IMPORTANT SAFETY INFORMATION

READ ALL INSTRUCTIONS BEFORE USING
HEED ALL WARNINGS IN THESE INSTRUCTIONS
SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

WARNING

RTMS units must be installed and adjusted in accordance with the installation instructions contained in this manual.

Use the RTMS only for its intended purposes as described in this manual.

Changes or modifications not expressly approved by EIS Electronic Integrated Systems Inc. could void the user's authority to operate the equipment.

NOTE
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

Contact EIS

Please contact EIS with any questions or concerns about the RTMS or other EIS products, toll free at 1-800-668-9385. More information about our complete product line is available on the web at www.eistraffic.com.

Preliminary

Brief Description

The RTMS (Remote Traffic Microwave Sensor) 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.

The sensor can be mounted on road-side poles and aimed at a right angle to the road; refered to as the side-fired configuration. A single sensor can monitor traffic in up to 8 lanes. Sensors may also be mounted on overhead structures to monitor traffic in a single lane; the forward-looking configuration.

The internal processor calculates volume, occupancy and average speed as well as vehicle class by length in each lane and transmits the information using its data port. Optional contact closure outputs are also available for for compatibility with loop based systems.

For optimal accuracy, EIS strongly recommends installation of all RTMS and RTMS related products by personnel trained by EIS.

EIS also strongly recommends surveying of installation sites for all RTMS and RTMS related products by personnel trained by EIS.

For more information about our installation, surveying, and training programs, contact EIS at 1-800-668-9385.

WARNING: **Consult EIS before using the RTMS or other RTMS related products for any purpose not expressly described in this manual or any of the other RTMS product manuals. Do not use the RTMS to control or operate a gate opening mechanism. Use of the RTMS for this, or any other unauthorized purpose, may lead to serious injury.**

Scope of this Document

This user manual provides information on setup, operation and troubleshooting of the RTMS sensor model K4, and its setup employing the RTMS Setup Utility (WinRTMS) version 3.5. It is backwards compatible with all previous RTMS versions.

Revision History

Issue No.	Issue date	Reason for issue
Draft 1.0	June 2007	Initial Revison based on V6.8 firmware

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1 INCOMING INSPECTION

The RTMS shipment contains:

- The RTMS sensor with lynch pin.
- Ball-joint mounting bracket; the vertical style is shipped by default; a horizontal style is available on request.
- Connector kit consisting of :
  - MS connector, female crimp pins, backshell, and pin insertion/extraction tool
  - DB-9F connector, female crimp pins and backshell
  - RJ-45 jack, if ordered with internal TCP/IP option
- RTMS Setup Utility Software on CD.
- Antenna, if equipped with an internal DSS modem (indicated by a label).

Please notify EIS Inc. immediately if the contents are incomplete or there is physical damage.

2 RTMS OPTIONS

The standard RTMS offers the following:

- K-band (24.125 GHz) radar signaling
- Low voltage power 12-24V AC or DC
- RS-232/485/USB Serial Interface
- Integrated 8MB of internal data storage for counting applications

RTMS may be ordered with the following options:

Data Communication Options

- Secondary RS-232/485 Serial Interface
- Integrated Digital Spread Spectrum (DSS) transceiver
- Integrated CDMA or GPRS RF modem
- Integrated NTCIP 1209 Protocol Converter
- Integrated TCP/IP Ethernet Interface
- 16-zone contact closures
- Integrated Video Camera

Power options

- 115V AC

For battery-operated systems RTMS the following may be activated on request:

- Power Management Option

  Allows operating the RTMS in programmable cycles, to conserve battery power. The maximum standby period during, which RTMS draws negligible power, is 254 minutes i.e. 4 hours, 14 minutes.

- Low Voltage Disconnect Option

  Protects the battery against damaging deep discharge if the voltage falls below 11.5 V. Recommended in applications where the battery charging equipment does not offer such protection.

  Factory options are indicated by labels on the bottom of the unit.

3 RTMS INSTALLATION – SIDE FIRED CONFIGURATION

Mounting and Aiming

The distance between the close edge of the first lane of traffic to be monitored and the front of the structure on which the RTMS is mounted is referred to as set-back; it is the most important parameter in the setup and installation of an RTMS. Generally the more set-back that can be obtained, the easier the calibration will be.

Use the diagram in Figure 2 to determine the setback required to monitor a given number of lanes. Once the set-back is set, the associated height can be determined. Height is with reference to the road surface of the detection area; not the bottom of the mounting pole.

Example: For 5 lanes the minimum set-back should be 12 feet [3.7m].
A set-back of 12 feet [3.7m], requires a height of 17 feet [5.2m].

Note: It is better to be 20 feet [6 m] further back from the minimum than 2 inches [5 cm] closer than the minimum. If ground conditions allow, move the RTMS further back.

The mounting height is based on the setback. Height is selected to allow the RTMS to be aimed so that it gets maximum return signal while covering all required lanes. Mounting an RTMS at a height different from the recommended height will not improve accuracy.

Equivalent lanes include median strips, as an example, an eight lane road with a two lane wide median strip has 10 equivalent lanes.

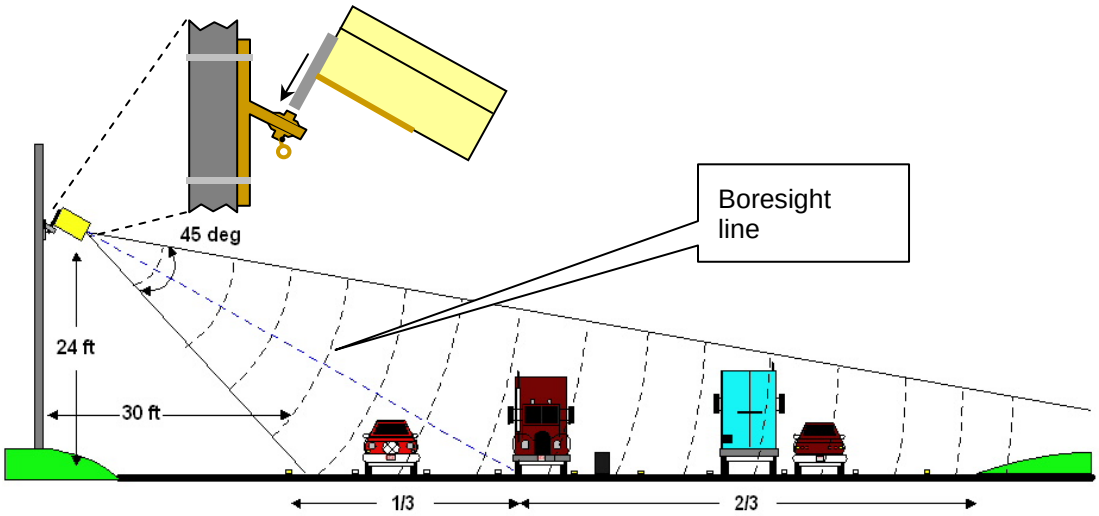


Figure 1 – RTMS Aiming

- Attach the RTMS to the roadside pole using bolts or stainless steel banding.
- Aim the RTMS as indicated on the diagram above. A 7/16” wrench is required to release/tighten the ball-joint bolt.
  - Secure the RTMS to the mounting bracket by inserting the lynch pin
  - Adjust the RTMS to be perpendicular to the travel lanes.
  - Look from behind the unit and use the top aiming fin to tilt so that the top of the RTMS is aimed to the first 1/3 of the monitored lanes.
  - Keep the RTMS level, side to side.
  - Lock the aim by tightening the ball-joint bolt.

Setback/Height diagrams

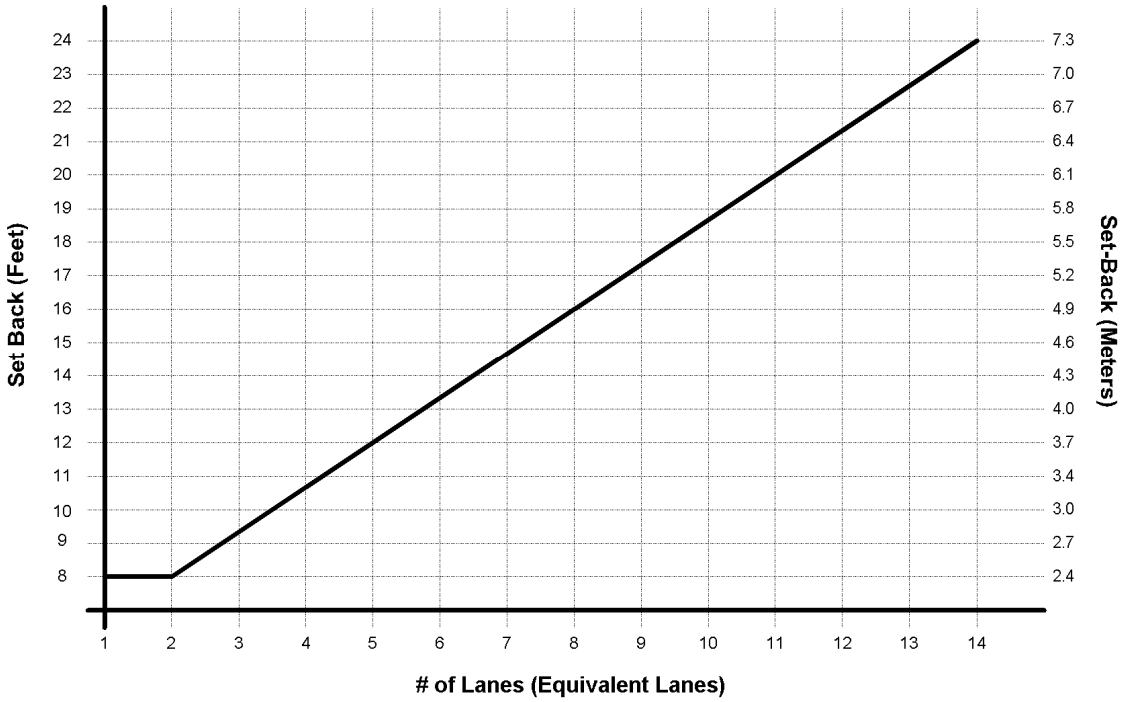


Figure 2 - Set-back Distance Chart

Equivalent lane calculation is measured from edge of first lane of detection to outside edge of the last lane of detection and dividing this number by the average lane width. 12 feet is considered typical lane width.

Example: total detection area = 120 feet; lane = 12 feet; 120/12 = 10 equivalent lanes

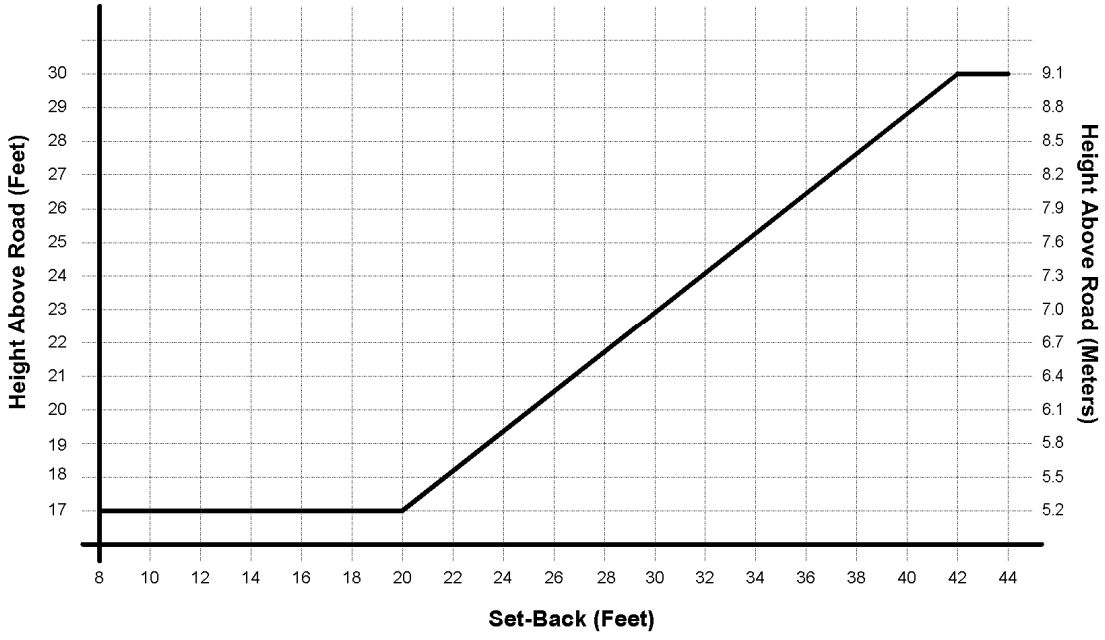


Figure 3 – Mounting Height Chart

If more room is available increase the setback as much as possible; then obtain the proper mounting height based upon actual set-back distance.

4 CABLING

Surge suppression

Although the RTMS has built-in surge suppression, it is strongly recommended that external surge suppression be installed with every detector. In situations where long cable runs are utilized, the communication and power lines of the RTMS should be equipped with external surge protecting devices on the same pole as the detector. The suppression devices should be located close to the sensor; e.g. in a cabling cabinets mounted on the pole below the RTMS. See Appendix 1 for further details on installing surge suppression.

The RTMS Cable

RTMS units use a single 32-pin MS connector for power and communications. The RTMS ships with all required connectors, crimp pins and back-shells.

The RTMS cable should be made from 20 or 22 gauge stranded wire arranged in pairs. Cables that will be exposed to outdoor conditions should be UV shielded. The number of pairs required depends on the communication options chosen:

Table 1 – Cable pairs required

Communication Options	# of Pairs
Standard RS232 or RS485 plus power	4
Standard RS232 plus power and Internal RF modem option	4
TCP/IP and RS232 or RS485, plus power	6
Zone contact option can be added to any of the above	1 per zone (max 8)

A cable such as the Belden number 95xx (xx indicates number of pairs, i.e. 9516 is a 6-pair cable) or similar should be used.

In preparing a cable note the following:

- The crimp pins are designed for stranded wire. **Do not use cable employing solid wires**.
- EIS suggests the Daniels Manufacturing Corporation crimping tool M22520/1-01 AF8 with head no. M22520/1-02 or equivalent. **Do not solder crimp pins!**
- Thread cable through the backshell before inserting pins into shell.
- Use the insertion tool (red) to insert wires with crimped pin into shell.
- Use the extraction tool (white) to remove a crimped wire to correct an error.
- It is recommended to use a cable with at least one spare pairs of wires for future growth.

Consideration needs to be made with regards to placement of an access point within view of the monitored lanes, as an example, an access panel or cabinet on the pole. This allows verification of the sensors calibration to be easily be done by seeing the RTMS data together with the actual roadway data.

MS Connector pin-out

Table 3 – MS Connector Pin Outs

Pin #	Function	Pin #	Function
A, B	Zone #1	U, W	Serial Port Signal Ground
C, D	Zone #2	X	RS-485 Tx + or Ethernet Rx + or RTS
E, F	Zone #3	Y	RS-485 Rx + or Ethernet Rx – or CTS
G, H	Zone #4	Z	Unused
J, K	Zone #5	a	USB D+
L, M	Zone #6	b	USB VBUS
N, P	Zone #7	c	USB D-
R	Zone #8	d	Ethernet Tx +
S	Zone #8	e	Ethernet Tx -
T	Serial Port Input to RTMS RS-232 Rx or RS-485 Rx -	f, g	Low Voltage power 12-24V AC or DC
V	Serial Port Output from RTMS RS-232 Tx or RS-485 Tx -	h, j	115V AC power

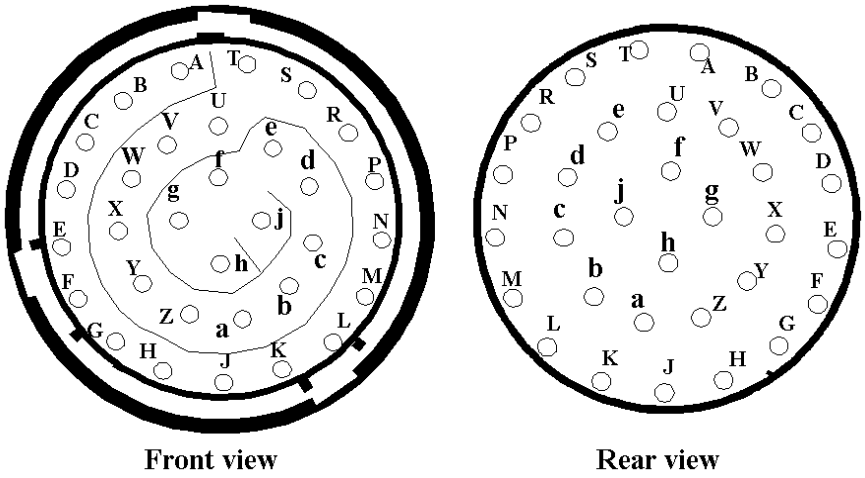


Figure 4 – MS Connector

Note: Pin labeling above is guideline only – verify pin location on actual connector before inserting wire

WARNING – The RTMS 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.

Standard RS-232 Port Wiring

The standard RTMS RS-232 port wiring consists of Transmit (Tx), Receive (Rx) and Ground lines wired to MS pins V, T and U/W respectively. The use of a female connector and wiring shown allows the use of standard serial cable for direct connection to the PC for setup purposes. Rear views of connectors are shown to assist in cable preparation. The RTMS is configured as a DCE device. Figure 5 outlines the cabling requirement.

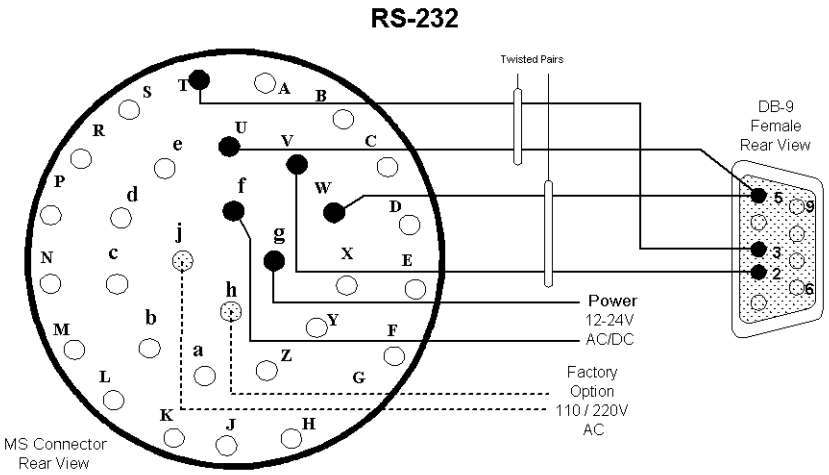


Figure 5 – RS-232 Wiring Diagram

The RS-485 Port

Over short distances the wiring diagram shown below is compatible with an RS-232 port. There is no standard pin configuration for RS-485 on a DB9 connector. The wiring diagram shown will connect directly to a RS-232 configured DB9 without the need for a RS-232/RS-485 converter.

A demarcation point is recommended to allow the RTMS to be disconnected from the transmission line without disruption of communications with other sensors on the line. See **Connecting RTMS to Communication Systems** for details.

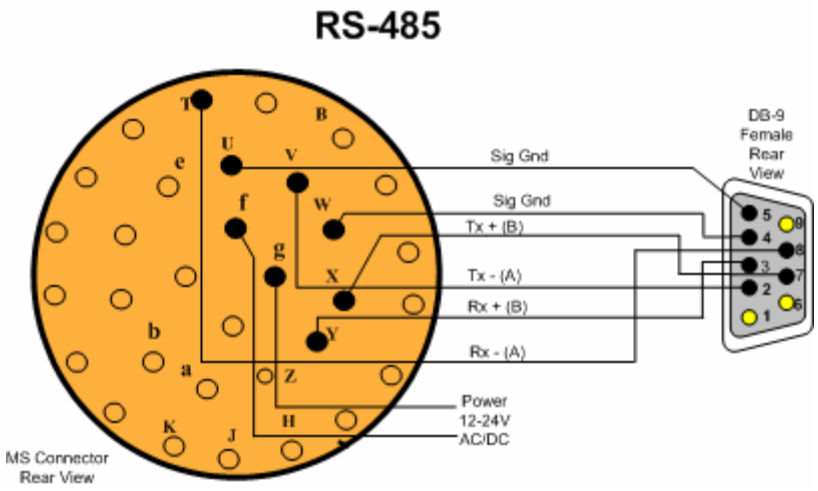


Figure 6 - RS-485 Wiring Diagram

The TCP/IP Port with RS-232

CAT5 cable must be used for lengths between 30 ft [10m] and 330 ft [100m]. Lengths greater than 330 feet are not supported for Ethernet communication.

It is recommended that both TCP/IP and RS-232 ports be brought out to their respective connectors, as shown. Only one port may be in use at a time. The RS-232 port is useful for setup and maintenance purposes.

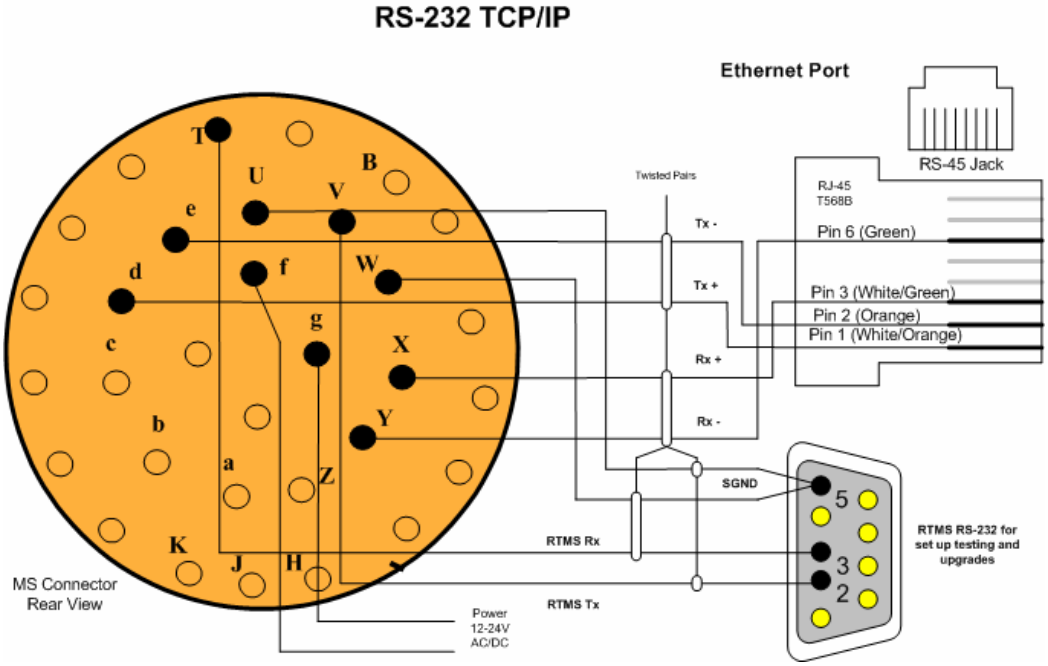


Figure 7 - TCP/IP Wiring Diagram

Note: There are no extra cabling requirements when Internal Memory is installed with a unit communicating over TCP/IP.

The TCP/IP port with RS-485

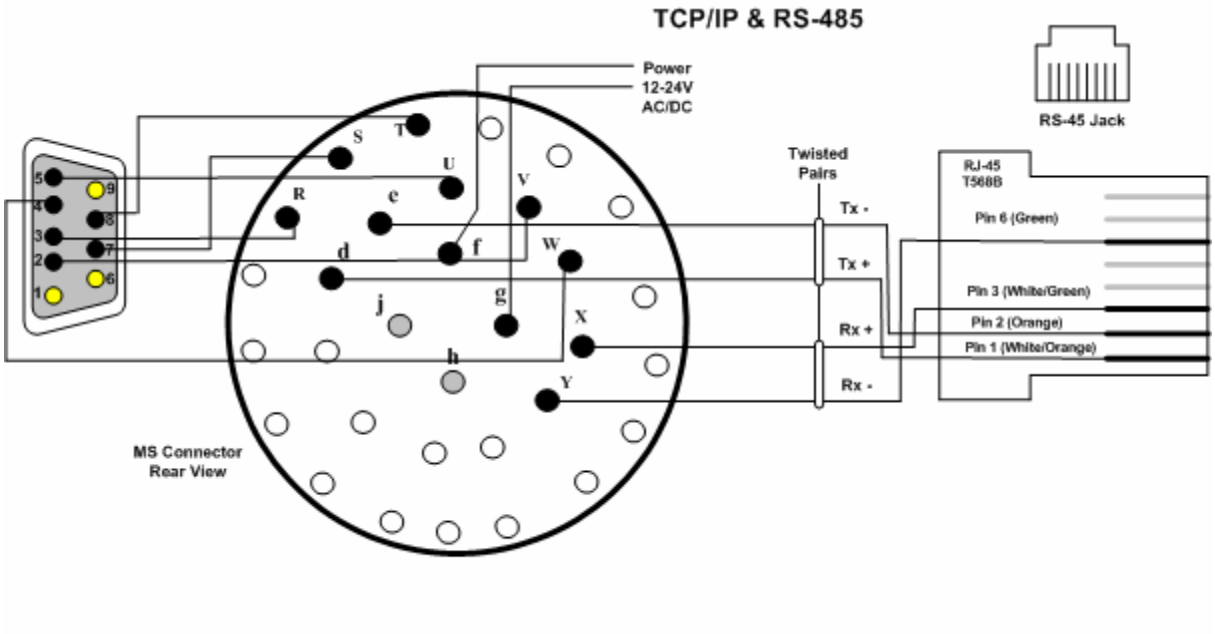


Figure 8 - TCP/IP with RS-485 Wiring Diagram

Connecting RTMS to Remote Systems

RTMS may be connected to a remote traffic data collection system over private telephone lines using modems.

Multiple RTMS units connecting to remote systems, including EIS Cluster or NEWS systems must be placed in their **Polled** mode and will require the use of modems.

Modem Cables

A cable connecting the RTMS RS-232 port to the modem's RS-232 port must provide the following:

- male connectors at both ends
- provide the functions listed below

A modem's RS-232 ports will usually employ DB9 or DB25 connectors.

Table 4 – Modem Cabling

Function	From RTMS DB9	To Modem	
		DB9	DB25
Transpose Tx and Rx	Pin 2 Pin 3	Pin 3 Pin 2	Pin 2 Pin 3
Connect Ground	Pin 5	Pin 5	Pin 7
CTS to RTMS (Internal storage only)	Pin 7	Pin 8	Pin 5
Modem side control line looping			
CTS to RTS (Standard RTMS) DCD to RTS (Internal storage option) DSR to DTR		Pin 8 to Pin 7 Pin 1 to Pin 7 Pin 6 to Pin 4	Pin 5 to Pin 4 Pin 8 to Pin 4 Pin 6 to Pin 20

Standard RTMS **RTMS with Internal Data Storage Option**

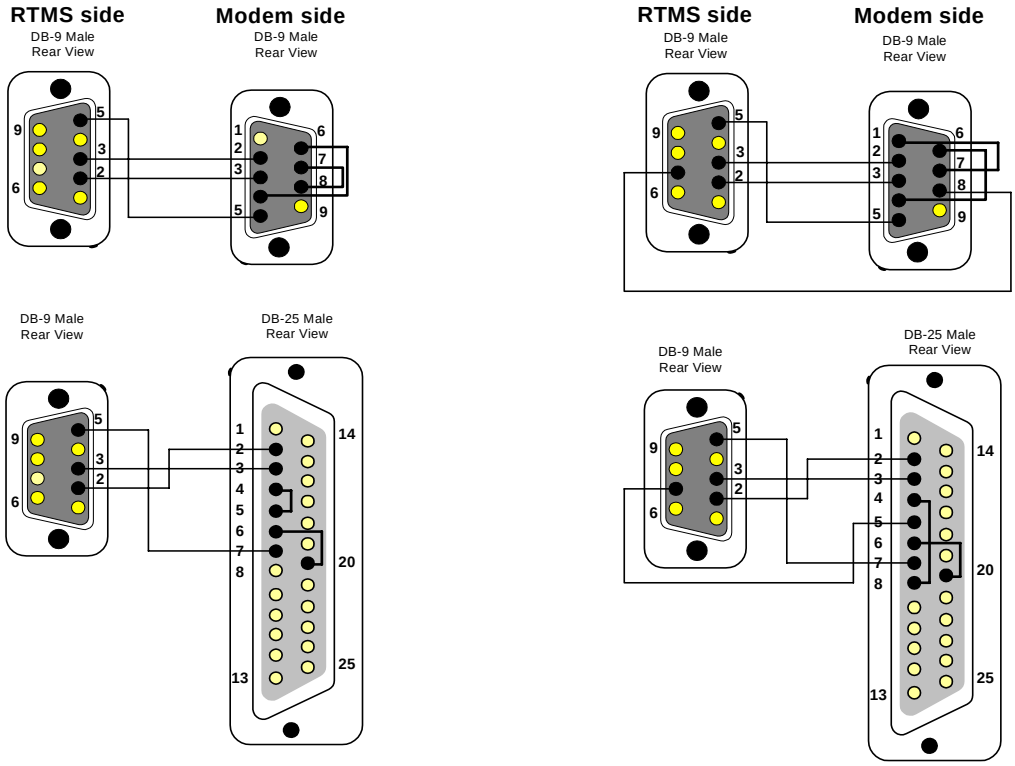


Figure 9 – RTMS to Modem connections

Modem Sharing

RTMS 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 RTMS 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 RTMS RS-232 port.

Connection Function	From RTMS DB9M	To modem	
		DB9M	DB25M
Transpose Tx and Rx	Pins 2 Pins 3	Pin 3 Pin 2	Pin 2 Pin 3
Connect Signal Ground	Pins 5	Pin 5	Pin 7
Modem side strapping			
Strap RTS to CTS		Pin 7 to Pin 8	Pin 4 to Pin 5
Strap DTR to DSR		Pin 4 to Pin 6	Pin 6 to Pin 20
Connect a 4.7KΩ resistor from Tx to ground to prevent noise		Pin 3 to Pin 5	Pin 2 to Pin 7

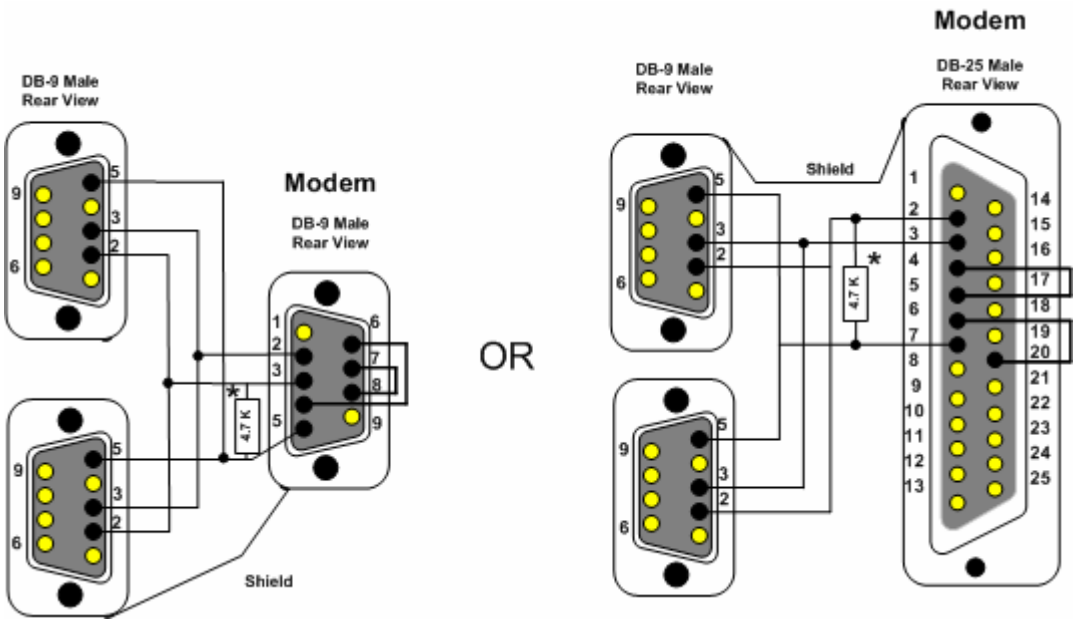


Figure 10 – Modem sharing Y cables

RS-485 Multidrop

The RS-485 Serial Port option may be employed for distances up to 4000 feet (1200m). The maximum number of units per channel is 32.

The diagram below shows the use of a 4-Wire line. The use of a half-duplex 2-Wire line is feasible but it is suitable for data collection only. Consult RS-485/422 Application Guides for details on wiring solutions for your project.

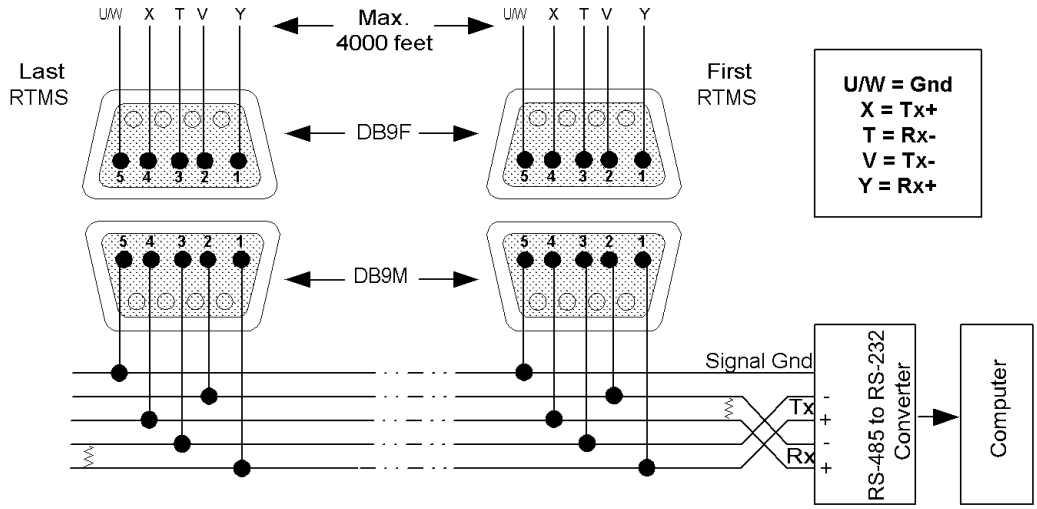


Figure 11 - RS-485 Multi-drop wiring

Notes:

1. The DB9 connectors and terminal blocks serve as a demarcation point, which allows unplugging the RTMS from the transmission line for direct connection to the laptop's COM port for setup.
2. Terminating resistors (100-120 ohms) are required at the extreme ends of the Receive and Transmit transmission pairs.
3. Transmit and receive pairs must be transposed when connecting to a DTE (PC, Data processing System). To interface with a PC a RS-485/232 converter may be required as PCs typically do not have RS-485 interfaces
4. RS-485/232 converter connector type and pin assignment are not shown as these are not standardized and vary between models.

5 SETUP OF THE RTMS

Once installed, RTMS sensors must be calibrated using the RTMS Setup Utility program running on a Microsoft Windows based PC. The PC will require a USB, serial or Ethernet port to communicate with the RTMS.

The RTMS Setup Utility (WinRtms)

The WinRTMS is supplied as a self installing program "WinRTMSInst.exe". The installer will create a folder in C:Program Files\EIS\WinRTMSV#' with the WinRTMS.exe executable program, auxiliary files and a shortcut on the desktop.

The WinRTMS program has two operating modes, **Direct** and **Multidrop.** In **Direct** mode it communicates with a single RTMS. **Multidrop** mode is used to communicate with multiple RTMS on a single communications channel.

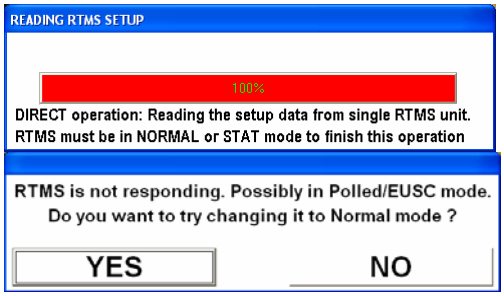
The WinRTMS buttons and menus may be operated by any of the three methods listed below. The terms select/click will be used throughout this manual to describe any of these methods

- by mouse
- by up/down/left/right keys followed by ENTER
- by keyboard shortcut (keying the underlined letter)

Getting Started

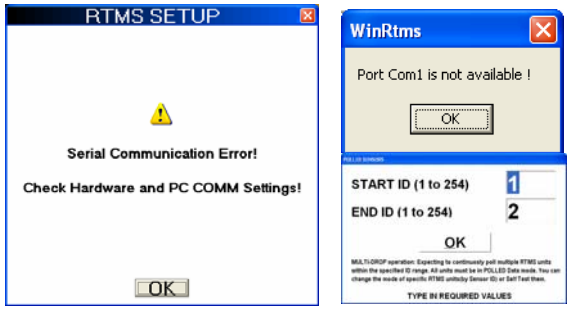
DO NOT connect the RTMS to the COM port before the PC has been powered and Windows is running! Windows may disable the COM port if it detects activity during the boot process.

- With the RTMS sensor powered and connected to the PC, click the **WinRtms.exe** icon to launch the RTMS Setup Utility program.
- While reading the RTMS' parameters, WinRTMS displays the **READING RTMS SETUP** information window. If unable to establish communications within a timeout period; dialog boxes suggesting corrective action will be displayed.
- Select **YES** to send corrective commands to the RTMS and re-attempt reading its setup.



If communication is still not established, a default main window will be displayed with "Serial Communication Error!". Possible reasons are:

- RTMS is not powered
- No connection to the PC's COM Port (e.g. cable not plugged in or is faulty, etc)
- Wrong COM port selected
- Communication of RTMS is IP
- Tx & Rx lines are crossed
- COM port is being used by another program



See the Troubleshooting Guide for additional suggestions on diagnosis.

If the default COM1 port is used by another application, the information window on the right will be displayed. If the WinRTMS program has been set to Multi-drop mode, the window with the sensor ID range will be displayed.

- In either case, click **OK** to display the default window

Changing RTMS Setup Utility COM Port and Mode

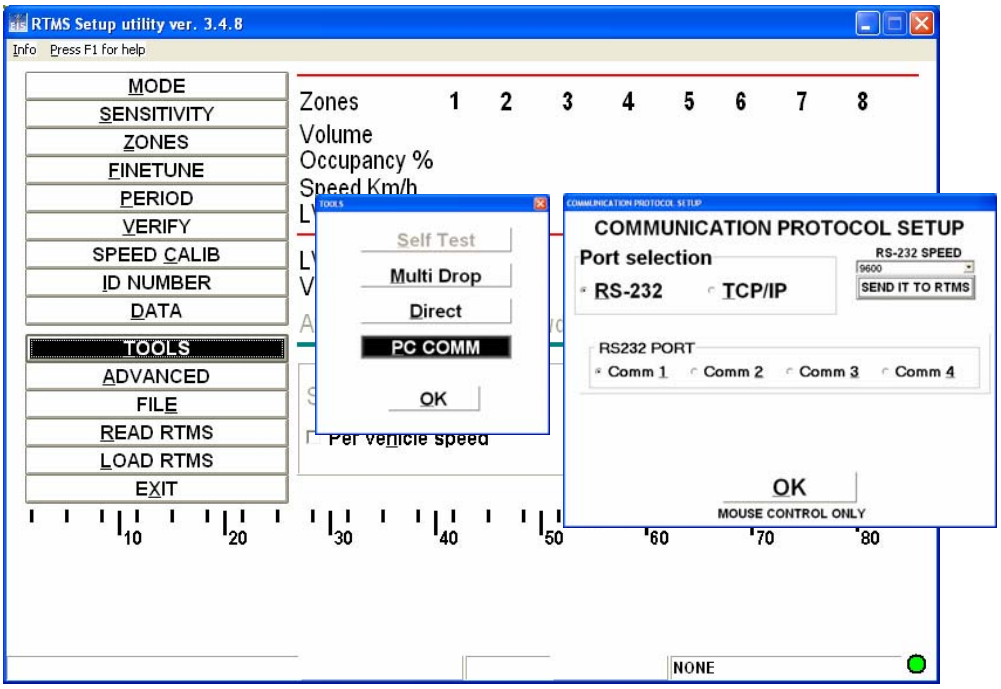


Figure 12 - Changing RTMS Communication

Changing WinRTMS Mode

- Select **TOOLS**
- Select **Direct** or **Multi Drop**, as applicable
- Click **OK**

Selecting a different COM Port

- Select **TOOLS** and **PC COMM**
- Select a different COM Port in the **COMMUNICATION PROTOCOL SETUP** window
- Click **OK**

Once communication with the RTMS is established and the sensor has responded to the READ command, the current RTMS settings are displayed in the menu button column and the COMM indicator at the bottom right of the window flashes. The RTMS is now ready to be calibrated.

Changing Serial Port Speed

Default communication speed is 9600 bits per second (bps) for serial units, and 19200 bps for Ethernet based units (internal serial to IP connection); other speeds can be selected from the drop down menu if required. RTMS with internal DSS radios have the communications rate fixed at 115200 bps.

- Open **TOOLS - PCCOMM - COMMUNICATION PROTOCOL SETUP** window
- Select another speed from the pull-down menu
- Click **SEND IT TO RTMS**

Data rates below 9600 are useful where high quality transmission lines are not available. They are however, unsuitable for setup and must be selected after setup has been completed. When using data rates below 9600 bps, the RTMS data mode must be set to **STAT** to reduce the amount of data and prevent communication problems. See **DATA MODE** for further details.

Setting DSS Parameters (if equipped)

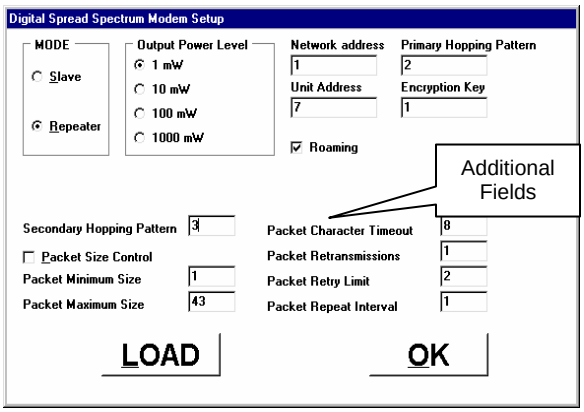
RTMS DSS units are set to communicate at 115200 bps; the speed is not selectable. DSS units will display a DSS box at the bottom right of the WinRTMS window; this box will display green if a connection is present with the master radio, if no connection is available, the box will display red. A DSS button also appears in the **Communication Protocol Setup** Window.

RTMS DSS units are shipped with all of the basic radio parameters set to 1, unless other arrangements have been made with EIS. These parameters must be changed to match those of the master radio modem that the units will be communicating with.

Proceed as follows:

- Select **TOOLS** then **PC COMM**
- Click **DSS Modem** button.

The Digital Spread Spectrum Modem Setup window will open.



- Ensure that the settings are as follows:

Mode = Slave — For simple line of sight communication

or

Mode = Repeater — Where the RTMS DSS relays data from other DSS modems and acts as a master for these modems.

Roaming =Always on. — This feature allows slaves or repeaters to locate a master by the network address and encryption key and adopt its primary hopping pattern.

- Enter the Master's Network, Address, and Encryption codes.
- Enter **Unit Address:** This parameter must be unique for each slave.

It is mandatory to make **Unit Address = RTMS Sensor ID.**

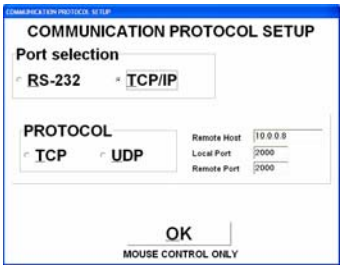
- **Output Power Level** – is determined based upon the Radio Site Survey. Strength of signal is important to ensure data quality. If power setting is too high it may interfere with other radio systems in the area, if it is too low the data messages may be missed.
- Enter the additional parameters if the DSS is set as a repeater.
- Click **LOAD** to send displayed settings to the RTMS.
- Click **OK** to exit without change.

The DSS box will turn green when communication with a master modem is established.

The master DSS communicating with the RTMS slave or repeater must be of the same type and frequency band. All units supplied on the same order will be of the same type and frequency. Refer to the manufacturers' documentation and instructions for setup of the master DSS parameters.

IP Address (if equipped)

For ease of setup/maintenance, it is suggested to wire of the RS-232 interface as recommended in Section 4 – RTMS Cable-TCP/IP. WinRTMS may be used to communicate with an RTMS via the Internet to view/change its setup. Proceed as follows:



- Select Tools/PC Comm/Communication Protocol Setup
- Click **TCP/IP**
- Enter the RTMS IP address in **Remote Host** box
- Set Protocol = TCP, Local Port=2000 and Remote Port=2000.
- Click **OK** to close the window

The WinRTMS stores the entered IP address in its internal files, ready to establish a link with the stored IP address on subsequent opening. To access another RTMS, repeat the above process and enter a new IP address.

The internal RTMS IP server is programmed with a default TCP/IP address of **128.100.101.254**. Use the procedure below to change it to the required address.

Default IP address is 128.100.101.254

Preparing the PC

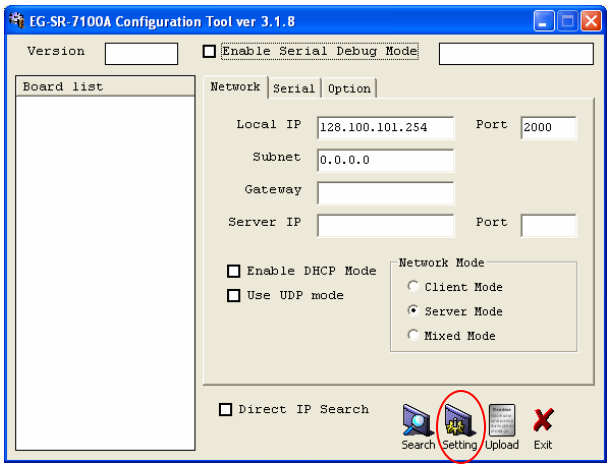
Configure the PC for static IP operation in the following steps (assumes Windows XP Operating System)

- Access the Control Panel. Open **Network Connections**.
- Right-click Local Area Connections and open Properties.
- From the list of installed network components select and open **Internet Protocol (TCP/IP)**.
- Click Properties and select Use Following IP Address.
- Enter 128.100.101.1 and Subnet = 255.255.0.0. Click **OK** and **Close.**

Programming the RTMS IP address

- Connect RTMS to the PC. The PC's Network Port Link and Activity indicator lights should light. Use a crossover cable if communication was not established
- Open the supplied EG-SR-7100A Configuration Tool program
- With the **Network** tab open, click **Search**.

After communication with the internal EG-SR-7100A Gateway Module is established, the program will display the MAC address of the unit in the **Board list** area and the default settings of the board.



- Local IP = 128.100.101.254
- Port = 2000
- Subnet = 0.0.0.0
- Gateway = blank
- Server IP & Port = blank
- Network Mode = Server Mode
- Enable DHCP mode = disabled
- Use UDP mode = disabled
- Direct IP search = disabled

- Enter new IP address
- Edit Port #, and subnet, if applicable
- Leave all other areas unedited
- Click **Setting** to save and **Exit** to close program

WARNING: **DO NOT** open and make changes to settings under the **Serial** tab

Detection Zone setup

The RTMS Setup Utility shows the position of vehicles by the red target "blips" against the distance scale

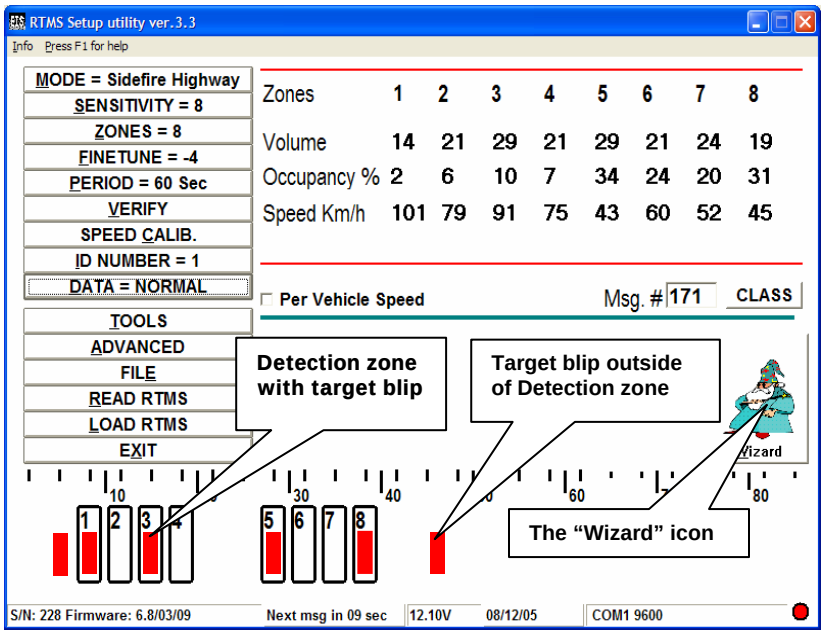


Figure 13 - RTMS Setup Utility main screen

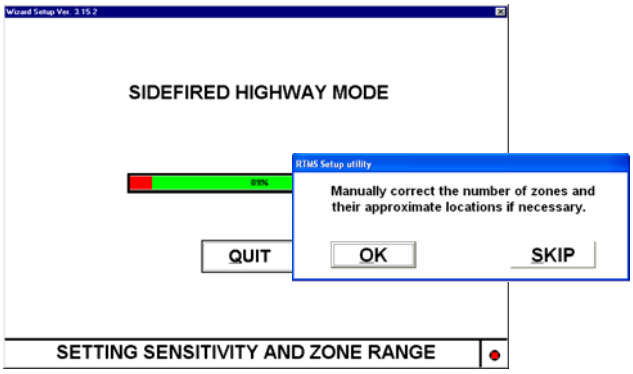
Up to 8 detection zones may be defined by positioning the rectangular zone icons where the target blips are seen. The zone's contact closure circuit is closed while vehicles are present in the detection zones.

Automated Detection Zone Setup (Wizard)

The automated zone setup process requires free flowing traffic in all lanes of interest. It scans the range of the RTMS microwave beam and positions up to 8 detection zones where vehicles are detected. The process differentiates between vehicles and barriers.

Proceed as follows:

- Verify that target blips are observed in all lanes of interest. Adjust aiming if necessary.
- Click the **Wizard** icon.
- Select the RTMS operating mode



The Wizard will proceed to set sensitivity; and position detection zones where vehicles are detected.

The process will assign consecutive zone numbers with Zone 1 closest to the sensor. The resulting zone setup is presented for approval.

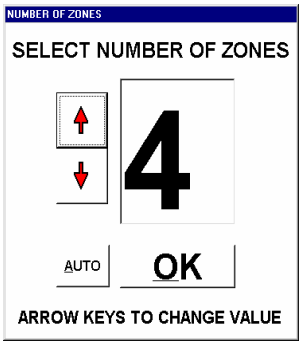
- Click **SKIP** if allocated zones are acceptable and no changes are required.
- Click **OK** if changes are required, e.g. to select fewer zones, exclude ramps, etc.

After selecting the required lanes, the Wizard will continue the automatic setup with Fine Tune adjustments and a final Zone Setup unless terminated by clicking **Quit**. On completion, control will return to the main window.

Manual Zone Setup - Side-Fired

- Select **ZONES**; the **NUMBER OF ZONES** window will open.
- Use up/down keys or the window arrows to select the number of zones required.
- Click **AUTO** to initiate automated location of selected number of zones,

  or
- Click **OK** or press **ENTER**; the **ZONES SETUP** window will open.
- Type the zone number. It will be highlighted and its icon (rectangle) on the main window will flash.
- Use left/right keys or on-screen position arrows to move the flashing zone to the desired position. Repeat process for each of the zones configured.
- Exit **ZONES SETUP** when finished.



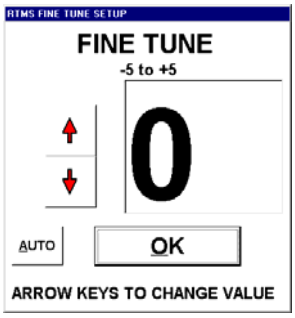
Fine Tune Adjustment

"Splashing" is defined as a single vehicle that shows more than one target blip in adjacent detection zones. This can occur when the zones' positions do not line up with the lanes.

To reduce splashing the **FINE TUNE** control is used to obtain a better position of the detection zones with respect to the lanes.

The **FINE TUNE** window includes the **AUTO** button, which activates the automated procedure.

- Select fine tune.
- Select **AUTO** or use the manual procedure, described below.
- The AUTO feature will fine tune the zones selected. Active traffic needs to be in all lanes to ensure proper operation. Auto must be used with free flow traffic; not in congested conditions.



Manual Fine Tuning

- For manual Fine Tune setup, start with a setting of "0".

  Observe the incidence of splashes and determine whether the Fine Tune number should be increased or decreased. To reduce splashing into a closer zone, increase the Fine Tune number; in a farther zone, decrease the Fine Tune.
- Use the arrows in the window or the up/down arrow keys.

A change in Fine tune setting needs a few seconds to take effect and the display will turn gray while it is being processed.

Detection Zone Size

In some applications it may be useful to define detection zones that are wider than the default size. The contact closure output will close if a vehicle is present anywhere in the enlarged zone. To define a larger detection zone, do the following:

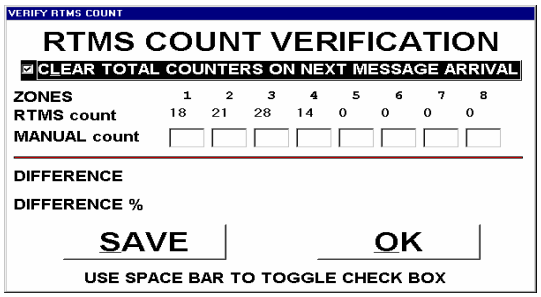
- Open the **ZONE SETUP** window.
- Highlight a zone.
- Use up/down keys or on-screen size arrows to increase/decrease its size.

Count Verification

To verify the zone setup, compare RTMS volume measurements over a period of time to a manual count for the same interval. Use of a hand-held tally counter is recommended.

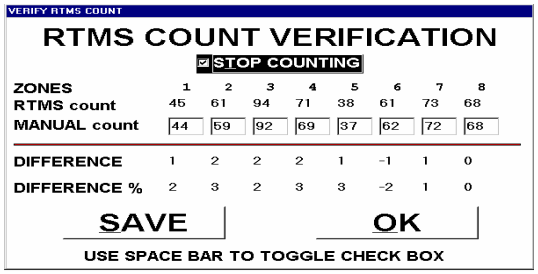
The WinRTMS program's Count Verification procedure is an aid for comparing RTMS counts in each detection zone to observer's counts over the same interval. Perform the following steps:

- Select **PERIOD** and set it to 30 seconds.
- Select **VERIFY** button. The **RTMS COUNT VERIFICATION** window opens.
- Tap the Space bar. A checkmark will appear in the **CLEAR TOTAL COUNTERS** box. Get ready to start counting.



At the end of the current message period the window background blinks, the PC beeps and the RTMS count line is cleared, signaling the precise time to start the count.

- Select a lane and count vehicles as they cross the RTMS beam. Several observers may be enlisted in the process, each counting traffic in one lane.



The **RTMS COUNT** for each zone will be updated at the end of each message period. Continue counting until each lane has a count of at least 50 vehicles; this will usually take several message periods. Stop counting at the end of the next message period.

- Tap the space bar.

The **STOP COUNTING** box will replace the Clear Counters box and the RTMS Count will be frozen.

- Highlight a **Manual count** box and enter the manual count for the zone in the corresponding box. For the Forward-looking mode count verification is applicable to zone 1 only.

The difference between the RTMS and the manual counts in absolute and percent deviation terms is displayed. Deviation of more than 5% requires zone setup correction to improve detection accuracy. The verification process should then be repeated.

- To repeat the process, tap the space bar until the window displays the **CLEAR TOTAL COUNTERS** box
- To save the results of verification in a text file select **SAVE**. Use normal Windows procedures to name and save the file using the **Save As** dialog box
- To exit to the main screen, select **OK**

Speed Calibration

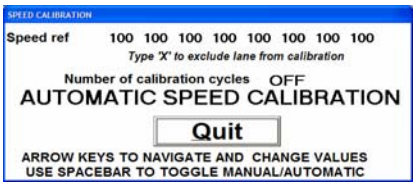
The speed calibration process sets the internal speed coefficients used to calculate the average speed of traffic in each zone. The calibration procedure used depends on traffic conditions.

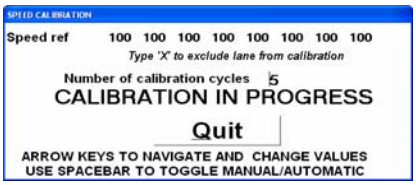
- **Automatic Speed Calibration** is intended for use with high-volume traffic, flowing at stable speeds. It requires per-lane reference speeds, which may be estimated or measured (e.g. by a radar gun) and setting the number of calibration cycles (message periods). A minimum of 5 cycles is recommended. The speed coefficients will not update if there are less than 8 vehicles detected per message period. Increase the message period if the number of vehicles is less than 8 vehicles per period.
- **Manual Speed Calibration** is intended for very low-volume traffic (e.g. volume less than 5 per minute).

  Here the coefficients are directly changed to bring the calculated speed closer to the estimated speed.

Note: When setting up relocated units in their new locations, all speed coefficients should be first reset to their default values using the Manual Speed Calibration window.

Side-fired Automatic Speed Calibration



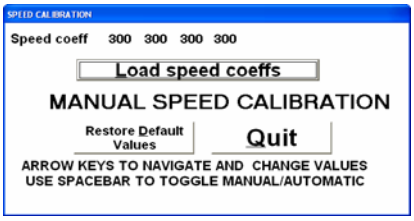


- Select **SPEED CALIB** to open the window.
- Use the left/right keys to highlight the **Speed references** for each zone, **Number of calibration cycles** or the **Quit** button.
- Use up/down keys to set the desired reference speed in the highlighted zone box. Enter "X" to exclude zone from the calibration process.
- Enter the number of calibration cycles by using the up arrow key to increase it in multiples of 5. **CALIBRATION IN PROGRESS** will flash.

At the end of each message period, the WinRTMS adjusts the coefficients values of all active zones to converge the measured speeds to the reference speeds.

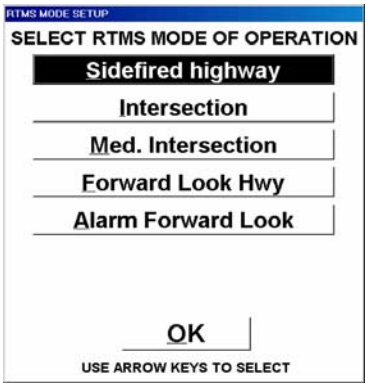
- To verify that the Automatic Speed Calibration was successful for all lanes, review the speed data over multiple message periods to see if the average reported speed is within 10% of actual.
- If the difference is more than 10% a manual adjustment should be made. See Manual Speed Calibration below.
- Select **Quit** to exit.

Side-fired Manual Speed Calibration



- Select **SPEED CALIB** button and tap the space bar to open the **Manual Speed Calibration** window. Zone boxes will show the current coefficients. Select **Restore Default Values** to restore defaults, if required.
- Compare the displayed speed measurement to your estimated average speed in each lane.
- Use **l**eft/right keys to select zone and up/down keys to adjust coefficients proportionately to the required change; as an example, if speed readings are 10% too low, increase that lane's coefficient value by 10%, if 10% too high then decrease by same percentage.
- Select **Load speed coeffs** to update all RTMS coefficients to the displayed values. Observe the effect on average speed measurements displayed on the screen.
- Select **Quit** to exit

RTMS Operating Modes - Details



- Select **MODE.** The **RTMS MODE SETUP** window will be displayed.
- Choose the required mode for your application. See description below.

Re-selecting a Mode of Operation will reset the Threshold and EDT to default settings.

MODE	Application	Default settings Refer to **Advanced Parameters** for changes to settings	
		Threshold	**EDT**
Sidefired Highway	For use in highway and counting applications. Not for use at intersections. The sensor detects presence and generates traffic data in up to 8 zones.	Normal	200ms
Intersection	For use in stop-bar detection The sensors detect presence in multiple zones. Traffic data is not generated.	Low	1000ms
Mid. Intersection	For use in mid-block applications. Similar to Sidefired Highway mode; this mode is optimized for detection in urban settings.	Medium	200ms
Forward Look Hwy	For applications demanding high accuracy speed measurements. Zones 1, 2 and 3 are set as a speed trap for accurate speed measurements. Per vehicle Doppler-based speed measurement is made when speeds exceed 15Km/h (10MPH). Volume counts in up to 7 speed-bins are available.	Normal	200ms
Alarm Forward Look	Adds programmable speed threshold and closes contact #8 for 20ms when a vehicle exceeds that threshold. Intended for use in speed enforcement and warning applications. Window for setup of threshold is displayed when this mode is selected.	Normal	200ms

6 RTMS STATISTICAL TRAFFIC DATA

Side-Fired, Mid-Intersection and the two Forward looking modes generate statistical traffic data collected over the selected "Message Period". The data is displayed in the upper right area of the RTMS Setup Utility main window and transmitted over the data port. The measurements consist of:

- Total Volume
- Occupancy - available as integer (default) or one decimal place resolution
- Average Speed
- Volume in Length Classes - applies to the Side-Fired mode only. Up to 6 length classes are available. Headway measurement may be requested to replace the Long Vehicle 1 measurement.
- Per vehicle speed
- Speed Bins - applicable to Forward Looking Mode only

Transmitted data consists of a base set of 4 messages, Long Vehicle Volume, Volume, Occupancy and Speed; plus any additional data selected for transmission.

The standard message in Hex file format as transmitted by the RTMS is:

FF1B09000000100000000FDFE
FF10090303080B00000000061F
FF1109020205060000000000110
FF120B4E6D6B80F0F0F0F000F03086

Information on the RTMS protocol is available on request from EIS.

Message Period

Message period is the time interval on which traffic data is reported. Message periods are selectable in 10 second increments. Firmware version 6.8 and higher has a message period range from 10 to 900 seconds. Earlier firmware versions have a range from 10 to 600 seconds.

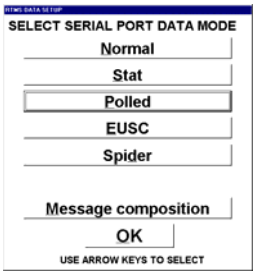
Use 30 second message periods for setup functions. A 300 second message period is suggested for counting applications. Real-time applications will generally use message periods that are one minute or less.

- Select **PERIOD**. Use the up/down keys or arrows to set the required value.
- Click **OK**, or press **ENTER**. The new period will start after a delay of three seconds and message numbering will be reset to 0.

Vehicle Classification

Setting the RTMS for vehicle classification (side-fired mode only) is a two stage process:

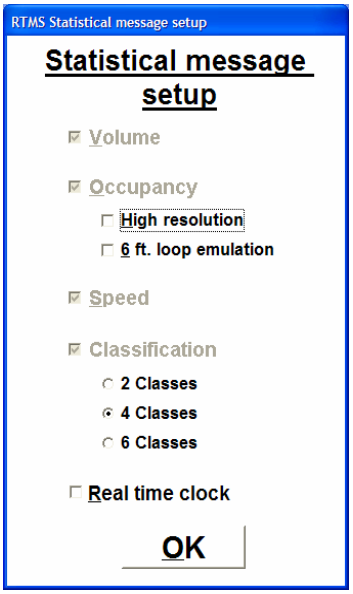
1. Defining the number of classes.
2. Defining the class boundaries.



Setting the number of vehicle classes

- Select DATA mode then Message composition.

The **Statistical message setup** window will open.



- Select 2, 4 or 6 classes

  2 Classes (default) provides the reporting of long vehicle volumes only.

  Transmitted data will consist of 4 messages: (long vehicle volume, volume, occupancy and speed).

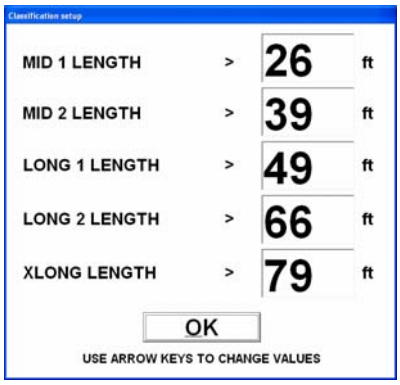
  4 Classes adds Mid and XLong messages

  6 Classes adds Mid2 and Long2 messages

- After completing selections in this window, open the **ADVANCED** menu**,** select **CLASSIFICATION** and define the classes selected.

The length of cars is pre-set, only vehicles longer than cars can have lengths defined. Only the length classifications that were chosen in the classification menu will show on this screen.

For best results, ensure that length differences are greater than 3m [10 feet] between size classifications. The closer the separation the greater the potential “merging” of classes.



Class Measurements Display

The display of volumes in defined vehicle classes is available by clicking the **CLASS** button. This opens the **Volume and Classification** window, shown below.

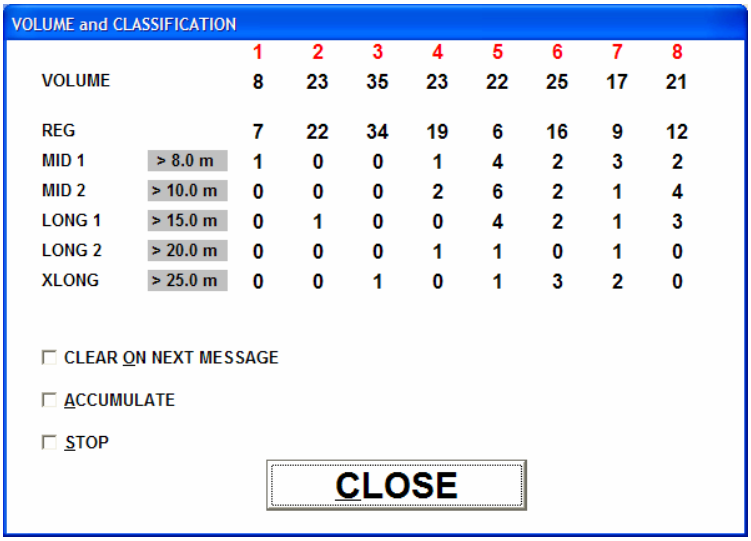


Figure 14 - RTMS Utility Verification Screen

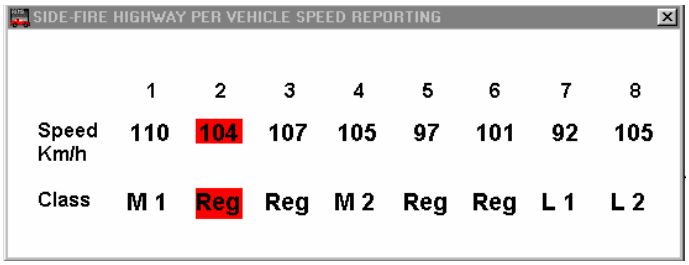
The **CLEAR ON NEXT MESSAGE**, **ACCUMULATE** and **STOP** boxes are provided as aids to verify the vehicle counts in configured classes, similar to the volume count verification procedure.

- Click **CLEAR ON NEXT MESSAGE** to clear all counts
- Click **ACCUMULATE** to start accumulation of counts over several message periods
- Click **STOP** at the end of a message period after sufficient numbers of vehicles have accumulated.
- Compare manual counts to the RTMS counts.
- Modify class length limits to achieve best correspondence to desired vehicle classification (see **Advanced Parameters/Classification** in the next section).
- Use the **Side-fired Highway Per Vehicle Reporting** real time display (shown below) to verify that Class limits provide required discrimination between vehicle types.

Per Vehicle Speed Display

The per vehicle speed selection box is located below the statistical data area.

When selected, an additional window will open showing the speed of each vehicle and its class.

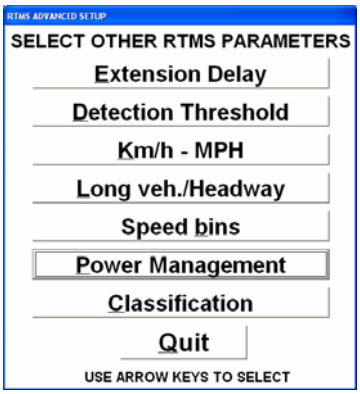


The display is highlighted in red while a vehicle transits the detection zone. The data is displayed until overwritten with the data from the next vehicle.

The RTMS will send this data over its communication port in real-time along with the Statistical Data at the end of each message period.

In forward looking mode the Per Vehicle Speed is displayed in the main window.

Advanced Parameters



- Select **ADVANCED** to display the menu of RTMS parameters described below.

The number of displayed functions depends on the RTMS model and firmware version. The window shown at right is for RTMS X3/K3 models. Parameters are set or edited as follows:

- Select the desired parameter and follow instructions below for that parameter.

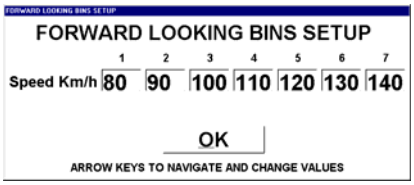
Parameter	**Description**
	Extension Delay window; allows the user to change the default value. • Highlight the EDT value (Click or use left/right keys). • Overwrite or use up/down keys to change value. • This parameter should not need to be changed from its default value.
Detection Threshold 	Allows the user to change the default value. Lowering thresholds effectively increases the sensitivity. Changes made will take up to 5 seconds to take effect. • Select **Normal, Medium** or **Low** and return to main window. • Select **OK** to return to main window without changes. • This parameter should not need to be changed from it's default value.
Km/h – MPH 	The speed data reported by the RTMS is always in km/h. If MPH is selected, the WinRTMS program will report the speed from in MPH. Current setting is shown in the Traffic data area. • Select required units. • Select **OK** to return to main window without changes.
Long Veh./Headway 	This parameter applies to the Sidefired Highway Mode only. Headway is the average time/gap between vehicles measured in units of 0.1seconds. • Select either **Long Vehicles**, or **Headway**, as required, and return to main window. • Select **OK** to exit without changes.

Parameter	Description

Speed bins

See **Additional Forward Looking Measurements Definitions**

- Use LEFT/RIGHT keys or click to highlight a bin.
- Use UP/DOWN keys to set the bin's upper speed limit.
- The upper limit setting of a bin automatically defines the lower limit of the next bin. To reset previous settings, reduce each bin to minimum and set to desired level.
- Key **ENTER** or click **OK** to confirm when all required values are displayed and return to main window.



Power Management

Allows RTMS powered by batteries to be operated in cycles to conserve battery power. This is a factory option.

Two parameters are defined:

- **Number of cycles on** (Message Periods, range 1-254)

Defines the number of Message periods the sensor operates. It will go into standby 1-second after the last period. Time on depends on the length of the Message Period. Set the above as desired.

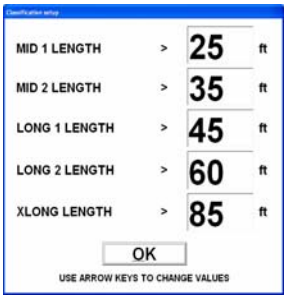
Set either or both to 0 or 255 to turn **Power Management** off.

- **Standby in minutes** (Range 1 to 254).

Defines the number of minutes the sensor is in standby and draws minimal power. Maximum time off is 4 hours 14 minutes.

- Click **OK** or press **Enter** to accept settings as displayed and return to main window.

Classification



Allows the user to set the lower limit for classes other than "Regular". The number of classes displayed is selected in the **Statistical Message Setup** window (opened via **Data/Normal/Message Composition**).

Shown is the window displayed when 6 classes are selected (firmware 6.8 and up). Displayed units (feet/meters) correspond to the km/h – MPH setting.

- Use **LEFT/RIGHT** keys to highlight a class.
- Use **UP/DOWN** keys to adjust its lower length limit.
- Click **OK** or press **Enter** to accept settings as displayed and return to main window.

Note 1: For RTMS with firmware below 6.8, classes are defined in terms of a vehicle length multiplier rather than length.

Note 2: Long 1 measurement will not be available if headway is selected (see above) or if the message period is greater than 300 seconds.

Real Time Clock Change

The RTMS' Real Time Clock may require adjustment for any of the following:

- To correct RTMS clock due to time zone change.
- To perform seasonal changeover between Standard and Daylight Saving Time.
- To correct accumulated drift between RTMS clock and the traffic management centre's clock.

The WinRTMS will copy the PC's clock setting to the RTMS on selecting **LOAD RTMS.** Ensure the PC's clock is correct before connecting to an RTMS.

Data Recording

WinRTMS can record RTMS data to a text file on the PC's disk.

- To initiate data recording select **File** then **Record Data to File**. A Save As dialog box will open for folder selection and file naming.
- Select folder to store the file (default folder is the location of the WinRTMS program) and name it. The suggested name should identify the RTMS and date of creation. The **RECORDING DATA** window shows that recording is in progress.
- Click the **STOP** button to stop recording.

The data file will have extension .asc. The file will contain all parameters that have been selected Speed units are identified in the header.

Eight columns are always generated. Volumes in unassigned zones is always report 0 and speeds will always report "?". The file also provides a voltage reading and a diagnostic indicator in every message. Fig. 17 shows a sample file generated by RTMS with Rev 6.8 and 6 classes reporting.

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

10 04 2007 15:03:17
MESSAGE NO. 78        VOLUME:   2   3   9   4   0   0   0   0
                  MID SIZE 1:   0   0   2   0   0   0   0   0
                  MID SIZE 2:   1   0   0   0   0   0   0   0
                    LONG VEH:   0   0   0   0   0   0   0   0
                  LONG VEH 2:   0   0   0   0   0   0   0   0
                   XLONG VEH:   0   0   0   0   0   0   0   0
STATION ID. 1      OCCUPANCY:   2   1   5   2   0   0   0   0
FWDLK SPEED ?   SIDEFRD SPD:   57  57  62  66  ?   ?   ?   ?              Dir. 0 V. 250 H. 48

10 04 2007 15:03:47
MESSAGE NO. 79        VOLUME:   0   3   11  12  0   0   0   0
                  MID SIZE 1:   0   0   0   1   0   0   0   0
                  MID SIZE 2:   0   0   0   0   0   0   0   0
                    LONG VEH:   0   0   0   0   0   0   0   0
                  LONG VEH 2:   0   0   0   0   0   0   0   0
                   XLONG VEH:   0   0   0   0   0   0   0   0
STATION ID. 1      OCCUPANCY:   0   1   5   6   0   0   0   0
FWDLK SPEED ?   SIDEFRD SPD:   ?   58  62  73  ?   ?   ?   ?              Dir. 0 V. 249 H. 48
```

Figure 15 – Sample RTMS data file

Note The volume measurement represents total number of vehicles. Regular vehicle volumes (cars), displayed in the **Volume and Classification** window are not shown in the asc files. If the message period is greater than 300 seconds, the long vehicle message is replaced with the most significant byte of the volume. The volume measurement under these conditions is LONG VEH * 255 + Volume.

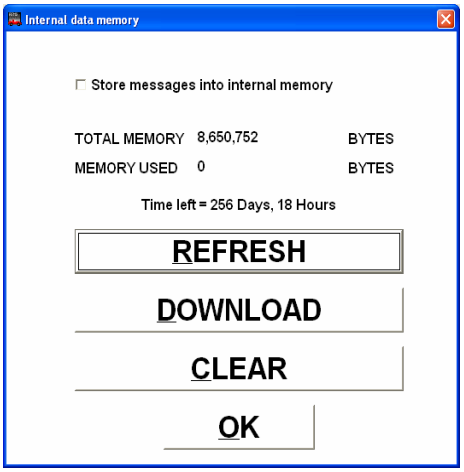
If per vehicle speed measurements are selected, this data is presented in the .asc file ahead of the message period data.

Storage and Downloading of Traffic data

RTMS K4 sensors are equipped with internal memory. To record data using the internal memory:

- Ensure the **Message Composition** section has been set. The ability to change the message composition is disabled while data storage is ON.
- Select FILE.
- Select **Internal Memory.** This option is only displayed when connected to an RTMS equipped with internal memory.
- Click the Store messages in **internal memory** box.

The **Internal data memory** window displays the amount of memory installed, memory used; and time left based on the selected message period and message composition. The **DATA** button on the main display will show an asterisk (*) next to the mode to indicate that data is being store in the internal memory.



- Click the **REFRESH** to update the MEMORY USED display (to verify that data is being stored).
- Click **OK** to close the window.

To retrieve and clear stored data perform the following steps:

- Open the **Internal data memory** window.
- Click **DOWNLOAD** to start downloading.
- Enter a file name and select a folder before the download can start.

Downloads should be done at the highest connection speed available. A full memory will take just over 12 minutes to download at 115200 bps; 146 minutes at 9600 bps.

The lower left corner of the main window will display the amount of data left to download.

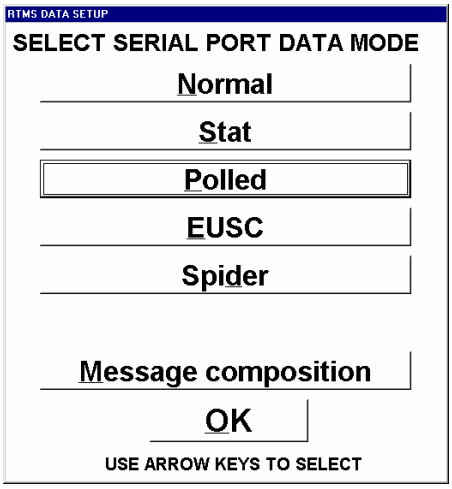
Clicking **OK** will close the **Internal data memory** window without affecting the download process. The **Recording data** window will continue the display the progress of the download.

Clicking the **STOP** button will terminate the download before it is completed.

- To erase stored memory, click **CLEAR**. A dialog box will be presented to confirm. Accept or reject action, as appropriate.

Data Modes

The **DATA** button is used to select how the RTMS communicates with the communications channel. The different modes determine what data is transmitted and when.



The **Normal** mode is used to set up the RTMS. In normal mode, the sensor is in constant communication with the WinRTMS program. Data transmitted by RTMS includes:

- Target messages every 100 mSec. This message contains the data used to create the target blips displayed on the screen.
- Per vehicle speed, if selected.
- Statistical data at the end of each message period.

The **Message Composition** button displays the **Statistical Message Setup** window.

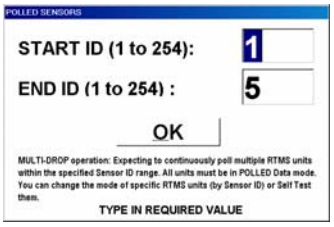
Other data modes provide the following:

Stat	At the end of each Message Period the sensor transmits statistic traffic data. Target messages are not transmitted; vehicle blips are not displayed on the screen in this mode. For use in applications where reduced number of messages is desired and polling is not required. As examples, TCP/IP or Cellular Packet Data applications.
Polled	The RTMS transmits statistical traffic data for the last message period only on receipt of a polling message with its ID number. Polled mode is used to communicate with multiple RTMS on a single communication channel that does not have collision detection; RS-232 and RS-485 are examples. WinRTMS, in Multi-Drop mode, can poll, display and record traffic data from several RTMS, connected on the same communications channel.
EUSC	This mode is used by the EUSC System for Traffic Management. This mode is only used when an RTMS is connected to a system using this communication protocol.
Spider	This mode is used when the unit is connected to an EIS SPIDER controller. The communications protocol is specific to this application. Select only if the RTMS will be linked to a SPIDER controller.

7 OPERATING WINRTMS IN MULTI-DROP MODE

The WinRTMS program, set to its multi drop mode, is used to verify the operation of RTMS sensors operating in **POLLED** mode.

- Open the program and wait for the main screen display.
- Open the **TOOLS** menu, select **Multi Drop** and set the range of RTMS IDs.

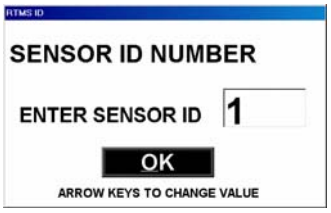


WinRTMS will transmit polling messages in sequence from lowest to highest. RTMS sensors answering the poll will transmit their data and WinRTMS will display it in the statistical traffic data area. The display will be overwritten by new data. The data can be recorded as described in the section on **Data Recording.**

Accessing a specific sensor in Multi-Drop Mode

WinRTMS has the ability to access a specific sensor in Multi-Drop mode to allow viewing and changing the sensor's setup. When this capability is in use, polling of other sensors is stopped. To access a sensor proceed as follows:

- Select the **DATA**.
- Select **NORMAL** mode.
- Specify the **SENSOR ID** number in the window using up/down keys only.
- Select **OK**



The specified sensor's data mode is now changed to **Normal** and WinRTMS communicates with that unit, automatically reading its setup and displaying its parameters, target blips and statistical data. The setup of the unit can now be changed as required.

- To select another sensor for access, restore this RTMS to **Polled** mode and repeat above sequence with the new Sensor's ID.

8 INSTALLATION AND ZONE SETUP - FORWARD LOOKING MODE

Forward-looking Mounting and Aiming

Sensors are mounted on a sign-bridge or overpass away from interfering structures as shown below. The sensor can be aimed at approaching or receding traffic, aiming at receding traffic is preferable.

- Mount the sensor above the center of the lane at a height between 5m [17 feet] and 6m [20 feet].
- Point it parallel to the monitored lane.
- Mount it level side to side.
- Looking from behind the unit, aim it to a point about 10m [33 feet] from the sensor. This will ensure a sufficiently long footprint but restrict its width to a single lane.
- Forward-looking RTMS may be mounted on a roadside pole, if the offset (distance from sensor to lane centerline) is less than 3m (10 feet). Extension arms can be used to reduce offset.

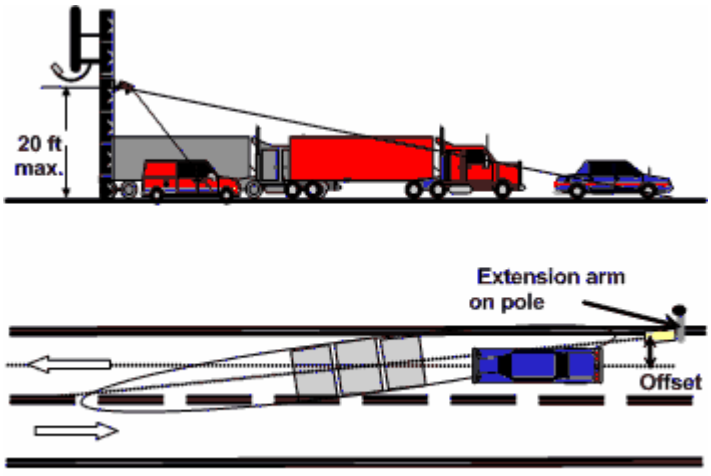


Figure 16 - Forward Looking mounting options

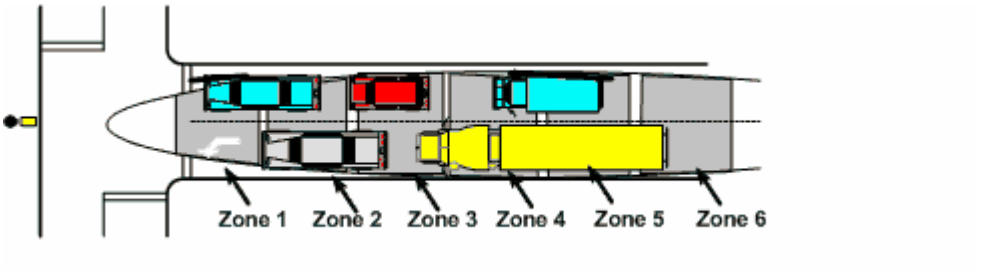


Figure 17 – Queue Detection

RTMS can be set up in forward looking mode when serving off-ramp or T-intersection queue applications. In such applications, the RTMS is aimed farther than in the traffic monitoring highway applications. One or more detection zones are defined to span the required distance (within the range limit of the RTMS). The width of the microwave beam may cover two lanes; the sensor cannot discriminate between lanes.

Zone Setup – Forward-looking Mode

When forward looking mode is selected, WinRTMS will present a window for setting the height and offset parameters.

- Use left/right keys to highlight a parameter and up/down keys to enter the value. Press **Enter** or click **OK** to accept the displayed parameters. The length units will be decimeters or feet depending on the units used for reporting speeds.
- See Km/h-MPH in the Advanced menu for changing between metric and imperial units.

Automatic setup

- Initiate the automated zone setup either by clicking the Wizard icon or **AUTO** button on the Zone Setup window.

The Wizard will determine the best location for the 3-zone speed trap. If it cannot find a good speed trap due to incorrect RTMS aiming, low volume or other causes, it will display warnings.

Manual Zone Setup

- Set the number of zones to 8 and position all zones in sequence with the first zone at approximately 8 meters from the sensor (farther if the sensor is higher than 5M).

Observe approaching (or receding) vehicles in the lane as "waves" of blips and adjust the tilt and sway angles so that blip waves from small vehicles go through at least 5 of the 8 zones and so that vehicles in adjacent lanes do not show blips in the zones. Detection of vehicles from an adjacent lane indicates that the sensor is angled in that direction or aimed too high.

- Set Fine Tune control to +5.
- Observe approximately 50 vehicles. Find three consecutive zones, for which vehicle counts are in close agreement with each other. The location of these three zones will form the speed-trap. Note their position on the range scale and using ZONES, move zones numbers 1, 2 and 3 over these three consecutive zone positions, then reduce the total number of zones to 3.
- Only Zone #1 is used for volume and occupancy data. Zone #2 and #3 complete the speed trap and help determine the direction of travel.

Forward-Looking Speed calibration

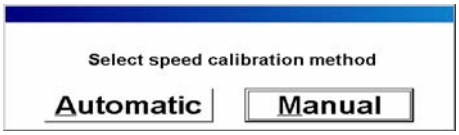
The RTMS provides Doppler speed measurements and does not need to be calibrated for this, only the Speed Trap length for slow moving traffic needs to be calibrated.

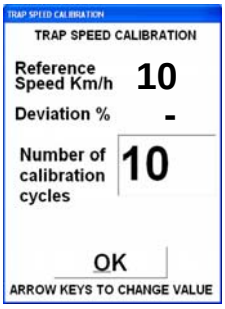
Ensure that the main screen box **Per Vehicle Speed** is check-marked. Uncheck this box to suppress reporting of per vehicle data, if desired, after completion of speed calibration.

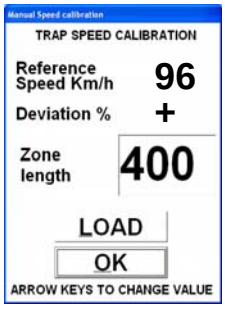
In the Forward-Looking Highway mode, the RTMS uses the Doppler speed, as the reference speed to calibrate the speed trap. Speed trap measurements are used when speeds are below 10 MPH [16 km/h] where the Doppler measurement does not function.

When **SPEED CALIB** is selected, a choice of automatic or manual calibration is presented:

- Select the required mode of calibration.
- Set the number of cycles for automatic calibration to 10.
- In manual calibration, use left/right keys to highlight the zone length box.
- Use up/down keys to adjust the zone length in proportion to the desired change i.e. increase if measured speed is low.
- The Doppler reference speed and percent deviation of the average speed from the reference are updated at the end of each message period.
- For manual calibration - when deviation from the reference speed is acceptable click **LOAD**.
- Click **OK** to exit.







9 RTMS INSTALLATION FOR STOP BAR DETECTION

Locate poles at positions that allow aiming at the stop bar while perpendicular to the traffic lanes.

Mounting the RTMS sensors across the road from the traffic lanes to be monitored widens the footprint by increasing the set-back and ensures no occlusion of left-turn lane.

When existing poles are not in optimal position, use of extension arms is recommended to bring the position of the RTMS as close to optimal as possible.

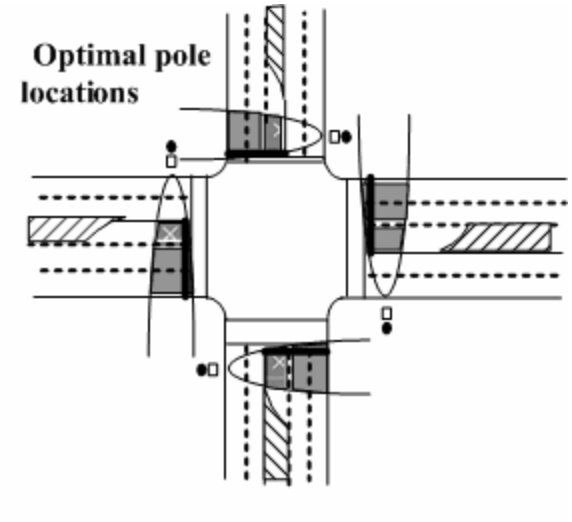


Figure 18 – RTMS Intersection Installation

Intersection Controller Settings

Intersection Controllers can be set into one of two modes Lock and Delay. When the Controller is set into the Delay mode, the delay setting must take into account the RTMS' extension delay time (EDT) setting (Default EDT = 1 sec, Maximum = 3 seconds). The actual controller delay will be the sum of the two settings.

10 RTMS TROUBLESHOOTING GUIDE

Field troubleshooting of the RTMS consists mainly of ensuring that the unit is powered and communicating. Communication with the sensor in Normal mode is confirmed by presence of the RTMS settings on the menu buttons (RTMS has received the Read Command and responded by sending the parameters), and by the flashing of the indicator in the lower right corner of the screen, denoting data transmission activity.

RTMS Self Test

The RTMS provides a diagnostic test of its internal functions. Select **TOOLS** and **Self-Test** in the normal mode to run the self test.

The test checks internal functions and locates hardware faults. The "All tests complete System OK!" message is displayed on the screen if no faults are found. 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

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 table below outlines symptoms and suggested action in troubleshooting power and communication problems:

Table 5

Symptoms	Possible causes	Suggested action
Timeout has expired and the main window with "Communication Error" message is displayed.	• RTMS is not powered	• Check that the supply voltage is within limits at source and at the MS connector. Voltage outside the limits (too low or too high) will cause power supply to shut down.
	• Cable problem	• Check cable pin-out and continuity.
	• Hardware fault	• With power applied to the RTMS and DB9F disconnected from PC, check the RTMS serial Port by measuring approx. 10V between pins 2 and 5 of the DB9F RS-232 connector. If the voltage is not present there could be a hardware fault in the RTMS serial port or power supply.
	• PC unable to communicate with the RTMS due to H/W problems	• Check that PC's serial port is operational (10V present between pins 3 and 5)
Polling range window is	• WinRTMS is in Multi-	• Click OK on the polling range

displayed on start of WinRTMS.	drop mode.	window; RTMS Setup default screen will be displayed. • Select TOOLS, Change to Direct mode, if direct access to one RTMS is desired.
PC and sensor are communicating (Sensor settings are displayed on buttons) but target "blips "are not shown on the main screen.	• RTMS is not in Normal mode. • Unit is not aimed properly. • Low Sensitivity. • Internal parameters corrupted. • MW module fault.	• Ensure the unit is in the Normal mode. • Check sensitivity setting. See if targets appear when sensitivity is increased. • Cycle power to unit and then edit parameters (mode, sensitivity, zone setup, etc). • Run Self-Test if above not successful. Report findings to EIS.
PC and sensor are communicating (Sensor settings are displayed on buttons) but target "blips "are not shown on the main screen.	• RTMS is not in Normal mode. • Unit is not aimed properly. • Low Sensitivity. • Internal parameters corrupted. • MW module fault.	• Ensure the unit is in the Normal mode. • Check sensitivity setting. See if targets appear when sensitivity is increased. • Cycle power to unit and then edit parameters (mode, sensitivity, zone setup, etc). • Run Self-Test if above not successful. Report findings to EIS.
Main screen shows target blips but no zone icons or parameters on buttons. Self-Test results are not displayed on PC screen.	• RTMS transmits and WinRTMS displays received data but RTMS has not received the WinRTMS READ command.	• Check cable to ensure continuity between MS connector pin T and COM port's pin 3.
The setup program is unable to read an RTMS with DSS modem (targets displayed but sensor settings are not displayed).	• Pin "a" is not cabled. PC cannot send any commands and has not received setup data.	• Examine cable and correct to include pin "a" cabling to DB9F pin 4 (DTR) if omitted.
Cannot establish communications with an RTMS equipped with internal data storage.	• 10-12V is not present at MS pin "b".	• Examine cable and correct to include pin "b" cabling to DB9F pin 7 (RTS) if omitted. • Examine any modem cable used for conformance to the cabling diagrams.

11 WARRANTY AND SERVICE

EIS Warranty

EIS Electronic Integrated Systems Inc. warrants this product to be free from defects in material and workmanship for a period of two years from date of delivery. Damage to the product due to accident, abuse by the buyer, or unauthorized modification, improper installation, or operation outside the specifications is not covered by the warranty.

CAUTION

Do not attempt to open, repair or disassemble the RTMS unit.
Such action (breaking the seal) will void the warranty.

Contact EIS if the unit requires servicing.

EIS warrants that its software and firmware designated for use with the instrument will execute its programming instructions when properly installed. EIS does not warrant that operation of software or firmware will be uninterrupted or error free.

Service Information

The RTMS does not require routine maintenance. It is recommended that the Self-Test is included in the installation procedure. Self-Test should be invoked with the unit installed and aimed at a road. Self-Test performed indoors may produce erroneous results.

If the unit fails to operate, please refer to the troubleshooting guide in Section 10 of the RTMS User Manual or call EIS technical support. An RTMS connected to a dial-up modem can be accessed remotely for testing and support purposes.

EIS Inc. will repair or replace at its option, any components, which prove to be defective during the warranty period. Buyer shall pay for shipping charges to EIS. EIS will pay shipping charges and insurance for warranty repaired product. Buyer will be invoiced for repair and shipping of product repaired outside of warranty or when no fault is found.

Units returned to EIS for service should include the following information with the shipment:

- Name, address, and contact information of owner.
- Name and telephone number of someone familiar with the problem who may be contacted by EIS personnel for further information if necessary.
- Model number, serial number and software revision number.
- A complete description of the problem. e.g. under what conditions did the problem occur? What equipment was attached? What was the result of the Self Test diagnostic?
- Shipping address for the return.
- Return Merchandise Authorization number. Contact EIS Customer Support prior to shipping merchandise to obtain it.

The unit should be shipped in the original container. If it is unavailable, there should be approximately one inch of packing material between the unit and inner carton e.g. plastic bubble-wrap. The carton should be sealed with strong tape or strapping.

Note: Shipping papers, i.e. Commercial Invoices and Way Bills, should include the statement "Shipped to Manufacturer for Repair", and “Canadian Goods being Returned for Repair” to avoid repayment of duties and taxes.

12 SPECIFICATIONS

Microwave Signal and Coverage area

Center Frequency	24.125 GHz
Bandwidth	45MHz
Power Output	10mW
Beam width – horizontal (azimuth)	12°
Side lobes	>-20dB
Beam width – vertical (elevation)	40°
Range	3-60m (10-200feet)
Number of detection zones	8

Measurements, their Accuracies and Ranges

Measurement	% Error *	Range
Per lane Volume - Sidefired	5%	0-255 0-65535 for MP>300 sec
Per lane Occupancy - Sidefired	5%	0-100 %, 1 decimal place resolution
Per lane Classification by length – Sidefired	10%	
Volume and Occupancy - Forward-looking	2%	
Average Speed - Sidefired	7%	0-160km/h (100mph)
Average Speed - Forward-looking	2%	0-160km/h (100mph)
Range Resolution	3m (10 ft.)	
Resolution of Time events	10 ms	

Accuracy Performance Conditions

Error performance parameters outlined above are achieved under normal, high-flow traffic conditions and are subject to proper installation and setup. Reduced accuracy (higher errors) will be experienced under the following conditions:

- Low speed, high congestion conditions: The RTMS may slightly over-count at low speed conditions (below 1mph)
- Improper selection of installation site: insufficient set-back, height beyond the recommendation, obstruction of monitored lanes by barriers or high fences.
- Improper fine tune setting for the road geometry (lane width, barriers, etc.) will result in “splashing” and, therefore, over-counting. In some cases, attempts to cover too many traffic lanes with a single RTMS may result in inability to find a correct fine tune setting and compromised performance.
- In Forward-Looking Hwy configuration, high variance between the volumes in the speed-trap zones due to improper aiming or obstructions within the trap range or incorrect height or offset parameters may result in higher speed and length measurement errors.

Mechanical

Enclosure dimensions	22x15x19 cm (8.5 x 6 x 7.5 in.)
Overall dimensions	22x15x25 cm (8.5 x 6 x 10 in.)
Weight	1.3-2.2 Kg (3-5 Lbs.) depending on options
Enclosure	Polycarbonate
Weatherproofing	NEMA-4X and IP-65
Mounting	Zinc plated steel universal ball-joint bracket. Vertical and horizontal brackets are available. Lynch pin locking allows quick sensor replacement without disturbing the aiming.
Allowable pole flexing	Less than 5 degrees.

Power Requirements and Consumption

- RTMS standard power requirement 12-24V AC or DC
- Over-voltage shutdown limit 34VDC or 24VAC.
- Recommended fusing (external) 2A slow blow minimum
- Automatic recovery from power failure Within 5 seconds, with DSS – 20 seconds
- Power consumption (Standard Power) 2.7 Watts
- Additional Power consumption of options DSS = 2.0 W, TCP/IP =1.2 W
- Commercial AC power option 115±20V AC @ 50-60Hz, 3W

Interfaces

Zone Contact Ratings

- Maximum current 100mA
- Maximum voltage 400V
- Maximum dissipated power 300mW .

Data Ports

- USB 2.0 with range up to 30 feet
- One isolated port Standard, additional port Optional
- Ports operating at no parity, 8 bit, 1 stop bit at adjustable speed between 2400 and 115200 bits/sec (bps).
- RS-232 operating distance depends on selected speed: 200 -1000 ft.
- RS-485 option extends range up to 1200m (4000 feet).
- Optional Ethernet port with range up to 30 feet.

Flash Upgrade

Available over data port remotely or locally

Surge immunity

The RTMS withstands ± 1kV surge (rise time = 1.2 μsec, hold = 50μsec) applied in differential mode to all lines, power and output, as defined by IEC 1000-4-5 and EN 61000-4-5 standards.

Environmental Conditions

	Operating limits	Shipping and Storage
Temperature range	-37 to +74°C [-35 to 165°F]	-40° to 80°C [-40° to 171°F]
Humidity	Up to 95% relative humidity	Up to 95% relative humidity
Vibration	2g up to 200Hz sinusoidal	
Shock		5g 10ms half sine wave
Wind	Winds up to 160 km/h [100mph]will not degrade performance	
Precipitation (rain or snow)	Up to 100mm/h	

Electromagnetic Interference

RTMS Model K4 is certified to meet

- US FCC Rule part 15 Class A, Canadian CSA C108.8 M1983 Class A and CE mark requirements.

Reliability

The RTMS is designed for Mean Time Between Failures (MTBF) of in its operating environment of 90000 hours [10 years].

APPENDIX 1 RECOMMENDED SURGE PROTECTION

It is recommended that communication and power lines of the RTMS be equipped with surge protecting devices, located as close as possible to the sensor, e.g. in a cabling cabinet mounted on the RTMS on the pole. The surge suppression should be applied as follows:

- The Tx and Rx communication lines should employ low capacitance, bipolar surge suppressors with a clamping voltage of 15V.
- The Signal ground line should be grounded
- A bipolar surge suppressor with a clamping voltage of 40 V shall be placed between two low voltage (16-18V AC or 12-24VDC) power lines.
- One of the power lines, negative line in case of DC, shall be grounded

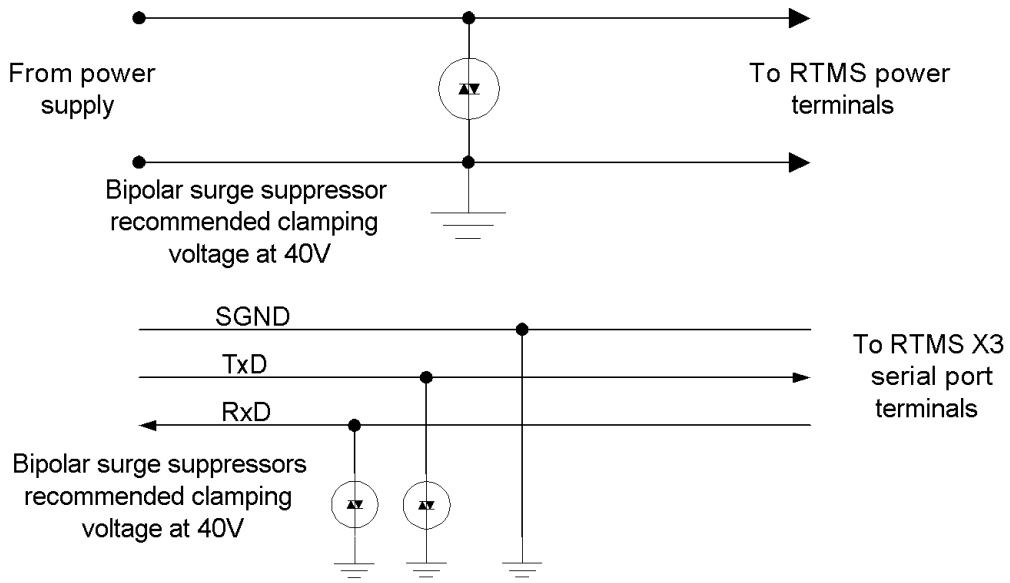


Figure 19 – Surge Suppression

Above is an example for surge suppression with RS232 communications and 12-24VAC/DC power input.

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