



AT Command Set and Register Summary for Cisco PVDM2 Digital Modems

First Published: August 15, 2007
Last Updated: December 5, 2007

This document describes modem AT commands and S-registers for Cisco PVDM2-xxDM digital modems.



Note

IOS feature support for PVDM2-xxDM digital modems supersedes CSM V12 capabilities. Please refer to the IOS feature set documentation for details of support on specific platforms.

For information about managing modems on Cisco access gateways using Cisco IOS software commands, refer to the software configuration guide for the access server in which the modems are installed.

This document contains the following sections:

- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page 2](#)
- [Entering AT Commands, page 2](#)
- [Command Syntax, page 4](#)
- [AT Command Set Summary, page 5](#)
- [AT Commands Description, page 11](#)
- [V92 Data Mode AT Commands, page 55](#)
- [Error Detection and Data Compression Commands, page 64](#)
- [MNP 10EC Commands, page 66](#)
- [AT Command Result Codes, page 67](#)
- [S Registers, page 74](#)
- [FAX Class 2 Commands, page 96](#)



Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Entering AT Commands

To send AT commands to the modem, you must first put the modem in AT command mode. Entering AT command mode involves a reverse Telnet procedure. The table below shows how to enter AT command mode from Cisco IOS EXEC mode using reverse Telnet.

Step	Command	Purpose
Step 1	> telnet <i>ip-address line#</i> Trying 172.0.0.1, 2001 ... Open	Open a reverse Telnet connection to the modem. In this example, <i>ip-address</i> is the IP address of the access server and <i>line#</i> is the two-digit line number of the modem, prefixed by 20. (For example, enter telnet 172.0.0.1 2001 if the IP address is 172.0.0.1 and the modem line number is 1.) If you do not know which line number to use, enter the show line command and check the resulting display for tty numbers that have <i>inout</i> in the Modem column. Use one of those numbers. The Telnet connection is open when the word <code>Open</code> appears.
Step 2	at OK	There is no command prompt in AT command mode. To confirm that you can enter AT commands, enter at and press Return . If you are in AT command mode, the modem returns <code>OK</code> .
Step 3	Ctrl-Shift-6 X # disconnect	When you have finished entering AT commands, exit AT command mode and return to privileged EXEC mode. To do so, enter Ctrl-Sh-6 X (that is, hold down the Control and Shift keys and press 6 , and then release everything and press X). Enter disconnect to end the Telnet connection.

Use these guidelines when you send AT commands to a modem:

- Enter the **AT** prefix before all commands except **A/** (Repeat Last Command) and **+++** (Escape code). Commands are carried out when you press **Return** or **Enter**.
- Command lines are limited to 128 characters, not including the **AT** prefix and **Return** characters. Dial strings, however, are limited to 49 characters.

- You can enter several commands on the same command line, as long as you do not exceed the 128-character limit (see preceding item). Enter commands with no spaces or separators between them. The commands are carried out in the order in which they appear on the command line. If an individual command fails (returns ERROR), any subsequent commands on that line are not carried out.
- Certain commands work only if they are the last command on the line. Such commands include **A** (answer), **D** (dial), **H** (hang up), **Z** (reset), and any command that takes time to execute or that does not return a result immediately.
- Spaces within AT commands are permitted anywhere except between the A and the T. For example, enter **ATS0?**, **AT S0?**, **ATS 0?**, but not **A TS0?**.
- Enter commands as either uppercase or lowercase, not mixed case.
- Enter **Ctrl-C** (^C) to abort a partially entered command. The modem echoes ^c.
- Use the **Backspace** key (or another key specified in register S5) to erase characters on the command line, except for the leading characters AT. To clear the characters AT, press **Return** for a fresh command line. For information on changing the command-line erase key, see the “[S5 - Backspace Character](#)” section on page 77.
- A missing numeric argument is assumed to be zero. For example, the **Quiet** command **Q** is equivalent to **Q0**.
- The modem operates in the following modes:
 - Command state: The modem is idle and waiting for commands.
 - Set-up state: Establishing a connection.
 - Online state: Connected to another modem. To return to the online state from any other state, enter **ATO** and press **Return**. A fresh connect message is sent.
 - Escape state: Allows you to enter commands while the modem is on line. To go to escape state, enter +++ (+++ is the default escape code; see “[S2 - Escape Character](#),” on page 76 for details on changing the escape code). When you enter the +++ command, pause for at least a second before and after typing it, but do *not* pause between characters. Do not press **Return**. Wait for the OK prompt before entering commands.

The escape code can be enabled and disabled; for instructions, see “[S2 - Escape Character](#),” on page 76 .

Command Syntax

DTE/DCE Command-Response Protocol

Communication between the DTE and modem (DCE) follows command-response protocol, i.e., the DTE sends a command to the modem, then waits for a response from the modem.

Command Syntax and Guidelines

DTE Commands

The ISO 646 character set (CCITT T.50 International Alphabet 5, American Standard Code for Information Interchange) is used for the issuance of commands and responses. Only the low-order 7 bits of each character are used for commands or parameters; the high-order bit is ignored. Upper case characters are equivalent to lower case characters.

DTE Command Lines

A command line is a string of characters sent from a DTE to the DCE while the DCE is in a command state. Command lines have a prefix, a body, and a terminator. The prefix consists of the ASCII characters “AT” (41h, 54h) or “at” (61h, 74h). The body is a string of commands restricted to printable ASCII characters (20h - 7Eh). Space characters (ASCII 20h) and control characters other than carriage return <CR> (default value = ASCII 013 = 0Dh, see register S3), backspace <BS> (default value = ASCII 008 = 08h, see register S5), and cancel <cntrl-x> (ASCII 024 = 18h) in the command string are ignored. The default terminator is the <CR> character. Characters that precede the AT prefix are ignored.

AT Command Guidelines

Modem operation is controlled by generic AT commands. These AT commands may be basic AT (i.e., commands preceded by AT, AT&, AT%, AT*, AT\, AT), AT-, or AT#), S-Register (e.g., S6=n) or Fax class 2 (e.g., +FDCS:) commands. The command syntax and operation guidelines governing each of these command categories are described in subsequent sections.

Basic Command Syntax

Characters within the command line are parsed as commands with associated parameter values. The basic commands consist of single ASCII characters, or single characters preceded by a prefix character, followed by a decimal parameter (e.g., “&D1”). Missing decimal parameters are evaluated as 0.

+ Command Termination

A “+” command must be terminated by the semicolon “;” character (ASCII 3Bh) if in a command string prior to another command, or by the <CR> at the end of the command string.

AT Command Set Summary

Basic AT Commands

Command	Function
A/	Re-execute command
A	Go off-hook and attempt to answer a call.
B0	Select V.22 connection at 1200 bps.
B1	Select Bell 212A connection at 1200 bps.
C1	Return OK message.
Dn	Dial modifier.
E0	Turn off command echo.
E1	Turn on command echo.
H0	Initiate a hang-up sequence.
H1	If on-hook, go off-hook and enter command mode.
I0	Report product code.
I1	Report pre-computed checksum.
I2	Report OK.
I3	Report firmware revision, model, and interface type.
I4	Report response programmed by an OEM.
I5	Report the country code parameter.
I6	Report modem data pump model and code revision.
I7	Report OK.
N0	Turn off automode detection.
N1	Turn on automode detection.
O0	Go on-line.
O1	Go on-line and initiate a retrain sequence.
P	Force pulse dialing.
Q0	Allow result codes to DTE.
Q1	Inhibit result codes to DTE.
Sn	Select S-Register as default.
Sn?	Return the value of S-Register n.
=v	Set default S-Register to value v.
?	Return the value of default S-Register.
T	Force DTMF dialing.
V0	Report short form (terse) result codes.
V1	Report long form (verbose) result codes.

Command	Function
W0	Report DTE speed in EC mode.
W1	Report line speed, EC protocol and DTE speed.
W2	Report DCE speed in EC mode.
X0	Report basic call progress result codes, i.e., OK, CONNECT, RING, NO CARRIER (also, for busy, if enabled, and dial tone not detected), NO ANSWER and ERROR.
X1	Report basic call progress result codes and connections speeds (OK, CONNECT, RING, NO CARRIER (also, for busy, if enabled, and dial tone not detected), NO ANSWER, CONNECT XXXX, and ERROR.
X2	Report basic call progress result codes and connections speeds, i.e., OK, CONNECT, RING, NO CARRIER (also, for busy, if enabled, and dial tone not detected), NO ANSWER, CONNECT XXXX, and ERROR.
X3	Report basic call progress result codes and connection rate, i.e., OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXXX, BUSY, and ERROR.
X4	Report all call progress result codes and connection rate, i.e., OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXXX, BUSY, NO DIAL TONE and ERROR.
Y0	Disable long space disconnect before on-hook.
Y1	Enable long space disconnect before on-hook.
Z0	Restore default profile after warm reset.
Z1	Restore default profile after warm reset.
&C0	Force RLSD active regardless of the carrier state.
&C1	Allow RLSD to follow the carrier state.
&D0	Interpret DTR ON-to-OFF transition per &Qn: <ul style="list-style-type: none"> • &Q0, &Q5, &Q6 <ul style="list-style-type: none"> – The modem ignores DTR • &Q1, &Q4 <ul style="list-style-type: none"> – The modem hangs up • &Q2, &Q3 <ul style="list-style-type: none"> – The modem hangs up
&D1	Interpret DTR ON-to-OFF transition per &Qn: <ul style="list-style-type: none"> • &Q0, &Q1, &Q4, &Q5, &Q6 <ul style="list-style-type: none"> – Asynchronous escape • &Q2, &Q3 <ul style="list-style-type: none"> – The modem hangs up
&D2	Interpret DTR ON-to-OFF transition per &Qn: <ul style="list-style-type: none"> • &Q0 through &Q6 <ul style="list-style-type: none"> – The modem hangs up

Command	Function
&D3	Interpret DTR ON-to-OFF transition per &Qn: <ul style="list-style-type: none"> • &Q0, &Q1, &Q4, &Q5, &Q6 <ul style="list-style-type: none"> – The modem performs soft reset • &Q2, &Q3 <ul style="list-style-type: none"> – The modem hangs up
&F0	Restore factory configuration.
&F1	Restore factory configuration.
&G0	Disable guard tone.
&G1	Disable guard tone.
&G2	Enable 1800 Hz guard tone.
&L0	Select dial up line operation.
&M0	Select direct asynchronous mode.
&M1	Select sync connect with async off-line command mode (serial interface operation only).
&M2	Select sync connect with async off-line command mode and enable DTR dialing of directory zero (serial interface operation only).
&M3	Select sync connect with async off-line command mode and enable DTR to act as Talk/Data switch (serial interface operation only).
&Q0	Select direct asynchronous mode.
&Q1	Select sync connect with async off-line command mode (serial interface operation only).
&Q2	Select sync connect with async off-line command mode and enable DTR dialing of directory zero (serial interface operation only).
&Q3	Select sync connect with async off-line command mode and enable DTR to act as Talk/Data switch (serial interface operation only).
&Q4	Reserved.
&Q5	Modem negotiates an error corrected link.
&Q6	Select asynchronous operation in normal mode.
&R0	CTS tracks RTS (async) or acts per V.25 (sync).
&R1	CTS is always active.
&S0	DSR is always active.
&S1	DSR acts per V.25.
&T0	Terminate any test in progress.
&T1	Initiate local analog loopback.
&T2	Returns ERROR result code.
&T3	Initiate local digital loopback.
&T4	Allow remote digital loopback.
&T5	Disallow remote digital loopback request.
&T6	Request an RDL without self-test.

Command	Function
&T7	Request an RDL with self-test.
&T8	Initiate local analog loop with self-test.
&V	Display current configurations.
&V1	Display connection statistics
&W0	Report OK
&W1	Report OK
&X0	Select internal timing for the transmit clock.
&X1	Select external timing for the transmit clock.
&X2	Select slave receive timing for the transmit clock.
&Y0	Recall stored profile 0 upon power up.
&Y1	Recall stored profile 1 upon power up.
&Zn=x	Store dial string x (to 34) to location n (0 to 3).
%E0	Disable line quality monitor and auto retrain.
%E1	Enable line quality monitor and auto retrain.
%E2	Enable line quality monitor and fallback/fall forward.
%L	Return received line signal level.
%Q	Report the line signal quality.
\Kn	Controls break handling during three states: 1. When modem receives a break from the DTE:
\K0,2,4	Enter on-line command mode, no break sent to the remote modem.
\K1	Clear buffers and send break to remote modem.
\K3	Send break to remote modem immediately.
\K5	Send break to remote modem in sequence with transmitted data.
	2. When modem receives \B in on-line command state:
\K0,1	Clear buffers and send break to remote modem.
\K2,3	Send break to remote modem immediately.
\K4,5	Send break to remote modem in sequence with transmitted data.
	3. When modem receives break from the remote modem:
\K0,1	Clear data buffers and send break to DTE.
\K2,3	Send a break immediately to DTE.
\K4,5	Send a break with received data to the DTE.
\N0	Select normal speed buffered mode.
\N1	Select direct mode.

Command	Function
\N2	Select reliable link mode.
\N3	Select auto reliable mode.
\N4	Force LAPM mode.
\N5	Force MNP mode.
\V0	Connect messages are controlled by the command settings X, W, and S95.
\V1	Connect messages are displayed in the single line format.
+CTD	Enables and disables tone detection
+IPT	ISDN Protocol Selection
+ISP	Selects Pass-Through Mode or POTS Modem Connection
+MS	Select modulation.
+PTF	Sets up frequencies to be detected for each filter 0 - 15
+QTR?	Queries detected tone
+TSA	Program the Time Slot Assignment
+VTS	Generates single/dual tones

V.92 Data Mode Commands

Command	Function
+QC	V.92 QuickConnect Enable
+HEN	Modem On-Hold Enable
+HTL	Modem On-Hold Time-Out Setting
+DS44	V.44 Compression Parameters
+DCS	V.42bis/V.44 Negotiation Enable
%Cn	Enable/Disable Data Compression Negotiation (see ECC Commands)
&V2	V.92 connection statistics

ECC Commands

Command	Function
%C0	Disable data compression.
%C1	Enable MNP 5 data compression negotiation.
%C2	Enable V.42 bis data compression negotiation.
%C3	Enable both V.42 bis and MNP 5 compression negotiation.
%C4	Forces V.44 data compression negotiation with fallback to no data compression.

Command	Function
%C5	Allows V.44 data compression negotiation and fallback to V.42 bis and MNP 5 data compression negotiation the same as %C3 (Default).
\A0	Set maximum block size in MNP to 64.
\A1	Set maximum block size in MNP to 128.
\A2	Set maximum block size in MNP to 192.
\A3	Set maximum block size in MNP to 256.

MNP10EC Commands

Command	Function
-SEC=0	Disable MNP10-EC.
-SEC=1,[<tx level>]	Enable MNP10-EC and set transmit level <tx level> 0 to 30 (0 dBm to -30 dBm).

FAX Class 2 Commands

Command	Function
+FCLASS=n	Service class.
+FAA=n	Adaptive answer.
+FAXERR	Fax error value.
+FBOR	Phase C data bit order.
+FBUF?	Buffer size (read only).
+FCFR	Indicate confirmation to receive.
+FCLASS=	Service class.
+FCON	Facsimile connection response.
+FCIG	Set the polled station identification.
+FCIG:	Report the polled station identification.
+FCR	Capability to receive.
+FCR=	Capability to receive.
+FCSI:	Report the called station ID.
+FDCC=	DCE capabilities parameters.
+FDCS:	Report current session.
+FDCS=	Current session results.
+FDIS:	Report remote capabilities.
+FDIS=	Current sessions parameters.

Command	Function
+FDR	Begin or continue phase C receive data.
+FDT=	Data transmission.
+FDTC:	Report the polled station capabilities.
+FET:	Post page message response.
+FET=N	Transmit page punctuation.
+FHNG	Call termination with status.
+FK	Session termination.
+FLID=	Local ID string.
+FLPL	Document for polling.
+FMDL?	Identify model.
+FMFR?	Identify manufacturer.
+FPHCTO	Phase C time out.
+FPOLL	Indicates polling request.
+FPTS:	Page transfer status.
+FPTS=	Page transfer status.
+FREV?	Identify revision.
+FSPL	Enable polling
+FTSI:	Report the transmit station ID.

AT Commands Description

- [AT Commands, page 11](#)
- [AT& Commands, page 22](#)
- [AT% Commands, page 44](#)
- [AT\ Commands, page 46](#)
- [AT+ Commands, page 48](#)

AT Commands

A/ - Re-execute Command

The modem behaves as though the last command line had been re-sent by the DTE. "A/" will repeat all the commands in the command buffer.

The principal application of this command is to place another call (using the Dial command) that failed to connect due to a busy line, no answer, or a wrong number. This command must appear alone on a command line. This command should not be terminated by a carriage return.

AT= x - Write to Selected S-Register

This command writes the value x to the currently selected S-Register. An S-Register can be selected by using the ATSn command. All of the S-Registers will return the OK response if x is a number. Some registers may not be written due to country specific PTT limitations.

Result Code	Meaning
OK	For all arguments

AT? - Read Selected S-Register

This command reads and displays the selected S-Register. An S-Register can be selected by using the ATSn command.

Result Code	Meaning
OK	For all arguments

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. 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.

If +FCLASS= 2 is selected, the modem will go off-hook in V.21 answer mode. It will generate the V.21 2100 Hz answer tone for 3 0.5 seconds and, following a delay of 70 ms, will proceed as if the +FTH=3 command were issued. At any stage up to (but excluding) the +FTH=3 command state, any character will abort the communication. (See the description of the +FTH command for details.)

Bn - 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 according to the parameter supplied. Any other line speed will use a CCITT modulation standard. The parameter value, if valid, is written to S27 bit 6.

Parameter Value	Meaning
B0	Selects CCITT operation at 300 or 1200 bps during Call Establishment and a subsequent connection.
B1	Selects BELL operation at 300 or 1200 bps during Call Establishment and a subsequent connection.

Dn - 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.

If +FCLASS= 2 is selected, the modem will behave as a facsimile modem and attempt to connect to a facsimile machine (or modem) by entering the HDLC V.21 channel 2 receive state (as if +FRH=3 had been issued). This command will be aborted upon receipt of any DTE character if the modem has not finished dialing. In this case, the modem will go on-hook and return to command mode after displaying the NO CARRIER message. If the modem has finished dialing, it proceeds as if the +FRH=3 command has been issued. (Refer to the +FRH command to determine how the modem behaves following this stage.)

Dial Modifiers

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

Dial Modifier	Meaning
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 these digits during dialing.
T	Select tone dialing: tone dial the numbers that follow.
,	Dial pause: the modem will pause for one second before dialing the digits following “,”. Longer pauses may be achieved by using more than one “,”.
<i>	Invalid character:: unspecified behavior.

En - Command Echo

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

Parameter Value	Meaning
E0	Disables command echo.
E1	Enables command echo. (Default)

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

Hn - Disconnect (Hang-Up)

This command initiates a hang up sequence.

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

Parameter Value	Meaning
H0	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.
H1	If on-hook, the modem will go off-hook and enter command mode. For US models, the modem will remain off-hook.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

In - Identification

The modem reports to the DTE the requested result according to the command parameter.

Parameter Value	Meaning
I0	Reports product code. Example: XXX ARM CSM
I1	Calculates the code checksum and reports the least significant word (16 bits) of the checksum in decimal.
I2	Report OK
I3	Reports the firmware version.
I4	Response can be configured using CMDDAT and CMDREQ messages.
I5	Reports Country Code parameter. Example: 022
I6	Reports modem data pump model, internal ROM code revision, and RAM code revision. Example: RL56DDP L8565A Rev 47.22/47.22
I7	Reports OK

Result Code	Meaning
OK	n = 0 to 7
ERROR	Otherwise

Nn - Automode Enable

This command enables or disables automode detection. The parameter value, if valid, is written to S31 bit 1.

Parameter Value	Meaning
N0	Automode detection is disabled (equivalent to setting the +MS <automode> subparameter to 0). A subsequent handshake will be conducted according to the contents of S37 or, if S37 is zero, according to tms <mod><min><max> parameters.
N1	Automode detection is enabled (equivalent to setting the +MS <automode> subparameter to 1). A subsequent handshake will be conducted according the automode algorithm supported by the modem, e.g., according to the contents of S37 or, if S37 is zero, starting at the highest enabled modulation. (Default)

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise



Note

- The Nn and S37=x commands override the +MS command settings. When the N0 or N1 command is issued, the +MS subparameters are updated to reflect the Nn and S37 values (see +MS command and S37 register).

For example:

N1S37=10 updates the +MS command subparameters to reflect +MS=10,1,300,12000

N0S37=10 updates the +MS command subparameters to reflect +MS=10,0,12000,12000

- Use of the +MS command is recommended instead of the Nn and S37=x commands. Nn and S37=x commands are supported for compatibility with existing communication software.

On - Return to On-Line Data Mode

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

Parameter Value	Meaning
O0	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 (+++).
O1	Enters on-line data mode with a retrain before returning to on-line data mode.
O2	Same as O0
O3	Enters on-line data mode with a rate renegotiation (no speed shift) before returning to on-line data mode.
O4	Enters on-line data mode with a rate renegotiation and one speed shift downward before returning to on-line data mode.
O5	Enters on-line data mode with a rate renegotiation and one speed shift upward before returning to on-line data mode.

Result Code	Meaning
OK	n = 0 to 5 and a connection exists.
ERROR	Otherwise

P - Set Pulse Dial Default

This command is included for compatibility only, and has no effect other than returning a result code.

Result Code: OK

Qn - Quiet Results Codes Control

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

Parameter Value	Meaning
Q0	Enables result codes to the DTE. (Default)
Q1	Disables result codes to the DTE.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

Sn - Select S-Register

The modem selects an S-Register or performs an S-Register read or write function.

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

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

Command Example	Meaning
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 beyond the range of the S-Registers available, the modem will return the ERROR message. The value "v" is "MOD"ed with 256. If the result is outside the range permitted for a given S-Register the values will still be stored, but functionally the lower and higher limits will be observed. Input and output are always in decimal format. Note that some S-Registers are read-only. In these cases, writing to the S-Register 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.

T - Set Tone Dial Default

This command is included for compatibility only, and has no effect other than returning a result code.

Result Code: OK

Vn - 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 3.

Parameter Value	Meaning
V0	Enables short-form (terse) result codes. Line feed is not issued before a short-form result code.
V1	Enables long-form (verbose) result codes. (Default)

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

Wn - Connect Message Control

This command controls the format of CONNECT messages. The parameter value, if valid, is written to S31 bits 2 and 3. Note that the Wn command can be overridden by register S95 bits (see S95 description).

Parameter Value	Meaning
W0	Upon connection, the modem reports only the DTE speed (e.g., CONNECT 19200). Subsequent responses are disabled. (Default)
W1	Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed, respectively. Subsequent responses are disabled.
W2	Upon connection, the modem reports the DCE speed (e.g., CONNECT 14400). Subsequent responses are disabled.

Result Code	Meaning
OK	n = 0, 1, or 2
ERROR	Otherwise

Xn - Extended Result Codes

This command selects which subset of the result messages will be 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). Note that the information below is based upon the default implementation of the X results table. [Table 1](#) indicates the messages which are enabled for each X value.

If the modem is in facsimile mode (+FCLASS= 2), the only message sent to indicate a connection is CONNECT without a speed indication.

Parameter Value	Meaning
X0	Disables monitoring 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.
X1	Disables monitoring 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.

Parameter Value	Meaning
X2	Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIALTONE, 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.
X3	Enables monitoring 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.
X4	Enables monitoring of busy tones; send all messages. The value 111b is written to S22 bits 6, 5, and 4, respectively. (Default)

Result Code	Meaning
OK	n = 0 to 4
ERROR	Otherwise

Table 1 *Extended Result Codes*

Short Form	Long Form	n Value in ATXn Command				
		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 DIALTONE	3	3	x	x	x
7	BUSY	3	3	3	x	x
8	NO ANSWER	x	x	x	x	x
9	CONNECT 0600	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

Table 1 *Extended Result Codes (continued)*

Short Form	Long Form	n Value in ATXn Command				
		0	1	2	3	4
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
32	BLACKLISTED	4	4	4	4	x
33	FAX	x	x	x	x	x
35	DATA	x	x	x	x	x
40	CARRIER 300	x	x	x	x	x
44	CARRIER 1200/75	x	x	x	x	x
45	CARRIER 75/1200	x	x	x	x	x
46	CARRIER 1200	x	x	x	x	x
47	CARRIER 2400	x	x	x	x	x
48	CARRIER 4800	x	x	x	x	x
49	CARRIER 7200	x	x	x	x	x
50	CARRIER 9600	x	x	x	x	x
51	CARRIER 12000	x	x	x	x	x
52	CARRIER 14400	x	x	x	x	x
53	CARRIER 16800	x	x	x	x	x
54	CARRIER 19200	x	x	x	x	x
55	CARRIER 21600	x	x	x	x	x
56	CARRIER 24000	x	x	x	x	x
57	CARRIER 26400	x	x	x	x	x
58	CARRIER 28800	x	x	x	x	x
59	CONNECT 16800	1	x	x	x	x
61	CONNECT 21600	1	x	x	x	x
62	CONNECT 24000	1	x	x	x	x
63	CONNECT 26400	1	x	x	x	x
64	CONNECT 28800	1	x	x	x	x
66	COMPRESSION: CLASS 5	x	x	x	x	x
67	COMPRESSION: V.42 bis	x	x	x	x	x
69	COMPRESSION: NONE	x	x	x	x	x
70	PROTOCOL: NONE	x	x	x	x	x
77	PROTOCOL: LAPM	x	x	x	x	x
78	CARRIER 31200	x	x	x	x	x
79	CARRIER 33600	x	x	x	x	x
80	PROTOCOL: ALT	x	x	x	x	x
81	PROTOCOL: ALT-CELLULAR	x	x	x	x	x
84	CONNECT 33600	1	x	x	x	x
91	CONNECT 31200	1	x	x	x	x
110	V110	x	x	x	x	x
120	V120 Multiframe I mode	x	x	x	x	x
121	V120 UI unacknowledged	x	x	x	x	x
150	CARRIER 32000	x	x	x	x	x
151	CARRIER 34000	x	x	x	x	x

Table 1 Extended Result Codes (continued)

Short Form	Long Form	n Value in ATXn Command				
		0	1	2	3	4
152	CARRIER 36000	x	x	x	x	x
153	CARRIER 38000	x	x	x	x	x
154	CARRIER 40000	x	x	x	x	x
155	CARRIER 42000	x	x	x	x	x
156	CARRIER 44000	x	x	x	x	x
157	CARRIER 46000	x	x	x	x	x
158	CARRIER 48000	x	x	x	x	x
159	CARRIER 50000	x	x	x	x	x
160	CARRIER 52000	x	x	x	x	x
161	CARRIER 54000	x	x	x	x	x
162	CARRIER 56000	x	x	x	x	x
165	CONNECT 32000	x	x	x	x	x
166	CONNECT 34000	x	x	x	x	x
167	CONNECT 36000	x	x	x	x	x
168	CONNECT 38000	x	x	x	x	x
169	CONNECT 40000	x	x	x	x	x
170	CONNECT 42000	x	x	x	x	x
171	CONNECT 44000	x	x	x	x	x
172	CONNECT 46000	x	x	x	x	x
173	CONNECT 48000	x	x	x	x	x
174	CONNECT 50000	x	x	x	x	x
175	CONNECT 52000	x	x	x	x	x
176	CONNECT 54000	x	x	x	x	x
177	CONNECT 56000	x	x	x	x	x
+F4	+FCERROR	x	x	x	x	x



Note 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 [Error Detection and Data Compression Commands](#)).

Yn - Long Space Disconnect

This command enables/disables the generation and response to long space disconnect. The parameter value, if valid, is written to S21 bit 7.

Parameter Value	Meaning
Y0	Disables long space disconnect. (Default)
Y1	Enables long space disconnect. In non-error correction mode, the modem will send a long space of four seconds prior to going on-hook. In non-error correction mode, the modem will respond to the receipt of a long space (i.e., a break signal greater than 1.6 seconds) by going on-hook.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

Zn - Soft Reset and Restore Profile

The modem performs a soft reset and restores (recalls) the default profile. If no parameter is specified, zero is assumed. There is only one default profile and ATZ0 and ATZ1 restores the same default profile.

Parameter Value	Meaning
Z0	Soft reset and restore default profile.
Z1	Soft reset and restore default profile.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

AT& Commands

&Cn - RLSA (DCD) Option

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

Parameter Value	Meaning
&C0	RLSA remains ON at all times.
&C1	RLSA follows the state of the carrier. (Default)

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

&Dn - 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.

Parameter Value	Meaning
&D0	DTR drop is interpreted according to the current &Qn setting as follows: <ul style="list-style-type: none"> • &Q0, &Q5, &Q6: DTR is ignored (assumed ON). Allows operation with DTEs which do not provide DTR. • &Q1, &Q4: 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.
&D1	DTR drop is interpreted according to the current &Qn setting as follows: <ul style="list-style-type: none"> • &Q0, &Q1, &Q4, &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.
&D2	DTR drop is interpreted according to the current &Qn setting as follows: <ul style="list-style-type: none"> • &Q0 through &Q6: DTR drop causes the modem to hang up. Auto-answer is inhibited. (Default)
&D3	DTR drop is interpreted according to the current &Qn setting as follows: <ul style="list-style-type: none"> • &Q0, &Q1, &Q4, &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, &Q6, +FCLASS=2 is in effect, the action taken is the same as for &Q0.

&Fn - Restore Factory Configuration (Profile)

The modem loads the factory default configuration (profile). The factory defaults are identified for each command and in the S-Register descriptions. A configuration (profile) consists of a subset of S-Registers. There is only one factory configuration and AT&F0 and AT&F1 restore the same factory configuration.

Parameter Value	Meaning
&F0	Restore factory configuration.
&F1	Restore factory configuration.

Result Code	Meaning
OK	If the modem is not connected and n = 0 or 1
ERROR	If the modem is connected

&Gn - Select Guard Tone

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

Parameter Value	Meaning
&G0	Disables guard tone. (Default)
&G1	Disables guard tone.
&G2	Selects 1800 Hz guard tone.

This command may not be permitted in some countries.

Result Code	Meaning
OK	n = 0 to 2
ERROR	Otherwise

&K - Flow Control

This command is included for compatibility only, and has no effect other than returning a result code.
Result Code: OK

&Ln - Leased Line Operation

This command requests leased line or dial-up operation. This command is provided for compatibility only; no mode change is performed, dial-up operation continues. The OK response is returned for a valid parameter, but no other action is performed. The parameter value, if valid, is written to S27 bit 2.

Parameter Value	Meaning
&L0	Requests dial-up operation. Dial-up operation continues.

Result Code	Meaning
OK	n = 0
ERROR	Otherwise

&Mn - Asynchronous/Synchronous Mode Selection

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

Parameter Value	Meaning
&M0	Selects direct asynchronous operation. Note that 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).
&M1	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.)
&M2	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.)
&M3	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 Code	Meaning
OK	n = 0 to 3
ERROR	Otherwise

&Qn - 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 &Q4 command is issued to select the mode, the subsequent connect message will report the DCE speed regardless of the W command and S95 settings

Parameter Value	Meaning
&Q0	Selects direct asynchronous operation. The value 000b is written to S27 bits 3, 1, and 0, respectively. See &M0.
&Q1	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.)
&Q2	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.)
&Q3	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.)
&Q4	Reserved.
&Q5	The modem will try to negotiate an error-corrected 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)
&Q6	Selects asynchronous operation in normal mode (speed buffering). The value 110b is written to S27 bits 3, 1, and 0, respectively.

Result Code	Meaning
OK	n = 0 to 6
ERROR	Otherwise

&Rn - 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.

Parameter Value	Meaning
&R0	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.
&R1	In sync mode, CTS is always ON (RTS transitions are ignored). tracks the state of RTS; In async mode, CTS is normally ON and will turn OFF only if required by flow control.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

&Sn - DSR Override

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

Parameter Value	Meaning
&S0	DSR will remain ON at all times. (Default)
&S1	DSR will become active after answer tone has been detected and inactive after the carrier has been lost.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

&Tn - Test and Diagnostics

The modem will perform selected test and diagnostic functions according to the parameter supplied. A test can be run only when in an asynchronous operation in non-error-correction mode (normal or direct mode). To terminate a test in progress, the escape sequence must be entered first, except for parameters 7 and 8. If S18 is non-zero, a test will terminate automatically after the time specified by S18 and display the OK message. Note: For tests 3, 6, and 7, a connection between the two modems must first be established.

Parameter Value	Meaning
&T0	Terminates test in progress. Clears S16.
&T1	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.
&T2	Returns ERROR.
&T3	Initiates local digital loopback, V.54 Loop 2. Sets S16 bit 2. If no connection exists, ERROR is returned. Sets S16 bit 4 when the test is in progress.
&T4	Enables digital loopback acknowledgment for remote request, i.e., an RDL request from a remote modem is allowed. Sets S23 bit 0.
&T5	Disables digital loopback acknowledgment for remote request, i.e., an RDL request from a remote modem is denied. Clears S23 bit 0. (Default)
&T6	Requests a remote digital loopback (RDL), V.54 Loop 2, without self test. If no connection exists, ERROR is returned. Sets S16 bit 4 when the test is in progress. The CONNECT XXXX message is displayed upon the start of the test.

Parameter Value	Meaning
&T7	Requests a remote digital loopback (RDL), V.54 Loop 2, with self test. (In self test, a test pattern is looped back and checked by the modem.) If no connection exists, ERROR is returned. When the test is terminated either via expiration of S18, or via the &T0 or H command, the number of detected errors is reported to the DTE. Sets S16 bit 5 when the test is in progress.
&T8	Initiates local analog loopback, V.54 Loop 3, with self test. (In self test, a test pattern is looped back and checked by the modem.) If a connection exists, the modem hangs up before the test is initiated. When the test is terminated either via expiration of S18, or via the &T0 or H command, the number of detected errors is reported to the DTE. Sets S16 bit 6 when the test is in progress. This command may not be available in some countries due to PTT restrictions. Note that a loopback path from TXDATA to RXDATA is required.

&V - Display Current Configuration and Stored Profiles

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:
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &J0 &K3 &Q5 &R1 &S0 &T4 &X0 &Y0
S00:002 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030 S08:002 S09:006
S10:014 S11:255 S12:050 S18:000 S25:005 S26:001 S36:007 S37:000 S38:020 S46:138
S48:007 S95:000
```

&V1 - Display Last Connection Statistics

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

```
TERMINATION REASONLINK DISCONNECT or LOCAL REQUEST
LAST TX data rate48000 BPS
HIGHEST TX data rate48000 BPS
LAST RX data rate31200 BPS
HIGHEST RX data rate31200 BPS
Error Correction PROTOCOLLAPM
ModulationV.90
Data COMPRESSIONV42Bis
Digital Pad Detected000
Line QUALITY000
Receive LEVEL023
Highest SPX Receive state068
Highest SPX Transmit state067
Last SPX Receive state000
Last SPX Transmit stateV42Bis
EQM Sum Value0014
RBS Pattern Detected21
Data Rate Dropped in kbps04
Local Retrain Count00
Remote Retrain Count00
Local Rate Reneg Count00
Remote Rate Reneg Count00
Flex 94018302000
```

Connected V.90

&V2 - Modem Status Reporting

&V2 reports a string that contains a modem status report.

&V2 responds with a character string organized in the following manner:

```
BEGINaa26ab26ac26ad26ba11bb11 ... ti0END
```

where:

- The only capitalized letters are BEGIN and END, signifying the start and stop of the message.
- The only small letters are for fields described in this section.
- The only numbers are the values of the fields.
- All values are initialized to 255 or 0, except for 'qa' which is initialized to 21 upon power up and upon the start of each handshake.
- Firmware revisions may add or remove parameters in the &V2 response. Consult the latest firmware release notes.

Automatic Reporting

By setting bit 4 of S202 (i.e., S202=16), the modem status string will automatically display before every connect message and after each hang-up (before the 'NO CARRIER' message).

Supported &V2 Command Fields

The &V2 Command Fields are described in [Table 2](#). These values are for the US profile; other profiles are not taken into account.

Table 2 *&V2 Command Field Description*

Field Code	Field Name	Field Description
aa	Current transmit speed	These fields display the data rate codes. These speeds can be decoded using Table 3 .
ab	Minimum transmit speed	
ac	Maximum transmit speed	
ad	Initial transmit speed	
ba	Current receive speed	
bb	Minimum receive speed	
bc	Maximum receive speed	
bd	Initial receive speed	
ca	Error correction protocol	This field displays the type of error correction chosen. Refer to Table 4 .
cb	Data compression type	This field displays the type of compression chosen. Refer to Table 5 .
cc	Modulation type	These fields display the modulation type chosen, i.e., the DDP CONF value (see DDP designer's guide). Refer to Table 6 .
cd	Initial modulation type	

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
da	Symbol rate	This field is only for V.34, K56flex, and V.90 connections. For all other connections see the data pump manual for symbol rate. Symbol rates are shown in Table 7 .
ea	Transmit carrier frequency	These fields are only for V.34 connections. See Table 8 for a list of frequencies. For all other connections see the data pump manual for the carrier frequency. A one signifies the high frequency and a zero signifies the low frequency. These are dependent on the symbol rate which can be found in field “ea”.
eb	Receive carrier frequency	
fa	Last AGC gain value	These fields display the decimal value of the AGC gain high byte. This value can be used to calculate the Receive level with the calculations shown in Table 9 .
fb	Minimum AGC gain value	
fc	Maximum AGC gain value	
ga	Transmit level	This field displays the transmit level based on S91. The value given is in negative dBs. The Transmit Level in –dB can be calculated from the reported value as follows: Transmit Level in –dB = S91 – (0xA48)
gb	Transmit Level Reduction	This field indicates the transmit level reduction as requested by the remote modem.
ha	Last EQM value	These fields display the values from the last, maximum and minimum EQM readings.
hb	Minimum EQM value	
hc	Maximum EQM value	
hd	Number of EQM hits	This field will display the number of times EQM values became larger than 7Fh. This condition will cause a rate renegotiation
he	EQM Sum (Low Byte)	These fields contain the EQM Sum. The higher two bytes are used for the speed selection.
hf	EQM Sum (Middle Byte)	
hg	EQM Sum (High Byte)	
hh	Reserved	These fields are reserved for future use

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
hj	EQM 1 second before &v2 issued or hangup	These fields contain the last 1 to 10 seconds of EQM accumulated
hk	EQM 2 seconds before &v2 issued or hangup	
hl	EQM 3 seconds before &v2 issued or hangup	
hm	EQM 4 seconds before &v2 issued or hangup	
hn	EQM 5 seconds before &v2 issued or hangup	
ho	EQM 6 seconds before &v2 issued or hangup	
hp	EQM 7 seconds before &v2 issued or hangup	
hq	EQM 8 seconds before &v2 issued or hangup	
hr	EQM 9 seconds before &v2 issued or hangup	
hs	EQM 10 seconds before &v2 issued or hangup	
ia	SNR ratio	These fields display the SNR values obtained during the V.34 probe. The value needs to be converted in the following manner: SNR in dB = 1.7 (X) - 7, where X is the value displayed
ib	Minimum SNR value	
ic	Maximum SNR value	
ja	Number of local retrains	These fields display the number of retrains which occurred during the connection.
jb	Number of remote retrains	
jc	Number of local rate renegs	These fields display the number of rate renegotiations which occurred during the connection.
jd	Number of remote rate renegs	
je	Number of retrains (local and remote) during V.42 negotiation	These fields display the number of local and remote retrains and rate renegs during V.42 negotiation.
jf	Number of rate renegs (local and remote) during V.42 negotiation	
jg	Number of overflow that occurs in any message queue	
ka	Transmit Non-linear Encoding	These fields display a 1 if non-linear encoding is on and a 0 if non-linear encoding is off.
kb	Receive Non-linear Encoding	
kc	Transmit precoding	These fields display a 1 if precoding is on and a 0 if precoding is off.
kd	Receive precoding	

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
ke	Transmit shaping	These fields display a 1 if shaping is on and a 0 if shaping is off.
kf	Receive shaping	
kg	Trellis mapping	This field displays the code for the type of trellis mapping used. Refer to Table 10 .
kh	Pre-emphasis	This field displays the number of the pre-emphasis filter chosen during the call. The value will be between 0 and 10.
ki	Upper band edge	These fields display the upper and lower band edges. The values need to be converted using the following equations: Lower -3 dB edge (Hz) = 37.5(X) +150 Upper -3 dB edge (Hz) = 37.5(X) + 2400 where X is the decimal value displayed.
kj	Lower band edge	
kk	Round trip delay high byte	These fields display the values needed to calculate the round trip delay using the following calculation: $RTD = (N/8000)$ (for V.92 and V.90) $RTD = (N / X) - 3.5$ (for V.34, K56flex, and V.FC) $RTD = (N / 2.4) - 29$ (for V.32 bis) where: <ul style="list-style-type: none"> • RTD is the round trip delay in ms, • N is the decimal value of the 16-bit word achieved by the combination of the hex values of the two fields. • X is the symbol rate found in the field 'ea' divided by 1000. Example: kk32k1127 converts 32 to 20h and 127 to 7Fh to get the 16-bit word 207Fh. Now convert this to it's decimal equivalent (8319) and this is the value of N.
kl	Round trip delay low byte	
km	Info 0 Sequence (High byte)	These fields make up the Info 0 sequence. Convert km to hex -this is the high byte of the sequence. When kn is converted to hex this is the low byte of the sequence.
kn	Info 0 Sequence (Low byte)	
ko	RX MP sequence byte 1 (Low byte)	These fields make up the RX MP sequence. Convert all to hex in this order kqkrkokp.
kp	RX MP sequence byte 1 (High byte)	
kq	RX MP sequence byte 2 (Low byte)	
kr	RX MP sequence byte 2 (High byte)	

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
la	Highest transmit state	These fields display the highest transmit and receive SPX states reached. A description of these states can be found in the DDP designer's guide. The values must be changed to hex format
lb	Highest receive state	
lc	Last transmit state	These fields display the last transmit and receive SPX states reached. A description of these states can be found in the DDP designer's guide. The values must be changed to hex format.
ld	Last receive state	
le	2 nd Last transmit state	These fields display the last n th transmit and n th receive spx states reached. A description of these states can be found in the DDP designer's guide. The values must be changed to hex format.
lf	2 nd Last receive state	
lg	3 rd Last transmit state	
lh	3 rd Last receive state	
li	4 th Last transmit state	
lj	4 th Last receive state	
lk	5 th Last transmit state	
ll	5 th Last receive state	
lm	6 th Last transmit state	
ln	6 th Last receive state	
lo	7 th Last transmit state	
lp	7 th Last receive state	
lq	8 th Last transmit state	
lr	8 th Last receive state	
ls	9 th Last transmit state	
lt	9 th Last receive state	
lu	10 th Last transmit state	
lv	10 th Last receive state	
lw	11 th Last transmit state	
lx	11 th Last receive state	
ly	12 th Last transmit state	
lz	12 th Last receive state	
ma	Connection time (Hours)	These fields combine to give the total time of connection
mb	Connection time (Minutes)	
mc	Connection time (Seconds)	
na	Auto gain amplitude	This field displays the auto gain value chosen for the connection. The amplitude values are shown in Table 11 .

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
nb	Auto gain attenuation	This field displays the auto gain attenuation. The attenuation values are shown in Table 12 .
oa	Digital Pad Detected	This field displays the digital pad found during the connection. These fields need to be converted into its hex equivalent. The digital pad is determined using Table 13 .
ob	RBS Pattern	This field displays the total RBS pattern found during the connection. This field needs to be converted to its hex equivalent and the lower six bits display the pattern. Bits 6 and 7 are not used.
oc	Rate drop due to RBS	This field displays the rate dropped due to RBS (in kbps).
pa	Maximum number of retransmissions for one frame	These fields show statistics on the number of V.42 retransmissions. Frames can also be referred to as Blocks.
pb	Total number of retransmissions during connection	
pc	Number of LAPM REJ frames received	
pd	Number of LAPM REJ frames transmitted	
pe	Number of TX blocks (High byte)	These fields show statistics on the number of V.42 data transfers.
pf	Number of TX blocks (Low byte)	
pg	Number of RX blocks (High byte)	
ph	Number of RX blocks (Low byte)	
pi	Number of TX characters (High byte)	These fields report the number of characters transmitted/received during the connection.
pj	Number of TX characters (2nd byte)	
pk	Number of TX characters (3rd byte)	
pl	Number of TX characters (Low byte)	
pm	Number of RX characters (High byte)	
pn	Number of RX characters (2nd byte)	
po	Number of RX characters (3rd byte)	
pp	Number of RX characters (Low byte)	
qa	Disconnect reason	This field displays a code which describes the reason for disconnection. Table 14 shows the disconnect reason codes.
qb	Reason for Retrain or rate renegotiation	This field displays a code to show where the last request for a retrain or rate renegotiation originated from. These codes are given in Table 15 .

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
qc	ABCODE (Abort code)	This field stores the last known ABCODE received from the data pump.
ra	Negotiation Status	This field reports the negotiation status. Refer to Table 16 .
rb	V.8bis octet 13	This field displays octet 13 from the V.8bis negotiation. This field represents the manufacturer's ID: 148 = K56flex (generic) 74 = Lucent
rc	V.8bis octet 14	This field displays octet 14 from the V.8bis negotiation. This field represents the Licensee code. Refer to Table 17 .
rd	V.8bis octet 15	This field displays octet 15 from the V.8bis negotiation. This field represents the manufacturer's product capabilities. Bit 0: Indicates K56flex capability. (1= K56flex capable, 0= not K56flex capable) Bits 1-6: Reserved for future use Bit 7: Indicates if this octet is the last byte. (1= last byte, 0= not last byte)
re	V.8bis octet 16	This field displays octet 16 from the V.8bis negotiation. This field represents the flex version number. Bits 0-4: Indicate the flex version number Bit 5: Prototype bit (1=prototype, 0=not prototype) Bit 6: Indicates whether the remote is a server or client (1=server, 0= client) Bit 7: Indicates if this octet is the last byte. (1=last byte, 0= not last byte)
rf	V.8bis octet 17	This field displays octet 17 from the V.8bis negotiation. This field represents CONEXANT's data pump revision number. Bits 0-6: Indicate CONEXANT's data pump revision number Bit 7: Indicates if this octet is the last byte. (1=last byte, 0= not last byte) Note This field is only valid for CONEXANT-to-XXX connections.

Table 2 &V2 Command Field Description (continued)

Field Code	Field Name	Field Description
rg	V.8bis octet 18	<p>This field displays octet 18 from the V.8bis negotiation. This field represents x-law status and CONEXANT’s controller revision.</p> <p>Bits 0-4: Indicate CONEXANT’s controller revision.</p> <p>Bit 5: Indicates a-law or μ-law. (1= A-law, 0 = μ-law)</p> <p>Bit 6: Indicates whether x-law was forced or not. (1=forced, 0= not forced)</p> <p>Bit 7: Indicates if this octet is the last byte. (1=last byte, 0 = not last byte)</p>
rh	V.8bis progress	<p>Bit 0: Set if received Cre Tone</p> <p>Bit 1: Set if received CRd Tone</p> <p>Bit2: Set if received CL message</p> <p>Bit3: Set if received MS message</p> <p>Bit4: Set if received ACK message</p> <p>Bit5: Set if received NAK message</p> <p>Bit6: Set if V.8bis finish</p> <p>Bit7: Set if V.8 started</p>
sa	V.90 Minimum Distance (High Byte)	<p>These fields report the high and low bytes of the minimum distance value negotiated in V.90.</p>
sb	V.90 Minimum Distance (Low Byte)	
sc	V.90 Digital Pad Value (High Byte)	<p>These fields display the digital pad value negotiated in V.90.</p> <p>2000h is the approximate value for no pad.</p> <p>2D6Ah is the approximate value for a 3 dB pad.</p> <p>3F07h is the approximate value for a 6 dB pad.</p> <p>The equation for this calculation is: $20 * \log_{10}(N/2000h)$</p> <p>Where N is the value from the sc and sd fields.</p>
sd	V.90 Digital Pad Value (Low Byte)	
ta	Handshake time	This field displays the number of seconds it took to connect:
tb	Number of the handshake retries	This field displays the number times the handshake reached phase three then repeated to phase two before connecting.
tc	EC state 1	Refer to Table 18 for a description of the EC state bits.
td	EC state 2	

Table 2 **&V2 Command Field Description (continued)**

Field Code	Field Name	Field Description
te	Firmware state	These fields show internal error notification.
tf	Memory address High byte	
tg	Memory address Low byte	
th	Number of minutes since last retrain or rate renege	
ti	WA status	This field shows the number of minutes since the last retrain or rate renege.

Table 3 **Data Rate Codes (&V2 - aa through bd fields)**

Value	Speed	Transmit/ Receive
0	0-300	T/R
1	600	T/R
2	1200	T/R
3	2400	T/R
4	4800	T/R
5	9600	T/R
6	12000	T/R
7	14400	T/R
8	7200	T/R
9	16800	T/R
10	19200	T/R
11	21600	T/R
12	24000	T/R
13	26400	T/R
14	28800	T/R
15	31200	T/R
16	33600	T/R
17	32000	T
18	34000	T
19	36000	T
20	38000	T
21	40000	T
22	42000	T
23	44000	T
24	46000	T

Table 3 *Data Rate Codes (&V2 - aa through bd fields) (continued)*

Value	Speed	Transmit/ Receive
25	48000	T
26	50000	T
27	52000	T
28	54000	T
29	56000	T
30	28000	T
31	29333	T
32	30667	T
33	32000	T
34	33333	T
35	34667	T
36	36000	T
37	37333	T
38	38667	T
39	40000	T
40	41333	T
41	42667	T
42	44000	T
43	45333	T
44	46667	T
45	48000	T
46	49333	T
47	50667	T
48	52000	T
49	53333	T
50	54667	T
51	56000	T
52	Digital 56000	T/R
53	Digital 64000	T/R

Table 4 *Error Correction Types (&V2 - ca field)*

Value	Protocol
70	NONE
77	LAP-M

Table 4 Error Correction Types (&V2 - ca field)

Value	Protocol
80	MNP4
81	MNP10 with cellular

Table 5 Data Compression Types (&V2 - cb field)

Value	Compression
69	NONE
66	MNP 5
67	V.42 bis
68	V.44

Table 6 Modulation Types for V.34, K56flex, and V.90 connections (&V2 - cc, cd fields)

224-246	V.90
192-206	V.34
177-184	V.17
161-164	V.23
160 or 168	V.21
144-157	K56flex (K56Plus) ¹
130-132	V.22 bis
112-120	V.32
98	Bell 212
96	Bell 103
81-82	V.22
64-76	V.FC
49-56	V.33
35	Bell 208
17-20	V.29
1-2	V.27
224-246	V.90

- Parameter ra can be used to distinguish between K56flex and K56Plus.
For example:
Parameter cc = 000000E0-000000F6: V.90
Parameter cc = 00000090-0000009D and parameter ra bit 5 = 1: K56flex
Parameter cc = 00000090-0000009D and parameter ra bit 5 = 0: K56Plus

Table 7 *Symbol Rates (&V2 - da field)*

Value	Symbol Rate
0	2400
2	2800
3	3000
4	3200
5	3429

Table 8 *Transmit and Receive Carrier Frequencies (&V2 - ea, eb fields)*

Symbol Rate	High Frequency (Hz)	Low Frequency (Hz)
2400	1800	1600
2800	1867	1680
3000	2000	1800
3200	1920	1829
3429	1959	1959

Table 9 *Receive Level Calculations for AGC Gain (&V2 - fa, fb, fc fields)*

Configuration	Calculation ¹
V.90, K56flex, V.34, V.33, V.17, V.29, V.27, V.FC	RL = N/2.7 - 52 dB
V.32 bis, V.32	RL = N/2.7 - 53 dB
V.22 bis, V.22, Bell 212, V.23/1200	RL = N/2.7 - 48 dB
V.21, V.23/75	RL = N/2.7 - 54 dB
Bell 103	RL = N/2.7 - 51 dB

1. Where n is the number displayed

Table 10 *Trellis Mapping Values (&V2 - kg field)*

Value	Trellis Mapping
0	16 state
8	32 state
16 or 24	64 state

Table 11 *Auto Gain Amplitude Values (&V2 - na field)*

Value	Auto Gain (dB)
0	0
2	10

Table 11 *Auto Gain Amplitude Values (&V2 - na field)*

Value	Auto Gain (dB)
4	15
6	20

Table 12 *Auto Gain Attenuation Values (&V2 - nb field)*

Value	Attenuation (dB)
0	0
16	4

Table 13 *Digital Pad Detection (&V2 - oa field)*

Bit 7	Bit 6	Pad
0	0	None
0	1	3 dB
1	0	6 dB

Table 14 *Disconnection Codes (&V2 - qa field)*

Value in Hex	Value in Decimal	Disconnect Reason
0	0	Normal hangup, no error occurred.
1	1	Reserved.
2	2	Reserved.
3	3	Call Waiting caused disconnect.
4	4	Physical carrier loss.
5	5	No error correction at the other end.
6	6	No response to feature negotiation.
7	7	This modem is async only; the other modem is sync only.
8	8	No framing technique in common.
9	9	No protocol in common.
0A	10	Bad response to feature negotiation.
0B	11	No sync information from the remote modem.
0C	12	Normal hangup initiated by the remote modem.
0D	13	Retransmission limit reached.
0E	14	Protocol violation occurred.
0F	15	Lost DTR.
10	16	Received GSTN clear-down.

Table 14 *Disconnection Codes (&V2 - qa field) (continued)*

Value in Hex	Value in Decimal	Disconnect Reason
11	17	Inactivity timeout.
12	18	Speed not supported.
13	19	Long space disconnect.
14	20	Key abort disconnect.
15	21	Clears previous disconnect reason. (None)
16	22	No connection established.
17	23	Disconnect after three retrains.
18	24	V.42bis expander failure
19	25	Reserved
1A	26	Remote call-waiting
1B	27	Modem on-hold time-out
1C	28	Local request while modem on-hold
1D	29	Local request while FRR

Table 15 *Retrain and Rate Renegotiation Codes (&V2 - qb field)*

Value	Retrain/Renegotiation Reason
0	None
1	Retrain/rate renegot successful
2	Local retrain due to ATO1
3	Local retrain due to high EQM
4	Local rate renegot due to high EQM (FB)
5	Local rate renegot due to low EQM (FF)
6	Local retrain due to 2 consecutive rate renegs
7	Carrier loss but line still looks active
8	Lost connection
9	Fallback to V.34
10	Local rate renegot due to MNP10
11	Local retrain due to MNP10
12	Remote retrain
13	Remote rate renegot
14	V34/2400 retrain
15	V.42 retrain if excessive retransmissions

Table 16 *Negotiation Status (&V2 - ra field)*

Bit(s)	Description
0	Reserved, reports 0.
1	Indicates RLSD status (1 = RLSD on; 0 = RLSD off).
2	Indicates K56flex/K56Plus Negotiation status (1 = K56flex/K56Plus negotiation successful; 0 = K56flex/K56Plus negotiation not successful).
3	Reserved, reports 0.
4	Indicates V.90 Negotiation Tried status (1 = V.90 negotiation tried; 0 = V.90 negotiation not tried).
5	Indicates V.90/K56flex (but not K56Plus) Negotiation status (1 = V.90/ K56flex negotiation successful; 0 = V.90/K56flex negotiation not successful).
6 -7	Reserved, report 0.

Table 17 *Licensee Codes (&V2 - rc field)*

Value	Licensee Code
129	CONEXANT
1	Lucent
128-255	CONEXANT based
0-127	Lucent based

Table 18 *EC State Bit Description (&V2 - tc, td fields)*

Bit	EC State 1 (tc field)	EC State 2 (td field)
7	Received ODP	Received XID frame
6	Transmitted ODP	Transmitted XID frame
5	Received ADP	Received SABME frame
4	Transmitted ADP	Transmitted SABME frame
3	Received LR frame	Received UA frame
2	Transmitted LR frame	Transmitted UA frame
1	Received LA frame	Switched to sync mode
0	Transmitted LA frame	Reserved for future use

&Xn - Select Synchronous Clock Source

Selects the source of the transmit clock for the synchronous mode of operation. The parameter value, if valid, is written to S27 bits 4 and 5.

In asynchronous mode, the transmit and receive clocks are turned OFF. In synchronous mode, the clocks are turned ON with the frequency of 1200 Hz or faster corresponding to the speed that is selected for modem operation.

Parameter Value	Meaning
&X0	Selects internal timing. The modem generates the transmit clock signal and applies it to the TXCLK output at the serial interface.
&X1	Selects external timing. The local DTE sources the transmit clock signal on the XTCLK input of the serial interface. The modem applies this clock to the TXCLK output at the serial interface.
&X2	Selects slave receive timing. The modem derives the transmit clock signal from the incoming carrier and applies it to the TXCLK output at the serial interface.

Result Code	Meaning
OK	n = 0 to 2
ERROR	Otherwise

&Yn - Designate a Default Reset Profile

Selects which user profile will be used after a hard reset. There is only one factory default profile and AT&Y0 and AT&Y1 will restore same default profile.

Parameter Value	Meaning
&Y0	The modem will use default profile.
&Y1	The modem will use default profile.

Result Code	Meaning
OK	n = 0 or 1
ERROR	Otherwise

&Zn=x - Store Telephone Number

This command is included for compatibility only, and has no effect other than returning a result code.
Result Code: OK

AT% Commands

%En - 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.

Parameter Value	Meaning
%E0	Disable line quality monitor and auto-retrain.
%E1	Enable line quality monitor and auto-retrain.
%E2	Enable line quality monitor and fallback/fall forward. (Default)

Result Code	Meaning
OK	n = 0 to 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 current modulation. 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.

%L - 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 Code: OK

%Q - Line Signal Quality

Reports the line signal quality. Returns the higher order byte of the EQM value.

An example is as follows.

```
AT%Q
015
```

Result Code	Meaning
OK	If connected.
ERROR	If not connected, or connected in 300 bps, V.23, or fax modes.

AT\ Commands

\Kn - Break Control

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

The response is different in depending on three separate cases.

Case 1

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

Parameter Value	Meaning
\K0	Not supported.
\K1	Not supported.
\K2	Not supported.
\K3	Not supported.
\K4	Not supported.
\K5	Send break to remote modem in sequence with transmitted data. (Default)

Case 2

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:

Parameter Value	Meaning
\K0	Not supported.
\K1	Not supported.
\K2	Not supported.
\K3	Not supported.
\K4	Not supported.
\K5	Send break to remote modem in sequence with data. (Default)

Case 3

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

Parameter Value	Meaning
\K0	Not supported.
\K1	Not supported.
\K2	Not supported.
\K3	Not supported.

Parameter Value	Meaning
\K4	Not supported.
\K5	Send a break in sequence with received data to DTE. (Default)

Result Code	Meaning
OK	n = 0 to 5
ERROR	Otherwise

\Nn - Operating Mode

This command controls the preferred error correcting mode to be negotiated in a subsequent data connection.

Parameter Value	Meaning
\N0	Selects normal speed buffered mode (disables error-correction mode). (Forces &Q6.)
\N1	Serial interface selected - Selects direct mode and is equivalent to &M0, &Q0 mode of operation. (Forces &Q0.) Parallel interface selected - Same as \N0.
\N2	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.)
\N3	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.)
\N4	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.
\N5	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 Code	Meaning
OK	n = 0 to 5
ERROR	Otherwise

\Vn - Single Line Connect Message Enable

The single line connect message format can be enabled or disabled by the \Vn command as follows:

Parameter Value	Meaning
\V0	Connect messages are controlled by the command settings X, W, and S95.
\V1	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, or COMPRESSION messages apart from the fields described below.

The single line connect message format is:

CONNECT <DTE Speed></Modulation></Protocol></Compression></Line Speed></Voice and Data>

where:

- DTE Speed = DTE speed, e.g., 57600.
- Modulation = “K56” for K56flex modulations, “V32” for V.32 or V.32bis modulations, “V34” for V.34 modulations.



Note Modulation parameter is omitted for all other modulations.

- Protocol = “NONE” for no protocol, “ALT” for Microcom Network Protocol, “LAPM” for LAP-M protocol.
- Compression = “CLASS5” for Microcom MNP5 compression, “V42BIS” for V.42bis compression.



Note Compression parameter is omitted if protocol is NONE

- Line Speed
 - Asymmetric rates are displayed as /rate:TX/rate:RX, e.g., /56000:TX/31200:RX for K56flex, or /1200:TX/75:RX for V.23.
 - Symmetric rates are displayed as a single DCE rate, e.g., 14400.
- Voice and Data = Blank for Data mode only.

AT+ Commands

A “+” command must be terminated by the semicolon “;” character (ASCII 3Bh) if in a command string prior to another command, or by the <CR> at the end of the command string.

+A8E – Enable/Disable V.8bis (K56flex) Operation

This command enables or disables K56flex operation by enabling or disabling V.8bis negotiation.

Syntax

+A8E = 0,0,00,<v8b>,0,0

Defined Values

Parameter	Meaning	Values
<v8b>	Number which enables and disables V.8bis (K56flex) negotiation.	0: Disables V.8bis (K56flex) negotiation. 1: Enable V.8bis (K56flex) negotiation. (Default.)

Reporting Current or Selected Values

Command	+A8E?
Response	+A8E: 0,0,00,1,0,0 (For the defaults)

Reporting Supported Range of Parameter Values

Command	+A8E=?
Response	+A8E: 0,0,00,(0-1),0,0

+MS - Select Modulation

This extended-format command selects the modulation, optionally enables or disables automode, and optionally specifies the lowest and highest connection rates using one to four subparameters (client modem) or five subparameters (server modem).

Syntax

+MS = <mod> [, [<automode>] [, [<min_RX_rate>] [, [<max_RX_rate>] [, [<x_law>] [, [<min_TX_rate>] [, [<max_TX_rate>]]]]]]] <CR>



Note

1. For 14400 bps and lower speeds, the Nn command and S37 register can alternatively be used, in which case the +MS subparameters will be modified to reflect the Nn and S37=x settings. Use of the Nn and S37=x commands is not recommended but is provided for compatibility with existing communication software. (S37 is not updated by the +MS command.)
2. Subparameters not entered (enter a comma only or <CR> to skip the last subparameter) remain at their current values.

Defined Values

Parameter	Meaning	Values
<mod>	A decimal number which specifies the preferred modulation (automode enabled), or the modulation to use in originating or answering a connection (automode disabled).	See “<mod> Command Information” section on page 50.
<automode>	An optional numeric value which enables or disables automatic modulation negotiation using V.8 bis/V.8 or V.32 bis Annex A.	0: Automode disabled 1: Automode enabled using V.8bis/V.8 or V.32 Annex A (Default) Note There are modulations for which there is no automatic negotiation. For example: Bell 212 (<mod> = 69). For further information on automode, see “<automode Command Information” section on page 51.
<min_RX_rate>	An optional decimal number which specifies the lowest rate (bps) at which the modem may receive data during a connection.	300 to 33600. Default is 300.
<max_RX_rate>	An optional decimal number which specifies the highest rate (bps) at which the modem may receive during a connection.	300 to 33600. Default is 33600.
<x_law>	An optional number which specifies the codec type and is valid for the server modem only. Any value entered for the client modem is ignored.	0 = μ -Law 1 = A-Law Note ATZ will reset the <x_law> selection to 0 (μ -Law).
<min_TX_rate>	An optional decimal number which specifies the lowest rate (bps) at which the modem may transmit during a connection.	300 to 56000. Default is 300.
<max_TX_rate>	An optional decimal number which specifies the highest rate (bps) at which the modem may transmit during a connection.	300 to 56000. Default is 33600.

<mod> Command Information

<mod> Value	Modulation	Possible Rates (bps) ¹
0	V.21	300

<mod> Value	Modulation	Possible Rates (bps) ¹
1	V.22	1200
2	V.22 bis	2400 or 1200
3	V.23 ²	1200
9	V.32	9600 or 4800
10	V.32 bis	14400, 12000, 9600, 7200, or 4800
11	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
12	V.90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000
64	Bell 103	300
69	Bell 212	1200

1. See optional <automode>, <min_RX_rate>, <max_RX_rate> and <max_TX_rate> subparameters.
2. For V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

The modem may also automatically switch to another modulation (automode), subject to the following constraints:

- The modem may not be able to automatically switch from the current modulation (specified by <mod>) to some other modulation. For example, there is no standard way to automode from Bell 103 to V.23.
- The DTE may disable automode operation (see <automode> below).
- The DTE may constrain the range of modulations available by specifying the lowest and highest rates (see <min_rate> and <max_rate> above).

<automode Command Information

For <automode> = 0 (automode disabled, i.e., fixed modulation):

- If <max_rate> is within the rates supported by the selected modulation, the selected rate is that specified by <max_rate>. For example:
+MS=10,0,1200,4800 selects V.32 bis 4800 bps fixed rate.
- If <max_rate> is greater than the highest speed supported by the modulation specified by <mod>, the starting rate is the highest rate supported by the selected modulation. For example:
+MS=10,0,2400,14400 selects V.32 bis 14400, 12000, 9600, 7200, or 4800 bps.
- To emulate issuance of the N0S37=x command sequence to select fixed mode operation, specify the <max_rate> and <min_rate> both to be the same requested speed, and <mod> to be the modulation for that speed. For example:
+MS=11,0,16800,16800 selects V.34 16800 bps fixed mode (no comparable S37 command).
+MS=10,0,12000,12000 selects V.32 bis 12000 bps fixed mode (same as N0S37=10).

For <automode> = 1 (automode enabled, i.e., automatically selected speed and modulation):

The modem connects at the highest possible rate in accordance with V.8 bis/V.8, or V.32 bis Annex A if V.8 bis/V.8 is not supported by the remote modem.

- If <max_rate> is greater than the highest rate supported by the modulation specified by <mod>, the modem automodes down from the highest rate of the selected modulation. For example:
+MS=10,1,1200,24000 selects automoding down from V.32 bis 14400 bps.
- To emulate issuance of the N1S37=x sequence command, specify the modulation and the rate to start automoding down from using <mod> and <max_rate>, respectively. Set <min_rate> to 300 to allow automoding all the way down to V.21 300 bps. For example:
+MS=11,1,300,16800 selects automode starting at V.34 16800 bps (no comparable S37 command).
+MS=9,1,300,12000 selects automode starting at V.32 bis 12000 bps (same as N1S37=10).

Reporting Selected Options

Command	+MS?
Response	+MS: <mod>,<automode>,<min_RX_rate>,<max_RX_rate>,<x_law>,<min_TX_rate>,<max_TX_rate>
Example	+MS: 12,1,300,33600,0,300,56000 (for default values)

Reporting Supported Options

Command	+MS=?
Response	+MS: (list of supported <mod> values), (list of supported <automode> values), (list of supported <min_RX_rate> values), (list of supported <max_RX_rate> values), (list of supported <x_law> values), (list of supported <min_TX_rate> values), (list of supported max_TX_rate> values)
Example	+MS: (0,1,2,3,9,10,11,12,56,64,69), (0,1), (300-33600), (300-336000), (0,1), (300-56000), (300-56000)

+ISP Command - Select Digital Pass-Through Mode or Analog Modem Connection

The +ISP command selects digital pass-through mode or analog modem connection.

Syntax

Defined Values

Parameter	Meaning	Values
X	Selects digital pass-through mode or the analog modem connection	

The +ISP command operates as following:

+ISP=X	X = 0	Digital 64 kbps pass-through mode
	X = 1	Digital 56 kbps pass-through mode
	X = 2	Analog modem connection

+IPT Command – ISDN Protocol Selection

The +IPT command selects the ISDN protocol.

Syntax

+IPT = X

Defined Values

Parameter	Meaning	Values
X	Selects ISDN protocol	0: Asynchronous pass-through mode 1: Synchronous pass-through mode. This will make the channel an ISDN B channel and transparently pass ISDN HDLC frames. 2: V.120 rate adaption protocol multi-frame mode (Multiframe I mode). 3: V.120 rate adaption protocol ui-frame mode (UI mode). 4: V.110 rate adaption protocol.



Note

- AT+IPT configures V.120 to be either off (+IPT = 0, 1, or 4), UI mode (+IPT = 3), or Multiframe I mode (+IPT = 2).
- Multiframe I mode operates similarly to V. 42, in that information frames are exchanged and frames are resent when necessary.
- UI mode is unacknowledged.
- It is recommended that V.120 use Multiframe I mode whenever possible.
- There is no detection phase, signaling stack software is used to determine that V.120 is to be negotiated.
- SABME-UA is exchanged to go into Multiframe I mode. XIDS are exchanged to go into UI mode.

+IPR Command – Async Rate Selection

The +IPR command selects the async rate.

Syntax

+IPR = r

Defined Values

Parameter	Meaning	Values
r	Selects the async rate	600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 19200, 24000, 28800, or 38400 bps

Example Command Sequence for V.110

1. 1) AT+ISP=0(Select 64 kbps pass-through mode)
2. 2) AT+IPT=4(Select V.110)
3. 3) AT+IPR= 19200(Select async 19200 bps rate)
4. 4) ATD or ATA(Command connect or answer)

V.110 will be automatically configured. The E1, E2, and E3 bits will be initialized based on Table 5/V.110, and the frames will be generated based on the adaption rates (Table 6a-f/V.110).

Disconnect:

+++ATH for both modems

V92 Data Mode AT Commands

V.92 Data mode is enabled or disabled using AT commands.

New Connect Message

With the addition of V.92 features, the CSM reports different connect messages as follows:

- In the one-line format, the modulation is reported as V92 when the modems have successfully connected using the QuickConnect algorithm.
- V44 is reported for connections successfully negotiating V.44 compression.

AT Commands

The AT commands available for V.92 mode are listed below and described in more detail in the subsequent sections. The &V2 Diagnostics available in V.92 mode are also described.

- [+QC - V.92 QuickConnect Enable](#)
- [+HEN - Modem On-Hold Enable](#)
- [+HTL—Modem On-Hold Time-Out Setting](#)
- [+DS44—V.44 Compression Parameters](#)
- [+DCS—V.42bis/V.44 Negotiation Enable](#)
- [%C—Enable/Disable Data Compression Negotiation](#)
- [V.92 Specific Diagnostics](#)

+QC - V.92 QuickConnect Enable

This command enables or disables the V.92 QuickConnect feature. V.92 QuickConnect allows for a fast V.92 training sequence (about 10 seconds). If enabled, V.92 must also be supported by the client modem for V.92 operation.

Syntax:

+QC = <QCE>,<Level of ANSPCM>;

Defined Values:

Parameter	Meaning	Values
<QCE>	Number which enables and disables V.92 QuickConnect.	0: Disables V.92 QuickConnect (Default) 1: Enables V.92 QuickConnect.
<Level of ANSPCM>	Number which sets the level of the ANSPCM.	0: -9dBm0 1: -12 dBm0 (Default) 2: -15 dBm0 3: -18 dBm0

Reporting Current or Selected Values:

Command	+QC?
Response	+QC: <QCE value>, <Level of ANSPCM>
Example	+QC: 0,1 (for the defaults)

Reporting Supported Range of Parameter Values:

Command	+QC=?
Response	+QC: (<QCE> range), (<Level of ANSPCM> range)
Example	+QC: (0,1), (0-3)

+HEN - Modem On-Hold Enable

This command enables or disables the Modem On-Hold feature.

Modem On-Hold allows the client modem to accept a Call Waiting call without releasing the current data connection. When the client is finished with the voice call, the modems reconnect and continue where the data connection was interrupted.

Even when disabled, the modem still responds to the remote's MH sequences; the modem just does not allow being put on-hold. When disabled and an MHreq is received, an MHnack is sent in return. The remote then decides to either disconnect (by sending MHclrd) or request a fast reconnect (by sending MHfr). If the remote decides to disconnect, the server modem logs the disconnect as Remote Call Waiting.

Syntax:

+HEN = <MHE>, <Max MH sessions>;

Defined Values:

Parameter	Meaning	Values
<MHE>	Number which enables/disables the Modem On-Hold feature.	0: Disables Modem On-Hold. Rejects any requests to be placed on-hold (Default). 1: Enables Modem On-Hold. Allows requests to be placed on-hold for the amount of time specified by the +HTL command.
<Max MH sessions>	Decimal number which indicates the maximum number of MH sessions allowed. This parameter is ignored when <MHE> is 0.	0: No limit (Default). n: The value is the maximum number of times the modem allows being placed on-hold.

Reporting Current or Selected Values:

Command	+HEN?
Response	+HEN: <MHE value>,< Max MH sessions >
Example	+HEN: 0, 0 (For the defaults)

Reporting Supported Range of Parameter Values:

Command	+HEN=?
Response	+HEN: (<MHE> range), (<Max MH sessions> range)
Example	+HEN: (0,1), (0–255)

+HTL—Modem On-Hold Time-Out Setting

This command allows the user to specify the desired maximum time-out for the MH feature.

Modem On-Hold allows the client modem to accept a Call Waiting call without releasing the current data connection. When the client is finished with the voice call, the modems reconnect and continue where the data connection was interrupted.

The +HTL value is transferred to the requesting modem in the MHack. If the remote does not send MHfr (request for fast reconnect) or MHclrd (request for clear-down) within the specified time, the modem disconnects with a MH Time-Out disconnect reason. When this value is set to 13 (no limit), the Host can disconnect the call by using ATH or by dropping DTR. The server modem records the disconnect with a Local Request While On-Hold reason.

Syntax:

+HTL= <T1>;

Defined Values:

Parameter	Meaning	Values
<T1>	Decimal number which sets the maximum time-out for the MH feature.	0: Reserved 1: 10 seconds 2: 20 seconds 3: 30 seconds 4: 40 seconds 5: 1 minute (Default) 6: 2 minutes 7: 3 minutes 8: 4 minutes 9: 6 minutes 10: 8 minutes 11: 12 minutes 12: 16 minutes 13: Time-out handled by Host 14: Reserved 15: Reserved

Reporting Current or Selected Values:

Command	+HTL?
Response	+HTL: <T1 value>
Example	+HTL: 5 (For the defaults)

Reporting Supported Range of Parameter Values:

Command	+HTL=?
Response	+HTL: (T1 range)
Example	+HTL: (0-15)

+DS44—V.44 Compression Parameters

This command is used to adjust the parameters for V.44 compression. V.44 is a feature that allows higher compression rates with certain file types. This compression is optimized for internet traffic.

For more information, refer to *ITU-T V.44*.

Syntax:

+DS44 = <dir>, <comp neg>, <max code tx>, <max code rx>, <max string tx>, <max string rx>, <max hist tx>, <max hist rx>

Defined Values:

Parameter	Meaning	Values
<dir>	Number which sets desired direction of operation of the data compression.	0: Negotiated. No compression. 1: Transmit only. 2: Receive only. 3: Both directions. Accept any direction.
<comp neg>	Number which specifies whether or not the DCS should continue to operate if the desired result is not obtained.	0: Do not disconnect if Rec. V.44 is not negotiated by the remote DCE as specified in <direction>. 1: Disconnect if Rec. V.44 is not negotiated by the remote DCE as specified in <direction>.
< max code tx >	Decimal number which specifies the maximum number of codewords which should be negotiated in the transmit direction.	Range = 256–2048
< max code rx >	Decimal number which specifies the maximum number of codewords which should be negotiated in the transmit direction.	Range = 256–2048
< max string tx >	Decimal number which specifies the maximum string length which should be negotiated in the transmit direction.	Range = 31–255
< max string rx >	Decimal number which specifies the maximum string length which should be negotiated in the receive direction.	Range = 31–255
< max hist tx >	Decimal number which specifies the maximum size of history buffer which should be negotiated in the transmit direction.	Value = 2 x the number of codewords.
< max hist rx >	Decimal number which specifies the maximum size of history buffer which should be negotiated in the receive direction.	Value = 2 x the number of codewords.

Default values: +DS44: 3, 0, 2048, 2048, 140, 140, 10240, 10240

Reporting Current or Selected Values

Command	+DS44?
Response	+DS44: <dir>, <comp neg>, <max code tx>, <max code rx>, <max string tx>, <max string rx>, <max hist tx>, <max hist rx>
Example	+DS44: 3, 0, 2048, 2048, 140, 140, 10420, 10420 (For the defaults)

Reporting Supported Range of Parameter Values

Command	+DS44=?
Response	+DS44: (dir range), (comp neg range), (code tx range), (code rx range), (string tx range), (string rx range), (hist tx range), (hist rx range)
Example	+DS44: (0–3), (0–1), (256–2,048), (256–2,048), (31–255), (31–255), (512–10,240), (512–10,240)

+DCS—V.42bis/V.44 Negotiation Enable

This command enables and disables V.42bis and V.44 data compression negotiation. Also, see the %Cn command.

V.44 is a feature that allows higher compression rates with certain file types. This compression is optimized for Internet traffic. For more information, see *ITU-T V.44*.

Syntax

+DCS = <V.42bis enable>, <V.44 enable>

Defined Values

Parameter	Values
<V.42bis enable>	0: Do not allow V.42bis data compression negotiation. 1: Allow V.42bis data compression negotiation. (Default)
<V.44 enable>	0: Do not allow V.44 data compression negotiation. 1: Allow V.44 data compression negotiation. (Default)



Note

1. A V.44 connection is enabled by default. This is NOT reflected in S41 (bits 0 and 1). Nevertheless, selection of %C4 or %C5 will change S41 (bit 0, 1) accordingly. V.44 can be disabled by the +DCS command or by setting %C0 to %C3.
2. Except as described in Note 1, the +DCS or %Cn command, whichever was received last, selects the data compression negotiation method.

Reporting Current or Selected Values

Command	+DCS?
Response	+DCS: <V.42bis enable>, <V.44 enable>
Example	+DCS: 1, 1 (For the defaults)

Reporting Supported Range of Parameter Values

Command	+DCS=?
Response	+DCS: (range of V.42bis enable), (range of V.44 enable)
Example	+DCS: (0,1), (0,1)

%C—Enable/Disable Data Compression Negotiation

This command is used to enable or disable data compression negotiation. The modem can only perform data compression on an error corrected link. The parameter value, if valid, is reflected in S41 bits 0 and 1. See also the +DCS command.

Commands:

%Cn: Refer to the [Error Detection and Data Compression Commands](#) section for details.

V.92 Specific Diagnostics

V.92 specific diagnostics information available during a V.92 connection as reported by the &V2 AT command are listed in [Table 19](#).

Table 19 *&V2 Statistics Information for V.92 Connections*

Field Code	Field Name	Bit(s)	Field Description
se	Remote V.92 Capability	0	Indicates whether or not the remote modem indicated V.92 capability during the INFO0 sequence. 0 = V.92 not supported 1 = V.92 supported
	QuickConnect Attempted	1	Indicates whether QuickConnect was attempted. 0 = QC not attempted 1 = QC attempted
	V.92 Fallback to V.90	2	Indicates if the modem tried a V.92 QuickConnect and fell back to a V.90 connection. 0 = Fallback to V.90 from V.92 QuickConnect did not occur 1 = Fallback to V.90 from V.92 QuickConnect occurred
	QuickConnect Connected	3	Indicates whether the call actually connected with QuickConnect 0 = QC not connected 1 = QC connected
	Short Phase 2 Request from Remote	5	Indicates if the remote modem requested a short Phase 2 0 = Remote modem did not request a short Phase 2 1 = Remote modem requested a short phase 2
	ANSPCM Levels	6-7	See Table 20 .
sf	UQTS and QC Identifiers		Reports parameter values transferred during V.92 QuickConnect
sg	Number of MH Sessions Requested		Reports the number of Modem On-Hold sessions requested by the remote modem.
sh	Number of MH Sessions Granted		Reports the number of Modem On-Hold sessions granted.
si	MH State	0	Indicates whether the modem is currently On-Hold. 0 = Not On-Hold 1 = On-Hold
	MH FRR	1	Indicates whether the modem is currently in FRR (Fast Reconnect from MH) 0 = Not in FRR 1 = In FRR
	MH Limit	2	Indicates whether the modem has reached its Modem On-Hold Limit. 0 = Limit not reached 1 = On-Hold limit reached
	DIL Transmission	3	Indicates if the DIL was sent 0 = DIL was not sent 1 = DIL was sent

Table 19 &V2 Statistics Information for V.92 Connections

Field Code	Field Name	Bit(s)	Field Description
qa	V.92 Disconnect Reasons		Reports the reason for the last disconnect. 0x1A = Remote Call Waiting 0x1B = Modem On-Hold Time-out 0x1C = Local Request while Modem On-Hold 0x1D = Local Request while FRR
qb	V.92 Retrain Reason		Reports the reason for the last retrain. 0x11 = Modem was On-Hold 0x12 = Modem was in FRR 0x13 = Modem has sent a MH message

Table 20 V.92 ANSPCM Levels (&V2 - se)

Bit 7	Bit 6	ANSPCM Level
0	0	-9 dB
1	0	-12 dB
0	1	-15 dB
1	1	-18 dB

The Host may have to monitor the MH status so that connection status can be reported correctly. For example, the upper layer statistics should record a disconnection due to Call Waiting as a normal disconnection.

Error Detection and Data Compression Commands

AT% Commands

%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 reflected in S41 bits 0 and 1.

Parameter	Meaning
%C0	Disables data compression.
%C1	Enables MNP 5 data compression negotiation.
%C2	Enables V.42 bis data compression.
%C3	Enables both V.42 bis and MNP 5 data compression.
%C4	Forces V.44 data compression negotiation with fallback to no data compression.
%C5	Allows V.44 data compression negotiation and fallback to V.42 bis and MNP 5 data compression negotiation the same as %C3 (Default).



Note

- A V.44 connection is enabled by default. This is NOT reflected in S41 (bits 0 and 1). Nevertheless, selection of %C4 or %C5 will change S41 (bit 0, 1) accordingly. V.44 can be disabled by the +DCS command or by setting %C0 to %C3.
- Except as described in the previous paragraph, the +DCS or %Cn command, whichever was received last, selects the data compression negotiation method.

Result Code	Meaning
OK	n = 0 to 5
ERROR	Otherwise

AT\ Commands

\An - Select Maximum MNP Block Size

The modem will operate an MNP error corrected link using a maximum block size controlled by the parameter supplied. The parameter value, if valid, is written to S40 bits 6 and 7.

Parameter	Meaning
\A0	64 characters
\A1	128 characters (default)

Parameter	Meaning
\A2	192 characters
\A3	256 characters

Result Code	Meaning
OK	n = 0 to 3
ERROR	Otherwise

MNP 10EC Commands

AT-SEC Commands

-SEC=n - Enable/Disable MNP10-EC

Enables or disables MNP10-EC operation.

Syntax

-SEC=n,[<tx level>]

Defined Values:

Parameter	Meaning	Values
<tx level>	Decimal number which is the optional transmit level subparameter.	0: Disables MNP10-EC; the transmit level is that defined in S91. 1, [<tx level>]: Enables MPC10-EC with the transmit level being defined by the subparameter <tx level>. Range is 0 to 30 (0 dBm to -30 dBm). Default is unspecified in S91.

Result Code	Meaning
OK	n = 0, or 1 with <tx level> from 0 to 30
ERROR	Otherwise

Example:

AT-SEC=1,18 enables MNP10-EC and sets the transmit level to -18 dBm.



Note

If AT-SEC=0, the modem will automatically set AT-SEC=1 if the remote modem indicates Cellular in the V.8 bis/V.8 phase or if a Cellular Driver is loaded and the Cell Phone is attached.

Inquiries

AT-SEC? retrieves the current -SEC command settings, e.g., 1,18.

AT Command 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 21](#).

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 ConfigurACE Configuration Utility Program. (See ConfigurACE description.)

Table 21 *AT Command Result Code Definitions*

Code	Message	Meaning
+F4	+FCERROR	High speed fax data (V.27, V.29, V.33, or V.17) is expected but a V.21 signal is received.
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, modifiable through ConfigurACE. When cellular interface is selected, RING indicates that the cellular phone is receiving an receiving an incoming call.
3	NO CARRIER	Sent when attempting to establish a call if: <ul style="list-style-type: none"> • Ringback is detected and later ceases but no carrier is detected within the period of time determined by register S7, or • 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: <ul style="list-style-type: none"> • If busy tone detection is enforced, busy or circuit busy has been detected. • If dial tone detection is enforced or selected, dial tone has not been detected.

Table 21 AT Command Result Code Definitions (continued)

Code	Message	Meaning
4	ERROR	<p>Sent during an attempt to execute a command line if any of the following conditions occur:</p> <ul style="list-style-type: none"> • The command line contains a syntax error. • The modem cannot execute a command contained in the command line, i.e., the command does not exist or is not supported. • A command parameter within the command line is outside the permitted range. <p>For X0, X1, X2, and X3, this message is sent instead of DELAYED and BLACKLISTED.</p>
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 DIALTONE	<p>For X2 and X4, the modem has been instructed to wait for dial tone during dialing but none is received.</p> <p>When cellular phone interface is selected, indicates that cellular service is not currently available.</p>
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 0600	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.

Table 21 AT Command Result Code Definitions (continued)

Code	Message	Meaning
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	CONNECT 75TX/1200RX	The modem has established a V.23 originate connection and line speed reporting is enabled.
23	CONNECT 1200TX/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'.
33	FAX	A fax modem connection is established in a facsimile mode.
35	DATA	A data modem connection is established in a facsimile mode.
40	CARRIER 300	The modem has connected to the line at 0-300 bps and carrier reporting is enabled. (See S95 and Xn.)
44	CARRIER 1200/75	The V.23 backward channel carrier is detected and carrier reporting is enabled. (See S95 and Xn.)
45	CARRIER 75/1200	The V.23 forward channel carrier is detected and carrier reporting is enabled. (See S95 and Xn.)
46	CARRIER 1200	The modem has connected to the line at 1200 bps and carrier reporting is enabled. (See S95 and Xn.)
47	CARRIER 2400	The modem has connected to the line at 2400 bps and carrier reporting is enabled. (See S95 and Xn.)
48	CARRIER 4800	The modem has connected to the line at 4800 bps and carrier reporting is enabled. (See S95 and Xn.)
49	CARRIER 7200	The modem has connected to the line at 7200 bps and carrier reporting is enabled. (See S95 and Xn.)
50	CARRIER 9600	The modem has connected to the line at 9600 bps and carrier reporting is enabled. (See S95 and Xn.)
51	CARRIER 12000	The modem has connected to the line at 12000 bps and carrier reporting is enabled. (See S95 and Xn.)
52	CARRIER 14400	The modem has connected to the line at 14400 bps and carrier reporting is enabled. (See S95 and Xn.)
53	CARRIER 16800	The modem has connected to the line at 16800 bps and carrier reporting is enabled. (See S95 and Xn.)
54	CARRIER 19200	The modem has connected to the line at 19200 bps and carrier reporting is enabled. (See S95 and Xn.)
55	CARRIER 21600	The modem has connected to the line at 21600 bps and carrier reporting is enabled. (See S95 and Xn.)

Table 21 AT Command Result Code Definitions (continued)

Code	Message	Meaning
56	CARRIER 24000	The modem has connected to the line at 24000 bps and carrier reporting is enabled. (See S95 and Xn.)
57	CARRIER 26400	The modem has connected to the line at 26400 bps and carrier reporting is enabled. (See S95 and Xn.)
58	CARRIER 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	COMPRESSION: CLASS 5	The modem has connected to the line in MNP Class 5 and COMPRESSION message reporting is enabled. (See S95, Wn, and Xn.)
67	COMPRESSION: V.42 bis	The modem has connected to the line in V.42 bis and COMPRESSION message reporting is enabled. (See S95, Wn, and Xn.)
69	COMPRESSION: NONE	The modem has connected to the line without data compression and COMPRESSION message reporting is enabled. (See S95, Wn, and Xn.)
70	PROTOCOL: NONE	The modem has connected to the line without any form of error correction and the PROTOCOL message reporting has been enabled. (See S95, Wn, and Xn.)
77	PROTOCOL: LAPM	The modem has connected to the line in V.42 LAPM error correction mode and PROTOCOL message reporting has been enabled. (See S95, Wn, and Xn.)
78	CARRIER 31200	The modem has connected to the line at 31200 bps and carrier reporting is enabled. (See S95 and Xn.)
79	CARRIER 33600	The modem has connected to the line at 33600 bps and carrier reporting is enabled. (See S95 and Xn.)
80	PROTOCOL: ALT	Sent when the modem has connected in the MNP mode of error correction, and PROTOCOL message reporting has been enabled. (See S95, Wn, and Xn.)
81	PROTOCOL: ALT-CELLULAR	The modem has connected in the MNP 10 mode and cellular power level adjustment is enabled (")M1 or)M2"). (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.

Table 21 AT Command Result Code Definitions (continued)

Code	Message	Meaning
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.
150	CARRIER 32000	The modem has connected to the line at 32000 bps and carrier reporting is enabled. (See S95 and Xn.)
151	CARRIER 34000	The modem has connected to the line at 34000 bps and carrier reporting is enabled. (See S95 and Xn.)
152	CARRIER 36000	The modem has connected to the line at 36000 bps and carrier reporting is enabled. (See S95 and Xn.)
153	CARRIER 38000	The modem has connected to the line at 38000 bps and carrier reporting is enabled. (See S95 and Xn.)
154	CARRIER 40000	The modem has connected to the line at 40000 bps and carrier reporting is enabled. (See S95 and Xn.)
155	CARRIER 42000	The modem has connected to the line at 42000 bps and carrier reporting is enabled. (See S95 and Xn.)
156	CARRIER 44000	The modem has connected to the line at 44000 bps and carrier reporting is enabled. (See S95 and Xn.)
157	CARRIER 46000	The modem has connected to the line at 46000 bps and carrier reporting is enabled. (See S95 and Xn.)
158	CARRIER 48000	The modem has connected to the line at 48000 bps and carrier reporting is enabled. (See S95 and Xn.)
159	CARRIER 50000	The modem has connected to the line at 50000 bps and carrier reporting is enabled. (See S95 and Xn.)
160	CARRIER 52000	The modem has connected to the line at 52000 bps and carrier reporting is enabled. (See S95 and Xn.)
161	CARRIER 54000	The modem has connected to the line at 54000 bps and carrier reporting is enabled. (See S95 and Xn.)
162	CARRIER 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.

Table 21 *AT Command Result Code Definitions (continued)*

Code	Message	Meaning
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.

Table 21 AT Command Result Code Definitions (continued)

Code	Message	Meaning
194	CONNECT 54667	The modem has connected to the line at 54667 bps and DCE speed reporting is enabled.
195	CARRIER 28000	The modem has connected to the line at 28000 bps and carrier reporting is enabled. (See S95 and Xn.)
196	CARRIER 29333	The modem has connected to the line at 29333 bps and carrier reporting is enabled. (See S95 and Xn.)
197	CARRIER 30667	The modem has connected to the line at 30667 bps and carrier reporting is enabled. (See S95 and Xn.)
198	CARRIER 33333	The modem has connected to the line at 33333 bps and carrier reporting is enabled. (See S95 and Xn.)
199	CARRIER 34667	The modem has connected to the line at 34667 bps and carrier reporting is enabled. (See S95 and Xn.)
200	CARRIER 37333	The modem has connected to the line at 37333 bps and carrier reporting is enabled. (See S95 and Xn.)
201	CARRIER 38667	The modem has connected to the line at 38667 bps and carrier reporting is enabled. (See S95 and Xn.)
202	CARRIER 41333	The modem has connected to the line at 41333 bps and carrier reporting is enabled. (See S95 and Xn.)
203	CARRIER 42667	The modem has connected to the line at 42667 bps and carrier reporting is enabled. (See S95 and Xn.)
204	CARRIER 45333	The modem has connected to the line at 45333 bps and carrier reporting is enabled. (See S95 and Xn.)
205	CARRIER 46667	The modem has connected to the line at 46667 bps and carrier reporting is enabled. (See S95 and Xn.)
206	CARRIER 49333	The modem has connected to the line at 49333 bps and carrier reporting is enabled. (See S95 and Xn.)
207	CARRIER 50667	The modem has connected to the line at 50667 bps and carrier reporting is enabled. (See S95 and Xn.)
208	CARRIER 53333	The modem has connected to the line at 53333 bps and carrier reporting is enabled. (See S95 and Xn.)
209	CARRIER 54667	The modem has connected to the line at 54667 bps and carrier reporting is enabled. (See S95 and Xn.)

Note

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.

S Registers

S Register Summary

The S-Registers are summarized in this section along with their default values. Registers or register fields quoted as “reserved” are reserved for current or future use by the firmware, or are permanently overridden by PTT limitations.

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

[Table 22](#) provides a summary of the S-Registers. The [S Register Definitions](#) section describes each register in more detail.

Table 22 *S Register Summary*

Register	Function	Range	Units	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 for Dial Tone	2-255	s	2
S7	Wait Time for Carrier	1-255	s	60
S8	Reserved	-	-	-
S9	Carrier Detect Response Time	1-255	0.1 s	6
S10	Carrier Loss Disconnect Time	1-255	0.1 s	14
S11	Reserved	50-255	0.001 s	95
S12	Escape Prompt Delay	0-255	0.02 s	50
S13	Reserved	-	-	-
S14	General Bit Mapped Options Status	-	-	138 (8Ah)
S15	Reserved	-	-	-
S16	Test Mode Bit Mapped Options Status (&T)	-	-	0
S17	Reserved	-	-	-
S18	Test Timer	0-255	s	0
S19	Reserved	-	-	0
S20	Reserved	-	-	0
S21	V.24/General Bit Mapped Options Status	-	-	52 (34h)
S22	Speaker/Results Bit Mapped Options Status	-	-	119 (77h)
S23	General Bit Mapped Options Status	-	-	54 (36h)

Table 22 S Register Summary (continued)

Register	Function	Range	Units	Default
S24	Sleep Inactivity Timer	0-255	s	09 (09h)
S25	Delay to DTR Off	0-255	s or 0.01 s	0
S26	RTS-to-CTS Delay	0-255	0.01 s	0
S27	General Bit Mapped Options Status	-	-	0
S28	General Bit-Mapped Options Status	-	-	6 (06h)
S29	Flash Dial Modifier Time	0-255	10 ms	17 (11h)
S30	Disconnect Inactivity Timer	0-255	10 s	19 (13h)
S31	General Bit-Mapped Options Status	-	-	1
S32	XON Character	0-255	ASCII	-
S33	XOFF Character	0-255	ASCII	7
S34	V44 Compression	0-1	ASCII	0
S35	Reserved	-	-	20
S36	LAPM Failure Control	-	-	3
S37	Line Connection Speed	-	-	88 (58h)
S38	Delay Before Forced Hangup	0-255	s	139 (8Bh)
S39	Flow Control Bit Mapped Options Status	-	-	-
S40	General Bit-Mapped Options Status	-	-	7
S41	General Bit-Mapped Options Status	-	-	128(40h)
S42-S46	Reserved	-	-	-
S48	V.42 Negotiation Control	-	-	13 (Country dependent)
S82	LAPM Break Control	-	-	10 (Country dependent)
S86	Call Failure Reason Code	0-255	-	47
S91	PSTN Transmit Attenuation Level in Analog Modulations	0-15	dBm	223
S92	Fax Transmit Attenuation Level	0-15	dBm	255
S95	Result Code Messages Control	-	-	2
S200	Disable K56Plus Protocol	-	-	255
S201	Reserved	-	-	13
S202	K56flex/V90 Tx level & auto status message	0-255	-	11
S204	Reserved	-	-	50
S210	Symbol Rate Limit	0-255	-	0
S220	Duration of Answer Tone	0-255	450 ms	-12db
S221	Duration of Billing Delay	0-255	500 ms	0

Table 22 S Register Summary (continued)

Register	Function	Range	Units	Default
S222	General purpose	0-255	-	09 (09h)
S223	V.90 Transmit level	11-31	Db	0
S224	Digital detect timer	0-100	Ms	0

S Register Definitions

S0 - Number of Rings to Auto-Answer

Sets the number of the rings required before the modem automatically answers a call. Setting this register 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

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

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

Default

10 (Line Feed)

S5 - Backspace Character

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 for Dial Tone Before Blind Dialing

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.

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 After Dial, for Silence, or for Dial Tone After “W” Dial Modifier

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.

Range

1-255 seconds

Default

50

S8 - Reserved

S9 - Carrier Detect Response Time

Sets the length of time, in tenths of a second, that the carrier must be present before the modem considers it valid and turns on RLSD. As this time is increased, there is less chance to detect a false carrier due to noise from the telephone line.

Range

1-255 tenths of a second

Default

6 (0.6 second)

S10 - Lost Carrier To Hang Up Delay

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)

S11 - DTMF Tone Duration

Returns OK. The default value is set to 95D. This register is reserved.

S12 - Escape Prompt Delay (EPD)

Returns OK.

Range

0-255

Default

50D

S13 - Reserved

S14 - General Bit Mapped Options Status

Indicates the status of command options.

Bit	Meaning	Values
0	This bit is ignored.	
1	Command echo (En)	0: Disabled (E0) 1: Enabled (E1) (Default)
2	Quiet mode (Qn)	0: Send result codes (Q0) (Default) 1: Do not send result codes (Q1)
3	Result codes (Vn)	0: Numeric (V0) 1: Verbose (V1) (Default)
4	Reserved	
5	Tone (T)/Pulse (P)	0: Tone (T) (Default) 1: Pulse (P)
6	Reserved	
7	Originate/Answer (This Bit is not used.)	0: Answer 1: Originate (Default)

Default

138 (8A hex) (10001010 binary)

S15 - Reserved**S16 - General Bit Mapped Test Options Status**

Indicates the test in progress status.

Bit	Meaning	Values
0	Local analog loopback (LAL)	0: Disabled (Default) 1: Enabled (&T1)
1	Not used	
2	Local digital loopback	0: Disabled (Default) 1: Enabled (&T3)
3	Remote digital loopback (RDL) status	0: Modem not in RDL (Default) 1: RDL in progress
4	RDL requested (AT&T6)	0: RDL not requested (Default) 1: RDL requested (&T6)
5	RDL with self test	0: Disabled (Default) 1: Enabled (&T7)
6	LAL with self test	0: Disabled (Default) 1: Enabled (&T8)
7	Not used	

Default

0

S17 - Reserved**S18 - Test Timer**

Sets the length of time, in seconds, that the modem conducts a test (commanded by &Tn) before returning to the command mode. If this register value is zero, the test will not automatically terminate; the test must be terminated from the command mode by issuing an &T0 or H command. When S18 is non-zero, the modem returns the OK message upon test termination.

Range

0-255 seconds

Default

0

S19 - Reserved**S20 - Reserved****S21 - V.24/General Bit Mapped Options Status**

Indicates the status of command options.

Bit(s)	Meaning	Values
0	Set by &Jn command but ignored otherwise.	0: &J0 (Default) 1: &J1
1	Reserved	
2	CTS behavior (&Rn)	0: CTS tracks RTS (&R0) 1: CTS always on (&R1) (Default)
3-4	DTR behavior (&Dn)	0: &D0 selected 1: &D1 selected 2: &D2 selected (Default) 3: &D3 selected
5	RLSD (DCD) behavior (&Cn)	0: &C0 selected 1: &C1 selected (Default)
6	DSR behavior (&Sn)	0: &S0 selected (Default) 1: &S1 selected
7	Long space disconnect (Yn)	0: Y0 selected (Default) 1: Y1 selected

Default

52 (34h) (00110100b)

S22 - Speaker/Results Bit Mapped Options Status

Indicates the status of command options.

Bit(s)	Meaning	Values
0-1	Speaker volume (Ln)	Not supported
2-3	Speaker control (Mn)	Not supported
4-6	Limit result codes (Xn)	Not supported
7	Reserved	

Default

119 (77h) (01110111b)

S23 - General Bit Mapped Options Status

Indicates the status of command options.

Bit(s)	Meaning	Values
0	Grant RDL	0: RDL not allowed (&T5) (Deafault) 1: RDL allowed (&T4)
1-5	Reserved	
6-7	Guard tone (&Gn)	0: None (G0) (Default) 1: None (&G1) 2: 1800 Hz (&G2)

Default

54 (36h) (00111110b)

S24 - Sleep Inactivity Timer

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

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

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

S27 - Bit Mapped Options Status

Indicates the status of command options.

Bit(s)	Meaning	Values
0, 1, 3	Synchronous/asynchronous selection (&Mn/&Qn)	See Sync/Async Bit Table .
2	Leased line control (&Ln)	0: Dial up line (&L0) (Default)
4-5	Internal clock set (Xn)	0: 1: 2:
6	CCITT/Bell mode select (Bn)	0: CCITT mode (B0) 1: Bell mode (B1) (Default)
7	Reserved	

Table 23 *Sync/Async Bit Table*

Bit 3	Bit 1	Bit 0	Meaning
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	&Q4
1	0	1	&Q5 (Default)&Q6
1	1	0	

Default

73 (49h) (01001001b)

S28 - Bit Mapped Options Status

Bit(s)	Meaning	Values
0-1	Reserved	
2	Reserved	Always 0

Bit(s)	Meaning	Values
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)
5-7	Reserved	

Default

0

S29 - Flash Dial Modifier Time

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. The time can be limited as it is a country dependent parameter.

Range

0-255 10 ms intervals

Default

0 (0 ms)

S30 - Disconnect Inactivity Timer

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

Bit(s)	Meaning	Values
0	Single line connect message enable/disable (\Vn)	0: Messages controlled by S95, Wn and Vn (\V0) (Default) 1: Single line connect message (\V1)
1	Auto line speed detection (Nn)	0: Disabled (N0) 1: Enabled (N1) (Default)

Bit(s)	Meaning	Values
2-3	Error correction progress messages (Wn)	0: DTE speed only (W0) 1: Full reporting (W1) (Default) 2: DCE speed only (W2)
4-5	Reserved	
6-7	Reserved	Default = 00b

Default

06 (06h) (00000110b)

S32 - XON Character

Sets the value of the XON character.

Range

0-255, ASCII decimal

Default

17 (11h)

S33 - XOFF Character

Sets the value of the XOFF character.

Range

0-255, ASCII decimal

Default

19 (13h)

S34 – V.44 compression

0 – disable

1 – Enable (default)

S35 - Reserved**S36 - LAPM Failure Control**

Bits	Meaning	Values
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)
3-7	Reserved	

Default

7 (00000111b)

S37 - Desired Line Connection Speed

This register specifies the desired line connection speed.

Bits	Meaning	Values
0-4	Desired line connection speed. If an invalid number is entered, the number is accepted into the register, but S37 will act as if the default value has been entered.	<p>0: Attempt automode connection. If N0 is active, connection is attempted at the most recently sensed DTE speed (+MS command settings are updated to the appropriate values). If N1 is active, connection is attempted at the highest possible speed (e.g., +MS settings are updated to 11,1,300,33600 to reflect V.34, automode, 300 bps minimum speed, and 33600 bps maximum speed). (Default)</p> <p>1-3: Attempt to connect at 300 bps.</p> <p>4: Reserved</p> <p>5: Attempt to connect at V.22 1200 bps.</p> <p>6: Attempt to connect at V.22 2400 bps.</p> <p>7: Attempt to connect at V.23.</p> <p>8: Attempt to connect at V.32 bis/V.32 4800 bps.</p> <p>9: Attempt to connect at V.32 bis/V.32 9600 bps.</p> <p>10: Attempt to connect at V.32 bis 12000 bps.</p> <p>11: Attempt to connect at V.32 bis 14400 bps.</p> <p>12: Attempt to connect at V.32 bis 7200 bps.</p>
5-7	Reserved	

Default

0

**Note**

- When the Nn command is issued or the S37 register value is modified, the +MS command subparameters are updated to reflect the speed and modulation specified by the S37 value (see +MS command). For example:
 - If N0 command is active, S37=10 updates the +MS command subparameters to reflect +MS=10,1,300,12000
 - If N1 command is active, S37=10 updates the +MS command subparameters to reflect +MS=10,0,12000,12000
- S37 is not updated by the +MS command.
- Use of the +MS command is recommended instead of the Nn and S37=x commands. Nn and S37=x commands are supported for compatibility with existing communication software.

S38 - Delay Before Forced Hang Up

This register 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 register can be used to ensure that data in the modem buffer is sent before the modem disconnects.

Range

0-255 seconds

Default

20

**Note**

- 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.
- 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.

S39 - Flow Control Bit Mapped Options Status

Bits	(s)Meaning	Values
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)
3-7	Reserved	

Default

3 (00000011b)

S40 - General Bit Mapped Options Status

Indicates the status of command options.

Bit(s)	Meaning	Values
0-1	MNP extended services (-Kn)	0: Disable extended services (-K0) (Default) 1: Enable extended services (-K1) 2: Enable extended services (-K2)
2	Reserved	

Bit(s)	Meaning	Values
3-5	Break handling (\Kn)	0: Not supported 1: Not supported 2: Not supported 3: \K5 default 4: Not supported 5: Not supported
6-7	MNP block size (\An)	0: 64 chars (\A0) 1: 128 chars (\A1) (Default) 2: 192 chars (\A2) 3: 256 chars (\A3)

Default

88 (58h) (01011000b)

S41 - General Bit Mapped Options Status

Indicates the status of command options.

Bit(s)	Meaning	Values
0-1	Compression negotiation selection (%Cn)	0: Disabled (%C0 or %C4) 1: MNP 5 (%C1) 2: V.42 bis (%C2) 3: MNP 5 and V.42 bis (%C3 or %C5) (Default)
2-3	Auto retrain and fallback/fall forward (%En)	0: Retrain and fallback/fall forward disabled (%E0) 1: Retrain enabled (%E1) 2: Fallback/fall forward enabled (%E2) (Default)
4-7	Reserved	

Default

139 (8Bh) (10001011b)

S48 - V.42 Negotiation Action

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-Register, but S48 will act as if 128 has been entered.

Default

7

Register Value	Meaning
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.

S82 - Break Handling Options

S82 is for compatibility purposes only, changing this register will not have any affect.

S86 - Call Failure Reason Code

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

Register Value	Meaning
S86 = 0	Normal hangup, no error occurred.
S86 = 1	Sync loss in ISDN mode
S86 = 2	Compression parameter error
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 clear-down.
S86 = 17	Inactivity timeout.
S86 = 18	Speed not supported.
S86 = 19	Long space disconnect.

Register Value	Meaning
S86 =20	Key abort disconnect.
S86 =21	Clears previous disconnect reason.
S86 =22	No connection established.
S86 =23	Disconnect after three retrains.
S86 =24	V44 expander error
S86 =25	Channel reset used to hangup
S86 =26	Remote request due to call waiting
S86 =27	MOH timed out
S86 =28	Host disconnected while on-hold
S86 =29	Host disconnected during FRR

Range

0-23

Default

21

S91 - PSTN Transmit Attenuation Level in Analog Modulations

Sets the transmit attenuation level from 0 to 20 dBm in analog modulations (e.g., V.34, V.32 bis, V.22 bis, and tone modes) resulting in a transmit level from 0 to -20 dBm.

Range:

0 to 20 (0 to -20 dBm transmit level)

Default

10 (-10 dBm transmit level)

S92 - Fax Transmit Attenuation Level

Sets the transmit attenuation level from 10 to 15 dBm for the fax mode, resulting in a transmit level from -10 to -15 dBm.

Range

10 to 15 (-10 to -15 dBm transmit level)

Default

10 (-10 dBm transmit level)

S95 - Extended Result Codes

The bits in this register can be set to override some of the Wn command options. A bit set to a 1 in this register will enable the corresponding result code regardless of the Wn setting. Also, refer to [Table 1](#).

Bit	Meaning
0	CONNECT result code indicates DCE speed instead of DTE speed.
1	Append/ARQ to CONNECT XXXX result code in error-correction mode (XXXX = rate; see Table 1).
2	Enable CARRIER XXXX result code (XXXX = rate; see Table 1).
3	Enable PROTOCOL XXXX result code (XXXX = protocol identifier; see Table 1).
4	Reserved
5	Enable COMPRESSION result code (XXXX = compression type; see Table 1).
6	Reserved
7	Reserved

Default

0

S200 – Disable K56Plus Protocol

Enables/disables K56Plus protocol.

Bit(s)	Meaning	Values
0-4	Reserved	
5	Disable K56Plus	0: Enable K56Plus 1: Disable K56Plus (Default)
6-7	Reserved	

Default

4

S202 - CSM Bit Mapped Control Register

Controls K56flex/V90 Tx level and automatic modem status response.

Bit	Meaning	Values
0	K56Plus Protocol	0: Follows the setting of ATNn. (Default) 1: Forces LAPM when a K56Plus call is established
1	Enable V.90 digital pad compensation	0: Disables V.90 digital pad compensation. 1: Enables V.90 digital pad compensation (Default)
2	Display Tx and Rx HNDSHK states	
3	Reserved (used for Disable Auto-Gain on client server)	

Bit	Meaning	Values
4	Automatic modem status response	0: No automatic modem status response (requires &V2 command) (Default) 1: Automatic modem status response before every connect message and after every disconnect message
5	K56flex Tx level select	0: -12 dBm (Default) 1: -6 dBm
6	V90 Tx level select	0: -12 dBm (Default) 1: -6 dBm
7	Enable V.42 selective reject	0: Disables V.42 selective reject (Default) 1: Enables V.42 selective reject

Default

2

S210 – Symbol Rate Limit

Limits the symbol rate for V.34.

Bit(s)	Meaning	Values
0-2	Symbol rate limit	0: 2400 only 1: 2400 only 2: 2400, 2800 3: 2400, 2800, 3000 4: 2400, 2800, 3000, 3200 5: 2400, 2800, 3000, 3200, 3429 (Default)
3	Asymmetric/symmetric rate select	0: V.34 asymmetric rates disabled 1: V.34 asymmetric rates enabled (Default)
4-7	Reserved	

Default

13 (0Dh)

S220 – Duration of Answer Tone

Modifies the duration of the answer tone.

Command is in units of 450 ms.

- 1 unit lower decreases answer tone duration by 450 ms
- 1 unit higher increases answer tone duration by 450 ms

For +MS=11, +MS=12, or +MS=56 (even if automoding to a lower modulation):

Register Value	Meaning
S220 > 15	Increase by 450 ms multiples for each unit greater than 15
S220 = 15	default +1800 ms (6760 ms)
S220 = 13	default +1350 ms (5850 ms)
S220 = 12	default +450 ms (5400 ms)
S220 = 11	default (4950 ms)
S220 = 10	default - 450 ms (4500 ms)
S220 = 9	default - 900 ms (4050 ms)
S220 = 7	default - 1350 ms (3155 ms)
S220 = 5	default - 2250 ms (2250 ms)
S220 < 5	Decrease by 450 ms multiples for each unit less than 5

For +MS = anything other than 11, 12, or 56

Register Value	Meaning
S220 > 15	Increase by 450 ms multiples for each unit greater than 15
S220 = 15	default+1800 ms (5395 ms)
S220 = 13	default+900 ms (4500 ms)
S220 = 12	default+450 ms (4050 ms)
S220 = 11	default (3600 ms)
S220 = 10	default-450 ms (3150 ms)
S220 = 9	default-900 ms (2700 ms)
S220 = 5	default-1350 ms (906 ms)
S220 < 5	Decrease by 450 ms multiples for each unit less than 5

Default

11

S221 – Duration of Billing Delay

Modifies the duration of the billing delay.

Range

0-255 in 10 ms increments

Default

50 (500 ms)

S222 – General purpose register

Bit	Meaning
0	Disable Lucent negotiation with V.8bis
1	&V3 – outputs Ja sequence.

Range

0-255.

Default value

0

S223 – V.90 PCM Transmit level adjustment

V.90 transmit level can be varied from 0dbm to –16dbm. The allowed value range is 0 to 31.

DCE will output an Error, if input decimal value is greater than 31. Bit 6 of S202 must be zero for S223 to have any effect. If bit 6 of S202 is one, the TX level is restricted to –6dbm only and S223 will not have any effect on V.90 transmit level.

Formula to convert dBm to S223 value is “dBm = -(S223+1)/2”. For example –12dBm = -(23+1)/2. S223 =23 is the default value after power up.

Default

-12db

S224 – Digital detect timer

This register is used to autodetect the incoming call from ISDN V110/V120 (UI and Multiframe) or analog modem.

Values

100ms per unit

Range

0-100

Default

0. The default mode disables ISDN autodetect mode.

FAX Class 2 Commands

This section describes the fax class 2 commands. These commands are summarized in [Table 24](#).

Command Syntax and Guidelines

DTE Commands

The ISO 646 character set (CCITT T.50 International Alphabet 5, American Standard Code for Information Interchange) is used for the issuance of commands and responses. Only the low-order 7 bits of each character are used for commands or parameters; the high order bit is ignored. Upper case characters are equivalent to lower case characters.

For Phase C data transmission or reception, all 8 bits are needed.

DTE Command Lines

A command line is a string of characters sent from a DTE to the modem (DCE) while the modem is in a command state. A command line has a prefix, a body, and a terminator. Each command line (with the exception of the A/ command) must begin with the character sequence AT and must be terminated by a carriage return. Commands entered in upper case or lower case are accepted, but both the A and T must be of the same case, i.e., "AT" = ASCII 065, 084 or "at" = ASCII 097, 116. The body is a string of commands restricted to printable ASCII characters (032 - 126). Space characters (ASCII 032) and control characters other than CR (ASCII 013) and BS (ASCII 010) in the command string are ignored. The default terminator is the ASCII <CR> character. Characters that precede the AT prefix are ignored. The command line interpretation begins upon receipt of the carriage return character.

Facsimile Command Syntax

After the "AT" or "at" prefix, facsimile commands use extended syntax. Each command is preceded by the "+F" character and consists of single characters and a decimal parameter (if applicable) terminated by the semicolon ";" character (ASCII 059) or by the <CR> that terminated the command line. A missing decimal parameter is evaluated as 0.

For example, the command to instruct the modem to automatically answer a data or fax call and also enable reception is:

```
AT+FAE=0; +FCR 1 <CR>
```

Basic data mode and fax service class mode select commands are:

```
AT+FCLASS=0 <CR>for Data Mode
AT+FCLASS=2 <CR>for Service Class 2 Fax
```

In Class 2, the DCE makes and terminates calls, manages the communication session and negotiates (T.30 protocol) and transports the image data to DTE. The T.4 protocol management of image data, etc., is done by DTE.

The response to

```
AT+FCLASS= 0<CR>in Data Mode
```

or

```
AT+FCLASS=2<CR>in Service Class 2 Fax
```


is

OK

The service class may be set by the DTE from the choices available using the “+FCLASS=<VALUE>” command.

Table 24 Fax Class 2 Commands

Command	Function
Service Class ID	
+FCLASS=	Service Class
Class 2 Action Commands	
D	Originate a Call
A	Answer a Call
+FDT	Data Transmission
+FET=N	Transmit Page Punctuation
+FDR	Begin or Continue Phase C Receive Data
+FK	Session Termination
Class 2 DCE Responses	
+FCON	Facsimile Connection Response
+FDCS:	Report Current Session
+FDIS:	Report Remote Identification
+FCFR	Indicate Confirmation to Receive
+FTSI:	Report the Transmit Station ID
+FCSI:	Report the Called Station ID
+FPTS:	Page Transfer Status
+FET:	Post Page Message Response
+FHNG	Call Termination with Status
Class 2 Session Parameters	
+FMFR?	Identify Manufacturer
+FMDL?	Identify Model
+FREV?	Identify Revision
+FDCC=	DCE Capabilities Parameters
+FDIS=	Current Sessions Parameters
+FDCS=	Current Session Results
+FLID=	Local ID String
+FCR	Capability to Receive
+FPTS=	Page Transfer Status
+FCR=	Capability to Receive
+FAE	Adaptive Answer

Table 24 Fax Class 2 Commands (continued)

Command	Function
+FBUF?	Buffer Size (Read Only)
+FPHCTO	Phase C Time Out
+FAXERR	Fax Error Value
+FBOR	Phase C Data Bit Order

General Rules

- +Fnnn commands must be entered completely, otherwise an ERROR response is sent.
- All response messages are preceded and followed by <CR><LF>. Multiple response commands (e.g., +FDIS: +FCSI: and +FDCS:) will, therefore, appear to have a blank line between them.
- Fax Class 2 commands can be separated by the “:” character. The “:” character can be omitted if desired. Note that non-data commands cannot be separated by the “:” which is allowed as a dial modifier.
- All Class 2 commands are assumed to be the final command on a command line. Additional characters will be ignored.
- An ERROR message will be generated if a Class 2 action command is received while in data modem mode:
 - A Class 2 action command is received while in data modem mode.
 - A Class 2 read-only parameter is given the “=” form of a +F command (e.g., AT+FAXERR=5).
 - A Class 2 action command is given the inappropriate “=” or “=?” form (e.g., AT+FDR=?).

Serial Port Speed and Flow Control

During fax mode, the DTE-DCE port speed is 19200 bps.

The DCE provides a speed buffer of 1024 bytes and provides the DC1/DC3 (XON/XOFF) or RTS/CTS method of controlling the data into the buffer. This flow control is controlled by the &K3 or &K4 command.

This method of data flow control is available only for DTE to DCE direction of data. There is no provision for data flow control from DCE to DTE.

Data Stream Termination

The DCE exchanges streams of data with the DTE while executing data transfer commands. These data streams use the termination described in Section “[AT Commands Description,](#)” on page 11.

The ASCII <DLE> character (016) is used as a special character to shield special characters. The <DLE><ETX> character pair (<106><003>) is used to mark the end of a stream. The following patterns are used:

Pattern	Meaning
any data...<DLE><ETX>	End of stream

Pattern	Meaning
any data...<DLE><DLE>	Single <DLE> in data
any data...<DLE><any byte>	Delete <DLE><any byte>

DTE to DCE Streams

The DCE filters the data stream from the DTE, and removes all character pairs beginning with <DLE>. The DCE recognizes <DLE><ETX> as the stream terminator. The DCE recognizes <DLE><DLE> and reinserts a single <DLE> in its place.

The DTE must filter stream data to the DCE, and insert extra <DLE> characters ahead of data.

DCE to DTE Streams

The DTE must filter the data stream from the DCE, and remove all character pairs beginning with <DLE>. The DTE must recognize <DLE><ETX> as the stream terminator. The DTE must recognize <DLE><DLE> and reinsert a single <DLE> in its place.

The DCE filters stream data to the DTE, and inserts extra <DLE> characters ahead of data.

Auto Answer

The DCE can answer as a data DCE or as a fax DCE. It can answer the call adaptively, in that it can determine whether the call is 'data' or 'fax'. The +FAA parameter controls this feature. Fax adaptive answer operates only when +FCLASS=0.

Parameter Value	Meaning
AT+FAA=1	Auto answer as a facsimile or a data modem depending on the call

DCE Response	Meaning
CONNECT XXXX	DCE status response if data call
+FCON	DCE status response if fax call

Identification of T.30 Options

Group 3 devices negotiate session subparameters in DIS, DCS, and DTC frames. These subparameters are defined in [Table 25](#).

Session Status Reporting

The DCE provides reports to the DTE on the status of a session. The DCE provides the following status reports:

1. Connection and hang up status:
 - a. +FCON
 - b. +FHNG:<0-255>

2. Requested DIS session parameters in +FDIS: <string> report remote facsimile capabilities.
Syntax: +FDIS: VR, BR, WD, LN, DF, EC, BF, ST
3. +FDCS: <string> reports the negotiated parameters
4. Phase C prompts:
 - a. XON
 - b. XOFF
 - c. DC2
5. Phase C base status reports, depending upon copy quality and related end-of-page status:
 - a. +FPTS: <1-5>

Procedure Interrupt Negotiation

CCITT allows a station to request a procedure interruption at the end of a page. This request is passed between stations by the PIP, PIN, and PRI-Q messages.

Service Class 2 Identification and Selection Commands

Three commands (+FMFR?, +FMDL?, +FREV?) report identification and selection information. Each of these three commands cause the DCE to send a message to the DTE. The messages are programmable using ConfigurACE.

+FMFR?, Request Manufacturer Identification

The +FMFR? command causes the DCE to send a message identifying the DCE product manufacturer. The default message is:

```
ROCKWELL
OK
```

+FMDL?, Identify Product Model

The +FMDL? command causes the DCE to send a message identifying the DCE product model. The default message is similar to:

```
RC96XXXAC
OK
```

+FREV?, Identify Product Revision

The +FREV? command causes the DCE to send a message identifying the DCE product model revision number. The message format is the same as the ATI3 message, e.g.:

```
VX.XXX-model number
OK
```

Service Class 2 Action Commands

These commands transfer data, and punctuate sessions. They also release specific T.30 messages. All action commands must be the last command on a command line as indicated by the terminating <CR>.

All action commands initiate processes. The modem will not accept other commands from the DTE until the modem issues a final result code (e.g., OK, CONNECT). The modem will abort the process if it receives any character before the final result code is issued.

ATD, Originate a Call

The DCE can support a DTE command to originate a call using the ATD command (see the [“AT Commands Description” section on page 11](#)).

Syntax

ATD....<CR>

If this command is unsuccessful, the DCE reports an appropriate failure or error type result code such as NO CARRIER, NO DIALTONE, or BUSY (see the [“Error Detection and Data Compression Commands” section on page 64](#)).

If this call is successful, the typical DCE response is:

- ATDnn..nn (go off-hook, dial, get CED)
- +FCON (DCE detects flags)
- [+FCSI:<remote ID string>]
- +FDCS:<T.30 subparameter string>
- OK

The DCE dials, detects call progress, and generates the CNG tone. It then waits for a DIS frame. On detection of the first Phase B preamble (V.21 ch. 2 modulated by 300 bps HDLC flags), it reports the “+FCON” message to the DTE. The DCE then switches to 19200 bps.

The DCE generates a DCS frame based on the received DIS frame and on the previously set +FDIS parameter. A +FDT command from the DTE releases the DCE to transmit that DCS frame.

The DCE reports the initial received T.30 negotiation messages, including the DIS frame and the optional CSI ID string. The +FDIS: report is followed by the OK final result code.

ATA, Answer a Call

The DCE can support a DTE command to answer an incoming call using the ATA command (see the [“AT Commands Description” section on page 11](#)).

The DTE may issue an Answer command in response to an incoming ring.

If the Answer command is unsuccessful, the DCE will report an appropriate failure or error type result code, such as NO CARRIER (see the [“Error Detection and Data Compression Commands” section on page 64](#)).

Manual Call Answer

If this call is successful, the typical DCE response (answer and receive) is:

- +FCON

- [+FTSI:<remote ID string>]
- +FDCS:<T.30 subparameter string>
- OK (DTE should issue +FDR command here)

Upon receipt of an Answer command from the DTE, the DCE answers and generates the CED tone. The DCE then generates a DIS frame (derived from the +FDIS parameter) and hunts for the first T.30 negotiation frames. Upon detection of the first Phase B preamble (V.21 ch 2 modulated by 300 bps HDLC flags), it reports the “+FCON” message to the DTE.

The DTE should report the initial received T.30 negotiation messages, including the DCS frame. The +FDCS: report will be followed by the OK final result code.

Automatic Answer

The modem provides for automatic answering of incoming calls. If configured for automatic answer, the modem answers an incoming call in compliance with T.30, and reports the same messages as described for manual answer.

Connection as a Data Modem

If configured to do so by the +FAA parameter, the DCE will adaptively answer as a facsimile DCE or as a data DCE. If the DCE answers as a data DCE, it resets the +FCLASS parameter to 0 and issues the appropriate final result code (e.g., CONNECT, or NO CARRIER) to the DTE.

+FDT, Data Transmission

The +FDT command prefixes Phase C data transmission. When the DCE is ready to accept Phase C data, it issues the negotiation responses and the CONNECT result code to the DTE.

Syntax

+FDT <CR>

In Phase B, the +FDT command releases the DCE to proceed with negotiation, and releases the DCS message to the remote station. In Phase C, the +FDT command resumes transmission after the end of a prior transmit data stream.

Initiate Page Transmission

Phase B DCE polled response:

- [+FCSI:<remote ID string> (if new CSI received)
- [+FDIS:<subparameters from remote station>] (if new DIS received)
- +FDCS:<T.30 subparameter string>
- CONNECT
- <XON> (when ready for data)

After placing a call, or after finishing a document exchange, the DTE may command the DCE to re-enter T.30 Phase B to attempt to negotiate a document transmission.

Continue a Page

The DTE may issue more than one +FDT command for a given page, so that different files may be concatenated together. These files must have the same format.

- CONNECT
- <XON>

Phase C Data Framing

Phase C data must be presented to the DCE in stream mode. The DCE expects Phase C data to follow until it detects <DLE><ETX> termination characters. The DCE will filter the stream as described in the “[Serial Port Speed and Flow Control](#)” section on page 98.

The DCE will acknowledge the end of the data by returning the OK result code to the DTE.

If there is data underrun before the next +FDT or +FET= command, the DCE will zero-fill the pad as per T.4 until the Phase C timeout (+FPHCTO) is reached, or until more data is received. The DCE appends an RTC pattern to the transmit data after an +FET= command is received from the DTE.

Phase C Data Format

The Phase C data will be of the format specified by the negotiated T.30 DCS frame. The +FDCS:<string> response is defined in the “[+FDCS:; Report Current Session Capabilities](#)” section on page 110. The subparameter values are described in [Table 25](#).

The DCE will use the negotiated minimum Scan Time parameter from the DCS frame, and insert sufficient fill bits to pad each line to the minimum scan time. This is reported in the +FDCS:ST subparameter.

If the DCE finds more than one consecutive EOL in Phase C data (e.g., RTC), it will send only one EOL.

- Phase C data must conform to T.4 specifications.
- The DTE need not include a final RTC, since the DCE will append an RTC in response to an FET= command.
- Some facsimile machines may treat two EOLs as an RTC.

Table 25 *T.30 Session Subparameter Codes*

Label	Function	Value	Description	
VR	Vertical Resolution	0	Normal, 98 lpi	
		1	Fine, 196 lpi	
BR	Bit Rate ¹		+FDCS (originate)	+FDIS (answer)
		0	2400 bps/V.27 ter	V.27 ter (2400 only)
		1	4800 bps/V.27 ter	V.27 ter
		2	7200 bps/V.29	V.29, V.27 ter
		3	9600 bps /V.29 or V.17	V.29, V.27 ter
		4	12000 bps/V.33 or V.17	V.17, V.33, V.29, V.27 ter
WD	Page Width	5	14400 bps/V.33 or V.17	V.17, V.33, V.29, V.27 ter
		0	1728 pixels in 215 mm	
		1	2048 pixels in 255 mm	
		2	2432 pixels in 303 mm	
		3 ²	1216 pixels in 151 mm	
	4 ²	864 pixels in 107 mm		

Table 25 T.30 Session Subparameter Codes (continued)

Label	Function	Value	Description	
LN	Page Length	0	A4, 297 mm	
		1	B4, 364 mm	
		2	unlimited length	
DF	Data Compression Format	0	1-D modified Huffman	
		1 ²	2-D modified Read	
		2 ²	2-D uncompressed mode	
		3 ²	2-D modified modified Read	
EC	Error Correction (Annex A/T.30)	0	Disable ECM	
		1 ²	Enable ECM, 64 bytes/frame	
		2 ²	Enable ECM, 256 bytes/frame	
BF	Binary File Transfer	0	Disable BFT	
		1 ²	Enable BFT	
ST	Scan Time/Line		VR = normal	VR = fine
		0	0 ms	0 ms
		1	5 ms	5 ms
		2	10 ms	5 ms
		3	10 ms	10 ms
		4	20 ms	10 ms
		5	20 ms	20 ms
		6	40 ms	20 ms
		7	40 ms	40 ms

1. CCITT T.30 does not provide for the answering station to specify all speeds exactly using the DIS frame. Implementation of some BR codes (e.g., code 2) by an answering DCE is manufacturer specific.
2. Not supported.

<CAN>, Escape from Transmission

The DCE may request the DTE to halt Phase C transmission, by sending a cancel <CAN> character (024) to the DTE. In this case, the DTE should terminate Phase C transmission, issue <CAN>, and wait for the OK response code from the DCE.

+FET, Transmit Page Punctuation

This command is used to punctuate page and document transmission after one or more +FDT commands. This command generates T.30 Post Page Messages selected by the <ppm> code (Table 26).

Syntax

+FET=<ppm>[,<pc>,<bc>,<fc>]

DCE response

+FPTS:<ppr>- when received from remote OK

The +FET=<ppm> command indicates that the current page is complete; no more data will be appended to it. The value indicates whether there are any additional pages are to be sent and, if so, whether there is a change in any of the document parameters.

The DTE can command the DCE to generate PRI-Q messages with the +FET=<ppm> command using ppm codes 4-6 (Table 26).

This command must be sent within the time out specified by +FPHCTO after sending Phase C data, or else the DCE will end the page and document transmission. If the Phase C timeout is reached, the DCE sends an EOP post page message and terminates the session.

The remote facsimile station should respond to the post page message with a post page response. The DCE will report this using the +FPTS:<ppr> response (Table 27).

Table 26 T.30 Post Page Message Codes

ppm Code	Mnemonic	Description
0	[PPS-]MPS	Another page next, same document
1	[PPS-]EOM	Another document next
2	[PPS-]EOP	No more pages or documents
3	PPS-NULL	Another partial page next
4	[PPS-]PRI-MPS	Another page, procedure interrupt
5	[PPS-]PRI-EOM	Another doc., procedure interrupt
6	[PPS-]PRI-EOP	All done, procedure interrupt
=8+ppm		Post Page Message (ppm code)

Table 27 T.30 Post Page Response Messages

ppr Code	Mnemonic	Description
1	MCF	Page good
2	RTN	Page bad; retrain requested
3	RTP	Page good; retrain requested
4	PIN	Page bad; interrupt requested
5	PIP	Page good; interrupt requested

End a Page

The +FET= command causes the DCE to append an RTC (6 EOL) pattern as needed and enter Phase D by sending the selected T.30 Post Page message.

The +FET=1 (EOM) command signals the remote station that the next document will have a new DCS negotiated; this causes the session to re-enter Phase B.

+FDR, Begin or Continue Phase C Receive Data

The +FDR command initiates transition to Phase C data reception. This can occur after answering, dialing, a document is received, or a page is received.

Syntax

+FDR <CR>

Default value

3 seconds in some places

The DCE reports the negotiated T.30 parameters, with the remote ID information if available. When the DCE is ready to commence data transfer, it issues a CONNECT response code. If the DCE cannot resume data transfer because there is no more data, it responds OK. When the DTE is ready to accept data, it issues an <DC2> character (018) to the DCE.

If the DTE issues an <XOFF> character to the DCE for flow control, the DCE signals the DTE when its buffers are empty by sending a <DLE><DC2> (<016><018>) character pair.

When the DCE delivers the last byte of a page, the DCE reports the Page Transfer Status via the +FPTS:<ppr> response (Table 27).

After a Page Transfer Status Report, the DCE reports the post page message from the remote facsimile station with the +FET:<ppm> response (Table 26) which signals the intentions of the remote station.

The DCE holds the post page response message to the remote facsimile station (MCF, etc.), represented in the +FPTS parameter until the next +FDR command. The DTE may modify the +FPTS parameter before issuing the +FDR command which releases that message. The DTE must issue a +FDR command to release Post Page Messages.

Initiate Document Reception

The +FDR command may be issued in Phase B after an answer command, or in Phase B after a previous document.

The DCE response in stream mode is:

- +FCFR (when CFR sent)
- [+FTSI:<remote ID string>] (if new TSI received)
- [+FDCS:<T.30 subparameter string>] (if new DCS)
- CONNECT (<DC2> needed from DTE here)
- <Phase C data stream>
- <DLE><ETX>
- +FPTS:<ppr>, <lc> [,<blc>, <cbic>]
- +FET:<ppm>
- OK (DTE must issue +FDR command to release post page response)

Continue Document Reception

The DTE may issue a +FDR command in Phase D, which releases the post page message, and indicates readiness to receive another page after receipt of a Multipage (+FET:0) or PPS-NULL (+FET:3) message. The DCE response will be:

- CONNECT (<DC2> needed from DTE here)

- <Phase C data stream>
- <DLE><ETX>
- +FPTS:<ppr>, <lc> [,<blc>, <cblc>]
- +FET:<ppm>
- OK (DTE must issue +FDR command to release post page response)

If done receiving:

- +FHNG: <hangup cause code>
- OK

Continue page reception

Phase C Data Framing

Phase C data may be presented to the DTE in stream mode. The DCE will transfer a stream of data to the DTE, followed by the <DLE><ETX> stream termination characters. The DCE will filter the stream as described in the [“Serial Port Speed and Flow Control” section on page 98](#).

Phase C Data Format

The received data format is negotiated under T.30 reported by the +FDCS:VR,BR,WD,LN,DF,EC,BF,ST response.

The DCE will delete the terminating RTC (6 EOLs) patterns.

<CAN>, Escape from Reception

From the +FDR command until the end of Phase D Date, the DCE is in a data transfer state, and will not respond to DTE command characters. The DCE will respond to three ASCII control characters: <DC1> (017) and <DC3> (019) flow control characters, and cancel <CAN> (024).

Upon receipt of the <CAN> character, the DCE will terminate the reporting of received data by sending trailing <DLE><ETX> characters to the DTE, and will then execute an implied +FK command in order to conduct an orderly disconnection.

+FK, Session Termination

The +FK command causes the DCE to terminate the session in an orderly manner. In particular, the DCE will send a DCN message at the next opportunity and hang up. At the end of the termination process, the DCE will report the +FHNG response with result code ([Table 28](#)).

Syntax

+FK

This operation can be invoked by using the cancel <CAN> character during Phase C data reception (see prior section)

The DCE will wait until the current page completes, unless the reception is of unlimited length; in that case, the DCE may halt reception and terminate the session at any time.

Table 28 *Hang Up Status Codes*

Code	Cause Description
0-9	Call Placement and Termination
0	Normal and proper end of connection
1	Ring Detected or Ringback Detected, but Fax HNDSHK never started (i.e., CED ANS Tone, or HDLC Flags not detected)
2	Call aborted, from +FK or AN
3	No Loop Current
10-19	Transmit Phase A & Miscellaneous Errors
10	Unspecified Phase A error
11	CED ANS Tone, or HDLC Flags detected, but Fax HNDSHK not completed within the T.30 T1 timeout period
20-39	Transmit Phase B Hangup Codes
20	Unspecified Transmit Phase B error
21	Remote cannot receive or send
22	COMREC error in transmit Phase B
23	COMREC invalid command received
24	RSPEC error
25	DCS sent three times without response
26	DIS/DTC received 3 times; DCS not recognized
27	Failure to train at 2400 bps or +FMINSP value
28	RSPREC invalid response received
40-49	Transmit Phase C Hangup Codes
40	Unspecified Transmit Phase C error
43	DTE to DCE data underflow
50-69	Transmit Phase D Hangup Codes
50	Unspecified Transmit Phase D error
51	RSPREC error
52	No response to MPS repeated 3 times
53	Invalid response to MPS
54	No response to EOP repeated 3 times
55	Invalid response to EOP
56	No response to EOM repeated 3 times
57	Invalid response to EOM
58	Unable to continue after PIN or PIP
70-89	Receive Phase B Hangup Codes
70	Unspecified Receive Phase B error
71	RSPREC error

Table 28 *Hang Up Status Codes*

Code	Cause Description
72	COMREC error
73	T.30 T2 timeout, expected page not received
74	T.30 T1 timeout after EOM received
90-99	Receive Phase C Hangup Codes
90	Unspecified Receive Phase C error
91	Missing EOL after 5 seconds
92	Unused code
93	DCE to DTE buffer overflow
94	Bad CRC or frame (ECM or BFT modes)
100-119	Receive Phase D Hangup Codes
100	Unspecified Receive Phase D errors
101	RSPREC invalid response received
102	COMREC invalid response received
103	Unable to continue after PIN or PIP
120-255	Reserved Codes
Note	Some codes are not implemented.

+FCIG, Set Polling ID

This command allows setting the Local Polling ID string used in a CIG frame. The syntax of this command is identical to +FLID.

Write syntax

```
+FCIG="<local ID string>"
```

Valid value

20-character ASCII string

Default value

Null string

+FLPL, Indicate a Document for Polling

This command allows setting up an answering modem to know that it has a document available for polling. This allows a calling modem to receive this fax from the answerer.

Syntax

```
AT+FLPL=<value>
```

Valid Values

0: Document not available

1: Document available

+FSPL, Enable Polling

This command allows setting up an originating modem to be able to request to receive a document from a polled station.

Syntax

AT+FSPL=<value>

Valid Values

0: Request disallowed

1: Request allowed

Service Class 2 DCE Responses

The DCE sends information responses to the DTE as a facsimile session proceeds. They indicate the state of the facsimile session and convey needed information. These messages are solicited messages generated in execution of DTE action commands described in the [“Service Class 2 Action Commands” section on page 101](#).

The DCE precedes and follows the information responses with <CR><LF>.

The DCE provides the on-line status of several session parameters when they are available during T.30 handshaking. These include the remote ID string and the DIS/DCS parameters. These responses report the T.30 session parameter frames. The subparameters are described in [Table 25](#).

+FCON, Facsimile Connection Response

+FCON indicates connection with a fax machine. It is released by detection of HDLC flags in the first received frame. +FCON is generated in response to an Originate or Answer command.

+FDCS:, Report Current Session Capabilities

+FDCS:<string> reports the negotiated parameters. Phase C data will be formatted as described by the subparameters. This message may be generated in execution of +FDT or +FDR commands before the CONNECT result code if new DCS frames are generated or received. (See [Table 25](#))

Syntax

+FDCS:VR,BR,WD,LN,DF,EC,BF,ST

+FDIS:, Report Remote Station Capabilities

+FDIS:<string> reports remote facsimile station capabilities and intentions. The parameters are provided in ASCII notation. (See [Table 25](#))

Syntax

+FDIS:VR,BR,WD,LN,DF,EC,BF,ST

This message is generated in execution of Originate, Answer, +FDT, or +FDR commands.

+FCFR, Indicate Confirmation to Receive

The DCE sends a +FCFR response to the DTE upon reception of an acceptable TCF training burst and a valid DCS signal from the remote machine. This indicates that the DCE will receive Phase C data after the remote station receives the local DCE's CFR message. The +FCFR message is generated in execution of a +FDR command.

Syntax

+FCFR

+FTSI:, Report the Transmit Station ID

This response reports the received transmit station ID string, if any. This message is generated in execution of Originate, Answer, +FDT, or +FDR commands.

Syntax

+FTSI: "<TSI ID string>" Transmit Station ID

+FCSI:, Report the Called Station ID

This response reports the received called station ID string, if any. This message is generated in execution of Originate, Answer, +FDT, or +FDR commands.

Syntax

+FCSI: "<CSI ID string>" Called Station ID

+FPTS:, Receive Page Transfer Status

The +FPTS:<ppr> is generated by the DCE at the end of Phase C data reception in execution of a +FDR command.

Syntax

+FPTS:<ppr>, <lc> [,<blc>, <cblc>]

The <ppr> is generated by the DCE; it depends on the DCE capabilities at T.4 error checking. See [Table 27](#) for <ppr> values.

The receiving DCE will count the lines. These values are:

- <lc> = line count
- <blc> = bad line count
- <cblc> = <consecutive bad line count>

A receiving DTE may inspect <ppr> and write a modified value into the +FPTS parameter. The DCE will hold the corresponding Post Page Response message until released by a +FDR command from the DTE.

+FET:, Post Page Message Response

The +FET:<post page message> response is generated by a receiving DCE after the end of Phase C reception on receipt of the post-page message from the transmitting station. The +FET:<ppm> response is generated in execution of a +FDR command. The <ppm> codes respond to the T.30 post page messages ([Table 26](#)).

Syntax

+FET:<ppm>

+FPTS:, Transmit Page Transfer Status

The +FPTS: response reports a <ppr> number representing the copy quality and related post-page message responses received from the remote DCE. The valid <ppr> values are defined in [Table 27](#).

Syntax

+FPTS:<ppr>

The +FPTS:<ppr> response is generated in execution of a +FET=<ppm> command.

+FHNG:, Call Termination with Status

+FHNG indicates that the call has been terminated. The hangup cause is reported and stored in the +FAXERR parameter for later inspection. The <hangup status code> values are described in [Table 28](#).

Syntax

+FHNG:<hangup status code>

+FHNG:<hsc> is a possible intermediate result code to any DTE action command described in the [“Service Class 2 Action Commands” section on page 101](#). It is always followed by the OK final result code.

Upon termination of a call, the DCE determines the cause of termination and reports it as part of the FHNG:<hsc> response. It also stores this <hsc> code in the +FAXERR parameter for later inspection.

The hangup values are organized according to the phases of the facsimile transaction as defined by T.30. A COMREC error or RSPREC error indicates that one of two events occurred:

1. A DCN (disconnect) signal was received, or
2. An FCS error was detected and the incoming signal was still present after 3 seconds.

The table values are in decimal notation. Leading zero characters are optional.

+FCIG:, Report the Polled Station ID

This response reports the received transmit station ID string, if any. This message is generated in execution of Originate, Answer, +FDT, or +FDR commands.

Syntax

+FCIG: “<ID string>” Polled Station ID

+FDTC:, Report the Polled Station Capabilities

If the answerer has a document to poll, it would be communicated to the originator in bit 9 of the DIS frame. The originating station may elect to transmit a fax, and later, send SIG and DTC frames to pick up the polled document. The answering station would report the incoming DTC frame via the +FDTC: response message after command mode is cancelled with the AT+FDR command.

Syntax

+FDTC: "<string>" Polled Station Capabilities

+FPOLL, Indicate Polling Request

This message is sent to the DTE if the received DIS message indicates that the remote station has a document to poll (by bit 9 in the DIS) and polling has been enabled with the AT+FSPL command. The DTE may then decide to receive rather than transmit.

Syntax

+FPOLL:

Service Class 2 Parameters

All Service Class 2 parameters can be read, written, and tested for range of legal values by the DCE. The general syntax is described in the [“Command Syntax and Guidelines” section on page 96](#).

Group 3 FAX devices negotiate session parameters in DIS, DCS, and DTC frames. The following parameters are provided to condition the facsimile DCE for the capabilities it will offer and to report the session settings negotiated.

The three primary T.30 session parameters are +FDCC, +FDIS and +FDCS. They are compound parameters, using values listed in [Table 25. Figure 1](#) illustrates their relationships.

Figure 1 T.30 Session Parameter Relationships

+FDCC, DCE Capabilities Parameters

+FDCC allows the DTE to sense and constrain the capabilities of the facsimile DCE from the choices defined in CCITT T.30 Table 2. When +FDCC is modified by the DTE, the DCE copies +FDCC into +FDIS.

Write syntax

+FDCC=VR,BR,WD,LN,DF,ED,BF,ST

Valid values

See [Table 25](#)

Default values

0,3,0,2,0,0,0,0 (9600 bps fax models)

or

0,5,0,2,0,0,0,0 (14400 bps fax models)

+FDIS, Current Sessions Capabilities Parameters

The +FDIS parameter allows the DTE to sense and constrain the capabilities used for the current session. The DCE uses +FDIS to generate DIS or DTC messages directly, and uses +FDIS and received DIS messages to generate DCS messages.

Write syntax

+FDIS=VR,BR,WD,LN,DF,EC,BF,ST

Valid valuesSee [Table 25](#)**Default values**

0,3,0,2,0,0,0,0 (9600 bps fax models)

or

0,5,0,2,0,0,0,0 (14400 bps fax models)

The DCE initializes the +FDIS parameter from the +FDCC parameter on initialization, when +FDCC is written, and at the end of a session.

+FDCS, Current Session Results Parameters

The +FDCS parameter is loaded with the negotiated T.30 parameters for the current session. A transmitting DCE generates DCS; a receiving DCE gets DCS from the remote station. The DTE may read this parameter.

Read Syntax

+FDCS?

DCE response

+FDCS=VR,BR,WD,LN,DF,EC,BF,ST

or

FDCS=

Valid valuesSee [Table 25](#)**Default values**

0,0,0,0,0,0,0,0

The +FDCS parameter is initialized 0,0,0,0,0,0,0,0 upon initialization and at the beginning of a session. If the DTE issues a +FDCS? command in the initial state, the DCE reports:

```
<CR><LF>0,0,0,0,0,0,0,0<CR><LF>
```

The contents of +FDCS are spontaneously reported during execution of +FDR or +FDT commands by the +FDCS:VR,BR,WD,LN,BF,EC,BF,ST response using the same compound parameter format.

Several commands and responses reference T.30 session negotiated parameters. These are described by a set of common subparameters. These subparameters are described in [Table 25](#) with notes. Optional parameter values are marked with footnote 2. Unspecified parameter values are reserved for future use.

The +FDCC, +FDIS, and +FDCS compound parameters use these session parameters (On writes, unspecified subparameters are unchanged.)

The +FDIS:, +FDCS:, and +FDTC: session report responses use these subparameters.

For test response, ranges of values are reported for each subparameter enclosed in parentheses characters. For example, a DCE response to +FDCC=? could report:

```
<CRLF> (0,1), (0-5), (0-3), (0-2), (0-2), (0-2), (0), (0-7) <CRLF> (14400 fax models)
```

Example

+FDIS=0,5,0,2,0,0,0,1 =

- VR = 0 (98 dpi vertical resolution)
- BR = 5 (14400 bits)
- WD = 0 (1728 pixels)
- LN = 2 (unlimited length)
- DF = 0 (1-D modified Huffman coding)
- EC = 0 (no ECM)
- BF = 0 (no BFT)
- ST = 1 (5 ms scan time)

+FLID=, Local ID String**Write syntax**

+FLID="<local ID string>"

Valid value

20-character ASCII string

Default value

Null string

If FLID is not a null string, it generates a TSI or CSI frame. CCITT Table 3/T.30 includes digits 0-9, “+” and space.

If the DCE supports use of CCITT Table 3/T.30 only, the response to a +FLID=? command is “(20) (32, 43, 48-57).” If the DCE supports printable ASCII <, the response is: “(20) (32-127)<CRLF>.” The first “(20)” represents string length, the second (character values) field reports supported string values.

- The string is saved in RAM.
- Non-numeric characters are not filtered out.
- The string is right justified.

+FCR, Capability to Receive**Write syntax**

+FCR=<value>

Valid values

0 or 1

Default value

0

+FCR=0 indicates that the DCE will not receive message data. This can be used when the DTE has insufficient storage. The DCE can send and can be polled for a file.

+FCR is sampled in CCITT T.30 Phase A and Phase D.

+FPTS=, Page Transfer Status

The +FPTS parameter contains a value representing the post page response, including copy quality and related end-of-page status. These values correspond to post page response messages defined in T.30. The receiving DCE sets this parameter after it receives a page of Phase C data. The transmitting DCE sets this parameter with the status reported by the receiving station. The DTE may inspect or modify this parameter.

Write Syntax

+FPTS=<ppr>

Valid values

1, 2, 3, 4, 5

Default value

0

The set of <ppr> values is defined in CCITT Table 6-4. These values are also reported in the +FPTS response to the +FDR command.

+FCQ, Copy Quality Checking

This parameter controls Copy Quality checking by a receiving facsimile DCE.

Write syntax

+FCQ=<value>

Valid values

0

Default value

0

The DCE returns +FCQ=0 which indicates the DCE does no quality checking. The DCE will generate Copy Quality OK (MCF) responses to complete pages, and set +FPTS=1.

+FPHCTO, DTE Phase C Response Time-out

The +FPHCTO command determines how long the DCE will wait for a command after reaching the end of data when transmitting in Phase C. When this time-out is reached, the DCE assumes there are no more pages and no documents to send. It then sends the T.30 EOP response to the remote device.

Write syntax

+FPHCTO=<value>

Valid values

0 - 255, 100 millisecond units.

Default value

30

+FAXERR, T.30 Session Error Report

This read-only parameter indicates the cause of the hangup. CCITT Table 6-5 shows the valid values for this parameter as well as the meaning of the each value. +FAXERR is set by the DCE at the conclusion of a fax session. The DCE resets +FAXERR to 0 at the beginning of Phase A off-hook time.

Read syntax

+FAXERR= <table value>, read only

Valid values

0 - 255, see CCITT Table 6-5 for meaning

+FBOR, Data Bit Order

This command controls Phase C data (T.4 encoded data) transferred during execution of +FDT or +FDR commands.

Write syntax

+FBOR=<value>

Valid values

0, 1, 2, or 3

Default value

0

This parameter controls the mapping between PSTN facsimile data and the DTE-DCE link. There are two choices:

- Direct: The first bit transferred to each byte on the DTE-DCE link is the first bit transferred on the PSTN data carrier.
- Reversed: The last bit transferred of each byte on the DTE-DCE link is the first bit transferred on the PSTN data carrier.

The following two codes are supported:

- +FBOR = 0 or 2 selects direct bit order for Phase C data.
- +FBOR = 1 or 3 selects reversed bit order for Phase C data.



Note

This parameter does not affect the bit order of control characters generated by the DCE.

+FAA, Answer Parameter

+FAA=0 constrains the DCE to answer as set by +FCLASS.

+FAA=1 indicates that the DCE can answer and automatically determine whether to answer as a Class 2 facsimile DCE or as a data modem. If the DCE automatically switches, it modifies FCLASS appropriately.

Write syntax

+FAA=<value>

Valid values

0 or 1

Default value

0

Fax adaptive answer operates only when +FCLASS=0.

Class 2 adaptive answer is implemented as follows:

1. First, a data mode handshake is attempted. If the DCE has been configured for automode detection (using the +MS command), the DCE may try several protocols before terminating attempts to make a data mode connection. This can take as long as 6-8 seconds.
2. If the data mode connection attempt fails, a facsimile Class 2 connection is assumed. When a connection is made as a result of the adaptive answer, the DCE issues the DATA or FAX result code before the CONNECT or +FCON message to inform the DTE of the connection type. After making a Class 2 connection, the DCE stays on-line.

+FBUF?, Buffer Size

The +FBUF parameter allows the DTE to determine the characteristics of the DCE's data buffer. Data buffers are used for flow control. Use of the reported values allow the DTE to transfer data without provoking XOFF.

Read syntax

+FBUF?

DCE response syntax

<bs>, <xoft>, <xont>, <bc>, where:

- <bs> = total buffer size
- <xoft> = XOFF threshold
- <xcont> = XON threshold
- <bc> = current buffer byte count

Example

+FBUF?

512, 506, 500, 0

Example Sessions

[Table 29](#) and [Table 30](#) show the typical commands and responses for sending and receiving two pages, respectively.

Table 29 Send Two Pages, 1-D Data, No Errors

DTE Command	DCE Response	Local DTE Action	Remote Station Action
AT+CLASS=2	OK	Set Class 2	x
AT+FLID="<local ID>"	OK	Set local ID	

Table 29 *Send Two Pages, 1-D Data, No Errors (continued)*

DTE Command	DCE Response	Local DTE Action	Remote Station Action
AT<dial string>	+FCON [+FCSI:"<csi>"] +FDIS: <dis codes> OK	Off hook, dial Send CNG Detect flags [Get CSI] Get DIS	Answer, Send [CED] V.21 flags [CSI] DIS
AT+FDT	+FDCS:<DCS codes> CONNECT <XON>	[Send TSI] Send DCS Send TCF Get CFR Send carrier	[Get TSI] Get DCS Get TCF Send CFR Receive carrier
<1st page data>		Send page data	Receive page data
<DLE><ETX>	OK		
AT+FET=0	+FPTS:1 OK	Send RTC Get MPS Get MCF	Get RTC Get MPS Send MCF
AT+FDT	CONNECT <XON>	Send carrier	Receive carrier
<2nd page data>		Send page data	Receive page data
<DLE><ETX>	OK		
AT+FET=2	+FPTS:1 +FHNG:0 OK	Send RTC Send EOP Get MCF Send DCN Hang up	Get RTC Get EOP Send MCF Get DCN Hang up

Table 30 *Receive Two Pages, 1-D Data, No Errors*

DTE Command	DCE Response	Local DTE Action	Remote Station Action
AT+FCR=1	OK	Enable reception	
AT+FLID="<local ID>"	OK	Set local ID	
	RING	Detect ring	Dials[, Send CNG]
ATA	+FCON [+FTSI:"<tsi>"] +FDCS:<dcs codes> OK	Off hook Send CED Send CSI Send DIS Detect flags [Get TSI] Get DCS Begin TCF receive	Get CED Get CSI Get DIS Send V.21 flags [Send TSI] Send DCS Start TCF

Table 30 *Receive Two Pages, 1-D Data, No Errors (continued)*

DTE Command	DCE Response	Local DTE Action	Remote Station Action
AT+FDR <DC2>	+FCFR [+FDCS:"<dcs codes>] CONNECT <page data stream> <DLE><ETX> +FPTS:1, <lc> +FET:0 OK	Accept TCF Send CFR Get page carrier Get page data Detect RTC Get MPS	Finish TCF Get CFR Send pager carrier Send page data Send RTC Drop carrier Send MPS
AT+FDR <DC2>	CONNECT <page data stream> <DLE><ETX> +FPTS:1, <lc> +FET:2 OK	Send MCF Get page carrier Get page data Detect RTC Get EOP	Get MCF Send page carrier Send page data Send RTC Drop carrier Send EOP
AT+FDR	+FHNG:0 OK	Send MCF Get DCN	Get MCF Send DCN

CCVP, the Cisco logo, and Welcome to the Human Network are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn is a service mark of Cisco Systems, Inc.; and Access Registrar, Aironet, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Enterprise/Solver, EtherChannel, EtherFast, EtherSwitch, Fast Step, Follow Me Browsing, FormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, iQuick Study, LightStream, Linksys, MeetingPlace, MGX, Networkers, Networking Academy, Network Registrar, PIX, ProConnect, ScriptShare, SMARTnet, StackWise, The Fastest Way to Increase Your Internet Quotient, and TransPath are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or Website are the property of their respective owners. The use of the word partner does not imply a partnership. Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

© 2007 Cisco Systems, Inc. All rights reserved.

