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**NETWORK CONNECTION SPECIFICATION
FOR CONNECTION OF CUSTOMER
PREMISES EQUIPMENT (CPE) TO THE
PUBLIC TELECOMMUNICATIONS
NETWORKS (PTNs) IN HONG KONG USING
DIGITAL LEASED CIRCUITS AT DATA RATE
OF 2048 kbit/s BASED ON ITU-T
RECOMMENDATION G.703**



**TELECOMMUNICATIONS AUTHORITY
HONG KONG**

FOREWORD

1. This specification is issued pursuant to Section 32D of the Telecommunications Ordinance (Cap. 106). This specification sets out the technical requirements for connection of customer premises equipment (CPE) to the public telecommunications networks (PTNs) in Hong Kong using digital leased circuits at data rate of 2048 kbit/s (E1 circuits) based on ITU-T Recommendation G.703.
2. Digital leased circuits may be provided by any one of the Fixed Telecommunications Network Services (FTNS) operators in Hong Kong. CPE should comply with this specification for connection to the E1 circuits provided by the FTNS operators. The general technical characteristics of the FTNS networks are given in HKTA 2201. Supplementary information on network characteristics and services of the FTNS networks may be obtained direct from the operators. Contact information of the FTNS operators can be found in the information note OFTA I 412.
3. At present, the Office of the Telecommunications Authority (OFTA) operates a **Hong Kong Telecommunications Equipment Evaluation and Certification** (“HKTEC”) scheme. Details of the scheme can be found in the information note OFTA I 421. Under the scheme, suppliers or manufacturers may apply for certification of their customer premises equipment against this specification. The application procedures for certification of customer premises equipment can be found in the information note OFTA I 412. A label prescribed by the Telecommunications Authority (TA) may be affixed to the certified equipment. Details of the labelling arrangement can be found in the Standardisation Guide HKTA 3211.
4. The TA may amend any part of this specification as and when he deems necessary.
5. In case of doubt about the interpretation of this specification, the methods of carrying out the test and the validity of statements made by the manufacturers of the equipment, the decision of the TA shall be final.
6. The TA accepts no responsibility for the satisfactory performance of the CPE connected to the public telecommunications networks. The CPE is not normally evaluated against performance, reliability or quality-of-service parameters.
7. The HKTA specifications and information notes issued by the TA can be downloaded from OFTA’s website at <http://www.ofta.gov.hk>. Enquiries about this specification may be directed to:

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AMENDMENT TABLE

Item	Issue No.	Paragraph	Descriptions
1.	Issue 2	Foreword	Certification and labelling requirements are updated.
2.	Issue 3	Para. 4.4	The requirement for over-voltage protection is referred to ITU-T Recommendation K.20 (Table 7) instead of G.703 (Annex B) as the latter has been repealed by ITU-T.
3.	Issue 3	Para. 5.7	Add the ITU-T Recommendation K.20 to the list of reference documents.
4.	Issue 4	Title	Revise the title to cover only connection interface based on ITU-T Recommendation G.703.
5.	Issue 4	Foreword	Update information on certification and labelling as a result of the accreditation of Certification Bodies (CBs).
6.	Issue 4	Foreword Para. 1	Revise the information to reflect the coverage of only connection interface based on ITU-T Rec. G.703.
7.	Issue 4	Para. 2.2, 5	Update the title of HKTA 2001.
8.	Issue 4	Para. 3.5	Update cable attenuation requirements based on updated version of ITU-T Rec. G.703.
9.	Issue 4	Para. 4	Update the technical requirements based on the updated version of ITU-T Rec. G.703. Delete the requirements on protection against overvoltage due to lightning according to ITU-T Rec. K.20 Table 7 as there is no such control in the HKTA specifications covering other wireline CPE, and the cable infrastructures in Hong Kong are largely laid underground and the risk of inducing overvoltage to the CPE due to lightning strike is low.
10.	Issue 4	Para. 4.1	Delete the note about the use of other types of interfaces (other than G.703, such as V.35 or V.11) which are to be covered in another HKTA specification.

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1. SCOPE

This network connection specification covers the minimum technical requirements for connection of customer premises equipment (CPE) to the public telecommunications networks (PTNs) in Hong Kong using digital leased circuits at data rate of 2048 kbit/s based on ITU-T Recommendation G.703.

2. ELECTRICAL SAFETY

2.1 PRINCIPLE OF PROTECTION

In order to safeguard operating personnel, users, and plant, it is essential to prevent the transmission of excessive voltages from the CPE into the public telecommunications networks (PTNs) in Hong Kong.

2.2 SAFETY REQUIREMENTS

The CPE shall comply with the HKTA 2001 specification entitled “Compliance Test Specification - Safety and Electrical Protection Requirements for Subscriber Telecommunications Equipment” issued by the Telecommunications Authority (TA).

3. INTERCONNECT POINT

3.1 Digital leased circuits may be provided by any one of the Fixed Telecommunications Network Services (FTNS) operators (hereafter referred to as the “network operators”) in Hong Kong. Interconnection with the digital leased circuits at 2048 kbit/s (E1 circuits) will require the installation of the network operators’ equipment and internal cabling in customer premises. A normal office air-conditional environment is required together with a maintained power supply. Either a mains power supply of 220 Vrms \pm 10% taken from the same point in the building distribution as the CPE or a suitable power supply of -48 Vdc \pm 10% should be provided by the customer.

3.2 The interconnect point (IP) marks the division of responsibility between the network operator and the customer (see Figure 1).

3.3 The network operator will provide sockets for connection, disconnection or re-connection of the equipment to the IP. The customer will be responsible for connection and disconnection of CPE at the IP.

3.4 The IP configuration will depend on the number of circuits provided to the customer. For a large number of E1 circuits, terminating strips / frame will be used for physical interconnection at the IP. For a few number of E1 circuits, one of the following types of connectors will be used:

- (a) Symmetrical cable with either one of the following type of connectors:
 - ISO 4903 (DB15); or
 - ISO 2110 (DB25); or
 - RJ-45 type connector.
- (b) Coaxial cable with 75 ohm BNC connector

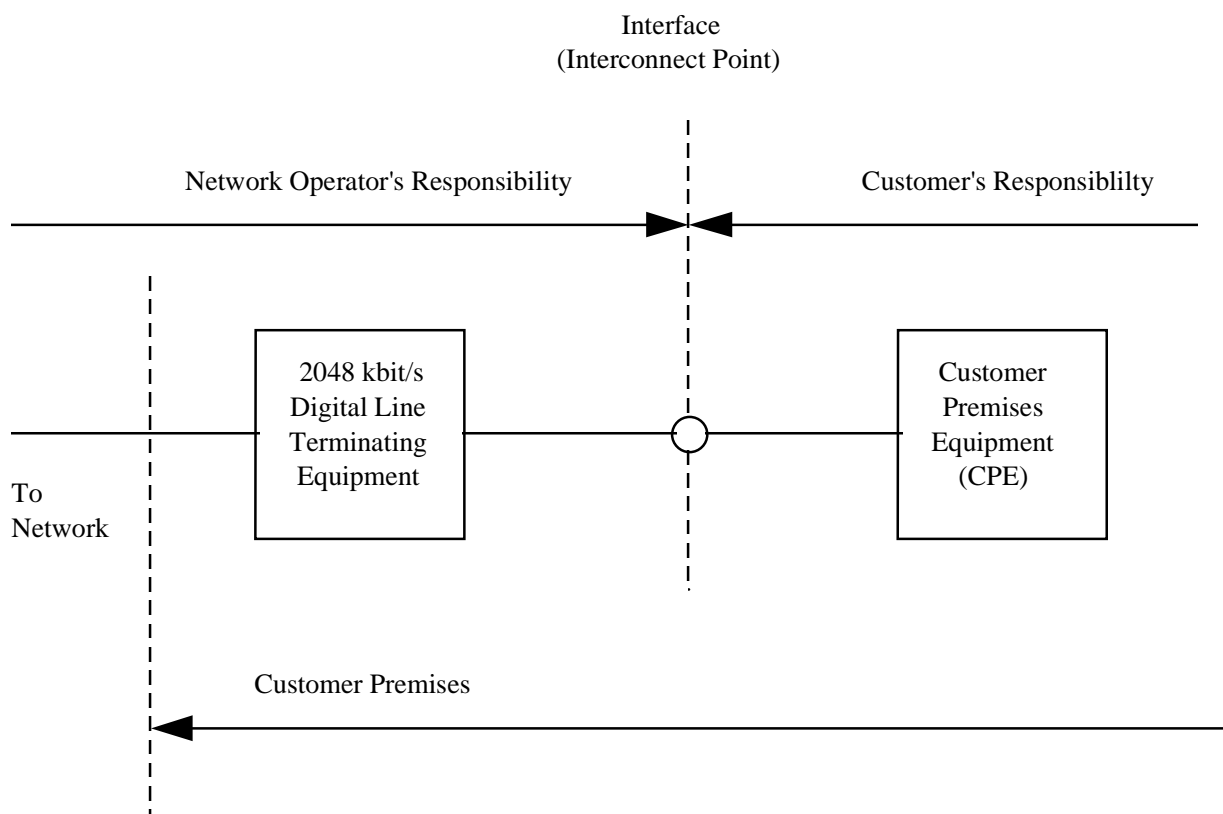


Figure 1 - Interconnection of CPE with 2048 kbit/s digital interface to the PTN at the Interconnect Point

3.5 The attenuation of the cable pairs connecting the CPE to the IP shall be assumed to follow a \sqrt{f} law and the loss at 1024 kHz shall be in the range of 0 to 6 dB. Coaxial or symmetrical cables may be used.

3.5.1 Connection by coaxial cables

- (a) One coaxial cable shall be used for each direction of transmission.
- (b) Characteristic impedance : 75 ohms
- (c) The outer conductor of each coaxial cable shall be connected to earth at the output port and left open-circuit at the input port, on the CPE side of the IP (see Figure 2).

3.5.2 Connection by symmetrical cables

- (a) One screened, twisted symmetrical pair shall be used for each direction of transmission.
- (b) Characteristic impedance : 120 ohms
- (c) The screen of the symmetrical pair shall be connected to earth at the output port and left open-circuit at the input port, on the CPE side of the IP (see Figure 2).

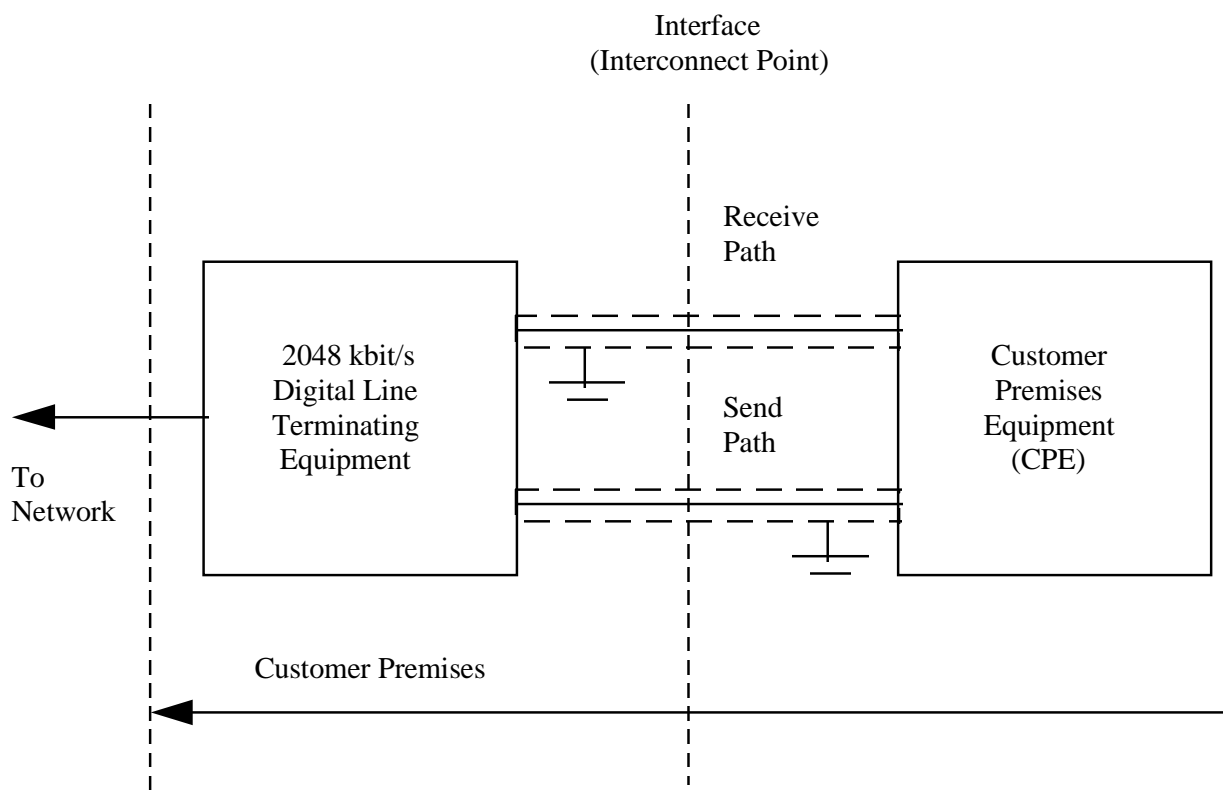


Figure 2 - Earthing of Cable Pair at Output Port

4. INTERFACE ELECTRICAL REQUIREMENTS

4.1 GENERAL

The digital interface of the CPE shall conform to ITU-T Recommendations G.703 and G.823 referring to a digital interface operating at a nominal bit rate of 2048 kbit/s, as specified below.

4.2 BIT RATE ACCURACY

The CPE shall have a bit rate accuracy of ± 50 parts per million (ppm).

Note: The bit-error-ratio of the 2048 kbit/s digital links provided by the network at the interface is less than 1 in 10^6 .

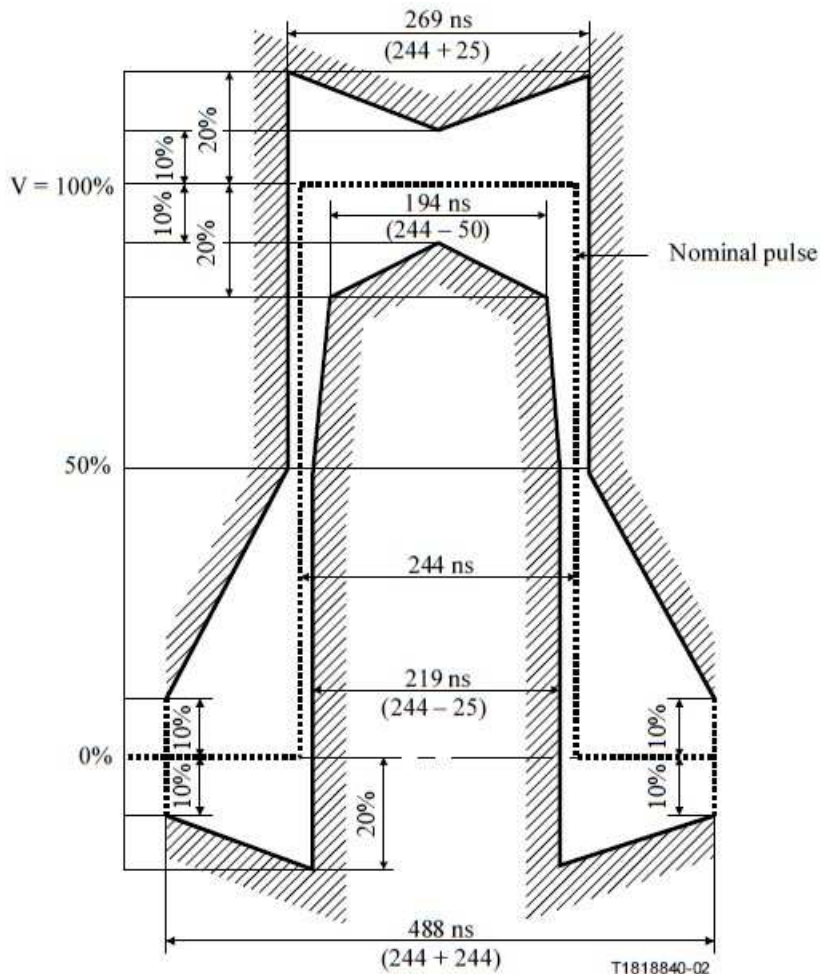
4.3 LINE CODE

The CPE shall use HDB3 code.

4.4 SPECIFICATIONS AT THE OUTPUT PORT

4.4.1 Pulse Shape

All marks of a valid signal shall conform with the mask below irrespective of the sign:



NOTE – V corresponds to the nominal peak value.

4.4.2 Test Load Impedance

The test load impedance shall be 75 ohms resistive for coaxial cable connection (see para. 3.5.1) and 120 ohms resistive for symmetrical cable connection (see para. 3.5.2).

4.4.3 Peak Voltage

The nominal peak voltage of a mark (pulse) shall be 2.37 V for coaxial cable connection and 3 V for symmetrical cable connection. The peak voltage of a space (no pulse) shall be 0 ± 0.237 V for coaxial cable connection and 0 ± 0.3 V for symmetrical cable connection.

4.4.4 Pulse Width

The nominal pulse width shall be 244 ns.

4.4.5 Ratios of Amplitudes of Positive and Negative Pulses

The ratio of amplitudes of positive and negative pulses at the centre of the pulse interval shall be between 0.95 to 1.05.

4.4.6 Ratios of Widths of Positive and Negative Pulses

The ratio of widths of positive and negative pulses at the nominal half amplitude shall be between 0.95 to 1.05.

4.4.7 Return Loss

The return loss at the output port shall have the following minimum values:

Frequency Range (kHz)	Return Loss (dB)
51 to 102	6
102 to 3072	8

4.5 SPECIFICATIONS AT THE INPUT PORT

4.5.1 Return Loss

The return loss at the input port shall have the following minimum values:

Frequency Range (kHz)	Return Loss (dB)
51 to 102	12
102 to 2048	18
2048 to 3072	14

4.5.2 Immunity against Signal Reflections

A nominal aggregate signal, encoded into HDB3 and having a pulse shape as defined in the pulse mask given in para. 4.4.1 above, shall have added to it an interfering signal with the same pulse shape as the wanted signal. The interfering signal should have a bit rate within the limits specified in para. 4.1 and 4.2 above, but should not be synchronous with the wanted signal. The interfering signal shall be combined with the wanted signal in a combining network, with an overall zero loss in the signal path and with the nominal impedance 75 ohms (for coaxial cable connection) or 120 ohms (for symmetrical cable connection), to give a signal-to-interference ratio of 18 dB. The binary content of the interfering signal should comply with ITU-T Rec. O.151 (2^{15} - 1 bit period). No errors shall result when the combined signal, attenuated by up to the maximum specified interconnecting cable loss, is applied to the input port.

4.6 JITTER AND WANDER

The control of jitter and wander at the CPE interface shall conform to ITU-T Recommendation G.823.

Suitable test apparatus is described in ITU-T Recommendation O.171. Testing will be conducted if loop-back facility is provided by the CPE.

4.7 FRAME STRUCTURE

There is no requirement on the frame structure for the signal being transmitted over the 2048 kbit/s circuit.

5. REFERENCE

- 5.1 HKTA 2001 - "Compliance Test Specification - Safety and Electrical Protection Requirements for Subscriber Telecommunications Equipment" issued by the Telecommunications Authority
- 5.2 ITU-T Recommendation G.703 - Physical/electrical characteristics of hierarchical digital interfaces
- 5.3 ITU-T Recommendation G.823 - The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy
- 5.4 ITU-T Recommendation O.151 - Error performance measuring equipment operating at the primary rate and above
- 5.5 ITU-T Recommendation O.171 - Timing jitter and wander measuring equipment for digital systems which are based on the plesiochronous digital hierarchy (PDH)
- 5.6 ISO 4903:1989 Information technology -- Data communication -- 15-pole DTE/DCE interface connector and contact number assignments
- 5.7 ISO/IEC DIS 2110 Information technology -- Data communication -- 25-pole DTE/DCE interface connector and contact number assignments (Revision of ISO 2110:1989)

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