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SERIES V: DATA COMMUNICATION OVER THE  
TELEPHONE NETWORK

Interfaces and voiceband modems

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**Serial asynchronous automatic dialling and  
control**

ITU-T Recommendation V.25 *ter*

(Previously CCITT Recommendation)

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ITU-T V-SERIES RECOMMENDATIONS  
DATA COMMUNICATION OVER THE TELEPHONE NETWORK

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*For further details, please refer to ITU-T List of Recommendations.*

**SERIAL ASYNCHRONOUS AUTOMATIC DIALLING AND CONTROL**

**Summary**

This Recommendation defines commands and responses for use by a DTE to control a V-Series DCE using serial data interchange over an asynchronous interface. It contains four elements:

- codifies existing practice in common GSTN-DCE that use the ATtention (AT) command set;
- defines a format for orderly extension of the AT command set;
- provides a set of standardized extensions for common functions to identify the DCE, to control the DTE-DCE interface, and to control DCE-DCE protocols (signal conversion, error control and data compression);
- provides a mapping for these commands into V.25 *bis* frame format for use with DCEs employing synchronous serial interfaces.

**Source**

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**Keywords**

AT Commands, Data Modems, Data Transmission, DCE control.

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## **Recommendation V.25 *ter***

### **SERIAL ASYNCHRONOUS AUTOMATIC DIALLING AND CONTROL**

*(revised in 1997)*

#### **1 Introduction and scope**

This Recommendation is applicable to the interconnection of Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) employing serial binary data operation via the V.100-Series interchange circuits.

This Recommendation contains four elements:

- codifies existing practice in common Asynchronous GSTN-DCE that use the ATtention (AT) command set. It identifies the protocol elements, procedures, and behaviours that were found to be held in common among a large portion of DCE manufacturers. It is intended, as much as possible, to preserve compatibility between DCEs and DTEs. Most DCEs implement a number of extensions and behavioural differences beyond the descriptions in this Recommendation; such extensions and differences are explicitly permitted by this Recommendation (see 5.8);
- defines a format for extension of the AT command set in an orderly fashion. It reserves the "+" command prefix to be used by other standardized extensions, such as those found in Recommendations T.31 and T.32 (Asynchronous Facsimile DCE Control, Study Group 8);
- provides a set of standardized extensions, based on the extended "+" command format. These commands identify the DCE, control the DTE-DCE interface, and control DCE-DCE protocol behaviour (signal conversion, error control and data compression);
- provides a mapping of the commands defined in this Recommendation into V.25 *bis* frame format for use with DCEs employing synchronous serial interfaces. See Appendix III.

The procedures described for automatic calling equipment conforming to this Recommendation allow interworking with automatic answering equipment conforming to Recommendations V.25 and V.25 *bis*.

#### **2 References**

##### **2.1 Normative references**

The following 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 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*.

- CCITT Recommendation V.4 (1988), *General structure of signals of international alphabet No. 5 code for character oriented data transmission over public telephone networks.*
- 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.*
- 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.*

Other relevant Recommendations are listed in the Supplement to this Recommendation.

## 2.2 Informative references

- ITU-T Recommendation V.8 (1994), *Procedures for starting sessions of data transmission over the general switched telephone network.*
- ITU-T Recommendation V.14 (1993), *Transmission of start-stop characters over synchronous bearer channels.*
- ITU-T Recommendation V.18 (1996), *Operational and interworking requirements for DCEs operating in the text telephone mode.*
- CCITT Recommendation V.21 (1984), *300 bits per second duplex modem standardized for use in the general switched telephone network.*
- CCITT Recommendation V.22 (1988), *1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits.*
- CCITT Recommendation V.22 bis (1988), *2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits.*
- CCITT Recommendation V.23 (1988), *600/1200-baud modem standardized for use in the general switched telephone network.*
- ITU-T Recommendation V.24 (1996), *List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE).*
- CCITT Recommendation V.26 bis (1984), *2400/1200 bits per second modem standardized for use in the general switched telephone network.*
- CCITT Recommendation V.26 ter (1988), *2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits.*
- CCITT Recommendation V.27 ter (1984), *4800/2400 bits per second modem standardized for use in the general switched telephone network.*
- ITU-T Recommendation V.32 (1993), *A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuits.*
- CCITT Recommendation V.32 bis (1991), *A duplex modem operating at data 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.34 (1996), *A modem operating at data signalling rates of up to 33 600 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.42 (1996), *Error-correcting procedures for DCEs using asynchronous-to-synchronous conversion.*
- CCITT Recommendation V.42 bis (1990), *Data compression procedures for Data Circuit-terminating Equipment (DCE) using error correction procedures.*
- CCITT Recommendation V.54 (1988), *Loop test devices for modems.*
- ITU-T Recommendation V.58 (1994), *Management Information model for V-Series DCEs.*
- CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*
- CCITT Recommendation X.209 (1988), *Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1).*
- ITU-T Recommendation T.31 (1995), *Asynchronous facsimile DCE Control – Service Class 1.*
- ITU-T Recommendation T.32 (1995), *Asynchronous facsimile DCE Control – Service Class 2.*

NOTE – See the Supplement to this Recommendation for additional informative references.

### 3 Definitions and abbreviations

For the purposes of this Recommendation, the following definitions and abbreviations apply:

**3.1 command state:** In Command State, the DCE is not communicating with a remote station, and the DCE is ready to accept commands. Data signals from the DTE on circuit 103 are treated as command lines and processed by the DCE, and DCE responses are sent to the DTE on circuit 104. The DCE enters this state upon power-up, and when a call is disconnected.

**3.2 online command state:** In Online Command State, the DCE is communicating with a remote station, but treats signals from the DTE on circuit 103 as command lines and sends responses to the DTE on circuit 104. Depending on the implementation, data received from the remote station during Online Command State may be either discarded or retained in the DCE until Online Data State is once again entered (by a command from the DTE). Data previously transmitted by the local DTE and buffered by the DCE may be transmitted from the buffer to the remote DCE during Online Command State, or it may be discarded or transmission deferred until Online Data State is once again entered. Online Command State may be entered from Online Data state by a mechanism defined in 6.2.9 or by other manufacturer-defined means.

**3.3 online data state:** In Online Data State, the DCE is communicating with a remote station. Data signals from the DTE on circuit 103 are treated as data and transmitted to the remote station, and data received from the remote station are delivered to the DTE on circuit 104. Data and control signals are monitored by the DCE to detect events such as loss of the remote connection and DTE requests for disconnection or switching to Online Command state. Online Data State is entered by successful completion of a command to originate or answer a call, by automatically answering a call, or by a DTE command to return to Online Data state from Online Command state.

**3.4 direct mode:** Mode of OnLine Data State whereby the V.24 circuits 103 (transmit data) and 104 (received data) transfer data at the same rate or rates in use on the DCE-to-DCE communication channels. The DCE does not buffer data in either direction, nor does it implement flow control. For

DCE modulation methods that transfer data synchronously, this mode implies the use of V.14 synchronous/asynchronous protocol within the DCE.

**3.5 buffered mode:** Mode of OnLine Data State whereby the V.24 circuits 103 (transmit data) and 104 (received data) transfer data at data rates independent of the rates in use on the DCE-to-DCE communication channels. The DCE buffers the data rate differences as required. Neither error control nor data compression is used. For DCE modulation methods that transfer data synchronously, this mode implies the use of V.14 synchronous/asynchronous protocol within the DCE. For DCE modulation methods that transfer data asynchronously, asynchronous start-stop framing is used on the DCE-to-DCE communications channels.

**3.6 leadin:** Commands defined using the extended syntax defined in 5.2.3 begin with a "+" character. The second character is reserved for a particular function or application. That two-character sequence, "+<char>" is the Leadin.

**3.7 [...]:** Square brackets are used to indicate that the enclosed items are optional. The square brackets themselves do not appear in the command line.

**3.8 <...>:** Angle brackets are used to enclose the names of other syntactical elements. When those elements appear in an actual command line, the actual element is used and the angle brackets are omitted.

All other characters, including "?", "=", parentheses, etc., shall appear in commands as written.

CCITT International Telephone and Telegraph Consultative Committee

IRA International Reference Alphabet (Recommendation T.50)

ITU-T International Telecommunication Union – Telecommunication Standardization Sector

## **4 Physical layer**

The circuits listed in 4.1 are intercepted and controlled by the DCE. The DCE is designed so that it will function properly if only these circuits are connected or implemented. V.24 circuit designators are listed in this subclause.

### **4.1 Circuits**

Signal Ground (Circuit 102) – Connection of this circuit is required for proper recognition of signals on other circuits.

Transmitted Data (Circuit 103) – While in command state or online command state, data signals are processed by the DCE and not transmitted to the remote station.

Received Data (Circuit 104) – While in command state or online command state, data received from the remote station may be ignored (see clause 3, definition of Online Command State), and the DCE generates responses on this circuit.

Data Terminal Ready (Circuit 108/2) – The DCE monitors the effect of changes in the state of this circuit on the operation of the underlying DCE and operates accordingly. For example, if the DCE responds to an on-to-off transition on this circuit by disconnecting a call, the DCE will act accordingly by returning from online data state to command state.

Received Line Signal Detector (Circuit 109) – The DCE may intercept this signal so that the issuance of result codes can be properly coordinated with transitions on this signal.

Calling Indicator (Circuit 125) – The DCE may intercept this signal so that it can detect network alerting signals and automatically answer, if so conditioned by the appropriate command (S0, see 6.3.8).

## **4.2 Character formatting**

During command state and online command state, data transmitted between the DTE and DCE shall conform to the requirements for start-stop data transmission specified in Recommendation V.4 and ISO 1177. Parity may be even, odd, mark, space or not used. Each character shall have at least one complete stop element. The DCE should accept commands using any combination of parity and stop elements supported during online data state. These shall include, as a minimum, the following combinations, as defined in Annex B/V.42, each of which consists of ten total bits (including the start element):

- 7 data bits, even parity, 1 stop element;
- 7 data bits, odd parity, 1 stop element;
- 7 data bits, space parity, 1 stop element;
- 7 data bits, mark parity, 1 stop element (7 data bits, no parity bit, 2 stop elements);
- 8 data bits, no parity, 1 stop element.

During online data state, the DCE shall be transparent to changes in data format; the use of a particular format during command state should not restrict the use of other formats that are supported during online data state. However, DCE responses issued to indicate transition from online data state back to command state are issued using the same format and parity as the last command line issued by the DTE (see 5.7), and the DTE must therefore be prepared to recognize these responses even though the character format may have been changed.

See 6.2.11 for a command to explicitly select the DTE-DCE character format.

## **4.3 Data rates**

The DCE shall be able to accept commands at either 1200 bit/s or 9600 bit/s. It is desirable that the DCE be able to accept commands and automatically detect the rate being used by the DTE at all rates supported by the DCE on the DTE-DCE interface. The DCE may provide a strap, switch, or other facility to define the rate at which the DTE is operating; however, while the rate is so selected, the DCE shall continue to be capable of accepting commands at either 1200 bit/s or 9600 bit/s. See 6.2.10 for a command to explicitly select the DTE-DCE rate.

When operating in the online command state, the DCE is not required to accept commands at other than the online data rate; i.e. the requirement to accept commands at 1200 bit/s or 9600 bit/s does not apply during online command state.

# **5 Syntax and procedures**

## **5.1 Alphabet**

The T.50 International Alphabet 5 (hereinafter cited as "IA5") is used in this Recommendation. Only the low-order seven bits of each character are significant to the DCE; any eighth or higher-order bit(s), if present, are ignored for the purpose of identifying commands and parameters. Lower-case characters (IA5 values from 6/1 to 7/10) are considered identical to their upper-case equivalents (IA5 values from 4/1 to 5/10) when received by the DCE from the DTE. Result codes from the DCE which are defined in this Recommendation shall be in upper case.

## 5.2 DTE commands lines

In the descriptions that follow, words enclosed in **<angle brackets>** are references to syntactical elements defined in this Recommendation. When they appear in a command line, the brackets are not used. Words enclosed in **[square brackets]** represent optional items; such items may be omitted from the command line at the point where they are specified, and when they appear the square brackets are not included in the command line. Other characters that appear in syntax descriptions shall appear in the places shown.

In the following subclauses regarding DTE commands, references are made to responses issued by the DCE which are defined in 5.7. In order to provide a clearer presentation, DCE responses are mentioned in terms of their alphabetic format; the actual response issued will depend on the setting of parameters that affect response formats (e.g. **Q** and **V** commands).

### 5.2.1 Command line general format

A command line is made up of three elements: the prefix, the body, and the termination character.

The command line prefix consists of the characters "**AT**" (IA5 4/1, 5/4) or "**at**" (IA5 6/1, 7/4), or, to repeat the execution of the previous command line, the characters "**A/**" (IA5 4/1, 2/15) or "**a/**" (IA5 6/1, 2/15).

The body is made up of individual commands as specified later in this Recommendation. Space characters (IA5 2/0) are ignored and may be used freely for formatting purposes, unless they are embedded in numeric or string constants (5.4.2.1 or 5.4.2.2). The termination character may not appear in the body. The DCE shall be capable of accepting at least 40 characters in the body.

The termination character may be selected by a user option (parameter **S3**), the default being CR (IA5 0/13).

### 5.2.2 Command line editing

The character defined by parameter **S5** (default, BS [IA5 0/8]) is intended to be interpreted as a request from the DTE to the DCE to delete the previous character; the precise action undertaken is manufacturer-specific. Any control characters (IA5 0/0 through 1/15, inclusive) that remain in the command line after receipt of the termination character shall be ignored by the DCE.

The DCE checks characters from the DTE first to see if they match the termination character (**S3**), then the editing character (**S5**), before checking for other characters. This insures that these characters will be properly recognized even if they are set to values that the DCE uses for other purposes. If **S3** and **S5** are set to the same value, a matching character will be treated as matching **S3** (**S3** is checked before **S5**).

### 5.2.3 Command line echo

The DCE may echo characters received from the DTE during command state and online command state back to the DTE, depending on the setting of the **E** command. If so enabled, characters received from the DTE are echoed at the same rate, parity, and format as received. Echoing characters not recognized as valid in the command line or of incomplete or improperly-formed command line prefixes is manufacturer-specific (see 5.8).

### 5.2.4 Repeating a command line

If the prefix "**A/**" or "**a/**" is received (IA5 4/1, 2/15 or 6/1, 2/15), the DCE shall immediately execute once again the body of the preceding command line. No editing is possible, and no termination character is necessary. A command line may be repeated multiple times through this mechanism, if desired. Responses to the repeated command line shall be issued using the parity and format of the



original command line, and the rate of the "A/". If "A/" is received before any command line has been executed, the preceding command line is assumed to have been empty (that results in an **OK** result code).

### 5.2.5 Types of DTE commands

There are two types of commands: action commands and parameter commands.

Action commands may be "executed" (to invoke a particular function of the equipment, which generally involves more than the simple storage of a value for later use), or "tested" (to determine whether or not the equipment implements the action command, and, if subparameters are associated with the action, the ranges of subparameter values that are supported).

Parameters may be "set" (to store a value or values for later use), "read" (to determine the current value or values stored), or "tested" (to determine whether or not the equipment implements the parameter, and the ranges of values supported).

### 5.2.6 DTE command syntax

Subclause 5.3 defines Basic Syntax DTE commands, which are implemented in common DCE. This Recommendation also defines Extended Syntax DTE commands in 5.4. Commands of either type may be included in command lines, in any order.

## 5.3 Basic syntax commands

### 5.3.1 Basic syntax command format

The format of Basic Syntax commands, except for the D and S commands, is as follows:

**<command>[<number>]**

where <command> is either a single character, or the "&" character (IA5 2/6) followed by a single character. Characters used in <command> shall be taken from the set of alphabetic characters.

<number> may be a string of one or more characters from "0" through "9" representing a decimal integer value. Commands that expect a <number> are noted in the description of the command (see clause 6). If a command expects <number> and it is missing (<command> is immediately followed in the command line by another <command> or the termination character), the value "0" is assumed. If a command does not expect a <number> and a number is present, an **ERROR** is generated. All leading "0"s in <number> are ignored by the DCE.

Additional commands may follow a command (and associated parameter, if any) on the same command line without any character required for separation. The actions of some commands cause the remainder of the command line to be ignored (e.g. **A**).

See the **D** command for details on the format of the information that follows it.

### 5.3.2 S-parameters

Commands that begin with the letter "S" constitute a special group of parameters known as "S-parameters". These differ from other commands in important respects. The number following the "S" indicates the "parameter number" being referenced. If the number is not recognized as a valid parameter number, an **ERROR** result code is issued.

Immediately following this number, either a "?" or "=" character (IA5 3/15 or 3/13, respectively) shall appear. "?" is used to read the current value of the indicated S-parameter; "=" is used to set the S-parameter to a new value.

**S<parameter\_number>?**

**S<parameter\_number>=[<value>]**

If the "=" is used, the new value to be stored in the S-parameter is specified in decimal following the "=". If no value is given (i.e. the end of the command line occurs or the next command follows immediately), the S-parameter specified may be set to 0, or an **ERROR** result code issued and the stored value left unchanged. The ranges of acceptable values are given in the description of each S-parameter.

If the "?" is used, the DCE transmits a single line of information text to the DTE. For S-parameters defined in this Recommendation, the text portion of this information text consists of exactly three characters, giving the value of the S-parameter in decimal, with leading zeroes included.

## **5.4 Extended syntax commands**

### **5.4.1 Command naming rules**

Both actions and parameters have names, which are used in the related commands. Names always begin with the character "+" (IA5 2/15). Following the "+", from one to sixteen (16) additional characters appear in the command name. These characters shall be selected from the following set:

**A through Z** (IA5 4/1 through 5/10)

**0 through 9** (IA5 3/0 through 3/9)

**!** (IA5 2/1)

**%** (IA5 2/5)

**—** (IA5 2/13)

**.** (IA5 2/14)

**/** (IA5 2/15)

**:** (IA5 3/10)

**\_** (IA5 5/15)

The first character following the "+" shall be an alphabetic character in the range of "A" through "Z". This first character generally implies the application in which a command is used or the standards committee that defined it (e.g. command names beginning with "F" are generally associated with facsimile-related standards, promulgated by Study Group 8). See Appendix I for information on first command characters reserved for use by particular standards committees. All other + leadin character sequences are reserved for future standardization by the ITU-T.

The command interpreter in the Data Circuit-terminating Equipment (DCE) considers lower-case characters to be the same as their upper-case equivalents; therefore, command names defined in standards referencing this Recommendation that include alphabetic characters should be defined using only the upper-case characters.

Standards that reference this Recommendation may choose to establish internal naming conventions that permit implicit recognition of a name as an action or as a parameter. For example, the standard could choose to end all action names with an exclamation point ("!"), or all parameter names with a percent sign ("%"). This Recommendation imposes no such conventions, however.

## 5.4.2 Values

When subparameters are associated with the execution of an action, or when setting a parameter, the command may include specification of values. This is indicated by the appearance of <value> in the descriptions below.

<value> shall consist of either a numeric constant or a string constant.

### 5.4.2.1 Numeric constants

Numeric constants are expressed in decimal, hexadecimal, or binary. In standards that reference this Recommendation, the definition of each command shall specify which form is used for values associated with that command; however, such standards may, in introductory information, specify a "default" type of numeric constant that is assumed for commands within that standard that do not explicitly specify the type. Such standards shall also define the minimum and maximum acceptable values.

Decimal numeric constants shall consist of a sequence of one or more of the characters "0" (IA5 3/0) through "9" (IA5 3/9), inclusive.

Hexadecimal numeric constants shall consist of a sequence of one or more of the characters "0" (IA5 3/0) through "9" (IA5 3/h), inclusive, and "A" (IA5 4/1) through "F" (IA5 4/6) inclusive. The characters "A" through "F" represent the equivalent decimal values 10 through 15.

Binary numeric constants shall consist of a sequence of one or more of the characters "0" (IA5 3/0) and "1" (IA5 3/1).

In all numeric constants, the most significant digit is specified first. Leading "0" characters shall be ignored by the DCE. No spaces, hyphens, periods, commas, parentheses, or other generally-accepted numeric formatting characters are permitted in numeric constants; note in particular that no "H" suffix is appended to the end of hexadecimal constants.

### 5.4.2.2 String constants

String constants shall consist of a sequence of displayable IA5 characters, each in the range from 2/0 to 7/15, inclusive, except for the characters "" (IA5 2/2) and "\" (IA5 5/12). String constants shall be bounded at the beginning and end by the double-quote character ("", IA5 2/2).

Any character value may be included in the string by representing it as a backslash ("\") character followed by two hexadecimal digits. For example, "\0D" is a string consisting of the single character <CR> (IA5 0/13). If the "\" character itself is to be represented in a string, it shall be encoded as "\5C". The double-quote character, used as the beginning and ending string delimiter, shall be represented within a string constant as "\22". Standards that reference this Recommendation may prohibit use of this "\" mechanism if only displayable characters are permitted in string constants in that standard and if the double-quote character is not permitted within string constants; in this case, the "\" character shall be treated as any other IA5 character included within a string constant.

A "null" string constant, or a string constant of zero length, is represented by two adjacent delimiters ("").

Standards that reference this Recommendation shall specify, for each string value, any limitations on the characters that may appear within the string, and the maximum and minimum acceptable string length.

### 5.4.2.3 Compound values

Actions may have more than one subparameter associated with them, and parameters may have more than one value. These are known as "compound values", and their treatment is the same in both actions and parameters.

A compound value consists of any combination of numeric and string values (as defined in the description of the action or parameter). The comma character (IA5 2/12) shall be included as a separator, before the second and all subsequent values in the compound value. If a value is not specified (i.e. defaults assumed), the required comma separator shall be specified; however, trailing comma characters may be omitted if all associated values are also omitted.

### 5.4.3 Action commands

#### 5.4.3.1 Action execution command syntax

There are two general types of action commands: those that have associated subparameter values that affect only that invocation of the command, and those that have no subparameters.

If subparameters are associated with a command, the definition of the action command shall indicate, for each subparameter, whether the specification of a value for that subparameter is mandatory or optional. For optional subparameters, the definition shall indicate the assumed (default) value for the subparameter if no value is specified for that subparameter; the assumed value may be either a previous value (i.e. the value of an omitted subparameter remains the same as the previous invocation of the same command, or is determined by a separate parameter or other mechanism), or a fixed value (e.g. the value of an omitted subparameter is assumed to be zero). Generally, the default value for numeric subparameters is 0, and the default value for string subparameters is "" (empty string).

The following syntax is used for actions that have no subparameters:

**+<name>**

The following syntax is used for actions that have one subparameter:

**+<name>[=<value>]**

The following syntax is used for actions that have two or more subparameters:

**+<name>[=<compound\_value>]**

For actions that accept subparameters, if all subparameters are defined as being optional, and the default values for all subparameters are satisfactory, the Data Terminal Equipment (DTE) may use the first syntax above (i.e. omit the "=" from the action execution command as well as all of the subparameter value string).

If the named action is implemented in the DCE and other relevant criteria are met (e.g. the DCE is in the proper state), the command shall be executed with any indicated subparameters. If **<name>** is not recognized, the DCE issues the **ERROR** result code and terminates processing of the command line. An **ERROR** is also generated if a subparameter is specified for an action that does not accept subparameters, if too many subparameters are specified, if a mandatory subparameter is not specified, if a value is specified of the wrong type, or if a value is specified that is not within the supported range.

#### 5.4.3.2 Action test command syntax

The DTE may test if an action command is implemented in the DCE by using the syntax:

**+<name>=?**

If the DCE does not recognize the indicated name, it shall return an **ERROR** result code and terminate processing of the command line. If the DCE does recognize the action name, it shall return an **OK** result code. If the named action accepts one or more subparameters, the DCE shall send an information text response to the DTE, prior to the **OK** result code, specifying the values supported by the DCE for each such subparameter, and possibly additional information. The format of this information text is defined for each action command; general formats for specification of sets and ranges of numeric values are described in 5.7.1 and 5.7.2.

#### 5.4.4 Parameter commands

##### 5.4.4.1 Parameter types

Parameters may be defined as "read-only" or "read-write". "Read-only" parameters are used to provide status or identifying information to the DTE, but are not settable by the DTE; attempting to set their value is an error. In some cases (specified in the description of the individual parameter), the DCE may ignore attempts to set the value of such parameters rather than respond with an **ERROR** result code, if the continued correct operation of the interface between the DCE and DTE will not be affected by such action. Read-only parameters may be read and tested.

"Read-write" parameters may be set by the DTE, to store a value or values for later use. Read-write parameters may be set, read, and tested.

Parameters may take either a single value, or multiple (compound) values. Each value may be either numeric or string; the definition of the parameter shall specify the type of value for each subparameter. Attempting to store a string value in a numeric parameter, or a numeric value in a string parameter, is an error.

##### 5.4.4.2 Parameter set command syntax

The definition of the parameter shall indicate, for each value, whether the specification of that value is mandatory or optional. For optional values, the definition shall indicate the assumed (default) value if none is specified; the assumed value may be either a previous value (i.e. the value of an omitted subparameter retains its previous value), or a fixed value (e.g. the value of an omitted subparameter is assumed to be zero). Generally, the default value for numeric parameters is 0, and the default value for string parameters is "" (empty string).

The following syntax is used for parameters that accept a single value:

**+<name>=[<value>]**

The following syntax is used for parameters that accept more than one value:

**+<name>=[<compound\_value>]**

If the named parameter is implemented in the DCE, all mandatory values are specified, and all values are valid according to the definition of the parameter, the specified values shall be stored. If **<name>** is not recognized, one or more mandatory values are omitted, or one or more values are of the wrong type or outside the permitted range, the DCE issues the **ERROR** result code and terminates processing of the command line. An **ERROR** is also generated if too many values are specified. In case of an error, all previous values of the parameter are unaffected.

##### 5.4.4.3 Parameter read command syntax

The DTE may determine the current value or values stored in a parameter by using the following syntax:

**+<name>?**

If the named parameter is implemented in the DCE, the current values stored for the parameter are sent to the DTE in an information text response. The format of this response is described in the definition of the parameter. Generally, the values will be sent in the same form in which they would be issued by the DTE in a parameter setting command; if multiple values are supported, they will generally be separated by commas, as in a parameter setting command.

#### 5.4.4.4 Parameter test command syntax

The DTE may test if a parameter is implemented in the DCE, and determine the supported values, by using the syntax:

**+<name>=?**

If the DCE does not recognize the indicated name, it returns an **ERROR** result code and terminates processing of the command line. If the DCE does recognize the parameter name, it shall return an information text response to the DTE, followed by an **OK** result code. The information text response shall indicate the values supported by the DCE for each such subparameter, and possibly additional information. The format of this information text is defined for each parameter; general formats for specification of sets and ranges of numeric values are described in 5.7.1 and 5.7.2.

#### 5.4.5 Additional syntax rules

##### 5.4.5.1 Concatenating commands after extended syntax commands

Additional commands may follow an extended syntax command on the same command line if a semicolon (";", IA5 3/11) is inserted after the preceding extended command as a separator. The semicolon is not necessary when the extended syntax command is the last command on the command line.

##### 5.4.5.2 Concatenating commands after basic format commands

Extended syntax commands may appear on the same command line after a basic syntax command without a separator, in the same manner as concatenation of basic syntax commands.

#### 5.5 Issuing commands

All characters in a command line shall be issued at the same data rate, and with the same parity and format.

The DCE shall ignore any command line that is not properly terminated. The DCE may consider 30 seconds of mark idle time between any two characters as an improperly terminated command line. In this case the DCE may or may not generate an **ERROR** message. The DCE shall ignore any characters received from the DTE that are not part of a properly-formatted command line.

If the maximum number of characters that the DCE can accept in the body is exceeded, an **ERROR** result code shall be generated after the command line is terminated.

The DTE shall not begin issuing a subsequent command line until at least one-tenth of a second has elapsed after receipt of the entire result code issued by the DCE in response to the preceding command line.

#### 5.6 Executing commands

Upon receipt of the termination character, the DCE shall commence execution of the commands in the command line in the order received from the DTE. Should execution of a command result in an error, or a character be not recognized as a valid command, execution is terminated, the remainder of the command line is ignored, and the **ERROR** result code is issued. Otherwise, if all commands

execute correctly, only the result code associated with the last command shall be issued; result codes for preceding commands are suppressed. If no commands appear in the command line, the **OK** result code is issued.

### 5.6.1 Aborting commands

Some action commands that require time to execute may be aborted while in progress; these are explicitly noted in the description of the command. Aborting of commands is accomplished by the transmission from the DTE to the DCE of any character. A single character shall be sufficient to abort the command in progress; however, characters transmitted during the first 125 milliseconds after transmission of the termination character shall be ignored (to allow for the DTE to append additional control characters such as line feed after the command line termination character). To insure that the aborting character is recognized by the DCE, it should be sent at the same rate as the preceding command line; the DCE may ignore characters sent at other rates. When such an aborting event is recognized by the DCE, it shall terminate the command in progress and return an appropriate result code to the DTE, as specified for the particular command.

### 5.6.2 Handling of invalid numbers and S-parameter values

The DCE shall react to undefined numbers and S-parameter values in one of three ways:

- 1) issue the **ERROR** result code, and leave the previous value of the parameter unchanged;
- 2) issue the **OK** result code, and leave the previous value of the parameter unchanged; or
- 3) issue the **OK** result code, and set the parameter value to the valid value nearest to that specified in the command line.

The description of each command may specify which of these three techniques shall be used to handle invalid parameter values for that command or parameter. If the description does not specify the handling technique, it shall be defined by the manufacturer.

## 5.7 DCE responses

While in command state and online command state, the DCE shall issue responses using the same rate, word length, and parity as the most recently received DTE command line. In the event that no DTE command has yet been received, rate, word length, and parity used will depend on the capabilities of the DCE.

When the DCE transitions from the command state or online command state to the online data state, the result code **CONNECT** should be issued at the bit rate and parity used during the command state. When the DCE transitions from the online data state to the command state or online command state, the result codes should be issued at the bit rate used during the online data state. Thereafter, any unsolicited result codes should use the bit rate and parity of the last command line issued by the DTE to the DCE.

The characters of a response shall be contiguous, with no more than 100 milliseconds of mark idle issued between characters in addition to stop elements.

### 5.7.1 Responses

There are two types of responses that may be issued by the DCE: information text and result codes.

Information text responses consist of three parts: a header, text, and a trailer. The characters transmitted for the header are determined by a user setting (see the **V** command, 6.2.6). The trailer consists of two characters, being the character having the ordinal value of parameter **S3** followed by the character having the ordinal value of parameter **S4**. Information text specified in this Recommendation always consists of a single line; information text returned in response to

manufacturer-specific commands may contain multiple lines, and the text may therefore include IA5 CR, LF, and other formatting characters to improve readability.

Result codes consist of three parts: a header, the result text, and a trailer. The characters transmitted for the header and trailer are determined by a user setting (see the **V** command, 6.2.6). The result text may be transmitted as a number or as a string, depending on a user-selectable setting (see the **V** command).

There are three types of result codes: final, intermediate, and unsolicited.

A final result code indicates the completion of a full DCE action and a willingness to accept new commands from the DTE.

An intermediate result code is a report of the progress of a DCE action. The **CONNECT** result code is an intermediate result code (others may be defined by manufacturers). In the case of a dialling or answering command, the DCE moves from command state to online data state, and issues a **CONNECT** result code. This is an intermediate result code for the DCE because it is not prepared to accept commands from the DTE while in online data state. When the DCE moves back to the command state, it will then issue a final result code (such as **OK** or **NO CARRIER**).

Unsolicited result codes (such as **RING**) indicate the occurrence of an event not directly associated with the issuance of a command from the DTE.

Table 1 indicates result codes that shall be implemented by the DCE, their numeric equivalents, and a brief description of the use of each. In clause 6, the description of each command includes the specific result codes that may be issued in relation to that command and the circumstances under which they may be issued.

**Table 1/V.25 *ter* – Result codes**

<b>Result code (ATV1)</b>	<b>Numeric (ATV0)</b>	<b>Description</b>
OK	0	Acknowledges execution of a command
CONNECT	1	A connection has been established; the DCE is moving from command state to online data state
RING	2	The DCE has detected an incoming call signal from the network
NO CARRIER	3	The connection has been terminated or the attempt to establish a connection failed
ERROR	4	Command not recognized, command line maximum length exceeded, parameter value invalid, or other problem with processing the command line
NO DIALTONE	6	No dial tone detected
BUSY	7	Engaged (busy) signal detected
NO ANSWER	8	"@" (Wait for Quiet Answer) dial modifier was used, but remote ringing followed by five seconds of silence was not detected before expiration of the connection timer (S7)
CONNECT <text>	Manufacturer-specific	Same as CONNECT, but includes manufacturer-specific text that may specify DTE speed, line speed, error control, data compression, or other status



### 5.7.2 Extended syntax result codes

Extended syntax result codes may be issued in response to either basic or extended commands, or both. The appropriate responses shall be specified in the definitions of the commands, the responses, or both.

The general format of extended syntax result codes is the same as result codes defined in TIA-602 with regard to headers and trailers. The characters specified in S-parameters **S3** and **S4** shall be used in headers and trailers of extended syntax result codes as they are in basic format result codes. The setting of the "V" command shall affect the headers and trailers associated with extended syntax result codes in the same manner as basic format result codes; however, unlike basic format result codes, extended syntax result codes have no numeric equivalent, and are always issued in alphabetic form.

Extended syntax result codes shall be subject to suppression by the "Q1" command, as with basic format result codes. The issuance of extended syntax result codes shall not be affected by the setting of the "X" command.

Extended syntax result codes may be either final, intermediate, or unsolicited; the type shall be indicated in the definition of the result code.

Extended syntax result codes shall be prefixed by the "+" character to avoid duplication of basic format result codes specified in TIA-602 and by manufacturers. Following the "+" character, the name of the result code appears; result code names shall follow the same rules as command names (see 5.4.1). It is strongly advised that the reservation of the first character of command names noted in Appendix I also be observed with regard to the assignment of names of extended syntax result codes.

Extended syntax result codes may include the reporting of values. The definition of the result code shall specify whether or not values are appended to the result code, and, if so, how many, their types, and their assumed default values if omitted. When no values are to be reported, the result code appears in the simplest form:

**+<name>**

If a single value is to be reported, the form of the result code shall be:

**+<name>: <value>**

Note that a single space character (ASCII 20h) separates the colon character (ASCII 3Ah) from the <value>; no space appears between the result code name and the colon. If multiple values are to be reported with the result code, the form is:

**+<name>: <compound\_value>**

where <compound\_value> follows the rules specified in 5.4.2.3.

### 5.7.3 Information text formats for test commands

In general, the format of information text returned by extended syntax commands shall be specified in the definition of the command. This subclause describes recommended formats for information text returned in response to action test (for actions that accept one or more subparameters) and parameter test commands. The definitions of the responses to such testing commands, as described in the definitions of the associated commands in standards that reference this Recommendation, may use this recommended format or any other suitable format that is adequately specified.

Note that the DCE may insert intermediate <CR> characters in very long information text responses, in order to avoid overrunning DTE receive buffers. If intermediate <CR> characters are included, the DCE shall not include the character sequences "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of these information text responses.

### 5.7.3.1 Range of values

When the action accepts a single numeric subparameter, or the parameter accepts only one numeric value, the set of supported values may be presented in the information text as an ordered list of values. The list shall be preceded by a left parenthesis "(", IA5 2/8), and is followed by a right parenthesis ")", IA5 2/9). If only a single value is supported, it shall appear between the parentheses. If more than one value is supported, then the values may be listed individually, separated by comma characters (IA5 2/12), or, when a continuous range of values is supported, by the first value in the range, followed by a hyphen character (IA5 2/13), followed by the last value in the range. The specification of single values and ranges of values may be intermixed within a single information text. In all cases, the supported values shall be indicated in ascending order.

For example, the following are some examples of value range indications:

- (0) Only the value 0 is supported.
- (1,2,3) The values 1, 2, and 3 are supported.
- (1-3) The values 1 through 3 are supported.
- (0,4,5,6,9,11,12) The several listed values are supported.
- (0,4-6,9,11-12) An alternative expression of the above list.

### 5.7.3.2 Compound range of values

When the action accepts more than one subparameter, or the parameter accepts more than one value, the set of supported values may be presented as a list of the parenthetically-enclosed value range strings described in 5.7.3.1 above, separated by commas. For example, the information text in response to testing an action that accepts three subparameters, and supports various ranges for each of them, could appear as follows:

(0),(1-3),(0,4-6,9,11-12)

This indicates that the first subparameter accepts only the value 0, the second accepts any value from 1 through 3 inclusive, and the third subparameter accepts any of the values 0, 4, 5, 6, 9, 11 or 12.

## 5.8 Manufacturer-specific characteristics

This Recommendation describes characteristics universal to a large installed base of DCEs. Most DCEs implement a number of extensions and behavioural differences beyond the descriptions in this Recommendation. The following subclauses mention a few specific and well-known examples of areas in which these extensions and behavioural differences exist. This is not intended to be a comprehensive list; extensions and differences do exist in other areas. This Recommendation is not intended to preclude or limit extensions in these or other areas.

Equipment that implements non-standard commands, values, features, or behaviours, such as described in the following subclauses, shall be capable of being configured, by one or more commands, parameters, or switches, so that the equipment will properly interwork with DTEs that implement only the mandatory provisions of this Recommendation.

### 5.8.1 Extensions

DCEs claiming compliance to this Recommendation often include extensions in a number of areas. This Recommendation does not preclude the use of these extensions; however, the definition of these is totally up to the manufacturer. Other Recommendations may call out extensions as well. Some areas in which extensions exist include:

- 1) command characters and commands consisting of a prefix character followed by one or more characters (however, the "+" prefix is reserved for future use in this and other standards and should not be used for non-standard purposes);
- 2) command numbers (including additional numbers associated with commands defined in this Recommendation);
- 3) parameter values (including additional values associated with parameters defined in this Recommendation);
- 4) S-parameter numbers;
- 5) S-parameter values (including additional values associated with S-parameters defined in this Recommendation);
- 6) command line editing characters;
- 7) result codes;
- 8) dial string modifiers;
- 9) syntax extensions to the body of the command line;
- 10) information responses;
- 11) mechanisms to exit from online data state and return to command state or online command state (using, for example, particular sequences of characters, timing, or other techniques).

### 5.8.2 Behavioural differences

This Recommendation specifically and intentionally does not describe DCE behaviour in some situations. This is generally due to variations in existing implementations. DTEs must take into account the possibility of differences in the behaviour of various DCEs in particular situations.

The following are some examples of areas in which differences are known to exist. This is not intended to be a comprehensive list; behaviour differences exist in other areas as well:

- 1) handling of unsolicited result codes while a command line is being entered (may be sent, suppressed, deferred, etc.);
- 2) answering of incoming calls while a command line is being entered (may occur, be deferred, etc.);
- 3) handling of loss of carrier during online command state [may be reported immediately (and data rate may vary), may be deferred until attempted re-entry into online data state, etc.];
- 4) handling of undefined command numbers, and S-parameters values (may result in an **ERROR**, clamping of value to the valid range, retention of previous value, etc.);
- 5) execution time of actions (for example, **Z** command);
- 6) handling of variations in command line format and editing (for example: "AT" in mixed case; length of command line buffer; command line too long; whether or not space characters and control characters are stored in the command buffer; whether or not unrecognized control characters are echoed; echoing of other characters prior to receipt of the "AT" prefix; disposition of command lines in which the DTE changed the rate, format, or parity; etc.);
- 7) displaying of S-parameter values which cannot be expressed as three decimal digits;
- 8) states of connection establishment (e.g. handshaking) in which attempts to abort a command by transmission of a character to the DCE may not be recognized;
- 9) handling of additional characters that appear on the same command line after a semicolon that terminates a dial string (see 6.1.1); i.e. whether the additional characters are ignored or processed as commands;

- 10) carry-over of the effect of **P** and **T** dial modifiers from one dial string to the next.

## 6 Functions

The following descriptions of DCE functions and associated commands include information on both mandatory and optional capabilities. All mandatory commands, parameters, and responses shall be implemented in devices claiming conformance to this Recommendation. If an optional capability is implemented in a DCE, the associated command(s), parameter(s), and response(s) defined in this Recommendation shall be implemented.

For simplicity, the following descriptions use a particular syntax; alternatives may be used when available. For example:

- 1) Result codes are described in terms of their alphabetic format, except in situations where the setting of a parameter directly affects the format (e.g. **V** and **Q** commands). The actual result code issued would depend on the setting of parameters that affect result code formats.
- 2) The description of the **OK** result code for each command does not mention the fact that the result code will be deferred if any further commands appear on the same command line (see 5.4).

Default values that are specified for some commands have been selected to provide proper operation of the DCE in its initial state. Implementation of the specified defaults is desirable but not mandatory, with the exception of **S3** (which has a mandatory default value of 13). Default values for all parameters supported shall be specified by the manufacturer.

Some DCE functions and associated commands may be subject to national regulations. The manner of handling such restrictions (e.g. elimination of commands, restriction on ranges of accepted values, handling of values outside acceptable ranges, etc.) shall be determined by the manufacturer.

Table I.2 lists all commands contained in the Recommendation, sorted alphabetically.

### 6.1 Generic DCE control

#### 6.1.1 Reset to default configuration

*Syntax*

**Z**[<value>]

*Description*

This command instructs the DCE to set all parameters to their factory defaults as specified by the manufacturer. This may include taking into consideration the settings of hardware configuration switches or non-volatile parameter storage (if implemented). If the DCE is connected to the line, it is disconnected from the line, terminating any call in progress.

All of the functions of the command shall be completed before the DCE issues the result code. The DTE should not include additional commands on the same command line after the **Z** command because such commands may be ignored.

NOTE – Because this command may take into consideration the settings of switches and non-volatile parameter storage, it does not necessarily return the DCE to a "known state". In particular, the DCE may, as a result of execution of this command, be placed in a state in which it appears to not respond to DTE commands, or respond in a completely different format than was being used prior to execution of the command.

### *Abortability*

This command may not be aborted.

### *Result codes*

**OK** If <value> is recognized.

**ERROR** If <value> is not recognized or supported.

An **OK** result code for this command is issued using the same rate, parity, and word format as the DTE command line containing the command, but using the new values for parameters that affect the format of result codes (e.g. **Q**, **V**, **S3**, **S4**).

### *Execution time*

Execution time for this action varies widely depending on manufacturer implementation. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

### *Implementation*

Implementation of this command is mandatory. Interpretation of <value> is optional and manufacturer-specific.

## **6.1.2 Set to factory-defined configuration**

### *Syntax*

**&F[<value>]**

### *Description*

This command instructs the DCE to set all parameters to default values specified by the manufacturer, which may take into consideration hardware configuration switches and other manufacturer-defined criteria.

### *Abortability*

This command may not be aborted.

### *Defined values*

**0** Set parameters to factory defaults.

**(other)** Reserved for manufacturer proprietary use.

### *Result codes*

**OK** If value is valid.

**ERROR** If value is not recognized or not supported.

An **OK** result code for this command is issued using the same rate, parity, and word format as the DTE command line containing the command, but using the factory-defined values for other parameters that affect the format of result codes (e.g. **Q**, **V**, **S3**, **S4**) and dependent upon other commands that may follow on the same command line.

### *Execution time*

Execution time for this action varies widely depending on manufacturer implementation. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

### *Implementation*

Implementation of this command is mandatory. If the value specified is not recognized or implemented, an **ERROR** result code is issued.

#### **6.1.3 Request identification information**

##### *Syntax*

**I[<value>]**

##### *Description*

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, followed by a final result code. <value> may optionally be used to select from among multiple types of identifying information, specified by the manufacturer.

NOTE – The responses to this command may not be reliably used to determine the DCE manufacturer, revision level, feature set, or other information, and should not be relied upon for software operation. In particular, expecting a specific numeric response to an **I0** command to indicate which other features and commands are implemented in a DCE dooms software to certain failure, since there are widespread differences in manufacturer implementation among devices that may, coincidentally, respond with identical values to this command. Software implementors should use **I** commands with extreme caution, since the amount of data returned by particular implementations may vary widely from a few bytes to several thousand bytes or more, and should be prepared to encounter **ERROR** responses if the value is not recognized.

##### *Abortability*

This command is not ordinarily abortable, but may be so in some implementations.

##### *Execution time*

Execution time is dependent on the time required to transmit the information to the DTE. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

##### *Implementation*

Implementation of this command is optional.

#### **6.1.4 Request manufacturer identification (+GMI)**

##### *Syntax*

**+GMI**

##### *Description*

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the DCE to identify the manufacturer. Typically, the text will consist of a single line containing the name of the manufacturer, but manufacturers may choose to provide more information if desired (e.g. address, telephone number for customer service, etc.).

The total number of characters, including line terminators, in the information text returned in response to this command shall not exceed 2048 characters. Note that the information text shall not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of this information text.

### *Defined values*

None.

### *Result codes*

**OK** In all cases.

### *Execution time*

Execution time is dependent on the time required to transmit the information to the DTE. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

### *Abortability*

This command is not abortable.

### *Implementation*

Implementation of this command is mandatory.

## **6.1.5 Request model identification (+GMM)**

### *Syntax*

**+GMM**

### *Description*

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the DCE to identify the specific model of device. Typically, the text will consist of a single line containing the name of the product, but manufacturers may choose to provide any information desired.

The total number of characters, including line terminators, in the information text returned in response to this command shall not exceed 2048 characters. Note that the information text shall not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of this information text.

### *Defined values*

None.

### *Result codes*

**OK** In all cases.

### *Execution time*

Execution time is dependent on the time required to transmit the information to the DTE. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

### *Abortability*

This command is not abortable.

### *Implementation*

Implementation of this command is mandatory.

### 6.1.6 Request revision identification (+GMR)

#### *Syntax*

**+GMR**

#### *Description*

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the DCE to identify the version, revision level or date, or other pertinent information of the device. Typically, the text will consist of a single line containing the version of the product, but manufacturers may choose to provide any information desired.

The total number of characters, including line terminators, in the information text returned in response to this command shall not exceed 2048 characters. Note that the information text shall not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of this information text.

#### *Defined values*

None.

#### *Result codes*

**OK** In all cases.

#### *Execution time*

Execution time is dependent on the time required to transmit the information to the DTE. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

#### *Abortability*

This command is not abortable.

#### *Implementation*

Implementation of this command is mandatory.

### 6.1.7 Request product serial number identification (+GSN)

#### *Syntax*

**+GSN**

#### *Description*

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the DCE to identify the individual device. Typically, the text will consist of a single line containing a manufacturer determined alpha-numeric string, but manufacturers may choose to provide any information desired.

The total number of characters, including line terminators, in the information text returned in response to this command shall not exceed 2048 characters. Note that the information text shall not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of this information text.

#### *Defined values*

None.



### *Result codes*

**OK** In all cases.

### *Execution time*

Execution time is dependent on the time required to transmit the information to the DTE. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

### *Abortability*

This command is not abortable.

### *Implementation*

Implementation of this command is optional.

## **6.1.8 Request global object identification (+GOI)**

### *Syntax*

**+GOI**

### *Description*

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the DCE to identify the device, based on the ISO system for registering unique object identifiers. Typically, the text will consist of a single line containing numeric strings delimited by period characters.

The general format of object identifiers is defined in clause 28/X.208; the encoding rules are defined in Recommendation X.209.

The total number of characters, including line terminators, in the information text returned in response to this command shall not exceed 2048 characters. Note that the information text shall not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of this information text.

### *Defined values*

None.

### *Result codes*

**OK** In all cases.

### *Execution time*

Execution time is dependent on the time required to transmit the information to the DTE. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

### *Abortability*

This command is not abortable.

### *Implementation*

Implementation of this command is optional.

### 6.1.9 Request complete capabilities list (+GCAP)

#### *Syntax*

**+GCAP**

#### *Description*

This extended-format command causes the DCE to transmit one or more lines of information text in a specific format. The content is a list of additional capabilities command +<name>s, which is intended to permit the user of the DCE to identify the overall capabilities of the DCE.

In particular, if the DCE implements a particular DCE control standard that uses Extended Syntax Commands, and if that DCE control standard includes command(s) that indicate general capabilities, the +<names>(s) of those commands shall be reported to the DCE in response to a +GCAP command. See Table 2.

**Table 2/V.25 *ter* – Examples of required +GCAP responses**

<b>+GCAP response</b>	<b>DCE control standard</b>	<b>Description</b>
+FCLASS	T.class1, +F or T.class2, +F	Class 1 Facsimile DCE Control Class 2 Facsimile DCE Control
+MS	+M commands	Modulation Control: +MS and +MR commands
+MV18S	+MV18 commands	V.18 Modulation Control: +MV18S and +MV18R
+ES	+E commands	Error Control: +ES, +EB, +ER, +EFCS, +ETBM
+DS	+D commands	Data Compression: +DS and +DR

For example, a data modem that supported all capabilities described in this Recommendation may report:

**+GCAP: +MS, +ES, +DS, +MV18S**

If that example DCE implemented other commands, they shall also be included. If that DCE implemented stubs (e.g. +FCLASS=0 only), it may report +FCLASS as part of its +GCAP response.

The response is not specifically limited as to number of lines of text. Note that the information text shall not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), so that DTE can avoid false detection of the end of this information text.

It is not necessary for a DTE to inquire of the +GCAP where the application is specific to a technology, such as facsimile where the +FCLASS command would be sufficient to determine capabilities.

#### *Abortability*

This command is not abortable.

## *Implementation*

Implementation of this command is mandatory. The response might be null if the DCE lacks specific capabilities commands. A DTE that is aware of a specific DCEs capabilities might elect not to use the +GCI command.

### **6.1.10 Country of installation, (+GCI)**

#### *Parameter*

**+GCI=<T.35 country code>**

#### *Description*

This extended syntax command is used to indicate and select the country of installation for the DCE. If implemented, the DCE shall use this parameter to select the settings for any operational parameters that need to be adjusted for national regulations or telephone networks. DTE may use this value to determine country-specific functions.

If a DCE supports legal connection in only one country, then that DCE shall report only the T.35 country code for that country in response to a read or test command, and accept only that value for a write command.

#### *Defined values*

Recommendation T.35 defines 8-bit country codes. Annex A/T.35 lists country codes, with bits 8-1 and the country names. For use with the +GCI parameter, the value shall be the hexadecimal equivalent of the T.35 code, with bit 8 treated as the most significant bit and bit 1 treated as the least significant bit. Example values: 00 for Japan; 0A for Austria; 64 for Lebanon; C4 for Zimbabwe.

#### *Recommended default*

If the DCE is specified for use in only one country, that country code shall be the default. Otherwise, the recommended default is the expected country of sale or first installation. DCE may use hardware means to select the country of installation, in which case the DCE shall use that to determine the default value.

#### *Read syntax*

**+GCI?**

The DCE shall transmit information text which reports the hexadecimal numeric value corresponding to the current setting:

**+GCI:<current country code>**

e.g. +GCI:3D indicates that the DCE is set for France.

#### *Test syntax*

**+GCI=?**

The DCE shall transmit information text which reports the list of numerical values corresponding to the country or countries that are supported:

**+GCI:(<country code>[,<country code>[,<country code > .....]])**

e.g. +GCI:(20,73,B5) indicates that the DCE can be set for Canada, Mexico or the United States.

### *Implementation*

This command shall be implemented in DCE that can be installed in more than one country, and which need to adjust operating parameters in order to function correctly in those countries.

## **6.2 DTE-DCE interface commands**

The parameters defined in this subclause control the operation of the interface between the DTE and DCE.

### **6.2.1 Command line termination character**

#### *Parameter*

#### **S3**

#### *Description*

This S-parameter represents the decimal IA5 value of the character recognized by the DCE from the DTE to terminate an incoming command line. It is also generated by the DCE as part of the header, trailer, and terminator for result codes and information text, along with the **S4** parameter (see the description of the **V** parameter for usage).

The previous value of **S3** is used to determine the command line termination character for entry of the command line containing the **S3** setting command. However, the result code issued shall use the value of **S3** as set during the processing of the command line. For example, if **S3** was previously set to 13 and the command line "**ATS3=30**" is issued, the command line shall be terminated with a CR character (IA5 0/13), but the result code issued will use the character with the ordinal value 30 (IA5 2/14) in place of the CR.

#### *Defined values*

**0 to 127** Set command line termination character to this value.

#### *Mandatory default setting*

**13** Carriage return character (CR, IA5 0/13).

### *Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

## **6.2.2 Response formatting character**

#### *Parameter*

#### **S4**

#### *Description*

This S-parameter represents the decimal IA5 value of the character generated by the DCE as part of the header, trailer, and terminator for result codes and information text, along with the **S3** parameter (see the description of the **V** parameter for usage).

If the value of **S4** is changed in a command line, the result code issued in response to that command line will use the new value of **S4**.

#### *Defined values*

**0 to 127** Set response formatting character to this value.

*Recommended default setting*

**10** Line feed character (LF, IA5 0/10).

*Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

### **6.2.3 Command line editing character**

*Parameter*

**S5**

*Description*

This S-parameter represents the decimal IA5 value of the character recognized by the DCE as a request to delete from the command line the immediately preceding character (see 5.2.2).

*Defined values*

**0 to 127** Set command line editing character to this value.

*Recommended default setting*

**8** Backspace character (BS, IA5 0/8).

*Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

### **6.2.4 Command echo**

*Parameter*

**E[<value>]**

*Description*

The setting of this parameter determines whether or not the DCE echoes characters received from the DTE during command state and online command state (see 5.2.3).

*Defined values*

**0** DCE does not echo characters during command state and online command state.

**1** DCE echoes characters during command state and online command state.

*Recommended default setting*

**1** DCE echoes characters during command state and online command state.

*Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

### **6.2.5 Result code suppression**

*Parameter*

**Q[<value>]**

### *Description*

The setting of this parameter determines whether or not the DCE transmits result codes to the DTE. When result codes are being suppressed, no portion of any intermediate, final, or unsolicited result code – header, result text, line terminator, or trailer – is transmitted. Information text transmitted in response to commands is not affected by the setting of this parameter.

### *Defined values*

- 0** DCE transmits result codes.
- 1** Result codes are suppressed and not transmitted.

### *Recommended default setting*

- 0** DCE transmits result codes.

### *Result codes*

- OK** If value is **0**.
- (none)** If value is **1** (because result codes are suppressed).
- ERROR** For unsupported values (if previous value was **Q0**).
- (none)** For unsupported values (if previous value was **Q1**).

### *Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

## **6.2.6 DCE response format**

### *Parameter*

**V[<value>]**

### *Description*

The setting of this parameter determines the contents of the header and trailer transmitted with result codes and information responses. It also determines whether result codes are transmitted in a numeric form or an alphabetic (or "verbose") form. The text portion of information responses is not affected by this setting.

Table 3 shows the effect of the setting of this parameter on the format of information text and result codes. All references to <cr> mean "the character with the ordinal value specified in parameter **S3**"; all references to <lf> likewise mean "the character with the ordinal value specified in parameter **S4**". See Table 3.

**Table 3/V.25 ter – Effect of V parameter on response formats**

	<b>V0</b>	<b>V1</b>
Information responses	<text><cr><lf>	<cr><lf> <text><cr><lf>
Result codes	<numeric code><cr>	<cr><lf> <verbose code><cr><lf>

### *Defined values*

- 0** DCE transmits limited headers and trailers and numeric text.  
**1** DCE transmits full headers and trailers and verbose response text.

### *Recommended default setting*

- 1** DCE transmits full headers and trailers and verbose response text.

### *Result codes*

- 0** If value is **0** (because numeric response text is being used).  
**OK** If value is **1**.  
**4** For unsupported values (if previous value was **V0**).  
**ERROR** For unsupported values (if previous value was **V1**).

### *Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

## **6.2.7 Result code selection and call progress monitoring control**

### *Parameter*

**X[<value>]**

### *Description*

The setting of this parameter determines whether or not the DCE transmits particular result codes to the DTE. It also controls whether or not the DCE verifies the presence of dial tone when it first goes off-hook to begin dialling, and whether or not engaged tone (busy signal) detection is enabled. However, this setting has no effect on the operation of the **W** dial modifier, which always checks for dial tone regardless of this setting, nor on the busy signal detection capability of the **W** and **@** dial modifiers. See Table 4.

### *Implementation*

Implementation of this parameter is mandatory. If the specified value is not recognized, an **ERROR** result code is issued.

**Table 4/V.25 ter – Defined values for X parameter**

<b>X&lt;value&gt;</b>	<b>Description</b>
<b>0</b>	<b>CONNECT</b> result code is given upon entering online data state. Dial tone and busy detection are disabled.
<b>1</b>	<b>CONNECT &lt;text&gt;</b> result code is given upon entering online data state. Dial tone and busy detection are disabled.
<b>2</b>	<b>CONNECT &lt;text&gt;</b> result code is given upon entering online data state. Dial tone detection is enabled, and busy detection is disabled.
<b>3</b>	<b>CONNECT &lt;text&gt;</b> result code is given upon entering online data state. Dial tone detection is disabled, and busy detection is enabled.
<b>4</b>	<b>CONNECT &lt;text&gt;</b> result code is given upon entering online data state. Dial tone and busy detection are both enabled.

## 6.2.8 Circuit 109 (Received line signal detector) behaviour

### *Parameter*

**&C[<value>]**

### *Description*

This parameter determines how the state of circuit 109 relates to the detection of received line signal from the distant end. Changing the parameter will take effect immediately in both the command and online command states.

In **&C1** mode of operation, circuit 109 is not turned off until all data previously received from the remote DCE is delivered to the local DTE. However, such buffered data shall be discarded and circuit 109 turned off if the DTE turns off circuit 108 (if **&D1** or **&D2** is set).

### *Defined values*

- 0** The DCE always presents the ON condition on circuit 109.
- 1** Circuit 109 changes in accordance with the underlying DCE, which may include functions other than the physical layer functions (e.g. Recommendations V.42, V.110, V.120 and V.13).

### *Recommended default setting*

- 1** Circuit 109 changes in accordance with the underlying DCE, which may include functions other than the physical layer functions (e.g. Recommendations V.42, V.110, V.120 and V.13).

### *Implementation*

Implementation of this parameter is mandatory. If the value specified is not recognized, an **ERROR** result code is issued.

## 6.2.9 Circuit 108 (Data terminal ready) behaviour

### *Parameter*

**&D[<value>]**

### *Description*

This parameter determines how the DCE responds when circuit 108/2 is changed from the ON to the OFF condition during online data state.

### *Defined values*

- 0** DCE ignores circuit 108/2.
- 1** Upon an on-to-off transition of circuit 108/2, the DCE enters online command state and issues an OK result code; the call remains connected.
- 2** Upon an on-to-off transition of circuit 108/2, the DCE instructs the underlying DCE to perform an orderly cleardown of the call. The disposition of any data in the DCE pending transmission to the remote DCE is controlled by the +ETBM parameter (see 6.5.6) if implemented; otherwise, this data is sent before the call is cleared, unless the remote DCE clears the call first (in which case pending data is discarded). The DCE disconnects from the line. Automatic answer is disabled while circuit 108/2 remains off.



## *Implementation*

Implementation of this parameter is mandatory. If the value specified is not recognized, an **ERROR** result code is issued. Implementation of defined values 0 and 2 is mandatory; implementation of defined value 1 is optional.

### **6.2.10 Fixed DTE rate (+IPR)**

#### *Parameter*

**+IPR=<rate>**

#### *Description*

This numeric extended-format parameter specifies the data rate at which the DCE will accept commands, in addition to 1200 bit/s or 9600 bit/s (as required in 4.3). It may be used to select operation at rates at which the DCE is not capable of automatically detecting the data rate being used by the DTE. Specifying a value of 0 disables the function and allows operation only at rates automatically detectable by the DCE. The specified rate takes effect following the issuance of any result code(s) associated with the current command line.

The <rate> specified does not apply in OnLine Data State if Direct mode of operation is selected.

#### *Defined values*

The <rate> value specified shall be the rate in bits per second at which the DTE-DCE interface should operate, e.g. "19 200" or "115 200". The rates supported by a particular DCE are manufacturer-specific; however, the +IPR parameter should permit the setting of any rate supported by the DCE during online operation. Rates which include a non-integral number of bits per second should be truncated to the next lower integer (e.g. 134.5 bit/s should be specified as 134; 45.45 bit/s should be specified as 45). If unspecified or set to 0, automatic detection is selected for the range determined by 4.3 and the DCE manufacturer, and the character format is also forced to autodetect, +ICF=0 (see 6.2.11).

#### *Recommended default setting*

It is recommended that the default for this parameter be the automatic detection setting (0), which facilitates initial DTE-DCE communications.

#### *Read syntax*

**+IPR?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+IPR:<rate>**

e.g. +IPR:0 if set for automatic rate detection.

e.g. +IPR:9600 if set to 9600 bit/s.

#### *Test syntax*

**+IPR=?**

The DCE shall transmit one or two strings of information text to the DTE, consisting of:

**+IPR:(list of supported autodetectable <rate> values)[,(list of fixed-only <rate> values)]**

e.g. +IPR:(0,300,1200,2400,4800,9600),(19200,38400,57600)

if the DCE can autodetect up to 9600 bit/s and can support three additional higher fixed rates.

## Implementation

Implementation of this parameter is optional. If the rate specified is not supported by the DCE, an **ERROR** result code shall be returned.

### 6.2.11 DTE-DCE character framing (+ICF)

#### Parameter

**+ICF**=[<format>[,<parity>]]

#### Description

This extended-format compound parameter is used to determine the local serial port start-stop (asynchronous) character framing that the DCE shall use while accepting DTE commands and while transmitting information text and result code, if this is not automatically determined; +IPR=0 forces +ICF=0 (see +IPR, 6.2.10). Note that the definition of fixed character format for OnLine Data State is for further study.

<format> determines the number of bits in the data bits, the presence of a parity bit, and the number of stop bits in the start-stop frame.

NOTE – The semantics of this command are derived from Recommendation V.58.

<parity> determines how the parity bit is generated and checked, if present.

#### Defined values

See Table 5.

**Table 5/V.25 ter – Character format values**

<format>	Valid numeric values
<b>0</b>	auto detect
<b>1</b>	8 Data 2 Stop
<b>2</b>	8 Data 1 Parity 1 Stop
<b>3</b>	8 Data 1 Stop
<b>4</b>	7 Data 2 Stop
<b>5</b>	7 Data 1 Parity 1 Stop
<b>6</b>	7 Data 1 Stop
<parity>	Defined numeric values
<b>0</b>	Odd
<b>1</b>	Even
<b>2</b>	Mark
<b>3</b>	Space

#### Recommended default setting

For <format>: **3**

For <parity>: **3**

*Read syntax*

**+ICF?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ICF:<format>,<parity>**

e.g. +ICF:3,3 for the recommended defaults.

*Test syntax*

**+ICF=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ICF:(list of supported <format> values),(list of supported <parity> values)**

e.g. +ICF:(0-6),(0-3) for all defined values.

*Implementation*

Implementation of this parameter is optional. If the format specified is not supported by the DCE, an **ERROR** result code shall be returned.

### **6.2.12 DTE-DCE local flow control (+IFC)**

*Parameter*

**+IFC=[<DCE\_by\_DTE>[,<DTE\_by\_DCE>]]**

*Description*

This extended-format compound parameter is used to control the operation of local flow control between the DTE and DCE during the data state when V.42 error control is being used, or when fallback to non-error control mode is specified to include buffering and flow control. It accepts two numeric subparameters:

- **<DCE\_by\_DTE>**, which specifies the method to be used by the DTE to control the flow of received data from the DCE; and
- **<DTE\_by\_DCE>**, which specifies the method to be used by the DCE to control the flow of transmitted data from the DTE.

*Defined values*

See Table 6.

**Table 6/V.25 ter – <DCE\_by\_DTE> and <DTE\_by\_DCE> values**

<b>&lt;DCE_by_DTE&gt;</b>	<b>Description</b>
<b>0</b>	None
<b>1</b>	DC1/DC3 on circuit 103; do not pass DC1/DC3 characters to the remote DCE
<b>2</b>	Circuit 133 (Ready for Receiving)
<b>3</b>	DC1/DC3 on circuit 103 with DC1/DC3 characters being passed through to the remote DCE in addition to being acted upon for local flow control
<b>4 to 127</b>	Reserved for future standardization
<b>Other</b>	Reserved for manufacturer-specific use
<b>&lt;DTE_by_DCE&gt;</b>	<b>Description</b>
<b>0</b>	None
<b>1</b>	DC1/DC3 on circuit 104
<b>2</b>	Circuit 106 (Clear to Send/Ready for Sending)
<b>3 to 127</b>	Reserved for future standardization
<b>Other</b>	Reserved for manufacturer-specific use
NOTE – DC1 is IA5 1/1; DC3 is IA5 1/3.	

*Recommended default settings*

For <DCE\_by\_DTE>:           **2**

For <DTE\_by\_DCE>:           **2**

*Read syntax*

**+IFC?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+IFC:<DCE\_by\_DTE>,<DTE\_by\_DCE>**

e.g. +IFC:2,2 for the recommended defaults.

*Test syntax*

**+IFC=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+IFC:(list of supported <DCE\_by\_DTE> values),(list of supported <DTE\_by\_DCE> values)**

e.g. +IFC:(0-3),(0-2) for all defined values.

*Implementation*

Implementation of this parameter is mandatory if V.42 error control or Buffered mode is provided in the DCE; otherwise it is optional. DCEs which do not implement circuit 106 and/or circuit 133 do not need to support the value of 2 for the corresponding subparameter.

### **6.2.13 DTE-DCE local rate reporting (+ILRR)**

*Parameter*

**+ILRR=<value>**

### *Description*

This extended-format numeric parameter controls whether or not the extended-format "+ILRR:<rate>" information text is transmitted from the DCE to the DTE. The <rate> reported shall represent the current (negotiated or renegotiated) DTE-DCE rate. If enabled, the intermediate result code is transmitted after any modulation, error control or data compression reports are transmitted, and before any final result code (e.g. CONNECT) is transmitted. The <rate> is applied after the final result code is transmitted.

The DTE-DCE port rate will change only if neither buffered mode nor error-controlled means are enabled (+ES=x,0) and if the negotiated carrier rate (+MRR) does not match the current DTE-DCE port rate (set by +IPR command or autodetected from the previous command line).

The format of this intermediate result code is:

**+ILRR:** <rate>[,<rx\_rate>] e.g. +ILRR: 19 200

<rate> values are decimal values. The optional <rx\_rate> value reports the rate on circuit 104 (RXD), if it is different from the rate on circuit 103 (TXD).

### *Defined values*

See Table 7.

**Table 7/V.25 *ter* – Local port rate reporting values**

<value>	Description
<b>0</b>	Disables reporting of local port rate (+ILRR: is not transmitted)
<b>1</b>	Enables reporting of local port rate (+ILRR: is transmitted)

### *Recommended default setting*

**0**

### *Read syntax*

**+ILRR?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+ILRR:<current setting>**

For example, with the recommended default setting, the DCE could report:

+ILRR:0

### *Test syntax*

**+ILRR=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ILRR:(list of supported values)**

For example, a DCE that supported all defined settings would report:

+ILRR:(0,1)

### *Implementation*

Implementation of this parameter and the associated intermediate result codes is mandatory for V-Series data modems conforming to this Recommendation.

### 6.2.14 +ICLOK Select Sync Transmit Clock Source

#### *Parameter*

**+ICLOK=<value>**

#### *Description*

This command determines how the DTE transmit clock is generated while the DCE is in the synchronous mode.

#### *Values*

- 0** The DCE generates transmit clock and applies it to V.24 circuit 114.
- 1** The DCE accepts transmit clock on V.24 circuit 113 and applies it to circuit 114.
- 2** The DCE derives transmit clock from the receive clock on V.24 circuit 115 and applies it to circuit 114.

#### *Default value*

**0**

#### *Read syntax*

**+ICLOK?**

The DCE shall send a line of information text to the DTE:

**+ICLOK: <value>**

#### *Test syntax*

**+ICLOK=?**

The DCE shall send a line of information text to the DTE:

**+ICLOK: (range of supported values)**

#### *Implementation*

Optional

### 6.2.15 +ILSD Select Long Space Disconnect Option

#### *Parameter*

**+ILSD=<value>**

#### *Description*

This command determines if the DCE shall disconnect a call upon receiving a long space (1.6 sec break) signal from the distant end and if the DCE shall send a long space to cause a disconnect.

If enabled, the modem shall send a 4-second break (continuous space) before performing signal converter clear-down (if any) and before going on-hook, when instructed to hang up by the DTE.

Long Space Disconnect is applicable in Direct Mode and Buffered Mode.

#### *Values*

- 0** Disable long space disconnect
- 1** Enable long space disconnect

#### *Default value*

**0**

*Read syntax*

**+ILSD?**

The DCE shall send a line of information text to the DTE:

**+ILSD: <value>**

*Test syntax*

**+ILSD=?**

The DCE shall send a line of information text to the DTE:

**+ILSD: (0,1)**

*Implementation*

Optional

## **6.2.16 +IDSR Select Data Set Ready Option**

*Parameter*

**+IDSR=<value>**

*Description*

This parameter determines how V.24 circuit 107 (Data Set Ready, DSR) shall behave.

*Values*

- 0** DSR is always ON.
- 1** DSR functions as defined in Recommendation V.24 and the relevant V-Series Recommendation for the signal converter in use.
- 2** DSR is always ON except for 5 seconds after disconnect.

*Default value*

**0**

*Read syntax*

**+IDSR?**

The DCE shall send a line of information text to the DTE:

**+IDSR: <value>**

*Test syntax*

**+IDSR=?**

The DCE shall send a line of information text to the DTE:

**+IDSR: (range of supported values)**

*Implementation*

Optional

## **6.2.17 +IRTS Select Synchronous Mode RTS Option**

*Parameter*

**+IRTS=<value>[,<delay>]**

### *Description*

This parameter configures the operation of V.24 circuit 105 (Request to Send, RTS) and circuit 106 (Ready for Sending, or CTS), while the DCE is operating in Synchronous Mode. In any operating mode where the DTE interface is asynchronous (i.e. Direct, Buffered, Error Control, or Synchronous Access Modes) the setting of this parameter is ignored. In this case, circuit 105 is assumed ON, and the actual state of this circuit, if present, is ignored. The operation of circuit 106 in this case is determined by the +IFC parameter.

NOTE – In many DCE, circuits 105 and 133 share the same signal lead. In those cases, the setting of the +IFC parameter determines which circuit is in effect at the signal lead.

### *Values*

- 0** While in Online State, circuit 106 tracks circuit 105 according to the relevant V-Series Recommendation for the modulation, with an additional delay equal to the value of <delay>, in units of 10 msec.
- 1** Circuit 106 is clamped ON, and Circuit 105 is ignored.

### *Default value*

**0**

### *Read syntax*

**+IRTS?**

The DCE shall send a line of information text to the DTE:

**+IRTS: <value>**

### *Test syntax*

**+IRTS=?**

The DCE shall send a line of information text to the DTE:

**+IRTS: (0,1)**

### *Implementation*

Optional

## **6.3 Call control**

This subclause defines action commands and parameters used to make and maintain calls. It defines result codes generated in executions of these action commands. It also defines one unsolicited DCE result code, RING (6.3.4).

### **6.3.1 Dial**

#### *Syntax*

**D[<dial\_string>][:]**

#### *Description*

This command instructs the DCE to originate a call. This may include several steps, depending upon the DCE type, such as: connecting to the line (going off-hook), waiting for the network to indicate readiness to receive call addressing information (wait for dial tone), signalling call addressing information to the network (dialling the number), monitoring the line for call progress signals (e.g. busy), and instructing the underlying DCE to start the call origination procedure (modulation handshaking).



All characters appearing on the same command line after the "D" are considered part of the call addressing information to be signalled to the network, or modifiers used to control the signalling process (collectively known as a "dial string"), up to a semicolon character (IA5 3/11) or the end of the command line. If the dial string is terminated by a semicolon, the DCE does not start the call origination procedure as defined for the underlying DCE, but instead returns to command state after completion of the signalling of call addressing information to the network.

Any characters appearing in the dial string that the DCE does not recognize as a valid part of the call addressing information or as a valid modifier shall be ignored. This permits characters such as parentheses and hyphens to be included that are typically used in formatting of telephone numbers.

NOTE – The behaviour of the **D** command may be modified if DTE control of V.8 or V.8 *bis* is enabled; refer to Annex A in this case.

### *Abortability*

The **D** command may be aborted in the manner described in 5.6.1. If the DCE is connected to the line, it disconnects from the line in an orderly manner as required by the state of the connection. Aborting the connection by reception of a character is generally possible at any time before the DCE enters online data state, but may not be possible during some states of connection establishment such as handshaking. The DCE shall issue a final result code; which result code to issue shall be determined by the manufacturer, and may depend upon the state of the connection at the time the character was received from the DTE. If a **CONNECT** or **CONNECT <text>** result code is received by the DTE, this indicates that the attempt to abort the command was not successful, possibly due to the state of connection establishment at the time the character was sent. See Table 8.

### *Execution time*

Execution time for this action varies widely depending on the call origination procedure of the underlying DCE and the time required to determine whether or not a connection is successfully established.

### *Implementation*

Implementation of the **D** command and all associated result codes is mandatory. The elements of the dial string are discussed in the following subclauses.

The steps necessary for establishing a call are dependent upon the type of DCE in use and national requirements.

NOTE – Some applications, such as call-back security, may require a modem to originate a call using the frequencies normally reserved for an answering modem. No dial modifier is specified in this Recommendation for this purpose. However, it can be accomplished by terminating the **D** command with a semicolon, and following the semicolon with an **A** (Answer) command.

**Table 8/V.25 *ter* – D command result codes**

<b>Alphabetic (ATV1)</b>	<b>Numeric (ATV0)</b>	<b>Description</b>
<b>CONNECT</b>	1	If connection is successfully established and <b>X0</b> is selected. This result code is transmitted immediately before circuit 109 is turned on
<b>CONNECT &lt;text&gt;</b>	–	If connection is successfully established and <b>Xn</b> is selected where "n" is any value other than 0. This result code is transmitted immediately before circuit 109 is turned on. The contents of <text> are manufacturer-specific, and may include indication of DTE interface speed, line speed, error control and data compression techniques in use, and other information
<b>NO CARRIER</b>	3	If a connection cannot be established, or was aborted by reception of an additional character from the DTE
<b>ERROR</b>	4	If issued while in online command state
<b>BUSY</b>	7	If busy signal detection is enabled or the <b>W</b> or <b>@</b> dial modifier is used, and a busy signal is detected
<b>NO ANSWER</b>	8	If the <b>@</b> dial modifier is used, and remote ringing followed by five seconds of silence is not detected before the expiration of the connection timer defined by <b>S7</b>
<b>NO DIALTONE</b>	6	If dial tone detection is enabled or the <b>W</b> dial modifier is used, and no dial tone is detected within the associated timeout period
<b>OK</b>	0	If command is aborted by either reception of an additional character from the DTE or by the DTE turning off circuit 108 (if &D1 or &D2 is selected; see 6.2.9), or if the dial string is terminated by a semicolon character

### **6.3.1.1 Dialling digits**

#### *Syntax*

A string of 0 or more of the characters:

**"0 1 2 3 4 5 6 7 8 9 \* # + A B C D"**

#### *Description*

For each digit, the DCE signals the digit to the network as part of the call addressing sequence. For GSTN applications, refer to Recommendation Q.23 and national regulations for information on signalling procedures.

Optional dial modifiers and parameters can affect the signalling of call addressing information (for example, whether pulse or DTMF signalling is to be used in GSTN applications).

#### *Implementation*

The dialling digits **0** through **9** shall be implemented. If DTMF dialling is implemented, **\***, **#**, **A**, **B**, **C**, and **D** characters shall be implemented. If the DCE is designed to operate with network services that translate "+" to the international access code, then "+" shall be implemented.

### 6.3.1.2 Pause during dialling

#### *Syntax*

"," (comma, IA5 2/12)

#### *Description*

In GSTN applications, causes a pause in the signalling of addressing information (dialling). The duration of the pause is specified by parameter **S8** (see 6.3.10).

#### *Implementation*

The comma dial modifier shall be implemented.

### 6.3.1.3 Select tone dialling (dial modifier)

#### *Syntax*

**T**

#### *Description*

Causes subsequent dial digits to be signalled using DTMF. The effect of the **T** modifier may carry forward to subsequent **D** commands (i.e. once a **T** dial modifier is used, all subsequent dialling uses DTMF tones until a **P** dial modifier or command is issued); however, it is recommended that the DTE explicitly specify pulse or DTMF dialling with the appropriate dial modifier (**P** or **T**) at the beginning of each dial string.

#### *Implementation*

Implementation of this dial modifier is mandatory; however, if DTMF dialling is not implemented, this modifier will have no effect.

### 6.3.1.4 Select pulse dialling (dial modifier)

#### *Syntax*

**P**

#### *Description*

Causes subsequent dial digits to be signalled using pulse dialling. The effect of the **P** modifier may carry forward to subsequent **D** commands (i.e. once a **P** dial modifier is used, all subsequent dialling uses pulse dialling until a **T** dial modifier or command is issued); however, it is recommended that the DTE explicitly specify pulse or DTMF dialling with the appropriate dial modifier (**P** or **T**) at the beginning of each dial string.

#### *Implementation*

Implementation of this dial modifier is mandatory; however, if pulse dialling is not implemented, this modifier will have no effect.

### 6.3.1.5 Register recall/hook flash

#### *Syntax*

!" (exclamation point, IA5 2/1)

### *Description*

Causes the DCE to go on-hook for a specified period of time, and then return off-hook for at least a specified period of time before continuing with the remainder of the dial string. The specified period of time is normally one-half second, but may be governed by national regulations.

### *Implementation*

Implementation of this dial modifier is mandatory in devices intended for operation on the GSTN.

#### **6.3.1.6 Wait for dial tone**

### *Syntax*

**W**

### *Description*

Causes the DCE to listen for dial tone on the line. If a valid dial tone is detected, the DCE continues processing the remainder of the dial string.

If the DCE decides to abort dialling because the dial tone does not occur within the connection timeout period specified by parameter **S7**, the **NO DIALTONE** or **NO CARRIER** result code is issued and the remainder of the command line is ignored.

The DCE may, but is not required to, detect busy signal while listening for dial tone; this capability may be conditioned upon the setting of the **X** command. The **BUSY** or **NO CARRIER** result codes may be issued if the DCE detects a busy signal while listening for dial tone; in this event, the remainder of the command line is ignored.

### *Implementation*

Implementation of this dial modifier is mandatory for devices intended for operation on the GSTN. The amount of time that dial tone must be present to be considered "detected" may be governed by national regulations, and in the absence of such regulations is manufacturer-specific.

#### **6.3.1.7 Wait for quiet answer**

### *Syntax*

@ (at sign, IA5 4/0)

### *Description*

Causes the DCE to listen for remote ringing, followed by five seconds of silence on the line. If silence is detected for this period, the DCE continues processing the remainder of the dial string.

If the DCE decides to abort dialling because the required period of silence does not occur within the timeout period specified by parameter **S7**, the **NO ANSWER** or **NO CARRIER** result code is issued and the remainder of the command line is ignored.

The DCE may, but is not required to, detect busy signal while listening for silence; this capability may be conditioned upon the setting of the **X** command. The **BUSY** or **NO CARRIER** result codes may be issued if the DCE detects a busy signal while listening for silence; in this event, the remainder of the command line is ignored.

### *Implementation*

Implementation of this dial modifier is mandatory for devices intended for operation on the GSTN. The duration of the period of silence for which the DCE listens may be governed by national regulations.

### 6.3.2 Select tone dialling (command)

#### *Syntax*

**T**

#### *Description*

Causes subsequent **D** commands to assume that DTMF dialling is to be used unless otherwise specified. Once a **T** command is used, all subsequent dialling uses DTMF tones until a **P** command or dial modifier is issued.

#### *Implementation*

Implementation of this command is mandatory; however, if DTMF dialling is not implemented, this command will have no effect.

### 6.3.3 Select pulse dialling (command)

#### *Syntax*

**P**

#### *Description*

Causes subsequent **D** commands to assume that pulse dialling is to be used unless otherwise specified. Once a **P** command is used, all subsequent dialling uses pulse dialling until a **T** command or dial modifier is issued.

#### *Implementation*

Implementation of this command is mandatory; however, if pulse dialling is not implemented, this modifier will have no effect.

### 6.3.4 Incoming call indication

The Incoming Call Indication is an unsolicited result code.

#### *Syntax*

**RING**        Alphabetic form (ATV1).

**2**            Numeric form (ATV0).

#### *Description*

This result code is issued by the DCE to report an incoming call to the DTE. Interpretation of indications from the network to determine what constitutes a "ring" is defined by national regulations. This result code should be repeated each time the network repeats the incoming call indication.

The transmitting of **RING** result codes from the DCE to the DTE may be suppressed during command entry and execution (see 5.8.2). Circuit 125, if provided, may be unaffected by the status of command entry and execution and continue to indicate incoming calls even though transmitting of **RING** result codes is suppressed.

#### *Implementation*

Implementation of this result code is mandatory.

### 6.3.5 Answer

#### *Syntax*

**A**

#### *Description*

This command instructs the DCE to immediately connect to the line and start the answer sequence as specified for the underlying DCE.

Any additional commands that appear after **A** on the same command line are ignored.

NOTE – The behaviour of the **A** command may be modified if DTE control of V.8 or V.8 *bis* is enabled; refer to Annex A in this case.

#### *Abortability*

The **A** command may be aborted in the manner described in 5.6.1. If the DCE is connected to the line, it disconnects from the line in an orderly manner as required by the state of the connection. Aborting the connection by reception of a character is generally possible at any time before the DCE enters online data state, but may not be possible during some states of connection establishment, such as handshaking. The DCE shall issue a final result code; which result code to issue shall be determined by the manufacturer, and may depend upon the state of the connection at the time the character was received from the DTE. If a **CONNECT** or **CONNECT <text>** result code is received by the DTE, this indicates that the attempt to abort the command was not successful, possibly due to the state of connection establishment at the time the character was sent. See Table 9.

#### *Execution time*

Execution time for this action varies widely depending on the answer sequence of the underlying DCE and the time required to determine whether or not a connection is successfully established.

#### *Implementation*

Implementation of this command is mandatory.

**Table 9/V.25 *ter* – A command result codes**

Alphabetic (ATV1)	Numeric (ATV0)	Description
<b>CONNECT</b>	1	If connection is successfully established and <b>X0</b> is selected. This result code is transmitted immediately before circuit 109 is turned on
<b>CONNECT</b> <text>	–	If connection is successfully established and <b>Xn</b> is selected where "n" is any value other than 0. This result code is transmitted immediately before circuit 109 is turned on. The contents of <text> are manufacturer-specific, and may include indication of DTE interface speed, line speed, error control and data compression techniques in use, and other information
<b>NO CARRIER</b>	3	If a connection cannot be established, or was aborted by reception of an additional character from the DTE
<b>ERROR</b>	4	If issued while in online command state
<b>OK</b>	0	If command is aborted by either reception of an additional character from the DTE or by the DTE turning off circuit 108 (if &D1 or &D2 is selected; see 6.2.9), or if the dial string is terminated by a semicolon character

### 6.3.6 Hook control

#### *Syntax*

**H**[<value>]

#### *Description*

This command instructs the DCE to disconnect from the line, terminating any call in progress. All of the functions of the command shall be completed before the DCE issues any result code.

#### *Abortability*

This action may not be aborted.

#### *Defined values*

**0** Disconnect from line and terminate call.

#### *Result codes*

**OK** The result code is issued after circuit 109 is turned off, if it was previously on.

**ERROR** If <value> is not recognized or supported.

#### *Execution time*

Execution time for this action varies widely depending on the call termination procedure of the underlying DCE and manufacturers' implementation. The DTE should wait for the result code before proceeding with subsequent commands.

#### *Implementation*

Implementation of this command is mandatory. If the value specified is not recognized or implemented, an **ERROR** result code shall be generated.

### 6.3.7 Return to online data state

#### *Syntax*

**O[<value>]**

#### *Description*

Causes the DCE to return to online data state and issue a **CONNECT** or **CONNECT <text>** result code.

#### *Abortability*

This command may not be aborted.

#### *Defined values*

**0** Return to online data state from online command state.

**(other)** Reserved for manufacturer proprietary use.

#### *Result codes*

See Table 10.

**Table 10/V.25 ter – O command result codes**

<b>CONNECT</b>	If connection is successfully resumed and <b>X0</b> is selected
<b>CONNECT &lt;text&gt;</b>	If connection is successfully resumed and <b>Xn</b> is selected where "n" is any value other than 0
<b>NO CARRIER</b>	If connection is not successfully resumed
<b>ERROR</b>	If <value> is not recognized or supported

#### *Implementation*

Implementation of this command is mandatory.

### 6.3.8 Automatic answer

#### *Parameter*

**S0**

#### *Description*

This S-parameter controls the automatic answering feature of the DCE. If set to 0, automatic answering is disabled. If set to a non-zero value, the DCE shall cause the DCE to answer when the incoming call indication (ring) has occurred the number of times indicated by the value (see 6.1.2). For example, in GSTN modem applications, setting this parameter to 1 will cause the modem to answer an incoming call on the first ring.

#### *Defined values*

**0** Automatic answering is disabled.

**1 to 255** Enable automatic answering on the ring number specified.

#### *Recommended default setting*

**0** Automatic answering is disabled.



### *Implementation*

Implementation of this parameter is mandatory. The value 0 shall be supported (for interworking with DTEs that wish to disable automatic answering); values other than 0 may be supported. National regulations may limit the allowable non-zero values.

#### **6.3.9 Pause before blind dialling**

##### *Parameter*

**S6**

##### *Description*

This parameter specifies the amount of time, in seconds, that the DCE shall wait between connecting to the line and signalling call addressing information to network (dialling), when dial tone detection is not implemented or enabled.

##### *Defined values*

**2 to 10**      Number of seconds to wait before blind dialling.

##### *Recommended default setting*

**2**              Wait two seconds before blind dialling.

### *Implementation*

Implementation of this parameter is mandatory. However, the effect of settings may be governed by national regulations (some countries may not permit blind dialling, or place a limit on the maximum pause before dialling begins).

#### **6.3.10 Connection completion timeout**

##### *Parameter*

**S7**

##### *Description*

This parameter specifies the amount of time, in seconds, that the DCE shall allow between either answering a call (automatically or by the **A** command) or completion of signalling of call addressing information to network (dialling), and establishment of a connection with the remote DCE. If no connection is established during this time, the DCE disconnects from the line and returns a result code indicating the cause of the disconnection (see the descriptions of the **A** and **D** commands and related dial modifiers for more information).

##### *Defined values*

**1 to 255**      Number of seconds in which connection must be established or call will be disconnected.

### *Implementation*

Implementation of this parameter is mandatory. The effect of settings may be governed by national regulations.

#### **6.3.11 Comma dial modifier time**

##### *Parameter*

**S8**

### *Description*

This parameter specifies the amount of time, in seconds, that the DCE shall pause, during signalling of call addressing information to the network (dialling), when a "," (comma) dial modifier is encountered in a dial string.

### *Defined values*

- 0** DCE does not pause when "," encountered in dial string.
- 1 to 255** Number of seconds to pause.

### *Recommended default setting*

- 2** DCE pauses two seconds when "," is encountered.

### *Implementation*

Implementation of this parameter is mandatory. The effect of settings may be governed by national regulations.

## **6.3.12 Automatic disconnect delay**

### *Parameter*

**S10**

### *Description*

This parameter specifies the amount of time, in tenths of a second, that the DCE will remain connected to the line (off-hook) after the DCE has indicated the absence of received line signal. If the received line signal is once again detected before the time specified in **S10** expires, the DCE remains connected to the line and the call continues.

### *Defined values*

- 1 to 254** Number of tenths of a second of delay.

### *Implementation*

Implementation of this parameter is mandatory. Effect of some settings may be governed by national regulations.

## **6.3.13 Monitor speaker loudness**

### *Parameter*

**L[<value>]**

### *Description*

This parameter controls the volume of the monitor speaker. The specific loudness level indicated by "low", "medium", and "high" is manufacturer-specific, although they are intended to indicate increasing volume.

### *Defined values*

See Table 11.

**Table 11/V.25 ter – Speaker loudness values**

<value>	Description
<b>0</b>	Low speaker volume
<b>1</b>	Low speaker volume
<b>2</b>	Medium speaker volume
<b>3</b>	High speaker volume

*Implementation*

Implementation of this parameter is mandatory; however, if there is no monitor speaker, if the volume of the speaker is fixed, or if the volume is controllable only via a hardware control, the setting of this parameter will be ignored.

**6.3.14 Monitor speaker mode***Parameter*

**M[<value>]**

*Description*

This parameter controls when the monitor speaker is on. The speaker shall be off while the DCE is on-hook, and may be on when the DCE is off-hook, depending on the setting of this parameter. If the setting of this parameter is changed while the DCE is already off-hook, it is desirable that the speaker be immediately set to reflect the new setting.

*Defined values*

See Table 12.

**Table 12/V.25 ter – Speaker mode values**

<value>	Description
<b>0</b>	Speaker is always off
<b>1</b>	Speaker on until DCE informs DCE that carrier has been detected
<b>2</b>	Speaker is always on when DCE is off-hook

*Implementation*

Implementation of this parameter is mandatory; however, if there is no monitor speaker, the setting of this parameter will be ignored.

**6.3.15 +ASTO Store Telephone Number***Parameter*

**+ASTO=<location>,<dial\_string>**

*Description*

This parameter stores dialing strings, which may be invoked later by the **S=<location>** dial modifier.

The following characters are storable in dial strings:

**0123456789ABCD#\*, "TPW@!;**

Other characters are ignored and not stored. Disposition of characters following a ";" dial modifier in a dial string is not specified. However, it is recommended, that if such characters are not stored, that they be ignored.

Lower-case letters entered are converted into upper case for storage. If the string of "storable" characters will not fit into the available space, then no change to the pre-existing stored string will occur. The command shall return the ERROR result code.

#### *Values*

location: 0 to (one less than maximum number of storage locations)

dial\_string: the stored phone number as a T.30 string

#### *Default values*

no values stored

#### *Read syntax*

**+ASTO?**

The DCE shall return the location numbers and dial string, one pair per line for each location that has a value stored, for example:

**+ASTO: 0,555-1234**

**+ASTO: 3,555-4321**

#### *Test syntax*

**+ASTO=?**

The DCE shall return the valid range of location numbers and the maximum length of a dial string, for example:

**+ASTO: (0-3),(20)**

## **6.4 Modulation control commands**

This subclause defines control commands for data modems and for modems defined for use in Text Telephones in Recommendation V.18.

### **6.4.1 Modulation selection (+MS)**

#### *Parameter*

**+MS=[<carrier>[,<automode>[,<min\_rate>[,<max\_rate>[,<min\_rx\_rate>[,<max\_rx\_rate>]]]]]]**

#### *Description*

This extended-format compound parameter is used to control the manner of operation of the modulation capabilities in the DCE. For DCE that support a primary and an auxiliary channel, this parameter applies to the primary channel. It accepts six subparameters:

- **<carrier>**, a string which specifies the preferred modem carrier to use in originating or answering a connection. <carrier> values are strings of up to eight characters, consisting only of numeric digits and upper case letters. <carrier> values for ITU standard modulations shall take the form: <letter><1-4 digits><other letters as needed>. Defined values are shown in Table 13 below.

The DCE may also automatically switch to another modulation (automode), subject to several constraints:

- The DCE might not support some other modulations, regardless of the automode mechanism supported.
- The DCE might not be able to automatically switch from the current modulation <carrier> to some other modulations, restricted by the selected modulation standard and by the DCE manufacturer's technology. For example, there is no standard way to automode from Recommendation V.32 *bis* to Recommendation V.27 *ter*.
- The DTE may disable automode operation; see <automode> below.
- The DTE may constrain the range of modulations available; see <min\_rate> and <max\_rate> below.
- The DTE may selectively disable some modulations by reading, editing and writing the +MA parameter (see 6.4.2).

If the DTE issues a +MS=<carrier> command to the DCE, and if the DCE supports the +MA parameter, the DCE shall reinitialize the +MA parameter.

- **<automode>**, an optional numeric value which enables or disables automatic modulation negotiation (e.g. Annex A/V.32 *bis* or Recommendation V.8). The default value shall be enabled if it is defined for the associated modulation (e.g. Recommendations V.32 *bis*, V.8 or V.34); however, there are modulations for which there is no automatic negotiation defined (e.g. Recommendation V.26 *bis*).
- **<min\_rate>** and **<min\_rx\_rate>**, optional numeric values which specify the lowest value at which the DCE may establish a connection. If unspecified (set to 0), they are determined by the modulation means selected in the <carrier> and <automode> settings. Values for this subparameter are decimal encoded, in units of bit/s.
- **<max\_rate>** and **<max\_rx\_rate>**, optional numeric values which specify the highest value at which the DCE may establish a connection. If unspecified (set to 0), they are determined by the modulation means selected in the <carrier> and <automode> settings and by the current DTE-DCE rate. Non-zero values for this subparameter are decimal encoded, in units of bit/s.
- **<min\_rx\_rate>** and **<max\_rx\_rate>** may be used to condition distinct limits for the receive direction as distinct from the transmit direction. For example, these can be used to select either direction for asymmetric modulations like Recommendation V.23 with constant carrier.

NOTE 1 – Recommendation V.34 has provisions for selectively enabling modulation rates in any combination, selectively disabling any rate. Future versions of this Recommendation may define additional optional subparameters to control this V.34 feature.

#### *Defined values*

For <carrier>:

**Table 13/V.25 *ter* – Standard modulation <carrier> strings**

<carrier>	Description
	ITU (CCITT) Standard Modulations
<b>V21</b>	Rec. V.21
<b>V22</b>	Rec. V.22
<b>V22B</b>	Rec. V.22 <i>bis</i>
<b>V23S</b>	Rec. V.23, with Switched carrier, TDM
<b>V23C</b>	Rec. V.23, with Constant carrier, asymmetric FDM
<b>V26B</b>	Rec. V.26 <i>bis</i>
<b>V27TC</b>	Rec. V.27 <i>ter</i> , with Constant carrier, FDM
<b>V32</b>	Rec. V.32
<b>V32B</b>	Rec. V.32 <i>bis</i>
<b>V34</b>	Rec. V.34
NOTE – Manufacture proprietary strings may be defined; they shall not begin with the "V" character.	

For <automode>:

<b>0</b>	Disabled
<b>1</b>	Enabled, with Rec. V.8 or Annex A/V.32 <i>bis</i> where applicable

*Recommended default settings*

For <carrier>: Manufacturer-specific  
 For <automode>: **1** (If possible)  
 For <min\_rate>: **0**  
 For <max\_rate>: **0** Maximum supported by <carrier>  
 For <min\_rx\_rate>: **0** If implemented  
 For <max\_rx\_rate>: **0** If implemented

*Read syntax*

**+MS?**

The DCE shall transmit a string of information text to the DTE, reporting the current +MS subparameter settings, consisting of:

**+MS: <carrier>,<automode>,<min\_rate>,<max\_rate>,<min\_rx\_rate>,<max\_rx\_rate>**

NOTE 2 – The current active settings are reported under control of the +MR parameter.

Optional subparameters do not need to be reported if not implemented or set to 0.

e.g. +MS: V32B,1,1200,14400 if set to Recommendation V.32 *bis*, automode, explicit limits, but no distinct receive and transmit rate limits.

### *Test syntax*

**+MS=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+MS: (list of supported <carrier> values),(list of supported <automode> values),(list of supported <min\_rate> values),(list of supported <max\_rate> values),(list of supported <min\_rx\_rate> values), (list of supported <max\_rx\_rate> values)**

Optional subparameters do not need to be reported if not implemented in the DCE.

For example, a DCE that supported the following modulations: Recommendations V.21, V.22, V.22 *bis*, V.32 and V.32 *bis*, with Automode, could report:

**+MS: (V21,V22,V22B,V32,V32B),(0,1),(0,300-14400),(0,300-14400)**

### *Implementation*

Implementation of this parameter is mandatory for V-Series data modems conforming to this Recommendation.

## **6.4.2 Modulation automode control (+MA)**

### *Parameter*

**+MA=[<carrier>[,<carrier>[,<carrier>[,...]]]]**

### *Description*

This extended-format compound parameter is a list of modulations that the DCE may use to connect with the remote DCE in Automode operation, for answering or originating data calls, as additional alternatives to the modulation specified in +MS=<carrier>. The use of automode is controlled by the +MS=,<automode> subparameter.

This parameter is an optional extension to the +MS command (see 6.4.1). The implied highest priority modulation is specified in the <carrier> subparameter for the +MS command. As an extension of the +MS command, this parameter is reset to the manufacturer-determined default setting whenever +MS=<carrier> is changed by the DTE, subject to the constraints listed below under recommended defaults.

If the DTE writes values to +MA that are not supported for the current +MS=<carrier> setting, the DCE shall return **ERROR**.

If the automode priority has any meaning in context of the modulations specified (or depending on the availability of general mechanisms like Recommendation V.8), the order of <carrier> values determines priority.

<carrier> values omitted are not available for Automode negotiation, even if the DCE is capable of them. For example, if <carrier> value V26T (Recommendation V.26 *ter*) is omitted from the +MA list, this means that the DCE is not configured to automatically switch to this modulation, given the current setting of the +MS=<carrier> subparameter, even if the DCE is capable of Recommendation V.26 *ter*.

### *Defined values*

Valid <carrier> values are defined in Table 13. +MA takes a variable number of <carrier> values, limited to those <carrier> values indicated by the DCE in response to a +MS=? command (see 6.4.1). If the DTE includes any <carrier> values that the DCE does not support, the DCE shall return an **ERROR** final result code.

### *Recommended default settings*

This is manufacturer determined, each time +MS=< carrier> is changed.

The valid settings for +MA are constrained by five factors:

- the modulation types supported in the DCE;
- the current modulation selected in +MS;
- the current <max\_rate> and <max\_rx\_rate> selected in +MS;
- the current <min\_rate> and <min\_rx\_rate> selected in +MS;
- by the DCE's technology for automatic modulation selection.

For example, if a DCE supported all V-Series standard modulations from Recommendation V.21 up to Recommendation V.34, but if +MS=V32B (Recommendation V.32 *bis*) and the only Automode technology supported in the DCE is Annex A/V.32 *bis*, then this device might only apply Automode between Recommendations V.32 *bis*, V.32 and V.22 *bis*. For that example, the default would be +MA=V32,V22B. If the <min\_rate> subparameter was set to 9600, then Recommendation V.22 *bis* could not be an available Automode choice, and the default would be +MA=V32.

### *Read syntax*

**+MA?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+MA: <current list of <carrier> values><CR>**

For example, a DCE capable of Annex A/V.32 *bis* Automode operation and set for +MS=V32B,1,2400,14400; the DCE could report:

**+MA=V32**

### *Test syntax*

**+MA=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+MA: (list of supported <carrier> values)**

For example, a DCE that is set for a top modulation of V.34 (+MS=V34,1,300,28800) with V.8 negotiation and several symmetric duplex modulations could report:

**+MA:(V32B,V32,V26B,V22B,V22,V21)**

which indicates ability to Automode to Recommendations V.32 *bis*, V.32, V.26 *ter*, V.22 *bis*, V.22, and V.21 in that order of preference.

### *Implementation*

This command is optional.

## **6.4.3 Modulation reporting control (+MR)**

### *Parameter*

**+MR**

### *Description*

This extended-format numeric parameter controls whether or not the extended-format +MCR:<carrier> and +MRR:<rate> intermediate result codes are transmitted from the DCE to the



DTE. The <carrier> reported shall represent the current (negotiated or renegotiated) modulation <carrier>. If enabled, the intermediate result codes are transmitted at the point during connect negotiation (handshaking) at which the DCE has determined which modulation and rate will be used, before any Error Control or Data Compression reports are transmitted, and before any final result code (e.g. CONNECT) is transmitted.

The format of this information text is:

**+MCR:** <carrier> e.g. +MCR: V32B

**+MRR:** <rate>[,<rx\_rate>] e.g. +MRR: 14400

<carrier> string values are defined in Table 13.

<rate> values are the decimal transmit rates in bits/s, or set to 0 if negotiation failed (e.g. V.32 *bis* cleardown).

<rx\_rate> may be reported if the modulation negotiated has a different rate for the RXD channel than for the transmit channel.

#### *Defined values*

See Table 14.

**Table 14/V.25 *ter* – Modulation reporting values**

<value>	Description
<b>0</b>	Disables reporting of modulation connection (+MCR: and +MRR: are not transmitted)
<b>1</b>	Enables reporting of modulation connection (+MCR: and +MRR: are transmitted)

#### *Recommended default setting*

**0**

#### *Read syntax*

**+MR?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+MR:<current setting>**

For example, with the recommended default setting, the DCE could report:

+MR:0

#### *Test syntax*

**+MR=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+MR:(list of supported values)**

For example, a DCE that supported all defined settings would report:

+MR:(0,1)

## Implementation

Implementation of this parameter and associated intermediate result codes is mandatory for V-Series data modems.

### 6.4.4 V.18 Selection (+MV18S)

#### Parameter

+MV18S=[<mode>[,<dflt\_ans\_mode>[,<fbk\_time\_enable>[,<ans\_msg\_enable>]]]]

#### Description

This extended-format compound parameter is used to control the manner of operation of the V.18 capabilities (if present) in the DCE. It accepts four numeric subparameters:

- <mode>, which specifies the calling mode of operation;
- <dflt\_ans\_mode>, which specifies the preferred fallback mode of operation when the DCE is operating as the answerer; and
- <fbk\_time\_enable>, which specifies the enabling of re-acquisition after two seconds of no transmission;
- <ans\_msg\_enable>, which specifies the enabling of the answer message as part of continuous carrier mode probes.

#### Defined values

See Table 15.

**Table 15/V.25 ter – V.18 Operation modes**

<mode>	Description
0	Disables V.18 operation
1	V.18 operation, auto detect mode
2	V.18 operation, connect in 5-bit (Baudot) mode
3	V.18 operation, connect in DTMF mode
4	V.18 operation, connect in EDT mode
5	V.18 operation, connect in V.21 mode
6	V.18 operation, connect in V.23 mode
7	V.18 operation, connect in Bell 103-type mode
<dflt_ans_mode>	Description
0	Disables V.18 answer operation
1	No default specified (auto detect)
2	V.18 operation connect in 5-bit (Baudot) mode
3	V.18 operation connect in DTMF mode
4	V.18 operation connect in EDT mode

**Table 15/V.25 ter – V.18 Operation modes (concluded)**

<b>&lt;fbk_time_enable&gt;</b>	<b>Description</b>
<b>0</b>	Disable
<b>1</b>	Enable
<b>&lt;ans_msg_enable&gt;</b>	<b>Description</b>
<b>0</b>	Disable
<b>1</b>	Enable

*Recommended default settings*

For <mode>:                   **0**

For <dflt\_ans\_mode>:       **0**

For <fbk\_time\_enable>:      **0**

For <ans\_msg\_enable>:       **0**

*Read syntax*

**+MV18S?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+MV18S: <mode>,<dflt\_ans\_mode>,<fbk\_time\_enable>,<ans\_msg\_enable>**

For example, with the recommended default settings, the DCE could report:

**+MV18S: 0,0,0,0**

which selects disabled mode, with re-acquisition after inactivity disabled.

*Test syntax*

**+MV18S=?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+MV18S:(range of supported <mode>s),(range of supported <dflt\_ans\_mode>s),(range of supported <fbk\_time\_enable>s),(range of supported <ans\_msg\_enable>s)**

For example, a completely capable DCE could report:

**+MV18S:(0-7),(0-4),(0,1),(0,1)**

*Implementation*

Implementation of this parameter is mandatory if Recommendation V.18 is implemented in the DCE.

#### **6.4.5 V.18 Reporting control (+MV18R)**

*Parameter*

**+MV18R=<value>**

*Description*

This extended-format numeric parameter controls whether or not the extended-format "+MV18R:" result code is transmitted from the DCE to the DTE. The +MV18:<type> reported shall represent the

current (negotiated or renegotiated) V.18 <type>. If enabled, the result code is transmitted at the point during connect negotiation (handshaking) at which the DCE has determined which modulation and format will be used (if any) for Recommendation V.18. The format of this result code is the following (see Table 16):

**Table 16/V.25 *ter* – V.18 Connection report intermediate result codes**

<b>+MV18:5BIT</b>	Indicates connection with 5-bit
<b>+MV18:EDT</b>	Indicates connection with EDT
<b>+MV18:DTMF</b>	Indicates connection with DTMF
<b>+MV18:V21</b>	Indicates connection with Rec. V.21
<b>+MV18:V23</b>	Indicates connection with Rec. V.23
<b>+MV18:B103</b>	Indicates connection with Bell 103-type modulation
<b>+MV18:V18</b>	Indicates both DCEs are in Rec. V.18

The +MV18 result code, if enabled, is issued by the DCE in place of any other Modulation reporting when V.18 connection occurs (e.g. +MCR). If the +MV18 parameters are set to disable V.18 operation, the effect is to override an enable setting of +MV18R.

#### *Defined values*

See Table 17.

**Table 17/V.25 *ter* – V.18 Reporting values**

<b>&lt;value&gt;</b>	<b>Description</b>
<b>0</b>	Disables reporting of Rec. V.18 connection
<b>1</b>	Enables reporting of Rec. V.18 connection

#### *Recommended default setting*

**0**

#### *Read syntax*

**+MV18R?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+MV18R: <current setting>**

For example, with the recommended default setting, the DCE could report:

+MV18R: 0

#### *Test syntax*

**+MV18R=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+MV18R: (list of supported values)**

For example, a DCE that supported both defined settings would report:

+MV18R: (0,1)

#### *Implementation*

Implementation of this parameter (and the +MV18 result codes) is mandatory if Recommendation V.18 is implemented in the DCE.

### **6.4.6 V.18 Answering message editing (+MV18AM)**

#### *Parameter*

+MV18AM=[<edit\_msg\_enable>]

#### *Description*

This extended-format string parameter contains the answer message stored in the DCE. The command +MV18AM=" " sets this to the null string. The command +MV18AM="<message>" appends this message to the stored string, up to the maximum length supported by the DCE.

#### *Defined values*

This string can contain any printable character.

#### *Recommended default settings*

Manufacturer-specific, dependent on country of installation.

#### *Read syntax*

+MV18AM?

The DCE shall transmit the text of the stored answer message to the DTE. For example, for installation in an English speaking country, it could report:

+MV18AM: "Hello, GA"

#### *Test syntax*

+MV18AM=?

The DCE shall transmit the maximum message length allowable, as a decimal value. For example, if the DCE could handle a maximum message of 100 characters, it shall report:

+MV18AM:100

#### *Implementation*

Implementation of this parameter is mandatory if Recommendation V.18 is implemented in the DCE.

### **6.4.7 Order of probes (+MV18P)**

#### *Parameter*

+MV18P=[<probe\_mode>[,<probe\_mode>[,...]]]

#### *Description*

This extended-format compound parameter is a list of text telephone modes that specify the order of the modes in which to send probes during the automodring answering process. The order is of importance for minimizing the connect time when answering calls. The <probe\_mode> values 2-7,

are defined in Table 18. The order determines the probing order, with the first value specified representing the first probe tried.

#### *Defined values*

See Table 18.

**Table 18/V.25 *ter* – Probe order**

<probe_mode>	Description
<b>2</b>	Send probe message in 5-bit (Baudot) mode
<b>3</b>	Send probe message in DTMF mode
<b>4</b>	Send probe message in EDT mode
<b>5</b>	Send Rec. V.21 carrier as a probe
<b>6</b>	Send Rec. V.23 carrier as a probe
<b>7</b>	Send Bell 103 carrier as a probe

#### *Recommended default setting*

Manufacturer-specific, based on national regulations or common practice.

#### *Read syntax*

**+MV18P?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+MV18P: <current priority list of probe\_mode settings>**

For example, if the DCE is set to support the above list in that priority order, the DCE could report:

**+MV18P: 2,3,4,5,6,7**

#### *Test syntax*

**+MV18P=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+MV18P: (list of supported values)**

For example, a DCE that supported all values shall report:

**+MV18P: (2-7)**

#### *Implementation*

Implementation of this parameter is mandatory if Recommendation V.18 is implemented in the DCE.

## **6.5 Error control commands**

This Recommendation contains parameters to condition DCE use of standard V.42 LAPM and Alternative Error Control Procedures, and Buffered modes. Support for the selection, control and reporting of other error control procedures is beyond the scope of this Recommendation.

### 6.5.1 Error control selection (+ES)

#### Parameter

**+ES=[<orig\_rqst>[,<orig\_fbk>[,<ans\_fbk>]]]**

#### Description

This extended-format compound parameter is used to control the manner of operation of the V.42 protocol in the DCE (if present). It accepts three numeric subparameters:

- **<orig\_rqst>**, which specifies the initial requested mode of operation when the DCE is operating as the originator;
- **<orig\_fbk>**, which specifies the acceptable fallback mode of operation when the DCE is operating as the originator;
- **<ans\_fbk>**, which specifies the acceptable fallback mode of operation when the DCE is operating as the answerer.

#### Defined values

See Table 19.

**Table 19/V.25 *ter* – Error control operation subparameters**

<b>&lt;orig_rqst&gt;</b>	<b>Description</b>
<b>0</b>	Direct mode
<b>1</b>	Initiate call with Buffered mode only
<b>2</b>	Initiate V.42 without Detection Phase. If Rec. V.8 is in use, this is a request to disable V.42 Detection Phase
<b>3</b>	Initiate V.42 with Detection Phase
<b>4</b>	Initiate Alternative Protocol
<b>&lt;orig_fbk&gt;</b>	<b>Description</b>
<b>0</b>	Error control optional (either LAPM or Alternative acceptable); if error control not established, maintain DTE-DCE data rate and use Buffered mode with flow control during non-error control operation
<b>1</b>	Error control optional (either LAPM or Alternative acceptable); if error control not established, change DTE-DCE data rate to match line rate and use Direct mode
<b>2</b>	Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect
<b>3</b>	Error control required (only LAPM acceptable); if error control not established, disconnect
<b>4</b>	Error control required (only Alternative protocol acceptable); if error control not established, disconnect

**Table 19/V.25 *ter* – Error control operation subparameters (*concluded*)**

<b>&lt;ans_fbk&gt;</b>	<b>Description</b>
<b>0</b>	Direct mode
<b>1</b>	Error control disabled, use Buffered mode
<b>2</b>	Error control optional (either LAPM or Alternative acceptable); if error control not established, maintain DTE-DCE data rate and use local buffering and flow control during non-error control operation
<b>3</b>	Error control optional (either LAPM or Alternative acceptable); if error control not established, change DTE-DCE data rate to match line rate and use Direct mode
<b>4</b>	Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect
<b>5</b>	Error control required (only LAPM acceptable); if error control not established, disconnect
<b>6</b>	Error control required (only Alternative protocol acceptable); if error control not established, disconnect

*Recommended default settings*

For <orig\_rqst>:     **3**

For <orig\_fbk>:     **0**

For <ans\_fbk>:     **2**

*Read syntax*

**+ES?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ES: <orig\_rqst>,<orig\_fbk>,<ans\_fbk>**

e.g. +ES: 3,0,2<CR> for the recommended defaults.

*Test syntax*

**+ES=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ES: (list of supported <orig\_rqst> values),(list of supported <orig\_fbk> values),(list of supported <ans\_fbk> values)**

e.g. +ES: (0-4),(0-4),(0-5) for all defined values.

*Implementation*

Implementation of this parameter is mandatory if V.42 error control or Buffered mode is implemented in the DCE.

## **6.5.2 Break handling in error control operation (+EB)**

*Parameter*

**+EB=[<break\_selection>[,<timed>[,<default\_length>]]]**



### Description

This extended-format compound parameter is used to control the manner of V.42 operation (if present in the DCE). It accepts three numeric subparameters:

- **<break\_selection>**, which specifies the type of break to be signalled to the remote DCE upon detecting a break from the local DTE (see Recommendation V.42 for definition of the different break types);
- **<timed>**, which specifies if the break signal to be signalled to the remote DCE is timed or not;
- **<default\_length>**, which specifies the amount of time in tens of milliseconds that a break should be signalled to the local DTE when an indication of break is received from the remote DCE without a break length explicitly indicated.

### Defined values

See Table 20.

**Table 20/V.25 ter – Break control subparameters**

<b>&lt;break_selection&gt;</b>	<b>Description</b>
<b>0</b>	Ignore break (do not signal to remote DCE)
<b>1</b>	Non-expedited, non-destructive
<b>2</b>	Expedited, non-destructive
<b>3</b>	Expedited and destructive
<b>&lt;timed&gt;</b>	<b>Description</b>
<b>0</b>	Any transmitted V.42 L-SIGNAL shall not indicate break signal length
<b>1</b>	Any transmitted V.42 L-SIGNAL shall indicate break signal length
<b>&lt;default_length&gt;</b>	<b>Description</b>
<b>0</b>	Do not deliver break to DTE
<b>1 to 254</b>	Default break length of 0.01 to 2.54 seconds
<b>Other</b>	Higher values may be supported

### Recommended default settings

For <break\_selection>:       **1**

For <timed>:               **0**

For <default\_length>:       **30**

### Read syntax

**+EB?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+EB: <break\_selection>,<timed>,<default\_length><CR>**

e.g. +EB: 1,0,30<CR> to report the recommended default settings.

### Test syntax

**+EB=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+EB: (range of supported <break\_selection> values),(range of <timed> values),(range of supported <default\_length> values)<CR>**

e.g. +EB: (0-3),(0,1),(0-200) for all defined selections and break lengths from 0.01 to two seconds.

#### *Implementation*

Implementation of this parameter is mandatory if V.42 error control or Buffered mode is implemented in the DCE.

### **6.5.3 Selective repeat (+ESR)**

#### *Parameter*

**+ESR=[<value>]**

#### *Description*

This extended-format numeric parameter controls the use of the selective reject (SREJ) option in Recommendation V.42 (if present in the DCE).

#### *Defined values*

See Table 21.

**Table 21/V.25 ter – Selective repeat values**

<b>&lt;value&gt;</b>	<b>Description</b>
<b>0</b>	Do not use SREJ
<b>1</b>	Use SREJ if available in remote DCE; continue without it if not
<b>2</b>	Use SREJ if available in remote DCE; disconnect if SREJ is not available

#### *Recommended default value*

**1**

#### *Read syntax*

**+ESR?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ESR: <current setting>**

e.g. +ESR: 1<CR> for the recommended default.

#### *Test syntax*

**+ESR=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ESR: (list of supported values)**

e.g. +ESR: (0-2) for all defined values.

#### *Implementation*

Implementation of this parameter is optional.

#### 6.5.4 32-bit frame check sequence (+EFCS)

##### *Parameter*

**+EFCS=[<value>]**

##### *Description*

This extended-format numeric parameter controls the use of the 32-bit frame check sequence option in Recommendation V.42 (if present in the DCE).

##### *Defined values*

See Table 22.

**Table 22/V.25 *ter* – Frame check sequence values**

<b>&lt;value&gt;</b>	<b>Description</b>
<b>0</b>	Use 16-bit FCS
<b>1</b>	Use 32-bit FCS if available in remote DCE; otherwise use 16-bit FCS
<b>2</b>	Use 32-bit FCS if available in remote DCE; otherwise disconnect

##### *Recommended default value*

**1**

##### *Read syntax*

**+EFCS?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+EFCS: <current setting>**

e.g. +EFCS: 1 for the recommended default.

##### *Test syntax*

**+EFCS=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+EFCS: (list of supported values)**

e.g. +EFCS: (0-2) for all defined values.

##### *Implementation*

Implementation of this parameter is mandatory if V.42 error control is implemented in the DCE.

#### 6.5.5 Error control reporting (+ER)

##### *Parameter*

**+ER=[<value>]**

##### *Description*

This extended-format numeric parameter controls whether or not the extended-format "+ER:" intermediate result code is transmitted from the DCE to the DTE. The +ER:<type> reported shall represent the current (negotiated or renegotiated) DCE-DCE error control type. If enabled, the intermediate result code is transmitted at the point during error control negotiation (handshaking) at

which the DCE has determined which error control protocol will be used (if any), before the final result code (e.g. CONNECT) is transmitted. The format of this result code is the following (see Table 23):

**Table 23/V.25 *ter* – Error control report intermediate result codes**

<b>+ER: NONE</b>	Error control is not in use
<b>+ER: LAPM</b>	Rec. V.42 LAPM protocol is in use
<b>+ER: ALT</b>	Rec. V.42 Alternative protocol is in use

The +ER intermediate result code, if enabled, is issued after the Modulation report (+MCR and +MRR) and before the Data Compression Report (+DR).

#### *Defined values*

See Table 24.

**Table 24/V.25 *ter* – Error control reporting**

<b>&lt;value&gt;</b>	<b>Description</b>
<b>0</b>	Error control reporting disabled (no +ER intermediate result code transmitted)
<b>1</b>	Error control reporting enabled (+ER intermediate result code transmitted)

#### *Recommended default setting*

**0**

#### *Read syntax*

**+ER?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+ER: <current setting>**

For example, with the recommended default setting, the DCE could report:

**+ER: 0**

#### *Test syntax*

**+ER=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ER: (list of supported values)**

For example, a DCE that supported all defined settings would report:

**+ER: (0,1)**

#### *Implementation*

Implementation of this parameter and associated intermediate result codes are mandatory if V.42 error control is implemented in the DCE.

## 6.5.6 Call termination buffer management (+ETBM)

### Parameter

**+ETBM=[<pending\_TD>[,<pending\_RD>[,<timer>]]]**

### Description

This extended-format compound parameter controls the handling of data remaining in DCE buffers upon call termination. It accepts three numeric subparameters:

- **<pending\_TD>**, which controls how previously-transmitted data remaining in the DCE buffers should be handled when the local DTE requests disconnection of the call;
- **<pending\_RD>**, which controls how previously-received data remaining in the DCE buffers should be handled when the remote DCE disconnects the call; and
- **<timer>**, which sets a maximum time limit on how long the DCE will attempt to deliver the buffered data before abandoning the attempt and discarding remaining data.

Circuit 109 is held in the ON condition until all pending data is delivered or discarded.

### Defined values

See Table 25.

**Table 25/V.25 ter – Call termination buffer management subparameters**

<b>&lt;pending_TD&gt;</b>	<b>Description</b>
<b>0</b>	Discard all buffered data immediately and disconnect
<b>1</b>	Attempt until all data is delivered and acknowledged (ignore timer); if remote DCE disconnects, discard remainder
<b>2</b>	Attempt until all data is delivered and acknowledged; if timer expires or remote DCE disconnects, discard remainder
<b>&lt;pending_RD&gt;</b>	<b>Description</b>
<b>0</b>	Discard all buffered data immediately and disconnect
<b>1</b>	Attempt until all data is delivered (ignore timer); if local DTE requests disconnect, discard remainder
<b>2</b>	Attempt until all data is delivered; if timer expires or local DTE requests disconnect, discard remainder
<b>&lt;timer&gt;</b>	<b>Description</b>
<b>0 to 30</b>	Delivery timer value in seconds
<b>Other</b>	Higher values may be supported at manufacturer's option

### Recommended default values

For <pending\_TD>: **1**

For <pending\_RD>: **1**

For <timer>: **20**

### Read syntax

**+ETBM?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+ETBM:** <pending\_TD>,<pending\_RD>,<timer>

For example, with the recommended default settings, the DCE could report:

+ETBM: 1,1,20

*Test syntax*

**+ETBM=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+ETBM:** (list of supported <pending\_TD>values),(list of supported <pending\_RD> values),(list of supported <timer> values)

For example, a DCE that supported all defined settings could report:

+ETBM: (0-2),(0-2),(0-30)

*Implementation*

Implementation of this parameter is mandatory if V.42 error control or Buffered mode is implemented in the DCE.

### **6.5.7 +EWIND Window Size**

*Parameter*

**+EWIND=**<value1>[,<value2>]

*Description*

This parameter allows the user to set the maximum number of unacknowledged frames allowed at the link layer (window size), N401. Changes to this value take effect when the next connection is established.

Value1 is the desired window size in the transmit direction, value2 for the receive direction. If value2 is 0 or is not included, then value1 is used for value2.

Value2 is optional for the DCE. If not supported by the DCE, then it must accept value 0 without error.

*Defined values*

**1-127**

*Recommended default setting*

15 (per Recommendation V.42).

*Read syntax*

**+EWIND?**

The DCE shall transmit the following information text to the DTE.

**+EWIND:** <value1>,<value2>.

If the DCE does not support a separate value2, then the information text shall report 0 as value2.

*Test syntax*

**+EWIND=?**

The DCE shall transmit the supported range to the DTE as in the following example:

+EWIND: (1-127),(<value2 range>).

If value2 is not supported by the DCE, then the test response shall have the value 0 for value2 range.

#### *Implementation*

Optional

### **6.5.8 +EFRAME Frame Length**

#### *Parameter*

**+EFRAME=<value1>[,<value2>]**

#### *Description*

This parameter indicates the maximum link layer frame information field size that shall be attempted with the protocol. The values equal the information field size in octets. The desired frame sizes shall be the smaller of the sizes indicated by the values of +EFRAME and any restrictions imposed by the particular link layer protocol in use.

Value1 is for the sending direction, value2 for the receiving. If value2 is not specified or has value 0, then the value1 shall be used for both directions of transmission.

#### *Defined values*

**1** to **65535** bytes.

Value2 is optional for the DCE. If value2 is not supported, then a value2 of 0 must be accepted by the DCE without error.

NOTE – A DCE may support a smaller range and may round the value to the nearest power of 2.

#### *Recommended default setting*

**128** (per Recommendation V.42).

#### *Read syntax*

**+EFRAME?**

The DCE shall transmit the following information text to the DTE.

**+EFRAME: <value1>,<value2>.**

#### *Test syntax*

**+EFRAME=?**

The DCE shall transmit the supported range of values to the DTE as in the following example:

+EFRAME: (16-4096),<value2 range>.

The value2 range shall be 0 if a separate value2 is not supported.

#### *Implementation*

Optional

## **6.6 Data compression commands**

This subclause contains parameters to condition DCE use of standard V.42 *bis* Data Compression Procedures. Support for selection, control and reporting of other data compression procedures is beyond the scope of this Recommendation.

## 6.6.1 Data compression (+DS)

### Parameter

**+DS**=[<direction>[,<compression\_negotiation>[,<max\_dict>[,<max\_string>]]]]

### Description

This extended-format compound parameter controls the V.42 *bis* data compression function if provided in the DCE. It accepts four numeric subparameters:

- **<direction>**, which specifies the desired direction(s) of operation of the data compression function; from the DTE point of view;
- **<compression\_negotiation>**, which specifies whether or not the DCE should continue to operate if the desired result is not obtained;
- **<max\_dict>**, which specifies the maximum number of dictionary entries which should be negotiated (may be used by the DTE to limit the codeword size transmitted, based on its knowledge of the nature of the data to be transmitted);
- **<max\_string>**, which specifies the maximum string length to be negotiated (V.42 *bis* P2).

### Defined values

See Table 26.

**Table 26/V.25 *ter* – Data compression control subparameters**

<b>&lt;direction&gt;:</b>	<b>Description</b>
<b>0</b>	Negotiated ... no compression (V.42 <i>bis</i> P0 = 0)
<b>1</b>	Transmit only
<b>2</b>	Receive only
<b>3</b>	Both directions, accept any direction (V.42 <i>bis</i> P0 = 11)
<b>&lt;compression_negotiation&gt;</b>	<b>Description</b>
<b>0</b>	Do not disconnect if Rec. V.42 <i>bis</i> is not negotiated by the remote DCE as specified in <direction>
<b>1</b>	Disconnect if Rec. V.42 <i>bis</i> is not negotiated by the remote DCE as specified in <direction>
<b>&lt;max_dict&gt;:</b>	<b>512 to 65535</b>
<b>&lt;max_string&gt;:</b>	<b>6 to 250</b>

### Recommended default settings

For <direction>: **3**  
For <compression\_negotiation>: **0**  
For <max\_dict>: Determined by the manufacturer (see Appendix II/V.42 *bis*)  
For <max\_string>: **6**

### Read syntax

**+DS?**



The DCE shall transmit a string of information text to the DTE, consisting of:

**+DS=<direction>,<compression\_negotiation>,<max\_dict>,<max\_string>**

e.g. +DS:3,0,8192,6 for the recommended defaults and 8K max dictionary.

*Test syntax*

**+DS=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+DS: (list of supported <direction> values),(list of supported <compression\_negotiation> values),(list of supported <max\_dict> values),(list of supported <max\_string> values)**

e.g. +DS: (0-3),(0-2),(512-8192),(6-250).

*Implementation*

Implementation of this parameter is mandatory if V.42 *bis* data compression is implemented in the DCE.

### 6.6.2 Data compression reporting (+DR)

*Parameter*

**+DR=<value>**

*Description*

This extended-format numeric parameter controls whether or not the extended-format "+DR:" intermediate result code is transmitted from the DCE to the DTE. The +DR:<type> reported shall represent the current (negotiated or renegotiated) DCE-DCE data compression type. If enabled, the intermediate result code is transmitted at the point after error control negotiation (handshaking) at which the DCE has determined which data compression technique will be used (if any) and the direction of operation. The format of this result code is the following (see Table 27):

**Table 27/V.25 *ter* – Data compression reporting intermediate result codes**

<b>+DR: NONE</b>	Data compression is not in use
<b>+DR: V42B</b>	Rec. V.42 <i>bis</i> is in use in both directions
<b>+DR: V42B RD</b>	Rec. V.42 <i>bis</i> is in use in receive direction only
<b>+DR: V42B TD</b>	Rec. V.42 <i>bis</i> is in use in transmit direction only

The +DR intermediate result code, if enabled, is issued after the Error Control Report (+ER) and before the final result code (e.g. CONNECT).

*Defined values*

See Table 28.

**Table 28/V.25 *ter* – Data compression reporting values**

<b>&lt;value&gt;</b>	<b>Description</b>
<b>0</b>	Data compression reporting disabled (no +DR result code transmitted)
<b>1</b>	Data compression reporting enabled (+DR result code transmitted)

*Recommended default setting*

**0**

*Read syntax*

**+DR?**

The DCE shall transmit a line of information text to the DTE, consisting of:

**+DR: <current setting>**

For example, with the recommended default setting, the DCE could report:

+DR: 0

*Test syntax*

**+DR=?**

The DCE shall transmit a string of information text to the DTE, consisting of:

**+DR: (list of supported values)**

For example, a DCE that supported all defined settings would report:

+DR: (0,1)

*Implementation*

Implementation of this parameter and the associated intermediate result code is mandatory if V.42 *bis* data compression is implemented in the DCE.

## **6.7 DCE testing**

This subclause contains a set of +T (test) commands and parameters that are based on the test objects of Recommendation V.58.

The parameters correspond as closely as possible to V.58 objects. In some cases the parameters were structured to more in keeping with AT command practice.

### **6.7.1 List of Test Commands and Parameters**

The following commands and parameters are defined in this subclause:

+TE140    Enable Ckt 140

+TE141    Enable Ckt 141

+TERDL    Enable RDL From Remote

+TEPDL    Enable Front Panel RDL

+TEPAL    Enable Front Panel Analog Loop

+TALS     Analogue Loop Status

+TDLS	Local Digital Loop Status
+TRDLS	Remote Digital Loop Status
+TADR	Local V.54 Address
+TMODE	Set V.54 Mode
+TTER	Test Error Rate
+TNUM	Errored Bit and Block Counts
+TLDL	Local Digital Loop
+TRDL	Request Remote Digital Loop
+TAL	Local Analogue Loop
+TSELF	Self Test
+TRES	Self Test Result

## 6.7.2 Test Commands and Parameters

### 6.7.2.1 +TE140 Enable Ckt 140

#### *Parameter*

**+TE140=<value>**

#### *Description*

This parameter enables or disables DCE response to signals on V.24 circuit 140, which controls remote digital loop (V.54 loop 2).

#### *Values*

<b>0</b>	Disabled
<b>1</b>	Enabled

#### *Recommended default setting*

<b>0</b>	Disabled
----------	----------

#### *Read syntax*

**+TE140?**

The DCE shall transmit the following information text to the DTE:

**+TE140: <value>**

#### *Test syntax*

**+TE140=?**

The DCE shall transmit the following information text to the DTE:

**+TE140: (0,1)**

#### *Implementation*

Optional

### 6.7.2.2 +TE141 Enable Ckt 141

#### *Parameter*

**+TE141=<value>**

### *Description*

This parameter enables or disables DCE response to signals on circuit 141, which controls local analogue loop test (V.54 loop 3).

### *Defined values*

- 0**        Response is disabled
- 1**        Response is enabled

### *Recommended default setting*

- 0**        Disabled

### *Read syntax*

**+TE141?**

The DCE shall transmit the following information text to the DTE:

**+TE141: <value>**

### *Test syntax*

**+TE141=?**

The DCE shall transmit the following information text to the DTE:

**+TE141: (0,1)**

### *Implementation*

Optional

## **6.7.2.3    +TERDL Enable RDL From Remote**

### *Parameter*

**+TERDL=<value>**

### *Description*

This parameter enables the local DCE response to a digital loop command (V.54 loop 2 initiation) from the remote DCE.

### *Defined values*

- 0**        Local DCE will ignore command from remote
- 1**        Local DCE will obey command from remote

### *Recommended default setting*

- 0**

### *Read syntax*

**+TERDL?**

The DCE shall send the following information text to the DTE:

**+TERDL: <value>**

### *Test syntax*

**+TERDL=?**

The DCE shall send the following information text to the DTE:

**+TERDL: (0,1)**

## *Implementation*

Optional

### **6.7.2.4 +TEPDL Enable Front Panel RDL**

#### *Parameter*

**+TEPDL=<value>**

#### *Description*

This parameter enables the sending of RDL (V.54 loop 2 initiation) commands to the remote DCE from the front panel control.

#### *Defined values*

**0** Disabled

**1** Enabled

#### *Recommended default setting*

**0**

#### *Read syntax*

**+TEPDL?**

The DCE shall send the following information text to the DTE:

**+TEPDL: <value>**

#### *Test syntax*

**+TEPDL=?**

The DCE shall send the following information text to the DTE:

**+TEPDL: (0,1)**

## *Implementation*

Optional

### **6.7.2.5 +TEPAL Enable Front Panel Analogue Loop**

#### *Parameter*

**+TEPAL=<value>**

#### *Description*

This parameter enables initiation of local analogue loop by the front panel (V.54 loop 3).

#### *Defined values*

**0** Disabled

**1** Enabled

#### *Recommended default setting*

**0**

#### *Read syntax*

**+TEPAL?**

The DCE shall send the following information text to the DTE:

**+TEPAL: <value>**

*Test syntax*

**+TEPAL=?**

The DCE shall send the following information text to the DTE:

**+TEPAL: (0,1)**

*Implementation*

Optional

#### **6.7.2.6 +TALS Analogue Loop Status**

*Parameter*

**+TALS?**

*Description*

This read-only parameter reports the current status of the local analogue loop (V.54 loop 3).

*Values*

- |          |                                   |
|----------|-----------------------------------|
| <b>0</b> | Inactive                          |
| <b>1</b> | V.24 circuit 141 invoked          |
| <b>2</b> | Front panel invoked               |
| <b>3</b> | Network management system invoked |

*Recommended default setting*

**0**

*Read syntax*

**+TALS?**

The DCE shall send the following information text to the DTE.

**+TALS: <value>**

*Test syntax*

**+TALS=?**

The DCE shall send the following information text to the DTE.

**+TALS: (range of supported values)**

*Implementation*

Optional

#### **6.7.2.7 +TDLS Local Digital Loop Status**

*Parameter*

**+TDLS?**

*Description*

This read-only parameter reports the status of the local digital loop (V.54 loop 1).

#### *Defined values*

- 0** Disabled
- 1** Enabled, inactive
- 2** Front panel invoked
- 3** Network management system invoked
- 4** Remote invoked

#### *Recommended default setting*

**0**

#### *Read syntax*

**+TDLS?**

The DCE shall send the following information text to the DTE:

**+TDLS: <value>**

#### *Test syntax*

**+TDLS=?**

The DCE shall send the following information text to the DTE:

**+TDLS: (range of supported values)**

#### *Implementation*

Optional

### **6.7.2.8 +TRDLS Remote Digital Loop Status**

#### *Parameter*

**+TRDLS?**

#### *Description*

This read-only parameter reports the status of the remote local digital loop (V.54 loop 2).

#### *Defined values*

- 0** Disabled
- 1** Enabled, inactive
- 2** V.24 circuit 140 invoked
- 3** Front panel invoked
- 4** Network management system invoked

#### *Recommended default setting*

**0**

#### *Read syntax*

**+TRDLS?**

The DCE shall send the following information text to the DTE:

**+TRDLS: <value>**

#### *Test syntax*

**+TRDLS=?**

The DCE shall send the following information text to the DTE:

**+TRDLS: (range of supported values)**

*Implementation*

Optional

#### **6.7.2.9 +TADR Local V.54 Address**

*Parameter*

**+TADR=<value>**

*Description*

This parameter is the V.54 address of the local DCE.

*Defined values*

See Table 4/V.54

*Recommended default setting*

**0**

*Read syntax*

**+TADR?**

The DCE shall send the following information text to the DTE:

**+TADR: <value>**

*Test syntax*

**+TADR=?**

The DCE shall send the following information text to the DTE:

**+TADR: (Range of supported V.54 address values)**

*Implementation*

Optional

#### **6.7.2.10 +TMODE Set V.54 Mode**

*Parameter*

**+TMODE=<value>**

*Description*

This parameter selects the V.54 mode: point-to-point or multipoint.

*Defined values*

**0** Point-to-point

**1** Multipoint or tandem

*Recommended default setting*

**0**

*Read syntax*

**+TMODE?**



The DCE shall send the following information text to the DTE:

**+TMODE: <value>**

*Test syntax*

**+TMODE=?**

The DCE shall send the following information text to the DTE:

**+TMODE: (0,1)**

*Implementation*

Optional

### **6.7.2.11 +TTER Test Error Rate**

*Syntax*

**+TTER=<type>,<block\_length>,<blocks>,<pattern>**

*Description*

This command starts and stops a bit error rate or block error rate test. A suitable loop must be established before this test can proceed. The DCE remains in Command State after this command is executed. The parameter +TTER=0 stops the test. When the test is stopped, the block and bit error count is preserved and can be determined by the +TNUM parameter.

*Defined values*

Type	0	Stop the test
	1	Bit error rate
	2	Block error rate
	3	Both
Block length	1-65535 bits	
Blocks	1-65535 blocks	
Pattern	0	63-bit pseudo random pattern
	1	511-bit pattern
	2	2047-bit pattern
	3	All ones
	4	Alternating ones and zeroes

*Execution time*

Command execution consists of starting or stopping the test in question. In the case of starting a test, the test continues to run until the specified block count is reached or a type of 0 is sent to the DCE. The time depends on the current DCE speed.

*Read syntax*

**+TTER?**

The DCE shall send the following information text to the DTE:

**+TTER: <test type in progress>,<block length>,<remaining blocks in test>,<pattern in use>**

*Test syntax*

**+TTER=?**

The DCE shall send the following information text to the DTE:

**+TTER: (range of supported type),(range of supported block\_length),(range of supported blocks),(range of supported pattern)**

*Implementation*

Optional

#### **6.7.2.12 +TNUM Errored Bit and Block Counts**

*Parameter*

**+TNUM?**

*Description*

The values of this parameter are the number of errored bits and blocks received during the current or last error rate test. This is a read-only, double-valued parameter. The response to +TNUM? is the number of bit and block errors detected during the current or previous test. If either of the error counts is not available, the number displayed is 0. See also the +TTER command.

*Defined values*

bit\_errors        0-65535

block\_errors     0-65535

*Read syntax*

**+TNUM?**

The DCE shall send the following information text to the DTE:

**+TTER: <number of bit errors>,<number of block errors>**

*Test syntax*

**+TTER=?**

The DCE shall send the following information text to the DTE:

**+TTER: (range of supported bit\_errors),(range of supported block\_errors)**

*Implementation*

Optional

#### **6.7.2.13 +TLDL Local Digital Loop**

*Syntax*

**+TLDL=<value>**

*Description*

This command starts a digital loop of the local DCE. The test stops when the command +TLDL=0 is received by the DCE. This command is valid only while the DCE is connected to a remote DCE (On Line Command State).

When the DCE is in digital loop mode, all characters sent from the DTE to the DCE are looped and returned to the DTE unless an error rate test is invoked. See the +TTER command.

The DCE must be placed in On-Line Command State in order to accept a command to stop the local digital loop.

### *Defined values*

- 0**       Stop test
- 1**       Start test

### *Execution time*

Command execution consists of starting or stopping the test in question. The test continues to run until a +TLDL=0 command is sent to the DCE.

### *Read syntax*

**+TLDL?**

The DCE shall send the following information text to the DTE:

- +TLDL: 0** If a test is not in progress
- +TLDL: 1** If a test is in progress

### *Test syntax*

**+TLDL=?**

The DCE shall send the following information text to the DTE:

**+TLDL: (0,1)**

### *Implementation*

Optional

## **6.7.2.14 +TRDL Request Remote Digital Loop**

### *Syntax*

**+TRDL=<value>**

### *Description*

This command starts or stops a digital loop (V.54 loop 2) at the remote DCE. This command is valid only while the DCE is in the Online Command State.

After issuing this command, the DTE will normally issue the ATO command to return to the Online State.

An **OK** result code is returned and V.24 circuit 107 (DSR) is turned off after the remote DCE signals acceptance of the command.

If confirmation is not received, then the DCE shall return the ERROR result code.

### *Defined values*

- 0**       Stop RDL
- 1**       Start RDL

### *Execution time*

Command execution consists of starting or stopping the test in question. The test continues to run until a +TRDL=0 command is sent to the DCE.

### *Abortability*

Command execution consists of the transient action of starting or stopping the test in question and is thus not abortable.

### *Read syntax*

#### **+TRDL?**

The DCE shall send the following information text to the DTE:

**+TRDL: 0** If a test is not in progress

**+TRDL: 1** If a test is in progress

### *Test syntax*

#### **+TRDL=?**

The DCE shall send the following information text to the DTE:

**+TRDL: (0,1)**

### *Implementation*

Optional

## **6.7.2.15 +TAL Local Analogue Loop**

### *Syntax*

**+TAL=<action>,<band>**

### *Description*

This command starts or stops a local analogue loop (V.54 loop 3). For the case of starting a loop, the DCE issues an OK result code and returns to Online Command State if the loop initiation was successful, and issues a NO CARRIER result code and returns to Command State if not successful. The <band> subparameter is applicable to frequency divided duplex modems. The DCE continues in loop 3 mode until stopped by a subsequent +TAL=0 command.

Non-zero values of <action> are not valid in Online Command State.

Unless an error rate test is invoked, the DTE will normally enter Data State with ATO. In Data State, all characters sent to the DCE are looped back to the DTE; the DTE must cause a change to the Command State in order to command an end to the loop condition.

If an error rate test is enabled, that test continues until stopped by command. At the end of the error rate test, the DCE remains in the looped condition, until the loop is disabled.

### *Defined values*

Action	0	Disable analogue loop
	1	Enable analogue loop
Band	0	Low frequency band
	1	High frequency band

NOTE 1 – If <band> is omitted, 0 is assumed.

NOTE 2 – If a valid <band> is supplied but is not needed, the DCE shall ignore it.

### *Execution time*

Command execution consists of starting or stopping the test in question. The test continues to run until a +TAL=0 command is sent to the DCE.

### *Abortability*

Command execution consists of the transient action of starting or stopping the test in question and is thus not abortable.

### *Read syntax*

#### **+TAL?**

The DCE shall send the following information text to the DTE:

**+TAL: 0** If a test is not in progress

**+TAL: 1** If a test is in progress

### *Test syntax*

#### **+TAL=?**

The DCE shall send the following information text to the DTE:

**+TAL: (0,1),(range of supported band values)**

### *Implementation*

Optional

## **6.7.2.16 +TSELF Self Test**

### *Syntax*

**+TSELF=<value>**

### *Description*

This command invokes a self test of the modem. The nature of this test is not specified; however it shall include checks on the operation of hardware components and memory. It is assumed that the test duration is short (typically no longer than 5 seconds). A full test of DCE functions is assumed to be intrusive, i.e. would interfere with normal operation; a partial test is assumed to be non-intrusive, i.e. could typically be performed during Online Command State, but only provides a cursory check on DCE operation.

### *Defined values*

**0** Intrusive full test

**1** Safe partial test

### *Execution time*

The execution time is implementation specific: typically no longer than 5 seconds.

### *Abortability*

This command is not ordinarily abortable, but may be so in some implementations.

### *Test syntax*

**+TSELF=?**

The DCE shall send the following information text to the DTE:

**+TSELF: (range of supported values)**

### *Implementation*

Optional

## **6.7.2.17 +TRES Self Test Result**

### *Parameter*

**+TRES?**

### *Description*

This read-only parameter contains the result of the last self test conducted since power up or reset. If a test has not been conducted, then the value shall be 0.

### *Defined values*

- |          |         |
|----------|---------|
| <b>0</b> | No test |
| <b>1</b> | Pass    |
| <b>2</b> | Fail    |

### *Recommended default setting*

**0**

### *Read syntax*

**+TRES?**

The DCE shall send the following information text to the DTE:

**+TRES: <value>**

### *Test syntax*

**+TRES=?**

The DCE shall send the following information text to the DTE:

**+TRES: (0-2)**

### *Implementation*

Optional

## ANNEX A

### **Procedure for DTE-controlled call negotiation**

#### **A.1 Introduction**

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 annex 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.

## **A.2 Additional references and definitions**

The following Recommendations are referenced in 2.1:

- 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.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.*

## **A.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.

## **A.4 Definitions and conventions**

For the purposes of this Recommendation, the following definitions apply.

**A.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

**A.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.

**A.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.

**A.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*.

## A.5 Commands

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

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

Valid Values: see Table A.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 A.1/V.25ter – 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 V8 <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 A.2.

**Table A.2/V.25ter – 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 annex 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 A.10.

### **A.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.

### **A.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 A.3):

**Table A.3/V.25<sup>ter</sup> – 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 (A.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 A.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*.

### **A.6 V.8 signal indications**

#### **A.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.

#### **A.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 A.4):

**Table A.4/V.25ter – Calling tone indication values**

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 <v8a>=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.

#### **A.6.3 Answer signal indication, +A8A**

Format: +A8A:<type><CR>

#### *Description*

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

**Table A.5/V.25ter – Answering signal indication values**

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 bis USB1 signal
6	Indicates sigA signal: V.32 bis 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 <v8o>=6 subparameter value in the +A8E command. Individual values 1-7 shall be implemented if the DCE supports detection of the relevant signal.

#### **A.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.

#### **A.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.

### **A.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 A.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) (A.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.

### **A.7 V.8 origination procedures**

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

#### **A.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.

#### **A.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.

#### **A.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 (A.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 (A.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 (A.7.7).

If an answering signal other than ANSam is detected, the DCE shall report this to the DTE using the +A8A indication (A.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 (A.7.7).

#### **A.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 A.7.3.

#### **A.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 A.7.6.

For DCE-controlled operation with <v8o>=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.

#### **A.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 <v8o>≠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 A.7.7.

#### **A.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  $75 \pm 5$  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.

## **A.8 V.8 Answer procedures**

The procedures in this subclause apply if +A8E <v8a> has values other than 0 or 1.

### **A.8.1 Configuration before the Answer command**

Before the Answer command, the DCE must be enabled by setting the +A8E <v8a> to values other than 0 or 1.

### **A.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 <v8a>=1, the DCE shall commence transmitting ANSam.

### **A.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 (A.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 (A.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 A.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 (A.8.6).

### **A.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 A.8.6.

### **A.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 A.8.3.

#### **A.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.

### **A.9 V.8 bis procedures**

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

#### **A.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.

#### **A.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.

#### **A.9.3 Transmission**

The DTE shall use the +A8T (A.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.

#### A.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.

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

##### A.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>		Off-hook, dial	Detect ringing answer	
	+A8A:1 OK	Detect ANSam	Send ANSam	
AT+A8M=C14513902A		Send CM	Detect CM	Indicate Rec. V.34, Rec. V.32 <i>bis</i> , Rec. V.22 <i>bis</i> , Rec. V.22 and Rec. V.21, with LAPM. Remote selects Rec. V.34 with LAPM
	+A8M:C14513902A OK	Detect JM	Stop ANSam Send JM	
AT+A8M=C1453180		Send CM	Detect CM	
	+A8M:A145 OK	Detect JM	Stop ANSam Send JM	

DTE commands and data	DCE indications and data	DCE actions	Remote terminal actions	Notes
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 <i>bis</i> , Rec. V.22 <i>bis</i> , 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 <i>bis</i>
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 <i>bis</i>
exchange data				

#### A.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	+A81: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=C1451 3902A: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				

### A.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 <i>bis</i>
AT+A8T=5,,,1,1	OK			Send CR <sub>d</sub> at -5 dBm, look for responding signal (e.g. CR) or message (e.g. CL, CLR)
			+A8R:5	indicate received CR <sub>d</sub>
		AT+A8T=0,1283 80808306D009 C4,0,1	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 <i>bis</i> ; Rec. V.70-Series with Rec. V.34, Rec. V.42 <i>bis</i> . Look for initiating signals (none expected) and messages (e.g. MS)
	+A8R:0,128380 808306D009C4			Indicate received CL
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

## APPENDIX I

### Summary of basic and extended format commands

**Table I.1/V.25 *ter* – Defined leading character sequences**

<b>Leadin</b>	<b>Includes commands related to</b>
<b>+A</b>	Call control (network Addressing) issues, common, PSTN, ISDN, Rec. X.25, switched digital
<b>+C</b>	Digital Cellular extensions
<b>+D</b>	Data Compression, Rec. V.42 <i>bis</i>
<b>+E</b>	Error Control, Rec. V.42
<b>+F</b>	Facsimile, Rec. T.30, etc.
<b>+G</b>	Generic issues such as identity and capabilities
<b>+I</b>	DTE-DCE Interface issues, Rec. V.24, etc.
<b>+M</b>	Modulation, Rec. V.32 <i>bis</i> , etc.
<b>+S</b>	Switched or Simultaneous Data Types
<b>+T</b>	Test issues
<b>+V</b>	Voice extensions
<b>+W</b>	Wireless extensions
NOTE – See the Supplement to Recommendation V.25 <i>ter</i> for a current summary of other Standards that are based on this Recommendation.	

**Table I.2/V.25 *ter* – Summary of commands**

<b>Name</b>	<b>Type</b>	<b>Syntax</b>	<b>Reference</b>	<b>Description</b>
&C	Parameter	Basic	6.2.8	Circuit 109 (Received line signal detector) Behaviour
&D	Parameter	Basic	6.2.9	Circuit 108 (Data terminal ready) Behaviour
&F	Action	Basic	6.1.2	Set to Factory-defined Configuration
+DR	Parameter	Extended	6.6.2	Data Compression Reporting
+DS	Parameter	Extended	6.6.1	Data Compression
+EB	Parameter	Extended	6.5.2	Break Handling in Error Control operation
+EFCS	Parameter	Extended	6.5.4	32-bit Frame Check Sequence
+ER	Parameter	Extended	6.5.5	Error Control Reporting
+ES	Parameter	Extended	6.5.1	Error Control Selection
+ESR	Parameter	Extended	6.5.3	Selective Repeat
+ETBM	Parameter	Extended	6.5.6	Call Termination Buffer Management
+GCAP	Action	Extended	6.1.9	Request Complete Capabilities List
+GCI	Parameter	Extended	6.1.10	Country of Installation
+GMI	Action	Extended	6.1.4	Request Manufacturer Identification

**Table I.2/V.25 *ter* – Summary of commands**

<b>Name</b>	<b>Type</b>	<b>Syntax</b>	<b>Reference</b>	<b>Description</b>
+GMM	Action	Extended	6.1.5	Request Model Identification

**Table I.2/V.25 *ter* – Summary of commands (concluded)**

Name	Type	Syntax	Reference	Description
+GMR	Action	Extended	6.1.6	Request Revision Identification
+GOI	Action	Extended	6.1.8	Request Global Object Identification
+GSN	Action	Extended	6.1.7	Request Product Serial Number Identification
+ICF	Parameter	Extended	6.2.11	DTE-DCE Character Framing
+IFC	Parameter	Extended	6.2.12	DTE-DCE Local Flow Control
+ILRR	Parameter	Extended	6.2.13	DTE-DCE Local Rate Reporting
+IPR	Parameter	Extended	6.2.10	Fixed DTE Rate
+MA	Parameter	Extended	6.4.2	Modulation Automode Control
+MR	Parameter	Extended	6.4.3	Modulation Reporting Control
+MS	Parameter	Extended	6.4.1	Modulation Selection
+MV18AM	Parameter	Extended	6.4.6	Answering message editing
+MV18P	Parameter	Extended	6.4.7	Order of Probes
+MV18R	Parameter	Extended	6.4.5	V.18 Reporting Control
+MV18S	Parameter	Extended	6.4.4	V.18 Selection
A	Action	Basic	6.3.5	Answer
D	Action	Basic	6.3.1	Dial
E	Parameter	Basic	6.2.4	Command Echo
H	Action	Basic	6.3.6	Hook Control
I	Action	Basic	6.1.3	Request Identification Information
L	Parameter	Basic	6.3.13	Monitor Speaker Loudness
M	Parameter	Basic	6.3.14	Monitor Speaker Mode
O	Action	Basic	6.3.7	Return to Online Data State
P	Parameter	Basic	6.3.3	Select Pulse Dialling
Q	Parameter	Basic	6.2.5	Result Code Suppression
S0	Parameter	Basic	6.3.8	Automatic Answer
S10	Parameter	Basic	6.3.12	Automatic Disconnect Delay
S3	Parameter	Basic	6.2.1	Command Line Termination Character
S4	Parameter	Basic	6.2.2	Response Formatting Character
S5	Parameter	Basic	6.2.3	Command Line Editing Character
S6	Parameter	Basic	6.3.9	Pause Before Blind Dialling
S7	Parameter	Basic	6.3.10	Connection Completion Timeout
S8	Parameter	Basic	6.3.11	Comma Dial Modifier Time
T	Parameter	Basic	6.3.2	Select Tone Dialling
V	Parameter	Basic	6.2.6	DCE Response Format
X	Parameter	Basic	6.2.7	Result Code Selection and Call Progress Monitoring Control
Z	Action	Basic	6.1.1	Reset To Default Configuration

## APPENDIX II

### DCE configuration, dialling, negotiation and reporting, example session

**Table II.1/V.25 *ter***

DTE Command	DCE Response	DCE action	Line condition	Reference
AT+GCAP	+MS, +ES, +DS OK	Indicate areas of capabilities	On-hook	6.1.9
AT&F	OK	Initialize parameters to factory default	On-hook	6.1.2
AT&D2	OK	Set-up of DTR hangup	On-hook	6.2.9
AT+MS=11,1; +MR=1	OK	Set-up modulation enable reports	On-hook	6.4.1 6.4.3
AT+ES=3,0,2; +ER=1	OK	Set-up error control enable reports	On-hook	6.5.1 6.5.5
AT+DS=3,1; +DR=1	OK	Set-up compression enable reports	On-hook	6.6.1 6.6.2
AT+IFC=2,2	OK	Set-up flow control	On-hook	6.2.12
AT+IPR=57600; +ILRR=1	OK	Set-up local port rate enable reports	On-hook	6.2.12 6.2.13
ATDT<number>	+MCR: V32B +MRR: 14400 +ER: LAPM +DR: V42B +ILRR: 57600 CONNECT <text>		Off-hook Dial <number> Carrier type Carrier rate Error control Compression Local port rate Result code	6.3.1 6.4.3 6.4.3 6.4.5 6.5.5 6.6.2
<data> ->	<- <data>	Data connection	Connection	
<negate ckt 108/2>	OK	Hangup	Hangup	6.3.6

## APPENDIX III

### Encapsulation of V.25 *ter* messages in V.25 *bis* DCE

#### III.1 Scope

This appendix defines means to use V.25 *ter* messages in a V.25 *bis* compliant DCE.

This Recommendation contains three types of messages:

- commands, with parameters as needed;
- final or intermediate result codes;
- information text.



### III.2 Encapsulation of V.25 *ter* messages

A DCE compliant with Recommendation V.25 *bis* and this appendix shall implement two new opcodes. See Table III.1

**Table III.1/V.25 *ter* – V.25 *ter* opcodes for encapsulation of V.25 *ter* messages**

Op Code	Description	Messages	Examples
EXC	EXtended Command	Commands	EXC+GMI? EXC+MR=1
EXI	EXtended Indication	Result codes, information text	EXI+MCR: V32B EXI+MRR: 14400

Unless otherwise noted in this appendix, any valid individual V.25 *ter* command, information text or result code may be encapsulated as a V.25 *bis* message. The V.25 *ter* command may include any necessary parameter values, of numeric, string or compound type.

### III.3 Applicable V.25 *ter* commands

See Table III.2.

**Table III.2/V.25 *ter* – V.25 *ter* commands for use in V.25 *bis* DCE**

Name	Type	Reference	Description
&C	Parameter	6.2.8	Circuit 109 (Received line signal detector) Behaviour
&F	Action	6.1.2	Set to Factory-defined Configuration
+GCAP	Action	6.1.9	Request Complete Capabilities List
+GMI	Action	6.1.4	Request Manufacturer Identification
+GMM	Action	6.1.5	Request Model Identification
+GMR	Action	6.1.6	Request Revision Identification
+GOI	Action	6.1.8	Request Global Object Identification
+GSN	Action	6.1.7	Request Product Serial Number Identification
+GCI	Parameter	6.1.10	Country of Installation
+MA	Parameter	6.4.2	Modulation Automode Control
+MR	Parameter	6.4.3	Modulation Reporting Control
+MS	Parameter	6.4.1	Modulation Selection
L	Parameter	6.3.13	Monitor Speaker Loudness
M	Parameter	6.3.14	Monitor Speaker Mode
S6	Parameter	6.3.9	Pause Before Blind Dialling
S7	Parameter	6.3.10	Connection Completion Timeout
S10	Parameter	6.3.12	Automatic Disconnect Delay
Z	Action	6.1.1	Reset To Default Configuration

All other V.25 *ter* commands are either not applicable or reserved for future study.

### III.4 Applicable V.25 *ter* responses

See Table III.3.

**Table III.3/V.25 *ter* – V.25 *ter* commands for use in V.25 *bis* DCE**

Name	Type	Reference	Description
+MCR: <carrier>	Intermediate result	6.4.3	DCE-DCE Carrier Report
+MRR: <rate>	Intermediate result	6.4.3	DCE-DCE Carrier Rate Report
+GMI response	Information text	6.1.4	Mfg ID
+GMM response	Information text	6.1.5	Model ID
+GMR response	Information text	6.1.6	Revision ID
+GOI response	Information text	6.1.8	Object ID
+GSN response	Information text	6.1.7	Serial Number
+GCAP response	Information text	6.1.9	Capabilities

All other V.25 *ter* indications are either not applicable or reserved for future study.

## APPENDIX IV

### Areas reserved for further study

DTE-DCE commands for control of the following features are for further study:

- a) in-band DCE control;
- b) V.8 DCE control (future Annex A);
- c) Recommendation V.8 *bis* DCE control;
- d) new modulations and signalling (e.g. ISDN, Cellular, Personal Communication Systems);
- e) new DCE types (e.g. Voice I/O);
- f) new DCE protocols (Voice, Simultaneous or Alternating Voice/Data, Videotelephones);
- g) DCE testing (e.g. Recommendations V.54, V.56).

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