Reference Manual

AT Commands
for
IG56/IG336/IG144 Modems

Data Connect Enterprise

AT Commands for IG56/IG336 Modem

Reference Document
Conexant AT Commands document number REM-201692B for CX930xx-2x Modem products

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1 Introduction

1.1 Overview

This manual describes the host command and responses for the Conexant® CX930xx modem.

1.1.1 Command Syntax

The fundamental DTE interface command syntax is described in Section 2.

1.1.2 Command Descriptions

Commands are grouped into the following categories:

Syntax and procedures	Section 2
Data commands	Section 3
Fax Class 1 and 1.0 commands	Section 4
Fax Class 2 commands	Section 5
Voice commands	Section 6

1.2 Reference Documentation

Document Title	Document No.
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2   Syntax and Procedures

The command and response syntax and procedures generally conform to referenced recommendations and standards. Since these recommendations and standards describe characteristics universal to a large installed base of modems to a maximum degree, there may be syntax and procedural differences due to extensions and behavioral differences in implemented commands, parameters, and responses beyond those described in these recommendations and standards.

The syntax and procedures described in this section are based on V.250 and V.253 with additional information included for implemented extensions, behavioral differences beyond V.250, and legacy commands.

2.1   Alphabet

The T.50 International Alphabet 5 (IA5) is used in this document. Only the low-order seven bits of each character are significant to the modem; any eighth or higher-order bit(s), if present, are ignored for the purpose of identifying commands and parameters. Lower-case characters are considered identical to their upper-case equivalents when received by the modem from the DTE. Result codes from the modem are in upper case.

2.2   DTE Commands Lines

Words enclosed in <angle brackets> are references to syntactical elements. The brackets are not used when the words appear in a command line. Words enclosed in [square brackets] represent optional items which may be omitted from the command line at the specified point. The square brackets are not used when the words appear in the command line. Other characters that appear in syntax descriptions must be included as shown. Any modem 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 (see 2.7).

2.2.1 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" or "at" or, to repeat the execution of the previous command line, the characters "A/" or "a/".

The body is made up of individual commands described in this document. Space characters (IA5 2/0) are ignored and may be used freely for formatting purposes, unless they are embedded in numeric or string constants. The termination character may not appear in the body. The modem can accept at least 50 characters in the body.

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

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2.2.2 Command Line Editing

The character defined by parameter S5 (default, BS) is interpreted as a request from the DTE to the modem to delete the previous character. Any control characters (IA5 0/0 through 1/15, inclusive) that remain in the command line after receipt of the termination character are ignored by the modem.

The modem 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 ensures that these characters will be properly recognized even if they are set to values that the modem 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).

2.2.3 Command Line Echo

The modem 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 enabled, characters received from the DTE are echoed in the same format as received. Invalid characters in the command line or incomplete or improperly-formed command line prefixes may not be echoed.

2.2.4 Repeating a Command Line

If the prefix "A/" or "a/" is received, the modem immediately executes 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 in this manner. Responses to the repeated command line are issued using format of the original command line. 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).

2.2.5 **Types of DTE Commands**

There are two types of commands: action commands and parameter commands. Commands of either type may be included in command lines, in any order.

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).

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2.3   Basic Syntax Commands

2.3.1 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 followed by a single character per V.250. In addition, <command> can be the "%" character followed by a single character, the "*" character followed by a single character, or the "^" character followed by a single character.

<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. 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 modem.

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.

2.3.2 S-Parameters

Commands that begin with the letter "S" are known as "S-parameters". 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 must 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 modem transmits a single line of information text to the DTE. 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.

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2.4 Extended Syntax Commands

2.4.1 Command Naming Rules

Both actions and parameters have names, which are used in the related commands. Names always begin with the character "+" or "–". Following the "+" or "–", from one to 16 additional characters appear in the command name. These characters will 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 "+" or "–" is an alphabetic character in the range of "A" through "Z". This first character generally implies the application in which a command is used (e.g., V for voice).
The modem considers lower-case characters to be the same as their upper-case equivalents.

2.4.2 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> consists of either a numeric constant or a string constant.

Numeric Constants

Numeric constants are expressed in decimal, hexadecimal, or binary.

Decimal numeric constants consist of a sequence of one or more of the characters "0" through "9", inclusive.

Hexadecimal numeric constants consist of a sequence of one or more of the characters "0" through "9", inclusive, and "A" through "F" inclusive. The characters "A" through "F" represent the equivalent decimal values 10 through 15.

Binary numeric constants consist of a sequence of one or more of the characters "0" and "1".

In all numeric constants, the most significant digit is specified first. Leading "0"

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characters are ignored by the modem. 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.

String Constants

String constants 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 are 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 is encoded as "\5C". The double-quote character, used as the beginning and ending string delimiter, is represented within a string constant as "\22".

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

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 must 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 must be specified; however, trailing comma characters may be omitted if all associated values are also omitted.

2.4.3 Action Commands

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 indicates, for each subparameter, whether the specification of a value for that subparameter is mandatory or optional. For optional subparameters, the definition indicates 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

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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> or –<name>

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

      +<name>[=<value>] or –<name>[=<value>]

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

      +<name>[=<compound_value>] or –<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 all other relevant criteria are met (e.g., the modem is in the proper state), the command is executed with any indicated subparameters. If <name> is not recognized, the modem 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.

Action Test Command Syntax

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

      +<name>=?

If the modem does not recognize the indicated name, it returns an ERROR result code and terminates processing of the command line. If the modem does recognize the action name, it returns an OK result code. If the named action accepts one or more subparameters, the modem sends an information text response to the DTE, prior to the OK result code, specifying the values supported by the modem for each such subparameter, and possibly additional information. The format of this information text is defined for each action command.

2.4.4 Parameter Commands

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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 cannot be set by the DTE; attempting to set their value is an error. In some cases (specified in the description of the individual parameter), the modem 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 modem 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 will 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.

Parameter Set Command Syntax

The definition of the parameter indicates, for each value, whether the specification of that value is mandatory or optional. For optional values, the definition indicates 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>] or –<name>=[<value>]

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

+<name>=[<compound_value>] or –<name>=[<compound_value>]

For each implemented parameter, if all mandatory values are specified, and all values are valid according to the definition of the parameter, the specified values are 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 modem 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.

Parameter Read Command Syntax

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

+<name>? or –<name>?

The modem responds by sending the current values stored for the parameter to the DTE

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in an information text response. The format of this response is described in the definition of the parameter. Generally, the values are 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.

Parameter Test Command Syntax

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

+<name>=? or –<name>=?

If the modem does not recognize the indicated name, it returns an ERROR result code and terminates processing of the command line. If the modem does recognize the parameter name, it returns an information text response to the DTE, followed by an OK result code. The information text response indicates the values supported by the modem for each such subparameter, and possibly additional information. The format of this information text is defined for each parameter.

2.4.5 Additional Syntax Rules

Concatenating Commands after Extended Syntax Commands

Additional commands may follow an extended-syntax command on the same command line if a semicolon (";") 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.

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.

2.5 Issuing Commands

All characters in a command line must be issued at the same data rate, and with the same parity and format.
The modem will ignore any command line that is not properly terminated. The modem may consider 30 seconds of mark idle time between any two characters as an improperly terminated command line. In this case the modem may or may not generate an ERROR message. The modem will 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 modem can accept in the body is exceeded, an ERROR result code is generated after the command line is terminated.
The DTE will 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 modem in response to the preceding command line.

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2.6 Executing Commands

Upon receipt of the termination character, the modem commences 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 is issued; result codes for preceding commands are suppressed. If no commands appear in the command line, the OK result code is issued.

2.6.1 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 modem of any character. A single character is sufficient to abort the command in progress; however, characters transmitted during the first 125 milliseconds after transmission of the termination character are ignored (to allow for the DTE to append additional control characters such as line feed after the command line termination character). **To ensure that the aborting character is recognized by the modem, it should be sent at the same rate as the preceding command line; the modem may ignore characters sent at other rates.** When such an aborting event is recognized by the modem, the modem terminates the command in progress and returns an appropriate result code to the DTE, as specified for the particular command.

2.6.2 Handling of Invalid Numbers and S-Parameter Values

The modem reacts 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 specifies which of these three techniques is used to handle invalid parameter values for that command or parameter.

2.7 Modem Responses

While in command state and online command state, the modem will 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 modem.

When the modem 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

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used during the command state. When the modem 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 modem.

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

2.7.1 Responses

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

Information Text. Information text responses consist of three parts: a header, information text, and a trailer:

1. The characters transmitted for the header are determined by the V command.
2. 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.
3. Information text usually consists of a single line; information text returned in response to some commands may contain multiple lines, and the text may therefore include CR, LF, and other formatting characters to improve readability.

Result Code Parts. Result codes consist of three parts: a header, the result text, and a trailer.

1. The characters transmitted for the header and trailer are determined by the V command setting.

2. The result text may be transmitted as a number or as a string, also depending on a the V command setting.

Result Code Types. There are three types of result codes: final, intermediate, and unsolicited. Result codes are described in Section 3.4.

1. A final result code indicates the completion of a full modem action and a ability to accept new commands from the DTE.
2. An intermediate result code is a report of the progress of an modem action. The CONNECT result code is an intermediate result code. In the case of a dialing or answering command, the modem switches from command state to online data state, and issues a CONNECT result code. This is an intermediate result code for the modem because it cannot accept commands from the DTE while in online data state. When the modem switches back to the command state it then issues a final result code (such as OK or NO CARRIER).
3. Unsolicited result codes (such as RING) indicate the occurrence of an event not directly associated with the issuance of a command from the DTE.

2.7.2 Extended Syntax Result Codes

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

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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 are used in headers and trailers of extended syntax result codes as they are in basic format result codes. The setting of the V command affects 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 are subject to suppression by the Q1 command, as with basic format result codes. The issuance of extended syntax result codes are not be affected by the setting of the X command.

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

Extended syntax result codes are prefixed by the "+" character to avoid duplication of basic format result codes specified in TIA-602. Following the "+" character, the name of the result code appears; result code names follow the same rules as command names.

Extended syntax result codes may include the reporting of values. The definition of the result code specifies whether or not values are appended to the result code, and, if so, how many, their types, and their assumed default values if omitted.

Data/Voice Modes. 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 is:

    +<name>: <value>

A single space character separates the colon character 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>

Fax Modes. If a single value is to be reported, the form of the result code is:

    <value>: <compound_value>

2.7.3 +<name>: <compound_value>Information Text Formats for Test Commands

In general, the format of information text returned by extended syntax commands is described in the definition of the command.

The modem 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 modem does not include the character sequences "0 <CR>"or "OK<CR>", so that DTE can avoid false detection of the end of these information text responses.

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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 is preceded by a left parenthesis (() , and is followed by a right parenthesis ()). If only a single value is supported, it appears between the parentheses. If more than one value is supported, then the values may be listed individually, separated by comma characters, or, when a continuous range of values is supported, by the first value in the range, followed by a hyphen character (-), 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 are 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.

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 is presented as a list of the parenthetically-enclosed value range strings described 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.

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₃ Data Command Set

3.1 Command Guidelines

The commands used to control and report modem operation in data modem mode are defined in this section.

The Data Modem Mode commands and responses described in this section are applicable when command +FCLASS=0. (See Section 3.2.1 for the definition of the FCLASS command.)

The default values are typical of a fully configured modem supporting all data rates and options. The actual default value is dependent upon installed modem firmware and country specific parameters.

Commands are accepted by the modem once the previous command has been fully executed, which is normally indicated by the return of an appropriate result code. Execution of commands D and A, either as a result of a direct command or a re-execute command, will be aborted if another character is entered before completion of the handshake.

3.1.1 Escape Code Sequence

When the modem has established a connection and has entered on-line data mode, it is possible to break into the data transmission in order to issue further commands to the modem in an on-line command mode. This is achieved by the DTE sending to the modem a sequence of three ASCII characters specified by register S2. The default character is '+'. The maximum time allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE is controlled by the S12 register.

3.2 Data Commands

The modem will respond to the commands detailed below. Parameters applicable to each command are listed with the command description. The defaults shown for each configuration command are those used in the Conexant factory profile 0.

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3.2.1 Generic Modem Control

Z - Soft Reset and Restore Profile

This command causes the modem to perform a soft reset and restore (recall) the configuration profile. If no <value> is specified, zero is assumed.

Syntax

    Z<value>

Defined Values

    <value>   Decimal number corresponding to the selected profile.

          0   Soft reset and restore stored profile 0.

          1   Soft reset and restore stored profile 1.

Result Codes

    OK   <value> = 0 or 1.

    ERROR   Otherwise.

+FCLASS - Select Active Service Class

This command selects the active service class (mode).

Syntax

    +FCLASS=<mode>

Defined Values

    <mode>   Decimal number which corresponds to the selected service class.

          0   Select Data Mode (Section 3). (Default.)

          1   Select Facsimile Class 1 Mode. (Section 4).

          1.0   Select Facsimile Class 1.0 Mode. (Section 4).

          2   Select Facsimile Class 2 Mode. (Section 5).

          8   Select Voice Mode. (Section 6).

Result Codes

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       OK   For <mode> = 0, 1, 1.0, 2, and 8

       ERROR   Otherwise.

Reporting Current or Selected Values

Command: +FCLASS?

Response: <mode>

Example: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +FCLASS=?

Response: (<mode> range)

Example: 0,1,1.0,2,8

+VCID - Caller ID (CID)

This command controls the reporting and presentation of data associated with the Caller ID services in the Incoming Call Line ID (ICLID) data format for the next call.

Syntax

    +VCID=<mode>

Defined Values

    <mode>   Decimal number corresponding to the selected option.

                      0   Disable Caller ID reporting. (Default.)

                      1   Enables Caller ID with formatted presentation to the DTE. The modem presents the data items in a <Tag><Value> pair format. The expected pairs are date, time, name, and caller code (telephone number),

                      2   Enables Caller ID with unformatted presentation to the DTE.

Reporting Current or Selected Values

Command: +VCID?

Response: <mode>

Example: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +VCID=?

Response: (<mode> range)

Example: (0-2)

-SCID - Snooping CID (Type II)

This command allows the modem to snoop a telephone line for Type II CID and relay this information in order to report to DTE while on-hook. It is similar in functionality with the standard Type II CID, which fetches CID information while off-hook. The main difference is that the -SCID command requires equipment with Type II CID capability connected in parallel with the modem, and hence the name Snooping CID. It will not work without the CID equipment.

Syntax

-SCID=<pmode>

Defined Values

<pmode>   Decimal number corresponding to the selected option.

0   Disables snooping mechanism only. It does **not** disable Type I CID nor Line In Use features. (Default)

1   Enables snooping mechanism, Type I CID with formatted presentation to the DTE, and Line In Use features. The expected pairs are date, time, name, and caller code (telephone number.) Forces +VCID=1 and sets the Line In Use bit in –STE command.

2   Enables the snooping mechanism, Type I CID with unformatted presentation to the DTE, and Line In Use features. Forces +VCID=2 and sets the Line In Use bit in –STE command.

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Example:

The following command sequence demonstrates how the –SCID affects both Line In Use and Type I CID features:

AT Command	Snooping CID	Type I CID	Line In Use	Comment
ATZ	-SCID: 0	+VCID: 0	-STE: 0	All three features are disabled
AT-SCID=1	-SCID: 1	+VCID: 1	-STE: 1	Enables all three features
AT-SCID=0	-SCID: 0	+VCID: 1	-STE: 1	Disables SCID only
AT-STE=21	-SCID: 0	+VCID: 1	-STE: 2	Enables extension pick-up while disabling Line In Use
AT-SCID=2	-SCID: 2	+VCID: 2	-STE: 3	Enables all three features with unformatted CID info. Toggles Line In Use bit2.

1. Line In Use is bit 0 and extension pick-up is bit 1. See -STE command.
2. The –SCID command only toggled the Line In Use bit and left the extension pick-up bit as is.

Reporting Current or Selected Values

Command: -SCID?

Response: <pmode>

Example: 0   For the default setting.

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+VRID - Report Retrieved Caller ID (CID)

This command reports the data associated with the Caller ID services in the Incoming Call Line ID (ICLID) data format for the last received call.

Syntax

+VRID=<mode>

Defined Values

<mode>   Decimal number corresponding to the selected option.

0   Reports Caller ID with formatted presentation to the DTE. The modem presents the data items in a <Tag><Value> pair format. The expected pairs are date, time, name, and caller code (telephone number),

1   Reports Caller ID with unformatted presentation to the DTE.

Reporting Supported Range of Parameter Values

Command: +VRID=?
Response: (<mode> range)
Example: (0,1)

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\N - Operating Mode

This command controls the preferred error correcting mode to be negotiated in a subsequent data connection. This command is affected by the OEM firmware configuration.

Syntax

    \N<mode>

Defined Values

<mode>	Decimal number which corresponds to the selected mode.

0	Selects normal speed buffered mode (disables error-correction mode). (Forces &Q6.)
1	Selects direct mode and is equivalent to &M0, &Q0 mode of operation. (Forces &Q0.)
2	Selects reliable (error-correction) mode. The modem will first attempt a LAPM connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=7.)
3	Selects auto reliable mode. This operates the same as \N2 except failure to make a reliable connection results in the modem falling back to the speed buffered normal mode. (Forces &Q5, S36=7, and S48=7.)
4	Selects LAPM error-correction mode. Failure to make an LAPM error-correction connection results in the modem hanging up. (Forces &Q5 and S48=0.) Note: The -K1 command can override the \N4 command.
5	Selects MNP error-correction mode. Failure to make an MNP error-correction connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=128.)

Result Codes

OK	<mode> = 0 to 5.
ERROR	Otherwise.

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I – Identification

This command causes the modem to reports the requested result according to the command parameter.

Syntax

I<value>

Defined Values

<value>   Decimal number corresponding to the selected information.

0   Reports product code, e.g., "56000".

1   Reports "OK".

2   Reports "OK".

3   Reports masked firmware identification code.

Example:

CX93001-EIS_V0.2013-V92

4   Reports "OK"

5   Reports Country Code parameter (see +GCI).

6   Reports "OK".

7   Reports "OK".

Result Codes

OK   <value> = 0 - 7.

ERROR   Otherwise.

+GMI - Request Manufacturer Identification

This command causes the modem to report the modem product manufacturer.

Syntax

+GMI

Typical Response

+GMI: CONEXANT
OK

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+GMI9 - Request Conexant Identification

This command causes the modem to report CONEXANT ACF identification.

Syntax

+GMI9

Response

+GMI9: CONEXANT ACF
OK

+GMM - Request Model Identification

This command causes the modem to report the modem product.

Syntax

+GMM

Typical Response

+GMM: V90

+GMR - Request Revision Identification

This command causes the modem to report the modem version, revision level or date. This is the same as the I3 command.

Syntax

+GMR

Typical Response

+GMR: CX93001-EIS_V0.2013-V92
OK

+GCAP - Request Complete Capabilities List

This extended-format command causes the modem to transmit one or more lines of information text listing additional capabilities command +<name>s , which is intended to permit the user to identify the overall capabilities of the modem. In particular, if the modem implements a particular modem control standard that uses Extended Syntax Commands, and if that modem control standard includes command(s) that indicate general capabilities, the +<names>(s) of those commands will be reported to the modem in response to a +GCAP command.

Syntax

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+GCAP

Example Responses
+GCAP: +FCLASS, +MS, +ES, +DS
for a data modem that supports all capabilities listed

Where:
+FCLASS	T.class1, +F (Class 1 Facsimile modem Control)
+MS	+M commands (Modulation Control: +MS and +MR commands)
+ES	+E commands (Error Control: +ES, +EB, +ER, +EFCS, +ETBM)
+DS	+D commands (Data Compression: +DS and +DR)

+GCI - Country of Installation

This extended syntax command selects and indicates the country of installation for the modem. This parameter selects the settings for any operational parameters that need to be adjusted for national regulations or telephone networks.

Syntax

+GCI=<country_code>

Defined Values

<country_code>   8-bit country code from Annex A of T.35. The value is 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.
The supported countries are listed in the CX930xx modem data sheet.

Default

If the modem is specified for use in only one country, that country code is the default. Otherwise, the default is defined by the OEM. Factory default is B5 (United States).

Reporting Current or Selected Values

Command: +GCI?

Response: +GCI: <current country_code>

Example: +GCI: 3D   The modem is set for France.

Reporting Supported Range of Parameter Values

Command: +GCI=?

Response: +GCI: (<country_code>[,<country_code>[,<country_code].......]]

Example: +GCI: (00,B4,B5)   The modem can be set for Japan, United Kingdom, or the United States.

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&F - Restore Factory Configuration (Profile)

The modem loads the factory default configuration (profile). The factory defaults are identified for each command and in the S-Parameter descriptions. A configuration (profile) consists of a subset of S-Parameters.

Syntax

&F[<value>]

Defined Values

<value>   Decimal number corresponding to the selected configuration.

                        0   Restore factory configuration 0.

                        1   Restore factory configuration 1.

Result Codes

OK

ERROR   If the modem is connected.

&T - Local Analog Loopback Test

The modem will perform the local analog loopback test if &T1 is selected. The test can be run only when in an asynchronous operation in non-error-correction mode (normal), e.g., AT&Q6. To terminate the test in progress, the escape sequence must be entered first
(see Section 3.1.1).

Syntax

&T[<value>]

Defined Values

<value>   Decimal number corresponding to the selected option.

                        0   Terminates test in progress. Clears S16.

                        1   Initiates local analog loopback, V.54 Loop 3. Sets S16 bit 0. If a connection exists when this command is issued, the modem hangs up. The CONNECT XXXX message is displayed upon the start of the test.

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&Y - Designate a Default Reset Profile

This command selects which user profile will be used after a hard reset.

Syntax

&Y<value>

Defined Values

<value>   Decimal number corresponding to the selected profile.

0   The modem will use profile 0.

1   The modem will use profile 1.

Result Codes

OK   <value> = 0 to 1.
ERROR   If <value> > 1, or if NVRAM is not installed or is not
                    operational.

&W - Store Current Configuration

Saves the current (active) configuration (profile), including S-Parameters, in one of the two user profiles in NVRAM as denoted by the parameter value. This command will yield an ERROR message if the NVRAM is not installed or is not operational as detected by the NVRAM test.

The current configuration is comprised of a list of storable parameters illustrated in the &V command. These settings are restored to the active configuration upon receiving a Zn command or at power up (see &Yn command).

Syntax

&W<value>

Defined Values

<value>   Decimal number corresponding to the selected profile.

0   Store the current configuration as profile 0.

1   Store the current configuration as profile 1.

Result Codes

OK   <value> = 0 or 1.
ERROR   Otherwise.

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&Zn=x - Store Telephone Number

The modem can store up to four telephone numbers and each telephone number dial string can contain up to 31 digits. (Requires 256-byte NVRAM installed.)

Syntax

&Z<value>=<string>

Defined Values

<value>   Decimal number from 0 to 3 corresponding to the selected telephone number.

<string>   Dial string from 0 to 31 characters.

Result Codes

OK   For <value> $\leq$ 3 and <string> $\leq$ 31 digits.
ERROR   If <value> > 3 or <string> > 31 digits.

%7 - Plug and Play Serial Number

Sets and stores eight serial numbers in hex format used for serial Plug and Play and for USB Plug and Play.

Syntax

%7<8 hex numbers><same 8 hex numbers>

Example

%70000000100000001

Result Codes

OK   <8 hex numbers><same 8 hex numbers>
ERROR   Otherwise

To display the stored serial number, issue AT"?.

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%8 - Plug and Play Vendor ID and Product Number

Sets and stores Vendor ID and product number for serial Plug and Play and for USB Plug and Play.

Syntax

Serial:
%8<Vendor ID><Product ID><Same Vendor ID><Same Product ID>
Where <Vendor ID> is 3 ASCII characters long and <Product ID> is 4 ASCII characters long.
USB:
%8<Vendor ID><Product ID><Release ID><Same Vendor ID><Same Product ID><Same Release ID>
Where <Vendor ID>, <Product ID>, and <Release ID> are each 4 ASCII characters long.

Example
Serial:
%8CXT0324CXT0324
USB:
%8057213400100057213400100

Result Codes
OK
ERROR   Otherwise

**- Download Firmware Code

The AT** command allows users to customize modem firmware and add or override country profiles by uploading NVRAM or SRAM patches.

Uploading NVRAM Patch

The NVRAM loader allows NVRAM connected to the modem serial EEPROM bus to be upgraded with custom patch code. This process transfers the modem patch code from the host computer to the modem, which transfers the data to the NVRAM device. Uploading an NVRAM patch to the NVRAM device is a two-step process.

1. When the AT** command is issued, the modem firmware boot loader is invoked and the user will first load the NVRAM loader into the modem's RAM. The data transfer is done via an ASCII transfer. The NVRAM loader contains the programming algorithm for the NVRAM device being programmed.

2. The user will then load the NVRAM patch which the NVRAM loader will then program into the NVRAM device. This transfer is done via ASCII transfer.

Procedure

1. Put the NVRAM loader (e.g., NVM_LOADER_32-256_CX93002serial_verC.S37) and the NVRAM patch file (e.g., Patch_F2-00-01-00-00_NVRAM_Serial_Alone.ptc) in an appropriate directory on the computer's hard disk.

2. Configure the communications application program for a DTE rate of between 9600 bps and 115200 bps and RTS/CTS flow control.

3. Check the modem for response by typing AT.

4. Initiate the download process using the AT** command. The "Download initiated .."message appears upon issuing the AT** command.

5. Perform an ASCII transfer of the NVRAM loader file (e.g., NVM_LOADER_32-256_CX93002serial_verC.S37) from the host computer to the modem RAM using an industry standard communications software or an equivalent process (ensure that all ASCII translation or pacing is turned off).

6. After the NVRAM loader has been loaded perform an ASCII transfer of the NVRAM patch file (e.g., Patch_F2-00-01-00-00_NVRAM_Serial_Alone.ptc) from the host computer to the modem RAM using industry standard communications software or an equivalent process.

Uploading SRAM patch

An internal SRAM patch does not require a loader. The AT** command can be used to transfer the SRAM patch directly to the modem's internal RAM. When the AT** command is issued, the modem firmware boot loader is invoked and the user will transfer the SRAM patch into the modem's RAM. The data transfer is done via an ASCII transfer.

Procedure

1. SRAM patch file (e.g., Patch_F2-00-01-00-00_NVRAM_Serial_Alone.ptc) in an appropriate directory on the computer's hard disk.

2. Configure the communications application program for a DTE rate of between 9600 bps and 115200 bps and RTS/CTS flow control.

3. Check the modem for response by typing AT.

4. Initiate the download process using the AT** command. The "Download initiated .." message appears upon issuing the AT** command.

5. Perform an ASCII transfer of the SRAM patch file (e.g., Patch_F2-00-01-00-00_NVRAM_Serial_Alone.ptc) from the host computer to the modem RAM using industry standard communications software or an equivalent process.

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3.2.2 DTE-Modem Interface commands

The parameters defined in this section control the operation of the interface between the DTE and modem.

E - Command Echo

The modem enables or disables the echo of characters to the DTE. The parameter value, if valid, is written to S14 bit 1.

Syntax

E<value>

Defined Values

<value>   Decimal number corresponding to the option.

0   Disables command echo.

1   Enables command echo. (Default.)

Result Codes

OK   <value> = 0 or 1.
ERROR   Otherwise.

Q - Quiet Results Codes Control

The command enables or disables the sending of result codes to the DTE. The parameter value, if valid, is written to S14 bit 2.

Syntax

Q<value>

Defined Values

<value>   Decimal number corresponding to the option.

0   Enables result codes to the DTE. (Default.)

1   Disables result codes to the DTE.

Result Codes

OK   <value>= 0 or 1.
ERROR   Otherwise.

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V - Result Code Form

This command selects the sending of short-form or long-form result codes to the DTE. The parameter, if valid, is written to S14 bit 4.

Syntax

   V<value>

Defined Values

   <value>   Decimal number corresponding to the selected option.

                0   Enables short-form (terse) result codes. Line feeds
                         not issued before a short-form result code.

                1   Enables long-form (verbose) result codes.
                         (Default.)

Result Codes

OK <value>= 0 or 1.
ERROR Otherwise.

W - Connect Message Control

This command, in conjunction with S95 bits 0, 2, 3, and 5 (bits 2, 3, and 5 can be written directly by the host or by the +MR, +ER, and +DR commands, respectively), control the format of CONNECT messages (see Section 3.4 and Table 3-5). The actual result code messages reported reflect the W command setting and the S95 bit settings. (Also see +MR, +ER, and +DR commands.)

The W parameter value, if valid, is written to S31 bits 2 and 3.

Syntax

   W<value>

Defined Values

   <value>   Decimal number corresponding to the selected option.

                0   Upon connection, the modem reports only the
                         DTE speed (e.g., CONNECT 19200).
                         Subsequent responses are disabled. (Default.)

                1   Upon connection, the modem reports the
                         modulation, line speed, the error correction
                         protocol, and the DTE speed, respectively.
                         Subsequent responses are disabled.

                2   Upon connection, the modem reports the DCE
                         speed (e.g., CONNECT 14400). Subsequent

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responses are disabled.

Result Codes
OK   \<value\> = 0, 1, or 2.
ERROR   Otherwise.

X - Extended Result Codes

This command selects the subset of the result code messages used by the modem to inform the DTE of the results of commands.

Blind dialing is enabled or disabled by country parameters. If the user wishes to enforce dial tone detection, a "W" can be placed in the dial string (see D command). The information below is based upon the default implementation of the X results table. Table 3-1 indicates the messages which are enabled for each X value.

If the modem is in facsimile mode (+FCLASS=1 or 1.0), the only message sent to indicate a connection is CONNECT without a speed indication.

Syntax

     X\<value\>

Defined Values

     \<value\>   Decimal number corresponding to the selected option.

         0   Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 000b is written to S22 bits 6, 5, and 4, respectively.

         1   Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX (XXXX = rate). Blind dialing enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 100b is written to S22 bits 6, 5, and 4, respectively.

         2   Disables reporting of busy tones unless forced

otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIAL TONE, NO ANSWER, and CONNECT XXXX. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO DIAL TONE will be reported instead of NO CARRIER. The value 101b is written to S22 bits 6, 5, and 4, respectively.

3   Enables reporting of busy tones; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX. Blind dialing is enabled/disabled by country parameters. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported. The value 110b is written to S22 bits 6, 5, and 4, respectively.

4   Enables reporting of busy tones; send all messages. The value 111b is written to S22 bits 6, 5, and 4, respectively. (Default.)

Result Codes
   OK   <value> = 0 to 4.
   ERROR   Otherwise.

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Table 3-1. Result Codes

Short Form	Long Form	n Value in ATXn Command					Notes
		0	**1**	**2**	**3**	**4**	
0	OK	x	x	x	x	x	
1	CONNECT	x	x	x	x	x	
2	RING	x	x	x	x	x	
3	NO CARRIER	x	x	x	x	x	
4	ERROR	x	x	x	x	x	
5	CONNECT 1200	1	x	x	x	x	
6	NO DIAL TONE	3	3	x	x	x	
7	BUSY	3	3	3	x	x	
8	NO ANSWER	x	x	x	x	x	
9	CONNECT 600	1	x	x	x	x	
10	CONNECT 2400	1	x	x	x	x	
11	CONNECT 4800	1	x	x	x	x	
12	CONNECT 9600	1	x	x	x	x	
13	CONNECT 7200	1	x	x	x	x	
14	CONNECT 12000	1	x	x	x	x	
15	CONNECT 14400	1	x	x	x	x	
16	CONNECT 19200	1	x	x	x	x	
17	CONNECT 38400	1	x	x	x	x	
18	CONNECT 57600	1	x	x	x	x	
19	CONNECT 115200	1	x	x	x	x	
20	CONNECT 230400	x	x	x	x	x	
22	CONNECT 75TX/1200RX	1	x	x	x	x	
23	CONNECT 1200TX/75RX	1	x	x	x	x	
24	DELAYED	4	4	4	4	x	
25	MESSAGE-WAITING						
32	BLACKLISTED	4	4	4	4	x	
39	+MRR: 75	x	x	x	x	x	
40	+MRR: 300	x	x	x	x	x	
42	+MRR: 600	x	x	x	x	x	
44	+MRR: 1200/75	x	x	x	x	x	
45	+MRR: 75/1200	x	x	x	x	x	
46	+MRR: 1200	x	x	x	x	x	
47	+MRR: 2400	x	x	x	x	x	
48	+MRR: 4800	x	x	x	x	x	
49	+MRR: 7200	x	x	x	x	x	
50	+MRR: 9600	x	x	x	x	x	
51	+MRR: 12000	x	x	x	x	x	
52	+MRR: 14400	x	x	x	x	x	
53	+MRR: 16800	x	x	x	x	x	Note 2
54	+MRR: 19200	x	x	x	x	x	Note 2
55	+MRR: 21600	x	x	x	x	x	Note 2
56	+MRR: 24000	x	x	x	x	x	Note 2
57	+MRR: 26400	x	x	x	x	x	Note 2
58	+MRR: 28800	x	x	x	x	x	Note 2
59	CONNECT 16800	1	x	x	x	x	Note 2
61	CONNECT 21600	1	x	x	x	x	Note 2
62	CONNECT 24000	1	x	x	x	x	Note 2
63	CONNECT 26400	1	x	x	x	x	Note 2
64	CONNECT 28800	1	x	x	x	x	Note 2
66	+DR: ALT	x	x	x	x	x	

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Short Form	Long Form	n Value in ATXn Command					Notes
		0	**1**	**2**	**3**	**4**	
67	+DR: V42B	x	x	x	x	x	
68	+DR: V44	x	x	x	x	x	
69	+DR: NONE	x	x	x	x	x	
70	+ER: NONE	x	x	x	x	x	
77	+ER: LAPM	x	x	x	x	x	
78	+MRR: 31200	x	x	x	x	x	Note 2
79	+MRR: 33600	x	x	x	x	x	Note 2
80	+ER: ALT	x	x	x	x	x	
83	LINE IN USE	x	x	x	x	x	
84	CONNECT 33600	1	x	x	x	x	Note 2
85	OFF-HOOK INTRUSION	x	x	x	x	x	
86	LINE REVERSAL DETECTED	x	x	x	x	x	
87	NO LINE	x	x	x	x	x	
88	DIGITAL LINE DETECTED	x	x	x	x	x	
91	CONNECT 31200	1	x	x	x	x	Note 2
134	+MCR: B103	x	x	x	x	x	
135	+MCR: B212	x	x	x	x	x	
136	+MCR: V21	x	x	x	x	x	
137	+MCR: V22	x	x	x	x	x	
138	+MCR: V22B	x	x	x	x	x	
139	+MCR: V23	x	x	x	x	x	
139	+MCR: V23C	x	x	x	x	x	
140	+MCR: V32	x	x	x	x	x	
141	+MCR: V32B	x	x	x	x	x	
142	+MCR: V34	x	x	x	x	x	Note 3
145	+MCR: V90	x	x	x	x	x	Note 3
146	+MCR: V92	x	x	x	x	x	
147	+MCR: V29	x	x	x	x	x	
150	+MRR: 32000	x	x	x	x	x	Note 3
151	+MRR: 34000	x	x	x	x	x	Note 3
152	+MRR: 36000	x	x	x	x	x	Note 3
153	+MRR: 38000	x	x	x	x	x	Note 3
154	+MRR: 40000	x	x	x	x	x	Note 3
155	+MRR: 42000	x	x	x	x	x	Note 3
156	+MRR: 44000	x	x	x	x	x	Note 3
157	+MRR: 46000	x	x	x	x	x	Note 3
158	+MRR: 48000	x	x	x	x	x	Note 3
159	+MRR: 50000	x	x	x	x	x	Note 3
160	+MRR: 52000	x	x	x	x	x	Note 3
161	+MRR: 54000	x	x	x	x	x	Note 3
162	+MRR: 56000	x	x	x	x	x	Note 3
165	CONNECT 32000	x	x	x	x	x	Note 3
166	CONNECT 34000	x	x	x	x	x	Note 3
167	CONNECT 36000	x	x	x	x	x	Note 3
168	CONNECT 38000	x	x	x	x	x	Note 3
169	CONNECT 40000	x	x	x	x	x	Note 3
170	CONNECT 42000	x	x	x	x	x	Note 3
171	CONNECT 44000	x	x	x	x	x	Note 3
172	CONNECT 46000	x	x	x	x	x	Note 3
173	CONNECT 48000	x	x	x	x	x	Note 3
174	CONNECT 50000	x	x	x	x	x	Note 3
175	CONNECT 52000	x	x	x	x	x	Note 3
176	CONNECT 54000	x	x	x	x	x	Note 3

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Short Form	Long Form	n Value in ATXn Command					Notes
		0	1	2	3	4	
180	CONNECT 28000	x	x	x	x	x	Note 3
181	CONNECT 29333	x	x	x	x	x	Note 3
182	CONNECT 30667	x	x	x	x	x	Note 3
183	CONNECT 33333	x	x	x	x	x	Note 3
184	CONNECT 34667	x	x	x	x	x	Note 3
185	CONNECT 37333	x	x	x	x	x	Note 3
186	CONNECT 38667	x	x	x	x	x	Note 3
187	CONNECT 41333	x	x	x	x	x	Note 3
188	CONNECT 42667	x	x	x	x	x	Note 3
189	CONNECT 45333	x	x	x	x	x	Note 3
190	CONNECT 46667	x	x	x	x	x	Note 3
191	CONNECT 49333	x	x	x	x	x	Note 3
192	CONNECT 50667	x	x	x	x	x	Note 3
193	CONNECT 53333	x	x	x	x	x	Note 3
194	CONNECT 54667	x	x	x	x	x	Note 3
195	+MRR: 28000	x	x	x	x	x	Note 3
196	+MRR: 29333	x	x	x	x	x	Note 3
197	+MRR: 30667	x	x	x	x	x	Note 3
198	+MRR: 33333	x	x	x	x	x	Note 3
199	+MRR: 34667	x	x	x	x	x	Note 3
200	+MRR: 37333	x	x	x	x	x	Note 3
201	+MRR: 38667	x	x	x	x	x	Note 3
202	+MRR: 41333	x	x	x	x	x	Note 3
203	+MRR: 42667	x	x	x	x	x	Note 3
204	+MRR: 45333	x	x	x	x	x	Note 3
205	+MRR: 46667	x	x	x	x	x	Note 3
206	+MRR: 49333	x	x	x	x	x	Note 3
207	+MRR: 50667	x	x	x	x	x	Note 3
208	+MRR: 53333	x	x	x	x	x	Note 3
209	+MRR: 54667	x	x	x	x	x	Note 3
210	+MRR: 2533	3	x	x	x	x	
211	+MRR: 26667	x	x	x	x	x	
212	+MRR: 25333	x	x	x	x	x	
213	+MRR: 22666	x	x	x	x	x	

Notes:
1. An 'x' in a column indicates that the message (either the long form if verbose, or the value only for short form) will be generated when that particular value of 'n' (shown at the top of the column) has been selected by the use of ATXn. If the column is blank, then no message will be generated for that x option. A numeral indicates which less explicit message (verbose or short form) will be output for that X option. (Also, see Section 3.3).
2. V.34, V.90, and V.92 models only.
3. V.90 and V.92 models only.

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&C - RLSD (DCD) Option

The modem controls the RLSD output in accordance with the parameter supplied. The parameter value, if valid, is written to S21 bit 5.

Syntax

&C<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   RLSD remains ON at all times.

1   RLSD follows the state of the carrier. (Default.)

Result Codes

OK   0 or 1.
ERROR   Otherwise.

&D - DTR Option

This command interprets the ON to OFF transition of the DTR signal from the DTE in accordance with the parameter supplied. The parameter value, if valid, is written to S21 bits 3 and 4. Also, see S25.

Syntax

&D<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   DTR drop is interpreted according to the current &Qn setting as follows:

&Q0, &Q5, &Q6: DTR is ignored (assumed ON). Allows operation with DTEs which do not provide DTR.

&Q1: DTR drop causes the modem to hang up. Auto-answer is not affected.

&Q2 &Q3: DTR drop causes the modem to hang up. Auto-answer is inhibited.

1   DTR drop is interpreted according to the current &Qn setting as follows:

&Q0, &Q1, &Q5, &Q6: DTR drop is interpreted by the modem as if the asynchronous escape sequence had been entered. The modem returns to asynchronous command state without disconnecting.

&Q2 &Q3: DTR drop causes the modem to hang up. Auto-answer is inhibited.

2   DTR drop is interpreted according to the current &Qn setting as follows:

&Q0 through &Q6: DTR drop causes the modem to hang up. Auto-answer is inhibited. (Default.)

3   DTR drop is interpreted according to the current &Qn setting as follows:

&Q0, &Q1, &Q5, &Q6: DTR drop causes the modem to perform a soft reset as if the Z command were received. The &Y setting determines which profile is loaded.

&Q2 &Q3: DTR drop causes the modem to hang up. Auto-answer is inhibited.

If &Q5 or &Q6, is in effect, the action taken is the same as for &Q0.

&K - Flow Control

This command defines the DTE/DCE (terminal/modem) flow control mechanism. The parameter value, if valid, is written to S39 bits 0, 1, and 2.

Syntax

&K<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   Disables flow control.

3   Enables RTS/CTS flow control. (Default for data modem modes.)

4   Enables XON/XOFF flow control.

5   Enables transparent XON/XOFF flow control.

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Result Codes

OK	\<value\> = 0, 3, 4, or 5.
ERROR	Otherwise.

&M - Asynchronous/Synchronous Mode Selection

This command determines the DTR operating mode. The modem treats the &M command as a subset of the &Q command.

Syntax

&M\<value\>

Defined Values

\<value\>   Decimal number corresponding to the selected option.

0   Selects direct asynchronous operation. The command sequence &M0\N0 selects normal buffered mode, but the command sequence \N0&M0 selects direct mode. This is because the \N0 command is analogous to the &Q6 command. The value 000b is written to S27 bits 3, 1, and 0, respectively. (See &Q).

1   Selects synchronous connect mode with async off-line command mode. The value 001b is written to S27 bits 3, 1, and 0, respectively. (Serial interface operation only.)

2   Selects synchronous connect mode with async off-line command mode. Same as &M1 except that &M2 enables DTR dialing of directory slot 0. The modem will disconnect if DTR is OFF for more than the period in S25 (in units of hundredths of a second): the data connection will be synchronous. The value 010b is written to S27 bits 3, 1, and 0, respectively. (Serial interface operation only.)

3   Selects synchronous connect mode. This mode allows DTR to act as a talk/data switch. The call is manually initiated while DTR is inactive. When DTR becomes active, the handshake proceeds in originate or answer mode according to S14 bit 7. The value 011b is written to S27 bits 3, 1, and 0, respectively. (Serial interface operation only.)

Result Codes

OK	\<value\> = 0 to 3
ERROR	Otherwise.

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&Q - Sync/Async Mode

This command is an extension of the &M command and is used to control the connection modes permitted. It is used in conjunction with S36 and S48. (Also, see \N.)

NOTE: When the &Q0 to &Q3 command is issued to select the mode, the subsequent connect message will report the DCE speed regardless of the W command and S95 settings.

Syntax

&Q<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   Selects direct asynchronous operation. The value 000b is written to S27 bits 3, 1, and 0, respectively. See &M0.

1   Selects synchronous connect mode with async off-line command mode. The value 001b is written to S27 bits 3, 1, and 0, respectively. See &M1. (Serial interface operation only.)

2   Selects synchronous connect mode with async off-line command mode and enables DTR dialing of directory 0. The value 010b is written to S27 bits 3, 1, and 0, respectively. See &M2. (Serial interface operation only.)

3   Selects synchronous connect mode with async off-line command mode and enables DTR to act as Talk/Data switch. The value 011b is written to S27 bits 3, 1, and 0, respectively. See &M3. (Serial interface operation only.)

5   The modem will try to negotiate an errorcorrected link. The modem can be configured using S36 to determine whether a failure will result in the modem returning on-hook or will result in fallback to an asynchronous connection. The value 101b is written to S27 bits 3, 1, and 0, respectively. (Default.)

6   Selects asynchronous operation in normal mode (speed buffering). The value 110b is written to S27 bits 3, 1, and 0, respectively.

Result Codes

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OK   <value> = 0 to 3, 5, or 6
ERROR   Otherwise.

&R - RTS/CTS Option

This selects how the modem controls CTS. CTS operation is modified if hardware flow control is selected (see &K command). The parameter value, if valid, is written to S21 bit 2.

Syntax

&R<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   In sync mode, CTS tracks the state of RTS; the RTS-to-CTS delay is defined by S26. In async mode, CTS is normally ON and will turn OFF only if required by flow control.

1   In sync mode, CTS is always ON (RTS transitions are ignored). In async mode, CTS is normally ON and will turn OFF only if required by flow control.

Result Codes

OK   <value> = 0 or 1.
ERROR   Otherwise.

&S - DSR Override

This command selects how the modem will control DSR. The parameter value, if valid, is written to S21 bit 6.

Syntax

&S<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   DSR will remain ON at all times. (Default.)

1   DSR will become active after answer tone has been detected and inactive after the carrier has been lost.

Result Codes

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OK   <value> = 0 or 1.
ERROR   Otherwise.

+IPR - Fixed DTE Rate

This numeric extended-format parameter specifies the data rate at which the modem will accept commands during online operation. It may be used to select operation at rates at which the modem 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 modem. 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 Normal Mode (Direct Mode) of operation is selected.

Syntax

> +IPR=<rate>

Defined Values

> <rate>   Specifies the DTE-modem interface operation rate in bits/s. The available rates are: 0, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, or 230400
>
> If unspecified or set to 0, automatic detection is selected and the character format is also forced to autodetect, +ICF=0.
>
> If the rate specified is not supported by the modem, an ERROR result code will be returned

Reporting Current or Selected Values

Command: +IPR?

Response: +IPR: <rate>

Example 1: +IPR: 0   For automatic rate detection.

Example 2: +IPR: 115200   For 115200 bps.

Reporting Supported Range of Parameter Values

Command: +IPR=?

Response: +IPR (<rate> range)

Example: +IPR: (0,300,1200,2400,4800,9600,19200,38400,57600,115200, 230400)

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+IFC - DTE-Modem Local Flow Control

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

Syntax

+IFC=[<modem_by_DTE>[,<DTE_by_modem>]]

Defined Values

<modem_by_DTE>   Specifies the method to be used by the DTE to control the flow of received data from the modem.

0	None.
1	XON/XOFF on transmitted data (XON/XOFF on transmit data); do not pass XON/XOFF characters to the remote modem.
2	Circuit 133 (Ready for Receiving). (Default.)
3	DC1/DC3 on circuit 103 (Transmitted Data) with DC1/DC3 characters being passed through to the remote DCE in addition to being acted upon for local flow control

<DTE_by_modem>   Specifies the method to be used by the modem to control the flow of transmitted data from the DTE.

0	None.
1	XON/XOFF on received data.
2	CTS/RTS. (Default.)

Reporting Current or Selected Values

Command: +IFC?

Response: +IFC: <modem_by_DTE>,<DTE_by_modem>

Example: +IFC: 2,2   For the defaults.

Reporting Supported Range of Parameter Values

Command: +IFC=?

Response: +IFC: (<modem_by_DTE> range),(<DTE_by_modem> range)

Example: +IFC: (0-3),(0-2)

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+IBC – In Band Commands

This command provides a mechanism by which an in-band secondary channel may be implemented. This in-band secondary channel can be utilized to transparently exchange commands and responses to/from the modem during a data connection. This is an alternative approach to using the +++ escape sequence. The +IBC command also provides a mechanism to exchange V.24 signaling via the secondary channel. The primary reason the In Band Channel is implemented is to retrieve Caller ID type II information.

The supported In Band Channel command is compatible with the ITU-T V.80 standard but is not a full V.80 implementation. TheV.80 protocol supported is described below. Portions of the V.80 protocol not described are not supported. Please refer Section 7 of the ITU-T V.80 standard for more details.

Syntax

+IBC=<IB>,<105>,<106>,<107>,<108>,<109>,<110>,<125>,<132>,<133>,<135>, <142>,<hook>

Defined Values

<IB>   Enables or disables in-band control sequence.

              0   Disable in-band control sequences.

              1   Enable 7-bit in-band control sequences. Ignore eighth bit.

              2   Enable 8-bit in-band control sequences.

<105>   Enables or disables circuit number 105: RTS (Ready to Send).

              0   Disable in-band reporting for this circuit.

              1   Enable in-band reporting for this circuit.

<106>   Enables or disables circuit number 106: CTS (Clear to Send).

              0   Disable in-band reporting for this circuit.

              1   Enable in-band reporting for this circuit.

<109>   Enables or disables circuit number 109: DCD (Data Carrier Detect).

              0   Disable in-band reporting for this circuit.

              1   Enable in-band reporting for this circuit.

<125>   Enables or disables circuit number 125: RI (Ring Indicate).

              0   Disable in-band reporting for this circuit.

                      1   Enable in-band reporting for this circuit.

<other> Not supported; leave '0' for the unsupported circuit types.

<hook> Not supported; leave '0'.

Reporting Current or Selected Values

Command: +IBC?

Response: +IBC=<value>,<value>,<value>,0,0,<value>,0,<value>,0,0,0,0,0

Example: +IBC=0,0,0,0,0,0,0,0,0,0,0,0,0

Reporting Supported Range of Parameter Values

Command: +IBC=?

Response: +IBC: (0-2),(0-1),(0-1),0,0,(0-1),0,(0-1),0,0,0,0,0

Entering and Exiting In Band Active State

In Band Command mode will be active only when a modem connection has been made and DCD is on and the modem is not in command mode. Upon a data connection before the connect message is sent, an In Band message will be sent to the DTE to notify that all further data will be EM shielded and should be filtered. Any other time (i.e., command mode or idle mode) the DTE should allow all user data to be in pass-through mode in which the data is unfiltered.

The DTE will receive one of the following active messages:

EM<60h><26h><62h>+IBC:1 to indicate In Band is active and the server is V.92

EM<60h><26h><62h>+IBC:2 to indicate In Band is active and the server is non-V.92

Upon Hang up or escape to command mode, the In Band command mode will end and the DTE should stop filtering EM data and return to pass-through mode.

The DTE will receive the following inactive In Band message:

    EM<60h><26h><62h>+IBC:0 to indicate In Band is inactive

EM Shielding Data

When in-band control sequences are enabled, the DTE and the modem must shield and filter data containing EM. In V.80, in-band data is shielded from normal data by an EM character represented by a <19h> or <99h>. If the DTE's data contains an EM, an additional character is inserted.

For example, sending <19h> from the DTE to the modem requires inserting a <singleEM> or <5Ch> into the data stream (e.g., <19h><5Ch>). The modem encodes this as one <19h> in the user data. On the other hand, sending <19h> from the modem to the DTE requires inserting a <singleEM> or <7Ch>. See Table 3-2. Please refer to the V.80 standard for more information.

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Table 3-2. Supported V.80 Commands

Command	Hex Codes	Description
Supported V.80 DTE-to-DCE Commands	
<extend0> <length> <control> <rest of command>	<40h> <42h>	The DCE decodes this as a sequence of 3 + (<length>-1Fh).
<105off> <105on>	<42h> <43h>	Circuit 105 is OFF. Circuit 105 is ON.
<singleEMp> <doubleEMp>	<58h> <59h>	The DCE decodes this as one <99h> in user data. The DCE decodes this as <99h><99h> in user data.
<singleEM> <doubleEM>	<5Ch> <5Dh>	The DCE decodes this as on <19h> in user data. The DCE decodes this as <19h><19h> in user data.
<poll>	<5Eh>	The DCE decodes this command and deliver a set of status commands, one for each circuit enabled.
Supported V.80 DCE-to-DTE Commands	
<extend0> <length> <status> <rest of command>	<60h> <62h>	The DCE decodes this as a sequence of 3 + (<length>-1Fh).
<106off> <106on>	<62h> <63h>	Circuit 106 is OFF. Circuit 106 is ON.
<109off> <109on>	<66h> <67h>	Circuit 109 is OFF. Circuit 109 is ON.
<125off> <125on>	<6Ah> <6Bh>	Circuit 125 is OFF. Circuit 125 is ON.
<singleEMp> <doubleEMp>	<76h> <77h>	The DCE encodes this as one <99h> in user data. The DCE encodes this as <99h><99h> in user data.
<singleEM> <doubleEM>	<7Ch> <7Dh>	The DCE encodes this as on <19h> in user data. The DCE encodes this as <19h><19h> in user data.

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In band processing of AT commands

When in-band control sequences are enabled, the modem responds to EM shielded AT commands via the extend-0 CONTROL sequence. This command may be used to transmit any AT commands to the modem as follows:

EM <extend-0> <length> <CONTROL> <AT Command without AT and trailing carriage return>

Upon receipt of an in-band command, the modem responds with the extend-0 STATUS REPORT sequence. This sequence will contain the response to the AT command issued via the CONTROL sequence with the trailing <cr> <lf> omitted:

EM <extend-0> <length> <STATUS> <AT Command response without trailing LF>

Example: Send +VRID=2 command to the modem and respond with terse caller ID:

EM <60h> <27h> <42h> +VRID=2

Note: <length> is 27h corresponding to 27h-1Fh=8. This is the length of the sequence following the <length> octet.

The modem responds to this command by transmitting the caller ID information to the DTE via the in-band sequence:

EM <60h> <length> <62h> <raw caller ID information>

EM<60h><22h><62h>OK

In this case, the <length> octet is the actual length of the raw caller ID + 1 + 1Fh.

In band signaling of CTS and Ring Indicate (Circuit 106 and Circuit 125)

Whenever the V.24 circuit selected via the +IBC command changes, the modem will send an unsolicited EM shielded frame to the DTE to inform the DTE of the new state. This is used for CTS and RI. For MOH applications, the DTE is specifically interested in circuit 125 (Ring Indicate).

When RI is asserted, the sequence EM <125on> or 19h 6Bh is sent to the DTE.

When RI is de-asserted, the sequence EM <125off> or 19h 6Ah is sent to the DTE.

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3.2.3 Call Control

D - Dial

This command directs the modem to go on-line, dial according to the string entered and attempt to establish a connection. If no dial string is supplied, the modem will go on-line and attempt the handshake in originate mode.

NOTE: If the ATD command is issued before the S1 register has cleared, the modem will respond with the NO CARRIER result code.

If +FCLASS=0 is selected, the modem will behave as a data modem and will attempt to connect to another data modem. The modem will have up to the period of time specified by register S6 or S7 to wait for carrier and complete the handshake. If this time expires before the modem can complete the handshake, the modem will go on-hook with the NO CARRIER response. This command will be aborted in progress upon receipt of any DTE character before completion of the handshake.

Dial Modifiers

The valid dial string parameters are described below. Punctuation characters may be used for clarity, with parentheses, hyphen, and spaces being ignored.

Syntax

   D<string>

Defined Values

   <string>   Character string corresponding to the selected option(s).

0-9	DTMF digits 0 to 9.
*	The 'star' digit (tone dialing only).
#	The 'gate' digit (tone dialing only).
A-D	DTMF digits A, B, C, and D. Some countries may prohibit sending of these digits during dialing.
L	Re-dial last number: the modem will re-dial the last valid telephone number. The L must be immediately after the D with all the following characters ignored).
P	Select pulse dialing: pulse dial the numbers that follow until a "T" is encountered. Affects current and subsequent dialing. Some countries prevent changing dialing modes after the first digit is dialed.

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T Select tone dialing: tone dial the numbers that follow until a "P" is encountered. Affects current and subsequent dialing. Some countries prevent changing dialing modes after the first digit is dialed.

R This command will be accepted, but not acted on.

S=n Dial the number stored in the directory (n = 0 to 3). (See &Z.)

! Flash: the modem will go on-hook for a time defined by the value of S29. Country requirements may limit the time imposed.

W Wait for dial tone: the modem will wait for dial tone before dialing the digits following "W". If dial tone is not detected within the time specified by S7 (US) or S6 (W-class), the modem will abort the rest of the sequence, return on-hook, and generate an error message.

@ Wait for silence: the modem will wait for at least 5 seconds of silence in the call progress frequency band before continuing with the next dial string parameter. If the modem does not detect these 5 seconds of silence before the expiration of the call abort timer (S7), the modem will terminate the call attempt with a NO ANSWER message. If busy detection is enabled, the modem may terminate the call with the BUSY result code. If answer tone arrives during execution of this parameter, the modem handshakes.

& Wait for credit card dialing tone before continuing with the dial string. If the tone is not detected within the time specified by S7 (US models) or S6 (W-class models), the modem will abort the rest of the sequence, return on-hook, and generate an error message.

, Dial pause: the modem will pause for a time specified by S8 before dialing the digits following ",".

; Return to command state. Added to the end of a dial string, this causes the modem to return to the command state after it processes the portion of the dial string preceding the ";". This allows the user to issue additional AT commands while remaining off-hook. The additional AT commands may be placed in the original command line following the ";" and/or may be

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entered on subsequent command lines. The
modem will enter call progress only after an
additional dial command is issued without the ";"
terminator. Use "H" to abort the dial in progress,
and go back on-hook.

^   Toggles calling tone enable/disable: applicable to
current dial attempt only.

( )   Ignored: may be used to format the dial string.

-       Ignored: may be used to format the dial string.

\<space\> Ignored: may be used to format the dial string.

\<i\>   Invalid character: will be ignored.

\>   If enabled by country specific parameter, the
modem will generate a grounding pulse on the
EARTH relay output.

T - Set Tone Dial Default

This command forces DTMF dialing until the next P dial modifier or P command is
received. The modem will set an S-Parameter bit to indicate that all subsequent dialing
should be conducted in tone mode. The DP command will override this command. Clears
S14 bit 5.

This command may not be permitted in some countries. (See P.)

Result Code
OK

P - Set Pulse Dial Default

This command forces pulse dialing until the next T dial modifier or T command is
received. Sets S14 bit 5.

As soon as a dial command is executed which explicitly specifies the dialing mode for
that particular call (e.g., ATDT...), this command is overridden so that all future dialing
will be tone dialed. (See T command.)

This command may not be permitted in some countries.

Result Code
OK

A - Answer

The modem will go off-hook and attempt to answer an incoming call if correct conditions
are met. Upon successful completion of answer handshake, the modem will go on-line in

answer mode. This command may be affected by the state of Line Current Sense, if enabled. (Most countries do not require Line Current Sense.) Operation is also dependent upon +FCLASS command and country-specific requirements.

If +FCLASS=0 is selected, the modem will enter the connect state after exchanging carrier with the remote modem. If no carrier is detected within a period specified in register S7, the modem hangs up. Any character entered during the connect sequence will abort the connection attempt.

H - Disconnect (Hang-Up)

This command initiates a hang up sequence.

This command may not be available for some countries due to PTT restrictions.

Syntax

H<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   The modem will release the line if the modem is currently on-line, and will terminate any test (AT&T) that is in progress. Country specific, modulation specific, and error correction protocol specific (S38) processing is handled outside of the H0 command.

1   If on-hook, the modem will go off-hook and enter command mode. For US models, the modem will remain off-hook. For W-class models, the modem will return on-hook after a period of time determined by S7.

Result Codes

OK	<value> = 0 or 1.
ERROR	Otherwise.

O - Return to On-Line Data Mode

This command determines how the modem will enter the on-line data mode. If in the online command mode, the modem enters the on-line data mode with or without a retrain. If in the off-line command mode (no connection), the modem reports ERROR.

Syntax

O<value>

Defined Values

<value>		Decimal number corresponding to the selected option.
	0	Enters on-line data mode without a retrain. Handling is determined by the Call Establishment task. Generally, if a connection exists, this command connects the DTE back to the remote modem after an escape (+++).
	1	Enters on-line data mode with a retrain before returning to on-line data mode.
	2	Fast retrain without speed change (used for diagnostic purpose only).
	3	Renegotiate rate without speed change (used for diagnostic purpose only.
	4	Renegotiate rate down one speed (used for diagnostic purpose only).
	5	Renegotiate rate up one speed (used for diagnostic purpose only).

Result Codes

OK	<value> = 0 to 5 and a connection exists.
ERROR	Otherwise or if not connected.

L - Speaker Volume

This command sets the speaker volume control. The parameter value, if valid, is written to S22 bits 0 and 1.

Syntax

L<value>

Defined Values

<value>		Decimal number corresponding to the selected option.
	0	Low volume.
	1	Low volume.
	2	Medium volume. (Default.)
	3	High volume.

Result Codes

OK	<value> = 0 to 3.
ERROR	Otherwise.

M - Speaker Control

This command selects when the speaker will be on or off. The parameter value, if valid, is written to S22 bits 2 and 3.

Syntax

M<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   Speaker is always off.

1   Speaker is on during call establishment, but off when receiving carrier. (Default.)

2   Speaker is always on.

3   Speaker is off when receiving carrier and during dialing, but on during answering.

Result Codes

OK   <value> = 0 to 3.
ERROR   Otherwise.

&G - Select Guard Tone

This command causes the modem to generate the guard tone selected by this command (DPSK modulation modes only). The parameter value, if valid, is written to S23 bits 6 and 7.

Syntax

&G<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   Disables guard tone. (Default.)

1   Selects 550 Hz guard tone.

2   Selects 1800 Hz guard tone.

This command may not be permitted in some countries.

Result Codes

OK   <value> = 0 to 2.
ERROR   Otherwise.

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&P - Select Pulse Dial Make/Break Ratio

This command determines the make/break ratio used during pulse dialing. The default is country-dependent. The parameter value, if valid, is written to S28 bits 3 and 4.

Syntax

&P<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   Selects 39%-61% make/break ratio at 10 pulses per second. (Default.)

1   Selects 33%-67% make/break ratio at 10 pulses per second.

2   Selects 39%-61% make/break ratio at 20 pulses per second.

3   Selects 33%-67% make/break ratio at 20 pulses per second.

Result Codes

OK   <value> = 0 to 3.
ERROR   Otherwise.

&V - Display Current Configuration and Stored Profiles

This command reports the current (active) configuration, the stored (user) profiles, and the first four stored telephone numbers. The stored profiles and telephone numbers are not displayed if the NVRAM is not installed or is not operational as detected by the NVRAM test during reset processing.

Result Code

OK

Example:

```
AT&V
ACTIVE PROFILE:
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5
&R1 &S0 &T5 &X0 &Y0
S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002
S07:050 S08:001 S09:006
S10:014 S11:085 S12:050 S18:000 S25:005 S26:001 S36:007
S38:020 S46:138 S48:007

S95:000
STORED PROFILE 0:
```

```
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5
&R1 &S0 &T5 &X0
S00:000 S02:043 S06:002 S07:050 S08:001 S09:006 S10:014
S11:085 S12:050 S18:000
S36:007 S40:104 S41:195 S46:138 S95:000

STORED PROFILE 1:
B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5
&R1 &S0 &T5 &X0
S00:000 S02:043 S06:002 S07:050 S08:001 S09:006 S10:014
S11:085 S12:050 S18:000
S36:007 S40:168 S41:195 S46:138 S95:000

TELEPHONE NUMBERS:
0 = 1 =
2 = 3 =

OK
```

&V1 - Display Last Connection Statistics

Displays the last connection statistics in the following format (shown with typical results):

```
TERMINATION REASON.......... NONE
LAST TX rate................ 26400 BPS
HIGHEST TX rate............. 26400 BPS
LAST RX rate................ 50667 BPS
HIGHEST RX rate............. 50667 BPS
PROTOCOL.................... LAPM
COMPRESSION................. V44
Line QUALITY................ 015
Rx LEVEL.................... 013
Highest Rx State............ 67
Highest TX State............ 67
EQM Sum..................... 008A
RBS Pattern................. 04
Rate Drop................... 00
Digital Loss................ 2000
Local Rtrn Count............ 00
Remote Rtrn Count........... 00
V90
```

TERMINATION REASON: Call termination reason.

LAST TX rate: Last transmit speed achieved.

HIGHEST TX rate: Highest transmit speed achieved.

LAST RX rate: Last receive speed achieved.

HIGHEST RX rate: Highest transmit rate achieved.

PROTOCOL: Error correction protocol.

COMPRESSION: Data compression protocol.

Line QUALITY: Quantitative measure of the line quality. A value of 0 indicates no quality degradation.

Rx LEVEL: Indicates receive level in dBm.

Highest Rx State: Highest handshake receiver state (modulation dependant).

Highest TX State: Highest handshake transmitter state (modulation dependant).

EQM Sum: Eye Quality Monitor Sum. Used by the modem to determine the speed selection.

RBS Pattern: Indicates the robbed bit pattern (least significant 6 bytes), e.g., 03 indicates 2 robbed bits in positions 0 and 1.

Rate Drop: Indicates speed rate drops from the attempted speed.

Digital Loss: Indicates loss in dB caused by digital pads.

Local Rtrn Count: Number of retrains initiated by the modem.

Remote Rtrn Count: Number of retrains initiated by the remote modem.

V90: Indicates connection mode.

\V - Single Line Connect Message Enable

This command enables or disables the single line connect message format as follows:

Syntax

   \V<value>

Defined Values

   <value>   Decimal number corresponding to the selected option.

   0   Connect messages are controlled by the command settings X, W, and S95.

   1   Connect messages are displayed in the single line format described below subject to the command settings V (Verbose) and Q (Quiet). In Non-Verbose mode (V0), single line connect messages are disabled and a single numeric result code is generated for CONNECT DTE.

When single line connect messages are enabled, there are no CARRIER, PROTOCOL (+ER:), or COMPRESSION (+DR:) messages apart from the fields described below.

The single line connect message format is:

   CONNECT <DTE Speed>/<Modulation>/<Protocol>/<Compression>/
   <Line Speed>

Where:

DTE Speed =	DTE speed, e.g., 57600.
Modulation =	"V92" for V.92 modulation. "V90" for V.90 modulation. "V34" for V.34 modulation. "V32" for V.32 or V.32bis modulation. Note: Modulation is omitted for all other modulations.
Protocol =	"NONE" for no protocol. "ALT" for Microcom Network Protocol. "LAPM" for LAP-M protocol.
Compression =	"V44" for V.44 compression. "V42B" for V.42bis compression. "ALT" for Microcom MNP5 compression. Note: Compression is omitted if protocol is NONE.
Line Speed =	Asymmetric rates are displayed as "/rate:TX/rate:RX", e.g., /1200 TX/75 RX. Symmetric rates are displayed as a single DCE rate, e.g., 14400.

%L - Report Line Signal Level

Returns a value which indicates the received signal level. The value returned is a direct indication (DAA dependent) of the receive level at the MDP, **not** at the telephone line connector. For example, 009 = -9 dBm, 043 = -43 dBm, and so on.

Result Codes

OK	If connected.
ERROR	If not connected..

%Q - Report Line Signal Quality

Reports the line signal quality (DAA dependent). Returns the higher order byte of the EQM value. Based on the EQM value, retrain or fallback/fall forward may be initiated if enabled by %E1 or %E2.

Example:

    AT%Q

    015

Result Codes

OK	If connected.
ERROR	If not connected, or connected in 300 bps or V.23 mode.

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*B - Display Blacklisted Numbers

This command requests the modem to return a list of blacklisted numbers to the DTE. The format of the response is shown by the example below. Permanently forbidden numbers as defined by country requirements will not appear on this list. If no numbers are blacklisted, only the OK result code is issued.

Syntax

    *B

Example

```
NO. - PHONE NUMBER -
------ ------------------------------
1; 4175537660
2; 8288924961
3; 3887278862
4; 3124839442
5; 6284664
OK
```

*D - Display Delayed Numbers

This command causes the modem to send a list of the delayed numbers together with the delay associated with each. The modem will return a list of delayed telephone numbers as defined in the *B command. The format of the response is shown by the example below (delay times are shown as hours:minutes:seconds). If no numbers are delayed, only the OK result code is issued.

Syntax

    *D

Example

```
NO. - PHONE NUMBER -DELAY
------ -------------------------------------------
1; 8264734660 2:00:00
2; 7532634661 2:00:00
3; 2587334662 0:02:00
4; 7532651663 0:03:25
5; 7459931664 0:01:45
OK
```

Data Connect Enterprise

–SLP= - Set Low Power Mode (Serial Only)

This command sets the modem low power mode entered when no line connection exists or when no host activity occurs for the period specified in the S24 register.

Syntax

-SLP=<value>

Defined Values

<value>   Decimal number corresponding to the selected option:

0 =   Idle mode. The CPU and SPX clocks stop, and the SSD clock runs at low frequency. The modem can detect and qualify ring signals and process AT commands. The modem returns to normal mode upon receiving an AT command or receiving a qualified ring.

1 =   Sleep mode. The SPX clock stops, and the CPU and SSD clocks run at low frequency. The modem can detect and qualify ring signals. The modem cannot process AT commands. The modem can be awakened by the host sending a single (any) character (typically followed by an AT command) or by the modem receiving a qualified ring.

2 =   Deep Sleep mode. The SPX and SSD clocks stop, and the CPU clock runs at low frequency. The modem can detect and qualify ring signals. The modem cannot process AT commands. The modem can be awakened by the host sending a single (any) character (typically followed by an AT command) or by the modem receiving a qualified ring.

3 =   Stop mode. The CPU, SPX and SSD clocks stop. The modem cannot process AT commands and cannot detect and qualify ring signals. The modem can be awakened by the host sending a single (any) character (typically followed by an AT command).

Result Codes

OK   <value> = 0-3
ERROR   Otherwise.

Data Connect Enterprise

–STE= - Set Telephony Extension

The –STE command enables/disables Line In Use, Extension Pickup, and Remote Hangup detection features.

Note: Additional hardware may be required to support these features.

Syntax

-STE=<value>

Defined Values

<value>   Decimal number corresponding to the selected bit-mapped options. The bit fields are defined as follows:

Bit 0 Line In Use detection enable/disable.

Bit 1 Extension Pickup detection enable/disable.

Bit 2 Remote Hangup detection enable/disable.

<value> (Dec.)	Remote Hangup	Extension Pickup	Line In Use
0 (default)	Disabled	Disabled	Disabled
1	Disabled	Disabled	Enabled
2	Disabled	Enabled	Disabled
3	Disabled	Enabled	Enabled
4	Enabled	Disabled	Disabled
5	Enabled	Disabled	Enabled
6	Enabled	Enabled	Disabled
7	Enabled	Enabled	Enabled

Reporting Current or Selected Values

Command: -STE?

Response: -STE: <value>

Example: -STE: 4   Remote Hangup enabled, Extension Pickup disabled, and Line In Use disabled.

Reporting Supported Range of Parameter Values

Command: -STE=?   Show available options.

Response: -STE: 0-7

Result Codes

OK   <value> = 0-7
ERROR   Otherwise.

Data Connect Enterprise

Behavior in Data Mode (+FCLASS=0) and Fax Mode (+FCLASS=1, 1.0)

When on-hook, if the line is in use and an ATDT is issued, the modem will not go offhook and will return with the message LINE IN USE.

When off-hook and either an extension is picked up or a line reversal is detected, the modem will drop the connection. The disconnect reason in register S86=25 (this is also defined for #UD). The user must flash the hook in order to get a dial tone due because the remote server will be retraining.

If the local handset is picked up while the modem is off-hook, the modem will do a linkdisconnect, flash the hook for 1.5 seconds, then connect the local handset to the line. At this point, the user dial tone should be on the local handset. The disconnect reason in S86=25.

Behavior in Voice Mode (+FCLASS=8)

When in voice mode and an extension is picked-up, a <DLE>P is sent to the DTE. When the modem is off-hook , a line reversal may also be detected in which case a <DLE>l is sent to the DTE.

In voice mode, there is no blocking of ATDT when the line is in use. Also, there is no automatic hang-up in voice mode as in data mode. There is only the above stated <DLE> shielding event reporting.

Operation in Data Mode

Line In Use (Enabled by AT-STE=1, AT-STE=3, AT-STE=5, or AT-STE=7)

Case 1: Telephone Line is in Use

If an ATDT, ATDP or ATDL is issued while Line In Use detection is enabled and the telephone line is in use, the modem will immediately return the message LINE IN USE to the DTE without going off-hook, and then return to command mode.

Case 2: Telephone Line is in Use But Disconnected

If an ATDT, ATDP or ATDL is issued while Line In Use detection is enabled and the telephone line is NOT in use, the modem will go off-hook after a short pause, then respond with CONNECT or NO CARRIER message.

Case 3: Telephone Line is Not Connected to Modem

If an ATDT, ATDP or ATDL is issued while Line In Use detection is enabled and the telephone line is not connected, the modem will go off-hook momentarily, go back onhook, then respond with NO LINE message.

Extension Pick-up (Enabled by AT-STE=2, AT-STE=3, AT-STE=6, or ATSTE= 7):

Case 1: Modem off-hook, Local Handset Goes Off-Hook

If the local handset goes off-hook while the modem is in a data connection, the local handset will be muted. The modem will then send a GSTN Cleardown to the remote modem and then go on-hook. The modem will then send an OFF HOOK INTRUSION

---

message to the DTE. A result code of 25 will be left in S86 register. After 2 seconds, the local handset will be connected to the telephone line so the user hears the dial tone.

Case 2: Modem off-hook, Extension Pick-up

If the modem is connected and another extension goes off-hook, the modem will send a GSTN Cleardown to the remote modem and then immediately hang-up. Due to the noise possibly being added to the line when a telephone extension is picked-up, a GSTN Cleardown may or may not successfully be received by the remote mode. If the GSTN Cleardown is not received successfully by the remote modem, the remote modem may attempt a retrain until the retrain fails and the remote modem drops the line. In any case, the modem will send an OFF HOOK INTRUSION message to the DTE immediately after sending the GSTN Cleardown. A result code of 25 will be left in the S86 register.

Because the extension is off-hook, the modem cannot flash the hook for the central office to generate a dial tone. In this case, the user must flash the extension handset to obtain a dial tone.

Remote Hang-up (enabled by AT-STE=4, AT-STE=5, AT-STE=6, or AT-STE=7):

Case 1: Modem off-hook, Remote Hang-up

If the modem is connected (off-hook) and the remote modem/server goes hangs up, the central office may issue a line polarity reversal. If a line polarity reversal is detected, the modem will drop the call and respond with NO LINE REVERSAL DETECTED. The reason for hang-up can be determined by #UD or by S86=25. A line reversal can also be simulated by simply pulling out the telephone line during a connection.

Operation in Voice Mode

Line In Use (enabled by AT-STE=1, AT-STE=3, AT-STE=5, or AT-STE=7):

This feature does not apply in voice mode.

Extension Pickup (Enabled by AT-STE=2, AT-STE=3, AT-STE=6, or AT-STE=7)

If the modem is off-hook and an extension goes off-hook, the modem issues a <DLE>P to the DTE. The application software should then hang up the line (VLS=0).

Remote Hang-up (Enabled by AT-STE=4, AT-STE=5, AT-STE=6, or AT-STE=7)

If the modem is off-hook and the remote user goes on-hook, the modem issues a <DLE>P to the DTE. The application software should then hang up the line (VLS=0).

Examples
User is talking on an extension and the modem tries to dial

    AT-STE=7

    ATDT555-1212

    LINE IN USE

The line is not in use and the modem tries to dial

    AT-STE=7

    ATDT555-1212

                                        Modem goes off-hook

    CONNECT

An extension is off-hook but there is silence on the line and the modem tries to dial

    AT-STE=3

    ATDT555-1212

                                        Modem goes off-hook

    NO LINE

Modem is connected in data mode and an extension goes off-hook

    AT-STE=2

    ATDT555-1212

    CONNECT

    OFF HOOK INTRUSION   Extension is picked up, GSTN
                                Cleardown sent

    ATS86=?

    025

Modem is connected in data mode and remote modem goes on-hook

    AT-STE=4

    ATDT555-1212

    CONNECT

    OFF HOOK INTRUSION   Remote modem drops line

    ATS86=?

    025

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Modem is connected in data mode and the LOCAL HANDSET goes off-hook

AT-STE=7

ATDT555-1212   5 sec delay

CONNECT

LINE REVERSAL DETECTED   Local handset goes off-hook,
                                              GSTN Cleardown sent, and remote
                                              modem goes on-hook

ATS86=?

025

                                              500 ms after no carrier a dial tone
                                              is heard on the local handset

Modem is in answer machine mode and an extension goes off-hook

AT-STE=2

AT+FCLASS=8

OK

<DLE>h   Local handset on-hook

<DLE>R   Ring

AT+VLS=1

OK

AT+VSM=1,7200,0,0

AT+VTX   Starts to play greeting message

<DLE>P   User picks up extension

<DLE>!   DTE send abort to end playback

AT+VLS=0   DTE hangs up

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Automated system that needs to periodically use the line while giving the voice
user the highest priority

A common use for these features would be an automated system that needs to
periodically use the line while giving the voice user the highest priority.

The automated system would make a connection when the line is free. It would do this
without disturbing the line if the line is in use. The automated system would
periodically retry the connection until the line is free. Once the line is free it would dial
and make its connection. If a voice user wishes to use the line while the modem is
connected. The modem will drop the line and give the line to the user. The modem will
then try to regain control of the line by once again periodically retrying to establish a
connection.

AT-STE=7

OK

ATDT5551212

CONNECT

                                                    Sometime later, the user picks up
                                                    phone
NO CARRIER

ATS86?

25

OK

                                                    Delay 30 seconds

ATDT5551212

LINE IN USE

                                                    Try again some time later user
                                                    hangs up the phone

CONNECT

-TRV – Tip & Ring Voltage

This command allows the host to read the voltage that the modem sees across Tip &
Ring.

Syntax

   -TRV

Example

Command: AT-TRV

Response: 1.4
Note: The voltage measurement is read on the opposite of the diode bridge, so the modem assumes and compensates for the voltage drop across 2 diodes. Therefore, if no line is connected, the modem will report 1.4V.

-TTE - Threshold Adjustments for Telephony Extension

This command allows the host to set/tune the telephone extension features for the modem to determine Line In Use, Extension Pickup, Remote Hang-up, and Digital Line Protection and Line Interruption Immunity conditions. An ATZ or AT&F will load default values.

Syntax

-TTE=<Line In Use voltage drop threshold>, <Extension Pickup voltage drop threshold>, <Remote Hang-up voltage drop threshold>, <Digital Line Protection current threshold >, <Line Interruption Immunity >,<RESERVED>

Range: (0-9999) [1], (0-9999) [1], (0-9999) [1], (0-9999), (0-255), (0-255)

Units: 1/10 volt (first three parameters), 1 mA (fourth parameter), 100 ms (fifth parameter)

Defined Values

<Line In Use voltage drop threshold>[1]
        1000 = 10.00 V drop while modem is on-hook. (Default.)

<Extension Pickup voltage drop threshold>[1]
        150 = 1.50 V drop while modem is off-hook; this value must be less than the Remote Hang-up voltage drop threshold. (Default.)

<Remote Hang-up voltage drop threshold>[1, 2]
        500 = 5.00 V drop while modem is off-hook; this value must be greater than the Extension Pickup voltage drop threshold. (Default.)

<Digital Line Protection current threshold>
        160 = 160 mA while modem is off-hook (Default.):

<Line Interruption Immunity>
        0 = 200 ms (Default.)
        1 = 200 ms
        2 = 200 ms
        n (where n > 2) = n*100 ms

<RESERVED> 0 (Default.)

Reporting Current or Selected Value

Command: AT-TTE?   Queries current setting

Notes:
1. Thresholds are difference thresholds. Example: The line would be considered "in use" if the Tip & Ring voltage dropped by 10.00 V. Another Example: If the modem is off-hook and the voltage drops by more than 2.50 V, then the modem would consider the condition as an extension pickup.
2. The <Remote Hang-up voltage drop threshold> must always be less than the <Extension Pickup voltage drop threshold). Otherwise, the extension pickup will not function.

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3.2.4 Modulation Control Commands

+MS - Modulation Selection

This extended-format compound parameter controls the manner of operation of the modulation capabilities in the modem. It accepts six subparameters.

Syntax

+MS=[<carrier>[,<automode>[,<min_tx_rate>[,<max_tx_rate>[,<min_rx_rate> [,<max_rx_rate>]]]]]]

Where possible <carrier>, <min_tx_rate>, <max_tx_rate>, <min_rx_rate>, and <max_rx_rate> values are listed in Table 3-3.

Table 3-3. +MS Command Supported Rates

Modulation	<carrier>	Possible (<min_rx_rate>, <min_rx_rate>, (<min_tx_rate>), and <max_tx_rate>) Rates (bps)
Bell 103	B103	300
Bell 212	B212	1200 Rx/75 Tx or 75 Rx/1200 Tx
V.21	V21	300
V.22	V22	1200
V.22 bis	V22B	2400 or 1200
V.23	V23C	1200
V.32	V32	9600 or 4800
V.32 bis	V32B	14400, 12000, 9600, 7200, or 4800
V.34	V34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
V.90 V90		56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
V.92 downstream	V92	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
V.92 upstream	V92	48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000, 26667, 25333, 24000

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Defined Values

          `<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 take the form: `<letter><1-4 digits><other letters as needed>`. Defined values are listed in Table 3-3.

          `<automode>` A numeric value which enables or disables automatic modulation negotiation (e.g., ITU-T V.32*bis* Annex A or V.8).

          0 =   Automode disabled.

          1 =   Automode enabled. (Default.)

          `<min_rx_rate>` and `<max_rx_rate>`

Numeric values which specify the lowest (`<min_rx_rate>`) and highest (`<max_rx_rate>`) rate at which the modem may establish a receive connection. May be used to condition distinct limits for the receive direction as distinct from the transmit direction. Values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 3-3. Actual values will be limited to possible values corresponding to the entered `<carrier>` and fall-back `<carrier>` as determined during operation. (Default = lowest (`<min_rx_rate>`) and highest (`<max_rx_rate>`) rate supported by the selected carrier.)

          `<min_tx_rate>` and `<max_tx_rate>`

Numeric values which specify the lowest (`<min_tx_rate>`) and highest (`<max_tx_rate>`) rate at which the modem may establish a transmit connection. Non-zero values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 3-3. Actual values will be limited to possible values corresponding to the entered `<carrier>` and fall-back `<carrier>` as determined during operation. (Default = lowest (`<min_tx_rate>`) and highest (`<max_tx_rate>`) rate supported by the selected carrier.)

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Reporting Current or Selected Values

Command: +MS?

Response: +MS:<carrier>,<automode>,<min_tx_rate>, <max_tx_rate>,
            <min_rx_rate>,<max_rx_rate>

Note: The current active settings are reported under control of the +MR parameter.

Example: +MS: V92, 1,300,48000,300,56000

            For default values. This example allows maximum system flexibility to
            determine optimal receive and transmit rates during operation.

Reporting Supported Range of Parameter Values

Command: +MS=?

Response: +MS: (< carrier> range),(<automode> range),(<min_tx_rate> range),
            (<max_tx_rate> range), (<min_rx_rate> range), (<max_rx_rate> range)

Example: +MS: (B103,B212,V21,V22,V22B,V23C,V32,V32B,V34,
            V90,V92),(0,1),(300-33600),(300-48000),(300-56000),(300-56000)

Result Code

OK   Valid subparameter string
ERROR   Otherwise.

+MR - Modulation Reporting Control

This extended-format numeric parameter controls whether or not the extended-format
+MCR:<carrier> and +MRR:<rate> intermediate result codes are transmitted from the
modem to the DTE. If enabled, +MCR:<carrier> and +MRR:<rate> intermediate result
codes represent the current (negotiated or renegotiated) modulation <carrier> and
<rate>that are transmitted at the point during connect negotiation (handshaking) at
which themodem has determined which modulation and rate will be used, i.e., before
any Error Control or Data Compression reports are transmitted, and before any final
result code(e.g., CONNECT) is transmitted.

S95 bit 2 is reset to 0 for +MR=0 and is set to a 1 for +MR=1 or +MR=2. The more
recent setting of +MR or S95 bit 2, and the W command setting, determines
modulation
result code reporting (see S95 Parameter and W Command).

Syntax

    +MR=[<value>]

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Defined Values

<value>   A decimal number corresponding to the selected option:

0   Disables reporting of modulation connection (+MCR: and +MRR: are not transmitted). (Default.)

1   Enables reporting of modulation connection (+MCR: and +MRR: are transmitted with tx rate, rx rate).

2   Enables reporting of modulation connection (+MCR: and +MRR: are transmitted with rx rate only).

Reporting Current or Selected Values

Command: +MR?

Response: +MR: <current value>

Example: +MR: 0 For default setting

Reporting Supported Range of Parameter Values

Command: +MR=?

Response: +MR: (<value>range)

Example: +MR: (0-2)

+MCR: Report Syntax

Response: +MCR: <carrier>

<carrier>   Alphanumeric code corresponding to the reported carrier. Defined values are:

B103	For Bell 103
B212	For Bell 212
V21	For V.21
V22	For V.22
V22B	For V.22bis
V23C	For V.23
V32	For V.32
V32B	For V.32bis
V34	For V.34
V90	For V.90
V92	For V.92

+MRR: Report Syntax

Response: +MRR: <tx_rate>,<rx_rate>

    <tx_rate>   Decimal transmit rate in bits/s.

    <rx_rate>   Decimal receive rate in bits/s.

Example: +MRR: 28800, 48000

%E - Enable/Disable Line Quality Monitor and Auto-Retrain or
Fallback/Fall Forward

Controls whether or not the modem will automatically monitor the line quality and request a retrain (%E1) or fall back when line quality is insufficient or fall forward when line quality is sufficient (%E2). The parameter value, if valid, is written to S41 bits 2 and 6.

If enabled, the modem attempts to retrain for a maximum of 30 seconds.

Syntax

    %E<value>

Defined Values

<value>		Decimal number corresponding to the selected option.
	0	Disable line quality monitor and auto-retrain.
	1	Enable line quality monitor and auto-retrain.
	2	Enable line quality monitor and fallback/fall forward. (Default.)

Result Codes

OK	<value> = 0, 1, or 2.
ERROR	Otherwise.

Fallback/Fall Forward. When %E2 is active, the modem monitors the line quality (EQM). When line quality is insufficient, the modem will initiate a rate renegotiation to a lower speed within the V.34/V.32 bis/V.32 (RC336) modulation speeds. The modem will keep falling back within the current modulation if necessary until the speed reaches 2400 bps (V.34) or 4800 bps (V.32). Below this rate, the modem will only do retrains if EQM thresholds are exceeded. If the EQM is sufficient for at least one minute, the modem will initiate a rate renegotiation to a higher speed within the current modulation speeds. The rate renegotiations will be done without a retrain if a V.32 bis connection is established.

Speeds attempted during fallback/fall forward are those shown to be available in the rate sequences exchanged during the initial connection. Fallback/fall forward is available in error correction and normal modes, but not in direct mode or synchronous mode with external clocks.

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B - CCITT or Bell

When the modem is configured to allow either option, the modem will select Bell or CCITT modulation for a line speed connection of 300 or 1200 bps. Any other line speed will use a CCITT modulation standard. The parameter value, if valid, is written to S27 bit 6.

Syntax

B<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

0   Selects CCITT operation at 300 or 1200 bps during Call Establishment and a subsequent connection. (Default.)

1   Selects BELL operation at 300 or 1200 bps during Call Establishment and a subsequent connection.

Result Codes

OK   <value> = 0 or 1.
ERROR   Otherwise.

Data Connect Enterprise

3.2.5 Error Control Commands

+ES - Error Control and Synchronous Mode Selection

This extended-format command specifies the initial requested mode of operation when the modem is operating as the originator, optionally specifies the acceptable fallback mode of operation when the modem is operating as the originator, and optionally specifies the acceptable fallback mode of operation when the modem is operating as the answerer. It accepts three numeric subparameters:

Syntax

+ES=[<orig_rqst>[,<orig_fbk>[,<ans_fbk>]]]

Defined Values

<orig_rqst> Decimal number which specifies the initial requested mode of operation when the modem is operating as the originator. The options are:

0 Initiate call with Direct Mode.

1 Initiate call with Normal Mode (also referred to as Buffered Mode) only.

2 Initiate V.42 without Detection Phase. If V.8 is in use, disable V.42 Detection Phase.

3 Initiate V.42 with Detection Phase. (Default.)

4 Initiate MNP.

6 Initiate V.80 Synchronous Access Mode when connection is completed, and Data State is entered. (See +ESA and +ITF commands.)

7 Initiate Frame Tunneling Mode when connection is complete, and Data Mode is entered.

<orig_fbk> Decimal number which specifies the acceptable fallback mode of operation when the modem is operating as the originator.

0 LAPM, MNP, or Normal Mode error control optional. (Default.)

1 LAPM, MNP, or Direct Mode error control optional.

2 LAPM or MNP error control required; disconnect if error control is not established.

3 LAPM error control required; disconnect if error

control is not established.

| | 4 | MNP error control required; disconnect if error control is not established. |

<ans_fbk>   Decimal number which specifies the acceptable fallback mode of operation when the modem is operating as the answerer or specifies V.80 Synchronous Access Mode.

	0	Direct Mode.
	1	Error control disabled, use Normal Mode.
	2	LAPM, MNP, or Normal Mode error control optional. (Default.)
	3	LAPM, MNP, or Direct Mode error control optional.
	4	LAPM or MNP error control required; disconnect if error control is not established.
	5	LAPM error control required; disconnect if error control is not established.
	6	MNP error control required; disconnect if error control is not established.
	8	Initiate V.80 Synchronous Access Mode when connection is completed, and Data State is entered (see +ESA and +ITF commands).
	9	Initiate Frame Tunneling Mode when connection is complete, and Data Mode is entered.

Examples
+ES=6   Enable V.80 Synchronous Access Mode originator.
+ES=6   Enable V.80 Synchronous Access Mode originator.
+ES=,,8   Enable V.80 Synchronous Access Mode answerer.
+ES=6,,8 Enable V.80 Synchronous Access Mode originator and answerer.
+ES=3   Enable V.42 with Detection Phase originator. Disable V.80 Synchronous Access Mode originator.
+ES=,,2   Allow LAPM, MNP, or Normal Mode connection answerer. Disable V.80 Synchronous Access Mode answerer.
+ES=3,,2 Enable V.42 with Detection Phase originator, allow LAPM, MNP, or Normal Mode connection answer. Disable Synchronous Access Mode originator and answerer.

Reporting Current or Selected Values

Command: +ES?

Response: +ES: <orig_rqst>,<orig_fbk>,<ans_fbk>

Example: +ES: 3,0,2   For the default setting.

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+ES: 6,0,8   For V.80 Synchronous Access Mode
                                    originator and answerer.

Reporting Supported Range of Parameter Values
Command: +ES=?

Response: +ES: (<orig_rqst> range),(<orig_fbk> range), (<ans_fbk> range)

Example: +ES: (0-4,6,7),(0-4),(0-6,8,9)

+EB - Break Handling in Error Control Operation

This extended-format compound parameter controls the break handling in V.42
operation. It accepts three numeric subparameters:

Syntax

   +EB=[<break_selection>[,<timed>[,<default_length>]]]

Defined Values

   <break_selection>   Decimal number 0 specifying that break is to be ignored, i.e.,
                       not signaled to remote DCE.

   <timed>   Decimal number 0 specifying that any transmitted V.42
                       LSIGNAL will not indicate break signal length

   <default_length>   Decimal number 0 specifying that break is not delivered to the
                       DTE.

Reporting Current or Selected Values

Command: +EB?

Response: +EB: <break_selection>,<timed>,<default_length><CR>

Example: +EB: 0,0,0   For default settings.

Reporting Supported Range of Parameter Values

Command: +EB=?

Response: +EB: (<break_selection> range),(<timed> range),
             (default_length> range)

Example: +EB: (0),(0),(0)

+ESR - Selective Repeat

This extended-format numeric parameter controls the use of the selective repeat (SREJ)
option in V.42.

Syntax

+ESR=[<value>]

Decimal number 0 specifying that SREJ is not used.

Reporting Current or Selected Values:

Command: +ESR?

Response: +ESR: <value>

Example: +ESR: 0   For default setting

Reporting Supported Range of Parameter Values:

Command: +ESR=?

Response: +ESR: (<value>)

Example: +ESR: (0)

+EFCS - 32-bit Frame Check Sequence

This extended-format numeric parameter controls the use of the 16-bit or 32-bit frame check sequence (FCS) option in V.42.

Syntax

   +EFCS=[<value>]

Defined Values

   <value>   Decimal number 0 specifying the use of the 16-bit FCS
                     specified in V.42.

Reporting Current or Selected Values

Command: +EFCS?

Response: +EFCS: <value>

Example: +EFCS: 0   For default setting.

Reporting Supported Range of Parameter Values

Command: +EFCS=?

Response: +EFCS: (<value> range)

Example: +EFCS: (0)

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+ER - Error Control Reporting

This extended-format numeric parameter controls whether or not the extended-format +ER: intermediate result code is transmitted from the modem to the DTE.

S95 bit 3 is reset to 0 for +ER=0 and is set to a 1 for +ER=1. The more recent setting of +ER or S95 bit 3, and the W command setting, determines the actual error control result code reporting (see S95 Parameter and W Command).

Syntax

   +ER=[<value>]

Defined Values

   <value>   A decimal number corresponding to the selected error control option:

                         0 =   Error control reporting disabled (no +ER intermediate result code transmitted). (Default.)

                         1 =   Error control reporting enabled (+ER intermediate result code transmitted).

Reporting Current or Selected Values

Command: +ER?

Response: +ER: <current value>

Example: +ER: 0   for the default setting

Reporting Supported Range of Parameter Values

Command: +ER=?

Response: +ER: (<value> range)

Example: +ER: (0,1)

+ER: <type>

The +ER: <type> reported represents the current (negotiated or renegotiated) modem-modem error control type. If enabled, the intermediate result code is transmitted at the point during error control negotiation (handshaking) at which the modem 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 +ER intermediate result code, if enabled, is issued after the Modulation report (+MCR and +MRR) and before the Data Compression Report (+DR).

Syntax

+ER: <type>

Defined Values

<type>   An alphanumeric code corresponding to the selected protocol.

NONE   Error control is not in use.

LAPM   V.42 LAPM protocol is in use.

ALT   MNP is in use.

Example

+ER: LAPM

+ETBM - Call Termination Buffer Management

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

Syntax

+ETBM=[<pending_TD>[,<pending_RD>[,<timer>]]]

Defined Values

<pending_TD>   Decimal number 0 specifying that disconnect will occur immediately and all buffered transmit data will be discarded when the local DTE requests call disconnection.

<pending_RD>   Decimal number 0 specifying that disconnect will occur immediately and all buffered receive data will be discarded when the local DTE requests call disconnection.

<timer>   Decimal number 0 specifying that the modem will not attempt to deliver the buffered data before abandoning the attempt and discarding remaining data.

Reporting Current or Selected Values

Command: +ETBM?

Response: +ETBM: <pending_TD>,<pending_RD>,<timer>

Example: +ETBM: 0,0,0

Reporting Supported Range of Parameter Values

Command: +ETBM=?

Response: +ETBM: (<pending_TD> range),(<pending_RD> range), (<timer> range)

Example: +ETBM: (0),(0),(0)

\B - Transmit Break to Remote

In non-error correction mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100 ms according to parameter specified. If a number in excess of 9 is entered, 9 is used. The command works in conjunction with the \K command.

In error correction mode, the modem will signal a break through the active error correction protocol, giving no indication of the length.

Syntax

    \B<value>

Defined Values

    <value>   Decimal number corresponding to the selected option.

                       1-9   Break length in 100 ms units. (Default = 3.)
                                  (Non-error corrected mode only.)

Result Codes

    OK   If connected in data modem mode.

    NO CARRIER   If not connected in data modem mode.

Note: When the modem receives a break from the remote modem, break is passed to the DTE as follows: In non-error correction mode direct, the break length is passed; in nonerror correction mode normal and in error correction mode, a 300 ms break is passed.

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\K - Break Control

Controls the response of the modem to a break received from the DTE or the remote modem or the \B command. The parameter value, if valid, is written to S40 bits 3, 4, and 5.

Syntax

\K<value>

Defined Values

<value> Decimal number corresponding to the selected option.

The response is different in three separate states.

The **first state** is where the modem receives a break from the DTE when the modem is operating in data transfer mode:

0 Enter on-line command mode, no break sent to the remote modem.

1 Clear data buffers and send break to remote modem.

2 Same as 0.

3 Send break to remote modem immediately.

4 Same as 0.

5 Send break to remote modem in sequence with transmitted data. (Default.)

The **second case** is where the modem is in the on-line command state (waiting for AT commands) during a data connection, and the \B is received in order to send a break to the remote modem:

0 Clear data buffers and send break to remote modem.

1 Clear data buffers and send break to remote modem. (Same as 0.)

2 Send break to remote modem immediately.

3 Send break to remote modem immediately. (Same as 2.)

4 Send break to remote modem in sequence with data.

5 Send break to remote modem in sequence with

data. (Same as 4.) (Default.)

The third case is where a break is received from a remote modem during a non-error corrected connection:

0	Clears data buffers and sends break to the DTE.
1	Clears data buffers and sends break to the DTE. (Same as 0.)
2	Send a break immediately to DTE.
3	Send a break immediately to DTE. (Same as 2.)
4	Send a break in sequence with received data to DTE.
5	Send a break in sequence with received data to DTE. (Same as 4.) (Default.)

Result Codes

OK	0 to 5.
ERROR	Otherwise.

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3.2.6 Data Compression Commands

This section contains parameters to condition modem use of standard ITU-T V.42*bis* Data Compression Procedures.

+DS - Data Compression

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

Syntax

    +DS=[<direction>[,<compr_neg>[,<max_dict>[,<max_string>]]]]

Defined Values

<direction>	Specifies the desired direction(s) of operation of the data compression function; from the DTE point of view.

    0   Negotiated; no compression (V.42bis P0=0).

    3   both directions, accept any direction (V.42bis P0=11). (Default.)

<compr_neg>	Specifies whether or not the modem should continue to operate if the desired result is not obtained.

    0   Do not disconnect if V.42bis is not negotiated by the remote modem as specified in <direction>.

<max_dict>	Specifies the maximum number of dictionary entries (2048 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>	Specifies the maximum string length (32 bytes) to be negotiated (V.42bis P2).

Reporting Current or Selected Values

Command: +DS?

Response: +DS: <direction>,<compr_neg>,<max_dict>,<max_string>

Example: +DS: 3,0,2048,32   for the defaults and 2048 entry max dictionary.

Reporting Supported Range of Parameter Values

Command: +DS=?

Response: +DS: (<direction> range),(< compr_neg > range),

(<max_dict> range),(<max_string> range)

Example: +DS: (0,3),(0),(2048),(32)

+DS44 - V.44 Compression Select

This extended-format compound parameter controls the V.44 data compression function.

Syntax

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

Defined Values

<direction>	Decimal number that specifies the desired direction(s) of operation of the data compression function; from the DTE point of view.

0 Negotiated, no compression.

3 Both directions, accept any direction. (Default.)

<compress_negotiation>	Decimal number that specifies whether or not the modem should continue to operate if the desired result is not obtained.

0 Do not disconnect if V.44 is not negotiated by the remote DCE as specified in <direction>. (Default.)

<capability>	Decimal number that specifies the use of stream method, packet method, multi-packet method.

0 Stream method. (Default.)

<max_codewords_tx>	Decimal number that specifies the maximum number of codewords which should be negotiated in the transmit direction. (Default = 512.)
<max_codewords_rx>	Decimal number that specifies the maximum number of codewords which should be negotiated in the receive direction. (Default = 512.)
<max_string_tx>	Decimal number from 32 to 255 that specifies the maximum string length to be negotiated in the transmit direction. (Default = 32.)
<max_string_rx>	Decimal number from 32 to 255 that specifies the maximum string length to be negotiated in the receive direction. (Default = 32.)
<max_history_tx>	Decimal number that specifies the maximum size of the

history buffer to be negotiated in the transmit direction. (Default = 1024.)

<max_history_rx> Decimal number that specifies the maximum size of the history buffer to be negotiated in the receive direction. (Default = 1024.)

Reporting Current or Selected Values

Command: +DS44?

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

Example: +DS44: 3,0,0,512,512,32,32,1024,1024 For the default setting.

Reporting Supported Range of Parameter Values

Command: +DS44=?

Response: +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)

+DR - Data Compression Reporting

This extended-format numeric parameter controls whether or not the extended-format +DR: intermediate result code is transmitted from the modem to the DTE.

S95 bit 5 is reset to 0 for +DR=0 and is set to a 1 for +DR=1. The more recent setting of +DR or S95 bit 5, and the W command setting, determines the actual data compression result code reporting (see S95 Parameter and W Command).

Syntax

+DR=[<value>]

Defined Values

<value> decimal number corresponding to the selected option:

0 Data compression reporting disabled (no +DR result code transmitted). (Default.)

1 Data compression reporting enabled (+DR result code transmitted).

Reporting Current or Selected Values

Command: +DR?

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Response: +DR: <current value>

Example: +DR: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +DR=?

Response: +DR: (<value> range)

Example: +DR: (0,1)

+DR: <type> Intermediate Result Code

The +DR: <type> reported represents the current (negotiated or renegotiated) modem-modem data compression type. If enabled, the intermediate result code is transmitted at the point after error control negotiation (handshaking) at which the modem has determined which data compression technique will be used (if any) and the direction of operation. The +DR intermediate result code, if enabled, is issued after the Error Control Report (+ER) and before the final result code (e.g., CONNECT).

The format of this result code is:

Result Code Syntax

     +DR: <type>

Defined Values

     <type>   An alphanumeric code corresponding to the selected option:

                       NONE   Data compression is not in use.

                       V42B   V.42bis is in use in both directions.

                       V42B RD   V.42 bis is in use in receive direction only

                       V42B TD   V.42 bis is in use in transmit direction only

                       V44   V.44 is in use in both directions

                       V44 RD   V.44 is in use in receive direction only

                       V44 TD   V.44 is in use in transmit direction only

                       ALT   MNP 5 compression.

Example

     +DR: V42B

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%C - Enable/Disable Data Compression

Enables or disables data compression negotiation. The modem can only perform data compression on an error corrected link. The parameter value, if valid, is written to S41 bits 0, 1, and 3.

Syntax

%C<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

     0   Disables data compression. Resets S46 bit 1.

     1   Enables MNP 5 data compression negotiation. Resets S46 bit 1.

     2   Enables V.42 bis data compression. Sets S46 bit 1.

     3   Enables V.44, V.42 bis, and MNP 5 data compression. Sets S46 bit 1. (Default.)

     4   Enables V.44 data compression. Resets S46 bit 1.

Result Codes

OK   <value> = 0, 1, 2, 3, or 4.
ERROR   Otherwise.

3.2.7 V.8/V.8bis Commands

+A8E - V.8 and V.8bis Operation Controls
This command is defined for two conditions: as a parameter while the modem is on-hook, and as an action command while the modem is off-hook. If enabled, V.8 negotiation does not preclude simultaneous implementation of other negotiation means (e.g., V.8bis, V.18, V.32bis Annex A).
This command is a compound parameter if issued while the modem is on-hook, used to precondition V.8 and V.8bis originating and answering operation. It is issued by the DTE before the Dial (D) or Answer (A) command, regardless of the state of the +FCLASS parameter.
This command is an action command if issued while the modem is off-hook, to (re)start V.8 or V.8bis negotiation. For example, if initial V.8 negotiation failed, but subsequent T.30 negotiation indicated V.8 capability, this command may be used to initiate V.8 negotiation.

Syntax

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

Defined Values

<v8o>	Decimal number which enables/disables issuance of +A8x indications during modem-controlled V.8 origination negotiation. Not Supported.
	1 Enable DCE-controlled V.8 origination negotiation without +A8x indications. (Default.)
	6 Enable DCE-controlled V.8 origination negotiation with +A8x indications.
<v8a>=	Decimal number which enables/disables issuance of +A8x indications during modem-controlled V.8 answer negotiation. Not supported.
	1 Enable DCE-controlled V.8 answer negotiation without +A8x indications. (Default.)
	5 Enable DCE-controlled V.8 answer negotiation with +A8x indications.
<v8cf>=	Set the V.8 CI signal call function to the hexadecimal octet XY. Not supported.
	00 (Default.)
	21
	C1
<v8b>=	Decimal number which enables/disables V.8bis negotiation.
	0 Disable V.8bis negotiation.
	1 Enable V.8bis negotiation. (Default.)
<cfrange>=	"<string of values>". Applicable only for <v8a>=5. Not supported.
< protrange >=	"<string of values>". Applicable only for <v8a>=5. Not supported.

Default values: 1,1,00,1,0,0
The ATD and ATA commands behave as specified in V.250, and +A8n indications are not generated by the modem.
For subparameter values <v8o>=6 and <v8a>=5, the +A8I indications are issued during

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the course of the V.8 session to notify the DTE when the relevant V.8 signals are received.

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3.2.8 Synchronous Access Mode Commands

Three commands support Synchronous Access Mode:

+ES	Enables and disables Synchronous Access Mode in the client or central site modem (see section 3.2.5)
+ESA	Configures the operation of the Synchronous Access Submode
+ITF	Selects Transmit Flow Control Thresholds

Enabling Synchronous Access Mode enables the use of the 8-bit command characters defined in Table 9/V.80 of the Draft ITU-T Recommendation V.80 (DATA COMMUNICATION OVER THE TELEPHONE NETWORK; In-Band DCE Control and Synchronous Data Modes for Asynchronous DTE).

+ESA - Configure Synchronous Access Submode

The operation of the Synchronous Access sub-Mode is configured by the +ESA parameter.

This extended-format compound parameter is used to control the manner of operation of the Synchronous Access Mode in the modem. It accepts six numeric subparameters:

Syntax

+ESA=[<trans_idle>[,<framed_idle>[,<framed_un_ov>[,<hd_auto>[,<crc_type>[,<nrzi_en>[,<syn1>[,<syn2>]]]]]]]]

Defined Values

<trans_idle>	Specifies the bit sequence transmitted by the modem when a transmit data buffer underrun condition occurs, while operating in Transparent sub-Mode. The options are:
	0 In Transparent sub-Mode, modem transmits 8-bit SYN sequence on idle. Modem receiver does not hunt for synchronization sequence (default and fixed).
<framed_idle>	Specifies the bit sequence transmitted by the modem when a transmit data buffer underrun condition occurs immediately after a flag, while operating in Framed sub-Mode. The options are:
	0 In Framed sub-Mode, modem transmits HDLC flags on idle (default and fixed).
<framed_un_ov>	Specifies the actions undertaken by the modem when a transmit data buffer underrun or overrun condition occurs immediately after a non-flag octet, while operating in Framed sub-Mode.

<table>
<tr><td>0</td><td>In Framed sub-Mode, modem transmits abort on underrun in middle of frame (default).</td></tr>
<tr><td>1</td><td>In Framed sub-Mode, DCE transmits a flag on underrun in middle of frame, and notifies DTE of underrun or overrun.</td></tr>
</table>

<hd_auto> Specifies whether or not, in V.34 half-duplex operation, additional procedures besides those specified in § 12/V.34 shall be performed by the modem when switching from primary channel to secondary channel operation, and vice versa. This subparameter should not be commanded.

<crc_type> Specifies the CRC polynomial used while operating in Framed sub-Mode. The options are:

0 CRC generation and checking disabled (default).

1 In Framed sub-Mode, the 16-bit CRC is generated by the modem in the transmit direction, and checked by the modem in the receive direction.

<nrzi_en> Specifies if Non Return to Zero Inverted (NRZI) encoding is to be used by the modem for transmit and receive data. The options are:

0 NZRI encoding and decoding disabled (default and fixed).

<syn1>, <syn2> Specifies the octet value(s) to be used while performing character-oriented framing. <syn1> is to be commanded to 255 (FFh); <syn2> is not to be commanded.

Reporting Selected Options

The modem reports the selected options in response to the following command:

+ESA?

The response is:

+ESA: <trans_idle>,<framed_idle>,<framed_un_ov>,<hd_auto>, <crc_type>,<nrzi_en>,<syn1>,<syn2>

Example:

+ESA?
+ESA: 0,0,0, ,0,0,255,   For the defaults.

Reporting Supported Options

The modem reports the supported options in response to the following command:

+ESA=?

The response is:

+ESA: (list of supported <trans_idle> values), (list of supported <framed_idle> values),(list of supported <framed_un_ov> values), (list of supported <hd_auto> values),(list of supported <crc_type> values), (list of supported <nrzi_en> values),
(list of supported <syn1> values), (list of supported <syn2> values)

Example:
+ESA=?
+ESA: (0),(0),(0-1), ,(0-1),(0),(255),

+ITF - Transmit Flow Control Thresholds

The +ITF command determines the flow control thresholds used by the modem for transmit data from the DTE.

This optional compound parameter allows the DTE to determine the input buffer size in the modem for data on circuit 103 (transmit data) from the DTE, to control the thresholds used for flow control of such data, and to control how often the modem reports to the DTE the number of octets in this buffer. The DTE can adjust its own thresholds for flow control of data on circuit 104 (received data) from the modem.

Syntax

+ITF=[<off>[,<on>[,<report_period>]]]

Defined Values

<off>   Determines the threshold, in octets, above which the modem will generate a flow off signal. Applicable in Synchronous Access and Frame Tunneling modes. Default <off> value is 255.

For the <on> and <off> subparameters, the input buffer is assumed to reside between the modem's V.24 interface and the Synchronous Access protocol layer; i.e., the buffer count includes all octets, including EM codes, received from the DTE, with the exception of DC1 and DC3 if these are used to signal <modem-by-DTE> flow control.

The modem returns the ERROR result code if the DTE specifies that the <off> subparameter be set to a value less than or equal to the <on> subparameter; in this case, the current parameter value settings are not modified.

<on>   Determines the threshold, in octets, below which the modem will generate a flow on signal. Applicable in Synchronous Access and Frame Tunneling modes. Default <on> value is 64.

<report_period> Not supported. A fixed value of zero is used and reported.

Reporting Selected Options

The modem sends a string of information text to the DTE consisting of selected options in response to the following command:

+ITF?

The response is:

+ITF: <off>,<on>,<report_period>

Example:

+ITF?
+ITF: 255,64,0   Default values

Reporting Supported Options

The modem sends a string of information text to the DTE consisting of supported options in response to the following command:

+ITF=?

The response is:

+ITF: (list of supported <off> values),(list of supported <on> values),(list of supported <report_period> values)

Example:

+ITF=?
+ITF: (0-255),(0-255),(0)

The maximum reported <off> value is the input transmit data buffer level at which the modem signals a transmit data overrun indication to the DTE.

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3.2.9 Diagnostic Commands

%TT - PTT Test Command

This command facilitates PTT testing of signal levels by providing continuous signals regards of whether or not the modem is connected to the line. The signal transmitted is in accordance with the parameter provided.

A range of commands allows the user to initiate a series of signals required to obtain PTT approval. The signals emitted include answer tone, modulation, carriers, and other pertinent signals. A test is initiated upon receipt of a %TTn (the second T is a password and n is a test number), and the test is aborted when any keyboard character is entered. The modem will continuously transmit the tone or carrier according to the parameter supplied.

DTMF Tones

%TT0x DTMF Tones

Command syntax:

%TT0x

x = "digit to dial": 1,2,3,4,5,6,7,8,9,0,*,#,A,B,C,D

FSK, V.22 and V.22 bis Spectrum

%TT1x V.21,V.23,V.22,V.22bis

%TT10 - V.21 channel 1 mark [originate] symbol

Command syntax:

%TT10

%TT11 - V.21 channel 2 mark symbol

Command syntax:

%TT11

%TT12 - V.23 backward channel mark symbol

Command syntax:

%TT12

%TT13 - V.23 forward channel mark symbol

Command syntax:

%TT13

%TT14 - V.22 originate [call mark] signalling at 600 bps

Command syntax:

%TT14

%TT15 - V.22 originate [call mark] signalling at 1200 bps

Command syntax:

%TT15

%TT16 - V.22 bis originate [call mark] signalling at 2400 bps

Command syntax:

%TT16

%TT17 - V.22 answer signalling (guard tone: 1800Hz, 550Hz, none) at 1200bps

Command syntax:

%TT17<guard tone>

<guard tone>	
0	none
1	550 Hz
2	1800 Hz

%TT18 - V.22 bis answer signalling (guard tone: 1800Hz, 550Hz, none) at 2400bps

Command syntax:

%TT18<guard tone>

<guard tone>	
0	none
1	550 Hz
2	1800 Hz

%TT19 - V.21 channel 1 space symbol

Command syntax:

%TT19

%TT1A - V.21 channel 2 space symbol

Command syntax:

%TT1A

%TT1B - V.23 backward channel space symbol

Command syntax:
%TT1B

%TT1C - V.23 forward channel space symbol

Command syntax:

%TT1C

%TT1D - V.22 answer signalling (guard tone: 1800Hz, 550Hz, none) at 600 bps

Command syntax:

%TT1D<guard tone>

                                                                                                           <guard tone>

<guard tone>	
0	none
1	550 Hz
2	1800 Hz

V.32 and V.32bis Spectrum

%TT2x V.32,V32bis

%TT20 - V.32bis TCM 14400 bps (Answer Mode, Originate Mode)

Command syntax:

%TT20<mode>

<mode>	
A	Answer
O	Originate

%TT21 - V.32bis TCM 12000 bps (Answer Mode, Originate Mode)

Command syntax:

%TT21<mode>

<mode>	
A	Answer
O	Originate

%TT22 - V.32 TCM 9600 bps (Answer Mode, Originate Mode)

Command syntax:

%TT22<mode>

        <mode>
            A   Answer
            O   Originate

%TT23 - V.32 9600 bps (Answer Mode, Originate Mode)

    Command syntax:

    %TT23<mode>

        <mode>
            A   Answer
            O   Originate

%TT24 - V.32bis TCM 7200 bps (Answer Mode, Originate **Mode)**

    Command syntax:

    %TT24<mode>

        <mode>
            A   Answer
            O   Originate

%TT25 - V.32 4800 bps (Answer Mode, Originate Mode)

    Command syntax:

    %TT25<mode>

        <mode>
            A   Answer
            O   Originate

Tone Generation

%TT3x Tone Generation

%TT30 - Silence [on-line], i.e., go off-hook

    Command syntax:

    %TT30

%TT31 - V.25 answer tone

    Command syntax:

    %TT31

%TT32 - 1800 Hz guard tone

Command syntax:

%TT32

%TT33 - V.25 calling tone [1300 Hz]

Command syntax:

%TT33

%TT34 - FAX calling tone [1100 Hz]

Command syntax:

%TT34

%TT35 - Bell answer tone [2225 Hz]

Command syntax:

%TT35

V.34 Spectrum

%TT60 - V.34 Spectrum

Command syntax:

%TT60<mode><symbol rate><secondary channel><pre-emphasis filter><data rate>

<mode>
A	Answer
O	Originate

<symbol rate>
0	2400
1	Reserved
2	2800
3	3000
4	3200
5	3429

<secondary channel>
0	Disable
1	Enable

<pre-emphasis filter>
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

9	9
A	10

<data rate>

0	2400
1	4800
2	7200
3	9600
4	12000
5	14400
6	16800
7	19200
8	21600
9	24000
A	26400
B	28800
C	31200
D	33600

Japan-Specific Sequences

%J0 - V.21 originate alternating mark & space

Command syntax:

%J0

%J1 - V.21 answer alternating mark & space

Command syntax:

%J1

%J2 - V.21 channel 2 alternating mark & space

Command syntax:

%J2

%J3 - Bell103 originate alternating mark & space

Command syntax:

%J3

%J4 - Bell103 originate mark

Command syntax:

%J4

%J5 - Bell103 originate space

Command syntax:

%J5

%J6 - Bell103 answer alternating mark & space

Command syntax:

%J6

%J7 - Bell103 answer mark

Command syntax:

%J7

%J8 - Bell103 answer space

Command syntax:

%J8

%J9 - V.23 backward channel mark & space

Command syntax:

%J9

%J10 - V.23 forward channel mark & space

Command syntax:

%J10

%J11 - Bell212A originate

Command syntax:

%J11

%J12 - Bell212A answer

Command syntax:

%J12

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3.2.10 Fast Connect Commands

$F – Fast Connect Control

This command allows configuring of the client modem to connect to a central site modem that supports non-standard V.22, V.22 bis, and V.29 fast connect protocols. It is used in conjunction with S17.

Syntax

$F<n>

Defined Values

<n>   Decimal number which specifies the initial requested mode of operation when the modem is operating as the originator. The options are:

0	Normal connection (Default)
1	Fast connect without answer tone
2	V.22 fast connect
3	Fast connect with answer tone
4	V.29 FastPOS
6	V.29 FastPOS with alternate sequence

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3.2.11 V.92 +P and –Q Commands

This section describes the +P (PCM DCE) and –Q commands and parameters used to control the V.92 Mode operation.

+PCW - Call Waiting Enable

This command controls the operation of the modem in the presence of call waiting.

Syntax

+PCW=<value>

Defined Values

<value>   Decimal number corresponding to the selected operation.

0   Request modem-on-hold if enabled by +PMH and collect caller ID information if enabled by +VRID. Toggle V.24 circuit 125.

1   Hang-up.

2   Ignore call waiting. (Default.)

Result Codes

OK	<value> = 0, 1, or 2.
ERROR	Otherwise.

Reporting Selected Value(s)

Command: +PCW?

Response: <value>

Example: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +PCW=?

Response: (<value> range)

Example: (0,1,2)

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+PMH - Modem-on-Hold Enable

This command controls the selection of modem-on-hold in the modem. The action of the modem in response to modem-on-hold events is determined by the state of this command as well as the state of a negotiated handshake with a V.92-compliant server in V.92 Mode.

Syntax

    +PMH=<value>

Defined Values

    <value>   Decimal number corresponding to the selected operation.

                       0   Modem-on-hold enabled in V.92 Mode. (Default.)

                       1   Disabled modem-on-hold.

Result Codes

    OK   0 or 1 in V.92 Mode (see the +MS command)
    ERROR   Otherwise.

Reporting Current or Selected Value

Command: +PMH?

Response: <current value>

Example: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +PMH=?

Response: (<value> range)

Example: (0,1)

+PMHT – Modem-on-Hold Timer

This command controls whether or not the modem will grant or deny a modem-on-hold (MOH) request as well as setting the MOH Timeout value.

Syntax

    +PMHT=<value>

Defined Values

    <value>   Decimal number corresponding to selected setting.

0	Deny V.92 modem-on-hold Request (Default.)
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

Result Codes

OK	0-13 in V.92 Mode (+MS=V92)
ERROR	Otherwise

Reporting Current or Selected Values

Command: +PMHT?

Response: <value>

Example: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +PMHT=?

Response: (<value> range)

Example: (0-13)

+PMHR - Initiate Modem-on-Hold

This command requests the modem to initiate or to confirm a modem-on-hold procedure. The modem will return ERROR if modem-on-hold is not enabled or if the modem is in an idle condition. The modem will return the string response +PMHR: <value> where <value> is a decimal value corresponding to the status of the modem's hold exchange procedure as defined below. 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.

Note: If modem-on-hold is enabled but the remote server does not support V.92 then the modem will always report 0 to show that the hold request is denied.

Syntax

   +PMHR

Response

+PMHR:<value>

<value>   Decimal number corresponding to the maximum hold time the
               server or hold-granting modem will allow.

0	V.92 MOH request denied or not available.
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.

Result Codes

OK   0-13 in V.92 Mode (+MS=V92)
ERROR   Otherwise

+PIG - PCM Upstream Ignore

This command controls the selection of PCM upstream in the modem. The actual state
of PCM upstream is determined by the state of this command as well as the state of a
negotiated handshake with a V.92-compliant server in V.92 Mode.

Syntax

+PIG=<value>

Defined Values

<value>   Decimal number corresponding to the selected operation.

0   Enable PCM upstream negotiation.

1   Disable PCM upstream negotiation. (Default.)

Result Codes

OK   0 or 1 in V.92 Mode (+MS=V.92)
ERROR   Otherwise

Reporting Selected Value(s)

Command: +PIG?

Response: <value>

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Example: 1   For the default setting.

Reporting Supported Range of Parameter Values

Command: +PIG=?

Response: (<value> range)

Example: (0,1)

+PMHF - V.92 Modem-on-Hold Hook Flash

This command causes the modem to initiate the flash hook sequence when in the modem-on-hold procedure. This enables switching to the second call (incoming or outgoing). This command applies only to V.92 modem-on-hold. There are no parameters associated with this command.

Syntax

    +PMHF

Result Code

    OK   When the modem completes the flash hook sequence.
    ERROR   If this command is initiated and the modem is not on hold.

+PQC - V.92 Phase 1 and Phase 2 Control

This command controls the global enabling or disabling of the V.92 shortened Phase 1 and Phase 2 startup procedures. This command is used in conjunction with the +PSS command.

Syntax

    +PQC=<value>

Defined Values

    <value>   Decimal number corresponding to the selected setting.

            0   Enable Short Phase 1, Short Phase 2, Short Phase 3, and Short Phase 4. (Default.)

            1   Not supported.

            2   Enable Short Phase 1 only.

            3   Disable all Short Phases.

Result Codes

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OK   0, 2, or 3 in V.92 Mode (+MS=V.92)
ERROR   Otherwise

Reporting Selected Values

Command: +PQC?

Response: +PQC: <value>

Example: +PQC: 0

Reporting Supported Range of Parameter Values

Command: +PQC=?

Response: +PQC: (<value> range)

Example: +PQC: (0-3)

+PSS - Use Short Sequence

This command causes a calling modem to force either a V.92 short or full startup sequence as defined by the +PQC command on the next and subsequent connections.

Syntax

    +PSS=<value>

Defined Values

    <value>   Decimal number corresponding to the selected sequence.

                  0   The modems decide whether or not to use the
                         short startup procedures. The short startup
                         procedures can only be used if enabled by the
                         +PQC command. (Default.)

                  1   Reserved.

                  2   Forces the use of the full startup procedures on
                         the next and subsequent connections independent
                         of the setting of the +PQC command.

Result Codes

    OK   0 - 2 in V.92 Mode (+MS=V.92)
    ERROR   Otherwise

Reporting Selected Values

Command: +PSS?

Response: <value>

Example: 0   For the default <value>.

Reporting Supported Range of Parameter Values

Command: +PSS=?

Response: (<value> range)

Example: (0-2)

-QCPC - Force Full Startup Procedure Next Connection

This command causes the modem to use full startup procedures on the next connection attempt regardless of the setting of the +PQC command. After this attempt, the modem will select the startup procedure as defined by the +PQC command. If a shortened startup procedure is enabled by the +PQC command, then the quick connect profile will also be updated on the next connection attempt.

Syntax

    -QCPC

Result Code

    OK   In V.92 Mode (+MS=V.92)
    ERROR   Otherwise

-QCPS - Enable Quick Connect Profile Save

This command controls whether or not the modem will save the generated quick connect profile.

Syntax

    -QCPS=<value>

Defined Values

    <value>   Decimal number corresponding to the desired operation.

                 0   Do not allow the quick connect profile to be saved.

                 1   Allow the quick connect profile to be saved. (Default.)

Result Codes

    OK   0 or 1 in V.92 Mode (+MS=V.92) and quick connect is enabled (+PSS = 0)
    ERROR   Otherwise

Reporting Selected Value(s)

Command: -QCPS?

Response: <value>

Example: 1   For the default setting.

Reporting Supported Range of Parameter Values

Command: -QCPS=?

Response: (<value> range)

Example: (0,1)

3.3 S-Parameters

The S-Parameters are summarized in Table 3-4 along with their default values; registers denoted with an '*' may be stored in one of the two user profiles by entering the &W command. One of these profiles may be loaded at any time by using the Z command. Registers or register fields quoted as "reserved" are reserved for current or future use by the firmware, or are permanently overridden by PTT limitations. For the latter, control of the equivalent functionality is available with Call Progress and Blacklisting options.

All bit-mapped registers are read-only. The appropriate AT command which controls the relevant bits in the S-Parameter should be used to change the value.

S - Read/Write S-Parameter

The modem selects an S-Parameter, performs an S-Parameter read or write function, or reports the value of an S-Parameter.

n	Establishes S-Parameter n as the last register accessed.
n=v	Sets S-Parameter n to the value v.
n?	Reports the value of S-Parameter n.

The parameter n can be omitted, in which case the last S-Parameter accessed will be assumed. The S can be omitted for AT= and AT?, in which case the last S-Parameter accessed will be assumed. For example:

ATS7 establishes S7 as the last accessed register.

AT=40 sets the contents of the last register accessed to 40.

ATS=20 sets the contents of the last register accessed to 20.

If the number "n" is outside the range of the S-Parameters available, the modem will return the ERROR message. If the value "v" is outside the range permitted for a given SParameter, the modem will return the ERROR message. Input and output are always in

decimal format. Note that some S-Parameters are read-only.

In some cases, writing to the S-Parameter will appear to be accepted but the value will not actually be written.

Due to country restrictions, some commands will be accepted, but the value may be limited and replaced by a maximum or minimum value.

3.3.1 Factory Defaults

The factory default values are stored in ROM and are loaded into the active configuration at power up or by the ATZ command. In addition, the designated default profile is subsequently loaded, and may change some of the factory default values. The designated default profile can be changed by entering the &Y command where n is one of the two possible user profiles.

The factory default values may be loaded at any time by entering the &Fn command.

Table 3-4. S-Parameter Summary

Register	Function	Range	Units	Saved	Default
S0	Rings to Auto-Answer	0-255	rings	*	0
S1	Ring Counter	0-255	rings		0
S2	Escape Character	0-255	ASCII	*	43
S3	Carriage Return Character	0-127	ASCII		13
S4	Line Feed Character	0-127	ASCII		10
S5	Backspace Character	0-255	ASCII		8
S6	Wait Time before Blind Dialing or for Dial Tone	2-255	s	*	2
S7	Wait Time for Carrier, Silence, or Dial Tone	1-255	s	*	50
S8	Pause Time for Dial Delay Modifier	2-255	s	*	1
S9	Carrier Detect Response Time	1-255	0.1 s	*	6
S10	Lost Carrier To Hang Up Delay	1-255	0.1 s	*	14
S11	DTMF Tone Duration	50-255	0.001 s	*	85
S12	Escape Prompt Delay (EPD)	0-255	0.02 s	*	50
S14	General Bit Mapped Options Status	-	-		146
S16	Test Mode Bit Mapped Options Status	-	-		0
S17	Point of Sale Options Selection	-	-		0
S19	Reserved	-	-		0
S20	Reserved	-	-		0
S21	V.24/General Bit Mapped Options Status	-	-		52
S22	Speaker/Results Bit Mapped Options Status	-	-		118
S23	General Bit Mapped Options Status		-		0
S24	Sleep Inactivity Timer	0-255	s		0
S25	Delay to DTR Off	0-255	s or 0.01 s		5
S26	RTS-to-CTS Delay	0-255	0.01s		1
S27	General Bit Mapped Options Status	-	-		73
S28	General Bit-Mapped Options Status	-	-		0
S29	Flash Dial Modifier Time	0-255	10 ms		70
S30	Disconnect Inactivity Timer	0-255	10 s		0
S31	General Bit-Mapped Options Status	-	-		192
S36	LAPM Failure Control	-	-	*	7
S38	Delay Before Forced Hangup	0-255	s		20
S39	Flow Control Bit Mapped Options Status	-	-		3
S40	General Bit-Mapped Options Status	-	-	*	104
S41	General Bit-Mapped Options Status	-	-	*	203
S46	Data Compression Control	-	-	*	138
S48	V.42 Negotiation Control	-	-		7
S86	Call Failure Indication	0-26	-		21
S91	PSTN Transmit Attenuation Level	0-15	dBm		10
S92	Fax Transmit Attenuation Level	0-15	dBm		10
S95	Extended Result Codes Control	-	-	*	0
S210	V.34 Symbol Rate	0-255	-		13
* Register value may be stored in one of two user profiles with the &W command. Defaults shown are for US.					

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3.3.2 S-Parameter Definitions

S0 - Number of Rings to Auto-Answer

S0 sets the number of the rings required before the modem automatically answers a call. Setting this parameter to zero disables auto-answer mode.

Range: 0-255 rings

Default: 0

S1 - Ring Counter

S1 is incremented each time the modem detects a ring signal on the telephone line. S1 is cleared if no rings occur over an eight second interval.

Range: 0-255 rings

Default: 0

S2 - Escape Character

S2 holds the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII '+'. A value over 127 disables the escape process, i.e., no escape character will be recognized.

Range: 0-255, ASCII decimal

Default: 43 (+)

S3 - Carriage Return Character

S3 sets the command line and result code terminator character. Pertains to asynchronous operation only.

Range: 0-127, ASCII decimal

Default: 13 (Carriage Return)

S4 - Line Feed Character

S4 sets the character recognized as a line feed. Pertains to asynchronous operation only. The Line Feed control character is output after the Carriage Return control character if verbose result codes are used.

Range: 0-127, ASCII decimal

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Default: 10 (Line Feed)

S5 - Backspace Character

S5 sets the character recognized as a backspace. Pertains to asynchronous operation only. The modem will not recognize the Backspace character if it is set to a value that is greater than 32 ASCII. This character can be used to edit a command line. When the echo command is enabled, the modem echoes back to the local DTE the Backspace character, an ASCII space character and a second Backspace character; this means a total of three characters are transmitted each time the modem processes the Backspace character.

Range: 0-32, ASCII decimal

Default: 8 (Backspace)

S6 - Wait Time before Blind Dialing or for Dial Tone

S6 operation is country dependent.

1. Sets the length of time, in seconds, that the modem will wait before starting to dial after going off-hook when blind dialing. This operation, however, may be affected by some ATX options according to country restrictions. The "Wait for Dial Tone" call progress feature (W dial modifier in the dial string) will override the value in register S6. (US models.)
2. Sets the length of time, in seconds, that the modem will wait for dial tone when encountering a "W" dial modifier before returning NO DIAL TONE result code. (W class.)

The modem always pauses for a minimum of 2 seconds, even if the value of S6 is less than 2 seconds.

Range: 2-255 seconds

Default: 2

S7 - Wait Time for Carrier, Silence, or Dial Tone

S7 operation is country dependent.

1. Sets the length of time, in seconds, that the modem will wait for carrier before hanging up. The timer is started when the modem finishes dialing (originate), or 2 seconds after going off-hook (answer). In originate mode, the timer is reset upon detection of answer tone if allowed by country restrictions.
2. Sets the length of time, in seconds, that modem will wait for silence when encountering the @ dial modifier before continuing with the next dial string parameter.
3. Sets the length of time, in seconds, that the modem will wait for dial tone when encountering a "W" dial modifier before continuing with the next dial string parameter. (US models.)

Range: 1-255 seconds

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Default: 50

S8 - Pause Time For Dial Delay

S8 sets the time, in seconds, that the modem must pause when the "," dial modifier is encountered in the dial string.

Range: 2-255 seconds

Default: 1

S9 - Carrier Detect Response Time

S9 is supported for backwards compatibility only. No value can be written. Responds with default value.

Range: 6 tenths of a second

Default: 6 (0.6 second)

S10 - Lost Carrier To Hang Up Delay

S10 sets the length of time, in tenths of a second, that the modem waits before hanging up after a loss of carrier. This allows for a temporary carrier loss without causing the local modem to disconnect. When register S10 is set to 255, the modem functions as if a carrier is always present.

The actual interval the modem waits before disconnecting is the value in register S10 minus the value in register S9. Therefore, the S10 value must be greater than the S9 value or else the modem disconnects before it recognizes the carrier.

Range: 1-255 tenths of a second

Default: 14 (1.4 seconds)

Note: For Call Waiting detection, if the modem is set to US country code and S10 >=16, then the modem will detect the Call Waiting tone and hang-up the line. If S10 <16, the modem will not detect Call Waiting tone.

S11 - DTMF Tone Duration

S11 sets the duration of tones in DTMF dialing (has no effect on pulse dialing).

Range: 50-255 milliseconds

Default: 85 (85 milliseconds)

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S12 - Escape Prompt Delay (EPD)

S12 defines the maximum period, in fiftieths of a second, allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE. If any characters are detected during this time, the OK will not be sent. Sending of the OK result code does not affect entry into command mode. (See 3.1.3.)

Range: 0-255 1/50 of a second

Default: 50 (1 second)

S14 - General Bit Mapped Options Status

S14 indicates the status of command options.

Default: 146 (92h) (10010010b)

| Bit 0 | This bit is ignored. |

Bit 1   Command echo (En)
    0 =   Disabled (E0)
    1 =   Enabled (E1) (Default.)

Bit 2   Quiet mode (Qn)
    0 =   Send result codes (Q0) (Default.)
    1 =   Do not send result codes (Q1)

Bit 3   Reserved

Bit 4   Result codes (Vn)
    0 =   Numeric (V0)
    1 =   Verbose (V1) (Default.)

Bit 5   Tone (T)/Pulse (P)
    0 =   Tone (T) (Default.)
    1 =   Pulse (P)

Bit 6   Reserved

Bit 7   Originate/Answer
    0 =   Answer
    1 =   Originate (Default.)

S16 - Test Mode Bit Mapped Options Status

S16 indicates the test in progress status.

Default: 0

Bit 0   Local analog loopback

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0 =   Disabled (Default.)
1 =   Enabled (&T1)

Bits 1-7   Not used

S17 - Point Of Sale Options Selection

S17 selects the different options available for Point of Sale applications.

Default: 0 (00000000b)

Bit 0   V.80 sub-mode selection (applicable only if V.80 Synchronous Access Mode is enabled; see +ES command)

        0 =   Enable transparent sub-mode. (Default)
        1 =   Enable framed sub-mode.
        Note: When V.80 is enabled in V.22 fast connect ($F2) or V.29FastPOS ($F4), the modem automatically connects in framed sub-mode even if bit1 = 0.

Bit 1   V.22bis/V.22/Bell 212 early data mode selection

        0 =   Enable normal V.22bis/V.22/Bell212 handshake. (Default)
        1 =   Enable early data mode (CTS turned ON sooner) for V.22bis/V.22/Bell 212.

Bit 2   Logical/physical hang-up selection (applicable only if V.80 Synchronous Access Mode is enabled; see +ES command)

        0 =   Enable logical hang-up if remote had already dropped its carrier when ATH command is issued to the modem. Otherwise, the modem waits for S38 delay before it physically disconnects. (Default)
        1 =   Enable physical hang-up if remote side had already dropped its carrier when ATH command is issued to the modem. Otherwise, the modem does not wait for S38 delay but hangs up immediately.

Bit 3   Enable/Disable HDLC in V.22 fast connect (applicable only in V.22 fast connect mode ($F2 is selected), and &Q0, &Q5, or &Q6 is selected)

        0 =   Enable asynchronous mode. (Default)
        1 =   Enable HDLC (synchronous mode).
        Note: If V.80 Synchronous Access Mode is enabled, the modem will automatically connect in V22 fast connect synchronous mode even if bit 3 = 0.

Bit 3   V.22 fast connect synchronous mode handshake selection (applicable only in hardware synchronous mode, i.e., &Q1, &Q2, or &Q3 is selected)

        0 =   Select standard handshake (scrambled ones are sent

during handshake). (Default)

1 =   Select SDLC handshake (scrambled flags are sent during handshake).

Note: If V.80 Synchronous Access Mode is enabled, the modem will automatically connect in V22 fast connect synchronous mode even if bit 3 = 0.

Bit 4   V.29 FastPOS mode selection

0 =   Enable V.29 FastPOS. (Default)
1 =   Enable V.29 FastPOS alternate sequence.

Bit 5   V.29 FastPOS fallback selection

0 =   Enable V.29 FastPOS with fallback to standard V.22 bis. (Default)
1 =   Enable V.29 FastPOS with fallback to V.22 fast connect.

Bit 6   Fast Bell 103/V.21 (applicable only if Bell 103, V.21, or V.23 halfduplex (HDX) is enabled; see +MS and B2 commands)

0 =   Enable standard Bell 103/V.21/V.23HDX (Default)
1 =   Enable fast Bell 103/V.21 or non-standard V.23HDX 21

Bit 7   Not used (Reserved)

S19 - Reserved

S19 is supported for backwards compatibility only. No value can be written. Responds with default value.

Range: None

Default: 0

S20 - Reserved

S20 is supported for backwards compatibility only. No value can be written. Responds with default value.

Range: None

Default: 0

S21 - V.24/General Bit Mapped Options Status

S21 indicates the status of command options.

Default: 52 (34h) (00110100b)

Bits 0 - 1   Reserved (0)

Bit 2 CTS behavior (&Rn)
  0 = CTS tracks RTS (&R0)
  1 = CTS always on (&R1) (Default.)

Bits 3-4 DTR behavior (&Dn)
  0 = &D0 selected
  1 = &D1 selected
  2 = &D2 selected (Default.)
  3 = &D3 selected

Bit 5 RLSD (DCD) behavior (&Cn)
  0 = &C0 selected
  1 = &C1 selected (Default.)

Bit 6 DSR behavior (&Sn)
  0 = &S0 selected (Default.)
  1 = &S1 selected

Bit 7 Long space disconnect (Yn)
  0 = Y0 (Default.)
  1 = Y1

S22 - Speaker/Results Bit Mapped Options Status

S22 indicates the status of command options.

Default: 117 (75h) (01110101b)

Bits 0-1 Speaker volume (Ln)
  0 = Low volume (L0)
  1 = Low volume (L1)
  2 = Medium volume (L2) (Default.)
  3 = High volume (L3)

Bits 2-3 Speaker control (Mn)
  0 = Speaker is always off (M0)
  1 = Speaker is on during call establishment, but off when receiving carrier (M1) (Default.)
  2 = Speaker is always on (M2)
  3 = Speaker is off when receiving carrier and during dialing, but on during answering (M3)

Bits 4-6 Limit result codes (Xn)
  0 = X0
  4 = X1
  5 = X2
  6 = X3
  7 = X4 (Default.)

Bit 7 Reserved

S23 - General Bit Mapped Options Status

S23 indicates the status of command options.

Default: 0

Bits 0-6	Not used	
Bits 6-7	Guard tone (&Gn)	
	0 =	None (&G0) (Default.)
	1 =	550 Hz (&G1)
	2 =	1800 Hz (&G2)

S24 - Sleep Inactivity Timer

S24 sets the length of time, in seconds, that the modem will operate in normal mode with no detected telephone line or DTE line activity before entering low-power sleep mode. The timer is reset upon any DTE line or telephone line activity. If the S24 value is zero, neither DTE line nor telephone inactivity will cause the modem to enter the sleep mode.

Range: 0-255 seconds

Default: 0

S25 - Delay To DTR Off

S25 sets the length of time that the modem will ignore DTR for taking the action specified by &Dn. Its units are seconds for synchronous modes and one hundredths of a second for other modes.

Range: 0-255 (1 second for synchronous modes 1; 0.01 second otherwise)

Default: 5

S26 - RTS to CTS Delay

S26 sets the time delay, in hundredths of a second, before the modem turns CTS ON after detecting an OFF-to-ON transition on RTS when &R0 is commanded. Pertains to synchronous operation only.

Range: 0-255 hundredths of a second

Default: 1

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S27 - Bit Mapped Options Status

S27 indicates the status of command options.

Default: 73 (49h) (01001001b)

Bits 0,1,3 Synchronous/asynchronous selection (&Mn/&Qn)

3	1	0		
0	0	0	=	&M0 or &Q0
0	0	1	=	&M1 or &Q1
0	1	0	=	&M2 or &Q2
0	1	1	=	&M3 or &Q3
1	0	0	=	Reserved
1	0	1	=	&Q5 (Default.)
1	1	0	=	&Q6

Bit 2   Leased line control (&Ln)
             0 =   Dial up line (&L0) (Default.)

Bits 4 - 5 Internal clock select (&Xn)
             0 =   Internal clock (&X0) (Default.)
             1 =   External clock (&X1)
             2 =   Slave clock (&X2)

Bit 6   CCITT/Bell mode select (Bn)
             0 =   CCITT mode (B0)
             1 =   Bell mode (B1) (Default.)

Bit 7 - Reserved

S28 - Bit Mapped Options Status

S28 indicates bit mapped options status.

Default: 0

Bits 0 - 1 Reserved

Bit 2   Reserved (always 0).

Bits 3 - 4 Pulse dialing (&Pn)
             0 =   39%-61% make/break ratio at 10 pulses per second (&P0)
                       (Default.)
             1 =   33%-67% make/break ratio at 10 pulses per second (&P1)
             2 =   39%-61% make/break ratio at 20 pulses per second (&P2)
             3 =   33%-67% make/break ratio at 20 pulses per second (&P3)

Bit 5-7   Reserved

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S29 - Flash Dial Modifier Time

S29 sets the length of time, in units of 10 ms, that the modem will go on-hook when it encounters the flash (!) dial modifier in the dial string. S29 is a country dependent parameter. The S29 value cannot be changed using S29=XX.

Range: 0-255 10 ms intervals

Default: 70 (700 ms) for U.S.

S30 - Disconnect Inactivity Timer

S30 sets the length of time, in tens of seconds, that the modem will stay online before disconnecting when no data is sent or received. In error-correction mode, any data transmitted or received will reset the timer. In other modes, any data transmitted will reset the timer. The timer is inoperative in synchronous mode.

Range: 0-255 tens of seconds (0-2550 seconds)

Default: 0 (disabled)

S31 - Bit Mapped Options Status

S31 indicates bit mapped options status.

Default: 192 (C0h) (11000000b)

Bit 0	Single line connect message enable/disable (\Vn)	
	0 =	Messages controlled by S95, Wn and Vn (\V0) (Default.)
	1 =	Single line connect message (\V1)
Bit 1	Reserved (0)	
Bits 2-3	Error correction progress messages (Wn)	
	0 =	DTE speed only (W0) (Default.)
	1 =	Full reporting (W1)
	2 =	DCE (line) speed only (W2)
Bits 4-5	Caller ID (+VCID)	
	0 =	Caller ID disabled (+VCID=0) (Default.)
	1 =	Short (formatted) Caller ID enabled (+VCID=1)
	2 =	Long (unformatted) Caller ID enabled (+VCID=2)
Bits 6-7	Reserved (Default = 11b)	

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S36 - LAPM Failure Control

Default: 7 (00000111b)

Bits 0-2 This value indicates what should happen upon a LAPM failure. These fallback options are initiated immediately upon connection if S48=128. If an invalid number is entered, the number is accepted into the register, but S36 will act as if the default value has been entered.

0 =	Modem disconnects.
1 =	Modem stays on-line and a Direct mode connection is established.
2 =	Reserved.
3 =	Modem stays on-line and a Normal mode connection is established.
4 =	An MNP connection is attempted and if it fails, the modem disconnects.
5 =	An MNP connection is attempted and if it fails, a Direct mode connection is established.
6 =	Reserved.
7 =	An MNP connection is attempted and if it fails, a Normal mode connection is established. (Default.)

Bits 3-7 Reserved

S38 - Delay Before Forced Hang Up

S38 specifies the delay between the modem's receipt of the H command to disconnect (or ON-to-OFF transition of DTR if the modem is programmed to follow the signal), and the disconnect operation. Applicable to error-correction connection only. This parameter can be used to ensure that data in the modem buffer is sent before the modem disconnects.

1. If S38 is set to a value between 0 and 254, the modem will wait that number of seconds for the remote modem to acknowledge all data in the modem buffer before disconnecting. If time expires before all data is sent, the NO CARRIER result code will be issued to indicate that data has been lost. If all data is transmitted prior to time-out, the response to the H0 command will be OK.

2. If S38 is set to 255, the modem does not time-out and continues to attempt to deliver data in the buffer until the connection is lost or the data is delivered.

Range: 0-255 seconds

Default: 20

S39 - Flow Control Bit Mapped Options Status

Default: 3 (00000011b)

Bits 0-2   Status of command options
   0 =   No flow control
   3 =   RTS/CTS (&K3) (Default.)
   4 =   XON/XOFF (&K4)
   5 =   Transparent XON (&K5)
   6 =   Both methods (&K6)

Bits 3-7   Reserved

S40 - General Bit Mapped Options Status

S40 indicates the status of command options.

Default: 104 (68h) (01101000b)

Bits 0-1   MNP Extended Services (-Kn)
   0 =   Disable extended services (-K0) (Default.)
   1 =   Enable extended services (-K1)
   2 =   Enable extended services (-K2)

Bit 2   Reserved

Bits 3-5   Break Handling (\Kn)
   0 =   \K0
   1 =   \K1
   2 =   \K2
   3 =   \K3
   4 =   \K4
   5 =   \K5 (Default.)

Bits 6-7   Reserved

S41 - General Bit Mapped Options Status

S41 indicates the status of command options.

Default: 203 (CBh) (11001011b)

Bits 0 -1, 3 Compression selection (%Cn)
   0 =   Disabled (%C0)
   1 =   MNP 5 (%C1)
   2 =   V.42 bis (%C2)
   3 =   MNP 5, V.42 bis, and V.44 (%C3) (Default.)
   4 =   V.44 (%C4)

Bits 2, 6   Auto retrain and fallback/fall forward (%En)
   Bit 6 Bit 2

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0	0 =	Retrain and fallback/fall forward disabled (%E0)
0	1 =	Retrain enabled (%E1)
1	0 =	Fallback/fall forward enabled (%E2) (Default.)

Bits 4-5   Reserved

Bit 7   Reserved

S46 - Data Compression Control

S46 controls selection of compression. The following actions are executed for the given values:

Range: 136 or 138

Default: 138

S46= 136   Execute error correction protocol with no compression.
S46= 138   Execute error correction protocol with compression. (Default.)

S48 - V.42 Negotiation Control

The V.42 negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and negotiation is unnecessary, this process can be bypassed if so desired.

Range: 0, 7, or 128 If an invalid number is entered, it is accepted into the S-Parameter, but S48 will act as if 128 has been entered.

Default: 7

S48=0   Disable negotiation; bypass the detection and negotiation phases; and proceed with LAPM.
S48=7   Enable negotiation. (Default.)
S48=128 Disable negotiation; bypass the detection and negotiation phases; and proceed at once with the fallback action specified in S36. Can be used to force MNP.

S86 - Call Failure Reason Code

When the modem issues a NO CARRIER result code, a value is written to S86 Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The code definitions are:

Range: 0-26

Default: 21

S86=0   Normal hangup, no error occurred.
S86=1   Reserved.
S86=2   Reserved.

S86=3   Call Waiting caused disconnect.
S86=4   Physical carrier loss.
S86=5   No error correction at the other end.
S86=6   No response to feature negotiation.
S86=7   This modem is async only; the other modem is sync only.
S86=8   No framing technique in common.
S86=9   No protocol in common.
S86=10 Bad response to feature negotiation.
S86=11 No sync information from the remote modem.
S86=12 Normal hangup initiated by the remote modem.
S86=13 Retransmission limit reached.
S86=14 Protocol violation occurred.
S86=15 Lost DTR.
S86=16 Received GSTN cleardown.
S86=17 Inactivity timeout.
S86=18 Speed not supported.
S86=19 Long space disconnect.
S86=20 Key abort disconnect.
S86=21 Clears previous disconnect reason.
S86=22 No connection established.
S86=23 Disconnect after three retrains.
S86=24 Call Waiting tone detected.
S86=25 Extension pickup detected.
S86=26 Remote hangup detected.

S91 - PSTN Transmit Attenuation Level

In non-PCM modes (V.90 and V.92 are PCM modes), S91 sets the transmit attenuation level from 0 to 15 dBm for the PSTN mode, resulting in a transmit level from 0 to -15 dBm.

Range: 0 to 15 dBm (Corresponding to 0 to -15 dBm transmit level.)

Default: 10 (-10 dBm transmit level.)

S92 - Fax Transmit Attenuation Level

S92 sets the transmit attenuation level from 0 to 15 dBm for the fax mode, resulting in a transmit level from 0 to -15 dBm. In some countries, the transmit level may not be changed or the full range of attenuation may not be available.

Range: 0 to 15 dBm (Corresponding to 0 to -15 dBm transmit level.)

Default: 10 (-10 dBm transmit level.)

S95 - Extended Result Codes Control

A bit set to a 1 in this parameter, in conjunction with the W command, will enable the corresponding extended result code (see Section 3.4 and Table 3-5).

The +MR, +ER, and +DR settings also control S95 bits 2, 3, and 5, respectively. The

more recent settings of +MR, +ER, and +DR, or host writing of S95 bits 2, 3, and 5, along with the W command setting, determine the corresponding actual result code reporting (see +MR, +ER, DR, and W commands).

Default: 0

Bit 0	CONNECT result code indicates DCE speed instead of DTE speed.
Bit 1	Append/ARQ to CONNECT XXXX result code in error-correction mode (XXXX = rate).
Bit 2	Enable +MCR: XXXX result code (XXXX = modulation) and +MRR: XXXX result code (XXXX = rate). (Also, see +MR.)
Bit 3	Enable +ER: XXXX result code (XXXX = protocol identifier).
Bit 4	Reserved.
Bit 5	Enable +DR: XXXX result code (XXXX = compression type).
Bits 6-7	Reserved.

S210 – V.34 Symbol Rates

The bits in this parameter control V.34 symbols rates and enables/disables V.34 asymmetric rates. This parameter is used for diagnostic purpose only.

Default: 13 (0Dh) (00001101b)

Bits 0-2 Selects the range of allowed V.34 symbol rates.

2 1 0		Symbol Rates (baud)
0 0 0	=	2400 only
0 0 1	=	2400 only (no 2734)
0 1 0	=	2400, 2800
0 1 1	=	2400, 2800, 3000
1 0 0	=	2400, 2800, 3000, 3200
1 0 1	=	2400, 2800, 3000, 3200, 3429 (Default.)

Bit 3   Enable/disable V.34 asymmetric rates.
0 =	Disable asymmetric rates
1 =	Enable asymmetric rates (Default.)

Bits 4-7 Reserved.

Examples

S210=13	Enable asymmetric rates with all symbol rates available (Default.).
S210=5	Disable asymmetric rates with all symbol rates available.
S210=8	Enable asymmetric rates with only 2400 baud available.
S210=11	Enable asymmetric rates with 2400 to 3000 baud available.

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3.4   Result Codes

The modem responds to commands from the DTE and to activity on the line by signaling to the DTE in the form of result codes. The result codes that the modem can send are described in Table 3-5.

Two forms of each result code are available: long-form, an English-like "verbose" response, and short-form, a data-like numeric response (included in parentheses following the long-form). The long-form code is preceded and terminated by the sequence < CR> < LF>. The short-form is terminated by < CR>, only with no preceding sequence.

If result messages are suppressed, nothing is returned to the DTE. The long-form results codes can be modified by the OEM through the .INF file.

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Table 3-5. Result Code Definitions

Code	Message	Meaning
0	OK	A command line has been executed.
1	CONNECT	For X command values specifying no speed reporting, the modem has connected to the line and either the line speed is 300 bps and line speed is enabled, or the DTE speed is 300 bps and DTE speed reporting is enabled.
2	RING	An incoming ring signal is detected on the line. What qualifies as a ring signal is determined by country-dependent parameters.
3	NO CARRIER	Sent when attempting to establish a call if: 1. Ringback is detected and later ceases but no carrier is detected within the period of time determined by register S7, or 2. No ringback is detected within the period of time determined by register S7. Also sent when the modem auto-disconnects due to loss of carrier. For X0, sent for the following conditions: 1. If busy tone detection is enforced, busy or circuit busy has been detected. 2. 2. If dial tone detection is enforced or selected, dial tone has not been detected.
4	ERROR	Sent during an attempt to execute a command line if any of the following conditions occur: 1. The command line contains a syntax error. 2. The modem cannot execute a command contained in the command line, i.e., the command does not exist or is not supported. 3. 3. A command parameter within the command line is outside the permitted range. For X0, X1, X2, and X3, this message is sent instead of DELAYED and BLACKLISTED.
5	CONNECT 1200	The modem has connected to the line and either the line speed is 1200 bps and DCE speed reporting is enabled, or the DTE speed is 1200 bps and DTE speed reporting is enabled.
6	NO DIAL TONE	For X2 and X4, the modem has been instructed to wait for dial tone during dialing but none is received.
7	BUSY	For X3 and X4, if busy tone detection is enforced, the busy (engaged) signal is detected on the line when the modem is attempting to originate a call.
8	NO ANSWER	The modem is attempting to originate a call if a continuous ringback signal is detected on the line until the expiration of the timer S7.
9	CONNECT 600	The modem has connected to the line, the DTE speed is 600 bps, and DTE speed reporting is enabled.
10	CONNECT 2400	The modem has connected to the line and either the line speed is 2400 bps and DCE speed reporting is enabled, or the DTE speed is 2400 bps and DTE speed reporting is enabled.
11	CONNECT 4800	The modem has connected to the line and either the line speed is 4800 bps and DCE speed reporting is enabled, or the DTE speed is 4800 bps and DTE speed reporting is enabled.
12	CONNECT 9600	The modem has connected to the line and either the line speed is 9600 bps and DCE speed reporting is enabled, or the DTE speed is 9600 bps and DTE speed reporting is enabled.
13	CONNECT 7200	The modem has connected to the line at 7200 bps and DCE speed reporting is enabled.
14	CONNECT 12000	The modem has connected to the line at 12000 bps and DCE speed reporting is enabled.
15	CONNECT 14400	The modem has connected to the line at 14400 bps and DCE speed reporting is enabled.
16	CONNECT 19200	The modem has connected to the line and either the line speed is 19200 bps and DCE speed reporting is enabled, or the DTE speed is 19200 bps and DTE speed reporting is enabled.
17	CONNECT 38400	The modem has connected to the line, the DTE speed is 38400 bps, and DTE speed reporting is enabled.
18	CONNECT 57600	The modem has connected to the line, the DTE speed is 57600 bps, and DTE speed reporting is enabled.
19	CONNECT 115200	The modem has connected to the line, the DTE speed is 115200 bps, and DTE speed reporting is enabled.
22	CONNECT75TX/1200RX	The modem has established a V.23 originate connection and line speed reporting is

		enabled.

Table 3-5. Result Code Definitions (Continued)

Code	Message	Meaning
23	CONNECT1200TX/75RX	The modem has established a V.23 answer connection and line speed reporting is enabled.
24	DELAYED	For X4, sent when a call fails to connect and the number dialed is considered 'delayed' due to country blacklisting requirements.
32	BLACKLISTED	For X4, sent when a call fails to connect and the number dialed is considered 'blacklisted'.
40	+MRR: 300	The modem has connected to the line at 300 bps and carrier reporting is enabled. (See S95 and Xn.)
44	+MRR: 1200/75	The V.23 backward channel carrier is detected and carrier reporting is enabled. (See S95 and Xn.)
45	+MRR: 75/1200	The V.23 forward channel carrier is detected and carrier reporting is enabled. (See S95 and Xn.)
46	+MRR: 1200	The modem has connected to the line at 1200 bps and carrier reporting is enabled. (See S95 and Xn.)
47	+MRR: 2400	The modem has connected to the line at 2400 bps and carrier reporting is enabled. (See S95 and Xn.)
48	+MRR: 4800	The modem has connected to the line at 4800 bps and carrier reporting is enabled. (See S95 and Xn.)
49	+MRR: 7200	The modem has connected to the line at 7200 bps and carrier reporting is enabled. (See S95 and Xn.)
50	+MRR: 9600	The modem has connected to the line at 9600 bps and carrier reporting is enabled. (See S95 and Xn.)
51	+MRR: 12000	The modem has connected to the line at 12000 bps and carrier reporting is enabled. (See S95 and Xn.)
52	+MRR: 14400	The modem has connected to the line at 14400 bps and carrier reporting is enabled. (See S95 and Xn.)
53	+MRR: 16800	The modem has connected to the line at 16800 bps and carrier reporting is enabled. (See S95 and Xn.)
54	+MRR: 19200	The modem has connected to the line at 19200 bps and carrier reporting is enabled. (See S95 and Xn.)
55	+MRR: 21600	The modem has connected to the line at 21600 bps and carrier reporting is enabled. (See S95 and Xn.)
56	+MRR: 24000	The modem has connected to the line at 24000 bps and carrier reporting is enabled. (See S95 and Xn.)
57	+MRR: 26400	The modem has connected to the line at 26400 bps and carrier reporting is enabled. (See S95 and Xn.)
58	+MRR: 28800	The modem has connected to the line at 28800 bps and carrier reporting is enabled. (See S95 and Xn.)
59	CONNECT 16800	The modem has connected to the line, the DTE speed is 16800 bps and DTE speed reporting is enabled.
61	CONNECT 21600	The modem has connected to the line, the DTE speed is 21600 bps and DTE speed reporting is enabled.
62	CONNECT 24000	The modem has connected to the line, the DTE speed is 24000 bps and DTE speed reporting is enabled.
63	CONNECT 26400	The modem has connected to the line, the DTE speed is 26400 bps and DTE speed reporting is enabled.
64	CONNECT 28800	The modem has connected to the line and either the line speed is 28800 bps and DCE speed reporting is enabled, or the DTE speed is 28800 bps and DTE speed reporting is enabled.
66	+DR: ALT	The modem has connected to the line in MNP Class 5 and +DR: message reporting is enabled. (See S95, Wn, and Xn.)
67	+DR: V.42B	The modem has connected to the line in V.42 bis and +DR: message reporting is enabled. (See S95, Wn, and Xn.)
69	+DR: NONE	The modem has connected to the line without data compression and +DR: message

		reporting is enabled. (See S95, Wn, and Xn.)

Table 3-5. Result Code Definitions (Continued)

Code	Message	Meaning
70	+ER: NONE	The modem has connected to the line without any form of error correction and the +ER: message reporting has been enabled. (See S95, Wn, and Xn.)
77	+ER: LAPM	The modem has connected to the line in V.42 LAPM error correction mode and +ER: message reporting has been enabled. (See S95, Wn, and Xn.)
78	+MRR: 31200	The modem has connected to the line at 31200 bps and carrier reporting is enabled. (See S95 and Xn.)
79	+MRR: 33600	The modem has connected to the line at 33600 bps and carrier reporting is enabled. (See S95 and Xn.)
80	+ER: ALT	Sent when the modem has connected in the MNP mode of error correction, and +ER: message reporting has been enabled. (See S95, Wn, and Xn.)
83	LINE IN USE	The modem attempted to go off-hook when an extension was already occupying the line.
84	CONNECT 33600	The modem has connected to the line, the DTE speed is 33600 bps and the DTE speed reporting is enabled.
91	CONNECT 31200	The modem has connected to the line DTE speed is 31200 bps and the modem is to report the DTE speed upon connecting.
134	+MCR: B103	The modem has connected to the line with Bell 103 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
135	+MCR: B212	The modem has connected to the line with Bell 212 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
136	+MCR: V21	The modem has connected to the line with ITU-T V.21 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
137	+MCR: V22	The modem has connected to the line with ITU-T V.22 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
138	+MCR: V22B	The modem has connected to the line with ITU-T V.22 bis modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
139	+MCR: V23	The modem has connected to the line with ITU-T V.23 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
140	+MCR: V32	The modem has connected to the line with ITU-T V.32 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
141	+MCR: V32B	The modem has connected to the line with ITU-T V.32 bis modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
142	+MCR: V34	The modem has connected to the line with ITU-T V.34 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
145	+MCR: V90	The modem has connected to the line with ITU-T V.90 modulation and modulation reporting is enabled. (See +MR, S95 and Xn.)
150	+MRR: 32000	The modem has connected to the line at 32000 bps and carrier reporting is enabled. (See S95 and Xn.)
151	+MRR: 34000	The modem has connected to the line at 34000 bps and carrier reporting is enabled. (See S95 and Xn.)
152	+MRR: 36000	The modem has connected to the line at 36000 bps and carrier reporting is enabled. (See S95 and Xn.)
153	+MRR: 38000	The modem has connected to the line at 38000 bps and carrier reporting is enabled. (See S95 and Xn.)
154	+MRR: 40000	The modem has connected to the line at 40000 bps and carrier reporting is enabled. (See S95 and Xn.)
155	+MRR: 42000	The modem has connected to the line at 42000 bps and carrier reporting is enabled. (See S95 and Xn.)
156	+MRR: 44000	The modem has connected to the line at 44000 bps and carrier reporting is enabled. (See S95 and Xn.)
157	+MRR: 46000	The modem has connected to the line at 46000 bps and carrier reporting is enabled. (See S95 and Xn.)

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Table 3-5. Result Code Definitions (Continued)

Code	Message	Meaning
158	+MRR: 48000	The modem has connected to the line at 48000 bps and carrier reporting is enabled. (See S95 and Xn.)
159	+MRR: 50000	The modem has connected to the line at 50000 bps and carrier reporting is enabled. (See S95 and Xn.)
160	+MRR: 52000	The modem has connected to the line at 52000 bps and carrier reporting is enabled. (See S95 and Xn.)
161	+MRR: 54000	The modem has connected to the line at 54000 bps and carrier reporting is enabled. (See S95 and Xn.)
162	+MRR: 56000	The modem has connected to the line at 56000 bps and carrier reporting is enabled. (See S95 and Xn.)
165	CONNECT 32000	The modem has connected to the line at 32000 bps and DCE speed reporting is enabled.
166	CONNECT 34000	The modem has connected to the line at 34000 bps and DCE speed reporting is enabled.
167	CONNECT 36000	The modem has connected to the line at 36000 bps and DCE speed reporting is enabled.
168	CONNECT 38000	The modem has connected to the line at 38000 bps and DCE speed reporting is enabled.
169	CONNECT 40000	The modem has connected to the line at 40000 bps and DCE speed reporting is enabled.
170	CONNECT 42000	The modem has connected to the line at 42000 bps and DCE speed reporting is enabled.
171	CONNECT 44000	The modem has connected to the line at 44000 bps and DCE speed reporting is enabled.
172	CONNECT 46000	The modem has connected to the line at 46000 bps and DCE speed reporting is enabled.
173	CONNECT 48000	The modem has connected to the line at 48000 bps and DCE speed reporting is enabled.
174	CONNECT 50000	The modem has connected to the line at 50000 bps and DCE speed reporting is enabled.
175	CONNECT 52000	The modem has connected to the line at 52000 bps and DCE speed reporting is enabled.
176	CONNECT 54000	The modem has connected to the line at 54000 bps and DCE speed reporting is enabled.
177	CONNECT 56000	The modem has connected to the line at 56000 bps and DCE speed reporting is enabled.
178	CONNECT 230400	The modem has connected to the line, the DTE speed is 230400 bps, and DTE speed reporting is enabled.
180	CONNECT 28000	The modem has connected to the line at 28000 bps and DCE SPEED reporting is enabled.
181	CONNECT 29333	The modem has connected to the line at 29333 bps and DCE SPEED reporting is enabled.
182	CONNECT 30667	The modem has connected to the line at 30667 bps and DCE SPEED reporting is enabled.
183	CONNECT 33333	The modem has connected to the line at 33333 bps and DCE SPEED reporting is enabled.
184	CONNECT 34667	The modem has connected to the line at 34667 bps and DCE SPEED reporting is enabled.
185	CONNECT 37333	The modem has connected to the line at 37333 bps and DCE SPEED reporting is enabled.
186	CONNECT 38667	The modem has connected to the line at 38667 bps and DCE SPEED reporting is enabled.
187	CONNECT 41333	The modem has connected to the line at 41333 bps and DCE SPEED reporting is enabled.
188	CONNECT 42667	The modem has connected to the line at 42667 bps and DCE SPEED reporting is enabled.
189	CONNECT 45333	The modem has connected to the line at 45333 bps and DCE SPEED reporting is enabled.
190	CONNECT 46667	The modem has connected to the line at 46667 bps and DCE SPEED reporting is enabled.
191	CONNECT 49333	The modem has connected to the line at 49333 bps and DCE SPEED reporting is enabled.
192	CONNECT 50667	The modem has connected to the line at 50667 bps and DCE SPEED reporting is enabled.
193	CONNECT 53333	The modem has connected to the line at 53333 bps and DCE SPEED reporting is enabled.
194	CONNECT 54667	The modem has connected to the line at 54667 bps and DCE SPEED reporting is enabled.
195	+MRR: 28000	The modem has connected to the line at 28000 bps and carrier reporting is enabled. (See S95 and Xn.)
196	+MRR: 29333	The modem has connected to the line at 29333 bps and carrier reporting is enabled. (See S95 and Xn.)
197	+MRR: 30667	The modem has connected to the line at 30667 bps and carrier reporting is enabled. (See S95 and Xn.)
198	+MRR: 33333	The modem has connected to the line at 33333 bps and carrier reporting is enabled. (See S95 and Xn.)
199	+MRR: 34667	The modem has connected to the line at 34667 bps and carrier reporting is enabled. (See S95 and Xn.)
200	+MRR: 37333	The modem has connected to the line at 37333 bps and carrier reporting is enabled. (See S95 and Xn.)

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Table 3-5. Result Code Definitions (Continued)

Code	Message	Meaning
201	+MRR: 38667	The modem has connected to the line at 38667 bps and carrier reporting is enabled. (See S95 and Xn.)
202	+MRR: 41333	The modem has connected to the line at 41333 bps and carrier reporting is enabled. (See S95 and Xn.)
203	+MRR: 42667	The modem has connected to the line at 42667 bps and carrier reporting is enabled. (See S95 and Xn.)
204	+MRR: 45333	The modem has connected to the line at 45333 bps and carrier reporting is enabled. (See S95 and Xn.)
205	+MRR: 46667	The modem has connected to the line at 46667 bps and carrier reporting is enabled. (See S95 and Xn.)
206	+MRR: 49333	The modem has connected to the line at 49333 bps and carrier reporting is enabled. (See S95 and Xn.)
207	+MRR: 50667	The modem has connected to the line at 50667 bps and carrier reporting is enabled. (See S95 and Xn.)
208	+MRR: 53333	The modem has connected to the line at 53333 bps and carrier reporting is enabled. (See S95 and Xn.)
209	+MRR: 54667	The modem has connected to the line at 54667 bps and carrier reporting is enabled. (See S95 and Xn.)

Notes:
1. See Vn for result code selection, i.e., short form (result code) or verbose/extended (result message).
2. See Wn for extended connect message control.
3. See S95 for extended result code enabling options (which override some Wn commands).
4. See Xn for extended result code subset enabling options.
5. See \Vn for single line connect message enable options.
6. See +MR for modulation reporting control.

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4 Fax Class 1 and Fax Class 1.0 Commands

4.1 *Fax I/O Processing*

The fax I/O interface supports asynchronous serial and parallel interfaces. The character format is 8 bits data, no parity, and 1 stop bit. Start and stop elements are removed from the transmit data and added to the receive data. Both transmit and receive data are buffered. Flow control using XON/XOFF or RTS/CTS is provided.

Unique control character strings are identified, filtered, or reinserted into the I/O data stream. These control characters and their resultant action are described below.

4.1.1 DTE-to-Modem Transmit Data Stream

Characters Detected	Action Taken
<DLE><data>	Delete <DLE><data> characters.
<DLE><ETX>	Recognize as a string terminator and take appropriate action.
<DLE><DLE>	Replace with single <DLE> character.

4.1.2 Modem-to-DTE Receive Data Stream

Characters Detected	Action Taken
<DLE>	Insert extra <DLE> ahead of <DLE>.

The modem also identifies the end of a frame by inserting <DLE><ETX> into the data stream after the FCS bytes.

4.1.3 Fax Mode Selection

Fax Class 1 and Fax Class 1.0 commands are identified in Table 4-1. Fax Class 1.0 includes all Fax Class 1 commands.

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Table 4-1. Fax Class 1 and Fax Class 1.0 Commands

Command/Parameter	Function	Applicable in Fax Class 1	Applicable in Fax Class 1.0
+FCLASS=<class>	Select, read or test service class	X	X
+FAA=<value>	Auto answer enable	-	X
+FAE=<value>	Auto answer enable	X	X
+FTS=<time>	Stop transmission and pause	X	X
+FRS=<time>	Wait for silence	X	X
+FTM=<mod>	Transmit data with <mod> carrier	X	X
+FRM=<mod>	Receive data with <mod> carrier	X	X
+FTH=<mod>	Transmit HDLC data with <mod> carrier	X	X
+FRH=<mod>	Receive HDLC data with <mod> carrier	X	X
+FAR=<off/on>	Adaptive reception control	-	X
+FCL=<time>	Carrier loss timeout	-	X
+FDD=<value>	Double escape character replacement control	-	X
+FIT=<time>, <action>	DTE inactivity timeout	-	X
+FPR=<rate>	Fixed DTE Rate	-	X
+FMI?	Report manufacturer ID	-	X
+FMM?	Report model ID	-	X
+FMR?	Report revision ID	-	X
+FLO	Flow Control	-	X
&K	Local DTE-modem flow control (see Section 0)	X	X
A	Answer (see Section 0)	X	X
D <string>	Dial (see Section 0)	X	X
H	Hangup (see Section 0)	X	X
X = Applicable; - = Not applicable.			

4.1.4 Fax Origination

Origination of fax calls is made using the ATD command. Upon completion of the dial function, a calling tone at 1100 Hz is transmitted, with a cadence of 0.5 seconds on and 3 seconds off. The modem automatically enters mode +FRH=3 and sends the CONNECT message to the DTE when FSK flags are detected from the remote.

4.1.5 Fax Answering

Answering of fax calls is identical to answering of data calls with the exception that the modem enters the fax handshaking mode instead of the data handshaking mode after going off-hook. If +FAE=0, the modem, after sending answer tone, automatically enters fax mode (+FTH=3), sends the CONNECT message to the DTE, and starts sending FSK flags. If +FAE=1, the modem determines whether the caller is a data modem or fax modem and sends the DATA or FAX result code, respectively, to the DTE.

4.1.6 Fax Control Transmission

Fax control transmission is initiated by the +FTH=<mod> command. After this command is issued, the modem generates the CONNECT message and transmits carrier in the modulation scheme specified by the parameter n. The modem then transmits HDLC flags for a minimum of 1 second. The modem continues to transmit the HDLC flags until it receives a character from the DTE.

When characters are received from the DTE, the modem adds start and end flags, performs zero-bit insertion, generates FCS, and deletes <DLE><chr> character pairs before transmitting the characters to the remote fax machine. Each <DLE><DLE> sequence is transmitted as a single <DLE>. <DLE><ETX> is considered as the end of frame marker and is not transmitted. All data received from the DTE after <DLE><ETX> is ignored by the modem until the modem generates either the CONNECT, OK, or ERROR result code.

If no more data is in the transmit buffer and the final bit was a 1 (bit 4 of the second byte received from the DTE), the modem generates the OK result code and returns to the command mode. If the final bit was a 0, the modem generates the CONNECT message and waits for further data from the DTE while transmitting HDLC flags. If no more data is received before 5 seconds elapse, the modem drops carrier, goes on-hook, and generates the ERROR result code.

4.1.7 Fax Control Reception

Fax control reception is initiated using the AT+FRH=<mod> command. After this command is issued, the modem looks for carrier in the modulation scheme specified by the parameter n. If no carrier is detected before the period of time specified by register S7 expires, the modem generates the NO CARRIER message and returns to command mode. If a carrier is detected that is not the one specified by the parameter n, the modem generates the +FCERROR message and returns to the command mode. If the specified carrier is detected, the modem generates the CONNECT message and enters the HDLC receive mode.

In HDLC receive mode, the modem receives HDLC frames from the remote fax machine, strips the flags, performs zero-bit deletion, performs error checking, and handles <DLE><chr> character pairs before passing the data to the DTE. The modem prefixes each <DLE> character with another <DLE> character before sending it to the DTE. After the last byte in the frame, the modem sends <DLE><ETX> to the DTE marking the end of the frame. The modem then generates either the OK message if no errors were detected or the ERROR message if errors were detected (FCS is incorrect), and returns to command mode.

While in command mode, the modem continues to receive data in the selected modulation scheme, and sends the data after sending the CONNECT message to the DTE when the DTE reissues the +FRH command with the same parameter. If the DTE issues the +FRH command with a different parameter, the modem clears all buffers and proceeds as described previously.

If carrier is lost while in command mode and the DTE reissues the +FRH command with the same parameter, and there is no data in the buffer, the modem sends the ERROR result code to the DTE and returns to the command mode. If there is data in the buffer, the modem sends the next frame of buffered data to the DTE, followed by <DLE><ETX>, and either the ERROR result code if errors were detected or the OK result code if no errors were detected. The modem then returns to command mode.

The modem concludes an error is detected if carrier is lost for any period of time during or before the reception of a frame. If carrier is lost for a time period longer than the time specified by the register S10, the modem finishes delivering the data in the receive buffer (if any) to the DTE, sends <DLE><ETX>, generates the ERROR message, and returns to

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command mode. All subsequent data received from the remote is discarded.

If the modem detects a frame abort sequence (seven consecutive ones with no zero insertion) while it is waiting for a frame beginning flag (it was receiving HDLC flags), it will wait for the HDLC flags again until either carrier is lost, or the DTE aborts the process by sending an abort character or by dropping DTR with &D2 in effect. If the frame abort sequence is detected while the modem is receiving a frame it finishes delivering the data in the receive buffer (if any) to the DTE, sends <DLE><ETX>, generates the ERROR message, and returns to command mode. The modem keeps looking for HDLC flags followed by more data from the remote, with the selected modulation scheme.

If the modem detects a receive buffer overflow condition, it concludes that there was an FCS error in that frame. The modem will receive more frames only if a starting flag is detected and there is room in the receive buffer. If a starting flag is detected and there is no room in the buffer, the modem discards all data in that frame.

If the modem receives any character from the DTE after the +FRH command (except flow control characters if software flow control is in effect), or if the modem detects a high-to-low transition of the DTR signal while &D1 is in effect, it sends <DLE><ETX> to the DTE, generates OK result code, and returns to command mode. The receive buffer is cleared and all data received from the remote is discarded. If the modem detects a DTR drop while &D2 is in effect, it goes on-hook, sends <DLE><ETX> to the DTE, generates OK result code, and returns to command mode. If the modem detects a DTR drop while &D3 is in effect, the modem performs a warm reset.

4.1.8 Fax Data Transmission

Fax data transmission is initiated by the AT+FTM=<mod> command. After this command is issued, the modem generates the CONNECT message and transmits carrier in the modulation scheme specified by the parameter n. The modem then transmits constant 1 bits for a minimum of one second and continues to transmit constant 1 bits until it receives a character from the DTE.
When data is received from the DTE, the modem deletes start and stop bits and deletes all <DLE><chr> character pairs before transmitting the data to the remote. Each <DLE><DLE> sequence is transmitted as a single <DLE>. <DLE><ETX> is considered as the end of stream marker, and is not transmitted. All data received from the DTE after the <DLE><ETX> is ignored by the modem until the modem generates either the CONNECT, OK, or ERROR result code.

If no more data is in the transmit buffer, and the last transmitted character was not an ASCII NULL, the modem generates the OK result code and returns to the command mode. If the last character transmitted was an ASCII NULL, the modem generates the CONNECT message to the DTE and waits for further data from the DTE while transmitting NULLs to the remote. If more data is received before five seconds elapse, the modem continues to transmit the data as described in the previous paragraph. If five seconds elapse and no data is received from the DTE, the modem drops carrier, goes onhook, and generates the ERROR result code.

4.1.9 Fax Data Reception

Fax data reception is initiated using the AT+FRM=<mod> command. After this

command is issued, the modem looks for carrier in the modulation scheme specified by the parameter n. If no carrier is detected before the period of time specified by register S7 expires, the modem generates the NO CARRIER message and returns to command mode. If a V.21 carrier is detected when a high speed carrier is expected, the modem generates the +FCERROR message and returns to the command mode. If the specified carrier is detected, the modem generates the CONNECT message and enters the data receive mode.

While in data receive mode, the modem receives data from the remote, adds start and stop bits, and handles <DLE><chr> character pairs before passing the data to the DTE. The modem prefixes each <DLE> character with another <DLE> character before sending it to the DTE.

If the modem detects a receive buffer overflow condition, it stops receiving from the remote until there is room in the receive buffer. The modem informs the DTE of the buffer overflow after it sends to the DTE the last character that was stored in the buffer before the overflow occurred.

If the modem receives any character from the DTE after the +FRM command (except flow control characters if software flow control is in effect), or if the modem detects a high-to-low transition of the DTR signal while &D1 is in effect, it sends <DLE><ETX> to the DTE, generates the OK result code, and returns to command mode. The receive buffer is cleared and all data received from the remote is discarded. If loss of DTR is detected while &D2 is in effect, the modem goes on-hook, sends <DLE><ETX> followed by OK result code to the DTE, and returns to command mode. If the modem detects a DTR drop while &D3 is in effect, the modem performs a warm reset.

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4.2 Commands and Parameters

4.2.1 Mode Entry Commands

+FCLASS=1 - Select Facsimile Class 1 Mode

+FCLASS=1 selects the Fax Class 1 Mode. The Fax Class 1 Mode commands and responses described in this section are applicable when command +FCLASS=1 as shown in Table 4-1.

+FCLASS=1.0 - Select Facsimile Class 1.0 Mode

+FCLASS=1.0 selects the Fax Class 1.0. The Fax Class 1.0 Mode commands and responses described in this section are applicable when command +FCLASS=1.0 as shown in Table 4-1.

4.2.2 Mode Commands

+FAA - Auto Answer Enable

This command enables or disables fax adaptive answer. This command operates identically to the +FAE command.

Syntax

    +FAA=<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

    0   Disable data /fax auto answer mode. (Default.)

    1   Enable data /fax auto answer mode. The modem determines the calling type and issues DATA result code (13) if the caller is a data modem or issues FAX result code (15) if the caller is a fax modem.

+FAE - Auto Answer Enable

This command enables or disables fax adaptive answer. This command operates identically to the +FAA command.

Syntax

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+FAE=<value>

Defined Values

<value>   Decimal number corresponding to the selected option.

> 0   Disable data /fax auto answer mode. (Default.)
>
> 1   Enable data /fax auto answer mode. The modem determines the calling type and issues DATA result code (13) if the caller is a data modem or issues FAX result code (15) if the caller is a fax modem.

After a data (not fax) connection is achieved (indicated by the DATA result code), the DTE must issue an ATO command to cause the modem to go on-line.

+FTS - Transmit Silence

This command causes the modem to terminate a transmission and wait for <time> 10-ms intervals before responding with the OK result code.

Syntax

+FTS=<time>

Defined Values

<time>   Decimal number from 0 (default) to 255 which specifies the length of time in 10-ms intervals to delay before responding with the OK result code after terminating the session.

Result Codes

OK   Reported when transmission has been terminated for the specified amount of time.
ERROR   <value> is invalid or this command is issued while the modem is on-hook.

Reporting Supported Range of Parameter Values

Command: +FTS=?

Response: +FTS: <time> range

Example: +FTS: 0-255

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+FRS - Receive Silence

This command causes the modem to listen and report an OK result code when silence has been detected on the line for the specified period of time. This command will terminate when the required period of silence is detected or when the DTE sends the modem another character other than XON or XOFF, which is discarded. In either event, the OK result code is returned.

This command is aborted if any character is received from the DTE after receipt of the command but before the time delay elapses. In this case, the modem discards the aborting character and issues an OK result code.

Syntax

    +FRS =<time>

Defined Values

    <time>   Decimal number from 0 (default) to 255 which specifies the length of time in 10-ms intervals to delay before responding with the OK result code after detecting silence on the line.

Result Codes

    OK   Reported when silence has been present on the line for the specified amount of time or when the DTE sends the modem a character other than XON or XOFF.

    ERROR   <value> is invalid or this command is issued while the modem is on-hook.

Reporting Supported Range of Parameter Values

Command: +FRS=?

Response: +FRS: <time> range

Example: +FRS: 0-255

+FTM - Transmit Facsimile

This command causes the modem to transmit data using the modulation defined below. When a valid <mod> value is entered, the modem transmits the proper training sequence in the selected mode, followed by constant 1 bits until data is received from the DTE. The modem also returns the CONNECT result code at the beginning of the training sequence.

Syntax

    +FTM=<mod>

Defined Values

    <mod>   Decimal number corresponding to the selected modulation

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Table 4-2. Fax Class 1 and Fax Class 1.0 Modulation Modes and Rates

<mod>	Modulation	Training	Modulation Mode and Rate
3	V.21		300 bps
24	V.27 ter		2400 bps
48	V.27 ter		4800 bps
72	V.29		7200 bps
73	V.17	long	7200 bps long
74	V.17	short	7200 bps short
96	V.29		9600 bps
97	V.17	long	9600 bps long
98	V.17	short	9600 bps short
121	V.17	long	12000 bps long
122	V.17	short	12000 bps short
145	V.17	long	14400 bps long
146	V.17	short	14400 bps short

Result Codes

CONNECT   Reported when the modems begins the training sequence after receipt of a valid <mod> value.

ERROR   If the modem's transmit buffer becomes empty and the last transmitted character is NUL (00), the modem continues to transmit NULs until the DTE sends more data or five seconds elapses. After five seconds elapse with a empty transmit buffer, the modem will turn off the transmit carrier, return to the command state, and report the ERROR result code.

OK   If the modem's transmit buffer becomes empty and the last transmitted character is was not NUL, the modem will turn off the transmit carrier, return to the command state, and report the OK result code.

Reporting Current or Selected Values

Command: +FTM?

Response: +FTM: <mod>

Example: +FTM: 98   For V.17 9600 bps.

Reporting Supported Range of Parameter Values

Command: +FTM=?

Response: +FTM: (<mod> range)

Example: +FTM: 3,24,48,72,73,74,96,97,98,121,122,145,146

+FRM - Receive Facsimile

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This command causes the modem to enter the receiver mode using the modulation defined below.

Syntax

+FRM=<mod>

Defined Values

<mod>   Decimal number corresponding to the selected modulation mode and data rates shown in Table 4-2.

Reporting Current or Selected Values

Command: +FRM?

Response: +FRM: <mod>

Example: +FRM: 98   For V.17 9600 bps.

Reporting Supported Range of Parameter Values

Command: +FRM=?

Response: +FRM: (<mod> range)

Example: +FRM: 3,24,48,72,73,74,96,97,98,121,122,145,146

Result Codes

CONNECT   Reported when the selected carrier is detected.
+FCERROR   Reported if another carrier is detected and FAR=0; the modem then returns to the command state.
NO CARRIER   Reported if loss-of-carrier is detected.
OK   Reported if the DTE sends any character to the modem other than XON or XOFF while operating in configured flow control from the DTE; the modem then returns to the command state.

+FTH - Transmit Data with HDLC Framing

This command causes the modem to transmit data using HDLC protocol and the modulation defined below.

Syntax

+FTH=<mod>

Defined Values

<mod>   Decimal number corresponding to the selected modulation mode and data rates shown in Table 4-2.

Result Codes

CONNECT	Reported for either of two conditions:
	1. At the beginning of transmission of the training pattern for the selected modulation.
	2. If the Final Frame bit is 0.
OK	Reported for either of two conditions:
	1. If the Final Frame Bit is 1.
	2. if the DTE sends only <DLE><ETX> (a null frame) while transmitting flags.
ERROR	Reported if five seconds elapse from the time when the modem reported the CONNECT result code without any additional data transmitted from the DTE; the modem then turns off carrier and returns to the command mode.

Reporting Current or Selected Values

Command: +FTH?

Response: +FTH: <mod>

Example: +FTH: 98   For V.17 9600 bps.

Reporting Supported Range of Parameter Values

Command: +FTH?

Response: +FTH?

Example: +FTH: 98   For V.17 9600 bps.

+FRH - Receive Data with HDLC Framing

This command causes the modem to receive frames using HDLC protocol and the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.

Syntax

   +FRH=<mod>

Defined Values

   <mod>   Decimal number corresponding to the selected modulation mode and data rates shown in Table 4-2.

Reporting Current or Selected Values

Command: +FRH?

Response: +FRH: <mod>

Example: +FRH: 98   For V.17 9600 bps.

Reporting Supported Range of Parameter Values

Command: +FRH?

Response: +FRH?

Example: +FRH: 98   For V.17 9600 bps.

Result Codes

    CONNECT   Reported for either of two conditions:
1. When the selected carrier is detected with an HDLC flag.
2. If the DTE sends another +FTH=<MOD> command after sending the result code indicating frame reception is complete.

    +FCERROR   Reported if a different carrier is detected and FAR=0.

    NO CARRIER   Reported if loss of carrier is detected.

    OK   Reported for either of two conditions:
1. If a frame was received correctly.
2. If the DTE sends any character other than XON or XOFF while the modem is in the configured flow control.

    ERROR   Reported if a frame was received in error.

4.2.3 Service Class 1 Parameters

+FAR - Adaptive Reception Control

If Adaptive Reception is enabled, the modem adaptively detects the selected message carrier or V.21 control messages. If the expected carrier is detected, the modem operates as specified in the respective +FRM=<mod> or +FRH=<mod> commands. If V.21 flag preamble is detected instead, the modem issues a +FRH:3 intermediate result code, and then executes an implied +FRH=3 command.

Write Syntax

+FAR=<value>

Defined Values

<value>   Decimal number corresponding to the selected option.
          0   Disable Adaptive Reception. (Default.)
          1   Enable Adaptive Reception.

Reporting Current or Selected Values

Command: +FAR?

Response: +FAR: <value>

Example: +FAR: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +FAR=?

Response: +FAR: (<value> range)

Example: +FAR: (0,1)

+FCL - Carrier Loss Timeout

This parameter allows the DTE to select the modem's loss-of-carrier delay between initial loss-of-carrier and qualified loss-of-carrier, when the modem will give up and exit a receive mode. Intermediate (less than FCL timeout) loss-of-carrier should be indicated by insertion of the SQ-BAD signal quality indicator in the received data stream.

In unframed receive modes, if the modem detects RTC as described in Recommendation T.30 prior to initial loss of the high speed carrier, or if the modem detects V.21 carrier after initial loss of high speed carrier, then the modem immediately accepts the loss-of-carrier as qualified, without waiting for the FCL timer to expire.

In HDLC receive modes, if the modem detects HDLC abort prior to initial loss of the high speed carrier, or if the modem detects V.21 carrier after initial loss of high speed

carrier, then the modem l immediately accepts the loss-of-carrier as qualified, without waiting for the FCL timer to expire.

Write Syntax

 +FCL=<time>

Defined Values

 <value>   Decimal number representing the loss-of-carrier delay time in units of 100 ms. The range is 0 - 255.

Reporting Current or Selected Values

Command: +FCL?

Response: +FCL: <time>

Example: +FCS: 0 For the default setting.

Reporting Supported Range of Parameter Values

Command: +FCL=?

Response: +FCL: (<time> range)

Example: +FCL: (0-255)

+FDD - Double Escape Character Replacement

This parameter conditions the use of the _DLE___SUB_ pair to encode consecutive <1/0>□<1/0> in data. This may be used to prevent unbound expansion of data that contains many <1/0> patterns.

Syntax

 +FDD=<value>

Defined Values

 <value>   Decimal number corresponding to the selected option. For modem decode of <DLE><SUB>, the defined range are:
      0   <DLE> <DLE> or discard (default and only)
      1   <DLE> <DLE> (not supported)

      For modem encoding of <1/0> <1/0>the defined values are:
      0   <DLE> <DLE> <DLE> <DLE> (default and only)
      1   <DLE> <SUB> (not supported)

Reporting Current or Selected Values

Command: +FDD?

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Response: +FDD: <value>

Example: +FDD: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +FDD=?

Response: +FDD: (<value> range)

Example: +FDD: (0)

+FIT - DTE Inactivity Timeout

This command specifies a DTE inactivity timeout value that allows the modem to break way from an unsuccessful connection attempt at any stage of a facsimile transfer. The DTE inactivity timer operates only while the modem is off-hook.

Syntax

    +FIT=<time>,<action>

Defined Values

<time>	The <time> parameter indicates the DTE inactivity timeout in seconds. The value of 0 indicates that timeout is disabled (default). The required timeout range is 1 to 255 seconds. The inactivity timer starts when the modem has taken some action that requires DTE response. If the DTE does respond, the modem resets the inactivity timer. Inactivity timer related events are listed in Table 4-3.
<action>	The <action> parameter has two meanings.

    0   Upon timeout, the modem will go on-hook, executing an implied ATH command; then reset to +FCLASS=0.

    1   Upon timeout, the DCE will only go on-hook.

Reporting Current or Selected Values

Command: +FIT?

Response: +FIT: <time>,<action>

Example: +FIT: 0,0   For the default settings.

Reporting Supported Range of Parameter Values

Command: +FIT?

Response: +FIT: (<time> range), (<action> range)

Example: +FIT: (0-255),(0-1)

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Table 4-3. Inactivity Timer Start and Stop Events

On-line state	Start timer event	Stop timer event
Waiting for a command	modem sends final result code	DTE sends AT or "at"
Waiting for transmit data	modem sends CONNECT after +FTM or +FTH command	DTE sends data
Waiting for transmit data	modem sends <XON> or sets CTS ON	DTE sends data
Waiting to deliver received data	modem sends <XOFF> after +FRM or +FRH command	DTE sends <XON>
Waiting to deliver received data	DTE sets V.24 Ckt 133 OFF after +FRM or +FRH command	DTE sets V.24 Ckt 133 ON

+FPR - Fixed DTE Rate

This numeric extended-format parameter specifies the data rate at which the modem will accept commands during on-line operation. It may be used to select operation at rates at which the modem 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 modem. 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 Normal Mode (Direct Mode) of operation is selected.

Syntax

+FPR=<rate code>

Defined Values

<rate code>   Specifies the DTE-modem interface operation rate in bits/s with a rate code. The available rate codes are:
  0   Automatic detection (default)
  1   2400 bits/s (executes +IPR=2400)
  2   4800 bits/s (executes +IPR=4800)
  4   9600 bits/s (executes +IPR=9600)
  8   19200 bits/s (executes +IPR=19200)
  10   38400 bits/s (executes +IPR=38400)
  18   57400 bits/s (executes +IPR=57400)

If unspecified or set to 0, automatic detection is selected and the character format is also forced to autodetect, +ICF=0.

If the rate specified is not supported by the modem, an ERROR result code will be returned.

Reporting Current or Selected Values

Command: +FPR?

Response: <rate code>

Example 1: 0   For automatic rate detection.

Example 2: 18   For 57600 bits/s.

Reporting Supported Range of Parameter Values

Command: +FPR=?

Response: (<rate code> range)

Example: (0,1,2,4,8,10,18)

+FMI? - Request Manufacturer Identification

This command causes the modem to report the modem product manufacturer.

Syntax

    +FMI?

Typical Response

    CONEXANT
    OK

+FMM? - Request Model Identification

This command causes the modem to report the modem product model.

Syntax

    +FMM?

Typical Response

    V90
    OK

+FMR? - Request Revision Identification

This command causes the modem to transmit one or more lines of information text identifying the modem version, revision level or date.

Syntax

    +FMR?

Typical Response

    V3.001-V90_2M_DLS
    OK

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+FLO - Flow Control

This parameter allows the DTE to identify and select the type of flow control used.

Syntax

+FLO=<method>

Defined Values

<method>	Decimal number corresponding to the selected option.

0   XON/XOFF and RTS/CTS flow control turned off.

1   Use XON/XOFF flow control in either direction.

2   Use RTS for flow control of the modem by the DTE; use CTS for flow control of the DTE by the modem.

Reporting Current or Selected Values

Command: +FLO?

Response: +FLO: <method>

Example: +FLO: 0   For the default setting.

Reporting Supported Range of Parameter Values

Command: +FLO=?

Response: +FLO: (<method>range)

Example: +FLO: (0-2)

Result Codes

OK   <method> = 0-2.
ERROR   Otherwise.

4.3 Examples

Examples of calling (transmitting) and answering (receiving) one page using fax class 1 commands are shown in Table 4-4 and Table 4-5, respectively. The examples show the interchange between the DTE and the modem for various cases. Comments are included to explain how to handle various situations. Commands and responses are in upper case (e.g., AT+FRH=3) and comments are in lower case. All streams of data denoted by <..frame> are terminated by the <DLE><ETX> characters.

Table 4-4. Fax Class 1 Calling Sequence (Transmitting a Single Page)

DTE Commands	Modem Responses	Local Modem Action	Remote Station Action	Notes
AT+FCLASS=1	OK	Set Class 1		
ATDT<string>		Dial and send CNG Look for V.21 Detect flags	Answer send CED, V.21 Send HDLC flags	AT+FRH=3 implied by dialing with +FCLASS=1.0
	CONNECT <NSFframe> <DLE><ETX> OK		Send NSF frame	
AT+FRH=3	CONNECT <CFI frame data> <DLE><ETX> OK	Detect flags get CSI get FCS accept FCS	send CSI frame check FCS	Frame status OK
AT+FRH=3	CONNECT <DIS frame data> <DLE><ETX> OK	Detect flags get DIS get FCS accept FCS	send DIS frame check FCS	DTE must detect final frame bit to anticipate loss of carrier
AT+FRH=3	NO CARRIER	detect loss-of-carrier	drop carrier	
AT+FTH=3 <TSI frame data> <DLE><ETX> <DCS frame data> <DLE><ETX>	CONNECT CONNECT OK	send V.21 carrier send flags send TSI frame send FCS send flags send DCS frame send FCS, flags drop carrier	detect carrier detect flags get TSI frame get DCS frame	Final frame bit clear tell the modem to expect another frame. Final frame bit set tells the modem not to expect another frame
AT+FTS=8; +FTM=96 <TCF data pattern> <DLE><ETX>	CONNECT OK	wait 80 ms send V.29 carrier send TCF data drop carrier	detect carrier get TCF data	
AT+FRH=3	CONNECT <CFR frame data> <DLE><ETX> OK	detect carrier detect flags get CFR frame check FCS accept FCS	send V.21 carrier send flags get CRF frame send FCS	Final frame bit set. frame OK
AT+FRH=3	NO CARRIER	detect loss-of-carrier	drop carrier	
AT+FTM=96 <page image data> <DLE><ETX>	CONNECT OK	send V.29 carrier send page data drop carrier	detect carrier receive page	
AT+FTS=8; +FTH=3 <EOP frame data> <DLE><ETX>	CONNECT OK	wait 80 ms send V.21 carrier send flags send EOP frame send FCS drop carrier	detect carrier detect flags receives EOP	final frame
AT+FRH=3	CONNECT <MCF frame data> <DLE><ETX> OK	detect carrier detect flags get MCF frame check FCS accept FCS	send V.21 carrier send flags get MCF frame send FCS	Final frame bit set. frame OK
AT+FRH=3	NO CARRIER	detect loss-of-carrier	drop carrier	
AT+FTH=3 <DNC frame>	CONNECT	send V.21 carrier send flags	detect carrier	

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<DLE><ETX>		send DNC frame send FCS	detect flags receive DC|NC	
	OK	drop carrier		final frame
ATH0	OK	hang up	hang up	

Table 4-5. Fax Class 1 Answering Sequence (Receiving a Single Page)

DTE Commands	Modem Responses	Local Modem Action	Remote Station Action	Notes
AT+FCLASS=1	OK	Set Class 1		
	RING<-	detect ringing	dials [,send CNG]	
ATA		off-hook, send CED, send V.21 carrier	get CED, detect carrier	AT+FRH=3 implied by answering with +FCLASS=1.0. not final frame
	CONNECT	send flags	detect flags	
<CSI frame data>		send CSI frame	receive CSI	
<DLE><ETX>	CONNECT	send FCS send flags	get FCS get flags	
<DIS frame data>		send DIS data	get DIS	
<DLE><ETX>	OK	send FCS and flags drop carrier	get flags	final frame
AT+FRH=3		detect carrier	send V.21 carrier	
	CONNECT	detect flags	send flags	
	<TSI frame data>	receive TSI	send TSI frame	
	<DLE><ETX>	receive FCS	send FCS	
	OK	accept FCS		frame OK
AT+FRH=3				
	CONNECT	receive DCS	send DCS frame	final frame bit set
	<DCS frame data>	receive FCS	send FCS	
	<DLE><ETX>	accept FCS		frame OK
	OK			
AT+FRH=3	NO CARRIER	detect loss-of-carrier	drop carrier	DTE did not check final frame bit and issued +FRH=3
AT+FRM=96			wait 75 ms	
	CONNECT	detect carrier	send V.29 carrier	
	<TCF data>	receive TCF	send TCF data	
	<DLE><ETX>	detect loss-of-carrier	drop carrier	
	OK			
AT+FTH=3		send V.21 carrier	detect carrier	
	CONNECT	send flags	detect flags	
		get CRF frame	receive CFR	
<CFR frame data>		send FCS		
<DLE><ETX>	OK	drop carrier		final frame
AT+FRM=96				
	CONNECT	detect carrier	send V.29 carrier	
	<page image data>	receive page	send page data	
	<DLE><ETX>	detect loss-of-carrier	drop carrier	
	NO CARRIER			
			wait 75 ms	
	CONNECT	detect carrier	send V.21 carrier	
	<EOP frame data>	detect flags	send flags	
	<DLE><ETX>	receive EOP	send EOP frame	
	NO CARRIER	receive FCS	send FCS	
		accept FCS		frame OK
AT+FRH=3	NO CARRIER	detect loss-of-carrier	drop carrier	
AT+FTH=3		send V.21 carrier	detect carrier	
	CONNECT	send flags	detect flags	
<MCFame data>		get MCF frame	receive MCF frame	
<DLE><ETX>		send FCS		
	OK	accept FCS		final frame

AT+FRH=3		detect carrier	send V.21 carrier	
	CONNECT	detect flags	send flags	
	<DCN frame data>	receive DCN	send DCN frame	
	<DLE><ETX>	receive FCS	send FCS	
	OK	accept FCS		frame OK
AT+FRH=3	NO CARRIER	detect loss-of-carrier	drop carrier	end of session
ATH0	OK	hang up		