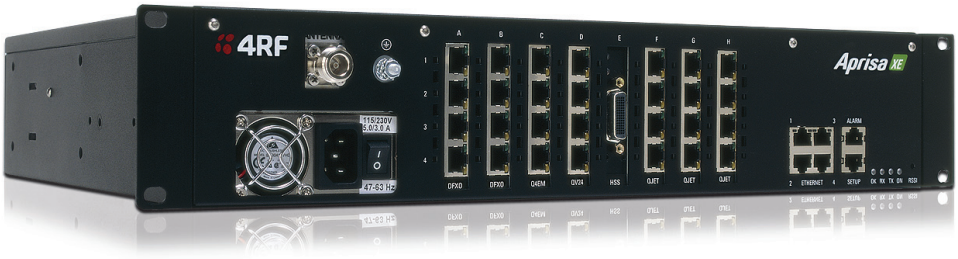
Aprisa XE

POINT-TO-POINT DIGITAL MICROWAVE LINKS

300 MHz to 2.5 GHz licensed ETSI bands



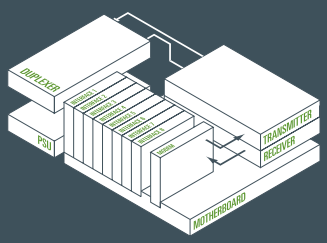
ETSI Aprisa XE: maximizing spectrum use and making challenging long distance links possible

- **Efficient future-proof single-box architecture**: the Aprisa XE's built-in multiplexer and cross-connect eliminate external equipment and minimize the over-the-air requirements, with customer-configurable interface slots integrating all IP, voice and data traffic. Configuration, performance monitoring and diagnostics are easy with the 4RF embedded web-based element management system, SuperVisor.
- **High capacity**: class-leading spectral efficiency and up to 128 QAM modulation make the maximum use of the available spectrum, with industry leading capacity of up to 65.4 Mbit/s in a 14.0 MHz channel.
- **Long range**: a single Aprisa XE can link distances in excess of 150 km (100 miles), overcoming the problems of water, environmental conditions and topographical obstacles.
- **Carrier-class performance**: Aprisa XE links are engineered to achieve 'five 9s' availability, benefiting from state of the art forward error correction and inherent low latencies, for unrivalled quality of service.
- **Cost effective**: the Aprisa XE has a low total cost of ownership, providing a rapid return on investment by minimizing both capital and operational expenditure.
- **Redundancy options**: Monitored Hot Standby and Hitless Space Diversity are available for protection in mission-critical applications.
- **Reliable**: the Aprisa XE has an actual MTBF of 95.72 years, and zero out-of-the-box failures in 2008. It can be relied upon to perform in the harshest and most remote environments.

The Aprisa XE in brief

- 300 MHz, 400 MHz, 600 MHz, 800 MHz, 900 MHz, 1.4 GHz, 1.8 GHz, 2.0 GHz and 2.5 GHz licensed bands
- Built-in cross-connect and multiplexer
- Up to 65.4 Mbit/s capacity
- 25 kHz, 50 kHz, 75 kHz, 125 kHz, 150 kHz, 200 kHz, 250 kHz, 500 kHz, 1.0 MHz, 1.35 MHz, 1.75 MHz, 3.5 MHz, 7.0 MHz and 14.0 MHz channel sizes
- QPSK to 128 QAM modulation
- Range of 150+ km (100+ miles)
- Industry-leading reliability
- Web server and SNMP management
- All voice, data and IP applications
- MHSB and HSD protection options

Future-proof single-box architecture



4RF

SYSTEM SPECIFICATION

RF	BAND	TUNING RANGE	SYNTHESIZER STEP SIZE
FREQUENCIES	300 MHz	330 – 400 MHz	6.25 kHz
	400 MHz	394 – 460 MHz	5.0 kHz
	400 MHz	400 – 470 MHz	6.25 kHz
	600 MHz	620 – 715 MHz	12.5 kHz
	800 MHz	805 – 890 MHz	12.5 kHz
	900 MHz	850 – 960 MHz	12.5 kHz
	1400 MHz	1350 – 1550 MHz	12.5 kHz
	1800 MHz	1700 – 2100 MHz	62.5 kHz
	2000 MHz	1900 – 2300 MHz	62.5 kHz
	2500 MHz	2300 – 2700 MHz	62.5 kHz
MODULATION TYPES	Software configurable: QPSK / 16 / 32 / 64 / 128 QAM		
FREQUENCY STABILITY	Short term ± 1 ppm (environmental effects and power supply variations) Long term ± 2 ppm (aging of crystal oscillators ≈ over 5 years)		
ANTENNA CONNECTION	N-type female 50 ohm		
TRANSMITTER POWER OUTPUT		**300 – 1800 MHz**	**2000 – 2500 MHz**
QPSK		+21 to +35 dBm	+20 to +34 dBm
16 QAM		+17 to +31 dBm	+17 to +31 dBm
32 QAM		+16 to +30 dBm	+16 to +30 dBm
64 QAM		+15 to +29 dBm	+15 to +29 dBm
128 QAM		+15 to +29 dBm	+15 to +29 dBm
RECEIVER			
MAXIMUM INPUT LEVEL	–20 dBm		
DYNAMIC RANGE	58 to 87 dB at 10^{-6} BER		
C/I RATIO	Co-channel	QPSK	better than 16 dB
		16 QAM	better than 20 dB
		32 QAM	better than 23 dB
		64 QAM	better than 27 dB
		128 QAM	better than 30 dB
	First adjacent channel		better than –5 dB
	Second adjacent channel		better than –30 dB

DUPLEXER (bandpass)	TX / RX SPLIT	FREQUENCY BANDS
500 kHz	≥ 5 MHz	300, 400 MHz
2.0 MHz	≥ 9.45 MHz	300, 400 MHz
3.5 MHz	≥ 20 MHz	300, 400 MHz
7.0 MHz	≥ 45 MHz	600 MHz
	≥ 40 MHz	800, 900 MHz
	≥ 48 MHz	1400 MHz
14.0 MHz	≥ 47.5 MHz	1800 MHz
	≥ 91 MHz	2000 MHz
	≥ 74 MHz	2500 MHz

POWER SUPPLY		
INPUT RANGE	115 / 230 VAC, 50 / 60 Hz	
	±12 VDC (10.5 – 18 VDC), ±24 VDC (20.5 – 30 VDC), ±48 VDC (40 – 60 VDC)	
	+12 VDC (10.5 – 18 VDC) Low Power Option	
POWER CONSUMPTION	(dependent on frequency band, power supply, transmitter output power and interface cards fitted)	
	115 / 230 VAC, ±12 VDC ±24 VDC, ±48 VDC	39 – 167 W input power
	Low Power Option (12 VDC)	29 – 53 W input power
INTERFACES		
ETHERNET	Integrated 4-port 10 / 100Base-T switch with port-based rate limiting, VLAN tagging and QoS Support	
E1 / T1	Quad 120 ohm G.703 / G.704	
DATA	Quad V.24 asynchronous, synchronous and over sampling mode Single synchronous X.21 / V.35 / RS-449 / RS-530	
ANALOGUE	Dual 2-wire FXS / FXO (POTS); Quad 4-wire E&M	
AUXILIARY INTERFACES		
ALARMS	4 external alarm outputs, 2 external alarm inputs	
CONFIGURATION	Embedded web server with SNMP	
MANAGEMENT	Ethernet interface for SuperVisor and SNMP, V.24 setup port	
RSSI	Front panel test point	
ENVIRONMENTAL		
OPERATING	–10° C to +50° C (+14° F to +122° F)	
STORAGE	–20° C to +70° C (–4° F to +158° F)	
HUMIDITY	Maximum 95 % non-condensing	
MECHANICAL		
RACK MOUNT	19" 2U high (internal duplexer)	
WEIGHT	10 kg (23 lbs) typical	
PROTECTED OPTIONS		
MHSB	≤ 4 dB splitter / cable loss, ≤1 dB TX relay / cable loss (system gain reduced by a maximum of 5 dB)	
HSD	≤ 1 dB TX relay / cable loss, < 25 ms TX switching / hitless RX switching	
COMPLIANCE		
RADIO	EN 302 217	
EMI /EMC	EN 301 489 Parts 1 & 4	
SAFETY	EN 60950-1:2006	
ENVIRONMENTAL	ETS 300 019 Class 3.2, EN 50385, WEEE	

PRODUCT RANGE

		CHANNEL SIZE													
		25 kHz	50 kHz	75 kHz	125 kHz	150 kHz	200 kHz	250 kHz	500 kHz	1 MHz	1.35 MHz	1.75 MHz	3.5 MHz	7 MHz	14 MHz
FREQUENCY BAND	300 MHz	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	400 MHz	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	600 MHz											✓	✓		
	800 MHz			✓				✓	✓	✓		✓	✓		
	900 MHz	✓	✓	✓		✓	✓	✓				✓			
	1400 MHz			✓		✓		✓	✓	✓		✓	✓	✓	
	1800 MHz							✓	✓	✓		✓	✓	✓	✓
	2000 MHz								✓	✓		✓	✓	✓	✓
	2500 MHz							✓	✓	✓		✓	✓	✓	✓

SYSTEM PERFORMANCE

25 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	N/A	72 (1 TS + 8) kbit/s	96 (1 TS + 32) kbit/s	112 (1 TS + 48) kbit/s	136 (2 TS + 8) kbit/s
RECEIVER SENSITIVITY [2]		N/A	–105 dBm	–102 dBm	–99 dBm	–96 dBm
SYSTEM GAIN [2]		N/A	136 dB	132 dB	128 dB	125 dB
50 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	80 (1 TS + 16) kbit/s	168 (2 TS + 40) kbit/s	208 (3 TS + 16) kbit/s	256 (4 TS + 0) kbit/s	296 (4 TS + 40) kbit/s
RECEIVER SENSITIVITY [2]		–109 dBm	–103 dBm	–100 dBm	–97 dBm	–94 dBm
SYSTEM GAIN [2]		144 dB	134 dB	130 dB	126 dB	123 dB
75 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	128 (2 TS + 0) kbit/s	264 (4 TS + 8) kbit/s	312 (4 TS +56) kbit/s	400 (6 TS + 16) kbit/s	440 (6 TS + 56) kbit/s
RECEIVER SENSITIVITY [2]		–107 dBm	–101 dBm	–98 dBm	–95 dBm	–92 dBm
SYSTEM GAIN [2]		142 dB	132 dB	128 dB	124 dB	121 dB
125 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	208 (3 TS + 16) kbit/s	424 (6 TS + 40) kbit/s	536 (8 TS + 24) kbit/s	640 (10 TS + 0) kbit/s	744 (11 TS + 40) kbit/s
RECEIVER SENSITIVITY [2]		–105 dBm	–99 dBm	–96 dBm	–93 dBm	–90 dBm
SYSTEM GAIN [2]		140 dB	130 dB	126 dB	122 dB	119 dB
150 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	264 (4 TS + 8) kbit/s	536 (8 TS + 24) kbit/s	672 (10 TS + 32) kbit/s	808 (12 TS + 40) kbit/s	944 (14 TS + 48) kbit/s
RECEIVER SENSITIVITY [2]		–104 dBm	–98 dBm	–95 dBm	–92 dBm	–89 dBm
SYSTEM GAIN [2]		139 dB	129 dB	125 dB	121 dB	118 dB
200 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	336 (5 TS + 16) kbit/s	680 (10 TS + 40) kbit/s	840 (13 TS + 8) kbit/s	1024 (16 TS + 0) kbit/s	1168 (18 TS + 16) kbit/s
RECEIVER SENSITIVITY [2]		–102 dBm	–96 dBm	–93 dBm	–90 dBm	–87 dBm
SYSTEM GAIN [2]		137 dB	127 dB	123 dB	119 dB	116 dB
250 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	408 (6 TS + 24) kbit/s	824 (12 TS + 56) kbit/s	1032 (16 TS + 8) kbit/s	1240 (19 TS + 24) kbit/s	1448 (22 TS + 40) kbit/s
RECEIVER SENSITIVITY [2]		–101 dBm	–95 dBm	–92 dBm	–89 dBm	–86 dBm
SYSTEM GAIN [2]		136 dB	126 dB	122 dB	118 dB	115 dB
500 kHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	792 (12 TS + 24) kbit/s	1592 (24 TS + 56) kbit/s	1992 (31 TS + 8) kbit/s	2392 (1 E1 + 304) kbit/s	2792 (1 E1 + 704) kbit/s
RECEIVER SENSITIVITY [2]		–99 dBm	–93 dBm	–90 dBm	–87 dBm	–84 dBm
SYSTEM GAIN [2]		134 dB	124 dB	120 dB	116 dB	113 dB
1.0 MHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	1624 (25 TS + 24) kbit/s	3256 (1 E1 + 1168) kbit/s	4072 (1 E1 + 1984) kbit/s	4888 (2 E1 + 712) kbit/s	5704 (2 E1 + 1528) kbit/s
RECEIVER SENSITIVITY [2]		–96 dBm	–90 dBm	–87 dBm	–84 dBm	–81 dBm
SYSTEM GAIN [2]		131 dB	121 dB	117 dB	113 dB	110 dB
1.35 MHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	2200 (1 E1 + 112) kbit/s	4408 (2 E1 + 232) kbit/s	5512 (2 E1 + 1336) kbit/s	6616 (3 E1 + 352) kbit/s	7720 (3 E1 + 1456) kbit/s
RECEIVER SENSITIVITY [2]		–95 dBm	–89 dBm	–86 dBm	–83 dBm	–80 dBm
SYSTEM GAIN [2]		130 dB	120 dB	116 dB	112 dB	109 dB
1.75 MHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	2872 (1 E1 + 784) kbit/s	5752 (2 E1 + 1576) kbit/s	7192 (3 E1 + 928) kbit/s	8632 (4 E1 + 280) kbit/s	10072 (4 E1 + 1720) kbit/s
RECEIVER SENSITIVITY [2]		–94 dBm	–88 dBm	–85 dBm	–82 dBm	–79 dBm
SYSTEM GAIN [2]		129 dB	119 dB	115 dB	111 dB	108 dB
3.5 MHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	5720 (2 E1 + 1544) kbit/s	11448 (5 E1 + 1008) kbit/s	14312 (6 E1 + 1784) kbit/s	17176 (8 E1 + 472) kbit/s	20040 (9 E1 + 1248) kbit/s
RECEIVER SENSITIVITY [2]		–90 dBm	–84 dBm	–81 dBm	–78 dBm	–75 dBm
SYSTEM GAIN [2]		125 dB	115 dB	111 dB	107 dB	104 dB
7.0 MHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	11832 (5 E1 + 1392) kbit/s	23672 (11 E1 + 704) kbit/s	29592 (14 E1 + 360) kbit/s	35512 (17 E1 + 16) kbit/s	41432 (19 E1 + 1760) kbit/s
RECEIVER SENSITIVITY [2]		–87 dBm	–81 dBm	–78 dBm	–75 dBm	–72 dBm
SYSTEM GAIN [2]		122 dB	112 dB	108 dB	104 dB	101 dB
14.0 MHz CHANNEL		QPSK	16 QAM	32 QAM	64 QAM	128 QAM [3]
CAPACITY [1]	gross (E1 + wayside)	23992 (11 E1 + 1024) kbit/s	47992 (22 E1 + 2056) kbit/s	59992 (28 E1 + 1528) kbit/s	65464 (28 E1 + 7000) kbit/s	65400 (28 E1 + 6936) kbit/s
RECEIVER SENSITIVITY [2]		–84 dBm	–78 dBm	–75 dBm	–72 dBm	–69 dBm
SYSTEM GAIN [2]		119 dB	109 dB	105 dB	101 dB	98 dB

NOTES

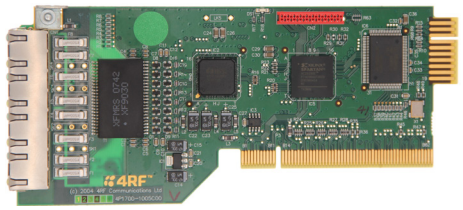
1 Capacities are specified as unframed. The management Ethernet capacity must be subtracted from the gross capacity (default 64 kbit/s).

2 Performance specified at the antenna port for 10^{-6} BER. Figures for 10^{-3} BER are typically 1 dB better.

3 Unreleased: Please contact 4RF for availability.

INTERFACE CARDS

QJET — Quad E1 / T1 framed / unframed interface card



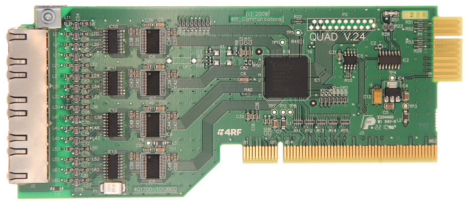
The QJET is a quad port 2 Mbit/s E1 /T1 digital interface providing unframed (G.703) and framed (G.704) interfaces.

Unframed (G.703) E1 is typically used for transport of an entire E1 / T1 over the radio link.

Framed (G.704) E1 / T1 timeslots can be cross connected to:

1. Any other E1 / T1 timeslot on any other E1 / T1 interface providing transport, timeslot grooming and drop and insert functionality.
2. Analogue interface cards providing digital trunk interface connection to PBX and telephone exchanges.
3. QV24 interface cards providing synchronous over sampling circuits.

QV24 — Quad V.24 serial interface card



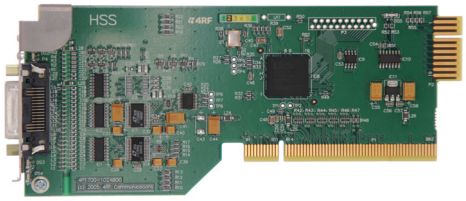
The QV24 is a quad port serial interface card providing asynchronous and synchronous V.24 data transmission.

Asynchronous mode provides V.24 circuits at data rates of 300, 600, 1200, 2400, 4800, 7200, 9600, 12800, 14400, 19200, 23040, 28800, 38400, 57600 and 115200 bit/s.

In synchronous mode, interface data is synchronously mapped to radio capacity using proprietary subrate multiplexing providing data rates of 300, 600, 1200, 2400, 4800, 9600 and 19200 bit/s. QV24 interfaces are required at both ends of the circuit.

In over sampling mode, the interface data is sampled at a fixed 64 kHz. This timeslot can be cross connected to an E1 or T1. This over sampling mode can be operated up to 19200 bit/s.

HSS — Single synchronous serial interface card

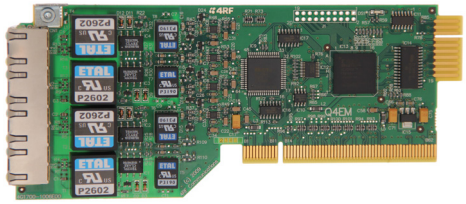


The HSS is a single port high speed serial interface card providing V.35, X.21, RS-449 and RS-530 synchronous data transmission as either a DTE or a DCE. It supports data rates of 8 to 2048 kbit/s in 8 kbit/s steps (dependent on rate selected). 8 kbit/s is used for control lines.

The interface card provides an LFH 60 connector and uses standard Cisco WAN port serial interface cables to provide the correct data interface connector.

The interface specification (X.21 / V.35 etc) is automatically changed by simply changing the type of interface cable connected to the HSS.

Q4EM — Quad 4 wire E&M interface card

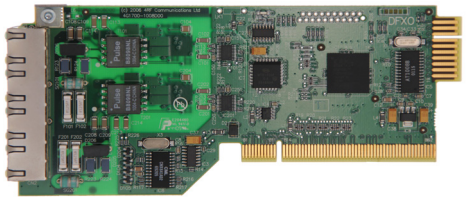


The Q4EM is a quad port analogue interface card providing a 4 wire analogue circuit and single E&M signalling.

The Q4EM digitizes analogue signals using either 64 kbit/s PCM (G.711-compliant) or 32, 24 or 16 kbit/s ADPCM compression (G.726-compliant), providing phone-quality voice transmission. Channel Associated Signalling (A bit) is used to signal between the interfaces.

The Q4EM E&M signalling leads are optically isolated, bi-directional lines which can be externally referenced to meet any of the EIA-464 connection types I, II,IV or V.

DFXO — Dual 2 wire loop signalling foreign exchange office (FXO) interface card

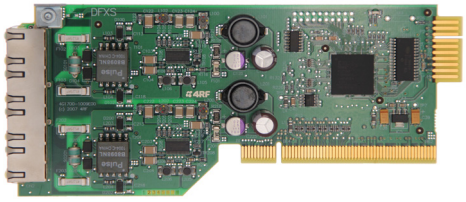


The function of FXO / FXS two wire loop interface circuits is to transparently extend the 2 wire interface from the exchange line card to the telephone / PBX, ideally without loss or distortion. These circuits are known as 'ring out, dial in' 2 wire loop interface circuits. The DFXO interface simulates the function of a telephone.

The DFXO digitizes analogue signals using either 64 kbit/s PCM (G.711-compliant) or 32, 24 or 16 kbit/s ADPCM compression (G.726-compliant), providing phone-quality voice transmission. Channel Associated Signalling (ABCD bits) is used to signal the remote DFXS.

Line and balance impedances are synthesized with high-performance DSP architecture.

DFXS — Dual 2 wire loop signalling foreign exchange subscriber (FXS) interface card



The function of FXO / FXS two wire loop interface circuits is to transparently extend the 2 wire interface from the exchange line card to the telephone / PBX, ideally without loss or distortion. These circuits are known as 'ring out, dial in' 2 wire loop interface circuits. The DFXS interface simulates the function of an exchange line card.

The DFXS digitizes analogue signals using either 64 kbit/s PCM (G.711-compliant) or 32, 24 or 16 kbit/s ADPCM compression (G.726-compliant), providing phone-quality voice transmission. Channel Associated Signalling (ABCD bits) is used to signal the remote DFXO.

Line and balance impedances are synthesized with high-performance DSP architecture.

ABOUT 4RF

Operating in more than 130 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 and PDH applications.

4RF

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