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Autoscope RTMS Sx-300
User Guide

PN A900-1155-1 Rev. A

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Record of Revisions

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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 an 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.

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.

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.

Certified Bluetooth Module

The Sx-300 contains the Sena Psarani ESD200:

- FCC ID S7APARANIESD200
- IC ID 8154A-PARANISD200

The Bluetooth module FCC and IC IDs can also be found on the label affixed to the outside of the Sx-300.

Chapter 1: Introduction

General

The Autoscope RTMS Sx-300 measures the distance to objects in the path of its microwave beam. This ranging capability allows it to detect moving and stationary vehicles in multiple detection zones.

A single Autoscope RTMS Sx-300 can monitor traffic in up to 12 lanes. The Autoscope RTMS Sx-300 can be mounted on road-side poles and aimed perpendicular to the road; this is referred to as the "side-fired" configuration.

The internal processor calculates volume, occupancy, average speed, and vehicle classifications for each lane and transmits the information using its communication interfaces. Note, other data is also available, for a full list, see "Define Message Composition" on page 4-20.

The Autoscope RTMS Sx-300 is a true RADAR device, designed for traffic sensing applications. It measures the distance to objects in the path of its microwave beam. The ranging capability allows the Autoscope RTMS Sx-300 to detect stationary and moving vehicles in multiple detection zones. When pointed onto a roadway, the Autoscope RTMS Sx-300 microwave beam projects an oval footprint. Its range is divided into multiple micro-slices, in which vehicles are detected.

The Autoscope RTMS Sx-300 receives reflected signals from all surfaces within its beam; pavement, barriers, vehicles and trees. Vehicles are detected when their reflected signal exceeds the background level in their micro-slice by a certain threshold. If that detection is part of a defined zone, its contact (optional) is closed during the detection period to indicate detection.

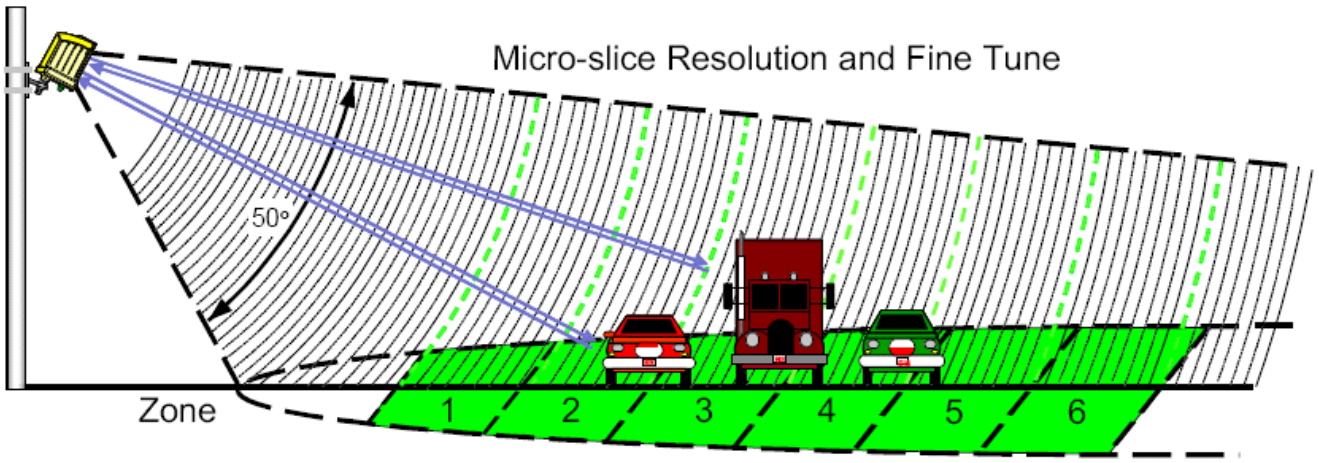


Figure 1-1: Beam Range and Micro-Slices

Multiple operating modes optimize internal parameter settings for highway (mainly free flowing traffic) and urban (mainly congested traffic) applications. A user can select how the Autoscope RTMS Sx-300 is configured by setting these modes in the Autoscope RTMS Setup Utility.

For mounting:

- The Autoscope RTMS Sx-300 is located on a roadside pole and is aimed perpendicular to the traffic lanes.
- Micro-slices corresponding to the location of traffic lanes are allocated as detection zones during the setup process.
- Each detection zone consists of multiple micro-slices.
- The length of the detection zone is determined by the width of the beam's footprint.

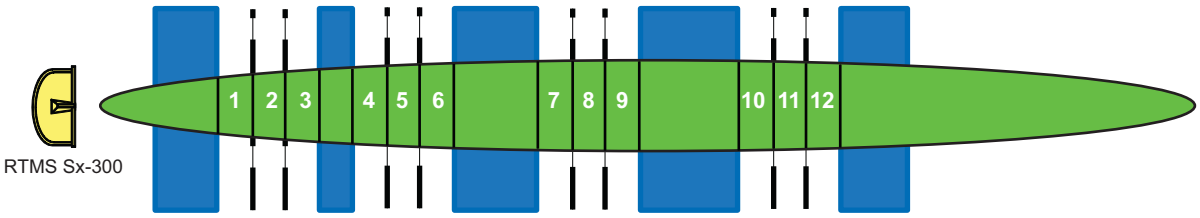


Figure 1-2: Autoscope RTMS Sx-300 Footprint

Vehicle Detection

Autoscope RTMS Sx-300 technology allows accuracy in the following conditions, even with a relatively low mounting-height:

- Severe weather and fog
- At night
- Strong vibrations common to roadways that carry large vehicles
- When vehicles are completely occluded by other vehicles

Autoscope RTMS Sx-300 Options

The standard Autoscope RTMS Sx-300 model offers the following:

- K-band (24.125 GHz)
- Low Voltage Power 12-24 VAC or DC
- Eight MB Internal Data Storage Memory
- Serial RS-232/485
- Bluetooth Wireless

Additional models of the Autoscope Sx-300 that are available include:

- Autoscope Sx-300 TCP (base unit with TCP/IP Ethernet)
- Autoscope Sx-300 SSP (base unit with Second Serial Port and Contact Closure)

For information about these options, see the *Autoscope RTMS Sx-300 Optional Configurations User Guide (PN A900-1155-2)*.

Autoscope RTMS Sx-300 Technical Specifications

Table 1-1: Mechanical Specifications

Measurement	Dimensions
Enclosure Dimensions	23x18x17cm (9x7.25x6.75 in.)
Enclosure Weight (Without mount)	1.02kg (2.24 lbs)
Enclosure Material	Polycarbonate
Ingress Protection	IP-67
Mounting	Chromate conversion per MIL-C-5541, Type II, Class 1a on cast aluminum bracket capable of supporting a load of up to 9.1 kg (20 lbs). (Vertical or horizontal).
Allowable pole flexing	Less than 5 degrees

Table 1-2: Power Specifications

Component	Details
Autoscope RTMS Sx-300 standard power requirement	12-24 VAC or DC (see the "Power Considerations" on page 2-1.
Polarity protection	Not polarity sensitive
Over-voltage shutdown limit	34 VDC or 24 VAC
Recommended fusing (external)	2A slow blow minimum
Power consumption (Without optional equipment)	3 Watts
Automatic recovery from power failure	Within 20 seconds
Surge Immunity	EN 61000-4-4 and EN 61000-4-5 (see Appendix B: "Surge Protection")

Table 1-3: Microwave Signal and Coverage Area Specification

Specification	All RTMS Sx-300 Models
Center Frequency	24.125 GHz
Bandwidth	50 or 75 MHz (depending on settings)
Power Output	20 dBm EIRP
Beam Width: Vertical (Elevation)	50°
Beam Width: Horizontal (Azimuth)	12°
Side Lobes Suppression	less than -20 dB
Range	0 – 76 m (0 – 250 ft)
Number Of Detection Zones (Lanes)	12

Table 1-4: Accuracy of Measurement & Error Rates

Measurement	% Error *
Per Lane Volume: Side-Fired	5%
Volume Range	0 – 65535
Per Lane Occupancy: Side-Fired	5%
Occupancy Range & Resolution	0-100%, 0.1%
Per Lane Classification By Length (6 classes)	10%
Class Lengths Limits range and resolution	25.5 m, 0.1 m (83.6 ft, 0.3 ft)
Average Vehicle Speed: Side-Fired	10%
Speed range and resolution	0 – 160 Km/h, 1.6 Km/h (100 mph, 1 mph)
Resolution of time events	1.25 mS
Voltage readout resolution	0.1v

***Accuracy Performance Conditions**

Error performance parameters outlined above are achieved under normal, high-flow traffic conditions and are subject to proper installation and setup. Lower accuracy is expected under the following conditions:

- Low speed, high congestion conditions: The Autoscope RTMS Sx-300 tends to be less accurate under very low speed conditions.
- Improper selection of installation site: insufficient set-back, height beyond the recommendation, obstruction by barriers or high fences before monitored lanes.
- Improper fine tune setting for the road geometry (lane width, barriers, etc.) will result in “splashing” and therefore, over-counting.
- Large trucks may occlude smaller vehicles. If there is a high number of trucks in traffic, the potential of occlusion increases, which may affect accuracy.

Environmental Conditions

Table 1-5: Environmental Conditions

Item	Operating Limits	Shipping & Storage
Temperature Range	-37 to +74°C (-35 to 165°F)	-40° to 77°C (-40° to 171°F)
Humidity	Up to 95% Relative Humidity	Up to 95% Relative Humidity
Vibration	0.5 g up to 30 Hz	
Shock		10 g peak for 11 ms
Wind	Winds up to 139 km/h (120 MPH)	
Precipitation	Up to 100 mm/h	

Note, printed circuit boards are conformally coated for protection against humidity and corrosion.

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 vii.

Upgrade Capability

User upgrades of firmware are available. Units can be upgraded through either direct or remote connection. Direct connection is done using the RS-232/485 connection at the site. If going to the site is not feasible, the Autoscope RTMS Sx-300 does support remote firmware upgrade through our optional communications modules (see "Autoscope RTMS Sx-300 Options" on page 1-3). If the remote communication link is unstable, it is recommended that you use the direct connection method.

Chapter 2: Hardware Installation

General

This chapter describes the installation and set up of the hardware components of the Autoscope RTMS Sx-300.

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.
- Autoscope RTMS Sx-300 units must be installed and adjusted in accordance with the installation instructions contained in this manual.
- Use the Autoscope RTMS Sx-300 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 Autoscope RTMS Sx-300 or other Autoscope RTMS Sx-300-related products for any purpose not expressly described in this manual or any other Autoscope RTMS Sx-300 product manual. Do not use the Autoscope RTMS Sx-300 to control or operate a gate-opening mechanism. Use of the Autoscope RTMS Sx-300 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 Autoscope RTMS Sx-300-related products.
- For more information about our installation, surveying, and training programs, contact your Autoscope RTMS Sx-300 sales representative.

Pre-Installation Considerations

The following information on power, cabling and communications should be taken into consideration prior to installing the Autoscope RTMS Sx-300.

Power Considerations

The Autoscope RTMS Sx-300 is a constant power device that requires in its basic configuration 3 watts of power. Electrical power has two components, voltage and current; both must be available in the correct ranges to operate the Autoscope RTMS Sx-300. The voltage must be between 12 and 24 volts (DC or AC RMS) with the voltage level read at the Autoscope RTMS Sx-300. Voltages below 12 volts will be insufficient to power the Autoscope RTMS Sx-300; voltages above 24 volts will cause the Autoscope RTMS Sx-300 to shut down to protect itself from an overvoltage condition. 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 Autoscope RTMS Sx-300 will draw 250 mA of current; at 24 volts 125 mA (base model, higher for units with additional communications options). Using an adaptor that provides 12 volts and 100 mA of current means that the total power to the Autoscope RTMS Sx-300 will be 12*0.1 = 1.2 watts, or roughly 40% of the power needed to turn on the Autoscope RTMS Sx-300.

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 (AC or 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 Autoscope RTMS Sx-300 to sense an overvoltage condition and shut down to protect itself.

If additional hardware (such as optional communications modules) is added to the Autoscope RTMS Sx-300, the power required to operate the Autoscope RTMS Sx-300 will increase. The voltage seen by the Autoscope RTMS Sx-300 will remain the same, but the current will increase to meet the new power requirement.

Cabling Considerations

The design of an Autoscope RTMS Sx-300 installation should include a breakout box close to the Autoscope RTMS Sx-300 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. For additional information see Appendix A: “Cabling and Connectors” and Appendix B: “Surge Protection”.

Communications Considerations

The communication method that comes standard on all Autoscope RTMS Sx-300 units is serial, which can be configured for RS-232 or RS-485 and Bluetooth. Port 1 is the main port that is connected to the outside world, Port 2 (optional) can be installed to also communicate with the outside world (for a complete list, see “Autoscope RTMS Sx-300 Options” on page 1-3).

It is recommended that serial port 1 be accessible to field technicians for maintenance purposes, even if the primary communication with the Autoscope RTMS Sx-300 will use Port 2.

IMPORTANT: The serial port can support hardware handshaking. It is critical that hardware handshaking (RTS/CTS) not be enabled by the software if the corresponding wires are not installed in the cable. Enabling RTS/CTS without the wires being in the cable will prevent the Autoscope RTMS Sx-300 serial port from communicating.

Placement in Side-Fired Highway Configuration

Autoscope RTMS Sx-300 is designed to mount on existing poles and road structures. Figure 2-1 shows typical cases of Autoscope RTMS Sx-300 side-fired/highway sites. The design considerations for each case are:

- **Case 1** — Maximal utilization of the Autoscope RTMS Sx-300 zone capability. Limitations are as follows:
  - A 12-zone coverage requires a larger setback (the distance to the first lane. If setback is insufficient, two Autoscope RTMS Sx-300 units may be required (see "Height and Setback Requirements" on page 2-5).
  - Limitations in mapping range slices to lanes will cause decreased accuracy. The site designer must weigh the trade-off between required level of accuracy and cost.
  - In almost all cases, the Autoscope RTMS Sx-300 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 2-8).
- **Case 2 —** Overpass installations: Do not mount the Autoscope RTMS Sx-300 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 Autoscope RTMS Sx-300 by a secondary reflection from a large flat surface (such as a sign or overpass). If the overpass is at an angle to the road, take advantage of the angle to point the Autoscope RTMS Sx-300 at the monitored roadway and away from the overpass. Do not aim the beam under it.
- **Case 3 —** Using median poles to mount two Autoscope RTMS Sx-300 sensors, one per direction may save poles but the designer should verify available set-back (see "Height and Setback Requirements" on page 2-5).
- **Case 4** — Sign-structure installations (see "Installing Autoscope RTMS Sx-300 on Sign Structures" on page 2-10).
- **Case 5** — Typical ramp metering site.

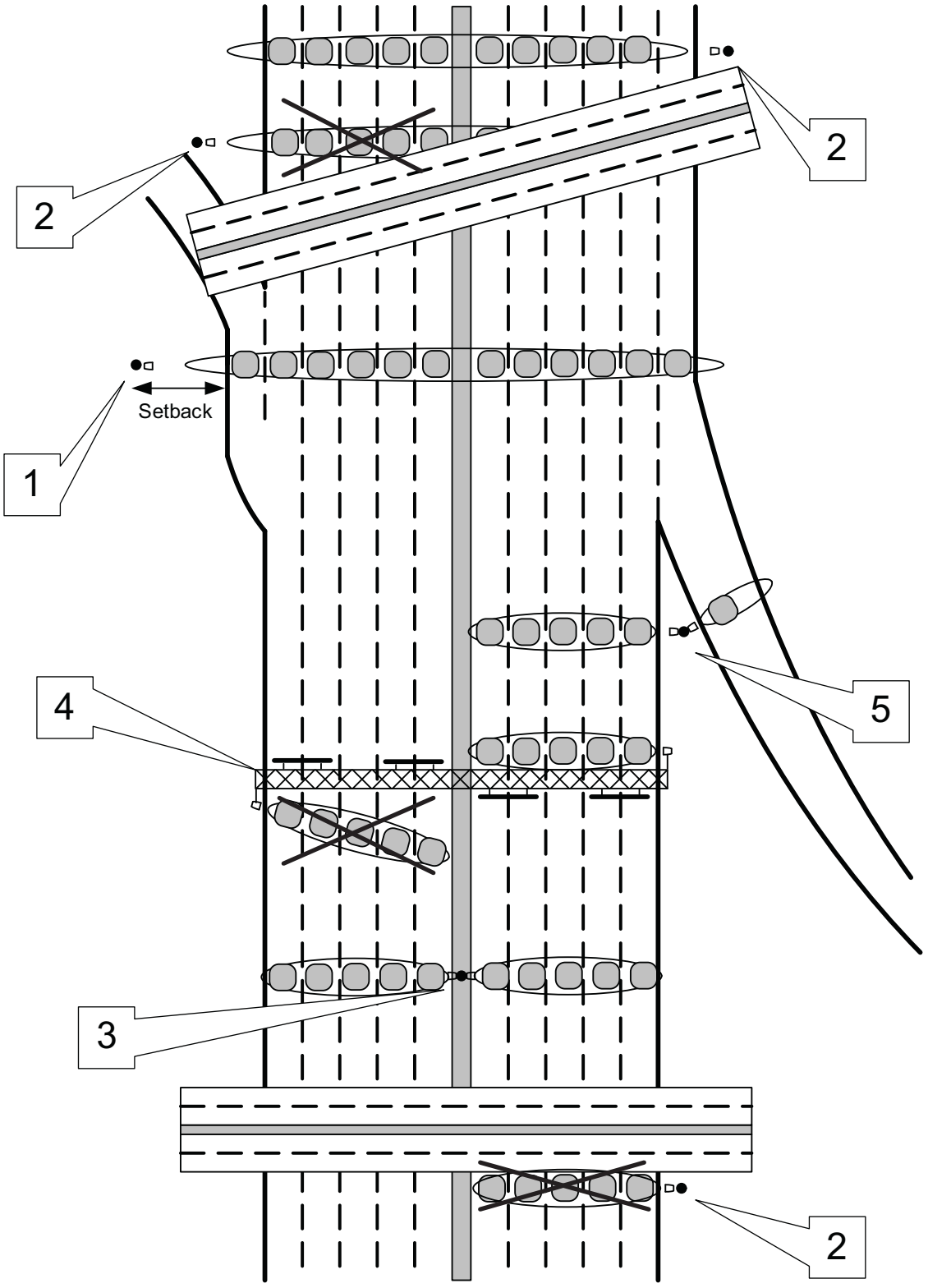


Figure 2-1: Autoscope RTMS Sx-300 Side-Fired Highway Sites

Height and Setback Requirements

The Autoscope RTMS Sx-300 has a detection area of 76 m (250 ft), and is able to detect up to 12 lanes of traffic within that distance. Make sure that all lanes of traffic are within 76 m (250 ft) of the Autoscope RTMS Sx-300.

Setback is the distance between the nearest edge of the first lane of traffic to be monitored and the front of the structure on which the Autoscope RTMS Sx-300 is mounted. Setback is a limiting installation parameter of the Autoscope RTMS Sx-300. More lanes can be covered with a larger setback.

Zero Setback

The Autoscope RTMS Sx-300 has the ability to detect vehicles in lanes with zero setback, i.e., pole location immediately beside the first lane of detection. Many Midblock detection sites, as well as bridges, have limited setback.

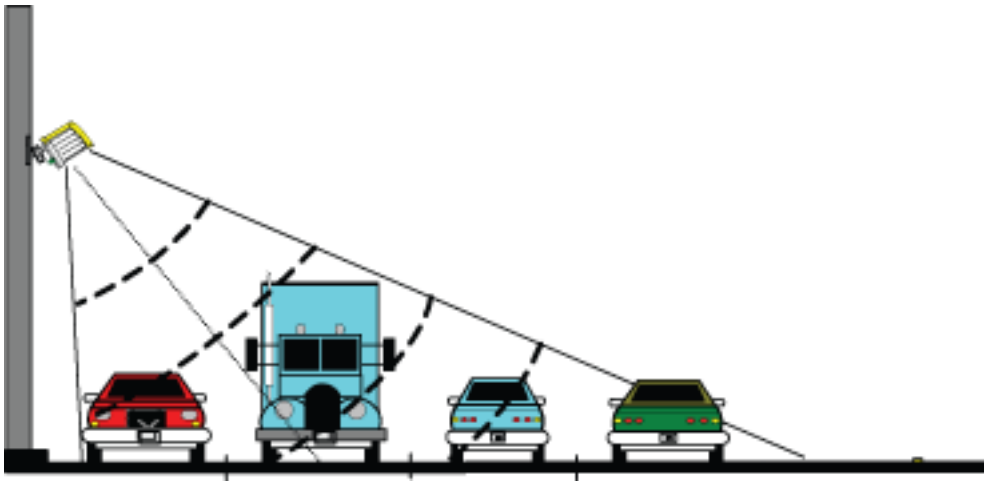


Figure 2-2: Zero Setback

Zero setback operation is limited to a maximum of four lanes and the mounting height would be approximately 4 m (14 ft).

It is always recommended to obtain as much setback as possible as this may improve the overall detection. The zero setback feature is available with all RTMS Sx-300 units and should only be used if the situation dictates. Where significant setback is available please refer to the standard installation charts.

Standard Setback

The Autoscope RTMS Sx-300 should be mounted at a minimum height of 5 m (17 ft) to minimize occlusion of vehicles even by the tallest trucks.

It must be set back from the first monitored lane to ensure it includes all required lanes within its field of view. The amount of setback varies with the width of the road to be covered.

Use the diagrams in Figure 2-3, Figure 2-4, and Figure 2-5 to determine the setback required to monitor a given number of lanes. The correct installation height can be determined once the setback is set. Height is measured relative to the road surface of the detection area. Do not measure height from the bottom of the mounting pole.

NOTES:

- It is almost always better to be further back from the minimum. If clear space is available, move the Autoscope RTMS Sx-300 further back.
- The mounting height is based on the setback. Using the correct height value allows the Autoscope RTMS Sx-300 to be aimed so that it receives maximum return signal while covering all required lanes. Mounting the Autoscope RTMS Sx-300 at an incorrect height will reduce accuracy.
- Widths of roadway medians must be included in the total detection area. For example: You may be able to set up 12 zones, but they must be within 76 m (250 ft).

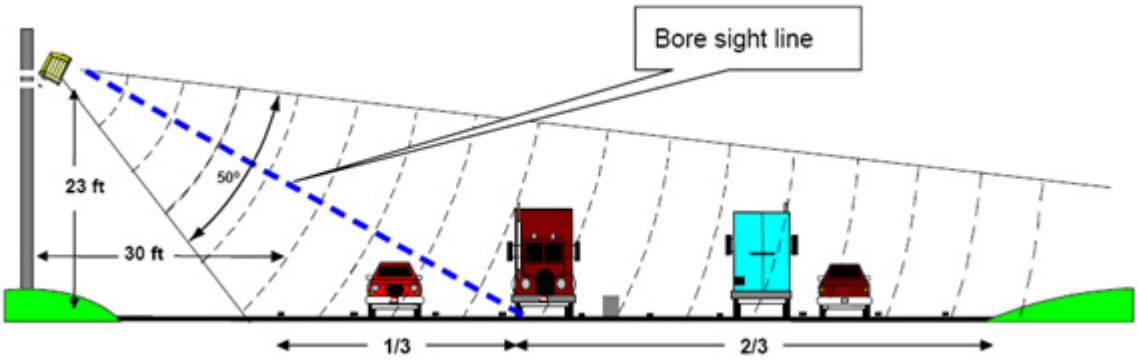


Figure 2-3: Autoscope RTMS Sx-300 Initial Aiming

The amount of setback you have will determine your actual detection area. As shown in Figure 2-2, a setback of 0 to 1.6 m (0 to 5 ft) will allow the Autoscope RTMS Sx-300 to detect vehicles up to about 15 m (50 ft). A setback of 7 m (23 ft) allows the Autoscope RTMS Sx-300 to detect vehicles up to 61 m (200 ft) of the Autoscope RTMS Sx-300.

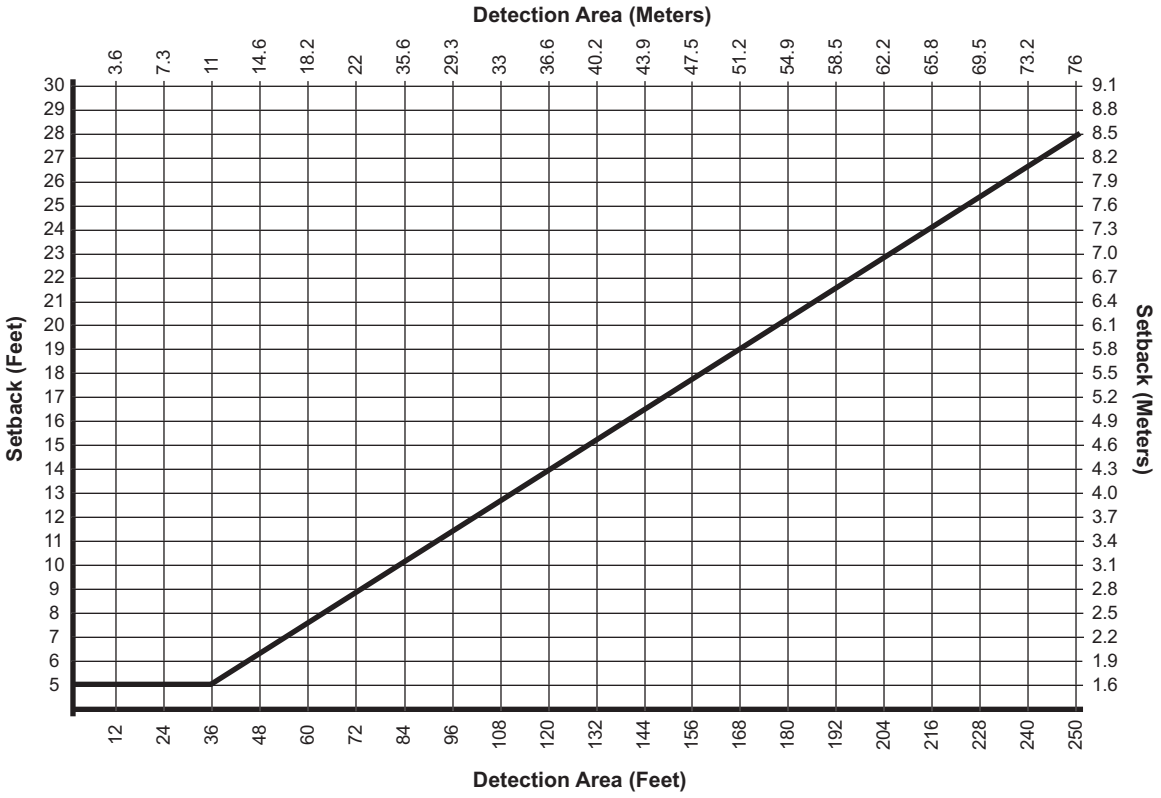


Figure 2-4: Setback Distance Chart

A setback greater than the minimum is desirable if room is available. Set the proper mounting height based upon actual setback distance.

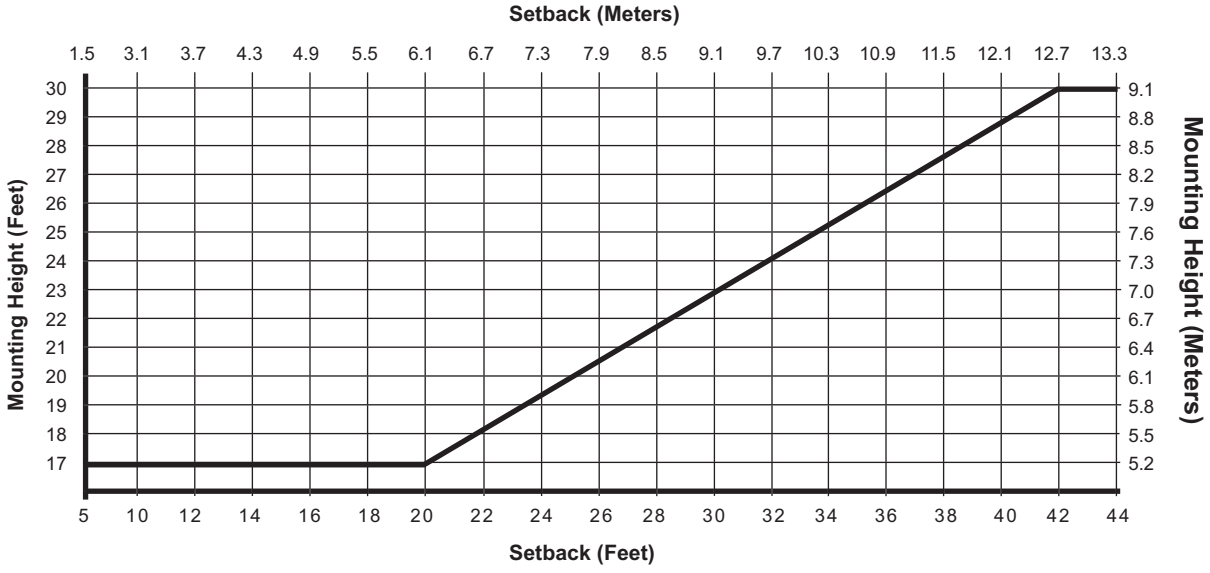


Figure 2-5: Mounting Height Chart.

Figure 2-6 shows the effect of restricted setback on the number of lanes that can be monitored by a single Autoscope RTMS Sx-300. Depending on the total area of detection required and the available setback the need for a second unit may be required. The same pole can be used to install the unit; however, a minimum of 1 m (3.3 ft) is required between the units.

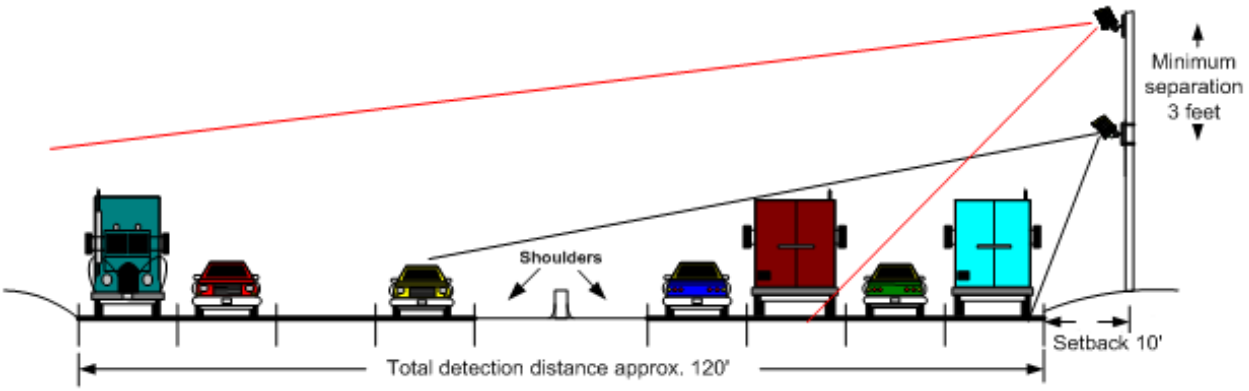


Figure 2-6: Effect of Low Setback

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.

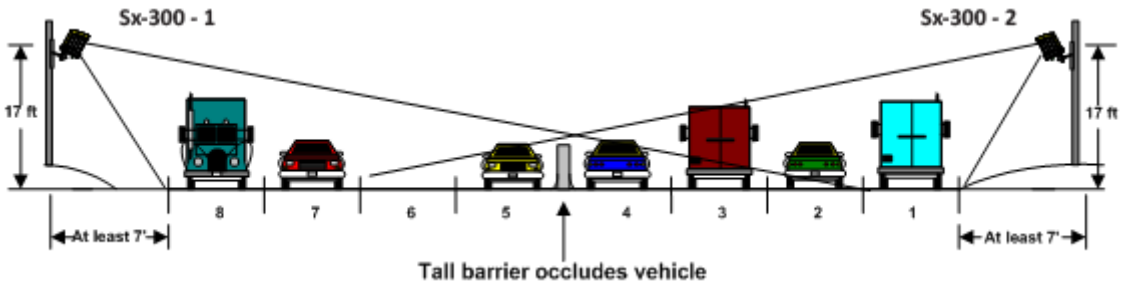


Figure 2-7: Two-Sided Placement

Elevated Roadway

On elevated or sunken roadways with insufficient outside shoulders, it may be an impossible job for a single sensor. Two Autoscope RTMS Sx-300 units, configured as shown by Figure 2-8, will cover all lanes if detection zones are defined as shown in Figure 2-8.

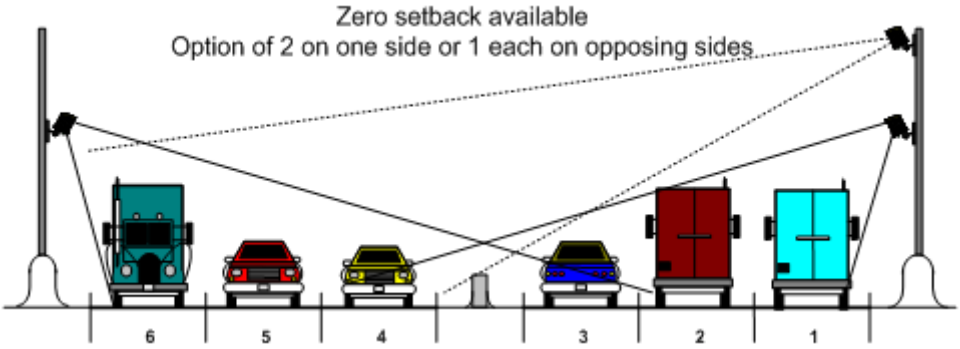


Figure 2-8: Autoscope RTMS Sx-300 on Elevated Roadway

Autoscope RTMS Sx-300 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.

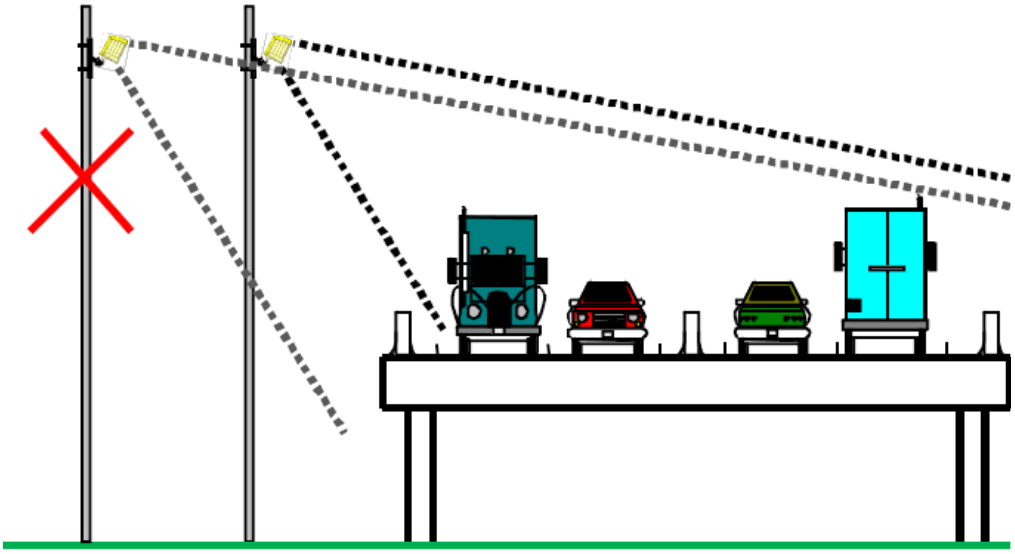


Figure 2-9: Pole Location for an Elevated Roadway

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.

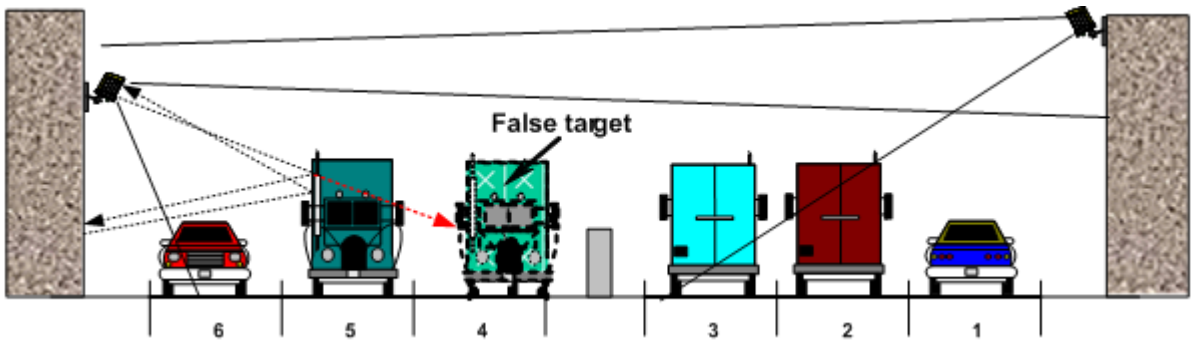


Figure 2-10: False Target Generated by Fence Or Wall

To avoid this problem install the Autoscope RTMS Sx-300 higher and increase the elevation angle to detect the far lanes of traffic excluding the nearest lanes, as shown on the right in Figure 2-10.

Installing Autoscope RTMS Sx-300 on Sign Structures

The installation of the Autoscope RTMS Sx-300 on Message Sign structures is acceptable only if the Autoscope RTMS Sx-300 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 type can cause more interference than other lattice work type structures and may require consultation with Autoscope RTMS Sx-300 Technical Support.

The best way to mount the Autoscope RTMS Sx-300 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.

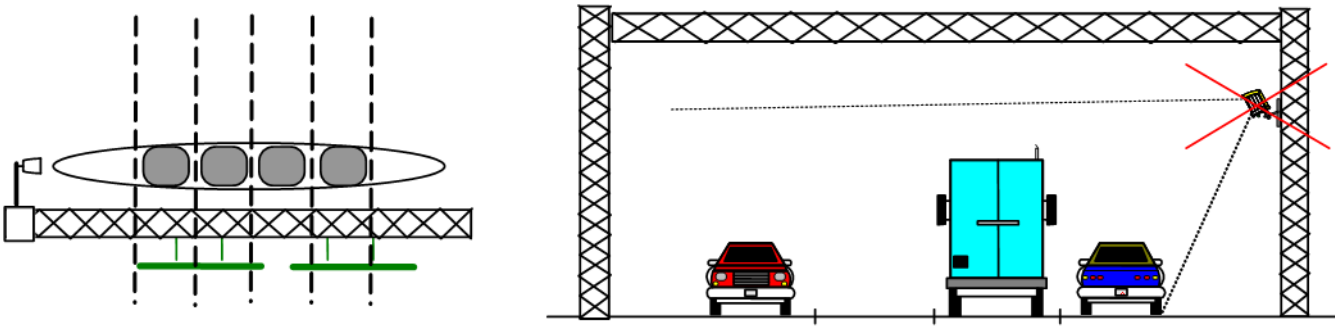


Figure 2-11: Autoscope RTMS Sx-300 on Sign Structures

Grade Differentials

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

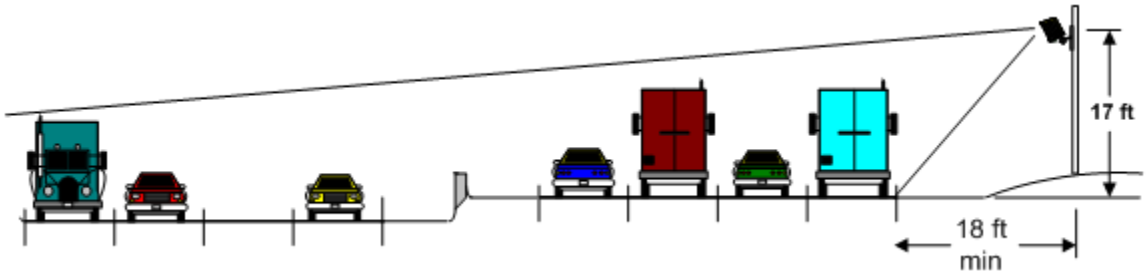


Figure 2-12: Small Grade Differentials

When the grade differential is large enough to put a part of the lower level in a "shadow", two Autoscope RTMS Sx-300 units are required as shown by the following.

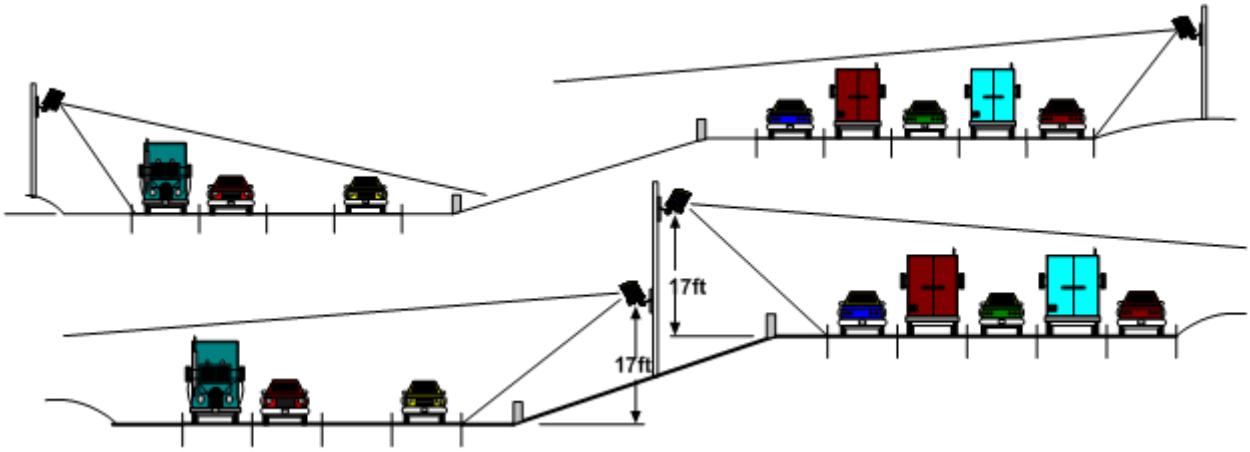


Figure 2-13: Large Grade Differential

Trees

Trees and bushes in the path of the microwave beam (in the setback or in medians) must be avoided. Autoscope RTMS Sx-300 units must be relocated or a gap in vegetation maintained in the path of the beam.

Placement in Midblock Applications

Placement in Midblock application is similar to Side-fired Highway. If sufficient setback is available, up to 12 zones of traffic can be configured. If the Autoscope RTMS Sx-300 is mounted in a zero setback configuration, only the nearest four zones are available for detection; however, the nearest zones can be excluded from detection (creating adequate sensor setback) if data from zones farther away is desired. The installer should verify which intersection approaches are most critical to proper data collection and configure the Autoscope RTMS Sx-300 to capture information from these lanes of traffic.

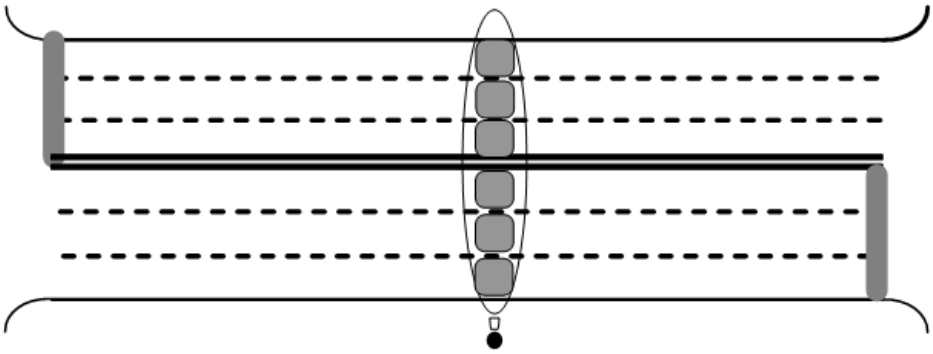


Figure 2-14: Midblock Placement

Mounting and Aiming Procedure

Warning

Installation of Autoscope RTMS Sx-300 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 Autoscope RTMS Sx-300 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.

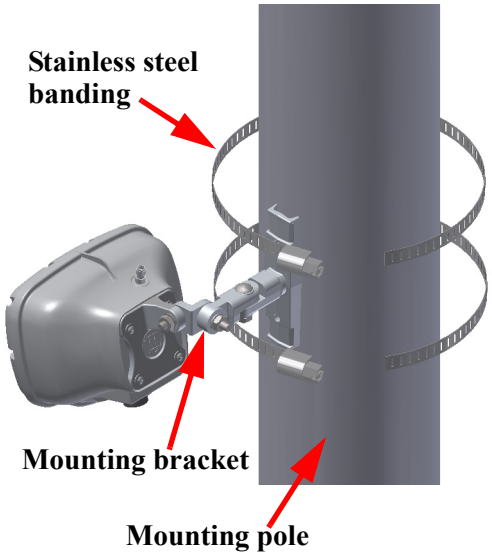
The following equipment is required to mount and aim the Autoscope RTMS Sx-300 unit:

- Provided: Autoscope RTMS Sx-300 unit, bracket, washers, nut and bolts (for brackety only) and connectors or optional pre-made Autoscope RTMS Sx-300 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 Autoscope RTMS Sx-300 unit is mounted on a wooden pole than when the Autoscope RTMS Sx-300 unit is mounted on a

concrete wall. 7/16” wrench, 1/2” wrench, assorted tools to be determined by mounting specifications.

To mount and aim the Autoscope RTMS Sx-300 sensor, do the following.

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



2. Secure the Autoscope RTMS Sx-300 to the mounting bracket using the 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 Autoscope RTMS Sx-300 to be perpendicular to the travel lanes and level side to side.
4. Look from behind the unit and use the top sight-ridge as a guide to align the bore sight.
5. Tilt the Autoscope RTMS Sx-300 so that the top of the sensor is aimed to the first 1/3 of the monitored lanes (see Figure 2-3 on page 2-6).
6. Secure the position by tightening the nuts.
7. Connect the cables for power, communications and surge suppression (see Appendix A: “Cabling and Connectors” and Appendix B: “Surge Protection”).

NOTE: Steps 3 and 6 are general guidelines. Actual mounting and tilt may need to be adjusted based on multiple factors such as obstacles and number of lanes.

8. Configure the Autoscope RTMS Sx-300 sensor (see Chapter 4: “Configuration and Setup”).

Chapter 3: RTMS Setup Utility

General

The Autoscope RTMS Setup Utility is the program that is used to interface with the Autoscope RTMS Sx-300. It can communicate with a single Autoscope RTMS Sx-300 (Direct) or with multiple RTMS Sx-300 units (Multidrop) when they are on the same communications channel and Polled Data Mode is active.

The application has numerous screens that you use to configure and operate the system.

This chapter describes:

- how to install the Setup Utility.
- how to start the Setup Utility application.
- how to start the Setup Utility in Demo mode.

System Requirements

The Setup Utility must be installed on a computer that has the following:

- Operating System: Microsoft® Windows XP® operating system or Windows 7 operating system (32 or 64 bit)
- Software: Microsoft .NET Framework 3.5 SP1
- Hardware: Serial (preferred), or USB with a USB-to-serial adapter

NOTE: The Setup Utility runs with Microsoft .NET 2.0 and higher. Run the software with Microsoft .NET 3.5.1 for optimal performance. In most cases the software performs acceptably but you may notice visual differences in the graphical user interface. A warning message is displayed if the .NET version is incompatible. Click **Ignore** to proceed.

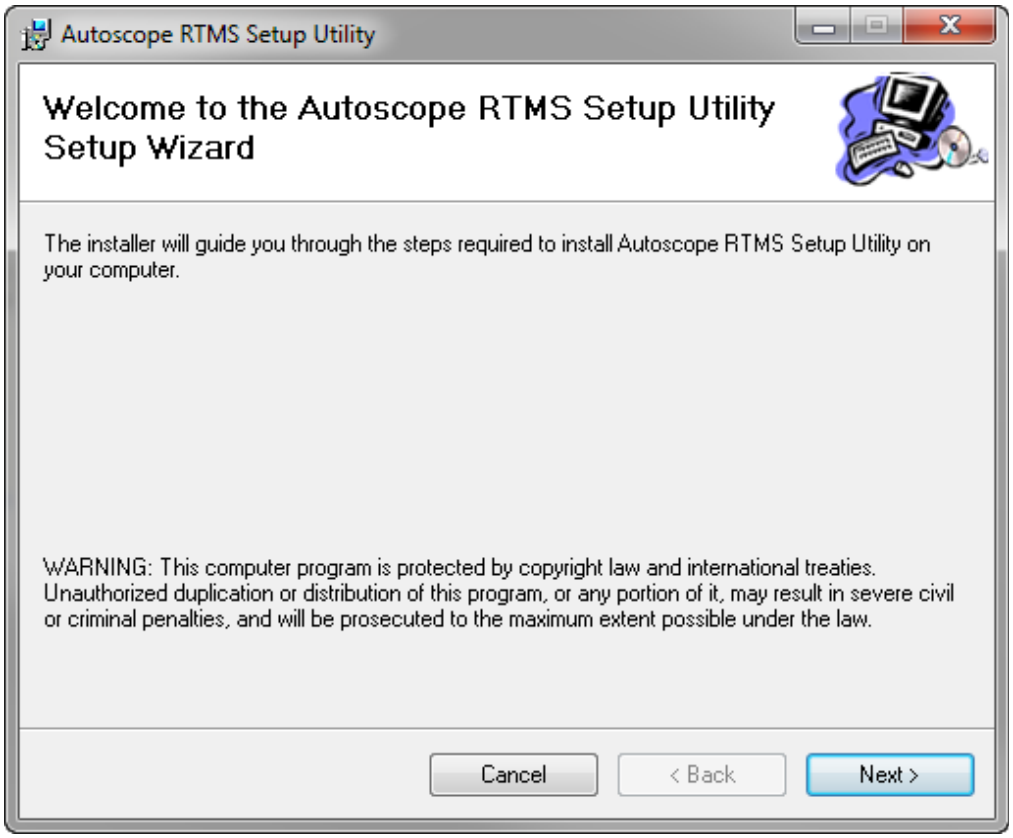
Installing the Setup Utility

NOTE: If there are RTMS Sx-300 and RTMS G4 sensors in the network, you will need to install the setup utility for both sensor types.

To install the Setup Utility, do the following.

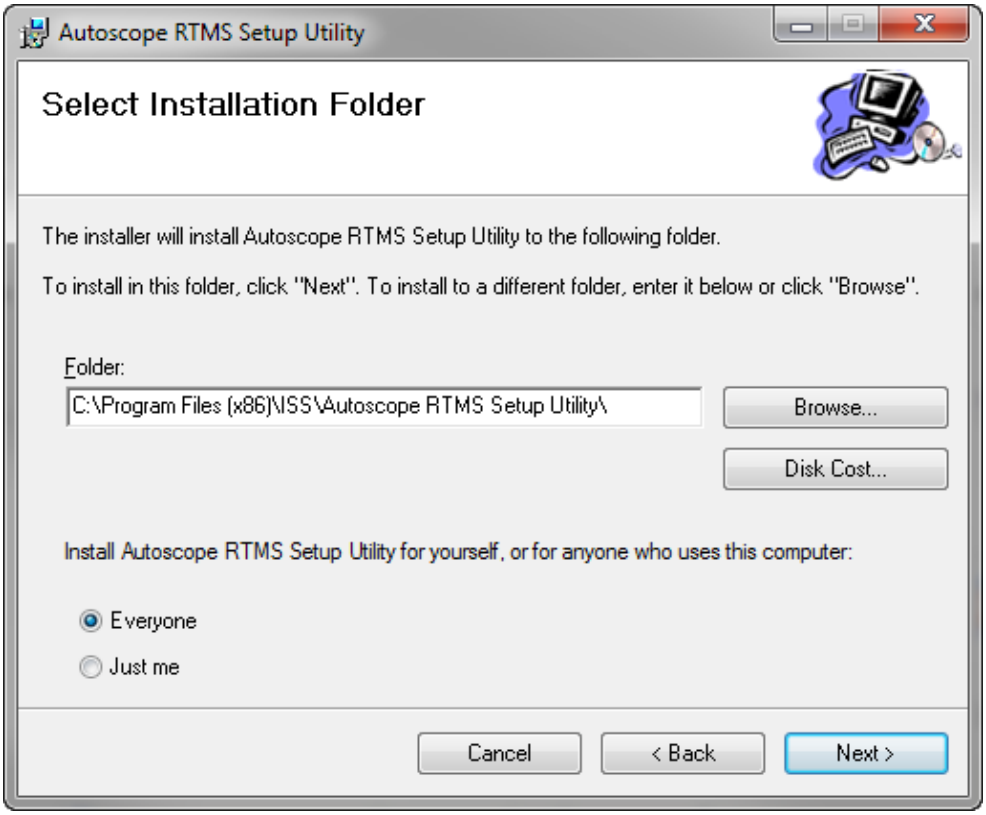
1. Locate and double-click the installation file:
   - For RTMS Sx-300 sensors: **Autoscope_RTMS_Setup Utility xxx.msi** (xxx is the version number).
   - For RTMS G4 sensors: **RTMS_Setup Utility xxx.msi** (xxx is the version number)

   The following window appears.



2. Click **Next**.

The following window appears.

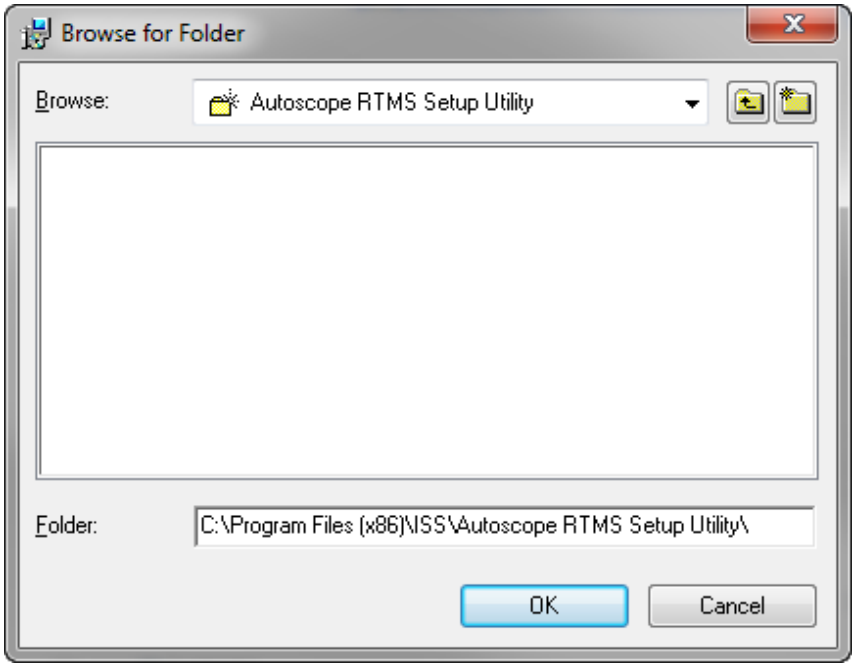


3. Select whether you want only the logged in user to be able to access the setup utility.
4. To see how much disk space is available on your system, click **Disk Cost. . .**
5. Do you want the files installed in the default location?

Yes	No
Proceed to Step 9	Continue with Step 6. **NOTE:** The default location is recommended.

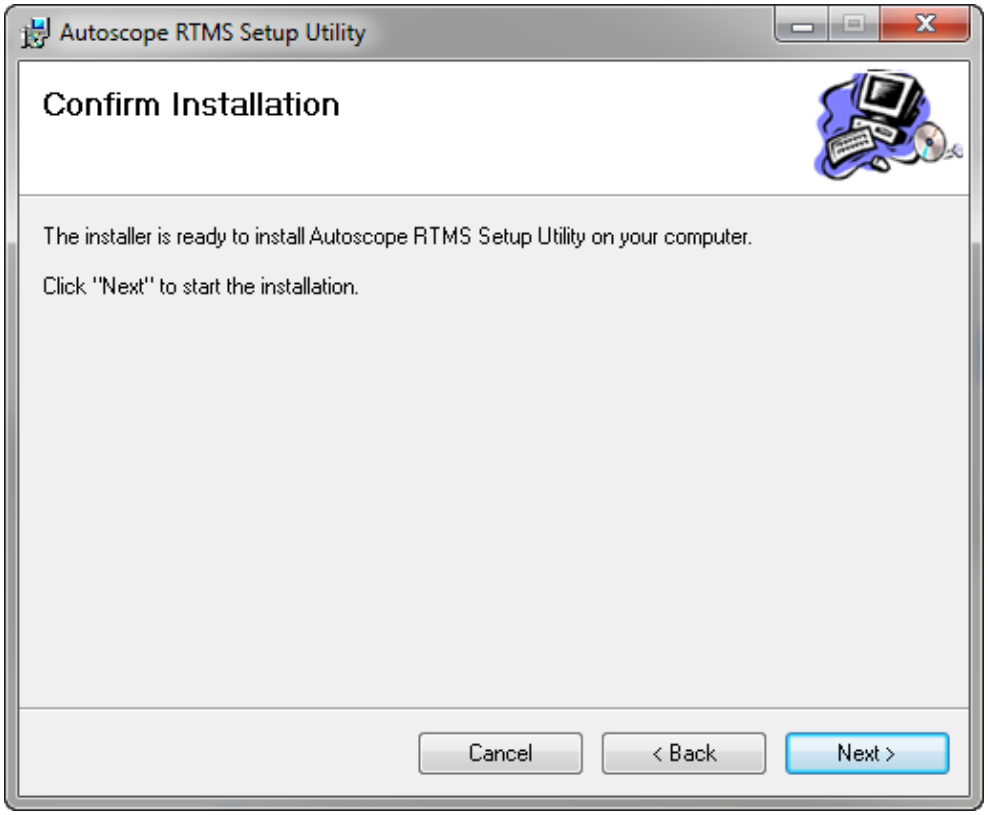
6. Click **Browse**.

The following window appears.



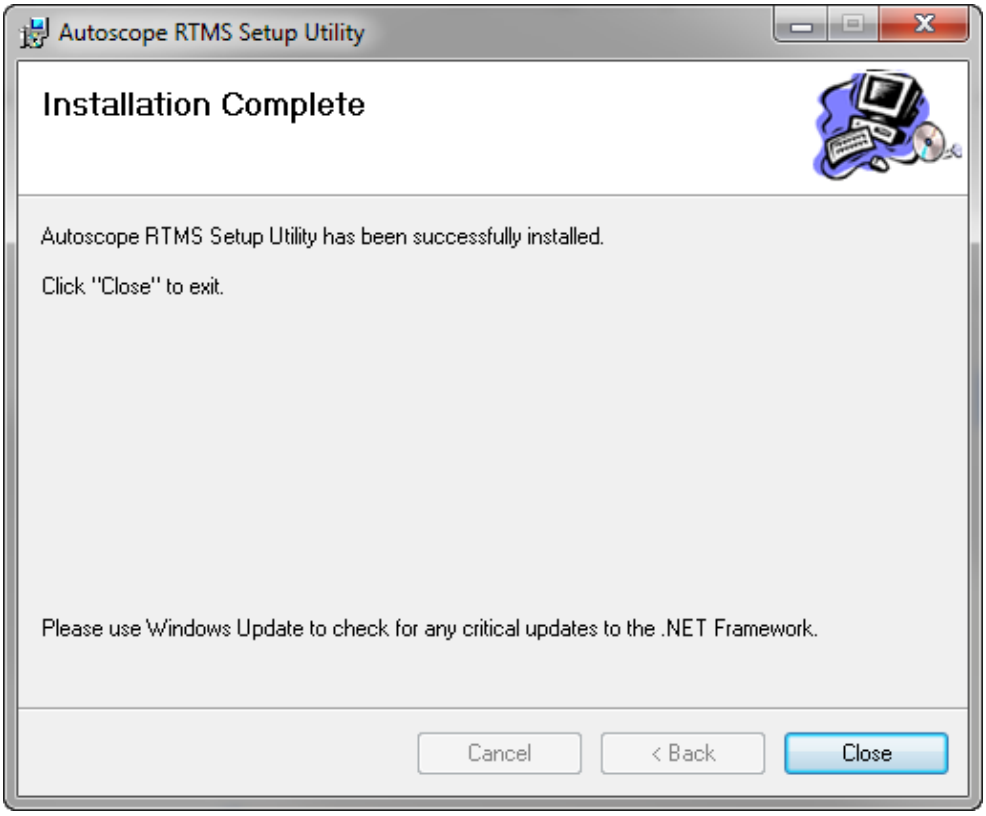
7. Select a new location for the files to be installed.
8. Click **OK**.
9. Click **Next**.

The following window appears.



10. Click **Next**.

When the installation is completed the following window appears.



11. Click **Close**.

    An icon appears on your desktop as a shortcut to starting the Setup Utility application.

Starting the Setup Utility

IMPORTANT: Windows may disable the COM port if port activity is detected during the boot process. DO NOT connect the Autoscope RTMS Sx-300 to the COM port before Windows startup is complete.

How the setup utility is started is dependent on whether there are RTMS G4 sensors in the network along with RTMS Sx-300 sensors.

For Networks With Only RTMS Sx-300 Sensors

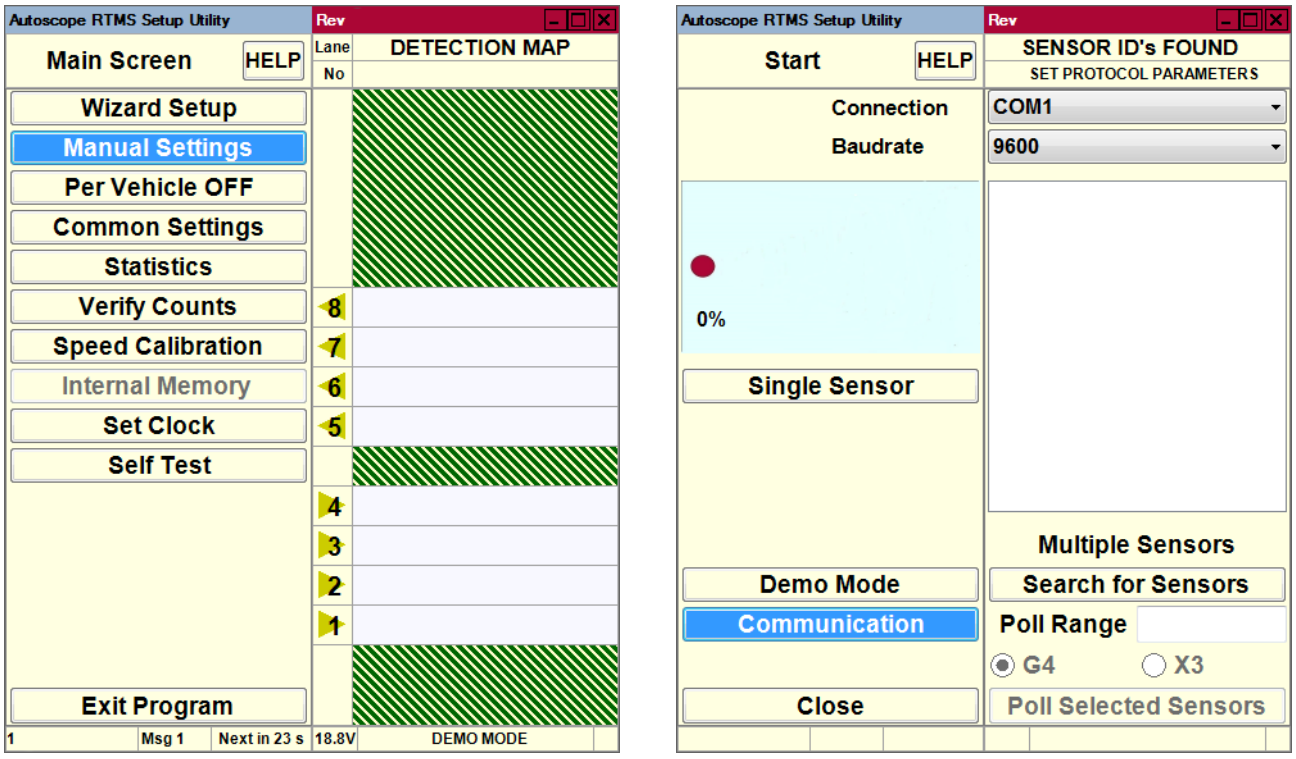
To connect to the Autoscope RTMS Sx-300 and start the Setup Utility, do the following.

1. Using a serial cable, connect the Autoscope RTMS Sx-300 to the serial port of the computer that has the Setup Utility installed.
2. Power up the Autoscope RTMS Sx-300.
3. Select **Start>All Programs>ISS>Autoscope RTMS Setup Utility>Autoscope RTMS Setup Utility** or double-click the shortcut icon on the desktop.

   The following window appears.

If communication is established with the Autoscope RTMS Sx-300 sensor, the Main Screen will appear. If communication could not be established or if multiple units are located, the Start screen will appear.

Main Screen **Start Screen**



4. Did the Main Screen or Start screen appear?

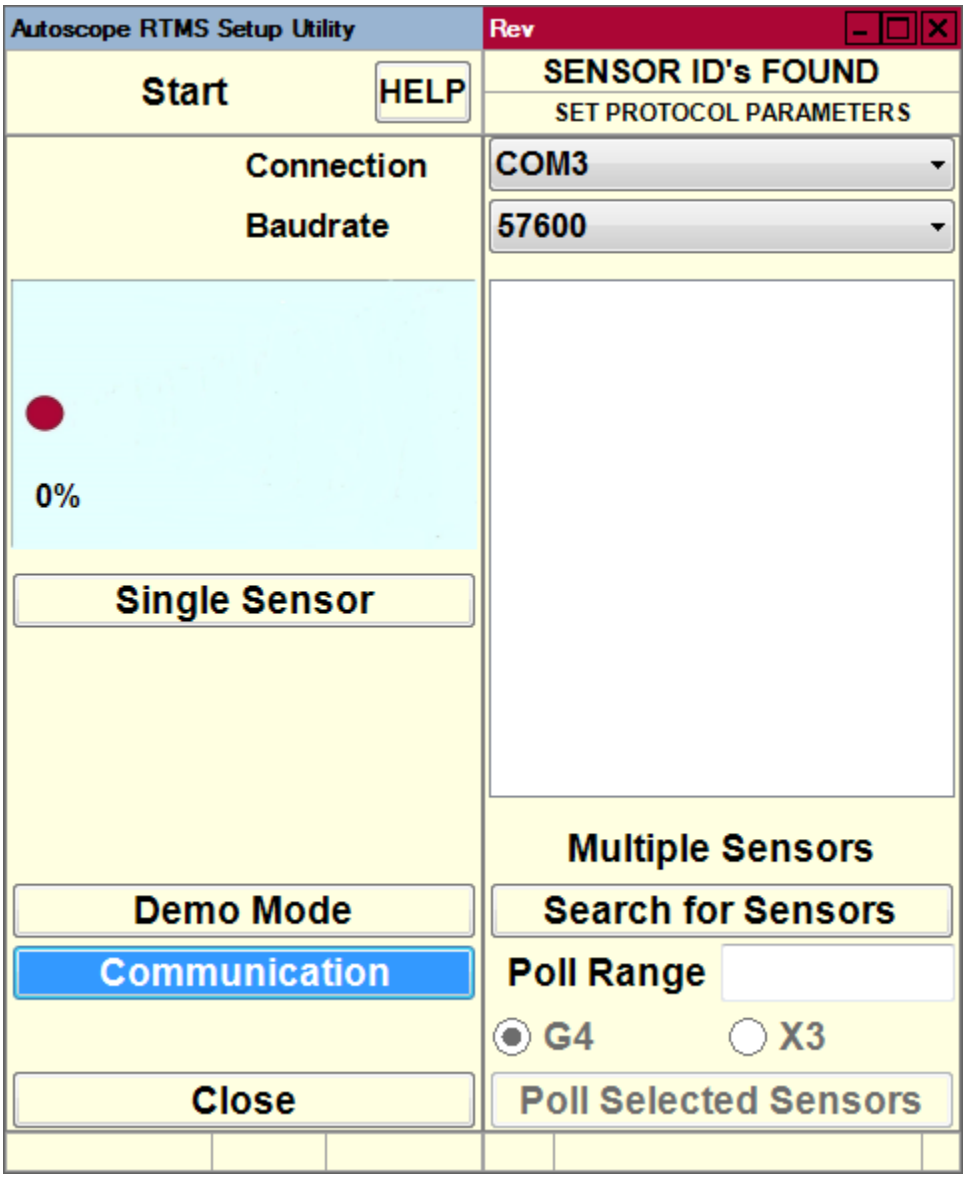
Main Screen	Start Screen
The connection is established.	Conduct a search for sensors (see "Finding Sensors" on page 5-19).

For Multidrop Networks With RTMS Sx-300 and RTMS G4 Sensors

To connect to the Autoscope RTMS sensors and start the Setup Utility, do the following.

1. Using a serial cable, connect an Autoscope RTMS sensor to the serial port of the computer that has the Setup Utility installed.
2. Power up the Autoscope RTMS sensor.
3. Select **Start>All Programs>ISS>Autoscope RTMS Setup Utility>Autoscope RTMS Setup Utility** or double-click the shortcut icon on the desktop.
4. When the opening screen appears, press the **ESC** key.

   The Start screen appears.



5. Conduct a search for sensors (see "Finding Sensors" on page 5-19).

Navigating the Setup Utility

The Setup Utility buttons and menus may be operated by any method listed below. The terms select and click are used throughout this manual to describe actions you can complete using the mouse or keyboard.

- The interface consists of buttons and text displays.
- Point and click to select a button.
- Navigate using up/down/left/right keys and ENTER keys. Select by the arrow keys and take action by hitting ENTER.
- In some cases the TAB key can be used to navigate between the two main panels.

For a complete description of the Main Screen, see "Main Screen" on page 3-19

Running Demo Mode

The following describes the procedure for operating the utility in demo mode.

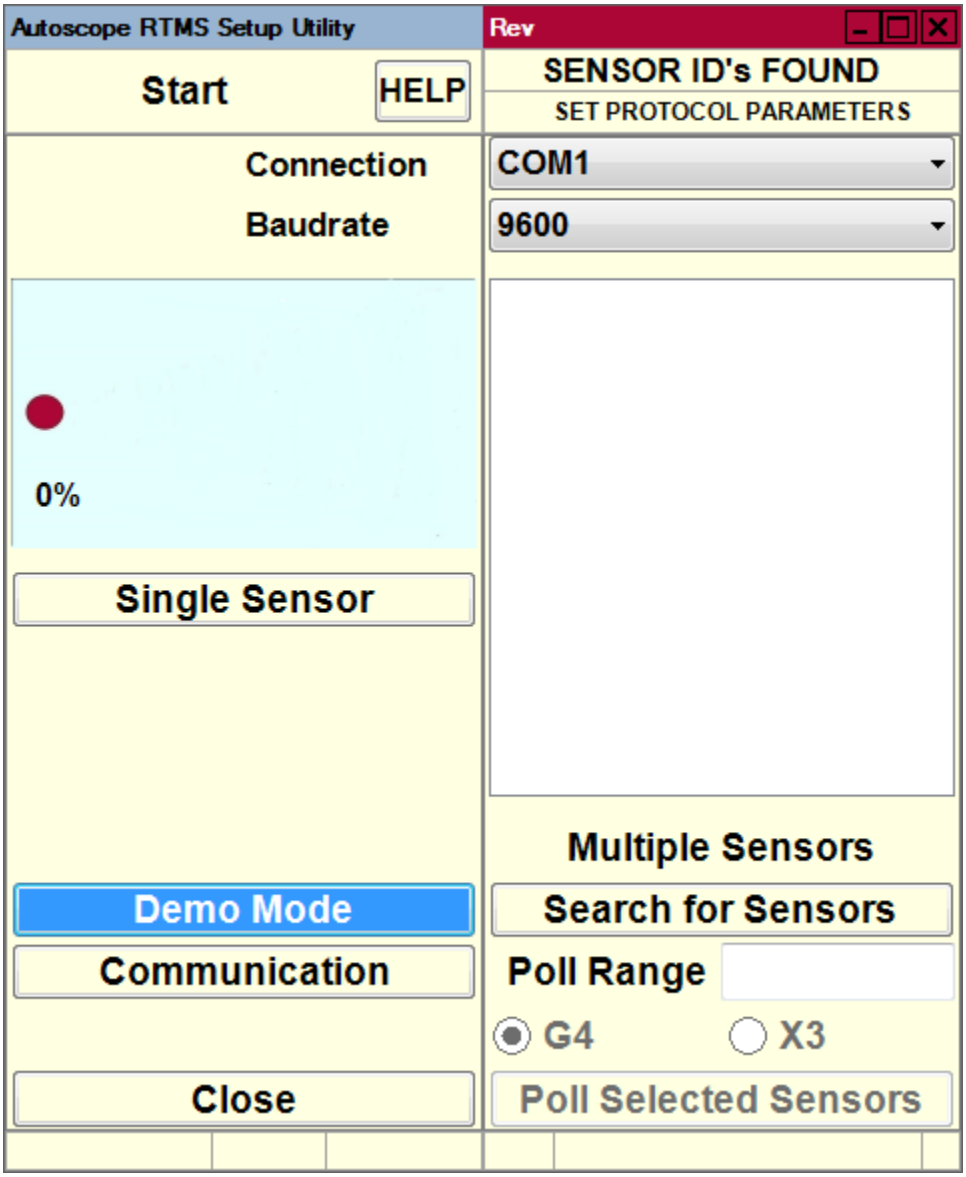
NOTE: Before running Demo mode, verify that the computer is NOT connected to an Autoscope RTMS Sx-300 unit.

1. Start the Setup Utility; see "Starting the Setup Utility" on page 3-7.

   The following screen appears.

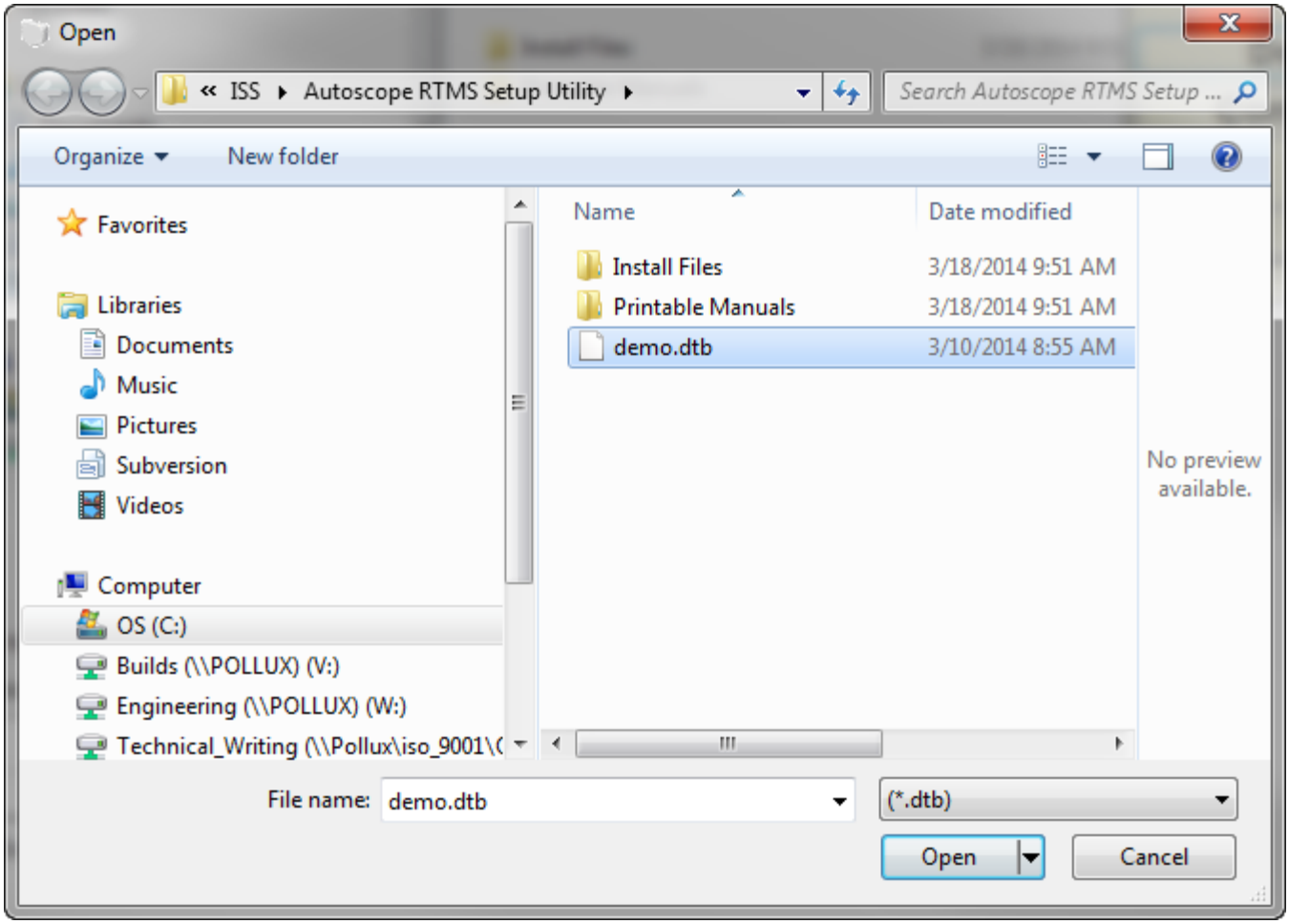
2. Press the **ESC** key to halt the search.

The Start screen appears.



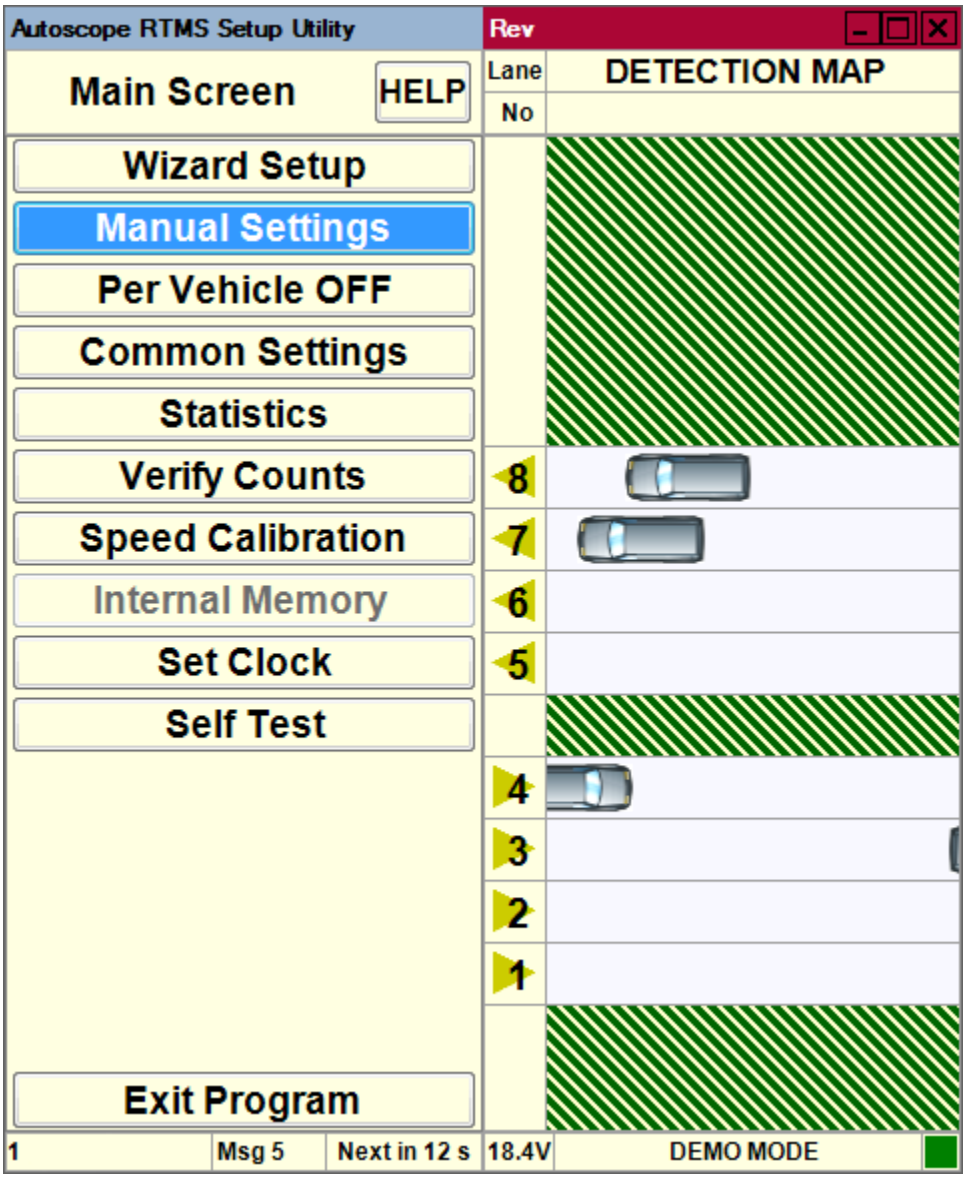
3. Click **Demo Mode**.

The Open window appears.



4. Double-click the sample file named **demo.dtb** or any other saved Autoscope RTMS Sx-300 setup file.

   This initializes the program with sample data and displays the Main Screen.

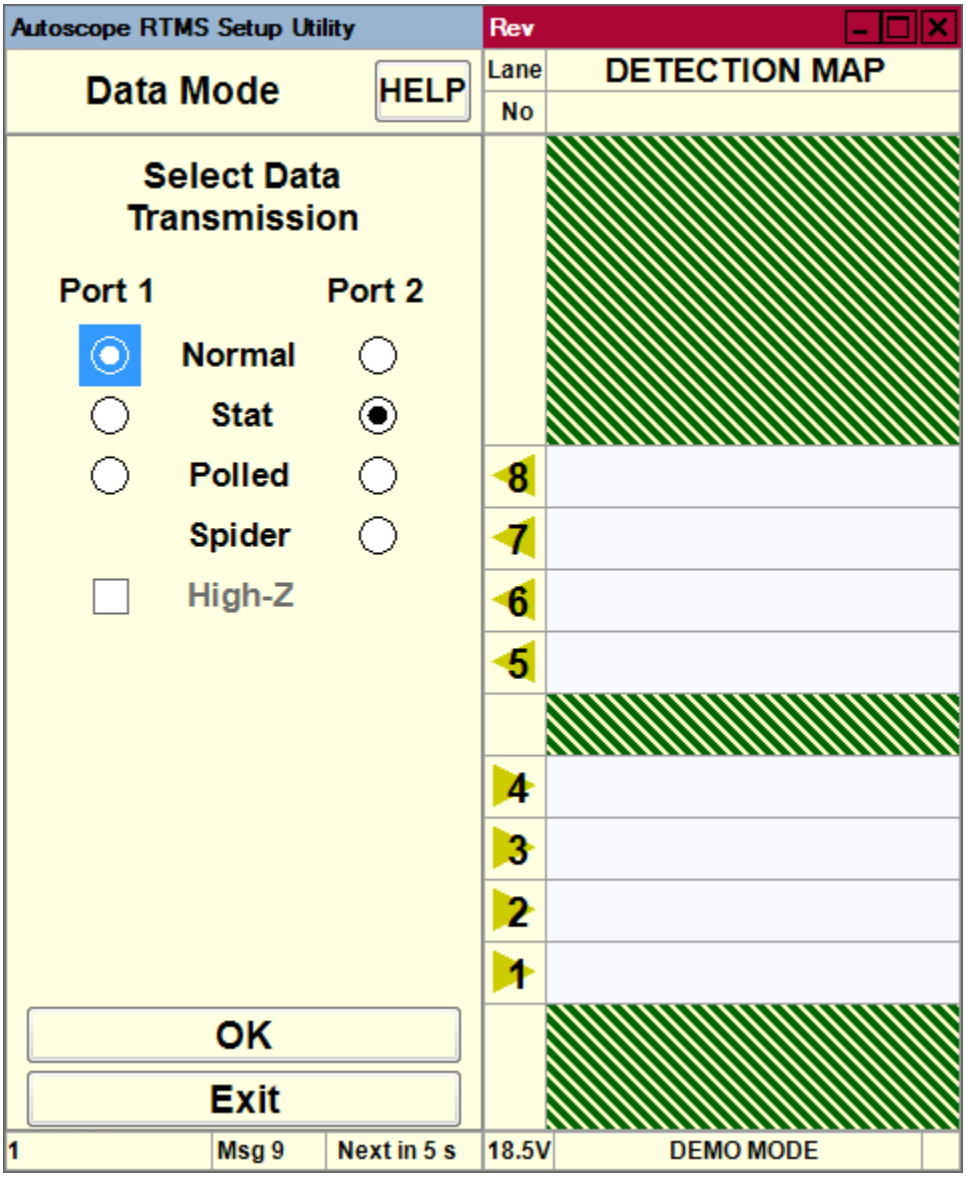


5. Do you see traffic in the Detection Map area?

Yes	No
You can now operate the software just as if you were connected to an active Autoscope RTMS Sx-300 gathering data from live traffic. For information on how to operate the software, see the sections that follow in this manual.	Continue with Step 6

6. On the Main Screen, click **Manual Settings**.
7. On the Manual Setup screen, click **Data=**.

The following screen appears.



8. For **Port 1**, select **Normal**.
9. Click **OK**.

   Traffic should appear in the Detection Map.

NOTE: If you want to change the message period from 60 seconds, see "Changing the Message Period" on page 5-33.

Setup Utility Screens

The Setup Utility has numerous screens which provide for the various functions supported by the utility. A list of the various screens and where information on each can be found is provided in Table 3-1.

NOTE: There is a help file associated with each of the screens listed in the table.

Table 3-1: Location of Screen Descriptions

Screen Name	Description Location
Advanced	"Advanced Options" on page 5-1
Application	"Step 1: Set the Application Mode" on page 4-2
Classification	"Step 7: Define Vehicle Classifications" on page 4-23
Common Settings	"Common Setup Options" on page 5-5
Communications	"Defining Communications" on page 5-7
Data Mode	"Changing the Data Mode" on page 5-2
File	"Loading a Previously Saved Setup File" on page 5-22 "Recording Data To a File" on page 5-44
Fine Tune	"Adjusting Zone Boundaries" on page 5-55 "Assigning Labels to Zones" on page 5-58
Firmware Upgrade	"Upgrading Firmware" on page 5-49
Initial Setup (Wizard)	"Step 2: Run the Wizard" on page 4-5
Internal Memory	"Memory Operations" on page 5-25
Labelling	"Assigning Labels to Zones" on page 5-58
Main	"Main Screen" on page 3-19
Manual Setup	"Manual Setup Screen" on page 3-21
Message Comp	"Step 6: Define Message Composition" on page 4-20
Message Period	"Changing the Message Period" on page 5-33
Self Test	"Self Test" on page 5-45
Sensitivity	"Sensitivity Adjustment" on page 5-47
Sensor ID	"Setting the Sensor ID" on page 5-48

(Table continues on the next page)

Table 3-1: Location of Screen Descriptions (Cont'd)

Screen Name	Description Location
Speed Calibration	"Step 5: Calibrate Speed" on page 4-15 "Manual Speed Calibration" on page 5-24
Start	"Start Screen" on page 3-17
Statistics	"Viewing Statistics" on page 5-51
Verify Counts	"Step 4: Verify Vehicle Counts" on page 4-10
Zone Setup	"Step 3: Adjust the Zones" on page 4-8

Start Screen

The Start screen is most often used to run Demo Mode and to test sensors in a polled mode. This screen only appears during the start up of the Setup Utility when:

- You press the ESC key.
- No sensors are found.
- The detected Autoscope RTMS Sx-300 sensor is in Polled mode.

.

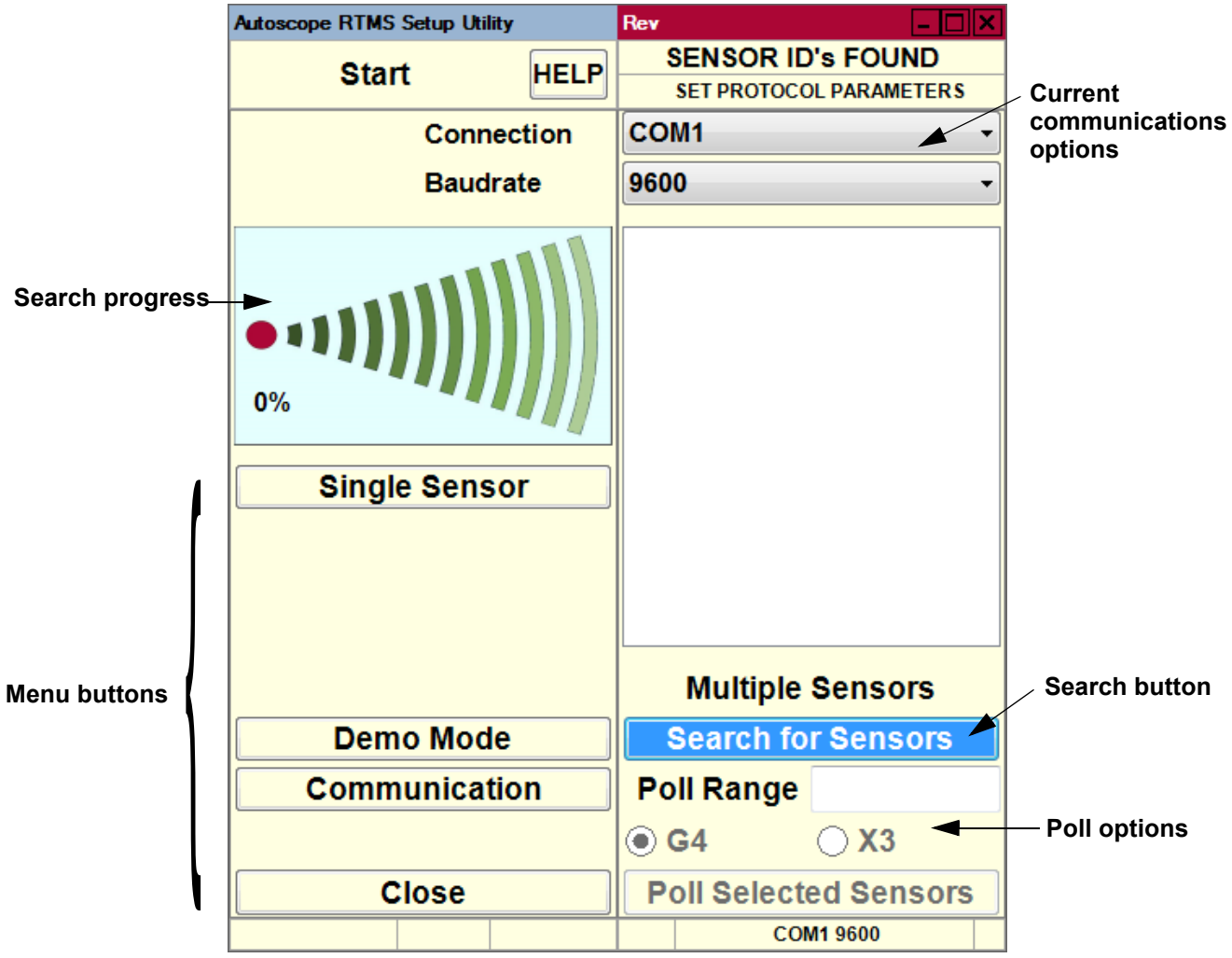


Figure 3-1: Start Screen

The following provides a brief description of each of the function buttons.

- **Help** — Opens a help page for this screen.
- **Single RTMS** — This option is used to connect to a single Autoscope RTMS Sx-300 selected from the list in the right pane generated from a Search for Sensors operation. The Main Screen will appear with the settings for that Autoscope RTMS Sx-300.

- **Demo Mode** — This option is used to run Demo Mode. For more information, see "Running Demo Mode" on page 3-10.
- **Communication** — This option allows you to specify the connection method between the Autoscope RTMS Sx-300 and your computer. For more information see "Defining Communications" on page 5-7.
- **Close** — Used to exit the Setup Utility.
- **Search for Sensors** — This option is used to search for Autoscope RTMS Sx-300 units. For more information, see "Finding Sensors" on page 5-19.
- **Poll Selected Sensors** — This option is used to poll the selected units. For more information, see "Polling Sensors" on page 5-41.

Main Screen

The Main Screen is vertically divided into two separate panels. The left panel consists of function buttons. The right panel displays the detection map with the current detection zones and the real-time detections indicated by moving vehicles. The title bar runs horizontally across the top of the screen. The status bar runs horizontally across the bottom.

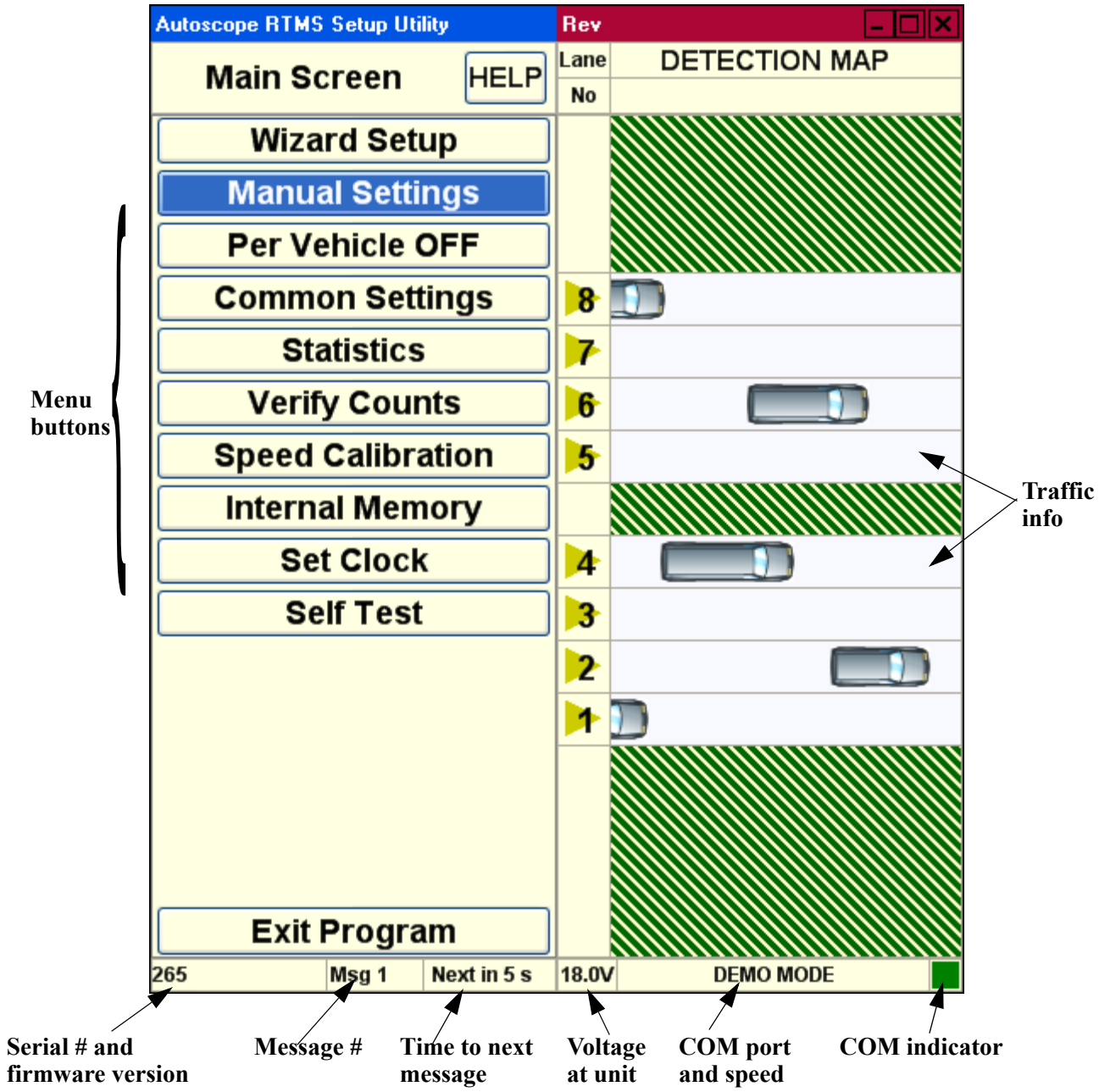


Figure 3-2: Setup Utility Main Screen

The following provides a brief description of each of the function buttons.

- **Help** — Opens a help page for this screen.
- **Wizard Setup** — This option is an automated Zone setup process. It scans the range of the Autoscope RTMS Sx-300 microwave beam and automatically configures up to 12 zones. For more information, see "Step 2: Run the Wizard" on page 4-5.
- **Manual Settings** — This option displays a screen that allows you to configure the Autoscope RTMS Sx-300. For more information, see "Manual Setup Screen" on page 3-21.
- **Per Vehicle** — When this option is turned ON, it adds the time stamp, lane number, classification, speed, and dwell time of every vehicle in real-time data output. For more information see "Defining Per Vehicle Messages" on page 5-31.

  NOTE: This added information can create a huge file in a short time if recording data to a file or it can fill the internal memory of the sensor.

- **Common Settings** — This option displays a screen that allows you to save configuration settings from one Autoscope RTMS Sx-300 and load them into other Autoscope RTMS Sx-300 units. For more information see "Common Setup Options" on page 5-5.
- **Statistics** — This option displays a screen that allows you to monitor key data on the user interface.For more information see "Viewing Statistics" on page 5-51.
- **Verify Counts** — This option displays a screen that allows you to compare manual vehicle counts with Autoscope RTMS Sx-300 vehicle counts. For more information see "Step 4: Verify Vehicle Counts" on page 4-10.
- **Speed Calibration** — This option displays a screen that allows you to match actual speeds with the Autoscope RTMS Sx-300 calculated speed. For more information see:
  - "Step 5: Calibrate Speed" on page 4-15
  - "Manual Speed Calibration" on page 5-24
- **Internal Memory** — This option displays a screen that allows you to store data inside the Autoscope RTMS Sx-300 unit. The data can then be downloaded at a later time. For more information see "Downloading Autoscope RTMS Sx-300 Memory" on page 5-27.
- **Set Clock** — This option is used to synchronize the Autoscope RTMS Sx-300 clock with the clock on your computer.
- **Self Test** — This option displays a screen that allows you to initiate an internal diagnostic test of the Autoscope RTMS Sx-300. For more information see "Self Test" on page 5-45.
- **Exit Program** — This option closes the Setup Utility.

Manual Setup Screen

This screen displays options that allow you to manually configure the Autoscope RTMS Sx-300.

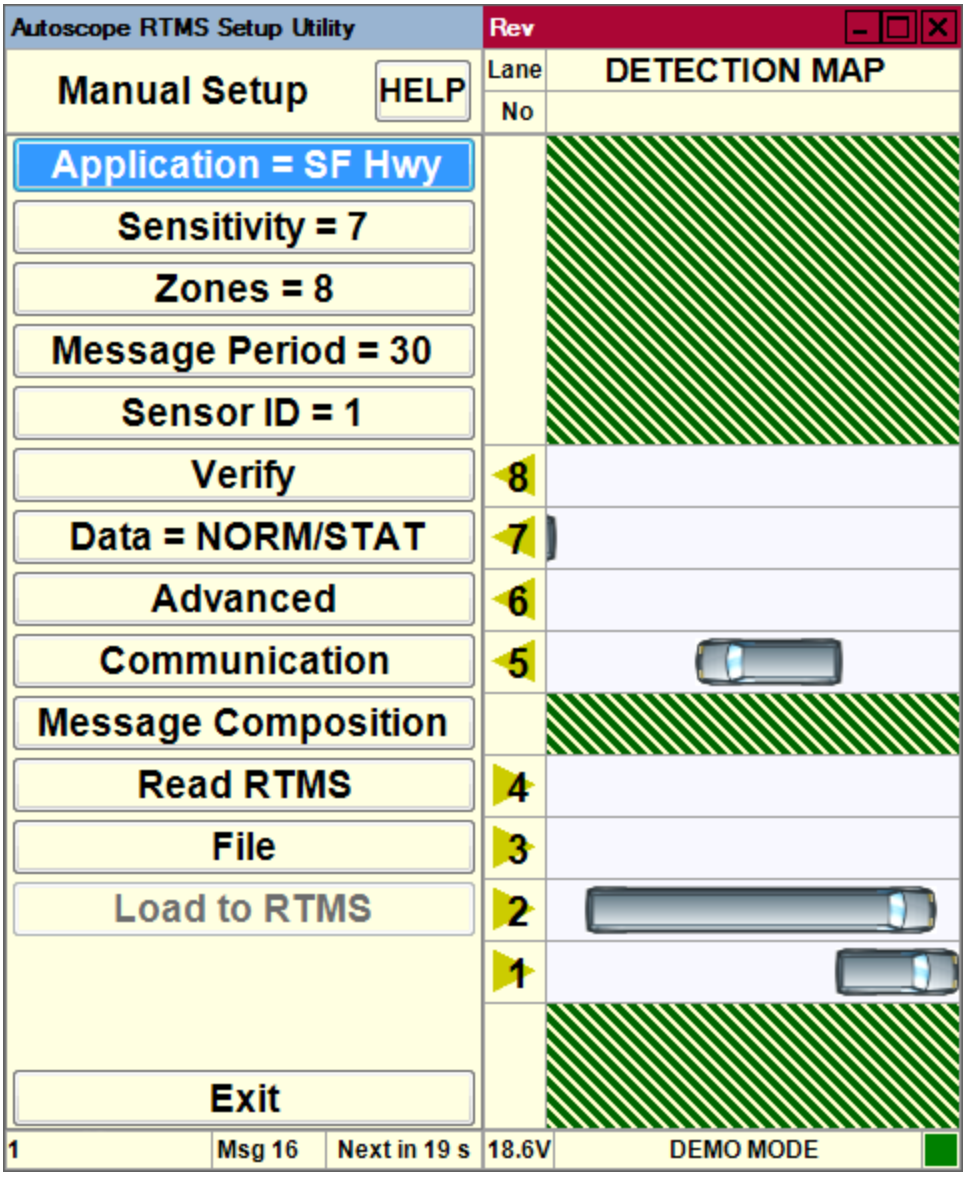


Figure 3-3: Manual setup Screen

The options on this screen are:

- **Help** — Opens a help page for this screen.
- **Application** — This option displays a list of different sensing modes such as side-fired and midblock. Select the mode that best matches your hardware configuration and detection requirements. See "Step 1: Set the Application Mode" on page 4-2.

- **Sensitivity** — This option displays sensitivity adjustment parameters used to calibrate the sensitivity for a variety of vehicle sizes and sensing applications. For more information see "Sensitivity Adjustment" on page 5-47.
- **Zones** — This option allows you to alter lane numbers, labeling, and to manually adjust zone position and width. For more information see the following:
  - "Step 3: Adjust the Zones" on page 4-8
  - "Zone Setup" on page 5-52
  - "Assigning Labels to Zones" on page 5-58
- **Message Period** — This option allows you to configure the message period for which statistical reports are generated. For more information see "Changing the Message Period" on page 5-33.
- **Sensor ID** — This option allows you to set the Sensor ID parameter. For more information see "Setting the Sensor ID" on page 5-48.
- **Verify** — This option allows you to manually verify traffic count results and determine the percentage error. For more information see "Step 4: Verify Vehicle Counts" on page 4-10.
- **Data** — This option allows you to control the basic data mode for a single Autoscope RTMS Sx-300 device. For more information see "Changing the Data Mode" on page 5-2.
- **Advanced** — This option accesses advanced features such as vehicle classification options, Contact Closure configuration (if available) and firmware upgrade management. For more information see "Advanced Options" on page 5-1.
- **Communication** — This option allows you to specify the connection method between the Autoscope RTMS Sx-300 and your computer. For more information see "Defining Communications" on page 5-7.
- **Message Composition** — This option allows you to configure the content and format of each statistical message. For more information see "Step 6: Define Message Composition" on page 4-20.
- **Read RTMS** — This option transfers the current setup parameters from the Autoscope RTMS Sx-300 to the software. For more information see "Updating the Setup Utility With a New Configuration" on page 5-49.
- **File** — This option allows you to save and load configuration files as well as record traffic statistical information. For more information see "Loading a Previously Saved Setup File" on page 5-22.
- **Load To RTMS** — Clicking this button loads the current configuration running in the Setup Utility to the Autoscope RTMS Sx-300. Note, this option is not available in Demo mode. For more information see the following:
  - "Loading a Previously Saved Setup File" on page 5-22
  - "Recording Data To a File" on page 5-44
- **Exit** — Returns to the Main Screen.

Default Settings

The following table lists all of the default settings that are in place when you first start up the Autoscope RTMS Setup Utility for an unconfigured sensor.

Table 3-2: Default Settings

Option	Default Setting
Application	Side-Fired Highway For information about changing the Application setting, see "Step 1: Set the Application Mode" on page 4-2.
Communications	• PC Serial selected • Serial Port: COM1 • Baudrate: 9600 • RTS/CTS Handshake: not selected • Timeout, ms: 500 For information about changing the Communications setting, see "Defining Communications" on page 5-7.
Data Mode	• Port 1: Normal • Port 2: Stat For information about changing the Data Mode, see "Changing the Data Mode" on page 5-2.
Internal Memory	• Store Into Memory not selected • FIFO not selected For information about changing the Internal Memory settings, see "Defining Memory Options" on page 5-25.
Lane labeling	None For information about labeling lanes, see "Assigning Labels to Zones" on page 5-58.

(Table continues on the next page)

Table 3-2: Default Settings (Cont'd)

Option	Default Setting
Message Composition	• G4 STAT selected • Volume selected • Occupancy selected • High Resolution selected • 6 Foot Loop Emulation selected • Speed: Km/h • Classification: 6 Classes • Gap/Headway not selected • 85% Speed selected • Real Time Clock selected For information about changing the Message Composition setting, see "Step 6: Define Message Composition" on page 4-20.
Message Period	30 second For information about changing the Message Period, see "Changing the Message Period" on page 5-33.
Per Vehicle	OFF For more information see "Defining Per Vehicle Messages" on page 5-31.
Sensitivity	7 or 8 (depends on the transceiver in the sensor) For information about changing the Sensitivity setting, see "Sensitivity Adjustment" on page 5-47.
Sensor ID	1 For information about changing the Sensor ID, see "Setting the Sensor ID" on page 5-48.
Vehicle Classification Lengths	Small ----------5 Regular ----------7 Medium ----------10 Large ----------15 Truck ----------20 XLRG For information about changing the Vehicle Classification Lengths, see "Step 7: Define Vehicle Classifications" on page 4-23.
Zones	Eight zones are selected.

Chapter 4: Configuration and Setup

General

This chapter describes the procedures for configuring the Autoscope RTMS Sx-300 system using the Autoscope RTMS Setup Utility.

Configuration Process

After the Autoscope RTMS Sx-300 hardware and software are installed (see Chapters 2 and 3), you must set up and configure each of the Autoscope RTMS Sx-300 units in the system.

The configuration process requires you to physically connect the computer where the Autoscope RTMS Setup Utility is installed to each Autoscope RTMS Sx-300 in the system. Once connected, you must start the Setup Utility (see "Starting the Setup Utility" on page 3-7).

Each Autoscope RTMS Sx-300 must be set up (configured) according to the following eight step process.

- Step 1:Set the Application Mode
- Step 2:Run the Wizard
- Step 3:Adjust the Zones
- Step 4:Verify Vehicle Counts
- Step 5:Calibrate Speed
- Step 6:Define Message Composition
- Step 7:Define Vehicle Classifications
- Step 8:Save the Configuration File

After the Configuration process is completed, you can adjust the Autoscope RTMS Sx-300 setup as needed for your site. For more information see Chapter 5: "Operations and Adjustments".

Required Equipment/Personnel

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

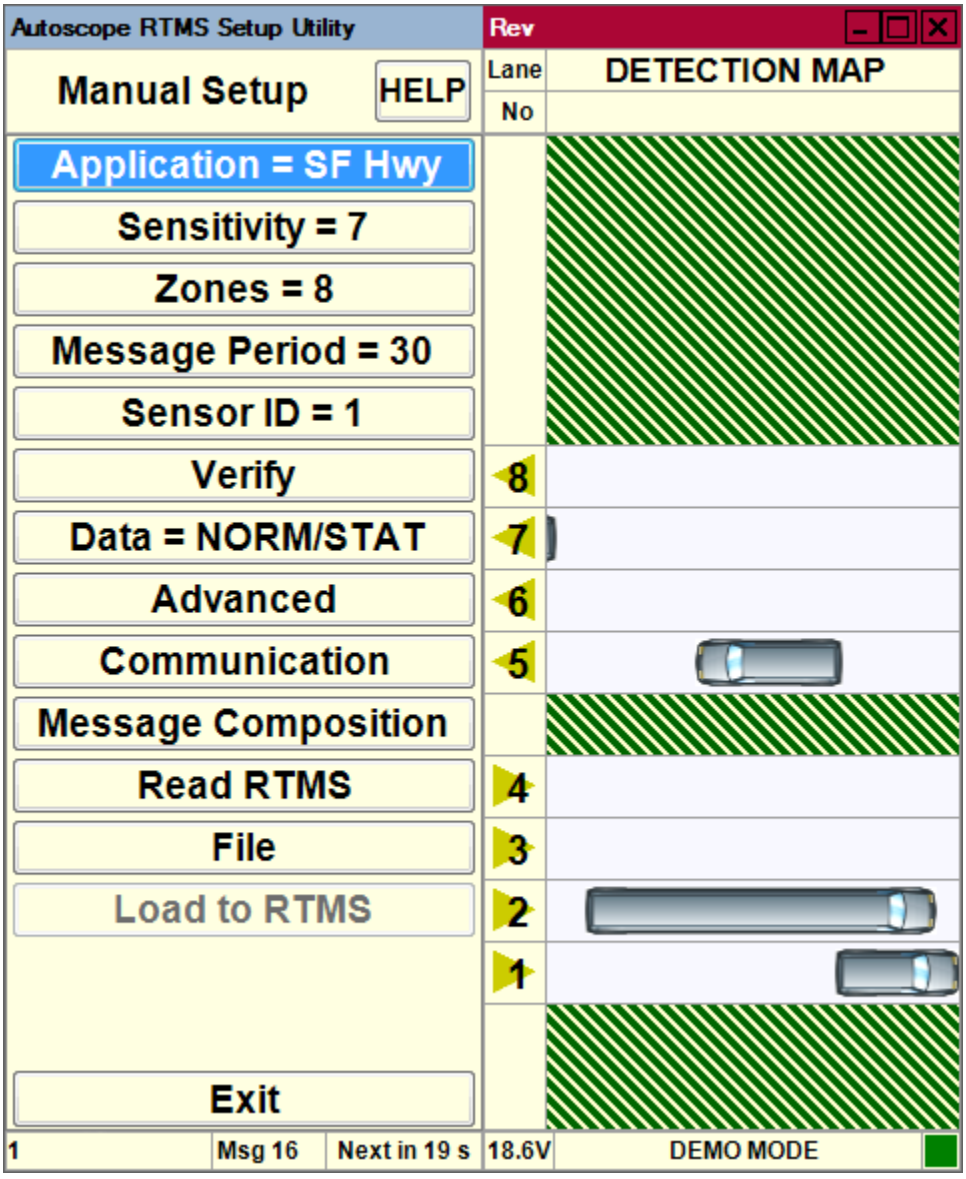
- At least two persons
- A hand-held tally counter
- Light Detecting and Ranging (LIDAR) radar gun
- Speed calibration worksheet (see Appendix E: "Speed Calibration Worksheet")
- Stop watch

Step 1: Set the Application Mode

You must define whether the Autoscope RTMS Sx-300 is to operate in a Side-Fired or Midblock application.

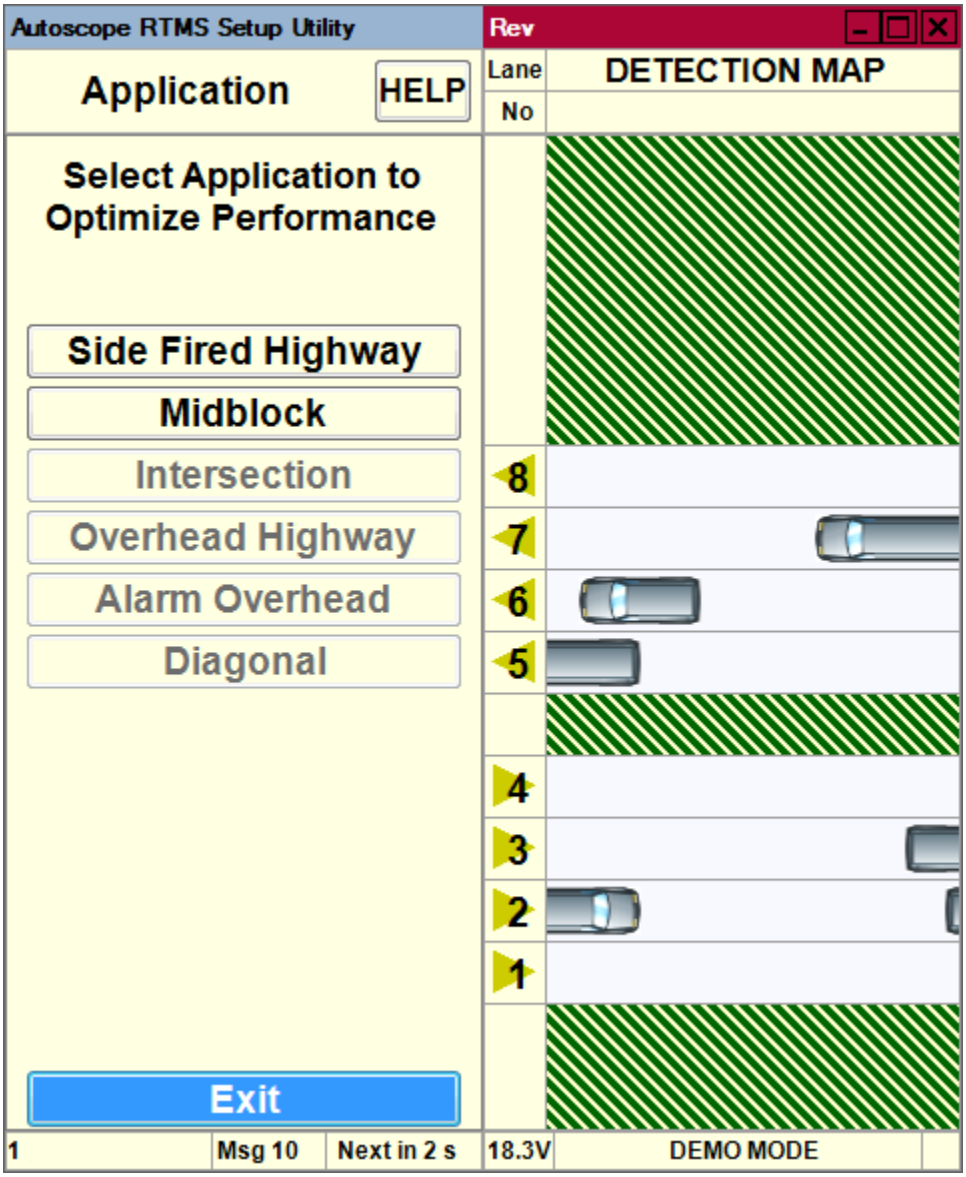
1. On the Main Screen, click **Manual Settings**.

   The following screen appears.



2. Click **Application** =.

The following screen appears.



3. Select the application the Autoscope RTMS Sx-300 will be used for.

   - **Side Fired Highway** — in general, used when:
     - traffic is mainly free-flowing
     - farther detection distance needed
     - lanes are wide
   - **Midblock** — in general, used when:
     - traffic is mainly urban (can be congested)
     - shorter detection distance needed
     - lanes are narrow

NOTES:

- Click on the application to be used even if it already appears to be selected. This will ensure that all settings are sent to the Autoscope RTMS Sx-300.
- If you get a message indicating that the application requires a new wizard setup, click **Yes**.

4. To return to the Main Screen, click **Exit**.
5. Continue with "Step 2: Run the Wizard" on page 4-5.

Step 2: Run the Wizard

The automated zone setup process requires free flowing traffic in all lanes of interest. It scans the range of the Autoscope RTMS Sx-300 microwave beam and positions up to 12 detection zones, representing lanes where vehicles are detected.

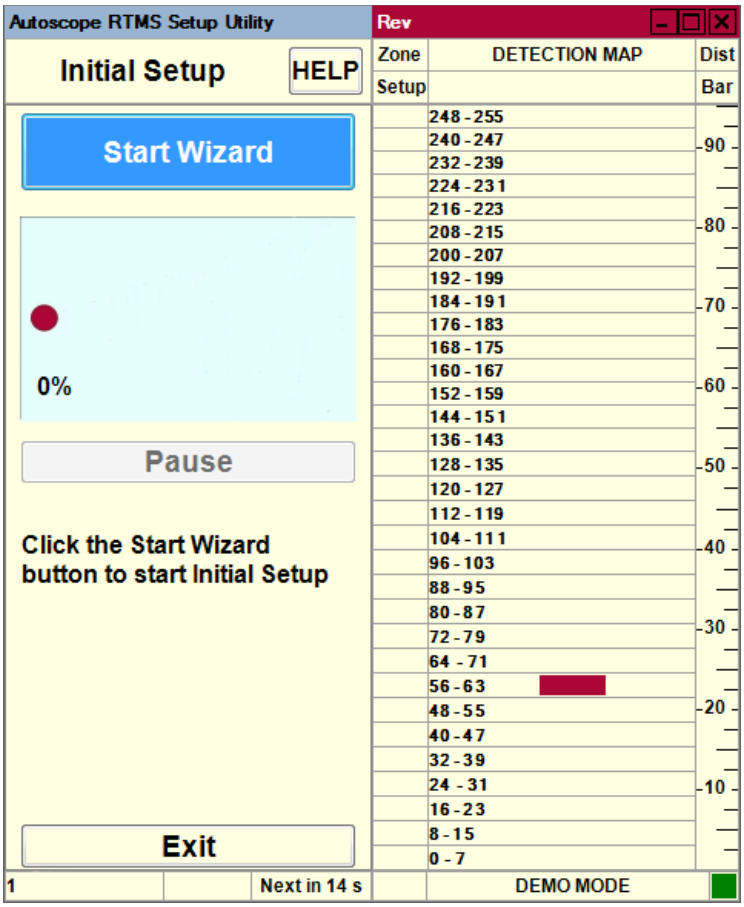
The Autoscope RTMS Setup Utility automatically detects traffic in its detection area and configures lane parameters accordingly. This is a two-stage process.

- Initial setup: The Wizard finds zones which match up to the lanes of traffic.
- Final setup: The Wizard fine tunes the zone boundaries and detection parameters.

NOTE: You may receive warnings while detecting traffic in low-volume lanes. The warning asks if you would like to continue detection for one additional minute. If the sensor is installed where it detects both mainline and secondary zones such as ramps or frontage roads, these potentially low-volume zones can be ignored if desired. Extending the wizard setup for the benefit of the secondary zones is not necessary.

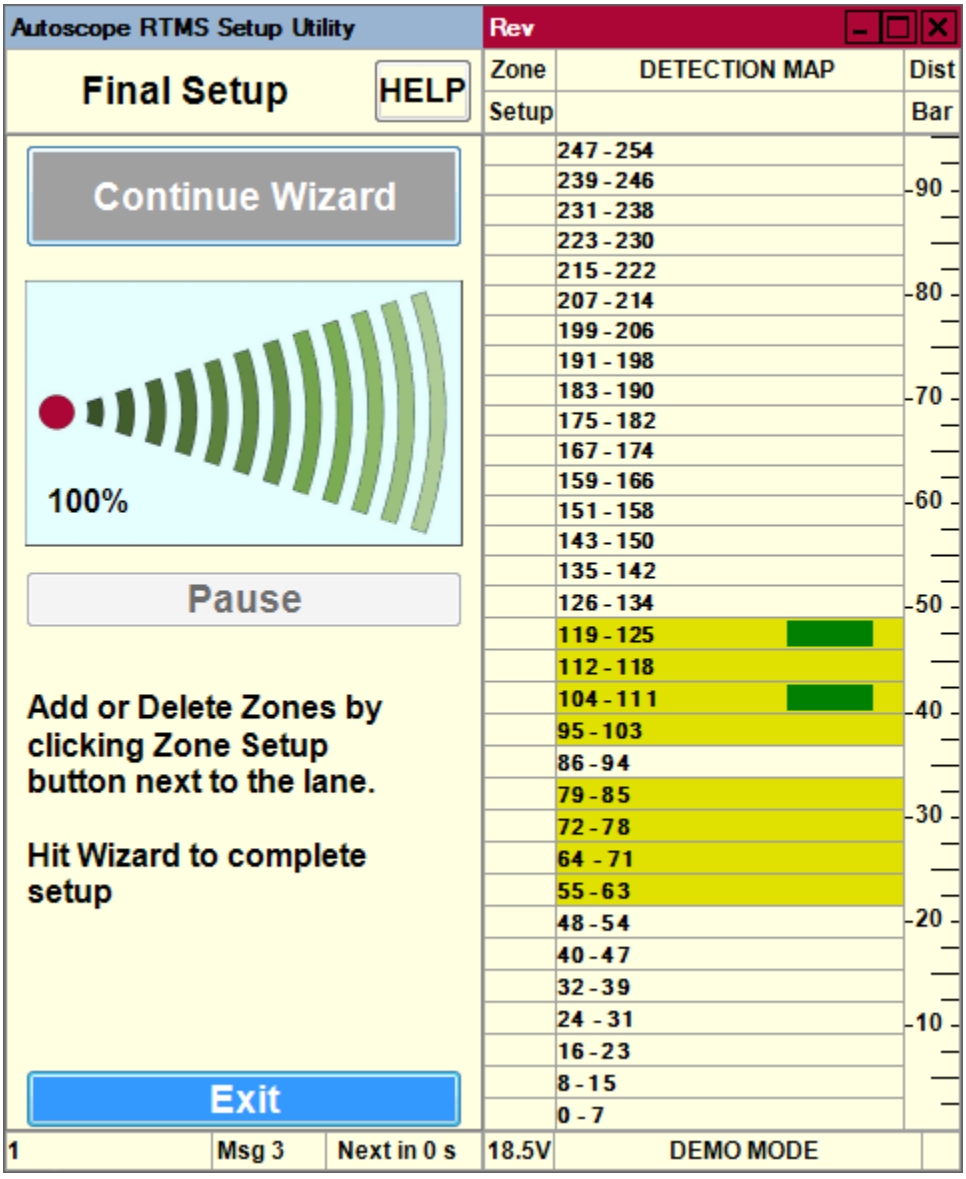
1. On the Main Screen, click **Wizard Setup**.

   The following screen appears.



2. Click **Start Wizard**.

   When the progress indicator reaches 100% the Wizard initial setup is complete. The resulting zone setup is presented for approval.

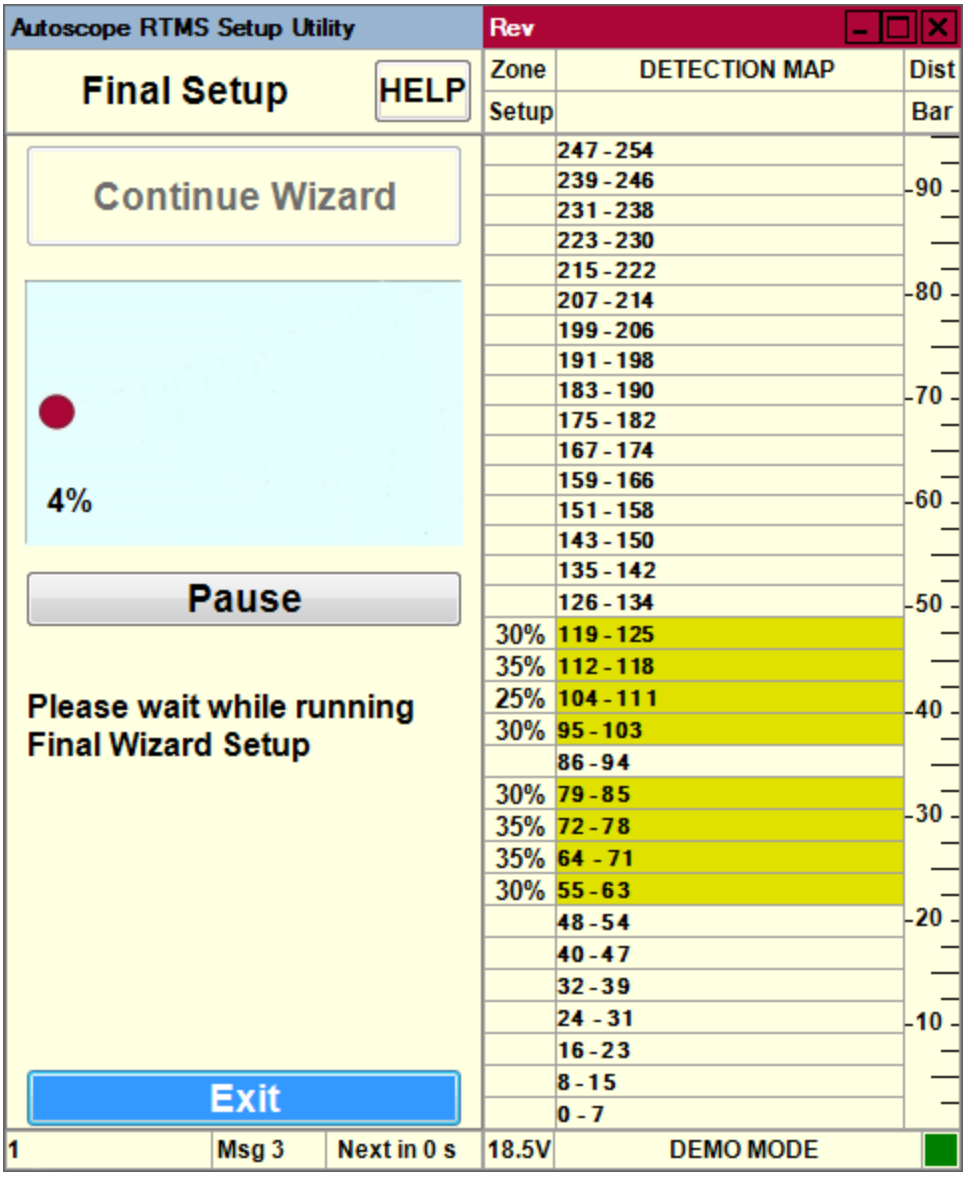


3. Using the detection blips, confirm visually that the proposed location of lanes corresponds to the zones you wish to include in the setup.
4. Add or delete zones until the desired position and quantity of zones is achieved.

   Note, zones can be added or deleted by using the Fine Tune process (see "Zone Setup" on page 5-52).
5. To complete the setup, click **Continue Wizard**.

   The Wizard will begin and automatically run the Final Setup process.

If traffic slows down momentarily or there is a large gap in the traffic flow, click **Pause**. Pausing during moments of non-free-flow traffic will help the Wizard extend it's calibration time and ensure better calibration accuracy.



6. On completion, the Autoscope RTMS Setup Utility will return to the Main Screen.

   Note, allow the Wizard to complete and return to the Main Screen, clicking **Cancel** will interrupt the Final Setup process.

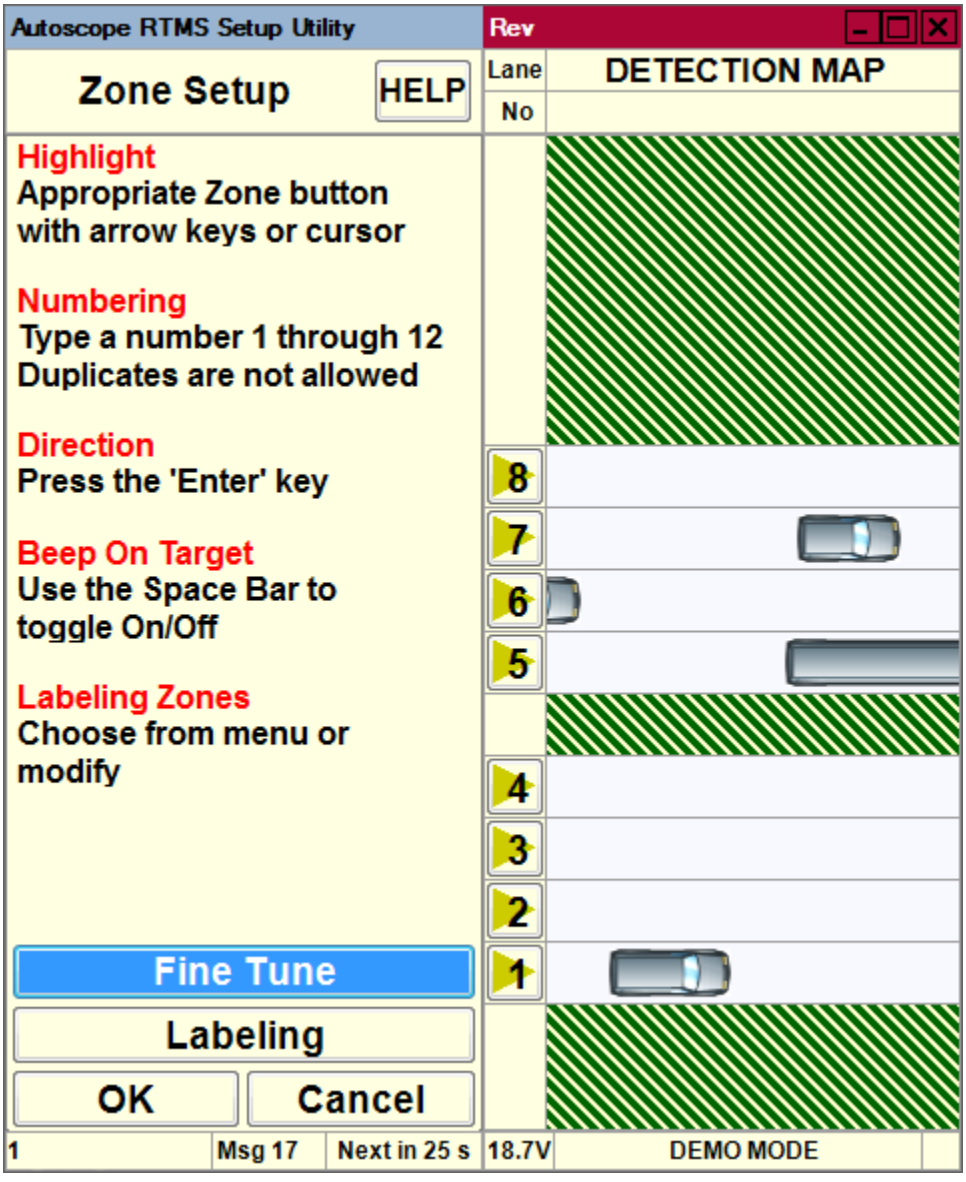
7. Continue with "Step 3: Adjust the Zones" on page 4-8.

Step 3: Adjust the Zones

A zone that is created by the Autoscope RTMS Sx-300 ideally represents a detected lane of traffic.

1. On the Main Screen, click **Manual Settings**.
2. On the Manual Setup screen, click **Zones =**.

   The following screen appears.



3. Is traffic being shown travelling in the correct direction for each zone.?

Yes	No
Continue with Step 4.	a) Click on the zone number. b) To change the direction, press **Enter**. c) Continue with Step 4.

4. For each zone monitor the vehicle icons on the detection map and compare them with what you are physically seeing on the road.
5. Do the vehicle icons on the screen match what you are physically seeing on the road?

Yes	No
Proceed to Step 8.	The situation must be fixed. Continue with Step 6.

6. Is the utility detecting more or fewer vehicles than what you are actually seeing on the road?

More	Fewer
Fine tune the zones. See "Zone Setup" on page 5-52	Adjust the sensitivity. See "Sensitivity Adjustment" on page 5-47.

7. Repeat Steps 4 – 6 of this procedure for each zone.
8. Do you want to add labels to the zones?

Yes	No
See "Assigning Labels to Zones" on page 5-58. After all labels have been added, continue with Step 9.	Continue with Step 9.

NOTE: Zone numbering must start at 1 and use sequential numbering.

The placement of the numbers can be in any order; however, it is recommended that the nearest lane to Autoscope RTMS Sx-300 be designated as 1, and the other lanes numbered in sequential order going away from the Autoscope RTMS Sx-300.

9. Click **OK** to save your settings and return to the Manual Setup screen.
10. To return to the Main Screen, click **Exit**.
11. Continue with "Step 4: Verify Vehicle Counts" on page 4-10.

IMPORTANT: DO NOT proceed to Verifying Vehicle Counts until you are confident that the physical vehicle detections match the detections of the software.

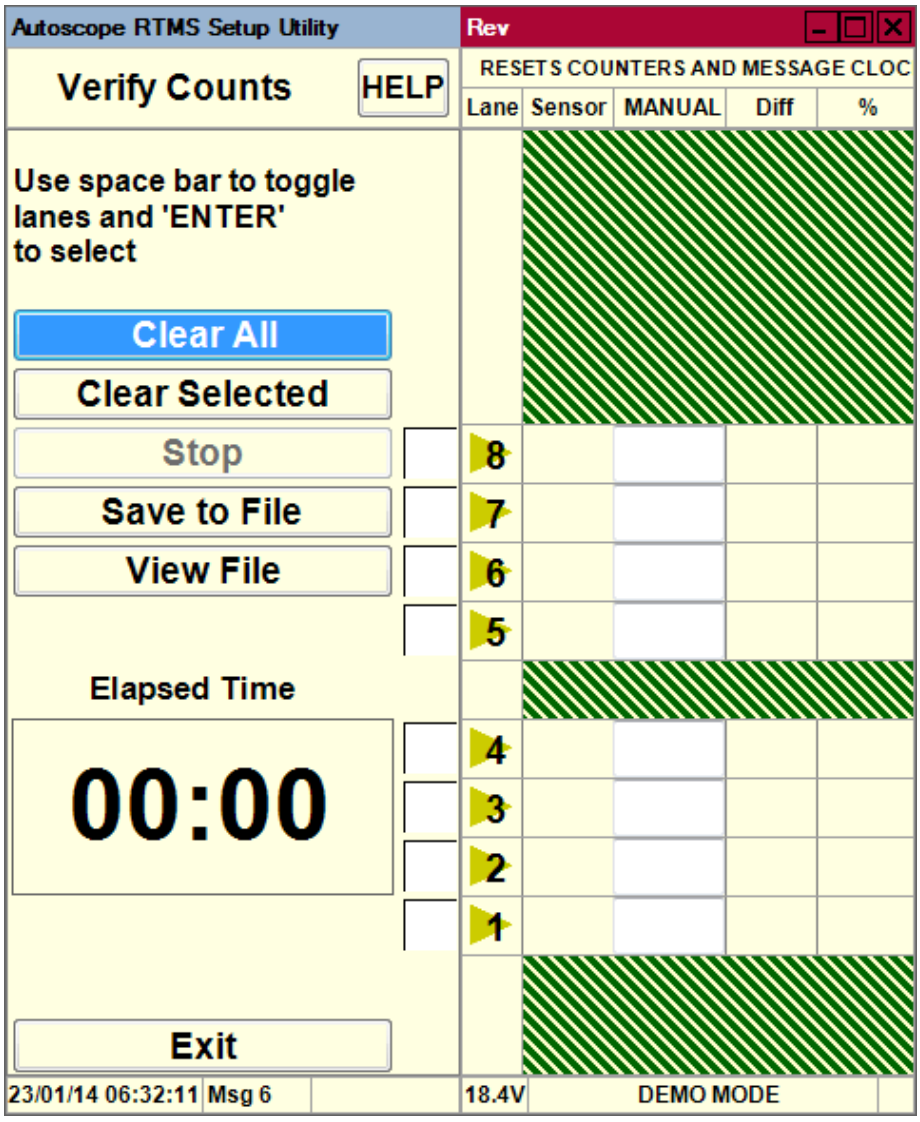
Step 4: Verify Vehicle Counts

The vehicle count verification of a successful zone setup is an essential part of the installation. During the process you will compare Autoscope RTMS Sx-300 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. On the Main Screen, click **Verify Counts**.

   The following screen appears.

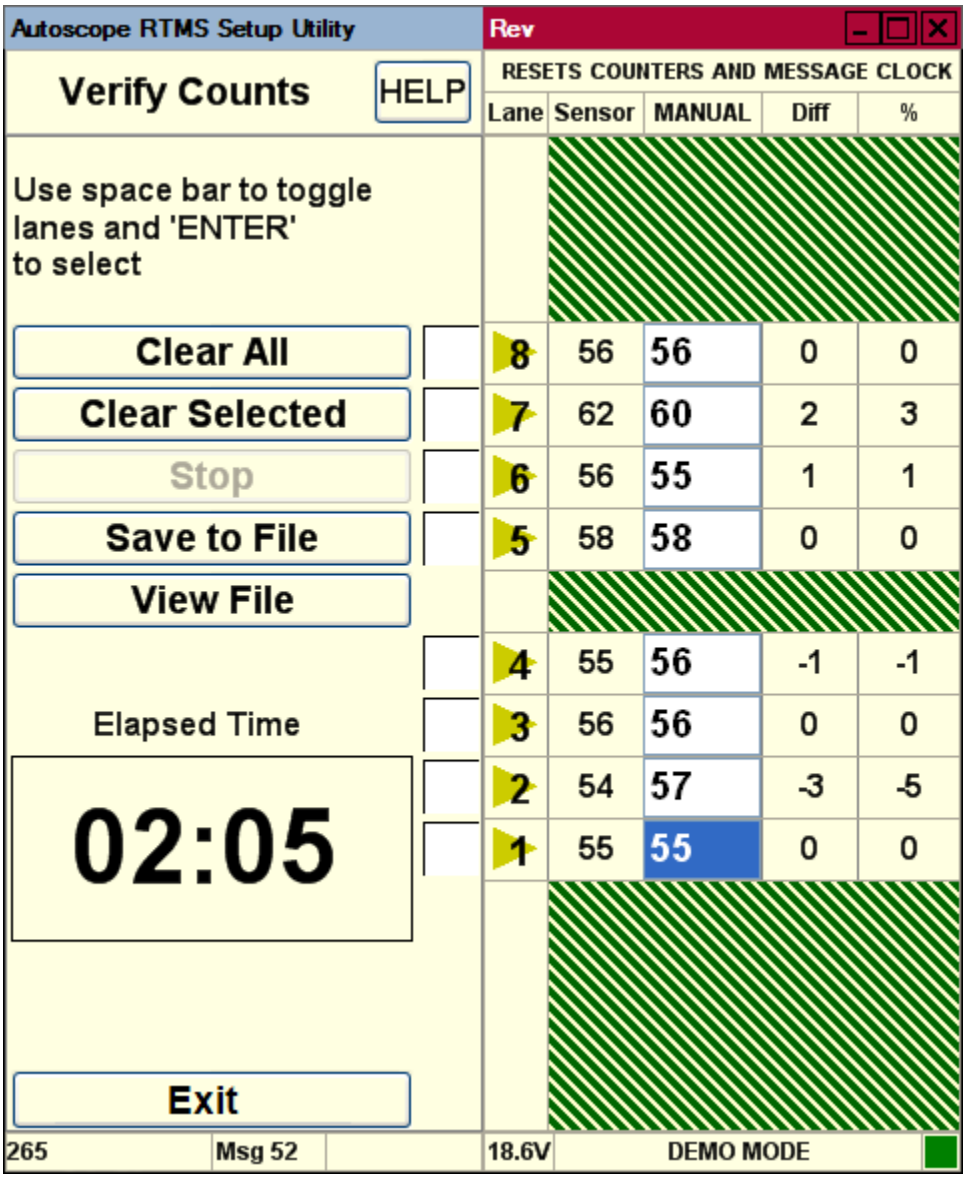


2. Are you verifying counts for a single zone or for all zones?

Single Zone	All Zones
a) Select the check box to the left of each zone. b) Click **Clear Selected** and immediately begin counting vehicles as they cross the Autoscope RTMS Sx-300 beam.	**NOTE:** There must be one person per zone. Click **Clear All** and immediately begin counting vehicles as they cross the Autoscope RTMS Sx-300 beam.

The elapsed time counter starts automatically, and the count for each selected zone is updated as vehicles pass.

3. Continue counting until a minimum of 50 vehicles (more than 50 is recommended) have been counted for the zone being verified. This will usually take several minutes.
4. Click **Stop** when there is a gap in the traffic and immediately stop your manual counting.
5. Select the box in the **Manual** column and enter the manual count for the zone.



The difference between the Autoscope RTMS Sx-300 and the manual counts in difference and percentage deviation is immediately displayed. Deviation of more than 5% requires zone setup correction to improve detection accuracy.

If the Autoscope RTMS Sx-300 count is greater than 5% of the manual count, 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
- Sensitivity set too high

If the Autoscope RTMS Sx-300 count is less than 5% of the manual count (negative percentage), this could be caused by:

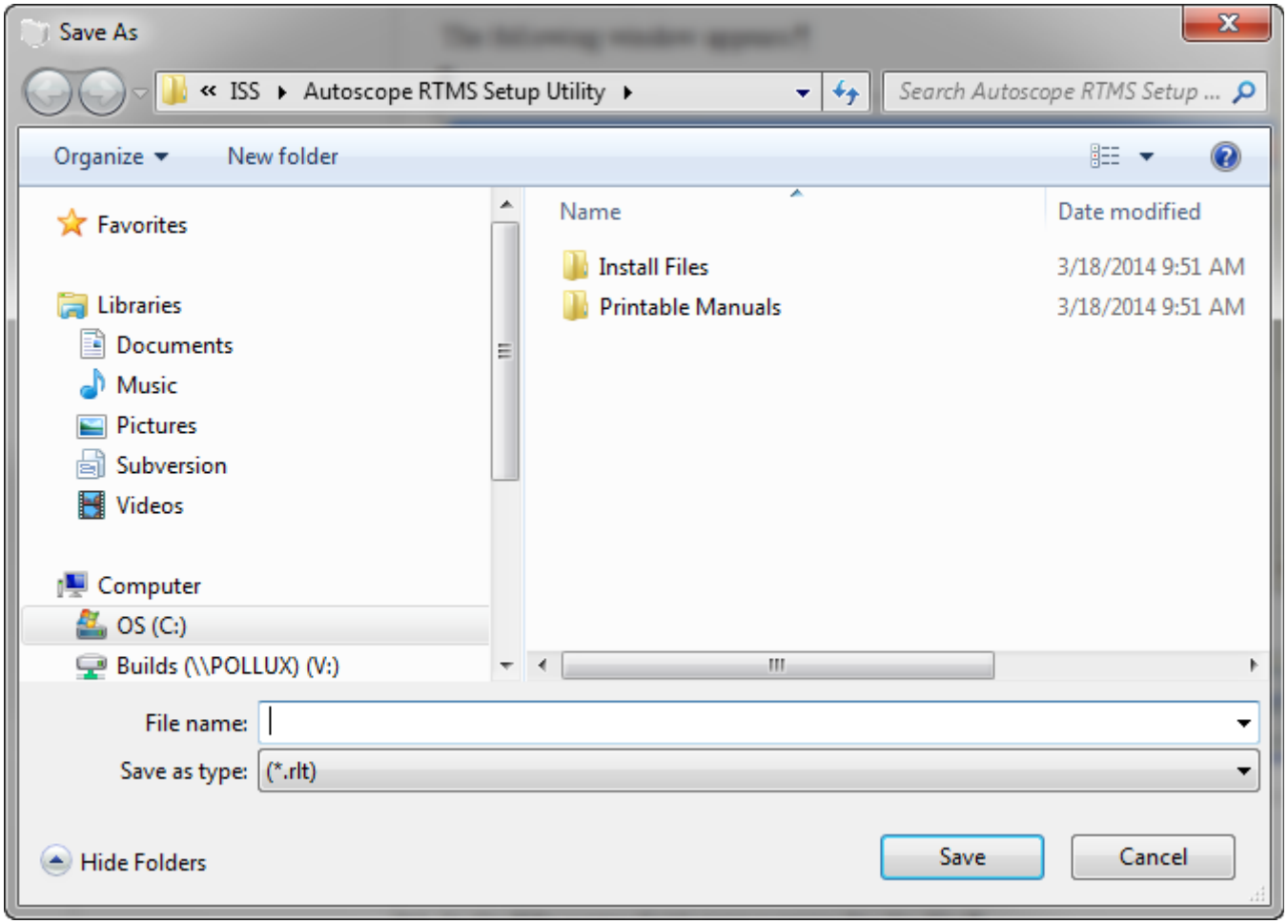
- Missed small vehicles (sensitivity is too low)
- Occlusions
- Incorrect aiming

6. 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 5-34. After adjustments have been made, repeat the verification process.	Continue with Step 7.

7. (Optional) If you want save the accumulated results of verification in a text file, click **Save to File**.

   The following window appears.



8. In the **Save in** field, select the folder where the file is to be saved.

   The default location, **Autoscope RTMS Setup Utility**, is recommended.
9. In the **File name** field, type a name for the file.
10. Click **Save**.
11. To return to the Main Screen, click **Exit**.
12. Continue with "Step 5: Calibrate Speed" on page 4-15.

Step 5: Calibrate Speed

Speed calibration is a three step process that requires the following to be performed:

- Setting up the reference speed
- Running the automatic calibration
- Checking the calibration

In order to perform the speed calibration process, the following is required:

- Light Detecting and Ranging (LIDAR) radar gun or a similar device
- Speed calibration worksheet (see Appendix E: "Speed Calibration Worksheet" or the online version in the Autoscope RTMS Sx-300 help files).
- Two people

NOTES:

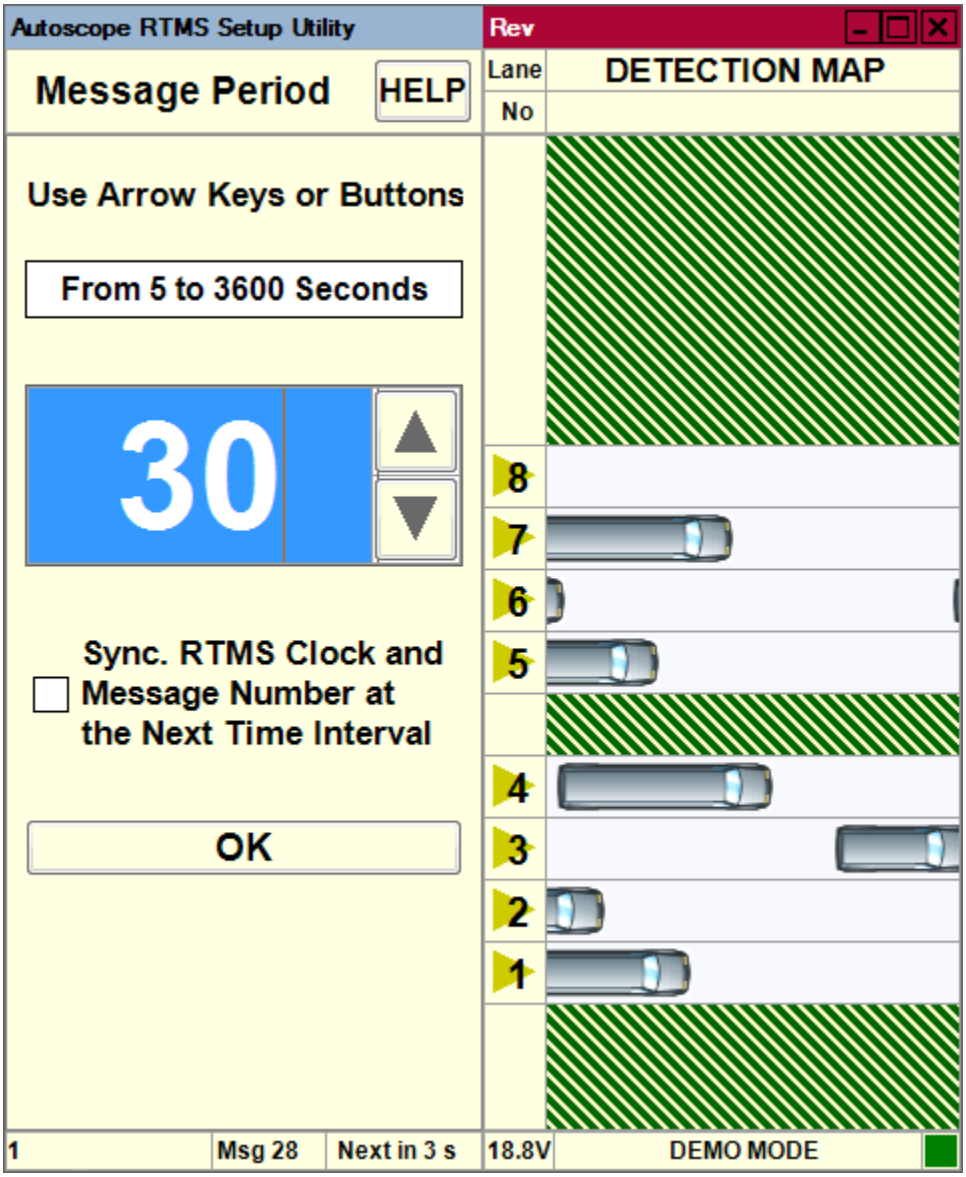
- Prior to performing any speed calibration on the Autoscope RTMS Sx-300, ensure that the volume accuracy has been optimized. This will enable the speed calibration to proceed smoothly and provide quality results.
- Speed calibration should be performed when traffic is moving at the posted speed limit, do not perform any calibration during periods of fluctuation or congestion.

Step 5A: Setting the Reference Speed

The reference speed is the average speed that most vehicles travel through a zone.

1. On the Main Screen, click **Manual Settings**.
2. On the Manual Setup screen, click **Message Period**.

The following screen appears.

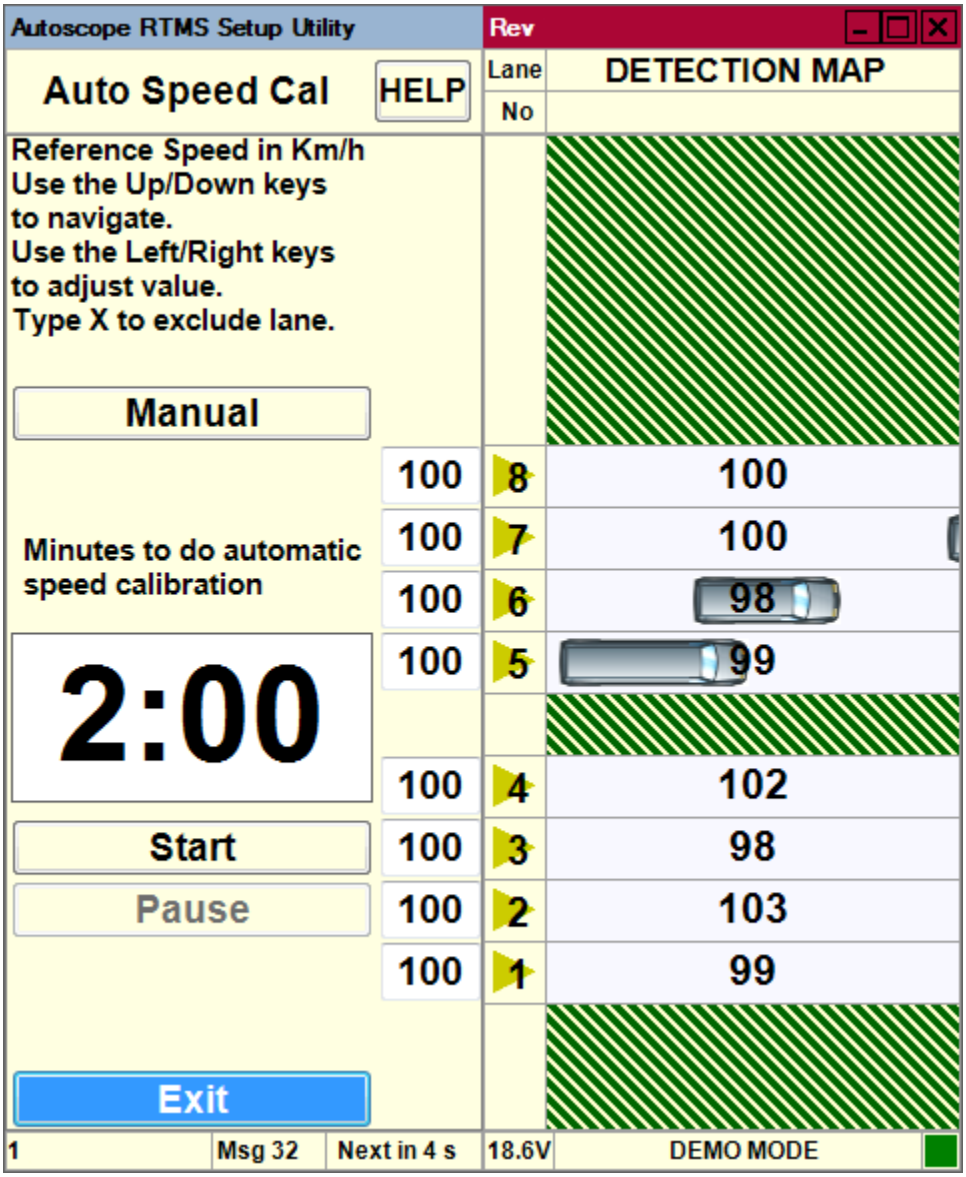


3. Verify that the message period is 30 seconds. If not, use the up/down arrows to set it to 30.

NOTE: During automatic speed calibration the message period is temporarily changed to 30 seconds and will sync with the countdown timer. When the timer completes, the message period will return to the original value.

4. Click **OK** to return to the Manual Settings screen.
5. Click **Exit** to return to the Main Screen.
6. On the Main Screen, click **Speed Calibration**.

The following screen appears.



7. Verify the following:
   - All zones are correctly shown.
   - **Auto Speed Cal** is displayed at the top of the screen.
8. Using the radar gun, check the speed of 5 random vehicles in a single lane.
9. On the Autoscope RTMS Sx-300 Speed Calibration Worksheet, record the speeds in the rows labeled **LIDAR - A**.
10. Calculate the average of the 5 speeds and record the value in the Ref Speed = block of the worksheet.

11. On the Speed Calibration screen, enter the value to the left of the lane number.
12. Repeat Steps 8 – 11 for each lane at the site.
13. Continue with "Step 5B: Auto Calibration".

Step 5B: Auto Calibration

In this step you will try to match the Autoscope RTMS Sx-300 calculated speed of vehicles with actual speed.

1. On the Speed Calibration screen, set the run time to 5 minutes.
   a) Click in the time field.
   b) Use the Right and Left Arrow keys on the keyboard to increase or decrease the value.

NOTE: Depending on traffic volumes the calibration time may need to be extended. If volumes are less than 5-6 vehicles per lane per minute the time should be extended as necessary to obtain at least 25-30 samples per lane during the auto calibration.

2. Click **Start**.

   Statistical speed values are displayed in each of the lanes in the detection map.

   Note, do not stop the process until the 5 minutes has run out.

3. After the time period elapses, continue with "Step 5C: Check Calibration".

Step 5C: Check Calibration

This step must be performed on each lane at the site, and requires a two-person team and a stop watch.

NOTE: The Autoscope RTMS Sx-300 utility should be setup to record the 30-second message periods. This procedure must be started at the beginning of a new message period, **Next in** at the bottom of the screen shows 30.

Person 1 is responsible for monitoring the time and recording the information called out by person 2 on the Speed Calibration Worksheet (see Appendix E: "Speed Calibration Worksheet").

Person 2 is responsible for using the radar gun to check the speeds of vehicles in the zone being monitored and calling out the recorded speeds to person 1.

1. **Person 1:** At the beginning of a message period, instruct person 2 to start gathering individual speed readings.

   Person 2: When told to start, use the radar gun to check the speed of passing vehicles in one lane. Call out the speed of each vehicle to person 1.

2. **Person 1:** Record the speeds in the four rows labeled **LIDAR - B** on the worksheet as reported by person 2.

   The number of vehicles recorded is dependent on how many (40 or less) are checked during the five minute period.

3. **Persons 1 and 2:** Continue monitoring and recording for a total of 5 minutes (10 message periods).
4. When the 5 minute period is up:
   - **Person 1:** Tell person 2 to stop monitoring. Calculate the average of the recorded speeds and enter the value in the RTMS Sx-300 **Avg =** field on the worksheet.
   - **Person 2:** Stop monitoring and reporting.
5. **Person 1:** Calculate the average of the recorded speeds and enter the value in the **LIDAR Avg =** field on the worksheet.
6. **Person 1:** Calculate the difference between the RTMS Sx-300 **Avg** and the **LIDAR Avg** and enter the value in the **Speed Difference (LIDAR - RTMS Sx-300)** field.
7. **Person 1:** Calculate the percentage difference and record the value in the**% Difference (LIDAR-Sx-300/LIDAR)** field.
8. Is the percentage difference less than or more than ±10%?

Less than	More than
Calibration passes. Repeat the procedure for each zone at the site.	Calibration fails. Manually calibrate the zone (see "Manual Speed Calibration" on page 5-24).

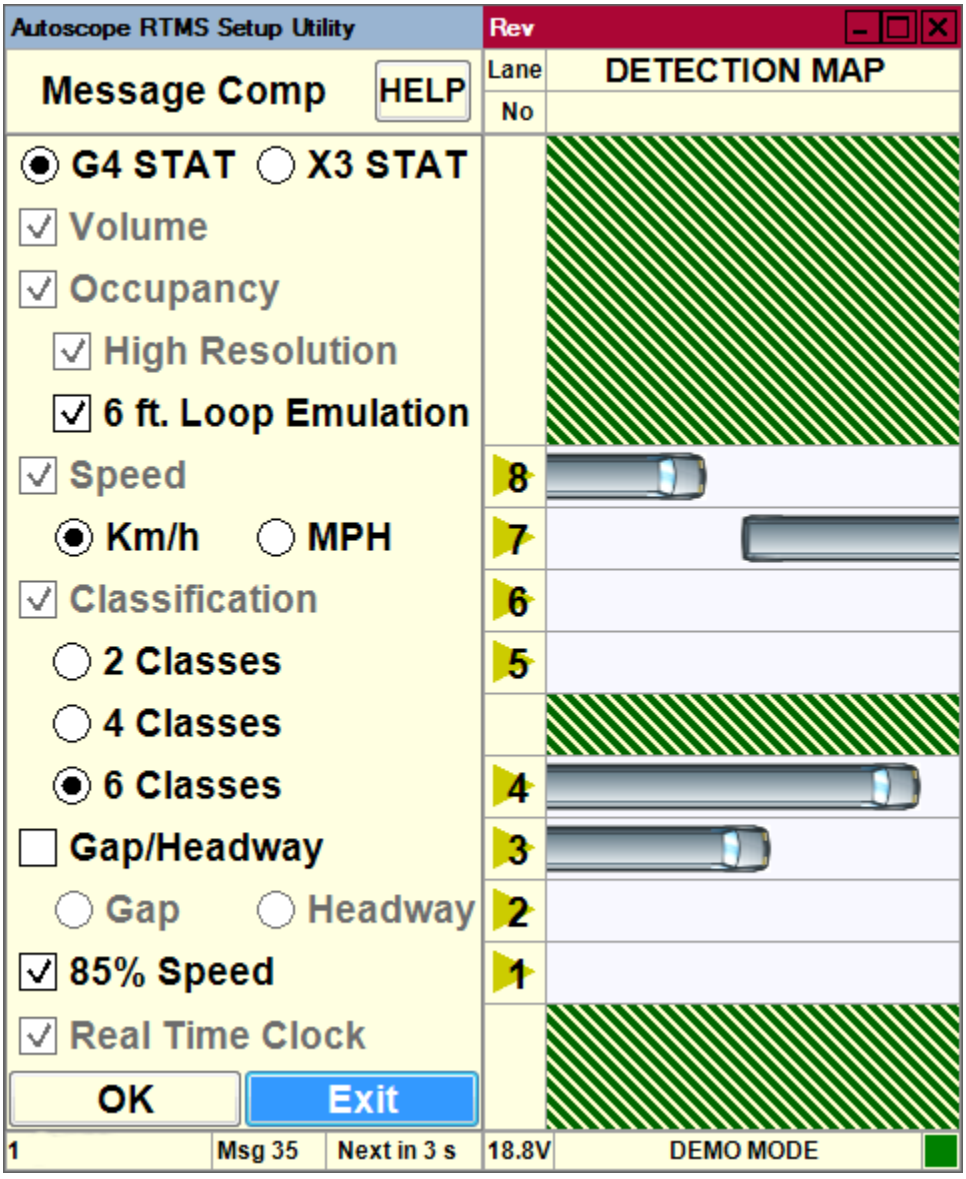
9. To return to the Main Screen, click **Back**.
10. Continue with "Step 6: Define Message Composition" on page 4-20.

Step 6: Define Message Composition

The Message Composition defines the content and format of the statistical messages that are sent from the Autoscope RTMS Sx-300 sensor to the connected hardware (e.g., computer, smart phone, etc.). Messages are automatically sent every message period (see "Changing the Message Period" on page 5-33) when the data mode is set to STAT or Normal (see "Changing the Data Mode" on page 5-2).

1. On the Main Screen, click **Manual Settings**.
2. On the Manual Setup screen, click **Message Composition**.

   The following screen appears.



3. Select options as appropriate for your site.

Some options are always selected, some are always selectable and some are not available for X3 STAT protocol. For a description of each option, see Table 4-1 below.

Table 4-1: Message Composition Options

Option	Description
G4 STAT	Select this option if data is to be transmitted using the G4 protocol (message format). **Note**, if you change from X3 STAT to G4 STAT, a message appears indicating that the contents of memory will be erased.
X3 STAT	Select this option if data is to be transmitted using the X3 protocol (legacy message format). **Note**, if you change from G4 STAT to X3 STAT, a message appears indicating that the contents of memory will be erased.
Volume	This option is always selected and indicates that the total number of vehicles detected in each message period will be included in the statistical message.
Occupancy	This option is always selected and indicates that the percentage of time a lane is occupied by a vehicle during the message period will be included in the statistical message.
High Resolution	When selected, decimal places will be used for the Occupancy results. For example, if this option selected, 87.7 = 87.7; if not selected, 87.7 = 88. For G4 STAT protocol, this option is always selected. For X3 STAT protocol, this option is selectable.
6 ft Loop Emulation	When selected, adds a virtual loop length of 6ft to the vehicle length for occupancy calculations.
Speed	This option is always selected and indicates that the average vehicle speed during the message period will be included in the statistical message in the selected measurement unit (Km/h or MPH).
Km/h	When selected, the average vehicle speed data will be in kilometers per hour. **Note**, in X3 STAT protocol, the data output is always in Km/h units. The Autoscope RTMS Setup Utility will display in MPH, but the output is always Km/h.
MPH	When selected, the average vehicle speed data will be in miles per hour.

(Table continues on the next page)

Table 4-1: Message Composition Options (Cont'd)

Option	Description
Classification	This option is always selected and indicates that the selected number of vehicle classifications will be included in the statistical message. The number selected (2, 4 or 6) is what appears on the Classification screen.
2 Classes	When selected, classification data is for Small and Truck.
4 Classes	When selected, classification data is for Small, Medium, Large and Truck.
6 Classes	When selected, classification data is for Small, Regular, Medium, Large, Truck and Extra Large.
Gap/Headway	When selected, the average time between vehicles by Gap or Headway during a message period will be included in the statistical message.
Gap	When selected, the average time between the trailing edge of the previous vehicle and leading edge of the current vehicle during a message period will be included in the statistical message.
Headway	When selected, the average time between the leading edge of the previous vehicle and leading edge of the current vehicle during a message period will be included in the statistical message. **Note**, this option is not available for X3 STAT protocol.
85% Speed	When selected, 85% of the vehicles are at or below this speed during a message period will be included in the statistical message. **Note**, this option is not available for X3 STAT protocol.
Real Time Clock	When selected, the Autoscope RTMS Sx-300 sends its time stamp with each statistical message. For G4 STAT protocol, this option is always selected. For X3 STAT protocol, this option is always selected if Store Into Memory is selected on the Internal Memory screen (see "Defining Memory Options" on page 5-25). If Store Into Memory is not selected, then the Real Time Option can be unselected.

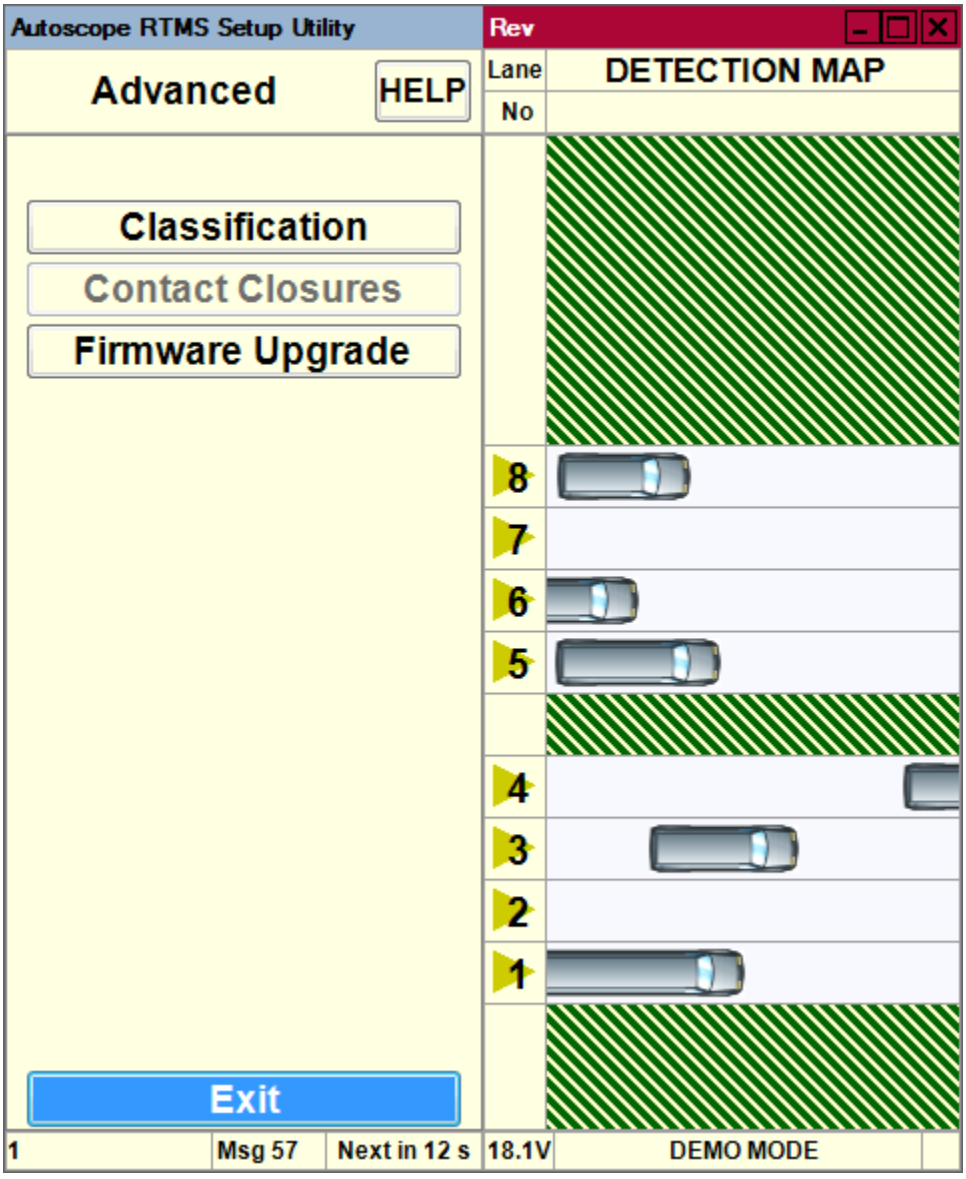
4. To save the options and return to the Manual Setup screen, click **OK**. Otherwise, click **Exit** to return without saving.
5. Continue with "Step 7: Define Vehicle Classifications" on page 4-23.

Step 7: Define Vehicle Classifications

The correct classification of vehicles by length requires accurately defined limits per vehicle class.

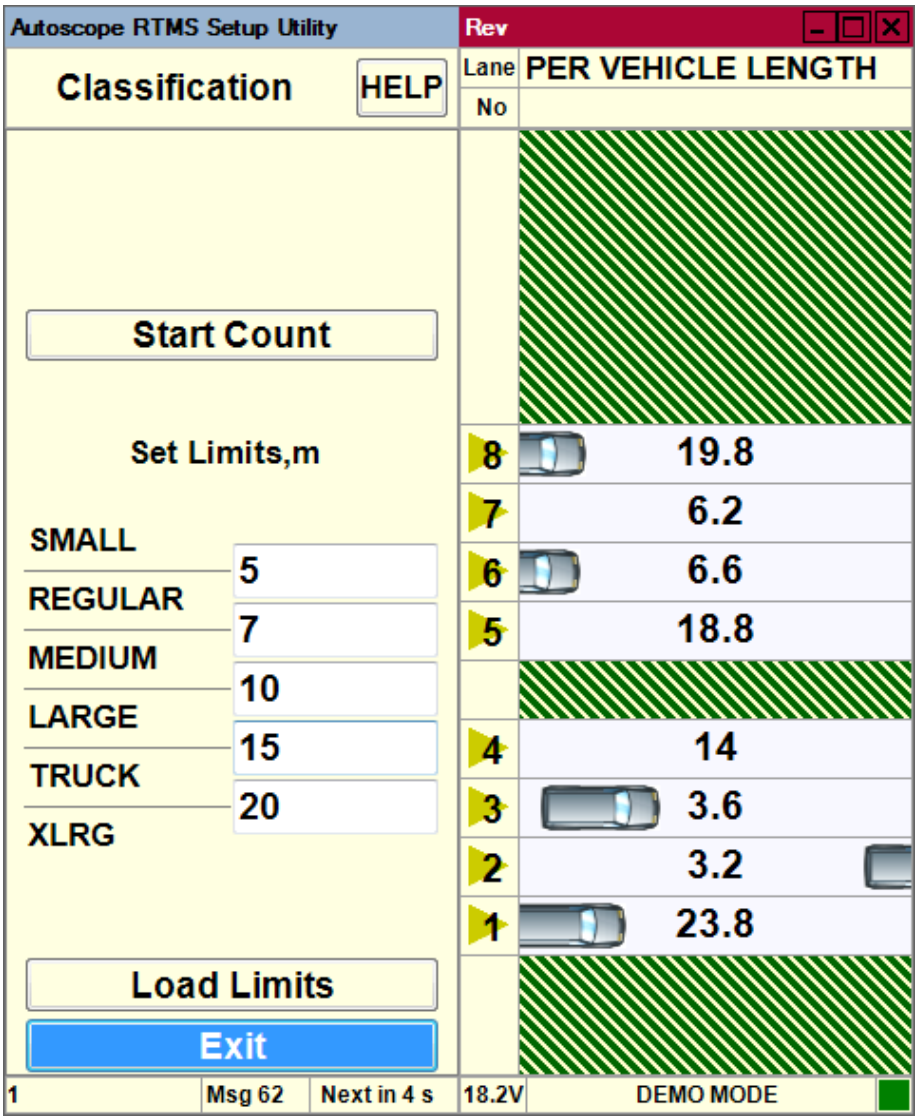
1. On the Manual Setup screen, click **Advanced**.

   The following screen appears.



2. Click **Classification**.

The following screen appears.



NOTE: The number of classifications shown and the length measurement unit (meters or feet) are determined by the selections for Classification and Speed on the Message Comp screen (see "Step 6: Define Message Composition" on page 4-20).

3. To the right of each class enter the estimated size of the vehicle lengths.

   The maximum length that can be specified is 25.5 m (83.6 ft)

   The default size for each class is:

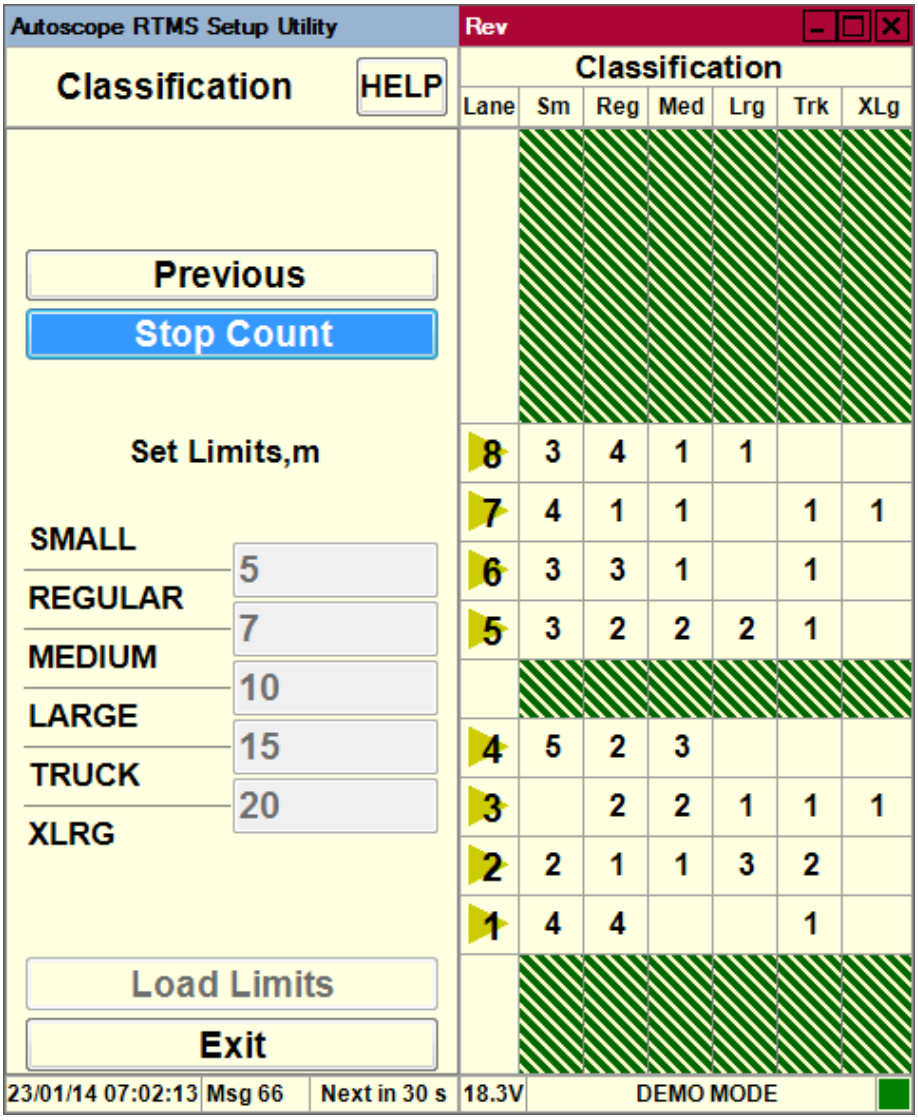
   - Small: 0 – 5 meters (0 – 16.4 ft)
   - Regular: 5 – 7 meters (16.4 – 22.9 ft)
   - Medium: 7 – 10 meters (22.9 – 32.8 ft)

- Large: 10 – 15 meters (32.8 – 49.2 ft)
- Truck: 15 – 20 meters (49.2 – 65.6 ft)
- XLRG: greater than 20 meters (65.6 ft)

For best results, ensure that differences between length limits are greater than 3 m (10 ft) especially for larger vehicles. Small separation values increase potential for "merging" of classes (vehicle counting errors are the result).

4. Click **Load Limits** to send the defined length limits to the Autoscope RTMS Sx-300.
5. Check the accuracy of the length limits by comparing the accumulated per vehicle classification counts to manual counts for a period of at least two minutes.
6. Click **Start Count**.

   The following screen appears.



7. Watch the actual traffic and compare what you see with the Autoscope RTMS Sx-300 counts.
8. Click **Stop Count**.
9. Do the automated counts match what you're seeing?

Yes	No
Continue with Step 10.	Repeat Steps 3 – 8.

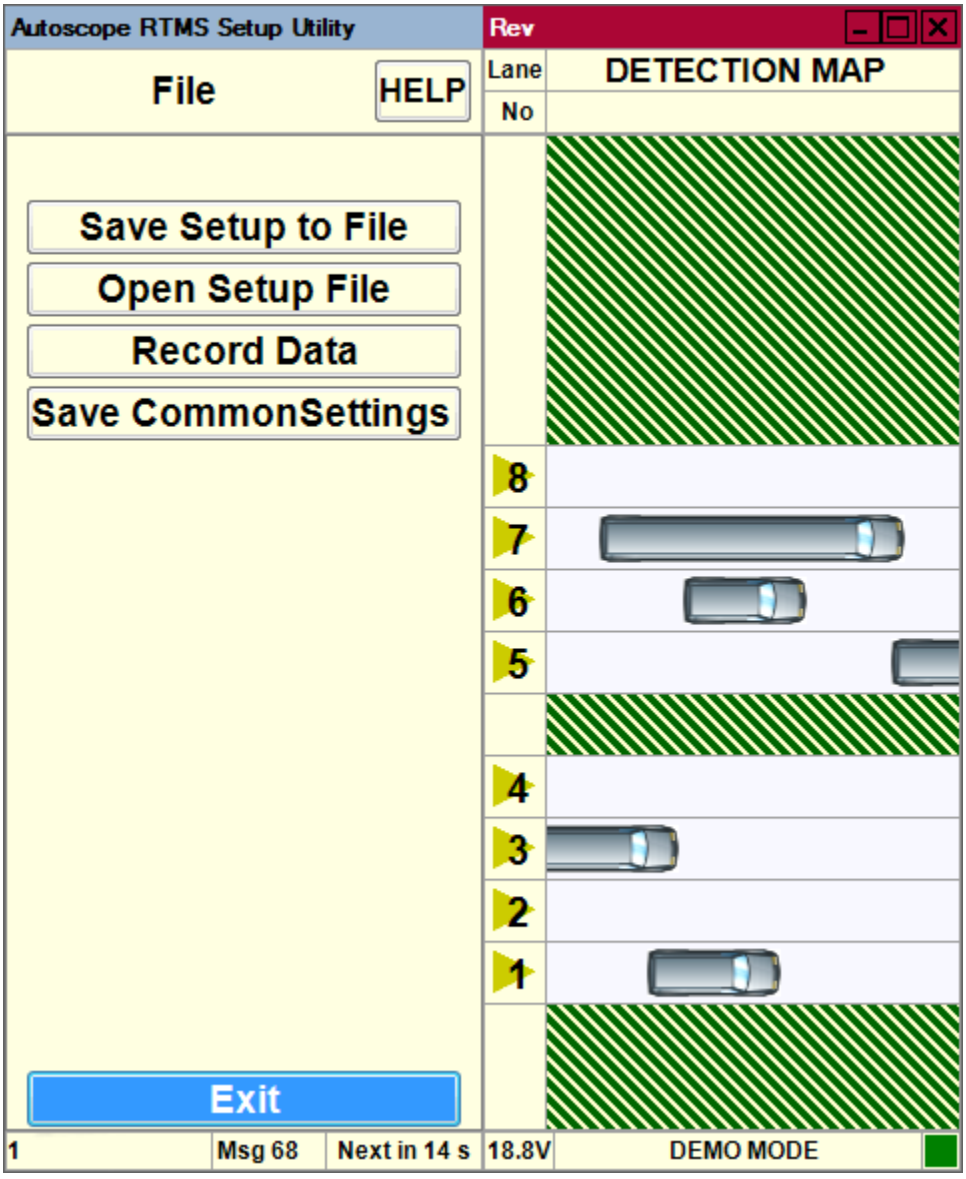
10. Click **Back** twice to return to the Manual Setup screen.
11. Continue with "Step 8: Save the Configuration File" on page 4-27.

Step 8: Save the Configuration File

After you have completed the configuration you should save it to a file on your hard drive for backup purposes.

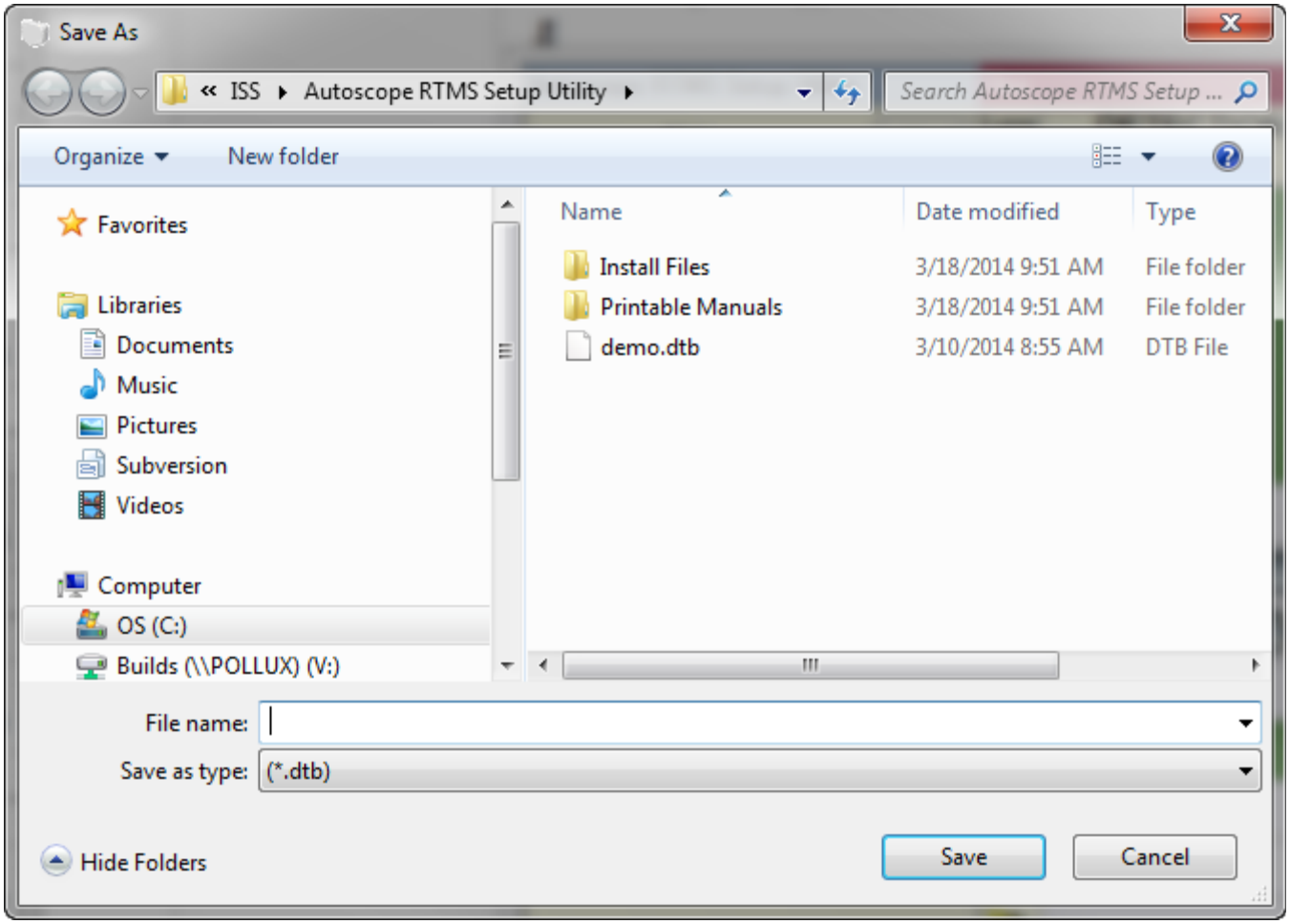
1. On the Manual Setup screen, click **File**.

   The following screen appears.



2. Click **Save Setup to File**.

The following window appears.



3. In the **Save in** field, select the location where the file is to be saved.
4. In the **File name** field, enter a name for the file.

   The following format is recommended: RTMS Sx-300**xxx_date.dtb**

   where: xxx = location ID
   date = date the file was created in YYYY_MM_DD format
   dtb = file type (mandatory)
5. Click **Save**.
6. If you will be configuring several Autoscope RTMS Sx-300 sensors with the same basic set up, click **Save Common Settings**.

   For more information about common settings, see "Common Setup Options" on page 5-5.
7. Click **Back** twice to return to the Main Screen.
8. Make adjustments and setup other options as required (see Chapter 5: "Operations and Adjustments").

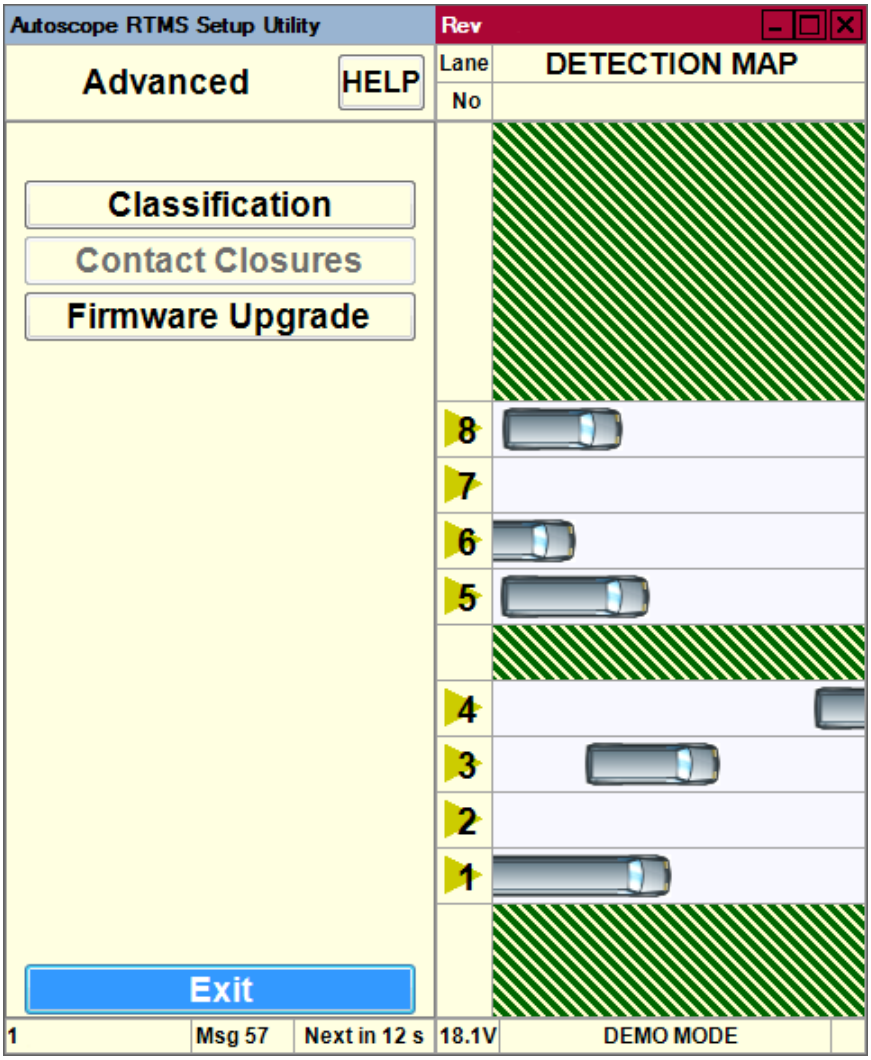
Chapter 5: Operations and Adjustments

General

This chapter describes operations that can be performed and adjustments that can be made after the Autoscope RTMS Sx-300 is installed and configured.

Advanced Options

The advanced options enable you to set the vehicle classifications and to upgrade the firmware in the Autoscope RTMS Sx-300 sensor.



For information about these functions, see:

- For Classification: "Step 7: Define Vehicle Classifications" on page 4-23
- For Contact Closure: the *Autoscope RTMS Sx-300 Optional Configurations User Guide (PN A900-1155-2)*
- For Firmware Upgrade: "Upgrading Firmware" on page 5-49

Changing the Data Mode

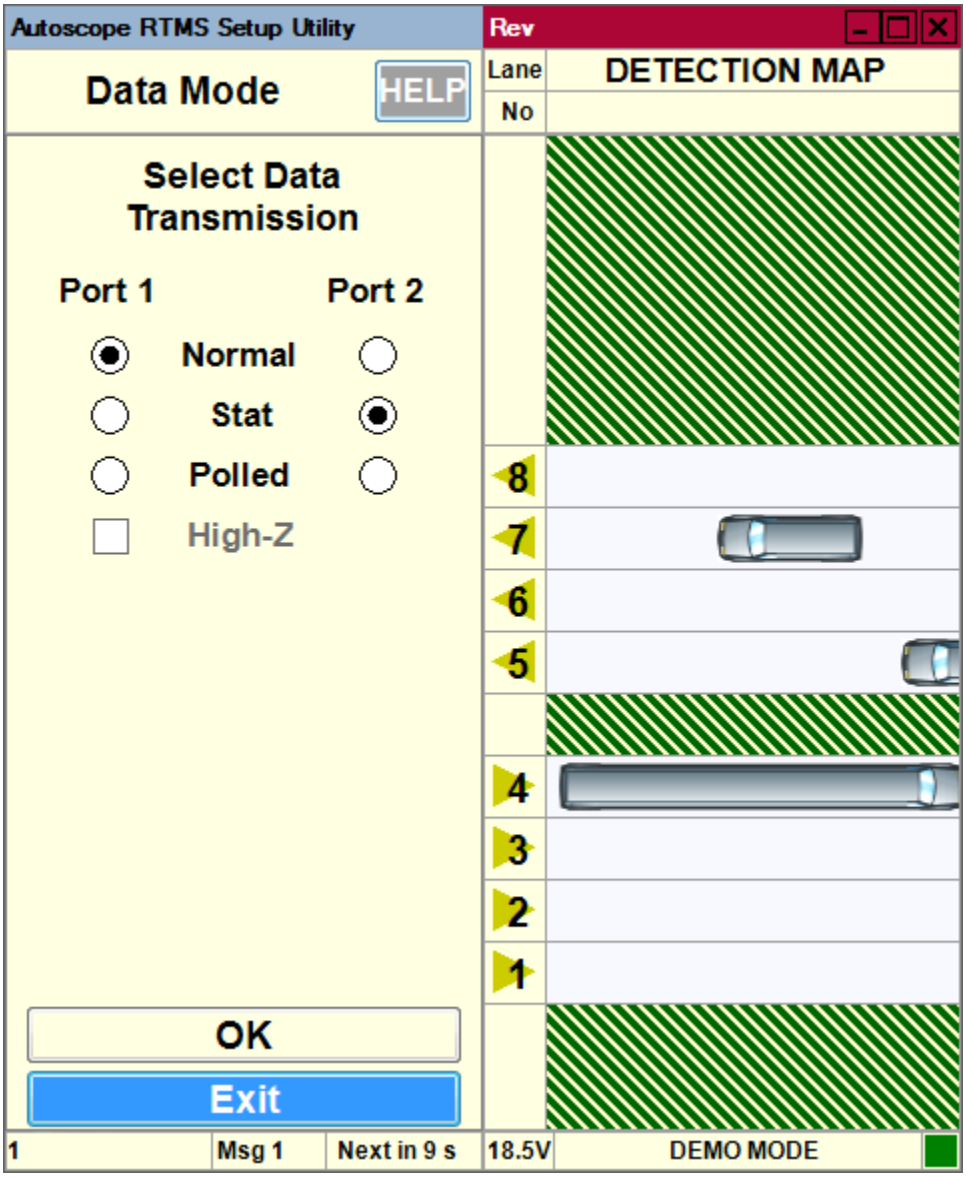
The Data Mode determines how the Autoscope RTMS Sx-300 sensor transmits statistical messages, per vehicle data (if Per Vehicle is turned ON) and lane presence information (used for vehicle animation).

The data mode is set per transmission port within the Autoscope RTMS Sx-300 sensor as follows:

- Port 1 is a serial port used for communication with the Autoscope RTMS Sx-300. Every Autoscope RTMS Sx-300 device has this communication port. Port 1 is also shared with the bluetooth module for wireless communication with Autoscope RTMS Sx-300.
- Port 2 is a communication channel used by optional equipment such as, TCP/IP module or second serial port. For more information on these module refer to the *Autoscope RTMS Sx-300 Optional Configurations User Guide (PN A900-1155-2)*.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Data=**.

The following screen appears.



4. Select the appropriate options.

   - **Normal** — Statistical messages are transmitted at the end of every message period and all per vehicle information to display traffic lane presence information such as vehicle icons, speeds etc.
   - **Stat** — Statistical messages are only transmitted at the end of every message period.
   - **Polled** — Only statistical data that is currently stored in the Autoscope RTMS Sx-300 buffer is transmitted and only when a matching sensor ID request is received by the Autoscope RTMS Sx-300 sensor.

NOTE: If the Autoscope RTMS Sx-300 port over which the Autoscope RTMS Setup Utility communicates to the sensor is set to polled, the data recording functions on the Statistics and File screens are disabled. Also, there will not be any per vehicle data available in the live data stream; however, the per vehicle data is available from internal memory downloads if the Store Into Memory option is enabled (see "Defining Memory Options" on page 5-25).

- **High-Z** — This option leaves the transmit pin in high-impedance mode. This is only available in Polled mode when there are more than two sensors on the same line.

5. To set the new value and return to the Manual Setup screen, click **OK**.

Common Setup Options

Setup Parameters are often common to all sensors on a single site. For example, the sensors in a midblock deployment or string of detection stations along the same highway. To save the installer time and effort in repeatedly entering the same parameters in each site, a group of settings is defined as common settings. Common settings allow you to specify the basic parameters for an entire group of sensors and to load these settings into each Autoscope RTMS Sx-300 in the group.

The common setup options that can be selected are:

- Application ("Set the Application Mode" on page 4-2)
- Data ("Changing the Data Mode" on page 5-2)
- Message Period ("Changing the Message Period" on page 5-33)
- Classification ("Define Vehicle Classifications" on page 4-23)
- Message Comp. ("Define Message Composition" on page 4-20)
- Per vehicle On/Off ("Defining Per Vehicle Messages" on page 5-31)
- Lane #s & Labeling ("Zone Setup" on page 5-52)

In order to establish and download a common set of parameters for several Autoscope RTMS Sx-300 sensors, do the following.

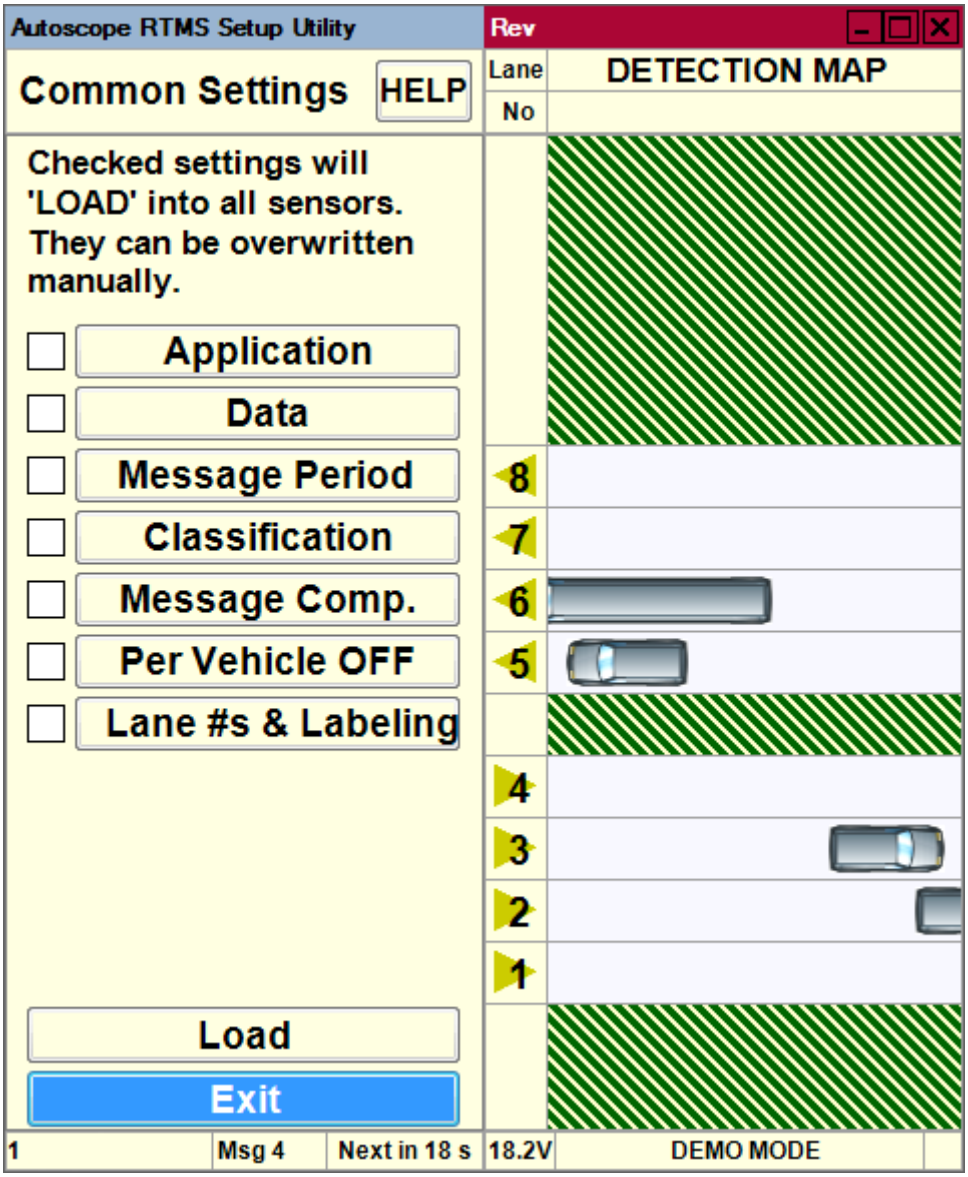
1. Create a configuration for the first Autoscope RTMS Sx-300 sensor (see "Configuration Process" on page 4-1).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **File**.
4. On the File screen, click **Save Common Settings**.

   All of the common setting are saved and you are returned to the Manual Setup screen.

NOTE: The common settings are stored on your computer. You are NOT asked to save these to a file.

5. Exit the Setup Utility and disconnect the computer from the Autoscope RTMS Sx-300 sensor.
6. Connect the computer to the Autoscope RTMS Sx-300 sensor to which the common settings are to be downloaded.
7. Start the utility (see "Starting the Setup Utility" on page 3-7).
8. On the Main Screen, click **Common Settings**.

The following screen appears.



9. To see what the current setting is for a parameter or to change it, click on the parameter (Application, Data, etc.).
10. To use a parameter as a common setting, select the check box to the left.
11. To upload the common parameters to the Autoscope RTMS Sx-300 sensor, click **Load**.

    You are returned to the Main Screen.
12. Repeat Steps 5 – 11 for each Autoscope RTMS Sx-300 sensor.

Defining Communications

The Communication screen is used to define the communication method used between your computer and the Autoscope RTMS Sx-300.This screen is also used to troubleshoot data connections, and if need be, to modify an existing connection.

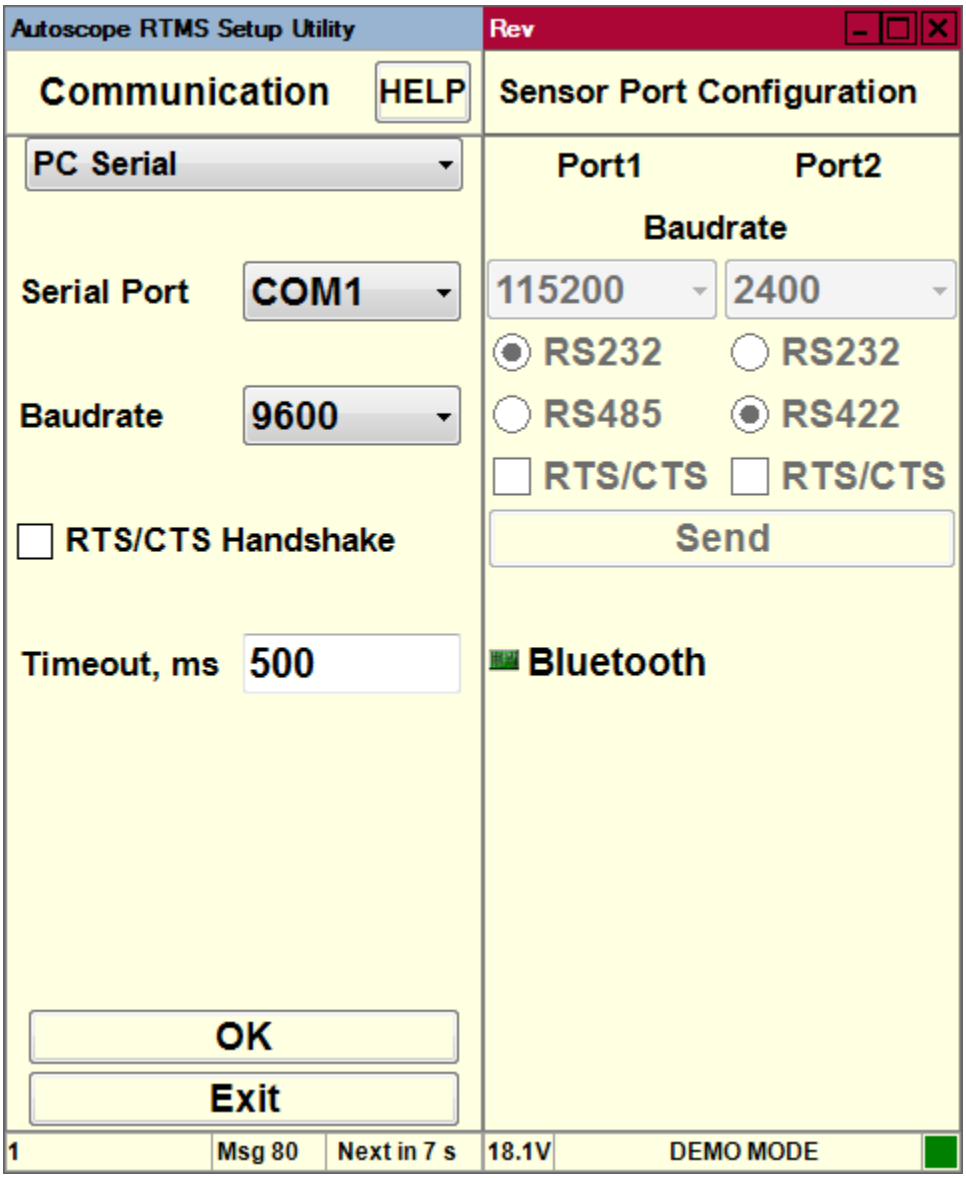


Figure 5-1: Communications Screen

The types of communication that can be defined are:

- Serial —See "Defining a Serial Connection" on page 5-9.
- Bluetooth — See "Defining a Bluetooth Connection" on page 5-11.
- Dialup — See "Defining a Dialup Connection" on page 5-13.

- TCP/IP — This option must be used with the RTMS Sx-300-TCP models (see the *Autoscope RTMS Sx-300 Optional Configurations User Guide, PN A900-1155-2*). This option can also be used when the Autoscope RTMS Sx-300 serial port is connected to an external Ethernet modem that the Autoscope RTMS Setup Utility can communicate with (see "Defining a TCP/IP Connection" on page 5-15).

NOTE: When the Communication screen appears, the left side of the screen is used to define the connection you would like to make; the right side is used to modify parameters after you are connected.

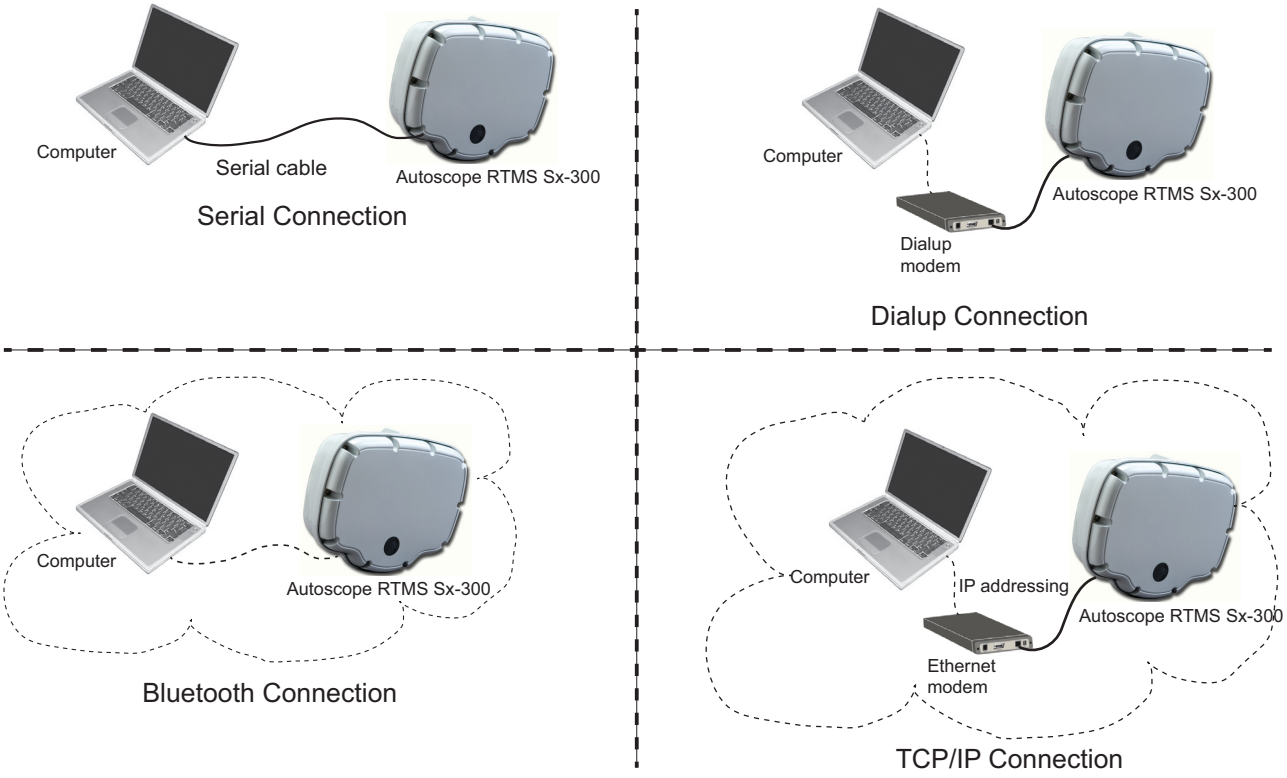


Figure 5-2: Autoscope RTMS Sx-300 Communication Connections

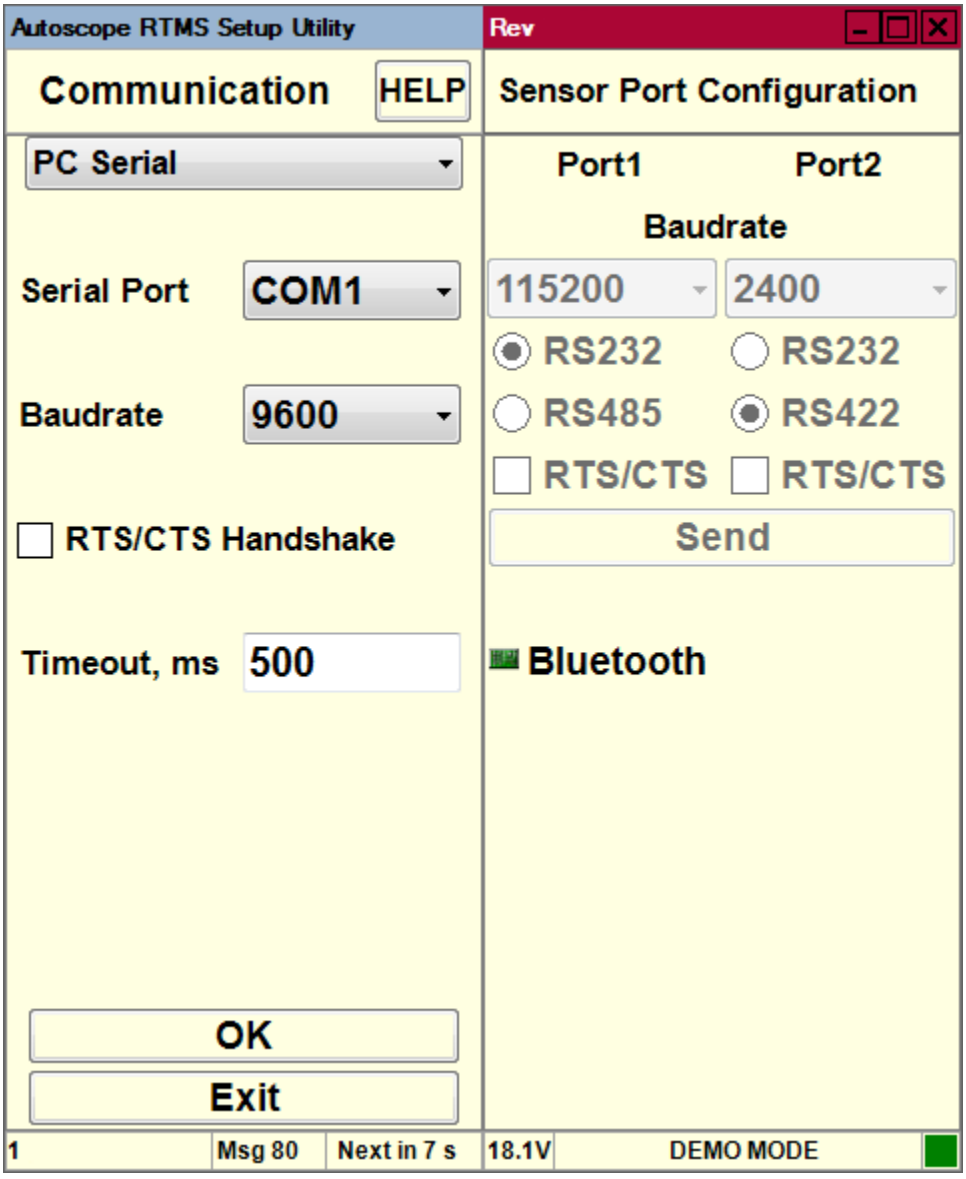
Defining a Serial Connection

A serial connection is used when a serial cable connects the Autoscope RTMS Sx-300 sensor to the serial port on a computer running the Autoscope RTMS Setup Utility.

To define a serial connection, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Communication**.

   The following screen appears.



Note, you can also get to this screen by clicking the **Communication** button on the Start screen.

4. Select **PC Serial** from the drop-down at the top as the type of communication.
5. For **Serial Port**, select the computer port that will be used for communicating with the Autoscope RTMS Sx-300.
6. For **Baudrate**, select the speed, in bits per second (bps) at which communication is to take place.

   The minimum is 2400, the maximum is 115200. The most common setting is 9600.
7. If handshaking is required, select the **RTS/CTS Handshake** check box.

NOTE: Make sure you have four wires for hardware handshake on your serial cable if you use this option.

8. For **Timeout, ms**, enter the number of milliseconds to wait for communication from the Autoscope RTMS Sx-300 before the connection times out.
9. When finished, click **OK**.

   If a connection is established, the green COM indicator in the bottom right of the screen will be blinking if the Autoscope RTMS Sx-300 sensor is in STAT or Normal mode. The indicator does not blink if the sensor is in Polled mode unless the Autoscope RTMS Setup Utility sends poll requests from the Start screen.
10. To return to the Manual Setup screen, click **Exit**.

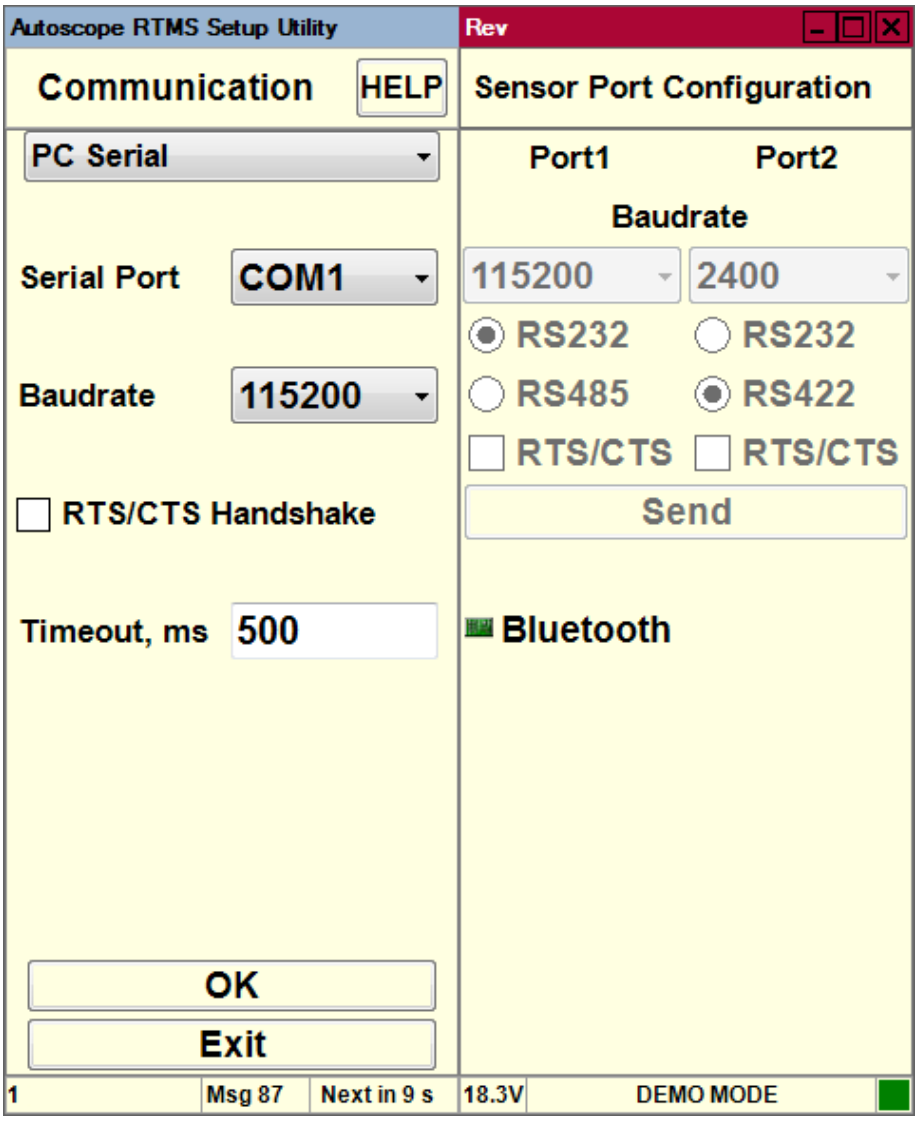
Defining a Bluetooth Connection

The following describes how to define a bluetooth connection in the Autoscope RTMS Setup Utility. For additional information on Bluetooth operations, see Appendix D: "Bluetooth Device Operations".

IMPORTANT: Bluetooth shares serial port 1 in the Autoscope RTMS Sx-300; therefore, any physical connection to port 1 must be disconnected so that communications to the Autoscope RTMS Sx-300 via bluetooth can be established.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Communication**.

   The following screen appears.



Note, you can also get to this screen by clicking the **Communication** button on the Start screen.

4. Select **PC Serial** from the drop-down at the top as the type of communication.
5. For **Serial Port**, select the serial port that was assigned to the Bluetooth serial port interface (see Appendix D: "Bluetooth Device Operations").
6. For **Baudrate**, select **115200** (this is mandatory for Bluetooth).
7. Make sure the **RTS/CTS Handshake** check box is unchecked (not selected)
8. For **Timeout, ms**, enter the number of milliseconds to wait for communication from the Autoscope RTMS Sx-300 before the connection times out.
9. When finished, click **OK**.

   If a connection is established, the green COM indicator in the bottom right of the screen will be blinking if the Autoscope RTMS Sx-300 sensor is in STAT or Normal mode. The indicator does not blink if the sensor is in Polled mode unless the Autoscope RTMS Setup Utility sends poll requests.
10. To return to the Manual Setup screen, click **Exit**.

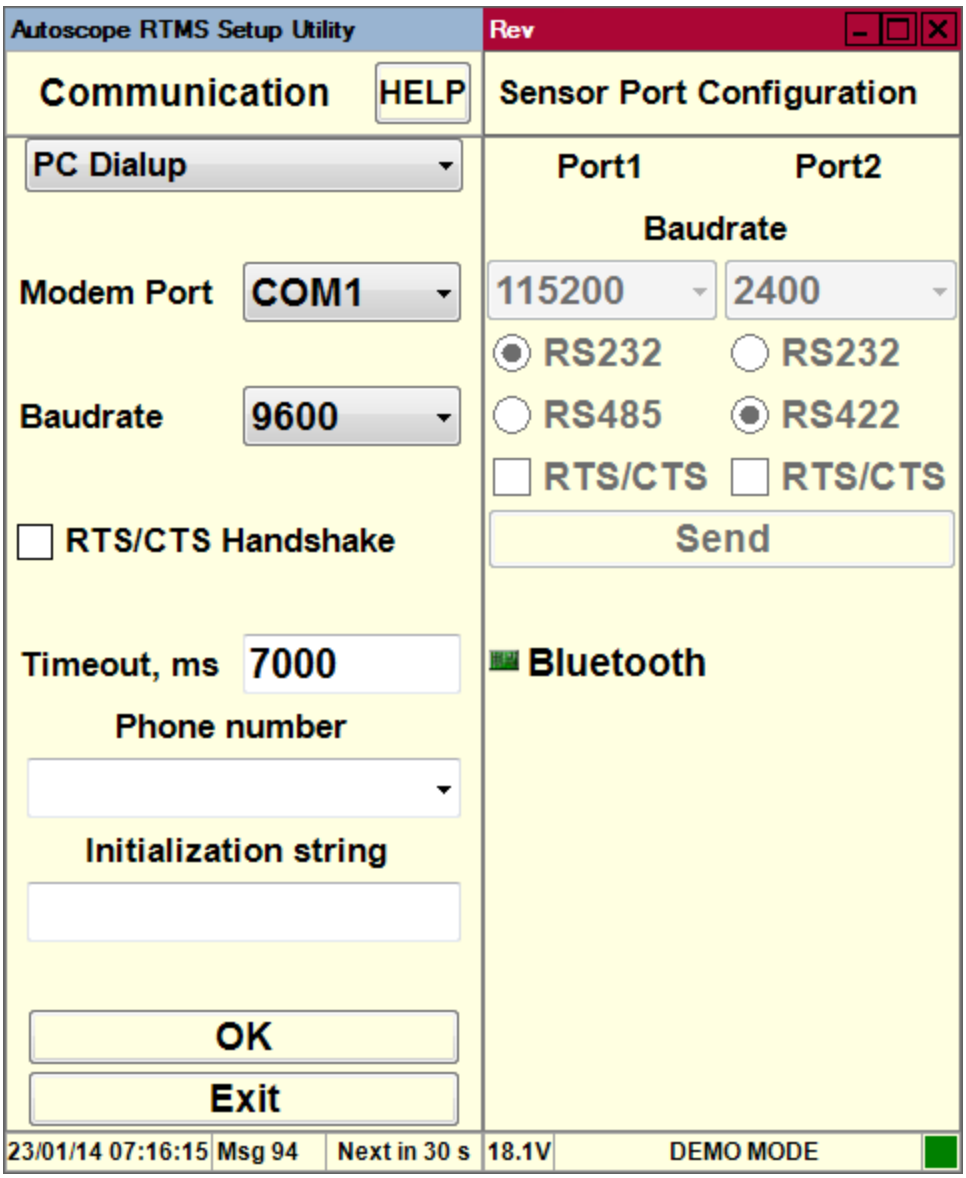
Defining a Dialup Connection

In this type of connection, a modem must be connected to the serial port on the Autoscope RTMS Sx-300 and the computer with the Autoscope RTMS Setup Utility must be able to contact the modem, usually through its own internal modem.

To define a dialup connection, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Communication**.

   The following screen appears.



Note, you can also get to this screen by clicking the **Communication** button on the Start screen.

4. Select **PC Dialup** from the drop-down at the top as the type of communication.
5. For **Modem Port**, select the serial port that your dialup modem is configured to use.
6. For **Baudrate**, select the speed, in bits per second (bps) of the dialup modem.
7. If your connection requires handshaking, select the **RTS/CTS Handshake** check box.

NOTE: Make sure you have four wires for hardware handshake on your serial cable if you use this option.

8. For **Timeout, ms**, enter the number of milliseconds to wait for communication from the Autoscope RTMS Sx-300 before the connection times out.

NOTE: The default value (7000) is recommended.

9. In the **Phone Number** field, enter or select the phone number that your modem needs to call.
10. If your modem requires an initialization string, enter it in the **Initialization String** field.
11. When finished, click **OK**.

    If a connection is established, the green COM indicator in the bottom right of the screen will be blinking if the Autoscope RTMS Sx-300 sensor is in STAT or Normal mode. The indicator does not blink if the sensor is in Polled mode unless the Autoscope RTMS Setup Utility sends poll requests.
12. To return to the Manual Setup screen, click **Exit**.

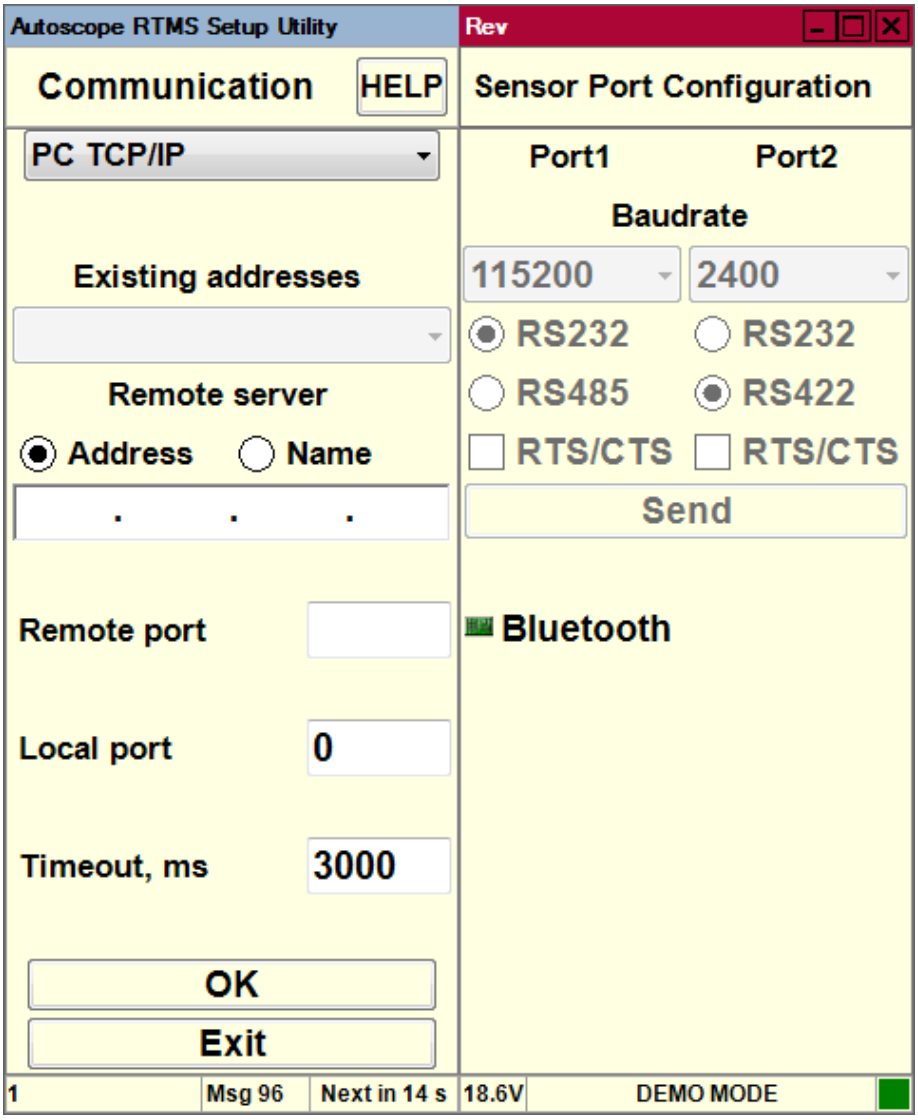
Defining a TCP/IP Connection

NOTE: This type of connection can only be made when the Autoscope RTMS Sx-300 serial port is connected to an external Ethernet modem that the Autoscope RTMS Setup Utility can communicate with, or when used with the RTMS Sx-300-CAM or RTMS Sx-300-TCP models (see the *Autoscope RTMS Sx-300 Optional Configurations User Guide, PN A900-1155-2*).

To define a TCP/IP connection, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Communication**.

   The following screen appears.



Note, you can also get to this screen by clicking the **Communication** button on the Start screen.

4. Select **PC TCP/IP** from the drop-down at the top as the type of communication.
5. For **Remote server**, select **Address**.
6. Enter the IP address or name of the Autoscope RTMS Sx-300.
7. For **Remote port**, enter the port number to be used. Default is 2000.
8. For **Local port**, use the default of 0.
9. For **Timeout, ms**, enter the number of milliseconds to wait for communication from the Autoscope RTMS Sx-300 before the connection times out.

NOTE: The default value (3000) is recommended.

10. Click **OK**.
11. To return to the Manual Setup screen, click **Exit**.

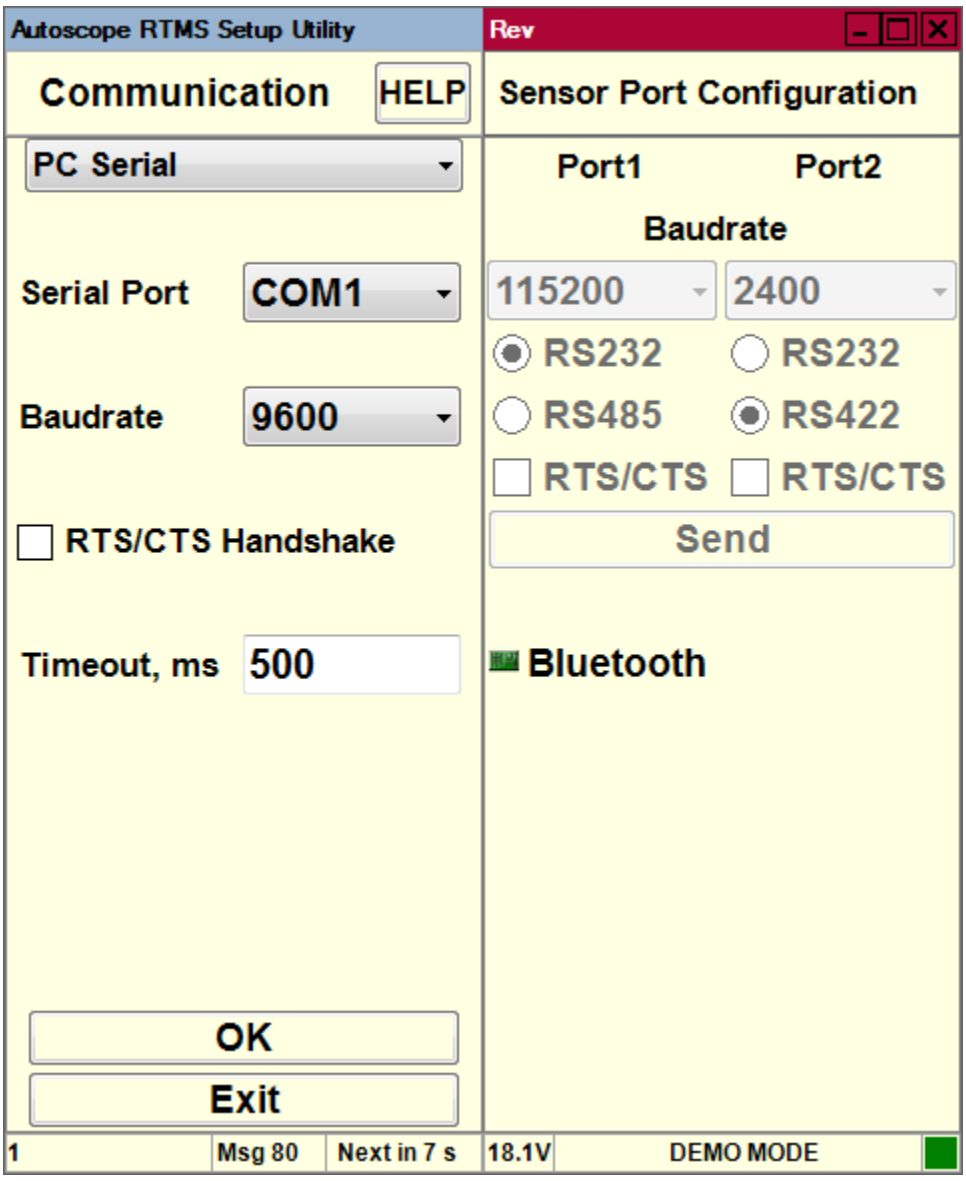
Changing an Existing Connection

Normally, the Autoscope RTMS Setup Utility connects to the last known Autoscope RTMS Sx-300 connection (e.g., COM1). If there are Autoscope RTMS Sx-300 sensors connected through different communication ports (e.g., COM3, TCP/IP, etc.), the connection type must be established manually.

To make changes to an existing connection, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Communication**.

   The following screen appears.



4. Once a connection is made, in the right pane you can:
   - Alter communication speed (baudrate).
     – 115200 bits per second (bps) is the factory default for serial units.
     – Data rates below 9600 are useful where high quality transmission lines are not available. When using data rates below 9600 bps, the Autoscope RTMS Sx-300 data mode must be set to STAT to reduce the amount of data and prevent communication problems. See "Changing the Data Mode" on page 5-2 for further details.
   - Change whether the connection is RS-232 or RS-485.
   - Activate RTS/CTS handshaking if the cable used for the connection is wired for it.
5. When finished, click **Send**.

NOTE: Once you change the settings, you may lose the connection to the Autoscope RTMS Sx-300. If this happens, enter the connection parameters on the left side of the screen and click **OK**.

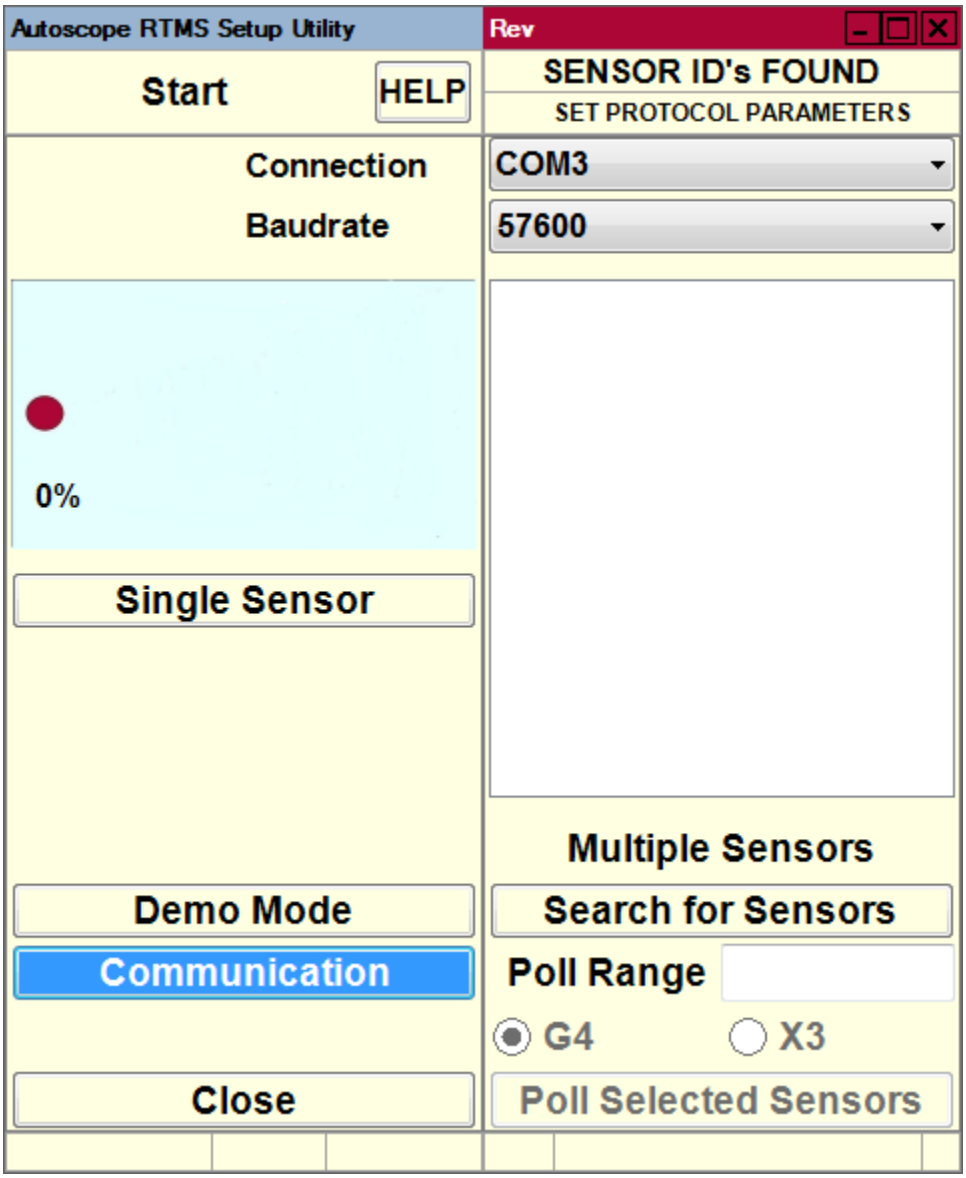
Finding Sensors

This option is used when an Autoscope RTMS Sx-300 sensor is not found by the Autoscope RTMS Setup Utility when it starts up. This includes Autoscope RTMS Sx-300 sensors that might be in Polled mode.

NOTE: This procedure will also find any RTMS G4 sensors that are in the network.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).

   If an Autoscope RTMS Sx-300 unit is not found the Start screen appears.

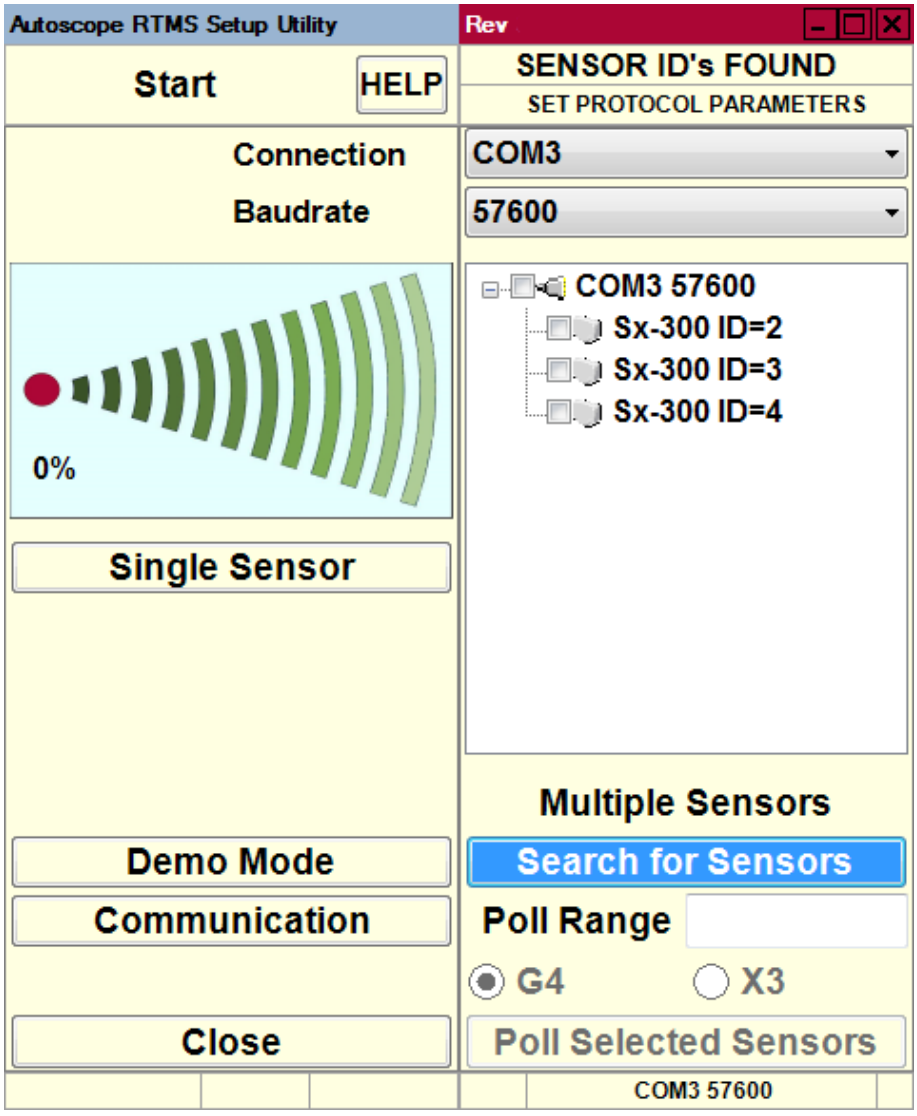


2. Did the Start screen appear?

Yes	No
Continue with Step 3.	a) Close the Autoscope RTMS Setup Utility. b) Start the utility and when the opening window appears press **ESC**. c) Continue with Step 3.

3. To begin the search, click **Search for Sensors**.

   The search is conducted using the current communications options. Any Autoscope RTMS Sx-300 units found appear in the list above "Multiple Sensors." **Note**, to change the communications option, click **Communication** to display the Communication screen.



4. If the unit you are searching for appears in the list, or if no units appear after one minute, click **Stop Search**.
5. Does the unit you are searching for appear in the list?

Yes	No
Continue with Step 6.	a) Troubleshoot the connection. See symptom "**Could not establish communications with the** Autoscope RTMS Sx-300" in Chapter 6: "Troubleshooting". b) If the problem is resolved, continue with Step 6; otherwise, contact Technical Support.

6. Do G4 sensors appear in the list along with Sx-300 sensors?

Yes	No
Continue with Step 7.	Select the unit from the list and click **Single Autoscope RTMS Sx-300** or double-click the unit in the list. The Main Screen will appear with the settings for the selected Autoscope RTMS Sx-300.

7. If the G4 sensor is the unit you want to configure, double-click it.

   One of the following will occur.

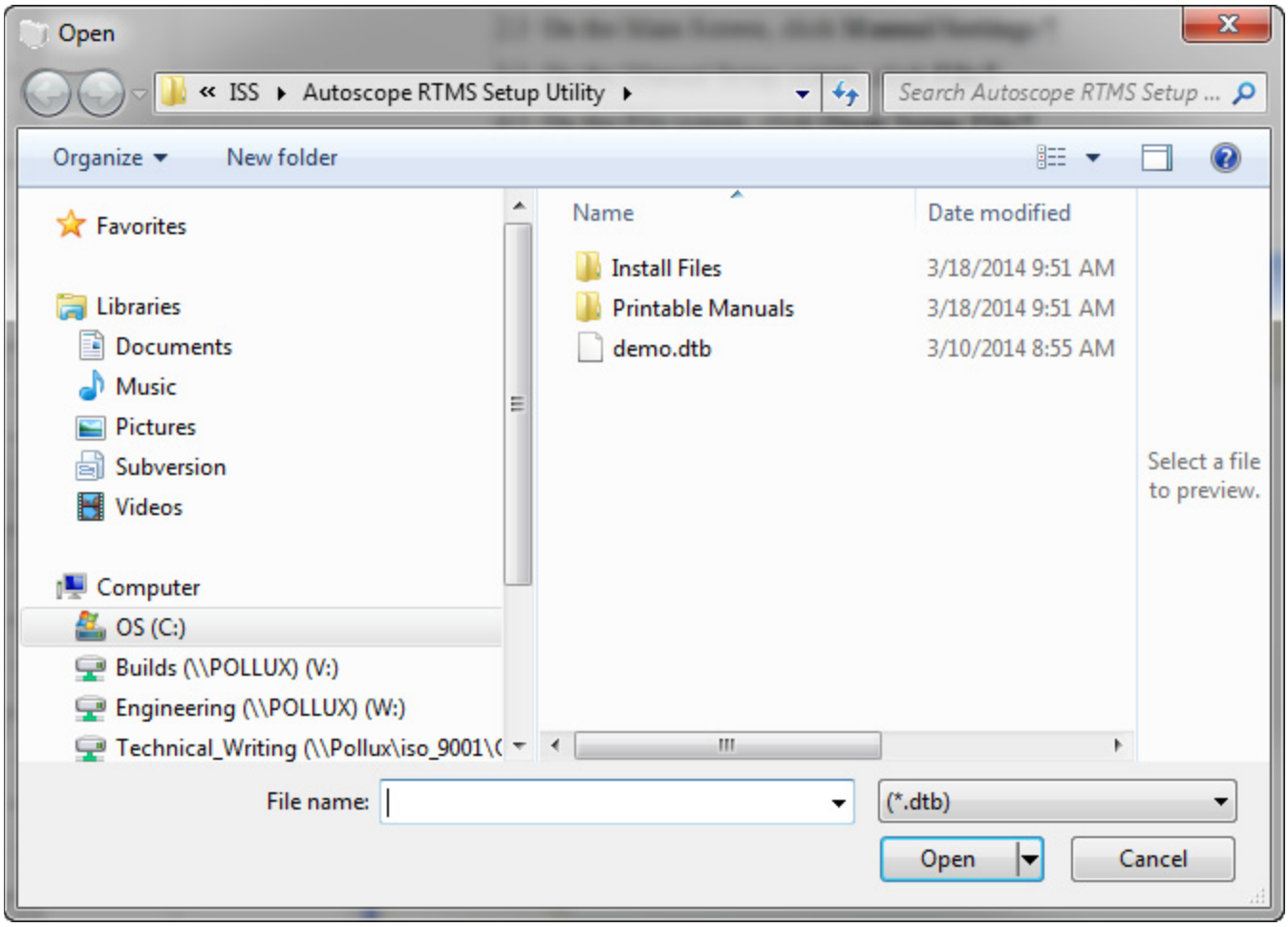
   - If the RTMS Setup Utility for G4 sensors is installed on your computer, it will start up and the Main Screen will appear.
   - If the RTMS Setup Utility for G4 sensors is not installed on your computer, a message will appear indicating that you must install the utility in order to configure the sensor. For more information, contact your sales or service representative.

Loading a Previously Saved Setup File

This option enables you to open a saved setup file and load it into the Autoscope RTMS Sx-300. This option can be used to restore a configuration that has been modified to its original settings.

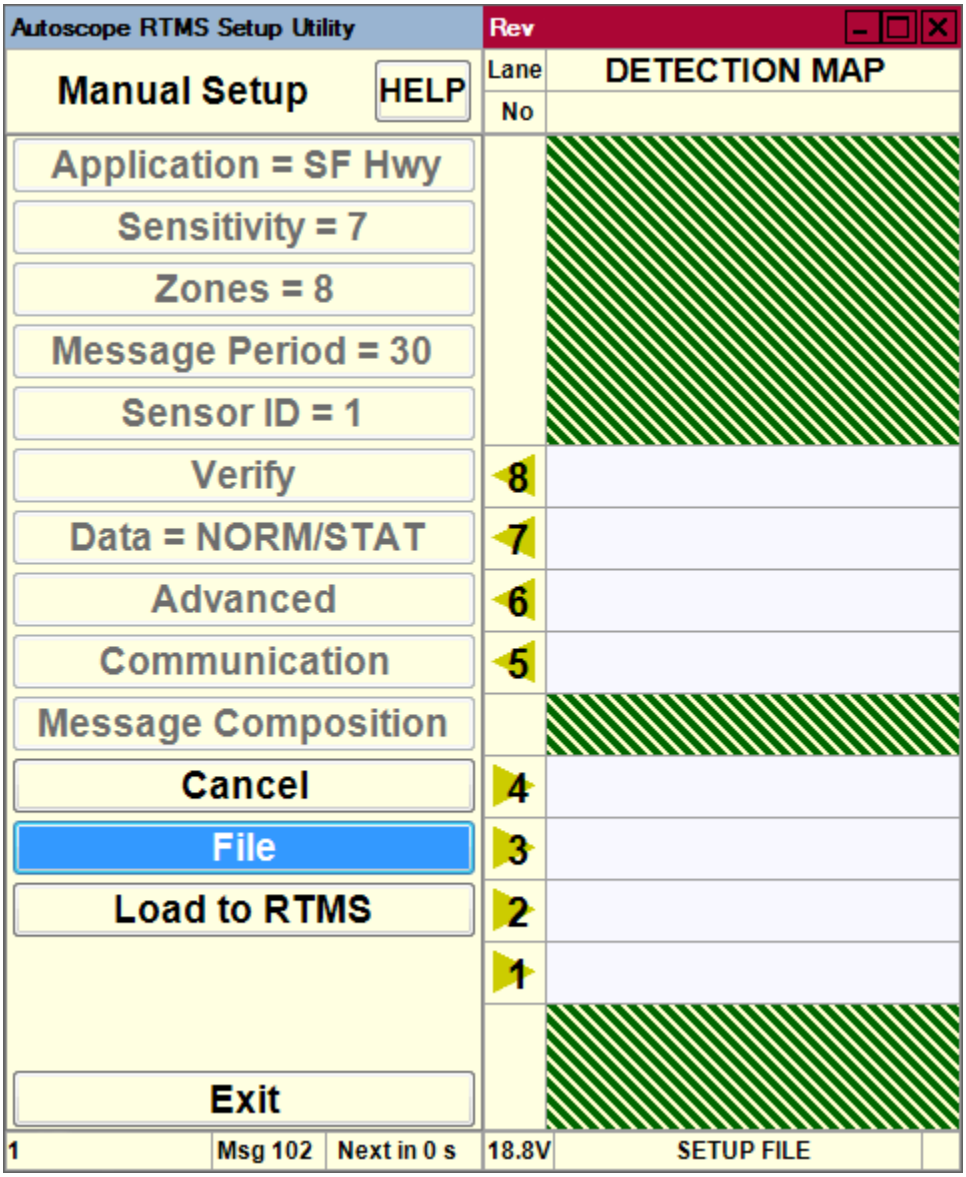
1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **File**.
4. On the File screen, click **Open Setup File**.

   The Open window appears.



5. Locate and select the setup file.
6. Click **Open**.

The following screen appears.



The greyed out options show the settings in the file that will be loaded into the Autoscope RTMS Sx-300.

7. If everything is correct, click **Load to RTMS**.

   The configuration is loaded into the Autoscope RTMS Sx-300.

Manual Speed Calibration

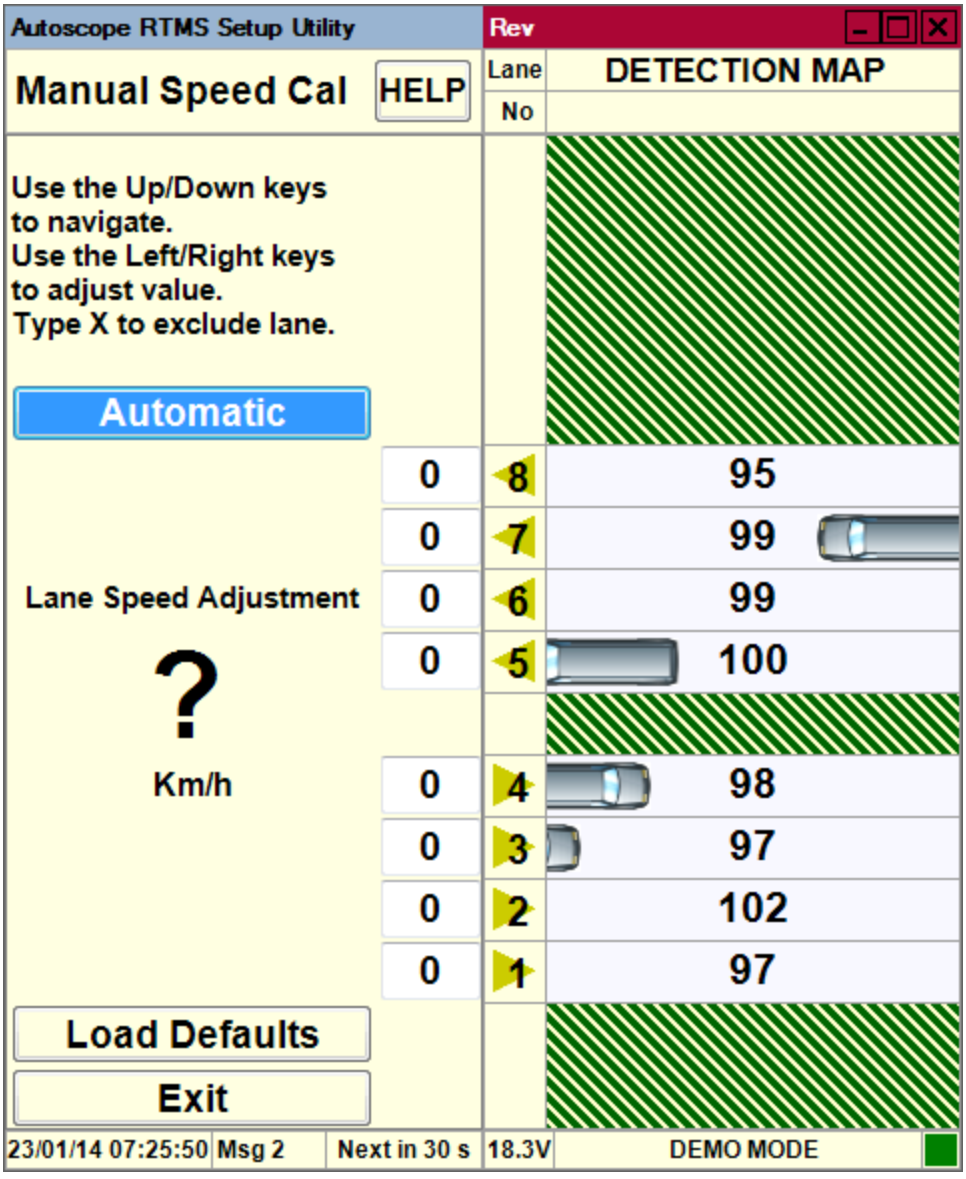
A two-person team is required for this procedure.

NOTE: This procedure should only be performed:

- If the automated speed calibration fails (the percentage difference for Step 8 on page 19 is more than ±10%).
- When volumes are too low for automatic calibration.

1. On the Speed Calibration screen, Click **Manual**

   The following screen appears.



2. Select the zone number for which the speed is to be adjusted.

3. Use the right and left arrow keys on your keyboard to increase or decrease the reference speed by the value listed in the **Speed Difference (LIDAR - Autoscope RTMS Sx-300)** field on the worksheet.

NOTE: If there was no volume detected over the previous message period the Autoscope RTMS Setup Utility will not accept any manual adjustments to speed. You can only adjust after a message period in which vehicles were detected and a speed calculated.

4. Repeat Step 2 and Step 3 for each zone
5. Wait for two message periods to let the Autoscope RTMS Sx-300 speeds adjust.
6. Repeat "Step 5C: Check Calibration" on page 4-18 for each zone until the percentage difference is less than ±10%.

Memory Operations

The Autoscope RTMS Sx-300 sensor has 8 MB of internal memory that can be used to store statistical and per vehicle messages for later download.

The memory operations that can be performed are:

- Defining whether and how data (messages) is to be stored in the internal memory of the Autoscope RTMS Sx-300.
- Downloading the stored data from internal memory to a computer.
- Clearing the internal memory (erase all data) of the Autoscope RTMS Sx-300.

Defining Memory Options

This operation enables you to define whether or not statistical and per vehicle messages are saved and stored in the Autoscope RTMS Sx-300 memory, and whether the oldest messages should be overwritten when the memory becomes full.

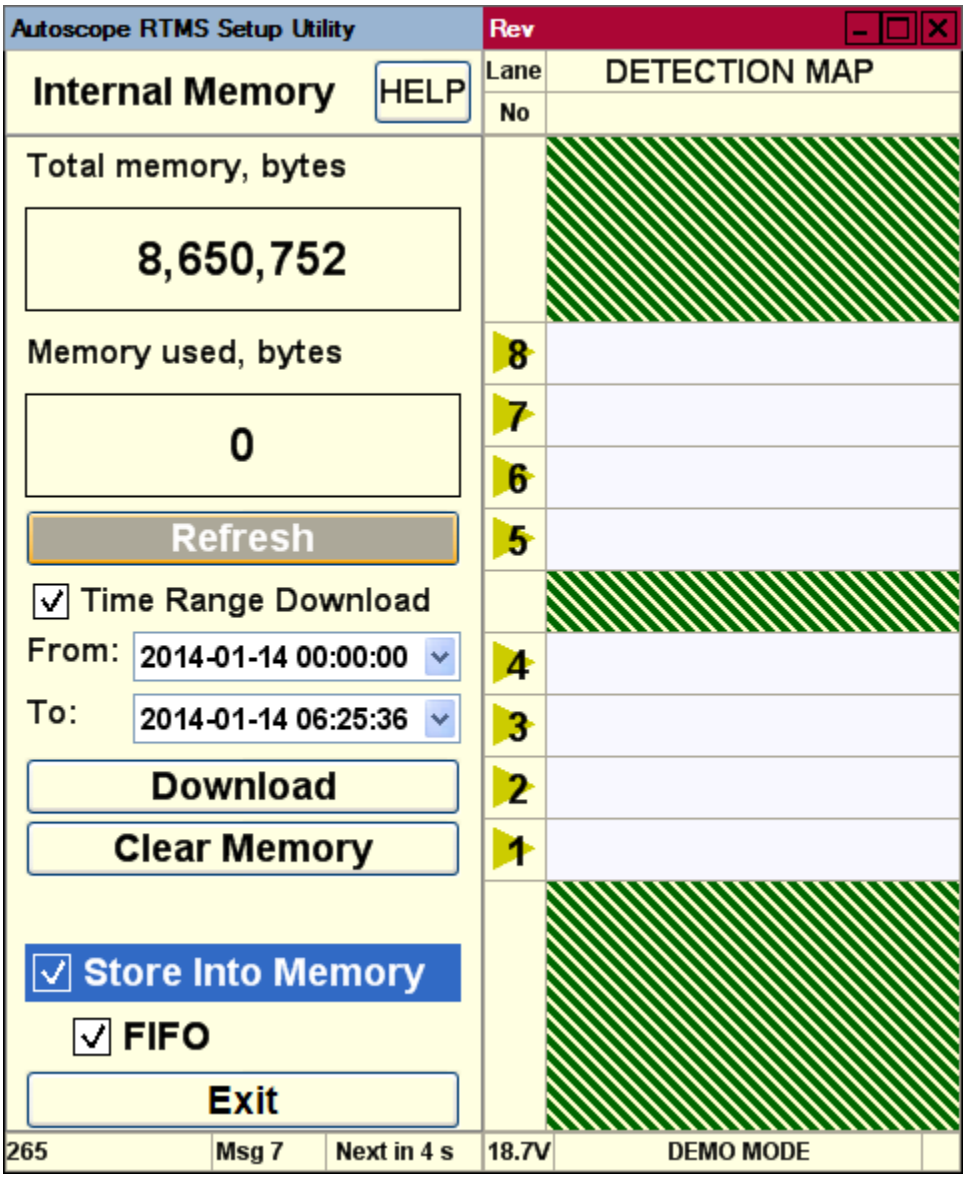
NOTES:

- It is recommended that this option always be enabled if there are communications issues caused by the network. This allows data to be retrieved from the time period when the communications was down.
- Activation of memory automatically selects Real Time Clock in message composition for X3 STAT protocol.
- Enabling Store Into Memory when the Per Vehicle option is active (ON), will cause the internal memory of the Autoscope RTMS Sx-300 sensor to fill up faster.

To define the memory option, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Internal Memory**.

The following screen appears.



3. To enable storage of Autoscope RTMS Sx-300 data in the Autoscope RTMS Sx-300 onboard memory, select the **Store Into Memory** check box.
4. Use the **FIFO** check box to determine what action is to be taken once the sensors' internal memory is full.
   - **FIFO** selected: when memory is full, messages will continue to be stored but the earliest stored messages will the overwritten.
   - **FIFO** not selected: when memory is full, no more messages will be stored in internal memory. In this case, the only ways to start saving messages again is to either select the check box or clear internal memory (see "Clearing Memory" on page 5-30).
5. To save the settings and return to the Main screen, click **Exit**.

Downloading Autoscope RTMS Sx-300 Memory

Once data is stored in the Autoscope RTMS Sx-300 memory, you have the option of downloading all or part of the data to the hard drive of a computer.

The following should be considered, especially when downloading large amounts of memory.

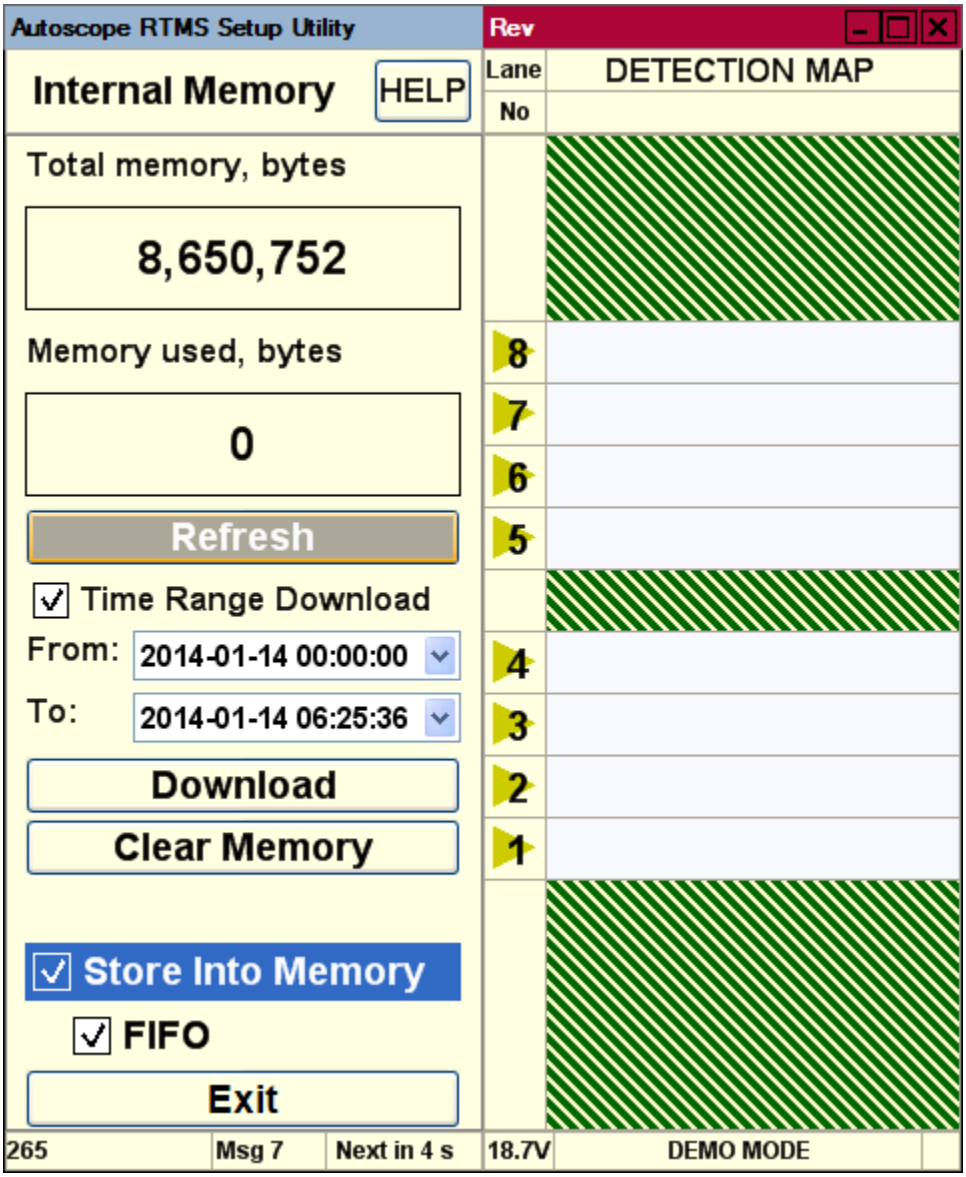
- Download at the highest connection speed available when directly connected to the Autoscope RTMS Sx-300 sensor. A full memory will take just over 12 minutes to download at 115200 bps with an RS-232 serial connection.
- If downloading at 115200 bps, ensure that the cable length is no longer than 15 m (50 ft). Otherwise, data corruption is possible.

NOTE: When a download is in progress, no other operations can be performed.

To download the messages stored in memory, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Internal Memory**.

The following screen appears.



3. Do you want to download all of memory or part of it?

All	Part
Proceed to Step 7.	Continue with Step 4.

4. Select the **Time Range Download** check box.
5. In the **From** field, set the date and time from which the download is to start.
   - To set the date, select it from the drop-down menu.
   - To set the time, select the appropriate field (hours, minutes, seconds) then use the keyboard to enter a new time.

6. In the **To** field, set the date and time at which the download is to end

   Note, if you specify a **To** date beyond the current date, the **Download** button will not be active.

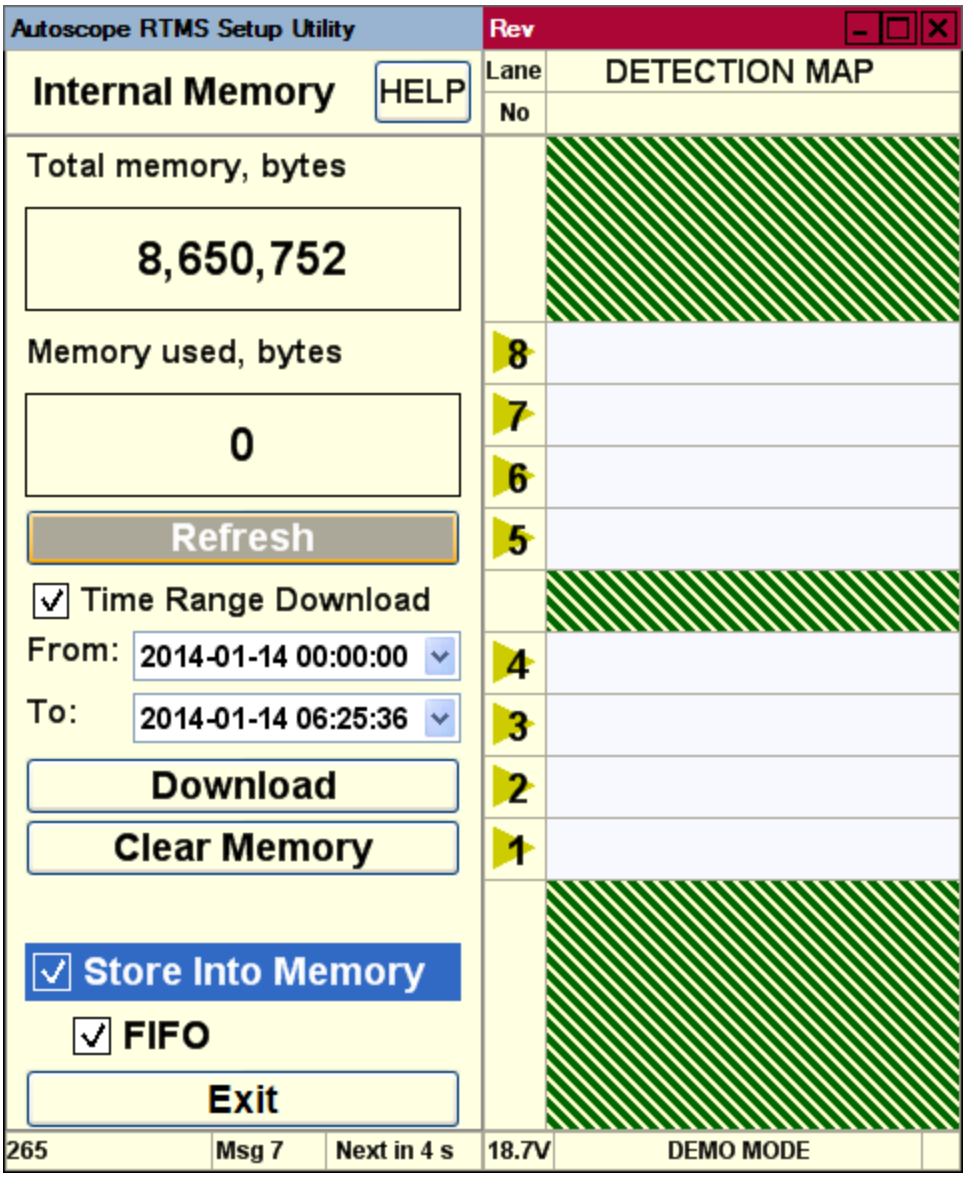
7. Click **Download**.
8. When the Save As window appears, do the following.
   a) In the **Save in** field, select the location where the file is to be saved.
   b) In the **File name** field, type a name for the file.
   c) In the **Save as type** field, select:
      – **Text files (*.asc)** for human-readable format
      – **Binary files (*.bin)** for machine readable, binary format
      – **Text and Binary files (*.asc, *.bin)** for both formats
   d) Click **Save**.
9. When the download is complete, click **Exit** to return to the Main screen.

Clearing Memory

This operation enables you to clear (erase) all of the messages that are stored in the Autoscope RTMS Sx-300 internal memory.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click Internal Memory.

   The following screen appears.



3. Click **Clear Memory**.

   All messages are erased and the count for **Memory used, bytes** is set to zero (0).
4. To return to the Main screen, click **Exit**.

Message Operations

There are three different operations that have an effect on the messages that are sent by the Autoscope RTMS Sx-300 sensor:

- Defining the message composition
- Defining per vehicle messages
- Changing the frequency at which messages are sent

Defining the Message Composition

This operation defines the format of the statistical message (G4 or X3) and what data is to be included in the message. For information about setting the composition of the message, see "Step 6: Define Message Composition" on page 4-20.

Defining Per Vehicle Messages

When the Per Vehicle option is turned ON, a message is sent for every vehicle when it is detected.

In the data file (see Appendix C: "Data Files and Message Formats") the per vehicle data is listed between the statistical messages that are sent for each message period (see Figure C-4 on page C-5). The per vehicle data will add up to the same values that are listed in the statistical message.

When Per Vehicle is ON, the per vehicle data is sent in between the regular statistical messages. The data provided is as follows:

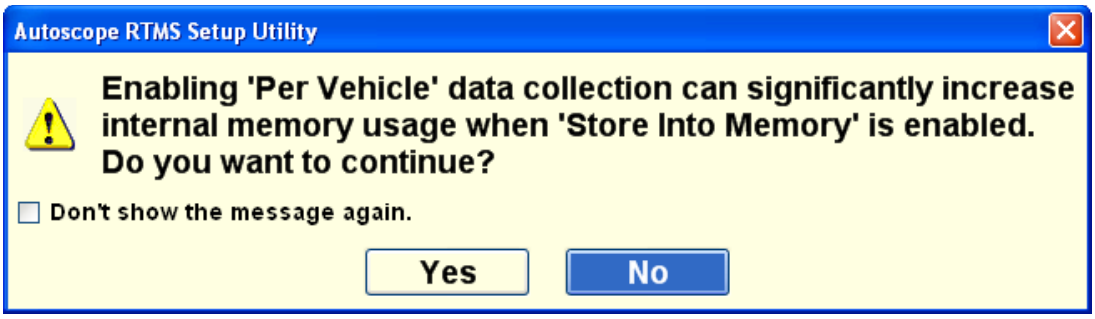
- Autoscope RTMS Sx-300 ID - ID number assigned to the sensor
- Lane - the zone where the vehicle was detected
- Class - the vehicle classification (small, medium, truck, etc.)
- Speed - the detected speed of the vehicle
- Length - the length of the vehicle
- Dwell - amount of time, in milliseconds, the vehicle is being detected

NOTE: If the Autoscope RTMS Sx-300 sensor is set to polled mode (see "Changing the Data Mode" on page 5-2) with Per Vehicle turned ON, there will not be any per vehicle data available in the live data stream. However, the per vehicle data is available from internal memory downloads if the Store Into Memory function is enabled (see "Defining Memory Options" on page 5-25).

To enable the Per Vehicle option, do the following.

1. On the Main Screen click **Per Vehicle** to turn the option ON or OFF.

When the option is turned ON, the following window appears.



2. Click **Yes** to enable (turn ON) the Per Vehicle option, or **No** to cancel the operation.

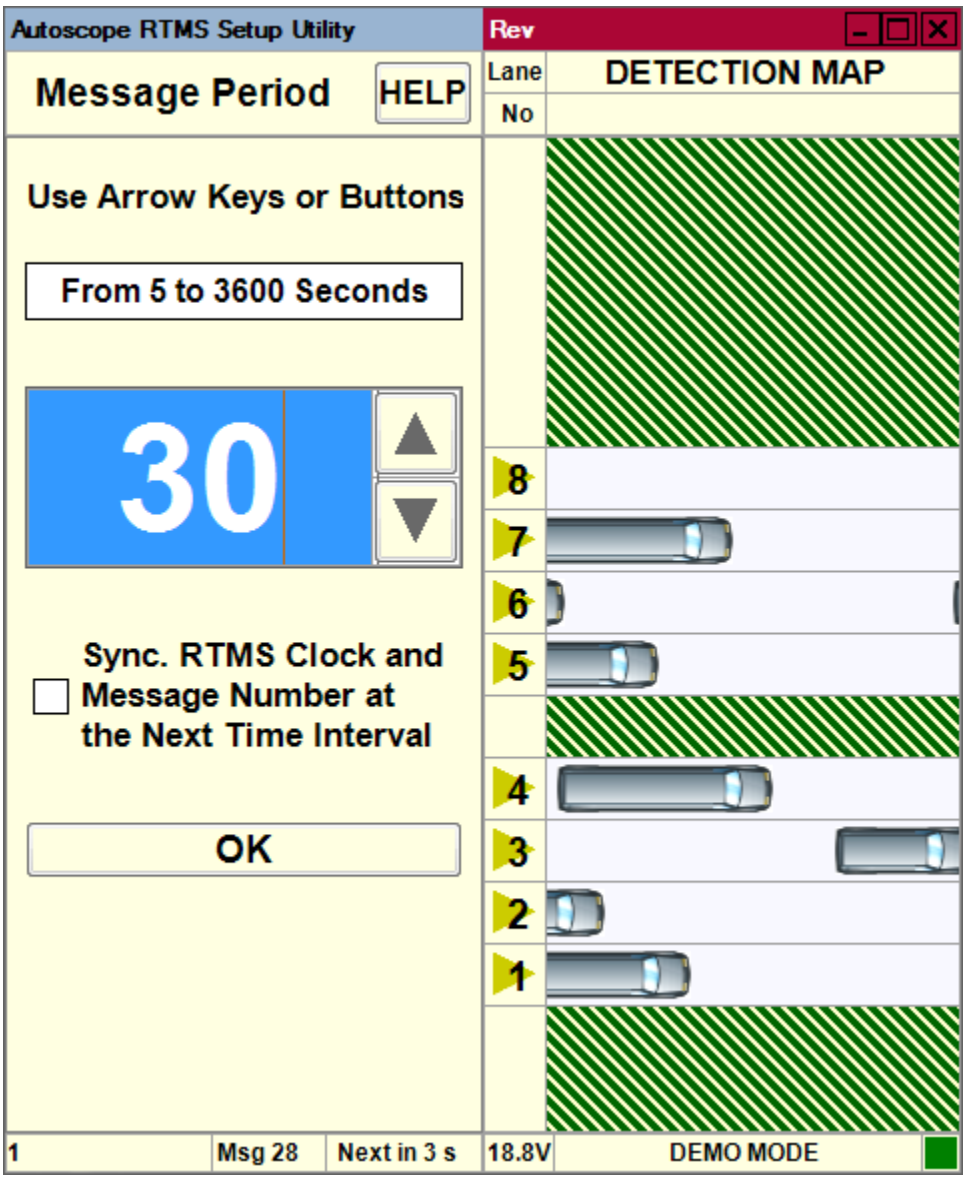
Changing the Message Period

The message period is the amount of time between sending statistical reports from the Autoscope RTMS Sx-300. When the system is set up, a default period of 30 seconds is used. This is the message period generally used for Real-Time traffic data. A 300 to 900 second period (5 to 15 min) is recommended for counting applications.

To change the message period, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Message Period**.

   The following screen appears.



4. Click the Up and Down arrows or use the arrow keys on your computer to set Message Period to the desired interval.

   For G4 STAT protocol the range is 5 to 3600 seconds. For X3 STAT protocol it is 5 to 900 seconds.

5. To synchronize the message with the Autoscope RTMS Sx-300 clock, select the **Sync** check box.

   Example: If the message period is set to 30 seconds, the message will be sent out at 00:00:00 and 00:00:30; not at 00:00:03 or 00:00:33.

   Note, this feature synchronizes the Autoscope RTMS Sx-300 clock and message period with the connected PC. The program must be running to synchronize Autoscope RTMS Sx-300.

6. Click **OK**.

   The new value is set and you are returned to the Manual Setup screen.

Optimizing Volume Count Accuracy

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 by one or more micro-slices 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.
- Sensitivity too high or low – If the sensor is correctly aimed, incorrect counts could be caused by an improper sensitivity setting.
- 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 5-3, zone 2 shows an over count, while zone 3 shows and under count.

Lane	Sensor	MANUAL	Diff	%
8	59	58	1	1
7	58	57	1	1
6	58	59	-1	-1
5	56	56	0	0
4	61	62	-1	-1
3	58	62	-4	-6
2	52	48	4	8
1	55	55	0	0

Figure 5-3: Over/Under Count: Adjacent Zones

The above could indicate that vehicles from zone 3 are being detected in zone 2. Fine tune the zone boundary between the two zones by one micro-slice to begin with (Move Closer –1). See "Adjusting Zone Boundaries" on page 5-55. Recheck the results and adjust further if needed.

Condition B: Under Count in Near Zone

In the situation shown in Figure 5-4, the count for zone 1 is well below what is expected; vehicles are being missed.

Lane	Sensor	MANUAL	Diff	%
8	59	58	1	1
7	58	57	1	1
6	58	59	-1	-1
5	56	56	0	0
4	61	62	-1	-1
3	58	59	-1	-1
2	52	52	0	0
1	55	63	-8	-12

Figure 5-4: 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 Autoscope RTMS Sx-300 and make sure it is aimed down enough to view the first lane of traffic (zone 1).

Condition C: Under Count in Far Zone

In the situation shown in Figure 5-5, the count for zone 8 is well below what is expected; vehicles are being missed.

Lane	Sensor	MANUAL	Diff	%
8	59	66	-7	-10
7	58	57	1	1
6	58	59	-1	-1
5	56	56	0	0
4	61	60	1	1
3	58	59	-1	-1
2	52	52	0	0
1	55	55	0	0

Figure 5-5: 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 Autoscope RTMS Sx-300 and make sure it is aimed up enough to view the last lane of traffic (zone 8).

Condition D: Under Count in Several Zones

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

Lane	Sensor	MANUAL	Diff	%
8	59	64	-5	-7
7	58	62	-4	-6
6	58	60	-2	-3
5	56	58	-2	-3
4	61	64	-3	-4
3	58	62	-4	-6
2	52	53	-1	-1
1	55	58	-3	-5

Figure 5-6: Under Count: Many Zones

In the above situation the signal strength reflection may be too low. This could be caused could by the following:

- The aiming angle is not perpendicular to the traffic.
- The sensitivity is too low.

Check the aiming angle. If this is OK, then increase the sensitivity (see "Sensitivity Adjustment" on page 5-47).

Condition E: Over Count in Several Zones

In the situation shown in Figure 5-7, the count for many zones is above what is expected.

Lane	Sensor	MANUAL	Diff	%
8	59	59	0	0
7	58	56	2	3
6	58	56	2	3
5	56	55	1	1
4	61	60	1	1
3	58	55	3	5
2	52	49	3	6
1	55	54	1	1

Figure 5-7: Over Count: Many Zones

In the above situation the signal strength reflection may be too high, causing "splashing" into adjacent lanes. The most likely cause is that the sensitivity is too high. Decrease the sensitivity (see "Sensitivity Adjustment" on page 5-47).

Condition F: Under Count in First Zone Past a Barrier

In the situation shown in Figure 5-8, the count for zone 5 is lower than what is expected.

Lane	Sensor	MANUAL	Diff	%
8	59	59	0	0
7	58	57	1	1
6	58	59	-1	-1
5	56	66	-10	-15
4	61	60	1	1
3	58	59	-1	-1
2	52	52	0	0
1	55	54	1	1

Figure 5-8: Under Count: First Zone Past Barrier

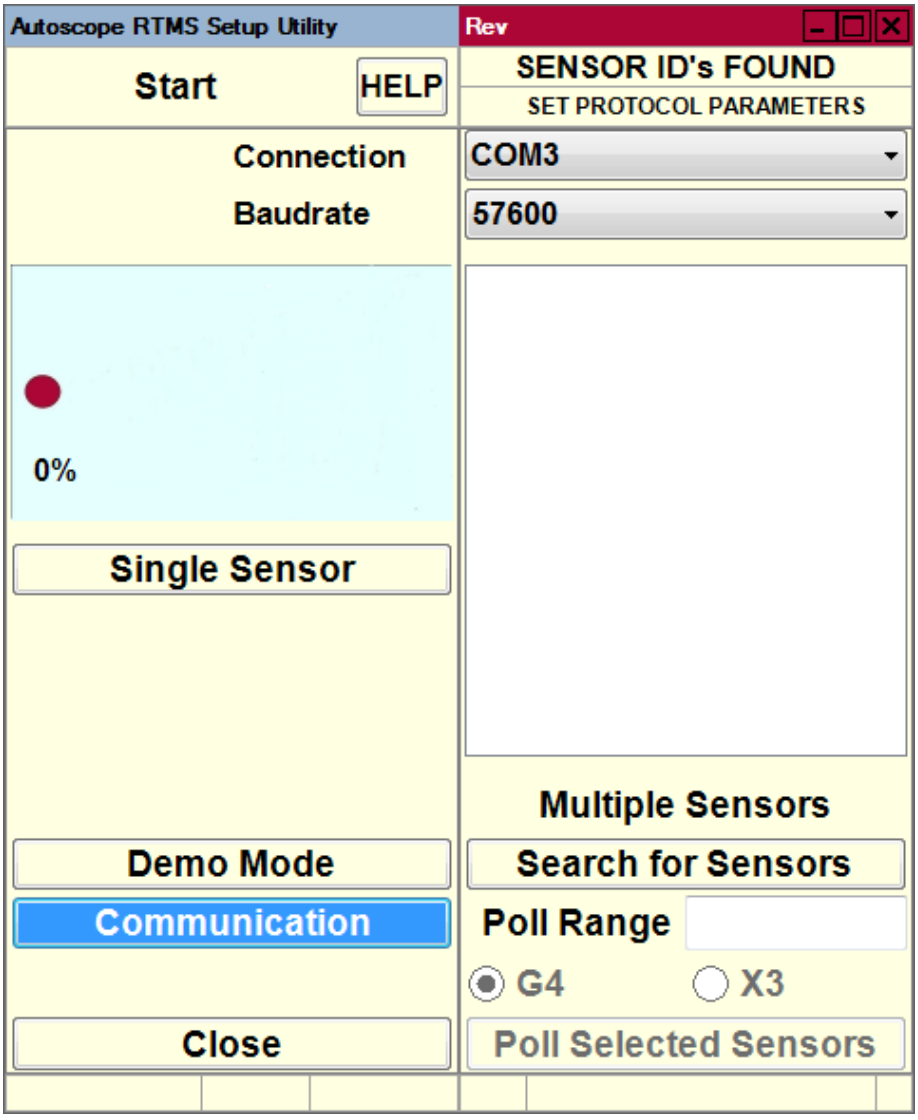
The above could indicate there is some kind of barrier between zones 4 and 5. The signal from the barrier is imposing on zone 5, causing smaller vehicles to be missed. Moving the zone boundary away from the barrier should help resolve this situation. Fine tune zone 5 by moving the zone boundary closest to the barrier further away from the barrier (move away +1). An adjustment of 1 or 2 micro-slices can make a large improvement. See "Adjusting Zone Boundaries" on page 5-55. Recheck the results and adjust further if needed.

Polling Sensors

This option can be used to verify the operation of a single Autoscope RTMS Sx-300 sensor or multiple Autoscope RTMS Sx-300 sensors that share the same communications line. The Autoscope RTMS Sx-300 units must be in polled mode.

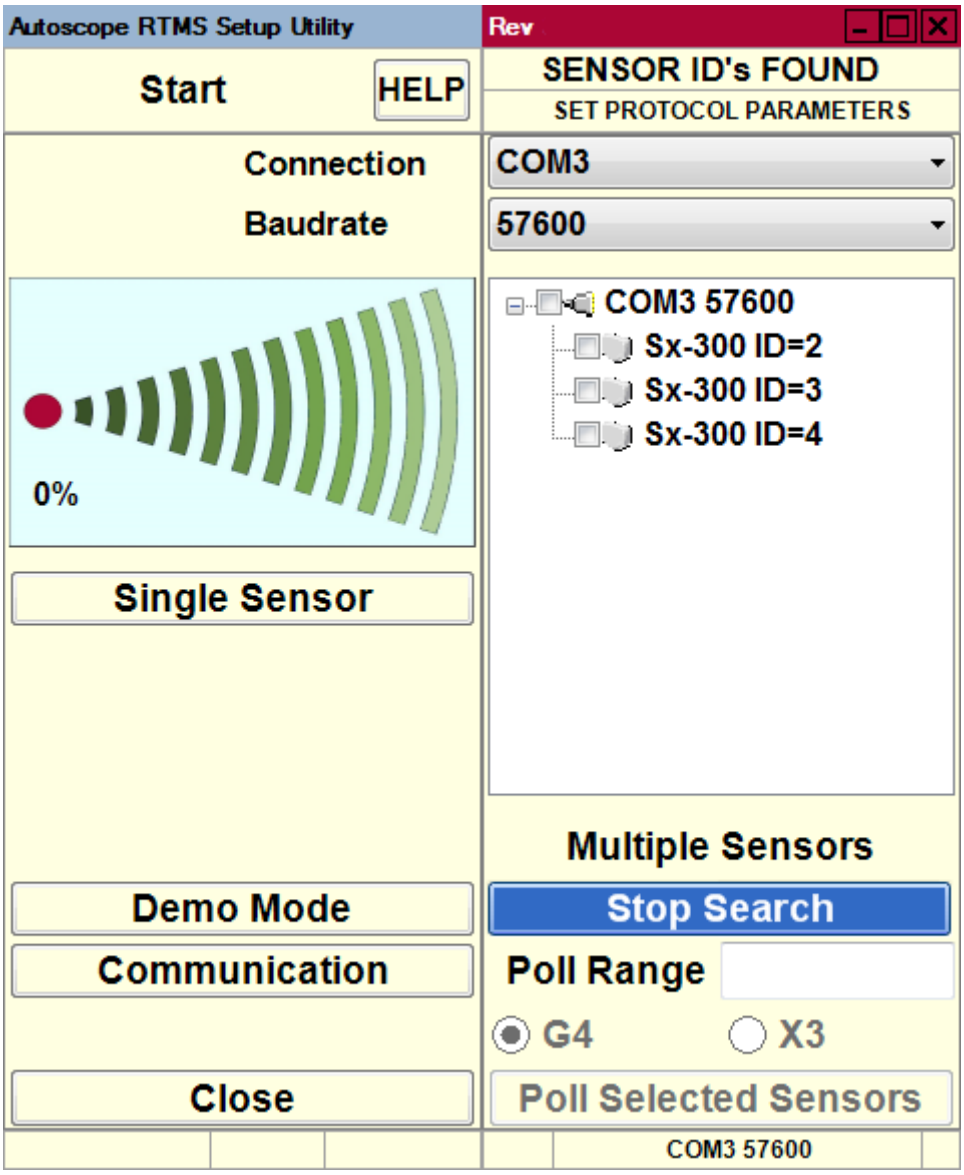
1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. Did the Start screen or Main Screen appear?

Start Screen	Main Screen
Continue with Step 3.	a) Close the Autoscope RTMS Setup Utility. b) Restart the utility but press the ESC key immediately after the opening screen appears. c) Continue with Step 3.



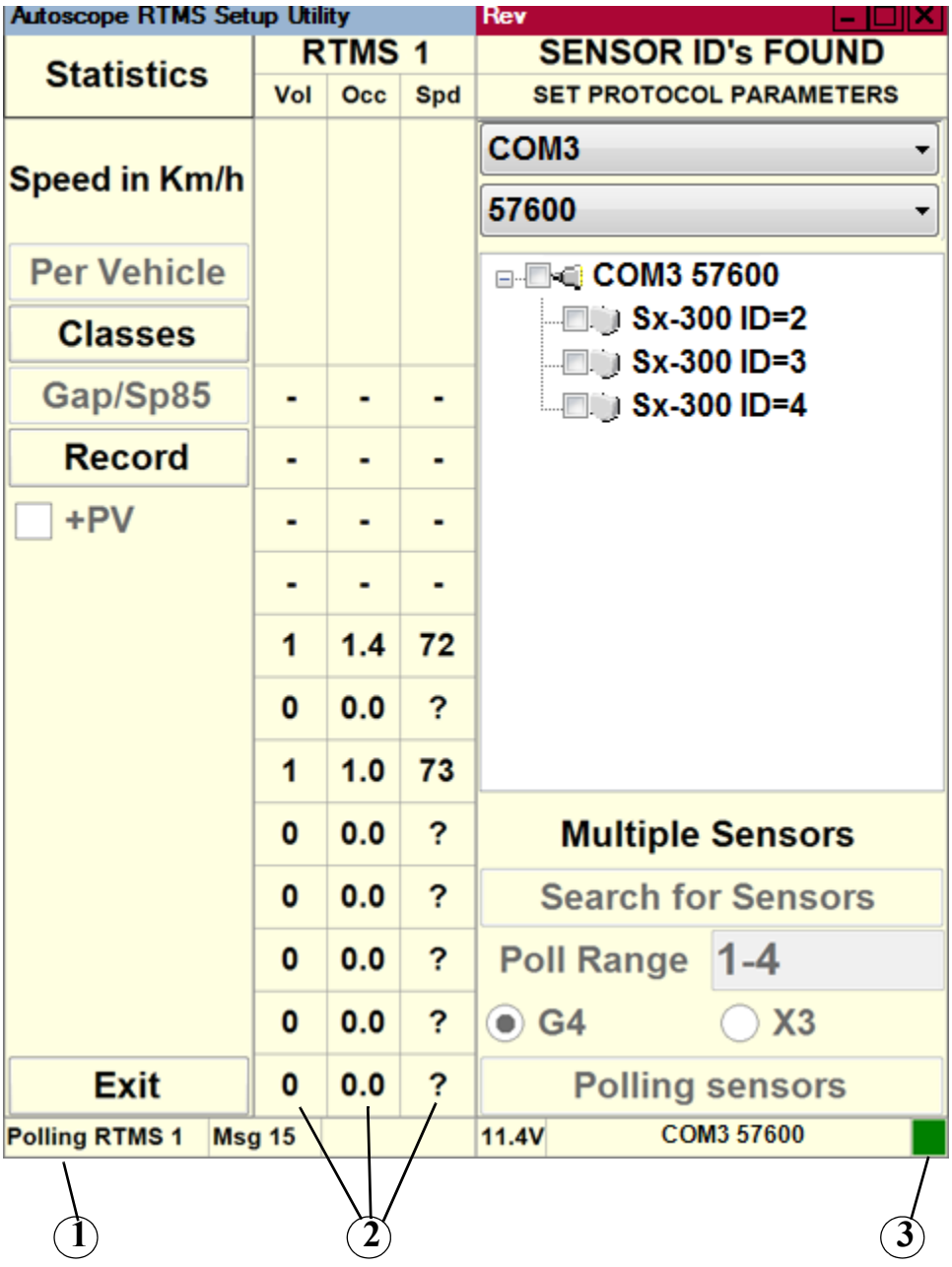
3. Click **Search for Sensors**.

   Sensors that are found will appear in the list on the right side.



4. If all of the sensors you want to check appear in the list, click **Stop Search** to halt the search.
5. In the **Poll Range** field, enter the starting and ending ID numbers, separated by a dash or individual sensor IDs separated by a comma, of the units to be polled (e.g., 1-4 indicates sensors 1 thru 4, while 1,3 indicates sensors 1 and 3).
6. Select the protocol type (**G4** or **X3**) used to communicate with the Autoscope RTMS Sx-300 sensors.
7. Click **Poll Selected Sensors**.

Statistics information is displayed, in turn, for each polled unit.



1 – Indicates which Autoscope RTMS Sx-300 sensor is being polled.

2 – The data that is displayed is for this sensor.

3 – When green, the sensor is connected to the computer. When flashing, data is being exchanged between the computer and sensor. When red, the sensor is not connected to or communicating with the computer.

Recording Data To a File

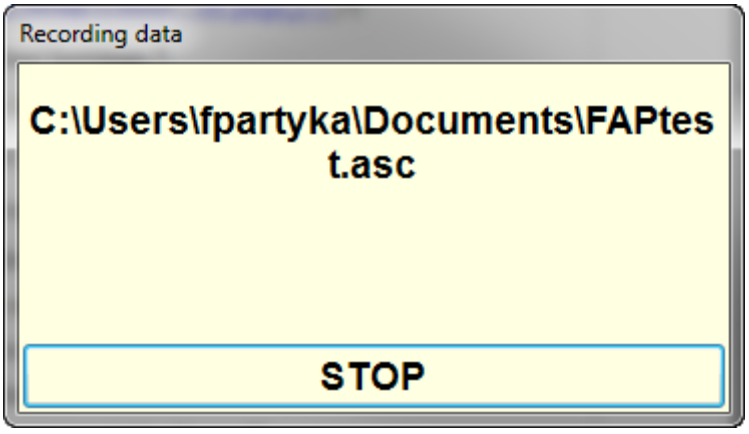
The Autoscope RTMS Setup Utility can record statistical and per vehicle data to a file on the hard drive of the attached computer, a network drive, USB drive or other storage media.

NOTE: The Record option is disabled if the Autoscope RTMS Sx-300 is set to Polled mode (see "Changing the Data Mode" on page 5-2). The exception is when **Poll Selected Sensors** is selected on the Start screen; in this case the Statistics screen opens with the Record button enabled.

This option can be used to record data as it becomes available and would not require additional time to perform a download from the internal memory later on. This requires an uninterrupted communication link to the Autoscope RTMS Sx-300 sensor.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **File**.
4. On the File screen, click **Record Data**.
5. When the Save As window appears, do the following.
   a) In the **Save in** field, select the folder where the file is to be saved.
      Note, the default location is recommended.
   b) In the **File name** field, type a name for the file.
   c) In the **Save as type** field, select:
      – **Text files (*.asc)** for human-readable format
      – **Binary files (*.bin)** for machine readable, binary format
      – **Text and Binary files (*.asc, *.bin)** for both formats
6. Click **Save**.

   A window similar to the following appears.



7. To stop recording, click **Stop**.
8. To return to the Manual Setup screen, click **Back**.

Self Test

The Autoscope RTMS Sx-300 provides a diagnostic test of its internal functions which can be used to verify that the Autoscope RTMS Sx-300 hardware components are operating correctly. The test checks internal functions and locates hardware faults. Please note:

- The All System OK message is displayed on the screen if no faults are found.
- For Autoscope RTMS Sx-300 sensors with the Contact Closure module, the self-test will also close the zone contacts for one second each in sequence. Operation of the contacts can then be verified using the controller display, ohm-meter or any other suitable device showing continuity.

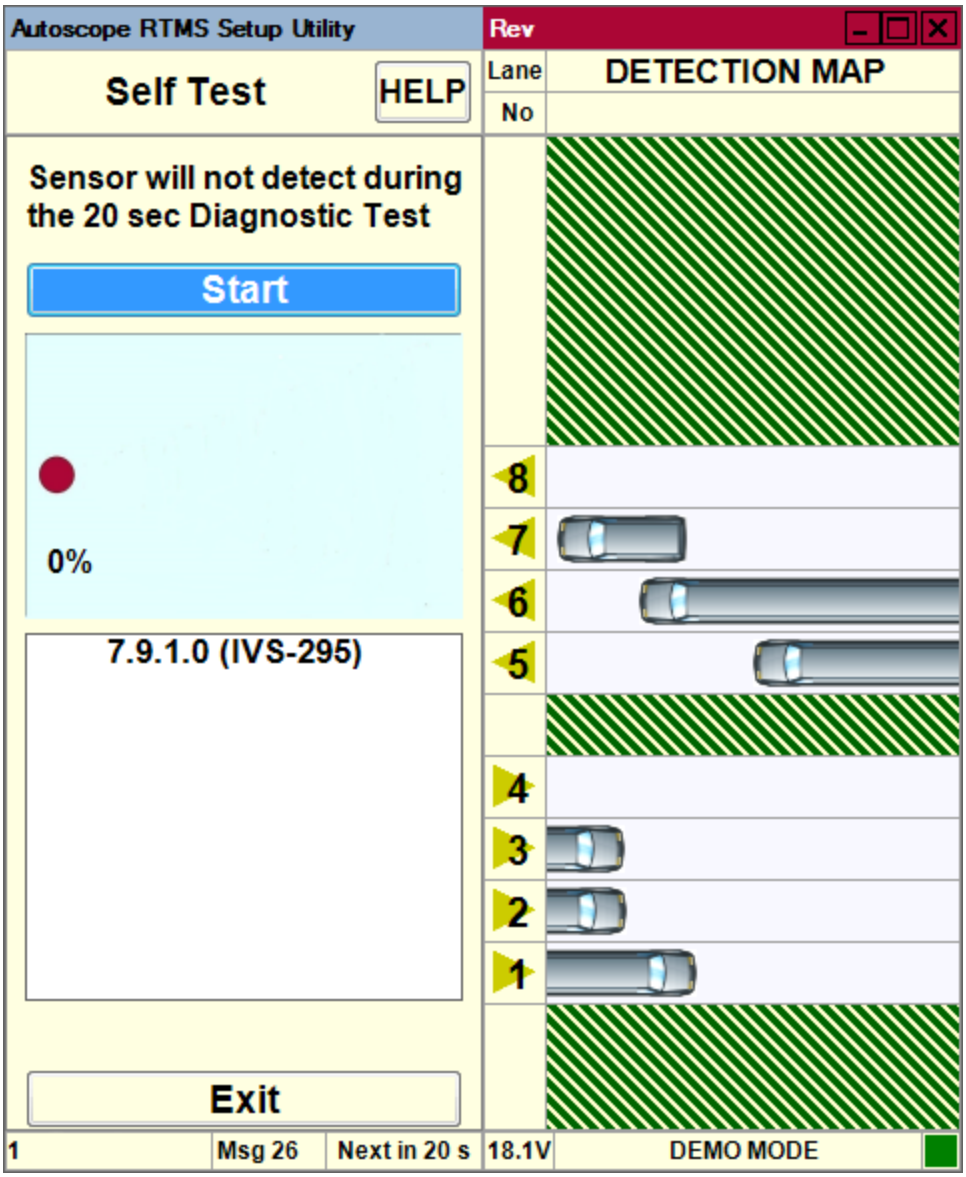
The following is a list of self-test messages describing a fault:

- Power supply fault
- Modulator signal fault
- Microwave module fault
- Modulator memory fault
- Program memory fault
- DSP fault
- Gain too low or ADC fault
- Logic failure
- No signal
- Saturation signal level

To perform the self test, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Self Test**.

The following screen appears.



3. To begin the test, click **Start**.

   The self test results will display below the progress bar after approximately 20 seconds.

4. To stop the test and return to the Main Screen, click **Exit**.

Sensitivity Adjustment

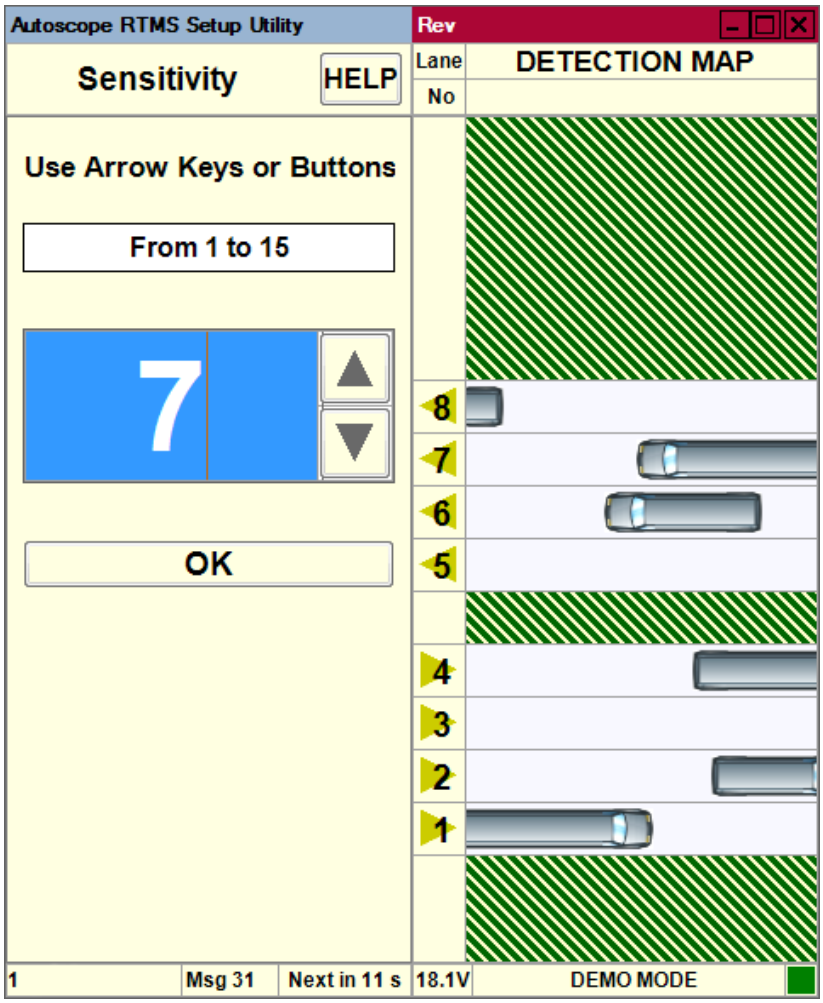
Sensitivity adjustments may be necessary to detect small vehicles, or to reduce splashing. If small vehicles in close or in far lanes are being missed, adjust sensor aim by tilting the sensor towards the zones with poor detection.

NOTE: Do not increase sensitivity to compensate for improper aiming.

The initial sensitivity setting is about 7, which is automatically set when you run the Wizard. To adjust the level, do the following.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Sensitivity**.

   The following screen appears.



4. If needed, click the arrows to increase sensitivity to detect small vehicles, or reduce sensitivity if a vehicle is causing "ghost" vehicles to be detected in adjacent zones (splashing).
5. To save the setting and exit the screen, click **OK**.

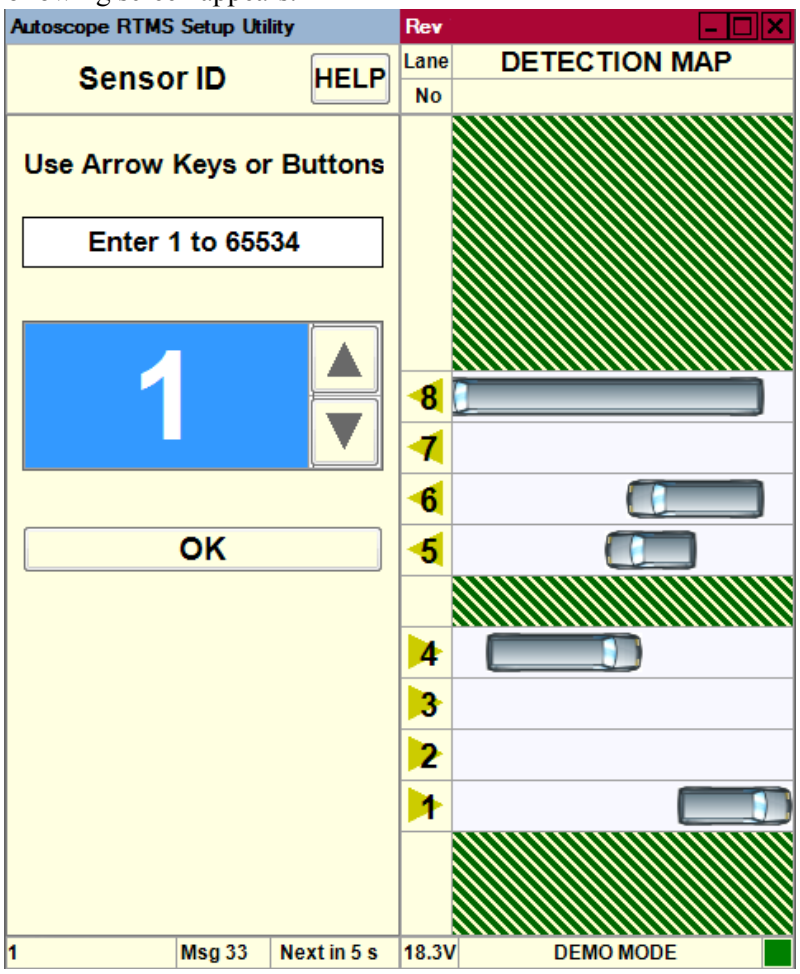
Setting the Sensor ID

This function is used to assign an ID number to a sensor. It is recommended that you number all sensors with consecutive numbers, starting at 1. Please consult your sales/service representative for assistance when designing large networks.

IMPORTANT: If Polled Data mode is used, Autoscope RTMS Sx-300 sensors should be assigned unique ID numbers to avoid data corruption.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Sensor ID**.

   The following screen appears.



4. Click the Up and Down arrows (or the arrow keys on your keyboard) to increase or decrease the number.

   - For G4 STAT protocol, the Sensor ID range is 1 - 65534
   - For X3 STAT protocol, the Sensor ID range is 1 - 254.

   NOTE: 255 and 65,535 are reserved and should not be used for sensor IDs.

5. Click **OK**.

Updating the Setup Utility With a New Configuration

This function enables you to read the configuration on the connected Autoscope RTMS Sx-300 and update the Autoscope RTMS Setup Utility with the information.

This is required when connecting different Autoscope RTMS Sx-300 sensors to the same communication port without closing the Autoscope RTMS Setup Utility first.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Read** Autoscope RTMS Sx-300.

   The Autoscope RTMS Setup Utility is updated with the configuration from the Autoscope RTMS Sx-300.

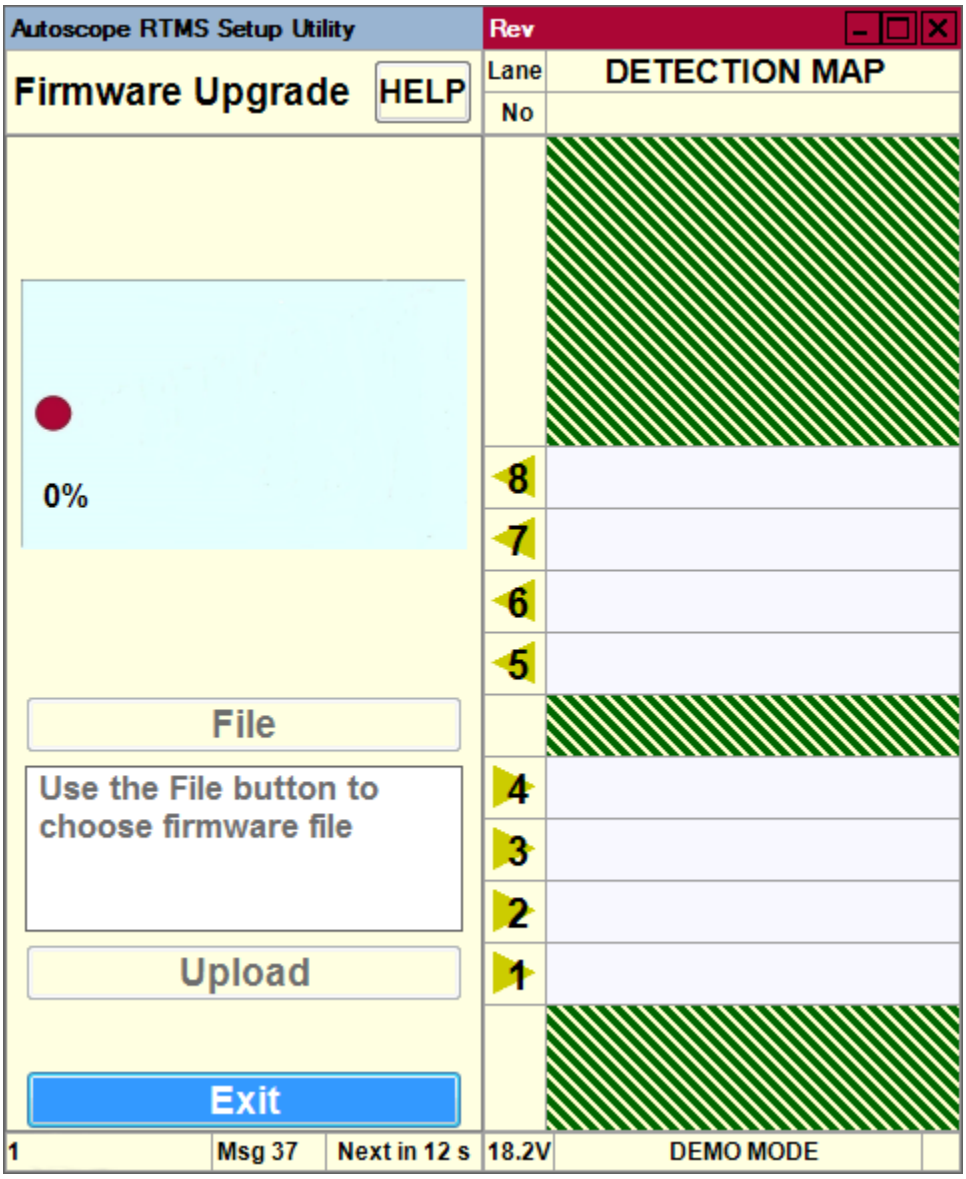
Upgrading Firmware

The following describes the procedure for upgrading the firmware in an Autoscope RTMS Sx-300 sensor.

NOTE: **Do not** attempt to upgrade without a solid communication channel. A direct RS-232 connection to port 1 is recommended.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Advanced**.
4. On the Advanced screen, click **Firmware Upgrade**.

The following screen appears.



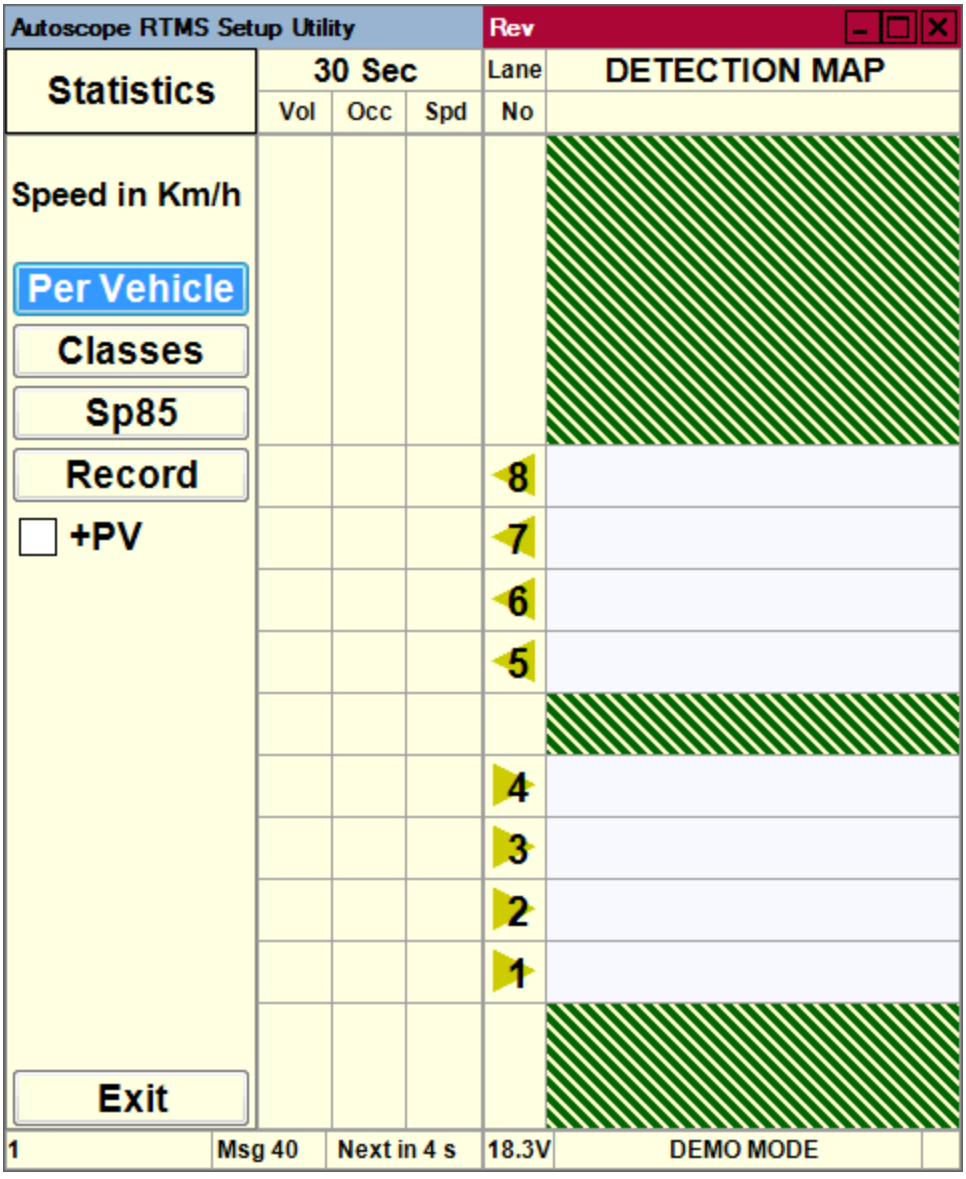
5. Check that the current firmware version is displayed on screen.
6. Click **File**.
7. Locate and select the firmware file to upload into the Autoscope RTMS Sx-300.
   This is the **.arf** file; e.g., RTMS Sx-300_FW_8.0.0.0.arf.
8. Click **Upload**.
   During upgrade, the progress bar advances and indicates Percentage Complete.
9. Wait for the message "*Upgrade Succeeded*".
10. To return to the Manual Setup screen, click **Exit** twice.

Viewing Statistics

This option enables you to display traffic count information on the Statistics screen.

1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Statistics**.

   The following screen appears.



3. Select the appropriate option:

   - **Per Vehicle** — Provides classification and speed information for each vehicle as the vehicles are detected.
   - **Classes** — Displays the number of vehicles from each class that are detected during the message period.

- **Sp85** — Displays the 85th percentile speed for the most recent message period. If GAP or Headway is selected for message composition, it will also be displayed.
- **Record** — Records a stream of data that can typically be used for troubleshooting. The data can be saved in the following formats:
  - **Text files (*.asc)** for human-readable format
  - **Binary files (*.bin)** for machine readable, binary format
  - **Text and Binary files (*.asc, *.bin)** for both formats

  On the Save screen you have the option of saving the data in both file formats at the same time.

NOTE: The Record option is disabled if the Autoscope RTMS Sx-300 is set to Polled mode (see "Changing the Data Mode" on page 5-2). The exception is when **Poll Selected Sensors** is selected on the Start screen; in this case the Statistics screen opens with the Record button enabled.

- **+PV** — select this option to observe per vehicle data as well as statistical data.
- **Exit** — Returns to the Main Screen.

The displayed information is as follows:

- xx Sec — Indicates the number of seconds in the message period. The default is 30 seconds.
- Vol — The total number of vehicles per zone.
- Occ — The percentage of lane occupancy for the message period.
- Spd — The average speed of traffic in the lane.
- Lane No — Displays the lane number.
- Detection Map — Displays a real-time visualization of traffic.

Zone Setup

After the initial configuration is complete, it may be necessary to add or delete zones, or to adjust the boundaries of individual zones or sensitivity, such as when "splashing" occurs or for accommodating wider merge lanes, etc. For information about sensitivity see "Sensitivity Adjustment" on page 5-47.

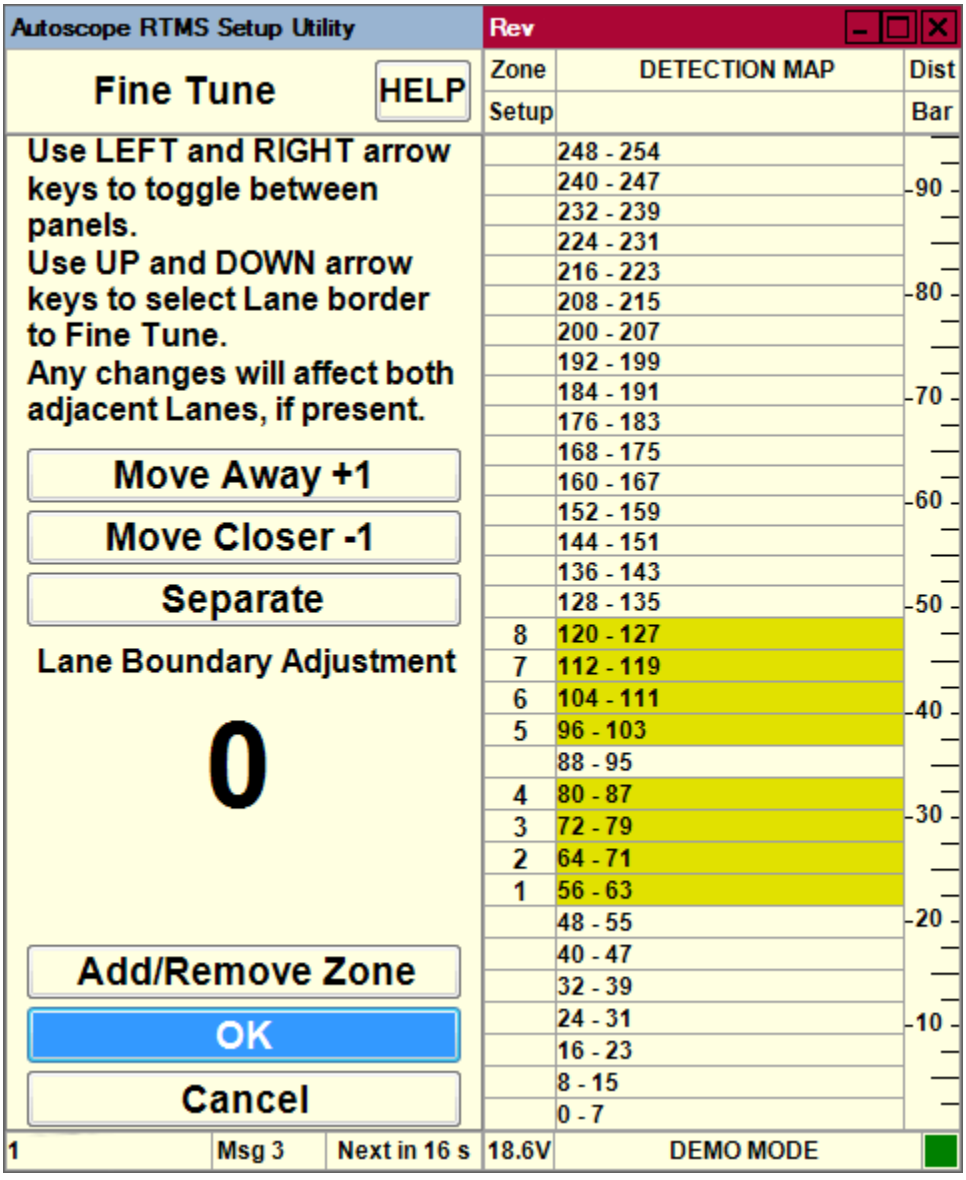
Splashing occurs when a vehicle from one lane triggers a detection in another lane. Lane changes are one cause of splashing. Narrow lanes or incorrect boundaries are other common causes.

Adding/Deleting Zones

To add or delete a zone to/from an existing configuration, do the following.

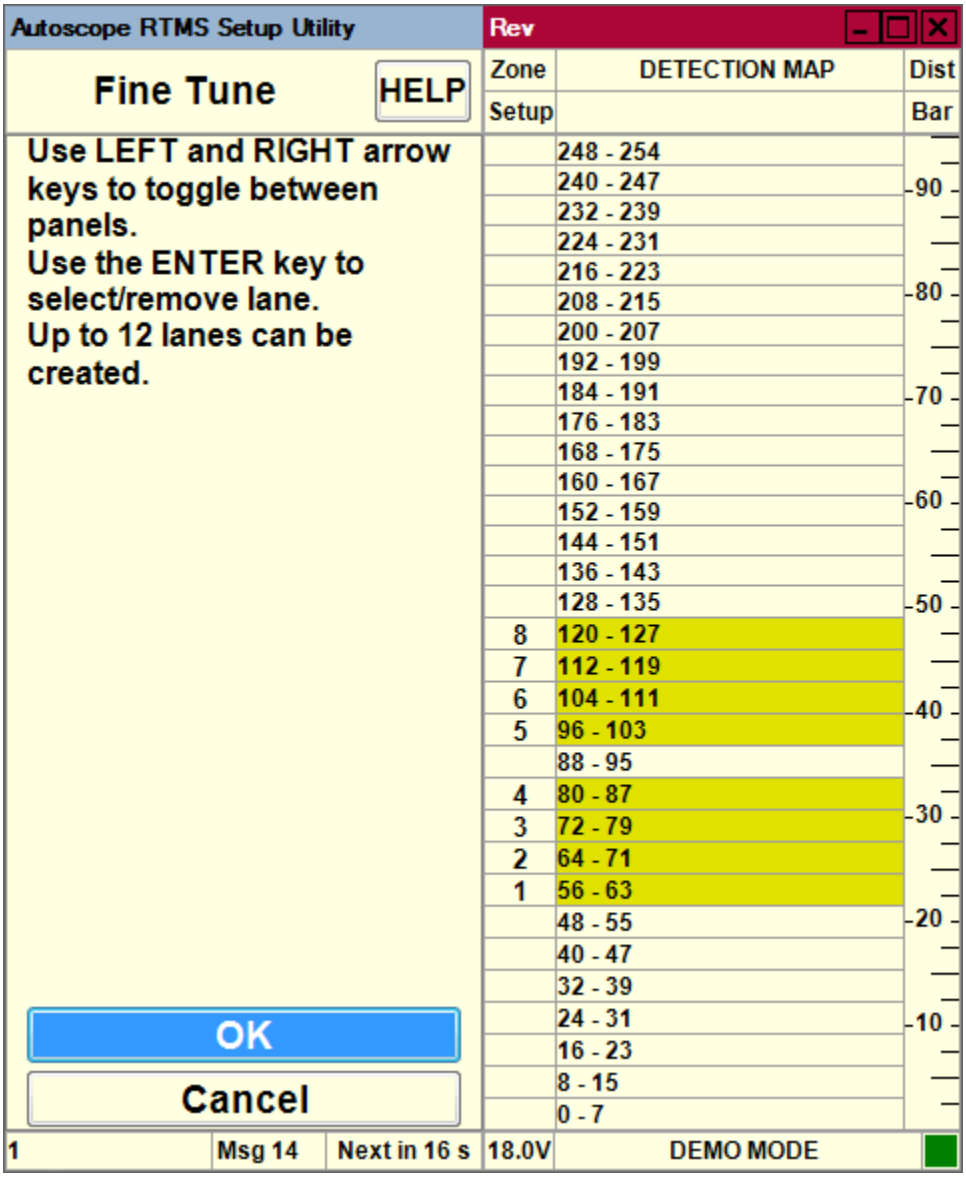
1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Zones**.
4. On the Zone Setup screen, click **Fine Tune**.

   The following screen appears.



5. Click **Add/Remove Zone**.

The following screen appears.



6. Do you want to add or delete a zone?

Add	Delete
In the right panel, click where you want to add the zone.	In the right panel, click the number of the zone to be deleted.

7. Click **OK**.

   The zone is added/deleted and you are returned to the Zone Setup screen.

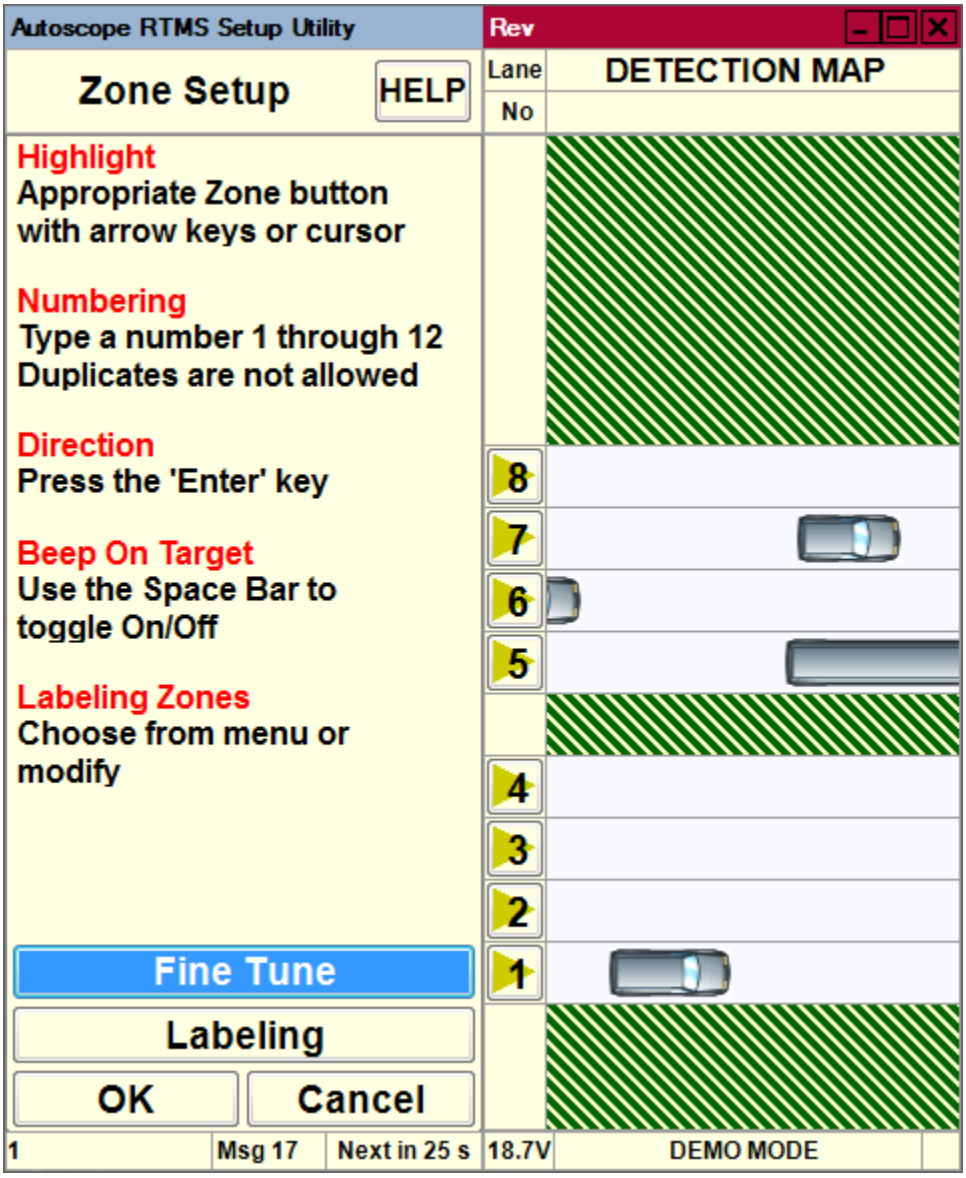
8. To add or delete additional zones, repeat Steps 4 – 7.

Adjusting Zone Boundaries

This function is used to slightly move zone boundary positions. The minimum zone width for Side-Fired Highway mode is five micro-slices. For Midblock Mode it is seven micro-slices.

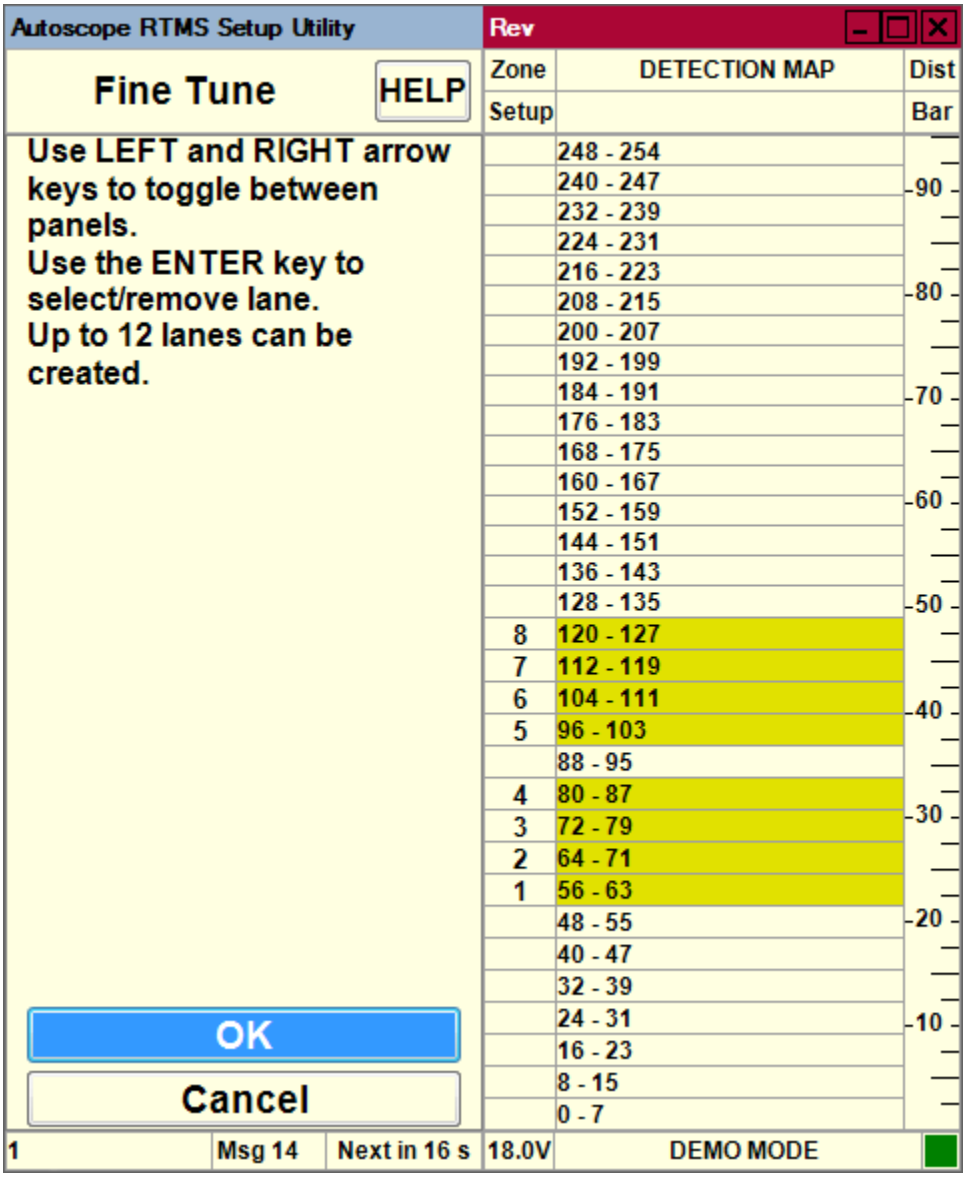
1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Zones**.

   The following screen appears.



4. Click **Fine Tune**.

The following screen appears.



5. Select the zone number that needs to be adjusted.
6. Use the up and down arrow keys to select the zone boundary.
7. To change the boundary by a single micro-slice at a time, click **Move Away** or **Move Closer**.

   Observe the effect on detection accuracy with the blips on the detection map. The boundary move affects the zones on either side, reducing one and enlarging the other.

   – A counter shows the amount of shift at any time. This counter resets when you select the next boundary.

- By selecting **Add/Remove Zone** you can change the number of zones and create wider zones spanning more than one lane.
- The same two mechanisms allow you to perform the entire zone setup process manually, by adding zones and moving their boundaries.

8. To insert a space between zones, click **Separate**.

   This feature can be used to separate lanes if barriers or raised lane dividers are found on the road. Lane separation will further reduce “splashing” between lanes.

9. Repeat Steps 5 – 8 for each zone to be adjusted.

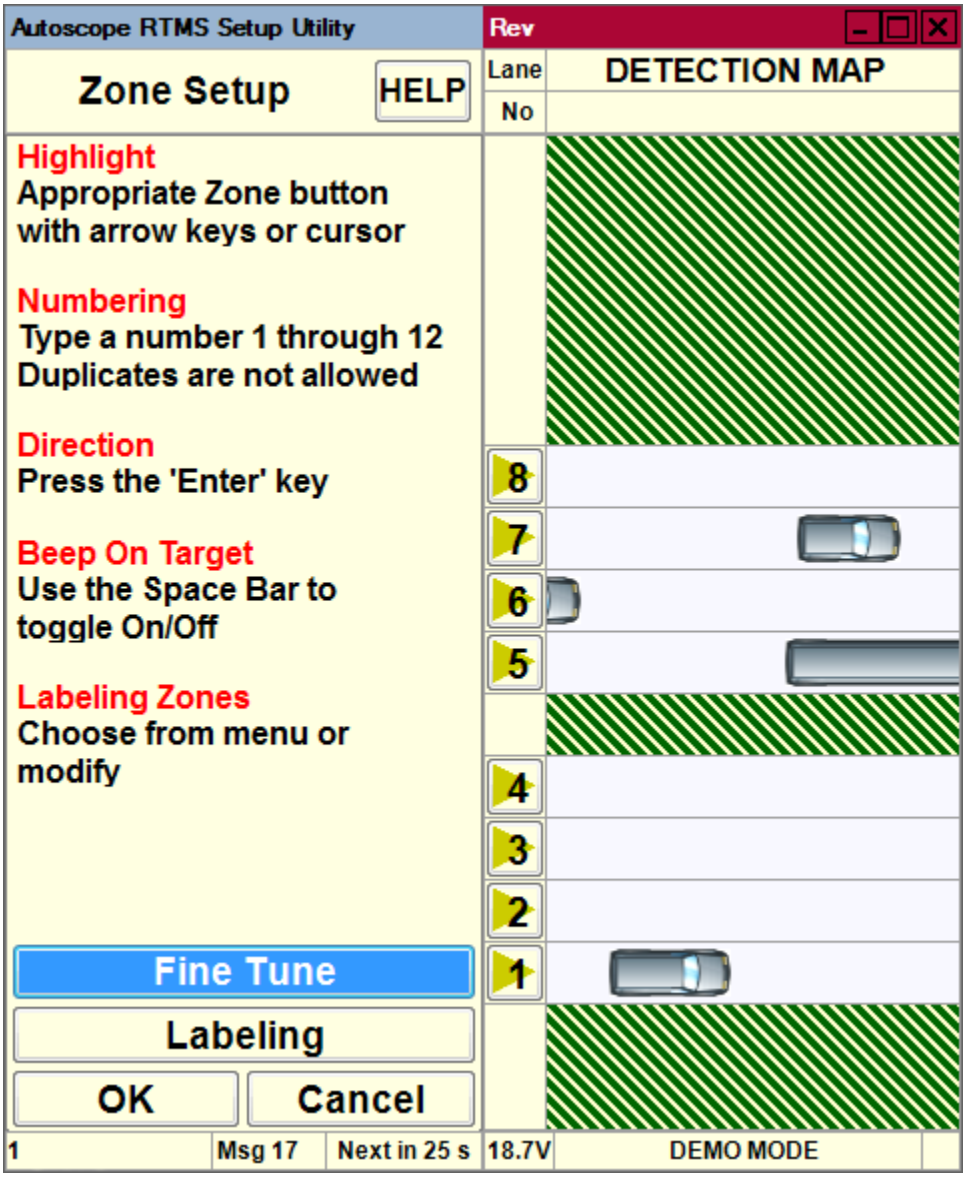
10. When finished, click **OK**.

Assigning Labels to Zones

This function is used to assign a meaningful name to a traffic lane (e.g., NORTHBOUND I69).

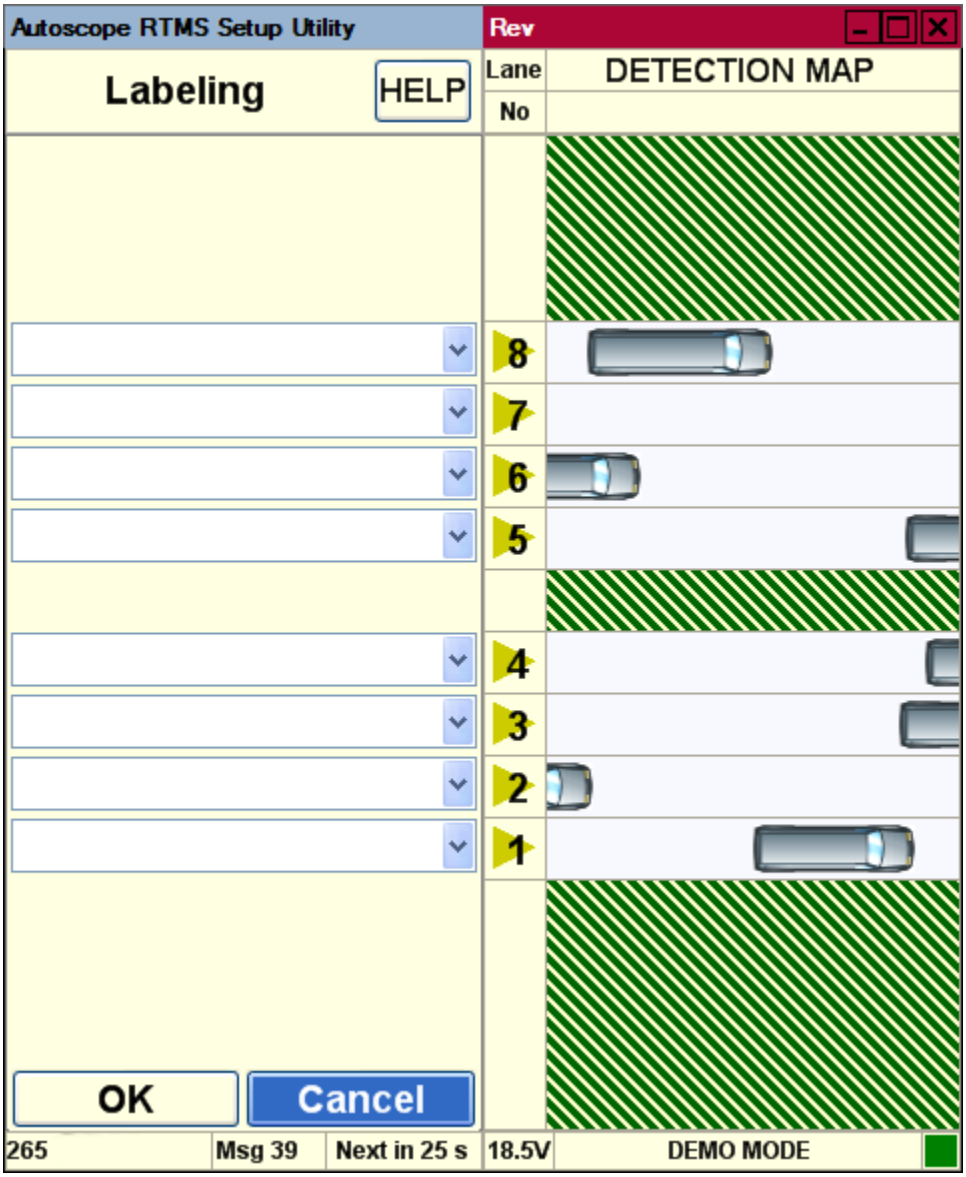
1. Start the utility (see "Starting the Setup Utility" on page 3-7).
2. On the Main Screen, click **Manual Settings**.
3. On the Manual Setup screen, click **Zones**.

   The following screen appears.



4. Click **Labeling**.

The following screen appears.



5. Type or select a label for each lane.

   The label can be up to 16 characters in length. Labels are stored in the Autoscope RTMS Sx-300, but are not transmitted in the statistical data message.

6. After all lanes have been labeled, click **OK**.

   You are returned to the Zone Setup screen.

7. To return to the Manual Setup screen, click **OK.**

8. To return to the Main Screen, click **Exit**.

Chapter 6: Troubleshooting

General

Field troubleshooting of the Autoscope RTMS Sx-300 consists mainly of ensuring that the unit is powered and communicating. Communication with the sensor in Normal mode is confirmed by presence of the vehicles shown in the detection map and menu buttons, and by the flashing of the indicator in the lower right corner of the screen, denoting data transmission activity.

Messages

The following describe messages that may appear during Autoscope RTMS Sx-300 operations.

Message: **Enabling 'Per Vehicle' data collection can significantly increase internal memory usage when 'Store Into Memory' is enabled. Do you want to continue?**

Description: This warning message indicates that selecting Per Vehicle ON when Store Into Memory is already selected, will cause the internal memory of the Autoscope RTMS Sx-300 sensor to fill up faster than when the Per Vehicle option is disabled (OFF).

Suggested Action: Click **Yes** to set Per Vehicle ON, or **No** to cancel the operation.

Message: **Enabling 'Store Into Memory' can significantly increase internal memory usage when 'Per Vehicle' data collection is enabled. Do you want to continue?**

Description: This warning message indicates that selecting Store Into Memory when Per Vehicle ON is active, will cause the internal memory of the Autoscope RTMS Sx-300 sensor to fill up faster than when Per Vehicle is disabled (OFF).

Suggested Action: Click **Yes** to enable the Store Into Memory option, or **No** to cancel the operation.

Message: **'Per Vehicle ON' is active. Disabling 'Store Into Memory' will result in failing to collect 'Per Vehicle' data. Do you want to continue?**

Description: This warning message indicates that data collection for Per Vehicle cannot occur when the Autoscope RTMS Sx-300 sensor is in Polled mode unless the Store Into Memory option is selected.

Suggested Action: Do one of the following:

1. Click **Yes** to disable the Store Into Memory option. There will be no Per Vehicle data collected unless the mode is changed to STAT or Polled (see "Changing the Data Mode" on page 5-2).
2. Click **No** to cancel the operation. Per Vehicle data will continue to be collected and stored in the internal memory.

Message: **'Per Vehicle ON' is active. In order for 'Per Vehicle' data to be collected when in Polled mode, the 'Store Into Memory' option should be selected.**

Description: This warning message indicates that data collection for Per Vehicle cannot occur when the Autoscope RTMS Sx-300 sensor is in Polled mode unless the Store Into Memory option is selected.

Suggested Action: Click **OK**. Data collection for Per Vehicle is disabled. To enable data collection for Per Vehicle, do one of the following.

1. Change the mode to STAT or Normal (see "Changing the Data Mode" on page 5-2).
2. Turn on the Store Into Memory option (see "Defining Memory Options" on page 5-25.

Message: **The sensor you have selected is not compatible with this version of the setup utility. Please install the G4 setup utility to configure this sensor.**

Description: You attempted to configure an RTMS G4 sensor but the setup utility for this type of sensor is not installed on your computer.

Suggested Action: Install the latest version of the setup utility for this type of sensor. For more information, contact your sales or service representative.

Message: **There is at least one port working in Polled mode. In order for 'Per Vehicle' data to be collected, the 'Store Into Memory' option should be selected.**

Description: This warning message indicates that data collection for Per Vehicle cannot occur when the Autoscope RTMS Sx-300 sensor is in Polled mode unless the Store Into Memory option is selected.

Suggested Action: Click **OK**. To not do data collection for Per Vehicle, select Per Vehicle OFF. To enable data collection for Per Vehicle, do one of the following.

1. Change the mode to STAT or Normal (see "Changing the Data Mode" on page 5-2).
2. Turn on the Store Into Memory option (see "Defining Memory Options" on page 5-25).

Symptoms

The following outlines symptoms and suggested actions in troubleshooting power and communication problems.

Symptom: **Could not establish communications with the Autoscope RTMS Sx-300**

Description: If you are unable to establish communications between an Autoscope RTMS Sx-300 unit and the Autoscope RTMS Setup Utility, the utility opens the Start screen to allow you to direct a search for the Autoscope RTMS Sx-300. Possible causes are:

- Autoscope RTMS Sx-300 is not powered.
- Autoscope RTMS Sx-300 is not connected to the PC.
- Autoscope RTMS Sx-300 connection cable is faulty.
- COM port is being used by another program.
- Wrong COM port is selected.
- Communication to Autoscope RTMS Sx-300 is IP.
- Tx & Rx lines are crossed.

Suggested Action: Do the following in the order provided.

1. Check that:
   - Autoscope RTMS Sx-300 is powered on.
   - Autoscope RTMS Sx-300 is connected to the serial port of the laptop.
   - No other program is using the COM port. Close down any other application that is running on the laptop.
2. Try re-connecting (see "Defining Communications" on page 5-7).
3. Check the voltage:
   a) Disconnect the DB9 cable from your computer.
   b) Using a Voltmeter, measure the voltage between pins 2 and 5 of the connector. It should read between 5 - 10 VDC.
   c) If the voltage is not present, there could be a hardware fault.
4. If the problem persists, contact Technical Support.

Symptom: **Download button on the Internal Memory screen is grayed out**

Description: You have entered a date or time where:

- the date/ time is beyond the current date/time.
- the date/time in the From field is later than the date/time in the To field.

Suggested Action: Correct the date and/or time entries and retry the operation.

Symptom: **Main screen shows target blips but no zone icons or parameters on buttons.**

Description: Autoscope RTMS Sx-300 transmits and displays received data but Autoscope RTMS Sx-300 has not received the READ command.

Suggested Action: Do the following.

1. Check cable to ensure continuity between MS connector pin T and COM port's pin 3.
2. If the problem persists, contact Technical Support.

Symptom: **Messages are no longer being stored into internal memory**

Description: Internal memory is full and the FIFO check box on the Internal Memory screen is not selected.

Suggested Action: To continue storing messages into internal memory do one of the following:

- Select the FIFO check box. Message will again be stored into internal memory, but the oldest messages will be overwritten. See "Defining Memory Options" on page 5-25.
- Erase the messages currently in memory. Once memory has been cleared, new messages will be stored. See "Clearing Memory" on page 5-30.

Symptom: **PC and sensor are communicating (Sensor settings are displayed on buttons) but target "blips" are not shown on the main screen.**

Description: Possible causes are:

- Autoscope RTMS Sx-300 is not in Normal mode.
- Unit is improperly aimed.
- Internal parameters corrupted.
- MW module fault.

Suggested Action: Do the following.

1. Ensure the unit is in the Normal mode.
2. Check sensitivity setting. See if targets appear when sensitivity is increased.
3. Cycle power to the unit and then edit parameters (mode, sensitivity, etc.).
4. Run Self-Test if the above is not successful.
5. Report findings to Technical Support.

Symptom: **Autoscope RTMS Setup Utility will not start**

Description: Microsoft .NET Framework 3.5 is not installed.

Suggested Action: Do the following.

1. Check that .NET Framework 3.5 is installed on the computer. If not, install it and retry the operation.
2. If the problem persists, contact Technical Support.

Symptom: **Selected firmware file is not compatible with this Autoscope RTMS Sx-300 hardware**
(Firmware file version = x.x.x.x, Board version = y)

Description: The version of firmware you are trying to load is not supported on this version of the hardware. This normally occurs when trying to load a version prior to 7.3.2.0 into a sensor that only operates with 7.3.2.0 or above.

Suggested Action: Click **OK**. The operation is aborted.

Symptom: **Timeout has expired and the main Communication Screen is displayed**

Description: Possible causes are:

- Autoscope RTMS Sx-300 is not powered
- Timeout is not long enough
- Cable problem

Suggested Action: Do the following.

1. Check that the supply voltage is within limits at the source and at the MS connector. Voltage outside the limits (too low or too high) will cause the power supply to shut down.
2. Increase the timeout value by 2000 – 3000 ms, or longer depending on the type of connection (see "Defining Communications" on page 5-7).
3. Check cable pin-out and continuity.
4. If the problem persists, contact Technical Support.

Symptom: **You are trying to load setup to a different unit!**
Do you want to continue?

Description: The setup file you are trying to upload to the Autoscope RTMS Sx-300 was created for a different sensor. You should review the options to make sure everything is appropriate for the sensor you want to upload to.

Suggested Action: Click **Yes** to continue with the operation or **No** to cancel.

Do's and Don'ts

Table 6-1: Do's and Don'ts

Do	Don't
Ensure setback is sufficient and height is not over recommendations (see "Height and Setback Requirements" on page 2-5).	Attempt to mount a Side-fired Autoscope RTMS Sx-300 closer than 1.5 m (5 ft) to the first monitored lane without reviewing the following: "Zero Setback" on page 2-5.
Use extension arms where needed to improve sensor placement on exiting structures.	Place Autoscope RTMS Sx-300 units where overhead structures can interfere with the microwave beam, e.g. under overpass bridges and heavy structures.
Aim the Autoscope RTMS Sx-300 perpendicular to the lane direction.	Aim the Autoscope RTMS Sx-300 at an angle exceeding five degrees from perpendicular to the monitored lane.
Aim Autoscope RTMS Sx-300 according to the 1/3 rule, then verify aiming interactively with the Autoscope RTMS Setup Utility by checking detection in all lanes.	Separate installation and aiming from the setup stage. Increase sensitivity to offset poor aiming.
Pay attention to site cabling design. Ensure serial port access is available for set up. If necessary, add a pole-mounted junction box.	Run the Autoscope RTMS Sx-300 cable directly to cabinets out of visual range of the sensor's detection footprint.
When powering with low voltage input AC transformer, design for 16 VAC.	Specify use of Controllers in new applications requiring data only.
Evaluate power arrangements vs. distance. Use 1. Heavy gauge power wires to reduce voltage drop, or 2. Higher supply voltage.	Use thin power wires with low voltage supply. Attempt connecting wires thicker than #18 with the Autoscope RTMS Sx-300 MS connector.
Use wireless communication for: • Long distances, to offset trenching cost. • Quick deployment and portability.	Specify dial-up communication in applications requiring real time data. It is applicable to infrequent downloads of traffic counting data.

Technical Support

If you cannot correct the problem, do the following before contacting Technical Support:

- Return to the beginning of the entire installation process and review the steps. Be sure that you followed all of the instructions provided.
- If you reviewed the installation instructions and you are still encountering a problem, document:
  - What is happening. Example: Unable to set up networking.
  - When the problem started. Example: During software installation.
  - Any error messages that were shown including the exact words and any numbers in the message.
- If possible, have another person try the installation to the stage where you encountered problems.
- If the attempts to correct the problem fail, call Technical Support.

North American Users' Resource

North and South American customers call Econolite Control Products, Inc. at:

Toll Free: **1.800.225.6480**
Main telephone: **1.714.630.3700**
Fax questions to: **1.714.630.6349**

All Other Users' Resources

Customers outside Northern and Southern America may call Image Sensing Systems, Inc. headquarters at:

Main telephone: **651.603.7700**
Fax questions to: **651.305.6402**
Or contact one of our international offices:

ISS Europe Ltd.

Phone: +**44.1707.378870**
Fax: +**44.1707.378875**
City Park
Swiftfields
Welwyn Garden City
Hertfordshire AL7 1LY United Kingdom

ISS AsiaPac

Phone: +**852.2827.1123**
Fax: +**852.2827.0056**
Suite 1513, 15th Floor, Chevalier Centre
No. 8 Wang Hoi Road
Kowloon Bay, Hong Kong

Appendix A: Cabling and Connectors

General

Autoscope RTMS Sx-300 units use a single 32-pin MS connector for power and communications. For information about the MS pinouts, see "MS Connector Pin Out" on page A-3.

The Autoscope RTMS Sx-300 cable should be made from 20 or 22 gauge stranded wire arranged in twisted pairs.

Cables exposed to outdoor conditions should be UV shielded.

The number of pairs required depends on the RTMS Sx-300 model.

Table A-1: Required Wiring Pairs

Model	Number of Pairs
RTMS Sx-300 (Base Unit)	Standard RS-232/485 plus power: three pair If using RTS/CTS option for RS-232: four pair If using RS-485: four pair
RTMS Sx-300 TCP (Base Unit plus TCP/IP)	Two additional pair
RTMS Sx-300-SSP (Base RTMS Unit plus Second Serial Port)	If using without RTS/CTS option for RS-232: one additional pair If using RTS/CTS option for RS-232: two additional pair If using RS-485: two additional pair
Contact Closures: The Sx-300 SSP model has built in Contact Closures. If you are utilizing them you will need:	Eight additional pair. **Note**, Up to eight additional only if all Contact Closures are used.

Preparing a Cable

Use cable such as the Belden number 951x (1x indicates number of pairs). For example: 9516 is a 6-pair cable. In preparing a cable note the following:

- Use the Connector Kit from ISS to match the product:
  - For Sx-300 base system use RTMS CNSET RS232 per ISS Part Number A750-1146
  - For Sx-300 TCP use RTMS CNSET RJ45 per ISS Part Number A750-1153
  - For Sx-300 SSP use RTMS CNSET RS232 per ISS Part Number A750-1149
  - For Sx-300 SSP-CC use RTMS CNSET RS232 per ISS Part Number
- Decide whether or not to install extra cable pairs for growth purposes.
- The crimp pins are designed for stranded wire only.
- **Do not** use cable employing solid wires.
- The Daniels Manufacturing Corporation crimping tool M22520/1-01 AF8 with head number M22520/1-02 or equivalent is recommended.
- **Do not** solder MS connector pins to the cable. They must be properly crimped.

The following table lists the maximum length of the cable based on the type.

Table A-2: Max Cable Length

Protocol	Max Cable Length
RS-232	**For baud rate of 19,200 or 115,200:** 15 m (50 ft) **For baud rate of 9600:** 152 m (500 ft) is the recommended maximum. However, you can go up to 244 m (800 ft) when the: • Cable has a minimum gauge of 20 AWG • Baud rate is 9600 • Environment is ideal • Cable is continuous
RS-485/RS-422	1219 m (4000 ft) for all baud rates.
TCP/IP over CAT 5	91 m (300 ft)

Connecting a Cable to the Autoscope RTMS Sx-300

To connect a cable to the Autoscope RTMS Sx-300 device, do the following.

1. Thread the cable through the backshell before inserting pins into shell.
2. Use the insertion tool (red) to insert wires with crimped pin into shell.
3. Use the extraction tool (white) to remove a crimped wire to correct an error.
4. Access to the serial connection should be available within view of the monitored lanes.
    - For example: inside an access panel or cabinet on the pole.
    - Verifying the sensor's calibration is easy when the user sees the Autoscope RTMS Sx-300 data together with manual counts.

Surge Suppression/Protection

Each Autoscope RTMS Sx-300 unit has built-in surge-suppression hardware. For complete information see Appendix B: “Surge Protection”

Wiring Notes

The DB9 connectors and terminal blocks serve as a disconnect point, which allows disconnecting the Autoscope RTMS Sx-300 from the transmission line for direct connection to the laptop's COM port for setup.

Terminating resistors (100-120 ohms) are required at the extreme ends of the Receive and Transmit transmission pairs.

Transmit and receive pairs must be transposed when connecting to a DTE (PC, Data processing System). To interface with a PC an RS-485/232 converter may be required as PCs typically do not have RS-485 interfaces.

RS-485/232 converter connector type and pin assignment are not shown as these are not standardized and vary between models.

MS Connector Pin Out

Pin labeling in Figure A-1 is a guideline only. Verify pin location on actual connector before inserting wire.

NOTES:

- The Autoscope RTMS Sx-300 unit can be configured for a variety of communication options. It is important to know which options are included with your unit prior to preparing cables. MS connector pins cannot be shared. Take note of the individual wiring instructions provided in this manual.
- Connect the cable’s shield (drain wire) to pin U at the MS connector.

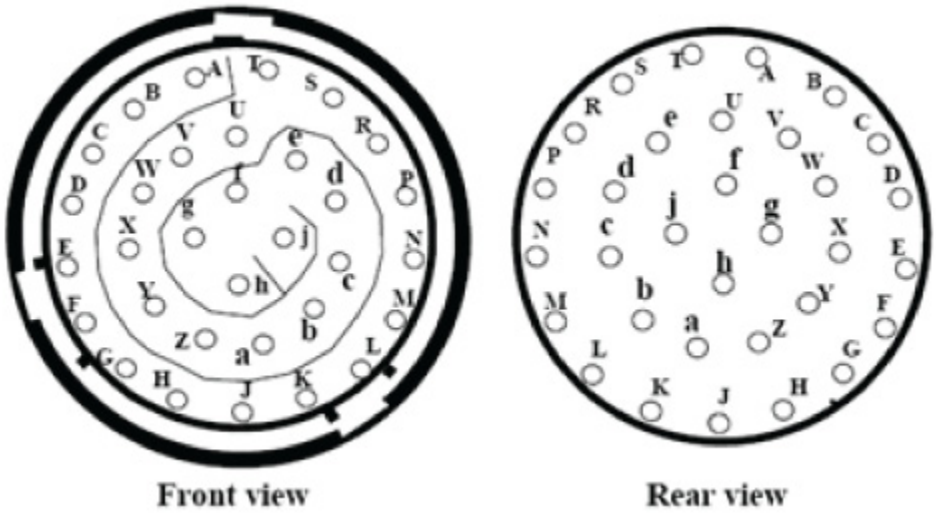


Figure A-1: MS Connector

Table A-3: Cable Pair Requirements

Pin #	Function
NOTE: Pins A- S are used only for Contact Closure. Pins W, Z, d and e are only used for secondary communication options. For information on cable pair requirements for theses pins, see the appropriate chapters in the *Autoscope RTMS Sx-300 Optional Configurations User Guide (PN A900-1155-2)*.	
T	Rx (Serial Port RS-232) Rx- (Serial Port RS-485)
U	Ground (all Serial Ports and Contact Closures)
V	Tx (Serial Port RS-232) Tx- (Serial Port RS-485)
X	CTS (Serial Port RS-232) Tx+ (Serial Port RS-485)
Y	RTS (Serial Port RS-232) Rx+ (Serial Port RS-485)
f, g	Low voltage power 12-24 VAC or DC
h, j	Reserved

Standard Serial Port

The Autoscope RTMS Sx-300 comes with a Serial Port that can be configured as RS-232 or RS-485. For information about how to set the communications configuration, see "Defining Communications" on page 5-7.

Standard RS-232 Port Wiring

The standard Autoscope RTMS Sx-300 RS-232 port wiring consists of Transmit (Tx), Receive (Rx), Request to Send (RTS), Clear to Send (CTS) and Ground lines wired to the MS pins respectively. The use of a female DB9 connector and wiring shown allows the use of standard serial cable for direct connection to the PC for setup purposes. For the maximum cable length, see Table A-2 on page A-2). Rear views of connectors are shown to assist in cable preparation. The Autoscope RTMS Sx-300 is configured as a Data Communications Equipment (DCE) device.

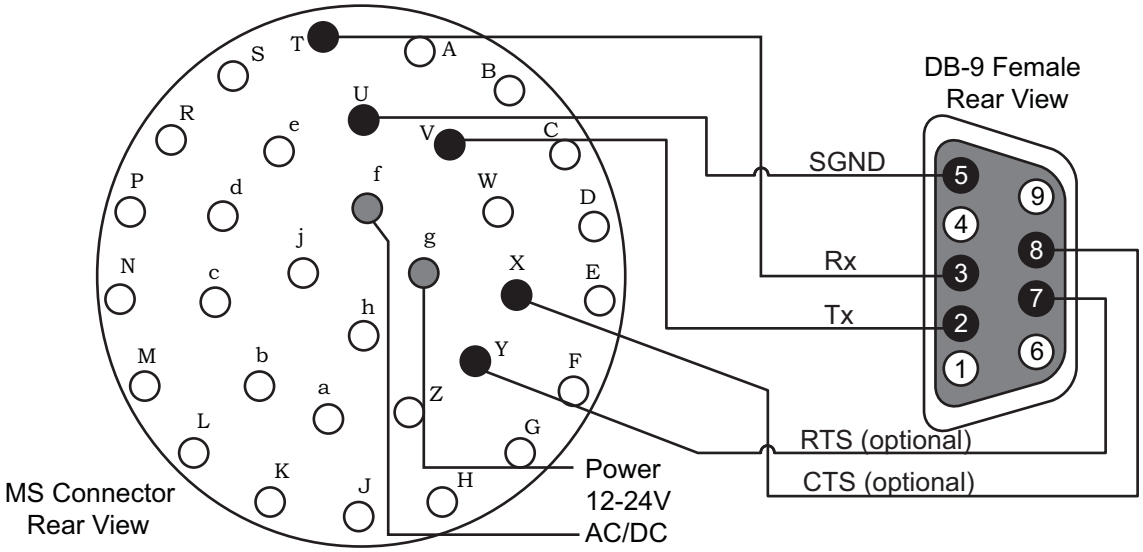


Figure A-2: RS-232 Wiring Diagram

Table A-4: RS-232 Wiring Matrix

DB9 Pin	Signal	MS Connector Pin
1	NC	N/A
2	Tx	V
3	Rx	T
4	NC	N/A
5	SGnd	U
6	NC	N/A
7	RTS	Y
8	CTS	X
9	NC	N/A

RS-485 Port Wiring

There is no standard pin configuration for RS-485 on a DB9 connector.; so we suggest the following configuration. The wiring diagram shown will connect directly to a RS-232 configured DB9 without the need for an RS-232/RS-485 converter. The maximum cable length is 1219 m (4000 ft). Over short distances (9 m [30 ft]) the wiring diagram shown below is compatible with an RS-232 port.

A disconnect point is recommended to allow the Autoscope RTMS Sx-300 to be detached from the transmission line without disruption of communications with other sensors on the line. See "Connecting Autoscope RTMS Sx-300 to External Modems" on page A-7 for details.

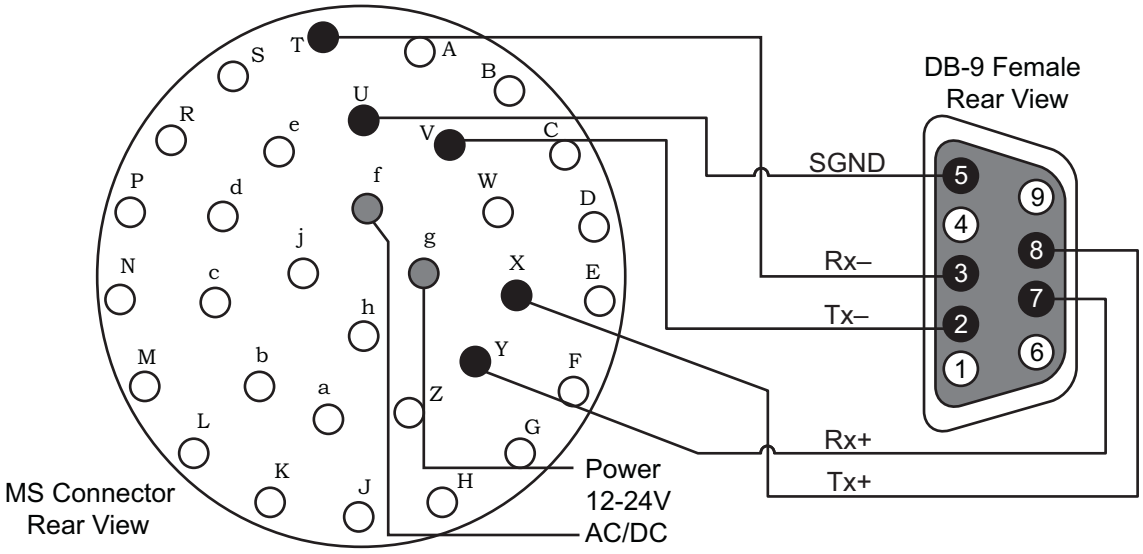


Figure A-3: RS-485 Wiring Diagram

Table A-5: RS-485 Wiring Matrix

DB9 Pin	Signal	MS Connector Pin
1	NC	N/A
2	Tx-	V
3	Rx-	T
4	NC	N/A
5	SGnd	U
6	NC	N/A
7	Rx+	Y
8	Tx+	X
9	NC	N/A

RS-485 Multi-Drop Wiring

The RS-485 setting of the Autoscope RTMS Sx-300 Serial Port allows up to 32 Autoscope RTMS Sx-300 units to be employed on the same serial bus over distances up to 1219 m (4000 ft).

RS-485 is used for multipoint communications. This allows more devices to be connected to a single cable, similar to an Ethernet network which uses a coaxial cable. Most RS-485 use a Master/Slave architecture, where each slave unit has its own unique address and responds only to packets addressed to it. The packets are generated by a master (e.g., PC) which periodically polls all connected slave units.

The following diagram shows the use of a 4-Wire line. **Note**, a 2-wire line is **not** recommended or supported.

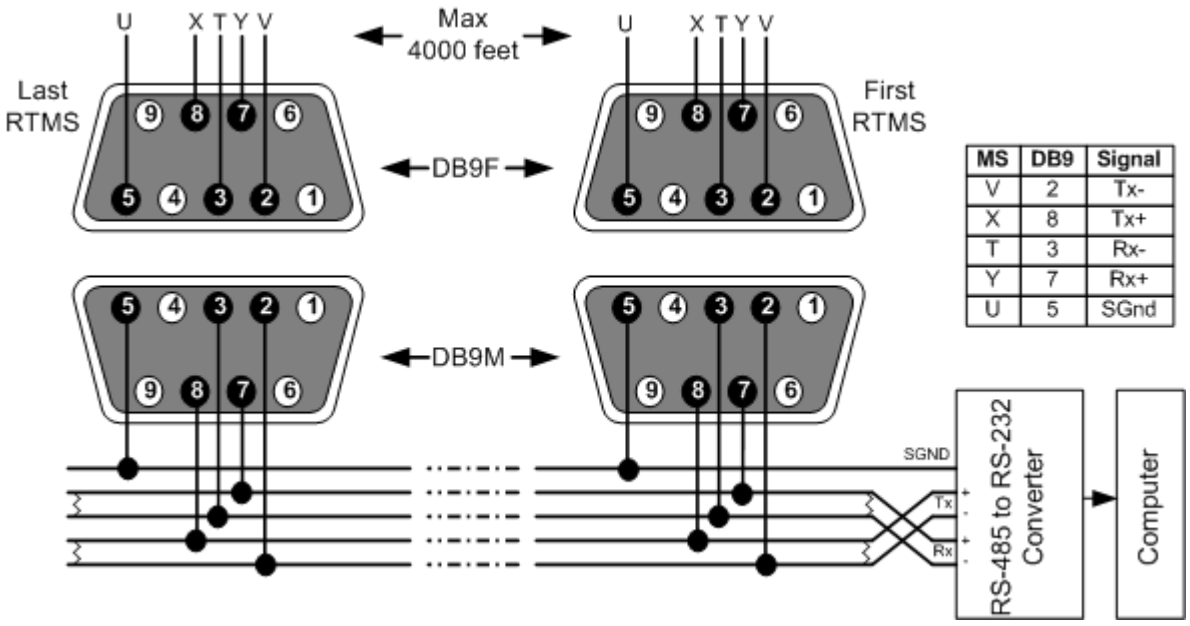


Figure A-4: RS-485 Multi-Drop Wiring

Connecting Autoscope RTMS Sx-300 to External Modems

The Autoscope RTMS Sx-300 may be connected to a remote traffic data collection system over private telephone lines using modems. Multiple Autoscope RTMS Sx-300 units connecting to remote systems, including the Cluster Hub or NEWS Hub systems must be placed in Polled mode and may require the use of modems.

Modem Cables

A cable connecting the Autoscope RTMS Sx-300 RS-232 port to the modem's RS-232 port must provide a Male connectors at both ends (null cable) and the cable must operate within the parameters provided below. A modem's RS-232 ports will usually employ DB9 or DB25 connectors.

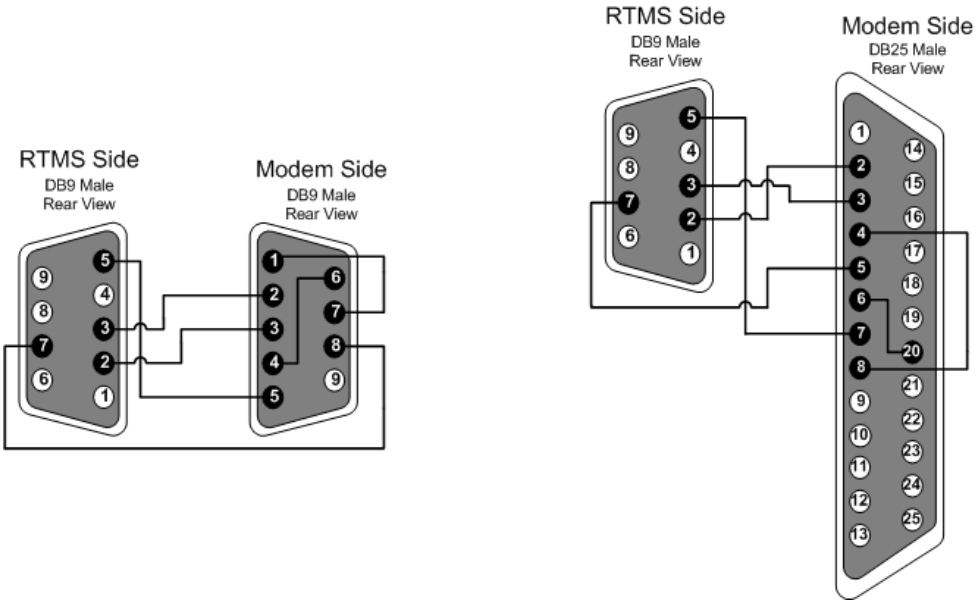


Figure A-5: Autoscope RTMS Sx-300-To-Modem Connections

Table A-6: Modem Cabling

Function	From Autoscope RTMS Sx-300 DB9	To Modem DB9	To Modem DB25
Transpose Tx and Rx	Pin 2	Pin 3	Pin 2
	Pin 3	Pin 2	Pin 3
Connect ground	Pin 5	Pin 5	Pin 7
RTS to Autoscope RTMS Sx-300	Pin 7	Pin 8	Pin 5
Modem Side Control Looping			
DCD to CTS		Pin 1 to Pin 7	Pin 4 to Pin 8
DSR to DTR		Pin 4 to Pin 6	Pin 6 to Pin 20

Modem Sharing

Autoscope RTMS Sx-300 units located in close proximity may connect to a single modem. A modem sharing cable will have "Y" construction and will consist of one DB-9M connector per Autoscope RTMS Sx-300, and one DB-9M or DB-25M connector at the modem (as shown below).

Modem side strapping provides required flow control functions, not provided by the standard Autoscope RTMS Sx-300 RS-232 port.

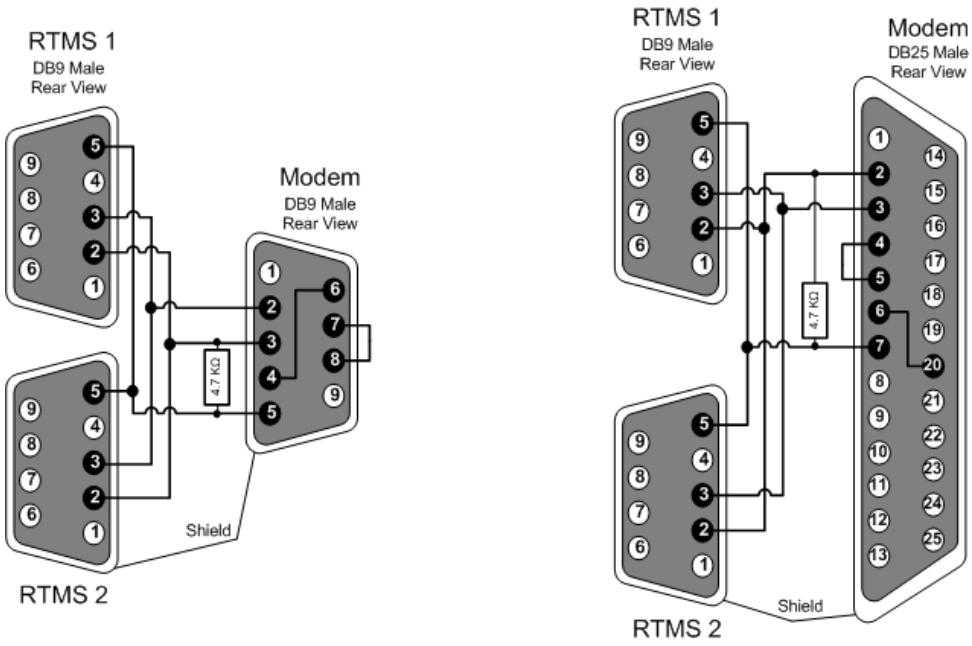


Figure A-6: Modem sharing "Y" cables. (No Memory Download.)

Table A-7: Modem Sharing "Y" Cabling

Connection/Function	From Autoscope RTMS Sx-300 DB9	To Modem DB9	To Modem DB25
Transpose Tx and Rx	Pin 2	Pin 3	Pin 2
	Pin 3	Pin 2	Pin 3
Connect ground	Pin 5	Pin 5	Pin 7
Modem Side Strapping			
RTS to CTS		Pin 1 to Pin 7	Pin 4 to Pin 8
DSR to DTR		Pin 4 to Pin 6	Pin 6 to Pin 20
Connect a 4.7 kΩ resistor from Tx to ground to prevent noise.		Pin 3 to Pin 5	Pin 2 to Pin 7

Appendix B: Surge Protection

General

Autoscope RTMS Sx-300 sensors are deployed in locations where the quality of power lines can be questionable. Industrial machinery and environmental factors can cause excess noise and voltage/current spikes on power lines. Additionally, poor grounding of equipment can amplify the effects of these disturbances. It is recommended that all lines connected to the Autoscope RTMS Sx-300 sensor (i.e., power and communication) have surge protection and each sensor be sufficiently grounded as outlined in this appendix.

The purpose of this appendix is to provide an understanding of why proper grounding and surge protection is important to a successful Autoscope RTMS Sx-300 sensor deployment and provide guidelines for grounding of equipment and installing surge protection devices to protect each Autoscope RTMS Sx-300 sensor.

Breakout Boxes

Every sensor should have a breakout box on the same pole that the Autoscope RTMS Sx-300 sensor is mounted (see Figure B-1). The breakout box should be no more than 6 m (20 ft) from the Autoscope RTMS Sx-300 sensor (see Figure B-1).

Figure B-1: Typical Installation

Each breakout box should contain a manufacturers approved surge suppression package, which includes a power supply and all the necessary surge protection devices.

Cabling to the Breakout Box

The Mains power should enter the breakout box and go directly to the surge protection package as described in the wiring diagram provided with the package. The earth ground wire from the Mains power should tie to the breakout box, the surge protection package, and directly to the grounding rod as described in "Grounding" on page B-5.

IMPORTANT: The Mains earth ground conductor MUST come with the Mains power conductors from the utility. The local ground rod is only for suppression of surge and must be tied to the earth ground reference from the power source.

Cabling From the Breakout Box

The only cable leaving the breakout box should be the low voltage power cable going directly to the sensor.

IMPORTANT: The cable from the breakout box to the Autoscope RTMS Sx-300 sensor should be routed up the pole directly to the sensor and should not share conduits with or be routed next to high voltage/high current (AC or DC) power lines.

Parts of the Surge Suppression Package

Power Line Protection

The first part of a surge suppression package is providing a barrier between the incoming power lines and the power provided to the Autoscope RTMS Sx-300 sensor. A circuit breaker (CB) and a power transient suppressor (PTS) provide this protection. The incoming power line should go through the circuit breaker, then to the PTS device. In this configuration, if a surge occurs the PTS will shunt excessive current to earth ground and subsequently trigger the CB. This opens the circuit and prevents damage to the sensor and the PTS. The CB must have a 2A rating.

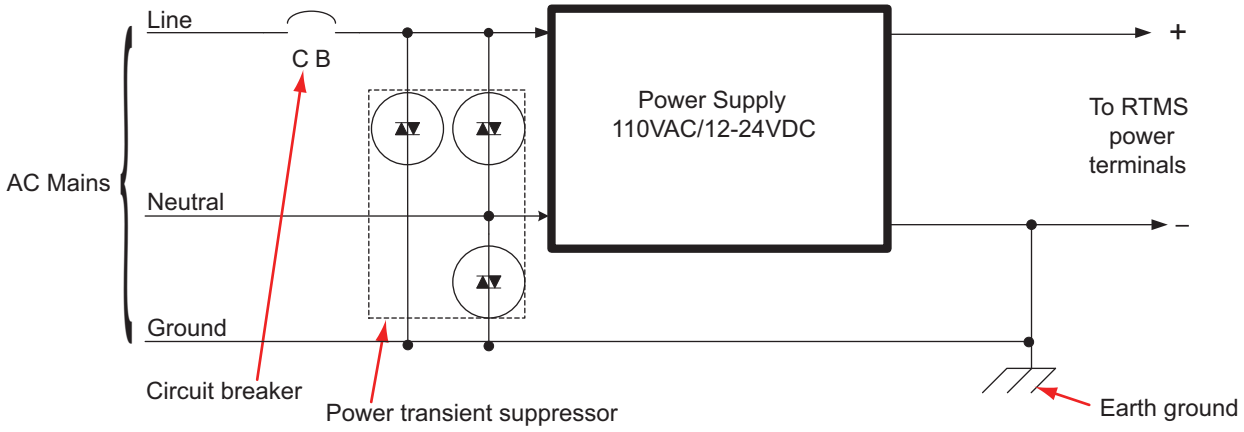


Figure B-2: Power Lines Protection

IMPORTANT: The negative terminal of the low voltage side of the power supply, battery, or solar controller must be connected to the earth ground in order to provide a reference point for the Autoscope RTMS Sx-300 built-in surge protection.

Communication Line Protection

Communication lines to the Autoscope RTMS Sx-300 sensor are sensitive lines that must be protected from external influences to prevent damage to the communication interface on the sensor and ensure uncorrupted data flow to and from the sensor. Each communication line should be protected by a device that will shunt excess current on the line to earth ground rather than sending that current through the Autoscope RTMS Sx-300 sensor and causing damage to the device. Care must be taken when providing protection on communication lines to ensure the device chosen will not add excess capacitance or inductance that could cause disruptions to the integrity of the data. Figure B-3 and Figure B-4 show the protections provided by the manufacturers approved surge suppression packages on the communications interfaces for the Autoscope RTMS Sx-300 sensor.

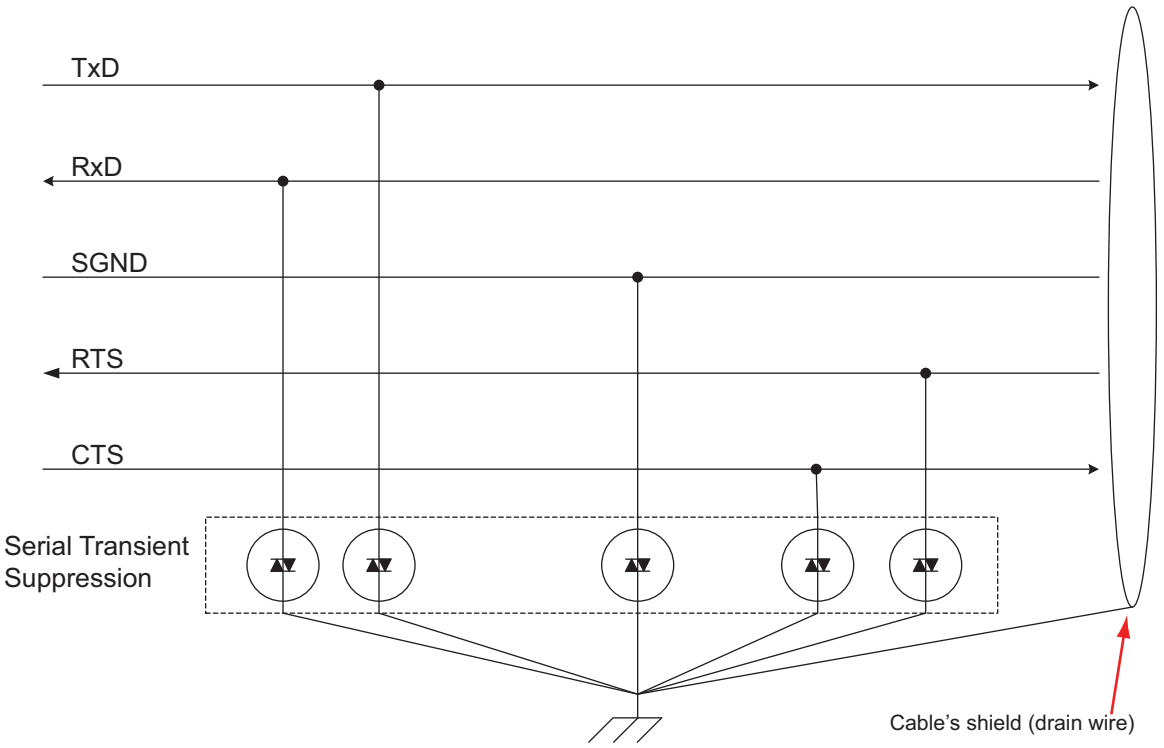


Figure B-3: Serial Port Protection

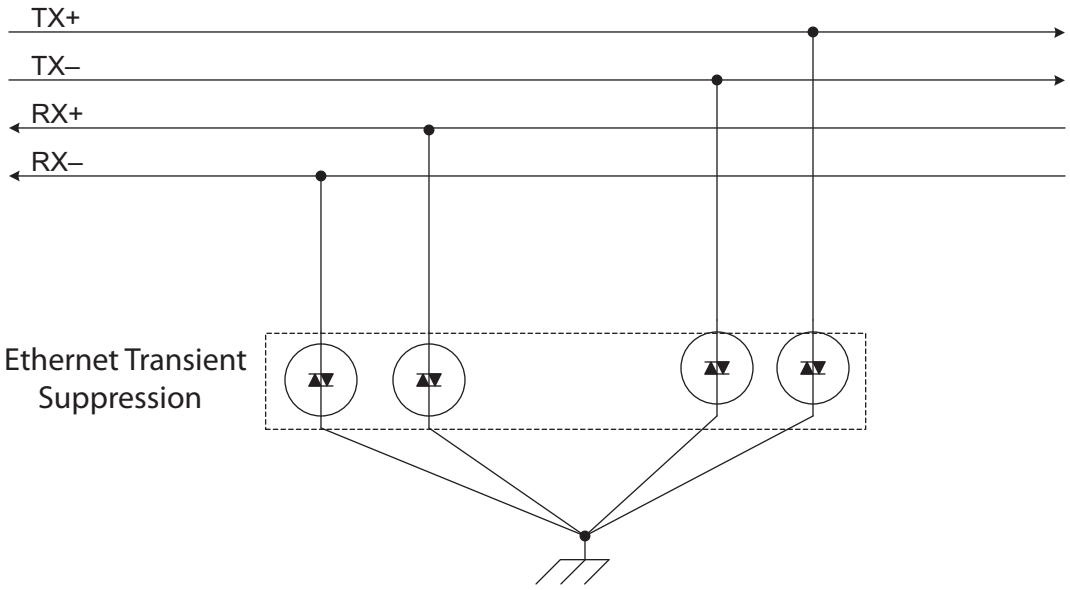


Figure B-4: Ethernet Port Protection

Grounding

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.

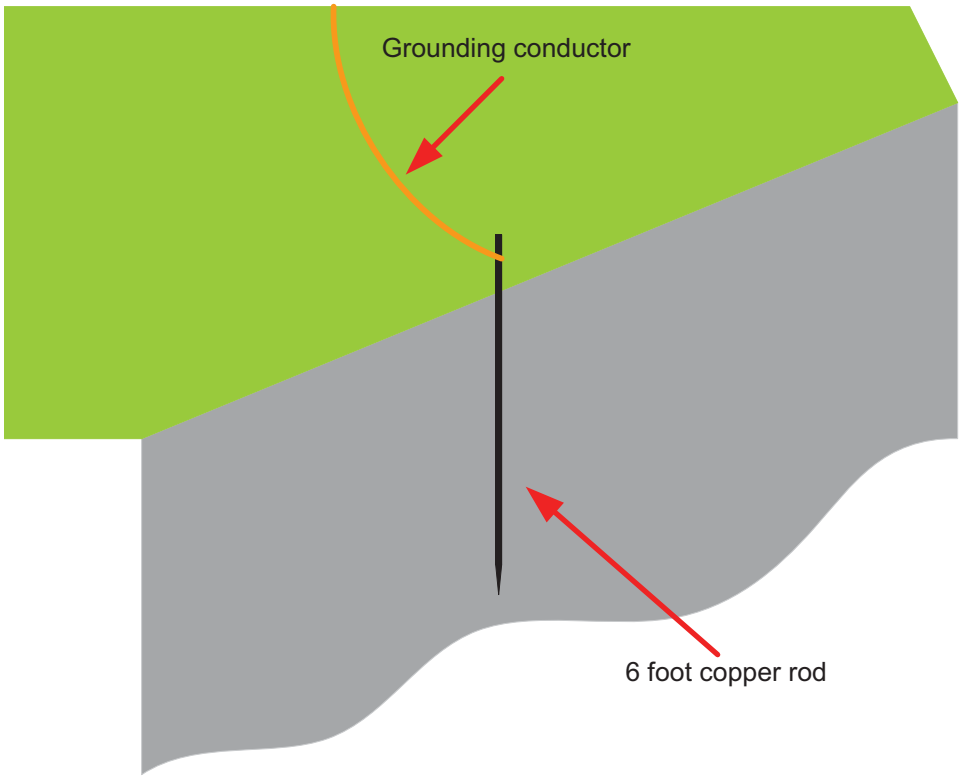


Figure B-5: Earth Ground Connection

A grounding rod (see Figure B-5) should be at least 1.83 m (6 ft) in length and placed as close as possible to the base of the Autoscope RTMS Sx-300 mounting pole. The grounding conductor should be flexible copper braid or copper wire 12AWG or larger.

Why Grounding is Important

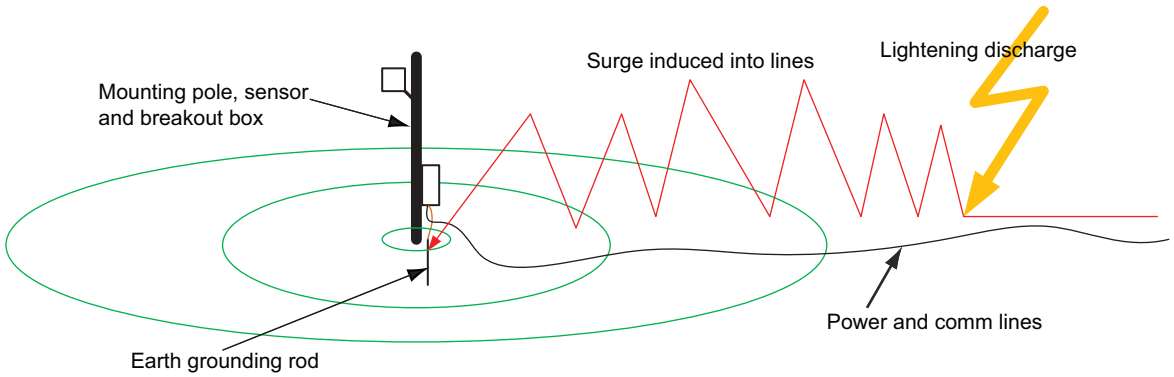


Figure B-6: Surge Channeled into Earth Ground

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 B-6). These charges and surges may be caused by industrial noise, power surges, or lightning.

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 Autoscope RTMS Sx-300 sensor is being installed. In areas that are exposed to large number of thunderstorms, protecting sensors will be more challenging.

Low Voltage Power

The manufacturers approved surge suppression packages include a 24VDC power supply. The output of this supply is tied to the cable that powers the Autoscope RTMS Sx-300 sensor. This cable should not be longer than 6 m (20 ft) in length and should only be run directly from the breakout box at the mounting pole for each Autoscope RTMS Sx-300 sensor up the mounting pole to the Autoscope RTMS Sx-300 sensor.

IMPORTANT: The cable from the breakout box to the Autoscope RTMS Sx-300 sensor should be routed up the pole directly to the sensor and should not share conduits with or be routed next to high voltage/high current (AC or DC) power lines.

You should not power Autoscope RTMS Sx-300 sensors from low voltage sources (either AC or DC) over cables longer than 6 m (20 ft) for the following reasons:

- Long low voltage lines act as an antenna for all sorts of disturbances, noise, and surges.
- Significant power loses can occur at long distances.
- 305 m (1000 ft) of typical 18 AWG stranded wire introduces resistance of about 6.6Ω per wire. The base Autoscope RTMS Sx-300 unit draws 0.25A at 12V. The cable loss can be calculated as:

  $$V_{device} = I_{RTMS} * R_{cable} = 0.25A * (2 * 6.6\Omega) = 3.3 \text{ VDC}$$

  Note:
  R_{cable} = 2 * resistance per wire because the current travels to the device on the power wire and returns from the device on the ground wire.

  With a cable input voltage of 12 VDC and a 3.3V cable loss, the voltage at the Autoscope RTMS Sx-300 input will be 8.7V.
  This is less than the minimum voltage requirement of the Autoscope RTMS Sx-300 sensor (12V).

The manufacturer cannot guarantee proper operation of the unit and/or its longevity if low voltage power over a long line is used to power an Autoscope RTMS Sx-300 sensor, and does not recommend or support providing power in this configuration. However, the following are some things to help limit the risks.

- Use an isolated 24VDC power source.
- Increase the gauge of the power wires to reduce voltage drop. Reference the datasheet for the wire you are installing or an American Wire Gauge lookup table for resistance per foot of each wire gauge.
- Mount low voltage surge protection at the base of the mounting pole and ensure the protection device has a low resistance reference (<5 ohms) to earth ground.
- Avoid running Autoscope RTMS Sx-300 sensor cables parallel or close to high voltage/high current power lines (including in conduits).

Autoscope RTMS Sx-300 Interface Panels

It is recommended that approved interface panels, which include appropriate surge protection, be used to protect Autoscope RTMS Sx-300 sensors. The approved interface panels, which include appropriate surge protection, are listed in Table B-8. The connections for each surge panel is shown in the pages that follow.

Table B-8: Autoscope RTMS Sx-300 Interface Panel Part Numbers

Description	Part Number
DIN Rail Power and RS-232 Interface Panel	A600-1099
DIN Rail Power and RS-232 and RS-422/485Interface Panel	A600-1098
DIN Rail Power and RS-232 and TCP/IP Interface Panel	A600-1097
DIN Rail Power and RS-485 Interface Panel	A600-1100

DIN Rail Power and RS-232 Interface Panel (P/N A600-1099)

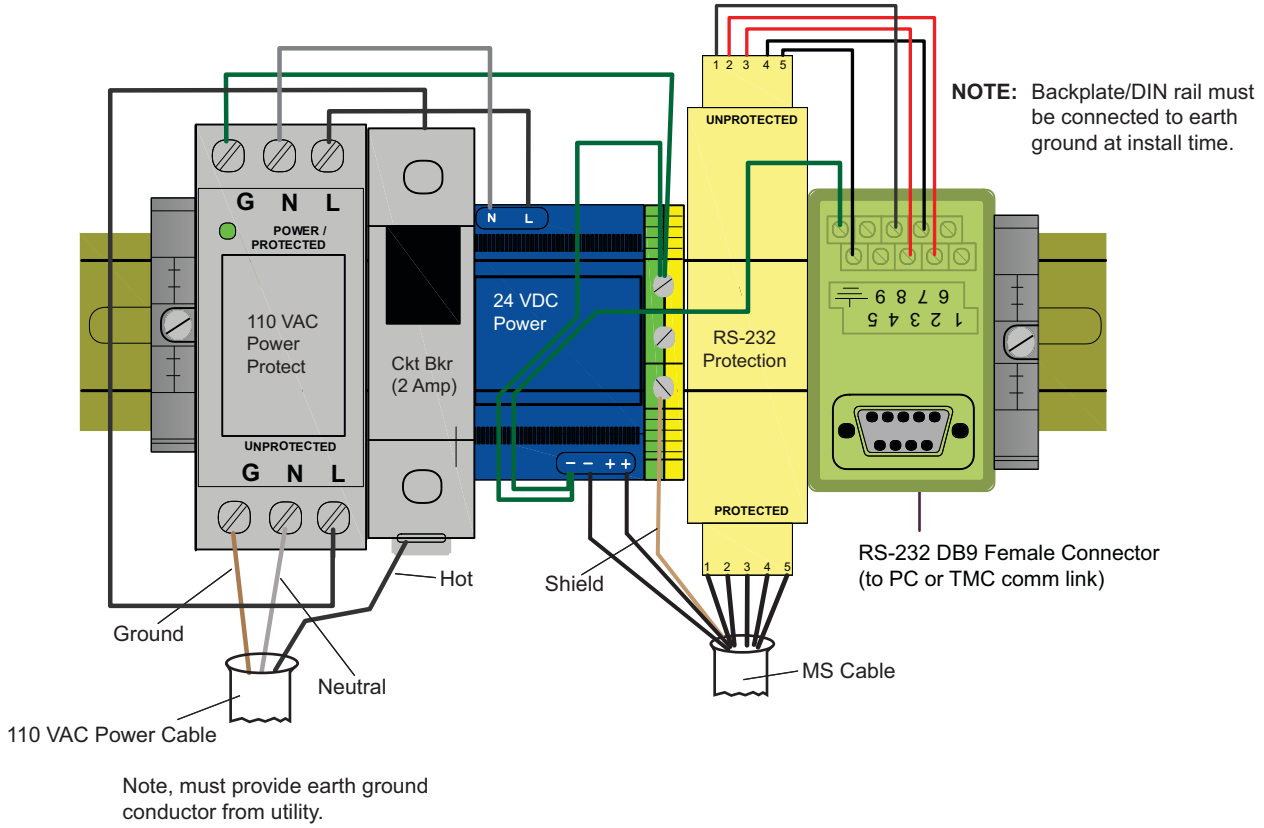


Figure B-7: Power and RS-232 Interface Panel Wiring

Table B-9: MS Cable Wiring for Power and RS-232 Interface Panel

MS Cable Pin	RS-232 Protect Pin	24 VDC Power Pin	Signal Name
g	N/A	–	DC GND
f	N/A	+	+24 VDC
X	1	N/A	CTS
V	2	N/A	TxD
U	5	N/A	SGND
T	3	N/A	RxD
Y	4	N/A	RTS
Shield	N/A	–	Earth GND

DIN Rail Power and RS-232 & RS-422/485 Interface Panel (P/N A600-1098)

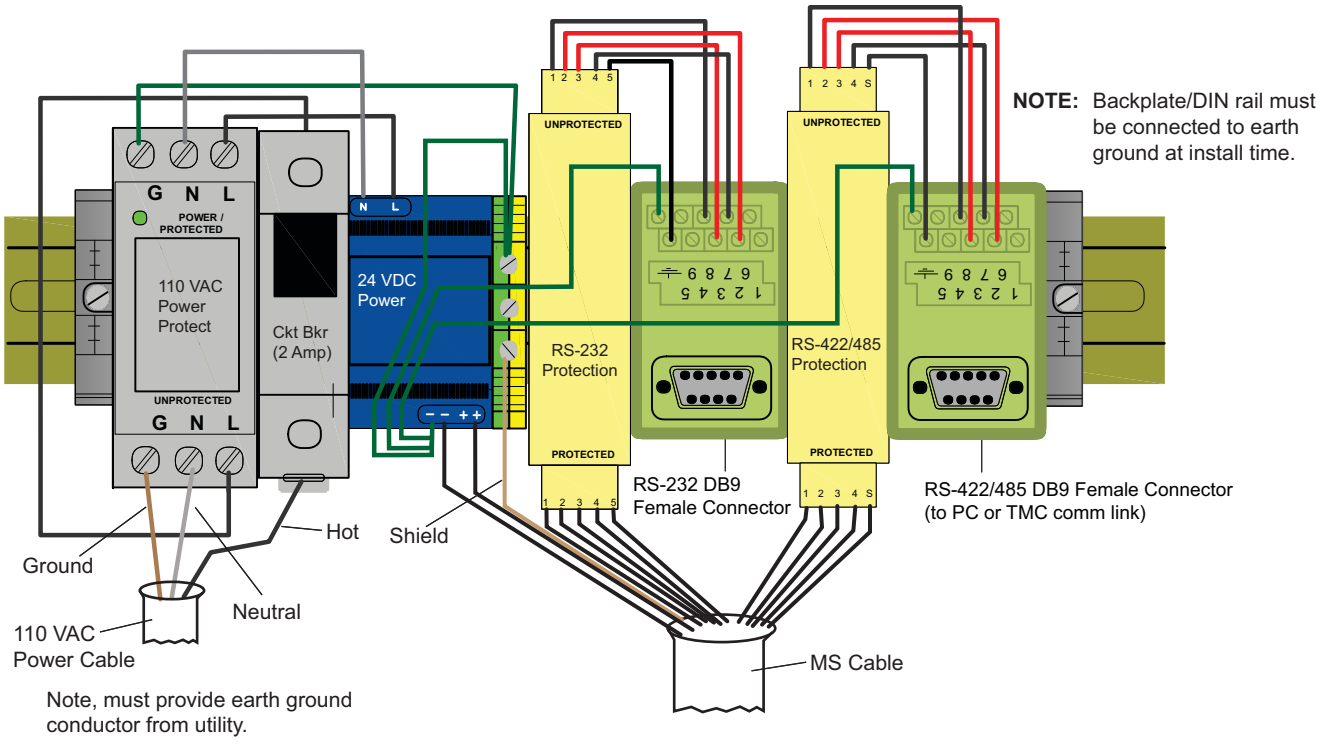


Figure B-8: Power and RS-232 and RS-422/485 Interface Panel Wiring

Table B-10: MS Cable Wiring for Power and RS-232 and RS422/485 Interface Panel

MS Cable Pin	RS-232 Protect Pin	RS-422/48 Protect Pin	24 VDC Power Pin	Signal Name
g	N/A	N/A	–	DC GND
f	N/A	N/A	+	+24 VDC
e	N/A	1	N/A	TxD+ (422)
d	N/A	2	N/A	TxD– (422)
U	5	S	N/A	SGND
W	N/A	3	N/A	RxD+ (422)
Z	N/A	4	N/A	RxD– (422)
X	1	N/A	N/A	CTS (232)
V	2	N/A	N/A	TxD (232)
T	3	N/A	N/A	RxD (232)
Y	4	N/A	N/A	RTS (232)
Shield	N/A	N/A	–	Earth GND

DIN Rail Power and RS-232 and TCP/IP Interface Panel (P/N A600-1097)

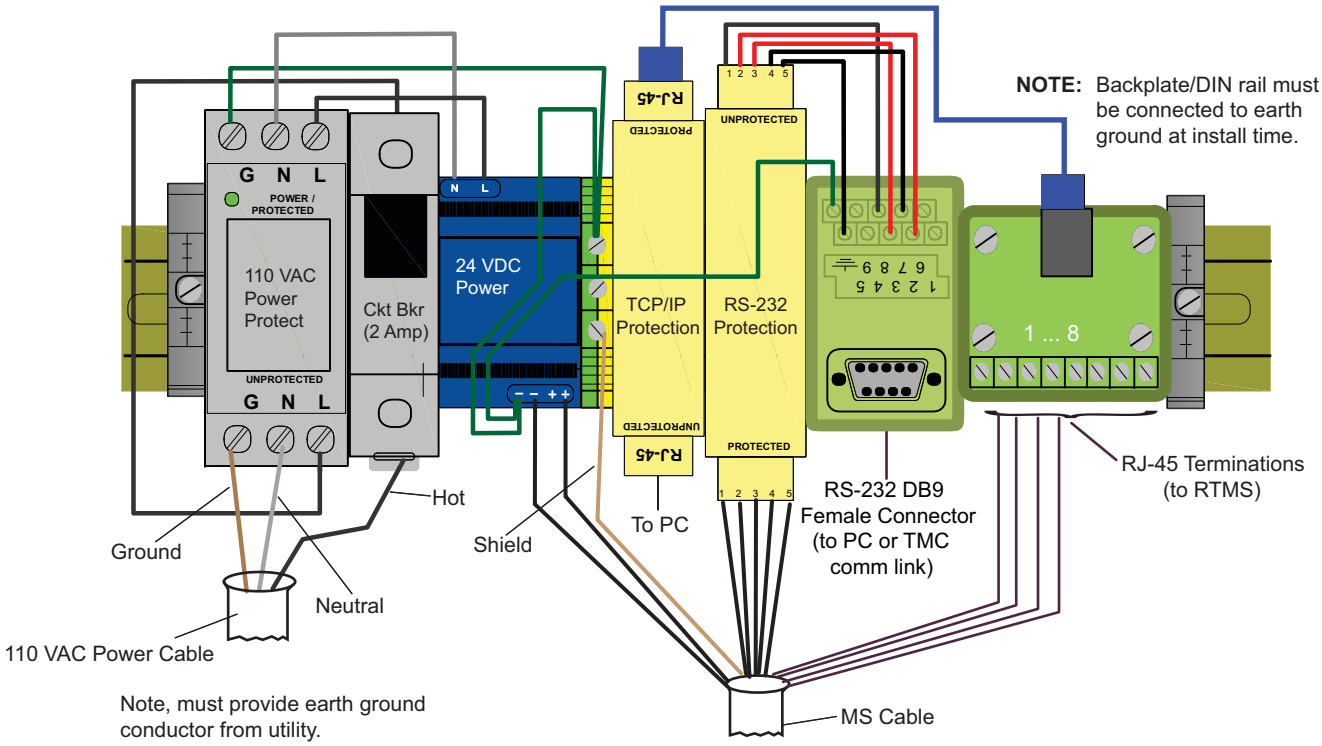


Figure B-9: Power and RS-232 and TCP/IP Interface Panel Wiring

Table B-11: MS Cable Wiring for Power and RS-232 and TCP Interface Panel

MS Cable Pin	RS-232 Protect Pin	TCP/IP Protect Pin	24 VDC Power Pin	Signal Name
g	N/A	N/A	–	DC GND
f	N/A	N/A	+	+24 VDC
e	N/A	2	N/A	TX– (TCP)
d	N/A	1	N/A	TX+ (TCP)
U	5	N/A	N/A	SGND
W	N/A	3	N/A	RX+ (TCP)
Z	N/A	6	N/A	RX– (TCP)
X	1	N/A	N/A	CTS (232)
V	2	N/A	N/A	TxD (232)
T	3	N/A	N/A	RxD (232)
Y	4	N/A	N/A	RTS (232)
Shield	N/A	N/A	–	Earth GND

DIN Rail Power and RS-485 Interface Panel (P/N A600-1100)

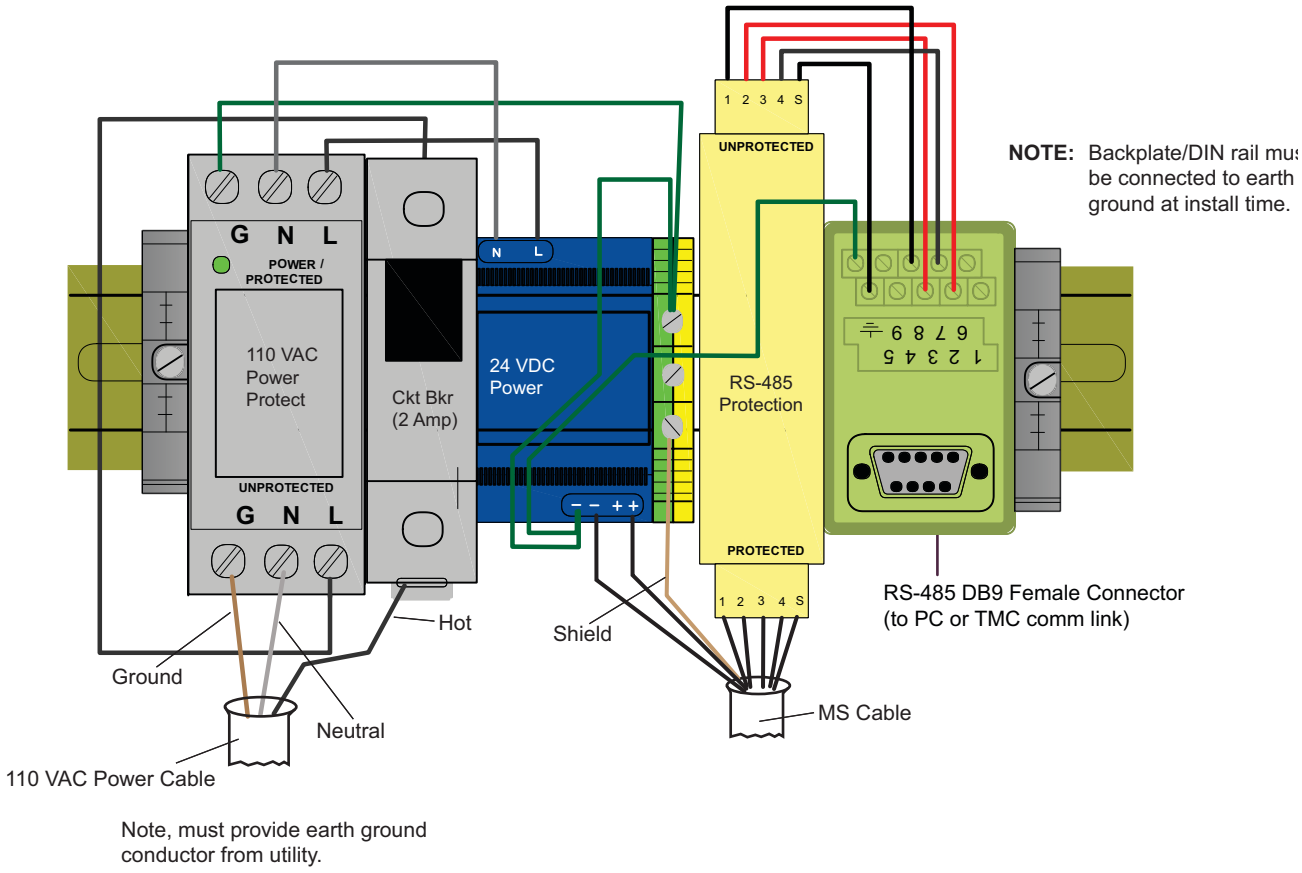


Figure B-10: Power and RS-485 Interface Panel Wiring

Table B-12: MS Cable Wiring for Power and RS-485 Interface Panel

MS Cable Pin	RS-485 Protect Pin	24 VDC Power Pin	Signal Name
g	N/A	–	DC GND
f	N/A	+	+24 VDC
X	1	N/A	TxD+
V	2	N/A	TxD–
U	S	N/A	SGND
T	3	N/A	RxD–
Y	4	N/A	RxD+
Shield	N/A	–	Earth GND

Appendix C: Data Files and Message Formats

Traffic Data Files

The text file that is created is identified by the extension ".asc". The file is formatted in a table form.

The files contain Time/Date stamped data from one or more sensors. The format of the file is shown below.

```
1  RTMS STAT. MESSAGES     ZONE: 1      2      3      4      5      6     7      8
2   SPEED IN Units.  Occupancy 6 ft loop normalized.


3  DDMMYYYY HH:MM:SS
4  MESSAGE NO. #        VOLUME:  0      0      0      0      0      0      0      0
5                          REG:  0      0      0      0      0      0      0      0
6                          MED:  0      0      0      0      0      0      0      0
7                        LARGE:  0      0      0      0      0      0      0      0
8                        TRUCK:  0      0      0      0      0      0      0      0
9                       XLARGE:  0      0      0      0      0      0      0      0
10 STATION ID. #     OCCUPANCY:  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
11 FWDLK SPEED ?   SIDEFRD SPD:  0      0      0      0      0      0      0      0    Dir. 0  V.0   H.0
12                         GAP:  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
```

Figure C-1: Autoscope RTMS Sx-300 .asc Fle Format (X3 STAT protocol)

Table C-1: File Format Description

Line	Description
1	Header for the following Rows.
2	Header information. **Speed in units** — The speed values in the table are in these units. **Occupancy …** — If the 6ft emulation is turned this message is displayed.
3	Date and Time Stamp.

(Table continues on the next page)

Table C-1: File Format Description (Cont'd)

Line	Description
4	**Message No.** — The message number. It will go from 0 to 255. On the 256th message it will be message 0 again. **Volume** — This is the total volume for each zone. **** Note:** To calculate "Small" classification, add up the individual classifications listed below and subtract that number from the total volume.
5	Volume counts for each zone for the Regular Class size.
6	Volume counts for each zone for the Medium Class size.
7	Volume counts for each zone for the Large Class size.
8	Volume counts for each zone for the Truck Class size.
9	Volume counts for each zone for the Extra Large Class size.
10	**Station ID** — This is the sensor ID. Set in Manual Settings -> Sensor ID **Occupancy** — The occupancy value for each zone.
11	**FWDLK SPEED** — Not used. **SideFrd SPD** — The is the speed value for each zone when using the Side-Fired or Midblock modes. **Dir** — This is the direction value when using the forward looking mode (this value is sometimes needed when troubleshooting with Technical Support personnel). **V** — This is the voltage reading at the Autoscope RTMS Sx-300. This is a real number reported as a whole number. For example 239 equals 23.9 V. The maximum value that can be shown is 25.5. **H** — This is a Health Byte value. This is only used for troubleshooting purposes with Technical Support personnel.
12	The Gap or Headway values for each zone.

Sample X3 Compatible Statistical Message

The X3 message format will:

- Always display all eight zones even if fewer zones are setup.
- Always displays speed values in Km/h.
- The designation vehicle classes will only display the number of classifications shown in the Autoscope RTMS Setup Utility.

The following is a sample X3 STAT file with six length classes reporting.

```
 RTMS STAT. MESSAGES   ZONE:   1    2    3    4    5    6    7    8
 SPEED IN Km/h.Occupancy 6 ft loop normalized.

27 11 2012 10:03:34
MESSAGE NO. 45       VOLUME:   0    0    0    0    0    0    0    0
                MID SIZE 1:   0    0    0    0    0    0    0    0
                LONG VEH 1:   0    0    0    0    0    0    0    0
                 XLONG VEH:   0    0    0    0    0    0    0    0
STATION ID. 2     OCCUPANCY:   0    0   100   0    0    0    0    0
FWDLK SPEED ?   SIDEFRD SPD:   ?    ?    0    ?    ?    ?    ?    ?     Dir. 128 V. 251 H. 16

27 11 2012 10:03:44
MESSAGE NO. 46       VOLUME:   0    0    0    0    0    0    0    0
                MID SIZE 1:   0    0    0    0    0    0    0    0
                LONG VEH 1:   0    0    0    0    0    0    0    0
                 XLONG VEH:   0    0    0    0    0    0    0    0
STATION ID. 2     OCCUPANCY:   0    0   100   0    0    0    0    0
FWDLK SPEED ?   SIDEFRD SPD:   ?    ?    0    ?    ?    ?    ?    ?     Dir. 128 V. 251 H. 16

27 11 2012 10:03:54
MESSAGE NO. 47       VOLUME:   0    0    0    0    0    0    0    0
                MID SIZE 1:   0    0    0    0    0    0    0    0
                LONG VEH 1:   0    0    0    0    0    0    0    0
                 XLONG VEH:   0    0    0    0    0    0    0    0
STATION ID. 2     OCCUPANCY:   0    0   100   0    0    0    0    0
FWDLK SPEED ?   SIDEFRD SPD:   ?    ?    0    ?    ?    ?    ?    ?     Dir. 128 V. 254 H. 16
```

Figure C-2: Sample X3 STAT

G4 Statistical Message

Please note:

- G4 Statistics Message will have a variable length based on how many lanes are configured.
- The designation of vehicle classes will also be the same as shown in the Autoscope RTMS Setup Utility.
- If Per Vehicle is ON, their data will be ahead of each message period's statistics.

The following is a sample G4 STAT file with all 12 lanes and 6 length classes reporting.

```
RTMS STAT. MESSAGES     ZONE: 1    2    3    4    5    6    7    8    9    10   11   12
 SPEED IN Km/h.  Occupancy 6 ft loop normalized.


03 27 2011 1:40:00
MESSAGE NO. 250       VOLUME: 8    8    11   7    20   10   12   14   9    11   13   11
                         REG: 2    0    0    0    1    1    1    1    1    1    3    1
                         MED: 0    0    1    0    1    2    0    0    0    1    1    1
                       LARGE: 0    1    0    0    0    0    1    0    0    0    2    2
                       TRUCK: 0    0    1    0    0    0    0    2    0    1    0    0
                      XLARGE: 0    0    2    0    0    0    0    0    0    0    2    0
STATION ID. 1      OCCUPANCY: 5.6  5.1  12.4 4.4  17.5 11.5 9.3  13.0 6.3  8.7  16.6 10.0
FWDLK SPEED ?    SIDEFRD SPD: 52   65   60   58   50   57   55   63   48   66   63   62  Dir. 0 V.239 H.0


03 27 2011  1:41:00
MESSAGE NO. 251       VOLUME: 7    9    11   10   18   12   10   10   12    8   7    6
                         REG: 1    3    2    0    7    3    3    2    1     0   2    0
                         MED: 1    0    0    1    0    0    0    0    0     1   2    3
                       LARGE: 0    0    1    0    0    0    1    0    0     0   0    0
                       TRUCK: 0    0    1    0    0    0    0    3    0     0   0    0
                      XLARGE: 0    0    0    1    0    1    0    0    1     0   0    1
STATION ID. 1      OCCUPANCY: 5.4  5.2  12.4 11.5 16.8 9.4  11.5 10.9 7.4   7.8 4.4  4.1
FWDLK SPEED ?    SIDEFRD SPD: 53   64   58   60   52   54   58   64   47    66  66   64  Dir. 0 V.239 H.0
```

Figure C-3: Sample G4 STAT File

Statistical Message with Per Vehicle On

For more information about the Per Vehicle setting, see "Defining Per Vehicle Messages" on page 5-31.

```
 RTMS STAT. MESSAGES   ZONE:   1    2    3    4    5    6    7    8    9    10   11   12
 SPEED IN Km/h.Occupancy 6 ft loop normalized.

27 11 2012 10:11:24
MESSAGE NO. 92       VOLUME:   0    0    1    0    0    0    0    0    0    0    0    0
                        MED:   0    0    0    0    0    0    0    0    0    0    0    0
                      LARGE:   0    0    0    0    0    0    0    0    0    0    0    0
                      TRUCK:   0    0    0    0    0    0    0    0    0    0    0    0
STATION ID. 2     OCCUPANCY:   0.0  0.0  47.2 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
FWDLK SPEED ?   SIDEFRD SPD:   ?    ?    1    ?    ?    ?    ?    ?    ?    ?    ?    ?     Dir. 128 V. 251 H. 16
                   HEADWAY:   10.0 10.0 5.0  10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0

pv                          RTMS_ID Lane Class Speed[km/h] Length[m] Dwell
pv                          ------------------------------------------------
pv  27 11 2012 10:11:26.470       2   3    Sm      1        3.4        602
pv  27 11 2012 10:11:27.090       2   2    Sm     20        2.0         62
pv  27 11 2012 10:11:28.220       2   3    Sm      3        2.0        139
pv  27 11 2012 10:11:28.690       2   1    Sm     26        2.0         53
pv  27 11 2012 10:11:28.710       2   3    Sm      6        2.0         70
pv  27 11 2012 10:11:33.400       2   3    Sm     14        2.0         77
pv  27 11 2012 10:11:33.420       2   1   Trk     26       26.8        397
pv  27 11 2012 10:11:33.730       2   2    Sm     36        2.0         41

27 11 2012 10:11:34
MESSAGE NO. 93       VOLUME:   2    2    4    0    0    0    0    0    0    0    0    0
                        MED:   0    0    0    0    0    0    0    0    0    0    0    0
                      LARGE:   0    0    0    0    0    0    0    0    0    0    0    0
                      TRUCK:   1    0    0    0    0    0    0    0    0    0    0    0
STATION ID. 2     OCCUPANCY:   44.8 10.2 64.0 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
FWDLK SPEED ?   SIDEFRD SPD:   26   28   6    ?    ?    ?    ?    ?    ?    ?    ?    ?     Dir. 128 V. 251 H. 16
                   HEADWAY:   14.8 6.8  2.9  10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0

pv                          RTMS_ID Lane Class Speed[km/h] Length[m] Dwell
pv                          ------------------------------------------------
pv  27 11 2012 10:11:37.600       2   2   Trk     36       27.6        297
pv  27 11 2012 10:11:42.510       2   3    Sm      7        9.0        529
```

Figure C-4: Sample File With Per Vehicle ON

Table C-2: Per Vehicle Message Field Descriptions

Field	Description
RTMS_ID	Sensor ID of the Autoscope G4.
Lane	Lane number the vehicle was detected in.
Class	Classification of the detected vehicle.
Speed	Speed of the detected vehicle.
Length	Length of the detected classification.
Dwell	Number of milliseconds the vehicle is being detected.

Appendix D: Bluetooth Device Operations

General

IMPORTANT: Bluetooth shares serial port 1 in the Autoscope RTMS Sx-300; therefore, any physical connection to port 1 must be disconnected so that communications to the Autoscope RTMS Sx-300 via bluetooth can be established.

Before you can set up Bluetooth communications with the Autoscope RTMS Sx-300, use the manufacturer's instructions to install a Bluetooth device on your computer.

Some computers come with pre-installed Bluetooth capabilities. We recommend that you determine the specifications of the internal Bluetooth adapter prior to establishing a link to the Autoscope RTMS Sx-300. Using the internal Bluetooth adapter may not give you adequate range to establish a reliable link to the Autoscope RTMS Sx-300.

NOTES:

- It is recommended that at least Bluetooth 2.0+EDR Class 1, and strongly recommends the Sena Parani UD100-G03 USB Bluetooth adapter.
- Bluetooth requires that the baud rate for port 1 in the Autoscope RTMS Sx-300 be set to 115,200, which is the default setting.

There are three classes of Bluetooth devices. The different classes have different ranges as follows:

- Class 3 radios – 1 m (3 ft)
- Class 2 radios – 10 m (33 ft): most commonly found in mobile devices
- Class 1 radios – 100 m (328 ft): used primarily in industrial use cases

Bluetooth is not a line-of-sight connection, so it can be used through walls and floors. However, things such as walls, people, poles and vehicles can reduce the range.

The following sections describe how to locate and connect to a Bluetooth device when using recommended Sena Parani adapter or through Microsoft Windows.

Method 1: Using the Sena Parani UD100-G03 USB Adapter

This is the Bluetooth adapter that is recommended for communicating with the Autoscope RTMS Sx-300.

Determining if Your Computer Has Bluetooth Installed

To determine whether your computer has a bluetooth device, look for the Bluetooth icon in the system tray at the lower right of your screen. If it does not appear, follow the manufacturer's instruction for installing the Bluetooth device.

Pairing With and Connecting to the Autoscope RTMS Sx-300

IMPORTANT: Before performing this procedure you must set up the Autoscope RTMS Sx-300 to communicate with a Bluetooth device (the Communication screen must be set to PC serial and the Baudrate must be set to 115,200). For additional information see "Defining a Bluetooth Connection" on page 5-11.

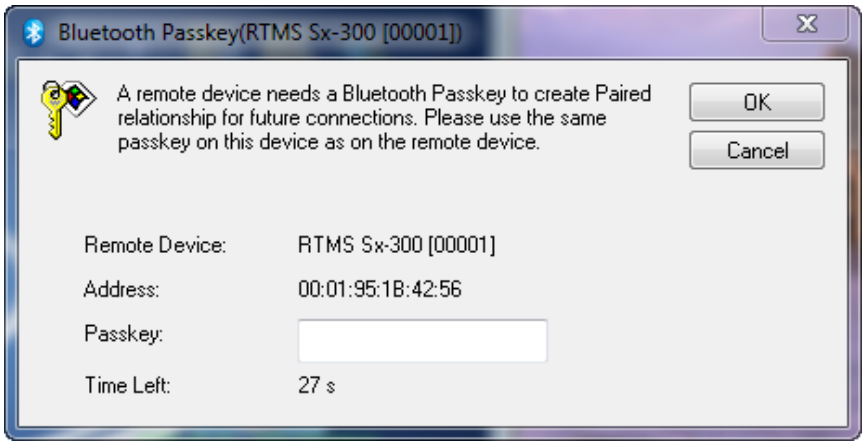
To connect to the Autoscope RTMS Sx-300 using Bluetooth communication, do the following.

1. Make sure the Autoscope RTMS Sx-300 is powered up and within range of your computer.
2. Double-click the Bluetooth icon in the system tray.

The following window appears.

3. Wait for the correct device names to appear on the display.
4. Double-click on the RTMS Sx-300 sensor.

   The following window appears.



5. In the **Bluetooth Passkey (PIN)** field, type **admin**.
6. Click **OK**.

   The following window appears.

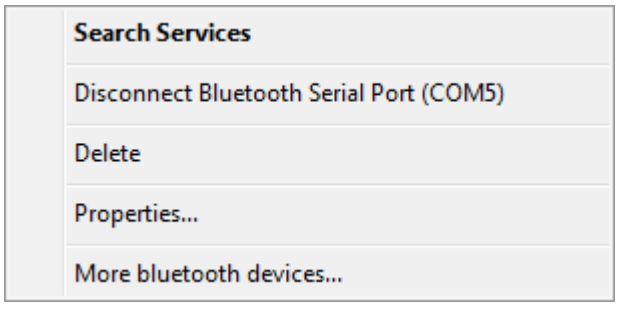
   Note that a green circle appears by the selected sensor.

7. Right-click on the sensor and select **Connect Bluetooth Serial Port**.

Wait until the following appears.

The question mark turns green and **Connected** appears in the lower right of the window.

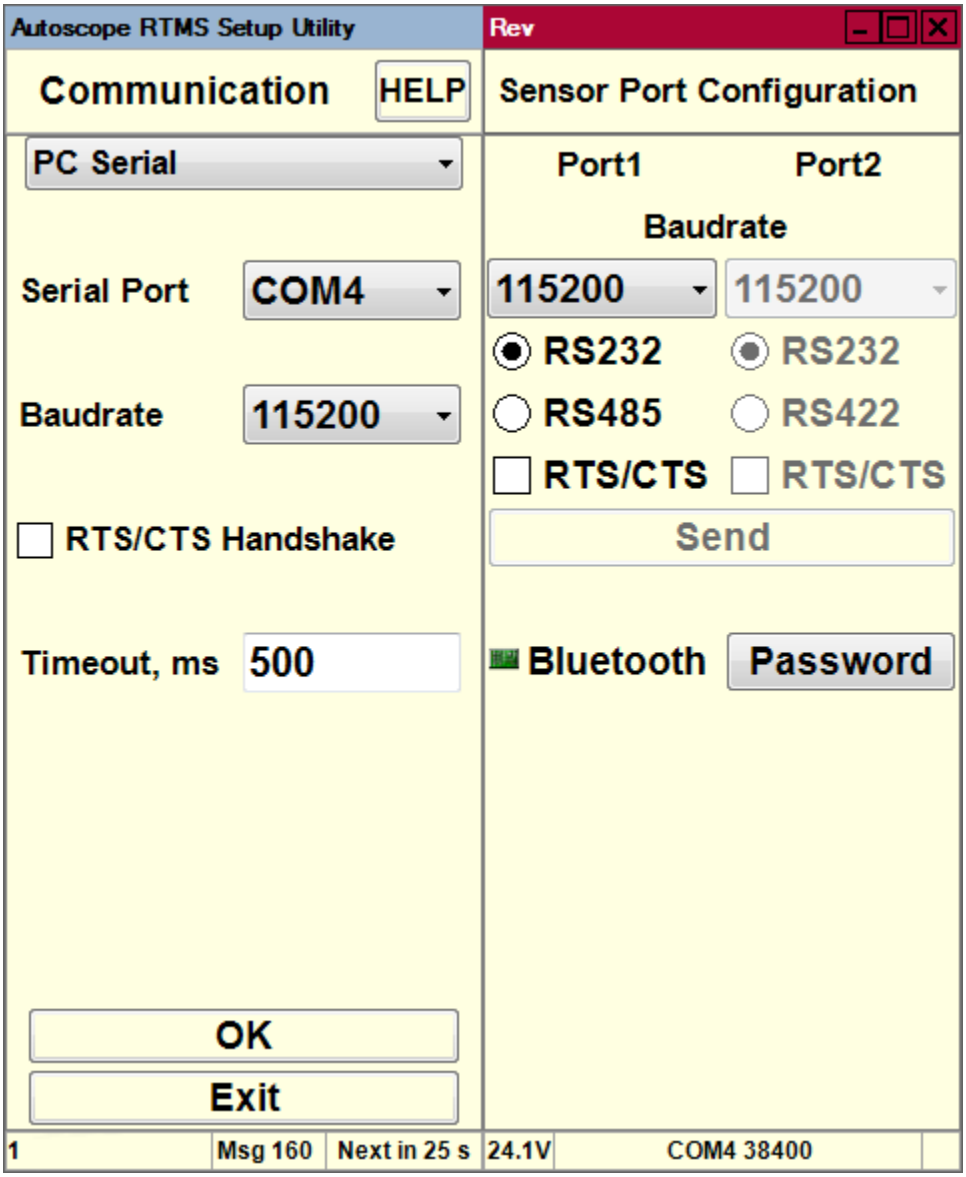
8. Right-click on the sensor and make note of the COM port listed.



In the above sample, the COM port is 5.

9. Start the Setup Utility (see "Starting the Setup Utility" on page 3-7).
10. On the Main Screen, click **Manual Settings**.
11. On the Manual Setup screen, click **Communication**.

The following screen appears.



NOTE: You can also get to this screen by clicking the **Communication** button on the Start screen.

12. Select **PC Serial** as the type of communication.
13. For **Serial Port**, select the serial port that you made note of in Step 8.
14. For **Baudrate**, select **115200** (this is mandatory for Bluetooth).
15. For **Timeout, ms**, the default value, 500, is recommended.

16. Click **OK**.

    If a connection is established, the green COM indicator in the bottom right of the screen will be blinking.

17. You can now perform any of the Setup Utility operations.

IMPORTANT: After you are through with the Autoscope RTMS Setup Utility, it is strongly recommended that you disconnect and delete the Bluetooth connection. If not, Windows will retain the COM Port settings, which could cause issues with the COM port settings on your computer. See "Disconnecting Bluetooth" on page D-8.

Disconnecting Bluetooth

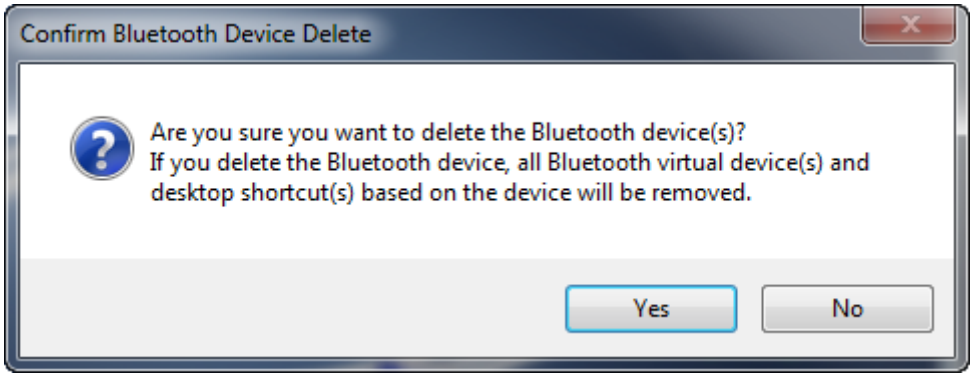
To disconnect from the Autoscope RTMS Sx-300 and delete the Bluetooth connection, do the following.

1. Exit the Autoscope RTMS Setup Utility.
2. Double-click the Bluetooth icon in the System tray.

   The following window appears.

3. Right-click the Autoscope RTMS Sx-300 sensor and select **Delete**.

   The following window appears.



4. Click **Yes**.

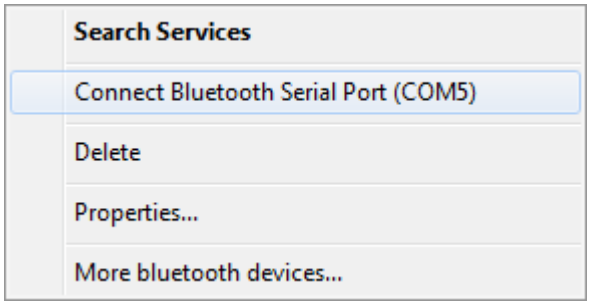
   The sensor disappears from the display.

Finding the Bluetooth COM Port Assignment

To find out what COM port the Bluetooth adapter is assigned to, do the following.

1. Double-click the Bluetooth icon in the System tray.
   The following window appears.

2. Right-click the Autoscope RTMS Sx-300 sensor.



Make note of the COM port listed. Note, it is not necessary to connect to the sensor.

Method 2: Using Microsoft Windows

NOTE: The following information is applicable for Windows 7 operating systems.

Determining if Your PC has Bluetooth Installed

To determine whether your computer has a bluetooth device, look for the Bluetooth icon in the system tray at the lower right of your screen.

If the icon is in the tray, you can set up Bluetooth communications with the Autoscope RTMS Sx-300 (see "Defining a Bluetooth Connection" on page 5-11.

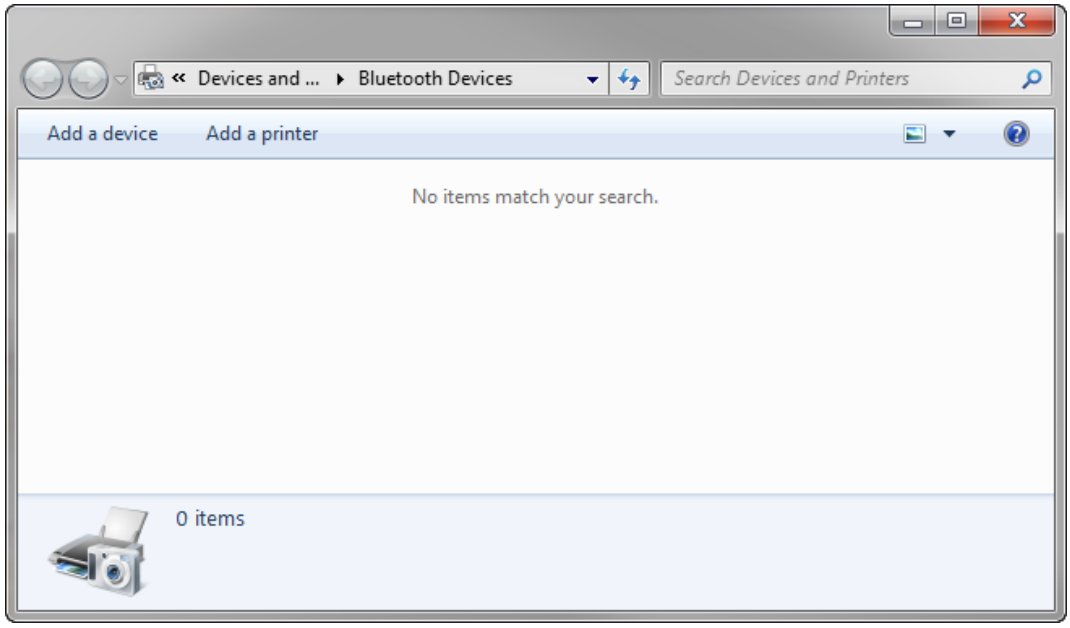
If there is no Bluetooth adapter installed. Install a Bluetooth adapter and software according to the manufacturer's instructions

Search For and Connect to A Bluetooth Device

The following describes how to see if the Autoscope RTMS Sx-300 is setup as a Bluetooth device.

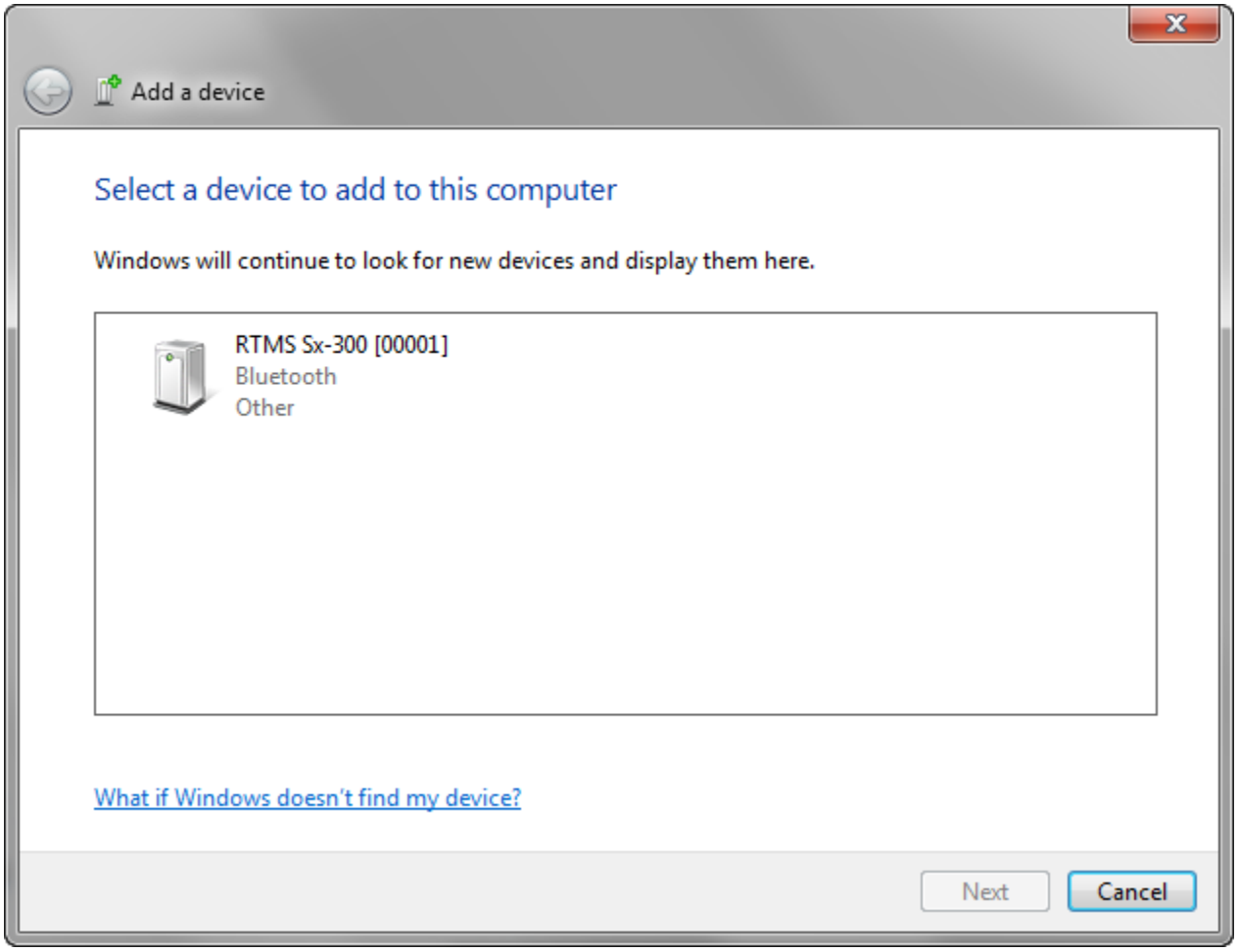
1. Make sure the Autoscope RTMS Sx-300 (with internal Bluetooth option) is powered up and within range of your computer.
2. Double-click the bluetooth icon in the system tray.

   The following window appears.



3. Click **Add a device**.

   A search for Bluetooth devices is conducted. When the search is complete, the following window appears

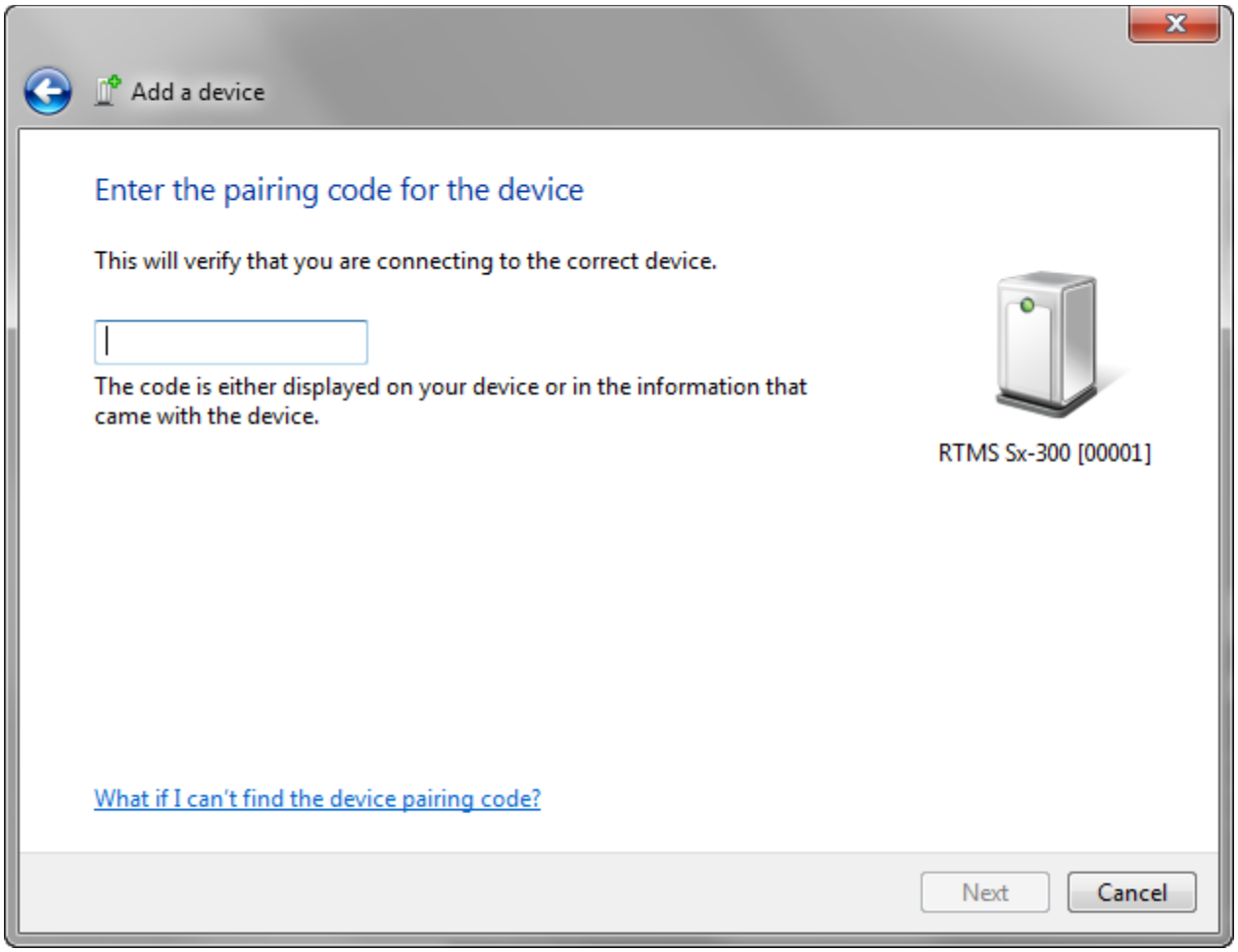


4. Is the Autoscope RTMS Sx-300 listed in the window?

Yes	No
Continue with Step 5.	a) Make sure the Autoscope RTMS Sx-300 is on and you are within range. b) Click **Search Again**. c) Continue with Step 5.

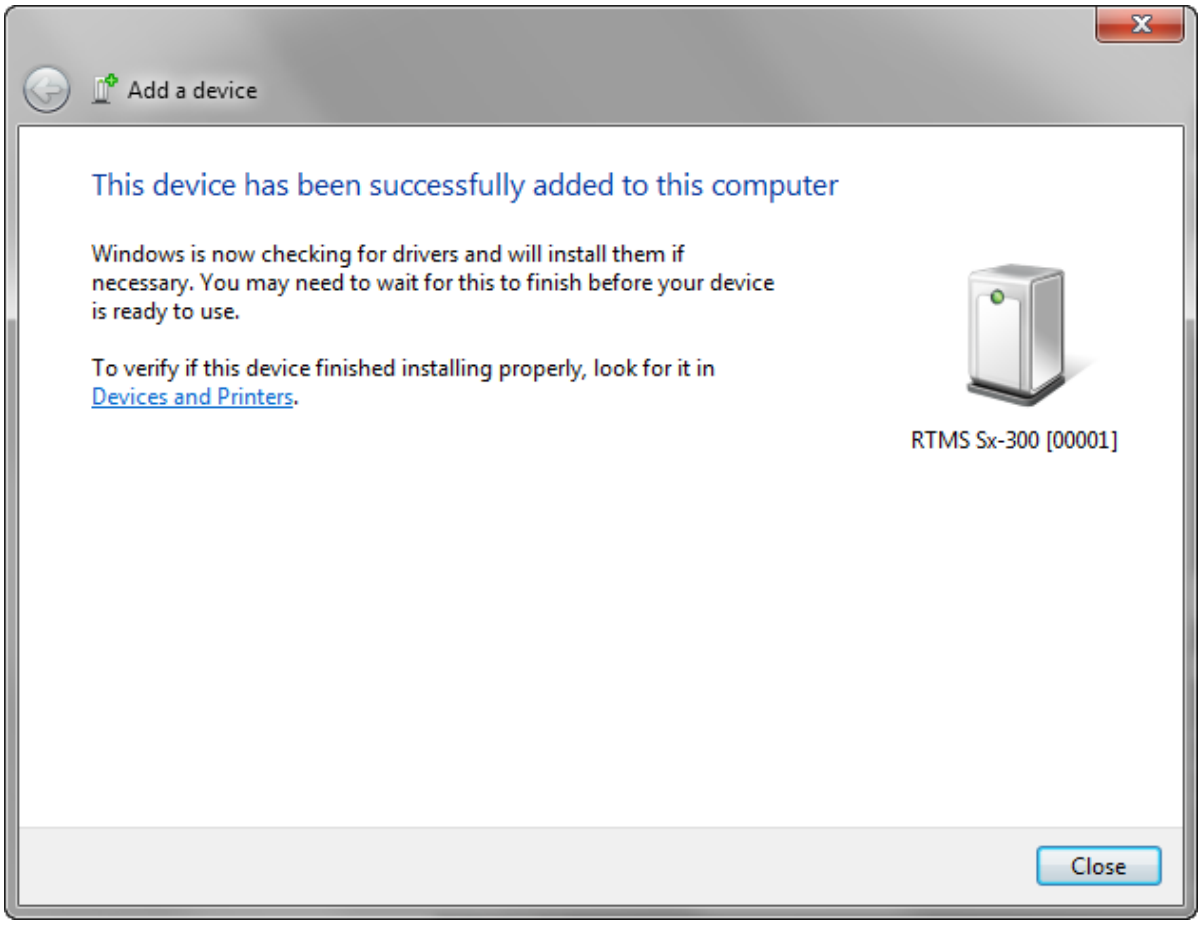
5. Double-click the RTMS Sx-300 sensor.

The following window appears.



6. Enter **admin**.
7. Click **Next**.

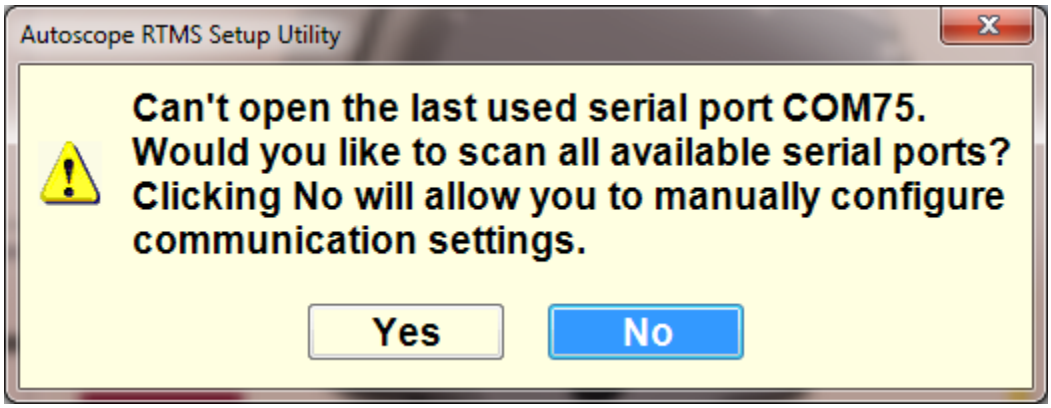
Wait for the following window to appear.

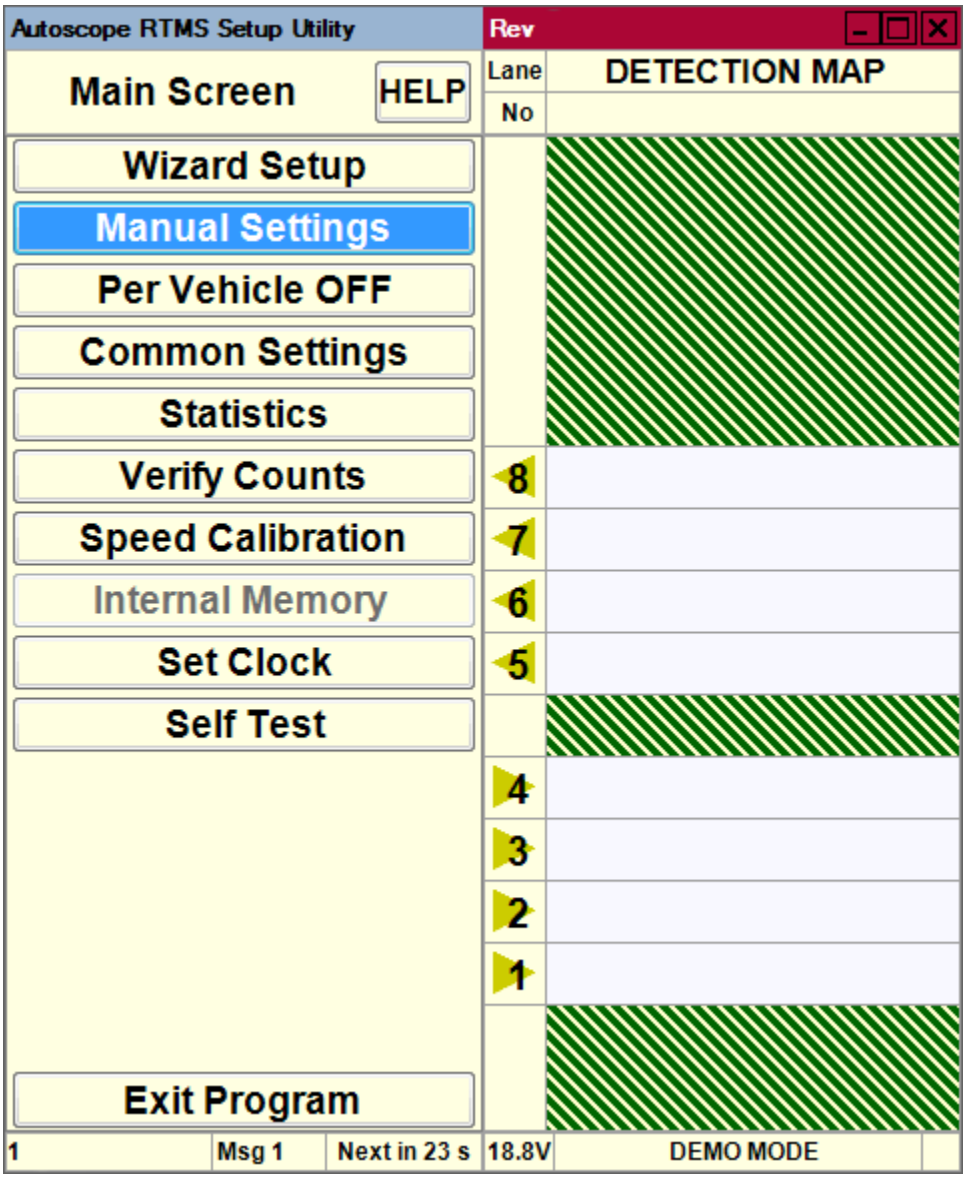


8. Click **Close**.
9. Start the Autoscope RTMS Setup Utility (see "Starting the Setup Utility" on page 3-7).

   The Main screen should appear.

NOTE: If the following window appears, click **Yes**.





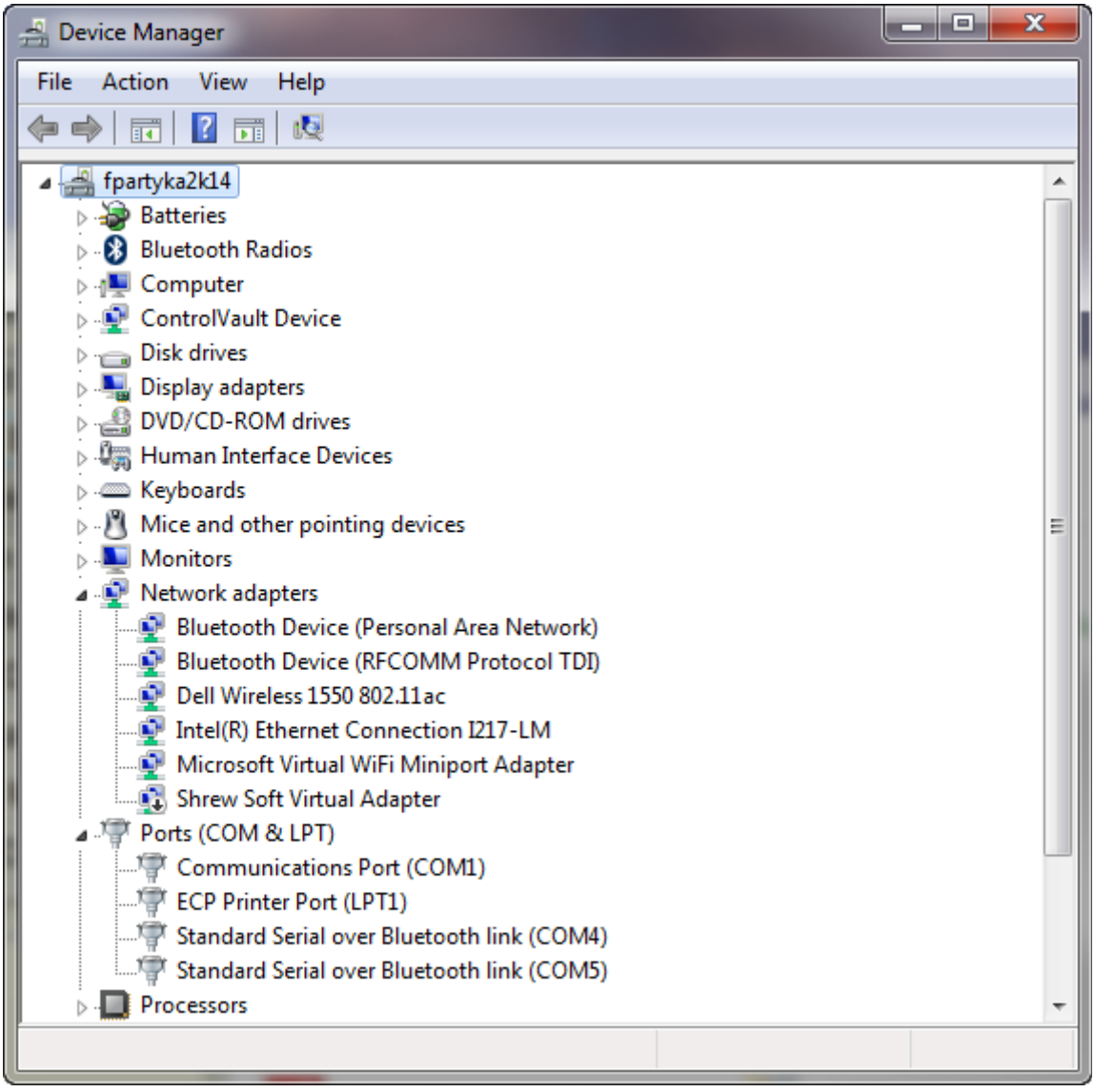
NOTE: If something other than the Main screen apperas, it is possible there is a problem with the COM port assignment for your bluetooth device. If this occurs, try using a different COM port (see "Changing the Bluetooth COM Port Assignment" on page D-16.

Finding the Bluetooth COM Port Assignment

The following describes how to find out what COM port the Bluetooth adapter is assigned to.

1. Select **Start>Control Panel**.
2. Click **Device Manager**.

   The following window appears.



3. Expand **Ports (COM &LPT)**.

   The first COM port listed is the outgoing port number, which is the one used when trying to connect to the Autoscope RTMS Sx-300. In the above, COM4 is the outgoing port.

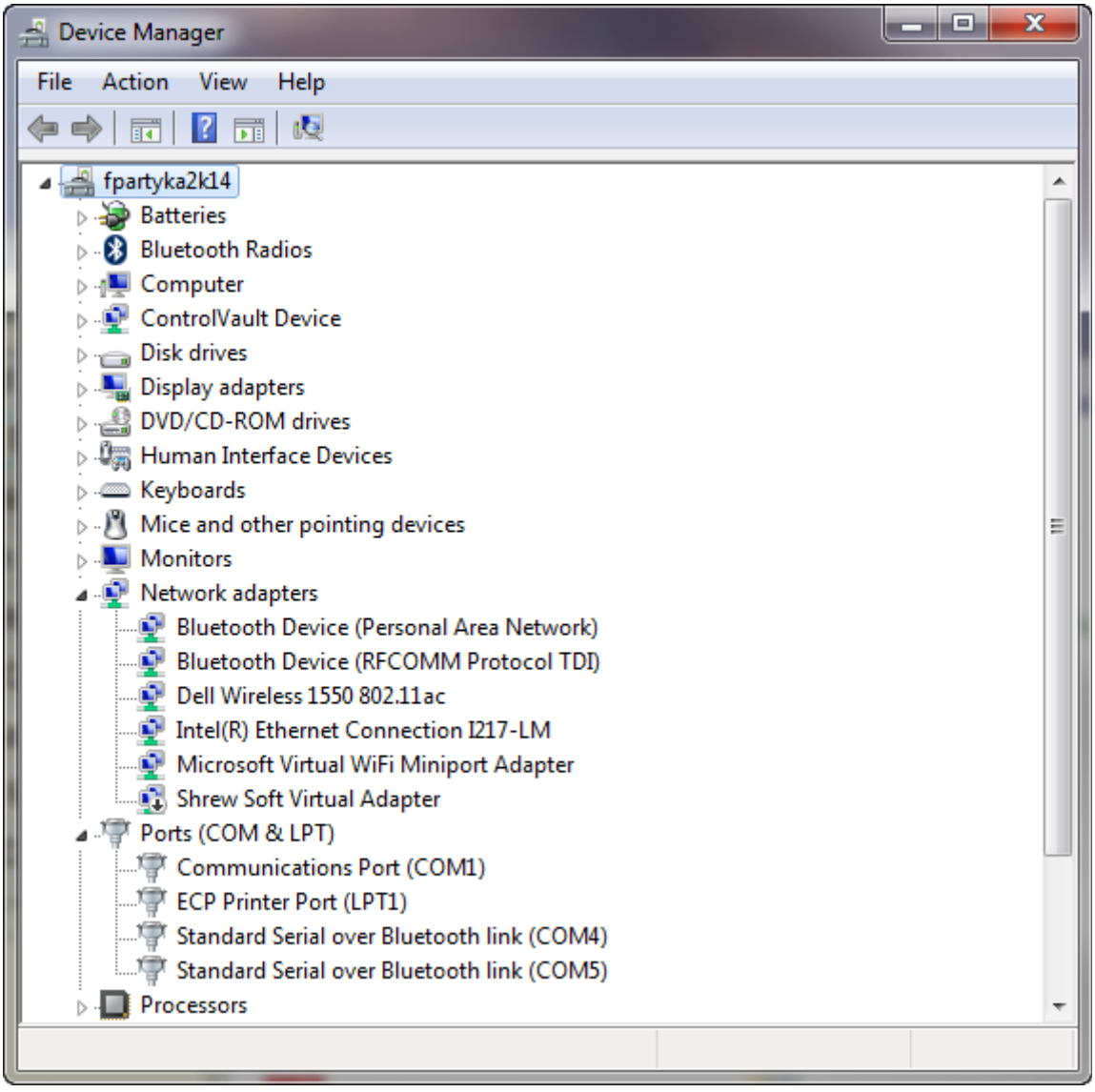
4. Close the Device Manager.

Changing the Bluetooth COM Port Assignment

The following describes how to change theCOM port the Bluetooth adapter is assigned to.

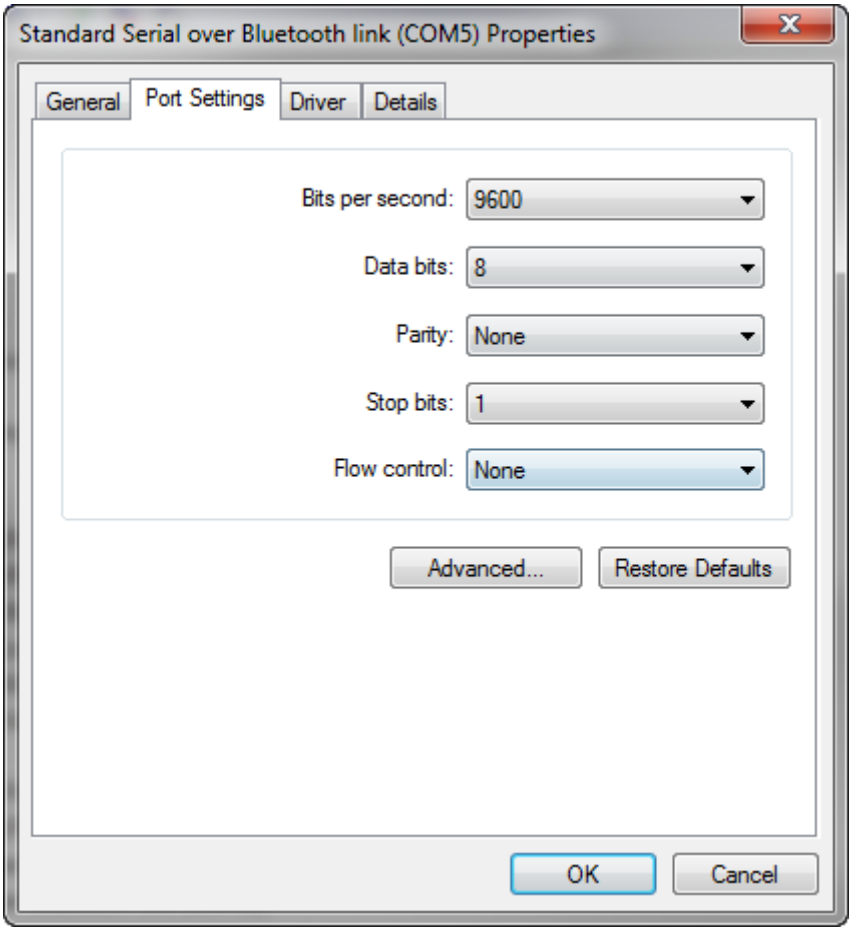
1. Select **Start>Control Panel**.
2. Click **Device Manager**.

   The following window appears.



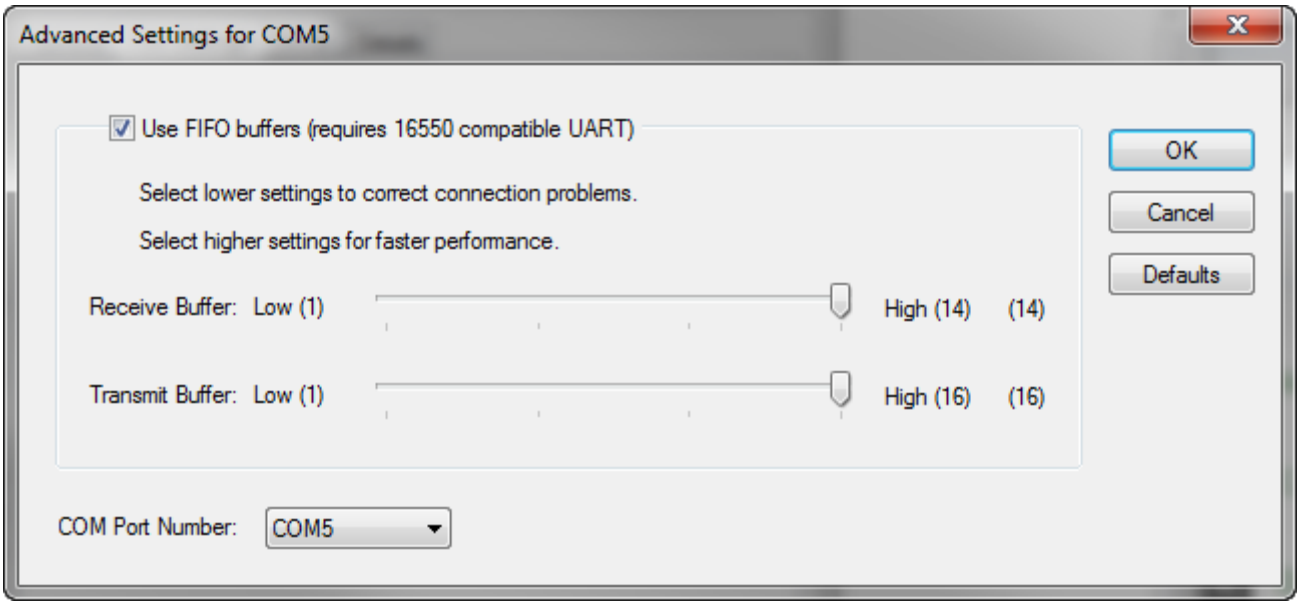
3. Expand **Ports (COM &LPT)**.
4. Right-click on the port to be change.
5. Select **Properties**.

The following window appears.



6. Select the **Port Settings** tab.
7. Click **Advanced**.

The following window appears.



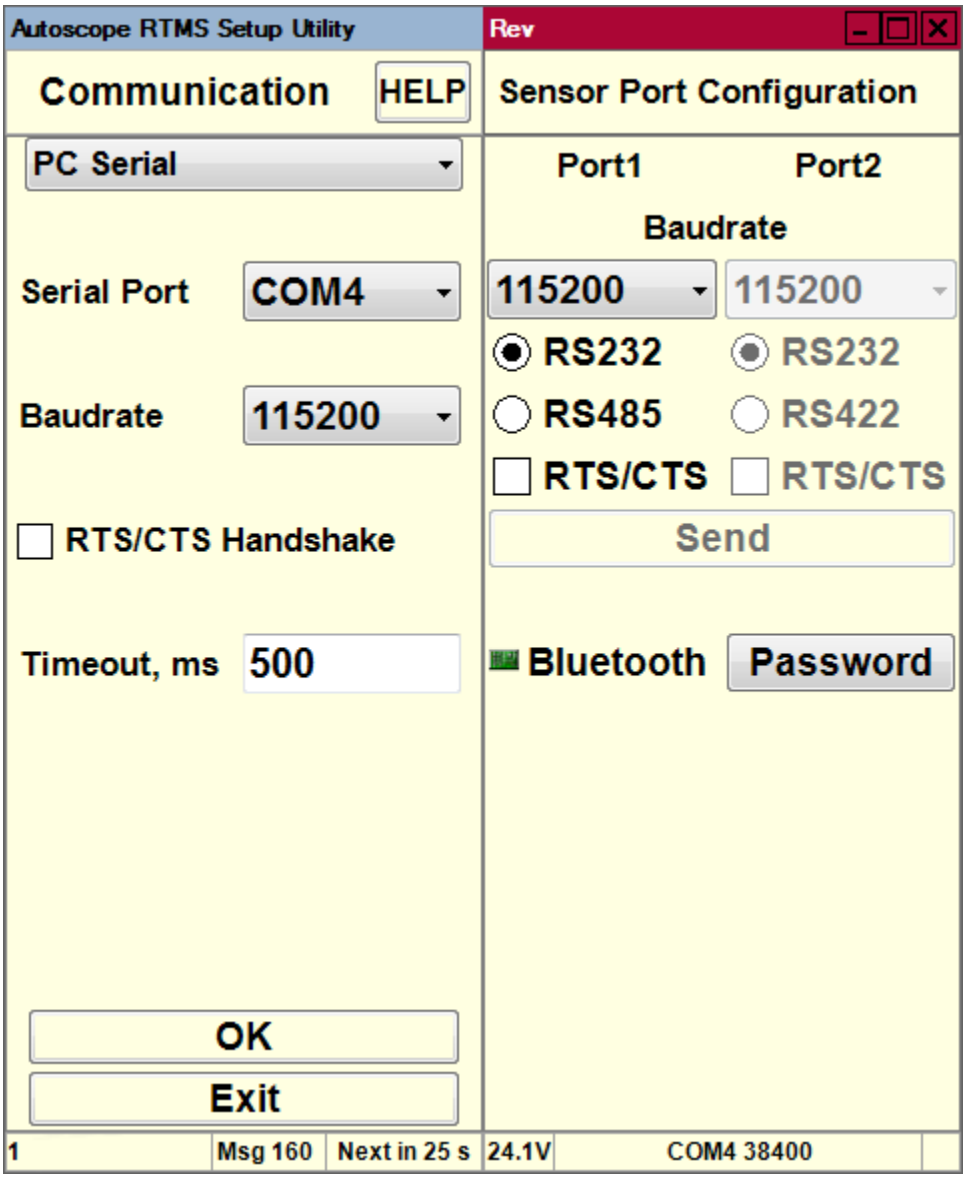
8. Use the drop-down to select the new COM port to be used.
9. Click **OK**.
10. Close the Device Manager.

Changing the Bluetooth Password/Passkey

The default password/passkey for the Autoscope RTMS Sx-300 Bluetooth connection is **admin**. If you would like to change this, use the following procedure.

1. Connect to the Autoscope RTMS Sx-300 through Direct serial connection (see "Defining a Serial Connection" on page 5-9).

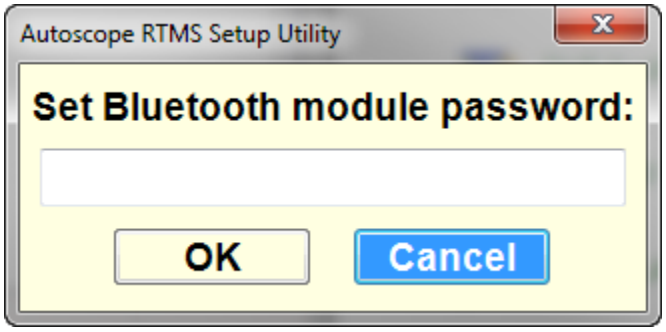
NOTE: DO NOT use the Bluetooth connection.



NOTE: Make sure the **Baudrate** is set to **115200**.

2. Click **Password**.

The following window appears.



3. Type the new password.
4. Click **OK**.

Appendix E: Speed Calibration Worksheet

General

This worksheet is used in conjunction with the speed calibration that must be run for Autoscope RTMS Sx-300 sensors.

Run the Autoscope RTMS Sx-300 setup procedure for Speed Calibration (see "Calibrate Speed" on page 4-15). Set Autoscope RTMS Sx-300 Message Period to 30 seconds. Run Speed Calibration for at least 15 minutes. Speed should be at a steady flow, and at least 50% of vehicles past the Autoscope RTMS Sx-300 should have a LIDAR reading. If you need to complete Speed Calibration with the Manual option, please note it on the worksheet.

IMPORTANT: Speed Calibration is complete when all zones are less than ±10 Km/h (±6 MPH).

An online version of the worksheet is available in the same directory as this manual, or by clicking the link in the Autoscope RTMS Sx-300 **Speed Calibration Screen** help file.

Sx-300- Speed Calibration Worksheet

Sx-300 Location ID: ______ **Page** ___ **of** ___

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1. Collect 20 vehicle speeds from each zone using LiDAR device and record speeds in the table below (LiDAR - A).
2. Calculate average speed per zone. This will be the zone reference speed. Record each reference speed in right column.
3. Use the Setup Utility to change message period to 30 seconds. Run Automatic Speed Calibration for 5 minutes using calculated reference speeds.
4. Once Automatic Speed Calibration is complete, simultaneously collect 40 additional LiDAR speeds (LiDAR - B) and 10 Sx-300 speeds per zone over a 5 minute period and record in table below.
5. Calculate average of 40 LiDAR speeds and 10 Sx-300 speeds per zone and record in right column. If difference is less than +/- 10%, Speed calibration is complete
6. If difference of LiDAR average speed and Sx-300 average speed is greater than +/- 10%, proceed to Manual Speed Calibration and adjust speeds based on difference between LiDAR and Sx-300 average.

Zone	Notes	Speed Source	Vehicle Speeds (Select One) MPH Km/h											Speed Difference (LiDAR-Sx-300)	% Difference (LiDAR-Sx-300) /LiDAR
		LIDAR - A											Ref Speed =		
		LIDAR - A													
		Post Automatic Calibration Check													
		Sx-300											Sx-300 Avg =		
		LIDAR - B											LIDAR Avg =		
		LIDAR - B													
		LIDAR - B													
		LIDAR - B													
		LIDAR - A											Ref Speed =		
		LIDAR - A													
		Post Automatic Calibration Check													
		Sx-300											Sx-300 Avg =		
		LIDAR - B											LIDAR Avg =		
		LIDAR - B													
		LIDAR - B													
		LIDAR - B													
		LIDAR - A											Ref Speed =		
		LIDAR - A													
		Post Automatic Calibration Check													
		Sx-300											Sx-300 Avg =		
		LIDAR - B											LIDAR Avg =		
		LIDAR - B													
		LIDAR - B													
		LIDAR - B													
		LIDAR - A											Ref Speed =		
		LIDAR - A													
		Post Automatic Calibration Check													
		Sx-300											Sx-300 Avg =		
		LIDAR - B											LIDAR Avg =		
		LIDAR - B													
		LIDAR - B													
		LIDAR - B													

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Glossary

ADC	(Analog to Digital Converter) A device that converts analog signals to digital signals.
AWG	(American Wire Gauge) A U.S. measurement standard of the diameter of non-ferrous wire, which includes copper and aluminum. In general, the thicker the wire, the greater the current-carrying capacity and the longer the distance it can span. The smaller the AWG number, the thicker the wire.
CB	Abbreviation for Circuit Breaker.
CC	(Contact Closure) One of the optional configurations available with Autoscope Sx-300 SSP.
CTS	(Clear to Send) A signalling message transmitted from the data communications equipment (DCE) indicating to the data terminal equipment (DTE) that it may begin data transmission.
DB	(Decibel) Used to indicate the level of acoustic waves and electronic signals.
DB9	A connector used for RS-232 connections and for several video interfaces on IBM-compatible computers.
DIN Rail	A standardized 35 mm wide metal rail with hat-shaped cross section. It is widely used for mounting circuit breakers and industrial control equipment inside equipment racks.
DSP	(Digital Signal Processing) The manipulation of analog information that has been converted to a digital form.
Dual Loop	An option that requires that all contacts share a common ground and provides eight zones of detection. This option also provides eight primary and secondary outputs that can be used to simulate the closure information that is collected from a dual loop station.
FIFO	(First In First Out) A method of organizing and manipulating data relative to time and prioritization.
Gap	The average time between the trailing edge of the previous vehicle and the leading edge of the current vehicle.
GHz	(Gigahertz) One billion cycles per second.
GND	Abbreviation for electrical ground.
Headway	The average time between the leading edge of the previous vehicle and the leading edge of the current vehicle.

High Z	In polled mode, the transmit pin is in high impedance mode.
IP	(Internet Protocol) a protocol used for communicating data across a packet-switched internetwork using the Internet Protocol Suite, also referred to as TCP/IP.
Km/h	Abbreviation for kilometers per hour.
LIDAR	(Light Detecting and Ranging) A type of radar gun.
mA	(Milliamp) One thousandth of an amp.
MB	(Megabyte) A measure of data storage equal to 1,048,576 bytes.
MPH	Abbreviation for miles per hour.
MHz	(Megahertz) One million cycles per second.
NEMA	(National Electrical Manufacturers Association) A U.S.-based association that defines standards for many commonplace electrical interconnects, as well as outlining manufacturing standards for electrical products, such as various grades of electrical enclosures.
Occupancy	The percentage of time a lane is occupied by a vehicle during the defined message period.
PTS	(Power Transient Suppressor) A device designed to react to a sudden or momentary over voltage condition.
RS-232	A series of standards for serial binary single-ended data and control signals connecting between a DTE and a DCE. It is commonly used in computer serial ports.
RS-422	A standard that specifies the characteristics of a digital signaling circuit. This type of circuit is capable of transmitting data at rates of 10 million bps and can be sent on cables as long as 1500 m (4921 ft).
RS-485	A serial interface standard in which data is sent in a differential pair (two wires or (twisted pair), which allows for greater distances and higher data rates than RS-232.
RTC	(Real Time Clock) A computer clock (often in the form of an integrated circuit) that keeps track of the current time.
RTS	(Request To Send) An RS-232 signal sent from the transmitting station to the receiving station requesting permission to transmit.
RxD	Abbreviation for received data.
Spd85	The speed at which 85 percent of the vehicles are at or below.

TCP/IP	(Transfer Control Protocol/Internet Protocol) Data transmission standard used by many computer networks including the internet.
TxD	Abbreviation for transmitted data.
USB	(Universal Serial Bus) High-speed serial communications standard.
VAC	Abbreviation for Volts Alternating Current
VDC	Abbreviation for Volts Direct Current

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