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SERIES V: DATA COMMUNICATION OVER THE
TELEPHONE NETWORK

Control procedures

**Serial asynchronous automatic dialling and
control**

ITU-T Recommendation V.250

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DATA COMMUNICATION OVER THE TELEPHONE NETWORK

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ITU-T Recommendation V.250

Serial asynchronous automatic dialling and control

Summary

This version of ITU-T Rec. V.250 integrates Amendment 1 (07/2001), Amendment 2 (03/2002) and Amendment 3 (07/2003) with the 05/1999 version of the Recommendation.

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 for 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

ITU-T Recommendation V.250 was approved on 14 July 2003 by ITU-T Study Group 16 (2001-2004) under the ITU-T Recommendation A.8 procedure.

Keywords

AT Commands, data modems, data transmission, DCE control.

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ITU-T Recommendation V.250

Serial asynchronous automatic dialling and control

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 ITU-T Recs 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 ITU-T Recs T.31 and T.32 (Asynchronous Facsimile DCE Control);
- 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 ITU-T Recs V.25 and V.25 *bis*.

2 References

2.1 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- ITU-T Recommendation Q.23 (1988), *Technical features of push-button telephone sets*.
- ITU-T Recommendation T.50 (1992), *International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange*.
- ITU-T Recommendation 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* (2000), *Procedures for the identification and selection of common modes of operation between data circuit-terminating equipments (DCEs) and*

between data terminal equipments (DTEs) over the public switched telephone network and on leased point-to-point telephone-type circuits.

- ITU-T Recommendation V.24 (2000), *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE).*
- 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 1 to this Recommendation.

2.2 Informative references

- 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.*
- ITU-T Recommendation V.8 (2000), *Procedures for starting sessions of data transmission over the public switched telephone network.*
- ITU-T Recommendation V.14 (1993), *Transmission of start-stop characters over synchronous bearer channels.*
- ITU-T Recommendation V.18 (2000), *Operational and interworking requirements for DCEs operating in the text telephone mode.*
- ITU-T Recommendation V.21 (1988), *300 bits per second duplex modem standardized for use in the general switched telephone network.*
- ITU-T 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.*
- ITU-T 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.*
- ITU-T Recommendation V.23 (1988), *600/1200-baud modem standardized for use in the general switched telephone network.*
- ITU-T Recommendation V.26 bis (1988), *2400/1200 bits per second modem standardized for use in the general switched telephone network.*
- ITU-T 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.*
- ITU-T Recommendation V.27 ter (1988), *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.*
- ITU-T 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 (1998), *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 (2002), *Error-correcting procedures for DCEs using asynchronous-to-synchronous conversion.*
- ITU-T Recommendation V.42 bis (1990), *Data compression procedures for data circuit-terminating equipment (DCE) using error correction procedures.*
- ITU-T Recommendation V.44 (2000), *Data compression procedures.*
- ITU-T Recommendation V.54 (1988), *Loop test devices for modems.*
- ITU-T Recommendation V.58 (1994), *Management information model for V-Series DCEs.*
- ITU-T Recommendation V.59 (2000), *Managed objects for diagnostic information of public switched telephone network connected V-series modem DCEs.*
- ITU-T Recommendation V.90 (1998), *A digital modem and analogue modem pair for use on the Public Switched Telephone Network (PSTN) at data signalling rates of up to 56 000 bit/s downstream and up to 33 600 bit/s upstream.*
- ITU-T Recommendation V.91 (1999), *A digital modem operating at data signalling rates of up to 64 000 bit/s for use on a 4-wire circuit switched connection and on leased point-to-point 4-wire digital circuits.*
- ITU-T Recommendation V.92 (2000), *Enhancements to Recommendation V.90.*
- ITU-T Recommendation X.680 (2002) | ISO/IEC 8824-1:2002, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

NOTE – See Supplement 1 to this Recommendation for additional informative references.

3 Definitions and abbreviations

3.1 Definitions

This Recommendation defines the following terms:

3.1.1 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.

3.1.2 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.

3.1.3 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.

3.1.4 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.

3.1.5 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.

3.1.6 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.

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

3.1.8 <...>: 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.

3.2 Abbreviations

This Recommendation uses the following abbreviations:

CCITT International Telephone and Telegraph Consultative Committee

IRA International Reference Alphabet (ITU-T Rec. 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 clause.

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 3.1.2 for the 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 ITU-T Rec. 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 (see 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

Clause 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). 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.250 – Result codes

Result code (ATV1)	Numeric (ATV0)	Description
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 clause 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 Annex D/X.680, the encoding rules are defined in Annex C/X.680.

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 +<name>(s) of those commands shall be reported to the DCE in response to a +GCAP command. See Table 2.

Table 2/V.250 – Examples of required +GCAP responses

+GCAP response	DCE control standard	Description
+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 +GCAP 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

ITU-T Rec. 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 clause 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.250 – Effect of V parameter on response formats

	V0	V1
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 a 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 a dial tone regardless of this setting, nor on the busy signal detection capability of the **W** and **@** dial modifiers. See Table 4.

Table 4/V.250 – Defined values for X parameter

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

Implementation

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

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., ITU-T Recs 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., ITU-T Recs 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 clear-down 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 as in 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 ITU-T Rec. V.58.

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

Defined values

See Table 5.

Table 5/V.250 – Character format values

<format>	Valid numeric values
0	auto detect
1	8 Data; 2 Stop
2	8 Data; 1 Parity; 1 Stop
3	8 Data; 1 Stop
4	7 Data; 2 Stop
5	7 Data; 1 Parity; 1 Stop
6	7 Data; 1 Stop
<parity>	Defined numeric values
0	Odd
1	Even
2	Mark
3	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.250 – <DCE_by_DTE> and <DTE_by_DCE> values

<DCE_by_DTE>	Description
0	None
1	DC1/DC3 on circuit 103; do not pass DC1/DC3 characters to the remote DCE
2	Circuit 133 (Ready for Receiving)
3	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
4 to 127	Reserved for future standardization
Other	Reserved for manufacturer-specific use
<DTE_by_DCE>	Description
0	None
1	DC1/DC3 on circuit 104
2	Circuit 106 (Clear to Send/Ready for Sending)
3 to 127	Reserved for future standardization
Other	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.250 – Local port rate reporting values

<value>	Description
0	Disables reporting of local port rate (+ILRR: is not transmitted)
1	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 Select Sync Transmit Clock Source (+ICLOK)

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:

+ICLOCK: <value>

Test syntax

+ICLOCK=?

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

+ICLOCK: (range of supported values)

Implementation

Optional

6.2.15 Select Long Space Disconnect Option (+ILSD)

Parameter

+ILSD=<value>

Description

This command determines if the DCE shall disconnect a call upon receiving a long space (1.6-s 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-s 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 Select Data Set Ready Option (+IDSR)

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 ITU-T Rec. V.24 and the relevant V-series Recommendation for the signal converter in use.
- 2** DSR is always ON except for 5 s 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 Select Synchronous Mode RTS Option (+IRTS)

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 ms.
- 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 clause 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 (see 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 1 – 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.

Table 8/V.250 – D command result codes

Alphabetic (ATV1)	Numeric (ATV0)	Description
CONNECT	1	If connection is successfully established and X0 is selected. This result code is transmitted immediately before circuit 109 is turned on
CONNECT <text>	–	If connection is successfully established and Xn 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
NO CARRIER	3	If a connection cannot be established, or was aborted by reception of an additional character from the DTE
ERROR	4	If issued while in online command state
BUSY	7	If busy signal detection is enabled or the W or @ dial modifier is used, and a busy signal is detected
NO ANSWER	8	If the @ 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 S7
NO DIALTONE	6	If dial tone detection is enabled or the W dial modifier is used, and no dial tone is detected within the associated timeout period
OK	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

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 2 – 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.

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 ITU-T Rec. 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.

6.3.1.8 Invoke stored string

Syntax

S=<location>

Description

Causes the string stored at <location> by the +ASTO command to be processed.

The S is followed by "=<location>" where <location> is in the range 0 to one (less than the number of storage locations). The last digit of <location> is recognized by the presence of a non-digit character or the end of the command line. Any characters on the command line after the last digit of <location> shall be ignored. Other (non-stored) dial string characters may precede the S in the command line.

An out of range value for <location> shall cause an **ERROR** result code. If the character immediately following the S is not an "=" or there is no digit following the "=", then all characters after the S are ignored, and stored number 0 is dialled.

Implementation

Implementation of this dial modifier is optional.

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.

Table 9/V.250 – A command result codes

Alphabetic (ATV1)	Numeric (ATV0)	Description
CONNECT	1	If connection is successfully established and X0 is selected. This result code is transmitted immediately before circuit 109 is turned on
CONNECT <text>	–	If connection is successfully established and Xn 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
NO CARRIER	3	If a connection cannot be established, or was aborted by reception of an additional character from the DTE
ERROR	4	If issued while in online command state
OK	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

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.

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.

NOTE – When used with modem-on-hold procedures per V.92, the call may be terminated without disconnecting from the line. Other V.250 commands such as AT+PMHF may then be used to cause the PSTN to switch to another line for placing another outgoing call or accepting another incoming call.

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. Also used to retrain after a modem-on-hold transaction or to reconnect to a modem that has been placed in anon-hold state per V.92.
- (other)** Reserved for manufacturer proprietary use.

Result codes

See Table 10.

Table 10/V.250 – O command result codes

CONNECT	If connection is successfully resumed and X0 is selected
CONNECT <text>	If connection is successfully resumed and Xn is selected where "n" is any value other than 0
NO CARRIER	If connection is not successfully resumed
ERROR	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.250 – Speaker loudness values

<value>	Description
0	Low speaker volume
1	Low speaker volume
2	Medium speaker volume
3	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.250 – Speaker mode values

<value>	Description
0	Speaker is always off
1	Speaker on until DCE informs DCE that carrier has been detected
2	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 Store telephone number (+ASTO)

Parameter

+ASTO=<location>,<dial_string>

Description

This parameter stores dialing strings, which may be invoked later by the **S=<location>** dial modifier (see 6.3.1.8).

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, they should 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.

The double-quote (") character, as such, is not permitted in a string constant and must be replaced by the combination "\22" in <dial_string>. However, the actual (") character is stored (see 5.4.2.2).

Values

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

dial_string: the stored phone number.

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 clause defines control commands for data modems and for modems defined for use in text telephones in ITU-T Rec. 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 supports 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 ITU-T Rec. V.32 *bis* to ITU-T Rec. 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 ITU-T Rec. V.8). The default value shall be enabled if it is defined for the associated modulation (e.g., ITU-T Rec. V.32 *bis*, ITU-T Rec. V.8 or ITU-T Rec. V.34); however, there are modulations for which there is no automatic negotiation defined (e.g., ITU-T Rec. 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 ITU-T Rec. V.23 with constant carrier.

NOTE 1 – ITU-T Rec. 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.250 – Standard modulation <carrier> strings

<carrier>	Description
	ITU-T standard modulations
V21	ITU-T Rec. V.21
V22	ITU-T Rec. V.22
V22B	ITU-T Rec. V.22 <i>bis</i>
V23S	ITU-T Rec. V.23, with Switched carrier, TDM
V23C	ITU-T Rec. V.23, with Constant carrier, asymmetric FDM
V26B	ITU-T Rec. V.26 <i>bis</i>
V27TC	ITU-T Rec. V.27 <i>ter</i> , with Constant carrier, FDM
V32	ITU-T Rec. V.32
V32B	ITU-T Rec. V.32 <i>bis</i>
V34	ITU-T Rec. V.34
V90	ITU-T Rec. V.90
V91	ITU-T Rec. V.91
V92	ITU-T Rec. V.92
NOTE – Manufacture proprietary strings may be defined; they shall not begin with the "V" character.	

For <automode>:

0	Disabled
1	Enabled, with ITU-T 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 ITU-T Rec. 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: ITU-T Recs 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 ITU-T Rec. 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 (ITU-T Rec. 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 ITU-T Rec. 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 ITU-T Rec. V.21 up to ITU-T Rec. V.34, but if +MS=V32B (ITU-T Rec. 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 ITU-T Recs 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 ITU-T Rec. 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 ITU-T Recs 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 the intermediate result code **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* clear-down).

<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.250 – Modulation reporting values

<value>	Description
0	Disables reporting of modulation connection (+MCR: and +MRR: are not transmitted)
1	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>|,<probing_en>|]|||

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 five 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;
- **<probing_en>**, which controls activation of the probing in answer mode. Disabling the probing will cause the V.18 DCE to enter the automodring monitor mode when answering.

Defined values

See Table 15.

Table 15/V.250 – V.18 operation modes

<mode> <dflt_ans_mode>	Description
0	Disables V.18 operation
1	V.18 operation, auto detect mode (Note 1)
2	V.18 operation, connect in 5-bit (Baudot) mode at 45.5 bit/s
12	V.18 operation, connect in 5-bit (Baudot) mode at 50 bit/s
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 (Note 2)
6	V.18 operation, connect in V.23 mode (Note 2)
7	V.18 operation, connect in Bell 103-type mode (Note 2)
15	V.18 operation, connect in V.21 answer mode (Note 3)
16	V.18 operation, connect in V.23 master mode (Note 3)
17	V.18 operation, connect in Bell 103 answer mode (Note 3)
<fbk_time_enable>	
0	Disable
1	Enable

Table 15/V.250 – V.18 operation modes

<ans_msg_enable>	Description
0	Disable
1	Enable
<probing_en>	
0	Disable the probing
1	Enable the probing
2	Initiate probing (expire Ta Timer)
NOTE 1 – There is no option to select calling or answer mode for V.18.	
NOTE 2 – Calling mode implies transmit on channel 1 and receive on channel 2.	
NOTE 3 – Answer mode implies transmit on channel 2 and receive on channel 1.	

Recommended default settings

For <mode>: **0**
 For <dflt_ans_enable>: **0**
 For <fbk_time_enable>: **0**
 For <ans_msg_enable>: **0**
 For <probing_en>: **1**

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 ITU-T Rec. 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 ITU-T Rec. V.18. The format of this result code is the following (see Table 16):

Table 16/V.250 – V.18 connection report intermediate result codes

+MV18: 5BIT50	Indicates connection with 5-bit mode
+MV18: 5BIT45	Indicates connection with 5-bit mode
+MV18: EDT	Indicates connection with EDT
+MV18: DTMF	Indicates connection with DTMF
+MV18: V21C (Note)	Indicates connection with ITU-T Rec. V.21
+MV18: V21A (Note)	Indicates connection with ITU-T Rec. V.21
+MV18: V23M	Indicates connection with ITU-T Rec. V.23 in Master Mode (sending on 1200 bit/s, receiving on 75 bit/s)
+MV18: V23S	Indicates connection with ITU-T Rec. V.23 in Slave Mode, (sending on 75 bit/s, receiving on 1200 bit/s)
+MV18: B103C (Note)	Indicates connection with Bell 103-type modulation
+MV18: B103A (Note)	Indicates connection with Bell 103-type modulation
+MV18: V18	Indicates both DCEs are in ITU-T Rec. V.18
NOTE – "C" indicates modem is in call mode, i.e., transmitting on channel 1 and receiving on channel 2. "A" indicates modem is in answer mode.	

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.250 – V.18 Reporting values

<value>	Description
0	Disables reporting of ITU-T Rec. V.18 connection
1	Enables reporting of ITU-T 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 ITU-T Rec. V.18 is implemented in the DCE.

6.4.6 V.18 Answering message editing (+MV18AM)

Parameter

+MV18AM= [<message>]

Description

This extended-format string parameter contains the answer message stored in the DCE and used as a probe (see 6.4.7) in the automode answer mode. The command +MV18AM="" sets this to the null string. The command +MV18AM=<message> appends <message> to the stored string, up to the maximum length supported by the DCE.

Defined values

message: the stored message as a string constant.

Recommended default setting

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 ITU-T Rec. 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 automoding 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.250 – Probe order

<probe_mode>	Description
2	Send probe message in 5-bit (Baudot) mode
3	Send probe message in DTMF mode
4	Send probe message in EDT mode
5	Send ITU-T Rec. V.21 carrier as a probe
6	Send ITU-T Rec. V.23 carrier as a probe
7	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 ITU-T Rec. V.18 is implemented in the DCE.

6.4.8 Seamless rate change enable (+MSC)

Parameter

+MSC=<src_v34>

Description

This extended-format compound numeric parameter controls whether or not seamless rate change procedures are enabled during V.34 operation.

NOTE 1 – The addition of other subparameters to control other aspects of Seamless Rate Change Operation, and control of V.90 SRC Operation, is for further study. The effect that enabling seamless rate change may have on other modem characteristics, such as startup time, is for further study.

The results of seamless rate change negotiation are reported with the **+MSCR** indication, which is enabled with the same **+MR** command that enables other modulation reports such as **+MRR**. The form of the indication is as follows:

+MSCR:<v34_src_mode> e.g., +MSCR: 1

<v34_src_mode> has a value of zero for no V.34 seamless rate change (SRC), and a value of one for V.34 SRC operation.

NOTE 2 – Additional reported values are for further study.

Defined values

See Table 19.

Table 19/V.250 – Seamless rate change control values

<src_v34>	Description
0	Disables V.34 seamless rate change
1	Enables V.34 seamless rate change

Recommended default setting

1

Read syntax

+MSC?

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

+MSC: <current setting>

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

+MSC: 1

Test syntax

+MSC=?

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

+MSC: (list of supported values)

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

+MSC: (0,1)

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 20.

Table 20/V.250 – Error control operation subparameters

<orig_rqst>	Description
0	Direct mode
1	Initiate call with Buffered mode only
2	Initiate V.42 without Detection Phase. If ITU-T Rec. V.8 is in use, this is a request to disable V.42 Detection Phase
3	Initiate V.42 with Detection Phase
4	Initiate Alternative Protocol
<orig_fbk>	Description
0	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
1	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
2	Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect
3	Error control required (only LAPM acceptable); if error control not established, disconnect
4	Error control required (only Alternative protocol acceptable); if error control not established, disconnect

Table 20/V.250 – Error control operation subparameters

<ans_fbk>	Description
0	Direct mode
1	Error control disabled, use Buffered mode
2	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
3	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
4	Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect
5	Error control required (only LAPM acceptable); if error control not established, disconnect
6	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 ITU-T Rec. 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 21.

Table 21/V.250 – Break control subparameters

<break_selection>	Description
0	Ignore break (do not signal to remote DCE)
1	Non-expedited, non-destructive
2	Expedited, non-destructive
3	Expedited and destructive
<timed>	Description
0	Any transmitted V.42 L-SIGNAL shall not indicate break signal length
1	Any transmitted V.42 L-SIGNAL shall indicate break signal length
<default_length>	Description
0	Do not deliver break to DTE
1 to 254	Default break length of 0.01 to 2.54 seconds
Other	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 supported <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 ITU-T Rec. V.42 (if present in the DCE).

Defined values

See Table 22.

Table 22/V.250 – Selective repeat values

<value>	Description
0	Do not use SREJ
1	Use SREJ if available in remote DCE; continue without it if not
2	Use SREJ FCS 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 ITU-T Rec. V.42 (if present in the DCE).

Defined values

See Table 23.

Table 23/V.250 – Frame check sequence values

<value>	Description
0	Use 16-bit FCS
1	Use 32-bit FCS if available in remote DCE; otherwise use 16-bit FCS
2	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 24):

Table 24/V.250 – Error control report intermediate result codes

+ER: NONE	Error control is not in use
+ER: LAPM	ITU-T Rec. V.42 LAPM protocol is in use
+ER: ALT	ITU-T 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 25.

Table 25/V.250 – Error control reporting

<value>	Description
0	Error control reporting disabled (no +ER intermediate result code transmitted)
1	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 26.

Table 26/V.250 – Call termination buffer management subparameters

<pending_TD>	Description
0	Discard all buffered data immediately and disconnect
1	Attempt until all data is delivered and acknowledged (ignore timer); if remote DCE disconnects, discard remainder
2	Attempt until all data is delivered and acknowledged; if timer expires or remote DCE disconnects, discard remainder
<pending_RD>	Description
0	Discard all buffered data immediately and disconnect
1	Attempt until all data is delivered (ignore timer); if local DTE requests disconnect, discard remainder
2	Attempt until all data is delivered; if timer expires or local DTE requests disconnect, discard remainder
<timer>	Description
0 to 30	Delivery timer value in seconds
Other	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 Window Size (+EWIND)

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 ITU-T Rec. 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 Frame Length (+EFRAM)

Parameter

+EFRAM=<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 +EFRAM 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 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 ITU-T Rec. V.42).

Read syntax

+EFRAM?

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

+EFRAM: <value1>,<value2>

Test syntax

+EFRAM=?

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

+EFRAM: (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 clause contains parameters to condition the DCE to use standard Data Compression Procedures.

6.6.1 V.42 bis 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 27.

Table 27/V.250 – Data compression control subparameters

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

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 V.44 Data Compression (+DS44)

Parameter

+DS44=[<direction>|,<compression_negotiation>|,<capability>|,<max_codewords_tx>|,<max_codewords_rx>|,<max_string_tx>|,<max_string_rx>|,<max_history_tx>|,<max_history_rx>|
|||||]

Description

This extended-format compound parameter controls the V.44 data compression function if provided in the DCE. It accepts nine 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;
- **<capability>**, which specifies the use of stream method, packet method, multi-packet method;
- **<max_codewords_tx>**, which specifies the maximum number of codewords which should be negotiated in the transmit direction;
- **<max_codewords_rx>**, which specifies the maximum number of codewords which should be negotiated in the receive direction;
- **<max_string_tx>**, which specifies the maximum string length to be negotiated in the transmit direction;
- **<max_string_rx>**, which specifies the maximum string length to be negotiated in the receive direction;
- **<max_history_tx>**, which specifies the maximum size of the history buffer to be negotiated in the transmit direction;
- **<max_history_rx>**, which specifies the maximum size of the history buffer to be negotiated in the receive direction.

Defined values

See Table 28.

Table 28/V.250 – Data compression control subparameters

<direction>	Description
0	Negotiated ... no compression
1	Transmit only
2	Receive only
3	Both directions, accept any direction

Table 28/V.250 – Data compression control subparameters

<compression_negotiation>	Description
0	Do not disconnect if ITU-T Rec. V.44 is not negotiated by the remote DCE as specified in <direction>
1	Disconnect if ITU-T Rec. V.44 is not negotiated by the remote DCE as specified in <direction>
<capability>	
0	Stream method
1	Packet method
2	Multi-packet method
<max_codewords_tx>	256 to 65536
<max_codewords_rx>	256 to 65536
<max_string_tx>	32 to 255
<max_string_rx>	32 to 255
<max_history_tx>	≥ 512
<max_history_rx>	≥ 512

Recommended default settings

- For <direction>: **3**
- For <compression_negotiation>: **0**
- For <capability>: **0**
- For <max_codewords_tx>: Determined by the manufacturer (see Appendix I/V.44)
- For <max_codewords_rx>: Determined by the manufacturer (see Appendix I/V.44)
- For <max_string_tx>: Determined by the manufacturer (see Appendix I/V.44)
- For <max_string_rx>: Determined by the manufacturer (see Appendix I/V.44)
- For <max_history_tx>: Determined by the manufacturer (see Appendix I/V.44)
- For <max_history_rx>: Determined by the manufacturer (see Appendix I/V.44)

Read syntax

+DS44?

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

+DS44:<direction><compression_negotiation>,<capability>,<max_codewords_tx>,<max_codewords_rx>,<max_string_tx>,<max_string_rx>,<max_history_tx>,<max_history_rx>

e.g., +DS44:3,0,0,1024,1024,255,255,3072,3072.

Test syntax

+DS44=?

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

+DS44: (list of supported <direction> values),(list of supported <compression_negotiation> values),(list of supported <capability> values),(list of supported <max_codewords_tx>

values),(list of supported <max_codewords_rx> values),(list of supported <max_string_tx> values),(list of supported <max_string_rx> values),(list of supported <max_history_tx> values),(list of supported <max_history_rx> values)

Implementation

Implementation of this parameter is mandatory if V.44 data compression is implemented in the DCE.

6.6.3 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 29):

Table 29/V.250 – Data compression reporting intermediate result codes

+DR: NONE	Data compression is not in use
+DR: V42B	ITU-T Rec. V.42 <i>bis</i> is in use in both directions
+DR: V42B RD	ITU-T Rec. V.42 <i>bis</i> is in use in receive direction only
+DR: V42B TD	ITU-T Rec. V.42 <i>bis</i> is in use in transmit direction only
+DR: V44	ITU-T Rec. V.44 is in use in both directions
+DR: V44 RD	ITU-T Rec. V.44 is in use in receive direction only
+DR: V44 TD	ITU-T Rec. V.44 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 30.

Table 30/V.250 – Data compression reporting values

<value>	Description
0	Data compression reporting disabled (no +DR result code transmitted)
1	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 data compression is implemented in the DCE.

6.7 DCE testing

This clause contains a set of +T (test) commands and parameters that are based on the test objects of ITU-T Rec. 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 clause:

+TE140	Enable Ckt 140
+TE141	Enable Ckt 141
+TERDL	Enable RDL From Remote
+TEPDL	Enable Front Panel RDL
+TEPAL	Enable Front Panel Analogue 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 Enable Ckt 140 (+TE140)

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

0 Disabled

1 Enabled

Recommended default setting

0 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 Enable Ckt 141 (+TE141)

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 Enable RDL From Remote (+TERDL)

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 Enable Front Panel RDL (+TEPDL)

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 Enable Front Panel Analogue Loop (+TEPAL)

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 Analogue Loop Status (+TALS)

Parameter

+TALS?

Description

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

Values

- 0** Inactive
- 1** V.24 circuit 141 invoked
- 2** Front panel invoked
- 3** 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 Local Digital Loop Status (+TDLS)

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 Remote Digital Loop Status (+TRDLS)

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 Local V.54 Address (+TADR)

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 Set V.54 Mode (+TMODE)

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 Test Error Rate (+TTER)

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 Errored Bit and Block Counts (+TNUM)

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 Local Digital Loop (+TLDL)

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 (Online 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 Online 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 Request Remote Digital Loop (+TRDL)

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 Local Analogue Loop (+TAL)

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 Self Test (+TSELF)

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 Self Test Result (+TRES)

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

0 No test

1 Pass

2 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

6.8 PCM DCE commands

This clause contains a set of +P (PCM DCE) commands and parameters to condition and control DCE use of ITU-T Rec. V.92.

6.8.1 Call Waiting enable (+PCW)

Parameter

+PCW=[<call waiting>]

Description

This extended-format compound numeric parameter controls the action to be taken upon detection of call waiting in a V.92 DCE.

Defined values

See Table 31.

Table 31/V.250 – Call Waiting Values

<call waiting>	Description
0	Toggle V.24 Circuit 125 and collect Caller ID if enabled by +VCID
1	Hang up
2	Ignore V.92 call waiting

Default setting

0

Read syntax

+PCW?

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

+PCW: <call waiting>

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

+PCW: 0

Test syntax

+PCW=?

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

+PCW: (list of supported values of <call waiting>)

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

+PCW: (0,1,2)

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.2 Modem-on-Hold enable (+PMH)

Parameter

+PMH=[<value>]

Description

This extended-format compound numeric parameter controls whether or not modem-on-hold procedures are enabled during V.92 operation.

Defined values

See Table 32.

Table 32/V.250 – Modem-on-hold enable

<value>	Description
0	Enables V.92 modem on hold
1	Disables V.92 modem on hold

Default setting

0

Read syntax

+PMH?

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

+PMH: <current setting>

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

+PMH: 0

Test syntax

+PMH=?

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

+PMH: (list of supported values)

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

+PMH: (0,1)

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.3 Modem-on-Hold Timer (+PMHT)

This extended-format compound numeric parameter controls whether or not the modem will grant or deny a Modem-on-hold (MOH) request as well as setting the Modem-on-Hold Timeout.

Defined values

See Table 33.

Table 33/V.250 – Modem-on-Hold Timer values

<value>	Description
0	Deny V.92 Modem-on-hold Request
1	Grant MOH with 10-second timeout
2	Grant MOH with 20-second timeout
3	Grant MOH with 30-second timeout
4	Grant MOH with 40-second timeout
5	Grant MOH with 1-minute timeout
6	Grant MOH with 2-minute timeout
7	Grant MOH with 3-minute timeout
8	Grant MOH with 4-minute timeout
9	Grant MOH with 6-minute timeout
10	Grant MOH with 8-minute timeout
11	Grant MOH with 12-minute timeout
12	Grant MOH with 16-minute timeout
13	Grant MOH with indefinite timeout

Read syntax

+PMHT?

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

+PMHT: <current setting>

For example, with <value> set to Deny V.92 Modem-on-hold Request, the DCE would report:

+PMHT: 0

Test syntax

+PMHT=?

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

+PMHT: (list of supported values)

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

+PMHT: (0,1,2,3,4,5,6,7,8,9,10,11,12,13)

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.4 Initiate Modem on Hold (+PMHR)

Parameter

+PMHR

Description

This extended-format command requests the DCE to initiate or to confirm a modem-on-hold procedure. The DCE shall return **ERROR** if Modem on Hold is not enabled or if the DCE is in an idle condition. The DCE shall return the string response +PMHR: <value> where <value> is a decimal value corresponding to the Modem-on-Hold timer value received or the request status during the DCE's modem on hold exchange procedure as defined in Table 34. This response may be delayed depending upon the context under which the +PMHR command is made, i.e., if the +PMHR is in response to an incoming Modem on Hold or if it is initiating a request.

Defined values

None.

Read Syntax

+PMHR

Table 34/V.250 – Modem-on-Hold Response values

<value>	Description
0	V.92 Modem-on-Hold Request Denied or not available. The modem may initiate another Modem-on-hold request later.
1	MOH with 10-second timeout Granted
2	MOH with 20-second timeout Granted
3	MOH with 30-second timeout Granted
4	MOH with 40-second timeout Granted
5	MOH with 1-minute timeout Granted
6	MOH with 2-minute timeout Granted
7	MOH with 3-minute timeout Granted
8	MOH with 4-minute timeout Granted
9	MOH with 6-minute timeout Granted
10	MOH with 8-minute timeout Granted
11	MOH with 12-minute timeout Granted
12	MOH with 16-minute timeout Granted
13	MOH with indefinite timeout Granted
14	MOH Request denied. Future requests will also be denied during this session.

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.5 PCM upstream ignore (+PIG)

Parameter

+PIG=[<value>]

Description

This extended-format compound numeric parameter controls the use of PCM upstream in a V.92 DCE.

Defined values

See Table 35.

Table 35/V.250 – PCM upstream ignore values

<value>	Description
0	Enable PCM upstream
1	Disable PCM upstream

Default setting

0

Read syntax

+PIG?

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

+PIG: <current setting>

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

+PIG: 0

Test syntax

+PIG=?

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

+PIG: (list of supported values)

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

+PIG: (0,1)

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.6 V.92 Modem-on-Hold Hook Flash (+PMHF)

Parameter

+PMHF

Description

This command causes the DCE to go on-hook for a specified period of time, and then return on-hook. The specified period of time is normally one-half second, but may be governed by national regulations. If this command is initiated and the modem is not On Hold, **ERROR** is returned. This command applies only to V.92 Modem on Hold.

Defined values

None.

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.7 V.92 Phase 1 and Phase 2 Control (+PQC)

Parameter

+PQC=<value>

Description

This extended-format compound numeric parameter controls the global enabling or disabling of the V.92 shortened Phase 1 and Phase 2 startup procedures, not the initiation thereof. This command is used in conjunction with the +PSS command.

Defined values

See Table 36.

Table 36/V.250 – Phase 1 and Phase 2 values

<value>	Description
0	Enable Short Phase 1 and Short Phase 2
1	Enable Short Phase 1
2	Enable Short Phase 2
3	Disable short Phase 1 and Short Phase 2

Default setting

0

Read syntax

+PQC?

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

+PQC: <current setting>

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

+PQC: 0

Test syntax

+PQC=?

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

+PQC: (list of supported values)

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

+PQC: (0,1,2,3)

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.8.8 Use Short Sequence (+PSS)

Parameter

+PSS=<value>

Description

This extended-format compound numeric parameter causes a calling DCE to force either a V.92 short or full startup sequence as defined by the +PQC command on the next and subsequent connections.

Defined values

See Table 37.

Table 37/V.250 – Use Short Sequence Values

<value>	Description
0	The DCEs decide whether or not to use the short startup procedures. The short startup procedures shall only be used if enabled by the +PQC command.
1	Forces the use of the short startup procedures on the next and subsequent connections if they are enabled by the +PQC command.
2	Forces the use of the full startup procedures on the next and subsequent connections independent of the setting of the +PQC command.

Default setting

0

Read syntax

+PSS?

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

+PSS: <current setting>

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

+PSS: 0

Text syntax

+PSS=?

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

+PSS: (list of supported values)

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

+PSS: (0,1,2)

Implementation

Implementation of this parameter is mandatory if ITU-T Rec. V.92 is implemented in the DCE.

6.9 V.59 Command (+TMO)

This extended-format command causes the DCE to transmit one or more lines of information text in specific formats. The command retrieves the information from the managed objects in ITU-T Rec. V.59. The command can be used in three ways as described in the following clauses.

6.9.1 Repeat last +TMO command

Syntax

+TMO

Description

The +TMO command without extensions will cause the DCE to repeat the last +TMO command that was issued.

NOTE – For all common mid-level objects retrieved by the +TMO command, only the one applicable to the most recent modulation used, irrespective of how many modulations the modem has operated in during the previous connection, is returned.

6.9.2 Retrieve diagnostic supported

Syntax

+TMO [<list level><n>]=?

Defined list levels:

- 0 The DCE shall transmit information text which reports the list of all objects support as defined in ITU-T Rec. V.59.
- 1 The DCE shall transmit information text which reports the list of all high-level objects supported as defined in ITU-T Rec. V.59.
- 2 The DCE shall transmit information text which reports the list of all mid-level objects supported as defined in ITU-T Rec. V.59.
- 3 The DCE shall transmit information text which reports the list of all low-level objects supported as defined in ITU-T Rec. V.59.
- 4 The DCE shall transmit 0 if it supports object names, and 1 if it supports tagIDs.

Defined <n>:

- n If present, the object names are returned; if not present, tagIDs are returned. n shall not be used with list level 4. If a DCE supports only tagIDs and n is included with the +TMO command, **ERROR** will be returned.

For example, a DCE that supported both object names and tagIDs would report:

+TMO 4=? (0,1)

6.9.3 Retrieve specific diagnostic information

Syntax

+TMO <tagID or Name> <all or only>

Description

This command retrieves the diagnostic identified by either the V.59 tagID or the name. The response from the DCE shall be in the same form as the request, i.e., a tagID will return a response identified by the tagID. A named diagnostic will return the name and the requested information.

A two-digit tagID indicates that the request is for the high-level V.59 objects. A four-digit tagID indicates that the request is for a mid-level or a low-level V.59 object.

<all or only> specifies if any or all sub-objects of a high- or mid-level objects are returned in response to the command.

For example:

+TMO <Name> <all or only>

+TMO V92 All would return all the diagnostics defined for ITU-T Rec. V.92 in ITU-T Rec. V.59.

+TMO V92 rxHistory would only return the rx rate history of the V.92 diagnostic as defined in ITU-T Rec. V.59.

+TMO <tagID> <all or only>

+TMO 09 would return the entire V.90 object.

+TMO 0900 would return mode V.90 object only.

Appendix I

Summary of basic and extended format commands

Table I.1/V.250 – Defined leading character sequences

Leadin	Includes commands related to
+A	Call control (network Addressing) issues, common, PSTN, ISDN, ITU-T Rec. X.25, switched digital
+C	Digital Cellular extensions
+D	Data Compression, ITU-T Rec. V.42 <i>bis</i>
+E	Error Control, ITU-T Rec. V.42
+F	Facsimile, ITU-T Rec. T.30, etc.
+G	Generic issues such as identity and capabilities
+I	DTE-DCE Interface issues, ITU-T Rec. V.24, etc.
+M	Modulation, ITU-T Rec. V.32 <i>bis</i> , etc.
+P	PCM DCE commands, ITU-T Rec. V.92
+S	Switched or Simultaneous Data Types
+T	Test issues
+V	Voice extensions
+W	Wireless extensions

NOTE – See Supplement 1 to this Recommendation for a current summary of other Standards that are based on this Recommendation.

Table I.2/V.250 – Summary of commands

Name	Type	Syntax	Reference	Description
&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
+DS44	Parameter	Extended	6.6.2	V.44 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

Table I.2/V.250 – Summary of commands

Name	Type	Syntax	Reference	Description
+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
+GMM	Action	Extended	6.1.5	Request model identification
+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
+PCW	Parameter	Extended	6.8.1	Call Waiting enable
+PMH	Parameter	Extended	6.8.2	Modem-on-Hold enable
+PMHT	Parameter	Extended	6.8.3	Modem-on-Hold Timer
+PMHR	Action	Extended	6.8.4	Initiate Modem on Hold
+PIG	Parameter	Extended	6.8.5	PCM upstream ignore
+PMHF	Parameter	Extended	6.8.6	V.92 Modem-on-Hold Hook Flash
+PQC	Parameter	Extended	6.8.7	V.92 Phase 1 and Phase 2 Control
+PSS	Parameter	Extended	6.8.8	Use Short Sequence
+TMO	Parameter	Extended	6.9	V.59 command
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

Table I.2/V.250 – Summary of commands

Name	Type	Syntax	Reference	Description
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.250

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

Table II.1/V.250

DTE Command	DCE Response	DCE action	Line condition	Reference
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	Hang up	Hang up	6.3.6

Appendix III

Encapsulation of V.250 messages in V.25 bis DCE

III.1 Scope

This appendix defines the means to use V.250 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.250 messages

A DCE compliant with ITU-T Rec. V.25 bis and this appendix shall implement two new opcodes. See Table III.1.

Table III.1/V.250 – V.250 opcodes for encapsulation of V.250 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.250 command, information text or result code may be encapsulated as a V.25 *bis* message. The V.250 command may include any necessary parameter values, of numeric, string or compound type.

III.3 Applicable V.250 commands

See Table III.2.

Table III.2/V.250 – V.250 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.250 commands are either not applicable or reserved for future study.

III.4 Applicable V.250 responses

See Table III.3.

Table III.3/V.250 – V.250 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.250 indications are either not applicable or reserved for future study.

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