

Specification for

# Simple telex terminals using single channel voice frequency signalling for connection to British Telecommunications telex network

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- Independent Telecommunications Suppliers' Association
- Post Office Engineering Union
- Society of Telecom Executives
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- Telecommunications Managers' Association
- Telecommunications Users' Association (TUA)

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## Foreword

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

This series of standards will include product specifications giving particular requirements for individual items of apparatus, together with standards covering general requirements for the connection of apparatus to the various networks of British Telecommunications. At the present time, these networks include the public switched telephone network, the telex network and private circuits leased from British Telecommunications.

The requirements specified in the standards are intended to ensure that apparatus complying with them, when connected to British Telecommunications networks, will neither adversely affect any network nor interfere with the service available to other users. The standards include safety requirements for only the protection of personnel operating the network and for the protection of users from hazards that may arise from the connection of the apparatus to the network.

This standard specifies particular requirements for simple telex terminals using SCVF signalling and is intended to be used in conjunction with BS 6301.

This standard has been presented to the Secretary of State for approval under Section 16(1) of the British Telecommunications Act, 1981. It is government policy that, once the Secretary of State's approval has entered into force, apparatus within the scope of this standard may be connected to British Telecommunications networks only if it conforms to the technical requirements of this standard and has been approved by the Secretary of State, British Telecommunications or the British Approvals Board for Telecommunications. The Secretary of State will not normally entertain applications for approval of apparatus. Applications for approval of apparatus should therefore be addressed in the first instance to The Director, British Approvals Board for Telecommunications (BABT), Mark House, The Green, 9-11 Queen's Road, Hersham, Walton-on-Thames, Surrey, KT12 5NA.

In approving the standard, the Secretary of State may, at his discretion, stipulate variations of, or additions to, the requirements of this standard and may also set conditions which have to be complied with as regards the apparatus, or its connection, or use. A copy of the Secretary of State's approval will be included, when available with all copies of this standard. Any further information on details of approval of this standard may be obtained from the Department of Industry, Room 307, Ashdown House, 123 Victoria Street, London SW1E 6RB.

Some apparatus may incorporate facilities for which a mandatory standard is necessary, but for which no standard has yet been approved by the Secretary of State. Other apparatus may incorporate innovative features not foreseen when the relevant standard was written and approved and for which that standard is not fully appropriate. The BABT can sometimes deal with cases such as these by writing a "Special Investigation Test Schedule" (SITS) which has the effect of supplementing or varying the requirements in the application of the approved British Standard. Information on any relevant SITS may be obtained from the Director, BABT.

Where this course is not possible, then BT may nevertheless approve apparatus for connection to its networks and should be consulted directly as to its requirements.

Attention is drawn to the fact that on 31 July 1984 the requirements for output signal power in 4.2.2 b) will be withdrawn from this standard.

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.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 44, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.



## 1 Scope

This British Standard specifies requirements for simple telex terminals (STT) for direct connection to the British Telecommunications (BT) telex network. The requirements are intended to minimize the risk of interference to other subscribers and to ensure compatibility with the BT telex network and with other telex terminals connected to the network.

This standard applies to apparatus having the following basic characteristics:

- only one communications interface;
- the capability to produce a complete printed record of all messages sent and received;
- the ability to receive and present correctly an input line sequence of up to 69 printing or spacing characters without receiving a new line sequence;
- single channel voice frequency (SCVF) signalling;
- a signalling rate of 50 baud;
- transmitted characters coded in the international telegraph alphabet (ITA) No. 2 (see Appendix A).

This standard makes provision for two types of simple telex terminal as follows:

*type 1:* An STT capable of working to an electromechanical exchange;

*type 2:* An STT capable of working to a stored programme control (SPC) exchange.

NOTE 1 An STT may be so constructed as to comply with the requirements for both type 1 and type 2. However it may only operate as one distinct type at any one time.

The tests described in this standard are type tests.

Unless otherwise stated in this standard the values of a.c. voltage and current are r.m.s. at 50 Hz.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

## 2 Abbreviations and definitions

For the purposes of this standard the definitions given in BS 4727:Group 03:1971 apply, together with the following abbreviations and definitions.

### 2.1 Abbreviations

|       |                                          |
|-------|------------------------------------------|
| ABS   | absent condition                         |
| BT    | British Telecommunications               |
| PTS   | proceed to select                        |
| STT   | simple telex terminal                    |
| SPC   | stored programme control                 |
| TNTTP | telex network termination and test point |
| SCVF  | single channel voice frequency           |
| FSP   | forward signalling path                  |

|      |                                           |
|------|-------------------------------------------|
| BSP  | backward signalling path                  |
| CSCS | commence selection character sequence     |
| ITA  | international telegraph alphabet          |
| WRU  | who are you (ITA No. 2 Combinations 30 4) |
| TDMS | telegraph distortion measuring set        |
| LISN | line impedance and stabilizing network    |
| RDI  | call re-directed                          |
| PRM  | pre-recorded message activated            |
| CUS  | call units statement                      |
| FS   | figure-shift                              |
| LS   | letter-shift                              |
| CR   | carriage return                           |
| LF   | line feed                                 |
| SP   | space                                     |

### 2.2 Definitions

#### 2.2.1

##### communications interface

the means of electrically transferring signals between the STT and the BT network

#### 2.2.2

##### channel signal states

the two channel states defined as “space” and “mark” or by the alternatives shown below:

| SPACE                                                                         | MARK     |
|-------------------------------------------------------------------------------|----------|
| START                                                                         | STOP     |
| A                                                                             | Z        |
| BINARY 0                                                                      | BINARY 1 |
| POSITIVE                                                                      | NEGATIVE |
| ON                                                                            | OFF      |
| $F_A$                                                                         | $F_Z$    |
| NOTE Except in Appendix A, $F_A$ and $F_Z$ are used throughout this standard. |          |

#### 2.2.3

##### signal power reference level

the level of signal power with reference to a milliwatt and expressed in dBm such that 0 dBm = 1 mW

#### 2.2.4

##### anisochronous signal

a signal such that the time interval separating any two significant instants is not necessarily related to the time interval separating any other two significant instants

#### 2.2.5

##### telex network termination and test point

a connection facility provided by BT and located in a position in the subscriber's premises, to enable connection to be made to the BT line

2.2.6  
forward signalling path

the path conveying signals transmitted from the direction of the STT

2.2.7  
backward signalling path

the path conveying signals from the direction of the exchange

2.2.8  
proceed to select signal

the signal of  $F_z$  returned to the STT over the backward signalling path when the telex exchange is ready to receive the selection signals from the STT

2.2.9  
return loss

a quantity, expressed in dB, associated with the degree of match between two impedances calculated from the following expression:

$$20 \log_{10} \left| \frac{Z_b + Z_t}{Z_b - Z_t} \right|$$

where

- $Z_t$  is the measured complex impedance;
- $Z_b$  is the reference complex impedance.

NOTE 1 Input impedance of the apparatus is measured at the line terminals.  
NOTE 2 Return loss is an indication of the impedance matching of the apparatus to the circuit. For example, a large return loss represents a good impedance match.

2.2.10  
open STT

an STT capable of receiving characters at any time

2.2.11  
hit

a short duration change in the received signal characteristics

2.2.12  
fox message

a message for testing purposes comprising “THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG” (CCITT Recommendation R.52:1981.)

2.2.13  
clear signal

the signal of continuous  $F_A$  sent on the FSP when it is required to clear from the STT and on the BSP when the exchange initiates a clear

2.2.14  
clear confirmation signal

the signal of continuous  $F_A$  on the FSP returned as a response to an incoming clear, or continuous  $F_A$  on the BSP received as a response to an outgoing clear from the STT

2.2.15  
exchange simulator

an apparatus that can be arranged to simulate the functions and signalling timings of a BT telex exchange that are relevant to this standard

3 General requirements

3.1 Connection to telex network. The STT shall be fitted with a plug complying with BS 6312:1982.

NOTE Connection is made into BT supplied line jack units. The allocation of plug pins shall be as given in Table 1.

Compliance shall be checked by inspection.

Table 1 — Allocation of plug pins

| Pin number | Allocation |
|------------|------------|
| 1          | A or B leg |
| 2          | Not used   |
| 3          | Not used   |
| 4          | Not used   |
| 5          | Not used   |
| 6          | A or B leg |

3.2 Safety. The STT shall comply with BS 6301:1982.

3.3 Line impedance

NOTE 1 Except where otherwise stated the nominal BT line impedance is 600 Ω.  
The STT shall comply with requirements of this standard when connected to a worst case line having an impedance presenting a return loss against 600 Ω of 4 dB.

Compliance shall be checked by applying the test conditions described in B.4.

4 Physical signal characteristics

NOTE The facilities and performance requirements that are specified in this clause for a frequency shift modulation means of providing telex over BT circuits are, where practicable, in agreement with those contained in CCITT Recommendations R.20:1981.

4.1 Simultaneous transmission and reception, The STT, including STTs with limited facilities, e.g. receive-only STTs, shall provide facilities for simultaneous transmission and reception of signals separated by frequency division at 50 baud over two-wire presented circuits. (See clause 5 for technical signal characteristics.)

NOTE For a receive-only STT, outgoing transmission is required for answerback.

## 4.2 Transmission frequencies

**4.2.1 Transmitter.** The STT shall convert the transmit data stream into transmit signals and transmit them to the exchange via the forward signalling path (FSP). The output spectrum due to the modulation shall be equivalent to that produced by continuous phase frequency shift keying with a band width limitation on the output.

The nominal FSP frequencies shall be as follows:

$$F_Z = 1\,650\text{ Hz}$$

$$F_A = 1\,850\text{ Hz}$$

The steady state frequencies transmitted from the STT to the exchange shall not differ by more than  $\pm 3$  Hz from the nominal values specified for  $F_A$  and  $F_Z$  while the STT is operating under selected combinations of the following conditions:

|                               |                  |
|-------------------------------|------------------|
| Temperature range             | 5 °C to 40 °C    |
| Primary power input voltage   | 240 V $\pm$ 10 % |
| Primary power input frequency | 48 Hz to 52 Hz   |

Compliance shall be checked by the test described in **C.1**.

**4.2.2 Output signal power.** The output power of each signal state  $F_A$  and  $F_Z$ , when the STT is connected to a 600  $\Omega$  non-reactive load, shall meet one of the following requirements:

- a) the output signal power shall be  $-13^{+0}_{-1}$  dBm; or
- b) the output signal power shall be  $-13 \pm 1$  dBm and the difference in output power levels between continuous  $F_A$  and  $F_Z$  signals shall be not greater than 1 dB.

Compliance shall be checked by the test described in **C.2**.

NOTE Requirement b) will be withdrawn from this standard on 31 July 1984.

**4.2.3 Transmitter distortion.** The degree of gross start/stop distortion of transmitted signals measured at the output of the test reference modem shall not exceed 10 %.

Compliance shall be checked by the test described in **C.3**.

NOTE The value of 10 % assumes that the transmitter distortion excluding the STT modem is 5 % maximum in accordance with CCITT Recommendation S.3:1981.

## 4.2.4 Spectral power limits

NOTE The spectral power limits are measured with a peak reading selective signal analyser calibrated in the r.m.s. power of a sinusoidal signal.

**4.2.4.1** The transverse component of the output signal appearing between pins 1 and 6 of the STT plug shall not exceed the limits given in Table 2 (see also Figure 1) when the STT is connected to a 600  $\Omega$  balanced resistive load and when ITA No. 2 combination 15 (letter O) is transmitted continuously at 50 baud.

Compliance shall be checked by the test described in **C.4.3**.

NOTE Wetting current is not required for this test.

**4.2.4.2** When the STT is connected to the circuit shown in Figure 2, the power level of individual spectral components of any longitudinal component of the output signal shall not exceed  $-59$  dBm at frequencies from 200 Hz to 15 kHz, and  $-70$  dBm at frequencies from 28 kHz to 10 MHz. At frequencies between 15 kHz and 28 kHz the power level shall not exceed a value determined by logarithmic interpolation of the frequency between  $-59$  dBm at 15 kHz and  $-70$  dBm at 28 kHz (see Figure 3).

Compliance shall be checked by the test described in **C.4.4**.

NOTE Wetting current is not required for this test.

**Table 2 — Spectral power limits**

| Frequency range               | Power limit                                                                                                          | Bandwidth of measurement |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------|
| Below 100 Hz                  | $-33$ dBm                                                                                                            | 10 Hz                    |
| Between 100 Hz and 200 Hz     | $-23$ dBm                                                                                                            | 10 Hz                    |
| Above 200 Hz up to 3 200 Hz   | $-13$ dBm <sup>a</sup>                                                                                               | 10 Hz                    |
| Above 3 200 Hz up to 3 400 Hz | $-23$ dBm                                                                                                            | 10 Hz                    |
| Above 3 400 Hz up to 5 100 Hz | A value determined by logarithmic interpolation of frequency between $-33$ dBm at 3 400 Hz and $-40$ dBm at 5 100 Hz | 10 Hz                    |
| Above 5 100 Hz up to 8 900 Hz | $-40$ dBm                                                                                                            | 10 Hz                    |
| Above 8 900 Hz up to 50 kHz   | A value determined by logarithmic interpolation of frequency between $-40$ dBm at 8 900 Hz and $-70$ dBm at 50 kHz   | 300 Hz                   |
| Above 50 kHz up to 10 MHz     | $-70$ dBm                                                                                                            | 3 kHz                    |

<sup>a</sup> A power limit of  $-12$  dBm for output signal power is permissible until 31 July 1984 (see **4.2.2**).

### 4.3 Reception

**4.3.1 Receive frequencies.** The STT shall receive signals from the exchange via the backward signalling path and convert them into the received data stream.

NOTE The nominal backward signalling path frequencies are as follows:

$$F_Z = 980 \text{ Hz}$$

$$F_A = 1\,180 \text{ Hz}$$

The STT shall meet the requirements specified in 4.3.2 for receiver margin while operating under selected combinations of the following conditions:

|                               |                  |
|-------------------------------|------------------|
| Temperature range             | 5 °C to 40 °C    |
| Primary power input voltage   | 240 V $\pm$ 10 % |
| Primary power input frequency | 48 Hz to 52 Hz   |

**4.3.2 Receiver margin.** The receiver margin measured at the input to the test reference modem shall not be less than 35 % when  $F_A$  and  $F_Z$  are received at nominal frequencies by the STT and not less than 33 % when the received frequencies are nominal  $\pm$  6 Hz.

NOTE 1 For the purposes of determining margin the STT is judged to be receiving correctly when the error rate of the received characters is not more than one in any 1 000 characters received.

NOTE 2 The values of 33 % and 35 %, assume that the receiver margin is a minimum of 40 % in accordance with CCITT Recommendation S.3:1981.

NOTE 3 It should be noted that telex networks operating within CCITT Recommendations may provide continuous signals of character length equal to 7.25 units with occasional characters of 7.00 units (i.e. 1-unit stop element) occurring at a maximum rate of 1/s.

Compliance with the requirements of 4.3.1 and 4.3.2 shall be checked by the tests described in C.5.1.

#### 4.3.3 Received signal level

**4.3.3.1** When the received signal level is  $-43$  dBm or greater, and remains so for a period of 20 ms or more, the STT shall correctly interpret the line condition as either  $F_A$  or  $F_Z$  (the “clamp off” condition).

**4.3.3.2** When the received signal level falls to  $-48$  dBm or less and remains so for a period of 20 ms or more, the STT shall interpret the line condition as  $F_A$  (the “clamp on” condition).

**4.3.3.3** When the received signal falls to within the range  $-43$  dBm to  $-48$  dBm the STT shall either correctly interpret the line condition, or interpret the line condition as  $F_A$ .

A detector with a minimum 2 dB hysteresis between clamp on/off and clamp off/on shall be provided. It shall respond to the total power contained within the nominal spectrum of the received line signal.

When the level of the received signal falls to or below the level at which the STT clamps to  $F_A$  (clamp on threshold) and remains at or below that level for 20 ms or more the STT shall clamp on. It shall remain in the  $F_A$  condition until the signal level has increased by at least 2 dB above the  $F_A$  clamping level for 20 ms or more when the clamp shall be removed.

**4.3.3.4** The clamp shall not respond to signal level changes as specified in 4.3.3.1 to 4.3.3.3 inclusive persisting for less than 10 ms. However, character corruption is permitted.

**4.3.3.5** Compliance with the requirements of 4.3.3.1 to 4.3.3.4 shall be checked by the test described in C.5.2.

NOTE Wetting current is not required for this test and a 600  $\Omega$  termination is used.

### 4.4 Line interface

**4.4.1 General.** The requirements of 4.4.2 shall be met when the interface with the STT is carrying d.c. wetting current in the range 5 mA to 15 mA of either polarity.

NOTE The BT wetting battery is earthed to positive at the public telex exchange.

#### 4.4.2 Termination impedance

**4.4.2.1 Nominal impedance and d.c. resistance.** The line interface of the STT shall be balanced and shall present a nominal impedance of 600  $\Omega$  at frequencies between 300 Hz and 3 400 Hz. The d.c. resistance of the termination shall not be greater than 60  $\Omega$ .

Compliance shall be checked by measurement using a d.c. wetting current of 5 mA and 15 mA.

**4.4.2.2 Return loss.** The return loss shall be not less than 14 dB with respect to a 600  $\Omega$  resistive load at all frequencies between 300 Hz and 3 400 Hz.

Compliance shall be checked by the test described in C.6.1.

**4.4.2.3 Apparatus balance about earth.** The impedance balance about earth shall be not less than 46 dB at all frequencies between 300 Hz and 3 400 Hz.

Compliance shall be checked by measurement of longitudinal and transverse conversion losses by the tests described in C.6.2.1 and C.6.2.2 respectively.

## 5 Technical signal characteristics

NOTE The requirements of 5.1 to 5.10 inclusive apply to both STT types 1 and 2 except where otherwise specified in this clause.

### 5.1 Signalling

**5.1.1 Keyboard selection.** Keyboard selection signals shall consist of a number of ITA No. 2 characters (see 5.1.2).

NOTE The use of the term “keyboard selection” is a generic term which does not bar selection signals in ITA No. 2 which are not controlled by the keyboard at the time of selection.

### 5.1.2 Telegraph characters

**5.1.2.1** Telegraph characters transmitted and received while setting up, sending or receiving a call shall conform to ITA No. 2 as given in Appendix A. Compliance shall be checked by the tests described in **D.1.1**.

**5.1.2.2** The STT shall be capable of receiving 69 printing or spacing characters without the local introduction of a new line sequence.

Compliance shall be checked by the test described in **D.1.2**.

**5.1.2.3** Where an STT is provided with storage facilities, a WRU signal shall be automatically deleted from any retransmission of the stored message.

Compliance shall be checked by the test described in **D.1.3**.

**5.1.3 Modulation rate.** The STT shall have a start/stop transmitting cycle with a mean modulation rate of 50 baud at  $\pm 0.1\%$ . The duration of each transmitting cycle shall be at least 7.4 units with a start element of one unit, five code elements of one unit each, and a stop element of at least 1.4 units (preferably 1.5 units).

Compliance shall be checked by the test described in **D.1.4**.

## 5.2 Telex control and supervisory signals

**5.2.1 Subscriber absent.** For each provided condition indicating that the STT is out of service the transmitted signal power to line shall not exceed  $-50$  dBm over the range 300 Hz to 3 400 Hz.

NOTE The telex exchange will interpret this as an ABS (absent condition).

The conditions causing the STT to give a subscriber absent indication shall be included in the information provided in the instructions for use [see clause 8 a)].

Compliance shall be checked by the test described in **D.2**.

**5.2.2 Free line condition.** When the STT is in service and disengaged, it shall transmit  $F_A$  on the FSP and shall be able to receive from the telex exchange  $F_A$  on the BSP.

Compliance shall be checked by inspection during the appropriate tests described in Appendix D.

## 5.3 Outgoing calls from the STT

**5.3.1 Call request signal.** To initiate a call the  $F_A$  state on the FSP shall be replaced by  $F_Z$ . A call shall not be initiated unless:

- a) the terminal is in the free line condition; and

- b) at least 260 ms has elapsed after restoring the free line condition following an out-of-service period; and

- c) at least 1 s has elapsed after the start of an incoming or an outgoing clear confirmation.

NOTE A change from  $F_A$  to  $F_Z$  of less than 50 ms will not be recognized as a call request signal by the exchange.

Compliance shall be checked by the tests described in **D.3.1**.

**5.3.2 Repeat calling.** For an STT with automatic repeat call facility, the repeat call rates shall not exceed those given in Appendix E.

Compliance shall be checked by the test described in **D.3.2**.

## 5.4 Proceed to select (PTS) signal

### 5.4.1 General

NOTE 1 The PTS signal is sent by the exchange on the BSP in response to a call request signal from the STT.

Periods of  $F_Z$  lasting 20 ms or less shall not be recognized as a PTS signal.

Compliance shall be checked by the test described in **D.4.1**.

NOTE 2 The delay between commencement of the call request from the STT and the receipt of the start of the PTS signal will not normally exceed 5 s.

### 5.4.2 PTS: STT type 1

NOTE A PTS signal from an electromechanical exchange is a change to  $F_Z$  lasting between 25 ms and 500 ms followed by  $F_A$ .

When an STT type 1 receives a PTS signal it shall:

- a) enable the dial pulse transmitter in such a way that only dial pulses can be transmitted by the STT; and
- b) on non-automatic machines, indicate the PTS to the operator within 1 s of the commencement of the PTS pulse.

Compliance shall be checked by the test described in **D.4.2**.

### 5.4.3 PTS: STT type 2

NOTE 1 A PTS signal from an SPC exchange is a change to  $F_Z$  on the BSP lasting for at least 500 ms. Two options are available after the start of the PTS signal as specified in **5.4.3.1** and **5.4.3.2**.

NOTE 2 Normally the STT should receive, within a period of 5 s from the start of the PTS signal a commence selection character sequence (CSCS) in ITA No. 2 consisting of the following ITA No. 2 combinations:

27 28 30 3 27 28 30  
(CR LF FS : CR LF FS)

When optional exchange facilities such as call re-directed (RDI) or pre-recorded message activated (PRM) are subscribed to, the CSCS will be preceded by a non-clearing message combined with a CSCS to remind users that the facilities are in use. The message will be in the format:

27 28 29 18 4 9 27 28 30 3 27 28 30  
(CR LF LS R D I CR LF FS : CR LF FS)

The message will normally commence within 5 s from the start of the PTS signal.

**5.4.3.1** When an STT type 2 receives a PTS signal it shall:

- a) correctly receive the CSCS or facility message where applicable; and
- b) on non-automatic machines, present the character sequence operationally; and
- c) on non-automatic machines, indicate the PTS to the operator within 1 s from the end of the 500 ms period.

If for any reason a CSCS is not received and this is not due to an incoming call, an automatic STT shall clear the call attempt. The manufacturer shall state the clearing time [see clause 9 l)].

Compliance shall be checked by the tests described in **D.4.3.1** and **D.4.3.2**.

**NOTE** To avoid corruption of the CSCS it is recommended that outgoing selection should not be commenced until the CSCS has been received.

**5.4.3.2** If the line, by prior agreement with BT, has been arranged not to transmit the CSCS, the STT shall commence the outgoing selection sequence in accordance with **5.5.2** without the need to await CSCS.

Compliance shall be checked by the test described in **D.4.3.3**.

**NOTE 1** If facilities such as RDI or PRM are adopted then service messages as detailed in note 2 of **5.4.3** will not be received.

**NOTE 2** Whether the STT is arranged to receive or not receive the CSCS will be included in information to be provided by the supplier for testing purposes [see clause 9 j)].

**5.4.4** *No PTS after call request.* Where an automatic call origination is employed, if no PTS signal is received within 5 s from the commencement of the call request from the STT, the STT shall revert to the free line condition.

Not more than two additional call attempts shall be made, each new call being separated by at least 20 s from the previous clear. If further call attempt sequences are repeated, they shall be at not less than hourly intervals. If the STT is unable to establish a call at the last attempt, the call attempt shall be abandoned and an appropriate fault report given.

Compliance shall be checked by the test described in **D.4.4**.

**NOTE** For a manual machine the call clear, should PTS not be received, may be under operator control.

## 5.5 Selection

### 5.5.1 STT type 1 (Electromechanical exchanges)

**NOTE** The requirements of **5.5.1.1** to **5.5.1.5** inclusive refer to times measured at the d.c. output of the test modem.

**5.5.1.1** The output of an STT type 1 shall continue as  $F_Z$  during the period the terminal is not transmitting dial pulses to line.

**5.5.1.2** Dial pulses shall be transmitted as pulse trains of  $F_A$  for 60 ms nominal duration separated by 40 ms nominal duration of  $F_Z$ . The number of pulses in each train shall be equal to the digit dialled with 0 (zero) consisting of ten pulses of  $F_A$ .

**5.5.1.3** The ratio of the duration of  $F_Z$  to  $F_A$  shall be  $1 : 1.5^{+0.3}_{-0.2}$ .

**5.5.1.4** The rate of pulsing shall be  $10 \pm 1$  pulses per second.

**5.5.1.5** The pulse trains shall be separated by an inter-digit pause of not less than 720 ms. For an STT with automatic dialling the inter-digit pause shall, in addition, be not greater than 880 ms.

**5.5.1.6** For automatic machines the first dial pulse shall be transmitted within the period 1 s to 12 s after the start of the PTS signal.

Compliance of **5.5.1.1** to **5.5.1.6** shall be checked by the test described in **D.5.1**.

**NOTE 1** In all cases, the exchange may initiate disconnection procedures if the first dial pulse is not received within 12 s of the commencement of the PTS signal. It is preferable that the first dial pulse is transmitted as close as possible to 1 s after the start of the PTS signal.

**NOTE 2** For manual machines, the time to transmission of the first dial pulse is under operator control.

**5.5.1.7** A forced release signal received on the BSP shall be accepted by the STT and shall result in the transmission of a clear confirmation signal (**2.2.14**) by the STT.

**NOTE 1** The forced release signal is 150 ms to 300 ms of  $F_Z$  on the BSP followed by a clear signal (see **2.2.13**) and will occur between 12 s and 24 s after the PTS signal. It is sent by the telex exchange if the STT fails to transmit dialling pulses.

**NOTE 2** For intercontinental calls a forced release signal will be received if the STT fails to transmit and maintain transmission of second phase keyboard selection characters. It will occur if the first selection character is not input within 5 s of the STT receiving key (+) or if the delay between selection characters exceeds 5 s.

Compliance shall be checked by the test described in **D.5.2**.

**5.5.2 STT type 2 (SPC exchanges).** On recognition of the PTS or CSCS (see **5.4.3**) an STT type 2 shall enable the transmission of any combination of keyboard selection characters complying with **5.1**.

Automatic machines shall start to send selection characters within 5.5 s of the start of PTS or CSCS and have to complete selection within the time constraints described in notes 2 and 4.

Compliance shall be checked by the test described in **D.5.3**.

**NOTE 1** The selection sequence and its associated terminology is defined in the operating formats published by BT in the telex directory and/or operating manuals.

A typical selection sequence format will be as follows:

- a) prefix character (FS);

followed by:

- b) selection information followed by end of selection signal (+).

NOTE 2 If the time between reception of CSCS and the transmission of the first selection character or the time between successive selection characters exceeds 10 s, the exchange will send a clear signal which may be preceded by the service signal NP.

NOTE 3 If the STT type 2 allows a period of time greater than 30 s to elapse between:

a) receipt of the CSCS (or, if this is not transmitted, the PTS), and the transmission of the end of address signal or the end of the first address separator; and

b) transmission of an address separator and transmission of subsequent address separators or the end of selection signal; then the SPC exchange may detect that the call selection sequence has failed. The service signal text consisting of ITA No. 2 code combination characters:

27 28 29 14 16 29 27 28

(CR LF LS N P LS CR LF

followed by the clearing signal will then be transmitted by the SPC exchange to the STT.

NOTE 4 If the STT type 2 allows a period of time greater than 10 s to elapse between the transmission to the SPC exchange of an address separator and ITA No. 2 combination 30 (FS) representing the start of the next address in a multiple entry keyboard selection, the SPC exchange may determine that the call selection sequence has failed and will transmit the service and call clear signals as described in note 3.

## 5.6 Post selection responses

### 5.6.1 Call connect

5.6.1.1 An automatic STT shall wait for a call connected signal, (see notes 1 to 3) an answerback, or a service signal for a period, measured from the end of selection sequence, of not less than:

a) 35 s for inland calls;

b) 95 s for continental and intercontinental calls.

but shall initiate call clearing within 125 s if no call connected signal, answerback or service signal is received.

Compliance shall be checked by the tests described in D.6.1.2 to D.6.1.8 inclusive.

5.6.1.2 An STT type 1 shall respond to the receipt of a call connected signal (see notes 1 and 2) by inhibiting the dial pulse transmitter and by connecting the message transmission and reception devices to the FSP and BSP respectively. This response shall occur within 65 ms of the start of the call connected signal.

Compliance shall be checked by the test described in D.6.1.

#### Notes to 5.6.1.1 and 5.6.1.2

NOTE 1 A call connected signal from an electromechanical exchange is an inversion of  $F_A$  to  $F_Z$  on the BSP that exists for at least 400 ms. It should be received by the STT within 35 s of the end of the last dial pulse on inland calls. It will be followed by telegraph characters culminating in an answerback. The answerback may be followed by combinations of characters representing facilities, etc.

For continental calls the delay between the end of the last dial pulse and the call connected signal will be a maximum of 95 s. Alternatively, if the call is unsuccessful, no call connected signal is transmitted by the exchange and service signals should be received. Service signals are normally followed by a call clear (see 5.8.1).

Certain service signals which indicate connection is waiting for an answer, e.g. MOM, are not followed by a call clear.

NOTE 2 For intercontinental calls from an STT type 1 the call connected signal will be followed by a sequence of ITA No. 2 characters terminating in combinations 30 and 4 (WRU).

After transmission of the STT's answerback, combinations 27 28 29 11 5 25 30 26 (key +) will be received.

Second phase keyboard selection digits, commencing with figure shift, may then be entered, terminating with the end of selection character which is given in the telex directory. (At the time of publication, the end of selection character is combination 26 (+).). Within 95 s of transmitting the end of selection character an answerback or service signal should be received.

NOTE 3 No call connected signal will be received by an STT type 2 as the BSP at that terminal will already be at  $F_Z$ . The STT should receive an answerback or a service signal within 35 s of the end of selection character on inland calls and within 95 s on continental or intercontinental calls.

5.6.2 *Network responses following selection but before call connect, answerback or a service signal is received.* If various printing or non-printing characters are returned by certain administrations following selection, but before call connect, answerback or service signals, then an automatic STT shall maintain the connection in response to such signals until satisfactory call connection is achieved, or until a signal failure occurs when the call shall be cleared in accordance with 5.6.1.

Compliance shall be checked by the test described in D.6.2.

5.6.3 *AUTO RETRY by network.* An automatic STT shall maintain the connection if the AUTO RETRY service signal sequence is received. When such a signal is received any call time-outs shall be reset to zero and restarted. The STT shall clear the connection if the link has not been established by the time the relevant time-out given in notes 1 to 3 of 5.6.1 and 5.6.2 has been reached.

Compliance shall be checked by the test described in D.6.3.

NOTE The format of AUTO RETRY message is:

27 28 29 Service signal text 27 28 29

AUTO 31 RETRY 29 27 28

(CR LF LS Service signal text CR LF LS

AUTO SP RETRY LS CR LF)

Failure to establish a call is subsequently signalled by:

27 28 29 Service signal text 27 28 29 RETRY 31

(CR LF LS Service signal text CR LF LS RETRY SP

ENDS 29 27 28 Clearing signal

ENDS LS CR LF Clearing signal)

## 5.7 Message transmission

5.7.1 The STT shall be ready to transmit signals after the answerback is received from the distant terminal.

NOTE 1 Compliance will have been checked previously during checks for the requirements of 5.6.1 by the tests described in D.6.1.1 and D.6.1.4 to D.6.1.8 inclusive.

NOTE 2 Because of possible sequences, e.g. date/time, WRU, following reception of answerback it is recommended that automatic transmission of the STT's answerback does not commence within 7 s of reception of the answerback or after receipt of WRU whichever is the sooner.

**5.7.2** When connection is established but messages are not being transmitted the STT shall provide continuous  $F_Z$  on the FSP.

Compliance shall be checked by the test described in **D.7.1**.

**5.7.3** The STT shall be capable of receiving characters while it is transmitting.

NOTE The printing of these characters may become corrupted. Compliance shall be checked by the test described in **D.7.2**.

**5.7.4** During an outgoing automatic transmission, except transmissions from automatic answerback devices, the STT shall halt transmission when a number of incoming characters are detected on the BSP. At least two characters shall be detected within 1 s of each other before transmission of that message is abandoned. If one incoming character or spurious pulse exceeding 10 ms is detected the STT may halt transmission but shall resume sending without corruption within 1 s if no further incoming characters are detected. Where transmission of the message is abandoned a suitable alarm shall be raised.

NOTE 1 Although not a requirement in the case of automatic answerback devices, this mode of operation may also be applied. Compliance shall be checked by the test described in **D.7.3**.

NOTE 2 It is advised that an STT should clear the call if no further action is taken by either end of the link within 2 min.

## 5.8 Clearing an established call

**5.8.1 Clear signal.** A clear signal (see **2.2.13**) shall be sent from the STT on the FSP when it is required to clear from the STT.

NOTE When the exchange initiates a clear, a clear signal is sent from the exchange on the BSP.

**5.8.2 Clear confirmation signal.** A clear confirmation signal (see **2.2.14**) shall be sent from the STT on the FSP as a response to an incoming clear from the exchange.

NOTE A clear confirmation signal sent from the exchange on the BSP is in response to an outgoing clear from the STT.

**5.8.3 Clearing from the local end (STT).** To clear a call,  $F_A$  shall be connected to the FSP and maintained until correct receipt of clear confirmation.

NOTE 1 This requirement does not preclude the use of manual controls.

The STT shall monitor the BSP and when it recognizes a clear confirmation signal (see **5.8.2**), it shall revert to the free line condition (see **5.2.2**).

NOTE 2 The normal maximum time between the application of the  $F_A$  clear signal on the FSP, and the receipt of the clear confirmation signal  $F_A$  on the BSP is 1.5 s for an outgoing call and 3.1 s for an incoming call.

NOTE 3 At the customer's option SPC exchanges can provide the following facilities:

- a) call units statement (CUS);
- b) message separation.

These options, if taken, will delay the clear confirmation signal (**5.8.2**) (see note 1) by a further 3.3 s and 3.0 s respectively. The sequence for CUS is CR LF FS N1 N2 N3 N4 SP LS UNIT SP CHARGE CR LF FS.

The sequence for message separation is 20 consecutive line feed signals.

Where these options are adopted the STT should receive and associate this information with the local record of the call.

NOTE 4 It is recommended that an alarm is raised and/or a fault is logged if clear confirmation is not received within the appropriate time.

## 5.8.4 Clearing from the exchange

NOTE 1 To clear a call from the exchange,  $F_Z$  on the BSP will be replaced by a clear signal.

When the STT recognizes a clear signal (see **5.8.1**) it shall respond by sending a clear confirmation signal (see **5.8.2**) on the FSP and reverting to the free line condition (see **5.2.2**). The clear confirmation signal shall be connected to the FSP within the period of 400 ms to 1 500 ms from the beginning of the clear signal received from the exchange.

Compliance with **5.8.1** to **5.8.4** shall be checked by the tests described in **D.8**.

NOTE 2 Note 3 of **5.8.3** also applies to this subclause.

## 5.9 Answerback and WRU signals

**5.9.1 Answerback code.** Except as described in **5.9.1**, the means of insertion or adjustment of the answerback code shall be:

- a) operated only after the release of software locks requiring skills and detailed knowledge that are not made available to the user of the terminal apparatus by means of operating instructions or otherwise, in any circumstances [see clause 8 e)]; or
- b) operated only after the release of mechanical locks or latches requiring skills and detailed knowledge or special tools that are not made available to the user of the terminal apparatus.

Compliance shall be checked by inspection.

NOTE The answerback code is the STT identification code and is composed of a unique series of 20 ITA No. 2 code characters issued to the STT user [see clause 8 e)] by British Telecommunications.

**5.9.2 More than one answerback.** The STT may be capable of holding more than one answerback, but each shall be protected as specified in **5.9.1**.

NOTE The means of selecting the required answerbacks may be accessible to the user [see clause 8 e)].

**5.9.3 Automatic STT.** An automatic STT shall not automatically transmit WRU following the transmission of its answerback code.

Compliance shall be checked by inspection.

**5.9.4 Response to WRU (Who are you).** The STT shall respond to the WRU signal ITA No. 2 combinations (30 4) (FS D) (see Appendix A) by transmitting its answerback code commencing within 150 ms to 600 ms of the start of combination 4 of the WRU. Under no circumstances shall any other transmission take place as a consequence of receiving the WRU signal other than that of the authorized answerback sequence.

Compliance shall be checked by the test described in **D.9**.

In the case of multiple answerbacks (**5.9.2**), compliance shall be checked by the test described in **D.9** for each answerback available.

## 5.10 Incoming call

NOTE At the start of an incoming call the BSP will change from the  $F_A$  state to the  $F_Z$  state.

### 5.10.1 General response to incoming calls

**5.10.1.1** Periods of  $F_Z$  on the BSP of less than 20 ms shall not be recognized as an incoming call.

Compliance shall be checked by the test described in **D.10.1**.

**5.10.1.2** An incoming message shall be printed directly and/or recorded via a storage facility. Where the incoming message is not printed immediately the conditions specified in **5.10.1.3** to **5.10.1.5** shall apply.

Compliance shall be checked by inspection.

**5.10.1.3** When the STT preserves messages in any volatile store, it shall be able to do so for a minimum period of 80 h irrespective of whether the power supply is connected or not during this period, after the mains power has been applied continuously for a period of at least 8 h.

Compliance shall be checked by the test described in **D.10.2**.

**5.10.1.4** The STT shall be able to print the text of the stored message in the exact form in which it was received.

Compliance shall be checked by inspection.

**5.10.1.5** Should the store become full during reception of a message, the STT shall respond in such a manner that the whole message is recorded correctly except as specified in **5.11.3**.

Compliance shall be checked by the test described in **D.10.3**.

**5.10.2 Incoming call while STT in free line condition.** To accept an incoming call the  $F_A$  state on the FSP shall be replaced by  $F_Z$  within 400 ms of the start of  $F_Z$  state on the BSP. The STT shall be able to respond to incoming ITA No. 2 characters immediately  $F_Z$  is applied to the FSP.

Compliance shall be checked by the test described in **D.10.4**.

### 5.10.3 Incoming call while STT working "in local"

**5.10.3.1** When the STT is working "in local", priority shall be given to incoming calls. The STT shall not return a call connected signal to the exchange in response to an  $F_Z$  signal on the BSP until it is ready to receive the incoming call.

Compliance shall be checked during the tests for **5.10.3.2** or **5.10.3.3** as appropriate, as described in **D.10.5.1** or **D.10.5.2**.

NOTE If a STT remains "in local", the exchange will automatically transmit a WRU signal within 2.2 s to 5.0 s after the start of the incoming  $F_Z$  signal.

**5.10.3.2** Where an STT is not arranged to avoid interruption of local message preparation, it shall accept an incoming call within 2 s of the BSP changing from  $F_A$  to  $F_Z$ . The last local character prior to cut off shall be correctly recorded.

Compliance shall be checked by the test described in **D.10.5.1**.

**5.10.3.3** Where an STT is arranged to avoid interruption of local message preparation, it shall correctly respond to the incoming call (A/B etc.) within 2 s. It may store and/or print out the incoming message without interrupting local working and shall indicate by means of a suitable alarm that there is an incoming message awaiting attention.

Compliance shall be checked by the test described in **D.10.5.2**.

### 5.10.4 Incoming call while the STT is attempting to make an outgoing call

**5.10.4.1 STT type 1.** If the  $F_Z$  returned on the BSP has not reverted to  $F_A$  after 550 ms (PTS pulse), the STT shall abandon the outgoing call and make itself immediately ready to receive the incoming call.

Compliance shall be checked by the test described in **D.10.6.1**.

**5.10.4.2 STT type 2 with CSCS option.** If the first character received on the BSP is a FS (i.e. beginning of WRU) the outgoing call shall be abandoned and the STT shall attempt to accept the incoming call by responding to WRU (see **5.9.4**).

Compliance shall be checked by the test described in **D.10.6.2**.

**5.10.4.3 STT type 2 without CSCS option.** During an outgoing call the BSP shall be monitored. If within 2.5 s of the BSP inversion to  $F_Z$  a FS (combination 30) is received on the BSP the outgoing call shall be abandoned and the STT shall attempt to accept the incoming call by respondint to WRU (see **5.9.4**).

Compliance shall be checked by the test described in **D.10.6.3**.

#### 5.11 Paper low or paper out/storage full

**5.11.1** If a paper low indication is fitted, a paper low indication occurring at any time during an incoming or outgoing call shall not cause call clear.

Compliance shall be checked by inspection.

**5.11.2** If, after the STT reverts to the free line condition, it is found that the paper low alarm is activated or a paper out condition occurs, the STT shall apply the “subscriber absent” condition as specified in **5.2.1** except where the requirements specified in **5.11.3** apply.

Compliance shall be checked during the test for **5.2.1** (see **D.2**).

**5.11.3** If an STT is provided with storage facilities and a paper low or paper out condition occurs it may continue to receive or transmit calls but the “subscriber absent” condition shall be applied when or before the store reaches the full condition.

Compliance shall be checked by inspection during the test described in **D.2**.

## 6 Reliability

**6.1 Answerback corruption.** The STT shall be interrogated for and respond with its answerback 5 000 times consecutively without error.

Compliance shall be checked by the test described in **F.1**.

**6.2 Drop test.** The STT shall show no damage that prevents it from complying with BS 6301:1982 after being tested in accordance with the tests described in **F.2**.

**6.3 Vibration test.** The STT shall show no damage that prevents it from complying with BS 6301:1982 after being tested in accordance with the test described in **F.3**.

**6.4 Impact test.** The STT shall show no damage that prevents it from complying with BS 6301:1982 after being tested in accordance with the test described in **F.4**.

## 7 Marking

**7.1** The STT shall be marked with the supplier's or manufacturer's name or identification mark and model number or type reference.

**7.2** The STT shall be marked with a statement that the STT conforms to BS 6403:1983<sup>1)</sup> type 1 and/or type 2. (See clause 1.)

<sup>1)</sup> Marking BS 6403:1983 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with the requirements of the standard. Attention is drawn to the approvals procedure, under Section 16(1) of the British Telecommunications Act, 1981, given in the foreword.

**7.3** The marking shall be indelible, legible and easily discernible on the apparatus.

Compliance shall be checked by inspection and by rubbing the marking lightly, first for 15 s with a piece of cloth soaked in water, and then for 15 s with a piece of cloth soaked in petroleum spirit.

The marking shall still be legible at the conclusion of the test. Adhesive labels, where used, shall not have worked loose or become curled at the edges.

## 8 Instructions for use

Instructions for use shall be supplied with the STT. The instructions shall be written in English and shall include the following information.

- a) A description of the functions provided by the STT.
- b) A statement of the BT circuits to which the apparatus is suitable for connection.
- c) A repeat of the information required in **7.1**.
- d) A statement informing the user whether the STT is configured as a BS 6403 type 1 or type 2 and whether conversion of the STT is possible and where conversion can be carried out accompanied by a warning of the possible need to change the signalling type if the machine is moved or if BT replace a type 1 exchange with a type 2 exchange.
- e) A statement warning the user that:
  - 1) he is responsible for ensuring that the STT is equipped with the answerback or answerbacks agreed with BT for the circuit(s) to which the STT may be connected; and
  - 2) he shall not insert or change the answerback(s) himself, but shall approach the STT supplier, or his agent, for this work to be undertaken. If an STT is capable of holding more than one answerback, only those answerbacks agreed with BT may be inserted. The means of selecting the required answerback may be accessible to the user.

## 9 Information to be provided by the supplier for testing purposes

The supplier shall provide for testing purposes the following information where applicable.

- a) How to obtain outputs of steady  $F_A$  and  $F_Z$ .
- b) Conditions generating subscriber absent (see **5.2.1**).