

**NETWORK CONNECTION  
SPECIFICATION  
FOR CONNECTION OF  
CUSTOMER PREMISES EQUIPMENT (CPE)  
TO THE PUBLIC TELECOMMUNICATIONS  
NETWORK (PTN) IN HONG KONG  
USING ISDN PRIMARY RATE ACCESS  
(PRA)  
AT 1544 kbit/s  
BASED ON ANSI STANDARDS**



**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 of customer premises equipment (CPE) which uses Primary Rate Access (PRA) at the transmission rate of 1544 kbit/s and is to be connected to Integrated Services Digital Network (ISDN) based on ANSI standards.
2. The following services are classified as basic services and transparent communication of ISDN terminal equipment connected to different ISDNs is supported:
  - (a) basic voice and data communications by using the B channels;
  - (b) Calling Line Identification Presentation;
  - (c) Calling Line Identification Restriction;
  - (d) Multiple Subscriber Number;
  - (e) Subaddressing; and
  - (f) Group 4 fax transmission.

The three services (a), (b) and (c) above are the minimum services which must be included by the operators offering ISDN services in their portfolio. For ISDN services other than the basic services, they will be offered by individual operators at their own discretion.

3. ISDN services 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 ANSI based PRA ISDN line provided by the FTNS operators. 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.
4. 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 to OFTA 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 prescribed label may be affixed to the equipment which has been certified by the Telecommunications Authority (TA). Details of the labelling arrangement can be found in the Standardisation Guide HKTA 3211.
5. The TA may amend any part of this specification as and when he deems necessary.
6. 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.

7. 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.
8. The HKTA specifications and information notes issued by the TA can be obtained through one of the following methods:-
  - Downloading direct through the OFTA's Internet Home Page. The Home Page address is <http://www.ofta.gov.hk>;
  - Making a request for hard copies to:-

Senior Telecommunications Engineer  
Standards Section  
Office of the Telecommunications Authority  
29/F Wu Chung House  
213 Queen's Road East  
Wanchai  
Hong Kong

Fax: +852 2838 5004  
Email: [standards@ofta.gov.hk](mailto:standards@ofta.gov.hk)

9. Enquiries about this specification may be directed to:-

Senior Telecommunications Engineer  
Standards Section  
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29/F Wu Chung House  
213 Queen's Road East  
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## AMENDMENT TABLE

Item	Issue No.	Paragraph	Descriptions
1.	Issue 2	Foreword Para. 4	Update contact information for FTNS operators.
2.	Issue 2	Foreword Para. 6	Add information for HKTEC Scheme and classify the CPE under CCS Cat. I.
3.	Issue 2	Para. 2	The electrical safety requirement is grouped under this new paragraph.
4.	Issue 2	Para. 3	ANSI T1.403.01 is adopted as the layer 1 requirements.
5.	Issue 3	Foreword	Certification and labelling arrangements are updated.

## **CONTENTS**

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## 1. SCOPE

This Network Connection Specification defines the requirements for the access protocol for interconnection between the FTNS operator's network and user's equipment (e.g. a PABX or network terminal adapter) using Primary Rate Access (PRA) of Integrated Services Digital Network (ISDN) at the transmission rate of 1544 kbit/s. The protocol shall be applied to reference points as defined in the ANSI T1.403.01. ISDN terminal equipment intended to be connected to the ISDN by PRA in Hong Kong based on ANSI standards shall comply with this specification.

The layered protocol defined is based on the ANSI specifications T1.403.01, T1.602 and T1.607. All definitions and descriptions contained in these specifications apply, except for where contradicted by this and associated documents.

This Specification only stipulates the technical requirements on the physical layer, data link layer and network layer protocols for a user to access to the ISDN using PRA at the transmission rate of 1544 kbit/s.

## 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 PTN in Hong Kong.

### 2.2 SAFETY REQUIREMENTS

The CPE shall comply with specification HKTA 2001 titled "Compliance Test Specification – Safety and Electrical Protection Requirements for Subscriber Equipment Connected to the Public Telecommunications Networks in Hong Kong" issued by the Telecommunications Authority (TA).

## 3. TECHNICAL REQUIREMENTS

ISDN CPEs designed to connect to ISDN PRA Interface provided by FTNS operators based on ANSI standard shall comply with the following specifications:-

- a) ANSI T1.403.01 "Network and Customer Installation Interfaces - Integrated Services Digital Network (ISDN) Primary Rate Layer 1 Specification Electrical Interfaces Specification"<sup>1</sup>;

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<sup>1</sup> ANSI T1.408 "Integrated Services Digital Network (ISDN) Primary Rate – Customer Installation Metallic Interfaces Layer 1 Specification" is also accepted. However, acceptance of equipment in compliance with T1.408 may be reviewed in the future.

- b) ANSI T1.602 “Integrated Service Digital Network (ISDN) - Data-Link Layer Signaling Specification for Application at the User-Network Interface” with exception items in Appendix 1; and
- c) ANSI T1.607 “Integrated Services Digital Network (ISDN) - Layer 3 Signaling Specification for Circuit Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)”.

#### 4. INTERCONNECT POINT

- 4.1 Provision of the ISDN PRA service at 1544 kbit/s will require the installation of the Fixed Telecommunication Network Services (FTNS) operator's equipment and internal cabling in customer premises. A normal office air-conditioning environment is required as well as a maintained power supply. Either a mains power supply at 220 Vrms  $\pm$  10% taken from the same point in the building distribution as the CPE or a suitable power supply at -48 Vdc  $\pm$  10% should be provided by the customer.
- 4.2 The interconnect point marks the division of responsibility between the network service provider and the customer.
- 4.3 The network operator will provide socket for connection, disconnection or re-connection of the equipment to the interconnect point. The customer will be responsible for connection and disconnection of CPE at the interconnect point. However, when more than four 1544 kbit/s links are provided to a single location, other methods (e.g. connection panel, MDF) may be used instead of sockets.

#### 5. DIGITAL NETWORK - GENERAL REQUIREMENTS

##### 5.1 CODING OF ANALOGUE SIGNALS BY PULSE CODE MODULATION

All analogue signals are encoded and decoded in accordance with the  $\mu$ -law defined in Section 3.2 of ITU-T Recommendation G.711 “Pulse Code Modulation (PCM) of Voice Frequencies”.

##### 5.2 PAD SETTINGS FOR TRANSMISSION PATHS

Figure 1 shows the pad settings for the “Send” path and the “Receive” path on the public exchange side. CPE should be capable of interworking with the public exchange when the following requirements are taken into consideration:

- 5.2.1 Send Loudness Ratings (SLRs) and Receive Loudness Ratings (RLRs) measured at the interface (i.e. 0 dBr points) are in accordance with the short-term and/or long-term objectives given in ITU-T Recommendation G.121 “Loudness Ratings (Lrs) of National Systems”.

5.2.2 "Stability" and "echo" semi-loop losses meet the requirements of ITU-T Recommendation G.122 "Influence of National Systems on Stability, Talker Echo, and Listener Echo in International Connections".

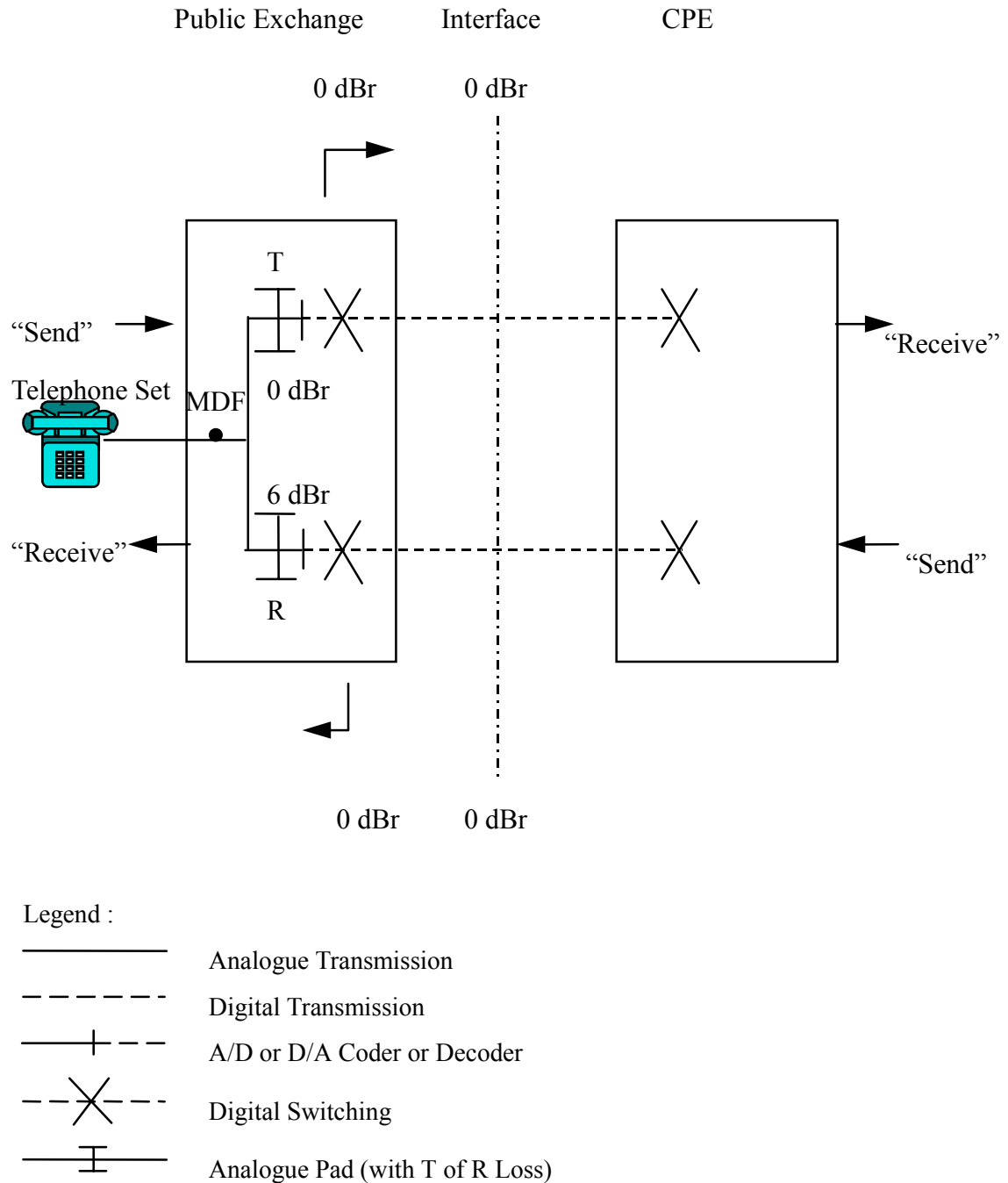


Figure 2 Pad Settings for Transmission Paths

## 5.3 NETWORK SYNCHRONIZATION

### 5.3.1 General

Network synchronization is required in a digital network. Reliable synchronization of CPE clocks (treated as stratum 4 entities) depends entirely on receiving a time reference that is phase-locked to an equal or higher quality clock. To increase the availability of a timing reference, the CPE clocks are preferred to be capable of accepting more than a single synchronization reference source (e.g. one primary and one or more secondaries). An automatic means is desirable to switch over from a facility carrying the primary reference source to another facility carrying the secondary reference.

### 5.3.2 Basic Requirements on CPE Synchronization Equipment

#### (a) Synchronization Method

The CPE must be able to synchronize (as a slave) to the digital exchange using master-slave synchronization method.

#### (b) Capability of External Synchronization

It is preferable that the CPE clock should be capable of externally synchronized via a feedback mechanism from at least two external PCM links under a multi-link configuration. The CPE should be able to select and extract the timing signal from the incoming bit stream of a normal traffic-carrying link, and preferably be able to select between the primary and secondary links under a multi-link configuration (see Figure 2).

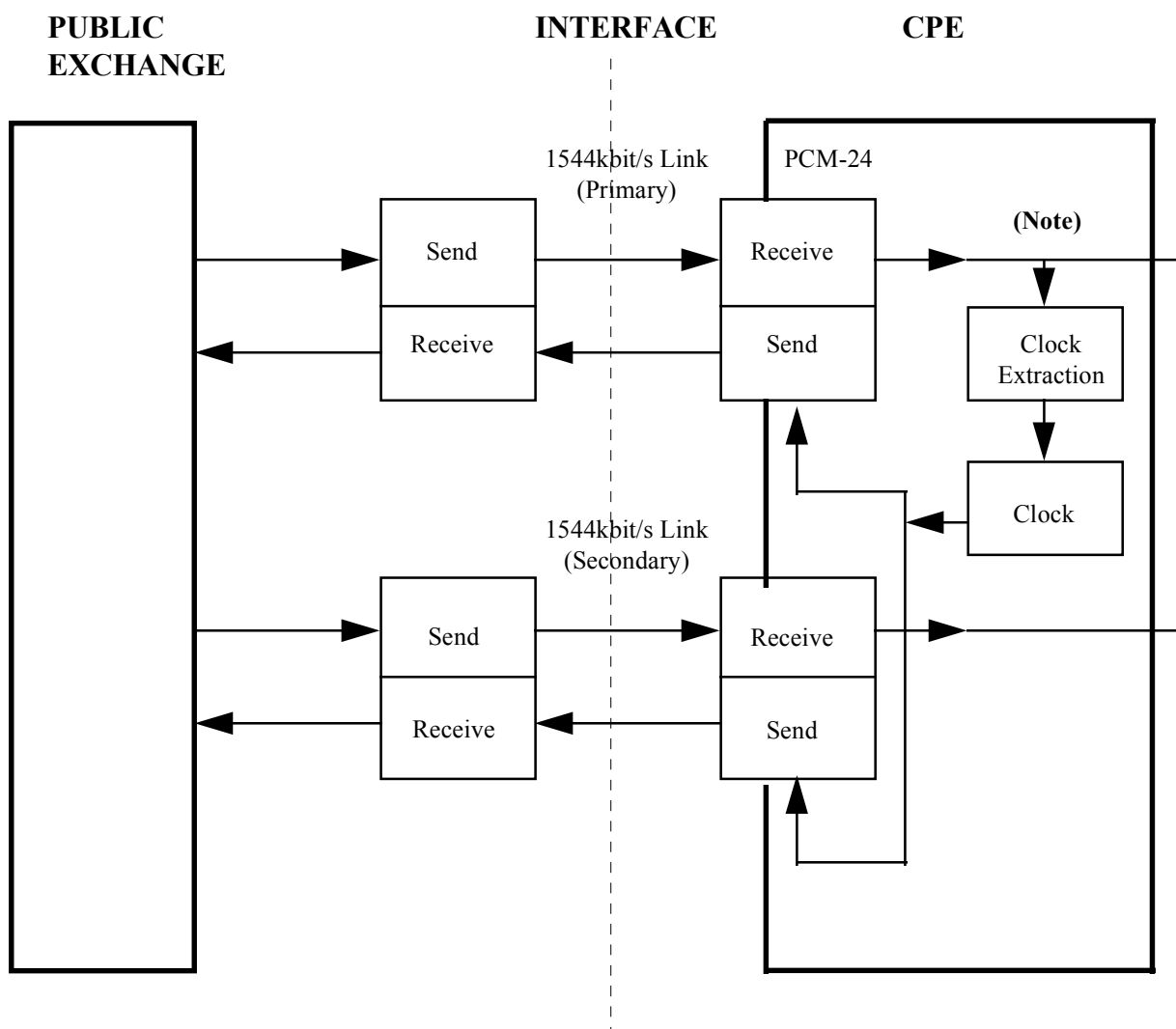
#### (c) Clock Requirements

The clock of the CPE must meet the following requirements.

Item Description	Note	Requirement of CPE Clock
Minimum Accuracy	1	+/- $3.2 \times 10^{-5}$
Minimum Stability (Per 24 Hours)	2	+/- $3.7 \times 10^{-7}$
Pull-In Range	3	Must be capable of synchronizing to clock with accuracy of +/- $3.2 \times 10^{-5}$

Note 1 : Minimum accuracy represents the maximum long-term (e.g., 20 years) deviation from the nominal frequency with no external frequency reference.

- Note 2 : Minimum stability or drift rate represents the maximum rate of change of the clock frequency with respect to time upon loss of all frequency references.
- Note 3 : Pull-in range is a measure of the maximum input frequency deviation from the nominal clock rate that can be overcome by a clock to pull itself into synchronization with another clock.



Note : The CPE should be able to select and extract the timing signal from the incoming bit stream of a normal traffic-carrying link, and preferably be able to switch between the primary and secondary links under a multi-link configuration.

Figure 3 Preferred Synchronisation Method between Public Exchange and CPE

## 6. PROPAGATION DELAY

Because of various types of connection media being used in the FTNS operator's network and international network, propagation delay varies significantly depending on media used, e.g. satellite, cable, etc. In order to adapt to delay caused by different media, CPE should be able to perform handshaking for propagation delay up to 800 ms. Capability of the CPE to handle extra delay which could occur in long distance calls will be desirable.

## 7. HOW TO OBTAIN THE TECHNICAL SPECIFICATIONS

7.1 The HKTA series specifications are issued by the TA. The documents can be obtained through the following method:-

- download direct through the OFTA's Internet Home Page. The Home Page address is <http://www.ofa.gov.hk>;
- Hard copies will be provided on request and the contact address is as follows:-

Office of the Telecommunications Authority,  
29/F, Wu Chung House,  
213 Queen's Road East,  
Wanchai,  
Hong Kong.

(Attn. Senior Telecommunications Engineer (Standards))

7.2 The ANSI's technical references are available from the Committee T1's website at <http://www.t1.org>.

## 8. REFERENCE DOCUMENTS

- [1] ITU-T Recommendation I.431 Primary rate user-network interface layer 1 specification.
- [2] ITU-T Recommendation Q.920 (I.440) ISDN user-network interface data link layer - General aspects.
- [3] ITU-T Recommendation Q.921 (I.441) ISDN user-network interface data link layer specification.
- [4] ITU-T Recommendation Q.930 (I.450) ISDN user-network interface layer 3 - General aspects.
- [5] ITU-T Recommendation Q.931 (I.451) ISDN user-network interface layer 3 specification for basic call control.
- [6] ITU-T Recommendation I.41X - ISDN user-network interfaces.
- [7] ITU-T Recommendation G.711 - Pulse code modulation (PCM) of voice frequencies.

## **APPENDIX 1 - EXCEPTION ITEMS IN ANSI T1.602**

- unnumbered information commands not supported
- DL-UNIT DATA primitive not supported
- broadcast procedures - TEI 127 is not supported
- management information transfer - SAPI 63 not supported
- identity remove message not supported
- MDL-UNIT DATA primitive not supported
- TEI removal procedure not supported (network or user will not be able to request the other end to remove its TEI)
- XID procedures not supported
- MPH primitives not supported
- deactivation procedures not supported
- only SAPI 0 is supported
- only TEI 0 is used by the network

**- END -**