# Dataradio Sentry 4G 900™

***900 MHZ***

***802.16e-2005 SUBSCRIBER STATION BROADBAND ROUTER***

User Manual
P/N 001-9190-000
Rev.0
June 2010

**1. PREFACE ..... 4**

1.1 COPYRIGHT NOTICE ..... 4
1.2 ROUTER USE ..... 4
1.3 INTERFERENCE ISSUES ..... 4
1.4 MOBILE APPLICATION SAFETY ..... 5
1.5 FCC NOTIFICATION ..... 5

**2. PRODUCT OVERVIEW ..... 6**

2.1 GENERAL DESCRIPTION ..... 6
2.2 FEATURES ..... 6
2.3 EXTERNAL INTERFACES ..... 7
2.4 RJ-45 ETHERNET PORT INTEGRATION PARAMETERS ..... 8
2.5 POWER CABLE CONNECTIONS ..... 8
2.6 ANTENNA OPTIONS ..... 10

**3. NETWORKING BASICS ..... 13**

3.1 GENERAL NETWORKING DEFINITIONS ..... 13

**4. GETTING STARTED ..... 15**

4.1 PACKAGE CONTENTS ..... 15
4.2 SETUP REQUIREMENTS ..... 15
4.3 QUICK START ..... 15
4.4 CONFIGURING LOCAL PC ..... 16
4.5 SENTRY 4G ROUTER SETUP ..... 17

**5. SENTRY 4G CONFIGURATION ..... 19**

5.1 GENERAL INSTRUCTIONS ..... 19
5.2 HOME PAGE PARAMETERS ..... 19
5.3 WWAN PARAMETERS ..... 27
5.4 LAN SETTINGS (ETH0 AND ETH1) ..... 24
5.5 WIFI (WLAN) ..... 31
5.6 ROUTER SETTINGS ..... 40
5.7 GENERAL SETTINGS ..... 22
5.8 GPS STATUS AND SETTINGS ..... 44
5.9 I/O SETTINGS ..... 48
5.10 SYSTEM UPGRADE (OPTIONAL SERVICE) ..... 51

**6. SPECIFICATIONS ..... 52**

**7. ABBREVIATIONS ..... 53**

**8. SERVICE AND SUPPORT ..... 54**

8.1 PRODUCT WARRANTY, RMA AND CONTACT INFORMATION ..... 54
8.2 RMA REQUEST ..... 54
8.3 PRODUCT DOCUMENTATION ..... 54
8.4 TECHNICAL SUPPORT ..... 54

FIGURE 1 - SENTRY 4G ROUTER FRONT PANEL ..... 7
FIGURE 2 - SENTRY 4G POWER CABLE CONNECTIONS ..... 9
FIGURE 3 - ANTENNA SPACING ..... 11
FIGURE 4 - SENTRY 4G ROUTER SETUP EQUIPMENT ..... 15
FIGURE 5 - LOCAL AREA CONNECTION PROPERTIES (WINDOWS XP) ..... 16

FIGURE 6 - INTERNET PROTOCOL (TCP/IP PROPERTIES) ..... 17
FIGURE 7 - SENTRY 4G ROUTER HOMEPAGE ..... 18
FIGURE 8 - SENTRY 4G ROUTER UNIT STATUS ..... 20
FIGURE 9 - DATE/TIME ..... 22
FIGURE 10 - REMOTE ADMINISTRATION ..... 23
FIGURE 11 - EXAMPLE OF REMOTE LOGIN ..... 23
FIGURE 12 - DYNAMIC DNS ..... 23
FIGURE 13 - POWER MANAGEMENT ..... 24
FIGURE 14 - IP SETTINGS ..... 25
FIGURE 15 - SENTRY 4G ROUTER WWAN SETTINGS ..... 28
FIGURE 16 - SENTRY 4G ROUTER WWAN CHANNEL SELECTION ..... 29
FIGURE 17 - SENTRY 4G ROUTER WWAN STATUS ..... 30
FIGURE 18 - SENTRY 4G WIFI MODES: ACCESS POINT (A); CLIENT MODE (B) ..... 31
FIGURE 19 - WLAN (ACCESS POINT) → SETTINGS ..... 32
FIGURE 20 - WLAN (ACCESS POINT) → STATUS ..... 34
FIGURE 21 - WLAN (ACCESS POINT) → STATISTICS ..... 35
FIGURE 22 - WLAN (CLIENT) → SETTINGS ..... 36
FIGURE 23 - WLAN (CLIENT)→ STATUS ..... 38
FIGURE 24 - WLAN (CLIENT)→ SITE SURVEY ..... 39
FIGURE 25 - WLAN (CLIENT)→ STATISTICS ..... 39
FIGURE 26 - STATIC ROUTES ..... 40
FIGURE 27 - IP FILTERING ..... 42
FIGURE 28 - PORT FORWARDING ..... 43
FIGURE 29 - ROUTING TABLE ..... 43
FIGURE 30 - INTERFACE PRIORITY ..... 44
FIGURE 31 - GPS STATUS ..... 44
FIGURE 32 - AAVL SETTINGS ..... 46
FIGURE 33 - I/O SETTINGS-STATUS ..... 49
FIGURE 34 - I/O SETTINGS ..... 50
FIGURE 35 - I/O SETTINGS-LABELS ..... 50
FIGURE 36 - UPGRADE ..... 51

TABLE 1 - LED DEFINITIONS ..... 7
TABLE 2 - STANDARD RJ-45 ETHERNET PIN-OUT ..... 8
TABLE 3 - POWER SUPPLY CONNECTIONS ..... 9
TABLE 4 - ENCRYPTION KEYS EXAMPLES ..... 34
TABLE 5 - I/O SIGNAL PINOUT ..... 48

# 1. PREFACE

## 1.1 Copyright Notice

©2010 CalAmp Corp. All Rights Reserved.

This manual covers the operation of the Sentry 4G 900™ router. Specifications described are typical only and are subject to normal manufacturing and service tolerances.

CalAmp reserves the right to modify the equipment, its specifications or this manual without prior notice, in the interest of improving performance, reliability, or servicing. At the time of publication all data is correct for the operation of the equipment at the voltage and/or temperature referred to. Performance data indicates typical values related to the particular product.

No part of this documentation or information supplied may be divulged to any third party without the express written consent of CalAmp Corp.

Products offered may contain software which is proprietary to CalAmp Corp. The offer or supply of these products and services does not include or infer any transfer of ownership.

## 1.2 Router Use

The Sentry 4G 900™ router is designed and intended for use in fixed, nomadic or mobile applications. "Fixed" assumes the device is physically secured at one location and not easily moved to another location. " Nomadic" assumes the unit is installed in a vehicle but is operated when the vehicle is stationary. "Mobile" assumes the unit is physically secured in a vehicle and is operated when the vehicle is moving. The Sentry4G router supports full mobility.

## 1.3 Interference Issues

Avoid possible radio frequency (RF) interference by following these guidelines:

- Do not operate in the vicinity of gasoline or diesel-fuel pumps unless use has been approved and authorized.
- Do not operate in locations where medical equipment that the device could interfere with may be in use.
- Do not operate in fuel depots, chemical plants, or blasting areas unless use has been approved and authorized.
- Use care if operating in the vicinity of protected personal medical devices, i.e., hearing aids and pacemakers.
- Operation in the presence of other electronic equipment may cause interference if equipment is incorrectly protected. Follow recommendations for installation from equipment manufacturers.

## 1.4 Mobile Application Safety

- Road safety is crucial. Do not change parameters or perform other maintenance of the Sentry 4G router while driving.
- Avoid potential interference with vehicle electronics by correctly installing the Sentry 4G router. CalAmp Corp recommends installation by a professional.

## 1.5 FCC Notification

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

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

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

# 2. PRODUCT OVERVIEW

## 2.1 General Description

The Sentry 4G 900™ from CalAmp provides high-speed, long-range 802.16e-2005 compliant connectivity in the license-free 900 MHz band. Based on industrial grade IEEE 802.16e-2005 technology, it features extensive routing capabilities with an easy-to-use interface and comprehensive remote management. Built-in GPS, two Ethernet ports and an optional 802.11b/g access point allows connectivity in the office or on the road.

Ensuring the protection of even the most sensitive data, Sentry 4G combines built-in standard 802.16e-2005 encryption services such as TKIP/AES and EAP-TTLS supplicant. Not only versatile and secure, its rugged enclosure withstands even the harshest conditions with an extended temperature range.

## 2.2 Features

- 4G Subscriber station broadband router based on IEEE 802.16e-2005 technology
- Secure data access with 802.16e-2005 encryption services such as TKIP/AES
- Fast handover for real time applications with no service degradation
- Superior RF performance with MIMO capabilities
- AVL support through integrated GPS with local remote NMEA data
- Optional integrated 802.11 b/g local wireless connectivity (WiFi IEEE 802.11b/g 2.4GHz)
- Built-in WiFi client and access point
- Embedded Linux (with support for custom applications) on PowerPC processor
- Built-in DHCP server and NAT support
- Browser-based management
- Local and remote configuration
- Two (2) 10/100 Ethernet interfaces
- I/O capability

# 2.3 External Interfaces

## 2.3.1 Front Panel Connections

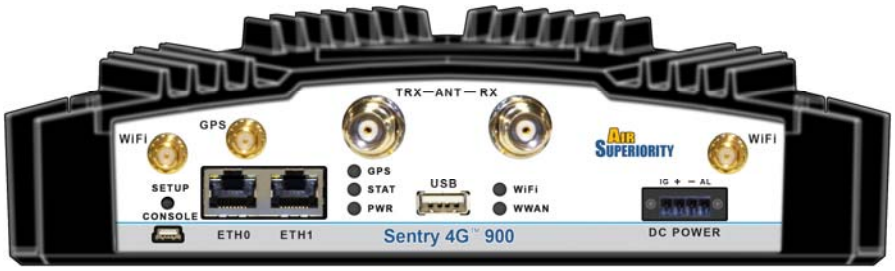



*Figure 1 - Sentry 4G Router Front Panel*

Sentry 4G router front panel connections include:

**TRX**: Two TNC female, Transmit/Receive antenna connections. See section 2.6 "Antenna options" for more information.

**WiFi**: RP-SMA jack, WiFi antenna. See section 2.6 "Antenna options" for more information.

**ETH0 and ETH1**: Inputs for standard or crossover Ethernet cable

**GPS**: SMA female, GPS antenna connector. This input requires a 3.3V, GPS antenna with an SMA connection. For best coverage, use an active GPS antenna with a gain between 10 and 30 dB.

**USB**: USB A Female connector. Reserved for future use.

**Console**: 3-wire serial in a USB Mini B female form factor (requires a custom USB Mini B to EIA-232-F DB9 cable) for debugging and maintenance only.

**PWR**: 10-30 VDC; the mating connector is a Weidmuller 1615800000 connector.

## 2.3.2 LEDs

There are seven LEDs on the front panel of the Sentry 4G unit. Each can display three colors: Red, Green, and Amber. The definition for each LED is as follows:

*Table 1 - LED Definitions*

| INDICATOR | OFF | SOLID GREEN | FLASHING GREEN | SOLID AMBER | FLASHING AMBER | SOLID RED | FLASHING RED |
|---|---|---|---|---|---|---|---|
| **PWR** (Power) | No Power | Power on App.Running | Test Mode | Hardware Power up Sequence | Software boot sequence | Power Supply Fault | N/A |
| **STAT** (Status) | No Power | Status Normal | N/A | Warning | Factory Defaults | Fault | N/A |
| **GPS** | GPS Disabled | Position Fix Acquired | 1PPS Activity | No Satellites in View | Acquiring Satellites | Fault | N/A |
| **4G (WWAN)** | I/F Disabled | Connected | RX/TX Activity | Failed to establish connection | Establishing Connection | Fault | N/A |
| **WiFi (client)** | N/A | Connected | RX/TX Activity | Failed to establish connection | Establishing Connection | Fault | N/A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **WiFi (Access Point)** | IF/Disabled | Ready | RX/TX Activity | N/A | N/A | Fault | N/A |
| **ETH0** | No link | 100mbps link | RX/TX Activity | 10 mbps link | N/A | N/A | N/A |
| **ETH1** | No activity | N/A | RX/TX Activity | N/A | N/A | N/A | N/A |

## 2.4 RJ-45 Ethernet Port Integration Parameters

Table 2 below provides the information to purchase Ethernet cables to integrate the Sentry 4G product into your system.

Note:

The Sentry 4G unit can accept either a standard or cross over Ethernet cable.

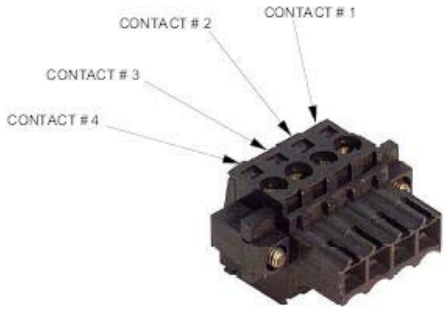
*Table 2 - Standard RJ-45 Ethernet Pin-out*

| Pin | Function | Color |
|---|---|---|
| 1 | TX + | White/Orange |
| 2 | TX - | Orange/White |
| 3 | RX + | White/Green |
| 4 | | Blue/White |
| 5 | | White/Blue |
| 6 | RX - | Green/White |
| 7 | | White/Brown |
| 8 | | Brown/White |

## 2.5 Power Cable Connections

If using the provided power cable to connect to a DC supply (car battery) use the following diagrams and table to connect the unit.

Note: Both ignition sense and DC power are required to start up a Sentry 4G unit.



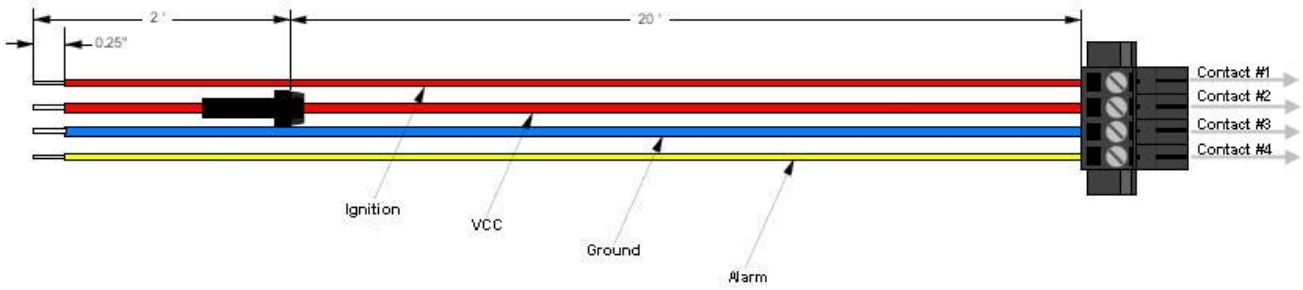



*Figure 2 - Sentry 4G Power Cable Connections*

*Table 3 - Power supply connections*

| Pin | Color | Description |
|---|---|---|
| 1 | Thin Red | Ignition Sense |
| 2 | Red | DC Power, 10 to 30V DC |
| 3 | Blue | Ground |
| 4 | Yellow | Officer down alarm |

If connection to an AC supply is desired, an AC/12VDC power supply and cable are available.

# 2.6 Antenna Options

Antennas are available for Sentry 4G routers installations from CalAmp Corp.

## 2.6.1 Transmit/Receive Antennas (TRX)

The primary antenna connections on the Sentry 4G unit are TNC female connectors; therefore you must purchase antennas with TNC male connectors. Do not select TNC antennas with "reverse polarity" or RP-Male. Mounting options and cable lengths are the user's choice and application specific.

Caution:

This device has been designed to operate with the antenna described below, and having a maximum gain of 7.15 dBi*. Antennas having a gain greater than 7.15 dBi are strictly prohibited for use with this device. The required antenna impedance is 50Ω.

*Antenna gains over 6 dBi require reducing the rated output power by the same dB value by which they exceed the 6 dBi. The attenuation of the cable between the unit and the antennas and the insertion loss of the connectors can be deducted from the required reduction described above.

Recommended antenna:

| Manufacturer | Model Number | Antenna Type | Gain |
|---|---|---|---|
| PCTEL | MAX9105 | Perm. Mount | 7.15 dBi |

It is highly recommended to have the antenna installation performed by a professional.

## 2.6.2 GPS Antenna

The Sentry 4G router's GPS connector requires an external 3.3V GPS antenna. The GPS antenna connection on the Sentry 4G product is a female SMA connector; therefore an antenna with an SMA male connector is required. For best coverage, use an active antenna with a gain between 10 and 30 dB. Mounting options and cable lengths are user's choice and application specific.

## 2.6.3 WiFi Antenna

The WiFi antenna connections on the Sentry 4G product are RP-SMA jacks; therefore antennas with an RP-SMA plug are required. Mounting options and cable lengths are user's choice and application specific.

**Industry Canada RSS Notices:**

This device has been designed to operate with the antennas listed below, and having a maximum gain of 5.5 dBi. Antennas having a gain greater than 5.5 dBi are strictly prohibited for use with this device. The required antenna impedance is 50Ω.

Recommended Antenna:

| Manufacturer | Model Number | Antenna Type | Gain |
|---|---|---|---|
| RadioLabs Inc | 2.4-mobile3 | Mag Mount | 5.5 dBi |

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication.

### 2.6.4 Antenna Spacing

Referring to Figure 3 for illustration, Sentry 4G unit commonly uses four separate antennas:

- "T" - Main transceiver -
  Constraints are the limit of 20 cm and omni-directional factors
- "A" - Auxiliary transceiver –
  Constraints are the receiver spacing of at least 5/8 λ (wavelength) from transceiver antenna and omni-directional requirements
- "G" - Global Positioning System (GPS)
  Constraints are TX spacing of at least 60cm/23.62 inch from all transmitting antennas and a clear view of the sky.
- "W" – WiFi antenna
  Constraints are TX spacing of at least 8 inches or 20 cm from all transmitting antennas

Note: For units utilizing diversity antennas, best overall operation is achieved utilizing antennas with equal gains

*WARNING: As per FCC rules, all Sentry 4G transmitting antennas should be at a minimum of eight (8) inches (approximately 20 centimeters) from all persons.*

T- Primary Antenna
A-Auxiliary Antenna
G-GPS Antenna
W-WiFi Antenna

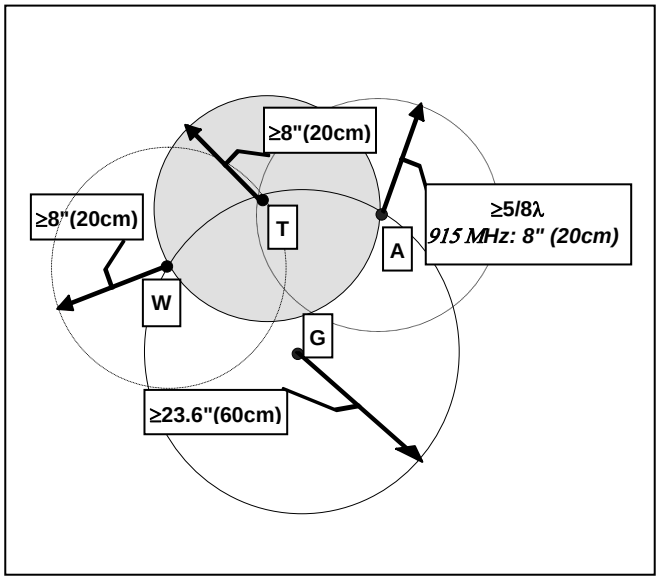



*Figure 3 - Antenna Spacing*[1]

For installation of ground-plane dependent antennas (main and WiFi antennas), the center of the metal surface used for mounting is preferable for best omni-directional pattern. For ground-plane independent antennas (diversity and GPS antennas), installation may be close to the edges of the surface.

For vehicular installations CalAmp recommends the following antenna positions:

[1] The diagram is not drawn to scale

- Most preferred for all antennas: centerline of roof. For transmitter antenna, it is the ONLY acceptable position.
- Less preferred for receiver antenna: trunk lid, providing distance to transmitting antenna is respected whether lid is opened or closed.
- Much less preferred, but permissible for receiver antenna: left or right rear fenders, just in back of rear window
- Least preferred, but permissible for receiver antenna: left or right front fenders, ahead of windshield

# 3. Networking basics

## 3.1 General Networking Definitions

The Sentry 4G router is based on Ethernet connectivity and follows general IP networking guidelines and terminology. Below are definitions of some basic network terminology as they pertain to the Sentry 4G environment.

| Term | Definition |
|---|---|
| BTS | Base Transceiver Station, fixed equipment that incorporates all radio-intelligence functions controlling the 802.16e-2005 link with one or more Sentry 4G routers. |
| CINR | Carrier to Interference-plus-Noise Ratio, expressed in decibels (dBs), is a measurement of signal effectiveness. It provides information on how strong the desired signal is compared to the unwanted energy (interference plus noise). |
| DNS | Domain Name System: operates like a phone book to translate domain names (i.e., google.com) to IP addresses (70.212.19.1).<br>The Sentry 4G unit functions as the DNS Server in the network. |
| DHCP | Dynamic Host Configuration Protocol: the DHCP server assigns IP addresses, gateway and subnet masks to all clients on the network.<br>The Sentry 4G unit functions as a DHCP Server. |
| Dynamic/Static IP | A device with Dynamic IP selected may have a different IP address every time it connects to the network. A device with a Static IP will always connect with the same IP address. |
| EAP-TTLS (Extensible Authentication Protocol-Tunneled Transport Layer Security) | Is a universal authentication framework frequently used in wireless networks and Point-to-Point connections. EAP-TTLS is an EAP method that encapsulates a TLS session, consisting of a handshake phase and a data phase. During the handshake phase, the server is authenticated to the client using standard TLS procedures, and keying material is generated in order to create a cryptographically secure tunnel for information exchange in the subsequent data phase. During the data phase, the client is authenticated to the server using an arbitrary authentication mechanism encapsulated within the secure tunnel. |
| Gateway | A (node) device enabling data transfer between different networks (i.e., from a private LAN to a public WAN). |
| LAN | Local Area Network. A private network. |
| MIMO | Multiple Input Multiple Output. MIMO algorithms send information out over two or more antennas; the information is received via multiple antennas as well. This use of multiple antennas at both the transmitter and receiver provides a significant capacity gain over conventional single antenna systems and/or a more reliable communication. |
| NAT | Network Address Translation: A technology that allows hosts on the LAN with private IP addresses to communicate with public IP addresses on the WAN. This is an essential function of a network router. |
| OFDM | Orthogonal Frequency Division Multiplexing. 802.16e-2005 being a wide area network is very sensitive to interference and multi-path fading. OFDM addresses these problems by partitioning the data stream into multiple narrowband transmissions in the frequency domain using subcarriers that are orthogonal to one another (do not interfere). These subcarriers are then reassembled for over-the-air retransmission. |
| OFDMA | Orthogonal Frequency Division Multiple Access. Allows OFDM to serve many terminals. Each terminal will be assigned a subset of the subcarrier set for a given time interval. |
| Port | A special number present in the header of a data packet in the data transfer |

| | |
|---|---|
| | process. Ports are typically used to map data to a particular process running on a computer. |
| PPP | Point-to-point Protocol: creating a direct link between two nodes in network communication. |
| Private IP address | Private IP addresses are addresses that will not be routed on external networks. Any device on an internal LAN should be assigned a private IP address to avoid contention. The suggested private address ranges are<br>Class A: 10.x.x.x<br>Class B: 172.16.x.x through 172.31.x.x<br>Class C: 192.168.x.x<br>By default the Sentry 4G unit uses the 192.168.1.x address range. |
| RIP | Routing Information Protocol, protocol that helps routers dynamically adapt to changes of network connections by communicating information about which networks each router can reach and how far away those networks are. |
| SOFDMA | Scalable OFDMA. With bandwidth scalability, Mobile 802.16e-2005 technology can comply with various frequency regulations worldwide. |
| SSID | Service Set Identifier. This is a name used to identify a WiFi wireless network. |
| Subnet | A range of addresses assigned to a LAN.<br>All devices connected in a Sentry 4G network must be on the same subnet as the Sentry 4G routers. |
| Subnet Mask | Binary string that separates the subnet portion of an IP address and the host portion. |
| TKIP/AES | "Temporal Key Integrity Protocol" is an encryption method used by the WiFi interface when operating in WPA mode. TKIP was designed to solve security issues in WEP (it is considered stronger then WEP).<br>"Advanced Encryption Standard" is the encryption protocol used by the WiFi interface when it operates in WPA2 mode. |
| WAN | Wide Area Network, a public network. The Internet is an example of a WAN. |
| WEP | Wired Equivalent Privacy. This is an IEEE security protocol for wireless 802.11 networks. It is an encryption method used by the WiFi interface. |
| WiFi (802.11b, 802.11g) | Wireless Fidelity is an IEEE 802.11 standard for wireless LANs<br>→802.11b is a standard for operating at 2.4 GHz frequency with data rates up to 11 Mbps<br>→802.11g is a standard for operating at 2.4 GHz frequency with data rates up to 54 Mbps |
| WiFi Access Point (802.11) | A Sentry 4G unit can operate in 802.11 access point mode. It can communicate with other devices operating in 802.11 access point mode. |
| WiFi Client (802.11 Infrastructure mode) | A Sentry 4G unit can operate in 802.11 Infrastructure mode. In this mode it is a WiFi client and will try to connect to a WiFi access point. |
| WLAN | Wireless Local Area Network, a private network. Refers to the network covered by the WiFi interface. |
| WPA/WPA2 | WiFi Protected Access" is a subset of 802.11i (security mechanisms for wireless networks).<br>"WiFi Protected Access 2" is the complete version of 802.11i. |

# 4. GETTING STARTED

## 4.1 Package Contents

- Sentry 4G router
- Quick Start Guide
- Power cable
- User Manual and Quick Start Guide on CD
- Mounting Screws

## 4.2 Setup Requirements

- Sentry 4G router
- Computer running any operating system with a web browser installed such as Microsoft Internet Explorer version 6.0 or later or Firefox version 2.0 or later.
- 10-30V 5-A power supply
- Ethernet cable*
- Two antennas with male TNC connector* (915 MHz 50-Ohm)
- GPS Antenna (SMA Male) *
- Two WiFi Antennas (RP-SMA Plug) * ( if applicable)

*These accessories are available from CalAmp.

## 4.3 Quick Start

### 4.3.1 Hardware Setup

*Figure 4 - Sentry 4G router setup equipment*

1. Connect the two Transmit/Receive antennas to the TRX TNC connectors on the front of the unit. Connect the GPS antenna to the GPS connector. For units utilizing WiFi, connect the WiFi antennas to the WiFi connectors.
2. Connect an Ethernet cable from the ETH0 connector of the Sentry 4G unit to the PC. If multiple PCs are being used, connect the Sentry 4G unit to an Ethernet switch or hub connected to the PCs.
3. Connect a power supply cable to the PWR connector of the Sentry 4G unit. Do not power the unit on yet.

## 4.4 Configuring Local PC

1. Verify network settings on local PC are set to automatically detect IP and DNS server. The path to network settings varies with the version of Windows you are using.

   Windows XP: Start-> Control Panel -> Network Connections

   Windows 2000: Start -> Settings -> Network and dial up connections
2. Select the appropriate network connection, typically the Local Area Connection -> right click on the connection and select "Properties"
3. Select "Internet Protocol (TCP/IP) properties.

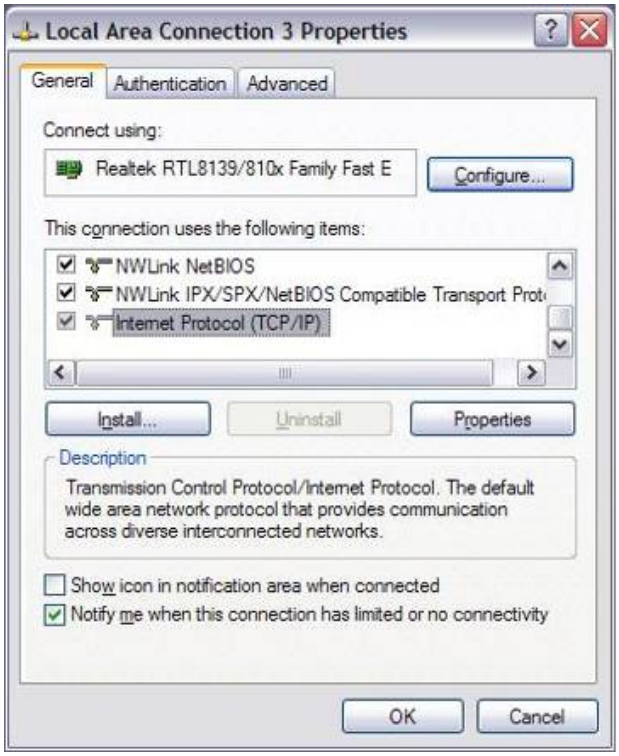



*Figure 5 - Local Area Connection Properties (Windows XP)*

4. Verify that "Obtain an IP address automatically" and "Obtain DNS Server address automatically" are selected.

*Figure 6 - Internet Protocol (TCP/IP Properties)*

## 4.5 Sentry 4G Router Setup

1. Power on the Sentry 4G router with 10-30VDC power supply.
2. In an Internet browser, enter http://192.168.1.50. This will bring up the Sentry 4G product login page (Note: It may take 30 seconds from initial power-up for the homepage to be available.)
3. Login to the device

   Default Login values

   **User logon: *admin***

   **password: *password***
4. This brings up the Sentry 4G product homepage. You can view status and configuration parameters from this screen. The configuration options are further explained later in this document.

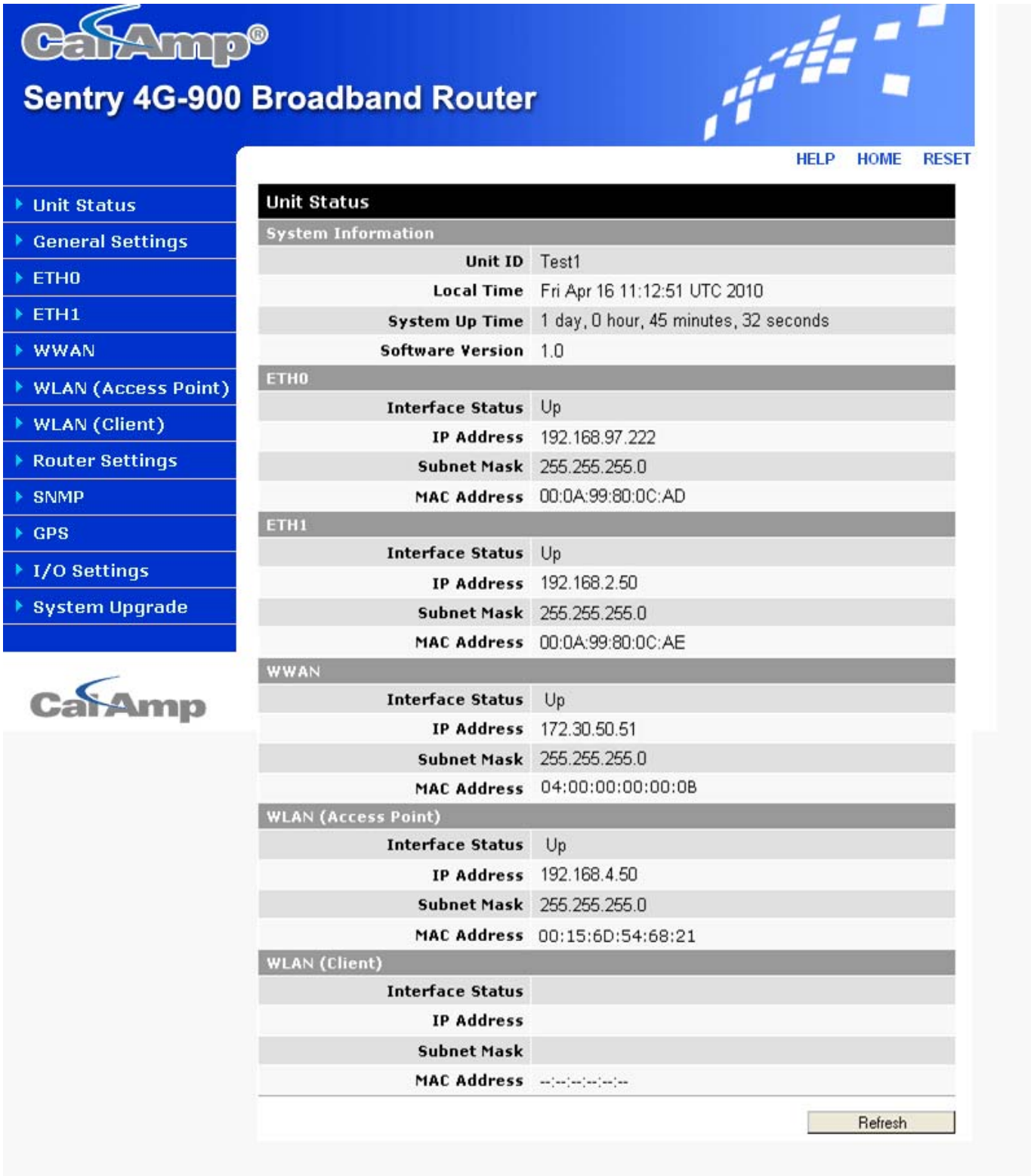



*Figure 7 - Sentry 4G Router Homepage*

# 5. Sentry 4G Configuration

This section explains status information and configuration options available on all HTML pages.

## 5.1 General Instructions

The following instructions are common to all HTML pages

The Help, Home and Reset links are located at the top right of all HTML pages.

**Help:** Select this link on any of the devices configuration pages to bring up the help text for that screen.

**Home:** Select this link to return to the home page of the router.

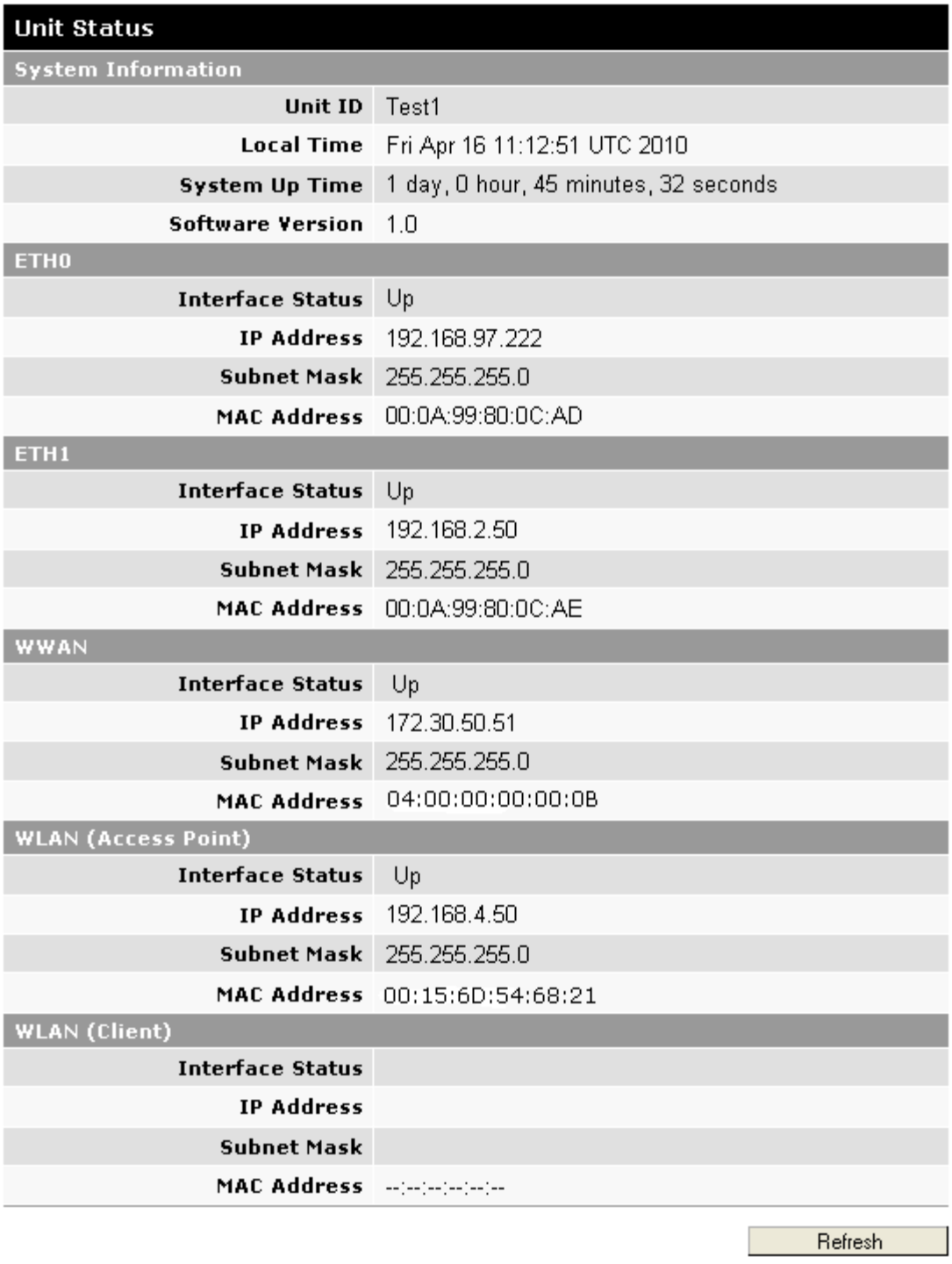
**Reset:** Select this link to command the unit to reboot. This process will take about 40 seconds. The software will ask you to confirm this command prior to re-booting.

**Save:** Most changes to a configuration parameter require the user to click save before the change will take effect.

**Clear/Cancel:** Most configuration menus also have a "Clear/Cancel" option. Selecting this button will restore all fields in a section to their last saved value. Note: This does not return them to their factory defaults.

## 5.2 Home Page Parameters

The Sentry 4G router home page lists the unit's primary operating parameters and status. Configuration changes cannot be made from this page.



| Unit Status | |
|---|---|
| **System Information** | |
| **Unit ID** | Test1 |
| **Local Time** | Fri Apr 16 11:12:51 UTC 2010 |
| **System Up Time** | 1 day, 0 hour, 45 minutes, 32 seconds |
| **Software Version** | 1.0 |
| **ETH0** | |
| **Interface Status** | Up |
| **IP Address** | 192.168.97.222 |
| **Subnet Mask** | 255.255.255.0 |
| **MAC Address** | 00:0A:99:80:0C:AD |
| **ETH1** | |
| **Interface Status** | Up |
| **IP Address** | 192.168.2.50 |
| **Subnet Mask** | 255.255.255.0 |
| **MAC Address** | 00:0A:99:80:0C:AE |
| **WWAN** | |
| **Interface Status** | Up |
| **IP Address** | 172.30.50.51 |
| **Subnet Mask** | 255.255.255.0 |
| **MAC Address** | 04:00:00:00:00:0B |
| **WLAN (Access Point)** | |
| **Interface Status** | Up |
| **IP Address** | 192.168.4.50 |
| **Subnet Mask** | 255.255.255.0 |
| **MAC Address** | 00:15:6D:54:68:21 |
| **WLAN (Client)** | |
| **Interface Status** | |
| **IP Address** | |
| **Subnet Mask** | |
| **MAC Address** | --:--:--:--:--:-- |

Refresh

*Figure 8 - Sentry 4G Router Unit Status*

### 5.2.1 Home Page Parameter Descriptions

**System Information**

**Unit ID:** Sentry4G unit identification number (configured under General Settings).

**Local Time:** Displays local time (subject to configurations made in General Settings→Date/Time)

**System Up Time**: System Up Time displays a counter that starts when the unit is powered on and resets when the unit is powered down or hardware reset.

**Software Version:** This reflects the version of application software loaded on the unit.

**WWAN**

**Interface Status**: indicates if the device has an established connection to the WWAN. Status is UP or DOWN

**IP Address**: WWAN IP address of the Sentry 4G unit.

**Subnet Mask:** This subnet mask of the WWAN interface

**MAC Address**: Media Access Control Address of the WWAAN interface.

**ETH0 and ETH1**

**Interface Status**: indicates if the device has an established connection to the LAN on ETH0 or ETH1 interface. Status is UP or DOWN

**IP Address:** IP address assigned to the ETH0/ETH1 interface

**Subnet Mask:** The Subnet mask assigned to the ETH0/ETH1 interface

**MAC Address:** Media Access Control Address of the ETH0/ETH1 interface

**WLAN (Access Point or Client)**

**Interface Status:** Indicates if the WiFi interface is "UP" or "DOWN"

**IP Address:** IP address assigned to the WiFi interface of this device. When the WiFi interface is set to operate in WiFi Client mode, the WiFi Access Point must have a DHCP server running to assign an IP address to its WiFi clients.

**Subnet Mask:** Subnet Mask assigned to the WiFi interface of this device.

**MAC Address:** Media Access Control Address of the WiFi interface.

# 5.3 General Settings

## 5.3.1 Unit ID

The Sentry4G unit identification number is configured under General Settings→Unit ID.

## 5.3.2 Password

The Sentry 4G unit's web interface management login details are modified using the Password tab of the Advanced Settings page.
To change the login details, enter the current and new password. The new password must be entered twice (reconfirmed).

## 5.3.3 Date/Time

The Sentry4G unit's date and time configuration can be configured as shown below.

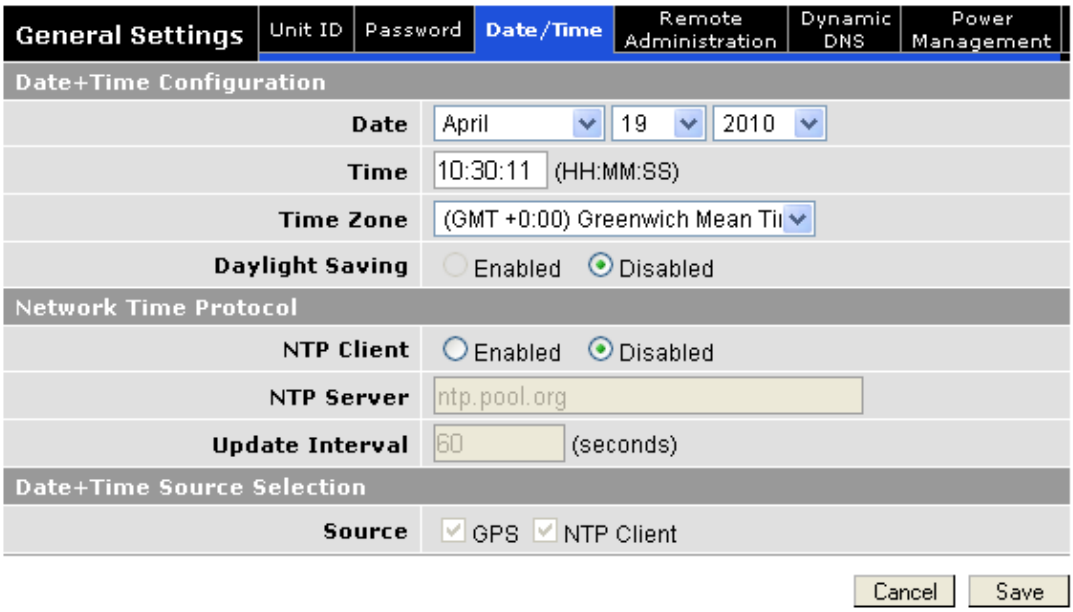



*Figure 9 - Date/Time*

The time can be updated automatically via the NTP (Network Time Protocol) pool, which is a dynamic collection of networked computers that volunteer to provide accurate time to clients worldwide.

When applicable, the Sentry4G units will use their GPS feed as input for the internal clock (highest priority). If GPS feed is unavailable and the NTP client is enabled and configured, the Sentry4G unit will use the NTP client as input for the internal clock.

## 5.3.4 Remote Administration

The user can configure remote access to Sentry4G's HTTP server, SNMP agent, and Command Shell (Telnet).

Note: Users can be logged into a single unit both locally and remotely at the same time. Changes made on one end will not be reflected on the other unless the web page is refreshed.

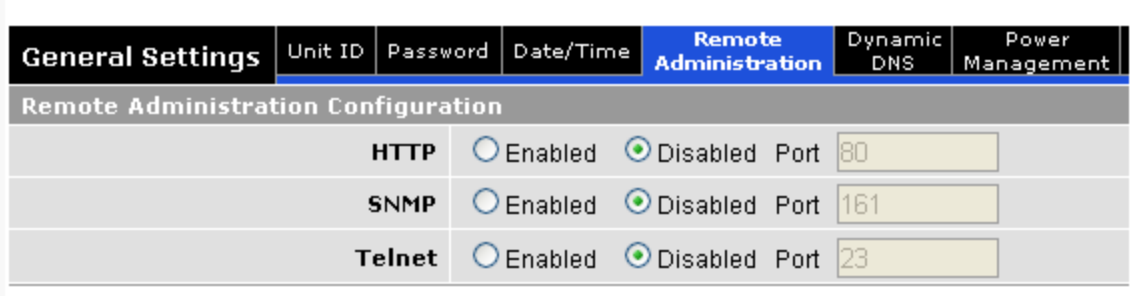



*Figure 10 - Remote Administration*

**Configuration Port:** Change the port of incoming requests. It is not necessary to change this parameter unless it conflicts with other devices on the network.

*5.3.4.1.1 Example of Remote Login (HTTP)*

The following should be entered into a browser on a remote PC to remote login to the Sentry 4G router. The Sentry 4G unit must have remote administration enabled for this functionality to work.

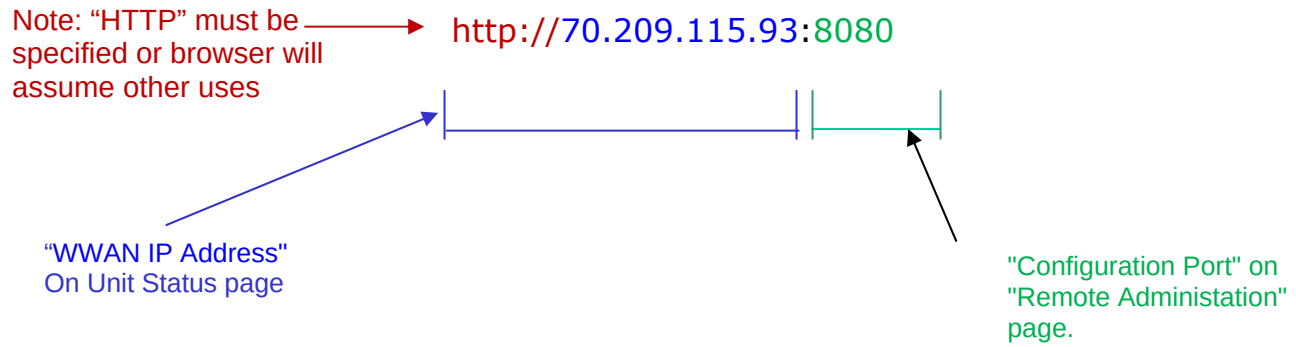



*Figure 11 - Example of Remote Login*

## 5.3.5 Dynamic DNS

Dynamic DNS configuration allows the Sentry4G to register its current WAN IP address with a dynamic DNS server.

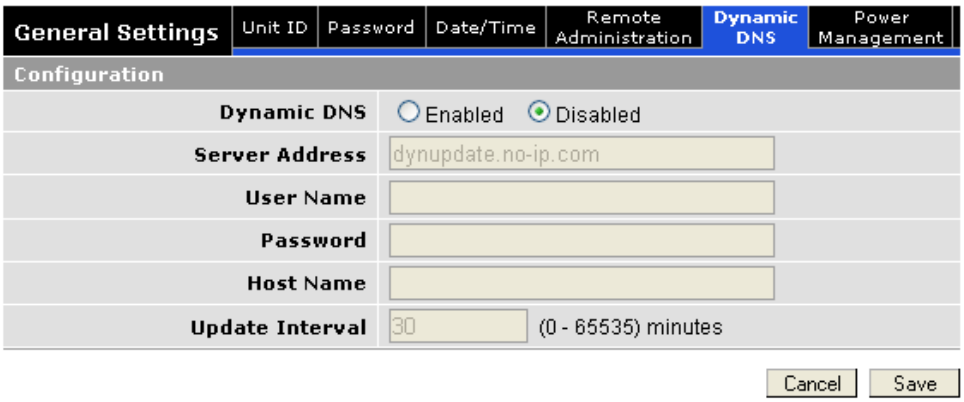



*Figure 12 - Dynamic DNS*

To configure enter the IP address (or name) of the dynamic DNS server as well as the user name and password of the account. Enter the hostname identifying this unit on the dynamic DNS server. Set the appropriate update interval (0 to 65,535 minutes).

### 5.3.6 Power Management

The SENTRY 4G unit is designed to stay ON even if the ignition is turned OFF. You can configure your Sentry 4G unit to automatically shut down 1, 5, 30, or 60 minutes after ignition is turned off or when the supply voltage drops to a certain level.

**Shutdown Method**: Disabled by default (unit always ON after ignition is turned OFF). Select "Power Off" to enable power management.

**After ignition line off:** Select between the following time intervals: 1 minute, 5 minutes, 30 minutes, or 60 minutes.

**When Voltage Drops to:** Enter desired voltage. Enter "0" to disable. (Note: A value of 11V would be usually entered here as a precaution in order to ensure the car battery does not drain.)

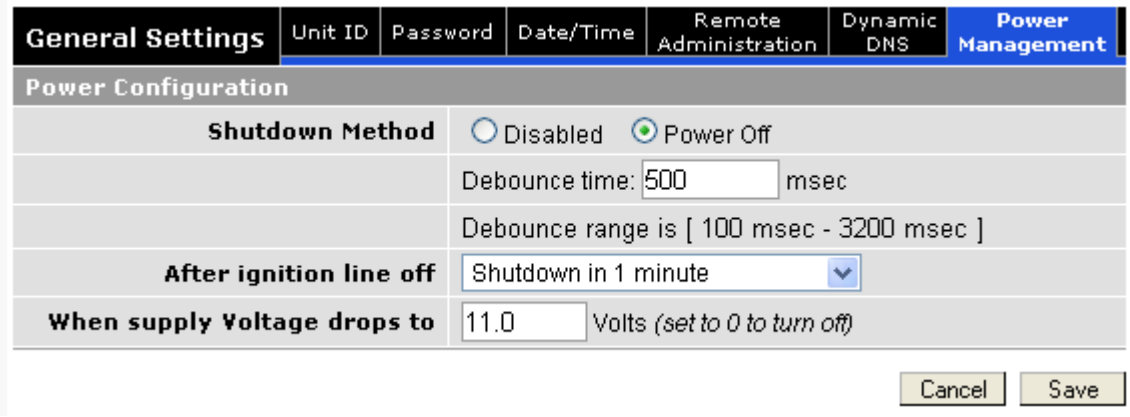



*Figure 13 - Power Management*

## 5.4 LAN Settings (ETH0 and ETH1)

Sentry4G router features two Ethernet ports. The ETH0 and ETH1 Settings pages contain the basic configuration information required to customize your LAN with the Sentry 4G router as the network connection point. User configuration will primarily occur on this page.

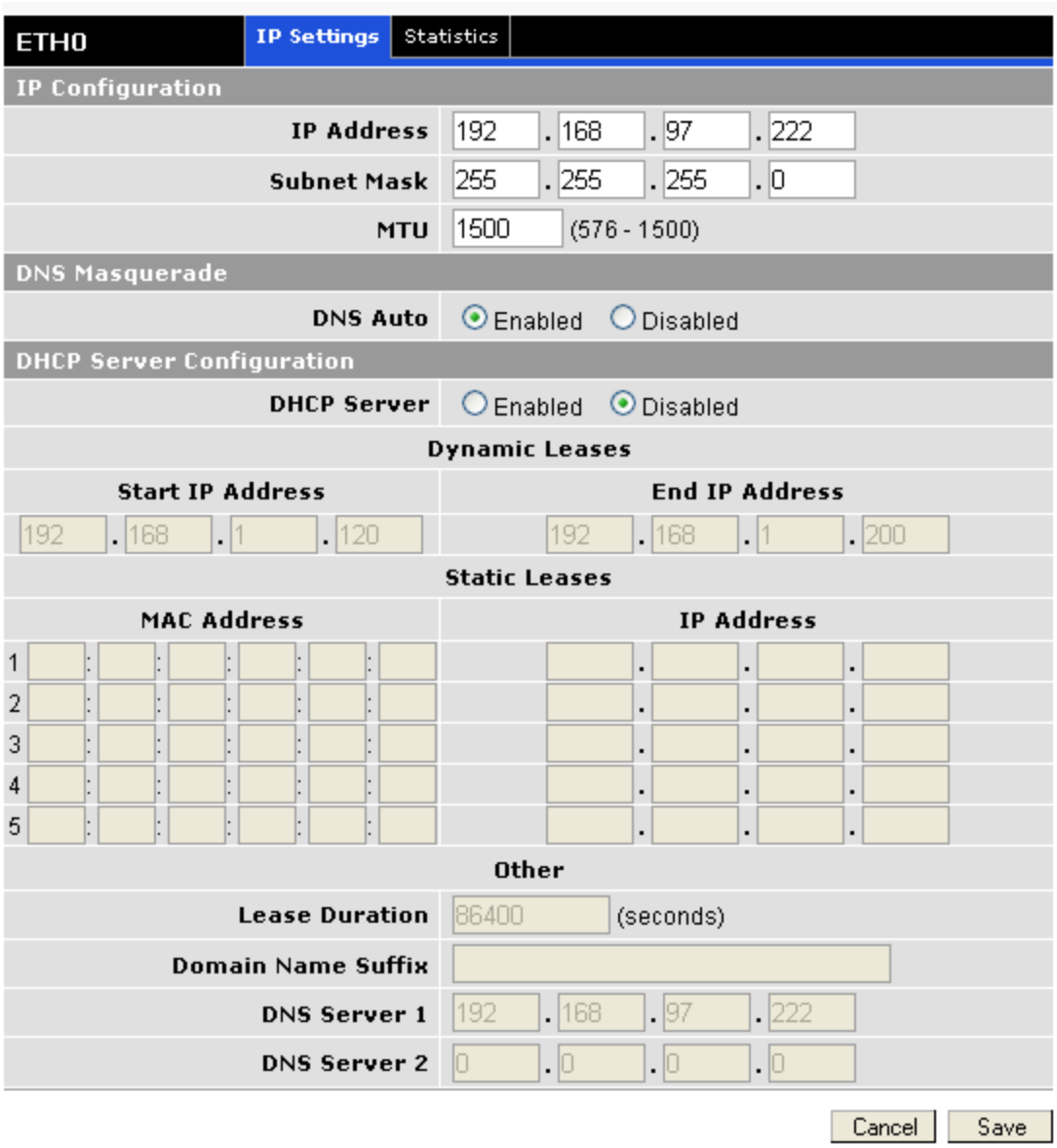



*Figure 14 - IP Settings*

## 5.4.1 IP Settings

### 5.4.1.1 IP Configuration

**Ethernet IP address:** LAN IP of the Sentry 4G unit. This address is entered into a browser on a local PC when logging into the Sentry 4G home page. To decrease the chances of unwanted access, this value should be changed from its default prior to use.

IMPORTANT NOTE:

Changing this value will cause you to lose connection to the Sentry 4G unit. Enter the new address in the browser to reconnect. If you forget an address or make a mistake entering the new value, it may be difficult to reconnect to the device.

**Ethernet Subnet Mask:** The Subnet mask is used in conjunction with the Ethernet IP address to partition the address into the network (subnet) portion and the host portion. This value will be entered automatically by the software based on the class of IP address entered. It is not be necessary to change the default value once the Ethernet IP is entered.

#### 5.4.1.2 DNS Masquerade

See the definition for DNS in Network Basics in section 3.1 above.

**DNS Auto:** The command enables/disables the Sentry 4G DNS server. Except in special cases, this should always be enabled.

#### 5.4.1.3 DHCP Server Configuration

**DHCP Server:** (Dynamic Host Configuration Protocol) A protocol used by client devices that are connected to the LAN port of this device to automatically obtain an IP address assigned by this server/router. Selecting Enable will configure this device to assign IP addresses to client devices taken from a pool specified by the values entered in DHCP start range and DHCP end range. If DHCP is disabled, the information must be entered manually on all PCs.

**DHCP Start IP Address/End IP Address:** Sets the range of IP addresses assigned to the PCs. The user can limit the number of devices allowed on the network by limiting the range of IP addresses.

IMPORTANT NOTE:

The addresses in this range must be on the same subnet as the Ethernet IP

IMPORTANT NOTE:

The Ethernet IP should not be in the DHCP range.

**DHCP Lease Time:** Number that dictates the length of time a device on the LAN can hold an IP address. In most cases, this should be set to the maximum (default value) of 86400. If this value is set too low, it can cause network connectivity problems.

**Domain Name Suffix:** The DNS suffix to be assigned by the DHCP server.

**Preferred DNS Server:** IP address of the preferred DNS server.

**Alternate DNS Server**: IP address of the alternate DNS server.

#### 5.4.1.4 Disabling DHCP server

When DHCP server is enabled, any PC with physical access to the Sentry 4G Ethernet port will be assigned an IP address and have access to browse the Internet. This may cause security problems. Disabling DHCP server will allow the user to control which PCs have the ability to connect through the Sentry 4G unit. *If changes are made to the network settings, be sure to keep a record of the changes for future use.*

- Disabling DHCP server is performed on the LAN settings page**.** Under the DHCP section, select Disable, then click Save.

IMPORTANT NOTE:

This also disables DNS Masquerading. Disabling DHCP server will remove all values in the DHCP and DNS sections. Record all values in these fields prior to disabling in case you are required to go back to the original configuration.

- To improve security, change the Ethernet IP of the Sentry 4G unit from the default setting.

**IMPORTANT NOTE:**

If the DHCP server is disabled, and you do not have a record of the Ethernet IP, you will not be able to login to the Sentry 4G home page.

On the network setting page of each PC set the following

- IP address: Set a unique address on the same subnet as the Sentry 4G router
- Subnet Mask: Set to the same value as the Sentry4G's Ethernet Subnet Mask field
- Default Gateway: Ethernet IP of the Sentry 4G router
- Preferred DNS: Ethernet IP of Sentry 4G router

When these settings are complete, the PC will have network access.

#### 5.4.1.5 Static IP Setup

If your network requires each PC to have a statically set LAN IP addresses, follow the previous procedure for all PCs on the network. If the network requires a mix of static and dynamically assigned IP addresses, assign static IPs outside the DHCP address range for PCs that require static IP addresses and allow the Sentry 4G router DHCP to assign the remaining PC IP addresses.

### 5.4.2 Statistics

This tab displays information regarding the number of packets and bytes transmitted and received over the ETH0 or ETH1 interface.

## 5.5 WWAN Parameters

This page contains WWAN configuration information and settings.

### 5.5.1 Settings

This screen contains main WWAN configuration. Select "Enabled" to enable WWAN interface and "Disabled" to disable WWWAN interface. See Figure 15.

#### 5.5.1.1 IP Configuration

**Mode:** Dynamic (IP Configuration obtained dynamically from a DHCP server) or Static (configured by the user).

*For Static IP Configuration, enter:*

**IP Address:** IP address of the WWAN interface

**Subnet Mask:** The network mask of the WWAN interface

**Gateway:** The gateway of the WWAN interface

**MTU**: Maximum Transmit Unit (minimum 576, maximum 1500).

#### 5.5.1.2 DNS Configuration

DNS servers can be configured as follows:

**Mode:**

**Dynamic (Default):** Obtain DNS IP addresses dynamically from a DHCP server.
**Static:** The DNS IP addresses are configured by the user.
**DNS Server 1:**
IP address of DNS server 1 (preferred DNS Server).
**DNS Server 2:**
IP address of DNS server 2 (secondary DNS Server).

### 5.5.1.3 NAT Configuration

When NAT is enabled, the LAN interfaces (ETH0, ETH1, WLAN (Access Point)) are considered private, the WWAN is considered public. Any IP packets leaving the Sentry4G unit through the LAN interface will have its source IP address changed to that of the WWAN interface.
Any data transfer must be initiated from the private side of the network toward the public side.

### 5.5.1.4 Authentication

*Supported with systems including a MiG (Mobile Internet Gateway). Single base systems or multi-base systems not offering seamless mobility do not support this feature.*

The Sentry4G router uses EAP-TTLS (Extensible Authentication Protocol-Tunneled Transport Layer Security) to obtain authorization and traffic key material from the BTS. The EAP-TTLS is disabled by default.

To enable EAP-TTLS authentication:

- Under "Authentication" select "EAP-TTLS" from the Protocol drop-down box
- Under "EAP-TTLS" fill in the User Name and Password fields and click "Save"
- Click "Browse" to locate certificate file supplied by the backhaul provider and click "Save"

Contact your backhaul provider for more information.

Once EAP-TTLS authentication is enabled, the IP configuration for the WWAN interface will be obtained through the BTS.
Note: The IP address for the WWAN interface is displayed under the Unit Status
If no authentication is selected, the IP address for the WWAN interface must be entered manually.

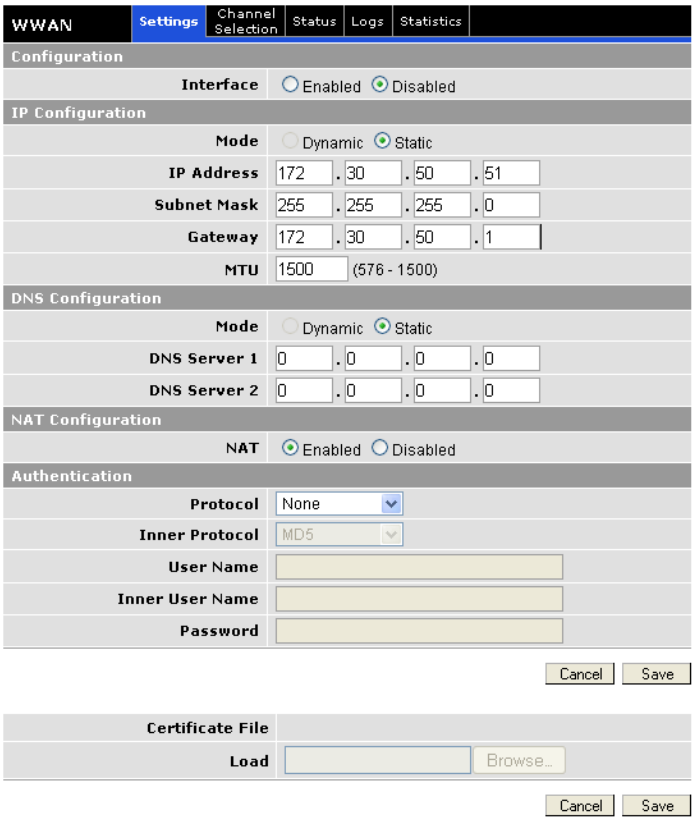



*Figure 15 - Sentry 4G Router WWAN Settings*

## 5.5.2 Channel Selection

### Configuration

**Maximum TX Power:** The maximum transmit power

**Idle Timeout:** Not currently Supported

### Static Channel Scanning

**Channel Filter:** Select from the following channel bandwidths: 3.5MHz, 5MHz, 7MHz, or 10MHz.

### Add Static Channel

**No:** Index for Static Channel Table below

**Frequency:** Frequency associated to the base station

**Bandwidth**: Bandwidth associated to the base station

### Static Channel Table

Lists frequencies and bandwidths used by the base station.

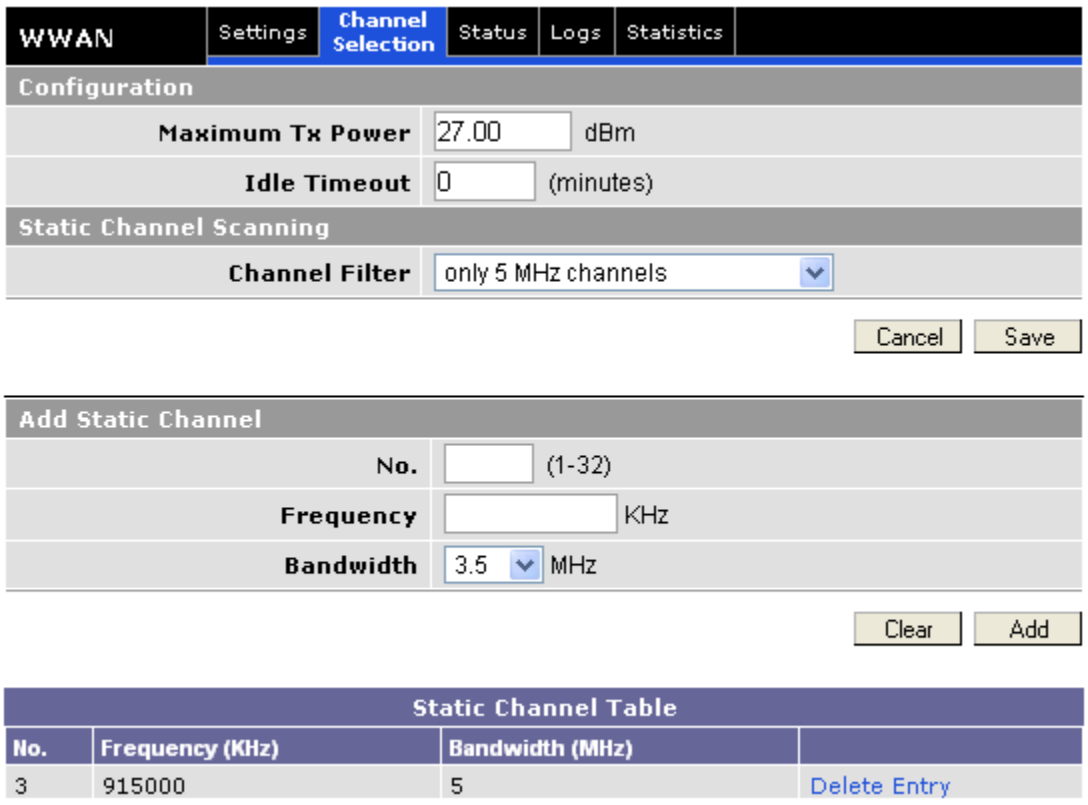



*Figure 16 - Sentry 4G Router WWAN Channel Selection*

### 5.5.3 Status

The Status tab of the WWAN page displays the current WWAN interface status including model number, firmware version, link status, and link information. Information on this page is read-only.

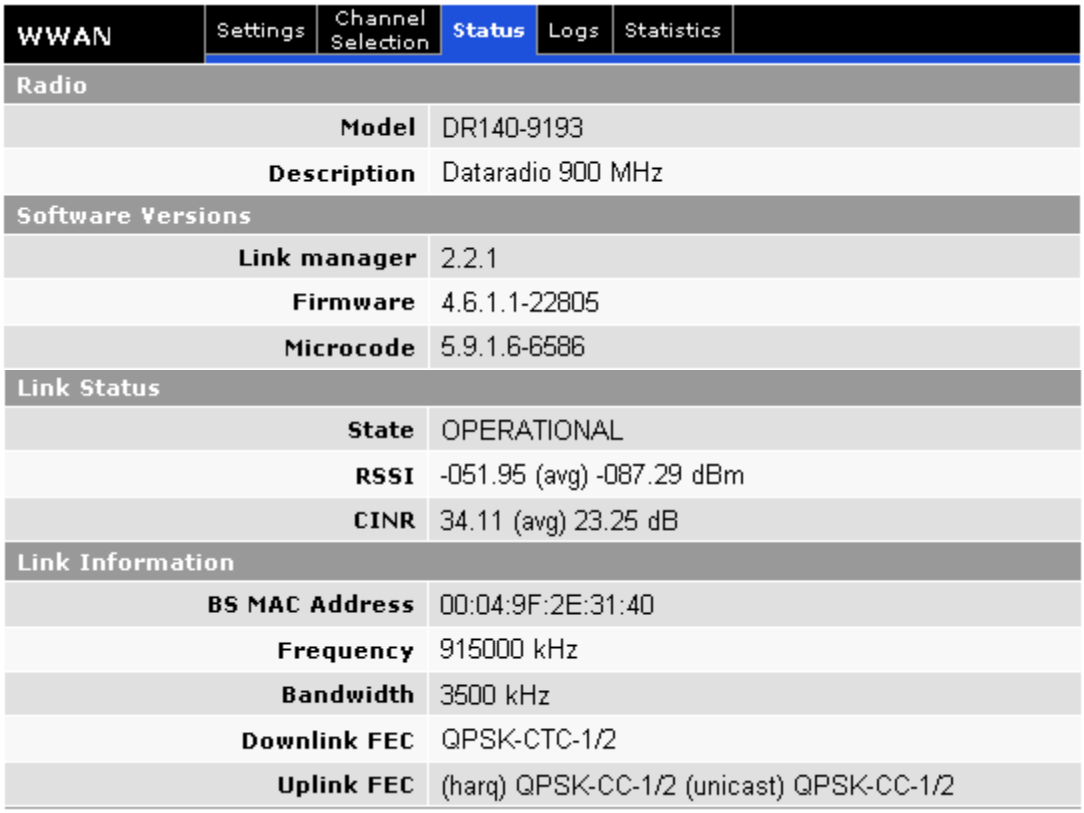



*Figure 17 - Sentry 4G Router WWAN Status*

### 5.5.4 Logs and Statistics

The Logs tab displays logs associated with the WWAN interface. Have this information handy if contacting CalAmp customer support.

The Statistics tab displays information regarding the number of packets and bytes transmitted and received over the WWAN interface.

## 5.6 WiFi (WLAN)

A Sentry 4G unit can operate in an access point mode and in a client mode.

In access point mode, the Sentry 4G router offers wireless tether. It forwards local WiFi traffic to application servers over the broadband 802.16e-2005 network and works in parallel with Ethernet connection, providing for simultaneous WiFi and Ethernet connections (see Figure 18A).

In client mode the Sentry 4G unit can automatically switch between broadband 802.16e-2005 and WiFi connections providing for seamless handover when coupled with modern applications (see Figure 18B).

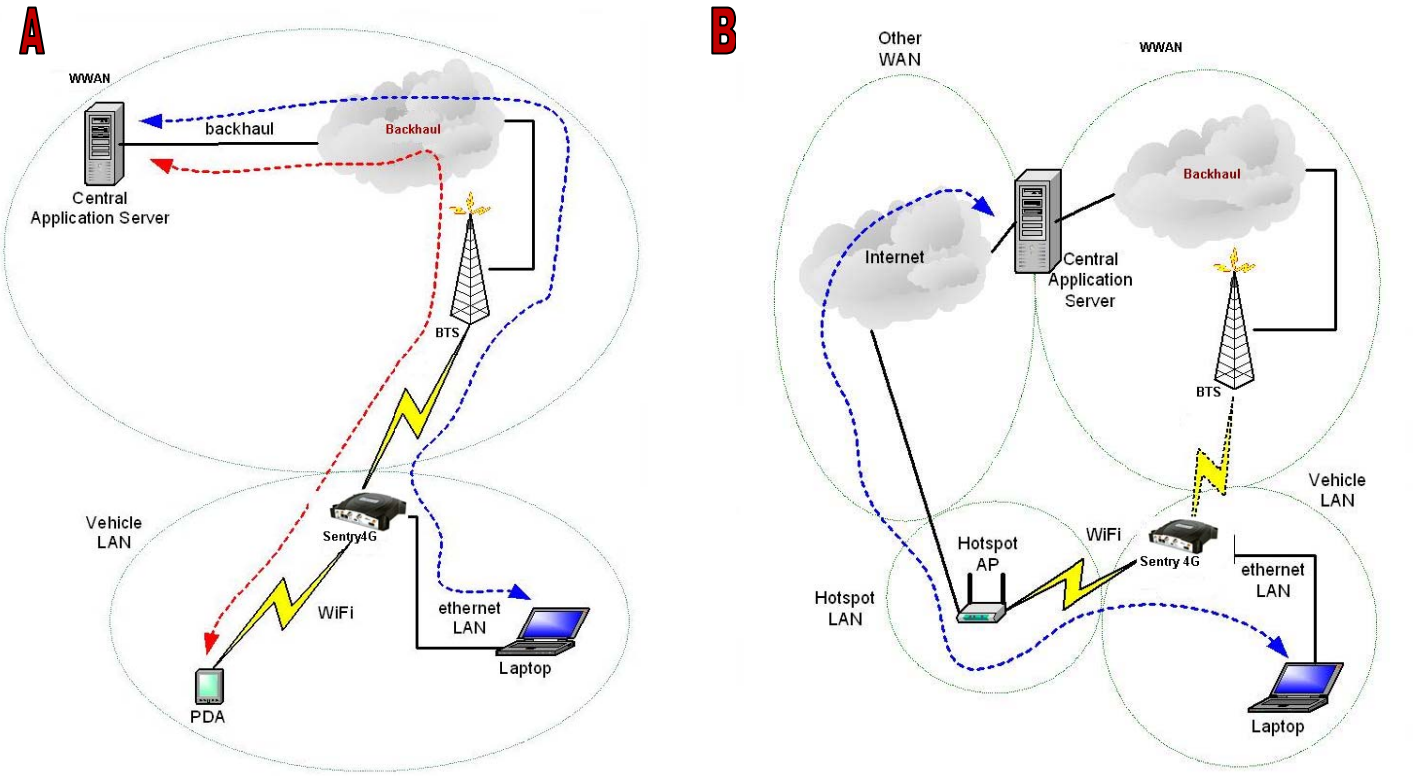



*Figure 18 - Sentry 4G WiFi Modes: Access Point (A); Client Mode (B)*

### 5.6.1 WLAN (Access Point)

The user can configure up to 20 access points in a system.

*Note: All access points must run a DHCP server.*

#### 5.6.1.1 WLAN (Access Point) - Settings

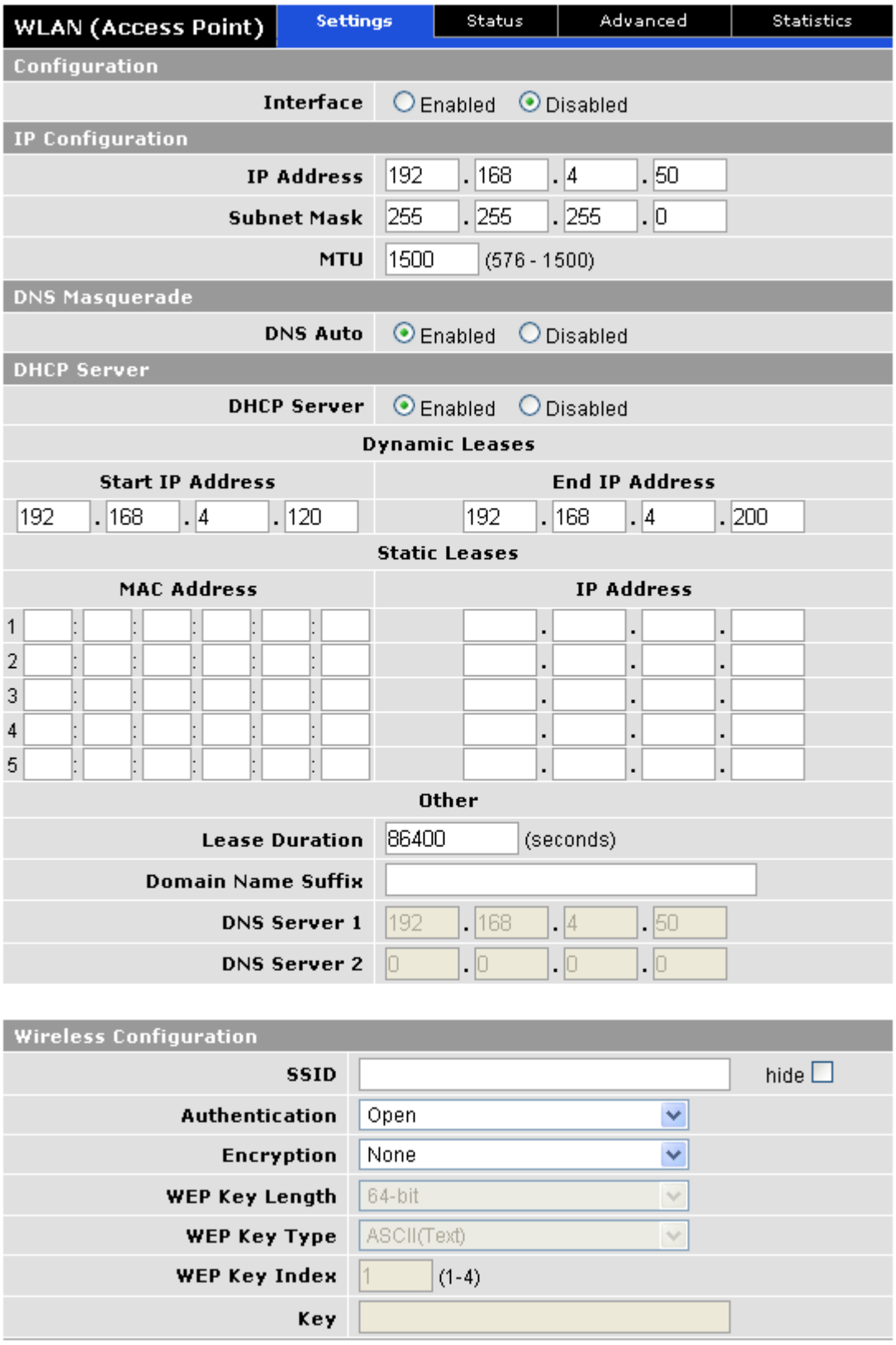



*Figure 19 - WLAN (Access Point) → Settings*

### Configuration

**Interface:** Enabled or Disabled (default)

### IP Configuration

**IP Address:** IP address of the WiFi interface

**Subnet Mask:** The network mask of the WiFi interface

**MTU**: Maximum Transmit Unit (minimum 576, maximum 1500).

### DNS Masquerade

**DNS Auto:** Enables or disables the Sentry 4G DNS server on the WiFi interface

### DHCP Server

**DHCP Server:** Enables or disables DHCP server on the WiFi interface

**Dynamic Leases:**

**Start IP Address:** Starting IP address (defines the pool of addresses allocated for DHCP purpose)

**End IP Address:** Ending IP address (defines the pool of addresses allocated for DHCP purpose)

**Static Leases:**

List of IP addresses to assign to the given MAC addresses.

**MAC Address:** MAC address associated to a host on the interface.

**IP Address:** IP address to lease to the host with the given MAC address.

**Lease Duration:** The period over which the IP address allocated to a DHCP client is referred to as a "lease". Lease duration is the amount entered in seconds.

**Domain Name Suffix:** DNS suffix to be assigned by the DHCP server

**DNS Server 1:** Preferred DNS Suffix: IP address of the preferred DNS server

**DNS Server 2:** Alternate DNS Suffix: IP address of the alternate DNS server

### Wireless Configuration

**SSID:** Service Set Identifier. This is the name of the wireless local area network.

**Authentication:** Authentication method to be used (Example: Open, Shared, WPA-PSK, WPA2-PSK)

**Encryption:** Encryption method currently used

**WEP Key Length**: the bit key length

**WEP Key Type:** type of WEP security

**WEP Key Index:** 1-4

**Key:** The encryption key

***Note:*** *For a 64-bit key, keys are 5 character strings long if WEP Key Type is set to ASCII and 10 hexadecimal digits long if WEP Key Type is set to HEX.*

*For a 128-bit key, keys are 13 character strings long if WEP Key Type is set to ASCII and 26 hexadecimal digits long if WEP Key Type is set to HEX.*

The following table shows examples of encryption keys depending on encryption type chosen.

*Table 4 - Encryption Keys Examples*

| Encryption Type | Description | Key (Example) |
|---|---|---|
| **WEP Encryption** | | |
| 64-bit/ASCII | 5 character string | CrYpT |
| 64-bit/Hexadecimal | 10 hexadecimal digits | mYEncryptKeY4 |
| 128-bit/ASCII | 13 character string | LongHello1234 |
| 128-bit/Hexadecimal | 26 hexadecimal digits | 12345678901234567890ABCDEF |
| **TKIP Encryption** | | |
| Any Key | A string of 8 to 63 characters | AbCdEfGhIjKlMnOp |
| **AES Encryption** | | |
| Any Key | A string of 8 to 63 characters | AbCdEfGhIjKlMnOp |

### 5.6.1.2 WLAN (Access Point) - Status

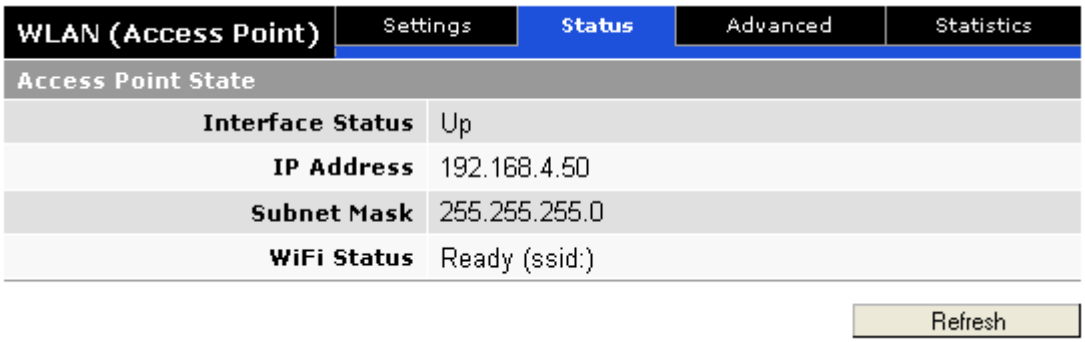



*Figure 20 - WLAN (Access Point) → Status*

**Interface Status:** Status of the WLAN (Access Point) interface (up or down)
**IP Address:** IP address assigned to the WiFi interface
**Subnet Mask:** IP Subnet Mask assigned to the WiFi interface
**WiFi Status:** Current state of the WiFi interface (Disabled, Ready)

### 5.6.1.3 WLAN (Access Point) - Advanced

Select **Channel:** Channel number to use (1-11)

#### 5.6.1.4 WLAN (Access Point) – Statistics

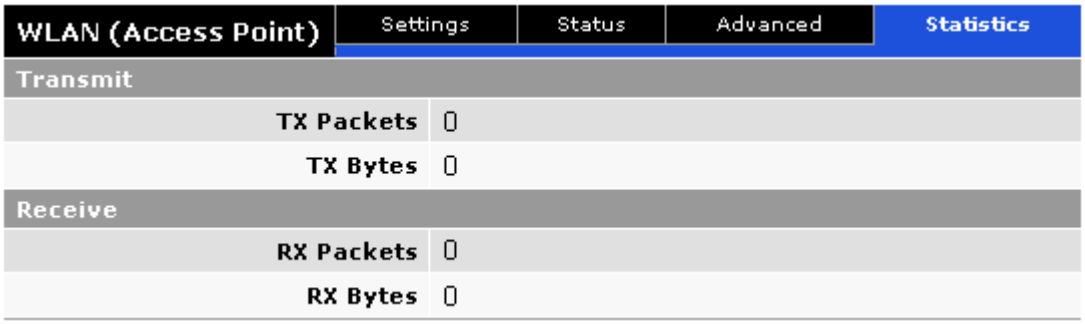



*Figure 21 - WLAN (Access Point) → Statistics*

**Transmit**

**TX Packets:** Number of packets sent by the Sentry 4G unit over the WiFi interface
**TX Bytes:** Number of bytes sent by the Sentry 4G unit over the WiFi interface

**Receive**

**RX Packets:** Number of packets received by the Sentry 4G unit over the WiFi interface
**RX Bytes:** Number of bytes received by the Sentry 4G unit over the WiFi interface

### 5.6.2 WiFi (Client)

In wireless client mode, the Sentry 4G unit will try to connect to the Access Point with the strongest signal on the list. When the Sentry 4G unit connects to an access point, it starts a DHCP client service. The DHCP server running on the access point must provide an IP address, netmask, and gateway to the Sentry 4G unit. When the WiFi client is connected to a WiFi access point, the default route is set to point to the gateway address obtained by the DHCP client.

#### 5.6.2.1 WLAN (Client) - Settings

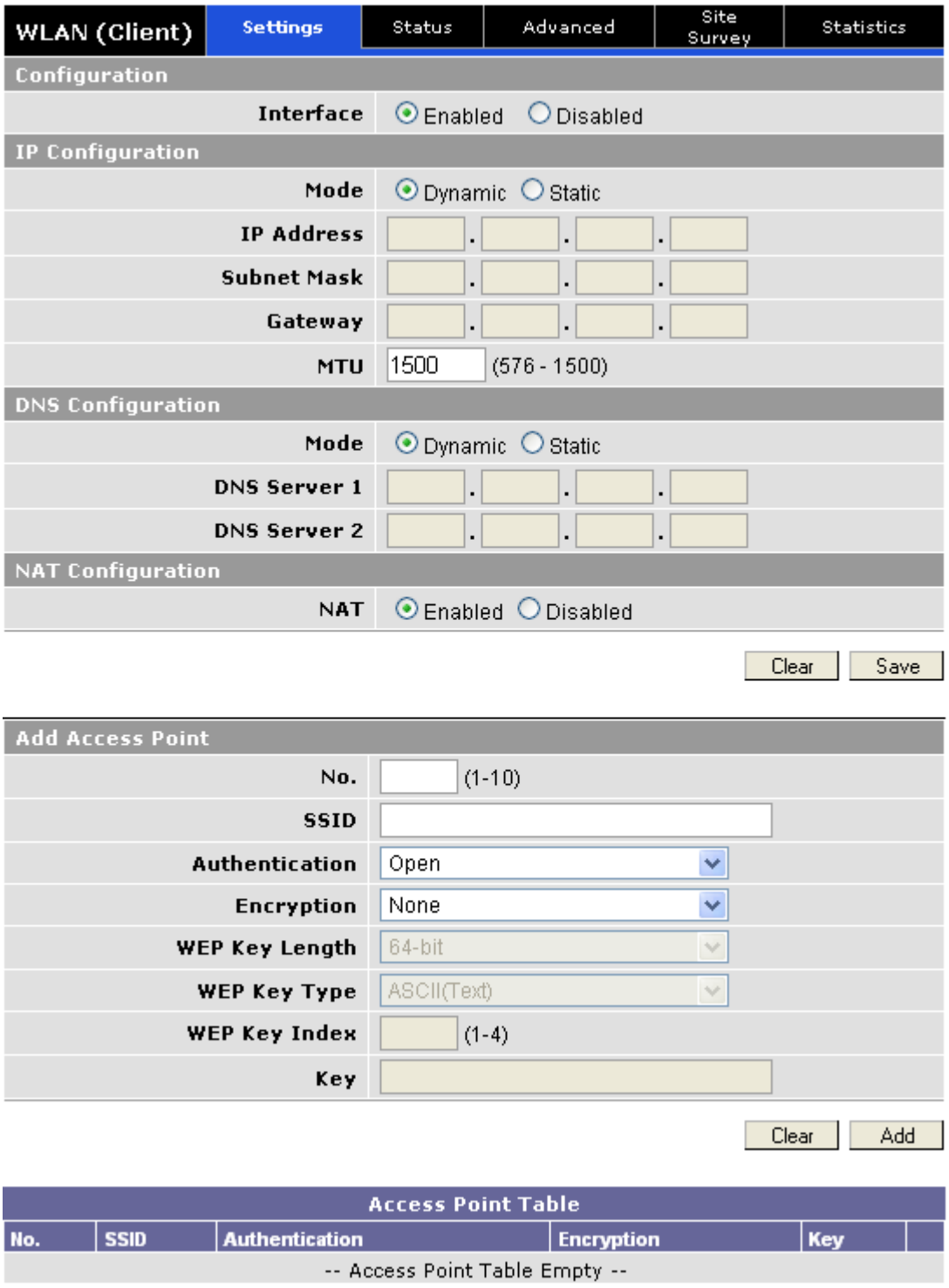



*Figure 22 - WLAN (Client) → Settings*

**Configuration**

**Enabled / Disabled**: The WiFi interface operates in Client mode when enabled

**IP Configuration**

**Mode:** Dynamic (IP Configuration obtained dynamically from a DHCP server) or Static (configured by the user).

*For Static IP Configuration enter:*

**IP Address:** IP address of the WiFi interface

**Subnet Mask:** The network mask of the WiFi interface

**MTU**: Maximum Transmit Unit (minimum 576, maximum 1500).

**DNS Configuration:**

Configuration of the DNS servers is used by the unit when it is sending DNS requests.

**Mode:** Dynamic (DNS Configuration obtained dynamically from a DHCP server) or Static (configured by the user).

*For Static DNS Configuration enter:*

**DNS Server 1:** Preferred DNS Suffix: IP address of the preferred DNS server

**DNS Server 2:** Alternate DNS Suffix: IP address of the alternate DNS server

**NAT Configuration:**

**Enabled** (NAT is enabled on the WLAN interface) **/ Disabled**

**Add Access Point:**

**No.:** Access point number

**SSID:** Service Set Identifier. This is the name of the wireless local area network.

**Authentication:** Authentication method to be used (Example: Open, Shared, WPA-PSK, WPA2-PSK)

**Encryption:** None, WEP, TKIP, or CCMP

**WEP Key Length**: the bit key length

**WEP Key Type:** type of WEP security

**WEP Key Index:** 1-4

**Key:** The encryption key

***Note:*** *For a 64-bit key, keys are 5 character strings long if WEP Key Type is set to ASCII and 10 hexadecimal digits long if WEP Key Type is set to HEX.*

*For a 128-bit key, keys are 13 character strings long if WEP Key Type is set to ASCII and 26 hexadecimal digits long if WEP Key Type is set to HEX.*

Refer to Table 4 for examples of encryption keys depending on encryption type chosen.

### 5.6.2.2 WLAN (Client) – Status

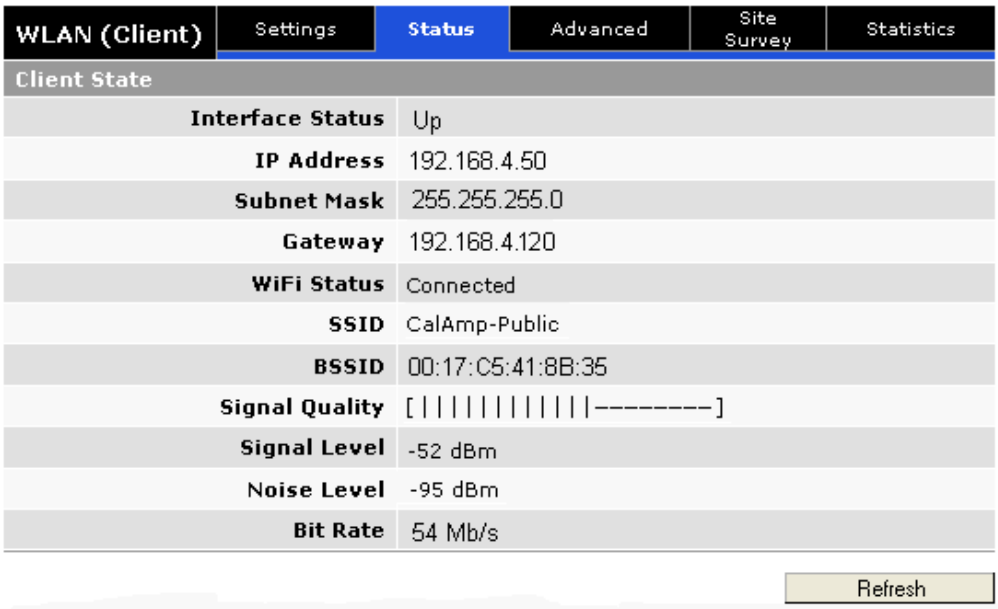



*Figure 23 - WLAN (Client)→ Status*

**Interface Status:**

Up - The WiFi client interface is up and operational.

Down - The WiFi client interface is down.

**IP Address:**

IP address associated to the WLAN client interface.

**Subnet Mask:**

Subnet mask associated to the WLAN client interface.

**Gateway:**

Gateway associated to the WLAN client interface.

**WiFi Status:**

*Unknown*: The status is unknown

*Disconnected*: The client was previously connected to an access point but is now disconnected (scanning for an access point will resume shortly).

*Connected*: Connected to an access point. The access point's ssid and bssid are displayed.

*Scanning*: Searching for an access point

**SSID:** Service Set Identifier. This is the name of the wireless local area network currently connected to

**BSSID:** Basic service set identifier. This is commonly the MAC address of the AP (Access Point).

**Signal Quality:** A horizontal bar meter is displayed to show signal quality (20 bars max)

**Signal Level:** Signal level is displayed (in dBm)

**Noise Level:** Noise level is displayed (in dBm)

**Bit Rate:** Bit rate is displayed (Mb/s)

### 5.6.2.3 WLAN (Client) – Advanced

Select **Channel:** Channel number to use (1-11)

## 5.6.3 WLAN (Client)→Site Survey

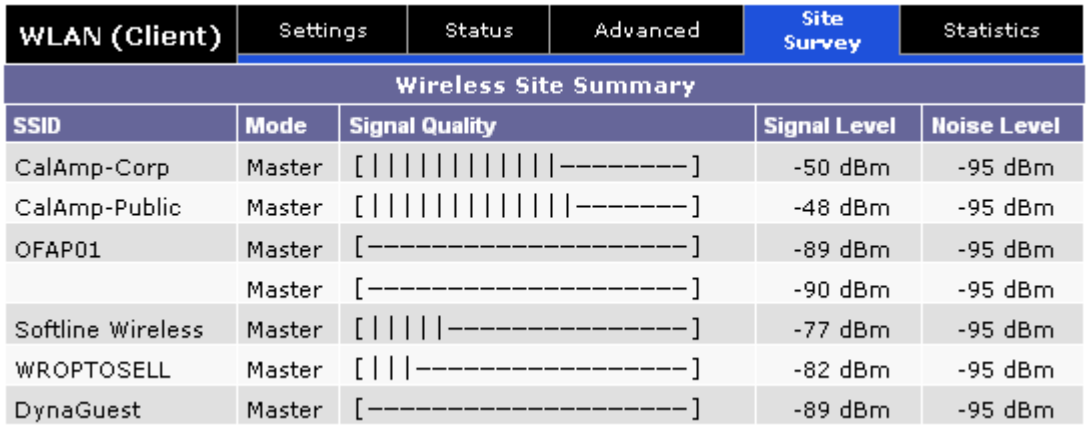



*Figure 24 - WLAN (Client)→ Site Survey*

When the WiFi interface of the Sentry 4G unit operates in Client mode, this screen shows the WiFi Access Points detected during last wireless scan.

The list is empty when the Sentry 4G unit is operating in Access Point mode.

## 5.6.4 WLAN (Client)→Statistics

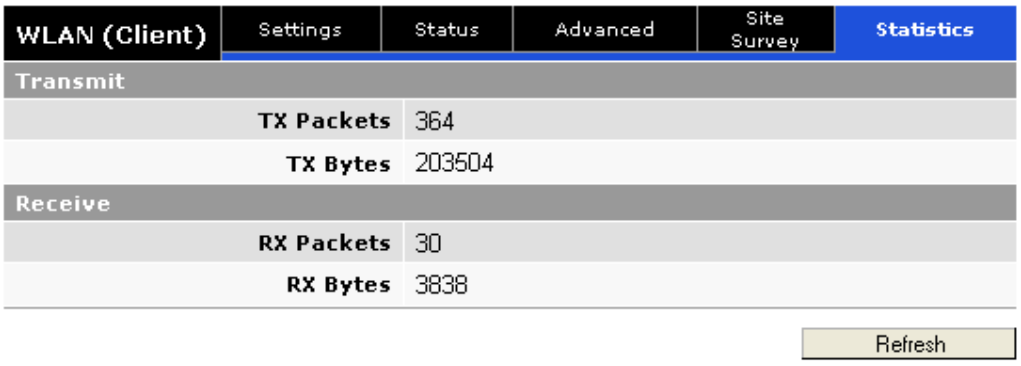



*Figure 25 - WLAN (Client)→ Statistics*

**Transmit**

**TX Packets:** Number of packets sent by the Sentry 4G unit over the WiFi interface
**TX Bytes:** Number of bytes sent by the Sentry 4G unit over the WiFi interface

**Receive**

**RX Packets:** Number of packets received by the Sentry 4G unit over the WiFi interface
**RX Bytes:** Number of bytes received by the Sentry 4G unit over the WiFi interface

# 5.7 Router Settings

Router settings provide advanced user configuration for large network setups.

## 5.7.1 Static Routes

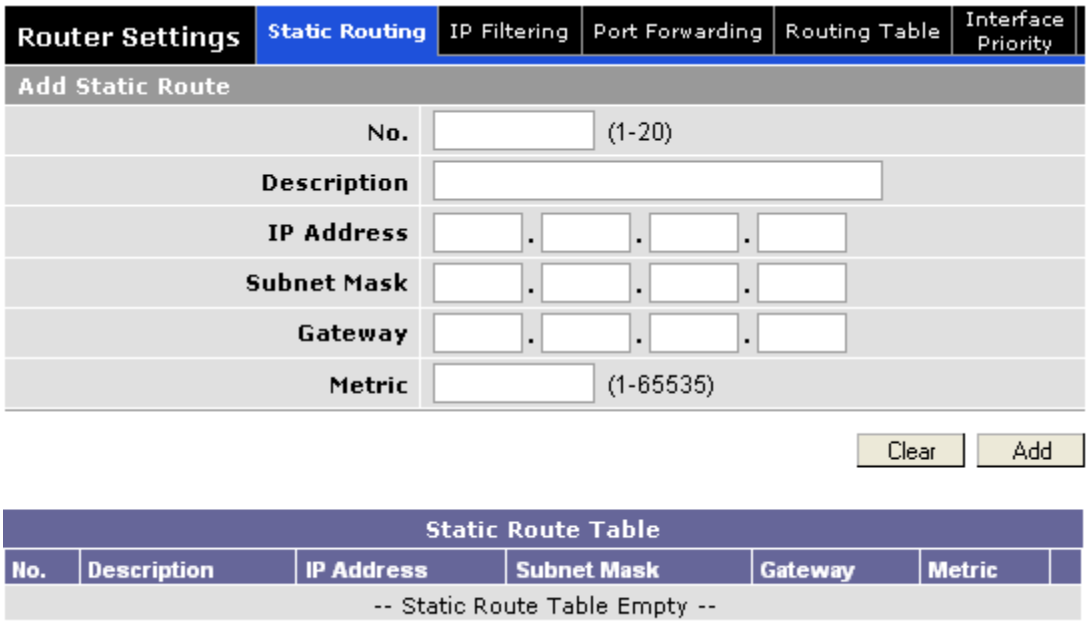



*Figure 26 - Static Routes*

The Sentry 4G unit will automatically set up routing to all devices on the same subnet. In some cases however, the Sentry 4G unit may need to communicate with a previously existing subnet other than its own. This route cannot be automatically generated; it must be manually entered as a static route by the user. The static route gives the Sentry 4G router its "next hop" instructions.

**Route no**: A generic number assigned to the route. Multiple static routes can be assigned as long as they have distinct route numbers.

**Description:** Nickname assigned to the route by the user.

**IP Address:** This is the destination IP address that is delivered to the Sentry 4G unit. Since this IP address will not be on the same subnet, the Sentry 4G unit will not have a defined route, and will not know where to send it by default. Setting up the static route will inform the Sentry 4G unit where to send the data.

**Subnet Mask:** The Subnet mask is determined by the subnet of the destination address

**Gateway:** This is the address that the data packet will be routed to.

Note:

The device at this address must be a router that is either on the same subnet as the Destination IP or one with its own statically setup route to the destination address. If this is not the case, the packet data will be dropped.

**Metric:** This sets the priority of the routes compared to other static routed defined. The lower the number, the higher priority the route.

Click on "Add" when all necessary information has been entered. The route will be shown on the bottom of the screen (under Static Routing Table). Additional routes can be added provided they have a unique Route no, name and metric. Routes can be deleted by clicking the Delete Entry option of the desired entry.

Note:

Routing table (found under "Routing Table" tab) shows all routes, while Static Table (found under "Static Routing" tab) shows manually entered routes only.

## 5.7.2 IP Filtering

IP Filtering provides certain Internet firewall protection. The user can enter up to 20 IP filters. Each IP filter is identified by a unique number (from 1 to 20). When IP filtering is enabled, any custom IP filter entered by the user as well as predefined IP filters will be taken into account when processing IP packets. See Figure 27.

An IP packet passes through the filtering logic when IP filtering is enabled:

1) An IP packet is received on one of the interface and is destined to the Sentry 4G unit
OR
2) An IP packet is sent by the Sentry 4G unit
OR
3) An IP packet is forwarded by the Sentry 4G unit.

### 5.7.2.1 Predefined IP Filters

**Drop Remote Pings:** If IP filtering is enabled, any ICMP echo request coming from the WAN interface will not be replied to. This prevents remote hosts from detecting your IP address on the WAN.
**Drop Remote IP Fragments:** If IP filtering is enabled, any fragmented IP packets coming from the WAN interface will be dropped.
**Drop Invalid Packets:** If IP filtering is enabled, any *invalid* packet received by the unit will be silently dropped. An invalid IP packet is one that cannot be identified.

### 5.7.2.2 Add Custom IP Filters

Fill in the parameters described below and click "Add…". Your entry should appear in the **Custom IP Filters** table on the bottom of the page.

*Note: Criteria are for inclusion by default. Select "exclude" if your criterion is for exclusion.*

**Filter Number:** Each IP filter is identified by a unique number from 1 to 20.

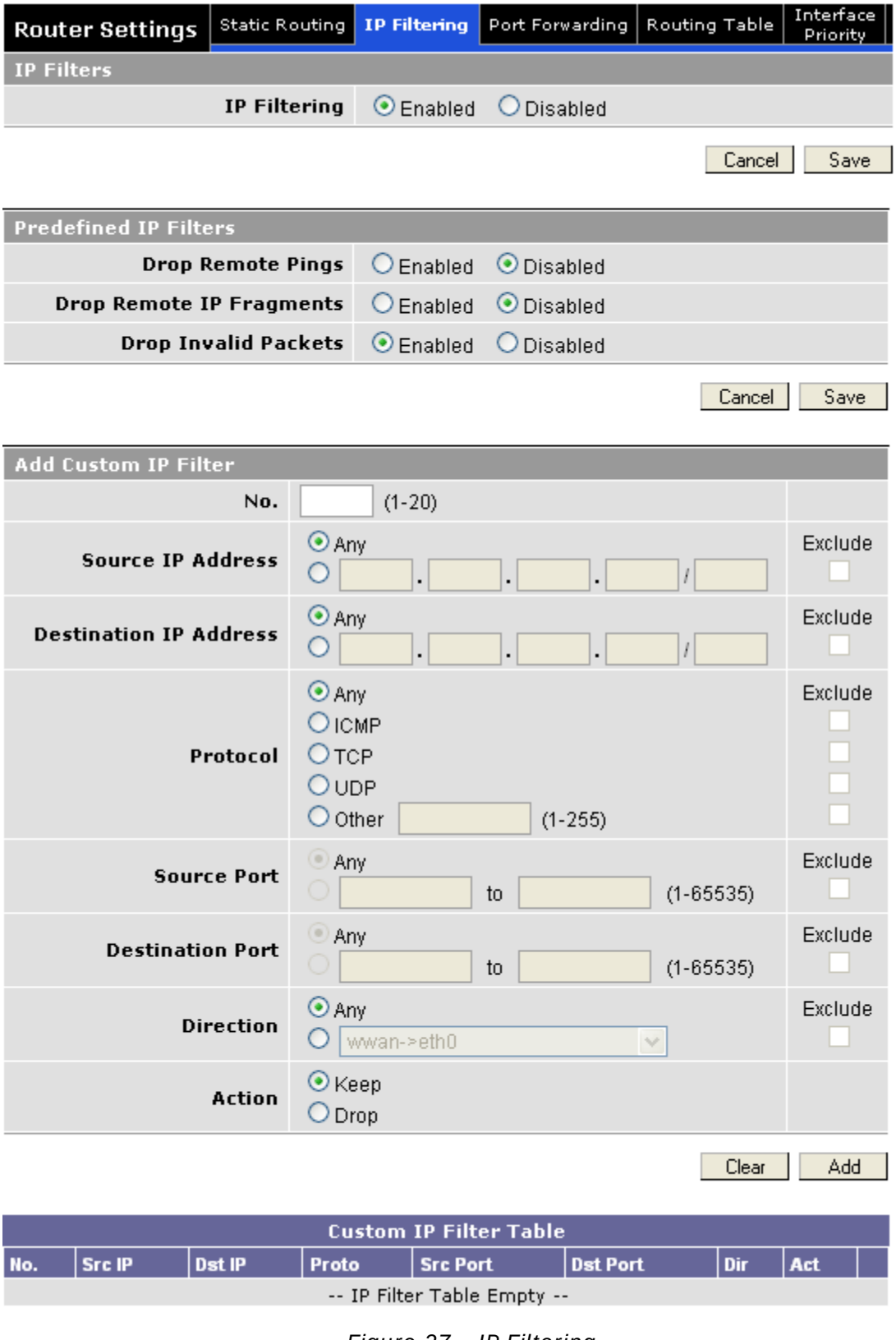



*Figure 27 - IP Filtering*

### 5.7.3 Port Forwarding

Port Forwarding is used to provide remote access to third party devices on the LAN, such as Web Cameras or printers. Port Forwarding routes incoming requests from the WWAN, with a specific port to a local device with a static IP.

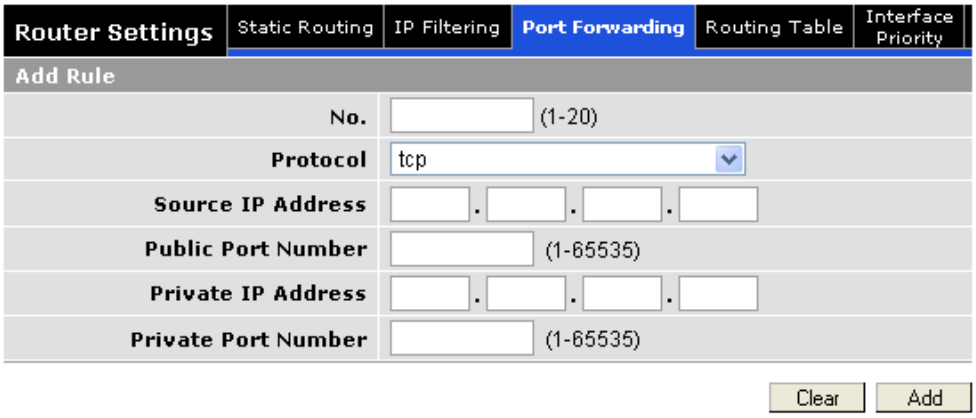



*Figure 28 - Port Forwarding*

### 5.7.4 Routing Table

The table in Figure 29 shows a list of all routes (static and dynamic).

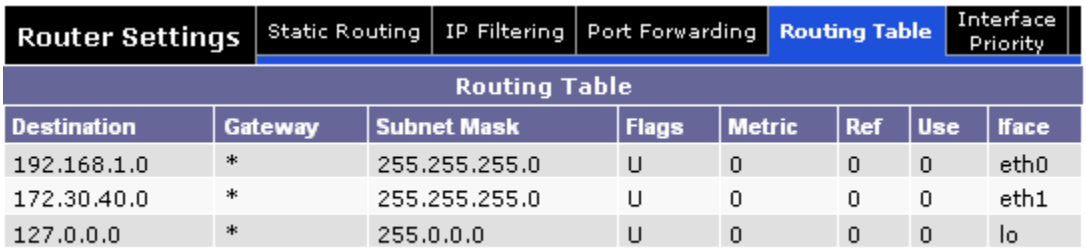



*Figure 29 - Routing Table*

### 5.7.5 Interface Priority

When there is more than one WAN interface up at the same time, the unit needs to make a selection on where to put the default route and what DNS servers must be used. To select interface priority navigate to Interface Priority tab under Router Settings (see Figure 30).
Note: Highest priority is given to the interface identified as having Priority Number 1.

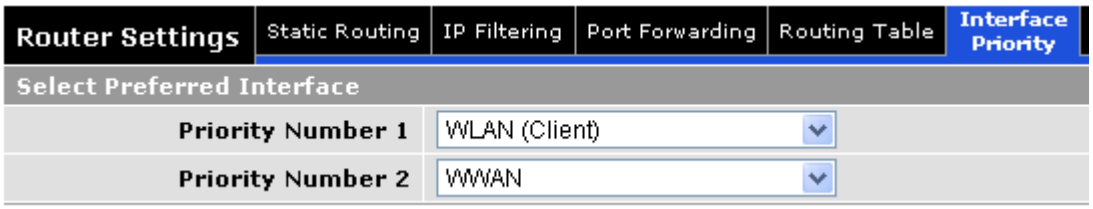



*Figure 30 - Interface Priority*

## 5.8 GPS Status and Settings

The Sentry 4G unit incorporates a highly sensitive 16-channel GPS receiver and an intelligent algorithm that offers outstanding receive sensitivity. Summarized below are the specifications of the integrated GPS module:

| | |
|---|---|
| Typical sensitivity | -135 dBm |
| Reacquisition time | Less than 2 seconds |
| Average Cold/Warm/Hot Start time to first fix | Under 45/15/3.5 seconds |
| Position Accuracy | |
| GPS Standard Positioning Service (SPS) | <15 meters |
| DGPS (WAAS) corrected | <3 meters |

The GPS page allows the user to see the GPS status and configure remote or local delivery of GPS position reports. Viewing the GPS data from a local or remote PC requires a UDP port listener program be installed on the PC. Any UDP listener will work provided you can set an appropriate port value for the program.

### 5.8.1 GPS Status

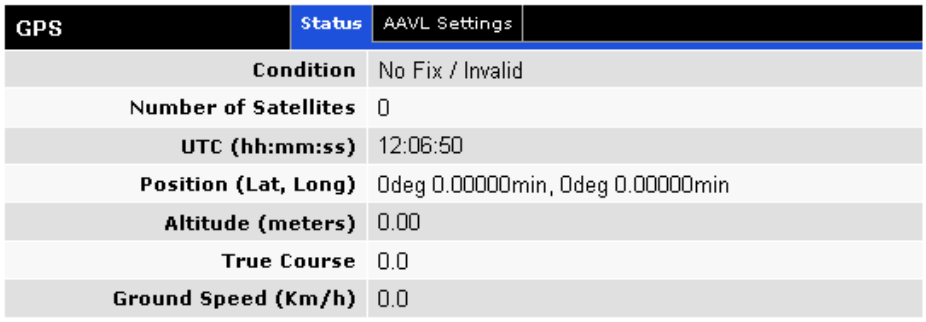



*Figure 31 - GPS Status*

**Condition:** Indicates No Fix, Standard GPS Fix, Differential GPS Fix, or Estimated / Last Known Position

**Number of Satellites:** Indicates the number of satellites the GPS has locked on to. A minimum of 3 is required to establish a position. Generally, the more satellites the GPS has locked, the more accurate the position reporting will be.

**UTC:** Time of day in Universal Coordinated Time

**Position:** Device position reported in degrees and minutes

**Altitude:** Altitude from Mean Sea Level reported in meters.

**True Course:** Heading, reported in degrees (0 – 360)

**Ground Speed:** Reported in km/hr

### 5.8.2 AAVL Settings (Local and Remote Delivery)

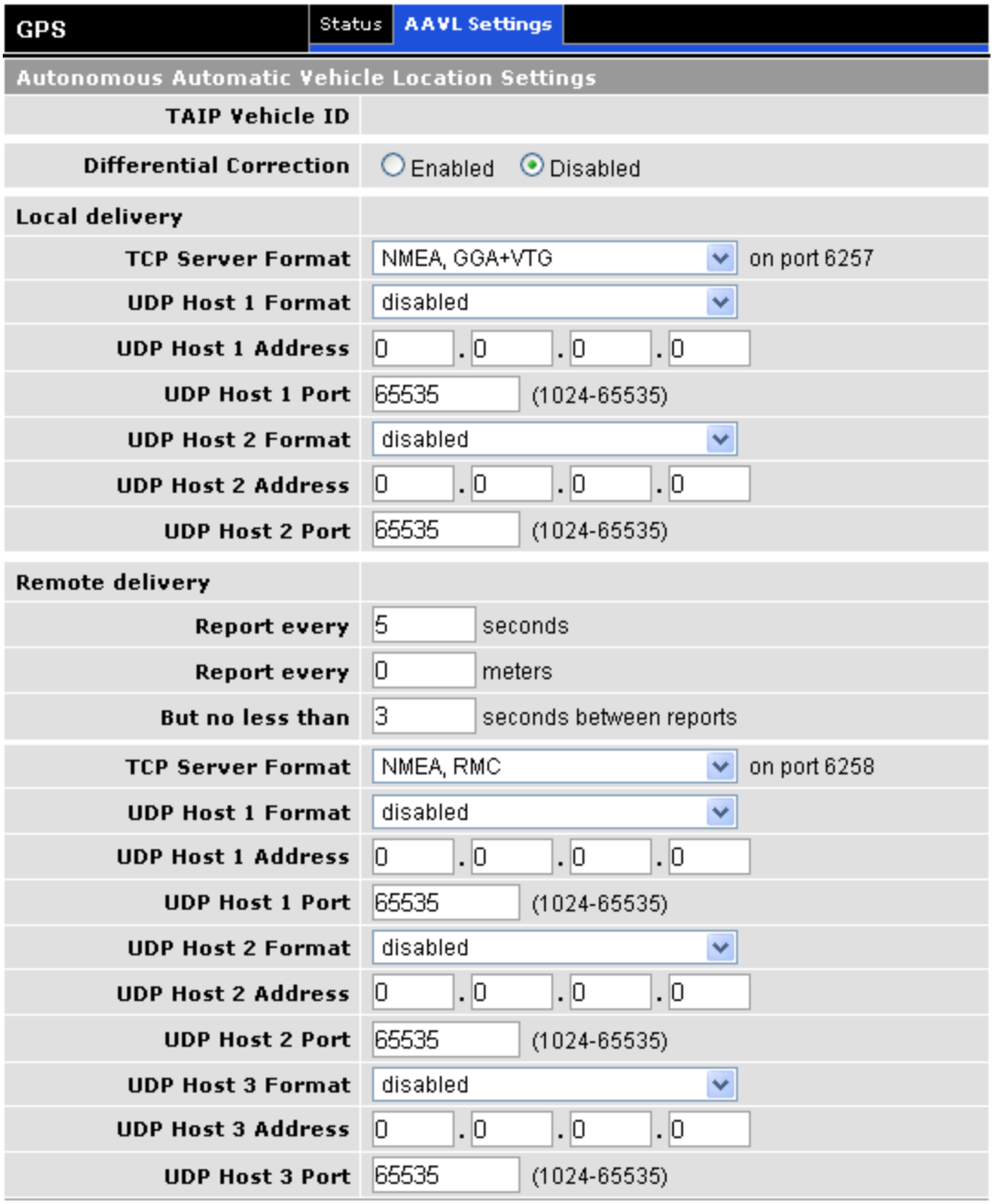



*Figure 32 - AAVL Settings*

**TAIP Vehicle ID:** User assigned number to identify the vehicle or Sentry 4G unit that each GPS report belongs to. This will be reported in the GPS messages if TAIP with ID is selected for TCP Server Format and/or UDP Host format. Configured under Basic Settings.

**Differential Correction:** Differential GPS corrects various inaccuracies in the GPS system to yield measurements accurate to a couple of meters when the mobile is moving and even better when stationary.

### 5.8.3 Local Delivery

The GPS data can be delivered to up to two local PCs with UDP viewer programs can provide data through a TCP connection, e.g. telnet. GPS data will be delivered once per second to all local PCs

**TCP Server Format:** Select one of the following options for the format of the GPS messages

**TAIP no ID:** Trimble ASCII Interface Protocol, a Trimble specified digital communication interface. When this option is selected, the TAIP vehicle ID is not included in the GPS messages.

**TAIP with ID**: Same as above except the Vehicle ID is reported

**NMEA** National Marine Electronics Association interface specification for electronic equipment. The NMEA GPS message set includes several message types, each containing specific GPS information. See message descriptions below. TAIP Vehicle ID is not reported when NMEA is selected.

**NMEA GLL:** Position in LAT/LONG coordinates and time of day in UTC coordinates.

**NMEA GGA**: Position in LAT/LONG coordinates, time of day in UTC coordinates, fix quality, number of satellites and altitude

**NMEA RMC:** Position in LAT/LONG coordinates, time of day in UTC coordinates, ground speed in knots, heading in degrees and date

**NMEA VTG:** Ground speed in kilometers per hour and knots, heading in degrees.

To get GPS data by telneting into the device, enter the following from a prompt

*telnet <local IP address of the Sentry4G> 6257.*

Note:

It is possible to telnet to the Sentry 4G unit's port 6257 from a remote location however this is not recommended as delivering the data once per second across the broadband 802.16e-2005 network will greatly increase the amount of data transferred.

**UDP Host Format:** Same options as TCP server format

**UDP Host Address:** IP address of local PC that GPS data will be delivered to. This address must be on the same subnet as the Sentry 4G LAN IP

**UDP Host Port**: Port assigned to UDP program. This must match the port assigned in the chosen UDP Port Listener Program.

### 5.8.4 Remote Delivery

The GPS data can be delivered to up to three remote PCs with UDP viewer programs running on the host.

**Report every:** GPS can be programmed to report position after a specified time has elapsed or the unit has moved a specified distance since its last report.

**But no less than:** This feature prevents a fast moving vehicle from reporting too frequently if its "Report every ….. meters" setting is sufficiently low" by setting a minimum amount of time, in seconds, between GPS reports.

## 5.9 I/O Settings

The Sentry 4G router supports the following I/Os:

- Ignition Sense
- One external digital alarm

See Table 5 for pinout.

| J4 Pin | Signal | I/O | Description / specification |
|---|---|---|---|
| 1 | Ignition Sense | Input to Sentry4G | Standard ignition-on signal 1. Pin 1 is the left most pin when looking directly at the front panel.<br>Maximum voltage above which Ignition Sense will be detected as ignition asserted = 9.0V;<br>Minimum voltage below which Ignition Sense will be detected as ignition de-asserted = 5.7V. |
| 4 | External Alarm | Input to Sentry4G | Active low signal. To trigger an alarm, short this signal to $V_{IN-}$ using a low impedance path (100-Ohm max)<br>For 200ms minimum. Otherwise, leave open or connect to $V_{IN+}$. This signal can also be driven from a 5V/3.3V TTL/LVTTL or CMOS circuit. |

*Table 5 - I/O Signal Pinout*

### 5.9.1 I/O Configuration

The Sentry 4G I/O subsystem is configured via the Sentry 4G WEB pages. Status Monitoring is provided via NMEA-based protocol. The Sentry 4G I/O subsystem operates according to a manager/agent model. The PC-hosted manager sends requests to the Sentry 4G I/O agent, which performs the required actions. The Sentry 4G agent reports alarms and indications to the PC-hosted manager.

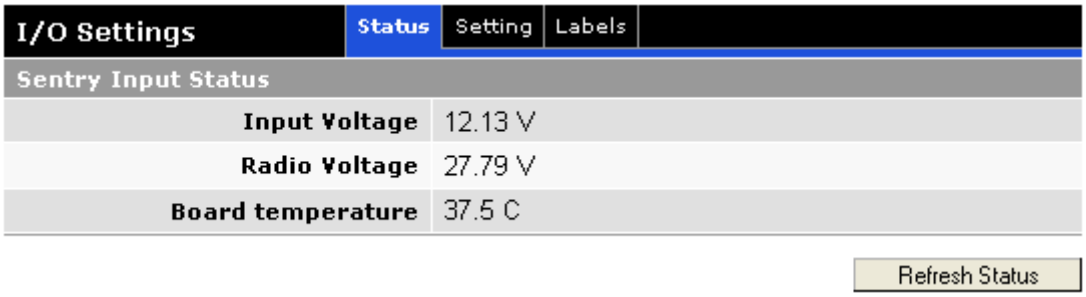



*Figure 33 - I/O Settings-Status*

The Manager IP address is configured under I/O Settings→NMEA Settings→ **Manager IP address** (see Figure 34).
The port number is 6969 by default and can be customized under I/O Settings→NMEA Settings→ Manager IP address→ **Port.**

Note: If Auto is selected for "Manager IP address", the Sentry 4G automatically computes the manager IP address to be Sentry 4G ETH address +1 if DHCP is disabled. If DHCP is enabled, the IP address is the starting address offered by the DHCP server.

**The unit IP** address is the source IP address (displayed in the alarm messages received by the Manager). The user can configure this to be the WAN Sentry 4G IP address or the LAN (Ethernet) Sentry 4G IP address. If auto is selected, the source IP address is automatically computed to be Sentry 4G ETH address +1 if DHCP is disabled. If DHCP is enabled, the IP address is the starting address offered by the DHCP server.

The user can enable and disable digital alarms by selecting appropriate "enabled" and "disabled" radio buttons under I/O Settings (Figure 34).

The alarm messages can be configured for each diagnostic value under I/O Settings→Labels (see Figure 35).

Remember to save your settings for each configuration.

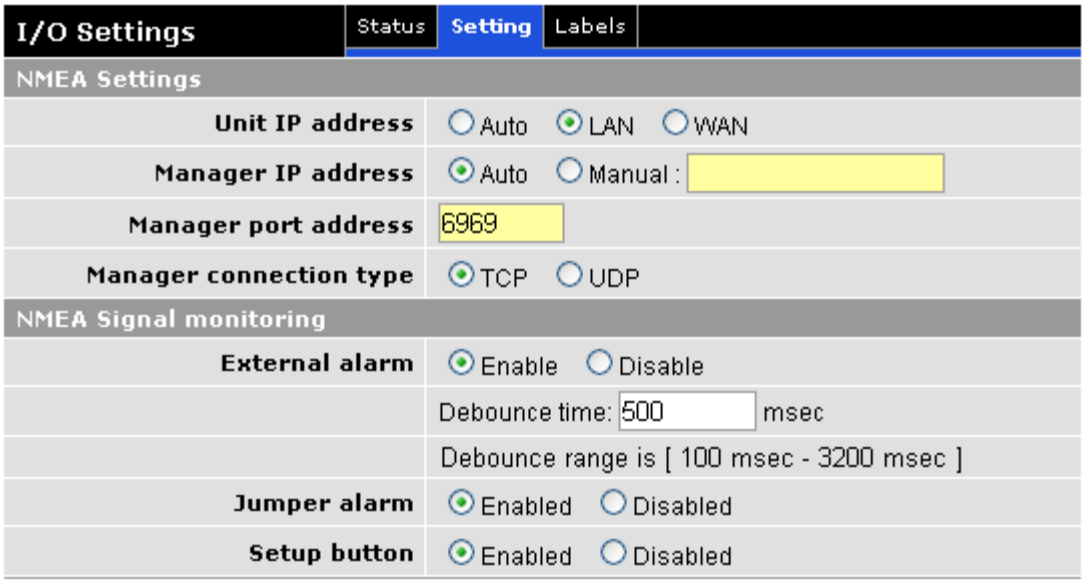



*Figure 34 - I/O Settings*

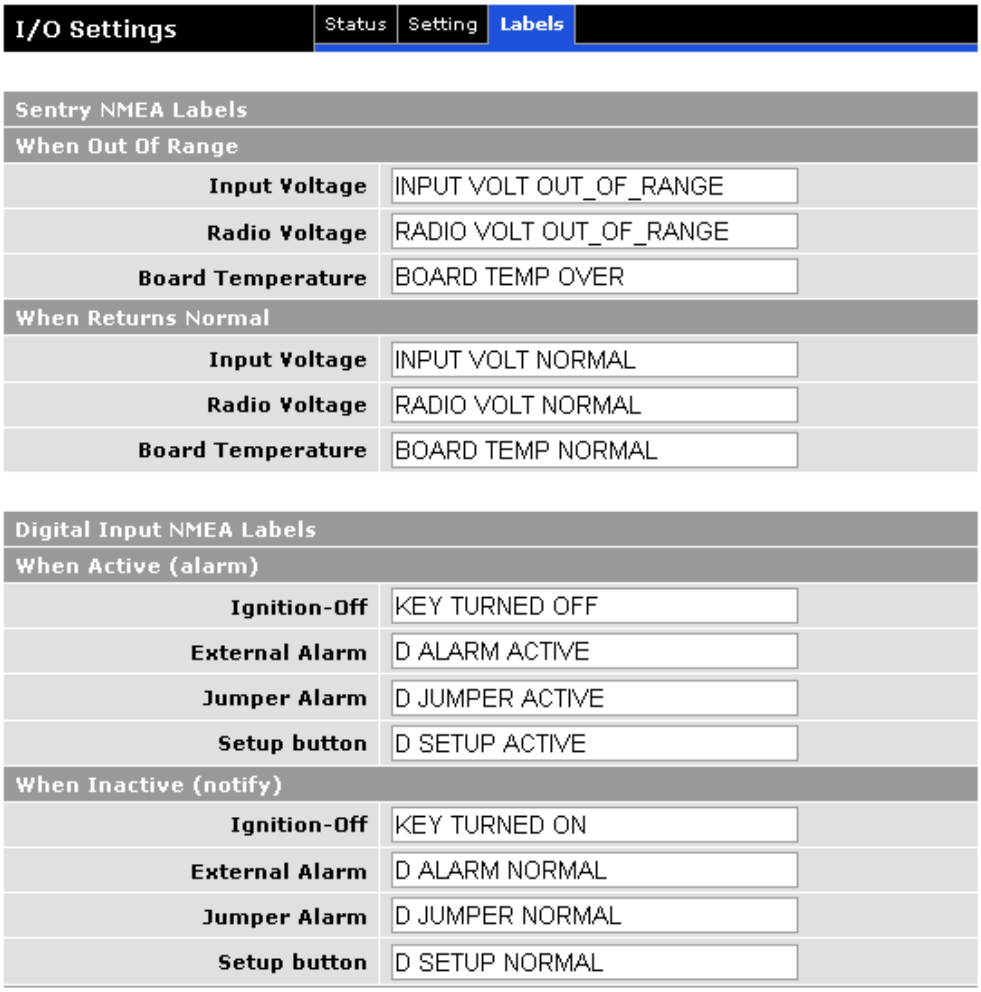



*Figure 35 - I/O Settings-Labels*

## 5.10 System Upgrade (Optional Service)

It is possible to update the system by receiving an update file from CalAmp Corp. This may be done periodically to add features or fix errata. When you receive an update file, perform the following to update the unit. Upgrading can only be performed from a local PC, not remotely.

- Save the file on a local drive or network accessible directory.
- On the System Upgrade page (see Figure 36), browse to the update file and select it.
- Click Save. The system update can take up to 6 minutes. Do not navigate away from the system upgrade page during the transfer. A result page will be displayed automatically when the upgrade is completed.

Note: This will not delete your configuration settings.

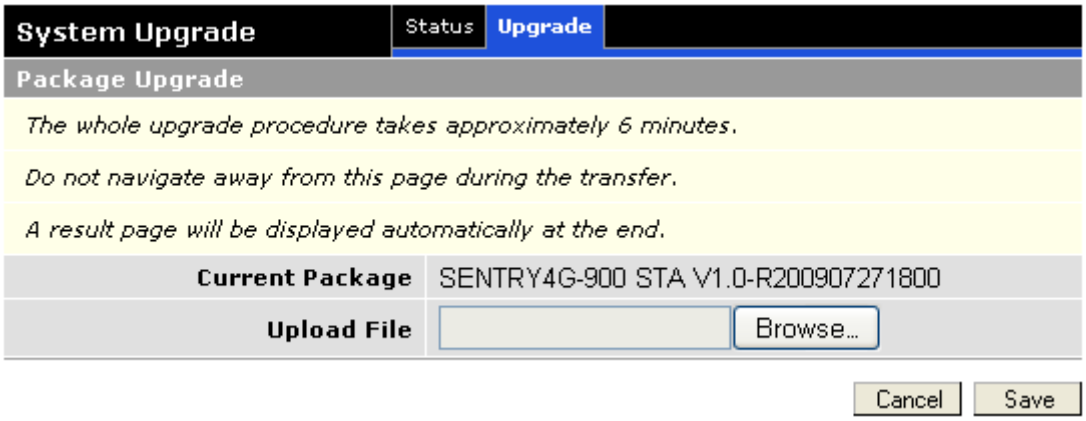



*Figure 36 - Upgrade*

# 6. SPECIFICATIONS

*Product specifications are subject to change without notice.*

## GENERAL SPECIFICATIONS

**Interface Connectors:** Two 10/100 BaseT auto-MDIX, RJ-45
USB A Female Client port[2]
3-wire serial in a USB mini B female form factor

**Power Connector:** 4-pin Weidmuller 1615550000

**LED Indicators:** PWR, STAT, GPS, 4G, WiFi, ETH0, ETH1

**Antenna Interface:** Two 4G Antennas: 50-Ohm TNC Female
GPS Antenna: 50-Ohm, 3.3V SMA Female
Two WiFi Antennas: 50-Ohm RP-SMA Plug

**Size:** 7 (L) x 7 (W) x 2.2(H) inches (17.8 x 17.8 x 5.6 cm)

**Weight:** 4 lbs (1.81 kg)

**Power Input:** 10-30 VDC

**Current Drain:** (Average at 13.8 VDC)

| Current Drain | TX |
|---|---|
| With WiFi module | 3.5 A |
| Without WiFi module | 2.6 A |

**TX Power Range:** 4G: BTS controlled, up to 30 dBm (SIMO & SISO)
WiFi: 26 dBm (802.11b) & 21-26 dBm (802.11g)

**Frequency Range:** 4G: 902-928 MHz ISM Band

**Channels:** 5 to 7 non-overlapping 3.5 MHz channels (up to 20 overlapped)

**Modulation:** S-OFDMA TDD QPSK, 16QAM, 64QAM

**Diversity:** 2x2 MIMO Matrix A

**Operating Temperature:** -30°C to +60°C (-22 to +140 °F)

**Protocols:** Ethernet / IPV4 suite, DHCP client/server, NAT

**Management:** HTTP embedded WEB server

**Certifications:** FCC Part 15b, IC

[2] Reserved for future use

# 7. ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| BTS | Base Transceiver Station |
| CTS | Clear to Send |
| DHCP | Dynamic Host Configuration Protocol |
| DNS | Domain name Server |
| ESN | Electronic Serial Number |
| GPS | Global Positioning System |
| HSDPA | High Speed Downlink Packet Access |
| IP | Internet Protocol |
| LAN | Local Area Network |
| LED | Light Emitting Diode |
| NAT | Network Address Translation |
| PAD | Packet Assembly/Disassembler |
| PPP | Protocol Point to Point |
| PRL | Preferred Roaming List |
| RIP | Routing Information Protocol |
| RSSI | Receive Signal Strength Indication |
| RTS | Request to Send |
| WAN | Wide Area Network |
| WLAN | Wireless Local Area Network |
| WWAN | Wireless Wide Area Network |
| UART | Universal Asynchronous Receiver-Transmitter |
| USB | Universal Serial Bus |

# 8. SERVICE AND SUPPORT

## 8.1 PRODUCT WARRANTY, RMA AND CONTACT INFORMATION

CalAmp Corp guarantees that every Sentry 4G router will be free from physical defects in material and workmanship for one (1) year from the date of purchase when used within the limits set forth in the Specifications section of this manual. Extended warranty plans are available.

If the product proves defective during the warranty period, contact CalAmp Customer Service to obtain a Return Material Authorization (RMA).

## 8.2 RMA REQUEST

Contact Customer Service:
CalAmp
299 Johnson Avenue, Suite 110
Waseca, MN 59093-USA

phone: (1) 507.833.8819
fax: (1) 507.833.6748

BE SURE TO HAVE THE EQUIPMENT MODEL AND SERIAL NUMBER, AND BILLING AND SHIPPING ADDRESSES ON HAND WHEN CALLING.

When returning a product, mark the RMA clearly on the outside of the package. Include a complete description of the problem and the name and telephone number of a contact person. RETURN REQUESTS WILL NOT BE PROCESSED WITHOUT THIS INFORMATION.

For units in warranty, customers are responsible for shipping charges to CalAmp Corp. For units returned out of warranty, customers are responsible for all shipping charges. Return shipping instructions are the responsibility of the customer.

## 8.3 PRODUCT DOCUMENTATION

CalAmp Corp reserves the right to update its products, software, or documentation without obligation to notify any individual or entity. Product updates may result in differences between the information provided in this manual and the product shipped. For the most current product documentation, visit www.calamp.com for spec sheets.

## 8.4 TECHNICAL SUPPORT

Technical support hours: Monday to Friday 9:00 AM to 5:00 PM, Eastern Time

**CalAmp** 6160
Peachtree Dunwoody RD., suite C-200
Atlanta, Georgia 30328

phone: (1) 770.392.0002
fax: (1) 770.392.9199
Email address: PSMGsupport@calamp.com