

V.3229/V.3229L
Manual

Compliments of
ARC ELECTRONICS
800-926-0226 / 281-392-6333

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Appendix A Specifications

Size Width 7.0 inches (17.78 cm)

Depth 10.5 inches (26.67 cm)

Height 2.25 inches (5.72 cm)

Weight 2 lbs. 13 oz. (1.28 kg)

Environmental Conditions Temperature: Operation +32° F to +122° F
(0° C to +50° C)

Storage -40° F to +158° F
(-40° C to +70° C)

Humidity: 0 to 95% relative humidity:
noncondensing

Power Requirements The modem can be ordered for operation with one of
three power input options.

Voltage: 115 Vac ± 10%; 50-60 Hz,
230 Vac ± 10%; 50-60 Hz, or
12 to 60 Vdc

Power consumption: 14 watts

Telephone Line Balanced 600 ohm type 3002 or equivalent 16 dB
nominal loss, frequency translation up to ± 10 Hz

Digital Interface Conforms to EIA-232D and CCITT V.24

Modem Data Rates 14400, 12000, 9600, and 7200 bps coded, 9600 and
4800 uncoded as stated in CCITT recommendation
V.32 bis,
2400 and 1200 compatible with CCITT recom-
mendation V.22 bis,
300 compatible with Bell specification 103.

A
Specifications

Modulation	14400, 12000, 9600, 7200, 4800, 2400 QAM with suppressed carrier (V.32 bis, V.22 bis compliant)	
Transmit Carrier Frequencies	V.32 bis	1800 Hz
	1200 PSK	
	300 FSK	
	Originate	Answer
	1200,	2400 Hz ± 0.01%
	2400	1200 Hz ± 0.01%
	300 bps	
	Mark: 1270 Hz ± .5%	2225 Hz ± .5%
	Space: 1070 Hz ± .5%	2025 Hz ± .5%
Internal Transmit Clock Frequency	Selected bit rate ± 0.01%	
External Transmit Clock Frequency	Selected bit rate ± 0.01%	
Transmit Output Level	Leased line	0 through -21 dBm
	Dial line	-9 through -21 dBm
Operation	4-wire, full-duplex, private line; 2-wire, full-duplex, private line or PSTN	
Carrier Detect Level	Dynamic to -43 dBm	
Telco Connection	8-pin modular jack, dial and private lines	
Testing	511 PN pattern (per V.52) V.54 remote loopback control	
Line Equalization	Automatic adaptive	
RTS/CTS Delay	From 0 ± 2 ms to 150 ± 2 ms, user selectable in 10 ms increments. (The default is 0 ms)	

Appendix B
Phone Jack Descriptions

DIAL LINE PIN FUNCTIONS

The 8-pin DIAL jack connects to the PSTN dial-up lines. Pin functions are

Pin 1, 2 - Not used

Pin 3 MI - Switch hook on exclusion key telephone

Pin 4 R - Ring side of telephone line

Pin 5 T - Tip side of telephone line

Pin 6 MIC - Switch hook on exclusion key telephone

Pin 7 PR - To data jack program resistor

Pin 8 PC - To data jack program resistor

TELSET / LEASED LINE PIN FUNCTIONS

The 8-pin TELSET / LEASED LINE jack allows a standard telephone or a leased line to be connected to the modem. The pin functions for this jack are

Pin 1, 2 - Transmit pair - 4-wire leased line or Tx and Rx for 2-wire leased line

Pin 4, 5 - Ring and tip (respectively) of telephone line for TELSET

Pin 7, 8 - Receive pair - 4-wire leased line

Appendix C Test Procedures

FAULT ISOLATION PROCEDURE

This test procedure and the indicator lights built into the modem allow a rapid check of the terminal, modem, and telephone line interfaces. This procedure can be used to verify normal system operation and to isolate faulty equipment in case of failure.

Ensure the units are turned on and remote tests are enabled at both sites before starting the fault isolation procedure.

Note: In some cases the observer must distinguish between rapid LED blinking and steady on in tests.

TELEPHONE INTERFACE

- Connect the modem to the dial up line via the DIAL jack on the back panel.
- Connect a telephone to the TELSET / LEASED LINE jack on the back panel of the modem.
- Press the TALK/DATA button (to turn on the TALK/DATA LED on the L model) and wait for dial tone.
- Dial the remote modem; the phone should operate normally.

FALLBACK RATES

Since there is no standard fallback procedure from V.32b rates to V.22 rates, problems may arise when a V.32 optioned for 14400 originates a call to a V.22 bis modem. If this is a problem, change the originate modem speed to 2400 bps from the front panel or with the AT command AT%B3.

MODEM AND TELEPHONE LINE CHECK

Step 1

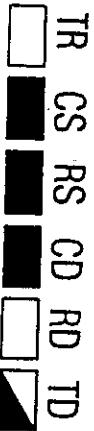
• Configure the modem for LOCAL ANALOG LOOP WITH TEST PATTERN. This forces the modem on hook, terminates the local modem leased lines into 600 ohms, and connects the local modem transmit output amplifier back to its own receiver. Transmit input data from the terminal is inhibited and is substituted with a V.52 test pattern.

• This test checks operation of the local modem modulator and demodulator circuitry and should be attempted at both local and remote sites if operators are available.

When errors are present, the TEST PATTERN ERRORS display counts errors.

Note: The following LED illustrations show indications for diagnostic tests. These indications are valid when DTE options are set by factory option set #1 and RTS is active from the DTE. Where indicated RD and/or TD may be on, off, or flashing depending on the type of DTE and its operating state.

If the circuitry is working properly, the front panel indicators show the following:



• Configure the modem for LOCAL ANALOG LOOP to switch the transmitter back to its normal data input.

The modem should display on the local monitor whatever is entered at the local DTE.

If the transmit data input is in a mark hold condition, both the TD and RD indicators should remain off.

If the transmit data input is in a space hold condition, both the TD and RD indicators should come on. All other indicators should remain the same except for CS which should turn on.

If the indicators are correct, the modem is probably operating correctly.

If the preceding tests were not successful, call Technical Services.

Step 2

This step determines the performance of the local and remote modems and the telephone circuits. It also determines each modem's ability to receive a transmitted signal from the other site, properly equalize and decode the signal, and then loop this regenerated signal into the transmitter for transmission back to the other modem. This test applies to both leased line and dial line applications.

- Configure the local modem for REMOTE DIGITAL LOOP WITH TEST PATTERN. This signals the remote modem to go into digital loop. The remote modem receives and then retransmits the data back to the local mode. If digital bilateral loop is enabled at the remote, the remote DTE is looped back to itself.

- An alternative to the above procedure is to request the operator at the remote modem to configure his modem for LOCAL DIGITAL LOOP. Configure the local modem for TEST PATTERN. The remote modem receives and retransmits the data back to the local modem.

The TEST PATTERN ERRORS display will count received errors.

- At the local modem, the indicators should be:



- To further test the modem and communications link, reverse the system loopback. First exit the existing loopback test. Reverse the roles of the local and remote modems and repeat step two.

Note: If the bilateral digital loop is enabled at the local modem, the DTE interface is looped to itself through the modem and permits the DTE and interface circuitry to be checked.

Step 3

This step determines the performance of the telephone line. This test is valid for 4-wire operation only.

- Configure the modem for REMOTE ANALOG LOOP WITH TEST PATTERN. This signals the remote to connect its receive pair to its transmit pair through a buffer amplifier stage. The test pattern transmitted locally is now looped back to the local modem.

- An alternative to the above procedure is to request the operator at the remote modem to place his modem in LOCAL ANALOG LOOP and enable his bilateral analog option. This places the remote modem in local analog loop test. It also connects the transmit phone line to the receive phone line through a buffer amplifier stage. At the local modem, configure for TEST PATTERN. The test pattern transmitted by the local modem is looped around through a buffer stage at the remote modem and back to the local modem.

- At the local modem, the front panel indicators under ideal conditions should be:



The TEST PATTERN ERRORS display counts received errors.

In this test you are connecting two telephone line links in series, doubling the distortion effects. A telephone link indicated as marginal by this test may be satisfactory as used in normal operation.

AT COMMAND RECOVERY FOR L MODELS

- After determining the quality of the telephone lines, exit the test.
 - If fault remains unidentified, call Technical Services.
- For the L model of the modem, holding the TALK/DATA button down for 5 seconds reenables AT commands. The TALK LED flashes 3 times to indicate that the command set has been loaded.

TEST CATEGORIES

Diagnostic tests are divided into four categories: online, offline, those with test patterns, and those without. For test pattern diagnostics the LCD displays a cumulative error count. For other tests the DTE transmission is the test signal. Disparity between DTE transmitted and received characters indicates errors.

Table C-1 indicates with an X the operating mode required for specific tests.

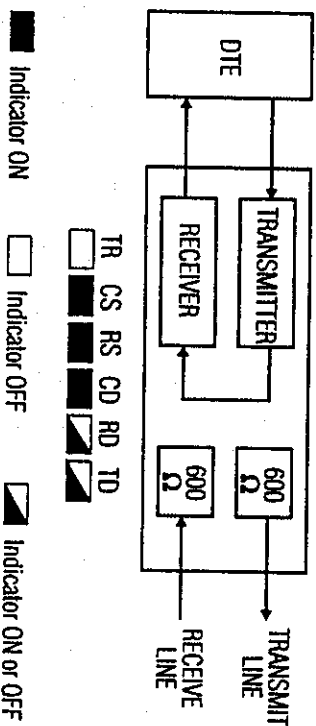
*Table C-1
Test Operating Mode Requirements*

Test	Offline	Online
LAL	X	
LAL/TP	X	
RAL (4-W)		X
RAL/TP (4-W)		X
LDL		X
RDL		X
RDL/TP		X
TP		X

*Note: Local Analog Loopback, with or without test pattern, is the only test available in protocol mode.
A diagnostic test performed during dial backup will terminate when the modem performs leased line loopback.*

Local Analog Loop

The local modem transmitter is connected to its receiver so the analog signal normally sent over the telephone line is received locally. If operating on 2- or 4-wire private lines, the leased lines are terminated into 600 ohms (Figure C-1). If operating 2-wire over the PSTN, any call is terminated and the modem is forced on hook (Figure C-2).



*Figure C-1
Local Analog Loopback (4-wire operation)*

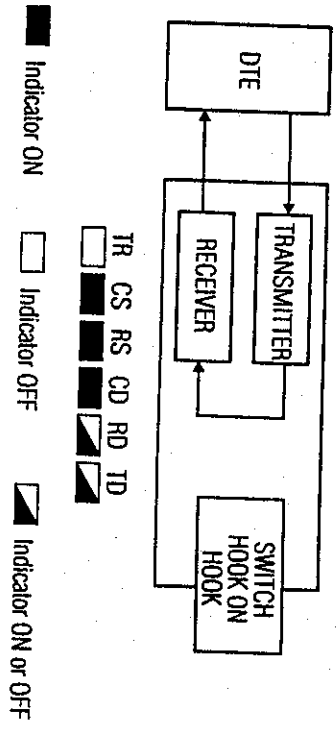


Figure C-2
Local Analog Loop (2-wire dial operation)

Note: Figure C-1 through C-8 include LED indications for diagnostic tests. These indications are valid when DTE options are set by factory option set #1 and RTS is active from the DTE. Where indicated, RD and/or TD may be on, off, or flashing depending on the type of DTE and its operating state.

For 2-wire operation, Analog Bilateral Loopback is invalid. In 4-wire operation, Analog Bilateral Loopback connects the receive leased line to the transmit line through a buffer amplifier (Figure C-3).

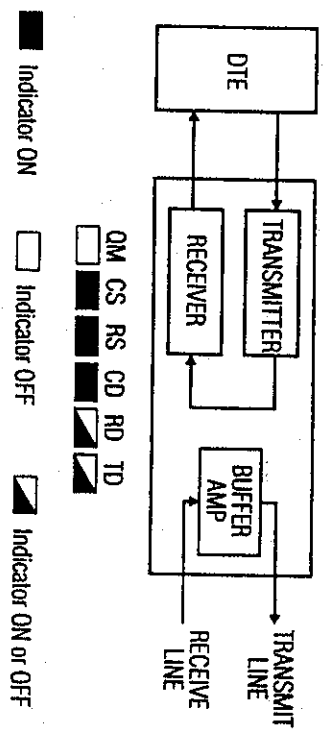


Figure C-3
Local Analog Loopback with Analog Bilateral Loopback Enabled.
(4-wire operation only)

Remote Analog Loop

This test is valid only in 4-wire operation. The initiating modem signals the remote modem to go to Remote Analog Loopback. The remote receive leased line connects to the transmit leased line through a buffer amplifier (Figure 3-4). The remote modem transmitter goes off, but its receiver stays connected and waits for the signal to end the test.

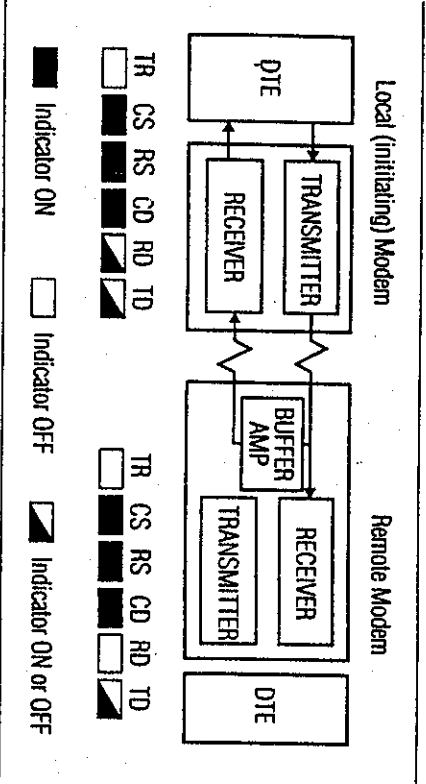


Figure C-4
Remote Analog Loop (4-wire operation only)

Local Digital Loop

The local modem receiver connects to its transmitter so received data is digitally processed and retransmitted to the remote site. If Digital Bilateral Loopback is enabled locally, the local DTE is looped back to itself (Figure C-5). If disabled, the local DTE receives a constant mark.

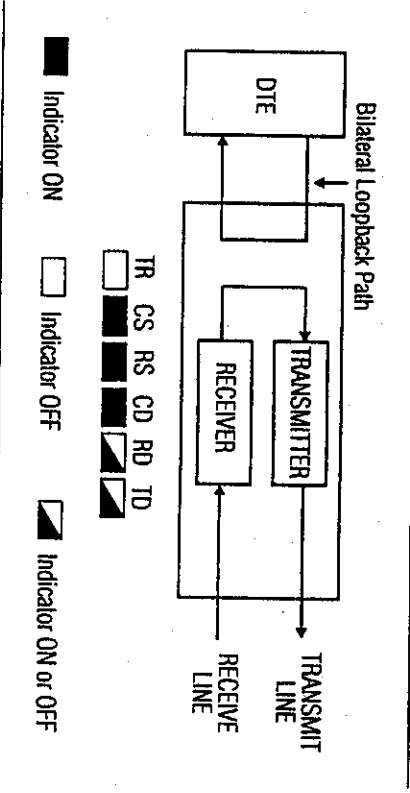
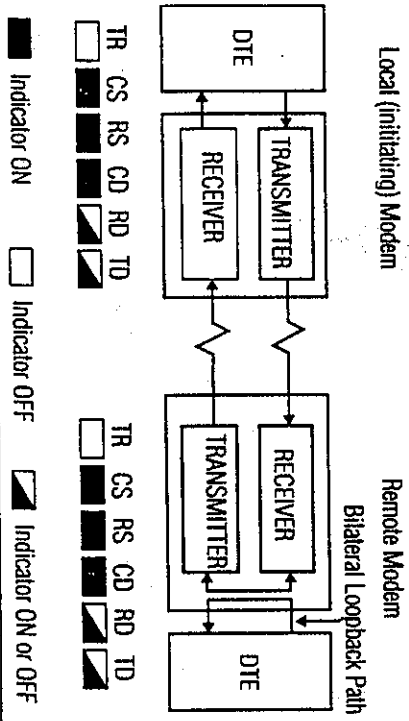


Figure C-5
Local Digital Loopback with Bilateral Loop Enabled

Remote Digital Loop

The initiating modem signals the remote modem to enter Digital Loopback. The remote modem receives the data, digitally processes it, and retransmits the data back to the local modem. If Digital Bilateral Loopback is enabled, the remote DTE is looped back to itself (Figure C-6).



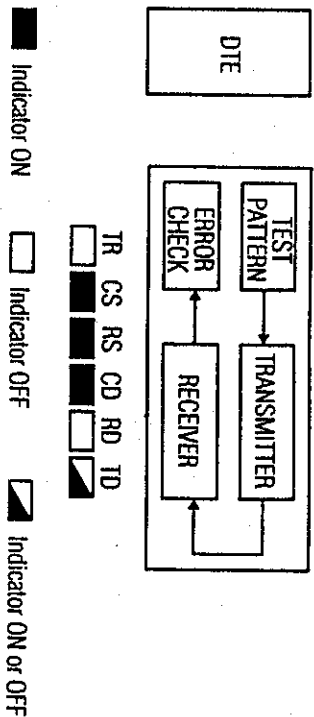
*Figure C-6
Remote Digital Loopback with Digital Bilateral Loop
Enabled at the Remote Site*

Test Pattern

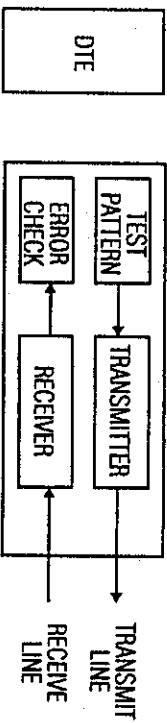
In Test Pattern, transmit data from the local DTE is blocked and replaced by a V.52 compatible test pattern. When the modem transmits the test pattern, it expects to receive the same pattern. The V.52 test pattern error detector is enabled and indicates received errors by the TEST PATTERN ERRORS display.

With Test Pattern

When Local Analog Loopback, Remote Analog Loopback, or Remote Digital Loopback is selected, the local DTE transmits data that may be replaced by a V.52 compatible test pattern (Figures C-7 and C-8). To do so answer yes to the LCD prompt



*Figure C-7
Local Analog Loopback with Test Pattern*



*Figure C-8
Local Modern Initiating Remote Test
(Analog or Digital Loopback) with Test Pattern*

Appendix D Command Index and Defaults

This reference guide provides asynchronous command characters and their meanings. Pages listed provide initial information on the commands. S-registers are listed as a cross reference.

Command	Page	S-Reg	Description
AT	5-2		Attention code - command prefix
A/	5-4		Repeat last command
+++	5-23	S2, S12	Escape sequence (pause, + + +, pause)
A	5-16		Answer
D	5-12		Dial
T	5-13	S14	Tone dial *
P	5-13	S14	Pulse dial
W	5-13	S8	Long pause (2 sec or S8 value)
!	5-13	S7	Wait for 2nd dial tone (S7 value)
R	5-14		Flash switchboard
@	5-14		Switch to answer mode after dialing
:	5-14		Wait for 5 seconds of silence
S=n	5-15		Return to command mode after dialing Dial stored command line (n = dial command line)

Note: The * in the command is part of the command; the * in the description indicates the default.

* Factory default

Command Index and Defaults

Command	Page	S-Reg	Description
E	5-23	S14	Local character echo off
E1			Local character echo on *
F	5-24		Not supported - returns ERROR
F1			Disables online character echo
H	5-24		Hang up
I	5-24		Request product code
I1			Request EPROM CRC value
I3			Request product version
L or L1	5-24	S22	Speaker volume low
L2			Speaker volume medium *
L3			Speaker volume high
M	5-25	S22	Speaker off
M1			Speaker off when carrier is present *
M2			Speaker always on
M3			Speaker off when dialing and carrier is present
O	5-25		Restore data mode (after escape)
Q	5-6	S14	Response displays on *
Q1			Response displays off
Q2			Response displays on in originate mode only
Sn?	6-4		Read value in register n (decimal)
Sn?^			Read value in register n (hexadecimal)
Sn=v			Set v (value) in register n (decimal)
Sn=^v			Set v (value) in register n (hexadecimal)
Sn.#=1 or 0			Set single bit value in register
V	5-6	S14	Response codes
V1			Response messages *

* factory default

Command Index and Defaults

Command	Page	S-Reg	Description
X	5-7	S22	CONNECT (code 1), for all speeds, no dial tone or busy signal detection
X1			Appropriate connect codes for rate, no dial tone detection
X2			Wait for dial tone (appropriate connect codes)
X3			Detect busy signal (appropriate connect codes)
X4			Wait for dial tone, detect busy signal * (appropriate connect codes)
Y	5-25	S21	Long space disconnect disabled
Y1			Long space disconnect enabled *
Z	5-36		Reset to user option set #1
Z1			Reset to user option set #2
&C	5-17	S21	DCD always on *
&C1			DCD on while carrier is present
&C2			DCD off 5 seconds after disconnect
&C3			DCD follows remote RTS
&D	5-18	S21	DTR ignored *
&D1			DTR recalls command mode
&D2			DTR disconnects
&D3			DTR disconnects and resets modem to stored configuration
&F or &F1	5-35		Restore factory configuration 1 *
&F2			Restore factory configuration 2
&F3			Restore factory configuration 3
&F4			Restore factory configuration 4
&F5			Restore factory configuration 5
&F6			Restore factory configuration 6
&F7			Restore factory configuration 7
&F8			Restore factory configuration 8
&F9			Restore factory configuration 9

* factory default

Command Index and Defaults

Command	Page	S-Reg	Description
&G	5-26	S23	No guard tone *
&G1			550 Hz tone
&G2			1800 Hz tone
&L	5-26	S27	Dial line *
&L1		S32	Leased line 2-wire
&L2			Leased line 4-wire
&M	5-26	S27	Async dial / async data *
&M1			Async dial / sync data
&M2			Dials stored number when DTR off / on transition is detected / sync data
&M3			Manual dial / sync data
&M4		S30	V.25 bis autodialer with BISSYNC protocol / sync data
&M5			V.25 bis autodialer with SDLC protocol / sync data
&P	5-28	S22	39/61 pulse make / break ratio *
&P1			33/67 pulse make / break ratio
&R	5-19	S21	CTS normal operating state
&R1			CTS forced on *
&R2		S72	CTS follows DCD
&R9			CTS equals RTS
&S	5-17	S21	DSR always on *
&S1			DSR on when ready to accept data
&S2			DSR off for 5 seconds after disconnect
&S3			DSR follows off hook (OH)
&T	5-21		Terminate current test
&T1			Initiate analog loopback
&T2			Initiate remote analog loopback
&T3		S23	Initiate digital loopback
&T4			Grant remote commanded digital loopback *
&T5		S23	Denies remote commanded digital loopback

* factory default

Command Index and Defaults

Command	Page	S-Reg	Description
&T6			Initiate remote digital loopback
&T7			Initiate self test remote digital loopback
&T8			Initiate self test analog loopback
&T9			Initiate self test remote analog loopback
&V	5-36		View configuration profiles
&V1			Display received signal status
&W	5-34		Store current configuration to user option set #1
&W1			Store current configuration to user option set #2
&X	5-28	S27	Internal clock *
&X1			External clock
&X2			Receive clock
&Y	5-35	S66	Powerup with user option set #1
&Y1			Powerup with user option set #2
&Y?			Display powerup option set
&Zn	5-36		Store dial string (n=dial string)
%A	5-43	S64	Disable auto-reliable fallback character *
%An			Set auto-reliable fallback character to n (n=ASCII 1-127)
%B	5-28	S69	Use DTE speed
%B1			300 bps max
%B2			1200 bps max
%B3			2400 bps max
%B4			4800 bps max
%B5			9600 bps max
%B6			9600 bps trellis coded max
%B7			7200 bps trellis coded max
%B8			12000 bps trellis coded max
%B9			14400 bps trellis coded max *

* factory default

Command Index and Defaults

Command	Page	S-Reg	Description
%C	5-50	S56	Compression disabled
%C1			Compression enabled on transmit and receive data *
%C2			Compression enabled on transmit data only
%C3			Compression enabled on receive data only
%D	5-29	S62	Disable disconnect buffer delay *
%Dn			Set disconnect buffer delay in seconds n (n=1-255)
%E	5-29	S60	Disable auto retrain
%E1			Enable auto retrain *
%P=	5-38		Sets remote configuration security code to value entered after equal sign (0-999999999)
%P=D			Disabled
%P?			Displays remote configuration security code of local modem
%P=<blank>			Clears the security code*
%R	5-30	S53	Disable auto rate renegotiation *
%R1			Enable auto rate renegotiation using low BER
%R2			Enable auto rate renegotiation using medium BER
%R3			Enable auto rate renegotiation using high BER
%T	5-21		Transmit test pattern
%T=	5-39		Followed by a remote configuration security code, establishes remote configuration
%V	5-30		Display product revision level
%Z	5-30		Permissive (RJ11) *
%Z1			Programmable (RJ45)

* factory default

Command Index and Defaults

Command	Page	S-Reg	Description
VA	5-49	S63	Maximum block size of 64 characters
VA1			Maximum block size of 128 characters
VA2			Maximum block size of 192 characters
VA3			Maximum block size of 256 characters *
VB	5-49	S79	Transmit a break signal
Vbn			Sets break length in 20 ms increments, n=1-255, default is 35 (700 ms)
VC	5-50	S60	Disable auto-reliable buffer *
VC1			Buffer data for 4 seconds or 200 characters
VG	5-46	S54	Disable modem port flow control *
VG1			Enable modem port XON/XOFF flow control
V	5-41	S72	Disable slaved DTE/DCE speed * (constant speed DTE on)
V1			Enable slaved DTE/DCE speed (constant speed DTE off)
VKn	5-46	S59	Selects action when encountering a break
VK			Break option 0
VK1			Break option 1
VK2			Break option 2
VK3			Break option 3
VK4			Break option 4
VK5			Break option 5 *
VM	5-42	S70	V.42 fast detect data sequence disabled
VM1			V.42 fast detect data sequence enabled *
VN	5-42	S70	Normal mode
VN1			Direct mode
VN2			MNP only
VN3			MNP or normal
VN4			LAPM only
VN5			LAPM with normal fallback
VN6			LAPM with MNP fallback
VN7			LAPM with MNP and normal fallback *

* factory default

Command Index and Defaults

Command	Page	S-Reg	Description
VO	5-50	S60	Originate a reliable link
VQ	5-44	S54	Disable DTE flow control
VQ1			Enable DTE XON/XOFF flow control *
VQ2			Enable CTS flow control to the DTE
VQ3			Enables bilateral CTS/RTS flow control
VQ4			Disable DCE flow control
VQ5			Enable DCE XON/XOFF flow control *
VQ6			Enable CTS flow control to the DTE
VQ7			Enable CTS flow control to the DTE
VR	5-18	S60	Ring indicate, blinks for ring and remains on for duration of call
VR1			Ring indicate, blinks for ring and turns off when call is answered *
VT	5-48	S58	Disable inactivity timer *
VTn			Set inactivity timer to n (n=1-255 minutes)
VU	5-51	S60	Accept an MNP link
IV	5-43	S60	Disable protocol result codes *
IV1			Enable protocol result codes
IX	5-45	S54	No XON/XOFF characters to remote DCE *
IX1			Pass XON/XOFF characters to remote DCE
IY	5-51	S60	Switch to MNP from normal mode
IZ	5-51	S60	Switch to normal from MNP mode
*AN	5-22	S34	Disables bilateral analog loop *
*AN1			Enables bilateral analog loop
*AUn	5-15		Dial number stored at location n upon transition of DTR in command mode (n=1-9) autodial number

*factory default

Command Index and Defaults

Command	Page	S-Reg	Description
*CNx, n	5-36		Store phone number n in location x (x=1-9)
*DB	5-31	S32	Manual dial backup operation *
*DB1			Automatic dial backup operation
*DG	5-22	S34	Disables bilateral digital loop *
*DG1			Enables bilateral digital loop
*FB	5-20	S29	Ignore pin 23 *
*FB1			Pin 23 transition causes DTE speed fallback
*FT	5-31	S29	Disable fast train *
*FT1			Enable fast train
*LA	5-22	S34	Ignore pin 18 *
*LA1			DTE commanded LAL enabled
*LB	5-31		Return to leased line from dial backup
*LC	5-32	S32	Line current disconnect disabled
*LC1			Short (8 ms) line current disconnect
*LC2			Long (90 ms) line current disconnect *
*LD	5-32		Manual dial backup from leased line
*ND	5-36		Displays the nine stored numbers
*NT	5-32	S29	AT command set disabled
*NT1			AT command set enabled *
*OR	5-33	S14	Originate *
*OR1			Forced answer
*RC	5-9	S57	15 - 4800 bps, 18 - 9600 bps *
*RC1			11 - 4800 bps, 12 - 9600 bps
*RD	5-22	S34	Ignore pin 21 *
*RD1			DTE commanded RDL enabled
*RO	5-38	S29	Retain options at disconnect *
*RO1			Restore options at disconnect

*factory default

Command Index and Defaults

Command Page S-Reg Description

*TDn	5-33	S52	Sets dial transmit level to n where n is a number between 9 and 21 corresponding to -9 to -21 dBm
*TLn	5-33	S52	Sets leased line transmit level to n where n is a number between 0 and 21 corresponding to 0 to -21 db
\$V	5-30		Display product serial number
Security Commands			
\$S=x	5-40		Sets an empty password location to x
\$C=x,y	5-40		Changes either password where x represents the old password and y is the new one
\$C=x,-	5-40		Deletes password x from memory
\$DR	5-40		Reset security
\$D?	5-40		Displays the current status of security
\$D=x	5-40		Disables security where x is either password
\$E=x	5-40		Enables security where x is either password
\$E?	5-40		Displays the current security status

Command Index and Defaults

STATUS REGISTERS

S-Reg	RO/RW	Page	Function	Default
S0	RW	6-6	Ring to answer	1
S1	RO	6-6	Ring count	
S2	RW	6-6	Escape sequence character	43 (+)
S3	RW	6-6	End-of-line character	13 (CR)
S4	RW	6-6	Line feed character	10 (LF)
S5	RW	6-6	Backspace character	8 (BS)
S6	RW	6-7	Pause before blind dialing	2 (2 sec)
S7	RW	6-7	Pause for carrier	30 (30 sec)
S8	RW	6-7	Pause for comma	2 (2 sec)
S9	RW	6-7	Carrier validation	6 (0.6 sec)
S10	RW	6-7	Loss carrier delay time	14 (1.4 sec)
S11	RW	6-7	DTMF tone duration	80 (80 ms)
S12	RW	6-8	Escape sequence pause	50 (1 sec)
S14	RW	6-9	Bit mapped	
S16	RO	6-10	System tests	0
S18	RW	6-10	Test timer	0
S21	RW	6-11	Bit mapped	
S22	RW	6-12	Bit mapped	
S23	RW	6-12	Bit mapped	
S25	RW	6-13	DTR recognition time	5 (0.5 sec)
S26	RW	6-13	RTS/CTS delay	0
S27	RW	6-13	Bit mapped	
S28	RW	6-13	Lookback timer	15 min
S29	RW	6-14	Bit mapped	
S30	RW	6-14	V.25 mode selection	
S31	RW	6-15	4-wire leased line train	
S32	RW	6-15	Bit mapped	
S34	RW	6-16	Bit mapped	
S39	RW	6-16	Bit mapped	
S51	RW	6-17	Connect message rate	0
S52	RW	6-17	Bit mapped	-10 dBm
S53	RW	6-17	Bit mapped	
S54	RW	6-18	801 V.32 timeout	0 (long)
S55	RW	6-18	Flow control DTE	0
S56	RW	6-18	V.42 compression	
S57	RW	6-19	Number code application	0

RO=Read only
RW=Read or write

Command Index and Defaults

S-Reg	RO/RW	Page	Function	Default
S58	RW	6-19	Inactivity timer	0
S59	RW	6-19	Break control	5
S60	RW	6-20	Bit mapped	6
S61	RO	6-20	DTE character size, parity	0
S62	RW	6-21	Disconnect buffer delay	255
S63	RW	6-21	Maximum block size	0
S64	RW	6-21	Auto-reliable character	0
S66	RW	6-21	Bit mapped	0
S67	RO	6-22	Link speed status	1
S69	RW	6-22	Maximum DCE speed	1
S70	RW	6-23	Operating mode	1
S71	RO	6-23	Operating mode status	1
S72	RW	6-24	Bit mapped	30
S78	RW	6-24	Autocallback timer	35
S79	RW	6-25	Break length	6
S80	RO	6-25	Serial port speed	6
S84	RW	6-26	Bit mapped	6

RO=Read only
RW=Read or write

Command Index and Defaults

V.25 bis DIALER
COMMANDS

Command	Page	Description
Synchronous Command	7-8	Connect incoming call command
CIC	7-8	Connect incoming call command
CRN <i>nn...n</i>	7-4	Dial command (<i>nn...n</i> = number to be dialed) 0 - 9 DTMF and pulse digit * # DTMF digit : Wait for dial tone W Wait for second type of dial tone > Pause for 1 second = Pause for 3 seconds < Pause for programmed delay time P Pulse dial T Tone dial & Flash (go on hook) for 1/2 second ; Parameter separator Space Clarity characters dash parenthesis period
CRR <i>n</i>	7-8	Redial the last number a maximum of <i>n</i> times
CRS <i>a</i>	7-6	Dial stored number command (<i>a</i> = address)
DIC	7-7	Disregard incoming call command
PRK	7-14	Save current option settings
PRL <i>a;b</i>	7-9	Link number at address <i>a</i> with number at address <i>b</i>
PRN <i>a; nn...n</i>	7-5	Program number command (<i>nn...n</i> = number to be dialed, <i>a</i> = address)

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Command Index and Defaults

Synchronous Command	Page	Description
PRO xxx.yy:0:0...	7-11	Program options command (xxx = register address, yy = option count)
PRP n	7-14	Restores current option settings to the factory defaults in default bank n (1-9)
RLL	7-10	Request list of linked numbers command
RLN	7-6	Request list of stored numbers command
RLO xxx.yy	7-15	Request list of stored options command (xxx = register address, yy = option count)
RLV	7-11	Request list of version information command
Response Message	Meaning	
CFIAB	Call failure - answer back tone but no connection	
CFIDT	Call failure - no dial tone	
CFIET	Call failure - reorder or busy	
CFILD	Call failure - link list complete	
CFINS	Call failure - number not stored	
CFINT	Call failure - no answer back tone, no ringback	
CFIRT	Call failure - timeout occurred	
CNX @ 14400 bps V.32 bis	Intermediate call progress - connection made at 14400	

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Command Index and Defaults

Response Message	Meaning
CNX @ 12000 bps V.32 bis	Intermediate call progress - connection made at 12000
CNX @ 9600 bps V.32 bis	Intermediate call progress - connection made at 9600
CNX @ 7200 bps V.32 bis	Intermediate call progress - connection made at 7200
CNX @ 4800 bps V.32 bis	Intermediate call progress - connection made at 4800
CNX @ 2400 bps V.32 bis	Intermediate call progress - connection made at 2400
CNX @ 1200 bps V.32 bis	Intermediate call progress - connection made at 1200
INC	Incoming ring detected
INVCU	Invalid command - command unknown
INVMMS	Invalid command - message syntax error
INVPSS	Invalid command - parameter syntax error
INVPV	Invalid command - parameter value error
VAL	Valid command received

*Command Index and Defaults***FACTORY OPTION SETS**

FACTORY OPTION SET #1 (ASYNCHRONOUS DIAL-UP WITH V.42 bis PROTOCOL) (AT&F or AT&F1)

- **MODEM OPTIONS**
 - DCE rate - 14400 trellis
 - Normal originate
 - Fast train disabled
 - Auto retrain enabled
 - SQ auto rate disabled
 - Internal transmit clock
 - Dial line transmit level -10 dBm
 - Dial line
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop disabled
 - Bilateral digital loop disabled
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol enabled
 - MNP protocol enabled
 - Protocol fallback enabled
 - Data compression normal
 - Constant DTE speed
 - DTE flow control XON/XOFF
 - DCE flow control XON/XOFF
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break option 5
 - V.42 fast detect enabled
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Wait delay 2 seconds
 - Pause delay 2 seconds
 - Call timeout 30 seconds
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Async data
 - DTE rate - 9600
 - 8 bit
 - No parity
 - Async controlled dialer
 - AT command set enabled
 - Ignores DTR
 - DSR forced high
 - DCD forced high
 - CTS forced high
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - On until carrier detect

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Command Index and Defaults

FACTORY OPTION SET #2 (ASYNCHRONOUS DIAL-UP WITHOUT V.42 bis PROTOCOL) (AT&F2)

- **MODEM OPTIONS**
 - DCE rate = 14400 *
 - Normal originate
 - Fast train disabled
 - Auto retrain enabled
 - SQ auto rate disabled
 - Internal transmit clock
 - Dial TX level -10 dBm
 - Dial line
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop disabled
 - Bilateral digital loop disabled
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol disabled *
 - MNP protocol disabled *
 - Direct mode
 - DTE flow control disabled *
 - DCE flow control disabled *
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break Option 0
 - V.42 fast detect disabled *
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Wait delay 2 seconds
 - Pause delay 2 seconds
 - Call timeout 30 seconds
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Async data
 - DTE rate = 9600
 - 8 bit
 - No parity
 - Async controlled dialer
 - AT command set enabled
 - Ignores DTR
 - DSR forced high
 - DCD forced high
 - CTS forced high
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - On until carrier detect

* Indicates variation from factory option set #1

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Command Index and Defaults

FACTORY OPTION SET #3 (SYNCHRONOUS DIAL-UP) (AT&F3)

- **MODEM OPTIONS**
 - DCE rate - 14400 teillis
 - Normal originate
 - Fast train disabled
 - Auto retrain enabled
 - SQ auto rate disabled
 - Internal transmit clock
 - Dial TX level -10 dBm
 - Dial line
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop disabled
 - Bilateral digital loop disabled
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol disabled *
 - MNP protocol disabled *
 - Direct mode *
 - DTE flow control disabled *
 - DCE flow control disabled *
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break Option 0 *
 - V.42 fast detect disabled *
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Wait delay 2 seconds
 - Pause delay 2 seconds
 - Call timeout 30 seconds
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Sync data *
 - Dial method manual *
 - AT command set disabled *
 - DTR disconnects *
 - DSR normal *
 - DCD normal *
 - CTS follows RTS *
 - RTS/CTS delay 0 ms *
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - On until carrier detect

* Indicates variation from factory option set #1

Command Index and Defaults

FACTORY OPTION SET #4 (SYNCHRONOUS 4-WIRE LEASED LINE) (AT&F4)

- **MODEM OPTIONS**
 - DCE rate - 14400 teillis
 - Normal originate
 - Fast train disabled
 - Auto retrain enabled
 - SQ auto rate disabled
 - Internal transmit clock
 - Dial TX level is -10 dBm
 - Leased line *
 - 4-wire *
 - Lease Tx level is 0 dBm *
 - Manual dial backup *
 - Lookback timer is 15 min *
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop enabled *
 - Bilateral digital loop enabled *
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol disabled *
 - MNP protocol disabled *
 - Direct mode *
 - DTE flow control disabled *
 - DCE flow control disabled *
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break option 0 *
 - V.42 fast detect disabled *
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Wait delay 2 seconds
 - Pause delay 2 seconds
 - Call timeout 60 seconds *
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Sync data *
 - AT command set disabled *
 - Ignores DTR
 - DSR normal *
 - DCD normal *
 - CTS follows RTS *
 - RTS/CTS delay 0 ms *
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - Speaker off *

* Indicates variation from factory option set #1

Command Index and Defaults

FACTORY OPTION SET #5 (ASYNCHRONOUS 4-WIRE LEASED LINE WITH V.42 bis PROTOCOL) (AT&F5)

• MODEM OPTIONS

- DCE rate - 14400 teillis
- Normal originate
- Fast train disabled
- Auto retrain enabled
- SQ auto rate disabled
- Internal transmit clock
- Dial Tx level is - 10 dBm
- Leased line *
- 4-wire *
- Lease Tx level is 0 dBm *
- Manual dial backup *
- Lookback timer is 15 min *
- Jack type RJ11 (permissive)
- Line current disconnect long
- Long space disconnect enabled
- V.22 guard tone disabled

DTE fallback disabled
Options retained at disconnect

• TEST OPTIONS

- Bilateral analog loop disabled
- Bilateral digital loop disabled
- DTE local test disabled
- DTE remote test disabled
- Remote commanded test enabled
- Test timeout off

• PROTOCOL OPTIONS

- LAPM protocol enabled
- MNP protocol disabled *
- Protocol fallback disabled *
- Data compression normal
- Constant DTE speed
- DTE flow control XON/XOFF
- DCE flow control XON/XOFF
- XON/XOFF pass through disabled
- Inactivity timer off
- Break option 5 *
- V.42 fast detect enabled

• DIAL LINE OPTIONS

- Tone dial
- Auto dial #1
- Wait for dial tone
- Wait delay 2 seconds
- Pause delay 2 seconds
- Call timeout 30 seconds
- Answer on 1 ring
- 801 V.32b timeout long
- Autocallback disabled

• DTE OPTIONS

- Async data
- DTE rate - 9600
- 8 bit
- No parity
- AT command set enabled
- Ignores DTR
- DSR forced high
- DCD forced high
- CTS forced high

• SPEAKER OPTIONS

- Volume medium
- Speaker off

* Indicates variation from factory option set #1

Command Index and Defaults

FACTORY OPTION SET #6 (ASYNCHRONOUS 4-WIRE LEASED LINE WITHOUT V.42 bis PROTOCOL) (AT&F6)

• MODEM OPTIONS

- DCE rate 14400 teillis
- Normal originate
- Fast train disabled
- Auto retrain enabled
- SQ auto rate disabled
- Internal transmit clock
- Dial Tx level is - 10 dBm
- Leased line *
- 4-wire *
- Lease Tx level is 0 dBm *
- Manual dial backup *
- Lookback timer is 15 min *
- Jack type RJ11 (permissive)
- Line current disconnect long
- Long space disconnect enabled
- V.22 guard tone disabled

• TEST OPTIONS

- Bilateral analog loop disabled
- Bilateral digital loop disabled
- DTE local test disabled
- DTE remote test disabled
- Remote commanded test enabled
- Test timeout off

• PROTOCOL OPTIONS

- LAPM protocol disabled *
- MNP protocol disabled *
- Direct mode
- DTE flow control disabled *
- DCE flow control disabled *
- XON/XOFF pass through disabled
- Inactivity timer off
- Break option 0 *
- V.42 fast detect disabled

• DIAL LINE OPTIONS

- Tone dial
- Auto dial #1
- Wait for dial tone
- Wait delay 2 seconds
- Pause delay 2 seconds
- Call timeout 30 seconds
- Answer on 1 ring
- 801 V.32b timeout long
- Autocallback disabled

• DTE OPTIONS

- Async data
- DTE rate = 9600
- 8 bit
- No parity
- AT command set enabled
- Ignores DTR
- DSR forced high
- DCD forced high
- CTS forced high
- DTE fallback disabled
- Options retained at disconnect

• SPEAKER OPTIONS

- Volume medium
- Speaker off

* Indicates variation from factory option set #1

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Command Index and Defaults

FACTORY OPTION SET #7 (SYNCHRONOUS 2-WIRE LEASED LINE NORMAL ORIGINATE) (AT&F7)

- **MODEM OPTIONS**
 - DCE rate - 14400 trellis
 - Normal originate
 - Fast train disabled
 - Auto retrain enabled
 - SQ auto rate disabled
 - Internal transmit clock
 - Dial TX level is - 10 dBm
 - Leased line *
 - 2-wire *
 - Lease Tx level is 0 dBm *
 - Manual dial backup *
 - Lookback timer is 15 min *
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop enabled *
 - Bilateral digital loop enabled *
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol disabled *
 - MNP protocol disabled *
 - Direct mode *
 - DTE flow control disabled *
 - DCE flow control disabled *
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break option 0 *
 - V.42 fast detect disabled *
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Pause delay 2 seconds
 - Call timeout 60 seconds *
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Sync data *
 - AT command set disabled *
 - Ignores DTR
 - DSR normal *
 - DCD normal *
 - CTS follows RTS *
 - RTS/CTS delay 0 ms *
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - Speaker off

* Indicates variation from factory option set #1

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Command Index and Defaults

FACTORY OPTION SET #8 (SYNCHRONOUS 2-WIRE LEASED LINE FORCED ANSWER) (AT&F8)

- **MODEM OPTIONS**
 - DCE rate - 14400 trellis
 - Forced answer *
 - Fast train disabled
 - Auto retrain enabled
 - SQ auto rate disabled
 - Internal transmit clock
 - Dial TX level is - 10 dBm
 - Leased line *
 - 2-wire *
 - Lease Tx level is 0 dBm *
 - Manual dial backup *
 - Lookback timer is 15 min *
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop enabled *
 - Bilateral digital loop enabled *
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol disabled *
 - MNP protocol disabled *
 - Direct mode *
 - DTE flow control disabled *
 - DCE flow control disabled *
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break option 0 *
 - V.42 fast detect disabled *
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Pause delay 2 seconds
 - Call timeout 60 seconds *
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Sync data *
 - AT command set disabled *
 - Ignores DTR
 - DSR normal *
 - DCD normal *
 - CTS follows RTS *
 - RTS/CTS delay 0 ms *
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - Speaker off

* Indicates variation from factory option set #1

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Command Index and Defaults

FACTORY OPTION SET #9 (SYNCHRONOUS V.25 bis DIALER) (A17&F9)

- **MODEM OPTIONS**
 - DCE rate - 14400 trellis
 - Normal originate
 - Fast train disabled
 - Auto retrain enabled
 - SO auto rate disabled
 - Internal transmit clock
 - Dial TX level is -10 dBm
 - Dial line
 - Jack type RJ11 (permissive)
 - Line current disconnect long
 - Long space disconnect enabled
 - V.22 guard tone disabled
- **TEST OPTIONS**
 - Bilateral analog loop disabled
 - Bilateral digital loop disabled
 - DTE local test disabled
 - DTE remote test disabled
 - Remote commanded test enabled
 - Test timeout off
- **PROTOCOL OPTIONS**
 - LAPM protocol disabled *
 - MNP protocol disabled *
 - Direct mode *
 - DTE flow control disabled *
 - DCE flow control disabled *
 - XON/XOFF pass through disabled
 - Inactivity timer off
 - Break option 0 *
 - V.42 fast detect disabled *
- **DIAL LINE OPTIONS**
 - Tone dial
 - Auto dial #1
 - Wait for dial tone
 - Wait delay 2 seconds
 - Pause delay 2 seconds
 - Call timeout 30 seconds
 - Answer on 1 ring
 - 801 V.32b timeout long
 - Autocallback disabled
- **DTE OPTIONS**
 - Sync data *
 - V.25 SDLC dialer *
 - Character type ASCII *
 - SDLC data format NRZ *
 - DTR disconnect *
 - DSR normal *
 - DCD normal *
 - CTS follows RTS *
 - RTS/CTS delay 0 ms *
 - DTE fallback disabled
 - Options retained at disconnect
- **SPEAKER OPTIONS**
 - Volume medium
 - On until carrier detect

* Indicates variation from factory option set #1

Appendix E
Abbreviations and Acronyms

GENERAL
This appendix contains terms commonly used in the data communications field.

A	ABT	About Timer OR Answer Back Tone	CCITT	International Consultative Committee for Telegraph and Telephone
	ac	Alternating Current	CCU	Communications Control Unit
	ACK	Acknowledgment, Positive	CD	Carrier Detect
	ACR	Abort Call, Retry	CFICB	Call Failure Indication - Local DCE Busy
	ACU	Automatic Call Unit	CFIDT	Call Failure Indication - No Dial Tone
	AD	Analog-to-Digital	CFINT	Call Failure Indication - No Answer Back Tone
	ADDR	Address Field	CFIRT	Call Failure Indication - Ringback Detected
	AGC	Automatic Gain Control	Ch Gnd	Chassis Ground
	ASCH	American Standard Code for Information Interchange (7 level)	CIC	Connect Incoming Call
	AT&T	American Telephone and Telegraph	CMOS	Complementary Metal Oxide Semiconductor
B	BC	Bearer Capability	CNX	Connect Complete
	BCD	Binary Coded Decimal	COM	Computer Output Microfilm
	BER	Bit Error Rate	CO	Central Office
	BERT	Bit-Error-Rate-Test (set)	COS	Call Originate Status
	BILL LB	Bilateral Loopback	CPE	Customer Premise Equipment
	Bit	Binary Digit	CPH	Characters Per Hour
	bps	Bits Per Second	CPU	Central Processing Unit
	BSC	Binary Synchronous Communications	CR	Carriage Return
	BUFF	Elastic Buffer	CRC	Cyclic Redundancy Check
			CRQ	Call Request
			CSA	Canadian Standards Association
C			CSPDC	Circuit Switched Digital Capability
	C	Celsius	CSU	Channel Service Unit
	CA	Circuit Assurance	CSULL	Channel Service Unit Local Loopback
	CBX	Computerized Private Branch Exchange	CTRL	Control Field
	CC	Carrier Control	CTS, CS	Clear to Send