VIPER SC+™ BASE STATION

DIGITAL INFRASTRUCTURE FOR VIPER SC+ SERIES

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User Manual
Viper SC+™ Base Station Digital Infrastructure for Viper SC+ Series
PN 001-5100-000 Rev. B
Revised February 2014

REVISION HISTORY

REV	DATE	REVISION DETAILS
0	December 9, 2009	Initial release 001-5100-000.
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 version sections 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.
A	January 2014	Added new models, Viper SC™+; all Viper SC™ models become Viper SC+ when upgraded with new Viper SC+ firmware. Updated the chapter about the Viper Web Interface to add sections to explain the new menu selections for DeviceOutlook™ and IP Relay Agent.
B	February 2014	Corrected Section 6 – Firmware Upgrade instructions were in error.

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+™ and Viper SC+ Base Station are used in a normal manner with a well-constructed network. 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 or 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 Viper SC+ or Viper SC+ Base Station, or for the failure of Viper SC+ or Base Station to transmit or receive such data.

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RF Exposure Compliance Requirements

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

Minimum Safety Distance	Antenna Gain		
(cm @max power)	**5 dBi**	**10 dBi**	**15 dBi**
132 MHz (VHF)	123 cm	219 cm	389 cm
215 MHz (UHF)	123 cm	219 cm	389 cm
406.1 MHz	106 cm	188 cm	334 cm
900 MHz (Model/PN 140-5198-304, 140-5398-304)	66 cm	117 cm	208 cm
900 MHz (Model/PN 140-5198-504, 140-5398-504)	64 cm	115 cm	202 cm

Note: *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 above. 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.*

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.

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. 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)

Caution: Before you deploy your system, you must read and understand Section 2.2 Selecting Antenna and Lightning Arrestor Combinations.

Exigences de conformité d'exposition aux Radiofréquences

Exposition aux Radiofréquences

La radio Viper SC+ est destinée à être utilisé dans les marchés contrôles industriels et SCADA. L'unité Viper SC doit être installée par un professionnel et doit assurer une distance minimale de séparation entre les sources radiantes et toute personne. Les distances sont indiquées dans le tableau ci-dessous. L'installation typique est une antenne de type fouet 1/2-longueur d'onde installée sur un poteau ou pylône.

Distance de sécurité minimum	Gain de Antenne		
(puissance cm @ max)	**5 dBi**	**10 dBi**	**15 dBi**
132 MHz (VHF)	123 cm	219 cm	389 cm
215 MHz (UHF)	123 cm	219 cm	389 cm
406.1 MHz	106 cm	188 cm	334 cm
900 MHz (Modèle # 140-5198-304, 140-5398-304)	66 cm	117 cm	208 cm
900 MHz (Modèle # 140-5198-504, 140-5398-504)	64 cm	115 cm	202 cm

Note: *Il est de la responsabilité de l'utilisateur de garantir le respect des règlements MPE de la FCC lorsque vous utilisez cet appareil d'une façon autre que celle décrite ci-dessus. L'installateur doit s'assurer que l'antenne est située ou orientée de façon à ne pas émettre un champ RF dépassant les limites de radiations pour la population générale établies par Santé Canada.*

La radio Viper SC+ utilise un émetteur à radiofréquence à faible puissance. L'énergie concentrée d'une antenne peut poser un risque pour la santé. On ne devrait pas être en face de l'antenne lorsque l'émetteur est en marche.

Les consignes de sécurité recommandées pour l'exposition humaine à l'énergie électromagnétiques de radiofréquences sont contenues dans le Code 6 canadien de la sécurité (disponible auprès de Santé Canada), la Commission Communications Fédéral (FCC) Bulletin 65 et la recommandation du 12 Juillet 1999 sur la limitation de l'exposition du public aux champs électromagnétiques (de 0 Hz à 300 GHz) (1999/519/CE) du Conseil de l'Union européenne.

Class A Digital Device Compliance

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

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.

TABLE OF CONTENTS

1 VIPER SC+ BASE STATION OVERVIEW

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

- The Standard Base Station uses a single Viper SC+ radio to transmit and receive data from remote radios.
- The Redundant Base Station uses two Viper SC+ 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 web pages. You must access the controller's web pages 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-inch-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 omnidirectional 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 Chapter 2 about Antennas and RF Exposure for information about 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 Chapter 5, which documents the Viper SC+ Base Station Web Interface.

The Viper SC+ Base Station consists of a Controller Board, and LED display board, two fans, and shelving to house one (Standard) or a pair of (Redundant) Viper SC+ radios in a rugged aluminum case. The unit is not hermetically sealed and should be mounted in a suitable enclosure when dust, moisture, 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. The following figure shows the physical dimensions of the Viper SC+ Base Station.

Figure 1 Base Station Dimensions (Units are in inches.)

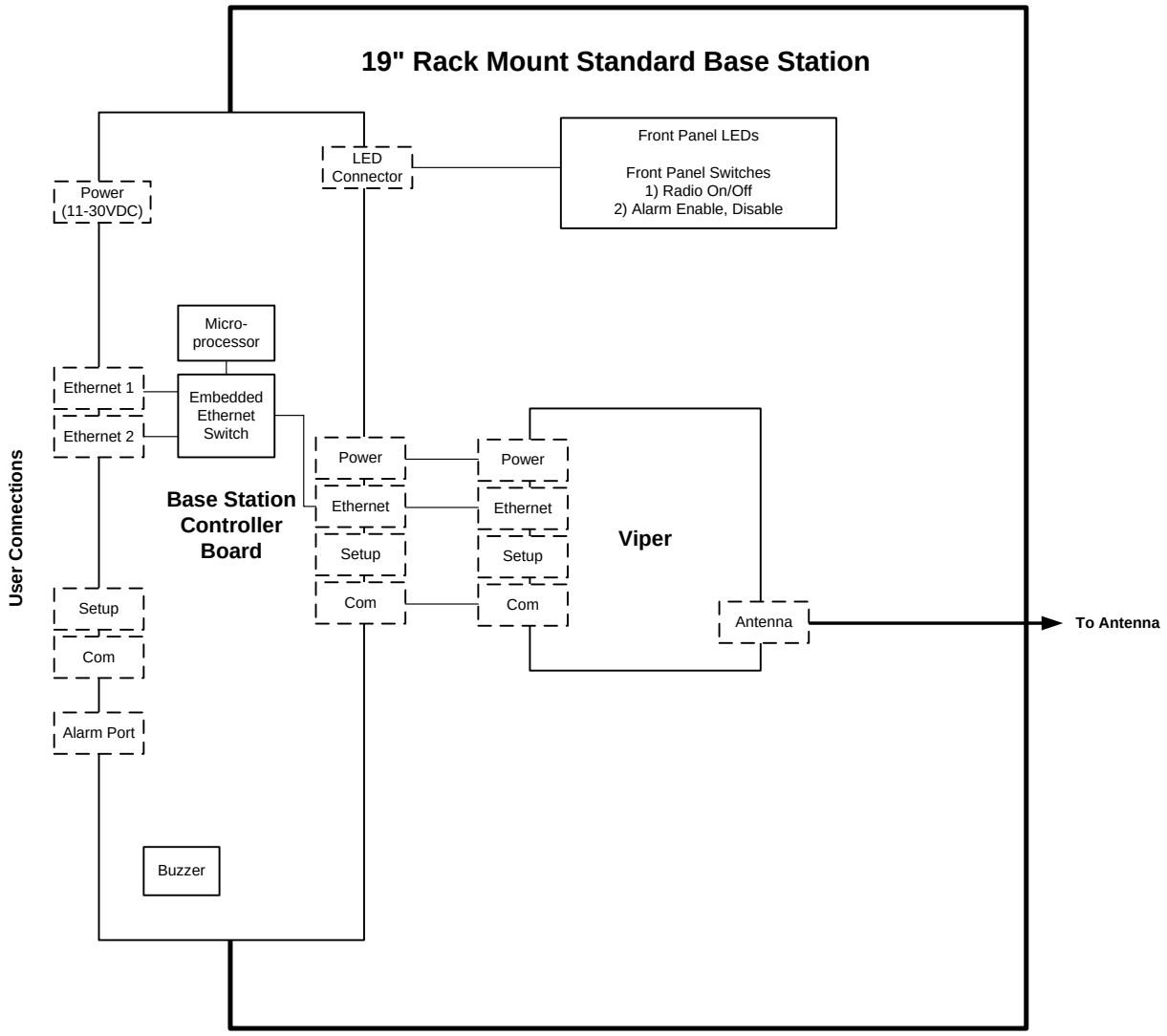
1.1 VIPER SC+ STANDARD BASE STATION OVERVIEW

The Standard Base Station consists of one Viper SC+ in a 19-inch-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 web pages. Both external Ethernet connections are connected by an embedded Ethernet switch to the radio. The Standard Base Station provides access to the SETUP and COM Ports of the internal Viper SC+.

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

The following figure 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-inch rack-mountable chassis.

Figure 2 Viper SC+ Standard Base Station Block Diagram



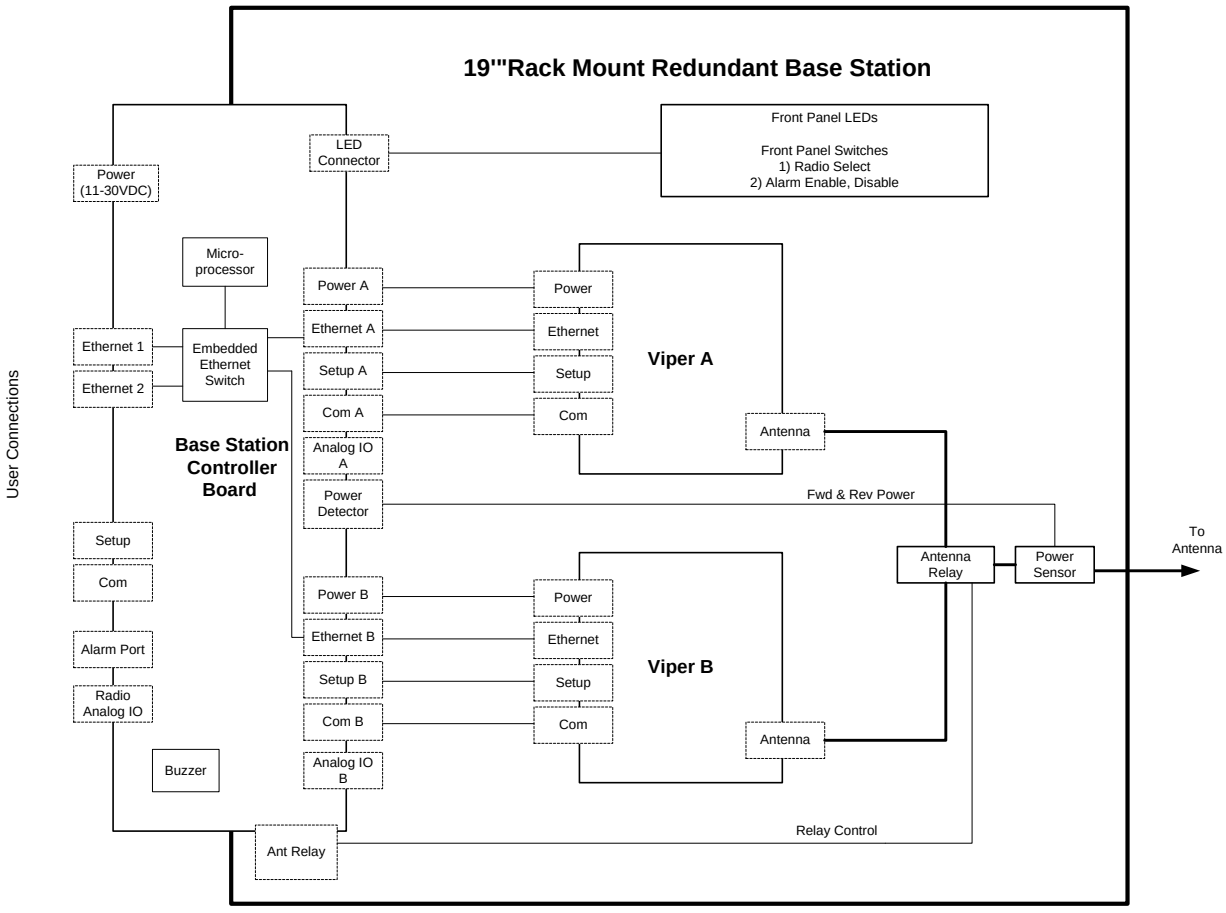
1.2 VIPER SC+ REDUNDANT BASE STATION OVERVIEW

The Viper SC+ Redundant Base Station has two Viper SC+ radios with identical RF and Ethernet MAC addresses, a Controller Board, an RF power sensor, and an RF antenna relay inside the 19-inch rack-mountable chassis.

The Viper SC+ Redundant Base Station features two 10/ 100 Base T Auto-MDIX Ethernet connections and an I/O Port which can be controlled or monitored from the Viper SC+ Base Station Controller's web pages. Both external Ethernet connections are connected by an embedded Ethernet switch to the radios. The Viper SC+ Redundant Base Station provides connections to the SETUP Port and the COM Port of the active Viper SC+ radio. The Ethernet, SETUP, and COM Ports are automatically routed by the Controller Board to whichever Viper SC+ radio is currently in use.

The following figure 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 SC+ radios, an antenna relay, and an RF power sensor, all contained in a 3U 19-inch 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 the first figure below is used on the Standard Base Station.
- The panel in the second figure below is used on the Redundant Base Station.

Each of the front panels has two push buttons and up to seventeen (17) tri-colored LEDs. The functionality of each LED is described in the table that follows.

Figure 4 Standard Base Station Control Panel

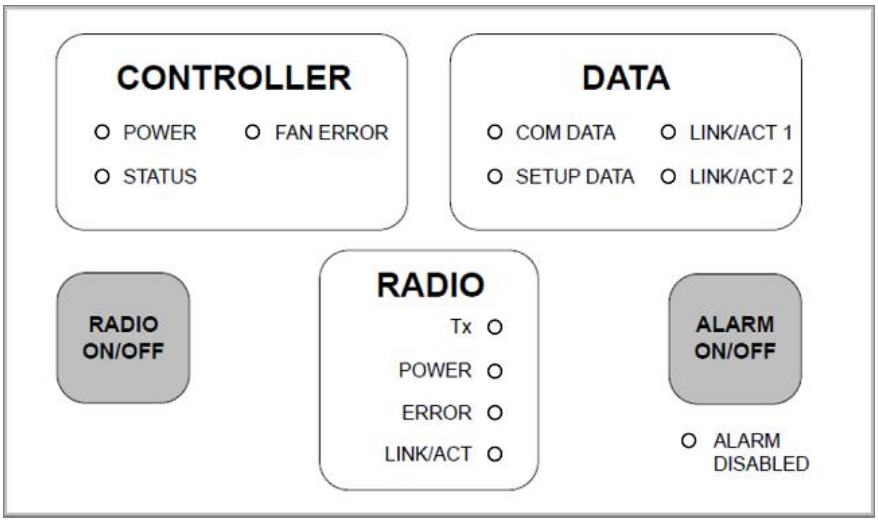
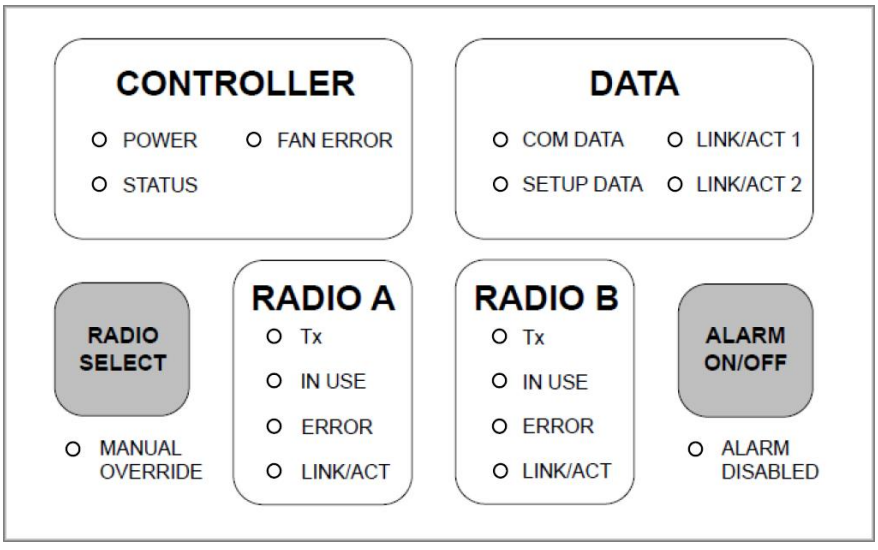


Figure 5 Redundant Base Station Control Panel



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

Table 1 Base Station Button Functionality

Base Station Version	Button Name	Button Function
Standard Base Station	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 in the Viper SC+ Base Station Controller will sound. This button disables or enables the alarm buzzer. **Hold the button down for five (5) seconds to clear any radio errors. You will hear two long beeps as errors are cleared.**
Redundant Base Station	Radio Select	Cycles through the modes listed below to turn the power on and off to the radios and and to select Auto or Manual Mode. 1. Radio A in Use, Auto Mode. 2. Radio A in Use, Manual Mode. 3. Radio B in Use, Auto Mode. 4. Radio B in Use, Manual Mode.
	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. **Note: Hold button down for five (5) seconds to clear any radio errors. You will hear two (2) long beeps as errors are cleared.**

The LED panel has twelve (12 – Standard Base Station) or seventeen (17 – Redundant Base Station) tri-color LEDs. The functionality of each LED is described in the following table.

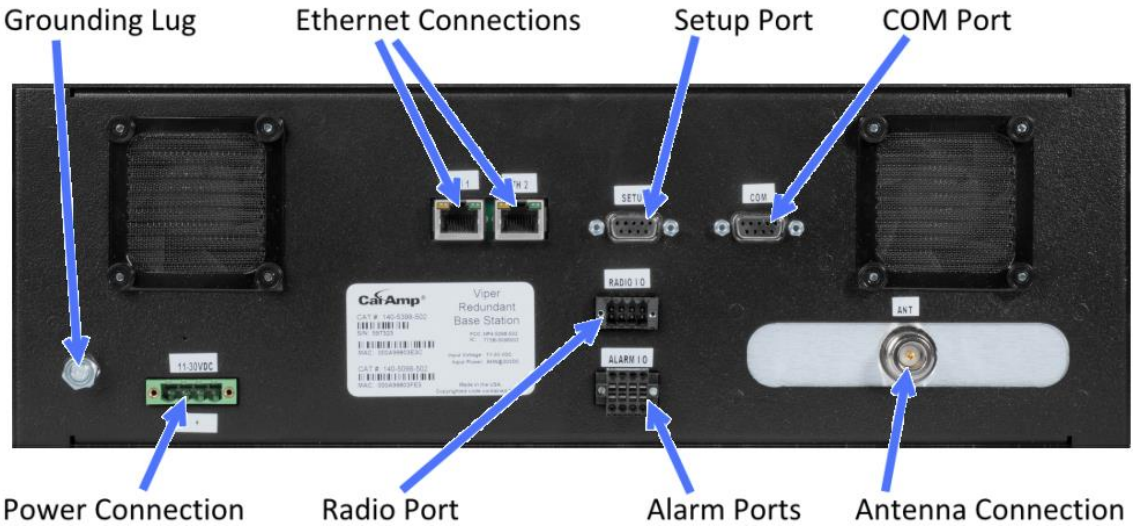
Table 2 Base Station LED Functionality

LED	Color	Definition
Power	Green (Solid) 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 or power is not applied
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 10 Mbit/s Activity at 10 Mbit/s Link at 100 Mbit/s Activity at 100 Mbit/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. For Redundant Base Station, 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 10 Mbit/s Activity at 10 Mbit/s Link at 100 Mbit/s Activity at 100 Mbit/s
Manual Override (redundant version only)	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 the preceding figure). The two external Ethernet Ports are connected to each other and to the Viper SC+ radio(s) inside the Base Station by 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 RJ-45 receptacles with a 10 Base T (or 100 Base T/Tx for 220 MHz and 290 MHz models) Ethernet connection and Auto-MDIX. Refer to the following table for pin-out descriptions and to instructions for Initial Configuration Using the Setup Wizard or to instructions for Setup (Basic), to configure the LAN settings for this port.

Table 3 – Pin-out for IEEE-802.3 RJ-45 Receptacle Contacts

Contact	10BaseT Signal
1	TXP(1)
2	TXN (1)
3	RXP (1)
4	SPARE
5	SPARE
6	RXN(1)
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 functions could be swapped.	

1.3.2.2 SETUP AND COM PORTS

The SETUP and COM serial connections are DE-9F RS-232 ports. Refer to the following table for pin-out descriptions for control line configurations of DCD, DTR, RTS, and CTS control lines.

Serial port considerations:

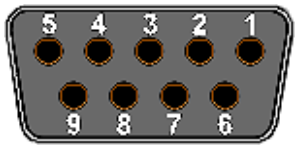
- Base Station SETUP and COM ports are Data Communication Equipment (DCE) devices.
- In general, equipment connected to the Base Station's Setup or COM serial ports are Data Terminal Equipment (DTE) and a straight-through cable is recommended.

Note: If a DCE device is connected to the Viper serial ports, a null-modem cable or adapter is required.

- In a Standard Base Station (with one Viper SC+ 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.

Table 4 – Pin-Out for DCE SETUP and COM Port, 9 Contact DE-9 Connector

SETUP / COM port Pin-Out



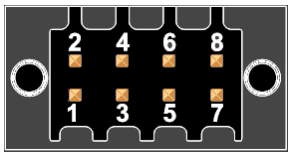
Contact Numbering

Contact	Signal Name	Signal Direction
1	Data Carrier Detect (DCD)(1)	DTE ← DCE
2	Receive Data (RxD)	DTE ← DCE
3	Transmit Data (TxD)	DTE → DCE
4	Data Terminal Ready (DTR)	DTE → DCE
5	Signal Ground (GND)	DTE — DCE
6	Data Set Ready (DSR)(2)	DTE ← DCE
7	Ready To Send (RTS)(1)	DTE → DCE
8	Clear To Send (CTS)(1)	DTE ← DCE
9	Ring Indicator (RI)(3)	DTE — DCE
(1) Programmable (2) Always asserted (3) Future use		

1.3.2.3 ALARM PORT

The Viper SC+ Base Station is equipped with an 8-pin plug that mates to the 8-pin header on the Alarm Port. The Alarm Port , shown in the following figure, has two relays and a general-purpose input/output pin. 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.

Alarm Connections



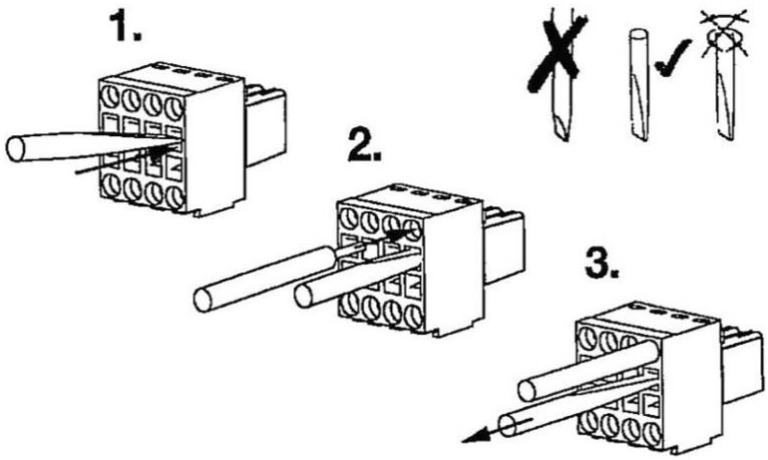
The plug features a spring-loaded retention clamp to make inserting and removing the wire or cable as simple as possible. To connect wires to the plug, use the following steps.

Step 1. Release Spring Clamp. Insert a small tool into one of the square holes as shown in the following figure. This will release the spring clamp for the nearest wire to allow the wire to be inserted or removed.

Step 2. Remove Insulation. Strip the insulation off the end of the wire and insert it into the round hole as shown in the following figure.

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



Note: Use a small flat-blade screw driver or similar tool specifically for this purpose. Do not use a twisting motion.

1.3.2.4 RADIO I/O PORT

The Radio I/O port is an 8-pin header that provides access to the Base Station 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 in the Redundant Base Station). 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.

1.3.2.5 POWER CONNECTOR

The Viper is supplied with a right-angle power connector (10-30 V DC) and 60 inches of cable. The following table shows the pin-out of the power connector.

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 Base Station Power Connector and Reset Button location

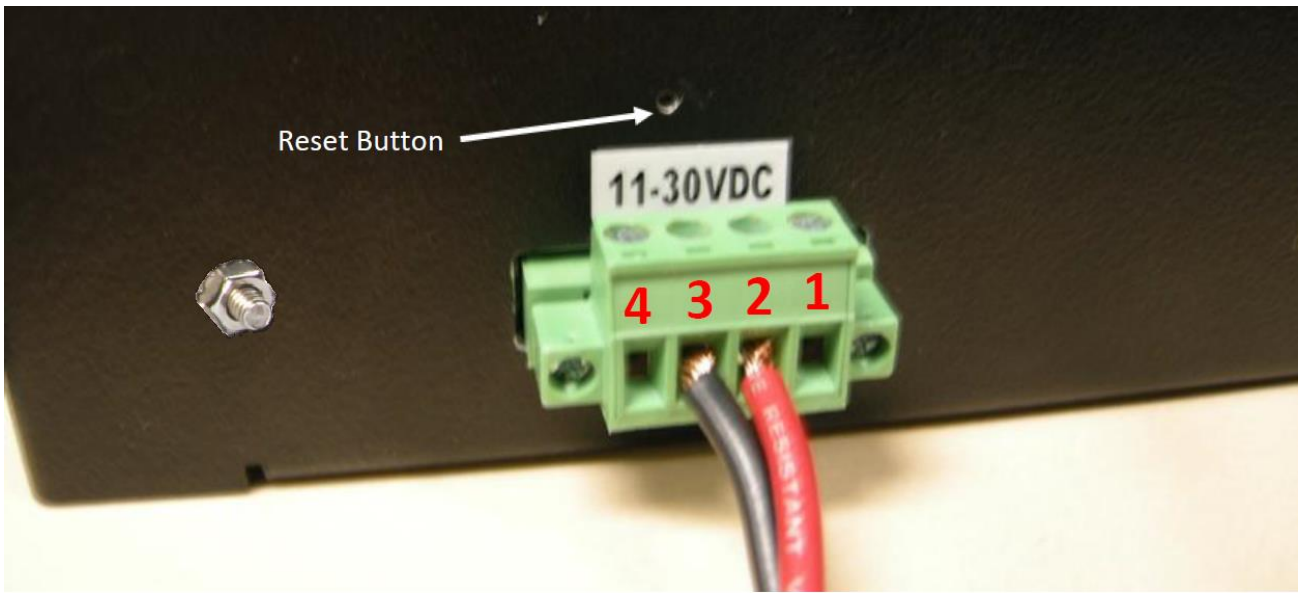
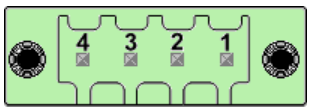


Table 5 – Pin-Out of the Power Connecto

Power Connector Pin-Out	Contact number (Left to Right)	Color	Description
	4	Not Connected	Auxiliary Power A
	3	Black	Ground
	2	Red	Positive (10-30) VDC
	1	Not Connected	Auxiliary Power B

1.3.2.6 RESET BUTTON

A small hole directly above the Base Station power connector allows access to the reset button. (See the figure above.)

To reset the Viper SC+ Base Station, place the end of a paperclip or similar object into the hole to press and hold the reset button for five (5) seconds. After five seconds, you will hear short chirp, and the settings of the Base Station will be reset to the factory defaults. After the settings have been reset, the Base Station will automatically reboot.

Note: This operation will reset 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

Standard and Redundant Viper SC+ Base Stations have a single 50 ohm N female antenna connector. This connection functions for both transmit and receive. In the Redundant Base Station, an internal RF relay will automatically switch the antenna connection to whichever radio is currently in use.

Warning: ***See Selecting Antenna and Lightning Arrestor Combinations for information about types of lightning arrestors to not use and good design practices to use when selecting a lightning arrestor for use with an antenna.***

Dual RF port models feature a 50 ohm N female antenna connector functioning for transmit (only) and a 50 ohm SMA female antenna connector functioning for receive (only). The separate receive antenna connector is ideal for applications that require additional receive filtering, external PA(s) and other options.

Warning: ***The transmit antenna port must not be connected directly to the receive antenna port of the Dual Port Viper SC+. Excessive power into the receive antenna port will damage the radio. Input power to the receiver should not exceed 17 dBm (50 mW).***

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.

1.3.2.8 GROUNDING

A #8 copper ground wire should be connected to the grounding lug that is located on the back of the Base Station housing. The grounding wire should then be connected to the site facility grounding system.

1.4 PART NUMBERS

The Viper SC+™ Base Station is available in various models, each available with a single radio (standard), dual radio for redundant setup, or dual radio with dual RF ports. Some models for use in specific areas are available as a standard, single radio with RF ports. Refer to the following tables for product d part numbers.

1.4.1 VIPER SC+ BASE STATION PART NUMBERS

The following tables list Viper SC+ Base Station part numbers by operating frequency and specify whether they are standard (single radio, single RF port), redundant (dual radio), redundant with dual RF ports, or in areas where applicable, single radio with dual RF ports.

Table 6 Viper SC+ Base Station Model/Part Numbers

U.S. & Canada

Model Number	Frequency Range		Description
140-5118-502	VHF	136-174 MHz	Viper SC+ 136-174 MHz 6.25-50 kHz BW Standard Base Station
140-5318-502	VHF	136-174 MHz	Viper SC+ 136-174 MHz 6.25-50 kHz BW Redundant Base Station
140-5318-503	VHF	136-174 MHz	Viper SC+ 136-174 MHz 6.25-50 kHz BW Redundant Base - Dual RF
140-5128-504	VHF	215-240 MHz	Viper SC+ 215-240 MHz 6.25-100 kHz BW Standard Base Station
140-5328-504	VHF	215-240 MHz	Viper SC+ 215-240 MHz 6.25-100 kHz BW Redundant Base Station
140-5328-505	VHF	215-240 MHz	Viper SC+ 215-240 MHz 6.25-100 kHz BW Redundant Base - Dual RF
140-5148-302	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 6.25-50 kHz BW Standard Base Station
140-5348-302	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 6.25-50 kHz BW Redundant Base Station
140-5348-303	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 6.25-50 kHz BW Redundant Base - Dual RF
140-5148-502	UHF	450-512 MHz	Viper SC+ 450-512 MHz 6.25-50 kHz BW Standard Base Station
140-5348-502	UHF	450-512 MHz	Viper SC+ 450-512 MHz 6.25-50 kHz BW Redundant Base Station
140-5348-503	UHF	450-512 MHz	Viper SC+ 450-512 MHz 6.25-50 kHz BW Redundant Base - Dual RF
140-5198-304	UHF	880-902 MHz	Viper SC+ 880-902 MHz 12.5-100 kHz BW Standard Base Station
140-5398-304	900	880-902 MHz	Viper SC+ 880-902 MHz 12.5-100 kHz BW Redundant Base Station
140-5398-305	900	880-902 MHz	Viper SC+ 880-902 MHz 12.5-100 kHz BW Redundant Base - Dual RF
140-5198-504	900	928-960 MHz	Viper SC+ 928-960 MHz 12.5-100 kHz BW Standard Base Station
140-5398-504	900	928-960 MHz	Viper SC+ 928-960 MHz 12.5-100 kHz BW Redundant Base Station
140-5398-505	900	928-960 MHz	Viper SC+ 928-960 MHz 12.5-100 kHz BW Redundant Base - Dual RF

ETSI/AS/NZ Compliant

Model Number	Frequency Range		Description
140-5118-600	VHF	142-174 MHz	Viper SC+ 142-174 MHz 12.5-25 kHz BW Standard Base Station
140-5118-601	VHF	142-174 MHz	Viper SC+ 142-174 MHz 12.5-25 kHz BW Standard Base - Dual RF
140-5318-600	VHF	142-174 MHz	Viper SC+ 142-174 MHz 12.5-25 kHz BW Redundant Base Station
140-5318-601	VHF	142-174 MHz	Viper SC+ 142-174 MHz 12.5-25 kHz BW Redundant Base - Dual RF
140-5148-400	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 12.5-25 kHz BW Standard Base Station
140-5148-401	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 12.5-25 kHz BW Standard Base - Dual RF
140-5348-400	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 12.5-25 kHz BW Redundant Base Station
140-5348-401	UHF	406.1-470 MHz	Viper SC+ 406.1125-470 MHz 12.5-25 kHz BW Redundant Base - Dual RF
140-5148-600	UHF	450-512 MHz	Viper SC+ 450-512 MHz 12.5-25 kHz BW Standard Base Station
140-5148-601	UHF	450-512 MHz	Viper SC+ 450-512 MHz 12.5-25 kHz BW Standard Base - Dual RF
140-5348-600	UHF	450-512 MHz	Viper SC+ 450-512 MHz 12.5-25 kHz BW Redundant Base Station
140-5348-601	UHF	450-512 MHz	Viper SC+ 450-512 MHz 12.5-25 kHz Redundant Base - Dual RF

1.4.2 BASE STATION INTERNAL IP RADIOS

The following tables list Viper SC+ Base Stations and specifies, by part number, the Viper SC+ IP Router(s) and quantity (× 1 or × 2) used internally.

Table 7 – Viper SC+ Base Station Orderable Part Number breakdown

U.S. & Canada

Model Number	Description	Viper SC+ IP Radio
140-5118-502	Viper SC+ Standard Base Station 136-174 MHz 6.25-50 kHz BW	140-5018-502 (× 1)
140-5318-502	Viper SC+ Redundant Base Station 136-174 MHz 6.25-50 kHz BW	140-5018-502 (× 2)
140-5318-503	Viper SC+ Redundant Base Station 136-174 MHz 6.25-50 kHz BW Dual RF	140-5018-503 (× 2)
140-5128-504	Viper SC+ Standard Base Station 215-240 MHz 6.25-100 kHz BW	140-5028-504 (× 1)
140-5328-504	Viper SC+ Redundant Base Station 215-240 MHz 6.25-100 kHz BW	140-5028-504 (× 2)
140-5328-505	Viper SC+ Redundant Base 215-240 MHz 6.25-100 kHz BW Dual RF	140-5028-505 (× 2)
140-5148-302	Viper SC+ Standard Base Station 406.1-470 MHz 6.25-50 kHz BW	140-5048-302 (× 1)
140-5348-302	Viper SC+ Redundant Base Station 406.1-470 MHz 6.25-50 kHz BW	140-5048-302 (× 2)
140-5348-303	Viper SC+ Redundant Base 406.1-470 MHz 6.25-50 kHz BW Dual RF	140-5048-303 (× 2)
140-5148-502	Viper SC+ Standard Base Station 450-512 MHz 6.25-50 kHz BW	140-5048-502 (× 1)
140-5348-502	Viper SC+ Redundant Base Station 450-512 MHz 6.25-50 kHz BW	140-5048-502 (× 2)
140-5348-505	Viper SC+ Redundant Base Station 450-512 MHz 6.25-50 kHz BW Dual RF	140-5048-503 (× 2)
140-5198-304	Viper SC+ Standard Base Station 880-902 MHz 6.25-100 kHz BW	140-5098-304 (× 1)
140-5398-304	Viper SC+ Redundant Base Station 880-902 MHz 6.25-5100 kHz BW	140-5098-304 (× 2)
140-5398-305	Viper SC+ Redundant Base 880-902 MHz 6.25-100 kHz BW Dual RF	140-5098-305 (× 2)
140-5198-504	Viper SC+ Standard Base Station 928-960 MHz 6.25-100 kHz BW	140-5098-504 (× 1)
140-5398-504	Viper SC+ Redundant Base Station 928-960 MHz 6.25-100 kHz BW	140-5098-504 (× 2)
140-5398-505	Viper SC+ Redundant Base 928-960 MHz 6.25-100 kHz BW Dual RF	140-5098-505 (× 2)

Table 8 – Viper SC+ EN 300 113 ETSI Compliant and AS/NZ Compliant Radio and Kit Part Numbers

ETSI/AS/NZ Compliant

Model Number	Base Station Description	Viper SC+ IP Radio
140-5118-600	Viper SC+ Standard Base Station 136-174 MHz 12.5-25 kHz BW ETSI AS/NZ	140-5018-600 (× 1)
140-5118-601	Viper SC+ Standard Base 136-174 MHz 12.5-25 kHz BW ETSI AS/NZ Dual RF	140-5018-601 (× 1)
140-5318-600	Viper SC+ Redundant Base Station 142-174 MHz 12.5-25 kHz BW ETSI AS/NZ	140-5018-600 (× 2)
140-5318-601	Viper SC+ Redundant Base 142-174 MHz 12.5-25 kHz BW ETSI AS/NZ Dual RF	140-5018-601 (× 2)
140-5148-400	Viper SC+ Standard Base 406.1-470 MHz 12.5-25 kHz BW ETSI AS/NZ	140-5048-400 (× 1)
140-5148-401	Viper SC+ Standard Base 406.1-470 MHz 12.5-25 kHz BW ETSI AS/NZ Dual RF	140-5048-401 (× 1)
140-5348-400	Viper SC+ Redundant Base 406.1-470 MHz 12.5-25 kHz BW ETSI AS/NZ	140-5048-400 (× 2)
140-5348-401	Viper SC+ Redundant Base 406.1-470 MHz 12.5-25 kHz BW ETSI AS/NZ Dual RF	140-5048-401 (× 2)
140-5148-600	Viper SC+ Standard Base 450-512 MHz 12.5-25 kHz BW ETSI AS/NZ	140-5048-600 (× 1)
140-5148-601	Viper SC+ Standard Base 450-512 MHz 12.5-25 kHz BW ETSI AS/NZ Dual RF	140-5048-601 (× 1)
140-5348-600	Viper SC+ Redundant Base 450-512 MHz 12.5-25 kHz BW ETSI AS/NZ	140-5048-600 (× 2)
140-5348-601	Viper SC+ Redundant Base 450-512 MHz 12.5-25 kHz BW ETSI AS/NZ Dual RF	140-5048-601 (× 2)

1.4.3 ANTENNA FEEDLINE

The following lengths of antenna feedline are available for use with the Viper SC+™ Base Station.

Table 9 – Viper SC+ Base Station Antenna Feedline

Length	Connectors	Type	Part Number
25 feet	N-Male	LMR400	250-0200-025
50 feet	N-Male	LMR400	250-0200-055

1.5 COMPONENTS

1.5.1 BASIC UNIT

Description	Item
Viper SC+ Base Station	
60 in. Cat 5 Ethernet Cable	
Power Cable	
Start Up CD-ROM and Product Documentation Card	

2 ANTENNAS AND RF EXPOSURE

Information presented in this User Manual assumes access to and familiarity with information provided in the *Viper SC+ Intelligent IP Routers for Licensed Spectrum User Manual* (*Viper SC+ IP Router User Manual*, CalAmp part number 001-5008-000). For information about network architecture and system planning, understanding RF path requirements, and terrain and signal strength and radio interference, refer to the applicable section in the *Viper SC+ IP Router User Manual*.

Very Important! Before you deploy your system, you must read and understand information about Selecting Antenna and Lightning Arrestor Combinations in the following sections.

Very Important! You must read and understand the RF Exposure Compliance Requirements in the section that follows.

2.1 SELECTING ANTENNA AND FEEDLINE

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. Viper has been tested and approved with antennas having a maximum gain of 10 dBi.

2.1.1 ANTENNA GAIN

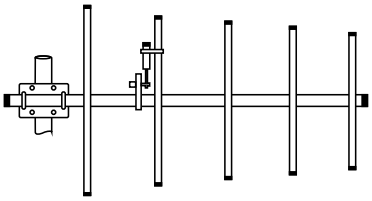
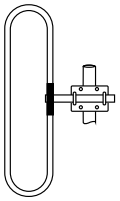
Antenna gain is usually measured in comparison to a dipole. A dipole acts much like the filament of a flashlight bulb: it radiates energy in almost all directions. One bulb like this would provide very dim room lighting. Add a reflector capable of concentrating all the energy into a narrow angle of radiation 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.

2.1.2 TYPES OF ANTENNAS

A number of FCC-approved antennas have been tested for use with the Viper. Similar antenna types from other manufacturers may be equally acceptable. It is important to follow the manufacturer's recommended installation procedures and instructions when mounting any antenna.

Table 10 Antenna Types

Omni (Vertical Collinear)	Yagi	Vertical Dipole
		

Omni-Directional Antenna

In general, an omni-directional antenna should be used at a master station and 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.

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.

Vertical Dipoles

Vertical dipoles are very often mounted in pairs, or sometimes groups of three or four, 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.

2.1.3 FEEDLINE

The choice of feedline should be carefully considered. Poor quality coaxial cables should be avoided, as they will degrade system performance for both transmission and reception. The cable should be kept as short as possible to minimize signal loss. See the following table for feedline recommendations

Table 11 Transmission Loss (per 100 Feet)

	Frequency Range		
Cable Type	**VHF**	**UHF**	**900 MHz**
LMR-400	1.5 dB	2.7 dB	3.9 dB
1/2" Heliax	0.68 dB	1.51 dB	2.09 dB
7/8" Heliax	0.37 dB	0.83 dB	1.18 dB
1-5/8" Heliax	0.22 dB	0.51 db	0.69 dB

Outside cable connections should have a weather kit applied to each connection to prevent moisture. Feedline connections should be routinely inspected to minimize signal loss through the connection. A 3 dB loss in signal strength due to cable loss and/or bad connections represents a 50% reduction in signal strength.

2.2 SELECTING ANTENNA AND LIGHTNING ARRESTOR COMBINATIONS

Very Important! Before you deploy your system you must read and understand this section.

RF engineers and installers have seen many types of radio installations over the years, and they know there are certain details that must not be overlooked at any installation. Most radio installations contain some form of lightning protection. However, the wrong combination of antenna and lightning arrestor can create high voltage transients on the radio's antenna port having devastating impacts on the life and reliability of modern day radio equipment.

2.2.1 LIGHTNING ARRESTOR OVERVIEW

Lightning arrestors can take many forms. But some of the most common lightning arrestors use gas discharge tubes that turn on when the voltage across their terminals exceeds the specified threshold. Under normal conditions, these devices have very high impedance and no current flows through the device. When the turn on voltage threshold is exceeded, the gas discharge tube turns on instantaneously and becomes a short.

This functionality works well to limit the magnitude of a transient from a nearby lightning discharge. However, it can have very negative consequences if a gas discharge lightning arrestor is used with the wrong antenna.

2.2.2 ANTENNA OVERVIEW

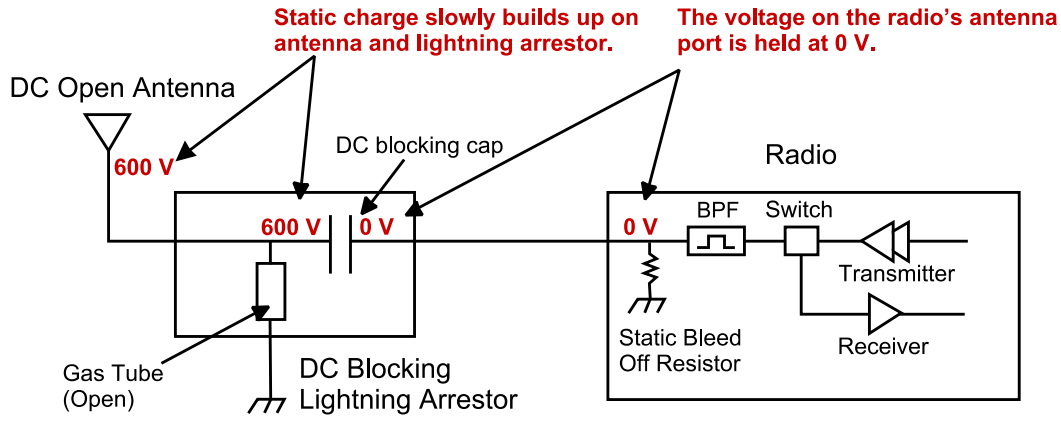
Antennas can come in just about any shape or size. However, there is one parameter, in particular, that the system designer should not overlook, especially if the radio installation uses gas discharge tube lightning arrestors. The parameter is the DC grounding of the active element in the antenna.

A DC grounded antenna will measure 0 ohms from the active element to ground when tested with an ohm-meter. One way to test this is to connect the ohm-meter from the center conductor to ground of the RF cable that is attached directly to the antenna. This will read as a short for a DC grounded antenna, and as an open for a non DC grounded antenna. Note: Some antenna datasheets are misleading and will indicate the antenna is DC grounded. However, the datasheet may be referring to the body of the antenna and not necessarily the active element. For this reason, it is best to measure the antenna you plan to use to verify the active element is DC grounded.

2.2.3 THE WRONG COMBINATION

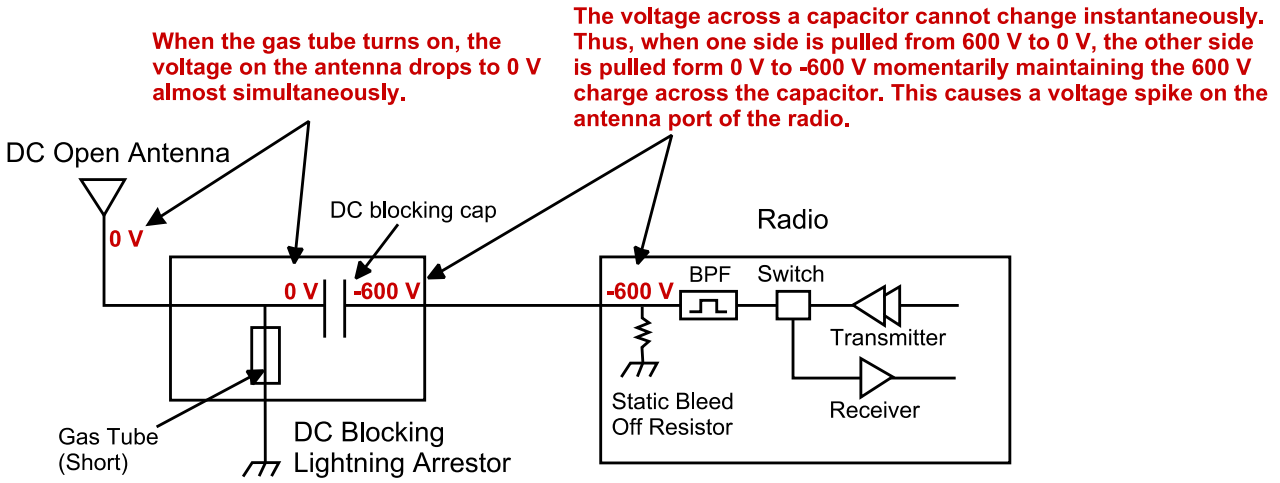
The combination of a DC open antenna and a DC blocked gas discharge tube lightning arrestor creates a situation where static charge can build up slowly on the active element of the antenna. Static charge can be created by wind blowing across the antenna, precipitation hitting the active element, or other environmental causes. As static charge builds up on the antenna's active element, over a period of minutes or even hours, the DC blocking capacitor inside the lightning arrestor is charged.

Figure 9 Voltage buildup due to static



When the voltage exceeds 600V (the breakdown voltage for IS-B50LN series PolyPhasers), the gas discharge tube turns on and the antenna side of the DC blocking capacitor is immediately pulled from 600V to 0V. Since the lighting arrestor's capacitor was charged to 600V, that charge must dissipate through the radio. As the capacitor discharges, a large negative transient is created on the antenna port of the radio. Positive transients can also be created if the static charge buildup on the antenna has a negative polarity.

Figure 10 Voltage transient immediately after the gas tube turns on



During testing, transients were measured on the antenna port of CalAmp's Viper at voltage levels up to +/-280V. These voltage transients often have high frequency content that can easily pass through any filtering in the radio and damage components in the transmitter and receiver circuitry.

2.2.4 GOOD DESIGN PRACTICES

There are two relatively easy ways to avoid creating large transients due to static buildup on an antenna and the subsequent firing of the gas discharge tube in the lightning arrestor. Following either or both of the recommendations below will eliminate this potential problem.

1. Use antennas with a DC grounded active element. Antennas can easily be tested, by using an ohm meter, to measure the resistance from the center conductor to the ground of the RF cable that is directly attached to the antenna. The ohm-meter should indicate a short. (Some antenna designs, such as folded dipole or folded dipole Yagi antennas, inherently have a DC ground on the active element due to the nature of the antenna design.)

2. Use a lightning arrestor that does not have a gas discharge tube. PolyPhaser makes several DC-blocked lightning arrestors that have an inductor to ground instead of a gas tube. These lightning arrestors will not allow the static to build up on the antenna, and there is no gas tube that can trigger causing a transient into the antenna port of the radio. The following lightning arrestors, manufactured by PolyPhaser, have inductors to ground instead of gas tubes:

   a. PolyPhaser Part Number: VHF50HN Frequency Range: 100MHz - 512MHz, 750W

   b. PolyPhaser Part Number: TSX-NFF Frequency Range: 700MHz - 2.7GHz, 750W

Tip: Lightning arrestors that use gas tubes will normally specify a "Turn-On Voltage" in the data sheet. If you see this specification in the datasheet, it is very likely that the lightning arrestor has a gas discharge tube. If you are still unsure, contact the manufacturer.

2.2.5 RF EXPOSURE COMPLIANCE REQUIREMENTS

RF Exposure

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

Minimum Safety Distance	Antenna Gain		
(cm @max power)	**5 dBi**	**10 dBi**	**15 dBi**
132 MHz (VHF)	123 cm	219 cm	389 cm
215 MHz (UHF)	123 cm	219 cm	389 cm
406.1 MHz	106 cm	188 cm	334 cm
900 MHz (Model/PN 140-5198-304, 140-5398-304)	66 cm	117 cm	208 cm
900 MHz (Model/PN 140-5198-504, 140-5398-504)	64 cm	115 cm	202 cm

Note: *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 above. 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.*

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.

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. 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.

Exigences de conformité d'exposition aux Radiofréquences

Exposition aux Radiofréquences

La radio Viper SC+ est destinée à être utilisé dans les marchés contrôles industriels et SCADA. L'unité Viper SC doit être installée par un professionnel et doit assurer une distance minimale de séparation entre les sources radiantes et toute personne. Les distances sont indiquées dans le tableau ci-dessous. L'installation typique est une antenne de type fouet 1/2-longueur d'onde installée sur un poteau ou pylône.

Distance de sécurité minimum	Gain de Antenne		
(puissance cm @ max)	**5 dBi**	**10 dBi**	**15 dBi**
132 MHz (VHF)	123 cm	219 cm	389 cm
215 MHz (UHF)	123 cm	219 cm	389 cm
406.1 MHz	106 cm	188 cm	334 cm
900 MHz (Modèle # 140-5198-304, 140-5398-304)	66 cm	117 cm	208 cm
900 MHz (Modèle # 140-5198-504, 140-5398-504)	64 cm	115 cm	202 cm

Note: *Il est de la responsabilité de l'utilisateur de garantir le respect des règlements MPE de la FCC lorsque vous utilisez cet appareil d'une façon autre que celle décrite ci-dessus. L'installateur doit s'assurer que l'antenne est située ou orientée de façon à ne pas émettre un champ RF dépassant les limites de radiations pour la population générale établies par Santé Canada.*

La radio Viper SC+ utilise un émetteur à radiofréquence à faible puissance. L'énergie concentrée d'une antenne peut poser un risque pour la santé. On ne devrait pas être en face de l'antenne lorsque l'émetteur est en marche.

Les consignes de sécurité recommandées pour l'exposition humaine à l'énergie électromagnétiques de radiofréquences sont contenues dans le Code 6 canadien de la sécurité (disponible auprès de Santé Canada), la Commission Communications Fédéral (FCC) Bulletin 65 et la recommandation du 12 Juillet 1999 sur la limitation de l'exposition du public aux champs électromagnétiques (de 0 Hz à 300 GHz) (1999/519/CE) du Conseil de l'Union européenne.

3 GETTING STARTED: QUICK SETUP AND INITIAL CONFIGURATION

These instructions allow you to setup a Viper SC+ Base Station so you will be able to verify basic unit operation and experiment with network designs and configurations.

Note: It is important to use a network IP subnet address that does not overlap with subnets currently in use in your test area to eliminate unnecessary disruption of traffic on the existing network while you become familiar with the Viper SC+, Base Station.

3.1 MEASURE PRIMARY POWER

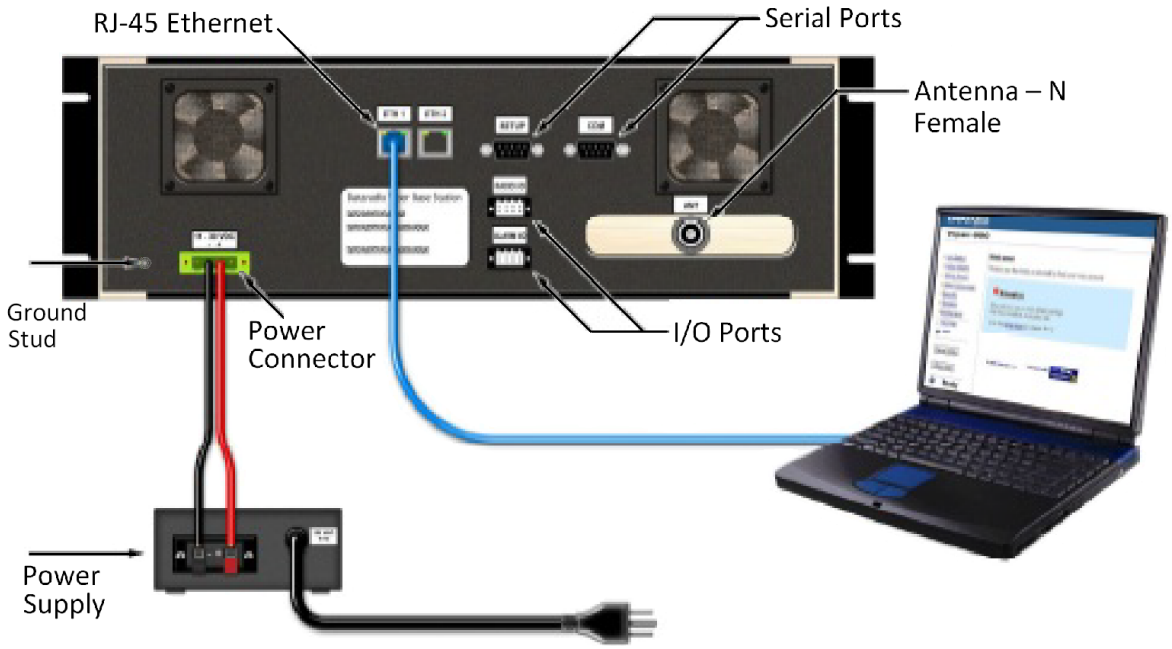
Primary power for the Viper SC+ Base Station must be within 11-30 VDC and must be capable of providing a minimum of:

- 40 W supply for Tx at 1 W
- 55 W supply for Tx at 5 W, or
- 60 W supply for Tx at 10 W

3.2 CONNECT THE VIPER SC+ TO PROGRAMMING PC

Connect an Ethernet cable into the Ethernet LAN port of the Base Station and plug the other end into the Ethernet port of your PC. The LINK/ACT LED in the DATA box on the front panel of the Base Station should illuminate.

Figure 11 Viper SC+ cable connections

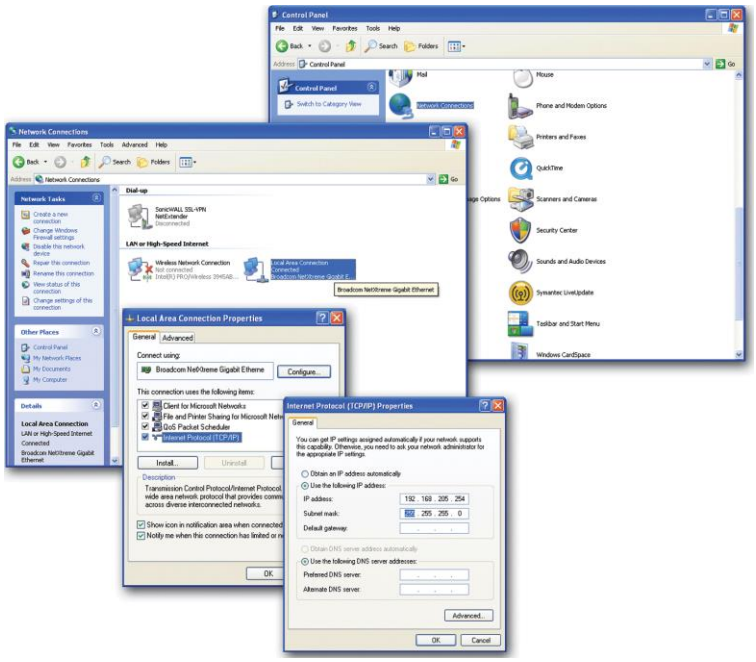


3.3 LAN CONFIGURATION

The Viper SC+ Base Station contains a DHCP server which will automatically assign an IP address to your computer; however in some cases it may be necessary to change the network settings on your computer to accept the assigned IP address. Before powering on the unit, confirm that your computer's Ethernet port is set up to receive an IP address from an external DHCP server, confirm it is not set to a static address. The process required to do this differs depending on the version of Windows or other operating system you are using.

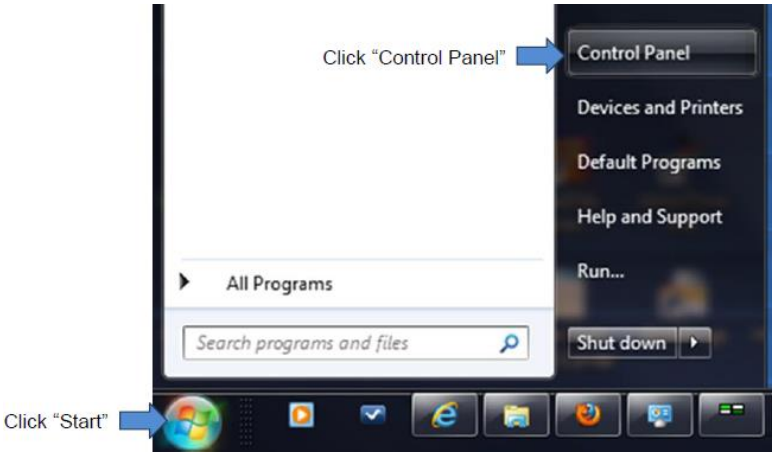
For Microsoft **Windows XP**, do the following.

1) From the PC, select **Start** » **Settings** » **Control Panel** » **Network Connections**.
2) Right-click **Local Area Connection** to open the Properties box.
3) From the list, select **Internet Protocol (TCP/IP)** and click **Properties** to open the TCP/IP Properties box.
4) Select **Use the Following IP Address** and enter:
   a. IP Address: **192.168.205.100**
   b. Subnet Mask: **255.255.255.0**
   c. Default Gateway: Leave empty
5) Click **OK** to apply your changes. You may need to reboot your computer to complete this process, or right-click the network connection icon in the system tray that corresponds to the Ethernet connection and click **Repair**.



For Microsoft **Windows®7**, do the following:

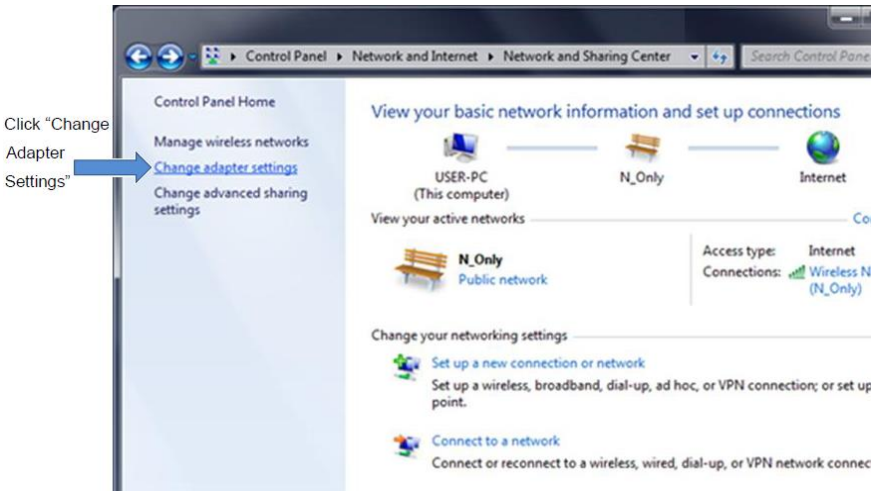
1) From the PC, select the Windows **Start** button » **Control Panel**.



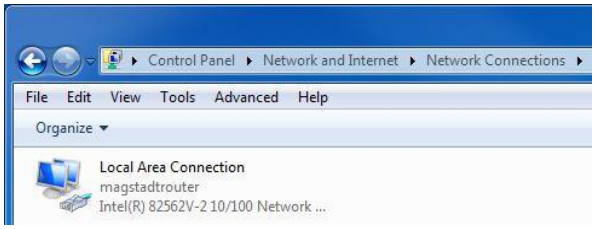
2) Click **Network and Internet**.

3) Click **Network and Sharing Center**.

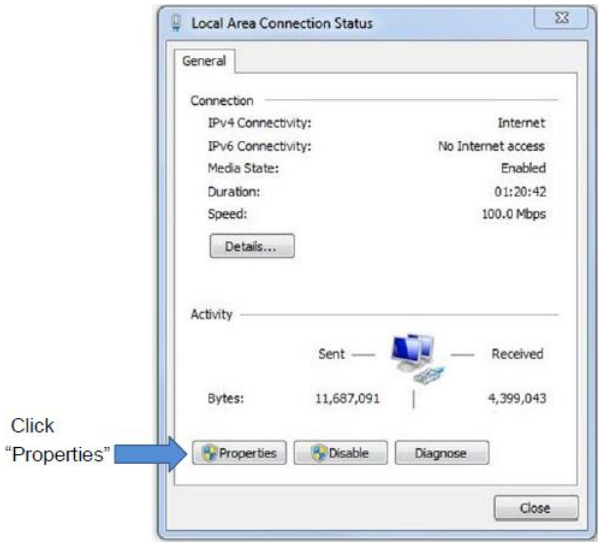
4) Click **Change Adapter Settings**.



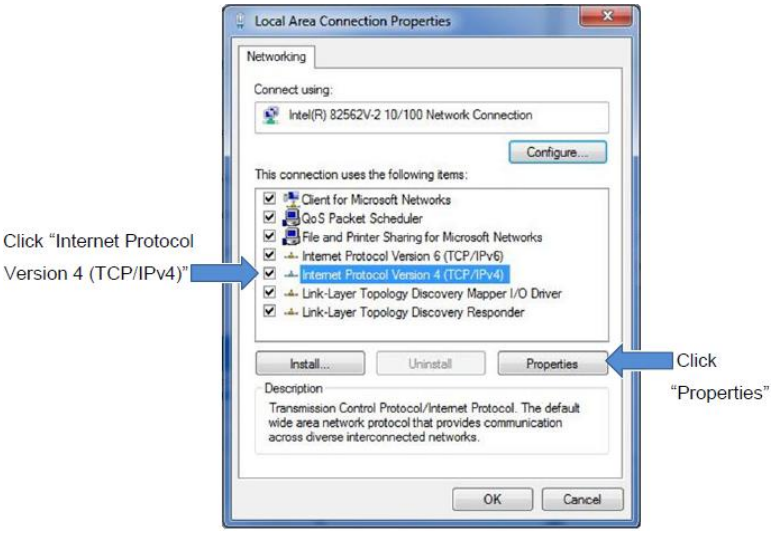
5) Double-click **Local Area Connection**.



6) Click the **Properties** button.

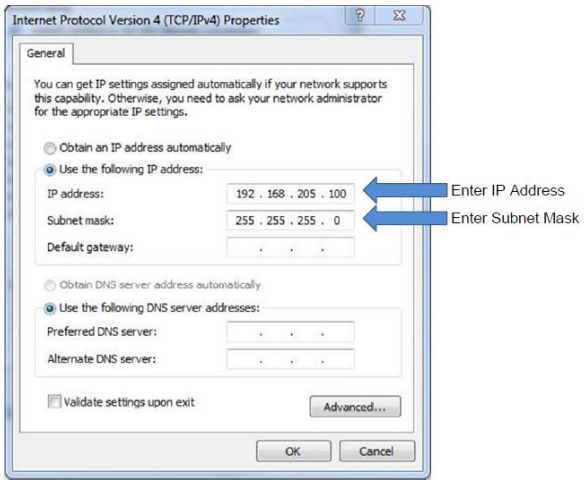


7) Select **Internet Protocol Version 4 (TCP/IPv4)** and click the **Properties** button.



8) Select Use the following IP Address and enter:
   a. I IP Address: **192.168.205.100**
   b. Subnet Mask: **255.255.255.0**
   c. Default Gateway: Leave empty

9) Click **OK** to apply and save these settings. (You may need to reboot your computer to complete the process.)



3.4 LOG IN

After you have connected your PC to the Viper SC+ Base Station by Ethernet cable and powered the Base Station, start your Web browser and enter **192.168.205.254** in the address bar. A connection Login window (or Web Server Authentication Window or Web Security window) similar to one of the following appears.

Figure 12 Login or Web Server Authentication Window

or

Enter a user name and password. The default user name and password the Viper SC+ Base Station ships with are **admin** and **ADMINISTRATOR** (both admin and ADMINISTRATOR are case-sensitive—enter admin in all lowercase and ADMINISTRATOR in all uppercase or capital letters) and click **OK**.

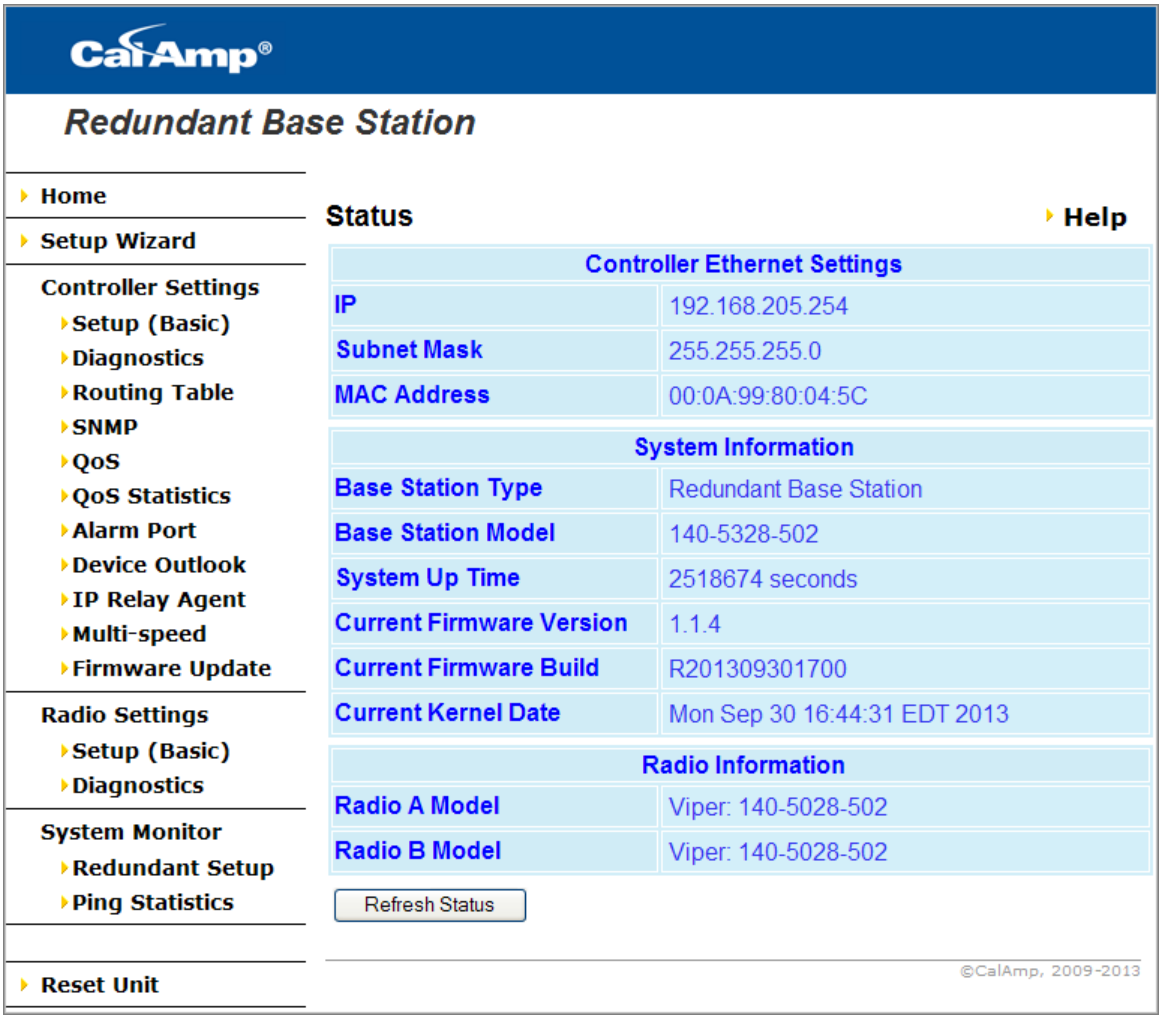
Table 12 Default setting Login IP Addresses, User names, and Passwords for Viper SC+ IP Radios and Base Stations

Parameter	Viper SC+ IP Radio	Viper SC+ Base Station
IP Address	192.168.205.1	192.168.205.254
User name	Admin	admin
Password	ADMINISTRATOR	ADMINISTRATOR

3.5 INTRODUCTION TO THE VIPER SC+ BASE STATION WEB INTERFACE

All operating parameters of the Viper SC+ Base Station are set through a web interface in your web browser once you have logged in. The built-in web server of the Base Station makes configuration possible from any computer with network access to it. The following figure shows the Home page of the Viper SC+ Base Station Web Interface.

Figure 13 CalAmp Viper SC+ IP Router Web Interface home page



In this example, the Home page for a redundant base station is shown.

Note: If the computer you are using has previously been used to set up a CalAmp router, you may need to delete browser history (specifically temporary internet files) for some pages of the web interface to display correctly.

The Viper SC+ Base Station Web interface window is displayed in two panels or panes. In the left pane is the main navigation menu. On the right is the content area for each page and displays the parameter settings available for the selected menu item.

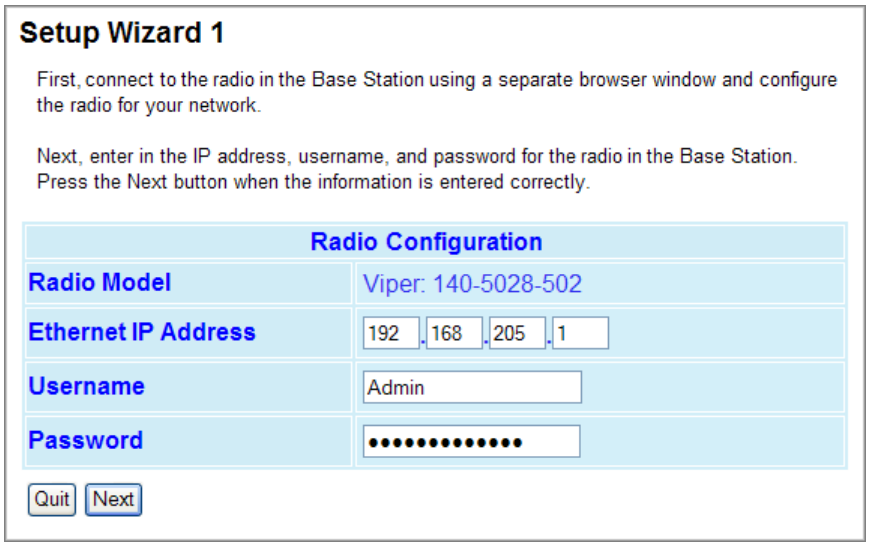
The navigation menu on the left allows you to navigate to configuration pages for the Viper Base Station. For quick setup of a few key parameters, select **Setup Wizard** near the top of the main menu, just below Home. The remainder of this chapter will take you through configuration pages of the Setup Wizard. More advanced information about parameters available for selection and configuration in all of the tabbed pages is provided in the following chapter.

- To access online Help for content of a specific tab in the Viper Web Interface, click the **Help** link (near the top at the right of the page) while in the tab.
- To return to the Home Status page from any page in the Viper Web Interface, click the **Home** link.

3.6 INITIAL CONFIGURATION USING THE SETUP WIZARD

Before configuring the Viper SC+ Base Station, connect to each Viper SC+ IP Router using a separate web browser window (use the same Ethernet cable connection, however, and use the IP address and login credentials for the internal radio — refer to the *Viper SC+ IP Router User Manual*, CalAmp part number 001-5008-000) configure the internal Viper SC+ radio(s) for your network.

Figure 14 Setup Wizard initial page with Instructions



The Setup Wizard consists of four (4) steps. Each step is presented as a single page with a few simple options to fill in or select. Each of the four pages for each step of the Setup Wizard that follow contain the basic configuration settings that are most commonly required to select or change to set up the Viper SC+ Base Station.

The steps of the Setup Wizard are as follows.

Setup Wizard 1: **Radio A Configuration** (and **Radio B Configuration**, if Redundant Base Station): Ethernet IP Address, Username, and Password for the internal Viper SC+ IP Radio. (For Redundant Radio models.)

Setup Wizard 2: **LAN Configuration:** Ethernet IP Address and Ethernet Subnet Mask of the Base Station controller board. (The controller board must be on the same subnet as the internal radio or radios.

Setup Wizard 3: **Ping Settings:** Primary and Secondary Ping IP Address, Ping Timer, and Ping Failure Threshold.

Setup Wizard 4: **Static Routes:** Allows you to build a Routing Table by adding known static routes.

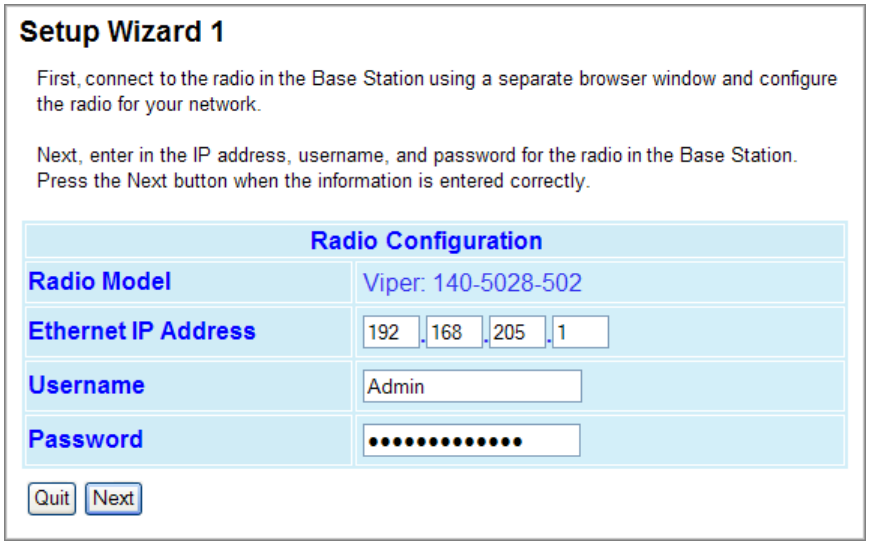
Instructions for each of the preceding steps are provided on the following pages.

As you read each page, enter the requested information and then click **Next** to proceed to the next page of the Setup Wizard.

3.6.1 SETUP WIZARD 1: ETHERNET IP ADDRESS AND LOGIN SECURITY

The Base Station Setup Wizard 1 page allows you to set the Base Station IP Address and the Username and Password of the internal Viper SC+ IP radio or radios. Only one set of parameters need to be set for a Single-Radio Base Station, as shown in the following figure. The Setup Wizard 1 page for a Redundant Base Station is shown on the following page.

Figure 15 Viper Setup Wizard 1 (Single Radio)



Ethernet IP Address

Enter an IP Address for the Ethernet IP interface of the internal Viper radio. This will be a different IP Address, but on the same subnet as the IP Address for the Ethernet interface of the controller board. The default Ethernet IP Address for the internal Viper radio is 192.168.205.1.

Username and **Password**

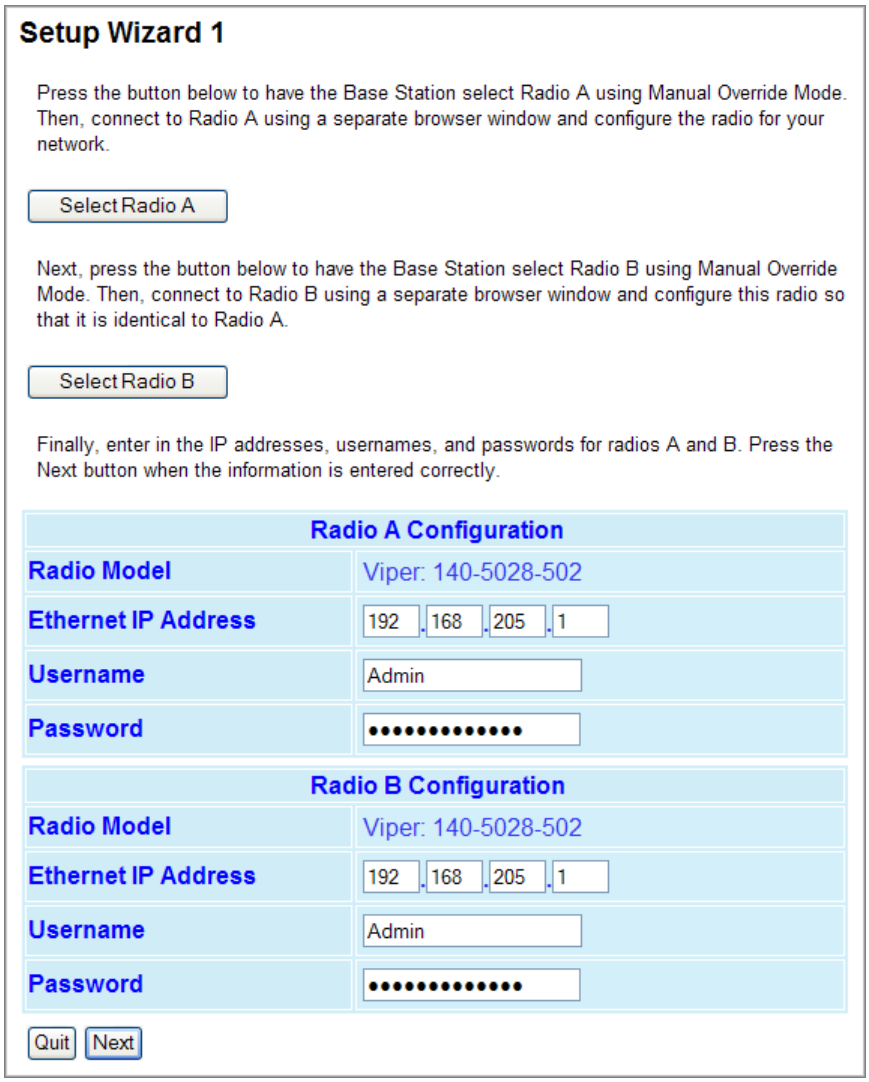
These fields are for the username and password used to log on to the internal Viper radio. The default Username is Admin and the default Password is ADMINISTRATOR. **Important:** Username and Password are both case-sensitive.

Click **Next** to save the values in this page and proceed to the next page.
(Click Quit only if you need to abandon any changes in the current page and this will return to the Home page.)

Redundant Base Station

For a Redundant Base Station, Setup Wizard 1 parameters must be set for both of the internal radios, as shown in the following figure. Because the purpose of the redundancy is so that if an error is detected in the primary radio, the Base Station Controller will automatically switch to the backup radio, both internal Viper radios must be configured with the same settings. Only one radio is functional at any time so buttons in the Setup Wizard 1 page for Redundant Base Stations allow you to select which radio is active, Radio A or Radio B.

Figure 16 Viper Setup Wizard 1 (Redundant Base Station)



Click **Select Radio A** to make Radio A active and connect to Radio A using a separate browser window to its Ethernet IP Address. (Use the same Ethernet cable connection, however, and use the IP address and login credentials for the internal radio — refer to the *Viper SC+ IP Router User Manual*, if needed.) Configure the internal Viper SC+ Radio A for the Viper network. See the preceding page, if necessary, for the default Ethernet IP Address, Username, and Password for the internal Viper SC+ radios.

Next, click **Select Radio B** to make Radio B active and connect to Radio B using the separate browser window to its Ethernet IP Address. (Use the same Ethernet cable connection. The IP address and login credentials for internal Radio B should be the same as internal Radio A — refer to the *Viper SC+ IP Router User Manual*, if needed.) Configure Radio B the same as Radio A.

Important: The second internal Viper SC+ Radio (Radio B) must be configured with the same IP Address as the first Viper SC+ Radio (Radio A). See the **Additional Notes about Redundant Base Station Setup**, below.

Click **Next** to save the values in this page and proceed to the next page.
(Click Quit only if you need to abandon any changes and this will return to the Home page.)

Additional Notes about Redundant Base Station Setup

In a Redundant Viper SC+ Base station, both Radio A and Radio B must be set up identically. The user must either copy the configuration file from one radio 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+ IP Router User Manual* for details about operation and programming of the Viper SC+ radios.

- **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 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 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 Vipers to reestablish tunnels with the VPN server and resume communication. When a Viper SC+ configured as 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 was already powered on) and the remove Vipers will not reconnect to the VPN server until they timeout.

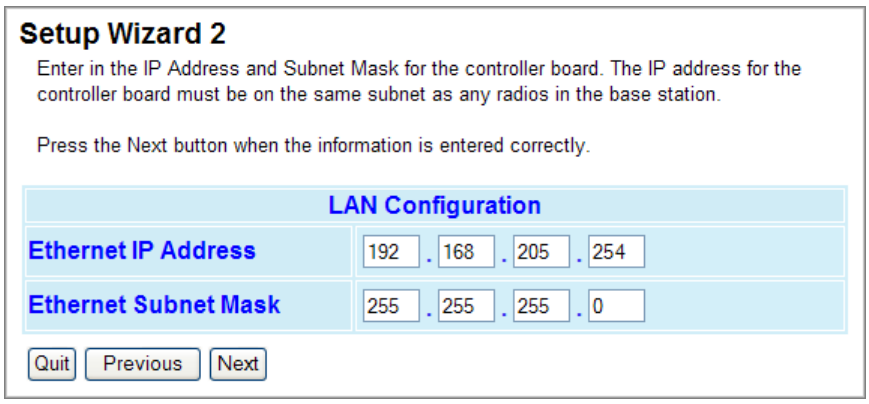
More information about Redundant Base Station operation and error conditions that will cause the base station controller board to determine a radio is not operating correctly and switch to the backup radio is contained in the following chapter about **Base Station Operation**.

3.6.2 SETUP WIZARD 2: LAN CONFIGURATION

The Setup Wizard 2 page allows you to set the Ethernet IP Address and Ethernet Subnet Mask for the Base Station controller board. The Ethernet IP Address and Ethernet Subnet Mask for the controller board must be set so that the controller board has a unique IP address on the same subnet as the internal Viper SC+ radio(s) in the base station.

Note: The IP address of the Base Station controller must be different from the IP address of the internal Viper SC+ Radio(s), but must be on the same IP subnet as the internal radio(s).

Figure 17 Viper Setup Wizard 2



Ethernet IP Address

Enter the IP Address for the Base Station controller board. The default Ethernet IP Address for the Base Station controller board is 192.168.205.254.

Ethernet Subnet Mask

Enter the Ethernet Subnet. The default Ethernet Subnet Mask is 255.255.255.0.

When the IP address is entered correctly, click **Next** at the bottom of the page to save the values in this page. The IP address of the Base Station controller will update immediately. A new browser window will open, bringing you to the next Setup Wizard page (Setup Wizard 3). You will need to re-enter the log-in credentials.
(Click Previous if you need to review or change any settings in the previous page. Click Quit only if you need to abandon any changes in the current page and this will return to the Home page.)

3.6.3 SETUP WIZARD 3: PING SETTINGS

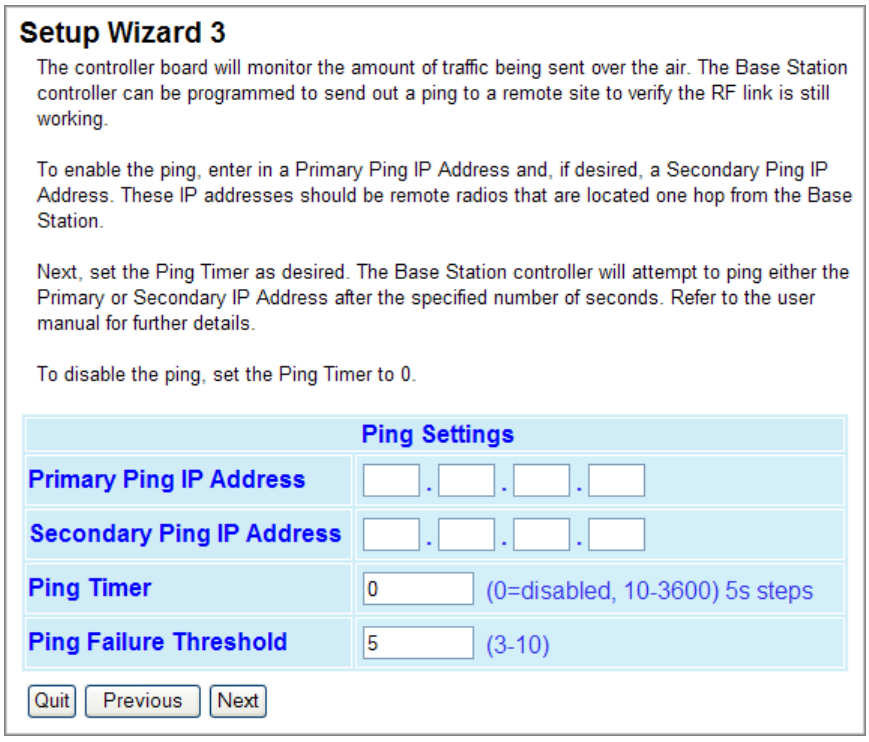
The Base Station Setup Wizard 3 page is optional and allows you to set up the Viper Base Station to ping remote IP addresses to verify the RF link is active.

The Base Station controller will monitor the amount of traffic being sent over the air. The Base Station controller can be programmed so that, during periods of inactivity it will send out a ping to a remote site to verify that the RF link is still operational. To enable this feature, enter 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) and enter a number of seconds of inactivity for the ping timer (in five-second intervals).

If there has been no RF traffic for the duration specified by the Ping Timer, the Base Station will attempt to ping either the primary or secondary IP address. If the ping is unsuccessful, the base station will switch to the backup radio. When this has occurred for the number of times specified by the Ping Failure Threshold, the base station will determine that the RF link is down.

To disable this feature, enter a 0 in the Ping Timer.

Figure 18 Viper Setup Wizard 3



Primary Ping IP Address

Enter the IP Address of the primary remote that pings will be sent to, to determine if the RF link is working. There is not a default Primary Ping IP Address, so the default setting is blank (no IP address).

Secondary Ping IP Address

Enter the IP Address of the secondary remote to which pings will be sent if pings to the primary fail. .There is not a default Secondary Ping IP Address

Ping Timer

Enter the amount of time, a multiple of 5 seconds, from a minimum of 10 seconds to 3600 seconds (1 hour) between each ping that is sent. The default setting is 0, which disables the feature of pinging remotes.

Ping Failure Threshold

Enter the number of ping failures allowed (minimum of three to a maximum of ten) before the RF link is determined to be down. The default setting is five.

Click **Next** to save the values in this page and proceed to the next page.
(Click Previous if you need to review or change any settings in a previous page. Click Quit only if you need to abandon any changes in the current page and this will return to the Home page.)

3.6.4 SETUP WIZARD 4: STATIC ROUTES AND ROUTING TABLE

The Base Station Setup Wizard 4 page is optional and allows you to create static routes. The static routes will appear in the table at the bottom of the page. Static routing refers to a manual method used to set up routing between networks.

Figure 19 Viper Setup Wizard 4

Route Name

Enter a name for the route by which you will recognize the route entry in the Routing Table displayed in the lower part of the page. This field sets the alphanumeric identifier of the static route in the Routing Table.

Destination IP Address

Enter the IP Address of the destination network. This field sets the IP address of the destination network. This is a network name and not an actual IP address.

IP Subnet Mask

Enter the IP subnet mask for the destination network. This field sets the subnet mask of the destination network.

Gateway IP Address

Enter the IP Address of the local gateway. 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 Viper SC+ Base Station.

Metric

Enter a number ranging from 1 to 56,535. The lower the metric value, the higher the route priority. This is typically set to one (1)

Add — Click the Add button to add the route you have defined in the fields above to the Routing Table below.

A Default Gateway must be used if remote access to the Viper SC+ Base Station is required from outside the Viper SC+ IP network. **Router Mode Example 1** in the *Viper SC+ IP Router User Manual* provides examples of Default Gateway entries. The Gateway for the Default Gateway typically points to the central router.

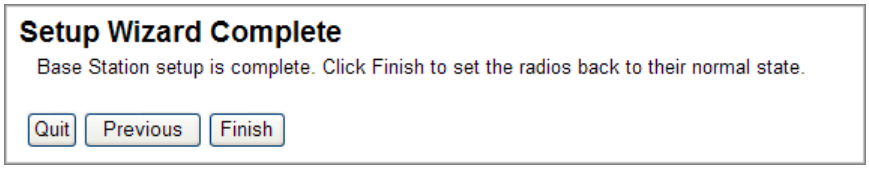
Delete Entry — This link appears in the right-most column of each row representing a static route and provides a means of removing or deleting the static route from the table. To remove a static route, click the corresponding Delete Entry link in the right-most column of the row representing the route.

Click **Next** to save the values in this page and proceed to the next page.
(Click Previous if you need to review or change any settings in a previous page. Click Quit only if you need to abandon any changes in the current page and this will return to the Home page.)

3.6.5 SETUP WIZARD COMPLETE

The final page of the Viper Setup Wizard informs you that the Viper Setup Wizard is complete.

Figure 20 Viper Setup Wizard Complete



You may use the Previous button to return to previous pages of the Setup Wizard to review configuration settings. Click Quit only if you wish to exit the Setup Wizard without implementing your settings, otherwise click **Finish**.

Setup complete: Setup Wizard completion and return Base Station to normal operation.

4 BASE STATION OPERATION

4.1 VIPER SC+ FAILURE DETECTION

The Base Station 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.

4.2 MONITOR VIPER SC+ WITH ETHERNET CONNECTION

The controller board will attempt to establish a Telnet connection to the Viper SC+ currently in use. The 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 web page 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 that follows. If the Viper SC+ alarm persists, then contact CalAmp Technical Support for assistance.

Table 13 Viper SC+ Error Conditions

Viper SC+ Parameter	Error Condition
Radio Temperature	Temperature is greater than 80° C
Foldback Status	Viper SC+ folds back transmit power for any reason
Error Status Message	The Viper SC+ is in error if any of the following error messages are reported by the Viper SC+ Board temperature is outside allowed range. Board input power failure. Software watchdog. Power-On Self-Test (POST) Failure. Viper SC+ default warning. DSP sanity check failure. DSP load error: file, code, and/or params. DSP Rx Clock alarm. DSP Tx Clock alarm. DSP Rx Proc Overflow alarm. DSP Tx Proc Underflow alarm. DSP watchdog alarm. DSP external h/w alarm. DSP power supply alarm. DSP anti-hack alarm. Radio does not respond to sanity check Radio not ready after reset. Radio receiver tuning failure. Radio EEPROM failure. Radio DCXO failure. Radio Rx synthesizer lock failure.

Viper SC+ Parameter	Error Condition
	Radio Tx synthesizer lock failure. Radio local power failure. Radio reference clock failure. Radio watchdog failure.

4.3 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-inch rack-mount chassis (inside the Base Station). 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 14 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 Forward Power	Reverse power is greater than 50 % of wanted power.

4.4 MONITOR RECEIVE AND TRANSMIT DATA / SEND PINGS

The controller board monitors the number of received and transmitted packets that go to and from the Viper SC+. If there are no new received packets or if there are not 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 the 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 five (5) seconds, the controller board will attempt to ping the secondary IP. When the maximum number of retries has been reached for both the primary and secondary IP addresses, the controller board will mark the active Viper as bad and will switch to the backup Viper. 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 maximum number of retries can be programmed on the System Monitor » Redundant Setup web page. The controller board will attempt to ping the primary IP address for the maximum number of retries and the secondary IP address for the maximum number of retries before reporting an error.

4.5 WHEN A FAILURE IS DETECTED

When a failure is detected and the Viper 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 radio requires approximately twenty (20) seconds to boot up before being able to send and receive data. The controller board will switch to the Ethernet, Setup, and COM connections of the newly-activated Viper radio.

If the Viper Base Station is set for Warm Standby, the controller board will attempt to disable the Ethernet, serial (Setup and COM) ports, and transmitter of 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 illuminate, indicating on which radio (Radio A or Radio B) the fault was detected. The Base Station controller's web page will report an error message indicating which fault occurred. If the alarm is enabled, the buzzer will sound two short chirps every five (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 of the Viper radios in the Base Station have identical Ethernet and RF MAC addresses, when the radios are switched, neither the Local Area Network nor any remote Vipers will notice that the Viper Base Station has switched to the backup Viper radio.

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

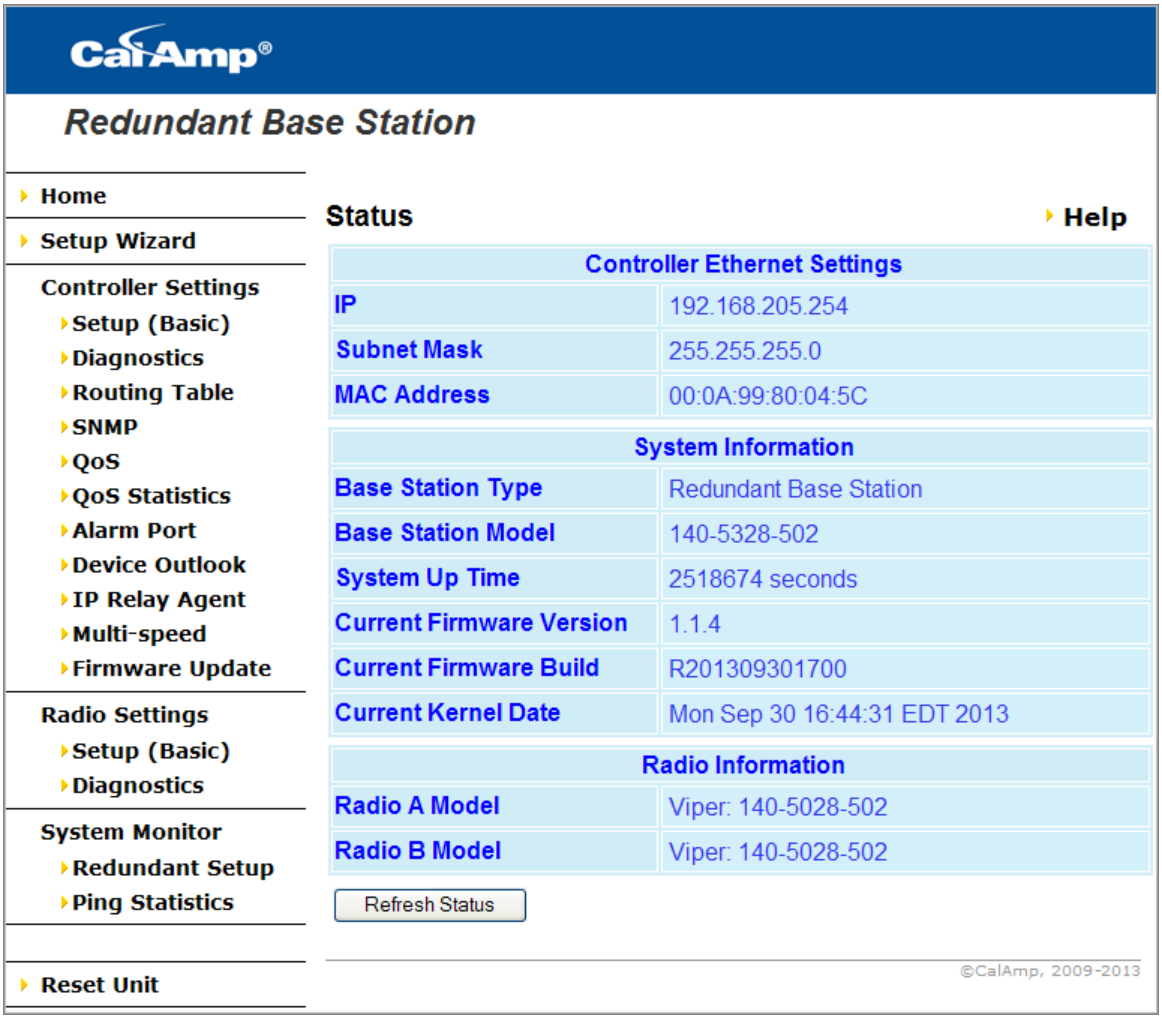
5 VIPER SC+ BASE STATION WEB INTERFACE

All operating parameters of the Viper SC+ Base Station are set through a web interface in your web browser once you have logged in. The built-in web server of the Viper SC+ Base Station makes configuration and status monitoring possible from any computer with network access to the Viper, either locally or remotely.

Note: If the computer you are using has previously been used to set up a CalAmp router, you may need to delete browser history (specifically temporary internet files) for some pages of the web interface to display correctly.

The Viper SC+ Base Station Web interface window is displayed in two panels or panes. In the left pane is the main navigation menu. On the right is the content area for each page and displays the parameter settings available for the selected menu item.

Figure 21 CalAmp Viper SC+ Base Station Web Interface home page



The navigation menu on the left allows you to navigate to configuration pages for the Viper SC+ Base Station. Settings for each menu item are displayed in the page at the right when the menu item selected. Each page may have one or more sections.

The Home, or Status page, for example, shown in the previous figure, has three sections: Controller Ethernet Settings, System Information, and Radio Information. Occasionally a page will be too tall for all sections or settings to be visible on-screen in the browser window at once. When this occurs, use the vertical window-controls to scroll the window vertically.

- To access online Help for content of a specific window in the Viper Web Interface, click the **Help** link (near the top right of the page) while in the window.
- To return to the Home or Status page from any page in the Viper Web Interface, click the **Home** link.
- The Viper Base Station can be reset if necessary by clicking the **Reset Unit** link, the bottom selection of the main navigation menu. You will be asked to confirm that you want to reset the router and the Viper Web Interface will be unavailable until after the Viper Base Station powers up.

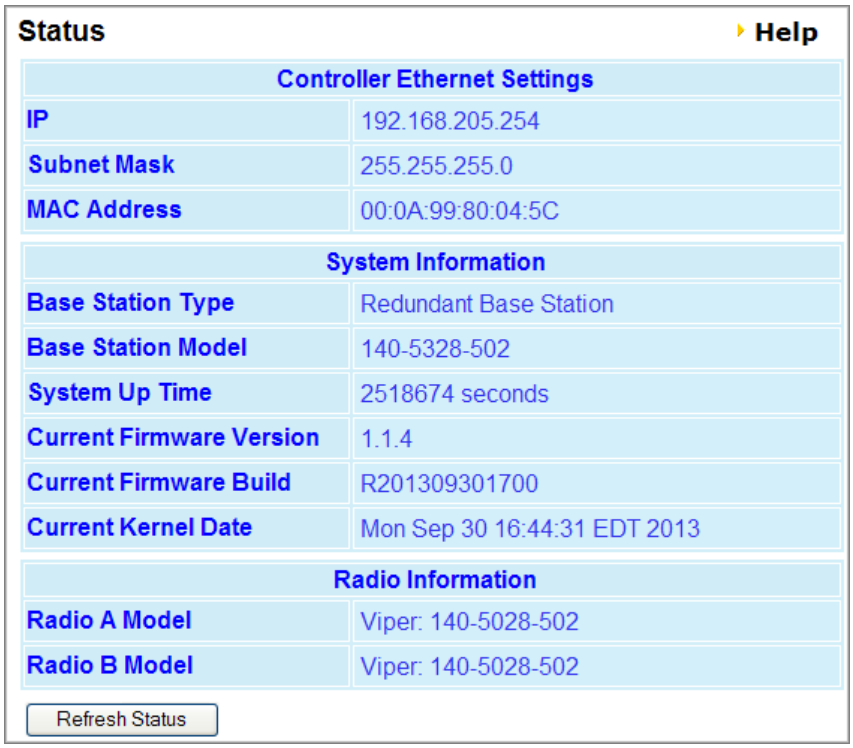
Any time you enter or change settings in a page, you must save the change by clicking the Save button at the bottom of the page.

When a page contains status information or statistics, you may refresh the page to show current information by clicking the Refresh button at the bottom of the page. To clear information displayed in the page and restart counting, click the Clear button.

5.1 STATUS (HOME PAGE)

The Status (Home) page displays general information and very basic diagnostic information about the Base Station.

Figure 22 Status (Home Page)



The Status page, shown in the previous figure, has three sections: Controller Ethernet Settings, System Information, and Radio Information.

Controller Ethernet Settings

IP

Displays the IP Address of the Viper SC+ Base Station (controller board IP Address). The IP address of the Viper Base Station controller can be changed in the Controller Settings » Setup (Basic) web page.

Subnet Mask

Displays the Ethernet subnet mask for the Viper Base Station controller. The subnet mask of the Viper Base Station controller can be changed in the Controller Settings» Setup (Basic) web page.

MAC Address

Media Access Control Address. Every Ethernet device (for example, LAN card) 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.

System Information

Base Station Type

The type of Base Station configuration. This setting is programmed at the factory. Possible Base Station types include: Standard Base Station or Redundant Base Station.

Base Station Model

The model or part number of the Viper SC+ Base Station.

System Up Time

The timer counts seconds and shows the time elapsed 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

The current firmware version loaded and running in the Viper SC+ Base Station controller.

Current Kernel Date

The date of the current operating system kernel the Viper SC+ Base Station controller is running.

Radio Information

This section displays the model number of the radio(s) installed in the Base Station. “N/A” will be displayed 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 Model or **Radio B Model**

The model or part number of the radio(s) installed in the Base Station.

Refresh Status — Click this button to refresh the page to show the most current information (System Up Time).

5.2 SETUP WIZARD

The Setup Wizard contains five pages, which must be accessed and completed sequentially, and therefore are not individually selectable from the main navigation menu. Navigation and settings in the Setup Wizard are explained in the previous chapter Getting Started: Quick Setup and Initial Configuration, in the section about Initial Configuration Using the Setup Wizard.

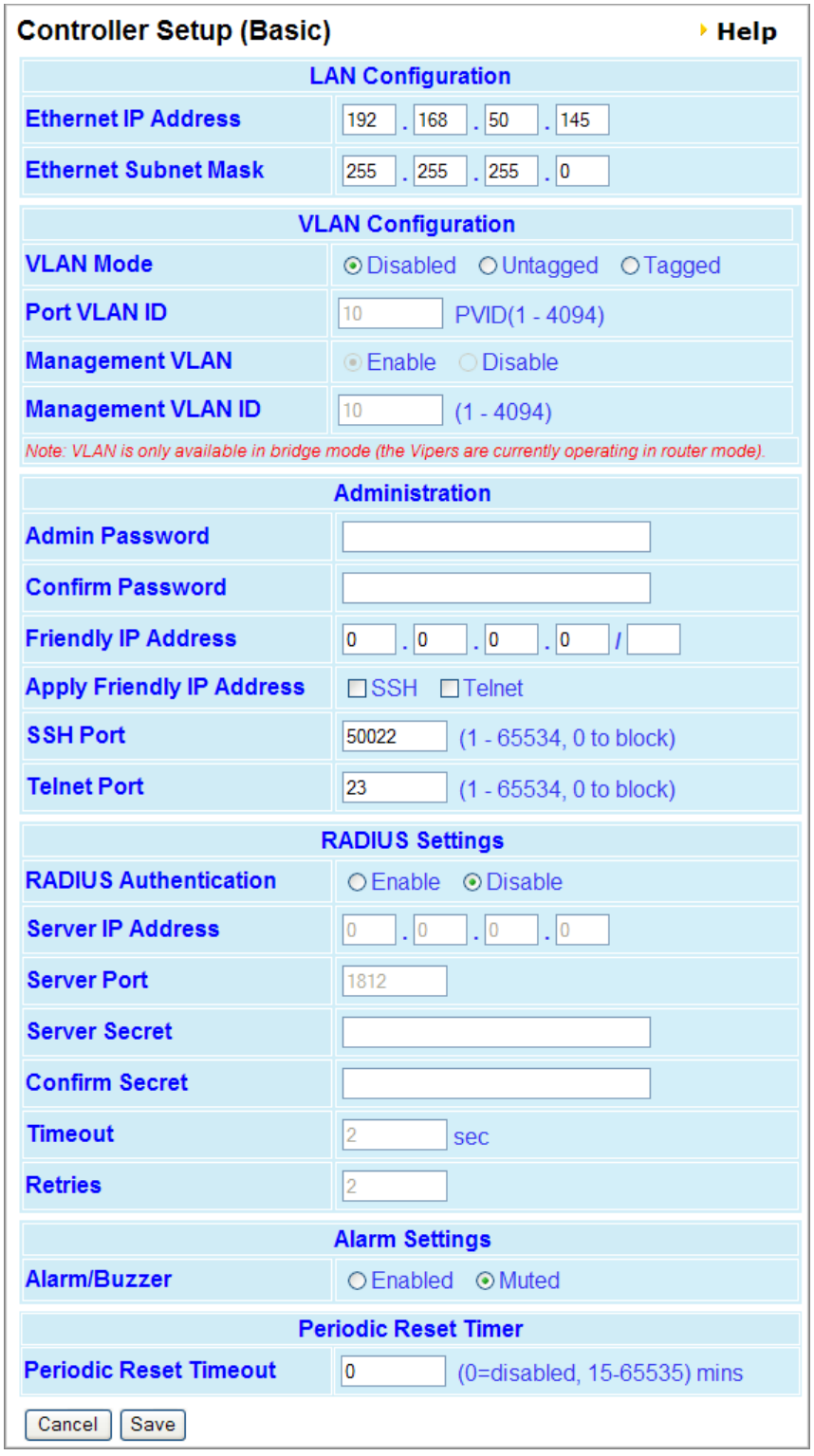
5.3 CONTROLLER SETTINGS

The Controller Settings section of the main navigation menu contains links to eleven pages: Setup (Basic), Diagnostics, Routing Table, SNMP, QoS, QoS Statistics, Alarm Port, DeviceOutlook™, IP Relay Agent, Multi-speed, and Firmware Update.

5.3.1 SETUP (BASIC)

Setup (Basic) is the first link under Controller Settings in the main menu. The Controller Setup (Basic) web page allows you to set basic configuration settings for the Base Station. These include LAN Configuration settings, and optional settings for Administration, RADIUS Settings, Alarm Settings, and Periodic Reset Timer.

Figure 23 Controller Settings » Setup (Basic)



LAN Configuration

These settings can be modified to change the IP address and subnet mask of the Base Station controller board.

Ethernet IP Address

This setting allows the setting the IP address of the Base Station to an IP address other than the default IP address, which is 192.168.205.254. When a new IP address is entered, it will take effect immediately when you click the Save button. Reconfigure the network card in your PC to access the new subnet, if necessary, and then enter the new IP address you have assigned to the Base Station in the address bar field of the web browser.

Ethernet Subnet Mask

This setting allows you to change the subnet mask of the Base Station. The Ethernet IP Address together with the Ethernet Subnet Mask determines the subnet that the Base Station is on. The default Ethernet Subnet Mask is 255.255.255.0.

VLAN Configuration

Note: VLAN (Virtual Local Area Network) mode is available in bridge mode only. If the base station is operating in router mode, a note to this effect is displayed, VLAN will be disabled, and you will not be able to change settings in this section.

VLAN Mode

VLAN may be disabled, untagged, or tagged when the Viper is operating in bridge mode. When VLAN mode is enabled, the Ethernet interface can be configured to operate in “tagged” or “untagged” mode. The RF interface operates in “tagged” mode and the Serial ports operate in “untagged” mode.

Untagged: Devices on this interface are not using VLAN tags. Incoming (ingress) packets are tagged with the port VLAN ID (PVID). VLAN tags are removed on outgoing (egress) packets.

Tagged: Devices on this interface are using VLAN tags. Incoming (ingress) packets are forwarded with their VLAN ID. Outgoing (Egress) packets keep their VLAN tags.

See configuration tabs for each interface for more specific VLAN configuration options.

Port VLAN ID

Sets the Port VLAN ID (PVID).

Management VLAN

When the Management VLAN is enabled, access to the Viper Base Station (HTTP, FTP, Command Shell) will be allowed only through this port. This is true only for ports of Tagged type. Ports of Untagged type can always access the internal functions of the Viper Base Station.

Management VLAN ID

The ID is a value from 1 to 4094, inclusive.

Administration

Admin Password

Use this field to change the administration password for the unit. Enter a string of any letters or numbers of at least 8 characters and not exceeding 15 characters in length. This will replace the ADMINISTRATOR password for the admin user.

CAUTION: Do not lose the new password or you will not be able to gain access to the unit. If you lose your password, you will need to contact CalAmp for technical support.

Confirm Password

Re-enter the new password string you entered above.

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 slash, /) 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. Clearing the check from the box will allow access from a computer with any IP address.

SSH Port / Telnet Port

Enter the port number that will be used for access to the service. 22 is a well-known port number for SSH service; 23 is a well-known port number for Telnet service. Entering zero (0) for the port number will block access to the service.

RADIUS Settings

RADIUS Authentication

Enable or Disable RADIUS authentication for web interface 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

Enter the number of minutes to wait before a retry in five minute increments from fifteen (15) minutes minimum to 65535 minutes (45 days, 12 hours, and 15 minutes) maximum. Enter 0 to disable.

Retries

Enter the number of attempts at authenticating with the server before giving up.

Alarm Settings

Alarm/Buzzer

Enable or disable (mute) the audible buzzer located on the controller board. Typically the buzzer will beep when an error is detected with the controller board or with a radio installed in the Base Station.

Periodic Reset Timer

Periodic Reset Timeout

To force a reset of the Base Station at regular time intervals, enter the number of minutes after which to reset in five minute increments from fifteen (15) minutes minimum to 65535 minutes (45 days, 12 hours, and 15 minutes) maximum. Enter 0 to disable.

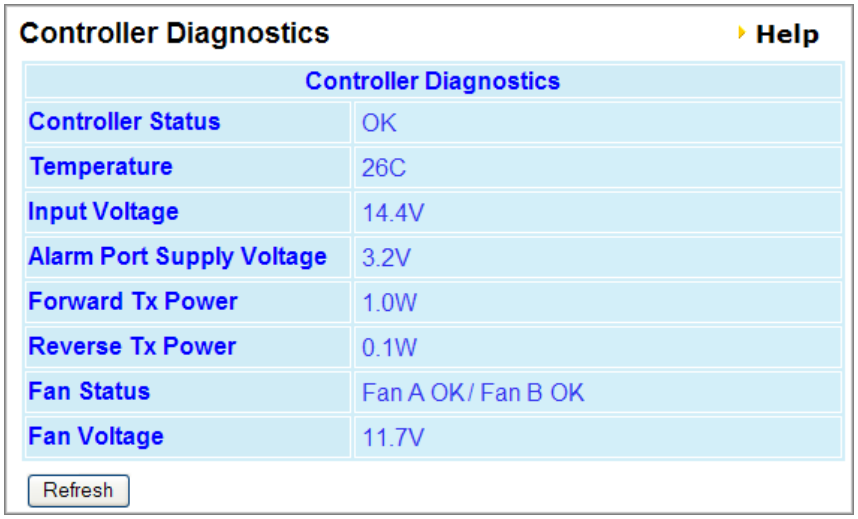
Cancel — Click Cancel to cancel any changes you may have entered in the page.

Save — Click Save to save any changes you have entered in this page.

5.3.2 DIAGNOSTICS (CONTROLLER BOARD)

Diagnostics is the second link under Controller Settings. Use this link to navigate to the Controller Diagnostics web page. There are no configurable options in this page. It displays diagnostic status information only.

Figure 24 Controller Settings » Diagnostics



Controller Diagnostics

Controller Status

Displays the current status of the controller board and is used to report any errors detected with the controller board.

Temperature

Displays the current temperature inside the Base Station enclosure in degrees Celsius.

Input Voltage

Displays the current input voltage to the Base Station.

Alarm Port Supply Voltage

Displays the supply voltage to the alarm port logic circuits. The supply voltage is user-selectable and can be set to either 1.8 V or 3.3 V. Click the Alarm Port link (seventh link under Controller Settings) in the main menu to access the alarm port settings.

Forward Tx Power (Redundant models only)

Displays the last measured forward transmit power of the radio in use. This power is measured by the Base Station controller with a power sensor mounted inside the 19-inch rack-mount chassis.

Reverse Tx Power (Redundant models only)

Displays the last measured reflected transmit power of the radio in use. This power is measured by the Base Station controller with a power sensor mounted inside the 19-inch rack-mount chassis.

Fan Status

Displays the status of the two 12 V DC fans located in the Base Station.

Fan Voltage

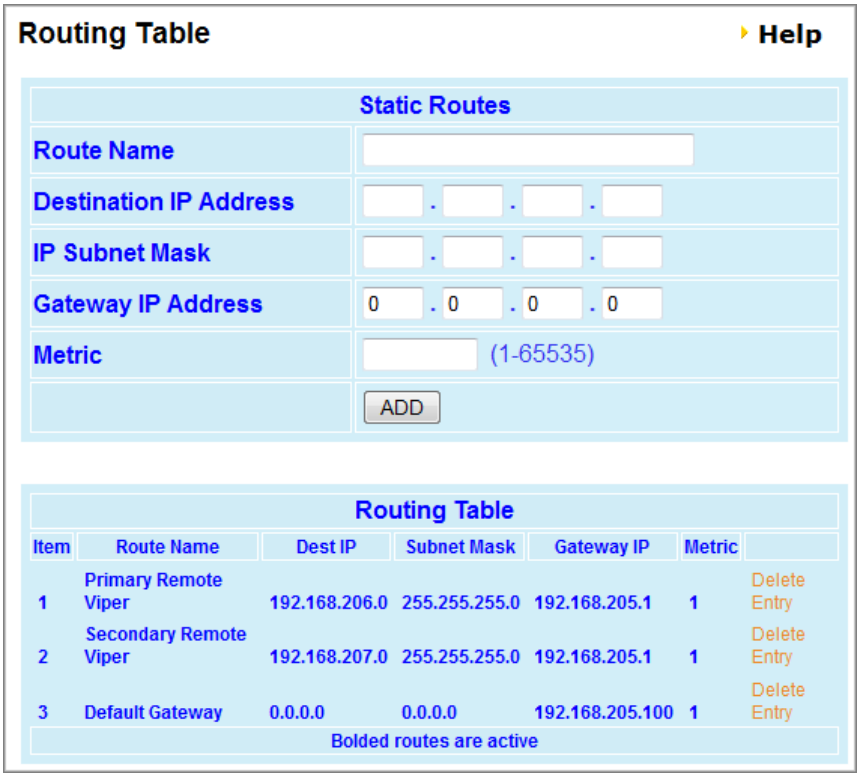
Displays the supply voltage to the two 12 V DC fans. If the input voltage to the Base Station drops to 13 V or lower, the fan voltage will dip below 12 V. This is normal due to the voltage drop through the switching power supply on the controller board. The fans may spin slower, but they will not be harmed by the lower voltage.

Refresh — Click Refresh to update the information displayed in the Controller Diagnostics web page.

5.3.3 ROUTING TABLE

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

Figure 25 Controller Settings » Routing Table



Static Routes

Route Name

Enter a descriptive alphanumeric identifier of the static route by which you will identify the static route you are creating in the Routing Table below.

Destination IP Address

Enter the IP address of the destination network. This is a network name and not the actual IIP address.

IP Subnet Mask

Enter the subnet mask for the destination network.

Gateway IP Address

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's internal Viper SC+ IP Router.

Metric

Enter a number ranging from 1 to 65535, inclusive. The lower the metric value, the higher the route priority. Typically this is set to one (1).

Add — As you define static routes by entering the parameters above, click Add to add each static route to the Routing table below in the web page.

Routing Table

Item

A row number that the Viper Base Station uses internally to organize routing entries in the Routing Table.

Route Name

The Route Name, provided above when the static route was created.

Dest IP

The Destination IP Address of the route.

Subnet Mask

The IP Subnet Mask, described above.

Gateway IP

The Gateway IP Address.

Metric

Number that indicates the priority level of the route, with 1 being highest priority and 65535 being the lowest priority.

Delete Entry — To delete a route entry, click the Delete Entry link in the right-most column of the row that corresponds to the route to be deleted..

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

5.3.4 SNMP

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 26 Controller Settings » SNMP

SNMP Configuration

SNMP

Selecting Enable will allow SNMP functionality. Selecting Disable will turn off SNMP functionality.

Read-only Community Name

Sets the community string used for accessing all Management Information Bases (MIBs).

Read-Write Community Name

Sets the community string used for accessing all Management Information Bases (MIBs), including writable MIBs.

Trap Community Name

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 has been downloaded to your computer, extract the files. The base station controller-specific MIBs can then be loaded into any third-party MIB browser.

SNMP Traps Configuration

To enable a trap, check the box next to it. The traps listed in the table that follows are available in the Base Station controller.

SNMP Trap Name	Description
Board Alive	A trap is generated whenever the Base Station controller board boots up.
Board Error Detected	A trap is generated whenever an error is detected with the controller board.
Board Error Cleared	A trap is generated whenever errors are cleared form the controller board.
Radio A Error Detected	A trap is generated whenever an error is detected with Radio A.
Radio A Error Cleared	A trap is generated whenever Radio A errors are cleared. Errors are cleared when the Clear Errors button in the Radio Settings » Diagnostics web page is clicked, or when the Alarm On/Off button on the Base Station front panel is pressed and held for five (5) seconds.
Radio B Error Detected	A trap is generated whenever an error is detected with Radio B.
Radio B Error Cleared	A trap is generated whenever Radio B errors are cleared. Errors are cleared when the Clear Errors button in the Radio Settings » Diagnostics web page is clicked, or when the Alarm On/Off button on the Base Station front panel is pressed and held for five (5) seconds.
Fan Error Detected	A trap is generated when the controller detects that either of the two fans have stopped operating.
Fan Error Cleared	A trap is generated when the controller detects that both fans are operating normally again after an error condition had occurred.
Alarm Pin 1 Low to High	A trap is generated whenever a low to high transition is detected on Pin 1 of the Alarm port.
Alarm Pin 1 High to Low	A trap is generated whenever a high to low transition is detected on Pin 1 of the Alarm port.
Alarm Pin 5 Low to High	A trap is generated whenever a low to high transition is detected on Pin 5 of the Alarm port.

SNMP Trap Name	Description
Alarm Pin 5 High to Low	A trap is generated whenever a high to low transition is detected on Pin 5 of the Alarm port.
Alarm Pin 7 Low to High	A trap is generated whenever a low to high transition is detected on Pin 7 of the Alarm port.
Alarm Pin 7 High to Low	A trap is generated whenever a high to low transition is detected on Pin 7 of the Alarm port.
Alarm Pin 7 Analog Voltage High	A trap is generated whenever the analog voltage on Pin 7 of the Alarm port exceeds the upper voltage threshold specified by the Pin 7 Voltage Range, below.
Alarm Pin 7 Analog Voltage Low	A trap is generated whenever the analog voltage on Pin 7 of the Alarm port falls below the lower voltage threshold specified by the Pin 7 Voltage Range, below.
Alarm Pin 7 Analog Voltage In Range	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 after having been above or below either threshold. This voltage range is specified below.

Pin 7 Voltage Range

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

SNMP Trap Sink

Trap Sink IP

Enter the IP address of computer(s) that are configured to receive SNMP traps, if applicable.

Trap Sink Port

Enter the port number that the SNMP traps will be sent to. Most MIB browsers are set to listen for traps on port 162.

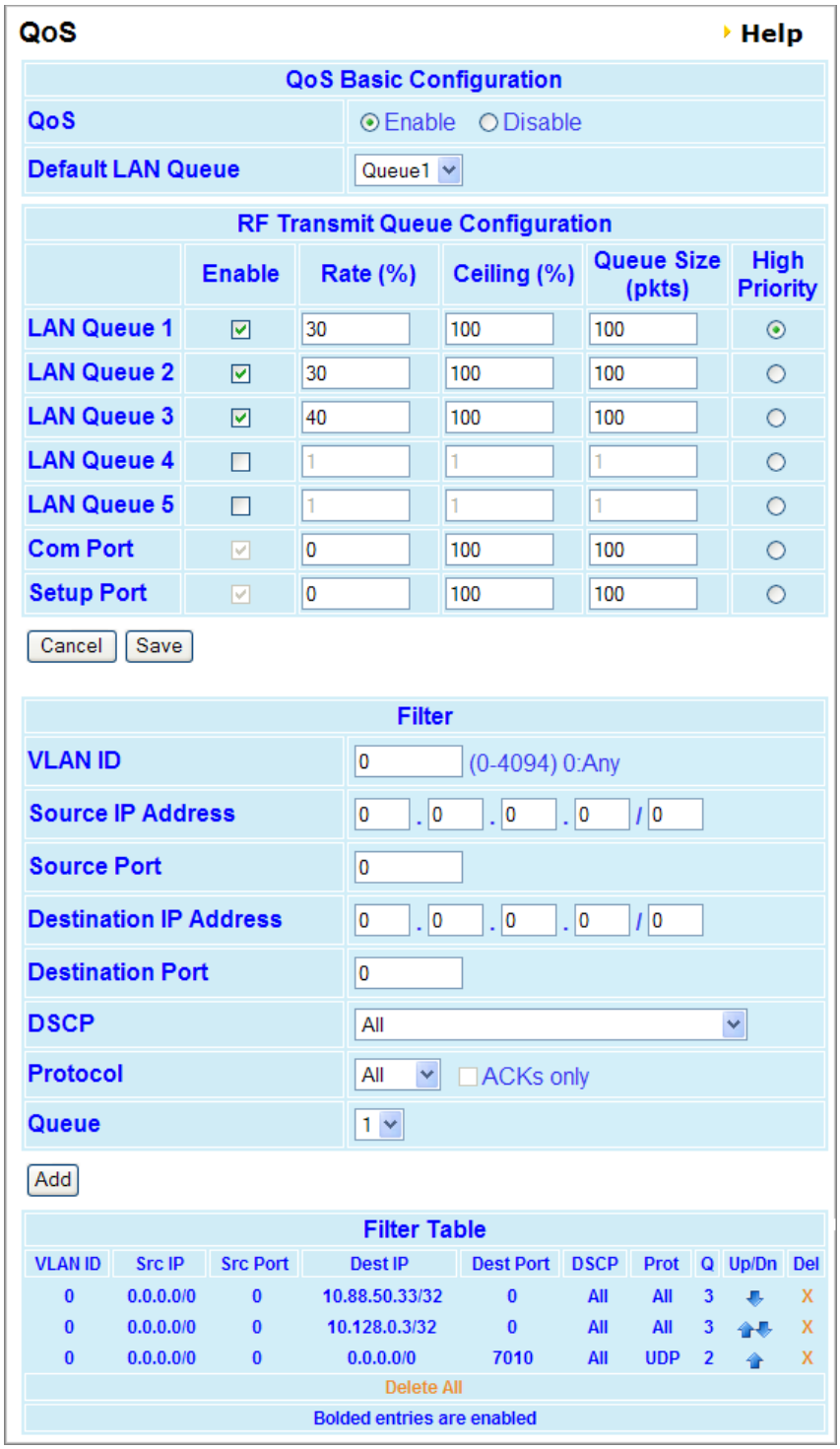
Add — As you define new SNMP trap sinks by entering the parameters above, click Add to add each to the SNMP Trap Sink table below in the web page.

Delete Entry — To delete a SNMP trap sink from the table, click the Delete Entry link in the right-most column of the row that corresponds to the SNMP trap sink to be deleted..

5.3.5 QOS

The QoS (Quality of Service) 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 the *Viper SC+ IP Radio User Manual* for details regarding configuring QoS. The QoS is generally set and then monitored to ensure the desired priorities are being served. The Setup Tips at the end of this section provide tips for QoS setup and tuning for the Viper SC+ Base Station using Wireshark.

Figure 27 Controller Settings » QoS



QoS Basic Configuration

QoS

Select Enable to use the QoS module. Select Disable to turn it off.

Default LAN Queue

Sets the queue from LAN queues 1 through 5, which are defined and enabled in the following section, through which all traffic will flow unless otherwise filtered. If no queue is selected, then unfiltered traffic will bypass the QoS module. A packet coming from the Ethernet interface that must be sent over the RF interface will be put into the default transmit queue unless a specific filter is defined that indicates what RF transmit queue to use.

When changes are made to the QoS Basic Configuration, you must click **Save** (at the bottom of the RF Transmit Queue Configuration section, directly below) for the changes to take effect.

RF Transmit Queue Configuration

Enable

Place a check mark in the box to use the queue. At least one LAN port queue must be enabled at all times.

Rate (%)

Set the minimum guaranteed bit rate expressed as a percentage of the available bandwidth. The minimum value for this setting is 0 (%); the maximum value is 100 (%). A value of zero (0) means discard any packets sent to this queue.

Ceiling (%)

Sets the maximum bit rate expressed as a percentage of the available bandwidth. The minimum value for this setting is 1 (%); the maximum value is 100 (%).

Queue Size (pkts)

Sets the maximum number of packets the transmit queue can hold. The minimum value for this setting is 1 (packet); the maximum value is 128) packets.

High Priority

When sending packets, the packet scheduler basically sends a packet from one transmit queue, moves on to the next transmit queue, sends, sends one packet, moves on to the next transmit queue, etc. All of this is done while maintaining the configured throughputs per transmit queue. When the high priority queue is set, this queue will be processed first when transmitting and once every two times.

Cancel — Click Cancel only if you have made any changes in the page that you do not want to take effect.

Save — Click Save to save any changes you have entered in this page.

Filter

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

VLAN ID

The VLAN identifier is used only if operating in bridge mode.

Source IP Address

Use this to specify a single IP address or range of IP addresses that will represent a valid source IP address. 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

The UDP/TCP destination port number (a value of 0 means any value).

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 check box is enabled. Checking this box creates a filter that matches TCP Acks only. Removing the check mark from this box creates a filter that matches all types of TCP traffic.

Queue

Sets the queue that traffic matching the filter will go into.

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 down toward the bottom. Once a packet is found to match a given filter, filter comparison stops and filters further down in the table are ignored. When the next packet is received, the same process begins again from the top of the table for this packet.

As new filters are created, they are added to the bottom of the filter table.

To change the order in which filters are applied to packets, as indicated by their order in the table, click the up- or down-arrow (in the UP/Dn column) to move the filters up or down in the table.

To delete a filter from the table, click the X in the rightmost (Del) column in the row that corresponds to the filter. To delete all filters and remove from them from the table, click the Delete All link, centered at the bottom of the table.

Setup Tips (Using Wireshark)

Wireshark can be a useful tool to help determine the IP packets that need to be prioritized if there is a question of which packets to prioritize. Following are general guidelines.

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. Te 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, and 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 web page (detailed in the following section) 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.

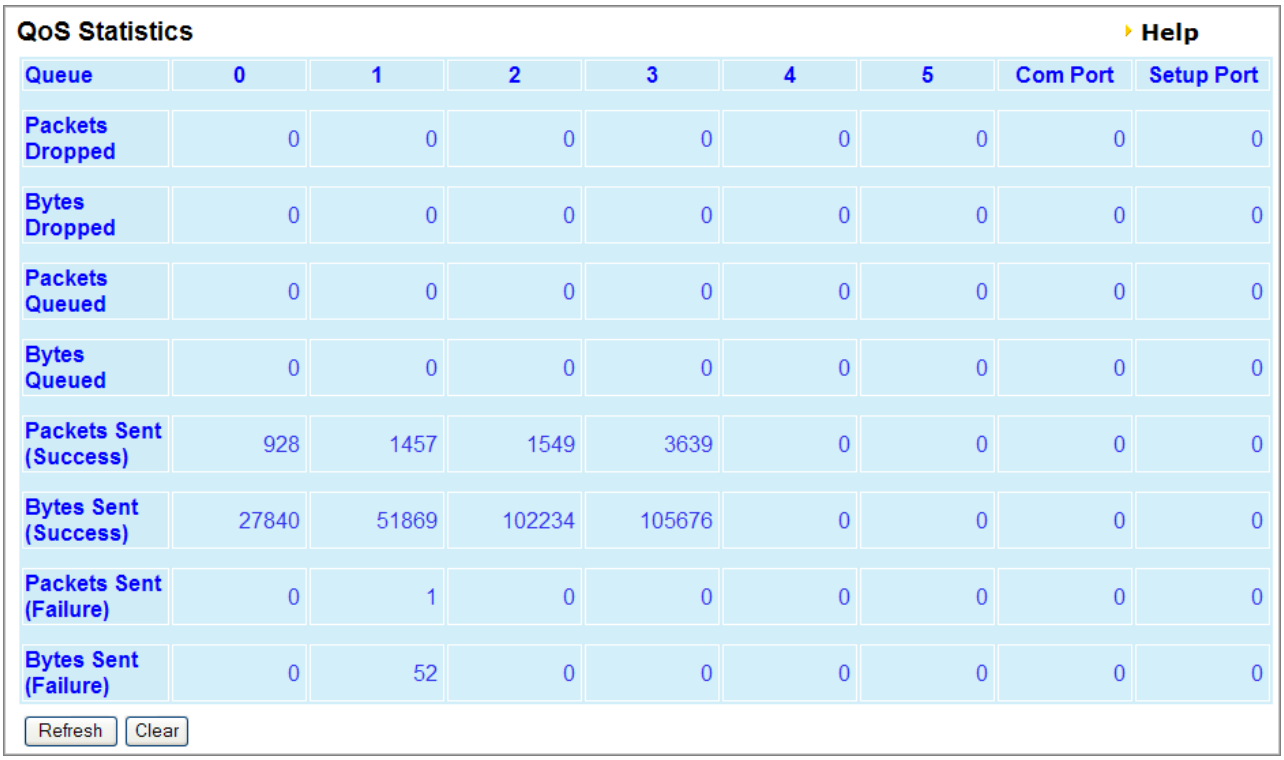
Actual radio throughput can sometimes be optimized depending on the network topology and characteristics of traffic being transmitted over the air. Collision-avoidance techniques, RF back-off algorithms, RF Acks/RF retries are not needed in all networks. While all of these features have definite benefits in certain situations, they can also slow throughput. See the Viper SC+ IP Router User Manual or contact CalAmp technical services for more details.

5.3.6 QOS STATISTICS

The QoS Statistics page displays information in table form about 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.

The QoS statistics page displays statistics for the up to seven (7) transmit queues that can be used to classify packets before they are transmitted over the RF interface. Two of the RF transmit queues are used for packets coming from the serial ports of the Viper Base Station (one per serial port: one for COM; and one for SETUP) and statistics for these queues can be seen at the right of the window. Statistical information for the LAN Queues, of which you can configure and enable up to five (5) as explained in the previous section Controller Settings » QoS, are displayed arranged across the middle of the window. Packets generated by the Viper itself are sent into a hidden RF transmit queue called the control transmit queue, which does not have any configurable options (packets in this queue are transmitted over the air in FCFS (first-come, first-served) order), and statistics for this queue are displayed in the left column labeled 0 (zero).

Figure 28 Controller Settings » QoS Statistics



QoS Statistics

Help

Queue	0	1	2	3	4	5	Com Port	Setup Port
Packets Dropped	0	0	0	0	0	0	0	0
Bytes Dropped	0	0	0	0	0	0	0	0
Packets Queued	0	0	0	0	0	0	0	0
Bytes Queued	0	0	0	0	0	0	0	0
Packets Sent (Success)	928	1457	1549	3639	0	0	0	0
Bytes Sent (Success)	27840	51869	102234	105676	0	0	0	0
Packets Sent (Failure)	0	1	0	0	0	0	0	0
Bytes Sent (Failure)	0	52	0	0	0	0	0	0

Refresh Clear

Queue

The control transmit queue (queue 0) and up to seven (7) configurable queues, including COM Port and Setup Port queues, as explained in the preceding page.

Packets dropped

Number of packets dropped, due to exceeding the buffer size for the queue, since the last clear or setting change.

Bytes dropped

Number of bytes dropped, due to exceeding the buffer size for the queue, since the last clear or setting change.

Packets Queued

Number of packets in the RF transmit queue.

Bytes Queued

Number of bytes in the RF transmit queue.

Packets Sent (Success)

Number of packets taken from the RF transmit queue sent over the RF interface.

Bytes Sent (Success)

Number of bytes taken from the RF transmit queue sent over the RF interface.

Packets Sent (Failure)

Number of packets taken from the RF transmit queue that failed to be sent over the RF interface.

Bytes Sent (Failure)

Number of bytes taken from the RF transmit queue that filed to be sent over the RF interface.

Refresh — Click Refresh to update all QoS statistics displayed in the page to show the most-current information.

Clear — Click Clear to clear all QoS statistics information displayed in the page to zero (0) and restart counting.

5.3.7 ALARM PORT

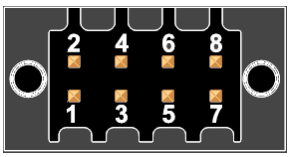
This section describes the function of the ALARM port. The Alarm port is connected to two relays, the Alarm Relay (Relay 1) and the Radio In Use Relay (Relay 2). Either of these two relays may be controlled automatically by the Viper SC+ Base Station (Redundant Base Station only) or may be switched manually by the user using the Base Station's web 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 Base Station web interface.

5.3.7.1 OVERVIEW

The following table and figures provide a pin-out of the Alarm IO connector and a block diagram of the internal circuitry.

Table 15 Alarm Port Pin-Out

Pin	Function
1	Relay 2 (Normally Open) Digital Input 1
2	Relay 1 (Normally Open)
3	Relay 2 (Common)
4	Relay1 (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



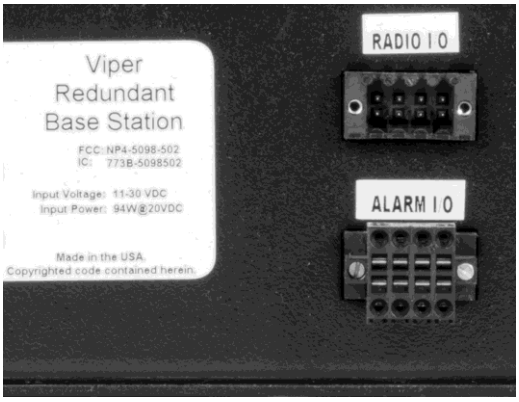
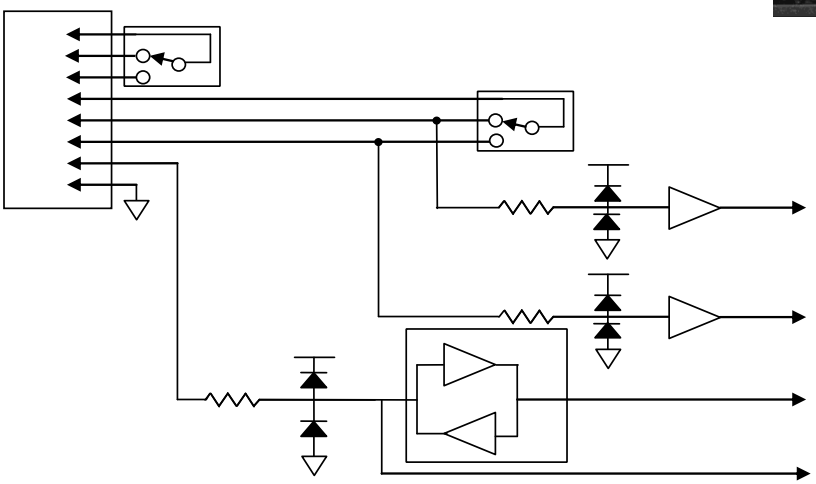


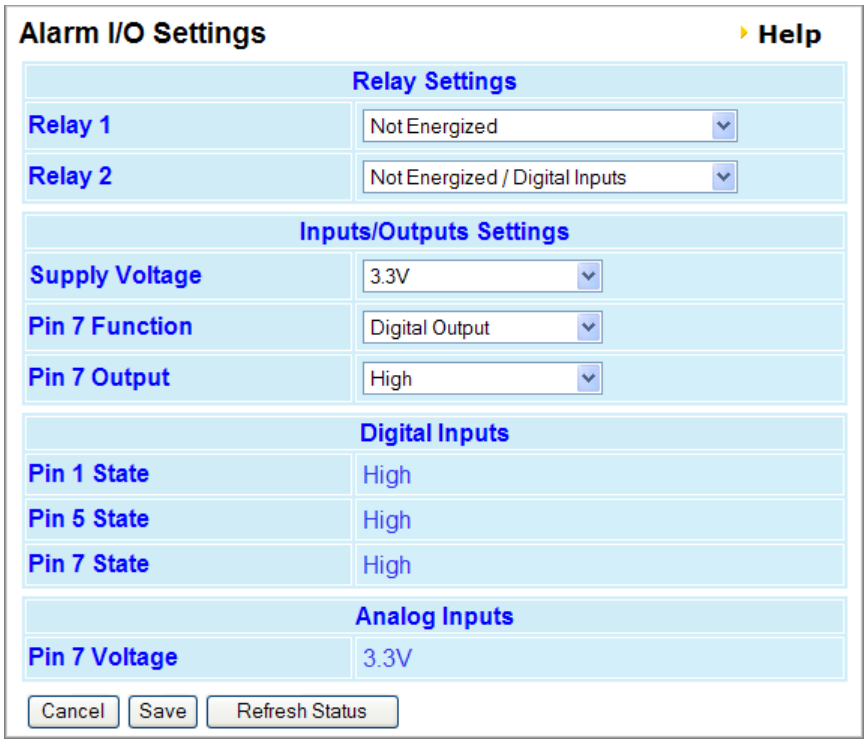
Figure 29 Simplified Block Diagram of Alarm Port Circuitry



5.3.7.2 CONFIGURING THE ALARM PORT

To navigate to the Alarm I/O Settings page, click the Alarm Port link under Controller Settings. Use this web page to configure the Alarm port pins and monitor the status of input lines..

Figure 30 Controller Settings » Alarm Port



Relay Settings

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

Relay 1	Description
Not Energized	Shorts pins 4 and 6.
Energized	Shorts pins 4 and 2.
Auto: Indicates Error Status (Redundant Base Station only)	Indicates if an error has been detected. Not Energized = Error has been detected with radio(sO 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 Error Status (Redundant Base Station only)	Indicates which radio is currently in use. Not Energized = Radio A is in use. Energized = Radio B is in use.

Inputs/Outputs Settings

Supply Voltage

Select the supply voltage for the digital and analog logic on the Alarm port. The supply voltage may be set to either 1.8 V or 3.3 V. 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 3.3 V, but the analog input on Pin 7 will be clamped at 0.6 V 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 alalog voltage and the digital state of the pin will be reported on the web page.

Pin 7 Output

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

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 150 kΩ resistor, through a buffer to the microprocessor. The input voltages are clamped between 0.5 V below ground and 0.6 V 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 B for a complete list of Alarm Port specifications.

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 100 resistor before being read by the ADC. The input voltages are clamped between 0.6 V below ground and 0.6 V above the i/O supply voltage.

5.3.8 IP RELAY AGENT

The "IP Relay Agent" is an application managing 2 IP sockets at the same time. One socket is called "Right" and the other is called "Left". The user can configure the two sockets in any mode possible (TCP client, TCP server, UDP). Data received from the "Right" socket is passed to the "Left" socket, data received from the "Left" socket is passed to the "Right" socket. The user can configure up to 5 independent instance of the "IP Relay Agent" application.

Figure 31 Controller Settings »

Advanced Settings (UDP)

UDP Auto-Response

When this UDP Auto-Response is enabled, the module remembers the remote UDP endpoint each time it receives data from it. If data needs to be sent to the remote UDP endpoint, the IP address and UDP port number of the remote endpoint learned when we received a packet from it is used to return the UDP packet.

UDP Local Copy

This parameter is only useful when sending a UDP packet to 255.255.255.255 or a multicast address. This means, send a copy outside the device but also a copy to any internal application listening on the destination UDP port.

Advanced Settings (TCP)

TCP Keepalive

The TCP Keepalive feature makes TCP send a "TCP Keepalive" message to test the TCP connection when there is no data transferred through the opened TCP connection after X number of minutes. If the TCP Keepalive message is received successfully by the remote TCP endpoint the TCP connection remains open. If the TCP Keepalive message is not received successfully the existing TCP connection will be closed.

To disable this feature, set the TCP Keepalive to "0".

TCP Idle Timeout

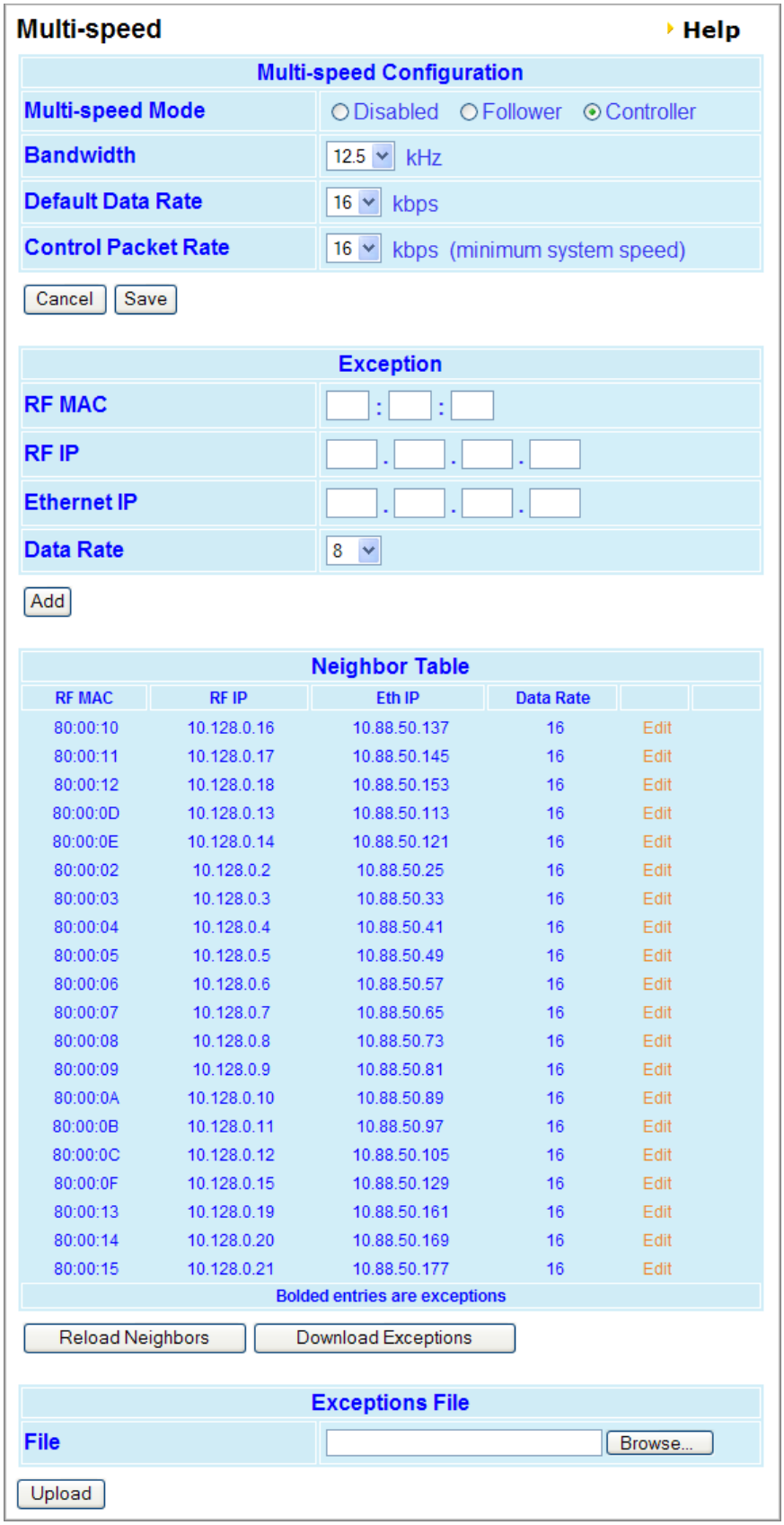
Close the TCP session if no data is seen for the given amount of time. If the TCP session is close in TCP client mode, the TCP client will try to establish a new TCP session.

5.3.9 MULTI-SPEED

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

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 32 Controller Settings » Multi-speed



5.3.9.1 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 SC+s 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 SC+s successfully receive these packets.

5.3.9.2 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.

5.3.9.3 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.

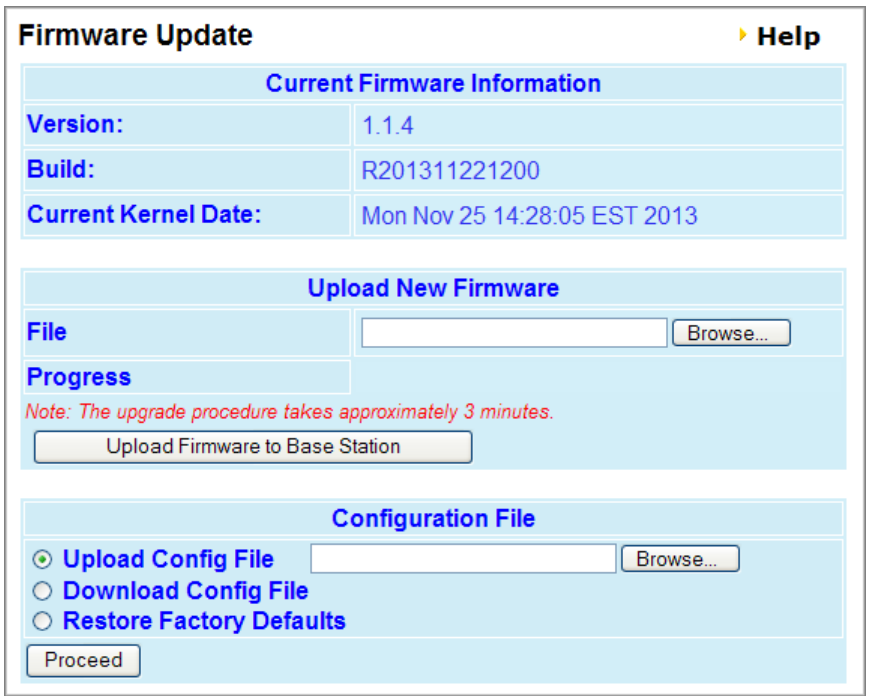
5.3.10 FIRMWARE UPDATE

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 33 Controller Settings » Firmware Update



Save — Click Save to save any changes you have made in this page.

Cancel — Click Cancel to cancel any changes you may have made to any of the settings in this page that you do not want to take effect.

5.3.10.1 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.

5.3.10.2 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.**

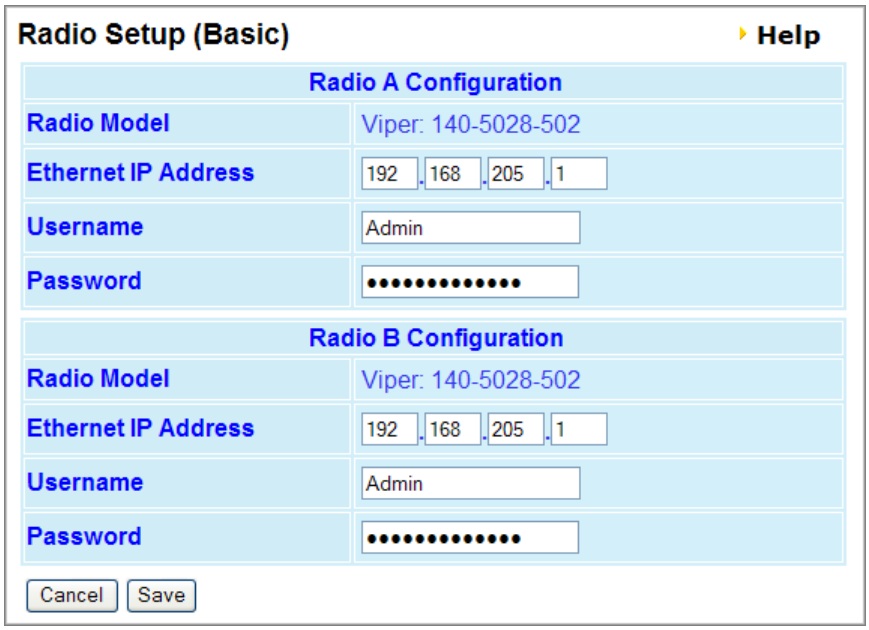
The user also has the option of restoring the factory default values via an external hardware reset pinhole button located on the back of the base station just right above the power connector.

RADIO SETTINGS

5.3.11 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.

Figure 34 Radio Settings » Setup (Basic)



5.3.12 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.

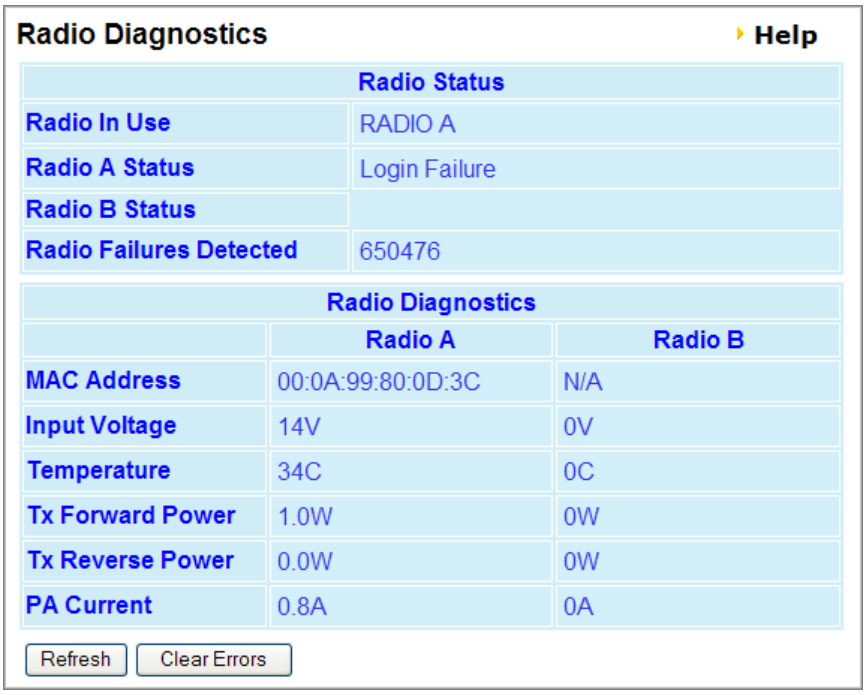
Password. Enter the password needed to connect to the radio.

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.

5.3.13 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 **Error! Reference source not found.**.

Figure 35 Radio Settings » Diagnostics



5.3.13.1 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.

5.3.13.2 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.

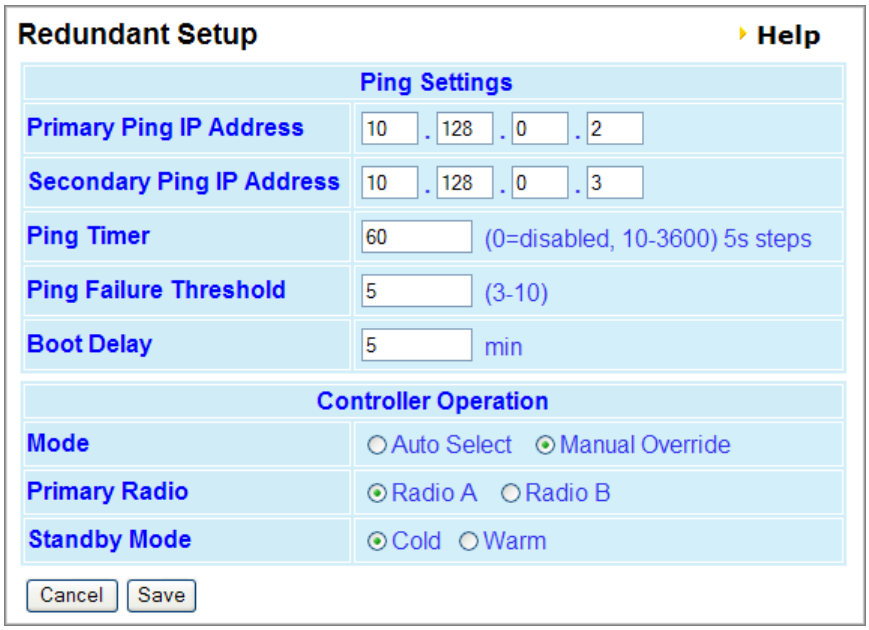
Refresh. The button will update the webpage to reflect the most recent changes.

5.4 SYSTEM MONITOR

5.4.1 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 36 System Monitor » Redundant Setup



Save — Click Save to save any changes you have made to settings in this page.

Cancel — Click Cancel to cancel any changes you may have made to any of the settings in this page that you do not want to take effect.

5.4.1.1 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.

5.4.1.2 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.

5.4.2 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.

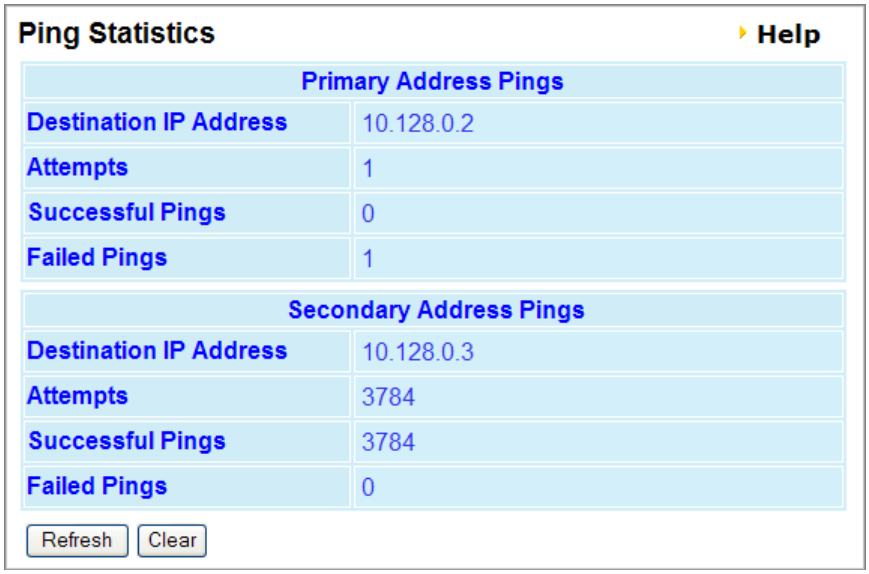
Destination IP Address. This field displays the destination IP address the Controller Board is attempting to ping.

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.

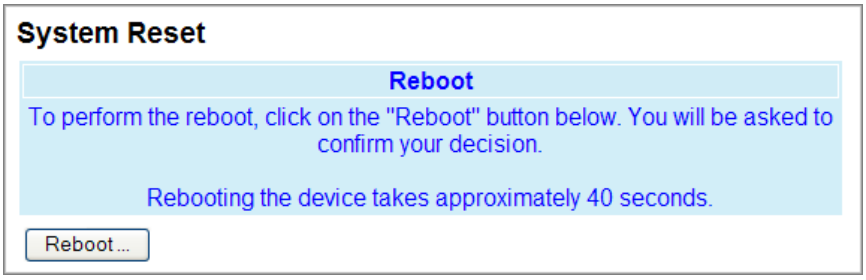
Failed Pings. This field displays the number of failed pings to either the Primary or the Secondary IP address.

Figure 37 System Monitor » Ping Statistics



5.5 RESET UNIT

Figure 38 System Reset



6 UPGRADING FIRMWARE

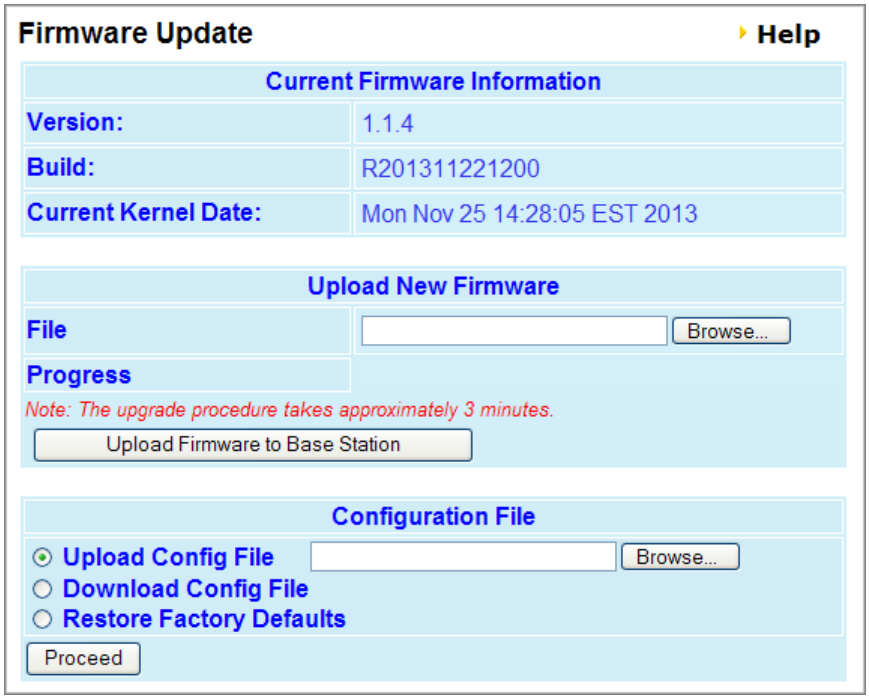
6.1 FIRMWARE UPDATE

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 39 Firmware Update Webpage



6.2 UPLOAD FIRMWARE

6.2.1 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.

6.2.2 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.

6.2.3 UPLOAD NEW FIRMWARE

- **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.

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APPENDIX A — ABBREVIATIONS AND 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.

ADC: Analog-to-digital converter.

AES: Advanced Encryption Standard.

Airlink: Physical radio-frequency connection used for communication between units.

ARP: Address Resolution Protocol; maps Internet addresses to physical addresses.

Backbone: The part of a network connecting the bulk of the systems and networks together, handling most of the 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 Viper SC and Viper SC+ wireless radio modems are COM ports configured as DCE and designed to connect directly to DTE.

CWID: a station identifier or "call sign" broadcast in Morse code at specified periodic intervals to identify the broadcasting radio.

DCE: Data Communication Equipment

Default Gateway: A device forwarding Internet traffic from the Local Area Network (LAN)

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 network 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 in one direction at a time.

HMI: Human Machine Interface. Button panel, keyboard, or touch-screen equipped device that provides a means of human interaction in controlling devices.

HTTP: HyperText Transfer Protocol; Communications protocol used to connect to servers on the World Wide Web.

IPconfig: Internet Protocol Configuration; A console application available in Microsoft Windows and Mac OS X that displays all current TCP/IP network configuration values. Displays the IP address for a particular networking device.

LAN: Local Area Network.

MAC: Media Access Control; The unique address a manufacturer assigns to each networking device.

MTU: Maximum Transmission Unit; The largest TCP/IP packet that the 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 workstation.

OCBW: Occupied Bandwidth. The amount of radio spectrum or bandwidth the radio actually uses.

OIP: Optimized IP; Compresses TCP and UDP headers, and filters unnecessary acknowledgements. 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 (also called a PHYceiver) provides the interface to the 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; A network 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.

PVID: Port VLAN ID.

QoS: Quality of Service; refers to resource reservation control mechanisms.

RADIUS: Remote Authentication Dial In User Service; A networking protocol that provides centralized authentication authorization, and account management for computers to connect and use a network service.

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 transmfer.

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 or performing control operations.

SINAD: SIgnal-to-Noise And Distortion; a ratio used as a measure of the quality of a signal from a communications device.

SNMP: Simple Network Management Protocol; A protocol used by network management systems to manage and monitor network-attached devices.

SNTP: Simple Network Time Protocol; A 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 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 and determining which addresses belong or do not on a specified subnet.

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 communication.

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

Terminal Server: Acts as a converter between Ethernet/IP and RS-232 Protocol.

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.

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.

VDC: Voltage Direct Current

VLAN: Virtual Local Area Network

VPN: Virtual Private Network; A computer network that uses a public network (example: the Internet) to transmit private data. VPN users can exchange data as if inside an internal network even if they are not directly interconnected.

VTS: Virtual Terminal Server

APPENDIX B —VIPER SC+ BASE STATION SPECIFICATIONS

These specifications are typical and subject to change without notice.

GENERAL SPECIFICATIONS

General				
Power Source	11-30 V DC, Negative GND The Viper is UL approved when powered with a listed Class 2 power supply.			
RF Impedance	50 Ω			
Specified Temperature	- 30° to + 60° C			
Operating Temperature	- 40° to + 70° C			
Storage Temperature	- 40° to +85°C, non-condensing RH			
Operating Humidity	5% to 95% non-condensing RH			
Rx Current Drain at 25°C with one Viper SC+ radio powered		**DC Input 11 V**	**DC Input 20 V**	**DC Input 30 V**
	All Relays On All Relays Off	1.7 A (max.) 1.5 A (typ.) 1.3 A (typ.)	1.2 A (max.) 945 mA (typ.) 925 mA (typ.)	760 mA (max.) 646 mA (typ.) 622 mA (typ.)
Tx Current Drain at 25°C with one Viper SC+ radio powered	**Power Out**	**DC Input 11 V**	**DC Input 20 V**	**DC Input 30 V**
	Tx Power: Max All Relays On All Relays Off	6.7 A (max.) 4.5 A (typ.) 4.3 A (typ.)	4.7 A (max.) 3.1 A (typ.) 2.9 A (typ.)	2.9 A (max.) 1,9 A (typ.) 1.7 A (typ.)
	Tx Power: 1 W All Relays On All Relays Off	2.6 A (max.) 2.1 A (typ.) 1.9 A (typ.)	1.7 A (max.) 1.4 A (max.) 1.2 A (typ.)	1.1 A (max.) 880 mA (typ.) 860 mA (typ.)
Cold start	60 seconds			
Nominal Dimensions	Overall: 19 in. W × 5.22 in. H × 11.63 in. D (48.3 cm × 13.3 cm × 29.5 cm) Chassis: 16 in. W × 4.75 in. H × 11.38 in. D (40.6 cm × 12.1 cm × 28.9 cm) Front Panel: 19 in W × 5.22 in H × 0.25 in. thickness (48.3 cm × 13.3 cm × 0.64 cm)			
Shipping Weight	Standard: 11.5 lbs. (5.2 kg), Redundant: 15 lbs. (6.8 kg)			
Mounting Options	19-inch EIA rack-mountable chassis, 3 U (unit height, where 1 U ≈ 1.75 in. or 4.43 cm)			
RF Specifications	See radio specifications and *Viper SC+ IP Router User Manual*			
Regulatory Certifications	See APPENDIX C — Regulatory Certifications			

Display	
12 Status LEDs (Standard) 17 Status LEDs (Redundant)	Controller LEDs: Power, Status, Fan Error 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 (2 ×) 10/100 Base T/Tx auto MDIX (100 kHz capable models) Two (2 ×) 10 Base T auto MDIX (other models) (The two Ethernet connections are connected internally to each other and to the radio(s) with an embedded Ethernet switch.)	
Power – I/O	**Power Header**	**Power Plug**
	4 Pin, 5.08 mm, Power Header	4 Pin, 5.08 mm Power Header Cable: 60 inches Connections: • Aux. Power A • Ground • Power • Aux. Power B
Alarm – I/O, Radio – I/O	**Header**	**Plug**
	8 Pin, 3.5 mm, Header	8 Pin, 3.5 mm, Tension Clamp Conductor size: 18-28 AWG
Internal Auxiliary Power	**Header**	**Plug**
	8 Pin, 3.5 mm, Power Header	8 Pin, 3.5 mm, Power Plug Connections: • Aux. Power B • Power • Ground • Aux. Power A
Alarm – I/O Port Specifications	**Relays**	Characteristics
	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	Characteristics
	VIH: High Level Input Voltage (Pins 1, 5, 7) I/O Supply Voltage = 1.8 V I/O Supply Voltage = 3.3 V	 1.2 V min. 2.0 V min.
	VIL: Low Level Input Voltage (Pins 1, 5, 7) I/O Supply Voltage = 1.8 V I/O Supply Voltage = 3.3 V	 0.6 V min. 0.8 V min.

Connectors (Continued)

Connectors (Continued)		
Alarm – I/O Port Specifications (Continued)	**Digital Inputs and Outputs (Continued)**	Characteristics (Continued)
	Digital Inputs: Input Impedance (Pins 1, 5)	150 k ohms
	Digital I/O: Input/Output Impedance (Pin 7)	100 ohms
	Min/Max Input Voltage: Pins 1, 5 Pin 7 (I/O Supply = 1.8 V) Pin 7 (I/O Supply = 3.3 V)	 +/- 50 V max. - 1.0 min, + 2.8 V max. - 1.0 min, + 4.3 V max.
	Output Voltage Pin 7 Output High: I/O Supply = 1.8 V, Isource= 1 mA) I/O Supply = 3.3 V, Isource = 1 mA) Output Low: I/O Supply = 1.8 V, Isink = 1 mA) I/O Supply = 3.3 V, Isink = 1 mA)l	 1.7 V (typical) 3.2 V (typical 0.1 V (typical) 0.1 V (typical)
	Analog Input	Characteristics
	Analog Input (Pin 7) Range I/O Supply = 1.8 V I/O Supply = 3.3 V	 0.0 V to 1.8 V 0.0 V to 3.3 V
	Analog Input Accuracy	+/- 0.1 V

Model Number	Frequency Range	Channel Bandwidths Available
FCC/IC Certified Models		
140-5118-502	136 - 174 MHz	6.25 kHz, 12.5 kHz, 25 kHz, 50 kHz
140-5318-502		
140-5318-503		
140-5128-504	215 - 240 MHz	6.25 kHz, 12.5 kHz, 25 kHz, 50 kHz, 100 kHz
140-5328-504		
140-5328-505		
140-5148-302	406.1125 - 470.000 MHz	6.25 kHz, 12.5 kHz, 25 kHz, 50 kHz
140-5348-302		
140-5348-303		
140-5148-502	450.000 - 511.975 MHz	6.25 kHz, 12.5 kHz, 25 kHz, 50 kHz
140-5348-502		
140-5348-505		
140-5198-304	880 - 902 MHz	12.5 kHz, 25 kHz, 50 kHz, 100 kHz
140-5398-304		
140-5398-305		
140-5198-504	928 - 960 MHz	12.5 kHz, 25 kHz, 50 kHz, 100 kHz
140-5398-504		
140-5398-505		

Model Number	Frequency Range	Channel Bandwidths Available
ETSI/ACMA Certified Models		
140-5118-600	142 - 174 MHz	12.5 kHz, 25 kHz (ETSI/AS/NZ)
140-5118-601		
140-5318-600		
140-5318-601		
140-5148-400	406.1125 - 470.000 MHz	12.5 kHz, 25 kHz (ETSI/AS/NZ)
140-5148-401		
140-5348-400		
140-5348-401		
140-5148-600	450.000 - 511.975 MHz	12.5 kHz, 25 kHz (ETSI/AS/NZ)
140-5148-601		
140-5348-600		
140-5348-601		
Frequency Stability	1.0 ppm for all models except the models specified below; 0.50 ppm for 140-5128-504, 140-5328-504, 140-5328-505, 140-5198-304, 140-5398-504, 140-5298-505, 140-5198-504, 140-5398-504 and 140-5398-505	

Transmitter	VHF	UHF	900
Tx Frequencies	136 - 174 MHz 215 - 240 MHz	406.1125 - 470.000 MHz 450.000 - 511.975 MHz	880 - 902 MHz 928 - 960 MHz
Carrier Output Power	1 - 10 Watts, Adjustable	1 - 10 Watts, Adjustable	1 - 8 Watts, Adjustable
Duty Cycle	100 % (Power Foldback Allowed for High Temperatures)		
Radiated Spurious Emissions	Per FCC / Regulatory		
Conducted Spurious Emissions	Per FCC / Regulatory		
Transmitter Stability into VSWR	> 10:1 (Power Foldback Allowed)		
Rx to Tx Time	< 2 ms 4 ms (ETSI Versions)		
Channel Switching Time	< 15 ms (Band-End to Band-End)		

Receiver						
	Bandwidth Bit Rate	**140-5118-50x** **130-5318-50x**	**140-5128-50x** **140-5328-50x**	**140-5148-30x** **140-5348-50x**	**140-5198-30x** **140-5398-50x**	**Units**
Rx Frequencies		136 - 174	215 - 240	406.1125 - 470.000 450.000 - 511.975	880 - 902 928 - 960	MHz MHz
Data Sensitivity @ 10^{-6} Bit Error Rate (BER) Typical / Max	**6.25 kHz** 4 kbps 8 kbps 12 kbps	 -115 / -112 -106 / -103 -100 / -95	 -115 / -112 -106 / -103 -100 / -95	 -115 / -112 -106 / -103 —	 — — —	 dBm dBm dBm
	12.5 kHz 8 kbps 16 kbps 24 kbps 32 kbps	 -116 / -114 -109 / -106 -102 / -98 -95 / -91	 -116 / -114 -109 / -106 -102 / -98 -95 / -91	 -116 / -114 -109 / -106 -102 / -98 -95 / -91	 -112 / -109 -106 / -103 -99 / -95 -90/ -86	 dBm dBm dBm dBm
	25 kHz 16 kbps 32 kbps 48 kbps 64 kbps	 -114 / -111 -106 / -103 -100 / -96 -92 / -88	 -114 / -111 -106 / -103 -100 / -96 -92 / -88	 -114 / -111 -106 / -103 -100 / -96 -92 / -88	 -111 / -108 -104 / -101 -97 / -93 -89 / -85	 dBm dBm dBm dBm
	50 kHz 32 kbps 64 kbps 96 kbps 128 kbps	 -111 / -108 -104 / -101 -97 / -94 -88 / -85	 -111 / -108 -104 / -101 -97 / -94 -88 / -85	 -111 / -108 -104 / -101 -97 / -94 -88 / -85	 -108 / -105 -101 / -98 -94 / -91 -85 / -82	 dBm dBm dBm dBm
	100 kHz 64 kbps 128 kbps 192 kbps 256 kbps		 -103 / -100 -96 / -93 -89 / -86 -80 / -77		 -100 / -97 -93 / -90 -86 / -83 -77 / -74	 dBm dBm dBm dBm

Receiver						
	Bandwidth Bit Rate	**140-5118-60x** **140-5318-60x**		**140-5148-40x, 60x** **140-5348-40x, 60x**		**Units**
Rx Frequencies		142 - 174		406.1125 - 470.000 450.000 - 511.975		MHz MHz
ETSI Mode Useable Senstitvity @ 10^{-2} Bit Error Rate (BER)	**12.5 kHz (ETSI)** 8 kbps 16 kbps 24 kbps	 -111 / -108 -104 / -101 -96 / -92		 -111 / -108 -104 / -101 -96 / -92		 dBm dBm dBm
Typical / Max	**25 kHz (ETSI)** 16 kbps 32 kbps 48 kbps	 -110 / -107 -103 / -100 -96 / -92		 -110 / -107 -103 / -100 -96 / -92		 dBm dBm dBm
Adjacent Channel Rejection (min.)	6.25 kHz	45	45	45	—	dB
	12.5 kHz	60	60	60	55	dB
	25 kHz	70	70	70	65	dB
	50 kHz	75	75	75	70	dB
	100 kHz	—	75	—	70	dB
Spurious Response Rejection	All	> 75 dB				dB
Intermodulation Rejection	All	> 75 dB				dB
Tx to Rx Time	All	< 1 ms 5 ms (ETSI Versions)				ms
Channel Switching Time	All	< 15 ms (Band End to Band End)				ms
Receive Input Power	All	17 dBm (50 mW) max.				dBm

Modem / Logic						
	Model	**6.25 kHz**	**12.5 kHz**	**25 kHz**	**50 kHz**	**100 kHz**
Viper	**Viper 100** 140-5018-500 (obsolete) 140-5018-501 (obsolete) **Viper 400** 140-5048-300 (obsolete) 140-5048-301 (obsolete) 140-5048-500 (obsolete) 140-5048-501 (obsolete)	 4 kbps 8 kbps	 8 kbps 16 kbps	 16 kbps 32 kbps		
	Viper 900 140-5098-500 (obsolete) 140-5098-501 (obsolete)		8 kbps 16 kbps	16 kbps 32 kbps		

Modem / Logic						
Viper SC	**Viper SC 100** 140-5018-502 140-5018-503 **Viper SC 200** 140-5028-502 140-5028-503	4 kbps 8 kbps 12 kbps	8 kbps 16 kbps 24 kbps 32 kbps	16 kbps 32 kbps 48 kbps 64 kbps	32 kbps 64 kbps 96 kbps 128 kbps	
	Viper SC 400 140-5048-302 140-5048-303 140-5048-502 140-5048-503	4 kbps 8 kbps	8 kbps 16 kbps 24 kbps 32 kbps	16 kbps 32 kbps 48 kbps 64 kbps	32 kbps 64 kbps 96 kbps 128 kbps	
	Viper SC 900 140-5098-502 140-5098-503		8 kbps 16 kbps 24 kbps 32 kbps	16 kbps 32 kbps 48 kbps 64 kbps	32 kbps 64 kbps 96 kbps 128 kbps	
Viper SC+	**Viper SC+ 200** 140-5028-504 140-5028-505	4 kbps 8 kbps 12 kbps	8 kbps 16 kbps 24 kbps 32 kbps	16 kbps 32 kbps 48 kbps 64 kbps	32 kbps 64 kbps 96 kbps 128 kbps	64 kbps 128 kbps 192 kbps 256 kbps
	Viper SC+ 900 140-5098-304 140-5098-305 140-5098-504 140-5098-505		8 kbps 16 kbps 24 kbps 32 kbps	16 kbps 32 kbps 48 kbps 64 kbps	32 kbps 64 kbps 96 kbps 128 kbps	64 kbps 128 kbps 192 kbps 256 kbps
Viper SC+ ETSI	**Viper SC 100 (ETSI AS/NZ)** 140-5018-600 140-5018-601 **Viper SC 400 (ETSI AS/NZ)** 140-5048-400 140-5048-401 140-5048-600 140-5048-601		8 kbps 16 kbps 24 kbps	16 kbps 32 kbps 48 kbps		
Modulation Type	2FSK, 4FSK, 8FSK, 16FSK					
Addressing	IP					

SETUP and COM Port	
Interface	EIA-232F DCE
Data Rate	Setup Port 300 - 115,200 bps (Default: 19.2 kbps) (100 kHz capable models) Setup Port 300 – 19,200 bps (Default 19.2 kbps) (other models)
	COM Port 300 – 115,200 bps (Default: 9.6 kbps)

Diagnostics	
Message elements	Controller Status Temperature Input Voltage Alarm Port Supply Voltage Forward Power Reverse Power Fan Status Fan Voltage

OVERALL DIMENSIONS AND MOUNTING HOLE LOCATIONS

The following figure shows the overall dimensions of the Viper SC+ Base Station. Dimensions shown are applicable for both Standard and Redundant Base Stations. This drawing may be used for layout reference when mounting the Viper Base Station. The Base Station chassis is designed to be rack-mountable in a standard 19-inch EIA rack. The cassis is 3 Units tall.

Figure 40 Viper SC+ Base Station Overall Dimensions

APPENDIX C — REGULATORY CERTIFICATIONS

Domestic and International Certifications					
Model Number	**Frequency Range**	**FCC**	**IC (DOC)**	**European Union EN 300 113**	**Australia / New Zealand**
140-5118-500* 140-5318-500* 140-5318-501*	136 - 174 MHz	NP4-5018-500	773B-5018500		
140-5118-502 140-5318-502 140-5318-503	136 - 174 MHz	NP4-5018-500	773B-5018502		
140-5118-600 140-5118-601 140-5318-600 140-5318-601	142 - 174 MHz			CE 1588 !	ACMA AS/NZS 4925-2004 (Spectrum Impact Assessment)
140-5128-502** 140-5328-502** 140-5328-503**	215 - 240 MHz	NP4-5028-502	773B-5028502		
140-5128-504 140-5328-504 140-5328-505	215 - 240 MHz	NP45028504	773B-5028504		
140-5148-300* 140-5348-300* 140-5348-301*	406.1 - 470 MHz	NP4-5048-300	773B-5048300		
140-5148-302 140-5348-302 140-5348-303	406.1125 - 470 MHz	NP4-5048-300	773B-5048302		
140-5148-400 140-5148-401 140-5348-400 140-5348-401	406.1125 - 470 MHz			CE 1588 !	ACMA AS/NZS 4925-2004 (Spectrum Impact Assessment)
140-5148-500* 140-5348-500* 140-5348-501*	450 - 512 MHz	NP4-5048-300	773B-5048300		
140-5148-502 140-5348-502 140-5348-503	450 - 512 MHz	NP4-5048-300	773B-5048302		
140-5148-600 140-5148-601 140-5348-600 140-5348-601	450 – 512 MHz			CE 1588 !	ACMA AS/NZS 4925-2004 (Spectrum Impact Assessment)
140-5198-304 140-5398-304 140-5398-305	880 - 902 MHz	NP45098304	773B-5098304		
140-5198-500* 140-5398-500* 140-5398-501*	928 - 960 MHz	NP4-5098-500	773B-5098500		

Domestic and International Certifications					
140-5198-502** 140-5398-502** 140-5398-503**	928 - 960 MHz	NP4-5098-502	773B-5098502		
140-5198-504 140-5398-504 140-5398-505	928 - 960 MHz	NP45098504	773B-5098504		
UL Certification	All models UL approved when powered with a listed Class 2 source. This device is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.				
Installation	This device is intended for installation only in a RESTRICTED ACCESS LOCATION per EN60950-1:2006.				

* Obsolete models

** End of Life in 2014

DECLARATION OF CONFORMITY FOR MODELS # 140-5018-60x, 140-5048-40x, and 140-5048-60x

The Viper radio is tested to and conforms with the essential requirements for protection of health and the safety of the user and any other person and Electromagnetic Compatibility, as included in following standards.

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

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

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

It 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.

Language	Declaration
cs Česky [Czech]	CalAmp tímto prohlašuje, že tento rádio je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
da Dansk [Danish]	Undertegnede CalAmp erklærer herved, at følgende udstyr radio overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
de Deutsch [German]	Hiermit erklärt CalAmp, dass sich das Gerät radio in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
et Eesti [Estonian]	Käesolevaga kinnitab CalAmp seadme raadio vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
en English	Hereby, CalAmp, declares that this radio is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
es 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.
el Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ CalAmp ΔΗΛΩΝΕΙ ΟΤΙ ΡΑΔΙΌΦΩΝΟ ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
fr 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.
it 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.
lv Latviski [Latvian]	Ar šo CalAmp deklarē, ka radio atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
lt Lietuvių [Lithuanian]	Šiuo CalAmp deklaruoja, kad šis radijo atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Language	Declaration
nl 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.
mt Malti [Maltese]	Hawnhekk, CalAmp , jiddikjara li dan tar-radju jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
hu Magyar [Hungarian]	Alulírott, CalAmp nyilatkozom, hogy a rádió megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
pl Polski [Polish]	Niniejszym CalAmp oświadcza, że radio jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
pt Português [Portuguese]	CalAmp declara que este rádio está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
sl Slovensko [Slovenian]	CalAmp izjavlja, da je ta radio v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
sk Slovensky [Slovak]	CalAmp týmto vyhlasuje, že rádio spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
fi Suomi [Finnish]	CalAmp vakuuttaa täten että radio tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
sv 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 útvarp er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
no 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
Belgium	146 - 174, 406.1 - 430 or 440 - 470 450 - 470	470 - 512
Bulgaria	None	All
Denmark	406.125 - 470, 450 - 511.975	136 - 174
Estonia	None	All
France	Contact Authority	Contact Authority
Germany	Contact Authority	Contact Authority
Greece	142 - 174 421 - 449	406.1250 - 420 450 - 511.975
Hungary	142 - 174 406.125 - 470 450 - 511.975	Contact Authority
Italy	142 - 174	Contact Authority
Latvia	142 - 174 406.125 - 470	450 - 470 470 - 511.975
Lithuania	406.125 - 430 440 - 470	136 - 146 430 - 440 470 - 512

Country	Acceptable Frequencies	Prohibited Frequencies
Luxembourg	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
Malta	Contact Authority	Contact Authority
Slovak Republic	146 - 174 410 - 448	142 - 145 406.25 - 409, 449 - 470 450 - 511.975
Slovenia	146 - 174 401.6 - 410, 440 - 470 450 - 470	142 - 145 411 - 439 471 - 511.975
Spain	147 - 174 406.1 - 470	430 - 440
All other EU and EFTA Member States	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.

FCC Emission Designators

Viper SC+ 100 / 400	FCC/IC Type Acceptance – 6.25 kHz / 12.5 kHz / 25.0 kHz			
Model Number	**Channel Bandwidth**	**Data Rate**	**Baud Rate (kHz)**	**Emission Designator**
140-5018-502 140-5018-503 140-5048-302 140-5048-303 140-5048-502 140-5048-503	6.25 kHz	4 kbps	4	3K30F1D
		8 kbps	4	3K55F1D
		12 kbps	4	3K20F1D
		16 kbps	4	3K45F1D
	12.5 kHz	8 kbps	8	8K20F1D
		16 kbps	8	8K30F1D
		24 kbps	8	8K50F1D
		32 kbps	8	8K08F1D
	25.0 kHz	16 kbps	16	16K5F1D
		32 kbps	16	16K8F1D
		48 kbps	16	17K8F1D
		64 kbps	16	17K0F1D

FCC Emission Designators

Viper SC+ 200	FCC / IC Type Acceptance – 6.25 kHz / 12.5 kHz / 25.0 kHz / 100 kHz			
Model Number	**Channel Bandwidth**	**Data Rate**	**Baud Rate (kHz)**	**Emission Designator**
140-5028-504 140-5028-505	6.25 kHz	4 kbps	4	3K30F1D
		8 kbps	4	3K55F1D
		12 kbps	4	3K20F1D
	12.5 kHz	8 kbps	8	8K20F1D
		16 kbps	8	8K30F1D
		24 kbps	8	8K50F1D
		32 kbps	8	8K08F1D
	25.0 kHz	16 kbps	16	16K5F1D
		32 kbps	16	16K8F1D
		48 kbps	16	17K8F1D
		64 kbps	16	17K0F1D
	50.0 kHz	32 kbps	32	33K3F1D
		64 kbps	32	34K3F1D
		96 kbps	32	36K0F1D
		128 kbps	32	33K0F1D
	100 kHz	64 kbps	64	55K0F1D
		128 kbps	64	53K3F1D
		192 kbps	64	51K7F1D
		256 kbps	64	52K5F1D

FCC Emission Designators

Viper SC+ 900	FCC / IC Type Acceptance – 6.25 kHz / 12.5 kHz / 25.0 kHz / 50.0 kHz / 100 kHz			
Model Number	**Channel Bandwidth**	**Data Rate**	**Baud Rate (kHz)**	**Emission Designator**
140-5098-304 140-5098-305 140-5098-504 140-5098-505	6.25 kHz	4 kbps	4	3K30F1D
		8 kbps	4	3K55F1D
		12 kbps	4	3K20F1D
	12.5 kHz	8 kbps	8	8K20F1D
		16 kbps	8	8K30F1D
		24 kbps	8	8K50F1D
		32 kbps	8	8K08F1D
	25.0 kHz	16 kbps	16	16K5F1D
		32 kbps	16	16K8F1D
		48 kbps	16	17K8F1D
		64 kbps	16	17K0F1D
	50.0 kHz	32 kbps	32	29K8F1D
		64 kbps	32	30K0F1D
		96 kbps	32	29K5F1D
		128 kbps	32	30K5F1D
	100 kHz	64 kbps	64	51K0F1D
		128 kbps	64	52K7F1D
		192 kbps	64	49K7F1D
		256 kbps	64	51K3F1D

FCC Emission Designators

Viper SC+ 100 / 400	ETSI Type Acceptance – 12.5 kHz / 25.0 kHz			
Model Number	**Channel Bandwidth**	**Data Rate**	**Baud Rate (kHz)**	**Emission Designator**
140-5018-600	12.5 kHz	8 kbps	8	6K30F1D
140-5018-601		16 kbps	8	6K10F1D
140-5048-400		24 kbps	8	6K00F1D
140-5048-401	25.0 kHz	16 kbps	16	13K8F1D
140-5048-600		32 kbps	168	13K2F1D
140-5048-601		48 kbps	16	12K9F1D

APPENDIX D — SERVICE AND SUPPORT AND WARRANTY STATEMENT

Product Warranty, RMA, and Contact Information

CalAmp guarantees that every Viper SC+™ IP router will be free from physical defects in material and workmanship for one (1) year from the date of purchase when used within the limits set forth in the specifications section of this manual.

The manufacturer's Warranty Statement is available on the following page. If the product proves defective during the warranty period, contact CalAmp Customer Service to obtain a Return Material Authorization (RMA).

RMA Request/Contact Customer Service

CalAmp
1401 North Rice Avenue
Oxnard, CA 93030
Tel: 805.987.9000
Fax: 805.987.8359

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

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

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

Product Documentation

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 the most current product documentation and application notes, visit www.calamp.com.

Tech Support

CalAmp
1401 North Rice Avenue
Oxnard, CA 93030
1.805.987.9000 or 1.507.833.6701 Option 2 for Fixed, narrowband, and radio modem products
E-mail: productsupport@calamp.com

WARRANTY STATEMENT

CalAmp warrants to the original purchaser for use ("Buyer") that data telemetry products manufactured by CalAmp ("Products") are free from defects in material and workmanship and will conform to published technical specifications for a period of, except as noted below, one (1) year from the date of shipment to Buyer. CalAmp makes no warranty with respect to any equipment not manufactured by CalAmp, and any such equipment shall carry the original equipment manufacturer's warranty only. CalAmp 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 CalAmp. CalAmp, 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 CalAmp. 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 CalAmp or authorized service agent. CalAmp 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 CalAmp.

This warranty is void and CalAmp 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 CalAmp 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 CalAmp or authorized service agent of the defect during the applicable warranty period. CalAmp 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. CALAMP AND BUYER AGREE THAT BUYER'S EXCLUSIVE REMEDY FOR ANY BREACH OF ANY OF SAID WARRANTIES IT AS SET FORTH ABOVE. BUYER AGREES THAT IN NO EVENT SHALL CALAMP 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 CalAmp 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

ABOUT CALAMP

CalAmp (NASDAQ: CAMP) is a proven leader in providing wireless communications solutions to a broad array of vertical-market applications and customers. CalAmp's extensive portfolio of intelligent communications devices, robust and scalable cloud service platform, and targeted software applications streamline otherwise complex machine-to-machine (M2M) deployments. These solutions enable customers to optimize their operations by collecting, monitoring, and efficiently reporting business-critical data and intelligence from high-value remote assets. CalAmp provides wireless data communication solutions for the telemetry and asset tracking markets, private wireless networks, railroad Positive Train Control (PTC) radio transceivers, public safety communications and critical infrastructure and process control applications. For additional information, please visit the CalAmp website: www.calamp.com.