all zones can be verified simultaneously. This alternate process requires at least one person per zone for manual count purposes.

1. Select the **Calibrate** tab.



2. To ensure that all columns are set to zero, click **Clear all**.
3. Select the check box for the zone(s) for which vehicles are to be counted.

NOTE: There should be one person with a hand-held counter monitoring each zone selected.

4. Click **Start** and immediately begin manually counting vehicles as they cross the radar beam.
5. Continue counting until a minimum of 50 vehicles have been counted for each selected zone.
6. Click **Stop**.

7. Enter the number(s) from the counter into the Manual Count column.

   The difference between the Sensor Count and Manual Count in difference and percentage of deviation is immediately calculated.

   If the Sensor Count is greater than the Manual Count by 5% or more, this could be caused by:

   - "Splashing" (vehicles in one zone are shown as being detected in an adjacent zone)
   - Lane changing
   - Reflections from fixed objects

   If the Sensor Count is less than the Manual Count by 5% or more (negative percentage), this could be caused by:

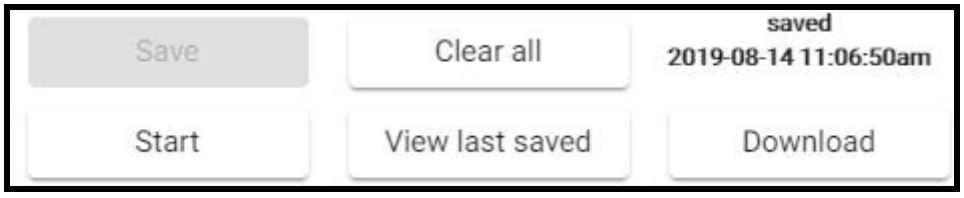
   - Missed small vehicles
   - Occlusions
   - Incorrect aiming

8. Are any of the percentages over five percent (either plus or minus)?

Yes	No
You should make corrections before continuing. See "Optimizing Volume Count Accuracy" on page 7-2. After adjustments have been made, repeat the verification process.	Continue with the next step.

9. To save the accumulated results of verification to a file in the sensor's memory, click **Save**.

   A download option appears.

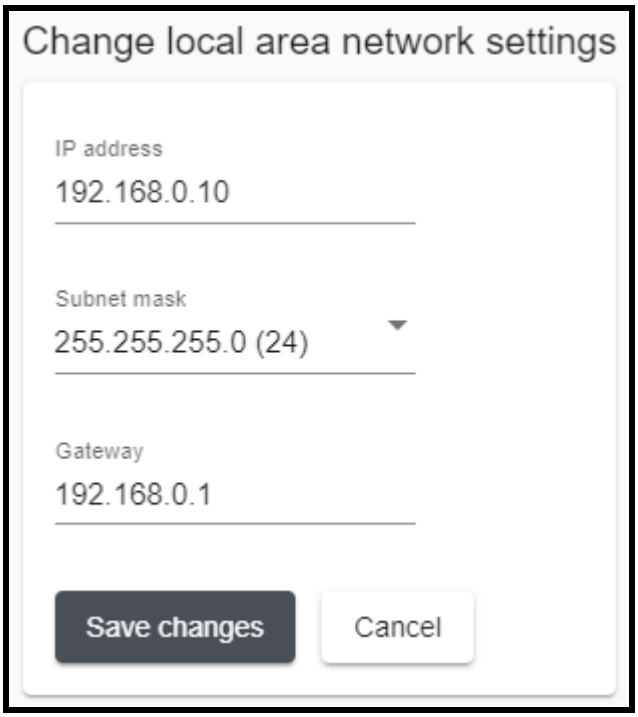


10. To download the saved file to your computer, click **Download**. The file is saved to your default folder as a CSV file.

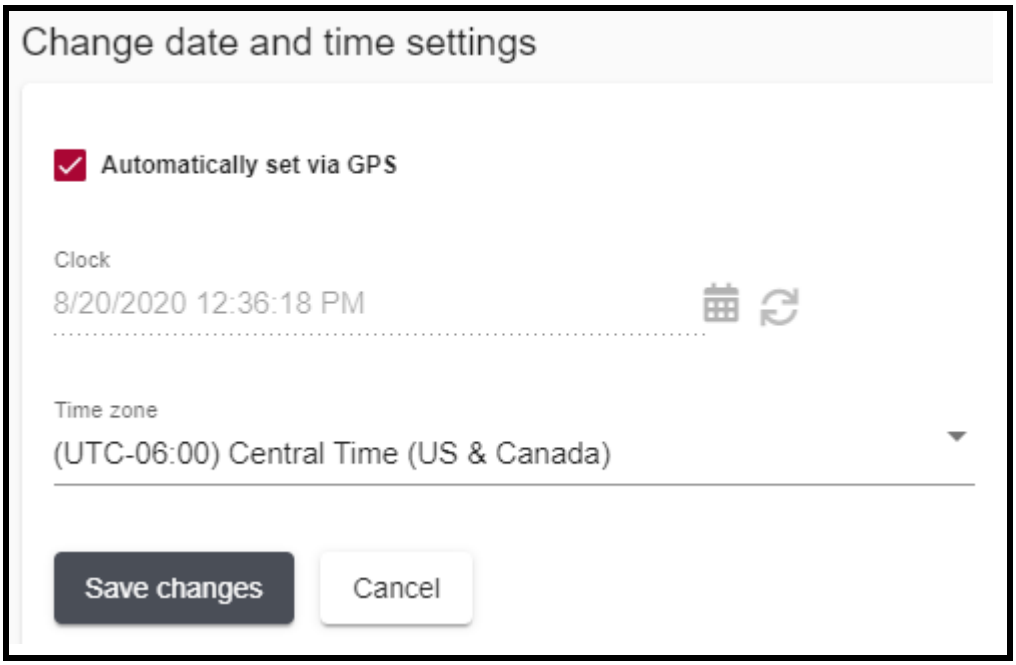
Configure Settings

At minimum, the setting for the sensors IP address and time zone should be changed from the defaults.

1. Select the **Settings** tab.
2. In the **Local area network** section, click **Change**.



3. Enter the IP address, Subnet mask and Gateway.
4. Click **Save changes**.
5. In the **Date and time** section, click **Change**.



6. Select the time zone where the RTMS Echo sensor is installed.
7. Click **Save changes**.
8. Make any other required changes. For complete information on the various settings and how to change them, see "Settings Tab" on page 4-43.

Chapter 4: Operations and Adjustments

General

This chapter describes operations that can be performed and adjustments that can be made after the RTMS Echo is installed and configured.

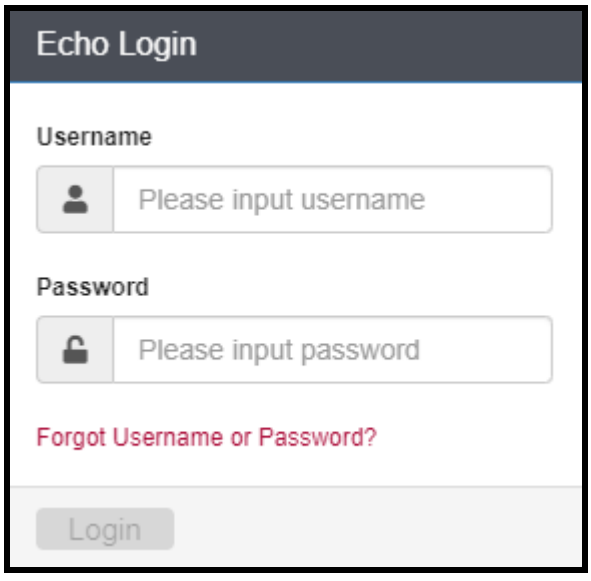
Logging in to the RTMS Echo

The following describes the procedure for logging in to the RTMS Echo, after you have set the network parameters for the sensor (see "Local Area Network Setting" on page 4-46).

NOTE: Users can log in to the Echo application from any device running an HTML5 compatible browser, such as Google Chrome. Browsers such as Firefox and Edge are partially HTML5 compatible and users may experience some differences when using them.

1. Start your internet browser. **Note**, the screen shots shown below are taken from Google Chrome and Firefox.
2. In the address field, type the IP address of the RTMS Echo.
3. Press **Enter**.
4. Enter your login credentials.

   If this is your first time logging in to the RTMS Echo, see "Logging in to the Sensor" on page 3-5.

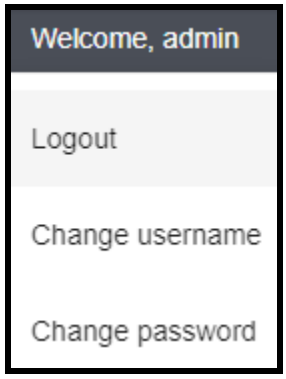


5. Click **Login**.

Change Login Credentials

This procedure can be used to change the login username and/or password.

1. Log in to the Echo sensor.



2. On the right side of the page, click on **Welcome**.
3. Do you want to change the username or password?

Username	Password
Continue with the next step.	Proceed to Step 8.

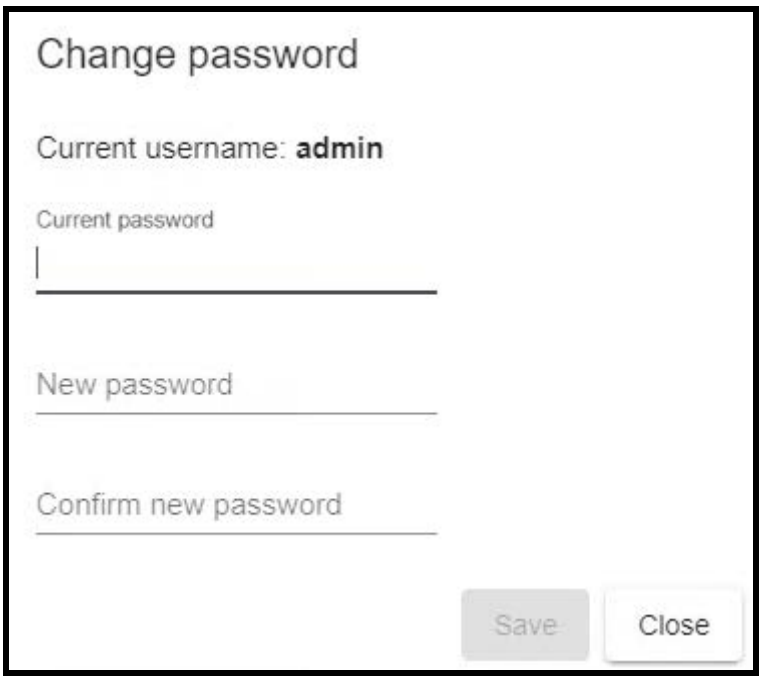
4. Click **Change username**.

5. Enter the new username.
6. Enter the current password.

7. Click **Save**.

   The new username will be required the next time the user logs in to the Echo sensor.

8. Click **Change password**.



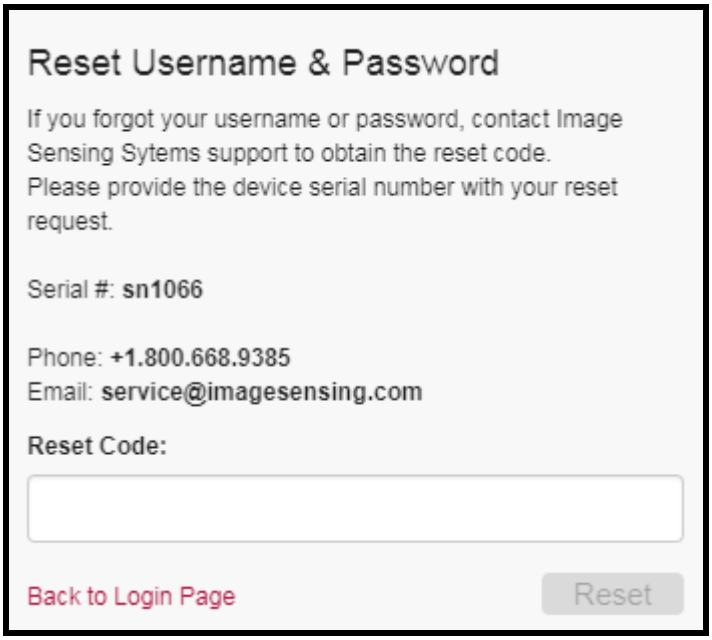
9. Enter the current password.
10. Enter the new password.
11. Re-enter the new password.
12. Click **Save**.

    The new password will be required the next time the user logs in to the Echo sensor.

Reset Login Credentials

This procedure can be used if the login username or password was changed from the default and the new name and/or password has been forgotten.

1. Start a network browser.
2. In the url field, enter the IP address of the RTMS Echo sensor.
3. Click **Forgot Username or Password**.



4. Call the number or send an email to the address shown on the screen.

   You will need to provide the Serial number shown and indicate that this is for a reset of the username and/or password.
5. When the reset code is received, enter it in the space provided.
6. Click Reset.
7. Log in to Echo using the new credentials.

Home Tab

The Home tab provides a display of the current vehicle detections occurring for each zone. The display can be set to show either the speed or length of each detected vehicle. This tab also shows how much of the sensor's memory has been used and the input voltage for the sensor.

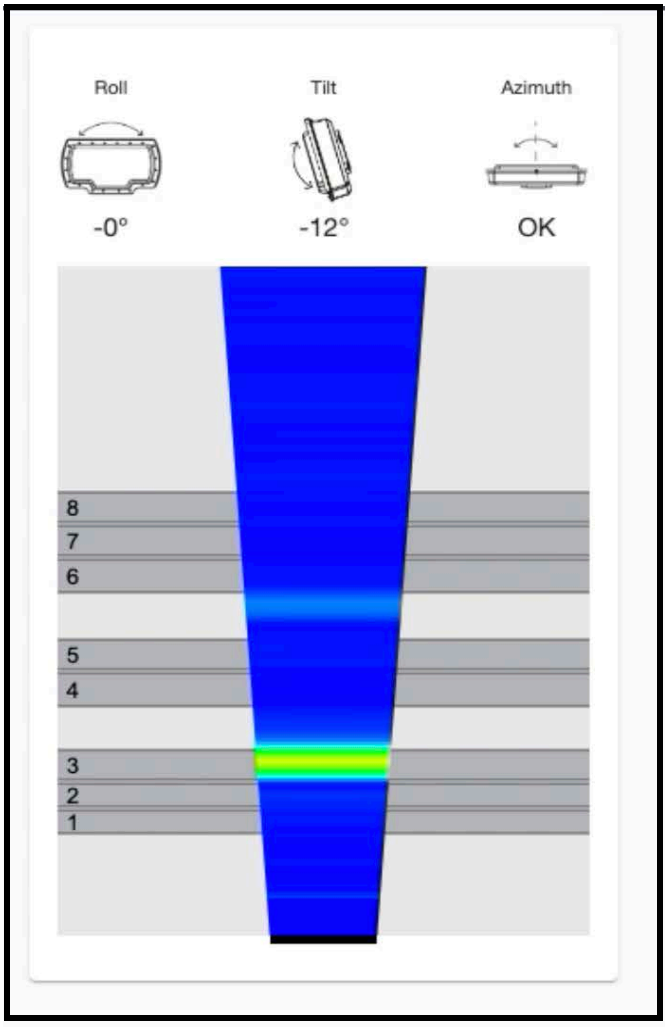
Figure 4-1: Home Tab

Table 4-1: Home Tab Descriptions

Item	Description
1	Zone indicators.
2	Representation of real vehicles in the zone.
3	Radar beam.
4	Select whether the live vehicle display shows vehicle speed or length.
5	Percentage of the number of aggregated records currently in this data table. One record is created for each zone during each period as defined by the interval period in the Settings tab.
6	Percentage of the number of per vehicle records currently in this data table.
7	The input voltage to the sensor. The best performance is when the value is between 12V and 24V.

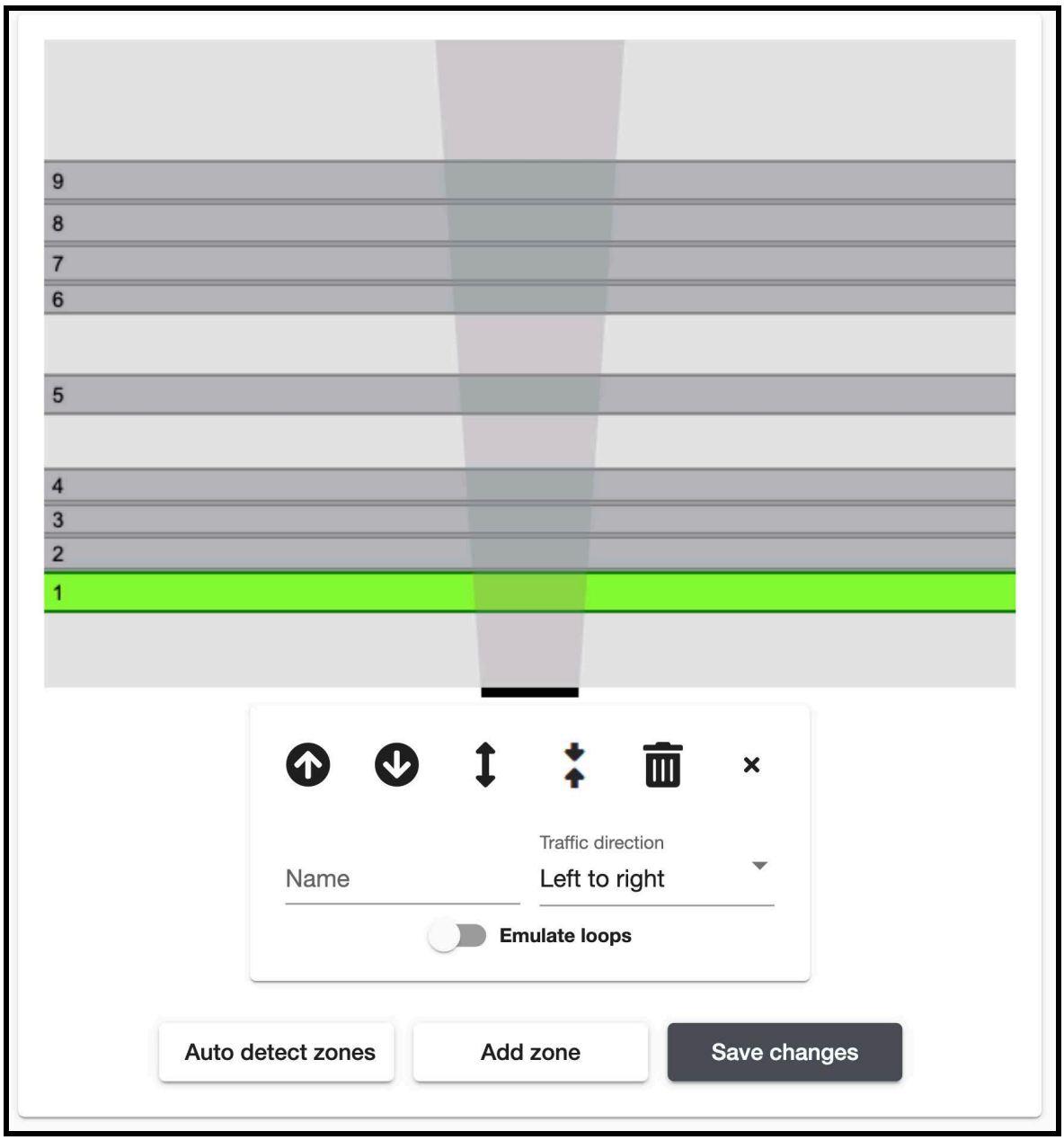
Aim Tab

This tab is used to set the roll, tilt and azimuth of the sensor during the installation process. For more information see "Aiming the Sensor" on page 3-7.



Zones Tab

This tab is used to add, remove and edit zones, and to set the direction of traffic for a zone. This tab is also used to start the automatic zone detection operation.

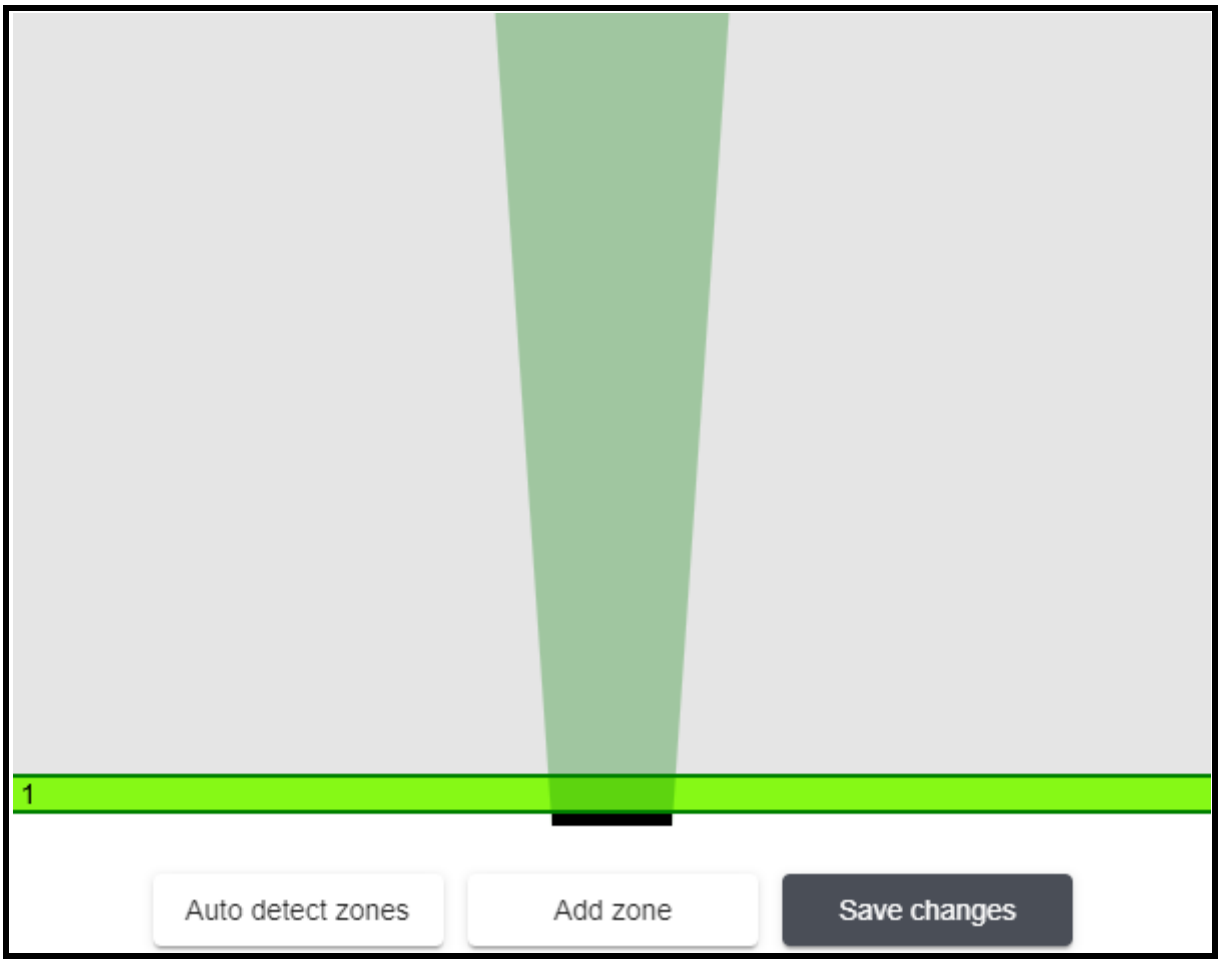


Add a Zone

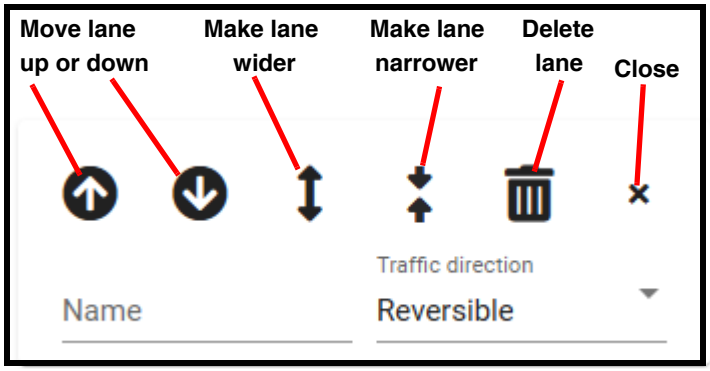
This function is used to add a zone manually to the configuration.

NOTE: If adding a zone to a previously defined configuration, a pop-up message will appear indicating that the accumulated data for all zones will be deleted.

1. Click the **Zones** tab.



2. Click **Add zone**.
3. Move the cursor onto the zone until a hand icon appears, then click the zone to select it and display the control panel.



4. Use the controls to move the position of the lane up or down, to widen the lane or make it narrower. **Note**, the lane can also be moved by clicking on it then moving it with the mouse.
5. To add a name for the zone, enter a maximum of 25 characters, including alphanumeric, special and space characters.
6. Click the drop-down under **Traffic direction** and select the direction of traffic in the zone.
7. Repeat steps Steps 2 – 6 to add other zones.
8. After all zones have been added, click **Save changes**.

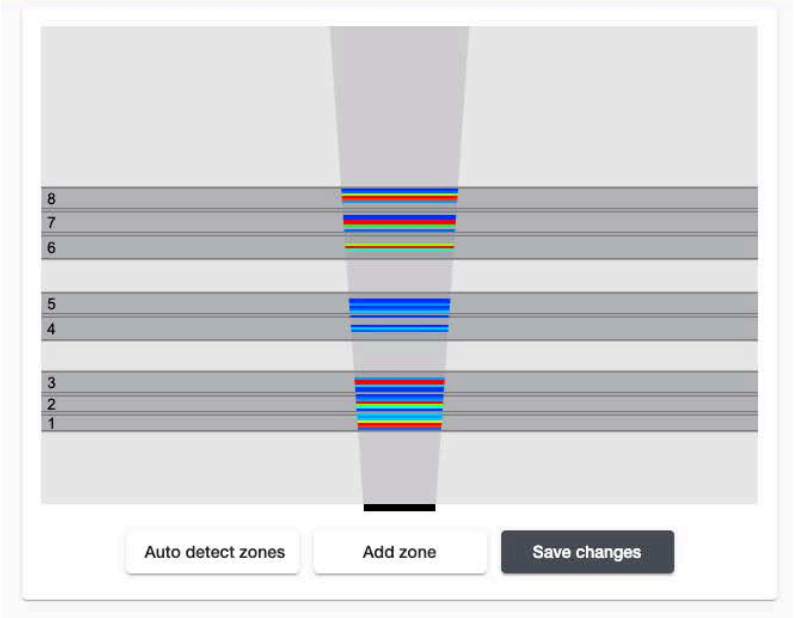
Edit a Zone

This function is used to change the position, name, or traffic flow indicator for a zone.

1. Click the **Zones** tab.
2. To change the position of the zone, click on it. When the hand icon appears, move the zone up or down as needed, or use the controls to move, widen or make the zone narrower.
3. To change the name, highlight it and enter a new name.
4. To change the traffic flow direction, click the drop-down to the right of the current flow indicator and select a new direction.
5. After all changes have been made, click **Save changes**.

Detection Heat Map

After you save the edits to the zone, the detection heat map will begin to populate automatically. This allows you to verify where vehicles are being detected with relation to your zone placement. Below is a screenshot showing the detection heat map.



Remove a Zone

This function removes a zone permanently from the configuration.

NOTE: If removing a zone from a previously defined configuration, a pop-up message will appear indicating that the accumulated data for all zones will be deleted.

1. Select the zone to be removed.
2. Click the remove (trash can) icon.
3. Click **Save changes**.

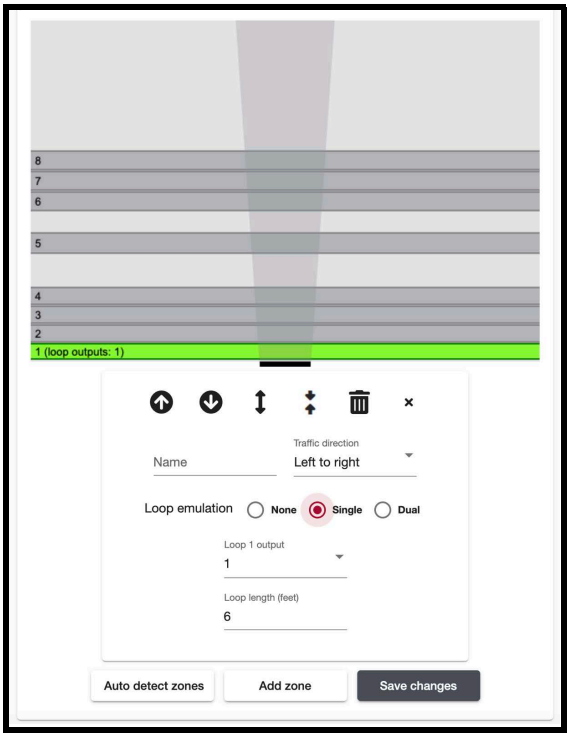
Auto Detect Zones

This function is used to automatically detect and add zones to the configuration. Zones are added as traffic is detected. For more information, see "Detect and Adjust Zones" on page 3-8.

Emulate Loops

This function only appears for an Echo device that has been licensed for Loop Emulation via Contact Closures and when a Contact Closure device is selected on the **Settings** page.

1. Click the **Zones** tab.



NOTE: If Loop emulation options do not appear, refresh the page in the browser.

2. Click on the desired zone to highlight it.
3. If emulating a single loop, select Single.
4. Enter the Loop output of the contact module that is associated with the emulated loop.
5. Enter a value for Loop length.
6. If emulating a dual loop, select Dual.
7. Enter the Loop outputs of the contact module that are associated with the emulated loops.
8. Enter values for Loop length and Trap length.
9. Click **Save changes**.

Calibrate Tab

This tab is used to verify vehicle counts in the defined zones and to adjust the calibration of vehicle speeds and lengths.

Vehicle Counts

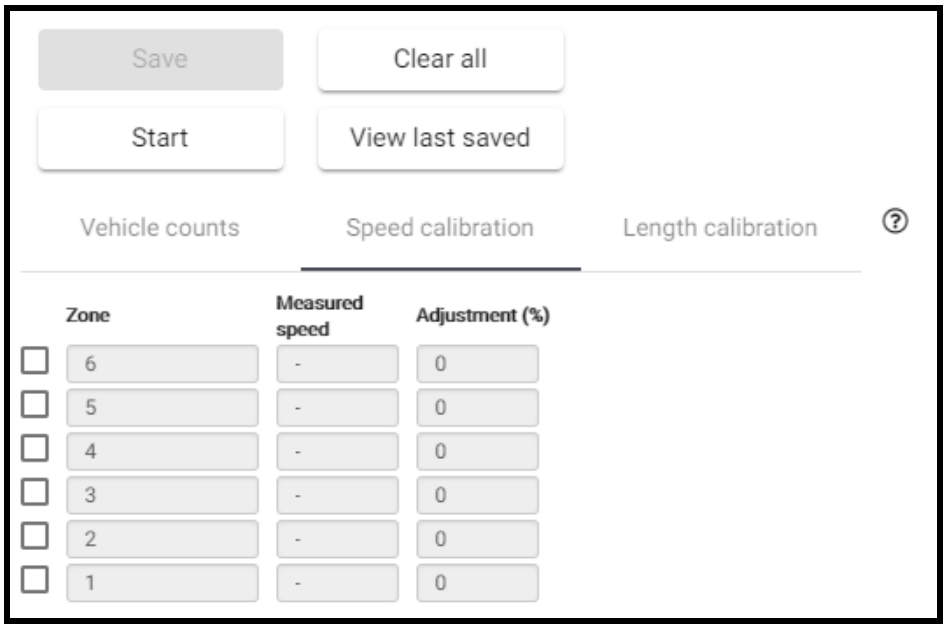
For information about the vehicle counts section, see "Verifying Vehicle Counts" on page 3-12.

Speed Calibration

This function is used to adjust the vehicle speed detected by the Echo sensor if required.

NOTE: RTMS Echo cannot be used for speed enforcement.

1. Click the **Calibrate** tab.
2. Click **Speed calibration**.



3. Select the check box to the left of each zone for which speeds are to be checked.
4. Click **Start**.
5. If the value in the Measured Speed column is not correct, enter the difference in the **Adjustment** column.

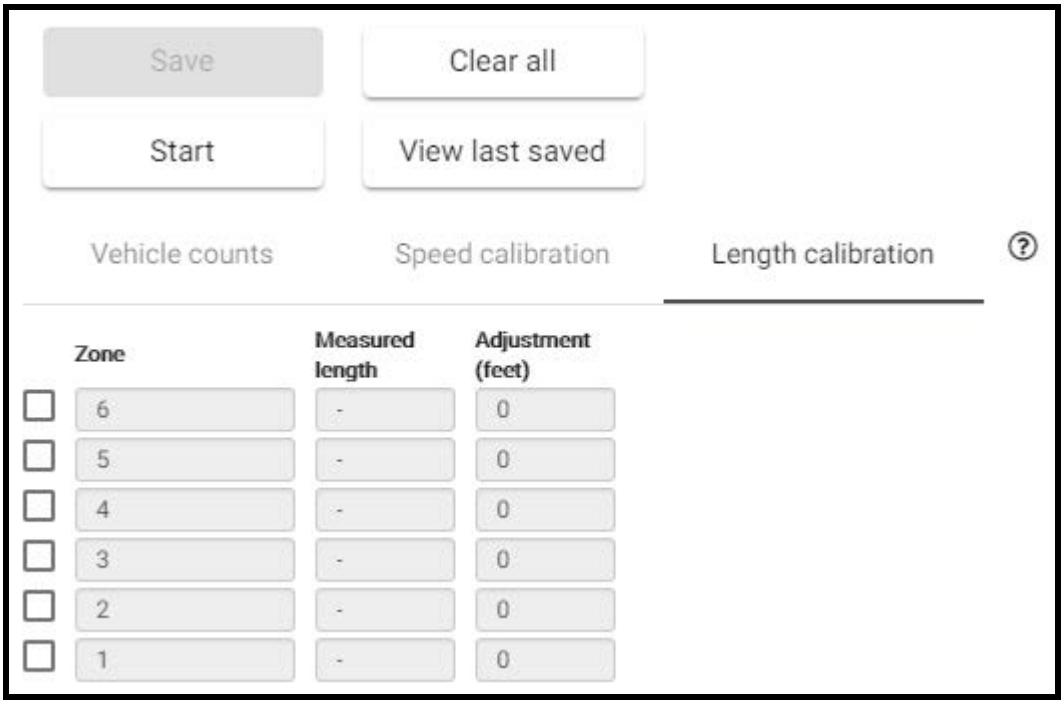
   The value must be expressed as a percentage between +/- 10 and must be a whole number (e.g., 4 is OK but 4.5 is not).

   All detected speeds for the lane will be adjusted by the amount specified.
6. To save the values, click **Save**.

Length Calibration

This function is used to adjust the vehicle length detected by the Echo sensor if required.

1. Click the **Calibrate** tab.
2. Click **Length calibration**.



3. Select the check box to the left of each zone for which lengths are to be checked.
4. Click **Start**.
5. If the value in the Measured length column is not correct, enter the difference in the **Adjustment** column.

   The value specified can be between +/- 10 and can have one decimal place (e.g., 3.2, 1.4, etc.).

   All detected lengths for the lane will be adjusted by the amount specified.
6. To save the values, click **Save**.

Data Tab

This tab is used to run queries based on the collected data. Click the drop-down indicator to the right of **Query** to see a list of available queries. In the list that appears there are three date ranges shown.

- The Interval Data Range indicates the earliest record available when doing an Interval Data query. Traffic data is aggregated during the interval defined in the Settings tab for the time period specified in the query. This provides a number of pre-defined traffic data types in a single interval record.
- The Occupancy Data Range indicates the earliest record available when doing an Occupancy Data query. Because Occupancy data is stored every five seconds for each zone, the date range shown might be different from the other two data ranges.
- The Per-vehicle Date Range indicates the earliest record available for all queries except Interval and Occupancy Data. The per-vehicle queries generate on-demand access to specific traffic data generated from the per-vehicle data. The queries can be customized with user inputs.

To obtain the data:

1. Click the drop-down next to **Query**.
2. Select the query type.
3. Enter the necessary inputs.

   NOTE: If non-valid selections appear when clicking in a parameter field, the forms auto-fill option in the browser history needs to be cleared.

4. Click **Download** to create a CSV file containing the data.

For individual query formats, see the following:

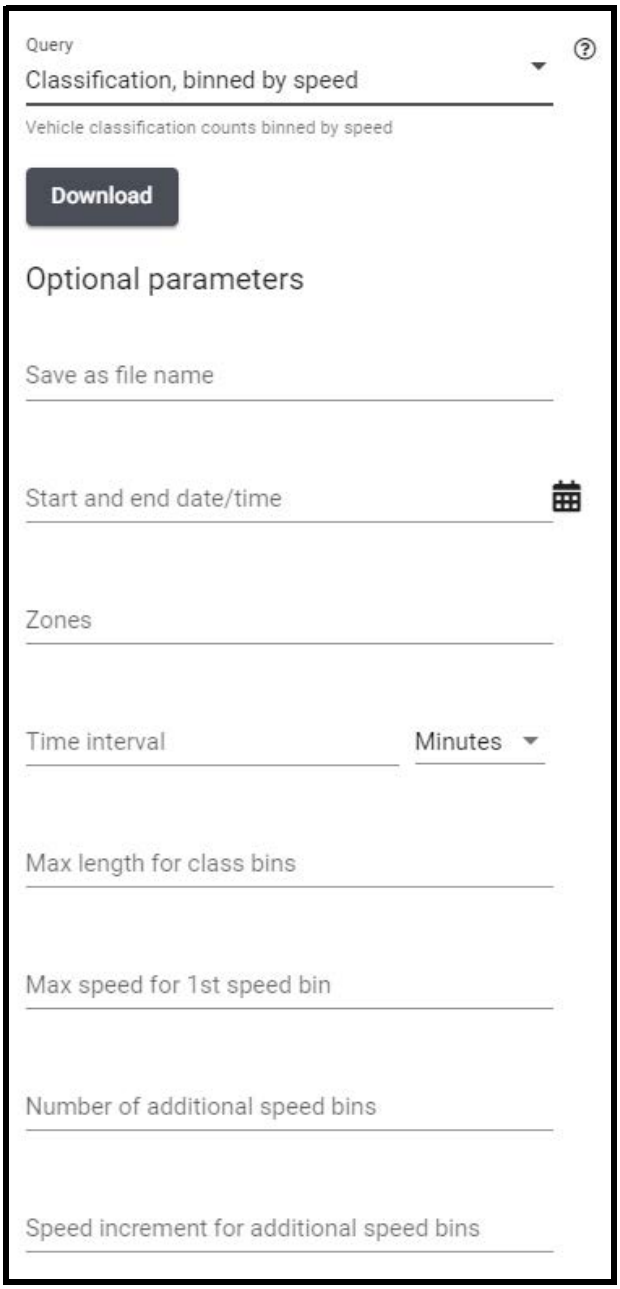
- "Classification By Binned Speed Data Query" on page 4-16
- "Classification by Length Data Query" on page 4-19
- "Gap Average Data Query" on page 4-21
- "Headway Average Data Query" on page 4-23
- "Interval Data Query" on page 4-25
- "Occupancy Data Query" on page 4-27
- "Per-Vehicle Data Query" on page 4-29
- "Speed 85th Percentile Data Query" on page 4-31
- "Speed Average Data Query" on page 4-33
- "Speed By Bin Data Query" on page 4-35
- "Voltage Query" on page 4-38
- "Volume Data Query" on page 4-40

Classification By Binned Speed Data Query

This query returns speed data spread over several user-customizable bins based on vehicle classification.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

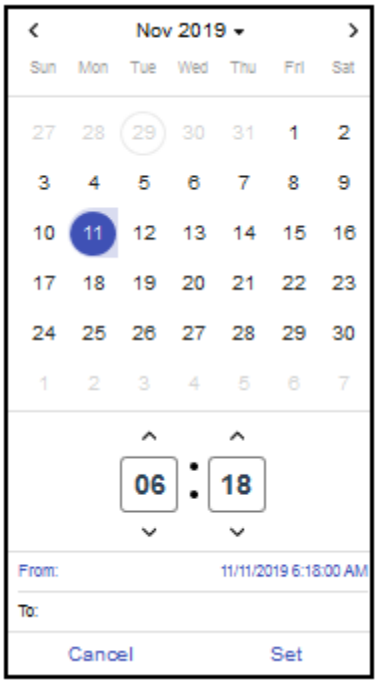
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Classification, binned by speed**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is speed-class-bin.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the **From** field.
6. Select the ending date and time of the query. It will appear in the **To** field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.

9. Select the time frame and enter the interval for which data is to be binned.

   The value must be less than or equal to the difference between the start and end times. If omitted, the default is 15 minutes.

10. Enter the length of each class bin.

Multiple bins can be specified by separating the bins with a space (e.g., 5 7 10, etc.). If omitted, the default class bins will be 5, 7, 10, 15, and 20.

11. Enter the speed of the initial bin.

    If omitted, the default value is 20.

12. Enter the number of speed bins to be included in the result.

    If omitted, the default is 15. The query will always include one additional bin, the Nth + 1 bin, where N is the speed-bin-count, to indicate the number of vehicles with speeds greater than the Nth bin.

13. Enter the speed increment of each bin after the initial setting.

    If omitted, the default is 5.

14. To run the query, click **Download**.

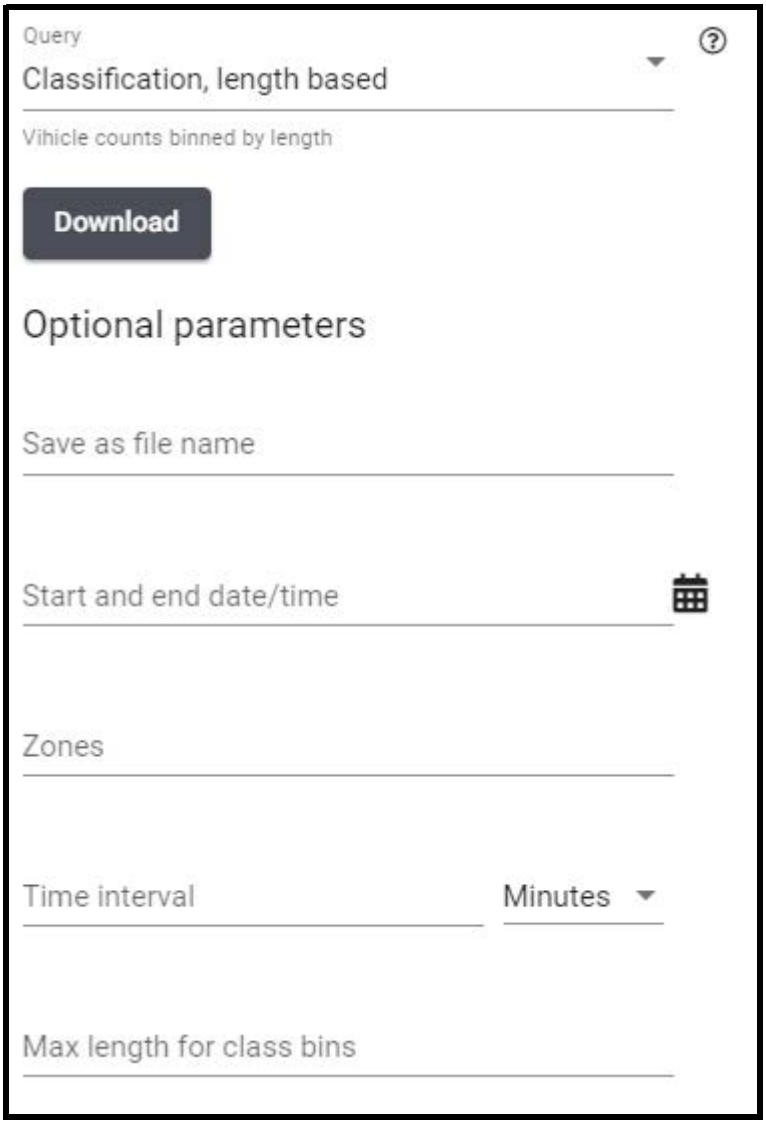
    The requested data is saved as a CSV file in the Downloads folder.

Classification by Length Data Query

This query returns the count of the different classes of vehicles, according to length, detected in one or more zones over a statistical interval.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

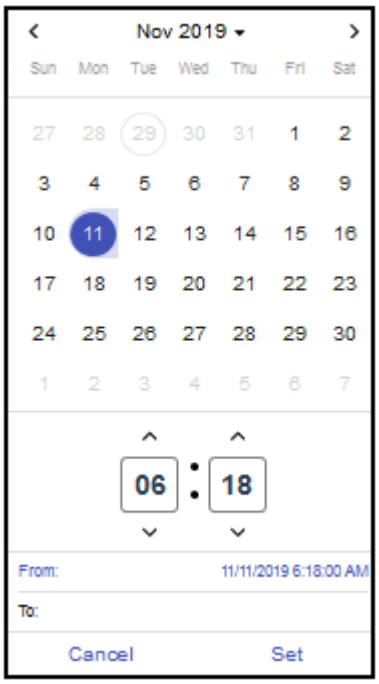
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Classification, length based**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is class-bin.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be binned.

   The value must be less than or equal to the difference between the start and end times. If omitted, the default is 15 minutes.
10. Enter the length of each class bin.

    Multiple bins can be specified by separating the bins with a space (e.g., 5 7 10, etc.).If omitted, the default class bins will be 5, 7, 10, 15, and 20.
11. To run the query, click **Download**.

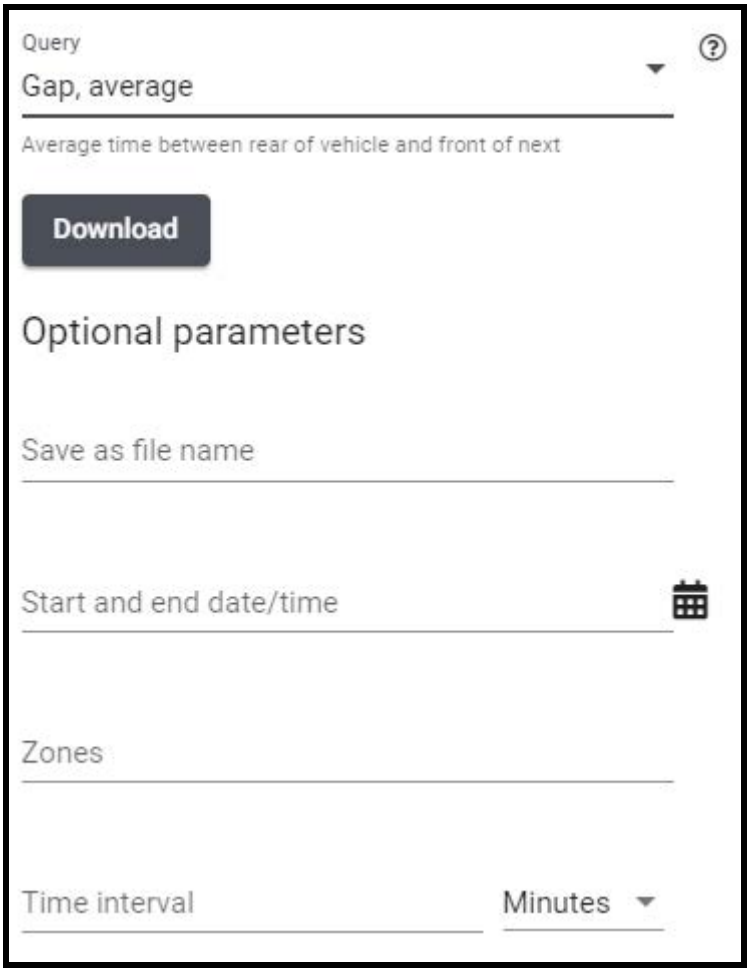
    The requested data is saved as a CSV file in the Downloads folder.

Gap Average Data Query

This query returns the average of gaps over a statistical interval. The gap is the difference between the time when the rear of a vehicle leaves at a point on the highway and the time the front of the next vehicle arrives at the same point (in seconds).

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

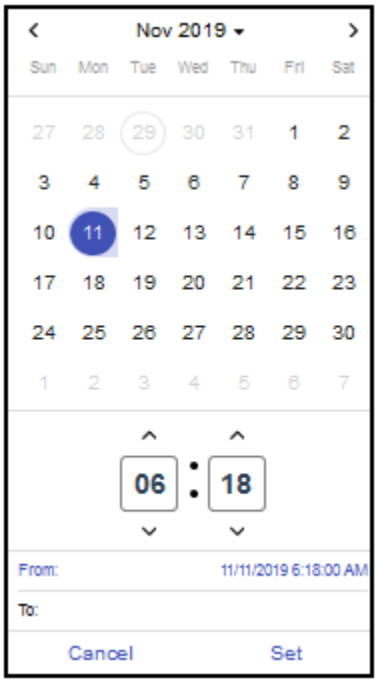
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Gap, average**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is average-gap.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be included in the download.

   If omitted, the default is 15 minutes.
10. To run the query, click **Download**.

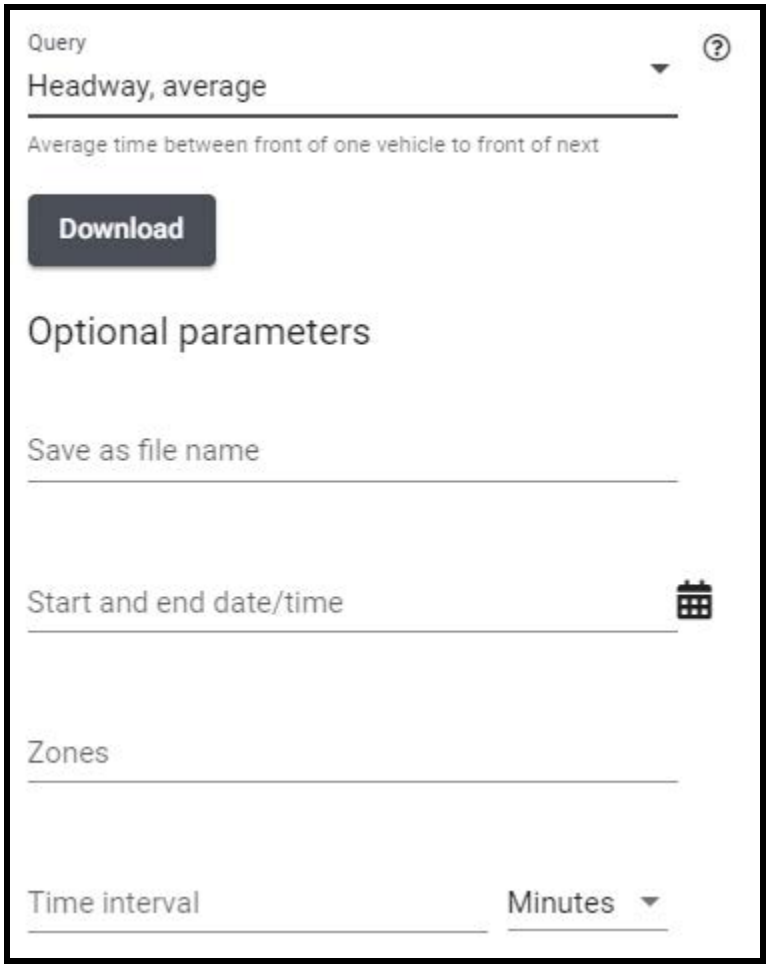
    The requested data is saved as a CSV file in the Downloads folder.

Headway Average Data Query

This query returns the average of headways over a statistical interval. Headway is the difference between the time when the front of a vehicle arrives at a point on the highway and the time the front of the next vehicle arrives at the same point (in seconds).

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

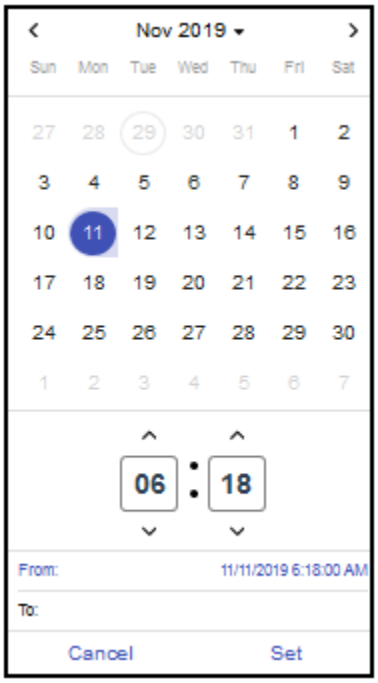
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Headway, average**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is average-headway.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be included in the download.

   If omitted, the default is 15 minutes.
10. To run the query, click **Download**.

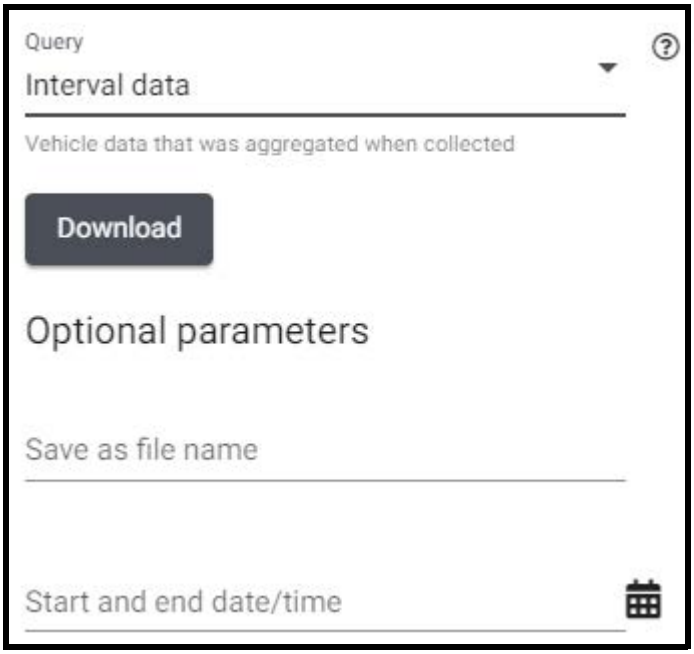
    The requested data is saved as a CSV file in the Downloads folder.

Interval Data Query

This query returns vehicle data that was aggregated when collected over a statistical interval.

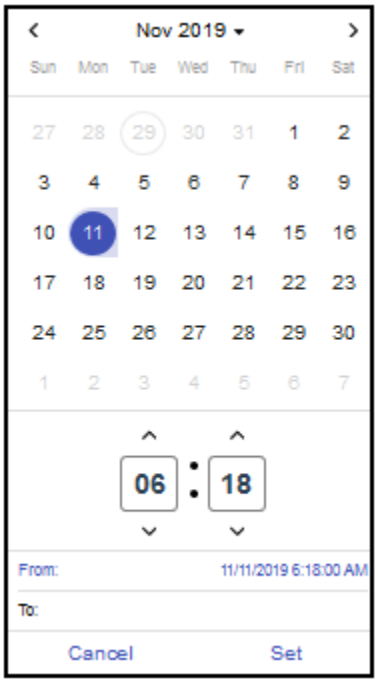
NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Interval data**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is interval-data.
4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Select the maximum number of records to be returned in the response.
9. To run the query, click **Download**.

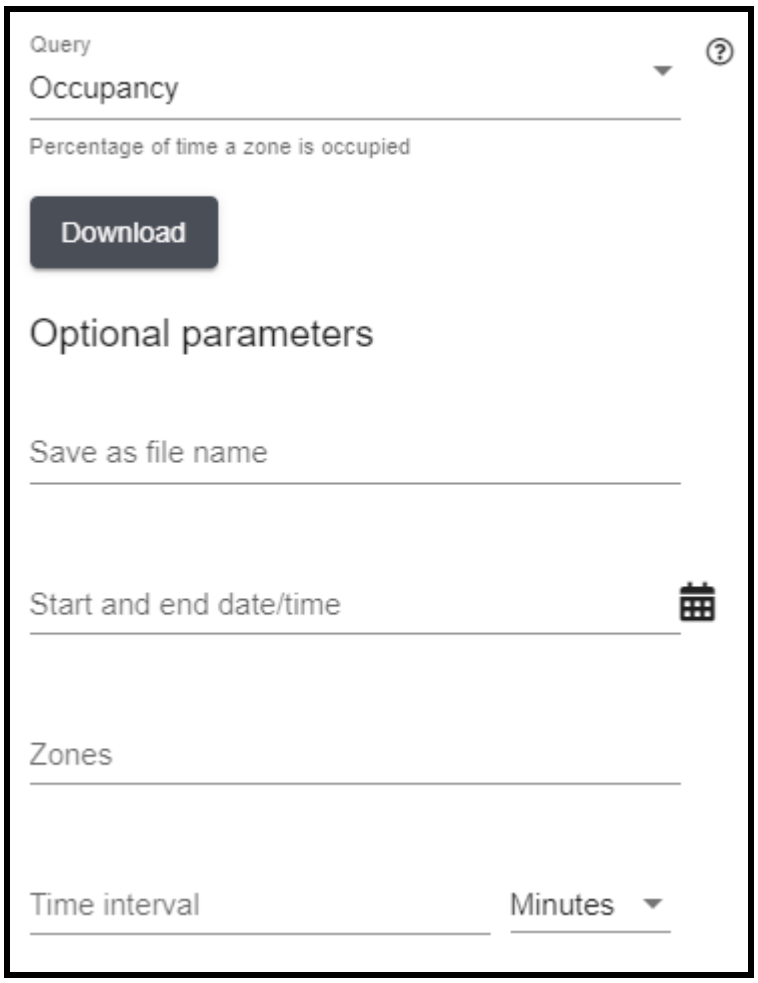
   The requested data is saved as a CSV file in the Downloads folder.

Occupancy Data Query

This query returns the percentage of time a zone is occupied by a vehicle.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

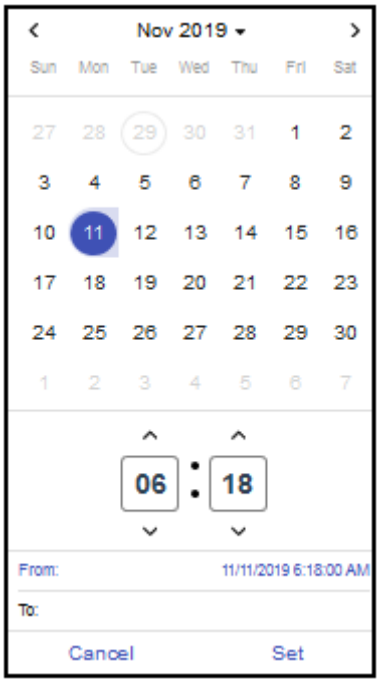
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Occupancy**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is occupancy.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the response.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be included in the download.

   For Seconds, the interval must be a multiple of 5 (i.e., 5, 10, 25, etc.).

   If omitted, the default is 15 minutes.
10. To run the query, click **Download**.

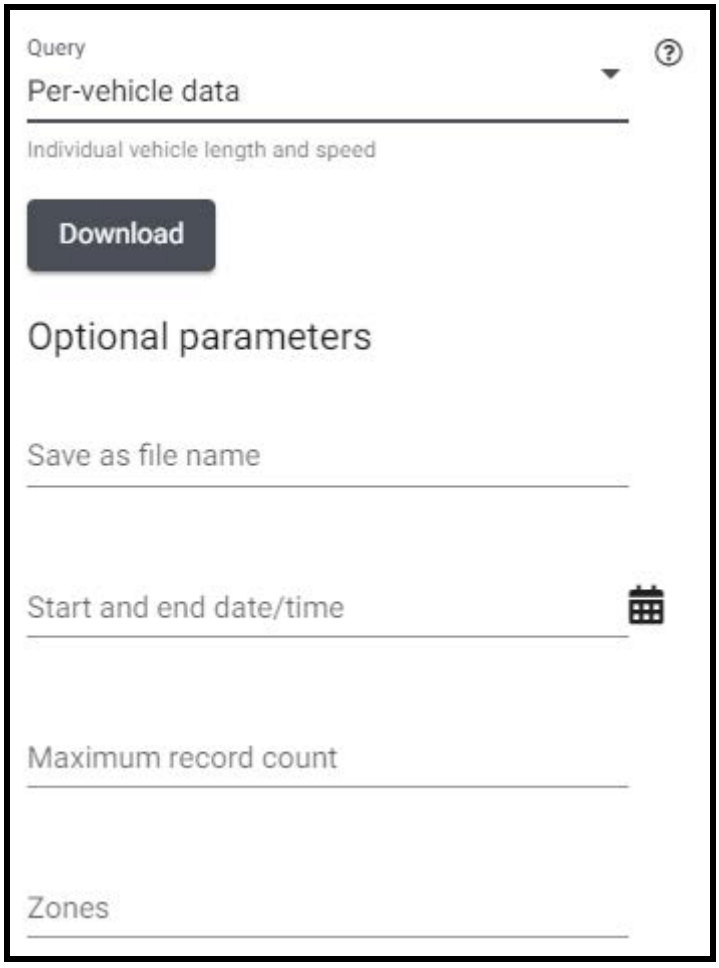
    The requested data is saved as a CSV file in the Downloads folder. The value shown in the Occupancy column is the actual percentage.

Per-Vehicle Data Query

This query returns the length, speed and direction (left or right) for each vehicle detected in a zone over a statistical interval.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

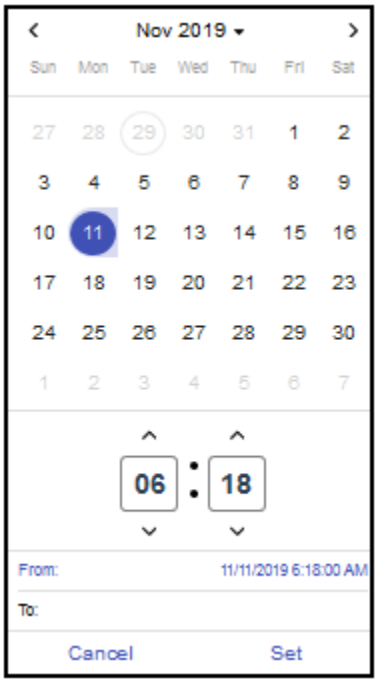
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Per-vehicle data**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is per-vehicle.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Select the maximum number of records to be returned in the response.
9. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
10. To run the query, click **Download**.

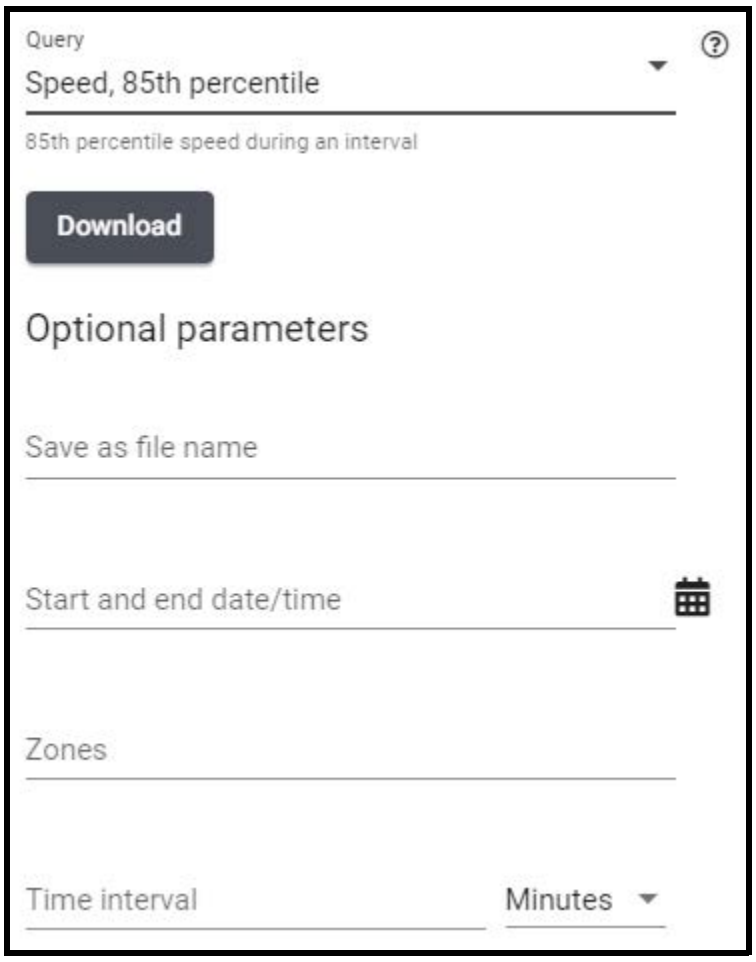
    The requested data is saved as a CSV file in the Downloads folder.

Speed 85th Percentile Data Query

This query returns the speed that 85 percent of the vehicles travel at or below during the requested interval.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

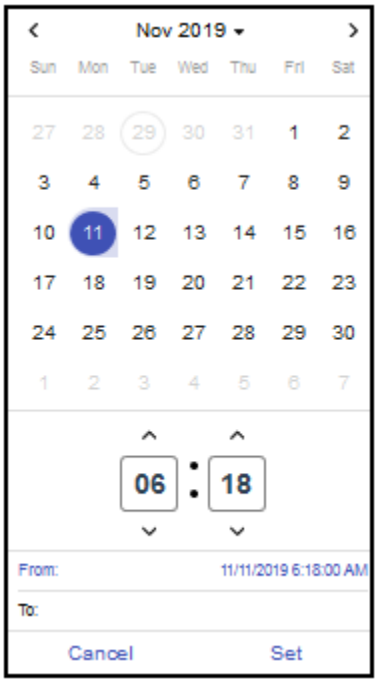
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Speed, 85th percentile**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is speed85.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be included in the download.

   If omitted, the default is 15 minutes.
10. To run the query, click **Download**.

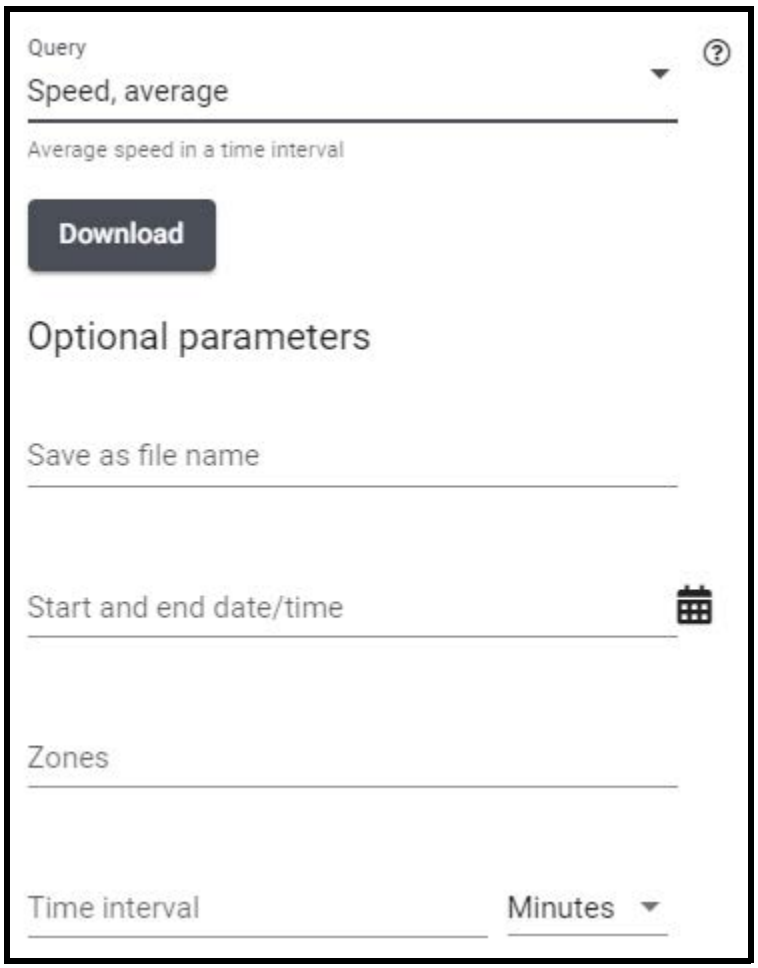
    The requested data is saved as a CSV file in the Downloads folder.

Speed Average Data Query

This query returns the average speed of all vehicles detected in a zone over a statistical interval.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

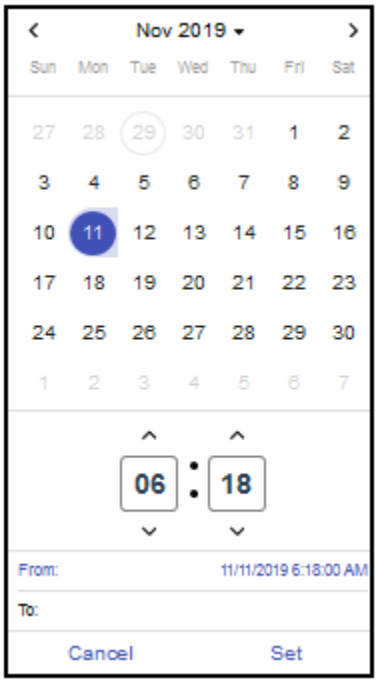
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Speed, average**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is average-speed.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be included in the download.

   If omitted, the default is 15 minutes.
10. To run the query, click **Download**.

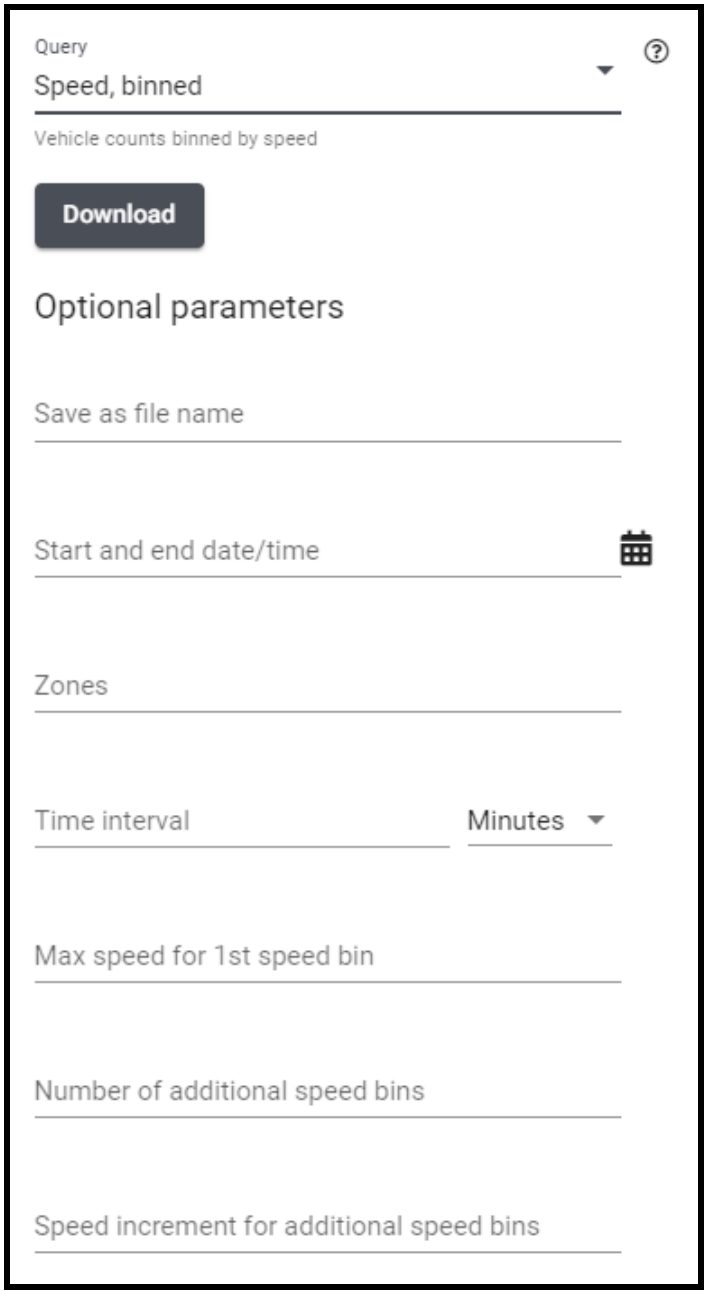
    The requested data is saved as a CSV file in the Downloads folder.

Speed By Bin Data Query

This query returns speed data spread over several user-customizable bins. The results can be reported for individual zones or aggregated over all zones.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

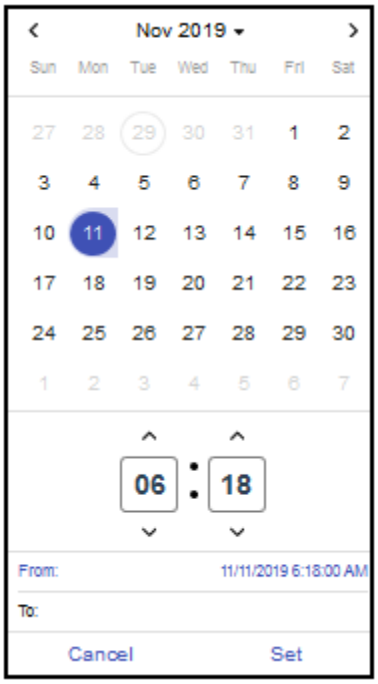
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Speed, binned**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is speed-bin.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank (default).

9. Select the time frame and enter the interval for which data is to be binned.

   The value must be less than or equal to the difference between the start and end times. If omitted, the default is 15 minutes.

10. Enter the speed of the initial bin.

    If omitted, the default value is 20.

11. Enter the number of speed bins to be included in the result.

If omitted, the default is 15. The query will always include one additional bin, the Nth + 1 bin, where N is the speed-bin-count, to indicate the number of vehicles with speeds greater than the Nth bin.

12. Enter the speed increment of each bin after the initial setting.

    If omitted, the default is 5.

13. To run the query, click **Download**.

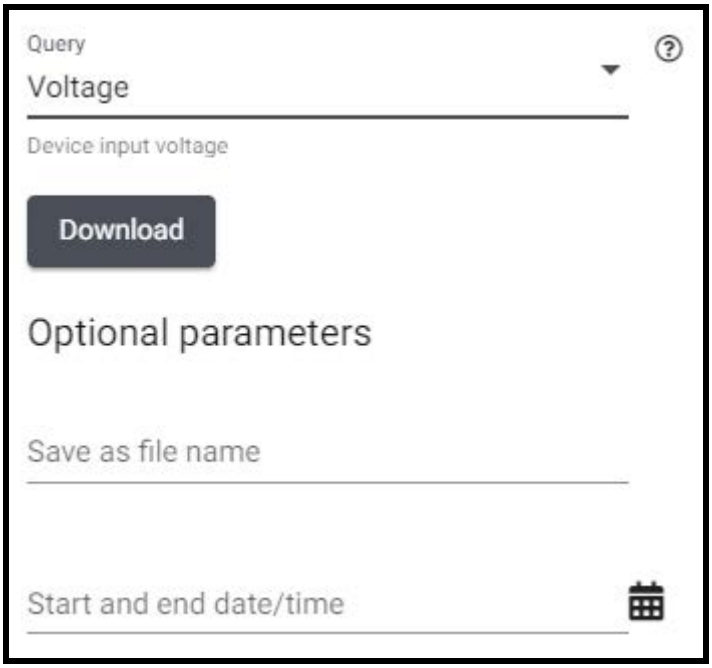
    The requested data is saved as a CSV file in the Downloads folder.

Voltage Query

This query returns the input voltage at the sensor detected over a statistical interval.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

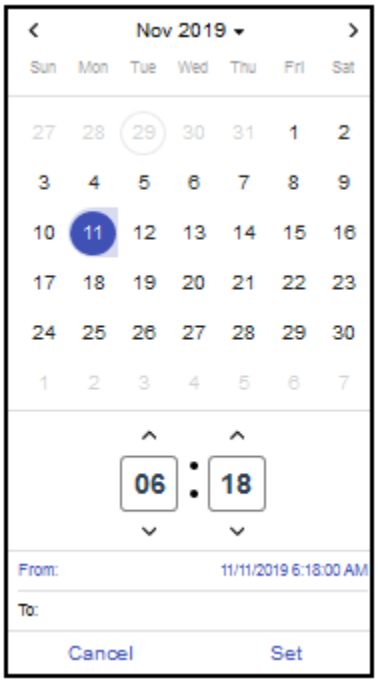
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Voltage**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is input-voltage.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. To run the query, click **Download**.

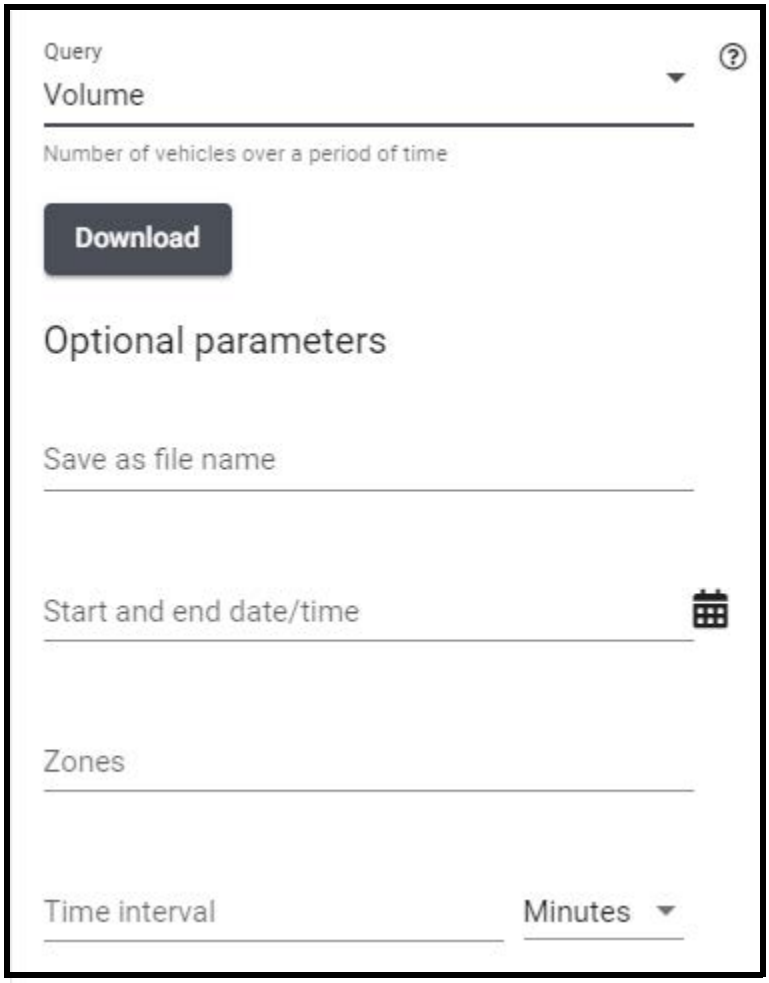
   The requested data is saved as a CSV file in the Downloads folder.

Volume Data Query

This query returns the number of vehicles detected in a zone over a statistical interval.

NOTE: If non-valid selections appear when clicking in a parameter field, the forms autofill option in the browser history needs to be cleared.

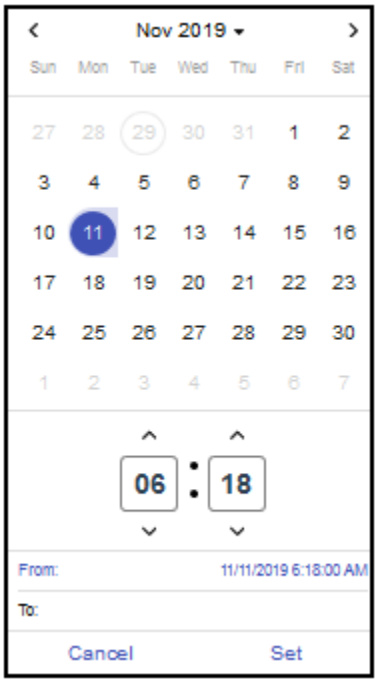
1. Click the **Data** tab.
2. From the drop-down to the right of Query, select **Volume**.



3. Click **Save as file name** and enter a name for the file.

   The name can be any number of alphanumeric, dash (-), underscore (_) or space characters. The default is volume.

4. Click the icon to the right of the date/time field.



5. Select the starting date and time of the query. It will appear in the From field.
6. Select the ending date and time of the query. It will appear in the To field.

NOTE: The defaults for date/time are the earliest record to the current date and time.

7. Click **Set**.
8. Enter the zone(s) for which data is to be included in the download.

   To enter multiple zones, separate each entry with a space (e.g., 1 2 4 etc.), or with a dash for a range of zones (e.g., 2-5).

   To specify all zones, leave the field blank.
9. Select the time frame and enter the interval for which data is to be included in the download.

   If omitted, the default is 15 minutes.
10. To run the query, click **Download**.

    The requested data is saved as a CSV file in the Downloads folder.

Log Tab

Each RTMS Echo sensor maintains a log which contains messages about operational errors, warnings, and other helpful information about sensor operations.

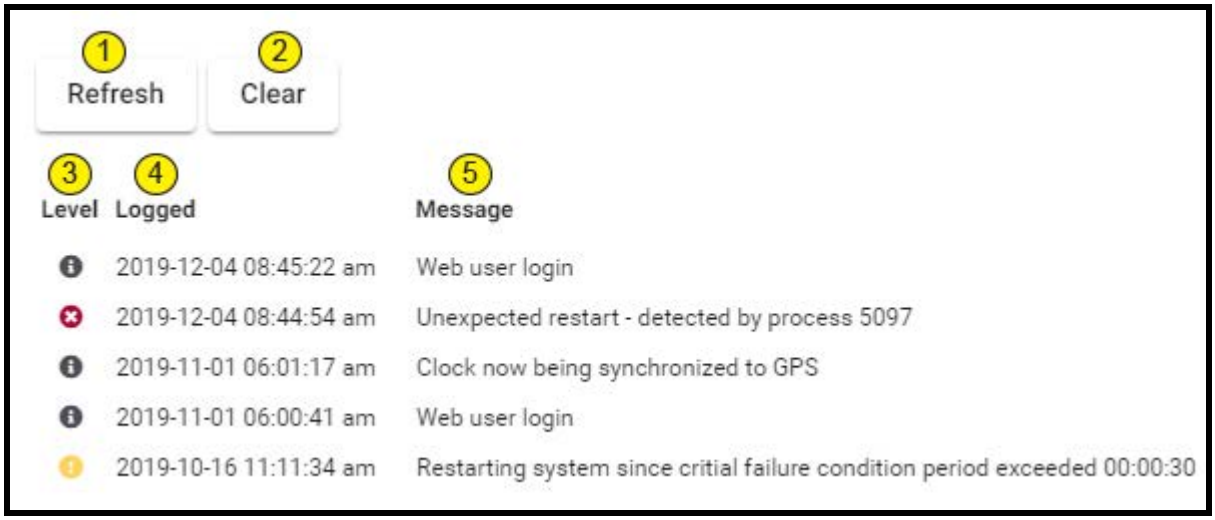


Figure 4-2: Log Tab

Table 4-2: Log Tab Descriptions

Item	Description
1	Click to refresh the displayed messages.
2	Click to clear all of the messages from the log.
3	Icons that indicate the severity level of the entry. • Blue icon indicates informational message. • Yellow icon indicates warning message. • Red icon indicates error message.
4	Date and time when the message was issued.
5	The message that was issued.

Settings Tab

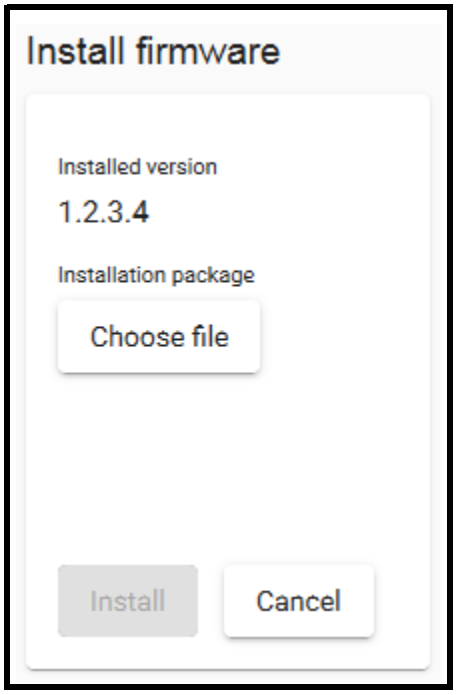
This tab is used to enter a name for the Echo sensor and to set operational parameters for the sensor.

For **Device description** enter a name for the sensor.

Install Firmware

This function is used to upgrade the firmware in the RTMS Echo sensor.

1. Download the latest firmware file from the ISS web site at:
   http://imagesensing.com/solutions/radar-detection/radar-detection-products/rtms-echo.html#downloads
2. Click the **Settings** tab.
3. Click **Install firmware**.



4. Click **Choose file**.

5. Locate and select the downloaded **x.x.x.x.issf** file (where x.x.x.x is the version number).
6. Click **Open**.
7. Click **Install**.

   Wait for the sensor to reboot.

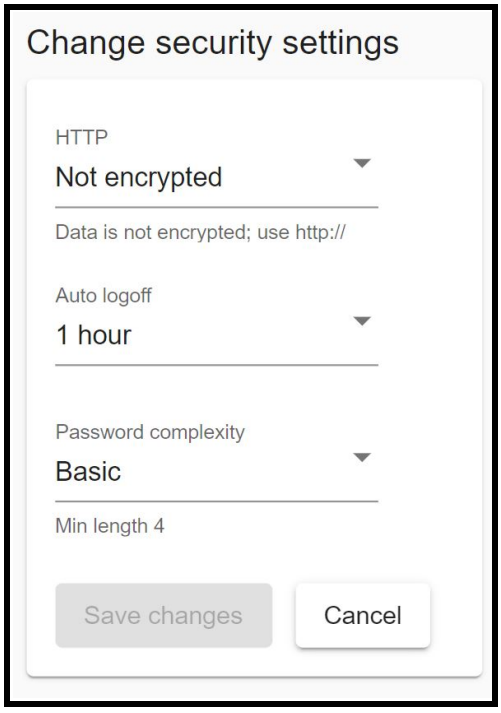
Security Setting

This function is used to change the security settings in the RTMS Echo sensor.

NOTE: Google Chrome is the preferred web browser.

HTTPS Encryption

1. Click the **Settings** tab.
2. In the **Security** section, click **Change**.



3. To enable encryption, use the drop-down under HTTP and select Encrypted.

   NOTES:

   - Encrypted data uses HTTPS protocol.
   - Not encrypted data uses HTTP protocol.
   - Enabling encryption will disallow access to HTTP protocol.

4. Click **Save changes**.

   There will be a 3 second delay to allow the server to reset the web server.

5. The web server will restart and use HTTPS protocol. This may require logging back in to the RTMS Echo (see "Logging in to the RTMS Echo" on page 4-1).
6. When encryption is enabled, the **Security** section will now display "Factory self-signed certificate".

Auto Logoff

1. Click the **Settings** tab.
2. In the **Security** section, click **Change**.
3. Use the drop-down under Auto logoff to select the time the user will be logged out of the web interface.

   The options are: 1 hour, 8 hours, 12 hours or 24 hours.

   Note, 1 hour is the default.
4. Click **Save changes.**

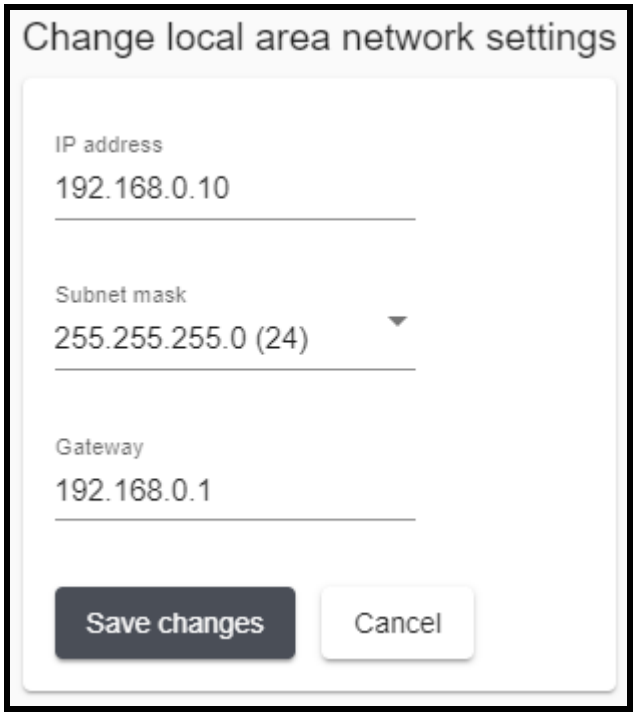
Password Complexity

1. Click the **Settings** tab.
2. In the **Security** section, click **Change**.
3. Use the drop-down under Password complexity to make changes.
   - Basic: minimum of 4 characters.
   - Enhanced: minimum of 8 characters and must use 3 of the following categories: alpha, numeric, special characters, upper and lower case characters.
4. Click **Save changes.**

Local Area Network Setting

This function is used to set the IP address of the RTMS Echo sensor.

1. Click the **Settings** tab.
2. In the **Local area network** section, click **Change**.



3. Enter the IP address, Subnet mask and Gateway.

   NOTE: The default IP address is 192.168.0.10.

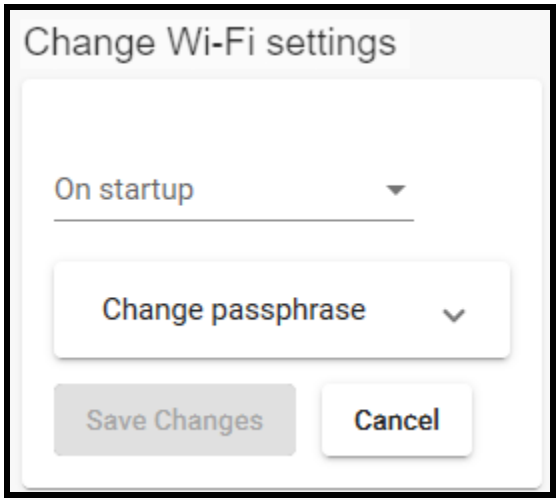
4. If a change was made, click **Save changes**.

Wi-Fi Setting

This function is used to enable or disable the Wi-Fi feature and/or change the password to allow Wi-Fi access.

The wireless network for the Echo sensor is echo-xxxx (where xxxx is the Echo device serial number) and the default password is echo123456. The default Wi-Fi IP address is 10.99.50.1

1. Click the **Settings** tab.
2. In the **Wi-Fi** section, click **Change**.



3. Use the drop-down to select whether Wi-Fi is enabled or disabled.

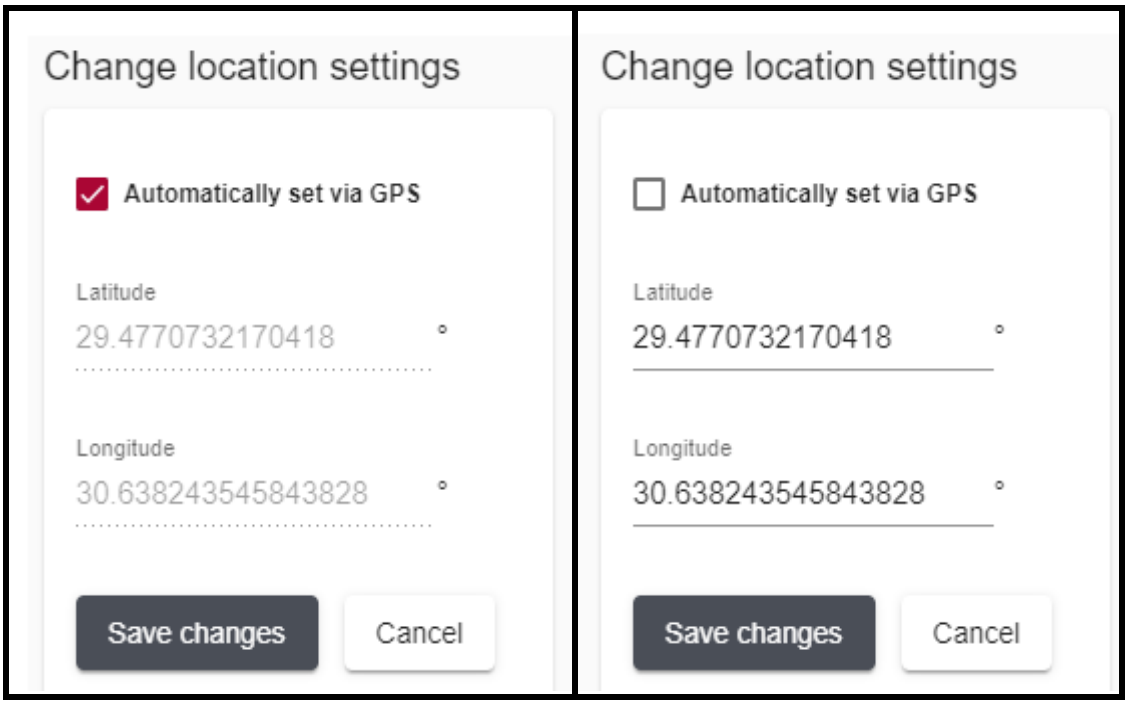
   Wi-Fi can be enabled permanently, for 15 minutes or for one hour.
4. To change the password used to access the Wi-Fi, click in the field, enter then re-enter the new password.

   A minimum of 8 and a maximum of 63 characters can be entered.
5. If a change was made, click **Save changes**.

Location Setting

This function is used to set the latitude and longitude of where the RTMS Echo sensor is installed. The location can either be set automatically, by GPS or manually.

1. Click the **Settings** tab.
2. In the **Location** section, click **Change**.



3. Is the location to be set automatically or manually?

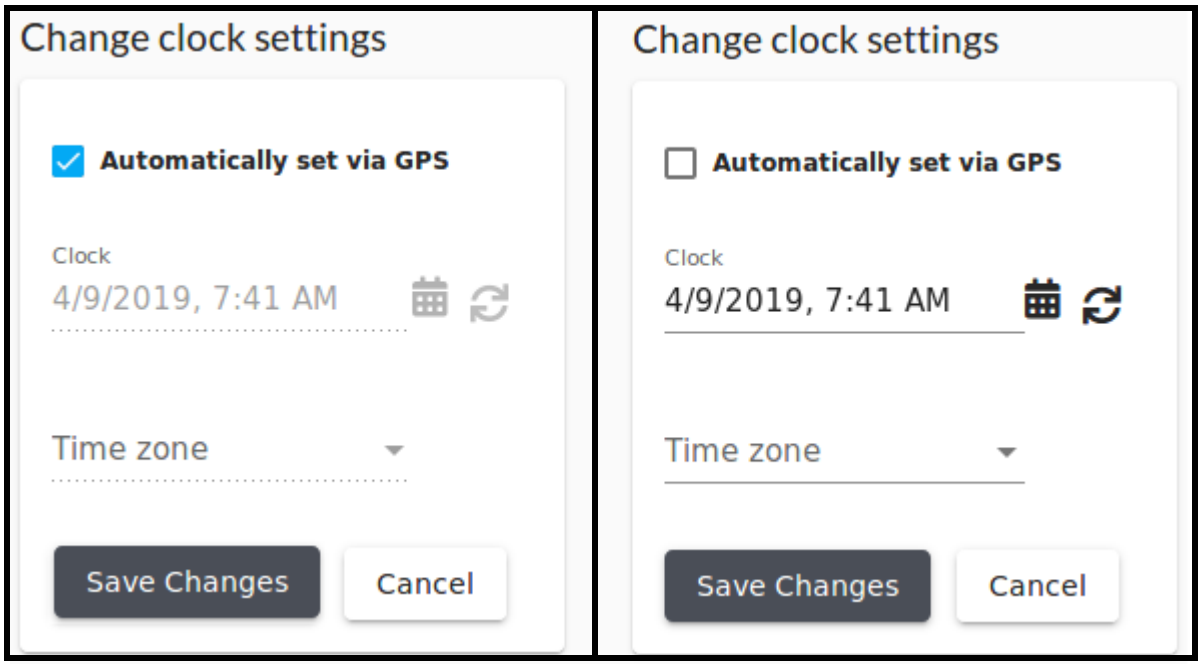
Automatically	Manually
Select the **Automatically set via GPS** check box.	a) De-select the **Automatically set via GPS** check box. b) Enter the latitude and longitude.

4. If a change was made, click **Save changes**.

Date and Time Setting

This function is used to set the date and time in the RTMS Echo sensor.

1. Click the **Settings** tab.
2. In the **Date and time** section, click **Change**.



3. Is the date and time to be set automatically or manually?

Automatically	Manually
Select the **Automatically set via GPS** check box.	a) De-select the **Automatically set via GPS** check box. b) Continue with the next step.

4. Is the date and time to be set according to the connected computer?

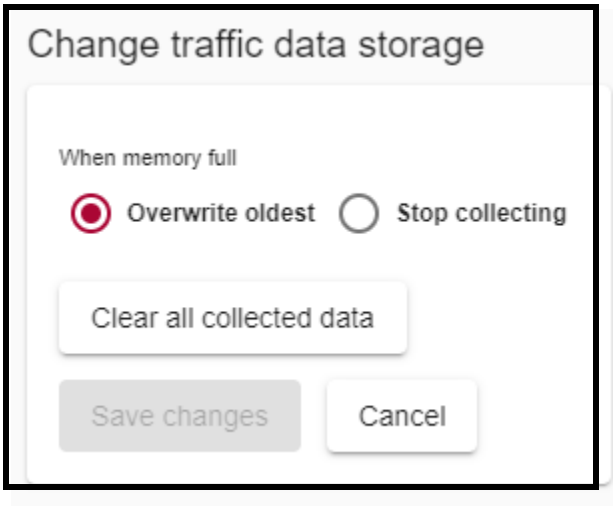
Yes	No
a) Click the Use computer date and time icon.  b) Continue with the next step.	a) Click the calendar icon.  b) Select the date and time. c) Click **Set**. d) Continue with the next step.

5. Select the time zone where the RTMS Echo sensor is installed.
6. If a change was made, click **Save changes**.

Traffic Data Storage Setting

This function is used to determine what action is to be taken when the memory in the RTMS Echo sensor is full.

1. Click the **Settings** tab.
2. In the **Traffic data storage** section, click **Change**.



3. Select one of the following.
   - **Overwrite oldest** – when memory is full, continue storing messages by overwriting the oldest messages.
   - **Stop collecting** – when memory is full, no new messages will be stored in internal memory. In this case, the only way to start saving messages again is to either select **Overwrite oldest** or to click **Clear all collected data**.
4. To clear (delete) all of the messages stored in internal memory, click **Clear all collected data**.
5. If a change was made, click **Save changes**.

Legacy Protocols

NOTE: The selection for Legacy protocols should be made before the selections in the Interval data section.

This function is used to determine the protocol used for retrieving data from the RTMS Echo. Three choices are available.

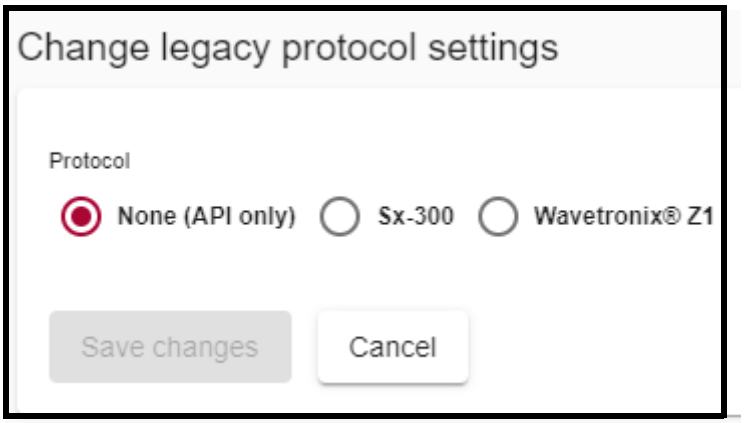
- API only
- Sx-300
- Wavetronix® Z1

For all three choices, data can be retrieved through the queries from the Data tab (see "Data Tab" on page 4-15) or from the RTMS Echo API (see the *RTMS Echo API Programmers Guide*).

API Only Option

This option indicates that data can only be retrieved through the queries from the Data tab or from the RTMS Echo API.

1. Click the **Settings** tab.
2. In the **Legacy protocols** section, click **Change**.

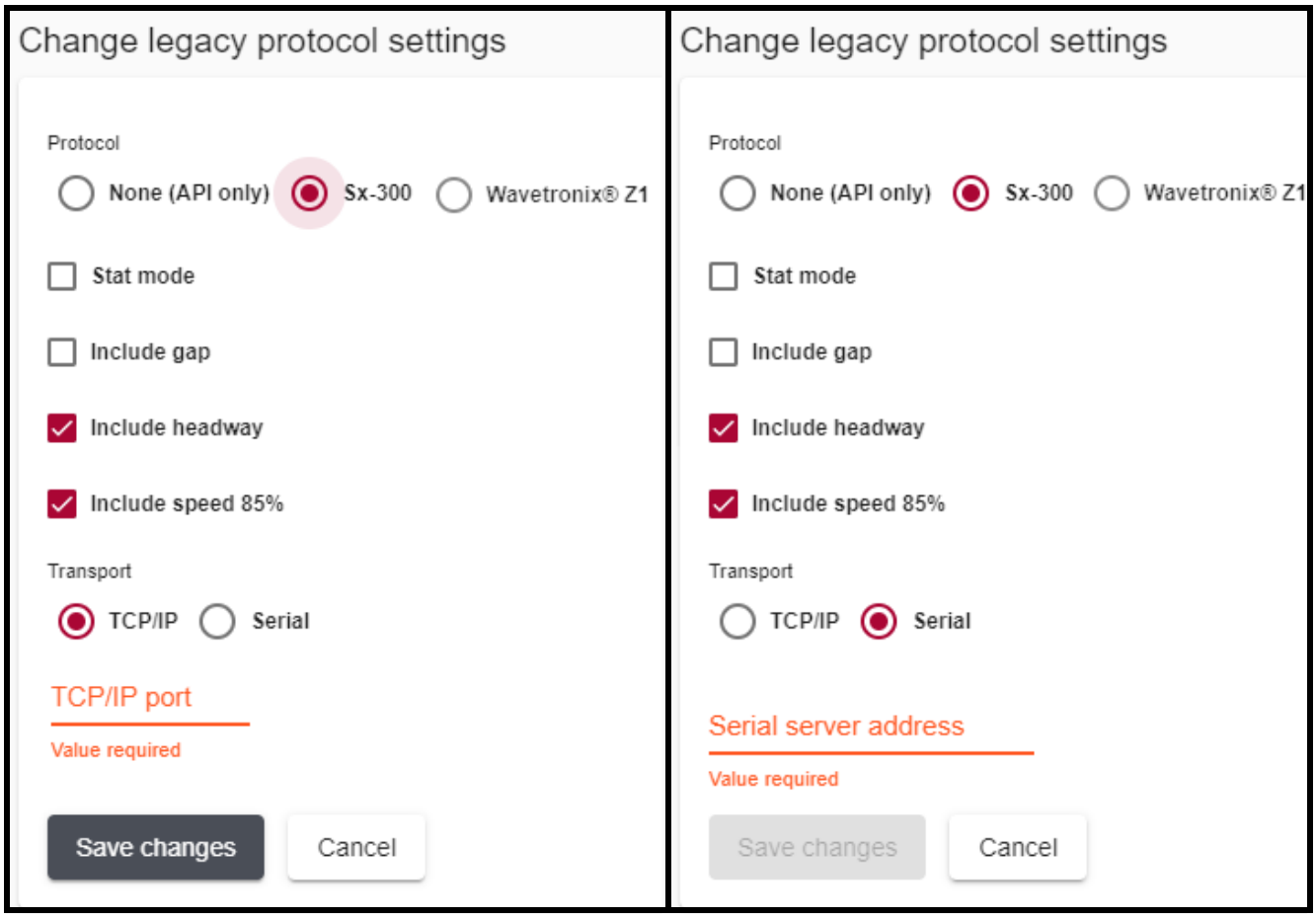


3. For **Protocol**, select **None (API only)**.
4. If a change was made, click **Save changes**.

Sx-300 Protocol

This protocol indicates that data can be retrieved through the queries from the Data tab, the RTMS Echo API or from the supported RTMS Sx-300 protocols defined in the *RTMS Echo Sx-300 Protocol Reference Guide*.

1. Click the **Settings** tab.
2. In the **Legacy protocols** section, click **Change**.



3. For **Protocol**, select **Sx-300**.
4. To put the sensor in Stat mode, select the check box. If unchecked, the sensor is in polled mode.

   In Stat mode, statistical messages are only transmitted at the end of every message period.

   In Polled mode, only statistical data that is currently stored in the Echo buffer is transmitted and only when a matching sensor ID request is received by the Echo sensor. The default/fixed ID for the sensor is 1.
5. If Gap or Headway data is to be included in the statistical message, select the check box.

   If neither Gap nor Headway data is to be collected, leave both check boxes unselected.

6. If Speed 85th percentile data is to be included, select the check box.
7. For **Transport**, select whether data from the sensor is transferred through a TCP/IP or a serial connection. The default is TCP/IP.

   If **TCP/IP** is selected, enter the port number to be used for communicating with the Echo sensor. The default is 2000.

   If **Serial** is selected, enter the IP address and port number of the serial terminal server in the cabinet. The port number must be separated from the IP address by a colon (e.g., 192.168.10.101:2000). For additional information, see "Configure the Serial Terminal Server" on page 2-12.
8. If a change was made, click **Save changes**.

Wavetronix® Z1 Protocol

This protocol indicates that data can be retrieved through the queries from the Data tab, the RTMS Echo API or from the following Wavetronix® Z1 protocols.

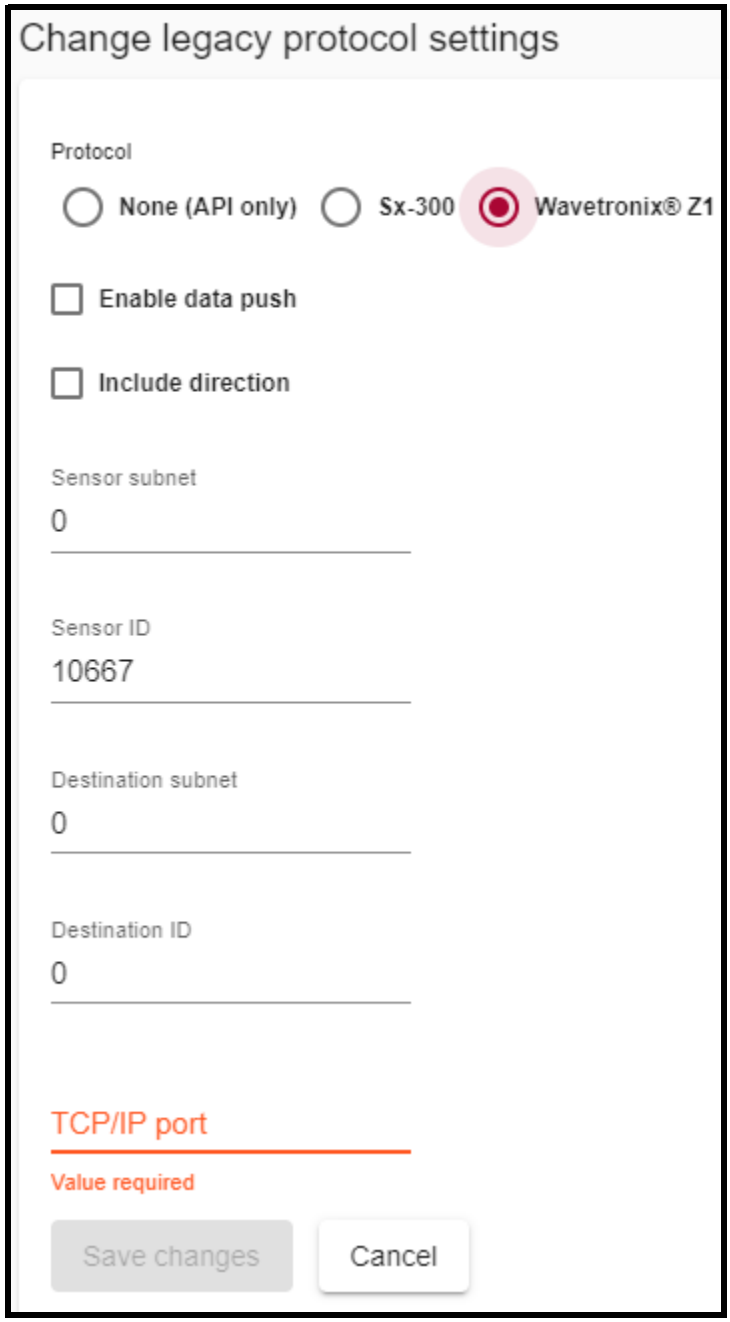
- *Classification Configuration Message (0x13; read only)
- Clear Event FIFO Message (0x6D)
- Get Presence Message (0x68)
- *Get Variable Size Interval Data (0x72)
- Global Push Mode Message (0x0D; read only)
- Legacy Active Lane Information Message (0x17; read only)
- *Legacy General Configuration Message (0x00; read only)
- **Legacy Approach Information (0x11; read only)
- Sensor Time Message (0x0E; read only)
- *Speed bins Configuration (0x1D; read only)

*These messages require configuration settings in the Interval data section.

**RTMS Echo does not currently support configuring Wavetronix® approaches.

NOTE: Even though RTMS Echo supports up to 12 zones, the Wavetronix® Z1 protocol only supports a maximum of 10 zones. Therefore, only 10 zones should be configured in the system (see "Detect and Adjust Zones" on page 3-8).

1. Click the **Settings** tab.
2. In the **Legacy protocols** section, click **Change**.



3. For **Protocol**, select **Wavetronix® Z1**.
4. Select the **Enable data push** check box to only transmit data messages at the end of every message period. If unchecked, data messages are only retrieved on request (polled mode).

5. Select the **Include direction** check box to have vehicle data binned by direction.

   Bin 0 is the count of all vehicles that traveled in the same direction assigned to their respective lane. Bin 1 is the count of all vehicles that traveled in the opposite direction assigned to their respective lane.

6. For **Sensor subnet**, enter the subnet on which the Echo sensor is located.

   The value must be from 1 to 254. Do not use 255.

7. For **Sensor ID**, enter the ID of the Echo sensor.

   The value must be from 1 to 65534. Do not use 65535.

   The default is the first five digits of the serial number.

8. For **Destination subnet**, when **Enable data push** is selected enter the subnet on which the device receiving the data is located. Not used when **Enable data push** is unchecked.

   NOTE: A value of 255 indicates that messages will be transmitted to all devices on the subnet.

9. For **Destination ID**, when **Enable data push** is selected enter the identification of the device to receive the messages. Not used when **Enable data push** is unchecked.

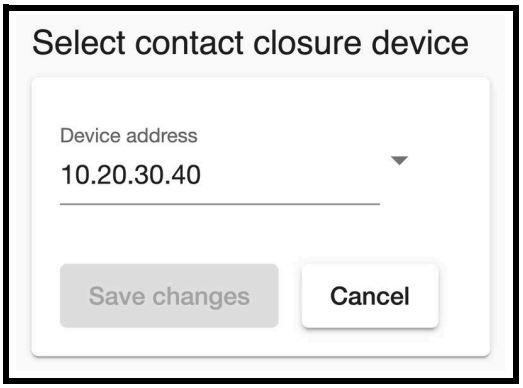
   NOTE: A value of 65535 indicates that the device will receive all messages sent to the subnet.

10. For **TCP/IP port**, enter the port number used for the Echo sensor.
11. If a change was made, click **Save changes**.

Contact Closure Device

This function is used to select the IP address for the contact closure module.

1. Click the **Settings** tab.
2. In the **Contact closure device** section, click **Change**.



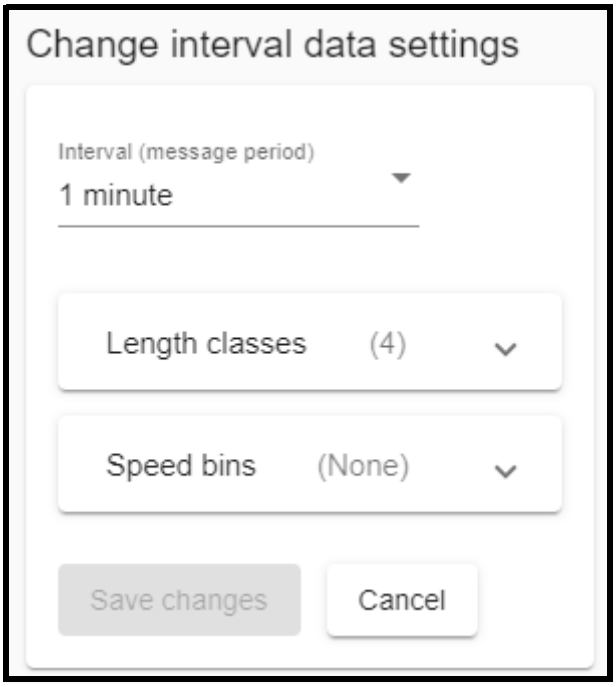
3. Use the drop-down to select the IP address of the contact closure device.
4. Click **Save changes**.

Interval Data

This function is used to set the message period interval and the number and length of vehicle classes.

NOTE: The selection for Interval data should be made after the selections in the Legacy protocols section.

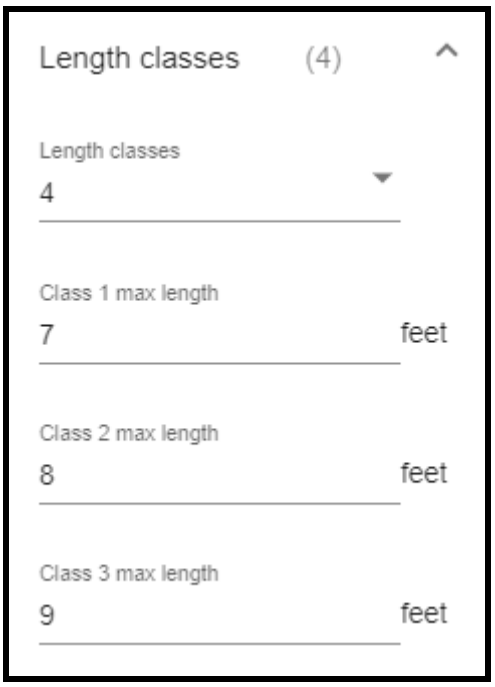
1. Click the **Settings** tab.
2. In the **Interval data** section, click **Change**.



3. Select how often a statistical message is created. One record is created for each zone during each period.
4. Select the number of vehicle length classifications to be detected.

   NOTES:

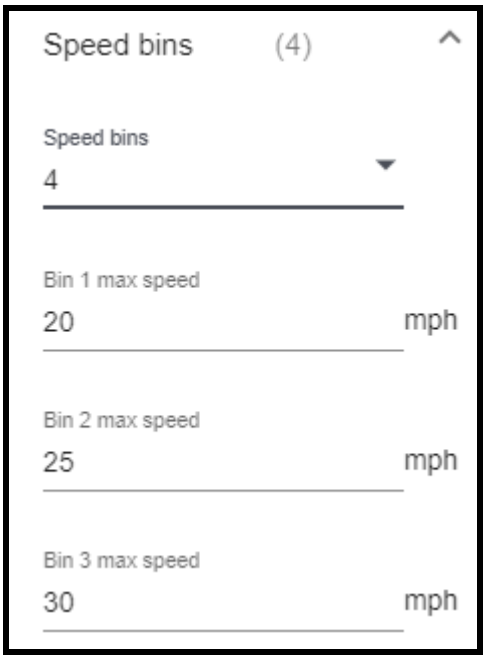
   - The number of length classifications shown is one less than the number of classes selected because the last classification is everything greater than the last classification specified.
   - If the selection for the Legacy protocol is None or Wavetronix® Z1, up to eight (8) classifications can be selected. If the Legacy protocol is Sx-300, up to six (6) classifications can be selected.



5. Enter the length of each vehicle classification.
6. Select the number of speed bins in which speed data is to be separated.

   NOTES:

   - The number of bins shown is one less than the number of bins selected because the last bin is everything greater than the last bin specified.
   - This parameter only appears when the selection for the Legacy protocol is None or Wavetronix® Z1.

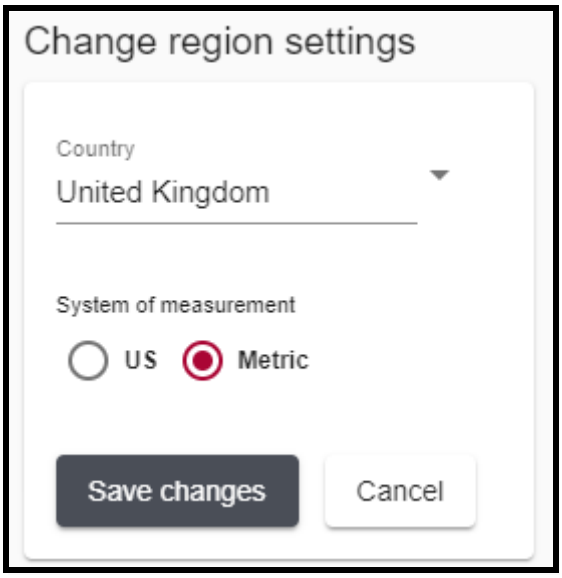


7. Enter the maximum speed for each bin.
8. If a change was made, click **Save changes**.

Region Setting

This function is used to set the units in which speed and length are displayed and to indicate the country in which the RTMS Echo is installed.

1. Click the **Settings** tab.
2. In the **Measurement** section, click **Change**.



3. Use the drop-down to select the country where the Echo sensor is installed.

   NOTE: If United States is displayed for Country, it cannot be changed.

4. Select one of the following.
   - **US** – speed and lengths are shown in mph and feet.
   - **Metric** – speed and lengths are shown in kph and meters.
5. If a change was made, click **Save changes**.

Licensing

This function is used to enable licenses for additional features for the RTMS Echo unit.

1. Click the **Settings** tab.
2. In the **Licensing** section, click **Change**.

3. Did you purchase the contact closure module with this Echo?

Yes	No
The license is enabled and the license key will be listed.	Please contact your ISS representative to get the license key to manually enter into the Additional features license box.

4. If a change was made, click **Save changes**.

Backup/Restore Device Configuration

These functions are used to backup the current device configuration to a file in the Downloads folder of the computer, or to restore a previously saved backup file.

The information that is included in the backup file is as follows.

- Setup File Version
- Sensor ID
- Sensor Model
- Firmware Version
- Timestamp when saved
- User Descriptions
- Location
  - Location Source
  - Latitude
  - Longitude
- Data Aggregation Config
  - Interval
  - Classification lengths
- Data Collection Config
  - Drop Inserts When Full (true/false)
- Legacy Protocol Settings
  - Protocol (No Protocol/SX300/Wavetronix)
  - SX300

ID (1)
Port
Push Statistics (true/false)
Gap or Headway
Include Speed85 (true/false)

- Wavetronix

Push Statistics (true/false)
Include Direction (true/false)
Source Subnet ID
Source ID
Destination Subnet ID
Destination ID
Port
Sensor Orientation
Sensor Location
Sensor Description

- Detection Config
  - Device ID (0)
  - Last Modified Date
  - Software Version
  - Config Version
  - Actions
- Sensors
  - Sensor Type (Radar)
  - Annotations
- Zones
  - Zone Type (vertical line zone)
  - ID
  - Name
  - Start
  - End
  - Traffic Direction
  - Lane Index
  - Speed Calibration (offset, multiplier)
  - Length Calibration (offset, multiplier)
  - Rules
- Radar Environment Config
  - Range Bin Energy Thresholds
- Zone Finder Settings
  - Count Threshold
- Zone Finder Vehicles
  - Main Bin
  - Length
  - Time Tick
  - speed
  - Speed Confidence
  - Dwell Time

Download Diagnostics

This function creates a file that can be sent to ISS for diagnostic purposes if the sensor is experiencing problems. The file is saved to the default folder of your browser (usually the Downloads folder) on the computer and includes the following information:

- Interval and per-vehicle databases
- Operation logs
- Device configuration settings

NOTE: Depending on the amount of data in the databases, this file can be extremely large, 100MB or more.

Reset Region

This function is for Manufacturing use only.

Reboot Device

This function is used to send a reboot command that will cause the sensor to restart.

Chapter 5: iPro Camera Install

(Echo + Camera Optional Configuration)

Introduction

This section is for the Echo + Camera optional configuration. If you do not have this configuration, continue to Chapter 6: "Contact Closure Hardware Install"

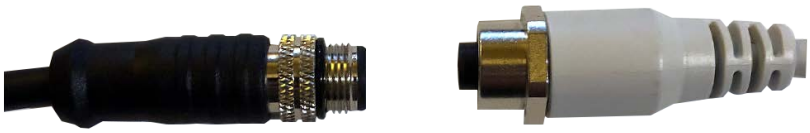
Connecting the Camera

Required Equipment

- Echo + Camera
- Mounting bracket
- Camera cable (50 ft, male M12 to male RJ45)
- IEEE802.3af compliant PoE injector that supports Mode A (Endspan)
- Security Torx T-10 bit (provided)

Connecting the Cable

1. Connect the camera M12 connector to the provided cable.



2. Twist the connectors clockwise until the connection is tight.

3. Plug the other end of the cable with the RJ45 connector into the PoE injector.
4. When ready, power up the PoE injector.

NOTES:

- The default IP address of the camera is **192.168.0.10** which is the same as the default IP address of the RTMS Echo. Communication issues will result if both devices are plugged into the same switch in their default state.
- The camera could receive an IP address from a DHCP server upon initial boot up. To avoid confusion, ISS recommends not plugging the camera into a network switch with a DHCP server enabled until the IP address has been changed from its default.

Logging in For the First Time

This section provides information on logging in to the camera for the first time.

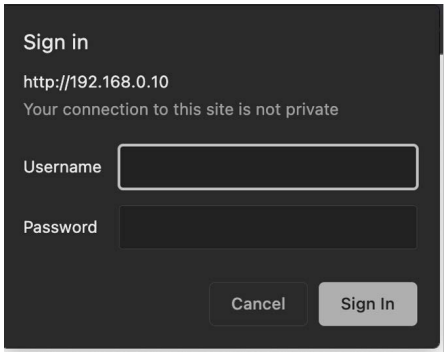
1. Open an Internet browser and type in the default IP address: **192.168.0.10**

   The following screen will appear.

2. Create an appropriate username and password. Several rules are outlined in the Note area.
3. Click **Set**.

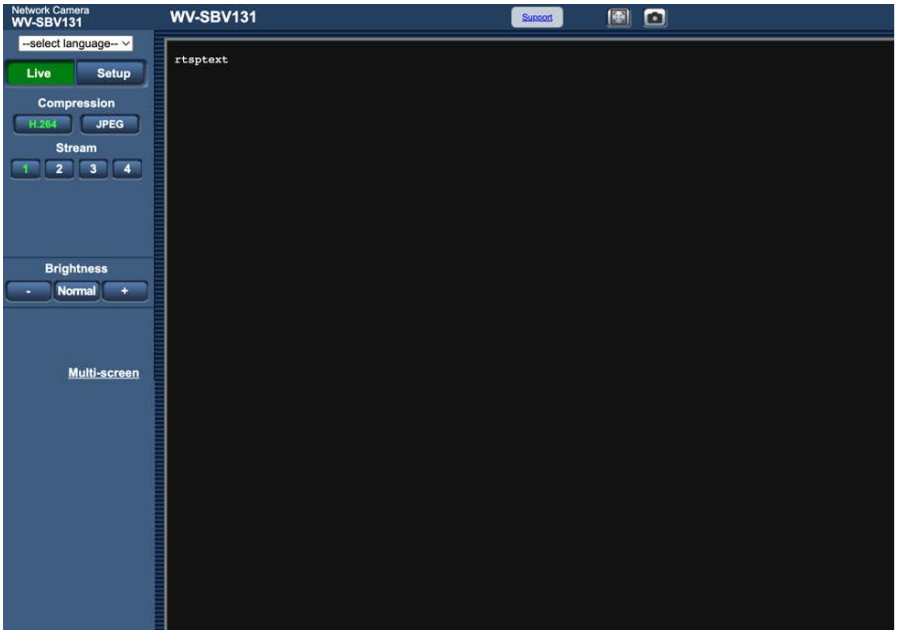
   The following screen will appear.

   A Sign in dialog will appear on the screen.



4. Enter the credentials that were just created and click **Sign in**.

The following screen will appear.

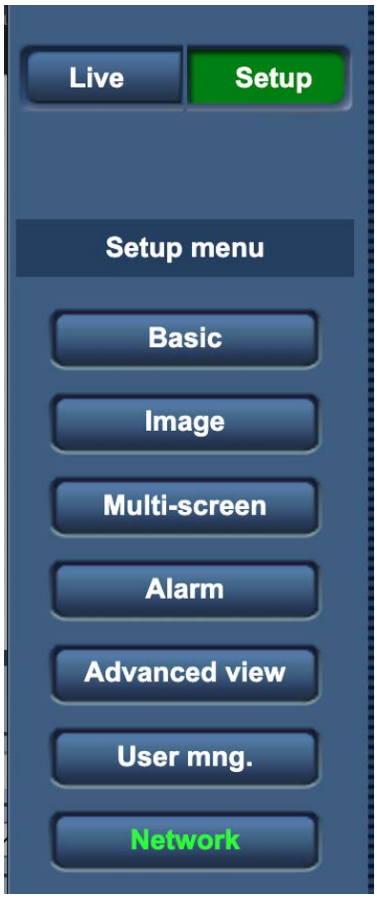


NOTE: Modern HTML5 browsers like Chrome do not support video streaming in the browser. Use Internet Explorer or VLC to stream from the camera. You can also select **JPEG** in the menu to view a stream of images from the camera within an HTML5 browser.

Setting Network Parameters

This section provides information on setting up the network parameters.

1. From the side bar menu, select **Setup**, then **Network**.



2. Network parameters will be shown on the screen.

Changing the IP Address

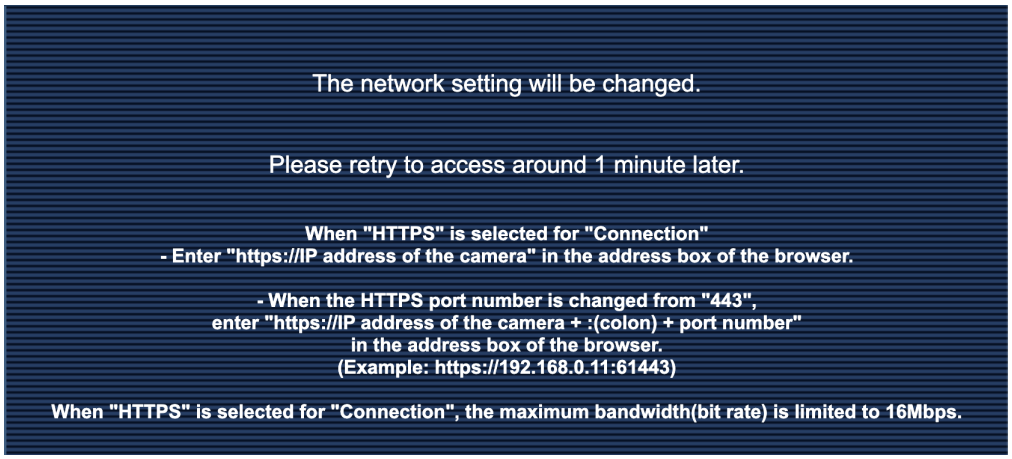
This section provides information on changing the IP address for the camera.

1. The camera will automatically self-assign an IP address if connected to a network without a DCHP server configured.
2. To set a static IP address, select **Static** from the Network Settings drop down.

3. Enter the appropriate network parameters.

NOTE: Be sure to configure the DNS settings if NTP will be used and the NTP server is not an IP address.

4. When all settings have been configured, select **Set** at the bottom of the page. If the IP address has changed, the following message will appear.



5. Re-connect to the camera by typing the new IP address in the address bar of the Internet browser.
6. To change the HTTP port, select **Setup** from the sidebar menu, then select **Network**.
7. Find the **HTTP port** setting.

8. Change the value to the desired number.

Verifying Video Stream

This section provides information on verifying the video stream from the camera.

1. From the sidebar menu, select **JPEG**.

2. Watch the video stream to visually verify that all of the lanes of traffic are visible in the camera image.

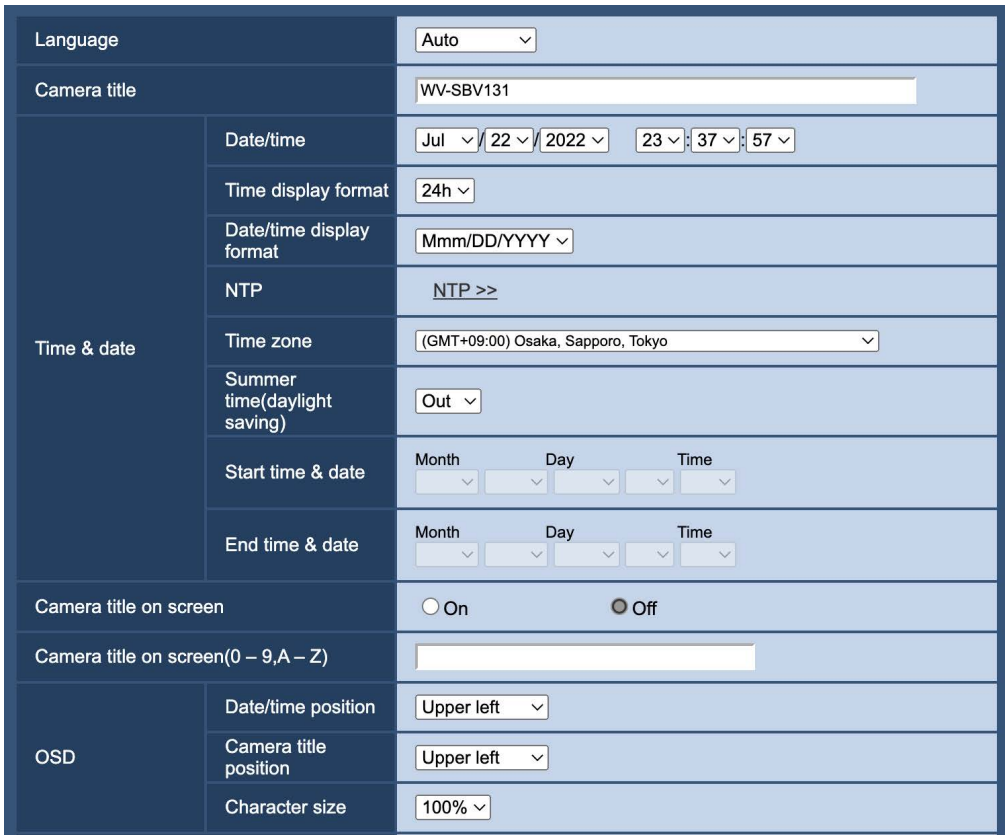
NOTE: If they are not all visible, adjustments can be made to the camera lens. See "Adjusting the Aim of the Camera Lens" on page 5-12.

Setting Time

This section provides information on setting the date, time, and time zone parameters for the camera.

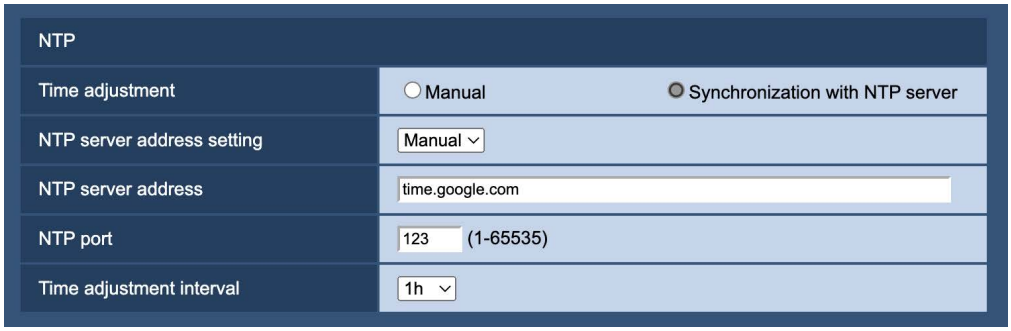
Option 1: Configure the correct date, time and time zone parameters manually.

1. From the sidebar menu, select **Setup**, then **Basic**.
2. Manually enter the correct date and time settings.



Option 2: Select NTP.

1. From the sidebar menu, select **Setup**, then **Basic**.
2. Select **NTP >>**.
3. A pop-up will appear. Select **OK** to proceed and open the NTP window.
4. Type in an NTP server address.
5. Example using time.google.com.

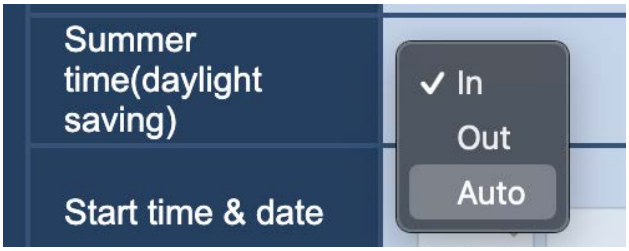


6. Select **Set** at the bottom of the screen.
7. Navigate back to the **Basic** menu.
8. If using NTP, you must still select the appropriate time zone and then select **Set** at the bottom of the screen to apply the changes.

Configuring Daylight Savings

This section provides information on configuring daylight savings time.

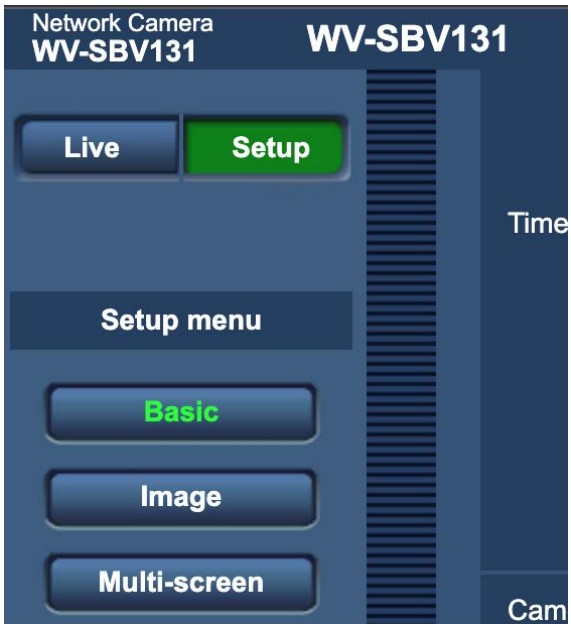
1. From the sidebar menu, select **Setup**, then **Basic**.
2. Under Summer time (daylight saving), choose **In**, **Out**, or **Auto**, where the time will automatically adjust to the time changes based on the date.



Setting the Camera Label

This section provides information on setting the label or name for the camera.

1. From the sidebar menu, select **Setup**, then **Basic**.

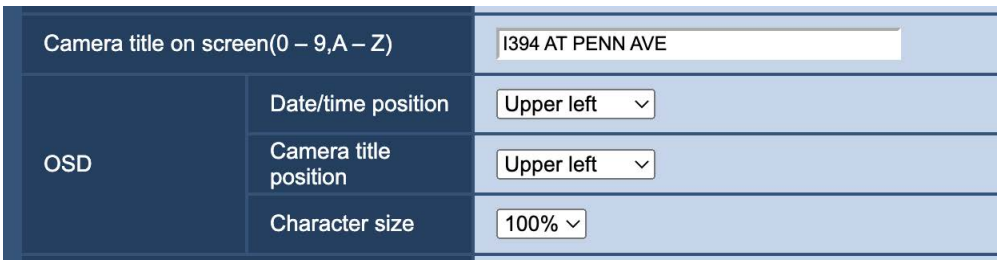


2. To turn on the camera label, select the **On** radio button.

3. Enter the camera title.

NOTE: Only capital letters and numbers are allowed.

4. Select the desired position.



5. Select **Set** at the bottom of the screen.

Setting Stream Parameters

This section provides information on setting stream parameters for the camera.

1. From the sidebar menu, select **Setup**, then **Image**.
2. To configure the main RTSP stream parameters, adjust the **H.264(1)** parameters.
3. To adjust the settings of one of the other stream profiles, find the **H.264** section for the correct stream number.

Streaming from the Camera

This section provides information on how to stream from the camera.

RTSP URL: **rtsp://<user>:<pass>@<cameraip>:<port>/MediaInput/h264**

NOTE: This will use the default streaming profile which is configured on the **Setup** > **Image** page.

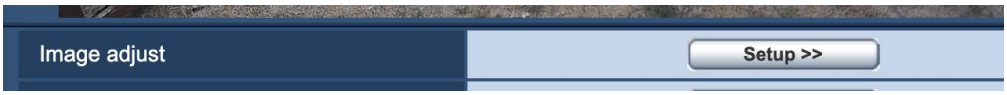
To stream one of the other streaming profiles, use the following url:
rtsp://<user>:<pass>@<cameraip>:<port>/MediaInput/h264/stream_#

(Where the # will be replaced with the stream number)

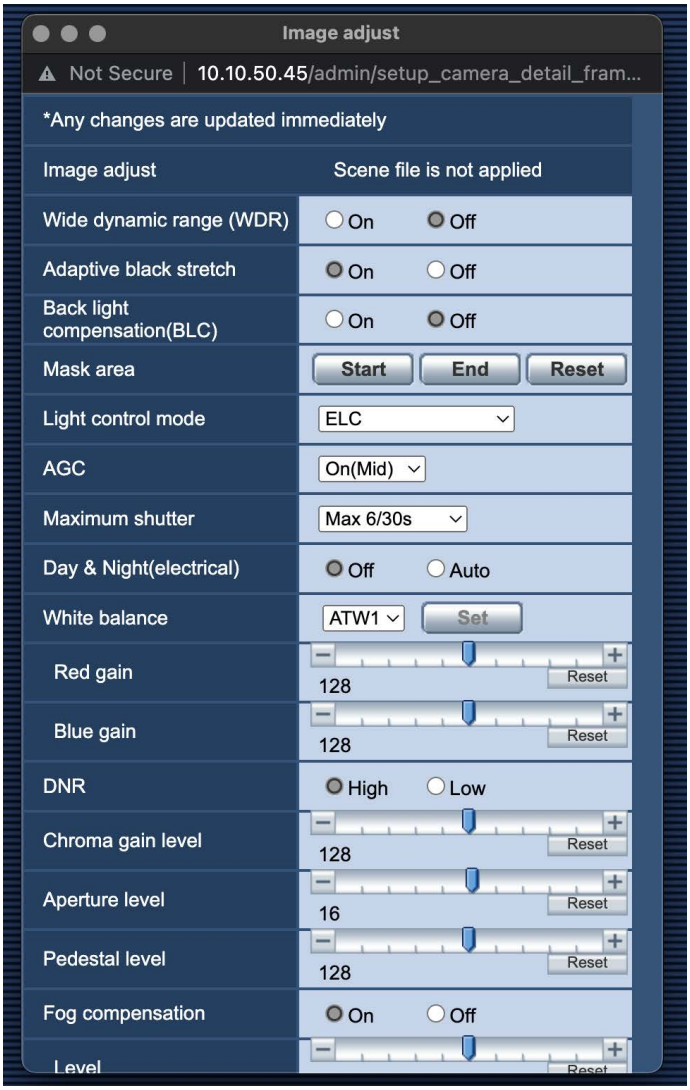
Adjusting Image Parameters

This section provides information on how to adjust image parameters on the camera.

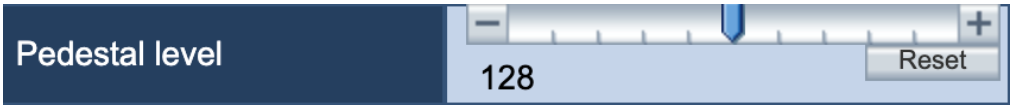
1. From the sidebar menu, select **Setup**, then **Image**.
2. Select the **Image quality** tab at the top of the page.
3. Under the **Image adjust** field, select **Setup >>**.



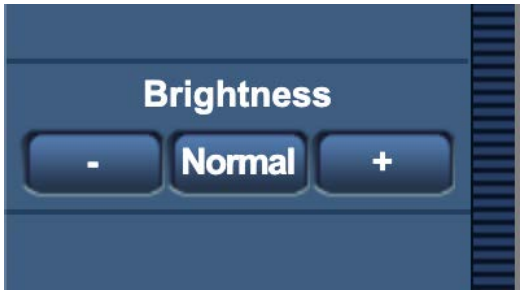
4. A new window will appear.



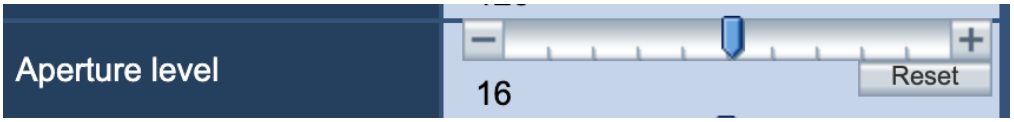
5. To adjust the image contrast, modify the **Pedestal level** and/or the **Chroma gain level** as necessary until the desired levels are reached.



6. To adjust the image brightness, navigate to the **Live** page. Click the **+** or **–** controls until the desired brightness has been reached.



7. To adjust the image sharpness, modify the **Aperture level**.



8. To adjust the image saturation, modify the **Chroma gain level**.

Adjusting the Aim of the Camera Lens

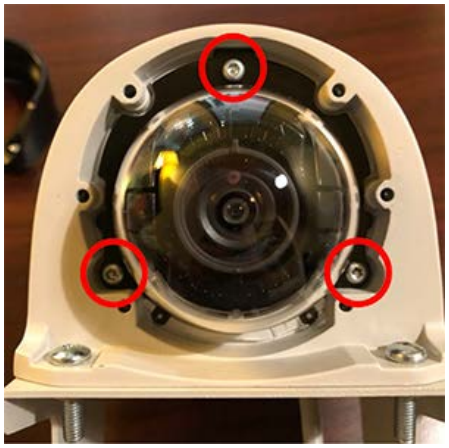
This section provides information on how to adjust the aim of the camera lens.

1. Use the Security Torx T-10 bit to loosen the two screws on the sunshield.

2. Remove the sunshield and set aside.

The clear polycarbonate anti-tampering lens will be exposed.

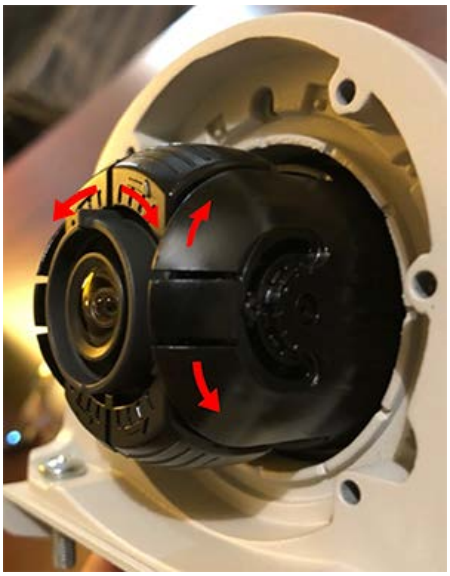
3. Loosen the three screws on the polycarbonate shield.



4. Once it is loose, remove the clear polycarbonate shield.

The camera lens will be exposed.

5. To optimize the view of the traffic lens, adjust the tilt and/or roll of the lens as necessary.

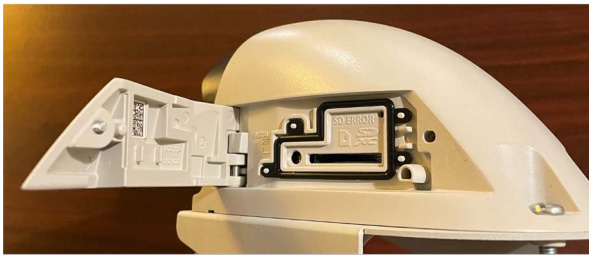


Resetting the Camera Password

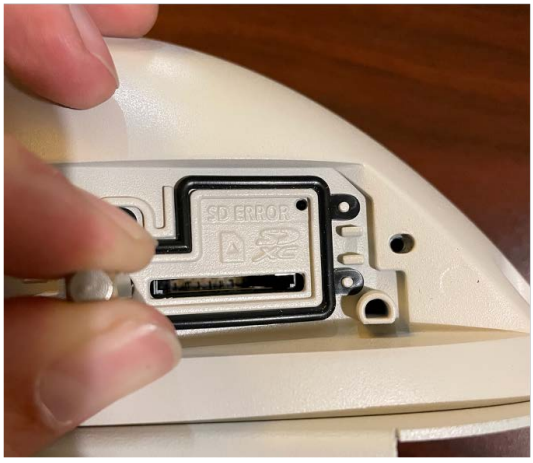
This section provides information on how to reset the password for accessing the camera interface.

If you forgot your password or want to change it, the following steps can be performed to reset the camera to factory defaults.

1. Power down the camera.
2. Using the Security Torx T-10 bit, loosen the screw on the camera side door and open the door.



3. Using a small screwdriver or the T-10 bit, push down the reset button.



4. While continuing to hold down the reset button, apply power to the camera.
5. Continue to hold the reset button for another 15 seconds.
6. Release the reset button and wait for the camera to boot. This will take approximately two minutes.
7. Log into the camera using the steps from "Logging in For the First Time" on page 5-2.
8. The **Administrator registration** screen will appear on the screen. If this does not appear and you are prompted for the existing credentials, the camera reset procedure was not successful. Return to Step 1.
9. If the camera reset was successful, close the camera side door and tighten the screw. Continue with the steps outlined in "Logging in For the First Time" on page 5-2.

Chapter 6: Contact Closure Hardware Install

General

This section describes the procedure for installing the hardware on the contact closure module.

Pre-Installation Considerations

The following information should be taken into consideration prior to installing the contact closure module.

Installation Location

The contact closure module is designed to be installed in the controller cabinet on a DIN rail.

NOTE: The DIN rail should have between 3.25 inches and 4.25 inches of available mounting space depending on the number of daughter cards that are required for the installation.

Power Considerations

To power the contact closure module and operate the outputs, the system requires 24VDC and a maximum of 4 watts of power.

NOTE: Ensure that the cabinet power supply has sufficient capacity to support the power draw.

Cabling Considerations

When wiring in the contact closure module, ensure that the correct wire gauge is used:

Wire Type	Gauge AWG
Solid wire	28-14
Stranded wire	28-14
Wire with ferrule	26-16

Communication Considerations

The contact closure module communicates with RTMS Echo using an Ethernet connection. All Ethernet standards should be followed during installation of the system.

RTMS Echo and the contact closure module must be configured on the same subnet. Communication between the two system components cannot be sent over a routed network.

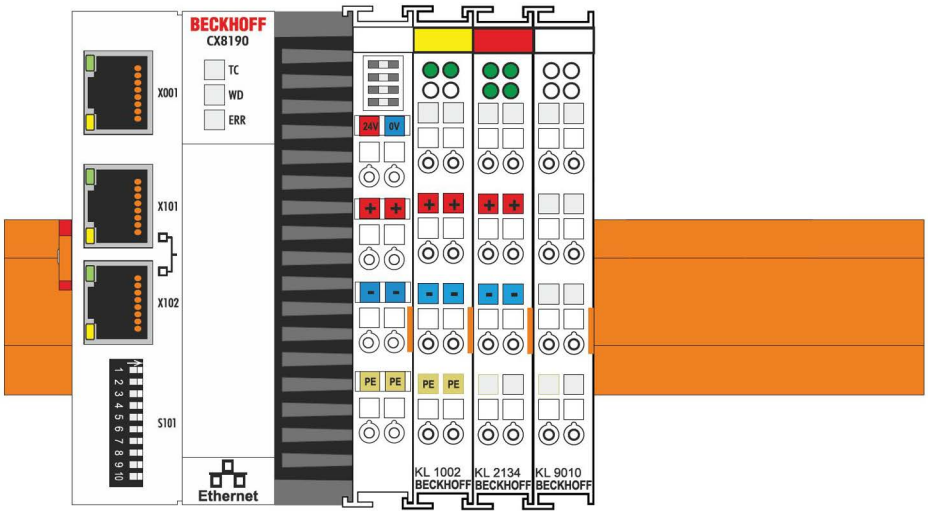
Installing on a DIN Rail

The following equipment will be needed for the installation process.

- Mounting rail of type TS35/7.5 or TS35/15 according to DIN EN 60715
- Screwdriver

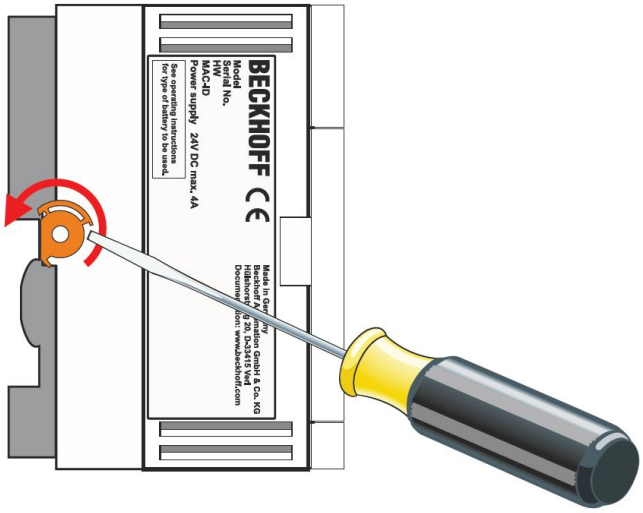
Secure the contact closure module on the mounting rail as follows:

1. Place the contact closure module at the front of the mounting rail. Slightly press the contact closure module onto the mounting rail until a soft click can be heard and the contact closure module has latched.



2. Subsequently, lock the catch on the left side of the contact closure module.

   NOTE: Use a screwdriver to do this.



3. Double-check the correct installation and latching of the contact closure module on the mounting rail.

Connecting to Cabinet Power

IMPORTANT: The contact closure module may be damaged during wiring. The cables for the power supply should only be connected in a de-energized state.

The power supply terminals require an external voltage source, which provides 24V DC (-15% / +20%). The power supply terminal must provide 4A at 24V, in order to ensure the operation of the contact closure module in all situations.

The cabling of the contact closure module in the control cabinet must be done in accordance with the standard EN 60204-1:2006 PELV (Protective Extra Low Voltage):

- The "PE" and "0V" conductors of the voltage source for a basic CPU module must be on the same potential (connected in the control cabinet).
- Standard EN 60204-1:2006, section 6.4.1:b stipulates that one side of the circuit, or a point of the energy source for this circuit must be connected to the protective earth conductor system.

Connection Example:

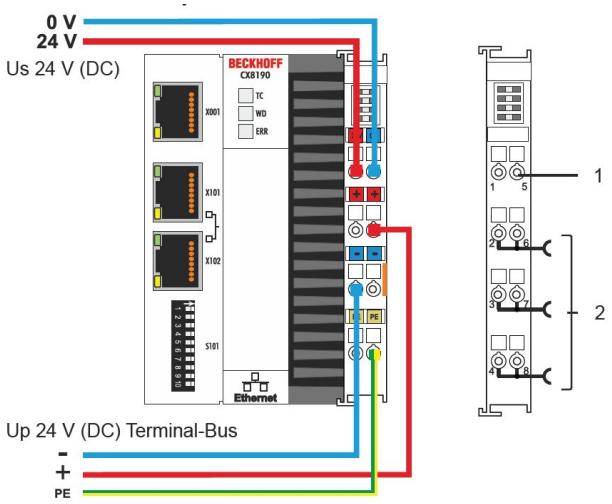


Table 6-3: Legend for the connection example

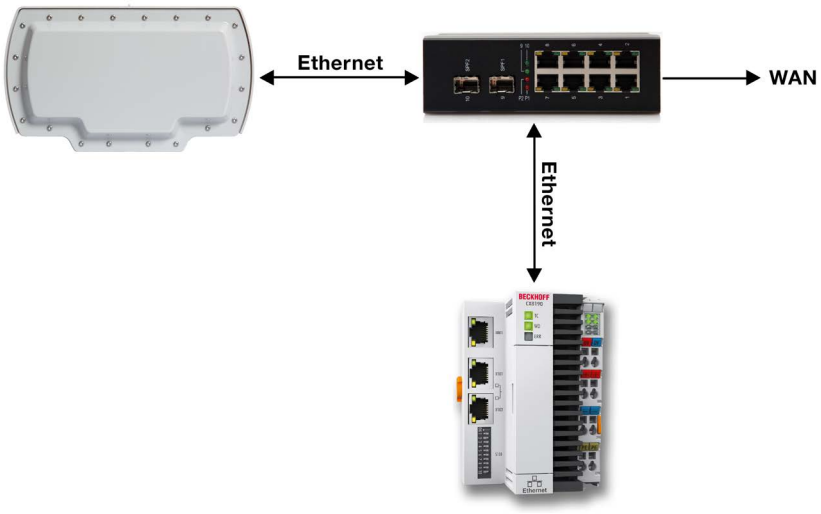
No.	Description
1	The upper spring-loaded terminals identified with "24V" and "0V" supply the contact closure module and the terminal bus (data transfer via K-bus or E-bus).

Table 6-3: Legend for the connection example

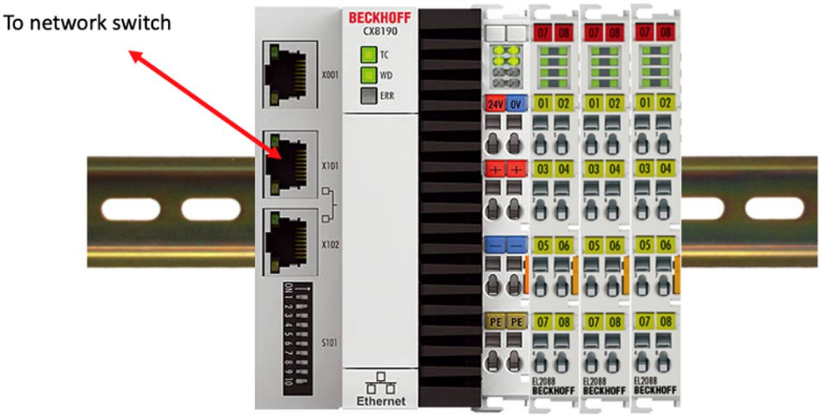
No.	Description
2	The spring-loaded terminals identified as "+", "-" and "PE" supply the Bus Terminals via the power contacts and the sensors or actuators connected to the Bus Terminals.

Connecting to the Network

1. Below is the network block diagram for the RTMS Echo contact closure solution:

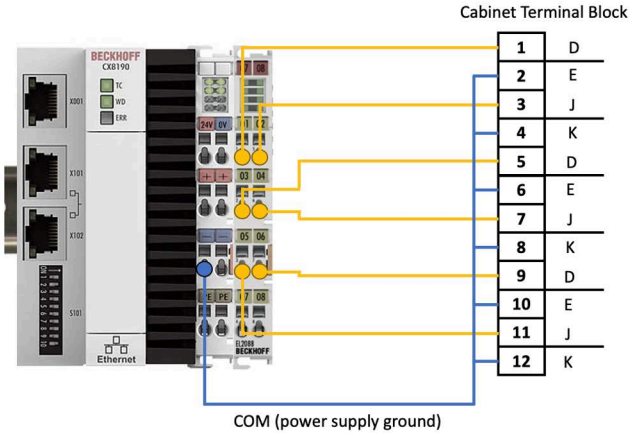


2. Connect port X101 to the network switch:



Connecting to the Controller

1. Output wiring for typical NEMA controller:



2. Power up the system after wiring to the controller.

Configuring the IP Address

The contact closure module will be preset to use the following IP addresses:

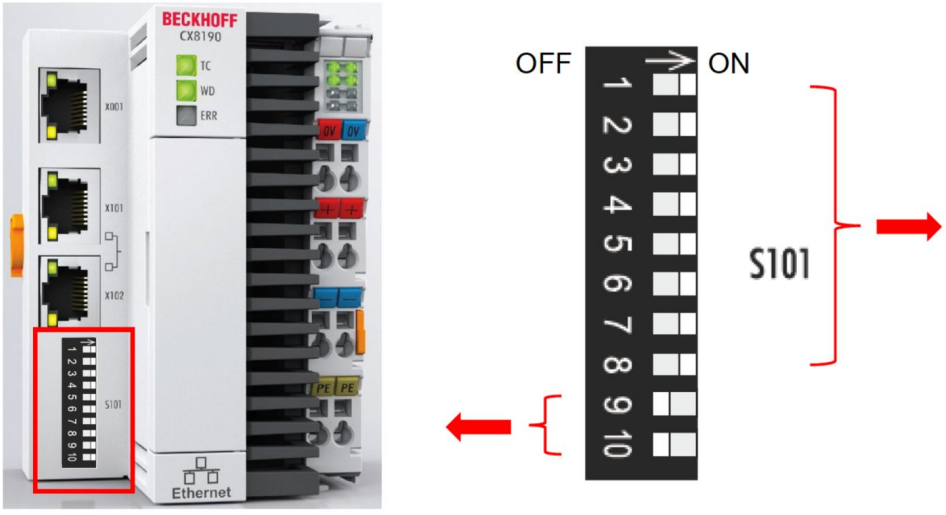
Port X001 (maintenance) - **192.168.0.11**

Port X101/X102 (data) - **192.168.127.254**

NOTES: The IP address can be changed based on the needs of your network.

You must have an active network connection to port X101.

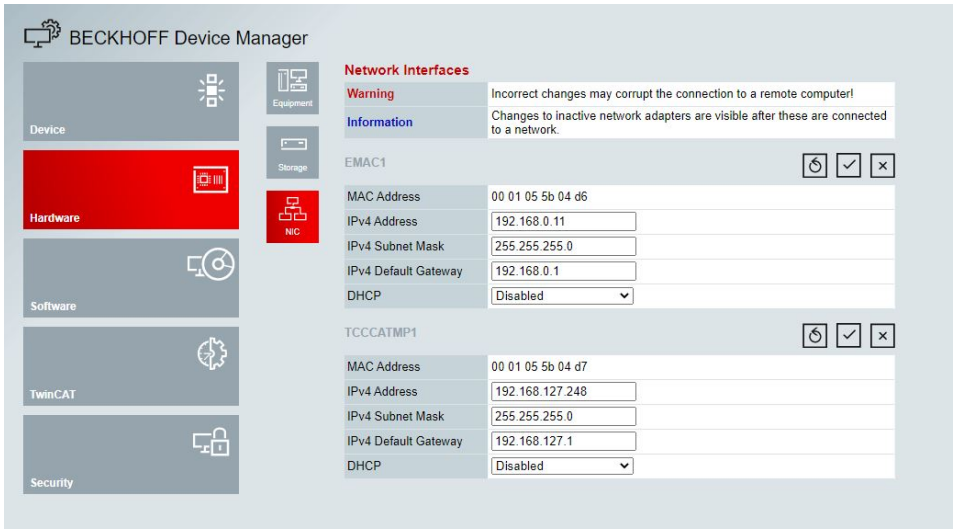
1. Verify the DIP switch match the following settings:
   - Switches 1-8 are in the ON position while switches 9 and 10 are in the OFF position.



2. Set the IP address of your PC to **192.168.0.99**
3. Connect the network cable of your PC to the maintenance port **X001.**

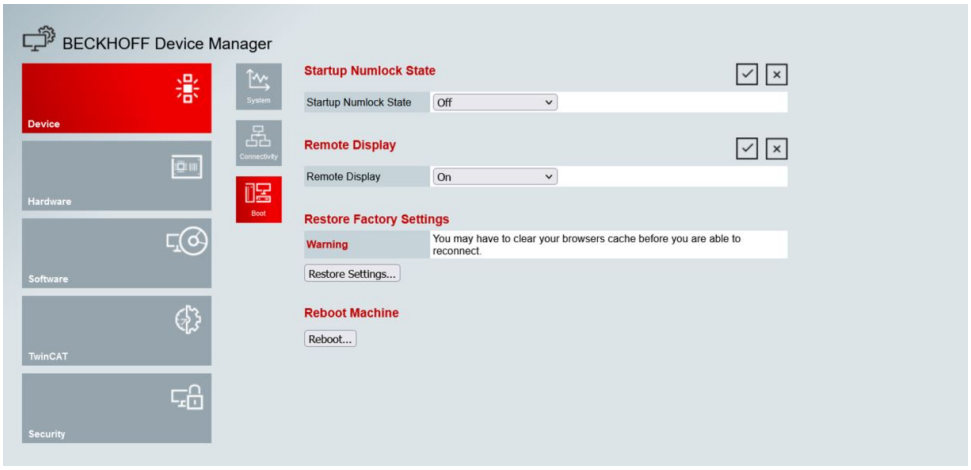
4. Open an Internet Browser and navigate to the following URL:
   https://192.168.0.11/config
5. Enter login credentials:
   - Username: **administrator**
   - Password: **Echo123**

6. In the **Hardware** section, click **NIC**.



7. Set "TCCATMP1" address and default gateway to desired subnet.
8. Click the check mark button after the network changes have been made to TCCATMP1.

9. In the **Device** section, click **Boot**.



10. Click the **Reboot** button at the bottom of the screen to reboot the system.
11. Verify the IP address after the reboot.
12. Connect the Echo Ethernet port and CX8190 X101 Ethernet port to network switch or point to point.

Verifying Operation

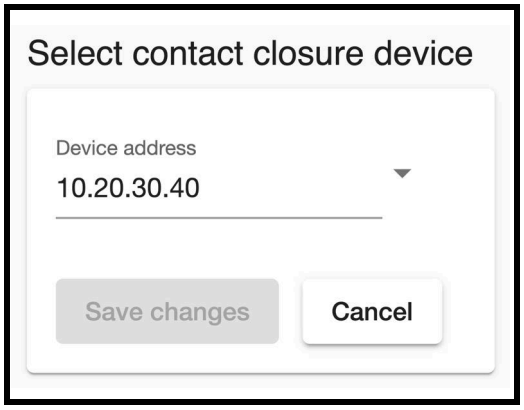
The following is normal LED behavior for the RTMS Echo.

Table 6-4: Normal LED Behavior

TC LED	Green indicates running status.
WD LED	Flashing red indicates running but no activity was received from the RTMS Echo.
ERR LED	Red indicates a system error. Unit is not running.

Contact Closure Device

1. Log in to the RTMS Echo. See "Logging in to the RTMS Echo" on page 4-1.
2. Click the **Settings** tab.
3. In the **Contact closure device** section, click **Change**.



4. Use the drop-down to select the IP address of the contact closure device.
5. Click **Save changes**.

Chapter 7: Troubleshooting

Troubleshooting Tips

Issue: No power

- Check connectors
- Starting voltage is too low for length of cable
- Voltage outside of 12-24VDC parameters, too high or too low will cause unit to shut down
- Using PoE injector instead of power supply, unit is passive PoE

Issue: No communication (LAN)

- No power to unit
- Check cable connections
- Check cable pin out (see Figure 2-1 on page 2-3)
- Forgot LAN credentials – contact ISS support for access to the Device locator tool

Issue: No communication (WiFi)

- No power to unit
- WiFi not enabled (see "Wi-Fi Setting" on page 4-47)
- Not within range
- Forgot WiFi password – the default is echo123456; otherwise, define a new password (see "Wi-Fi Setting" on page 4-47)

Issue: No detection

- Reboot the sensor (see "Reboot Device" on page 4-63)

Issue: Vehicle direction

- Displays incorrect direction on Home tab – check Traffic direction in Zones tab.
- Too many vehicles appear to travel in the wrong direction – check lane boundaries

Issue: Vehicle speed

- Speed reporting is too high – check US or Metric setting (see "Region Setting" on page 4-59)
- Are volume counts correct – verify to 95% or better (see "Verifying Vehicle Counts" on page 3-12)
- If above good, check speed calibration (see "Speed Calibration" on page 4-13)

Optimizing Volume Count Accuracy

For information about the vehicle counts section, see "Verifying Vehicle Counts" on page 3-12.

The most common reasons for vehicle count discrepancies are:

- Zone boundaries overlap or are too close – When this occurs, vehicles in one zone are shown as being detected in an adjacent zone. This is referred to as "splashing." In this case, changing the zone by increasing or decreasing the boundary can eliminate splashing.
- Improper sensor aiming – When this occurs vehicle counts are below what is expected. If the sensor is aimed too low or high, or is not perpendicular to the zone, vehicles may not be detected.
- Obstruction between the sensor and zone – An obstruction, such as a concrete lane divider may cause smaller vehicles to be missed.
- Occlusion – This is when a vehicle is hidden from view by another vehicle or object. A large truck can occlude (hide) the detection of a small car hidden behind.

The following provides information about the possible cause and solution for various conditions that can cause inaccuracies in the volume count.

Condition A: Over/Under Count in Adjacent Zones

In the situation shown in Figure 7-3, zone 3 shows an over count, while zone 2 shows an under count.

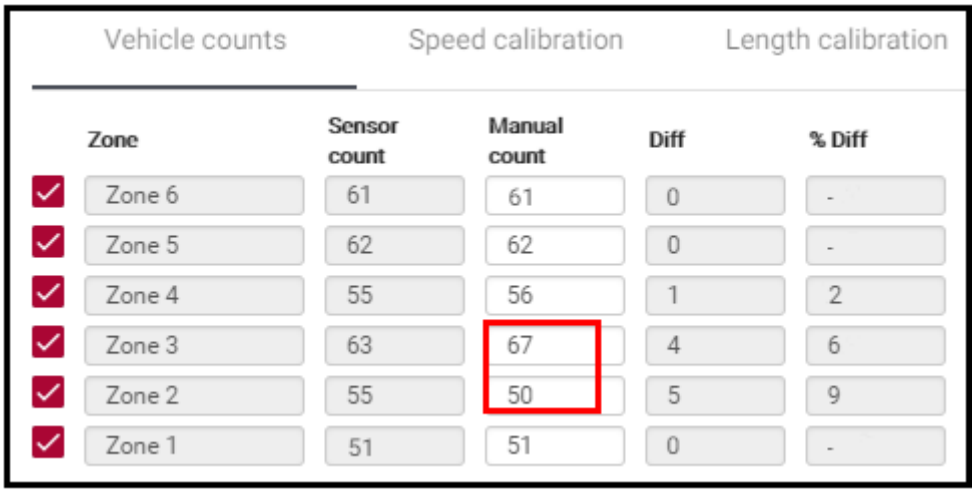


Figure 7-3: Over/Under Count: Adjacent Zones

The above could indicate that vehicles from zone 2 are being detected in zone 3. Fine tune the zone boundary between the two zones.

Condition B: Under Count in Near Zone

In the situation shown in Figure 7-4, the count for zone 1 is well below what is expected; vehicles are being missed.

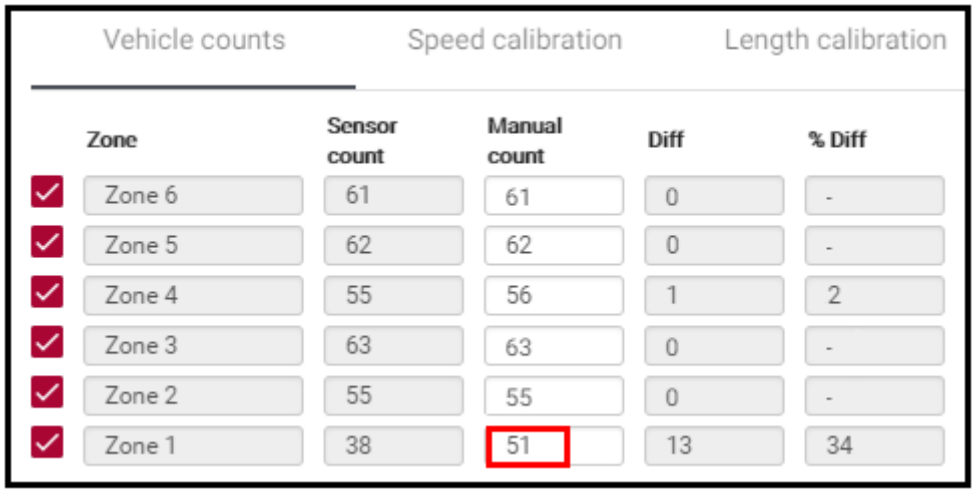


Figure 7-4: Under Count: Near Zone

The above is probably due to aiming issues. The sensor may be missing small profile vehicles. Check the aiming of the RTMS Echo and make sure it is aimed down enough to view the first zone of traffic (zone 1).

Condition C: Under Count in Far Zone

In the situation shown in Figure 7-5, the count for zone 6 is well below what is expected; vehicles are being missed.

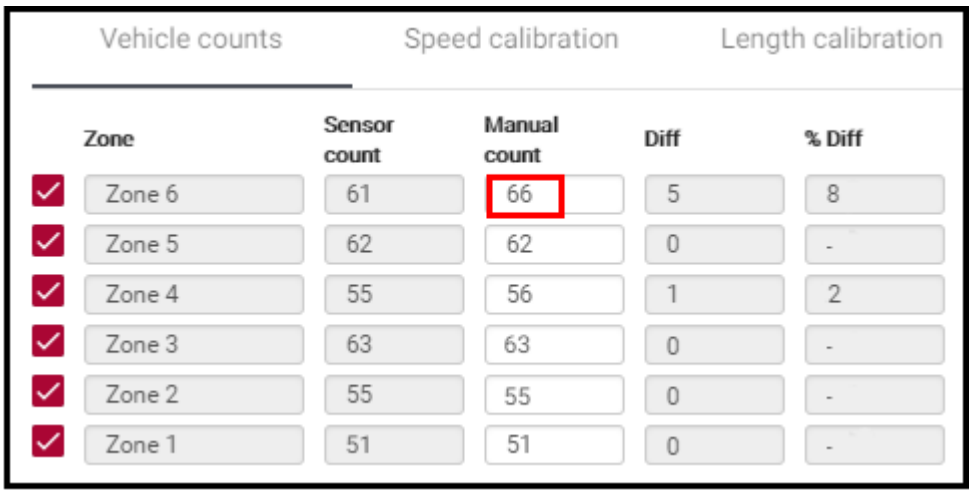


Figure 7-5: Under Count: Far Zone

The above is probably due to aiming issues. The sensor may be missing small profile vehicles. Check the aiming of the RTMS Echo and make sure it is aimed up enough to view the last zone of traffic (zone 6).

Condition D: Under Count in Several Zones

In the situation shown in Figure 7-6, the count for many zones is below what is expected; vehicles are being missed.

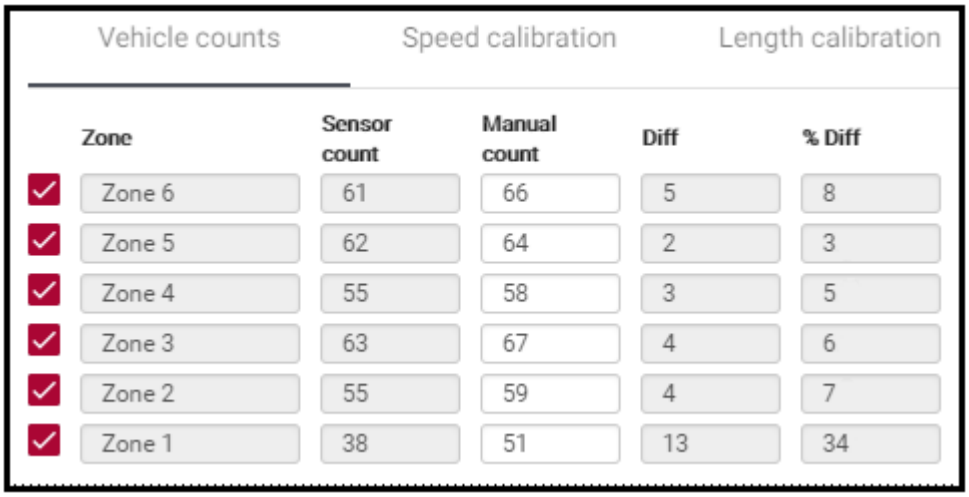


Figure 7-6: Under Count: Many Zones

In the above situation, the signal strength reflection may be too low. This could be caused by the aiming angle not being perpendicular to the traffic.

Condition E: Over Count in Several Zones

In the situation shown in Figure 7-7, the count for many zones is above what is expected.

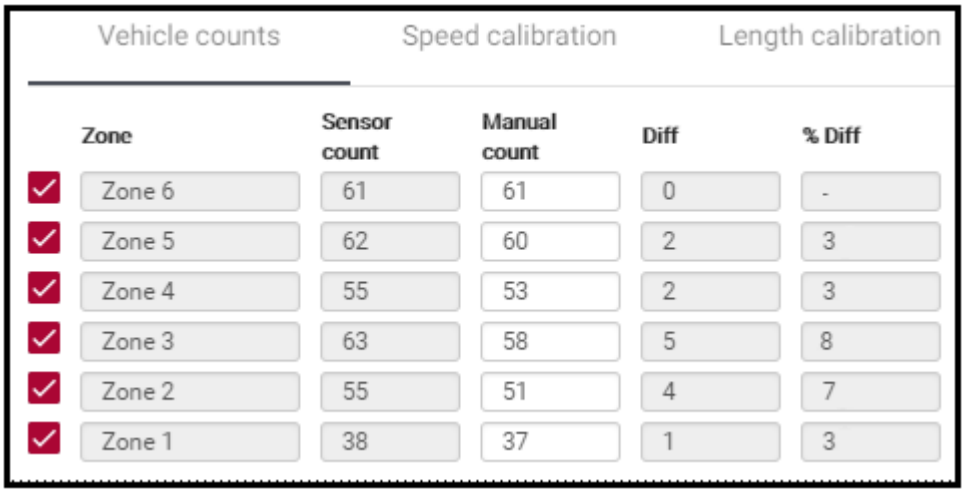


Figure 7-7: Over Count: Many Zones

In the above situation, the signal strength reflection may be too high, causing "splashing" into adjacent lanes. Over counts could also be a result of objects in the field of view (e.g., trees, signs, barriers, etc.). Check for these possibilities and re-adjust lane boundaries where possible. It may be necessary to change the height of the sensor to avoid possible obstructions.

Condition F: Under Count in First Zone Past a Barrier

In the situation shown in Figure 7-8, the count for zone 4 is lower than what is expected.

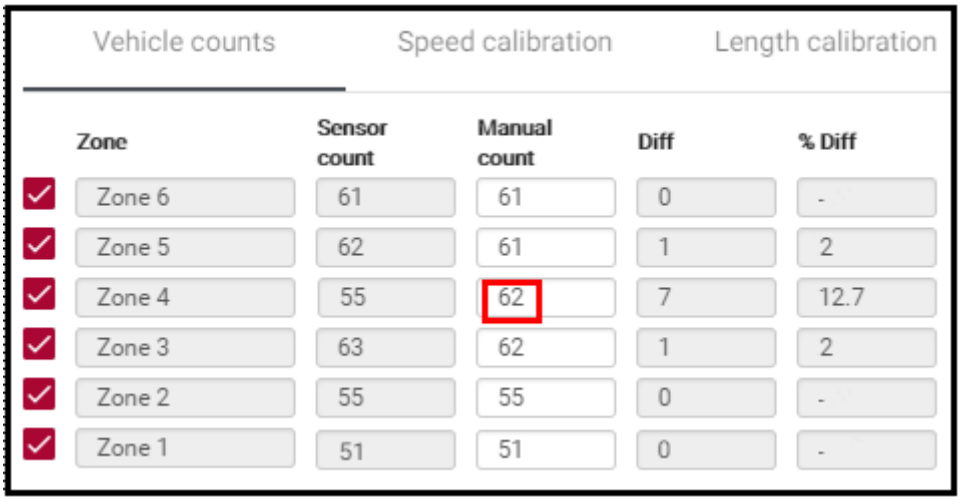


Figure 7-8: Under Count: First Zone Past Barrier

The above could indicate there is some kind of barrier between zones 3 and 4. The signal from the barrier is imposing on zone 4, causing smaller vehicles to be missed. Moving the zone boundary away from the barrier should help resolve this situation. Fine tune zone 4 by moving the zone boundary closest to the barrier further away from the barrier (move away +1). A slight adjustment can make a large improvement.