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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

(Previously 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 centers, 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, 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 Recommendation 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 T.50.

For selection between multimedia protocols and this Recommendation, modem connection procedures based on Recommendation V.8 *bis* are provided.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The 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 Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 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.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not 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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Recommendation V.18

OPERATIONAL AND INTERWORKING REQUIREMENTS FOR DCEs OPERATING IN THE TEXT TELEPHONE MODE

(revised in 1998)

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 Recommendation Q.23 (DTMF) character set used by some existing text telephones into the 7-bit code set as given in Recommendation 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 future universal text telephone could 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 new 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 Recommendation 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 editions of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

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

– CCITT Recommendation 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 Recommendation T.140 (1998), *Protocol for multimedia application text conversation.*

– ITU-T Recommendation V.8 (1994), *Procedures for starting sessions of data transmission over the general switched telephone network.*

– ITU-T Recommendation V.8 bis (1996), *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 general switched telephone network and on leased point-to-point telephone-type circuits.*

– CCITT Recommendation V.21 (1984), *300 bits per second duplex modem standardized for use in the general switched telephone network.*

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

– ITU-T Recommendation 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 Recommendation 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 Recommendation V.250 (1998), *Serial asynchronous automatic dialling and control.*

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 Recommendation V.21. The cadence of this shall be bursts of 4 CI sequences separated by 2 s of silence. The CI sequence is defined in Recommendation V.8 as shown below. The 30-bit CI sequence for this Recommendation in left-to-right order of transmission is given by:

1 1111 1111 10 0000 0000 1 0 1000 00101.

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

3.5   text telephone: A device incorporating text telephony functions.

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

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

3.8   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.

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

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

3.11   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 the sequence of bits from the CI signal shown in 3.3 above and sent at 1200 bit/s. The signal consists of:

–   400 ms mark;
–   CI pattern;
–   800 ms mark;
–   CI pattern;
–   800 ms mark;
–   CI pattern;
–   800 ms mark;
–   CI pattern;
–   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 Recommendation 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 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.

This clause specifies the automoding procedures when V.8 *bis* procedures are not implemented and when the originate or answer mode can be selected. The procedures for cases when the mode can not be pre-selected or for when V.8 *bis* is used are described in clause 6 and Appendix III.

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

5.1 Automoding originating

The following procedures assume that the DCE has been placed in the V.18 mode with the CI specified in this Recommendation and that the called party is known to be equipped with a text telephone. The procedure is defined below, and represented in Figure 1.

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 (ANS);

– 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 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.

5.1.2.1 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.

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

5.1.2.3 If the DCE detects 1650 Hz for $\geq$ 0.5 s, it shall connect as per Annex F.

5.1.2.4 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.

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

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

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

5.1.6 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.

5.1.7 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.

5.1.8 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.

5.1.9 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.

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

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

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

5.1.10 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;
– 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 on CI pattern in signal XCI (as described in 3.11) is detected, the DCE shall initiate transmission of answer tone, ANS, as defined in Recommendation V.25, monitor for signal TXP and start a 3-s timer (Tt).

5.2.2.1 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. Recommendation V.21 with the operational requirements specified in clause 4. See Annex G.

5.2.2.2 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 and 5.2.2.2 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 probing state, 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, 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 ANS, 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 subclause 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.

5.3 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 in monitor mode, the DCE line interface should be in a high impedance or bridging state.

6   Multi-mode text telephony

The capability for Simultaneous Voice and Data (SVD) provided by Recommendations 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, Recommendation V.8 *bis* procedures shall be used, whenever possible, 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.

6.1   Simultaneous Voice and Text telephony (SVT)

When Simultaneous Voice and Data (SVD) capability is included, in a V.18 text telephone, connections involving 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.
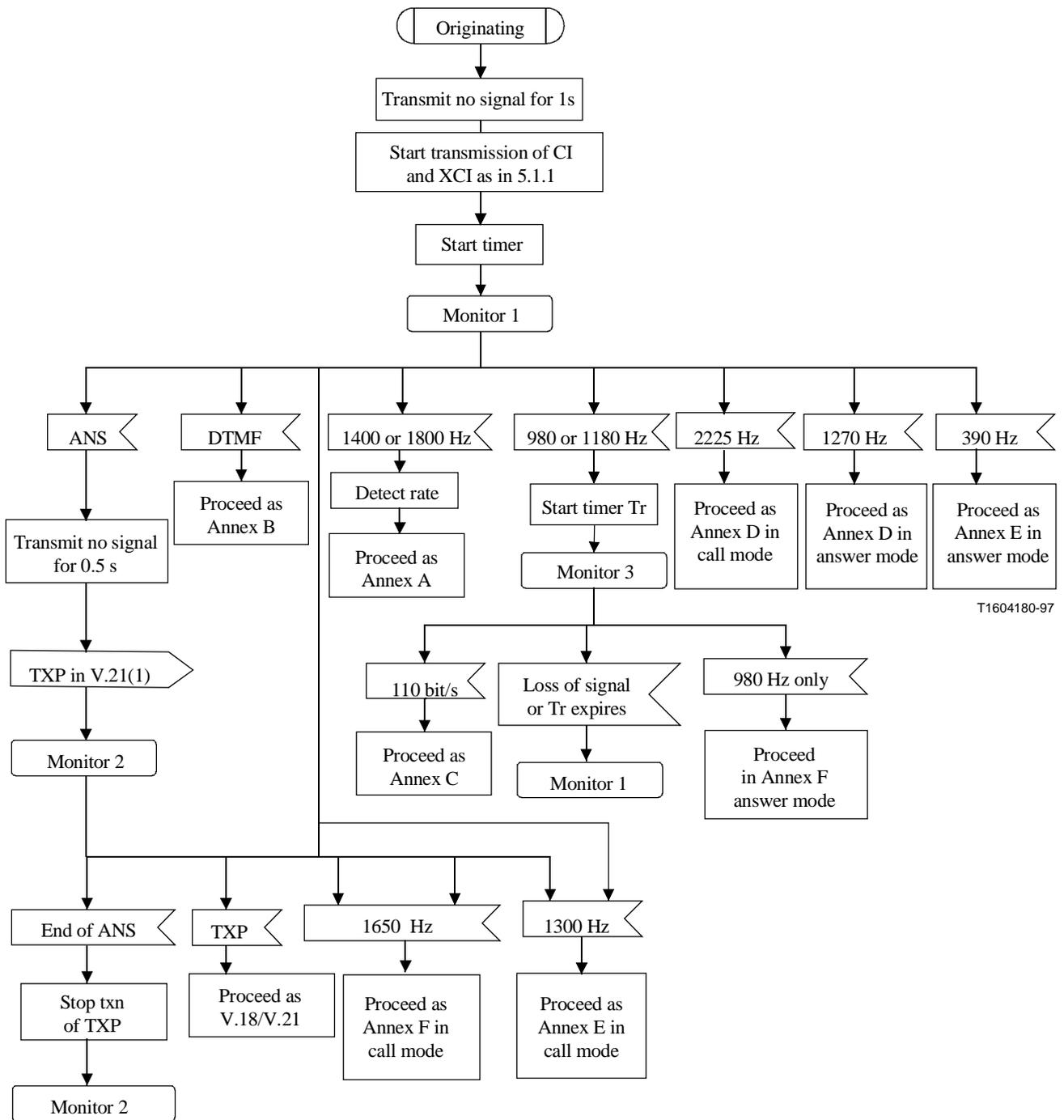
Figure 1/V.18 – Start-up procedure in the originating V.18 DCE with automoding to existing types of text telephone without use of V.8 *bis*
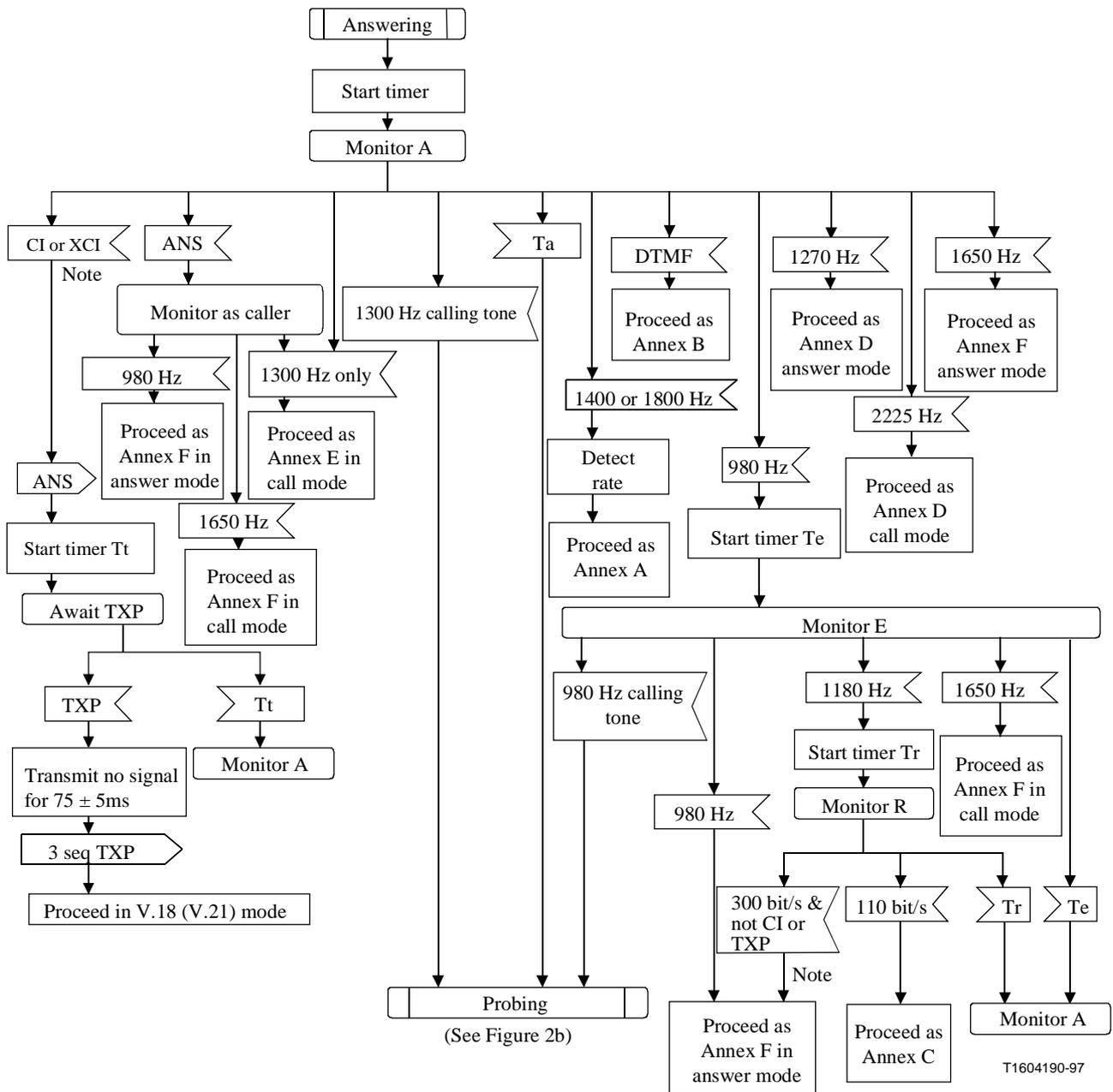
NOTE – The detection of CI may be integrated with the detection of other V.21(1) signals.
The detection of XCI may be integrated with the detection of other V.23(2) signals (i.e. 1300 Hz).

**Figure 2a/V.18 – Start-up procedure in the answering V.18 DCE showing
automoding without use of V.8 *bis* procedures**
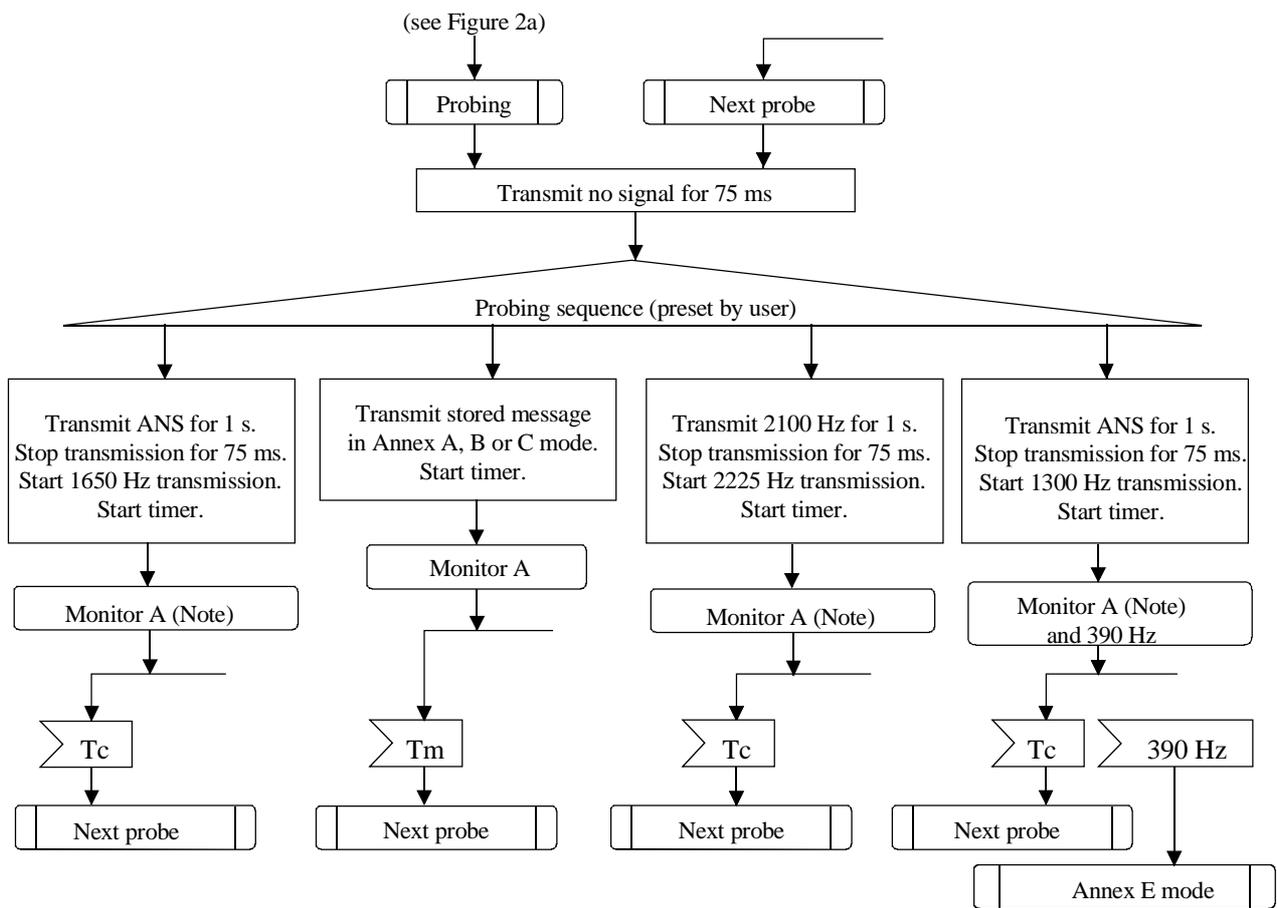
NOTE – Excluding detection of the tone currently being transmitted.   T1604200-97

Figure 2b/V.18 – Automode probing

ANNEX A

5-bit operational mode

A.1   Mode of operation

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 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 Annex A) and transmit to the line.

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	:	010 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	'	*00101*
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	'	*00101*	110 0111	g	11010
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

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 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

DTM F 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.

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
*#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

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
*#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
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

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
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
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 Recommendation 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)].

ANNEX E

V.23 Videotex terminals

There are two main types of Videotex terminals in use, usually known as Minitel and Prestel. The modulation is asymmetric duplex conforming to Recommendation 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.

Answer mode terminal sends	Call mode terminal responds
Reset (1B,39,7F)	Acknowledge Reset (13, 5E)
Request scroll up mode (1B, 3A,69,43)	Acknowledge scroll mode (1B,3A,73,46)
Clear screen (0C)	

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 Recommendation 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 Recommendation 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.

F.5 Presentation control

Transmitted characters are viewed through the use of local echo. Erasure of the last character is requested by BS (0/7). New line is requested by CR LF. 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 is through typing. 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 Recommendation V.21 at 300 bit/s, except as specified in clause 6.

G.2   Presentation protocol for V.18 mode

The text conversation protocol in the DTE shall be as specified in Recommendation 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:

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 Annex D 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 Annex D carrier

Germany, Switzerland, Italy

send EDT code buffered message
send V.21 carrier
send V.23 carrier
send 5-bit code buffered message
send DTMF buffered message
send Annex D carrier

USA

send 5-bit code buffered message
send Annex D 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 Annex D 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 Annex D carrier

Scandinavian countries

send V.21 carrier
send DTMF buffered message
send 5-bit code buffered message
send EDT code buffered message
send V.23 carrier
send Annex D 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

Connection procedures for terminals including V.18 functionality

Connection considerations:

The following procedures are advised for reliable connection establishment where a V.18 device is connected to the same line as other terminal equipment.

In text telephone operation mode, transition from voice to text mode during a call is not uncommon. Selection of originate or answer mode is not an obvious task for a user in voice mode. Therefore, the following procedures are provided for guidance.

III.1   V.18 connection procedures without V.8 *bis*

If this Recommendation is implemented in the DCE, but not Recommendation V.8 *bis*, the following procedures should be followed.

III.1.1 As soon as the line is seized by any device on the line, the DCE should be placed in automoding monitor state. Care should be taken not to respond to any DTMF dialled digits from other terminals on the line.

III.1.2 If the DCE is activated in the calling mode, i.e. performs the dialling, then the V.18 originating procedures should be invoked.

III.1.3 If the DCE is ordered to go off-hook within 10 s after an incoming ring is detected, the line should be monitored for network signals. If ringing tone is detected, then the V.18 originating procedure should be invoked. (This situation appears for example in the call back after the "Call back when free" supplementary service is invoked.) If no ringing tone is detected, the V.18 answering procedures should be activated.

III.1.4 If the DCE is activated without evident connection to calling or answering, according to III.1.3 and III.1.4, a timeout of 7 s should be set and the V.18 originating procedures should be initiated. If no text telephone signal is detected during this time, the V.18 modem should revert to answer mode.

NOTE – This subclause is intended to address of 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.

III.2 V.8 *bis* connection procedures

If Recommendation 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 capability in the connection parameters, and appropriate supported modulations. If other protocols than the V.18-based protocol for text conversation are supported (e.g. in Recommendation H.324), they should also be indicated, and the V.8 *bis* procedure used to select the best common mode. When a V.8 *bis* sequence is completed, the DCE which sent the V.8 *bis* signal ACK should be set in the originating mode; the other DCE should be set in the answering mode.

III.2.1 As soon as the line is seized by any DTE on the connection, the DTE should set the V.18 modem to the automoding monitor state. The modem should also monitor for V.8 *bis* signals.

III.2.2 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.

– Send V.8 *bis* signals CRd/e.

– Monitor for V.8 *bis* signals and text telephone signals (according to the automode monitoring mode).

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 to enter a common mode for text conversation.

If no signals are received within 3 s, initiate the V.18 originating mode.

III.2.3 If the DCE is activated within 10 s after a ring is detected, the DCE should monitor the line for network tones. If ringing tone is detected, then the procedure in III.2.2 should be applied. (This situation occurs, for example, as a result of a "callback when free" supplementary service activation.) If ringing tone is not detected, then the V.18 answering procedures should be invoked applied as follows:

– Send V.8 *bis* signal Capability Request (CRd/e).

– Monitor for V.8 *bis* CRd/e signals except for a time of 1.2 s after transmitting CRd/e.

– Monitor for other V.8 *bis* signals.

– At detection of a CI signal or an XCI signal, send CRd/e, and set a time-out of 2 s. If no V.8 *bis* response is detected during this time, a response to the CI or XCI should be given according to V.18 answering procedure. If a V.8 *bis* response is received, the V.8 *bis* procedure should be continued.

III.2.4 If the DCE is activated without evident connection to calling or answering, according to the three paragraphs above, a time-out of 7 s should be set and the procedures according to III.2.2 should be applied with the difference that CRd should only be generated once. If no V.8 *bis* or text telephone signal is detected during this time, the V.18 answering mode should be entered.

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