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SERIES V: DATA COMMUNICATION OVER THE
TELEPHONE NETWORK

Control procedures

Procedure for DTE-controlled call negotiation

ITU-T Recommendation V.251

(Previously CCITT Recommendation)

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DATA COMMUNICATION OVER THE TELEPHONE NETWORK

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PROCEDURE FOR DTE-CONTROLLED CALL NEGOTIATION

Summary

This Recommendation defines means for use in DTE control of V.8 and V.8 *bis* call negotiation.

Source

ITU-T Recommendation V.251 was prepared by ITU-T Study Group 16 (1997-2000) and was approved and published as V.25 *ter* Annex A under the WTSC Resolution No. 1 procedure on 11 July 1997. It was then renumbered as V.251 under the WTSC Resolution No. 1 procedure on 6 February 1998, without further modification.

FOREWORD

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Recommendation V.251

PROCEDURE FOR DTE-CONTROLLED CALL NEGOTIATION

(Geneva, 1998)

1 Introduction and scope

Recommendation V.8 is standardized for use in negotiating the call type at the beginning of a PSTN call. Recommendation V.8 *bis* is standardized for use in negotiating the call type during a PSTN call. They provide means to select amongst several single media or multimedia operating modes.

- data modem (V-Series modems);
- text telephone (Recommendation V.18);
- send G3 facsimile (from calling terminal);
- receive G3 facsimile (polling);
- simple voice telephony;
- analog simultaneous Voice and data;
- digital simultaneous Voice and data;
- multimedia terminal (e.g. Recommendation H.324).

Means are defined in this Recommendation for use in DTE control of V.8 and V.8 *bis* call negotiation.

These means are designed so that the negotiation decisions are made in the DTE, so that compliant DCE do not need modification each time V.8 or V.8 *bis* code points are added or modified in other ways.

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 Recommendation V.8 *bis* (1998), *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 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.*

3 Functions

A DCE compliant with this annex shall provide the following functions:

- a) accept DTE preconfiguration command before call establishment;
- b) provide necessary V.8 physical layer functions, including ANSam and V.21 modem;
- c) provide indications to the DTE for detection of remote V.8 signals (ANSam, CI, CM, JM, CJ), V.25 signals (CT, T.30 CNG) and relevant sigA and sigC signals (e.g. T.30 Ch2 flags);
- d) accept V.8 signals from the remote station, and convert them to hexadecimal octet coding for presentation to the DTE;
- e) accept V.8 signal octets in hexadecimal octet coding from the DTE and convert them to V.8 format for transmission;
- f) return to Command State after CJ transmission, detection or failure detection, so that DTE can take timely action;
- g) accept V.8 *bis* signal codes and V.8 *bis* message octets in hexadecimal octet coding from the DTE and convert them to V.8 *bis* format for transmission;
- h) detect V.8 *bis* signals and messages from the remote station, and convert them to the appropriate signal codes and hexadecimal octet coding for presentation to the DTE.

4 Definitions and conventions

This Recommendation defines the following terms:

4.1 hexadecimal octet coding: Hexadecimal octet coding is a means for representing a string of octets as a string of hexadecimal digits, with two digits representing each octet.

Each octet is issued by the DTE or DCE in the same time sequence as transmitted on the GSTN line, with no intervening characters.

For each octet, the 8-bit sequence is encoded as two hexadecimal digits. Bit 0 is the first transmitted; bit 7 is the last.

Bits 7-4 are encoded as the first hexadecimal digit, with Bit 7 as MSB and Bit 4 as LSB. Bits 3-0 are encoded as the second hexadecimal digit, with Bit 3 as MSB and Bit 0 as LSB.

Examples:

Octet bit pattern (time order)	Hexadecimal coding	T.50 codes
00011011	D8	4/4, 3/8
11100100	27	3/2, 3/7
10000011 10100010 11001000 00001001	C1451390	4/3, 3/1, 3/4, 3/5, 3/1, 3/3, 3/9, 3/0

4.2 hexadecimal octet sequence: A hexadecimal octet sequence is an even number of hexadecimal digits, terminated by a <CR> (T.50 0/13) character.

4.3 V.8 signal format: There are three V.8 signals that include strings of octets: CI, CM and JM. In these signals, the DCE transmits a repeating pattern including 10 bits of 1 (mark idle) followed by a synchronization signal and one or more octets; see Tables 1/V.8 to 6/V.8.

4.4 V.8 *bis* signal and message format: All V.8 *bis* signals consist of a dual tone followed by a single tone; see 7.1/V.8 *bis*. All V.8 *bis* messages consist of one or two HDLC frames carried on V.21 (H) modulation; see 7.2/V.8 *bis*.

5 Commands

5.1 V.8 and V.8 bis operation controls, +A8E

Write Syntax: +A8E=<v8o>,<v8a>,<v8cf>[,<v8b>][,<cfrange>][,<protrange>]

Valid Values: see Table 1 below

Default values: 1,1,,1,"","",""

Description

This command is defined for two conditions: as a parameter while the DCE is on-hook, and as an action command while the DCE is off-hook. If enabled, V.8 negotiation does not preclude simultaneous implementation of other negotiation means (e.g. Recommendation V.8 *bis*, Recommendation V.18, Annex A/V.32 *bis*).

This command is a compound parameter if issued while the DCE is on-hook, used to precondition V.8 and V.8 *bis* originating and answering operation. It is issued by the DTE before the Dial (D) or Answer (A) command, regardless of the state of the +FCLASS parameter.

This command is an action command if issued while the DCE is off-hook, to (re)start V.8 or V.8 *bis* negotiation. For example, if initial V.8 negotiation failed, but subsequent T.30 negotiation indicated V.8 capability, this command may be used to initiate V.8 negotiation.

The subparameters are defined as follows:

Table 1/V.251 – V.8 operation control subparameters

Values	Description
<v8o>=0	Disable V.8 origination negotiation
<v8o>=1	Enable DCE-controlled V.8 origination negotiation
<v8o>=2	Enable DTE-controlled V.8 origination negotiation, send V.8 CI only
<v8o>=3	Enable DTE-controlled V.8 origination negotiation, send 1100 Hz CNG only
<v8o>=4	Enable DTE-controlled V.8 origination negotiation, send 1300 Hz CT only
<v8o>=5	Enable DTE-controlled V.8 origination negotiation, send no tones
<v8o>=6	Enable DCE-controlled V.8 origination negotiation, issue +A8x indications
<v8a>=0	Disable V.8 answer negotiation
<v8a>=1	Enable DCE-controlled V.8 answer negotiation
<v8a>=2	Enable DTE-controlled V.8 answer negotiation, send ANSam
<v8a>=3	Enable DTE-controlled V.8 answer negotiation, send no signal
<v8a>=4	Disable DTE-controlled V.8 answer negotiation, send ANS
<v8a>=5	Enable DCE-controlled V.8 answer negotiation, issue +A8x indications
<v8cf>=X..Y	Set the V.8 CI signal call function to the hexadecimal octet value X..Y
<v8b>=0	Disable V.8 <i>bis</i> negotiation <v8b>=1 enable DCE-controlled V.8 <i>bis</i> negotiation
<v8b>=2	Enable DTE-controlled V.8 <i>bis</i> negotiation
<cfrange>=<string of values>"	Set to alternative list of call function "option bit" values that the answering DCE shall accept from the caller
<protrange>=<string of values>"	Set to alternative list of protocol "option bit" values that the answering DCE shall accept from the caller

For subparameters <v8o>, <v8a> and <v8b>, values of 0 disable the corresponding feature. Values of 1 enable the feature, with operation controlled by the DCE, based implicitly on manufacturer-determined procedures and on previous configuration commands. The ATD and ATA commands behave as specified in 6.3.1 and 6.3.5, respectively, and +A8n indications are not generated by the DCE. For example, a DCE configured with +FCLASS=0 gets V.8 CI, CM and JM information from the settings of the +MS, +ES, +DS, +MV18S parameters in this Recommendation. Similarly, a DCE configured with +FCLASS=1.0 gets some CI, CM and JM information from the +F34 parameter (Annex B/T.31).

For subparameter values <v8o>=6 and <v8a>=5, the +A8I, +A8C, +A8A, +A8J, and +A8M indications are issued during the course of the V.8 session to notify the DTE when the relevant V.8 signals are received. The DCE control the V.8 session, however, and the +A8M command is not used.

The <cfrange> subparameter setting is used when <v8a>=5. The subparameter is set to a string, consisting of an alternative list of call function "option bit" values that the answering DCE shall accept from the caller; for example, "2,6" for V.18 and data. If the caller transmits a call function of either the preferred value, or a value from this list, the answerer shall respond with a JM set to the value received from the caller. If a different call function is received, the DCE shall transmit a JM with the call function set to the preferred value, with the modulation bits set to zero (per Recommendation V.8).

The range of valid option bit values depends on the extension octet capabilities of the DCE. Values 0-6 correspond to the setting of the b5-b7 bits in a basic (non-extended) call function octet, e.g. a value of 6 corresponds to Transmit and Receive data. Values 7-38 correspond to the use of one extension octet, where bits b5-b7 in the basic octet all set to one.

Each extension octet has five bits available for expressing category values. Thus, values 39-1062 correspond to the use of two extension octets, constructed by considering b0 of the first extension octet to be the least significant bit of a ten-bit number, with b7 of the second extension octet as the most significant bit; this ten-bit number is then offset by 39 so as not to conflict with the single-extension-octet values. This process may be extended for additional call function extension octets.

The preferred call function option bit value is determined by DCE configuration. For example, it is equal to 4 if +FCLASS=1.0.

The function of the <protrange> subparameter is identical to <cfrange>, except it applies to the protocol category. See Table 2.

Table 2/V.251 – V.8 operation control read and test

Command	DCE action
+A8E?	Report current values of subparameters
+A8E=?	Report supported ranges of values: (range of supported <v8o> values), (range of supported <v8a> values), (maximum size of v8cf in octets), (range of supported <v8b> values), (range of supported cfrange option bit values), (range of supported protrange option bit values)

Implementation

V-Series DCEs implementing this Recommendation shall support at least one of these subparameter values: <v8o>=(2-6), <v8a>=(2-5), or <v8b>=2.

NOTE – The DCE shall return ERROR if the DTE attempts to enable DTE control of V.8 simultaneous with DCE control of V.8 *bis*.

Example usage is shown in clause 10.

5.2 Send V.8 menu signals

Syntax: +A8M=<hexadecimal coded CM or JM octet string>

Description

This command directs the DCE to send a V.8 CM or JM signal using the specified hexadecimal coded string. If the DCE can decode the menu octet string, and if it cannot implement a specified feature, the DCE shall report an ERROR final result code, but stay in V.8 operation awaiting another command.

Implementation

Implementation of this command is mandatory for V-Series DCEs supporting DTE control of Recommendation V.8.

5.3 Send V.8 bis signal and/or message(s)

Syntax: +A8T=<signal>[,<1st message>][,<2nd message>][,<sig_en>][,<msg_en>][,<supp_delay>]

Description

The command directs the DCE to transmit a V.8 *bis* signal and/or message. The first subparameter selects the V.8 *bis* signal (see Tables 1-3/V.8 *bis*). Values of 0 correspond to no signal sent. The hexadecimal coded messages, if provided, are used to generate V.8 *bis* messages.

Subparameter values (see Table 3):

Table 3/V.251 – V.8 bis signal subparameter values

Signal value	Description
0	None
1	Initiating Mre
2	Initiating MRd
3	Initiating CRe, low power
4	Initiating CRe, high power
5	Initiating CRd
6	Initiating Esi
7	Responding MRd, low power
8	Responding MRd, high power
9	Responding CRd
10	Responding Esr

The transmitted V.8 *bis* message frame(s) is specified as hexadecimal octet coded string (see 4.1). Additional messages are delimited by comma characters. Flag generation, flag transparency 0-bit insertion and FCS generation are performed by the DCE. If no data is provided by the DTE, no V.21 carrier is generated beyond that used in segment 2. For two concatenated messages, the DCE shall insert the required preamble between the first and second messages.

Subparameter <sig_en> directs the DCE to search for specified V.8 *bis* signals. A value of zero enables detection of initiating signals; a value of one enables detection of responding signals; a value of two enables detection of both signals.

Subparameter <msg_en>, if set to 1, directs the DCE to search for V.8 *bis* messages. A value of zero disables detection of the messages. Note that detection of an ES signal automatically conditions the DCE to look for an immediately subsequent V.8 *bis* message regardless of the setting of <msg_en>; see 9.2

Subparameter <supp_delay>, if set to 1, directs the DCE to insert a 1.5 second delay between the transmitted V.8 *bis* signal and the subsequent V.8 *bis* message, if any.

Read Syntax: +A8T?

The DCE shall respond with the following information text:

+A8T: ,,<current value of sig_en>,<current value of msg_en>,<current value of supp_delay>

Test Syntax: +A8T=?

The DCE shall report: (0-10),(max length of message 1),(max length of message 2),(range of supported sig_en values),(0-1),(0-1).

Implementation

Implementation of this command is mandatory for V-Series DCEs supporting DTE control of Recommendation V.8 *bis*.

6 V.8 signal indications

6.1 CI signal indication, +A8I

Format: +A8I:<v8c><CR>

Description

This indication is issued by an answering DCE, if +A8E, <v8a> ≠ 0, to indicate detection of a V.8 CI signal, and report the recovered Call Function octet(s). Value <v8cf> is a hexadecimal code octet representation of those Call Function octet(s). +A8I:0 indicates that the DCE timed out waiting for CI.

Implementation

Implementation of this indication is optional.

6.2 Calling tone indication, +A8C

Format: +A8C: <type><CR>

Description

This indication is issued by an answering DCE, if +A8E, <v8a> ≠ 0, to indicate detection of 1100 Hz or 1300 Hz calling tones, or sigC signals, as defined in Recommendations T.30, V.8 and in V.25. The following +A8C:<type> values are defined (see Table 4):

Table 4/V.251 – Calling tone indication values

Signal value	Description
0	Indicates that the DCE concluded answer tone transmission without reporting detection of any calling tone
1	Indicates a CNG tone (1100 Hz)
2	Indicates 1300 Hz V.25 data modem calling tone
3	Indicates sigC signal: V.32/V.32 <i>bis</i> AA tone

Implementation

Implementation of this indication is mandatory for V-Series DCEs supporting DTE control of V.8, or for DCEs supporting the $<\text{v8o}>=5$ subparameter value in the +A8E command. Individual values 1, 2 and 3 shall be implemented if the DCE supports detection of the relevant signal.

6.3 Answer signal indication, +A8A

Format: +A8A:<type><CR>

Description

This indication is issued by a calling DCE, if +A8E $<\text{v8o}>\neq 0$, to indicate detection of an answering signal. The <type> codes are (see Table 5):

Table 5/V.251 – Answering signal indication values

Signal value	Description
0	Indicates that the DCE timed out waiting for an answering signal
1	Indicates V.8 ANSam signal (2100 Hz with amplitude modulation)
2	Indicates V.25 answer tone (2100 Hz)
3	Indicates V.25 answer tone with phase reversals (Note)
4	Indicates sigA signal: V.21 Ch2 with flags (e.g. T.30 control preamble)
5	Indicates sigA signal: V.22 <i>bis</i> USB1 signal
6	Indicates sigA signal: V.32 <i>bis</i> AC signal
7	Indicates sigA signal: V.34 ToneA signal

Other values are reserved for other answering signal detection indication.

NOTE – If the DCE cannot distinguish between V.25 answer tones with and without phase reversals, the DCE shall report value 2 for both signals. The presence or absence of phase reversals in V.25 ANS is intended to signal GSTN echo control equipment and may not be a reliable indicator of the subsequent V-series modulation.

Implementation

Implementation of this indication is mandatory for V-Series DCEs supporting DTE control of V.8, or for DCEs supporting the $<\text{v8o}>=6$ subparameter value in the +A8E command. Individual values 1-7 shall be implemented if the DCE supports detection of the relevant signal.

6.4 V.8 negotiation complete, +A8J

Format: +A8J:<value><CR>

Description

This indication is issued by either DCE, if DTE control of V.8 negotiation is enabled, when the negotiation is complete and CJ is sent or detected. An answering DCE will issue this on detection of CJ from the remote terminal. A calling DCE will send a CJ signal to the remote terminal at the same time as a +A8J indication. +A8J:1 indicates CJ; +A8J:0 indicates that the DCE timed out waiting for a CJ signal.

Implementation

Implementation of this indication is mandatory for V-Series DCEs supporting DTE control of V.8, or for DCEs supporting the <v8o>=6 or <v8a>=5 subparameter values in the +A8E command.

6.5 V.8 menu report, +A8M

Format: +A8M:<CM or JM hexadecimal coded string>

Description

This indication is issued by either DCE, during V.8 negotiation, to indicate the contents of a valid received CM or JM signal. A +A8M:0 indicates that the DCE timed out waiting for a CM or JM signal.

Implementation

Implementation of this indication is mandatory for V-Series DCEs supporting DTE control of V.8, or for DCEs supporting the <v8o>=6 or <v8a>=5 subparameter values in the +A8E command.

6.6 V.8 bis signal and message reporting

Syntax: +A8R:<signal>[,<1st message>][,<2nd message>]<CR>

Description

If enabled by +A8E=,,,[<v8b>=2] command, the DCE shall monitor for V.8 *bis* signals and messages, and use the +A8R: intermediate result code response to report that signal.

The V.8 *bis* signal, if detected, is indicated using a <signal> value defined in Table 3 above. Values of 4 and 8 are not reported, i.e. the DCE is not expected to discern the power level of received CRe and MRd signals. If a V.8 *bis* message is detected without a preceding V.8 *bis* signal, the preamble is reported as a 0 <signal> value.

The contents of valid V.8 *bis* message(s), if detected, are reported using hexadecimal octet coded string(s) (see 4.1). Flag detection and consumption, flag transparency 0-bit deletion and FCS checking are performed by the DCE. The DCE shall not report invalid messages (e.g. bad FCS). If two consecutive messages are detected but the first is invalid, the DCE shall indicate this with no characters between the first and second comma (e.g. +A8R:< signal>,,<2nd message>).

Two concatenated V.8 *bis* messages are reported with two consecutive <message> indications.

Implementation

Implementation of this indication is mandatory for V-Series DCEs supporting DTE control of Recommendation V.8 *bis*.

7 V.8 origination procedures

The procedures in this clause apply if +A8E <v8o> has values other than 0 or 1.

7.1 Configuration before the Dial command

Before the Dial command, the DCE must be enabled by setting the +A8E <v8o> to a value other than 0 or 1, and setting <v8cf> to a valid Call Function value (see Table 3/V.8). If <v8cf> is not valid, the DCE may still use it to generate a V.8 CI signal, but the remote terminal is unlikely to recognize it.

7.2 Operation after dialling is completed

After the Dial command has finished sending the dialling strings, the DCE shall condition its receiver to detect ANS, ANSam, or sigAs that are characteristic of acceptable modes of operation, and wait silent as specified in Recommendation V.8 or in national regulations. If +A8E = 2,, it shall then send a V.8 repeating CI signal, using the call function specified in <v8cf>. If +A8E = 3,, it shall then send a repeating CNG, as specified in Annex F/T.30. If +A8E = 4,, it shall then send the 1300 Hz calling tone specified in Recommendation V.25.

7.3 Answering signal detection

If ANSam is detected, the DCE shall stop transmitting the calling signal and report this to the DTE using the +A8A:1 indication (see 6.3). If <v8o>≠6, the DCE shall then issue an OK final result code after at least 1.0 s of ANSam has been detected without the presence of calling signal.

The DCE shall then proceed to CM signal generation (see 7.5).

NOTE – If it is unnecessary to allow for the disabling of network echo cancellers, the DCE may issue the OK final result code as soon as 0.5 s after the ANSam signal is first detected without the presence of calling signal, in accordance with 8.1.1/V.8.

If no answering signal is detected, as determined by DCE S7 parameter time-out, the DCE shall stop transmitting calling signal, if any. If V.8 bis negotiation has also been enabled by setting <v8b>≠0, or the DCE is otherwise configured to remain off-hook, the DCE shall issue a +A8A:0 indication, an OK final result code, and remain off-hook. If <v8b>=0 and the DCE not otherwise configured, the DCE shall issue a NO CARRIER result code and return on-hook. In either case, V.8 negotiation shall terminate, and no other +A8-type indications associated with such negotiations shall be issued. The DCE shall await further direction from the DTE (see 7.7).

If an answering signal other than ANSam is detected, the DCE shall report this to the DTE using the +A8A indication (see 6.3). If <v8o>≠6, the DCE shall then issue an OK final result code, continue to transmit calling signal, if any, and await direction from the DTE (see 7.7).

7.4 V.8 abort

For DTE-controlled V.8 operation, up to the point of reception of a signal from the answering terminal, V.8 call establishment is an extension of the D command execution. After the +A8A indication and the OK result code are issued, D command execution is complete.

V.8 negotiation during D command execution will terminate early if the DTE issues an any-key-abort to the DCE. In this case, the DCE action shall be the same as that described for the case of an S7 time-out in 7.3.

7.5 CM signal generation

For DTE-controlled V.8 operation, if ANSam is detected, the +A8A:1 indication followed by the final result code prompts the DTE to send the V.8 CM signal octets, as a hexadecimal octet sequence preceded by the +A8M= command. The DCE shall send the resulting CM signal to the remote terminal and condition its receiver to detect JM and proceed to 7.6.

For DCE-controlled operation with $\langle v8o \rangle = 6$, the DCE shall not issue an OK final result code after the +A8A:1 indication, and shall transmit the CM without the need of a +A8M= command from the DTE.

7.6 JM signal detection

If the DCE detects a valid JM signal, it shall deliver the JM signal to the DTE as a hexadecimal octet sequence within a +A8M: intermediate result code. If no valid JM signal is detected, as determined by DCE time-out, the DCE shall issue a +A8M:0 intermediate result code.

If $\langle v8o \rangle \neq 6$, the DCE shall follow +A8M intermediate result code with an OK final result code.

The DCE shall continue to send CM, and proceed to 7.7.

7.7 Transition to communications

Unless previously configured by the DTE, at the OK final result code, the DTE shall issue appropriate +FCLASS and other configuration and operation commands. If V.8 negotiation was successfully initiated and a valid JM signal was received, this configuration shall be in accordance with the received JM, followed by the appropriate action command to begin operation in the selected modulation mode. For data or V.18 operation, +FCLASS=0; the first action command is ATO.

If transmitting CM, upon receipt of ATO or other appropriate action command, the DCE shall complete V.8 negotiation by halting CM transmission, transmitting CJ, delaying 75 ± 5 ms, and transmitting the appropriate sigC signal in accordance with 8.1.2/V.8.

Simultaneous with the transmission of CJ, the DCE shall issue a +A8J:1 information text. Typically, this will be issued before other information text strings reporting modulation type, error control type, etc., and before a result code such as CONNECT or NO CARRIER. Once the +A8J string is issued, DTE-controlled V.8 operation is complete and the DTE shall issue no further +A8-type indications associated with such operation.

If the received JM signal had all the modulation category option bits set to zero, the DCE shall issue an OK result code after the +A8J:1 indication and remain off-hook.

8 V.8 Answer procedures

The procedures in this subclause apply if +A8E $\langle v8a \rangle$ has values other than 0 or 1.

8.1 Configuration before the Answer command

Before the Answer command, the DCE must be enabled by setting the +A8E $\langle v8a \rangle$ to values other than 0 or 1.

8.2 Operation after the Answer command

After the DCE has accepted the Answer command and connected to the GSTN, the DCE shall condition its receiver to detect V.8 CI and CM signals, other V.25 signals, T.30 CNG signals, and sigAs characteristics of acceptable modes of operation, e.g. the V.32 AA signal. The DCE shall transmit no signal for at least 0.4 s. If $\langle v8a \rangle = 1$, the DCE shall commence transmitting ANSam.

8.3 Calling signal detection

If V.8 CI is detected, the DCE shall report this to the DTE using the +A8I: <v8cf> indication with call function (see 6.1). If <v8a>=2, the DCE shall commence the transmission of ANSam.

The DTE may decode the <v8cf> hexadecimal octet sequence, as defined in Recommendation V.8, to determine the requested call function. If the DTE cannot accommodate the requested call function, the DTE may abort the V.8 negotiation by issuing an any-key-abort to the DCE (see 8.5).

If a 1100 Hz T.30 CNG tone or a 1300 Hz V.25 data calling tone or other suitable sigC signal is detected, the DCE shall continue transmitting ANSam if <v8a>=2 or commence transmitting ANSam if <v8a>=3, issue a +A8C:<type> code, an OK final result code, and wait for DTE command.

If the DCE detects a valid CM signal, it shall report the CM signal to the DTE as a hexadecimal octet sequence, preceded by a +A8M: prefix, and continue to transmit ANSam. The DCE shall issue an OK final result code and proceed to 8.4.

If the DCE fails to detect a valid calling signal before ANSam transmission is complete or before an any-key-abort is received, it shall issue a +A8C:0 intermediate result code, issue an OK final result code, and wait for DTE command (see 8.6).

8.4 JM signal generation

Unless previously configured by the DTE, at the OK final result code, the DTE shall issue appropriate +FCLASS and other configuration commands corresponding to the transmitted JM. If <v8a>≠5, the DCE shall await a +A8M command from the DTE before transmitting the specified JM; the DCE shall then issue an OK final result code.

With the commencement of JM transmission, the DCE shall proceed to 8.6.

8.5 V.8 abort

Until the detection of a calling signal or completion of answer tone transmission, V.8 call negotiation is an extension of the A command execution. After the OK final result code is issued, A command execution is complete.

The DTE may terminate the A command execution prematurely with an any-key-abort. DCE behaviour shall be as specified in 8.3.

8.6 Transition to communications

At the OK final result code, the DTE shall issue the appropriate operation command to transition to Data State. If <v8a>≠5, the DTE may issue the operation command on the same command line as the +A8M command to send JM, in order to insure that the DCE is ready to complete the actions required after detection of CJ, and/or to increase system robustness by configuring the DCE for simultaneous detection of CJ and the appropriate SigC.

For data or V.18 operation, +FCLASS=0, the first action command is ATO.

If the negotiation result is T.30 facsimile operation, the DTE shall issue the appropriate action commands as defined in Recommendation T.31 or T.32.

If a V.8 CJ signal is detected, the DCE shall indicate this to the DTE with the +A8J:1 intermediate result code.

If the transmitted JM signal had all the modulation category option bits set to zero, the DCE shall issue an OK result code after the +A8J:1 indication and remain off-hook.

9 V.8 bis procedures

The procedures in this subclause apply if +A8E <v8b> has a value of 2.

9.1 Initiation

The +A8E=,,<v8b> command with <v8b> value of 2 commences V.8 *bis* operation under DTE control, directing the DCE to begin listening for incoming initiating V.8 *bis* signals. Note that capable DCE may accept this command on-hook or off-hook, in any relevant +FCLASS setting. The DCE may be reconfigured from listening for initiating V.8 *bis* signals to listening for responding signals, or vice versa, with the +A8T command. Also, V.8 *bis* and V.8 operation may be initiated simultaneously.

9.2 Reception

Detection of any V.8 *bis* signal shall be reported using the +A8R: response. Detection of an ES signal shall cause the DCE to prepare to report a subsequent V.8 *bis* message, if any, to the DTE. The contents of this message shall be reported in the same +A8R intermediate result codes used to report the signal. At the conclusion of the V.8 *bis* message, or in the absence of such a message after the ES signal, the DCE does not report the contents of any V.21 (H) messages until commanded otherwise by the DTE.

9.3 Transmission

The DTE shall use the +A8T (see 5.3) command to transmit a V.8 *bis* signal and/or message.

According to the setting of the <sig_en> and <msg_en> subparameters, at the conclusion of the transmission, the DCE shall condition itself to report V.8 *bis* signals and/or messages received from the remote station.

Signal and/or message detection can be reconfigured at a later time by issuing a +A8T command with <signal>=0 and the <1st message> and <2nd message> subparameter empty.

NOTE – If the DCE is configured to detect the same type of signals that it is transmitting, the DCE may detect the echo of that signal and issue an erroneous +A8R response. Examples:

- a) If the +A8T command is used to generate V.8 *bis* initiating signals (<signal> values 1-6) and <sig_en> equals 0 or 2.
- b) If the +A8T command is used to generate V.8 *bis* responding signals (<signal> values 7-10) and <sig_en> equals 1 or 2.

9.4 Termination

The DTE shall use the +A8E=,,,0 command to terminate V.8 *bis* monitoring mode. Since Recommendation V.8 *bis* is used to negotiate for operating modes, the DTE is responsible to issue necessary DCE configuration and operation commands (e.g. AT+FCLASS=0; ; O) in time for the DCE to be correctly configured to execute any required actions.

10 Sample sessions

In these examples, actions between the DTE and DCE on both the originating and answering side are illustrated.

For purposes of some examples, it is assumed that the V.8 call function codes for originator transmit and receive T.30 facsimile are 10000001 and 10000101 respectively.

Sample session 10.2 is used to illustrate an answering terminal preconfigured for fax operation, but capable of fax or data, and adaptively switches to data.

10.1 V.8 origination, connect as V.34 transmit and receive data

DTE commands and data	DCE indications and data	DCE actions	Remote terminal actions	Notes
AT+A8E=5	OK			Enable DTE V.8 control, no calling tones
AT+FCLASS=0	OK	Select Class 0		Configure for data
ATD<string>	+A8A:1 OK	Off-hook, dial Detect ANSam	Detect ringing answer Send ANSam	
AT+A8M=C14513902A	+A8M:C14513902A OK	Send CM Detect JM	Detect CM Stop ANSam Send JM	Indicate Rec. V.34, Rec. V.32 bis, Rec. V.22 bis, Rec. V.22 and Rec. V.21, with LAPM. Remote selects Rec. V.34 with LAPM
AT+A8M=C1453180	+A8M:A145 OK	Send CM Detect JM	Detect CM Stop ANSam Send JM	
ATO	+A8J:1 +MCR: V34 +MRR: 28 800 +ER: LAPM +DR: V42B CONNECT	Send CJ Negotiate V.34 channel rates, protocols, etc.	Detect CJ Negotiate V.34 channel rates, protocols, etc.	Indicate Rec. V.34, Rec. V.32 bis, Rec. V.22 bis, Rec. V.22 and Rec. V.21. Remote selects Rec. V.34, report Rec. V.34 at 28 800, Rec. V.42 and Rec. V.42 bis
ATO	+A8J:1 +MCR: V34 +MRR: 28 800 +ER: LAPM +DR: V42B CONNECT	Send CJ Negotiate V.34 channel rates, protocols, etc.	Detect CJ Negotiate V.34 channel rates, protocols, etc.	Report Rec. V.34 at 28 800, Rec. V.42 and Rec. V.42 bis
exchange data				

10.2 V.8 answer, preconfigure for facsimile, but adaptively connect as a V.34 data modem

DTE commands and data	DCE indications and data	DCE actions	Remote terminal actions	Notes
AT+A8E=,2	OK			Enable ANSam
AT+FCLASS=1,0	OK	Select Class 1		Preconfigure for FAX
	RING	Detect ringing	Dial	
ATA	+A8I:C1 A8M:C14513902A OK	Off-hook Send ANSam Detect CI Detect CM	Send CI Detect ANSam Send CM	Remote terminal called in requesting a data connection
AT+FCLASS=0[; any configuration. commands....]	OK	Reconfigure for data operation		
AT+A8M=C14513902A:O	+A8J:1 +MCR: V34 +MRR: 28 800 +ER: LAPM +DR: V42B CONNECT	Send JM Detect CJ Negotiate V.34 duplex channel rate	Detect JM Send CJ Stop CJ Negotiate V.34 duplex channel rate	
exchange data				

10.3 V.8 bis sample session, based on Figure II.4/V.8 bis

Initiating DTE commands and data	Initiating DCE indications and data	Responding DTE commands and data	Responding DCE indications and data	Notes
				Voice call previously established
AT+A8E=,,,2	OK	AT+A8E=,,,2	OK	Configure for Rec. V.8 bis
AT+A8T=5,,,1,1	OK			Send CR _d at -5 dBm, look for responding signal (e.g. CR) or message (e.g. CL,CLR)
			+A8R:5	Indicate received CR _d
		AT+A8T=0,1283808080306D009C4,0,1	OK	Send CL, indicate V.8 and short V.8 capability; no network type; data with Rec. V.34, Rec. V.42, Rec. V.42 bis; Rec. V.70-series with Rec. V.34, Rec. V.42 bis. Look for initiating signals (none expected) and messages (e.g. MS)
	+A8R:0,1283808080306D009C4			Indicate received CL

Initiating DTE commands and data	Initiating DCE indications and data	Responding DTE commands and data	Responding DCE indications and data	Notes
AT+A8T=0,1181 80808209C4	OK			Send MS with Rec. V.34 Rec. V.70-series selected, no ACK
			+A8R:0,118280 808209C4	Receive MS
AT+A8E=1;D		AT+A8E=,1;A		Go to data mode; with Rec. V.8
	CONNECT		CONNECT	Exchange data

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