TECHNICAL SPECIFICATION FOR ACCESS MULTIPLEXER

SPC-TFRT0001
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Revision 1.00

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I DOCUMENT AUTHORISATION

FUNCTION	NAME	TITLE & DIVISION	SIGNATURE	DATE
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II ABBREVIATIONS, ACRONYMS AND DEFINITIONS

ABBREVIATIONS AND ACRONYMS	DESCRIPTION
AIS	Alarm Indication Signal
BER	Bit Error Rate
FERF	Far End Receive Failure
IEC	International Electro technical Commission
ITU-T	International Telecommunications Union
LCT	Local Craft Terminal
MSP	Multiplex Section Protection
NMS	Network Management System
OLTE	Optical Line Terminal Equipment
PCM	Pulse Code Modulation
SCADA	Supervisory Control and Data Acquisition

ABBREVIATIONS AND ACRONYMS	DESCRIPTION
SFP	Small Form Facture Pluggable Modules (Small – factor pluggable)
SNCP	Sub Network Connection Protection
STM	Synchronous Transport Mode

DEFINITIONS	DESCRIPTION
None	

1. GENERAL

1.1 This specification covers the supply of Access multiplexers for telecommunication transmission.

1.2 The hierarchical bit rates are based on a first level bit rate of 2 048 kbit/s. Voice frequency encoding is by means of PCM and based on A-law

1.3 The Access Multiplexer equipment must be able to operate from a 50V DC supply, with either the negative or the positive tied to the earth, without any loss in the functionality of any of the Access Multiplexer equipment cards.

1.4 Sub rack. Two options must be offered

1.4.1 Type A: 19 inch wide, Maximum 9 U height

1.4.2 Type B: 19 inch wide, Maximum 4 U height

1.5 Slots available for interface cards in subrack, excluding the common cards

1.5.1 Type A: 19 inch wide, Maximum 9 U height subrack

1.5.1.1 ; Minimum slots 5 maximum 10

1.5.2 Type B: 19 inch, Maximum 4 U height

1.5.2.1 ; Minimum 2 slots

1.6 Interfaces to be accommodated in the various subracks

1.6.1 Type A: Any combination of interfaces as per section 3

1.6.2 Type B: A combination of 2 Mbit/s / STM1 optical , V.24 (IEC232) , 6 wire E&M module and LAN10BaseT

1.7 All equipment supplied must be designed to operate without degradation under the following conditions:

1.7.1 Temperatures: from –10 to +50 Degrees Celsius

1.7.2 Relative Humidity from 0% to 95%

1.7.3 Air Pollution: dust and heavily laden saline and industrial pollutants

1.8 The tenderer must state his equipment's performance with respect to the following:

1.8.1 Resistibility of equipment to over voltages and over currents including surges due to lightning in accordance with ITU-T Recommendation K.20.

1.8.2 Immunity against RF radiation from external sources.

1.8.3 The equipment's radiation level and subsequent effect on other electronic equipment in close proximity.

2. STANDARDS

2.1 Except where otherwise stated in this specification, all equipment must conform to the latest recommendations of the ITU-T Standards: G703, G704, G707, G708, G711, G712, G713, G737, G784, G792, G793, G751, G803, G813, G821, G823, G826, G828, G829, G956, G958, M1040, M1020 and V.110.

2.2 Tenderers must certify that they are familiar with these recommendations and must state all instances where their equipment offered is unable to comply.

3. INTERFACES

3.1 Optical interface

This specification covers the requirements of optical line equipment for digital transmission on two single mode optic fibres, operating in the 1 330 or 1550 nm window on G.652.D fibre, and line transmission rates of 2 Mbit/s and n x 155 Mbit/s

3.1.1 Optical distances to be achieved for STM 1, based on SFP technology.

3.1.1.1.1 0 to 25 km

3.1.1.1.2 25 to 40 km

3.1.1.1.3 40 to 80 km

3.1.1.2 Optical distance to be achieved with 2 Mbit/s is 80 km

3.1.2 The SDH frame structure must conform to G.707

3.1.3 The following protection schemes must be available

3.1.3.1 SNCP

3.1.3.2 MSP

3.1.4 Should the optical receiver detect no signal for a period greater than 600 ms, the laser transmitter must shut down.

3.1.5 Should the optical path be restored, transmission must proceed. In order to achieve this, the laser source must be activated cyclically for 1 s every 60 s, and when a valid signal is detected then normal transmission must be restored.

3.1.6 The minimum alarm conditions that the equipment must detect and accurately display on LCT and NMS are:

(a) AIS;
(b) FERF;
(c) BER > 10^{-3};
(d) BER > 10^{-6};

3.1.7 Fault management for SDH to conform to ITU.T G784

3.2 LAN interface

3.2.1 Data Rates 64 kbit/s to 1984 kbit/s and 10 Mbit/s

3.2.2 IEEE 802.3 Frame structure.

3.2.3 Interfaces required is 10Base-T

3.2.4 Minimum of 2 ports per card

3.2.5 LED indicating the following must be on the card or visible at the NMS

3.2.5.1 Power on

3.2.5.2 Collisions

3.2.5.3 LAN transmit

3.2.5.4 LAN receive

3.2.5.5 Error (Buffer overflow)

3.2.5.6 WAN transmit

3.2.5.7 WAN receive

3.3 6-Wire Voice Frequency Circuit

3.3.1 These circuits are used for exchange junctions and the physical connection of radio repeaters and occupies a 64 kbit/s timeslot

3.3.2 This circuit must consist of two voice frequency pairs (for transmit and receive paths), and two wires for a simple on-off type of signalling.

3.3.3 A carrier channel must simulate this circuit by two identical 4-WIRE PLUS E & M interfaces at either end. Although there is no difference in the functions of either end, for convenience they are referred to as Exchange and Subscriber ends.

3.3.4 In order to signal the subscriber side from the exchange side, the one signalling wire, referred to as the M-wire, must be earthed. This earth must be transformed by the 4-WIRE PLUS E & M interface at the exchange side to suit the carrier system. This transformed signal must then be identified by the 4-WIRE PLUS E & M interface at the subscriber side, which must switch an earth onto the E-wire on that side.

3.3.5 Similarly, the subscriber side must signal the exchange side with the other signalling wire, referred to as the M-wire The E and M wires must therefore provide voltage-free contacts, which can have many uses, such as alarms and remote control. Whether these contacts are switched mechanically or by solid-state, they must have the following characteristics:

3.3.5.1 When "earthed", the resistance to earth must not exceed 500 ohms.

3.3.5.2 They must manage a maximum of 14 switches per second and the maximum distortion must be 5 ms.

3.3.5.3 They must manage at least 10 000 000 (10 million) switchings before failure.

3.3.5.4 When this circuit is simulated by a PCM channel, then -

3.3.5.5 The 4-WIRE PLUS E & M interface must provide the four wires available for channel associated signalling;

3.3.5.6 These wires must be capable of signalling at bit rates of up to 500 bits/s.

3.4 Analogue Subscriber and Exchange interface

3.4.1 This is the conventional circuit, which connects an automatic telephone instrument to an automatic exchange and occupies a 64 kbit/s timeslot.

3.4.2 To simulate this circuit over a carrier requires a different interface at either end; a SUBSCRIBER interface at the instrument end, and an EXCHANGE interface.

3.4.3 The SUBSCRIBER interface is required to provide speech current to the instrument over the two wires. When signalled by the EXCHANGE interface, it must produce ringing current to the instrument. It must incorporate a loop detector in order to signal the EXCHANGE side and transmit dial pulses accordingly.

3.4.4 The EXCHANGE interface is required to simulate the characteristics of an automatic telephone to an exchange. When signalled by the SUBSCRIBER side, it must produce the corresponding loops to the exchange. It must signal the SUBSCRIBER end when it detects ring current from the exchange. It must cease signalling the SUBSCRIBER when signalled by the SUBSCRIBER; this ring trip delay must not exceed 70 ms.

3.4.5 All 2-wire interfaces must incorporate inductive hybrids, hybrid loss 4 dB or 4,5 dB, the nominal impedance of the 2-wire circuit must be 600 ohms balanced and 900 ohms complex

3.4.6 Under no circumstances may any of the lines be unbalanced. A noise limiter must be installed when the line impedance, unbalanced, exceeds 1 %.

3.4.7 Speech current must simulate a battery supply of 50 volts. However, the speech current must not exceed 90 mA, and the minimum current provided must be 20 mA. (The line resistance, including instrument, may vary from 0 to 1 500 ohms).

3.4.8 Ring current must produce a voltage of 60 to 80 volts over the two wires, in the frequency range 15 to 25 Hz

3.4.9 Ring detectors must interpret a voltage between 20 and 120 volts, in the frequency range 15 to 25 Hz, as a signal.

3.4.10 When an interface is required to produce a loop, this must be by means of placing a resistance of 0 to 1 000 ohms across the line.

3.4.11 Loop detectors must interpret a line resistance less than 1 500 ohms as a loop.

3.4.12 Dial pulses must retain their mark-space ratio from one end of the circuit to the other, through both interfaces.

3.4.13 The method of signalling between the interfaces (e.g. sideband, carrier interrupts, DTMF, tone, timeslot 16, etc.) must of course be compatible.

3.4.14 Input attenuation must be provided with a minimum dynamic range of 16 dB in 0,5 dB steps.

3.4.15 The output level must be adjustable between 0 and 8 dB in 0,5 dB steps.

3.4.16 The equipment must be protected against line surges of 2,5 kV with a rise/decay time of 10/800 microseconds. If this protection can only be provided externally, i.e. on the distribution frame, then it must be offered as such. (Tenderers may quote an optional reduction should this protection not be required.)

3.4.17 The equipment must be immune to transverse potentials of 300 volts (RMS) and longitudinal potentials of 150 volts (RMS), which may exist on cables and lines for any length of time. Tenderers must specify their equipment limitations

3.5 Data interfaces

The typical configuration must contain at least four interfaces .

3.5.1 V.24

3.5.1.1 The interface must be configurable for full- or half-duplex operation.

3.5.1.2 It must be possible to give local and remote loops on the analogue or digital side of the interface.

3.5.1.3 The interface must be capable of internal or external clock operation.

3.5.1.4 The interface must be selectable as a DTE or DCE

3.5.1.5 Point-to-multipoint operation must be possible

3.5.1.6 Asynchronous transmission with oversampling (transparent)

3.5.1.7 Transmission of data signals with frame structure in compliance with ITU-T V.110, synchronous (full-duplex) or asynchronous (transparent) with oversampling.

3.5.1.8 Data rates

3.5.1.8.1 Synchronous 600 bit/s to 19,2 kbit/s

3.5.1.8.2 Asynchronous 600 bit/s to 38,4 kbit/s

3.5.1.9 Alarms and indication

3.5.1.9.1 Loss of Signal in

3.5.1.9.2 Loss of Signal out

3.5.1.9.3 Loss of Sync of data channel

3.5.1.9.4 Converter loop switched

3.5.1.10 The following line statuses must be available on the LCT and NMS

	ITU.T V24	DIN 66020	Meaning
3.4.1.10.1	102	E2	Signal ground
3.4.1.10.1	103	D1	Transmit data
3.4.1.10.1	104	D2	Receive data
3.4.1.10.1	108	S1	DEE operational
3.4.1.10.1	107	M1	Ready for operation
3.4.1.10.1	105	S2	Activation and checking for link

3.4.1.10.1	106	M2	Ready to Send
3.4.1.10.1	109	M5	Receive signal level

3.5.2 V11

3.5.2.1 Data rates 48, 56, 64 kbit/s and n x 64 kbit/s in compliance with the ITU V.110

3.5.2.2 Alarms and indications

3.5.2.2.1 Loss of signal in

3.5.2.2.2 Loss of signal out

3.5.2.2.3 Loss of sync of data channel

3.5.2.2.4 Converter loop switched

3.5.2.3 The following line statuses must be available on the LCT and NMS

3.5.2.3.1 Transmit (T)

3.5.2.3.2 Receive (R)

3.5.2.3.3 Control (C)

3.5.2.3.4 Signalling (I)

3.5.2.3.5 Timing signal (S)

3.5.3 HDB3 2Mbit/s equipment interface

3.5.3.1 The port interface must be 120 ohm balanced.

3.5.3.2 Remote looping of F1 out to F1 in of individual ports in must be possible

3.5.3.2.1 The LCT and NMS must indicate that the relevant E1 port has been looped

3.5.3.3 High impedance test sockets must be provided on the module for measurements of F1 in and F1 out

3.6 SCADA interface

3.6.1 Typical configuration must include a SCADA module, this module should contain a minimum of:

3.6.2 8 dry contacts

3.6.2.1 Closed contact

3.6.2.2 Minimum current 0.1 mA

3.6.2.3 Maximum current 1 A

3.6.2.4 Impedance < 0.1 Ohms

3.6.2.5 Open contact

3.6.2.6 Maximum DC voltage >60 V

3.6.2.7 Maximum residual current < 1µA

3.6.3 16 Sensors

3.6.3.1 Polarity - any

3.6.3.2 Residual voltage without detection <4 V

3.6.3.3 Sensor voltage with detection > 7 V, < 8.5 V

3.6.3.4 Current limiting in sensor > 1 mA <2,5 mA

4. NETWORK MANAGEMENT

4.1.1 The network control software must be such that it allows the user to control, configure and monitor the system in an easy and user-friendly way.

4.1.2 A centralized server type management platform is required.

4.1.3 All relevant licenses must be included

4.1.4 The software must run with a multitasking operating system. The software must preferably be in a Windows type set-up.

4.1.5 Network data must be kept at the central server.

4.1.6 The software must be such that it will prompt the user if an alarm condition occurs, irrespective of the level in which the user is busy in

4.1.7 The alarm must be in a different colour to the rest of the display and must give an audible indication.

4.1.8 The network layout must be graphically displayed and it must be possible for the user to zoom into the detail of each network element up to card/module level where the fault occurred.

4.1.9 It must be possible to freely assign channels to timeslots with software in through, drop/insert, conference, point to multipoint or terminal mode without affecting other channels

4.1.10 It must be possible to change the levels of individual channels through the NMS

4.1.11 It must be possible to specify the required clock synchronisation source and a list of priorities in the event of clock source failing.

4.1.12 It must also be possible to monitor network performance via software and must be in accordance with ITU-T Recommendation G821, G826, G828, G829, M2100, M2101, and must be available in Microsoft office 2003

4.1.13 It must be possible to conduct loop-back tests to all terminals

4.1.14 It must be possible to provide real time printouts of alarm conditions at one or more locations.

4.1.15 Performance measurements a minimum of 1 E1 per link must be possible and in accordance to G.826 The storage and format must be on Windows XP and Microsoft office 2003. Monthly management performance reports must be self generating

4.1.16 Access to individual nodes for fault diagnostics must be possible via a LCT and access to the LCT must be with dongles (for security purposes). Any changes made via the LCT must be overwritten by the main server when access is given back to the NMS

4.2 The Web Client Station

4.2.1 Web access to the system shall be provided, with no extra software to be installed, on any web browser (recent enough) and on any machine, whatever the operating system is. This access to be password protected.

4.2.2 The following functions shall be available :

4.2.2.1 View status of the alarms on any node

4.2.3 For security reasons, the following functions shall not be available by any means (even using user/password protection).

4.2.3.1 Resource administration.

4.2.3.2 Physical network documentation.

4.2.3.3 Deletion of circuits and nodes.

4.2.4 This access shall offer a specific "internet style" GUI, using frames and hyperlinks.

4.2.5 At least 5 simultaneous accesses to the server via the Web shall be possible.

4.3 The 9U subrack must be fully manageable from NMS and LCT

4.3.1 The 4U subrack can have limited manageability from the NMS. The minimum functions are AIS, near and far end loop-back, BER 10^{-3}.

END OF DOCUMENT