



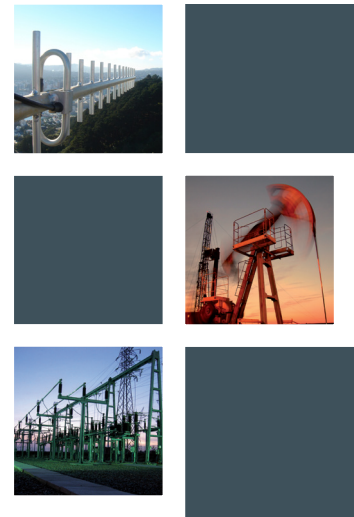
Aprisa SR+

SMART, SECURE POINT-TO-MULTIPOINT RADIO



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

- **High capacity:** to meet the growing number of data-intensive applications in the SCADA environment, the Aprisa SR+ provides data rates of up to 432 kbit/s half duplex / 864 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. 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

- 135–175, 215–240, 400–520, 757–758 and 787–788, 896–902 and 928–960 MHz
- RS-232 and IEEE 802.3 with multiple port options
- Software selectable 12.5 kHz, 15 kHz, 25 kHz, 30 kHz, 50 kHz, and 100 kHz channel sizes (frequency band dependent)
- Full and half duplex operation, single or dual frequency
- Data rates of up to 432 kbit/s half duplex / 864 kbit/s full duplex
- 256, 192 or 128 bit AES encryption
- AES-CCM to NIST SP 800-38C
- Adaptive Coding and Modulation: QPSK to 64 QAM
- 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 GPS for radio coordinates
- Protected station and remote station options
- 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
- IEEE 1613 and IEC 61850-3 substation protection
- 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)
- FCC and IC standards compliant

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

SYSTEM SPECIFICATION

GENERAL			
NETWORK TOPOLOGY	Point-to-multipoint (PMP), Master, 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 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
	220 MHz	215 – 240 MHz	0.625 kHz
	400 MHz	400 – 470 MHz	6.25 kHz
	(Note 4) 450 MHz	450 – 520 MHz	6.25 kHz
	(Note 4) 700 MHz	757 – 758 & 787 – 788 MHz	6.25 kHz
	(Note 5) 896 MHz	896 – 902 MHz	6.25 kHz
	(Note 5) 928 MHz	928 – 960 MHz	6.25 kHz
CHANNEL SIZE	12.5 kHz, 15 kHz, 25 kHz, 30 kHz, 50 kHz and 100 kHz 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	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 DESIGNATOR SUFFIX	QPSK G1D, QAM D1D		
RECEIVER			
		12.5 kHz	25 kHz 50 kHz 100 kHz
SENSITIVITY (BER < 10 ⁻⁵)	max coded	64 QAM	–103 dBm –99 dBm –96 dBm –93 dBm
	max coded	16 QAM	–110 dBm –107 dBm –104 dBm –101 dBm
	max coded	QPSK	–115 dBm –112 dBm –109 dBm –106 dBm
	min coded	4-CPFSK	–113 dBm –110 dBm –107 dBm –104 dBm
ADJACENT CHANNEL SELECTIVITY	> –47 dBm > –37 dBm > –37 dBm > –37 dBm (Note 1) [> 48 dB] [> 58 dB] [> 58 dB] [> 58 dB]		
CO-CHANNEL REJECTION max coded QPSK	> –10 dB		
CO-CHANNEL REJECTION max coded 64 QAM	> –20 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 (Note 3)	15 kHz	25 kHz 30 kHz 50 kHz 100 kHz
GROSS DATA RATE			
BANDS	220, 400, 700, 896, 450, 928	135 220	220, 400, 450, 896, 928 700 135 135, 220, 400, 896, 928 700 700, 896, 928
64 QAM	54 kbit/s 60 kbit/s	54 kbit/s 60 kbit/s	96 kbit/s 120 kbit/s 96 kbit/s 216 kbit/s 240 kbit/s 432 kbit/s
16 QAM	36 kbit/s 40 kbit/s	36 kbit/s 40 kbit/s	64 kbit/s 80 kbit/s 64 kbit/s 144 kbit/s 160 kbit/s 288 kbit/s
QPSK	18 kbit/s 20 kbit/s	18 kbit/s 20 kbit/s	32 kbit/s 40 kbit/s 32 kbit/s 72 kbit/s 80 kbit/s 144 kbit/s
4-CPFSK	9.6 kbit/s 9.6 kbit/s	9.6 kbit/s 9.6 kbit/s	19.2 kbit/s 19.2 kbit/s 19.2 kbit/s 38.4 kbit/s 38.4 kbit/s 76.8 kbit/s
OCC BW	10.7 kHz 12.0 kHz	10.7 kHz 12.0 kHz	19.8 kHz 24.5 kHz 19.8 kHz 43.0 kHz 48.0 kHz 88.0 kHz
FORWARD ERROR CORRECTION	Variable Reed Solomon plus convolutional code		
ADAPTIVE BURST SUPPORT	Adaptive Coding and Modulation		

SECURITY	
DATA ENCRYPTION	256, 192 or 128 bit AES
DATA AUTHENTICATION	CCM
INTERFACES	
ETHERNET	2, 3 or 4 port RJ45 10/100Base-T switch (specified at order)
SERIAL	2, 1 or 0 port RJ45 RS-232 (specified at order) Additional RS-232 / RS-485 port via USB converter (option)
MANAGEMENT	1 x USB micro type B (device port) 1 x USB standard type A (host port)
ANTENNA	2 x TNC 50 ohm female Software selectable single or dual port operation
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	
DATA PORT CONFIGURATION	2 x Ethernet ports + 2 serial ports 3 x Ethernet ports + 1 serial port 4 x Ethernet ports
POWER OPTIMIZED	Providing optimized power and sleep mode
PROTECTED STATION	Providing hot-swappable / hot-standby redundant hardware switching (13.8 VDC or 48 VDC)
GPS RECEIVER	Support for NMEA GPS receiver with radio coordinates
POWER	
INPUT VOLTAGE	10 – 30 VDC (13.8 V nominal)
RECEIVE	All bands < 3 W (217 mA at 13.8 VDC) in active receive state < 2 W (145 mA at 13.8 VDC) in idle receive state < 0.5 W (36 mA at 13.8 VDC) in sleep mode
TRANSMIT	135 and 220 MHz < 26 W (1884 mA at 13.8 VDC) 400, 450, 700, 896, 928 MHz < 28 W (2028 mA at 13.8 VDC)
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	1.25 kg (2.81 lbs)
MOUNTING	Wall, Rack or DIN rail
ENVIRONMENTAL	
OPERATING TEMPERATURE	–40 to +70 °C (–40 to +158 °F)
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	
RF	FCC CFR47 Part 24 / 27 / 80 / 90 / 95 / 101 IC RSS 119 / RSS 134

BAND	FCC ID:	IC:
135	UIPSQ135M150	6772A-SQ135M150
220	UIPSQ215M141	6772A-SQ215M141
400	UIPSQ400M1311	6772A-SQ400M1311
450	UIPSQ450M140	N/A
700	UIPSQ757M160	N/A
896	UIPSQ896M141	6772A-SQ896M141
928	UIPSQ928M141	6772A-SQ928M141

EMC	FCC CFR47 Part 15, EN 301 489-5, ICES-003
SAFETY	UL / EN 60950, Class 1 division 2 for hazardous locations
ENVIRONMENTAL	ETS 300 019 Class 3.4, IEEE 1613 Class 2 IEC 61850-3, Ingress Protection IP51

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.
- The gross data rate for the 12.5 kHz channel size varies with regulatory compliance.
- The 450 MHz and 700 MHz bands are only available for FCC.
- The receive tuning range is specified. The transmit tuning range is 896 - 960 MHz.

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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