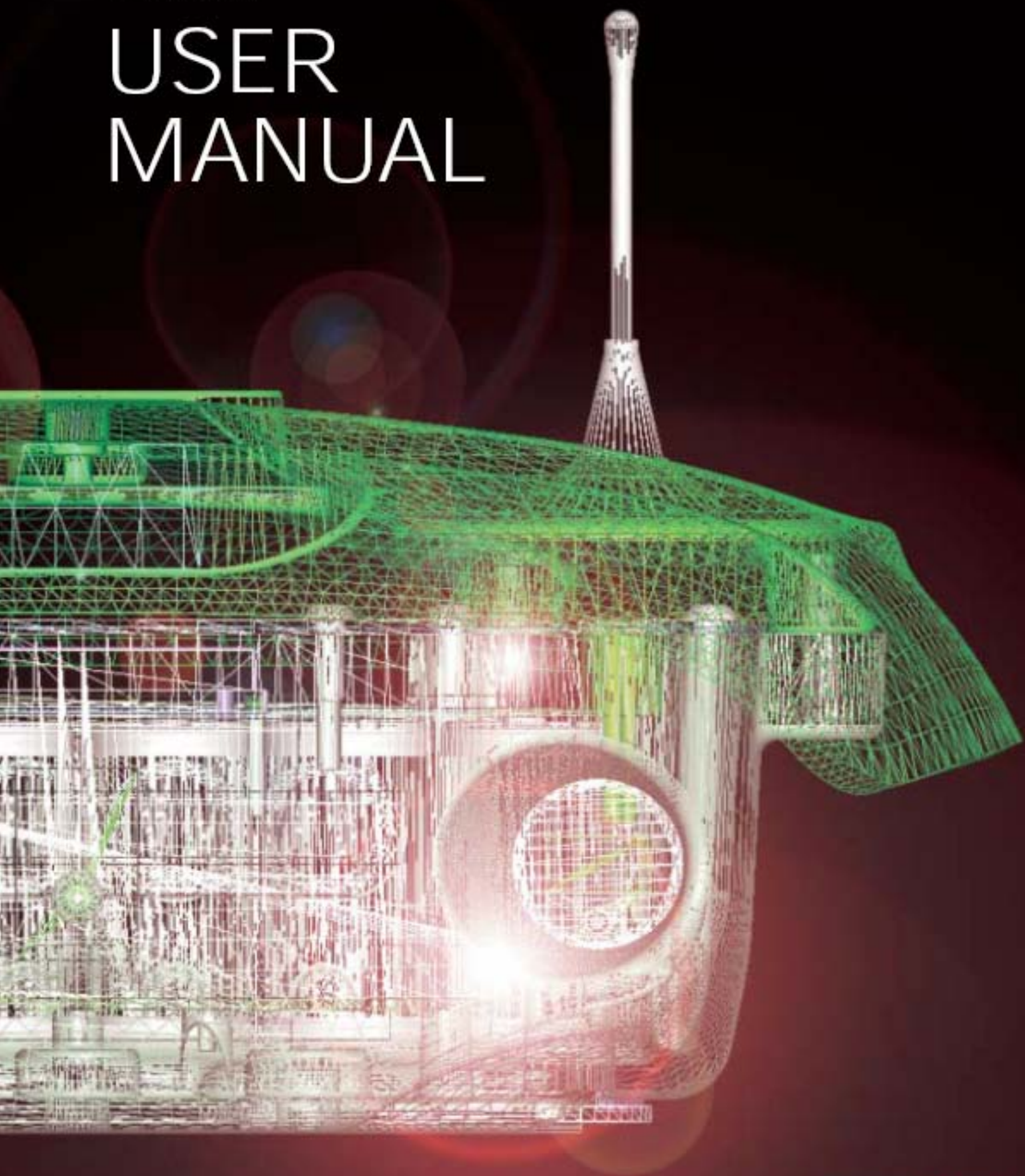
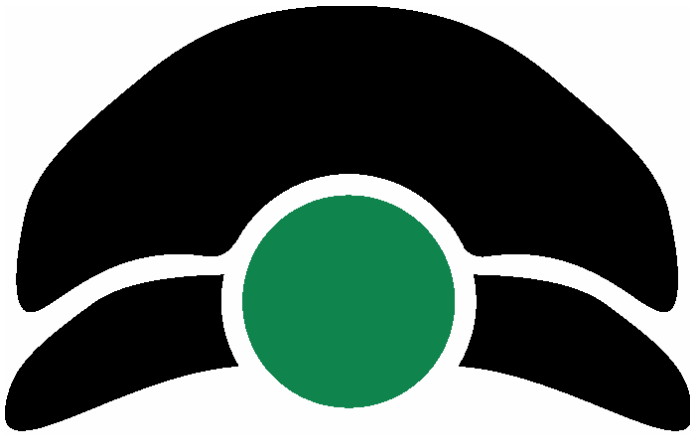




USER MANUAL





TIRTL

User Manual

Doc: MAN00001, Version: 2.3.0

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Revision History

Revision	Description	Date
V2.0.0	Accommodate changes to GUI windows in TIRTL ^{soft} . Add Palm Handheld user information	June 2003
V2.1.0	Power and RS232 pin-outs for TIRTL added. More detail on permanent installations	Nov 2003
V2.2.0	Change to Mode Button operation. Typographic corrections	May 2004
V2.3.0	Add compliance declaration Delete reference to Lithium C cells Add external GPS/GSM connector labelling Add solar power information Update external housing information	Oct 2004

Description of Manual

This manual describes the installation, operation and maintenance of The Infra Red Traffic Logger (TIRTL) system.

The manual covers the general theory of operation of TIRTL and provides detailed information on the operation of the application software used to control and monitor the equipment.

The manual has been structured in a way that leads the novice user to a systematic accumulation of knowledge regarding the use of TIRTL.

An Installation Reference Guide is included to assist the reader in navigating to key sections. The Installation Reference is particularly recommended to those readers already familiar with the operation of TIRTL and is by no means intended to be an exhaustive reference.

This revision of the manual is compatible with TIRTLsoft V1.4.x. for both Personal Computer and Palm Handheld PDA.



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1 Introduction

The Infra-Red Traffic Logger (TIRTL) is an advanced traffic surveillance system that is non-intrusive and capable of highly advanced functionality with features making it the most flexible ITS product in the world today.

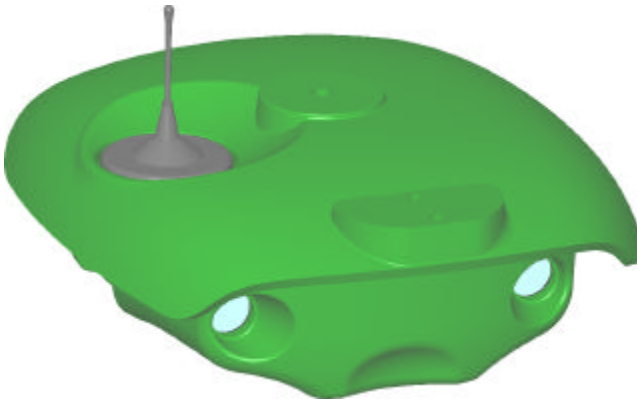


Figure 1 –TIRTL receiver incorporating GSM/GPS option.

1.1 Features

The features of TIRTL include:

- Infra-red light detection system.
- Non-invasive installation hidden from passing vehicles.
- Vehicle classification system based on axle counts, axle separation, wheel widths and wheel size ratios.
- Speed measurement based on parallel beam breaks.

- Vehicle counting, classification, location, lane identification and speed measurement for multi-lane, bi-directional highways.
- Date and time stamped traffic data logging including vehicle count, classification, speed, direction, lane and wheel base measurement.
- Portable with fast and easy installation during the day or night.
- Ultra-low power consumption for battery or fixed power installation.
- Remote operation, monitoring and data transfer via a mobile modem or fixed line modem.
- Supports SMS text, web page and data file transfer.
- Global Positioning System (GPS) location.
- Excellent environmental performance and capable of reliable operation in all weather conditions.
- User friendly Personal Computer or Palm Handheld based Graphic User Interface.

1.2 Applications

A single TIRTL may be installed in place of a number of different traffic surveillance products. Additionally, TIRTL may be used in ways not previously contemplated.

Applications include:

- Advanced traffic detection including non-intrusive vehicle counting, classification and speed measurement.
- Speed and red-light enforcement when connected with a standard image camera.
- Point-to-point speed and travel time enforcement.



- Tolling as the primary and secondary count and classification unit.
- Over height vehicle detection.
- WIM system support providing vehicle count and classification data, communications and data logging.
- Remote monitoring of rural highways for vehicle statistics and oversized vehicle detection.
- Traffic density monitoring for real-time applications.
- Closed roads, air-strips and track monitoring.

1.3 General Description

The Infra-Red Traffic Logger (TIRTL) counts, classifies, determines the lane and speed of passing vehicles using a novel light based technology. TIRTL is non-invasive and operates in installations involving uni-directional and bi-directional, multi-lane traffic with a single system.

TIRTL consists of transmitter and receiver units on opposite sides of a highway. TIRTL uses two parallel and two cross beams at below axle height to measure and classify passing vehicles. The system has a speed measurement accuracy of 1% @ 120 mph and precisely measures the number of axles, axle separation, wheel width and wheel width ratio to classify vehicles.

The non-intrusive measurement techniques employed by TIRTL reduces time and costs for installation, maintenance and road repair. As TIRTL is installed off the main highway there is no need for lane closures improving the safety for the public and service personnel.

TIRTL is designed to operate under extreme temperature conditions of -40°F to +185°F and is resistant to sunlight,



rain, hail, dust and fog. The main TIRTL enclosure and associated connectors are rated to IP67.

TIRTL has a large data logging memory to record vehicle information in a time and date stamped format. The data log may be downloaded at any time either locally or remotely via a variety of modem options.

The system is web-enabled, it incorporates GPS functionality and communicates with a mobile modem or a fixed line modem to provide real time and historic traffic data from a remote installation.

TIRTL has an RS232 interface to facilitate the connection of a sophisticated Graphic User Interface known as *TIRTLsoft*. A version of the *TIRTLsoft* is available for both a personal computer running under the Windows operating system and a Palm Handheld PDA. Using the *TIRTLsoft* the user can easily configure, monitor and download information to and from TIRTL. Communication is provided through ASCII protocol and can be connected to a camera to enable traffic enforcement, to an electronic variable message sign, to a WIM controller and to a wide range of ITS products.

The ultra-low power consumption of TIRTL enables the units to operate from fixed power, solar power or internal batteries.

TIRTL can be installed during the day or night and remain hidden from passing traffic.

The many features and ease of use make TIRTL the most flexible ITS product in the world today.



1.4 International Compliance Declaration

1.4.1 Operational Temperature Declaration

All components used within TIRTL are industrial rated (-40°F to +185°F) with the exception of the optionally fitted GSM module (-4°F to +131°F). However for the purposes of adherence to all internationally applicable safety compliance standards TIRTL must not be used in ambient environments in excess of 154°F unless housed in a secondary enclosure.

1.4.2 Safety Warning

On no account should the top flat cover of TIRTL be removed. TIRTL contains no user serviceable parts.

1.4.3 Infra-Red Transmitter Safety Statement

The infra-red LED transmitter used within TIRTL is confirmed as a:

“CLASS 1 LED PRODUCT”

in accordance with IEC 60825-1.



2 Document Key

2.1 Abbreviations

DC	Direct Current
DTE	Data Terminal Equipment
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
GUI	Graphical User Interface
ITS	Intelligent Traffic System
LED	Light Emitting Diode
nc	no connection
PDA	Personal Digital Assistant
PIN	Personal Identification Number
POTS	Plain Old Telephone System
SIM	Subscriber Information Module
TIRTL	The Infra-Red Traffic Logger
WIM	Weigh In Motion

2.2 Conventions

Italics Software Menus

2.3 References

[1] TIRTL command set listing



3 Theory of Operation

A TIRTL consists of a transmitter and receiver pair. The transmitter is the source of infra-red beams used to detect traffic. The receiver detects disturbances in the infra-red beams caused by passing tires, and uses intelligent software to produce vehicle classifications based upon the relative timing of those events.

3.1 Vehicle Detection

The transmitter emits a beam of infra-red light from each forward facing lens. These light beams overlap at the receiver, such that the light from each falls over both of the receiver's lenses. This beam overlap yields four different paths of light from the transmitter to the lenses of the receiver, two parallel beams and two crossed beams as illustrated in Figure 2. As a vehicle passes between the receiver and transmitter, each wheel interrupts each of the four beam paths.

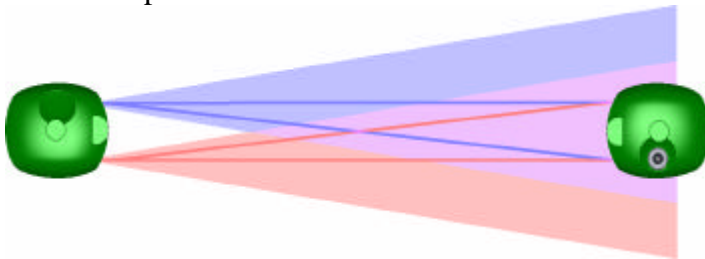


Figure 2 – TIRTL beam configuration.

Detecting the precise time each beam is interrupted allows the receiver to compute the velocity and lane of each vehicle wheel as it passes.

It is important to note the alignment of the transmitter and receiver units is critical and the beams traversing the highway are set at as low a point as possible. This allows effective

detection without interference from mud-flaps and other features hanging from the main body of the vehicles.

3.2 Classification of Vehicles

There are a number of different features of the wheel base of road vehicles which may be used by intelligent software in classification. Figure 3 illustrates some of these principles.

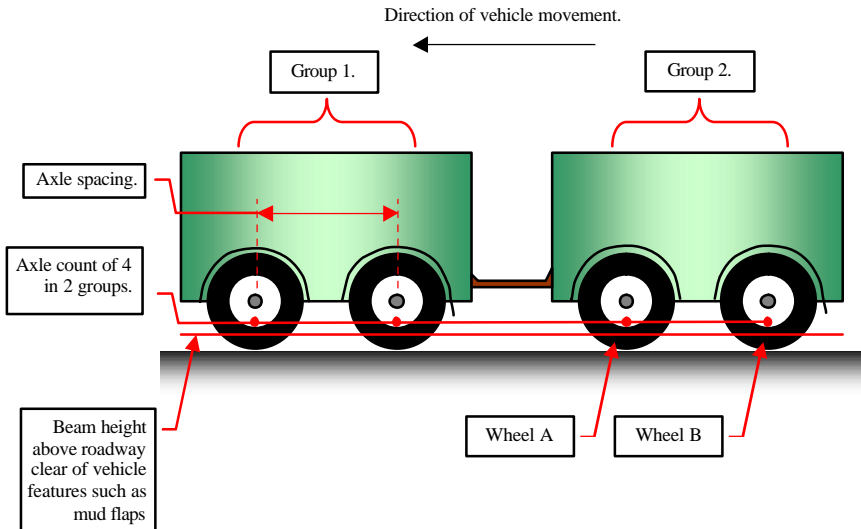


Figure 3 – Features of road vehicles.

Axle Count – The number of beam events allows a count of the number of axles on a given vehicle. This is useful for discriminating between standard cars and trucks.

Axle Groups – The frequency of beam events allows an assessment of groups of axles. Useful for discriminating between vehicles with the same axle count.

Axle Spacing – The duration between beam events allows a measurement of axle spacing. Allows discriminating between vehicles with the same axle count.

Wheel Size – A fine discrimination that allows vehicles with very similar axle profiles to be further categorized by ratio metric wheel size variations.

Wheel Ratio – A ratio metric measurement of the leading wheel size measurement (wheel A in Figure 3) divided by the trailing wheel size measurement (wheel B in Figure 3). A fine discrimination that allows vehicles with different wheels front and back to be categorized.

Similar axle characteristics are grouped together to form vehicles that are matched against vehicle classes. Classes are defined by the user and grouped into a classification scheme.

4 External Features

TIRTL traffic monitoring system is designed to operate as a pair of units. A transmitter unit paired with a complimentary receiver unit.

TIRTL transmitter and receiver are similar in appearance. Figure 4 to Figure 6 and Table 1 detail the external features of the TIRTL receiver unit. An identifiable external difference between the transmitter and receiver is Comm Port B is not present on the transmitter unit (item 9, Figure 6).

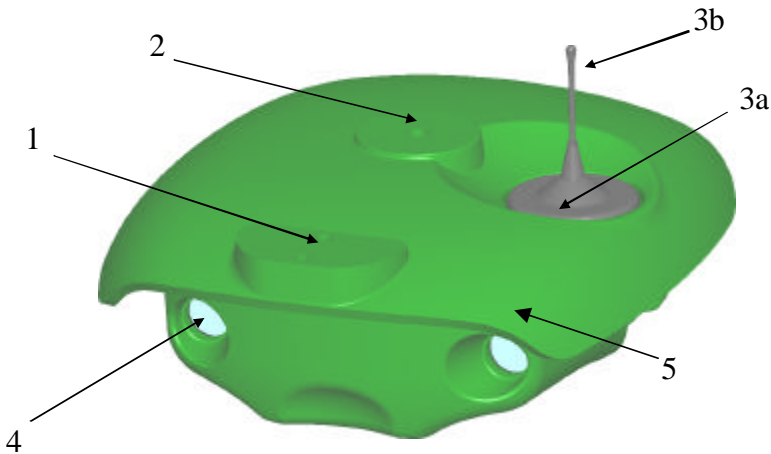


Figure 4– Front view of TIRTL receiver.

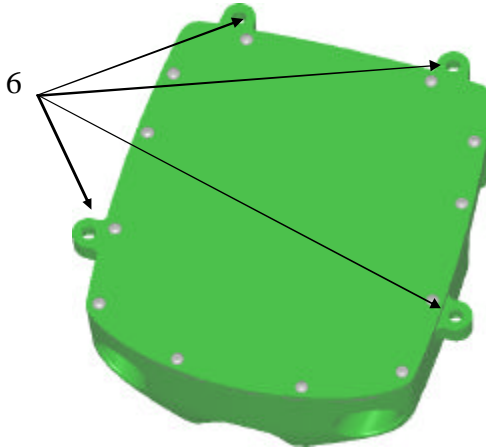


Figure 5– Top of TIRTL Receiver without Sun Shield.

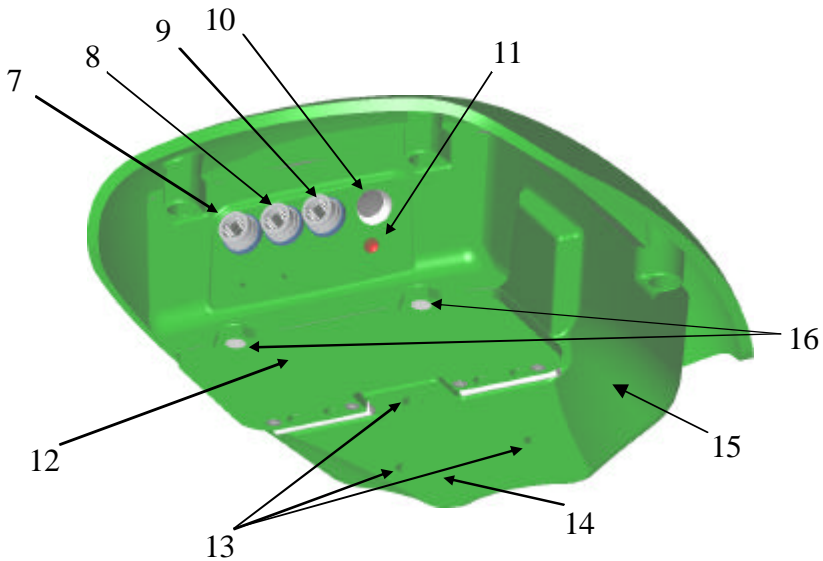


Figure 6– Rear of TIRTL receiver.

Table 1 –TIRTL exterior features.

Item	Feature	Description/Purpose
1	Top Sight Mount	Machined surface and alignment pin holes on the top of the sun-shield used for accurate Optical Sight placement.
2	Top Mount	Flat surface on the sun-shield used to fix TIRTL unit under a tripod or other mounting device.
3a	GSM & GPS Antenna	Fitted if the unit has the GSM/GPS option.
3b	GSM antenna	Fitted if the unit has the GSM option.
4	Lens	Passage for the infra-red beams.
5	Sun-shield	Used for portable applications to protect against direct solar radiation exposure.
6	Mounting Boss	Four large mounting points used to secure the unit to the sun-shield. Also used to securely mount the unit in a permanent installation.
7	Power Connector	5 pin external power connector and fixed line modem connection (when modem option is fitted).
8	Comm Port A	12 pin external communications connector (typically RS232).
9	Comm Port B	12 pin external communications connector (typically RS232, receiver unit only).
10	Mode Button	Used to turn the unit on and off as well as query its current operational state.
11	Indicator LED	Conveys information regarding the current operational state of the unit.
12	Battery Door	Access to the battery compartment.
13	Bottom Mount	Flat surface on the base of the unit used to fix TIRTL unit on top of a tripod or other mounting device.
14	Bottom Sight Mount Position	Machined surface and alignment pin holes on the base of the unit used for accurate Optical Sight placement.
15	Housing	Robust 5mm thick cast aluminium.
16	Battery Door Screws	Unscrewed to gain access to the battery compartment and the SIM card.



5 Installation Reference

The installation procedure for TIRTL centers around the Installation Reference illustrated in Figure 7 for the PC based application and Figure 8 for the Palm Handheld application. The Installation Reference acts as a guide for the experienced user to locate detailed installation instructions for TIRTL installation.

The Installation Reference assumes the user is deploying a temporary installation however the reference also assists with the establishment of a permanent installation.

5.1 Installation Equipment List

Table 2 –Installation equipment list.

Qty	Item
1	TIRTL transmitter unit.
1	TIRTL receiver unit.
2	Tripod &TIRTL mounting attachment.
1	TIRTL serial cable.
2	TIRTL power cable (for external power).
2	Optical Sight.
24	“C” cell Battery (for standalone power).
1	PC running Windows OS or Palm Handheld loaded with TIRTL <i>soft</i> .
1	Angel Finder

5.2 Reference Guide – Personal Computer

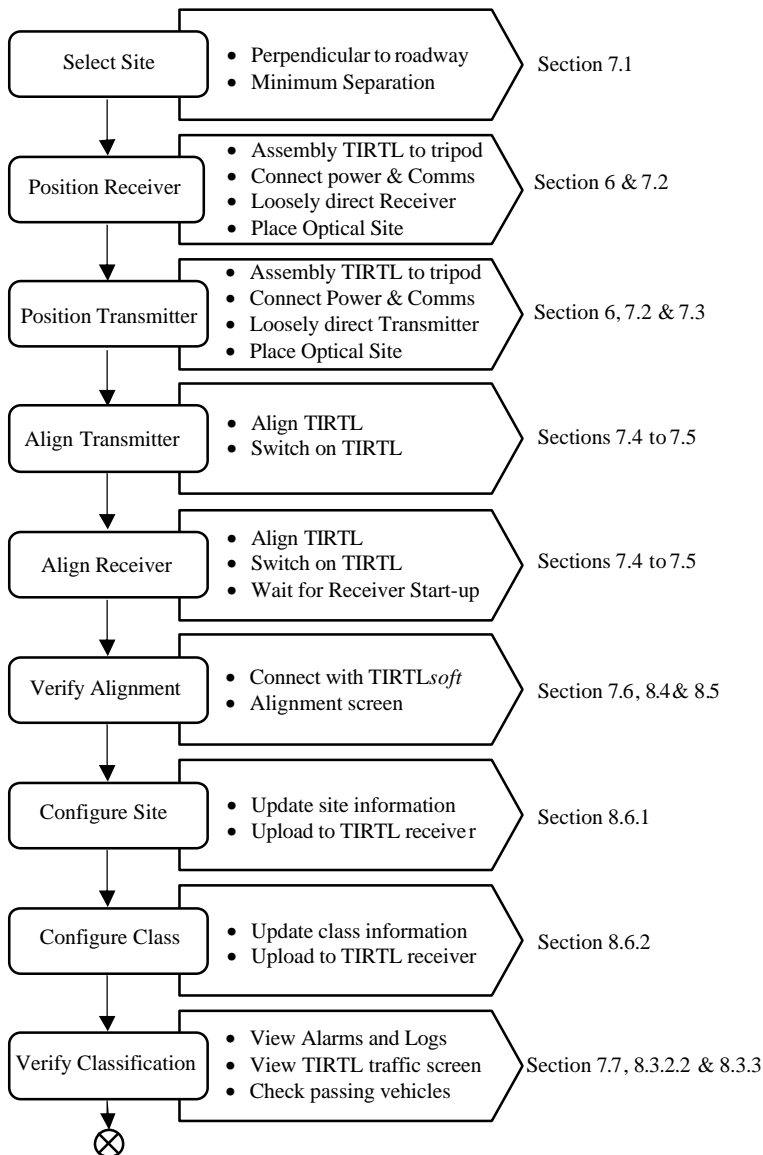


Figure 7 – PC Installation Reference.



5.3 Reference Guide – Palm Handheld

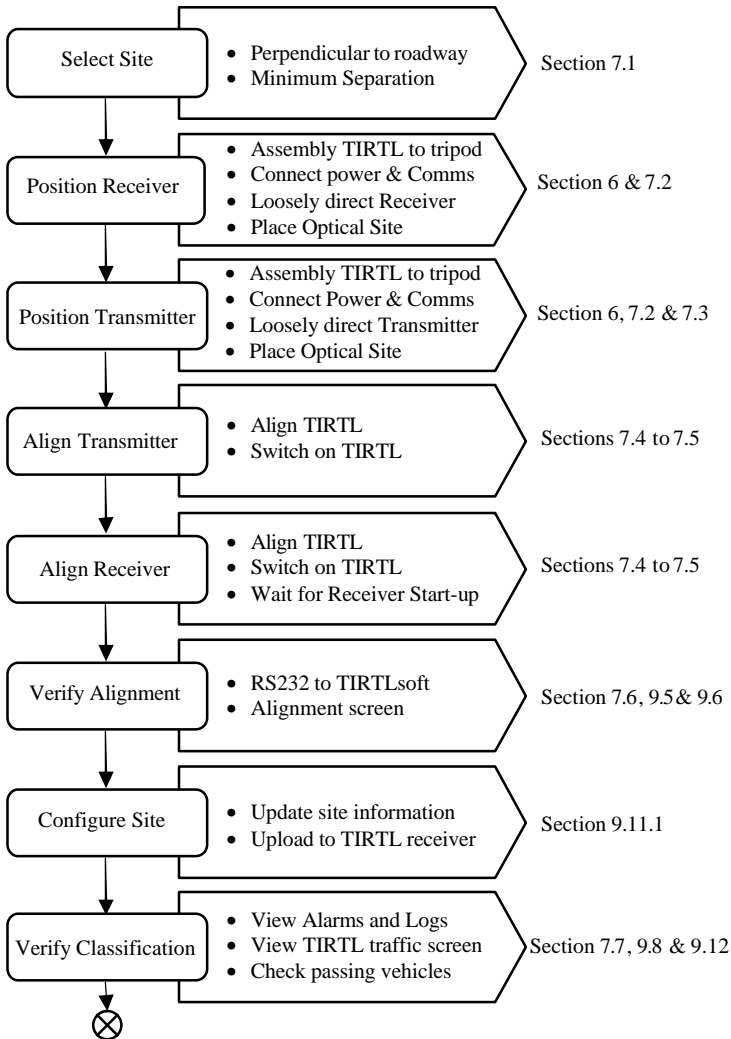


Figure 8 – Palm Handheld Installation Reference.

6 Tripod Mounting

Figure 9 shows the manner in which TIRTL is mounted in a temporary tripod installation. It is typical to mount TIRTL such that it hangs below the tripod center. For most installations this allows the infra-red beams to be located within 2 in. of the road surface. The figure shows how the tripod fitting is screwed into the sun-shield aperture (1). Once fitted to the tripod the body of TIRTL may be tilted and rotated for alignment purposes using the tripod gimbal joint (2). The gimbal may be locked in place using the locking screw of the tripod mount (3). The gimbal may be locked in place using the locking screw of the tripod mount (3).

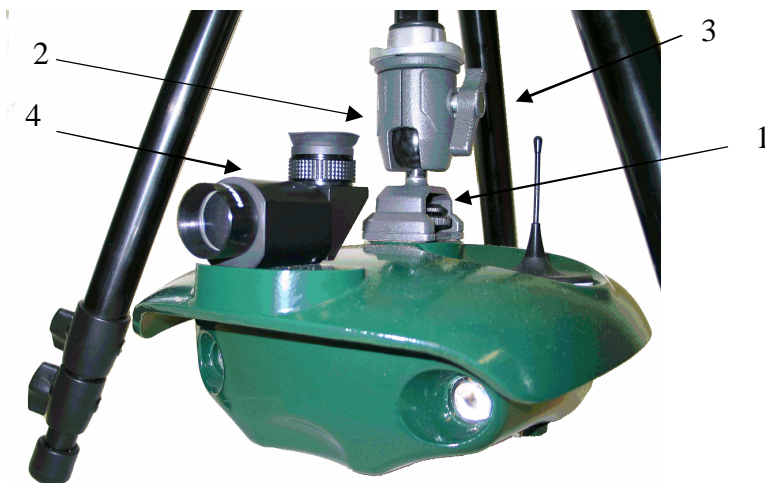


Figure 9 – Tripod installation.

Figure 9 also shows the manner in which the Optical Sight is fitted to the top of TIRTL sun-shield (4). The Optical Sight fits into the specially designed alignment holes located at the bottom of TIRTL and also in the sun shield. The Optical Sight is only used during alignment and should be removed after the process is complete. TIRTL unit must not be transported with the Optical Sight fitted.

7 Installation

7.1 Placement

The transmitter and receiver must be set up to meet the following conditions:

- The beams between the transmitter and receiver should be 90° to the roadside (Figure 11).
- For optimal operation, the distance between the transmitter and receiver should be kept to a minimum.

7.2 Power Options

7.2.1 Cabling to fixed supply

Two Power Cables are provided with TIRTL. These cables are used to provide fixed DC power to TIRTL units.

One end of the power cable has a five pin weatherproof connector, the other end is unterminated to facilitate connection into a client's power system.

Where the fixed line modem option has been included the TIRTL receiver cable also incorporates the two PSTN connections.

Table 3 describes the functionality of the unterminated ends of the power cable.

Table 3 – Power cable connections.

Description	Function
Unterminated end with brown insulation and red shrink wrap	Positive connection to a 10V to 16VDC supply.
Unterminated end with blue insulation and black shrink wrap.	Negative connection to a 10V to 16VDC supply.

7.2.2 Battery Power

The ultra-low power consumption of TIRTL enables portable operation with twelve “C” size batteries per unit. This is particularly useful for temporary and remote installations where fixed power is not available.

A battery powered installation using standard alkaline “C” cell batteries would typically function for 7 days.

7.2.3 Solar Power

Due to the ultra-low power consumption of TIRTL it is possible to power the units from a small self contained solar power system. The solar power system should provide the regulation and control of the solar battery system. The solar power system should provide a regulated supply to TIRTL unit.

The solar power system must be able to continuously supply 1W for the transmitter and a maximum of 2.2W for a fully optioned receiver.



The batteries within the solar power system should provide sufficient storage capacity to enable TIRTL to operate throughout the night.

Two solar power system are normally required per TIRTL installation, one on each side of the roadway. However it is possible to operate TIRTL from a single solar power supply if power is reticulated across the roadway within a transverse subterranean conduit.

The power to TIRTL unit from the solar power system is reticulated using the standard TIRTL fixed power cables.

7.2.4 Power Connector Pin-out

The connections to the power connector of TIRTL are described in Figure 10 and Table 4. The view of the connector in Figure 10 is that seen when looking into the power connector at the back of TIRTL.

The PSTN TIP and PSTN RING are connected if the PSTN MODEM option is installed. If the PSTN MODEM option is not installed these connections are not connected in the TIRTL receiver.

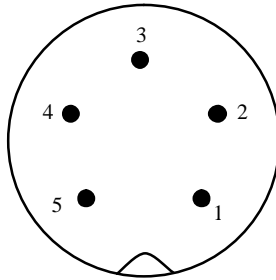


Figure 10 - Power connector as seen at the back of TIRTL

Table 4 - Power connector pin-out

Pin Designator	TIRTL Receiver	TIRTL Transmitter
1	PSTN Tip	nc
2	-ve supply	-ve supply
3	+ve supply	+ve supply
4	nc	nc
5	PSTN Ring	nc

7.3 Communication

TIRTL has a number of flexible communication interfaces for remote management of the units.

7.3.1 Fixed Line (PSTN or Leased Line) Modem

The optional fixed line modem enables TIRTL to be accessed remotely by a standard telephone line. The modem may also be used in leased line mode with the appropriate leased line connector.

When present, the communication lines use two of the pins on the external TIRTL receiver power connector.

The maximum data transfer rate is 56kbps downstream and 33.6kbps upstream.

See section 8.10 for PC controls and 9.16 for Palm controls.

For connections to the PSTN TIP and PSTN RING see section 7.2.4.

7.3.2 GSM/GPRS Modem

The optional GSM/GPRS unit allows wireless access to TIRTL receiver. This option requires an external antenna be installed on the receiver.

The GSM option requires a SIM card. A SIM card holder is located in the bottom of the battery compartment and is accessed by removing the screws holding the battery door in place and removing all batteries.

The maximum data transfer rate is 9.6 kbps GSM operation and 38.4 kbps for GPRS.

The PIN for the SIM is set under TIRTL^{soft} control.



See section 8.10 for PC controls and section 9.16 for Palm controls.

7.4 Alignment

The accurate optical beam alignment of TIRTL transmitter and receiver pair is critical to the operation of the system.

7.4.1 Alignment Requirements

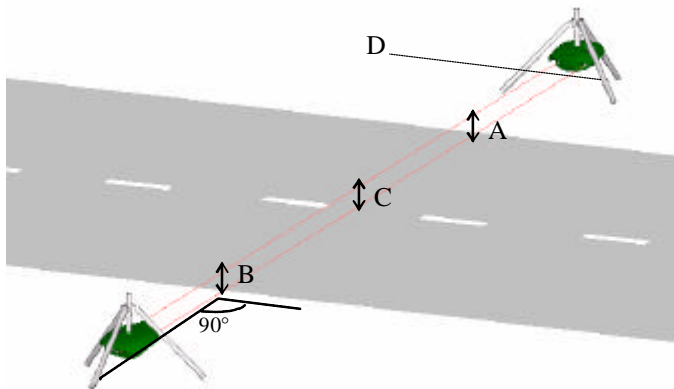


Figure 11 – Example TIRTL deployment.

A correct TIRTL deployment must meet all of the following installation conditions:

- TIRTL infra-red beams must be a 90° to the direction of traffic.
- A line (D) taken between the lenses on each TIRTL must be parallel with the surface of the road. This may require the user to tilt TRTL to the side.
- The height (C) of the beams above the peak of the road surface must be no more than 2 in.

- The height (A and B) of the beams above the edges of the road must be equal, this is important for roads with large camber.

7.4.2 Alignment Using the Angle Finder

Together with optical positioning TIRTL alignment is optimized by ensuring the line “D” of Figure 11 is at the same angle of inclination to vertical as the road surface. The inclination of both the road surface and the TIRTL receiver and transmitter is determined by the use of the Angle Finder (see Figure 12).



Figure 12 – Angle Finder positioned on top of TIRTL.

Place the Angle Finder on the edge of the roadway on a line between the positions of the TIRTL transmitter and receiver pair. Verify the body length of the Angle Finder is parallel to the direction of traffic movement and read off the road inclination to the vertical.

With the Optical Sight removed check the inclination of the TIRTL transmitter and receiver by placing the Angle Finder on the machined Optical Sight surface (see Figure 12). Verify

the body length of the Angle Finder is parallel to the direction of traffic movement. Verify the angle of inclination of the TIRTL receiver and transmitter is equal to that of the road surface. Adjust the inclination if necessary by loosening the gimbal joint.

7.4.3 Alignment Using the Optical Sights

To facilitate the alignment process a custom made Optical Sight is provided. The Optical Sight is mounted onto TIRTL on a machined surface incorporating alignment pin holes. One such mount position is illustrated in Figure 4, reference 1. In Figure 4 the Optical Sight position is shown on the top of the sun-shield, which is generally the position used for temporary installations. A second position is located on the bottom of the unit and is generally used in permanent installations (Figure 6, reference 14).

Figure 13 illustrates the view through the Optical Sight. Correct alignment is achieved by aligning the center of the sight cross-hairs with the bright dot associated with the Optical Sight on the complimentary unit.

The physical position of TIRTL is manipulated by loosening the gimbal joint of the tripod and manipulating the TIRTL body until the cross-hairs align correctly.

During night time the alignment is made easier by a second person shining a flashlight through the Optical Sight of the complimentary unit.

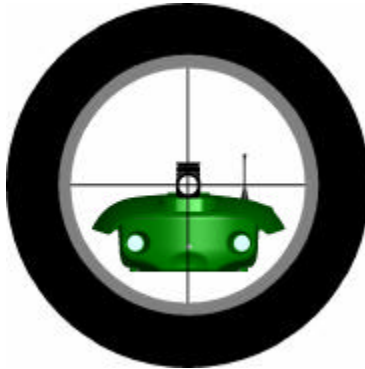


Figure 13 – Optical Sight view.

Note it is not necessary to have the cross-hairs horizontally or vertically aligned. The alignment process only requires the center of the cross-hairs is centered correctly.

7.5 Mode Button and Indicator LED

The button and LED combine to allow the user to turn TIRTL unit on and off. If connecting power from cold TIRTL will automatically begin booting when power is applied. This feature allows the unit to power on automatically during a total power outage.

- **Power Off** – Do not remove power from TIRTL until the power down sequence has completed. When the unit is on and fully operational, press and hold the button for at least six seconds to turn TIRTL unit off. The LED will give three flashes in quick succession every two seconds until it has completed shut down (approximately 15 seconds).
- **Power On** – When the unit is off and still connected to power, briefly press and release the button. While the unit is booting the LED will flash once every two seconds. When the boot cycle is complete

(approximately 1.5minutes) the LED will flash once every 30 seconds indicating the unit is fully operational.

- Setup Mode – This is a non-user mode that may be encountered if during power up or when fully operational the mode button is held for more than 3 and less than 6 seconds. In Setup Mode the LED flashes with a 50:50 duty cycle. To exit Setup Mode briefly press and release the mode button to return to the fully operational state. Then follow the standard procedure sequence for TIRTL power down.

7.6 Serial Communications

TIRTL is provided with a single customized Serial Cable used to provide RS232 serial connectivity into the receiver.

The serial cable with a 12 pin weatherproof connector plugs into the center TIRTL connector, or Comm Port A, at the rear of the receiver. The other end of this cable is terminated with a female DB9 connector wired with a standard DTE type pin out.

The Palm Handheld requires an additional cable to connect between the DB9 female and Palm connector.

TIRTL supports two types of connection protocol (see also section 8.4.1):

- Serial using raw RS232 for communication.
- PPP which adds extra functionality over the RS232 link including error correction, addressing and multiplexing.

All communications with the receiver use an ASCII based command set. This allows the user to access all the functionality of TIRTL unit via a simple terminal program,



such as HyperTerm. A complete description of each command is provided in reference [1]. However, the most user friendly technique for communication with the system is by using the Windows or Palm Handheld based “TIRTL*soft*” graphic user interface (section 8 and section 9 respectively).

7.6.1 Serial Communications Settings

The serial communication setting for the laptop computer or the Palm Handheld are detailed in Table 5.

Table 5 – Communications settings.

Function	Setting
Bit Rate	300 to 115.2kbps (default 19.2kbps)
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	Hardware

7.6.2 Serial Port Connector Pin-out

The connection to the serial port connector of TIRTL are described in Figure 14 and Table 6. The view of the connector in Figure 14 is that seen when looking into the RS232 connector at the back of TIRTL.

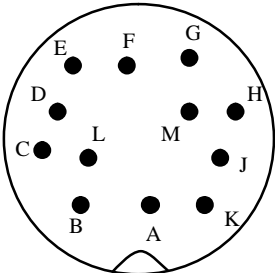


Figure 14 – Comm Port A and B connectors as seen at the back of TIRTL

Table 6 – Comm Port A and B connector pin-out

Pin Designator	TIRTL Receiver Comm Port A and B
A	CD
B	RD
C	TD
D	DTR
E	GND
F	DSR
G	RTS
H	CTS
J	n.c.
K	n.c.
L	n.c.
M	n.c.
Body	shield

7.6.3 Antenna Connection for Permanent Installations

For permanent installations the TIRTL sunshield is removed and the unit is installed upside down on the flat cover plate. In this position it is not possible for the GPS/GSM/GPRS or GSM/GPRS only antennas to be directly attached to the TIRTL body. Additionally for permanent installations, as the units are left unattended for extended periods of time, TIRTL is located in an external housing to protect the alignment of the equipment and secure the installation against vandalism. This requires that the antennas are mounted on a nearby pole with RF cables providing the connection to the TIRTL receiver. To facilitate the connection to the external antenna TIRTL is equipped with 1 or 2 (depending on the options fitted) SMA RF connector mounted to the side of the body. The position allocation of the connectors is given in Figure 15.

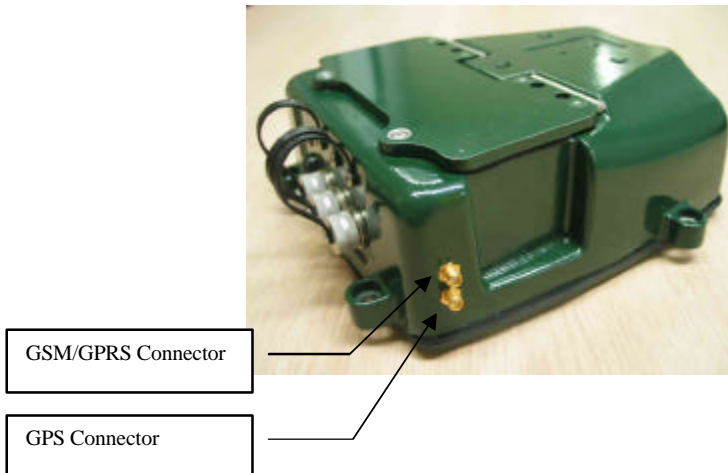


Figure 15 - RF Connector Positions

7.7 Alarms

The receiver provides a number of alarms to indicate adverse conditions. The alarms include the following:

- Beam levels degraded
- Beams blocked
- Beams not aligned
- Low internal battery voltage
- External power lost
- Real time clock battery low
- No GSM/GPRS coverage
- Invalid GSM/GPRS SIM PIN
- GSM SIM card missing
- Vehicle log space low
- Site information configuration file error
- Classification scheme configuration file error
- Classification software configuration file error
- Traffic conditions type not supported by this unit
- Classification traffic conditions configuration file error
- Log subsystem configuration file error

The receiver can be configured to output any alarm when it changes state. The state of each alarm may also be queried using the *TIRTLsoft* GUI (section 8.7.2).



8 PC Based TIRTL*soft*.

TIRTL*soft* provides an intuitive GUI to TIRTL. The GUI has a clear and comprehensive presentation that allows a real time view of traffic events.

8.1 Operating System Compatibility

TIRTL*soft* operates under all of the following operating systems:

- Windows XP
- Windows 2000
- Windows 98

8.2 Starting the Application

TIRTL*soft* is initialized by using a file navigation program, such as Windows Explorer, to locate the application in the host computer's memory and double clicking on TIRTL*soft* executable.

Alternatively the application may be initialized using *Run* under the Windows *Start* menu and browsing to the file location of TIRTL*soft*.

8.3 TIRTL*soft* Overview

This section provides an overview of the TIRTL*soft* GUI and general functionality of TIRTL*soft* application.

Figure 16 gives a broad view of the TIRTL*soft* GUI.



TIRTsoft

File View Tirt Options Help

Configuration Editor

Sites Information Classification Scheme

Name	Value
Scheme Name	AusRoads84
Max Axle Spacing	10000
Max Group Spacing	2100
Vehicle Classes	
<input type="checkbox"/> Short Vehicle	Short Vehicle
<input type="checkbox"/> Short Towing	Short Towing
<input type="checkbox"/> Two Axle Truck or Bus	Two Axle Truck or Bus
<input type="checkbox"/> Three Axle Truck or Bus	Three Axle Truck or Bus
Class Number	4
Class Type	User Defined
Vehicle Patterns	
<input type="checkbox"/> Pattern 1	
Min. No. Axles	3
Max. No. Axles	3
Min. No. Group	2
Max. No. Group	2
Axle Spacing	
Wheel Size	
Wheel Ratio	
<input type="checkbox"/> Four Axle Truck	Four Axle Truck
<input type="checkbox"/> Three Axle Articulated	Three Axle Articulated
<input type="checkbox"/> Four Axle Articulated	Four Axle Articulated
<input type="checkbox"/> Five Axle Articulated	Five Axle Articulated
<input type="checkbox"/> Six Axle Articulated	Six Axle Articulated
<input type="checkbox"/> B Double	B Double
<input type="checkbox"/> Double Road Train	Double Road Train
<input type="checkbox"/> Triple Road Train	Triple Road Train

Status

General Alarms Logging Modules

Rx Serial No.: RX_CEO5_048
Time: 4:48:05 PM
Date: 22/05/2004
Beam Levels: 2 8 9 3
Rx Temperature: 72°F
Rx Battery: Ext: 125 V Int: 0.0 V

Tx Serial No.: TX_CEO5_048
Tx Temperature: 72°F
Tx Battery: Ext: 125 V Int: 0.0 V

Traffic

000217

Vehicle Class	Speed	Lane	Time	# Axles	Wheel Base
1 Short Vehicle	47.3 mph	2	16:47:42	2	6.76 ft
1 Short Vehicle	59.8 mph	2	16:47:44	2	9.22 ft
1 Short Vehicle	58.3 mph	2	16:47:44	2	9.60 ft
1 Short Vehicle	48.2 mph	1	16:47:45	2	9.30 ft
1 Short Vehicle	48.3 mph	1	16:47:46	2	9.28 ft
1 Short Vehicle	47.7 mph	1	16:47:47	2	8.24 ft
1 Short Vehicle	48.1 mph	1	16:47:47	2	7.73 ft
1 Short Vehicle	57.1 mph	2	16:47:48	2	8.68 ft
1 Short Vehicle	56.5 mph	2	16:47:48	2	8.72 ft
1 Short Vehicle	51.6 mph	1	16:47:48	2	7.87 ft
1 Short Vehicle	54.8 mph	1	16:47:49	2	8.59 ft
2 Short Towing	50.8 mph	2	16:48:02	2	10.02 ft
1 Short Vehicle	50.6 mph	2	16:48:05	2	8.20 ft

Task Log

1/05/2004 8:49:05 AM: Connecting.
 1/05/2004 8:49:09 AM: Connected.
 1/05/2004 8:49:36 AM: Site Information transfer completed.
 1/05/2004 8:49:45 AM: Classification Scheme transfer completed.

Online Automated Tasks Disabled Connected 0:04:59

Figure 16 – Broad view of TIRTsoft.

8.3.1 Configuration Editor

The configuration editor is provided to create and edit structured files used to configure the operation of TIRTL receiver. It is located on the left hand side of the main application area.

There are two tabs associated with the Configuration Editor window, entitled “Site Information” and “Classification Scheme”. Detailed site and classification information must be configured in the receiver for it to successfully detect and classify vehicles. Definition of the site and classification information is entered with the Configuration Editor window.

Site Information

The number of lanes and their direction and optionally the site layout dimensions (detailed in Section 8.6.1).

Classification Scheme

A classification scheme containing information used to discriminate between vehicle classes. Optional field used throughout the classification window allows fine differentiation between similar vehicle profiles (detailed in Section 8.6.2).

8.3.2 Status

The Status panel shows the operational status of TIRTL (Figure 17). The Status panel is located in the top right section of GUI window. The panel is segmented into four different tabs:

- General
- Alarms
- Logging
- Modules

The Status panel can be shown/hidden by selecting *Status and Alarms* from the *View* pull down menu.

The Status panel can be activated/deactivated by selecting the check box in the top left corner of the Status panel.

Details of the contents of tabs is contained in the following four sections.

8.3.2.1 Status – General

Figure 17 illustrates the Status panel with General tab selected.

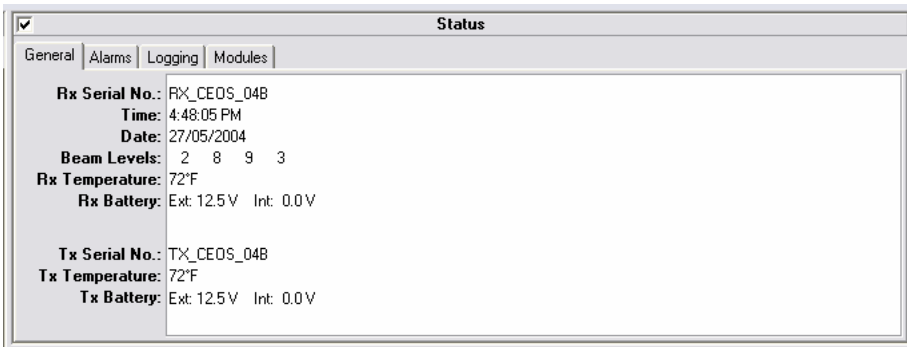


Figure 17 – Status panel – General tab.

Details of the Status – General panel include:

- Serial number – Unique serial number of the transmitter and the receiver.
- Time – Current time set in the receiver.
- Date – Current date set in the receiver.
- Beam Levels – Amplitude of the four beams at the receiver. This is the same information as displayed on the *View Alignment* form under *Tirtl* pull down menu.
- Temperature – Temperature in the receiver and transmitter.
- Battery – Internal and external battery voltages at the receiver and transmitter.

The date and time are updated every five seconds, all other information is updated every twenty seconds.

8.3.2.2 Status - Alarms

Figure 18 illustrates the Status panel with Alarms tab selected.

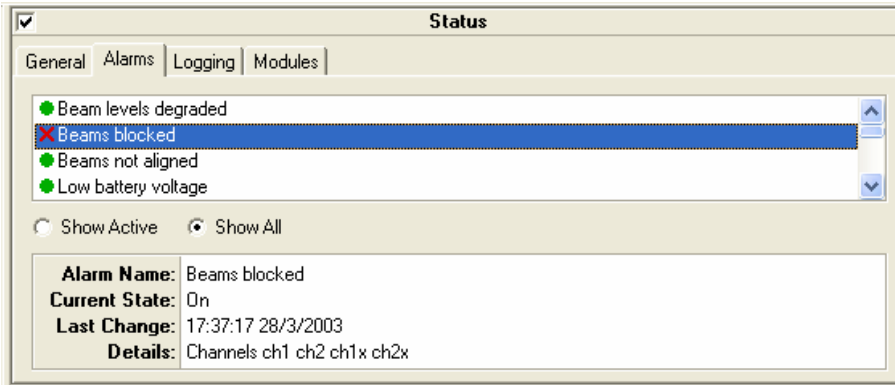


Figure 18 – Status panel – Alarms tab.

The Status – Alarms panel displays the current status of alarms in the receiver (Figure 18). The Alarms panel is located in the top right section of GUI window. See section 7.7 for a complete list of alarms.

During normal, error free operation, all alarms are inactive and displaying green. Active alarms are displayed in the upper window in red.

Specific details of each alarm are displayed in the lower window when an active alarm is selected from the list in the upper window of the panel (select by using the mouse/cursor).

The radio buttons between the Alarm panel windows enable the user to view all alarms, or only those alarms that are currently active (red).

Alarm status information is updated every twenty seconds.

8.3.2.3 Status - Logging

Figure 19 illustrates the Status panel with Logging tab selected.

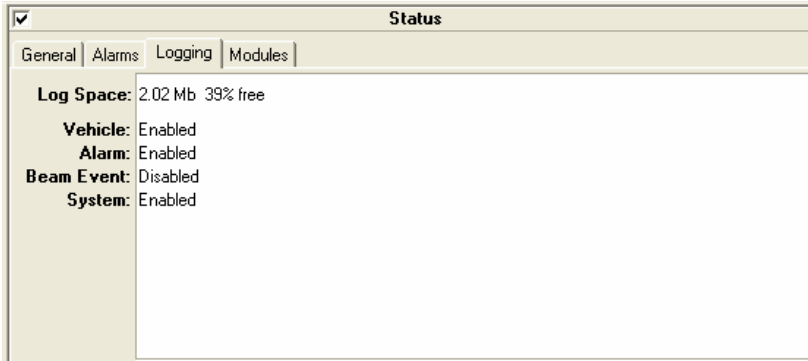


Figure 19 – Status panel – Logging tab.

The Status- Logging panel shows the following details

- Log Space – Capacity and amount of free log space as a percentage of the total on the receiver.
- The Enabled/Disabled status of the four different logging options, namely, Vehicle, Alarm, Beam Event and System. The Enabled/Disabled status may be changed through *Tirtl* pull down menu (see section 8.7).

Logging status information is updated every twenty seconds.

8.3.2.4 Status - Modules

Figure 20 illustrates the Status panel with Modules tab selected.

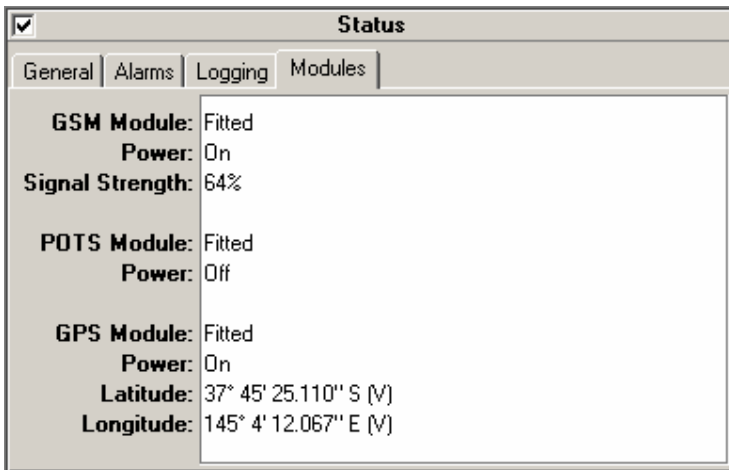


Figure 20 – Status panel – Modules tab.

The Status- Modules panel allows access to information relevant to optionally fitted modules within TIRTL.

- When the GSM module is installed the power on/off status and the signal strength is indicated.
- The POTS module option provides power on/off status.
- With the GPS module installed TIRTL provides power on/off status and the geographical location of the TIRTL receiver in degrees, minutes and seconds. A “V”, “I” and “U” in brackets after the latitude or longitude represents valid, invalid and un-initialized respectively. Where un-initialized implies the GPS receiver has not obtained a valid reading since power up.

8.3.3 Traffic

The Traffic panel provides a scrolling list of the classified traffic (Figure 21). The Traffic panel is intended to be used to verify correct operation of TIRTL after set up. The Traffic panel is located in the center right side of the GUI window.

The Traffic window is comprised of a number of columns that may be used to verify correct operation. These include:

- Vehicle Class – Displays the classification name of the recorded vehicle.
- Speed – Measured speed of each respective vehicle.
- Lane – Displays the lane number of each respective vehicle in a multi-lane deployment.
- Time – Time stamp of the record.
- # Axles – Number of axles detected.
- Wheel Base – Recorded distance between front and back axles.

Above the Traffic window a vehicle counter has been provided to aid traffic volume measurement.

The Traffic window can list up to one thousand vehicles. Once the capacity of the list is exceeded the oldest entry is discarded with every new vehicle record.

Traffic						
000217		Reset				
Vehicle Class	Speed	Lane	Time	# Axles	Wheel Base	
1 Short Vehicle	47.3 mph	2	16:47:43	2	6.76ft	
1 Short Vehicle	53.8 mph	2	16:47:44	2	9.22ft	
1 Short Vehicle	50.3 mph	2	16:47:44	2	8.60ft	
1 Short Vehicle	48.2 mph	1	16:47:45	2	9.30ft	
1 Short Vehicle	48.3 mph	1	16:47:46	2	9.28ft	
1 Short Vehicle	47.7 mph	1	16:47:47	2	8.24ft	
1 Short Vehicle	48.1 mph	1	16:47:47	2	7.71ft	
1 Short Vehicle	57.1 mph	2	16:47:48	2	8.68ft	
1 Short Vehicle	56.5 mph	2	16:47:48	2	8.72ft	
1 Short Vehicle	51.6 mph	1	16:47:48	2	7.87ft	
1 Short Vehicle	54.8 mph	1	16:47:49	2	8.59ft	
2 Short Towing	50.8 mph	2	16:48:03	3	18.02ft	
1 Short Vehicle	50.6 mph	2	16:48:05	2	8.20ft	

Figure 21 – Traffic panel.

The Traffic panel may be shown/hidden by selecting *Traffic* from the *View* menu.

The Traffic panel may be activated/deactivated by selecting the check box in the top left corner of the Traffic panel.

8.3.4 Task Log

The Task Log window contains a history of activities that have occurred since TIRTL^{soft} application was started (Figure 22). The Task Log is located in the bottom right side of the GUI window.

The information that appears in the task log is the same as that written to the System log file. Operational errors will also be displayed in the Task Log window.

Task Log
9/4/2003 10:31:39 AM : Connecting...
9/4/2003 10:31:40 AM : Connected.
9/4/2003 10:34:38 AM : Disconnecting...
9/4/2003 10:34:38 AM : Disconnected.
9/4/2003 10:35:25 AM : Connecting...
9/4/2003 10:35:25 AM : Connected.
9/4/2003 10:36:20 AM : Classification Scheme transfer completed.

Figure 22 – Task Log panel.

The Task Log panel may be shown/hidden by selecting *Task Log* from the *View* pull down menu.

8.3.5 Status Bar

The Status Bar is displayed at the bottom of the main application area. It shows the current status of time consuming activities, such as file transfers. The fields of the status bar are:

- Online/Offline – Displays the connective status between TIRTL and *TIRTLsoft* application.
- Configuration file transfer – Displays the progress of any configuration file transfer that is underway.
- Log file reception – Displays the progress of any c log file reception that is underway.
- Automated tasks- Displays the status of the automated tasks subsystem while in progress. This includes the task that is underway and the time of the next scheduled batch of automated tasks.
- Connected – Displays the elapsed time since the *TIRTLsoft* application first went online with the TIRTL receiver.



8.4 Communications Connectivity

8.4.1 Connection Types

In order to configure and interrogate TIRTL it is necessary to establish a communications session via the RS232 link.

Two connection types are supported:

- Serial (RS232) – serial communications uses raw RS232 to communicate with the TIRTL receiver.
- PPP – adds extra functionality to a standard RS232 link including (error correction, addressing, multiplexing).

Communication parameters are set in the connection dialog window by selecting *Connection Options* from the *Options* menu.

The screenshot shows a dialog box titled "Connection Options". It is divided into two main sections. The top section, "Connection Type", has two radio buttons: "PPP" (which is unselected) and "Direct Serial" (which is selected). Below the "PPP" radio button is a dropdown menu currently showing "Planet". Below the "Direct Serial" radio button is a dropdown menu currently showing "COM1" and a "Configure..." button. The bottom section, "Connection Options", contains a "Reconnect attempts:" label followed by a spin box set to the number "7". Below the spin box is a checked checkbox labeled "Reconnect if connection lost". At the bottom of the dialog are "OK" and "Cancel" buttons.

Figure 23 – Connection Options form.

From this dialog window, the user can configure:

- The communication type to either PPP or direct serial.
- Parameters associated with the connection type. See also section 7.6 for RS232 settings.
- An option is included to auto-reconnect should the connection be dropped. The number of attempts to reconnect may be set to any number between 0 and 9999.

8.4.2 Connection Status

The connection status of TIRTL to *TIRTLsoft* application is viewed from the Status bar at the bottom of the main application window. The following is a list of terms used to describe the current connection status of the application:

- Disconnected – The application is not currently connected with TIRTL unit.
- Connecting – The application is currently initiating a connection to TIRTL unit.
- Connected – The application currently has a connection with TIRTL unit.
- Disconnecting – The application is currently terminating the connection to TIRTL unit.
- Reconnect – A connection attempt has failed and the application is waiting to make another connection attempt.



8.4.3 Online & Offline

Some features of the TIRTL^{soft} application require it to establish a connection automatically (see Section 8.8). Because of this, a distinction is made as to whether a connection was established automatically or at the user's request.

The Online/Offline status of the system may be viewed from the Status bar located at the bottom of the main application window.

The following terms are used to make a distinction between Online and Offline.

- Online – The application is currently connected to TIRTL unit at the user's request. The user may interact with the TIRTL unit in this state. When Online the user is responsible for terminating the connection.
- Offline – The user cannot interact with the TIRTL unit. The application may be connected to the TIRTL unit due to an automatic connection, in this case, the application is responsible for terminating the connection.

To establish an Online connection to the TIRTL unit, or to use an existing connection, select *Go Online* from the *Tirtl* menu.

To inform the application that you are finished with a connection, select *Go Offline* from the TIRTL menu. If the application is not using the connection, it will disconnect immediately, otherwise it will disconnect when it is finished.

If the user performs an action that requires the application to be *Online*, the dialog shown in Figure 24 will query the user if they wish to go *Online*.

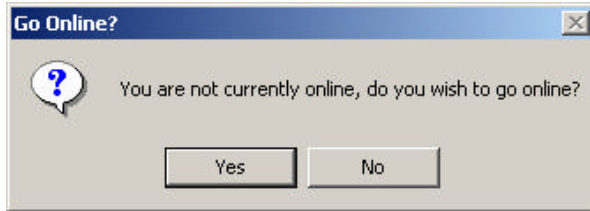


Figure 24 – On-line query box.

8.5 Alignment Verification

The Alignment screen graphically illustrates the current strength of the four beams at the receiver, as shown in Figure 25.

In order to view the alignment the application must be *Online*, Automated Tasks must be disabled, and no file transfer (configuration or log) may be occurring with TIRTL receiver.

The Alignment screen may be displayed by selecting *View Alignment* from *Tirtl* menu.

The Alignment screen is designed to be used during the set up of TIRTL. Each of the wide columns represent infra-red light, measured in relative units, that is transmitted by the TIRTL transmitter and received by the TIRTL receiver. The optimal alignment of the transmitter and receiver is represented by the 4 columns being of equal number of units at as high a value as possible. In practise the absolute level, and therefore the height of the columns, is highly dependent on environmental conditions. That is, if the units are operating in adverse weather conditions the received light will be less and therefore the column height will be reduced.

Typically beam intensity levels of between 40 and 50 units are required for best operation over 2 to 4 lanes, assuming TIRTL units are within 6 ½ feet of the edge of the road.

The intensity of all four beams should ideally be within 3 units of each other.

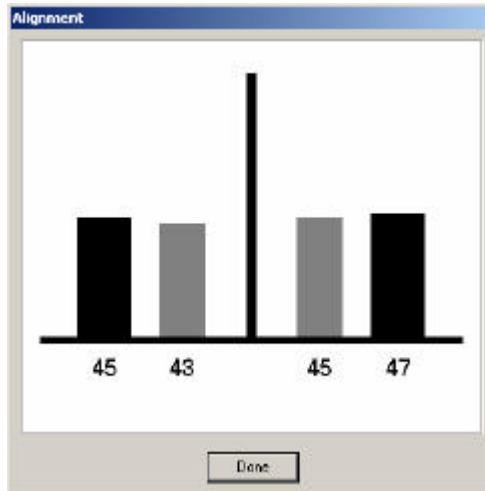




Figure 25 – Alignment screen.

8.6 Configuration Editor Details

The configuration editor is used to create and edit structured files used to configure the operation of the TIRTL unit. It is located on the left hand side of the main application area.

There are two tabs presented within the Configuration Editor window, entitled “Site Information” and “Classification Scheme”. Detailed site and classification information must be configured in the receiver for it to successfully detect and classify vehicles. Definition of the site and classification information is entered in the Configuration Editor window.

Each panel in the editor consists of two main sections:

- Tree – The left hand portion of the editor contains a tree of all the entries in the currently open file. The tree may be expanded by clicking on the “” symbol and contracted by clicking on the “” symbol. This tree also shows how the entries relate to each other.
- Value List – the right hand portion of the editor contains a list of the values associated with each entry in the file. Each value may be edited by clicking on the item and entering a new value using the options provided (text field or drop down list).

Configuration files may only be exchanged with the TIRTL unit while the application is *Online*.

8.6.1 Site Information

The Site Information contains parameters specific to the operational location. The Site Information panel is located in the Configuration Editor panel under the Site Information tab. A view of the Site Information panel is shown in Figure 26. Parameters include:

- Number of left and right bound lanes – This allows the unit to accurately learn the lane positions.
- Use Crossed Beams – Enable/disable the use of the crossed beam information. When the units are positioned less than 20 feet apart the crossed beams become invalid and must be disabled.
- Traffic Conditions – A field not modifiable by the user.
- Site Layout – Setting the parameters under this section prevents the receiver from learning the position of each lane, allowing it to immediately classify vehicles.

This optional information specifies the distance from the TIRTL transmitter and receiver to the road edge, the average width of each lane and the width of the median strip for a dual highway

installation. If there is no median strip then this parameter is set to zero.

When not set TIRTL learns the lane positions by knowing the number of lanes and developing a histogram of vehicle distances from the receiver.

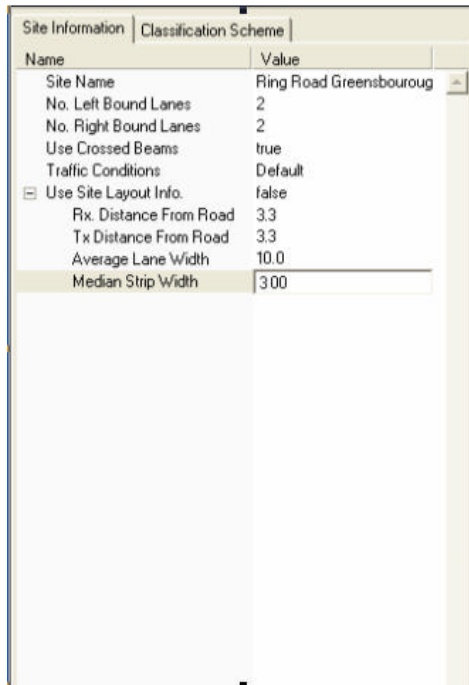


Figure 26 – Site Information panel.

Site Information files may be created, opened, saved and saved under a different name by selecting the corresponding entries under the *File* menu.

Eg. *File*→*Site Information*→*New*.

→*Open...*

→*Save*

→*Save As...*

The Site Information scheme may be transferred to TIRTL using *Tirtl* pull down menu and selecting:

Site Information ? Send Site Information.

The Site Information scheme may be transferred from TIRTL using *Tirtl* pull down menu and selecting:

Site Information ? Receive Site Information.

In this way an existing scheme may be uploaded from TIRTL, modified in the Configuration Editor – Site Information panel and the modified scheme downloaded back to TIRTL.

8.6.2 Classification Scheme

The Classification Scheme panel is located in the Configuration Editor panel under the Classification Scheme tab. A view of the Classification Scheme panel is shown in Figure 27.

A classification scheme contains the detailed information needed to classify vehicles into one or more vehicle classes.

User modifiable fields may be accessed within the Classification Scheme by clicking on the Name field.

Each scheme may be named to allow easy future reference .

A scheme allows the absolute maximum axle and axle group spacing to be specified for the entire scheme (specified in decimal feet).



Each vehicle class has associated with it one or more vehicle patterns and the vehicle class may be allocated an easily identifiable number and name.

A classification scheme contains a series of patterns based upon parameters associated with vehicle axles. Each pattern contains a number of parameters that uniquely describe a vehicle. Generally the Classification Scheme moves toward finer and finer detail as the parameters of a particular vehicle class are presented down the Classification Scheme window.

Parameters include:

- Number of Axles – Minimum and maximum number of axles that a matching vehicle may have.
- Number of Axle Groups – Minimum and maximum number of axle groups that a matching vehicle may have. An axle group is a series of axles, where no more than 7 feet separates each axle. This allows the user to be more specific about how the axles within a vehicle are distributed, without having to specify the distance between each axle pair.
- Axle spacings – minimum and maximum spacing between each axle. This allows the user to enter detailed patterns, distinguishing between vehicles having similar axle configurations (specified in decimal feet).
- Wheel Sizes – Allows fine differentiation of vehicle classes that have very similar axle characteristics. The absolute wheel size within TIRTL is a learned parameter, the average of which is normalized to 1 within the current wheel base class. This modifiable parameter gives the user the ability of differentiating wheel sizes measurably outside the average for this wheel base. For example, by specifying a minimum normalized wheel size of 0.97 and a maximum of 1.03 all

vehicles with a wheel size greater than $\pm 3\%$ will not be classified within this class.

- **Wheel Ratios** – Allows fine differentiation of vehicle classes that have very similar axle characteristics. The Wheel Ratio is the ratio of front wheel size to back wheel size (in that order). Therefore a Wheel Ratio of >1 represents a vehicle with a larger front wheel with respect to the back wheel. A Wheel Ratio of <1 represents a vehicle with a smaller front wheel with respect to the back wheel.

Vehicle Patterns may only be added to vehicle classes of type *User Defined*.

Entry of each of these parameters is optional. If a parameter is not entered it will not be used to match against detected vehicles. This enables the user to enter as simple or complex scheme as necessary. However, all entered parameters must be satisfied for a match.

Example: Figure 27 illustrates a classification scheme entry that is taken from the AustRoads94 scheme. It specifies a vehicle class named 'Three Axle Truck or Bus' with a class number of 4. This class will match all vehicles with exactly 3 axles. The axle must be separated into exactly 2 axle groups.

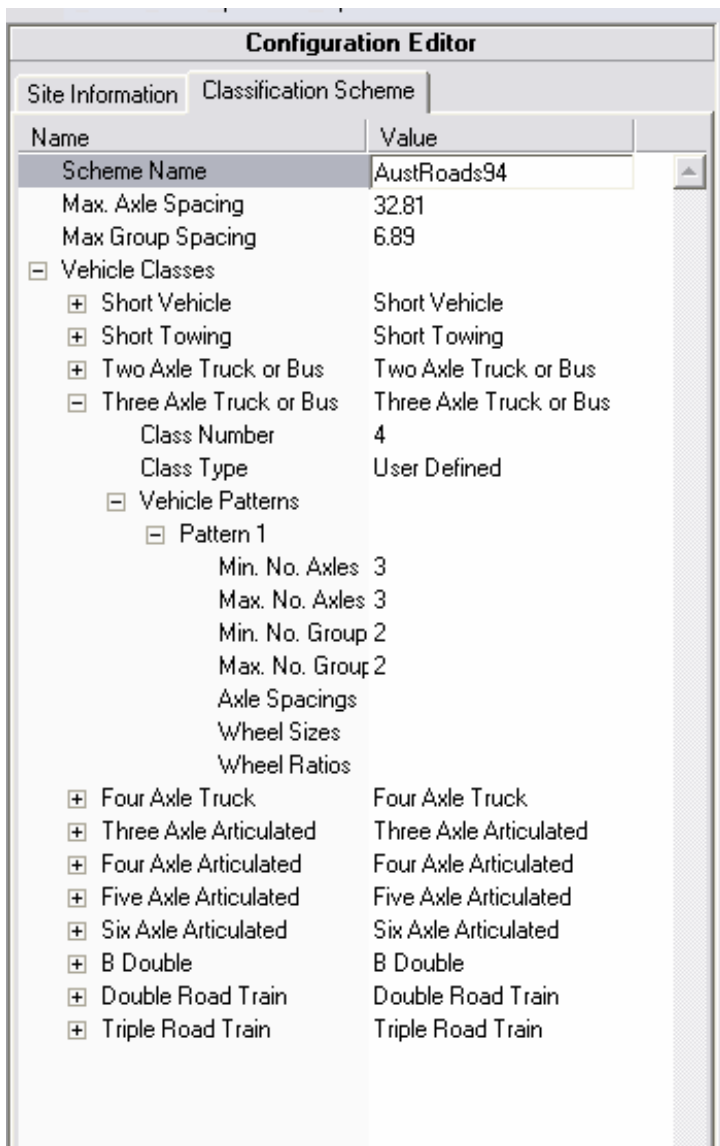


Figure 27 – Classification Scheme panel.

When a detected vehicle matches more than one vehicle class in the scheme, the first match in the ordered list will be used. The user must ensure vehicle classes are in the appropriate order to achieve the intended results.

Example: A classification scheme has two vehicle classes entered in the following order:

- class 'A' – 2 axles, axle separation of 3.3' to 8.2'.
- class 'B' – 2 axles, axle separation of 5' to 9.8'.

A detected vehicle with 6 ½ ft. axle separation will match both classes, however it will be classified by TIRTL as class 'A' because it appears first in the classification scheme.

The classification scheme editor not only allows you to alter information, it also allows you to add and remove items to/from the tree. The types of items which may be added/removed in this fashion include:

- Vehicle Classes
- Vehicle Patterns
- Axle Spacing
- Wheel Sizes
- Wheel Ratios

New items may be added by right clicking on the appropriate item in the tree and selecting *Add* from the popup menu.

Items may be removed from the tree by right clicking on them and selecting *Delete* from the popup menu. As a precaution., the user will be prompted to confirm all deletions.

Example: A new vehicle class may be added to the scheme by right clicking on the Vehicle Classes entry and selecting *Add Vehicle Class* from the popup menu.

Example: An Axle Spacing may be removed by right clicking on the axle spacing and selecting *Delete* from the popup menu.

A Vehicle Class may be moved up or down in the tree by right clicking on it and selecting *Move Up/Down* from the popup menu, this alters the precedence of the vehicle class in the classification scheme.

Classification Scheme files may be created new, opened, saved and saved under a different name by selecting the corresponding entries under the *File* menu.

Eg. *File*→*Classification Scheme* →*New*.

→*Open...*

→*Save*

→*Save As...*

The Classification Scheme may be transferred to TIRTL using *Tirtl* pull down menu band selecting

Classification Scheme ? Send Classification Scheme.

The Classification Scheme may be transferred from TIRTL using *Tirtl* pull down menu and selecting

Classification Scheme ? Receive Classification Scheme.

In this way an existing scheme may be uploaded from TIRTL, modified in the Configuration Editor – Classification Scheme panel and the modified scheme downloaded back to TIRTL.

8.6.3 Synchronize Time

The time and date information stored in TIRTL is used to time and date stamp the classified traffic data.

When powering TIRTL units for the first time it is necessary to update TIRTL time and date information.

The TIRTL clock has a dedicated battery that is independent of the main twelve “C” cell battery set. The clock therefore retains the current time and date when main power system or battery power is removed. The clock battery has an average life of 10 years.

The date and time is set through a *Tirtl* pull down menu by selecting *Set Date/Time*.

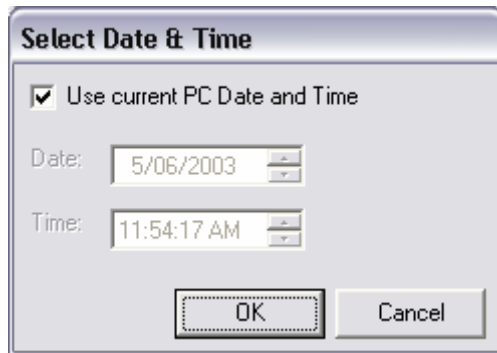


Figure 28 – Date and Time dialog box.

In the date/time dialog box it is possible to synchronize the TIRTL time with the PC time.

It is also possible to set a different time to the PC by unselecting the *Use current PC Date and Time* box and manipulating the scroll arrows associated with each date and time field.

8.7 Logging

This section describes the retrieval and maintenance of log files on TIRTL unit.

Logging interactions with the TIRTL receiver requires *TIRTLsoft* to be set *Online* and the Automated Tasks to be disabled (Section 8.8).

The TIRTL receiver contains a software subsystem that is responsible for all data logging. There are four types of data that can be logged:

- Vehicles – All vehicles successfully classified by the receiver. Vehicle data logged includes time, speed, direction, lane, number of axles, vehicle class number and name.
- Alarms – Changes in the state of any alarm condition, including the time of occurrence.
- Beam Events – The raw beam events before they are used in vehicle classification. Information includes beam number, beam event type (break or make) and time stamp.
- System – System events that can be used for troubleshooting.

The downloaded vehicle data is binned into comma separated value (.csv) files based on the time interval specified in the various logging options specified in the following sections.

When downloading a log file it is possible to abort the operation by accessing the *Cancel Log File Download* through the *Tirtl* drop down menu.

8.7.1 Vehicle Logging

Vehicle logging options may be configured from the Log Options form shown in Figure 29. This form may be accessed by selecting *Log Options* from the *Options* drop down menu.

- Log Directory – The default directory used when the user retrieves a log file. It is also the directory used by the



Automated Tasks subsystem. The application log file is also placed in this directory

- Vehicle Log Format – Allows the user to select which components of the classified vehicle data is downloaded by the application by selecting the appropriate boxes.



Figure 29 – Log Options form.

Extended Data for Verification may be selected where the download of extended parameters used for video confirmation are necessary.

Each type of vehicle logging may also be independently controlled by selecting the corresponding entry under the *Tirtl* menu.

eg. *TIRTl*→*Vehicle Logs*→*Receive Vehicle Log*

→*Clear Vehicle Log*

→*Enable Vehicle Logging*

→*Disable Vehicle Logging*

The user is asked if they want to clear the retrieved log entries from TIRTL receiver after they have successfully downloaded the information to the PC.

8.7.2 Alarm Logging

For a list of monitored alarm conditions see section 7.7.

The Alarm log may also be controlled by selecting the corresponding entry under the *Tirtl* menu.

eg. *TIRTL*→*Alarm Logs* →*Receive Alarm Log*
→*Clear Alarm Log*
→*Enable Alarm Logging*
→*Disable Alarm Logging*

The user will be asked if they wish to clear the retrieved log entries from the TIRTL receiver after they have successfully downloaded the information to the PC.

8.7.3 Beam Event Logging

The Beam Event log may also be controlled by selecting the corresponding entry under *Tirtl* menu.

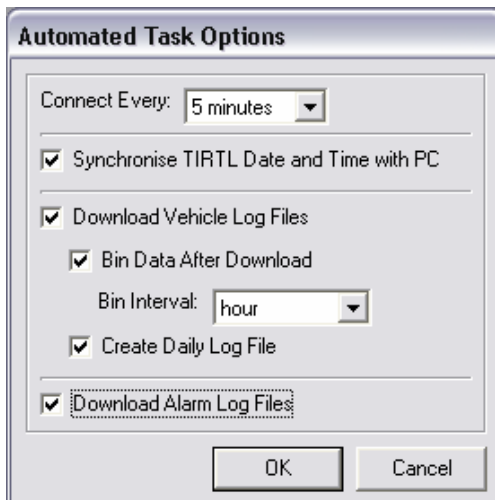
eg. *TIRTL*→*Beam Event Logs* → *Receive Beam Event Log*
→ *Clear Beam Event Log*
→ *Enable Beam Event Logging*
→ *Disable Beam Event Logging*

The user will be asked if they wish to clear the retrieved log entries from TIRTL receiver after they have successfully downloaded the information to the PC.



The Automated Task Options query box allows the user to specify a number of different actions including:

- The frequency of each task.
- Whether to auto-synchronize the TIRTL clock to the PC system clock.
- Enable the download of vehicle log files. A secondary option is to “Bin” the vehicle data into *.csv files at an interval specified in the drop down box. Alternatively a single check box is available to “Bin” the data on a daily basis.
- Enable the download of Alarm Log Files.



The screenshot shows a dialog box titled "Automated Task Options". It contains the following settings:

- Connect Every: 5 minutes (dropdown menu)
- Synchronise TIRTL Date and Time with PC
- Download Vehicle Log Files
 - Bin Data After Download
 - Bin Interval: hour (dropdown menu)
 - Create Daily Log File
- Download Alarm Log Files

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

Figure 30 – Automated Tasks Options form.

8.9 TIRTL Reset

TIRTL may be reset by accessing the *Reset Tirtl Unit* available on *Tirtl ? Advanced* pull down menu.

8.10 Control of Optional Modules

Optional modules that may be fitted to TIRTL include GSM/GPRS, POTS and/or GPS.

Power control of the optional modules is provided by selecting the appropriate on/off power control via *Modules* under the *Tirtl* pull down menu.

For the GSM option, in addition to power control, it is possible to set the SIM PIN by selecting *Set GSM SIM PIN* under *Tirtl ? Modules* and completing the pop-up dialog box as shown in Figure 31.

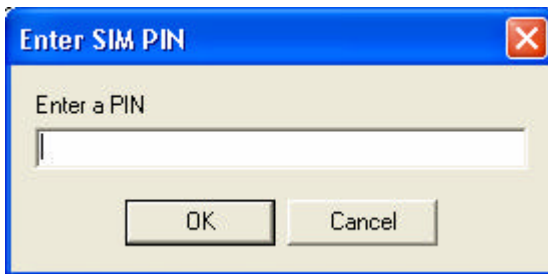


Figure 31 – SIM PIN dialog box.

9 Palm Handheld Based TIRTL*soft*

The Palm Handheld version of TIRTL*soft* provides an intuitive GUI to the TIRTL. The GUI has a clear and comprehensive presentation that allows a real time view of traffic events.

9.1 Palm Handheld Compatibility

TIRTL*soft* operates on the following Palm Handheld:

- Tungsten T and Tungsten T2

9.2 Starting the Palm Application

TIRTL*soft* is initialized by selecting the TIRTL icon from the Palm Handheld applications menu.

9.3 Palm – Main Menu

Figure 32 gives a view of the GUI first encountered by the user when first starting the TIRTL*soft* application. When a connection is established to the TIRTL (see section 9.5) the Main Menu allows access to the following sub-menus:

- General Status – This view gives information on TIRTL receiver/transmitter pair including operational temperature and serial numbers.
- Alarm Status – A view of active and inactive alarms within TIRTL.
- Module Status – Monitoring and control of optionally installed TIRTL modules including, GSM/GPRS, POTS Modem and GPS modules.



- Logging Status –Control of the logging options within TIRTL including, Vehicle, Alarms, Beam Events and System.
- Alignment – Graphical display of the quality of the beam alignment and intensity.
- Traffic – A table view of all classified traffic events. Useful for confirming classification accuracy.
- File Manager – Allows the manipulation and verification of information regarding TIRTL installation. Details include Site Information, Classification Scheme (view only) and Logs.

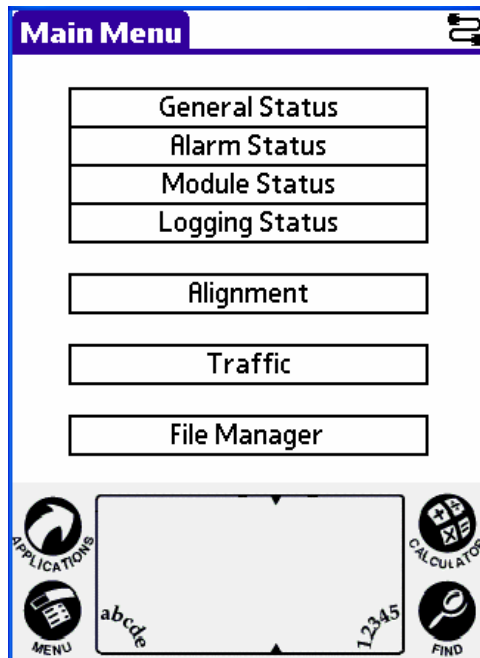


Figure 32 – Palm Main Menu view.

9.4 Navigating Palm Handheld Menus

Navigation of *TIRTLsoft* on the Palm Handheld uses a process of tapping context activated buttons. The buttons are activated by tapping on the graphic in the display using the Palm Handheld stylus.

Context activated buttons within Figure 32 include:

- Text surrounded by bold line boxes.
- The *Main Menu* tab displayed in white text on a dark background at the top left side of the screen. Note, depending on the context, tabs may or may not have a sub-menu.
- The Connection Button displayed with a dark graphic on a white background at the top right of the screen (see also Figure 36 and Figure 37).

When moving to a sub-menu within *TIRTLsoft* tapping the Return button located in the top right portion of the screen (Figure 33) returns the user to the top level menu.



Figure 33 – Palm Return button.

9.5 Palm – Communications Connectivity

9.5.1 Connection Types

In order to configure and interrogate the TIRTL it is necessary to establish a communication session via the RS232 link.

Two connection types are supported:

- Serial (RS232) – serial communications uses raw RS232 to communicate with TIRTL unit.
- PPP – adds extra functionality to a standard RS232 link including (error correction, addressing, multiplexing)

Communication parameters are set in the connection dialog window by selecting *Connection Options* from the *Main Menu ? TIRTL* menu (see also section 7.6 for RS232 settings). Figure 34 shows the resultant pop-up dialog box when *Connection Options* are selected.

The baud rate may be set by selecting from the drop down list activated by tapping the “▼” button from the pop-up dialog box.



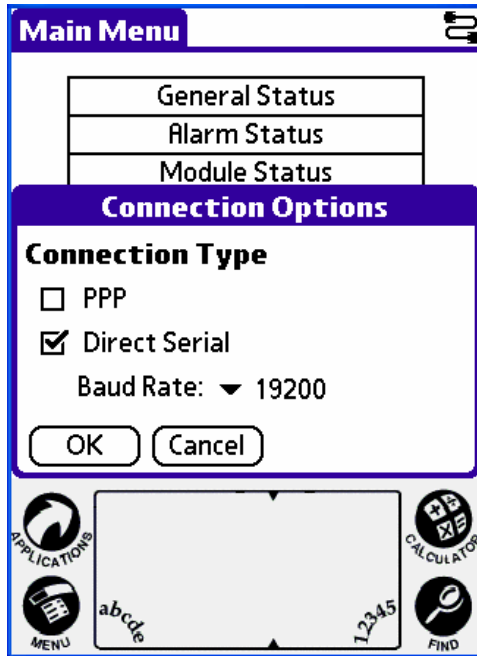


Figure 34 – Palm Connection Options dialog box.

9.5.2 Connect & Disconnect

Before attempting to go Online with TIRTL ensure the communication settings of section 9.5.1 have been completed.

To connect to TIRTL using the Palm Handheld tap the Connection Button with the stylus (see Figure 35). While the Palm Handheld is attempting to connect the view shown in Figure 35 will be displayed.

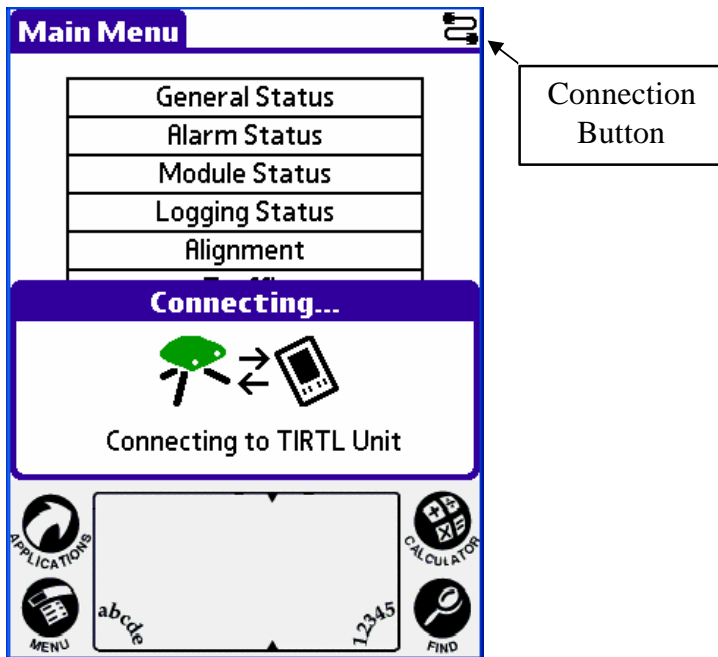


Figure 35 – Palm “Connecting” view.

When connected the Connection Button displays a white graphic on dark background on the right hand side of the Palm Handheld screen (Figure 36).

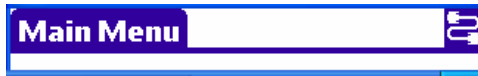


Figure 36 – Connection Button showing connected status.

To disconnect from TIRTL tap the white on dark background Connection Button.

When disconnected the Connection Button displays a dark graphic on a white background in the top right hand part of the display (Figure 37).

When disconnecting from TIRTL it is necessary to wait 60 seconds before attempting to reconnect.



Figure 37 – Connection Button showing disconnected status.

9.6 Palm – Alignment Verification

The Alignment screen graphically illustrates the current strength of the four beams at the receiver, as shown in Figure 38.

The Alignment screen may be displayed by tapping the *Alignment* box under the *Main Menu*.

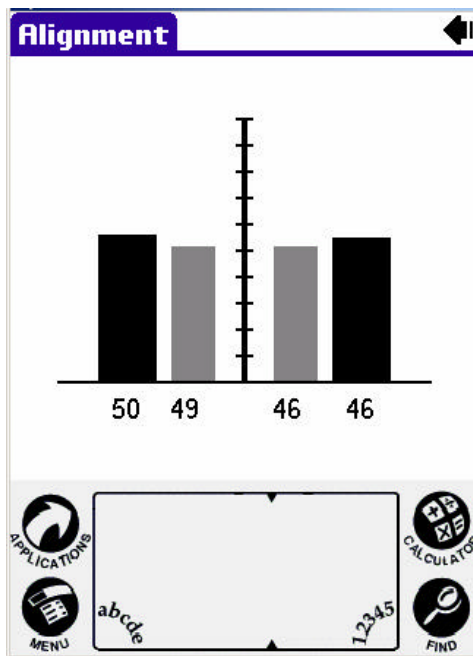


Figure 38 – Palm Alignment view.

The Alignment screen is designed to be used during the set up of the TIRTL. Each of the wide columns represent infra-red light, measured in relative units, that is transmitted by the TIRTL transmitter and received at the TIRTL receiver. The optimal alignment of the

transmitter and receiver is represented by the 4 columns being of equal number of units at as high a value as possible. In practise the absolute level, and therefore the height of the columns, is highly dependent on environmental conditions. That is, if the units are operating in adverse weather conditions the received light will be less and therefore the column height will be reduced.

Typically beam intensity levels of between 40 and 50 units are required for best operation over 2 to 4 lanes, assuming TIRTL units are within 6 ½ feet of the edge of the road.

The intensity of all four beams should ideally be within 3 units of each other.



9.7 Palm – General Status

Figure 39 illustrates the Palm Handheld General Status panel view. The Status panel is accessed by tapping the *General Status* button located on the *Main Menu* screen.

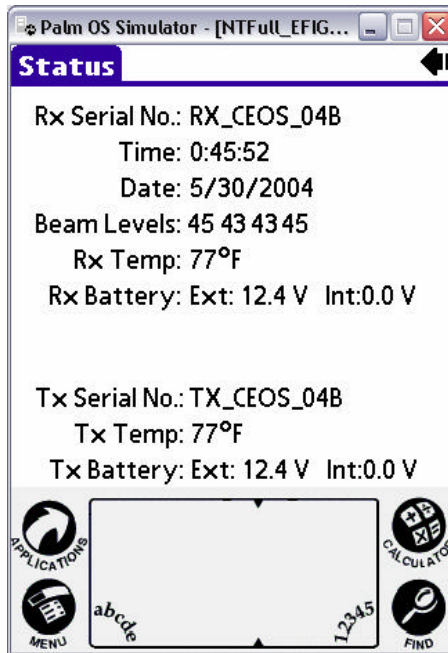


Figure 39 – Palm Status view.

Details of the Status panel include:

- Serial number – Unique serial number of the transmitter and the receiver.
- Time – Current time set in the receiver.

- Date – Current date set in the receiver.
- Beam Levels – Amplitude of the four beams at the receiver. This is the same information as displayed on the *Alignment* form under the *Main Menu*.
- Temperature – Temperature in the receiver and transmitter.
- Battery – Internal and external battery voltages at the receiver and transmitter.

The date and time are updated every five seconds, all other information is updated every twenty seconds.

9.8 Palm – Alarm Status

Figure 40 illustrates the Palm Handheld Alarm Status panel view. The Alarms panel is accessed by tapping the *Alarm Status* button located on the *Main Menu* screen. See section 7.7 for a complete list of alarms.

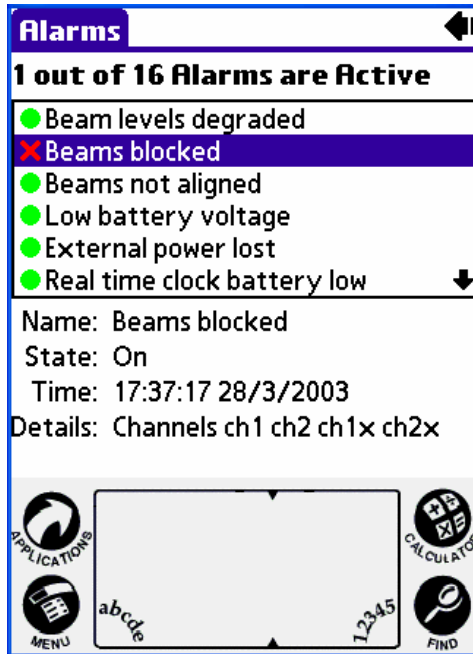


Figure 40 – Palm Alarms view.

During normal, error free, operation, all alarms are inactive and displaying green. Active alarms are displayed in the upper window in red. The alarm list may be scrolled by tapping the “↓” or “↑” buttons in the upper window.

Specific details of each alarm are displayed in the lower half of the window when an active alarm is selected from the upper alarm list.

Alarm status information is updated every twenty seconds.

9.9 Palm – Module Status

Figure 41 illustrates the Palm Handheld Module Status panel view. The Module Status panel is accessed by tapping the *Module Status* button located on the *Main Menu* screen.

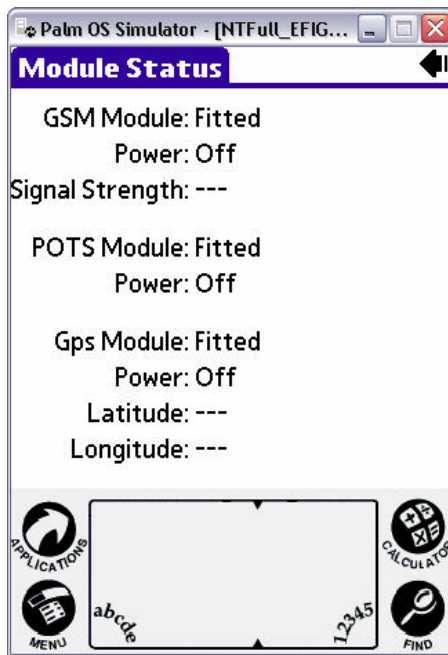


Figure 41 – Palm Module Status view.

The Module Status panel allows access to information relevant to optionally fitted modules within TIRTL.

- When the GSM module is installed the power on/off status and the signal strength is indicated.
- The POTS module option provides power on/off status.
- With the GPS module installed TIRTL provides power on/off status and the geographical A “V”, “I” and “U” in brackets after the latitude or longitude represents valid, invalid and un-initialized respectively. Un-initialized implies the GPS receiver has not obtained a valid reading since power up.

9.10 Palm – Logging

This section describes the retrieval and maintenance of log files on TIRTL.

The TIRTL receiver contains a software subsystem that is responsible for all data logging. There are four types of data that can be logged:

- Vehicles – All vehicles successfully classified by the receiver. Vehicle data logged includes time, speed, direction, lane, number of axles, vehicle class number and name.
- Alarms – Changes in the state of any alarm condition, including the time of occurrence.
- Beam Events – The raw beam events before they are used in vehicle classification. Information includes beam number, event type (break or make) and time stamp.
- System – System events that can be used for troubleshooting.

Each type of vehicle logging may be independently controlled by selecting the corresponding entry under the *Logging Status* from the *Main Menu* (Figure 42).

eg. Logging Status → Logging Status → Enable Vehicle Logging

→ Disable Vehicle Logging



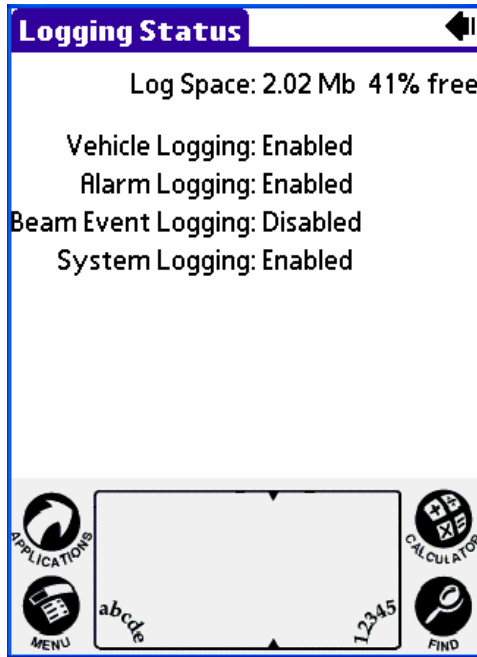


Figure 42 – Palm Logging Status view.

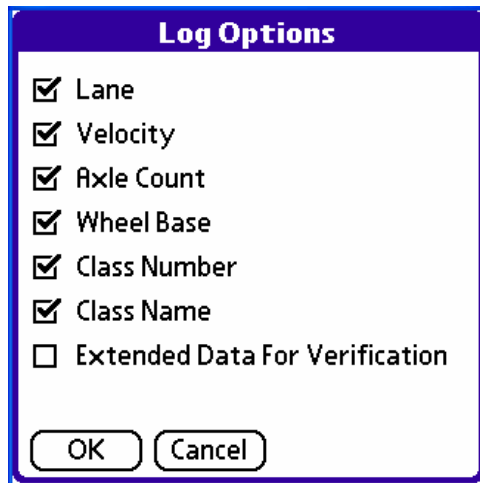
Logging Status also indicates the total log space available in megabytes on the Palm Handheld and the percentage unused.

9.10.1 Palm Vehicle Logging Options

Vehicle logging options may be configured from the Log Options form shown in Figure 43. This form may be accessed by selecting from the *Main Menu*:

File Manager ? File Manager ? Log Options.

Log Options allow the user to select the components of the classified vehicle data to be downloaded by the application by selecting the appropriate boxes.



Log Options

- Lane
- Velocity
- Axle Count
- Wheel Base
- Class Number
- Class Name
- Extended Data For Verification

OK Cancel

Figure 43 – Palm Log Options form.

Extended Data for Verification may be selected when the download of extended parameters, used for video confirmation, are necessary.

9.10.2 Palm Log Retrieval

Retrieval of logs from TIRTL is performed through the *File Manager* sub-menu accessed through the *Main Menu* panel (Figure 44).

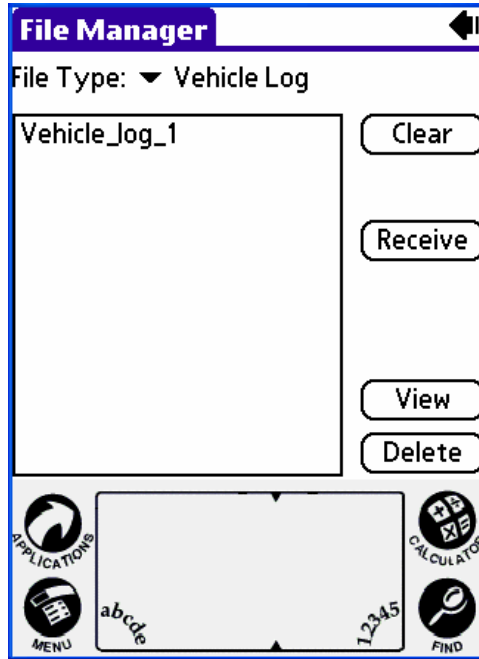


Figure 44 - Palm Logs sub-menu.

Once in the *File Manager* sub-menu the user selects the type of log to be transferred by tapping on the “▼” button located in the top center of the display. Options for log transfer include:

- Vehicle Logs

- Alarm Logs (for a list of monitored alarm conditions see section 7.7).
- Beam Event Logs
- System Logs

Tapping the *Receive* button transfers the log information and allows the user to enter a filename for the transferred data (Figure 45).

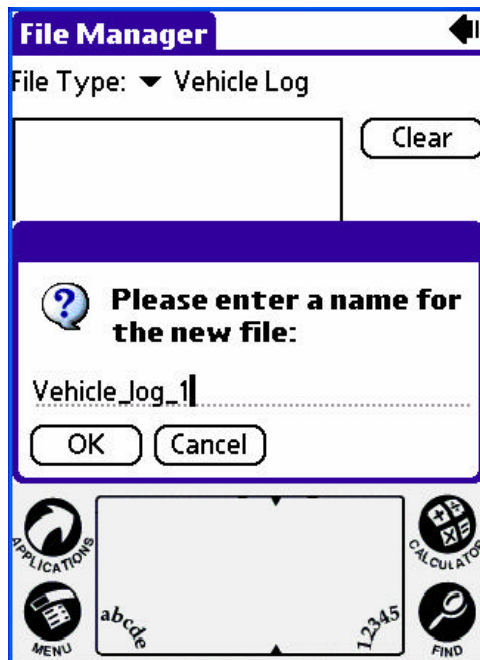


Figure 45 - Palm Filename dialog box.

When activating the *Ok* button the user is asked if they want to clear the retrieved log entries from the TIRTL receiver after they have successfully downloaded the log entries to the Palm Handheld.

Note a log cleared on TIRTL is not recoverable

A download may be aborted by tapping the *Cancel* button of the pop-up dialog box while the transfer is in progress (Figure 46).

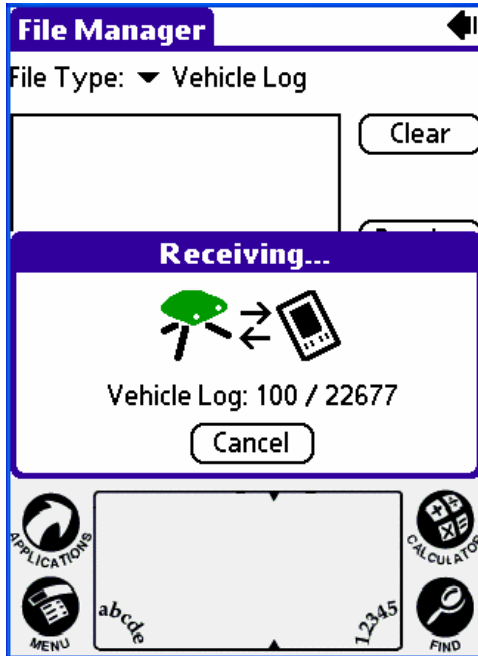


Figure 46 – Downloading a vehicle log.

Downloaded logs may be viewed from the Palm Handheld memory by first selecting the log from the filename window and activating the *View* button (Figure 47).

The view list may be scrolled by tapping the “▼” or “▲” in the display window.

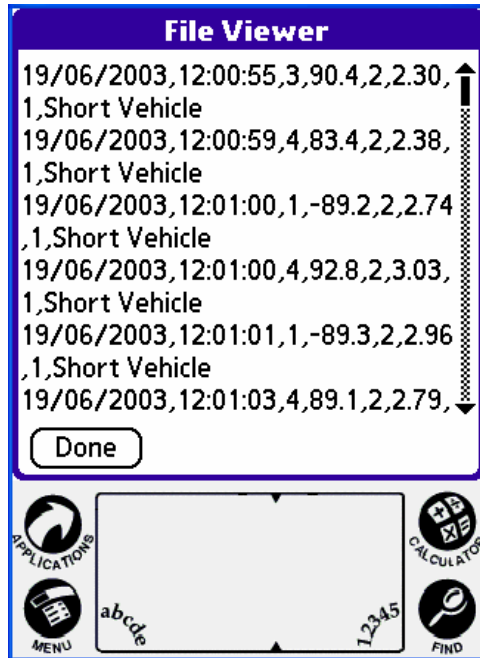


Figure 47 – File viewer.

Downloaded logs may be deleted from the Palm Handheld memory by first selecting the log from the filename window and tapping the *Delete* button. The user will be prompted to confirm the delete action (Figure 48).



Figure 48 – Deleting a log file.

9.10.3 TIRTL Log Clear

To clear the TIRTL receiver log memory the user selects the type of log to be cleared by tapping on the “▼” button located in the top center of the display (Figure 44). The log memory on TIRTL receiver unit is cleared by tapping the *Clear* button.

The user is prompted to confirm the clear action via a pop-up dialog window.

Cleared log data from TIRTL receiver is not recoverable.

9.11 Palm – Configuration Editing

Configuration editing on the Palm Handheld is used for viewing, creating and editing the structured files used to configure the operation of TIRTL.

The Palm Handheld version of TIRTL^{soft} allows the following configuration editing activities:

- Site Information – Read, write and modify editing capabilities and send/receive from the TIRTL..
- Classification Scheme – Read only operation and send/receive from the TIRTL.

The details of configuration editing for the Site Information and Classification Scheme are presented in the following sections 9.11.1 and 9.11.2.

9.11.1 Palm – Site Information

The Site Information contains parameters specific to the operational location of TIRTL. The Site Information is entered by tapping the *File Manager* button located on the *Main Menu*. Once in the *File Manager* sub-menu the user selects *Site Information* by tapping on the “▼” button located in the top center of the display.

A new Site Information file may be created by tapping the *New* button on the *File Manager – Site Information* display. The user is prompted to enter a new filename for the scheme (Figure 49).



Figure 49 – Creating a new Site Information file.

A view of the Site Information panel is shown in Figure 50. User defined parameters include:

- A text based location name tag to allow easy future reference.
- Number of left and right bound lanes – This allows the unit to accurately learn the lane positions. The number of lanes are selected from a drop down list accessed by tapping the “▼”.
- Use Crossed Beams – Enable/disable the use of the cross beam information. When the units are positioned less than 20 feet apart the cross beams become invalid and must be disabled.
- Specify complete site layout – Setting the parameters under this section prevents the receiver from learning the position of each

lane, allowing it to immediately classify vehicles.

This optional information specifies the distance from TIRTL transmitter and receiver to the road edge, the average width of each lane and the width of the median strip for a dual highway installation. If there is no median strip then this parameter is set to zero.

When not set the TIRTL learns the lane positions by knowing the number of lanes and developing a histogram of vehicle distances from the receiver.

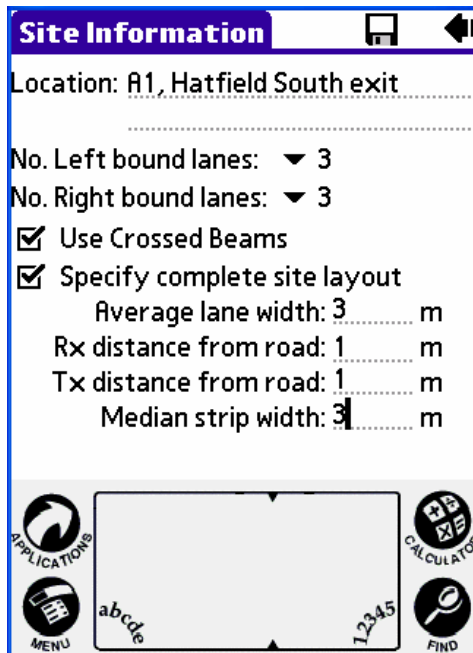



Figure 50 – Palm Site Information view.

The newly defined Site Information scheme may be saved by tapping the “” button located in the top right hand part of the display. A successful save of the Site Information file is indicated with a pop-up dialog box (Figure 51).

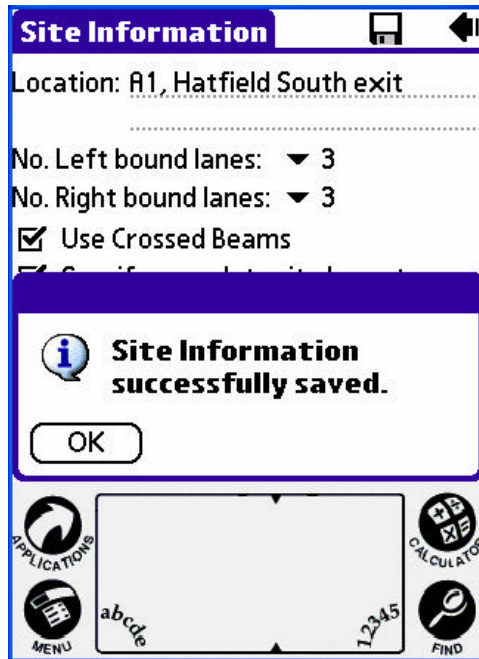


Figure 51 – Successful Site Information save.

Site Information files may be created, opened, saved, saved under a different name and deleted by selecting the corresponding entries within the *File* pull down menu accessed by tapping the *Site Information* tab at the top of the display (Figure 50).

A Site Information file may be edited by first selecting the filename from the *File Manager – Site Information* file list and tapping the *Edit* button.

A Site Information file may be viewed by first selecting the filename from the *File Manager – Site Information* file list and tapping the *View* button. A typical Site Information file view is shown in Figure 52.

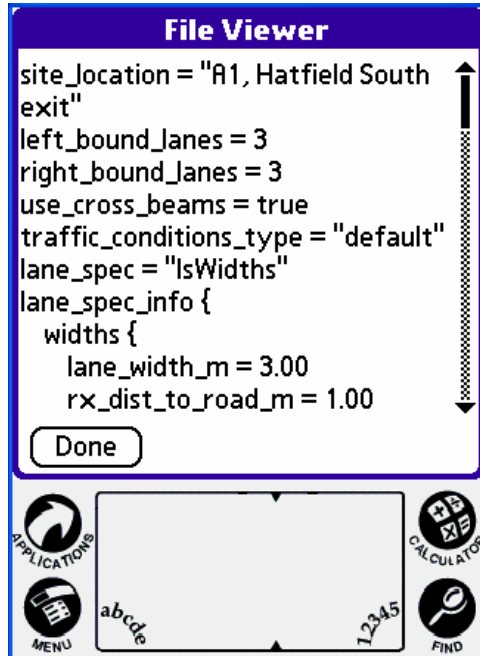


Figure 52 – Site Information file view.

A Site Information file may be deleted by first selecting the filename from the *File Manager – Site Information* file list and tapping the *Delete* button. The user is prompted to confirm the delete action (Figure 53).



Figure 53 – Site Information delete confirmation.

A Site Information file may be transferred to TIRTL by first selecting the filename from the *File Manager – Site Information* file list and tapping the *Send* button (Figure 54).



Figure 54 – Sending Site Information to TIRTL.

A Site Information file may be transferred from TIRTL by tapping the *Receive* button. The user is prompted to enter a filename for the incoming Site Information (Figure 55).



Figure 55 – Transferring Site Information from TIRTLL.

Using *Receive*, *Edit* and *Send* an existing scheme may be uploaded from TIRTLL, modified on the Palm Handheld and the modified scheme downloaded back to TIRTLL.

9.11.2 Palm – Classification Scheme

Classification Scheme functionality in the Palm Handheld version of TIRTLLsoft is limited to viewing, sending and receiving from TIRTLL only. The Classification Scheme is accessed by tapping the *File Manager* button under the *Main Menu* and selecting *Classification Scheme* from the “▼” drop down list.

To upload a Classification Scheme from TIRTL tap the *Receive* button from the *File Manager – Classification Scheme* screen. The user is prompted to enter a filename for the uploaded data (Figure 56).



Figure 56 – Classification Scheme receive from TIRTL.

While the receive Classification Scheme is in progress the screen shown in Figure 57 is displayed.

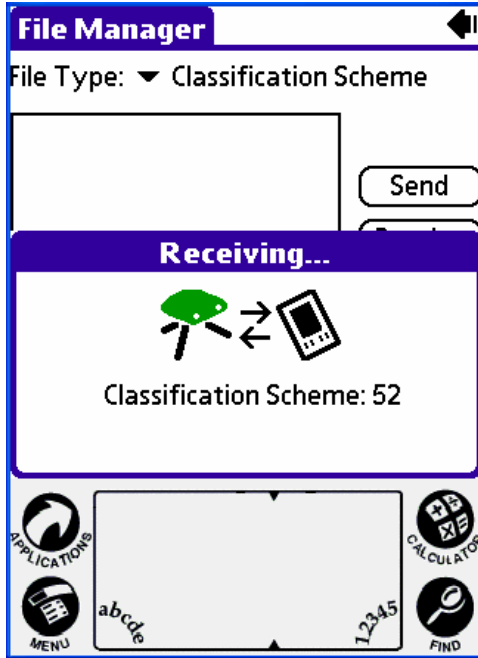


Figure 57 – Receiving Classification Scheme form TIRTL.

To view a Classification Scheme select the filename from the *File Manager – Classification Scheme* filename list and tap the *View* button. Figure 58 illustrates a typical Classification Scheme file view. The file may be scrolled up or down by tapping the “▲” or “▼” buttons within the window.

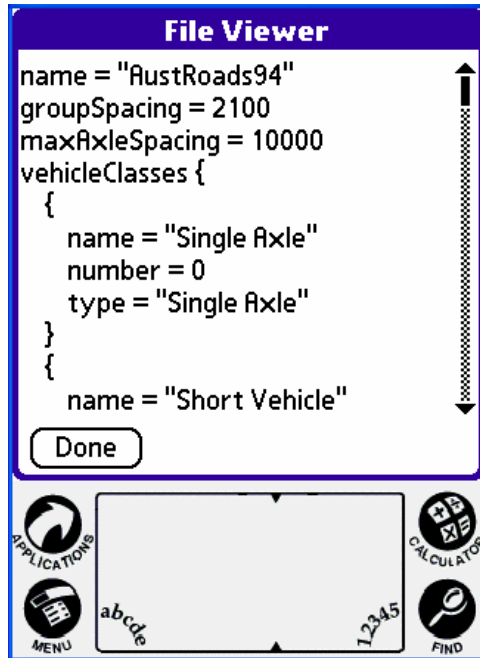


Figure 58 – Classification Scheme file viewer.

To delete a Classification Scheme from the Palm Handheld select the filename from the *File Manager – Classification Scheme* filename list and tap the *Delete* button. . The user is prompted to confirm the delete action (Figure 59).



Figure 59 – Deleting a Classification Scheme.

New Classification Schemes may be sent to TIRTL from the Palm Handheld flash card. The Classification Schemes are copied to the flash on a suitable PC before being inserted into the Palm Handheld. The Classification Scheme file must be loaded into a directory called “ClassificationSchemes”. Manipulation of the Classification Scheme prior to loading onto the flash card must be performed in the PC version of TIRTLsoft (section 8.6.2).

A Classification Scheme may be sent to TIRTL by first selecting the file to be sent from the *File Manager – Classification Scheme* file window and tapping the *Send* button. Progress of the file transfer is indicated with the pop-up window illustrated in Figure 60.

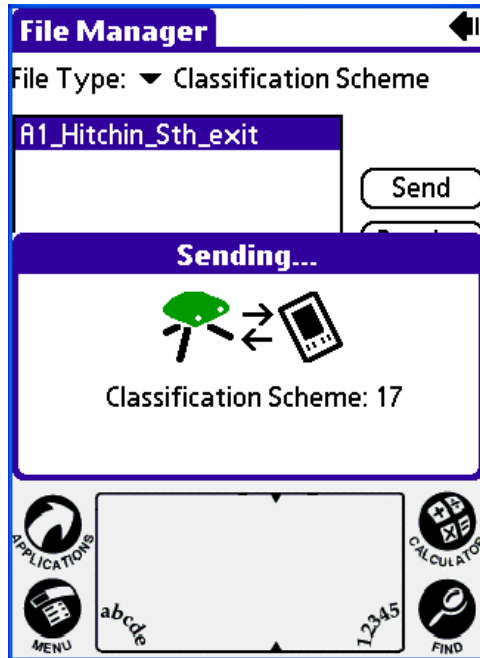


Figure 60 – Sending Classification scheme to TIRTL.

9.12 Palm – Traffic

The Traffic panel provides a scrolling list of the classified traffic (Figure 61). The Traffic panel is intended to be used to verify correct operation of the TIRTL unit after set up. The Traffic panel is accessed by tapping the *Traffic* button located on the *Main Menu* screen.

The Traffic window is comprised of a number of columns that may be used to verify correct operation. These include:

- Vehicle Class – Displays the classification name of each respective vehicle.
- Speed – Measured speed of each respective vehicle.

- Lane – Displays the lane number of each respective vehicle in a multi-lane deployment.
- Time – Time stamp of the record.

Above the Traffic window a vehicle counter has been provided to aid in traffic volume measurement.

The Traffic window can list up to one thousand vehicles. Once the capacity of the list is exceeded the oldest entry is discarded with every new vehicle record.



Figure 61 – Palm Traffic Status view.

9.13 Palm – Synchronize Time

The time and date information stored in the TIRTL is used to time and date stamp the classified traffic data.

When powering TIRTL units for the first time it is necessary to update TIRTL time and date information.

The TIRTL clock has a dedicated battery that is independent of the main twelve “C” cell battery set. The clock therefore retains the current time and date when main power system or battery power is removed. This dedicated battery has an average life of 10 years.

The date and time is set through the *Tirtl* pull down menu accessed by tapping the *Main Menu* tab at the top of the display and by selecting *Set Date & Time*. The Date and Time dialog box is shown in Figure 62.



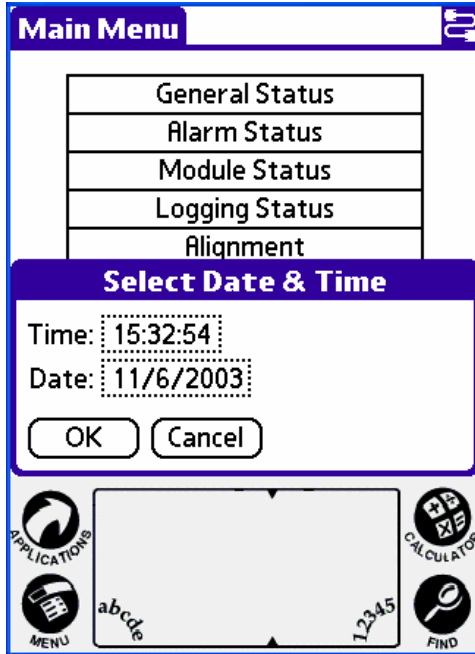


Figure 62 – Palm Date & Time dialog box.

Tapping on the Time or Date fields of Figure 62 brings up further dialog boxes for manipulation of these variables as shown in Figure 63 and Figure 64.

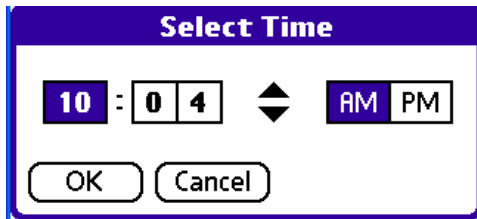


Figure 63 – Palm Time dialog box.



Figure 64 – Palm Date dialog box.

Tapping the *Today* button sets the date of TIRTL to the local Palm Handheld date.

9.14 Palm – Automated Tasks

Automated tasks functionality is not supported on the Palm Handheld version of TIRTLsoft.

9.15 Palm – TIRTL Reset

TIRTL may be reset by accessing the *Reset Tirtl Unit* available on the *Main Menu ? Tirtl* pull down menu.

A dialog box appears to allow the user to confirm the reset action (Figure 65).

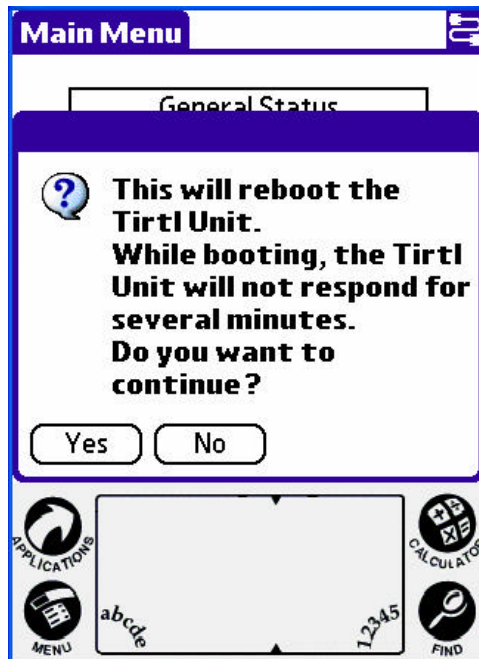


Figure 65 – Reset confirmation dialog box.

9.16 Palm – Control of Optional Modules

Optional modules that may be fitted to TIRTL include GSM/GPRS, POTS and/or GPS.

Power control of the optional modules is provided by selecting the appropriate on/off power control by tapping the *Modules* pull down menu under the *Main Menu - Modules Status* sub-menu.

For the GSM option, in addition to power control, it is possible to set the SIM PIN by selecting *Set GSM SIM PIN* under the *Module Status ? Modules* menu and completing the pop-up dialog box as shown in Figure 66.

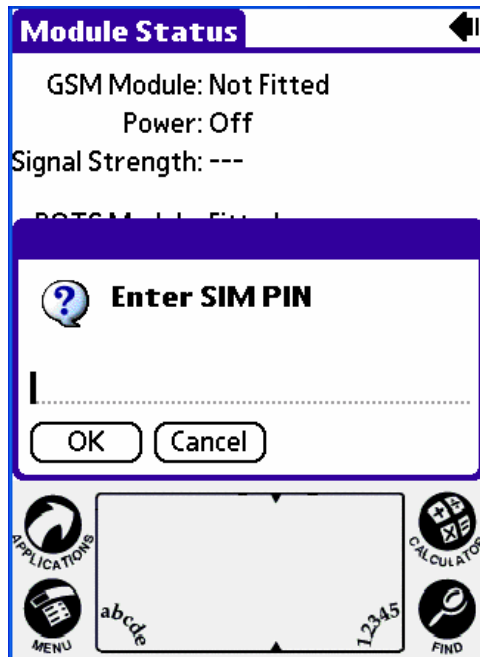


Figure 66 – Palm SIM PIN dialog box.

10 Permanent Installation

In addition to Section 7 the following information is intended to be used where the TIRTL is in a fixed installation,

10.1 Mounting

For permanent installations it is recommended the TIRTL unit be housed in a secondary cabinet with an infra-red (880nm) transmissive window (polycarbonate plastic) facing the road.

TIRTL units should be fixed rigidly to a solid footing. A suggestion for the permanent mounting fixture is presented in Appendix G.

The mounting arrangement needs to provide enough adjustment to align the transmitter and receiver.

The units should be mounted upside down in permanent installations giving easier access to the battery compartment and the rear connectors.

10.2 Alignment

A sight mount is located on the base of the units for alignment when the unit is mounted upside down (see item 14, Figure 6).

11 Maintenance

1. For best classification performance regularly clean the transmitter and receiver lenses with a mild solution of soapy water and a soft cloth.
2. Remove dead or unused batteries from the battery compartment to prevent corrosion damage.
3. When off TIRTL consumes a small standby current. It is therefore advised that when the units are not in use for long periods of time that the batteries be removed.
4. At 6 month intervals check the status of the seal associated with the battery compartment for signs of degradation.
5. Fit protective caps to unused TIRTL connectors as protection against contaminants.
6. Ensure all mated connectors are firmly screwed (finger tight) into the connectors to prevent the ingress of contaminants.
7. Ensure threaded parts and holes are kept clear of contaminants using a small nylon brush.
8. Ensure the Optical Sight mount holes are kept clear of contaminants using a mild solution of soapy water and a soft cloth or small nylon brush.

12 Troubleshooting

1. Unable to establish a communications link to TIRTL:
 - Ensure the RS232 cable is plugged into both the receiver unit and the serial port of the PC or Palm Handheld.
 - Ensure TIRTL receiver is switched on.
 - Check the power supply for the units (battery or main).
 - Check the communications settings for the PC. Ensure the correct Comm port is selected in the dialog box. Ensure Comm port settings and baud rate (use default baud rate) are correct.
2. Inaccurate speed measurement:
 - Ensure TIRTL is correctly aligned (section 7.4).
3. Incorrect classification:
 - Ensure TIRTL is correctly aligned (section 7.4).
 - Check for overlaps within the classification scheme. When overlaps do occur ensure the order within the classification list is appropriate.
 - Insufficient detail specified in the classification scheme.

A Specifications

Speed measurement accuracy:	±1% (0 - 125miles/hr)
Maximum number left bound lanes:	9
Maximum number left bound lanes:	9
Max. Tx/Rx separation distance:	330ft
Max Tx/Rx separation (long range optic)	660ft
Operating temperature range:	-40 to +185°F
Environmental rating:	IP67 (Main body) IP66 (Battery compartment)
Internal C-cell battery operating time:	7 days (alkaline)
External power input:	10V to 16V dc
Avg Rx Power Consumption at 77°F:	680 mW (no traffic) 770 mW (dense traffic)
Peak Rx Power Consumption 77°F:	1800 mW
Avg Tx Power Consumption at 77°F:	640 mW
Processor:	x486, 33 MHz
Operating System:	Linux (kernel 2.2)
On Board RAM:	8MB - 16MB
On Board ROM:	8MB - 64MB
Compact Flash Storage (log storage):	16MB - 1,024MB (~ 100,000 – 7M vehicles)
Communication Interfaces:	2 x RS232 serial ports PSTN modem (optional) GSM/GPRS modem (optional)



Optional modules:

CDMA modem (future)

GSM/GPRS unit

GPS unit

PSTN modem

CDMA modem (future)

Larger Memory.

B PC Software Menu Hierarchy

File

Site Information

New – clears the Site Information editor tab

Open – opens a Site Information file

Save – saves the currently open Site Information file

Save As – saves the Site Information to a new file

Classification Scheme

New – clears the Classification Scheme editor tab

Open – opens a Classification Scheme file

Save – saves the current Classification Scheme file

Save As – saves the Classification Scheme to a new file

View

Configuration Editor – show/hide the Configuration Editor

Status and Alarms – show/hide the Status and Alarms panel

Traffic – show/hide the traffic panel

Task Log – show/hide the task log panel

TIRTL

Go Online – establishes a connection to TIRTL receiver

Go Offline – terminate a connection to the TIRTL receiver.

Enable Automated Tasks – enables the scheduling of automated tasks.

Disable Automated Tasks – disables the scheduling of automated tasks.

View Alignment – Sets the TIRTL into alignment mode and shows the Alignment screen.



Set Date/Time – Enables the user to set the date and time in TIRTL.

Site Information

Send – Sends the current site information to the TIRTL receiver.

Receiver – Receives the site information from the TIRTL receiver.

Classification Scheme

Send – Sends the current classification scheme to the TIRTL receiver.

Receive – Receives the classification scheme from the TIRTL receiver.

Cancel Log File Download – Cancel a user initiated log file download.

Vehicle Logs

Receive Vehicle Log – Downloads the vehicle log from TIRTL to the PC.

Clear Vehicle Log – Clears the vehicle log in the TIRTL.

Enable Vehicle Logging – Enables logging of vehicle data.

Disable Vehicle Logging – Disables logging of vehicle data.

Alarm Logs

Receive Alarm Log – Downloads the alarm log.

Clear Alarm Log – Clears the alarm log in TIRTL.

Enable Alarm Logging – Enables logging of alarm events.

Disable Alarm Logging – Disables logging of alarm events.

Beam Event Logs

Receive Beam Event Log – Downloads the beam event log.

Clear Beam Event Log – Clears the beam event log in TIRTL.



Enable Beam Event Logging – Enables the logging of beam events to be used with video verification of TIRTL classification.

Disable Beam Event Logging – Disables the logging of beam events.

System Logs

Receive System Log – Downloads the system log.

Clear System Log – Clears the system log in TIRTL.

Enable System Logging – Enables logging of system events.

Disable System Logging – Disables logging of system events.

Advanced

Reset TIRTL Unit – Reboots the software in the TIRTL receiver.

Options

Connection Options – Shows the connection options screen.

Automated Task Options – Shows the automated tasks options screen.

Log Options – Show the log options screen.

Help

About – Shows the version of the application.



C Performance

The performance of TIRTL may be degraded by several factors:

- **Tilted TIRTL Unit** – If either/both of TIRTL units are not aligned parallel with the road the vehicle detection accuracy of the unit may be reduced. Tilting the unit causes the leading and trailing edge of each passing wheel to be deformed making it more difficult for the classification software to group them into vehicles.
- **Not Perpendicular Set-up** – If the units are placed such that the beams are not perpendicular to the road the recorded speed measurements will be less than the actual speed of the passing vehicles. Table 7 summarizes the effect for different degrees of misalignment.

Table 7 – Misalignment error.

Angle Error	Measured Speed Discrepancy
1°	-0.015%
2°	-0.061%
3°	-0.137%
4°	-0.244%
5°	-0.381%

- **General Misalignment** – Units misaligned in any other fashion will tend to exhibit both of the above types of performance degradation to some extent
- **Differing Heights** – If either/both of TIRTL units are situated too high above the road surface the classification accuracy

may be reduced. In this case each passing tire obscures each of the beams for a longer period of time thereby making the detection of overlapping vehicles in multiple lanes more difficult. Mudflaps may also begin to disturb the beams of high units thereby making classification more difficult.

- Dirty Lenses – If the TIRTL lenses are significantly dirty it may cause the operation of the system to be affected due to a low level of received infra-red light..



D Downloaded Log File Format

The following specifies the format of the log files that are downloaded by TIRTLsoft.

Fixed field are shown in square brackets – [].

Optional fields are shown in round brackets – ().

Vehicle Log File

fields are separated by commas.

[date], [time], (velocity), (lane), (axle count), (wheel base), (class number), (class name)

date – full date as dd/mm/yyyy

time – 24 hr time as hh:mm:ss

velocity – sign gives direction, speed in mph

class number – from user scheme

class name – from user scheme

For example:

21/05/2003, 15:04:01, -102, 4, 2, 2.30, 1, Short Vehicle

Alarm Log File

Fields are separated by spaces.

[code] [state] [date] [time] [name] (Text)

code - 3 digit alarm code for the alarm

state - defines whether the alarm is active or inactive.

date – full date as dd/mm/yyyy

time – 24 hr time as hh:mm:ss

name – textual alarm name associated with the alarm code.

text – additional text providing extra information where relevant.



For example: Retrieve the first 4 alarm log records:

```
tirtl_control$ alarm log rx 4 0
```

```
.OK
```

```
001 off 04/11/02 14:26:14 "Beam levels degraded" ""
```

```
002 on 04/11/02 14:34:33 "Beams blocked" "Channels ch1x
```

```
ch2x"
```

```
010 off 19/09/02 11:27:23 "Low battery voltage" ""
```

```
012 off 19/09/02 11:27:23 "External power lost" ""
```

```
4 records
```

Beam Event File

[beam number] [event type] [64 bit timestamp]

beam number – ch1, ch1x, ch2, ch2x

event type – M, B

For example:

```
ch1x M 602067958
```

E TIRTL Exterior Dimensions

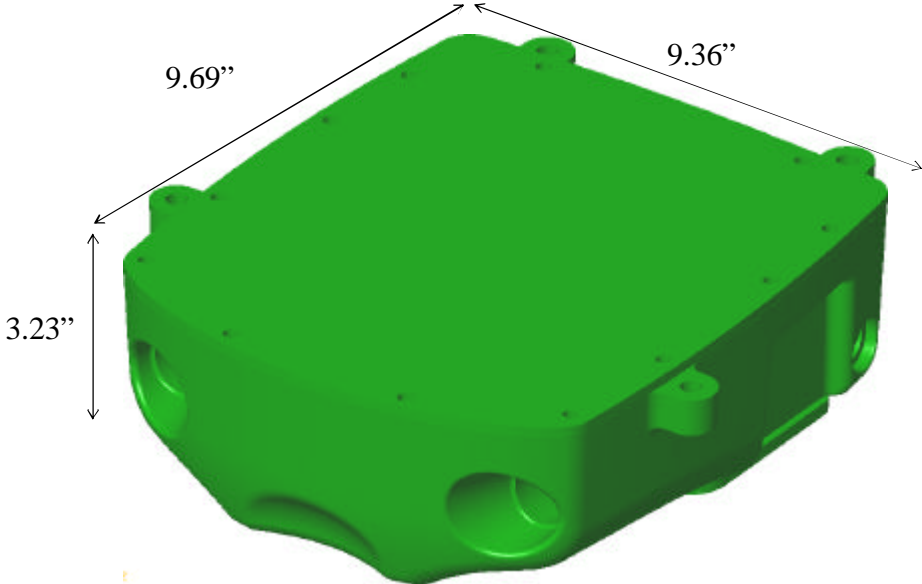


Figure 67 – Exterior dimension of TIRTL

F TIRTL Mounting Points

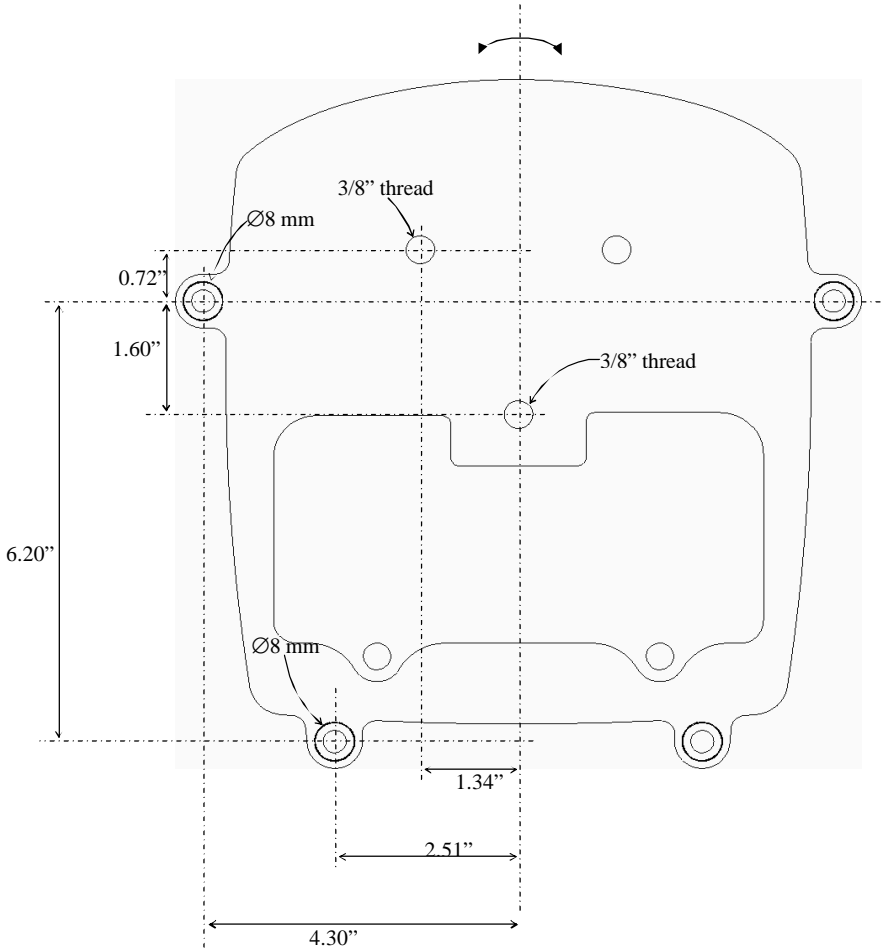


Figure 68 – Mounting Positions

G Suggested Permanent Mounting Arrangement

Figure 69 illustrates an arrangement for permanent installation of the TIRTL at a fixed location.

The four threaded mounting plate supports are held in a fixed position relative to each other by the base plate. The base plate support frame is embedded into permanent concrete footings located on either side of the road.

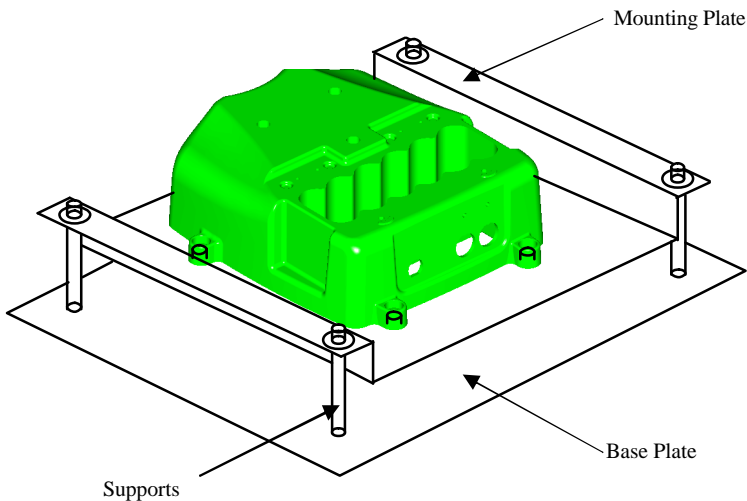


Figure 69 – Permanent mounting.

TIRTL is positioned on the customized mounting plate with the battery compartment face up allowing access to the 12 “C” cell batteries inside. TIRTL is fixed in place using the sun shield mounting bosses.

The threaded mounting plate supports fit through over-size holes in the mounting plate. The mounting plate itself is held in position by use of washers and lock nuts fitted top and bottom. The position of the TIRTL may be adjusted by changing the position of the locking nuts

associated with each of the four threaded mounting plate supports. In this way the height, tilt and horizontal orientation of the TIRTL unit with respect to the roadway may be finely adjusted.

To maintain the alignment and security of the permanent TIRTL installation the mounting plate is placed within an aluminium housing employing a gasket sealed lid (Figure 70). Vandalism and/or tampering of the TIRTL unit is prevented by securing the cover to the housing with a padlock.

The housing incorporates 2 infra-red transmissive windows for the ingress/egress of the beam pathways.

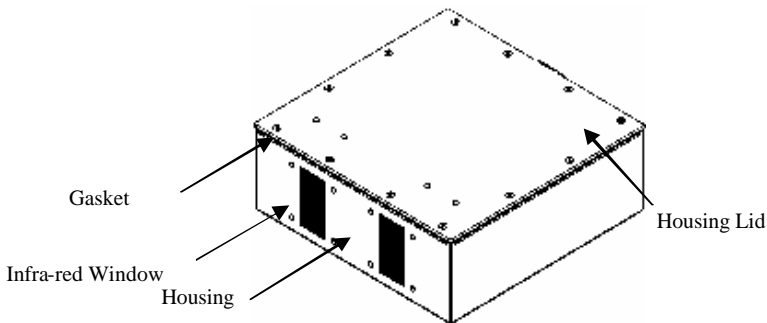


Figure 70 – Permanent Installation TIRTL Enclosure



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TIRTL
System

