

Aprisa SR+ Migration Master Station

The Aprisa SR+ Migration Master Station (MMS) provides smooth migration from legacy radio networks to next generation Aprisa SR+ SCADA radio networks utilizing existing frequencies and antenna infrastructure. From the very first remote radio replacement enjoy market leading Aprisa radio features in terms of speed, coverage, security, IP, and advanced management options. Your network is no longer limited to performing in a crippled backward compatibility mode.

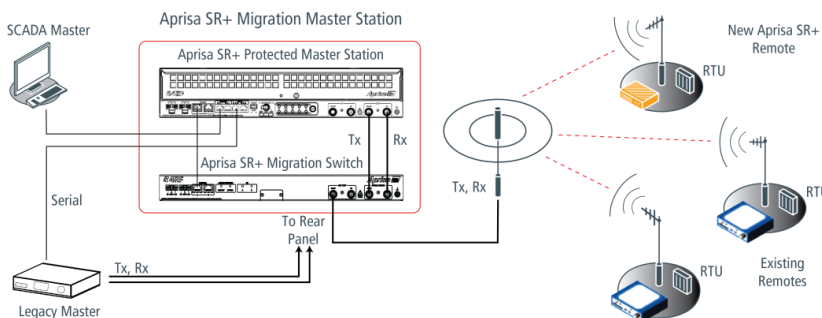


THE MMS BENEFITS

Benefit now by migrating your network smoothly with the minimum of cost and downtime, using existing frequencies and antennas. Leverage your maintenance budget to get a real performance and feature set upgrade. Legacy vendor backward compatibility solutions lead to a staged upgrade program, only achieving promised improvements and investment return at the end of the project at which point the network will be behind today's next generation Aprisa SR+ performance and feature set. Think forwards not backwards!

MMS SYSTEM COMPONENTS AND CONFIGURATION

The MMS system comprises of two main components, the standard Aprisa SR+ protected or non-protected master station and the new migration switch, a fully redundant RF switch. The MMS is installed side-by-side with the legacy master station. The new Aprisa SR+ network uses the same frequencies and antenna as the existing radio network. The migration switch connects to the RF antenna and shares this with the legacy master or the Aprisa SR+ master station as required by the remotes. The migration switch is managed by the advanced logic in the Aprisa SR+ protected master station. All SCADA traffic is directed through the Aprisa SR+ master, which passes traffic destined for the legacy network to the legacy base station in addition to setting the migration switch for the antenna.



Aprisa SR+



The Aprisa SR+ provides smart, secure point-to-multipoint communications for oil, gas and utility monitoring and control.

- 220 MHz, UHF, and 900 MHz licensed bands
- RS-232 and IEEE 802.3 protocols with multiple port options
- Software selectable: 12.5 kHz, 25 kHz, and 50 kHz channel sizes
- Software selectable single / dual frequency selection
- Software selectable dual / single antenna port operation
- Gross data rates up to 216 kbit/s
- 256, 192, or 128 bit AES encryption
- AES-CCM to NIST SP 800-38C
- Adaptive Coding and Modulation: QPSK, 16, and 64 QAM
- Advanced forward error correction
- Dedicated alarm port per radio
- Layer 2 bridge (VLAN aware) and layer 3 router modes
- VLAN add/remove, single or double VLAN (QinQ)
- QoS priority enforcement
- L3/L4 filtering and ICMP-ping, Telnet, HTTPS, SNMP, SNMP proxy protocol filtering
- Power supply options of 12 VDC and 48 VDC
- -40 to +70°C operating temperature without fans
- Class I, Div 2 for hazardous locations
- 432.6 mm (W) x 372 mm (D) x 83 mm (H)
- ETSI, FCC, and IC standards compliant

MMS OPERATING CONFIGURATIONS

The Aprisa SR+ MMS supports standard legacy radio networks, with repeater based network support scheduled for the near future. The MMS supports integration with MDS™ x790 / x710 networks with the master station operating in non-continuously keyed switched carrier mode. The legacy network traffic must be serial utilizing a standard poll/response protocol. Support is protocol specific. Multiple protocols including DNP3, Modbus and a range of others are supported with the initial release, additional protocols will be released on customer request. The MMS supports Aprisa SR+ protected or non-protected master stations. Future support for other products and operating modes is in development.

OPERATIONAL OVERVIEW

The Aprisa SR+ inspects the serial SCADA traffic packets to determine the destination address. Each packet is mapped to either the legacy or the Aprisa SR+ network based on SCADA address learning, utilizing the address / destination ID field of the SCADA protocol. Initially all SCADA protocol addresses will be assumed to exist on the legacy network. If a transaction to a remote address times out or there is no response the packet can be resent on the Aprisa SR+ network. If an address is detected as working on the Aprisa SR+ network, it is added to the address map for the Aprisa SR+ network. This allows you to progressively switch out legacy remote radios without any configuration of the MMS address map or host controller. The address map can also be manual defined as an option. When migration of all remotes is complete the legacy master and the migration switch component of the MMS can be removed resulting in a standard Aprisa SR+ master station installation.

REDUNDANCY

The migration switch contains a fully redundant RF switch, operating as a part of the MMS. Any hardware failure in the migration switch (or master station) results in a switchover and the MMS will continue to operate switching traffic between the legacy and Aprisa SR+ networks. The MMS provides full protection to the master station site.

CONNECTION TO SCADA MASTER / HOST CONTROLLER

For best performance the existing serial connection to the host controller should be set to the maximum bit rate (115 kbit/s) or replaced by an Ethernet connection, if available, to maximize the performance of the network as remote upgrades progress. These higher speeds also work to reduce serialization delays in the legacy master station connection.

OPERATING TEMPERATURE

With the superior thermal design common across all Aprisa products the MMS operates across the full temperature range without de-rating or the need for fans.

POWER SUPPLY

The Aprisa SR+ MMS supports redundant power supply inputs.

MANAGEMENT

Configuration and management of the Aprisa SR+ protected station (and MMS) is done via the 4RF SuperVisor web-based browser application. With its comprehensive, easy to use graphical user interface SuperVisor enhances network configuration and set up, improves fault identification and isolation, and increases asset visibility.

ABOUT 4RF LIMITED

Operating in more than 130 countries, 4RF Limited provides radio communications equipment for critical infrastructure applications. Customers include utilities, oil and gas companies, transport companies, telecommunications operators, international aid organisations, public safety, military and security organisations. 4RF point-to-point and point-to-multipoint products are optimized for performance in harsh climates and difficult terrain, supporting IP, legacy analogue, serial data and PDH applications.

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Aprisa SR+



The Aprisa SR+ fully redundant Migration Switch characteristics.

- 220 MHz, UHF, and 900 MHz licensed bands
- Dedicated TNC antenna port operation
- Dual / single N-Type antenna port connection to legacy master station
- Dual / single TNC antenna port connection to Aprisa SR+ master station
- Dedicated USB port
- Monitoring and operational LEDs
- -40 to +70°C operating temperature without fans
- <1.5 dB MMS RF switch insertion loss
- Class I, Div 2 for hazardous locations
- 432.6 mm (W) x 372 mm (D) x 83 mm (H)
- ETSI, FCC, and IC standards compliant

NOTE

All third party product names and trademarks are acknowledged as property of their respective owners. MDS™, x790 and x710 are trademarks and/or service marks owned by the General Electric Company.



For more information please contact
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Version 1.0.0



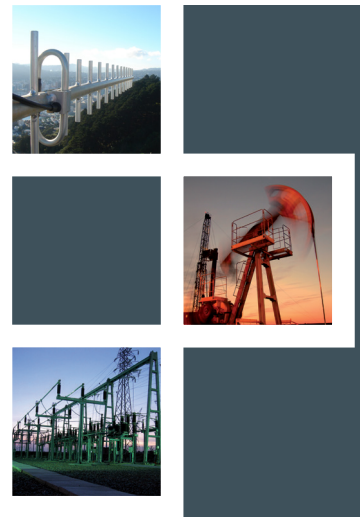
Aprisa SR+

SMART, SECURE POINT-TO-MULTIPOINT RADIO VHF, 220 MHz, and UHF licensed bands



Smart, secure, industry-leading speed licensed point-to-multipoint SCADA communications for industrial monitoring and control for the electricity, water, oil and gas industries – now with 256 QAM

- **High capacity:** to meet the growing number of data-intensive applications in the SCADA environment, the Aprisa SR+ provides data rates of up to 512 kbit/s half duplex / 1,024 kbit/s full duplex in 100 kHz licensed channels.
- **Secure:** with its defense in depth approach, including AES encryption, authentication, address filtering and user access control including RADIUS, the Aprisa SR+ protects against vulnerabilities and malicious attacks.
- **Future-proof:** the Aprisa SR+ supports dual serial and dual Ethernet ports in a single, compact form factor, designed to cryptographically secure legacy serial, protect existing device investment, and enable new applications. Old and new application protocols can be run side by side.
- **Advanced L2 / L3 capabilities:** selectable L2 bridge, L3 router, or advanced gateway router combination L2 / L3 modes with VLAN, QoS, NAT, and filtering attributes to maximize capacity in constrained bandwidth and prioritize mission critical traffic while meeting tough security and IP network policy imperatives.
- **Adaptable:** the Aprisa SR+ integrates into a range of network topologies, with each unit configurable as a master station, repeater or remote station; connect multiple RTUs / PLCs to a single radio.
- **Flexible interfaces:** the data interfaces can be configured for serial or Ethernet operation; a range of options are supported, including two serial and two Ethernet, one serial and three Ethernet, or four Ethernet ports. Support for NMEA GPS receiver option.
- **Link efficiency:** Adaptive Coding and Modulation (ACM) and forward error correction maintains the integrity of the wireless connection while an effective channel access scheme and IP routing ensures efficient transfer of data across the Aprisa SR+ network. Automatic Transmit Power Control maintains the minimum transmit power required for effective communications enhancing both frequency reuse and power savings. Advanced payload and Ethernet / IP / TCP / UDP header compression.
- **Reliable and robust:** the Aprisa SR+ requires no manual component tuning and maintains its performance over a wide temperature range using full specification industrially rated components and shared Aprisa family heritage.
- **Easily managed:** an easy to use GUI supports local element management via HTTPS and remote element management over the air and SNMP support allows network-wide monitoring and control via a variety of supported third party network management systems.



The Aprisa SR+ in brief

- VHF, 220 MHz, and UHF licensed bands
- RS-232 and IEEE 802.3 with multiple port options
- Software selectable 12.5 kHz, 20 kHz, 25 kHz, 50 kHz, and 100 kHz (note 2) channel sizes (frequency band dependent)
- Full and half duplex operation, single or dual frequency (point-to-point option)
- Data rates of up to 512 kbit/s half duplex / 1024 kbit/s full duplex
- 256, 192 or 128 bit AES encryption
- AES-CCM to NIST SP 800-38C
- Adaptive Coding and Modulation: QPSK to 256 QAM
- Automatic Transmit Power Control: reduces interference in large networks, improves power savings
- Advanced forward error correction
- Ethernet and IP / TCP / UDP header compression (ROHC) and payload compression
- Software selectable dual / single antenna port operation
- Transparent to all common SCADA protocols
- Dedicated alarm port and optional USB connected GPS receiver
- Protected station option
- Power optimized option
- Layer 2 bridge (VLAN aware), layer 3 router, and advanced gateway router combination L2/ L3 modes
- VLAN tagging and Q-in-Q
- Flexible QoS priority enforcement – by port or traffic type, VLAN, PCP/DSCP, rule including SMAC/DMAC, IP address and IP protocol, and EtherType
- L2 / L3 / L4 filtering
- MEMS accelerometer motion sensing anti-tamper option
- Substation hardened to IEEE 1613 class 2 and IEC 61850-3
- 30 kV ESD antenna protection
- Class 1, Division 2 for hazardous protection
- -40 to +70 °C operational temperature without fans
- 210 mm (W) x 130 mm (D) x 41.5 mm (H)
- Complies with EU RED (2014/53/EU)

Aprisa SR+ applications

- Electricity grid: distribution automation control and protection in MV / HV distribution / transmission
- Smart grid, DA, DFA, DER, cap bank control
- Oil & Gas: production metering, lift pump automation
- AMI / AMR: high density data concentrator backhaul
- Renewables: wind farm, tidal, hydro automation
- Water and wastewater: flow, level, pressure modulation automation and pump status

GENERAL							
NETWORK TOPOLOGY	Point-To-MultiPoint (PTMP), Base, Remote, Repeater Point-To-Point (PTP) FD see 'Aprisa SR+ PTP Datasheet'						
NETWORK INTEGRATION	Serial and Ethernet (router or bridge mode)						
PROTOCOLS							
ETHERNET	IEEE 802.3, 802.1d/q/p						
SERIAL	Legacy RS-232 transport, Mirrored Bits®, SLIP and Terminal Server support						
WIRELESS	Proprietary						
SCADA	Transparent to all common SCADA protocols such as Modbus, IEC 60870-5-101/104, DNP3 or similar						
RADIO							
FREQUENCY RANGE	FREQ BAND	TUNING RANGE	TUNE STEP				
	135 MHz	135 – 175 MHz	0.625 kHz				
	(Note 2) 220 MHz	215 – 240 MHz	0.625 kHz				
	320 MHz	320 – 400 MHz	6.25 kHz				
	400 MHz	400 – 470 MHz	1.25 kHz				
	450 MHz	450 – 520 MHz	6.25 kHz				
CHANNEL SIZE	12.5 kHz, 20 kHz, 25 kHz, 50 kHz and 100 kHz (Note 2) software selectable						
DUPLEX	Single frequency half-duplex Dual frequency half-duplex Dual frequency full-duplex						
FREQUENCY STABILITY	± 0.5 ppm						
FREQUENCY AGING	< 1 ppm / annum						
TRANSMITTER							
MAX PEAK ENVELOPE POWER (PEP)	10.0 W (+40 dBm)						
AVERAGE POWER OUTPUT	256 QAM 0.01 – 2.0 W (+10 to +33 dBm, in 1 dB steps) 64 QAM 0.01 – 2.5 W (+10 to +34 dBm, in 1 dB steps) 16 QAM 0.01 – 3.2 W (+10 to +35 dBm, in 1 dB steps) QPSK 0.01 – 5.0 W (+10 to +37 dBm, in 1 dB steps)						
	(Note 2) 4-CPFSK	0.01 – 10.0 W (+10 to +40 dBm, in 1 dB steps)					
ADJACENT CHANNEL POWER	< –60 dBc						
TRANSIENT ADJACENT CHANNEL POWER	< –60 dBc						
SPURIOUS EMISSIONS	< –37 dBm						
ATTACK TIME	< 1.5 ms						
RELEASE TIME	< 0.5 ms						
DATA TURNAROUND TIME	< 2 ms						
EMISSION DESIGNATORS	see https://4rf.com/emission-designators						
RECEIVER							
		12.5 kHz	20 kHz	25 kHz	50 kHz	100 kHz	
SENSITIVITY (BER < 10 ⁻⁶)	min coded	256 QAM	–95 dBm	–91 dBm	–91 dBm	–88 dBm	–85 dBm
	max coded	64 QAM	–103 dBm	–99 dBm	–99 dBm	–96 dBm	–93 dBm
	max coded	16 QAM	–110 dBm	–107 dBm	–107 dBm	–104 dBm	–101 dBm
	min coded	QPSK	–115 dBm	–112 dBm	–112 dBm	–109 dBm	–106 dBm
	min coded	4-CPFSK	–113 dBm	–110 dBm	–110 dBm	–107 dBm	–104 dBm
ADJACENT CHANNEL SELECTIVITY		> –47 dBm	> –37 dBm	> –37 dBm	> –37 dBm	> –37 dBm	> –37 dBm
	(Note 1)	[> 48 dB]	[> 58 dB]	[> 58 dB]	[> 58 dB]	[> 58 dB]	[> 58 dB]
CO-CHANNEL REJECTION max coded QPSK	> –10 dB						
CO-CHANNEL REJECTION min coded 256 QAM	> –26 dB						
INTERMODULATION RESPONSE REJECTION	> –35 dBm [> 60 dB Note 1]						
BLOCKING OR DESENSITISATION	> –17 dBm [> 78 dB Note 1]						
SPURIOUS RESPONSE REJECTION	> –32 dBm [> 63 dB Note 1]						
MODEM							
		12.5 kHz	20 kHz	25 kHz	50 kHz	100 kHz	
GROSS DATA RATE	256 QAM	80 kbit/s	112 kbit/s	160 kbit/s	288 kbit/s	512 kbit/s	
	64 QAM	60 kbit/s	84 kbit/s	120 kbit/s	216 kbit/s	384 kbit/s	
	16 QAM	40 kbit/s	56 kbit/s	80 kbit/s	144 kbit/s	256 kbit/s	
	QPSK	20 kbit/s	28 kbit/s	40 kbit/s	72 kbit/s	128 kbit/s	
	4-CPFSK	9.6 kbit/s	9.6 kbit/s	19.2 kbit/s	38.4 kbit/s	76.8 kbit/s	
FORWARD ERROR CORRECTION	Variable length concatenated Reed Solomon plus convolutional code						
ADAPTIVE BURST SUPPORT	Adaptive Coding and Modulation						

SECURITY		
DATA ENCRYPTION	256, 192 or 128 bit AES	
DATA AUTHENTICATION	CCM	
CRYPTOGRAPHIC PROTECTION	FIPS 140-2	
IPSEC	Transparent	
INTERFACES		
ETHERNET PORTS	RJ45 10/100Base-T auto-neg MDI/MDIX	
SERIAL PORTS	RJ45 RS-232 Additional RS-232 / RS-485 port via USB converter (optional)	
GPS RECEIVER	Support for optional USB connected GPS receiver	
MANAGEMENT	1 x USB micro type B (device port) 1 x USB standard type A (host port) 1 x Alarm port RJ45	
ANTENNA	2 x TNC 50 ohm female Software selectable single or dual port operation	
LEDs	Status: OK, MODE, AUX, TX, RX Diagnostics: RSSI, traffic port status	
TEST BUTTON	Toggles LEDs between diagnostics / status	
PRODUCT OPTIONS (specified at order)		
DATA PORT CONFIGURATION OPTIONS	2 x Ethernet ports + 2 serial ports 3 x Ethernet ports + 1 serial port 4 x Ethernet ports	
DUPLEX OPTIONS	Half Duplex or Full Duplex	
PROTECTED STATION OPTION	Providing hot-swappable / hot-standby redundant hardware switching	
POWER		
INPUT VOLTAGE	Radio	10 – 30 VDC negative earth
	Protected Station	10 – 60 VDC floating
RECEIVE	All bands except 320 MHz	< 3 W in active receive state < 2 W in idle receive state, < 0.5 W in sleep mode
	320 MHz	< 7 W
TRANSMIT	135 and 220 MHz	< 26 W
	400 and 450 MHz	< 28 W
	320 MHz	< 35 W
MECHANICAL		
DIMENSIONS	Radio	210 mm (W) x 130 mm (D) x 41.5 mm (H) 8.27" (W) x 5.12" (D) x 1.63" (H)
	Protected Station	434 mm (W) x 372 mm (D) x 88.9 mm (H) 2 RU 17.1" (W) 14.6" (D) 3.5" (H)
WEIGHT	Radio	1.25 kg (2.81 lbs)
	Protected Station	10.0 kg (22 lbs) (includes the 2 radios)
MOUNTING	Wall, Rack or DIN rail (radio only)	
ENVIRONMENTAL		
OPERATING TEMPERATURE	–40 to +70 °C	
HUMIDITY	Maximum 95 % non-condensing	
MANAGEMENT & DIAGNOSTICS		
LOCAL ELEMENT	SSH and HTTP/S web servers with full control / diagnostics Partial diagnostics via LEDs and test button Software upgrade from PC or USB flash drive	
REMOTE ELEMENT	SSH and HTTP/S over-the-air remote element management with control / diagnostics Network software upgrade over-the-air	
NETWORK	SNMPv2 and SNMPv3 security support for integration with external network management systems	
OVER THE AIR	Low overhead SuperVisor Extended Network Management (EXM)	
COMPLIANCE		
RED COMPLIANCE	Tested to Radio Equipment Directive 2014/53/EU (Note 3)	
RF	12.5 kHz	EN 300 113
	25 kHz, 50 kHz and 100 kHz	EN 302 561 (Note 4)
EMC	EN 301 489-1 and 5	
SAFETY	EN 60950 Class 1 division 2 for hazardous locations	
ENVIRONMENTAL	ETS 300 019 Class 3.4, Ingress Protection IP51 Substation hardened to IEEE 1613 class 2 and IEC 61850-3	

Notes:

- The receiver figures are shown in typical fixed interference dBm values and dB values [in brackets] relative to the sensitivity. Relative values are given for QPSK modulation and max coded FEC. Refer to the Aprisa SR+ User Manual for a complete list of modulation and coding levels.
- Please consult 4RF for availability.
- 100 kHz subject to EU RED verification
- 50 kHz, RX compliance to 64 QAM inclusive

ABOUT 4RF

Operating in more than 150 countries, 4RF provides radio communications equipment for critical infrastructure applications. Customers include utilities, oil and gas companies, transport companies, telecommunications operators, international aid organisations, public safety, military and security organisations. 4RF point-to-point and point-to-multipoint products are optimized for performance in harsh climates and difficult terrain, supporting IP, legacy analogue, serial data applications.

Made in USA from local and imported parts.

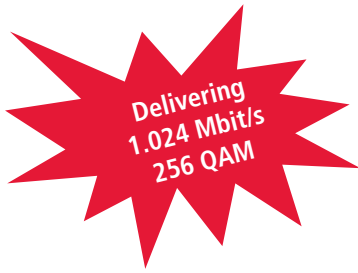
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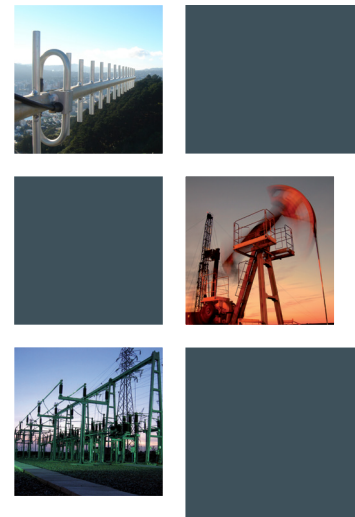
Aprisa SR+

SMART, SECURE POINT-TO-POINT RADIO VHF, 220 MHz, and UHF licensed bands



Smart, secure, industry-leading speed licensed point-to-point for linking and backhaul of industrial monitoring and control – now with 256 QAM

- **High capacity:** to meet the growing number of data-intensive applications in the SCADA environment, the Aprisa SR+ PTP provides data rates of up to 1,024 kbit/s full duplex in 100 kHz licensed channels.
- **Secure:** with its defense in depth approach, including AES encryption, authentication, address filtering and user access control including RADIUS, the Aprisa SR+ PTP protects against vulnerabilities and malicious attacks.
- **Future-proof:** the Aprisa SR+ PTP supports dual serial and dual Ethernet ports in a single, compact form factor, designed to cryptographically secure legacy serial, protect existing device investment, and enable new applications. Old and new application protocols can be run side by side.
- **Advanced L2 / L3 capabilities:** selectable L2 bridge, L3 router, or advanced gateway router combination L2 / L3 modes with VLAN, QoS, NAT, and filtering attributes to maximize capacity in constrained bandwidth and prioritize mission critical traffic while meeting tough security and IP network policy imperatives.
- **Flexible interfaces:** the data interfaces can be configured for serial or Ethernet operation; a range of options are supported, including two serial and two Ethernet, one serial and three Ethernet, or four Ethernet ports. Support for NMEA GPS receiver option.
- **Link efficiency:** Adaptive Coding and Modulation (ACM) and forward error correction maintains the integrity of the wireless connection while an effective channel access scheme and IP routing ensures efficient transfer of data across a Aprisa SR+ PTP link. Automatic Transmit Power Control maintains the minimum transmit power required for effective communications enhancing both frequency reuse and power savings. Advanced payload and Ethernet / IP / TCP / UDP header compression.
- **Reliable and robust:** the Aprisa SR+ PTP requires no manual component tuning and maintains its performance over a wide temperature range using full specification industrially rated components and shared Aprisa family heritage.
- **Easily managed:** an easy to use GUI supports local element management via HTTPS and remote element management over the air and SNMP support allows network-wide monitoring and control via a variety of supported third party network management systems.



The Aprisa SR+ PTP in brief

- VHF, 220 MHz, and UHF licensed bands
- RS-232 and IEEE 802.3 with multiple port options
- Software selectable 12.5 kHz, 20 kHz, 25 kHz, 50 kHz, and 100 kHz (note 2) channel sizes (frequency band dependent)
- Full duplex operation
- Data rates of up to 1024 kbit/s full duplex
- 256, 192 or 128 bit AES encryption
- AES-CCM to NIST SP 800-38C
- Adaptive Coding and Modulation: QPSK to 256 QAM
- Automatic Transmit Power Control: reduces interference in large networks, improves power savings
- Advanced forward error correction
- Ethernet and IP / TCP / UDP header compression (ROHC) and payload compression
- Transparent to all common SCADA protocols
- Dedicated alarm port and optional USB connected GPS receiver
- Protected station option
- Layer 2 bridge (VLAN aware), layer 3 router, and advanced gateway router combination L2/ L3 modes
- VLAN tagging and Q-in-Q
- Flexible QoS priority enforcement – by port or traffic type, VLAN, PCP/DSCP, rule including SMAC/DMAC, IP address and IP protocol, and EtherType
- L2 / L3 / L4 filtering
- MEMS accelerometer motion sensing anti-tamper option
- Substation hardened to IEEE 1613 class 2 and IEC 61850-3
- 30 kV ESD antenna protection
- Class 1, Division 2 for hazardous protection
- -40 to +70 °C operational temperature without fans
- 210 mm (W) x 130 mm (D) x 41.5 mm (H)
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Aprisa SR+ PTP applications

- Electricity grid: distribution automation control and protection in MV / HV distribution / transmission
- Smart grid, DA, DFA, DER, cap bank control
- Oil & Gas: production metering, lift pump automation
- AMI / AMR: high density data concentrator backhaul
- Renewables: wind farm, tidal, hydro automation
- Water and wastewater: flow, level, pressure modulation automation and pump status
- Ultra low latency for feeder protection – 6 ms at 100 kHz and 8 ms at 50 kHz

GENERAL																																																																			
NETWORK TOPOLOGY	Point-To-Point (PTP) Full Duplex																																																																		
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SECURITY							
DATA ENCRYPTION	256, 192 or 128 bit AES						
DATA AUTHENTICATION	CCM						
INTERFACES							
ETHERNET PORTS	RJ45 10/100Base-T auto-neg MDI/MDIX						
SERIAL PORTS	RJ45 RS-232 Additional RS-232 / RS-485 port via USB converter (optional)						
GPS RECEIVER	Support for optional USB connected GPS receiver						
MANAGEMENT	1 x USB micro type B (device port) 1 x USB standard type A (host port)						
ANTENNA	2 x TNC 50 ohm female						
ALARM I/O	1 x RJ45 Alarm I/O interface 2 x inputs + 2 x outputs						
LEDs	Status: OK, MODE, AUX, TX, RX Diagnostics: RSSI, traffic port status						
TEST BUTTON	Toggles LEDs between diagnostics / status						
PRODUCT OPTIONS (specified at order)							
DATA PORT CONFIGURATION OPTIONS	2 x Ethernet ports + 2 serial ports 3 x Ethernet ports + 1 serial port 4 x Ethernet ports						
PROTECTED STATION OPTION	Providing hot-swappable / hot-standby redundant hardware switching (13.8 VDC or 48 VDC)						
POWER							
INPUT VOLTAGE	10 – 30 VDC						
RECEIVE	<table border="1"> <tbody> <tr> <td>All bands except 320 MHz</td> <td>< 3 W (217 mA at 13.8 VDC)</td> </tr> <tr> <td>320 MHz</td> <td>< 7 W (507 mA at 13.8 VDC)</td> </tr> </tbody> </table>	All bands except 320 MHz	< 3 W (217 mA at 13.8 VDC)	320 MHz	< 7 W (507 mA at 13.8 VDC)		
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Protected Station	434 mm (W) x 372 mm (D) x 88.9 mm (H) 2 RU 17.1" (W) 14.6" (D) 3.5" (H)						
WEIGHT	1.25 kg						
MOUNTING	Wall, Rack or DIN rail						
ENVIRONMENTAL							
OPERATING TEMPERATURE	-40 to +70 °C						
HUMIDITY	Maximum 95 % non-condensing						
MANAGEMENT & DIAGNOSTICS							
LOCAL ELEMENT	SSH and HTTP/S web servers with full control / diagnostics Partial diagnostics via LEDs and test button Software upgrade from PC or USB flash drive						
REMOTE ELEMENT	SSH and HTTP/S over-the-air remote element management with control / diagnostics Network software upgrade over-the-air						
NETWORK	SNMPv2 and SNMPv3 security support for integration with external network management systems						
COMPLIANCE							
RED COMPLIANCE	Tested to Radio Equipment Directive 2014/53/EU ^(Note 3)						
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25 kHz, 50 kHz and 100 kHz	EN 302 561 ^(Note 5)						
EMC	EN 301 489-1 and 5						
SAFETY	EN 60950 Class 1 division 2 for hazardous locations						
ENVIRONMENTAL	ETS 300 019 Class 3.4, Ingress Protection IP51 Substation hardened to IEEE 1613 class 2 and IEC 61850-3						

Notes:

- The receiver figures are shown in typical fixed interference dBm values and dB values [in brackets] relative to the sensitivity. Relative values are given for QPSK modulation and max coded FEC. Refer to the Aprisa SR+ User Manual for a complete list of modulation and coding levels.
- Please consult 4RF for availability.
- 100 kHz subject to EU RED verification
- For 256 QAM on 100 kHz channel size, please consult 4RF for availability.
- 50 kHz, RX compliance to 64 QAM inclusive

ABOUT 4RF

Operating in more than 150 countries, 4RF provides radio communications equipment for critical infrastructure applications. Customers include utilities, oil and gas companies, transport companies, telecommunications operators, international aid organisations, public safety, military and security organisations. 4RF point-to-point and point-to-multipoint products are optimized for performance in harsh climates and difficult terrain, supporting IP, legacy analogue, serial data applications.

Made in USA from local and imported parts.

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For more information please contact
EMAIL sales@4rf.com
URL www.4rf.com

Version 2.9.0

New Modem 2 performance
New Aprisa SR+ mixed
network interoperation

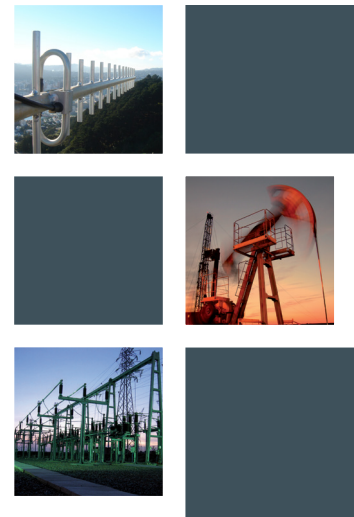
Aprisa SR

SMART, SECURE POINT-TO-MULTIPOINT RADIO VHF, 220 MHz, and UHF licensed bands



Smart, secure, point-to-multipoint SCADA communications for oil, gas and utility monitoring and control

- **Secure:** with its defense in depth approach, including AES encryption, authentication, address filtering and user access control including RADIUS, the Aprisa SR protects against vulnerabilities and malicious attacks.
- **Future-proof:** the Aprisa SR supports dual serial and dual Ethernet ports in a single, compact form factor, designed to cryptographically secure legacy serial, protect existing device investment, and enable new applications. Old and new application protocols can be run side by side. New Modem 2 firmware allows mixed network operation with Aprisa SR+ at full speed – facilitating a seamless upgrade to 256 QAM operation.
- **Advanced L2 / L3 capabilities:** selectable L2 bridge, L3 router, or advanced gateway router combination L2 / L3 modes with VLAN, QoS, NAT, and filtering attributes to maximize capacity in constrained bandwidth and prioritize mission critical traffic while meeting tough security and IP network policy imperatives.
- **Flexible:** the Aprisa SR integrates into a range of network topologies, with each unit configurable as a base station, repeater or remote unit. Support for NMEA GPS receiver option.
- **Link efficiency:** forward error correction maintains the integrity of the wireless connection while an effective channel access scheme and IP routing ensures efficient transfer of data across the Aprisa SR network. Automatic Transmit Power Control maintains the minimum transmit power required for effective communications enhancing both frequency reuse and power savings. Advanced payload and Ethernet / IP / TCP / UDP header compression.
- **Reliable and robust:** the Aprisa SR requires no manual component tuning and maintains its performance over a wide temperature range using full specification industrially rated components and shared Aprisa family heritage. Modem 2 performance brings new levels of robust QPSK demodulation and large network improvements.
- **Easily managed:** an easy to use GUI supports local element management via HTTPS and remote element management over the air and SNMP support allows network-wide monitoring and control via a variety of supported third party network management systems.



The Aprisa SR in brief

- VHF, 220 MHz, and UHF licensed bands
- RS-232 and IEEE 802.3 protocols
- Software selectable 12.5 kHz, 15 kHz, 25 kHz, 30 kHz, 50 kHz, and 100 kHz (note 2) channel sizes (frequency band dependent)
- Data rates of up to 128 kbit/s
- QPSK modulation with adaptive coding
- Mixed network operation with the Aprisa SR+
- Automatic Transmit Power Control: reduces interference in large networks, improves power savings
- Selectable error correction of min, max or no FEC
- AES-CCM to NIST SP 800-38C
- Ethernet and IP / TCP / UDP header compression (ROHC) and payload compression
- Transparent to all common SCADA protocols
- Dedicated alarm port
- Optional USB connected GPS receiver
- Power optimized option
- Layer 2 bridge (VLAN aware), layer 3 router, and advanced gateway router combination L2/ L3 modes
- VLAN tagging and Q-in-Q
- Flexible QoS priority enforcement – by port or traffic type, VLAN, PCP/DSCP, rule including SMAC/DMAC, IP address and IP protocol, and EtherType
- L2 / L3 / L4 filtering
- MEMS accelerometer motion sensing anti-tamper option
- Substation hardened to IEEE 1613 class 2 and IEC 61850-3
- 30 kV ESD antenna protection
- Class 1, Division 2 for hazardous protection
- -40 to +70 °C operational temperature without fans
- 210 mm (W) x 130 mm (D) x 41.5 mm (H)
- Complies with EU RED (2014/53/EU)

Aprisa SR applications

- Offshore rigs and onshore pump jacks
- Transmission pipelines
- Electricity generation plants and turbines
- Power storage and distribution
- Water and waste processing plants

GENERAL						
NETWORK TOPOLOGY	Point-to-multipoint (PMP), Base, Remote, Repeater					
NETWORK INTEGRATION	Serial and Ethernet (router or bridge mode)					
PROTOCOLS						
ETHERNET	IEEE 802.3, 802.1d/q/p					
SERIAL	Legacy RS-232 transport					
WIRELESS	Proprietary					
SCADA	Transparent to user traffic; e.g. Modbus, IEC 60870-5-101/104, DNP3 or similar					
RADIO						
FREQUENCY RANGE	FREQ BAND	TUNING RANGE	TUNE STEP			
	135 MHz	135 – 175 MHz	0.625 kHz			
	(Note 2) 220 MHz	215 – 240 MHz	0.625 kHz			
	320 MHz	320 – 400 MHz	6.25 kHz			
	400 MHz	400 – 470 MHz	1.25 kHz			
	450 MHz	450 – 520 MHz	6.25 kHz			
CHANNEL SIZE	12.5 kHz, 20 kHz, 25 kHz, 50 kHz and 100 kHz (note 2) software selectable					
DUPLEX	Single frequency half-duplex Dual frequency half-duplex Half duplex remote with SR+ full duplex base station					
FREQUENCY STABILITY	± 0.5 ppm					
FREQUENCY AGING	< 1 ppm / annum					
TRANSMITTER						
MAX PEAK ENVELOPE POWER (PEP)	10.0 W (+40 dBm)					
AVERAGE POWER OUTPUT	QPSK	0.01 – 5.0 W (+10 to +37 dBm, in 1 dB steps)				
ADJACENT CHANNEL POWER	< –60 dBc					
TRANSIENT ADJACENT CHANNEL POWER	< –60 dBc					
SPURIOUS EMISSIONS	< –37 dBm					
ATTACK TIME	< 1.5 ms					
RELEASE TIME	< 0.5 ms					
DATA TURNAROUND TIME	< 2 ms					
EMISSION DESIGNATOR SUFFIX	QPSK G1D					
RECEIVER						
		12.5 kHz	20 kHz	25 kHz	50 kHz	100 kHz
SENSITIVITY (BER < 10 ⁻⁹) max coded	QPSK	–115 dBm	–112 dBm	–112 dBm	–109 dBm	–106 dBm
ADJACENT CHANNEL SELECTIVITY		> –47 dBm	> –37 dBm	> –37 dBm	> –37 dBm	> –37 dBm
	(Note 1)	[> 48 dB]	[> 58 dB]	[> 58 dB]	[> 58 dB]	[> 58 dB]
CO-CHANNEL REJECTION max coded	QPSK	> –10 dB				
INTERMODULATION RESPONSE REJECTION		> –35 dBm [> 60 dB Note 1]				
BLOCKING OR DESENSITISATION		> –17 dBm [> 78 dB Note 1]				
SPURIOUS RESPONSE REJECTION		> –32 dBm [> 63 dB Note 1]				
MODEM						
		12.5 kHz	20 kHz	25 kHz	50 kHz	100 kHz
GROSS DATA RATE	QPSK	20 kbit/s	28 kbit/s	40 kbit/s	72 kbit/s	128 kbit/s
FORWARD ERROR CORRECTION	Variable length concatenated Reed Solomon plus convolutional code					
ADAPTIVE BURST SUPPORT	Adaptive Coding					
SECURITY						
DATA ENCRYPTION	256, 192 or 128 bit AES					
DATA AUTHENTICATION	CCM					

INTERFACES	
ETHERNET PORTS	2 port RJ45 10/100Base-T auto-neg MDI/MDIX
SERIAL PORTS	2 port RJ45 RS-232 Additional RS-232 / RS-485 port via USB converter (optional)
GPS RECEIVER	Support for optional USB connected GPS receiver
MANAGEMENT	1 x USB micro type B (device port) 1 x USB standard type A (host port) 1 x Alarm port RJ45
ANTENNA	1 x TNC 50 ohm female
LEDs	Status: OK, MODE, AUX, TX, RX Diagnostics: RSSI, traffic port status
TEST BUTTON	Toggles LEDs between diagnostics / status
POWER	
INPUT VOLTAGE	10 – 30 VDC
RECEIVE	All bands except 320 MHz < 3 W in active receive state < 2 W in idle receive state, < 0.5 W in sleep mode
	320 MHz < 7 W
TRANSMIT	135 and 220 MHz < 26 W 400 and 450 MHz < 28 W 320 MHz < 35 W
MECHANICAL	
DIMENSIONS	210 mm (W) x 130 mm (D) x 41.5 mm (H)
WEIGHT	1.25 kg
MOUNTING	Wall, Rack or DIN rail
ENVIRONMENTAL	
OPERATING TEMPERATURE	–40 to +70 °C
HUMIDITY	Maximum 95 % non-condensing
MANAGEMENT & DIAGNOSTICS	
LOCAL ELEMENT	SSH and HTTPS web servers with full control / diagnostics Partial diagnostics via LEDs and test button Software upgrade from PC or USB flash drive
REMOTE ELEMENT	SSH and HTTPS over-the-air remote element management with control / diagnostics Network software upgrade over-the-air
NETWORK	SNMPv2 and SNMPv3 security support for integration with external network management systems
COMPLIANCE	
RED COMPLIANCE	Tested to Radio Equipment Directive 2014/53/EU (note 3)
RF	12.5 kHz EN 300 113 25 kHz, 50 kHz and 100 kHz EN 302 561 400 MHz 12.5 kHz and 25 kHz EN 300 220-2 V3.2.1 for Ofcom IR2030/2/6 or IR2030/2/7
EMC	EN 301 489-1 and 5
SAFETY	EN 60950 Class 1 division 2 for hazardous locations
ENVIRONMENTAL	ETS 300 019 Class 3.4, Ingress Protection IP51 Substation hardened to IEEE 1613 class 2 and IEC 61850-3

Notes:

- The receiver figures are shown in typical fixed interference dBm values and dB values (in brackets) relative to the sensitivity. Relative values are given for QPSK modulation and max coded FEC. Refer to the Aprisa New SR User Manual for a complete list of modulation and coding levels.
- Please consult 4RF for availability.
- 100 kHz subject to EU RED verification.

ABOUT 4RF

Operating in more than 150 countries, 4RF provides radio communications equipment for critical infrastructure applications. Customers include utilities, oil and gas companies, transport companies, telecommunications operators, international aid organisations, public safety, military and security organisations. 4RF point-to-point and point-to-multipoint products are optimized for performance in harsh climates and difficult terrain, supporting IP, legacy analogue, serial data applications.

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