Aprisa SRi

Quick Start Guide

Aprisa SRi Protected Station v2

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Version 1.1.0

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1. Introduction

The Aprisa SRi Protected Station is a hot-swappable product providing radio and user interface protection for Aprisa SRi radios. The RF ports and interface ports from the active radio are switched to the standby radio if there is a failure in the active radio.

The Aprisa SRi Protected Station is comprised of an Aprisa Protection Switch and two standard Aprisa SRi radios mounted in a 2U rack mounting chassis.

All interfaces (RF, data, etc.) are continually monitored on both the active and standby radio to ensure correct operation. The standby radio can be replaced without impacting traffic flow on the active radio.

The Aprisa SRi radios can be any of the currently available Aprisa SRi radio frequency bands, channel sizes or interface port options. The Aprisa SRi Protected Station can operate as a base station, repeater station or remote radio.

This guide provides a quick startup and basic installation instructions for the Aprisa SRi Protected Station shown in the next figure below.

Refer to the Aprisa SRi User Manual for important warnings, cautions and notes and any detailed management relating to fault, configuration, maintenance, performance monitoring, and security.

Front Panel Connections

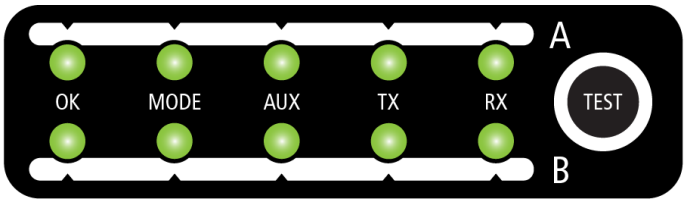
Example: 2 Ethernet ports and 2 serial ports.

All connections to the radio are made on the front panel. The functions of the connectors are (from left to right):

Designator	Description
10 - 60 VDC; 4A	10 to 60 VDC (floating) DC input using two Molex 2 pin male screw fitting connectors.
ALARM	Two Alarm ports using RJ45 connectors. Used for two alarm inputs and two alarm outputs.
ETHERNET 1 & 2	Two ports of Integrated 10Base-T/100Base-TX layer-3 Ethernet switch using RJ45 connectors. Used for Ethernet user traffic and product management.
SERIAL 1 & 2	Two ports of RS-232 serial using RJ45 connectors. Used for RS-232 asynchronous user traffic.
Remote Cont A and B	Two remote control ports using a Phoenix 1963447 connector. Used for remote switch-over of the active and standby radios.
Auto / Locked	The Hardware Manual Lock switch provides a manual override of the active / standby radio.
MGMT	Two Management ports using USB micro type B connectors. Used to access the radio A and radio B Command Line Interface (CLI).
LED Display Panel	See ‘LED Display Panel’ below.
TX / ANT	Four TNC, 50 ohm, female connectors for connection of the A and B antenna feeder cables.

LED Display Panel

The Aprisa SRi Protected Station has an LED Display panel which provides on-site alarms / diagnostics without the need for PC.



The LEDs indicate the following conditions:

	OK	MODE	AUX	TX	RX
Flashing Red		*Radio has not registered*			
Solid Red	*Alarm present with severity Critical, Major and Minor*			*TX path fail*	*RX path fail*
Flashing Orange		*Diagnostics Function Active* *OTA software distribution*	*Management traffic on the USB MGMT port*		
Solid Orange	*Alarm present with Warning Severity*		*Device detect on the USB host port (momentary)*		
Flashing Green	*Software Upgrade Successful*		*Tx / Rx Data on the USB host port*	*RF path TX is active*	*RF path RX is active*
Solid Green	*Power on and functions OK and no alarms*	*Processor Block is OK*	*USB interface OK*	*Tx path OK*	*Rx path OK*

LED Colour	Severity
Green	No alarm – information only
Orange	Warning alarm
Red	Critical, major or minor alarm

Ethernet and RS-232 RJ-45 LED Indicators

LED	Status	Ethernet Explanation	RS-232 Explanation
Green	On	Ethernet signal received	RS-232 device connected
Orange	Flashing	Data traffic present on the interface	Data present on the interface

2. Installation

The Aprisa SRi Protected Station is shipped to you in a box containing the following:

- One Aprisa SRi Protected Station containing two Aprisa SRi radios pre cabled to the protection switch (part number ends with AE).

- Two rack mounting brackets
- Two 2 pin female power connectors
- One 4 pin female remote control connector

2.1. Install the Aprisa SRi Protected Station and Connect the Protection Earth

The Aprisa SRi Protected Station is designed to mount in a standard 19" rack.

Rack mounted Aprisa SRi Protected Station without duplexer

Rack mounted Aprisa SRi Protected Station with duplexer

The Aprisa SRi Protected Station has an earth connection point on the bottom right of the chassis. Use the supplied M4 screw to earth the enclosure to a protection earth.

The antenna feeder cable should use grounding kits for lightning protection as specified or supplied by the coaxial cable manufacturer to properly ground or bond the cable outer.

Note * When the spare Aprisa Protection Switch is supplied (APGS-XPSW-X22-FR-SA), the item includes the Aprisa Protection Switch chassis, mounting brackets, 2x power connectors, 1x remote control connector but no radios.

2.2. Connect the Antenna and Apply Power to the Aprisa SRi Protected Station

Connect the antenna to the Protected Station antenna port (TNC female connector). If the antenna is not available, terminate the TX/ANT A/B antenna port with a TNC male 50 ohm terminator (10 Watts min). If the Protected Station is the dual antenna option, then both TX/ANT A/B antenna ports / terminators must be connected.

Warning: Do not directly connect the two radio antenna ports without attenuation of at least 40 dB. The receiver can be damaged if signals greater than +10 dBm are applied to the antenna port.

The Aprisa SRi Protected Station version 2 operates on an input voltage of 10 to 60 VDC floating and consumes up to 42 Watts. Two power connectors (Molex 2 pin female) are supplied fitted to the Protected Station. Wire your power source to the two power connectors (- / +) and plug the connectors into the Protected Station. The connector screws can be fastened to secure the connectors.

Note: The radio fuses will blow if the connected power supply is over voltage, or the polarity is reversed. Spare fuses are located on the Protection Switch board (see the 'Replacing Protection Switch Fuses' section of the Aprisa SRi User Manual).

Note: The factory default for the Terminal Operating Mode is set to 'Base' for all Protected Stations.

Turn your power source on. All the LEDs on both radios will flash orange for two seconds and then change to:

- Active radio - the OK, MODE, AUX, TX and RX LEDs will light green, and the TX and RX LEDs will also flash as traffic is transmitted / received.
- Standby radio - the OK, TX, RX and AUX LEDs will light green, and the MODE LED will flash green.

2.3. Connect to the Aprisa SRi Protected Station (via SuperVisor or CLI)

Ensure that the Hardware Manual Lock switch is set to radio A (this is a factory default setting). This prevents random switching when changing the radio settings.

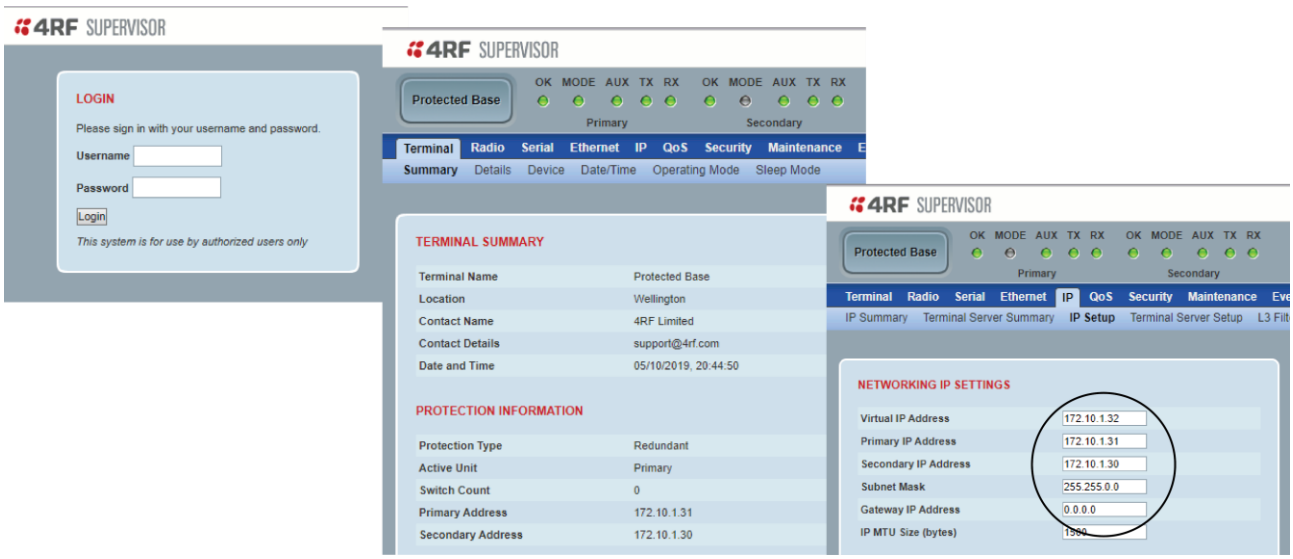
The Aprisa SRi primary radio (radio A) in the Protected Station has a factory default IP address of 169.254.50.10 and the secondary Aprisa SRi radio (radio B) in the Protected Station has a factory default IP address of 169.254.50.20, both with a subnet mask of 255.255.0.0.

- Set up your PC for a compatible IP address e.g. 169.254.50.1 with a subnet mask of 255.255.0.0.
- Connect your PC network port to one of the Aprisa SRi Protected Station Ethernet ports (1 to 4 depending on product option).

  Open a browser and enter http://169.254.50.10.

  Note: The Aprisa SRi has a self-signed security certificate which may cause the browser to prompt a certificate warning. It is safe to ignore the warning and continue. The valid certificate is 'Issued By: 4RF-APRISA' which can be viewed in the browser.
- Login to the primary radio with the default login 'admin' and password 'admin'.
- Each radio in the network and both radios in the Protected Station must be set up with unique IP addresses on the same subnet.

  Set the Primary IP address and the Secondary IP address to network compatible IP addresses. Set the Protected Station Virtual IP Address. This is the IP Address of the active radio used in both bridge and router modes. Set the Subnet mask and Gateway.



If the IP addresses of radios in the protected station are unknown for some reason, they can be shown or changed via the Command Line Interface (CLI) on the radios MGMT USB ports. USB to UART Bridge VCP Drivers are required to connect the radio USB port to your PC.

You can download and install the relevant driver from:

https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers.

Set the PC serial port to 38,400 baud, 8 data bits, no parity and 1 stop bit, with no hardware flow control.

- Open the protected station drawer by sliding it from the front.
- Connect your PC USB port to the primary Aprisa SRi (A) MGMT USB port.
- Login to the radio with the default login 'admin' and password 'admin'.
- At the command prompt >> type 'cd APRISASR-MIB-4RF' and enter
- At the command prompt >> type 'ls Terminal' and enter to show the existing IP address
- At the command prompt >> type 'set termEthController1IpAddress xxx.xxx.xxx.xxx' and enter to change the IP address.

The Protected Station is configured in the 4RF factory as a protected station. If for some reason it is not setup as a Protected Station, please see 'Creating a Protected Station' in the Aprisa SRi User Manual.

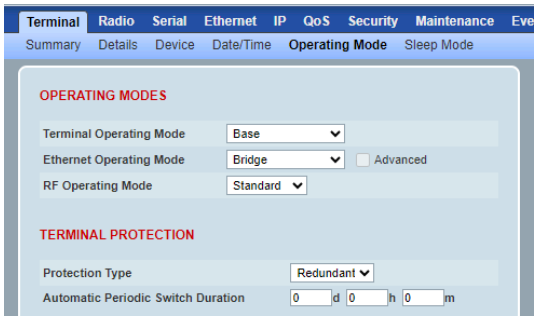
3. Setup the Aprisa SRi Protected Station

Login using the IP address of either the primary or secondary radio (do not use the PVIP address for login). All parameters will be automatically synchronized on both radios.

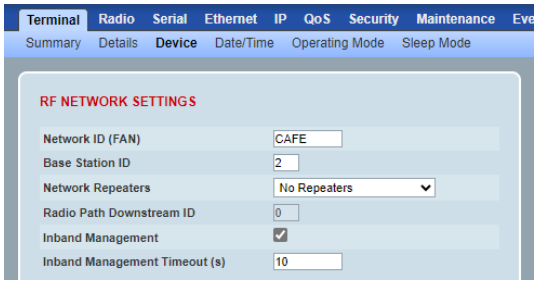
The Aprisa SRi has a factory default Terminal Operating Mode of Remote Station.

A single radio or a protected station in the Aprisa SRi network must be set up as a base station. The other radios or protected stations in the Aprisa SRi network are set up as remote stations or repeater stations.

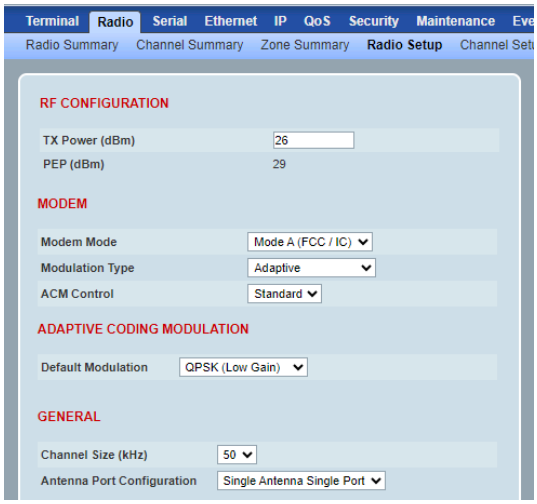
Set the Ethernet Operating Mode required.



Set the unique radio 'Base Station ID' to be the same in your entire network. Every base station and its attached remote radios (i.e. base station network) shall have a unique 'Base station ID' in case of close proximity or close coverage between two or more base station networks.



Set the Aprisa SRi TX Power and Channel Size to comply with your license.

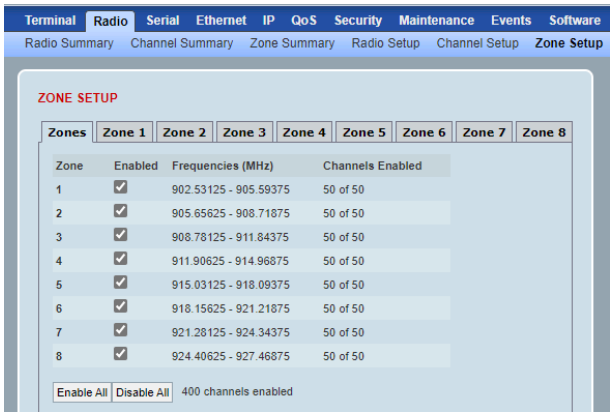


Setup the Aprisa SRi Zones / Channels.

Specific channels within the selected zone hop can be disabled if there is a known transmission within the channel that may cause interference to the operation of this network. The minimum number of enabled channels is 50.

If a channel is selected in a zone that is disabled, the zone will be enabled when the channel selection is saved. The default is all zones enabled.

The zone frequencies are pre-defined in the Aprisa SRi for the zone number. The zone frequencies are spaced at 62.5 kHz.



You can now configure the remaining protected station and network parameters and settings. For more information, please refer to the Aprisa SRi User Manual available from the 4RF website https://www.4rf.com/secure (login required).

Reboot both Primary and Secondary radios and restore the Hardware Manual Lock switch is set to AUTO.

The Aprisa SRi Protected Station is ready to operate.

4. Monitor the Aprisa SRi Protected Station Signal Strength

When the network is installed, the radio signal strength can be monitored on remote stations by setting the radio to Test Mode.

To enter Test Mode, press and hold the TEST button on the front panel until all the LEDs flash green (about 3 - 5 seconds).

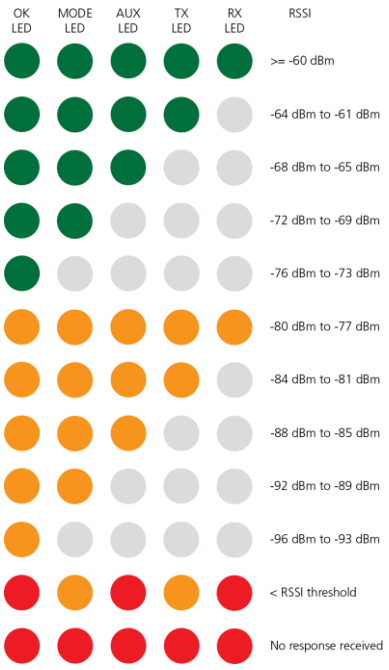
In Test Mode, the LED Display panel presents a real time visual display of the RSSI. This can be used to adjust the antenna for optimum signal strength.

Note: The response time is variable and can be up to 5 seconds.

To exit Test Mode, press and hold the TEST button until all the LEDs flash red (about 3 - 5seconds).

If the network is operating correctly, the LEDs will show:

- Active radio - the OK, MODE, AUX, TX and RX LEDs will light green, and the TX and RX LEDs will also flash as traffic is transmitted / received.
- Standby radio - the OK, TX, RX and AUX LEDs will light green, and the MODE LED will flash green.

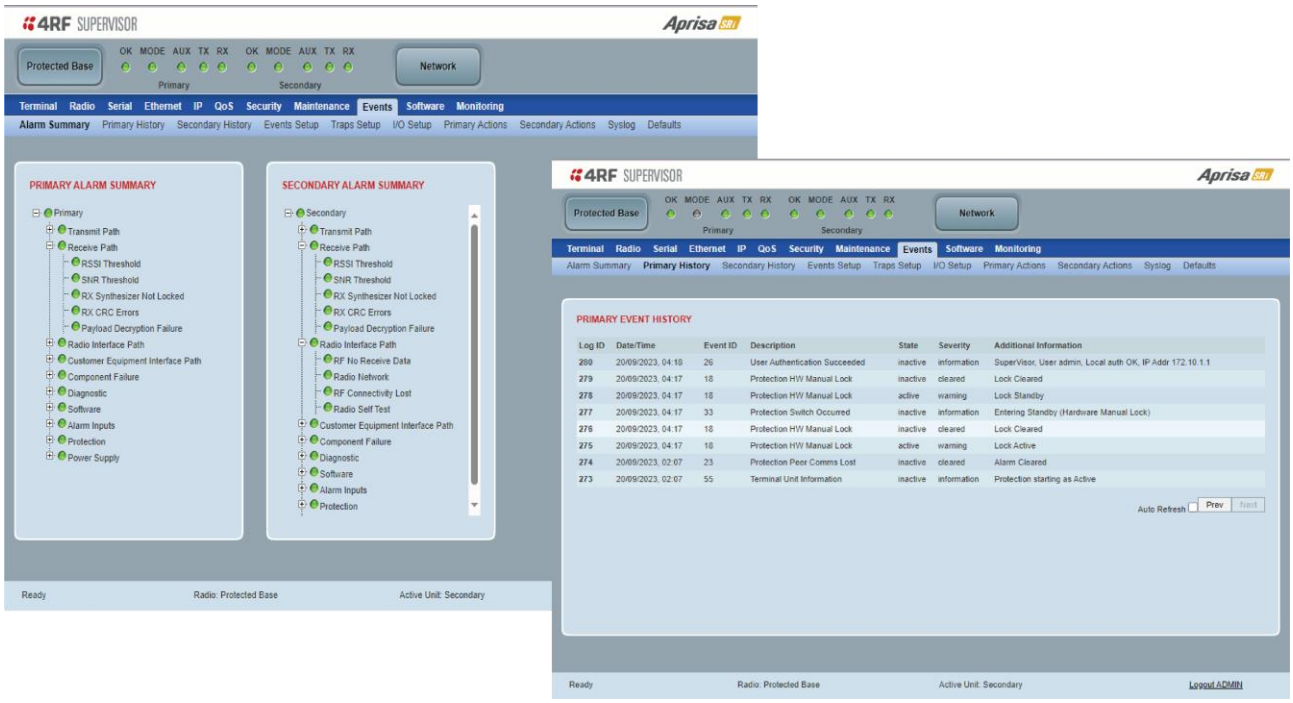


For more information, please refer to the Aprisa SRi User Manual available from the 4RF website https://www.4rf.com/secure (login required).

5. Fault Management and Troubleshooting

The Aprisa SRi supports extensive alarms for every section and building block of the device including the interfaces. SuperVisor allows user to view the main summary alarm at the top of the SuperVisor page which mimic the device LEDs and in addition all the detailed alarms of the device (see SuperVisor > Events > Alarm Summary). In addition, SuperVisor allows user to troubleshoot any alarm issue by using the event history log page for more information about the alarm (see SuperVisor > Events > Event History).

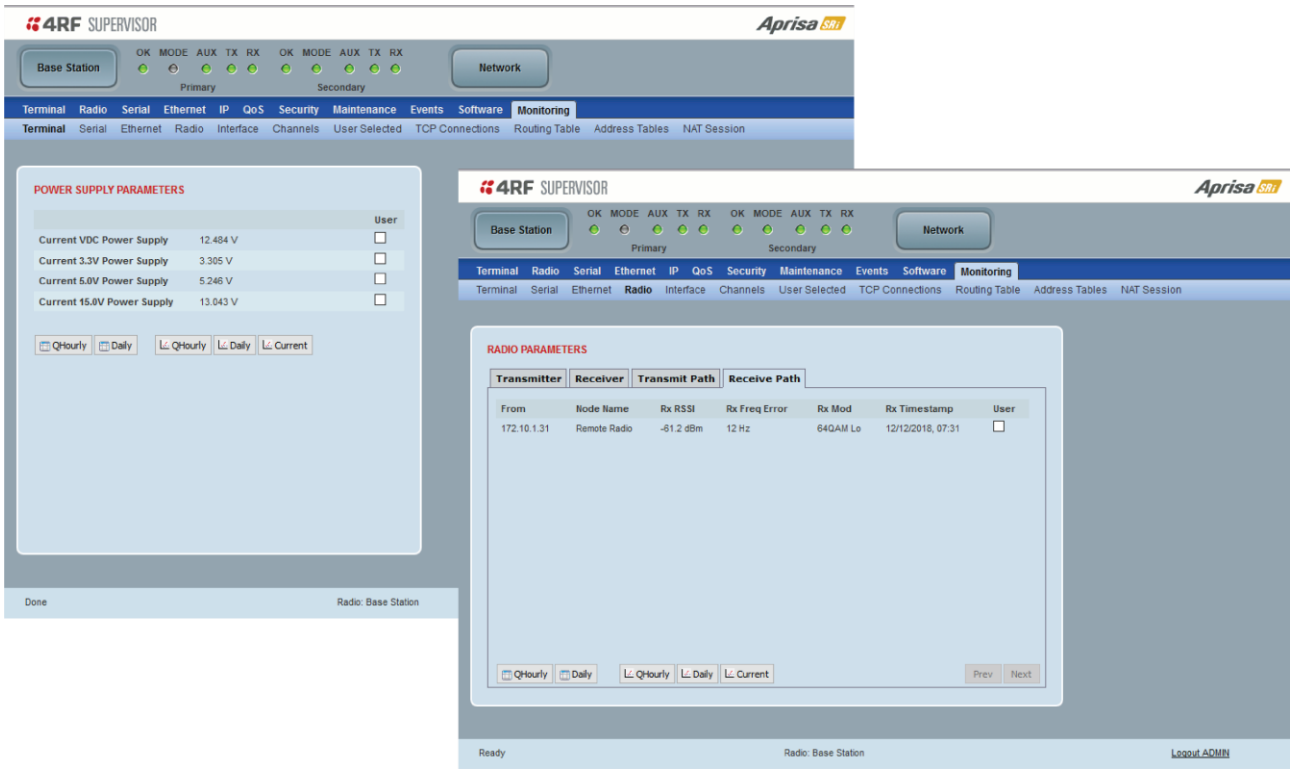
For more information see the Aprisa SRi user manual.

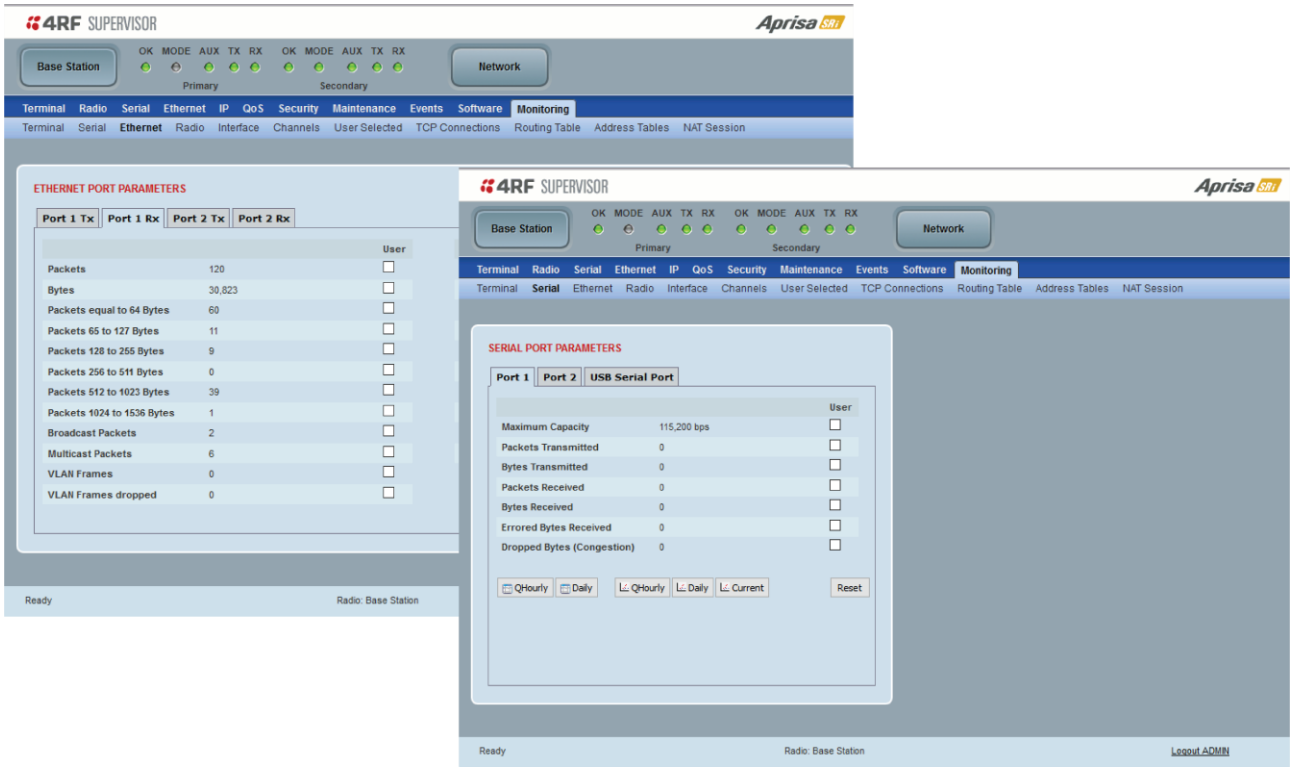


6. Performance Monitoring (RF and Data Traffic)

The Aprisa SRi supports extensive performance monitoring statistics and diagnostic per device and per data ports. The Aprisa SRi Terminal, Serial, Ethernet, Radio, and User Selected Monitored Parameter results have history log views for both Quarter Hourly and Daily. SuperVisor allows user to view trends of the performance monitoring parameters in graph or tabular format (see SuperVisor > Monitoring).

For more information see the Aprisa SRi user manual.





7. Compliance Considerations

The Aprisa SRi is a professional radio product and as such must be installed by a suitably trained and qualified installer who is aware of the local regulatory requirements existing at the time of installation and is capable of ensuring that the regulations are adhered to.

The maximum Equivalent Isotropic Radiated Power (EIRP) permitted from the Aprisa SRi is regulated and must not exceed the limits provided in the following table. To meet this regulatory requirement, knowledge of the antenna gain, and feeder cable loss must be known before setting the transmitter output power.

Regulatory Requirement	Frequency Range	Maximum EIRP[1]	SRi Equivalent Maximum Average Power (R_{dBm})
USA, FCC Part 15.247	902 MHz to 928 MHz	+36 dBm PEP	+32 dBm
Canada, ISED RSS-247	902 MHz to 928 MHz	+36 dBm PEP	+32 dBm
Australia, ACMA AS/NZS 4268	915 MHz to 928 MHz	+30 dBm	+30 dBm
New Zealand, General User Radio Licence for Short Range Devices	915 MHz to 928 MHz	+30 dBm	+30 dBm
New Zealand, General User Radio Licence for Short Range Devices	920 MHz to 928 MHz	+36 dBm	+36 dBm
Brazil, Act No. 14.448, of December 4, 2017	902 MHz to 907.5 MHz & 915 MHz to 928 MHz	+36 dBm PEP	+30 dBm
Mexico, NOM-208-SCFI-2016	902 MHz to 928 MHz	+36 dBm PEP	+30 dBm
Peru	915 MHz to 928 MHz	+30 dBm	+30 dBm

The Aprisa SRi has a maximum mean output power of +26 dBm into a 50 ohm antenna which equates to a maximum peak power of +30 dBm PEP. To determine the maximum power to be set on the Aprisa SRi, the following installation parameters must be known:

1. Aprisa SRi equivalent average power for maximum permitted EIRP (specified in dBm) R_{dBm}
2. Antenna isotropic gain (specified in dBi) G_{dBi}
3. Feeder coax loss between Aprisa SRi and antenna (specified in dB/m) $L_{dB/m}$
4. Length of feeder coax between Aprisa SRi and antenna (specified in metres) d_m

From these the above information, the power setting of the Aprisa SRi (P_{dBm}) can be calculated to ensure operation within the regulatory requirements using the formula:

$$P_{dBm} = R_{dBm} + (d_m \times L_{dB/m}) - G_{dBi}$$

Antenna gain information can be obtained from the Antenna manufacturer and is either expressed in terms of dBi, referenced to an isotropic radiator, or dBd, referenced to a dipole.

If the gain is expressed in dBd, it can be converted to dBi by adding 2.15 dB to the gain value.

The following is an example of transmitter power calculations:

Antenna Type and Gain	Feeder Coax Length and Loss	Regulatory Limit	Maximum SRi Power Setting
Yagi, 11 dBi	10 m of ½" Heliax @ 0.11 dB/m gives 1.1 dB loss	+36 dBm PEP	22 dBm
Panel, 12 dBi	33 m of RG214 @ 0.22 dB/m gives 7.3 dB loss	+30 dBm	25 dBm
Dipole, 3.5 dBi	3 m of RG214 @ 0.22 dB/m gives 0.66 dB loss	+30 dBm	26 dBm
Grid, 18 dBi	15 m of ½" Heliax @ 0.11 dB/m gives 1.65 dB loss	+30 dBm	13 dBm

[1] These are correct at the time of printing. The installer must ensure that the installation complies with the regulatory requirements at the time of installation.

Canada

This radio transmitter Aprisa SRi ISED: 6772A-SI902M160 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet émetteur radio Aprisa SRi ISED: 6772A-SI902M160 a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximum autorisé indiqué. Les types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits d'utilisation avec cet appareil.

Mexico

La operación de este equipo está sujeta a las siguientes dos condiciones:

(1) es posible que este equipo o dispositivo no cause interferencia perjudicial y

(2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Este equipo ha sido diseñado para operar con las antenas que enseguida se enlistan y para una ganancia máxima de antena de 6 dBi.

El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBi quedan prohibidas. La impedancia requerida de la antena es de 50 ohms.