CDM-570/570L

Installation and Operation Manual

CDM-570 - 70/140 MHz Satellite Modem
CDM-570L - L-band Satellite Modem
Optional IP Module
For Firmware Version 1.5.1 or higher
(see ***New in this Release*** – Section 1.5)

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.

Part Number MN/CDM570L.IOM Revision 4

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CDM-570/570L

Satellite Modem
Installation and Operation Manual
Addendum A

Subject: Incorporate NMCS Protocol
Part Number: MN/CDM570L.AA4
Addendum A
October 9, 2006

Special Instructions:

This document contains new information for the CDM-570/570L satellite modem installation and operation manual, part number MN/CDM570L.IOM Rev. 4 dated April 12, 2006.

Notes:

1. Insert this title page immediately *after* the manual title page to indicate that the manual was updated with this addendum.
2. To identify changes made to the previous edition, refer to the change bars located in the outside margins. [or:] Change bars were not utilized.

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Collating Instructions

To update the manual, remove and insert the pages as follows:

Remove	Insert
	Remote Control Section

CDM/CDD NMCS Protocol

Rev 1.0

Revision History

Date	Rev	Author	Comments
October 4, 2004	Draft 1.0	Wallace Davis	Created for Internal Distribution
3/01/05	Draft 1.1	Bryan Wilcutt	Modifications for implementation
6/27/05	Rev 1.0	Bryan Wilcutt	Released revision
11/10/2005	Rev 1.0	Harish Talanki	Modifications

Notes:

Table of Contents

1.0 Introduction

The scope of this document is to define the interface specification that will be used for a new Remote Control based interface to the CDM/CDD family of products. The primary interface is to be Telnet, however other interfaces may adapt to the **CIM** implementation, programmatically, via specific **API** calls.

2.0 Architecture

The Remote **NMCS** attaches to an external interface, such as Telnet, and processes basic text based commands to the **CiM** database manager. The database manager is responsible for resolving **GET** and **SET** actions to **Local** and **Remote** objects. (See Figure 1.)

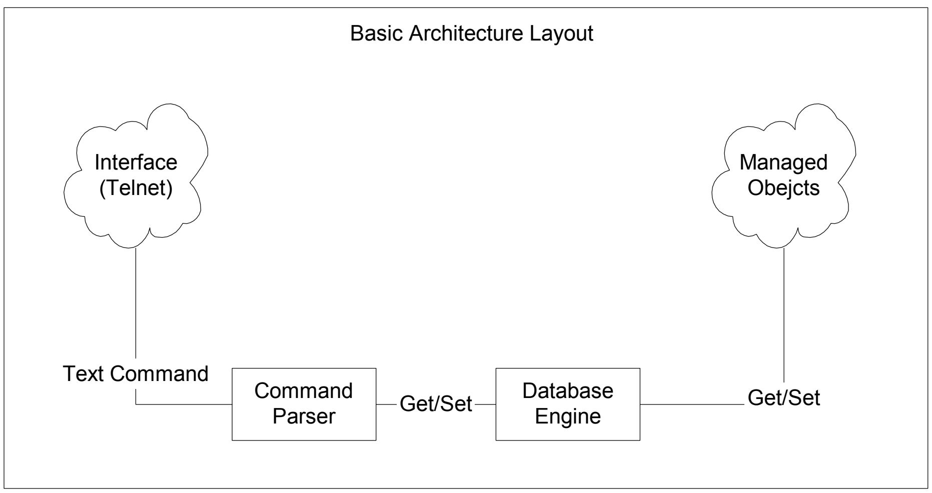


Figure 1. Architecture

NMCS Protocol

3.0 Introduction

The following sections outline the basic command set supported in this version of the **CIM NMCS** protocol.

3.1 Telnet interface

Telnet interface into the **NMCS** system must be on port 7023, which has been reserved for this protocol by the **IANA**.

The login process requires a name and password, which are defined by the systems administrator of the controlling equipment. This name and password is usually associated to the name and password of an administrator account.

3.2 Basic Protocol

All bytes within a command are printable ASCII characters, less than ASCII code 127. In this context, the **C**arriage **R**eturn (cr) and **L**ine **F**eed (lf) characters are considered printable.

All messages from controller to target require a response as indicated. This will be either to return data that has been requested by the controller, or to acknowledge reception of an instruction to change the configuration of the target.

3.3 Command Structure

Controller-to-target:

Start of Packet	Target Address	Address De-limiter	Instruction Code	Row Index (Optional)	Code Qualifier	Optional Arguments	End of Packet
< ASCII code 60 (1 character)	1 to 4 chars	/ ASCII code 47 (1 character)	(3 characters)	1 to 3 characters contained within [and] brackets.	= or ? ASCII code 61 or 63 (1 character)	(n characters)	Carriage Return And Line Feed. ASCII code 13 and code 10 [0x0D 0x0A] (2 character)

Example: <0135/TFQ=1949.2345{CR}

Example: <1/rte[1]=
rt1|239.022.033.044.32|1|**************|0011|0|0|0|0|3

Target-to-controller:

Start of Packet	Target Address	Address De-limiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	(4 characters)	/ ASCII code 47 (1 character)	(3 characters)	=, ?, !, *, # or ~ ASCII code 61, 63, 33, 42, 35, 126 (1 character)	(From 0 to n characters)	Carriage Return, Line Feed ASCII code 13,10 (2 characters)

Example: >0654/RSW=32{CR}{LF}

Example: <RTE[4]?
>0001/rte[4]=
rt4|239.022.033.044.32|1|**************|0011|0|0|0|0|3

3.3.1 Start Of Packet

Controller to Target: This is the character ‘<’ (ASCII code 60)

Target to Controller: This is the character ‘>’ (ASCII code 62)

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message. For multi line text message, each line should end with a new line character ‘\n’. The carriage return & new line [\r\n] combination should present only at the end of the message.

3.3.2 Address

Up to 9999 devices can be uniquely addressed. Even though the any number of devices can be addressed, but they all should be associated with single IP Address.

- For a CDM570, address of ‘1’ is being used to address both modulator and demodulator.
- For CDD564, each demodulator is identified by unique address from 1 to 4 respectively for all the four demodulators.

The address is not significant for commands targeted system wide. But, it does has significance when associated with demod specific commands like Frequency, data rate etc.

IMPORTANT

The controller sends a packet with the address of a target - the destination of the packet. When the target responds, the address used is the same address, to indicate to the controller the source of the packet. The controller does not have its own address.

3.3.3 Instruction Code

This is a three-character alphabetic sequence that identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance.

For example, TFQ stands for Transmit Frequency, RMD is for Receive Modulation type, etc. This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65 - 90).

3.3.4 Instruction Code Qualifier

This is a single character that further qualifies the preceding instruction code.

Code Qualifiers obey the following rules:

3.3.4.1 Controller to Target

The only permitted values are:
= (ASCII code 61)
? (ASCII code 63)

= Code	The **=** code (controller to target) is used as the assignment operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) which follow it. For example, in a message from controller to target, TFQ=0950.0000 would mean "set the transmit frequency to 950 MHz."
? Code	The **?** code (controller to target) is used as the query operator, and is used to indicate that the target should return the current value of the parameter defined by the preceding byte. For example, in a message from controller to target, TFQ? would mean 'return the current value of the transmit frequency'.

3.3.4.2 Target to Controller

The only permitted values are:

= (ASCII code 61)

! (ASCII code 33)

= Code	The **=** code (target to controller) is used in two ways: First, if the controller has sent a query code to a target (for example TFQ?, meaning 'what's the Transmit frequency?'), the target would respond with TFQ=xxxx.xxxx, where xxxx.xxxx represents the frequency in question. Second, if the controller sends an instruction to set a parameter to a particular value, then, providing the value sent in the argument is valid, the target will acknowledge the message by replying with TFQ= (with no message arguments).
! Code	The **!** code (target to controller) is only used as follows: If the controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is not valid, the target will acknowledge the message by replying (for example) with TFQ! (with no message arguments). This indicates that there was an error in the message sent by the controller.

If the controller sends an instruction to set a parameter to a particular value, and, if the value sent in the argument is valid, BUT the modem will not permit that particular parameter to be changed at that time, then the target will acknowledge the message by replying (for example) with TFQ! (with no message arguments).

If the controller sends an instruction code which the target does not recognize, then the target will acknowledge the message by echoing the invalid instruction, followed by the ! character. Example: XYZ!

Right now the CDM software is not organized to categorize various error codes, so it combines various errors into a single code (!).

3.3.5 Message Arguments

Arguments are not required for all messages. Arguments include ASCII codes for the characters 0 to 9 (ASCII 48 to 57), period (ASCII 46), and | (ASCII 124), plus miscellaneous printable characters.

3.3.6 Table Support Qualifier

In order to support accessing information that is represented in a table, the following syntax is supported.

3.3.6.1 Index

The desired row shall be encapsulated within '[' and ']' brackets. This option is only applicable for data that is represented as table. For example:

Get a route table entry (will return the contents of the four route table entry):

<1/RTE[4]?

Get a the entry route table (will return the contents of the four route table entry):

```
$NumEntries = <0/RTN?

for($I=1, $I<$NumEntries, $I++)
{
  entryInfo[$I] = <0/RTE[$I]?
}
```

To add a new route table entry:

```
$NumEntries = <0/RTN?
$NewRouteEntry = $NumEntries + 1

<1/RTE[$NewRouteEntry]=
rt4|239.011.033.022.32|1|192.168.001.221|00ab|1|0|1|4|3
```

To modify an existing route table entry:

```
<1/rte[1]=
rt4|239.011.033.022.32|1|192.168.001.221|00ab|1|0|1|4|3
```

3.3.6.2 Argument lists

In order to enforce atomic reads and writes and well as allow for checking related parameter for validity, multi-argument lists will have the following format:

- Arguments are positioned in fixed length format (see specification for each argument)
- `'|'` Is used to separate different argument values from each other.

3.3.7 End Of Packet

Controller to Target: This is the 'Carriage Return' character (ASCII code 13).

Target to Controller: This is the two-character sequence 'Carriage Return', 'Line Feed'. (ASCII code 13, and code 10.)

Both indicate the valid termination of a command.

3.4 Modem Commands

Unless otherwise specifically called out in the IP Commands section, the remaining commands are provided as part of the base modem command set and are defined in the CDM-570L modem manual.

Notes:

3.4.1 IP Commands

3.4.1.1 Admin Commands

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
System Working Mode	SWM=	1 byte, value of 0 through 1	Command or Query here: 1 -- Router - Small Network 2 -- Router - Large Network 3 -- Router - Point to Point 4 -- Router - Vipersat 5 -- Easy Connect. Router-Vipersat mode needs the vipersat option to be available on the modem. Changing the address/working mode may reboot the modem.	SWM= SWM!	SWM?	SWM =x (see description of arguments)
EasyConnect Multicast Option	EMO=	1 byte, value of 0 or 1	Command or Query where, 0=Disabled 1= Enabled Enables or disabled forwarding of multicast traffic while in EasyConnect mode. Valid only when in EasyConnect mode on 570.	EMO = EMO!	EMO?	EMO =x (see description of arguments)
Header Compression Refresh rate – UDP/RTP1	HRR=	3 bytes	Command or Query. Header compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for UDP/RTP1 streams. Example: HRR=50 Restrictions: 570 only	HRR = HRR!	HRR?	HRR =xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Header Compression Refresh rate – UDP	HRU=	3 bytes	Command or Query. Header compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for UDP only stream. Example: HRU =50 Restrictions: 570 only	HRU = HRU!	HRU?	HRU =xxx (see description of arguments)
Header Compression Refresh rate – All Others	HRA=	3 bytes	Command or Query. Header compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for all other streams. Example: HRU =50 Restrictions: 570 only	HRA = HRA!	HRA?	HRA =xxx (see description of arguments)
Payload Compression Refresh rate	PRA=	3 bytes	Command or Query. Payload compression refresh rate, 1 to 600 Resolution=1 packet Refresh rate for all other streams. Example: PRU =50 Restrictions: 570 only	PRA = PRA!	PRA?	PRA =xxx (see description of arguments)
Telnet timeout	TET=	2 bytes	Command or Query. Telnet log in timeout, 1 to 60 Resolution=1 minute Inactivity timeout on cli menu screen. Example: <1/TET=50	TET = TET!	TET?	TET =xx (see description of arguments)
Administrator UserName	ADU=	11 bytes No spaces allowed.	Command or Query. Change the administrator username, where: Example: ADU=comtech To get the new user name effective, ADP must be issued Immediately after ADU. Then query ADU? to see the new.	ADU = ADU!	ADU?	ADU =xxxxxxxxxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Administrator Password	ADP=	11 bytes No spaces allowed.	Command or Query. Change the administrator password, where: Example: ADP=comtech	ADP = ADP!	ADP?	ADP =xxxxxxxxxxx (see description of arguments)
ReadWrite UserName	RWU=	11 bytes No spaces allowed.	Command or Query. Change the ReadWrite username, where: Example: RWU =comtech To get the new user name effective, RWP must be issued Immediately after RWU.	RWU = RWU!	RWU?	RWU =xxxxxxxxxxx (see description of arguments)
ReadWrite Password	RWP=	11 bytes No spaces allowed.	Command or Query. Change the ReadWrite password, where: Example: RWP =comtech	RWP = RWP!	RWP?	RWP =xxxxxxxxxxx (see description of arguments)
ReadOnly UserName	ROU=	11 bytes No spaces allowed.	Command or Query. Change the ReadOnly username, where: Example: ROU =comtech To get the new user name effective, ROP must be issued Immediately after ROU.	ROU = ROU!	ROU?	ROU =xxxxxxxxxx (see description of arguments)
ReadOnly Password	ROP=	11 bytes No spaces allowed.	Command or Query. Change the ReadOnly password, where: Example: ROP =comtech	ROP = ROP!	ROP?	ROP =xxxxxxxxxxx (see description of arguments)
Access Client List	ACL=	18 bytes, numerical	Command or Query. Used to set the Access list entry, which contains a subnet and mask. Once the access list is enabled, only devices from the allowed ranges are allowed to communicate with the modem.: xxx.xxx.xxx.xxx/yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (0-31) Returns 000.000.000.000/32 when a particular Access Client is not configured. Example: <1/ACL[1]=010.006.030.001.24	ACL = ACL!	ACL?	ACL= xxx.xxx.xxx.xxx.yy (see description of arguments)
Access List Delete	ACD=x	1-byte numerical 1…4	Command only. Delete the specified access list entry from the access list table. <1/ACD=x, where x is value of 1…4	ACD= ACD!	N/A	ACD=x [1..4] (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IGMP enable/disable	IGE=	1 byte, value of 0 or 1	Command or Query where, 0=Disabled 1= Enabled Enables or disables the IGMP feature.	IGE = IGE!	IGE?	IGE =x (see description of arguments)
Access List Enforcement	ACE=	1 byte, value of 0 or 1	Command or Query where, 0=Disabled 1= Enabled Enables or disabled access list enforcement.	ACE = ACE!	ACE?	ACE =x (see description of arguments)
Ping Reply Enabled	PRE=	1 byte, value of 0 or 1	Command or Query where, 0=Disabled 1= Enabled Enables or disables ping reply. When disabled, the modem will not respond to pings (network security feature)	PRE = PRE!	PRE?	PRE =x (see description of arguments)
Telnet Enabled	TLE=	1 byte, value of 0 or 1	Command or Query where, 0=Disabled 1= Enabled Enables or disables the telnet interface. When disabled, the user will not be able to log in to the telnet interface.	TLE = TLE!	TLE?	TLE =x (see description of arguments)
SNMP Enabled	SPE=	1 byte, value of 0 or 1	Command or Query where, 0=Disabled 1= Enabled Enables or disables the snmp interface. When disabled, the user will not be able to use the snmp interface.	SPE = SPE!	SPE?	SPE =x (see description of arguments)
Downlink Route All Multicast	DRM=	1 byte, 0 or 1	Command or Query where, 0=Disabled 1=Enabled Enable/Disable Downlink Route All Multicast option.	DRM= DRM!	DRM?	DRM=x x – 0 or 1.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Trasnmit DES enable/disable	TDE=	1 byte, value of 0, 1, 2 or 3	Command or Query where, 0=Disabled 1= Enabled (EasyConnect Only mode) 2= PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) Acts as command, only in EasyConnect mode. In router mode, it's read-only. Enables or disables the Transmit 3xDES feature. Restriction: Can not enable if the 3xDES FAST feature has not been purchased	TDE = TDE!	TDE?	TDE =x (see description of arguments)
TX Header Compression enable/disable	THE=	1 byte, value of 0, 1, 2 or 3	Command or Query where, 0=Disabled 1= Enabled (EasyConnect Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) Acts as command, only in EasyConnect mode. In router mode, it's read-only. Enables or disables the Transmit 3xDES feature. Restriction: Can not enable if the 3xDES FAST feature has not been purchased	THE = THE!	THE?	THE =x (see description of arguments)
RX Header Compression enable/disable	RHE=	1 byte, value of 0, 1, 2 or 3	Command or Query where, 0=Disabled 1= Enabled Enables or disables the Transmit 3xDES feature. Restriction: Can not enable if the 3xDES FAST feature has not been purchased	RHE = RHE!	RHE?	RHE =x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
TX Payload Compression enable/disable	TPE=	1 byte, value of 0, 1, 2 or 3	Command or Query where, 0=Disabled 1= Enabled (EasyConnect Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) Acts as command, only in EasyConnect mode. In router mode, it's read-only. Enables or disables the Transmit 3xDES feature. Restriction: Can not enable if the 3xDES FAST feature has not been purchased	TPE = TPE!	TPE?	TPE =x (see description of arguments)
3xDES Encrypt Key	DEK[1..8]=	48 bytes, numerical	Command or Query. 3xDES encrypt key [192-Bit], where: Example: DEK[1]= 222222222222222244444444444444446666666666666666 All are Hexadecimal digits. [0…F], a total of 48 Hex digits.	DEK = DEK!	DEK[1..8]?	DEK= x [1..48] (see description of arguments)
3xDES Decrypt Key	DDK[1..8]=	48 bytes, numerical	Command or Query. 3xDES decrypt key, where: Example: DDK:0= 222222222222222244444444444444446666666666666666 All are Hexadecimal digits. [0…F], a total of 48 Hex digits.	DDK = DDK!	DDK[1..8]?	DDK =x [1..48] (see description of arguments)
SMTP Server IP Address	SIA=	15 bytes, numerical	Command or Query. Used to set the IP address of the SMTP server where mail should be sent, in the format: xxx.xxx.xxx.xxx is the IP address Example: <1/SIA=010.006.030.001. When not configured, it returns >0001/SIA=0.0.0.0	SIA = SIA!	SIA?	SIA = xx.xxx.xxx.xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
SMTP Domain Name	SDM=	128 bytes, characters, no spaces	Command or Query. SMTP Domain name of up to 128 characters. To delete the domain name, issue <1/SDM= Empty string will delete the domain name. Example: SMTP=somedomainname	SDM = SDM!	SDM?	SDM =x [1..128] (see description of arguments)
SMTP Destination Name	SDN=	128 bytes, characters,	Command or Query. SMTP Destination name of up to 128 characters. To delete the destination name, issue <1/SDN= Empty string will delete the domain name. Example: <1/SMTP=somedestinationname	SDN = SDN!	SDN?	SDN =x [1..128] (see description of arguments)
SNMP Read Community	SRC=	255 bytes, characters, no spaces	Command or Query. SNMP read community string. Empty string is not allowed Example: <1/SRC=public	SRC = SRC!	SRC?	SRC =x (see description of arguments)
SNMP Write Community	SWC=	255 bytes, characters, no spaces	Command or Query. SNMP write community string. Empty string is not allowed Example: <1/SWC =public	SWC = SWC!	SWC?	SWC =x (see description of arguments)
SNMP Trap Community	STC=	255 bytes, characters, no spaces	Command or Query. SNMP Trap community string. Empty string is not allowed Example: <1/STC =trapcomm	STC = STC!	STC?	STC =x (see description of arguments)
SNMP Trap Destination IP Address	STA=	15 bytes, Numerical	Command or Query. Used to set the IP address of the SNMP Trap destination IP Address where traps will be sent, in the format: xxx.xxx.xxx.xxx is the IP addresss Example: <1/STA=010.006.030.001 Returns >0001/STA=0.0.0.0 When not configured.	STA = STA!	STA?	STA = xx.xxx.xxx.xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
SNMP Trap Destination IP Address-2	STB=	15 bytes, Numerical	Command or Query. Used to set the IP address of the SNMP Trap destination IP Address where traps will be sent, in the format: xxx.xxx.xxx.xxx is the IP addresss Example: 010.006.030.001 Returns >0001/STB=0.0.0.0 When not configured.	STB = STB!	STB?	STB = xx.xxx.xxx.xxx (see description of arguments)
SNMP Trap Version	STV=	1 byte, value of 0 or 1	Command or Query. 1=Snmpv1 2=Snmpv2 Specifies the version of snmp traps that should be sent.	STV = STV!	STV?	STV = x (see description of arguments)
SNMP Trap Enable Authentication Traps	SAT=	1 byte, value of 1 or 2	Command or Query where, 2=Disabled 1= Enabled Enables or disables sending SNMP authentication traps.	SAT = SAT!	SAT?	SAT =x (see description of arguments)
SNMP System Contact	SSC=	128 bytes, characters,	Command or Query. SNMP System Contact string Example: <1/SSC=Joe Net Admin. If not configured it returns empty string. <1/SSC=	SSC = SSC!	STC?	STC =x [1..128] (see description of arguments)
SNMP System Name	SSN=	128 bytes, characters,	Command or Query. SNMP System Name string Example: <1/SSN=Remote1. If not configured it returns empty string. <1/SSC=	SSN = SSN!	SSN?	SSN =x [1..128] (see description of arguments)
SNMP System Location	SSL=	128 bytes, characters,	Command or Query. SNMP System Location string Example: <1/SSL=Upstairs back right. If not configured it returns empty string. <1/SSL=	SSL = SSL!	SSL?	SSL =x [1..128] (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Enable/Disable QoS Feature	QSE=	1 byte value 0 – Disable 1 – Enable	Command or Query. Setting this to ‘1’ enables the Quality of Service feature. Setting to ‘0’ disables it.	QSE= QSE!	QSE?	QSE=x
System Configuration Get	None	String of Variable byte size	Query only. Querying the SCG? Dumps the system configuration. This can be used for updating the GUI parameters. See the Appendix section for more information on individual field.	SCG= SCG!	SCG?	SCG= string of variable byte size.

3.4.2 Interface Commands

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Ethernet MAC	NONE	12 bytes	Query only. Returns the Ethernet MAC address, format: Example: ETM=0006B0000178	ETM!	ETM?	ETM=xxxxxxxxxxxx (see description of arguments)
Ether speed mode	ESM=	1 byte, value of 1..5	Command or Query. 1 -- Auto 2 -- 10 MB/sec Half Duplex 3 -- 100 MB/sec Half Duplex 4 -- 10 MB/sec Full Duplex 5 -- 100 MB/sec Full Duplex Specifies the speed and mode of Ethernet interface.	ESM = ESM!	ESM?	ESM = x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Address of Ethernet interface	IPA=	15 bytes length.	Command or Query. Used to set the IP address and mask of the Ethernet interface, in the format: xxx.xxx.xxx.xxx where xxx.xxx.xxx.xxx is the IP addresss Example: 010.006.030.001 Note: To make the IPA= command effective, one needs to issue the IPM command immediately following IPA command. IPM should be issued even if there is no change in the subnet mask. Changing the IP address will cause the telnet/socket connection to break. So, the telnet/application should reconnect to the new IP address after timeout. For Reading also, IPA? is followed by IPM?	IPA = IPA!	IPA?	IPA= xxx.xxx.xxx.xxx (see description of arguments)
IP Address Mask of Ethernet Interface	IPM=	Value of 8 – 32	Command or Query. Sets the IP Subnet mask for the interface IP address. yy is the submet mask in bits [8..32] See the NOTE above for IPA.	IPM= IPM!	IPM?	IPM=yy
HDLC Address	HAD	4 bytes, Numerical	Command or Query. Sets the one of four hdlc addresss, where: In small network mode value is 0x01-0xFE In large network value is 0x0001-0x7FFE To delete, set the value to 0xFFFF. Example: <1/HAD[3]=AB will set the HDLC address to 0xAB <1/HAD[2]=FFFF will Clear/Delete the HDLC Address. In Point-to-Point or vipersat mode the values are not used.	HAD= HAD!	HAD?	HAD= xxxx (see description of arguments)

3.4.3 QoS Commands

<table>
<tr><th>Parameter Type</th><th>Command (Instruction Code and Qualifier)</th><th>Arguments for Command or Response to Query</th><th>Description of Arguments</th><th>Response to Command</th><th>Query (Instruction Code and Qualifier)</th><th>Response to Query</th></tr>
<tr><td>QoS mode</td><td>QSM=</td><td>1 byte, value of 1, 2 or 3.</td><td>Command or Query.
QoS operating mode, where:
1=Priority/Max
2=Min/Max
3=DiffServ
Example: <1/QSM=2</td><td>QSM =
QSM!</td><td>QSM?</td><td>QSM =x
(see description of arguments)</td></tr>
<tr><td>DiffServ Rule</td><td>DSR=</td><td>48 bytes, numerical</td><td>Command:
The value in this is broken into separate values:

Read/Get Format:
cccc|ddd ddd|mmmmm|MMMMM|p
cccc – DiffServ class name
ddd ddd – DiffServ Code Point. The code point has 0, 1, X
mmmmm – Minimum bandwidth in kbps.
Range = 0..99999 (kbps)
MMMMM – Maximum bandwidth in kbps.
Range = 0..99999 (kbps)
p – priority is fixed and assigned by system.

User is allowed to modify Assured Class Rules 9, 10, 11, 12 ONLY, while the QoS [QSM=3] is in DiffServ mode.

Write/Set Format:
Example: DSR[9]=00100|00400
Sets min bw to 100, max bw to 400.
To set DSR, the system has to be set in DiffServ mode by issuing <1/QSM=3.</td><td>DSR=
DSR!</td><td>DSR?</td><td>DSR =x [1..48]

(m = Min value,
M = Max Value)</td></tr>
</table>

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
DiffServ Table Get	DTG?	String of DiffServ Table	Query only. Displays the complete diffserv rules. Can be issued when QoS mode is set in Diff Serv. There are 12-rows/rules. Each rule is separated by chr(13). >0001/DTG=chr(13) EXFD|101 110|00000|99999|1chr(13) CLS1|001 000|00000|99999|1chr(13) CLS2|010 000|00000|99999|2chr(13) CLS3|011 000|00000|99999|3chr(13) CLS4|100 000|00000|99999|4chr(13) CLS5|101 000|00000|99999|5chr(13) CLS6|110 000|00000|99999|6chr(13) CLS7|111 000|00000|99999|7chr(13) ASF1|001 xx0|00011|01111|8chr(13) ASF2|010 xx0|00022|02222|8chr(13) ASF3|011 xx0|00000|99999|8chr(13) ASF4|100 xx0|00000|99999|8chr(13)chr(10)	DTG= DTG!	DTG?	DTG=sssss…..ss Display all 12 diffserv rules.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Qos Rule	QSR=	QSR[0..32]= **Index-0 is the default rule**	Command or Query. QSR=tt|p|sss.sss.sss.sss/ss|ddd.ddd.ddd.ddd/dd|AAAAA|BBBBB|CCCCC|DDDDD|mmmmm|MMMMM|w|f Where t = Protocol Type: 01 - UDP 02 - TCP 03-ICMP 04-RTP 05-VOCE 06-VDEO 07-RTPS 08-FTP 09-HTTP 10-TELN 11-SMTP 12-SNMP 13-SAP 14-ORCL 15-CTRX 16-SQL 17-IP 18 for N-IP 19-ALL [Valid only for default rule] Where p = PRI=1..8 (only applies in max/priority mode). In Min/Max mode priority for all rules is fixed at 8. User should not be alled to change priority in Min/Max mode. Priority-9 is being used for default rule, and obtained from PARAM file. Pri-9 cannot be used for configuring other rules. Where s = Source IP SIP=xxx.xxx.xxx.xxx/yy [yy – subnet mask]. All '*' signifies all IP address range[***.***.***.***/**]. Where d = Destination IP DIP=xxx.xxx.xxx.xxx/yy [yy – subnet mask]. All '*' signifies all IP address range, like [***.***.***.***/**] All '*' signifies all port range of 00000 – 65535 for TCP/UDP. All port numbers should in fixed length of 5-chars Where A = TCP/UDP Source Port range SPS=aaaaa [Source Port range Start] Where B = [Source Port range Finish] SPF=bbbbb Where C = [Dest Port range Start] DPS=ccccc Where D = [Dest Port range Finish] DPF=ddddd Where m = MINBW = mmmmm (meaningful in min.max mode). This is 0 in Max Priority mode. The number should be mentioned with preceding zeros, to make it a fixed length of 5-chars. Where M = MXB=MMMMM (meaningful in max/pri and min./max modes only). The number should be mentioned with preceding zeros, to make it a fixed length of 5-chars. W = WRED = 0-No 1-Yes F = FILTER = 0-No 1-Yes	QSR = QSR!	QSR[0..32]? Index-0 is the default rule	QSR[0..32] = See description. Index-0 is the default rule

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Number of QOS Rule entries	QSN	QSN=2 bytes numerical	Query Only. Returns the number of active qos rules. Doesnot count default rule. Note: This command should be issued whenever a new rule is added/deleted.	QSN = QSN?	QSN?	QSN = xxx (see description of arguments)
Delete a QOS Rule entry	QSD=	QSD =2bytes, numerical	Command Only. Deletes the QoS rule entry at the specified index number Example: QSD=3 (deletes the 3rd qos rule)	QSD = QSD!	N/A	QSD = xx (see description of arguments)
QoS Typical System Latency	QTL=	1-Byte value 0 – 5 Seconds.	Command or Query Sets/Gets the QoS typical system latency At low datarates of upto 1Mbps this value can range from 0 – 5 Seconds.. At datarates above 1Mbps, the value range from 0 – 2 Seconds.	QTL = QTL!	QTL?	QTL=x X – A value of 0-5 Seconds.
QoS Maximum System Latency	QML=	1-Byte value 0 – 5000 milli Seconds.	Query Gets the QoS typical system latency Value range from 0 – 5000 milli Seconds.	QML = QML!	QML?	QML=x X – A value of 0-5000 milli Seconds.

3.4.4 Protocol Commands

<table>
<tr><th>Parameter Type</th><th>Command (Instruction Code and Qualifier)</th><th>Arguments for Command or Response to Query</th><th>Description of Arguments</th><th>Response to Command</th><th>Query (Instruction Code and Qualifier)</th><th>Response to Query</th></tr>
<tr><td>DHCP Relay IP Address</td><td>DRA=</td><td>15 bytes, numerical</td><td>Command or Query.
Used to set the IP address of the DHCP Server, in the format: xxx.xxx.xxx.xxx, where:
xxx.xxx.xxx.xxx is the IP address
Example: <1/DRA=010.006.030.001
Returns >0001/DRA=0.0.0.0 when not configured.</td><td>DRA =
DRA!</td><td>DRA?</td><td>DRA = xxx.xxx.xxx.xxx (see description of arguments)</td></tr>
<tr><td>Static Arp table</td><td>ARP=</td><td>256 bytes characters</td><td>Command or Query.
ARP Entry in format xxx.xxx.xxx.xxx|mm:mm:mm:mm:mm:mm

Where xxx.xxx.xxx.xxx = IP address.
mm:mm:mm:mm:mm:mm. = MAC Address.

Duplicate IP addresses are not allowed. They must also be locally attached (on the same subnet as the Ethernet interface). Using a different index with existing IP address may modify the existing ARP entry, rather than creating new one.
Example:
<1/arp[1]=010.020.030.040|00:11:ab:33:44:66
Returns >0001/ARP! When there is no ARP entry.</td><td>ARP =
ARP!</td><td>ARP[1..256]?</td><td>ARP=x [1..256] (see description of arguments)</td></tr>
<tr><td>Number of ARP entries</td><td>None</td><td>4 bytes, numerical</td><td>Query Only.

Returns the number of static arp entries.

Note: This command should be issued whenever a new ARP Entry is added/deleted.</td><td>ARN =
ARN!</td><td>ARN?</td><td>ARN=nnnn (see description of arguments)</td></tr>
</table>

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Delete an ARP entry	ARD=	ARD=xxx.xxx .xxx.xxx	Command Only. Delete the ARP entry associated with the specified IP Address. xxx.xxx.xxx.xxx IP address of ARP entry to delete. Example: <1/ARD=192.168.001.100	ARD = ARD!	N/A	ARD=xxx.xxx.xxx.xxx (see description of arguments)
IGMP Server: IGMP Query Period	IGQ=	IGQ=xxx Where xxx is 1 to 600	Command or Query Set the IGMP Query period in seconds while modem acting as IGMP Server.	IGQ= IGQ!	IGQ?	IGQ=xxx xxx – value of 1 to 600.
IGMP Server: IGMP Max Resp. Time	IMR=	IMR=xxx Where xxx is value of 1 to 598	Command or Query Set the Maximum response time for the IGMP Query in seconds. Should always be 2 less than query period. The range is 1 to (IGQ – 2). If IGQ is at 30, then IMR can be set from 1 through 28.	IMR= IMR!	IMR?	IMR=xxx xxx - value of 1 to 598.
IGMP Server: Number of Missed Responses	INM=	2 bytes, Numerical 1..30	Command or Query. Number of missed responses before leaving the IGMP Group. Configured from 1…30 Example: INM=15	INM = INM!	INM?	INM =xxx (see description of arguments)
IGMP Client Recognize Queries	IRQ=	1 byte, 0 or 1	Command or Query where, 0=No 1= Yes Enable/Disable Recognizing IGMP Queries. Example: IRQ=0	IRQ = IRQ!	IRQ?	IRQ =xxx (see description of arguments)
IGMP Client Router Alert Option for V1	IRO=	1 byte, 0 or 1	Command or Query where, 0=No 1= Yes Enable/Disable Router Alert option for V1 Reports. Example: IRO =0	IRO = IRO!	IRO?	IRO =xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IGMP Client: Version	ICV	1 byte, 0 or 1	Command or Query where, Set the IGMP Version for Unsolicited Reports. 0=V1 1= V2 Recognize IGMP Queries Example: ICV =0	ICV = ICV!	ICV?	ICV =xxx (see description of arguments)
IGMP Client: Unsolicated Report Internval	IRI=	2 bytes 0..25	Command or Query where, Set the unsolicited Report Interval [Modem as Client] Range = 1..25 Example: <1/IRI =14	IRI = IRI!	IRI?	IRI =xxx (see description of arguments)
IGMP View Table	None	String value	Query only. Display the IGMP table with different states. To see the entries, the system should have the IGMP feature enabled, and should be properly configured to forward IGMP packets. See WEB interface for proper table format. Note: Not yet supported in 1.5.3 Release. Will available in next release.	IGT= IGT!	IGT?	IGT=sssssss Table of IP Addresses and their state information.

3.4.6 Operations and Maintenance Commands

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Upgrade Slot	USI=	1 bytes, value of 0,1 or 2	Command or Query. Slot to upgrade new IP firmware where, 0= Oldest 1=Image 1 2=Image 2 Example: UPS=0	USI = USI!	USI?	USI=x (see description of arguments)
Software Revision	N/A	34-37 bytes	Query only. Unit returns the value of the internal software revision installed in the unit, in the form : Example: >0001/SWR=Boot:1.1.1 Bulk1:1.5.1u Bulk2:1.5.1P	SWR!	SWR?	SWR=Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz (see description of arguments)

<table>
<tr><th>Parameter Type</th><th>Command (Instruction Code and Qualifier)</th><th>Arguments for Command or Response to Query</th><th>Description of Arguments</th><th>Response to Command</th><th>Query (Instruction Code and Qualifier)</th><th>Response to Query</th></tr>
<tr><td>IP Software Information</td><td>None</td><td>String</td><td>Query only.
Complete IP software information:

Example: FRW=
System time is THU DEC 22 14:53:50 2005

Booted using image #1
Using configuration parameters from PARAM #1
<table>
<tr><th>Type</th><th>Date</th><th>Time</th><th>Name</th><th>Rev</th><th>Len</th></tr>
<tr><td>Boot</td><td>1/24/2006</td><td>15:26</td><td>FW/10873-1c</td><td>1.1.3</td><td>460804
chr(13)</td></tr>
<tr><td>IP Bulk#1</td><td>12/27/2005</td><td>17:27</td><td>5.3 Pre</td><td>1.5.3</td><td>2607240
chr(13)</td></tr>
<tr><td>IP Bulk
#2</td><td>12/14/2005</td><td>14:19</td><td>5.3 Pre</td><td>1.5.3</td><td>2604308
chr(13)</td></tr>
<tr><td>EVENT
LOG</td><td>02/01/2006</td><td>14:10</td><td>eventlog</td><td>1.5.3</td><td>1`28000
chr(13)</td></tr>
<tr><td>PARAM</td><td>1/26/2006</td><td>18:29</td><td>console</td><td>1.5.3</td><td>5160
chr(13)</td></tr>
<tr><td>BaseBoot</td><td>03/30/2004</td><td>-- --</td><td>FW/10804-1-</td><td>1.1.1</td><td>----
chr(13)</td></tr>
<tr><td>BaseBulk
#1</td><td>01/26/2006</td><td>-- --</td><td>FW/10805T</td><td>1.5.1
N</td><td>----
chr(13)</td></tr>
<tr><td>BaseBulk
#2</td><td>01/04/2006</td><td>-- --</td><td>FW/10805R</td><td>1.5.1
g</td><td>----
chr(13)
chr(10)</td></tr>
</table></td><td>IFW!</td><td>IFW?</td><td>IFW =x….x
(see description of arguments)</td></tr>
</table>

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Boot From Software Image	BLI=	1 byte, value of 0,1,2	Command or Query. Image which will be used the next time the system is booted, where: 0=Latest 1=Bulk Image # 1 2=Bulk Image # 2 Example: BLI=1 (which is Image #1 active)	BLI = BLI!	BLI?	BLI =x (see description of arguments)
Base Modem Boot From	BBI=	1 byte value 0,1,2	Command or Query. The binary image, which will be used by the base modem, to boot with. Where 0 – Latest 1 – Image in Slot# 1 2 – Image in Slot#2. Example: <1/BBI=0	BBI= BBI!	BBI?	BBI=x (see description of arguments)
Param file image to use	PFI=	1 byte, value of 1 or 3	Command or Query. Image which will be updated the next time firmware is uploaded to the system: 1=Param1 3=Factory Default To restore the Factory Defaults, set PFI=3 and issue RST to reset the box. This would bring up the box with factory default configuration. Example: PFI =1 (using param image on flash)	PFI = PFI!	PFI?	PFI =x (see description of arguments)
Save System Configuration Parameters	SCS=	1 byte value 1 – Save config	Command only Setting SCS to ‘1’, will save all the active system configuration on to the Flash.	SCS= SCS!	N/A	SCS=x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Reset Unit	RST	1 byte value. 1 - reset the system.	Command only. Setting the parameter to 1 resets the system. Telnet2 connection needs to be re-established.	RST= RST!	N/A	RST=x (see description of arguments)
Restore Factory Defaults	RFD	1-Byte value 1 - restore	Command only. Setting this to ‘1’ will bring the modem back to factory defaults. This may force unit reboot, depending on the mode of operation.	RFD= RFD!	N/A	RFD=x (see description of arguments)
Load Params from permanent storage	LPS=	1-Byte value 1 – load parameters	Command only. Setting this to ‘1’ loads the system with parameters from permanent storage/flash. This may force unit reboot, depending on the mode of operation.	LPS= LPS!	N/A	LPS=x (see description of arguments)
Codecast Multicast Address	CCA=	Multicast IP Address in xxx.xxx.xxx.xxx format	Command or Query. Set the Code cast multicast address, through which the modem can receive the software updates via vLoad application. Only Multicast address in the range 224.xxx.xxx.xxx To 239.xxx.xxx.xxx are allowed. There are some reserved multicast addresses which cannot be used. This cannot be deleted.	CCA= CCA!	CCA?	CCA=xxx.xxx.xxx.xxx (see description of arguments)
Unit Up Time	N/A	String value	Query only Displays the unit up time in days, hours, minutes & seconds. Example: >0001/uut=0 days 0 hours 13 mins 15 secs	N/A	UUT?	UUT=sssssss String. (see description of arguments)

3.4.7 Redundancy Commands

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Redundancy State	N/A	1 byte, value of 0 or 1	Query only. Unit returns the redundancy state of the unit, where 0=Offline 1=Online Example: RED=1 (which is Online)	N/A	RED?	RED=x (see description of arguments)

3.4.8 Routing Commands

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Route Table	RTE	RTE[1..256]= variable	Command or Query. sssssssssssss|ddd.ddd.ddd.ddd/DD|i|nnn.nnn.nnn.nnn|hhhh|t|p|c|k|S s = Route Name up to 13 characters. It should be unique. Reusing of route names with different index, will endup modifying the existing route. d = Destination IP Address in xxx.xxx.xxx.xxx/yy where xxx.xxx.xxx.xxx is IP address and yy – Subnet mask bits. To mean 'Any IP Address' indicate it by ***.***.***.***/** format. D = Destination Subnet Mask Bits. i = Interface 1 – Sat and 0 – Ethernet n = Next Hop IP Address in xxx.xxx.xxx.xxx format. To be valid the next hop should be on the same subnet as the router IP Address. This field will be all '*' for a 'SAT' directed route. It means, for a route with valid HDLC address this field will be '***************'. h = HDLC Addr in 4-digit hexadecimal number. Valid range is 0x00 to 0xFE in Router-Small Network mode. And 0x0000 to 0x7FFE for Router-Large Network mode. This field will be all '*' for 'ETH' directed route. It means, if the route has a valid next-hop, then this field is '****' [meaning HDLC Address is not Used.]. HDLC Address is not used in point-to-point mode, may default to '1'. t = Header Compression 0 – No 1 – Yes. p = Payload Compression 0 – No 1 – Yes. c = DES Encryption 0 – No 1 – Yes. k = DES Key to use 0 – Don't use any key 1 – 8 use as mentioned and 9 – Use Random key. S = Multicast state 0-None 1=Eth-to-Sat 2=Sat-to-Eth 3=toBoth	RTE = RTE!	RTE[1..256]?	RTE[1..256] = xxx (see description of arguments)

<table>
<tr><th>Parameter Type</th><th>Command (Instruction Code and Qualifier)</th><th>Arguments for Command or Response to Query</th><th>Description of Arguments</th><th>Response to Command</th><th>Query (Instruction Code and Qualifier)</th><th>Response to Query</th></tr>
<tr><td>Route Table (Continued)</td><td></td><td></td><td>When called using an existing index, the command is treated as a “modify”. Only new routes can be added at the END of the list:

Example:
RTN?
RTN=3
<1/rte[3]=
rt3|239.111.102.222.32|0|192.168.001.022|00AB|0|0|1|5|3

Sat Directed Route:
>0001/RTE[1]=rt1|011.012.013.014/32|1|***.***.***.***|1111|0|0|0|0|0

Eth Directed Route:
>0001/RTE[4]=rt4|012.013.014.015/32|0|192.168.001.111|****|0|0|0|0|0

Note: To be able to set/get the route entries, the system should be in the routing. It may retur RTE!, if system is in EasyConnect mode.</td><td></td><td></td><td></td></tr>
</table>

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Number of route entries	N/A	RTN=3 bytes, numerical	Query Only. Returns the number of route entries in the route table. Note: This command should be issued whenever a new route is added/deleted.	RTN = RTN!	RTN?	RTN = xxxx (see description of arguments)
Delete route entry	RTD=	RTD=4 bytes, numerical	Command Only. Deletes the route entry at the specified index number, if configured. Returns RTD!, if there is no route at the index.	RTD =	RTD!	RTD = xx.xx (see description of arguments)
Route Table Get	N/A	N/A	Query only. Get the whole Routing Table of the modem. Each route entry is separated by '\r' [chr(13)] The route table will be displayed only if system's working mode is "Router –Small, Router-Large, Router-PtP. If the system is in EasyConnect mode, it may return RCG!	RCG!	RCG?	RCG= xxxxxxxxxxxxxx xxxxxxxxxxxxxx

3.4.9 Statistics Commands

3.4.9.1 Wan Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments		Response to Command	Query (Instruction Code and Qualifier)	Response to Query
WAN TX: Statistics	None	10 bytes, Numerical	Query only. Display all WAN Transmit Statistics.		STT!	STT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
			WAN Tx Error – No Route	[0]chr(13)			
			WAN Tx Error – Packet Start	[0]chr(13)			
			WAN Tx Error – Packet Front Length	[0]chr(13)			
			WAN Tx Error – Packet End Length	[0]chr(13)			
			WAN Tx Packet Invalid Length	[0]chr(13)			
			WAN Tx Packet Dropped – Sat Overdriven	[0]chr(13)			
			WAN Tx HDLC Header Byte Count	[0]chr(13)			
			WAN Tx HDLC Payload Count	[0]chr(13)			
			WAN Tx HDLC Packet Count	[0]chr(13)			
			WAN Tx Utilisation	[0]chr(13)			
			Ethernet Traffic Destined to WAN	[0]chr(13)			
			Actual Satellite Traffic (kbps)	[0]chr(13)			
			Percentage of WAN Bandwidth Saved	[0]chr(13)chr(10)			

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
WAN RX: Statistics	None	10 bytes, Numerical	Query only. Display all WAN Receive Statistics. WAN Rx Bad Address Count [0]chr(13) WAN Rx Pkt Proc CRC Errors [0]chr(13) WAN Rx Abort/Oclet Errors [0]chr(13) WAN Rx Overrun Errors [0]chr(13) WAN Rx HDLC CRC Errors [0]chr(13) WAN Rx HDLC Payload Byte Count [0]chr(13) WAN Rx HDLC Header Byte Count [0]chr(13) WAN Rx HDLC Packet Count [0]chr(13) WAN Rx Invalid FlowID Errors [0]chr(13) WAN Rx SAR Re-Assemble Errors [0]chr(13) WAN Rx Header Decomp errors [0]chr(13) WAN Rx Memory Alignment Errors [0]chr(13) WAN Rx Bad CRC Errors [0]chr(13)chr(10)	SRT!	SRT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
WAN Stats Clear	WSC=	1Byte Numerical	Write only. Setting to '1' clears all the WAN Statistics. Clears both Transmit & Receive Stats.	WSC=	N/A	WSC= Clear WAN Stats.

3.4.9.2 IP Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Route Stats	N/A	10 bytes, Numericals	Query only. Display all IP Route packet statistics in text. Total Packets From Etheret [58]chr(13) Total Packets To Ethernet [56]chr(13) Unicast Packets To Ethernet [56]chr(13) Multicast Packets To Ethernet [0]chr(13) Broadcast Packets To Ethernet [0]chr(13) Total Packets From Satellite [0]chr(13) Total Packets From Endstation [61]chr(13) Total Packets To Endstation [58]chr(13) IGMP Packets Received [0]chr(13) IP Option Packets Received [0]chr(13)chr(10)	IPS!	IPS?	Text display of all IP Route Stats. \r =CR = 0x0D \n = Newline = 0x0A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Filtered Stats	None	10 bytes, Numerical	Query only. Display all IP Route Filtered packet statistics in text Filtered – Boot [8]chr(13) Filtered – Flow Descriptor [0]chr(13) Filtered – Unknow Reason Code [0]chr(13) Filtered – Flow Correlator [0]chr(13) Filtered – Management Path [0]chr(13) Filtered – WAN Scaling [0]chr(13) Filtered – Ping [0]chr(13) Filtered – Access Control [0]chr(13) Filtered – Vipersat MCP [0]chr(13) Filtered – Vipersat UCP [0]chr(13) Filtered – Vipersat Remote [0]chr(13) Filtered – Codeload [0]chr(13) Filtered – Multicast [0]chr(13) Filtered – Bad Packet [0]chr(13) Filtered – Route [0]chr(13) Filtered – QoS Rule [0]chr(13) Filtered – Vipersat Loop [0]chr(13) Filtered – Bad Header Loop [0]chr(13) Filtered – Bad Data Ptr [0]chr(13) Filtered – MAC Split error [0]chr(13) Filtered – L3 Type Error [0]chr(13) Filtered – Local Destination [0]chr(13) Filtered – Redundancy Error [0]chr(13) Filter – ICMP Filter [0]chr(13) Filter – Port Error [0]chr(13) Filter - Total [8]chr(13)chr(10)	IFT!	IFT?	Text display of all IP Filtered stats. \r =CR = 0x0D \n = Newline = 0x0A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments		Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Dropped Statistics	None	10bytes numerical values	Query only. Display all the IP Route Dropped Packet Statistics in text.		IDT!	IDT?	Text display of all IP Dropped stats. \r =CR = 0x0D \n = Newline = 0x0A
			Dropped – Bad IP Header Checksum Dropped – Bad Buffer Length Dropped – Bad IP Version Dropped – TTL Expired Dropped – No Route Dropped – No ARP Entry Dropped – Multicast Dropped – Multicast Disabled Group Dropped – Total	[0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13)			
Clear IP Route Statistics	RSC=	1Byte number 1 – Clear stats	Set only. Setting this value to '1' would clear all IP Route statistics. Clears IP Route Stats, IP Filtered Stats, IP Dropped Stats.		RSC= RSC!	RSC?	RSC!

3.4.9.3 Ethernet Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Ethernet Rx Statistics	None	10 bytes, Numericals	Query only. Display all the Ethernet Receive statistics in text. Ethernet Tx Bytes [0994]chr(13) Ethernet Tx Good Frames [112]chr(13) Ethernet Tx Max Collision Count [0]chr(13) Etherent Tx Late Collision Count [0]chr(13) Ethernet Tx DMA Underrun Errors [0]chr(13) Ethernet Tx Lost Carrier Sense Count [0]chr(13) Ethernet Tx Deferred Count [0]chr(13) Ethernet Tx Single Collision Count [0]chr(13) Ethernet Tx Multicast Collision Count [0]chr(13) Ethernet Tx Total Collision Count [0]chr(13)chr(10)	ERT!	ERT?	Text display of all Ethernet Receive statistics. \r =CR = 0x0D \n = Newline = 0x0A
Ethernet Rx Statistics	None	10 bytes, Numericals	Query only. Display all the Ethernet Transmit statistics in text. Ethernet Rx Bytes [6786]chr(13) Etherent Rx Good Frames [91]chr(13) Ethernet Rx CRC Error Frames [0]chr(13) Ethernet Rx Allignment Errors [0]chr(13) Ethernet Rx Resource Errors [0]chr(13) Ethernet Rx Collision Detect Errors [0]chr(13) Ethernet Rx Runt Frames [0]chr(13) Ethernet Rx Flow Control Pause Frames [0]chr(13)chr(10)	ETT!	ETT?	Text display of all Ethernet Transmit statistics. \r =CR = 0x0D \n = Newline = 0x0A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Clear Ether net Stats	ESC=1	1byte number. 1 – Clear stats	Set only. Setting this value to '1' clears all the Ethernet Receive & Transmit statistics.	ESC= ESC!	ESC?	ESC!

3.4.9.4 QoS Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Quality of Service Statistics Get	N/A	String of QoS Stats	Query only. Displays the QoS queue statistics of all active queues. nnn|pp|aaaaaaaaaa|bbbbb|cccccccccc|dddddddddd|eeeeeeeeee|fffff|ggggg|hhhhh|iiii n – QoS Rule Number p – Protocol number [Refer to QSR] a – Sent Packets b – Pkts per Second c – Sent Bytes d – Dropped Packets e – Dropped Bytes f – Current Transmit Rate [Kbps] g – Average Transmit Rate [Kbps] h – Maximum Transmit Rate [Kbps] I – Active Flow count associated with this QoS Queue. >0001/QST= 0|19| 0| 0| 0| 0| 0| 0| 0| 0| 0chr(13) 1| 0| 0| 0| 0| 0| 0| 0| 0| 0| 0chr(13)	QST!	QST?	QST=sssssssss… String displaying qos stats of all active queues. \r – CR – 0x0D \n – Newline – 0x0A
Quality of Service Stats Clear	QSC=xx xx = qos rule index	xx – qos rule index for which to clear stats.	Command only. Clears the QoS statistics for a specified queue. The command can be issued only on active/configured queue. To clear default queue stats use '0'. <1/QSC=0 will clear default queue stats <1/QSC=5 will clear stats of rule-5.	QSC= QSC!	None	QSC=xx (see description of argument)
Clear All QoS Queue Statistics	QSA=	QSA=x 1 – Clear all stats	Command only. Setting QSA=1 will clear all qos queue statistics. Also clears the default queue stats.	QSA= QSA!	None	QSA=x (see description of argument)

3.5 PARAM Files

This section gives more detail about the possible values of various parameters in PARAM file.

Param File Tag	Values Associated with Parameter
SYS_WORKING_MODE	Possible values are Router Mode Easy Connect Mode
EASYCON_MCAST_MODE	Enabled Disabled
HDR_REFRESH_UDP_RTP1	Decimal Value of 1…600
HDR_REFRESH_UDP	Decimal Value of 1…600
HDR_REFRESH_ALL_OTHERS	Decimal Value of 1…600
PAYLOAD_REFRESH	Decimal Value of 1…600
TELNET_TIMEOUT	Decimal Value of 1…60 Minutes
QOSMODE	Possible values are: Rule-Max/Pri Mode Rule-Min/Max Mode DiffServ Mode
DYNBUF_LATENCY	Decimal value of 200 to 5000 mSec.

Param File Tag	Values Associated with Parameter
Rt#0 …. Rt#nnn	Route table entries Rt#0 is the first entry and can go upto 256 entries. [No need to read this from param file, use RTG]
ROUTE_HDLC_ADDR_SAVE	Corresponding HDLC Addresses for Ethernet→Sat entries. [No need to read this from param file, use RTG]
DHCP_RELAY_IP_ADDR	DHCP Server IP Address. Possible values are NOT-DEFINED – When the parameter not set. 10.20.30.40 – When a DHCP Server IP Address is set.
REDUNDANCY_ACTIVE	Enabled Disabled
BASE_BOOT_IMAGE	Possible values are Latest Image 1 Image 2
UPGRADE_SLOT	Oldest Image 1 Image 2
BLINDLOAD_MCAST_ADDR	NOT-DEFINED when ip_addr is 0 Valid multicast IP address like 239.4.5.6
ADMIN_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
READWRITE_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
READONLY_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.

Param File Tag	Values Associated with Parameter
ACCESS_CLIENT	NOT-DEFINED/NA – When not set Valid IP address like 192.168.001.001/32
ACCESS_ENFORCEMENT_ENABLE	Enabled Disabled
PING_REPLY_ENABLE	Enabled Disabled
TELNETD_ENABLE	Enabled Disabled
SNMP_ENABLE	Enabled Disabled
IGMP_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
GENERIC_DOWNLINK_MCAST	Enabled Disabled
QOS_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
TRANS_DES_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is EasyConnect Disabled – If system working mode is EasyConnect
TX_HDR_COMPRESSION_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is EasyConnect Disabled – If system working mode is EasyConnect

Param File Tag	Values Associated with Parameter
RX_HDR_COMPRESSION_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
TX_PYLDCOMP_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is EasyConnect Disabled – If system working mode is EasyConnect
ENCRYPT_KEY# [0…7]	xxxxx….xx A 48 character length [192-Bit] 3xDES key. The key is formed with Hexadecimal digits from 0..9,A,B,C,D,E,F only. Like 2222222222222222 4444444444444444 6666666666666666. Notice there is a space for every 16-Hexadecimal digits for readability.
DECRYPT_KEY# [0…7]	xxxxx….xx A 48 character length [192-Bit] 3xDES key. The key is formed with Hexadecimal digits from 0..9,A,B,C,D,E,F only. Like 2222222222222222 4444444444444444 6666666666666666. Notice there is a space for every 16-Hexadecimal digits for readability.
SMTP_SERVER_IP_ADDRESS	NOT-DEFINED – If the parameter is not set. Other wise, IP address in the form 192.168.1.1
SMTP_DOMAIN	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character. Generally in domain name format.
SMTP_DESTNAME	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_READ_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like "public"
SNMP_WRITE_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like "private"
SNMP_TRAP_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like "public"

Param File Tag	Values Associated with Parameter
SNMP_TRAP_DEST	NOT-DEFINED – When the parameter is not set IP address in string format like 11.12.13.14
SNMP_TRAP_DEST_2	NOT-DEFINED – When the parameter is not set IP address in string format like 11.12.13.14
SNMP_TRAP_VERSION	SNMPv1 – When SNMP version-1 trap generation is selected. SNMPv2 – When SNMP version-2 trap generation is selected.
SNMP_TRAP_ENABLE_AUTHEN_TRAP	UNKNOWN – When invalid value is set. Enabled – When set to send the Authentication Trap. Disabled
SNMP_SYSCONTACT	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_SYSNAME	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_SYSLOCATION	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
ETHER_MAC	Ethernet MAC Address in the format 00-06-B0-xx-xx-xx. All are hexadecimal digits.
ETHER_SPEED_MODE	Possible Values are Auto 10 MB/sec Half Duplex 100 MB/sec Half Duplex 10 MB/sec Full Duplex 100 MB/sec Full Duplex
ETHER_IP_SNET	IP Address in the format 192.168.1.50/24

Param File Tag	Values Associated with Parameter
HDLC_ADDR_MODE	Small Network Mode Large Network Mode Point-To-Point Mode
QOSC	If there are no QoS rules configured, (or) system is not in Max-Pri (or) Min-Max mode, then param file will not have an entry for QOSC. Otherwise, the rules will be in the following format. QOSC### = SrcIP/Mask DstIP/Mask PROT spm spM dpm dpM mxB mb P W F QOSC#1 = ***/* ***/* RTP *** *** *** *** 22222 0 4 N Y QOSC#2 = 11.12.13.14/32 22.22.33.44/32 UDP 11111 22222 33333 44444 99999 0 0 Y N Where spm – source port min; spM – source port Max; dpm – Destination port min; dpM – Destination port Max mxB – Max bandwidth in kbps; mb – minimum bandwidth in kbps [Total aggregate min bandwidth of all the qos rules should be less than the Tx-Data rate of the system.] P – Priority; W – WRED; F – Filter; [Y – Yes, N – No]
QOSCDEFR	The default rule always exists in the system and in param file, but not meaningful if QoS mode is DiffServ. The format is QOSC### = SrcIP/Mask DstIP/Mask PROT spm spM dpm dpM mxB mb P W F QOSCDEFR#0 = ***/* ***/* ALL *** *** *** *** 99999 0 9 N N
DIFFSSV#0 … DIFFSSV#11	The DiffServ rules are meaningful only when QoS mode is DiffServ. Otherwise, these parameters can be discarded. The format is as follows. The first column is DIFFSSV#0 = 0 99999 NOTE: Donot use this from PARAM file, instead use DTG? Command.
IGMP_QRYP	A decimal value of 1…600
IGMP_MXRT	A decimal value of 1…598
IGMP_MRP	A decimal value of 1…30
IGMP_QUERIES	Possible string values are Yes No

Param File Tag	Values Associated with Parameter
IGMP_ROUTERALERT_OPT	Possible string values are Yes No
IGMP_VERSION2	Possible string values are V1 V2
IGMP_URI	A decimal value of 0…25
SARP#0 …. SARP#255	Static ARP entry if there are any, in the format IP Addr Layer2 MAC Address [Hexadecimal digits] 10.20.30.40 00:11:33:AA:BB:CC
MGC_SAVE	MGC Command response from the base modem. See the base modem document for more detail.
OGC_SAVE	OGC Command response from the base modem. See the base modem document for more detail.
LOGGING FEATURE	Enabled Disabled
LOGGING LEVEL	Possible string values are Errors Only Errors and Warnings All Information
HDLCADDR_SAVE	HDLC addresses in hexadecimal format aaaa bbbb cccc dddd where aaaa – First HDLC Address bbbb – Second HDLC Address…etc

Errata A

Comtech EF Data Documentation Update

Subject: Front Panel Operation – Change Values for CDM-570L

Date: July 12, 2006
Document: CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number: MN/CDM-570L.EA4
Collating Instructions: Attach this page to page 6-25

Comments:

Change highlighted values as follows:

Change Specifics:

In the CDM-570L, the range varies according to symbol rate:

+/- 1 kHz to +/- **32** kHz for rates less than or equal to 625 ksymbols/sec
+/- 1 kHz to +/- **200** kHz for rates greater than 625 ksymbols/sec

Errata B

Comtech EF Data Documentation Update

Subject:	Serial Remote Control - Unit Alarm Mask
Date:	July 12, 2006
Document:	CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number:	MN/CDM-570L.EB4
Collating Instructions:	Attach this page to page 13-16

Comments:

Change Description for Unit Alarm Mask (MSK) to read:

Change Specifics:

Unit Alarm Mask	MSK=	12 bytes	Command or Query. **Alarm mask conditions, provides response of 0 (unmasked/active) or 1 (masked) for each parameter, in form abcdefghijkl, where:** a=Tx FIFO b=G.703 BPV c=Tx-AIS d=Rx AGC Alarm e=Eb/No Alarm f=Rx-AIS g=Buffer slip h=Ext Reference alarm i=BUC alarm j=LNB alarm k=spare l= spare **Example: MSK=1110011100**	MSK= MSK? MSK* MSK#	MSK?	MSK=abcdefghijkl (see description of arguments)

Errata C

Comtech EF Data Documentation Update

Subject: Serial Remote Control - Front Panel Lockout

Date: July 12, 2006
Document: CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number: MN/CDM-570L.EC4
Collating Instructions: Attach this page to page 13-23

Comments:

Change Front Panel Lockout (FPL) to read:

Change Specifics:

Front Panel Lockout	FPL=	1 byte, value of 0 or 1	Command or Query. Control the state of front panel lockout, where: 0=no lockout 1=front panel lockout active Disable the lockout by either FPL=0, or by setting into local mode using LRS=0 (response is LRS+ meaning FPL is disabled at the same time)	**FPL**= **FPL**? **FPL*** **FPL**#	**FPL**?	**FPL**=x (see description of arguments)

Errata D

Comtech EF Data Documentation Update

Subject:	Changed Input Power Range
Date:	July 18, 2006
Document:	CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number:	MN/CDM-570L.ED4
Collating Instructions:	Attach this page to page 12-3

Comments:

Highlighted Input Power Range changes are as follows:

Change Specifics:

12.2 Demodulator

Data rate range, operating modes, de-scrambling, input impedance/return loss etc., as per Modulator

Input power range	**CDM-570 Desired Carrier:** -30 to -60 dBm. +35 dBc maximum composite, up to -5 dBm, absolute max. **CDM-570L Desired Carrier:** -130 + 10 log(Symbol Rate) to -90 + 10 log(Symbol Rate). **+40 dBc maximum composite, up to –10 dBm, absolute max.**

Errata E

Comtech EF Data Documentation Update

Subject: Changed Figure 7-5, TPC Curve for Rate 7/8

Date: July 27, 2006
Document: CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number: MN/CDM-570L.EE4
Collating Instructions: Attach this page to page 7-14

Comments:

Chnaged slope of curves for TPC 7/8 for Figure 7-5. The following table highlights the changes to the BER curve.

Change Specifics:

TURBO PRODUCT CODEC Rate 7/8 QPSK Rate 7/8 8-PSK Rate 7/8 16-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	Rate 7/8 (Q, OQ) Guaranteed Eb/No: (typical value in parentheses)	Rate 7/8 (8-PSK) Guaranteed Eb/No: (typical value in parentheses)	Rate 7/8 (16-QAM) Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-5}	**4.3 dB (4.0 dB)**	**7.0 dB (6.6 dB)**	**8.1 dB (7.7 dB)**
	BER=10^{-8}	**4.5 dB (4.2 dB)**	**7.2 dB (6.8 dB)**	**8.3 dB (7.9 dB)**

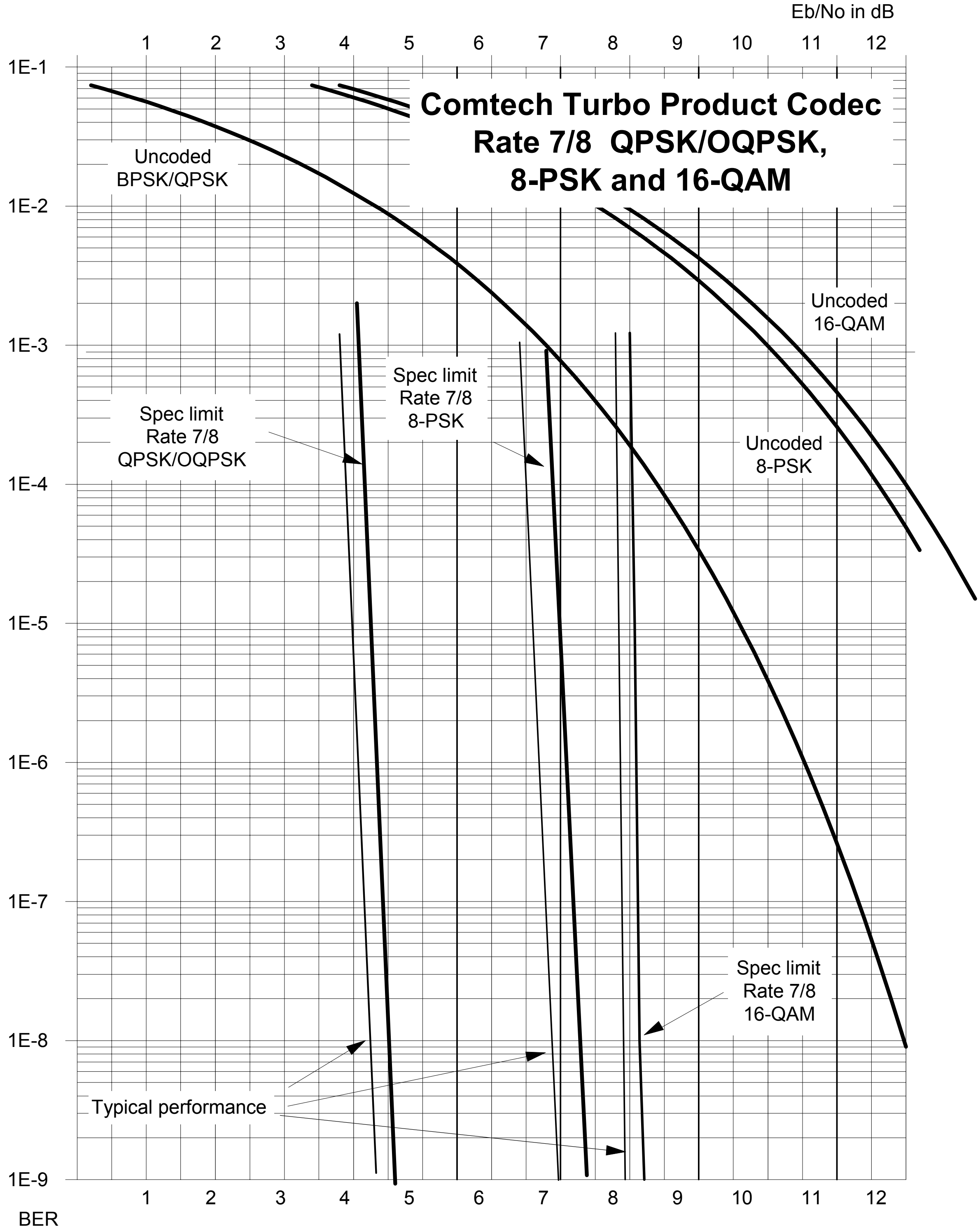


Figure 7-5. Comtech EF Data Turbo Product Codec Rate 7/8 QPSK/OQPSK, 8-PSK AND 16-QAM

Errata F

Comtech EF Data Documentation Update

Subject:	Revised AUPC Parameters in Remote Control
Date:	October 26, 2006
Document:	CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number:	MN/CDM-570L.EF4
Collating Instructions:	Attach this page to page 6-17

Comments:

The following changes affects the values shown on page 6-17 and 13-10.

Change Specifics:

Change to APU Target Eb/No Parameter

Since Revision 4 of the CDM-570/570(L) Manual was published, the range of the value of target Eb/No has been increased. Effective in firmware version 1.5.3 and subsequent:

- Previously the maximum value was 9.9 dB
- New maximum value is 14.9 dB

This affects the front panel and the remote control; refer to the remote control command table (Errata G) for more detail.

Errata G

Comtech EF Data Documentation Update

Subject:	Revised Serial Remote Commands
Date:	September 18, 2006
Document:	CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number:	MN/CDM-570L.EG4
Collating Instructions:	Attach this page to page 13-10

Comments:

Revised APP
Added ADJ
Added VFW

Change Specifics:

.

AUPC Parameters	APP=	6 bytes	Command or Query. Defines AUPC operating parameters. Has the form abc.cd, where: a=Defines action on max. power condition. (0=do nothing, 1=generate Tx alarm) b=Defines action on remote demod unlock. (0=go to nominal power, 1=go to max power) **c.c=target Eb/No value, for remote demod, from 0.0 to 14.9 dB, where numbers above 9.9 use hex representation for the 1 st character, ie 14.9 is coded as E.9.** d =Max increase in Tx Power permitted, from 0.0 to 9.0 dB Example: APP=015.67 (Sets no alarm, max power, 5.6 dB target Eb/No and 7 dB max power increase.	APP= APP? APP* APP#	APP?	APP=abc.cd (see description of arguments)
Internal 10MHz Reference Adjustment	**ADJ=**	**4 bytes, numeric**	**Command or query.** **This command provides fine adjustment of the Internal 10MHz Reference on the modem.** **Format is sddd, where:** **s = sign (+ or –)** **ddd = value, 0-999**	**ADJ=** **ADJ?** **ADJ*** **ADJ#**	**ADJ?**	**ADJ=sddd** **(see description of arguments)**
Viterbi Firmware Version	**VFW=**	**6 bytes**	**Query only.** **Used to query Viterbi chips firmware version.** **Response format:** **VFW=Q1900 for modem with Qual Comm. Q1900 Viterbi chip** **VFW=aa.b.c for modem with Alteva Viterbi chip, where aa.b.c is the chip's FPGA firmware version** **aa=major version** **b=minor version** **c=revision** **Example VFW=01.0.1**	**VFW=** **VFW?** **VFW *** **VFW #**	**VFW?**	**VFW=xxxxxx** **(see description of arguments)**

Errata H

Comtech EF Data Documentation Update

Subject: Revised Options Table

Date: October 26, 2006
Document: CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number: MN/CDM-570L.EH4
Collating Instructions: Attach this page to page 6-63

Comments:

Added Options 18 and 19 to the options table to read:

Change Specifics:

Option Number	Option Type	Displayed Code	Description
01	Hardware	150W BPSU	150 Watt, 48 volt BUC PSU
02	Hardware	100W BPSU	100 Watt, 24 volt BUC PSU
03	Hardware	RS Codec	Reed-Solomon Codec
04	Hardware	TPC Codec	Turbo Product Codec
05	Hardware	TPC/LDPC	TPC/LDPC Codec
06	Hardware	IP Module	IP Traffic Module
07	Hardware	H/W Exp-1	Future Hardware Expansion 1
08	Hardware	H/W Exp-2	Future Hardware Expansion 2
09	FAST	2048 kbps	2048 kbps max data rate
10	FAST	5000 kbps	5000 kbps max data rate
11	FAST	8PSK/8QAM	8-PSK and 8-QAM modulation
12	FAST	16-QAM	16-QAM modulation
13	FAST	9980 kbps	9980 kbps max data rate
14	FAST	Hdr Comp	IP Header Compression
15	FAST	Data Comp	IP Datagram Compression
16	FAST	IP QoS	IP Quality of Service
17	FAST	3xDES	IP 3xDES Encryption
18	**FAST**	**Vipersat**	**Management by VMS**
19	**FAST**	**VFS**	**Vipersat File Streamer**

Errata J

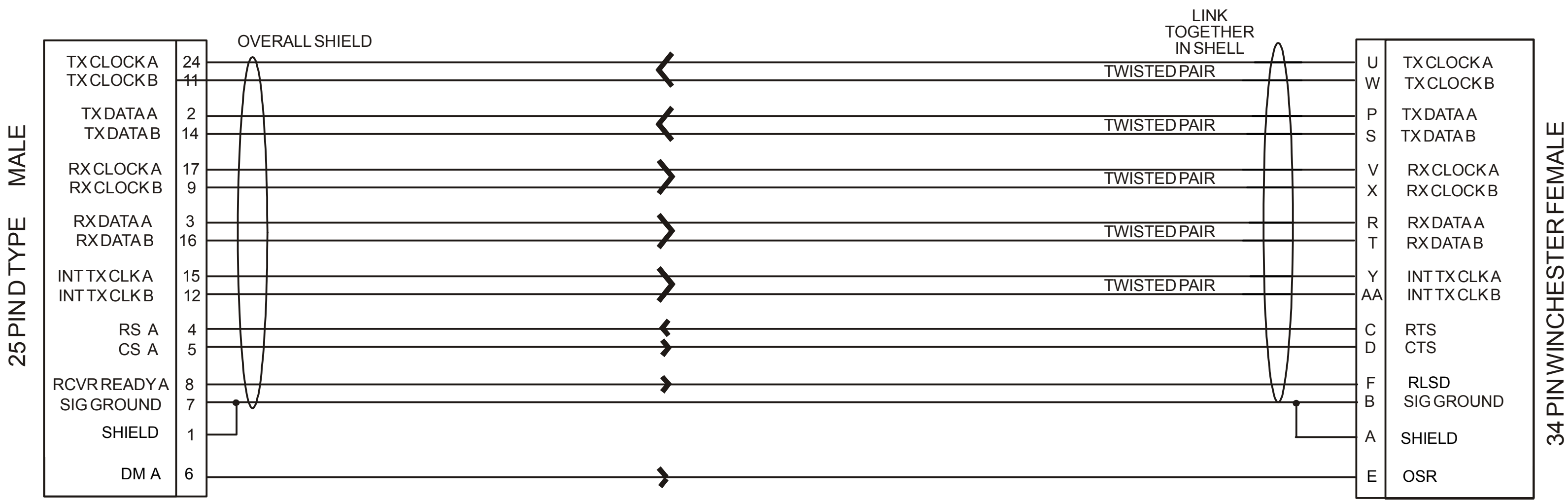
Comtech EF Data Documentation Update

Subject:	Revised EIA530 to V.35 DCE Conversion Cable
Date:	September 25, 2006
Document:	CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number:	MN/CDM-570L.EJ4
Collating Instructions:	Attach this page to page A-3

Comments:

Revised EIA530 to V.35 DCE Conversion table to show:

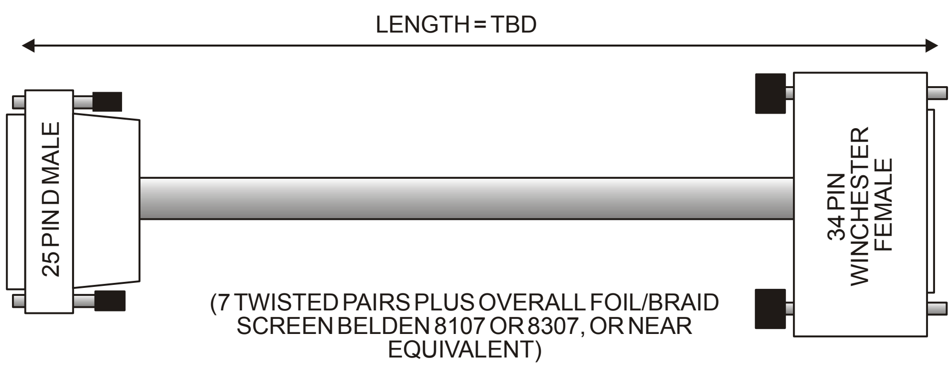
Change Specifics:



NOTES:

USE METAL BACKSHELLS FOR D TYPE CONNECTORS

ENSURE SHIELDING FOIL AND/OR BRAID IS BONDED TO METAL BACKSHELL FOR EMC SHIELDING



CDM-570L EIA530 TO V.35 DCE CONVERSION CABLE

Errata K

Comtech EF Data Documentation Update

Subject: Revised Table 5-2 Data Interface Connector Pin Assignments

Date: October 26, 2006
Document: CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number: MN/CDM-570L.EK4
Collating Instructions: Attach this page to page 5-2

Comments:

Changed TR A and TR B to DM A and DM B as shown:

Change Specifics:

Table 0-1. Data Interface Connector Pin Assignments

Pin #	Generic Signal Description	Direction	EIA-422 EIA-530	V.35	EIA-232	Circuit #
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
15	Internal Tx Clock A	Modem to DTE	ST A	SCT A	DB	114
12	Internal Tx Clock B	Modem to DTE	ST B	SCT B	-	114
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
8	Receiver Ready A	Modem to DTE	RR A	RLSD	CF	109
10	Receiver Ready B	Modem to DTE	RR B	-	-	109
5	Clear to Send A *	Modem to DTE	CS A	CTS	CB	106
13	Clear to Send B *	Modem to DTE	CS B	-	-	106
4	Request to Send A *	DTE to Modem	RS A	RTS	CA	105
19	Request to Send B *	DTE to Modem	RS B	-	-	105
6	Data Set Ready A *	Modem to DTE	**DM** A	DSR	CC	107
22	Data Set Ready B *	Modem to DTE	**DM** B	-	-	107
7	Signal Ground	-	SG	SG	AB	102
1	Shield	-	Shield	FG	AN	101

Errata L

Comtech EF Data Documentation Update

Subject:	Revised BUC Reference
Date:	October 26, 2006
Document:	CDM-570/570L Satellite Modem with Optional IP Module, Installation and Operation Manual, Rev. 4, dated April 12, 2006
Part Number:	MN/CDM-570L.EL4
Collating Instructions:	Attach this page to page 12-2

Comments:

Change BUC Reference as highlighted

Change Specifics:

BUC Reference (10 MHz)	On center conductor of L-band output connector; 10.0 MHz ± 0.02 ppm (Optional 1 ppm) **-3.0** dBm, ± 3 dBm; programmable ON/OFF Source: 1. Internal Modem Reference 2. External Reference (10 MHz)
Phase Noise	<u>dB/Hz</u> — <u>Frequency Offset</u> -80 — 1 Hz -110 — 10 Hz -135 — 100 Hz -140 — 1 kHz

CDM-570/570L

Installation and Operation Manual

CDM-570 - 70/140 MHz Satellite Modem
CDM-570L - L-band Satellite Modem
Optional IP Module
For Firmware Version 1.5.1 or higher
(see ***New in this Release*** – Section 1.5)

Comtech EF Data is an ISO 9001 Registered Company

Part Number MN/CDM570L.IOM
Revision 4
April 12, 2006

Comtech EF Data, 2114 West 7th Street, Tempe, Arizona 85281 USA, 480.333.2200, FAX: 480.333.2161

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Preface

Customer Service

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Information on upgrading or returning a product
- Reporting comments or suggestions concerning manuals

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data Number)
480.333.4357 (Customer Support Desk)
480.333.2161 FAX

or, E-Mail can be sent to the Customer Support Department at:
service@comtechefdata.com
Contact us via the web at www.comtechefdata.com.

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- Request a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support Department.
- Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- To ensure that the product is not damaged during shipping, pack the product in its original shipping carton/packaging.
- Ship the product back to Comtech EF Data. (Shipping charges should be prepaid.)

For more information regarding the warranty policies, see p. xiv.

About this Manual

This manual provides installation and operation information for the Comtech EF Data CDM-570 and CDM-570L satellite modems with optional IP Module. These two modems are essentially identical in their operation. The CDM-570 operates in the 70/140MHz IF band, whereas the CDM-570L operates at L-band, and includes support for externally connected BUCs and LNBs. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the CDM-570/570L with optional IP Module.

Conventions and References

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-metric to metric conversions.

Cautions and Warnings

IMPORTANT

Indicates information critical for proper equipment function.

WARNING

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department: techpub@comtechefdata.com.

Electrical Safety

The CDM-570/570L Modem has been shown to comply with the following safety standard:

- EN 60950: Safety of Information Technology Equipment, including electrical business machines

The equipment is rated for operation over the range 100 - 240 volts AC. It has a maximum power consumption of 250 Watts (when equipped with a 150W BUC power supply), and draws a maximum of 2.5 Amps.

IMPORTANT

The user should observe the following instructions:

Fuses

The CDM-570/570L is fitted with two fuses - one each for line and neutral connections. These are contained within the body of the IEC power inlet connector, behind a small plastic flap.

- For 230 volt AC operation, use T2.5A, 20mm fuses.
- For 115 volt AC operation, use T5.0A fuses, slow blow, P/N 5ASB-IEC.

The DC CDM-570/570L is fitted with two fuses – one each for positive and negative connections. These are contained within the body of the power inlet , behind a small plastic flap.

- For 38 to 60 VDC operation, use T2.0A, 20mm fuses if the modem has no BUC power supply.
- For 38 to 60 VDC operation, use T8.0A, 20 mm fuses if the modem is fitted with internal BUC power supply.

FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

Environmental

The CDM-570/570L must not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50°C, precipitation, condensation, or humid atmospheres above 95% RH, altitudes (non-pressurized) greater than 2000 meters, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed.

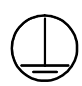
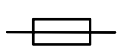
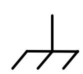
Installation

The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The CDM-570/570L is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to a power system that has no direct connection to ground.

The CDM-570/570L is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification. Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

International Symbols:

Symbol	Definition		Symbol	Definition
~	Alternating Current			Protective Earth
	Fuse			Chassis Ground

Telecommunications Terminal Equipment Directive

In accordance with the Telecommunications Terminal Equipment Directive 91/263/EEC, this equipment should not be directly connected to the Public Telecommunications Network.

EMC (Electromagnetic Compatibility)

In accordance with European Directive 89/336/EEC, the CDM-570/570L Modem has been shown, by independent testing, to comply with the following standards:

Emissions: EN 55022 Class B - Limits and methods of measurement of radio interference characteristics of Information Technology Equipment.

(Also tested to FCC Part 15 Class B)

Immunity: EN 50082 Part 1 - Generic immunity standard, Part 1: Domestic, commercial and light industrial environment.

Additionally, the CDM-570/570L has been shown to comply with the following standards:

EN 61000-3-2	Harmonic Currents Emission
EN 61000-3-3	Voltage Fluctuations and Flicker
EN 61000-4-2	ESD Immunity
EN 61000-4-4	EFT Burst Immunity
EN 61000-4-5	Surge Immunity
EN 61000-4-6	RF Conducted Immunity
EN 61000-4-8	Power frequency Magnetic Field Immunity
EN 61000-4-9	Pulse Magnetic Field Immunity
EN 61000-4-11	Voltage Dips, Interruptions, and Variations Immunity
EN 61000-4-13	Immunity to Harmonics

IMPORTANT

In order that the Modem continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive IF ports (‘N’ type female connectors) should be made using a good quality coaxial cable - for example, RG213/U.
- All 'D' type connectors attached to the rear panel must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back-shell.
- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly re-fitted before normal operation commences.

Warranty Policy

This Comtech EF Data product is warranted against defects in material and workmanship for a period of two years from the date of shipment. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective.

For equipment under warranty, the customer is responsible for freight to Comtech EF Data and all related custom, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges **only** for return of the equipment from the factory to the customer. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from improper installation or maintenance, abuse, unauthorized modification, or operation outside of environmental specifications for the product, or, for damages that occur due to improper repackaging of equipment for return to Comtech EF Data.

No other warranty is expressed or implied. Comtech EF Data specifically disclaims the implied warranties of merchantability and fitness for particular purpose.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order to provide an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact the Comtech EF Data Customer Support Department.

Chapter 1. INTRODUCTION

Figure 1-1. CDM-570/570L

1.1 Introduction

The CDM-570L is an L-band Satellite Modem, intended for closed network applications. The CDM-570 Satellite Modem is the 70/140 MHz IF version of the same modem. Apart from the IF frequency band, the two modems are essentially identical.

- Variable data rates from 2.4 kbps to 9.98 Mbps, in BPSK, QPSK, Offset QPSK, 8-PSK, 8-QAM, and 16-QAM modes are offered.
- Viterbi, concatenated Reed-Solomon (RS), Trellis Coded Modulation (TCM), and Turbo Product Coding (TPC, IESS-315 compliant) are provided as Forward Error Correction (FEC) options.
- A full range of interface types is built in, including T1 and E1 G.703 types.
- The CDM-570 IF frequency range covers 50 to 90 and 100 to 180 MHz.
- The CDM-570L IF frequency range covers 950 to 1950 MHz. and supports external Block Up-Converters (BUCs) and low-noise block downconverters (LNBs). An optional BUC power supply, up to 150 Watts may be installed internally. 10 MHz reference signals are available to drive both BUC and LNB. LNB power and FSK for ‘smart’ BUCs is standard.
- The CDM-570L is compact, 1U high and 16 inches deep, and consumes only 22 Watts (typical, not including BUC power supply or IP module). The CDM-570 is 12 inches deep and consumes 18 Watts (typical, not including IP module).
- They have a front panel VFD display and keypad for local configuration and control, although they can be fully remote-controlled.
- An optional integrated 10/100 BaseT Ethernet interface offers a wide range of network-based management options, such as SNMP, http (web server), and Telnet.

1.1.1 EDMAC

To facilitate network management for small networks, the CDM-570/570L incorporates **EDMAC**, (**E**mbedded **D**istant-end **M**onitor **A**nd **C**ontrol). In this mode, an additional 5% overhead is combined with the traffic data, (1.6% in Turbo BPSK modes, Turbo Rate 1/2 QPSK/OQPSK, and all data rates greater than 2 Mbps). M&C information is added (transparent to the user), allowing access to the distant-end modem. In addition, **EDMAC-2** uses 1.6% overhead in all modes for those applications where the 5% overhead is excessive. The EDMAC and EDMAC-2 modes do not require any additional cabling at either the local or distant-end Modems. Access to EDMAC is via the standard M&C control port. Full monitor and control is possible, and the on/off status at the distant-end carrier can be controlled.

1.1.2 AUPC

An important feature in the CDM-570/570L is the addition of Automatic Uplink Power Control (AUPC). This feature enables the modem to automatically adjust its output power to maintain the Eb/No of the remote end of the satellite link constant. This provides protection against rain fading, a particularly severe problem with Ku-band links.

To accomplish this, the framed (EDMAC) mode of operation must be used, and the distant end modem constantly sends back information about the demodulator Eb/No using reserved bytes in the overhead structure. Using the Eb/No, the local modem adjusts its output power, and a closed-loop feedback system is created over the satellite link.

A benefit of this feature is that whenever EDMAC/AUPC operation is selected, the remote demodulator's Eb/No can be viewed from the front panel display of the local modem. Note that both EDMAC and AUPC can be used simultaneously.

1.1.3 Software – Flash Upgrading

The internal software is both powerful and flexible, permitting storage and retrieval of up to 10 different modem configurations. The modem uses 'flash memory' technology internally, and new firmware can be uploaded to the unit from an external PC. This simplifies software upgrading, and updates can be sent via the Internet (from Comtech EF Data's Web server), e-mail, or on CD. The upgrade can be performed without opening the unit, by simply connecting the modem to a 10/100BaseT Ethernet port, or the USB port of a computer.

IMPORTANT

USB re-flash not available in this firmware release – please consult factory for release schedule.

1.1.4 Verification

The unit includes many test modes and loopbacks for rapid verification of the correct function of the unit. In particular, the IF loopback permits the user to perform a quick diagnostic test without disturbing external cabling. During the loopback, all the receive configuration parameters are temporarily changed to match the transmit side, and an internal RF switch connects the modulator output to the demodulator input. When normal operation is again selected, all of the previous values are restored.

1.1.5 Data Interfaces

The CDM-570/570L includes, as standard, a universal data interface that eliminates the need to exchange interface cards for different applications. The interfaces offered include:

- EIA-422 (EIA530) DCE (at rates up to 9.98 Mbps)
- X.21 DTE and DCE (at rates up to 9.98 Mbps)
- V.35 DCE (at rates up to 9.98 Mbps)
- Synchronous EIA-232 DCE (at rates up to 300 kbps)
- G.703 E1 (2048 kbps), balanced and unbalanced
- G.703 T1 (1544 kbps), balanced
- *Optional* – integrated 10/100 BaseT Ethernet interface

1.2 Major Assemblies

Assembly	Description
AS/10901	Modem Card - CDM-570
AS/9979	Modem Card - CDM-570L
AS/10554	Turbo Codec
AS/10551	Reed-Solomon Codec
PL/10047-1	Chassis
PL/10235	IP Module 10/100 BaseT Ethernet Interface (optional)

1.3 FAST Options and Hardware Options

The CDM-570/570L is extremely flexible and powerful, and incorporates a large number of optional features. In order to permit a lower initial cost, the modem may be purchased with only the desired features enabled. If, at a later date, a user wishes to upgrade the functionality of a modem, Comtech EF Data provides FAST (**F**ully **A**ccessible **S**ystem **T**opology) which permits the purchase and installation of options through special authorization codes, entered remotely, or through the front panel.

The base unit is configured with a Viterbi codec. It offers BPSK, QPSK, and OQPSK modulation types, and data rates up to 512 kbps, with all interface types except G.703. EDMAC and AUPC operation are included.

The following table shows what other options are available:

Option	Description and Comments	Option Installation Method
Low Rate Variable	Data rate 2.4 kbps to 512 kbps	BASE UNIT
Mid-Rate Variable	Data rate 2.4 kbps to 2.048 Mbps	FAST
Full Rate Variable	Data rate 2.4 kbps to 5.0 Mbps	FAST
Extended Rate Variable	Data rate 2.4 kbps to 9.98 Mbps	FAST
8-PSK/8-QAM	Modulation Type	FAST
16-QAM	Modulation Type	FAST
RS Codec	Closed-network Reed-Solomon Codec	Hardware
TPC Codec	5 Mbps Turbo Product Codec (IESS-315 compliant)	Hardware
TPC/LDPC Codec *	Combo TPC and LDPC (Low-density parity check) Codec	Hardware
100W BPSU	100 Watt, 24 volt BUC PSU ***(CDM-570L only)***	Hardware
150W BPSU	150 Watt, 48 volt BUC PSU ***(CDM-570L only)***	Hardware
	IP MODULE Ethernet Interface and IP Options	
IP MODULE Ethernet interface	10/100 BaseT Ethernet interface	Hardware
3xDES Data Encryption	Uses NIST certified 3x core Software Version 1.4.0 and later	FAST
IP Header Compression	Software Version 1.4.0 and later	FAST
Payload Compression	Software Version 1.4.0 and later	FAST
Quality of Service (QoS)	Software Version 1.4.0 and later	FAST

* consult factory for availability

1.3.1 FAST Accessible Options

Comtech EF Data's FAST system allows immediate implementation of different options through the user interface keypad, or via the remote control interface. All FAST options are available through the basic platform unit.

1.3.2 FAST System Theory

FAST is an enhancement feature available in Comtech EF Data products, enabling on-location upgrade of the operating feature set without removing a modem from the setup. When service requirements change, the operator can upgrade the topology of the modem to meet those requirements within minutes after confirmation by Comtech EF Data. This accelerated upgrade can be accomplished because of FAST's extensive use of programmable logic devices incorporated into Comtech EF Data's products. A unique access code enables configuration of the available hardware. The access code can be purchased at any time from Comtech EF Data. Once obtained, the access code is loaded into the unit through the front panel keyboard or the rear remote port.

With FAST technology, operators have maximum flexibility for enabling functions as they are required. FAST allows an operator to order a modem precisely tailored for the initial application.

1.3.3 Implementation

FAST is factory-implemented in the modem at the time of order. Hardware options for basic modems can be ordered and installed either at the factory or in the field. The operator can select options that can be activated easily in the field, depending on the current hardware configuration of the modem. The Activation Procedure is described in Appendix C.

1.3.4 Hardware Options

There are three hardware options available: Reed-Solomon Codec, Turbo Product Codec, and the IP Module Ethernet Interface. These cards fit into expansion slots on the main circuit board.

1.3.5 Supporting Hardware and Software

CDM-570L: For 1:1 applications the modem is supported by the CRS-170, a low-cost external switch. For Hub applications, the CDM-570L is supported by a low-cost 1:N switch, the CRS-300, with the CRS-280L.

CDM-570: For 1:1 applications the modem is supported by the CRS-180, a low-cost external switch. For Hub applications, the CDM-570 is supported by a low-cost 1:N switch, the CRS-300, with the CRS-280.

The CDM-570/570L is supported by Comtech EF Data's **CMCS** software, a Windows ™ based application that provides a 'point and click' interface for complete systems of Comtech EF Data equipment, comprising Modems, Transceivers, and Redundancy Switches. For more information, or to order a free demo disk, please contact the factory.

1.4 Compatibility

The CDM-570/570L is fully backwards-compatible with the Comtech EF Data CDM-500, CDM-550, and CDM-550T modems, in addition to the CDM-600, CDM-600L, SDM-300 and SDM-300L in selected modes.

Note: For CDM-570/570L with IP Module Ethernet Interface Option – The **CDM-570/570L** is fully backward-compatible with the Comtech EF Data CDM-IP 550 and CDM-IP 300L in selected modes.

1.5 New in this release

The following Firmware versions incorporate a number of additional features and enhancements. These include:

1.4.5 Release

- Adds GPS Mode to permit a Furuno GP-320B GPS receiver to be connected to a distant-end modem, and for the local end to query, via the EDMAC channel, the output from the GPS receiver. See document “CDM-570 GPS Mode” for operation detail.

1.5.1 Release

- CDM-570: FSK Communications to CSAT-5060 and KST-2000A/B Transceivers. The Transceivers can be monitored and controlled through multiple interfaces including Modem Front Panel, Serial Remote Port and Base Modem’s Ethernet Interfaces (HTTP, SNMP and Telnet).
  - New remote command “Outdoor Unit Comms Enable (ODU?, ODU=)” is added to Enable/Disable ODU communication. 0=Disabled, 1=Enabled.
  - Modem’s Serial Remote and Telnet interface use Transceivers’ Remote Commands directly to M&C the Transceivers.
  - Two new SNMP MIB files (FW10874-8-.mib and FW10874-9-.mib) are created to M&C CSAT and KST transceivers.

- High Rate FAST Option: 9980kbps Max Data Rate. Symbol rate is still limited to 3Msps maximum. Front Panel FAST option menu Option 13 is for used. Remote command Equipment ID (EID?) response is updated to reflect new data rate option: 3=up to 9980 kbps.

- Front panel lockout: Already, when in remote mode, user access of the front panel of the modem allows viewing of the configuration parameters, but does not allow changes to the configuration parameters. To make changes via the front panel, the user must first configure the modem for Local control via the Remote menu. This front panel lockout (FPL**)** feature, when activated, prevents or *locks-out* that ability to configure the modem into local mode from the front panel. New remote command FPL is added to enable/disable this feature.

- Supports small Receive Buffer Size: +/-128 bits, +/-256 bits and +/-512 bits. Remote command Rx Buffer Size (RBS) is update with new options: 7=+/-128 bits, 8=+/-256 bits, 9=+/-512 bits. Existing buffer sizes are not affected.

- Adds SNMP menus to configure SNMP parameters from Front Panel.

- Enhancements for IP Module:
  - Supports Supernetting of IP Addresses.
  - Supports upgrading Base Modem Firmware through IP Module. Allow FTP through IP Module to identified image (1, 2 or inactive image).
  - Retains Traffic IP Address across Base Modem Firmware upgrade.

- Enhancements for Vipersat support (not applicable for non-Vipersat systems).

1.5.2 Release

- Allows Telnet connection when modem is in Serial Remote mode. This enables modems in redundancy system to be monitored and controlled through Telnet. For the best performance of the entire modem functionality, it is recommended that the speed of command polling from Telnet is no faster than one command per second.

Notes:

Chapter 2. INSTALLATION

2.1 Unpacking

Inspect shipping containers for damage. If shipping containers are damaged, keep them until the contents of the shipment have been carefully inspected and checked for normal operation.

The modem and manual are packaged in pre-formed, reusable, cardboard cartons containing foam spacing for maximum shipping protection.

CAUTION

Do not use any cutting tool that will extend more than 1 inch into the container. This can cause damage to the modem.

Unpack the modem as follows:

1. Cut the tape at the top of the carton indicated by OPEN THIS END.
2. Remove the cardboard/foam space covering the modem.
3. Remove the modem, manual, and power cord from the carton.
4. Save the packing material for storage or reshipment purposes.
5. Inspect the equipment for any possible damage incurred during shipment.
6. Check the equipment against the packing list to ensure the shipment is correct.
7. Refer to the following sections for further installation instructions.

2.2 Mounting

If the CDM-570/570L is to be mounted in a rack, ensure that there is adequate clearance for ventilation, particularly at the sides. In rack systems where there is high heat dissipation, forced air cooling must be provided by top or bottom mounted fans or blowers. Under no circumstance should the highest internal rack temperature be allowed to exceed 50°C (122°F).

IMPORTANT

The CDM-570/570L CANNOT have rack slides mounted to the side of the chassis. Two cooling fans are mounted on the right-hand side of the unit. However, Comtech EF Data recommends that **an alternate** method of support within the rack be employed, such as rack shelves. If there is any doubt, please consult the Comtech EF Data Customer Support department.

2.2.1 Optional Rear-Mounting Installation Bracket

Install optional installation bracket (Figure 2-1) using mounting kit, KT/6228-2.

Table 2-1. Optional Mounting Kit , KT/6228-2

Quantity	Part Number	Description
2	FP/6138-1	Bracket, Rear Support
4	HW/10-32x1/2RK	Bolt, #10 Rack
2	HW/10-32HEXNUT	Nut, #10 Hex
4	HW/10-32FLT	Washer, #10 Flat
2	HW/10-32SPLIT	Washer, #10 Split
2	HW/10-32SHLDR	Screw, Shoulder #10

The tools required for this installation are a medium **Phillips™ screwdriver**, and a **5/32-inch SAE Allen™ Wrench.**

Refer to the following Figure, then install the Modem rear support brackets as follows:

a) Install the rear support brackets onto the mounting rail of the rack. Fasten with the bracket bolts.

b) Mount the modem into the equipment rack ensuring that the socket heads engage into the modem slots of the rear support brackets.

c) Fasten the provided #10 shoulder head screws to the rear-side mounting slots on either side of the chassis modem and secure with #10 flat washers, #10 split washers**,** and #10 hex nuts.

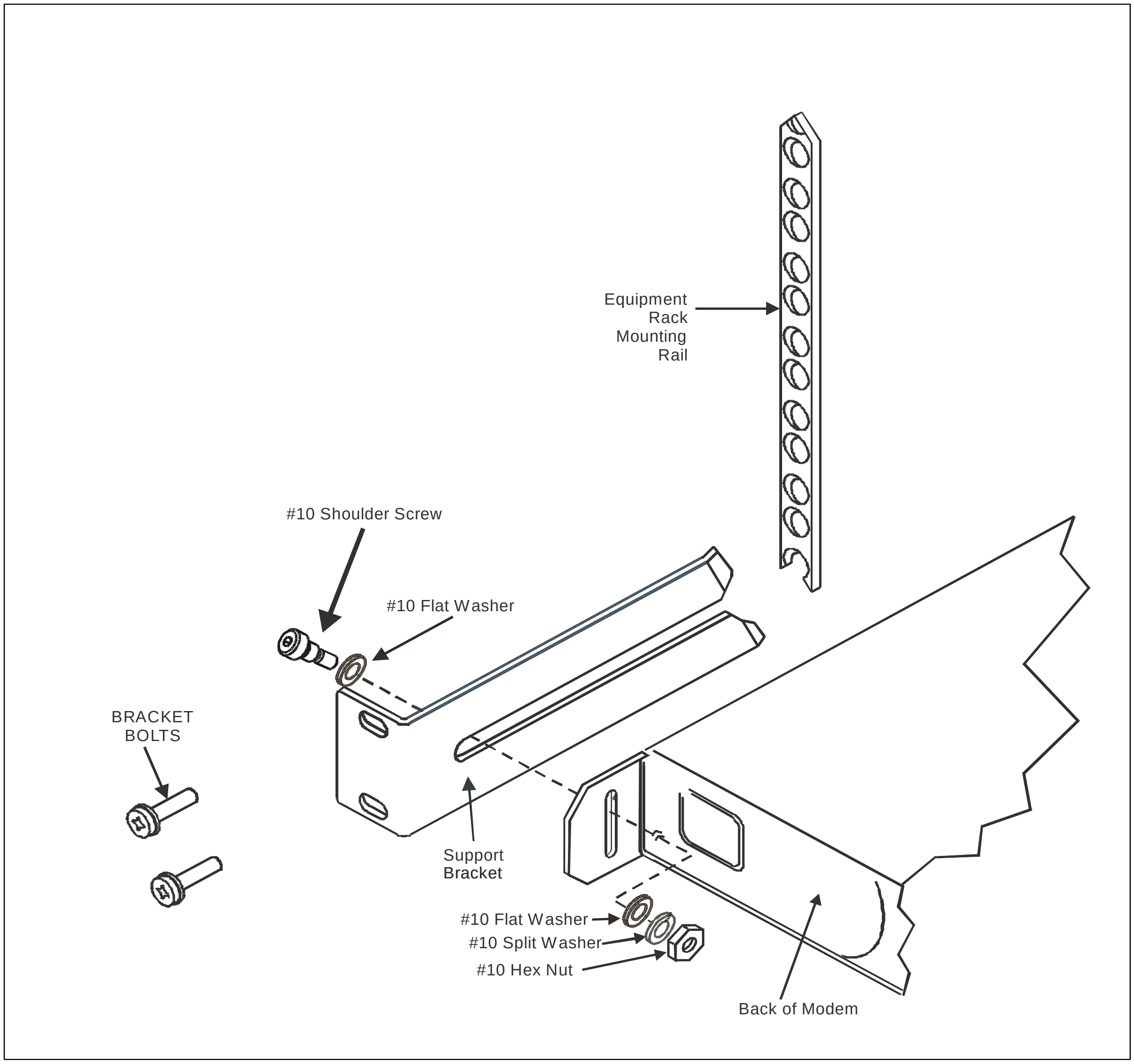


Figure 2-1. Installation of the Optional Mounting Bracket

2.3 Configuration

There are no internal jumpers to configure, no interface cards to install, and no other options to install. All configurations are carried out entirely in software. The unit should first be configured locally, using the front panel keypad and display. The unit will ship with a default 64 kbps, QPSK, Rate 1/2 configuration. Please refer to the ‘FRONT PANEL OPERATION’ section for details on how to fully configure the unit for the desired operating parameters.

Note: The auto-sensing AC power supply does not require any adjustments. Simply plug in the supplied line cord, and turn on the switch on the rear panel.

2.4 Select Internal IF Loop

Correct operation of the unit may be verified rapidly, without the need for externally connected equipment. From the top level menu, select TEST, then IF LOOP (refer to the ‘FRONT PANEL OPERATION’ section). The demod should synchronize, and the green RECEIVE TRAFFIC LED should illuminate. If the unit does not pass this test, call Comtech EF Data Customer Support department for assistance.

2.5 Connect External Cables

Having verified correct operation in IF loop, enter the desired configuration, and proceed to connect all external cables. If difficulties occur, please call the factory for assistance.

Chapter 3. FUNCTIONAL DESCRIPTION

The CDM-570/570L has two fundamentally different types of interface - IF and data.

- The data interface is a bi-directional path, which connects with the customer's equipment (assumed to be the DTE) and the modem (assumed to be the DCE).
- The IF interface provides a bi-directional link with the satellite via the uplink and downlink equipment.

Transmit data is received by the terrestrial interface where line receivers convert the clock and data signals to CMOS levels for further processing. A small FIFO follows the terrestrial interface to facilitate the various clocking and framing options. If framing is enabled, the transmit clock and data output from the FIFO pass through the framer, where the EDMAC overhead data is added to the main data. Otherwise, the clock and data are passed directly to the Forward Error Correction encoder. In the FEC encoder, the data is differentially encoded, scrambled, and then convolutionally encoded. Following the encoder, the data is fed to the transmit digital filters, which perform spectral shaping on the data signals. The resultant I and Q signals are then fed to the BPSK, QPSK/OQPSK, 8-PSK, or 16-QAM modulator. The carrier is generated by a frequency synthesizer, and the I and Q signals directly modulate this carrier to produce an IF output signal.

In the CDM-570L, the Rx IF signal in the range 950 to 1950 MHz is translated to an intermediate frequency at around 465 MHz, and from there further translated to baseband, using the carrier recovery VCO. In the CDM-570, the conversion of signals in the range 50 to 180 MHz is directly to baseband. This is a complex mix, resulting in the signal once more being split into an in-phase (I) and a quadrature (Q) component. An AGC circuit maintains the desired signal level constant over a broad range. Following this, the I and Q signals are sampled by high-speed (flash) A/D converters. All processing beyond this conversion is purely digital, performing the functions of Nyquist filtering, carrier recovery, and symbol timing recovery. The resultant demodulated signal is fed, in soft decision form, to the selected FEC decoder (which can be Viterbi, TCM, Reed-Solomon, or Turbo if installed). After decoding, the recovered clock and data pass to the de-framer (if EDMAC framing is enabled) where the overhead information is removed.

Following this, the data passes to the Plesiochronous/Doppler buffer, which has a programmable size, or may be bypassed. From here, the receive clock and data signals are routed to the terrestrial interface, and are passed to the externally connected DTE equipment.

The CDM-570/570L signal processing functions are performed in a single, large Field-Programmable Gate Array (FPGA), which permits rapid implementation of changes, additions and enhancements in the field. These signal processing functions are controlled and monitored by a 32-bit RISC microprocessor, which also controls all front panel, serial and Ethernet interfaces.

Physically the CDM-570/570L modem is comprised of a single printed circuit card assembly, with two expansion slots for FEC codecs and other option cards.

Chapter 4. PHYSICAL DESCRIPTION

4.1 Introduction

The CDM-570/570L is constructed as a 1U high rack-mounting chassis, which can be free-standing, if desired. Rack handles at the front facilitate removal from and placement into a rack. Figure 4-1 shows the front panel of the modem.

Figure 4-1. Front Panel

4.2 Front Panel

On the front panel of the unit is the Vacuum Fluorescent Display (VFD), keypad, and eight LED indicators. The user enters data via the keypad, and messages are displayed on the VFD. The LEDs indicate, in a summary fashion, the status of the unit.

The Vacuum Fluorescent Display (VFD) is an active display showing 2 lines, each of 24 characters. It produces a blue light, the brightness of which can be controlled by the user. It has greatly superior viewing characteristics compared to a Liquid Crystal Display (LCD), and does not suffer problems of viewing angle or contrast.

The keypad comprises six individual keyswitches, mounted directly behind a fully sealed membrane overlay. They have a positive ‘click’ action which provides the user with tactile feedback. These six switches are identified as ◄ ► (left, right), ▲▼ (up, down) arrows, **ENTER** and **CLEAR**. The functions of these keys are described in the ‘Front Panel Operation’ section.

There are eight LEDs on the front panel. The behavior of these LEDs is described in the ‘Front Panel Operation’ section.

There are eight LEDs on the rear panel, also. Six of these (all orange) indicate the interface type currently selected. For systems in a redundant configuration a green LED indicates the Online/Offline status of the unit. When the unit is connected to a 1:N switch, a red LED indicates that caution is required, as there may be DC voltages and other control signals present on certain pins on the 25 pin Data Interface connector. Associated with this mode is a slide switch that selects the 1:N mode.

At the far left of the front panel is a USB Type B connector, used for re-flashing the modem firmware, using a PC.

4.3 Rear Panel

Figure 4-2. Rear Panel - CDM-570L
(Shown with optional IP Module Ethernet Interface installed)

External cables are attached to connectors on the rear panel of the CDM-570L. These comprise:

- IEC line input connector
- Rx and Tx IF connectors - ‘N’ type female on CDM-570L, BNC female on CDM-570
- Data interface connector
- External reference connector
- Form C alarm connector
- T1/E1 Balanced G.703 connector
- Unbalanced G.703 Tx/Rx connectors
- Remote Control connector
- 1:1 Control connector
- 10/100BaseT Ethernet management port connector (M&C)
- 10/100BaseT Ethernet traffic port connector (Traffic, with optional IP Module)
- RJ11 6-pin Async Serial Console port (Console, with optional IP Module)

4.3.1 IEC Line Input Connector

The IEC line input connector contains the ON/OFF switch for the unit. It is also fitted with two fuses, one each for line and neutral connections (or L1, L2, where appropriate). These are contained within the body of the connector, behind a small plastic flap.

- For 230 volt AC operation, use T2.5A, (slow-blow) 20mm fuses.
- For 115 volt AC operation, use T5.0A, (slow-blow) 20mm fuses.

IMPORTANT

For continued operator safety, always replace the fuses with the correct type and rating.

4.3.2 Rx and Tx IF Connectors

CDM-570L: The IF port connectors are both a 50Ω 'N' female type. The return loss on these ports is greater than 19 dB (typically better than 21 dB), and if the user wishes to connect to a 75Ω system, an inexpensive 'N' to 'F' type adapter can be used. While there will be a reduction in return loss when doing this, the effect in most systems will be imperceptible.

CDM-570: The IF port connectors are both a BNC female type. The return loss on these ports is greater than 17 dB (typically better than 19 dB) in *BOTH* 50Ω and 75Ω systems.

4.3.3 Data Interface Connector

The Data connector is a 25-pin 'D' type female (DB25-F). This connector conforms to the EIA-530 pinout, which allows for connection of different electrical standards, including EIA-422, V.35, and EIA-232. A shielded 25-pin 'D' type provides a very solid solution to EMC problems, unlike the sometimes used V.35 Winchester connector.

IMPORTANT

It is the responsibility of the user to provide the appropriate cables to connect to this EIA-530 connector.

4.3.4 External Reference Connector

This is BNC female connector. The signal supplied here by the user is used for phase-locking the internal 10MHz reference oscillator, and can be 1, 2, 5, 10 or 20 MHz. The impedance is matched for 50/75Ω, and requires a level in the range –6 to +10 dBm.

4.3.5 Form C Traffic Alarm Connector

The Alarms connector is a 15-pin 'D' type male (DB15-M). This provides the user with access to the Form-C relay contacts which indicate the fault status of the unit. These are typically connected to an external fault monitoring system, often found in satellite earth stations. In addition, the receive I and Q demodulator samples are provided on this connector. Connecting these signals to an oscilloscope in X,Y mode will provide the receive signal constellation diagram, which is a useful diagnostic aid. A pin is also provided which can mute the transmit carrier. This requires that the pin be shorted to ground, or a TTL ‘low’, or an RS232 ‘high’ signal be applied.

As an aid to antenna pointing, or for driving step-track equipment, an analog AGC signal is provided on Pin 2 of this connector.

4.3.6 Balanced G.703 Connector Tx/Rx Connector

A 15-pin 'D' type female (DB15-F) for balanced operation at the G.703 data rates of T1 (1.544 Mbps) or E1 (2.048 Mbps).

4.3.7 Unbalanced G.703 Tx/Rx

Two female BNC 75Ω connectors for unbalanced operation at the G.703 data rates of E1 (2.048 Mbps).

4.3.8 Remote Control Connector

The Remote Control connector is a 9-pin ‘D’ type male (DB-9-M). Access is provided to remote control ports of the modem, both EIA-232 and EIA-485.

4.3.9 1:1 Control Connector

This connector is used to connect the modem to a CRS-170 switch in 1:1 redundancy configurations.

4.3.10 10/100 BaseT Ethernet management port connector (M&C)

This is a standard RJ45 receptacle for connecting UTP cable to an Ethernet hub, router, switch, PC, etc. Used for upgrading CDM-570L base modem firmware.

4.3.11 10/100 BaseT Ethernet Traffic Port Connector (Traffic, with Optional IP Module)

This is a standard RJ45 receptacle for connecting UTP cable to an Ethernet hub, router, switch, PC, etc. Used for Ethernet traffic, management of CDM-570L and IP Module functions via Telnet/HTTP/SNMP, upgrading of CDM-570L IP Module software.

4.3.12 Serial Console Port (Console, with Optional IP Module)

This is an RJ11 6-pin ASYNC RS-232 serial console port used for management of CDM-570L and IP Module functions using a terminal emulator connected to the Console port with supplied adaptor cable.

4.4 Dimensional Envelope

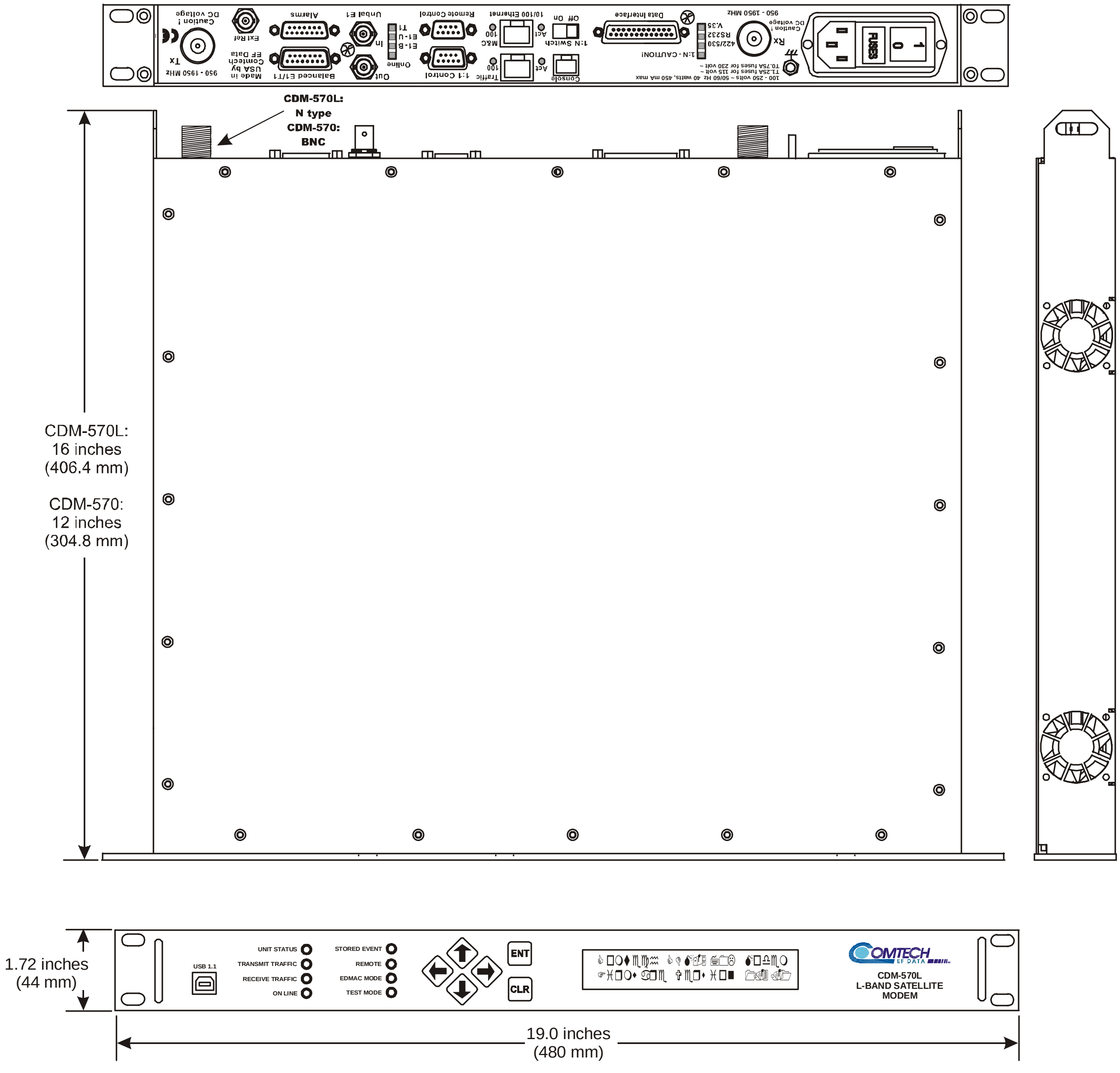


Figure 4-3. Dimensional Envelope

Chapter 5. CONNECTOR PINOUTS

5.1 Connector Overview

The rear panel connectors (Figure 5-1) provide all necessary external connections between the modem and other equipment.

Figure 5-1. Rear Panel (shown with optional IP Module Ethernet Interface installed)

Table 5-1. External Connections

Name	Connector Type	Function
Rx IF	**570L**: ‘N’ type (female) **570**: BNC (female)	RF Input
Tx IF	**570L**: ‘N’ type (female) **570**: BNC (female)	RF Output
1:1 Control	9-pin D (female)	Connects to CRS-170/180 switch
Data Interface	25-pin D (female)	Data Input/Output
External Reference	BNC (female)	Input
Remote Control	9-pin D (male)	Serial Remote Interface
Console	RJ-11	Serial Console Interface
10/100 Ethernet Traffic	RJ-45	Ethernet Traffic and M&C
10/100 Ethernet M&C	RJ-45	Upgrade of base modem M&C
Alarms	15-pin D (male)	Form C Alarms
Balanced G.703	15-pin D (female)	Balanced G.703 Data
Rx Unbalanced	BNC (female)	Receive G.703 Data
Tx Unbalanced	BNC (female)	Transmit G.703 Data

5.2 Data Interface Connector

The Data Interface connector, a 25-pin D type female, conducts data input and output breakout panel, or protection switch. Refer to Table 5-2 for pin assignments.

IMPORTANT **THE MODEM IS *ALWAYS* ASSUMED TO BE DCE.** IMPORTANT

Table 5-2. Data Interface Connector Pin Assignments

Pin #	Generic Signal Description	Direction	EIA-422 EIA-530	V.35	EIA-232	Circuit #
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
15	Internal Tx Clock A	Modem to DTE	ST A	SCT A	DB	114
12	Internal Tx Clock B	Modem to DTE	ST B	SCT B	-	114
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
8	Receiver Ready A	Modem to DTE	RR A	RLSD	CF	109
10	Receiver Ready B	Modem to DTE	RR B	-	-	109
5	Clear to Send A *	Modem to DTE	CS A	CTS	CB	106
13	Clear to Send B *	Modem to DTE	CS B	-	-	106
4	Request to Send A *	DTE to Modem	RS A	RTS	CA	105
19	Request to Send B *	DTE to Modem	RS B	-	-	105
6	Data Set Ready A *	Modem to DTE	TR A	DSR	CC	107
22	Data Set Ready B *	Modem to DTE	TR B	-	-	107
7	Signal Ground	-	SG	SG	AB	102
1	Shield	-	Shield	FG	AN	101

Notes:

- When the rear-panel switch marked “1:N Switch” is in the **OFF** position, all of the signals shown above are available and functional. In addition, pins not shown are not connected, and therefore no damage will occur if other signals are connected to the additional pins.
- When the rear-panel switch marked “1:N Switch” is in the **ON** position, the highlighted signals, plus pins 18, 20, 21, 22, 23 and 25 are reserved for use by the 1:N system. **DO NOT** connect signals to any of these pins in this mode. Certain pins have DC voltages present that may damage equipment other than a Comtech EF Data redundancy switch.
- For X.21 operation, use the EIA-422 pins, but ignore Receive Clock if the Modem is DTE, and ignore Transmit Clocks if the Modem is DCE.

5.3 Balanced G.703 Interface Connector

The Balanced G.703 connection is a 15-pin female connector located on the rear panel of the modem. Refer to Table 5-3 for pin assignments.

Table 5-3. Balanced G.703 Interface Connector Pin Assignments

Pin #	Signal Function	Name	Direction
1	Tx G.703 -	Tx G.703 In	In
9	Tx G.703 +	Tx G.703 In	In
2	Ground	GND	
3	Rx G.703 -	Rx G.703 Out	Out
11	Rx G.703 +	Rx G.703 Out	Out
4	Ground	GND	

Pins 5, 6, 7, 8, 10, 12, 13, 14 and 15 are not used.

5.4 Remote Control Interface Connector

The remote control interface connection is a 9-pin male connector located on the rear panel of the modem. Refer to Table 5-4 for pin assignments.

The remote control port is intended for connection to an M&C computer, or terminal device.

This interface is user selectable for either EIA-232 or EIA-485.

Table 5-4. Remote Control Interface Connector Pin Assignments

Pin #	Description	Direction
1	Ground	
2	EIA-232 Transmit Data	Out
3	EIA-232 Receive Data	In
4	Reserved - do not connect to this pin	
5	Ground	
6	EIA-485 Receive Data B *	In
7	EIA-485 Receive Data A *	In
8	EIA-485 Transmit Data B	Out
9	EIA-485 Transmit Data A	Out

*** Use for 2-wire EIA-485 operation**

5.5 BNC Connectors

There are three BNC connectors located on the rear panel of the modem. Refer to Table 5-5 for pin assignments.

Table 5-5. BNC Connectors

BNC Connector	Description	Direction
EXT REF	External Reference Input	In
G.703 Out	Rx G.703 (Unbalanced)	Out
G.703 In	Tx G.703 (Unbalanced)	In

5.6 Unit Alarms

Unit alarms are provided on a 15-pin male connector located on the rear panel of the modem. Refer to Table 5-6 for pin assignments.

Table 5-6. Alarm Interface Connector Pin Assignments

Pin #	Signal Function	Name
8	Rx Traffic (De-energized, Faulted)	RX-NC
15	Rx Traffic (Energized, No Fault)	RX-NO
7	Rx Traffic	RX-COM
14	Tx Traffic (De-energized, Faulted)	TX-NC
6	Tx Traffic (Energized, No Fault)	TX-NO
13	Tx Traffic	TX-COM
5	Unit Fault (De-energized, Faulted)	UNIT-NC
12	Unit Fault (Energized, No Fault)	UNIT-NO
4	Unit Fault	UNIT-COM
11	Rx I Channel (Constellation monitor)	RX-I
3	Rx Q Channel (Constellation monitor)	RX-Q
10	No Connection	N/C
2	AGC Voltage (Rx signal level, 0 to 10 volts)	AGC
9	EXT Carrier OFF	EXT-OFF
1	Ground	GND

5.7 1:1 Control Connector

The 1:1 Control connection is a 9-pin female connector located on the rear panel of the modem. Refer to Table 5-7 for pin assignments.

The 1:1 Control connector is intended ***only*** for connection to a CRS-170 Redundancy Switch.

Table 5-7. 1:1 Control Interface Connector Pin Assignments

Pin #	Description	Direction
1	Ground	
2	Receive Serial Data – auxiliary channel	In
3	Redundancy In 1	In
4	Redundancy In 2	In
5	Ground	
6	Transmit Serial Data – auxiliary channel	Out
7	Redundancy Out 1	Out
8	Redundancy Out 2	Out
9	Fused +12 volt	Out

5.8 Async-Serial Console (Optional IP Module Only)

The Console Connector is a RJ11-6 modulator jack located on the rear panel. The Async-Serial Console interfaces the IP Module Command Line Interface (CLI). This is a RS-232 DCE interface.

Table 5-8. ASYNC-Serial Console Connector

Pin #	Function
1	Ground
2	Rx
3	Tx
4	Ground
5	Not used
6	Not used

5.9 Ethernet Interface Connectors (Traffic and M&C)

The 10/100BaseT Ethernet connector is a RJ45-8 modular jack. There is one connector present on the base modem assembly, used for M&C purposes, and a second connector present if the optional IP module is installed. The second connector is used for the IP traffic connection. This interface is a Network Interface Card (NIC) pinout.

Table 5-9. Ethernet Interface Connector

Pin #	Function
1	Tx+
2	Tx-
3	Rx+
4	N/C
5	N/C
6	Rx-
7	N/C
8	N/C

5.10 AC Power Connector

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the modem. Note the following:

AC Power Specifications	
Input Power	40W maximum, 20W typical
Input Voltage	100 - 240 volts AC, +6%/-10% - autosensing (total absolute max. range is 90 - 254 volts AC)
Connector Type	IEC
Fuse Protection	5.0A Slow-blow (115 volt AC operation) 2.5A Slow-blow (230 volt AC operation) Line and neutral fusing 20 mm type fuses

5.11 Ground Connector

A #10-32 stud on the rear panel of the modem is used for connecting a common chassis ground among equipment.
Note: The AC power connector provides the safety ground.

Chapter 6. FRONT PANEL OPERATION

6.1 INTRODUCTION

Figure 6-1. Front Panel View

The user can fully control and monitor the operation of the CDM-570/570L from the front panel, using the keypad and display. Nested menus are used, which display all available options, and prompt the user to carry out a required action.

The display has two lines each of 24 characters. On most menu screens, the user will observe a flashing solid block cursor, which blinks at a once-per-second rate. This indicates the currently selected item, digit, or field. Where this solid block cursor would obscure the item being edited (for example, a numeric field) the cursor will automatically change to an underline cursor.

If the user were to display the same screen for weeks at a time, the display could become 'burnt' with this image. To prevent this, the unit has a 'screen saver' feature, which will activate after 1 hour. The top line of the display will show the Circuit ID (which can be entered by the user) and the bottom line will show the circuit Eb/No value (if the demod is locked) followed by 'Press any key....'. The message moves from right to left across the screen, then wraps around. Pressing any key will restore the previous screen.

The behavior of the front panel LEDs is described below in Table 6-1.

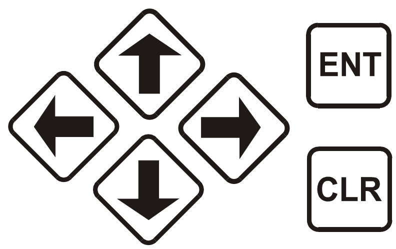
Table 6-1. Front Panel LED Indicators

LED	Color	Condition
Unit Status	**Red**	A Unit Fault exists (Example: PSU fault)
	Orange	No Unit Faults, but a Traffic Fault, or ODU (BUC or LNB) fault exists
	Green	No Unit Faults, or Traffic Faults
Transmit Traffic	**Green**	No Tx Traffic Faults
	Off	A Tx Traffic fault exists OR the Tx Carrier is in OFF state
Receive Traffic	**Green**	No Rx Traffic Faults (demod and Viterbi decoder are locked, everything is OK)
	Off	An Rx Traffic fault exists (the demod may still be OK – check the fault status of the unit from the **Monitor** menu).
On line	**Green**	The Unit is On Line, and carrying traffic
	Off	The Unit is Off Line (standby) - forced by externally connected 1:1 or 1:N redundancy system
Stored Event	**Orange**	There is a Stored Event in the log, which can be viewed from the front panel, or retrieved via the remote control interface
	Off	There are no Stored Events
Remote	**Orange**	The Unit is in Remote Mode - local monitoring is possible, but no local control
	Off	The Unit is in Local Mode - remote monitoring is possible, but no remote control
	Flashing	ODU FSK control has been enabled, and there is a communications fault
EDMAC Mode	**Orange**	Framing on, EDMAC on, and unit defined as Slave - local monitoring is possible, but no local control
	Off	Either the unit is in Transparent mode (no framing), or the framing has been selected, but in AUPC-only mode, or EDMAC Master configuration
Test Mode	**Orange**	A Test Mode is selected (Example: IF Loopback)
	Off	There is no Test Mode currently selected

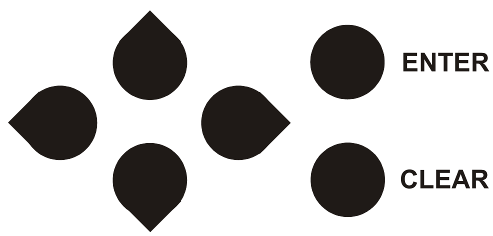
IMPORTANT

In general, the Alarm relay state will reflect the state of the Front Panel LEDs. For instance, if the Unit Status LED is red, the Unit Alarm relay will be active, etc. The one exception is the Transmit Traffic relay. This will only be activated if a Transmit Traffic Fault exists – it does **not** reflect the state of the TX carrier.

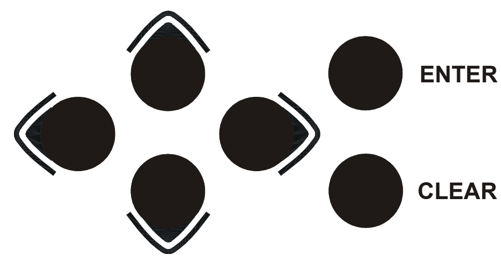
As the manufacturing process of CDM-570/570L has evolved, there have been three different keypad layouts, shown in Figure 6-2:



Keypad layout on units manufactured prior to June 2005 - flat membrane



Keypad layout on units manufactured between June and October 2005 - protruding black buttons



Keypad layout on units manufactured October 2005 onwards - protruding black buttons

Figure 6-2. Keypad

The function of these keys is as follows:

ENT (Enter)	This key is used to select a displayed function or to execute a modem configuration change.
CLR (Clear)	This key is used to back out of a selection or to cancel a configuration change which has not been executed using **ENTER**. Pressing **CLEAR** generally returns the display to the previous selection.
◄ ► **(Left, Right)**	These arrows are used to move to the next selection or to move the cursor position. Most of the menus (space permitting) include arrow key hints to guide the user.
▲ ▼ **(Up, Down)**	These arrows are used primarily to change configuration data (numbers), at the current cursor position. Occasionally they may be used to scroll through a number of choices at the current cursor position. Most of the menus (space permitting) include arrow key hints to guide the user.

IMPORTANT

The keypad has an auto-repeat feature. If a key is held down for more than 1 second, the key action will repeat, automatically, at the rate of 15 keystrokes per second. This is particularly useful when editing numeric fields, with many digits, such as frequency or data rate.

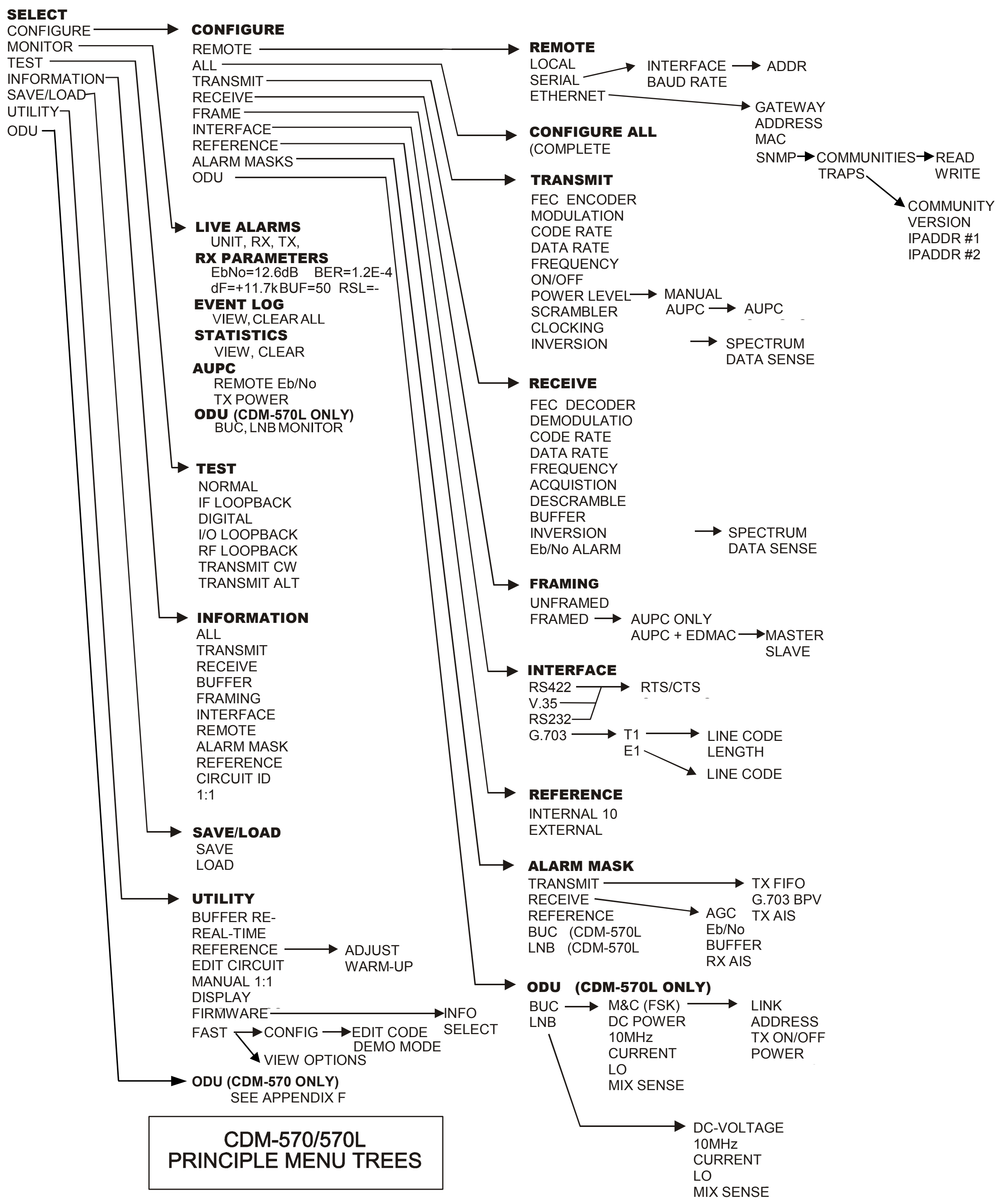


Figure 6-3. Menu Trees

6.2 OPENING SCREEN

This screen is displayed whenever power is first applied to the unit. If the Internal Reference warm-up delay feature has been disabled (see under **UTIL, REF, Warm-up Delay**) on of the following screens is displayed (depending on modem type):

```
Comtech CDM-570L Modem
Firmware Version:1.3.1
```

```
Comtech CDM-570 Modem
Firmware Version:1.3.1
```

If, however, the Internal Reference warm-up delay feature has been enabled, one of the following screens will be displayed:
The bottom right of the display counts down, in seconds, until the warm-up period is complete. ***During this period, the Tx Carrier is deliberately muted***. At the end of the warm-up period, the bottom line will revert to the 'normal' display of Firmware version, and the unit will enter its normal operational state. At this stage, pressing any key will take the user to the top level selection screen.

```
Comtech CDM-570L Modem
Ref Warming-up: 045 secs
```

```
Comtech CDM-570 Modem
Ref Warming-up: 045 secs
```

IMPORTANT

IMPORTANT NOTE: If the user wishes to bypass this feature, the warm-up period may be over-ridden at any time by pressing the **CLEAR** key.

6.3 MAIN SELECT MENU

CDM-570L

```
SELECT: Config  Monitor
Test Info Save/Load Util
```

CDM-570

```
SELECT: Config Test Info
Monitor Save/Ld Util ODU
```

Move the cursor to the desired choice using the ◄ ► arrow keys, then press **ENTER**.

Monitor	This menu branch permits the user to monitor the alarm status of the unit, to view the log of stored events, and to display the Receive Parameters screen.
Test	This menu branch permits the user to invoke one of several test modes (loopbacks, for example).
Info	(Information) This menu branch permits the user to view information on the unit, without having to go into configuration screens.
Save/Load	This menu branch permits the user to save and to retrieve up to 10 different modem configurations.
Util	(Utility) This menu branch permits the user to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.

ODU (CDM-570 only)	(Outdoor Unit). This permits the user to monitor and control a Comtech EF Data RF Transceiver (CSAT or KST-2000A/B), if connected.

6.4 CONFIG

Move the cursor to the desired choice using the ◄ ► arrow keys, then press **ENTER**.

```
CONFIG: Remote All Tx Rx
Frame Intfc Ref Mask ODU
```

Remote	(Remote Control) This menu sub-branch permits the user to define whether the unit is being controlled locally, or remotely.
Tx	(Transmit) This menu sub-branch permits the user to define, on a parameter-by-parameter basis, the transmit configuration of the unit. These menu sub-branches would be used if the user wished to change, for example, just the Transmit frequency.
Rx	(Receive) This menu sub-branch permits the user to define, on a parameter-by-parameter basis, the receive configuration of the unit. These menu sub-branches would be used if the user wished to change, for example, just the receive data rate.
Frame	This menu sub-branch permits the user to define operation in a transparent mode (no framing) or in a framed mode. In the framed mode, an overhead of 5% or 1.6% is added to the rate transmitted over the satellite so that M&C and AUPC information may be passed to the distant end.
Intfc	(Interface) This menu sub-branch permits the user to define which electrical interface type is active at the data connectors (either the EIA-530 port, or the G.703 ports).
Ref	(Reference) This menu sub-branch permits the user to define whether the unit should use its own internal 10MHz reference, or phase lock to an externally applied reference, and if so, at what frequency.
Mask	This menu sub-branch permits the user to mask certain traffic alarms, which may cause problems to the user. As an example, certain multiplexers use ‘all ones’ as an idle pattern. However, by convention, the ‘all ones’ condition is taken to be the Alarm Indication Signal (AIS). If desired, this alarm may be masked.
ODU (CDM-570L only)	(Outdoor Unit) This menu sub-branch permits the user to configure externally connected Low-noise Block Down Converter (LNB) and/or Block Up Converter (BUC).

Each of these options is now described in detail.

6.5 (CONFIG) REMCONT (Remote control)

Select **Local, Serial** or **Ethernet** using the ◄ ► arrow keys, then press **ENTER**.

```
Remote Control: Local
Serial Ethernet(◄ ►,ENT)
```

If **Local** is selected then remote control will be disabled. Remote monitoring is still possible.

6.5.1 (CONFIG, REMOTE) SERIAL

If **Serial** is selected and if the unit has not been defined as an EDMAC SLAVE then: then the following sub-menus will be displayed:

```
Serial Config: Interface
Baudrate      (◄ ►,ENTER)
```

(CONFIG, REMOTE, SERIAL, INTERFACE)

If **Interface** is selected:

```
M&C Bus Interface: RS232
RS485-2W RS485-4W  (◄ ►)
```

Select **RS232**, **RS485 (2-wire),** or **RS485 (4-wire),** using the ◄ ► arrow keys, then press **ENTER**. At this point the user will be further prompted to enter the bus address.

If **RS232** is selected, the following menu is displayed:

```
In RS232 Mode the Bus
Address is fixed at 0000
```

(CONFIG, REM, SERIAL, INTFC, ADDR) RS485 BUS ADDRESS

However, if either **RS485** mode is selected, the user will be further prompted:

```
 RS485 Bus Address: 0245
          (◄ ►,▲ ▼,ENTER)
```

Edit the RS485 bus address of this unit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲▼ arrow keys. The user should then press **ENTER**. The valid range of addresses is from 1 to 9999.

(CONFIG, REM, SERIAL, BAUD RATE)

If the user selects Baud Rate, the user is presented with the following menu: Edit the baud rate of the remote control bus, connected locally to the M&C

```
Local M&C Bus Baud Rate:
19200 Baud    (▲ ▼,ENTER)
```

computer. The value is changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. Values of 2400, 4800, 9600,19200, 38400 and 57600 baud are possible.

Note that the asynchronous character format is **FIXED** at 8 data bits, 1 stop bit, no parity (8-N-1).

6.5.2 (CONFIG, REMOTE) ETHERNET

If **Ethernet** is selected the following sub menu is displayed:

```
Ethernet Config: Gateway
Address MAC SNMP    (◄ ►)
```

(CONFIG, REMOTE, ETHERNET) GATEWAY

If **Gateway** is selected the following sub-menu is displayed:

```
Ethernet IP Gateway:
192.168.001.002  (◄ ►,▲ ▼)
```

Edit the IP Gateway Address for the Ethernet M&C port for this unit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**.

(CONFIG, REMOTE, ETHERNET) ADDRESS

If **Address** is selected the following sub-menu is displayed:

```
Ether IP Address/Range:
192.168.001.002/24 (◄ ►,▲ ▼)
```

Edit the IP Address and Range for the Ethernet M&C port for this unit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**.

(CONFIG, REMOTE, ETHERNET) MAC

If **MAC** is selected, the following *information-only* sub-menu is displayed: Once the MAC address has been noted, the user should then press **ENTER** or **CLEAR.**

```
M&C Port MAC Address:
00-06-B0-00-01-06 (ENTER)
```

(CONFIG, REMOTE, ETHERNET) SNMP

If **SNMP** is selected the following sub-menu is displayed:

```
SNMP:  Communities  Traps
                  (◄ ►, ENT)
```

(CONFIG, REMOTE, ETHERNET, SNMP) Communities

If **Communities** is selected, the following sub-menu is displayed:

```
SNMP Communities:
Read  Write       (◄ ►, ENT)
```

If **Read** is selected, the following sub-menu is displayed.

```
Read Community: (◄ ►,▲ ▼)
public
```

If **Write** is selected, the following sub-menu is displayed.

```
Write Community: (◄ ►,▲ ▼)
private
```

Edit the SNMP Read or Write Community string using the ◄ ► and ▲ ▼ arrow keys. Only the first 20 characters on the bottom line are available. The cursor selects the position on the bottom line (◄ ►) and the character is then edited (▲ ▼). All printable ASCII characters are available with the exception of the backslash (ASCII code 92) and ~ (ASCII code 126). When the user has composed the string, press **ENTER**. All trailing spaces are removed from the Community string upon entering.

(CONFIG, REMOTE, ETHERNET, SNMP) Traps

If **Traps** is selected, the following sub-menu is displayed:

```
Traps: Community Version
IP Addr#1 IP Addr#2   (◄ ►)
```

If **Community** is selected, the following sub-menu is displayed.

```
Trap Community: (◄ ►,▲ ▼)
comtech
```

Edit the SNMP Read or Write Community string using the ◄ ► and ▲ ▼ arrow keys. Only the first 20 characters on the bottom line are available. The cursor selects the position on the bottom line (◄ ►) and the character is then edited (▲ ▼). All printable ASCII characters are available with the exception of the backslash (ASCII code 92) and ~ (ASCII code 126). When the user has composed the string, press **ENTER**. All trailing spaces are removed from the Community string upon entering.

If **Version** is selected, the following sub-menu is displayed.

```
Trap Version:
SNMPv1  SNMPv2  (◄ ►,ENT)
```

Select **SNMPv1** or **SNMPv2** using the ◄ ► then, press **ENTER**.

If **IP Addr#1** is selected, the following sub-menu is displayed.

```
Trap IP #1:    (◄ ►,▲ ▼)
000.000.000.000
```

If **IP Addr#2** is selected, the following sub-menu is displayed.

```
Trap IP #2:    (◄ ►,▲ ▼)
000.000.000.000
```

These two IP Addresses are Trap Destination's IP Addresses. Edit the IP Address by using the
◄ ► and ▲ ▼ arrow keys. If both Trap IP Address are 000.000.000.000, it means Trap is disabled.

6.6 (CONFIG) ALL

The user is presented, in a sequential fashion, with ***every*** configuration option that is part of the individual configuration menus.

6.7 (CONFIG) TX (Transmit)

```
Tx:FEC Mod Code Data Frq
On/Off Pwr Scram Clk Inv
```

Select **FEC, Mod, Code, Data, Frq, On/Off, Pwr, Scram, Clk** or **Inv** using the ◄ ► arrow keys, then press **ENTER.** The user will then be taken to a further sub-menu. Each of these choices is described briefly in the table below:

FEC	(Forward Error Correction) This sub-menu permits the user to select the method of FEC used for transmission (Viterbi, TPC, etc). FEC type takes the highest configuration priority.
Mod	(Modulation) This sub-menu permits the user to select the modulation type used for transmission (BPSK, QPSK, 8-PSK, etc.). The choice of modulation will depend on the FEC type chosen.
Code	(FEC Code Rate) This sub-menu permits the user to select the FEC Code Rate used for transmission (Rate 1/2, Rate 3/4, etc.). The choice of Code Rate will depend on both the FEC type and Modulation selected.
Data	(Data Rate) This sub-menu permits the user to select the transmit data rate, in steps of 1 bps. The choice of data rate will depend on the FEC type, Modulation, and Code Rate selected.
Frq	(Frequency) This sub-menu permits the user to select the transmit frequency, in steps of 100Hz. **CDM-570L range:** 950 MHz to 1950 MHz **CDM-570 range**: 50 to 90 MHz and 100 to 180 MHz
On/Off	This sub-menu permits user to control the output state of the transmit carrier.
Pwr	(Output Power level) This sub-menu permits the user to control the output level of transmit carrier, either manually, or using the AUPC (Automatic Uplink Power Control) feature.
Scram	(Scrambler) This sub-menu permits the user to select whether or not data scrambling is used.
Clk	(Clock Source) This sub-menu permits the user to select the clock source for transmission. This can be from the CDM-570L's high stability internal source, from an external source, or from the distant-end of the satellite link (loop timed).
Inv	(Inversion) This sub-menu permits the user to invert the sense of the transmitted spectrum, or to invert the sense of the transmitted baseband data.

IMPORTANT

VERY IMPORTANT NOTE:
The FEC type takes the highest configuration priority, and the selection here depends on what, if any, optional plug-in codecs are installed. The choice of FEC type then determines what modulation types, code rates, and data rates are available. The order of hierarchy is therefore:

FEC type ► Modulation type ► Code Rate ► Data Rate
(Highest) (Lowest)

If the user changes a parameter within this hierarchy, the other parameters may become invalid. In this case, the software will change those other parameters, in order that the configuration remains valid at all times.

Example: Suppose the user has selected Viterbi + Reed-Solomon, QPSK, Rate 1/2. Now, the user changes the modulation type from QPSK to 16-QAM. In this case, Rate 1/2 is no longer a valid code rate, and so it will be automatically changed to the nearest valid code rate (Rate 3/4).

Each of the configuration sub-branches will now be described in detail.

6.7.1 (CONFIG, TX) FEC TYPE

```
Tx FEC: Viterbi Vit+RS
TCM+RS TPC LDPC Uncoded
```

IMPORTANT

IMPORTANT NOTE: ***All possible choices are presented at all times.*** If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

CASE	RULES	COMMENT
Viterbi	**ALWAYS VALID**	
Vit+RS (Viterbi +Concatenated Reed-Solomon)	If the RS codec is installed	
TCM+RS (Trellis Coded Modulation + Concatenated Reed-Solomon)	If the RS codec is installed **AND** 8-PSK FAST is enabled	Fixed at 8-PSK and Rate 2/3
TPC (Turbo Product Codec)	If the TPC codec is installed	
LDPC (Low Density Parity Check Codec) **WHEN AVAILABLE (consult factory)**	If the TPC/LDPC codec is installed	
Uncoded	Always valid - BPSK, QPSK and OQPSK only.	Forces Code Rate to 1:1 (uncoded)

6.7.2 (CONFIG, TX) MODULATION

```
Modulation: BPSK QPSK
OQPSK 8-PSK 16-QAM 8-QAM
```

IMPORTANT

IMPORTANT NOTE: ***All possible choices are presented at all times***. If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

CASE	RULES
BPSK	Valid for all FEC types **except** TCM+RS
QPSK	Valid for all FEC types **except** TCM+RS
OQPSK	Valid for all FEC types **except** TCM+RS
8-PSK	Requires TCM+RS **OR** Turbo **OR** TPC/LDPC **AND** requires 8-PSK/8-QAM FAST option
8-QAM	Requires Turbo **OR** TPC/LDPC **AND** requires 8-PSK/8-QAM FAST option
16-QAM	Requires Viterbi+RS **OR** Turbo **OR** TPC/LDPC **AND** requires 16-QAM FAST option

6.7.3 (CONFIG, TX) CODE RATE

```
Tx Code Rate: 5/16 21/44
1/2 2/3 3/4 7/8 0.95 Unc
```

IMPORTANT

IMPORTANT NOTE: ***All possible choices are presented at all times***. If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

CASE	RULES
5/16	Requires BPSK **AND** Turbo
21/44	Requires BPSK or QPSK/OQPSK **AND** Turbo
1/2	Valid for BPSK, QPSK and OQPSK
2/3	Requires TCM **AND** 8-PSK **AND** RS codec installed **OR** TPC/LDPC codec installed
3/4	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
7/8	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
0.95	Valid for QPSK, OQPSK, 8-PSK and 8-QAM
Unc (uncoded)	Valid only for 'Uncoded' in FEC choice

6.7.4 (CONFIG, TX) DATA RATE

```
Tx Dat Rate:5000.000kbps
3000.000ksym (◄ ►,▲ ▼,ENT)
```

IMPORTANT

The overall range of **data rates** is from 2.4 to 9980 kbps. The overall range of **symbol rates** is from 4.8 to 3000 ksymbols/second. The minimum and maximum data rates are dependent on modulation type and FEC encoder rate. If user changes the modulation or FEC, and the currently selected data rate can no longer be supported, then the data rate will be adjusted automatically, up or down, ***keeping the symbol rate constant.*** The bottom line of the display shows the symbol rate, based on FEC type, modulation, FEC Code Rate, and Data Rate. The valid ranges of data rate are shown in the table below.

If the current interface type is selected to be G.703, the data rate will be automatically set to either 1544 kbps (T1) or 2048 kbps (E1).

FEC Type	Modulation	Code Rate	Data Rate Range	EDMAC limited?
None	BPSK	Uncoded	4.8 kbps to 3.000 Mbps	Yes – see note below
None	QPSK/OQPSK	Uncoded	9.6 kbps to 5.000 Mbps	Yes – see note below
Viterbi	BPSK	Rate 1/2	2.4 kbps to 1.500 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 1/2	4.8 kbps to 3.000 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 3/4	7.2 kbps to 4.500 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 7/8	8.4 kbps to 5.250 Mbps	Yes – see note below
Viterbi + RS	BPSK	Rate 1/2	2.4 kbps to 1.363 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 1/2	4.3 kbps to 2.727 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 3/4	6.5 kbps to 4.091 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 7/8	7.5 kbps to 4.666 Mbps	Yes – see note below
Viterbi + RS	16-QAM	Rate 3/4	13.0 kbps to 4.000 Mbps	Yes – see note below
Viterbi + RS	16-QAM	Rate 7/8	16.8 kbps to 4.666 Mbps	Yes – see note below
TCM + RS	8-PSK	Rate 2/3	8.7 kbps to 4.400 Mbps	Yes – see note below
Turbo	BPSK	Rate 5/16	2.4 kbps to 0.937 Mbps	Yes – see note below
Turbo	BPSK	Rate 21/44	2.4 kbps to 1.430 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 21/44	4.8 kbps to 2.860 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 3/4	7.2 kbps to 4.500 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 7/8	8.4 kbps to 5.250 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 0.95	9.1 kbps to 5.666 Mbps	Yes – see note below
Turbo	8-PSK/8-QAM	Rate 3/4	10.8 kbps to 6.750 Mbps	No
Turbo	8-PSK/8-QAM	Rate 7/8	13.6 kbps to 7.875 Mbps	No
Turbo	8-PSK/8-QAM	Rate 0.95	15.3 kbps to 8.500 Mbps	No
Turbo	16-QAM	Rate 3/4	14.4 kbps to 9.000 Mbps	No
Turbo	16-QAM	Rate 7/8	16.8 kbps to 9.980 Mbps	No

Important Note: Where noted in the table above, if EDMAC framing is employed, the upper data rate will be reduced by 5% for data rates up to 2.048 Mbps, and by 1.6% for data rates above 2.048 Mbps, where EDMAC2 framing is used, or for Rate 21/44 BPSK/QPSK Turbo, or Rate 5/16 BPSK Turbo.

6.7.5 (CONFIG, TX) FREQUENCY

```
Tx IF Freq:1156.3456 MHz
           (◄ ►,▲ ▼,ENT)
```

Edit the Transmit IF Frequency. This is accomplished by selecting the digit to be edited using ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**.

For the **CDM-570L**, the range of frequencies is from 950 to 1950 MHz, with a resolution of 100 Hz. Furthermore, if, using the **ODU, BUC** menus, the user has selected a **BUC LO** frequency other than zero and defined whether the mix is high-side or low-side, the display will be modified as shown below, to include the calculated Transmit RF frequency of the modem/BUC combination:

```
Tx IF Freq:1156.3456 MHz
RF=14156.3456(◄ ►,▲ ▼,ENT)
```

As the **Tx IF** frequency is edited the RF frequency will automatically be updated.

However, for the **CDM-570**, the range of frequencies permitted is from 50 to 90 MHz, and from 100 to 180MHz, with a resolution of 100 Hz , as shown below:

```
Tx IF Freq:0085.1234 MHz
           (◄ ►,▲ ▼,ENT)
```

Note the leading zeros, which are included to maintain compatibility with the CDM-570L software.

6.7.6 (CONFIG, TX) ON/OFF

```
Tx Output State: Off  On
Rx-Tx Inhibit(◄ ►,ENTER)
```

Select either **On**, **Off**, or **Rx-Tx Inhibit**, using the ◄ ► arrow keys, then press **ENTER**.

When Rx-Tx Inhibit **is selected, it will prevent the TX carrier from being transmitted, until the demodulator is locked.**

To avoid the Tx Carrier from being turned off when the demodulator loses lock for a very short period of time, the demodulator must be unlocked continuously for a period of 10 seconds before the transmit carrier is inhibited. This time interval is fixed and the user cannot change it.

IMPORTANT

IMPORTANT NOTE: Having this feature enabled does not affect the internal IF loopback feature. However, be aware that if an external IF loopback is attempted (connecting an external cable from the Tx IF output to the Rx IF input), then this will not work! (The Tx carrier cannot turn on until the demod is locked, and the demod cannot lock, because the TX output is off. The net result is that the demod will not lock, and the Tx carrier will not turn on.) ***USE THE RTI FEATURE WITH EXTREME CARE!***

6.7.7 (CONFIG, TX) POWER

```
Output Power Level Mode:
Manual  AUPC (◄ ►,ENTER)
```

Select the output power level mode, either **Manual** or **AUPC**, then press **ENTER**.

If the user selects **Manual**, the following menu is displayed:

(CONFIG, TX, PWR, MODE) MANUAL

```
Tx Output Power Level:
-03.9 dBm (◄ ►,▲ ▼ ENT)
```

Edit the output power level using the ◄ ► and ▲ ▼ arrow keys, then press **ENTER**.

For the **CDM-570L** the range of output power is from 0 dBm to –40 dBm.
For the **CDM-570** the range of output power is from 0 dBm to –25 dBm.

If the user selects **AUPC**, and ‘Framed’ mode is not selected, the following menu is displayed:

```
Warning! AUPC needs
Framed Mode (ENT or CLR)
```

Pressing either **ENTER** or **CLEAR** returns the user to the previous menu with **Manual** selected.

If the user selects **AUPC**, and ‘Framed’ mode is selected, the following menu is displayed:

(CONFIG, TX, PWR, MODE) AUPC

```
Target-Eb/No  Max-Range
Alarm DemodUnlock (◄ ►)
```

Select either **Target EbNo**, **Max-Range**, **Alarm** or **Demod-Unlock** using the ◄ ► arrow keys. The user should then press **ENTER**.

(CONFIG, TX, PWR, MODE, AUPC) TARGET EbNo

```
Remote Demod - Target
Min Eb/No:9.9dB (◄ ►,▲ ▼)
```

Edit the target Eb/No of the remote demod, using the ◄ ► and ▲ ▼ arrow keys. Default value is 3.0 dB, and upper limit is 9.9 dB. The user should then press **ENTER**.

(CONFIG, TX, PWR, MODE, AUPC) MAX RANGE

```
Maximum-permitted Power
increase: 1dB  (▲ ▼,ENT)
```

Edit the maximum permitted increase in power level (when in **AUPC** mode), using the ▲ ▼ arrow keys. Default value is 1dB, and upper limit is 9 dB. Then press **ENTER**.

(CONFIG, TX, PWR, MODE, AUPC) ALARM

```
Action when max Tx Power
reached: None TxAlarm ◄ ►
```

Select the action that will occur if the AUPC causes the maximum output power level to be reached, either **None** or **TxAlarm**. Then press **ENTER**.

(CONFIG, TX, PWR, MODE, AUPC) DEMOD-UNLOCK

```
Action when Remote Demod
unlocks: Nom-Pwr Max-Pwr
```

Select the action that will occur if the remote demod is unlocked. The choices are: **Nom-Pwr** (Nominal Power), where the output level will revert to the nominal power level set under **Manual**, or **Max-Pwr**, (Maximum Power), where the output level will change to the maximum permitted. The user should then press **ENTER**.

6.7.8 (CONFIG, TX) SCRAMBLING

```
Tx Scrambling:Default-On
IESS-315-On Off (◄ ►,ENT)
```

The options are:

Default-On - the appropriate scrambler type is automatically selected
IESS-315-On - this only applies when Turbo is installed and has been selected as the FEC type
Off - No scrambling

As before, the options are displayed all of the time, but the ◄ ► arrow keys will force the cursor to skip past an unavailable choice.

IMPORTANT

The default scrambler types are:

Uncoded	**ITU V.35 (Intelsat variant)**
Viterbi, no framing:	**ITU V.35 (Intelsat variant)**
Viterbi, EDMAC frame:	**Comtech proprietary, frame synchronized**
Viterbi + RS or TCM/RS:	**Per IESS-308, frame synchronized**
TPC or LDPC:	**Comtech proprietary, frame synchronized**
8-QAM TPC:	**ITU V.35 (Intelsat variant)**

6.7.9 (CONFIG, TX) CLOCKING

```
Tx Clocking Mode:  Int
Ext Loop-Timed (◄ ►,ENT)
```

Select **Int** (Internal), **Ext** (External) or **Loop-Timed**, using the ◄ ► arrow keys, then press **ENTER**.

Internal indicates that the CDM-570/570L will supply a clock to the DTE, which is derived from its internal frequency reference. If the IP Module is installed and the selected Data Interface is IP, then Internal is the only valid selection.

External indicates that the CDM-570/570L expects to receive a clock from the DTE, to which the unit can phase-lock its internal circuits. (If G.703 is selected as the Interface type, the software will force the clock mode to **External**.)

Loop-Timed indicates that the transmit timing source should be the receive clock, from the direction of the satellite. This is a useful mode, in that no external connection needs to be made in this mode. If the demodulator loses lock, or if there is no receive signal present, the internal clock is substituted. Note also that this mode will work even with asymmetric Rx and Tx data rates.

6.7.10 (CONFIG, TX) INVERSION FUNCTIONS

```
Tx Inversion functions:
Spectrum  Data (◄ ►,ENT)
```

Select **Spectrum** or **Data**, using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, TX, INV) SPECTRUM

If **Spectrum** is selected, the following sub-menu will be displayed:

```
Tx Spectrum:  Normal
Inverted    (◄ ►,ENTER)
```

Select **Normal** or **Inverted**, using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, TX, INV) DATA

If **Data** is selected, the following sub-menu will be displayed:

```
Tx Data Sense:  Normal
Inverted    (◄ ►,ENTER)
```

Select **Normal** or **Inverted**, using the ◄ ► arrow keys, then press **ENTER**.

6.8 (CONFIG) RX (Receive)

The sub-branches available are:

```
Rx:FEC Dem Code Data Frq
Acq Descram Buf Inv EbNo
```

Select **FEC, Dem, Code, Data, Frq, Acq, Descram, Buf, Inv** or **EbNo** using the ◄ ► arrow keys, then press **ENTER.** The user will then be taken to a further sub-menu. Each of these choices is described briefly in the table below:

FEC	(Forward Error Correction) This sub-menu permits the user to select the method of FEC used for reception (Viterbi, TPC, etc.). FEC type takes the highest configuration priority.
Dem	(Demodulation) This sub-menu permits the user to select the modulation type used for reception (BPSK, QPSK, 8-PSK, etc.). The choice of demodulation will depend on the FEC type chosen.
Code	(FEC Code Rate) This sub-menu permits the user to select the FEC Code Rate used for reception (Rate 1/2, Rate 3/4, etc.). The choice of Code Rate will depend on both the FEC type and Demodulation selected.
Data	(Data Rate) This sub-menu permits the user to select the receive data rate, in steps of 1 bps. The choice of data rate will depend on the FEC type, Demodulation, and Code Rate selected.
Frq	(Frequency) This sub-menu permits the user to select the transmit frequency, in steps of 100Hz. **CDM-570L range:** 950 MHz to 1950 MHz **CDM-570 range**: 50 to 90 MHz and 100 to 180 MHz
Acq	(Acquisition) This sub-menu permits the user to determine the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier.
Descram	(Descrambler) This sub-menu permits the user to select whether or not data descrambling is used.
Buf	(Buffer) This sub-menu permits the user to select whether or not the Plesiochronous/Doppler buffer is used, and if so, the size of that buffer.
Inv	(Inversion) This sub-menu permits the user to invert the sense of the received spectrum, or to invert the sense of the received baseband data.
EbNo	(Eb/No Alarm threshold) This sub-menu permits the user to determine the Eb/No alarm threshold.

IMPORTANT

VERY IMPORTANT NOTE:
The FEC type takes the highest configuration priority, and the selection here depends on what, if any, optional plug-in codecs are installed. The choice of FEC type then determines what demodulation types, code rates, and data rates are available. The order of hierarchy is therefore:

FEC type ► Demodulation type ► Code Rate ► Data Rate
(Highest) (Lowest)

If the user changes a parameter within this hierarchy, the other parameters may become invalid. In this case, the software will change those other parameters, in order that the configuration remains valid at all times.

Example: Suppose the user has selected Viterbi + Reed-Solomon, QPSK, Rate 1/2. Now, the user changes the demodulation type from QPSK to 16-QAM. In this case, Rate 1/2 is no longer a valid code rate, and so it will be automatically changed to the nearest valid code rate (Rate 3/4).

Each of the configuration sub-branches will now be described in detail.

6.8.1 (CONFIG, RX) FEC TYPE

```
Rx FEC: Viterbi Vit+RS
TCM+RS TPC LDPC Uncoded
```

IMPORTANT

IMPORTANT NOTE: ***All possible choices are presented at all times***. If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

CASE	RULES	COMMENT
Viterbi	Always valid	
Vit+RS (Viterbi +Concatenated Reed-Solomon)	If the RS codec is installed	
TCM+RS (Trellis Coded Modulation + Concatenated Reed-Solomon)	If the RS codec is installed **AND** 8-PSK FAST is enabled	Fixed at 8-PSK and Rate 2/3
TPC (Turbo Product Codec)	If the TPC codec is installed	
LDPC (Low Density Parity Check Codec) **WHEN AVAILABLE -consult factory**	If the TPC/LDPC codec is installed	
Uncoded	Always valid - BPSK, QPSK and OQPSK only.	Forces Code Rate to 1:1 (uncoded)

6.8.2 (CONFIG, RX) DEMODULATION

```
Demodulation: BPSK QPSK
OQPSK 8-PSK 8-QAM 16-QAM
```

IMPORTANT

IMPORTANT NOTE: All possible choices are presented at all times. If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

CASE	RULES
BPSK	Valid for all FEC types **except** TCM+RS
QPSK	Valid for all FEC types **except** TCM+RS
OQPSK	Valid for all FEC types **except** TCM+RS
8-PSK	Requires TCM+RS **OR** Turbo **OR** TPC/LDPC **AND** requires 8-PSK/8-QAM FAST option
8-QAM	Requires Turbo **OR** TPC/LDPC codec **AND** requires 8-PSK/8-QAM FAST option
16-QAM	Requires Viterbi+RS **OR** Turbo **OR** TPC/LDPC codec **AND** requires 16-QAM FAST option

6.8.3 (CONFIG, RX) CODE RATE

```
Rx Code Rate: 5/16 21/44
1/2 2/3 3/4 7/8 0.95 Unc
```

IMPORTANT

IMPORTANT NOTE: All possible choices are presented at all times. If an option is not installed (either Hardware, or FAST) or valid, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

CASE	RULES
5/16	Requires BPSK **AND** Turbo
21/44	Requires BPSK or QPSK/OQPSK **AND** Turbo
1/2	Valid for BPSK, QPSK and OQPSK
2/3	Requires TCM **AND** 8-PSK **AND** RS codec installed **OR** TPC/LDPC codec installed
3/4	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
7/8	Valid for QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
0.95	Valid for QPSK, OQPSK, 8-PSK and 8-QAM
Unc (uncoded)	Valid only for 'Uncoded' in FEC choice

6.8.4 (CONFIG, RX) DATA RATE

```
Rx Dat Rate:5000.000kbps
2500.000ksym (◄ ►,▲ ▼,ENT)
```

IMPORTANT

Overall range of data rates is from 2.4 to 9980 kbps. Overall range of symbol rates is 4.8 to 2500 ksymbols/second. Minimum and maximum data rates are dependent on modulation type and FEC encoder rate. If the user changes modulation or FEC, and the currently selected data rate can no longer be supported, then the data rate will be adjusted automatically, up or down, ***keeping the symbol rate constant.*** The bottom line of the display shows symbol rate, based on FEC type, modulation, FEC Code Rate, and Data Rate.

If the current interface type is selected to be G.703, the data rate will be set to either 1544 (T1) or 2048 kbps (E1). This is shown below:

FEC Type	Modulation	Code Rate	Data Rate Range	EDMAC limited?
None	BPSK	Uncoded	4.8 kbps to 3.000 Mbps	Yes – see note below
None	QPSK/OQPSK	Uncoded	9.6 kbps to 5.000 Mbps	Yes – see note below
Viterbi	BPSK	Rate 1/2	2.4 kbps to 1.500 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 1/2	4.8 kbps to 3.000 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 3/4	7.2 kbps to 4.500 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 7/8	8.4 kbps to 5.250 Mbps	Yes – see note below
Viterbi + RS	BPSK	Rate 1/2	2.4 kbps to 1.363 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 1/2	4.3 kbps to 2.727 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 3/4	6.5 kbps to 4.091 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 7/8	7.5 kbps to 4.666 Mbps	Yes – see note below
Viterbi + RS	16-QAM	Rate 3/4	13.0 kbps to 4.000 Mbps	Yes – see note below
Viterbi + RS	16-QAM	Rate 7/8	16.8 kbps to 4.666 Mbps	Yes – see note below
TCM + RS	8-PSK	Rate 2/3	8.7 kbps to 4.400 Mbps	Yes – see note below
Turbo	BPSK	Rate 5/16	2.4 kbps to 0.937 Mbps	Yes – see note below
Turbo	BPSK	Rate 21/44	2.4 kbps to 1.430 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 21/44	4.8 kbps to 2.860 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 3/4	7.2 kbps to 4.500 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 7/8	8.4 kbps to 5.250 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 0.95	9.1 kbps to 5.666 Mbps	Yes – see note below
Turbo	8-PSK/8-QAM	Rate 3/4	10.8 kbps to 6.750 Mbps	No
Turbo	8-PSK/8-QAM	Rate 7/8	13.6 kbps to 7.875 Mbps	No
Turbo	8-PSK/8-QAM	Rate 0.95	15.3 kbps to 8.500 Mbps	No
Turbo	16-QAM	Rate 3/4	14.4 kbps to 9.000 Mbps	No
Turbo	16-QAM	Rate 7/8	16.8 kbps to 9.980 Mbps	No
Important Note: Where noted in the table above, if EDMAC framing is employed, the upper data rate will be reduced by 5% for data rates up to 2.048 Mbps, and by 1.6% for data rates above 2.048 Mbps, where EDMAC2 framing is used, or for Rate 21/44 BPSK/QPSK Turbo, or Rate 5/16 BPSK Turbo.				

6.8.5 (CONFIG, RX) FREQUENCY

```
Rx IF Freq:1156.3456 MHz
            (◄ ►,▲ ▼,ENT)
```

Edit the receive frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The range of frequencies is from 950 to 1950 MHz, with a resolution of 100 Hz.

For the **CDM-570L**, the range of frequencies is from 950 to 1950 MHz, with a resolution of 100 Hz. Furthermore, if, using the **ODU, LNB** menus, the user has selected an LNB LO frequency other than zero and defined whether the mix is high-side or low-side, the display will be modified as shown below, to include the calculated Transmit RF frequency of the modem/LNB combination:

```
Rx IF Freq:1156.3456 MHz
RF=12156.3456(◄ ►,▲ ▼,ENT)
```

As the Rx IF frequency is edited the RF frequency will automatically be updated.

However, for the **CDM-570**, the range of frequencies permitted is from 50 to 90 MHz, and from 100 to 180MHz, with a resolution of 100 Hz , as shown below:

```
Rx IF Freq:0075.9876 MHz
            (◄ ►,▲ ▼,ENT)
```

Note the leading zeros, which are included to maintain compatibility with the CDM-570L software.

6.8.6 (CONFIG, RX) ACQ

```
Demod Acquisition Range:
 +/- 010 kHz  (▲ ▼,ENTER)
```

Edit the acquisition search range of the demodulator (the value entered here determines the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier). Editing the value is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**.

The value entered here determines the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier.

In the **CDM-570L**. the range varies according to symbol rate:

+/- 1 kHz to +/- 200 kHz for rates less than or equal to 625 ksymbols/sec
+/- 1 kHz to +/- 32 kHz for rates greater than 625 ksymbols/sec

In the **CDM-570,** the range is +/- 1 kHz to +/- 32 kHz.

IMPORTANT

CAUTION MUST BE EXCERCISED at low data rates where the acquisition range is greater than the symbol rate of the desired carrier. In this circumstance it may be possible to acquire lock on an adjacent (and hence undesired) carrier, if that carrier has identical characteristics (modulation, FEC, code rate, data rate, etc.) to the carrier of interest.

6.8.7 (CONFIG, RX) DESCRAMBLING

```
Descrambling: Default-On
IESS-315-On Off (◄ ►,ENT)
```

Options are:
Default-On - the appropriate descrambler type is automatically selected.
IESS-315-On - this only applies when Turbo is installed and has been selected as the FEC type .
Off - no descrambling.

As before, the options are displayed all of the time, but the ◄ ► arrow keys will force the cursor to skip past an unavailable choice.

IMPORTANT

The default descrambler types are:

Uncoded:	**ITU V.35 (Intelsat variant)**
Viterbi, no framing:	**ITU V.35 (Intelsat variant)**
Viterbi, EDMAC frame:	**Comtech proprietary, frame synchronized**
Viterbi + RS or TCM/RS:	**Per IESS-308, frame synchronized**
TPC or LDPC:	**Comtech proprietary, frame synchronized**

6.8.8 (CONFIG, RX) BUFFER

Edit the size, in bits, of the Plesiochronous/Doppler Buffer. The value is changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. Values of **Disabled, +/- 128, 256, 512, 1024, 2048, 4096, 8192, 16384 and 32768 bits** are possible**.**

When **Disabled** is selected, the Plesiochronous/Doppler buffer is disabled. The receive clock will then be derived from the satellite signal, and will therefore be subject to clock offsets relative to the local transmit clock. This is due in part to the originating clock being slightly different from the local clock (a so-called ***plesiochronous*** offset), and to the motion of the satellite (a ***Doppler*** offset). This menu choice is shown below:

```
Rx Buffer: Disabled (Loop
Timing Mode)(▲ ▼, ENTER)
```

If the IP Module is installed and the selected Data Interface is IP, the buffer is Disabled by default and this is the only valid selection.

When a value other than 'Disabled' is selected, the Plesiochronous/Doppler buffer is enabled, and set to the selected size. This is shown below:

```
Rx Buffer: +/-32768 Bits
(13.1ms)      (▲ ▼, ENTER)
```

The input to the buffer will be the signal from the satellite, with any clock offsets and jitter. The output from the buffer will be derived from the local TRANSMIT clock. In this way, the receive data will be perfectly synchronous with this local clock. The CDM-570/570L can be operated with independent receive and transmit data rates. Even in this configuration, where Rx data rate <> Tx data rate, the output clock for the buffer will be phase locked to the transmit clock.

While it is only possible to select the size in bits, the corresponding total buffer size is displayed in ms (which will vary in inverse proportion to the data rate).

6.8.9 (CONFIG, RX) INVERSION FUNCTIONS

```
Rx Inversion functions:
Spectrum  Data (◄ ►,ENT)
```

Select **Spectrum** or **Data**, using the ◄ ► arrow keys, then press **ENTER**.

If Spectrum is selected, the following sub-menu will be displayed:

```
Rx Spectrum:  Normal
Inverted     (◄ ►,ENTER)
```

Select **Normal** or **Inverted**, using the ◄ ► arrow keys, then press **ENTER**.

If Data is selected, the following sub-menu will be displayed:

```
Rx Data Sense:  Normal
Inverted     (◄ ►,ENTER)
```

Select **Normal** or **Inverted**, using the ◄ ► arrow keys, then press **ENTER**.

6.8.10 (CONFIG, RX) Eb/No

```
Eb/No Alarm Point:
02.0 dB  (◄ ►,▲ ▼,ENTER)
```

Edit the Eb/No alarm point. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**.

The range of values is from 0.1 to 16.0 dB. The user may select a value here, and if the Eb/No falls below this value, a receive traffic fault will be generated.

6.9 (CONFIG) FRAME (Framing Mode)

```
Framing Mode:  Unframed
EDMAC EDMAC-2  (◄ ►,ENT)
```

Select **Unframed, EDMAC** or **EDMAC-2**, using the ◄ ► arrow keys, then press **ENTER**.

The sub-branches available are:

6.9.1 (CONFIG, FRAME) UNFRAMED

No framing is selected. No overhead is added, and the unit will be compatible with other manufacturer's equipment, when operating in a 'standard' configuration.

6.9.2 (CONFIG, FRAME) EDMAC or EDMAC-2

Comtech EF Data's proprietary framing is added. The framing permits the bi-directional passing of M&C and AUPC data between local and distant-end units. **EDMAC** is backwards compatible with the CDM-500, CDM-550, CDM-550T, CDM-600 and CDM-600L. **EDMAC-2** is a reduced overhead version of EDMAC, and is not completely backwards compatible with the modems listed above, but is in some modes (for example, in Turbo BPSK modes and at rates above 2.048 Mbps).

If **either** of these modes is selected, the following sub-menu will be displayed:

```
Framing mix: AUPC-Only
AUPC+EDMAC  (◄ ►,ENTER)
```

Select either **AUPC-Only** (default) or **AUPC+EDMAC,** using the ◄ ► arrow keys, then press **ENTER**.

Note that if framing is enabled (either **EDMAC** or **EDMAC-2**), then **AUPC** is automatically enabled, but the specific EDMAC feature (passing M&C data from a local to a distant-end unit) needs to enabled here.

If **AUPC-Only** is selected, then none of the EDMAC features are available, even though framing will still be enabled.

If **AUPC+EDMAC** is selected, then the user is further prompted to select whether the unit is an EDMAC master, or an EDMAC slave:

(CONFIG, FRAME, FRAMED EDMAC+AUPC, MODE)

```
EDMAC Mode:
Master  Slave (◄ ►,ENTER)
```

Select either **Master** or **Slave**, using the ◄ ► arrow keys, then press **ENTER**.

An **EDMAC Master** is a unit which is local to the M&C computer, and which passes messages, via the overhead, to a distant-end modem.

An **EDMAC Slave** is a unit which is not local to the M&C computer, which is at the distant-end of a satellite link. If **Master** is selected then the following sub-menu is displayed:

```
Distant-end Base Address
0240     (◄ ►,▲ ▼,ENTER)
```

Edit the address of the distant-end modem to which this unit will pass messages. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is changed using the ▲ ▼ arrow keys. The user should then press **ENTER**.

There is a restriction on values which can be entered here; they may only be entered in increments of 10. This is automatically taken care of; the user may not edit the last digit of the address. This has been implemented so that a single **Master** may pass messages for up to 10 devices at the distant end. The valid range of addresses is from 10 to 9990.

But if **Slave** is selected, then the following sub-menu is displayed:

```
Address of this Slave
Unit: 0241  (◄ ►,▲ ▼,ENT)
```

Edit the address of this **Slave** unit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The valid range of addresses is from 1 to 9999, although 'base 10' values will be automatically skipped. The Slave EDMAC address will always end in '1'.

Remember that this is a unit which is intended to be located at the distant-end of a link, and will therefore be under the control of a **Master** at the other end. This is the equivalent of putting the unit into Remote Control mode; no local control is possible.

6.10 (CONFIG) INTERFACE

Select **RS422** (EIA-530), **IP**, **V.35**, **RS232**, or **G.703** using the ◄ ► arrow keys, then press **ENTER**

```
Data Interface: RS422 IP
V.35 RS232 G.703(◄ ►,ENT)
```

If **RS422**, **V.35**, or **RS232** are selected, the following sub-menu will be displayed:

```
RTS/CTS Operation: (▲ ▼)
Loop,RTS Controls Tx Out
```

The option is changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The following options are possible :

1) RTS/CTS Loop, No Action
RTS and CTS are looped, so that CTS echoes the state of RTS, but RTS does not control the ON/OFF state of the carrier.
2) Loop, RTS Controls Tx Out
RTS and CTS are looped, so that CTS echoes the state of RTS, and RTS controls the ON/OFF state of the carrier (in other words, the modem will not bring up its TX carrier until RTS is asserted).
3) Ignore RTS, Assert CTS
RTS is ignored, and CTS is asserted unconditionally.
4) N/A - 1:N system in use -
If the 1:N switch on the rear panel is active, then RTS/CTS are not supported; the pins are assigned to redundancy functions.

If **G.703** is selected, the following sub menu will be displayed:

```
G.703 Type:  T1
E1-Bal E1-Unbal (◄ ►,ENT)
```

Select **T1 E1-Bal or E1-Unbal** using the ◄ ► arrow keys, then press **ENTER**

If **T1** is selected, the following sub-menu will be displayed:

```
T1 Configuration: Length
Line-Code     (◄ ►,ENTER)
```

Select **Length** or **Line Code** using the ◄ ► arrow keys, then press **ENTER**

If **Line-Code** is selected, the following sub-menu will be displayed:

```
T1 Line Code (B8ZS):
On  Off(AMI) (◄ ►,ENTER)
```

Select **On** or **Off** using the ◄ ► arrow keys, then press **ENTER.**

If **Length** is selected, the following sub-menu will be displayed:

```
T1 Line Length:
000-133 feet (▲ ▼,ENTER)
```

Edit the line length using the ▲ ▼ arrow keys, then press **ENTER.** Values will toggle between the following values: 0-133, 133-266, 266-399, 399-533 and 533-655 feet.

If either **E1-Bal or E1-Unbal** is selected, the following sub-menu will be displayed:

```
E1 Line Code (HDB3):
On   Off     (◄ ►,ENTER)
```

Select **On** or **Off** using the ◄ ► arrow keys, then press **ENTER.**

If the optional IP module is installed, and **IP** is selected by pressing **ENTER**, all of the rear-panel electrical interfaces are disabled, and all data for Tx and Rx is routed to and from the modem board to the IP module. The user is returned to the previous menu level.

6.11 (CONFIG) REFERENCE

IMPORTANT

IMPORTANT NOTE: The CDM-570/570L can accept an externally supplied frequency reference, using the BNC connector on the rear panel. However, rather than bypassing the internal reference, and substituting the external signal, the internal reference is used in a low-bandwidth (~ 2Hz) phase-locked loop (PLL), so the CDM-570/570L actually phase locks to the reference external signal. There are two distinct advantages to this scheme

1) It permits hitless switching between the operation of internal and external reference. There are no sudden discontinuities of frequency and phase in the transmitted carrier.
2) Due to the very low bandwidth of the PLL, it permits the external reference to have an inferior phase noise characteristic than the internal reference of the CDM-570/570L. The narrow loop essentially 'cleans up' the external signal. This is particularly important if the CDM-570L is being used to supply a 10MHz reference to a BUC or LNB.

Edit the configuration and value of the frequency reference. The value is changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. Values of **Internal 10 MHz, External 01 MHz, External 02 MHz, External 05 MHz, External 10 MHz,** and **External 20 MHz,** are possible**.** The user should then press **ENTER**. Two examples are shown below:

```
Frequency Reference:
Internal 10 MHz (▲ ▼,ENT)
```

```
Frequency Reference:
External 05 MHz (▲ ▼,ENT)
```

6.12 (CONFIG) MASK

```
Alarm Mask: Transmit
Receive Ref BUC LNB (◄ ►)
```

Select **Transmit**, **Receive**, **Reference**, **BUC** or **LNB** using the ◄ ► arrow keys, then press **ENTER**. Note that the **BUC** and **LNB** choices are only applicable for the **CDM-570L**.

If **Transmit** is selected the following sub-menu will be displayed:

```
Tx Alarm Mask: Tx-FIFO
G.703-BPV Tx-AIS(◄ ►,ENT)
```

Select **Tx-FIFO**, **G.703-BPV** or **Tx-AIS**, using the ◄ ► arrow keys, then press **ENTER**. For **each** of the choices a sub-menu similar to the one shown below will be displayed:

```
Tx-FIFO Alarm:
Active  Masked (◄ ►,ENT)
```

Select **Active or Masked**, using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Active**, then a Transmit Traffic fault will be generated whenever the transmitter sees that the transmit FIFO has slipped.

Similarly, the user can mask a G.703 BPV or Transmit AIS alarm.

If the user selects **Masked**, no alarm will be generated.

If **Receive** is selected the following sub-menu will be displayed:

```
Rx Alarm Mask: AGC Eb/No
Rx-AIS Buffer  (◄ ►,ENT)
```

Select **AGC**, **Eb/No**, **Rx-AIS** or **Buffer**, using the ◄ ► arrow keys, then press **ENTER**. For **each** of the choices a sub-menu similar to the one shown below will be displayed:

```
AGC Alarm:
Active  Masked (◄ ►,ENT)
```

Select **Active or Masked**, using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Active**, then a Receive Traffic fault will be generated whenever the demodulator sees that the composite input level being applied will cause compression in the IF stages, and hence degrade the performance of the demodulator.

Similarly, the user can mask an Eb/No, Receive AIS or Buffer alarm.

If the user selects **Masked**, no alarm will be generated.

If **Reference** is selected the following sub-menu will be displayed:

```
Reference Alarm:
Active  Masked (◄ ►,ENT)
```

Select **Active or Masked**, using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Active**, then a Transmit Traffic fault will be generated whenever the unit sees that **a)** External Reference is selected and **b)** there is no signal activity at the external reference port. If the user selects **Masked**, no alarm will be generated.

If **BUC** is selected the following sub-menu will be displayed:

```
BUC Alarm:
Active  Masked (◄ ►,ENT)
```

Select **Active or Masked**, using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Masked**, no alarm will be generated.

If **LNB** is selected the following sub-menu will be displayed:

```
LNB Alarm:
Active  Masked (◄ ►,ENT)
```

Select **Active or Masked**, using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Masked**, no alarm will be generated.

6.13 (CONFIG) ODU (CDM-570L ONLY)

```
ODU (Outdoor Unit):
BUC  LNB      (◄ ►,ENTER)
```

In **CDM-570L** applications, the **ODU** (Outdoor Unit) menu permits the user to choose between controlling and monitoring either a **BUC** (Block Upconverter) or an **LNB** (Low-noise Block downconverter). Select **BUC or LNB** , using the ◄ ► arrow keys, then press **ENTER**.

6.13.1 (CONFIG, ODU) BUC

```
BUC: M&C-FSK  DC-Power
10MHz Alarm LO Mix (◄ ►)
```

If **BUC** is selected, the following sub-menu is displayed:

Select **M&C-FSK, DC-Power, 10MHz, Alarm, LO or Mix** , using the ◄ ► arrow keys, then press **ENTER**.

M&C-FSK	If an FSK-capable BUC is employed, this menu provides access to a further set of menus that define the FSK setup, and use it for control and monitor.
DC-Power	If a BUC supply is installed this menu permits the user to turn DC power ON or OFF.
10MHz	This menu permits the user to turn the 10MHz frequency reference for the BUC ON or OFF.
Alarm	This menu permits the user to define the upper and lower limits for a current 'window'. If the measured BUC current falls outside this window, an alarm is generated.
LO	This menu permits the user to define the LO frequency used in the BUC. This is then used in the display of RF frequency in the **CONFIG Tx, Tx Frequency** menu.
Mix	This menu permits the user to define the sense of the frequency translation – either high-side mix or low-side mix.

(CONFIG, ODU, BUC) M&C-FSK

```
BUC M&C(FSK): FSK-Comms
Address Tx-On/Off  (◄ ►)
```

If **M&C-FSK** is selected, the following sub-menu is displayed:

Select **Comms, Address,** or **Tx-On/Off**, using the ◄ ► arrow keys, then press **ENTER**.

FSK-Comms	If an FSK-capable BUC is employed, this menu turns the FSK between the modem and BUC either ON or OFF.
Address	(Address) This menu permits the user to enter the logical address of the BUC, from 1 to 15.

(CONFIG, ODU, BUC, M&C-FSK) FSK-Comms

If **FSK-Comms** is selected, the following sub-menu is displayed:

```
BUC M&C FSK Comms:
On  Off        (◄ ►,ENTER)
```

Select **On or Off** , using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, ODU, BUC, M&C-FSK) Address

If **Addr** is selected, the following sub-menu is displayed:

```
BUC FSK Address: 01
               (▲ ▼,ENTER)
```

Edit the value of the address using the ▲ ▼ arrow keys, then press **ENTER**. The valid range is from 01 to 15.

(CONFIG, ODU, BUC, M&C-FSK) TX-ON/OFF

If **Tx-On/Off** is selected, the following sub-menu is displayed:

```
BUC RF Output:
On  Off        (◄ ►,ENTER)
```

Select **On** or **Off** , using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, ODU, BUC) DC-POWER

If **DC-Power** is selected, the following sub-menu is displayed:

```
BUC DC Power:
On Off         (◄ ►,ENTER)
```

Select **On** or **Off** , using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, ODU, BUC) 10MHz

If **10MHz** is selected, the following sub-menu is displayed:

```
BUC 10MHz Reference:
On  Off        (◄ ►,ENTER)
```

Select **On or Off** , using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, ODU, BUC) ALARM

If **Alarm** is selected, the following sub-menu is displayed:

```
Set BUC Current Alarm:
Upper  Lower   (◄ ►,ENTER)
```

Select **Upper or Lower** , using the ◄ ► arrow keys, then press **ENTER**.

If **Upper** is selected, the following sub-menu is displayed:

```
BUC Current Alarm Upper
Limit:1200mA (◄ ►,▲ ▼,ENT)
```

Edit BUC Current Alarm Upper limit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The range of current is 500 to 4000 mA.

If **Lower** is selected, the following sub-menu is displayed:

```
BUC Current Alarm Lower
Limit:1200mA (◄ ►,▲ ▼,ENT)
```

Edit BUC Current Alarm Lower limit. This is accomplished by selecting the digit to be edited, using ◄ ► arrow keys. The value of the digit is then changed using ▲ ▼ arrow keys. The user should then press **ENTER**. The range of current is 0 to 3000 mA.

(CONFIG, ODU, BUC) LO

If **LO** is selected, the following sub-menu is displayed:

```
BUC LO Frequency:
12000 MHz (◄ ►,▲ ▼,ENTER)
```

Edit the value of the BUC LO frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The valid range is from 3000 to 65000 MHz.

Note this value is used to display the RF frequency of the modem/BUC combination. If a value of 00000 is entered here (the default), then no RF frequency will be displayed on the **CONFIG, Tx, Tx Freq** menu.

(CONFIG, ODU, BUC) MIX

If **Mix** is selected, the following sub-menu is displayed:

```
BUC Frequency Mix:
High-Side Low-Side (◄ ►)
```

Select **High-Side** or **Low-Side**, using the ◄ ► arrow keys, then press ENTER.

6.13.2 (CONFIG, ODU) LNB

If **LNB** is selected, the following sub-menu is displayed:

```
LNB: DC-Voltage 10MHz
Alarm LO Mix (◄ ►, ENT)
```

Select **DC-Voltage, 10MHz, Alarm, LO or Mix** , using the ◄ ► arrow keys, then press **ENTER**.

DC-Voltage	Selects Power OFF, 13, 18, or 24 volts as the LNB power supply output voltage.
10MHz	This menu permits the user to turn the 10MHz frequency reference for the BUC ON or OFF.
Alarm	This menu permits the user to define the upper and lower limits for a current 'window'. If the measured LNB current falls outside this window, an alarm is generated.
LO	This menu permits the user to define the LO frequency used in the LNB. This is then used in the display of RF frequency in the CONFIG RX, RX FREQUENCY menu.
Mix	This menu permits the user to define the sense of the frequency translation – either high-side mix or low-side mix.

(CONFIG, ODU, LNB) VOLTAGE

If **Voltage** is selected, the following sub-menu is displayed:

```
LNB DC Supply Voltage:
13 volts     (▲ ▼,ENTER)
```

Edit the value of the LNB supply voltage, using the ▲ ▼ arrow keys. The user should then press **ENTER**. The choices are **13**, **18**, **24 volts**, **or Power OFF.**

(CONFIG, ODU, LNB) 10MHz

If **10MHz** is selected, the following sub-menu is displayed:

```
LNB 10MHz Reference:
On  Off        (◄ ►,ENTER)
```

Select **On or Off** , using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG, ODU, LNB) ALARM

If **Alarm** is selected, the following sub-menu is displayed:

```
Set LNB Current Alarm:
Upper  Lower   (◄ ►,ENTER)
```

Select **Upper or Lower** , using the ◄ ► arrow keys, then press **ENTER**.

If **Upper** is selected, the following sub-menu is displayed:

```
LNB Current Alarm Upper
Limit: 200mA (◄ ►,▲ ▼,ENT)
```

Edit the LNB Current Alarm Upper limit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The range of current is 50 to 600 mA.

If **Lower** is selected, the following sub-menu is displayed:

```
LNB Current Alarm Lower
Limit: 050mA (◄ ►,▲ ▼,ENT)
```

Edit the LNB Current Alarm Lower limit. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The range of current is 10 to 400 mA.

(CONFIG, ODU, LNB) LO

If **LO** is selected, the following sub-menu is displayed:

```
LNB LO Frequency:
12000 MHz (◄ ►,▲ ▼,ENTER)
```

Edit the value of the LNB LO frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. The valid range is from 3000 to 6
5000 MHz.

Note that this value is used for displaying the RF frequency of the modem/BUC combination. If a value of 00000 is entered here (the default), then no RF frequency will be displayed on the **CONFIG, Rx, Rx Freq** menu.

(CONFIG, ODU, LNB) MIX

If **Mix** is selected, the following sub-menu is displayed:

```
LNB Frequency Mix:
High-Side Low-Side (◄ ►)
```

Select **High-Side** or **Low-Side**, using the ◄ ► arrow keys, then press **ENTER**.

6.14 MONIT (Monitor)

```
MONITOR:Alarms Rx-Params
Event-Log Stats AUPC ODU
```

Select **Alarms**, **Rx-Params**, **Event-Log**, **Stats**, **AUPC** or **ODU** using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Alarms**, the following sub-menu is displayed:

6.14.1 (MONIT) ALARMS

```
Live Alarms:Unit Receive
Transmit ODU (◄ ►,ENTER)
```

IMPORTANT

IMPORTANT NOTE: The CDM-570L uses a system of ***Fault Prioritization.*** In each category of fault, only the ***highest priority*** fault is displayed. For instance, if the demodulator is unlocked, it is irrelevant if there are other receive faults present. If the demodulator then locks, but there is a fault of a lower priority present, this will then be displayed. This also holds true for the faults reported via the remote control. This system cuts down significantly on unwanted and irrelevant fault reporting. A comprehensive list of faults is shown at the end of this section.

Select **Unit**, **Receive**, **Transmit** or **ODU**, using the ◄ ► arrow keys, then press **ENTER**. Depending on the choice , one of the following menus will be shown:

(MON, ALARMS) UNIT (Unit alarms)

```
Unit Fault: -12 Volt PSU
is Under-Voltage   (ENT)
```

The screen will indicate if there are any Unit Faults. If not, it will display '**None**'. Pressing **ENTER** takes the user back to the previous menu.

(MON, ALARMS) RECEIVE (Receive Traffic Status)

```
Rx Traffic: AGC Alarm -
Reduce Input level (ENT)
```

The screen will indicate if there are any Receive Traffic Faults. If not, it will display '**None**'. Pressing **ENTER** takes the user back to the previous menu.

(MON, ALARMS) TRANSMIT (Transmit Traffic Status)

```
Tx Traffic: No Tx Clock
from Terrestrial (ENT)
```

The screen will indicate if there are any Transmit Traffic Faults. If not, it will display '**None**'. Pressing **ENTER** takes the user back to the previous menu.

(MON, ALARMS) ODU (Outdoor Unit alarms)

```
ODU Alarms: BUC Current
Over Limit        (ENT)
```

The screen will indicate if there are any ODU Alarms. If not, it will display '**None**'. Pressing **ENTER** takes the user back to the previous menu.

LISTING OF PRIORITIZED FAULTS:

Unit Faults:
1) Power supply fault, +5 volts
2) Power supply fault , +12 volts
3) Power supply fault, –5 volts
4) Power supply fault, +23 volts
5) Power supply fault, –12 volts
6) Tx synthesizer lock
7) Rx 1st LO synthesizer lock
8) Rx 2nd LO synthesizer lock
9) Reference PLL lock
10) IP Module fault
11) EEPROM checksum error

Tx Traffic status:
1) No clock from terrestrial interface
2) Tx FIFO slip
3) Loss of External Reference
4) AUPC upper limit reached
5) AIS detected on incoming data (from terrestrial direction)
6) Bipolar violation on G.703 interface

Rx Traffic status:
1) Demodulator unlocked
2) AGC Alarm - signal out of range
3) RS Frame sync alarm
4) EDMAC Frame sync alarm
5) Buffer Underflow
6) Buffer Overflow
7) Eb/No alarm
8) AIS detected on incoming data (from satellite direction)

ODU status:
1) BUC PLL lock fault
2) BUC current out of limits
3) BUC voltage out of limits
4) LNB current out of limits
5) LNB voltage out of limits
6) BUC temperature alarm
7) BUC software checksum error

6.14.2 (MONIT) RX-PARAMS (Receive Parameters)

If the user selects **Rx-Params**, the following sub-menu is displayed:

```
EbNo=05.7dB  BER=3.4E-9
ΔF=+11.7k Buf=50 RSL=-64
```

If the demodulator is locked, this screen shows the following:

Eb/No	This shows the value of Eb/No calculated by the demodulator. The value referred to here is the energy per information bit (Ebi), divided by the noise spectral density (No).
BER	This is an estimate of the corrected BER.
ΔF	The frequency offset of the received carrier, in kHz, with a displayed resolution of 100 Hz.
Buf	(Buffer fill state) This shows the fill state (in percent), of the receive Buffer. After a reset, it will read 50. A value <50 indicates that the buffer is emptying, and >50 indicates that it is filling.
RSL	(Receive Signal Level) A value in dBm, indicating the input power of the desired carrier, as seen by the demodulator. If the signal level is below the AGC range of the demod, this will display RSL <-99

If the demodulator is not locked, this screen shows the message **'Demod: Not Locked**', but continues to display the receive signal level. Pressing **ENTER** or **CLEAR** will take the user back to the previous menu.

```
  Demod: Not Locked
                RSL=-64
```

6.14.3 (MONIT) EVENT-LOG (STORED EVENTS)

If the user selects **Stored Events**, the following sub-menu is displayed:

```
Stored Events:      View
Clear-All         (◄ ►,ENTER)
```

Select **View** or **Clear-All**, using the ◄ ► arrow keys, then press **ENTER**.

(MON, EVENTS) VIEW

If the user selects **View**, the following screen is displayed:

```
Log23: 30/11/02 10:37:32
Fault - Demod Lock (▲ ▼)
```

The user may scroll backwards or forwards through the entries in the event log, using the ▲ ▼ arrow keys. Pressing **ENTER** or **CLEAR** will take the user back to the previous menu. The event log can store up to 255 events. When a fault condition occurs, it is time-stamped and put into the log. Similarly, when the fault condition clears, this is also recorded, as shown below:

```
Log240:30/11/97 10:37:35
Clear - Demod Lock (▲ ▼)
```

If the user selects **Clear-All**, the following screen is displayed:

```
Clear all Stored Events?
No  Yes       (▲ ▼, ENTER)
```

If the user selects **Yes**, the event log is cleared, and the user is taken directly back to the previous menu. However, if there are faults present on the unit at this time, they will be re-time-stamped, and new log entries will be generated.

IMPORTANT

Note that **in accordance with international convention**, the date is shown in DAY-MONTH-YEAR format.

6.14.4 (MONIT) STATS (Link Statistics)

If the user selects **Stats,** the following sub-menu is displayed:

```
Link Statistics:   View
Clear-All Config(◄ ►,ENT)
```

Select **View**, **Clear-All** or **Configure**, using the ◄ ► arrow keys, then press **ENTER**.

(MONIT, STATS) VIEW

If the user selects **View**, the following screen is displayed:

```
Sta198:02/11/02 10:37:32
16.0, 16.0, 9.0, 9.0(▲ ▼)
```

The user may scroll backwards or forwards through the entries in the statistics log, using the ▲ ▼ arrow keys. Pressing **ENTER** or **CLEAR** will take the user back to the previous menu. The event log can store up to 255 events.

IMPORTANT

The top line of the display indicates the log entry number, and the time and date of the entry. Note that in accordance with international convention, the date is shown in **DAY-MONTH-YEAR** format.

The bottom line of the display shows the statistics data which has been measured and recorded.

The meaning and format of the numbers is as follows:

Minimum Eb/No, Average Eb/No, Maximum TPLI, Average TPLI

(where TPLI means Transmit Power Level Increase, if AUPC is enabled).

The user defines a measurement interval (see MONITOR, STATS, CONFIGURE) and during this interval, Eb/No and TPLI are observed, at a one second rate. At the end of this period, the average Eb/No is calculated and recorded, and the minimum value seen in the interval. Similarly, the average TPLI is calculated, along with the highest value seen in the interval.

Note: If the demod has lost lock during the measurement interval, the minimum Eb/No will show 'Loss' rather than indicate a value. However, the average value (while the demod was locked) will still be calculated and shown. If, on the other hand, the demodulator has been unlocked for the entire measurement interval, the average Eb/No will also show 'Loss'. (The display will show 'Loss, Loss'.)

If the measured values are greater than, or equal to 16.0 dB, the display will show 16.0 dB.

If AUPC is not enabled, the values of maximum and average TPLI will both show 'Off'.

Examples:
08.0, 13.5, 2.5, 1.8 means:
Minimum Eb/No observed in the measurement interval = 8.0 dB
Average Eb/No observed in the measurement interval = 13.5 dB
Maximum TPLI observed in the measurement interval = 2.5 dB
Average TPLI observed in the measurement interval = 1.8 dB

Loss, 04.5, Off, Off means:
There was a loss of demod lock during the measurement interval
Average Eb/No observed in the measurement interval = 4.5 dB
Maximum TPLI observed in the measurement interval = AUPC disabled
Average TPLI observed in the measurement interval = AUPC disabled

(MONIT, STATS) CLEAR

If the user selects **Clear-All**, the following screen is displayed:

```
Clear all Stored Stats?
No  Yes     (▲ ▼, ENTER)
```

If the user selects **Yes**, the Statistics log is cleared, and the user is taken directly back to the previous menu.

(MONIT, STATS) CONFIGURE

If the users selects **Configure**, the following sub-menu is displayed:

```
Stats Logging Interval:
Disabled    (▲ ▼,ENTER)
```

The user is prompted to enter the logging interval (the period of time over which the statistics will be measured), using the ▲ ▼ arrow keys, then press **ENTER**. The user can choose **Disabled, 10, 20, 30, 40, 50, 60, 70, 80,** or **90 minutes**.

```
Stats Logging Interval:
30 minutes   (▲ ▼,ENTER)
```

6.14.5 (MONIT) AUPC

If the user selects **AUPC,** and the modem ***is not*** in Framed mode**,** the following sub-menu is displayed:

```
Framing is required for
AUPC Monitor (ENT or CLR)
```

If the user selects **AUPC,** and the modem ***is*** in Framed mode**,** the following sub-menu is displayed:

```
AUPC:Remote EbNo =14.0dB
TX Power Increase =2.2dB
```

The top line displays the value of Eb/No of the demodulator at the distant end of the satellite link. The Eb/No will display **Unlock** if the remote demod is unlocked. The bottom line shows how much the AUPC system has increased the output power. If AUPC is not enabled, the value of **Tx Power Increase** will show as 0.0 dB.

6.14.6 (MONIT) ODU

If **ODU** is selected, the following sub-menu is displayed:

```
Outdoor Unit Monitor:
BUC  LNB     (◄ ►,ENTER)
```

Select **LNB** or **BUC**, using the ◄ ► arrow keys, then press **ENTER**.

If **LNB** is selected, the following menu is displayed:

```
LNB Voltage: 13.1 volts
LNB Current: 235 mA(ENT)
```

The menu displays the LNB Voltage and Current. Press **ENTER** or **CLEAR** to return to the next-highest menu.

If **BUC** is selected, the following menu is displayed:

```
BUC:DC=47.8V,3.25A SW=05
T=+38C PLL=Flt Pwr=02.1W
```

The menu displays the following parameters:

DC	(DC Power) If a BUC supply is installed, displays measured BUC supply voltage and load current, measured at the Tx-IF connector.
T	(Temperature) If BUC FSK is enabled, displays BUC ambient temperature in °C.
SW	If BUC FSK is enabled, displays the M&C software version of the BUC.
PLL	If BUC FSK is enabled, displays the fault status of the BUC PLL synthesizers.
Pwr	(Output) If BUC FSK is enabled, displays the output power as measured by the BUC power monitor.

Press **ENTER** or **CLEAR** to return to the next-highest menu.

6.15 TEST

```
TEST: Norm IF> Dig> I/O>
RF> Tx-CW Tx-1,0(◄ ►,ENT)
```

Select **Norm**, **IF Loop**, **Dig Loop**, **I/O Loop**, **RF Loop**, **Tx-CW**, or **Tx-1,0**, using the ◄ ► arrow keys, then press **ENTER**.

This sub-menu permits the user to select the following test modes:

Norm	(Normal) This clears any test modes or loopbacks, and places the unit back into an operational state.
IF Loop	(IF Loopback) This test mode invokes an internal IF loop. This is a particularly useful feature, as it permits the user to perform a quick diagnostic test without having to disturb external cabling. Furthermore, all of the receive configuration parameters are temporarily changed to match those of the transmit side. When **Normal** is again selected, all of the previous values are restored. During an IF Loop, the Tx carrier continues to be transmitted. See Figure 6-4
Dig Loop	(Digital Loopback) This test mode invokes a digital loopback, which loops data at the output of the framer/scrambler on the transmit side, back into the deframer/descrambler on the receive side. If concatenated Reed-Solomon FEC is being used, this is also included in the digital loop. See Figure 6-4
I/O Loop	(Inward/Outward loopback) This test mode invokes two distinct loopbacks. The first of these is the inward loop, which takes data being received from the satellite direction, and passes it directly to the modulator. Simultaneously, the outward loop is invoked, whereby data being fed to the transmit data interface is routed directly back out of the receive data interface. See Figure 6-4
RF Loop	(RF Loopback) This test mode is almost identical to the IF loop mode. All of the receive configuration parameters are temporarily changed to match those of the transmit side, however, no internal connection is made. This is useful for performing a satellite loopback. When NORMAL is again selected, all of the previous values are restored.
TX-CW	(Transmit CW) This is a test mode which forces the modulator to transmit a pure carrier (unmodulated). Used for measuring phase noise.
TX-1,0	(Transmit an alternating 1,0,1,0 pattern) This is a test mode which forces the modulator to transmit a carrier modulated with an alternating 1,0,1,0 pattern, at the currently selected symbol rate. This causes two discrete spectral lines to appear, spaced at +/- half the symbol rate, about the carrier frequency. This mode is used to check the carrier suppression of the Modulator. If OQPSK is selected as the modulation type, the test will produce a spectral pattern suitable for the measurement of SSB rejection – useful in determining the phase and amplitude accuracy of the modulator.

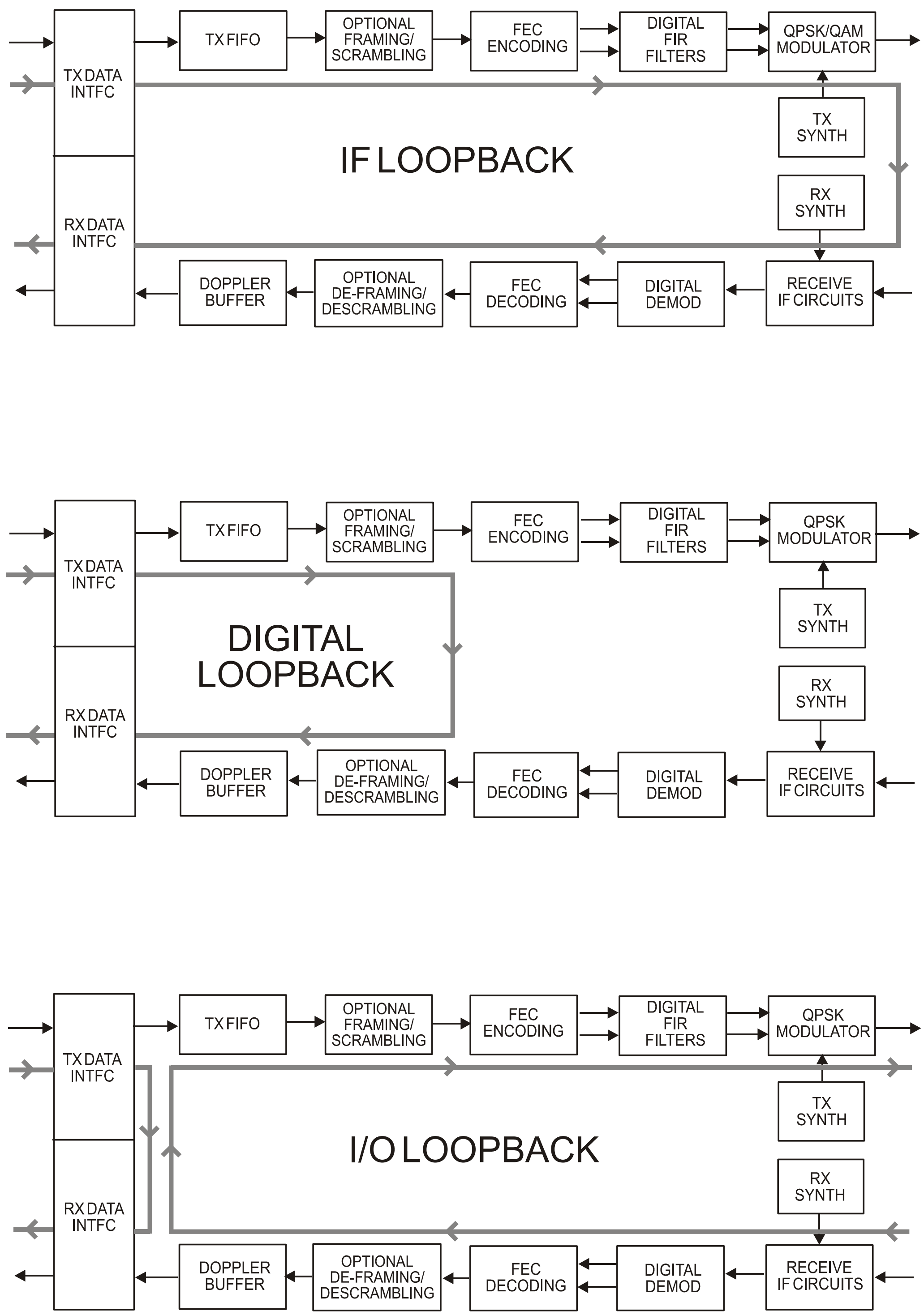


Figure 6-4. Loopback Modes

6.16 INFO (Information)

```
INFO:All Tx Rx Buf Frame
Intfc Rem Msk Ref ID 1:1
```

Select **All, Tx, Rx, Buf, Frame, Intfc, Rem, Mask, Red, ID** or **1:1**, using the ◄ ► arrow keys, then press **ENTER**.

These screens display information on the current configuration of the unit. Depending on the choice selected, one of the following screens will be displayed:

6.16.1 (INFO) ALL

This works in an identical fashion to **CONFIG, ALL**. It sequentially displays all **CONFIG** screens, but does not permit the user to edit a config, just to view it.

6.16.2 (INFO) TX (Transmit information)

```
Tx:1140.000 5000.000 TUR
8P 0.95 S EXT -20.0 ON I
```

The information displayed here is as follows:

Top line:
Transmit Frequency and **Data Rate** (**NOTE:** Due to space limitations, the resolution of displayed frequency is limited to 1 kHz, and data rate to 10 bps)
FEC Encoder type (VIT = Viterbi, VRS=Viterbi + Reed-Solomon,
TCM = Trellis Coded + Reed-Solomon, TUR = Turbo, UNC = uncoded)

Bottom line:
Modulation type (Q = QPSK, OQ= OQPSK, B = BPSK, 8P = 8-PSK, 8Q = 8QAM, 16=16-QAM).
Code Rate (Unc = Uncoded, 2144 = 21/44, then 5/16, 1/2, 2/3, 3/4, 7/8, 0.95)
Scrambler state (S = Scrambler on, N = Scrambler off, I = IESS-315 On)
Clocking Mode (INT = internal, EXT = external, LOP = loop)
Output power level
Transmit output state (ON = on , OF = off,
EO= external off, RT= Rx-Tx Inhibit)
TSI state (I = Transmit Spectral Inversion on, N = off)

6.16.3 (INFO) RX (Receive information)

```
Rx:1140.000 5000.000 TUR
8P 0.95 D BUF +/-32k   I
```

The information displayed here is as follows:

Top line:
Receive Frequency and **Data Rate** (**NOTE:** Due to space limitations, the resolution of displayed frequency is limited to 1 kHz, and data rate to 10Hz,)
FEC Decoder type (VIT = Viterbi, VRS=Viterbi + Reed-Solomon,
TCM = Trellis Coded + Reed-Solomon, TUR = Turbo, UNC = uncoded)

Bottom line:
Demodulation type (Q = QPSK, OQ= OQPSK, B = BPSK, 8P = 8-PSK, 8Q = 8QAM, 16=16-QAM).
Code Rate (Unc = Uncoded, 2144 = 21/44, then 5/16, 1/2, 2/3, 3/4, 7/8, 0.95)
Descrambler state (D = Descrambler on, N = Descrambler off, I = IESS-315 On)
Clocking Mode (SAT = buffer disabled, BUF = buffer enabled)
Demod Sweep Acquisition range
RSI state (I = Receive Spectral Inversion on, N = off)

6.16.4 (INFO) BUFF (Buffer information)

```
Buffer: Enabled  (Tx=Rx)
Size:+/-04096 bits (ENT)
```

This displays if the buffer is enabled or disabled, shows the exact clocking mode (**Tx=Rx**, or **Tx<> Rx**), and the buffer size. Pressing **ENTER** takes the user back to the previous menu.

6.16.5 (INFO) FRAME (Framing and EDMAC information)

Examples:

```
Framing: Disabled
        (ENTER or CLEAR)
```

```
Framing:AUPC-Only,EDMAC2
        (ENTER or CLEAR)
```

```
Framing: AUPC+EDMAC2
Master,0240 (ENT or CLR)
```

```
Framing: AUPC+EDMAC
Slave, 0241 (ENT or CLR)
```

This screen shows EDMAC mode, and shows if the unit is **EDMAC Master** or **Slave**, with the appropriate address. Pressing **ENTER** or **CLEAR** takes the user back to the previous menu.

6.16.6 (INFO) INTFC (Interface information)

This screen shows details of the electrical interface type of the main data port. If **RS422**, **V.35** or **RS232** is selected, the menu will also indicate the operation of RTS/CTS. Pressing **ENTER** or **CLEAR** takes the user back to the previous menu. For example:

```
Interface: RS422  (ENT)
RTS/CTS Loop, No Action
```

```
Interface:G.703 E1-Unbal
HDB3    (ENTER or CLEAR)
```

```
Interface: G.703 T1 B8ZS
533-655 feet(ENT or CLR)
```

```
Interface: IP      (ENT)
  IEEE 802.3 Ethernet
```

6.16.7 (INFO) REMCONT (Remote Control information)

This screen shows if the unit is in **Local** or **Remote** mode, and gives details of the electrical interface type selected, the unit's address, and the baud rate selected, etc. Pressing **ENTER** or **CLEAR** takes the user back to the previous menu. Example:

```
Remote M&C: Monitor Only
(Local Control only)
```

Further examples:

```
Remote M&C: RS485-4Wire
Address: 0001 19200 Baud
```

```
Remote M&C: 100BaseTx
IP Addr: 255.255.255.255
```

6.16.8 (INFO) MASK (Alarm mask information)

This shows, in the same format as the **CONFIG, Mask** sub menu, which alarms are currently masked. If an alarm is not masked, a blank is displayed in the relevant screen position.

```
Mask: FIFO BPV TAIS RAIS
AGC EbNo BUF Ref BUC LNB
```

6.16.9 (INFO) REF (Frequency Reference)

This shows the source of the frequency reference for the CDM-570/570L.

```
Frequency Reference:
Internal 10 MHz (ENTER)
```

6.16.10 (INFO) ID (Circuit ID)

This displays the user-defined Circuit ID string, which is entered via the UTIL, ID screen. To return to the previous menu, press **ENTER**.

```
Circuit ID:       (ENTER)
24 CHARACTER TST MESSAGE
```

6.16.11 (INFO) 1:1 (1:1 Redundancy information)

```
Redundancy State:Standby
Serial 1:1 Link: Active
```

This screen shows the following:

Redundancy status - either **Online** or **Standby** (1:1 or 1:N)
1:1 link status - this shows the status of the serial link between the two units –either **Active** or **Idle.**

Pressing **ENTER** or **CLEAR** takes the user back to the previous menu.

6.17 SAVE/LOAD

```
Save/Load Configuration:
Save  Load   (◄ ►,ENTER)
```

Select **Save** or **Load** using the ◄ ► arrow keys, then press **ENTER**.

These sub-menus permit the user to store or load up to 10 different modem configurations in the non-volatile memory of the modem **(0 through 9).**

6.17.1 (SAVE/LOAD) SAVE

Selecting **Save** will display the following screen, if the selected location is empty:

```
Save Config to Loc: 9
Empty              (▲ ▼)
```

However, if the location already contains data, the following screen will be displayed:

```
Save Config to Loc: 9
11:10:29 23/12/03 (▲ ▼)
```

The user is shown the time and date stamp of the previously stored configuration, for identification purposes.

Select the location where the current configuration will be stored, using the ▲ ▼ arrow keys, then press **ENTER**. Locations 0 through 9 are available.
If the selected location does not contain a previously stored configuration, the following screen is displayed:

```
Your Configuration has
been Saved to Loc 9 (ENT)
```

Pressing **ENTER** or **CLEAR** will take the user back to the previous menu.

If, however, the selected location contains a previously stored configuration, the following screen is displayed:

```
Loc 9 Contains Data!
Overwrite? NO YES  (◄ ►)
```

Select **No** or **Yes** using the ◄ ► arrow keys, then press **ENTER**.
Selecting **Yes** will overwrite the existing configuration at the selected location.

6.17.2 (SAVE/LOAD) LOAD

Having selected **Load**, if there is a configuration stored at the selected location the following screen will be displayed:

```
Load Config from Loc: 9
11:10:29 23/12/03 (▲ ▼)
```

Note the data and time stamp identifying the stored configuration.

If the selected location contains no data, the following screen will be displayed:

```
Load Config from Loc 9
Empty              (▲ ▼)
```

Select the location to load a configuration from, using the ▲ ▼ arrow keys, then press **ENTER**. Locations 0 through 9 are available.

If the selected location contains valid data, the following screen will be displayed:

```
New Config has been
Loaded from Loc 9 (ENT)
```

Pressing **ENTER** or **CLEAR** will take the user back to the previous menu.

6.18 UTILITY

```
UTIL: Buffer Clock Ref
ID 1:1 VFD Firmware FAST
```

Select **Buffer**, **Clock**, **Ref**, **ID**, **1:1, VFD, Firmware** or **FAST** using the ◄ ► arrow keys, then press **ENTER**.

According to the selection, the following sub-menus are displayed:

6.18.1 (UTIL) BUFFER (Buffer re-center)

```
Press ENTER to Re-Center
the Receive Buffer
```

Pressing **ENTER** will cause a forced re-centering of the Plesiochronous/Doppler buffer.

6.18.2 (UTIL) CLOCK (Set real-time clock)

```
Edit Real-Time Clock:
12:00:00 24/04/03(◄ ►,▲ ▼)
```

IMPORTANT

Edit the time and date settings of the real-time clock. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user should then press **ENTER**. Note that in accordance with international convention, the date is shown in **DAY-MONTH-YEAR** format.

6.18.3 (UTIL) REF (Reference)

```
Internal Freq Ref:Adjust
Warm-up delay (◄ ►,ENTER)
```

Select **Adjust** or **Warm-up delay** using the ◄ ► arrow keys, then press **ENTER**.

(UTIL, REF) ADJUST

If **Adjust** is selected, the following sub-menu is displayed:

```
Internal 10 MHz Freq Ref
Fine Adjust:+017(◄ ►,▲ ▼)
```

Fine adjustment of the Internal 10 MHz reference oscillator is possible through this menu. Use the ▲ ▼ arrow keys to edit the value. Note that in order to facilitate adjustment, the value is updated as the digits are incremented – the user does ***not*** need to press the **ENTER** key. The range of values is from –999 to +999.

Note: The numbers displayed here do not correspond to an exact frequency increment. A user should perform this fine adjustment while using an external frequency counter, connected to either:

a) the internal 10 MHz reference, if the user has internal access to the equipment, or

b) the Tx Output, set for CW, 0 dBm output level, and an exact center frequency (1000 MHz, for example).

(UTIL, REF) WARM-UP DELAY

If **Warm-up delay** is selected, the following sub-menu is displayed:

```
Warm-up delay:  Disable
Enable        (◄ ►,ENTER)
```

Select **Disable** or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

If the user selects **Disable,** the CDM-570/570L will power-up and go into normal operational service without any delay. Because the CDM-570L uses a high-stability oven-controlled 10 MHz reference oscillator (OCXO) there is a finite time required for the oven to reach operating temperature. Consequently, there will be a frequency error (as great as 2×10^{-6}) when the modem first powers up, and it may take up to 2 minutes before the frequency has settled to its correct value. This will affect the Tx synthesizer (and hence the Tx output frequency), the Rx synthesizers, and the generation of the Internal Tx baseband clock. For a CDM-570L operating on its own, this may not be a problem, but if the 10 MHz reference signal is being used to drive an externally-connected BUC, the frequency error at the RF output may be large, particularly at Ku or Ka-band.

In order to avoid this problem, the user may choose to enable a warm-up delay, which will suspend normal operation of the unit until the operating temperature of the OCXO has stabilized. This is accomplished by selecting **Enable,** then pressing **ENTER.**

Warm-up delay is not fixed. Instead, CDM-570L uses an intelligent algorithm to minimize this delay, under all circumstances. CDM-570L uses its internal temperature sensor, and a knowledge of how long the unit has been powered down, to determine how long the warm-up delay should be.

For example, the worst case occurs when the unit has been powered down sufficiently long that the unit has reached thermal equilibrium with its surroundings, and the external temperature is at the lowest value possible. In this circumstance the CDM-570L will take 2 minutes to warm-up.
If the external temperature is hot, and the unit was powered down, then a short time later, powered up again, the warm-up period will be very short, perhaps only several seconds.

In order to alert the user, when the warm-up delay has been enabled, the opening screen will display the following:

```
Comtech   CDM-570L Modem
Ref Warming-up: 045 secs
```

The bottom right of the display counts down, in seconds, until the warm-up period is complete. ***During this period, the Tx Carrier is deliberately muted***. At the end of the warm-up period, the bottom line will revert to the 'normal' display of Firmware version, and the unit will enter its normal operational state.

IMPORTANT

IMPORTANT NOTE: If the user wishes to bypass this feature, the warm-up period may be over-ridden at any time by pressing the **CLEAR** key.

6.18.4 (UTIL) ID (Circuit ID)

```
Edit Circuit ID:(◄ ►,▲ ▼)
24 CHARACTER TST MESSAGE
```

Edit the Circuit ID string, using the ◄ ► and ▲ ▼ arrow keys. Only the bottom line is available (24 characters). The cursor selects the position on the bottom line (◄ ►) and the character is then edited (▲ ▼). The following characters are available:

Space ( ) * + - , . / 0-9 and A-Z.

When the user has composed the string, press **ENTER**.

6.18.5 (UTIL) 1:1 (Manual 1:1 switchover)

```
Press ENT to force modem
to Standby (1:1 ONLY)
```

If the unit is part of a 1:1 redundant pair of modems, and this unit, is currently on-line, pressing **ENTER** will cause the unit to switch to standby. Pressing **CLEAR** will exit the menu without causing the switchover.

6.18.6 (UTIL) VFD (VFD Display brightness)

```
Edit Display Brightness:
100%          (▲ ▼,ENTER)
```

Edit the display brightness, using the ▲ ▼ arrow keys. The user should then press **ENTER**.

6.18.7 (UTIL) FIRMWARE

This series of sub-menus permits the user to view information about the CDM-570/570L internal firmware. The modem can store two complete firmware images, and the user can select which image will be loaded the next time the unit re-boots.

IMPORTANT

THESE MENUS ARE FOR DIAGNOSTIC PURPOSES. ONLY CHANGE AN IMAGE IF INSTRUCTED TO DO SO BY COMTECH EF DATA CUSTOMER SUPPORT TECHNICIANS.

```
Firmware Images:
Info   Select    (◄ ►,ENTER)
```

Select either **Info** or **Select**, using the ◄ ► arrow keys. Press **ENTER**.

If **Info** is selected, the following sub-menu is displayed:

```
Firmware Info: Bootrom
Image#1   Image #2   MPP50
```

Use the ◄ ► arrow keys and **ENTER** key to select and view information about the Bootrom, the 2 images, or the IP module (if installed).

Each image is further broken down as follows:

```
Image#x: Bulk   Main-FPGA
App Turbo-FPGA   RS-FPGA
```

Use the ◄ ► arrow keys and **ENTER** key to select which element is then displayed. A screen similar to the one shown below will be displayed:

```
Bulk#x:              01/21/04
FWxxxx                  1.1.1
```

If the user selects **Select**, the following sub-menu is displayed:

```
Current Active Image: #1
Next Reboot Image: #1 #2
```

The top line shows the current active image. On the bottom line the user may select, using the ◄ ► arrow keys and **ENTER** key, the image that will be active the next time the unit is re-booted.

6.18.8 (UTIL) FAST (FAST code options)

FAST is the way to enable new options in the modem. Obtain the FAST code for the new option from Comtech EF Data.

```
FAST:Cnfg View (H/W 0.03)
MainBoard S/N: 123456789
```

The FAST menu allows the user to either **Configure** (enter) a new FAST code into the unit or to enable Demo Mode, or to **View** which options are currently installed. Select **Cnfg** or **View** using the ◄ ► arrow keys, then press **ENTER**.

In addition, the user is also presented with the Hardware Revision Number, and the Main Board Serial Number. This Serial Number is a unique identifier for the FAST upgrade process (and is different from the Chassis Serial Number) and is required to obtain a new FAST code from the factory.

If the user selects **Cnfg**, then the following menu is displayed:

```
 FAST Configuration:
 Edit Code    Demo Mode
```

If the user selects **Edit Code**, then the following menu is displayed:

```
Edit 20 digit FAST Code:
00000000000000000000 ENT
```

Enter the code carefully. Use the ◄ ► arrow keys to move the cursor to each character. Use the ▲ ▼ arrow keys to edit the character, then press **ENTER**. The modem will respond with "Configured Successfully" if the new FAST option has been accepted as shown below.

```
Configured Successfully
       (ENTER or CLEAR)
```

If, on the other hand, the FAST code is rejected, the following menu will be displayed:

```
FAST Code Rejected!
       (ENTER or CLEAR)
```

If the user selects **Demo Mode**, then the following menu is displayed:

```
FAST Demo Mode: Off  On
 604800 seconds remain
```

Use the ◄ ► arrow keys to move the cursor to select **Off** or **On**. When **On**, the second line will display the number of seconds remaining available for the free Demo Mode. When enabled, Demo Mode allows access to ALL CDM-570/570L FAST options for 604800 seconds (7 full days). Demo Mode may be turned on and off an unlimited number of time until the 604800 seconds have expired. The seconds count only decrements when the mode is On. When the Demo period expires the following menu is displayed:

```
FAST Demo Mode: Off  On
  Demo Period Expired
```

IMPORTANT

CHANGING THE STATE OF DEMO MODE WILL CAUSE THE MODEM FIRMWARE TO REBOOT. ALSO, IF DEMO MODE IS ENABLED AND THE TIMER EXPIRES THE MODEM FIRMWARE WILL REBOOT.

If the user selects **View**, then the following menu is displayed:

```
View Options: 03     (▲ ▼)
150W BPSU   Not Installed
```

Use the ▲ ▼ arrow keys to scroll through each Option Number in turn. As the cursor highlights each option, the description of the option will be displayed on the bottom line, along with the information “Installed or Not Installed”. The options are shown in the following table:

Option Number	Option Type	Displayed Code	Description
01	Hardware	150W BPSU	150 Watt, 48 volt BUC PSU
02	Hardware	100W BPSU	100 Watt, 24 volt BUC PSU
03	Hardware	RS Codec	Reed-Solomon Codec
04	Hardware	TPC Codec	Turbo Product Codec
05	Hardware	TPC/LDPC	TPC/LDPC Codec
06	Hardware	IP Module	IP Traffic Module
07	Hardware	H/W Exp-1	Future Hardware Expansion 1
08	Hardware	H/W Exp-2	Future Hardware Expansion 2
09	FAST	2048 kbps	2048 kbps max data rate
10	FAST	5000 kbps	5000 kbps max data rate
11	FAST	8PSK/8QAM	8-PSK and 8-QAM modulation
12	FAST	16-QAM	16-QAM modulation
13	FAST	9980 kbps	9980 kbps max data rate
14	FAST	Hdr Comp	IP Header Compression
15	FAST	Data Comp	IP Datagram Compression
16	FAST	IP QoS	IP Quality of Service
17	FAST	3xDES	IP 3xDES Encryption

Notes:

Chapter 7. FORWARD ERROR CORRECTION OPTIONS

7.1 Introduction

As standard, the CDM-570/570L Modem is equipped with an industry-standard Viterbi **F**orward **E**rror **C**orrection (FEC) encoder/decoder. The constraint lengths and encoding polynomials are compatible with the vast majority of existing modems from other manufacturers. Comtech EF Data has performed compatibility testing to ensure interoperability. In addition, there are two plug-in daughter cards (SIMM modules), both field upgradeable, for adding other FEC functionality.

The first of these is a Concatenated Reed-Solomon Codec, which is combined with Viterbi coding, to significantly improve BER versus Eb/No performance. It is required for running 8-PSK/TCM, and for the 16-QAM Viterbi modes.

The second optional plug-in card is the Turbo Product Codec. Turbo Coding represents a very significant development in the area of FEC, and Comtech EF Data's Turbo Product Codec offers Rate 5/16 and Rate 21/44 for BPSK, Rate 21/44 QPSK, Rate 3/4 and Rate 7/8 for QPSK, OQPSK, 8-QAM, 8-PSK and 16-QAM, and Rate 0.95 for QPSK, 8-QAM and 8-PSK. Turbo Product Coding provides the best Forward Error Correction technology currently available, and is now offered with a sufficiently broad range of code rates and modulation types that link performance can be optimized under any conditions.

At the time of writing, Comtech EF Data is planning to release a new codec, which is a combination of Turbo Product Coding and Low Density Parity Check (LDPC) coding. Please consult the factory for details of availabilty on this new TPC/LDPC Codec.

7.2 Viterbi

The combination of convolutional coding and Viterbi decoding has become an almost universal standard for satellite communications. The CDM-570/570L complies with the Intelsat IESS 308/309 standards for Viterbi decoding with a constraint length of seven. This is a *de facto* standard, even in a closed network environment, which means almost guaranteed inter-operability with other manufacturer's equipment. It provides very useful levels of coding gain, and its short decoding delay and error-burst characteristics make it particularly suitable for low data rate coded voice applications. It has a short constraint length, fixed at 7, for all code rates. (The constraint length is defined as the number of output symbols from the encoder that are affected by a single input bit.) By choosing various coding rates (Rate 1/2, 3/4 or 7/8) the user can trade off coding gain for bandwidth expansion. Rate 1/2 coding gives the best improvement in error rate, but doubles the transmitted data rate, and doubles the occupied bandwidth of the signal. Rate 7/8 coding, at the other extreme, provides the most modest improvement in performance, but only expands the transmitted bandwidth by 14%. A major advantage of the Viterbi decoding method is that the performance is independent of data rate, and does not display a pronounced threshold effect (i.e., does not fail rapidly below a certain value of Eb/No). Note that in BPSK mode, the CDM-570/570L only permits a coding rate of 1/2. Because the method of convolutional coding used with Viterbi, the encoder does not preserve the original data intact, and is called *non-systematic*.

Table 7-1. Viterbi Decoding Summary

FOR	AGAINST
Good BER performance - very useful coding gain.	Higher coding gain possible with other methods
Almost universally used, with *de facto* standards for constraint length and coding polynomials	
Shortest decoding delay (~100 bits) of any FEC scheme - good for coded voice, VOIP, etc.	
Short constraint length produces small error bursts - good for coded voice.	
No pronounced threshold effect - fails gracefully.	
Coding gain independent of data rate.	

7.3 Reed-Solomon Outer Codec (Hardware Option)

IMPORTANT

It cannot be emphasized strongly enough that the purpose of the concatenated Reed-Solomon is to dramatically improve the BER performance of a link under given noise conditions. It should NOT be considered as a method to reduce the link EIRP to the point where rain-fade margin, particularly at Ku-band, is no longer required.

The concatenation of an outer Reed-Solomon Codec with Viterbi decoder first became popular when Intelsat introduced it in the early 1990s. It permits significant improvements in error performance without significant bandwidth expansion. The coding overhead added by the RS outer Codec is typically around 10%, which translates to a 0.4 dB power penalty for a given link. Reed-Solomon codes are block codes (as opposed to Viterbi which is convolutional), and in order to be processed correctly the data must be framed and de-framed. Additionally, Reed-Solomon codes are limited in how well they can correct errors that occur in bursts. This, unfortunately, is the nature of the uncorrected errors from a Viterbi decoder, which produce clusters of errors that are multiples of half the constraint length. For this reason, the data must be interleaved following RS encoding, and is then de-interleaved prior to decoding. This ensures that a single burst of errors leaving the Viterbi decoder is spread out over a number of interleaving frames, so errors entering the RS decoder do not exceed its capacity to correct those errors. In the case of the CDM-570/570L, two different RS code rates are used, according to the mode of operation.

A 220,200 code is used in transparent closed network modes, and a 200,180 code is used in framed (EDMAC) modes. (220,200 means that data is put into blocks of 220 bytes, of which 200 bytes are data, and 20 bytes are FEC overhead.) These two codes were chosen because they fit well into Comtech EF Data's clock generation scheme, and they have almost identical coding gain. When Viterbi decoding is used as the primary FEC, an interleaver depth of four is used. The increase in coding gain is at the expense of delay. The interleaving/de-interleaving delay and the delay through the decoder itself can be as high as 25 kbits. At very low data rates, this equates to several seconds, making it highly unsuitable for voice applications. Additionally, the de-interleaver frame synchronization method can add significantly to the time taken for the demodulator to declare acquisition.

A characteristic of concatenated RS coding is the very pronounced threshold effect. For any given modem design, there will be a threshold value of Eb/No below which the demodulator cannot stay synchronized. This may be due to the carrier-recovery circuits, or the synchronization threshold of the primary FEC device, or both. In the CDM-570/570L, and Rate 1/2 operation, this threshold is around 4 dB Eb/No. Below this value, operation is not possible, but above this value, the error performance of the concatenated RS system produces exceptionally low error rates for a very small increase in Eb/No.

CAUTION

Care should be taken not to operate the demodulator near its sync threshold. Small fluctuations in Eb/No may cause total loss of the link, with the subsequent need for the demodulator to re-acquire the signal.

Table 7-2. Concatenated RS Coding Summary

FOR	AGAINST
Exceptionally good BER performance - several orders of magnitude improvement in link BER under given link conditions.	Very pronounced threshold effect - does not fail gracefully in poor Eb/No conditions. Additional coding overhead actually degrades sync threshold, and reduces link fade margin.
Very small additional bandwidth expansion	Significant processing delay (~25 kbits) - not good for voice, or IP applications
	Adds to demod acquisition time.

7.4 Trellis Coding (requires 8-PSK/8-QAM FAST Option)

In the other FEC methods described here, the processes of coding and modulation are independent. The FEC codec has no knowledge of, or interaction with, the modulator. However, there are schemes in which the coding and modulation are combined together, where the encoder places FEC symbols in a precise manner into the signal constellation. This can yield an overall improvement in performance, and is used in higher-order modulation schemes, such as 8-PSK, 16-PSK, 16-QAM, etc. When convolution coding is used, the overall *coded modulation* approach is referred to as Trellis Coded Modulation (TCM). Ungerboeck was an early pioneer, and developed optimum mapping and decoding schemes. However, the decoding scheme was seen as complex, and expensive, and Qualcomm Inc. developed a variation on the theme, which uses a Viterbi decoder at the core, surrounded by adjunct processing. The scheme is able to achieve performance very close to the optimum Ungerboeck method, but with far less complexity, and is called *pragmatic Trellis Coded Modulation*.

Now, Intelsat recognized that, as more and more high power transponders are put into service, the transponders are no longer *power limited*, but *bandwidth limited.* In order to maximize transponder capacity, they looked at 8-PSK as a method of reducing the occupied bandwidth of a carrier, and adopted Qualcomm's pragmatic TCM, at Rate 2/3.

A Rate 2/3 8-PSK/TCM carrier occupies only 50% of the bandwidth of a Rate 1/2 QPSK carrier. However, the overall coding gain of the scheme is not adequate by itself, and so it is required that the scheme be concatenated with an outer RS codec. When combined, there is a threshold value of Eb/No of around 6 dB, and above approximately 7 dB, the bit error rate is better than 1 x 10^{-8}.

The detractions of the concatenated RS approach apply here also, along with more stringent requirements for phase noise and group delay distortion – the natural consequences of the higher-order modulation.

The CDM-570/570L implements a Closed Network version of Rate 2/3 8-PSK/TCM/RS, using either the 220, 200 or 200,180 Reed-Solomon outer codes. Although not compatible, it provides identical performance to the Open Network IESS-310 standard.

Table 7-3. 8-PSK/TCM Coding Summary

FOR	AGAINST
Exceptionally bandwidth efficient compared to QPSK	Needs concatenated RS outer codec to give acceptable coding gain performance
	Demod acquisition threshold much higher than for QPSK
	8-PSK is more sensitive to phase noise and group delay distortion than QPSK

7.5 Turbo Product Codec (Hardware Option)

7.5.1 Introduction

Turbo coding is an FEC technique developed within the last few years, which delivers significant performance improvements compared to more traditional techniques. Two general classes of Turbo Codes have been developed, Turbo Convolutional Codes (TCC), and Turbo Product Codes (TPC, a block coding technique). Comtech EF Data has chosen to implement an FEC codec based on TPC. A Turbo Product Code is a 2 or 3 dimensional array of block codes. Encoding is relatively straightforward, but decoding is a very complex process requiring multiple iterations of processing for maximum performance to be achieved.

Unlike the popular method of concatenating a Reed-Solomon codec with a primary FEC codec, Turbo Product Coding is an entirely stand-alone method. It does not require the complex interleaving/de-interleaving of the RS approach, and consequently, decoding delays are significantly reduced. Furthermore, the traditional concatenated RS schemes exhibit a very pronounced threshold effect. A small reduction in Eb/No can result in total loss of demod and decoder synchronization. TPC does not suffer from this problem. The demod and decoder remain synchronized down to the point where output error rate becomes unusable. This is considered to be an advantageous characteristic in fading environment. Typically, in QPSK, 8-PSK and 16-QAM TPC modes the demod and decoder can remain synchronized ***2 – 3 dB below*** the Viterbi/R-S or TCM cases.

With this release of the CDM-570/570L, Comtech EF Data now provides the best Forward Error Correction technology currently available, offering a very broad range of TPC code rates, combined with the entire range of modulation types, from BPSK to 16-QAM.

7.5.2 TPC modes available in the CDM-570/570L

Table 7-4. Available TPC Modes

Code Rate/Modulation	Data Rate Range
Rate 5/16 BPSK	2.4 kbps to 0.937 Mbps
Rate 21/44 BPSK	2.4 kbps to 1.430 Mbps
Rate 21/44 QPSK, OQPSK	4.8 kbps to 2.860 Mbps
Rate 3/4 QPSK, OQPSK	7.2 kbps to 4.500 Mbps
Rate 3/4 8-PSK, 8-QAM	10.8 kbps to 6.750 Mbps
Rate 3/4 16-QAM	14.4 kbps to 9.000 Mbps
Rate 7/8 QPSK, OQPSK	8.4 kbps to 5.250 Mbps
Rate 7/8 8-PSK, 8-QAM	13.6 kbps to 7.875 Mbps
Rate 7/8 16-QAM	16.8 kbps to 9.980 Mbps
Rate 0.95 QPSK, OQPSK	9.1 kbps to 5.666 Mbps
Rate 0.95 8-PSK, 8-QAM	15.3 kbps to 8.500 Mbps
Maximum rates are subject to the appropriate FAST codes being installed	

7.5.3 8-QAM Modulation

What is 8-QAM, and why is it important? Unlike 8-PSK, which comprises 8 equally spaced constellation points around a unit-circle, 8-QAM is comprised of exactly half of a 16-QAM signal. Fortuitously, the 8-QAM constellation possesses some unique properties that can be exploited to permit acquisition and tracking of signals at noise levels 2 - 3 dB worse than is possible with 8-PSK. This is, then, a perfect match for the expected Eb/No values that TPC demands. Naturally, it has exactly the same spectral efficiency as 8-PSK.

While the 8-QAM constellation itself is not new, Comtech has performed much original work related to the choice of optimum mapping and soft decision decoding, and, of course, on the techniques for acquiring and tracking 8-QAM signals. This work is the subject of a pending patent application filed by Comtech EF Data.

The basic performance of uncoded 8-QAM is broadly similar to uncoded 8-PSK, but has a slightly higher peak-to-average power ratio than 8-PSK (about 0.8 dB). In most linear transponders, this should not be considered a problem.

A major benefit of Comtech's implementation of 8-QAM is that it is inherently more immune to the effects of phase noise than 8-PSK. In L-band applications that use low-cost BUCs and LNBs this is considered particularly advantageous for lower bit rates, where phase noise can be very problematic.

7.5.4 End-to-End Processing Delay

In many cases, FEC methods that provide increased coding gain do so at the expense of increased processing delay. However, with TPC, this increase in delay is very modest. The table below shows, for the CDM-570/570L, the processing delays for the major FEC types, including the three TPC modes:

Table 7-5. Turbo Product Coding processing delay comparison

FEC Mode (64 kbps data rate)	End-to-end delay, ms
Viterbi, Rate 1/2	12
Viterbi Rate 1/2 + Reed Solomon	266
Turbo Product Coding, Rate 3/4	**47**
Turbo Product Coding, Rate 21/44, BPSK	**64**
Turbo Product Coding, Rate 5/16, BPSK	**48**
Turbo Product Coding, Rate 7/8	**245 ***
Turbo Product Coding, Rate 0.95	**69**

* A larger block is used for the Rate 7/8 code, which increases decoding delay.

Note that in all cases, the delay is inversely proportional to data rate, so for 128 kbps, the delay values would be half of those shown above. It can be seen that the concatenated Reed-Solomon cases increase the delay significantly, due mainly to interleaving/de-interleaving.

7.5.5 Comparison of all TPC Modes

Mode	Eb/No at BER = 10^{-6} Guaranteed (Typical in parentheses)	Eb/No at BER = 10^{-8} Guaranteed (Typical in parentheses)	Spectral Efficiency	Symbol Rate	Occupied * Bandwidth for 1 Mbps Carrier
*QPSK Rate 1/2 Viterbi **	6.0 dB (5.5 dB)	7.3 dB (6.8 dB)	1.00 bits/Hz	1.0 x bit rate	1190 kHz
BPSK Rate 21/44 Turbo	2.9 dB (2.6 dB)	3.3 dB (3.0 dB)	0.48 bits/Hz	2.1 x bit rate	2493 kHz
BPSK Rate 5/16 Turbo	2.4 dB (2.1 dB)	2.8 dB (2.5 dB)	0.31 bits/Hz	3.2 x bit rate	3808 kHz
QPSK/ OQPSK Rate 21/44 Turbo	2.9 dB (2.6 dB)	3.2 dB (2.8 dB)	0.96 bits/Hz	1.05 x bit rate	1246 kHz
QPSK/ OQPSK Rate 3/4 Turbo	3.8 dB (3.3 dB)	4.4 dB (4.0 dB)	1.50 bits/Hz	0.67 x bit rate	793 kHz
QPSK/ OQPSK Rate 7/8 Turbo	4.3 dB (4.0 dB)	4.5 dB (4.2 dB)	1.75 bits/Hz	0.57 x bit rate	678 kHz
QPSK/ OQPSK Rate 0.95 Turbo	6.4 dB (6.0 dB)	6.9 dB (6.5 dB)	1.90 bits/Hz	0.53 x bit rate	626 kHz
*8-PSK Rate 2/3 TCM ** and RS (IESS-310)*	6.5 dB (5.6 dB)	6.9 dB (6.0 dB)	1.82 bits/Hz	0.56 x bit rate	666 kHz
8-PSK Rate 3/4 Turbo	6.2 dB (5.7 dB)	6.8 dB (6.3 dB)	2.25 bits/Hz	0.44 x bit rate	529 kHz
8-PSK Rate 7/8 Turbo	7.0 dB (6.6 dB)	7.2 dB (6.8 dB)	2.62 bits/Hz	0.38 x bit rate	453 kHz
8-PSK Rate 0.95 Turbo	9.3 dB (8.9 dB)	10.3dB (9.9 dB)	2.85 bits/Hz	0.35 x bit rate	377 kHz
8-QAM Rate 3/4 Turbo	6.5 dB (6.1 dB)	7.2 dB (6.8 dB)	2.25 bits/Hz	0.44 x bit rate	529 kHz
8-QAM Rate 7/8 Turbo	6.6 dB (6.2 dB)	6.8 dB (6.4 dB)	2.62 bits/Hz	0.38 x bit rate	453 kHz
8-QAM Rate 0.95 Turbo	9.6 dB (9.2 dB)	10.6 dB (10.2 dB)	2.85 bits/Hz	0.35 x bit rate	377 kHz
16-QAM Rate 3/4 Turbo	7.4 dB (7.0 dB)	8.2 dB (7.7 dB)	3.00 bits/Hz	0.33 x bit rate	396 kHz
16-QAM Rate 7/8 Turbo	8.1 dB (7.7 dB)	8.3 dB (7.9 dB)	3.50 bits/Hz	0.28 x bit rate	340 kHz
*16-QAM Rate 3/4 ** Viterbi/Reed-Solomon*	8.1 dB (7.5 dB)	8.6 dB (8.0 dB)	2.73 bits/Hz	0.37 x bit rate	435 kHz
*16-QAM Rate 7/8 ** Viterbi/Reed-Solomon*	9.5 dB (9.0 dB)	10.1 dB (9.5 dB)	3.18 bits/Hz	0.31 x bit rate	374 kHz

* The occupied bandwidth is defined at the width of the transmitted spectrum taken at the –10 dB points on the plot of power spectral density. This equates to 1.19 x symbol rate for the CDM-570/570L transmit filtering.

** Included for comparative purposes

It can be seen that the 8-PSK Rate 3/4 Turbo performance closely approaches that of the Rate 2/3 TCM/Reed-Solomon case – the BER performance is within approximately 0.4 dB. However, it should be noted that the Rate 3/4 Turbo mode is ***20% more bandwidth efficient*** than the TCM case. The additional advantages of Turbo (lower delay, performance during fades, etc.) should also be considered.

Table 7-6. Turbo Product Coding Summary

FOR	AGAINST
Exceptionally good BER performance - significant improvement compared with every other FEC method in use today	Nothing!
No pronounced threshold effect - fails gracefully	
Exceptional bandwidth efficiency	
Coding gain independent of data rate (in this implementation)	
Low decoding delay	
Easy field upgrade in CDM-570/570L	

7.6 Uncoded Operation (No FEC)

There are occasions when a user may wish to operate a satellite link with no forward error correction of any kind. For this reason, the CDM-570/570L offers this uncoded mode for three modulation types - BPSK, QPSK, and OQPSK. However, the user should be aware of some of the implications of using this approach.

PSK demodulators have two inherent undesirable features. The first of these is known as ‘phase ambiguity’, and is due to the fact the demodulator does not have any absolute phase reference, and in the process of carrier recovery, the demodulator can lock up in any of K phase states, where K = 2 for BPSK, K = 4 for QPSK. Without the ability to resolve these ambiguous states there would be a 1-in-2 chance that the data at the output of the demodulator would be wrong, in the case of BPSK. For QPSK, the probability would be 3 in 4.

The problem is solved in the case of BPSK by differentially encoding the data prior to transmission, and then performing the inverse decoding process. This is a very simple process, but has the disadvantage that it doubles the receive BER. For every bit error the demodulator produces, the differential decoder produces two.

The problem for QPSK is more complex, as there are 4 possible lock states, leading to 4 ambiguities. When FEC is employed, the lock state of the FEC decoder can be used to resolve two of the four ambiguities, and the remaining two can be resolved using serial differential encoding/decoding. However, when no FEC is being used, an entirely different scheme must be used. Therefore, in QPSK, a parallel differential encoding/decoding technique is used, but has the disadvantage that it again doubles the receive BER.

OQPSK is a different situation again, where the ambiguities result not only from not having an absolute phase reference, but also not knowing which of the two parallel paths in the demod, I or Q, contains the half-symbol delay. Another type of differential encoding is used, but yet again the error rate is doubled, compared to ideal.

The second problem inherent in PSK demodulators is that of 'data false locking'.
In order to accomplish the task of carrier recovery, the demodulator must use a non-linear process. A second-order non-linearity is used for BPSK, and a fourth-order non-linearity is used for QPSK. When data at a certain symbol rate is used to modulate the carrier, the demodulator can lock at incorrect frequencies, spaced at intervals of one-quarter of the symbol rate away from the carrier. Fortunately, when FEC decoding is used, the decoder synchronization state can be used to verify the correct lock point has been achieved, and to reject the false locks.

However, if uncoded operation is used, there is no way to recognize a data false lock. The demodulator will indicate that it is correctly locked, but the data out will not be correct.

This problem has been almost entirely eliminated in the CDM-570/570L with the fast acquisition algorithm which includes Fast Fourier Transform (FFT) techniques. However, there is a very small probability that a data false lock could still occur in uncoded mode, and in this circumstance Comtech EF Data cannot be held responsible for incorrect operation.

7.7 Rates above 2.5 Msymbols/sec

IMPORTANT

Starting with Release 1.4.1 of the CDM-570/570L firmware, the maximum symbol rate has been increased from 2.5 to 3.0 Msymbols/sec. This has been done without modification to the hardware, and as a consequence, there may be a small degradation in BER versus Eb/No performance for rates above 2.5 Msymbols/sec. The degradation is as follows:

Rates from 2.5 to 2.65 Msps: degradation < 0.1 dB

Rates from 2.65 to 2.80 Msps: degradation < 0.2 dB

Rates from 2.80 to 3.00 Msps: degradation < 0.3 dB

Users should take this into account when considering the BER versus Eb/No graphs that follow.

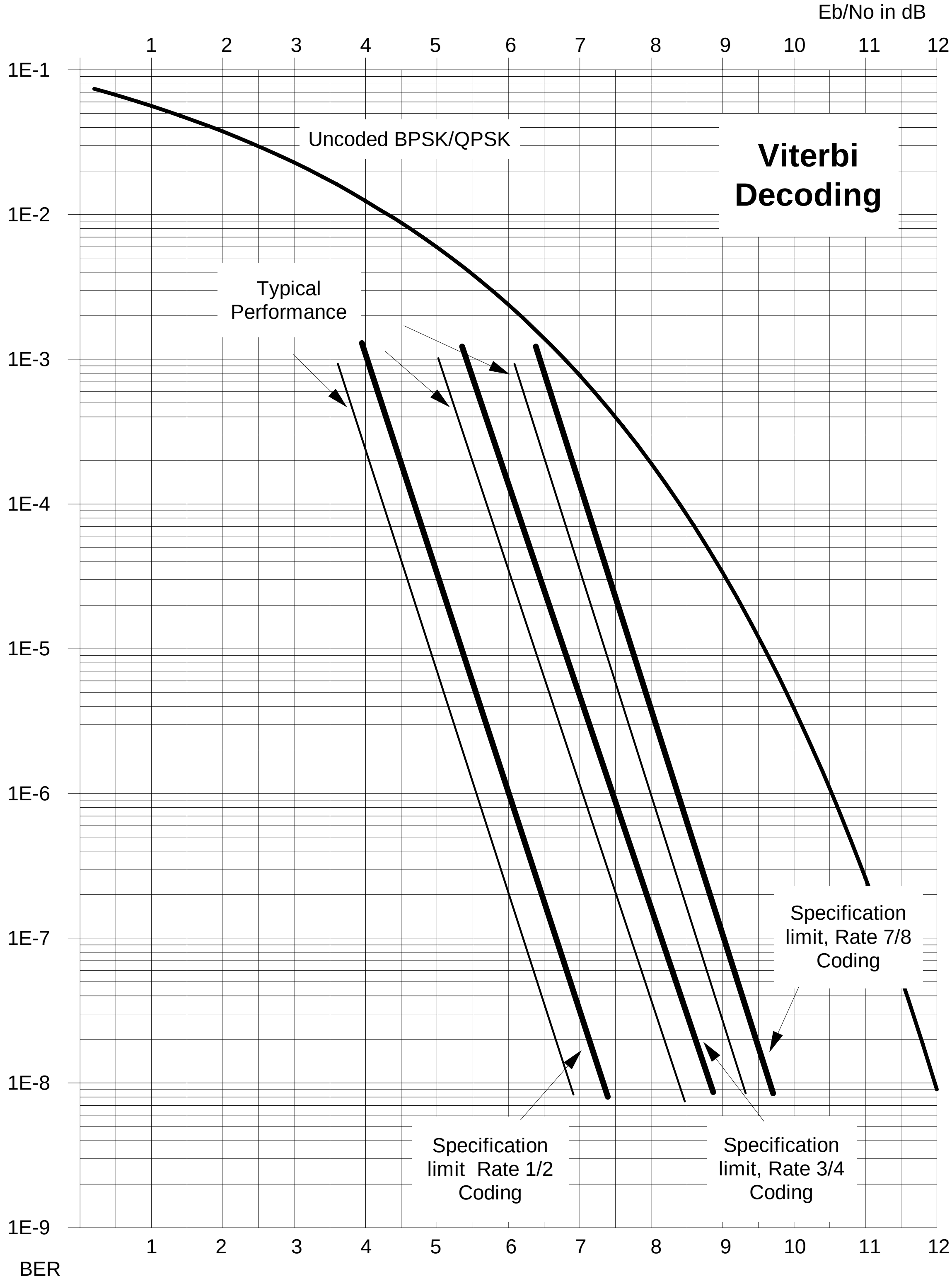


Figure 7-1. Viterbi Decoding

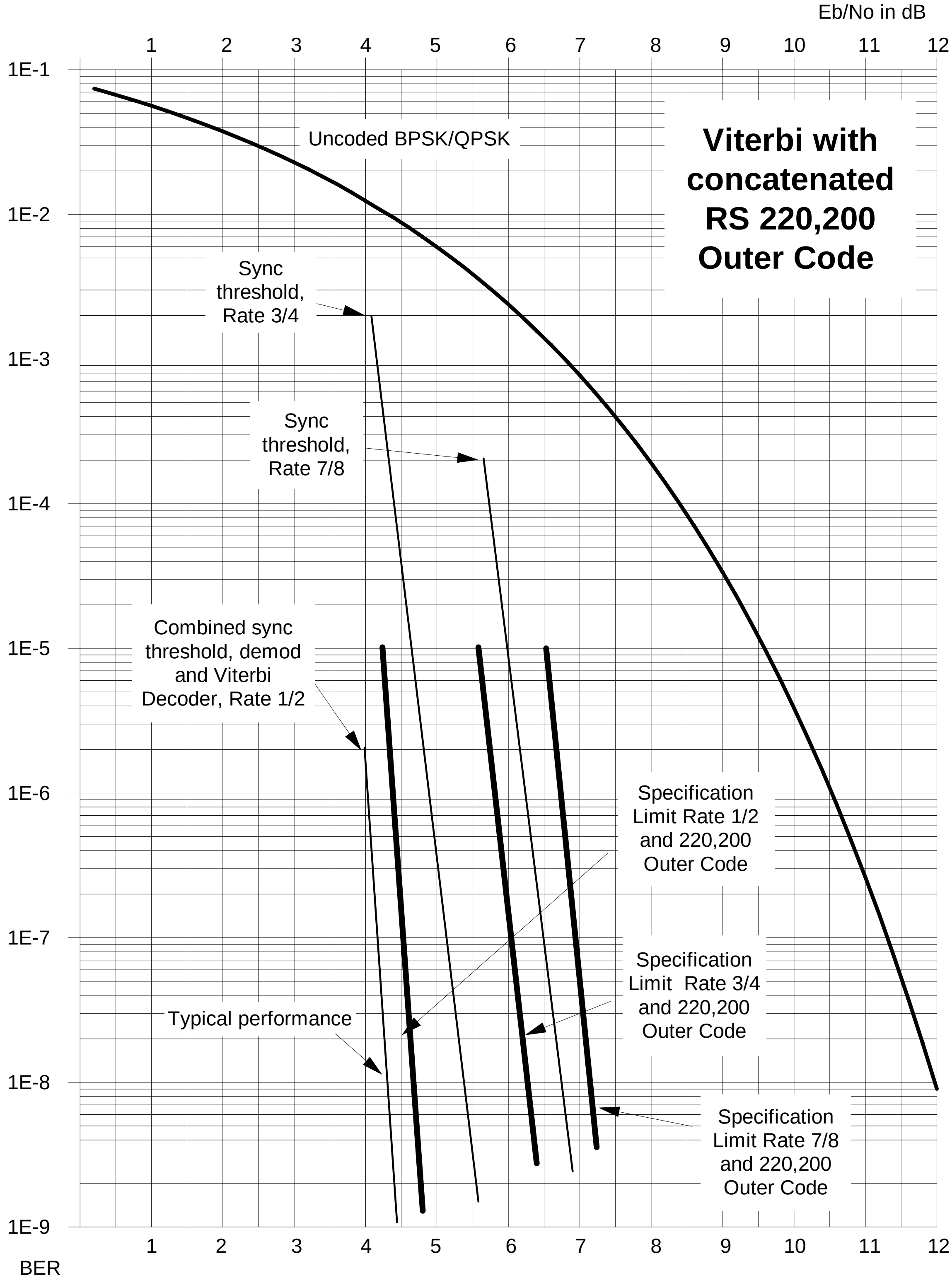


Figure 7-2. Viterbi with concatenated RS Outer Code

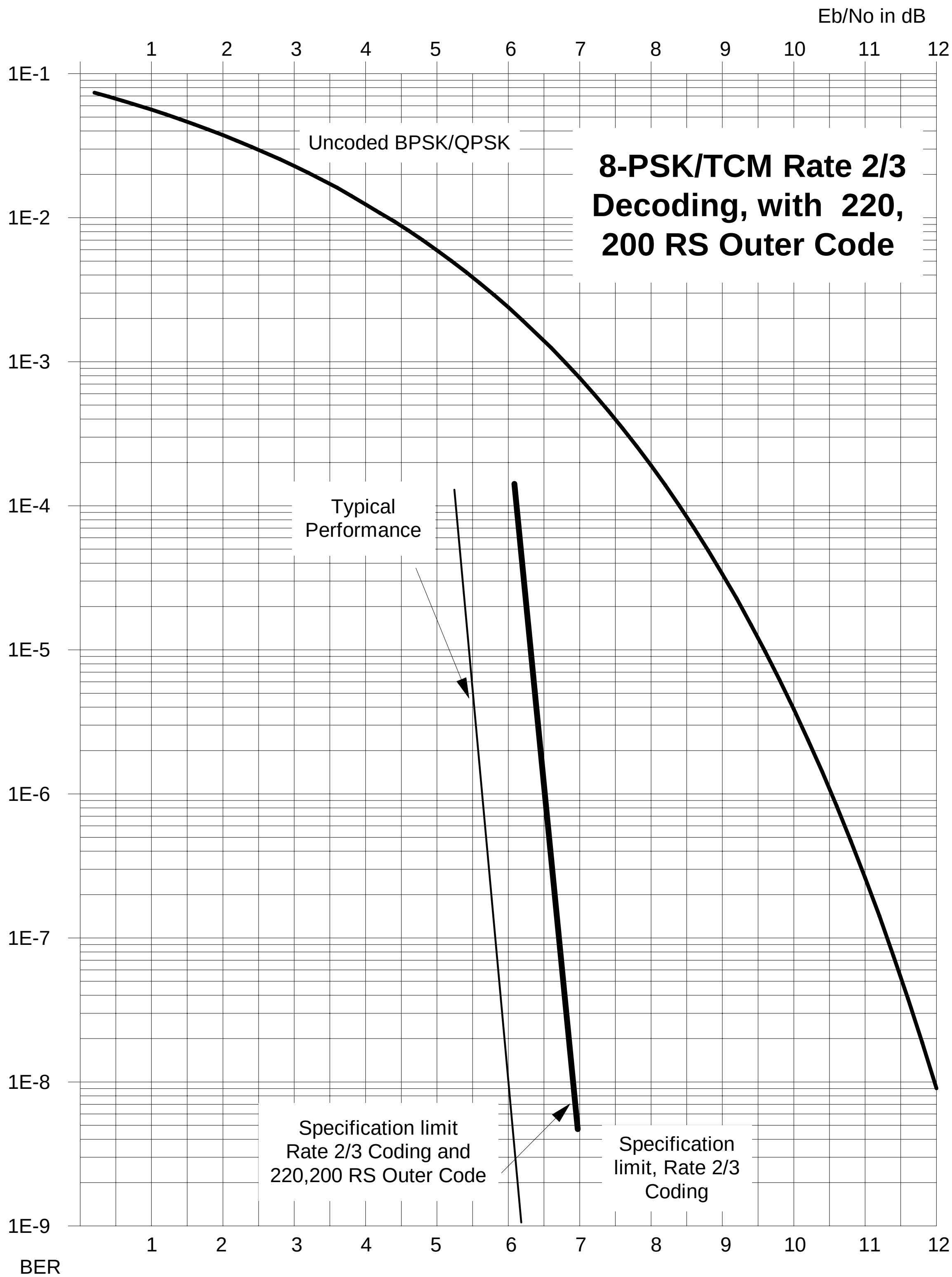


Figure 7-3. 8-PSK/TCM Rate 2/3 with concatenated RS Outer Code

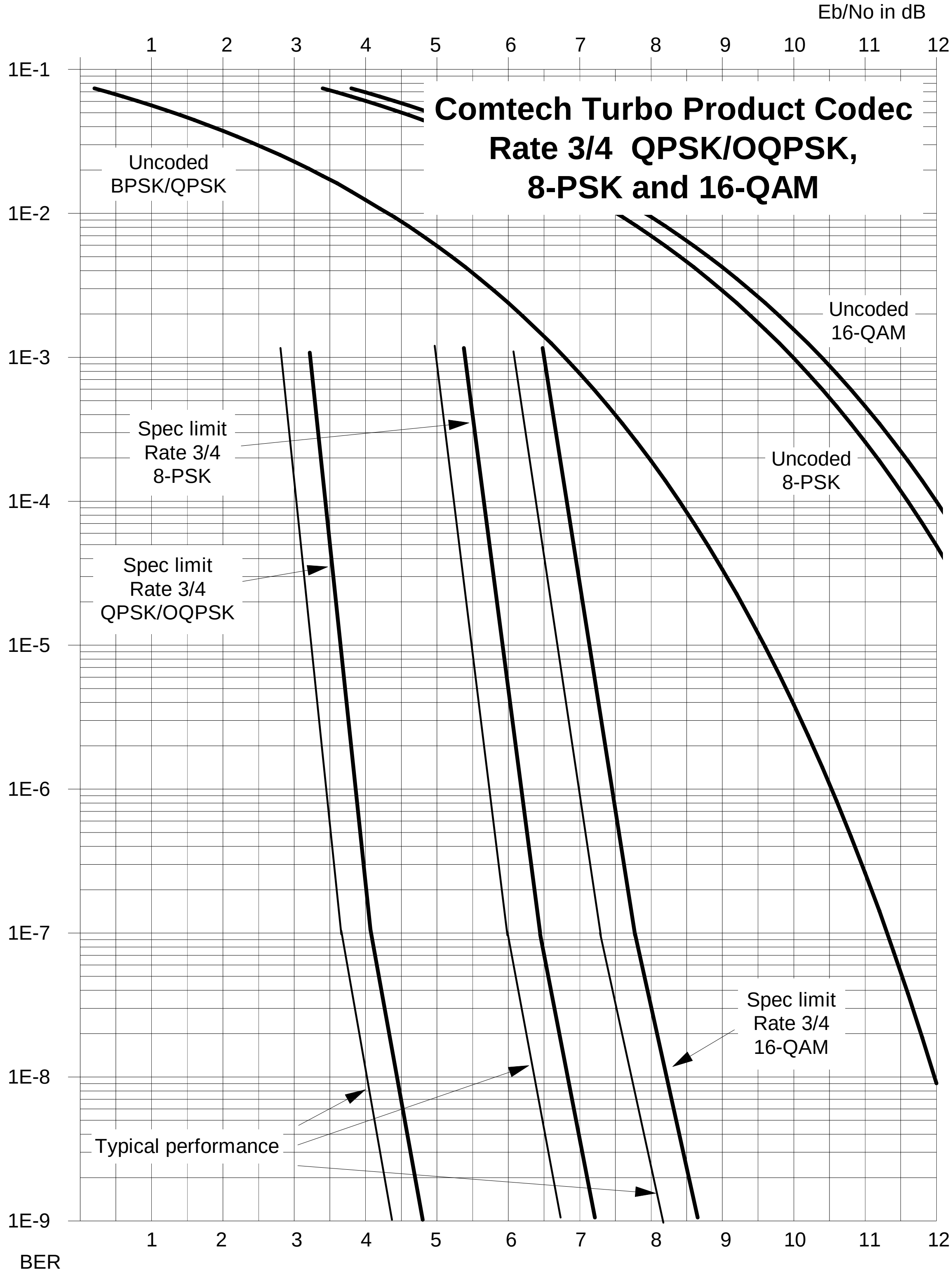


Figure 7-4. Comtech EF Data Turbo Product Codec Rate 3/4 QPSK/OQPSK, 8-PSK AND 16-QAM

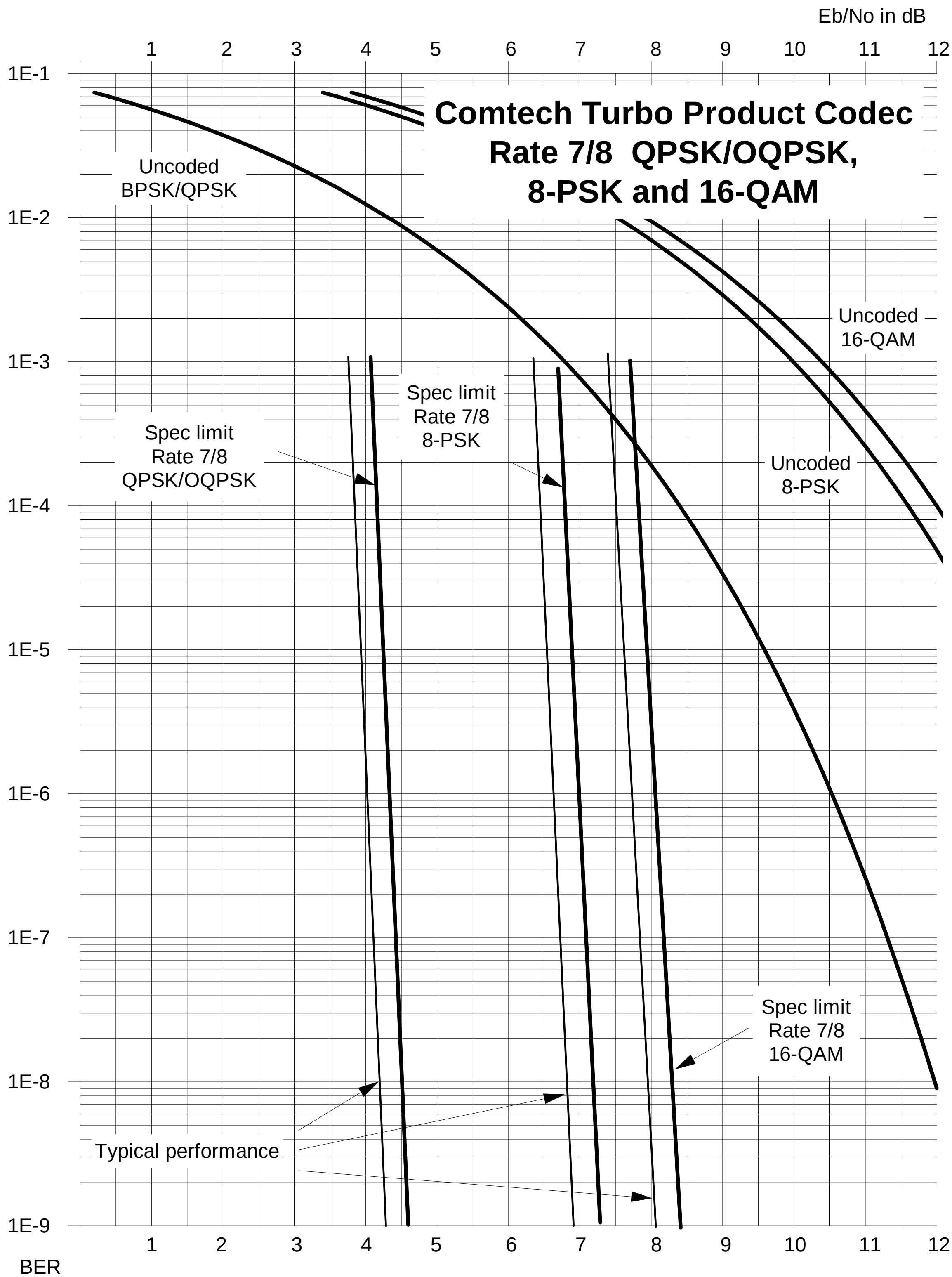


Figure 7-5. Comtech EF Data Turbo Product Codec
Rate 7/8 QPSK/OQPSK, 8-PSK AND 16-QAM

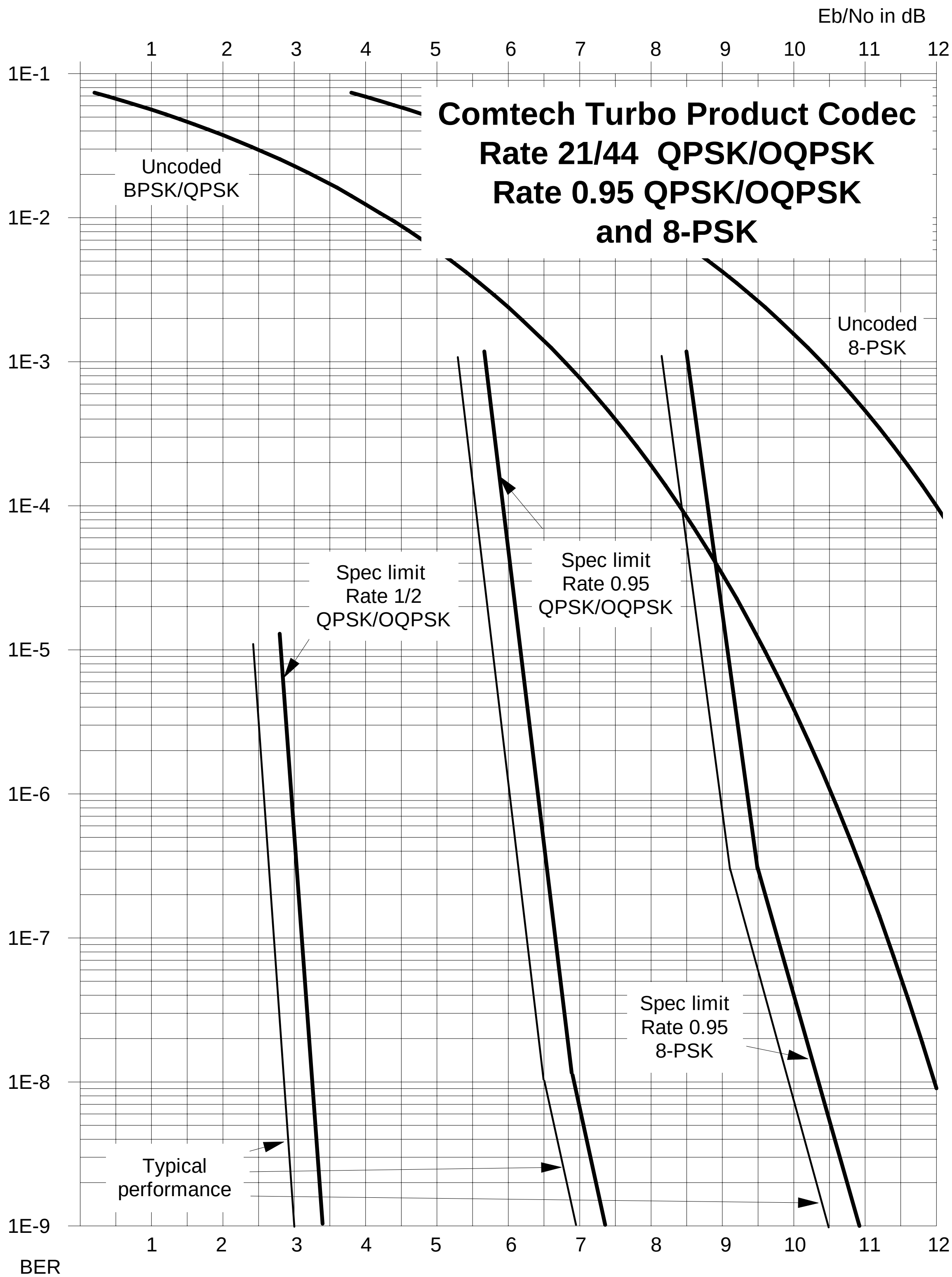


**Figure 7-6. Comtech EF Data Turbo Product Codec
Rate 21/44 QPSK, Rate 0.95 QPSK and Rate 0.95 8-PSK**

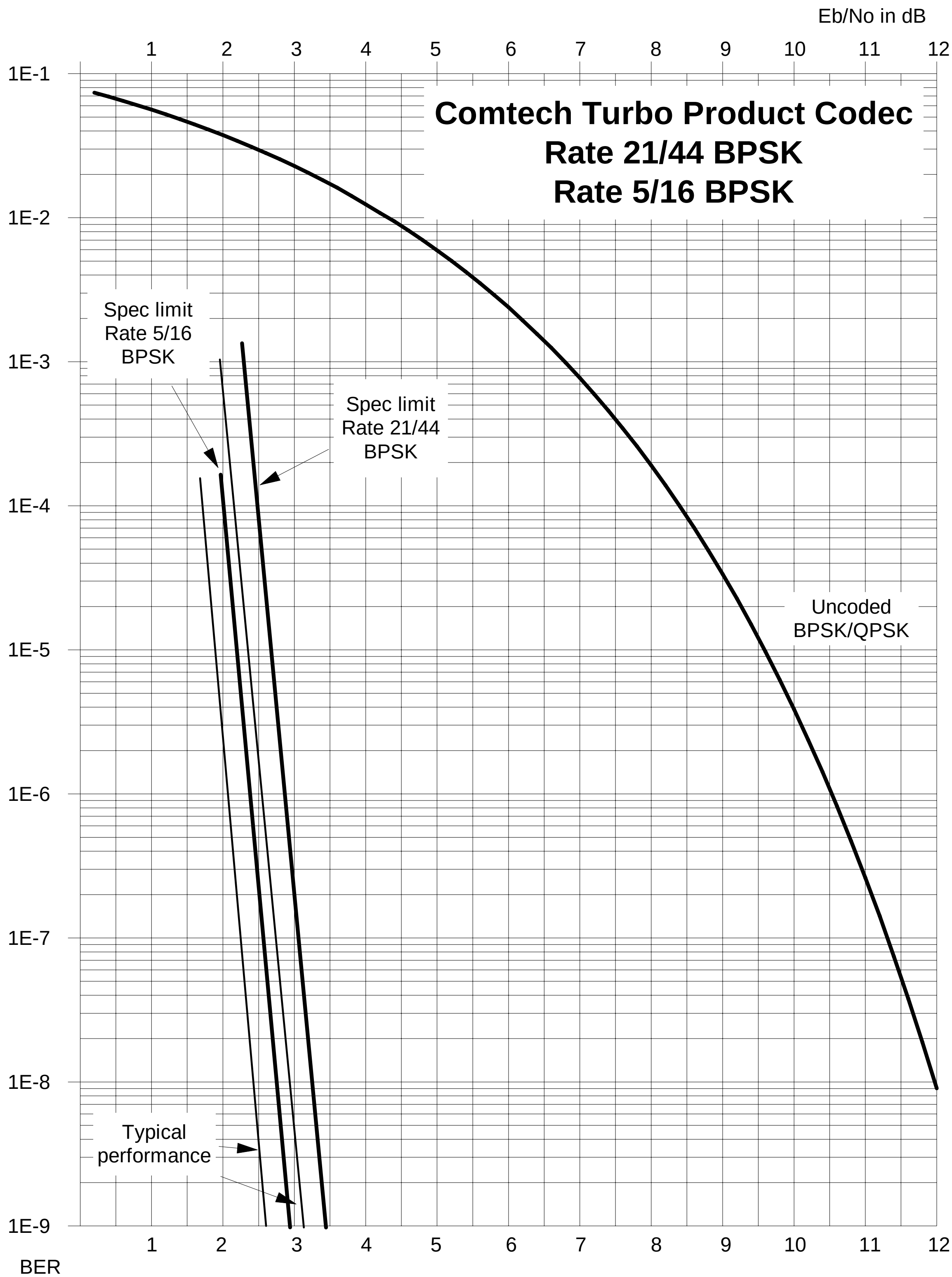


Figure 7-7. Rate 21/44 BPSK and Rate 5/16 BPSK Turbo

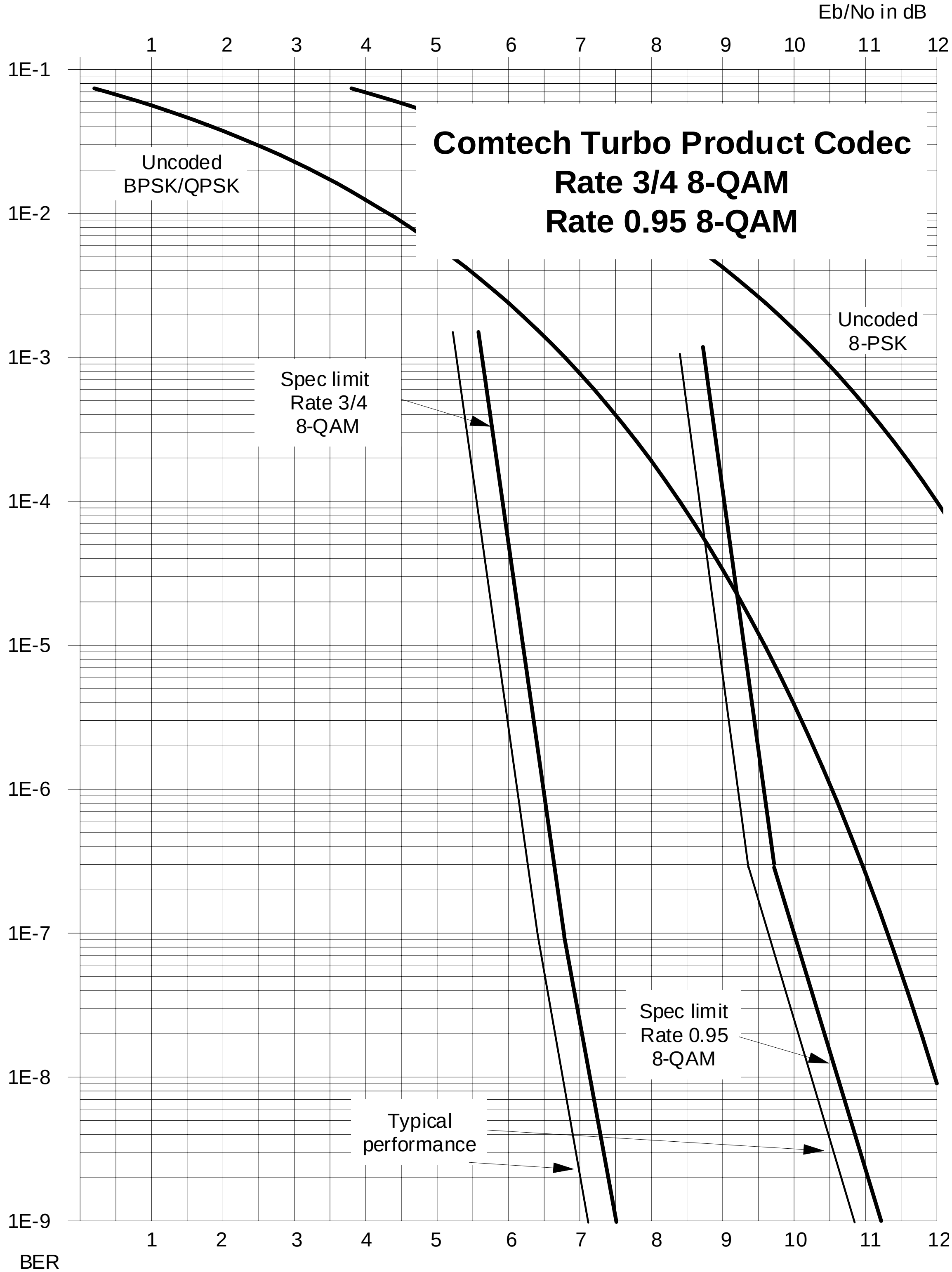


Figure 7-8. Rate 3/4 and Rate 0.95 8-QAM Turbo

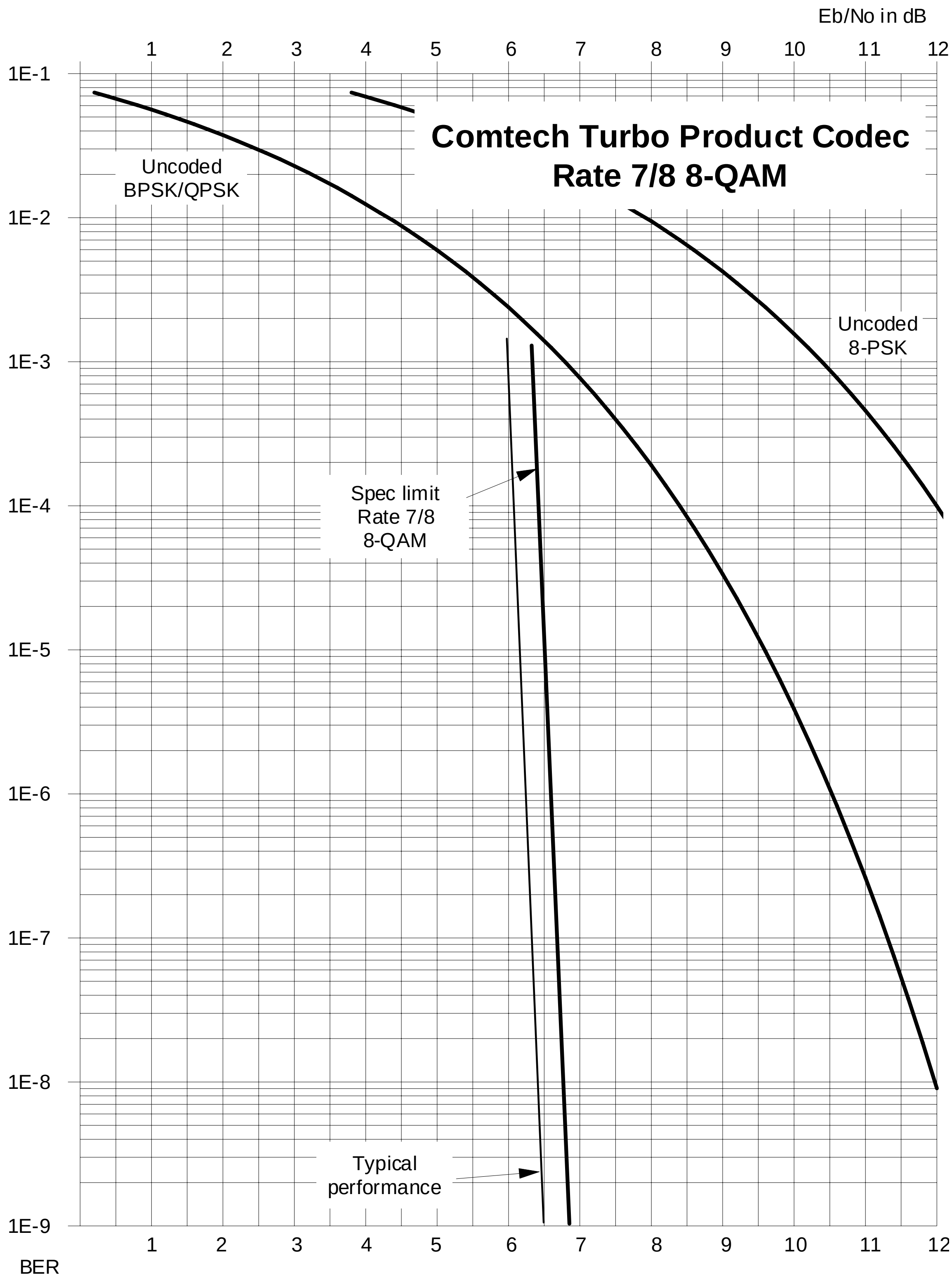


Figure 7-9. Rate 7/8 8-QAM Turbo

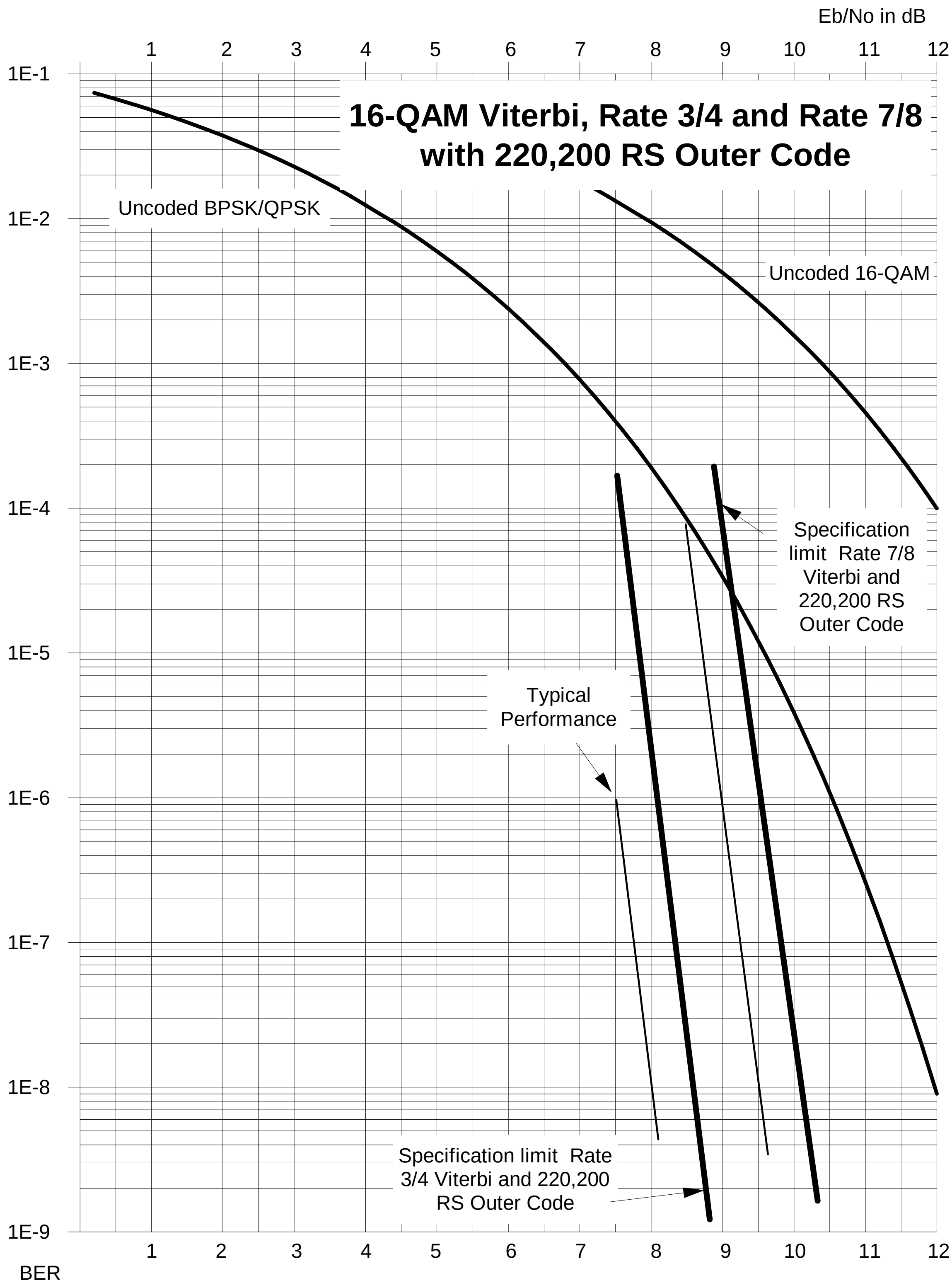


Figure 7-10. 16-QAM Viterbi, Rate 3/4 and Rate 7/8 with 220,200 RS Outer Code

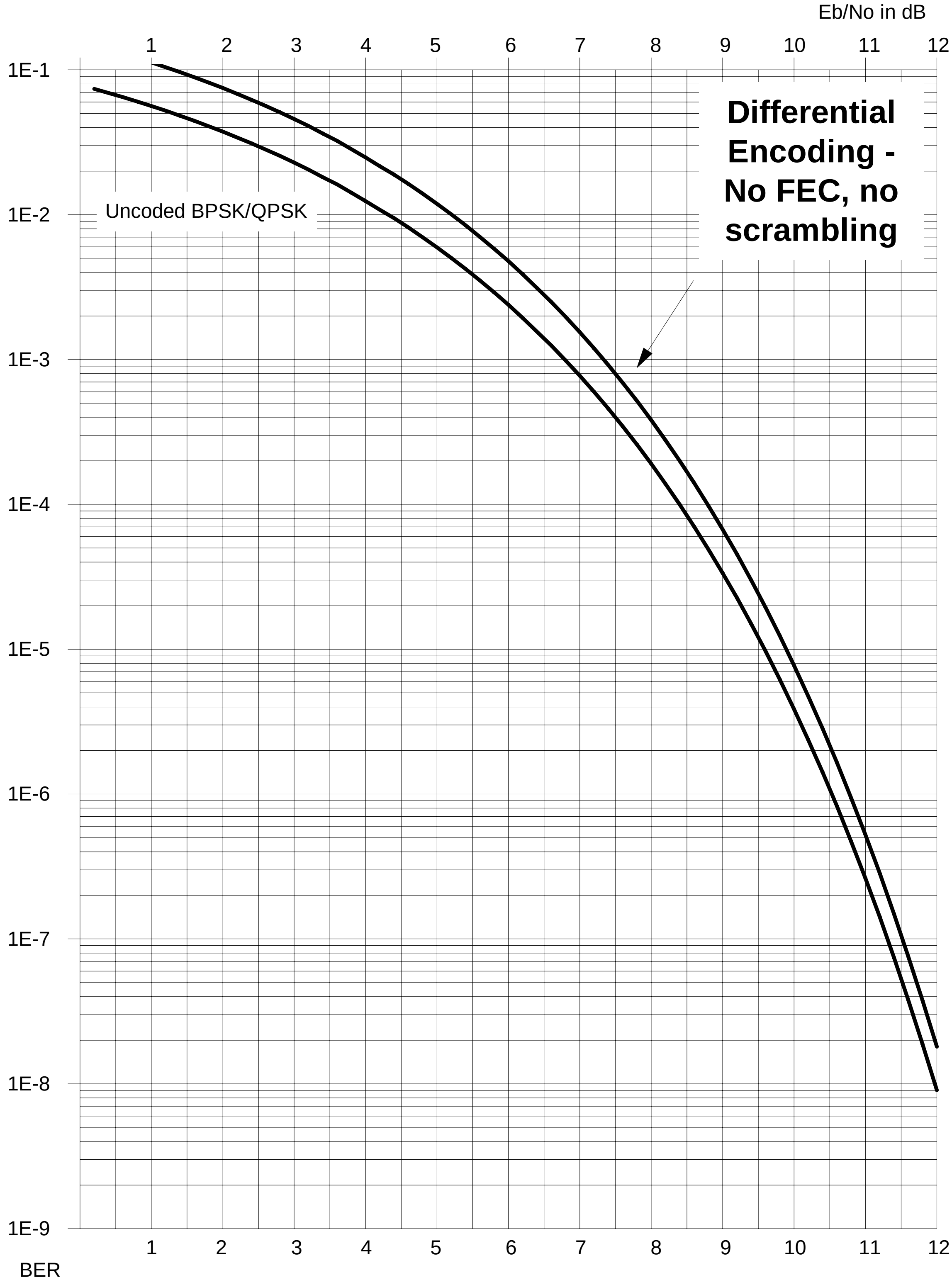


Figure 7-11. Differential Encoding - No FEC, no scrambling

Chapter 8. OFFSET QPSK OPERATION

Offset QPSK modulation is a variation of normal QPSK, which is offered in the CDM-570/570L. Normal, bandlimited, QPSK produces an RF signal envelope that necessarily goes through a point of zero amplitude when the modulator transitions through non-adjacent phase states. This is not considered to be a problem in most communication systems, as long as the entire signal processing chain is linear.

However, when bandlimited QPSK is passed through a non-linearity (for instance, a saturated power amplifier), there is a tendency for the carefully-filtered spectrum to degrade. This phenomenon is termed ‘spectral re-growth’, and at the extreme (hard limiting) the original, unfiltered sin(x)/x spectrum would result. In most systems, this would cause an unacceptable level of interference to adjacent carriers, and would cause degradation of the BER performance of the corresponding demodulator.

To overcome the problem of the envelope collapsing to a point of zero amplitude, Offset QPSK places a delay between I and Q channels of exactly 1/2 symbol. Now the modulator cannot transition through zero when faced with non-adjacent phase states. The result is that there is far less variation in the envelope of the signal, and non-linearities do not cause the same level of degradation.

The demodulator must re-align the I and Q symbol streams before the process of carrier recovery can take place. For various reasons this makes the process of acquisition more difficult, and acquisition times may be longer, especially at low data rates.

Notes:

Chapter 9. CLOCKING MODES

When dealing with satellite modems, the subject of clocking can be a complex issue. This section describes the various clocking options that are available with the CDM-570L. There are two fundamentally different interfaces provided by the modem plus the optional IP Module Ethernet interface:

- Synchronous clock and data interfaces (EIA-422, V.35, etc.) that permit great flexibility concerning the source and direction of clocks. These are complex.

- G.703 interfaces combine clock and data into a single signal (and are referred to as *self-clocking*). In their basic form these are less flexible and easier to understand.

- For the optional IP Module Ethernet interface, clocking is internally controlled and clock selection is not available.

9.1 Transmit Clocking

There are four transmit clocking modes in the CDM-570L. EIA-422/449 signal mnemonics will be used for illustration, but the description applies equally to V.35, and synchronous EIA-232.

9.1.1 Internal Clock

In this mode, the modem, assumed always to be the DCE, supplies the clock to the DTE. (The EIA-422/449 name for this signal is Send Timing, or ST.) The DTE then clocks from this source, and gives the modem transmit data (Send Data, or SD), synchronous with this clock. It is optional whether the DTE also returns the clock (Terminal Timing, or TT). The modem can accept it if it is present, but uses ST if it is not. At rates above 2 Mbps, Comtech EF Data highly recommends that the user returns TT to ensure the correct clock/data relationship.

G.703: The internal clock mode does not apply; the clock is always recovered from the incoming signal, and the modem locks its modulator clocks to this.

9.1.2 Tx Terrestrial

In this mode, the modem expects to see the DTE provide the clock, so that it can phase-lock its internal circuits. In this case, the modem does not provide any signal on ST, but instead requires a clock signal on Terminal Timing (TT), synchronous with the data. If no clock is present, an alarm will be generated and the modem will substitute its internal clock.

G.703: This is the ‘natural’ clock mode.

9.1.3 Rx Loop-Timed, Rx=Tx

In certain circumstances, a terminal at the distant-end of a satellite link may be required to provide a clock to the DTE equipment which is locked to the receive satellite signal. This is similar to Internal Clock mode, in that the modem will source Send Timing (ST) to the DTE, but now the timing is derived from the demodulator. The DTE then clocks from this source, and gives the modem transmit data (Send Data, or SD), synchronous with this clock. It is optional whether the DTE also returns the clock (Terminal Timing, or TT); the modem can accept it, if it is present, but uses ST if it is not. If the demodulator loses lock, the modem’s internal clock will be substituted, so an accurate and stable clock is present on ST, rather than a clock that may jitter and wander in a random fashion.

G.703: Does not apply.

9.1.4 Rx Loop-Timed, Rx<>Tx (Asymmetric Loop Timing)

The CDM-570L incorporates circuitry which permits loop timing when the Tx and Rx data rates are not the same. In this case the clock frequency appearing at ST will be whatever the TX data rate is programmed to, but phase-locked to the demodulator’s receive symbol clock. In all other respects the operation is the same as for ‘standard’ loop timing.

G.703: Does not apply.

9.2 Receive Clocking

There are three receive clocking modes in the CDM-570L, plus an additional setting used for Drop and Insert only – see later section.

9.2.1 Buffer Disabled (Rx Satellite)

When the buffer is disabled, the receive clock (Receive Timing, or RT) is derived directly from the demodulator, and hence will be subject to plesiochronous and Doppler offsets. In certain instances, this may be acceptable. There is still a minimum buffer in use to de-jitter the effects of removing overhead framing.

G.703: Applicable.

9.2.2 Buffer Enabled, Tx=Rx

In this instance, it is required that the buffer be enabled, so that the clock and data appearing on Receive Timing and Receive Data (RT and RD respectively) are synchronous with the transmit clock. This is a relatively simple case, as the output clock for the buffer is derived directly from either ST, TT or the external source.

G.703: Applicable.

9.2.3 Buffer Enabled, Rx<>Tx

This is an uncommon case, where the receive data rate does not equal the transmit clock. The modem will generate a phase-locked buffer output clock which uses the selected reference, regardless of its frequency in relation to the receive data rate.

G.703: Applicable.

9.3 X.21 Notes

For X.21 operation, use the RS-422 pins, but ignore Receive Clock if the Modem is DTE, and ignore Transmit clocks if the Modem is DCE.

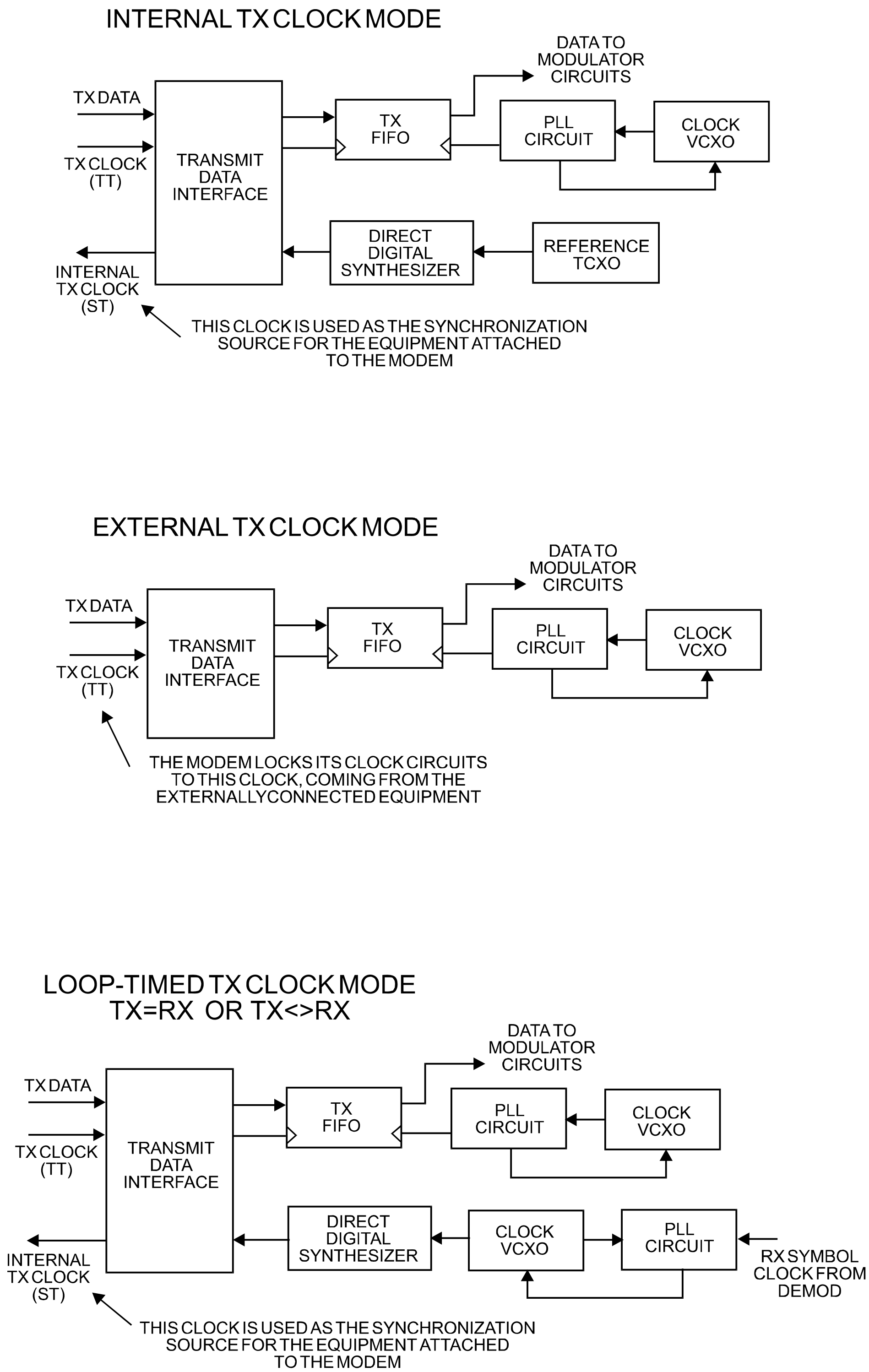


Figure 9-1. Tx Clock Modes

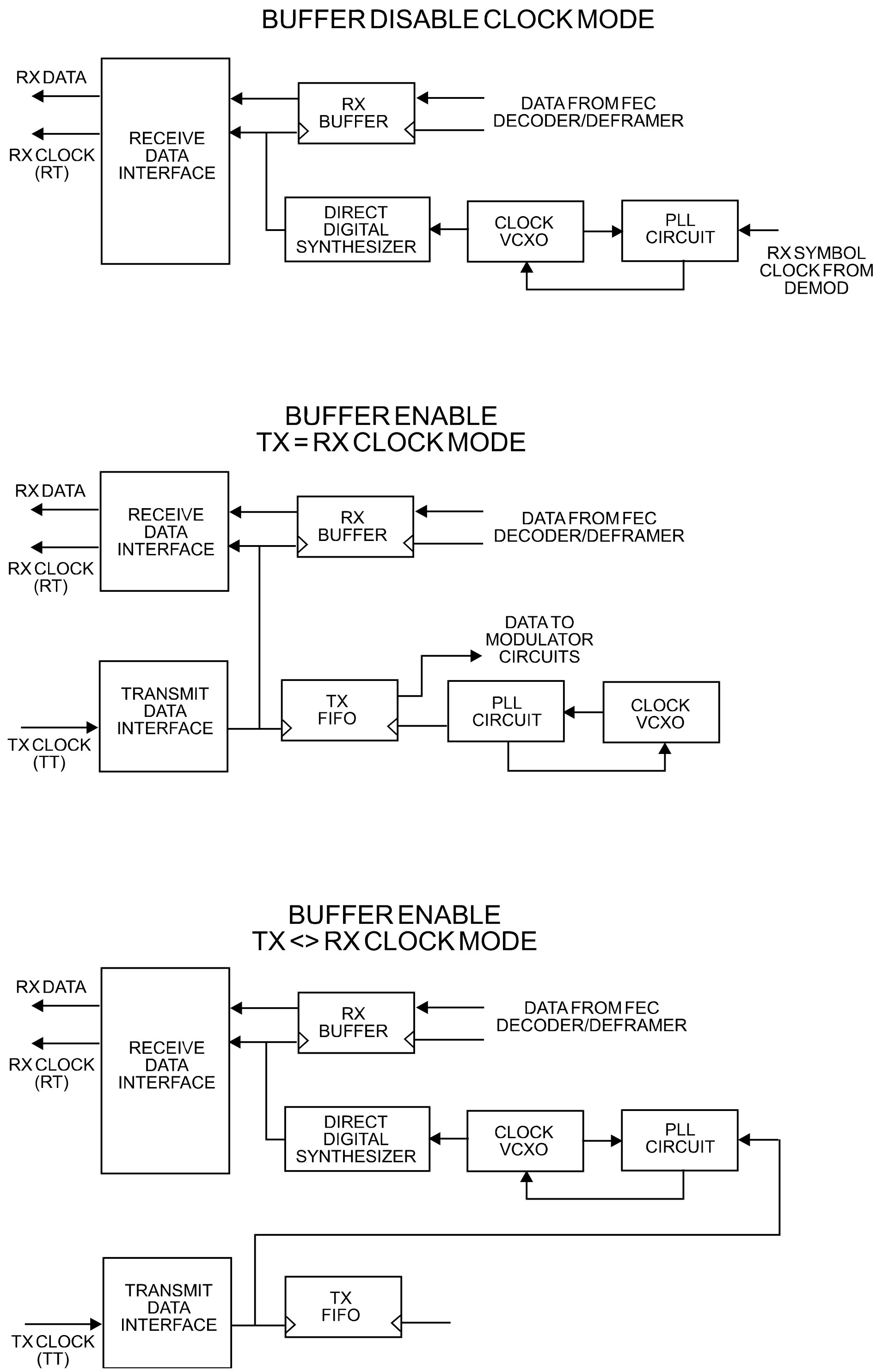


Figure 9-2. Rx Clock Modes

Notes:

Chapter 10. EDMAC CHANNEL

10.1 Theory Of Operation

As explained earlier, EDMAC is an acronym for **E**mbedded **D**istant-end **M**onitor **A**nd **C**ontrol. This is a feature which permits the user to access the M&C features of modems which are at the distant-end of a satellite link.

This is accomplished by adding extra information to the user's data, but in a manner which is completely transparent to the user.

On the transmit side:

The data is split into frames - each frame containing 1008 bits (except Rate 21/44 BPSK Turbo, or when the data rates exceed 2048 kbps, where the frame length is 2928 bits, and Rate 5/16 BPSK Turbo where the frame length is 3072 bits). 48 bits in each frame are overhead, and the rest of these bits are the user's data. This increases the rate of transmission by 5% (approximately 1.6% for the Turbo BPSK cases, and for all data rates greater than 2.048 Mbps). For example, if the user's data rate is 64 kbps, the actual transmission rate will now be at 67.2 kbps. Note that the user may also select EDMAC-2 framing, which uses a 2928 bit frame, and yields a 1.6% overhead for all modulation types and data rates.

At the start of each frame a 12 bit synchronization word is added. This allows the demodulator to find and lock to the start of frame. At regular intervals throughout the frame, additional data bytes and flag bits are added (a further 36 bits in total). It is these additional bytes which convey the M&C data.

When framing is used, the normal V.35 scrambler is no longer used. This V.35 approach is called 'self synchronizing', because in the receiver, no external information is required in order for the de-scrambling process to recover the original data. The disadvantage of this method is that it multiplies errors. On average, if one bit error is present at the input of the descrambler, 3 output errors are generated. However, there is an alternative when the data is in a framed format. In this case, a different class of scrambler may be used - one which uses the start of frame information to start the scrambling process at an exact known state. In the receiver, having synchronized to the frame, the de-scrambler can begin its processing at exactly the right time. This method does not multiply errors, and therefore has a clear advantage over V.35 scrambling. This is fortunate, as there is a penalty to be paid for adding the framing. By adding the extra 5% to the transmitted data rate, the effective Eb/No seen by the user will degrade by a factor of 10log(1.05), or 0.21 dB (0.07 dB in the case of the two BPSK Turbo rates). The use of an externally synchronized scrambler and descrambler almost exactly compensates for this degradation. The net effect is that the user will see effectively identical BER performance whether framing is used or not.

On the receive side:

When the demodulator locks to the incoming carrier, it must go through the additional step of searching for, and locking to, the synchronization word. This uniquely identifies the start of frame, and permits the extraction of the overhead bytes and flag bits at the correct position within the frame. In addition, the start of frame permits the de-scrambler to correctly recover the data. The user's data is extracted, and sent through additional processing, in the normal manner. The extracted overhead bytes are examined to determine if they contain valid M&C bytes.

10.2 M&C Connection

Data to be transmitted to the distant-end is sent to a local unit via the remote control port. A message for the distant-end is indistinguishable from a 'local' message - it has the same structure and content, only the address will identify it as being for a distant-end unit.

Before the M&C data can be successfully transmitted and received, pairs of units must be split into EDMAC Masters and EDMAC Slaves. Masters are local to the M&C Computer, and Slaves are distant-end.

Now, a unit which has been designated an EDMAC master not only responds to its own unique bus address, but it will also be configured to listen for the address which corresponds to its EDMAC Slave. When a complete message packet has been received by the EDMAC Master, it will begin to transmit this packet over the satellite channel, using the overhead bytes which become available.

Note: The 'normal' protocol for the message packet is not used over the satellite path, as it is subject to errors. For this reason, a much more robust protocol is used which incorporates extensive error checking.

At the distant-end, the EDMAC slave, configured for the correct address, receives these bytes, and when a complete packet has been received, it will take the action requested, and then send the appropriate response to the EDMAC Master, using the return overhead path on the satellite link. The EDMAC Master assembles the complete packet, and transmits the response back to the M&C Computer.

Apart from the round-trip satellite delay, the M&C Computer does not see any difference between local and distant-end units - it sends out a packet, addressed to a particular unit, and gets back a response. It can be seen that the EDMAC Master simply acts as forwarding service, in a manner which is completely transparent.

This approach does not require any additional cabling - connection is made using the normal M&C remote port. Furthermore, the user does not have to worry about configuring the baud rate of the M&C connection to match the lowest data rate modem in the system. The M&C system can have mixed data-rate modems, from 2.4 kbps to 2048 kbps, and still run at speeds in excess of 19,200 baud. It should be pointed out that at 2.4 kbps, the effective throughput of the overhead channel is only 11 async characters/second. For a message of 24 bytes, the time between sending a poll request and receiving a response will be around 5 seconds. (Note that when either of the BPSK Turbo rates are in use, the overhead rate is reduced by a factor of three, and therefore the response time will be around 15 seconds.)

10.3 Setup Summary

To access a distant-end unit:

- Designate a Master/Slave pair - Master at the local-end, Slave at the distant-end.
- On the local-end unit, enable framing, and EDMAC, define the unit as MASTER, then enter the bus address. This is constrained to be ‘base 10' meaning that only addresses such as 10, 20, 30, 40, etc, are allowed.
- Choose a unique bus address for the distant-end. This should normally be set to the ‘base 10' address + 1. For example, if the MASTER unit is set to 30, choose 31 for the distant-end unit.
- On the distant-end unit, enable framing, and EDMAC, define the unit as SLAVE, then enter the bus address. The orange EDMAC Mode LED should be illuminated.
- Set the local-end unit to RS485 remote control, and set the bus address of this local unit. The orange Remote Mode LED should be illuminated.
- Once the satellite link has been established, connect the M&C Computer, and begin communications, with both the local and distant end units.

Note: EDMAC modes are fully compatible with AUPC modes.

Notes:

Chapter 11. AUTOMATIC UPLINK POWER CONTROL

11.1 Introduction

Automatic Uplink Power Control (AUPC) is a feature whereby a local modem is permitted to adjust its own output power level in order to attempt to maintain the Eb/No at the remote modem.

WARNING

The user MUST obtain permission from the Satellite Operator to use this feature.

Improper use of this feature could result in a transmitting terminal seriously exceeding its allocated flux density on the Operator's satellite. This could produce interference to other carriers, and could cause transponder saturation problems.

To accomplish this, the framed (EDMAC, or EDMAC-2) mode of operation must be used. The remote modem constantly sends back information about the demodulator Eb/No using reserved bytes in the overhead structure. The local modem then compares this value of Eb/No with a pre-defined target value. If the Remote Eb/No is below the target, the local modem will increase its output power, and hence, a closed-loop feedback system is created over the satellite link. A particularly attractive benefit of this feature is that whenever framed operation is selected, the remote demodulator's Eb/No can be viewed from the front panel display of the local modem. Note also that AUPC can be used simultaneously with EDMAC.

There are several important parameters associated with this mode of operation, and the user needs to understand how the AUPC feature works, and the implications of setting these parameters.

11.2 Setting AUPC Parameters

1) The user, under the menu (**CONFIG, Frame)** first ensures that Framing is selected. **EDMAC** or **EDMAC-2** may be selected, then the Framing mix – either **AUPC-Only** or **AUPC +EDMAC**. The important consideration is that EDMAC framing should be enabled.

2) The user should verify that the remote modem also has EDMAC framing enabled.

3) The user, under the menu (**CONFIG, Tx, Power**) sets the nominal output power of the modem. This is done by selecting the **Manual** mode, then editing the Tx output power level displayed.

4) The user will then select **AUPC** as the operating mode. At this point the user will be prompted to define four key parameters:

11.2.1 Target Eb/No

Target Eb/No is value of Eb/No that the user desires to keep constant at the remote modem.

If the Eb/No exceeds this value, the AUPC control will reduce the Tx output power, but will never drop below the nominal value set.

If the Eb/No falls below this value, the AUPC control will increase the Tx output power, but will never exceed the value determined by the parameter **Max-Range**.

- The minimum value the user can enter is 0.0 dB
- The maximum value the user can enter is 9.9 dB
- The default value is 3.0 dB
- The resolution is 0.1 dB

11.2.2 Max Range

Max-Range defines how much the modem is permitted to increase the output level, under AUPC control.

- The minimum value the user can enter is 0 dB
- The maximum value the user can enter is 9 dB
- The default value is 1 dB
- The resolution is 1 dB

11.2.3 Alarm

The **Alarm** parameter defines how the user wants the modem to act if, under AUPC control, the maximum power limit is reached.

The two choices are:

- **None** (no action)
- **Tx-Alarm** (generate a TX alarm)

The default setting is **None**.

11.2.4 Demod Unlock

This defines the action the modem will take if the remote demodulator loses lock.

The two choices are:

- **Nom-Pwr** (reduce the Tx Output Power to the nominal value)
- **Max-Pwr** (increase the Tx Output Power to the maximum value permitted by the parameter **Max-Range**)

The default setting is **Nom-Pwr**.

(**Note**: If the local demod loses lock, the modem will automatically move its output power to the nominal value.)

11.3 Compensation Rate

As with any closed-loop control system, the loop parameters must be chosen to ensure stability at all times. Several features have been incorporated to ensure that the AUPC system does overshoot, or oscillate.

- First, the rate at which corrections to the output power can be made is fixed at once every 4 seconds. This takes into account the round trip delay over the satellite link, the time taken for a power change to be reflected in the remote demodulator’s value of Eb/No, and other processing delays in the modems.

- Second, if the comparison of actual and target Eb/No yields a result that requires a change in output power, the first correction made will be 80% of the calculated step. This avoids the possibility of overshoot. Subsequent corrections are made until the difference is less than 0.5 dB. At this point, the output power is only changed in increments of 0.1 dB, to avoid ‘hunting’ around the correct set point.

11.4 Monitoring

The remote demodulator's value of Eb/No can be monitored at all times, either from the front panel (**Monitor, AUPC**) or via the remote control interface. The resolution of the reading is 0.2 dB. For all values greater than or equal to 16 dB, the value 16.0 dB will be displayed. As long as framing is enabled, the value will still be available, regardless of the AUPC mode, or framing mix.

Also displayed is the current value of Tx power increase. If EDMAC framing is enabled, but AUPC is disabled, this will indicate 0.0 dB. This value is also available via the remote control interface.

CAUTION

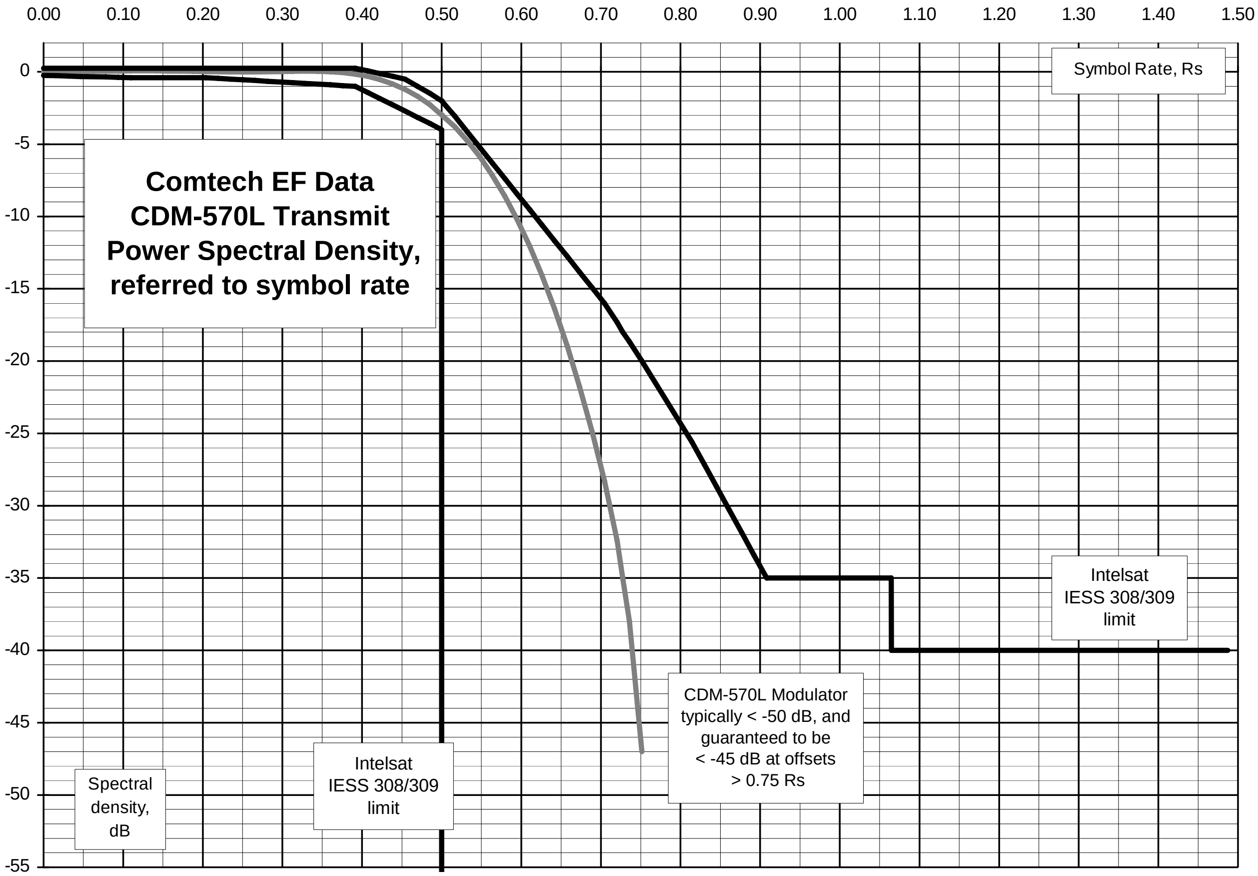
Comtech EF Data strongly cautions against the use of large values of permitted power level increase under AUPC control. Users should consider using the absolute minimum range necessary to improve rain-fade margin.

Chapter 12. SUMMARY OF SPECIFICATIONS

12.1 Modulator

Modulation	BPSK, QPSK, OQPSK, 8-PSK, 8-QAM and 16-QAM
Symbol rate range	4.8 ksps to 3.0 Msps
Data rate range	See Section 13.5
Operating modes	Transparent, Closed Network, IESS-315 (VSAT Turbo) Proprietary EDMAC framed mode: * 5% overhead - EDMAC (all modes except BPSK Turbo, Rate 21/44 OQPSK Turbo, and data rates < 2.048 Mbps) * 1.6% overhead - EDMAC-2 (Rate 21/44, 5/16 Turbo, Rate 1/2 OQPSK Turbo, and all other rates >2.048 Mbps) R-S Outer Codec (optional) * 220,200 outer code (transparent mode) * 200,180 outer code (EDMAC modes) Turbo Product Codec (optional): * Rate 21/44 BPSK * Rate 5/16 BPSK * Rate 21/44 QPSK/OQPSK * Rate 3/4 QPSK/OQPSK/8-PSK/8-QAM/16-QAM * Rate 7/8 QPSK/OQPSK/8-PSK/8-QAM/16-QAM * Rate 0.95 QPSK/OQPSK/8-PSK/8-QAM (exact Code Rate is actually 0.944) LDPC (planned future upgrade – consult Factory for latest information) Automatic Uplink Power Control (AUPC) mode
Transmit filtering	Per INTELSAT IESS-308 (FIR digital filter implementation)
Scrambling	Transparent Closed Network mode, no R-S or Turbo coding - per ITU V.35 (Intelsat variant) EDMAC mode, no R-S coding - externally frame synchronized - proprietary Turbo Product Code mode - externally frame synchronized - proprietary All R-S modes - externally frame synchronized per IESS-308/309/310
FEC	**None**: Uncoded BPSK/QPSK/OQPSK **Viterbi:** k=7, per IESS-308/309 BPSK: Rate 1/2 QPSK/OQPSK: Rate 1/2, Rate 3/4 and Rate 7/8 16-QAM: Rate 3/4 and Rate 7/8 (requires Reed-Solomon)

	Reed-Solomon (Closed Network): 220,200 outer code (transparent mode) 200,180 outer code (EDMAC modes) Interleaver depth = 4 **8-PSK/TCM Rate 2/3 (Trellis) with concatenated Reed-Solomon** CLOSED NETWORK - NOT IESS-310 COMPATIBLE **Turbo Product Codec** (optional plug-in card): Rate 5/16 BPSK - 2 dimensional Rate 21/44 BPSK - 3 dimensional Rate 21/44 QPSK/OQPSK - 3 dimensional Rate 3/4 QPSK/OQPSK/8-PSK/8-QAM/16-QAM - 2 dimensional Rate 7/8 QPSK/OQPSK/8-PSK/8-QAM/16-QAM - 2 dimensional Rate 0.95 QPSK/OQPSK/8-QAM/8-PSK - 2 dimensional eTPC (exact Code Rate is actually 17/18, or 0.944)
Output frequency	**CDM-570L**: 950 - 1950 MHz, 100 Hz resolution Stability ±0.06 ppm (±6 x 10^{-8}) 0 to 50^{o}C (32 to 122 ^{o}F), when using internal reference **CDM-570**: 50 - 90 MHz, and 100 – 180 MHz, 100 Hz resolution Stability ±1.0 ppm (±1 x 10^{-6}) 0 to 50^{o}C (32 to 122 ^{o}F), when using internal reference
Harmonics and spurious	Better than -55 dBC/4 kHz (typically <-60 dBC/4 kHz) – measured from 25 MHz to 2 GHz
Transmit on/off ratio	55 dB minimum
Output phase noise	< 0.67^{0}rms double sided, 100 Hz to 1 MHz (minimum of 10 dB better overall than the INTELSAT IESS-308/309 requirement)
Output power	**CDM-570L**: 0 to -40 dBm, 0.1 dB steps - manual mode. See Automatic Uplink Power Control section **CDM-570**: 0 to -25 dBm, 0.1 dB steps - manual mode. See Automatic Uplink Power Control section also.
Power accuracy	**CDM-570L**: ±1.0 dB over frequency, data rate, modulation type and temperature **CDM-570:** ±0.5 dB over frequency, data rate, modulation type and temperature
Output impedance	**CDM-570L**: 50Ω, 19 dB minimum return loss **CDM-570**: 50Ω, or 75Ω 17 dB minimum return loss
Output connector	**CDM-570L**: Type N female **CDM-570**: BNC female
Clocking options	**CDM-570L:** Internal, ±0.06 ppm (SCT) **CDM-570:** Internal, ±1.0 ppm (SCT) External, locking over a ±100 ppm range (TT) Loop timing (Rx satellite clock) - supports asymmetric operation - Rx and Tx data rates do not need to be identical
External TX Carrier Off	By TTL 'low' signal or external contact closure - hardware function automatically over-rides processor, or by RTS signal on main data interface
BUC Reference (10 MHz)	On center conductor of L-band output connector; 10.0 MHz ± 0.02 ppm (Optional 1 ppm) 0.0 dBm, ± 3 dBm; programmable ON/OFF Source: 1. Internal Modem Reference 2. External Reference (10 MHz)
Phase Noise	<u>dB/Hz</u> — <u>Frequency Offset</u> -80 — 1 Hz -110 — 10 Hz -135 — 100 Hz -140 — 1 kHz



12.2 Demodulator

Data rate range, operating modes, de-scrambling, input impedance/return loss etc., as per Modulator

Input power range	**Desired Carrier, CDM-570L:** -130 + 10 log(Symbol Rate) to -90 + 10 log(Symbol Rate) **Desired Carrier, CDM-570:** -30 to -60 dBm +35 dBc maximum composite, up to -5 dBm, absolute max.
FEC	**Viterbi:** 3 bit soft decision **Trellis:** Pragmatic TCM/8-PSK with closed network concatenated Reed-Solomon **Reed-Solomon (Closed Network):** Proprietary **Turbo Product Codec:** 4 bit soft decision, proprietary
Acquisition range	±1 to ±32 kHz, programmable in 1 kHz increments, for symbol rates below 625 ksymbols/sec ±1 to ±200 kHz, 1 kHz increments, for symbol rates above 625 ksymbols/sec, **CDM-570L only**
Acquisition time	Highly dependent on data rate, FEC rate, and demodulator acquisition range. **Examples:** 120 ms average at 64 kbps, R1/2 QPSK, ±10 kHz acquisition sweep range, 6dB Eb/No 3.5 s average at 9.6 kbps, R1/2 QPSK, ±10 kHz, 6dB Eb/No **Note:** Reed-Solomon and TPC increases acquisition time, due to the additional time taken for the RS/TPC decoder to declare synchronization.
Clock tracking range	± 100 ppm min

IMPORTANT NOTE: Starting with Release 1.4.1 of the CDM-570/570L firmware, the maximum symbol rate has been increased from 2.5 to 3.0 Msymbols/sec. This has been done without modification to the hardware, and as a consequence, there may be a small degradation in BER versus Eb/No performance for rates above 2.5 Msymbols/sec. The degradation is as follows:

Rates from 2.5 to 2.65 Msps: degradation < 0.1 dB

Rates from 2.65 to 2.80 Msps: degradation < 0.2 dB

Rates from 2.80 to 3.00 Msps: degradation < 0.3 dB

VITERBI BER performance (met in the presence of two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 1/2 (B, Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 3/4 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 7/8 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-5}	5.4 dB (4.9 dB)	6.8 dB (6.3 dB)	7.7 dB (7.2 dB)
	BER=10^{-6}	6.0 dB (5.5 dB)	7.4 dB (6.9 dB)	8.4 dB (7.9 dB)
	BER=10^{-7}	6.7 dB (6.2 dB)	8.2 dB (7.7 dB)	9.0 dB (8.6 dB)
VITERBI and RS 220,200 or 200,180 Outer Code BER (with two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 1/2 (B, Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 3/4 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 7/8 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-5}	4.3 dB (4.0 dB)	5.6 dB (4.7 dB)	6.5 dB (6.0 dB)
	BER=10^{-6}	4.4 dB (4.1 dB)	5.8 dB (4.8 dB)	6.7 dB (6.2 dB)
	BER=10^{-7}	4.5 dB (4.2 dB)	6.0 dB (5.2 dB)	6.9 dB (6.5 dB)
8-PSK/TCM/RS CODEC BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**R 2/3 8-PSK/TCM/RS** Guaranteed Eb/No: (typical value in parentheses)		
	BER=10^{-5}	6.3 dB (5.4 dB)		
	BER=10^{-7}	6.7 dB (5.8 dB)		
	BER=10^{-8}	6.9 dB (6.0 dB)		
TURBO PRODUCT CODEC Rate 21/44 QPSK Rate 21/44 BPSK Rate 5/16 BPSK BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 21/44 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 21/44 (B)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 5/16 (B)** Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-6}	2.9 dB (2.6 dB)	2.8 dB (2.5dB)	2.4 dB (2.1dB)
	BER=10^{-7}	3.1 dB (2.7 dB)	3.1 dB (2.8 dB)	2.6 dB (2.3dB)
	BER=10^{-8}	3.3 dB (2.8 dB)	3.3 dB (2.90dB)	2.7 dB (2.4dB)
TURBO PRODUCT CODEC Rate 3/4 QPSK Rate 3/4 8-PSK Rate 3/4 16-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 3/4 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 3/4 (8-PSK)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 3/4 (16-QAM)** Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-6}	3.8dB (3.4dB)	6.2 dB (5.8 dB)	7.4dB (7.0 dB)
	BER=10^{-7}	4.1dB (3.7dB)	6.4 dB (6.0 dB)	7.8 dB (7.3 dB)
	BER=10^{-8}	4.4dB (4.0dB)	6.8 dB (6.3 dB)	8.2 dB (7.7 dB)

TURBO PRODUCT CODEC Rate 7/8 QPSK Rate 7/8 8-PSK Rate 7/8 16-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 7/8 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 7/8 (8-PSK)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 7/8 (16-QAM)** Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-6}	4.3 dB (4.0 dB)	7.0 dB (6.6 dB)	8.1 dB (7.7 dB)
	BER=10^{-7}	4.4 dB (4.1 dB)	7.1 dB (6.7 dB)	8.2 dB (7.8 dB)
	BER=10^{-8}	4.5 dB (4.2 dB)	7.2 dB (6.8 dB)	8.3 dB (7.9 dB)
TURBO PRODUCT CODEC Rate 0.95 QPSK Rate 0.95 8-PSK BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 0.95 (Q, OQ)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 0.95 (8-PSK)** Guaranteed Eb/No: (typical value in parentheses)	
	BER=10^{-6}	6.4 dB (6.0 dB)	9.3 dB (8.9 dB)	
	BER=10^{-7}	6.7 dB (6.3 dB)	9.8 dB (9.4 dB)	
	BER=10^{-8}	6.9 dB (6.5 dB)	10.3 dB (9.9 dB)	
TURBO PRODUCT CODEC Rate 3/4 8-QAM Rate 7/8 8-QAM Rate 0.95 8-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**Rate 3/4 (8-QAM)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 7/8 (8-QAM)** Guaranteed Eb/No: (typical value in parentheses)	**Rate 0.95 (8-QAM)** Guaranteed Eb/No: (typical value in parentheses)
	BER=10^{-6}	6.5 dB (6.1 dB)	6.6 dB (6.2 dB)	9.6 dB (9.2 dB)
	BER=10^{-7}	6.8 dB (6.4 dB)	6.7 dB (6.3 dB)	10.1 dB (9.7 dB)
	BER=10^{-8}	7.2 dB (6.8 dB)	6.8 dB (6.4 dB)	10.6 dB (10.2 dB)
16-QAM VITERBI/RS (With two adjacent carriers, each 7 dB higher than the desired carrier)	For:	**16-QAM Rate 3/4 Viterbi/RS** Guaranteed Eb/No: (typical value in parentheses)	**16-QAM Rate 7/8 Viterbi/RS** Guaranteed Eb/No: (typical value in parentheses)	
	BER=10^{-6}	8.1 dB (7.5 dB)	9.5 dB (9.0 dB)	
	BER=10^{-8}	8.6 dB (8.0 dB)	10.1 dB (9.5 dB)	
Plesiochronous/ Doppler Buffer	Selectable size of ± 128, 256, 512, 1024, 2048, 4096, 8192, 16384 and 32768 bits Size selection is displayed in bits and milliseconds. Supports asymmetric operation - when buffer is clocked from Tx clock, Rx and Tx rates do not need to be identical.			
Monitor Functions	Eb/No estimate, 2 to 16 dB (± 0.25 dB accuracy) Corrected Bit Error Rate, 1E-3 to 1E-9 Frequency offset, ± 200 kHz range, 100 Hz resolution Buffer fill state, in percent Receive signal level (-20 to –90 dBm, accuracy is ± 2.5 dB)			

12.3 Automatic Uplink Power Control

Operating Mode	Requires Closed Network Framed mode for transport of Eb/No information from remote modem (EDMAC can be enabled or disabled)
Target Eb/No range	0 to 9.9 dB at remote demod (default is 4.0 dB)
Max AUPC range	0 to 9 dB (default is 3 dB)
Monitor functions	Remote demod Eb/No and Tx power level increase (front panel or via remote control interface)

12.4 Data and Miscellaneous Interfaces

Primary Data (3 selectable modes)	RS-422/EIA-530 DCE (Rates up to 5 Mbps) (also supports X.21 DCE & DTE) V.35 DCE (Rates up to 5 Mbps) Synchronous EIA-232 (Rates up to 300 kbps)	25-pin D-sub (female)
G.703	1.544 Mbps T1 (Balanced 100Ω) 2.048 Mbps E1 (unbalanced 75Ω or balanced 120Ω)	15-pin D-sub (female) or BNC (female)
External Reference In	1, 2, 5, 10 or 20 MHz, -6dBm to +10dBm (The Ext. ref. locks Tx and Rx synthesizers, and all baseband clock generation)	BNC (female)
Modem Alarms	Relay outputs (Tx, Rx & unit faults) Demodulator I & Q test outputs (constellation) Demodulator Rx Signal Level output (0 to 10 volts) External carrier off input	15-pin D-sub (male)
1:1 Control	Async serias link to other modem, and switching signals in 1:1 pair, via CRS-170	9-pin D-sub (female)
Alarm Relay	Type: Form C Contacts. Rating: Less than +/- volts up to 1 Amp	
Remote Control	RS-232 or RS-485 modem control and monitoring	9-pin D-sub (male)
Ethernet	10/100 Base Tx for http, SNMP and Telnet interfaces	RJ45

12.5 Data Rate Ranges

FEC Type	Modulation	Code Rate	Data Rate Range	EDMAC limited?
None	BPSK	Uncoded	4.8 kbps to 3.000 Mbps	Yes – see note below
None	QPSK/OQPSK	Uncoded	9.6 kbps to 5.000 Mbps	Yes – see note below
Viterbi	BPSK	Rate 1/2	2.4 kbps to 1.500 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 1/2	4.8 kbps to 3.000 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 3/4	7.2 kbps to 4.500 Mbps	Yes – see note below
Viterbi	QPSK/OQPSK	Rate 7/8	8.4 kbps to 5.250 Mbps	Yes – see note below
Viterbi + RS	BPSK	Rate 1/2	2.4 kbps to 1.363 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 1/2	4.3 kbps to 2.727 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 3/4	6.5 kbps to 4.091 Mbps	Yes – see note below
Viterbi + RS	QPSK/OQPSK	Rate 7/8	7.5 kbps to 4.666 Mbps	Yes – see note below
Viterbi + RS	16-QAM	Rate 3/4	13.0 kbps to 4.000 Mbps	Yes – see note below
Viterbi + RS	16-QAM	Rate 7/8	16.8 kbps to 4.666 Mbps	Yes – see note below
TCM + RS	8-PSK	Rate 2/3	8.7 kbps to 4.400 Mbps	Yes – see note below
Turbo	BPSK	Rate 5/16	2.4 kbps to 0.937 Mbps	Yes – see note below
Turbo	BPSK	Rate 21/44	2.4 kbps to 1.430 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 21/44	4.8 kbps to 2.860 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 3/4	7.2 kbps to 4.500 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 7/8	8.4 kbps to 5.250 Mbps	Yes – see note below
Turbo	QPSK/OQPSK	Rate 0.95	9.1 kbps to 5.666 Mbps	Yes – see note below
Turbo	8-PSK/8-QAM	Rate 3/4	10.8 kbps to 6.750 Mbps	No
Turbo	8-PSK/8-QAM	Rate 7/8	13.6 kbps to 7.875 Mbps	No
Turbo	8-PSK/8-QAM	Rate 0.95	15.3 kbps to 8.500 Mbps	No
Turbo	16-QAM	Rate 3/4	14.4 kbps to 9.000 Mbps	No
Turbo	16-QAM	Rate 7/8	16.8 kbps to 9.980 Mbps	No

Important Note: Where noted in the table above, if EDMAC framing is employed, the upper data rate will be reduced by 5% for data rates up to 2.048 Mbps, and by 1.6% for data rates above 2.048 Mbps, where EDMAC2 framing is used, or for Rate 21/44 BPSK/QPSK Turbo, or Rate 5/16 BPSK Turbo.

12.6 Miscellaneous

Front panel	Tactile keypad, 6 keys (Up/Down, Left/Right, Enter/Clear) Vacuum Fluorescent Display (blue) - 2 lines of 24 characters
Loopbacks	Internal IF loopback, RF loopback, digital loopback, and inward/outward loopback
Fault relays	Hardware fault, Rx and Tx Traffic Alarms
M&C Interface	EIA-232 and EIA-485 (addressable multidrop, 2-wire or 4-wire)
Ethernet	10/100 Base Tx for http:, SNMP and Telnet interfaces
M&C Software	CMCS software for control of local and distant units
Dimensions	**CDM-570L:** 1U high, 16 inches (406 mm) deep **CDM-570:** 1U high, 12 inches (304.8 mm) deep
Weight	**CDM-570L:** 7 lbs (3.2 kgs) max (not including BUC Power Supply) **CDM-570:** 5 lbs (32.3 kgs) max
AC consumption	**CDM-570L (without BUC Power Supply, or IP module):** 29 Watts (typical) 32 Watts (maximum) **CDM-570L When fitted with 150 Watt BUC power supply:** 250 Watts (maximum) **CDM-570: (without IP module):** 29 Watts (typical) 32 Watts (maximum) **Typical measured VA, Power Factor and Power data:** **CDM-570L - no IP module installed:** 240V 50 Hz: Power Factor = 0.44, 65VA, 29 Watts 110V 60 Hz Power Factor = 0.55, 50VA, 28 Watts **CDM-570L - with IP module installed:** 240V 50 Hz Power Factor = 0.46, 80VA, 37 Watts 110V 60 Hz Power Factor = 0.56, 63VA, 35 Watts **CDM-570 - no IP module installed:** 240V 50 Hz Power Factor = 0.33, 87VA, 29 Watts 110V 60 Hz Power Factor = 0.53, 51VA, 28 Watts **CDM-570 - with IP module installed:** 240V 50 Hz Power Factor = 0.36, 99VA, 37 Watts 110V 60 Hz Power Factor = 0.54, 64VA, 35 Watts
Operating voltage	100 - 240 volts AC, +6%/-10% - autosensing (total absolute max. range is 90 - 254 volts AC) Optional -48 volt DC supply available
Operating temperature	0 to 50^{o}C (32 to 122^{o}F)

12.7 Approvals

"CE" as follows:	EN 55022 Class B (Emissions) EN 50082-1 (Immunity) EN 60950 (Safety)	EN 61000-3-2 EN 61000-3-3 EN 61000-4-2 EN 61000-4-4 EN 61000-4-5	EN 61000-4-6 EN 61000-4-8 EN 61000-4-9 EN 61000-4-11 EN 61000-4-13
FCC	FCC Part 15 Class B		

Notes:

Chapter 13. SERIAL REMOTE CONTROL

13.1 Introduction

This section describes the protocol and message command set for remote monitor and control of the CDM-570/570L Modem.

The electrical interface is either an EIA-485 multi-drop bus (for the control of many devices) or an EIA-232 connection (for the control of a single device), and data is transmitted in asynchronous serial form, using ASCII characters. Control and status information is transmitted in packets, of variable length, in accordance with the structure and protocol defined in later sections.

13.2 RS-485

For applications where multiple devices are to be monitored and controlled, a full-duplex (or 4-wire) RS-485 is preferred. Half-duplex (2-wire) RS-485 is possible, but is *not preferred.*

In full-duplex RS-485 communication there are two separate, isolated, independent, differential-mode twisted pairs, each handling serial data in different directions. It is assumed that there is a 'controller' device (a PC or dumb terminal), which transmits data, in a broadcast mode, via one of the pairs. Many 'target' devices are connected to this pair, which all simultaneously receive data from the controller. The controller is the only device with a line-driver connected to this pair - the target devices only have line-receivers connected.

In the other direction, on the other pair, each target has a tri-stateable line driver connected, and the controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one (and only one) target transmits back to the controller.

Each target has a unique address, and each time the controller transmits, in a framed 'packet' of data, the address of the intended recipient target is included. All of the targets receive the packet, but only one (the intended) will reply. The target enables its output line driver, and transmits its return data packet back to the controller, in the other direction, on the physically separate pair.

RS-485 (full duplex) summary:

- Two differential pairs - one pair for controller to target, one pair for target to controller.
- Controller-to-target pair has one line driver (controller), and all targets have line-receivers.
- Target-to-controller pair has one line receiver (controller), and all targets have tri-state drivers.

13.3 RS-232

This a much simpler configuration in which the controller device is connected directly to the target via a two-wire-plus-ground connection. Controller-to-target data is carried, via RS-232 electrical levels, on one conductor, and target-to-controller data is carried in the other direction on the other conductor.

13.4 Basic Protocol

Whether in RS-232 or RS-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART. In this case, the only supported asynchronous character format is 8N1 (8 data bits, no parity, 1 stop bit). The baud rate may vary between 2400 and 57600 baud.

All data is transmitted in framed packets. The controller is assumed to be a PC or ASCII dumb terminal, which is in charge of the process of monitor and control. The controller is the only device which is permitted to initiate, at will, the transmission of data. Targets are only permitted to transmit when they have been specifically instructed to do so by the controller.

All bytes within a packet are printable ASCII characters, less than ASCII code 127. In this context, the Carriage Return and Line Feed characters are considered printable.

All messages from controller to target require a response (with one exception). This will be either to return data which has been requested by the controller, or to acknowledge reception of an instruction to change the configuration of the target. The exception to this is when the controller broadcasts a message (such as Set time/date) using Address 0, when the target is set to RS-485 mode.

13.5 Packet Structure

Controller-to-target:

Start of Packet	Target Address	Address De-limiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
< ASCII code 60 (1 character)	(4 characters)	/ ASCII code 47 (1 character)	(3 characters)	= or ? ASCII code 61 or 63 (1 character)	(n characters)	Carriage Return ASCII code 13 (1 character)

Example: <0135/TFQ=1949.2345{CR}

Target-to-controller:

Start of Packet	Target Address	Address De-limiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	(4 characters)	/ ASCII code 47 (1 character)	(3 characters)	=, ?, !, *, # or ~ ASCII code 61, 63, 33, 42, 35, 126 (1 character)	(From 0 to n characters)	Carriage Return, Line Feed ASCII code 13,10 (2 characters)

Example: >0654/RSW=32{CR}{LF}

Each of the components of the packet is now explained.

13.5.1 Start Of Packet

Controller to Target: This is the character '<' (ASCII code 60)

Target to Controller: This is the character '>' (ASCII code 62)

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message.

13.5.2 Address

Up to 9999 devices can be uniquely addressed. In RS-232 applications this value is set to 0. In RS-485 applications, the permissible range of values is 1 to 9999. It is programmed into a target unit using the front panel keypad.

IMPORTANT

The controller sends a packet with the address of a target - the destination of the packet. When the target responds, the address used is the same address, to indicate to the controller the source of the packet. The controller does not have its own address.

13.5.3 Instruction Code

This is a three-character alphabetic sequence which identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance. For example, TFQ stands for transmit frequency, RMD is for receive modulation type, etc. This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65 - 90).

13.5.4 Instruction Code Qualifier

This is a single character which further qualifies the preceding instruction code.

Code Qualifiers obey the following rules:

1) From Controller to Target, the only permitted values are:
   = (ASCII code 61)
   ? (ASCII code 63)

They have these meanings:

The **=** code (controller to target) is used as the assignment operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) which follow it. For example, in a message from controller to target, TFQ=0950.0000 would mean 'set the transmit frequency to 950 MHz'.

The **?** code (controller to target) is used as the query operator, and is used to indicate that the target should return the current value of the parameter defined by the preceding byte. For example, in a message from controller to target, TFQ? would mean 'return the current value of the transmit frequency'.

2) From Target to Controller, the only permitted values are:
   = (ASCII code 61)
   ? (ASCII code 63)
   ! (ASCII code 33)
   ***** (ASCII code 42)
   # (ASCII code 35)
   ~ (ASCII code 126)
   + (ASCII code 43)
   ^ (ASCII code 94)

They have these meanings:

The **=** code (target to controller) is used in two ways:

First, if the controller has sent a query code to a target (for example TFQ?, meaning 'what is the Transmit frequency?'), the target would respond with TFQ=xxxx.xxxx, where xxxx.xxxx represents the frequency in question.

Second, if the controller sends an instruction to set a parameter to a particular value, and if the value sent in the argument is valid, then the target will acknowledge the message by replying with TFQ= (with no message arguments).

The **?** code (target to controller) is only used as follows:
If the controller sends an instruction to set a parameter to a particular value, and if the value sent in the argument is not valid, then the target will acknowledge the message by replying (for example) with TFQ? (with no message arguments). This indicates that there was an error in the message sent by the controller.

The ***** code (target to controller) is only used as follows:
If the controller sends an instruction to set a parameter to a particular value, and, if the value sent in the argument is valid, BUT the modem will not permit that particular parameter to be changed at that time, then the target will acknowledge the message by replying (for example) with TFQ* (with no message arguments).

The **!** code (target to controller) is only used as follows:
If the controller sends an instruction code which the target does not recognize, then the target will acknowledge the message by echoing the invalid instruction, followed by the ! character. Example: XYZ!

The **#** code (target to controller) is only used as follows:
If the controller sends a correctly formatted command, BUT the modem is not in remote mode, then it will not allow reconfiguration, and it will respond with TFQ#.

The **~** code (target to controller) is only used as follows:
If a message was sent via a local modem to a distant end device or ODU, then the message was transmitted transparently through the local modem. In the event of the distant-end device not responding, the local modem would generate a response, for example, 0001/RET~, indicating that it had finished waiting for a response and was now ready for further communications.

The **+** code (target to controller) is only used as follows:
This is similar to the = code (acknowledgement), indicating that a command has been accepted and processed, but in addition, indicates that some other configuration parameter has also been modified. **Example**: Suppose the user has selected Viterbi + Reed-Solomon, QPSK, Rate 1/2. Now, the user changes the modulation type from QPSK to 16-QAM by sending **TMD=4.** In this case, Rate 1/2 is no longer a valid code rate, and so it will be automatically changed to the nearest valid code rate (Rate 3/4). The target will therefore respond with **TMD+**.

The **^** code (target to controller) is only used as follows:
This indicates that the modem is in Ethernet Remote mode, so serial remote control is not possible. There are two exceptions to this: the **LRS** (local/remote status) command is still active, and may be used to change the operating mode to local or to serial remote control. The **FPL** (front panel lockout) command is active, and may be used to configure the Front Panel Lockout to be “No lockout”or “Active.”

13.5.5 Message Arguments

Arguments are not required for all messages. Arguments include ASCII codes for the characters 0 to 9 (ASCII 48 to 57), period (ASCII 46) and comma (ASCII 44), plus miscellaneous printable characters.

13.5.6 End Of Packet

Controller to Target: This is the 'Carriage Return' character (ASCII code 13).

Target to Controller: This is the two-character sequence 'Carriage Return', 'Line Feed'. (ASCII code 13, and code 10.)

Both indicate the valid termination of a packet.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Interface Type	**ITF=**	**1 byte, value of 0 through 8**	**Command or Query.** **Terrestrial interface type, where:** **0=EIA-422/EIA530 DCE** **1=V.35 DCE** **2=EIA-232 (sync).** **3= G.703 T1 AMI (forces Rx and Tx data rates to 1544 kbps)** **4= G.703 T1 B8ZS (forces Rx and Tx data rates to 1544 kbps)** **5= G.703 E1 Unbal AMI (forces Rx and Tx rates to 2048 kbps)** **6= G.703 E1 Unbal HDB3 (forces Rx and Tx rates to 2048 kbps)** **7= G.703 E1 Bal AMI (forces Rx and Tx rates to 2048 kbps)** **8= G.703 E1 Bal HDB3 (forces Rx and Tx rates to 2048 kbps)** **9 = IP Interface** **All other codes invalid. Example: ITF=2 (V.35)**	**ITF=** **ITF?** **ITF*** **ITF#** **ITF+**	**ITF?**	**ITF =x** **(see description of arguments)**
T1 Line Build-Out	LBO=	1 byte, value of 0 thru 4	Command or Query. **Valid only for T1 interface,** where 0 = 0-133 feet 1 = 133-266 feet 2 = 266-399 feet 3 = 399-533 feet 4 = 533-655 feet Example: LBO=2 (In all other modes other thanT1, this is a don't care.)	LBO= LBO? LBO * LBO #	LBO?	LBO=x (see description of arguments)
Unit Framing Mode	**FRM=**	**1 byte, value of 0 or 1**	**Command or Query.** **Unit operating mode, where** **0=Unframed** **1= EDMAC Framing** **2= EDMAC-2 Framing** **Example: FRM=1 (which is framed)**	**FRM=** **FRM?** **FRM*** **FRM#** **FRM+**	**FRM?**	**FRM=x** **(see description of arguments)**

Priority System = ITF (Highest priority), FRM, TFT, TMD, TCR, and TDR (Lowest Priority), indicated by **shading**. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Frequency	TFQ=	9 bytes	Command or Query. Tx Frequency **CDM-570L**: 950 to 1950 MHz **CDM-570**: 50 to 90 and 100 - 180 MHz Resolution=100 Hz Example: TFQ=0950.9872 Example: TFQ=0073.4528	TFQ= TFQ? TFQ* TFQ#	TFQ?	TFQ=xxxx.xxxx (see description of arguments)
Tx FEC Type	**TFT=**	**1 byte, value of 0 thru 6**	**Command or Query. Tx FEC coding type, where: 0=None (uncoded - no FEC) (Forces TCR=7 1/1) with differential encoding ON 1=Viterbi 2=Viterbi + Reed-Solomon 3=Reserved – do not use 4= Reserved – do not use 5=TCM + Reed-Solomon (Forces TCR=3 2/3) 6=Turbo 7= TPC/LDPC (Future option) Example: TFT=1 (which is Viterbi coding)**	**TFT= TFT? TFT* TFT# TFT+**	**TFT?**	**TFT=x (see description of arguments)**
Tx Modulation Type	**TMD=**	**1 byte, value of 0 thru 5**	**Command or Query. Tx Modulation type, where: 0=BPSK 1=QPSK 2=OQPSK 3=8PSK 4=16-QAM (Turbo or Viterbi + RS only) 5=8-QAM (Future option) Depending on FEC type, not all of these selections will be valid. Example: TMD=2 (which is OQPSK)**	**TMD= TMD? TMD* TMD# TMD+**	**TMD?**	**TMD=x (see description of arguments)**

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx FEC Code Rate	**TCR=**	**1 byte, value of 0 thru 7**	**Command or Query Tx Code Rate, where: 0 = Rate 5/16 (Turbo Only) 1 = Rate 21/44 (Turbo Only) 2 = Rate 1/2 3 = Rate 2/3 (8-PSK TCM or 8-QAM only) 4 = Rate 3/4 5 = Rate 7/8 6 = Rate 0.95 (Turbo Only) 7 = Rate 1/1 (Uncoded or No FEC) Depending on FEC and Modulation type, not all of these selections will be valid. Example: TCR=4 (which is Rate 3/4)**	**TCR= TCR? TCR* TCR# TCR+**	**TCR?**	**TCR=x (see description of arguments)**
Tx Data Rate	**TDR=**	**8 bytes**	**Command or Query. Tx Data rate, in kbps, between 2.4 kbps and 9.98 Mbps Resolution=1 bps. Example: TDR=2047.999 (which is 2047.999 kbps)**	**TDR= TDR? TDR* TDR#**	**TDR?**	**TDR=xxxx.xxx (see description of arguments)**
Tx Symbol Rate	N/A	8 bytes	Query only. Tx Symbol rate, in ksymbols/sec, between 4.8 ksps and 3.00 Msps Resolution = 1 sps. Example: TSR=2047.999 (which is 2047.999 ksymbols/sec)	N/A	TSR?	TSR=xxxx.xxx (see description of arguments)
Tx Spectrum Invert	TSI=	1 byte, value of 0 or 1	Command or Query. Tx Spectrum Invert selection, where: 0=Normal, 1=Tx Spectrum Inverted Example: TSI=0 (which is normal)	TSI= TSI? TSI* TSI#	TSI?	TSI=x (see description of arguments)
Tx Scrambler	TSC=	1 byte, value of 0, 1 or 2	Command or Query. Tx Scrambler state, where: 0=Off 1=On (default scrambler type) 2 = On - IESS-315 (Turbo only) Example: TSC=1 (Scrambler On)	TSC= TSC? TSC* TSC#	TSC?	TSC=x (see description of arguments)
Tx Power Level	TPL=	4 bytes	Command or Query. Tx Output power level **CDM-570L:** 0 to -40 dBm (minus sign assumed). **CDM-570:** 0 to -25 dBm (minus sign assumed). Example: TPL=13.4 (Command not valid in AUPC mode)	TPL= TPL? TPL* TPL#	TPL?	TPL=xx.x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
AUPC Enable	AUP=	1 byte, value of 0 or 1	Command or Query. AUPC mode enable/disable, where: 0=Disabled 1=Enabled Example: AUP=1 Note: EDMAC framing must be selected for the AUPC feature to work.	AUP= AUP? AUP* AUP#	AUP?	AUP=x (see description of arguments)
AUPC Parameters	APP=	6 bytes	Command or Query. Defines AUPC operating parameters. Has the form abc.cd, where: a=Defines action on max. power condition. (0=do nothing, 1=generate Tx alarm) b=Defines action on remote demod unlock. (0=go to nominal power, 1=go to max power) c=target Eb/No value, for remote demod, from 0.0 to 9.9 dB d =Max increase in Tx Power permitted, from 0 to 9 dB Example: APP=015.67 (Sets no alarm, max power, 5.6 dB target and 7 dB power increase.) (Command not valid in Manual mode)	APP= APP? APP* APP#	APP?	APP=abc.cd (see description of arguments)
Remote Eb/No	N/A	4 bytes	Query only. Returns the value of Eb/No of the remote demod. Responds 99.9 = remote demod unlocked. Responds xx.x if EDMAC is disabled. xx.x=02.0 to 16.0 Example: REB=12.4 Note: For values > 16.0 dB, the reply will be 16.0	N/A	REB?	REB=xx.x (see description of arguments)
Tx Power Level Increase	N/A	3 bytes	Query only. Returns the increase in Tx power level, in dB (from the nominal setting) due to the action of AUPC. Range is 0.0 to 9.9 dB Responds x.x if AUPC is disabled. Example: PLI=2.3	N/A	PLI?	PLI=x.x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Clock Source	TCK=	1 byte, value 0 thru 2	Command or Query. Tx Clock Source, where: 0=Internal 1=Tx Terrestrial 2= Loop-Timed Example: TCK=0 (selects Internal)	TCK= TCK? TCK* TCK#	TCK?	TCK=x (see description of arguments)
Tx Data Invert	TDI=	1 byte, value 0 or 1	Command or Query. Invert Transmit Data 0=Normal 1=Inverted Example: TDI=1 (selects Inverted TX Data)	TDI= TDI? TDI* TDI#	TDI?	TDI=x (see description of arguments)
Tx Carrier State	TXO=	1 byte, value 0 thru 4	Command or Query. Tx Carrier State, where: 0=OFF due to front panel or remote control command 1=ON 2=RTI (receive/transmit inhibit) 3=OFF due to ext H/W Tx Carrier Off command (not a valid argument when used as a command) 4=OFF due to BUC warm up delay (not a valid argument in a command format.) Example: TXO=1 (Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO?	TXO=x (see description of arguments)
Warm-up Delay	WUD=	1 byte, value 0 or 1	Command or Query. Warm-up Delay for internal frequency reference (OCXO) 0=Disabled (instant on – no delay for OCXO to reach temperature) 1=Enabled (unit waits until OCXO reaches correct temperature) Example: WUD=1 (selects Warm-up Delay)	WUD= WUD? WUD* WUD#	WUD?	WUD=x (see description of arguments)
Countdown	CTD=	3 bytes	Command or Query. As a **query**, returns the Warm-up Delay countdown, in seconds remaining. Range is from 000 to 200 seconds. As a **command**, only takes the argument 000. Used to truncate the Warm-up delay period to zero, forcing the unit into 'instant-on' mode. Example: CTD? – responds with CTD=067 – means the unit will wait another 67 seconds before it will enter an operational state. CTD=000 terminates the warm-up delay.	CTD= CTD? CTD* CTD#	CTD?	CTD=xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Frequency	RFQ=	9 bytes	Command or Query. Rx Frequency **CDM-570L**: 950 to 1950 MHz **CDM-570**: 50 to 90 and 100 - 180 MHz Resolution=100 Hz Example: RFQ=0950.9872 Example: RFQ=0073.4528	RFQ= RFQ? RFQ* RFQ#	RFQ?	RFQ=xxxx.xxxx (see description of arguments)
Rx FEC Type	**RFT=**	**1 byte, value of 0 thru 6**	**Command or Query. Rx FEC Type, where: 0=None (uncoded – no FEC) with differential encoding ON 1=Viterbi 2=Viterbi + Reed-Solomon 3= Reserved – do not use 4= Reserved – do not use 5=TCM + Reed-Solomon 6=Turbo 7= TPC/LDPC (Future option) Example: RFT=1 (which is Viterbi only)**	**RFT= RFT? RFT* RFT# RFT+**	**RFT?**	**RFT=x (same format as command argument)**
Rx Demod type	**RMD=**	**1 byte, value of 0 thru 5**	**Command or Query. Rx Demodulation, where: 0=BPSK 1=QPSK 2=OQPSK 3=8PSK 4=16QAM (Turbo or Viterbi + RS only) 5=8-QAM (Future option) Depending on FEC type, not all of these selections will be valid. All other codes are invalid. Example: RMD=2 (selects OQPSK)**	**RMD= RMD? RMD* RMD# RMD+**	**RMD?**	**RMD=x (see description of arguments)**

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx FEC Code Rate	**RCR=**	**1 byte, value of 0 thru 7**	**Command or Query. Rx FEC Code Rate, where: 0 = Rate 5/16 (Turbo Only) 1 = Rate 21/44 (Turbo Only) 2 = Rate 1/2 3 = Rate 2/3 (8-PSK TCM or 8-QAM only) 4 = Rate 3/4 5 = Rate 7/8 6 = Rate 0.95 (Turbo Only) 7 = Rate 1/1 (Uncoded or No FEC) Depending on FEC and demodulation type, not all of these selections will be valid. Example: RCR=1 (selects Rate 3/4)**	**RCR= RCR? RCR* RCR# RCR+**	**RCR?**	**RCR=x (see description of arguments)**
Rx Data Rate	**RDR=**	**8 bytes**	**Command or Query. Rx Data Rate, in kbps, between 2.4 kbps to 9.98 Mbps. Resolution=1 bps Example: RDR=2047.999**	**RDR= RDR? RDR* RDR#**	**RDR?**	**RDR=xxxx.xxx (see description of arguments)**
Rx Symbol Rate	N/A	8 bytes	Query only. Rx Symbol rate, in ksymbols/sec, between 4.8 ksps and 3.00 Msps Resolution = 1 sps. Example: RSR=2047.999 (which is 2047.999 ksymbols/sec)	N/A	RSR?	RSR=xxxx.xxx (see description of arguments)
Rx Spectrum Invert	RSI=	1 byte, value of 0 or 1	Command or Query. Rx Spectrum Invert, where: 0=Normal 1=Rx Spectrum Invert Example: RSI=0 (selects Normal)	RSI= RSI? RSI* RSI#	RSI?	RSI=x (see description of arguments)
Rx Descrambler	RDS=	1 byte, value of 0, 1 or 2	Command or Query. Rx Descrambler state, where: 0=Off 1=On (default descrambler type) 2 = On - IESS-315 (Turbo only) Example: RDS=1 (Scrambler On)	RDS= RDS? RDS* RDS#	RDS?	RDS=x (see description of arguments)

Priority System = ITF (Highest priority) , FRM, RFT, RMD, RCR, and RDR (Lowest Priority), indicated by shading. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Data Invert	RDI=	1 byte, value 0 or 1	Command or Query. Invert Receive Data, where: 0=Normal 1=Inverted Example: RDI = 1 (selects Inverted Rx Data)	RDI= RDI? RDI* RDI#	RDI?	RDI=x (see description of arguments)
Rx Demod Acquisition Sweep Width	RSW=	3 bytes	Command or Query. Rx ± acquisition sweep range of demodulator, in kHz, ranging from ± 1 to ± 32 kHz (rates < 625 ksym/second) or ± 1 to ± 200 kHz (rates >= 625 ksym/second) **CDM-570L only** Example: RSW=009 (selects ± 9 kHz)	RSW= RSW? RSW* RSW#	RSW?	RSW=xxx (see description of arguments)
Eb/No Alarm Point	EBA=	4 bytes	Command or Query. Eb/No alarm point in dB, with a range between 0.1 and 16 dB. Resolution=0.1 dB Example: EBA=12.3	EBA= EBA? EBA* EBA#	EBA?	EBA=xx.x (see description of arguments)
Rx Buffer Size	RBS=	1 byte, value of 0 through 9	Command or Query. Rx buffer size, where: 0 = Buffer disabled (Clock mode = Rx satellite) 1 = +/- 1024 bits 2 = +/- 2048 bits 3 = +/- 4096 bits 4 = +/- 8192 bits 5 = +/- 16384 bits 6 = +/- 32768 bits 7 = +/- 128 bits 8 = +/- 256 bits 9 = +/- 512 bits Example: RBS=0	RBS= RBS? RBS* RBS#	RBS?	RBS=x (same format as command argument)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
External Reference Frequency	ERF=	1 byte, value of 0 thru 5	Command or Query. External Reference Frequency, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz Example: ERF=0 (External reference not used - uses internal)	ERF= ERF? ERF * ERF #	ERF?	ERF =x (see description of arguments)
EDMAC Framing Mode	EFM=	1 byte, value of 0, 1 or 2	Command or Query. EDMAC mode, where: 0 = EDMAC OFF (Framing is on, AUPC active) 1 = EDMAC MASTER 2 = EDMAC SLAVE (Query Only) Example: EFM=1 (EDMAC Enabled as Master)	EFM= EFM? EFM* EFM#	EFM?	EFM=x (see description of arguments)
EDMAC Slave Address Range	ESA=	4 bytes	Command or Query. EDMAC Slave Address Range - sets the range of addresses of distant-end units (modems or transceivers) for which this unit, as the Master, will forward messages. Only values which are integer multiples of ten are permitted. (0010, 0020, 0030, 0040, etc.). Example: ESA=0090 This command is only valid for an EDMAC master. When used as a Query, it may be sent to an EDMAC slave, which will respond with the appropriate address.	ESA= ESA? ESA* ESA#	ESA?	ESA=xxxx (see description of arguments)
IP Address	IPA=	18 bytes, numerical	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseT Ethernet management port, in the format: xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (8-30) Example: 010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xx.xxx.xxx.xxx.yy (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Test Mode	TST=	1 byte, value of 0 thru 6	Command or Query. CDM-570L Test Mode, where: 0= Normal Mode (no test) 1=IF Loopback 2=Digital Loopback 3=I/O Loopback 4=RF Loopback 5=Tx CW 6=Tx Alternating 1,0 Pattern Example: TST=1 (IF Loopback)	TST= TST? TST* TST#	TST?	TST=x (see description of arguments)
Unit Alarm Mask	MSK=	12 bytes	Command or Query. Alarm mask conditions, in form **abcdefghijkl**, where: a=Tx FIFO (0 = unmasked, 1 = masked) b=G.703 BPV (0 = unmasked, 1 = masked) c=Tx-AIS (0 = unmasked, 1 = masked) d=Rx AGC Alarm (0 = unmasked, 1 = masked) e=Eb/No Alarm (0 = unmasked, 1 = masked) f=Rx-AIS g=Buffer slip h=Ext Reference alarm i=BUC alarm j=LNB alarm k=spare, l= spare	MSK= MSK? MSK* MSK#	MSK?	MSK=abcdefghijkl (see description of arguments)
Request to Send	RTS=	1 byte, value of 0 thru 3	Command or Query. Defines how RTS/CTS will operate at the main data interface 0 = RTS/CTS Loop, No Action RTS and CTS are looped, so that CTS echoes the state of RTS, but RTS does not control the ON/OFF state of the carrier 1 = Loop, RTS Controls Tx O/P RTS and CTS are looped, so that CTS echoes the state of RTS, and RTS controls the ON/OFF state of the carrier (in other words, the modem will not bring up its TX carrier until RTS is asserted.) 2 = Ignore RTS, Assert CTS 3 = 1:N system in use. RTS/CTS ignored (Query only) RTS is ignored, and CTS is asserted unconditionally. Example: RTS=0 (RTS/CTS Loop, No Action).	RTS= RTS? RTS* RTS#	RTS?	RTS=x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Force 1:1 Switch	FSW=	None	Command only. Forces the unit to toggle the Unit Fail relay to the 'fail' state for approx 500ms. If the unit is a 1:1 pair, and it is currently the 'On Line' unit, this will force a switchover, so the unit will then be in 'Standby' mode. The command is always executed by the unit, regardless of whether it is stand-alone, in a 1:1 pair, or part of a 1:N system. This command takes no arguments.	FSW= (message ok)	N/A	N/A
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Global Configuration	MGC=	115 bytes, with numerical entries, fixed values and delimiters	Command or Query. Global Configuration of CDM570L, in the form: abcdddd.ddddefghhhh.hhhijkk.klmnoppp.ppqrrrrrrr AAAA.AAAABCDEEEE.EEEFGHIIIJJ.JKLLLLLLLLMNOOO OPQQQQQQQQQQQQRSTTTTTTTT where: a = Unit Interface Type — same as ITF b = T1 Line build-out — same as LBO c = Unit Framing mode — same as FRM dddd.dddd = Tx Frequency — same as TFQ e = Tx FEC Type — same as TFT f = Tx Modulation type — same as TMD g = Tx FEC Rate — same as TCR hhhh.hhh = Tx Data Rate — same as TDR i = Tx Spectrum Inversion — same as TSI j = Tx Scrambler state — same as TSC kk.k = Tx Power Level — same as TPL l = Tx Clock Source — same as TCK m = Tx Data Invert — same as TDI n = Tx Carrier State — same as TXO o = AUPC Enable — same as AUP ppp.pp = AUPC parameter setup — same as APP q = Warm-up delay — same as WUD rrrrrrr = expansion bytes AAAA.AAAA = Rx Frequency — same as RFQ B = Rx FEC Type — same as RFT C = Rx Modulation Type — same as RMD D= Rx FEC Rate — same as RCR EEEE.EEE = Rx Data Rate — same as RDR F = Rx Spectrum Inversion — same as RSI G = Rx Descrambler state — same as RDS H = Rx Data Invert — same as RDI III = Rx Sweep Width — same as RSW JJ.J = Eb/No Alarm Point — same as EBA K = Rx Buffer Size — same as RBS LLLLLLLL = expansion bytes M = External Reference Frequency — same as ERF N = EDMAC Framing Mode — same as EFM OOOO = EDMAC Slave Address — same as ESA P = Unit test Mode (Read only) — same as TST QQQQQQQQQQQQ = Unit Alarm Mask — same as MSK R=RTS/CTS Control — same as RTS S = Statistics Sampling Interval — same as SSI TTTTTTTT = expansion bytes Fill unused expansion bytes with 'x'	MGC= MGC? MGC* MGC#	MGC? MGC?n	MGC=abcdddd.ddddefg hhhh.hhhijkk.klmnoppp. ppqqqqqqqqAAAA.AA AABCDEEEE.EEEFG HIIIJJ.JKLLLLLLLLLM NOOOOPQQQQQQQQ QQQQRSTTTTTTTT (see description of arguments) Where n=0 to 9 Returns the MGC portion of 1 of 10 stored configurations (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Configuration Save	CST=	1 byte	Command only. Causes the CDM570L to store the current modem configuration in Configuration Memory location defined by the one-byte argument (0 to 9). Example: CST=4 (store the current configuration in location 4)	CST= CST? CST* CST#	N/A	N/A
Configuration Load	CLD=	1 byte	Command only. Causes the CDM570L to retrieve a previously stored modem configuration from Configuration Memory location defined by the one-byte argument (0 to 9). Example: CLD=4 (retrieve modem configuration from location 4)	CLD= CLD? CLD* CLD#	N/A	N/A
ReCenter Buffer	RCB=	None	Command only. Forces the software to recenter the receive Plesiochronous/Doppler buffer. Note: This command takes no arguments. Example: RCB=	RCB= RCB? RCB* RCB#	N/A	N/A
RTC Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) Example: DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy (see description of arguments)
RTC Time	TIM=	6 bytes	Command or Query. A time in the form hhmmss, indicating the time from midnight, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) Example: TIM=231259 (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Number of Unread stored Events	N/A	3 bytes	Query only. Unit returns the Number of stored Events, which remain Unread, in the form xxx. Note: This means unread over the remote control. Example: NUE=126	N/A	NUE?	NUE=xxx (see description of arguments)
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control. Reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss, A being the fault/clear indicator. F=Fault C=Clear I=Info B being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=ODU 5= Power on/off, or log cleared C **is Fault Code numbers, as in FLT?** or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	N/A	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss {CR}ABCddmmyyhhmmss (see description for details of arguments)
Clear All Stored Events	CAE=	None	Command only. Forces the software to clear the software events log. Example: CAE= Note: This command takes no arguments.	CAE= CAE? CAE* CAE#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP#	N/A	N/A
Statistics Sample Interval	SSI=	1 byte, numerical	Command or Query. Used to set the sample interval for the Statistics Logging Function SSI=x, where x= 0 to 9 in 10 minute steps. Note: Setting this parameter to 0 disables the statistics logging function. Example: SSI=3 means 30 minutes	SSI= SSI? SSI* SSI#	SSI?	SSI=x (see description for details of argument)
Number of Unread stored Statistics	N/A	3 bytes	Query only. Unit returns the number of stored Statistics, which remain Unread, in the form xxx. Note: This means unread over the remote control. Example: NUS=247	N/A	NUS?	NUS=xxx (see description of arguments)
Retrieve next 5 unread Stored Statistics	N/A	130 bytes	Query only. Unit returns the oldest 5 Stored Statistics, which have not yet been read over the remote control. Reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= AA.ABB.BC.CD.Dddmmyyhhmmss, AA.A=Minimum Eb/No during sample period. BB.B=Average Eb/No during sample period. C.C=Max. Tx Power Level Increase during sample period. D.D=Average Tx Power Level Increase during sample period. ddmmyyhhmmss = date/time stamp. If there are no new events, the unit replies with RNS*. If there are less than 5 statistics to be retrieved, the remaining positions are padded with zeros.	N/A	RNS?	RNS={CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss{CR}AA.ABB.BC.CD.Dddmmyyhhmmss (see description for details of arguments)
Clear All Stored Statistics	CAS=	None	Command only. Forces the software to clear the software statistics log. Example: CAS= Note: This command takes no arguments.	CAS= CAS? CAS* CAS#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Initialize Statistics Pointer	ISP=	None	Command only. Resets internal pointer to allow RNS? queries to start at the beginning of the statistics log.	ISP= ISP#	N/A	N/A
Rx Eb/No	N/A	4 bytes	Query only. Unit returns the value of Eb/No, between 0 and 16 dB, Resolution 0.1 dB. Returns 99.9 if demod is unlocked. Example EBN=12.3 (which is Eb/No = 12.3 dB) For values greater than 16.0 dB, the reply will be: EBN=+016	N/A	EBN?	EBN=xxxx (see description of arguments)
Rx Signal Level	N/A	4 bytes	Query Only. Unit returns the value of the Rx signal level, in dBm, between –5 and –99 dBm, in the form: ccxx, where: cc = code: GT=Greater Than LT=Less Than == is equal to xx = value (the '-' sign is implied) Examples: RSL=LT99 (Rx signal level is less than -99 dBm) RSL===41 (Rx signal level is equal to -41 dBm)	N/A	RSL?	RSL=ccxx (see description of arguments)
Rx Frequency Offset	N/A	6 bytes	Query only. Unit returns the value of the measured frequency offset of the carrier being demodulated, in the form sxxx.x, where: s = sign (+ or - character) xxx.x = value (range from ± 0 to ± 200 kHz, 100 Hz resolution) Returns +999.9 if the demodulator is unlocked. Example: RFO=+002.3 (which is + 2.3 kHz)	N/A	RFO?	RFO=sxxx.x (see description of arguments)
Buffer Fill State	N/A	2 bytes	Query only. Unit returns the value of the buffer fill state, between 1 to 99%. Returns 00 if demodulator is unlocked. Example: BFS=33 (which is 33%)	N/A	BFS?	BFS=xx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx BER	N/A	5 bytes	Query only. Unit returns the value of the estimated corrected BER in the form a.b x 10^{-c} . First three bytes are the value. Last two bytes are the exponent. Returns 99999 if the demodulator is unlocked. Example: BER=4.8E3 (which is BER = 4.8 x 10^{-3})	N/A	BER?	BER=a.bEc (see description of arguments)
Redundancy State	N/A	1 byte, value of 0 or 1	Query only. Unit returns the redundancy state of the unit, where 0=Offline 1=Online Example: RED=1 (which is Online)	N/A	RED?	RED=x (see description of arguments)
Outdoor Unit Comms Enable	ODU=	1 byte, value of 0 or 1	Command or Query. **CDM-570 Only** Enables or disables communications, via the FSK link, with a Comtech EF Data transceiver (ODU), where: 0=Disabled 1=Enabled Example: ODU=0 (selects Disabled)	ODU= ODU? ODU* ODU#	ODU?	ODU=x (see description of arguments)
Front Panel Lockout	FPL=	1 byte, value of 0 or 1	Command or Query. Control the state of front panel lockout, where: 0=no lockout 1=front panel lockout active Disable the lockout by either FPL=0, or by setting into local mode using LRS=0 (response is LRS+ meaning FPL is disabled at the same time)	ODU= ODU? ODU* ODU#	ODU?	ODU=x (see description of arguments)
Local/Remote Status	LRS=	1 byte, value of 0, 1 or 3	Command or Query. Local/Remote status, where: 0=Local 1=Serial Remote 3 = Ethernet Remote Example: LRS=1 (which is Serial Remote)	LRS= LRS? LRS* LRS# LRS+	LRS?	LRS=x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Software Revision	N/A	34-37 bytes	Query only. Unit returns the value of the internal software revision installed in the unit, in the form : Boot:x.y.z Bulk1:x.y.z Bulk2:x.y.z Or Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz	N/A	SWR?	SWR=Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz (see description of arguments)
Software Information	N/A	variable	Query only. Complete unit software information: Example: FRW= Boot: FW/10804-1-,1.1.1,03/30/04 Bulk1: FW/10805C,1.1.4,6/16/04 FW/10806-1C,1.1.4,6/16/04 FW/10807-1B,1.1.3,05/03/04 FW/10808-1-,1.1.1,03/30/04 FW/10809-1-,1.1.1,03/30/04 Bulk2: FW/10805B,1.1.3,5/28/04 FW/10806-1B,1.1.3,5/28/04 FW/10807-1B,1.1.3,05/03/04 FW/10808-1-,1.1.1,03/30/04 FW/10809-1-,1.1.1,03/30/04	N/A	FRW?	FRW=x….x (see description of arguments)
Software Image	IMG=	1 byte, value of 1 or 2	Command or Query. Current Active software image, where: 1=Bulk Image # 1 currently active 2=Bulk Image # 2 currently active Example: IMG=1 (which is Image #1 active)	IMG= IMG? IMG* IMG#	IMG?	IMG=x (see description of arguments)
Serial Number	N/A	9 bytes	Query only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. Example: SNO=176500143	N/A	SNO?	SNO=xxxxxxxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Temperature	N/A	3 bytes	Query only. Unit returns the value of the internal temperature, in the form of sxx (degrees C). s = sign (+ or - character) xx = value Example: TMP=+26	N/A	TMP?	TMP=sxx (see description of arguments)
Equipment ID	N/A	11 bytes	Query only. Unit returns information concerning the equipment identification, and the option field, in the form abbbcdefghi; where: a = Turbo option: 0 = None, 1 = Turbo, 2 = TPC/LDPC bbb = defines the modem model number **CDM-570** = 570 **CDM-570L** = 571 c = RS Codec Option: 0 = None, 1 = Installed d = Data Rate Option: 0 = Base (512 kbps), 1 = up to 2048 kbps, 2 = up to 5000 kbps, 3 = up to 9980 kbps e = Higher-order modulation: 0= None, 1 = 8-PSK/8-QAM, 2 = 16QAM, 3 = 8-PSK/8-QAM and 16QAM f = IP Module: 0 = None, 1 = Installed g = BUC option: 0 = None, 1 = 100 Watt, 2 = 150 Watt h = Spare – for future use i = Spare – for future use Example: EID=157101311xx means Turbo, CDM-570L, No RS codec, up to 2048bps, 8-PSK/8-QAM and 16-QAM, IP Module installed, 100 Watt BUC supply installed	N/A	EID?	EID= abbbcdefghi (see description of arguments) 570 is the CDM-570 571 is the CDM-570L

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status	N/A	6 bytes	Query only. Unit returns the current ***highest-priority*** fault and status codes for the Unit (hardware), Tx Traffic, Rx Traffic and ODU in the form **abcdef**, where: **a = Unit faults:** 0 = No faults 1 = Power supply fault, +5 volts 2 = Power supply fault , +12 volts 3 = Power supply fault, –5 volts 4 = Power supply fault, +23 volts 5 = Power supply fault, –12 volts 6 = Tx synthesizer lock 7 = Rx 1st LO synthesizer lock 8 = Rx 2nd LO synthesizer Lock 9 = Ref PLL lock E = IP Module F = EEPROM checksum error A, B, C, and D are TBD (for future expansion) **b = Tx Traffic status:** 0 = Tx traffic OK 1 = No clock from terrestrial interface 3 = Tx FIFO slip 5 = Loss of External Reference 7 = AUPC upper limit reached 9 = AIS detected on incoming data B = Bipolar violation on G.703 interface 2, 4, 6, 8 and A are TBD (for future expansion) **c = Rx Traffic status:** 0 = Rx Traffic OK 1 = Demodulator unlocked 3 = AGC Alarm - signal out of range 5 = RS Frame sync alarm 7 = EDMAC Frame sync alarm A = Buffer Underflow B = Buffer Overflow D = Eb/No alarm F = AIS detected on incoming data 2, 4, 6, 8, 9, C and E are TBD (for future expansion) **d = ODU status:** 0=No ODU faults 1=BUC PLL 3=BUC current 5=BUC voltage 7=LNB current 9=LNB voltage B=BUC temperature D=BUC checksum 2, 4, 6, 8, A, and C are TBD (for future expansion)	N/A	FLT?	FLT=abcdef (see description for details of arguments) e=Change in fault status since last poll. f=Change in unit configuration since last poll (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
LNB Power Control	LPC=	1 byte, value of 0,1,2 or 3	Command or Query. **CDM-570L Only** LNB Power Control, where 0=Off 1=On, 13V LNB Voltage 2=On, 18V LNB Voltage 3=On, 24V LNB Voltage Example: LPC=1 (LNB power is On, 13 volts)	LPC= LPC? LPC* LPC#	LPC?	LPC=x (see description of arguments)
LNB Frequency Reference enable	LFR=	1 byte, value of 0 or 1	Command or Query. **CDM-570L Only** 0=Disable LNB Reference 1=Enable LNB Reference Example: LFR=0 (LNB 10 MHz reference off)	LFR= LFR? LFR* LFR#	LFR?	LFR=x (see description of arguments)
LNB Low current limit	LCL=	3 bytes	Command or Query. **CDM-570L Only** LNB lower alarm limit for current, in the form xxx, where xxx is the current value between 10 and 400 mA. Example: LCL=050	LCL= LCL? LCL* LCL#	LCL?	LCL=xxx (see description of arguments)
LNB High current limit	LCH=	3 bytes	Command or Query. **CDM-570L Only** LNB upper alarm limit for current, in the form xxx, where xxx is is the current value between 50 and 600 mA. Example: LCH=450	LCH= LCH? LCH* LCH#	LCH?	LCH=xxx (see description of arguments)
LNB LO Frequency	LLO=	6 bytes	Command or Query. **CDM-570L Only** LNB Receive LO frequency information in the form: xxxxxs, where: xxxxx is the LO frequency, in the range of 3000 to 65000 MHz All 0's (000000) disables the feature. s is the sign for the mix (+ or - character) Terminal Frequency = LNB LO ± RFQ Example: LLO=06000- (LO is 6 GHz, high-side mix)	LLO= LLO? LLO* LLO#	LLO?	LLO=xxxxxs (see description of arguments)
LNB Current	N/A	3 bytes	Query only. **CDM-570L Only** Indicates the value of the LNB Current, in the form: xxx, where xxx is between 0 and 999, units mA. If not available, response is 000. Example: LDC=210 (LNB DC current is 210 mA)	N/A	LDC?	LDC=xxx (see description of arguments)
LNB Voltage	N/A	4 bytes	Query only. **CDM-570L Only** Indicates the value of the LNB Voltage, in the form: xx.x, where xx.x is between 0 and 30.0 If not available, response is 00.0. Example: LDV=24.2 (LNB DC voltage is 24.2 volts)	N/A	LDV?	LDV=xx.x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
BUC Address	BAD=	2 byte, value of 01 to 15	Command or Query. **CDM-570L Only** Indicates the BUC Address, in the form: xx, where xx is between 01 and 15. Example: BAD=03	BAD = BAD? BAD * BAD #	BAD?	BAD=xx (see description of arguments)
BUC Comms enable	BCE=	1 byte, value of 0 or 1	Command or Query. **CDM-570L Only** Enables or disables communications, via the FSK link, with an externally connected Block Up Converter (BUC), where: 0=Disabled 1=Enabled Example: BCE=0 (Disabled)	BCE= BCE? BCE* BCE#	BCE?	BCE=x (see description of arguments)
BUC Power Control	BPC=	1 byte, value of 0 or 1	Command or Query. **CDM-570L Only** 0=Disable BUC DC Power 1=Enable BUC DC Power Example: BPC=0 (BUC DC power disabled)	BPC= BPC? BPC* BPC#	BPC?	BPC=x (see description of arguments)
BUC 10 MHz Reference	BFR=	1 byte, value of 0 or 1	Command or Query. **CDM-570L Only** Enables or disables the 10 MHz frequency reference to the BUC 0 = Disabled 1 = Enabled Example: BFR=0 (BUC 10MHz reference disabled)	BFR= BFR? BFR* BFR#	BFR?	BFR=x (see description of arguments)
BUC Output Enable	BOE=	1 byte, value of 0 or 1	Command or Query. **CDM-570L Only** Indicates BUC Output enable, 0 = Off (output disabled) 1 = On (output enabled) Example: BOE=1 (BUC output is enabled)	BOE= BOE? BOE* BOE#	BOE?	BOE=x (see description of arguments)
BUC High Current Limit	BCH=	4 bytes	Command or Query. **CDM-570L Only** BUC High Current Limit, a value between 500 and 4000 mA Example: BCH=3100	BCH= BCH? BCH* BCH#	BCH?	BCH=xxxx (see description of arguments)
BUC Low Current Limit	BCL=	4 bytes	Command or Query. **CDM-570L Only** BUC Low Current Limit, a value between 0 and 3000 mA Example: BCL=0600	BCL= BCL? BCL* BCL#	BCL?	BCL=xxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
BUC LO Frequency	BLO=	6 bytes	Command or Query. **CDM-570L Only** BUC transmit LO frequency information in the form: xxxxxs, where: xxxxx is the LO frequency, in the range of 3000 to 65000 MHz All 0's (000000) disables the feature. s is the sign for the mix (+ or - character) Terminal Frequency = BUC LO ± TFQ Example: BLO = 12000+ (BUC LO is 12 GHz, low-side mix)	BLO= BLO? BLO* BLO#	BLO?	BLO=xxxxxs (see description of arguments)
BUC Output Power Level	N/A	4 bytes	Query only. **CDM-570L Only** BUC output power level in the form xx.x, where xx.x is the value in Watts. Example: BOL=08.3 (BUC reports output power is 8.3 Watts) Returns 00.0 when FSK and BUC power are not enabled.	N/A	BOL?	BOL=xx.x (see description of arguments)
BUC Temperature	N/A	3 bytes	Query only. **CDM-570L Only** Indicates BUC temperature, in the form: sxx, where: s = sign (+ or - character) xx = value If not available, response is –99 Example: BUT=-13 (BUC temperature is -13 degrees C) Note: This query is only valid when the FSK and BUC power are turned On.	N/A	BUT?	BUT=sxx (see description of arguments)
BUC PLL Alarm	N/A	1 byte, value of 0 or 1	Query only. **CDM-570L Only** BUC PLL lock state, where: 1=Unlocked 0=Locked Example: BPA=0 (BUC PLL is locked) If not available, response is 9 Note: This command is only valid when the FSK and BUC power are turned On.	N/A	BPA?	BPA=x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
BUC Software Version	N/A	2 bytes	Query only. **CDM-570L Only** Indicates the BUC software version, in the form xx, Example: BSV=05 (Software version 05) If not available, response is 00 Note: This command is only valid when the FSK and BUC power are turned On.	N/A	BSV?	BSV=xx (see description of arguments)
BUC Current	N/A	4 bytes	Query only. **CDM-570L Only** Indicates the value of the BUC Current, in the form: xxxx, where xxxx is between 0 and 9999, units mA. If not available, response is 0000. Example: BDC=3100	N/A	BDC?	BDC=xxxx (see description of arguments)
BUC Voltage	N/A	4 bytes	Query only. **CDM-570L Only** Indicates the value of the BUC Voltage, in the form: xx.x, where xx.x is between 0 and 64.0 If not available, response is 00.0. Example: BDV=43.6 (BUC DC voltage is 43.6 volts)	N/A	BDV?	BDV=xx.x (see description of arguments)
Terminal Tx Frequency	N/A	10 bytes	Query only. **CDM-570L Only** Terminal Tx Frequency, where frequency = BUC LO ± TFQ Resolution=100 Hz Returns 00000.0000 if LNB LO is zero Example: TTF=14250.9872	N/A	TTF?	TTF=xxxxx.xxxx (see description of arguments)
Terminal Rx Frequency	N/A	10 bytes	Query only. **CDM-570L Only** Terminal Rx Frequency, where frequency = LNB LO ± RFQ Resolution=100 Hz Returns 00000.0000 if LNB LO is zero Example: TRF=11650.2249	N/A	TRF?	TRF=xxxxx.xxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
OGC Outdoor Unit Global Configuration	OGC=	50 Bytes	Command or Query. **CDM-570L Only** ODU Global Configuration of CDM-570L in the form: aabcdexxxxhhhhiiiijjjjjkxxxxxxlmnnnoooppppppqxxxxxx, where: aa = BUC Address same as BAD b = BUC FSK comms enable same as BCE c = BUC Power Control same as BPC d = BUC 10MHz Frequency Reference enable same as BFR e = BUC Tx Output Enable same as BOE xxxx = expansion bytes hhhh = BUC Low Alarm Limit iiii = BUC High Alarm Limit same as BCL jjjjjk = BUC LO frequency, mix sign same as BCH xxxxxx = expansion bytes same as BLO l = LNB Power Control m = LNB 10MHz Frequency Reference enable same as LPC nnn = LNB Low Alarm Limit same as LFR ooo = LNB High Alarm Limit same as LCL pppppq = LNB LO Frequency, mix sign same as LCH xxxxxx = expansion bytes same as LLO Any unavailable parameters will be filled with xxx.	OGC= OGC? OGC* OGC#	OGC? OGC?n	OGC=aabcdfxxxhhhhiiii jjjjjkxxxxxxlmnnnooopp pppqxxxxxx (see description of arguments) Where n=0 to 9 returns the OGC portion of 1 of 10 stored configurations (see description of arguments)

Note: The following codes are used in the 'Response to Command' column:

- = Message ok
- ? Received ok, but invalid arguments found
- * Message ok, but not permitted in current mode
- # Message ok, but unit is not in **Remote** mode
- ~ Time out of an EDMAC pass-through message
- \+ Warning. Command accepted, but other parameters were changed in addition

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Chapter 14. ETHERNET MANAGEMENT (Base Modem)

14.1 Introduction

The base modem is equipped with an RJ-45, 10/100BaseT Ethernet management interface used for monitor and control purposes.

Note that the optional IP module does NOT need to be installed.

This chapter of the manual will provide a high-level overview of the functionality provided by this interface and references other chapters for further details.

14.2 Ethernet Management Interface Protocols

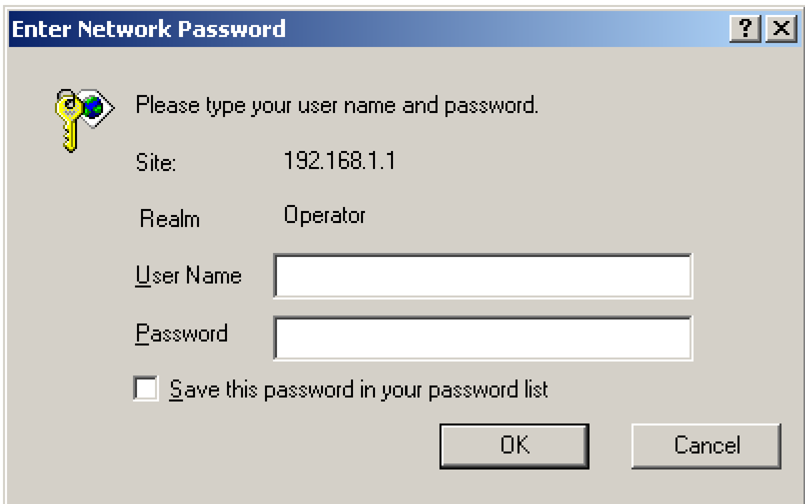
The modem 10/100BaseT Ethernet Management Interface supports three (3) different management protocols:

- Web Server interface for complete product management
- SNMP with public and private MIB
- Telnet interface for remote product M&C

In general, the operation of each of these interfaces is essentially identical to the management interfaces that are available when the optional IP module is installed.

14.3 Web Server (HTTP) Interface

The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the Base Modem. These web pages have been designed for optimal performance when using Microsoft's Internet Explorer 5.5 or higher. By typing http://xxx.xxx.xxx.xxx" (where xxx.xxx.xxx.xxx =Base Modem IP address) on your browser, the Login prompt will appear.



HTTP Login Access Levels are defined as follows:

User Interface	User Login Access Level		
	Admin User	**Read/Write User**	**Read Only User**
Web	**Full Access to all Web Pages**	**No Access to Admin Pages**	**No Access to Admin Pages**
		Full Access for all other Web Pages	**View Only Access for all other Web Pages**

Default Name/Passwords are:

- Admin comtech/comtech
- Read/Write opcenter/1234
- Read Only monitor/1234

14.3.1 Web Server Menu Tree

Table 14-1. Web Server Menu Tree

Level 1	Level 2
Home	Home Contact Support
Admin	Access Remote
Config Mdm	Modem Modem Utilities AUPC BUC (for CDM-570L only) LNA (for CDM-570L only)
Stats	Modem Status Modem Logs
ODU (CDM-570 only)	Config Status Utilities
Maint	Unit Info

For further details regarding the use of this interface please refer to Chapter 18 - *WEB Server Pages.*

14.4 SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an application-layer protocol designed to facilitate the exchange of management information between network devices. The CDM-570/570L SNMP agent supports both SNMPv1 and v2c.

IMPORTANT

For proper SNMP operation, the CDM-570/570L MIB files must be used with the associated version of the CDM-570/570L base modem M&C. Please refer to the CDM-570/570L SW Release Notes for information on the required FW/SW compatibility.

14.4.1 Management Information Base (MIB) Files

MIB files are used for SNMP remote management and consist of Object Identifiers (OID's). Each OID is a node that provides remote management of a particular function. A MIB file is a tree of nodes that is unique to a particular device.

There are five MIB files associated with the CDM-570:

There are five MIB files associated with the CDM-570L:

MIB File/Name	Description
fw10874-2-.mib ComtechEFData MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: Name: comtechEFData Type: MODULE-IDENTITY OID: 1.3.6.1.4.1.6247 Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) Module: ComtechEFData
fw10874-4c .mib CDM-570/570L MIB file	MIB file consists of all of the OID's for management of the modem functions
fw10874-5a .mib CDM-570/570L Traps MIB file	Trap MIB file is provided for SNMPv1 traps common for base modems.
Fw/10874-6a.mib CDM-570L BUC/LNB MIB file	Provided for management of the CDM-570L BUC and LNB.
Fw/10874-7-.mib CDM-570L BUC/LNB Traps M2B file	Trap MIB file is provided for SNMPv1 traps unique to CDM-570L.
Fw/10874-8-.mib CSAT-5060 MIB file	MIB file consists of all the OIDs for management of the CSAT-5060 Transceiver connected to the CDM-570 modem through FSK.
Fw/10874-8-.mib KST-2000A/B MIB file	MIB file consists of all the OIDs for management of the KST-2000A/B Transceiver connected to the CDM-570 modem through FSK.

These MIB files should be compiled in a MIB Browser or SNMP Network Monitoring System server.

Note: The SNMP agent supports both "**SNMPv1**" and "**v2c**". The "**Traps**" file only needs to be compiled if "**SNMPv1**" traps are to be used.

14.4.2 SNMP Community Strings

The modem uses community strings as a password scheme that provides authentication before gaining access to the modem agent's MIBs.

In "**SNMP v1/v2c**", the community string is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The community string is entered into the MIB Browser or Network Node Management software and is used to authenticate users and determine access privileges to the SNMP agent.

The user defines three Community Strings for SNMP access:

- Read Community default = public
- Write Community default = private
- Trap Community default = comtech

Note: Maximum number of characters for community strings shall not exceed 20.
All printable ASCII characters, except '\' and '~' are allowed. No trailing spaces for community strings.

14.4.3 SNMP Traps

The modem has the ability to send out SNMP traps when certain events occur in the modem. The modem sends out traps when an alarm or a fault occurs in the modem. These include unit faults, TX faults, RX faults, and ODU faults. A trap is sent both when a fault occurs and is cleared.

The modem supports both **SNMPv1** traps and **SNMPv2** notifications. Which style of traps the modem sends can be configured by the user using the CDM570SNMPTrapVersion OID.

The following are the MIB2 v1traps/v2 notifications that the modem supports:

MIB2 SNMPv1 trap: Authentication Failure 5

MIB2 SNMPv2 notifications: Authentication Failure 1.3.6.1.6.3.1.1.5.5

The following tables are the Alarms and Faults v1 traps / v2 notifications that the modem supports.

Alarms and Faults **SNMPv1** traps:

cdm570LTxTrafficAlarm	6247242
cdm570LUnitAlarm	6247241
cdm570LRxTrafficAlarm	6247243
cdm570LODUAlarm	6247244

Alarms and Faults **SNMPv2** notifications:

cdm570UnitAlarm	1.3.6.1.4.1.6247.24.2.0.1
cdm570TxTrafficAlarm	1.3.6.1.4.1.6247.24.2.0.2
cdm570RxTrafficAlarm	1.3.6.1.4.1.6247.24.2.0.3
cdm570LODUAlarm	1.3.6.1.4.1.6247.24.2.0.4

For further details regarding the use of this interface please refer to Chapter 19 - *SNMP Interface.*

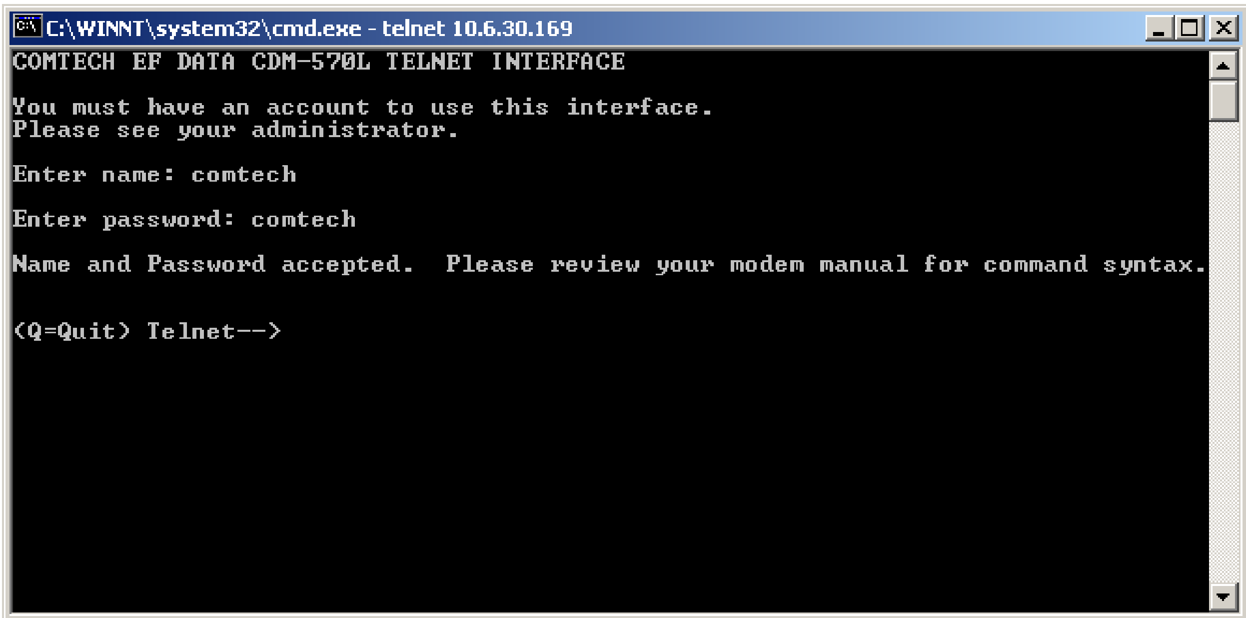
14.5 Telnet Interface

The modem provides a Telnet interface for two primary functions:

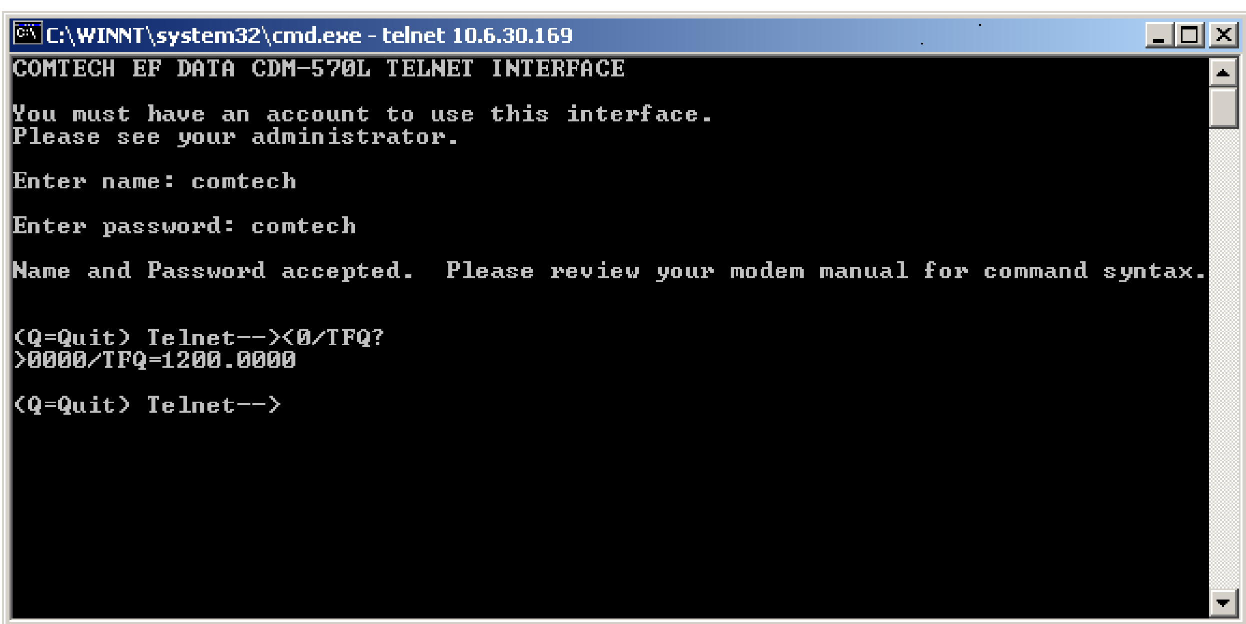
- Equipment M&C via the standard equipment Remote Control protocol.
- Equipment M&C via Comtech Monitor and Control System (CMCS) application.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level.

The screen capture below shows the login process :



Once logged into the Telnet interface as the Administrator, the user can access the standard remote control interface defined in Chapter 13 as shown in the example below:

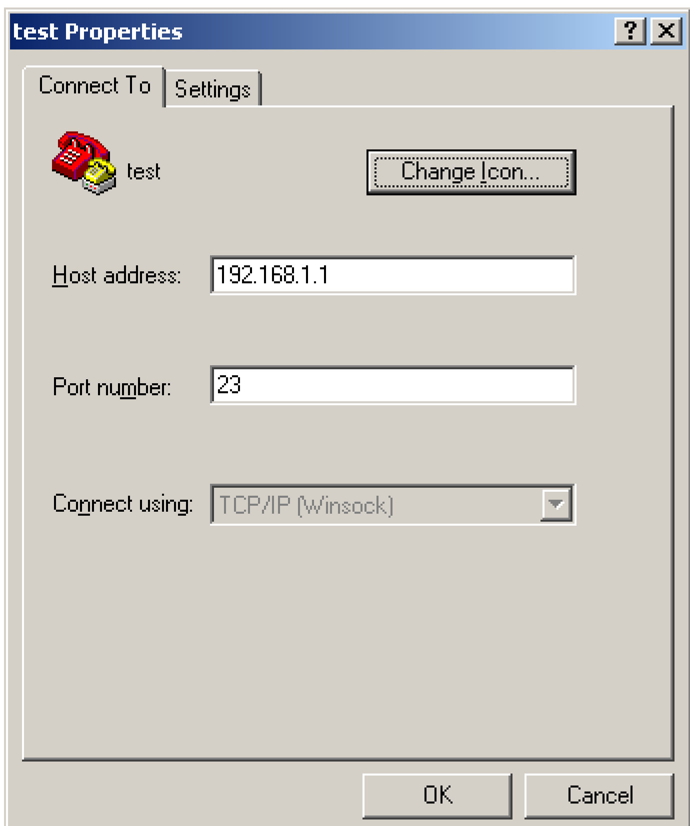


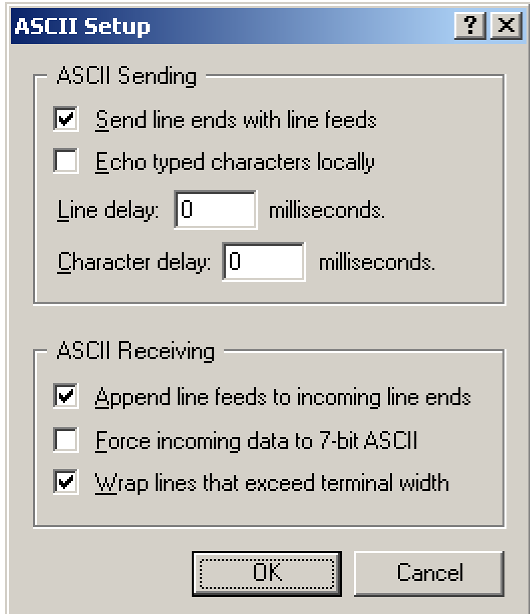
There is a disadvantage when using Windows DOS as Telnet Client. Since Windows DOS cannot translate a ‘\r’ to a ‘\r\n’ for the messages coming from Telnet Server, the multi-line command response (for example, FRW? response) will be displayed as one line, with the latter lines overwriting the previous lines.

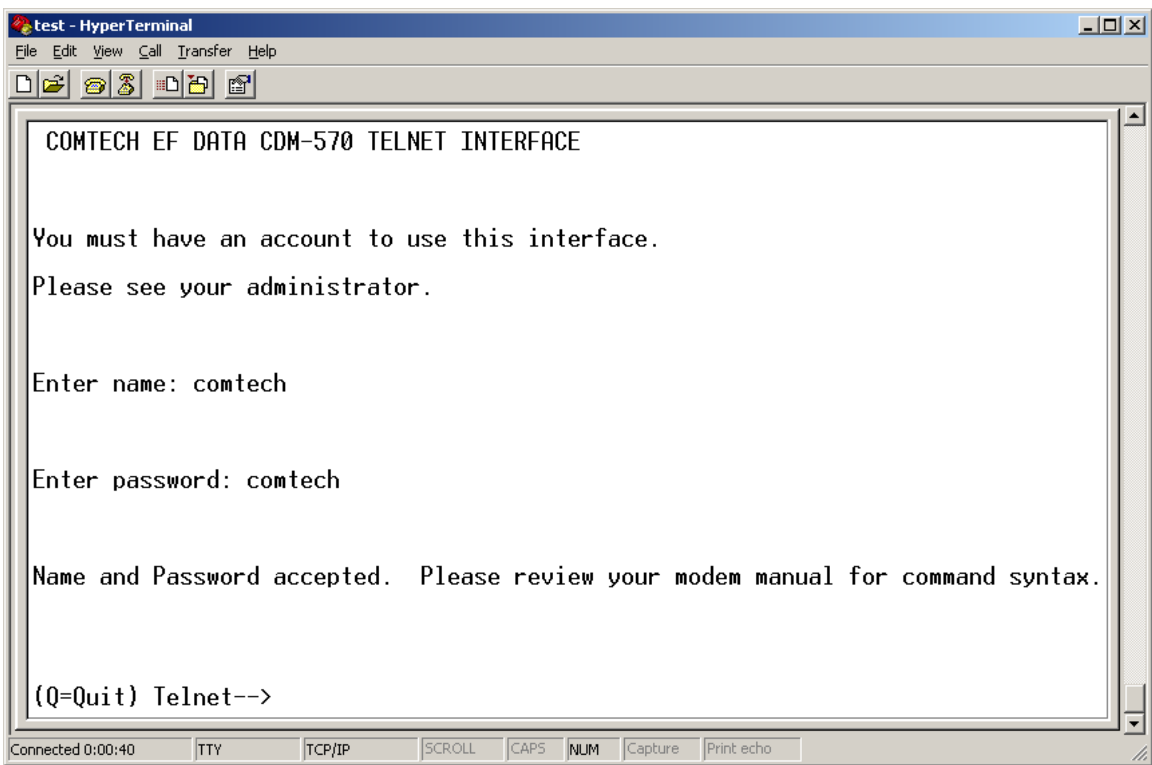
In order to view the full response messages, CEFD recommends using HyperTerminal configured as Telnet Client. To do so, configure the HyperTerminal as following:

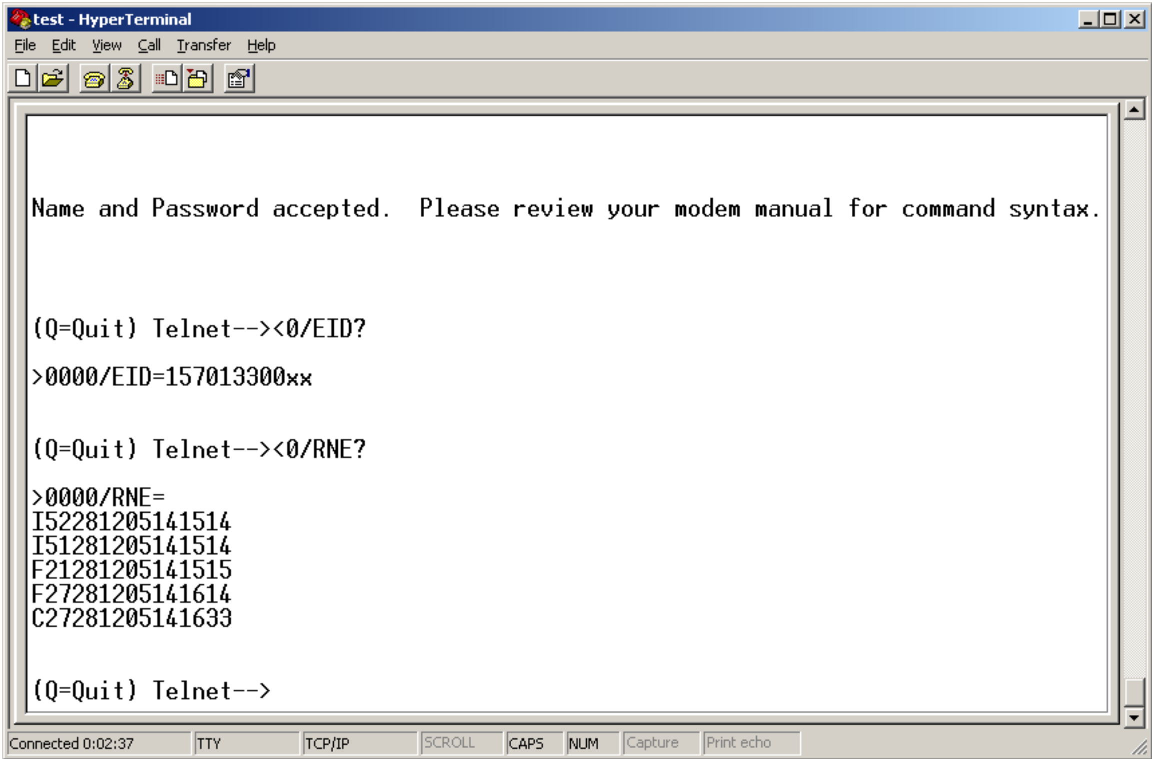
1. Connect using TCP/IP instead of COM1 or COM2;
2. ASCII setup: check both the "Send line ends with line feeds" and "Append line feeds to incoming line ends" options.

See the following screen captures for examples.




ASCII Setup
ASCII Sending
Send line ends with line feeds
Echo typed characters locally
Line delay: 0 milliseconds.
Character delay: 0 milliseconds.
ASCII Receiving
Append line feeds to incoming line ends
Force incoming data to 7-bit ASCII
Wrap lines that exceed terminal width
OK
Cancel


test - HyperTerminal
File Edit View Call Transfer Help
COMTECH EF DATA CDM-570 TELNET INTERFACE
You must have an account to use this interface.
Please see your administrator.
Enter name: comtech
Enter password: comtech
Name and Password accepted. Please review your modem manual for command syntax.
(Q=Quit) Telnet-->
Connected 0:00:40
TTY
TCP/IP
SCROLL
CAPS
NUM
Capture
Print echo


test - HyperTerminal
File Edit View Call Transfer Help
Name and Password accepted. Please review your modem manual for command syntax.
(Q=Quit) Telnet--><0/EID?
>0000/EID=157013300xx
(Q=Quit) Telnet--><0/RNE?
>0000/RNE=
I52281205141514
I51281205141514
F21281205141515
F27281205141614
C27281205141633
(Q=Quit) Telnet-->
Connected 0:02:37
TTY
TCP/IP
SCROLL
CAPS
NUM
Capture
Print echo

Chapter 15. IP MODULE ETHERNET INTERFACE OVERVIEW

15.1 Introduction

The optional IP Module Ethernet Interface can be added to make the CDM-570/570L a high-performance, low-cost, IP-Centric satellite modem well suited for closed network Single Channel Per Carrier (SCPC) links. It is ideal for many VSAT applications. A CDM-570/570L with the IP Module can also be utilized in a ViperSat satellite bandwidth management system. The following chapters focus on the CDM-570/570L IP Module capabilities and operation. Refer to the ViperSat Operational Manual, for more specific information on the CDM-570/570L IP Module operation when deployed in a ViperSat system.

15.2 Major Assemblies

Assembly	Description
PL/10235-	IP Module

15.3 IP Module Standard Features

- 10/100BaseT Ethernet Interface
- Powerful network management
- Web Server interface for complete product management
- SNMP with public and private MIB
- Telnet interface for remote product M & C
- Console Port interface for local network management
- Remote software/firmware upgrade via FTP

- Configuration backup and restore via FTP
- Event Logging to capture all IP Module activity
- Detailed Statistics of IP traffic
- IGMP support for multicast
- CDM-550 Emulation Mode
- Static IP routing for unicast and multicast
- easyConnect™ Mode

15.3.1 10/100BaseT Ethernet Interface

In Router Mode operation, the 10/100BaseT Ethernet Interface is used for routing IP traffic to be transmitted over the satellite or routed to another device on the local LAN. In easyConnect™ Mode, the Ethernet Interface is used to forward IP and non-IP traffic over the satellite. Local or remote management of all CDM-570/570L and IP Module functions is also available via Telnet, HTTP, or SNMP.

15.3.2 Powerful Network Management

The CDM-570/570L IP-Centric Modem may be configured, operated and monitored using any of the following methods:

User Interface	Connection	Modem Functions	IP Module Functions	Reference
Front Panel	Local - Keypad	ALL	IP Address/Subnet Mask only	Chapter 6
Serial Remote Control	Local - Serial RS-232/RS-485 via Remote Control Port	ALL	IP Address/Subnet Mask only	Chapter 14
Serial Command Line Interface (CLI)	Local - Serial RS-232 via Console Port	ALL	ALL	Chapter 17
Telnet	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 17
Web Server	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 18
SNMP	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 19

15.3.3 Remote software/firmware upgrade via FTP

The IP Module uses ‘flash memory’ technology internally, and new firmware can be uploaded to or from an external PC by FTP. This makes software upgrading very simple, and updates can now be sent via the Internet, E-mail, or on disk. The upgrade can be performed without opening the unit or having to be in the same physical location.

15.3.4 Configuration backup and restore via FTP

All Base Modem and IP Module configuration parameters are stored in a simple text file. The parameter file can easily be retrieved locally or remotely by FTP. The file can then be used to quickly configure a replacement modem if needed.

15.3.5 Event Logging to capture all IP Module activity

All IP Module activity can be stored into an easy-to-read Event Log. This file can also be retrieved locally or remotely by FTP.

15.3.6 Detailed Statistics of IP traffic

IP traffic statistics are continuously updated and allow detailed performance analysis or can be used to identify traffic problems. The statistics are available through the Serial Console locally, or can be gathered remotely by Telnet, HTTP, or SNMP.

15.3.7 IGMP support for multicast

IGMP is a standard feature in the IP Module. If enabled, it responds to IGMP queries for the configured multicast routes on the transmit side and generates IGMP queries on the receive side. If there are no active IGMP receivers on the LAN, it will stop forwarding the multicast traffic (received from the satellite) to the LAN.

15.3.8 CDM-570/570L Emulation Mode

With the IP module installed, the CDM-570/570L can be made to operate in CDM-570/570L emulation mode, allowing any traffic to be sent and received using any serial port. The emulation mode is selected from the front panel by selecting Configuration/Interface and then selecting either RS-422, V.35, RS-232, or G.703 as the interface rather than IP. The CDM-570/570L will then pass standard serial traffic, but will not pass IP traffic. The IP Module can still be accessed via the Ethernet port using Telnet, HTTP, or SNMP for configuring or monitoring the CDM-570/570L .

15.3.9 Static IP routing for unicast and multicast

Up to 256 static routes can be entered into the IP Module to direct IP traffic over the satellite or to another device on the local LAN. These 256 routes could be in any combination of unicast and multicast.

15.3.10 easyConnect™ Mode

easyConnect™ is the Comtech EF Data IP modem intelligent networking solution that allows a link to be setup with minimal configuration (no specific routes need to be configured). The IP Module also supports non-IP traffic with easyConnect™. All IP traffic will be subject to user configured QoS restrictions.

15.3.11 easyConnect™ Operation

The following is a detailed description of how an easyConnect™ pair should be setup and configured as well as information about how easyConnect™ functions.

- Because easyConnect™ is a "smart wire," the devices attached to it on either side of the satellite should be on the same subnet and should not configure a next hop address to be the CDM-570/570L IP address (as should be done with router mode). For purposes of configuration, easyConnect™ mode should be viewed to function in much the same way as a bridge (however, without spanning tree protocol).
- All of the features that groom and optimize the satellite link in router mode are also available in easyConnect™ mode.
- easyConnect™ Multicast Option – Multicast packets in easyConnect™ mode are identified using multicast MAC address. These identified multicast packets are either routed or dropped based on the easyConnect™ multicast option.
- easyConnect™ uses MAC (layer 2) addresses to learn where to send packets. In comparison, router mode uses the destination IP address in the packet in conjunction with the route table to determine where to forward the packets.
- The IP Module Ethernet interface in easyConnect™ mode is configured to be in promiscuous mode with a data rate of 10/100BaseT Half Duplex/Full Duplex. The IP Module needs to be in promiscuous mode in order to learn the attached networking devices.
- Since easyConnect™ does not use a routing table, the determination of where to send a packet is made by a learning process. When the system is powered-up, all packets from each subnet (local and remote) will be sent over the satellite interface. However, as each IP Module learns which devices are attached to their local Ethernet interfaces, the IP Module begins to filter packets which it has learned are locally attached to its Ethernet interface.
- The easyConnect™ learning/forwarding algorithm is as follows:
  - If the packet is destined for the IP Module, then process it locally.
  - If the packet is from the Ethernet interface, then send it to the Satellite interface; OR if the destination layer 2 (MAC address) of the packets matches the source layer 2 address for a packet we have already seen, then the destination MAC address of this packet is on our local subnet; so why send it over the satellite interface. In this case, the IP Module will drop the packet.
  - If the packet is from the satellite interface, then send it out the Ethernet interface.

IMPORTANT

easyConnect™ mode will automatically use Header Compression for compressing Layer 2 (even if Header Compression option has not been purchased). Because of this, some of the initial traffic sent between two devices will not be received over the satellite until a full Header is transmitted. For example, the default Header Compression Refresh Rate is 50 packets. If a ping is sent over the satellite, then it will time out until the full Header packet is sent. The Header Compression Refresh Rate on the Administration Menu can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Once communication between two devices has been established, both IP modems will be able to receive all traffic, unless one IP modem is power cycled or reset. Header Compression feature should be enabled for compressing Layer 3, Layer 4 and Layer 5.

IMPORTANT

Do not enable IF Loopback (or link the TX to RX by a BNC cable or satellite) on a IP modem operating in easyConnect™ mode when connected to a LAN. In this configuration, easyConnect™ will resend all layer 2 broadcast packets and cause a “broadcast storm” on the LAN. To perform a loop test to verify the modem or satellite link, do one of the following:

1. Reconfigure the CDM-570/570L interface selection by selecting Configuration/Interface and then selecting EIA-422/530, V.35, or EIA-232.

OR

2. Set the IP Module to Router Mode.

15.4 IP Module Optional Features

Enhancing the IP Module performance is easy. Additional features can be added quickly on site, using the FAST access code purchased from Comtech EF Data. To enable these features, simply enter the code at the front panel.

- 3xDES Data Encryption
- IP Header Compression
- Payload Compression
- Quality of Service (QoS) – supports 3 different modes of QoS
  - Minimum/Maximum Bandwidth
  - Maximum Bandwidth/Priority
  - DiffServe

IMPORTANT

Note: Enabling the Demo Mode from the front panel can temporarily enable all IP FAST Options (except 3xDES Encryption) for evaluation. Once enabled, the IP FAST Options will be available for a total time period of seven (7) days (168 hours). The 7-day Demo Mode is a cumulative counter (can be stopped and started at any time).

15.4.1 3xDES Encryption with Ability to Change Keys

The IP Module optionally supports 3xDES-128 (using NIST certified 3x core) encryption and decryption, for the highest level security for link encryption. Each unit supports eight encryption keys and eight decryption keys. The keys are user configurable. Each route can be assigned to be encrypted by any of the eight available keys, random key method, or transmitted in clear.

15.4.2 IP Header Compression

Header Compression is also an optional feature of the IP Module. The IP Module supports Header Compression for the following Ethernet and Layer 3, 4 & 5 Headers:

Supported Ethernet Headers
Ethernet 2.0
Ethernet 2.0 + VLAN-tag
Ethernet 2.0 + MPLS
802.3-raw
802.3-raw + VLAN-tag
802.3 + 802.2
802.3 + 802.2 + VLAN-tag
802.3 + 802.2 + SNAP
802.3 + 802.2 + SNAP + VLAN-tag
802.3 + 802.2 + SNAP + MPLS
Supported Layer 3&4 Headers
IP
TCP
UDP
RTP (Codec Independent)

Header Compression reduces the required VoIP bandwidth by 60 percent. Example: A G.729a voice codec, operating at 8 kbps, will occupy 32 kbps once encapsulated into IP framing on a LAN. Using IP/UDP/RTP Header Compression, the same traffic only needs 10.8 kbps total WAN satellite bandwidth to cross the link. A total maximum of 64 simultaneous VoIP calls can be compressed. Normal Web/HTTP traffic can be reduced an additional 10% via IP/TCP header compression.

Header Compression Configuration – Header Compression is completely independent from QoS, and there is no configuration required except enabling the Header Compression feature on both the sending and receiving Comtech EF Data IP modem. Packets with a Header Compression supported header will automatically be identified for compression. The only configuration consideration is the Header Compression Refresh Rate. This is how many compressed header packets will be sent before a single full header packet is sent. Some compressed header traffic could be lost during deteriorated satellite link conditions. Sending a full header packet will allow the return of the traffic stream. The Refresh Rate can be increased for poor satellite link conditions or decreased to further reduce overhead.

Header Compression Statistics - These statistics will display the total bytes of the pre-compressed and post-compressed traffic and effective compression ratio.

15.4.3 Payload Compression

Traffic optimization through Payload Compression is another optional feature of the CDM-570/570L /IP Module modem.

- FAST feature to upgrade
- Uses AHA chip
- Compression algorithm applied to all data (HDLC header excluded).
- Compression statistics are fed back to QoS in order to maximize WAN utilization while maintaining priority, jitter and latency.
- 1024 simultaneous compression sessions to maximize compression across multiple distinct traffic flows.
- Compression algorithm not applied to RTP streams because this traffic is already compressed and would only INCREASE the sat bandwidth if compressed again.
- Additional statistics have been added to the compression statistics menu in order to provide feedback on the compression efficiency that has been achieved.
- Payload Compression is selectable on a per route basis.

15.4.3.1 ADLC vs. LZS Compression Comparison

These numbers have been generated by using an internally created test program. This program takes the target benchmark files and splits the files into payload size chunks and compresses each chunk in a separate invocation of the compression algorithm. This is important to note because most compression algorithms are applied to the entire file data set as a single invocation of the compression algorithm which is easier for other types of compression algorithms (LZS, GZIP in specific). This, of course, does not apply to streamed packet data across an IP network (ftp transfer, for example).

Algorithm	Payload size	File Set	Ratio
ADLC	1472	Calgary	1.76
ADLC	1000	Calgary	1.76
ADLC	500	Calgary	1.77
ADLC	100	Calgary	2.09
ADLC	1472	Canterbury	1.71
ADLC	1000	Canterbury	1.72
ADLC	500	Canterbury	1.74
ADLC	100	Canterbury	2.04
LZS	1472	Calgary	1.66
LZS	1000	Calgary	1.66
LZS	500	Calgary	1.68
LZS	100	Calgary	1.97
LZS	1472	Canterbury	1.61
LZS	1000	Canterbury	1.62
LZS	500	Canterbury	1.63
LZS	100	Canterbury	1.91

15.4.4 Quality of Service

Quality of Service (QoS) is an optional feature of the IP Module. The user may select one of three modes of QoS operation:

- Mode 1 – QoS Rules based on Maximum Bandwidth and Priority
- Mode 2 – QoS Rules based on Minimum and Maximum Bandwidth
- Mode 3 – DiffServ

QoS Segmentation and Reassembly (SAR) - Packet Segmentation and Reassembly (SAR) is enabled automatically while QoS is enabled. However, SAR is an adaptive process; it will trigger only if the packet latency exceeds the threshold value (default to 20 msec). Latency value is calculated based on the satellite transmission bandwidth. There is no minimum segment size. However if the last segment is less than 16 bytes, then it will be appended to the previous segment excluding satellite HDLC header in order to avoid satellite overhead and consumption of CPU cycles.

Weighted Random Early Detection: The MIN-MAX and MAX-Priority QoS modes allow the user to enable or disable the WRED option. In Diffserv mode, WRED applicable to Asure forwarding only, however user can change the WRED option. WRED allows for more graceful dropping of packets, as QoS queues get full. Without WRED, typically packets are dropped based upon a simple tail drop algorithm, which was applied to packets as they were being added to the QoS queues. This can result in large numbers of contiguous packets being dropped which causes many protocols such as RTP and TCP to ungracefully degrade performance in an over-consumed or bursty scenario. WRED applies a randomization which means that the percentage change to drop packets

System Latency: System latency is used to define the maximum duration that a packet will stay in a QoS queue. This mechanism serves to ensure that old packets are “aged” out of the system rather than waste satellite bandwidth on invalid packets.

15.4.4.1 Maximum Bandwidth/Priority QoS Mode

QoS Rules can be assigned to up to 32 different types of flows to be defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.

Priority - A Priority level from 1 to 8 is assigned for each flow. The IP Module classifies each packet that is to be forwarded over the satellite. The packet will then have a Priority assigned according to the defined QoS Rules. Any packet that does not meet a QoS Rule is assigned to the Default Rule and will be assigned a Priority of 9. Priority 1 packets will be forwarded immediately, Priority 2 packets will be forwarded as soon as there are no Priority 1 packets in the Queue, and so on. Any latency critical traffic, such as VoIP/RTP should always be assigned Priority 1.

Maximum Bandwidth - This can also be assigned to a flow to restrict the Maximum Bandwidth that any particular flow will utilize, or the default of no bandwidth restriction can be selected.

Filtering - QoS also allows specific flows to be designated as “filtered,” so the IP Module will discard traffic that the user does not want to forward over a satellite link.

QoS Rule Hierarchy - It is quite possible to have traffic that meets the definitions of several QoS Rules. All traffic will be classified into the first QoS Rule that is a match, or fall into the Default Rule. The most specific QoS Rule will always be first. For example, a QoS Rule that identified a Source and Destination IP Address would be assigned ahead of a rule that just defined RTP protocol. QoS Rules that have the same amount of variables defined are sorted as follows:

1. Having a Protocol defined.

    Protocol Priority:

    a. VOCE – Voice Real Time Protocol
    b. VDEO – Video Real Time Protocol
    c. RTPS – Real Time Protocol Signaling
    d. RTP – All Real Time Protocol
    e. FTP – File Transfer Protocol
    f. HTTP – Hypertext Transfer Protocol
    g. TELN – Telnet Protocol
    h. SMTP – Simple Mail Transfer Protocol
    i. SNMP – Simple Network Management Protocol
    j. SQL – Structured Query Language Protocol
    k. ORCL – ORACLE Protocol
    l. CTRX – CITRIX Protocol
    m. SAP – Service Announcement Protocol
    n. UDP – User Datagram Protocol
    o. TCP – Transmission Control Protocol
    p. ICMP – Internet Control Message Protocol
    q. IP – All Internet Protocol
    r. N-IP – All Non-Internet Protocol

2. Source IP Address or subnet defined.

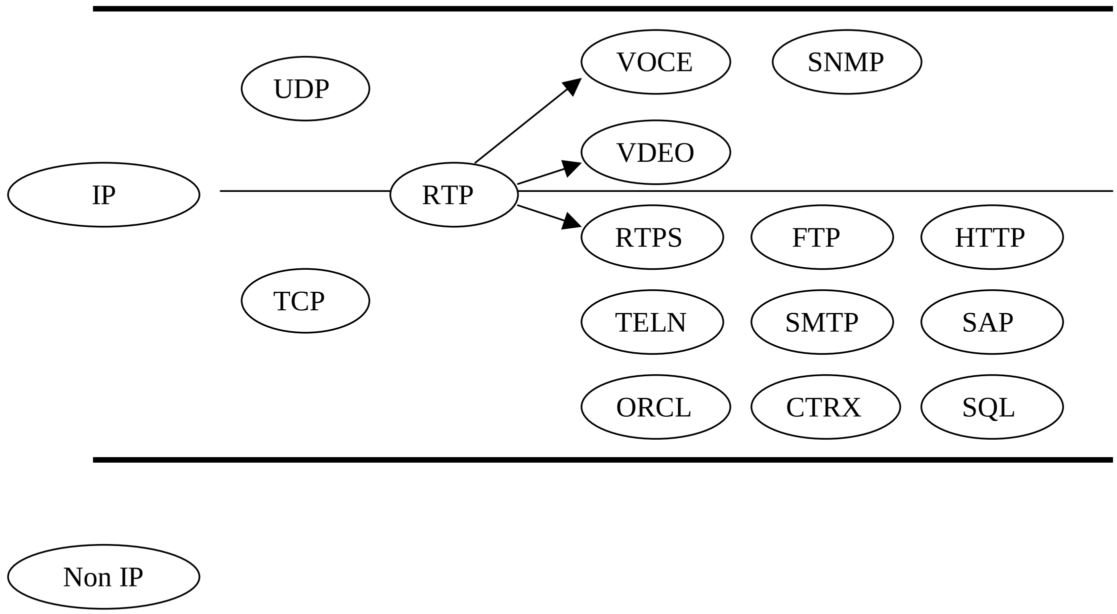
3. Destination IP Address or subnet defined.

4. Source Port defined (lowest Port number first).

5. Destination Port defined (lowest Port number first).

The IP Module will sort each QoS rule as they are added and the QoS Configuration display will be updated to reflect the order with which rules are matched.
QoS Statistics - Every QoS Rule defined can be monitored to see the traffic flow for each Queue. These statistics will display the traffic sent in each Queue, the amount of dropped traffic, and the number of Active Flows.

Protocol and Port Number Considerations - When defining QoS Rules, it is important to be aware of specifics of the traffic for which the rule is intended.
When selecting a protocol for a QoS Rule, be aware that the IP Module allows for a very broad selection (such as IP) or a very specific protocol. For example, RTP traffic can consist of UDP portion (for voice or video) and a TCP portion (for RTP signaling). These could have separate QoS Rules created or all be included in a single Rule by selecting RTP as the protocol. The following diagram illustrates where each protocol selection resides.



Selection of Source/Destination Ports should only be done if the user is aware of the port usage of the desired protocol or application. There are well known ports for various protocols, but often only the ‘command’ messaging is transacted on these ports and the ‘data’ is transferred through a negotiated port.

The following table can be used as a reference for some well known Port numbers:

Port	Description	Port	Description
1	TCP Port Service Multiplexer (TCPMUX)	118	SQL Services
7	ECHO	119	Newsgroup (NNTP)
20	FTP - Data	137	NetBIOS Name Service
21	FTP - Control	139	NetBIOS Datagram Service
22	SSH Remote Login Protocol	150	NetBIOS Session Service
23	Telnet	156	SQL Server
25	Simple Mail Transfer Protocol (SMTP)	161	SNMP
42	Host Name Server (Nameserv)	179	Border Gateway Protocol (BGP)
53	Domain Name System (DNS)	190	Gateway Access Control Protocol (GACP)
69	Trivial File Transfer Protocol (TFTP)	197	Directory Location Service (DLS)
70	Gopher Services	396	Novell Netware over IP
80	HTTP	443	HTTPS
108	SNA Gateway Access Server	444	Simple Network Paging Protocol (SNPP)
109	POP2	546	DHCP Client
110	POP3	547	DHCP Server
115	Simple File Transfer Protocol (SFTP)	1080	Socks

IMPORTANT

Once the QoS Rules are defined, each type of traffic flow should be isolated and sent to verify that it is being sent in the intended QoS Rule.

15.4.4.2 Minimum/Maximum Bandwidth QoS Mode

QoS Rules can be assigned to up to 32 different types of flows to be defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.

Weighted Random Early Detection (WRED) – The Min/Max BW QoS mode allows the user to select Weighted Random Early Detection (WRED).

WRED allows for more graceful dropping of packets, as QoS queues get full. Without WRED, typically packets are dropped based upon a simple tail drop algorithm which was applied to packets as they were being added to the QoS queues. This can result in large numbers of contiguous packets being dropped which causes many protocols such as RTP and TCP to ungracefully degrade performance in a over-consumed or bursty scenario. WRED applies a randomization which means that the percentage change to drop packets increases as the queue becomes full, and minimizes the chances of global synchronization. Thus, WRED allows the transmission line to be used fully at all times.

Maximum Bandwidth - This can be assigned to a flow to restrict the Maximum Bandwidth that any particular flow will utilize, or the default of no bandwidth restriction can be selected.

Minimum Bandwidth - Minimum specification that allows a committed information rate (CIR) to be applied to user defined classes of traffic, or the default of no minimum bandwidth can be selected.

Filtering – Any specific flow can be designated as filtered (see Maximum Bandwidth/Priority QoS).

QoS Rule Hierarchy – The QoS Rule Hierarchy is the same as Maximum Bandwidth/Priority QoS.

QoS Statistics - QoS Statistics are displayed as Maximum Bandwidth/Priority QoS.

15.4.4.3 DiffServ QoS Mode

The IP Module QoS can also be set to DiffServ Mode to make it fully compliant to the Differential Services QoS RFC standards.

Class Selector DiffServ Code Points (DSCP) – Some implementations of DiffServ will prioritize traffic by Class Selector assignment. This is defined in the DiffServ Code Points (DSCP) within the IP header. The first 3 bits of the DSCP define the Class Selector Precedence (or Priority):

Class Selector	DSCP	IP Module Priority
Precedence 1	001 000	1
Precedence 2	010 000	2
Precedence 3	011 000	3
Precedence 4	100 000	4
Precedence 5	101 000	5
Precedence 6	110 000	6
Precedence 7	111 000	7
Default	000 000	9

The IP Module will prioritize the traffic based upon the DSCP Class Selector Precedence. **Note:** All traffic that does not have the DSCP Class Selector Precedence defined (000 000) will be placed in the Default Queue and have a Precedence of 9.

Expedited Forwarding and Assured Forwarding DSCP – Another implementation of DiffServ uses all 6 bits of the DSCP to define Expedited and Assured Forwarding:

DiffServ Type	Class Selector	DSCP	IP Module Priority
Expedited Forwarding	Precedence 1	101 110	1
Assured Forwarding – Class 1	Precedence 8	001 xx0	8
Assured Forwarding – Class 2	Precedence 8	010 xx0	8
Assured Forwarding – Class 3	Precedence 8	011 xx0	8
Assured Forwarding – Class 4	Precedence 8	100 xx0	8

Expedited Forwarding (EF) DSCP – This defines premium service and is recommended for real time traffic applications such as VoIP and video conferencing.

Assured Forwarding (AF) DSCP – This defines 4 service levels and also uses the last 3 bits of the DSCP to define the Drop Precedence (Low, Medium, or High). The Drop Precedence determines which packets will most likely be dropped during periods of over congestion, similar to Weighted Random Early Detection (WRED). As a result, each of the 4 AF service levels also have 3 Drop Precedence levels for which the IP Module provides 12 separate queues.

Minimum Bandwidth (AF only) - Minimum specification that allows a committed information rate (CIR) to be applied to user defined classes of traffic, or the default of no minimum bandwidth can be selected.

Maximum Bandwidth (AF only) - This can be assigned to a flow to restrict the maximum bandwidth that any particular flow will utilize, or the default of no bandwidth restriction can be selected.

Note: Minimum and maximum bandwidth is only configurable for each of the 4 Assured Forwarding classes.

Note: Typically, DiffServ is implemented using exclusively Class Selector DSCP or exclusively Expedited and Assured Forwarding DSCP. The IP Module is fully DiffServ compliant and will work with either DiffServ implementation or with a combination of both.

15.4.5 CDM-570/570L IP Module Demo Mode

The Demo Mode allows all IP optional features (3xDES Encryption, IP Header Compression, Payload Compression, Quality of Service, and IGMP) to be enabled for seven Days (168 hours). To enable Demo Mode, use the CDM-570/570L Front Panel to select UTIL\DEMO\ON. The seven day Demo Mode Timer will start but can be stopped at any time by setting Demo Mode to OFF.

The Demo Mode enables the following IP optional features for seven days (168 hours):

- IP Header Compression
- Payload Compression
- Quality of Service

15.5 IP Module Specifications

Table 15-1. RFCs and Protocols

Supported RFCs and PROTOCOLS	
RFC 768 User Datagram Protocol	RFC 791 Internet Protocol
RFC 792 Internet Control Message Protocol	RFC 793 Transmission Control Protocol
RFC 826 An Ethernet Address Resolution Protocol	RFC 856 Telnet Binary Transmission
RFC 862 Echo Protocol	RFC 894 A Standard for the Transmission of IP Datagrams over Ethernet Networks
RFC 959 File Transfer Protocol	RFC 1112 Host Extensions for IP Multicasting
RFC 1213 Management Information Base for Network Management of TCP/IP-based internet: MIB-II	RFC 1812 Requirements for IP Version 4 Routers
RFC 2045 Multipurpose Internet Mail Extensions (MIME)	RFC 2236 Internet Group Management Protocol, Version 2
RFC 2474 Definition of the Differentiated Services Field (DS Field) in the Ipv4 and Ipv6 Headers	RFC 2475 An Architecture for Differentiated Services
RFC 2578 Structure of Management Information Version 2 (SMIv2)	RFC 2597 Assured Forwarding PHB Group
RFC 2598 An Expedited Forwarding PHB	RFC 2616 Hypertext Transfer Protocol – HTTP/1.1
RFC 2821 Simple Mail Transfer Protocol	RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3416 Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)	RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)

Notes:

Chapter 16. TYPICAL IP MODULE OPERATIONAL SETUPS

16.1 Overview

The CDM-570/570L with the IP Module has several modes of operation. This Chapter shows examples of typical setups for the CDM-570/570L / IP Module to determine the best mode of operation for the appropriate network topology and Ethernet traffic environment.

16.2 Modem Compatibility

The CDM-570/570L / IP Module is compatible with other Comtech EF Data IP modems (referred to hereafter as CDM-IP) provided the modems have similar operating modes and IP options. The following is a list of compatible CDM-IP modems:

Comtech EF Data IP Modem	IP Module Version	Additional Notes
CDM-IP 550	Version 1.1.0 or later	Must have Framer II Module (PL/9956-1) and Version 1.3.0 or later to support Data Compression IP option
CDM-IP 300L	Version 1.1.0 or later	Must have Framer II Module (PL/9956-1) and Version 1.3.0 or later to support Data Compression IP option
CDD-564/L	Version 1.5.1 or later	No restrictions
CDD-562L	Version 1.5.1 or later	No restrictions

16.3 IP Module Working Modes

Two Working Modes of the IP Module are available: easyConnect™ and Router Mode. There are also three HDLC Addressing Modes: Point-to-Point, Small Network, and Large Network. Separate HDLC Modes allows the user to minimize the HDLC overhead transmitted over the satellite based upon the size of their network. In Router/Point-to-Point Mode, no HDLC address is transmitted; Router/Small Network transmits 1 byte and Router/Large Network transmits 2 bytes as part of HDLC header for each packet. Non-IP traffic is not supported in Router Mode.

This section describes the functionality of these modes in order to optimize the Comtech EF Data IP modems in the network, based upon Network Topology and Ethernet Traffic requirements.

IMPORTANT

The Working Mode and HDLC Address Mode of the Comtech EF Data IP modems must be identical to pass traffic between modems.

Changing the Working Mode or HDLC address Mode of the IP modem requires the IP Module to be rebooted. Before the user can select a different mode, the IP Module will notify the user that changing the mode will require a reboot.

Working Mode **HDLC Address Mode**	**Network Topology**	**Ethernet Traffic**
easyConnect™ Mode **Point-to-Point**	Point-to-Point only Both sites on same LAN subnet	IP v4 and/or non-IP
Router Mode **Point-to-Point**	Point-to-Point only Both sites on different LAN subnet	IP v4 only
Router Mode **Small Network**	Point-to-Point or Point-to-Multipoint (up to 254 sites) All sites on different LAN subnet	IP v4 only
Router Mode **Large Network**	Point-to-Point or Point-to-Multipoint (up to 32766 sites) All sites on different LAN subnet	IP v4 only

Feature Support - The IP Module also has several standard and optional features to further optimize security, performance and efficiency. The following table defines how these features are supported in the two different Working Modes:

Feature	easyConnect™ Mode	Router Mode
HDLC Address Mode	Point-to-Point Only	Point-to-Point, Small Network, Large Network (can be Point-to-Multipoint)
10/100 BaseT Operation	10 or 100BaseT Half or Full Duplex	10 or 100 BaseT Half or Full Duplex
Access Lists	None	4 Clients by IP or IP Subnet
3xDES Encryption	1 Encrypt Decrypt Key All traffic encrypted when enabled	Up to 8 Encrypt Decrypt Keys or random Traffic encrypted on a per route basis
Quality of Service	Min/Max; Max/Priority; DiffServ	Min/Max; Max/Priority; DiffServ
Header Compression	Yes – Layer 2 is always compression. Applied to all Layers 3, 4, and 5 traffic when enabled	Yes – applied on a per route basis
Payload Compression	Yes - applied to all traffic when enabled	Yes – applied on a per route basis
Multicast	Select either all or no Multicast, Uplink or Downlink	All or specific Multicast streams, Uplink or Downlink
IGMP	No	Yes
Remote upgrade by FTP	Yes	Yes

16.3.1 easyConnect™ Working Mode

This is the default Working Mode of the IP Module. easyConnect™ only operates in Point-to-Point Mode, meaning that it is only communicating with one other Comtech EF Data IP modem. This mode allows the modem to be setup with minimal configuration (no specific routes need to be configured). In this mode, the IP Module is acting as a “smart wire” over a satellite link between two Comtech EF Data IP modems. This allows the IP Module to simultaneously forward IP traffic and non-IP traffic, such as IPX.

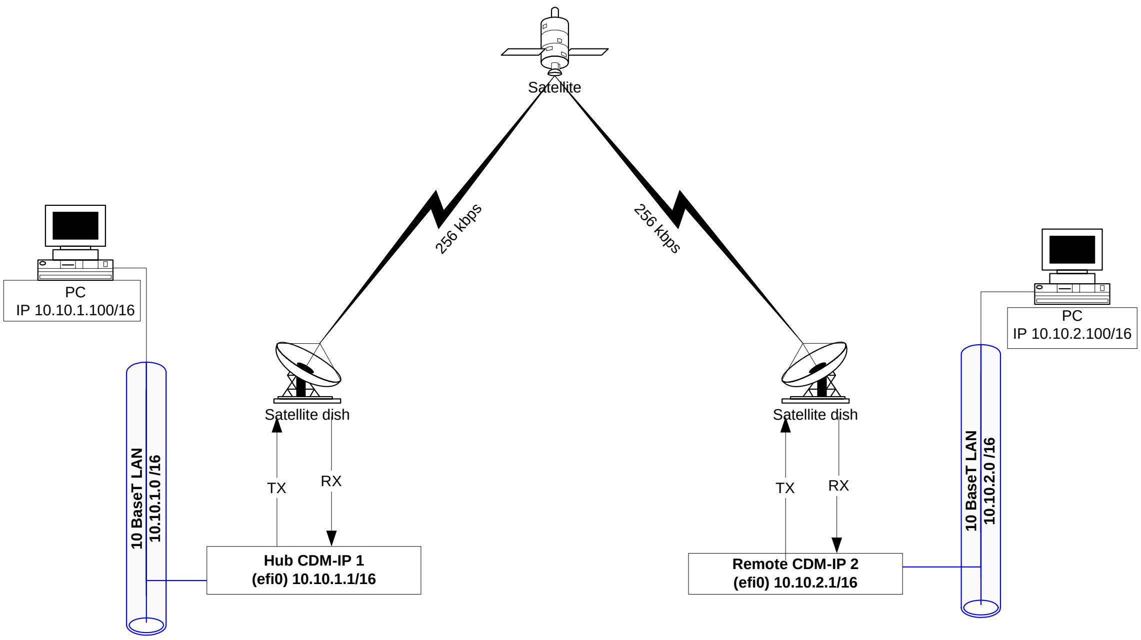


Figure 16-1. easyConnect™ Diagram

This diagram shows a 256 kbps Point-to-Point duplex link in easyConnect™ Mode. Note that both sides of the link are on the same IP subnet - 10.10.0.0/16. There are no routes or HDLC addresses to configure. When the system is powered-up, all packets from each subnet (local and remote) will be sent over the satellite interface. Each Comtech EF Data IP Modem learns which devices are attached to their local Ethernet interfaces and will only send packets over the satellite that are not destined for the locally attached devices.

IMPORTANT

The default setting in easyConnect™ Mode is 10BaseT/Half Duplex. Only 10BaseT operation is allowed in easyConnect™, but Half or Full Duplex can be selected. In Router Mode, the default setting allows the Ethernet port to auto-negotiate its link speed on power-up.

IMPORTANT

easyConnect™ mode will automatically use Header Compression (even if Header Compression option has not been purchased). Because of this, some of the initial traffic sent between two devices will not be received over the satellite until a full Header is transmitted. For example, the default Header Compression Refresh Rate is 50 packets. If a ping is sent over the satellite, then it will time out until the full Header packet is sent. The Header Compression Refresh Rate on the Administration Menu can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Once communication between two devices has been established, both CDM-IP modems will be able to receive all traffic, unless one CDM-IP is power cycled or reset.

16.3.2 Router Working Mode – Point-to-Point

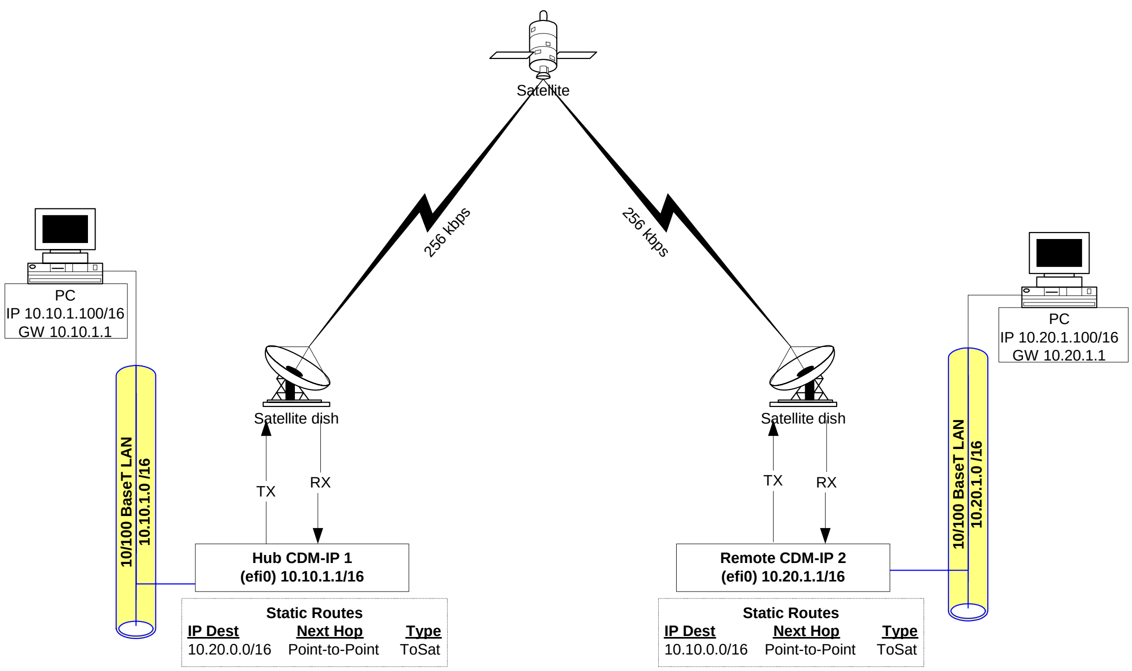


Figure 16-2. Router Mode, Point-to-Point Diagram

This diagram shows a 256 kbps Point-to-Point duplex link in Router Mode. Note that each side of the link has different IP subnets – 10.10.0.0/16 and 10.20.0.0/16. Each CDM-IP modem has a static route defined for the distant CDM-IP modem subnet. The Next Hop is automatically defined as Point-to-Point and there are no HDLC addresses to configure. All that would be required to send traffic between the PCs on each subnet would be to define the local CDM-IP modem as the PC default gateway. The CDM-IP modems will only pass traffic over the satellite link by the ToSat routes configured in the Route Table.

16.3.3 Router Working Mode – Point-to-MultiPoint

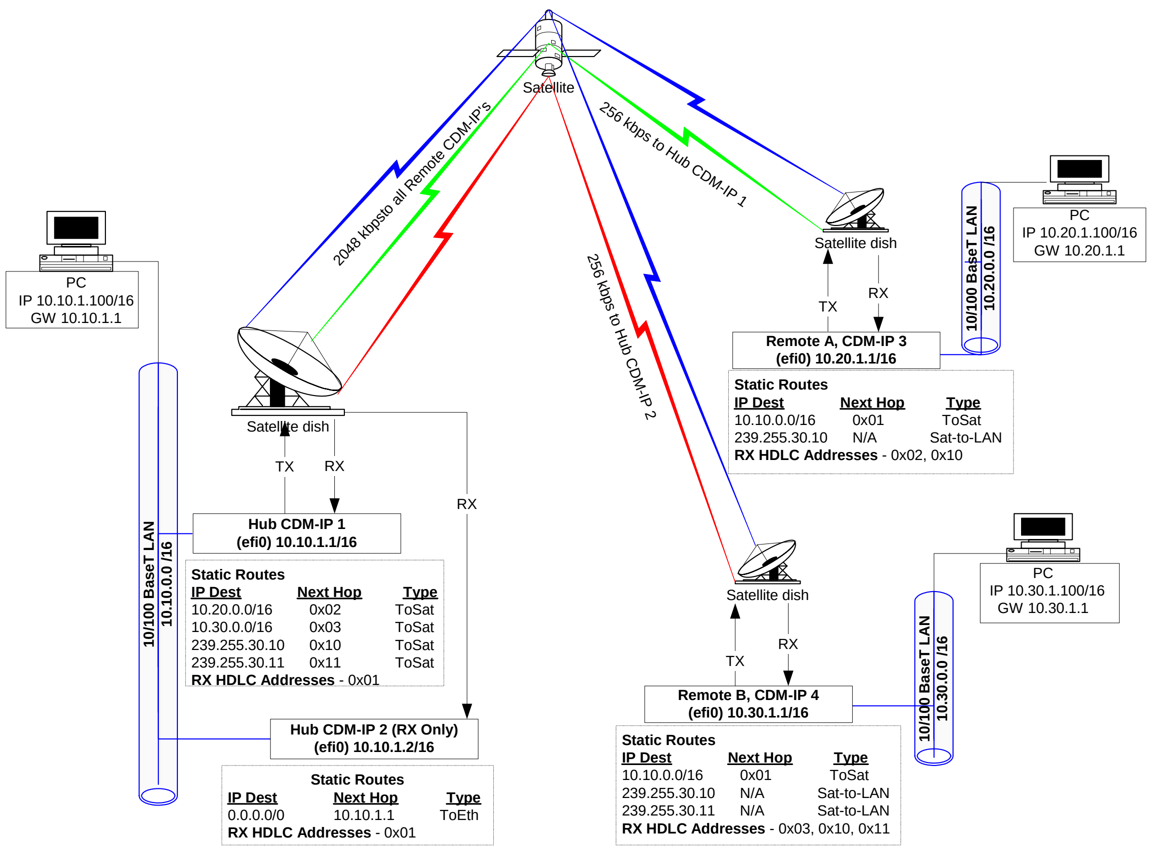


Figure 16-3. Router Mode, Point-to-Multipoint Diagram

"Star Network" Point-to-MultiPoint Configuration - Here, Hub CDM-IP 1 is transmitting a common 2.048 Mbps link to 2 remote CDM-IPs. In turn, Remote CDM-IP 3 is transmitting a 256 kbps link back to Hub CDM-IP 1. Remote CDM-IP 4 is also transmitting a 256 kbps link back to the Hub, but it is a separate link to Hub CDM-IP 2.

Since this is a Point-to-MultiPoint configuration, HDLC addressing is used so that the traffic not intended for a particular destination can be filtered. For unicast traffic, it is best to associate a unique HDLC address for each site in the network. For this case, the Hub Site is HDLC 0x01, Remote A is HDLC 0x02 and Remote B is 0x03. Each CDM-IP modem would select the HDLC address associated with its site as a RX HDLC Address, so both CDM-IP modems at the Hub would have 0x01 as the first RX HDLC Address, CDM-IP 3 would have 0x02 and CDM-IP 4 would have 0x03.

Hub CDM-IP 1 has static routes defined for both remote CDM-IP subnets with the Next Hop HDLC address being the HDLC address associated with the remote site. Both remote CDM-IPs have static routes to the hub with the next Hop being HDLC 0x01. The

Hub RX only CDM-IP 2 has a default route (ToEth) to Hub CDM-IP 1 because all outbound traffic will go through CDM-IP 1.

Additionally, HDLC addresses can be used to select or filter multicast traffic on the hub outbound common carrier. Hub CDM-IP 1 has two multicast routes defined with two Next Hop HDLC addresses, 0x10 and 0x11. Remote CDM-IP 2 has RX HDLC Address 0x10 enabled to receive one of the multicast streams. Remote CDM-IP 3 has RX HDLC Addresses 0x10 and 0x11 enabled to receive both of the multicast streams.

Additional remote sites can be added through a dedicated RX Only CDM-IP, such as the CDD-564/L or CDD-562L, at the hub for each remote.

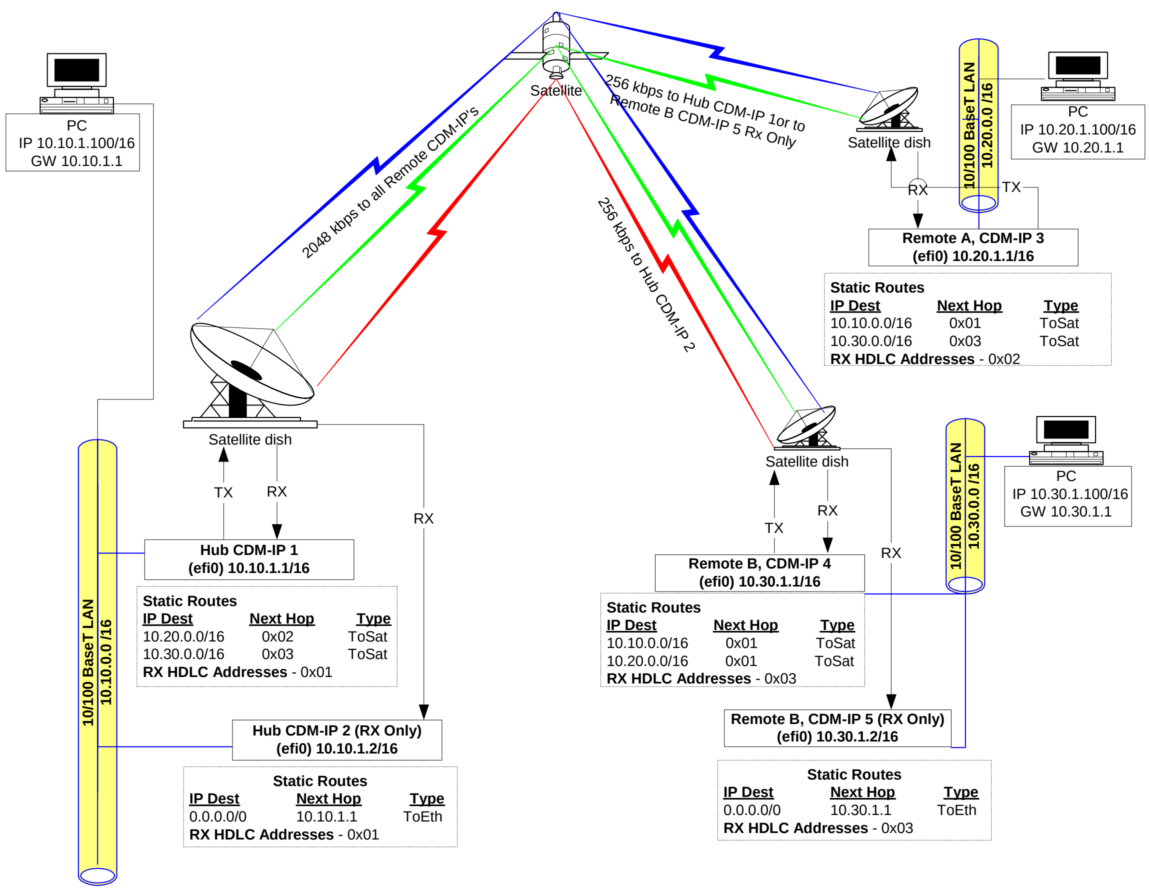


Figure 16-4. Router Mode, Partial Mesh, 1½ Hop Diagram

Full or partial "Mesh Network" Configuration – The "Star Network" configuration works for a "hub-centric" network, where all traffic is either coming to, or from, one central hub. There are several ways to send traffic between remote sites.

The first method does not require any additional CDM-IP modems than is described in Figure 16-3, Router Mode, Point-to-Multipoint Diagram. Just by adding static routes, traffic could be sent between Remote Site A and B. Remote site A and B would add a static route for remote destination subnet, but since the path to the remotes must go through the Hub, the Next Hop HDLC Address would be 0x01, not the HDLC address of the Remote. Traffic from Remote B would be transmitted to Hub RX Only CDM-IP 2, forwarded to Hub CDM-IP 1 and retransmitted to Remote A. With this method, all traffic must go through a “double hop” in order to arrive at the destination.

To avoid the additional delay of the “double hop” method, an alternative method would require an additional RX Only CDM-IP modem at remote site for every other remote site connection needed. In Figure 16-4, Router Mode, Partial Mesh, 1½ Hop Diagram, Remote Site B has added a RX Only CDM-IP and a static route to 10.20.0.0/16, Next Hop 0x01 (through the Hub). Remote Site A has added a static route for 10.30.0.0/16, Next Hop 0x03. To establish a connection between Remote A and B, Remote A would reconfigure the TX frequency and data rate to set up a link with the Remote B RX Only modem. The return path still must go from B to the Hub and then to A, but A has a direct link to B, thus this is considered a 1½ hop link.

Additional RX Only or full duplex CDM-IP modems can be added at Remotes based upon what 1½ hop link or single hop connections are required. Always use the following guidelines:

1) All CDM-IP modems will list the Site HDLC as their first RX HDLC Address.

2) For Satellite routes, the Next Hop is the destination Site HDLC (unless there is <u>not</u> a direct satellite link, whereas the Next Hop must be the Hub Site).

3) RX Only CDM-IP modems will need a default To Ethernet route to a duplex CDM-IP Modem at the site in order to forward traffic.

Chapter 17. IP MODULE - CLI AND TELNET OPERATION

17.1 Overview

This section defines the user menu system connected to the IP Module via a Terminal Emulator or Telnet. In the process of configuring each parameter, an overview of the parameter and its impact on the configuration of the IP Module is provided.

When connecting via a Terminal Emulator, the user should be physically attached to the Console Port of the IP Module. The terminal emulator should be configured to match the console port setting. The default console port setting is 38,400 bps, 8 data bits, no parity, 1 stop bit and no flow control.

When connecting via telnet, the user must have network connectivity to the Traffic Ethernet Port of the IP Module. This connectivity can be via a local LAN, a remote LAN, or via a satellite link from another IP modem. The Ethernet Speed Mode is a configurable parameter of the IP Module and thus its exact setting can vary between specific installations.

IMPORTANT

The IP MODULE does not allow concurrent access to the menu via telnet and the console port. If a user connects via telnet, IP MODULE automatically disables the console port for the duration of the Telnet session. All menu pages allow a Telnet logout to end a Telnet session. Also, the IP MODULE will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

IMPORTANT

Any changes made to the base modem and IP Module will be lost if the IP Module is reset or loses power unless the changes are saved to permanent storage. This applies to all of the IP Module and base modem parameters. The parameters can be saved by selecting “S”, available on any CLI/Telnet Menu page.

Note: As of CDM-IP version 1.5.3, all parameters for the modem are stored in the IP Module parameter file. This provides a single file to store the entire contents of the modem.

The CLI and Telnet Access Levels are defined as follows:

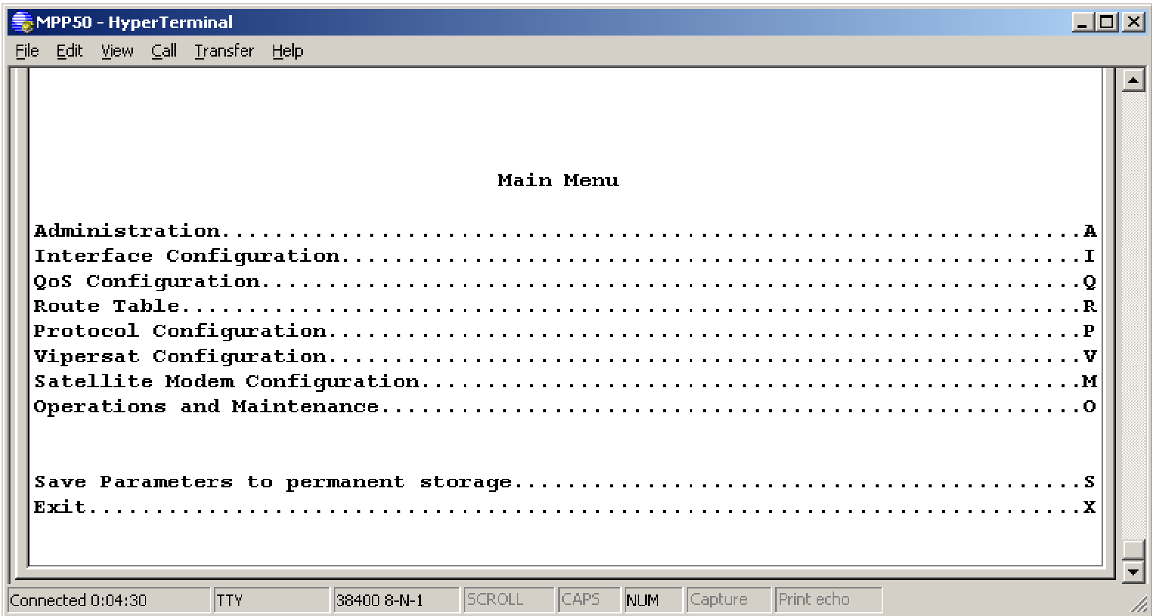
<table>
<tr><th rowspan="2">User Interface</th><th colspan="3">User Login Access Level</th></tr>
<tr><th>Admin User</th><th>Read/Write User</th><th>Read Only User</th></tr>
<tr><td>CLI
(direct to console port)</td><td colspan="3">Full Access – no Login</td></tr>
<tr><td rowspan="2">Telnet</td><td rowspan="2">Full Access
all Menus</td><td>No Access to Admin Menu</td><td rowspan="2">No Access</td></tr>
<tr><td>Full Access all other Menus</td></tr>
</table>

Default Name/Passwords are:

- Admin comtech/comtech
- Read/Write opcenter/1234
- Read Only monitor/1234

17.2 Main Menu Page

Menu pages are followed by a table listing the Menu Options/Fields, required Entry, and Descriptions.



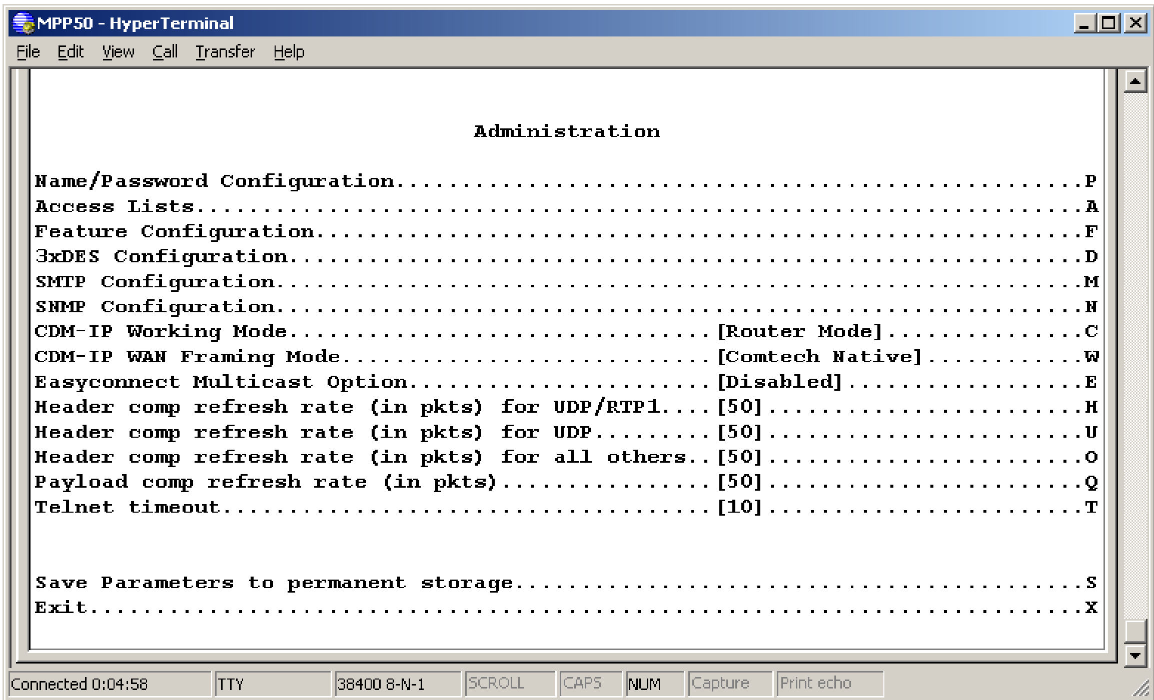
The *Main Menu* page has the following options/fields:

Menu Options/Fields	Entry	Description
Administration	**A**	The Administration menu provides a basic set of standard admin functions to the IP Module. When connected via telnet, navigation to this menu will be restricted to the admin user.
Interface Configuration	**I**	Allows the user to configure the Ethernet and Satellite interfaces.
QoS Configuration	**Q**	Allows the user to define QoS rules for up to 32 different types of flows.
Route Table	**R**	Allows a user to define how the IP Module will route packets that it receives on its Ethernet and Satellite interfaces.
Protocol Configuration	**P**	The Protocol Settings option allows the user to configure various protocols used by the IP Module. These protocols currently include ARP and IGMP.
Vipersat Configuration	**V**	Only used when the CDM-570/570L is used in a Vipersat system.

Menu Options/Fields	Entry	Description
Satellite Modem Configuration	**M**	The Modem Parameters option displays a set of menus that allows a user to configure and monitor the satellite base modem.
Operations and Maintenance	**O**	The Operations & Maintenance Menu allows a user to configure various options used to control and maintain the system. Also has diagnostic tools for troubleshooting and Statistics.
Save Parameters	**S**	This option allows a user to save the current configuration of the IP Module to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.1 Administration Page

The *Administration* page is activated from the *Main Menu* page.



IMPORTANT

Access to the Administration page is restricted to the Admin user when connecting via the Telnet, SNMP, or HTTP interface. The Administration page is available when connected via the Terminal Emulator (serial) connection because there is no log in.

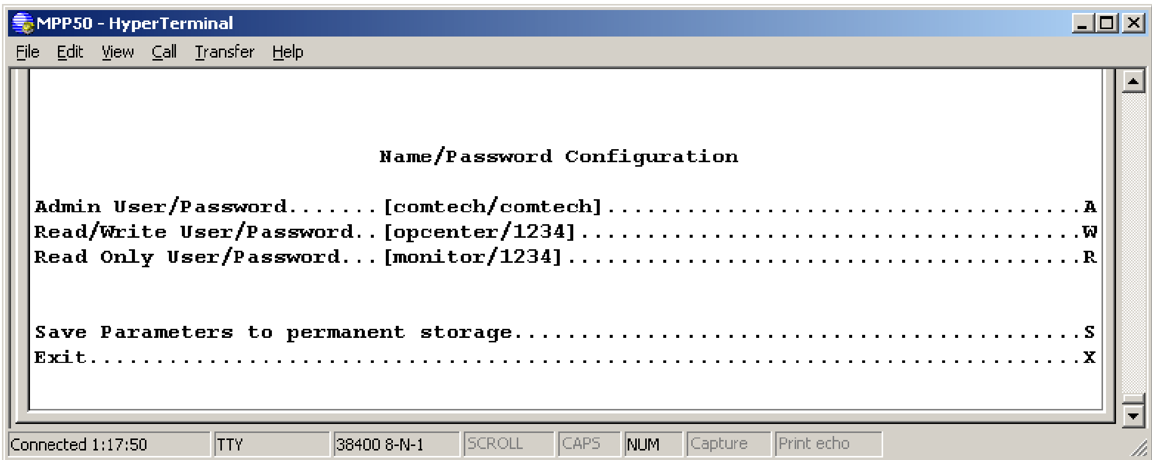
The *Administration* page contains the following options/fields.

Menu Options/Fields	Entry	Description
Name/Password Configuration	**P**	Activates *Name/Password Configuration* page. Allows the user to define the user name and passwords that are required in order to access the management interfaces.
Access Lists	**A**	Activates *Access Lists* page. Allows the user to restrict access to the management interfaces based upon the requester's IP address.
Feature Configuration	**F**	Activates *Feature Configuration* page.

Menu Options/Fields	Entry	Description
3xDES Configuration	**D**	The 3xDES Configuration Page allows the user to determine if 3xDES encryption is enabled on a device and if so, the 3xDES keys that are used to decrypt traffic. The keys specified for the transmit function are completely independent for the 3xDES keys specified for the receiver function.
SMTP Configuration	**M**	The SMTP configuration page allows the user to specify appropriate settings for SMTP email server.
SNMP Configuration	**N**	The SNMP configuration page allows the user to specify management parameters for SNMP.
Working Mode	**C**	Used to set the Working Mode to: Router – Small Network Router – Large Network Router – Point to Point Router – Vipersat easyConnect™ See Chapter 15 for additional information.
easyConnect™ Multicast Option	**E**	When unit is running in easyConnect™ mode, multicast is only forwarded across link if both units have this feature enabled.
Header comp refresh rate (in pkts) for UDP/RTP1	**H**	This setting allows for the adjustment of how often to send a full header of this type of traffic when Header Compression is enabled.
Header comp refresh rate (in pkts) for UDP	**U**	This setting allows for the adjustment of how often to send a full header of this type of traffic when Header Compression is enabled.
Header comp refresh rate (in pkts) for all others	**O**	This setting allows for the adjustment of how often to send a full header of this type of traffic when Header Compression is enabled.
Payload comp refresh rate (in pkts)	**Q**	This setting allows for the adjustment of how often to send a full payload when Payload Compression is enabled.
Telnet Timeout	**T**	The Telnet timeout determines how many minutes (1-60) of Telnet inactivity before the Telnet session is automatically terminated.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.1.1 Name/Password Configuration Page

The *Name/Password Configuration* page is activated from the *Administration* page. This option allows a user to define the passwords required to access via HTTP, FTP, SNMP, and TELNET.



IMPORTANT

All Usernames and Passwords are case sensitive.

There is a minimum of 1 and maximum of 11 characters.

Any or all of the Usernames and Passwords can be removed by entering “NONE NONE” from the CLI or Telnet.

Removing all Usernames and Passwords would only allow access to the IP functions when connected via the Terminal Emulator (serial) connection (because there is no log in).

FTP access is restricted to Admin Username/Password only. FTP is only used to upgrade the IP SOFTWARE or to load or retrieve the IP Parameter file.

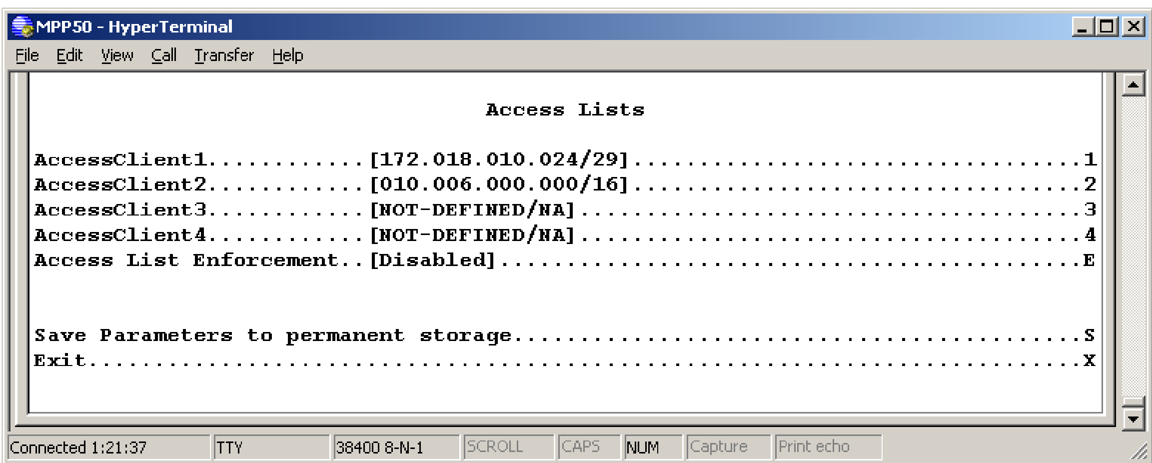
The *Name/Password Configuration* Page contains the following options/fields:

Menu Options/Fields	Entry	Description
Admin User/Password	**A**	Enter the user name and password with a space delimiter. Ex: <user> <passwd> Enter NONE NONE to erase
Read/Write User/Password	**W**	Enter the user name and password with a space delimiter. Ex: <user> <passwd> Enter NONE NONE to erase

Menu Options/Fields	Entry	Description
Read Only User/Password	**R**	Enter the user name and password with a space delimiter. Ex: <user> <passwd> Enter NONE NONE to erase
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.1.2 Access Lists Page

The *Access Lists* page is activated from the *Administration* page. This page allows the user to limit monitor and control access to the unit from a specified list of authorized clients.



IMPORTANT

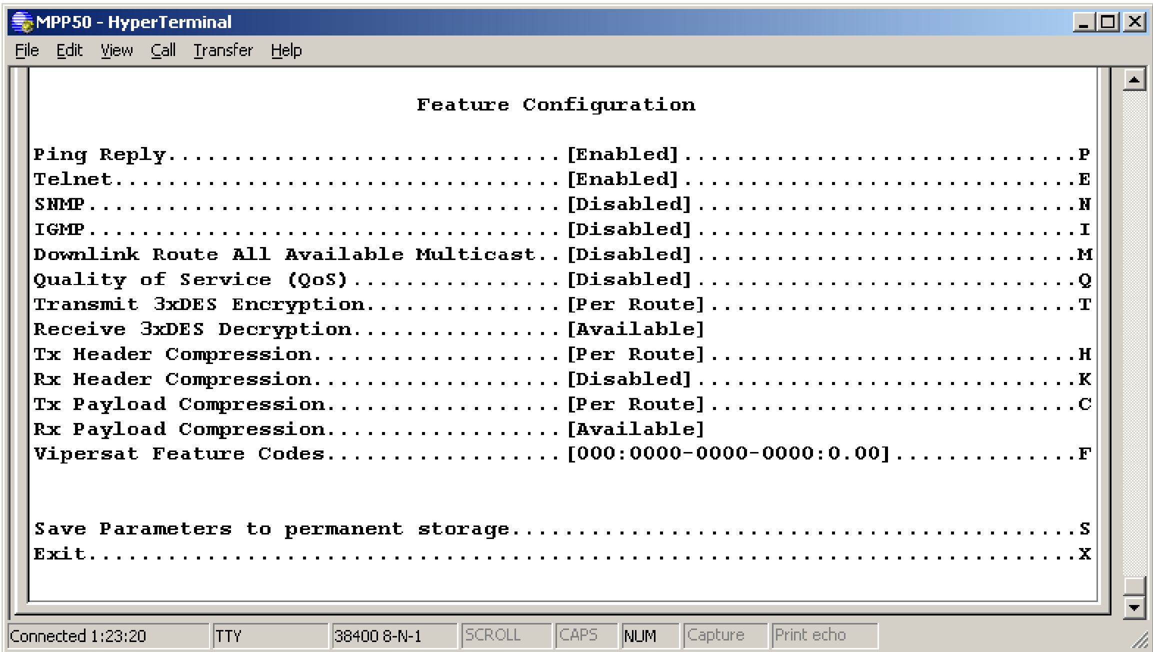
If connecting to the IP modem remotely, the IP address of the machine used to manage the IP modem should be included in the Access List.

The *Access Lists* page contains the following options/fields:

Menu Options/Fields	Entry	Description
AccessClient1 - 4	**1 - 4**	The Access Client list allows a user to define which remote clients can connect when the Access List Enforcement is enabled. Each entry allows a user to specify an IP Address or a subnet mask to define a unique class of machines that are allowed access. For example, if a user wanted to grant access to a PC with an IP Address of 10.10.10.1 and any PC on a subnet of 192.168.10.xxx, then the Access List would be defined as: AccessClient1 …[10.10.10.1/32] AccessClient2…. [192.168.10.0/24]
Access List Enforcement	**E**	The Access List Enforcement allows a user to grant access via ping, telnet, HTTP, FTP, and SNMP to a well-defined list of client machines. Access List Enforcement toggles between [Enabled] and [Disabled]. If disabled, then any client machine will be able to connect via ping, telnet, HTTP, FTP, and SNMP. If enabled, then only those machines specified in the Access Client List will be allowed to connect via ping, telnet, HTTP, and SNMP.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.1.3 Feature Configuration Page

The *Feature Configuration* page is activated from the *Administration* page.



The Feature Configuration menu communicates to the user the current availability for each of the features. If a feature is marked "Unavailable" then the feature is a FAST feature. FAST features must be purchased from Comtech EF Data.

The Feature Configuration menu contains the following options/fields:

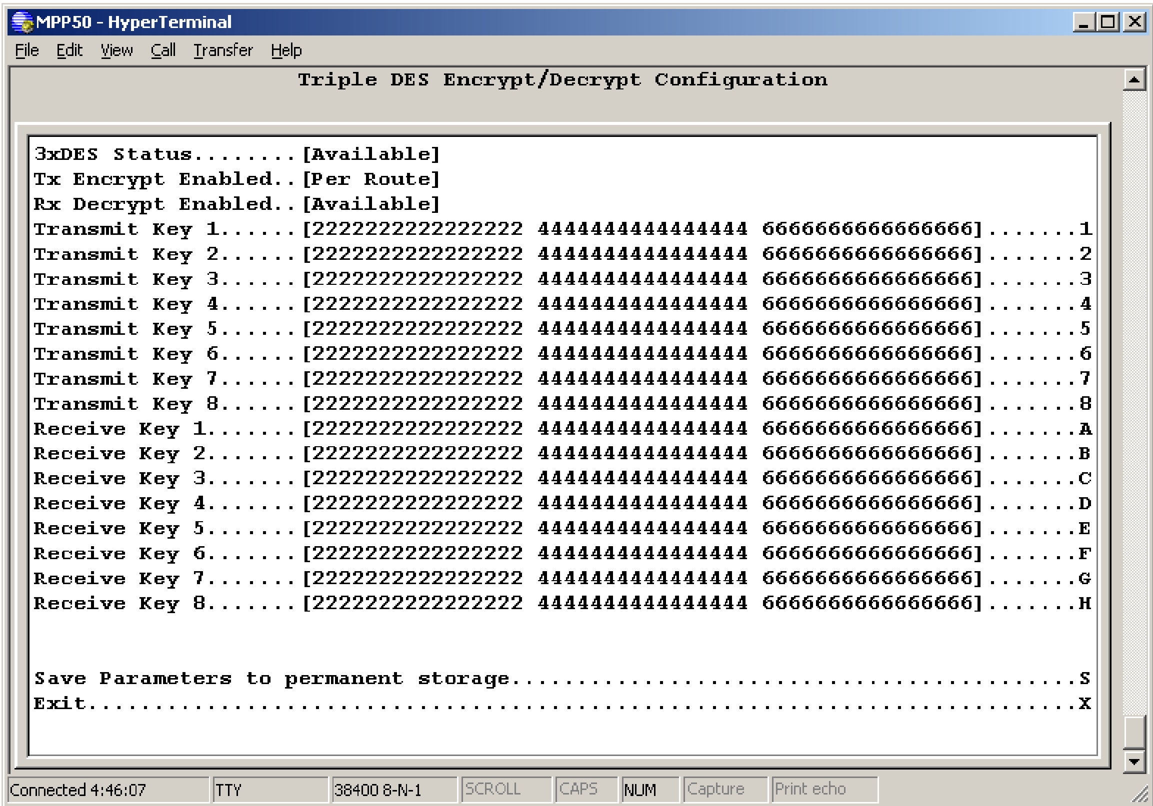
Menu Options/Fields	Entry	Description
Ping Reply	**P**	Toggles [Enabled] and [Disabled] Enabled tells the IP Module to respond to ping requests directed to the IP Module Ethernet Interface. Disabled tells the IP Module not to respond to ping requests. This is used as a security feature to prevent unauthorized parities from determining if a device exists via the ping utility.
Telnet	**E**	Toggles [Enabled] and [Disabled] Enabled allows access via Telnet. Disabled denies access via Telnet.

Menu Options/Fields	Entry	Description
SNMP	**N**	Toggles [Enabled] and [Disabled] Enabled tells the IP Module to respond to SNMP requests against the private and public MIB. Disabled tells the IP Module not to respond to SNMP requests against the private and public MIB.
IGMP	**I**	Toggles [Enabled] and [Disabled] The receive portion of a IP Module will utilize the IP Module as an IGMP server. The transmit portion of a IP Module will utilize the IP Module as an IGMP client. The *IGMP Information* Page configures the IP Module to report an interest to join a Multicast group on an IGMP server. The IGMP protocol is used to regulate Multicast traffic on a LAN segment to prevent information of no interest from consuming bandwidth on the LAN.
Downlink Route All Available Multicast	**M**	Toggles [Enabled] and [Disabled] Enabled tells the IP Module to route all Multicast packets coming from the Satellite interface to the Ethernet LAN regardless of the Route Table entries. Disabled tells the IP Module not to automatically forward all Multicast packets. This IP Module will only forward multicast traffic received from the satellite to the Ethernet port if the multicast route exists in the Route Table.
Quality of Service (QoS)	**Q**	Toggles [Enabled] and [Disabled]. This feature must be purchased. Enabled tells the IP Module to apply configured QoS rules on all packets going out the Satellite Interface. When Disabled the IP Module does not apply QoS rules for outgoing packets.
Transmit 3xDES Encryption	**T**	Toggles [Enabled] and [Disabled] This feature must be purchased. Enabled allows the IP Module to assign a TX key to encrypt packets for a specific route being sent over the Satellite Interface. When Disabled the IP Module cannot encrypt packets being sent over the Satellite interface.

Menu Options/Fields	Entry	Description
Receive 3XDES Decryption	**Read Only**	This feature must be purchased. Available allows the IP Module to decrypt packets being received from the Satellite Interface. When Unavailable the IP Module cannot decrypt packets received from the Satellite Interface. This option is auto-sensed by a bit carried in packet headers. This option is always available if the option is purchased.
Tx Header Compression	**H**	This option will compress headers. Headers available for compression can be referenced in the IP Header Compression section. Note that in easyConnect™ mode all Ethernet Headers will be compressed whether or not this feature is enabled. In Router mode, this screen will show Available, and the option must be enabled per route in Route table.
Rx Header Compression	**K**	This option tells the system to expect received streams to be Header compressed. Note a CDM-IP modem must receive all streams compressed or not compressed. The modem has no way to distinguish between compressed or not compressed.
Tx Payload Compression	**C**	This option allows a stream of traffic to be payload compressed. Payload is considered everything inside the HDLC satellite frame. Therefore, IP headers could be compressed as well. Note that in easyConnect™ mode, the option is enabled/disabled for all traffic. In Router mode, Payload compression will show Available, and one must set the option Per Route in Routing table.
Rx Payload Compression	**Read Only**	Receive payload compression option allows a unit receiving a stream of data that has been payload compressed to be correctly uncompressed. This option is auto-sensed by a bit carried in packet headers. This option is always available if the option is purchased.
Vipersat Feature Codes	**F**	This option allows a user to enter a Vipersat features enable code that has been provided by Comtech Vipersat for modem configured to operate under VMS control.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.1.4 3xDES Encrypt Configuration Page

The *3xDES Encrypt/Decrypt Configuration* page is activated from the *Administration* page.



Note: This menu will only be accessible if the 3xDES FAST feature has been purchased and the license key has been entered through the modem front panel.

The *3xDES Encrypt Configuration* contains the following options/fields:

Menu Options/Fields	Entry	Description
3xDES Status	**Read Only**	Displays status, [Available] or [Unavailable]. Available is displayed when the 3xDES feature has been installed. Unavailable is displayed when the 3xDES feature has not been installed.

Transmit Encrypt Enabled	**Read Only**	Displays feature status. This field is updated via the *Features Configuration* menu. If Transmit Encrypt is disabled, then all traffic processed by the IP Module will be transmitted in the clear regardless of the 3xDES encryption key specified in the Route table.
Receive Decrypt Enabled	**Read Only**	Displays feature status. This field updates via the *Features Configuration* menu.
Transmit Key 1 - 8	**1 through 8**	These 3xDES keys are used to encrypt traffic being sent over the Satellite Interface. The key is entered in HEX (48 digits max)
Receive Key 1 - 8	**A through H**	These 3xDES keys are used to decrypt traffic being received from the Satellite Interface. The key is entered in HEX (48 digits max)
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

IMPORTANT

A 24 Byte [192-bit] 3xDES key is actually a combination of 3 single DES keys of 8 Bytes [64-bits]. The CLI will display the Key with a space separating the Key into 3 sections. In the screen capture above, Transmit Key 1 is displayed as:

2222222222222222 4444444444444444 6666666666666666

Consider the first section as Key1A, the second as Key1B, and the third as Key1C.

Data is first encrypted with Key1A and then decrypted with Key1B and again encrypted with Key1C. So if a user specifies all the three Keys the same, (like 48 ‘1's OR all the characters in DES key the same) the cumulative effect of 3xDES is just a single DES. When data is first encrypted with Key1A and decrypted with Key1B we get back the original data and then when encrypted with Key1C results in a total effect of single DES key.

Because of this, the user is required to enter unique 64-bit keys. If any 2 sections of the Key match, the IP Module will respond `Invalid Key - Please Re-enter`

Also, The Least Significant bit of each byte in a 24 Byte [192-bit] 3xDES key is reserved for the DES Algorithm for parity. Entries of 1, 3, 5, 7, 9, B, D, or F will have all the corresponding bit positions masked. So a Key entry of:

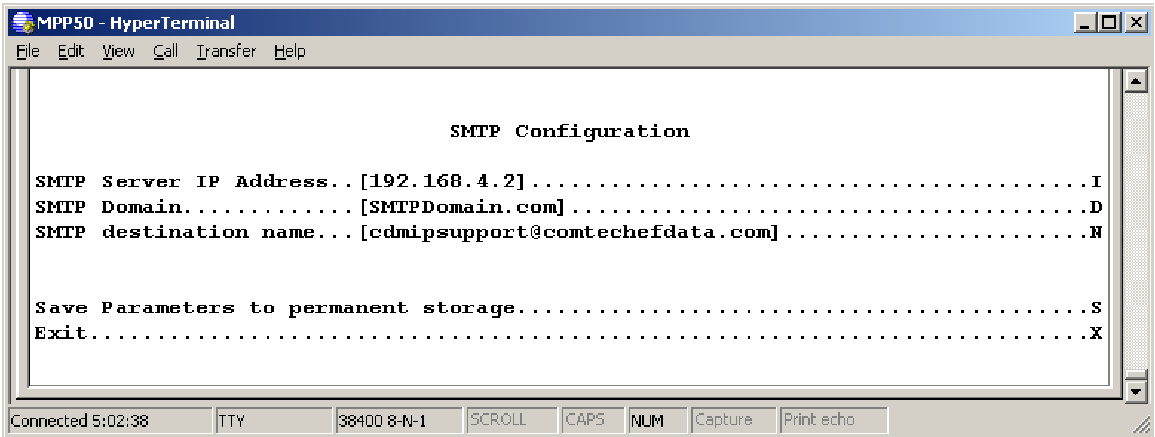
1111111133333333 5555555577777777 99999999BBBBBBBB

becomes

1010101032323232 5454545476767676 98989898BABABABA

17.2.1.5 SMTP Configuration Page

The *SMTP Configuration* page is activated from the *Administration* page.



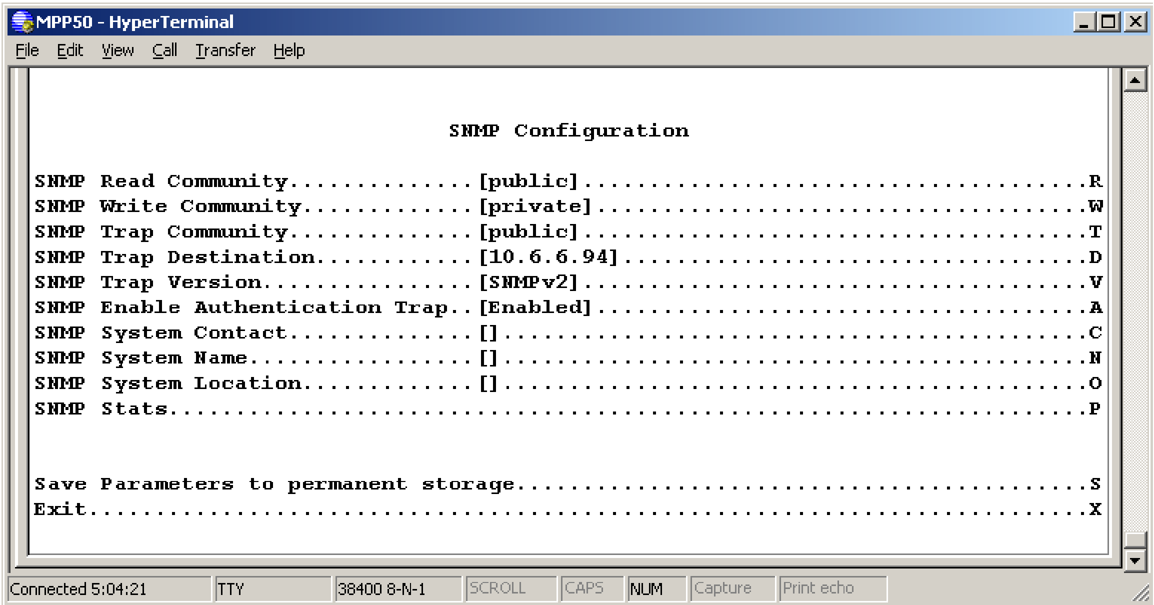
The SMTP Configuration contains the following options/fields:

Menu Options/Fields	Entry	Description
SMTP Server IP Address	**I**	The mail server address from where you want to send the email.
SMTP Domain	**D**	Set to the domain of the email server (usually found to the right of the @ symbol in an email address).
SMTP Destination Name	**N**	Set the email recipient names (usually found to the left of the @ symbol in an email address).
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

Note: SMTP can be used to send an email to Comtech EF Data IP Modem Support cdmipsupport@comtechefdata.com using the Support Web Page by connecting to the IP Module with a Web Browser. The Support Web Page allows you to compose an email message for questions or problems with the IP Module. The user can also select to automatically attach the IP Module parameter file in order to facilitate troubleshooting or to resolve configuration issues.

17.2.1.6 SNMP Configuration Page

The *SNMP Configuration* page is activated from the *Administration* page.



The SNMP Configuration contains the following options/fields:

Menu Options/Fields	Entry	Description
SNMP Read Community	**R**	GET community - allows GET operations to all portions of the IP Module Controller and CDM-570/570L modem MIBs.
SNMP Write Community	**W**	SET community string - allows SET operations to all portions of the IP Module Controller and CDM-570/570L modem MIBs.
SNMP Trap Community	**T**	Community String that will be set in the Community field of all outgoing traps. This field on the trap PDU may be checked by the network manager application to determine if the trap came from a “trusted” agent.
SNMP Trap Destination #1	**D**	First IP address where all traps/notifications will be sent. If a network management application is running in the network, it should be configured to receive traps and its IP address should be entered here.

Menu Options/Fields	Entry	Description
SNMP Trap Destination #2	**2**	Second IP address where all traps/notifications will be sent. If a network management application is running in the network, it should be configured to receive traps and its IP address should be entered here.
SNMP Trap Version	**V**	Determines whether an SNMPv1 trap or SNMPv2 notification is sent.
SNMP Enable Authentication Trap	**A**	Determines whether a MIB2 authentication trap will be sent when a PDU with an invalid community string is encountered. A community string is invalid when it does not match the Admin, the Read Write, or the Read Only community strings.
SNMP System Contact	**C**	User defined SNMP Contact information.
SNMP System Name	**N**	User defined SNMP Name information.
SNMP System Location	**O**	User defined SNMP Location information.
SNMP Stats	**N**	Displays statistics concerning the operation of the SNMP agent (number of IN SNMP packets, number of OUT SNMP packets, number of OUT Traps, etc.)
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.1.7 Working Mode

The *Working Mode* page is activated from the *Administration* page.

IMPORTANT

Changing the Working Mode will require a system reboot.

The *Working Mode* contains the following option/field:

Menu Options/Fields	Entry	Description
IP Module Working Mode	**C**	Select the Working mode: For all Router Modes - IP packets are routed based on the Route table information input by the user. Non-IP packets are discarded. Operates at 10/100BaseT. Router – Small Network: Router uses 1 byte hdlc addresses. Router – Large Network: Router mode using 2 byte hdlc addresses. Router – Point to Point: Router mode uses 0 hdlc addresses to save satellite bandwidth Router – Vipersat: Router mode when running in a Vipersat Network. EasyConnect: default operating mode, and operates at 10/100BaseT. In this mode the IP Module will forward both IP and non-IP datagrams over satellite without any defined routes. See Chapter 15 for additional information.

17.2.1.8 easyConnect™ Multicast Option

The e*asyConnect ™ Multicast Option* allows multicast to be either transmitted or received through the modem. This applies to easyConnect™ mode only. easyConnect™ mode will normally filter multicast traffic.

IMPORTANT

If the Working Mode is easyConnect™ and multicast traffic is intended to pass across a pair of modems, this option must be enabled on both modems.

17.2.1.9 Header/Payload Compression Refresh Rate

The *Header Compression Refresh Rates* are configured from the *Administration* page.

Menu Options/Fields	Entry	Description
Header comp refresh rate (in pkts) for UDP/RTP1	**H**	Selects how often a single, full header UDP/RTP1 packet is transmitted with Header Compression enabled.
Header comp refresh rate (in pkts) for UDP	**U**	Selects how often a single, full header UDP packet is transmitted with Header Compression enabled.
Header comp refresh rate (in pkts) for all others	**O**	Selects how often a single, full header packet is transmitted with Header Compression enabled (for all other types of IP headers).

The *Header Compression Refresh Rates* determines how many compressed header packets will be sent before a single full header packet is sent. Some compressed header traffic could be lost during deteriorated satellite link conditions. Sending a full header packet will allow the return of the traffic stream. Refresh rates from 1 to 600 can be individually selected for UDP/RTP1, UDP and all other IP headers. The Refresh Rate can be decreased for poor satellite link conditions or increased to further reduce overhead.

IMPORTANT

easyConnect™ mode will automatically use Header Compression (even if Header Compression option has not been purchased). Because of this, some of the initial traffic sent between two devices will not be received over the satellite until a full Header is transmitted. For example, the default Header Compression Refresh Rate is 50 packets. If a ping is sent over the satellite it will time out until the full Header packet is sent. The Header Compression Refresh Rate on the Administration Menu can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Once communication between two devices has been established, both CDM-IP modems will be able to receive all traffic, unless one CDM-IP is power cycled or reset.

17.2.1.10 Payload Compression Refresh Rate

The Payload Compression *Refresh Rates* determines how many compressed payload packets will be sent before a single full payload packet is sent. Some compressed payload traffic could be lost during deteriorated satellite link conditions. Sending a full payload packet will allow the return of the traffic stream. Refresh rates from 1 to 600 can be individually selected. The Refresh Rate can be decreased for poor satellite link conditions or increased to further reduce overhead.

17.2.1.11 Telnet Timeout

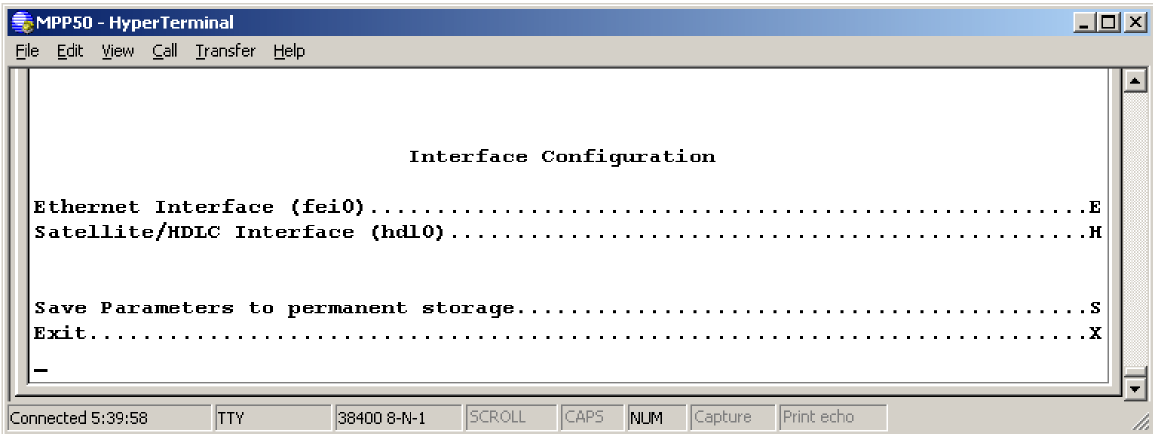
The Telnet timeout determines how many minutes (1-60) of Telnet inactivity before the Telnet session is automatically terminated by the IP Module.

IMPORTANT

The IP Module does not allow concurrent access to the menu via telnet and the console port. If a user connects via telnet, IP Module automatically disables the console port for the duration of the Telnet session. All menu pages allow a Telnet logout to end a Telnet session. Also, the IP Module will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

17.2.2 Interface Configuration Page

The *Interface Configuration* page is activated from the *Main Menu* page.

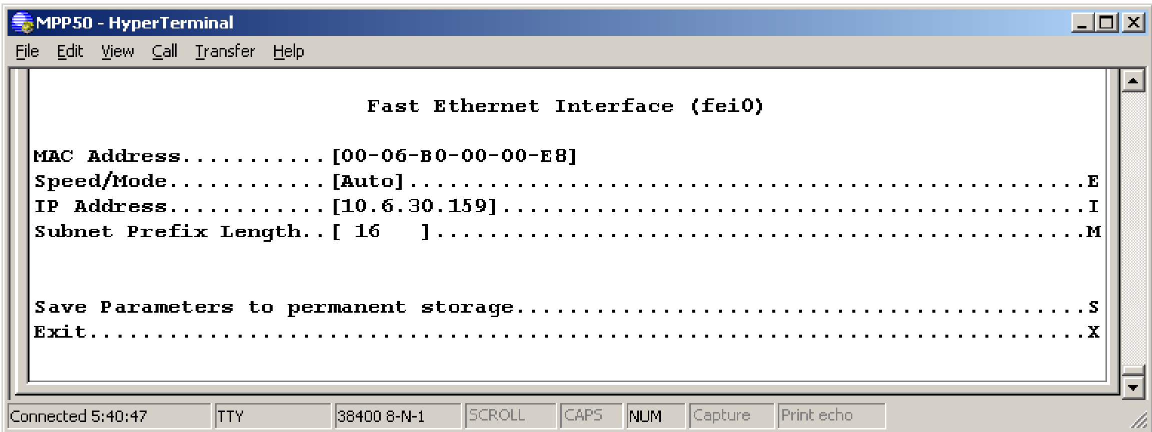


The Interface Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
Ethernet Interface	**E**	Activates *Ethernet Interface* page.
Satellite/HDLC Interface	**H**	Activates *Satellite/HDLC Interface* page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.2.1 Ethernet Interface Page

The *Fast Ethernet Interface* page is activated from the *Interface Configuration* page.

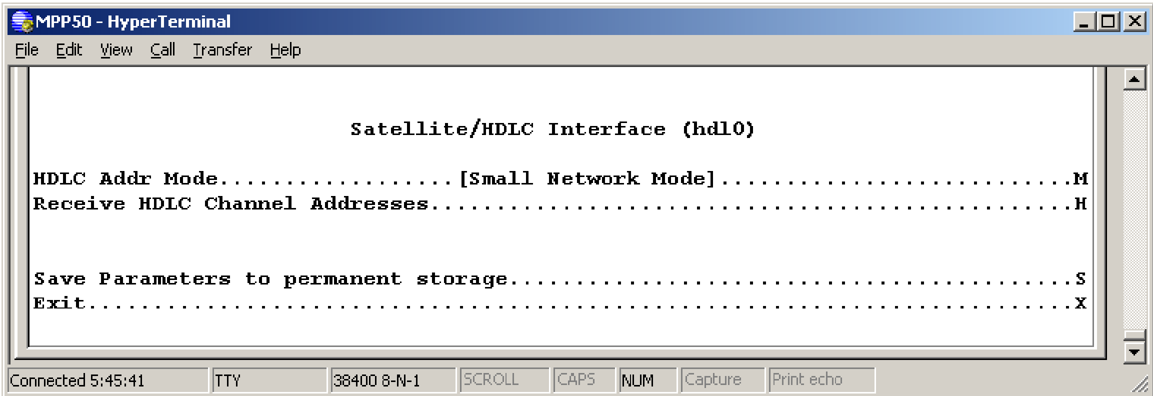


The *Ethernet Interface* page contains the following options/fields:

Menu Options/Fields	Entry	Description
MAC Address	**Read Only**	The MAC Address defines the hardware destination MAC Address that is used when an Ethernet packet is destined for the IP Module Traffic Ethernet Interface. This address is unique and has been assigned permanently at the factory.
Speed/Mode	**E**	The Ethernet Speed Mode is a configurable parameter and thus its exact setting can vary between specific installations. The default setting allows the Ethernet port to auto negotiate its link speed on power-up. Selections are: 1 -- Auto 2 -- 10 MB/sec Half Duplex 3 -- 100 MB/sec Half Duplex 4 -- 10 MB/sec Full Duplex 5 -- 100 MB/sec Full Duplex
IP Address	**I**	This is the IP Address assigned the Ethernet Traffic Interface. Enter the IP address in aaa.bbb.ccc.ddd format
Subnet Prefix Length	**M**	Specifies the Subnet Mask assigned to the Ethernet Traffic Interface. Enter the subnet mask prefix length (8...30)
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.2.2 Satellite/HDLC Interface Page

The *Satellite/HDLC Interface)* page is activated from the *Interface Configuration* page.

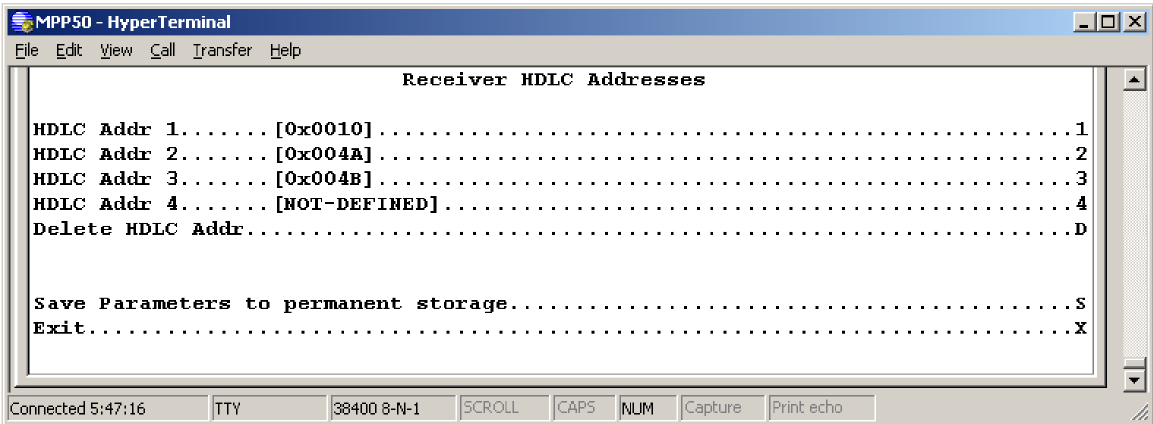


The Satellite/HDLC Interface page contains the following options/fields:

Menu Options/Fields	Entry	Description
HDLC Addr Mode	**Read Only**	The HDLC Address mode is configured via the Working mode which is found on the *Administration* page. Point-To-Point Mode – In this mode of operation, no HDLC address is transmitted over the satellite link. The restrictions on using this mode are that it can only be used for pure Point-to-Point configurations. Small Network Mode (up to 254 addresses) - In this mode of operation a single byte HDLC address will be transmitted over the satellite link (0x1 – 0xFE). Large Network Mode (up to 32766 addresses) - In this mode of operation a two byte HDLC address will be transmitted over the satellite link (0x1 – 0xFFFE).
Receive HDLC Channel Addresses	**H**	Activates *Receiver HDLC Addresses* page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.2.3 Receiver HDLC Addresses Page

The *Receiver HDLC Addresses* page is activated from the *Satellite/HDLC Interface* page. This page allows the user to define up to four HDLC addresses that can carry user information on the Satellite Interface.

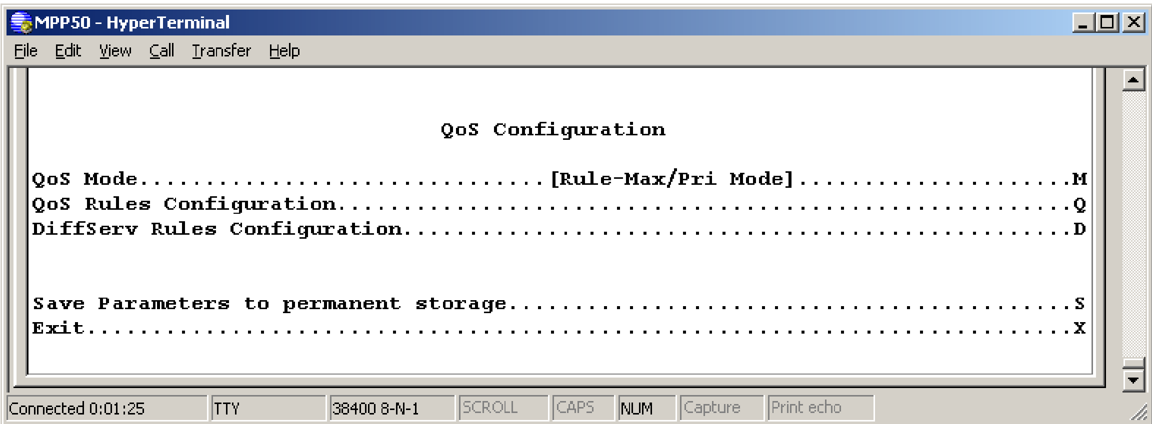


The *Satellite/HDLC Interface* page contains the following options/fields:

Menu Options/Fields	Entry	Description
HDLC Addr 1 - 4	**1 - 4**	HDLC address in hex <1 - FFFE, enter = 0001> **Note:** HDLC addresses are not used in Point-To-Point Mode. Small Network Mode (up to 254 addresses) - The user is limited to valid addresses between the values of 0x01 and 0xFE. Large Network Mode (up to 32766 addresses) - The user is limited to valid addresses between the values of 0x0001 and 0x7FFF.
Delete HDLC Addr	**D**	Enter the HDLC entry to delete <1...4>
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.3 QoS (Quality of Service) Configuration Page

The *QoS Configuration* page is activated from the *Main Menu* page.

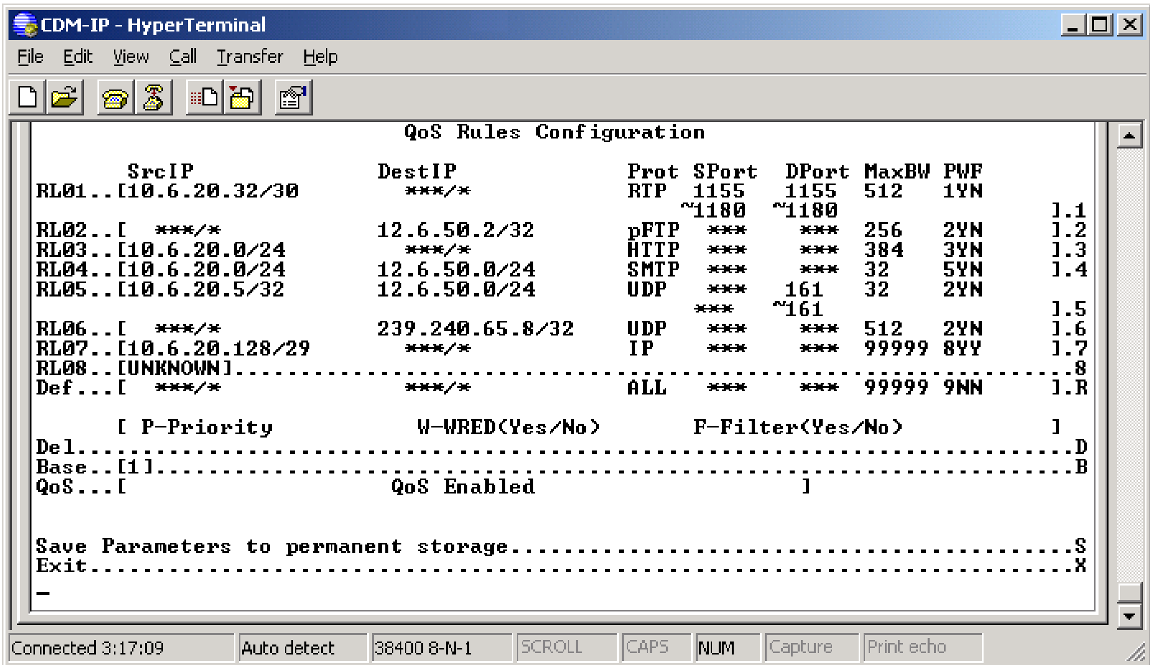


The QoS Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
QoS Mode	**M**	Select; 1 - Rule-Max/Pri Mode 2 - Rule-Min/Max Mode 3 - DiffServ Mode
QoS Rules Configuration	**Q**	Select to define QoS rules for Max/Pri Mode or Min/Max Mode
DiffServ Rules Configuration	**D**	Select to define QoS rules for DiffServ Mode
Maximum System Latency (msecs)	**A**	Defines the maximum duration that a packet will sit in a QoS queue before being aged out and dropped. This allows the user to specify the overall depth of the QoS queues in milliseconds of traffic that is destined to go over the satellite. Lower priority packets are dropped first until there is enough room to send the higher priority packets. Valid range is from 200 to 5000 milliseconds.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.3.1 QoS Configuration Page – Max/Priority Mode

The *QoS Rules Configuration* page is activated from the *QoS Configuration* page.



The *QoS Rules Configuration* page contains the following options/fields when in Max/Pri Mode:

Menu Options/Fields	Entry	Description
Rule 01 – 08 (32) (The 8 currently displayed QoS Rules, up to 32 can be defined). *By selecting a QoS Rule, the user will be asked to define the following:*	**1 - 08**	Max/Pri QoS can be assigned to up to 32 different types of flows to be defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.

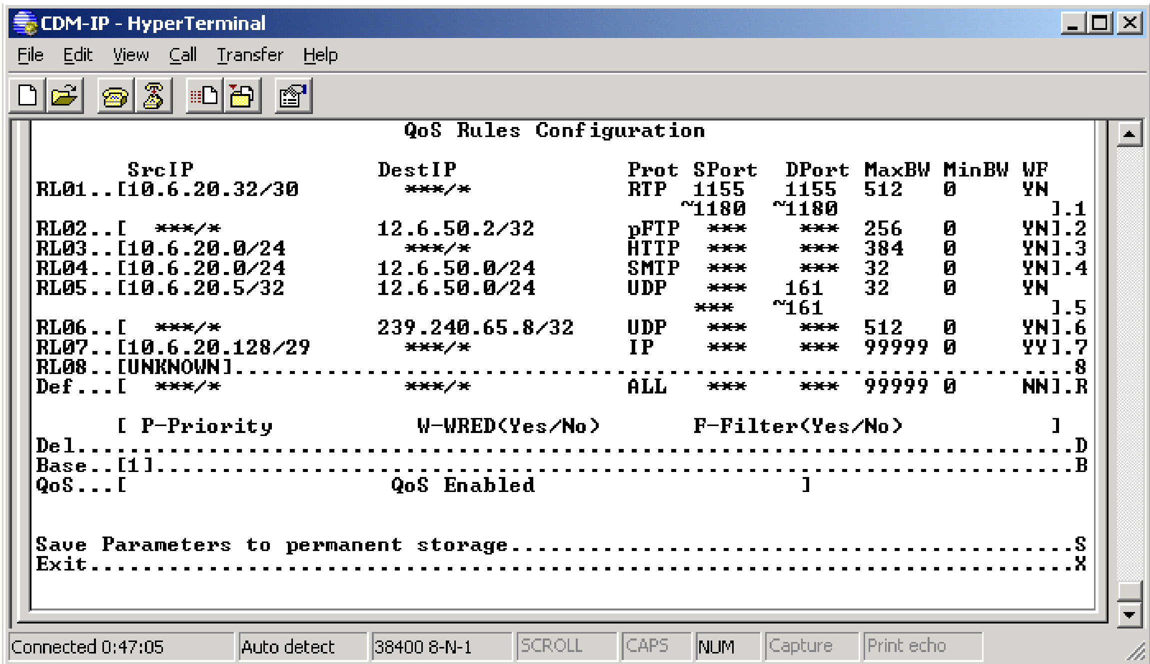
Specify Protocol for the rule	**1**	UDP - *User Datagram Protocol*
	2	TCP - *Transmission Control Protocol*
	3	ICMP – *Internet Control Message Protocol*
	4	RTP - *Real Time Protocol (includes all RTP – VOCE, VDEO, and RTPS)*
	5	VOCE – *Voice RTP*
	6	VDEO - *Video RTP*
	7	RTPS – *RTP Signaling*
	8	FTP - *File Transfer Protocol only*
	9	HTTP - *Hypertext Transfer Protocol*
	10	TELN - *Telnet*
	11	SMTP - *Simple Mail Transfer Protocol*
	12	SNMP - *Simple Network Management Protocol*
	13	SAP – *Service Announcement Protocol*
	14	ORCL - *Oracle application traffic*
	15	CTRX - *Citrix application traffic*
	16	SQL – *Structured Query Language*
	17	IP – *Internet Protocol (all inclusive)*
	18	N-IP - *Non-Internet Protocol (all inclusive)*
Specify priority for the rule	**1 - 8**	Priority 1 - Highest Priority 8 - Lowest 1 for QoS Priority-1 2 for QoS Priority-2 3 for QoS Priority-3 4 for QoS Priority-4 5 for QoS Priority-5 6 for QoS Priority-6 7 for QoS Priority-7 8 for QoS Priority-8

Maximum bandwidth in kbps <0 - 99999, enter = *99999*	0 - 99999	Enter desired Maximum Bandwidth in kbps. If no Maximum is desired, select enter, Bandwidth will be displayed as '99999'
Source IP address <enter = 0.0.0.0>:	x.x.x.x	Enter desired Source IP Address or subnet. If no Source IP is desired, select enter, Source IP will be displayed as '***'
Number of source subnet bits <0,8-32, enter = 0>:	0,8-32	Enter desired Source subnet bits. If no Source subnet is desired, select enter, Source subnet will be displayed as '/*'
Destination IP address <enter = 0.0.0.0>:	x.x.x.x	Enter desired Destination IP Address or subnet. If no Destination IP is desired, select enter, Destination IP will be displayed as '***'
Number of Destination subnet bits <0,8-32, enter = 0>:	0,8-32	Enter desired Destination subnet bits. If no Destination subnet is desired, select enter, Destination subnet will be displayed as '/*'
Specify TCP/UDP source port [MIN] (1 - 65535)<Enter: ***>	1 - 65535	Enter desired TCP/UDP source port (or Min port of a range). If no TCP/UDP source port is desired, select enter, Source port will be displayed as '***'
Specify TCP/UDP source port [MAX] (1 - 65535)<Enter: ***>	1 - 65535	Enter desired TCP/UDP source port (or Max port of a range). Will not display if no MIN TCP/UDP source port was selected.

Specify TCP/UDP destination port [MIN] (1 - 65535)<Enter: ***>	1 - 65535	Enter desired TCP/UDP destination port (or Min port of a range). If no TCP/UDP destination port is desired, select enter, Destination port will be displayed as '***'.
Specify TCP/UDP destination port [MAX] (1 - 65535)<Enter: ***>	1 - 65535	Enter desired TCP/UDP destination port (or Max port of a range). Will not display if no MIN TCP/UDP destination port was selected.
Set WRED (Weighted Random Early Discard) <Y or N><Enter : Y>	Y or N	Select to enable Weighted Random Early Detect.
Specify Filtering for the rule <Y or N><Enter : N>	Y or N	Select to prevent traffic defined in rule to be forwarded. Default N = not filtered
Delete	D	Enter the QoS Rule to delete <1..32>
Base [1]	B	Select Base to view, edit, or display a different set of 8 QoS Rules. For example, if 8 QoS Rules have been defined, add a new rule by selecting B 9. The QoS Configuration page will refresh and now display QoS Rules 9 – 16.
QoS [ ]	Read Only	Displays state of QoS option – Unavailable, Enabled Disabled. If available, QoS is Enabled or Disabled from the Administrator Features Page.
Save Parameters	S	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	X	This option allows a user to exit the current menu and return to its parent menu.

17.2.3.2 16.2.4.1 QoS Configuration Page – Min/Max Mode

The *QoS Rules Configuration* page is activated from the *QoS Configuration* page.



In Minimum/Maximum Mode, the QoS Rules Configuration page contains the same options/fields as in Max/Pri Mode with the following exceptions:

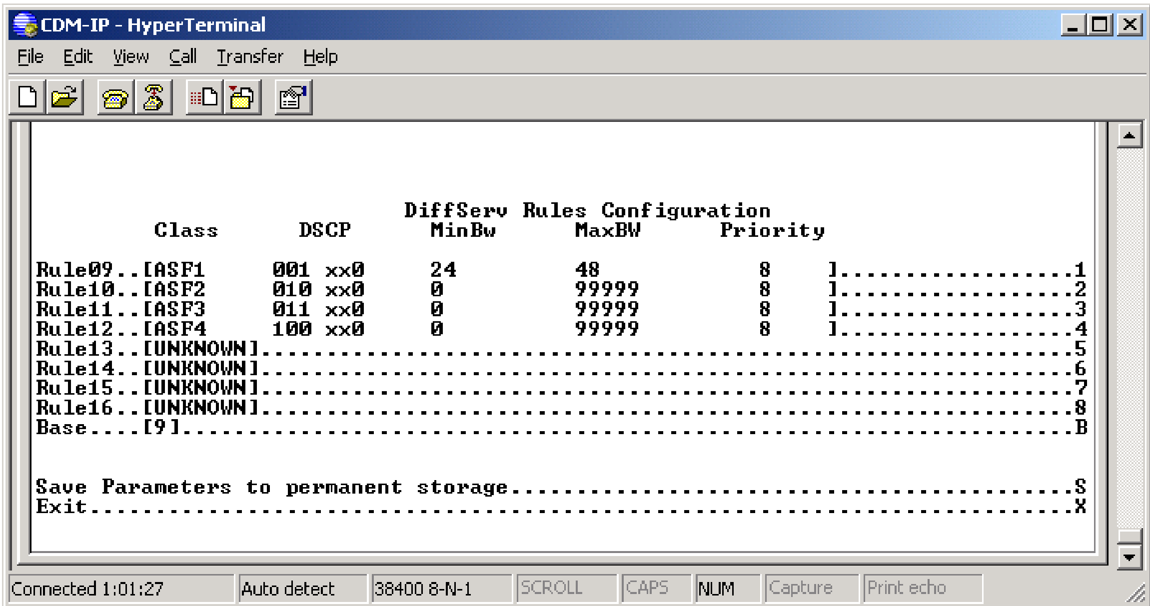
Priority is not assigned.

A Minimum Bandwidth can be assigned, or select enter to assign no Min Bandwidth (displayed as ‘0’).

See the **Quality of Service** section for a more detailed description of this QoS option.

17.2.3.3 16.2.4.2 QoS Configuration Page – DiffServ Mode

The *QoS Rules Configuration* page is activated from the *QoS Configuration* page.



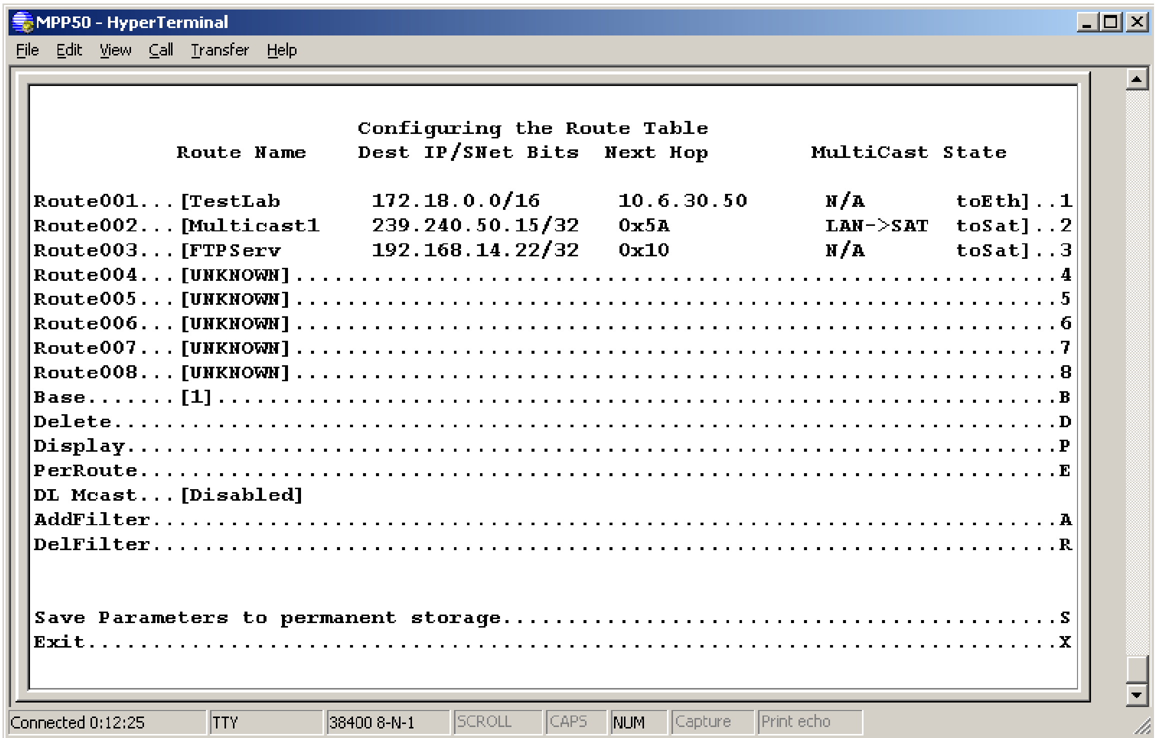
In DiffServ Mode, the IP Module will prioritize all traffic by the DSCP value contained within the IP header of each packet. All packets that do not have a DSCP value will be placed in the Default Queue and have a Priority of 9.

Configuration of DiffServe Rules is only allowed for Assured Forwarding Classes 1-4 (Rule 9-12), where a Minimum and Maximum Bandwidth can be assigned.

See 17.2.3 **Quality of Service** section for a more detailed description of this QoS option.

17.2.4 Route Table Configuration Page

The *Route Table Configuration* page is activated from the *Main Menu* page.



IMPORTANT

Do not operate a CDM-IP modem satellite link where both IP modems have a Default Route to the satellite. For example, if both IP modems had this Route Table entry:

IP Dest	Next Hop	Type
0.0.0.0/0	Point-to-Point	ToSat

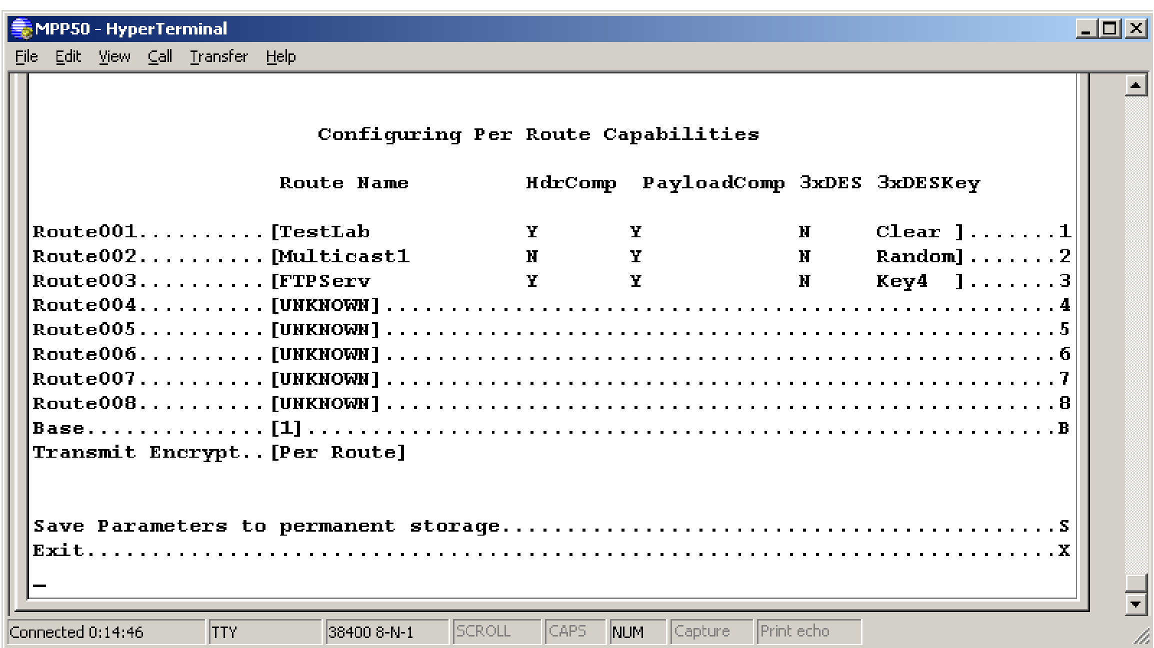
In this setup, any traffic forwarded by an IP modem that did not have a valid IP host at the remote LAN would then be resent by the remote IP modem. This traffic would continue to be forwarded until the TTL expired. This “routing loop” will limit the performance of the IP modem by wasting satellite bandwidth.

The *Route Table Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Route001-Route008 (256) (The 8 currently displayed routes, up to 256 can be defined)	**1-8**	Route Table allows user to define how packets the IP Module receives are routed. Defining an entry in this table is similar to using 'route add' command of machines that support that command. For each route, the user must define: 1. A name assigned by the user to reference the route. The assigned name cannot contain any whitespace and must be unique. 2. The destination address of an IP packet of interest. The number of network addresses that are governed by the selected destination entry, i.e., subnet mask. The Next Hop IP address. This is the IP where the packet will be routed for further processing. The Next Hop IP Address for traffic to be sent over the satellite will be the desired HDLC address. Point-to-Point – no HDLC address Small Network - 0x1 – 0xFE Large Network – 0x1 – 0xFFFE Also, a route can be defined to have IP Module send traffic to another IP address on the same subnet as the Ethernet interface. **Optionally**: If the user enters a multicast address (224.0.0.0-239.255.255.255) as the destination IP address, then the following parameters will be requested: Route MultiCast packets from Ethernet to Satellite? [y/n] The option allows the user to specify if multicast packets that match the provided IP address will be routed from the Ethernet to Satellite. “No” means that the packets will be discarded. Route MultiCast packets from Satellite to Ethernet? [y/n] The option allows the user to specify if multicast packets that match the provided IP address will be routed from the Satellite to Ethernet. “No” means that the packets will be discarded. Multicast Routes always have a subnet length of 32 and the next hop is 0.0.0.0 because it is not applicable. **Note:** The IP Module does allow the specification of one and only one default route. Destination IP = 0.0.0.0 Subnet Length = 0. The default route can be defined to send traffic to either the Satellite or Ethernet interface. This will cause all packets that do not match any other route to be sent to the destination you have defined for further processing.
Base	**B**	The Route Table menu allows the user to view up to 8

Menu Options/Fields	Entry	Description
		different routes per screen. To allow editing on any of the 256 entries that can be defined, the user can select a base address to control which 8 routes are displayed. For example, if the user wants to edit Routes 32-40, then a Base value of 32 should be defined.
Delete Route	**D**	Route Name to delete.
Display	**P**	Displays all of the routes that are currently defined in the system. This will include automatically generated routes that are provided to simplify provisioning of the system. The information displayed is: Route Name, DestIP/SnetBits, Next Hop, HDLC, and Flags.
PerRoute	**E**	Enter to enable Header Compression, Payload Compression or 3xDES Encryption on a Per Route basis.
Downlink Mcast	**Read Only**	Read only status of Downlink Multicast (Enabled or Disabled). This feature is enabled or disabled on the Administrator Feature page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

Selecting Per Route will display the following menu:



Header Compression, Payload Compression or 3xDES Encryption can be configured on a per Route basis by selecting the route number.

DES key select <Choose [1-8] for [key1-key8] 0=Clear 9=Random Enter= Clear>:

The value of 0 [CLEAR] will force the IP Module to not encrypt any traffic destined for the route.

The value of Key[1-8] will use the key specified in the 3xDES Encrypt/Decrypt Configuration Page to encrypt the traffic destined for the route.

The value of Random will cause the IP Module to randomly use any of the 8 TX Keys to encrypt the traffic destined for the route.

IMPORTANT

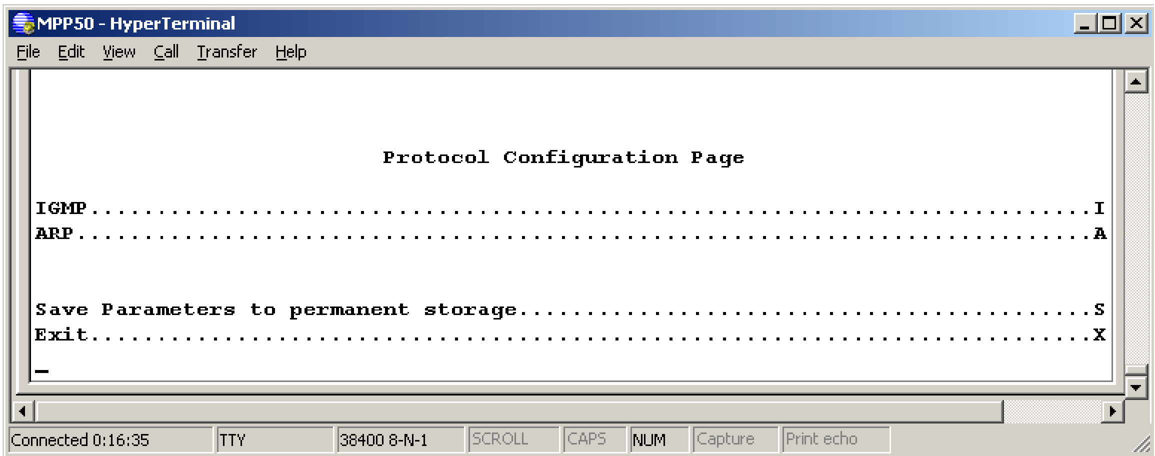
3xDES Encryption:

easyConnect™ Mode – By definition, there are no routes in easyConnect™ operation, so there is no way to assign different keys to traffic. When TX 3xDES encryption is enabled in easyConnect™, all traffic (IP and non-IP) is encrypted and TX Key1 is always used.

Router Mode – Different TX keys can be assigned to different routes and some routes can be sent unencrypted [Clear]. If Random is selected, then all TX Keys must be configured with different keys and the receiving IP modem must have identical corresponding RX Keys. The IP Module will randomly utilize all 8 Keys for encryption.

17.2.5 Protocol Configuration Page

The *Protocol Configuration* page is activated from the *Main Menu* page.

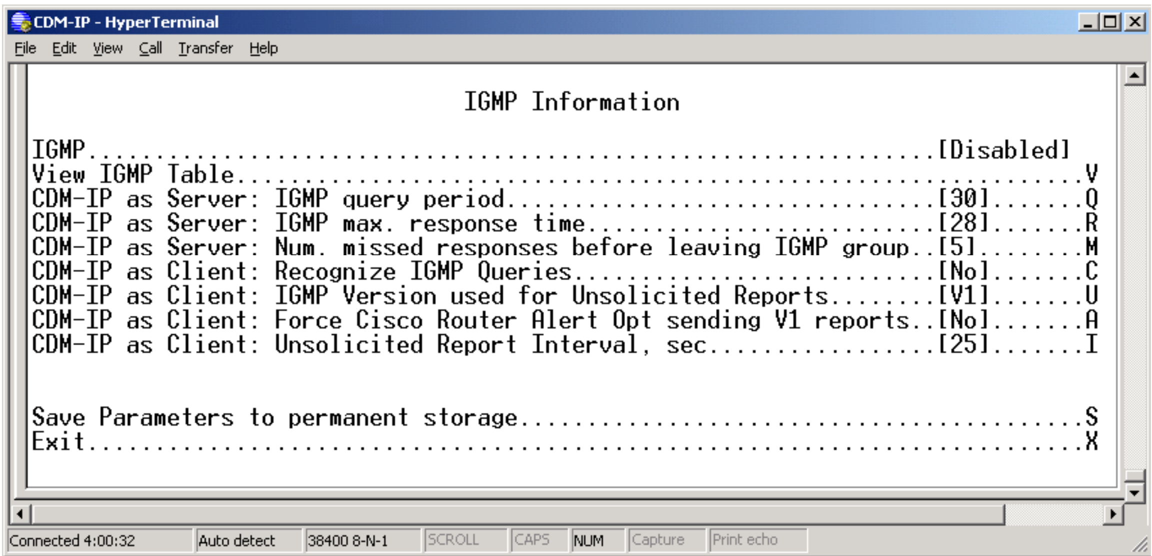


The Protocol Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
IGMP	**I**	Activates *IGMP* page.
ARP	**A**	Activates *ARP Table Utilities* page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.5.1 IGMP Information Page

The *IGMP information* page is activated from the *Protocol Configuration* page.
The IGMP Information page allows a user to view the IGMP clients that are actively listening to content being provided by the IP Module. It also allows the user to determine how the Ethernet Interface is configured either to receive requests to join IGMP groups or announce groups for others to join.



The *IGMP Information* page contains the following options/fields:

Menu Options/Fields	Entry	Description
IGMP	**Read Only**	Read only showing IGMP status (Enabled or Disabled).
View IGMP Table	**V**	This table reports the content that clients have subscribed to the IP Module using the IGMP protocol. This allows a user to determine which services are being used and the minimum time before a service will be terminated.
CDM-IP as Server: IGMP query period	**Q**	The IGMP protocol requests that a server periodically publish to users on the LAN the Multicast IP Addresses that it can service. The IGMP query period defines the time interval (in seconds) between each of these queries for membership.
CDM-IP as Server: IGMP max. response time	**R**	The IGMP max response time defines the time interval (in seconds) that the IP Module should wait before it assumes that no parties are interested in the content published via an IGMP query. This option is expressed in seconds, and the max response time that is accepted by the IP Module is 25 seconds.

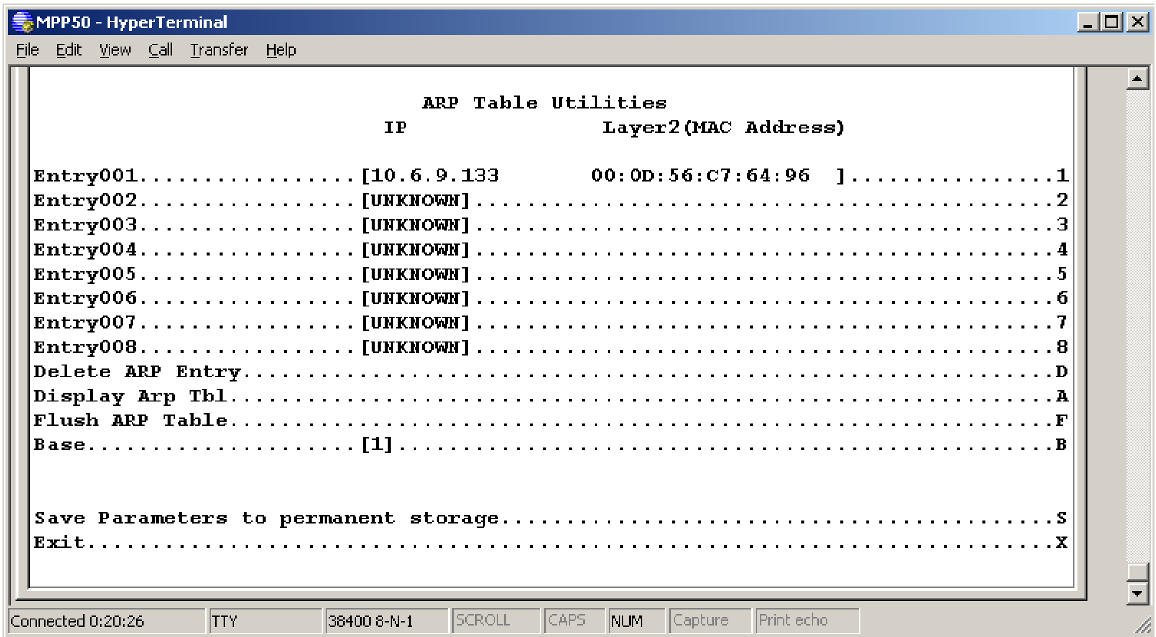
Menu Options/Fields	Entry	Description
CDM-IP as Server: Number of missed responses before leaving IGMP group	**M**	Defines the number of membership queries that go unanswered from LAN clients before the Ethernet Interface will no longer forward data for that IGMP group. Consider a IP Module that has the IGMP query period set to 60 seconds and the number of missed responses set to 3. If a client joins an IGMP group, then the service to that group will not be discontinued until no clients respond to a query from the IP Module for a period of 60*3 = 180 seconds.
CDM-IP as Client: Recognized IGMP queries	**C**	The Recognize IGMP Queries parameters determines if the IP Module should respond to periodic queries from an IGMP server that publishes a request to join a specified multicast group. This parameter can assume one of (2) values: 1. YES 2. NO If set to YES, the IP Module will respond to an IGMP query by requesting to join a Multicast Group published by the server that is defined in the IP Module's route table. If set to NO, the IP Module will not respond to IGMP queries from a server. In this type of configuration, the IP Module may be configured to unconditionally request to join an IGMP group at an interval specified by the "Unsolicited Report Interval" option in the Transmitter IGMP Client Configuration Page.

Menu Options/Fields	Entry	Description
CDM-IP as Client: IGMP Version used for Unsolicited Reports	**U**	This parameter defines which version of the IGMP protocol should be followed when attempting to join a group on a Multicast Server via an unsolicited report. When the IP Module is configured to Recognize IGMP Queries, the IP Module will respond to a query in the same version that the server used to initiate the query. This parameter will assume one of (2) values: 1. V1 2. V2 The value of V1 will configure the IP Module to use the IGMP Version 1 protocol to join a Multicast Group available on an IGMP Server in response to an IGMP Query. The value of V2 will configure the IP Module to use the IGMP Version 2 protocol to join a Multicast Group available on an IGMP Server in response to an IGMP Query. The user can toggle the value of the IGMP Version used for Unsolicited Reports from ‘V1’ and ‘V2’ with each selection.
CDM-IP as Client: Force Cisco Router Alert Option sending V1 reports	**A**	Some Cisco Routers may require the definition of a Router Alert Option to recognize a report from a Client to join a Multicast group. The IP Router Alert Option is defined in RFC2113 and was introduced by Cisco. While this option is not part of the IGMP standard, most IGMP V2 implementations contain this option. However, most implementations of IGMP V1 do not contain this option. This parameter is defined to prevent possible conflicts in networks in which a Cisco Router is configured as an IGMP V1 server. This parameter can assume one of the following (2) values: 1. YES 2. NO If set to YES, the IP Module will generate IGMP reports to join Multicast groups as specifically required by some Cisco Router configurations. If set to NO, the IP Module will generate IGMP reports to join Multicast groups as defined and implemented by most IGMP servers.

Menu Options/Fields	Entry	Description
CDM-IP as Client: Unsolicited Report Interval, sec	**I**	The Unsolicited Report Interval configures the IP Module to generate unsolicited reports to join a Multicast Group at specified time intervals. Each unsolicited report to join a Multicast group will use the version of the IGMP protocol as specified by the IGMP Version used for Unsolicited Reports option. The value of the Unsolicited Report Interval specifies the number of seconds between unsolicited reports. A value of zero implies that no unsolicited reports to join a Multicast group should be generated by the IP Module.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.5.2 ARP Table Utilities Page

The *ARP Table Utilities* page is activated from the *Protocol* page.



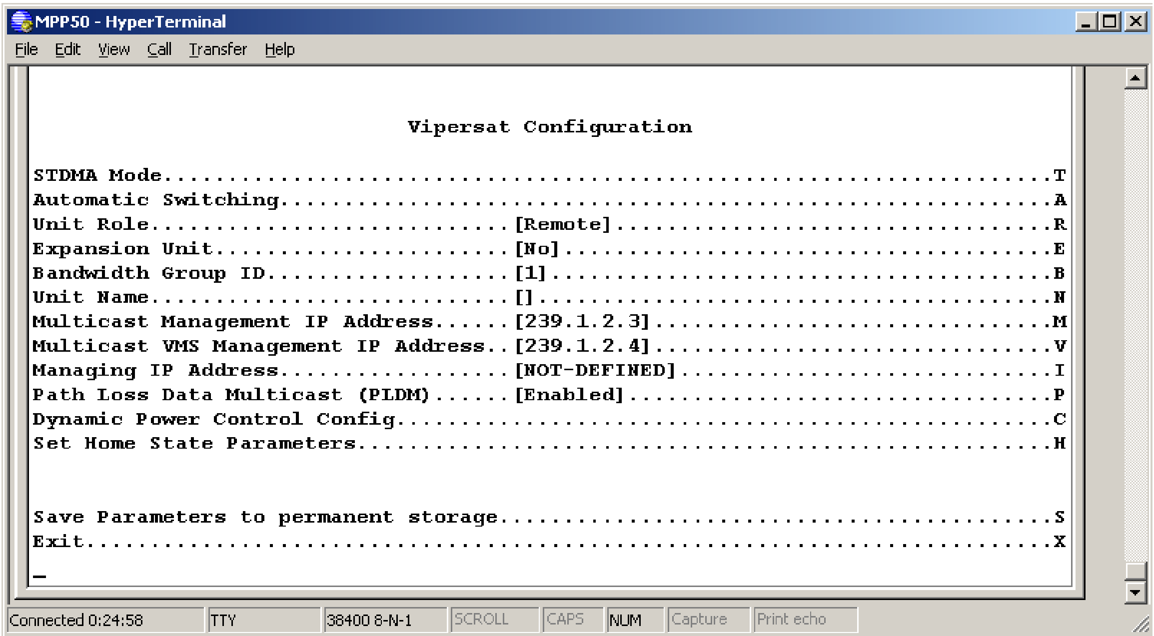
The *ARP Table Utilities* page allows the user to view and edit the ARP table defined by the IP Module. It allows up to 256 static IP->MAC ARP entries.
The *ARP Table Utilities* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Entry001 - 008	**1 - 8**	The user can define up to 256 static ARP definitions on the IP Module. This table allows the user to operate/view up to 8 of these definitions. An ARP definition is defined as: 1. Unicast IP Address This IP Address is used as a lookup into the ARP table when the IP Module needs to resolve a MAC or HDLC Address. **Restrictions**: IP Address must be on the same subnet as the Ethernet Interface. IP Address must be a valid Unicast address (Not Multicast, broadcast, etc.) 2. MAC Address The MAC Address defines the hardware destination MAC Address that is used when an Ethernet packet is destined for an IP machine from the IP Module.

Menu Options/Fields	Entry	Description
Add IP to MAC ARP entry	**M**	Adds an IP to MAC ARP entry.
Delete ARP Entry	**D**	Allows the user to delete a Static ARP entry. Queries the user for the IP address of the ARP entry to delete.
Display ARP Tbl	**A**	Displays the entire IP to MAC ARP table. Includes the Static as well as dynamic ARP entries. Displays blocks of 10 ARP entries. Hit ‘Enter’ key to display next 10 entries or ‘Escape’ to return to ARP Table Utilities page.
Flush ARP Table	**F**	This option allows the entire ARP table to be removed. This is equivalent to performing the standard UNIX command “arp –d” on each address reported in an “arp –a” command. The command only flushes the dynamic ARP entries. The static ARP entries will not be removed.
Base	**B**	The ARP Table menu allows the user to view up to 8 different ARP definitions per screen. To allow editing on any of the 256 entries that can be defined, the user can select a base address to control which 8 ARP entries are displayed. For example, if the user wants to edit static ARP Entries 32-40, then a Base value of 32 should be defined.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.6 Vipersat Configuration Page

The *Vipersat Configuration* page is activated from the *Main Menu* page.

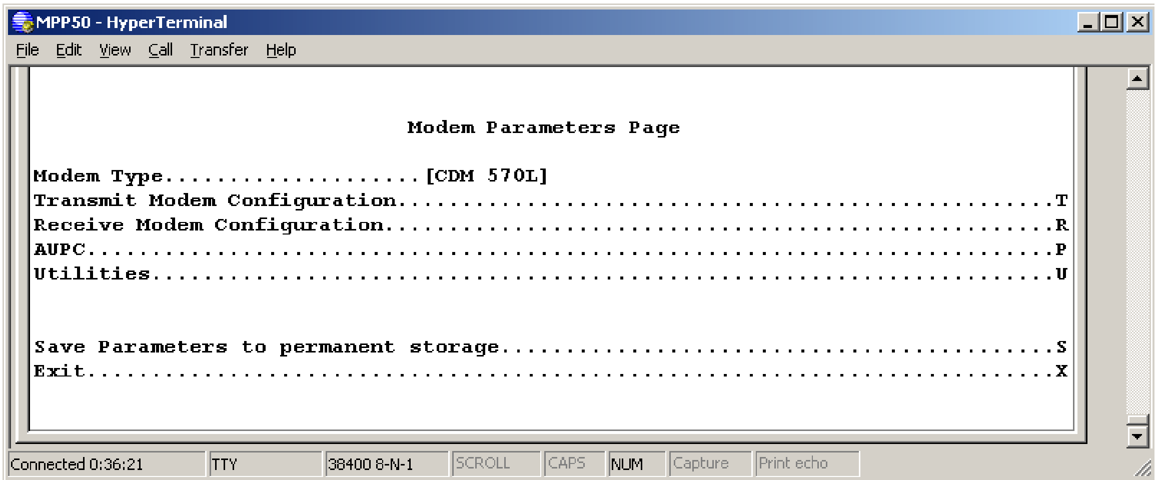


The Vipersat Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
STDMA Mode	**T**	Only used when CDM-570/570L is used in a Vipersat system. Refer to Vipersat Operators Manual for more information.
Automatic Switching	**A**	
Unit Role	**R**	
Expansion Unit	**E**	
Network ID	**B**	
Unit Name	**N**	
Receive Multicast Address	**V**	
Managing IP Address	**I**	
Primary Heart Beat	**P**	
Dynamic Power Control Config	**C**	
Set Home State Parameters	**H**	
Vipersat Summary	**D**	
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.7 Satellite Modem Page

The *Satellite Modem* page is activated by selecting *Satellite Modem Configuration* from the *Main Menu* page.

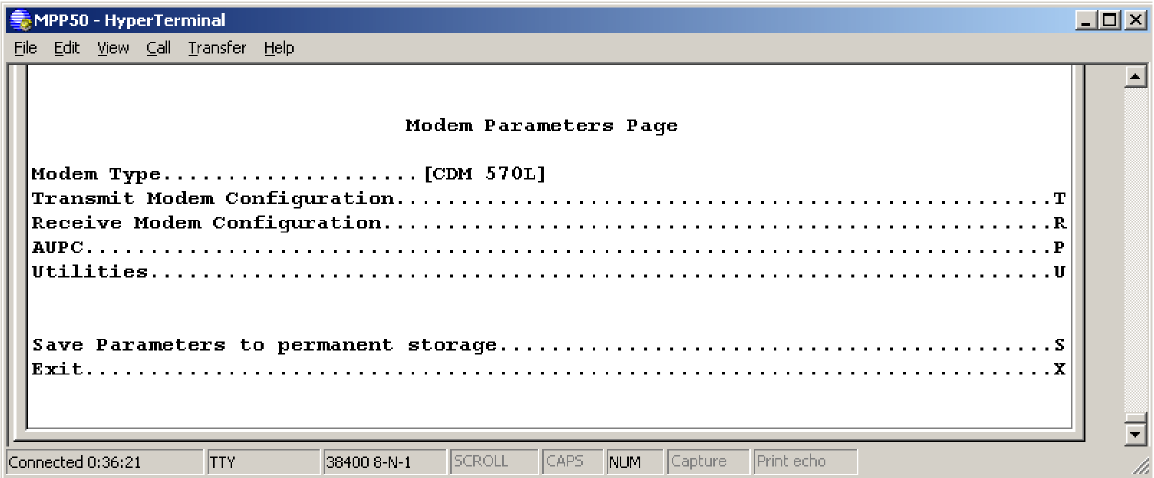


The Satellite Modem Parameters page contains the following options/fields:

Menu Options/Fields	Entry	Description
Modem Type	**Read Only**	Modem type – CDM-570/570L .
Configuration	**C**	Activates *Modem Configuration* page.
Monitor	**M**	Activates *Modem Monitor* page.
Information	**I**	Activates *Modem Information* page.
Utilities	**U**	Activates *Modem Utilities* page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8 Configuration Page

The *Configuration* page is activated by selecting *Configuration* from the *Satellite Modem* page.

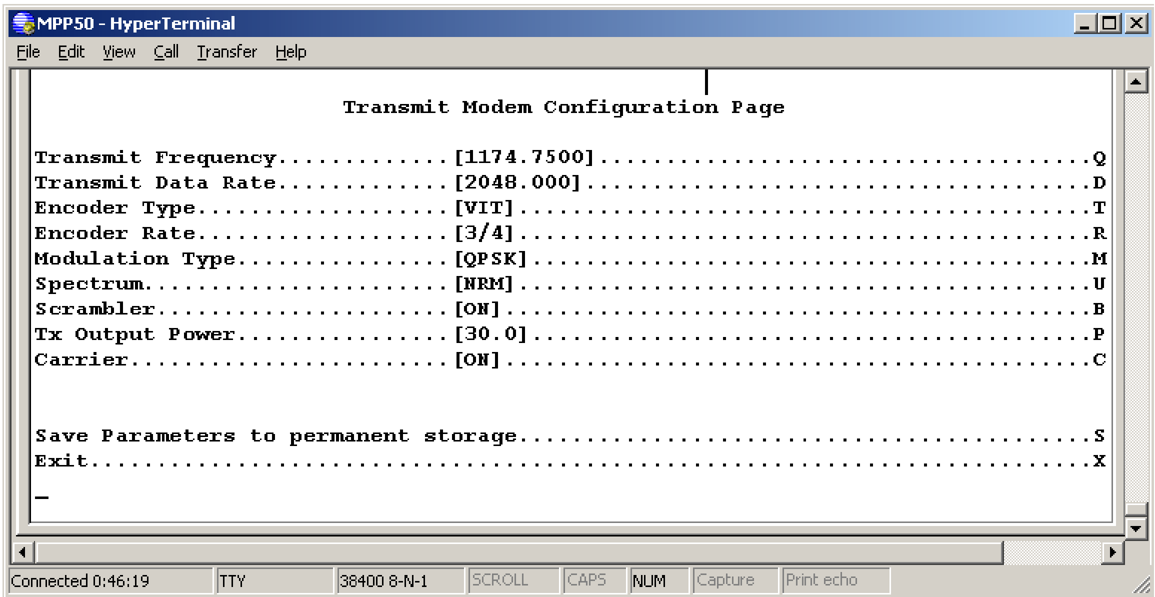


The Modem Parameters page contains the following options/fields:

Menu Options/Fields	Entry	Description
Modem Type	**Read Only**	Modem type – CDM-570/570L .
Tx Configuration	**T**	Activates *Tx Configuration* page.
Rx Configuration	**R**	Activates *Rx Configuration* page.
Framing Mode Configuration	**F**	Activates *Framing Mode Configuration* page.
Data Interface Configuration	**I**	Activates *Data Interface Configuration* page.
Reference Configuration	**E**	Activates *Reference Configuration* page.
Alarm Mask Configuration	**A**	Activates *Alarm Mask Configuration* page.
BUC Configuration	**B**	Activates *Block Up Converter (BUC) Configuration* page.
LNB Configuration	**N**	Activates *Low Noise Block Converter (LNB) Configuration* page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.1 Transmit Modem Configuration Page

The *Tx Configuration* page is activated from the *Configuration* page.



The Transmit Modem Configuration page contains the following options/fields:

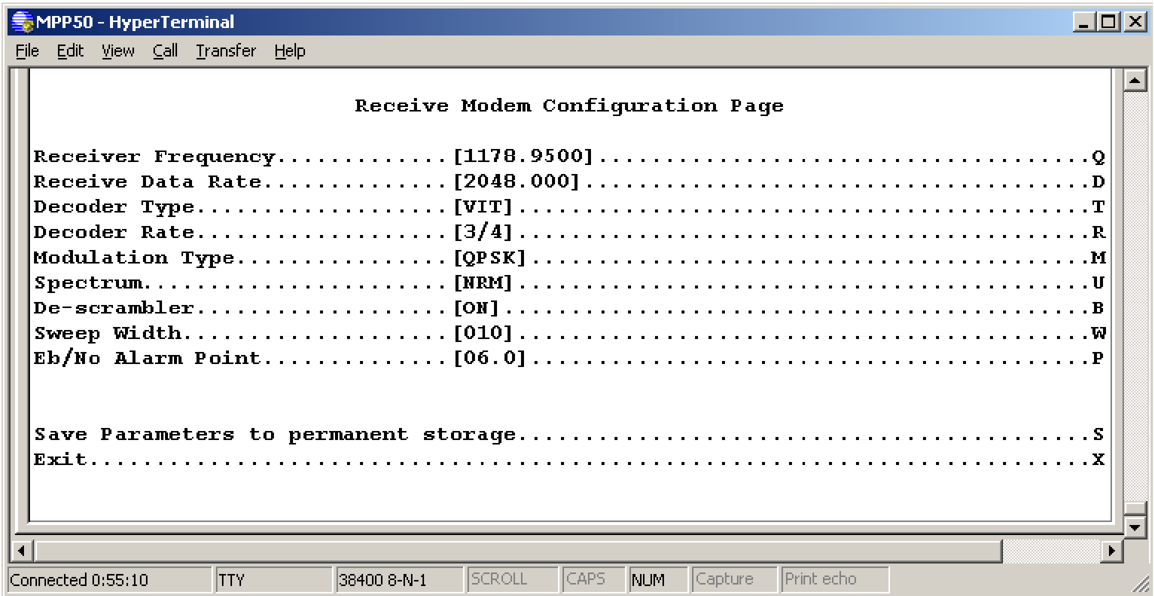
Note: Turbo FEC selections only displayed if Turbo card is installed.

Menu Options/Fields	Entry	Description
Tx Frequency	**Q**	Valid ranges are from 950 to 1950 MHz
Tx Data Rate	**D**	The rate at which the Modem will send traffic over the Satellite Interface. Valid ranges are from 2.4 to 9980 kbps. Up to 5000 kbps and 9980kbps are options that must be purchased.
Tx Symbol Rate	**Read Only**	Corresponding Symbol Rate for the currently selected data rate, encoder, rate and modulation scheme.
Tx Encoder Type	**T**	1 - VIT 2 - TURBO 3 – VIT+RS 4 – TCM-RS 5 – LDPC

Menu Options/Fields	Entry	Description
Tx Encoder Rate	**R**	1 – 5/16 2 – 21/44 3 – 1/2 4 – 2/3 5 – 3/4 6 – 7/8 7 – 0.95 9 – 1/1
Tx Modulation Type	**M**	Sets transmit modulation type 1 -- BPSK 2 -- QPSK 3 -- OQPSK 4 – 8-PSK 5 -- 16-QAM 6 -- 16-QAM
Tx Spectrum	**U**	1 - Normal 2 - Inverted
Tx Data Inversion	**I**	1 - Normal 2 - Inverted
Scrambler	**B**	1 - Off 2 – On-Default 3 – On-IESS-315
Tx Output Power	**P**	Valid ranges are from 0.0 to 40.0 dBm (minus sign assumed)
Carrier	**C**	1 - OFF 2 – ON 3 – Rx-Tx Inhibit – Turn off the transmitter if the Rx is not locked
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.2 Receive Modem Configuration Page

The *Rx Configuration* page is activated from the Configuration page.



The Receive Modem Configuration Page contains the following options/fields:

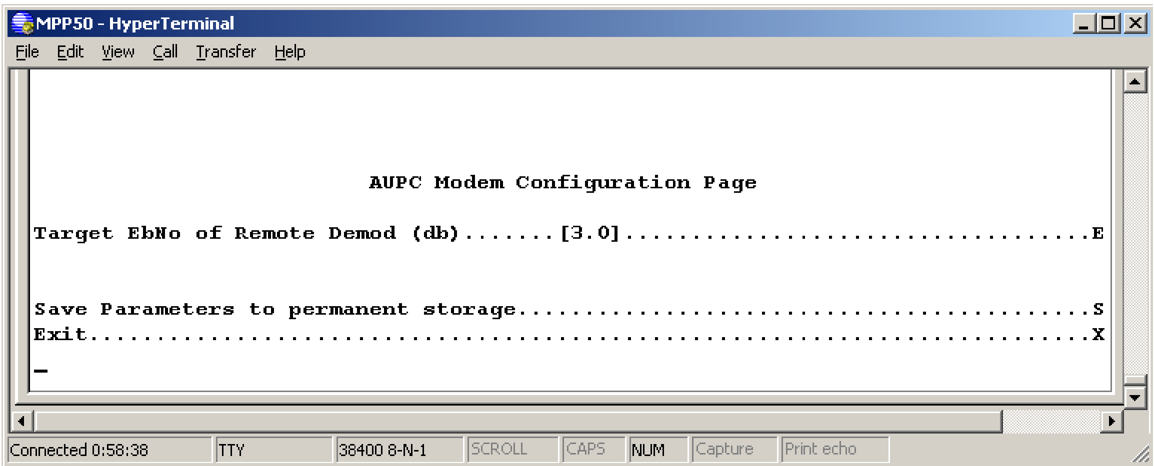
Note: Turbo FEC selections only displayed if Turbo card is installed

Menu Options/Fields	Entry	Description
Rx Frequency	**Q**	Valid ranges are from 950 to 1950 MHz.
Rx Data Rate	**D**	Valid ranges are from 2.4 to 9980 kbps. Up to 5000 kbps and 9980kbps are options that must be purchased.
Rx Symbol Rate	**Read Only**	Corresponding Symbol Rate for the currently selected data rate, encoder, rate and modulation scheme.
Rx FEC	**T**	1 - VIT 2 - TURBO 3 – VIT+RS 4 – TCM-RS 5 – LDPC

Menu Options/Fields	Entry	Description
Rx Code Rate	**R**	1 – 5/16 2 – 21/44 3 – 1/2 4 – 2/3 5 – 3/4 6 – 7/8 7 – 0.95 9 – 1/1
Rx Demodulation	**M**	Sets receive demodulation type 1 -- BPSK 2 -- QPSK 3 -- OQPSK 4 – 8-PSK 5 -- 16-QAM 6 -- 8-QAM
Rx Spectrum Inversion	**U**	1 - Normal 2 - Inverted
Rx Data Inversion	**I**	1 - Normal 2 – Inverted
Rx Descrambling	**B**	1 - Off 2 – On-Default 3 – On-IESS-315
Rx Acquisition Range (Sweep Width)	**W**	Valid ranges are from 0 to 200 kHz (1 to 32HKz if symbol rate < 625Ksymbol)
Eb/No Alarm Point	**P**	Valid ranges are from 0.1 to 16.0
Rx Buffer Size	**F**	1 -- Disabled 2 -- +/-_1024_bits 3 -- +/-_2048_bits 4 -- +/-_4096_bits 5 -- +/-_8192_bits 6 -- +/-_16384_bits 7 -- +/-_32768_bits
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.3 Framing Mode Configuration

The *Framing Mode Configuration* page is activated from the *Configuration* page.



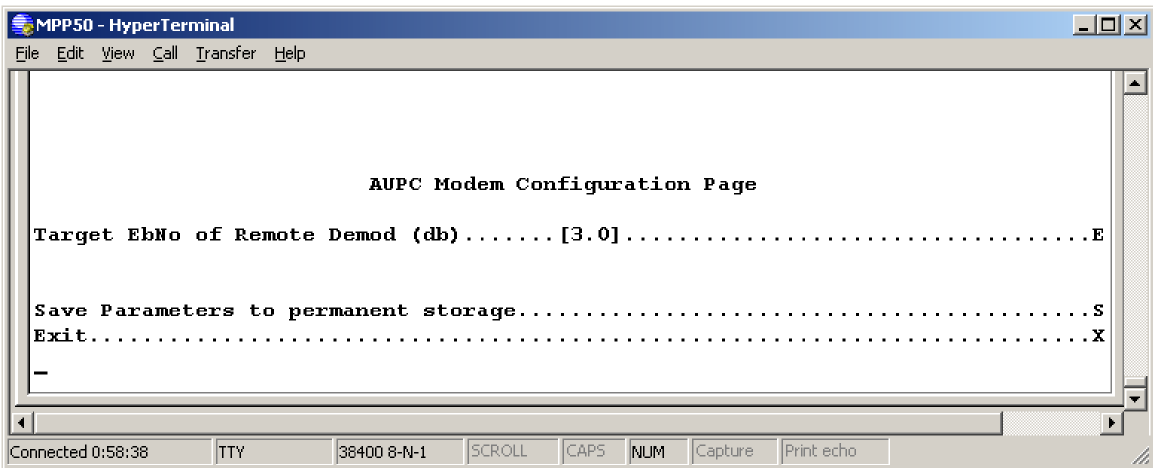
The *Framing Mode Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Framing Mode	**F**	1 -- Unframed 2 -- EDMAC Framing 3 -- EDMAC-2 Framing
EDMAC Mode	**D**	1 -- Unframed 2 -- EDMAC Framing 3 -- EDMAC-2 Framing
EDMAC Slave Address Range	**V**	10 to 9990 in multiple of ten.
AUPC	**A**	1 -- Enable 2 -- Disable
Max Power Reached Action	**R**	1 -- No_Action 2 -- Generate_TX_Alarm
Remote Demod Unlock Action	**U**	1 -- Nominal_Power 2 -- Maximum_Power
Target Eb/No of Remote Demod (db)	**E**	0.0 to 9.9
Maximum Power Limit	**M**	0 to 9

Menu Options/Fields	Entry	Description
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.4 Data Interface Configuration

The *Data Interface Configuration* page is activated from the *Configuration* page.

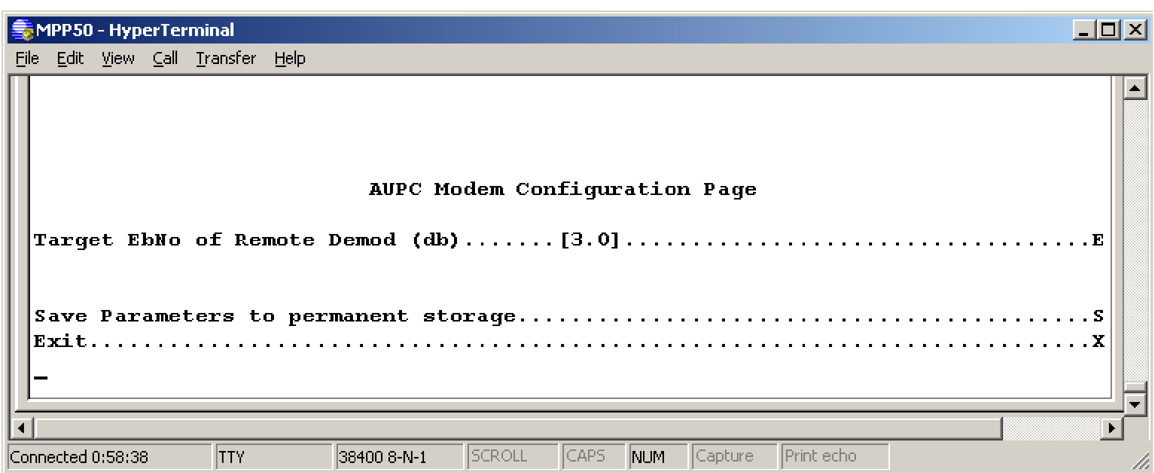


The *Data Interface Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Data Interface	**I**	1 -- EAI-422/EAI-530 DCE 2 -- V.35 DCE 3 -- EAI-232(sync) 4 -- G.703 T1 AMI 5 -- G.703 T1 B8ZS 6 -- G.703 E1 Unbal AMI 7 -- G.703 E1 Unbal HDB3 8 -- G.703 E1 Bal AMI 9 -- G.703 E1 Bal HDB3 10 -- IP Interface Note: The data interface must be set to IP Interface for IP traffic to pass over the satellite.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.5 Reference Configuration

The *Reference Configuration* page is activated from the *Configuration* page.

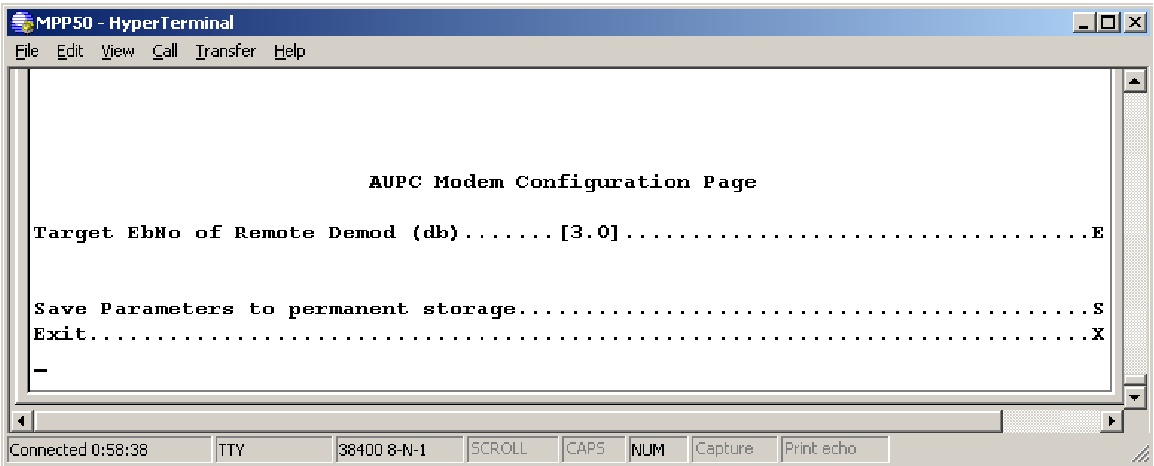


The *Reference Interface Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Frequency Reference	**R**	1 -- Internal 10 MHz 2 -- External 1 MHz 3 -- External 2 MHz 4 -- External 5 MHz 5 -- External 10 MHz 6 -- External 20 MHz
Test Mode	**T**	1 -- Normal 2 -- IF_loopback 3 -- Digital_loopback 4 -- I/O_Loopback 5 -- RF Loopback 6 -- Tx_CW 7 -- TX_alt_101010
Save Paramexters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.6 Alarm Mask Configuration

The *Alarm Mask Configuration* page is activated from the *Configuration* page.

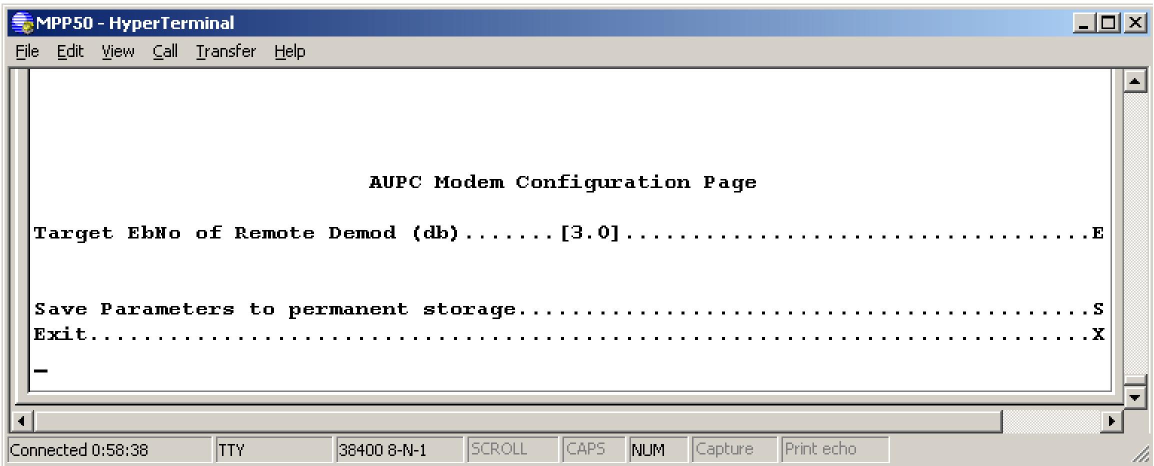


The *Alarm Mask Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Tx Fifo	**A**	Masked/UnMasked
G.703 BPV	**B**	Masked/UnMasked
Tx AIS	**C**	Masked/UnMasked
RX AGC	**D**	Masked/UnMasked
Eb/No	**E**	Masked/UnMasked
Rx AIS	**F**	Masked/UnMasked
Buffer Slip	**G**	Masked/UnMasked
External Reference	**H**	Masked/UnMasked
BUC	**I**	Masked/UnMasked
LNB	**J**	Masked/UnMasked
Save Paramexters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.7 Block Up Converter (BUC) Configuration

The *Block Up Converter (BUC) Configuration* page is activated from the *Configuration* page.

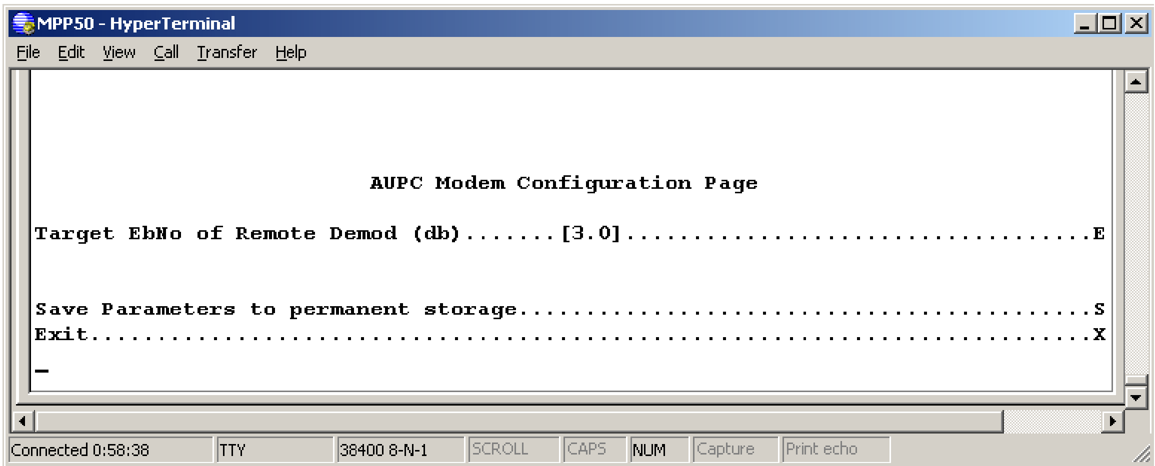


The *Block Up Converter (BUC) Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
BUC Address	**A**	1 to 15
BUC RF Output	**R**	Enabled/Disabled
BUC DC Power	**W**	Enabled/Disabled
BUC 10 MHz Reference	**P**	Enabled/Disabled
BUC Current Alarm Upper Limit (mA)	**H**	500 to 4000
BUC Current Alarm Lower Limit (mA)	**C**	0 to 3000
BUC LO Frequency (MHz)	**F**	3000 to 65000, 0 to disable
Save Paramexters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.8.8 Low Noise Block Converter (LNB) Configuration

The *Low Noise Block Converter (LNB) Configuration* page is activated from the *Configuration* page.

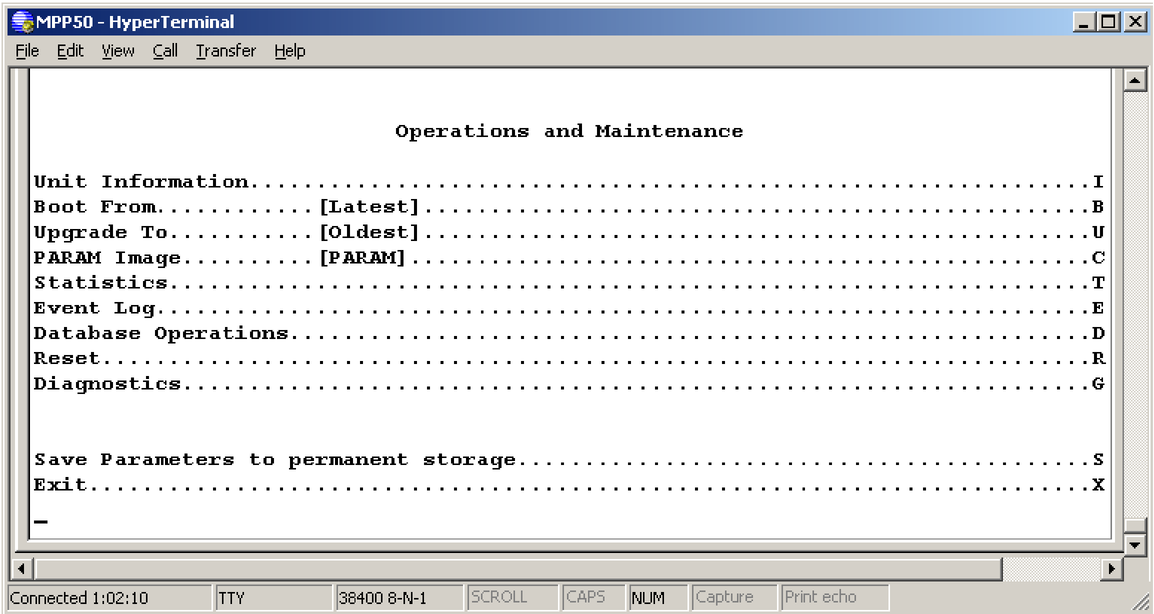


The *Low Noise Block Converter (LNB) Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
LNB DC Supply Voltage	**P**	1 -- Off 2 -- 13 Volts 3 -- 18 Volts 4 -- 24 Volts
LNB 10MHz Reference	**R**	On/Off
LNB Current Alarm Upper Limit (mA)	**H**	In mA
LNB Current Alarm Lower Limit (mA)	**C**	In mA
LNB LO Frequency (MHz)	**F**	3000 to 65000, 0 to disable
Save Paramexters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9 Operations and Maintenance Page

The *Operations and Maintenance* page is activated from the *Main Menu* page.



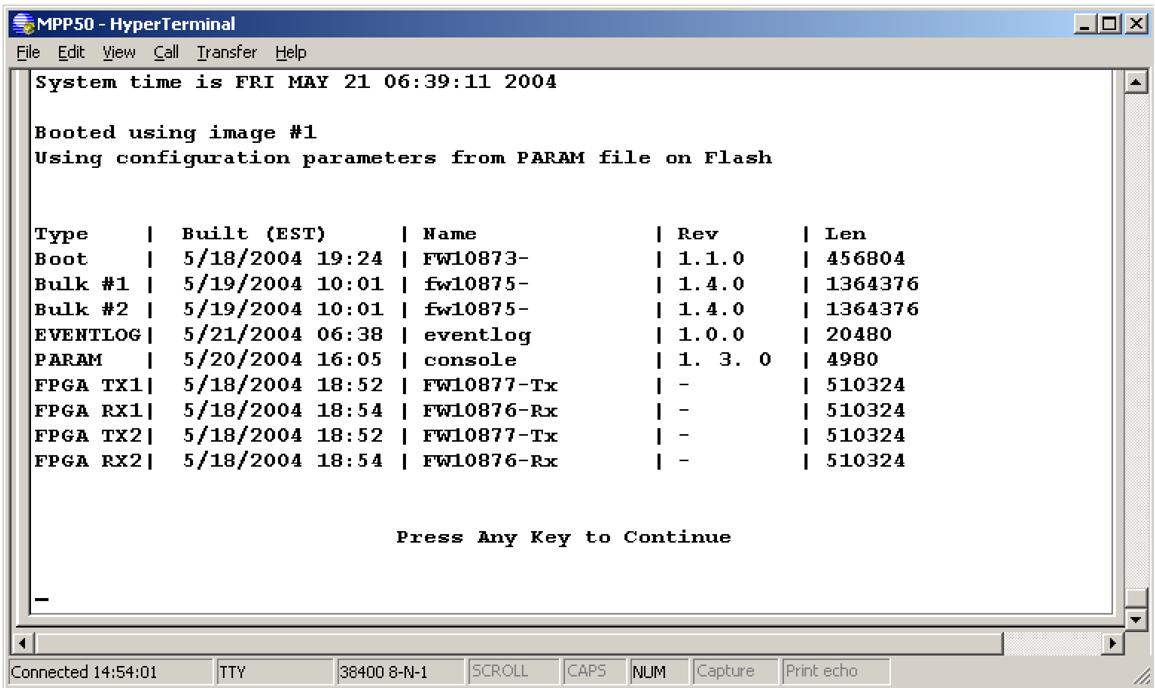
The *Operations and Maintenance* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Unit Uptime	**Read Only**	Time in days, hours, mins and secs since the last time the IP module was rebooted.
Unit Information	**I**	Displays unit current operational Software information.
IP Module Boot From	**B**	Determines which version of the IP Module software package (includes Application, FPGA, and FFPGA) will be loaded upon boot-up. The possible options are: 0. Latest - boot the newest software package based upon date. 1. Image1 - boot the software package loaded into the first slot in permanent storage. 2. Image2 - boot the software package loaded into the second slot in permanent storage.
Base Modem Boot From	**A**	Determines which version of the Base modem firmware will be loaded upon boot-up. The possible options are: 0. Latest - boot the newest software package based upon date. 1. Image1 - boot the software package loaded into the first slot in permanent storage. 2. Image2 - boot the software package loaded into the second slot in permanent storage.

Menu Options/Fields	Entry	Description
Upgrade To	**U**	Determines which installed software package that the IP Module or base modem firmware will overwrite when upgrading with a new software package. The possible options are: 0. Oldest – overwrite the oldest software package based upon date. 1. Image1 – overwrite the software package loaded into the first slot in permanent storage. 2. Image2 – overwrite the software package loaded into the second slot in permanent storage.
Codecast Multicast Address	**M**	Multicast address used by Vload to upgrade the modem firmware and param file via streaming multicast. Must match the address specified in Vload.
PARAM Image	**C**	Identifies the PARAM file that will be loaded on bootup. The options are: 1. Last saved Parameter file 2. Factory – uses the internal, hard-coded factory default parameters.
Statistics	**T**	Activates *Statistics Menu* page.
Event Log	**E**	Activates *Event Log* page.
Database Operations	**D**	Activates *Database Operations* page.
Reset	**R**	Allows user to reboot the modem (includes the IP modem and base modem). It has the same logical effect of power-cycling the unit.
Diagnostics	**G**	Activates *Diagnostics* page.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9.1 Unit Information Page

The *Unit Information* page is activated by entering “**I**” from the *Operations and Maintenance* page.



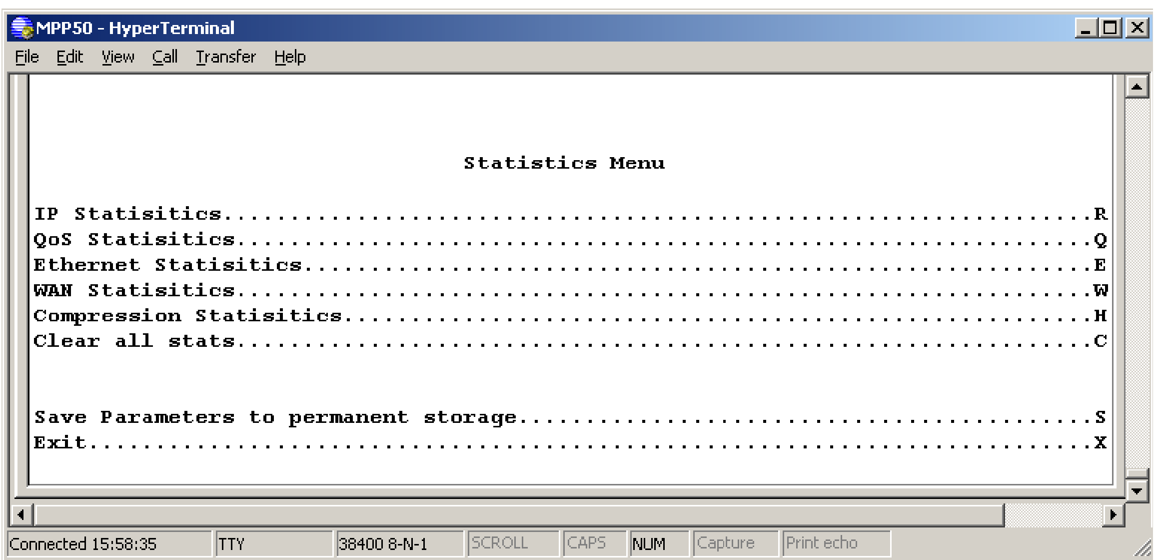
The *Unit Information* page contains the following information:

Current System time	DAY MONTH DATE hh:mm:ss YEAR
Image # that the IP Module is currently booted from	By default will be the Latest, unless “IP Module Boot From” is set to Image #1 or Image #2
Image # that the base modem is currently booted from.	By default will be the Latest, unless “Base Modem Boot From” is set to Image #1 or Image #2
PARAM file that the IP Module is currently configured from	Will be PARAM file from Flash or Factory Default If no parameter file is found in flash memory.

Currently Loaded IP Module and Base Modem SW	Will display Build Date, CEFD FW#, Revision #, and size of each IP Module and Base Modem SW file.
Boot	There will be boot file for the IP module and the Base Modem.
IP Bulk #1	The Bulk file contains all of the SW files for the IP Module and Base Modem and there are two slots available.
IP Bulk #2	
BaseBoot	
Base Bulk #1	
Base Bulk #2	
EVENTLOG	Will display the date/time that the EVENTLOG file was last updated.
PARAM	Will display the date/time that the PARAM1 file was last updated. It will also show what user interface was used to last update the PARAM file. From CLI will display 'console' From Web will display 'http' From Telnet will display the Telnet user login name From SNMP will display 'snmp

17.2.9.2 Statistics Page

The *Statistics Menu* page is activated from the *Operations and Maintenance* page.



The *Statistics Menu* page contains the following options/fields:

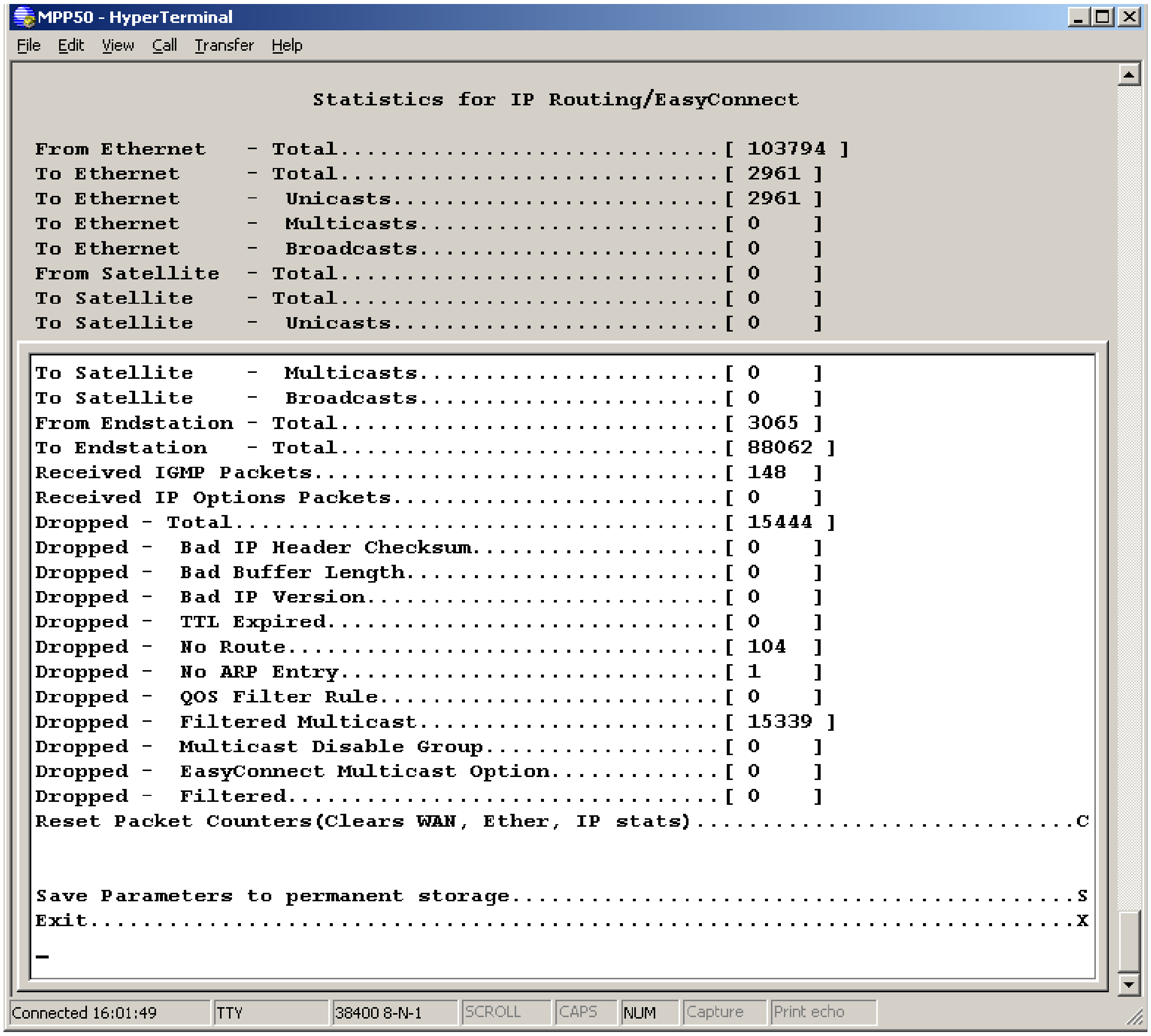
Menu Options/Fields	Entry	Description
IP Statistics	**R**	Displays Statistics for IP Routing and allows counters to be reset.
QoS Statistics	**Q**	Displays Statistics for QoS and allows counters to be reset.
Ethernet Statistics	**E**	Displays Statistics for the Ethernet Port and allows counters to be reset.
WAN Statistics	**W**	Displays Statistics for the WAN (HDLC) Port and allows counters to be reset.
Compression Statistics	**H**	Displays Statistics for Header & Payload Compression and allows counters to be reset.
Clear all stats	**C**	Globally resets all statistics counters.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

IMPORTANT

All updates for Statistics information will occur once every 6 seconds.

17.2.9.2.1 IP Statistics Page

The *IP Statistics* page is activated from the *Statistics Menu* page. The *IP Statistics* page displays counts of the number of packets routed or dropped in the IP Module.



```
                 Statistics for IP Routing/EasyConnect

From Ethernet   - Total...........................[ 103794 ]
To Ethernet     - Total...........................[ 2961 ]
To Ethernet     -  Unicasts.......................[ 2961 ]
To Ethernet     -  Multicasts.....................[ 0    ]
To Ethernet     -  Broadcasts.....................[ 0    ]
From Satellite  - Total...........................[ 0    ]
To Satellite    - Total...........................[ 0    ]
To Satellite    -  Unicasts.......................[ 0    ]
To Satellite    -  Multicasts.....................[ 0    ]
To Satellite    -  Broadcasts.....................[ 0    ]
From Endstation - Total...........................[ 3065 ]
To Endstation   - Total...........................[ 88062 ]
Received IGMP Packets.............................[ 148  ]
Received IP Options Packets.......................[ 0    ]
Dropped - Total...................................[ 15444 ]
Dropped -  Bad IP Header Checksum.................[ 0    ]
Dropped -  Bad Buffer Length......................[ 0    ]
Dropped -  Bad IP Version.........................[ 0    ]
Dropped -  TTL Expired............................[ 0    ]
Dropped -  No Route...............................[ 104  ]
Dropped -  No ARP Entry...........................[ 1    ]
Dropped -  QOS Filter Rule........................[ 0    ]
Dropped -  Filtered Multicast.....................[ 15339 ]
Dropped -  Multicast Disable Group................[ 0    ]
Dropped -  EasyConnect Multicast Option...........[ 0    ]
Dropped -  Filtered...............................[ 0    ]
Reset Packet Counters(Clears WAN, Ether, IP stats)............................C


Save Parameters to permanent storage..........................................S
Exit..........................................................................X
_
```

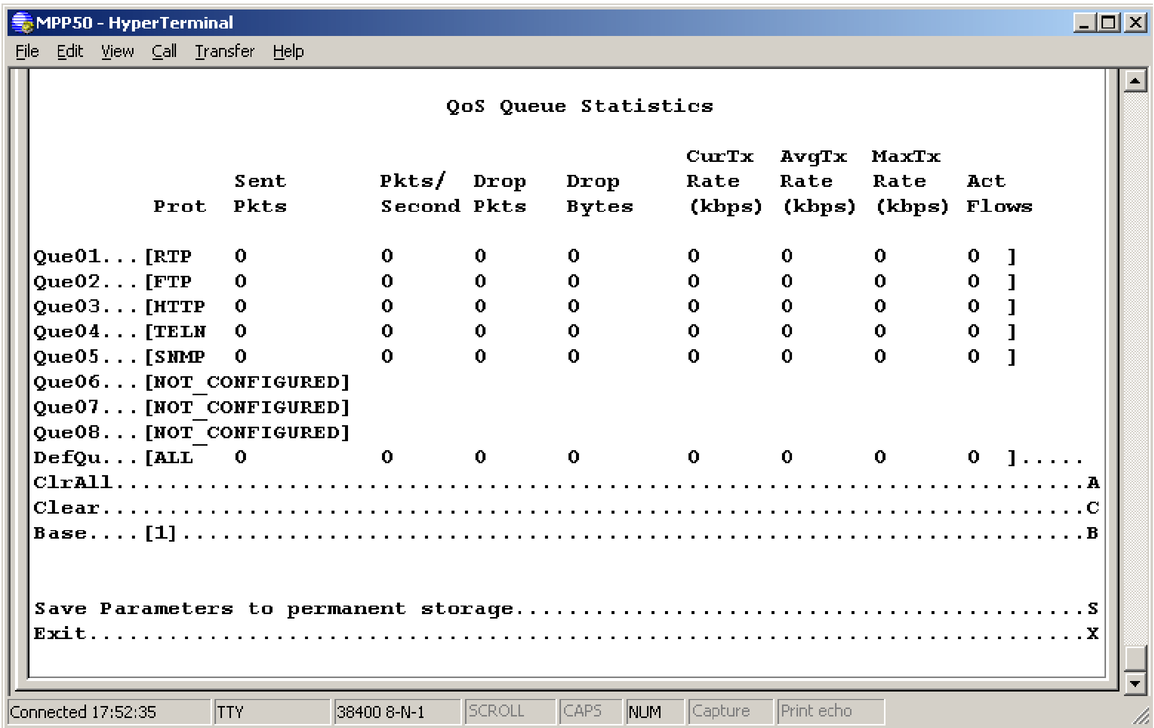
The *IP Statistics* page contains the following options/fields:

Menu Options/Fields	Entry	Description
From Ethernet - Total		Ethernet Statistics Page, Rx Good Frames
To Ethernet - Total		Ethernet Statistics Page, Tx Good Frames
To Ethernet - Unicast		Unicast packets to LAN
To Ethernet - Multicast		Multicast packets to LAN
To Ethernet - Broadcast		Broadcast packets to LAN
From Satellite - Total		WAN Statistics Page, Rx HDLC Packet Count
To Sat - Total		WAN Statistics Page, Tx HDLC Packet Count
To Sat - Unicast		Unicast packets to WAN
To Sat - Multicast		Multicast packets to WAN
To Sat - Broadcast		Broadcast packets to WAN
From Endstation - Total		Packets sent from IP Module
To Endstation - Total		Packets directed to IP Module
Received IGMP Packets		Internet Group Management Packets received (used for management of multicast traffic).
Received IP Options Packets		Number of IP Options packets received.
Dropped - Total		Total Dropped Packets
Dropped - Bad IP Header Checksum		Total Dropped Packets due to incorrect IP Header Checksum.
Dropped - Bad Buffer Length		IP length (as specified in packet header) was greater than payload received in the Ethernet packet. This would indicate the packet was truncated before arriving.
Dropped - Bad IP Version		Total Dropped IP Version 6 Packets (IP Module only supports IP Version 4).
Dropped - TTL Expired		Total Dropped Packets due to Time To Live counter expired (TTL limits the number of hops, or seconds, before a packet reaches it's destination).
Dropped - No Route		Total Dropped Packets due to no Route for the destination in the IP Module Route Table. These are packets that are directed to the IP Module's MAC address and the IP Module will reply to the sender with a ICMP 'Destination net unreachable' message.
Dropped - No ARP Entry		Total Dropped Packets due to no ARP entry in IP Module ARP Table. For example, if a IP Module receives packets from the satellite for a host that is not in the ARP table, the IP Module will send an ARP request. If there is no response, the packets will be dropped.

Menu Options/Fields	Entry	Description
Dropped - Filtered Multicast		Total Dropped Multicast Packets received from the satellite due to no SAT→LAN or
Dropped – Multicast Disable Group		Multicast packet was dropped because, although route existed, IGMP is being used, and there is no client requesting forwarding of this traffic or due to a IGMP “leave group” message.
Dropped – EasyConnect Multicast Option		Total Dropped Multicast Packets received from the satellite due to the ‘easyConnect Multicast Option’ feature not being enabled in easyConnect Mode.
Dropped – Router Queue Full		Indicates that the router task is dropping packets due to being full. Represents a graceful drop process when the processor performance is being overdriven.
Reset Packet Counters (Clears WAN, Ether, IP stats)		Executing this menu option resets all WAN, Ethernet and IP Routing statistics gathered to zero.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9.2.2 QoS Statistics Page

The *QoS Statistics* page is activated from the *Statistics Menu* page. The *QoS Statistics* page displays the statistics for the number of IP packets routed, based upon the defined QoS Rules, by the IP Module.



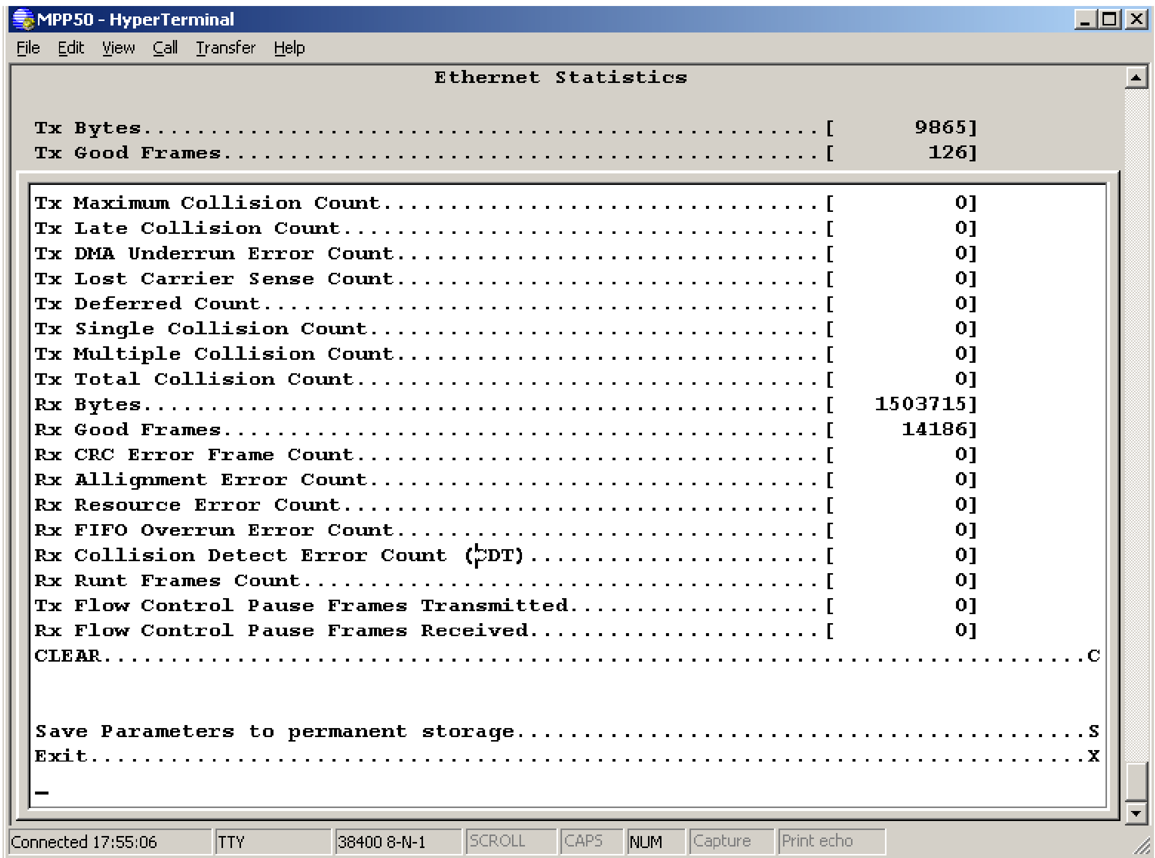

```
                              QoS Queue Statistics

                                                     CurTx   AvgTx   MaxTx
              Sent         Pkts/  Drop    Drop       Rate    Rate    Rate    Act
        Prot  Pkts         Second Pkts    Bytes      (kbps)  (kbps)  (kbps)  Flows

Que01...[RTP  0            0      0       0          0       0       0       0  ]
Que02...[FTP  0            0      0       0          0       0       0       0  ]
Que03...[HTTP 0            0      0       0          0       0       0       0  ]
Que04...[TELN 0            0      0       0          0       0       0       0  ]
Que05...[SNMP 0            0      0       0          0       0       0       0  ]
Que06...[NOT_CONFIGURED]
Que07...[NOT_CONFIGURED]
Que08...[NOT_CONFIGURED]
DefQu...[ALL  0            0      0       0          0       0       0       0  ].....
ClrAll...............................................................................A
Clear................................................................................C
Base....[1]..........................................................................B


Save Parameters to permanent storage.................................................S
Exit.................................................................................X
```

NOTE: In DiffServ QoS Mode, statistics for the various DiffServe DSCP Classes will be in the following Queues:

Queue01 – Expedited Forwarding
Queue02 – Class 1 Precedence
Queue03 – Class 2 Precedence
Queue04 – Class 3 Precedence
Queue05 – Class 4 Precedence
Queue06 – Class 5 Precedence
Queue07 – Class 6 Precedence
Queue08 – Class 7 Precedence
Queue09 – Assured Forwarding Class 1
Queue10 – Assured Forwarding Class 2
Queue11 – Assured Forwarding Class 3
Queue12 – Assured Forwarding Class 4

17.2.9.2.3 Ethernet Statistics Page

The *Ethernet Statistics* page is activated from the *Statistics Menu* page The *Ethernet Statistics* page displays the statistics for the number of IP packets received from and sent to the Ethernet interface.



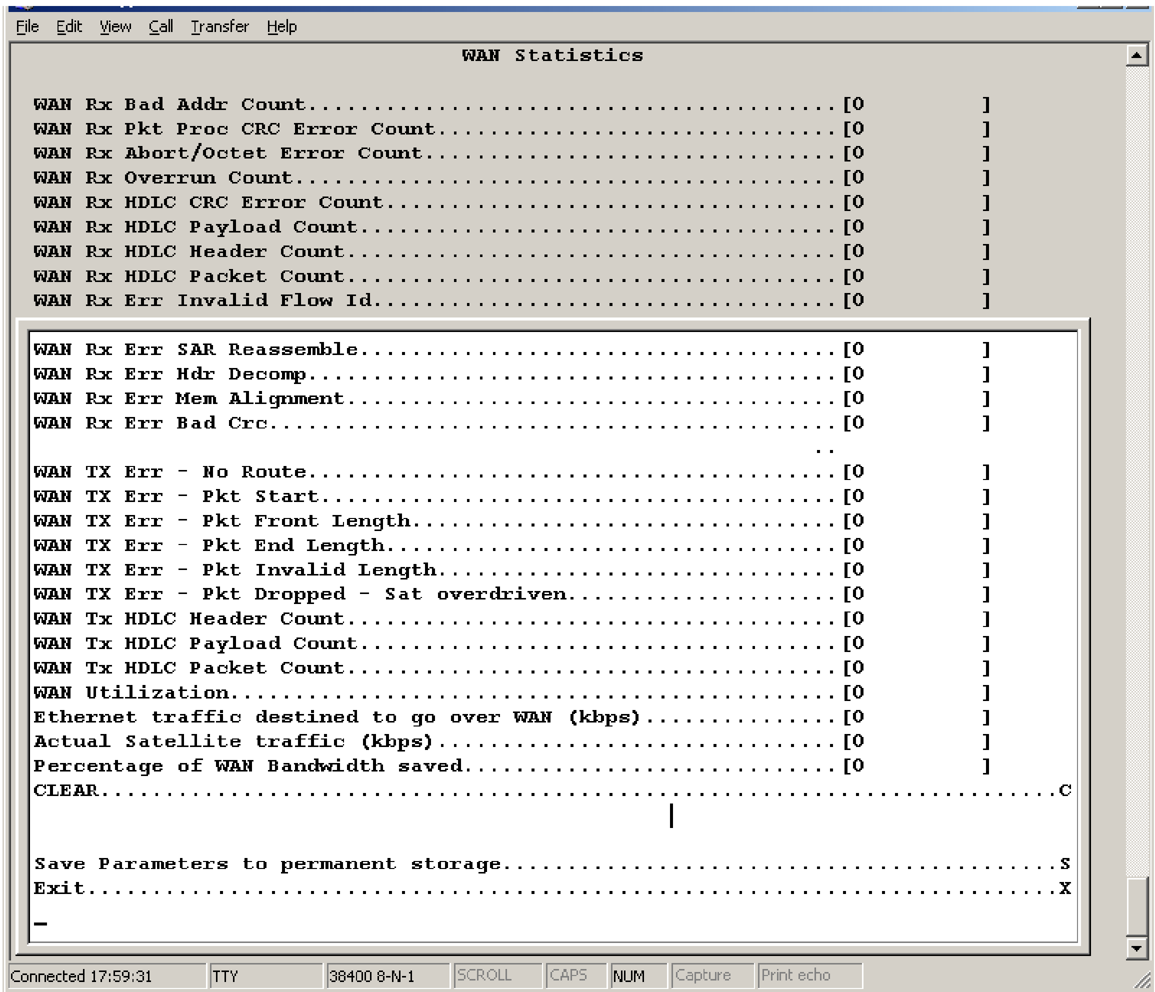
The *Ethernet Statistics* page contains the following options/fields

Menu Options/Fields	Entry	Description
	Read Only	The Ethernet Statistics presents the total packets transmitted and received for the Ethernet Port of the IP Module.
Tx Bytes		Number of bytes transmitted by this Ethernet interface.
Tx Good Frames		Number of good frames transmitted by this Ethernet interface.
Tx Maximum Collision Count		Number of frames that are not transmitted because they encountered configured max collisions.
Tx Late Collision Count		Number of frames dropped due to a late collision on the Ethernet.

Menu Options/Fields	Entry	Description
Tx DMA Underrun Error Count		Number of frames not transmitted or re-transmitted due to transmit DMA underrun.
Tx Lost Carrier Sense Count		Number of frames transmitted by device despite the fact that it detected a deassertion of carrier sense.
Tx Deferred Count		Number of frames deferred before transmission due to activity on link.
Tx Single Collision Count		Number of transmitted frames that encountered only one collision.
Tx Multiple Collision Count		Number of transmitted frames that encountered more than one collision.
Tx Total Collision Count		Total number of collisions encountered while attempting to transmit.
Rx Bytes		Number of bytes received by this Ethernet interface.
Rx Good Frames		Count of good frames received by the Ethernet device.
Rx CRC Error Frame Count		Number of aligned frames discarded due to a CRC error.
Rx Alignment Error Count		Number of frames that are both misaligned and contain a CRC error.
Rx Resource Error Count		Count of good frames discarded due to unavailable resources.
Rx FIFO Overrun Error Count		Number of good frames discarded due to overflow of internal receive FIFO.
Rx Collision Detect Error Count (CDT)		Number of frames encountered collisions during frame reception.
Rx Runt Frames Count		Count of undersize frames received by the Ethernet device.
Tx Flow Control Pause Frames Transmitted		Number of Flow Control frames transmitted by the device.
Rx Flow Control Pause Frames Received		Number of Flow Control frames received by the device.
CLEAR	**C**	Resets all Ethernet Statistics
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9.2.4 WAN Statistics

The *WAN Statistics* page is activated from the *Statistics Menu* page. The *WAN Statistics* page displays counts of the number of packets routed or dropped in the IP Module Satellite interface.



The *WAN Statistics* page contains the following options/fields:

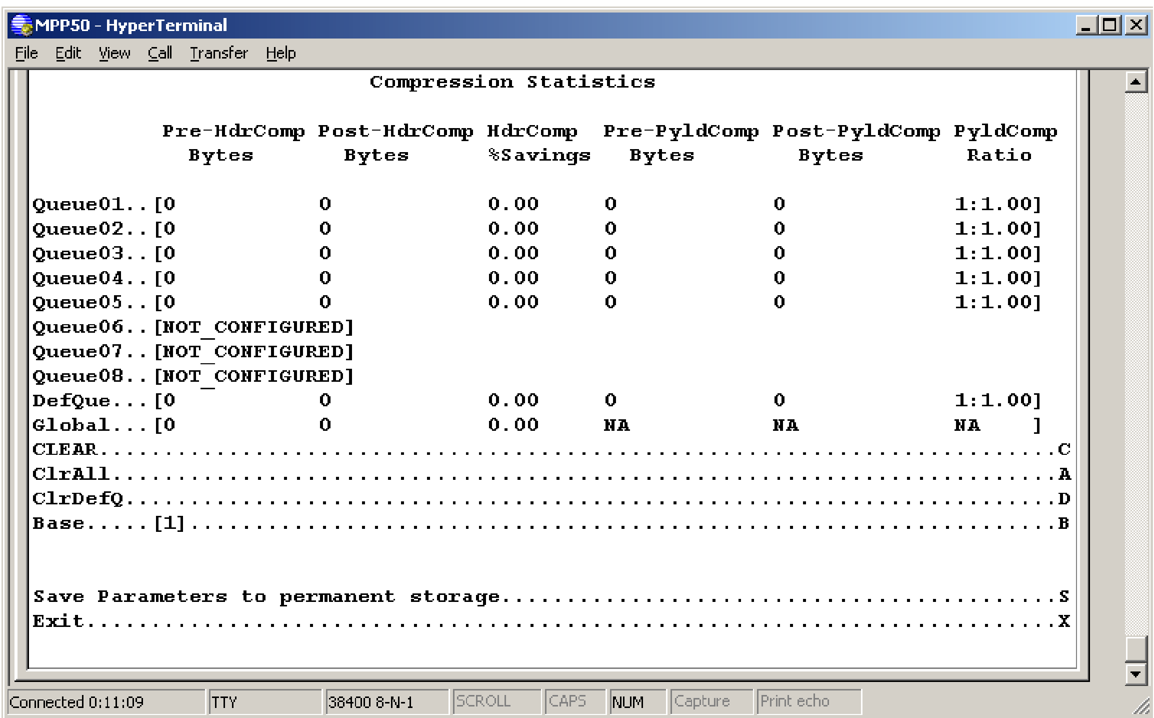
Menu Options/Fields	Entry	Description
WAN Rx Bad Addr Count	**Read Only**	The count of received frames that did not match any of the 4 HDLC addresses or the broadcast address.
WAN Rx Pkt Proc CRC Error Count		Count of received frames that failed packet processor CRC check.
WAN Rx Abort/Octet Error Count		Count of aborted frames and octet error frames.

Menu Options/Fields	Entry	Description
WAN Rx Overrun Count		Count of received frames that exceeded max frame length of 2K bytes in length (Or) overflowed the HDLC buffer.
WAN HDLC CRC Error Count		Number of received frames that failed HDLC CRC check.
WAN Rx HDLC Payload Count		The count of payload bytes that were received over satellite link excluding any frame overhead.
WAN Rx HDLC Header Count		The count of HDLC header bytes received over satellite link including control, HDLC address, Flow ID, and CRC.
WAN Rx HDLC Packet Count		Number of packets received over satellite link.
WAN Rx Err Invalid Flow Id		Number of packets which the flow identifier has been corrupted, does not fall into the range of acceptable values.
WAN Rx Err SAR Reassemble		Number of packets unable to correctly reassemble a segmented packet.
WAN Rx Err Hdr Decomp		Number of packets unable to correctly decompress the header information.
WAN Rx Err Mem Alignment		Number of packets discarded (caused by memory corruption).
WAN Rx Err bad CRC		Number of corrupted packets indicated by CRC check.
WAN TX Err - No Route		***Internal Traffic Statistics used for Factory Troubleshooting***
WAN TX Err - Pkt Start		
WAN TX Err - Pkt Front Length		
WAN TX Err - Pkt End Length		
WAN TX Err - Pkt Invalid Length		
WAN TX Err - Pkt Dropped - Sat overdriven		
WAN Tx HDLC Header Count		This counter keeps track of number of HDLC header bytes transmitted over satellite link.
WAN Tx HDLC Payload Count		Number of payload bytes transmitted over satellite link.
WAN Tx HDLC Packet Count		Count of packets transmitted over satellite link.
Ethernet traffic destined to go over WAN (kbps)		Bandwidth required to forward Ethernet traffic before compression.
Actual Satellite traffic (kbps)		Current satellite bandwidth being used.

Menu Options/Fields	Entry	Description
Percentage of WAN Bandwidth saved		Displays percent of bandwidth being saved as a result of Header and/or Payload Compression, and optimized satellite framing.
Clear	**C**	Resets all WAN statistics.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9.2.5 Compression Statistics

The *Compression Statistics* page is activated from the *Statistics Menu* page. The *Compression Statistics* page displays counts of the number of bytes before and after for both Header and Payload Compression. For Header Compression, the percentage of bandwidth savings is displayed. For Payload Compression, the effective compression ratio is displayed.



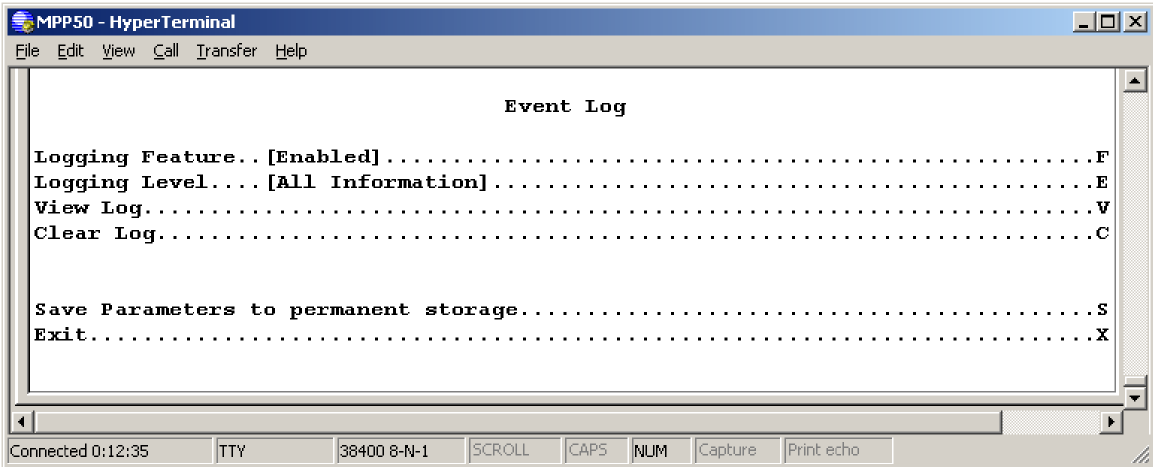
The *Compression Statistics* page contains the following options/fields:

Note: Although the QoS option is not required to use Header or Payload Compression, the Compression Statistics are displayed by QoS Rule flow Queues. If QoS is not enabled, all the Compression Statistics will fall within the Global Queue.

Menu Options/Fields	Entry	Description
Queue01…08	**Read Only**	Statistics are displayed in a table format showing: Pre-Header Comp Bytes Post-Header Comp Bytes Header Comp % Savings Pre-Payload Comp Bytes Post-Payload Comp Bytes Payload Compression Ratio
Global	**Read Only**	All traffic that does not fall within a defined QoS Rule will be indicated in the 'Global' (Default Rule Queue).
CLEAR	**C**	Allows a reset of the Statistics of a specific Queue.
ClrAll	**A**	Resets all Compression Statistics.
Base [1]	**B**	Allows the user to view up to 8 different Queues per screen. To allow editing on any of the 32 entries that can be defined, the user can select a base address to control which 8 QoS Queues are displayed. For example, if the user wants to view QoS Queues 16-24, then a Base value of 16 should be defined.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9.3 Event Log Page

The *Event Log* page is activated from the *Operations and Maintenance* page.



The *Event Log* page allows the user to capture all IP Module events to a log. The *Event Log* Page contains the following options/fields:

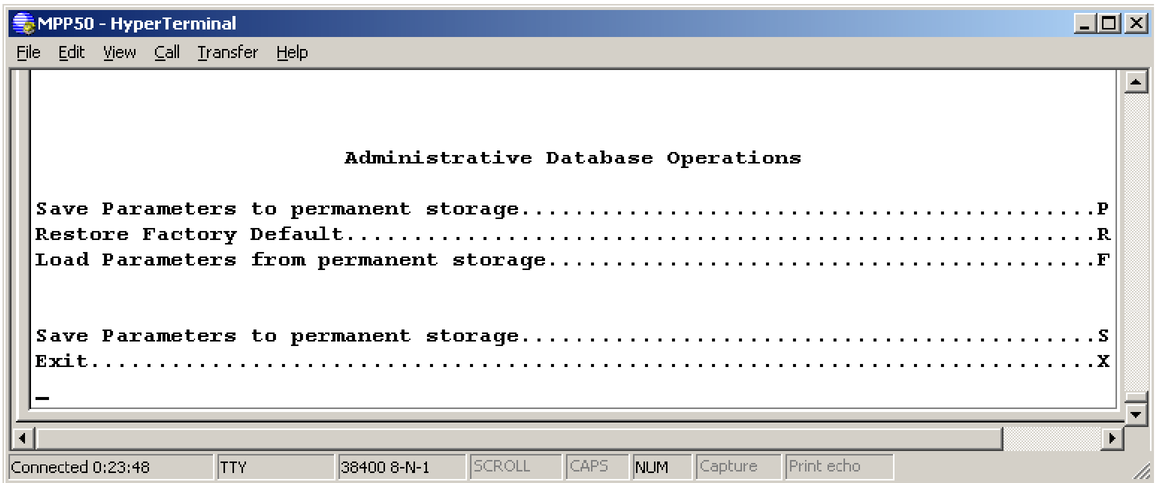
Menu Options/Fields	Entry	Description
Logging Feature	**F**	Select to Enable/Disable Logging
Logging Level	**E**	Select 1 – Errors Only 2 – Errors and Warnings 3 – All Information
View log	**V**	Select to view log. Will display most recent events. Press any key to scroll through events or Escape to exit. All events will display Type – Error, Warning, or Information Date/Time – NOTE: During Bootup, multiple Boot Events will be created, but a Date/Time will only be seen when the Bootup has completed. Category – Boot, Database, FTP logins, upgrade file transfers, Ethernet Link status change. Description – Event details
Clear log	**C**	Select to clear log contents.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

NOTE: The full Event log file can be retrieved by FTP. Use Admin login and type command 'get eventlog'. The entire Event log can then be viewed with a text viewer.

```
54        Information    05/21/2004 10:12:04 C:/Comtech/ftp/ftpCallbacks.c
1041      FTP                 FTP Connected - 'User: comtech' logged in

53        Information    05/21/2004 09:07:40 C:/Comtech/cimmib/cimMib.c
520       Database            Set system clock to FRI MAY 21 09:07:40 2004

52        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
534       Boot                Configuring router using PARAM file

51        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
364       Boot                Detected Framer Module II.

50        Information    05/21/2004 08:57:42 C:/Comtech/cimmib/cimMib.c
520       Database            Set system clock to FRI MAY 21 08:57:42 2004

49        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
534       Boot                Configuring router using PARAM file

48        Information    Unknown    Unknown  C:/Comtech/startup/usrAppInit.c
364       Boot                Detected Framer Module II.

47        Information    05/21/2004 08:13:02 C:/Comtech/ftp/ftpCallbacks.c
180       FTP                 Disconnected FTP

46        Information    05/21/2004 07:58:06 C:/Comtech/ftp/ftpCallbacks.c
540       FTP                 FTP Transfer complete

45        Information    05/21/2004 07:58:04 C:/Comtech/ftp/ftpCallbacks.c
863       FTP                 Image has been saved to FLASH

44        Information    05/21/2004 07:57:40 C:/Comtech/ftp/ftpCallbacks.c
1041      FTP                 FTP Connected - 'User: comtech' logged in

43        Information    05/21/2004 06:55:14 C:/Comtech/telnetd/telnetd.c
421       Telnet              Telnet disconnected

42        Information    05/21/2004 06:54:26 C:/Comtech/telnetd/telnetd.c
385       Telnet              Connected host 10.6.6.94

41        Information    05/21/2004 06:38:02 C:/Comtech/ftp/ftpCallbacks.c
180       FTP                 Disconnected FTP

40        Information    05/21/2004 06:23:07 C:/Comtech/ftp/ftpCallbacks.c
540       FTP                 FTP Transfer complete

39        Information    05/21/2004 06:23:06 C:/Comtech/ftp/ftpCallbacks.c
863       FTP                 Image has been saved to FLASH

38        Information    05/21/2004 06:22:43 C:/Comtech/ftp/ftpCallbacks.c
1041      FTP                 FTP Connected - 'User: comtech' logged in
```

17.2.9.4 Database Operations Page

Database Operations Page is activated from *Operations and Maintenance* Page.

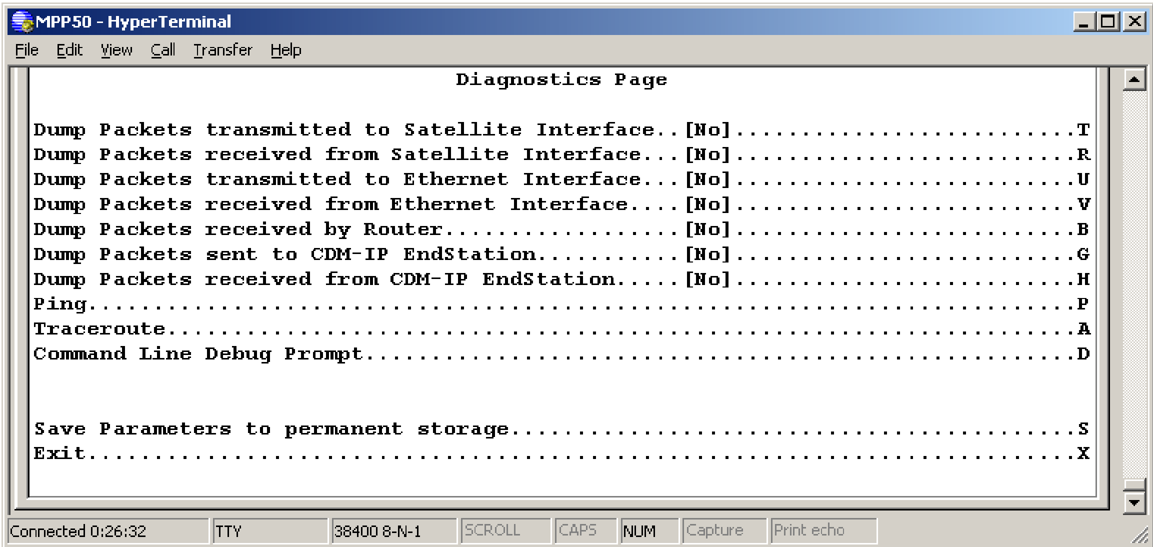


The Database Operations option allows the user to view, save, or erase an existing user configuration of the IP Module. An IP Module uses these types of configuration files to initialize itself on power-up.
The User Configuration File allows a User to over-write the values defined in the Factory Configuration file. This allows full customization of a IP Module without erasing a set of parameters defined from the factory. The User configuration file can also be retrieved or overwritten via FTP by specifying the filename 'param1'.
The Administrative Database Operations Page contains the following options/fields:

Menu Options/Fields	Entry	Description
Restore Factory Default	**R**	Restores the IP Module settings to "safe" values as defined by the factory.
Load Parameters from permanent storage	**P**	This option overwrites the current configuration of the IP Module with the configuration last saved to permanent storage. It allows the user to perform an "Undo" type operation if the IP Module is put into an undesirable state by the user.
Save Parameters	**S**	This option allows a user to save the current configuration of the IP Module to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.9.5 Diagnostics Page

The *Diagnostics* Page is activated from the *Operations and Maintenance* Page.



IMPORTANT

Using Dump Packets Diagnostics Utilities

1. The Dump Packet Utilities will display a hexadecimal representation of each packet and should not be used when the IP Module is on a "live" network.

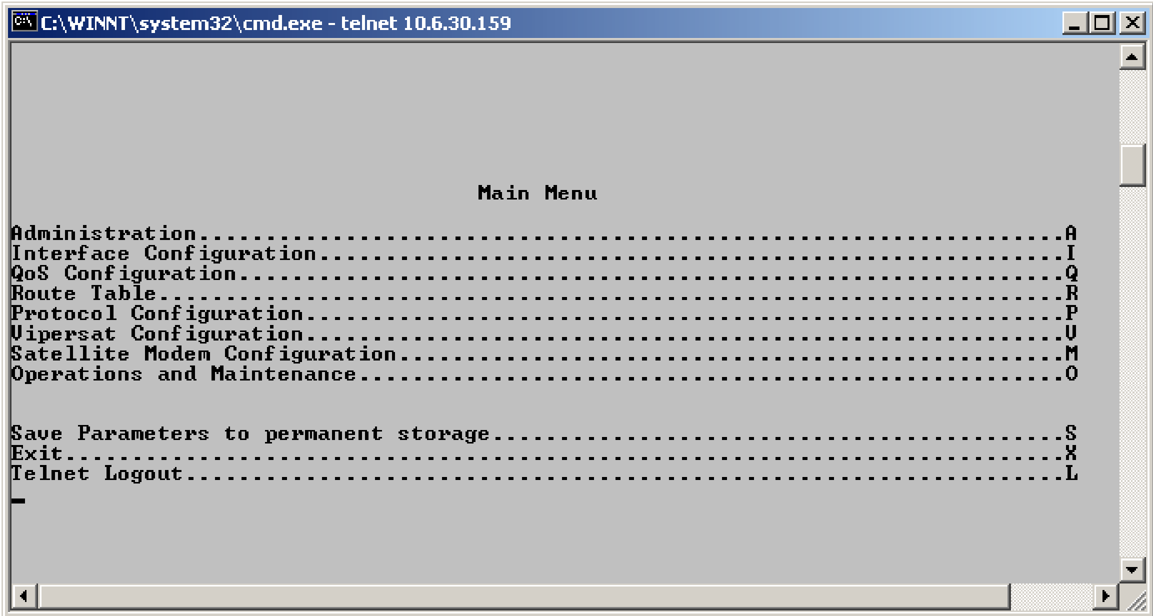
2. Selecting the menu option a second time terminates the dump operation. Each selection toggles the value of the dump engine.

The *Diagnostics* Page contains the following options/fields:

Menu Options/Fields	Entry	Description
Dump Packets transmitted to Satellite Interface	**T**	Toggles [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that it transmits over the Satellite Interface.
Dump Packets received from Satellite Interface	**R**	Toggles [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that it receives from the Satellite Interface.
Dump Packets transmitted to Ethernet Interface	**U**	Toggles [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that is transmitted to the Ethernet Interface.

Menu Options/Fields	Entry	Description
Dump Packets received from Ethernet Interface	**V**	Toggles [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that it receives from the Ethernet Interface.
Dump Packets received by Router	**B**	Toggle [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that is received by the routing engine. (Note: Does not apply when in easyConnect™ mode.)
Dump Packets sent to EndStation	**G**	Toggle [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that is received by and destined for this modem. This traffic would include Pings, SNMP, Telnet, HTTP, and FTP types of traffic.
Dump Packets received from EndStation	**H**	Toggle [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that is sourced from this modem and destined for some other device. This allows a user to see what type of packets this modem is generating internally.
Ping	**P**	Enter the ip address in aaa.bbb.ccc.ddd format
Traceroute	**A**	Enter the ip address in aaa.bbb.ccc.ddd format
Command Line Debug Prompt	**D**	Enter the password to access the debug command line. Note: This is reserved for Customer Service and engineering use.
Save Parameters	**S**	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each successive power cycle.
Exit	**X**	This option allows a user to exit the current menu and return to its parent menu.

17.2.10 Telnet - Logout Option



When connecting to the IP Module through a Telnet session, the menus present another option to logout of the Telnet session. This logout option is in all the menus and when selected, logs the user out of the Telnet session, returning control of the CLI to the serial interface.

IMPORTANT

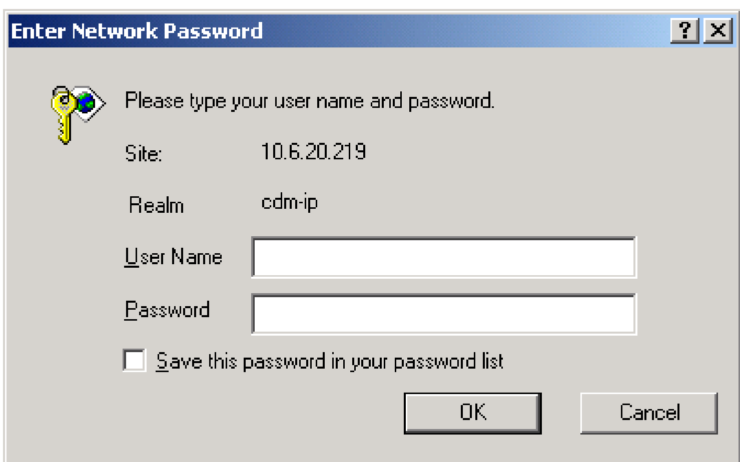
The IP Module does not allow concurrent access to the menu via telnet and the console port. If a user connects via telnet, IP Module automatically disables the console port for the duration of the Telnet session. All menu pages allow a Telnet logout to end a Telnet session. Also, the IP Module will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

Notes:

Chapter 18. WEB SERVER PAGES

18.1 Web Server Usage

The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the CDM-570/570L /IP Module. These web pages have been designed for optimal performance when using Microsoft's Internet Explorer 5.5 or higher. By typing http://xxx.xxx.xxx.xxx" (where xxx.xxx.xxx.xxx =IP Module IP address) on your browser, the Login prompt will appear.



HTTP Login Access Levels are defined as follows:

User Interface	User Login Access Level		
	Admin User	**Read/Write User**	**Read Only User**
Web	Full Access to all Web Pages	No Access to Admin or Encryption Web Pages	No Access to Admin or Encryption Web Pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages, able to reset Statistics

IP Module Default Name/Passwords are:

- Admin comtech/comtech
- Read/Write opcenter/1234
- Read Only monitor/1234

IMPORTANT

Any changes made to the base modem and IP Module will be lost if the IP Module is reset or loses power unless the changes are saved to permanent storage. This applies to all of the IP Module and base modem parameters. The modem parameters can be saved by selecting “Save” from the tool toolbar under Maintenance.

Note: As of CDM-IP version 1.5.3, all parameters for the modem are stored in the IP Module parameter file. This provides a single file to store the entire contents of the modem.

IMPORTANT

See Chapter 17 IP Module CLI and Telnet Interface section for a more detailed explanation of IP Module functions.

18.1.1 Web Server Menu Tree

Table 18-1. IP Module Web Server Menu Tree

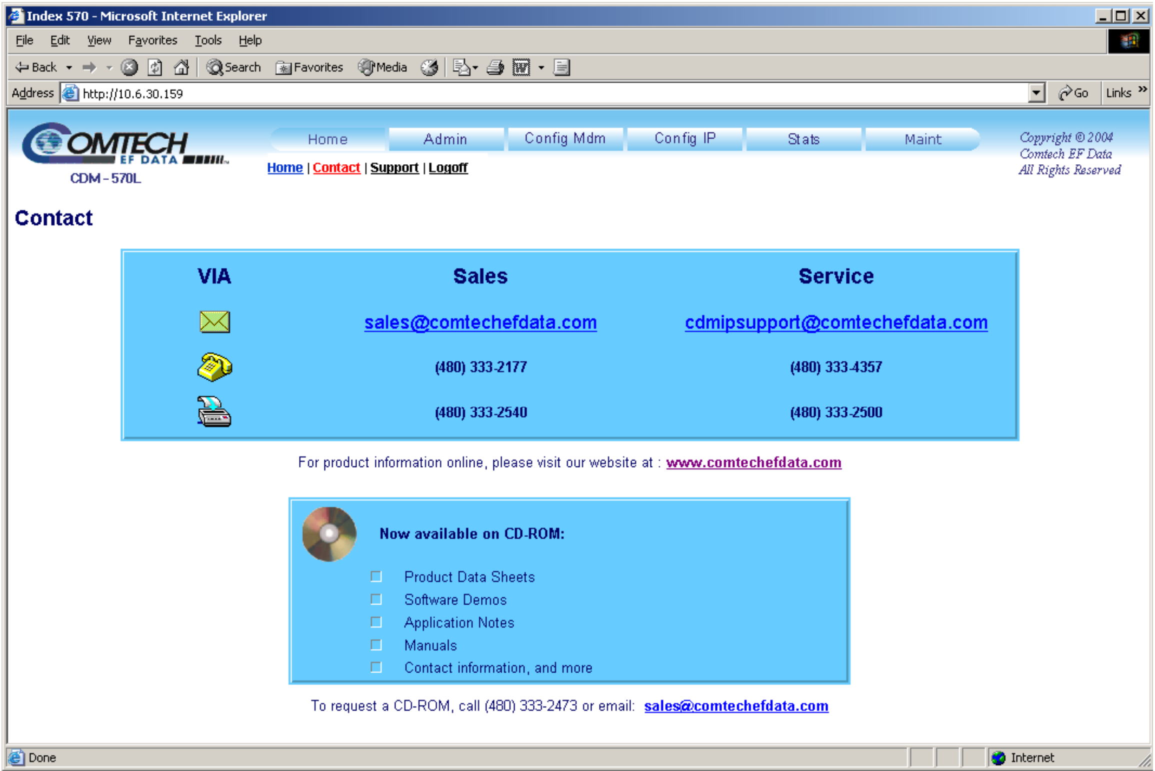
Level 1	Level 2
Home	Home
	Contact
	Support
	Logoff
Admin	Summary
	Access
	Features
	Remote
	Encryption
Modem	Modem
	Utilities
	Status
	Logs
	BUC
	LNB
IP	Interface
	Routes
	Multicast Routes
	QoS
	ARP
	IGMP
	Redundancy
Stats	Ethernet
	Routes
	QoS
	WAN
	Compression
Maintenance	Unit Info
	Operations
	Save
	Reboot

18.2 Home Pages

18.2.1 Home Page

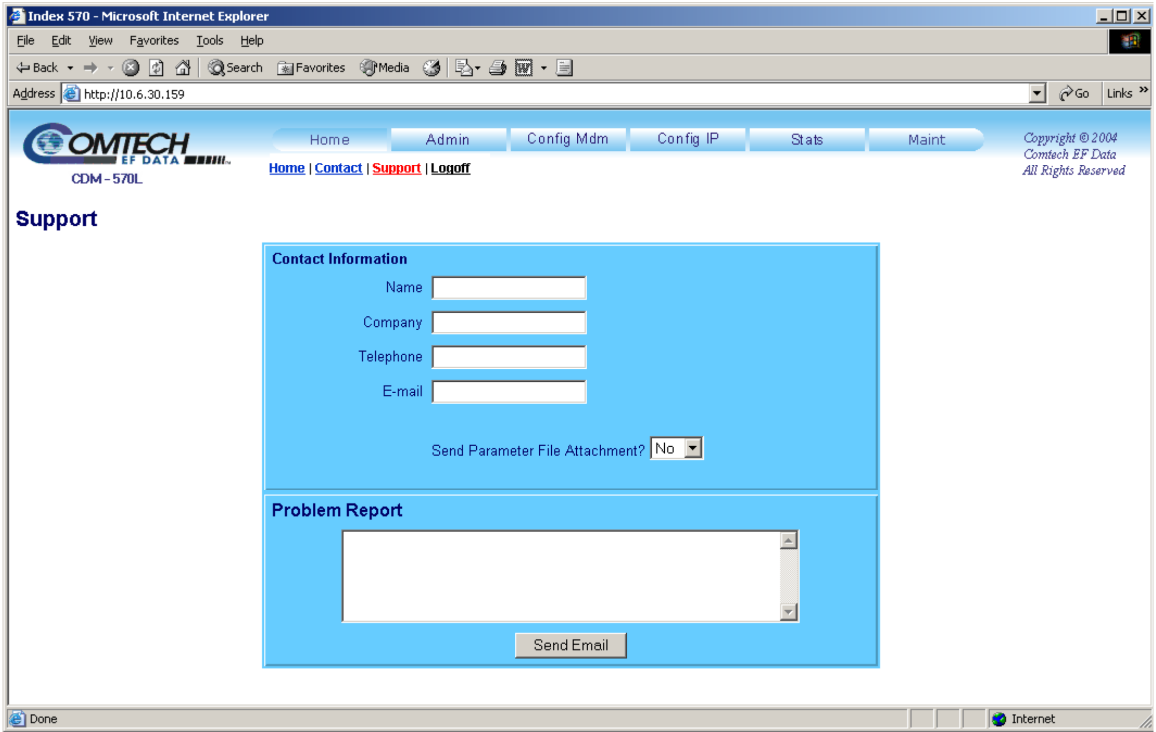
Welcome to the CDM-570/570L /IP Module Web Interface. The following sections will describe the functionality that is unique to the Web Interface. Please refer to Chapter 17 for a complete and detailed description of each configuration parameter.

18.2.2 Contact Information



This page provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone or automated e-mail links.

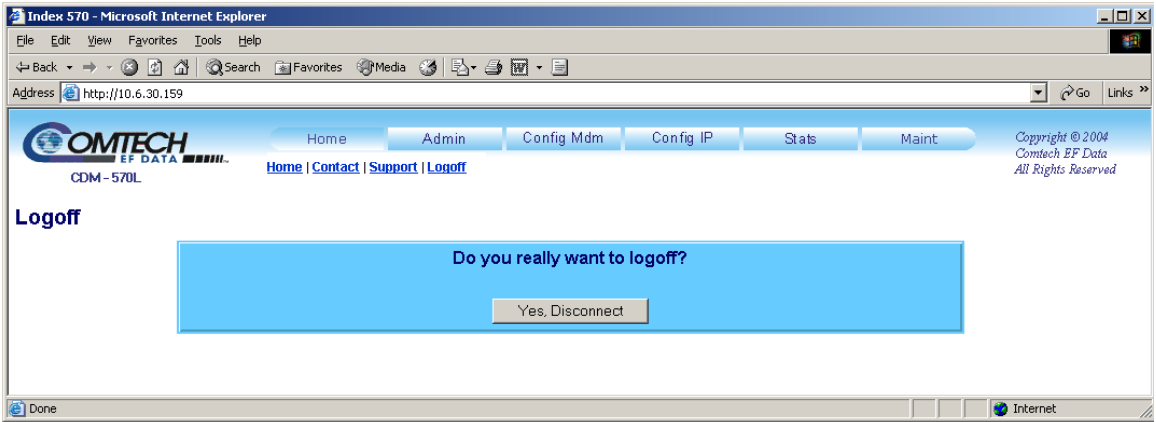
18.2.3 Support



Notes on SMTP – SMTP can be used to send an email to Comtech EF Data IP Modem Support cdmipsupport@comtechefdata.com from the Support Web Page. The Support Web Page allows you to compose an email message for questions or problems with the IP Module. The user can also select to automatically attach the IP Module parameter file (which will contain the modem's serial number and configuration information) in order to facilitate troubleshooting or to resolve configuration issues. The problem report area of the display allows up to 2,000 characters maximum.

The IP Module uses SMTP (Simple Mail Transport Protocol) to send email and will require the modem's administrator to specify the SMTP server, domain name and destination name on the Administration Screen for SMTP to operate correctly (see Section 17.2.1.5 for details on Administration SMTP Configuration).

18.2.4 Logoff



Currently the IP Module only allows one connection to the CLI or the Web Interface. Use this option to formally disconnect from the Web Interface.

IMPORTANT

Upon disconnection, you will be required to close the Web Browser so as to delete the security cookie to the IP Module.

Notes:

Chapter 19. SNMP INTERFACE

19.1 SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an application-layer protocol designed to facilitate the exchange of management information between network devices. The CDM-570/570L SNMP agent supports both SNMPv1 and v2c.

IMPORTANT

For proper SNMP operation, the CDM-570/570L MIB files must be used with the associated version of the CDM-570/570L base modem M&C and the IP module SW. Please refer to the CDM-570/570L SW Release Notes for information on the required FW/SW compatibility.

19.2 CDM-570/570L Management Information Base (MIB) Files

MIB files are used for SNMP remote management and consist of Object Identifiers (OIDs). Each OID is a node that provides remote management of a particular function. A MIB file is a tree of nodes that is unique to a particular device. There are six MIB files associated with the CDM-570/570L:

MIB File/Name	Description
fw10874-2-.mib ComtechEFData MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: Name: comtechEFData Type: MODULE-IDENTITY OID: 1.3.6.1.4.1.6247 Full path: iso(1).org(3).dod(6).internet(1).private (4).enterprises(1).comtechEFData(6247) Module: ComtechEFData
fw10874-3B.mib IP ModuleMIB file	IP Module MIB file consists of all of the OIDs for management of the IP functions.

FW10874-4D.mib CDM-570/570L MIB file	CDM-570/570L MIB file consists of all of the OIDs for management of the CDM-570/570L modem functions
FW10874-5A.mib CDM-570/570L Traps MIB file	CDM-570/570L Trap MIB file is provided for common SNMPv1 traps
Fw10874-6A.mib CDM-570L L-Band BUC and LNB MIB	CDM-570L MIB file consists of all of the OIDs for management of the BUC and LNB functions
FW10874-7-MIB	CDM-570L Trap MIB file is provided for BUC and LNB SNMPv1 traps

These MIB files should be compiled in a MIB Browser or SNMP Network Monitoring System server.

Note: The CDM-570/570L SNMP agent supports both SNMPv1 and v2c. The CDM-570/570L Traps file only needs to be compiled if SNMPv1 traps are to be used.

IMPORTANT

Any changes made to modem parameters will be lost if the IP Module is reset or loses power unless the changes are saved to flash. This applies to all of the IP parameters and Base Modem parameters. The IP and Base Modem parameters can be saved by a SET of the cdmipSaveConfiguration OID within the cdmipController MIB.

19.3 SNMP Community Strings

The CDM-570/570L uses community strings as a password scheme that provides authentication before gaining access to the CDM-570/570L agent's MIBs.

In SNMP v1/v2c, the community string is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The community string is entered into the MIB Browser or Network Node Management software and is used to authenticate users and determine access privileges to the SNMP agent.

The user defines three Community Strings for SNMP access:

- Read Community default = public
- Write Community default = private
- Trap Community default = public

19.4 SNMP Traps

The CDM-570/570L has the ability to send out SNMP traps when certain events occur in the modem. For example, when the CDM-570/570L boots it sends out a coldstart trap and three linkup traps, one for each interface that is brought up. The CDM-570/570L also sends out traps when an alarm or a fault occurs in the modem. These include unit faults, TX faults, and RX faults. A trap is sent both when a fault occurs and is cleared.

The CDM-570/570L supports both SNMPv1 traps and SNMPv2 notifications. Which style of traps the CDM-570/570L sends can be configured by the user using the cdmipSnmpTrapVersion OID.
The following are the MIB2 v1traps/v2 notifications that the CDM-570/570L supports.

CDM-570/570L MIB2 SNMPv1 traps:

Cold Start	1
Link Up	4
Authentication Failure	5

CDM-570/570L MIB2 SNMPv2 notifications:

Cold Start	1.3.6.1.6.3.1.1.5.1
Link Up	1.3.6.1.6.3.1.1.5.4
Authentication Failure	1.3.6.1.6.3.1.1.5.5

The following tables are the Alarms and Faults v1 traps / v2 notifications that the CDM-570/570L supports.

CDM-570/570L Alarms and Faults SNMPv1 traps:

cdm570LUnitAlarm	6247241
cdm570LTxTrafficAlarm	6247242
cdm570LRxTrafficAlarm	6247243
Cdm570LODUAlarm	6247244

CDM-570/570L Alarms and Faults SNMPv2 notifications:

cdm570LunitAlarm	1.3.6.1.4.1.6247.24.2.0.1
cdm570TxTrafficAlarm	1.3.6.1.4.1.6247.24.2.0.2
cdm570LrxTrafficAlarm	1.3.6.1.4.1.6247.24.2.0.3
cdm570LODUAlarm	1.3.6.1.4.1.6247.24.2.0.4

19.5 MIB-II

The CDM-570/570L agent implements RFC 1213, Management Information Base for Network Management of TCP/IP-based Internets. This is known as “MIB-II” or “Public MIB support.” For detailed OID information please refer to the actual MIB file. The agent implements the following Groups:

Table 19-1. MIB-II Support

Group	Comments
System Group	Mandatory for RFC1213
Interface	Mandatory for RFC1213
IP	Mandatory for RFC1213
ICMP	Mandatory for RFC1213
TCP	Mandatory for RFC1213
UDP	Mandatory for RFC1213
SNMP	Mandatory for RFC1213
Address Translation Group	Implemented but depreciated in MIB-II
EGP	Not applicable

19.6 CDM-570/570L Private MIB

The CDM-570/570L SNMP implements a common modem MIBs that contain all the modem specific parameters common to the 570/570L. In addition, the CDM-570L SNMP also implements a BUC and LNB MIB for RF parameters.

IMPORTANT

Whenever modifying the Modulator or Demodulator parameters by SNMP, the user must be aware that the following variables must be executed in this order:

1. FEC (Forward Error Correction)
2. Modulation or Demodulation
3. Code Rate
4. Data Rate

For detailed OID information please refer to the actual MIB file.

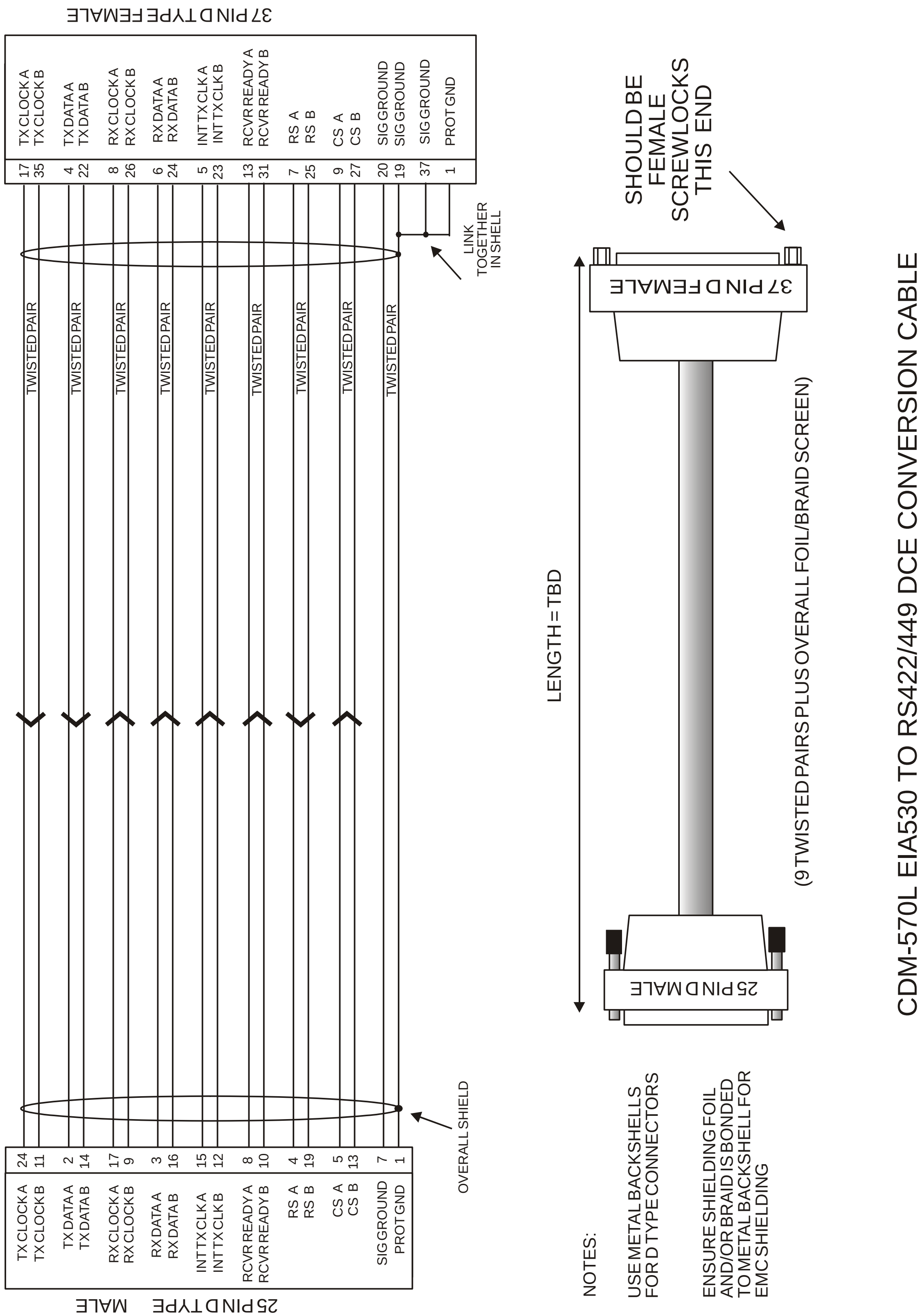
Notes:

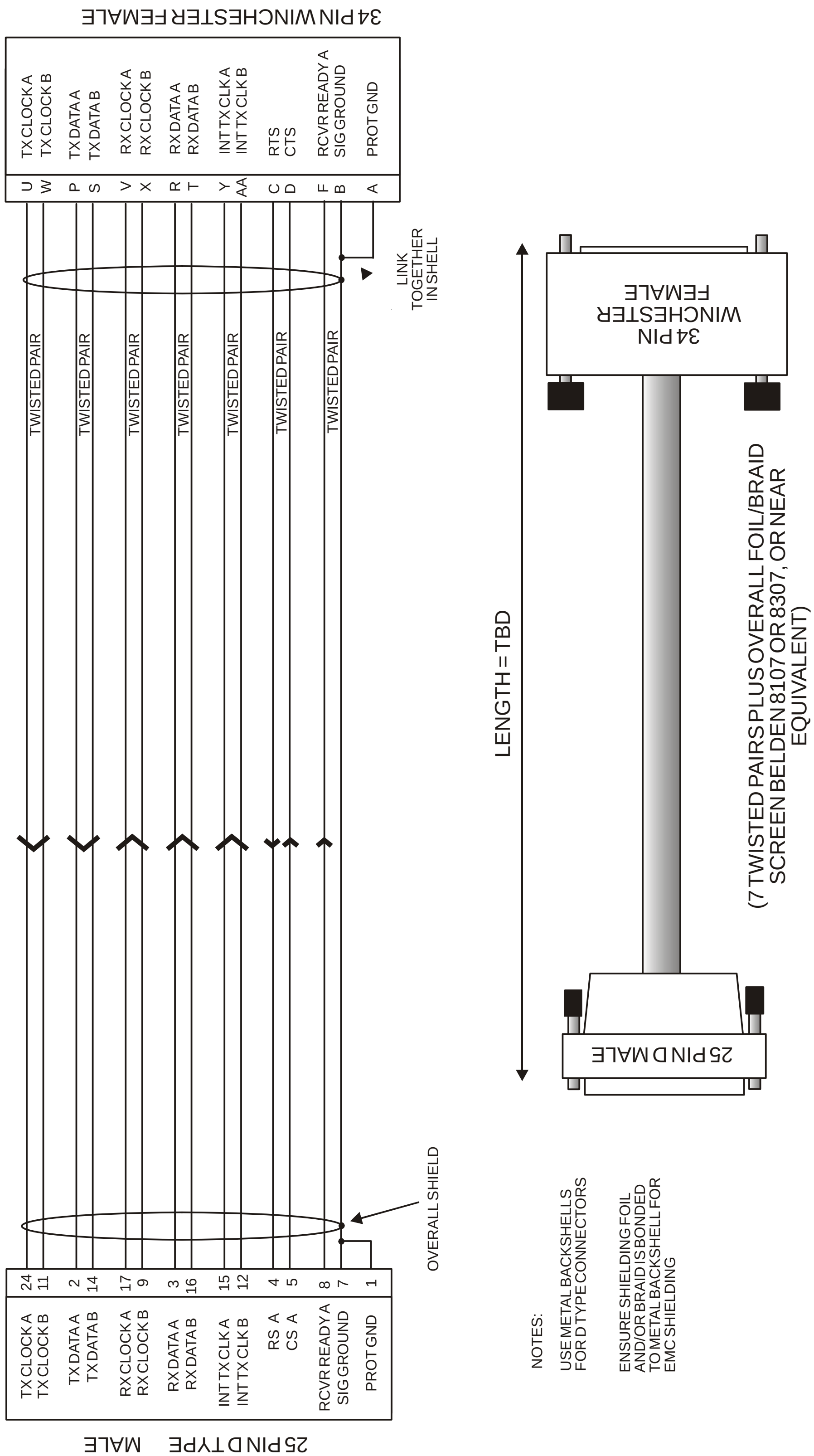
Appendix A. CABLE DRAWINGS

The EIA-530 standard pinout (provided on the CDM-570/570L) is becoming more popular in many applications. However, there are still many occasions when, especially for existing EIA-422/449 and V.35 users, a conversion must be made.

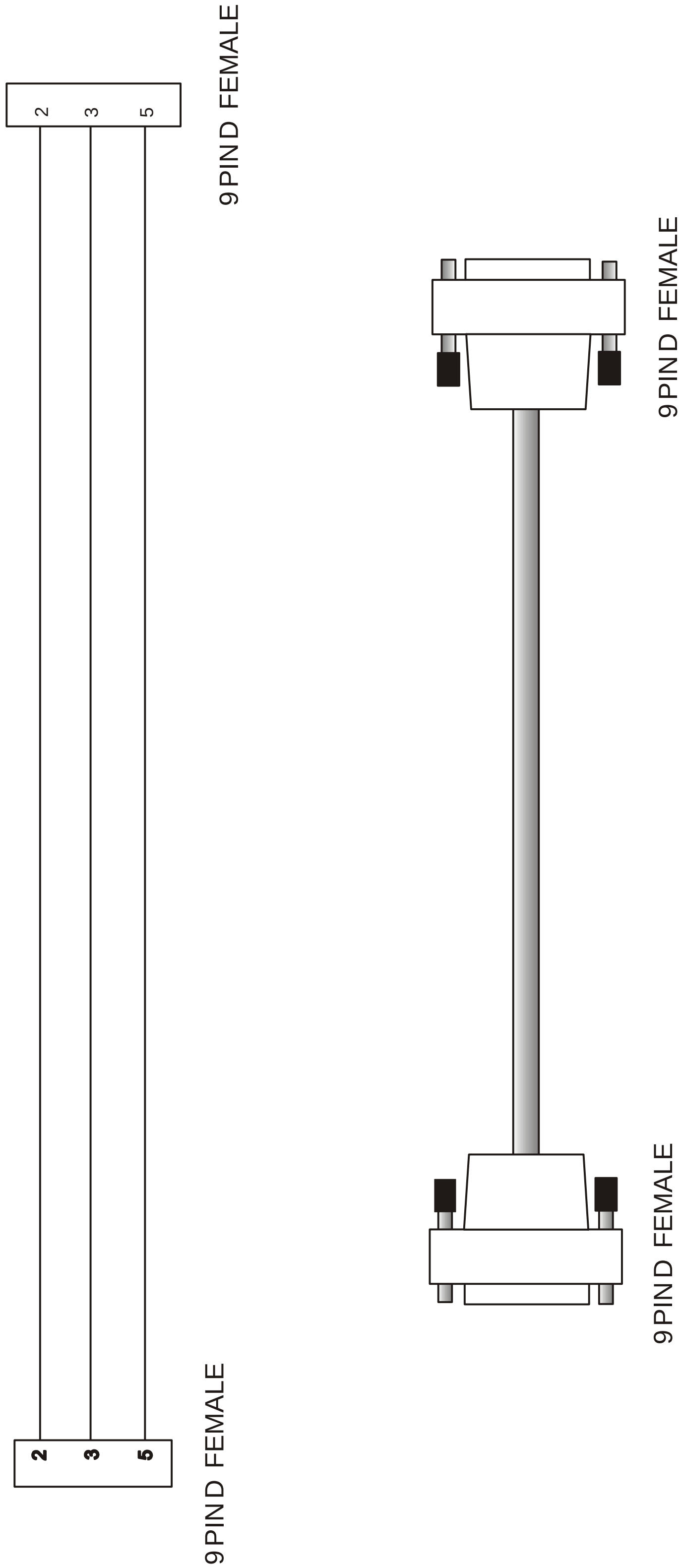
For these situations, the following two cable drawings show EIA-530 to EIA-422/449 DCE conversion, and EIA-530 to V.35 DCE conversion.

The third drawing shows a standard EIA-232 cable for use with the Remote Control Port of the Modem. This should also be used for performing Flash Upgrading via an external PC.


37 PIN D TYPE FEMALE
17 TX CLOCK A
35 TX CLOCK B
4 TX DATA A
22 TX DATA B
8 RX CLOCK A
26 RX CLOCK B
6 RX DATA A
24 RX DATA B
5 INT TX CLK A
23 INT TX CLK B
13 RCVR READY A
31 RCVR READY B
7 RS A
25 RS B
9 CS A
27 CS B
20 SIG GROUND
19 SIG GROUND
37 SIG GROUND
1 PROT GND
LINK TOGETHER IN SHELL
TWISTED PAIR
OVERALL SHIELD
25 PIN D TYPE MALE
24 TX CLOCK A
11 TX CLOCK B
2 TX DATA A
14 TX DATA B
17 RX CLOCK A
9 RX CLOCK B
3 RX DATA A
16 RX DATA B
15 INT TX CLK A
12 INT TX CLK B
8 RCVR READY A
10 RCVR READY B
4 RS A
19 RS B
5 CS A
13 CS B
7 SIG GROUND
1 PROT GND
SHOULD BE FEMALE SCREWLOCKS THIS END
37 PIN D FEMALE
LENGTH = TBD
(9 TWISTED PAIRS PLUS OVERALL FOIL/BRAID SCREEN)
25 PIN D MALE
NOTES:
USE METAL BACKSHELLS FOR D TYPE CONNECTORS
ENSURE SHIELDING FOIL AND/OR BRAID IS BONDED TO METAL BACKSHELL FOR EMC SHIELDING
CDM-570L EIA530 TO RS422/449 DCE CONVERSION CABLE



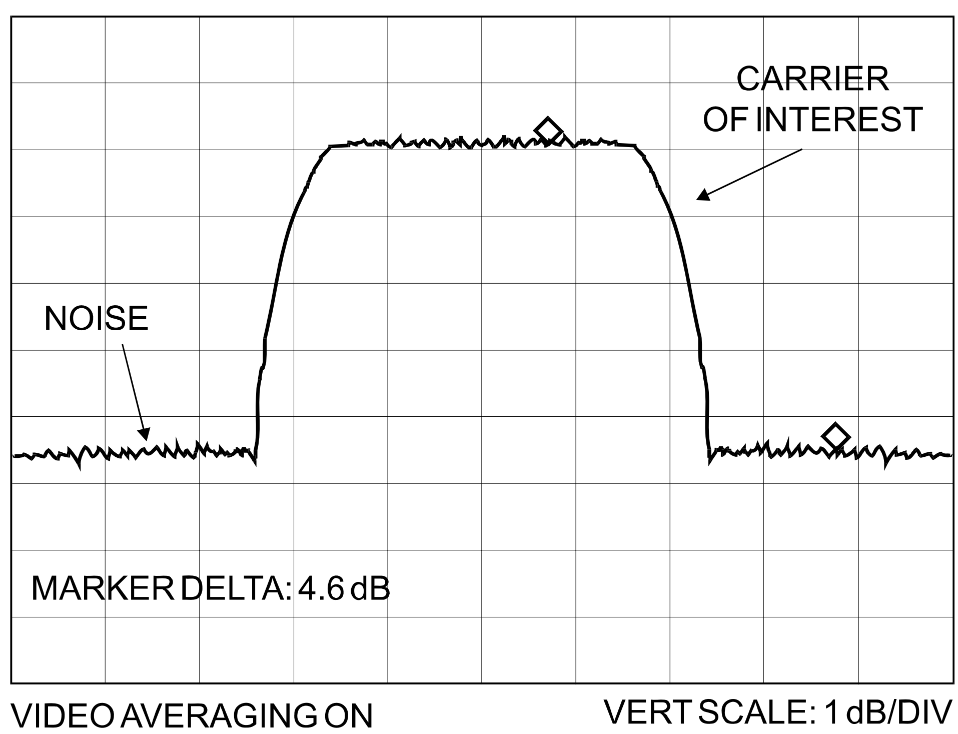
CDM-570L EIA530 TO V.35 DCE CONVERSION CABLE



PC 9 PIN SERIAL PORT TO CDM-570L RS232 REMOTE CONTROL PORT

Appendix B. Eb/No MEASUREMENT

Although the CDM-570/570L calculates and displays the value of receive Eb/No on the front panel of the unit, it is sometimes useful to measure the value using a spectrum analyzer, if one is available.



The idea is to accurately measure the value of (Co+No)/No, (Carrier density + Noise density/Noise density). This is accomplished by tuning the center frequency of the Spectrum analyzer to the signal of interest, and measuring the difference between the peak spectral density of the signal (the flat part of the spectrum shown) and the noise density. To make this measurement:

- Use a vertical scale of 1 or 2 dB/division.
- Set the Resolution Bandwidth of the Spectrum Analyzer to < 20% of the symbol rate.
- Use video filtering and/or video averaging to reduce the variance in the displayed trace to a low enough level that the difference can be measured to within 0.2 dB.
- Place a marker on the flat part of the signal of interest, then use the MARKER DELTA function to put a second marker on the noise to the side of the carrier. This value is (Co+No)/No, in dB.
- Use this value of (Co+No)/No in the table on the following page to determine the Eb/No. You will need to know the operating mode to read from the appropriate column.
- If the (Co+No)/No value measured does not correspond to an exact table entry, interpolate using the two nearest values.

Note that the accuracy of this method degrades significantly at low values of (Co+No)/No (approximately less than 6 dB).

Example:
In the diagram above, the (Co+No)/No measured is 4.6 dB. If Rate 1/2 QPSK is being used, this would correspond to an Eb/No of approximately 2.6 dB.

The exact relationship used to derive the table values is as follows:

$$Eb/No = 10 \log_{10}(10^{(Co+No/No)/10} - 1) - 10 \log_{10}(\text{FEC Code Rate}) - 10 \log_{10}(\text{bits/symbol})$$

where:

- Eb/No and (Co+No)/No are expressed in dB
- Bits/symbol = 1 for BPSK
- Bits/symbol = 2 for QPSK
- Bits/symbol = 3 for 8-PSK/8-QAM
- Bits/symbol = 4 for 16-QAM
- Code Rate for ‘uncoded’ = 1
- Pay close attention to the sign of the middle term

(Co+No) /No	Eb/No Uncoded BPSK	Eb/No Rate 1/2 BPSK	Eb/No Rate 21/44 BPSK	Eb/No Rate 5/16 BPSK	Eb/No Uncoded QPSK	Eb/No Rate 1/2 QPSK	Eb/No Rate 3/4 QPSK	Eb/No Rate 7/8 QPSK	Eb/No Rate 0.95 QPSK	Eb/No Rate 2/3 8-PSK	Eb/No Rate 3/4 8-PSK	Eb/No Rate 7/8 8-PSK	Eb/No Rate 0.95 8-PSK	Eb/No Rate 3/4 16-QAM	Eb/No Rate 7/8 16-QAM
1.4	-	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-
1.6	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-
1.8	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-
2.0	-	0.7	0.9	2.7	-	-	-	-	-	-	-	-	-	-	-
2.2	-	1.2	1.4	3.2		-	-	-	-	-	-	-	-	-	-
2.4	-	1.7	1.9	3.7	-	-	-	-	-	-	-	-	-	-	-
2.6	-	2.1	2.3	4.2	-	-	-	-	-	-	-	-	-	-	-
2.8	-	2.6	2.8	4.6	-	-	-	-	-	-	-	-	-	-	-
3.0	0.0	3.0	3.2	5.0	-	-	-	-	-	-	-	-	-	-	-
3.5	0.9	3.9	4.1	5.9	-	0.9	-	-	-	-	-	-	-	-	-
4.0	1.8	4.8	5.0	6.8	-	1.8	-	-	-	-	-	-	-	-	-
4.5	2.6	5.6	5.8	7.6	-	2.6	0.8	-	-	-	-	-	-	-	-
5.0	3.3	6.3	6.5	8.4	-	3.3	1.5	0.9	-	-	-	-	-	-	-
5.5	4.1	7.1	7.3	9.1	1.1	4.1	2.3	1.7	1.3	-	-	-	-	-	-
6.0	4.7	7.7	7.9	9.8	1.7	4.7	2.9	2.3	1.9	-	-	-	-	-	-
6.5	5.4	8.4	8.6	10.4	2.4	5.4	3.6	3.0	2.6	-	-	-	-	-	-
7.0	6.0	9.0	9.2	11.1	3.0	6.0	4.2	3.6	3.2	-	-	-	-	-	-
7.5	6.6	9.6	9.8	11.7	3.6	6.6	4.8	4.2	3.8	-	-	-	-	-	-
8.0	7.3	10.3	10.5	12.3	4.3	7.3	5.5	4.9	4.5	-	-	-	-	-	-
8.5	7.8	10.8	11.0	12.9	4.8	7.8	6.0	5.4	5.0	4.8	-	-	-	-	-
9.0	8.4	11.4	11.6	13.4	5.4	8.4	6.6	6.0	5.6	5.4	4.9	-	-	-	-
9.5	9.0	12.0	12.2	14.0	6.0	9.0	7.2	6.6	6.2	6.0	5.5	4.8	4.5	-	-
10.0	9.5	12.5	12.7	14.6	6.5	9.5	7.7	7.1	6.7	6.5	6.0	5.3	5.0	-	-
10.5	10.1	13.1	13.3	15.1	7.1	10.1	8.3	7.7	7.3	7.1	6.6	5.9	5.6	5.3	-
11.0	10.6	13.6	13.8	15.7	7.6	10.6	8.8	8.2	7.8	7.6	7.1	6.4	6.1	5.8	5.2
11.5	11.2	14.2	14.4	16.2	8.2	11.2	9.4	8.8	8.4	8.2	7.7	7.0	6.7	6.4	5.8
12.0	11.7	14.7	14.9	16.7	8.7	11.7	9.9	9.3	8.9	8.7	8.2	7.5	7.2	6.9	6.3
12.5	12.2	15.2	15.4	17.3	9.2	12.2	10.4	9.8	9.4	9.2	8.7	8.0	7.7	7.4	6.8
13.0	12.8	15.8	16.0	17.8	9.8	12.8	11.0	10.4	10.0	9.8	9.3	8.6	8.3	8.0	7.4
13.5	13.3	16.3	16.5	18.3	10.3	13.3	11.5	10.9	10.5	10.3	9.8	9.1	8.8	8.5	7.9
14.0	13.8	16.8	17.0	18.8	10.8	13.8	12.0	11.4	11.0	10.8	10.3	9.6	9.3	9.0	8.4
14.5	14.3	17.3	17.5	19.4	11.3	14.3	12.5	11.9	11.5	11.3	10.8	10.1	9.8	9.5	8.9
15.0	14.9	17.9	18.1	19.9	11.9	14.9	13.1	12.5	12.1	11.9	11.4	10.7	10.4	10.1	9.5
15.5	15.4	18.4	18.6	20.4	12.4	15.4	13.6	13.0	12.6	12.4	11.9	11.2	10.9	10.6	10.0
16.0	15.9	18.9	19.1	20.9	12.9	15.9	14.1	13.5	13.1	12.9	12.4	11.7	11.4	11.1	10.5
16.5	16.4	19.4	19.6	21.4	13.4	16.4	14.6	14.0	13.6	13.4	12.9	12.2	11.9	11.6	11.0
17.0	16.9	19.9	20.1	21.9	13.9	16.9	15.1	14.5	14.1	13.9	13.4	12.7	12.4	12.1	11.5
17.5	17.4	20.4	20.6	22.4	14.4	17.4	15.6	15.0	14.6	14.4	13.9	13.2	12.9	12.6	12.0
18.0	17.9	20.9	21.1	23.0	14.9	17.9	16.1	15.5	15.1	14.9	14.4	13.7	13.4	13.1	12.5
18.5	18.4	21.4	21.6	23.5	15.4	18.4	16.6	16.0	15.6	15.4	14.9	14.2	13.9	13.6	13.0
19.0	18.9	21.9	22.1	24.0	15.9	18.9	17.1	16.5	16.1	15.9	15.4	14.7	14.4	14.1	13.5
19.5	19.5	22.5	22.7	24.5	16.5	19.5	17.7	17.1	16.7	16.5	16.0	15.3	15.0	14.7	14.1
20.0	20.0	23.0	23.2	25.0	17.0	20.0	18.2	17.6	17.2	17.0	16.5	15.8	15.5	15.2	14.6

Notes: IBS Framing: add 0.2 dB EDMAC Framing: rates below 2048 kbps add 0.2 dB, otherwise 0 Reed-Solomon: add an *additional* 0.4 dB to the values shown

Notes:

Appendix C. FAST ACTIVATION PROCEDURE

C.1 Introduction

FAST is an enhancement feature available in Comtech EF Data products, enabling on-location upgrade of the operating feature set—in the rack—without removing a modem from the setup. This accelerated upgrade can be accomplished only because of FAST's extensive use of programmable devices incorporating Comtech EF Data-proprietary signal processing techniques. These techniques allow the use of a unique access code to enable configuration of the available hardware. The access code can be purchased at any time from Comtech EF Data. Once obtained, the access code is loaded into the unit through the front panel keyboard.

C.2 Activation Procedure

C.2.1 Serial Number

Obtain the Modem serial number as follows:

a. From the main menu, select **Util**, then **FAST**, then **ENTER**.
b. The Modem motherboard Serial Number is displayed on the bottom line

```
FAST:Cnfg View (H/W 0.03)
MainBoard S/N: 123456789
```

C.2.2 View currently installed features

To view the currently installed features, proceed as follows:

a. From the main menu, select **Util**, then **FAST**, then **View**, then **ENTER**.
b. Use the ▲ ▼ arrow keys to scroll through the Modem Options and note which are 'Installed' or 'Not Installed'. Any that are 'Not Installed' may be purchased as a FAST upgrade.

```
View Options: 09    (▲ ▼)
5000 kbps  Not Installed
```

Contact a Comtech EF Data sales representative to order features. You will be asked to provide the Modem Serial Number. Comtech EF Data Customer Support personnel will verify the order and provide an invoice and instructions, including a 20-character configuration code.

C.2.3 Enter Access Codes

Enter the access codes as follows:

a. Press **CLEAR** to return to the menu.
c. Select **Cnfg**, then press **ENTER.** Use the ◄ ► arrow keys to move the cursor to **Edit Code**.

```
 FAST Configuration:
Edit Code    Demo Mode
```

d. Press **ENTER**.

```
Edit 20 digit FAST Code:
00000000000000000000 ENT
```

e. Enter the code carefully. Use the ◄ ► arrow keys to move the cursor to each character. Use the ▲ ▼ arrow keys to edit the character, then press **ENTER**. The modem will respond with "Configured Successfully" if the new FAST option has been accepted as shown below.

```
Configured Successfully
       (ENTER or CLEAR)
```

If, on the other hand, the FAST code is rejected, the following menu will be displayed:

```
FAST Code Rejected!
       (ENTER or CLEAR)
```

C.2.4 Enable / Disable Demo Mode

Control FAST Demo Mode as follows:

a. Press **CLEAR** to return to the menu.
b. Select **Cnfg**, then press **ENTER.** Use the ◄ ► arrow keys to move the cursor to **Demo Mode**.

```
 FAST Configuration:
Edit Code    Demo Mode
```

c. Press **ENTER**.

```
FAST Demo Mode: Off  On
 604800 seconds remain
```

Use the ◄ ► arrow keys to move the cursor to select Off or On. When On, the second line will display the under of seconds remaining available for the free Demo Mode. When enabled, Demo Mode allows access to ALL CDM-570/570L FAST options for 604800 seconds (7 full days). Demo Mode may be turned on and off an unlimited number of time until the 604800 seconds have expired. The seconds count is only decrement when the mode is On. When the Demo period expires the following menu is

```
FAST Demo Mode: Off  On
  Demo Period Expired
```

display displayed:

IMPORTANT

CHANGING THE STATE OF DEMO MODE WILL CAUSE THE MODEM FIRMWARE TO REBOOT. ALSO, IF DEMO MODE IS ENABLED AND THE TIMER EXPIRES THE MODEM FIRMWARE WILL REBOOT.

Notes:

Appendix D. QUICK-START GUIDE

D.1 Introduction

This quick start guide will allow a user to configure a pair of CDM-570/570L modems with IP Modules installed (referred to as CDM-IP in rest of the document) from beginning (i.e., starting from factory default settings) and be able to pass traffic within minutes. It is assumed that the user is familiar with the configuration of the base satellite modem.

D.1.1 Equipment List

Following equipment is required:

Item	Equipment	Quantity	Comments
1	CDM-IP Modem	2	CDM-570/570L w/ IP Module, CDM-IP 550, and CDM-IP 300L **Note:** customer may need to provide equipment to convert 70 MHz IF to L-band for a duplex connection depending upon modems.
2	10/100 BaseT Ethernet Hub	2	Provided by customer **Note**: Only 10BaseT operation is supported in easyConnect™ mode. RJ-45 crossover Ethernet cables can be substituted to directly connect PC to CDM-IP modem without the use of a hub.
3	PC with NIC and a terminal emulation program	2	Provided by customer
4	Console cable (DB-9 to RJ-11)	1	Supplied by Comtech EF Data
5	Ethernet cables (CAT 5)	4	Provided by customer
6	IF cables	2	Provided by customer (To interconnect TX-RX between both CDM-IP modems.)

D.1.2 Equipment Setup

Step	Description
1	Connect each CDM-IP to the PC via the Ethernet Hub.
2	Connect the TX IF on CDM-IP 1 to RX IF of CDM-IP 2 and vice-versa.
3	Connect the DB-9 end of the console cable to the COM1 or COM2 port of the PC and the RJ-11 end to the console port at the back of CDM-IP 1.
4	Connect CDM-IP 1 and CDM-IP 2 to suitable power supply and turn them ON.

D.1.3 Transmit and Receive IF Configuration

Step	Description
1	Configure the transmit and receive IF parameters on CDM-IP 1 and CDM-IP 2 via the front panel. **Note:** The IF parameters can also be set via console menu, Telnet, web interface and SNMP, but for this exercise, it is recommended that the front panel be used.
2	Set the **TxPower** to minimum level.
3	Before proceeding to next step, make sure that each CDM-IP is appropriately carrier-locked to the other CDM-IP.

D.1.4 Serial console port Command Line Interface (CLI) Configuration

Step	Description
1	Launch the terminal emulation program - such as HyperTerminal on Microsoft Windows.
2	Select the appropriate COM port (to which the DB-9 end of the console cable is connected) and configure it for: ‣ 38,400 bps ‣ 8 data bits ‣ no parity ‣ 1 stop bit ‣ no hardware flow control
3	Press return and to bring up the Main menu.

D.1.5 Main Menu

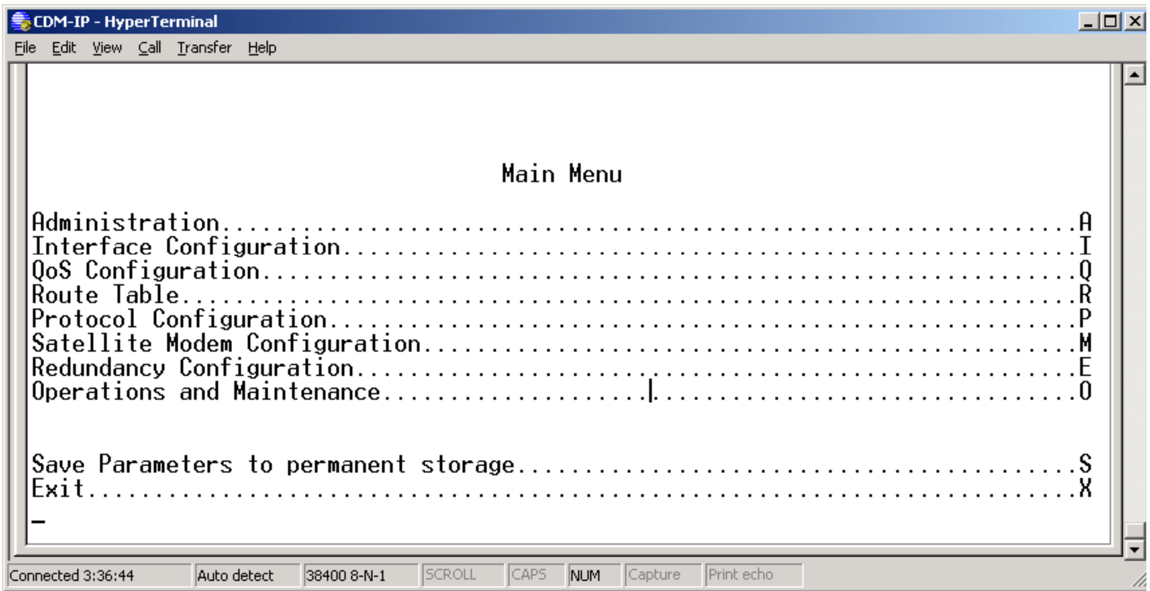
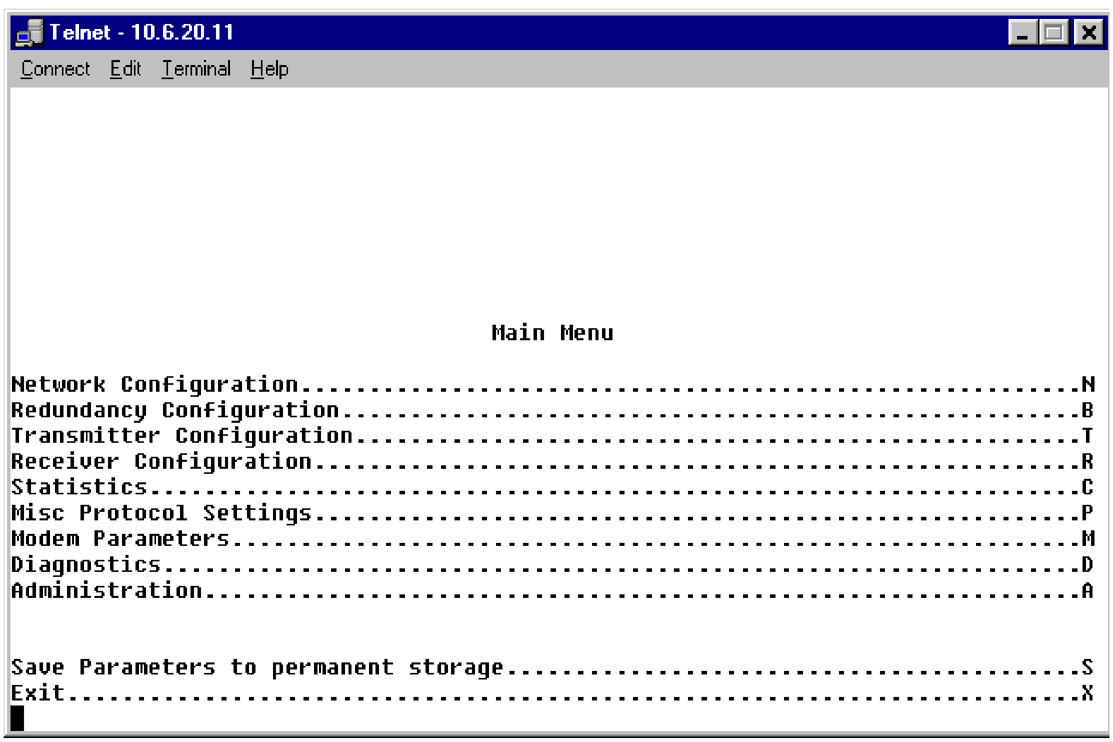


Figure D-1. Main Menu



To use the Command Line Interface (CLI), select the appropriate sub-menu or the entry by pressing the character indicated at the right. Enter ***x*** to return to the previous menu.

Note: Any CDM-IP configuration changes need to be saved to permanent storage by selecting [**S**] from any menu screen and then typing [**y**] to save.

D.1.6 Restoring Factory Default Configuration

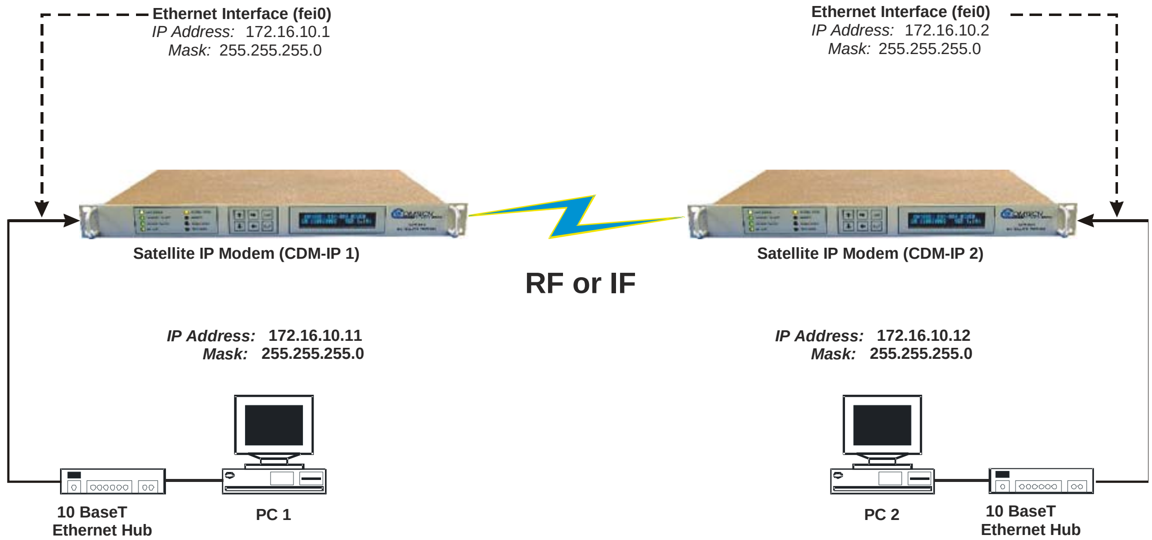
The following sections in this guide assume that the CDM-IP is still in factory default configuration for IP. If that' is not the case, the factory default configuration can be restored from the menu:

Step	Description
1	From the **Main Menu,** select **Operations and Maintenance** sub-menu [**O**].
2	From the **Operations and Maintenance** menu, select **Database Operations** sub-menu [**D**].
3	From the **Database Operations** menu, select **Restore Factory Default** option [**R**].
4	Confirm when prompted by typing '**yes**' when the following prompt is displayed:

```
Are you sure you want to restore factory default settings?
WARNING: Choosing Yes will restore factory defaults and then
reboot..
```

This will erase any user configuration and restore the CDM-IP to factory default configuration. Proceed to Section D.2 to perform the easyConnect™ Mode configuration or to Section D.3 to perform the Router Mode configuration.

D.2 easyConnect™ Point-to-Point System Configuration



The steps in this guide will lead to the following configuration:

Figure D-2. easyConnect™ Point-to-Point System Configuration

D.2.1 PC Configuration

Step	Description
1	Set the IP address on PC 1 to **172.16.10.11**, mask to **255.255.255.0**.
2	Set the IP address on PC 2 to **172.16.10.12**, mask to **255.255.255.0.**
3	Reboot the PCs (if required).

D.2.2 CDM-IP Configuration

The CDM-IP will also be in Point-to Point HDLC Addressing Mode. HDLC addresses are used to identify remote satellite interfaces when there are more than two CDM-IP modems sending and receiving traffic. In Point-to-Point Mode, there is no need to define any HDLC addresses since all of the traffic will be to and from a single remote CDM-IP.

The HDLC MAC address is user configurable.

D.2.3 Setting IP Address(es)

Step **Description**

1 From the **Main Menu** select **Network Interface Configuration** sub-menu [**I**].

2 From the **Interface Configuration Menu** select **Ethernet Interface (fei0)** sub-menu [**E**].

3 Set **Ethernet IP Address** [**I**].

CDM-IP 1 to **172.16.10.1**

CDM-IP 2 to **172.16.10.2**

4 Set **Subnet Prefix Length** [**M**] to **24**

Set ***Remote HDLC IP Address*** to **192.168.1.2**

The other parameters can be left to their factory default settings.

At this point the basic configuration is over and you should be able to:

5 From **PC1**

Ping 172.16.10.1 (**CDM-IP 1**)

Ping 172.16.10.2 (**CDM-IP 2**)

Ping 172.16.10.12 (**PC 2**)

6 From **PC2**

Ping 172.16.10.2 (**CDM-IP 2**)

Ping 172.16.10.1 (**CDM-IP 1**)

Ping 172.16.10.11 (**PC 1**)

IMPORTANT

Do not enable IF Loopback (or link the TX to RX by a BNC cable or satellite link) on a CDM-IP modem operating in easyConnect™ when connected to a LAN. In this configuration, easyConnect™ will resend all layer 2 broadcast packets and cause a “broadcast storm” on the LAN.

D.3 Router Mode Point-to-Point System Configuration

The steps in this guide will lead to the following configuration:

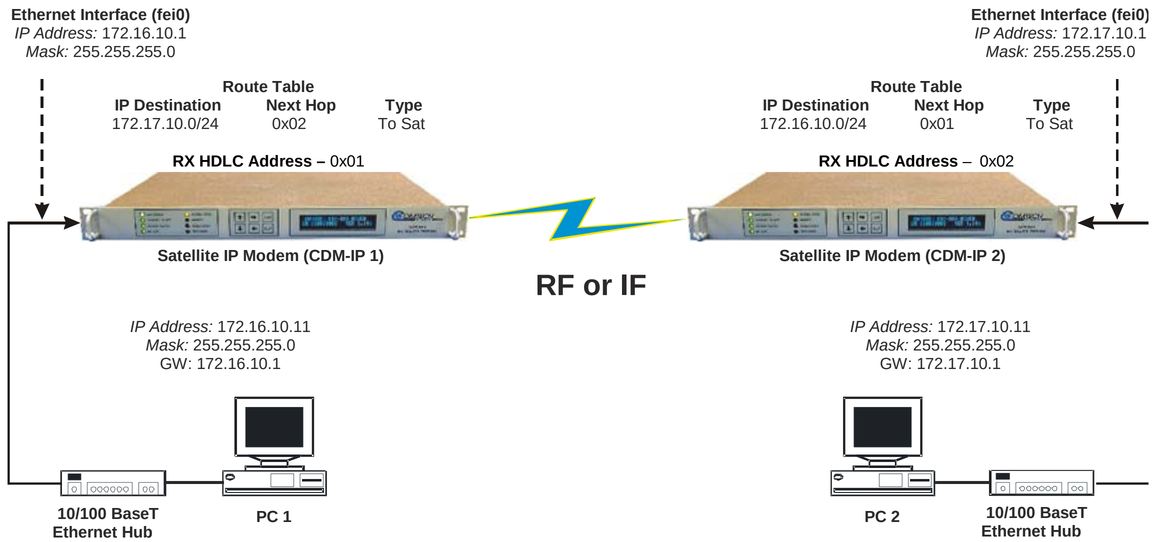


Figure D-3. Router Mode Point-to-Point System Configuration

D.3.1 PC Configuration

Step	Description
1	Set the IP address on **PC 1** to **172.16.10.11**, mask to **255.255.255.0**. Set PC Gateway to **172.16.10.1**
2	Set the IP address on **PC 2** to **172.17.10.11**, mask to **255.255.255.0.** Set PC Gateway to **172.17.10.1**
	Reboot the PCs (if required).

D.3.2 Setting CDM-IP Modems to Router Mode Operation

Perform the following steps on **CDM-IP 1**

Step	Description
1	From the **Main Menu,** select **Administration** [**A**] sub-menu.
2	From the **Administration** menu, select **CDM-IP Working Mode** [**C**].

3	Confirm when prompted by typing **'y'** when the following prompt is displayed:
	`Changing Modem working mode requires system Reboot.`
	`Do you want to continue(Y/N)[Enter :No]`
	Select [**1**] for **Router Mode**.

4	Allow CDM-IP to reboot, then select **Interface Configuration** [**I**] from **Main Menu**.
5	From the **Interface Configuration** menu, select **Satellite/HDLC Interface (hdl0)** [**H**].
6	From the **Satellite/HDLC Interface (hdl0)** menu, select **HDLC Addr Mode** [**M**].
7	Confirm when prompted by typing **'y'** when the following prompt is displayed:; **`Changing HDLC address mode causes system Reboot.`** **`Do you want to continue(Y/N)[Enter :No]`** Select [**1**] for **Small Network Mode**.
8	Allow CDM-IP to reboot. After reboot, select **Interface Configuration** [**I**] from the **Main Menu**.
9	From the **Interface Configuration** menu, select **Receive HDLC Channel Addresses** [**H**].
10	From the **Receive HDLC Channel Addresses** menu, select [**1**] for **HDLC Addr 1**. The following prompt will be displayed: **`Please enter a value for the HDLC Addr 1`** **`Press ESC to abort`** **`HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0001>:`** Enter [2] to set **HDLC Addr 1** to **0x01**. **Note:** **HDLC Addr 1** will display as **0x0001**, although only the last 2 digits are used in **Small Network Mode,** allowing up to 254 separate HDLC addresses.
11	Repeat **Steps 1 - 9** on **CDM-IP 2**. Also, repeat **Step 10**, but set **HDLC Addr 1** to **0x02**.

Both CDM-IP modems are now in Router/Small Network Mode, which means that the CDM-IP modems will be on independent IP subnets and will require adding static routes to pass traffic between them.

The HDLC MAC address is user configurable.

D.3.3 Setting IP Address(es)

Step	Description
1	From the **Main Menu** select **Network Interface Configuration** sub-menu [**I**].
2	From the **Interface Configuration Menu** select **Ethernet Interface (fei0)** sub-menu [**E**].
3	Set **Ethernet IP Address** [**I**]. **CDM-IP 1** to **172.16.10.1** **CDM-IP 2** to **172.17.10.1**
4	Set **Ethernet Subnet MaskSubnet Prefix Length** [**M**] to **24.**

D.3.4 Set IP Stack DES Select Key to ClearRoute Table

Perform the following steps on **CDM-IP 1**

Step	Description
1	From **Transmitter Configuration Main Menu** sub-menu select **Route Table [R]**sub-menu.
2	Enter **1** to configure the first route.
3	Enter a suitable name.
4	Set **IP Address** to **172.17.10.0**
5	Set **Number of Subnet Bits** to **24.**
6	For **Interface to which route is destined to <E-Ethernet S-Satellite Enter : S>** select **S.**
6	For **HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0000>:** select **2.**
7	CDM-IP 1 Route Table should display the following:

```
Route Name  Dest IP/SNet Bits  Next Hop  MultiCast   State
Route001..[test  172.17.10.0/24    0x2       N/A      toSat]
```

Perform the following steps on **CDM-IP 2**

Step	Description
8	From **Transmitter Configuration Main Menu** sub-menu select **Route Table [R]** sub-menu.
9	Enter **1** to configure the first route.
10	Enter a suitable name
11	Set **IP Address** to **172.16.10.0**
12	Set **Number of Subnet Bits** to **24**
13	For **Interface to which route is destined to <E-Ethernet S-Satellite Enter : S>** select **S**

14 For **HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0000>:**

select **1**

15 CDM-IP 2 Route Table should display the following:

```
Route Name   Dest IP/SNet Bits  Next Hop  MultiCast   State
Route001..[test  172.16.10.0/24    0x1       N/A      toSat]
```

Set ***Remote HDLC IP Address*** to **192.168.1.2**

At this point the basic configuration is over and you should be able to:

Ping PC 1 from PC 2 and vice versa
Ping **CDM-IP** 2 from PC 1 and vice versa
Pass any other data between the 2 PCs

1 From **PC1**

Ping 172.16.10.1 (**CDM-IP 1**)

Ping 172.17.10.2 (**CDM-IP 2**)

Ping 172.17.10.11 (**PC 2**)

2 From **PC2**

Ping 172.17.10.1 (**CDM-IP 2**)

Ping 172.16.10.1 (**CDM-IP 1**)

Ping 172.16.10.11 (**PC 1**)

D.4 Troubleshooting IP Module

The CDM-IP comes with a variety of diagnostic tools to aid in identifying the traffic path going into and out of the CDM-IP modem. This troubleshooting section shows how to use some of these tools and also identifies several common problems encountered when first setting up two CDM-IP modems. If following these troubleshooting steps fails to resolve the problem, contact a Customer Support representative at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

(480) 333-2200 (Main Comtech EF Data Number)

(480) 333-4357 (Customer Support Desk)

(480) 333-2161 FAX

or, E-Mail can be sent to the Customer Support Department at:

cdmipsupport@comtechefdata.com

D.4.1 easyConnect™ Mode Troubleshooting

Use the following troubleshooting steps if unable to successfully send traffic in easyConnect™.

easyConnect™ Mode Troubleshooting

Step	Problem	Action

1	No Ping response from the locally connected PC to the CDM-IP Ethernet port. ICMP response is 'Request timed out'.	a) Verify correct IP address/subnet on PC and CDM-IP.
		b) Verify Ethernet connection – cables, hub, etc. PC, hub, and CDM-IP should have Ethernet activity LED lit.
		Note: A PC must be connected to the CDM-IP using a hub, switch or a RJ45 crossover cable. When the CDM-IP Ethernet port senses an Ethernet connection, the CLI will display:
		`phymon_callback():  enet link change!  link=1`
		If the connection is broken, the CLI will display:
		`phymon_callback():  enet link change!  link=0`

easyConnect™ Mode Troubleshooting

2	No Ping response from the locally connected PC to the remote CDM-IP or remote PC. ICMP response is 'Request timed out'.	a) Verify both CDM-IP's are in easyConnect™/Point-to-Point Modes. b) Verify IF link between modems for proper settings and carrier quality (RX signal level, E_b/N_0, etc.). It is possible that there is a spectrum inversion, particularly if you are using the CDM-IP with RF converter equipment. If this is the case, the signal level & E_b/N_0 may be OK, but no data will be received. To correct this, invert the TX and RX Spectrum on one of the CDM-IPs. c) Send a constant ping from the PC 1 'ping 172.16.10.2 –t' to PC 2. In the CDM-IP1, go to Operations and Maintenance/Diagnostics. Enable 'Dump Packets transmitted to Satellite Interface'. Verify that the Pings are being transmitted by observing 1 packet on CLI every second. If not displayed, reverify PC 1 and CDM-IP 1 settings. Disable 'Dump Packets transmitted to Satellite Interface' by entering 'T'. d) Continue sending constant ping from the PC 1 to PC 2. In the CDM-IP 2, go to Operations Maintenance/Diagnostics. Enable 'Dump Packets received from Satellite Interface'. Verify that the Pings are being received by observing 1 packet on CLI every second. If not displayed, reverify PC 2 and CDM-IP 2 settings. Disable 'Dump Packets received from Satellite Interface' by entering 'R'. **Note:** All pings transmitted will require a reply to be transmitted from the target host. Use the Diagnostics 'Dump Packets' tools to isolate where packets are lost in the CDM-IP duplex paths. Also, always disable 'Dump Packets' before sending live traffic.

D.4.2 Router Mode Troubleshooting

Use the following troubleshooting steps if unable to successfully send traffic in Router Mode.

Router Mode Troubleshooting

Step	Problem	Action

1	No Ping response from the locally connected PC to the CDM-IP Ethernet port. ICMP response is 'Request timed out'.	a) Verify correct IP address/subnet on PC and CDM-IP.
		b) Verify Ethernet connection – cables, hub, etc. PC, hub, and CDM-IP should have Ethernet activity LED lit.
		Note: A PC must be connected to the CDM-IP using a hub, switch or a RJ45 crossover cable. When the CDM-IP Ethernet port senses an Ethernet connection, the CLI will display:
		`phymon_callback():  enet link change!  link=1`
		If the connection is broken, the CLI will display:
		`phymon_callback():  enet link change!  link=0`

2	No Ping response from the locally connected PC to the remote CDM-IP or remote PC. ICMP response is 'Request timed out'.	a) Verify both CDM-IP's are in Router/Small Network Modes. b) Verify PC's Gateways are set to local CDM-IP address. c) Verify IF link between modems for proper settings and carrier quality (RX signal level, E_b/N_0, etc.). It is possible that there is a spectrum inversion, particularly if you are using the CDM-IP with RF converter equipment. If this is the case, the signal level & E_b/N_0 may be OK, but no data will be received. To correct this, invert the TX and RX Spectrum on one of the CDM-IPs.
3	No Ping response from PC 1 to PC 2 or vice versa. ICMP response is ' Reply from 172.XXX.10.1 - Destination net unreachable'	a) Verify CDM-IP Route Tables are correct.

Appendix E. FLASH UPGRADING

The CDM-570/570L eliminates the need for updating firmware by physically replacing EPROMs. Instead, the CDM-570/570L modem uses ‘flash memory’ technology internally, and new firmware can be uploaded to the unit from an external PC, as follows:

Go to: www.comtechefdata.com
Click on: downloads
Click on: flash upgrades

This makes software upgrading very simple, and updates can now be sent via the Internet, E-mail, or on disk. The upgrade can be performed without opening the unit, by simply connecting the modem to the USB or Ethernet port of a computer.

E.1 Ethernet FTP Upload Procedure

1. Identify the reflashable product, firmware number, and version for download.

   The current base modem M&C version can be viewed at the top level menu of the front panel display (press “CLR” button several times to view). Also, you can find the firmware information within the <Util > <Firmware > <Info> <Image#1, Image#2 > menu tree.

   Using serial remote control, you can query the firmware revision levels with the

   <0/SWR? Command. (Abbreviated)
   Or
   <)/FRW? Command (Detailed)

2. Create a temporary directory (folder) on your PC.

   Windows: Select File > New > Folder > and rename the New Folder to "temp" or another convenient and unused name. Assuming "temp" works, you should now have a "c:\temp" folder created.

Note: The c: is the drive letter used in this example. Any valid writable drive letter can be used.

CMD Prompt: At the command prompt (c:\>) type "MD temp" without quotes (MD stands for make directory). This is the same as creating a new folder from Windows. You should now have a "c:\temp" subdirectory created where c: is the drive letter used in the example.

3. Download the correct firmware file to this temporary folder.

   Access the download server with the flash firmware data files link, http://206.223.8.10/linksite/flashupgrades/CDM570L/

   About Firmware Numbers, File Versions, and Formats:

   The flashable files on the download server are organized by product first, then by firmware number, (make sure you know the correct firmware number; see step 1) version, if applicable, and release date. The base modem bulk firmware for the CDM-570/570L will be F10805*_*_* (where the asterisks show revision, version and date).

   The current version firmware release is provided. If applicable, one version prior to the current release is also available. Be sure to identify and download the desired version.

   The downloadable files are stored in two formats: *.exe (self extracting) and *.zip (compressed).
   Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.

   For additional help with "zipped" file types, refer to "pkzip for windows", "winzip", or "zip central" help files. Pkzip for DOS is not supported due to file naming conventions.

4. Unzip the files in the temporary folder on your PC.

   At least 3 files should be extracted:

   a. FW10805x.bin, where "x" is the version (bulk image file).
   b. FW10805x.txt, where "x" is the version (history notes).
   c. README.TXT installation notes

5. Connect the client PC to the CDM-570/570L modem 10/100 Ethernet M&C via a hub or a switch, or directly to a PC with a crossover cable.

IMPORTANT

Base modem firmware can only be loaded via the Ethernet M&C port. Do not use the Ethernet Traffic port.

Verify the communication and connection by issuing a "ping" command to the modem. You can find the IP address of the modem either remotely using the <0/IPA? command or from the front panel with the <Config> <Remote> <Remote> <Ethernet> menus.

To PING and FTP from DOS, press the “Start” button on the Windows toolbar, and select the “Run...” option. From Win95 or Win98, type “command”. From WinNT, Win2K or WinXP, type “cmd”. You can also use the “DOS Prompt” or “Command Prompt” icons in the Start Menu. Now change to the temporary directory you created earlier with “cd c:\temp”. A quick “dir” will show the downloaded files.

6. Initiate an FTP session with the modem. The example is with a DOS window.

    a. From the PC, type "ftp xxx.xxx.xxx.xxx" where "xxx.xxx.xxx.xxx" is the IP address of the CDM-570/570L .

    b. Enter your admin user name and password to complete login.

    c. Verify your FTP transfer is binary by typing "bin".

    d. Type "prompt" then type "hash" to facilitate the file transfers.

7. Transfer the files.

    Type "put FW10805*.bin bulk:" to begin the file transfers. The destination “bulk:” must be all lower-case. It will take approximately one minute to transfer the file.

8. Verify the file transfer.

    a. The PC should report that the file transfer has occurred, and the display on the modem will stop reporting “PROGRAMMING FLASH SECTOR # xx – PLEASE WAIT”.

    b. Terminate the FTP session by typing "bye" and closing the DOS window.

    c. Verify that the new file loaded using the procedure in step 1.

9. Change the desired image to boot using the <Util> <Firmware> <Select> <left or right arrow to change to the other image>, then reboot the modem.

10. Verify the new software versions are booting by observing the following messages on the modem display:

    Comtech CDM-570/570L Modem
    Firmware Version: 1.1.x

E.2 Ethernet IP Module FTP Upload Procedure

1. Identify the reflashable product, firmware number, and version to be downloaded.

   From the front panel display, find the IP Module information in the <Util > <Firmware > <Info> < MPP50 > menu tree.

   From the Serial Console port, view the IP Module information by selecting Operations and Maintenance/Unit Information.

   From Telnet via the 10/100 Ethernet Traffic port, view the IP Module information by selecting Operations and Maintenance/ Unit Information.

   From HTTP via the 10/100 Ethernet Traffic port, view the IP Module information by selecting Operations and Maintenance/Unit Information.

2. Create a temporary directory (folder) on your PC.

   Windows: Select File > New > Folder > and rename the New Folder to "temp" or another convenient and unused name. Assuming "temp" works, you should now have a "c:\temp" folder created.

Note: The c: is the drive letter used in this example. Any valid writable drive letter can be used.

   CMD Prompt: At the command prompt (c:\>) type "MD temp" without quotes (MD stands for make directory). This is the same as creating a new folder from within Windows. Assuming this works, you should now have a "c:\temp" subdirectory created where c: is the drive letter used in the example.

3. Download the correct firmware file to this temporary folder.

   Access the download server with the flash firmware data files link, http://206.223.8.10/linksite/flashupgrades/CDM570L/

   About Firmware Numbers, File Versions, and Formats:

   The flashable files on the download server are organized by product first, then by firmware number, (make sure you know the correct firmware number; see step 1) version, if applicable, and release date. The IP Module firmware for the CDM-570/570L will be Fxxxxx*_*_* (where the asterisks show revision, version and date).

   The current version firmware release is provided. If applicable, one version prior to the current release is also available. Be sure to identify and download the desired version.

   The downloadable files are stored in two formats: *.exe (self extracting) and *.zip (compressed).

Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.

For additional help with "zipped" file types, refer to "pkzip for windows", "winzip", or "zip central" help files. Pkzip for DOS is not supported due to our file naming conventions.

4. Unzip the files in the temporary folder on your PC.

   At least 3 files should be extracted:

   a. FWxxxxxx.bin, where "x" is the version (bulk image file).
   b. FWxxxxxx.txt, where "x" is the version (history notes).
   c. README.TXT installation notes.

5. Connect the client PC to the CDM-570/570L modem 10/100 Ethernet Traffic via a hub or a switch, or directly to a PC with a crossover cable.

IMPORTANT

IP MODULE software can only be loaded via the Ethernet Traffic port; do not use the Ethernet M&C port.

Verify the communication and connection by issuing a "ping" command to the modem. Find the IP address of the modem either remotely using the <0/IPA? command or from the front panel with the <Config> <Remote> <Remote> <Ethernet> menus.

To PING and FTP from DOS, press the “Start” button on the Windows toolbar, and select the “Run...” option. From Win95 or Win98, type “command”. From WinNT, Win2K or WinXP, type “cmd”. You can also use the “DOS Prompt” or “Command Prompt” icons in the Start Menu. Now change to the temporary directory you created earlier with “cd C:\temp”. A quick “dir” will show the downloaded files.

6. Initiate an FTP session with the modem. The example is with a DOS window.

   a. From the PC, type "ftp xxx.xxx.xxx.xxx" where "xxx.xxx.xxx.xxx" is the IP address of the CDM-570/570L .

   b. Enter admin user name and password to complete login.

   c. Verify FTP transfer is binary by typing "bin".

   d. Type "prompt" then type "hash" to facilitate the file transfers.

7. Transfer the files.

   Type "put FWxxxxx*.bin" to begin the file transfers. It will take several minutes to transfer and write the files to flash memory.

8. Verify the file transfer.

   a. The PC should report that the file transfer has occurred, and the display on the modem will stop reporting “PROGRAMMING FLASH SECTOR # xx – PLEASE WAIT”.

   b. Terminate the FTP session by typing "bye" and closing the DOS window.

   c. Verify that the new file loaded using the procedure in step 1.

E.3 USB Procedure

TBD

Appendix F. ODU OPERATION

F.1 Introduction

The user can fully control and monitor the operation of a Comtech EF Data ODU (Transceiver) from the front panel, using the keypad and display of a CDM-570 modem. Nested menus display all available options and prompt the user for required actions. The ODUs that can be controlled are:

CSAT-5060 series
KST-2000A
KST-2000B

The display has two lines each of 24 characters. On most menu screens, a flashing ***solid block cursor*** blinks once per second to indicate the currently selected item, digit, or field. Where this solid block cursor would obscure the item being edited (for example, a numeric field) the cursor will automatically change to an ***underline cursor***. The six key functions are:

ENT (Enter)	This key is used to select a displayed function or to execute a modem configuration change.
CLR (Clear)	This key is used to back out of a selection or to cancel a configuration change which has not been executed using **ENTER**. Pressing **CLEAR** generally returns the display to the previous selection.
◀ ▶ **(Left, Right)**	These arrows are used to move to the next selection or to move the cursor position. Most of the menus (space permitting) include arrow key hints to guide the user.
▲ ▼ **(Up, Down)**	These arrows are used primarily to change configuration data (numbers), at the current cursor position. Occasionally they may be used to scroll through a number of choices at the current cursor position. Most of the menus (space permitting) include arrow key hints to guide the user.

IMPORTANT

The keypad has an auto-repeat feature. If a key is held down for more than 1 second, the key action will repeat, automatically, at the rate of 15 keystrokes per second. This is particularly useful when editing numeric fields, with many digits, such as frequency or data rate.

F.2 ODU Remote Control Address Setup

The Outdoor Unit (ODU) connected to a CDM-570 Modem through FSK can be remotely monitored and controlled by using ODU remote commands through Serial Remote or Telnet. The address of the ODU is setup as follows:

- For local-end ODUs,
  - use Modem's RC address + 1 for Stand-alone unit or Online unit in a 1:1 redundancy system;
  - use Modem's RC address + 2 for Offline unit in a 1:1 redundancy system.

- For distant-end ODUs in an EDMAC setup,
  - use Slave Modem's RC address + 3 for Stand-alone unit or Online unit in a 1:1 redundancy system;
  - use Slave Modem's RC address + 4 for Offline unit in a 1:1 redundancy system.

F.3 MENU TREES

F.3.1 MODEM MAIN MENU

The user is presented with the following choices:

```
SELECT: Config Test Info
Monitor Save/Ld Util ODU
```

Config	(Configuration) This menu branch permits the user to fully configure the unit.
Monitor	This menu branch permits the user to monitor the alarm status of the unit, to view the log of stored events, and to display the Receive Parameters screen.
Test	This menu branch permits the user to invoke one of several test modes (loopbacks, for example).
Info	(Information) This menu branch permits the user to view information on the unit, without having to go into configuration screens.
Save/Ld	(Save/Load) This menu branch permits the user to save and to retrieve up to 10 different modem configurations.

Util	(Utility) This menu branch permits the user to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.
ODU	(Outdoor Unit). This permits the user to monitor and control a Comtech EF Data RF Transceiver (CSAT or KST-2000A/B), if connected.

The ODU menu item is described in this section, in detail.

F.3.2 ODU

```
Transceiver Control:
Disable Enable (◄ ►,ENT)
```

Disable	This menu item turns OFF the FSK link to the ODU
Enable	This menu item turns ON the FSK link to the ODU

F.3.3 CSAT Transceiver Menus

F.3.3.1 (ODU,ENABLE) System Type

```
Select ODU System Type:
Stand-Alone 1:1 (◄ ►,ENT)
```

Stand-Alone should be selected when the Modem is linked via the Rx IF cable to a single Comtech EF Data ODU. Selecting Stand-Alone for a CSAT will take the user to the menu shown in paragraph F.2.3.8. If the modem detects a KST, the user will be taken to the menu shown in paragraph F.2.4.1.

1:1 should be selected when the Modem is linked to a redundant CSAT system via connection between the Rx IF and the ODU Redundancy Controller Box. Selecting 1:1 will take the user to the menu shown next.

F.3.3.2 (ODU,ENABLE) 1:1

```
Monitor/Control:  CSAT#1
CSAT#2  Red-Box (◄ ►,ENT)
```

Use the ◄ or ► arrow keys to select the menu option, then press **ENT**.

Selecting ODU#1 or ODU#2 will take the user to the menu of paragraph F.2.3.8. Selecting REDUNDANCY-BOX will take the user to the following menu.

F.3.3.3 (ODU,ENABLE,1:1) RED-BOX (Redundancy Controller Box)

```
Redundancy Box:  Online
Mode  Switches  Voltages
```

The user is prompted to select from 1 of 4 items.

F.3.3.4 (ODU,ENABLE,1:1,RED BOX)ONLINE

```
Online Unit:
CSAT#1  CSAT#2  (◄ ►,ENT)
```

The cursor will be flashing under either CSAT#1 or CSAT#2. This is the indication of the currently **Online** unit. If the user desires to change the **Online** unit the ◄ ► arrow keys are used to move the cursor position and then the **ENT** key must be depressed.

NOTE: If the ODU Redundancy system is in AUTO mode, a 'forced switch-over' can only occurs if the currently **Offline** unit is fault-free.

F.3.3.5 (ODU,ENABLE,1:1,RED BOX)MODE

```
Operating Mode:
Manual  Auto    (◄ ►,ENT)
```

The cursor will be flashing under either **Manual** or **Auto**. This is the indication of the current operating mode of the 1:1 ODU system. If the user desires to change the operating mode of the 1:1 system, the ◄ ► arrow keys are used to move the cursor position and then the ENT key must be depressed.

F.3.3.6 (ODU,ENABLE,1:1,RED BOX)SWITCHES

```
Waveguide Switch Status:
Tx=OK Rx=OK (ENT or CLR)
```

This menu item provides the status of both the Tx and Rx Waveguide transfer Switches. If either Switch is reporting an ambiguity from the commanded position the "OK" will change to "FT". This indicates a switch fault.

F.3.3.7 (ODU,ENABLE,1:1,RED BOX)VOLTAGES

```
Redundancy Box Voltages:
5V= 5.0  12V=12.0  (ENT)
```

This menu item provides monitor of the voltages inside the Redundancy Controller Box. This is provided to assist in trouble-shooting system problems.

F.3.3.8 (ODU,ENABLE,1:1,CSAT#1) Selections (ODU,ENABLE,1:1,CSAT#2) Selections (ODU,ENABLE,STAND-ALONE) Selections

```
ODU SELECT: Config  Info
Monitor  Alarms (◄ ►,ENT)
```

The user is prompted from 1 of 4 sub-menu branches using the ◄ ► arrow keys, then press **ENT**.

F.3.3.9 (ODU,ENABLE,1:1,CSAT#1) CONFIG (Configuration) (ODU,ENABLE,1:1,CSAT#2) CONFIG (Configuration) (ODU,ENABLE,STAND-ALONE) CONFIG (Configuration)

```
ODU CONFIG: Transmitter
Receiver  Misc  (◄ ►,ENT)
```

The user uses this menu item to select either the 'Transmitter configuration branch", "Receiver configuration branch" or "Miscellaneous configuration branch". Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.10 (ODU,ENABLE,1:1,CSAT#1,CONFIG) TRANSMITTER (ODU,ENABLE,1:1,CSAT#2,CONFIG) TRANSMITTER (ODU,ENABLE,STAND-ALONE,CONFIG) TRANSMITTER

```
ODU TX: Frequency Atten
Amplifier Mute Slope  ◄ ►
```

This menu item is used to select which ODU Transmitter parameter is to be modified. Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.11 (ODU,ENABLE,1:1,CSAT#1,CONFIG,TRANSMITTER) FREQUENCY (ODU,ENABLE,1:1,CSAT#2,CONFIG,TRANSMITTER) FREQUENCY (ODU,ENABLE,STAND-ALONE,CONFIG,TRANSMITTER) FREQUENCY

```
ODU Tx Frequency:
 5912.5 MHz (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the transmit frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user may then press **ENT**.

F.3.3.12 (ODU,ENABLE,1:1,CSAT#1,CONFIG,TRANSMITTER) ATTEN (Attenuation) (ODU,ENABLE,1:1,CSAT#2,CONFIG,TRANSMITTER) ATTEN (Attenuation) (ODU,ENABLE,STAND-ALONE,CONFIG,TRANSMITTER) ATTEN (Attenuation)

```
ODU Tx Attenuation:
15.00 dB    (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the transmit attentuation. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user then presses **ENT**.

F.3.3.13 (ODU,ENABLE,1:1,CSAT#1,CONFIG,TRANSMITTER) AMPLIFIER (ODU,ENABLE,1:1,CSAT#2,CONFIG,TRANSMITTER) AMPLIFIER (ODU,ENABLE,STAND-ALONE,CONFIG,TRANSMITTER) AMPLIFIER

```
ODU Tx Amp State:
On   Off        (◄ ►,ENT)
```

The user is prompted to select either **On** or **Off**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.14 (ODU,ENABLE,1:1,CSAT#1,CONFIG,TRANSMITTER) MUTE (ODU,ENABLE,1:1,CSAT#2,CONFIG,TRANSMITTER) MUTE (ODU,ENABLE,STAND-ALONE,CONFIG,TRANSMITTER) MUTE

```
ODU Tx Mute State:
Muted  Unmuted  (◄ ►,ENT)
```

The user is prompted to select either **Muted** or **Unmuted**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.15 (ODU,ENABLE,1:1,CSAT#1,CONFIG,TRANSMITTER) SLOPE (ODU,ENABLE,1:1,CSAT#2,CONFIG,TRANSMITTER) SLOPE (ODU,ENABLE,STAND-ALONE,CONFIG,TRANSMITTER) SLOPE

```
ODU Tx Slope Mode:
Manual  Calibrated  (◄ ►)
```

The user is prompted to select either **Manual** or **Calibrated**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.16 (ODU,ENABLE,1:1,CSAT#1,CONFIG,TRANSMITTER,SLOPE) MANUAL (ODU,ENABLE,1:1,CSAT#2,CONFIG,TRANSMITTER,SLOPE) MANUAL (ODU,ENABLE,STAND-ALONE,CONFIG,TRANSMITTER,SLOPE) MANUAL

```
ODU Tx Slope:
0.0            (▲ ▼,ENT)
```

If **Manual** mode is selected, the user is prompted to edit the transmit slope setting. This is accomplished using the ▲ ▼ arrow keys. The user then presses **ENT**.

F.3.3.17 (ODU,ENABLE,1:1,CSAT#1,CONFIG) RECEIVER (ODU,ENABLE,1:1,CSAT#2,CONFIG) RECEIVER (ODU,ENABLE,STAND-ALONE,CONFIG) RECEIVER

```
ODU RX: Frequency Atten
Mute Slope      (◄ ►,ENT)
```

This menu item is used to select which ODU Receiver parameter is to be modified. Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.18 (ODU,ENABLE,1:1,CSAT#1,CONFIG,RECEIVER) FREQUENCY (ODU,ENABLE,1:1,CSAT#2,CONFIG,RECEIVER) FREQUENCY (ODU,ENABLE,STAND-ALONE,CONFIG,RECEIVER) FREQUENCY

```
ODU Rx Frequency:
 3912.5 MHz (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the receive frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user then presses **ENT**.

F.3.3.19 (ODU,ENABLE,1:1,CSAT#1,CONFIG,RECEIVER) ATTEN (Attenuation) (ODU,ENABLE,1:1,CSAT#2,CONFIG,RECEIVER) ATTEN (Attenuation) (ODU,ENABLE,STAND-ALONE,CONFIG,RECEIVER) ATTEN (Attenuation)

```
ODU Rx Attenuation:
15.00 dB   (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the receive attentuation. This is accomplished by selecting the digit to be edited, using the ◄ ► arrow keys. The value of the digit is then changed using the ▲ ▼ arrow keys. The user then presses **ENT**.

F.3.3.20 (ODU,ENABLE,1:1,CSAT#1,CONFIG,RECEIVER) MUTE (ODU,ENABLE,1:1,CSAT#2,CONFIG,RECEIVER) MUTE (ODU,ENABLE,STAND-ALONE,CONFIG,RECEIVER) MUTE

```
ODU Rx Mute State:
Muted  Unmuted (◄ ►,ENT)
```

The user is prompted to select either **Muted** or **Unmuted**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.21 (ODU,ENABLE,1:1,CSAT#1,CONFIG,RECEIVER) SLOPE (ODU,ENABLE,1:1,CSAT#2,CONFIG,RECEIVER) SLOPE (ODU,ENABLE,STAND-ALONE,CONFIG,RECEIVER) SLOPE

```
ODU Rx Slope Mode:
Manual  Calibrated   (◄ ►)
```

The user is prompted to select either **Manual** or **Calibrated**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.22 (ODU,ENABLE,1:1,CSAT#1,CONFIG,RECEIVER,SLOPE) MANUAL (ODU,ENABLE,1:1,CSAT#2,CONFIG,RECEIVER,SLOPE) MANUAL (ODU,ENABLE,STAND-ALONE,CONFIG,RECEIVER,SLOPE) MANUAL

```
ODU Rx Slope:
0.0             (▲ ▼,ENT)
```

If **Manual** mode is selected, the user is prompted to edit the transmit slope setting. This is accomplished using the ▲ ▼ arrow keys. The user then presses **ENT**.

F.3.3.23 (ODU,ENABLE,1:1,CSAT#1,CONFIG) MISCELLANEOUS (ODU,ENABLE,1:1,CSAT#2,CONFIG) MISCELLANEOUS (ODU,ENABLE,STAND-ALONE,CONFIG) MISCELLANEOUS

```
MISC: Cold-Start AFR LNA
XRef Ref-Adjust RTC (◄ ►)
```

This menu item is used to select miscellaneous ODU parameters for modification. Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.24 (ODU,ENABLE,1:1,CSAT#1,CONFIG,MISCELLANEOUS) COLD-START (ODU,ENABLE,1:1,CSAT#2,CONFIG,MISCELLANEOUS) COLD-START (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS) COLD-START

```
Cold-Start State:
Enabled  Disabled  (◄ ►)
```

The user is prompted to select either **ENABLED** or **DISABLED**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.25 (ODU,ENABLE,1:1,CSAT#1,CONFIG,MISCELLANEOUS) AFR(Auto Flt Rec) (ODU,ENABLE,1:1,CSAT#2,CONFIG,MISCELLANEOUS) AFR(Auto Flt Rec) (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS) AFR(Auto Flt Rec)

```
Auto Fault Recovery:
Enabled  Disabled  (◄ ►)
```

The user is prompted to select either **ENABLED** or **DISABLED**, using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.26 (ODU,ENABLE,1:1,CSAT#1,CONFIG, MISCELLANEOUS) LNA (ODU,ENABLE,1:1,CSAT#2,CONFIG, MISCELLANEOUS) LNA (ODU,ENABLE,STAND-ALONE,CONFIG, MISCELLANEOUS) LNA

```
LNA: State  Curr-Window
Cal Fault-Logic (◄ ►,ENT)
```

The user is prompted to select 1 of 4 selections using the ◄ ► arrow keys, then to press **ENT**.

F.3.3.27 (ODU,ENABLE,1:1,CSAT#1,CONFIG, MISCELLANEOUS,LNA) STATE (ODU,ENABLE,1:1,CSAT#2,CONFIG, MISCELLANEOUS,LNA) STATE (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS,LNA) STATE

```
ODU LNA State:
On   Off       (◄ ►,ENT)
```

The user is prompted to select either **On** or **Off**, using the ◄ ► arrow keys, then to press **ENT**. This controls whether or not the CSAT will provide LNA POWER via the Receive RF Cable.

F.3.3.28 (ODU,ENABLE,1:1,CSAT#1,CONFIG, MISCELLANEOUS,LNA) CURR-WINDOW (ODU,ENABLE,1:1,CSAT#2,CONFIG, MISCELLANEOUS,LNA) CURR-WINDOW (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS,LNA) CURR-WINDOW

```
LNA Current Window:
99 %           (▲ ▼,ENT)
```

The user is prompted to edit the Current Window setting using the ▲ ▼ arrow keys, then to press **ENT**. The value will scroll between 20% and 50% to define the allowable LNA current change before declaring a fault. Selecting 99% disables the LNA Current Window function.

F.3.3.29 (ODU,ENABLE,1:1,CSAT#1,CONFIG, MISCELLANEOUS,LNA) CAL (Calibrate) (ODU,ENABLE,1:1,CSAT#2,CONFIG, MISCELLANEOUS,LNA) CAL (Calibrate) (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS,LNA) CAL (Calibrate)

```
Calibrate LNA Current?
Cal  Exit      (◄ ►,ENT)
```

The user is prompted to select either **Cal** or **Exit**, using the ◄ ► arrow keys, then to press **ENT**. This provides a means to calibrate the LNA current for use with the Current-Window function described previously.

F.3.3.30 (ODU,ENABLE,1:1,CSAT#1,CONFIG, MISCELLANEOUS,LNA) FAULT-LOGIC (ODU,ENABLE,1:1,CSAT#2,CONFIG, MISCELLANEOUS,LNA) FAULT-LOGIC (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS,LNA) FAULT-LOGIC

```
LNA Fault Logic: Summary
No-Summary      (◄ ►,ENT)
```

The user is prompted to select either **Summary** or **No Summary**, using the ◄ ► arrow keys, then to press **ENT**. This controls whether or not a LNA Current-Window fault will activate the SUMMARY FAULT RELAY. This allows the user to select whether or not to switch the ONLINE/OFFLINE CSAT in the event of a LNA current-window fault.

F.3.3.31 (ODU,ENABLE,1:1,CSAT#1,CONFIG,MISCELLANEOUS) EXT-REF (ODU,ENABLE,1:1,CSAT#2,CONFIG,MISCELLANEOUS) EXT-REF (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS) EXT-REF

```
ExternalRef Fault Logic:
Summary No-Summary  (◄ ►)
```

The user is prompted to select either **Summary** or **No-Summary**, using the ◄ ► arrow keys, then to press **ENT**. NOTE: The CSAT will automatically lock to an external 5 or 10 MHz reference independent of the state of this selection. This selection determines whether or not the Summary Fault Relay is activated if the CSAT loses lock with the external reference.

F.3.3.32 (ODU,ENABLE,1:1,CSAT#1,CONFIG,MISCELLANEOUS) REF-ADJUST (ODU,ENABLE,1:1,CSAT#2,CONFIG,MISCELLANEOUS) REF-ADJUST (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS) REF-ADJUST

```
Internal Ref Adjustment:
087             (▲ ▼,ENT)
```

The user is prompted to edit the Internal 10MHz Reference setting using the ▲ ▼ arrow keys, then to press **ENT**. The value will scroll between 000 and 255. NOTE: The Internal Reference is adjusted in the factory to be very accurate with the default setting of 087. This parameter is made available to compensate for the long-term frequency drift of the oscillator.

F.3.3.33 (ODU,ENABLE,1:1,CSAT#1,CONFIG,MISCELLANEOUS) RTC (ODU,ENABLE,1:1,CSAT#2,CONFIG,MISCELLANEOUS) RTC (ODU,ENABLE,STAND-ALONE,CONFIG,MISCELLANEOUS)RTC

```
Sync ODU RTC to Lcl RTC:
Yes  No       (◄ ►,ENT)
```

The user is prompted to select either **Yes** or **No**, using the ◄ ► arrow keys, then to press **ENT**. Selecting Yes will cause the CSAT Real Time Clock (RTC) to be synchronized with the Modem RTC.

F.3.3.34 (ODU,ENABLE,1:1,CSAT#1) INFO (Information) (ODU,ENABLE,1:1,CSAT#2) INFO (Information) (ODU,ENABLE,STAND-ALONE) INFO (Information)

```
INFO: Model Transmitter
Receiver LNA Misc  (◄ ►)
```

The operator uses this menu item to select enter 1 of 5 ‘Information Windows’. Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.35 (ODU,ENABLE,1:1,CSAT#1,INFO) MODEL (ODU,ENABLE,1:1,CSAT#2,INFO) MODEL (ODU,ENABLE,STAND-ALONE,INFO) MODEL

```
CSAT-5060/010  V2.09
SERIAL # 00225     (ENT)
```

This window provides the CSAT Model Number and Serial Number, press **ENT**.

F.3.3.36 (ODU,ENABLE,1:1,CSAT#1,INFO) TRANSMITTER (ODU,ENABLE,1:1,CSAT#2,INFO) TRANSMITTER (ODU,ENABLE,STAND-ALONE,INFO) TRANSMITTER

```
Tx: ON  5845.0MHz 10.00dB
AMP:ON   Unmuted   Sl:0.0
```

This window provides the CSAT Transmitter information including transmitter status, Tx Frequency, Tx Attenuation, Amplifier state, Tx Mute state and Tx Slope adjustment. Press **ENT**.

F.3.3.37 (ODU,ENABLE,1:1,CSAT#1,INFO) RECEIVER
(ODU,ENABLE,1:1,CSAT#2,INFO) RECEIVER
(ODU,ENABLE,STAND-ALONE,INFO) RECEIVER

```
Rx: ON  3625.0MHz 10.00dB
         Unmuted   Sl:0.0
```

This window provides the CSAT Receiver information including receiving status, Rx Frequency, Rx Attenuation, Rx Mute state and Rx Slope adjustment. Press **ENT**.

F.3.3.38 (ODU,ENABLE,1:1,CSAT#1,INFO) LNA
(ODU,ENABLE,1:1,CSAT#2,INFO) LNA
(ODU,ENABLE,STAND-ALONE,INFO) LNA

```
LNA: On     Window: 99%
Fault Logic: No-Summary
```

This window provides the current state of the LNA functions. Press **ENT**.

F.3.3.39 (ODU,ENABLE,1:1,CSAT#1,INFO) MISC
(ODU,ENABLE,1:1,CSAT#2,INFO) MISC
(ODU,ENABLE,STAND-ALONE,INFO) MISC

```
Cold Start: Off
Auto Fault Recovery: On
```

This window provides the current state of the Cold Start and Auto Fault Recovery functions. Press **ENT**.

F.3.3.40 (ODU,ENABLE,1:1,CSAT#1) MONITOR
(ODU,ENABLE,1:1,CSAT#2) MONITOR
(ODU,ENABLE,STAND-ALONE) MONITOR

```
ODU MONITOR: Tx Rx Misc
Pwr-Supp1 Pwr-Supp2 (◄ ►)
```

The operator uses this menu item to select enter 1 of 5 ‘Monitor Windows’. Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.41 (ODU,ENABLE,1:1,CSAT#1,MONITOR) TX (Transmitter) (ODU,ENABLE,1:1,CSAT#2,MONITOR) TX (Transmitter) (ODU,ENABLE,STAND-ALONE,MONITOR)TX (Transmitter)

```
TX: SynTune=04.8 Pwr=040
IFLO = 10.7  Temp = 27 °C
```

This window provides the Tx Synthesizer and IFLO tuning voltages, the RF Output Power in dBm and the Transmitter temperature. Press **ENT**.

F.3.3.42 (ODU,ENABLE,1:1,CSAT#1,MONITOR) RX (Receiver) (ODU,ENABLE,1:1,CSAT#2,MONITOR) RX (Receiver) (ODU,ENABLE,STAND-ALONE,MONITOR)RX (Receiver)

```
RX: Synth Tune = 03.1
IFLO = 10.9  Temp = 28 °C
```

This window provides the Rx Synthesizer and IFLO tuning voltages and the Receiver temperature. Press **ENT**.

F.3.3.43 (ODU,ENABLE,1:1,CSAT#1,MONITOR) MISC (ODU,ENABLE,1:1,CSAT#2,MONITOR) MISC (ODU,ENABLE,STAND-ALONE,MONITOR)MISC

```
MISC: Ref Tune = 03.0
LNA=000.0mA FAN=568.0mA
```

This window provides the Internal Reference Oscillator tuning voltages, the LNA Current in milliamps and the Fan Current in milliamps. Press **ENT**.

F.3.3.44 (ODU,ENABLE,1:1,CSAT#1,MONITOR) PWR SUPP1 (ODU,ENABLE,1:1,CSAT#2,MONITOR) PWR SUPP1 (ODU,ENABLE,STAND-ALONE,MONITOR) PWR SUPP1

```
PS: 24V=23.8  20V=22.6
    12V=13.0  10V=10.1
```

This window provides a monitor for four of the six internal power supplies. Press **ENT**.

F.3.3.45 (ODU,ENABLE,1:1,CSAT#1,MONITOR) PWR SUPP2 (ODU,ENABLE,1:1,CSAT#2,MONITOR) PWR SUPP2 (ODU,ENABLE,STAND-ALONE,MONITOR) PWR SUPP2

```
PS: +5V=5.5   -5V=-4.9
```

This window provides a monitor for the remaining two internal power supplies. Press **ENT**.

F.3.3.46 (ODU,ENABLE,1:1,CSAT#1) ALARMS (ODU,ENABLE,1:1,CSAT#2) ALARMS (ODU,ENABLE,STAND-ALONE) ALARMS

```
ALARMS:  Current  Stored
                (◄ ►,ENT)
```

The operator uses this menu item to view either **Current** Alarm Status or the **Stored** Alarms Log. Use the ◄ ► arrow keys, then press **ENT**.

F.3.3.47 (ODU,ENABLE,1:1,CSAT#1,ALARMS) CURRENT (ODU,ENABLE,1:1,CSAT#2,ALARMS) CURRENT (ODU,ENABLE,STAND-ALONE,ALARMS)CURRENT

```
 TX = OK        RX = OK
PWR SUP = OK   MISC = OK
```

The operator uses this menu item to view **Current** Alarm Status. This window provides a summary of the current CSAT status. If any of the 4 items displays “FT,” the operator should view the **Stored** Alarms Log for details.

F.3.3.48 (ODU,ENABLE,1:1,CSAT#1,ALARMS) STORED (ODU,ENABLE,1:1,CSAT#2,ALARMS) STORED (ODU,ENABLE,STAND-ALONE,ALARMS) STORED

```
Stored Events:  View
Clear All      (◄ ►,ENT)
```

The operator uses this menu item to either **View** or **Clear All** the Stored Events Log using the ◄ ► arrow keys, then press **ENT**.

F.3.3.49 (ODU,ENABLE,1:1,CSAT#1,ALARMS,STORED) VIEW (ODU,ENABLE,1:1,CSAT#2,ALARMS,STORED) VIEW (ODU,ENABLE,STAND-ALONE,ALARMS,STORED) VIEW

```
LOG 02:11/13/99 10:42:47
OK- REF  LOCK       (▲ ▼)
```

The operator uses the ▲ ▼ arrow keys to sequentially view the individual entries in the Stored Events Log, then press **CLR** to exit the window.

F.3.3.50 (ODU,ENABLE,1:1,CSAT#1,ALARMS,STORED) CLEAR ALL (ODU,ENABLE,1:1,CSAT#2,ALARMS,STORED) CLEAR ALL (ODU,ENABLE,STAND-ALONE,ALARMS,STORED) CLEAR ALL

```
     PRESS ENT TO
CLEAR THE EVENTS LOG
```

The operator should press the **ENT** key to clear the event log, otherwise should press **CLR** to exit the window.

F.3.4 KST2000A/B Menus

F.3.4.1 (ODU,ENABLE) Selections

```
KST SELECT: Config  Info
Status          (◄ ►,ENT)
```

The user is prompted to select 1 of 3 sub-menu branches using the ◄ ► keys, then press **ENT**.

F.3.4.2 (ODU,ENABLE) CONFIG (Configuration)

```
KST CONFIG: Transmitter
Receiver Misc   (◄ ►,ENT)
```

The user uses this menu item to select either the 'Transmitter configuration branch", "Receiver configuration branch" or "Misc configuration branch". Use the ◄ ► keys, then press **ENT**.

F.3.4.3 (ODU,ENABLE,CONFIG) TRANSMITTER

```
KST TX: Frequency  Atten
Output  HPA     (◄ ►,ENT)
```

This menu item is used to select which ODU Transmitter parameter is to be modified. Use the ◄ ► keys, then press **ENT**.

F.3.4.4 (ODU,ENABLE,CONFIG,TRANSMITTER) FREQUENCY

```
ODU Tx Frequency:
14500.0 MHz (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the transmit frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► keys. The value of the digit is then changed using the ▲ ▼ keys. The user may then press **ENT**.

The frequency limits of the **KST-2000A** are known and the frequency values are constrained accordingly.

F.3.4.5 (ODU,ENABLE, CONFIG,TRANSMITTER) ATTEN (Attenuation)

```
ODU Tx Attenuation:
15 dB        (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the transmit attenuation. This is accomplished by selecting the digit to be edited, using the ◄ ► keys. The value of the digit is then changed using the ▲ ▼ keys. The user then presses **ENT**.

F.3.4.6 (ODU,ENABLE,CONFIG,TRANSMITTER) OUTPUT

```
KST Tx Output:
Off  On  Warm  (◄ ►,ENT)
```

The user is prompted to select either **ON**, **OFF**, or **WARM** using the ◄ ► keys, then press **ENT**.

- WARM is OFF, if COLD.
- WARM is ON, if warm and NO FAULTS
- FAULTS present, stays WARM and OFF indefinitely

F.3.4.7 (ODU,ENABLE,CONFIG,TRANSMITTER) HPA

```
HPA:  State  Fault-Logic
               (◄ ►,ENT)
```

The user may select a parameter using the ◄ ► keys, then press **ENT**.

F.3.4.8 (ODU, ENABLE,CONFIG,TRANSMITTER) STATE

```
KST HPA State:
On  Off        (◄ ►,ENT)
```

Note: If the HPA power is **Off**, it cannot report errors, answer messages, provide serial numbers, etc.

F.3.4.9 (ODU,ENABLE,CONFIG, TRANSMITTER) FAULT-LOGIC

```
HPA Fault Logic: Summary
No-Summary     (◄ ►,ENT)
```

The user may select from the options shown, using the ◄ ► keys, then press **ENT**. This controls whether or not HPA fault will activate the SUMMARY FAULT RELAY.

F.3.4.10 (ODU,ENABLE, CONFIG) RECEIVER

```
KST RX: Frequency  Atten
LNA              (◄ ►,ENT)
```

This menu item is used to select which ODU Receiver parameter is to be modified. Use the ◄ ► keys, then press **ENT**.

F.3.4.11 (ODU,ENABLE, CONFIG,RECEIVER) FREQUENCY

```
ODU Rx Frequency:
10950.0 MHz (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the receive frequency. This is accomplished by selecting the digit to be edited, using the ◄ ► keys. The value of the digit is then changed using the ▲ ▼ keys. The user may then press **ENT**.

F.3.4.12 (ODU,ENABLE, CONFIG,RECEIVER) ATTEN (Attenuation)

```
ODU Rx Attenuation:
15 dB      (◄ ►,▲ ▼,ENT)
```

The user is prompted to edit the receive attenuation. This is accomplished by selecting the digit to be edited, using the ◄ ► keys. The value of the digit is then changed using the ▲ ▼ keys. The user then presses **ENT**.

F.3.4.13 (ODU,ENABLE, CONFIG,RECEIVER) LNA / LNB

If the ODU is a **KST-2000A** unit, the following menu is displayed.

```
LNA:  State  Fault-Logic
Calibrate        (◄ ►,ENT)
```

If the ODU is a **KST-2000B** unit, a different menu is displayed.

```
LNB:  State  Fault-Logic
Calibrate Band   (◄ ►,ENT)
```

The user may select a parameter using the ◄ ► keys, then press **ENT**.

F.3.4.14 (ODU,ENABLE, CONFIG,RECEIVER,LNA) STATE

```
ODU LNA State:
On  Off          (◄ ►,ENT)
```

The user is prompted to select either **ON** or **OFF**, using the ◄ ► keys, then to press **ENT**. This controls whether or not the ODU will provide LNA POWER via the Receive RF Cable.

F.3.4.15 (ODU,ENABLE, CONFIG,RECEIVER,LNA) FAULT-LOGIC

```
LNA Fault Logic: Summary
No-Summary       (◄ ►,ENT)
```

The user is prompted to select either **SUMMARY** or **NO SUMM**, using the ◄ ► keys, then to press **ENT**. This controls whether or not LNA fault will activate the SUMMARY FAULT RELAY.

F.3.4.16 (ODU,ENABLE, CONFIG,RECEIVER,LNA) CAL (Calibrate)

```
Calibrate LNA Current?
Cal  Exit        (◄ ►,ENT)
```

The user is prompted to select either **CAL** or **EXIT**, using the ◄ ► keys, then to press **ENT**. Calibration allows the system to determine nominal LNA power consumption. This need only be performed at initial installation.

F.3.4.17 (ODU,ENABLE, CONFIG, RECEIVER, LNB) BAND

```
LNB Rx Band:
A   B   C        (◄ ►,ENT)
```

The user is prompted to select either **A**, **B**, or **C**, using the ◄ ► keys to press **ENT**. This menu is to set LNB Receive Frequency Band, and it's ONLY used for the **KST-2000B**.

F.3.4.18 (ODU,ENABLE, CONFIG) MISCELLANEOUS

```
KST MISC: AGC Ref-Adjust
                 (◄ ►,ENT)
```

This menu item is used to select miscellaneous ODU parameters for modification. Use the ◄ ► keys, then press **ENT**.

F.3.4.19 (ODU,ENABLE,CONFIG,MISCELLANEOUS) AGC (Auto Gain Control)

```
AGC MODE:
Off  On  Burst (◄ ►,ENT)
```

The user is prompted to select either **OFF**, **ON** or **BURST**, using the ◄ ► keys, then to press **ENT**.

F.3.4.20 (ODU,ENABLE,CONFIG,MISCELLANEOUS) REF-ADJUST

```
Internal Ref Adjustment:
087            (▲ ▼,ENT)
```

The user is prompted to edit the INT 10MHz REF setting using the ▲ ▼ keys, then to press **ENT**. The value will scroll between 000 and 255.

Note: The INT REF is adjusted in the factory to be very accurate with the default setting of 028. This parameter is made available to compensate for the long-term frequency drift of the oscillator.

F.3.4.21 (ODU,ENABLE) INFO (Information)

```
INFO:TX RX HPA LNA Equip
Assembly+SN FW (◄ ►,ENT)
```

The operator uses this menu item to select enter 1 of 7 'Information Windows'. Use the ◄ ► keys, then press **ENT**.

F.3.4.22 (ODU,ENABLE,INFO) TRANSMITTER

```
TX: ON  14500.0MHz  19dB
AGC: OFF
```

This window provides the **KST-2000A** Transmitter information including RF output state Tx Frequency, and Tx Attenuation and AGC state, press **ENT**.

F.3.4.23 (ODU,ENABLE, INFO) RECEIVER

```
RX:     10950.0MHz  15dB
Ref-Adjust: 228
```

This window provides the **KST-2000A** Receiver information including Rx Frequency, and Rx Attenuation and Internal Reference adjustment, press **ENT**.

F.3.4.24 (ODU,ENABLE, INFO) HPA

```
HPA: On
Fault Logic: No Summary
```

This window provides the current configuration of the HPA functions, press **ENT**.

F.3.4.25 (ODU,ENABLE, INFO) LNA

```
LNA: On
Fault Logic: No Summary
```

This window provides the current configuration of the LNA functions, press **ENT**.

F.3.4.26 (ODU,ENABLE,INFO) EQUIP (Equipment)

```
EQUIP-TYPE: KST-2000A
HPA-TYPE: CEFD-SSPA
```

F.3.4.27 (ODU,ENABLE,INFO) ASSEMBLY+SN

```
ASSEMBLY INFO:   M&C
AS:11565-4  SN:001370891
```

Note: The blinking cursor is on the **M&C**. Use the ▲ ▼ keys to view additional assembly and S/N information for the Up Converter, Down Converter, and HPA.

F.3.4.28 ODU,ENABLE,INFO) FW (Firmware)

```
FIRMWARE INFO:   M&C
FW:10303-1D  VER:01.01.05
```

Note: The blinking cursor is on the **M&C**. Use the ▲ ▼ keys to view additional firmware information for the Up Converter, Down Converter, and HPA.

F.3.5 (ODU,ENABLE) STATUS

```
STATUS:PS:OK RF:OK UC:OK
LNA:OK AG:OK HP:OK DC:OK
```

This menu displays summary information. The operator may select 1 of 6 detailed status windows. Use the ◄ ► keys, then press **ENT**.

The cursor may be moved over 6 of the 7 status parameters to view more detailed status information. These screens are continually updated while being viewed.

AG	= AGC Status
DC	= Down Converter
HP	= HPA Status
LNA	= Low Noise Amplifier (No further detail)
PS	= Power Supplies
RF	= Reference
UC	= Up Converter

FT	= Fault
NA	= Not Applicable
OK	= OK – No Fault

```
P/Supplies: 7V:OK 17V:OK
           -7V:OK 12V:OK
```

```
REF:WARM 72M:OK RANGE:NA
SRC:INT  XLK:NA PHASE:NA
```

```
UPCONV STATUS: OVRTMP:OK
SSYN:OK  KSYN:OK   PRG:OK
```

```
AGC STATUS:  EIP:OK
LOOP:OK      IIP:OK
```

```
HPA: OVERTMP:OK 9.75V:OK
-5V:OK  BIAS:OK   PRG:OK
```

```
DNCONV STATUS: OVRTMP:OK
LSYN:OK  KSYN:OK   PRG:OK
```

Appendix G. GPS MODE

This section briefly describes the new software feature that has been added to the CDM-570/570L to permit a Furuno GP-320B GPS receiver to be connected to a distant-end modem, and for the local end to query, via the EDMAC channel, the output from the GPS receiver.

In order to do this, the local modem is set as MASTER, and the distant-end is set as SLAVE. The Furuno GP-320B GPS receiver is connected to the remote control serial port of the distant end modem.

NOTE: If ‘standard’ EDMAC framing is used, the MASTER can be a CDM-550, CDM-600/600L, or CDM-570/570L. However, if EDMAC-2 framing is used, both ends of the link need to be CDM-570/570L.

New remote commands sent to the SLAVE modem are used to retrieve GPS data sentences. The modem has a circular buffer to contain the most recent 1000 characters received from the GPS receiver, which is about 2-3 seconds of data. The method of searching for the correct sentence is to simply look for the first match in the buffer. This gives about two seconds’ delay time in the worst case at the “slave” end, plus any delay added by the EDMAC channel. When a query is actively taking place, the placing of new GPS data into the buffer is temporarily suspended.

G.1 Hardware Setup:

1. Ensure that the serial remote control type of the SLAVE modem is set to RS232.
2. Follow the Setup sequence of EDMAC described in the CDM-570 product manual. The SLAVE Modem must be a CDM-570 or CDM-570L, and the MASTER modem can be any modem compatible with the SLAVE modem.
3. Connect the GP-320B GPS receiver to the SLAVE modem’s serial port. The **YELLOW** wire in the Furuno GPS cable (RDA) should be connected to pin 3 of the CDM-570L serial remote control port (9 pin D-type male). Connect the ground wire from the GPS to pin 1.
4. Establish an RF link between the SLAVE and MASTER modems, and once satisfied that both demods are locked, set up a serial communications session via the serial port of the MASTER modem, and begin sending EDMAC messages to the distant-end SLAVE.

G.2 Remote Commands:

Several new remote commands are added to enable the GPS Mode and retrieve GPS information. These new commands are for the SLAVE modem ONLY, which means the address field must be the address of the Slave unit, for example 0021.

- **GPS – GPS Mode, Query and Command**
  0 = Disabled
  1 = Enabled

Note: When the GPS mode is enabled, the slave modem's serial's Baud Rate is changed to 4800 to receive data from GP-320B. To go back to normal serial operation mode, disable the GPS Mode.

- **DTM? – Retrieve GPDTM data sentence**
- **GGA? – Retrieve GPGGA data sentence**
- **ZDA? – Retrieve GPZDA data sentence**
- **GLL? – Retrieve GPGLL data sentence**
- **VTG? – Retrieve GPVTG data sentence**
- **RMC? – Retrieve GPRMC data sentence**

Example capture of the remote commands:

<0021/GPS? ***queries current GPS status***
>0021/GPS=0[cr][lf] ***slave responds that GPS is disabled***
<0021/GPS=1 ***slave is commanded to enable GPS***
>0021/GPS=[cr][lf] ***slave confirms that GPS is enabled***

<0021/DTM? ***slave is commanded to return GPDTM data sentence***
>0021/DTM=$GPDTM,W84,,00.0000,N,00.0000,W,,W84*53[cr][lf]
<0021/GGA?
>0021/GGA=$GPGGA,222830,3325.4268,N,11158.2640,W,0,01,00.00,000293.6,M,-026.2,M,,*7F[cr][lf]
<0021/ZDA?
>0021/ZDA=$GPZDA,223145,14,10,2005,+00,00*63[cr][lf]
<0021/GLL?
>0021/GLL=$GPGLL,3325.4268,N,11158.2640,W,222830,V,N*47[cr][lf]
<0021/VTG?
>0021/VTG=$GPVTG,,T,,M,,N,,K,N*2C[cr][lf]
<0021/RMC?
>0021/RMC=$GPRMC,222830,V,3325.4268,N,11158.2640,W,,,141005,011.8,E,N*12[cr][lf]
<0021/GPS=0 ***slave is commanded to disable GPS***
>0021/GPS=[cr][lf] ***slave confirms that GPS is disabled***
<0021/RMC? ***slave is commanded to return GPRMC data sentence***
>0021/RMC*[cr][lf] ***slave responds that data is not available***

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
C = (F - 32) * 0.555
F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoir.	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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