



# Viper SC™ Base Station

## Digital Infrastructure for Viper SC Series

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User Manual

Updated 11/18/12



**REVISION HISTORY**

REV	DATE	REVISION DETAILS
0	Dec 9, 2009	Initial Release
1	June 15, 2010	Section added regarding RADIUS Server : Section 6.5.3
2	August 3, 2010	Section added regarding Multi-speed: Section 6.9 Added information about Boot Delay parameter: Section 6.13.1 Updated available part numbers to include Viper SC versions: Section 1.3.1
3	March 7, 2011	Added Section regarding SNMP: Section 6.8 (renumbered following sections) Added information about Warm Standby: Sections 4.2.2, 4.4.3, and 6.14 Removed references to Repeater Base Stations Updated several webpage screen shots: Figure 6.1, 6.2, 6.15
4	August 3, 2011	Added Declaration of Conformance and Regulatory Certifications (Appendix B) Added ETSI Base Station Part Numbers (Section 1.3) Updated VHF ETSI frequencies from 136-174 to 142-174MHz. Updated RF Exposure Compliance Requirements since Viper User Manual was reorganized and section 2.6.6 has been moved. Added relevant regulatory standards in Appendix B.
5	August 24, 2011	Added Section for the QoS and QoS Statistics pages. Updated figure 20 and 21. Updated EU and EFTA Member States' Acceptable Frequency Table in Appendix B.
6	November 18, 2012	Reorganized some content to be more user friendly. Added additional references to figures and tables. Renumbered some sections. Replaced RF Exposure Compliance Requirements to match what is in the Viper SC Router Manual. Added a header. Fixed footers so they are book style layout. Improved layout of the Table of Contents. Added a Table of Figures. Deleted any duplicate information in the manual. Added a Customer Service Section.

**ABOUT CALAMP**

CalAmp is a leading provider of wireless communications products that enable anytime/anywhere access to critical information, data and entertainment content. With comprehensive capabilities ranging from product design and development through volume production, CalAmp delivers cost-effective high quality solutions to a broad array of customers and end markets. CalAmp is the leading supplier of Direct Broadcast Satellite (DBS) outdoor customer premise equipment to the U.S. satellite television market. The Company also provides wireless data communication solutions for the telemetry and asset tracking markets, private wireless networks, public safety communications and critical infrastructure and process control applications. For additional information, please visit the Company’s website at [www.calamp.com](http://www.calamp.com).

**IMPORTANT NOTICE**

Because of the nature of wireless communication, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors), or be totally lost. Significant delays or losses of data are rare when wireless devices such as The Viper SC Base Station are used in a normal manner with a well-constructed network. The Viper SC Base Station should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. CalAmp accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Base Station, or for the failure of The Viper SC Base Station to transmit or receive such data.

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**RF EXPOSURE COMPLIANCE REQUIREMENTS**



The Viper SC radio is intended for use in the Industrial Monitoring and Control and SCADA markets. The Viper SC unit must be professionally installed and must ensure a minimum separation distance between the radiating structure and any person, see Table 1. An antenna mounted on a pole or tower is the typical installation and in rare instances, a 1/2-wave whip antenna is used.

Table 1: Antenna Gain

Min Safety Distance (cm @max power)	Antenna Gain		
	5 dBi	10 dBi	15 dBi
VHF	123cm	219cm	389cm
UHF	122cm	217cm	386cm
900 MHz	81cm	143 cm	255 cm

⚠ **WARNING:** It is the responsibility of the user to guarantee compliance with the FCC MPE regulations when operating this device in a way other than described in this manual. The installer of this equipment must ensure the antenna is located or pointed such that it does not emit an RF field in excess of Health Canada limits for the general population.

⚠ **WARNING:** Viper SC uses a low power radio frequency transmitter. The concentrated energy from an antenna may pose a health hazard. People should not be in front of the antenna when the transmitter is operating.

Recommended safety guidelines for the human exposure to radio frequency electromagnetic energy are contained in the Canadian Safety Code 6 (available from Health Canada), the Federal Communications Commission (FCC) Bulletin 65 and the Council of the European Union's Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC).

Any changes or modifications not expressly approved by the party responsible for compliance (in the country where used) could void the user's authority to operate the equipment.

**Very Important!** Before you deploy your system you must read and understand Section 3.3.5, Selecting Antenna and Lightning Arrestor Combinations in the Viper SC IP Router for Licensed Spectrum User Manual.

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## 1 BASE STATION OVERVIEW

The Viper SC Base Station is available in two options: Standard and Redundant.

- The Standard Base Station uses a single radio to transmit and receive data from remote radios.
- The Redundant Base Station uses two radios, activating only one at a time, in order to provide a fail-safe in the event of a radio failure.

The Viper SC Base Station has a main controller PC board which is accessible via HTML webpages. You must access the controller's webpages to configure the user programmable settings and to view the status of the Base Station.

**Rugged Packaging.** The Viper SC Base Station is housed in a rugged, 19" rack mountable, aluminum case. Built for industrial applications in a variety of environments, the Viper SC Base Station operates over an extended temperature range and provides worry-free operation in the roughest environments.

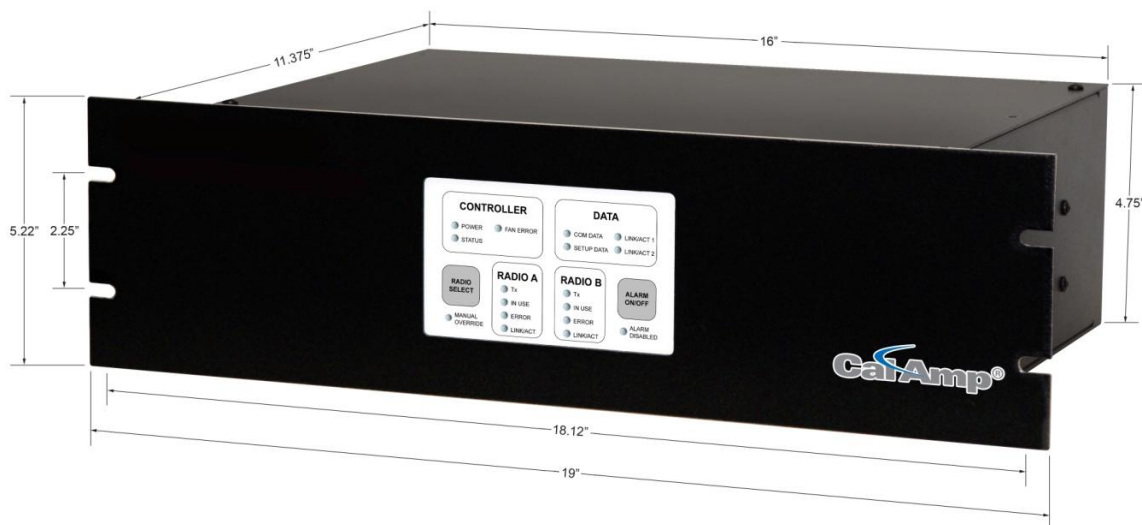
**Simple Installation.** Basic installation typically utilizes an omni-directional antenna at The Viper SC Base Station or Relay Point and a directional antenna at each remote site that is not a Relay Point. See Section 3 for information on antennas. For basic service, just hook up an antenna, connect your Ethernet LAN to the Base Station's LAN port, apply primary power, then check and set operating parameters.

**Flexible Management.** Configuration, commissioning, maintenance and troubleshooting can be done locally or remotely. All operating parameters can be set via a web browser, see Section 7.

The Viper SC Base Station consists of a Controller Board, an LED display board, two fans and shelving to house various radios. The unit is not hermetically sealed and should be mounted in a suitable enclosure when dust, moisture, and/or a corrosive atmosphere are anticipated.

The Viper SC Base Station is designed for easy installation and configuration. The Viper SC Base Station features two external buttons. However, all operating parameters may be set by connecting to the Viper SC Base Station via Ethernet and using a web browser. Figure 1 shows the physical dimensions of the Base Station.

Figure 1 - Base Station Dimensions (units are in inches)



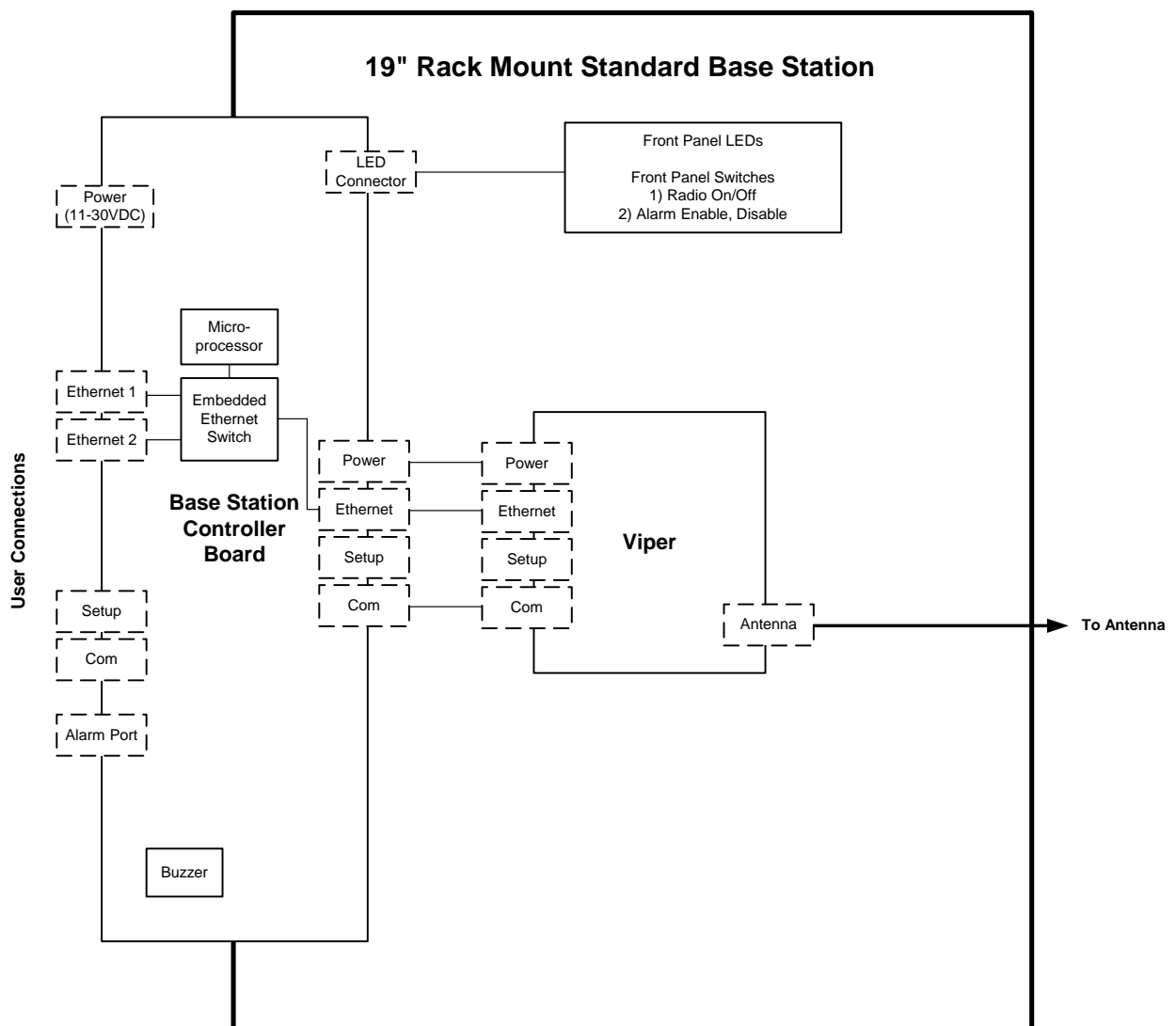
## 1.1 VIPER SC STANDARD BASE STATION OVERVIEW

The Standard Base Station consists of one Viper SC in a 19" rack mount enclosure. The Standard Base Station features two 10/100 BaseT Auto-MDIX Ethernet connections and an I/O Port which can be controlled or monitored from the Viper SC Base Station Controller's webpages. Both external Ethernet connections are connected with an embedded Ethernet switch to the radio. The Standard Base Station provides access to the SETUP and COM Port of the Viper SC.

As can all Viper SCs, the Viper SC in the Standard Base Station can be configured as a relay point if desired.

Figure 2 shows a simplified block diagram of a Viper SC Standard Base Station. The Viper SC Standard Base Station consists of a Base Station Controller Board and one Viper SC contained in a 3U 19" rack mountable chassis.

Figure 2 - Viper SC Standard Base Station Block Diagram



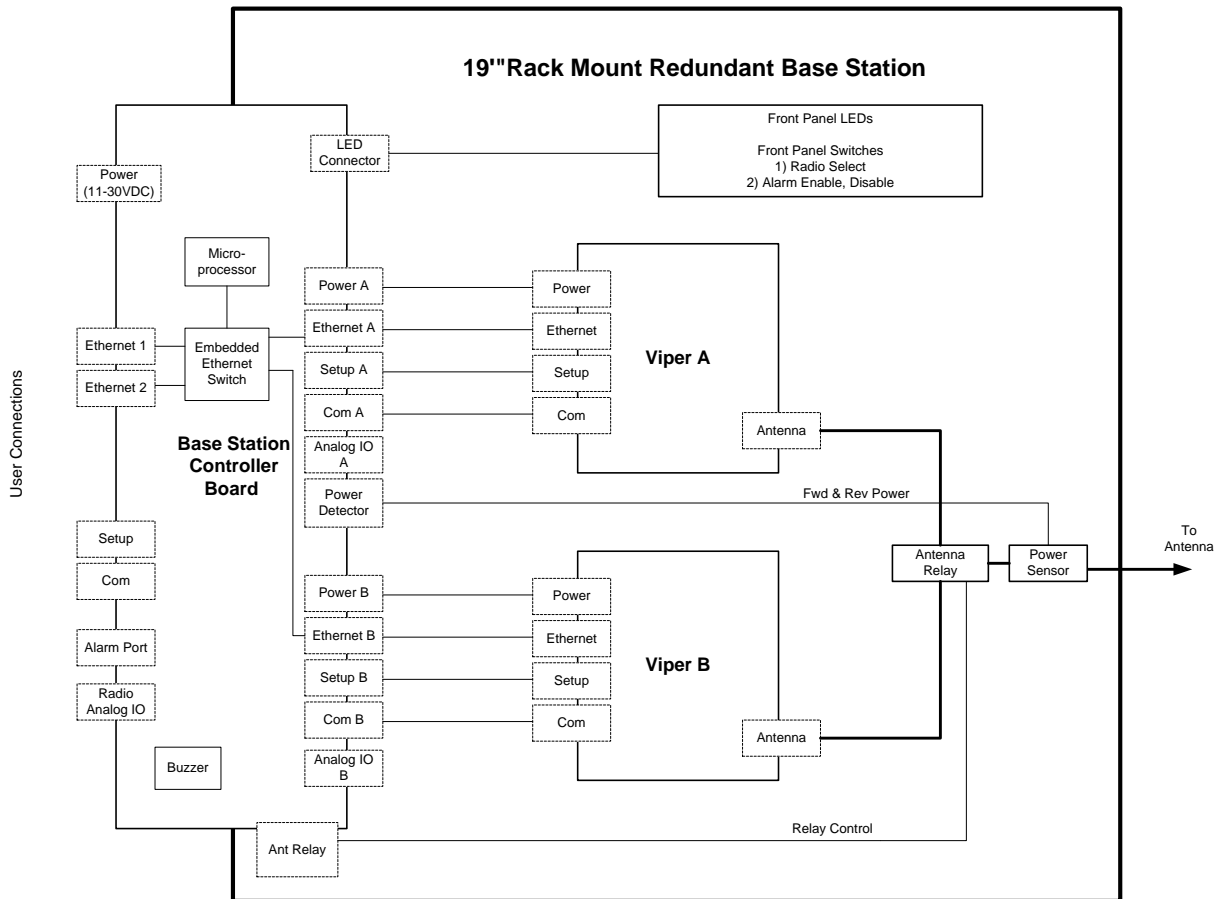
## 1.2 VIPER SC REDUNDANT BASE STATION OVERVIEW

The Viper SC Redundant Base Station has two Viper SCs with identical RF and Ethernet MAC addresses, a Controller board, an RF power sensor, and an RF antenna relay inside the 19” rack mount chassis.

The Viper SC Base Station features two 10/100 BaseT Auto-MDIX Ethernet connections and an I/O Port which can be controlled or monitored from the Viper SC Base Station Controller’s webpages. Both external Ethernet connections are connected with an embedded Ethernet switch to the radios. The Viper SC Base Station provides connections to the SETUP Port and the COM Port of the active Viper SC. The Ethernet, SETUP and COM Ports are automatically routed by the Controller Board to whichever Viper SC is currently in use.

Figure 3 shows a simplified block diagram of a Redundant Base Station. The Viper SC Redundant Base Station consists of a Base Station Controller Board, two Viper SCs, an antenna relay, and an RF power sensor all contained in a 3U 19” rack mountable chassis. Only one Viper SC operates at a time. When an error is detected with the primary radio the Viper SC Base Station Controller automatically switches to the backup radio.

Figure 3 - Viper SC Redundant Base Station Block Diagram



## 1.3 BASE STATION CONTROL PANELS & CONNECTIONS

### 1.3.1 CONTROL PANEL FEATURES

The base station can come with either of the following front panels.

- The panel in Figure 4 is used on the Standard Base Station.
- The panel in Figure 5 is used on the Redundant Base Station.

Each of the front panels has two push buttons and up to 17 tri-colored LEDs. The functionality of each LED is described in Table 2.

Figure 4 - Standard Base Station Control Panel

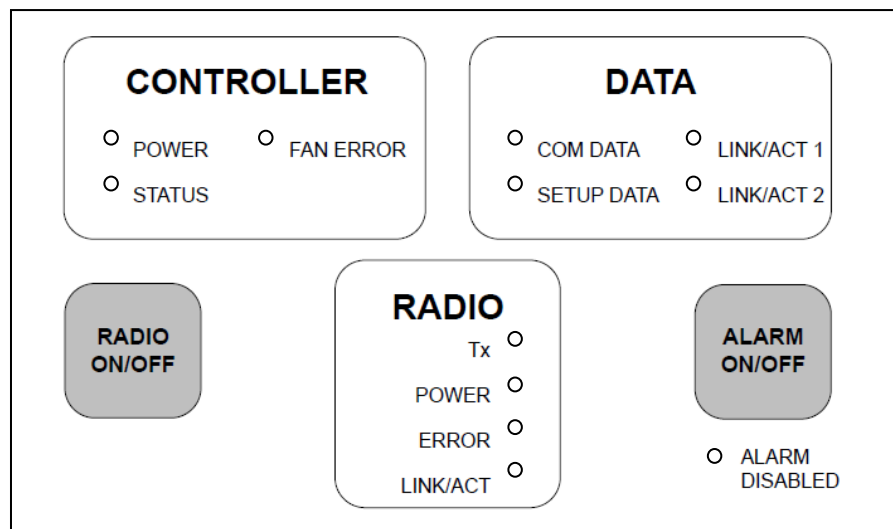
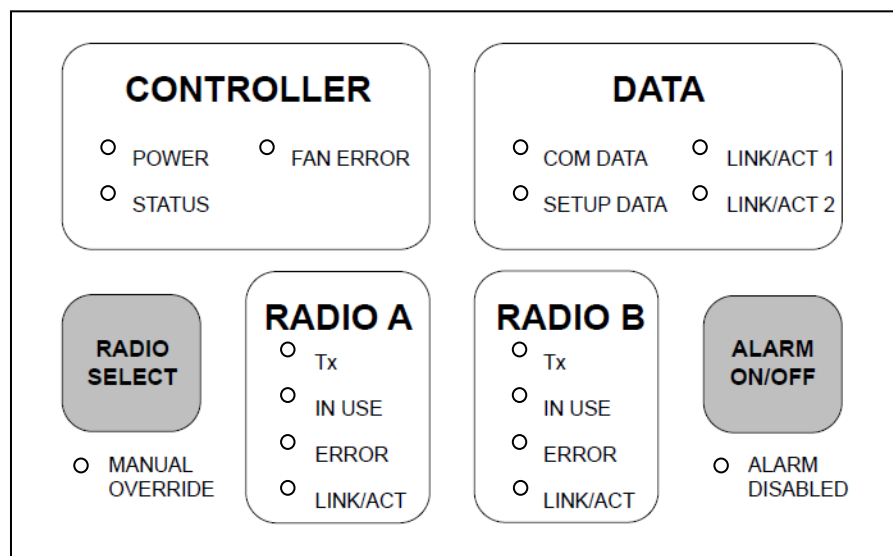


Figure 5 - Redundant Base Station Control Panel



Note: It is very common for the base station to indicate errors until it has been configured properly.

Table 2 - Base Station Button Functionality

Base Station Version	Button Name	Button Function
<b>Standard Base Station</b>	Radio On/Off	Toggles the power to the radio on and off.
	Alarm On/Off	If an error with the radio is detected a buzzer on the Viper SC Base Station Controller will sound. This button disables or enables the alarm buzzer.  <b>Hold button down for 5 seconds to clear any radio errors. You will hear two long beeps as errors are cleared.</b>
<b>Redundant Base Station</b>	Radio Select	Cycles through the modes listed below to turn power on and off to the radios and to select Auto or Manual Mode.  <ol style="list-style-type: none"> <li>1. Radio A In Use, Auto Mode</li> <li>2. Radio A In Use, Manual Mode</li> <li>3. Radio B In Use, Auto Mode</li> <li>4. Radio B In Use, Manual Mode</li> </ol>
	Alarm On/Off	If an error with the radio is detected a buzzer on the Viper SC Base Station Controller will sound. This button disables or enables the alarm buzzer.  <b>Note: Hold button down for 5 seconds to clear any radio errors. You will hear two long beeps as errors are cleared.</b>

The LED panel has seventeen Tri-Color LEDs. The functionality of each LED is shown in Table 3.

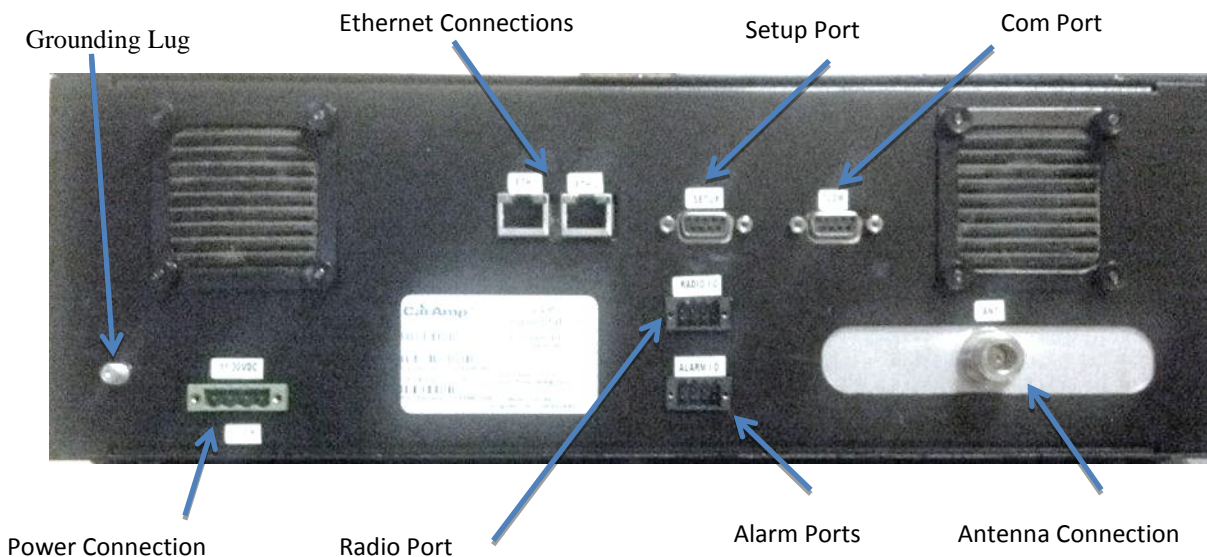
Table 3 - Base Station LED Functionality

LED	Color	Definition
Power	Green Off	Base Station ready, normal operations Base Station hardware fault or power is not applied
Status	Green Red	Base Station has no faults, normal operations Base Station has a fault condition, check unit status
Fan Error	Red Off	Indicates a problem with the fans Fans are operational
COM/SETUP Data	Blinking Red Blinking Green	Data is transmitting on one of the Ports Data is being received on one of the Ports
LINK/ACT 1/2	Solid Red Flashing Red Solid Green Flashing Green	Link at 10Mbit/s Activity at 10Mbit/s Link at 100Mbit/s Activity at 100Mbit/s
Radio A/B Tx	Red	Radio is transmitting data
Radio A/B In Use	Green	Radio is in use
Radio A/B Error	Off Red Flashing Red	No errors have been detected with the radio(s) An error has been detected with the radio(s) The maximum number of failures has been reached. The Controller will no longer attempt to switch radios.

LED	Color	Definition
Radio A/B Link/Act	Solid Red Flashing Red Solid Green Flashing Green	Link at 10Mbit/s Activity at 10Mbit/s Link at 100Mbit/s Activity at 100Mbit/s
Manual Override ( <i>redundant version only</i> )	Red Off	Radio selection is done manually Radio selection is done automatically by the Viper SC Base Station Controller
Alarm Disabled	Red Off	The onboard buzzer alarm is currently disabled The buzzer is enabled

### 1.3.2 BASE STATION CONNECTIONS

Figure 6 - Base Station Connections



#### 1.3.2.1 ETHERNET LAN PORTS

The Viper SC Base Station has two external Ethernet LAN Ports, see Figure 6. The two external Ethernet Ports are connected to each other and to the radios inside the Viper SC Base Station with an embedded Ethernet Switch. Either Ethernet Port can be used. It is recommended that only one port be connected to the network. The unused port can be used for maintenance or troubleshooting.

The Ethernet LAN ports consist of an RJ-45 receptacle with a 10/100 BaseT Ethernet connection and Auto-MDIX feature. Figure 4 shows pin-out descriptions for the RJ-45 port.

Table 4 - Pin-out for IEEE-802.3 RJ-45 Receptacle Contacts

Contact	10/100 Base-T Signal
1	TXP <sup>(1)</sup>
2	TXN <sup>(1)</sup>
3	RXP <sup>(1)</sup>
4	SPARE
5	SPARE
6	RXN <sup>(1)</sup>
7	SPARE
8	SPARE
SHELL	Shield

(1) The name shows the default function. Given the Auto-MDIX capability of the Ethernet transceiver, TX and RX function could be swapped.

### 1.3.2.2 SETUP AND COM PORTS

The SETUP and COM serial connections are DE-9F RS-232 ports, see Figure 6. Serial port considerations:

- Base Station SETUP and COM ports are Data Communication Equipment (DCE) devices
- In general, equipment connected to the Base Station’s SETUP / COM serial port is Data Terminal Equipment (DTE) and a straight-through cable is recommended.

Note: If a DCE device is connected to the Base Station’s SETUP / COM port, a null modem cable/adaptor is required.

- In a Standard Base Station with one radio, the external serial ports are always connected to the SETUP and COM ports of the radio inside the Base Station.
- In a two radio Redundant Base Station, the two serial ports are connected to whichever radio is currently in use. When the active radio changes, an internal multiplexer will switch both serial port connections to the second radio.

The pin outs for the serial connections can be found in the Viper SC IP Router for Licensed Spectrum User Manual.

### 1.3.2.3 ALARM PORT

The Viper SC Base Station is supplied with an 8 pin plug that mates to the 8 pin header on the Alarm Port. The Alarm Port, shown in Figure 6, has two relays and a general purpose input/output pin. The plug features a spring loaded retention clamp to make inserting and removing the wire/cable as simple as possible. To connect a wire(s) to the plug use the following steps.

In the Redundant Base Station, one relay can be configured to indicate if an error has been detected with either radio and the other relay can be configured to indicate which radio is currently being used.

#### Step 1. Release Spring Clamp

Insert a small tool into one of the square holes as shown in Figure 7. This will release the spring clamp for the nearest wire to allow the wire to be inserted or removed.

### Step 2. Remove Insulation

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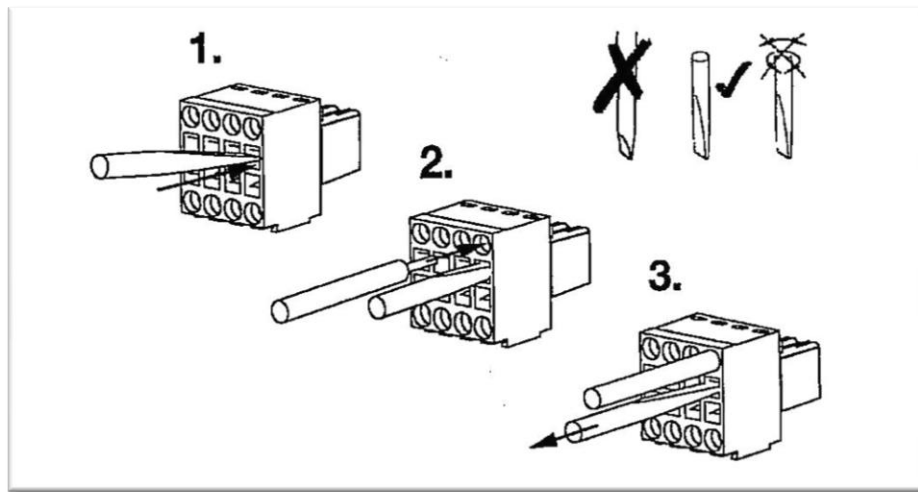
Strip the insulation off the end of the wire and insert it into the round hole as shown in Figure 7.

### Step 3. Remove Tool

---

Remove the tool. The spring loaded clamp will hold the wire firmly in place.

Figure 7 - Inserting Wire into the Alarm Port Plug



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#### 1.3.2.4 RADIO I/O PORT

The Radio I/O port, in Figure 6, is an 8 pin header that provides access to the Base Station's radio's digital or analog I/O lines. These 8 lines are routed to whichever radio is currently in use (Radio A or Radio B). This port may be used by future versions of the base station that incorporate radios with input/output lines.

Note: This port is not used and is not connected internally in any version of the Viper SC Base Station.

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#### 1.3.2.5 POWER CONNECTOR

The Viper SC Base Station is supplied with a right-angle power connector (11-30 VDC) and 60" of cable see Figure 8.

. When installing the power cable, trim the cable as short as possible to reduce the voltage drop through the wire.

The power connector has four pins. Only pins 2 and 3 need to be connected for normal operation (Main Power and Ground). Pins 1 and 4 are auxiliary power connections and do not normally need to be connected. These pins are wired directly to an internal power connector and provide an easy way to power a user's custom PC board, RTU, or other equipment that may be mounted inside the Base Station.



Figure 8 - Power Connector

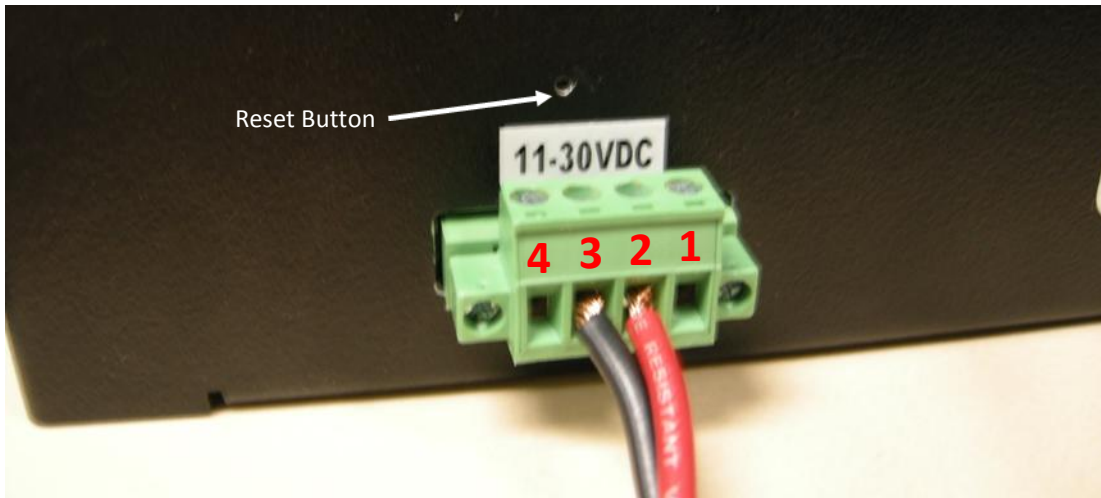


Table 5 - Pin-out of the Power Connector

Contact # (Left to Right)	Color	Description
4	Not Connected	Auxiliary Power A
3	Black	Ground
2	Red	Positive (11-30) VDC
1	Not Connected	Auxiliary Power B

### 1.3.2.6 RESET BUTTON

Directly above the Base Station’s power connector is a small hole that allows access to the reset button, see Figure 8.

Place a paper clip or other narrow object into the hole to press and hold the reset button for five seconds. After 5 seconds a short chirp will be heard and the settings of the Viper SC Base Station will be set back to the factory defaults. After the settings are reset, the Viper SC Base Station will automatically reboot.

**Note:** This operation will set the IP address of the Viper SC Base Station back to its default value of 192.168.205.254.

### 1.3.2.7 ANTENNA CONNECTOR

The Standard Base Station has a single 50-ohm N female antenna connector, see Figure 6. This connection functions for both transmit and receive. The Redundant Base Station has a single 50-ohm N female antenna connector. This connection functions for both transmit and receive. An internal RF relay will automatically switch the antenna connection to whichever radio is currently in use. To reduce potential interference, the antenna type and its gain should be chosen to ensure the effective isotropic radiated power (EIRP) is not more than required for successful communication.

**Very Important!** Before you deploy your system you must read and understand Section 3.3.5, Selecting Antenna and Lighting Arrestor Combinations, in the Viper SC IP Router for Licensed Spectrum User Manual.

### 1.3.2.8 GROUNDING

A #8 copper ground wire should be connected to the Viper base grounding lug, located on the back of the base station. The grounding wire should then be connected to the site facility grounding system, see Figure 6.

## 2 CUSTOMER SERVICE

### 2.1 PRODUCT WARRANTY

It is our guarantee that every Viper SC Radio modem will be free from physical defects in material and workmanship for ONE YEAR from the date of purchase when used within the limits set forth in APPENDIX A – Base Station Specifications and as stated in APPENDIX C – Product Warranty.

If the product proves defective during the warranty period, contact our Customer Service Department at the following numbers to obtain a Return Material Authorization (RMA).

- Domestic - (800) 992-7774
- Domestic & International – 507-833-8819

Note: Be sure to have the equipment model, serial number, along with the billing & shipping address when calling.

Note: You may also request an RMA number online at [www.calamp.com](http://www.calamp.com).

### 2.2 RMA REQUEST

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.

#### Contact Customer Service

CalAmp  
299 Johnson Ave., Ste 110  
Waseca, MN 56093  
Tel 1.507.833.8819

Very Important! Be sure to have the equipment model and serial number, and billing and shipping addresses on hand when calling.

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

### 2.3 FACTORY AND TECHNICAL SUPPORT

#### Hours:

Monday-Friday 7:30-4:30 CST  
Tel 507.833.8819  
Fax 507.833.6758  
Email [imcsupport@calamp.com](mailto:imcsupport@calamp.com)

#### Address:

CalAmp  
299 Johnson Ave., Ste 110,  
Waseca, MN 56093

## 2.4 DOCUMENTATION AND DOWNLOADS

CalAmp 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 access to the most current product documentation and application notes, visit [www.calamp.com](http://www.calamp.com).

This document provides information required for the operation and verification of the Viper SC Base Station. **For detailed operation and programming of the Viper SC radio please refer to the Viper SC IP for Licensed Spectrum User Manual.**

The information in this manual makes the assumption the user’s PC has an NIC (Network Interface Card) with TCP/IP implemented. Setup requires the knowledge and authorization to modify the TCP/IP settings for the NIC.

Note: Changing or installing new IP addresses in a network can cause serious network problems. If you have any questions or concerns, contact the Network Administrator for your system.

**Very Important!** Before you deploy your system you must read and understand Section 3.3.5, Selecting Antenna and Lighting Arrestor Combinations, in the Viper SC IP for Licensed Spectrum User Manual.

## 2.5 PART NUMBERS, FEEDLINE, AND CONNECTORS

### 2.5.1 BASE STATION PART NUMBERS

Table 6 lists the orderable part numbers and frequency ranges of the Viper SC Base Station. The radios that are installed inside the 19” Rack Mount Chassis are included with the Viper SC Base Station and do not need to be ordered separately.

Table 6 - Orderable Part Number Breakdown

DESCRIPTION	BASE STATION PART NUMBER	FREQUENCY	RADIO PART NUMBER
<b>Standard Base Station</b>			
<b>Viper</b>	140-5118-500	136.0 – 174.0 MHz	Viper 140-5018-500
	140-5148-300	406.1 – 470.0 MHz	Viper 140-5048-300
	140-5148-500	450.0 – 512.0 MHz	Viper 140-5048-500
	140-5198-500	928.0 – 960.0 MHz	Viper 140-5098-500
<b>Viper SC</b>	140-5118-502	136.0 – 174.0 MHz	Viper SC 140-5018-502
	140-5128-502	215.0 – 240.0 MHz	Viper SC 140-5028-502
	140-5148-302	406.1 – 470.0 MHz	Viper SC 140-5048-302
	140-5148-502	450.0 – 512.0 MHz	Viper SC 140-5048-502
	140-5198-502	928.0 – 960.0 MHz	Viper SC 140-5098-502
<b>Viper SC (ETSI, AS/NZ)</b>	140-5118-600	142.0 – 174.0 MHz	Viper SC 140-5018-600
	140-5148-400	406.1 – 470.0 MHz	Viper SC 140-5048-400
	140-5148-600	450.0 – 512.0 MHz	Viper SC 140-5048-600
<b>Redundant Base Station</b>			

DESCRIPTION	BASE STATION PART NUMBER	FREQUENCY	RADIO PART NUMBER
<b>Viper</b>	140-5318-500	136.0 – 174.0 MHz	Two Vipers 140-5018-500
	140-5348-300	406.1 – 470.0 MHz	Two Vipers 140-5048-300
	140-5348-500	450.0 – 512.0 MHz	Two Vipers 140-5048-500
	140-5398-500	928.0 – 960.0 MHz	Two Vipers 140-5098-500
<b>Viper SC</b>	140-5318-502	136.0 – 174.0 MHz	Two Viper SCs 140-5018-502
	140-5328-502	215.0 – 240.0 MHz	Two Viper SCs 140-5028-502
	140-5348-302	406.1 – 470.0 MHz	Two Viper SCs 140-5048-302
	140-5348-502	450.0 – 512.0 MHz	Two Viper SCs 140-5048-502
	140-5398-502	928.0 – 960.0 MHz	Two Viper SCs 140-5098-502
<b>Viper SC (ETSI, AS/NZ)</b>	140-5318-600	142.0 – 174.0 MHz	2 Viper SCs 140-5018-600
	140-5348-400	406.1 – 470.0 MHz	2 Viper SCs 140-5048-400
	140-5348-600	450.0 – 512.0 MHz	2 Viper SCs 140-5048-600

### 2.5.2 FEEDLINE AND CONNECTOR ACCESSORIES

Table 7 lists feedline and connector accessories that have been tested and approved for use with the Base Station.

Table 7 - Feedline and Connectors

ITEM	PART NUMBER
25 feet antenna feedline (LMR400), N-Male	250-0200-025
50 feet antenna feedline (LMR400), N-Male	250-0200-055
Barrel Connector, RF1 N type, Female	250-0200-100

## 3 ANTENNAS AND RF EXPOSURE

The Viper SC Base Station can be used with a variety of antenna types. The exact style used depends on the physical size and layout of a system.

**Very Important!** Before you deploy your system you must read and understand Section 3.3.5, Selecting Antenna and Lighting Arrestor Combinations, in the Viper SC IP for Licensed Spectrum User Manual.

**Very Important!** You must read and understand the RF Exposure Compliance Requirements at the beginning of this manual.

### 3.1 ANTENNA GAIN

Antenna gain is usually measured in comparison to a dipole. A dipole acts much like the filament of a flashlight bulb: it radiates energy in almost all directions. One bulb like this would provide very dim room lighting. Add a reflector capable of concentrating all the energy into a narrow angle of radiation and you have a flashlight. Within that bright spot on the wall, the light might be a thousand times greater than it would be without the reflector. The resulting bulb-reflector combination has a gain of 1000, or 30 dB, compared to the bulb alone. Gain can be achieved by concentrating the energy both vertically and horizontally, as in the case of the flashlight and Yagi antenna. Gain can be also be achieved by reducing the vertical angle of radiation, leaving the horizontal alone. In this case, the antenna will radiate equally in all horizontal directions, but will take energy that otherwise would have gone skywards and use it to increase the horizontal radiation.

The required antenna impedance is 50 ohms. To reduce potential radio interference, the antenna type and its gain should be chosen to ensure the effective isotropic radiated power (EIRP) is not more than required for successful communication.

It is important to follow the manufacturer's recommended installation procedures and instructions when mounting any antenna.

### 3.2 OMNI DIRECTIONAL ANTENNA

In general, an omni directional antenna should be used at a master station and at relay points. This allows equal coverage to all of the remote locations. Omni directional antennas are designed to radiate the RF signal in a 360-degree pattern around the antenna. Short range antennas such as folded dipoles and ground independent whips are used to radiate the signal in a ball shaped pattern while high gain omni antennas, such as a collinear antenna, compress the RF radiation sphere into the horizontal plane to provide a relatively flat disc shaped pattern that travels further because more of the energy is radiated in the horizontal plane.


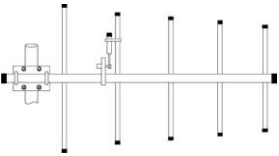
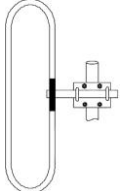
### 3.3 YAGI ANTENNA

At remote locations (not used as a relay point), a directional Yagi is generally recommended to minimize interference to and from other users.

3.4 VERTICAL DIPOLES

Vertical dipoles are very often mounted in pairs, or sometimes groups of 3 or 4, to achieve even coverage and to increase gain. The vertical collinear antenna usually consists of several elements stacked one above the other to achieve similar results.

Figure 9 - Antenna Types

Omni (Vertical Collinear)	Yagi	Vertical Dipole
		

## 4 SETUP THE BASE STATION NETWORK

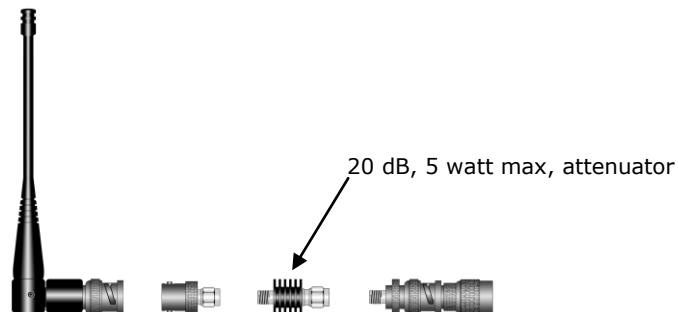
It is easy to set up a Base Station network to verify basic unit operation and experiment with network designs and configurations.

**Note:** It is important to use a network IP address different from others currently in use in your test area. This will eliminate unnecessary disruption of traffic on the existing network while you become familiar with the Base Station.

### Step 1. Install the Antenna

An RX/TX antenna is required for basic operation. For demo units only, connect the antenna as shown in Figure 10 to provide stable radio communications between demo devices.

Figure 10 - Demo Antenna Assembly



*Note: It is important to use attenuation between all demo units in the test network to reduce the amount of signal strength in the test environment.*

### Step 2. Connect Primary Power

Primary power for The Viper SC Base Station must be within 11-30 VDC and be capable of providing a minimum of 40 watt supply for Tx @ 1W, 55 watt supply for Tx @ 5W or 70 watt supply for Tx @ 10 W. A power connector with screw-terminals is provided with each unit. Observe proper polarity when connecting the cables to the power supply.

### Step 3. Connect Base Station to Programming PC

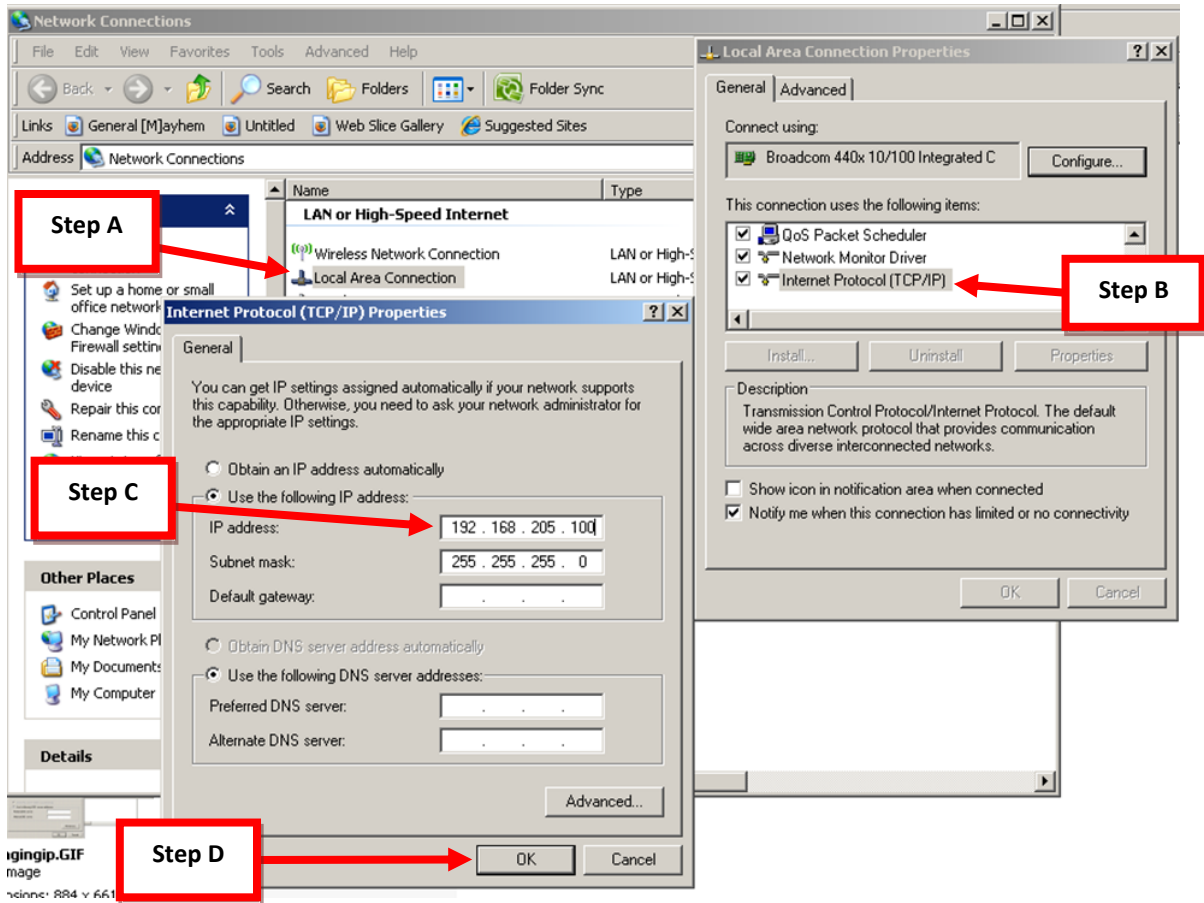
Connect a PC's Ethernet port to the LAN port using a CAT 5 Ethernet cable. The LINK/ACT LED in the DATA box should illuminate on the front panel of the Base Station.

### Step 4. LAN Setup

- Step A. From the Start menu on your PC, select Settings ⇒ Control Panel ⇒ Network Connections
- Step B. Right click the Local Area Connection icon to open the Properties box. Scroll through the list and highlight Internet Protocol (TCP/IP). Click Properties to open the TCP/IP Properties box.
- Step C. Enter the following values for USE THE FOLLOWING IP ADDRESS:  
IP Address: 192.168.205.100  
Subnet Mask: 255.255.255.0  
Default Gateway: (leave empty)
- Step D. Click OK to apply your changes and complete the connection process. Some Operating Systems may require a reboot to complete the connection process



Figure 11 - Computer IP Address Setup



**Step 5. Login to the Network**

**Base Station:** On your Internet browser address line, type the Viper SC Base Station factory-default IP address: 192.168.205.254. Press Enter to open the Network Password screen.

**Viper SC Radio:** With a separate Internet browser window, type the Viper SC factory-default IP address: 192.168.205.1. Press Enter to open the Network Password screen.

**Step 6. Initial Installation Login**

**Base Station:** For an initial installation, enter a User Name “*admin*” and the default Password “*ADMINISTRATOR*” (capital letters a must). Click OK. The web interface screen opens.

**Viper SC Radio:** For an initial installation, enter a User Name “*Admin*” and the default Password “*ADMINISTRATOR*” (capital letters a must). Click OK. The web interface screen opens.

Note: The base station user name is “*admin*” but the Viper SC is “*Admin*” these are case sensitive.

## 5 CONFIGURE A BASE STATION USING THE SETUP WIZARD

### 5.1 CONFIGURE A VIPER SC STANDARD BASE STATION

Base Station units must be programmed using the web interface. The following instructions describe how to configure the Standard Base Station.

#### **Step 1. Program the Viper SC**

---

Program the Viper SC by logging into the Viper’s webpages using the default IP address 192.168.205.1, username: “**Admin**” password: “**ADMINISTRATOR**” (capital letters a must). Setup the Viper SC using the Viper’s Setup Wizard. See the Viper SC user manual for additional information.

#### **Step 2. Login**

---

Login to The Viper SC Base Station Controller Board’s webpages using the default IP address 192.168.205.254, username: “**admin**” password: “**ADMINISTRATOR**” (capital letters a must).

#### **Step 3. Use the Setup Wizard**

---

Select “Setup Wizard” from the menu on the left hand side of the webpage. Enter the IP addresses, user names, and passwords of the Vipers inside the Base Station, see Figure 12. The Viper SC Base Station Controller Board uses these settings to talk to the radios and receive diagnostic information.

When the information is entered correctly click the “**Next**” button at the bottom of the webpage.

Figure 12 - Standard Base Station Setup Wizard 1

### Setup Wizard 1

First, connect to the radio in the Base Station using a separate browser window and configure the radio for your network.

Next, enter in the IP address, username, and password for the radio in the Base Station. Press the Next button when the information is entered correctly.

Radio Configuration	
<b>Radio Model</b>	Viper: 140-5028-502
<b>Ethernet IP Address</b>	<input style="width: 30px;" type="text" value="192"/> <input style="width: 30px;" type="text" value="168"/> <input style="width: 30px;" type="text" value="205"/> <input style="width: 30px;" type="text" value="102"/>
<b>Username</b>	<input style="width: 100%;" type="text" value="username"/>
<b>Password</b>	<input style="width: 100%;" type="password" value="....."/>

---

**Step 4. Enter IP Address**

---

If desired enter in a new IP address and subnet mask for the Viper SC Base Station Controller. If you do not want to change the IP address of the Base Station, click **“Next”**, see Figure 13.

Note: The IP address of the Viper SC Base Station Controller must be different than the Viper SC’s IP address but must be on the same IP subnet as the Viper SC radio inside the Base Station.

When the IP address is entered correctly click the **“Next”** button at the bottom of the webpage, see Figure 13. The IP address of the Viper SC Base Station Controller will update immediately. A new browser window will open taking you to the third setup wizard page. You will need to re-enter the login credentials.

Figure 13 - Standard Base Station Setup Wizard 2

**Setup Wizard 2**

Enter in the IP Address and Subnet Mask for the controller board. The IP address for the controller board must be on the same subnet as any radios in the base station.

Press the Next button when the information is entered correctly.

**LAN Configuration**

<b>Ethernet IP Address</b>	192	.	168	.	205	.	103
<b>Ethernet Subnet Mask</b>	255	.	255	.	255	.	0

Quit Previous Next

---

**Step 5. Complete**

---

Setup is now complete, click **“Finish”**, see Figure 14.

Figure 14 - Standard Base Station Setup Wizard 3

**Setup Wizard Complete**

Base Station setup is complete. Click Finish to set the radios back to their normal state.

Quit Previous Finish

## 5.2 SETUP & CONFIGURE A VIPER SC REDUNDANT BASE STATION

### 5.2.1 SETUP VIPER SC RADIO FOR A REDUNDANT SYSTEM

In a redundant Viper SC system both Radio A and Radio B must be setup identically. The user must either copy the configuration file from one unit to the other or must manually set all the parameters in the two radios identically. If desired, the Station Name in the two radios may be different. Please refer to the Viper SC manual for details on operation and programming of the Viper SC radio.

- **Bridge Mode Setup:** The two radios must have identical Ethernet IP addresses.
- **Router Mode Setup:** The two radios must have identical Ethernet IP and RF IP addresses. The two radios must have identical neighbor tables. As new remote units are added to a field, both the primary radio and the backup radio will need to have their neighbor tables updated.

Auto neighbor discovery is not recommended for a system with a Redundant Base Station. With Auto neighbor discovery, the network will have to rediscover all the routes when the backup radio comes online, generating a lot of traffic. Instead, it is recommended that the Viper SC network be configured for manual or disabled neighbor discovery mode. In Manual or Disabled neighbor discovery, the neighbor table must be preprogrammed into the backup radio. This will allow for a cleaner and faster switch to the backup radio when an error is detected with the primary radio.

The Viper SC VPN module is not compatible with warm standby mode. If VPN is enabled in the Viper SC network, the base station controller should be set for cold standby only. If warm standby mode is selected while VPN is enabled, it may take a very long time for remote Viper SCs to reestablish tunnels with the VPN server and resume communication. When a Viper SC configured as a VPN server powers on, it broadcasts a status message instructing all remotes to reestablish their VPN tunnels. In warm standby mode, that broadcast message is not sent (since the backup Viper SC was already powered on) and the remote Viper SCs will not reconnect to the VPN server until they timeout.

### 5.2.2 CONFIGURE A VIPER SC REDUNDANT BASE STATION

Base Station units must be programmed using the web interface. The following instructions described how to configure the **Redundant Base Station**.

**Note:** The Viper SC radios must be configured with the desired IP address separately (in step 2). The Viper SC's base station Wizard will not configure the Viper SC's IP.

#### Step 1. Login

---

Login to The Viper SC Base Station Controller Board's webpages using the default IP address 192.168.205.254, username: "**admin**" password: "**ADMINISTRATOR**" (capital letters a must).

#### Step 2. Click Setup Wizard

---

Select "Setup Wizard" from the menu on the left hand side of the webpage. Press the "Select Radio A" button, see Figure 15.

**Step 3. Program Radio A**

Program the first Viper SC by opening a new web browser window and logging into the Viper SC’s webpage using the default IP address 192.168.205.1, username: “Admin” password: “ADMINISTRATOR” (capital letters a must). Setup the Viper SC using the Viper SC’s Setup Wizard. See the Viper SC user manual for additional information.

**Step 4. Program Radio B**

Press the “Select Radio B” button. Program the second Viper SC by logging into the Viper SC’s webpages using the default IP address 192.168.205.1, username: “Admin” password: “ADMINISTRATOR” (capital letters a must). Setup the Viper SC using the Viper SC’s Setup Wizard.

Important: The second Viper SC must be programmed with the same IP Address as the first Viper SC.

Figure 15 - Redundant Base Station Setup Wizard 1

### Setup Wizard 1

Press the button below to have the Base Station select Radio A using Manual Override Mode. Then, connect to Radio A using a separate browser window and configure the radio for your network.

Select Radio A

Next, press the button below to have the Base Station select Radio B using Manual Override Mode. Then, connect to Radio B using a separate browser window and configure this radio so that it is identical to Radio A.

Select Radio B

Finally, enter in the IP addresses, usernames, and passwords for radios A and B. Press the Next button when the information is entered correctly.

Radio A Configuration	
Radio Model	Viper: 140-5018-502
Ethernet IP Address	192 . 168 . 205 . 1
Username	Admin
Password	••••••••••

Radio B Configuration	
Radio Model	Viper: 140-5018-502
Ethernet IP Address	192 . 168 . 205 . 1
Username	Admin
Password	••••••••••

Quit Next

Enter the IP addresses, user names, and passwords of the Viper SCs inside the Base Station. The Viper SC Base Station Controller Board uses these settings to talk to the radios and receive diagnostic information.

When the information is entered correctly click the “**Next**” button at the bottom of the webpage.

### Step 5. Enter IP Address

If desired, enter in a new IP address and subnet mask for The Viper SC Base Station Controller. If you do not want to change the IP address of the Base Station, click “**Next**” now.

Note: The IP address of the Viper SC Base Station Controller must be different than the Viper SC’s IP address but must be on the same IP subnet as the Viper SC radios inside the Base Station.

When the IP address is entered correctly click the “**Next**” button at the bottom of the webpage. The IP address of the Viper SC Base Station Controller will update immediately. A new browser window will open taking you to the third setup wizard page. You will need to re-enter the login credentials.

Figure 16 - Redundant Base Station Setup Wizard 2

**Setup Wizard 2**

Enter in the IP Address and Subnet Mask for the controller board. The IP address for the controller board must be on the same subnet as any radios in the base station.

Press the Next button when the information is entered correctly.

LAN Configuration	
Ethernet IP Address	192 . 168 . 205 . 254
Ethernet Subnet Mask	255 . 255 . 255 . 0

Quit Previous Next

### Step 6. Ping a Remote Site

The Controller Board will monitor the amount of traffic being sent over the air. During periods of inactivity the Viper SC Base Station Controller can be programmed to send out a ping to a remote site to verify the RF link is still working. To enable the ping utility, enter in a Primary Ping IP Address and, if desired, a Secondary Ping IP Address. These IP addresses should be remote radios that are located one hop from the Base Station.

Next, set the Inactivity Ping Timer as desired. If there has been no RF traffic for the duration of the Inactivity Ping Timer, the Viper SC Base Station Controller will attempt to ping either the Primary or Secondary IP Address. If the ping is unsuccessful, the base station will switch to the back-up radio.

To disable the ping, set the Inactivity Ping Timer to 0. When satisfied with the changes, click “**Next**”.

Figure 17 - Redundant Base Station Setup Wizard 3

### Setup Wizard 3

The controller board will monitor the amount of traffic being sent over the air. The Base Station controller can be programmed to send out a ping to a remote site to verify the RF link is still working.

To enable the ping, enter in a Primary Ping IP Address and, if desired, a Secondary Ping IP Address. These IP addresses should be remote radios that are located one hop from the Base Station.

Next, set the Ping Timer as desired. The Base Station controller will attempt to ping either the Primary or Secondary IP Address after the specified number of seconds. Refer to the user manual for further details.

To disable the ping, set the Ping Timer to 0.

Ping Settings	
Primary Ping IP Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Secondary Ping IP Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Ping Timer	<input type="text" value="0"/> (0=disabled, 10-3600) 5s steps
Ping Failure Threshold	<input type="text" value="5"/> (3-10)

#### Step 7. Program Static Routes

If the Viper SCs are setup in Bridge Mode, click **Next**. If the Viper SCs are setup in Router mode and the Inactivity Ping Timer is enabled, you must program in static IP routes in order for the Viper SC Base Station Inactivity Ping to work correctly. Program in static routes for the Primary and Secondary IP Ping Addresses entered in Figure 17.

When all of the routes have been entered, click **Next**.

Figure 18 - Redundant Base Station Setup Wizard 4

### Setup Wizard 4

If the radios are setup in Router mode and the Inactivity Ping Timer is enabled, you must program in static IP routes in order for the Base Station Inactivity Ping to work correctly. Program in static routes for the Primary and Secondary IP Ping Addresses entered on the previous page.

Static Routes	
<b>Route Name</b>	<input style="width: 90%;" type="text"/>
<b>Destination IP Address</b>	<input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/>
<b>IP Subnet Mask</b>	<input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/>
<b>Gateway IP Address</b>	<input style="width: 20%;" type="text"/> 0 . <input style="width: 20%;" type="text"/> 0 . <input style="width: 20%;" type="text"/> 0 . <input style="width: 20%;" type="text"/> 0
<b>Metric</b>	<input style="width: 20%;" type="text"/> (1-65535)
<input type="button" value="ADD"/>	

Routing Table					
Item	Route Name	Dest IP	Subnet Mask	Gateway IP	Metric
-- Static Routing Table Empty --					
Bolded routes are active					

**Step 8. Setup Wizard Complete**

If you have to change anything, select previous to get to the page you need. Otherwise, the Setup Wizard is completed and the Viper SC Base Station is ready to use. Click **“Finish”**.

Figure 19 - Redundant Base Station Setup Wizard Complete

### Setup Wizard Complete

Base Station setup is complete. Click Finish to set the radios back to their normal state.



## 6 BASE STATION OPERATION

### 6.1 VIPER SC FAILURE DETECTION

The Controller Board has a microprocessor that is continually monitoring the status of the active Viper SC via an Ethernet connection. The Controller Board will measure the transmit power of the Viper SC when it is sending data. The Controller Board also has the ability to send out a ping to a remote unit when necessary to verify if the active Viper SC is still capable of transmitting and receiving data.

### 6.2 MONITOR VIPER SC WITH ETHERNET CONNECTION

The Controller Board will attempt to establish a telnet connection to the Viper SC currently in use. The end user must tell the Controller Board the correct IP address, user name and password of the Viper SC so the Controller Board can establish a telnet connection. This information must be entered into the Radio Settings webpage or a base station error will occur.

Once the telnet connection has been established the Controller Board will periodically monitor several parameters in the Viper SC as listed in the Table 8 below. If the Viper SC alarm persists then contact CalAmp Support for assistance.

Table 8 - Viper SC Error Conditions

Viper SC Parameter	Error Condition
Radio Temperature	Temperature is greater than 80C
Foldback Status	Viper SC folds back transmit power for any reason
Error Status Message	<p>The Viper SC is in error if any of the following error messages are reported by the Viper SC:</p> <ul style="list-style-type: none"> <li>Board temperature is outside allowed range</li> <li>Board input power failure</li> <li>Software Watch-Dog</li> <li>Power On Self Test FAILURE</li> <li>Viper SC default warning</li> <li>DSP sanity check failure</li> <li>DSP load error: file, code and/or params</li> <li>DSP RX Clock alarm</li> <li>DSP TX Clock alarm</li> <li>DSP RX Proc Overflow alarm</li> <li>DSP TX Proc Underflow alarm</li> <li>DSP watchdog alarm</li> <li>DSP external h/w alarm</li> <li>DSP power supply alarm</li> <li>DSP anti-hack alarm</li> <li>Radio does not respond to sanity check</li> <li>Radio not ready after reset</li> </ul>

Viper SC Parameter	Error Condition
	Radio receiver tuning failure Radio EEPROM failure Radio DCXO failure Radio RX synthesizer lock failure Radio TX synthesizer lock failure Radio local power failure Radio reference clock failure Radio watchdog failure

### 6.3 MONITOR TRANSMIT POWER

The Controller Board will also measure the transmit power using an external RF power sensor. This power sensor is outside the Viper SC radio but is mounted inside the 19" rack mount chassis. It is mounted after the antenna relay and will measure forward and reverse power for whichever radio is currently in use.

An error will be reported if the power measured with the external power sensor indicates a problem and the base station will switch to the non-active backup radio for operations.

Table 9 - Viper SC External Power Sensor Error Conditions

Parameter	Error Condition
Externally Measured Forward Power	Forward power is 3 dB less than wanted power
Externally Measured Reverse Power	Reverse power is greater than 50% of wanted power

### 6.4 MONITOR RECEIVE AND TRANSMIT DATA / SEND PINGS

The Controller Board monitors the number of received and transmitted packets that go to/from the Viper SC. If there are no new received packets or if there are no new transmitted packets for a set period of time (Inactivity Time) the Controller Board will generate its own traffic to verify the Viper SC is working correctly.

When the inactivity timer expires the Controller Board will send a ping to a remote IP address. If the ping succeeds, the inactivity timer is reset and no errors are generated. If the ping response is not received within 5 seconds the Controller Board will attempt to ping the secondary IP. When the max number of retries has been reached for both the primary and secondary IP addresses the Controller Board will mark the Viper SC as bad and will switch to the backup radio. If any of the pings succeed the inactivity timer will be reset and no radio errors will be reported.

The primary and secondary IP addresses, the inactivity timer, and the max number of retries can be programmed on the System Monitor -> Redundant Setup webpage. The Controller Board will attempt to ping the primary IP address for the max number of retries and the secondary IP addresses for the max number of retries before **indicating** an error.

## 6.5 WHEN A FAILURE IS DETECTED

When a failure is detected and the Viper SC Base Station is set to Automatic Mode and Cold Standby, the first radio will be powered off and the backup radio will be powered on. The backup Viper SC requires approximately 20 seconds to boot up before being able to send and receive data. The Controller Board will switch the Ethernet, SETUP, and COM connections to the newly activated Viper SC.

If the Viper SC Base Station is set for Warm Standby, the Controller will attempt to disable the Ethernet, serial ports, and transmitter on the failed radio, if possible. Then the Ethernet, serial ports, and transmitter will be enabled on the backup radio. In warm standby, the Controller does not need to wait for the backup radio to boot. After the switch over, the failed radio will be rebooted in an attempt to resolve any issues; however it will not be activated again unless the backup radio fails too.

When an error is detected, the red Error LED on the Base Station's front panel will turn on indicating which radio (Radio A or Radio B) the fault was detected with. The Controller's Diagnostic webpage will report an error message reporting which fault occurred. If the alarm is enabled, the buzzer will sound two short chirps every 5 seconds indicating there is a failure. If the relays are programmed for automatic mode, the relays on the Alarm Port will switch indicating an error has been detected.

Since both the Viper SCs in the Viper SC Base Station have identical Ethernet and RF MAC addresses, when the radios are switched neither the Local Area Network nor any remote Viper SCs will notice that the Viper SC Base Station has switched to the backup Viper SC.

**Note:** If errors are detected with both the primary and secondary radios, the Viper SC Base Station Controller will try using each radio a maximum of 5 times each. After the maximum number of switches has occurred, The Viper SC Base Station Controller will flash the error LED of both radios. Then the Controller will no longer attempt to switch radios. It will leave one radio powered on and will let that radio try its best to continue to transmit and receive data.

## 7 BASE STATION WEB MANAGEMENT

A built-in web server makes configuration and status monitoring possible from any browser-equipped computer, either locally or remotely. Status, configuration, and online help are available without requiring special client software. Setup is password protected to avoid tampering or unauthorized changes.

Both the configuration parameters and operating firmware can be updated remotely, even over the RF network itself, using the webpages.

### 7.1 NAVIGATING THE NETWORK MANAGEMENT SYSTEM

The web interface is subdivided in two frames: the left frame allows the user to navigate the main menu, while the right main frame displays the selected page, see Figure 20.

Figure 20 - Redundant Base Station Homepage

**CalAmp®**  
**Redundant Base Station**

▶ Home      **Status**      ▶ Help

▶ Setup Wizard

**Controller Settings**

- ▶ Setup (Basic)
- ▶ Diagnostics
- ▶ Routing Table
- ▶ SNMP
- ▶ QoS
- ▶ QoS Statistics
- ▶ Alarm Port
- ▶ Multi-speed
- ▶ Firmware Update

**Radio Settings**

- ▶ Setup (Basic)
- ▶ Diagnostics

**System Monitor**

- ▶ Redundant Setup
- ▶ Ping Statistics

▶ Reset Unit

Controller Ethernet Settings	
IP	192.168.205.254
Subnet Mask	255.255.255.0
MAC Address	00:0A:99:80:04:5C

System Information	
Base Station Type	Redundant Base Station
Base Station Model	140-5328-503
System Up Time	1690 seconds
Current Firmware Version	1.1.0
Current Kernel Date	Mon Jun 13 13:55:38 CDT 2011

Radio Information	
Radio A Model	Viper: 140-5028-503
Radio B Model	Viper: 140-5028-503

Refresh Status

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**CalAmp**

## 7.2 MAIN MENU

The Base Station’s main menu grants the user access to a variety of webpages as shown in Figure 20. The Reset Unit link, on the lower left of the screen, allows the user to reset the Viper SC Base Station Controller. As the Viper SC Base Station Controller resets, it will power cycle all of the radios in the Base Station.

## 7.3 HOME PAGE

The Home page displays the Base Station’s general and diagnostic information, see Figure 20.

Figure 21 - Redundant Base Station General & Diagnostic Information

**Status**
[▶ Help](#)

Controller Ethernet Settings	
<b>IP</b>	192.168.205.254
<b>Subnet Mask</b>	255.255.255.0
<b>MAC Address</b>	00:0A:99:80:04:5C

System Information	
<b>Base Station Type</b>	Redundant Base Station
<b>Base Station Model</b>	140-5328-503
<b>System Up Time</b>	1690 seconds
<b>Current Firmware Version</b>	1.1.0
<b>Current Kernel Date</b>	Mon Jun 13 13:55:38 CDT 2011

Radio Information	
<b>Radio A Model</b>	Viper: 140-5028-503
<b>Radio B Model</b>	Viper: 140-5028-503

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### 7.3.1 CONTROLLER ETHERNET SETTINGS

- **IP.** This field displays the Ethernet IP address for the Viper SC Base Station Controller. The IP address of the Viper SC Base Station Controller can be changed on the Controller Settings -> Setup (Basic) webpage.
- **Subnet Mask.** This field displays the Ethernet subnet mask for the Viper SC Base Station Controller. The subnet mask of the Viper SC Base Station Controller can be changed on the Controller Settings -> Setup (Basic) webpage.
- **MAC Address.** Media Access Control Address. Every Ethernet device (i.e. LAN cards) has a unique hardware serial number or MAC address to identify each Network Device from all others. This number is programmed at the factory and cannot be changed.

### 7.3.2 SYSTEM INFORMATION

- **Base Station Type.** This field displays the type of Base Station configuration. This setting is programmed at the factory. Possible values include: Standard Base Station or Redundant Base Station.
- **Base Station Model.** This field displays the current part number / model number of the Viper SC Base Station being used.
- **System Up Time.** This timer is listed in seconds and shows the time since the last reboot. 1 minute = 60 seconds of up time, 1 hour = 3600 seconds, 1 day = 86400 seconds, 1 year = 31,536,000 seconds
- **Current Firmware Version.** This field displays the current firmware version loaded in the Viper SC Base Station Controller.
- **Current Kernel Date.** This field displays the date of the operating system kernel the Viper SC Base Station Controller is running.

### 7.3.3 RADIO INFORMATION

This field displays the model number of the radio(s) installed in the Base Station. "N/A" will be listed when a radio is not installed in the slot. For example, a Standard Base Station will only have one radio installed, while a Redundant Base Station will have radios installed in both slots.

- **Radio A/B Model.** This field displays the model number and type of radio(s) installed in the Base Station.
- **Refresh Status.** This button refreshes the current page.

## 7.4 SETUP WIZARD

The Setup Wizard will guide the user through the steps required to configure the Base Station. The Setup Wizard consists of 3 webpages for the Standard Base Station. The Setup Wizard for the Redundant Base Station consists of 5 webpages.

Each webpage in the Setup Wizard contains instructions for filling out the required information. All parameters that are entered through the Setup Wizard can be directly accessed later by loading the applicable webpage from the main menu.

## 7.5 CONTROLLER SETTINGS

### 7.5.1 SETUP (BASIC)

Figure 22 - Controller Setup (Basic) Webpage

**Controller Setup (Basic)**
[Help](#)

LAN Configuration

<b>Ethernet IP Address</b>	<input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="205"/> . <input type="text" value="254"/>
<b>Ethernet Subnet Mask</b>	<input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="0"/>

Administration

<b>Admin Password</b>	<input type="password"/>
<b>Confirm Password</b>	<input type="password"/>
<b>Friendly IP Address</b>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> / <input type="text" value=""/>
<b>Apply Friendly IP Address</b>	<input type="checkbox"/> SSH <input type="checkbox"/> Telnet
<b>SSH Port</b>	<input type="text" value="50022"/> (1 - 65534, 0 to block)
<b>Telnet Port</b>	<input type="text" value="23"/> (1 - 65534, 0 to block)

RADIUS Settings

<b>RADIUS Authentication</b>	<input type="radio"/> Enable <input checked="" type="radio"/> Disable
<b>Server IP Address</b>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>
<b>Server Port</b>	<input type="text" value="1812"/>
<b>Server Secret</b>	<input type="password"/>
<b>Confirm Secret</b>	<input type="password"/>
<b>Timeout</b>	<input type="text" value="2"/> sec
<b>Retries</b>	<input type="text" value="2"/>

Alarm Settings

<b>Alarm/Buzzer</b>	<input type="radio"/> Enabled <input checked="" type="radio"/> Muted
---------------------	--

Periodic Reset Timer

<b>Periodic Reset Timeout</b>	<input type="text" value="0"/> (0=disabled, 15-65535) mins
-------------------------------	--

#### 7.5.1.1 LAN CONFIGURATION

These settings can be modified to change the IP address and subnet mask of the Base Station’s Controller Board.

- Ethernet IP Address.** This setting can be changed to alter the IP address of the Base Station. The default IP address is 192.168.205.254. When a new IP address is entered, it will take effect immediately upon clicking the Save button. Reconfigure the network card in your PC to access the new subnet, if needed, and then enter the new IP address in the address bar of the web browser.
- Ethernet Subnet Mask.** This setting can be changed to alter the subnet mask of the Base Station. The default is 255.255.255.0.

### 7.5.1.2 ADMINISTRATION

These settings affect the Base Station’s security and how a user is allowed to connect to the Base Station.

- **Admin Password/Confirm Password.** This setting can be used to change the user’s password. The default password is “ADMINISTRATOR”. It is recommended that this be changed immediately upon installation. The confirm password field is used to ensure correct spelling.
- **Friendly IP Address.** Specifies the IP address from which remote administration is permitted. Entering 0.0.0.0 will allow any IP address. Leave the fifth box blank (after the /) if specifying a specific IP, or 0.0.0.0. A subnet mask may be entered in the fifth box. The mask indicates how many bits of the IP address to match. This can be a value from 1 to 32.
- **Apply Friendly IP Address.** Check the box next to a service to allow access to the service only from the friendly IP address. Unchecking the box will allow access from a computer with any IP address.
- **SSH Port/Telnet Ports.** Enter the port number that will be used for access to the service. Entering zero for the port number will block access to the service.

---

### 7.5.1.3 RADIUS SETTINGS

- **RADIUS Authentication.** Enable or disable RADIUS authentication for webpage access.
- **Server IP Address.** The IP address of the RADIUS server.
- **Server Port.** The port of the server.
- **Server Secret.** Sets the secret phrase to use with the server.
- **Confirm Secret.** Re-type the Server Secret to confirm spelling.
- **Timeout.** Specify the number of the seconds to wait before a retry.
- **Retries.** Specify the number of attempts at authenticating with the server before giving up.

---

### 7.5.1.4 ALARM SETTINGS

**Alarm/Buzzer.** This setting will enable or disabled the audible buzzer located on the Controller Board. Typically, the buzzer will beep when an error is detected with the Controller Board or an error is detected with a radio installed in the Base Station.

---

### 7.5.1.5 PERIODIC RESET TIMER

**Periodic Reset Timeout.** This field sets the Periodic Base Station Reset time from 15 to 65,535 minutes. The Periodic Reset is disabled when set to 0. When this timer expires, the Viper SC Base Station will automatically power down the Viper SC Base Station Controller and the radios then reboot the entire system.



## 7.5.2 CONTROLLER BOARD DIAGNOSTICS

Local Controller board diagnostics can be accessed by loading the Controller Diagnostics webpage from the main menu of the Base Station's homepage.

Figure 23 - Controller Diagnostics Webpage

Controller Diagnostics	
Controller Status	OK
Temperature	27C
Input Voltage	14.1V
Alarm Port Supply Voltage	3.2V
Forward Tx Power	0.0W
Reverse Tx Power	0.0W
Fan Status	Fan A ERROR / Fan B ERROR
Fan Voltage	11.7V

Refresh

- **Controller Status.** Displays the current status of the Controller Board and is used to report any errors detected with the Controller Board.
- **Temperature.** This field displays the current temperature inside the Viper SC Base Station in degrees Celsius.
- **Input Voltage.** This field displays the current input voltage to the Base Station.
- **Alarm Port Supply Voltage.** This field displays the supply voltage to the Alarm Port logic circuits. The supply voltage is user selectable and can be set to either 1.8V or 3.3V. Click on Alarm Port on the main menu to access the Alarm Port settings.
- **Forward Tx Power (Redundant Models Only).** This field displays the last measured forward transmit power of the radio in use. **This power is measured by the Viper SC Base Station Controller with a power sensor mounted inside the 19" rack mount chassis.**
- **Reverse Tx Power (Redundant Models Only).** This field displays the last measured reflected transmit power of the radio in use. **This power is measured by the Viper SC Base Station Controller with a power sensor mounted inside the 19" rack mount chassis.**
- **Fan Status.** This field displays the status of the two 12VDC fans located in the Base Station.
- **Fan Voltage.** This field displays the supply voltage to the two 12V DC fans. If the input voltage to the Viper SC Base Station drops to 13V or lower, the fan voltage will slump below 12V. This is normal due to the voltage drop through the buck switching power supply on the Controller Board. The fans may spin slower but they will not be harmed by the lower voltage.

### 7.5.3 ROUTING TABLE

Static routes may be created from the Routing Table webpage. The static routes will appear in the table at the bottom of the screen. Static Routing refers to a manual method used to set up routing between networks.

Figure 24 - Routing Table Webpage

**Routing Table**
[▶ Help](#)

**Static Routes**

<b>Route Name</b>	<input style="width: 90%;" type="text"/>
<b>Destination IP Address</b>	<input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/>
<b>IP Subnet Mask</b>	<input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/> . <input style="width: 20%;" type="text"/>
<b>Gateway IP Address</b>	<input style="width: 20%;" type="text"/> 0 . <input style="width: 20%;" type="text"/> 0 . <input style="width: 20%;" type="text"/> 0 . <input style="width: 20%;" type="text"/> 0
<b>Metric</b>	<input style="width: 40%;" type="text"/> (1-65535)
<input type="button" value="ADD"/>	

<b>Routing Table</b>						
Item	Route Name	Dest IP	Subnet Mask	Gateway IP	Metric	
	<b>Primary Remote</b>					
1	Viper	192.168.206.0	255.255.255.0	192.168.205.1	1	<a href="#">Delete Entry</a>
	<b>Secondary Remote</b>					
2	Viper	192.168.207.0	255.255.255.0	192.168.205.1	1	<a href="#">Delete Entry</a>
3	<b>Default Gateway</b>	<b>0.0.0.0</b>	<b>0.0.0.0</b>	<b>192.168.205.100</b>	<b>1</b>	<a href="#">Delete Entry</a>
<b>Bolded routes are active</b>						

- **Route Name.** This field sets the alphanumeric identifier of the static route in the Routing Table.
- **Destination IP Address.** This field sets the IP address of the destination network. This is a network name and not the actual IP address.
- **IP Subnet Mask.** This field sets the subnet mask of the destination network.
- **Gateway IP Address.** This field sets the local network IP address for the gateway to the destination network. Enter the address of the local gateway. This is typically the IP address of the base station Viper SC.
- **Metric.** Number ranging from 1 to 65,535. The lower the metric value the higher the route priority. Typically set to 1.
- **Add Button.** This button must be pressed to add the configured route to the table.
- **Delete Entry.** When clicked, this button deletes the route to the immediate left of the line.

A Default Gateway must be used if remote access to the Viper SCs is required from outside the Viper SC IP network. There is an example of a Default Gateway entry as shown in the routing example provided. The Gateway for the Default Gateway typically points to the customer’s router.

7.5.4 SNMP

The Simple Network Management Protocol (SNMP) is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention. The base station controller supports SNMP version v2c.

Figure 25 - SNMP Webpage

### SNMP Settings ▶ Help

---

#### SNMP Configuration

SNMP	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
Read-only Community Name	<input type="text" value="ADMINISTRATOR"/>
Read-write Community Name	<input type="text" value="ADMINISTRATOR"/>
Trap Community Name	<input type="text" value="ADMINISTRATOR"/>
MIBs	<a href="#">Download mibs.zip</a>

---

#### SNMP Traps Configuration

SNMP Traps	<input checked="" type="checkbox"/> Board Alive <input checked="" type="checkbox"/> Board Error Detected <input type="checkbox"/> Board Error Cleared <input checked="" type="checkbox"/> Radio A Error Detected <input type="checkbox"/> Radio A Error Cleared <input checked="" type="checkbox"/> Radio B Error Detected <input type="checkbox"/> Radio B Error Cleared <input type="checkbox"/> Fan Error Detected <input type="checkbox"/> Fan Error Cleared <input type="checkbox"/> Alarm Pin 1 Low to High <input type="checkbox"/> Alarm Pin 1 High to Low <input type="checkbox"/> Alarm Pin 5 Low to High <input type="checkbox"/> Alarm Pin 5 High to Low <input type="checkbox"/> Alarm Pin 7 Low to High <input type="checkbox"/> Alarm Pin 7 High to Low <input type="checkbox"/> Alarm Pin 7 Analog Voltage High <input type="checkbox"/> Alarm Pin 7 Analog Voltage Low <input type="checkbox"/> Alarm Pin 7 Analog Voltage In Range
Pin 7 Voltage Range	<input type="text" value="0"/> to <input type="text" value="0"/>

---

#### SNMP Trap Sink

Trap Sink IP	<input type="text" value="."/> <input type="text" value="."/> <input type="text" value="."/> <input type="text" value="."/>
Trap Sink Port	<input type="text"/>

---

#### SNMP Trap Sink List

Sink IP	Sink Port
-- SNMP Trap Sink List Empty --	

### 7.5.4.1 SNMP CONFIGURATION

- **SNMP.** Selecting Enable will allow the SNMP functionality. Selecting Disable will shut off SNMP functionality.
- **Read-only Community Name.** This field sets the community string used for accessing the read-only Management Information Bases (MIBs).
- **Read-write Community Name.** This field sets the community string used for accessing all Management Information Bases (MIBs) including writable MIBs.
- **Trap Community Name.** This field sets the community string used when sending traps.
- **MIBs.** Right-click the “Download mibs.zip” link and select “Save Target As...” to save a zip file of the controller-specific MIBs. Once the zip file is downloaded onto your computer, extract the files. Then, the base station controller specific MIBs can be loaded into any third party MIB browser.

### 7.5.4.2 SNMP TRAPS CONFIGURATION

Check the box next to a trap to enable it. Uncheck the box to disable that trap. The traps listed in Table 10 below are available in the base station controller.

Table 10 - SNMP Trap Description

SNMP Trap Name	Description
<b>Board Alive</b>	A trap is generated whenever the Controller board boots up.
<b>Board Error Detected</b>	A trap is generated whenever an error is detected with the Controller board.
<b>Board Error Cleared</b>	A trap is generated whenever errors are cleared from the Controller board.
<b>Radio A Error Detected</b>	A trap is generated whenever an error is detected with Radio A.
<b>Radio A Error Cleared</b>	A trap is generated whenever Radio A errors are cleared. Errors are cleared when the “Clear Errors” button on the Radio Settings -> Diagnostics webpage is pressed, or when the Alarm On/Off button on the Base Station’s front panel is held for 5 seconds.
<b>Radio B Error Detected</b>	A trap is generated whenever an error is detected with Radio B.
<b>Radio B Error Cleared</b>	A trap is generated whenever Radio B errors are cleared. Errors are cleared when the “Clear Errors” button on the Radio Settings -> Diagnostics webpage is pressed, or when the Alarm On/Off button on the Base Station’s front panel is held for 5 seconds.
<b>Fan Error Detected</b>	A trap is generated when the Controller detects that either of the two fans have stopped spinning.
<b>Fan Error Cleared</b>	A trap is generated when the Controller detects that both fans are operating normally again after an error condition had occurred.
<b>Alarm Pin 1 Low to High</b>	A trap is generated whenever a low to high transition is detected on Pin 1 of the Alarm Port.
<b>Alarm Pin 1 High to Low</b>	A trap is generated whenever a high to low transition is detected on Pin 1 of the Alarm Port.
<b>Alarm Pin 5 Low to High</b>	A trap is generated whenever a low to high transition is detected on Pin 5 of the Alarm Port.
<b>Alarm Pin 5 High to Low</b>	A trap is generated whenever a high to low transition is detected on Pin 5 of the Alarm Port.
<b>Alarm Pin 7 Low to High</b>	A trap is generated whenever a low to high transition is detected on Pin 7 of the Alarm Port.
<b>Alarm Pin 7 High to Low</b>	A trap is generated whenever a high to low transition is detected on Pin 7 of the Alarm Port.

SNMP Trap Name	Description
<b>Alarm Pin 7 Analog Voltage High</b>	A trap is generated whenever the Analog Voltage on Pin 7 of the Alarm Port exceeds the upper voltage threshold programmed by the user.
<b>Alarm Pin 7 Analog Voltage Low</b>	A trap is generated whenever the Analog Voltage on Pin 7 of the Alarm Port falls below the lower voltage threshold programmed by the user.
<b>Alarm Pin 7 Analog Voltage In Range</b>	A trap is generated whenever the Analog Voltage on Pin 7 of the Alarm Port returns to a value between the lower and upper voltage threshold programmed by the user.

---

#### 7.5.4.3 PIN 7 VOLTAGE RANGE

Enter the voltage thresholds (low and high) that will be used to generate the Alarm Pin 7 Analog Voltage traps. The analog to digital converter can report voltages from 0V up to the I/O Supply Voltage. The I/O Supply Voltage is user selectable, and can be set to either 1.8V or 3.3V. See appendix A for Alarm Port electrical specifications.

---

#### 7.5.4.4 SNMP TRAP SINK

- **Trap Sink IP.** The Trap Sink IP allows the user to enter in the IP address of the computer(s) that are configured to receive SNMP traps.
- **Trap Sink Port.** Enter in the port number that the SNMP traps will be sent to. Most MIB browsers are set to listen for traps on port 162.
- **Add/Delete.** Click the Add button to add the Trap Sink IP and the Trap Sink Port to the SNMP Trap Sink List. After an entry has been added to the list a “Delete” link is displayed next to the entry. Click the delete link to remove an individual entry from the list.

7.5.5 QoS

The Quality of Service (QoS) module throttles IP traffic sent to the radio network. Note that only traffic from the LAN to the radio network will be throttled. Traffic can be filtered and throttled at different rates using the QoS filters. Please refer to CalAmp’s Support Bulletins on CalAmp’s web site for a detailed procedure in configuring the QoS. The QoS is generally set and then monitored to ensure the desired priorities are being honored. The Viper SC Base Station QoS Support Bulletin describes a typical QoS setup and tuning procedure.

Figure 26 - QoS Webpage

**QoS**
[Help](#)

**QoS Basic Configuration**

<b>QoS</b>	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
<b>Max Rate</b>	<input type="text" value="52"/> kbps
<b>Default Queue</b>	<input checked="" type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5

**QoS Queue Configuration**

		Rate (kbps)	Ceiling (kbps)	Buffer Size (pkts)
<b>Queue 1</b>	<input checked="" type="checkbox"/> Enable	<input type="text" value="10"/>	<input type="text" value="52"/>	<input type="text" value="10"/>
<b>Queue 2</b>	<input type="checkbox"/> Enable	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
<b>Queue 3</b>	<input checked="" type="checkbox"/> Enable	<input type="text" value="20"/>	<input type="text" value="52"/>	<input type="text" value="15"/>
<b>Queue 4</b>	<input checked="" type="checkbox"/> Enable	<input type="text" value="15"/>	<input type="text" value="52"/>	<input type="text" value="20"/>
<b>Queue 5</b>	<input type="checkbox"/> Enable	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

*Note: Only traffic from the LAN to the radio network is throttled.*

Cancel
Save

**Filter**

<b>Source IP Address</b>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> / <input type="text" value="0"/>
<b>Source Port</b>	<input type="text" value="0"/>
<b>Destination IP Address</b>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> / <input type="text" value="0"/>
<b>Destination Port</b>	<input type="text" value="0"/>
<b>DSCP</b>	<input type="text" value="All"/>
<b>Protocol</b>	<input type="text" value="All"/> <input type="checkbox"/> ACKs only
<b>Queue</b>	<input type="text" value="1"/>

Add

**Filter Table**

Src IP	Src Port	Dest IP	Dest Port	DSCP	Prot	Q	Up/Dn	Del
0.0.0.0/0	0	0.0.0.0/0	0	All	All	1		X
Delete All								
Bolded entries are enabled								

---

### 7.5.5.1 QoS BASIC CONFIGURATION

- **QoS:** Select "Enable" to use the QoS module. Select "Disable" to turn it off.
- **Max Rate:** Sets the maximum data rate allowed by the QoS module (in kilobits per second).
- **Default Queue:** Sets the queue through which all traffic will flow unless otherwise filtered. If no queue is selected, then unfiltered traffic will bypass the QoS module.

When changes are made to the QoS Basic Configuration, the Save button must be pressed for the changes to take effect.

---

### 7.5.5.2 QoS QUEUE CONFIGURATION

The QoS contains five queues, which can each be configured independently to throttle traffic to different rates.

- **Enable:** Check "Enable" to use the queue.
- **Rate:** Sets the guaranteed rate at which traffic flows through the queue. The sum of this value for all enabled queues cannot exceed the Max Rate set in the QoS Basic Configuration.
- **Ceiling:** Sets the maximum rate that traffic can flow through the queue. This value cannot be set higher than the Max Rate set in the QoS Basic Configuration for any individual queue.
- **Buffer Size:** Sets how many packets can be queued up in the queue. If this buffer is exceeded the packets will be dropped.

When changes are made to the QoS Queue Configuration, the Save button must be pressed for the changes to take effect.

---

### 7.5.5.3 FILTER

Filters can be configured to route traffic to specific queues. Filters can be created that match on one or more of the following parameters.

- **Source IP Address:** Enter the source IP address to match. The Net Mask can be specified to match on either a range of IP addresses or on an individual address. Leave as 0.0.0.0/0 to ignore the source IP address.

*Example:*

*10.1.1.0/24      This filter matches all IP addresses from 10.1.1.0 to 10.1.1.255*

*10.1.1.43/32      This filter matches only one IP address: 10.1.1.43*

- **Source Port:** Enter the source port to match. Leave as 0 to ignore the source port.
- **Destination IP Address:** Enter the destination IP address to match. Leave as 0.0.0.0/0 to ignore the destination IP address.
- **Destination Port:** Enter the destination port to match. Leave as 0 to ignore the destination port.
- **DSCP:** Select the differentiated services code point to match.
- **Protocol:** IP traffic can be filtered by protocol. Select the protocol to match: TCP, UDP, ICMP, or all protocols. If TCP is selected the ACKs checkbox is enabled. Checking this box creates a filter that matches TCP Acks only. Unchecking this box creates a filter that matches all types of TCP traffic.

- **Queue:** Sets the queue that traffic matching the filter will go into.

---

#### 7.5.5.4 FILTER TABLE

The filter table displays a list of all filters that have been created. Filters that are currently enabled will be shown in bold. A filter is disabled if it is associated with a disabled queue. Traffic will be checked against each filter in this table starting at the top and working towards the bottom. Once a packet is found to match a given filter, the packet is placed into the specified queue. When a packet is found to match a given filter, filter comparison stops and filters further down the table are ignored. When the next packet is received the process starts over from the top of the table.

Click the up or down arrows to move a filter in the list. Click "X" to delete a filter or Delete All to remove all the filters. New filters will be added to the bottom of this list.

---

#### 7.5.5.5 SETUP TIPS (USING WIRESHARK)

CalAmp recommends using Wireshark to help determine the IP packets that need to be prioritized if the user has a question on which packets to prioritize.

- Only traffic from the LAN to the radio network will be throttled.
- Packets are prioritized and buffered in the Base Station controller, not in the radio. When packets are released from the QoS module they are sent to the radio.
- In order to properly throttle traffic, the QoS module must be the slowest point in your system. When the QoS rates are set too high, the radio system may not be able to keep up. In this scenario traffic will be backed up at the radio interface, waiting for the RF channel to free up.
- When a waiting line of packets forms at the radio's RF interface, the user's high priority traffic will not be allowed to jump to the front of the line and will be delayed. To ensure that high priority traffic is in fact given a high priority, the rates set in the QoS module must be the limiting point in the network.
- Many factors, such as packet size, network topology, radio collision avoidance settings, very low RF signal levels and over the air data rate, will have an effect on the overall throughput of your system. The outgoing throughput of your system can be measured by setting up the desired filters and setting all the QoS rates very high. Next, allow the system to run for a while. The QoS module will not throttle traffic since the rates are set very high.
- After enough time has elapsed to build a representative traffic profile, check the QoS Statistics webpage (detailed below) and observe the unthrottled Rate reported for each queue. This can be helpful information to have when setting up the QoS rules for the initial trials. For example, to increase the amount of bandwidth available for high priority traffic, low priority traffic must be throttled to rates slower than those measured during this initial test.
- Actual radio throughput can sometimes be optimized depending on the network topology and characteristics of traffic being transmitted over the air. Collision avoidance techniques, RF back off algorithms, RF Acks/RF retries are not needed in all networks. While all of these features have definite benefits in certain situations they can also slow throughput. These settings can sometimes be optimized to yield a greater throughput. See the radio's user manual or contact CalAmp technical services for more details.



### 7.5.6 QoS STATISTICS

The QoS Statistics page gives information on how the current QoS is performing, so that it can be adjusted with greater precision. The Refresh button will update the QoS Statistics page to the most current statistics. The Clear button will reset the statistics; changing any QoS setting will also reset the statistics.

Figure 27 - QoS Statistics Webpage

QoS Statistics						▶ Help
Queue	1	2	3	4	5	
Rate (kbps)	0	0	0	0	0	
Packets Sent	1	0	0	0	0	
Packets Backlogged	0	0	0	0	0	
Packets Dropped	0	0	0	0	0	
Bytes Sent	253	0	0	0	0	
Bytes Backlogged	0	0	0	0	0	

*Note: These stats only count traffic from the LAN to the radio network.*

Refresh Clear

- **Rate:** The rate of traffic flowing through the queue. The rate is calculated using a time weighted average over the past several minutes. The Clear button does not reset the rate.
- **Packets Sent:** The number of packets that have passed through the queue since the last clear or setting change.
- **Packets Backlogged:** The number of packets currently queued up and waiting for transmission. The Clear button will not reset this.
- **Packets Dropped:** The number of packets dropped, due to exceeding the buffer size for the queue, since the last clear or setting change.
- **Bytes Sent:** The number of bytes that have passed through the queue.
- **Bytes Backlogged:** The number of bytes currently queued up and waiting for transmission. The Clear button will not reset this.

### 7.5.7 ALARM PORT

This section describes the function of the ALARM port. The Alarm port is connected to two relays, the Alarm Relay (Relay 1) and the Radio In Use Relay (Relay 2). Either of these two relays may be controlled automatically by the Viper SC Base Station (Redundant Base Station only) or may be switched manually by the user using the Base Station’s webpage interface. Alternatively, the connections to Relay 2 can also be used as digital inputs when the Relay function is disabled. Pin 7 is not connected to any relays and can be used as a digital input, digital output or an analog input. These options can be set using the webpage interface.

7.5.7.1 OVERVIEW

Figure 28 and Figure 29 provide a pin out of the Alarm I/O connector and a block diagram of the internal circuitry.

Figure 28 - Alarm Port Pin Out

Pin	Function
1	Relay 2 (Normally Open) Digital Input 1
2	Relay 1 (Normally Open)
3	Relay 2 (Common)
4	Relay 1 (Common)
5	Relay 2 (Normally Closed) Digital Input 5
6	Relay 1 (Normally Closed)
7	Digital Input or Output 7 Analog Input 7
8	Ground

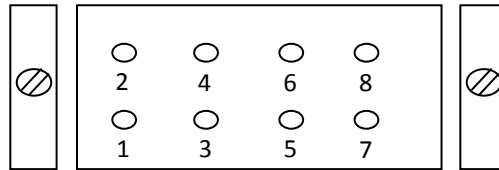
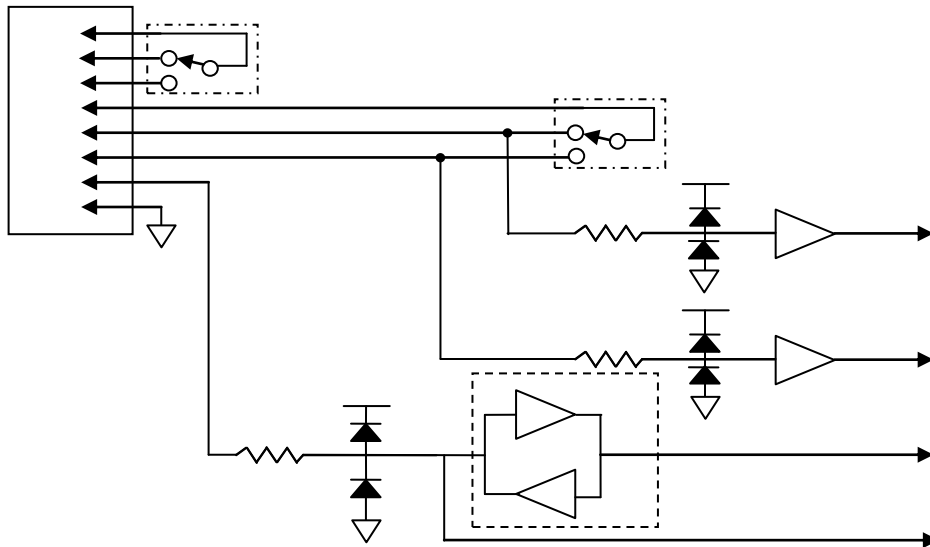


Figure 29 - Simplified Block Diagram of Alarm Port Circuitry



7.5.7.2 CONFIGURING THE ALARM PORT

The webpage is used to configure the Alarm Port pins and to monitor the status of input lines.

Figure 30 - Alarm Port Webpage

**Alarm I/O Settings** ▶ **Help**

---

**Relay Settings**

Relay 1 Not Energized ▼

Relay 2 Not Energized / Digital Inputs ▼

---

**Inputs/Outputs Settings**

Supply Voltage 3.3V ▼

Pin 7 Function Analog / Digital Input ▼

Pin 7 Output Low ▼

---

**Digital Inputs**

Pin 1 State Low

Pin 5 State High

Pin 7 State High

---

**Analog Inputs**

Pin 7 Voltage 1.6V

7.5.7.3 RELAY SETTINGS

To adjust the options for the relays, use the pull down menus under the Relay Settings section. Depending upon which type of Base Station you are using, there will be either two or three options available for the relays. A summary of the options is listed in the table below.

Table 11 - Relay Setting Options

Relay 1	Description
Not Energized	Shorts pins 4 and 6
Energized	Shorts pins 4 and 2
Auto: Indicates Error Status ( <i>Redundant Base Station only</i> )	Indicates if an error has been detected. Not Energized = Error Detected with radio(s) Energized = No Errors Detected
Relay 2	Description
Not Energized/Digital Input	Shorts pins 3 and 5 Select this mode when using Pins 1 and 5 as Digital Inputs
Energized	Shorts pins 3 and 1
Auto: Indicates Active Radio ( <i>Redundant Base Station only</i> )	Indicates which radio is currently in use. Not Energized = Radio A is in use Energized = Radio B is in use

#### 7.5.7.4 INPUT/OUTPUT SETTINGS

- Supply Voltage

The user can select the supply voltage for the digital and analog logic on the Alarm Port. The supply voltage may be set to either 1.8V or 3.3V. The voltage source supplies voltage to the following:

- Digital Inputs on Pins 1, 5, and 7
- Digital Output on Pin 7
- Analog Input on Pin 7

The analog-to-digital converter (ADC) supply is fixed at 3.3V, but the analog input on Pin 7 will be clamped 0.6V above the user settable supply voltage.

Changing this supply voltage will not affect the operation of the relays.

- Pin 7 Function

This setting determines the function of pin 7: Digital/Analog Input or Digital Output. When this pin is configured as an input, both the analog voltage and the digital state of the pin will be reported on the webpage.

- Pin 7 Output

When the Pin 7 function is set to "Digital Output", the user can set the output voltage level of Pin 7 as High or Low. The digital output is connected to the Alarm Port through a 100 ohm resistor.

---

#### 7.5.7.5 DIGITAL INPUTS

This section displays the state of the digital inputs as read by the Controller Board.

The digital inputs on pins 1 and 5 feed through a series 150kΩ resistor, through a buffer, to the microprocessor. The input voltages are clamped between 0.6V below ground and 0.6V above the I/O supply voltage.

The digital input on pin 7 feeds through a series 100Ω resistor, through a buffer, to the microprocessor. The input voltages are clamped between 0.6V below ground and 0.6V above the I/O supply voltage.

The I/O Supply Voltage level will affect the decision threshold between a high and low state on the digital inputs. Select the I/O Supply voltage level corresponding to the digital logic levels in use. See Appendix A for a complete list of Alarm Port specification.

---

#### 7.5.7.6 ANALOG INPUTS

This section displays the analog voltage read by the analog-to-digital converter input from Pin 7 of the Alarm Port. The analog input on pin 7 feeds through a series 100Ω resistor before being read by the ADC. The input voltages are clamped between 0.6V below ground and 0.6V above the I/O supply voltage.

7.5.8 MULTI-SPEED

Viper SC Base Stations, with Viper SCs installed, are capable of functioning as a Multi-speed Rate Controller. Multi-speed is available only with Viper SCs.

The base station controller Multi-speed webpage allows the user to configure the Viper SC radio to be a rate controller. From this webpage the user can select the bandwidth, default data rate, and the control packet rate. The base station controller can read the Neighbor Table programmed in the Viper SC. From this table the user can adjust the over-the-air data rate to each individual link. This allows strong RF links to run at the maximum speed, while weaker RF links can be adjusted for slower data rates that allow greater receive sensitivity and increased range.

Figure 31 - Multi-speed Webpage

## Multi-speed

▶ **Help**

**Multi-speed Configuration**

<b>Multi-speed Mode</b>	<input type="radio"/> Disabled <input type="radio"/> Follower <input checked="" type="radio"/> Controller
<b>Bandwidth</b>	50 <input type="text"/> kHz
<b>Default Data Rate</b>	64 <input type="text"/> kbps
<b>Control Packet Rate</b>	32 <input type="text"/> kbps (minimum system speed)

**Exception**

<b>RF MAC</b>	<input type="text"/> : <input type="text"/> : <input type="text"/>
<b>RF IP</b>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
<b>Ethernet IP</b>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
<b>Data Rate</b>	32 <input type="text"/>

**Neighbor Table**

RF MAC	RF IP	Eth IP	Data Rate		
80:00:02	10.128.0.2	192.168.206.1	64	Edit	
80:00:03	10.128.0.3	192.168.207.1	128	Edit	Delete
80:00:04	10.128.0.4	192.168.208.1	32	Edit	Delete
80:00:05	10.128.0.5	192.168.209.1	128	Edit	Delete
80:00:06	10.128.0.6	192.168.210.1	64	Edit	

**Bolded entries are exceptions**

### 7.5.8.1 MULTI-SPEED CONFIGURATION

A multi-speed Viper SC network may have any number of remotes configured for multi-speed as long as there is at least one multi-speed controller. In addition, a single RF network may have two or more multi-speed controllers if desired.

This type of configuration may be desirable when there are several relay points in the system. Additional multi-speed controllers would allow the user to configure a high speed backbone while still being able to individually customize the data rate to each remote link.

- **Multi-speed Mode**  
This parameter sets the multi-speed mode of the Viper SC. Select "Disabled" to disable multi-speed mode. Select "Follower" to program the Viper SC to be a rate follower. Select "Controller" to program the Viper SC to be a rate controller.

Note: Selecting "Follower" will put the Viper SC into the same mode as selecting Multi-speed Enabled on a remote unit (non-Base Station Viper SC).

- **Multi-speed Disabled (remote Vipers)**

In Disabled multi-speed mode a Viper SC will be capable of listening to and decoding any of the available data rates for a given channel bandwidth. When transmitting data the Viper SC will always use the programmed data rate.

Legacy Vipers without the SC are not capable of multi-speed but may still be deployed in the same field with new Viper SC models that use multi-speed. By default, these legacy Vipers are in disabled multi-speed mode. They will however, still be capable of receiving either of the slowest two data rates for a given channel bandwidth (2FSK or 4FSK modulation). They are not capable of transmitting at or receiving the faster data rates that use 8FSK or 16FSK modulation.

- **Multi-speed Follower (remote Viper SC)**

This mode sets the Viper SC to be a rate-follower and the Viper SC will be capable of receiving and decoding any of the available data rates for a given channel bandwidth. In this mode, whenever a Viper SC receives a packet it will remember the data rate of the incoming transmission. On subsequent transmissions, the Viper SC will use the recorded data rate to send data back over the air.

In this mode, the Viper SC will use the user programmed data rate for any transmissions that take place before the first packet is received. After the first packet is received, the Viper SC will "follow" the data rate of incoming transmission.

- **Multi-speed Controller (Base Station only)**

This mode is only available in a Viper SC Base Station. The Base Station controller webpages allow the user to configure the Speed Exception Table where the over-the-air data rate can be configured on a link by link basis. In this mode the base station Viper SC will be capable of listening to and decoding any of the available data rates for a given channel bandwidth. Each time it transmits a new message the Viper SC will check the entries in the Speed Exception table to determine what over-the-air data rate should be used for the next transmission.

Packets addressed to broadcast IP addresses and system control packets such as RTS/CTS handshaking packets are always sent at the Control Packet Rate. This parameter should be set equal to or below the lowest data rate used in the entire system. These types of packets must be received by all Viper SCs in the network, so the most robust RF modulation must be used.

- **Bandwidth**  
This parameter sets the system RF channel bandwidth. From the drop down box, choose one of the available bandwidths: 6.25 kHz, 12.5 kHz, 25 kHz, or 50 kHz (Note: Not all bandwidths are available for all Viper SC models).
- **Default Data Rate**  
This parameter sets the default data rate of the system. When a unicast packet is sent over the air, the Viper SC will use the default data rate, unless an entry exists in the Speed Exception Table that contains a different data rate.
- **Control Packet Rate**  
This parameter sets the control packet rate. All broadcast packets, multicast packets, and control packets such as RTS/CTS packets are transmitted at the control packet rate. This parameter should be set to the minimum data rate used in the system since it is necessary that all Viper SCs successfully receive these packets.

---

### 7.5.8.2 EXCEPTION

To manually create an exception for a remote Viper SC, enter in the 6 digit RF MAC address of the remote Viper SC and select the new over-the-air data rate for the link. If desired, the user may enter in the RF IP address and Ethernet IP address of the remote Viper SC, however this information is not required. Click the "Add" button to save the entry to the Speed Exception table.

---

### 7.5.8.3 NEIGHBOR TABLE (SPEED EXCEPTION TABLE)

This section displays the Viper SC's neighbor table and exceptions (also known as the Speed Exception Table). If the Viper SC is operating in Router mode, click the "Reload Neighbors" button to download or refresh the list of neighbors from the Viper SC's neighbor table.

Click "Edit" to change the data rate of an entry in the table. Click "Delete" to remove an exception. When clicking delete, the data rate for the link will be set back to the default data rate.

Click the "Download Exceptions" button to save the exception list to a file. This is very important if there is a large Exception list. The user can then import the Exception list in case the base station is replaced.

### 7.5.9 FIRMWARE UPDATE

When newer versions of the Viper SC Base Station Controller firmware become available, the user can manually update the unit by uploading the new firmware. The update file name must be **upgradebase.tar.gz**.

The new firmware will be sent to the customer upon request or via a customer email list.

1. The user must save the file (**upgradebase.tar.gz**) to a known location on their PC.
2. Click the Browse button to find the upgrade file on your PC.
3. After selecting the correct file click Upload Firmware to Base Station.

Figure 32 - Firmware Update Webpage

## Firmware Update

▶ Help

**Current Firmware Information**

<b>Version:</b>	1.1.1
<b>Current Kernel Date:</b>	Mon Jun 13 13:55:38 CDT 2011

**Upload New Firmware**

**File**

**Progress**

Note: The upgrade procedure takes approximately 3 minutes.

**Configuration File**

**Upload Config File**

**Download Config File**

**Restore Factory Defaults**

#### 7.5.9.1 CURRENT FIRMWARE VERSION

- **Version.** Displays the firmware version currently loaded in the Viper SC Base Station Controller.
- **Current Kernel Date.** Displays the date of the operating system kernel the Viper SC Base Station Controller is running.



### 7.5.9.2 UPLOAD NEW FIRMWARE

- **File.** This field specifies the path for the new firmware file to be uploaded to the Viper SC Base Station Controller. The Browse button can be used to locate the file on your computer. The update file name must be the following: **upgradebase.tar.gz**
- **Progress.** The field displays the update progress after the "Upload Firmware to Base Station" button has been pressed.

---

### 7.5.9.3 CONFIGURATION FILE

- **Upload Config File**  
In this field, enter the configuration file to be uploaded to the Viper SC Base Station Controller. The Browse button can be used to locate the file on your computer. The file to be uploaded must be named **config.xml**. Select the Upload Config File radio button. Then, click Proceed to upload a new configuration file.
- **Download Config File**  
Select the Download Config File radio button. Then, click Proceed to return a link to the configuration file on the Base Station. Right-click the link and select "Save Target As..." to save the file. The link page refreshes after 15 seconds. It is recommended to use the default filename to save the file. If multiple files need to be maintained, it is recommended to use directory paths to separate the files.
- **Restore Factory Defaults**  
Select the Restore Factory Defaults radio button. Then, click Proceed to set the Viper SC Base Station settings back to their original factory defaults. **The IP address of the Controller Board will be set back to 192.168.205.254.**

**The user also has the option of restoring the factory default values via an external hardware reset pinhole button located on the back of the base station just right above the power connector.**

## 7.6 RADIO SETTINGS

This configuration screen lists the settings for each radio in the Base Station. The information entered here will be used by the Controller Board to access the radio(s) to control and monitor their status.

Figure 33 - Radio Settings Webpage

### Radio Setup (Basic)

▶ Help

Radio A Configuration	
<b>Radio Model</b>	Viper: 140-5018-502
<b>Ethernet IP Address</b>	<input style="width: 20px;" type="text" value="192"/> <input style="width: 20px;" type="text" value="."/> <input style="width: 20px;" type="text" value="168"/> <input style="width: 20px;" type="text" value="."/> <input style="width: 20px;" type="text" value="205"/> <input style="width: 20px;" type="text" value="."/> <input style="width: 20px;" type="text" value="1"/>
<b>Username</b>	<input style="width: 100%;" type="text" value="Admin"/>
<b>Password</b>	<input style="width: 100%;" type="password" value="••••••••••"/>

Radio B Configuration	
<b>Radio Model</b>	Viper: 140-5018-502
<b>Ethernet IP Address</b>	<input style="width: 20px;" type="text" value="192"/> <input style="width: 20px;" type="text" value="."/> <input style="width: 20px;" type="text" value="168"/> <input style="width: 20px;" type="text" value="."/> <input style="width: 20px;" type="text" value="205"/> <input style="width: 20px;" type="text" value="."/> <input style="width: 20px;" type="text" value="1"/>
<b>Username</b>	<input style="width: 100%;" type="text" value="Admin"/>
<b>Password</b>	<input style="width: 100%;" type="password" value="••••••~•••••"/>

### 7.6.1 SETUP BASIC

This configuration screen lists the settings for each radio in the Base Station. The information entered here will be used by the Controller Board to access the radio(s) to control and monitor their status.

- **Radio Model.** This setting is pre-programmed at the factory and displays the radio model that is present in the Base Station.
- **Ethernet IP Address.** Enter the IP address that is programmed into the radio. The Controller Board will use this IP address to connect to the radio.
- **Username.** Enter the username needed to connect to the radio.
- **Password.** Enter the password needed to connect to the radio.
- **Radio Power.** This setting turns the power on or off to the radio. This option is only available on the Standard Base Station. For the Redundant Base Station, go to the "Redundant Setup" webpage to control which radio is used.

7.6.2 RADIO DIAGNOSTICS

The Viper SC Base Station Controller logs into the radios to monitor the radio’s diagnostics and overall health. The radios diagnostics are reported on this webpage, see Figure 34.

Figure 34 - Radio Diagnostics Webpage

Radio Status	
Radio In Use	RADIO B
Radio A Status	
Radio B Status	Login Failure
Radio Failures Detected	205

Radio Diagnostics		
	Radio A	Radio B
MAC Address	N/A	N/A
Input Voltage	0V	0V
Temperature	0C	0C
Tx Forward Power	0W	0W
Tx Reverse Power	0W	0W
PA Current	0A	0A

Refresh Clear Errors

7.6.2.1 RADIO STATUS

- **Radio in Use.** This field displays which radio is currently in use.
- **Radio Status (A and B).** These fields display the status of Radio A and B. If an error is detected with either radio it will be reported on these lines.
- **Radio Failures Detected.** Displays the number of times a failure was detected with the radios.

7.6.2.2 RADIO DIAGNOSTICS

The statistics reported in this section are measured and reported by the individual radio(s).

- **MAC Address.** This field displays the MAC Address of the radio(s).
- **Input Voltage.** This field displays the voltage level supplied to the radios from the Viper SC Base Station Controller.
- **Temperature.** This field displays the current temperature being read from within the radio.
- **Tx Forward Power.** This field displays the current forward power measured by the radio on its last transmission.
- **Tx Reverse Power.** This field displays the current reverse/reflected power measured by the radio on its last transmission.

- **PA Current.** This field displays the DC current that the power amplifier of the radio was drawing during its last transmission.
- **Refresh.** The button will update the webpage to reflect the most recent changes.

## 7.7 SYSTEM MONITOR

### 7.7.1 REDUNDANT SETUP

This webpage is only available with redundant versions of the Base Station. The link will not appear in the Standard version of the Base Station. The Redundant Setup webpage allows the user to program a remote IP address that the Viper SC Base Station Controller will ping to determine if the RF link is working. This page also allows the user to select Auto or Manual Override mode, switch between radios A and B, and select Cold or Warm Standby Mode.

Figure 35 - Redundant Setup Webpage

## Redundant Setup

▶ Help

Ping Settings	
<b>Primary Ping IP Address</b>	<input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/>
<b>Secondary Ping IP Address</b>	<input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid #ccc;" type="text"/>
<b>Ping Timer</b>	<input style="width: 40px; height: 20px; border: 1px solid #ccc;" type="text"/> (0=disabled, 10-3600) 5s steps
<b>Ping Failure Threshold</b>	<input style="width: 40px; height: 20px; border: 1px solid #ccc;" type="text"/> (3-10)
<b>Boot Delay</b>	<input style="width: 40px; height: 20px; border: 1px solid #ccc;" type="text"/> min

Controller Operation	
<b>Mode</b>	<input type="radio"/> Auto Select <input checked="" type="radio"/> Manual Override
<b>Primary Radio</b>	<input type="radio"/> Radio A <input checked="" type="radio"/> Radio B
<b>Standby Mode</b>	<input checked="" type="radio"/> Cold <input type="radio"/> Warm

---

### 7.7.1.1 PING SETTINGS

- **Primary Ping IP Address**  
Enter the IP address of a remote radio. The Viper SC Base Station will generate a ping request to the IP address specified after X number of seconds of inactivity as specified by the Inactivity Ping Timer. The primary and secondary IP ping address should be remote radios that are located one RF hop from the Base Station.

**Note: If the primary and secondary IP addresses are on separate subnets from the Viper SC Base Station Controller, static routes must be programmed into the Routing Table of the Viper SC Base Station Controller. If the routes are not programmed in, the Viper SC Base Station Controller will be unable to ping the remote addresses and the pings will fail.**

- **Secondary Ping IP Address**  
If pings to the Primary IP address fail, the Viper SC Base Station will attempt to ping the secondary IP address. The secondary ping IP address is not required for the ping utility to function and may be left blank if desired.
- **PING Timer**  
This field specifies an inactivity interval in increments of 5 seconds. The Viper SC Base Station will ping the primary or secondary IP addresses after the specified period of inactivity. Inactivity is defined as no packets received or no packets transmitted from the radio. Enter 0 to disable this feature. Typical value is 120 seconds. If there is not IP packets received in 120 from the primary remote Viper SC then it will be pinged.
- **Ping Failure Threshold**  
The Viper SC Base Station will switch to the back-up radio if both the primary and the secondary (if available) pings fail this number of times. The failure counter is reset each time a ping is successful. Typically set to 5.
- **Boot Delay**  
The Base Station Controller will wait the specified number of minutes after booting up the radio before attempting to ping. This parameter is useful when using VPN security with the Viper SC radios. The boot delay allows the VPN tunnels to be recreated before the Controller will attempt the first ping. Typically set to 5 minutes.

---

### 7.7.1.2 CONTROLLER OPERATION

- **Mode**  
The user can set the operational mode of the Base Station. Select "Auto" to allow the Viper SC Base Station to automatically detect radio failures and switch to the back-up radio in the event of a failure. Select "Manual Override" to override the Base Station's error detection algorithm and force the use of either Radio A or Radio B.
- **Primary Radio**  
In Auto mode, this setting selects which radio is the primary radio and which is the backup radio. In Manual Override mode, this setting selects which radio is currently in use.
- **Standby Mode**  
In cold standby mode, the Primary radio is powered and active. The backup radio is powered off. When the base station switches from the primary radio to the backup radio, the primary radio is first powered off. Then the backup radio is powered on. Communication resumes when the backup radio has finished its boot cycle.

In warm standby mode, both the primary and backup radios are powered simultaneously. The backup radio's transmitter, Ethernet, and serial ports are disabled. When the base station controller switches from the primary to the backup radio, the primary radio's transmitter, Ethernet, and serial ports are disabled. Then, the backup radio's transmitter, Ethernet, and serial ports are enabled.

The switch between radios occurs faster in warm standby than in cold standby because the base station controller does not have to wait for the backup radio to boot up. In warm standby, the radios can typically switch in about 5 to 6 seconds instead of 20 to 30 seconds for cold standby.

**The Viper SC VPN module is not compatible with warm standby mode.** If VPN is enabled in the Viper SC network, the base station controller should be set for cold standby only. If warm standby mode is selected while VPN is enabled, it may take a very long time for remote Viper SCs to reestablish tunnels with the VPN server and resume communication. When a Viper SC configured as a VPN server powers on, it broadcasts a status message instructing all remotes to reestablish their VPN tunnels. In warm standby mode, that broadcast message is not sent (since the backup Viper SC was already powered on) and the remote Viper SCs will not reconnect to the VPN server until they timeout.

### 7.7.2 PING STATISTICS

This webpage is only available with Redundant versions of the Base Station. The link will not appear in the Standard version of the Base Station. The Ping Statistics page show how often and with what success rate the Viper SC Base Station Controller has been at pinging the primary and secondary IP addresses specified on the Redundant Setup webpage.

- **Destination IP Address.** This field displays the destination IP address the Controller Board is attempting to ping.
- **Attempts.** This field displays the number of attempted pings to either the Primary or the Secondary IP address.
- **Successful Pings.** This field displays the number of successful pings to either the Primary or the Secondary IP address.
- **Failed Pings.** This field displays the number of failed pings to either the Primary or the Secondary IP address.

Figure 36 - Ping Statistics Webpage

Primary Address Pings	
Destination IP Address	...
Attempts	0
Successful Pings	0
Failed Pings	0

Secondary Address Pings	
Destination IP Address	
Attempts	0
Successful Pings	0
Failed Pings	0

Refresh Clear

## APPENDIX A: BASE STATION SPECIFICATIONS

These specifications are subject to change without notice.

General				
Power Source	11-30 VDC, Negative GND			
RF Impedance	50 $\Omega$			
Operating Temperature	-30° to + 60° C			
Storage Temperature	-40° to + 85° C			
Operating Humidity	5% to 95% non-condensing RH			
Rx Current Drain at 25°C with one Viper SC powered.		DC Input 11V	DC Input 20V	DC Input 30V
	All Relays On	1.7 A (max)	1.2 A (max)	760 mA (max)
	All Relays Off	1.5 A (typ)	945 mA (typ)	646 mA (typ)
	All Relays Off	1.3 A (typ)	925 mA (typ)	622 mA (typ)
Tx Current Drain at 25°C with one Viper SC powered.	Power Out	DC Input 11V	DC Input 20V	DC Input 30V
	Tx Pwr: Max	6.7 A (max)	4.7 A (max)	2.9 A (max)
	All Relays On	4.5 A (typ)	3.1 A (typ)	1.9 A (typ)
	All Relays Off	4.3 A (typ)	2.9 A (typ))	1.7 A (typ)
	Tx Pwr: 1W	2.6 A (max)	1.7 A (max)	1.1 A (max)
	All Relays On	2.1 A (typ)	1.4 A (typ)	880 mA (typ)
	All Relays Off	1.9 A (typ)	1.2 A (typ)	860 mA (typ)
Cold start	60 seconds			
Nominal Dimensions	Chassis: 16" W x 4.75" H x 11.375" D (41 x 12 x 29 cm) Front Panel: 19" x 5.22" x 0.25" (48 x 13 x 0.6 cm)			
Shipping Weight	Standard: 11.5 lbs. (5.2 kg), Redundant: 15 lbs. (6.8 kg)			
Mounting Options	19" Rack Mount			
RF Specifications	See radio specifications and user manual			
Regulatory Certifications	See Appendix B			

Display	
12 Status LEDs (Standard)	Controller LEDs: Power, Status, Fan Error
17 Status LEDs (Redundant)	Data LEDs: COM Data, Setup Data, Link/Act 1, Link/Act 2
	Radio LEDs: Tx, Power, Error, Link/Act
	Other: Alarm Disabled, Manual Override (Redundant Models only)

Connectors	
Antenna Connector	N Female (Tx/Rx)
Serial Setup Port	DE-9F
Serial Com Port	DE-9F
Ethernet RJ-45	Two 10/100 BaseT auto-MDIX (The 2 Ethernet connections are connected internally to each other and to the radio(s) with an embedded Ethernet Switch.)
Main Power	Power Header
	4 Pin, 5.08mm, Power Header
	Power Plug
	4 Pin, 5.08mm Power Header Cable: 60 inches Connections:

		<ul style="list-style-type: none"> <li>• Aux Power A</li> <li>• Ground</li> <li>• Power</li> <li>• Aux Power B</li> </ul>
Alarm – I/O; Radio – I/O	Header	Plug
	8 Pin, 3.5mm, Header	8 Pin 3.5mm Tension Clamp Conductor Size: 18-28 AWG
Internal Auxiliary Power	Header	Plug
	4 Pin, 3.5mm, Power Header	4 Pin, 3.5mm, Power Plug Connections: <ul style="list-style-type: none"> <li>• Aux Power B</li> <li>• Power</li> <li>• Ground</li> <li>• Aux Power A</li> </ul>
Alarm I/O Port Specifications	Relays	
	Max Switching Current: Relay 1 or 2 (Pins 1, 2, 3, 4, 5, 6)	1 A
	Max Voltage on Relay 1 (Pins 2, 4, 6)	+/-110 V (DC) +/-125 V (AC)
	Max Voltage on Relay 2 (Pins 1, 3, 5)	+/-50 V
	Max Switching Power	30 W (DC); 37.5 VA (AC)
	Digital Inputs and Outputs	
	VIH: High Level Input Voltage (Pins: 1, 5, 7) I/O Supply Voltage = 1.8V I/O Supply Voltage = 3.3V	1.2 V min 2.0 V min
	VIL: Low Level Input Voltage (Pins: 1, 5, 7) I/O Supply Voltage= 1.8V I/O Supply Voltage = 3.3V	0.6 V max 0.8 V max
	Digital Inputs: Input Impedance (Pins 1, 5)	150k ohms
	Digital I/O: Input/Output Impedance (Pin 7)	100 ohms
	Min/Max Input Voltage Pins 1, 5 Pin 7 (I/O Supply = 1.8V) Pin 7 (I/O Supply = 3.3V)	+/-50 V max -1.0 V min, +2.8 V max -1.0 V min, +4.3 V max
	Output Voltage: Pin 7 Output High: (I/O Supply = 1.8V, I <sub>source</sub> = 1mA) (I/O Supply = 3.3V, I <sub>source</sub> = 1mA) Output Low: (I/O Supply = 1.8V, I <sub>sink</sub> = 1mA) (I/O Supply = 3.3V, I <sub>sink</sub> = 1mA)	1.7V (typical) 3.2V (typical) 0.1V (typical) 0.1V (typical)
	Analog Input	
	Analog Input (Pin 7) Range I/O Supply = 1.8V I/O Supply = 3.3V	0.0 V to 1.8 V 0.0 V to 3.3 V
	Analog Input Accuracy	+/- 0.1 V



**APPENDIX B: REGULATORY CERTIFICATIONS**

Model Number	Frequency Range	FCC	IC (DOC)	EU (EN 300 113)	Australia/NZ
140-5118-500 140-5118-501 140-5118-502 140-5118-503 140-5318-500 140-5318-501 140-5318-502 140-5318-503	136 – 174 MHz	NP4-5018-500	773B-5018500		
140-5118-600 140-5118-601 140-5318-600 140-5318-601	142 – 174 MHz			CE1588 Ⓢ	ACMA AS/NZS 4295-2004 (Spectrum Impact Assessment)
140-5128-502 140-5128-503 140-5328-502 140-5328-503	215 – 240 MHz	NP4-5028-502	773B-5028502		
140-5148-300 140-5148-301 140-5148-302 140-5148-303 140-5348-300 140-5348-301 140-5348-302 140-5348-303	406.1 - 470 MHz	NP4-5048-300	773B-5048300		
140-5148-400 140-5148-401 140-5348-400 140-5348-401	406.1 - 470 MHz			CE1588 Ⓢ	ACMA AS/NZS 4295-2004 (Spectrum Impact Assessment)
140-5148-500 140-5148-501 140-5148-502 140-5148-503 140-5348-500 140-5348-501 140-5348-502 140-5348-503	450 - 512 MHz	NP4-5048-300	773B-5048300		
140-5148-600 140-5148-601 140-5348-600 140-5348-601	450 - 512 MHz			CE1588 Ⓢ	ACMA AS/NZS 4295-2004 (Spectrum Impact Assessment)

Model Number	Frequency Range	FCC	IC (DOC)	EU (EN 300 113)	Australia/NZ
140-5198-500 140-5198-501 140-5198-502 140-5198-503 140-5398-500 140-5398-501 140-5398-502 140-5398-503	928 - 960 MHz	NP4-5098-500	773B-5098500		

**DECLARATION OF CONFORMITY FOR ETSI MODELS # 140-5xx8-40x and 140-5xx8-60x**

The Viper SC Base Station is tested to and conforms to the essential requirements for protection of health and safety of the user and any other person and Electromagnetic Compatibility, as included in the following standards:







Standard	Issue Date
EN 60950-1	2006 (with Amendment A11: 2009 + A1: 2010)
EN 301 489-1	2008-04
EN 301 489-5	2002-08















And is tested to and conforms to the essential radio test suites so that it effectively uses the frequency spectrum allocated to terrestrial/space radio communication and orbital resources so to as to avoid harmful interference, as included in following standards:

Standard	Issue Date
EN 300 113-1/-2	2009-11

And therefore complies with the essential requirements and provisions of the **Directive 1999/5/EC** of the European Parliament and of the council of March 9, 1999 on Radio equipment and Telecommunications Terminal Equipment and the mutual recognition of their conformity and with the provisions of Annex IV (Conformity Assessment procedure referred to in article 10).

This device is a data transceiver intended for commercial and industrial use in all EU and EFTA member states.

 Český [Czech]	CalAmp tímto prohlašuje, že tento rádio je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
 Dansk [Danish]	Undertegnede CalAmp erklærer herved, at følgende udstyr radio overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
 Deutsch [German]	Hiermit erkläre CalAmp, dass sich das Gerät radio in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
 Eesti [Estonian]	Käesolevaga kinnitab CalAmp seadme radio vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
 English	Hereby, CalAmp, declares that this radio is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
 Español [Spanish]	Por medio de la presente CalAmp declara que el radio cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.

 Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ CalAmp ΔΗΛΩΝΕΙ ΟΤΙ ΡΑΔΙΟΦΩΝΟ ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
 Français [French]	Par la présente CalAmp déclare que l'appareil radio est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
 Italiano [Italian]	Con la presente CalAmp dichiara che questo radio è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
 Latviski [Latvian]	Ar šo CalAmp deklarē, ka radio atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
 Lietuvių [Lithuanian]	Šiuo CalAmp deklaruoja, kad šis radijo atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
 Nederlands [Dutch]	Hierbij verklaart CalAmp dat het toestel radio in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
 Malti [Maltese]	Hawnhekk, CalAmp , jiddikjara li dan tar-radju jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn rilevanti li hemm fid-Direttiva 1999/5/EC.
 Magyar [Hungarian]	Alulírott, CalAmp nyilatkozom, hogy a rádió megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
 Polski [Polish]	Niniejszym CalAmp oświadcza, że radio jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
 Português [Portuguese]	CalAmp declara que este rádio está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
 Slovensko [Slovenian]	CalAmp izjavlja, da je ta radio v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
 Slovensky [Slovak]	CalAmp týmto vyhlasuje, že rádio spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
 Suomi [Finnish]	CalAmp vakuuttaa täten että radio tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
 Svenska [Swedish]	Härmed intygar CalAmp att denna radio står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Íslenska [Icelandic]	Hér með lýsir CalAmp yfir því að útlarp er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
 Norsk [Norwegian]	CalAmp erklærer herved at utstyret radio er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

**EU and EFTA Member States' Acceptable Frequency Table**

Country	Acceptable Frequencies	Prohibited Frequencies
<b>Belgium</b>	146-174, 406.1–430 or 440-470 450–470	470–512
<b>Bulgaria</b>	None	All
<b>Denmark</b>	406.125-470, 450-511.975	136-174
<b>Estonia</b>	None	All
<b>France</b>	Contact Authority	Contact Authority
<b>Germany</b>	Contact Authority	Contact Authority
<b>Greece</b>	142-174 421–449	406.1250-420 450-511.975
<b>Hungary</b>	142-174 406.125-470 450-511.975	Contact Authority
<b>Italy</b>	142-174	Contact Authority
<b>Latvia</b>	142-174 406.125-470	450-470 470-511.975
<b>Lithuania</b>	406.125–430 440–470	136-146 430–440 470-512
<b>Luxembourg</b>	146-156.5125 156.5375-156.7625 156.8375-169.4 169.825-174 406.1-430 440-470	142-145 431-439 471-511.975
<b>Malta</b>	Contact Authority	Contact Authority
<b>Slovak Republic</b>	146-174 410–448	142-145 406.25-409, 449-470 450-511.975
<b>Slovenia</b>	146-174 401.6–410, 440–470 450-470	142-145 411–439 471-511.975
<b>Spain</b>	147-174 406.1-470	430-440
<b>All other EU and EFTA Member States</b>	142-174 406.125 – 512	

The countries not listed above did not reply to the notification, which means the country authority did not have any question or problem with the notification information, however it will still be necessary to obtain a license and/or authorization from the appropriate country authority, and to operate the device in accordance with the frequency, power and other conditions set forth in the authorization.

## APPENDIX C: PRODUCT WARRANTY

CalAmp warrants to the original purchaser for use ("Buyer") that data telemetry products manufactured by DRL ("Products") are free from defects in material and workmanship and will conform to DRL's published technical specifications for a period of, except as noted below, one (1) year from the date of shipment to Buyer. DRL makes no warranty with respect to any equipment not manufactured by DRL, and any such equipment shall carry the original equipment manufacturer's warranty only. DRL further makes no warranty as to and specifically disclaims liability for, availability, range, coverage, grade of service or operation of the repeater system provided by the carrier or repeater operator. Any return shipping charges for third party equipment to their respective repair facilities are chargeable and will be passed on to the Buyer.

If any Product fails to meet the warranty set forth above during the applicable warranty period and is returned to a location designated by DRL. DRL, at its option, shall either repair or replace such defective Product, directly or through an authorized service agent, within thirty (30) days of receipt of same. No Products may be returned without prior authorization from DRL. Any repaired or replaced Products shall be warranted for the remainder of the original warranty period. Buyer shall pay all shipping charges, handling charges, fees and duties for returning defective Products to DRL or DRL's authorized service agent. DRL will pay the return shipping charges if the Product is repaired or replaced under warranty, exclusive of fees and duties. Repair or replacement of defective Products as set forth in this paragraph fulfills any and all warranty obligations on the part of DRL.

This warranty is void and DRL shall not be obligated to replace or repair any Products if (i) the Product has been used in other than its normal and customary manner; (ii) the Product has been subject to misuse, accident, neglect or damage or has been used other than with DRL approved accessories and equipment; (iii) unauthorized alteration or repairs have been made or unapproved parts have been used in or with the Product; or (iv) Buyer failed to notify DRL or DRL's authorized service agent of the defect during the applicable warranty period. DRL is the final arbiter of such claims.

THE AFORESAID WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. DRL AND BUYER AGREE THAT BUYER'S EXCLUSIVE REMEDY FOR ANY BREACH OF ANY OF SAID WARRANTIES IS AS SET FORTH ABOVE. BUYER AGREES THAT IN NO EVENT SHALL DRL BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES WHETHER ON THE BASIS OF NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. The purpose of the exclusive remedies set forth above shall be to provide Buyer with repair or replacement of non-complying Products in the manner provided above. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as DRL is willing and able to repair or replace non-complying Products in the manner set forth above.

This warranty applies to all Products sold worldwide. Some states do not allow limitations on implied warranties so the above limitations may not be applicable. You may also have other rights, which vary from state to state.

### EXCEPTIONS

THIRTY DAY: Tuning and adjustment of telemetry radios

NO WARRANTY: Fuses, lamps and other expendable parts

## APPENDIX D: DEFINITIONS

**Access Point:** Communication hub for users to connect to a LAN. Access Points are important for providing heightened wireless security and for extending the physical range of wireless service accessibility

**Airlink:** Physical radio frequency connections used for communications between units

**ARP:** Address Resolution Protocol – Maps Internet address to physical address

**Backbone:** The part of a network connecting of the bulk of the systems and networks together - handling the most data

**Bandwidth:** The transmission capacity of a given device or network

**Browser:** An application program providing the interface to view and interact with all the information on the World Wide Web

**COM Port:** Both RS-232 serial communications ports of the Radio wireless radio modem. Configured as DCE and designed to connect directly to a DTE

**Default Gateway:** A device forwarding Internet traffic from your local area network

**DCE (Data Communications Equipment):** This designation is applied to equipment like modems. DCE is designed to connect to DTE

**DHCP (Dynamic Host Configuration Protocol):** A networking protocol that allows administrators to assign temporary IP addresses to network computers by "leasing" an IP address to a user for a limited amount of time, instead of assigning permanent IP addresses

**DNS (Domain Name Server):** Translates the domain name into an IP address

**Domain:** A specific name for a network of computers

**DTE (Data Terminal Equipment):** This designation is applied to equipment such as terminals, PCs, RTUs, PLCs, etc. DTE is designed to connect to DCE

**Dynamic IP Address:** A temporary IP address assigned by a DHCP server

**Ethernet:** IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium

**Firewall:** A set of related programs located at a network gateway server that protects the resources of a network from users on other networks

**Firmware:** The embedded programming code running a networking device

**Fragmentation:** Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet

**FTP (File Transfer Protocol):** A protocol used to transfer files over a TCP/IP network

**Gateway:** A device interconnecting networks with different, incompatible communications protocols

**HDX (Half Duplex):** Data transmission occurring in two directions over a single line, using separate Tx and Rx frequencies, but only one direction at a time

**HTTP (Hypertext Transport Protocol):** Communications protocol used to connect to servers on the World Wide Web

**IPCONFIG:** A Windows 2000 and XP utility that displays the IP address for a particular networking device

**MAC (Media Access Control):** The unique address a manufacturer assigns to each networking device

**MTU (Maximum Transmission Unit):** The largest TCP/IP packet hardware can carry

**NAT (Network Address Translation):** NAT technology translates IP addresses of a local area network to a different IP address for the Internet

**Network:** A series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users

**Network speed:** Bit rate on the RF link between units in a network

**Node:** A network junction or connection point, typically a computer or work station

**OIP (Optimized IP):** Compresses TCP and UDP headers, and filters unnecessary acknowledgments. OIP makes the most use of the available bandwidth

**OTA (Over the Air):** Standard for the transmission and reception of application-related information in a wireless communications system

**PHY:** A PHY chip (called PHYceiver) provides the interface to Ethernet transmission medium. Its purpose is digital access of the modulated link (usually used together with an MII-chip). The PHY defines data rates and transmission method parameters

**Ping (Packet Internet Groper):** An Internet utility used to determine whether a particular IP address is online

**PLC (Programmable Logic Controller):** An intelligent device that can make decisions, gather and report information, and control other devices

**RIPv2:** Dynamic IP routing protocol based on the distance vector algorithm

**Router:** A networking device connecting multiple networks

**RS-232:** Industry–standard interface for data transfer

**RTU (Remote Terminal Unit):** A SCADA device used to gather information or control other devices

**SCADA (Supervisory Control and Data Acquisition):** A general term referring to systems gathering data and/or performing control operations

**SNTP (Simple Network Time Protocol):** Protocol for synchronizing clocks of computer systems over packet-switched, variable-latency data networks. Uses UDP as its transport layer

**Static IP Address:** A fixed address assigned to a computer or device connected to a network

**Static Routing:** Forwarding data in a network via a fixed path

**Subnet Mask:** An Ethernet address code determining network size

**Switch:** A device connecting computing devices to host computers, allowing a large number of devices to share a limited number of ports

**TCP (Transmission Control Protocol):** A network protocol for transmitting data that requires acknowledgement from the recipient of data sent

**TCP/IP (Transmission Control Protocol/Internet Protocol):** A set of protocols for network communications

**Telnet:** User command and TCP/IP protocol used for accessing remote PCs

**TFTP (Trivial File Transfer Protocol):** UDP/IP based file transfer protocol

**Topology:** The physical layout of a network

**Transparent:** Device capable of transmitting all data without regard to special characters, etc.

**Terminal Server:** Acts as a converter between Ethernet/IP and RS-232 protocols

**UDP (User Datagram Protocol):** Network protocol for transmitting data that does not require acknowledgement from the recipient of the sent data

**Upgrade:** To replace existing software or firmware with a newer version

**URL (Universal Resource Locator):** The address of a file located on the Internet