4RF

ETSI licensed bands

Datasheet

Delivering 1.024 Mbit/s 256 QAM

Telemetic
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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.

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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
- 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 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
- 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

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Aprisa SR+

SYSTEM SPECIFICATION

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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	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 DESIGNATOR SUFFIX	QPSK G1D, QAM D1D	

RECEIVER							
			12.5 kHz	20 kHz	25 kHz	50 kHz	100 kHz
SENSITIVITY (BER < 10^{-6})	max coded	256 QAM	–97 dBm	–93 dBm	–93 dBm	–90 dBm	–87 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 max 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
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 (optional)
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	
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 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 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)
RF	12.5 kHz	EN 300 113
	25 kHz, 50 kHz and 100 kHz	EN 302 561
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

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.

4RF

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