

CryptoCom 2000



V.90 Security Modem

User's Manual

CRYPTOCOM 2000

V.90 Security Modem

**CC2K Firmware 357
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TABLE OF CONTENTS

1. Getting Started	1-1
2. Led Indicators	2-1
3. AT Commands	3-1
- Call Control	3-3
- Generic Modem Control	3-7
- Modulation Control	3-12
- Error Control	3-15
- Data Compression	3-17
- DTE/Modem Interface Commands	3-23
4. S-Registers	4-1
- S-Register Descriptions	4-2
5. Data Encryption & Security	5-1
- Remote Key Change	5-3
Appendix A Troubleshooting and Useful Hints	A-1
Appendix B RS-232 Pinout	B-1
Appendix C ASCII Table	C-1
Appendix D HEX Table	D-1
Appendix E HEX/BINARY Table	E-1
Appendix F Specifications	F-1
Appendix G Technical Support	G-1
Appendix H Additional Commands	H-1
Appendix I International Operation	I-1
Appendix J Registration Numbers	J-1
Addendum 1.1 International Operation	A1
Addendum 1.2 Leased-Line	A2
Addendum 1.3 Leased-Line	A3
Addendum 1.4 Callback Security	A4

1. GETTING STARTED

The CRYPTOCOM 2000 Modem is a pocket sized communications device designed for secure data communications. It is compatible with many international protocols and will accept data from your computer equipment at speeds up to 115,200 bps. The CRYPTOCOM is connected to asynchronous RS-232 devices and/or DTE terminals.

The CRYPTOCOM has been designed to transmit and receive data over standard telephone communications lines in accordance with the following standards/recommendations: CCITT V.90, KFLEX, V.34, V.32 bis, V.32, V.23, V.22 bis, V.22, V.21, Bell 212A and Bell 103. For facsimile transmission, CCITT V.17, V.29, V.27 ter, and V.21 are supported. In addition, the CRYPTOCOM supports MNP Level 2-4 and V.42 error correction in addition to MNP Class 5 and V.42bis data compression.

In addition to the above features, CRYPTOCOM provides for automatic dialing and call progress monitoring, auto-answer capabilities, storage of modem configurations and telephone numbers in non-volatile internal memory, industry-standard AT command set and remote/internal test modes.

CRYPTOCOM can also be placed in a mode where it will negotiate the highest possible speed and data compression capability with the remote modem giving you maximum performance every time you connect.

The CRYPTOCOM 2000 Package

CRYPTOCOM is shipped with the following items:

- One CRYPTOCOM pocket data/fax modem
- One RJ-11C telephone cable
- One wall-mount power adaptor (9VDC, 500mA)
- One CRYPTOCOM user manual
- One CRYPTOCOM installation diskette (MDMWDC.INF)
- One RS-232 cable (DB25M to DB9F)

System Requirements

- Any computer system with one unused RS232 serial interface
- Communications Software
- A graphics monitor
- 640 K of memory for all fax functions (1 Meg strongly recommended)
- A hard disk

Connecting your unit

1. Turn off the CRYPTOCOM unit (Power switch towards the battery compartment).
2. Connect the male end of the RS232 cable to CRYPTOCOM and the female end to the serial port located on the computer.
3. Connect the AC adaptor if wall power is desired or make sure a 9V Lithium battery is installed for battery operation.
4. Connect one end of a RJ11 telephone cable to the CRYPTOCOM telephone jack and the other end to the phone jack on your wall.

You are now ready to install the drivers necessary to operate your the CryptoCom modem:

Windows 2000

Under control panel select add new hardware, and allow Win2K to search for new hardware. When Win2K prompts you to search for best driver insert CryptoCom installation diskette and click OK. The correct driver should be copied from the diskette to the hard disk drive. This completes the installation under Windows 2K.

Windows NT

Under control panel select add new hardware, have disk. Insert CryptoCom installation diskette and click OK. Select the appropriate model when prompted by Windows. Select default parameters and click finish. Winnt will update remote access service and prompt for a re-boot. This completes the installation under Windows NT.

Windows 98

Under control panel select add new hardware, and allow Win98 to search for new hardware. When Win98 prompts you to search for best driver insert CryptoCom installation diskette and click OK. The correct driver should be copied from the diskette to the hard disk drive. This completes the installation under Windows 98.

Windows 95

Under control panel select add new hardware, have disk. Insert CryptoCom installation diskette and click OK. Select the appropriate model when prompted by Windows. Select default parameters and click finish. This completes the installation under Windows 95.

MS-DOS

No drivers are required for operation under MS-DOS.

The A / Command

□ If the characters A/ (instead of AT) are received, CRYPTOCOM will re-execute the most recently received command line. In this case, the parity is assumed to be the same as that of the most recently received AT prefix.

Escaping to Command Mode

□ In order to enter an AT command while on-line, the modem must temporarily be placed in command mode. This is done via the escape sequence. CRYPTOCOM implements the TIES (Time Independent Escape Sequence). To escape to command mode and enter an AT command, simply type +++ the modem will respond with OK, you can now enter valid AT commands. Returning to on-line mode is done via the ATO command.

Command Line Characters

□ All characters that follow the AT prefix are taken to be commands (these are described below).

□ The parity bit of all command characters is ignored.

□ Spaces (20 Hex) between command characters (and option characters) are ignored.

□ No more than 40 command line characters are allowed. If more than this is received, the command line will be ignored and the "ERROR" result code will be returned when the carriage return character is received

The Carriage Return Character

□ The carriage return character is used to signify the end of the command line. When this character is received, CRYPTOCOM will begin to process the command characters previously received.

□ The default value for this character is Control-M (D Hex) but it may be changed through modification of the appropriate S-register.

The Backspace Character

□ The backspace character is used to edit the command line. If it is received, CRYPTOCOM will ignore the most recently received command character and issue a backspace-space-backspace sequence to the DTE.

□ If an attempt is made to backspace onto the AT sequence, CRYPTOCOM will ignore the backspace character and take no action.

2. LED INDICATORS

There are 4 LED indicators on the CRYPTOCOM 2000 front panel. These are Power, Connect, Secure and Data.

POWER: (RED) This LED is on whenever power is applied to the unit. If the power switch is on and the AC adaptor is plugged in, power will be automatically drained from the wall outlet regardless of whether or not a battery is installed.

CONNECT: (YELLOW) This LED is on whenever a connection is up, if it is a secure connection the Secure LED will follow the Connect LED.

SECURE: (GREEN) This is on when the CRYPTOCOM is connected in encrypted mode using Triple DES encryption. Green indicates it is safe to send data securely.

DATA: (ORANGE) This LED flashes whenever data is received or transmitted from the CRYPTOCOM.

The CryptoCom 2000 has a built in power-on self test routine that is run after being powered on. The LED's indicate the self test by flashing in the routine: Power, Connect, Secure and Data all on; then Connect, Secure Data off; then Data on followed by Secure on followed by Connect on. Then all off except Power.

Should any error occur the LED's will indicate the failure with various patterns. If the user encounters an unidentified pattern please make note of it and recycle power. If the problem continues please contact Technical Support at 440-835-1510.

3. AT COMMANDS

This section discusses the operation of the AT command interpreter as well as describing all AT commands supported by CRYPTOCOM.

The AT Command Interpreter

CRYPTOCOM implements the industry-standard AT command set. These commands are only available to the user when CRYPTOCOM is in command or on-line command mode and are realized in the form of asynchronous characters received from the DTE.

Most users will never find the need to directly use AT commands as these are often handled by the communications software.

The AT prefix

- All command lines must begin with the two letters 'A' and 'T'. Either upper case or lower case is acceptable but both letters should have the same case.
- CRYPTOCOM attempts to determine the speed of the 'A' by measuring the duration of its start bit. The 'A' must be received at one of the speeds supported by CRYPTOCOM (i.e. 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 112,500 bits/s).
- Once the 'A' and 'T' characters have been received, CRYPTOCOM determines the parity of the DTE by analyzing the parity bits of these two characters. All result codes and information text issued by CRYPTOCOM will be generated with this parity.

The following asynchronous character formats are supported:

Start Bit	Data Bits	Parity Bit	Stop Bits
■	■	██████████	■
■	■	████	■
■	■	██████████	■
■	■	████	■

- If the CRYPTOCOM 2K receives a character but fails to detect it as an 'A', it begins to search for another 'A' character. If CRYPTOCOM receives an 'A' but it is not followed by a 'T', CRYPTOCOM begins searching for an 'A' again.

L: Speaker Volume

Sets the speaker volume when speaker is on.

L0 - Speaker off.

L1 - Low volume.

L2 - Medium volume

L3 - High volume.

M: Speaker Control

Controls how the speaker behaves when off hook.

M0 - Speaker always off.

M1 - Speaker on until handshake is complete.

M2 - Speaker always on.

M3 - Similar to M1 except speaker is disabled when dialing.

IV: Single Line Connect Message

Disables or enables single line connect message.

IV0 - Connect messages are controlled by the command settings X, W, and S95.

IV1 - 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.

O: Return to On-Line State

Applicable when a physical connection with a remote modem exists and CRYPTOCOM is in the on-line command state.

O0 - Returns CRYPTOCOM to the on-line state.

O1 - As O0 except that when a 2400 bits/s or higher connection is established an equalizer retrain sequence is transmitted.

□ The default value for this character is Control-H (8 Hex) but it may be changed through modification of the appropriate S-register.

Characters Ignored by CRYPTOCOM

□ Other than the above characters, all ASCII control characters (value less than 20 Hex) are ignored.

Processing Command Characters

□ CRYPTOCOM processes each command character in the sequence that it was received. Any change in operational state required by a command occurs as soon as the command is processed.

□ If an error occurs in the processing of a command, CRYPTOCOM will stop processing the command line and output the "ERROR" result code.

□ The detection of an unimplemented command during processing causes a command processing error.

□ Some commands (e.g. E, I, Q, V) may be followed by numeric arguments which select a particular option for that command. If the argument is missing, a value of zero is assumed. If the value is outside the valid range of arguments for that command, a command processing error occurs.

□ If command line processing completes without error, the "OK" result code will be output.

AT Commands Supported by CRYPTOCOM

This section discusses the AT commands generally used to handle the transmission of asynchronous data.

CALL CONTROL

A: Answer mode

Causes CRYPTOCOM to go off hook and attempt a handshake in answer mode.

P: Pulse Dialing

Causes subsequent dial digits to be executed as pulses.

D: Dial Number

Instructs CRYPTOCOM to go off-hook and execute the dial string which follows the D. Commands which may be part of the dial string are listed below. Any unrecognized character in the dial string is ignored. Once dialing is complete, CRYPTOCOM attempts a handshake in originate mode (unless the R parameter is given).

0-9 -DTMF digits 0 to 9

A, B, C, D, # or * (tone dial only) -Causes the indicated symbol to be dialed.

P -Causes subsequent numbers to be pulse dialed.

T -Causes subsequent numbers to be tone dialed.

R -Forces CRYPTOCOM to dial a call in answer mode.

W -Causes CRYPTOCOM to wait for a dial tone using S7 as a time out.

' -Causes a delay, determined by S8, before CRYPTOCOM proceeds with the next command or digit.

! -Causes CRYPTOCOM to go on-hook for .5 sec and then off-hook for .5 seconds before continuing.

@ -Causes CRYPTOCOM to wait until it detects 5 seconds of silence before continuing.

; -Causes CRYPTOCOM to go to the command mode when the number is dialed. In order to proceed with channel establishment mode ATO or ATD must be entered. Any characters that follow this parameter are treated as AT commands.

L -Causes the last telephone number that was dialed by CRYPTOCOM to be re-dialed.

Sn -Causes CRYPTOCOM to dial the number in stored position "n" [format is or Sn].

%L: Report Line Signal Level

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

Note: On-Line command ONLY, use escape sequence to request.

&G: Select Guard Tone

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

&G0 - Disables Guard Tone (Default)

&G1 - Disables Guard Tone

&G2 - Selects 1800 Hz Guard Tone

&P: Select Pulse Dial Make/Break Ratio

This command determines the make/break ratio used during pulse dialing.

&P0 Selects 39%-61% make/break ratio at 10 pulses per second. (Default)

&P1 Selects 33%-67% make/break ratio at 10 pulses per second.

&P2 Selects 39%-61% make/break ratio at 20 pulses per second.

&P3 Selects 33%-67% make/break ratio at 20 pulses per second.

H: Hook Switch Control

Controls the hook switch relay of CRYPTOCOM.

H0 - Causes CRYPTOCOM to go on-hook.

H1 - Causes CRYPTOCOM to go off-hook.

In error correction mode S38 dictates the delay before going on-hook.

%Q: Report Line Signal Quality

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

Note: On-Line command ONLY, use escape sequence to request.

I: Identification

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

I0 - Reports product code, e.g., 56000

I1 - Reports the least significant byte of the stored checksum in decimal (see firmware release notes). Reports 255 if the prestored checksum value is FFh.

I2 - Reports "OK".

I3 - Reports identification codes in the form VX.X-F_A where:

VX.X = Firmware version (e.g., V3.00)

F = Firmware model and ROM Size:

V90 or V34 = V90 or V34 in 1M ROM

V90_2M or V34_2M = V90 or V34 in 2M ROM

A = Application

DLS = Desktop serial

DLP = Desktop parallel

DLL = Low Power PC Card

DL3 = Low Power 3V

DLG = Low Power World Class

Example: V3.000-V90_2M_DLS

Note: If RPI+ is enabled (see +Hn command), "ROCKWELL RPI (TM)" is appended.

I4 - Reports OEM defined identifier string in either Hayes-compatible binary format (default) or ASCII format: e.g.

a007840284C6002F

bC60000000

r1005111151012000

r3000111170000000

I5 - Reports Country Code parameter (see +GCI command), e.g., B5.

I6 - Reports modem data pump model and internal code revision, e.g., RCV56DPF-PLL L8571A Rev 29.00/29.00

I7 - Reports OK.

Generic Modem Control

The parameters defined in this section are general modem operational commands.

Z: Soft Reset and Restore Profile

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

Z0 - Soft reset and restore stored profile 0

Z1 - Soft reset and restore stored profile 1

IN: Operating Mode

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

\N0 - N/A

\N1 - N/A

\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 - N/A

\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.)

Note: Error Correction CANNOT be disabled due to Encryption.

+GMI: Request Manufacturer Identification

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

+GMI

Typical Response

+GMI: WESTERN DATACOM

+GMM: Request Model Identification

This command causes the modem to report the modem product.

+GMM

Typical Response

+GMM: V90

+GMR: Request Revision Identification

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

+GMR

Typical Response

+GMR: V3.400 CCOM2K 356 2001jun27 - V90_2M_DLS

+GCAP: Request Capabilities List

This extended-format command causes the modem to transmit one or more lines of information text listing additional capabilities command +<name>s , which is intended to permit the user to identify the overall capabilities of the modem.

+GCAP

Example Responses

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

+GCI: Country of Installation

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

+GCI=<<country_code>

Country Code Country Code Country Code

Australia 09	Hungary 51	Poland 8A
Austria 0A	India 53	Portugal 8B
Belgium 0F	Ireland 57	Russia B8
Bulgaria 1B	Israel 58	Singapore 9C
Canada 20	Italy 59	Spain A0
China 26	Japan 00	Sweden A5
Korea 61	Switzerland A6	Denmark 31
Luxembourg 69	Taiwan FE	Finland 3C
Mexico 73	United Kingdom B4	France 3D
Netherlands 7B	United States B5	Germany 42
New Zealand 7E	Greece 46	Norway 82
Hong Kong 50	Philippines 89	

Countries in bold are currently supported by the CryptoCom, additional Countries available at request. If the modem is specified for use in only one country, that country code is the default.

Reporting Current or Selected Values

Command: +GCI=?

Response: +GCI: <current country_code>

Example: +GCI: B4 indicates that the modem is set for UK operation.

Reporting Supported Range of Parameter Values

Command: +GCI=?

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

Example: +GCI: (20,73,B5) The modem can be set for Canada, Mexico or the United States.

+MR: Modulation Reporting Control

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

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

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

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

Reporting Current or Selected Values

Command: +MR?

Response: +MR: <current value>

%E: 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).

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

%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.)

%U: Select CODEC Type

This command selects μ -Law or A-Law codec type for V.90 and K56flex modulation.

%U0 - Selects μ -Law.

%U1 - Selects A-Law.

&F: Restore Factory Configuration

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

&F0 - Restore factory configuration 0.

&F1 - Restore factory configuration 1.

&T: Local Analog Loopback Test

The modem will perform the local analog loopback test if &T1 is selected. The test can be run only when in an asynchronous operation in non-error-correction mode (normal).

&T0 - N/A

&T1 - N/A

This test is not available because it requires error correction to be disabled.

&Y: Designate a Default Reset Profile

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

&Y0 - The modem will use profile 0.

&Y1 - The modem will use profile 1.

&W: Store Current Configuration

Saves the current (active) configuration (profile), including S-Parameters, in one of the two user profiles in NVRAM as denoted by the parameter value. The current configuration is comprised of a list of storable parameters illustrated in the &V command. These settings are restored to the active configuration upon receiving a Zn command or at power up (see &Yn command).

&W0 Store the current configuration as profile 0.

&W1 Store the current configuration as profile 1.

&Z: Store Telephone Number

The modem can store up to four telephone numbers and each telephone number dial string can contain up to 31 digits.

&Z<value>=<string>

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

<string> Dial string from 0 to 31 characters.

Modulation Control

+MS: Modulation Selection

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

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

Where: Possible <carrier>, <min_tx_rate>, <max_tx_rate>, <min_rx_rate>, and <max_rx_rate> values are listed in are Table 3-2 (see definitions below).

Modulation	<carrier>	Possible (<min tx/rx rate>,<max tx/rx rate>) Rates
Bell 103	B103	300
Bell 212	B212	1200 Rx/75 Tx or 75 Rx/1200 Tx
V.21	V21	300
V.22	V22	1200
V.22 bis	V22B	2400 or 1200
V.23	V23C	1200
V.32	V32	9600 or 4800
V.32 bis	V32B	14400, 12000, 9600, 7200, or 4800
V.34	V34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
V.90	V90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
K56flex	K56	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000

Defined Values:

<carrier> A string which specifies the preferred modem carrier to use in originating or answering a connection. <carrier> values are strings of up to eight characters, consisting only of numeric digits and upper case letters. <carrier> values for ITU standard modulations take the form: <letter> <1-4 digits> <other letters as needed>. Defined values are listed in Table 3-2.

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

0 = Automode disabled.

1 = Automode enabled. (Default.)

<min_rx_rate> and <max_rx_rate> Numeric values which specify the lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate at which the modem may establish a receive connection. May be used to condition distinct limits for

the receive direction as distinct from the transmit direction. Values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 3-2.

Actual values will be limited to possible values corresponding to the entered <carrier> and fallback <carrier> as determined during operation. (Default = lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate supported by the selected carrier.)

<min_tx_rate> and <max_tx_rate> Numeric values which specify the lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate at which the modem may establish a transmit connection. Non-zero values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 3-2.

Actual values will be limited to possible values corresponding to the entered <carrier> and fallback <carrier> as determined during operation. (Default = lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate supported by the selected carrier.)

Reporting Supported Range of Parameter Values

Command: +MS=?

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

Example:

+MS:(B103,B212,V21,V22,V22B,V23C,V32,V32B,V34,K56,V90),(0,1),(300-33600),(300-33600),(300-56000),(300-56000)

+ES: Error Control and Mode Selection

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

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

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

0 Initiate call with Direct Mode.

2 Initiate V.42 w/o Detection Phase. If V.8 in use disable V.42 Detection Phase

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

4 Initiate MNP.

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

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

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

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

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

3 LAPM error control required; disconnect if error control is not established.

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

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

0 Direct Mode.

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

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

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

5 LAPM error control required; disconnect if error control is not established.

6 MNP error control required; disconnect if error control is not established.

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

Reporting Supported Range of Parameter Values

Command: +ES=?

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

+EB: Break Handling in Error Control

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

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

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

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

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

Reporting Current or Selected Values

Command: +EB?

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

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

+ESR: Selective Repeat

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

+ESR=[<value>]

0 specifying that SREJ is not used.

+ER: Error Control Reporting

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

+ER=[<value>]

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

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

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

+ETBM: Call Termination Buffer Mgmt.

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

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

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

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

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

Reporting Current or Selected Values

Command: +ETBM?

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

\K: Break Control

Controls the response of the modem to a break received from the DTE.

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

\K0 - Enter on-line command mode, no break sent to the remote modem.

\K1 - Clear data 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.

The **second case** is where the modem is in the on-line command state (waiting for AT commands) during a data connection:

\K0 - Clear data buffers and send break to remote modem.

\K2 - Send break to remote modem immediately.

\K4 - Send break to remote modem in sequence with data.

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

\K0 - Clears data buffers and sends break to the DTE.

\K2 - Send a break immediately to DTE.

\K4 - Send a break in sequence with received data to DTE.

-K: MNP Extended Services

Enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection.

-K0 - Disables V.42 LAPM to MNP 10 conversion. (Default.)

-K1 - Enables V.42 LAPM to MNP 10 conversion.

-K2 - Enables V.42 LAPM to MNP 10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

Data Compression

+DS: Data Compression

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

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

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

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

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

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

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

<**max_dict**> Specifies the maximum number of dictionary entries (2048 entries) which should be negotiated (may be used by the DTE to limit the codeword size transmitted, based on its knowledge of the nature of the data to be transmitted).

<**max_string**> Specifies the maximum string length (32 bytes) to be negotiated (V.42bis P2).

Reporting Current or Selected Values

Command: +DS?

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

+DR: Data Compression Reporting

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

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

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

Reporting Current or Selected Values

Command: +DR?

Example: +DR: (0,1)

+DR: <type> Intermediate Result Code

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

The format of this result code is:

+DR: <type>

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

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

ALT MNP 5 compression.

%C: Enable/Disable Data Compression

Enables or disables data compression negotiation. The modem can only perform data compression on an error corrected link.

%C0 - N/A

%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. (Default.)

Note: Data Compression required for encryption.

DTE-Modem Interface Commands

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

E: Command Echo

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

E0 - Disables command echo.

E1 - Enables command echo. (Default.)

Q: Quiet Results Codes

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

Q0 - Enables result codes to the DTE. (Default.)

Q1 - Disables result codes to the DTE.

V: Result Code Form

This command selects the sending of short-form or long-form result codes to the DTE. The parameter, if valid, is written to S14 bit 3.

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.)

W: Connect Message Control

This command controls the format of CONNECT messages. The actual result code messages reported reflect the W command setting and the S95 bit settings. (Also see +MR, +ER, and +DR commands.)

W0 - Upon connection, the modem reports only the DTE speed, (Default.)

W1 - Upon connection, the modem reports the modulation, line speed, the error correction protocol, and the DTE speed, respectively.

W2 - Upon connection, the modem reports the DCE speed.

&V - Display Current Configuration

This command reports the current (active) configuration, the stored (user) profiles, and the first four stored telephone numbers. The stored profiles and telephone numbers.

ACTIVE PROFILE:

```
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &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
```

STORED PROFILE 0:

```
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &K3 &Q5
&R1 &S0 &T4 &X0
S00:002 S02:043 S06:002 S07:030 S08:002 S09:006
S10:014 S11:095 S12:050 S18:000 S36:007 S37:000
S40:105 S41:003 S46:138 S95:000
```

STORED PROFILE 1:

```
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &K3 &Q5
&R1 &S0 &T4 &X0
S00:002 S02:043 S06:002 S07:030 S08:002 S09:006
S10:014 S11:095 S12:050 S18:000 S36:007 S37:000
S40:105 S41:003 S46:138 S95:000
```

TELEPHONE NUMBERS:

```
0 = 1 =
2 = 3 =
```

T: Tone dialing

Causes subsequent dial digits to be executed as DTMF tones.

&V1: Display Last Connection Status

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

```
TERMINATION REASON..... LOCAL REQUEST
LAST TX rate..... 26400 BPS
HIGHEST TX rate..... 26400 BPS
LAST RX rate..... 49333 BPS
HIGHEST RX rate..... 49333 BPS
PROTOCOL..... LAPM
COMPRESSION..... V42Bis
Line QUALITY..... 038
Rx LEVEL..... 015
Highest Rx State..... 67
Highest TX State..... 67
EQM Sum..... 00B4
Min Distance..... 0000
RBS Pattern..... 00
Rate Drop..... 00
Digital Loss..... 2000
Local Rtrn Count..... 00
Remote Rtrn Count..... 00
Flex 9481814347C4
```

***B: Blacklisted Number**

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

Example:

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

***D: Delayed Numbers**

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

Example:

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

&B: CTS/DCD Control

Controls the activity of the CTS and DCD signals on the RS-232 interface port. This command should only be used for out-of-band management applications with the CryptoCom.

&B0 Normal CTS/DCD signal operation.

&B1 CTS on all the time, DCD operates as normal (requires &K0 to be set).

&B2 CTS and DCD on all the time (requires &K0 to be set).

The &B command overrides other configuration commands for CTS and DCD.

+IPR: Fixed DTE Rate

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

+IPR=0 - Automatically detect DTE rate (Default).

+IPR=300 - 300bps
+IPR=1200 - 1,200bps
+IPR=2400 - 2,400bps
+IPR=4800 - 4,800bps
+IPR=9600 - 9,600bps
+IPR=19200 - 19,200bps
+IPR=38400 - 38,400bps
+IPR=57600 - 57,600 bps
+IPR=115200 - 115,200bps

If unspecified or set to 0, automatic detection is selected and the character format is also forced to autodetect, +ICF=0.

Reporting Supported Range of Parameter Values

Command: +IPR=?

Response: +IPR (<rate> range)

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

+ILRR: DTE-Modem Local Rate Reporting

This extended-format numeric parameter controls whether or not the extended-format information text is transmitted from the modem to the DTE.

+ILRR=0 - Disables reporting of local port rate (+ILRR: is not transmitted). (Default.)

+ILRR=1 - Enables reporting of local port rate (+ILRR: is transmitted).

Reporting Current or Selected Values

Command: +ILRR?

Response: +ILRR: <current value>

Example: +ILRR: 0

X: Extended Result Codes

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

X0 - Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE.

X1 - Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX (XXXX = rate). Blind dialing enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE.

X2 - Disables reporting 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.

X3 - Enables reporting of busy tones; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX. Blind dialing is enabled/disabled by country parameters. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported.

X4 - Enables reporting of busy tones; send all messages. (Default.)

&C: RLSD (DCD) Option

The modem controls the RLSD.

&C0 - RLSD remains ON at all times.

&C1 - RLSD follows the state of the carrier. (Default.)

&D: DTR Option

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

&D0 - DTR drop is interpreted according to the current &Qn setting as follows: &Q0, &Q5, &Q6 DTR is ignored (assumed ON). Allows operation with DTEs which do not provide DTR.

&Q1 DTR drop causes the modem to hang up. Autoanswer is not affected.
&Q2, &Q3 DTR drop causes the modem to hang up. Autoanswer is inhibited.

&D1 - DTR drop is interpreted according to the current &Qn setting as follows: &Q0, &Q1, &Q5, &Q6 DTR drop is interpreted by the modem as if the asynchronous escape sequence had been entered. The modem returns to asynchronous command state without disconnecting.
&Q2, &Q3 DTR drop causes the modem to hang up. Autoanswer is inhibited.

&D2 - DTR drop is interpreted according to the current &Qn setting as follows: &Q0 through &Q6 DTR drop causes the modem to hang up. Autoanswer is inhibited. (Default.)

&D3 - DTR drop is interpreted according to the current &Qn setting as follows: &Q0, &Q1, &Q5, &Q6 DTR drop causes the modem to perform a soft reset as if the Z command were received. The &Y setting determines which profile is loaded. &Q2, &Q3 DTR drop causes the modem to hang up. Autoanswer is inhibited.

&K: Flow Control

This command defines the DTE/DCE (terminal/modem) flow control mechanism.

&K0 - Disables flow control.

&K3 - Enables RTS/CTS flow control. (Default)

&K4 - Enables XON/XOFF flow control.

&K5 - Enables transparent XON/XOFF flow control.

&M: Asynchronous/Synchronous Mode

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

&M0 - Selects direct asynchronous operation.

&Q: Async/Sync 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 command is issued to select the mode, the subsequent connect message will report the DCE speed regardless of the W command and S95 settings.

&Q0 Selects direct asynchronous operation.

The CryptoCom 2000 ONLY operates in Asynchronous mode.

&R: RTS/CTS Option

This selects how the modem controls CTS. CTS operation is modified if hardware flow control is selected (see &K command).

&R0 - CTS is normally ON and will turn OFF only if required by flow control.

&S: DSR Override

This command selects how the modem will control DSR.

&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.

S-REGISTER DESCRIPTIONS

The complete set of S-registers is listed below with the corresponding bit maps where applicable. All values are in decimal format. Default values indicated in bold type are those written after execution of the &F command (factory default). If the register TYPE is non-storable then this default value will also be written whenever CRYPTOCOM is reset. For storable registers, however, the value after reset will be set to that stored in the appropriate stored profile.

Any register not specifically mentioned below is reserved.

S0: Rings To Auto-Answer

0 = No auto answer
1 to 255 CRYPTOCOM answers after this number of rings
Default = 0
TYPE: Storable

S1: Ring Counter

This register is reset to 0 if 8 seconds elapse since receipt of the previous ring
Default = 0
TYPE: Non-Storable, read only

S2: Escape Sequence Character

If the value is greater than 127, escape sequence is disabled
Default = 43 (+)
TYPE: Storable

S3: Carriage Return Character

Value: 0 - 127
Default = 13 (ASCII CR)
TYPE: Storable

S4: Line Feed Character

Value: 0 - 127
Default = 10 (ASCII LF)
Type: Storable

+IFC: DTE-Modem Local Flow Control

This extended-format compound parameter controls the operation of local flow control between the DTE and the modem during the data state when V.42 error control is used. It accepts two numeric subparameters.

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

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

+IFC=0 - None.
+IFC=1 - XON/XOFF on transmitted data (XON/XOFF on transmit data); do not pass XON/XOFF characters to the remote modem.
+IFC=2 - Circuit 133 (Ready for Receiving). (Default.)

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

<DTE_by_modem>

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

Reporting Current or Selected Values

Command: +IFC?

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

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

Reporting Supported Range of Parameter Values

Command: +IFC=?

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

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

": Request Modem Serial Number

This command requests the manufacturer serial number of the CryptoCom 2000 modem. This is the same serial number that is on the exterior of the modem.

Reporting Current or Selected Values

Command: "?

Response: 40100069

4. S-REGISTERS

S-registers are byte-wide locations in CRYPTOCOM memory that contain information about the configuration and operational status of CRYPTOCOM. Some of the more relevant S-Registers are shown on the following pages. Many of CRYPTOCOM's options can be directly set via the S-registers and some extended features are only available through setting of these registers.

Some S-registers are bit-mapped, that is, the individual bits (or, sometimes, groups of bits) contain significant information as opposed to the contents of the register as a whole. When references to bit-mapped registers are made, the least significant bit is bit 0 while the most significant bit is bit 7.

Reading an S-register

□ To display the value of an S-register in decimal format the command Sn? is used where 'n' references the desired register.

Writing an S-register

□ An S-register's value may be altered by the Sn=X command where 'n' is the register to be changed and 'X' is the new decimal value to be assigned to it.

Defaults

□ Entering AT? will display the content on the last register accessed while AT=n will alter the last accessed S register with the decimal value 'n'

□ If the Sn=X command is used and the value 'X' is not given, zero will be written to the appropriate S-register.

□ Unless otherwise specified, any value between 0 and 255 (decimal) may be written to an S-register. Out of range values are rejected and cause a command processing error.

S22: Bit-mapped

S22 indicates the status of command options, default: 117, Storable.

Bits 0-1 Speaker volume (Ln)

- 0 = Off (L0)
- 1 = Low (L1)**
- 2 = Medium (L2)
- 3 = High (L3)

Bits 2-3 Speaker control (Mn)

- 0 = Disabled (M0)
- 1 = Off on carrier (M1)**
- 2 = Always on (M2)
- 3 = On during handshake (M3)

Bits 4-6 Limit result codes (Xn)

- 0 = X0
- 4 = X1
- 5 = X2
- 6 = X3
- 7 = X4**

Bit 7 Reserved

S23: Bit-mapped

Bit 0-6 Reserved

- Bit 6-7 **0 = None (&G0)**
- 1 = None (&G1)
 - 2 = 1800 Hz (&G2)

TYPE: Storable

S24: Sleep Inactivity Timer

Value: 0 - 255 in 1 s increments (0 - 255 s)

Default = 0

TYPE: Storable

S25: DTR Detection

Value: 0 - 255 in 0.01 s increments (0 - 2.55 s)

Default = 5

TYPE: Storable

S5: Backspace Character

Value: 0 - 255

Default = 8 (ASCII BS)

TYPE: Storable

S6: Wait Time Before Dialing

Value: 2 - 255 s

Default = 2

TYPE: Storable

S7: Wait Time For Carrier/Silence/Dial Tone

Value: 1 - 255 s

Default = 50

TYPE: Storable

S8: Duration for Pause (,) Dial Modifier

Value: 0 - 255 s

Default = 2

TYPE: Storable

S9: Carrier Detect Response Time

Value: 1 - 255 in 0.1 s increments (.1 - 25.5 s)

Default = 6

TYPE: Storable

S10: Lost Carrier to Hang Up Delay

Value: 1 - 255 in 0.1 s increments (.1 - 25.5 s)

Default = 14

TYPE: Storable

S11: DTMF Tone Duration

Value: 50 - 255 in 0.001 s increments (.05 - .255 s)

Default = 95

TYPE: Storable

S12: Escape Prompt Delay

Value: 0 - 255 in 0.02 s increments (0 - 5.1 s)

0 = Do not check Escape Prompt Delay

Default = 50

TYPE: Storable

S14: Bit-mapped

S14 indicates the status of command options, default: 138

- Bit 0 This bit is ignored
 - Bit 1 Echo command characters (En)
0 = Disabled (E0)
2 = Enabled (E1)
 - Bit 2 Generate result codes (Qn)
0 = Send result codes (Q0)
4 = Do not send result codes
 - Bit 3 Verbose/numeric result codes (Vn)
0 = Numeric (V0)
8 = Verbose (V1)
 - Bit 5 Tone (T)/ Pulse (P)
0 = Tone dialing (T)
32 = Pulse dialing (P)
 - Bit 6 Reserved
 - Bit 7 0 = Answer mode
128 = Originate mode
- TYPE: Storable

S16: Test Status (Bit-mapped)

Indicates the test in progress status:

- Bit 0 Local Analog Loopback (&T1)
0 = No ALB
1 = ALB active (&T1)
- Bit 1-7 Not Used

S21: Bit-mapped

- Bit 0 Reserved
- Bit 1 Reserved
- Bit 2 CTS Behavior (&Rn)
0 = CTS tracks RTS (&R0)
4 = CTS always on (&R1)
- Bit 3,4 DTR control (&Dn)
0 = Ignore (&D0)
8 = Command state (&D1)
16 = Hang up (&D2)
24 = Reset (&D3)
- Bit 5 RLSD (DCD) behavior (&Cn)
0 = &C0 selected
1 = &C1 selected
- Bit 6 DSR behavior (&Sn)
0 = &S0 selected
1 = &S1 selected
- Bit 7 Long space disconnect (Yn)
0 = Y0
1 = Y1

S38: Delay before Forced Hangup

S38 specifies the delay between the modem's receipt of the H command to disconnect (or ON-to-OFF transition of DTR if the modem is programmed to follow the signal), and the disconnect operation.

0 to 254, the modem will wait that number of seconds for the remote modem to acknowledge all data in the modem buffer before disconnecting.

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: Bit-mapped

Bits 2,1,0 DTE flow control
0 = No DTE flow control
3 = RTS/CTS (&K3)
4 = XON/XOFF (&K4)
5 = XON/XOFF transparent (&K5)

TYPE: Storable

S41: Bitmapped

Bits 0-1 Compression selection (%Cn)
0 = Disabled (%C0)
1 = MNP 5 (%C1)
2 = V.42 bis (%C2)
3 = MNP 5 and V.42 bis (%C3)
Bits 2,6 Auto retrain and fallback/fall forward (%En)
0 = Disable (%E0)
4 = Retrain enabled (%E1)
8 = Fallback/Fall Forward enabled (%E2)

TYPE: read only

S46: Data Compression Control

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

S27: Bitmapped

Bit 6 Bell / CCITT (B CMD)
0 = CCITT
64 = Bell

TYPE: Storable

S27: Bitmapped

S28 indicates bit mapped options status, default: 0

Bits 0 - 1 Reserved
Bit 2 Reserved (always 0).
Bits 3 - 4 Pulse dialing (&Pn)

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

Bit 5-7 Reserved

S29: Flash Dial Modifier Time

S29 sets the length of time, in units of 10 ms, that the modem will go on-hook when it encounters the flash (!) dial modifier in the dial string. The time can be limited as it is a country dependent parameter.

Range: 0-255 10 ms intervals
Default: 70 (700 ms)

S30: Disconnect Inactivity Timer

S30 sets the length of time, in tens of seconds, that the modem will stay online before disconnecting when no data is sent or received. In error-correction mode.

Value: 0 - 255 in 10 s increments (10 - 2550 s)
0 - timer disabled

Default = 0
Type: Storable

S31: Bit-mapped

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

S36: LAPM Failute Control

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

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

Bits 3-7 Reserved

S48: V.42 Negotiation Control

The V.42 negotiation process determines capabilities of the remote modem

- S48=0 Disable negotiation
- S48=7 Enable negotiation**
- S48=128 Disable negotiation

S86: Call Failure Indication

- S86=0 Normal hangup, no error occurred.
- 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=12 Normal hangup initiated by the remote modem.
- S86=13 Retransmission limit reached.
- S86=14 Protocol violation occurred.
- S86=15 Lost DTR.
- S86=16 Received GSTN cleardown.
- S86=17 Inactivity timeout.
- S86=18 Speed not supported.
- S86=19 Long space disconnect.
- S86=20 Key abort disconnect.
- S86=21 Clears previous disconnect reason.
- S86=22 No connection established.
- S86=23 Disconnect after three retrains.
- S86=26 Remote hangup detected.

S95: Extended Results Codes Control

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

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

The following commands are used while in CryptoOfficer mode. These commands are issued to verify configuration parameters of the security settings used in the CryptoCom

+USERID=?

The +USERID query command is used to view the USERID setting:

AT+USERID=?

Response: WDC_TEST

+KEYz=?

The +KEYz=? command is used to view the various encryption keys stored in the CryptoCom memory.

AT+KEYz=?

where z is the number of the key to be viewed (1,2 or 3)

Example: AT+KEY1=?

Response: 01,23,45,67,89,AB,CD,EF

5. Data Encryption & Security

The Western DataCom(WDC) CRYPTCOM 2000 is a NIST DES/3DES encryption modem. It uses symmetric key encryption to protect the data transmitted and received.

In order to configure the CryptoCom security parameters you must first enter the CryptoOffice mode. CryptoOfficer mode is entered using the following command.

+CID Command

The +CID command is used to enter the CryptoOffice mode. This mode is used to store, clear and view security parameters, its format is:

+CID=yyyyyyyyyy

where y is CryptoOfficer password.

When in CryptoOfficer mode a CO> prompt will proceed all commands denoting you are in a sensitive state. To exit simply cycle the power. The default CryptoOfficer password is **cryptocom** and the password is NOT case sensitive.

Once you are in the CO mode you can configure the required security parameters for secure operation. These parameters include changing the CO password, setting the UserID and configuration Encryption Keys. From the factory the following security parameters are configured:

COPIN = CRYPTOCOM

USERID = WDC_TEST

KEY1 = 0123456789ABCDEF

KEY2 = 0102040810204080

KEY3 = FEDCBA9876543210

+COPIN Command

The **+COPIN** command is used to set the CryptoOffice Password of a particular modem. This password is used to protect the security parameters stored in the modem, its format is:

AT+COPIN=xxxxxxxx

where x is up to 9-characters (NOT case sensitive).

NOTE: This command can only be used when in CryptoOfficer Mode.

+USERID Command

The **+USERID** command is used to set the User ID of a particular modem. This User ID is used to determine what security parameters the modem uses during a connection attempt, its format is:

AT+USERID=xxxxxxxx

where x is the 8-character ASCII User ID.

+KEY Command

The **+KEY** command is used to set the Encryption Key(s) of the modem. The encryption keys are used to generate the session key for each connection the modem establishes, its format is:

AT+KEYz=yy,yy,yy,yy,yy,yy,yy,yy

where z is the key number (1,2,3) and y is the HEX value for the encryption key. Three keys are required for Triple DES operation.

NOTE: This command can only be used when in CryptoOfficer Mode.

Since the CryptoCom uses symmetric encryption it is important to remember that all CryptoCom modems that communicate with each other must have matching USERID's and KEY's.

+NEWID Command

The **+NEWID** command is used to remotely change USERID's. The new ID is stored in memory and upon a connection is loaded into the remote CryptoComs permanent memory. When the units disconnect the NEWID is validated and replaces the previous ID.

AT+NEWID=xxxxxxxx

where x is an 8 character ASCII userid.

NOTE: This command can only be used when in CryptoOfficer Mode.

+NEWKEY Command

The **+NEWKEY** command is used to remotely change KEY's. The new KEY is loaded into memory and upon a connection is loaded into the remote CryptoComs permanent memory.

AT+NEWKEYz=yy,yy,yy,yy,yy,yy,yy,yy

where z is the key number (1, 2 or 3) and y is the 16 character HEX key.

All 3 keys must be replaced at one time. In manual key changing operation (without the use of the LineGuard 9000) only the remote CryptoCom Keys are changed. This facilitates the changing of many remotes without affecting connectivity. In addition, when changing the USERID in manual mode only the remote CryptoCom USERID's is changed.

NOTE: This command can only be used when in CryptoOfficer Mode.

APPENDIX D - HEX TABLE

ASCII VALUE	HEX VALUE	CONTROL CHARACTER	KEY	ASCII VALUE	HEX VALUE	CONTROL CHARACTER	KEY
000	000	NUL	CTRL-0	064	040		@
001	001	SOH	CTRL-A	065	041		A
002	002	STX	CTRL-B	066	042		B
003	003	ETX	CTRL-C	067	043		C
004	004	EOT	CTRL-D	068	044		D
005	005	ENG	CTRL-E	069	045		E
006	006	ACK	CTRL-F	070	046		F
007	007	BEL	CTRL-G	071	047		G
008	008	BS	CTRL-H	072	048		H
009	009	HT	CTRL-I	073	049		I
010	00A	LF	CTRL-J	074	04A		J
011	00B	vr	CTRL-K	075	04B		K
012	00C	FF	CTRL-L	076	04C		L
013	00D	CR	CTRL-M	077	04D		M
014	00E	SO	CTRL-N	078	04E		N
015	00F	SI	CTRL-O	079	04F		O
016	010	DLE	CTRL-P	080	050		P
017	011	oci	CTRL-Q	081	051		Q
018	012	DC2	CTRL-R	082	052		R
019	013	OC3	CTRL-S	083	053		S
020	014	DC4	CTRL-T	084	054		T
021	015	NAK	CTRL-U	085	055		U
022	016	SYN	CTRL-V	086	056		V
023	017	ETB	CTRL-W	087	057		W
024	018	CAN	CTRL-X	088	058		X
025	019	EM	CTRL-Y	089	059		Y
026	01A	SUB	CTRL-Z	090	05A		Z
027	01B	ESC	CTRL-[	091	05B		[
028	01C	FS	CTRL-\	092	05C		\
029	01D	GS	CTRL-]	093	05D]
030	01E	RS	CTRL-^	094	05E		^
031	01F	US	CTRL-~	095	05F		~
032	020	SPACEBAR		096	060		
033	021	!		097	061		a
034	022	"		098	062		b
035	023	#		099	063		c
036	024	\$		100	064		d
037	025	%		101	065		e
038	026	&		102	066		f
039	027	'		103	067		g
040	028	(		104	068		h
041	029	)		105	069		i
042	02A	*		106	06A		j
043	02B	+		107	06B		k
044	02C	,		108	06C		l
045	02D	-		109	06D		m
046	02E	.		110	06E		n
047	02F	/		111	06F		o
048	030	0		112	070		p
049	031	1		113	071		q
050	032	2		114	072		r
051	033	3		115	073		s
052	034	4		116	074		t
053	035	5		117	075		u
054	036	6		118	076		v
055	037	7		119	077		w
056	038	8		120	078		x
057	039	9		121	079		y
058	03A	:		122	07A		z
059	03B	;		123	07B		{
060	03C	<		124	07C		|
061	03D	=		125	07D		}
062	03E	>		126	07E		~
064	03F	?		127	07F		DELETE

APPENDIX A - TROUBLESHOOTING

Troubleshooting and useful hints

In the unlikely event that you experience a problem with your CRYPTOCOM modem, please first attempt to identify it in the following list.

If the Modem does not respond to AT commands are:

- Make sure the COM port setting of the modem and communications software does not conflict with another peripheral in your computer.
- Make sure that a supported character format has been selected.
- Make sure that local character echo is on (ATE command)

If the Modem responds with NO DIAL TONE:

- Make sure that the phone line is properly connected between the wall jack and the modem.

If you are unable to get an MNP/V.42 connection:

- The remote modem may not be able to support this mode.
- Make sure the modem has been set for this mode.

If the connection drops immediately after the connection message is displayed:

- Make sure that the User ID's are set to the same on both modems attempting to communicate.

If you see garbage data on the screen after a connection has been established:

- Make sure that the data and parity format selected matches that of the remote modem.
- Make sure that the encryption keys are set the same on both communicating modems.

If you get single bursts of errors on your screen:

- The line condition may be poor. Try using error correction.
- Make sure, if your line has call waiting, that you disable before every modem call.

If you observe problems during a file transfer:

- Make sure that the modem's flow control type setting (AT&K command) is in accordance with that of the communications software.

Hints

- Use the CryptoComs default configuration whenever possible..

APPENDIX B

RS-232C Interface

DB25 Female Pinout

V.24 CIRCUIT	PIN	FUNCTION	DIRECTION
101	1	Protective Ground	GND
102	7	Signal Ground	GND
103	2	Transmit Data	Input
104	3	Receive Data	Output
105	4	Request to Send	Input
106	5	Clear to Send	Output
107	6	Data Set Ready	Output
108	20	Data Terminal Ready	Input
109	8	Receive Line Signal Detect	Output
125	22	Ring Indicator	Output

Cable Pinouts

The CryptoCom 2000 has a standard RS-232C Interface that is used to communicate with other equipment. Typically this interface is connect to a serial interface of a computer (Com port). Using a standard interface allows the CryptoCom the flexibility to connect to other devices that utilize the RS-232 standard. Above is a table of the PIN's used by the CryptoCom to communicate; in order to communicate with other devices this pinout must be mapped to the hardware that the CryptoCom is attached too.

When used as an out-of-band management device the CryptoCom configuration needs to be set to ignore DTR since most devices will not supply this signal. The configure the CryptoCom to ignore DTR enter the following commad:

AT&D0&W <cr>

APPENDIX C - ASCII TABLE

ASCII VALUE	HEX VALUE	CONTROL CHARACTER	KEY	ASCII VALUE	HEX VALUE	CONTROL CHARACTER	KEY
000	000	NUL	CTRL-0	064	040		@
001	001	SOH	CTRL-A	065	041		A
002	002	STX	CTRL-B	066	042		B
003	003	ETX	CTRL-C	067	043		C
004	004	EOT	CTRL-D	068	044		D
005	005	ENG	CTRL-E	069	035		E
006	006	ACK	CTRL-F	070	046		F
007	007	BEL	CTRL-G	071	047		G
008	008	BS	CTRL-H	072	048		H
009	009	HT	CTRL-1	073	049		I
010	00A	LF	CTRL-J	074	04A		J
011	00B	vr	CTRL-K	075	04B		K
012	00C	FF	CTRL-L	076	04C		L
013	00D	CR	CTRL-M	077	04D		M
014	00E	SO	CTRL-N	078	04E		N
015	00F	Si	CTRL-O	079	04F		O
016	010	DLE	CTRL-P	080	050		P
017	011	oci	CTRL-Q	081	051		Q
018	012	DC2	CTRL-R	082	052		R
019	013	OC3	CTRL-S	083	053		S
020	014	DC4	CTRL-T	084	054		T
021	015	NAK	CTRL-U	085	055		U
022	016	SYN	CTRL-V	086	056		V
023	017	ETB	CTRL-W	087	057		W
024	018	CAN	CTRL-X	088	058		X
025	019	EM	CTRL-Y	089	059		Y
026	01A	SUB	CTRL-Z	090	05A		Z
027	01B	ESC	CTRL-[	091	05B		[
028	01C	FS	CTRLA	092	05C		\
029	01D	GS	CTRL-1	093	05D]
030	01E	RS	CTRL-1	094	05E		^
031	01F	US	CTRL-	095	05F		~
032	020		SPACEBAR	096	060		
033	021		!	097	061		a
034	022		"	098	062		b
035	023		#	099	063		c
036	024		\$	100	064		d
037	025		%	101	065		e
038	026		&	102	066		f
039	027		'	103	067		g
040	028		(	104	068		h
041	029		)	105	069		i
042	02A		*	106	06A		j
043	02B		+	107	06B		k
044	02C		,	108	06C		l
045	02D		-	109	06D		m
046	02E		.	110	06E		n
047	02F		/	111	06F		o
048	030		0	112	070		p
049	031		1	113	071		q
050	032		2	114	072		r
051	033		3	115	073		s
052	034		4	116	074		t
053	035		5	117	075		u
054	036		6	118	076		v
055	037		7	119	077		w
056	038		8	120	078		x
057	039		9	121	079		y
058	03A		:	122	07A		z
059	03B		;	123	07B		{
060	03C		<	124	07C		|
061	03D		=	125	07D		}
062	03E		>	126	07E		~
064	03F		?	127	07F		DELETE

APPENDIX H - SUPPORT

Technical Support

Western DataCom would like to thank you for purchasing its products. We strive to provide products that will remain reliable through out their lifecycle. All products are warranted for 12-months from the date of purchase to be free of defects. Western DataCom also provides free technical support for the lifetime of the product.

To contact our technical support team please use one of the following methods:

Toll Free: 800-262-3311

International: +01 440-835-1510

Internet: <http://www.western-data.com>

Email: support@western-data.com

Fax: +01 440-835-9146

APPENDIX E - HEX to BINARY

Binary | HEX Table

0001	1	0001	1
0010	2	0010	2
0011	3	0011	3
0100	4	0100	4
0101	5	0101	5
0110	6	0110	6
0111	7	0111	7
1000	8	1000	8
1001	9	1001	9
1010	A	1010	A
1011	B	1011	B
1100	C	1100	C
1101	D	1101	D
1110	E	1110	E
1111	F	1111	F

The encryption keys are made up of 8 pairs of hexadecimal numbers (0 thru F). When creating encryptions keys the user must note that each HEX pair must be of odd parity. To verify that a key has odd parity you must first convert the key pairs from HEX to BINARY. Once in BINARY each pair will be represented in 1's and 0's. To determine the parity of each pair count the number of 1's if the total is an odd number you have odd parity. See the following example:

0123456789ABCDEF

01 is the first pair 23 is the second pair and so on. Convert 01 to BINARY:

0000 0001 -----> Total number of 1's is one (which is odd)

0010 0011 -----> Total number of 1's is three (which is also odd)

If the key is not entered with odd parity the CryptoCom will automatically convert it internally.

APPENDIX F

SPECIFICATIONS

- Protocols: V.90, K56flex, V.34bis, V.34, V.32bis, V.32, V.23, V.22bis, V.22, V.21, Bell 212 and Bell 103
- Non-Secure Transmission rate: 56,000 bps, 54,000 bps, 52,000 bps, 50,000 bps, 48,000 bps, 46,000 bps, 44,000 bps, 42,000 bps, 40,000 bps, 38,000 bps, 36,000 bps, 34,000 bps, 33,600bps, 32,000 bps, 31,200bps, 28,800bps, 26,400bps, 24,000bps, 21,600bps, 19,200bps, 16,800bps, 14,400bps, 12,000bps, 9600 bps, 7200bps, 4800bps, 2400bps, 1200bps, 1200bps/75bps, 600bps, 300bps.
- Secure Transmission rate: 33,600 bps, 31,200 bps, 28,800 bps, 26,400 bps, 24,000 bps, 21,600 bps, 19,200 bps, 14400 bps, 12000 bps, 9600 bps, 7200 bps, 4800 bps, 2400 bps, 1200 bps, 300 bps.
- Default transmit level: -9 dBm \pm 1 dBm
- Receive signal frequency tolerance \pm 7Hz
- Receive sensitivity: 0 dBm to -43 dBm
- Rate tolerance \pm /.01 %
- Flow control: RTS/CTS, XON/XOFF
- Data format: 7 data bits with mark, space or odd parity and 1 or 2 stop bits; 8 data bits with no parity and 1 or 2 stop bits
- Communication medium: 2 wire dial-up or lease line
- Hardware requirements: Computer or terminal with serial RS-232 port
- Typical power consumption: 750 mW

APPENDIX G

Additional Configuration Commands

The CryptoCom has to many AT commands to list in this manual. The commands shown in the previous sections are the most relevant for the everyday user. The following are a few commands that may be of help in configuring the modem:

+MS Command

The +MS command is used to force the modem to connect at a certain speed using a particular protocol (i.e. 9600 - V.32bis). The ability to force various connection speeds with certain protocols can be advantagous for various applications. Its format is:

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

Modulation	<carrier>	Possible min_/max_ Rates in Bps
Bell 103	B103	300
Bell 212	B212	1200 Rx/75Tx or 75Rx/1200Tx
V.21	V21	300
V.22	V22	1200
V.22bis	V22B	2400 or 1200
V.23	V23C	1200
V.32	V32	9600 or 4800
V.32bis	V32B	14400, 12000, 9600, 7200 or 4800
V.34	V34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400
V.90	V90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
K56flex	K56	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000

APPENDIX J

Registration Numbers:

FCC Part 68 Registration Number: EJP USA-36168-M5-E

FCC Part 15 Class A - Approved

UL - Approved

CS03 Registration Number: 1041 11510 A

TBR21 Registration Number: 1043/01

CE - Approved

APPENDIX H

Additional Configuration Commands

<carrier> Defines what protocol the CryptoCom will use to establish the connection, as shown in the previous table (i.e. V34, connect using V.34 protocol).

<automode> Enables/Disables automatic modulation negotiation:

0 = Automode disabled

1 = Automode enabled

<min_rx_rate> Specifies the minimum receive rate based on the previous table (i.e. 2400 or 4800).

<max_rx_rate> Specifies the maximum receive rate based on the previous table (i.e. 14400 or 19200).

<min_tx_rate> Specifies the minimum transmit rate based on the previous table (i.e. 2400 or 4800).

<max_tx_rate> Specifies the maximum transmit rate based on the previous table (i.e. 2400 or 4800).

Example usage of +MS command:

AT+MS=V32B,1,9600,14400,9600,14400

The above example sets the CryptoCom to connect using the V.32bis protocol at a minimum speed of 9600 and a maximum of 14400 bps.

The **AT+MS?** will report the current +MS parameters.

APPENDIX H

Additional Configuration Commands

+IPR Command

The +IPR command is used to fix the DTE rate of the CryptoCom. The DTE rate is the speed at which the PC, or other device, communicates to the modem. This command is used when the device that the CryptoCom is connected does not have the ability to issue AT commands to the modem (i.e. Router, PBX Port, etc.). In the case of a device that cannot communicate directly with the CryptoCom the DTE speed should be fixed to match the speed of said device (i.e. router console port speed is 9600, CryptoCom should be configured at a fixed DTE speed of 9600). Its format is:

AT+IPR=<rate>

Where rate is 300,1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. For example to configure the CryptoCom with a fixed port speed of 9600 use the following:

AT+IPR=9600 <cr>

Please note: Upon power or reset this value will default to 0 even though the command has been set. This is an internal issue to the modem which has been manually corrected to reflect the speed setting.

** Command

The CryptoCom 2000 has been designed with flash upgradeable memory allowing users in the field to upgrade to latest firmware. To upgrade the CryptoCom the user will need to obtain an upgrade file from Western DataCom. At this time the upgrade process will be further explained to the customer. All firmware files are Digitally Signed for security, uploading of a non-secure file image will disable the modem from operation. Its format is:

AT**

APPENDIX I

Interational Operation

The CryptoCom 2000 has the ability to be configured from the factory to operate in foreign countries. This option can only be configured at the factory and is available for countries that belong to TBR21. The following is a list of TBR 21 approved countries:

Country	Code
Australia	09
Austria	0A
Belgium	0F
Denmark	31
Finland	3C
France	3D
Germany	42
Greece	46
Ireland	57

Country	Code
Italy	59
Netherlands	7B
Norway	82
Portugal	8B
Spain	A0
Sweden	A5
Switzerland	A6
UK	B4
TBR/CTR21	FD

North America

United States	B5
Mexico	B5
canada	B5

+GCI Command

The +GCI command is used to select the Country you are operating the CryptoCom in. Its format is:

AT+GCI=<country code>

Where <country code> is selected from the table above. Please note the CryptoCom will operate in other Countries, the list above is the Countries that the CryptoCom is approved to operate in (i.e. FCC, etc.).

ADDENDUM 1.4

+CALLBK Command

The CryptoCom 2000 now has the option of using callback security in addition to data encryption. Callback security is enabled using the +CALLBK command and the &Zn command.

+CALLBK=xx,yy

Where xx is to enable 01 or disable 00 callback operation and yy is to specify originate 01 or answer 00 mode.

In addition to configuring callback security the user must also use the &Z command to store a callback number on the answer modem.

&Zn

Where n is the telephone number of the modem that will be called back.

A sample configuration is as follows:

Modem 1 (originate)

AT+CALLBK=01,01

Modem 2 (answer)

AT+CALLBK=01,00

AT&Z4408351510

ADDENDUM 1.1

International Operation

The CryptoCom 2000 has the ability to be configured from the factory to operate in foreign countries. This option can only be configured at the factory and is available for countries that belong to TBR21. The following is a list of countries supported:

Country	Code
Australia	09
Austria	0A
Belgium	0F
Denmark	31
Finland	3C
France	3D
Germany	42
Greece	46
Ireland	57

Country	Code
Italy	59
Netherlands	7B
Norway	82
Portugal	8B
Spain	A0
Sweden	A5
Switzerland	A6
UK	B4
TBR/CTR21	FD

North America

United States	B5
Mexico	B5
canada	B5

In general the TBR/CTR21 setting in conjunction with the proper jumper configuration is the optimal setting for International usage. Should problems occur please try selecting the Country specific setting (i.e. for Germany try +GCI=FD or +GCI=42).

PLEASE NOTE: International operation requires special jumper settings from the factory.

ADDENDUM 1.2

+GCI Command

The +GCI command is used to select the Country you are operating the CryptoCom in. Its format is:

AT+GCI=<country code>

Where <country code> is selected from the table above. Please note the CryptoCom will operate in other Countries, the list in appendix I are the Countries that the CryptoCom is approved to operate in (i.e. FCC, etc.).

To view what countries your CryptoCom is capable of operating in use the +GCI command with modifier:

AT+GCI=?

Response:

(09,0A,0F,31,3C,3D,42,46,57,59,7B,82,8B,A0,A5,A6,B4,B5,FD)

+LL Command

The +LL command is used to select 2-wire leased line operating mode. The CryptoCom when used with a 2-wire adapter has the ability to operate over twisted pair leased lines.

+LL=xx,yy

Where xx is to enable 01 or disable 00 leased line mode and yy is to specify originate 01 or answer 00 mode.

ADDENDUM 1.3

An example of 2-wire leased line configuration is as follows:

Modem 1 (originate)

AT+LL=01,01

Modem 2 (answer)

AT+LL=01,00

In order for the modems to be able to sync up in leased line mode one unit has to be configured for originate and one unit for answer. In addition the security parameters need to be configured properly.

PLEASE NOTE: In order to operate in 2-wire lease line mode the modems must have the 2-wire adapter installed. The 2-wire adapter is available from Western DataCom. The order number for the 2-wire adapter is 900-4011, call for pricing.