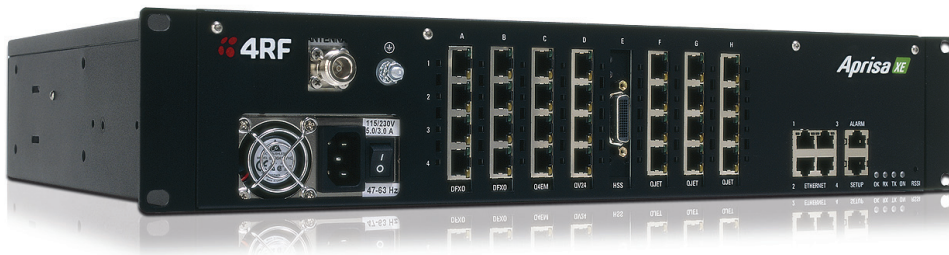


Aprisa XE

POINT-TO-POINT DIGITAL MICROWAVE LINKS 300 MHz to 2.5 GHz licensed ETSI bands



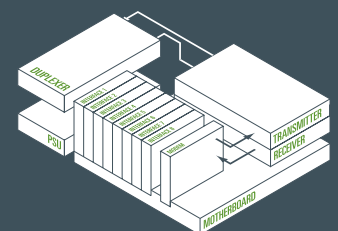
ETSI Aprisa XE: maximizing spectrum use and making challenging long distance links possible

- **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



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 \approx 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

| FREQUENCY BAND | 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 |
| 300 MHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 400 MHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 600 MHz | | | | | | | | | | | ✓ | ✓ | | |
| 800 MHz | | | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| 900 MHz | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | | ✓ | | | |
| 1400 MHz | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| 1800 MHz | | | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 2000 MHz | | | | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 2500 MHz | | | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |

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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

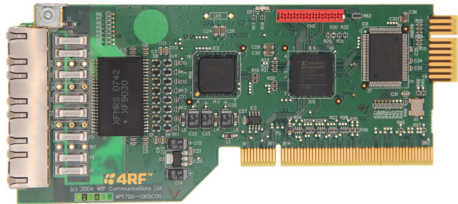
- Capacities are specified as unframed. The management Ethernet capacity must be subtracted from the gross capacity (default 64 kbit/s).
- Performance specified at the antenna port for 10⁻⁶ BER. Figures for 10⁻³ BER are typically 1 dB better.
- Unreleased: Please contact 4RF for availability.



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INTERFACE CARDS

QJET

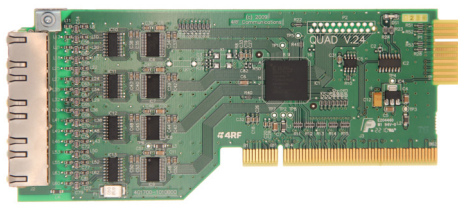


Quad E1 / T1 framed / unframed interface card

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



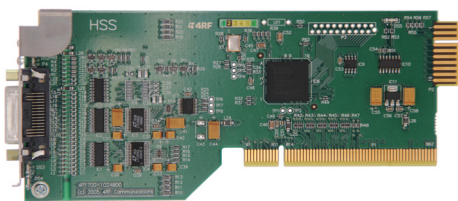
Quad V.24 serial interface card

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



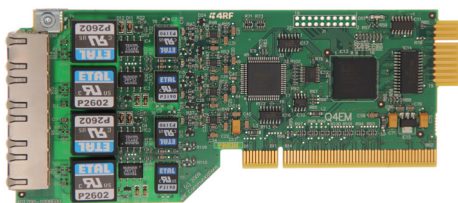
Single synchronous serial interface card

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

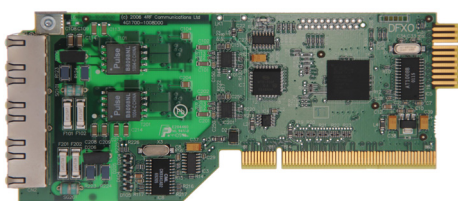


Quad 4 wire E&M interface card

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



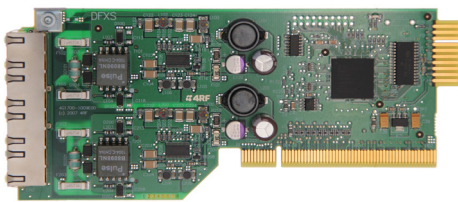
Dual 2 wire loop signalling foreign exchange office (FXO) interface card

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.

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