

Private branch exchanges for connection to public switched telephone networks run by certain public telecommunication operators

Part 4. Specification for ports

ICS 33.040.35

Committees responsible for this British Standard

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- British Approvals Board for Telecommunications
- British Gas plc
- British Telecommunications plc
- Department of Trade and Industry (Telecommunications and Posts Division)
- EEA (the Association of Electronics, Telecommunications and Business Equipment Industries)
- Electricity Association
- Engineering Equipment and Materials Users' Association
- Independent Telecommunications Suppliers' Association
- Mercury Communications Limited
- Ministry of Defence
- OFTEL (Office of Telecommunications)
- Telecommunications Users' Association (TUA)

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Foreword

BS 6450 has been prepared under the direction of the Telecommunications Assembly. It forms one of a series of British Standards that is being produced following the commencement of liberalization in October 1981 of the supply of certain telecommunications apparatus within the United Kingdom.

Attention is drawn to the foreword of BS 6450 : Part 1 : 1993.

This Part of BS 6450 is based on Office of Telecommunications (OFTEL) Publication OTR 001 : 1988 *Technical requirements for private branch exchanges with telecommunication ports*, Issue 3, July 1989. Changes between OTR 001 and this Part of BS 6450 include the following.

- a) For ports used for private networking some of the requirements of OTR 001 have been changed so that the specifications and tests remain but they are no longer requirements, subject to the supplier stating the performance values in the instructions for use.
- b) Annexes E (signalling convertors), F (multiplexers) and G (echo cancelling devices) of OTR 001 have been omitted.
- c) Some of the ports have been reclassified.
- d) The field trial requirements of OTR 001 have been transferred to BS 6450 : Part 7.
- e) The addition of cordless ITS based on BS 6833 : Part 5 (ITS-CA).
- f) The addition of requirements for computer integrated telecommunications ports.
- g) The addition of requirements for ISDN basic rate ports.
- h) The addition of requirements for CT2-CAI ports.
- i) The addition of requirements for DECT ports.
- j) The addition of requirements for ISDN primary rate ports.
- k) The addition of requirements for digital private link ports.
- l) The addition of requirements for ITS-CD cordless digital ports.
- m) The addition of requirements for the connection of two or more PSTN exchange lines to each other.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular, attention is drawn to the Telecommunications Act, 1984 [1].

Introduction

The requirements and recommendations in this Part of BS 6450 are constructed from the following main elements:

- a) a formal classification of the ports covered by these requirements and recommendations, providing a unique identification of each port type specified (clause 4);
- b) compliance principles (clause 5) and general testing principles (clause 6);
- c) tables, one for each port type, stating the particular requirements and recommendations (from amongst those contained in the overall set) which apply to that port type (clause 7);
- d) general requirements, applicable in all cases

(clause 8);

e) a set of specific technical requirements and recommendations, grouped according to subject matter (clauses 9, 10, 11, 12, 13 and 14);

f) detailed test methods (annexes A and B);

g) sets of recommendations (annexes C, D, E, F and G).

Ports are classified by:

- 1) the kind of circuit or apparatus to which the port may be connected;
- 2) the use to which the port may be put.

Classes are represented by an alphanumeric code that is summarized in table 1, and specified in clause 4.

Table 1. Summary of ports					
Usage	Type	Application	Presentation	Cabling	Signalling
P		PSTN connection			
	PA1 PA2 PD1 PD2 PD3 PD4	Analogue Analogue Digital Digital Digital Digital	2-wire 2-wire 2048 kbit/s 2048 kbit/s 144 kbit/s 2048 kbit/s	—	Bothway DDI CASS DASS DSS No.1 DSS No.1
1		PSTN access terminal			
	1AS 1BS 1AN 1CS 1DS 1ES	PSTN speech – analogue PSTN speech – analogue Speechband, receive only or send only Digital PSTN speech PSTN speech	2-wire or 3-wire 2-wire or 3-wire 2-wire 144 kbit/s, I.420 860 MHz radio 1880 MHz radio	Non-integrated Integrated Non-integrated Non-integrated Integrated Integrated	—
4		PBX terminal equipment			
	4A 4B 4C 4E 4F	Terminal Terminal Power Operation and maintenance terminal Simple accessory	—	Non-integrated ¹⁾ Integrated ¹⁾ Non-integrated Non-integrated ¹⁾ Non-integrated ¹⁾	—
NW		Private networking			
	NWH NW2 NW4 NWD NWS	Host Networking Networking Networking Subsidiary	2-wire 2-wire 4-wire 2048 kbit/s 2-wire or 3-wire	—	Unspecified Unspecified Unspecified Unspecified Loop calling unguarded clearing
L		Private network links			
	L2	No public telecommunications network connection or cross connection	2-wire	Integrated ¹⁾	Unspecified
	L4	No public telecommunications network connection or cross connection	4-wire	Integrated ¹⁾	Unspecified
	LD	No public telecommunications network connection or cross connection	2048 kbit/s	Non-integrated ¹⁾	Unspecified
ITS		Integral terminating stations			
	ITS-A ITS-D ITS-CA ITS-CD	PSTN speech – analogue PSTN PSTN speech – digital PSTN Cordless analogue Cordless digital		Non-integrated Non-integrated Not applicable Not applicable	

¹⁾ Advice on the suitability of a port type to share cabling with other port types can be found in the Wiring Code.

In using this standard it is necessary to first identify the particular port types incorporated in the PBX (see table 1 and clause 4). The tables in clause 4, i.e. tables 3, 4, 5, 6 and 7 will then indicate, by reference to subsidiary tables in clause 7, i.e. tables 8 to 30, the particular requirements and recommendations applicable to each port type. The appropriate column of requirements and recommendations in clause 7 should be used depending on whether the PBX is 2-wire switched or 4-wire switched. The PBX has to conform to the general requirements in clause 8 and each port type has to conform to its set of specific requirements.

Ports for direct connection to public switched telephone networks (PSTNs), i.e. exchange line ports, and terminating station ports, have the highest level of type approval requirement. The lowest levels of requirements and recommendations are for ports that have no direct or indirect access to any public switched network.

Ports are treated as being located at the means of connection at the end of the cable remote from the private branch exchange (PBX) central equipment. Some ports are therefore specified at the test jack frame (TJF); others are specified at the end of building wiring distant from the central equipment. Because a particular PBX could have many types of port, a large number of port-to-port interactions are possible. The requirements and recommendations have been written so that the number of interaction variables is minimized. Wherever possible, transmission requirements and recommendations use the ports test reference point (PTRP) concept, explained in 6.3.1. The PTRP is an accessible point within the PBX used as a reference point for the specification and measurement of transmission parameters. Because of the importance of transmission impairments and their part in the design of private networks, 6.3.1 and the figures referred to should be carefully studied to ensure that the PTRP concept is understood.

NOTE. Useful background information concerning general transmission principles is contained in clause 5 of CCITT Recommendation G.101 : 1988 Blue Book.

The PTRP concept is not suitable for 2-wire switched PBXs and consequently the requirements and recommendations are specified and tested on a port-to-port basis. It is expected that such PBXs will not offer such a wide range of port types as 4-wire switched PBXs and therefore the number of port-to-port combinations will be less.

OFTEL could partly or wholly withdraw document OTR 001 : 1988 when this Part of BS 6450 is published. The reduction in the number of port types used for private networking means that the categories contained in OTR 001 : 1988 have been replaced with a new range of port types. Table 2 shows the relationship between OTR 001 : 1988 and this Part of BS 6450. Port types not shown in table 2 have not been reclassified.

Table 2. Relationship between private networking port types

OTR 001 : 1988	This Part of 6450
2AN	NWH
2AS	NWH
2BN	NW2
2BS	NW2
2CN	NW4
2CS	NW4
2DN	NWD
2DS	NWD
3AN	NWH
3AS	NWH
3BN	NW2
3BNX	NW2
3BS	NW2
3BSX	NW2
3CN	NW4
3CNX	NW4
3CS	NW4
3CSX	NW4
3DN	NWD
3DS	NWD
5A	NW2
5B	NW4
5C	NWD
6A	L2
6AX	L2
6B	L4
6BX	L4
6C	LD

Specification

1 Scope

1.1 This Part of BS 6450 specifies requirements for private branch exchanges (PBXs) having ports that may be connected to one or more of the following:

- a) two or more public exchange lines;
- b) private leased circuits run by a public telecommunications operator (PTO);
- c) private links.

The ports within the scope of these requirements are those for connection to:

- 1) any of the public switched networks run by a PTO;
- 2) private leased circuits run by a PTO;
- 3) telecommunications apparatus of any description, specifically approved for connection to a PBX;
- 4) privately provided links, including links to other apparatus within the scope of these requirements;
- 5) approved accessories and other approved apparatus whose approval does not provide specifically for connection to a PBX.

1.2 The requirements do not cover all of the features or facilities with which a PBX could be equipped.

1.3 The requirements do not apply to PBXs for connection to shared service lines or 1 + 1 carrier systems.

1.4 The requirements enable a PBX to have, connected in parallel at 2-wire presented analogue exchange line ports, apparatus whose ringer equivalence number (REN) does not exceed 0.3 (see 4.2 of BS 6305 : 1992).

NOTE 1. Unless otherwise stated, all clause references refer to this Part of BS 6450. Where reference is made to a particular clause of another publication, the requirements contained in that clause are applicable irrespective of the scope of that publication. Any clauses of another publication not specifically invoked do not apply.

NOTE 2. Recommendations for the installation of PBXs, including wiring, are given in BS 6701 : Parts 1 and 2.

1.5 This Part of BS 6450 does not of itself specify the complete requirements for a particular PBX and needs to be read in conjunction with other Parts of BS 6450 as appropriate.

2 References

2.1 Normative references

This Part of BS 6450 incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 127. For dated references, only the edition cited applies; any subsequent amendments to,

or revisions of the cited publication apply to this Part of BS 6450 when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Part of BS 6450 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on page 128b, but reference should be made to the latest editions.

3 Definitions, abbreviations, notation and concept

3.1 Definitions

For the purposes of this Part of BS 6450, the definitions given in BS 6450 : Part 1 : 1993, BS 6450 : Part 2 : 1993, BS 6450 : Section 3.1 : 1993, BS 6450 : Section 5. 1 : 1993 and BS 6450 : Section 6.1 : 1993 apply, together with the following.

NOTE. If a term given in this Part of BS 6450 is defined differently in another Part of BS 6450, the definition in this Part takes precedence.

3.1.1 associated cable

Cable between a port and the PBX central equipment.

NOTE. For the purposes of this Part of BS 6450, such cable is considered to be part of the PBX.

3.1.2 associated cable loss

Loss for planning purposes, in decibels, of the cable between a port and the PBX central equipment at a frequency of 1600 Hz.

3.1.3 bit integrity

Condition of a digital channel in which information bits are conveyed without a change of their value or order.

3.1.4 channel

Path for the conveyance of individual messages.

NOTE 1. A channel may comprise any number of timeslots. All channels need not comprise the same number of timeslots.

NOTE 2. A pair of channels is required for bidirectional communication.

3.1.5 connection point

Point located at the test jack frame (TJF) that provides test access and isolation access to each circuit to and from the PBX.

3.1.6 cross connection

State in which a channel is established between two or among more ports of a PBX.

3.1.7 decadic pulsing

Representation, by means of timeslot 16 codes, of loop disconnect signalling which is normally at a rate of 10 pulses per second.



3.1.8 direct access

Access to a public switched telephone network (PSTN) from a port on the same PBX as the PSN connection point.

3.1.9 direct dialling in (DDI)

Mode of operation of a PBX that enables incoming PSTN calls to be routed to the required destination port without intervention by the PBX operator.

3.1.10 E & M signalling

D.C. signalling using two discrete wires, a receive 'E' wire and a transmit 'M' wire, that are electrically separate from the associated speech circuit (e.g. British Telecommunications plc SSDC5A signalling system).

3.1.11 extension apparatus

Apparatus approved for connection to a usage 1 port, or a type 4A or type 4B port.

3.1.12 host PBX

PBX, directly connected to a PSTN, having one or more ports of type 1AS, 1BS, or NWH connected to a subsidiary PBX.

3.1.13 ideal codec

Codec conforming to the pulse code modulation (PCM) A-law encoding defined in CCITT Recommendation G.711.

NOTE. The analogue ports of the ideal codec are 0 dBr 600 Ω points, that is, a sine wave signal of 1 kHz at a level of 0 dBm will be present when the sequence of character signals of table 5 of CCITT Recommendation G.711 : 1988 is applied to the ideal codec digital input. See 6.2.7.

3.1.14 indirect access

Access to a PSTN from a port or ITS on a PBX other than the one having the PSTN connection point.

3.1.15 input

Terminations through which an electrical signal passes to the apparatus from the connected circuit.

3.1.16 integral terminating station – analogue

Terminating station that is treated as an entirety with the PBX and that conforms to BS 6450 : Part 2 : 1993 (see table 7).

3.1.17 integral terminating station – cordless analogue

Cordless terminating station that is treated as an entirety with the PBX and that conforms to BS 6833 : Part 5 : 1991 (see table 7).

3.1.18 integral terminating station – digital

Terminating station that is treated as an entirety with the PBX and that conforms to table 7.

3.1.19 integrated cabling

Cabling in which circuits forming part of a public telecommunication system (PTS) and associated cabling of a port, or the cabling of a private link, are contained within a common casing or cover, or are so otherwise installed that separate maintenance of each is impractical.

3.1.20 interfering call path

PBX call path to which a test signal is applied for the purpose of measuring crosstalk to another call path.

3.1.21 major equipment failure (MEF)

State in which a PBX is unable to handle incoming call attempts on at least 60 % of a group of ports of usage P of the same type for a continuous period exceeding 16 s, because of a failure in the PBX.

3.1.22 maximum PBX call path loss

PBX call path loss when the associated cable loss has its maximum value.

3.1.23 nominally zero length associated cable

The shortest length of cable between a port and the PBX central equipment that it is physically practicable to provide for test purposes.

3.1.24 non-PSTN traffic

Telecommunication traffic that does not have direct or indirect access to a PSTN.

3.1.25 no signal

Break in the HDB3 transmission path equivalent to an insertion loss at the signal source of at least 40 dB at 1024 kHz.

3.1.26 output

Terminations through which an electrical signal passes from the apparatus to the connected circuit.

3.1.27 PBX call path

Means provided by the PBX to convey traffic from end to end between any two or more ports of the PBX.

3.1.28 PBX call path loss

Loss in decibels in each direction of transmission at a frequency in the range 1004 Hz to 1020 Hz between two ports when an end-to-end call path is established between them.

3.1.29 port

Point on a PBX including any associated cabling and connection arrangements where other apparatus or networks can be attached.

NOTE. According to BS 6301, a port will not be at an excessive voltage under normal operating conditions.

3.1.30 ports test reference point

Point on the call path within a 4-wire switched PBX, to and from which the various transmission parameters can be summed, to give a call path performance for planning purposes.

NOTE. See the explanation in 6.3.1.

3.1.31 private circuit

A connection between two ports on separate branch systems that forms part of a public telecommunication system.

3.1.32 private link

A connection between two ports on separate branch systems that does not form part of a public telecommunication system.

3.1.33 PSTN conversational speech traffic

Telecommunication two way, live speech traffic that has direct or indirect access to or from a PSTN that provides a switched telephony service.

3.1.34 PSTN traffic

Telecommunications traffic that has direct or indirect access to or from a PSTN.

3.1.35 relative level

Level in dBr (see 3.3.3), that a reference sinusoidal signal of 1004 Hz to 1020 Hz would have at the point in question, relative to the level the reference signal would have at a dedicated level reference point called a 0 dBr point.

NOTE. For A-law PCM the 0 dBr point is a point at which a +3.14 dBm sinusoidal signal is the maximum signal that can be encoded without clipping.

3.1.36 signalling channel

A channel assigned to the conveyance of call control messages.

NOTE. Network operation and maintenance messages are sometimes conveyed in a signalling channel.

3.1.37 signalling conversion

Process that takes place within a PBX whenever address information or supervisory signals are transferred from one port to another having a different signalling system, and where the PBX converts the address information signals from the format of one system to that of the other.

3.1.38 signalling regeneration

Process that takes place whenever address information or supervisory signals are transferred from one port to another, each having the same signalling system, but where the PBX reconstructs the signals received at one port for onward transmission to the other.

3.1.39 subsidiary PBX

PBX indirectly connected to a PSTN via both of the following:

- a) its exchange line port(s) when these ports are approved for loop calling unguarded clear signalling or an NWS port; and
- b) port(s) of type 1AS, 1BS or NWH on a host PBX.

3.1.40 subsidiary PBX connection

Connection of a subsidiary PBX to a host PBX.

3.1.41 supplier's declaration

Supplier's declaration in accordance with BS 7514.

NOTE. Such evidence should consist of actual test information or other substantiating material relating to the design of the apparatus.

3.1.42 target call path

Call path on which measurements are made of crosstalk from another call path.

3.1.43 telecommunication port

Port capable of acting as the end point of a PBX call path.

3.1.44 through-fed PBX

PBX in which ports derive feeding current from the PSTN, and not from the PBX, where the call is made between the PSTN and the port.

3.1.45 timeslot

The assignment on a temporary basis, at regular cyclic intervals, of a portion of the complete bit stream associated with a port and which is used for the conveyance of all or part of a particular message.

NOTE. A timeslot may comprise any number of bits, usually eight contiguous bits.

3.1.46 timing channel

Channel assigned to the conveyance of link operation and maintenance messages, e.g. frame synchronization patterns and link alarm indications.

3.1.47 traffic channel

Channel assigned to the conveyance of user information messages, e.g. speech or data.

3.1.48 transparent signalling

Process in which address information or supervisory signals are transferred from one port of a PBX (the signalling input port) to another (the signalling output port) without signalling conversion or signalling regeneration by the PBX.

3.1.49 2-wire switched PBX

PBX which when switching telecommunications traffic uses the same path for each direction of transmission.

3.1.50 4-wire switched PBX

PBX which when switching telecommunications traffic uses a separate path for each direction of transmission.

3.1.51 approved transmission system

Transmission system approved for connection to the PSTN at a 144 kbit/s CCITT Recommendation I.420 presented ISDN access point, suitable for the connection of ISDN passive S-bus or Terminal Equipment and used in accordance with its conditions of approval.

3.1.52 ISDN passive S-bus

Wiring arrangement described in CCITT Recommendation I.430 which supports the Point-to-Multipoint operation of Terminal Equipments.

3.1.53 PBX-TE

Terminal which has been approved for direct connection to the PSTN at a 144 kbit/s CCITT Recommendation I.420 presented ISDN access point and which is therefore suitable for connection to a 1CS port.

3.2 Abbreviations

The following abbreviations are used in this Part of BS 6450.

ADPCM	adaptive differential PCM
AIS	alarm indication signal
ARL	acoustic reference level
CAI	common air interface
CAS	channel associated signalling
CCITT	International Telegraph and Telephone Consultative Committee of the International Telecommunications Union
CFP	cordless fixed part
CPP	cordless portable part
CT2	cordless telephony type 2
DDI	direct dialling in
DECT	Digital European Cordless Telephony
DP	decadic pulsing
DTI	Department of Trade and Industry
DASS 2	Digital Access Signalling System No. 2

DSS No. 1	Digital Subscriber Signalling System No.1 (see CCITT Recommendations Q.921 and Q.931)
E & M	See 3.1.10
ETSI	European Telecommunications Standards Institute
FASM	frame alignment signal monitor to CCITT Recommendation 0.162
HDB3	high density bipolar 3 code to annex A of CCITT Recommendation G.703
ISDN	Integrated Services Digital Network
ITS	integral terminating station
ITS-A	integral terminating station — analogue
ITS-CA	integral terminating station — cordless analogue
ITS-D	integral terminating station — digital
LRGP	loudness rating guard-ring position referred to in annex A of CCITT Recommendation P.76
MEF	major equipment failure
MF	multi-frequency
NT1	as defined in CCITT Recommendation I.411
NTP	network termination point
OFTEL	Office of Telecommunications
PBX	private branch exchange
PCM	pulse code modulation
PSTN	public switched telephone network
PTO	public telecommunication operator
PTRP	ports test reference point
PTS	public telecommunication system
RAB	remote alarm bit
REN	ringer equivalence number
RLR	receive loudness rating
Rx	receive
SCRM	simple call routing mode
SLR	send loudness rating
STMR	side tone masking rating
TA	as defined in CCITT Recommendation I.411
TBRL	terminal balance return loss
TDU	transmission decoupling unit
TE	as defined in CCITT Recommendation I.411
TE1	as defined in CCITT Recommendation I.411
TJF	test jack frame
Tx	transmit

3.3 Notation

The following notation is used in this Part of BS 6450.

3.3.1 dBm

Apparent power level with respect to 1 mW, expressed in decibels.

NOTE. For resistive terminations, apparent power is equal to absolute power.

3.3.2 dBV

Absolute voltage level with respect to 1 V, expressed in decibels.

3.3.3 dBr

Level of a signal at a point in a transmission connection relative to the level of the same signal at a specified reference point.

3.3.4 dBm0

Apparent power level with respect to 1 mW expressed in decibels, referred to a point of zero relative level.

NOTE. For resistive terminations, apparent power is equal to absolute power.

3.3.5 dBm0p

Absolute psophometric power level with respect to 1 mW, expressed in decibels, referred to a point of zero relative level.

NOTE. Further information on all expressions for power levels used in this standard is given in CCITT Recommendations B.12 and O.9.

3.4 Concept

3.4.1 Basic rate interface structure at the S-reference point

CCITT Recommendation I.430 Figure 1/I.430 defines the connections to the ISDN. For the purposes of this Part of BS 6450, a conceptual configuration of an I.430 basic access PBX is shown in figure 21.

4 Classification

4.1 Ports shall be classified in accordance with tables 3, 4, 5, 6 and 7.

NOTE 1. Port types are not necessarily shown in numerical or alphabetical order.

NOTE 2. See the foreword concerning ports other than those classified in clause 4.

4.2 Classified ports shall conform to the requirements specified in tables 3, 4, 5, 6 and 7.

Table 3. Ports for direct connection to a PSTN

Usage	Port type	Interface to which port may be connected	Signalling	Integrated cabling	Requirements	Notes
Usage P Direct connection to a PSTN	PA1	2-wire presented analogue PSTN exchange line for PBX service without DDI	Earth calling; loop calling disconnect clearing; loop calling guarded clearing; loop calling unguarded clearing (SCRM only); address information; loop disconnect or MF	Not applicable	Table 8	
	PA2	2-wire presented analogue PSTN exchange line for PBX service with DDI	DDI (loop disconnect and/or MF)	Not applicable	Table 9	For signalling see BS 6450 : Section 3.1.
	PD1	2048 kbit/s CCITT Recommendation G.704 presented digital PSTN for PBX DDI and/or non-DDI operation	Channel associated signalling	Not applicable	Table 10	
	PD2	2048 kbit/s CCITT Recommendation G.704 presented digital PSTN for PBX DDI and/or non-DDI operation	DASS 2	Not applicable	Table 11	
	PD3	144 kbit/s I.420 presented ISDN for DDI and/or non-DDI operation	DSS No.1	Not applicable	Table 11a	These requirements do not cover packet handling in the D-channel.
	PD4	2048 kbit/s I.421 presented ISDN for DDI and/or non-DDI operation	DSS No.1	Not applicable	Table 11b	These requirements do not cover packet handling in the D-channel.

Table 4. Ports for direct connection of approved apparatus

Usage	Port type	Interface to which port may be connected	Signalling	Integrated cabling	Traffic	Requirements	Notes
Usage 1 Direct connection of approved apparatus	1AS	2- or 3-wire ¹⁾ analogue speechband interfaces on extension apparatus	Loop calling, unguarded clearing; address information (where provided): loop disconnect or MF	No	Unrestricted	Table 12	
	1BS	2- or 3-wire ¹⁾ analogue speechband interfaces on extension apparatus	Loop calling, unguarded clearing; address information (where provided): loop disconnect or MF	Yes	Unrestricted	Table 13	
	1AN	2-wire analogue speechband interfaces on signal generating or receiving apparatus	Unspecified	No	No PSTN conversational speech traffic	Table 14	Port where transmission is in one direction only, for any of the following: a) the attachment of music on hold machines; or b) the attachment of recorded announcement machines; or c) audiopaging.
Usage 4 Direct connection of approved apparatus	4A	2- or 3-wire analogue ¹⁾ speechband interfaces on any approved apparatus	Unspecified	No	No PSTN traffic	Table 15	See 5.6. Examples of use include connection of any apparatus to be used for internal (private network) calls only.

¹⁾ 3-wire analogue interfaces comprise two lines and the shunt wire. (See BS 6317.)

Table 4. Ports for direct connection of approved apparatus (*continued*)

Usage	Port type	Interface to which port may be connected	Signalling	Integrated cabling	Traffic	Requirements	Notes
Usage 4 Direct connection of approved apparatus	4B	2- or 3-wire ¹⁾ analogue speechband interfaces on any approved apparatus	Unspecified	Yes	No PSTN traffic	Table 16	See 5.6. Examples of use include connection of any apparatus to be used for internal (private network) calls only.
	4C	Any interface exclusively for receiving or supplying electrical power	Not applicable	No	Not applicable	Table 17	Power supply units will normally be those recommended by the PBX supplier and will conform to BS 6484 or have been otherwise approved
	4E	Any interface on an approved accessory that interacts with the PBX but cannot establish a call path to or from any other port(s)	Unspecified	No	Not applicable	Table 18	See 5.6. Examples of accessories are PBX system management terminals and call loggers. Connection arrangements for this port should be suitable for the purpose, and agreed with the approval authority.
	4F	Any interface on an approved accessory that does not interact with the PBX	Not applicable	No	Not applicable	Table 19	See 5.6. Examples of accessories are alarm lamps and night bells. Connection arrangements for this port should be suitable for the purpose, and agreed with the approval authority.

¹⁾ 3-wire analogue interfaces comprise two lines and the shunt wire. (See BS 6317.)

Table 4. Ports for direct connection of approved apparatus (continued)							
Usage	Port type	Interface to which port may be connected	Signalling	Integrated cabling	Traffic	Requirements	Notes
	1CS	144 kbit/s I.420 presented digital interface on extension apparatus	DSS No.1	No	Unrestricted	Table 13a	—
	1DS	Air interface conforming to I-ETS 300 131 on cordless extension apparatus	CT2 - CAI	—	Unrestricted	Table 13b	The port is compatible with the standard for CT2.
	1ES	Air interface conforming to TBR 6 on cordless extension apparatus	DECT Common Interface	—	Unrestricted	Table 13c	The port is compatible with the air interface standards for DECT.

Table 5. Private networking ports

Usage	Port type	Interface to which port may be connected	Signalling	Integrated cabling	Traffic	Requirements	Notes
Usage NW Connection of remote extension apparatus	NWH	2-wire presented analogue private circuit or private link interface (providing or simulating an end-to-end d.c. path) connected to extension apparatus	Loop calling, unguarded clearing; address information (where provided): loop disconnect or MF	Not applicable to private circuits. Yes for links	Unrestricted	Table 20	1. Port for connection of private circuits or private links used as external extensions including such circuits used between host and subsidiary PBXs. 2. Replaces OTR 001 : 1988 port types 2AS, 2AN, 3AS and 3AN.
Usage NW Private networking ports	NW2	2-wire presented analogue speechband private circuit or link interface connected to a remote PBX	Unspecified. See 9.3.3 note 5	Not applicable to private circuits. Yes for links	Unrestricted	Table 21	Replaces OTR 001 : 1988 port types 2BS, 2BN, 3BS, 3BSX, 3BN, 3BNX and 5A.
	NW4	4-wire presented analogue speechband private circuit or link interface connected to a remote PBX	Unspecified. See 9.3.3 note 5	Not applicable to private circuits. Yes for links	Unrestricted	Table 22	Replaces OTR 001 : 1988 port types 2CS, 2CN, 3CS, 3CSX, 3CN, 3CNX and 5B.
	NWD	2048 kbit/s CCITT Recommendation G.703 presented unstructured digital private circuit or link interface connected to a remote PBX	Unspecified. See 9.3.3 note 5	Not applicable to private circuits. No for links	Unrestricted	Table 23	Replaces OTR 001 : 1988 port types 2DS, 2DN, 3DS, 3DN and 5C.
Usage NW Connection to a host PBX via analogue private circuits or links	NWS	2-wire presented speechband analogue interface on a host PBX (an extension apparatus port NWH)	Loop calling, unguarded clearing	Not applicable to private circuits. Yes for links	Unrestricted	Table 24	Pseudo exchange line port enabling the PBX, acting as a subsidiary PBX provided with loop calling unguarded clearing signalling, to interwork with a host PBX and indirectly with a PSTN. Direct connection to the PSTN is not permitted.
	NWD2	Digital private link interface connected to other telecommunications apparatus	Unspecified. See 9.3.3 note 5	Optional	Unrestricted	Table 23a	Suitable for digital connections using customer-provided transmission facilities (including fibre-optic links). May use any bit rate or physical presentation.

Table 6. Ports for connection to private network links

Usage	Port type	Interface to which port may be connected	Signalling	Integrated cabling	Traffic	Requirements	Notes
Usage L Connection to private network links. No public telecommunications network connection or cross connection	L2	2-wire analogue private link interface	Unspecified	Yes	Non-PSTN traffic only	Table 25	Shall not be cross connected to a usage P port.
	L4	4-wire analogue private link interface	Unspecified	Yes	Non-PSTN traffic only	Table 26	
	LD	2048 kbit/s presented private link interface	Unspecified	No	Non-PSTN traffic only	Table 27	

Table 7. Integral terminating station

Usage	Port type	Interface to which port may be connected	Signalling	Traffic	Requirements	Notes
Usage ITS Terminating stations treated as an entirety with the PBX	ITS-A	User, acoustic and mechanical	Unspecified	Unrestricted	Table 28	Requirements are additional to BS 6450 : Part 2 and permit cross connection to ports specified in this Part of BS 6450. See note 1. Cabling between an ITS-A and PBX central equipment shall not be integrated. See note 2.
	ITS-D	User, acoustic and mechanical	Unspecified	Unrestricted	Table 29	See note 1. Cabling between ITS-D and PBX central equipment shall not be integrated. See note 2.
Usage ITS ITS cordless analogue	ITS-CA	User, acoustic and mechanical	Unspecified	Unrestricted	Table 30	Requirements are additional to BS 6833 : Part 5 and permit cross section to ports specified in this Part of BS 6450. See note 1. See note 2.
ITS cordless digital	ITS-CD	User, acoustic and mechanical	Unspecified	Unrestricted	Table 30a	Link between ITS and PBX central equipment includes a radio section conformist with standards for DECT.

NOTE 1. The distinction between an ITS-A and an ITS-D is the field of application for which the apparatus was designed, not the transmission system used between the ITS and the PBX.

Thus, an ITS-A is designed for use in the analogue domain (i.e. for connection to analogue PSTN lines) and as such has to meet the transmission requirements of BS 6450 : Part 2. These requirements will impose limits upon the speech transmission characteristics of the ITS. When used for connection to the digital PSTN, the only transmission requirements that apply are the send and receive loudness ratings for the digital network (as indicated in **10.2.1.4** of this Part of BS 6450). These comments also apply to ITS-CA, except that the transmission requirements in BS 6450 : Part 2 are replaced by those in BS 6833 : Part 5.

Similarly, an ITS-D is designed for use in the digital domain (i.e. for connection to digital PSTN lines) and as such has to meet the requirements of this Part of BS 6450, which are in themselves derived from NET 33. They are not identical because NET 33 is a digital telephony specification and as such takes no account of the switching functions inherent in a PBX. When used for connection to the analogue PSTN, the only transmission requirements that apply are the loudness rating requirements of BS 6450 : Part 2 (see **10.2.6** of this Part of BS 6450).

NOTE 2. It is implicit in the general requirements that ITS-A and ITS-CA cannot be declared without a port type PA1 or PA2. ITS-D should not be declared without a port type PD1 or PD2.

5 Compliance principles

5.1 For compliance with this Part of BS 6450, the tests shall be performed at the connection point unless otherwise specified.

5.2 Subclauses **3.1.2**, **3.2.2**, **3.2.3**, **3.2.4**, **3.2.7** and **3.2.8** of BS 6450 : Part 1 : 1993 shall apply. For digital ports a line shall be considered to be a bidirectional pair of traffic channels. For analogue ports each port shall be considered to be a line which is a single speechband bidirectional traffic channel.

5.3 The addition of any port on PBXs approved to their respective Parts of BS 6450 shall not vary their conformity to those Parts except to the extent provided for in this Part of BS 6450.

5.4 Every PBX configuration shall conform fully to this standard within its intended application.

NOTE. Exchange lines, private circuits, private links and cabling connected to the PBX will exhibit a range of insertion losses and impedances. To accommodate these variations and ensure satisfactory operation the PBX may use any number of different interface cards, or configurations of interface cards.

5.5 The PBX shall conform to these requirements in all operating modes, but not in overload condition, under all combinations of terminating stations (where applicable), PBX call paths and connections to PSTN lines, private circuits and private links, and with all possible combinations of PBX facilities in use, under the full range of installation dependent parameters defined by the supplier; however, testing will not be carried out in all these states.

5.6 If the port is an interface for an approved attachment or accessory that does not access the PSTN either directly or indirectly but performs one of the following:

- a) interacts with the PBX and can establish a call path to another port (port types 4A and 4B); or
- b) interacts with the PBX but cannot establish a call path to, from or between any other port(s) (port type 4E); or
- c) does not interact with the PBX (port type 4F);

then the PBX shall continue to conform to this Part of BS 6450 when it is in use.

5.7 If an ITS has a user-controlled receiving volume control the supplier shall indicate the range of settings of such a volume control for which the ITS will conform to the requirements for an ITS without such a volume control.

NOTE. ITSs that are specifically intended for use by the hearing impaired could be eligible for a relaxation of certain of the receiving transmission parameters. See OFTEL *Standard for simple telephones with additional receive amplification*.

6 General testing principles

6.1 General

The conditions applicable to the tests are given in **6.2** to **6.5**.

6.2 Specific

6.2.1 Terminations for measurement

Unless stated otherwise, conformity with the requirements for analogue ports shall be determined using one of the following:

- a) test equipment that has an impedance with a return loss against the reference impedance for the port of at least 25 dB over the frequency range 200 Hz to 4600 Hz;
- b) test equipment that has an impedance with a return loss against the actual impedance of the port of at least 25 dB over the frequency range 300 Hz to 3400 Hz and at least 20 dB over the frequency ranges 200 Hz to 300 Hz and 3400 Hz to 4600 Hz.

The supplier shall state which item is to be used for each port. (See clause **14**.)

NOTE 1. Item a) is preferred.

NOTE 2. The method of test up to 40 kHz remains under consideration.

NOTE 3. If no requirement is stated for connection arrangements, a method of connection should be agreed between the approval authority and the supplier.

Conformity shall be determined either in accordance with **A.5** for 2-wire ports, or in accordance with **A.6** for 4-wire ports.

6.2.2 Test frequencies

If requirements are specified at frequencies spaced at 1/12th octave intervals, the frequencies to be used for test measurement shall be as given by the R40 series of preferred numbers in BS 2045 : 1965 for the frequency range specified.

NOTE. When testing a digital PBX, it is advisable to avoid measurements at submultiples of the sampling frequency used. A variation of $\pm 2\%$ on the measurement frequencies may be used to avoid this problem.

6.2.3 Transmission decoupling unit (TDU)

It is essential to ensure that the TDU used in some tests, whilst maintaining the port in the appropriate state for test, does not introduce an impedance mismatch between the port and any measuring equipment.

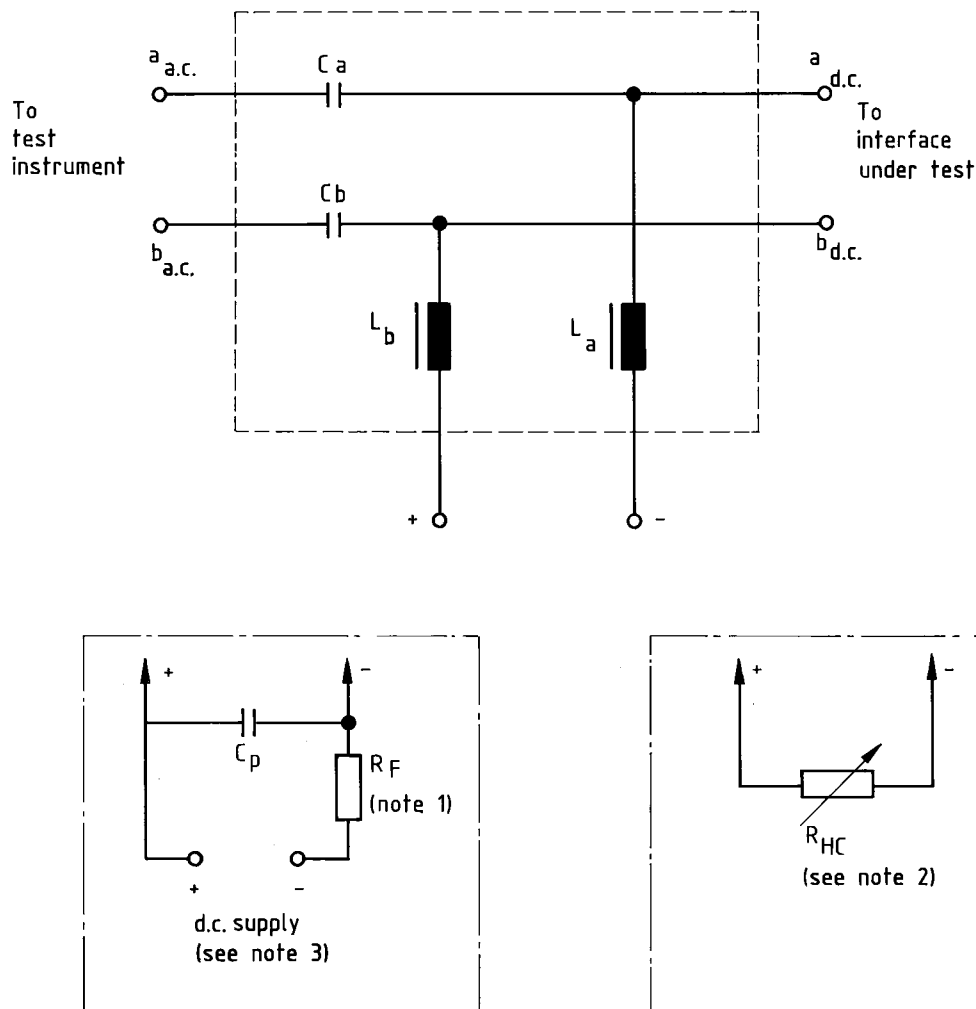
A TDU is used either to feed a d.c. current into the appropriate analogue 2-wire point of the system under test, or to provide a d.c. loop.

The basic circuit of a TDU is shown in figure 1. The realization has to also provide a negligible influence when used in common-mode configuration, as necessary for impedance unbalance measurements, in conjunction with earthed d.c. power supply.

If a TDU with active elements is used, linearity over the full range of test signal level and the respective noise performance has to be taken into account. Requirements for these parameters are under study.

The following characteristics of a TDU have to be considered as minimum requirements and shall be met over the full range of d.c. current.

NOTE. Measurements of the following high values for a single TDU, mainly return loss and insertion loss requirements over the full range of line current, could be difficult or impossible. Therefore it is recommended to connect two TDUs of the same type in a suitable configuration and perform the measurements including both TDUs. In this case, the requirements for insertion loss are 1.0 dB and 0.1 dB respectively and for return loss 6 dB less than the following values for a single TDU.

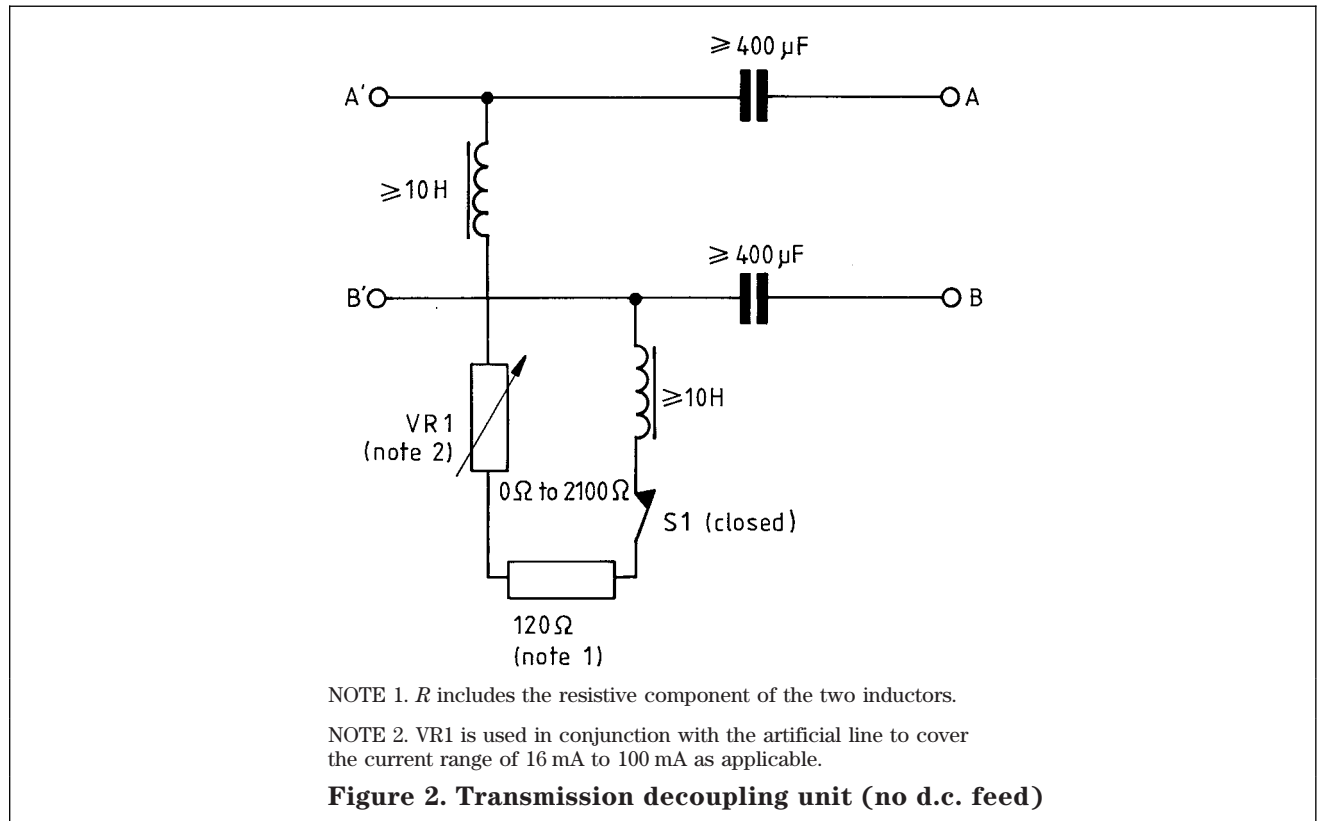


NOTE 1. The value of the resistor R_F is the value quoted for the nominal resistance of the feeding arrangements being used. The actual value of R_F is adjusted to allow for the resistance value of inductors L_a and L_b .

NOTE 2. The variable resistor R_{HC} is adjustable to give the range of hold resistance required to be tested. R_{HC} has to allow for the resistances of inductors L_a and L_b .

NOTE 3. The d.c. supply will be such that the full range of d.c. currents to be tested can be achieved. This could be by use of a low impedance d.c. voltage source in series with a variable resistor which replaces R_F or a variable constant current source.

Figure 1. Basic circuit diagram of a transmission decoupling unit



Return loss: ≥ 33 dB in the range from 200 Hz to < 500 Hz
 ≥ 40 dB in the range from 500 Hz to < 2500 Hz
 ≥ 33 dB in the range from 2500 Hz to 4000 Hz

All three items are measured with reference to a capacitive complex impedance.

Insertion loss: for 50 Hz to 200 Hz: < 0.5 dB
 for 200 Hz to 4000 Hz: < 0.05 dB
 for 4000 Hz to 72 kHz: < 0.5 dB

When used for impedance unbalance measurements, together with earthed d.c. power supply, a TDU shall meet the following inherent balance requirements.

Inherent balance: for 50 Hz to 20 kHz: longitudinal conversion loss and longitudinal conversion transfer loss ≥ 60 dB
 for 200 Hz to 3400 Hz: longitudinal conversion loss and longitudinal conversion transfer loss ≥ 75 dB

Both items are measured according to figure 1 and figure 3 of CCITT Recommendation O.9 : 1988, with respect to the bridged leads '+' and '-' of the TDU.

Typical TDUs that are d.c. excited are shown in figure 7 of BS 6305 : 1992 and figure 15 of BS 6317 : 1992. A typical TDU without excitation is shown in figure 2. The supplier shall state which TDU will be used for each test. If the TDU is not of a standard form the supplier shall provide information on the characteristics of such a TDU so that its effect on the measurement to be undertaken can be determined.

6.2.4 ITS with a user-controlled receiving volume control

The conformity tests for each ITS requirement will refer to either of the following:

- the conformity tests shall be carried out, at least, at a single setting within the range indicated by the supplier as required in 5.7 of this Part of BS 6450; or
- the conformity tests shall be carried out at the maximum, i.e. the loudest, setting of the volume control.

6.2.5 Test levels

If the level of a signal to be used for measurement is stated in dBm0, the absolute level of the signal shall be determined from the declarations of the relative levels in the information provided for test (see 10.2).

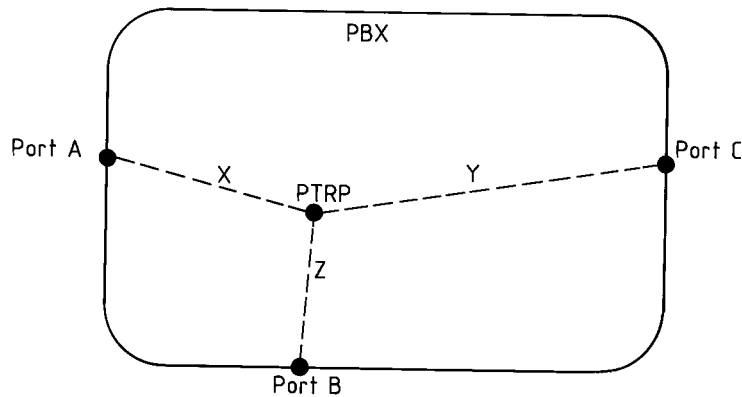


Figure 3. Simple PTRP example

6.2.6 Test voltages and power

Apparent power is calculated from

$$\frac{V^2}{|Z|}$$

where

V is the voltage at a port or PTRP;

$|Z|$ is the modulus of the impedance at 1 kHz.

The voltage obtained with the test signal shall be kept constant across the frequency range specified in the requirement and test.

The power of a signal at any frequency used for measurement is determined from the modulus of the nominal impedance at a frequency of 1 kHz.

The voltage of a 0 dBm0 signal at such a frequency at a point of x dBr is given by:

$$V = \{(10^{x/10} \cdot 10^{-3})|Z|\}^{1/2} \text{ volts}$$

where

Z is the impedance of the point at a nominal test frequency of 1 kHz.

NOTE. For resistive terminations, apparent power is equal to absolute power.

6.2.7 Ideal codec and reference codec

For the purposes of test, the ideal codec is replaced by a reference codec as described in CCITT Recommendation P.66 : 1988.

6.2.8 CT2 CAI transmission measurements

The transmission performance of the IDS (CT2 CAI) port shall be measured using a reference CPP. The reference CPP shall provide the equivalent of true air interface measurements and therefore shall not contain circuitry that will modify the true air interface speech transmission performance.

NOTE. A suitable reference CPP and its interconnection is shown in figure 22.

For transmission measurements in annex A or annex B, the reference CPP shall be treated as if it is a part of the port under test.

6.2.9 Ports, test points and cabling for 144 kbit/s I.420 presented ports

6.2.9.1 General

Where test equipment is required to be connected to a type PD3 or type 1CS port the same configuration as required for type PD1 and type PD2 ports shall be used except that test equipment specific to G.703 interfaces shall be replaced by test equipment suitable for basic access ISDN.

All tests shall be carried out with any proprietary transmission system operating at a distance agreed by the supplier and the approval authority.

NOTE 1. For the purposes of this Part of BS 6450, it is assumed that the PD3 port is considered to be a locally-powered, non-designated TE.

The tests for the ports are based upon those developed for CTR 3. The requirements of CTR 8 apply to the PBX-TE when accessing the voice service of the public telephony network. The CTR 8 requirements do not apply to the PD3 or 1CS ports in isolation.

NOTE 2. The various ports and connection points possible with PD3 and 1CS are shown in figure 23.

NOTE 3. As the PBX-TE connected to a 1CS port is also approved for direct connection to an ISDN basic access, the requirements applied to the 1CS port ensure that the port is capable of supporting at least one of each of those functions where there are alternatives e.g. en-bloc or overlap sending.

6.2.9.2 ICS port

The link between the PBX-TE and the PBX central equipment shall conform to one of the following options as given in figure 23:

- a) and b) a proprietary transmission system terminated in a 1CS port; this transmission system shall be regarded as part of the PBX;
- c) an ISDN passive S-bus connection between a 1CS port co-located with the PBX and the PBX-TE(s);
- d) an approved transmission system between the 1CS port and the PBX-TE, e.g. a generic cabling scheme; this transmission system shall not be regarded as part of the PBX.

Any proprietary transmission systems and cabling used in options a) and b) shall be regarded as being part of the PBX and shall be included in any port-to-port testing. The instructions for use shall indicate whether or not multiple PBX-TEs can be supported.

Conformity shall be determined by inspection of the instructions for use (see clause 14).

6.2.9.3 PD3 port

The link between the NTP and the PBX central equipment shall conform to one of the following options as given in figure 23:

- 1) and 2) a proprietary transmission system between the PD3 port and the PBX offering a point-to-point connection between the NTP and the PBX; this transmission system shall be regarded as part of the PBX;
- 3) connection to an ISDN passive S-bus where the PD3 port is physically co-located with the PDX;
- 4) an approved transmission system between the NTP and the PD3 port, e.g. a generic cabling scheme; this transmission system shall not be regarded as part of the PBX.

NOTE. Options 1) and 2) mean that the physical distance between the PBX and the PD3 port is not limited by the requirements of the ISDN passive S-bus.

Any proprietary transmission systems and cabling used in options 1) and 2) shall be regarded as being part of the PBX and shall be included in any port-to-port testing.

6.3 Testing principles applicable to 4-wire switched PBXs with a PTRP

6.3.1 Ports test reference point (PTRP)

NOTE. The PTRP concept applies to certain transmission requirements for 4-wire switched PBXs. The general testing principles applicable to speechband transmission requirements of 2-wire switched PBXs are given in 6.4. The general testing principles applicable to speechband transmission requirements for 4-wire switched PBXs without a PTRP are given in 6.5.

6.3.1.1 In order that conformity to the PBX call path transmission requirement can be determined and declared, private network design data should ideally be verifiable without the need to test every combination of ports that can occur in any PBX call path. To assist with this aim a concept that employs a reference point has been developed.

This concept entails the definition of a point within the PBX call path to and from which the various transmission parameters can be summed to give a call path performance for planning purposes (see clause 14). A simple example to illustrate this is shown in figure 3 where $AC = X + Y$ and $AB = X + Z$. The reference point is known as the PTRP. A call path defines the path across the PBX between two ports for a specific use of those two ports.

Any two ports that, in combination, may be used for call paths, can have a different PTRP for different combinations. If the same PTRP is used for a port in a number of call paths, only one set of measurements between the PTRP and the port is required.

New types of port may also be provided on a PBX without the need to retest all the PBX port-to-port combinations, see figure 4 where $AD = X + W$ and $BD = Z + W$, etc. provided that tests have been performed to all the existing ports involved using the PTRPs used for call paths to the new port(s). Only tests between the new port(s) and the PTRP need to be performed.

The essential purpose of the PTRP is to reduce the number of tests from m (input ports) multiplied by N (output ports); to m (input ports) multiplied by PTRPs used in call paths plus N (output ports) multiplied by PTRPs used in call paths, without compromising the port-to-port requirements.

6.3.1.2 A PBX may have more than one PTRP but the overriding criterion in the use of PTRPs is that the sum of the transmission performances of the parts of a call path are representative of the overall transmission performance. See figure 5, where K has to be known and measurable, see figure 6, where L has to equal $X + K + Y$ and see figure 7 where $\{(X + M_1) + (Y + M_1)\} = \{(X + Y) + 2M_2\}$ and M_1 is the tested value; M_2 is the value provided by the supplier. If a call path uses a single PTRP this PTRP may be defined as a 0 dBr point. Whilst it is possible for a particular call path to use more than one PTRP (see figure 5) this will significantly complicate the measurement of certain transmission parameters, as both PTRPs cannot simultaneously be 0 dBr reference points for the call path if there is not 0 dB loss between them, but each can have a relative level of 0 dBr. It is recommended that each call path employs only one PTRP.

NOTE. Consideration of call paths that employ more than one PTRP remains under discussion.

6.3.1.3 Certain parameters cannot be summed with sufficient accuracy to represent the overall PBX call path performance; signal propagation delay (see 10.9) is one such parameter.

6.3.2 Access to the PTRP

6.3.2.1 General

The means of access to the PTRP should not limit the amplitude of signals applied to or received from the PTRP below values that could exist at the PTRP under all possible conditions of excitation of any port. In particular where signals at the PTRP are digitally encoded, it shall be possible to apply and receive signals of the maximum encodable level (see clause 14).

6.3.2.2 4-wire switched PBXs

6.3.2.2.1 The PTRP shall be accessible for test purposes. It may be accessed at either a dedicated PTRP port (a digital/analog access port) or at one of the specified port types that has been nominated by the supplier to be the means of access to the PTRP (see figure 7). (See clause 14.)

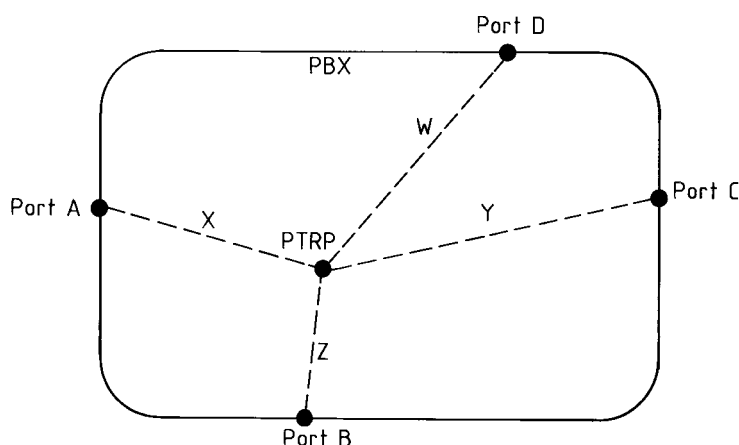
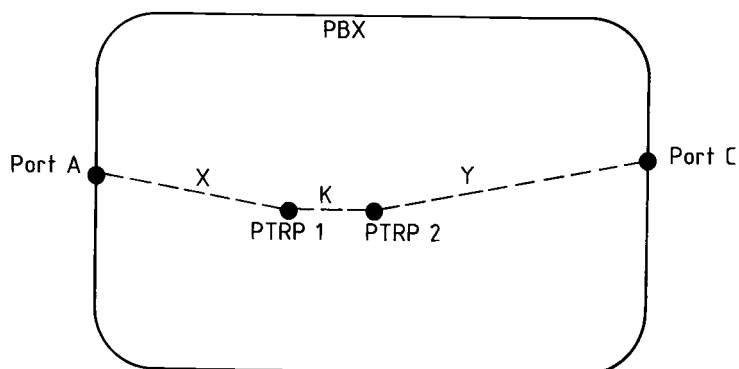
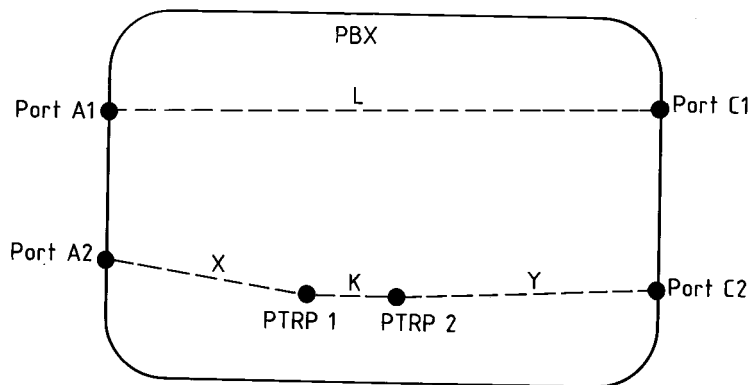


Figure 4. PTRP example with extra port



NOTE. K has to be known and measurable.

Figure 5. Multiple PTRP example



NOTE. L has to equal $X + K + Y$.

Figure 6. PTRP equivalence

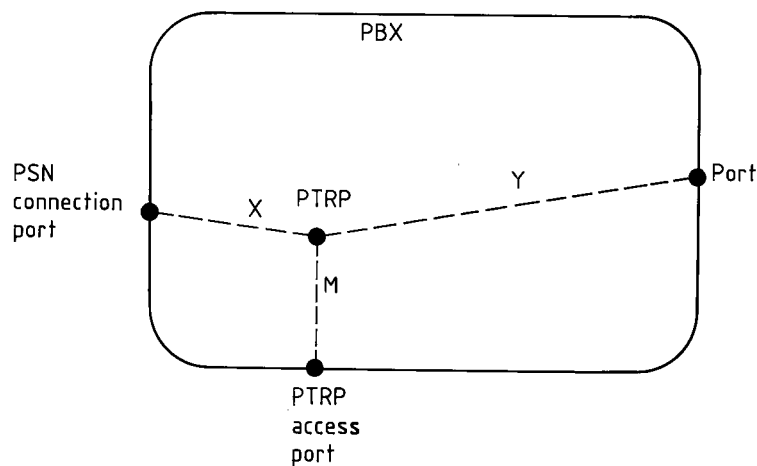


Figure 7. PTRP access

6.3.2.2.2 The impairments introduced by accessing the PTRP shall be capable of measurement by the evaluation authority so that their effect on the port to PTRP(s) measurements can be taken into account. The evaluation authority will test one port-to-port combination and compare the results obtained with those produced by the individual port-to-PTRP tests (see figure 7). One of the ports used will be the PSN connection port (type PA1 or PA2); the other will be chosen by the evaluation authority.

The port-to-port combination chosen by the approval authority for testing shall be within ± 1 dB of the sum of the individual port to PTRP measurements.

NOTE 1. The impairments introduced by the access to the PTRP should be kept to a minimum.

NOTE 2. When testing the port-to-port combination, the return transmission path should be minimized or disabled. This may be achieved by selecting a 4-wire port as the second port, or by disabling the return transmission path for the duration of the test.

6.3.2.2.3 If there is more than one PTRP involved in a connection case, the impairments of the link between them, K of figure 5, shall be established for those transmission parameters that are determined by port-to-PTRP measurements, e.g. frequency response, loss, etc. If bit integrity is maintained between the PTRPs, these parameters will not be affected, and impairment measurements shall not be made.

6.3.2.3 PTRP digital access

If a digital access to the PTRP is provided the PTRP interface shall conform to at least one of the following.

- a) Clause 6 of CCITT Recommendation G.703 : 1988, 2048 kbit/s interface, coaxial pair option.
- b) Clause 1 of CCITT Recommendation G.703 : 1988, 64 kbit/s interface, codirectional or contradirectional options only.
- c) Exceptionally, any other interface specification which can be mutually agreed by the evaluation authority, the supplier and test house.

The speech encoding process shall be in accordance with CCITT Recommendation G.711 : 1988 for A-law PCM.

NOTE 1. The options a), b) and c) are listed in order of preference.

NOTE 2. It is recommended that the PTRP should be a 0 dBr point.

6.3.2.4 PTRP analogue access

If analogue access to a PTRP is provided, the PTRP access port shall be a 4-wire interface which has a transmit and a receive path without d.c. excitation. The transmit and receive termination impedances shall be specified by the supplier together with information in respect of the interface impairments and the associated relative levels. Measurements shall be made using one of the arrangements given in **6.2.1** as stated by the supplier.

NOTE 1. For analogue access to a digital PTRP, the impairments will be kept to a minimum if the digital to analogue and analogue to digital conversions are made by an ideal codec as specified in CCITT Recommendation G.711, but see **6.2.7**.

NOTE 2. Digital access is recommended for digital switches.

6.3.2.5 PTRP access port: connection arrangements

The physical connection arrangements shall be as follows:

- a) if the PTRP access port is a PBX port the connection arrangement will be as specified for that port in this Part of BS 6450;
- b) if the PTRP access port is an interface provided purely for testing purposes, the supplier shall specify the connection arrangements.

NOTE. Where necessary, apparatus together with any information needed in order to operate it should be made available by the supplier to the test house. This apparatus and information should be retained by the test house until approval is granted and should be made available for any subsequent modification tests.

6.3.2.6 Port-to-PTRP losses and relative levels

The value of loss between a port under test and the PTRP (input loss) is given by

$$10\log(P/P_o) \text{ dB}$$

where:

- P is the apparent power of a sinusoidal test signal applied at the port;
- P_o is the apparent power of that test signal measured at the PTRP.

The value of loss between the PTRP and a port under test (output loss) is given by

$$10\log(P_o/P) \text{ dB}$$

where:

- P_o is the apparent power of a sinusoidal test signal applied at the PTRP;
- P is the apparent power of that test signal measured at the port.

The input relative level at a port is equal to the output relative level at the PTRP plus the port-to-PTRP loss. The output relative level at a port is equal to the input relative level at the PTRP minus the PTRP-to-port loss.

NOTE. CCITT Recommendation G.101 gives further information on input and output relative levels.

6.4 Testing principles applicable to 2-wire switched PBXs

6.4.1 Port-to-port

For 2-wire switched PBXs the requirements are applied on a port-to-port basis. Where the term 'PTRP' is used in a requirement clause for testing purposes it shall be replaced by 'other port'.

6.4.2 Port reference impedances

The reference impedances for the ports of a 2-wire switched PBX are as follows:

- a) 2-wire analogue terminating station ports usage 1 with nominally zero length associated cable: figure 5 of BS 6305 : 1992, or figure 13 of this Part of BS 6450; exceptionally 600 Ω may be used only for the termination of such a port when testing cross connections to analogue private circuits;
- b) 2-wire analogue private circuit ports type NW2: figure 5 of BS 6305 : 1992, or figure 13 of this Part of BS 6450 or 600 Ω ;
- c) 4-wire analogue private circuit ports type NW4: 600 Ω ;
- d) 2-wire analogue PSTN ports types PA1 and PA2: figure 5 of BS 6305 : 1992, or figure 13 of this Part of BS 6450;
- e) ITS: the impedance obtained when the earpiece is sealed to an artificial ear in an acoustically quiet environment. (See A.7.1 of BS 6317 : 1992.)

(See clause 14.)

6.5 Testing principles applicable to 4-wire PBXs without a PTRP

NOTE. Use of these principles may increase the number of PBX call paths to be tested but removes the need to test access to PTRP.

The general testing principles applicable to speechband transmission requirements for 4-wire switched PBXs with a PTRP are given in 6.3.

6.5.1 Port-to-port

For 4-wire switched PBXs without a PTRP the requirements of clauses 9 and 10, as referenced by the appropriate parts of tables 8 to 30, and which are applicable to any particular port type, shall here apply on a port-to-port basis.

The tests contained within annexes A and B which are described using a PTRP, shall here be conducted with respect to another port instead of a PTRP.

6.5.2 Port reference impedances

The reference impedances for the ports of a 4-wire switched PBX without PTRP shall be as follows:

- a) 2-wire analogue terminating station ports usage 1 with nominally zero length associated cable: see figure 5 of BS 6305 : 1992, or figure 13 of this Part of BS 6450;
- b) 2-wire analogue private circuit ports type NW2: see figure 5 of BS 6305 : 1992, or figure 13 of this Part of BS 6450;

c) 4-wire analogue private circuit ports type NW4: 600 Ω ;

d) 2-wire analogue PSTN ports type PA: see figure 5 of BS 6305 : 1992, or figure 13 of this Part of BS 6450;

e) ITS: the impedance obtained when the earpiece is sealed to an artificial ear in an acoustically quiet environment. See A.7.1 of BS 6317 : 1992 and clause 14 of this Part of BS 6450.

6.5.3 Transmission return path

The return transmission path in the PBX shall be disabled to prevent measurement effects occurring as a result of loop transmission effects for the following requirements : 10.1.6, 10.1.8.1, 10.1.9.1, 10.2.8, 10.4.5, 10.6.5 and 10.8.5.

7 Requirements applying to particular port types

7.1 Ports classified in accordance with clause 4 shall conform to the requirements specified in tables 8 to 30.

NOTE. See the foreword concerning ports other than those classified in clause 4.

Table 8. Requirements applying to port type PA1

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
6.3.2.2.2	
Clause 8 as applicable	Clause 8 as applicable
9.1.1.1	9.1.1.1
10.1.2	10.1.6
10.2.1.3	
10.2.1.7	
10.2.1.8	
10.2.4	10.2.8
10.3.1	10.3.1
10.4.1	
10.4.2	10.4.5
10.5.2 see note	
10.6.1	
10.6.2	10.6.5
10.7.1	10.7.4
10.8.1	
10.8.2	10.8.5
10.9	10.9.1 see note
10.10.3	10.10.3
10.11.2	10.11.2
10.13.2	10.13.2
Clause 12	Clause 12

NOTE 1. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.

NOTE 2. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 9. Requirements applying to port type PA2	
All clauses of BS 6450 : Section 3.1 : 1993	
The following clauses of this Part of BS 6450	
4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
6.3.2.2.2	
Clause 8 as applicable	Clause 8 as applicable
9.1.1.2	9.1.1.2
10.1.2	10.1.6
10.2.1.3	
10.2.1.7	
10.2.1.8	
10.2.4	10.2.8
10.3.2	10.3.2
10.4.1	10.4.5
10.4.2	
10.5.2 see note	
10.6.1	
10.6.2	10.6.5
10.7.1	10.7.4
10.8.1	
10.8.2	10.8.5
10.9.1	10.9.1 see note
10.10.3	10.10.3
10.11.1	10.11.1
Clause 12	Clause 12
NOTE 1. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.	
NOTE 2. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).	

Table 10. Requirements applying to port type PD1	
6.3.2.2.2	
Clause 8 as applicable	
9.1.1.3	
9.4.1	
9.4.2	
9.4.3	
9.4.4.1.2	
9.4.4.3	see note 1
9.4.5	
9.4.6	
9.4.7	
9.4.8	
9.4.9	
9.4.11	
10.1.5	
10.2.1.4	see note 2
10.2.1.5	
10.2.1.8	
10.2.1.9	
10.2.7	see note 3
10.4.4	see note 3
10.5.2	see note 1, note 3
10.6.4	see note 3
10.7.2	
10.8.4	see note 3
10.9.1	
10.13.4	
10.14	
10.15.1	see note 1
13.7	
NOTE 1. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.	
NOTE 2. Only if an ITS is provided.	
NOTE 3. For 4-wire PBXs without a PTRP, the appropriate tests of annex A are to be performed with the port connected in turn to port types PA, 1A or NW, excluding NWD, as applicable.	
For 4-wire PBXs with a PTRP, these requirements do not apply where there is bit integrity between the PTRP and the digital port. Where there is no bit integrity between the PTRP and the digital port, the appropriate analogue tests of annex A are to be performed using an ideal codec connected to the port and the PTRP (see 6.2.7).	

Table 11. Requirements applying to port type PD2**6.3.2.2.2**

Clause 8 as applicable

9.1.1.3**9.4.2****9.4.3****9.4.4.1.2****9.4.4.3** see note 1**9.4.5****9.4.6****9.4.8****9.4.10****9.4.11****10.1.5****10.2.1.4** see note 2**10.2.1.5****10.2.1.8****10.2.1.9****10.2.7** see note 3**10.4.4** see note 3**10.5.2** see note 1, note 3**10.6.4** see note 3**10.7.2****10.8.4** see note 3**10.9.1****10.13.4****10.4****10.15.1** see note 1**13.7**

NOTE 1. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.

NOTE 2. Only if an ITS is provided.

NOTE 3. For 4-wire PBXs without a PTRP, the appropriate tests of annex A are to be performed with the port connected in turn to port types PA, 1A or NW, excluding NWD, as applicable.

For 4 wire PBXs with a PTRP, these requirements do not apply where there is bit integrity between the PTRP and the digital port. Where there is no bit integrity between the PTRP and the digital port, the appropriate analogue tests of annex A are to be performed using an ideal codec connected to the port and the PTRP (see 6.2.7).

Table 11a. Requirements applying to port type PD3**6.3.2.2.2**

Clause 8 as applicable

9.1.1.3**9.1.4****9.6.1****9.6.2****9.6.3****10.2.1.4**

see note 2

10.2.1.5**10.2.1.6****10.2.1.8****10.2.1.9****10.2.7**

see note 4

10.4.4

see note 4

10.5.2

see note 4

10.6.4

see note 4

10.8.4

see note 4

10.9.1**10.15.1**

see note 3

13.2 or 13.8

see note 1

NOTE 1. A port should conform to either of these requirements.

NOTE 2. Only if an ITS is provided.

NOTE 3. This requirement is not subject to testing. The supplier shall provide information in accordance with table 48.

NOTE 4. For 4-wire PBXs without a PTRP, the appropriate tests of annex A are to be performed with the port connected in turn to port types PA, 1A or NW, excluding NWD, as applicable.

For 4 wire PBXs with a PTRP, these requirements do not apply where there is bit integrity between the PTRP and the digital port. Where there is no bit integrity between the PTRP and the digital port, the appropriate analogue tests of annex A are to be performed using an ideal codec connected to the port and the PTRP (see 6.2.7).

Table 11b. Requirements applying to port type PD4**6.3.2.2.2**

Clause 8 as applicable

9.1.1.3**9.1.4****9.6.1****9.6.2****9.6.4****10.2.1.4**

see note 2

10.2.1.5**10.2.1.6****10.2.1.8****10.2.1.9****10.2.7**

see note 4

10.4.4

see note 4

10.5.2

see note 4

10.6.4

see note 4

10.8.4

see note 4

10.9.1**10.15.1**

see note 3

13.2 or 13.10

see note 1

NOTE 1. A port should conform to either of these requirements.

NOTE 2. Only if an ITS is provided.

NOTE 3. This requirement is not subject to testing. The supplier shall provide information in accordance with table 48.

NOTE 4. For 4-wire PBXs without a PTRP, the appropriate tests of annex A are to be performed with the port connected in turn to port types PA, 1A or NW, excluding NWD, as applicable.

For 4 wire PBXs with a PTRP, these requirements do not apply where there is bit integrity between the PTRP and the digital port. Where there is no bit integrity between the PTRP and the digital port, the appropriate analogue tests of annex A are to be performed using an ideal codec connected to the port and the PTRP (see 6.2.7).

Table 12. Requirements and recommendations applying to port type 1AS**4-wire PBX****2-wire PBX and 4-wire PBX without PTRP****6.3.2.2.2**

Clause 8 as applicable

Clause 8 as applicable

9.1.2**9.1.3****9.1.4****9.2**

} see note 1

9.1.2**9.1.3****9.1.4****9.2**

} see note 1

10.1.3**10.2.1.1****10.2.1.2****10.2.1.3****10.2.2****10.3.2****10.4.1****10.4.2****10.5.1****10.6.1****10.6.2****10.7.1****10.8.1****10.8.2****10.9.1****10.10.2****10.13.1**

see note 2

see note 2

see note 3

see note 3

see note 3

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see note 3

see note 3

NOTE 1. Clauses appropriate to the signalling conditions provided at each usage P port apply, see 9.1.1.1 and 9.1.1.2

NOTE 2. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.

NOTE 3. To be met if external cabling can be provided.

NOTE 4. A port may conform to any one of these requirements.

NOTE 5. These are recommendations only and are not subject to either testing or declaration.

NOTE 6. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 13. Requirements and recommendations applying to port type 1BS

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
6.3.2.2.2	
Clause 8 as applicable	Clause 8 as applicable
9.1.2	9.1.2
9.1.3	9.1.3
9.1.4	9.1.4
9.2	9.2
10.1.3	10.1.7
10.2.1.1	10.2.1.1
10.2.1.2	10.2.1.2
10.2.1.3	
10.2.2	10.2.8
10.3.2	10.3.2
10.4.1	
10.4.2	10.4.5
10.5.1	
10.6.1	
10.6.2	10.6.5
10.7.1	10.7.4
10.8.1	
10.8.2	10.8.5
10.9	10.9
10.10.2	10.10.2
10.11.1	10.11.1
10.13.1	10.13.1
Clause 11	Clause 11
Clause 12	Clause 12
13.1	13.1
13.2	13.2
13.4	13.4
Annex G	Annex G

NOTE 1. Clauses appropriate to the signalling conditions provided at each usage P port apply, see **9.1.1.1** and **9.1.1.2**

NOTE 2. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.

NOTE 3. To be met if external cabling can be provided.

NOTE 4. A port may conform to any one of these requirements.

NOTE 5. These are recommendations only and are not subject to either testing or declaration.

NOTE 6. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 13a. Requirements and recommendations applying to port type 1CS

6.3.2.2.2
Clause 8 as applicable
9.1.4
9.6.3
10.2.1.6
10.2.7
10.4.4
10.5.2
10.6.4
10.8.4
10.9
13.2
13.4
13.9
NOTE 1. A port should conform to any of these requirements.
NOTE 2. Where there is bit integrity between the PTRP and the digital post, this requirement does not apply. Where there is no bit integrity between the PTRP and the digital post, the appropriate analogue tests of annex A shall be performed using an ideal codec connected to the port and the PTRP.

Table 13b. Requirements and recommendations applying to port type 1DS

Clause 8 as applicable
9.4.12
9.5.1
10.2.1.6
10.2.7
10.4.4
10.6.4
10.8.2
10.9.5
10.15.2
12
NOTE. PCM to ADPCM and ADPCM to PCM digital signal conversions are regarded as providing bit integrity for the purposes of voice frequency transmission measurements.

Table 13c. Requirements and recommendations applying to port type 1ES
Clause 8 as applicable
10.2.1.6 10.2.7 10.4.4 10.6.4 10.8.2 10.9.6 10.15.2
12
CTR 6 CTR 10
NOTE. PCM to ADPCM and ADPCM to PCM digital signal conversions are regarded as providing bit integrity for the purposes of voice frequency transmission measurements.

Table 14. Requirements applying to port type 1AN	
4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
10.1.3.3 see note 1	10.2.9
10.2.3	10.3
10.3 see note 2	Clause 12
13.2	13.2
NOTE 1. If a 2-wire to 4-wire conversion is not included in the port 10.1.3.3 does not apply.	
NOTE 2. 10.3 does not apply to a digital PBX.	
NOTE 3. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).	

Table 15. Requirements and recommendations applying to port type 4A			
4-wire PBX		2-wire PBX and 4-wire PBX without PTRP	
Clause 8 as applicable		Clause 8 as applicable	
10.10.2		10.10.2	
Clause 11	see note 1	Clause 11	see note 1
Clause 12		Clause 12	
13.1	} see note 2	13.1	} see note 2
13.2		13.2	
13.4		13.4	
Annex G	see note 3	Annex G	see note 3
NOTE 1. To be met if external cabling can be provided.			
NOTE 2. A port may conform to any one of these requirements.			
NOTE 3. These are recommendations only and are not subject to either testing or declaration.			
NOTE 4. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).			

Table 16. Requirements and recommendations applying to port type 4B

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
10.3.2	10.3.2
10.10.2	10.10.2
10.11.1	10.11.1
Clause 11 see note 1	Clause 11 see note 1
Clause 12	Clause 12
13.1 } see note 2	13.1 } note 2
13.2 }	13.2 }
13.4 }	13.4 }
Annex G see note 3	Annex G see note 3

NOTE 1. To be met if external cabling can be provided.

NOTE 2. A port may conform to any one of these requirements.

NOTE 3. These are recommendations only and are not subject to either testing or declaration.

NOTE 4. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 17. Requirements applying to port type 4C

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
13.6	13.6

NOTE. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 18. Requirements applying to port type 4E

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable

NOTE. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 19. Requirements applying to port type 4F

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable

NOTE. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 20. Requirements applying to port type NWH

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
9.3	9.3
9.3.2	9.3.2
9.3.3	9.3.3
10.1.3	10.1.8
10.2.1.3	10.2.9
10.3.2	10.3.2
10.5.1 see note 1	
10.7.1	10.7.4
10.8.1	10.8.5
10.8.2	
10.10.4	10.10.4
10.11.1	10.11.1
10.12.1	10.12.1
10.13.1	10.13.1
10.4.1 ⁺ see note 2	10.4.5 ⁺ see note 2
10.4.2 ⁺ see note 2	
10.6.1 ⁺ see note 2	10.6.5 ⁺ see note 2
10.6.2 ⁺ see note 2	
10.2.3 ⁺⁺ see note 3	
10.9.1 see note 3	10.9.1 ⁺⁺ see note 3
Clause 12	Clause 12
13.3	13.3

NOTE 1. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.

NOTE 2. See 7.2.

NOTE 3. See 7.3.

NOTE 4. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).

Table 21. Requirements and recommendations applying to port type NW2

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
9.3.1	9.3.1
9.3.2	9.3.2
9.3.3	9.3.3
10.1.2	10.1.8
10.2.1.3	
10.3 see note 1	10.3 see note 1
10.10.4 see note 1	10.10.4 see note 1
10.11.3	10.11.3
10.12.1	10.12.1
10.13.3	10.13.3
10.4.1⁺ see note 2	10.4.5⁺ see note 2
10.6.1⁺ see note 2	10.6.5⁺ see note 2
10.6.2⁺ see note 2	
10.7.1⁺ see note 2	10.7.4⁺ see note 2
10.8.1⁺ see note 2	
10.2.3⁺⁺ see note 3	10.2.9⁺⁺ see note 3
10.8.2⁺⁺ see note 3	10.8.5⁺⁺ see note 3
10.9.1⁺⁺ see note 3	10.9.1⁺⁺ see note 3
6.3.2.2.2 see note 4	
10.4.2 see note 4	
10.5.2.1 see note 5	
10.5.2.2 see note 5	
Clause 12	Clause 12
13.3	13.3

NOTE 1. If E & M signalling is to be used, the requirements of **10.3.3** and **10.10.4** apply only to the speech pair of this port type.

NOTE 2. See **7.2**

NOTE 3. See **7.3**

NOTE 4. In the context of this table, these are to be interpreted as recommendations only and are not subject to either testing or declaration.

NOTE 5. These requirements are not subject to testing. The supplier shall declare in accordance with clause **14**.

NOTE 6. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 22. Requirements and recommendations applying to port type NW4

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
9.3.1	9.3.1
9.3.2	9.3.2
9.3.3	9.3.3
10.1.4	10.1.9
10.3 see note 1	10.3 see note 1
10.10.4 see note 1	10.10.4 see note 1
10.11.3	10.11.3
10.12.1	10.12.1
10.13.3	10.13.3
10.4.1⁺ see note 2	10.4.5⁺ see note 2
10.6.1⁺ see note 2	10.6.5⁺ see note 2
10.6.2⁺ see note 2	10.7.4⁺ see note 2
10.7.1⁺ see note 2	
10.8.1⁺ see note 2	
10.2.3⁺⁺ see note 3	10.2.9⁺⁺ see note 3
10.8.2⁺⁺ see note 3	10.8.5⁺⁺ see note 3
10.9.1⁺⁺ see note 3	10.9.1⁺⁺ see note 3
6.3.2.2.2 see note 4	
10.4.2 see note 4	
10.5.2.1 see note 5	
10.5.2.2 see note 5	
Clause 12	Clause 12
13.3	13.3

NOTE 1. If E & M signalling is to be used, the requirements of **10.3.3** and **10.10.4** apply only to the speech pair of this port type.

NOTE 2. See **7.2**.

NOTE 3. See **7.3**

NOTE 4. In the context of this table, these are to be interpreted as recommendations only and are not subject to either testing or declaration.

NOTE 5. These requirements are not subject to testing. The supplier shall declare in accordance with clause **14**.

NOTE 6. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 23. Requirements and recommendations applying to port type NWD

Clause 8 as applicable	
9.3.1	
9.3.2	
9.3.3	
9.4.2	
9.4.3	
9.4.4.1.1	
9.4.5	
10.1.5	
10.13.4	
10.14.2	
9.4.6	see note 3
9.4.11⁺	see note 1
10.4.4⁺	see note 1
10.6.4⁺	see note 1
10.7.2⁺	see note 1
10.2.7⁺⁺	see note 2
10.8.2⁺⁺	see note 2
10.9.1⁺⁺	see note 2
9.4.4.3	see note 3
10.14.1	see note 3
13.7	
NOTE 1. See 7.2.	
NOTE 2. See 7.3.	
NOTE 3. In the context of this table, these are to be interpreted as recommendations only and are not subject to either testing or declaration.	

Table 23a. Requirements and recommendations applying to port type NWD2

Clause 8 as applicable	
9.3.1	
9.3.2	
9.3.3	
10.2.7	see note 2
10.4.4	see note 1
10.6.4	see note 1
10.8.4	see note 2
10.9.1	see note 2
NOTE 1. See 7.2.	
NOTE 2. See 7.3.	

Table 24. Requirements and recommendations applying to port type NWS

The following clauses of BS 6450 : Section 6.1 : 1993			
4-wire PBX		2-wire PBX and 4-wire PBX without PTRP	
5.4		5.4	
5.8		5.8	
6.1.2		6.1.2	
6.2.1.2		6.2.1.2	
6.3.1a		6.3.1a	
6.3.3b		6.3.3b	
7.3		7.3	
The following clauses of this Part of BS 6450			
4-wire PBX		2-wire PBX and 4-wire PBX without PTRP	
Clause 8 as applicable		Clause 8 as applicable	
9.1.1.1		9.1.1.1	
10.1.2		10.1.6	
10.2.1.3			
10.2.4		10.2.8	
10.3.1		10.3.1	
10.7.1		10.7.4	
10.8.1		10.8.5	
10.8.2			
10.10.3		10.10.3	
10.11.2		10.11.2	
10.12.1		10.12.1	
10.13.2		10.13.2	
10.4.1⁺	see note 1		
10.4.2⁺	see note 1	10.4.5⁺	see note 1
10.6.1⁺	see note 1		
10.6.2⁺	see note 1	10.6.5⁺	see note 1
10.9.1⁺⁺	see note 2	10.9.1⁺⁺	see note 2
9.1.5	see note 3	9.1.5	see note 3
Clause 10	see note 3		
10.5.2	see note 4		
Clause 12		Clause 12	
13.4		13.4	
NOTE 1. See 7.2.			
NOTE 2. See 7.3.			
NOTE 3. In the context of this table, these are to be interpreted as recommendations only and are not subject to either testing or declaration.			
NOTE 4. These requirements are not subject to testing. The supplier shall declare in accordance with clause 14.			
NOTE 5. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see 6.5.1).			

Table 25. Requirements applying to port type L2

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
10.3.3 see note	10.3.3 see note
10.10.4 see note	10.10.4 see note
10.11 as appropriate	10.11 as appropriate
Clause 12	Clause 12

NOTE 1. If E & M signalling is to be used, the requirements of **10.3.3** and **10.10.4** apply only to the speech pair of the port type.

NOTE 2. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 26. Requirements applying to port type L4

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
10.3.3 see note	10.3.3 see note
10.10.4 see note	10.10.4 see note
10.11 as appropriate	10.11 as appropriate
Clause 12	Clause 12

NOTE 1. If E & M signalling is to be used, the requirements of **10.3.3** and **10.10.4** apply only to the speech pair of this port type.

NOTE 2. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 27. Requirements and recommendations applying to port type LD

Clause 8 as applicable
9.4.2 see note
10.13.4 see note
10.14 see note

NOTE. In the context of this table, these are to be interpreted as recommendations only and are not subject to either testing or declaration.

Table 28. Requirements applying to integral terminating stations – analogue, ITS-A

All clauses of BS 6450 : Part 2 : 1993 ¹⁾	All clauses of BS 6450 : Part 2 : 1993 ¹⁾
The following clauses of this Part of BS 6450	The following clauses of this Part of BS 6450
4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
10.2.5	
10.9.1	10.9.1
10.10.6	
Clause 12	Clause 12

¹⁾ The requirement of BS 6450 : Part 2 : **6.2.13** is replaced by clause **12** of this Part.

NOTE. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 29. Requirements applying to integral terminating stations – digital, ITS-D

Clause 8 as applicable

10.2.6
10.4.3
10.6.3
10.7.3
10.8.3
10.9.1
10.10.6
Clause 12
13.5

Table 30. Requirements applying to integral terminating stations – cordless analogue, ITS-CA

All clauses of BS 6833 : Part 5 : 1991

The following clauses of this Part of BS 6450

4-wire PBX	2-wire PBX and 4-wire PBX without PTRP
Clause 8 as applicable	Clause 8 as applicable
10.2.5	
10.9.1	10.9.1
10.10.6	
Clause 12	Clause 12

NOTE. Where these subclauses are referenced for application to a 2-wire PBX and a 4-wire PBX without PTRP, they are applied on a port-to-port basis where the PTRP is taken to be another port on the PBX (see **6.5.1**).

Table 30a. Requirements and recommendations applying to port type ITS-CD

Clause 8 as applicable
10.2.6
10.9.7
12
CTR 6
CTR 10

7.2 For clauses marked + in tables 20 to 24 the supplier shall include one of the following in the instructions for use:

- a) a statement that the port meets the PSTN speech transmission requirements in BS 6450 : Part 4 : 1993;
- b) a statement that the port is not designed to carry PSTN speech traffic;
- c) the performance of the port in respect of the clause in BS 6450 : Part 4 : 1993 thus marked, together with the requirement of that clause, so that a comparison can be made.

Conformity shall be checked by inspection of the instructions for use.

NOTE. It is a requirement for approval to connect, that the information indicated by + is given. This information is not verified during the approval process and the supplier is solely responsible for its accuracy. Neither the evaluation authority nor the approval authority are responsible for any discrepancy.

7.3 For clauses marked ++ in tables 20 to 24 the supplier shall state, in the instructions for use, the performance of the port in accordance with 7.4.

Conformity shall be checked by inspection of the instructions for use.

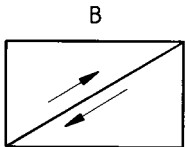
NOTE. It is a requirement for approval to connect, that the information indicated by ++ is given. This information is not verified during the approval process and the supplier is solely responsible for its accuracy. Neither the evaluation authority nor the approval authority are responsible for any inaccuracy.

7.4 The supplier shall provide in the instructions for use, in the form given in table 31, call path performance tables for planning purposes for each of the following:

- a) either:
 - 1) loss between ports, in decibels to one decimal place; or
 - 2) loudness ratings between ports and ITSSs, in decibels to one decimal place;
- b) quantization distortion units;
- c) delay, in milliseconds to one decimal place.

Table 31. Tabulation of call path performance

a) Tabulation of loss and loudness ratings in decibels			
Port type	Port A	Port B	Port C
Port A	-1.0 -1.0	-1.0 -1.0	
Port B			
Port D 0-3 0-6 0-8			
b) Tabulation of quantization distortion units			
Port type	Port A	Port B	Port C
Port A	1.0 1.0	1.0 1.0	2.0 2.0
Port B			
Port D 0-3 0-6 0-8			
c) Tabulation of delay in milliseconds			
Port type	Port A	Port B	Port C
Port A	1.0 1.0	1.0 1.0	2.0 2.0
Port B			
Port D 0-3 0-6 0-8			



Key A B

Direction of transmission

For the loss parameter, negative values shall indicate gain.

NOTE. A supplier may provide additional information.

The call path performance tables shall show:

- i) the relevant model numbers or type references;
- ii) the effect of any adjustments available to the user or the maintainer;
- iii) the direction of transmission.

Conformity shall be checked by inspection of the instructions for use.

8 General requirements

8.1 General

NOTE 1. *PSTN line services.* PTOs described in 1.1 provide, for use with PBXs, PSTN line services that have planning losses in a range from 0 dB to a maximum published loss as follows:

3 dB, 6 dB, 8 dB.

These PSTN line services are referred to as the 3 dB PSTN line service, the 6 dB PSTN line service or the 8 dB PSTN line service. The 3 dB and 6 dB PSTN line services are not necessarily available at every installation site. See also 6.2.0 of BS 6450 : Part 2 : 1993.

For installation planning purposes, the quoted PSTN line loss figures are based upon the image attenuation of the line at 1600 Hz, as calculated in 10.2.1.2.

NOTE 2. *PBX configurations.* The PBX supplier may submit more than one PBX configuration for working with the range of each PSTN line service described in note 1.

NOTE 3. *Visually handicapped telephonists.* If a PBX is capable of configuration with a PSTN call answering point for the centralized answering of PSTN calls for subsequent distribution to extensions, it is a regulatory requirement that there has to be a configuration of the PBX that incorporates facilities which the Director General of Telecommunications is satisfied enables blind and partially sighted persons to operate the apparatus. This requirement applies only to facilities provided at such a centralized answering point of a PBX capable of configurations involving more than six exchange lines. Guidance is provided in OFTEL documents Update SA35, Update SA41 and *Guidance note on the facilities required on private branch exchange consoles for visually handicapped telephonists.*

8.1.1 The PBX shall conform to BS 6450 : Part 1 : 1993 unless varied or replaced by this Part of BS 6450.

For PBXs that are to be connected to a public switched telephone network (PSTN) by PD1 and/or PD2 ports only, the following clauses of BS 6450 : Part 1 : 1993 shall not apply:

- a) 7.3;
- b) 7.4;
- c) 7.5;
- d) 7.6;
- e) clause 10;
- f) clause 11;
- g) clause 12;
- h) clause 13;
- i) clause 14;
- j) clause 15;
- k) clause 16;
- l) 17.1 except that 17.3 applies after replacing 'lines' by 'traffic channels';
- m) 18.1;
- n) clause 19;
- o) clause 20.

8.1.2 A PBX operating in simple call routeing mode (SCRM) shall conform to one of the following as appropriate.

- a) If the PBX is not cordless, BS 6450 : Section 6. 1 : 1993 shall apply except for 5.7, together with the requirements of this Part of BS 6450 applicable to any usage 1 or NWH ports provided. For the purpose of assessing a SCRM PBX with usage 1 or NWH ports, the term 'port' shall replace the term 'terminating station' in BS 6450 : Section 6.1 : 1993.
- b) If the PBX is cordless, BS 6833 : Part 3 shall apply.

NOTE. The requirements in BS 6450 : Part 1 appropriate to a PSTN port apply only if such a port is provided on the PBX.

8.1.3 If the requirements of clauses 13 to 18 of BS 6450 : Part 1 : 1993 apply to ports type PA1 they shall apply only to the handling of call connections between such ports and usage 1 ports or ITSs.

8.1.4 If the requirements of 6.4 and 6.5 of BS 6450 : Section 3.1 : 1993 apply to ports type PA2 they shall apply only to the handling of call connections between such ports, and usage 1 ports or ITSs.

8.1.5 If the requirements of 9.4.9, 9.4.10 or 9.6 apply to usage PD ports they shall apply only to the handling of call connections between such ports and usage 1 ports or ITSs.

NOTE. In order to ensure that users of the PBX are able to comply with the OFTEL *Code of practice for the design of private telecommunications networks*, when using the PBX as a node in a private network, all usage P ports of the PBX should conform to their respective signalling requirements, irrespective of the origin of the call path terminating on such a port.

8.2 PA1 port

NOTE. If the PBX has PA1 ports, it is recommended that the PBX should have a port or range of ports for connection to an 8 dB PSTN line service.

The supplier shall declare the configurations of PA1 port that are provided.

Conformity shall be checked by reference to the supplier's declared list of port types (see clause 14).

8.3 PA2 port

NOTE. If the PBX has PA2 ports, it is recommended that the PBX should have a port or range of ports for connection to an 8 dB PSTN line service.

The supplier shall declare the configurations of PA2 port that are provided.

Conformity shall be checked by reference to the supplier's declared list of port types (see clause 14).

8.4 Text deleted

8.5 Prevention of PBX cross connections

If cross connection of any combination of two or more types of port is not permitted by this Part of BS 6450, the PBX shall be capable of preventing such cross connections.

NOTE 1. It is possible that other cross connections will also need to be barred for licence or contractual requirements.

NOTE 2. See annex F.

Conformity shall be determined by attempting to cross connect those combinations that are not permitted (see clause 14).

8.6 Major equipment failure (MEF)

8.6.1 General

When the PBX is in a state of MEF, the PBX shall conform to the requirements of 8.6.2 to 8.6.4 specific to the particular port type.

8.6.2 Port(s) type PA1

The PBX shall conform to clause 19 of BS 6450 : Part 1 : 1993.