Delivering 1.024 Mbit/s 256 QAM

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

4RF

Aprisa SR+

SYSTEM SPECIFICATION

ETSI licensed bands

Datasheet

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		FREQ BAND	TUNING RANGE		TUNE STEP		
FREQUENCY RANGE		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
	max 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
		(Note 1)	[> 48 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:

1. 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.
2. Please consult 4RF for availability.
3. 100 kHz subject to EU RED verification
4. 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.

4RF

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

Version 3.1.0