4RF

Delivering 1.15 Mbit/s 256 QAM

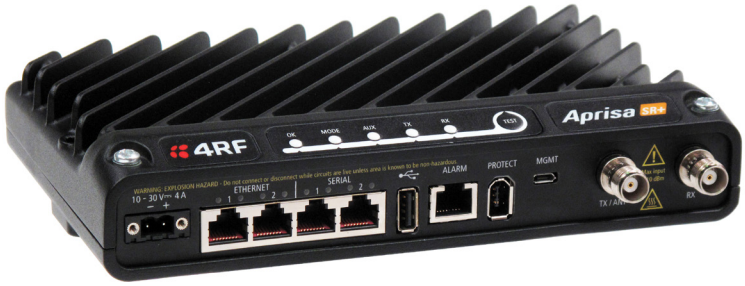
FCC / IC licensed bands
VHF, 220 MHz, UHF, 900 MHz

Private market spectrum
220, 700, and 900 MHz

Datasheet

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 – 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 576 kbit/s half duplex / 1,152 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

- 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 (point-to-point option)
- Data rates of up to 576 kbit/s half duplex / 1,152 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 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
- MEMS accelerometer motion sensing anti-tamper option
- 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

4RF

Aprisa SR+

FCC and IC licensed bands

Datasheet

SYSTEM SPECIFICATION

GENERAL	
NETWORK TOPOLOGY	Point-To-MultiPoint (PTMP), Master, 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
	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	(Note 6) 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	25 kHz	50 kHz	100 kHz
SENSITIVITY (BER < 10^{-6})	min coded (Note 6)	256 QAM	–95 dBm	–91 dBm	–88 dBm	–85 dBm
	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 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 (Note 3)		15 kHz		25 kHz		30 kHz	50 kHz		100 kHz
GROSS DATA RATE										
BANDS	220, 400, 450	700, 896, 928	135	220	220, 400, 450, 896, 928	700	135	135, 220, 400, 896, 928	700	700, 896, 928
(Note 6) 256 QAM	72 kbit/s	80 kbit/s	72 kbit/s	80 kbit/s	128 kbit/s	160 kbit/s	128 kbit/s	288 kbit/s	320 kbit/s	576 kbit/s
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
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 PORTS	RJ45 10/100Base-T auto-neg MDI/MDIX	
SERIAL PORTS	RJ45 RS-232 Additional RS-232 / RS-485 port via USB converter (option)	
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 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 (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 (10-30 VDC or 18-60 VDC)	

POWER		
INPUT VOLTAGE		10 – 30 VDC
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:

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. The gross data rate for the 12.5 kHz channel size varies with regulatory compliance.
4. The 450 MHz and 700 MHz bands are only available for FCC.
5. The receive tuning range is specified. The transmit tuning range is 896 - 960 MHz.
6. 256 QAM available in selected frequency bands and channel sizes. Contact 4RF for availability.

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

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