



OMANTEL

REFERENCE

INTERCONNECT

OFFER

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ANNEX E

TECHNICAL SPECIFICATIONS



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1 Application

- 1.1 This Annex describes the technical specifications concerning interconnection with Omantel's network.

2 Physical and electrical interface

Specifications at the output E1 traffic ports (G.703 compliant)

Bit rate	2 048 kbps +/- 50 ppm ITU-T G.703
Line code	HDB3 ITU-T G 703
Over voltage protection	refer to ITU-T K41
Load Impedance	75 ohms resistive ITU-T G.703
Mask of the pulse	ITU-T G.703
Maximum peak to peak jitter	refer to clause 2/ G.823

Specifications at the input E1 traffic ports (G.703 compliant)

- 2.1 The digital signal presented at the input port shall be as defined above but modified by the characteristic of the interconnecting pair. The attenuation of this pair shall be assumed to follow a \sqrt{f} law and the loss at a frequency of 1024 kHz shall be in the range 0 to 6 dB. This attenuation should take into account any losses incurred by the presence of a digital distribution frame between the equipments.
- 2.2 For the jitter to be tolerated at the input port, refer to clause 3/G.823. The return loss at the input port should have the following provisional minimum values:

Frequency range (kHz)	Return loss (dB)
51 to 102	12
102 to 2048	18
2048 to 3072	14



Grounding of outer conductor or screen (G.703 compliant)

2.3 The outer conductor of the coaxial pair or the screen of the symmetrical pair shall be connected to the bonding network both at the input port and the output port.

2.3.1 NOTE 1 – The cable routing is important if leaving the system block. Consult Recommendation K.27 for guidance.

2.3.2 NOTE 2 – The direct connection of the outer conductors of co-axial cables to the bonding network at the transmit and receive interfaces may, because of differences in earth potential at each end of the cable, result in unwanted current flowing in the outer conductor, through connectors and through the receiver input circuitry. This may result in errors or even permanent damage. To prevent this problem, DC isolation may be introduced between the outer conductor and bonding network at the receive interface. The method of DC isolation must not compromise the EMC compliance of the equipment and the overall installation.

Over voltage and lightning protection on the E1 interfaces

2.4 The ITU-T recommendations K27, K35, K40 and K41 must be applied. Connection of the Omantel’s E1 interfaces with customer’s E1 interfaces using improper over voltage and lightning protection measures are not allowed. Common earthing for both Omantel’s and customer’s equipment with E1 interfaces is mandatory.

Jitter and wander on the E1 traffic interface

2.5 Network limits for Output Jitter at E1 traffic interface (ITU-T G.823 compliant)

Maximum permissible jitter at traffic interfaces

Interface	Measurement bandwidth, -3 dB frequencies (Hz)	Peak-to-peak amplitude (U _{Ipp})
2 048 kbit/s	20 to 100 k	1.5



	18 k to 100 k (NOTE 2)	0.2
<p>NOTE 1</p> <p>For 2 048 kbit/s interfaces within the network of an operator, the high-pass cut-off frequency may be specified to be 700 Hz (instead of 18 kHz). However, at interfaces between different operator networks, the values in the Table apply, unless involved parties agree otherwise.</p> <p>NOTE 2</p> <p>2 048 kbit/s 1 UI = 488 ns</p>		

Network limits for Output Wander at E1 traffic interface (ITU-T G.823 compliant)

2.6 The maximum level of wander that may exist at a 2 048 kbit/s network interface, expressed in MRTIE, shall not exceed the limit given in the next table:

2 048 kbit/s interface output wander limit

Observation Interval t (sec)	MRTIE requirement (µs)
0.05 < t <= 0.2	46 t
0.2 < t <= 32	9
32 < t <= 64	0.28 t
64 < t <= 1 000 (NOTE 1)	18
<p>NOTE 1 - For the asynchronous configuration the maximum observation interval to be considered is 80 seconds</p>	

3 Transmission

- 3.1 In order to ensure their compatibility with Omantel's transmission equipment and the observance of quality requirements under this the interconnection agreement, the Operator's transmission systems must meet the following relevant ITU-T recommendations:
- 3.1.1 ITU-T Recommendation G.703, Physical/electrical characteristics of hierarchical digital interfaces.
 - 3.1.2 ITU-T Recommendation G.704, Synchronous frame structures
 - 3.1.3 ITU-T Recommendation G.707, Network node interface for the synchronous digital hierarchy (SDH).
 - 3.1.4 ITU-T Recommendation G.783, Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks
 - 3.1.5 ITU-T Recommendation G.784, Synchronous Digital Hierarchy (SDH) management
 - 3.1.6 ITU-T Recommendation G.803, Architecture of transport networks based on the Synchronous Digital Hierarchy (SDH).
 - 3.1.7 ITU-T Recommendation G.810, Definitions and terminology for synchronisation networks.
 - 3.1.8 ITU-T Recommendation G.811, Timing requirements of primary reference clocks.
 - 3.1.9 ITU-T Recommendation G.812, Timing requirements of slave clocks suitable for use as node clocks in synchronisation networks.
 - 3.1.10 ITU-T Recommendation G.813, Timing characteristics of SDH equipment slave clocks (SEC).
 - 3.1.11 ITU-T Recommendation G.821, Error performance of an international digital connection operating at a bit rate below the primary rate and forming part of an integrated services digital network
 - 3.1.12 ITU-T Recommendation G.822, Controlled slip rate objectives on an international digital connection.

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- 3.1.13 ITU-T Recommendation G.823, The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy
 - 3.1.14 ITU-T Recommendation G.826, Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate
 - 3.1.15 ITU-T Recommendation G.841, Types and characteristics of SDH network protection architectures.
 - 3.1.16 ITU-T Recommendation G.957, Optical interfaces for equipment and systems relating to synchronous digital hierarchy.
 - 3.1.17 ITU-T Recommendation G.958 Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables.
 - 3.1.18 ITU-T Recommendation G.114 (1996), One-way transmission time
 - 3.1.19 ITU-T Recommendation K.27, Bonding configurations and earthing inside a telecommunication building.
 - 3.1.20 ITU-T Recommendation K.35, Bonding Configurations and Earthing At Remote Electronic Sites
 - 3.1.21 ITU-T Recommendation K.40, Protection against LEMP in telecommunications centres
 - 3.1.22 ITU-T Recommendation K.41, Resistibility of internal interfaces of telecommunication centres to surge over voltages.
 - 3.1.23 ITU-T Recommendation M 2110 - Bringing-into-service of international PDH paths, sections and transmission systems and SDH paths and multiplex sections

4 Synchronisation

- 4.1 The Operator's system should be synchronised with Omantel's network in the following manner:
- 4.1.1 According to the "master-slave" principle with Omantel as master, and according to ITU-T Recommendation G.812;
 - 4.1.2 from a long-term primary reference standard (Cesium standard) in accordance with ITU-T Recommendation G.811, with a long-term accuracy above 10⁻¹¹ and comply with ITU-T Recommendation G.823 on jitter and wander or from a GPS synchronisation source meeting ITU-T specification G812
- 4.2 Omantel shall provide a synchronisation signal to operators in accordance with ITU-T Recommendation G.703. In normal conditions the 2.048 MHz signal will have a long-term stability above 10⁻¹¹. In case of faults in two independent synchronisation paths, the accuracy may drop to hold-over mode but will be better than 4.6: 10



5 SS7 Networks

- 5.1 For the time being the SS7 connections will be in the associated mode. Later on, when the Omantel SS7 SA-STP pair will be operational, the SS7 interconnections should be done in the quasi-associated mode. The parties shall ensure that the signalling circuits shall be routed separately.



6 SS7 Message Transfer Part

- 6.1 Message Transfer Port (“MTP”) is based on ITU-T Recommendation Q.701-Q.707 White Book 1993. Omantel’s specific implementation is based upon ITU-T Recommendations Q.702, Q.703 and Q.704, and detailed specifications shall be available when an interconnection agreement is concluded.



7 SS7 ISDN User Part

- 7.1 The ISDN User Port (“ ISUP”) is based on ITU-T Recommendation Q761-Q764 and Q850 White Book 1993 as well as ETSI ETS 300 356-1, 1995 (ETSI ISUP Ver. 2). The details of Omantel's implementation and the supported procedures shall be available when an interconnection agreement is concluded.

8 SS7 Supplementary Services

- 8.1 The Supplementary Services supported by ISUP implementation will be compliant with ITU-T Recommendations Q731, Q732, Q733 and Q737 White Book 1993. The details of Omantel's implementation and the supported procedures shall be available when an interconnection agreement is concluded.



9 Contacts

9.1 Contacts are listed in Annex K to this agreement.