



BS 6450: Part 1: 1983

UDC 621.395.2 : 654.152.7

(Reprinted, incorporating Amendment No. 1)

© British Standards Institution. No part of this publication may be photocopied or otherwise reproduced without the prior permission in writing of BSI

British Standard

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

Part 1. Specification for general requirements

Centraux privés destinés à être raccordés aux réseaux téléphoniques publics commutés de certaines entreprises de télécommunications publiques
Partie 1. Spécifications générales

Anschluß von Nebenstellen an das öffentlichen Fernsprechnetz, die von einigen Betreibern des öffentlichen Fernmeldenetzes bedient werden
Teil 1. Allgemeine Anforderungen

British Standards Institution

AVA Documents
Document Sharing Hub

BS 6450 : Part 1 : 1983

Contents

	Page		Page
Foreword	1	Appendices	
Committees responsible	Back cover	A. The need for requirements in addition to those specified in BS 6305 : 1982 and BS 6317 : 1982	15
Specification		B. Information covering electrical characteristics relevant to PBXs connected to the public switched telephone network	15
Section one. General		C. Additional standard supervisory tones	16
1. Scope	2	D. Test for correct call handling	16
2. Abbreviations, definitions and notation	2	E. Test for call arrival indication	17
3. Compliance principles	4	F. Test for correct PBX operation during PSTN line disturbances	18
4. Safety	4	G. Test for correct application of PSTN seize signal	20
5. <i>Text deleted.</i>	4	H. <i>Text deleted.</i>	
6. Night service	4	J. Test for correct interpretation of proceed signal	21
7. Connection point	4	K. Test for clear-down of PSTN line detector circuit and, for the earth calling signalling method, test for correct application of loop condition	21
8. Control layouts	5	L. Test for correct PBX behaviour when the PSTN places a PSTN line into the park state	22
Section two. Electrical characteristics		M. Test for integrity of design	22
9. Supervisory tones	5	N. Test for PSTN line termination capacitance	22
10. Idle state	5	Tables	
11. Ringing state	5	O. Provision of signalling methods	8
12. On-line state	6	1. Information to be provided by the supplier	13
13. Loop-disconnect dialling signalling from the PBX to the PSTN	7	2. Additional standard supervisory tones	16
14. Maximum duration of PSTN seize signal	7	Figures	
15. PSTN signalling methods	8	1. Method of injecting 50 Hz longitudinal pulses	6
16. PSTN supplementary service invocation	10	2. <i>Figure deleted.</i>	
17. Signalling interaction between the PBX and the PSTN	10	3. <i>Figure deleted.</i>	
18. Incoming PSTN call reception	11	4. <i>Figure deleted.</i>	
19. Power or equipment failure	11	5. Circuit for tests for correct call handling and for correct PBX operation during PSTN line disturbances	19
20. Integrity of design	11	6. Circuit for PSTN seize signal test and test for correct PBX behaviour when the PSTN places a PSTN line into the park state	20
Section three. Integrity of service		7. <i>Figure deleted</i>	
21. Requirement	12	8. Circuit for measuring PSTN line termination capacitance	23
22. Compliance	12		
Section four. Marking and information to be provided by the supplier			
23. Marking	12		
24. Information to be provided by the supplier	12		

Foreword

BS 6450 has been prepared under the direction of the Telecommunications Standards Committee. 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.

Compliance with the requirements of the appropriate Parts of BS 6450 does not of itself provide the right to connect to the PSTN, and public telecommunication operators (PTOs) may reserve the right to carry out such acceptance testing as they may deem to be necessary prior to the connection of a private branch exchange (PBX) to the PSTN*.

BS 6450 will be published in Parts; those already published, or in preparation, are as follows.

- Part 1 Specification for general requirements
- Part 2 Specification for private branch exchanges with terminating stations treated as an entirety
- † Part 3 Direct dialling in on private branch exchanges
- † Part 4 Ports on private branch exchanges
- Part 5 Facilities on private branch exchanges
 - Section 5.1 Specification for facilities on private branch exchanges with terminating stations treated as an entirety
- Part 6 Simple call-routing mode (SCRM)
 - Section 6.1 Specification for the simple call-routing mode of PBX operation, with terminating stations treated as an entirety
- Part 7 Specification for the procedure of in-service observation for PBXs undergoing type approval

NOTE 1. Full requirements for multi-frequency (MF) signalling from the PBX to the PSTN are not specified in Part 1 but are specified in the appropriate Part.

NOTE 2. Further Sections of Parts 4 and 5 are envisaged.

Some information on the necessity for requirements for PBXs in addition to or other than those contained in BS 6305 : 1982 and BS 6317 : 1982 is given in appendix A.

Appendix B gives some general information relevant to PBXs on the electrical characteristics of the PSTN. Information on tones additional to those given in BS 6305 : 1982 is given in appendix C.

The tests for compliance with the requirements of BS 6450 are written, in general, without specifying, for example:

- (a) the state of other PSTN lines not referred to in the test, e.g. on-line state, idle state, signalling state; or
- (b) the state of other terminating stations not referred to in the test, e.g. on-hook, off-hook; or

(c) which, or how many, switching paths are to be in use; or

(d) which installation-dependent parameters (e.g. PSTN line lengths) as defined by the supplier are selected; or

(e) which combinations of PBX facilities are in use; or

(f) which combinations of terminating stations, switching paths and connection to PSTN lines are selected; or

(g) whether the PBX is in power or equipment failure mode.

It is recognized that knowledge of individual PBX system architecture would be necessary in order to decide which combinations are significant when making each test for compliance.

It is also recognized that knowledge of individual PBX system architecture would be necessary in order to decide to what extent the requirements of BS 6450 are applicable when the PBX is operating in the overload condition.

Manufacturers should be aware that, by tradition, the operation of PBX consoles has been an important source of employment for blind and partially-sighted people. It is desirable that the social benefits of this tradition should continue, and although it is not a requirement of BS 6450, designers might consider ways by which they can adapt standard PBX equipment to incorporate facilities to enable the blind and partially-sighted to operate the equipment. The Royal National Institute for the Blind is able and willing to give advice as to which features are most acceptable to blind operators. Such adaptation is likely to add to the cost of standard equipment but some users are prepared to pay a small premium in order to meet their obligations to the disabled. The Manpower Services Commission is also generally able to assist in meeting costs of aids that are essential to the employment of disabled people. It is desirable that the basic design of apparatus should facilitate adaptation for visually handicapped operators at reasonable cost. It should be stressed that while the provision of facilities for the blind is not a requirement of BS 6450, any equipment so produced, whether by additions to, or adaptation of standard equipment, or by a complete re-design, has to comply with BS 6450 if approval is to be gained for connection to the PSTN.

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

This Part of BS 6450 has been presented for designation under Section 22(6) of the Telecommunications Act, 1984.

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

*For further information see British Telecommunications, *Preconnection inspection for call-routing apparatus to be connected to the British Telecommunications network*.

† In preparation.

British Standard

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

Part 1. Specification for general requirements

Section one. General

1. Scope

BS 6450 specifies requirements for private branch exchanges that are necessary for correct interworking with the public switched telephone networks run by British Telecommunications or Kingston-upon-Hull City Council.

This Part of BS 6450 specifies general requirements for private branch exchanges to be connected at the users' premises to the analogue interfaces of a PSTN.

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

BS 6450 does not apply to private branch exchanges for connection to shared service lines or 1 + 1 carrier systems.

BS 6450 does not apply to PBXs for connection in parallel with any other apparatus whose ringer equivalence number (REN) (see 4.2.1 of BS 6305 : 1982) exceeds 0.3.

BS 6450 applies to dealer boards and automatic call distributors.

NOTE 1. The titles of the publications referred to in this Part of BS 6450 are listed on the inside back cover.

NOTE 2. For the purposes of BS 6450, reference to male persons also includes females.

NOTE 3. Where reference is made in this Part of BS 6450 to a particular clause in another publication, the requirements are applicable irrespective of the scope of that publication. Any clauses of another publication not specifically invoked do not apply.

NOTE 4. Unless otherwise stated, all clause references refer to this Part of BS 6450.

2. Abbreviations, definitions and notation

2.1 Abbreviations. For the purposes of this Part of BS 6450, the following abbreviations, together with those given in BS 6301 : 1982, BS 6305 : 1982 and BS 6317 : 1982, apply.

2.1.1 CEPT. Conference of European Posts and Telecommunications Administrations.

2.1.2 CSA. Called subscriber answer.

2.1.3 PABX. Private automatic branch exchange.

2.1.4 PBX. Private branch exchange.

2.1.5 PMBX. Private manual branch exchange.

2.1.6 TJF. Test jack frame.

2.1.7 PTO. Public telecommunication operator.

2.2 Definitions. For the purposes of this Part of BS 6450, the following definitions, together with those given in BS 4727 (see note 1), BS 6301 : 1982, BS 6305 : 1982,

BS 6317 : 1982, BS 6320 : 1982 and BS 6328 : Part 1 : 1985 apply.

NOTE 1. The relevant BS 4727 publications concerned are:

Part 1 : Group 01 : 1971;

Part 3 : Group 01 : 1971;

Part 3 : Group 02 : 1971.

NOTE 2. One of the definitions differs from that given in BS 4727; it is marked with an asterisk.

2.2.1 Equipment

2.2.1.1 private branch exchange (PBX)*. A system that is capable of connecting calls between any one of two or more voice channels of the PSTN and its terminating stations, both incoming and outgoing, and that may also be capable of connecting calls between terminating stations. Such calls can be manually switched (PMBX) or automatically switched (PABX).

2.2.1.2 earth calling PBX. A PBX that calls the PSTN by means of the earth calling signalling method.

2.2.1.3 loop calling, disconnect clearing PBX. A PBX that calls the PSTN by means of the loop calling, disconnect clearing signalling method.

2.2.1.4 terminating station. An extension telephone instrument, operator's console or other equivalent device not directly connected to the PSTN except via the PBX. A terminating station may originate or receive calls to and from the PSTN and originate or receive calls to and from other terminating stations associated with the PBX.

2.2.1.5 connection point. Located on the PSTN line side of the TJF, and marking the boundary of responsibility between the PTO and the supplier or maintainer of any private terminal equipment for the installation and maintenance of the equipment.

NOTE. For the purposes of compliance with BS 6301, the connection point of the PBX is considered to be the NTP.

2.2.1.6 test jack frame (TJF). A circuit disconnection and test access facility.

2.2.1.7 loop calling, guarded clearing PBX. A PBX that calls the PSTN by means of the loop calling, guarded clearing signalling method.

2.2.2 Indications

2.2.2.1 call arrival indication. An indication from the PSTN to a called party that a call, incoming to him, awaits an answer.

2.2.2.2 proceed indication. An indication (e.g. dial tone) to a caller, subsequent to his having initiated a seize signal, that appropriate PSTN equipment is ready to receive routing information.

NOTE 1. The indication may not necessarily be the proceed indication from the PSTN.

NOTE 2. See C.2 of BS 6305 : 1982.

2.2.3 Signals and signalling methods

2.2.3.1 answer signal. A signal to indicate that a call has been answered.

2.2.3.2 called subscriber answer signal (CSA signal). A signal, initiated by a called party, to indicate to the PSTN that he has answered a call incoming to him.

2.2.3.3 PSTN answer signal. A signal, initiated by the PSTN, to indicate to the caller's PBX that the outgoing call that has been made has now been answered.

2.2.3.4 clear signal. A signal, initiated by a calling or called party, to indicate that he is in the process of reverting to, or has reverted to, the idle state.

2.2.3.5 PSTN disconnect clear signal. A signal, initiated by the PSTN towards a PBX, on a PSTN line provided with the loop calling, disconnect clearing signalling method, to indicate that the PSTN regards the call as irrevocably having come to an end.

2.2.3.6 PSTN clear back signal. A signal, initiated by the PSTN towards a caller or his PBX following a PSTN answer signal, to indicate that the called party has cleared.

NOTE. This signal is distinguished from the PSTN disconnect clear signal in that, at this stage, the PSTN does not regard the call as irrevocably having come to an end.

2.2.3.7 PSTN end-of-call clear signal. A signal, initiated by the PSTN towards a PBX, on a PSTN line provided with the earth calling signalling method, to indicate that the PSTN regards the call as irrevocably having come to an end.

NOTE. The signal arises from the reversion to the idle state of this type of PSTN termination, and has the same function as the PSTN disconnect clear signal.

2.2.3.8 dialling. The sending of information needed by the PSTN to set up a required connection or invoke a desired service.

NOTE. This term includes the use of a keypad as well as a dial, and loop-disconnect signalling, MF tone signalling, or other signalling.

2.2.3.9 earth calling signalling method. A method that calls the PSTN on an outgoing call by means of an earth condition applied to the B-wire. When the PSTN has been seized, a loop is applied between the A- and B-wires and the earth condition is removed. On an incoming call from the PSTN, a CSA signal is returned by means of a loop between the A- and B-wires. At the end of each call a PSTN end-of-call clear signal is received from the PSTN. The A-wire potential is disconnected at the PSTN during the idle state.

2.2.3.10 loop calling, disconnect clearing signalling method. A method that calls the PSTN on an outgoing call or returns a CSA signal to the PSTN on an incoming call, by means of a loop between the A- and B-wires. At the end of each call a PSTN disconnect clear signal is received from the PSTN.

NOTE. In the loop calling, disconnect clearing signalling method, the protocol is identical to that of a simple telephone connected to the PSTN with the addition of the PSTN disconnect clear signal.

2.2.3.11 hold signal. A condition needed to maintain a connection either partly or completely set up.

2.2.3.12 Text deleted.

2.2.3.13 PSTN equipment seized signal. A signal, initiated by the PSTN towards a PBX, on a PSTN line provided with the earth calling signalling method, to indicate that the PSTN equipment has recognized, and is acting upon, a PSTN seize signal.

2.2.3.14 seize (seizure) signal. A signal initiated by a caller to indicate that he intends to set up a new call.

2.2.3.15 PBX seize (seizure) signal. A seize signal from a PBX terminating station to the PBX.

2.2.3.16 PSTN seize (seizure) signal. A seize signal from a PBX to the PSTN.

2.2.3.17 register recall signal. A signal initiated during a call, by a party to that call, for the purpose of obtaining connection or reconnection to a register so that further instructions may be given.

2.2.3.18 PBX register recall signal. A register recall signal from a terminating station user to his PBX, to secure reconnection to the PBX register.

2.2.3.19 PSTN register recall signal. A register recall signal either from a party to the call directly connected to the PSTN, or forwarded from a PBX to the PSTN, with the object of securing reconnection to the PSTN register.

2.2.3.20 PSTN guarded release signal. A signal, generated by the PSTN when the loop calling, guarded clearing signalling method is used, to indicate that the call has come to an irrecoverable end and that the PSTN is releasing the connection.

The signal will occur at one of the following three points of a call:

(a) just prior to the park state, indicating that the PSTN is about to park the line if a PBX clear signal is not received;

(b) at the end of a normal call clearing sequence prior to the PSTN restoring to the idle state;

(c) prior to the PSTN restoring to the idle state from the park state.

NOTE. The signal at the public exchange is a reduction in the feed current to less than 1 mA for a period of 400 ms to 510 ms. Owing to PSTN line characteristics, the reduction in the feed current to less than 1 mA will not necessarily be immediately detectable at the connection point. The period at the connection point below 1 mA will be not less than 220 ms.

2.2.4 States and services

2.2.4.1 loop. A d.c. path between the A- and B-wires that permits the seizure and holding of a PSTN line.

2.2.4.2 calling state. The portion of a call during which a PSTN seize signal is applied.

2.2.4.3 regulated service. A service in which specified facilities are available to subscribers provided that they obey certain specific rules (set out by the regulating authority) when interfacing with that service.

2.2.4.4 park state. The condition into which the PSTN may place a PSTN line that is seized but not active on a call.

NOTE. See C.1.1 of BS 6305 : 1982.

2.2.4.5 power down state. The condition into which certain public exchanges place idle PSTN lines in order to conserve energy, and where the normal feeding arrangements are replaced by a high resistance feed.

NOTE. The PSTN is able to recognize a seize signal during the power down state (see C.1.1 of BS 6305 : 1982).

2.2.4.6 night service. A PBX facility provided to allow adequate service to be given during periods when the operators' positions are unstaffed, typically at night.

NOTE. In night service, incoming PSTN calls may be directed to specific terminating station(s), or indicated generally, so that any terminating station user can answer the call by dialling a suitable code.

The facilities afforded to various terminating station users may be modified as deemed desirable by the customer.

2.2.4.7 major failure. A state where at least 60 % of the PSTN lines of a PBX undergo simultaneous loss of service due to a failure within the PBX.

NOTE. An example of major failure would be a system 'crash' caused by the failure of the central processor in a single processor system or the simultaneous failure of all processors on a replicated system.

2.2.4.8 loss of service. A state where any established call is lost or where incorrect response to incoming calls or outgoing call attempts persists for more than 16 s.

2.2.4.9 overload. A state where the rate of actions required to operate the PBX at 100 % of its configured capacity is exceeded.

2.2.4.10 net restoration time. The sum of times spent in diagnostic and corrective work following a failure event listed in 22.2.2.

2.3 Notation

2.3.1 dBm. Absolute power level with respect to 1 mW, expressed in decibels.

2.3.2 dBmp. Absolute psophometric power level (weighted for telephony) with respect to 1 mW, expressed in decibels.

2.3.3 dBPa. Absolute sound pressure level with respect to 1 Pa, expressed in decibels.

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

NOTE TO 2.3. Further information on all expressions for power levels used in this standard is given in CCITT Recommendation B.12.

3. Compliance principles

3.1 Requirements

3.1.1 Unless otherwise stated in this Part of BS 6450, the requirements of this Part of BS 6450 shall apply to a PBX in all operating states (but not overload conditions) under all combinations of terminating stations, switching paths and connections to PSTN lines and with all the possible combinations of PBX facilities in use, under the full range of installation-dependent parameters as defined by the supplier (see clause 24).

3.1.2 Unless specific PSTN line polarities are stated in this Part of BS 6450, the requirements shall be met for both polarities of PSTN line connection.

NOTE. PSTN line polarity reversals, other than as part of the operation of a signalling system, will normally occur only when the PBX is in the idle state.

3.2 Tests

3.2.1 Unless otherwise stated in this Part of BS 6450, the tests of this Part of BS 6450 shall be applied to a PBX in all operating states (but not overload conditions) under all combinations of terminating stations, switching paths and connections to PSTN lines and with all the possible combinations of PBX facilities in use, under the full range of installation-dependent parameters as defined by the supplier (see clause 24).

NOTE 1. Tests may be performed in any order.

NOTE 2. Each appendix that describes tests for compliance covers, in general, tests for more than one requirement. The tests within each appendix are ordered in the logical sequence in which they can be performed in the test laboratory. This order is different from that of the presentation of the requirements, which follow a conceptual order.

3.2.2 The tests described in this Part of BS 6450 shall be type tests as defined in 21.5 of BS 4778 : Part 2 : 1979.

3.2.3 Unless otherwise stated in a particular test, the tests shall be performed under the normal operating conditions described in A.1.1 of BS 6305 : 1982.

3.2.4 For apparatus with protection barriers, the protection barrier shall be connected in its normal operating position for the tests.

3.2.5 Unless otherwise stated in this Part of BS 6450, tests shall be performed with a non-reactive 50 k Ω resistance between each of the relevant A- and B-wires and earth.

NOTE. These resistances simulate the worst conditions present on the PSTN (see B.2).

3.2.6 Unless otherwise stated in this Part of BS 6450, measurements shall be made at the PSTN line connection point of the PBX.

3.2.7 Unless otherwise stated in this Part of BS 6450, the tolerances associated with values of components and physical quantities referred to in the tests and figures shall be as given in table 7 of BS 6305 : 1982, except that the tolerances given for the item 'current' shall be replaced by the single entry ' $\pm 1\%$ '.

3.2.8 Where figures show an earth, this earth shall be connected to the PBX earth reference point.

NOTE. Where figures do not show an earth, and where for signalling purposes the line potential(s) need to be referenced to earth, the PBX may need to be artificially set in the appropriate signalling state for the test.

4. Safety

4.1 The PBX shall comply with BS 6301.

4.2 If protection devices are required on the A- and B-wires in order to comply with BS 6301, they shall be connected on the PBX side of the connection point (see 7.1).

Compliance shall be checked by inspection.

Clause 5. *Text deleted.*

6. Night service

The process of placing the PBX into or out of night service shall not interrupt any calls in progress.

Compliance shall be checked by appropriate functional tests.

7. Connection point

7.1 Location. The connection point shall be located at the test jack frame, which shall provide test and isolation access to each circuit to and from the PBX connected to networks of the PTO.

Compliance shall be checked by inspection.

NOTE. All cabling and apparatus on the PSTN side of the connection point is part of the PSTN.

7.2 Test jack frame. The test jack frame shall be either:

- (a) part of the PBX; or
- (b) connected to the PBX by a cable or cables whose length shall not exceed 30 m (but see item 19 of table 1).

Compliance shall be checked by inspection and/or measurement, as appropriate.

7.3 Cable termination. In order to allow standardized tools to be used for both PTO cable termination and testing activities, either:

- (a) the terminations used at the connection point shall be BT strips connection No. 237A, in accordance with BT Specification S1541; or
- (b) where alternative equipment is used, the PBX supplier shall provide the necessary tools and instructions for PTO staff (see item 21 of table 1).

Compliance shall be checked by inspection and, if appropriate, by making sufficient connections with the

tools following the instructions to ascertain that satisfactory cable terminations can be achieved.

NOTE 1. Terminations in accordance with (a) are preferred.

NOTE 2. Further details and recommendations for cable terminations are given in BS 6701 : Parts 1 and 2.

7.4 Presentation of circuits. All interfaces of the PBX that are to be connected to the cable that carries PTO services shall be brought out to a segregated area of the TJF and the associated connection strips suitably annotated (see 7.5).

Compliance shall be checked by inspection.

NOTE 1. In many cases the TJF will have telecommunications circuits of several types terminated on it, only some of which require connection to PTO networks. This requirement ensures that the cable that carries PTO services may be terminated in a logical manner.

NOTE 2. The order of presentation of PSTN circuits will be agreed between the installer and PTO. The order will depend, in part, on the order in which the PBX and the PSTN select bothway lines (see 17.3 and item 12 of table 1).

NOTE 3. See item 16 of table 1.

7.5 Identification of connections. All circuits requiring to be connected to PTO networks shall be readily identifiable at the connection point for ease of connection, disconnection, testing and reconnection.

Compliance shall be checked by inspection.

NOTE. Where BT strips connection 237A are used, the provision of strips designation 51 ... 53 ... or 54 ... as appropriate (see BT Specification S1541) will normally permit adequate identification, but reference to clearly presented records would also meet this requirement.

7.6 Transmission circuit, MF signalling and loop-disconnect signalling. The requirements of 6.3 of BS 6317 : 1982 shall apply at the connection point.

8. Control layouts

Control layouts shall comply with clause 15 of BS 6317 : 1982.

NOTE. It is recommended that the design of the user interface of terminating stations, including, where applicable, operator positions, should follow sound ergonomic principles; this is to minimize call failure or misrouting with consequent annoyance to PSTN users due to unnecessary operator error.

Section two. Electrical characteristics

9. Supervisory tones

Prior to answering incoming PSTN calls, only supervisory tones having the same characteristics and meaning as standard supervisory tones, i.e. those complying with C.2 of BS 6305 : 1982 and table 2 of this Part of BS 6450, shall be injected into the PSTN.

Compliance shall be checked by inspection and, where appropriate, measurement.

NOTE 1. In order to avoid user confusion, supervisory tones used in the PBX to indicate 'ringing', 'engaged (busy)', 'number unobtainable', and 'warning tone' should conform in character and significance to the standard BT supervisory tones (see C.2 of BS 6305 : 1982 and appendix C).

Additional supervisory tones required in connection with optional facilities, e.g. discriminatory ringing, call waiting indication (see appendix C), may be used. In deciding the characteristics of such tones, manufacturers should take account of CEPT Recommendation T/SF23. Also, the particular facility and the tone employed should be within the overall parameters applying to tones and signals transmitted to the PSTN line.

NOTE 2. It is recommended that the requirement specified in clause 9 should apply to inter-PBX circuits.

NOTE 3. It is recommended that on calls answered and connected by the PBX operator to terminating stations, only awaiting answer indication (see C.2 of BS 6305 : 1982) should normally be returned to the PSTN.

10. Idle state

NOTE. During tests for compliance with the idle state requirements, the ringing detector is connected.

10.1 Idle state current. The current flowing between the PBX, in the idle state, and the PSTN shall be not greater than 120 μ A in either direction. Where applicable, the special signalling conditions of 4.4.4.2 and 4.4.4.3 of BS 6305 : 1982 shall be disabled.

Compliance shall be checked by measurement of the current flowing when each wire of the PSTN line interface is connected in turn to a 50 V d.c. source (with its positive pole earthed) applied in series with a 200 Ω resistor, the measurement being made with the other wire earthed and, where applicable, the special signalling conditions specified in 4.4.4.2 and 4.4.4.3 of BS 6305 : 1982 disabled.

During the test for compliance, currents greater than 120 μ A shall be ignored if the duration of any current in excess of 120 μ A does not exceed 10 ms in any one 110 ms duration.

NOTE 1. The requirement of 3.2.5 does not apply to this test.

NOTE 2. PTOs described in the scope of this Part of BS 6450 do not guarantee that it will be possible in all present or future circumstances to draw 120 μ A from the PSTN.

NOTE 3. In order to enable PTOs to perform accurate fault prediction testing, it is recommended that the resistance of any intentional earth path is stable to within 3 %.

10.2 Direct potentials applied to the PSTN line

10.2.1 Positive potential. If the PBX applies a steady-state positive potential relative to earth on either the A- or B-wires, the potential shall not exceed 10 V.

Compliance shall be checked by measurement of open-circuit voltage.

10.2.2 Negative potential. The PBX shall not apply any negative potential exceeding 60 V relative to earth on either the A- or B-wires.

Compliance shall be checked by measurement of open-circuit voltage.

10.3 Power level. The power level shall comply with 4.1.4 of BS 6305 : 1982.

10.4 Capacitative termination. When tested in accordance with the method described in appendix N, the termination of each PSTN line shall present to the PSTN a capacitance, C , between the A- and B-wires of between 1.62 μ F and 2.64 μ F in series with a resistance, R , of between 1 k Ω and 10 k Ω .

10.5 Text deleted.

11. Ringing state

11.1 Ringing detection (call arrival indication detection). The relevant ringing indicator shall respond to the ringing signal.

Compliance shall be checked by the method described in appendix E.

11.2 Restrictions on signals sent to the PSTN line.

The PBX shall comply with 4.2.2 of BS 6305 : 1982, except that in the test for compliance figure 3 of this standard shall be used instead of figure 7 of BS 6305 : 1982.

BS 6450 : Part 1 : 1983

11.3 Impedance. The wire-to-earth impedance shall comply with paragraph two of 4.1.3 of BS 6305 : 1982 except that the frequency range shall be 16 Hz to 3400 Hz.

12. On-line state

12.1 Impedance balance about earth. The PBX shall comply with 4.3.3 of BS 6305 : 1982.

During the test for compliance, an impedance balance about earth outside the specified limit shall be ignored if the duration in which the impedance balance about earth is outside the specified limit does not exceed 10 ms in any one 110 ms duration.

12.2 Signal balance about earth. The signal balance about earth shall comply with 4.3.4 of BS 6305 : 1982.

During the test for compliance, a signal balance about earth outside the specified limit shall be ignored if the duration in which the signal balance about earth is outside the specified limit does not exceed 10 ms in any one 110 ms duration.

NOTE. The method of energization is specified in the appropriate Part of BS 6450.

12.3 Signal power presented to the PSTN. The signal power presented to the PSTN shall comply with 4.3.5 of BS 6305 : 1982.

During the test for compliance, a signal power outside the specified limit shall be ignored if the duration in which the signal power is outside the specified limit does not exceed 10 ms in any one 110 ms duration.

NOTE. Selection of the appropriate requirements of 4.3.5 of BS 6305 : 1982, and the application of the corresponding compliance check on the part of the approval authority, is determined by the supplier (see item 22 of table 1).

12.4 Text deleted.

12.5 Immunity to longitudinal voltages. The PBX shall not respond to longitudinal voltages, as described in C.6 of BS 6305 : 1982, induced into any PSTN line, other than to

register these as private meter pulses where this facility is provided. The calling arrival indicator shall not cause an indication to be given to the user nor shall any other false supervisory signals be generated as a result of the reception of such voltages.

Compliance shall be checked by inspection, using the circuit shown in figure 1.

12.6 Immunity to inappropriate signals. Outward signalling by the PBX shall not cause a ringing indication to be given to the user.

Compliance shall be checked by inspection.

NOTE. Two back-to-back 3.3 V zener diodes in series with the detector may be used to prevent the absorption of speech power.

12.7 Immunity to PSTN line disturbances

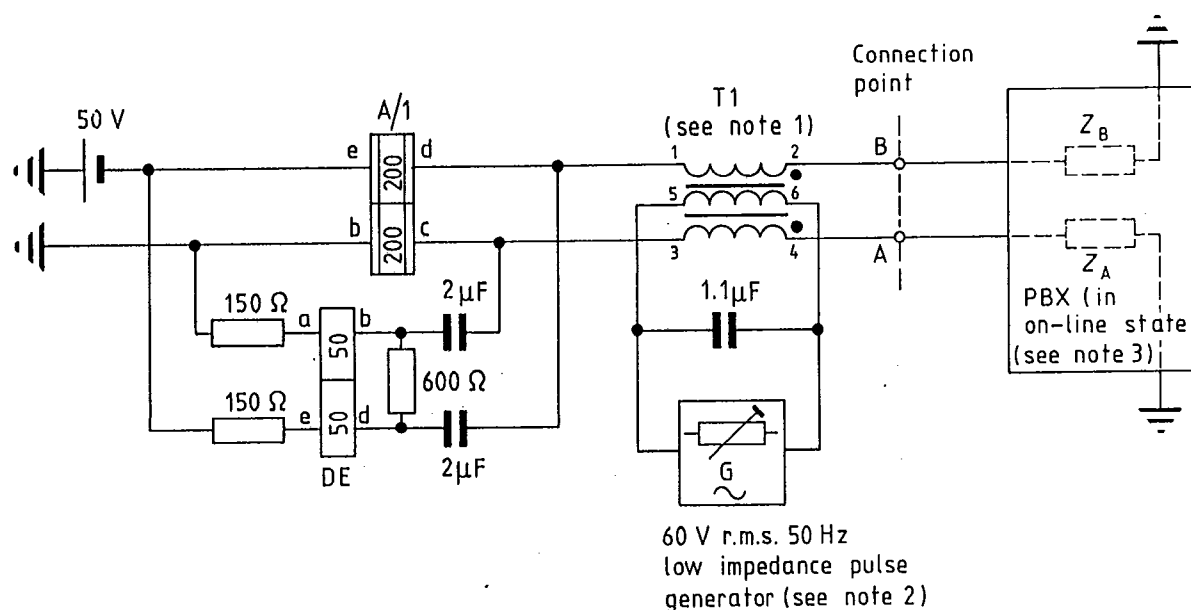
12.7.1 Earth calling and loop calling, disconnect clearing PBXs. A PBX configured for the earth calling or loop calling, disconnect clearing signalling method shall not malfunction if, during an outgoing PSTN call, PSTN line disturbances of the following types are received.

NOTE 1. All values of resistance in the following types are quoted at the connection point.

(a) *Type 1.* (See F.2.1.) The PSTN line feeding current is disconnected as specified in paragraph one of 10.2.2 of BS 6317 : 1982.

(b) *Type 2.* (See F.2.2.) The PSTN line feeding conditions are modified in the following sequence at the time a PSTN operator answers any call:

- (1) the B-wire is disconnected for up to 350 ms;
- (2) within 20 ms of the disconnection of the B-wire, the A-wire is connected to a positive potential, of 50 ± 5 V, via a resistance of up to 2 k Ω ;
- (3) the positive potential is removed from the A-wire no more than 20 ms before the normal feeding current is restored.



NOTE 1. Before the secondary windings of the transformer are loaded, adjust the output of the generator to give 46 V r.m.s. with respect to earth at A and B.

NOTE 2. The longitudinal signal, derived from the generator, is of 250 ± 50 ms duration.

NOTE 3. Z_A and Z_B represent the effective impedances to earth that the PBX connects to each wire.

NOTE 4. Relay A/1 is BT type 19/5. Relay DE is BT type 19014. Transformer T1 is BT type 3/317A. For details of these devices, see inside back cover.

Figure 1. Method of injecting 50 Hz longitudinal pulses

(c) *Type 3.* (See F.2.3.) The change of polarity that may be used as an answer signal is applied as a negative battery potential described in C.1.1 of BS 6305 : 1982 connected to the A-wire, and the B-wire connected to earth.

(d) *Type 4.* (See F.2.4.) The PSTN line feeding conditions are modified as follows immediately prior to the receipt of proceed indication.

The A- and B-wires are both connected to the nominal 50 V negative supply, each through a resistance of between 470 Ω and 1470 Ω for up to 100 ms.

(e) *Type 5.* (See F.2.5.) The PSTN line feeding conditions are modified as follows after the clear signal has been sent by the PBX on an outgoing call to any of the operator services.

The A- and B-wires are connected to nominal 50 V and 100 V negative supplies respectively, the A-wire through a resistance of up to 1 k Ω , and the B-wire through a resistance of up to 3.1 k Ω , depending on both PSTN line length and the exact sequence of events during the clearing of the call.

(f) *Type 6.* (See F.2.6.) The PSTN line feeding conditions are modified as follows on receipt of proceed indication, and during the sending of digit information.

The A- and B-wires are connected to earth and the nominal 50 V negative supply respectively, each through a resistance of up to 890 Ω , instead of the normal feeding conditions.

For a PBX configured for the loop calling, disconnect clearing signalling method, compliance shall be checked by the method described in F.1 and F.2.

For a PBX configured for the earth calling signalling method, compliance shall be checked by the method described in F.1 and F.3.

NOTE 2. Changes to the PSTN line conditions applied by the PSTN (e.g. polarity, voltage, level, feeding resistance and interruptions) can occur during processing of a call by the PSTN. These particularly occur during and following dialling. The examples listed above have been found to be significant for PBXs configured for the earth calling or loop calling, disconnect clearing signalling methods, but this is not intended to be an exhaustive list of PSTN line current anomalies.

12.7.2 Loop calling, guarded clearing PBX. A PBX configured for the loop calling, guarded clearing signalling method shall not malfunction if, during an outgoing PSTN call, the change of polarity that may be used as an answer signal is applied as a negative battery potential described in C.1.1 of BS 6305 : 1982 connected to the A-wire, with the B-wire being connected to earth.

Compliance shall be checked by the method described in F.1 and F.4.

13. Loop-disconnect dialling signalling from the PBX to the PSTN

NOTE 1. Full requirements for MF signalling from the PBX to the PSTN are not specified in Part 1 but are specified in the appropriate Part of BS 6450.

NOTE 2. Clause 24 (see item 14 of table 1) details requirements for the information to be provided by the supplier if the PBX has the various timing periods specified in 13.3, 13.4 or 13.5.

13.1 Limit on transmission of MF signal power. Where a PBX is capable of receiving digit information from a terminating station in MF form, and of converting the digits into loop-disconnect form, no frequency component of the MF signals received from the terminating station shall, during such conversion, exceed a power level of -33 dBm for a period in excess of 15 ms when measured at the connection point.

Compliance shall be checked by measurement.

NOTE. This requirement avoids the unintentional operation of any PSTN MF equipment.

13.2 Loop-disconnect pulses. Where provided, loop-disconnect dialling signalling shall comply with 4.4.2 of BS 6305 : 1982 except that, in the test for compliance, paragraph two of A.8.1 of BS 6305 : 1982 shall be replaced by the following:

'The PBX is connected to points A' and B' of figure 10.'

13.3 Restoration of receive transmission path. The receive transmission path back to the calling terminating station shall be restored within 1 s of the end of the sending of the latest digit to the PSTN, unless a further digit is being received from the calling terminating station at that time. Compliance shall be checked by measurement and inspection.

NOTE. During the call set-up phase, the PBX may:

(a) receive one or more dialled pulses from a terminating station and either store and then repeat them as loop-disconnect pulses, or just repeat them as loop-disconnect pulses; or

(b) pass on one or more dialled pulses from a terminating station direct to the PSTN line (i.e. a transparent-working PBX); or

(c) receive one or more MF digits from a terminating station, store and then translate them into loop-disconnect pulses.

During this operation, the transmission elements need to be disabled to prevent the caller hearing the outpulsing in an objectionable manner or suffering from acoustic shock (see the appropriate Part of BS 6450 and items 17 and 18 of table 1). Where a register or equivalent device performs these operations, it is likely to be one of a small pool of such devices and will require to be released back into the common pool as early as possible. The caller may pause during dialling to refer to the number afresh or to listen for a supervisory tone. Such normal user behaviour should not cause call failures.

13.4 Operation of forward transmission path. The forward transmission path shall be made operative within 4 s from the end of sending the latest digit to the PSTN, unless a further digit is being received from the calling terminating station at that time.

Compliance shall be checked by measurement.

NOTE. The forward transmission path may remain operational at all times provided the other requirements of this Part of BS 6450 are met.

It is desirable to minimize the delay before conversation becomes possible. The value in this requirement is the maximum tolerable. A lower value, e.g. 1 s, should be regarded as a design objective, subject to meeting the other requirements of this Part of BS 6450.

13.5 Ability to recognize further digits. The PBX shall remain capable of accepting and acting upon routing information received from a terminating station for at least 3 s after the latest routing information has been received, unless other considerations (e.g. known number length or an answer signal from the PSTN or a special signal from the terminating station (see item 10 of table 1)) indicate that no further routing information is needed.

NOTE. It is recommended that the PBX be designed to maximize the period during which further digits can be recognized.

Compliance shall be checked by measurement and inspection.

14. Maximum duration of PSTN seize signal

The PBX shall revert a PSTN line to the idle state within 60 s from the application of the PSTN seize signal if neither proceed indication from the PSTN has been received nor the PBX has started to send routing information.

Compliance shall be checked by measurement and inspection.

NOTE. This requirement does not apply when the PSTN seize signal is used to take out of service a PSTN line that has been reported as faulty.