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SERIES V: DATA COMMUNICATION OVER THE TELEPHONE NETWORK

Interfaces and voiceband modems

Operational and interworking requirements for DCEs operating in the text telephone mode

ITU-T Recommendation V.18

(Formerly CCITT Recommendation)

ITU-T V-SERIES RECOMMENDATIONS

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ITU-T Recommendation V.18

Operational and interworking requirements for DCEs operating in the text telephone mode

Summary

This Recommendation describes modem procedures to follow for automatic interworking with text telephones. Text telephones use various modem technologies. This Recommendation specifies the signal analysis, signal transmission and logic needed to determine what kind of text telephone there is on a connection. It also specifies the actions needed to communicate in the mode supported by each terminal type.

This Recommendation is intended for use in text telephones, in interworking units, in text relay services, in emergency centres, and in computers to be used for text telephony in the PSTN.

This Recommendation specifies transmission of identification signals to determine when the connection is between two V.18-equipped terminals. For that case, ITU-T V.21 is the default modulation used. For interworking in text conversation between humans, not only the modulation must be specified. Therefore, this Recommendation specifies that when the connection in V.18 mode is established, the presentation protocol specified in ITU-T T.140 should be used, including an internationally useful character set.

The text telephone types supported by this Recommendation are: EDT, 5-bit (or Baudot), DTMF, V.21, V.23, Bell 103 and V.18-based devices.

In originate mode, V.18 identification signals and V.23 stimulation signals are transmitted until a recognized text telephone signal is received and connection can be established in that mode.

In answer mode, this Recommendation specifies stimulation to connection by transmission of probing signals for the different kinds of text telephones while monitoring for text telephone signals. Once determined, the mode of communication is entered.

For cases when it is not obvious if the connection should be made in originate or answer mode, procedures are provided to resolve that and reach communication.

An automode monitor mode is provided for cases when it is desired to have a text telephone device prepared on the same line as a voice telephone and indicate when there is an active text telephone on the connection.

For DTMF and 5-bit text telephone types using character coding not commonly used with modems, conversion is specified in this Recommendation between these codes and ITU-T T.50.

For selection between multimedia protocols and this Recommendation, and also for negotiating procedures for simultaneous voice and text, modem connection procedures based on ITU-T V.8 *bis* are provided.

Source

ITU-T Recommendation V.18 was revised by ITU-T Study Group 16 (2001-2004) and approved under the WTSA Resolution 1 procedure on 17 November 2000.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Introduction

This Recommendation was revised by ITU-T Study Group 16 (1997-2000) and was approved under the WTSC Resolution 1 procedure on 6 February 1998.

Work with version 3 of this Recommendation was initiated in February 2000 with the following goals:

1) Include all amendments collected in implementors' guides.
2) Resolution of the open question from the implementors' guide on the contents of the XCI signal. The contents is decided to be 0x"FF",0x"FF".
3) Specify full V.8 connection procedures, in order to allow smooth initiation by a receiving terminal and allow modulation negotiation (still maintaining interoperability with the "TXP" based connection procedures of earlier versions). This obsoletes large parts of Appendix III.
4) Remind about the risk for false detection of DTMF signals as textphone signals when operating in automode monitor mode.
5) Clarify that the probe list may contain 0-6 elements.
6) Move the V.8 *bis* procedures specified in Appendix III to the main body of the Recommendation.
7) The new Appendix III is dedicated to V.18 implementation text.

ITU-T Recommendation V.18

Operational and interworking requirements for DCEs operating in the text telephone mode

Background

The ITU-T,

considering

a) that text telephones place special operational needs on the use of DCEs;

b) that for historical reasons, many existing text telephones do not use V-series modulation;

c) that there is a desire to have all future GSTN text telephones employ V-series modulation;

d) that to provide a migration path from the diverse installed base, it will be necessary to provide interworking with existing text telephones;

e) that to provide for interworking, the DCE will need to convert the 5-bit character code or ITU-T Q.23 (DTMF) character set used by some existing text telephones into the 7-bit code set as given in ITU-T T.50;

f) that such character conversion in the DCE will be undertaken solely to enable interworking with existing text telephones and to impose no constraints on character sets used in future text telephones;

g) that new technology is being developed that could be used to provide additional text telephone modes,

recommends the procedure below

1 Scope

This Recommendation specifies features to be incorporated in DCEs intended for use in, or communicating with, text telephones primarily used by the deaf and hard of hearing. One of the goals of this Recommendation is to provide a platform on which a universal text telephone can be built. To accommodate this goal, procedures for interworking with identified existing text telephones are provided in clause 5. In addition, this Recommendation has the goal of identifying ways in which the multimedia Recommendations could be used to support new modes of operation or create new multi-mode text telephone devices. To accommodate this additional goal, clause 6 identifies some possible uses of this technology to support text telephony and additionally specifies requirements for multi-mode text telephone devices.

To provide for maximum flexibility, it is envisaged that any of the text telephone modes of operation specified in this Recommendation will be invoked on an as required basis using the commands specified in ITU-T V.250 or some equivalent mechanism.

It provides for:

- calling identification signals;
- no DCE-initiated disconnect;
- procedures for call establishment;
- procedures for interoperation with existing text telephones;
- specification of requirements for the use of text telephones in a multimedia environment.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

– ITU-T H.324 (1998), *Terminal for low bit-rate multimedia communication*.

– ITU-T Q.23 (1988), *Technical features of push-button telephone sets*.

– ITU-T T.50 (1992), *International Reference Alphabet (IRA) (formerly International Alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange*.

– ITU-T T.140 (1998), *Protocol for multimedia application text conversation*.

– ITU-T V.8 (2000), *Procedures for starting sessions of data transmission over the public switched telephone network*.

– ITU-T V.8 *bis* (2000), *Procedures for the identification and selection of common modes of operation between Data Circuit-terminating Equipments (DCEs) and between Data Terminal Equipments (DTEs) over the public switched telephone network and on leased point-to-point telephone-type circuits*.

– ITU-T V.21 (1988), *300 bits per second duplex modem standardized for use in the general switched telephone network*.

– ITU-T V.23 (1988), *600/1200-baud modem standardized for use in the general switched telephone network*.

– ITU-T V.25 (1996), *Automatic answering equipment and general procedures for automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls*.

– ITU-T V.61 (1996), *A simultaneous voice plus data modem, operating at a voice plus data signalling rate of 4800 bit/s, with optional automatic switching to data-only signalling rates of up to 14 400 bit/s, for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits*.

– ITU-T V.70 (1996), *Procedures for the simultaneous transmission of data and digitally encoded voice signals over the GSTN, or over a 2-wire leased point-to-point telephone type circuits*.

– ITU-T V.250 (1999), *Serial asynchronous automatic dialling and control*.

– ANSI TIA/EIA-825 (2000), *A Frequency Shift Keyed Modem for use on the Public Switched Telephone Network*.

– ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*.

3 Definitions

This Recommendation defines the following terms:

3.1 carrierless mode: A mode for communication, where signals are only present on the connection when data is being exchanged (e.g. in response to the pressing of a key on a keyboard).

3.2 carrier mode: A mode for communication, where continuous signals (i.e. carriers) are present on the connection irrespective of whether data is being exchanged or not.

3.3 CI: A signal transmitted from the originating DCE to indicate the general communications function, consisting of a repetitive sequence of bits at 300 bit/s, using modulation in accordance with the low-band channel defined in ITU-T V.21. The cadence of this shall be bursts of 4 CI sequences separated by 2 s of silence. The CI sequence for textphone is defined in ITU-T V.8.

3.4 CM: The Call Menu signal defined in ITU-T V.8.

3.5 JM: The Joint menu signal defined in ITU-T V.8.

3.6 multi-mode text telephone: A device which incorporates simultaneous voice and data in addition to conforming to clauses 4 and 5.

3.7 text telephone: A device incorporating text telephony functions.

3.8 text telephone mode: The operational mode when two devices are interconnected to provide text telephone communications.

3.9 text telephony: A telecommunications capability which supports real-time text conversation on communication networks.

3.10 TXP: A signal transmitted to allow early termination of answer tone, and also to confirm V.18 capability in the answering device. It consists of a repetitive sequence of bits at 300 bit/s modulating V.21(1) if transmitted from the originating DCE, or modulating V.21(2) if transmitted from the answering DCE. The 40-bit TXP sequence in left-to-right order of transmission is given by:

(1 1111 1111 1) (0) 0010 1011 (1) (0) 0001 1011 (1) (0) 0000 1010 (1)

where brackets enclose start and stop bits. TXP is included for compatibility with earlier versions of ITU-T V.18.

3.11 V.18 mode: The operational mode when two devices conforming to this Recommendation are interconnected to provide text telephone capability.

3.12 V.18 text telephone: A communications device conforming to the requirements of this Recommendation.

3.13 XCI: A signal transmitted in high-band V.23 modulation to stimulate V.23 terminals to respond and to allow detection of V.18 capabilities in a DCE.

The 3-s XCI signal uses the V.23 upper channel having periods of "mark" (i.e. 1300 Hz) followed by two bytes XCI marker containing the data pattern (0) 1111 1111(1)(0)1111 1111(1) sent at 1200 bit/s. The signal consists of:

– 400 ms mark;
– XCI marker;
– 800 ms mark;
– XCI marker;
– 800 ms mark;
– XCI marker;
– 800 ms mark;
– XCI marker;
– 100 ms mark.

4 Operational requirements

The DCE, when configured to support text telephone mode, shall:

1) not initiate a disconnect;

2) have the capability to be configured to automatically reassume the initial interworking state, (e.g. re-initiate the calling id signal and activate the appropriate detectors) whenever transmission has ceased for a period of 10 s (e.g. a call transfer). When this capability is not invoked, the DCE shall stay in the selected transmission mode awaiting resumption of the communication (e.g. in alternating between voice and text);

3) implement the CI signal coded as specified in this Recommendation. The use of CI is required by the calling DCE except where it is known *a priori* that the called terminal supports ITU-T V.8 *bis* (see clause 6);

4) provide call progress indications to the DTE. These signals shall include, but not be limited to: BUSY, RINGING, CARRIER, LOSS OF CARRIER and CONNECT(x) where x indicates the mode of connection (e.g. V.18, EDT, etc.);

5) implement circuit 135 – Received energy present (or its equivalent) (see Note).

NOTE – Because of the subjective nature of this indication, the operational thresholds of this circuit are left to the discretion of the implementors; however, means should be provided to prevent the presence of CI signal specified in this Recommendation from interfering with the indication of call progress signals.

5 Connecting in text telephone mode including procedures for interworking with the installed base of existing text telephones

This clause specifies procedures for connecting in text telephone mode. This includes procedures for establishing communications between two V.18 text telephones, and procedures for establishing communications between a V.18 text telephone and the existing text telephones specified in Annexes A to F. Although it is envisaged that for most connections the user will have *a priori* knowledge of the type of device being called and will preset the DCE to the correct mode, automatic procedures are provided for originating and answering calls and for connection in text mode in an established call. These procedures are provided for automoding and, where required for interworking, modulation and protocol conversion.

When a connection between two V.18 text telephones is established, the DTEs shall apply the protocols and procedures specified in Annex G.

Although the obvious functionality of a DTE operating with a V.18 DCE, is to convert all forms of text telephone operation to and from the T.140 presentation protocol, for consistent application handling, this Recommendation does not specify any such conversion because it is out of scope of this DCE related Recommendation.

Clause 6 specifies procedures for cases when V.8 *bis* is supported.

Recommended common procedures for user terminals using the V.18 DCE are specified in Appendix II.

Further background information on text telephony and the user requirements behind it can be found in the bibliography, clause 7.

5.1 Automoding originating

The following procedures assume that the DCE has been placed in the V.18 mode and that the called party is expected to be equipped with a text telephone. The procedure is defined below, and represented in Figure 1 as an aid to the reader.

5.1.1 After connecting to line, the DCE shall transmit no signal for 1 s, and then transmit V.18 identification signals starting with the CI signal as specified in this Recommendation with the ON/OFF cadence defined in clause 3. After three CI signals have been sent, the DCE shall transmit 2 s of silence followed by signal XCI. This cycle shall be repeated until terminated by one of the events described below. In summary, the transmission sequence is as follows:

Silence	1 s
CI	400 ms
Silence	2 s
CI	400 ms
Silence	2 s
CI	400 ms
Silence	2 s
XCI	3 s
Silence	1 s
CI	400 ms
Silence	2 s
etc.	

The DCE shall condition its receiver to detect the following signals:

– 2100 Hz modulated (ANSam) as defined in ITU-T V.8;
– 2100 Hz (ANS) as defined in ITU-T V.25;
– 2225 Hz;
– 1300 Hz;
– 1650 Hz;
– 1400 or 1800 Hz;
– DTMF tones;
– 980 or 1180 Hz (Note);
– 1270 Hz;
– 390 Hz (only when sending XCI).

NOTE – Care should be taken in the design of 980 and 1180 Hz detectors to prevent incorrect triggering by echoes of transmitted CI signals.

If any of the above signals are detected, the DCE shall stop transmitting. No disconnect timers shall be started.

During the transmission of the XCI signal, the DCE shall be conditioned to detect a 390 Hz signal. The detection of 390 Hz shall be disabled at other times during the above sequence.

5.1.2 If modulated 2100 Hz ANSam is detected, the V.8 connection procedures should be followed as explained in clause 6.

5.1.3 If ANS is detected, the DCE shall stop transmitting, transmit no signal for 0.5 s, and then initiate the transmission of signal TXP in V.21(1) mode. The DCE shall then monitor for 1650 Hz, 1850 Hz, 1300 Hz and loss of ANS.

5.1.3.1 When the DCE detects the absence of ANS, it shall stop transmission of signal TXP after completion of the current TXP sequence and continue to monitor for 1650 Hz and 1300 Hz.

5.1.3.2 If the DCE detects TXP in 1650 Hz/1850 Hz, it shall connect as V.18, i.e. ITU-T V.21 with the operational characteristics given in clause 4. See Annex G.

5.1.3.3 If the DCE detects 1650 Hz for ≥ 0.5 s, it shall connect as per Annex F.

5.1.3.4 If the DCE detects 1300 Hz **only** for 1.7 s, it shall connect as per Annex E, transmitting on the 75 bit/s channel.

5.1.4 If the DCE detects 2225 Hz for 0.5 s, it shall connect as per Annex D.

5.1.5 If 1650 Hz is detected for 0.5 s, the DCE shall connect as per Annex F.

5.1.6 If 1300 Hz is detected for 1.7 s, the DCE shall connect as per Annex E, transmitting on the 75 bit/s channel.

5.1.7 If 390 Hz is received during transmission of XCI and is present during the last mark period of XCI, the mark transmission shall be extended until either 3 s of 390 Hz has been detected or the 390 Hz signal ceases. If 390 Hz was detected for 3 s, the DCE shall initiate a connection as per Annex E, transmitting on the 1200 bit/s channel.

5.1.8 If a sequence of 1400 Hz or 1800 Hz FSK signals (i.e. valid 5-bit characters) are detected, the DCE shall analyse the bit duration and connect in the appropriate signalling rate as per Annex A.

5.1.9 If Dual Tone Multi-Frequency (DTMF) signals are detected, the DCE shall connect in the DTMF mode using the character conversion and the operational characteristics specified in Annex B.

5.1.10 If 980 Hz or 1180 Hz signals are detected, the DCE shall start a 2-s timer (Tr) and attempt to determine the data signalling rate of the sequence.

5.1.10.1 If the data signalling rate is 110 bit/s, the DCE shall connect as per Annex C.

5.1.10.2 If 980 Hz only is detected for 1.5 s, the DCE shall connect as per Annex F in answer mode.

5.1.10.3 If the signal ceases for 0.4 s or timer Tr expires, the DCE shall return to monitoring, as specified in 5.1.1.

5.1.11 If 1270 Hz is detected for 0.7 s, the DCE shall connect as per Annex D in answer mode.

5.2 Automoding answering

5.2.1 When in the answer mode, the DCE shall connect to the line and condition its receiver to detect:

– V.23 high-band signals;
– 1300 Hz;
– 1400 Hz or 1800 Hz;
– DTMF tones;
– 980 Hz or 1180 Hz;
– signal CI;
– 2100 Hz;
– Modulated 2100 Hz according to ANSam specification in ITU-T V.8;
– 1270 Hz;
– 2225 Hz;
– 1650 Hz.

The 3-s timer Ta shall be started. No disconnect timers shall be started. The procedures are defined below, and are provided in Figures 2a and 2b as an aid to the reader.

5.2.2 If signal CI coded for text telephone is detected, or XCI marker in signal XCI (as described in 3.13) is detected, the DCE shall initiate transmission of answer tone, ANSam, as defined in ITU-T V.8, monitor for signals CM and TXP and start a 3-s timer (Tt).

5.2.2.1 If V.8 signal CM is detected, the V.8 procedures shall be entered to determine which call function and modulation to use. See clause 6 and Annex G.

5.2.2.2 If signal TXP is detected, the DCE shall transmit no signal for 75 ± 5 ms, transmit 3 TXP sequences in V.21(2) mode, and then proceed as V.18 (i.e. ITU-T V.21 with the operational requirements specified in clause 4). See Annex G.

5.2.2.3 If Tt expires, the DCE shall return to monitoring, as specified in 5.2.1.

5.2.3 If 2100 Hz is detected for 0.7 s, the DCE shall continue to monitor for 980 Hz, 1300 Hz or 1650 Hz.

5.2.3.1 If 980 Hz is detected for 0.4 s, the DCE shall connect as per Annex F in answer mode.

5.2.3.2 If 1300 Hz is detected for 1.7 s, the DCE shall connect as per Annex E, transmitting on the 75 bit/s channel.

5.2.3.3 If 1650 Hz is detected for 0.4 s, the DCE shall connect as per Annex F in the calling mode.

5.2.4 If 980 Hz is detected, the DCE shall start a 2.7-s timer Te and monitor for 1650 Hz, 980 Hz and 1180 Hz.

5.2.4.1 If 1650 Hz is detected for 0.4 s, the DCE shall connect as per Annex F in the calling mode.

5.2.4.2 If a V.25 calling tone consisting of 980 Hz **only** for more than 470 ms but less than 730 ms is detected and followed by 1 s of silence, the DCE shall enter probing state as specified in 5.2.12.

5.2.4.3 If 980 Hz only is detected for 1.5 s, the DCE shall connect as per Annex F in answer mode.

5.2.4.4 If a low-channel V.21-modulated signal is detected, the DCE shall start a 2-s timer (Tr) and attempt to determine the data signalling rate of the data sequence.

5.2.4.4.1 If the data signalling rate is 110 bit/s, the DCE shall connect as per Annex C.

5.2.4.4.2 If the data signalling rate is 300 bit/s and it is neither CI nor TXP, the DCE shall connect as per Annex F.

5.2.4.4.3 If timer Tr expires, the DCE shall return to monitoring as specified in 5.2.1.

5.2.4.5 If timer Te expires, the DCE shall return to monitoring as specified in 5.2.1.

5.2.4.6 If CI is detected, the DCE shall continue the connection procedure according to the V.18 mode as detailed in 5.2.2, 5.2.2.1, 5.2.2.2 and 5.2.2.3 above.

5.2.5 If a sequence of 1400 Hz and 1800 Hz FSK signals (i.e. valid 5-bit characters) are detected, the DCE shall analyse the bit duration and connect in the appropriate signalling rate as per Annex A.

5.2.6 If Dual Tone Multi-Frequency (DTMF) signals are detected, the DCE shall connect in the DTMF mode using the character conversion and the operational characteristics specified in Annex B.

5.2.7 If 1270 Hz is detected for 0.7 s, the DCE shall connect as per Annex D in answer mode.

5.2.8 If 2225 Hz is detected for 1 s, the DCE shall connect as per Annex D in the calling mode.

5.2.9 If 1650 Hz is detected for 0.4 s, the DCE shall connect as per Annex F in the calling mode.

5.2.10 If 1300 Hz is detected for more than 470 ms but less than 730 ms followed by 1 s of silence, the DCE shall immediately enter the probing state specified in 5.2.12.

5.2.11 If 1300 Hz only (i.e. no XCI) is detected for 1.7 s, then the DCE shall connect as per Annex E, transmitting on the 75 bit/s channel. If XCI is detected, the DCE shall proceed as described in 5.2.2.

5.2.12 If timer Ta expires, the DCE shall enter the probing state, starting by sending ANSam, and then sending signals intended to stimulate the calling text telephone or its user to respond. The DCE shall select a mode to probe in and proceed as described in either 5.2.12.1 or 5.2.12.2 depending on the most likely scenario preset by the user (see Appendix I).

5.2.12.1 When probing in the modes specified in Annexes A or B or C, the DCE shall transmit a buffered message in the selected mode and start variable timer Tm (default 3 s) to allow for a response from the caller. The DCE shall monitor for all the signals specified in 5.2.1.

The DCE shall have a stored, user-changeable, default buffered message (e.g. V.18 pls type). Although the primary use of this stored message is to stimulate a response from a carrierless text telephone, it may also be optionally sent after a connection is established with a continuous carrier-based text telephone.

5.2.12.1.1 If any valid signal as defined in 5.2.1 is detected, the DCE shall act according to the specification in 5.2.2 to 5.2.11 and 5.2.13 with the exception that if no connection has been made within 20 s, the probing sequence shall be continued from where it was interrupted by the signal detection.

5.2.12.1.2 If timer Tm expires and no response is received, the DCE shall proceed to the next appropriate probe (e.g. next carrier mode, or next carrierless mode). If the probe list is exhausted, start again from the beginning of the appropriate list.

5.2.12.2 When probing in the modes specified in Annexes D or E or F, the DCE shall transmit ANSam with preference for the type with phase reversals, for 1 s, then remain silent for 75 ± 5 ms and then transmit, for the duration of variable timer Tc (default 6 s) depending on the mode, 1300 Hz carrier, 1650 Hz or 2225 Hz. The DCE shall monitor for all appropriate signals while transmitting one of the above carriers. When 1300 Hz is transmitted, the DCE shall also monitor for 390 Hz.

5.2.12.2.1 If 390 Hz is detected for 3 s while 1300 Hz is being sent, the DCE shall connect as per Annex E, transmitting on the 1200 bit/s channel.

5.2.12.2.2 When any other valid signal as defined in 5.2.1 is detected, the DCE shall act according to the specification in 5.2.2 to 5.2.11 with the exception that if a connect attempt from 5.2.12.2.1 or from this clause has not succeeded within 4 s, the probing sequence shall be continued where it was interrupted by the signal detection.

5.2.12.2.3 If timer Tc expires, the DCE shall proceed to the next appropriate probe (e.g. next carrier mode or next carrierless mode). If the probe list is exhausted, start again from the beginning of the appropriate list.

5.2.12.3 If V.8 signal CM is detected, the V.8 procedures are entered to determine which call function and modulation to use. See clause 6 and Annex G.

5.2.13 If V.8 signal ANSam is detected, the V.8 procedures shall be entered, in calling mode, as explained in clause 6 and Annex G.

5.3 Automoding monitor mode

An automoding monitor mode shall be implemented for the purpose of detection of text telephone connection attempts from voice mode and for use in automatic voice/text answering systems.

The function of this mode is identical to the automoding answering mode as specified in 5.2, except that the timer Ta is not set and 5.2.4.2 and 5.2.10 shall not result in entering the probing state. Instead, if either of the conditions in 5.2.4.2 or 5.2.10 is detected, this shall be reported to the DTE as a V.25 calling tone.

When operating in automode monitor mode it may be desirable to handle the line interface so that parallel use for voice is enabled.

When operating in automode monitor mode, precautions must be taken not to enter textphone mode on indications of DTMF signals on the line that may occur during voice mode from other applications than text telephony.

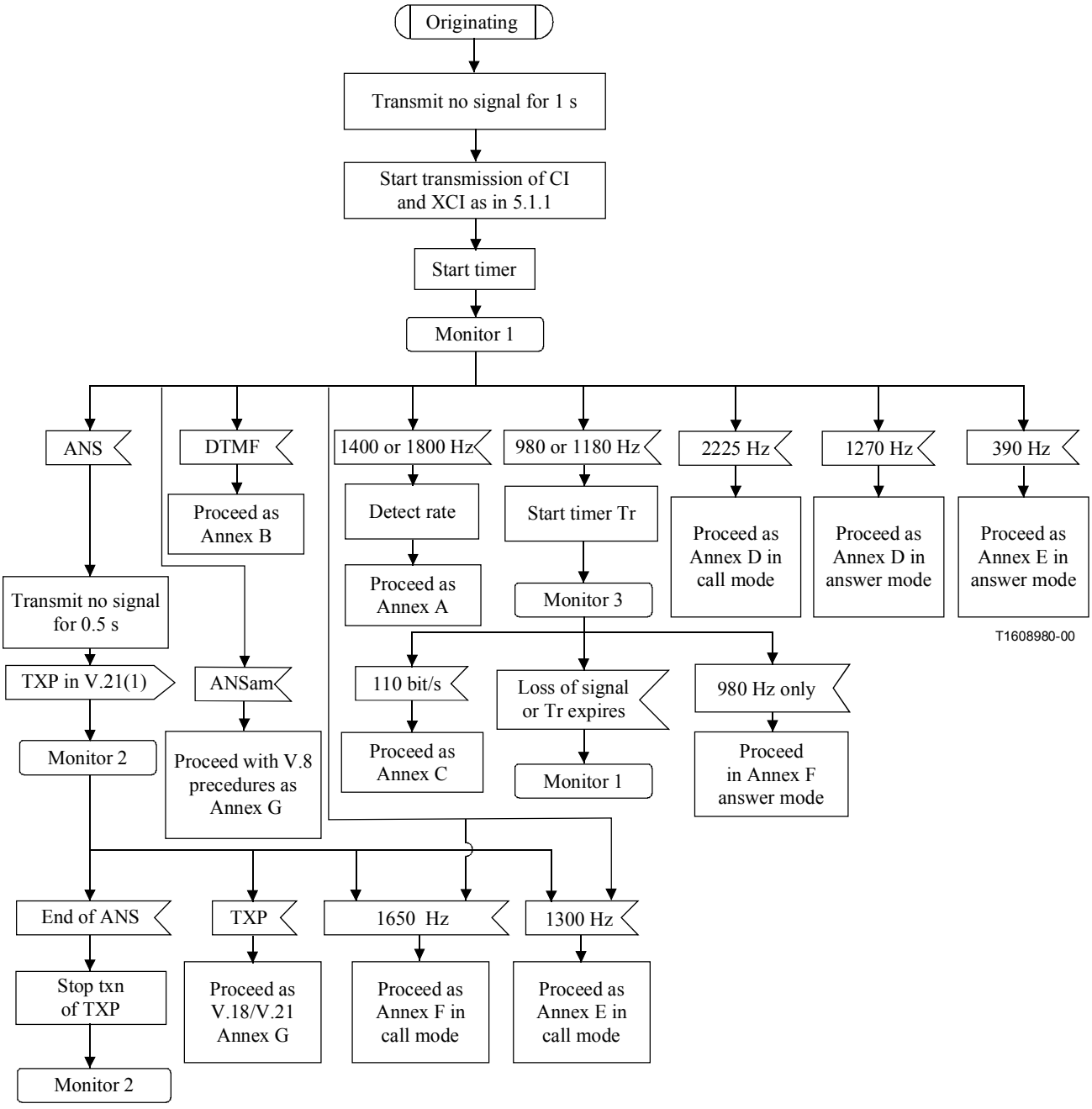
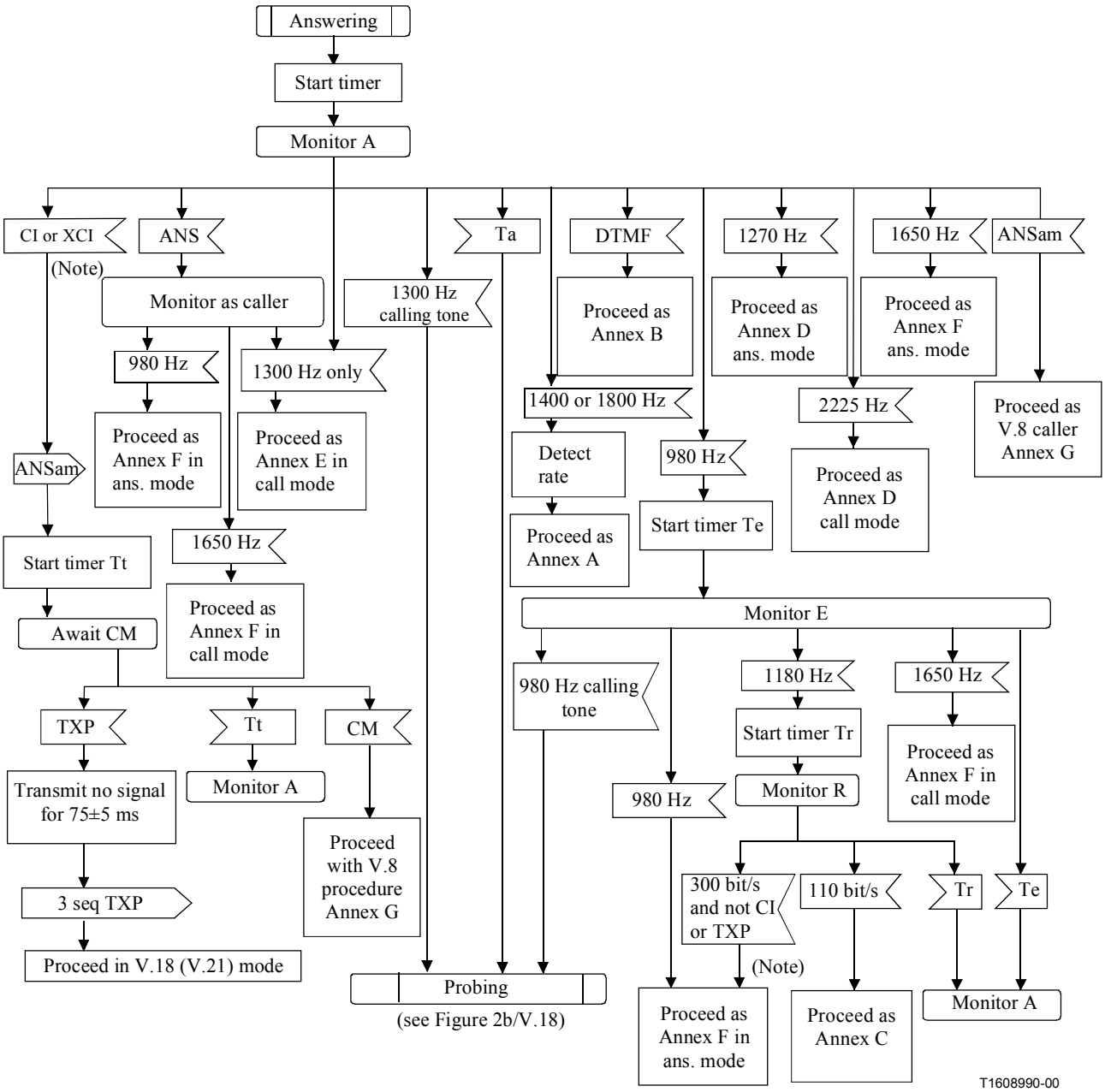


Figure 1/V.18 – Start-up procedure in the originating V.18 DCE with automoding to existing types of text telephone without use of ITU-T V.8 *bis*



NOTE – The detection of CI may be integrated with the detection of other V.21(1) signals.
The detection of XCI may be integrated with the detection of other V.23(2) signals (i.e.1300 Hz).

Figure 2a/V.18 – Start-up procedure in the answering V.18 DCE showing automoding without use of V.8 *bis* procedures

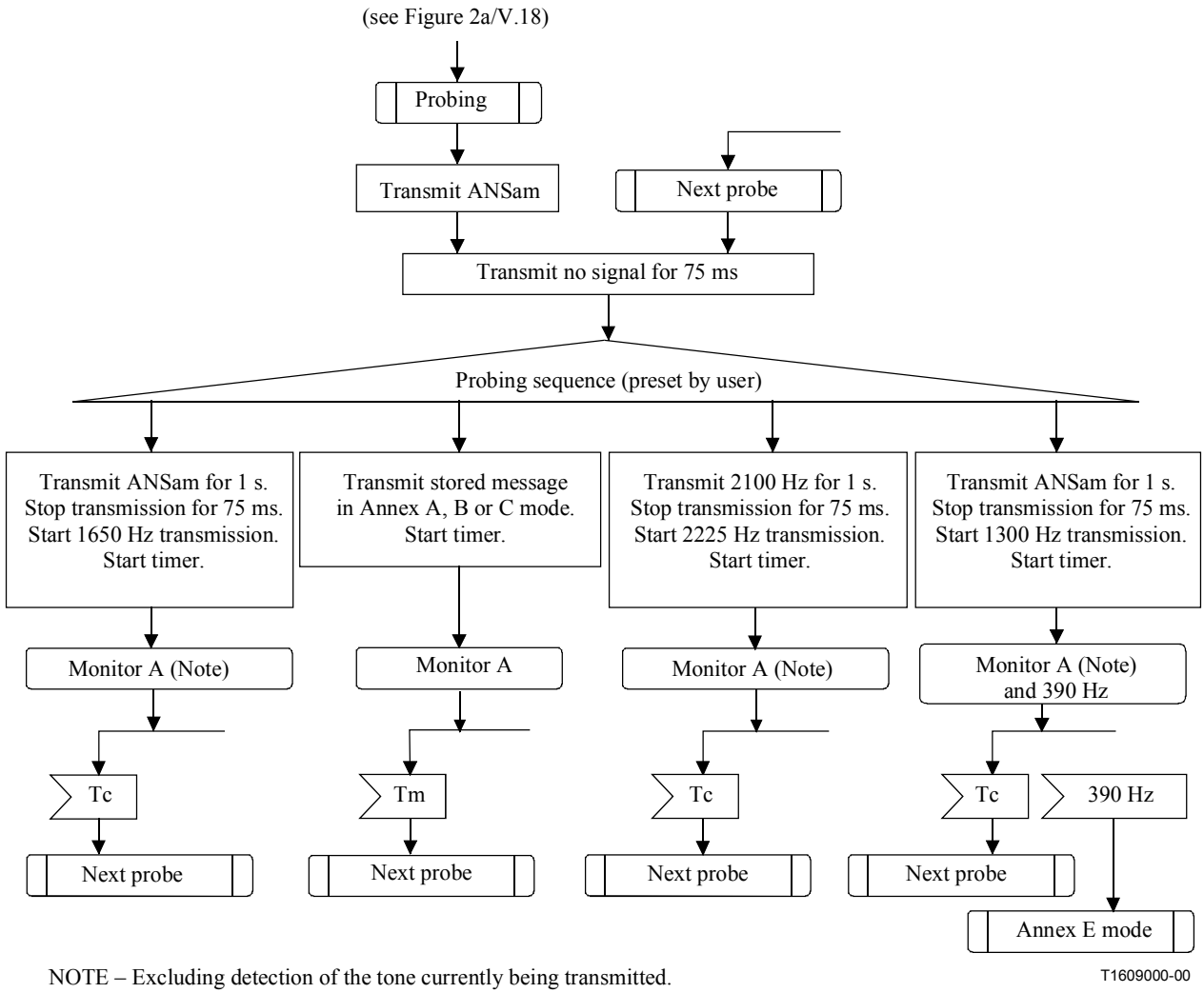


Figure 2b/V.18 – Automode probing

6 Connection in text telephone mode with V.8 and V.8 *bis* procedures

The procedures in this clause are used when both DCEs have capability to perform a V.8 or V.8 *bis* negotiation. Negotiation on the reason for the call and modulation to use in the call can be performed. This enables possibilities to select optional modes of operation.

6.1 V.8 procedures

For connection in V.18 mode, using the V.8 procedures, the "textphone" call type and V.21 modulation shall always be offered. Other valid modulations may also be offered.

If the V.8 procedure results in an agreement to start a textphone session, then the connection shall proceed as V.18 with modulation selected in the V.8 procedure and the operational requirements specified in Annex G.

6.1.1 Originate mode

In originate mode, CI and XCI should be transmitted and detection of ANSam, ANS and text telephone signals should be enabled.

If ANSam is received, a CM signal should be transmitted according to the V.8 procedures and the connection procedure according to V.8 should be completed. If the text telephone function selection

is completed, the selected modulation should be started and V.18 text telephone presentation protocol T.140 invoked as specified in Annex G.

If ANS is received, the TXP signal exchange is followed.

If other text telephone signals are detected, the V.18 procedures should be followed to enter a suitable mode.

6.1.2 Answer mode

In answer mode, detection of a CI with any call function or a XCI should cause ANSam to be sent.

If CM is received, the V.8 procedures should be followed to select a common call function and mode. If the selected call function is "textphone", the selected modulation should be started and V.18 text telephone presentation protocol T.140 invoked and the procedures of Annex G applied.

If "txp" is received, the original "txp" signal exchange is continued that normally ends in V.18 mode, V.21 modulation and T.140 presentation protocol as specified in Annex G.

If another text telephone signal is detected, the V.18 procedures should be followed to enter a suitable mode.

If no signal is detected within 3 seconds, the V.18 probing procedures should be initiated, still monitoring for V.8 signals.

6.1.3 V.8 procedure initiated by the answering terminal

If the V.8 sequence is started with ANSam by a DCE with the intention to start the textphone mode, the calling DCE has no indication on the purpose of the call, and may select to indicate another, unacceptable, call type in CM.

The answering DCE may then indicate the call type "textphone" in JM. The calling DCE can accept this mode by starting the DCE in the mode indicated in JM or deny it by not responding.

6.1.4 Enter text mode from voice

If the DCE is activated during a call without evident association to calling or answering, a 7-second timer should be started and the V.18 originating procedures described in 6.1.1 above should be initiated. If no text telephone signal and no V.8 signal is detected during this time, the V.18 modem should revert to answer mode as described in 6.1.2.

NOTE – This clause is intended to address the transfer from voice mode to text. The procedure implies a small risk of connecting in one of the compatibility modes between two V.18 capable devices. The V.8 *bis* procedures should be preferred for entering text telephone mode during a voice call.

6.2 Simultaneous voice and text telephony (SVT)

The capability for Simultaneous Voice and Data (SVD) provided by ITU-T H.324, V.61 and V.70 can be used to support expanded modes of text telephony without the need for any special modifications. When this capability is added to a device that supports the provisions of clauses 4 and 5, the device shall be considered a V.18 multi-mode text telephone device. In this case, V.8 *bis* procedures should be used, for the exchange and negotiation of capabilities as well as to provide the means for switching between supported text telephone modes and between text telephone mode and voice.

When Simultaneous Voice and Data (SVD) capability is included, in a V.18 text telephone, connections with functionality suitable for deaf, hearing-impaired, speech-impaired and hearing people are facilitated. In these cases, after the SVD capability is established, text and voice can be used simultaneously in any combination as required by the users.

NOTE – The audio channel provided by SVD DCEs (e.g. V.61, H.324) can, in many cases, support V.18 text telephony. In this case, the V.18 devices could be connected to the audio input of such devices and the text

telephone connection would be established, in accordance with the provisions of clause 5, after the SVD connection is established. In this case, however, the SVD devices are not considered to be text telephone devices and therefore would not need to conform to the provisions of this Recommendation.

6.3 Connection procedures based on ITU-T V.8 *bis*

ITU-T V.8 *bis* offers possibilities to indicate more than one mode to use during the call. It also offers mechanisms for negotiating details about the selected mode. Only by completing a V.8 *bis* start-up sequence, the H.324 multimedia terminals can invoke the multilink protocol, the component selection, the encryption and the text conversation protocol T.140. V.18 has one mode for voice and text selectable through ITU-T V.8 *bis*.

It is also possible to declare two or more available modes and agree on one. One example is that both V.18 and H.324 with T.140 can be declared, and any common mode for text conversation can be selected.

If ITU-T V.8 *bis* is implemented in the DCE, the following procedures should be followed.

In the V.8 *bis* procedure, a text telephone device should indicate "V.18 Text Telephone" in the V.8 *bis* parameters, and appropriate supported modulations, always including V.21. If other modes of interest for the current call are supported (e.g. H.324 with T.140), they should also be indicated, and the V.8 *bis* procedure used to select a common mode.

V.8 *bis* transactions 2 and 3 are preferred for use during a call and transactions 12 and 13 are preferred at the beginning of a call. When a V.8 *bis* sequence is completed, the procedures recommended in 9.9/V.8 *bis* for assigning answer mode and originate mode when entering communication mode should be applied.

Examples of V.8 *bis* procedures are given in Figure 3.

6.3.1 As soon as the line put in off-hook state by any DTE on the connection, the DTE controlling the V.18 DCE should set the DCE to the automoding monitor state. The DCE should also be configured to monitor for V.8 *bis* signals.

6.3.2 If the DCE is activated in the calling mode, i.e. performs the dialling, then the V.18 originating procedures should be invoked with the following additions:

– The DTMF tones used in dialling should not cause detection as valid text telephone signals in the calling DCE.

– Configure the DCE to detect V.8 *bis* signals and text telephone signals.

If V.8 *bis* signals are detected, the DCE should perform the V.8 *bis* procedures to enter a common mode.

If text telephone signals are detected, the DCE should perform the V.18 procedures in 5.1 to enter a common mode for text conversation.

6.3.3 If the DCE is activated within 10 seconds after a ring is detected, the DCE should monitor the line for network tones. If a ringing tone is detected, then the procedure in 6.3.2 should be applied. This situation appears for example in the call from when the supplementary service: "Completion of call to busy subscriber" is invoked. If a ringing tone is not detected, then the V.18 answering procedures should be applied as follows:

– Send V.8 *bis* signal Capability Request (CRe).

– Be configured to monitor for V.8 *bis* signals and text telephone signals.

– At detection of a CI signal or an XCI signal, start a 3-second timer, and then send CRe. If no V.8 *bis* response is detected during the 3-second timeout, or another CI or XCI is received, then continue according to the V.8 answering procedure. If a V.8 *bis* response is received, the V.8 *bis* procedure should be continued to select a common mode of operation.

6.3.4 If the DCE is activated during a call without evident association to calling or answering, a V.8 *bis* CRd signal should be sent, a timeout of 7 seconds should be set and the procedures according to 6.3.2 should be applied. If no V.8 *bis* or text telephone signals are detected during this time, the procedures according to 6.3.3 should be applied.

6.3.5 If the V.8 *bis* procedures are completed for V.18 text telephone parameters, the session procedures in Annex G shall be applied.

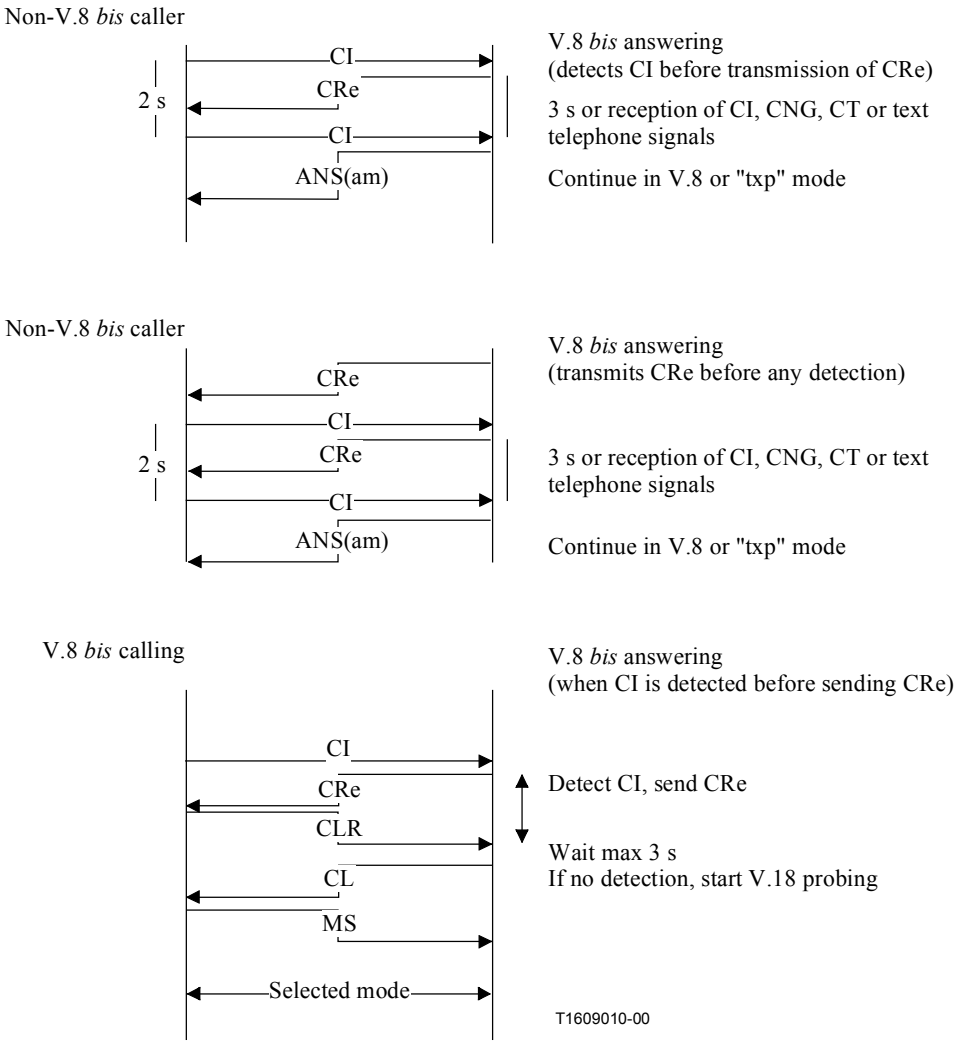


Figure 3/V.18 – Examples of sequences including V.8 *bis* capable of DCEs

7 Bibliography

Further informative reading about the background and needs of text telephony and text conversation can be found in the following document:

– ETSI ETR 333 (1997), Human Factors (HF); *Text Telephony; Basic user requirements and recommendations*.

ANNEX A

5-bit operational mode

A.1 Mode of operation

The 5-bit mode is defined in ANSI TIA/EIA-825 (2000), A Frequency Shift Keyed Modem for use on the Public Switched Telephone Network.

The communication channel is half-duplex with no channel turnaround. Carrier is transmitted 150 ms before the first character is transmitted. The receiver shall be disabled for 300 ms when a character is transmitted to mitigate false detection of echoes (in non-V.18 devices, the carrier may remain for up to 1 s after the last character to provide this same function).

A.2 Modulation

The modulation is frequency shift-keyed modulation (i.e. no carrier is present when a character is not being transmitted) using 1400 Hz (±5%) for a binary 1 and 1800 Hz (±5%) for a binary 0. A bit duration of either 20 or 22.00 ± 0.40 ms is used providing either a nominal data signalling rate of 50 or 45.45 bits/s respectively.

A.3 Probe

The probe in answer mode shall be at a 47.6-bit/s data signalling rate.

A.4 Character conversion

The initial condition of the converter shall be the Letters (LTRS) mode; therefore, the DCE shall send the LTRS character (11111) to the line prior to transmitting the first translated character. The receiver decoding shall also start up in the LTRS mode. Additionally, the DCE shall send the appropriate mode character (i.e. LTRS or FIGS) every 72 characters.

The 5-bit codes supported are given in Tables A.1 and A.2. Each character shall consist of the 5-bit sequence given in the tables preceded by a one start bit and followed by a minimum of one and one-half stop bits.

The DCE shall convert the 5-bit coded characters received from the line to the appropriate 7-bit T.50 coded characters (see Table A.1) and transfer them to the DTE on circuit 104 (or its equivalent).

The DCE shall convert the 7-bit T.50 coded characters received from the DTE on circuit 103 (or its equivalent) to the appropriate 5-bit coded characters (see Table A.2) and transmit to the line.

A.5 Informative usage information

Informative comment: "GA" is the turntaking characters commonly used in English speaking environments. "GASK" is used for invitation to finish and "SKSK" as the finishing token.

"Baudot" is a term often used for the 5-bit mode. "TTY" and "TDD" are terms often used for the text telephones operating in 5-bit mode.

Table A.1/V.18 – Line-to-DTE code conversion (5-bit to 7-bit)

5-bit code	LTRS	7-bit T.50 code	5-bit code	FIGS	7-bit T.50 code
00000	(BACKSP)	000 1000	*00000*	(BACKSP)	000 1000
00001	E	100 0101	*00001*	3	011 0011
00010	LF	000 1010	*00010*	LF	000 1010
00011	A	100 0001	*00011*	–	010 1101
00100	SPACE	010 0000	*00100*	SPACE	010 0000
00101	S	101 0011	*00101*	–	000 0000
00110	I	100 1001	*00110*	8	011 1000
00111	U	101 0101	*00111*	7	011 0111
01000	CR	000 1101	*01000*	CR	000 1101
01001	D	100 0100	*01001*	$	010 0100
01010	R	101 0010	*01010*	4	011 0100
01011	J	100 1010	*01011*	'	010 0111
01100	N	100 1110	*01100*	,	010 1100
01101	F	100 0110	*01101*	!	010 0001
01110	C	100 0011	*01110*	:	011 1010
01111	K	100 1011	*01111*	(	010 1000
10000	T	101 0100	*10000*	5	011 0101
10001	Z	101 1010	*10001*	"	010 0010
10010	L	100 1100	*10010*	)	010 1001
10011	W	101 0111	*10011*	2	011 0010
10100	H	100 1000	*10100*	=	011 1101
10101	Y	101 1001	*10101*	6	011 0110
10110	P	101 0000	*10110*	0	011 0000
10111	Q	101 0001	*10111*	1	011 0001
11000	O	100 1111	*11000*	9	011 1001
11001	B	100 0010	*11001*	?	011 1111
11010	G	100 0111	*11010*	+	010 1011
11011	FIGS	(Note)	11011	FIGS	(Note)
11100	M	100 1101	*11100*	.	010 1110
11101	X	101 1000	*11101*	/	010 1111
11110	V	101 0110	*11110*	;	011 1011
11111	LTRS	(Note)	11111	LTRS	(Note)

NOTE – The translator must keep track of (e.g. toggle a memory location) the mode (i.e. LTRS, FIGS). The default should be the LTRS mode. The 7-bit T.50 character DEL (111 1111) sent from the keyboard shall force the receiving translator to the LTRS mode (see Table A.2).

Table A.2/V.18 – DTE-to-line code conversion (7-bit to 5-bit)

7-bit code	T.50 character	5-bit code	7-bit code	T.50 character	5-bit code
000 0000	NULL	NULL	100 0000	@ >> X	11101
000 0001	SOH	NULL	100 0001	A	00011
000 0010	STX	NULL	100 0010	B	11001
000 0011	ETX	NULL	100 0011	C	01110
000 0100	EOT	NULL	100 0100	D	01001
000 0101	ENQ	NULL	100 0101	E	00001
000 0110	ACK	NULL	100 0110	F	01101
000 0111	BEL	NULL	100 0111	G	11010
000 1000	BACKSPACE	*00000*	100 1000	H	10100
000 1001	HT >> SPACE	*00100*	100 1001	I	00110
000 1010	LF	*00010*	100 1010	J	01011
000 1011	VT >> LF	*00010*	100 1011	K	01111
000 1100	FF >> LF	*00010*	100 1100	L	10010
000 1101	CR	01000	100 1101	M	11100
000 1110	SO	NULL	100 1110	N	01100
000 1111	SI	NULL	100 1111	O	11000
001 0000	DLE	NULL	101 0000	P	10110
001 0001	DC1	NULL	101 0001	Q	10111
001 0010	DC2	NULL	101 0010	R	01010
001 0011	DC3	NULL	101 0011	S	00101
001 0100	DC4	NULL	101 0100	T	10000
001 0101	NAK	NULL	101 0101	U	00111
001 0110	SYN	NULL	101 0110	V	11110
001 0111	ETB	NULL	101 0111	W	10011
001 1000	CAN	NULL	101 1000	X	11101
001 1001	EM	NULL	101 1001	Y	10101
001 1010	SUB >> ?	11001	101 1010	Z	10001
001 1011	ESC	NULL	101 1011	[>> (	*01111*
001 1100	IS4 >> LF	*00010*	101 1100	\ >> /	*11101*
001 1101	IS3 >> LF	*00010*	101 1101	] >>)	*10010*
001 1110	IS2 >> LF	*00010*	101 1110	^ >> '	*01011*
001 1111	IS1 >> SPACE	*00100*	101 1111	_ >> SPACE	*00100*
010 0000	SPACE	*00100*	110 0000	'	*00111*
010 0001	!	*01101*	110 0001	a	00011
010 0010	"	*10001*	110 0010	b	11001
010 0011	# >> $	*01001*	110 0011	c	01110
010 0100	$	*01001*	110 0100	d	01001
010 0101	% >> /	*11101*	110 0101	e	00001
010 0110	& >> +	*11010*	110 1110	f	01101
010 0111	'	*01011*	110 0111	g	11010

Table A.2/V.18 – DTE-to-line code conversion (7-bit to 5-bit) *(concluded)*

7-bit code	T.50 character	5-bit code	7-bit code	T.50 character	5-bit code
010 1000	(	*01111*	110 1000	h	10100
010 1001	)	*10010*	110 1001	i	00110
010 1010	*	*11100*	110 1010	j	01011
010 1011	+	*11010*	110 1011	k	01111
010 1100	,	*01100*	110 1100	l	10010
010 1101	-	*00011*	110 1101	m	11100
010 1110	.	*11100*	110 1110	n	01100
010 1111	/	*11101*	110 1111	o	11000
011 0000	0	*10110*	111 0000	p	10110
011 0001	1	*10111*	111 0001	q	10111
011 0010	2	*10011*	111 0010	r	01010
011 0011	3	*00001*	111 0011	s	00101
011 0100	4	*01010*	111 0100	t	10000
011 0101	5	*10000*	111 0101	u	00111
011 0110	6	*10101*	111 0110	v	11110
011 0111	7	*00111*	111 0111	w	10011
011 1000	8	*00110*	111 1000	x	11101
011 1001	9	*11000*	111 1001	y	10101
011 1010	:	*01110*	111 1010	z	10001
011 1011	;	*11110*	111 1011	{ >> (	*01111*
011 1100	< >> (	*01111*	111 1100	| >> !	*01101*
011 1101	=	*10100*	111 1101	} >>)	*10010*
011 1110	> >>)	*10010*	111 1110	~ >> SPACE	*00100*
011 1111	?	*11001*	111 1111	DEL	NULL (Note)

NOTE – Whenever the mode changes (e.g. an alphabet character is followed by a number), the translator must insert the appropriate mode code (i.e. 11011 or 11111) before transmitting the next 5-bit character code (see Table A.1). The 7-bit T.50 character DEL (111 1111) sent from the keyboard shall force the receiving translator to the LTRS mode.

ANNEX B

DTMF operational mode

B.1 Mode of operation

The communications channel is half-duplex. The receiver is disabled for 300 ms when a character is transmitted to mitigate false detection of echoes.

B.2 Character conversion

The Q.23 (DTMF) characters supported are given in Tables B.1 and B.2. Each character shall consist of the appropriate code sequence given in the table.

The DCE shall convert the DTMF characters received from the line to their equivalent T.50-coded characters and transfer them to the DTE on circuit 104 (or its equivalent) as per Table B.1.

The DCE shall convert the T.50-coded characters received from the DTE on circuit 103 (or its equivalent) to the appropriate DTMF characters and transmit to the line as per Table B.2.

B.3 Timing

The DCE shall detect characters at least 40 ms in length with silent intervals of at least 40 ms. The DCE shall transmit DTMF characters at least 70 ms in length with silent intervals of at least 50 ms.

Table B.1/V.18 – Line-to-DTE code conversion (DTMF to 7-bit)

DTMF codes	T.50 character	7-bit code	DTMF codes	T.50 character	7-bit code
1	b	110 0010	**4	:	011 1010
2	e	110 0101	**5	%	010 0101
3	h	110 1000	**6	(	010 1000
4	k	110 1011	**7	)	011 1110
5	n	110 1110	**8	,	010 1100
6	q	111 0001	**9	LF	000 1010
7	t	111 0100	**0	NULL	NULL
8	w	111 0111	#*1	æ (Note 1)	111 1011
9	z	111 1010	#*2	ø (Note 1)	111 1100
0	SPACE	010 0000	#*3	å (Note 1)	111 1101
**1*	a	110 0001	#*4	Æ (Note 1)	101 1011
**2*	d	110 0100	#*5	Ø (Note 1)	101 1100
**3*	g	110 0111	#*6	Å (Note 1)	101 1101
**4*	j	110 1010	##*1	A	100 0001
**5*	m	110 1101	##*2	D	100 0100
**6*	p	111 0000	##*3	G	100 0111
**7*	s	111 0011	##*4	J	100 1010
**8*	v	111 0110	##*5	M	100 1101
**9*	y	111 1001	##*6	P	101 0000
**0*	BACK SPACE	000 1000	##*7	S	101 0011
#1	c	110 0011	##*8	V	101 0110
#2	f	110 1110	##*9	Y	101 1001
#3	i	110 1001	##*0	NULL	NULL
#4	l	110 1100	##1	B	100 0010
#5	o	110 1111	##2	E	100 0101
#6	r	111 0010	##3	H	100 1000
#7	u	111 0101	##4	K	100 1011
#8	x	111 1000	##5	N	100 1110
#9	.	010 1110	##6	Q	101 0001
#0	?	011 1111	##7	T	101 0100
**#1*	1	011 0001	##8	W	101 0111
**#2*	2	011 0010	##9	Z	101 1010

Table B.1/V.18 – Line-to-DTE code conversion (DTMF to 7-bit) *(concluded)*

DTMF codes	T.50 character	7-bit code	DTMF codes	T.50 character	7-bit code
**#3*	3	011 0011	##0	SPACE	010 0000
**#4*	4	011 0100	###1	C	100 0011
**#5*	5	011 0101	###2	F	100 0110
**#6*	6	011 0110	###3	I	100 1001
**#7*	7	011 0111	###4	L	100 1100
**#8*	8	011 1000	###5	O	100 1111
**#9*	9	011 1001	###6	R	101 0010
**#0*	0	011 0000	###7	U	101 0101
**1	+	010 0110	###8	X	101 1000
**2	-	010 1101	###9	;	011 1011
**3	=	011 1101	###0	!	010 0001

NOTE 1 – National option.

NOTE 2 – Codes preceded by **# or *** are reserved for preprogrammed sentences and should be translated character by character to the corresponding T.50 codes.

Table B.2/V.18 – DTE-to-line code conversion (7-bit to DTMF)

7-bit code	T.50 character	DTMF	7-bit code	T.50 character	DTMF
000 0000	NULL	NULL	100 0000	@ >> X	###8
000 0001	SOH	NULL	100 0001	A	##*1
000 0010	STX	NULL	100 0010	B	##1
000 0011	ETX	NULL	100 0011	C	###1
000 0100	EOT	NULL	100 0100	D	##*2
000 0101	ENQ	NULL	100 0101	E	##2
000 0110	ACK	NULL	100 0110	F	###2
000 0111	BEL	NULL	100 0111	G	##*3
000 1000	BACKSPACE	*0	100 1000	H	##3
000 1001	HT >> SPACE	0	100 1001	I	###3
000 1010	LF	**9	100 1010	J	##*4
000 1011	VT >> LF	**9	100 1011	K	##4
000 1100	FF >> LF	**9	100 1100	L	###4
000 1101	CR	NULL	100 1101	M	##*5
000 1110	SO	NULL	100 1110	N	##5
000 1111	SI	NULL	100 1111	O	###5
001 0000	DLE	NULL	101 0000	P	##*6
001 0001	DC1	NULL	101 0001	Q	##6
001 0010	DC2	NULL	101 0010	R	###6
001 0011	DC3	NULL	101 0011	S	##*7
001 0100	DC4	NULL	101 0100	T	##7
001 0101	NAK	NULL	101 0101	U	### 7

Table B.2/V.18 – DTE-to-line code conversion (7-bit to DTMF) *(continued)*

7-bit code	T.50 character	DTMF	7-bit code	T.50 character	DTMF
001 0110	SYN	NULL	101 0110	V	##* 8
001 0111	ETB	NULL	101 0111	W	##8
001 1000	CAN	NULL	101 1000	X	### 8
001 1001	EM	NULL	101 1001	Y	##*9
001 1010	SUB >> ?	#0	101 1010	Z	## 9
001 1011	ESC	NULL	101 1011	Æ (Note)	#*4
001 1100	IS4 >> LF	**9	101 1100	Ø (Note)	#*5
001 1101	IS3 >> LF	**9	101 1101	Å (Note)	#*6
001 1110	IS2 >> LF	**9	101 1110	^ >> '	NULL
001 1111	IS1 >> SPACE	0	101 1111	_ >> SPACE	0
010 0000	SPACE	0	110 0000	'	NULL
010 0001	!	###0	110 0001	a	*1
010 0010	"	NULL	110 0010	b	1
010 0011	# >> $	NULL	110 0011	c	#1
010 0100	$	NULL	110 0100	d	*2
010 0101	% >> /	**5	110 0101	e	2
010 0110	& >> +	**1	110 1110	f	#2
010 0111	'	NULL	110 0111	g	*3
010 1000	(	**6	110 1000	h	3
010 1001	)	**7	110 1001	i	#3
010 1010	_ >> .	#9	110 1010	j	*4
010 1011	+	**1	110 1011	k	4
010 1100	,	**8	110 1100	l	#4
010 1101	-	**2	110 1101	m	*5
010 1110	.	#9	110 1110	n	5
010 1111	/	NULL	110 1111	o	#5
011 0000	0	*#0	111 0000	p	*6
011 0001	1	*#1	111 0001	q	6
011 0010	2	*#2	111 0010	r	#6
011 0011	3	*#3	111 0011	s	*7
011 0100	4	*#4	111 0100	t	7
011 0101	5	*#5	111 0101	u	#7
011 0110	6	*#6	111 0110	v	*8
011 0111	7	*#7	111 0111	w	8
011 1000	8	*#8	111 1000	x	#8
011 1001	9	*#9	111 1001	y	*9
011 1010	:	**4	111 1010	z	9
011 1011	;	###9	111 1011	æ (Note)	#*1

Table B.2/V.18 – DTE-to-line code conversion (7-bit to DTMF) *(concluded)*

7-bit code	T.50 character	DTMF	7-bit code	T.50 character	DTMF
011 1100	< >> (	**6	111 1100	ø (Note)	#*2
011 1101	=	**3	111 1101	å (Note)	#*3
011 1110	> >>)	**7	111 1110	~ >> SPACE	0
011 1111	?	#0	111 1111	DEL	*0
NOTE – National option.					

ANNEX C

EDT operational mode

C.1 Mode of operation

The communications channel is half-duplex. The carrier is transmitted 300 ms before the first character is transmitted. The receiver shall be disabled for 300 ms when a character is transmitted to mitigate false detection of echoes (in non-V.18 devices, the carrier may remain for up to 1 s after the last character to provide this same function).

C.2 Modulation

The modulation is frequency shift-keyed modulation using V.21(1) frequencies. The data signalling rate is 110 bits/s.

C.3 Characters in the EDT mode

The EDT must use the following character structure. The 7-bit T.50-coded character shall be preceded by one (1) START bit and shall be followed by one EVEN PARITY bit, and two STOP bits.

NOTE – Many EDT textphones use the NAK character (decimal 21) as a backspace and delete.

ANNEX D

Bell 103 mode

D.1 Mode of operation

The communication circuit for data transmission is a duplex circuit whereby data transmission in both directions simultaneously is possible at 300 bit/s or less. The frequency of the ANS used by this DCE is 2225 Hz.

D.2 Modulation

The modulation is a binary modulation obtained by frequency shift, resulting in a modulation rate being equal to the data signalling rate.

For channel No. 1, the nominal mean frequency is 1170 Hz; for channel No. 2, it is 2125 Hz.

The frequency deviation is ±100 Hz. In each channel, the higher characteristic frequency (FA) corresponds to a binary 1 [i.e. channel No. 1 (FA = 1270 Hz and Fz = 1070 Hz); channel No. 2 (FA = 2225 Hz and Fz = 2025 Hz)].

D.3 Character code and framing

Characters shall be coded in the US 7-bit national character set according to ITU-T T.50. Characters are framed by one start bit, 7-bit data, with one even parity bit and one stop bit. Received parity should be ignored.

D.4 Presentation control

Transmitted characters are viewed through the use of local echo. Erasure of the last character is requested by BS (0/8). New line is requested by CR LF, and erased with one BS. Local word wrapping is used at the end of line, and does not cause CR LF to be sent to the line.

D.5 Usage conventions

Many existing devices have only one common window for display of both directions of transmission. Therefore, an indicator is used to indicate when a user has finished typing and wants to give turn to the other. The most commonly used indicator for this purpose is the character string "GA".

ANNEX E

V.23 Videotex terminals

There are two main types of Videotex terminals in use for text telephony, usually known as Minitel and Prestel. The modulation is asymmetric duplex conforming to ITU-T V.23 with a 1200 bit/s forward channel and a 75 bit/s backward channel.

The characters are sent in asynchronous mode, 7-bit characters framed by one start bit, one stop bit and one even parity bit, (receive parity is ignored).

Prestel and Minitel terminals use different control sequences, and it may be necessary to distinguish between them.

E.1 Minitel terminals

E.1.1 Mode of operation

Minitel terminals must follow the 40 column Videotex mode Teletel standard with coding specified in profile 2 of the CEPT Videotex Recommendation.

When used in text telephone mode, the basic C0, G0 and G2 character sets shall be supported.

A repertoire of control sequences is defined for Minitel in accordance with Profile 2 of the CEPT Videotex protocol. A subset is required for text telephone usage. After connection, the answer mode terminal takes the initiative to set the terminals into a mode suitable for text telephony by the following control sequences. This table shows only recommended initial control sequences.

Answer mode terminal sends	Call mode terminal responds
Reset ($1B_{16}$,39_{16},$7F_{16}$)	Acknowledge Reset (13_{16}, $5E_{16}$)
Request scroll up mode ($1B_{16}$,$3A_{16}$,69_{16},43_{16})	Acknowledge scroll mode and lowercase mode ($1B_{16}$,$3A_{16}$,73_{16},$4A_{16}$)
Clear screen ($0C_{16}$)	

The answer mode terminal echos received characters and uses local echo to view transmitted characters. Call mode terminals do not have any echo capabilities.

E.1.2 Minitel "Dialogue" terminal

Minitel Dialogue terminals are intended for text telephone use and can operate in either call mode or answer mode, with mode selection being done automatically at connection establishment.

E.1.3 Minitel "Normal" terminal

Minitel Normal terminals operate only in call mode. The control sequences described above should be initiated by the answer mode terminal to ensure that the Minitel Normal terminal is placed in the correct mode.

E.2 Prestel terminals

Prestel terminals always operate in call mode and require the remote terminal to operate in answer mode. Like Minitel terminals, the answer mode terminal echoes received characters and uses local echo to view transmitted characters. Positive identification of a Prestel terminal may be achieved by transmission of an ENQ character which will cause an identification string to be sent if one is programmed. If there is no response to an ENQ character or the Minitel control sequences listed above, it should be assumed that the answering terminal is a Prestel terminal.

ANNEX F

V.21 text telephone mode

F.1 Mode of operation

The communication connection is 300 bit/s duplex.

F.2 Modulation

The modulation is frequency shift-keyed modulation using continuous carriers according to V.21 frequencies.

F.3 Channel selection

Existing text telephone devices use several different ways to select the mode of operation (i.e. originate or answer). The following is a list of known methods used for resolution of mode assignments:

1) The DCE starts in answer mode and then toggles at random intervals (0.6-2.4 s) between the originate and answer modes until a carrier connection is established.
2) The DCE uses stored information and chooses its mode of operation depending on whether the device has most recently dialled or detected a ring.

In other cases, where no form of resolution is provided, the assignment of the mode of operation relies on the users selecting different modes at each end by prior agreement.

F.4 Character code and framing

Characters shall be coded in 7-bit national character sets according to ITU-T T.50. Characters are framed by one start bit, 7-bit data, with one even parity bit and one stop bit. Devices should be designed to accept one or two stop bits. Received parity should be ignored.

F.5 Presentation control

Transmitted characters are viewed through the use of local echo. Erasure of the last character is requested by BS (0/8). New line is requested by CR LF, and erased with one BS. Local word wrapping is used at the end of line, and does not cause CR LF to be sent to the line.

F.6 Usage conventions

Most existing devices have only one common window for display of both directions of transmission; therefore, an indicator is used to indicate when a user has finished typing and wants to hand over to the other party. The most commonly used indicators for this purpose are the "*" (e.g. in the Nordic countries) and the character string "GA" (e.g. in the United Kingdom).

ANNEX G

V.18 text telephone mode

G.1 Mode of operation

The modulation in this mode shall be in accordance with ITU-T V.21 at 300 bit/s, if no other modulation is selected in the connection procedure (see clause 6).

G.2 Presentation protocol for V.18 mode

The text conversation protocol in the DTE shall be as specified in ITU-T T.140.

G.3 Framing and transmission

Each octet sent from the T.140 protocol shall be transmitted in asynchronous mode with one start bit, one stop bit and no parity bit. Characters shall not be echoed by the receiving device.

APPENDIX I

Representative ordering of automoding

The following orderings of automoding are suggested starting points for development of probing sequences for the specified countries. Any other probing sequence can be used as appropriate for the individual situation, including sequences containing only fewer, selected modes. When selecting modes and orders, the effect on connection success and connection time should be considered.

Australia, Ireland

send 5-bit code buffered message
send V.21 carrier
send V.23 carrier
send EDT code buffered message
send DTMF buffered message
send Bell 103 carrier

UK

send V.21 carrier
send 5-bit code buffered message
send V.23 carrier
send EDT code buffered message
send DTMF buffered message
send Bell 103 carrier

Germany, Switzerland, Italy, Spain Austria

send EDT code buffered message
send V.21 carrier
send V.23 carrier
send 5-bit code buffered message
send DTMF buffered message
send Bell 103 carrier

USA

send 5-bit code buffered message
send Bell 103 carrier
send V.21 carrier
send V.23 carrier
send EDT code buffered message
send DTMF buffered message

Netherlands

send DTMF buffered message
send V.21 carrier
send V.23 carrier
send 5-bit code buffered message
send EDT buffered message
send Bell 103 carrier

France, Belgium

send V.23 carrier
send EDT buffered message
send DTMF buffered message
send 5-bit code buffered message
send V.21 carrier
send Bell 103 carrier

Nordic countries (Iceland, Norway, Sweden, Finland, Denmark)

send V.21 carrier
send DTMF buffered message
send 5-bit code buffered message
send EDT code buffered message
send V.23 carrier
send Bell 103 carrier

APPENDIX II

Recommended common procedures for terminals using the V.18 DCE

II.1 Line status display

An indication of the status of the connection should be presented, including call progress information as well as the status of circuit 135, line energy present.

II.2 Connect mode

An indication of the mode in which the connection was made (e.g. V.18, V.23, Baudot, etc.) should be provided to the user.

APPENDIX III

Specification of V.18 implementation tests

Summary

This appendix contains test specifications for testing implementations of V.18 Operational and Interworking requirements for DCEs operating in the Text Telephone Mode. It contains basic interworking tests on a functional level and implementation test cases. The interworking test is meant to give some confidence in that there is reason to perform the most elaborate implementation tests. The tests are supposed to be supported by a semi-automatic test tool called the "tester". The tests are designed so that they verify one part of the V.18 logic each. The tests do not compose a full

conformance test, but are intended to give confidence in that a V.18 implementation is made according to the Recommendation.

III.1 Introduction

Tests have been defined for the majority of possible paths through the V.18 automoding states. These include calling, called and monitor automoding operation. There are tests for character conversion. There are also tests for operational functions such as provision of indications to the DTE of call status and tests for requirements of the compatibility modes described in the annexes.

There is a group of tests for exception conditions such as immunity to voice and fax machines. These are not specifically defined in ITU-T V.18 but are implicit if the Textphone Under Test (TUT) is to operate correctly under typical conditions.

There are no tests for V.8 *bis*, V.61 or for other multimedia related operations as described in clause 6. These may also be added at a later date.

Compliance with this suite of tests does not guarantee operation with all versions of all textphones. Although every effort has been made to test all relevant paths through ITU-T V.18, it may be that some modes of operation are not covered either due to unpredictable use of ITU-T V.18 or because ITU-T V.18 itself does not cater for that particular mode.

Proper end-to-end interworking in the text telephone mode relies on compatibility at the presentation level. Although there are tests for implementation of the ITU-T V.18 annexes, this should not be interpreted as guaranteeing end-to-end interworking at the presentation level.

The ease of use of text telephones relies on many factors including the network interface and human factors issues in the user interface. Verification against the following tests reflects only a part of the total usability.

III.2 Definitions

TUT Textphone Under Test

Tester The equipment used to perform the tests

Operator The person using the tester to perform the tests

III.3 Summary of tests

It is assumed throughout the tests that a purpose built test tool, referred to as the "tester" is available for an "operator" to perform the tests. The textphone under test is referred to as the TUT. The TUT will be connected to the tester via some kind of network simulator which may be incorporated into the tester.

Only the tests that are applicable to a particular V.18 implementation should be performed, e.g. detection of RINGING is not applicable to an acoustically coupled device.

III.3.1 Interworking tests

There are two interworking tests. They will be performed against the BT reference implementation of ITU-T V.18. This is a software implementation that runs on a PC using a purpose built DSP card to provide the necessary modem functions.

1) Automode Calling Test.
2) Automode Called Test.

III.3.2 Implementation tests

There are five groups of implementation tests:

III.3.2.1 Operational requirements tests

Test description	Identifier	V.18 ref.
No Disconnection Test	MISC-01	4 (1)
Automatic resumption of automoding	MISC-02	4 (2)
Retention of selected mode on loss of signal	MISC-03	4 (2)
Detection of BUSY tone	MISC-04	4 (4)
Detection of RINGING	MISC-05	4 (4)
"LOSS OF CARRIER" indication	MISC-06	4 (4)
Call progress indication	MISC-07	4 (4)
Circuit 135 test	MISC-08	4 (5)
Connection Procedures	MISC-09	

III.3.2.2 Automode originate tests

Test description	Identifier	V.18 ref.
CI & XCI Signal coding and cadence	ORG-01	5.1.1
ANS Signal Detection	ORG-02	5.1.3
End of ANS signal detection	ORG-03	5.1.3.1
ANS tone followed by TXP	ORG-04	5.1.3.2
ANS tone followed by 1650 Hz	ORG-05	5.1.3.3
ANS tone followed by 1300 Hz	ORG-06	5.1.3.4
ANS tone followed by no tone	ORG-07	5.1.3
Bell 103 (2225 Hz Signal) Detection	ORG-08	5.1.4
V.21 (1650 Hz Signal) Detection	ORG-09	5.1.5
V.23 (1300 Hz Signal) Detection	ORG-10	5.1.6
V.23 (390 Hz Signal) Detection	ORG-11	5.1.7
5 Bit Mode (Baudot) Detection Tests	ORG-12 a) to d)	5.1.8
DTMF signal detection	ORG-13	5.1.9
EDT Rate Detection	ORG-14	5.1.10
Rate Detection Test	ORG-15	5.1.10.1
980 Hz Detection	ORG-16	5.1.10.2
Loss of signal after 980 Hz	ORG-17	5.1.10.3
Tr Timer	ORG-18	5.1.10.3
Bell 103 (1270 Hz Signal) Detection	ORG-19	5.1.11
Immunity to Network Tones	ORG-20	–
Immunity to other non-textphone modems	ORG-21 a), b)	–

Immunity to Fax Tones	ORG-22	–
Immunity to Voice	ORG-23	–
ANSam detection	ORG-24	5.1.2
V.8 originate call	ORG-25	6.1

III.3.2.3 Automode answer tests

Test description	**Identifier**	**V.18 ref.**
Ta timer	ANS-01	5.2.1
CI Signal Detection	ANS-02	5.2.2
Early Termination of ANS tone	ANS-03	5.2.2.1
Tt Timer	ANS-04	5.2.2.2
ANS tone followed by 980 Hz	ANS-05	5.2.3.1
ANS tone followed by 1300 Hz	ANS-06	5.2.3.2
ANS tone followed by 1650 Hz	ANS-07	5.2.3.3
980 Hz followed by 1650 Hz	ANS-08	5.2.4.1
980 Hz calling tone detection	ANS-09 a) to d)	5.2.4.2
V.21 Detection by Timer	ANS-10	5.2.4.3
EDT Detection by Rate	ANS-11	5.2.4.4.1
V.21 Detection by Rate	ANS-12	5.2.4.4.2
Tr Timer	ANS-13	5.2.4.4.3
Te Timer	ANS-14	5.2.4.5
5 Bit Mode (Baudot) Detection Tests	ANS-15 a) to d)	5.2.5
DTMF Signal Detection	ANS-16	5.2.6
Bell 103 (1270 Hz signal) detection	ANS-17	5.2.7
Bell 103 (2225 Hz signal) detection	ANS-18	5.2.8
V.21 Reverse Mode (1650 Hz) Detection	ANS-19	5.2.9
1300 Hz Calling Tone Discrimination	ANS-20 a) to d)	5.2.10
V.23 Reverse Mode (1300 Hz) Detection	ANS-21	5.2.11
1300 Hz with XCI Test	ANS-22	
Stimulate Mode Country Settings	ANS-23	5.2.12
Stimulate Carrierless Mode Probe Message	ANS-24	5.2.12.1
Interrupted Carrierless Mode Probe	ANS-25	5.2.12.1.1
Stimulate Carrier Mode Probe Time	ANS-26	5.2.12.2
V.23 Mode (390 Hz) Detection	ANS-27	5.2.12.2.1
Interrupted Carrier Mode Probe	ANS-28	5.2.12.2.2
Stimulate Mode Response During Probe	ANS-29	5.2.12.2.2
Immunity to Network Tones	ANS-30	

Immunity to Fax Calling Tones	ANS-31	
Immunity to Voice	ANS-32	
V.8 CM detection and V.8 Answering	ANS-33	5.2.2.1

III.3.2.4 Automode monitor tests

For the following tests the TUT must be set to monitor mode as defined in 5.3 "Automode Monitor Mode".

Test description	Identifier	V.18 ref.
Repeat all answer mode tests excluding tests ANS-01, ANS-20 and ANS-23 to ANS-29	MON-01 to 20	5.3
Automode Monitor Ta timer	MON-21	5.3
Automode Monitor 1300 Hz Calling Tone Discrimination	MON-22 a) to d)	5.3
Automode Monitor 980 Hz Calling Tone Discrimination	MON-23 a) to d)	5.3

III.3.2.5 ITU-T V.18 annexes tests

For the following tests verify the requirements specified in Annexes A to F.

Test description	Identifier	V.18 ref.
Baudot carrier timing and receiver disabling	X-01	A.1
Baudot bit rate confirmation	X-02	A.2
Baudot probe bit rate confirmation	X-03	A.3
5 Bit to T.50 Character Conversion	X-04	A.4
DTMF receiver disabling	X-05	B.1
DTMF character conversion	X-06	B.2
EDT carrier timing and receiver disabling	X-07	C.1
EDT bit rate and character structure	X-08	C.2-3
V.23 calling mode character format	X-09	E
V.23 answer mode character format	X-10	E
V.21 character structure	X-11	F.4-5
V.18 mode	X-12	G.1-3

III.4 Interworking tests description

III.4.1 Introduction

The interworking tests ensure that the Textphone Under Test (TUT) interworks satisfactorily with the reference V.18 Text Telephone. These tests are intended to eliminate any implementation with serious errors and/or faulty equipment and to demonstrate the interworking integrity of the TUT. Further they provide an opportunity to test the acoustic coupling and/or PSTN interface of the TUT.

No measure of quality is applied in these tests. The aim is simply to gain sufficient confidence to merit continuation of the tests.

III.4.2 Test methodology

The TUT is set up in a working configuration and connected to the Tester possibly via a network simulator. No delays or errors are inserted into the link, so that high quality, trouble free operation should be achievable.

III.4.3 Test cases

Only two types of tests are performed:

1) A call is made from the TUT set up in the Automode calling mode to the reference V.18 text telephone.

2) A call is made from the reference V.18 text telephone to the TUT in Automode Answer configuration.

In both cases the terminals should arrive in V.18 mode in less than 5 seconds after the call is answered. It should then be possible to perform a text conversation correctly at least with the minimal character set and the editing operations specified in ITU-T T.140.

III.5 V.18 implementation tests description

III.5.1 Introduction

This group of tests verifies that the TUT protocol implementation conforms to the V.18 specification.

III.5.2 Test methodology

The TUT is set up in a working configuration and connected to the Tester via a suitable interface. This might be a direct PSTN connection or an acoustic coupler.

III.5.3 Test case identifier numbers

The structure of each case identified number is as follows:

<group>- <number>

where group can be:

- *MISC, Operational Requirements and other tests.*
- *ANS, Automode Answer Tests.*
- *ORG, Automode Originate Tests.*
- *MON, Automode Monitor Tests.*
- *X, V.18 Annex Tests.*

III.5.4 Test cases

III.5.4.1 Operational requirements tests

III.5.4.1.1 No disconnection test

Identifier: MISC-01

Purpose: To verify that the DCE does not initiate a disconnection.

Preamble: N/A

Method: A call is made to the TUT from the tester which remains off hook for 10 minutes without sending any signal.

Pass criteria: The TUT should answer the call and enter the probing state after 3 seconds. The TUT should continue to probe until the test is terminated.

Comments: This feature should also be verified by observation during the automoding tests.

III.5.4.1.2 Automatic resumption of automoding

Identifier: MISC-02

Purpose: To ensure that the DCE can be configured to automatically re-assume the automode calling state after 10 s of no valid signal.

Preamble: The TUT should be configured to automatically re-assume the initial automoding state.

Method: The tester should set up a call to the TUT in V.21 mode and then drop the carrier. The tester will then transmit silence for 11 seconds followed by a 1300 Hz tone for 5 seconds (i.e. V.23).

Pass criteria:
1) Ten seconds after dropping the carrier the TUT should return to state Monitor 1.
2) After 2.7±0.3 seconds the TUT should select V.23 mode and send a 390 Hz tone.

Comments: The TUT should indicate that carrier has been lost at some time after the 1650 Hz signal is lost.

III.5.4.1.3 Retention of selected mode on loss of signal

Identifier: MISC-03

Purpose: To ensure that the DCE stays in the selected transmission mode if it is not configured to automatically re-assume the initial automoding state.

Preamble: The TUT should be configured to remain in the selected transmission mode when the carrier is lost.

Method: The tester should set up a call to the TUT in V.21 mode, for example. It will drop the carrier for 9 seconds and then re-start transmission of the same carrier for 1 second followed by a short message.

Pass criteria: The TUT should resume operation in V.21 mode and capture the entire test message.

Comments: The TUT should indicate that carrier has been lost at some time after the carrier signal is removed and not disconnect.

III.5.4.1.4 Detection of BUSY tone

Identifier: MISC-04

Purpose: To ensure that the DCE provides the call progress indication "BUSY" in presence of the national busy tone.

Preamble: N/A

Method: The TUT should be configured to dial out and then be presented with the appropriate national busy tone.

Pass criteria: Detection of busy tone should be displayed by the TUT.

Comments: ITU-T V.18 specifies that the DCE should not hang up, but that is intended to apply to the case where a connection is established and then lost. A terminal may automatically hang up when busy tone is detected. PABX busy tones may differ in frequency and cadence from national parameters.

III.5.4.1.5 Detection of RINGING

Identifier: MISC-05

Purpose: To ensure that the DCE provides the call progress indication "RINGING" in presence of the national ringing tone.

Preamble: N/A

Method: The tester will make a call to the TUT using the nationally recommended cadence and the minimum recommended ring voltage/current.

Pass criteria: The RINGING condition should be visually indicated by the TUT.

Comments: This test should be repeated across a range of valid timings and ring voltages.

III.5.4.1.6 "LOSS OF CARRIER" indication

Identifier: MISC-06

Purpose: To ensure that the DCE provides the call progress indication "LOSS OF CARRIER" upon a loss of carrier in full duplex modes, i.e. V.21, V.23, Bell 103.

Preamble: N/A

Method: Set up a call in each of the full duplex modes and force a carrier failure to the TUT.

Pass criteria: Loss of carrier should be indicated and disappear when the carrier is restored.

Comments: The V.18 modem should not automatically disconnect when used in a manual conversation mode. However, a V.18 equipped terminal may disconnect based on operational decisions, e.g. when it is a terminal in automatic answering machine mode. There may be other cases, e.g. where the V.18 DCE is used in a gateway, when automatic disconnection is required.

III.5.4.1.7 Call progress indication

Identifier: MISC-07

Purpose: To ensure that the DCE provides the call progress indication "CONNECT(x)" upon a connection.

Preamble: N/A

Method: Correct CONNECT messages should be verified during the Automode tests that follow.

Pass criteria: The relevant mode should be indicated by the DCE when automoding is complete. However, this may possibly not be indicated by the DTE.

Comments: The possible modes are: V.21, V.23, Baudot 45, Baudot 50, EDT, Bell 103, DTMF.

III.5.4.1.8 Circuit 135 Test

Identifier: MISC-08

Purpose: To ensure that the DCE implements circuit 135 or an equivalent way of indicating presence of a signal.

Preamble: N/A

Method: A call from the TUT should be answered in voice mode after 20 seconds. The tester will transmit sampled voice messages. V.24 circuit 135 or its equivalent should be observed.

Pass criteria: The ring tone and speech shall be indicated by circuit 135.

Comment: The response times and signal level thresholds of Circuit 135 are not specified in ITU-T V.18 or V.24 and therefore the pattern indicated may vary.

III.5.4.1.9 Connection procedures

Identifier: MISC-09

Purpose: To ensure that the TUT implements the call connect procedure described in clause 6.

Preamble: N/A

Method: TBD

Pass criteria: TBD

Comment: TBD

III.5.4.2 Automode originate tests

In this group of tests, the TUT is placed in the automode originate mode, while the tester emulates the operation of the answering station.

III.5.4.2.1 CI and XCI signal coding and cadence

Identifier: ORG-01

Purpose: To verify that TUT correctly emits the CI and XCI signals with the ON/OFF cadence defined in 5.1.1.

Preamble: N/A

Method: V.21 demodulator is used to decode the CI sequence and a timer to measure the silence intervals between them. The XCI signal is also monitored and decoded to check for correct coding and timing of the signal.

Pass criteria:

1) No signal should be transmitted for one second after connecting to the line.
2) Four CI patterns are transmitted for each repetition.
3) No signal is transmitted for two seconds after the end of each CI.
4) Each CI must have the correct bit pattern.
5) The CI patterns followed by two seconds of silence must be repeated twice.
6) One second after every 3 blocks CI an XCI signal must be transmitted.
7) The XCI should have the structure defined in 3.11.
8) The whole sequence should be repeated until the call is cleared.
9) When V.18 to V.18, the XCI must not force V.23 or Minitel mode.

III.5.4.2.2 ANS signal detection

Identifier: ORG-02

Purpose: To verify that TUT correctly detects the ANS (2100 Hz) signal during the two-second interval (T_{off}) between transmission of CI sequences.

Preamble: Make a V.18 call from the TUT.

Method: The Test System waits for the TUT to stop transmitting a CI and responds with an ANS signal. The V.21 demodulator is used to decode the TXP sequence and a timer measures the silence intervals between them. ANS should be transmitted for 2 seconds.

Pass criteria: 1) No signal should be transmitted by TUT for 0.5 seconds from detection of ANS.

2) The TUT should reply with transmission of TXP as defined in 5.1.2.

3) Verify that TXP sequence has correct bit pattern.

III.5.4.2.3 End of ANS signal detection

Identifier: ORG-03

Purpose: The TUT should stop sending TXP at the end of the current sequence when the ANS tone ceases.

Preamble: Test ORG-02 should be successfully completed immediately prior to this test.

Method: The tester sends ANS for 2 seconds followed by silence. The tester will then monitor for cessation of TXP at the end of the answer tone.

Pass criteria: The TUT should stop sending TXP at the end of the current sequence when ANS tone ceases.

III.5.4.2.4 ANS tone followed by TXP

Identifier: ORG-04

Purpose: To check correct detection of V.18 modem.

Preamble: Tests ORG-02 and ORG-03 should be successfully completed prior to this test.

Method: Tester transmits ANS for 2.5 seconds followed by 75 ms of no tone then transmits 3 TXP sequences using V.21 (2) and starts a 1 s timer. It will then transmit 1650 Hz for 5 seconds.

Pass criteria: 1) TUT should initially respond with TXP.

2) TUT should stop sending TXP within 0.2 seconds of end of ANS.

3) TUT should respond with 980 Hz carrier within 1 second of end of 3 TXP sequences.

4) Data should be transmitted and received according to ITU-T T.140 to comply with the V.18 operational requirements.

Comments: The TUT should indicate that V.18 mode has been selected.

III.5.4.2.5 ANS tone followed by 1650 Hz

Identifier: ORG-05

Purpose: To check correct detection of V.21 modem upper channel when preceded by answer tone and to confirm discrimination between V.21 and V.18 modes.

Preamble: Tests ORG-02 and ORG-03 should be successfully completed prior to this test.

Method: Tester transmits ANS for 2.5 seconds followed by 75 ms of no tone then transmits 1650 Hz and starts a 0.7 second timer.

Pass criteria: 1) TUT should initially respond with TXP.

2) TUT should stop sending TXP within 0.2 seconds of end of ANS.

3) TUT should respond with 980 Hz at 0.5(+0.2-0.0) seconds of start of 1650 Hz.

4) Data should be transmitted and received at 300 bit/s complying with Annex F.

Comments: Selection of ITU-T V.21 as opposed to ITU-T V.18 should be confirmed by examination of TUT. If there is no visual indication, verify by use of ITU-T T.50 for ITU-T V.21 as opposed to UTF-8 coded ISO 10646 character set for ITU-T V.18.

III.5.4.2.6 ANS tone followed by 1300 Hz

Identifier: ORG-06

Purpose: To check correct detection of V.23 modem upper channel when preceded by answer tone.

Preamble: Tests ORG-02 and ORG-03 should be successfully completed prior to this test.

Method: Tester transmits ANS for 2.5 seconds followed by 75 ms of no tone then transmits 1300 Hz and starts a 2.7 s timer.

Pass criteria:

1) TUT should initially respond with TXP.
2) TUT should stop sending TXP within 0.2 seconds of end of ANS.
3) TUT should respond with 390 Hz after 1.7(+0.2-0.0) seconds of start of 1300 Hz.
4) Data should be transmitted and received at 75 bit/s and 1200 bit/s respectively by the TUT to comply with Annex E.

Comments: The TUT should indicate that V.23 mode has been selected.

III.5.4.2.7 ANS tone followed by no tone

Identifier: ORG-07

Purpose: To confirm that TUT does not lock up under this condition.

Preamble: Tests ORG-02 and ORG-03 should be successfully completed prior to this test.

Method: Tester transmits ANS for 2.5 seconds followed by no tone for 10 s. It then transmits DTMF tones for 2 seconds.

Pass criteria:

1) TUT should initially respond with TXP.
2) TUT should stop sending TXP within 0.2 seconds of end of ANS.
3) TUT should return to Monitor 1 state and then connect in DTMF mode within 12 seconds of the end of ANS tone.

Comments: This condition would cause the terminal to lock up if the V.18 standard is followed literally. It may however, occur when connected to certain Swedish textphones if the handset is lifted just after the start of an automatically answered incoming call.

III.5.4.2.8 Bell 103 (2225 Hz signal) detection

Identifier: ORG-08

Purpose: To verify that the TUT correctly detects the Bell 103 upper channel signal during the 2-second interval between transmission of CI sequences.

Preamble: N/A

Method: The tester waits for a CI and then sends a 2225 Hz signal for 5 seconds.

Pass criteria:

1) The TUT should respond with a 1270 Hz tone in 0.5±0.1 seconds.
2) Data should be transmitted and received at 300 bit/s to comply with Annex D.

Comments: The TUT should indicate that Bell 103 mode has been selected.

III.5.4.2.9 V.21 (1650 Hz signal) detection

Identifier: ORG-09

Purpose: To verify that the TUT correctly detects the V.21 upper channel signal during the 2-second interval between transmission of CI sequences.

Preamble: N/A

Method: The tester waits for a CI and then sends a 1650 Hz signal for 5 seconds.

Pass criteria:
1) The TUT should respond with a 980 Hz tone in 0.5±0.1 seconds.
2) Data should be transmitted and received at 300 bit/s to comply with Annex F.

Comments: The TUT should indicate that V.21 mode has been selected.

III.5.4.2.10 V.23 (1300 Hz signal) detection

Identifier: ORG-10

Purpose: To verify that the TUT correctly detects the V.23 upper channel signal during the 2-second interval between transmission of CI sequences.

Preamble: N/A

Method: The tester waits for a CI and then sends a 1300 Hz signal for 5 seconds.

Pass criteria:
1) The TUT should respond with a 390 Hz tone in 1.7±0.1 seconds.
2) Data should be transmitted and received at 75 bit/s and 1200 bit/s respectively by the TUT to comply with Annex E.

Comments: The TUT should indicate that V.23 mode has been selected.

III.5.4.2.11 V.23 (390 Hz signal) detection

Identifier: ORG-11

Purpose: To confirm correct selection of V.23 reverse mode during sending of XCI.

Preamble: N/A

Method: The tester should wait for the start of the XCI signal and then send 390 Hz to TUT for 5 seconds.

Pass criteria:
1) The TUT should complete the XCI as normal.
2) The TUT should then maintain the 1300 Hz tone while the 390 Hz test tone is present.
3) Data should be transmitted and received at 1200 bit/s and 75 bit/s respectively by the TUT to comply with Annex E when connection is indicated.

Comments: The TUT should indicate that V.23 mode has been selected at least 3 seconds after the start of the 390 Hz tone.

III.5.4.2.12 5 bit mode (Baudot) detection tests

Identifier: ORG-12 (a) to (d)

Purpose: To confirm detection of Baudot modulation at various bit rates that may be encountered.

Preamble: N/A

Method: The tester transmits the 5-bit coded characters "0" to "9" followed by "abcdef" at (a) 45.45, (b) 47.6, (c) 50 and (d) 100 bits per second. When TUT indicates a connection, type at least 5 characters back to the tester so that correct selection of bit rate can be confirmed.

Pass criteria: 1) TUT should select Baudot mode and the appropriate bit rate.

2) The tester will analyse the bit rate of received characters, which should be at either 45.45 or 50 bits per second as appropriate.

Comments: 45.45 and 50 bit/s are the commonly used Baudot bit rates. However, certain textphones can operate at higher rates (e.g. 100 bit/s). Responding at either 45.45 or 50 bit/s is acceptable to these devices which normally fall back to the selected rate.

47.6 bit/s may possibly be encountered from another V.18 textphone in the automode answer state. The TUT may then select either 45.45 or 50 bit/s for the transmission.

III.5.4.2.13 DTMF signal detection

Identifier: ORG-13

Purpose: To verify whether the TUT correctly recognizes DTMF signals during the 2-second interval between transmission of CI.

Preamble: N/A

Method: The tester will send a single DTMF tone of 40 ms duration to TUT. When TUT indicates a connection, type at least 5 characters back to the tester so that correct selection of mode can be confirmed.

Pass criteria: The tester will analyse the received characters to confirm DTMF mode selection.

Comments: TUT should indicate that it has selected DTMF mode. The DTMF capabilities of the TUT should comply with ITU-T Q.24 for the Danish Administration while receiving for best possible performance.

III.5.4.2.14 EDT rate detection

Identifier: ORG-14

Purpose: To confirm detection of EDT modems by detecting the transmission rate of received characters.

Preamble: N/A

Method: The tester transmits EDT characters "abcdef" to TUT at 110 bit/s. When TUT indicates that the connection is established, type characters "abcdef<CR>" back to the tester. The same characters will then be transmitted back to the TUT.

Pass criteria: Ensure correct reception of characters by tester and TUT.

Comments: The TUT should be able to determine the rate on the six characters given. If it takes more than this then performance is probably inadequate as too many characters would be lost. Some characters may be lost during the detection process. However, the number lost should be minimal. The data bits and parity are specified in Annex C.

III.5.4.2.15 Rate detection test

Identifier: ORG-15

Purpose: To verify the presence of 980/1180 Hz at a different signalling rate than 110 bit/s returns the TUT modem to the "monitor A" state.

Preamble: N/A

Method: The tester transmits 980/1180 Hz signals at 300 bit/s for 2 seconds.

Pass criteria: The TUT should not select EDT or any other mode and should continue to transmit the CI signal.

Comments: Echoes of the CI sequences may be detected at 300 bit/s.

III.5.4.2.16 980 Hz detection

Identifier: ORG-16

Purpose: To confirm correct selection of V.21 reverse mode.

Preamble: N/A

Method: The tester sends 980 Hz to TUT for 5 seconds.

Pass criteria:
1) TUT should respond with 1650 Hz tone after 1.5±0.1 seconds after start of 980 Hz tone.
2) Data should be transmitted and received at 300 bit/s complying with Annex F.

Comments: The TUT should indicate that V.21 mode has been selected.

III.5.4.2.17 Loss of signal after 980 Hz

Identifier: ORG-17

Purpose: To confirm that TUT returns to the Monitor 1 state if 980 Hz signal disappears.

Preamble: N/A

Method: The tester sends 980 Hz to TUT for 1.2 seconds followed by silence for 5 seconds.

Pass criteria: TUT should not respond to the 980 Hz tone and resume sending CI signals after a maximum of 2.4 seconds from the end of the 980 Hz tone.

III.5.4.2.18 Tr timer

Identifier: ORG-18

Purpose: To confirm that TUT returns to the Monitor 1 state if Timer Tr expires.

Preamble: N/A

Method: The tester sends 980 Hz to TUT for 1.2 seconds followed by 1650 Hz for 5 seconds with no pause.

Pass criteria: TUT should respond with 980 Hz after 1.3±0.1 seconds of 1650 Hz.

Comments: This implies timer Tr has expired 2 seconds after the start of the 980 Hz tone and then 1650 Hz has been detected for 0.5 seconds.

III.5.4.2.19 Bell 103 (1270 Hz signal) detection

Identifier: ORG-19

Purpose: To confirm correct selection of Bell 103 reverse mode.

Preamble: N/A

Method: The tester sends 1270 Hz to TUT for 5 seconds.

Pass criteria: 1) TUT should respond with 2225 Hz tone after 0.7±0.1 s.

2) Data should be transmitted and received at 300 bit/s complying with Annex D.

Comments: The TUT should indicate that Bell 103 mode has been selected.

III.5.4.2.20 Immunity to network tones

Identifier: ORG-20

Purpose: To ensure that the TUT does not interpret network tones as valid signals.

Preamble: N/A

Method: The tester will first send a dial tone to the TUT, this will be followed by a ringing tone and a network congestion tone. The frequencies and cadences of the tones will vary according to the country setting. The tester must be configured for the same country as the TUT.

Pass criteria: The countries supported by the TUT should be noted along with the response to each tone. The tones should either be ignored or reported as the relevant network tone to the user.

Comments: V.18 is required to recognize and report RINGING and BUSY tones. Other network tones may be ignored. Some devices may only provide a visual indication of the presence and cadence of the tones for instance by a flashing light. The TUT may disconnect on reception of tones indicating a failed call attempt.

III.5.4.2.21 Immunity to non-textphone modems

Identifier: ORG-21 (a) and (b)

Purpose: To ensure that the TUT does not interpret modem tones not supported by V.18 as valid text telephone tones.

Preamble: N/A

Method: The tester will respond with an ANS tone (2100 Hz) followed by simulated (a) V.32 *bis* and (b) V.34 modem training sequences.

Pass criteria: The tones should either be ignored or reported back to the user. No textphone modem should be selected.

Comments: Some high speed modems may fall back to a compatibility mode, e.g. V.21 or V.23 that should be correctly detected by the TUT.

III.5.4.2.22 Immunity to fax tones

Identifier: ORG-22

Purpose: To ensure that the TUT will not interpret a called fax machine as being a textphone.

Preamble: N/A

Method: The tester will respond as if it were a typical group 3 fax machine in automatic answer mode. It should send a CED tone (2100 Hz) plus Digital Identification Signal (DIS) as defined in ITU-T T.30.

Pass criteria: The TUT should ignore the received tones.

Comments: Ideally the TUT should detect the presence of a fax machine and report it back to the user.

III.5.4.2.23 Immunity to voice

Identifier: ORG-23

Purpose: To ensure that the TUT does not misinterpret speech as a valid textphone signal.

Preamble: N/A

Method: The tester will respond with sampled speech. A number of phrases recorded from typical male and female speakers will be transmitted. This will include a typical network announcement.

Pass criteria: The TUT should ignore the speech.

Comments: Ideally the TUT should report the presence of speech back to the user, e.g. via circuit 135.

III.5.4.2.24 ANSam signal detection

Identifier: ORG-24

Purpose: To verify that TUT correctly detects the ANSam (2100 Hz modulated) signal during the two-second interval (T_{off}) between transmission of CI sequences.

Preamble: Make a V.18 call from the TUT.

Method: The Test System waits for the TUT to stop transmitting a CI and responds with an ANSam signal. The V.21 demodulator is used to decode the CM sequence. ANSam should be transmitted for 2 seconds.

Pass criteria:

1) No signal should be transmitted by TUT for 0.5 seconds from detection of ANSam.
2) The TUT should reply with transmission of CM as defined in 5.2.13.
3) Verify that CM sequence has correct bit pattern.

III.5.4.2.25 V.8 calling procedure

Identifier: ORG-25

Purpose: To verify that TUT correctly performs a V.8 call negotiation.

Preamble: Make a V.18 call from the TUT. Answer with ANSam from the Tester and with JM for V.21 on the CM.

Method: The Test System waits for the TUT to start transmitting V.21 carrier (1).

Pass criteria: The TUT should connect by sending V.21 carrier (1).

III.5.4.3 Automode answer tests

For the tests in this clause a call must be established from the tester to the TUT. All tests, except where stated otherwise, will commence 0.5 seconds after the call is answered to ensure that the actions are begun before timer Ta expires within the TUT. This implies that the tester must detect when the TUT goes off hook.

III.5.4.3.1 Ta timer

Identifier: ANS-01

Purpose: To ensure that on connecting the call, the DCE starts timer **Ta** (3 seconds) and on expiry begins probing.

Preamble: N/A

Method: The tester makes a call to the TUT and attempts to determine when the TUT answers the call. It will then monitor for any signal.

Pass criteria: The TUT should start probing 3 seconds after answering the call.

III.5.4.3.2 CI signal detection

Identifier: ANS-02

Purpose: To confirm the correct detection and response to the V.18 CI signal.

Preamble: N/A

Method: The tester will transmit 2 sequences of 4 CI patterns separated by 2 seconds. It will monitor for ANS and measure duration.

Pass criteria:
1) The TUT should respond after either the first or second CI with ANSam tone.
2) ANSam tone should remain for 3 seconds ±0.5 s followed by silence.

Comments: The ANSam tone is a modulated 2100 Hz tone. It may have phase reversals. The XCI signal is tested in a separate test.

III.5.4.3.3 Early termination of ANSam tone

Identifier: ANS-03

Purpose: To confirm that the TUT will respond correctly to TXP signals, i.e. by stopping ANSam tone on reception of TXP signal.

Preamble: N/A

Method: The tester will transmit 2 sequences of 4 CI patterns separated by 2 seconds. On reception of the ANSam tone the tester will wait 0.5 seconds and then begin transmitting the TXP signal in V.21 (1) mode.

Pass criteria:
1) On reception of the TXP signal, the TUT should remain silent for 75±5 ms.
2) The TUT should then transmit 3 TXP sequences in V.21(2) mode.
3) The 3 TXPs should be followed by continuous 1650 Hz.
4) Correct transmission and reception of T.140 data should be verified after the V.18 mode connection is completed.

Comments: The TUT should indicate V.18 mode.

III.5.4.3.4 Tt timer

Identifier: ANS-04

Purpose: To ensure that after detection of ANSam the TUT will return to Monitor A after timer Tt expires.

Preamble: Successful completion of test ANS-03.

Method: After completion of test ANS-03 the tester will continue to monitor for signals.

Pass criteria: The TUT should start probing 3 seconds after ANSam disappears.

Comments: It is assumed that timer Ta is restarted on return to Monitor A.

III.5.4.3.5 ANS tone followed by 980 Hz

Identifier: ANS-05

Purpose: To check correct detection of V.21 modem lower channel when preceded by answer tone.

Preamble: N/A

Method: Tester transmits ANS for 2.5 seconds followed by 75 ms of no tone then transmits 980 Hz and starts a 1 s timer.

Pass criteria: TUT should respond with 1650 Hz within 400±100 ms of start of 980 Hz.

Comments: The TUT should indicate that V.21 mode has been selected.

III.5.4.3.6 ANS tone followed by 1300 Hz

Identifier: ANS-06

Purpose: To check correct detection of V.23 modem upper channel when preceded by answer tone.

Preamble: N/A

Method: Tester transmits ANS for 2.5 seconds followed by 75 ms of no tone then transmits 1300 Hz and starts a 2-s timer.

Pass criteria: TUT should respond with 390 Hz after 1.7(+0.2-0.0) seconds of start of 1300 Hz.

Comments: The TUT should indicate that V.23 mode has been selected.

III.5.4.3.7 ANS tone followed by 1650 Hz

Identifier: ANS-07

Purpose: To check correct detection of V.21 modem upper channel when preceded by answer tone and to confirm discrimination between V.21 and V.18 modes.

Preamble: N/A

Method: Tester transmits ANS for 2.5 seconds followed by 75 ms of no tone then transmits 1650 Hz and starts a 1-second timer.

Pass criteria: TUT should respond with 980 Hz within 400±100 ms of start of 1650 Hz.

Comments: The TUT should indicate that V.21 mode has been selected.

III.5.4.3.8 980 Hz followed by 1650 Hz

Identifier: ANS-08

Purpose: To ensure the correct selection of V.21 modem channel when certain types of Swedish textphones are encountered.

Preamble: N/A

Method: The tester will simulate a call from a Diatext2 textphone that alternates between 980 Hz and 1650 Hz until a connection is made.

Pass criteria: The TUT should respond with the appropriate carrier depending on when it connects.

Comments: The TUT should indicate a V.21 connection. The time for which each frequency is transmitted is random and varies between 0.64 and 2.56 seconds.

III.5.4.3.9 980 Hz calling tone detection

Identifier: ANS-09 (a) to (d)

Purpose: To confirm correct detection of 980 Hz calling tones as defined in V.25.

Preamble: N/A

Method: The tester will send bursts of 980 Hz signals (a) 400 ms, (b) 500 ms, (c) 700 ms and (d) 800 ms followed by 1 second of silence.

Pass criteria: 1) The TUT should not respond to bursts of 400 or 800 ms.

2) The TUT should immediately begin probing after a burst of 980 Hz for 500 or 700 ms followed by 1 second of silence.

Comments: The probe sent by the TUT will depend on the country setting.

III.5.4.3.10 V.21 detection by timer

Identifier: ANS-10

Purpose: To confirm correct selection of V.21 calling modem when the received signal is not modulated, i.e. there is no 1180 Hz.

Preamble: N/A

Method: The tester sends 980 Hz to TUT for 2 seconds.

Pass criteria: The TUT should respond with a 1650 Hz tone in 1.5±0.1 seconds.

Comments: The TUT should indicate that V.21 mode has been selected.

III.5.4.3.11 EDT detection by rate

Identifier: ANS-11

Purpose: To confirm detection of EDT modems by detecting the transmission rate of received characters.

Preamble: N/A

Method: The tester transmits EDT characters "abcdef" to TUT at 110 bit/s. When TUT indicates that the connection is established, type characters "abcdef<CR>" back to the tester. The same characters will then be transmitted back to the TUT.

Pass criteria: Ensure correct reception of characters by tester and TUT.

Comments: The TUT should indicate that EDT mode has been selected. Some characters may be lost during the detection process. However, the number lost should be minimal. The data bits and parity are specified in Annex C.

III.5.4.3.12 V.21 Detection by rate

Identifier: ANS-12

Purpose: To confirm detection of V.21 modem low channel by detecting the transmission rate of received characters and to ensure correct discrimination between V.18 and V.21 modes.

Preamble: N/A

Method: The tester transmits characters "abcdef" to TUT using V.21 (1) at 300 bit/s. When TUT indicates that the connection is established, type characters "abcdef<CR>" back to the tester. The same characters will then be transmitted back to the TUT.

Pass criteria: Ensure correct reception of characters by tester and TUT.

Comments: This situation is unlikely to occur in practice unless the DCE is sending a V.21 (1650 Hz) probe. However, it is catered for in V.18. It is more likely that this is where CI or TXP characters would be detected (see test ANS-02).

III.5.4.3.13 Tr timer

Identifier: ANS-13

Purpose: To ensure that the TUT returns to the Monitor A state on expiry of timer Tr (2 seconds). Timer Tr is started when a modulated V.21 (1) signal is detected.

Preamble: N/A

Method: The tester will transmit 980 Hz for 200 ms followed by alternating 980 Hz/1180 Hz at 110 bit/s for 100 ms followed by 980 Hz for 1 second.

Pass criteria: The TUT should begin probing 4±0.5 seconds after the 980 Hz signal is removed.

Comments: It is not possible to be precise on timings for this test since the definition of a "modulated signal" as in 5.2.4.4 is not specified. Therefore it is not known exactly when timer Tr will start. It is assumed that timer Ta is restarted on re-entering the Monitor A state.

III.5.4.3.14 Te timer

Identifier: ANS-14

Purpose: To ensure that the TUT returns to the Monitor A on expiry of timer Te (2.7 seconds). Timer Te is started when a 980 Hz signal is detected.

Preamble: N/A

Method: The tester will transmit 980 Hz for 200 ms followed silence for 7 s.

Pass criteria: The TUT should begin probing 5.5±0.5 seconds after the 980 Hz signal is removed.

Comments: It is assumed that timer Ta (3 seconds) is restarted on re-entering the Monitor A state.

III.5.4.3.15 5 Bit mode (Baudot) detection tests

Identifier: ANS-15 (a) to (d)

Purpose: To confirm detection of Baudot modulation at various bit rates that may be encountered.

Preamble: N/A

Method: The tester transmits the 5-bit coded characters "0" to "9" followed by "abcdef" at (a) 45.45, (b) 47.6, (c) 50 and (d) 100 bits per second. When TUT indicates a connection, type at least 5 characters back to the tester so that correct selection of bit rate can be confirmed.

Pass criteria:

1) The TUT should select Baudot mode and the appropriate bit rate.
2) The tester will analyse the bit rate of received characters, which should be at an appropriate rate, and confirm the carrier on/off times before and after the characters.

Comments: 45.45 and 50 bit/s are the commonly used Baudot bit rates. However, some textphones can transmit at higher rates, e.g. 100 bit/s. Responding at either 45.45 or 50 bit/s is acceptable to these devices which then fall back to the selected rate.

A rate of 47.6 bit/s may be encountered from another V.18 textphone in the automode answer state. The TUT may then select either 45.45 or 50 bit/s for the transmission.

III.5.4.3.16 DTMF signal detection

Identifier: ANS-16

Purpose: To verify whether the TUT correctly recognizes DTMF signals.

Preamble: N/A

Method: The tester will send a single DTMF tone of 40 ms duration to TUT. When TUT indicates a connection, type at least 5 characters back to the tester so that correct selection of mode can be confirmed.

Pass criteria: Tester will analyse the received characters to confirm DTMF mode selection.

Comments: The TUT should indicate that it has selected DTMF mode. The DTMF capabilities of the TUT should comply with ITU-T Q.24 for the Danish Administration.

III.5.4.3.17 Bell 103 (1270 Hz signal) detection

Identifier: ANS-17

Purpose: To ensure correct detection and selection of Bell 103 modems.

Preamble: N/A

Method: The tester sends 1270 Hz to TUT for 5 seconds.

Pass criteria: TUT should respond with 2225 Hz tone after 0.7±0.1 s.

Comments: The TUT should indicate that Bell 103 mode has been selected.

III.5.4.3.18 Bell 103 (2225 Hz signal) detection

Identifier: ANS-18

Purpose: To ensure correct detection and selection of Bell 103 modems in reverse mode.

Preamble: N/A

Method: The tester sends 2225 Hz to TUT for 5 seconds.

Pass criteria: The TUT should respond with 1270 Hz after 1±0.2 seconds.

Comments: The TUT should indicate that Bell 103 mode has been selected. Bell 103 modems use 2225 Hz as both answer tone and higher frequency of the upper channel.

III.5.4.3.19 V.21 Reverse mode (1650 Hz) detection

Identifier: ANS-19

Purpose: To ensure correct detection and selection of V.21 reverse mode.

Preamble: N/A

Method: The tester sends 1650 Hz to TUT for 5 seconds.

Pass criteria: The TUT should respond with 980 Hz after 0.4±0.2 seconds.

Comments: The TUT should indicate that V.21 mode has been selected.

III.5.4.3.20 1300 Hz calling tone discrimination

Identifier: ANS-20 (a) to (d)

Purpose: To confirm correct detection of 1300 Hz calling tones as defined in ITU-T V.25.

Preamble: N/A

Method: The tester will send 1300 Hz bursts of (a) 400 ms, (b) 500 ms, (c) 700 ms and (d) 800 ms followed by 1 second of silence.

Pass criteria: 1) The TUT should not respond to bursts of 400 or 800 ms.

2) The TUT should immediately begin probing after a burst of 1300 Hz for 500 or 700 ms followed by 1 second of silence.

Comments: The probe sent by the TUT will depend on the country setting.

III.5.4.3.21 V.23 Reverse mode (1300 Hz) detection

Identifier: ANS-21

Purpose: To ensure correct detection and selection of V.23 reverse mode.

Preamble: N/A

Method: The tester sends 1300 Hz only, with no XCI signals, to TUT for 5 seconds.

Pass criteria: The TUT should respond with 390 Hz after 1.7±0.1 seconds.

Comments: The TUT should indicate that V.23 mode has been selected.

III.5.4.3.22 1300 Hz with XCI test

Identifier: ANS-22

Purpose: To ensure correct detection of the XCI signal and selection of V.18 mode.

Preamble: N/A

Method: The tester sends XCI signal as defined in 3.11. On reception of ANS it will become silent for 500 ms then transmit the TXP signal in V.21 (1) mode.

Pass criteria: The TUT should respond with TXP using V.21 (2) and select V.18 mode.

III.5.4.3.23 Stimulate mode country settings

Identifier: ANS-23

Purpose: To ensure that the TUT steps through the probes in the specified order for the country selected.

Preamble: The TUT should be configured for each of the possible probe orders specified in Appendix I in turn.

Method: The tester will call the TUT, wait for Ta to expire and then monitor the probes sent by the TUT.

Pass criteria: The TUT should use the orders described in Appendix I.

Comments: The order of the probes is not mandatory.

III.5.4.3.24 Stimulate carrierless mode probe message

Identifier: ANS-24

Purpose: To ensure that the TUT sends the correct probe message for each of the carrierless modes.

Preamble: N/A

Method: The tester will call the TUT, wait for Ta to expire and then monitor the probes sent by the TUT.

Pass criteria: The TUT should send the user defined probe message for Annexes A, B, and C modes followed by a pause of Tm (default 3) seconds.

Comments: The carrierless modes are those described in Annexes A, B and C.

III.5.4.3.25 Interrupted carrierless mode probe

Identifier: ANS-25

Purpose: To ensure that the TUT continues probing from the point of interruption a maximum of 20 s after a failed connect attempt.

Preamble: The TUT should be configured for the UK country setting.

Method: The tester will call the TUT, wait for Ta to expire and then during the pause after the first Baudot probe it will send a 200 ms burst of 1270 Hz followed by silence for 30 s.

Pass criteria: The TUT should transmit silence on detecting the 1270 Hz tone and then continue probing starting with the V.23 probe 20 seconds after the end of the 1270 Hz signal.

III.5.4.3.26 Stimulate carrier mode probe time

Identifier: ANS-26

Purpose: To ensure that the TUT sends each carrier mode for time Tc (default 6 seconds) preceded by the correct answer tone.

Preamble: None.

Method: The tester will call the TUT, wait for Ta to expire and then monitor the probes sent by the TUT.

Pass criteria: The TUT should send the ANS tone (2100 Hz) for 1 second followed by silence for 75±5 ms and then the 1650 Hz, 1300 Hz and 2225 Hz probes for time Tc.

Comments: The carrier modes are those described in Annexes D, E, and F.

III.5.4.3.27 V.23 mode (390 Hz) detection

Identifier: ANS-27

Purpose: To confirm correct selection of V.23 mode.

Preamble: N/A

Method: The tester waits until the 1300 Hz probe is detected from the TUT and then transmits 390 Hz for 11 seconds.

Pass criteria:

1) After 3 seconds of the 390 Hz signal the TUT should indicate that V.23 has been selected.

2) The tester will confirm that the 1300 Hz carrier is maintained for at least 4 seconds beyond the normal probe duration, i.e. Tc (= 6 s default) + 4 s = 10 seconds total.

Comments: All known V.23 devices need to receive 1300 Hz tone before they will respond with 390 Hz. When the 1300 Hz probe is not being transmitted, a 390 Hz tone may be interpreted as a 400 Hz network tone.

III.5.4.3.28 Interrupted carrier mode probe

Identifier: ANS-28

Purpose: To ensure that the TUT continues probing from the point of interruption a maximum of 4 s after a failed connect attempt.

Preamble: The TUT should be configured for the UK country setting.

Method: The tester will call the TUT, wait for Ta to expire and then during the first V.21 probe it will send a 200 ms burst of 1270 Hz followed by silence for 30 s.

Pass criteria: The TUT should transmit silence on detecting the 1270 Hz tone and then continue probing with the Baudot stored message 4 seconds after the end of the 1270 Hz burst.

Comments: It is most likely that the TUT will return to probing time Ta (3 seconds) after the 1270 Hz tone ceases. This condition needs further clarification.

III.5.4.3.29 Stimulate mode response during probe

Identifier: ANS-29

Purpose: To ensure that the TUT is able to detect an incoming signal while transmitting a carrier mode probe.

Preamble: N/A

Method: The tester will step through each possible response as defined in tests ANS-08 to ANS-23 for each of the carrier mode probes and for each pause after a carrierless mode probe message.

Pass criteria: The TUT should respond as described in the appropriate test above.

Comments: The TUT may not respond to any signals while a carrierless mode probe is being sent since these modes are half duplex.

III.5.4.3.30 Immunity to network tones

Identifier: ANS-30

Purpose: To ensure that the TUT does not interpret network tones as valid signals.

Preamble: N/A

Method: The tester will first send a busy tone to the TUT this will be followed by a number unobtainable tone. The frequencies and cadences of the tones will vary according to the country setting. The tester must be configured for the same country as the TUT.

Pass criteria: The countries supported by the TUT should be noted along with the response to each tone. The tones should either be ignored or reported as the relevant network tone to the user.

Comments: V.18 is required to recognize and report RINGING and BUSY tones. Other network tones may be ignored. Some devices may only provide a visual indication of the presence and cadence of the tones for instance by a flashing light.

III.5.4.3.31 Immunity to fax calling tones

Identifier: ANS-31

Purpose: To determine whether the TUT can discriminate fax calling tones.

Preamble: N/A

Method: The tester will call the TUT and send the fax calling tone, CNG. This is an 1100 Hz tone with cadence of 0.5 seconds ON and 3 seconds OFF as defined in ITU-T T.30.

Pass criteria: The TUT should not respond to this signal and may report it as being a calling fax machine.

Comments: This is an optional test as detection of the fax calling tone is not required by ITU-T V.18.

III.5.4.3.32 Immunity to voice

Identifier: ANS-32

Purpose: To ensure that the TUT does not misinterpret speech as a valid textphone signal.

Preamble: N/A

Method: The tester will respond with sampled speech. A number of phrases recorded from typical male and female speakers will be transmitted. This will include a typical network announcement.

Pass criteria: The TUT should ignore the speech.

Comments: Ideally the TUT should report the presence of speech back to the user. This is an optional test.

III.5.4.3.33 CM detection and V.8 answering

Identifier: ANS-33

Purpose: To confirm that the TUT will respond correctly to CM signals and connect according to V.8 procedures.

Preamble: N/A

Method: The tester will transmit 2 sequences of 4 CI patterns separated by 2 seconds. On reception of the ANSam tone the tester will wait 0.5 seconds and then begin transmitting the CM signal with textphone and V.21 specified.

Pass criteria:

1) On reception of the CM signal, the TUT should transmit JM with textphone and V.21.
2) The TUT should then transmit in V.21 (2) mode.
3) The JM should be followed by continuous 1650 Hz.
4) Correct transmission and reception of T.140 data should be verified after the V.18 mode connection is completed.

Comments: The TUT should indicate V.18 mode.

III.5.4.4 Automode monitor tests

For the following tests the TUT must be set to monitor mode as defined in 5.3 "Automoding Monitor Mode". These tests should be the same as the Automode Answer case except that the stimulate tests are not applicable and the calling tone test should result only in the TUT reporting the fact that a calling tone has been detected.

III.5.4.4.1 Automode monitor Ta timer test

Identifier: MON-21

Purpose: To ensure that on entering monitor mode, timer Ta (3 seconds) is not active and that the TUT does not enter the probing state.

Preamble: N/A

Method: The TUT should be put into monitor state. The tester will then monitor for signals for 1 minute.

Pass criteria: The TUT should not start probing.

III.5.4.4.2 Automode monitor 1300 Hz calling tone discrimination

Identifier: MON-22 (a) to (d)

Purpose: To confirm correct detection and reporting of 1300 Hz calling tones as defined in ITU-T V.25.

Preamble: N/A

Method: The tester will send 1300 Hz bursts of (a) 400 ms, (b) 500 ms, (c) 700 ms and (d) 800 ms followed by 1 second of silence.

Pass criteria:
1) The TUT should not respond to bursts of 400 or 800 ms.
2) The TUT should report detection of calling tones to the DTE after a burst of 1300 Hz for 500 or 700 ms followed by 1 second of silence.

Comments: In automode answer, the 1300 Hz calling causes the DCE to start probing. In monitor mode it should only report detection to the DTE.

III.5.4.4.3 Automode monitor 980 Hz calling tone discrimination

Identifier: MON-23 (a) to (d)

Purpose: To confirm correct detection and reporting of 980 Hz calling tones as defined in ITU-T V.25.

Preamble: N/A

Method: The tester will send 980 Hz bursts of (a) 400 ms, (b) 500 ms, (c) 700 ms and (d) 800 ms followed by 1 second of silence.

Pass criteria:
1) The TUT should not respond to bursts of 400 or 800 ms.
2) The TUT should report detection of calling tones to the DTE after a burst of 980 Hz for 500 or 700 ms followed by 1 second of silence.

Comments: In automode answer, the 980 Hz calling causes the DCE to start probing. In monitor mode it should only report detection to the DTE.

III.5.4.5 V.18 annexes tests

The following tests verify features required in Annexes A to F.

III.5.4.5.1 Baudot carrier timing and receiver disabling

Identifier: X-1

Purpose: To verify that the TUT sends unmodulated carrier for 150 ms before a new character and disables its receiver for 300 ms after a character is transmitted.

Preamble: Establish a call between the tester and TUT in Baudot mode.

Method: The operator should send a single character from the TUT. The tester will immediately start sending a unique character sequence. Examination of the TUT display will show when its receiver is re-enabled.

Pass criteria:
1) The TUT should send unmodulated carrier for 150 ms before the beginning of the start bit.
2) The receiver should be re-enabled after 300 ms.
3) The tester will confirm that 1 start bit and at least 1.5 stop bits are used.

Comments: The carrier should be maintained during the 300 ms after a character.

III.5.4.5.2 Baudot bit rate confirmation

Identifier: X-2 (a) and (b)

Purpose: To verify that the TUT uses the correct bit rates in the Baudot mode.

Preamble: Establish a call between the tester and TUT in Baudot mode for each of the two tests.

Method: The operator should select Baudot (a) 45 bit/s followed by (b) 50 bit/s modes and transmit the string "abcdef" at each rate.

Pass criteria: The tester will measure the bit timings and confirm the rates.

III.5.4.5.3 Baudot probe bit rate confirmation

Identifier: X-3

Purpose: To verify that the TUT uses the correct bit rates in the Baudot mode probe during automoding.

Preamble: Set the user defined carrierless mode probe message to the string "abcdef" if possible. Set the TUT country setting to "United States". A call should be initiated from the tester to the TUT.

Method: The tester will wait for the Baudot mode probe and measure the bit rate.

Pass criteria: The tester will measure the bit timings and confirm the rate of 47.6 bit/s.

Comments: The probe message must be long enough for the tester to establish the bit rate. "GA" may not be sufficient.

III.5.4.5.4 5 Bit to T.50 character conversion

Identifier: X-4

Purpose: To check that the character conversion tables in Annex A have been correctly implemented.

Preamble: Establish a call between the tester and TUT in Baudot mode at 45 bit/s.

Method: The tester will send all possible characters preceded by the relevant case shift command one at a time and wait for a response from the TUT operator. Each character should be responded to at the TUT by typing the received character or <CR> if the character is not available.

Pass criteria:

1) The tester will verify that each character is correctly echoed back by the TUT. The operator should verify that each character is correctly displayed on the TUT.

2) The TUT will send the LTRS symbol before its first character and the appropriate mode character (either LTRS or FIGS) after every 72 subsequent characters.

Comments: The tester should indicate which character has been sent in each case. Some of the characters may not be available from the TUT keyboard and can be ignored. It is assumed that the character conversion is the same for Baudot at 50 bit/s and any other supported speed.

III.5.4.5.5 DTMF receiver disabling

Identifier: X-5

Purpose: To verify that the TUT disables its DTMF receiver for 300 ms when a character is transmitted.

Preamble: Establish a call between the tester and TUT in DTMF mode.

Method: The operator should send a single "e" character from the TUT which will result in sending a single DTMF tone to the tester. The tester will immediately start sending a unique character sequence using single DTMF tones. Examination of the TUT display will show when its receiver is re-enabled.

Pass criteria: The receiver should be re-enabled after 300 ms.

III.5.4.5.6 DTMF character conversion

Identifier: X-6

Purpose: To check that the character conversion tables in Annex B have been correctly implemented.

Preamble: Establish a call between the tester and TUT in DTMF mode.

Method: The tester will send each character from the set in Annex B, waiting for a response after each one. Each character should be responded to at the TUT by typing the same character.

Pass criteria: The tester will verify that each character is correctly echoed back by the TUT.

Comments: The conversion table is specified in Annex B. The receiver at the tester may be re-enabled 100 ms after transmission of each character to maximize likelihood of receiving character from the TUT. It is assumed that the echo delay in the test system is negligible.

III.5.4.5.7 EDT carrier timing and receiver disabling

Identifier: X-7

Purpose: To verify that the TUT sends unmodulated carrier for 300 ms before a character and disables its receiver for 300 ms after a character is transmitted.

Preamble: Establish a call between the tester and TUT in EDT mode.

Method: The operator should send a single character from the TUT. The tester will immediately start sending a unique character sequence. Examination of the TUT display will show when its receiver is re-enabled.

Pass criteria:

1) The TUT should send unmodulated carrier for 300 ms before the beginning of the start bit.
2) The receiver should be re-enabled after 300 ms.
3) The tester will confirm that 1 start bit and at least 1.5 stop bits are used.

Comments: The carrier should be maintained during the 300 ms after a character.

III.5.4.5.8 EDT bit rate and character structure

Identifier: X-8

Purpose: To verify that the TUT uses the correct bit rate and character structure in the EDT mode.

Preamble: Establish a call between the tester and TUT in EDT mode.

Method: The operator should transmit the string "abcdef" from the TUT.

Pass criteria:

1) The tester should measure the bit timings and confirm that the rate is 110 bit/s.
2) The tester should confirm that 1 start bit, 7 data bits, 1 even parity bit and 2 stop bits are used.

III.5.4.5.9 V.23 calling mode character format

Identifier: X-9

Purpose: To verify that the TUT uses the correct character format in the V.23 calling mode.

Preamble: Establish a call from the TUT to the tester in V.23 mode.

Method: The operator should transmit the string "abcdef" from the TUT. The tester will echo characters back to the TUT as they are received. The tester will then transmit the string "abcdef" with ODD parity to the TUT.

Pass criteria:

1) Confirm that 1 start bit, 7 data bits, 1 even parity bit and 2 stop bits are transmitted.
2) The operator should confirm that there is no local echo at the TUT by checking that there are no duplicate characters on the TUT display.
3) The received string should be correctly displayed despite the incorrect parity.

III.5.4.5.10 V.23 answer mode character format

Identifier: X-10

Purpose: To verify that the TUT uses the correct character format in the V.23 answer mode.

Preamble: Establish a call from the tester to the TUT in V.23 mode.

Method: The tester will transmit the string "abcdef" with ODD parity. The TUT should echo characters back to the tester as they are received. The operator should then transmit the string "abcdef" from the TUT.

Pass criteria:

1) The received string should be correctly displayed at the TUT despite the incorrect parity.
2) Confirm that 1 start bit, 7 data bits, 1 even parity bit and 2 stop bits are transmitted by the TUT.
3) The tester should confirm that there is remote echo from TUT.
4) The operator should confirm that there is local echo on the TUT.

Comments: This test is only applicable to Minitel *Dialogue* terminals. Prestel and Minitel *Normal* terminals cannot operate in this mode.

III.5.4.5.11 V.21 character structure

Identifier: X-11

Purpose: To verify that the TUT uses the character structure in the V.21 mode.

Preamble: Establish a call from the TUT to the tester in V.21 mode.

Method: The operator should transmit a string from the TUT that is long enough to cause the display to word wrap followed by "abcdef", new line (CR+LF). The tester will then transmit the string "123456", BACKSPACE (0/8) with ODD parity to the TUT.

Pass criteria:

1) The tester should confirm that 1 start bit, 7 data bits, 1 even parity bit and 1 stop bits are transmitted.
2) The word wrap should not result in CR+LF.
3) The forced new line should be indicated by CR+LF.
4) The last five characters on the TUT display should be "12345" (no "6") correctly displayed despite the incorrect parity.

III.5.4.5.12 V.18 mode

Identifier: X-12

Purpose: To verify that the TUT uses the protocol defined in ITU-T T.140.

Preamble: Establish a call from the TUT to the tester in V.18 mode.

Method: The operator should transmit a string from the TUT that is long enough to cause the display to word wrap followed by "abcdef", new line (CR+LF), new line (UNICODE preferred). The tester will then transmit the string "123456", BACKSPACE.

Pass criteria: The tester should confirm UTF8 encoded UNICODE characters are used with the controls specified in ITU-T T.140.

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