CDD-562L/-564

Demodulator with IP Module
Installation and Operation Manual

(This manual includes data for the CDD-562L, CDD-564, and CDD-564L Configurations.)

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

Part Number MN/CDD562L-564.IOM **Revision 0**

Errata A

Comtech EF Data Documentation Update

Subject:	Revised Figure 9-3. (CDD-562L) Router Mode, Point-to-Multipoint Diagram
Date:	December 30, 2008
Document:	CDD-562L 2 channel/Dual L-Band Demodulator Installation and Operation Manual Revision 0, dated January 10, 2007
Part Number:	ER-CDD562L-564.EA0
Collating Instructions:	Attach this page to page 9-6

Comments:

The revised page with figure present is presented on the following pages.

9.3.2 Router Working Mode – Point-to-MultiPoint

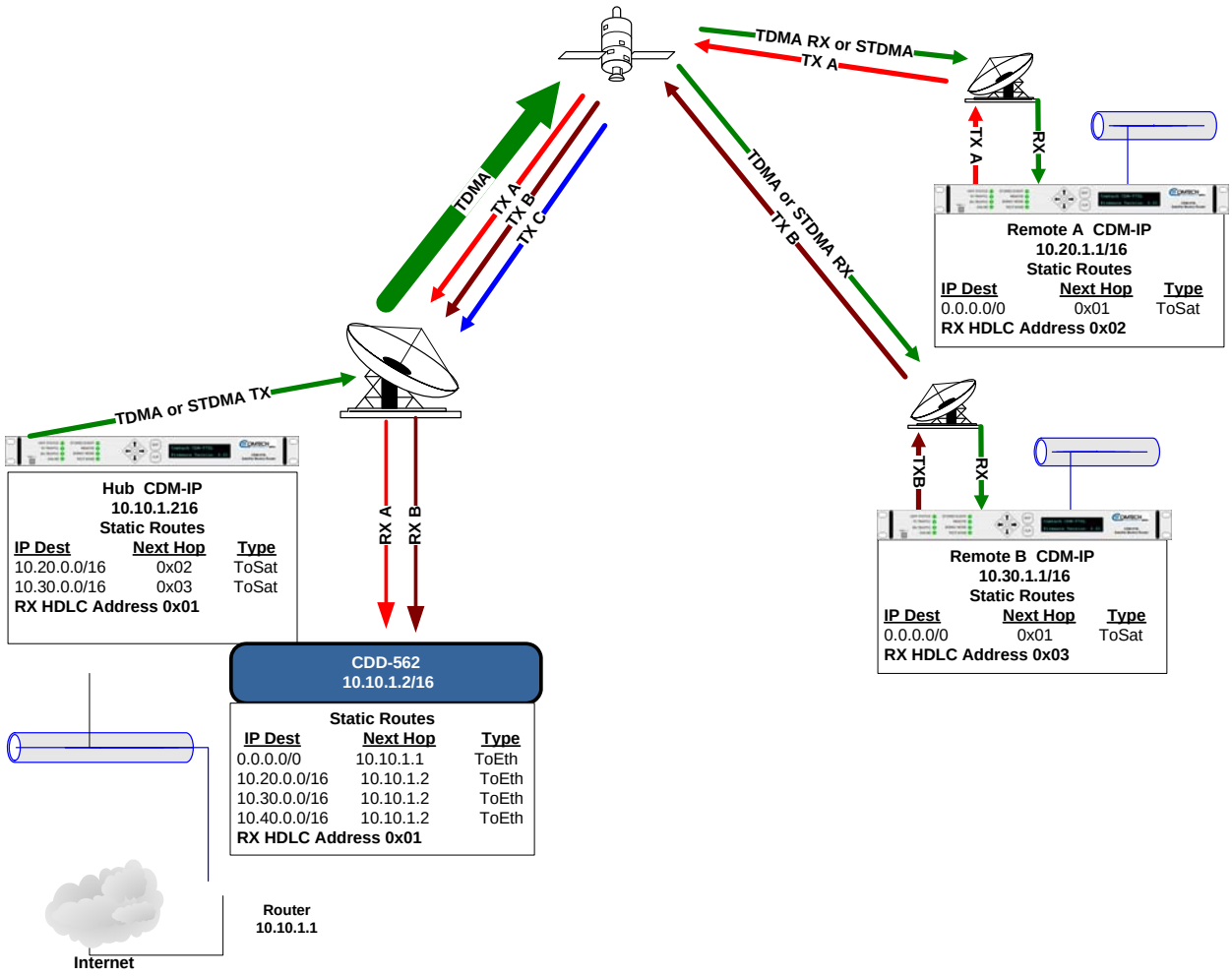

Figure 9-3. (CDD-562L) Router Mode, Point-to-Multipoint Diagram

"Star Network" Point-to-MultiPoint Configuration – Figure 9-3 shows the Hub CDM-IP modem is transmitting a common STDMA carrier to two remote sites with CDM-IP modems. In turn, Remote CDM-IP is transmitting a link back to Hub that is received by the CDD-562L.

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CDD-564/-564L

Demodulator with IP Module
Installation and Operation Manual
Addendum A

Subject: Incorporate NMCS Protocol
Part Number: MN/CDD562L-564.AA0
Addendum A
October 9, 2006

Special Instructions:

This document contains new information for the CDD-562L/564/564L demodulator installation and operation manual, part number MN/CDD562L/564.IOM Rev. 0 dated July 10, 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
12/08/05	1.0	Harish Talanki	Created from CDM-570/570L NMCS document.

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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.)

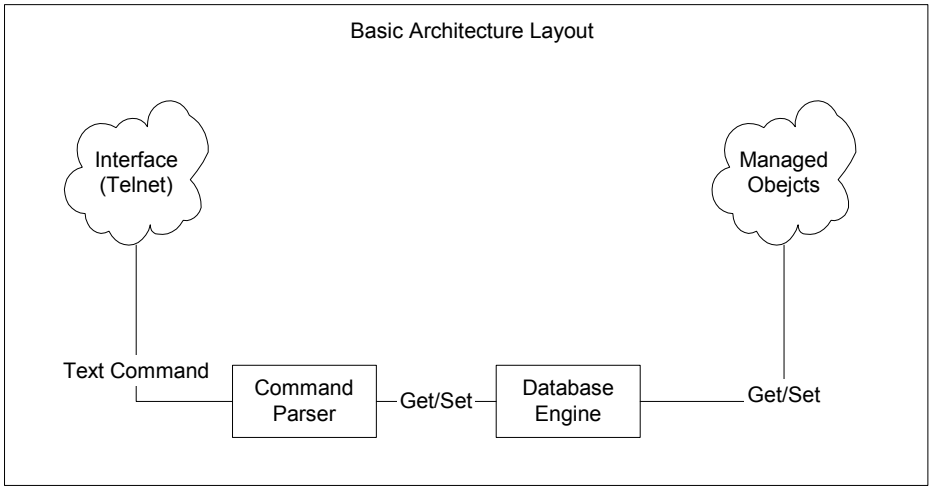

Figure 1. Architecture

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.

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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 CDD 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 CDM-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: CDM-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: CDM-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: CDM-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: CDM-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.

3.5.2 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)

3.5.3 QoS 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
QoS mode	QSM=	1 byte, value of 1, 2 or 3.	Command or Query. QoS operating mode, where: 1=Priority/Max 2=Min/Max 3=DiffServ Example: <1/QSM=2	QSM = QSM!	QSM?	QSM =x (see description of arguments)
DiffServ Rule	DSR=	48 bytes, numerical	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.	DSR= DSR!	DSR?	DSR =x [1..48] (m = Min value, M = Max Value)

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.

3.5.4 Protocol 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
DHCP Relay IP Address	DRA=	15 bytes, numerical	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.	DRA = DRA!	DRA?	DRA = xxx.xxx.xxx.xxx (see description of arguments)
Static Arp table	ARP=	256 bytes characters	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.	ARP = ARP!	ARP[1..256]?	ARP=x [1..256] (see description of arguments)
Number of ARP entries	None	4 bytes, numerical	Query Only. Returns the number of static arp entries. Note: This command should be issued whenever a new ARP Entry is added/deleted.	ARN = ARN!	ARN?	ARN=nnnn (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
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.

3.5.6 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=ssssss String. (see description of arguments)

3.5.7 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)

3.5.8 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)

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 (Continued)			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.			

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

3.5.9 Statistics Commands

3.5.9.1 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.		SRT!	SRT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
			WAN Rx Bad Address Count WAN Rx Pkt Proc CRC Errors WAN Rx Abort/Oclet Errors WAN Rx Overrun Errors WAN Rx HDLC CRC Errors WAN Rx HDLC Payload Byte Count WAN Rx HDLC Header Byte Count WAN Rx HDLC Packet Count WAN Rx Invalid FlowID Errors WAN Rx SAR Re-Assemble Errors WAN Rx Header Decomp errors WAN Rx Memory Alignment Errors WAN Rx Bad CRC Errors	[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) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13)chr(10)			
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.

3.5.9.2 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.		IPS!	IPS?	Text display of all IP Route Stats. \r =CR = 0x0D \n = Newline = 0x0A
			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)			

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		IFT!	IFT?	Text display of all IP Filtered stats. \r =CR = 0x0D \n = Newline = 0x0A
			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)			

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!

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

3.5.9.4 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|ccccccccc|ddddddddd|eeeeeeeee|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)

3.6 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

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CDD-562L/-564

Demodulator with IP Module
Installation and Operation Manual

(This manual includes data for the CDD-562L, CDD-564, and CDD-564L Configurations.)

Comtech EF Data is an ISO 9001
Registered Company

Part Number MN/CDD562L-564.IOM
Revision 0
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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 CDD-562L (L-Band) Dual, CDD-564 (70/140 MHz) Quad, and CDD-564L (L-Band) Quad Demodulator with IP Module. The demodulators include support for externally connected LNBs. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the demodulator.

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

Indicates information critical for proper equipment function.

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

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 Demodulators have 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 to 240 VAC. It has a maximum power consumption of 140 Watts (when all inputs are supplying DC to LNBs), and draws a maximum of 1.5 Amps.

The user should observe the following instructions:

Environmental

The demodulator 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.

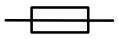
Installation

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

The demodulator 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 demodulator 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 demodulator has been shown, by independent testing, to comply with the following standards:

Emissions and Immunity: EN 301 489-1 (Also tested to FCC Part 15 Class B)

EN 301 489-1 complies with the following standards:

EN55022 Class B	Limits and Methods
EN 61000-3-2	Harmonic Currents Emission
EN 61000-3-3	Voltage Fluctuations and Flicker
EN 61000-4-2	ESD Immunity
EN 61000-4-3	
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

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

- Connections to the transmit and receive IF ports (female connectors) should be made using a good quality coaxial cable.
- 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

1.1 Introduction

The CDD-562L (Figure 1-1) is a 2-channel/Dual L-Band demodulator. The CDD-564/564L (Figure 1-2) is a 4-channel/Quad Demodulators with IP router, intended for Closed Network applications. The unit, herein after referred to as 'the demodulator' throughout the manual unless the need to identify the difference between units, then the model number will be utilized.

Figure 1-1. CDD-562L

Figure 1-2. CDD-564/564L

- (CDD-562L)Two independent demodulators
- (CDD564/-564L) Four independent demodulators
- (CDD-564) Demodulator programmed from 50 to 90, 100 to 180 MHz IF range
- (CDD-562L/CDD-564L)Demodulators programmed from 950 to 1950 MHz
- Variable data rates from 16 kbps to 9.98 Mbps is optional
- Rates above 512 kbps are optional
- Fast acquisition demodulator
- 2nd Generation Turbo Product Coding (TPC) forward error correction (FEC)
- LNB Support: 10 MHz reference and LNB power
- SNMP, HTTP (web server), and Telnet
- QPSK modulation
- 8-PSK and 16-QAM are optional

1.2 Software – Flash Upgrading

The demodulators uses 'flash memory' technology internally, and new firmware can be uploaded to the unit from an networked PC. This simplifies software upgrading, and new firmware can be downloaded via the Internet (from Comtech EF Data's Web server), or be obtained by e-mail, or on CD. The upgrade can be performed without opening the unit, by simply connecting the demodulators to a 10/100BaseT Ethernet port and FTPing the firmware from a PC.

1.2.1 Standard Features

Standard features include:

- Static IP routing for unicast and multicast
- Powerful network management via SNMP, Web, or Telnet
- IGMP v1 and v2
- Symmetric and/or asymmetric operation for maximum bandwidth efficiency
- Point-to-Point or Point-to-Multi-Point configuration
- 10/100 BaseT Ethernet data interface (RJ-45)
- Reflash using FTP via Ethernet port
- FAST feature upgrades from factory or field
- Front Panel LEDs for Unit Status, Stored Event and the status of each of the 2/4 receive channels
- Interoperable with the CDM-570/-570L with IP Module/router

1.3 Data Interfaces

The demodulators include, as standard, a 10/100 BaseT Ethernet interface.

1.4 FAST Options and Hardware Options

The demodulator is extremely flexible and powerful, and incorporates a number of optional features.

Standard features include:

- Integrated IP router compatible with the optional IP Module/router available in the CDM-570/-570L
- Integrated 2nd Generation Turbo FEC compatible with the CDM-570/-570L

In order to permit a lower initial cost, the demodulators may be purchased with only the desired features enabled. If, at a later date, a user wishes to upgrade the functionality of the demodulators, 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. The codes can be entered remotely.

The following table lists the other options that are available:

Option	Description and Comments	Option Installation Method
Low-Rate Variable	Data rate 16 kbps to 512 kbps	Base Unit
Mid-Rate Variable	Data rate 16 kbps to 2.048 Mbps	FAST
Full-Rate Variable	Data rate 16 kbps to 5.0 Mbps	FAST
High-Rate Variable	Data rate 16 kbps to 9.98 Mbps	FAST
3xDES Data Encryption	Uses NIST certified 3x core Software Version 1.5.1 and later	FAST
IP Header Compression	Uses proprietary IP Header Compressions Software Version 1.5.1 and later	FAST
Payload Compression	Uses proprietary Payload Compressions Software Version 1.5.1 and later	FAST
8-PSK	8-PSK Modulation	FAST
16-QAM	16-QAM Modulation	FAST
-48 VDC	-48 VDC Prime Power Supply	Hardware
QPSK	Modulation Type	Standard
TPC Codec	Turbo Product Codec (IESS-315 compliant)	Standard
IP Router	10/100 BaseT Ethernet interface	Standard

FAST Accessible Options

Comtech EF Data's FAST system allows immediate implementation of different options through any of the user interfaces. All FAST options are available through the basic platform unit.

1.4.2 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 unit from the setup. When service requirements change, the operator can upgrade the topology of the unit 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 user interfaces.

With FAST technology, operators have maximum flexibility for enabling functions, as they are required. FAST allows an operator to order a unit precisely tailored for the initial application, and then maintain the ability to adapt the features at a later date as the application evolves.

1.4.3 Implementation

FAST is factory-implemented in the demodulator at the time of order. Hardware options for basic demodulators 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 demodulator. The activation procedure is described in Appendix C.

1.5 Interoperability

The demodulator is interoperable with the CDM-570 and CDM-570L populated with the optional IP Module/router. The demodulator supports the functions associated with receive side of the equipment.

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

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

Unpack the demodulators 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 demodulators.
3. Remove the demodulator, 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 demodulator 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 demodulators 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, consult the Comtech EF Data Customer Support department.

Optional rear-mounting installation bracket

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

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 and install the rear support brackets as follows:

Step	Procedures
1	Install the rear support brackets onto the mounting rail of the rack. Fasten with the bracket bolts.
2	Mount the unit into the equipment rack ensuring that the shoulder heads engage into the slots of the rear support brackets.
3	Fasten the provided #10 shoulder head screws to the rear-side mounting slots on either side of the chassis and secure with #10 flat washers, #10 split washers, and #10 hex nuts.

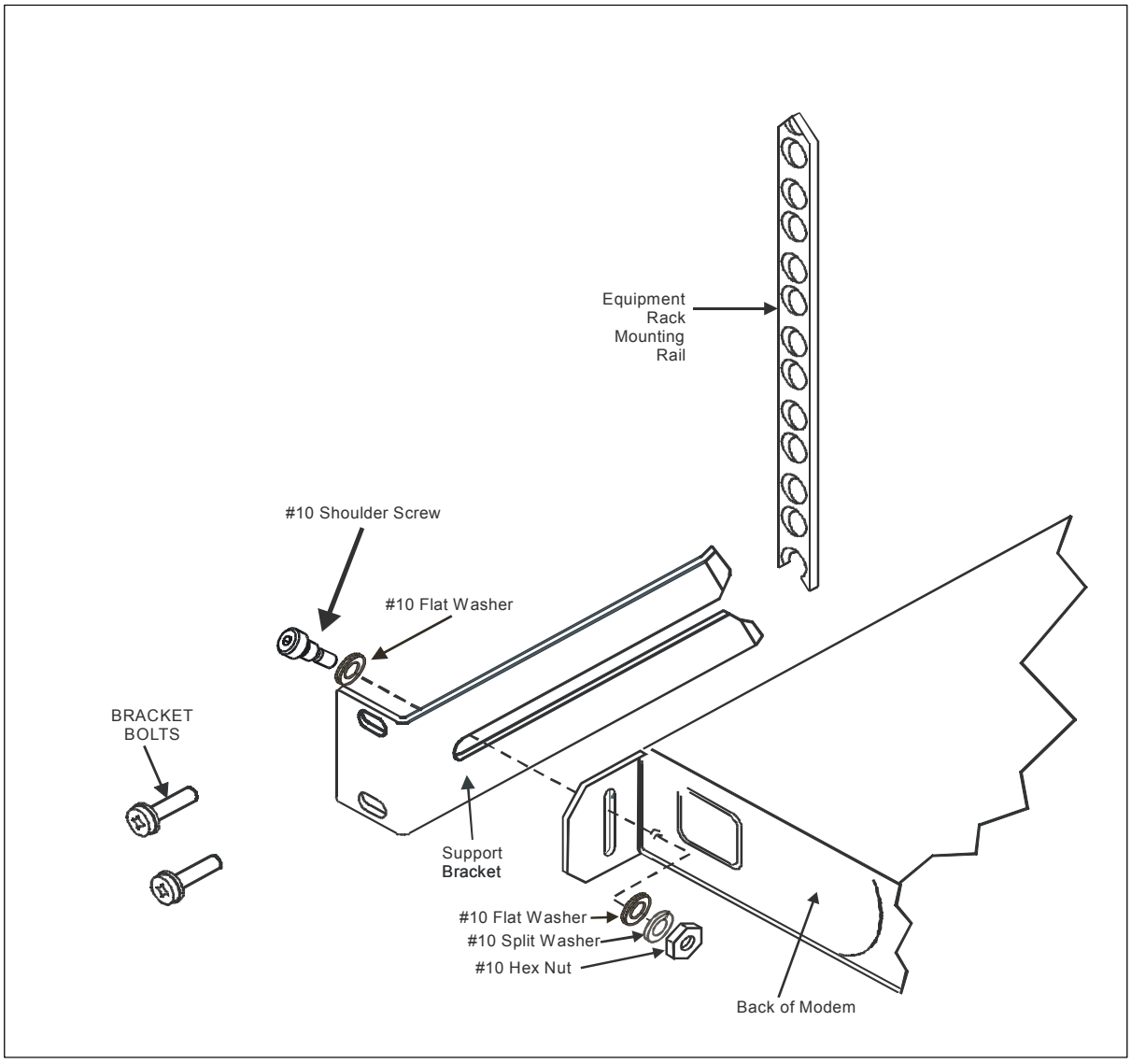


Figure 2-1. Installation of the Optional Mounting Bracket

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 RS-232 Console Interface. The unit will ship with a default 64 kbps, QPSK, Rate 3/4 configuration.

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 Connect External Cables

Having entered the desired configuration, then proceed to connect all external cables. If difficulties occur, call the factory for assistance.

Chapter 3. Functional Description

Note: CDD-562L has two Rx channels. The CDD564/564L has four Rx channels.

The demodulators have two fundamentally different types of interface - IF and Ethernet.

- The Ethernet interface is a bi-directional path, which connects with the customer's equipment through an Ethernet Switch. The Ethernet interface is a 10/100 BaseT Ethernet port where data flow is the combined output of the demodulator channels. Control and status information also uses this port.
- The IF interfaces provides independent unidirectional links (receive only) with the satellite via the downlink equipment.

In the demodulator, the Rx IF signal in the range (**70/140 MHz**: 50 to 90 or 100 to 180 MHz/ **L-Band:** 950 to 1950 MHz) is translated to an intermediate frequency **(L-Band:** 465MHz approximately), and then further translated to baseband, using the carrier recovery VCO. 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 (Turbo). After decoding, the recovered clock and data pass to the IP Module where traffic is examined and processed for four channels before it is delivered to the Ethernet port.

The demodulator signal processing functions are performed in two, large **F**ield-**P**rogrammable **G**ate **A**rray (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 indicators, serial and Ethernet interfaces.

Physically the demodulator is comprised of a single printed circuit card assembly, with integral Turbo FEC and IP router as shown in:

- Figure 3-1 (CDD-562L)
- Figure 3-2 (CDD-564/564L)

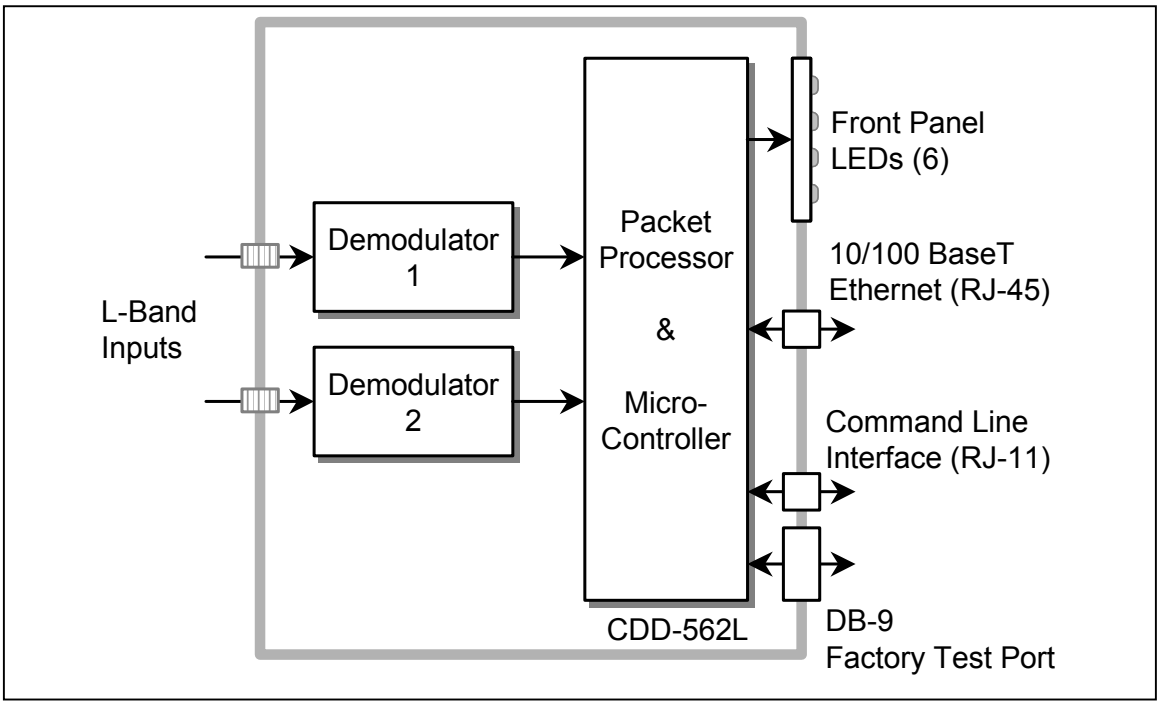


Figure 3-1. CDD-562L Block Diagram

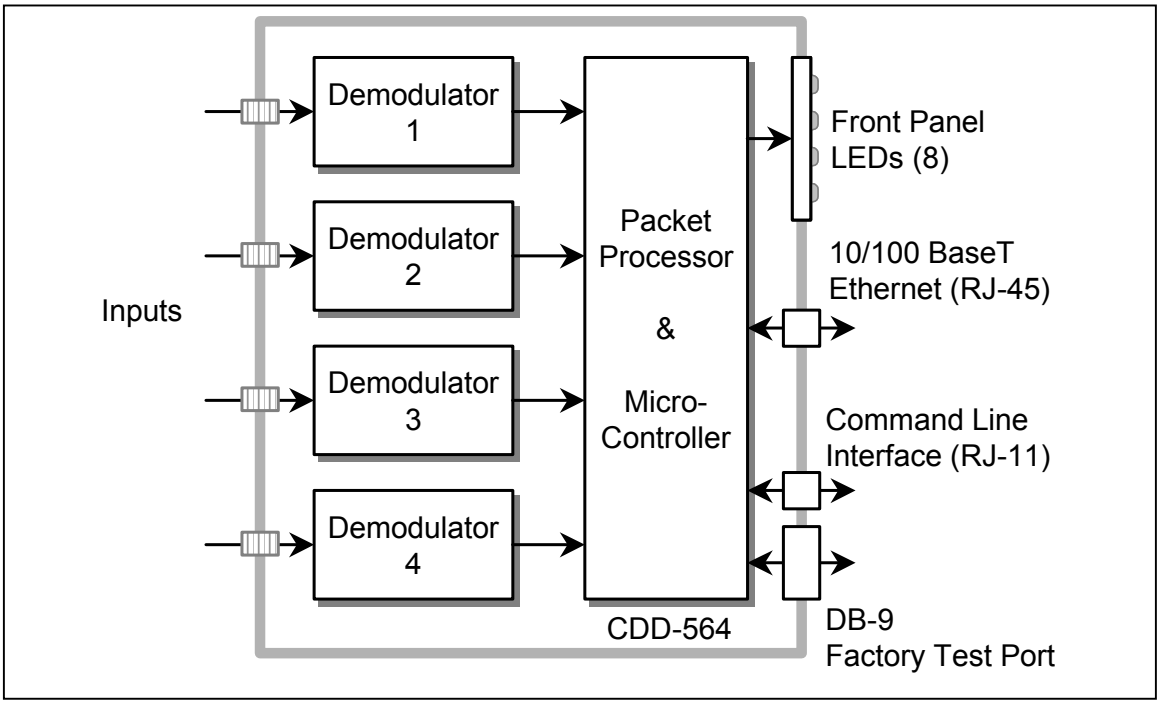


Figure 3-2. CDD-564/564L Block Diagram

Chapter 4. Physical Description

4.1 Introduction

The demodulators are constructed as a 1RU high rack-mounting chassis, which can be freestanding if desired. Rack handles at the front facilitate removal from and placement into a rack. Figures 4-1 and 4-2 show the front panel of the units.

Figure 4-1. CDD-562 Front Panel

Figure 4-2. CDD-564 and CDD-564L Front Panels

4.2 Front Panel

The front panel of the CDD-562L has six LEDs (eight LEDs on the CDD-564 and CDD-564L) indicating the status of the unit:

- Traffic Status for each of the two (CDD-562L)/four (CDD-564 and CDD 564L) receive channels
- Overall Unit Status
- Stored Event
- Ethernet Activity
- Ethernet 10 BaseT or 100BaseT active

4.3 Rear Panel

External cables are attached to connectors on the rear panels of the demodulators as shown in Figures 4-3 and 4-4. These comprise:

- IEC-320 AC line input connector with ON/OFF switch
- (L-Band) Rx IF connectors – four 'N' type female
- (70/140 MHz) Rx IF connectors – four "BNC" type female
- RJ-45 Data interface connector – 10/100BaseT Ethernet
- RJ-11 6-pin Async Serial Console port
- DB-9 factory test connector

Figure 4-3. CDD-562L Rear Panel

Figure 4-4. CDD-564 and CDD 564L Rear Panels

4.3.1 IEC Line Input Connector

The IEC line input connector contains the ON/OFF switch for the unit. It also is 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 120/230 VAC operation, use T3.15 A, slow-blow 20mm fuses.
- For 48 VDC (38 to 60 VDC) operation, use T8.0A, slow-blow 20mm fuses

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

4.3.2 Rx IF Connectors

70/140 MHz: The IF port connectors are “BNC” type female with a programmable impedance of 50 or 75Ω.

L-Band: The IF port connectors are 50Ω “N” type female. The return loss on these ports is typically better than 17dB, and if the user desires to connect to a 75Ω system, an inexpensive ‘N’ to ‘F’ type adapter is available as an optional accessory. While there will be a reduction in return loss when doing this, the effect in most systems will be imperceptible.

4.3.3 Data Interface Connector: 10/100BaseT Ethernet

This is a standard RJ-45 receptacle for connecting UTP cable to an Ethernet switch or hub. It is used for IP traffic, management of the demodulator functions via Telnet/HTTP/SNMP, as well as upgrading of the demodulators’ firmware via FTP.

4.3.4 Serial Console Port

This is an RJ-11 6-pin ASYNC RS-232 serial console port used for management of demodulator functions using a terminal emulator connected to the Console port with supplied adaptor cable.

4.3.5 Factory Test Connector

Note: This is NOT a standard EIA-232 interface.

The 9-pin “D” type male (DB-9-M), labeled “Remote Control” is a Factory Test interface. This interface is NOT intended for customer use.

Please consult CEFD Customer Support before attaching any cable to this interface.

4.4 Dimensional Envelope

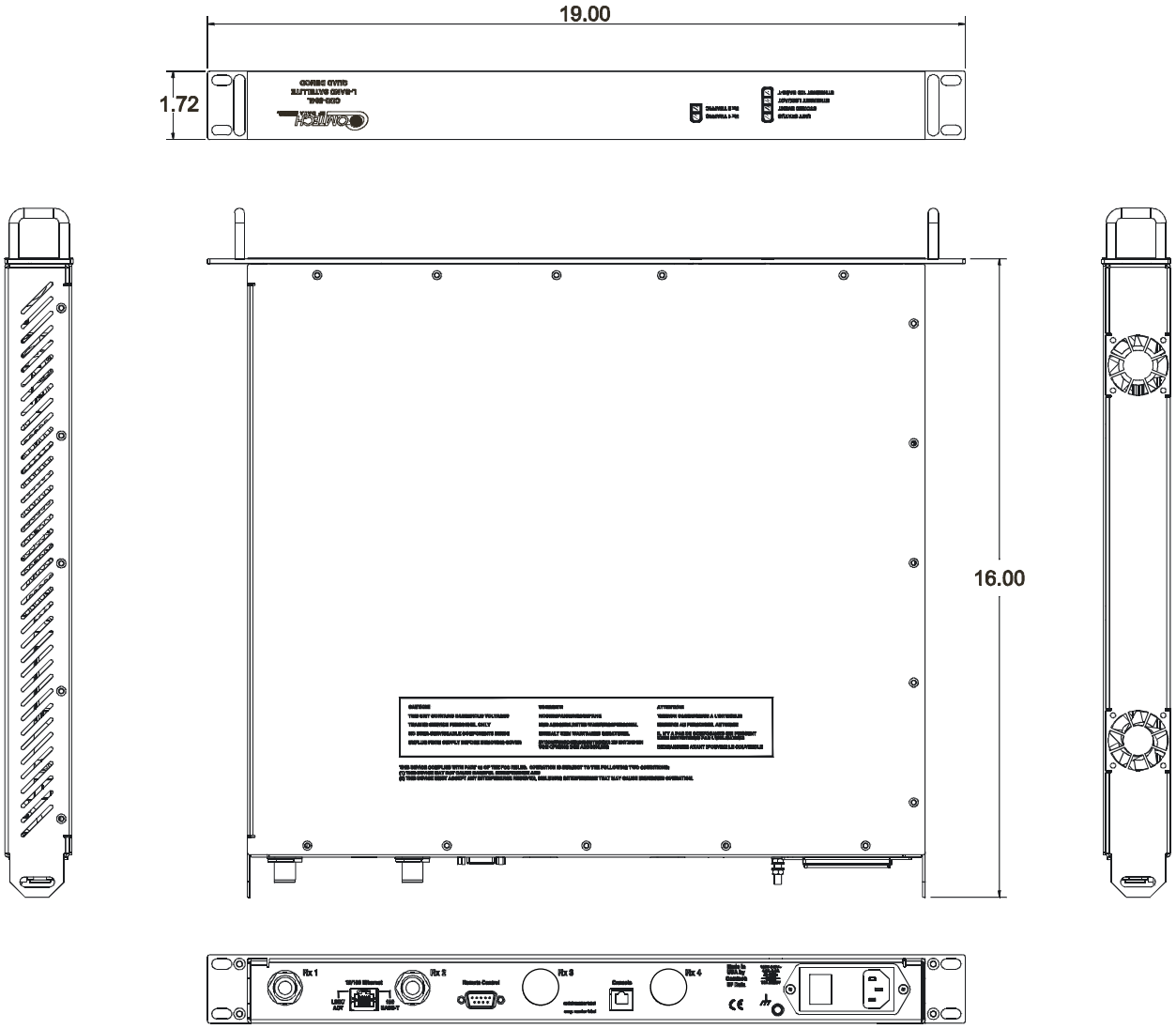


Figure 4-5. CDD-562L Dimensional Envelope

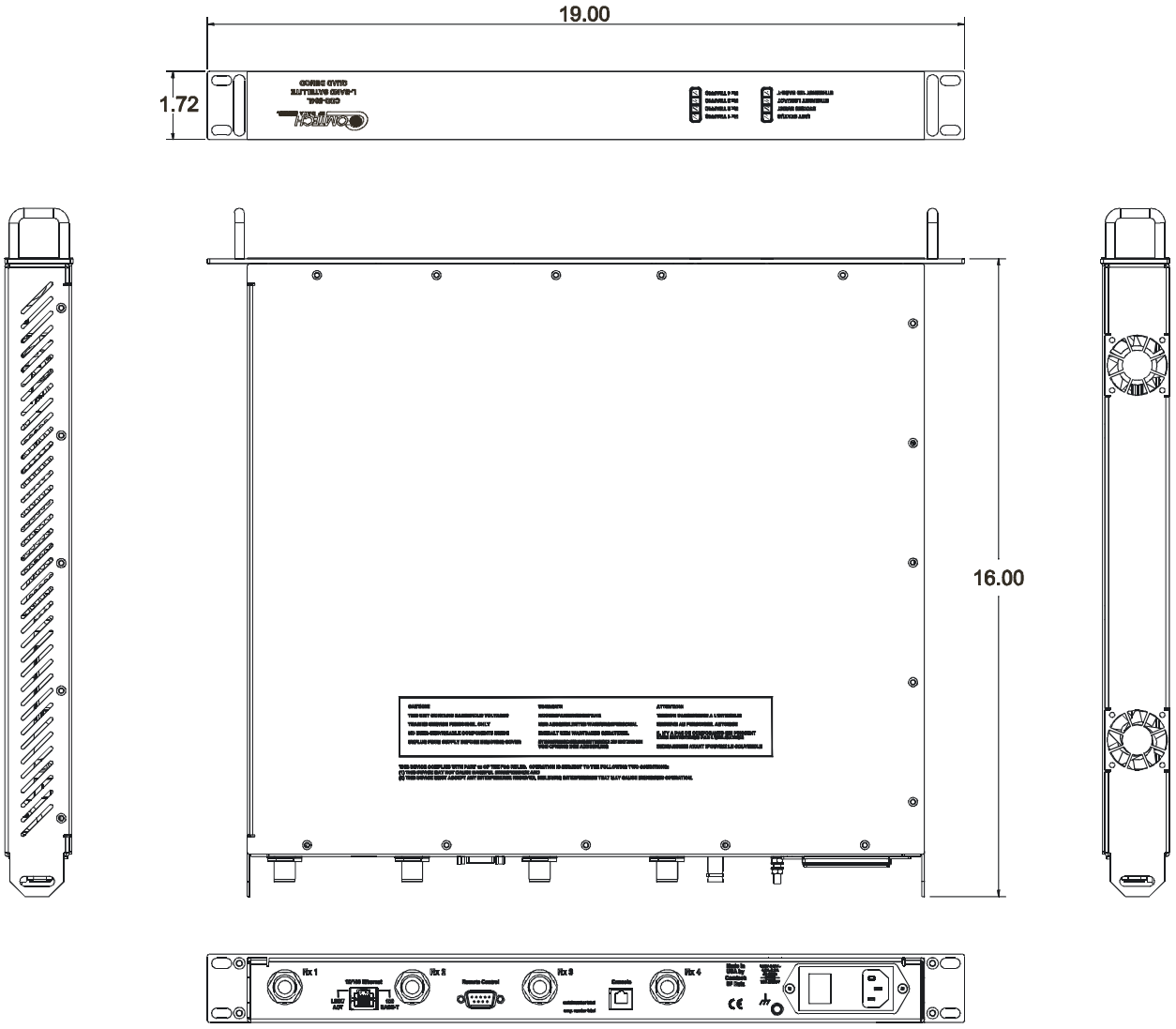


Figure 4-6. CDD-564/-564L Dimensional Envelope

Chapter 5. Connector Pinouts

5.1 Connector Overview

The rear panel connectors provide all necessary external connections between the unit and other equipment.

Figure 5-1. CDD-562L Rear Panel

70/140MHz

L-Band

Figure 5-2. CDD-564/564L Rear Panel

Table 5-1. External Connections

CDD-562L		
Name	**Connector Type**	**Function**
Rx IF	'N' type (female) – 2 each	RF Input
Remote Control	9-pin D (male)	Factory Test
Console	RJ-11	Serial Console Interface
10/100 Ethernet Traffic	RJ-45	Ethernet Traffic and M&C

CDD-564/564L		
Name	**Connector Type**	**Function**
70/140 MHz: Rx IF	'BNC' type (female)	RF Input (Rx 1,Rx 2, Rx 3, Rx 4)
L-Band: Rx IF	'N' Type female	RF Input (Rx A, Rx B, Rx C, Rx D)
Remote Control	9-pin D (male)	Factory Test
Console	RJ-11 (6-pin)	Serial Console Interface
10/100 Ethernet Traffic	RJ-45	Ethernet Traffic and M&C

+++

5.2 Remote Control (Factory Test) Connector

The Factory Test interface connection is a 9-pin male connector located on the rear panel of the unit. Refer to Table 5-2 for pin assignments.

IMPORTANT

This connector is NOT intended for customer use. Contact CEFD Customer Support prior to connecting any equipment to this interface.

Table 5-2. Remote Control (Factory Test) Connector Pin Assignments

Pin #	Description	Direction
1	Ground	
2	EIA-232 Transmit Data (38.4k, 8N1 fixed)	Out
3	EIA-232 Receive Data (38.4k, 8N1 fixed)	In
4	Selected Demod I-Channel monitor	Out
5	Selected Demod Q-Channel monitor	Out
6	Selected Demod RS-422 Rx Data +	In
7	Selected Demod RS-422 Rx Data -	In
8	Selected Demod RS-422 Tx Clock +	Out
9	Selected Demod RS-422 Tx Clock -	Out

5.3 Async-Serial Console

The Console Connector is a RJ-11 (6-pin) modulator jack located on the rear panel. The Async-Serial Console interfaces the Command Line Interface (CLI). This is a RS-232 DCE interface.

Table 5-3. ASYNC-Serial Console Connector

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

5.4 Ethernet Interface Connector (IP Traffic and M&C)

The 10/100BaseT Ethernet connector is a RJ-45 (8-pin) modular jack. This interface is a Network Interface Card (NIC) pinout.

Table 5-4. 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

5.5 AC Power Connector

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the unit. 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	Line and neutral fusing 20 mm type fuses. See Physical Description Chapter for ratings

5.6 Ground Connector

A #10-32 stud on the rear panel of the unit is used for connecting a common chassis ground among equipment.

Note: The AC power connector provides the safety ground.

Chapter 6. Forward Error Correction

6.1 Introduction

As standard, the demodulator is equipped with an integral 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 3/4 and 0.95 for QPSK and 8-PSK
- Rate 3/4 for 16-QAM
- Rate 7/8 for QPSK, 8-PSK, and 16-QAM

Turbo Product Coding provides the best of class Forward Error Correction technology currently available, along with modulation types that optimize link performance under any conditions.

6.2 Turbo Product Codec

6.2.1 Description

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, 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 demodulator, Comtech EF Data now provides the best Forward Error Correction technology currently available.

6.2.2 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. Table 6-2 shows the processing delays for the three TPCs at 64 kbps based on the latency through a CDM-570 with IP Module and either a CDD-564/564L or CDD-562L.

Table 6-1. Turbo Product Coding Processing Delay Comparison

FEC Mode (64 kbps data rate)	End-to-end delay, ms
Turbo Product Coding, Rate 3/4	**47**
Turbo Product Coding, Rate 7/8	**249**
Turbo Product Coding, Rate 0.95	**69**

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.

6.2.3 Comparison of All TPC Modes (Contains Additional Information)

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 3/4 Turbo	3.8 dB (3.4 dB)	4.4 dB (4.0 dB)	1.50 bits/Hz	0.67 x bit rate	793 kHz
QPSK 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 3/4 Turbo	6.2 dB (5.8 dB)	6.8 dB (6.3 dB)	2.25 bits/Hz	0.44 x bit rate	529 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
*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

* Future offering, firmware upgrade and FAST option.

The additional advantages of Turbo (lower delay, performance during fades, etc.) also should be considered.

Table 6-2. 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	

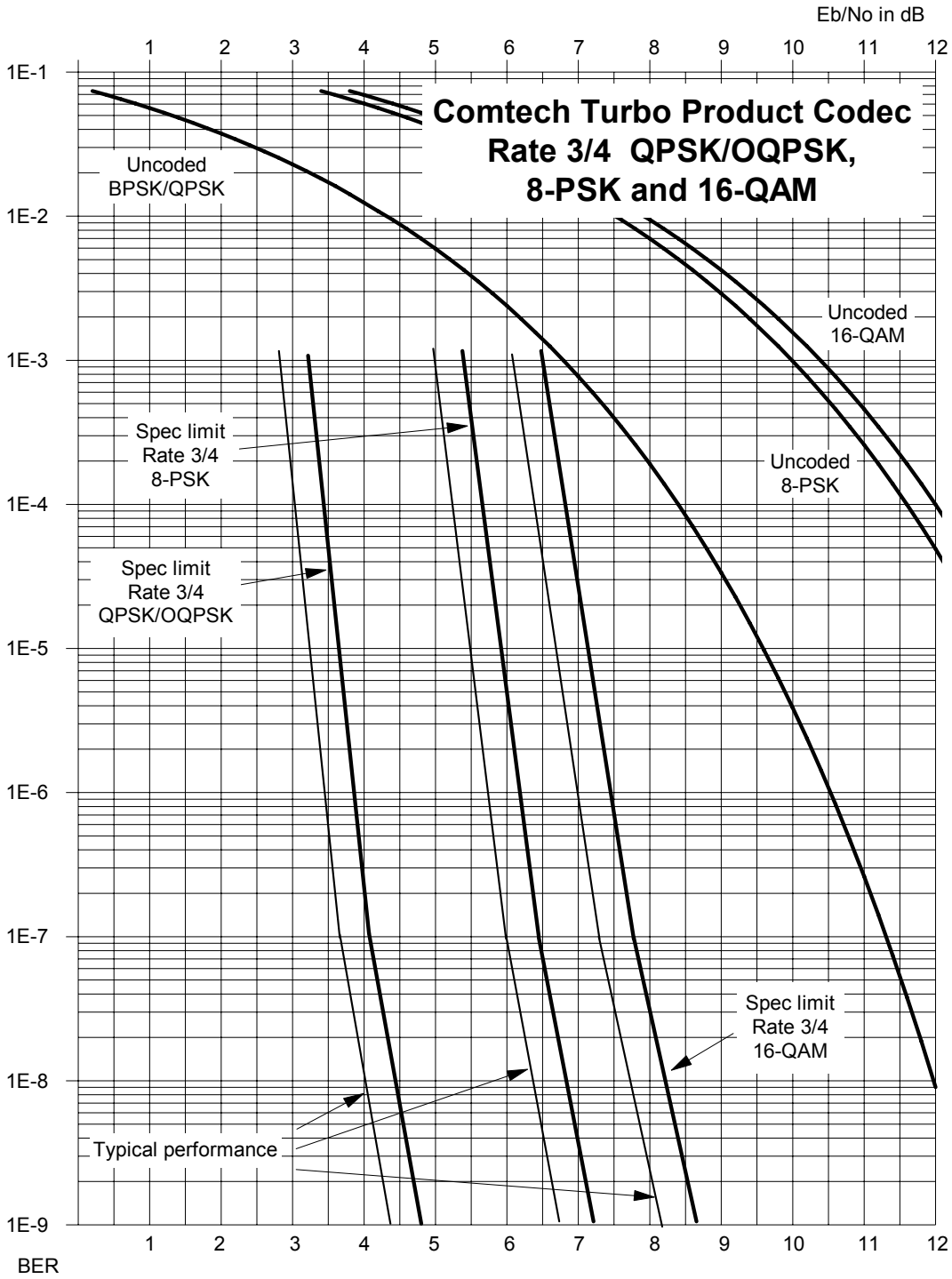


Figure 6-1. Comtech EF Data Turbo Product Codec Rate 3/4 QPSK (OQPSK), 8-PSK, and 16-QAM

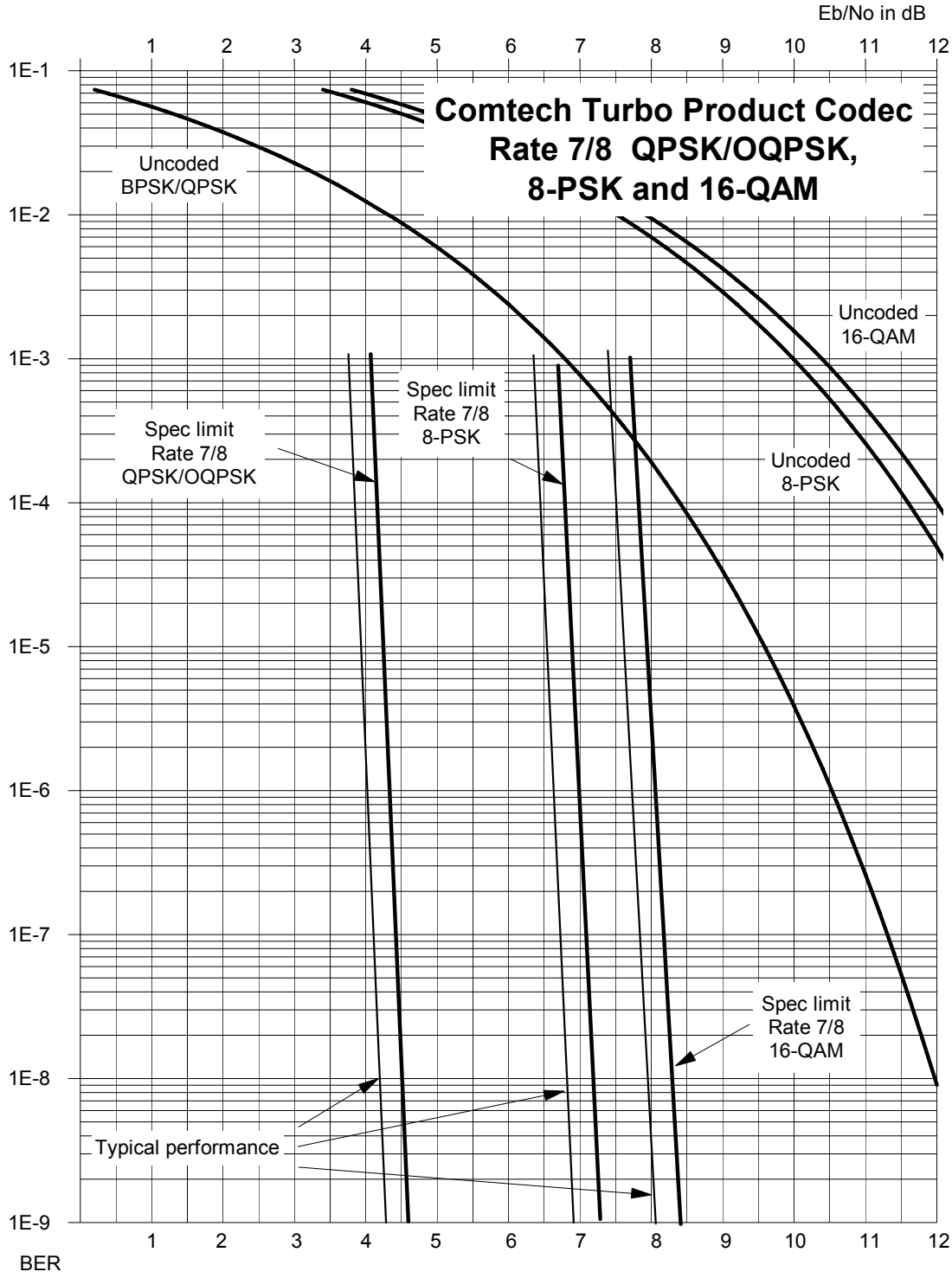


Figure 6-2. Comtech EF Data Turbo Product Codec Rate 7/8 QPSK(OQPSK) , 8-PSK, and 16-QAM

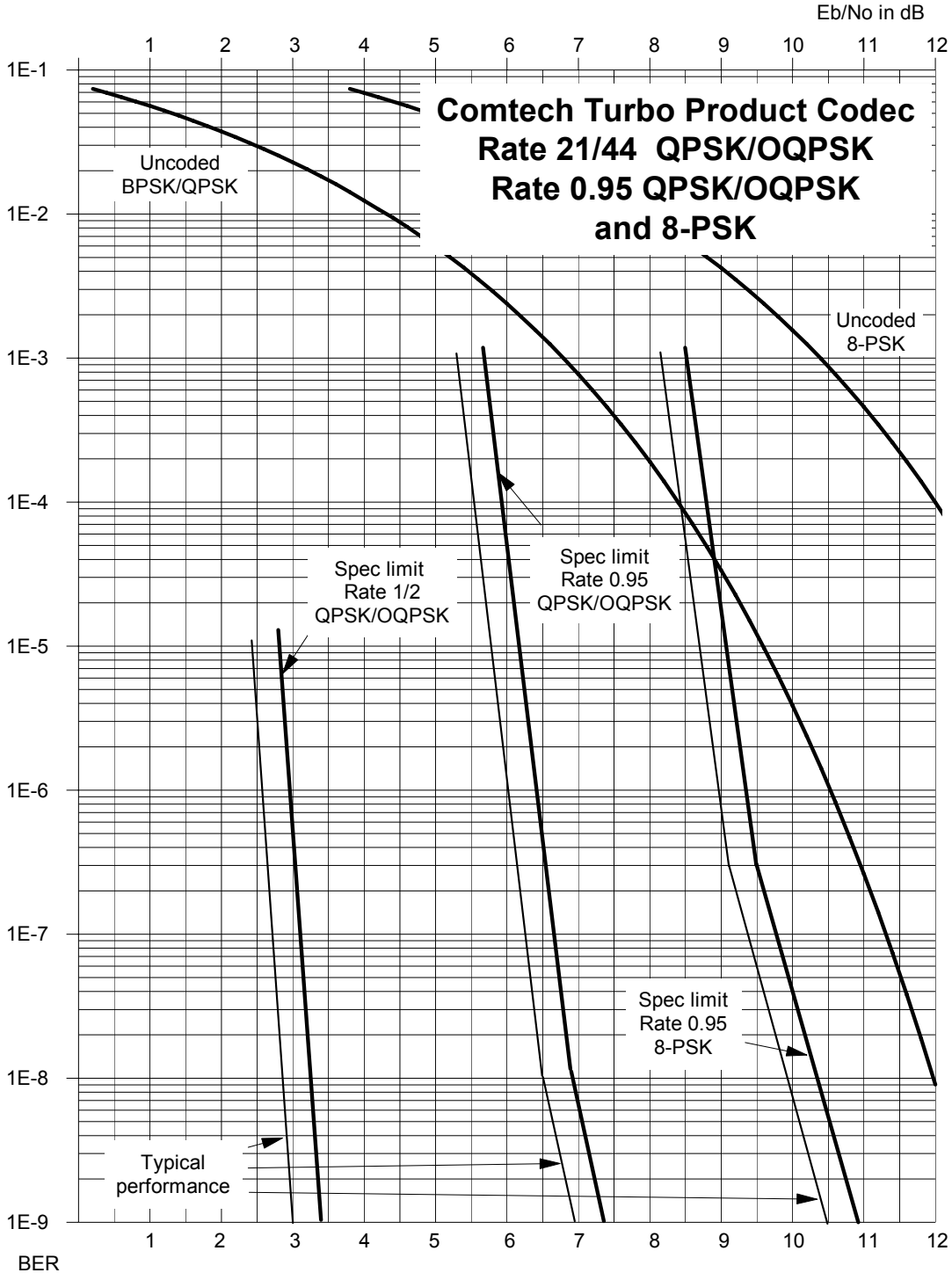


Figure 6-3. Comtech EF Data Turbo Product Codec
Rate 21/44 QPSK, Rate 0.95 QPSK, and Rate 0.95 8-PSK

Chapter 7. Summary Of Specifications

7.1 Demodulator (70/140 MHz)

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

System Specification	
Frequency Range	50 to 90 or 100 to 180 MHz, 100 Hz resolution
Symbol Rate Range	16 ksps to 3.0 Msps
Data Rate Range	Each demodulator independently in 1 bps increments
Rate 3/4 QPSK TPC	16 kbps to 4.5 Mbps
Rate 7/8 QPSK TPC	16 kbps to 5.25 Mbps
Rate 0.95 QPSK TPC	16 kbps to 5.666Mbps
Rate 3/4 8-PSK TPC	16 kbps to 6.75 Mbps
Rate 7/8 8-PSK TPC	16 kbps to 8.5 Mbps
Rate 0.95 8-PSK TPC	16 kbps to 7.875 Mbps
Rate 3/4 16-QAM TPC	16 kbps to 9.0 Mbps
Rate 7/8 16-QAM TPC	16 kbps to 9.98 Mbps
Descrambling	Comtech to IESS-315
FEC Turbo Product	Rate 3/4, 0.95 QPSK Rate 3/4, 0.95 8-PSK Rate 3/4, 16-QAM Rate 7/8, QPSK, 8-PSK, 16-QAM
Inputs	4 separate 'BNC' type
Input Impedance	50 or 75Ω user selection
Return Loss	17 dB min
Traffic and Management Interface	10/100 BaseT Ethernet RJ-45
Command Line Interface (CLI)	RS-232, RJ-11
Factory Test Connector	DB-9 male
Frequency Reference	Internal: ± 0.06 ppm, 32 to 122°F (0 to 50°C) External: None

Demodulator	
Input Power Range	-30 to –60 dBm
Max Composite Level	+35 dBc, up to –5 dBm
Acquisition Range	± 1 to ± 32 kHz (1 kHz steps) < 625 ksps
Monitor Functions	Eb/No Frequency Offset, BER LNB current and voltage Rx signal level

7.2 Demodulator (L-Band)

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

System Specification	
Frequency Range	950 to 1950 MHz
Symbol Rate Range	16 ksps to 3.0 Msps
Data Rate Range	Each demodulator independently in 1 bps increments
Rate 3/4 QPSK TPC	16 kbps to 4.5 Mbps
Rate 7/8 QPSK TPC	16 kbps to 5.25 Mbps
Rate 0.95 QPSK TPC	16 kbps to 5.666Mbps
Rate 3/4 8-PSK TPC	16 kbps to 6.75 Mbps
Rate 7/8 8-PSK TPC	16 kbps to 7.875 Mbps
Rate 0.95 8-PSK TPC	16 kbps to 8.5 Mbps
Rate 3/4 16-QAM TPC	16 kbps to 9.0 Mbps
Rate 7/8 16-QAM TPC	16 kbps to 9.98 Mbps
Descrambling	Comtech to IESS-315
FEC Turbo Product	Rate 3/4, 0.95 QPSK Rate 3/4, 0.95 8-PSK Rate 3/4, 16-QAM Rate 7/8, QPSK, 8-PSK, 16-QAM
Inputs	4 separate ‘N’ type
Input Impedance	50Ω, 17 dB minimum return loss
Traffic and Management Interface	10/100 BaseT Ethernet RJ-45
Command Line Interface (CLI)	RS-232, RJ-11
Factory Test Connector	DB-9 male
Frequency Reference	Internal: ± 0.06 ppm, 32 to 122°F (0 to 50°C) External: None
Demodulator	
Input Power Range	-130 + 10 log (Symbol Rate) to –90 +10 Log (Symbol Rate)
Max Composite Level	+40 dBc, up to –5 dBm
Acquisition Range	± 1 to ± 32 kHz (1 kHz steps) < 625 ksps ± 1 to ± 200 kHz ≥ 625 ksps
Monitor Functions	Eb/No Frequency Offset, BER LNB current and voltage Rx signal level

7.3 Low Noise Block (LNB) Converter Support (CDD-564L only)

Parameters	Specifications
LNB Voltage	+13 volts, +18 volts, and +24 volts DC or OFF at 500 mA max per Rx input
10 MHz Reference	-3 dBm ± 3 dB via Rx center conductor
Power Level	Selectable ON or OFF per Rx input

7.4 Environmental and Physical

Parameters	Specifications
Temperature: Operating Storage	 32 to 122°F (0 to 50°C) -13 to 185°F (-25 to 85°C)
Power Supply	100 to 240 volts AC, 50/60 Hz Optional: 48 VDC input (38 to 60)
Power Consumption	75 W typical (140 W max – powering 4 LNBs)
Fuse	120/230 VAC: T3, 15A, slow-blow 20 mm 48VDC (38 to 60 VDC): T8.0A, slow-blow 20 mm
Physical Dimensions	1 Ru, 16 inches deep (40.6 cm)
Weight	7 lbs (3.2 kg)
Agency Approvals	CE Mark FCC Part 15, Class B

7.5 Network Protocols

Protocol	Protocol
RFC 768 - UDP	RFC 2045 - MIME
RFC 791-IP	RFC 2236 – IGMP v2
RFC 792 – ICMP	RFC 2474 – DS Field
RFC 793 – TCP	RFC 2475 - ADS
RFC 826 - ARP	RFC 2578 - SMI
RFC 856 - Telnet	RFC 2597 – PHB Group
RFC 862 – Ping	RFC 2598 - PHB
RFC 894 – IP	RFC 2616 - HTTP
RFC 959 – FTP	RFC 2821 - SMTP
RFC 1112 – IP Multicast	RFC 3412 - SNMP
RFC 1213 –SNMP MIB II	RFC 3416 – SNMPv2
RFC 1812 – IPv4 Routers	RFC 3418 – SNMP MIB

7.6 BER

IMPORTANT NOTE: Starting with Release 1.4.1 of the CDM-570/570L firmware, the maximum sysmbol rate has been increased from 2.5 to 3.0 Msysmbol/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

TURBO PRODUCT CODEC **Rate 3/4 QPSK** **Rate 3/4 8-PSK** **Rate 3/4 16-QAM** **(With two adjacent carriers, each 7 dB higher than the desired carrier)**	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	**Rate 3/4 (Q)** Guaranteed Eb/No: (typical value in parentheses) 3.8dB (3.4dB) 4.1dB (3.7dB) 4.4dB (4.0dB)	**Rate 3/4 (8-PSK)** Guaranteed Eb/No: (typical value in parentheses) 6.2dB (5.8dB) 6.4dB (6.0dB) 6.8dB (6.3dB)	**Rate 3/4 (16-QAM)** Guaranteed Eb/No: (typical value in parentheses) 7.4dB (7.0dB) 7.8dB (7.3dB) 8.2dB (7.7dB)
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: BER=10^{-6} BER=10^{-7} BER=10^{-8}	**Rate 7/8 (Q)** Guaranteed Eb/No: (typical value in parentheses) 4.3dB (4.0 dB) 4.4dB (4.1 dB) 4.5dB (4.2 dB)	**Rate 7/8 (8-PSK)** Guaranteed Eb/No: (typical value in parentheses) 7.0dB (6.6dB) 7.1dB (6.7dB) 7.2dB (6.8dB)	**Rate 7/8 (16-QAM)** Guaranteed Eb/No: (typical value in parentheses) 8.1dB (7.7dB) 8.2dB (7.8dB) 8.3dB (7.9dB)
TURBO PRODUCT CODEC **Rate 0.95 QPSK** **Rate 0.95 (8-PSK)** **(With two adjacent carriers, each 7 dB higher than the desired carrier)**	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	**Rate 0.95 (Q)** Guaranteed Eb/No: (typical value in parentheses) 6.4dB (6.0dB) 6.7dB (6.3dB) 6.9dB (6.5dB)	**Rate 0.95 (8-PSK)** Guaranteed Eb/No: (typical value in parentheses) 9.3dB (8.9dB) 9.8dB (9.4dB) 10.3dB (9.9dB)	
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)			

Chapter 8. IP Module Ethernet Interface Overview

8.1 Introduction

The integral IP Module Ethernet Interface is a high-performance, low-cost, IP-Centric interface well suited for closed network **S**ingle **C**hannel **P**er **C**arrier (SCPC) links. It concentrates traffic from four independent demodulators into a single Ethernet port making it ideal for networked VSAT applications. A demodulator with the integral IP Module also can be utilized in a ViperSat satellite bandwidth management sytem. The following chapters focus on the CDD-562/562L/564/564L IP Module capabilities and operation. Refer to the ViperSat Operational Manual, for more specific information on the CDD-564/564L IP Module operation when deployed in a ViperSat system.

8.2 Standard Features

- 10/100BaseT Ethernet Interface (RJ-45)
- 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
- Static IP routing for unicast and multicast
- Symmetric and/or asymmetric operation for maximum bandwidth efficiency
- Point-to-Point or Point-to-Multi-Point configuration
- Interoperable with the CDM-570/570L with IP Module, CDM-IP550, and CDM-IP 300L

8.2.1 10/100BaseT Ethernet Interface

In Router Mode operation, the 10/100BaseT Ethernet Interface is used for routing IP traffic received over the satellite to another device on the local LAN. Local or remote management of all demodulator and IP Module functions is also available via Telnet, HTTP, or SNMP.

8.2.2 Powerful Network Management

The demodulator may be configured, operated and monitored using any of the following methods:

User Interface	Connection	Demod Functions	IP MODULE Functions	Reference
Serial Command Line Interface (CLI)	Local - Serial RS-232 via Console Port	ALL	ALL	Chapter 10
Telnet	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 10
Web Server	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 11
SNMP	Local or remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 12

8.2.3 Remote Software/Firmware Upgrade via FTP

The demodulator uses ‘flash memory’ technology internally, and new firmware can be uploaded 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.

8.2.4 Configuration Backup and Restore via FTP

All demodulator 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 unit if needed.

8.2.5 Event Logging to Capture All Demodulator Activity

All activity can be stored into an easy-to-read Event Log. This file also can be retrieved locally or remotely by FTP.

8.2.6 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.

8.2.7 IGMP Support for Multicast

IGMP is a standard feature in the demodulator. If enabled as an IGMP client, it responds to IGMP queries for the configured multicast routes. If enabled as an IGMP server, it generates IGMP queries and transmits multicast traffic per IGMP clients' request. If there are no active IGMP clients on the LAN, it will stop forwarding the multicast traffic (received from the satellite) to the LAN.

8.2.8 Static IP Routing for Unicast and Multicast

Up to 256 static routes can be entered into the demodulator to direct IP traffic to another device on the local LAN.

8.3 Demodulator Features

Enhancing the demodulator 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

8.3.1 3xDES Encryption with Ability to Change Keys

The demodulator optionally supports 3xDES-128 (using NIST certified 3x core) decryption for the highest-level security. For link encryption, each unit supports eight decryption keys.

8.3.2 IP Header Compression

Header Compression also is an optional feature of the demodulator. The demodulator supports Header Compression for the following Ethernet and Layer 3 & 4 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/demod. 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. Sometimes 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.

8.3.3 Payload Compression

Traffic optimization through Payload Compression is another optional feature of the demodulator.

- 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 satellite 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.

8.3.3.1 ADLC vs LZS Compression Comparison

These numbers have been generated 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

8.4 IP Module Specifications

Table 8-1. RFCs and Protocols

Supported RFC's 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 9. Typical IP Module Operational Setups

9.1 Overview

The demodulator with the integral IP Module has several modes of operation. This chapter shows examples of typical setups for the unit to determine the best mode of operation for the appropriate network topology and Ethernet traffic environment.

9.2 CDD564/562 Compatibility

The demodulator 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:

CDD-564L IP SW Version	Comtech EF Data IP Modem IP SW Version	Additional Notes
Version 1.1.0 or later	CDM-IP 550 Version 1.3.0 or later	Must have Framer II Module (PL/9956-1) to support Data Compression IP option
Version 1.1.0 or later	CDM-IP 300L Version 1.3.0 or later	Must have Framer II Module (PL/9956-1) to support Data Compression IP option
Version 1.1.0 or later	CDM-570/570L Version 1.4.0 or later	

9.3 IP Module Working Modes

Typical CDM-IP modems support two Working Modes: easyConnect™ and Router Mode. **The demodulator only supports Router Mode, so the CDM-IP modem that is transmitting to demodulator must be in Router Mode.** Non-IP traffic is not supported in Router Mode.

Router Mode supports 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.

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

1. **The demodulator only supports Router Mode, so the CDM-IP modem that is transmitting to demodulator must be in Router Mode**
2. **The HDLC Address Mode of the Comtech EF Data IP modems must be identical to pass traffic between the TX modems and the demodulator.**
3. **Changing the HDLC Address Mode of the demodulator requires the IP Module to be rebooted. Before the user can select a different mode, the demodulator will notify the user that changing the mode will require a reboot.**

Working Mode HDLC Address Mode	Network Topology	Ethernet Traffic
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 demodulator also has several standard and optional features to further optimize security, performance and efficiency. The following table defines how these features are supported:

Standard Features	**Additional Notes**
HDLC Address Mode	Point-to-Point, Small Network, or Large Network
Access Lists	4 Clients by IP or IP Subnet
Multicast	RX all or specific Multicast streams
IGMP	IGMPv1, IGMPv2
Upgrade by FTP	By local LAN or remotely through satellite (requires a two way connection to demodulator)
* Quality of Service	Min/Max, Max/Priority, or DiffServ
Optional Features	**Additional Notes**
Header Compression	Must be enabled if any TX modem stream has Header Compression enabled.
Payload Compression	Must be enabled if any TX modem stream has Payload Compression enabled.
3xDES Encryption	Must be enabled if any TX modem stream has 3xDES Encryption enabled. Up to 8 Decrypt Keys or random

* Quality of Service (QoS) processing is performed by the transmit end of the link and passed through the IP Module in the demodulator. Support for QoS is a standard feature in the demodulator.

9.3.1 Router – Point-to-Point Mode

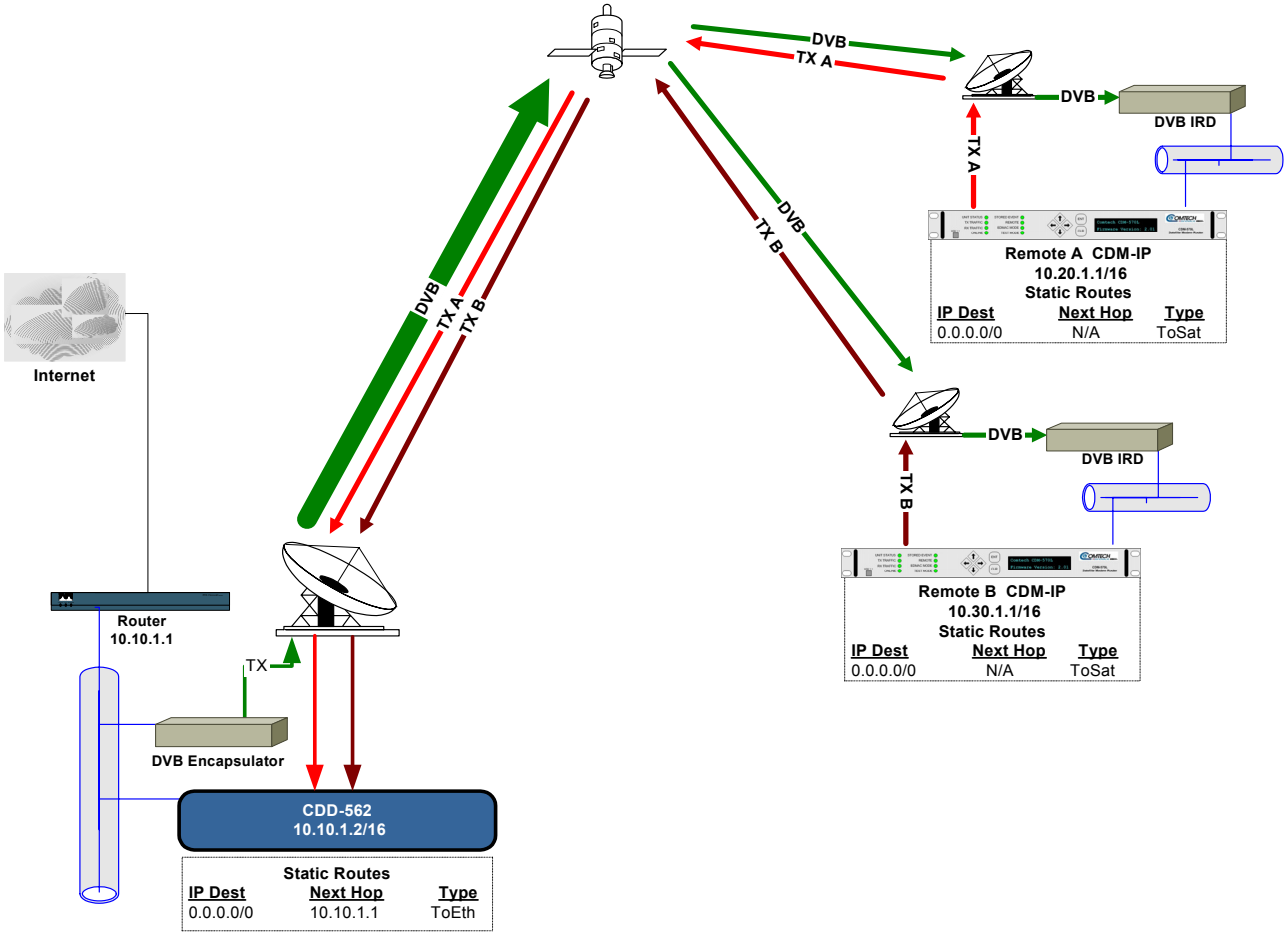


Figure 9-1. (CDD-562L) Router Mode, Point-to-Point Diagram

Figure 9-1 shows an example setup using the CDD-562L at a Hub site to receive two separate DVB return channels. The CDD-562L and all CDM-IP modems are in Point-to-Point Mode. Each remote site has a CDM-IP modem with a default static route. The CDD-562L has a default static route directing traffic to the hub router. The hub router would have routes defined for each remote network that would be directed to the DVB Encapsulator.

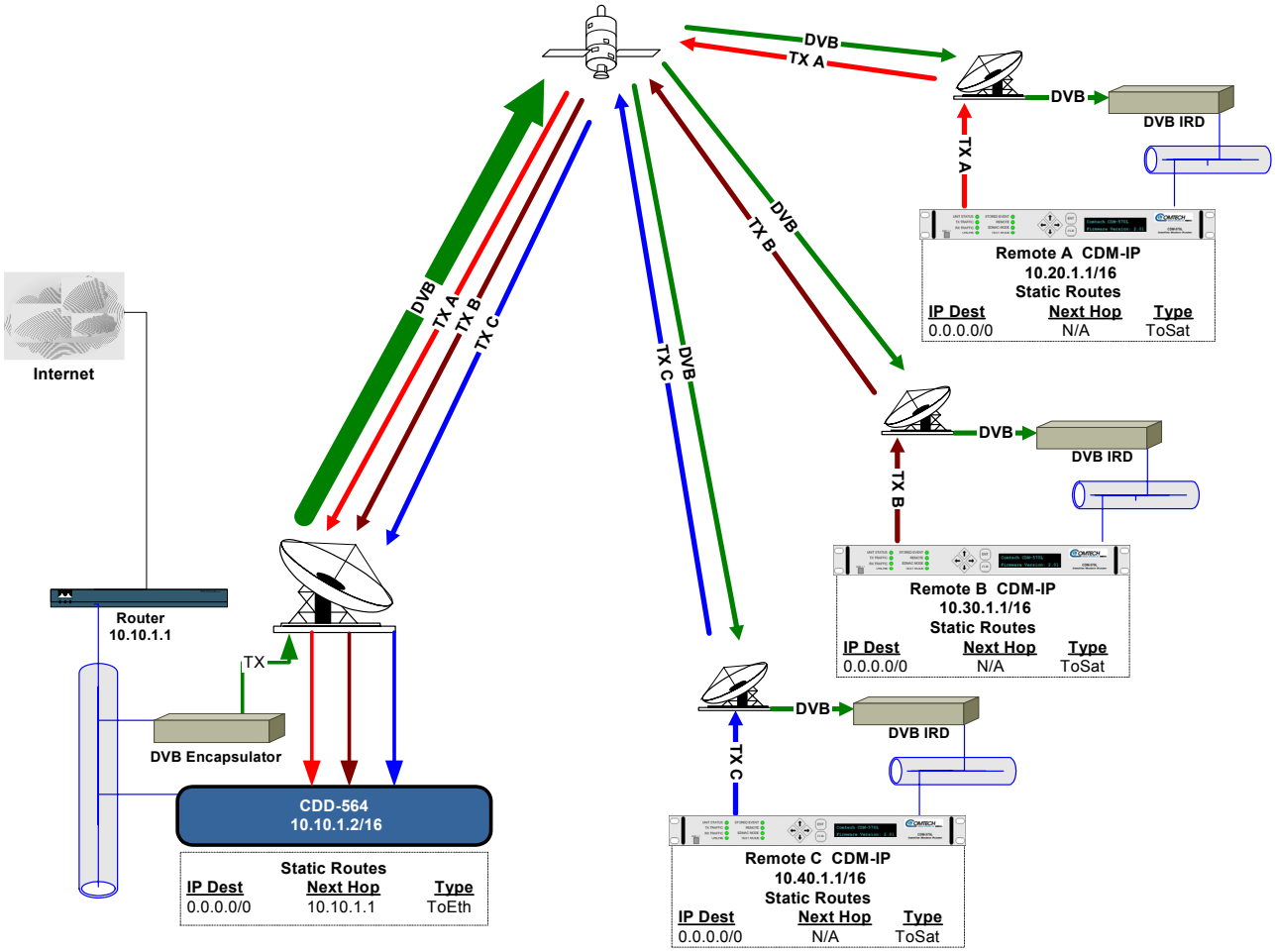


Figure 9-2. (CDD-564/-564L) Router Mode, Point-to-Point Diagram

Figure 9-2 shows an example setup using the demodualtor at a Hub site to receive three separate DVB return channels. The demodulator and all CDM-IP modems are in Point-to-Point Mode. Each remote site has a CDM-IP modem with a default static route. The demodulator has a default static route directing traffic to the hub router. The hub router would have routes defined for each remote network that would be directed to the DVB Encapsulator.

9.3.2 Router Working Mode – Point-to-MultiPoint

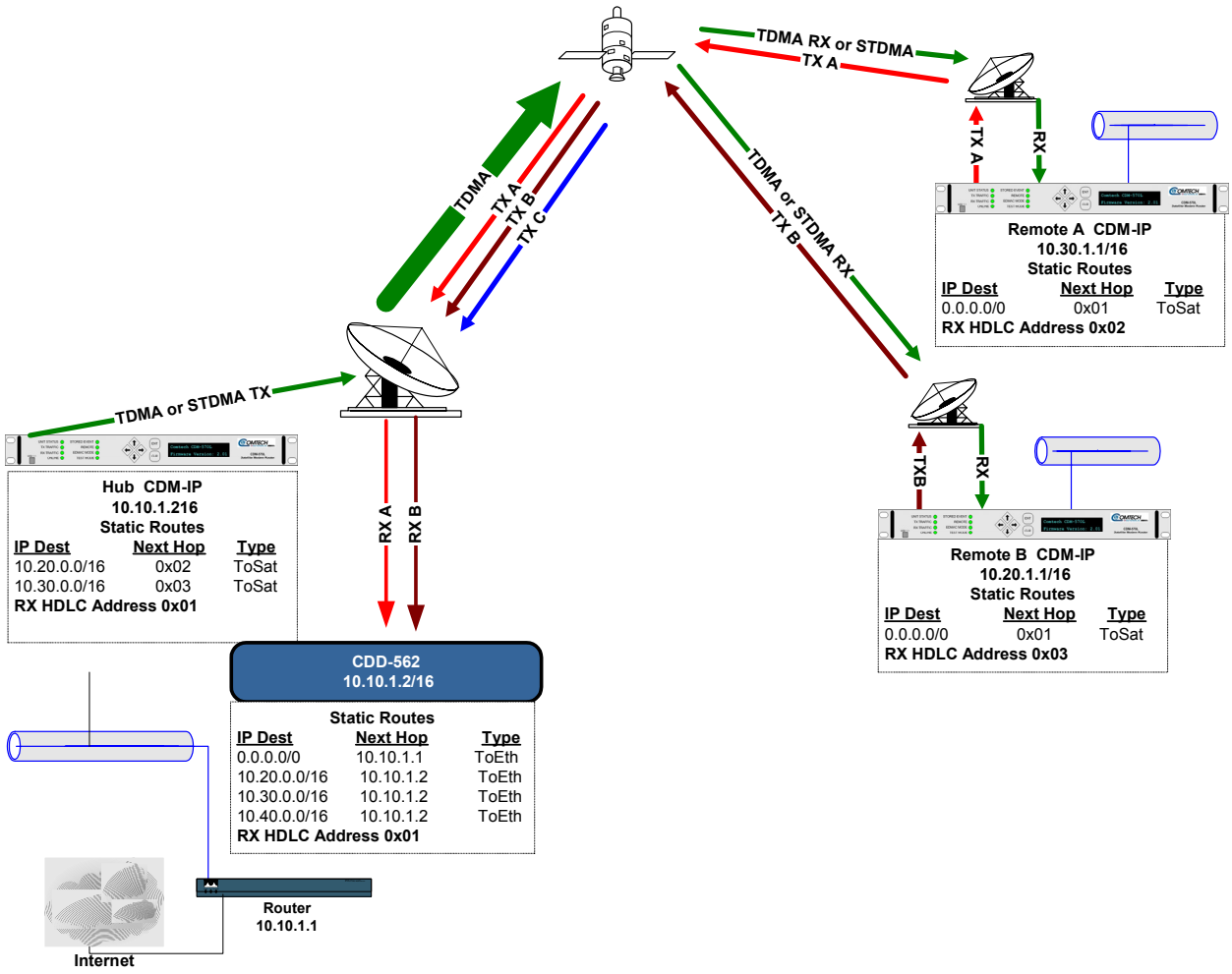


Figure 9-3. (CDD-562L) Router Mode, Point-to-Multipoint Diagram

"Star Network" Point-to-MultiPoint Configuration – Figure 9-3 shows the Hub CDM-IP modem is transmitting a common STDMA carrier to two remote sites with CDM-IP modems. In turn, Remote CDM-IP is transmitting a link back to Hub that is received by the CDD-562L.

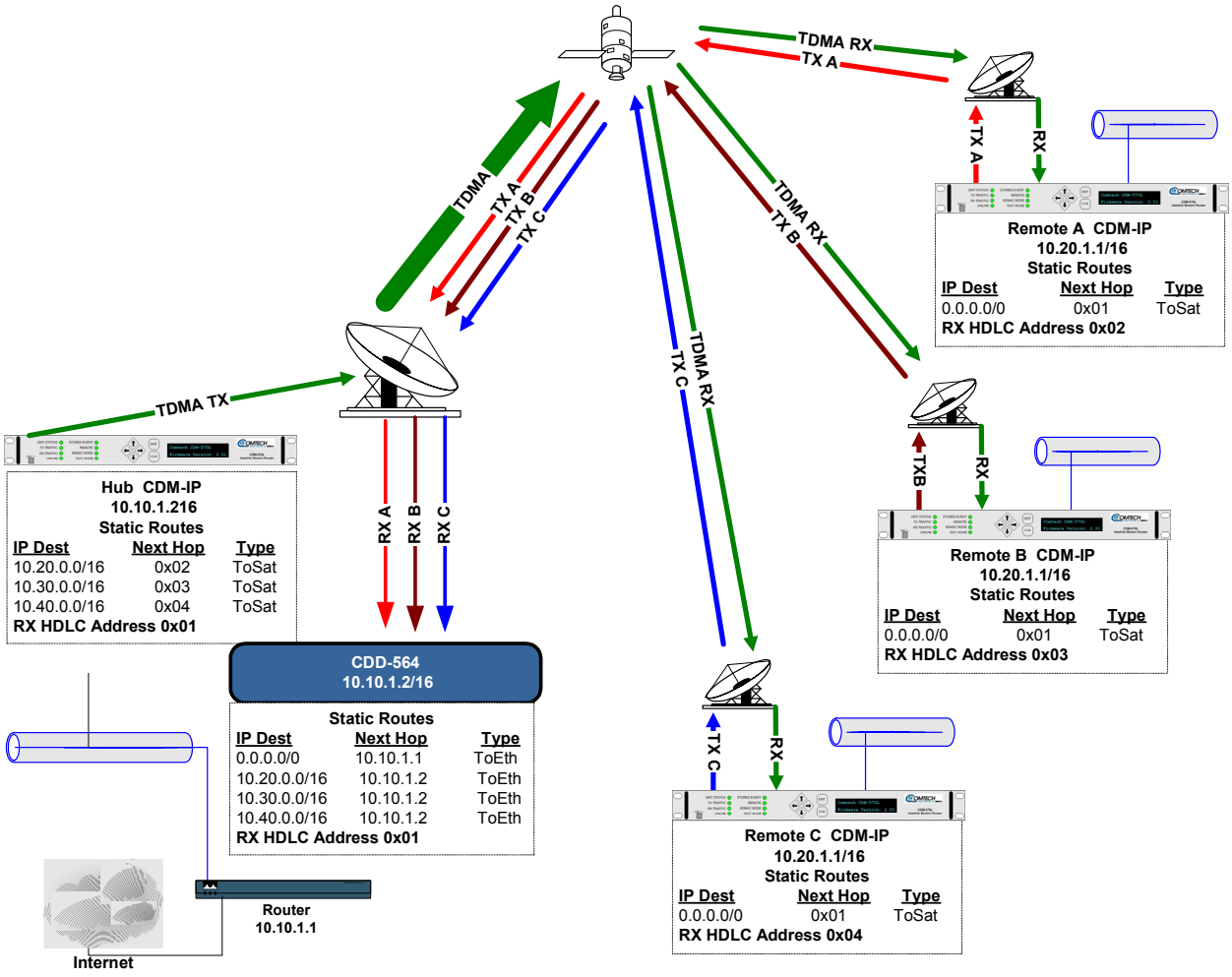


Figure 9-4. (CDD-564/-564L) Router Mode, Point-to-Multipoint Diagram

"Star Network" Point-to-MultiPoint Configuration – Figure 9-4 shows the Hub CDM-IP modem is transmitting a common STDMA carrier to three remote sites with CDM-IP modems. In turn, Remote CDM-IP is transmitting a link back to Hub that is received by the demodulator.

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 (Small or Large HDLC Mode). 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, and (CDD-564/-564L) Remote C is 0x04. Each CDM-IP modem would select the HDLC address associated with its site as a RX HDLC Address, so both CDM-IP modem and the CDD-564L at the Hub would have 0x01 as the first RX HDLC Address. Remote A CDM-IP would have 0x02, and B would have 0x03, and (CDD-564/-564L) C would have 0x04.

The remote CDM-IP modems only need a single default route to is directed to the Hub HDLC, 0x01. All of the traffic is managed by the static route entries in the hub CDM-IP and demodulator. The demodulator has a default route to the router for Internet access. It also has specific routes for the remote networks which are directed to the Hub CDM-IP. The Hub CDM-IP also has specific routes for the remote networks with the HDLC address associated with each site.

Chapter 10. IP Module - CLI and Telnet Operation

10.1 Overview

This section defines the user menu system provided by the console interface via a Terminal Emulator or via the Ethernet interface using Telnet. In the process of configuring each parameter, an overview of the parameter and its impact on the configuration of the demodulator 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 demodulator. 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 demodulator and thus its exact setting can vary between specific installations.

1. ***The demodulator does not allow concurrent access to the menu via telnet and the console port****. If a user connects via telnet, demodulator 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 demodulator will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).*
2. ***Any changes made to the demodulator IP parameters will be lost if the demodulator is reset or loses power unless the changes are saved to permanent storage****. This applies to all of the IP parameters. The IP parameters can be saved by selecting "**S**", available on any CLI/Telnet Menu page.*
3. *All demodulator parameters configured via the CLI or Ethernet interface will be automatically stored in the demodulator unit non-volatile RAM and will be retained if there is a power loss.*

The CLI and Telnet Access Levels are defined as follows:

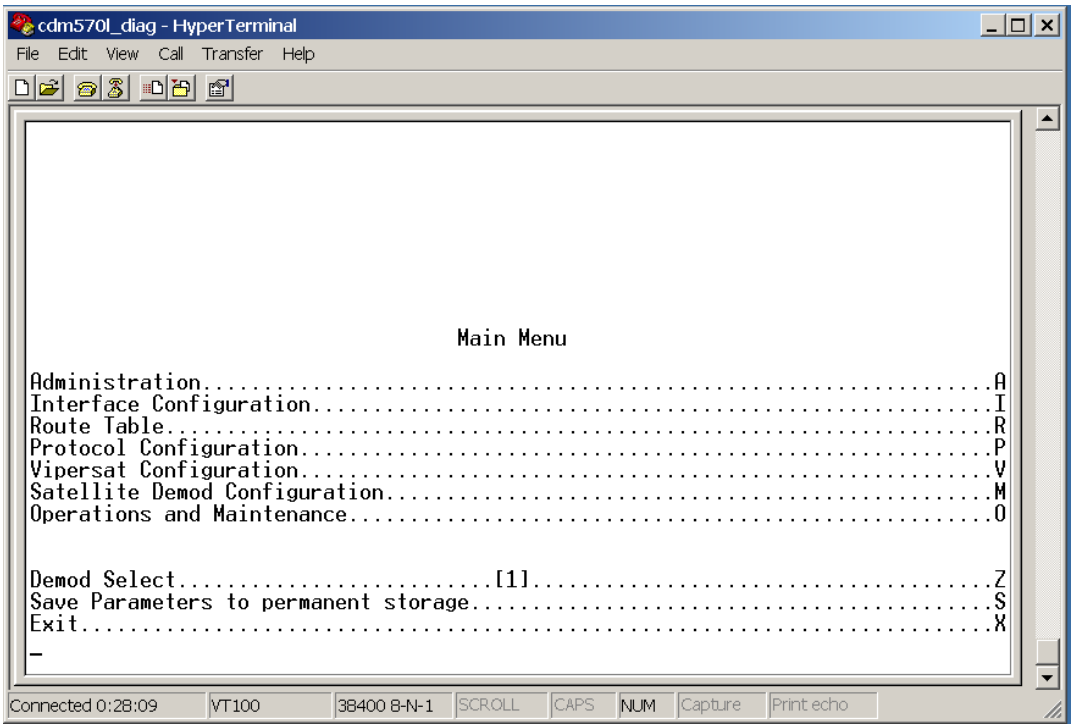
<table>
<tr><th rowspan="2">User Interface</th><th colspan="3">User Login Access Level</th></tr>
<tr><th>Admin User</th><th>Read/Write User</th><th>Read Only User</th></tr>
<tr><td>CLI
(direct to console port)</td><td colspan="3">Full Access – no Login</td></tr>
<tr><td rowspan="2">Telnet</td><td rowspan="2">Full 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

10.2 Main Menu Page

Menu pages are followed by a table listing the Menu Options/Fields, required Entry, and Descriptions.

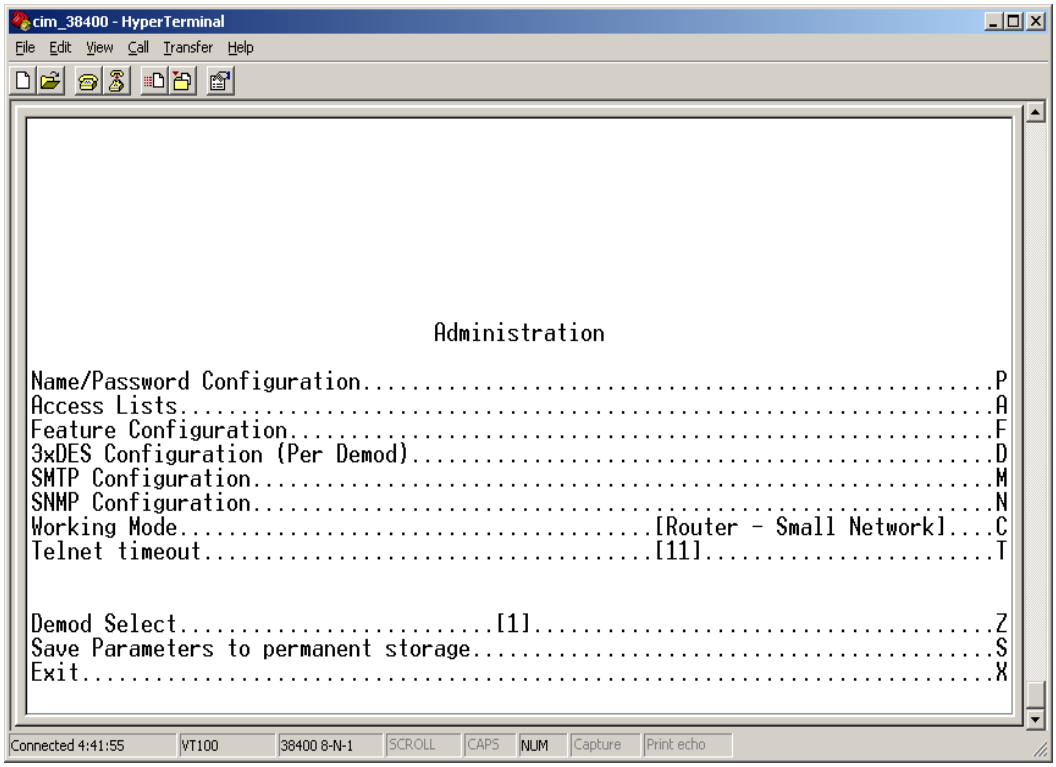


The *Main Menu* page has the following options/fields:

Menu Options/Fields	Entry	Description
Administration	**A**	The Administration menu provides a basic set of standard admin functions to the demodulator. 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.
Route Table	**R**	Allows a user to define how the demodulator 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 demodulator. These protocols currently include ARP and IGMP.
Vipersat Configuration	**V**	Only used when the demodulator is used in a Vipersat system.
Satellite Demod Configuration	**M**	The Demod Parameters option displays a set of menus that allows a user to configure and monitor the satellite base unit.
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.

10.2.1 Administration Page

The *Administration* page is activated from the *Main Menu* page.



IMPORTANT

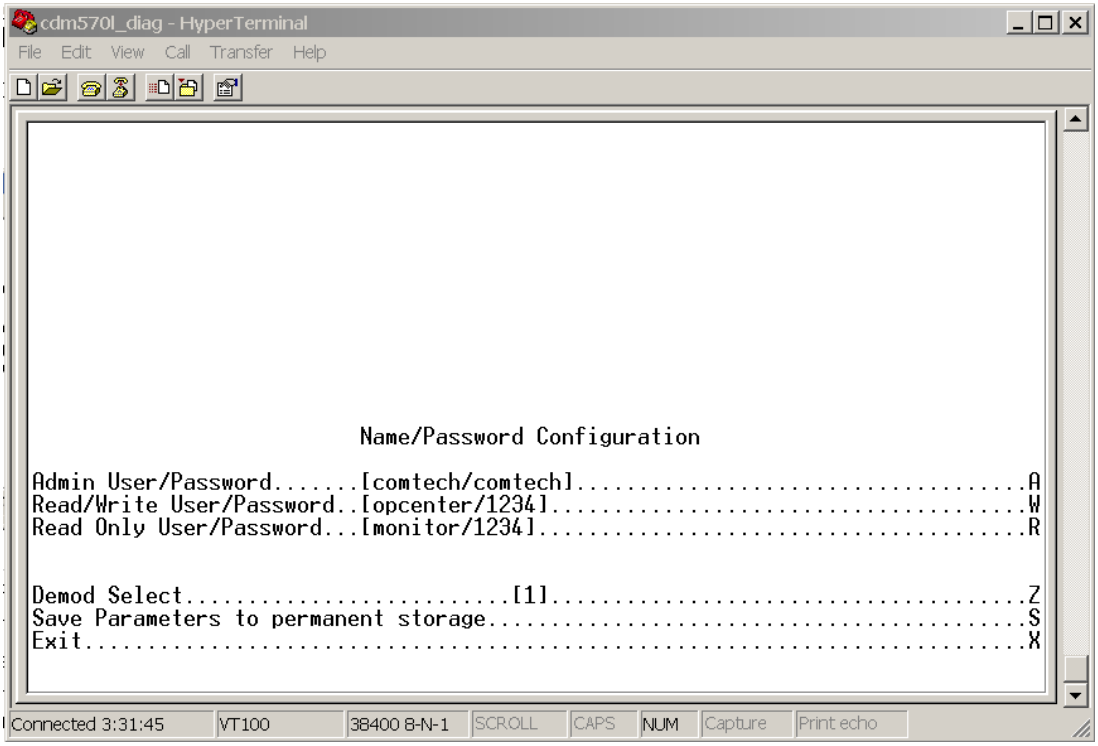
Access to the Administration page is restricted to the Admin user when connecting via the Telnet, SNMP, or HTTP interface. The Administration page is available when connected via the Terminal Emulator (serial) connection because there is no log in.

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, like Telnet, SNMP, HTTP.
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.
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 one receive channel are completely independent for the 3xDES keys specified for other receive channels.. The "Demod Select" appearing on the bottom of each CLI Menu specifies the active receive channel for which configuration is being done.
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**	Change the IP Module Working Mode. The supported modes are Router Point-to-Point Mode Router Small Network Mode Router Large Network Mode
Telnet Timeout	**T**	The Telnet timeout determines how many minutes (1-60) of Telnet inactivity before the Telnet session is automatically terminated.
Demod Select	**Z**	Selects the active receive channel to apply the configuration. CDD 564/564L has 4 – Rx Channels CDD 562/562L has 2 – Rx Channels.
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.

10.2.1.1 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

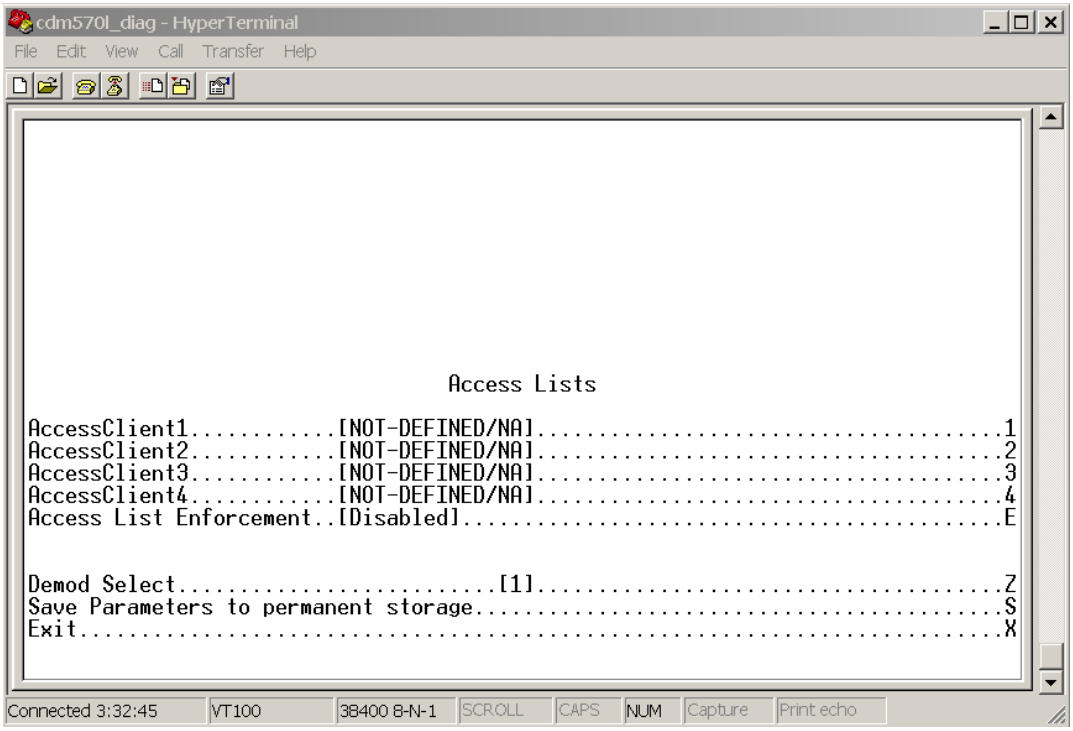
1. ***All Usernames and Passwords are case sensitive.***
2. ***There is a minimum of 1 and maximum of 11 characters.***
3. ***Any or all of the Usernames and Passwords can be removed by entering "NONE NONE" from the CLI or Telnet.***
4. ***Removing all Usernames and Passwords would only allow access to the IP functions when connected via the Terminal Emulator (serial) connection (because there is no log in).***
5. ***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
Read Only User/Password	**R**	Enter the user name and password with a space delimiter. Ex: <user> <passwd> Enter NONE NONE to erase
Demod Select	**Z**	Selects the active receive channel to apply the configuration. CDD 564/564L has 4 – Rx Channels CDD 562/562L has 2 – Rx Channels.
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.

10.2.1.2 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

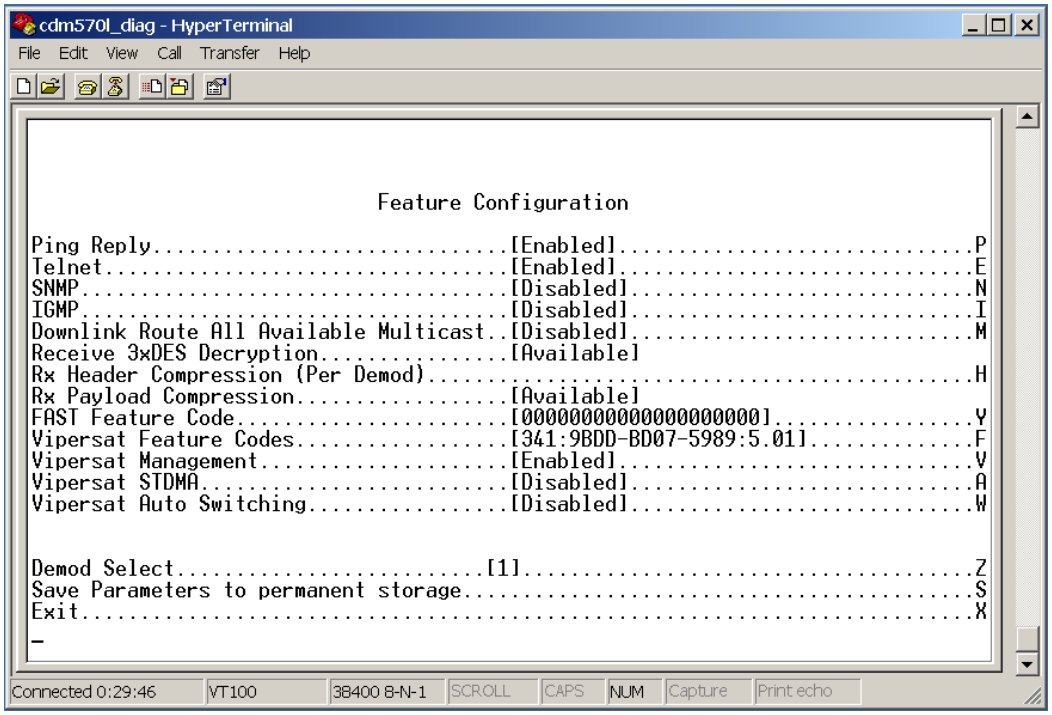
If connecting to the IP modem (or demodulator) remotely, the IP address of the machine used to manage the IP modem should be included in the Access List.

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.
Demod Select	Z	Selects the active receive channel to apply the configuration. CDD 564/564L has 4 – Rx Channels CDD 562/562L has 2 – Rx Channels.
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.

10.2.1.3 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.

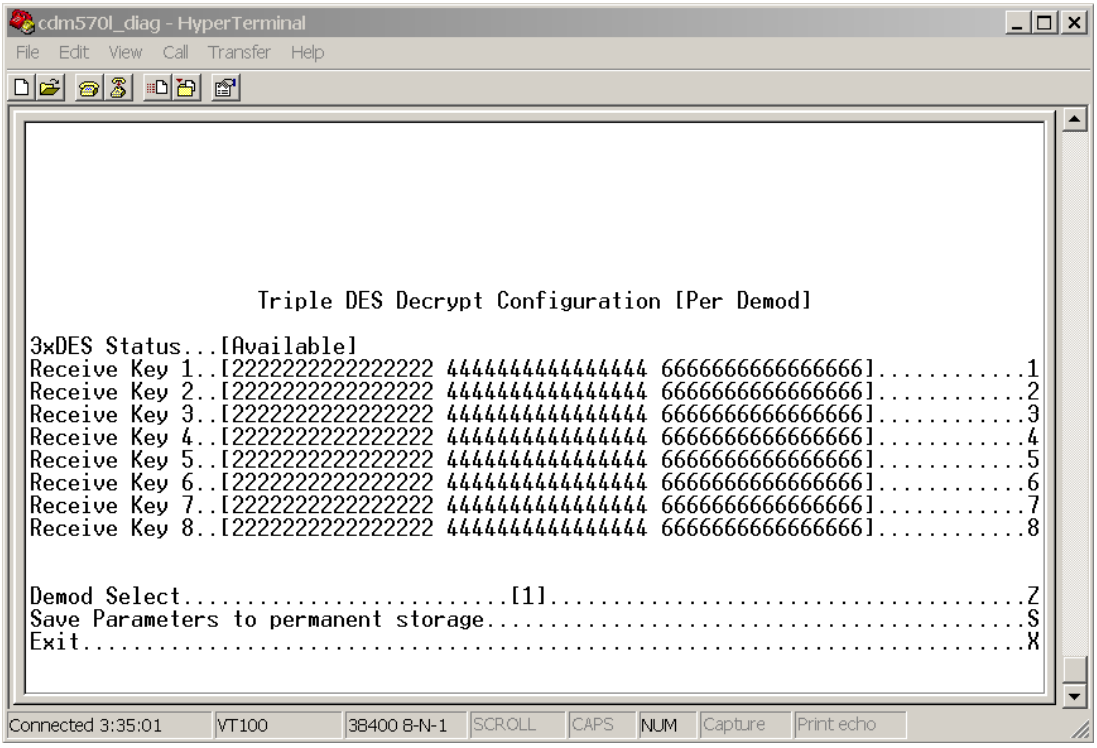
The Feature Configuration menu contains the following options/fields:

Menu Options/Fields	Entry	Description
Ping Reply	**P**	Toggles [Enabled] and [Disabled] Enabled tells the demodulator to respond to ping requests directed to the demodulator Ethernet Interface. Disabled tells the demodulator 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.
SNMP	**N**	Toggles [Enabled] and [Disabled] Enabled tells the demodulator to respond to SNMP requests against the private and public MIB. Disabled tells the demodulator not to respond to SNMP requests against the private and public MIB.
IGMP	**I**	Toggles [Enabled] and [Disabled] The receive portion of a demodulator will utilize the demodulator as an IGMP server. The transmit portion of a demodulator will utilize the demodulator as an IGMP client. The *IGMP Information* page configures the demodulator 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 demodulator to route all Multicast packets coming from the Satellite interface to the Ethernet LAN regardless of the Route Table entries. Disabled tells the demodulator not to automatically forward all Multicast packets. This demodulator will only forward multicast traffic received from the satellite to the Ethernet port if the multicast route exists in the Route Table.
Receive 3XDES Decryption	**Read Only**	This feature must be purchased. Available allows the demodulator to decrypt packets being received from the Satellite Interface. When Unavailable the demodulator 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.

Menu Options/Fields	Entry	Description
Rx Header Compression	**K**	This option tells the system to expect received streams to be Header compressed. Note a CDM-IP modem (or demodulator) must receive all streams compressed or not compressed. The modem has no way to distinguish between compressed or not compressed. This option is set per Rx Channel. For each Rx Channel, one can set it to 'Enabled' – Perform Header Decompression. 'Disabled' – Donot perform Header Decompression.
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 (or demodulator) 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.

10.2.1.4 3xDES Decrypt Configuration Page

The *3xDES 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.

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.
Receive Key 1 - 8	**1 through 8**	These 3xDES keys are used to decrypt traffic being received from the Satellite Interface. The key is entered in HEX (48 digits max)
Demod Select	**Z**	Selects the active receive channel to apply the configuration. CDD 564/564L has 4 – Rx Channels CDD 562/562L has 2 – Rx Channels.
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 demodulator 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:

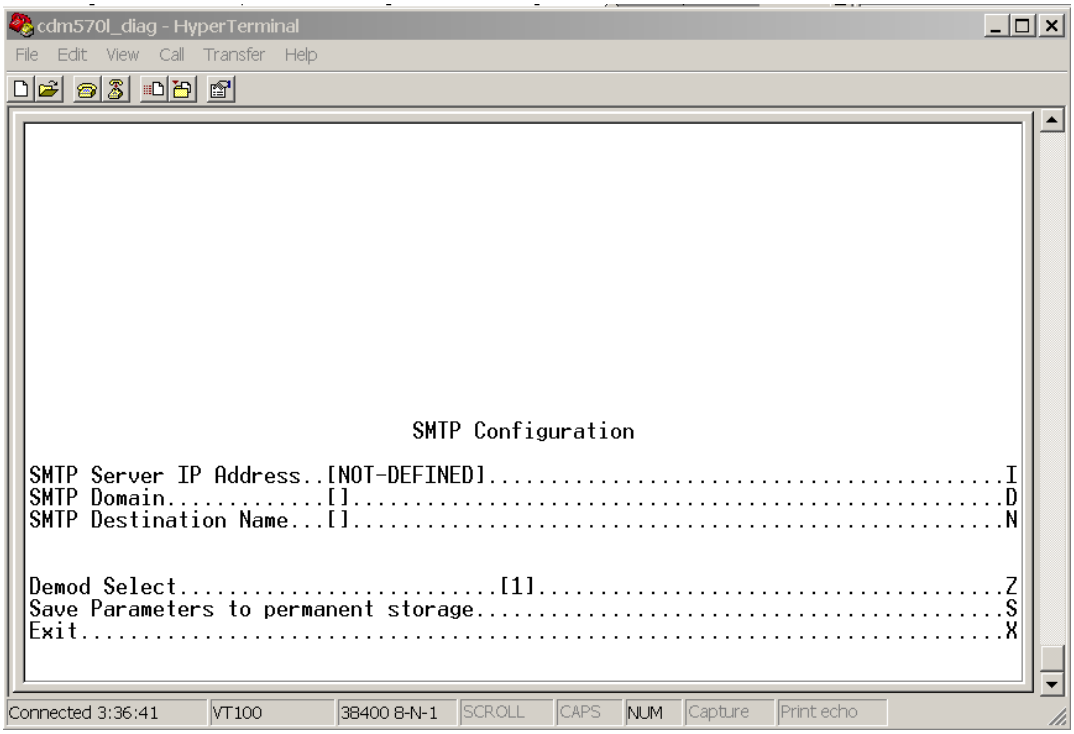
1111111133333333 5555555577777777 99999999BBBBBBBB

becomes

1010101032323232 5454545476767676 98989898BABABABA

10.2.1.5 SMTP Configuration Page

The *SMTP Configuration* page is activated from the *Administration* page.



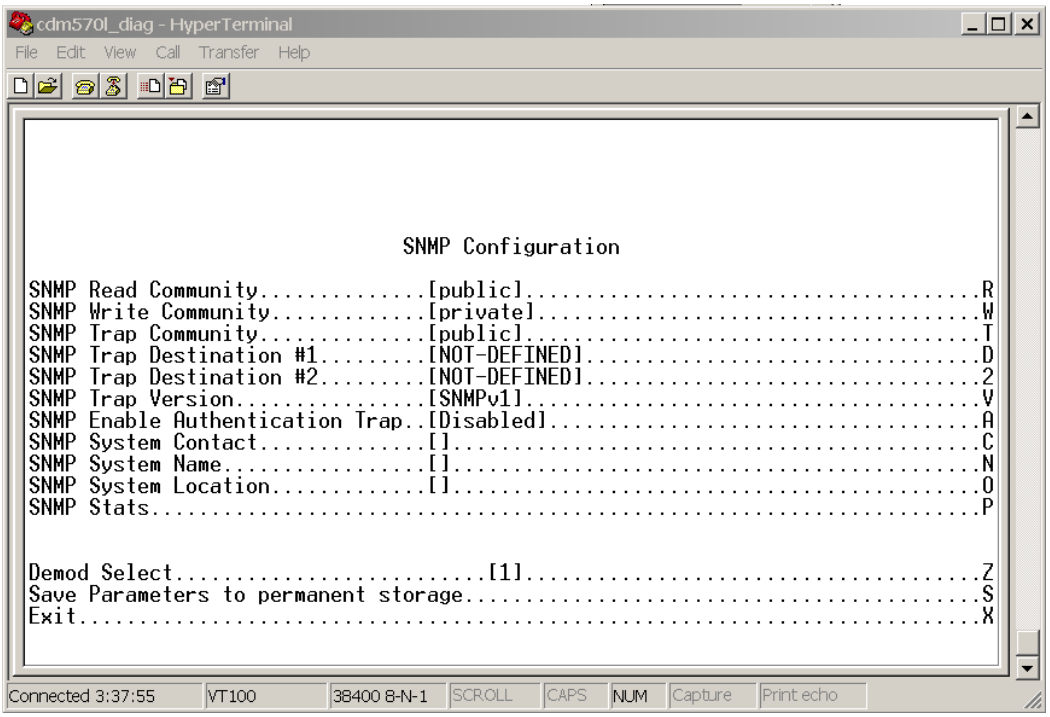
The SMTP Configuration contains the following options/fields:

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 demodulator with a Web Browser. The Support Web page allows you to compose an email message for questions or problems with the demodulator. The user can also select to automatically attach the demodulator parameter file in order to facilitate troubleshooting or to resolve configuration issues.

10.2.1.6 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 demodulator Controller and Quad Demodulator MIBs.
SNMP Write Community	W	SET community string - allows SET operations to all portions of the demodulator Controller and Quad Demodulator 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	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. Supports 2 – Trap Destinations.
SNMP Trap Destination #2	**2**	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. Supports 2 – Trap Destinations.
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	**P**	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.

10.2.1.7 Working Mode

The *Working Mode* page is activated from the *Administration* page.

The demodulator only supports Router.

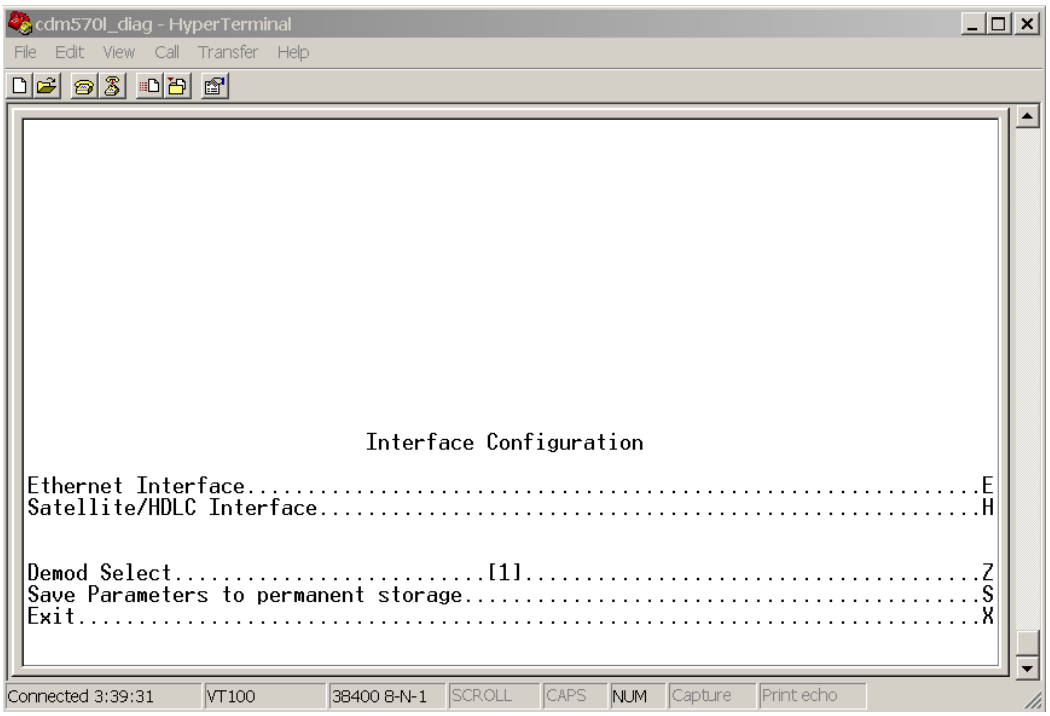
10.2.1.8 Telnet Timeout

The Telnet timeout determines how many minutes (1-60) of Telnet inactivity before the Telnet session is automatically terminated by the demodulator.

The demodulator does not allow concurrent access to the menu via telnet and the console port. If a user connects via telnet, demodulator 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 demodulator will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

10.2.2 Interface Configuration Page

The *Interface Configuration* page is activated from the *Main Menu* page.

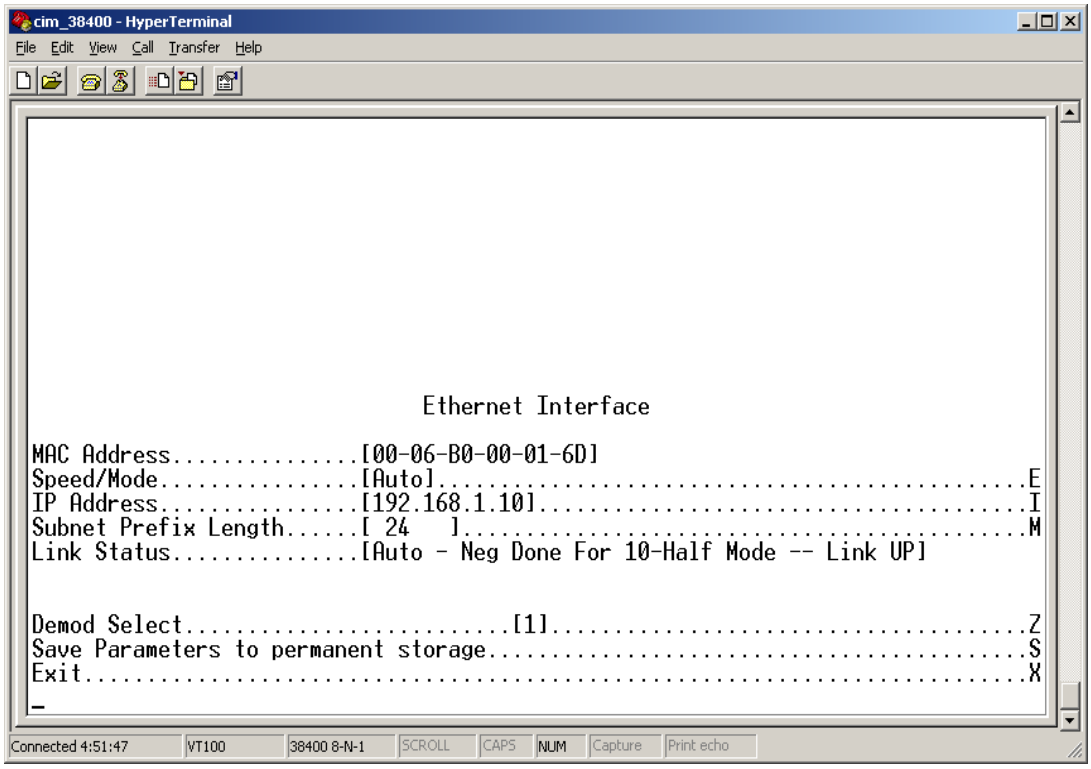


The Interface Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
Ethernet Interface (fei0)	**E**	Activates *Fast Ethernet* page.
Satellite/HDLC Interface (hdl0)	**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.

10.2.2.1 Fast Ethernet Interface (fei0) Page

The above picture needs to be replaced with the one below.

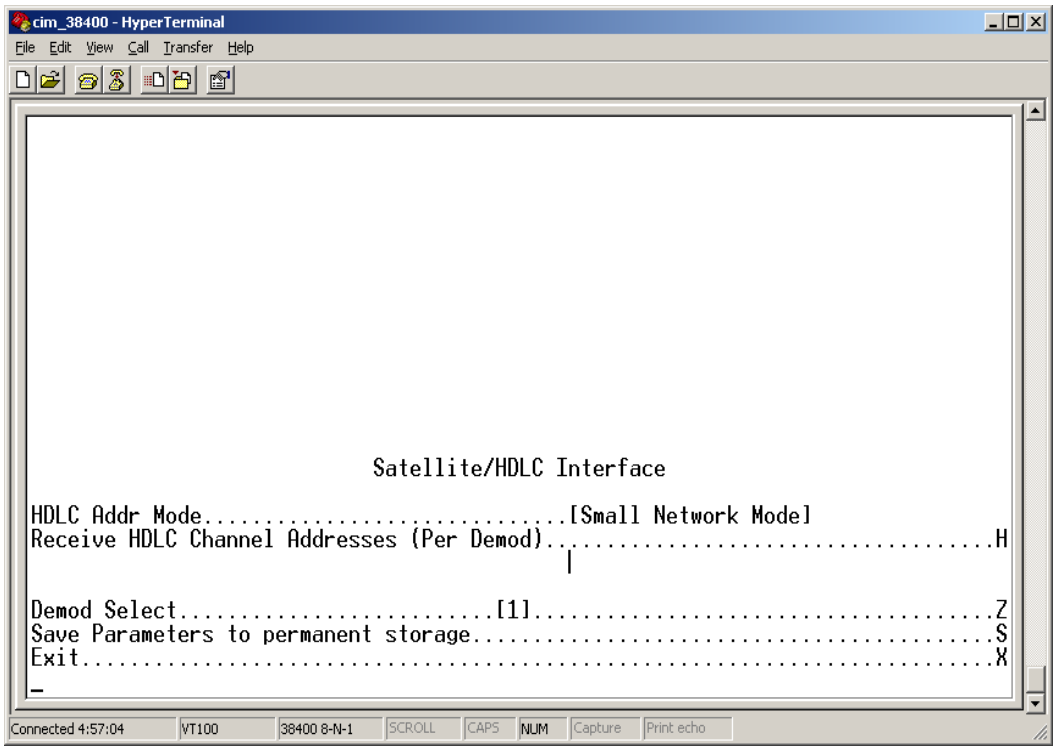


The *Fast Ethernet Interface* page is activated from the *Interface Configuration* page and contains the following options/fields:

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 demodulator 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 to 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)
Link Status	**Read only**	Read only – Displays the Ethernet Link status like the speed, duplex & if the link is ‘Up’ Or ‘Down’.
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.

10.2.2.2 Satellite/HDLC Interface (HDL0) Page

The *Satellite/HDLC Interface (HDL0)* 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 - Point-To-Point Mode – In this mode of operation, no HDLC address is used 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, demodulator expects a single byte HDLC address over the satellite link (0x1 – 0xFE). Large Network Mode (up to to 32766 addresses) - In this mode of operation, demodulator expects two byte HDLC address over the satellite link (0x1 – 0xFFFE).
Receive HDLC Channel Addresses	**H**	Activates *Receiver HDLC Addresses* page.

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.

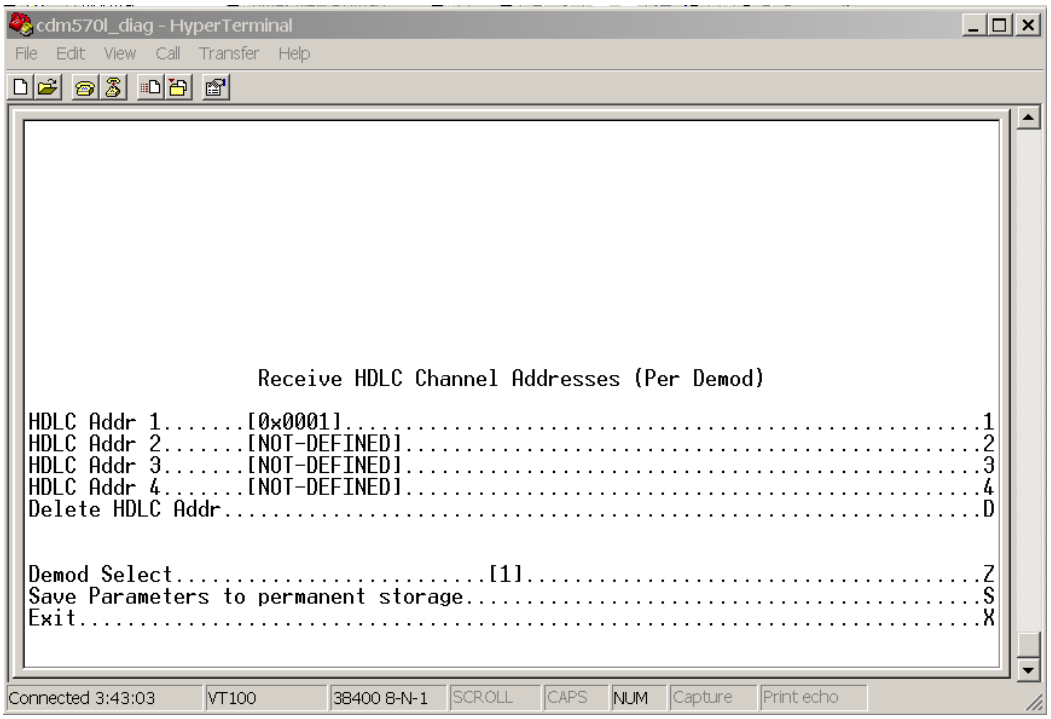
10.2.2.3 Receiver HDLC Addresses Page

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 per receive channel that can carry user information on the Satellite Interface.

CDD 564/564L has four – Receive channels

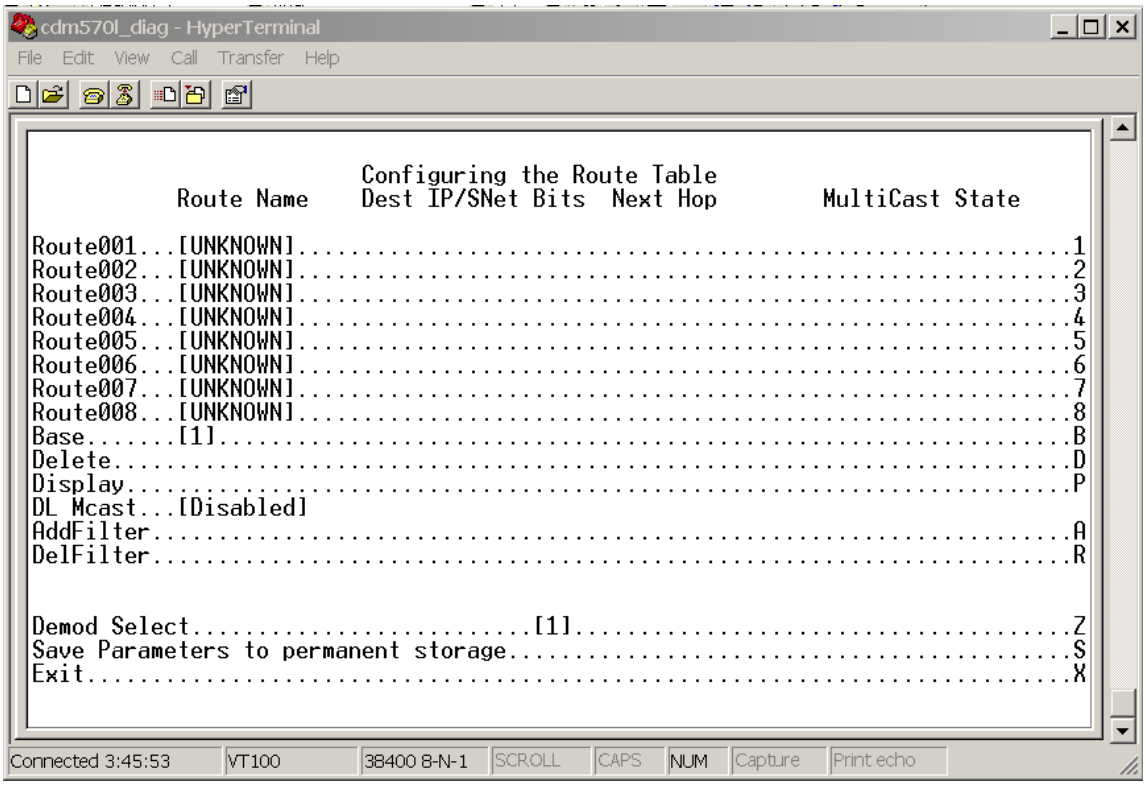
CDD 562/562L has two – Receive channels.



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 - 7FFE, 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 0x7FFE.
Delete HDLC Addr	**D**	Enter the HDLC entry to delete <1...4>
Demod Select	**Z**	Selects the active receive channel to apply the configuration. HDLC addresses for the 2nd receive channel can be configured by first setting the “Demod Select” to ‘2’. Then configure the HDLC addresses. CDD 564/564L has 4 – Rx Channels CDD 562/562L has 2 – Rx Channels.
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.

10.2.3 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.

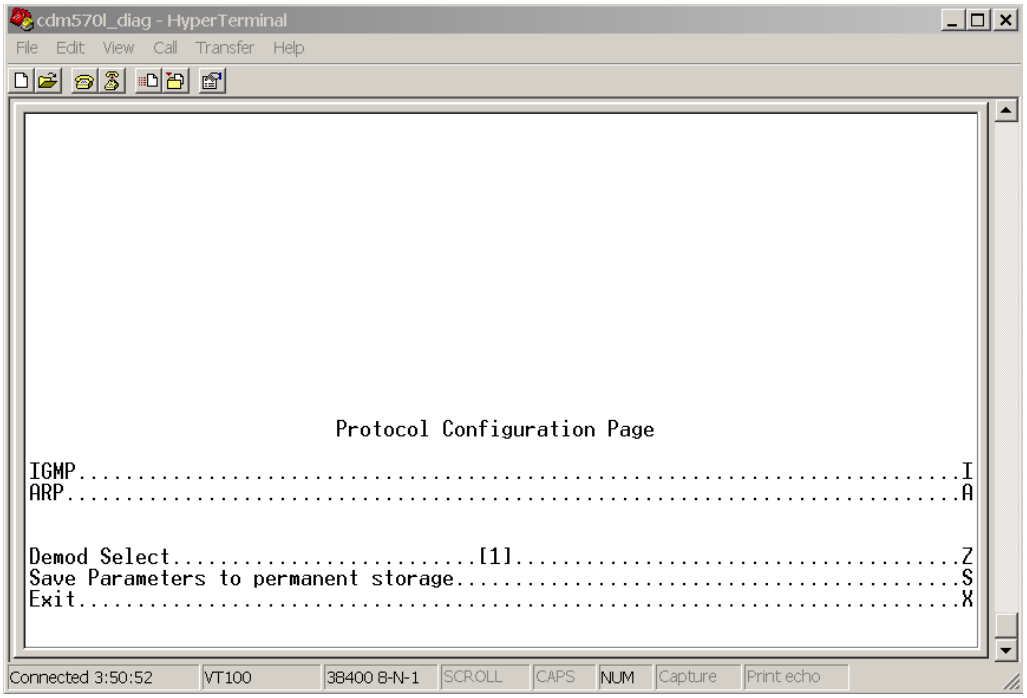
The *Route Table Configuration* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Route001-Route008 (256) (The menu page displays 8 routes at a time. System can be configured up to 256 routes.)	**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 address where the packet will be routed for further processing, 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 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 an IP Address on the same subnet as the 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 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 Flags.
Downlink Mcast	**Read Only**	Read only status of Downlink Multicast (Enabled or Disabled). This feature is enabled or disabled on the Administrator Feature page.

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.

10.2.4 Protocol Configuration Page

The *Protocol Configuration* page is activated from the *Main Menu* page.



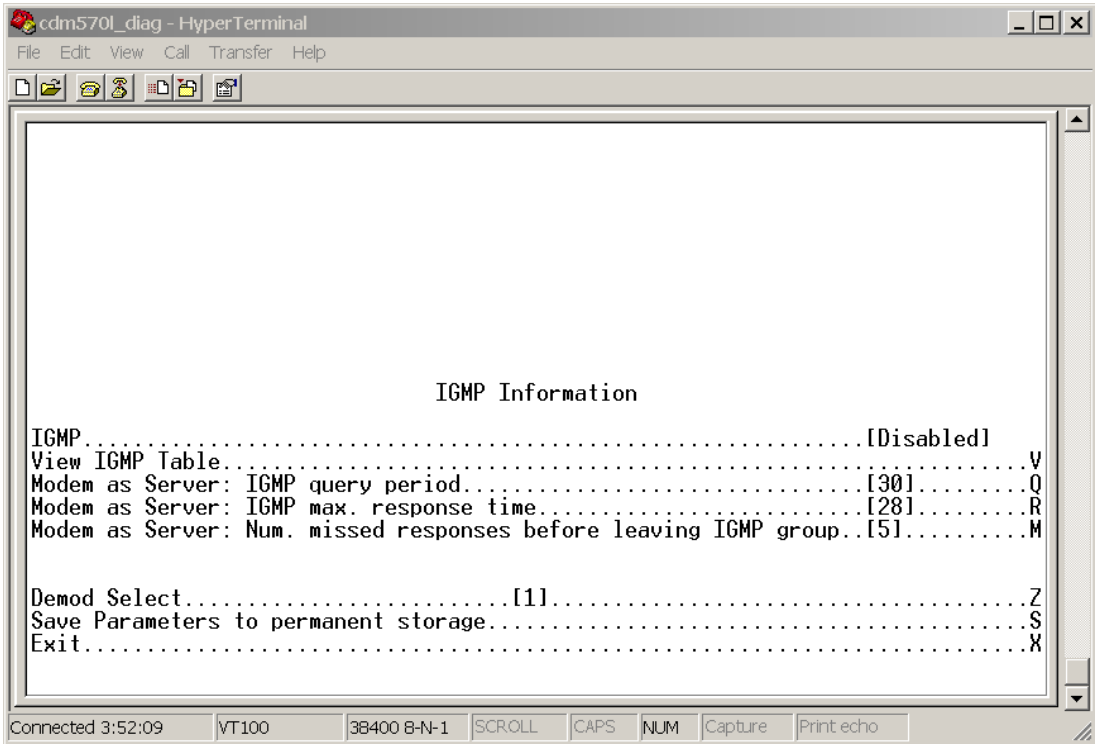
The Protocol Configuration page contains the following options/fields:

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.

10.2.4.1 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 demodulator. 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.

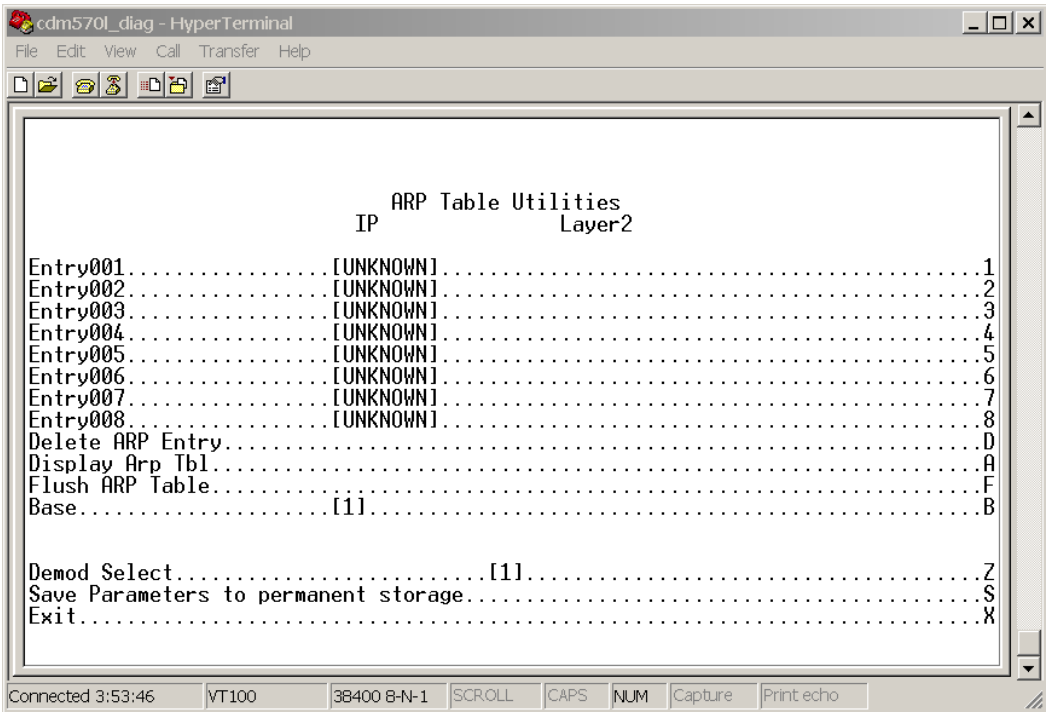


The *IGMP Information* page contains the following options/fields:

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 demodulator 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 demodulator 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 demodulator is 25 seconds.
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 demodulator 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 demodulator for a period of 60*3 = 180 seconds.
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.

10.2.4.2 ARP Table Utilities Page

The *ARP Table Utilities* page is activated from the *Protocol* page.

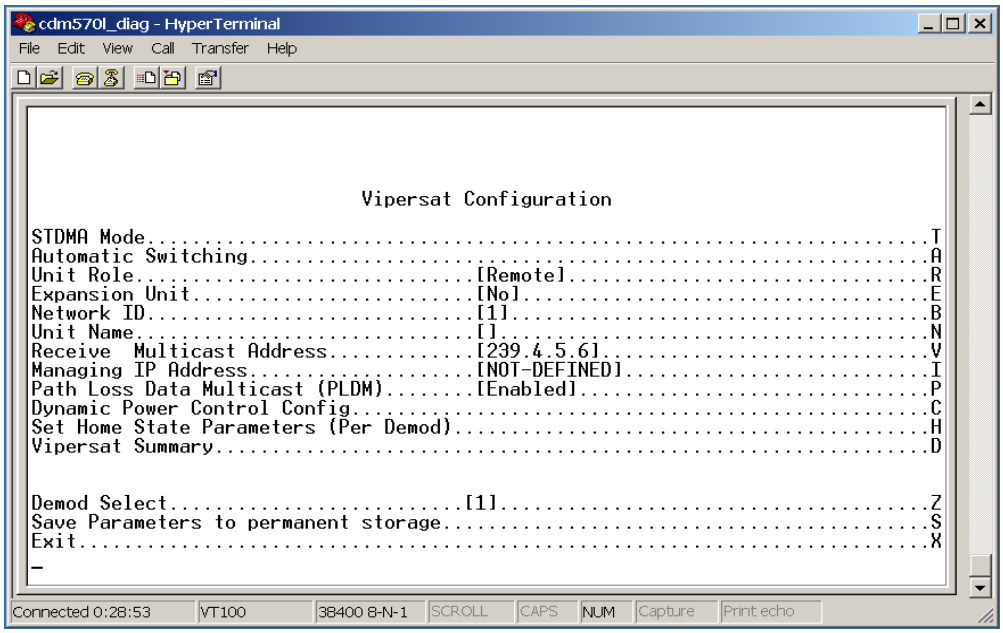


The *ARP Table Utilities* page allows the user to view and edit the ARP table defined by the demodulator. It allows up to 256 static IP->MAC ARP entries and contains the following options/fields:

Menu Options/Fields	Entry	Description
Entry001 - 008	**1 - 8**	The user can define up to 256 static ARP definitions on the demodulator. 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 demodulator 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 demodulator.
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 [Dynamic Entries] 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 Static 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.

10.2.5 Vipersat Configuration Page

The *Vipersat Configuration* page is activated from the *Main Menu* page.



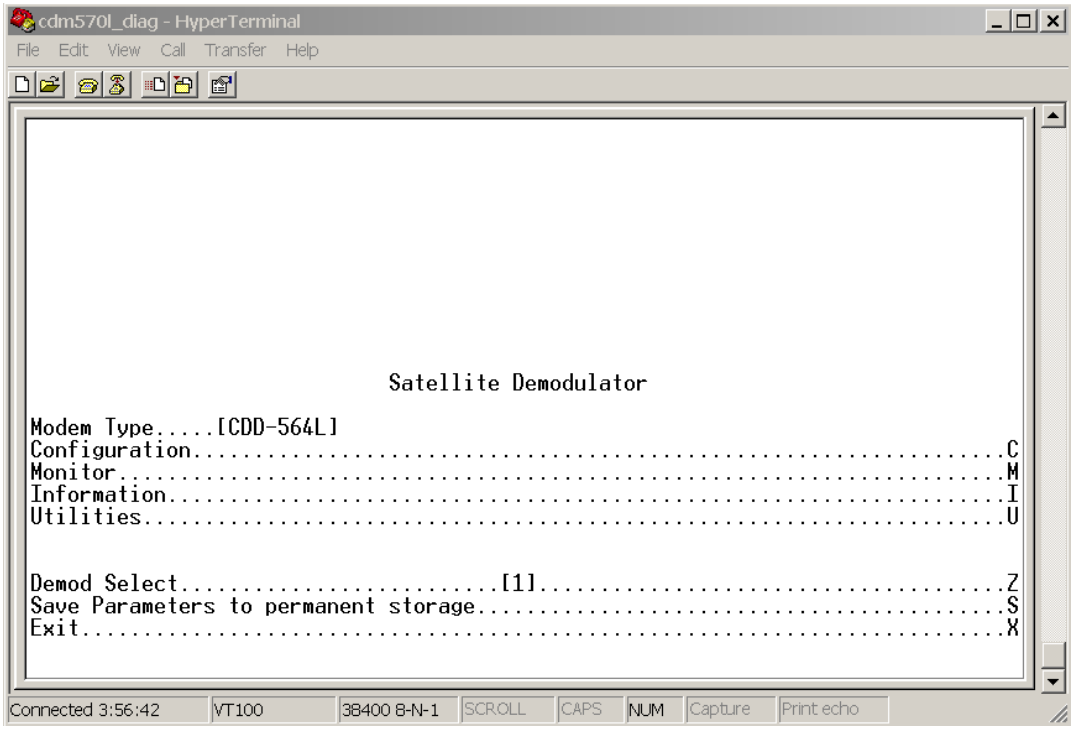
The Vipersat Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
STDMA Mode	T	Only used when demodulator is used in a Vipersat system. Refer to Vipersat Operators Manual for more information.
Automatic Switching	A	
Unit Role	R	
Expansion Unit	E	
Bandwidth Group ID	B	
Unit Name	N	
Multicast Management IP Address	M	
Multicast VMS Management IP Address	V	
Managing IP Address	I	
Path Loss Data Multicast (PLDM)	P	
Dynamic Power Config	C	
Set Home State Parameters	H	
Save Parameters	S	This option allows a user to save the current configuration to permanent storage. This configuration will be restored on each

Menu Options/Fields	Entry	Description
		successive power cycle.
Exit	X	This option allows a user to exit the current menu and return to its parent menu.

10.2.6 Satellite Demodulator Parameters Page

The *Satellite DemodulatorParameters* page is activated by selecting *Satellite Demodulator Configuration* from the *Main Menu* page.

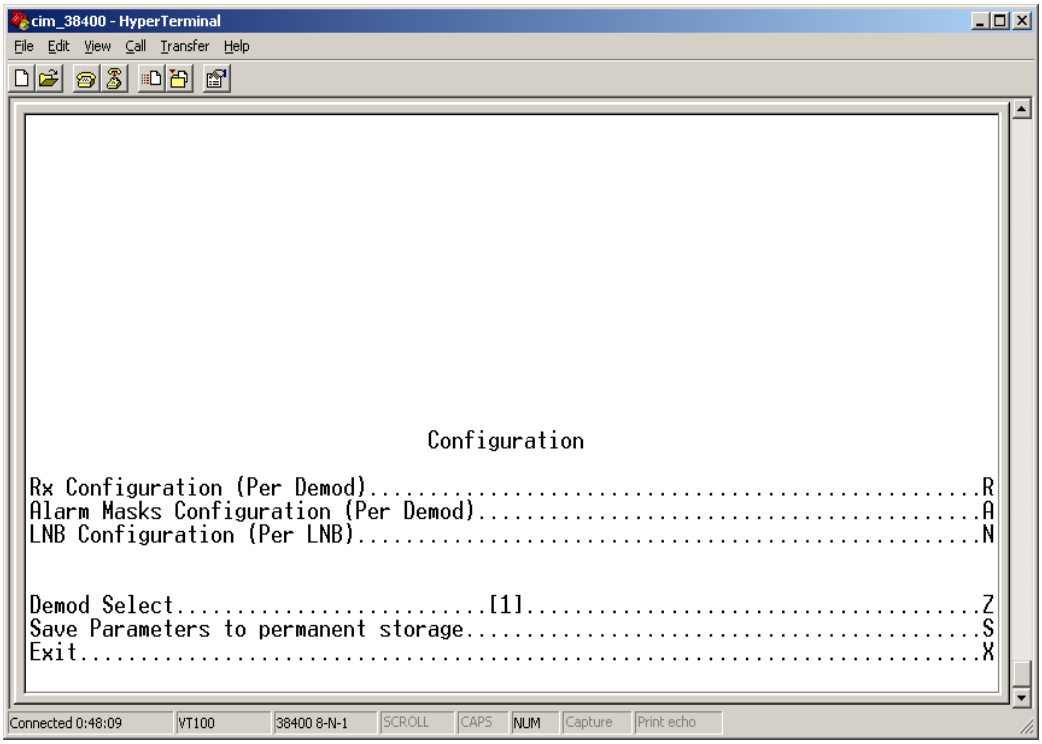


The Satellite Demod Parameters page contains the following options/fields:

Menu Options/Fields	Entry	Description
Modem Type	Read Only	Modem type – CDD-564L .
Configuration	C	Activates *Receive Configuration* page.
Monitor	M	Activates *Monitor* page.
Information	I	Activates *Information* page.
Utilities	U	Activates *Utilities* page.
Demod Select	Z	Used to select Demodulator.
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.

10.2.6.1 Configuration Page

The *Configuration* page is activated from the *Satellite Demod* page.

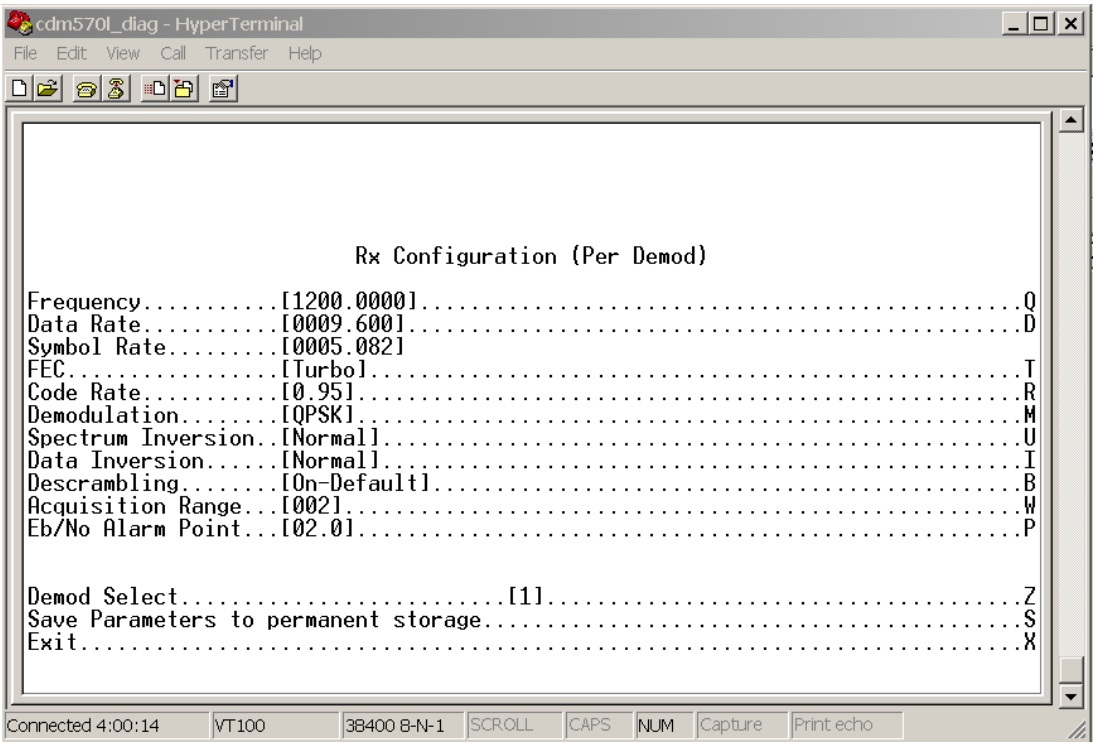


The Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
Rx Configuration	R	Activates *Receive Configuration* page.
Alarm Masks Configuration	A	Activates *Alarm Mask* page.
LNB Configuration	N	Activates *LNB Configuration* page.
Demod Select	Z	Used to select Demodulator.
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.

10.2.6.1.1 Rx Configuration Page

The *RxConfiguration* page is activated from the *Configuration* page.

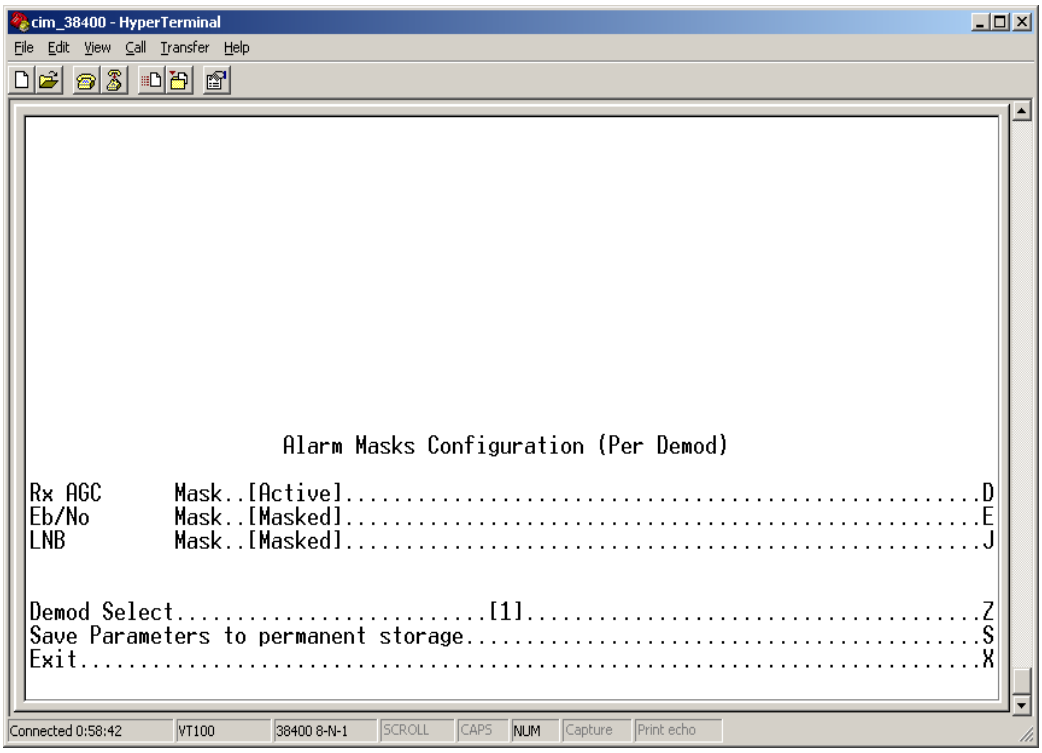


The Rx Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
Receive Frequency	Q	L-Band: Valid ranges are from 950 to 1950 MHz.
Receive Data Rate	D	Valid ranges are from 2.4 to 9980 kbps. High data rate [>5000Kbps] is a FAST Feature to be purchased from Comtech EF Data.
Decoder Type (Only Type 2 is available with CDD-564L)	T	1 – Uncoded 2 – TURBO
Decoder Rate	R	1 – 3/4 2 – 7/8 3 - 0.95 4 – 1/1
Modulation Type (Only M = 1, 2, 3 available with CDD-564L)	M	Sets receive demodulation type 1 – QPSK 2 – 8-PSK 3 -- 16QAM
Spectrum	U	1 – NRM [Normal] 2 – INV [Inverted]
Descrambler	B	1 - OFF 2 - ON – Default 3 - ON – IESS-315
Acquisition Range	W	Valid ranges are from 0 to 200 kHz (1 to 32HKz if symbol rate < 625Ksymbol on 564L) (1 to 32HKz on CDD 564)
Eb/No Alarm Point	P	Valid ranges are from 0.1 to 16.0
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any of these configurations.
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.

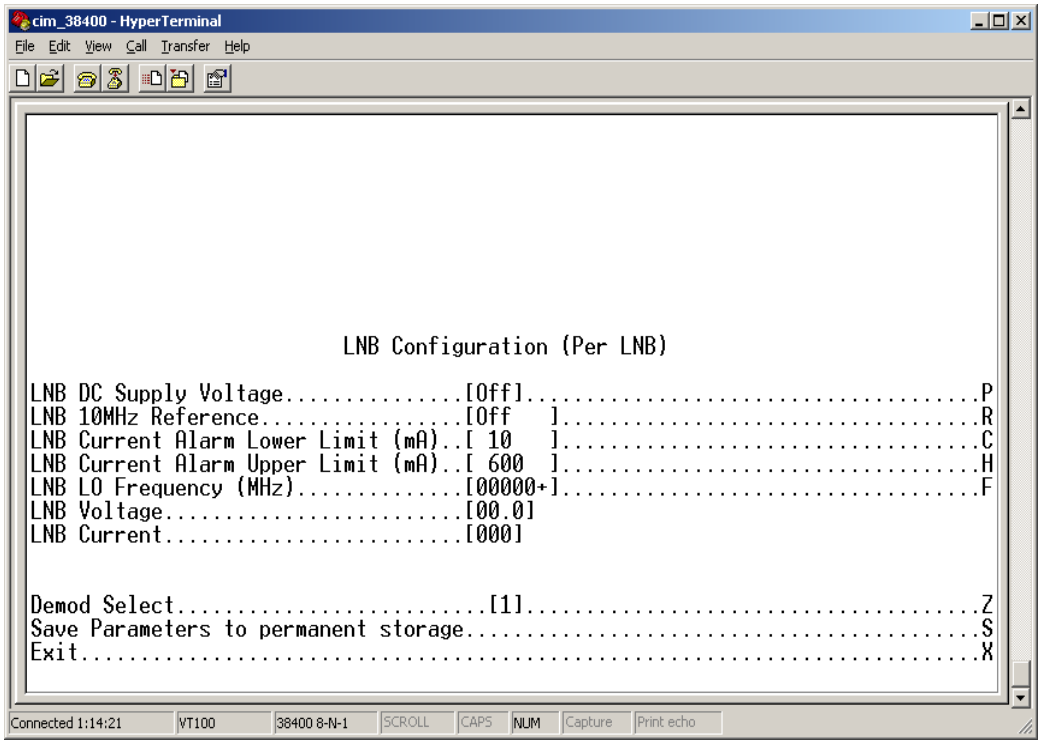
10.2.6.1.2 Alarm Mask Page

The *Alarm Mask configuration* page is activated from the *Configuration* page.



10.2.6.1.3 LNB Configuration Page

The *LNB Configuration* page is activated from the *Configuration* page.

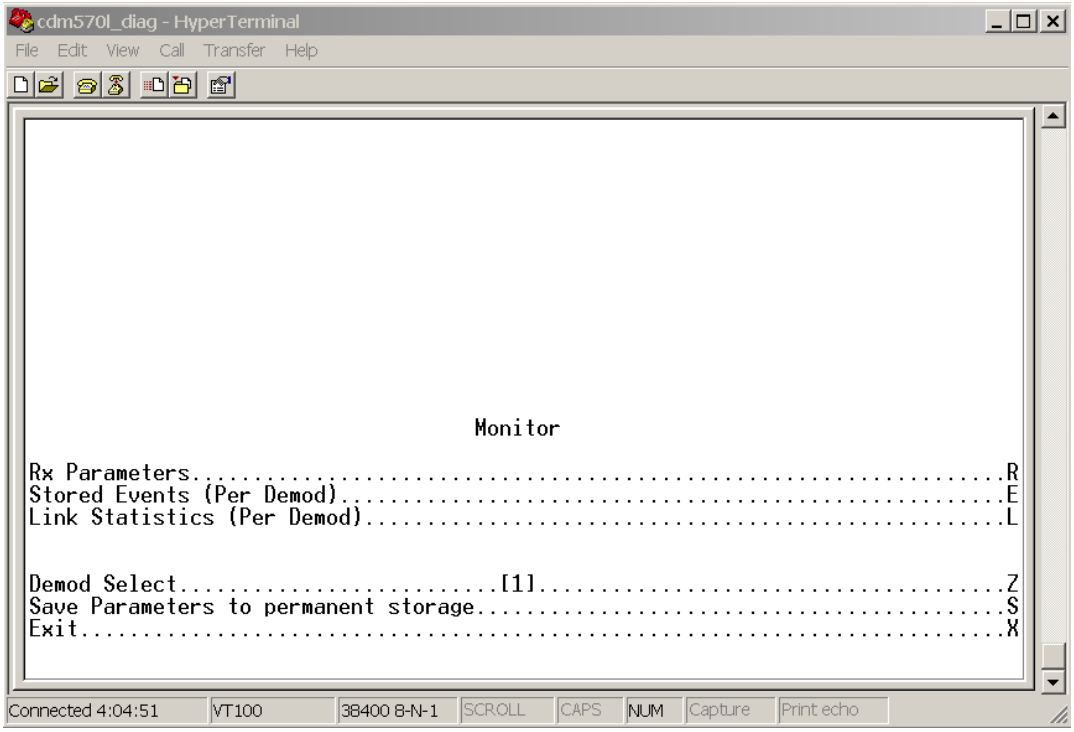


The LNB Configuration page contains the following options/fields:

Menu Options/Fields	Entry	Description
LNB DC Supply Voltage	P	Select ON or OFF.
LNB 10MHz Reference Enable	R	Select ON or OFF.
LNB Current Alarm Lower Limit	C	Valid ranges are from 10 to 400 mA.
LNB Current Alarm Upper Limit	H	Valid ranges are from 50 to 600 mA.
LNB LO Frequency (MHz)	L	Valid ranges are from 3000 to 65000.
LNB Current	-	Read Only
LNB Voltage	-	Read Only
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any of these configurations.
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.

10.2.6.2 Monitor

The *Monitor* page is activated from the *Satellite Demod* page.

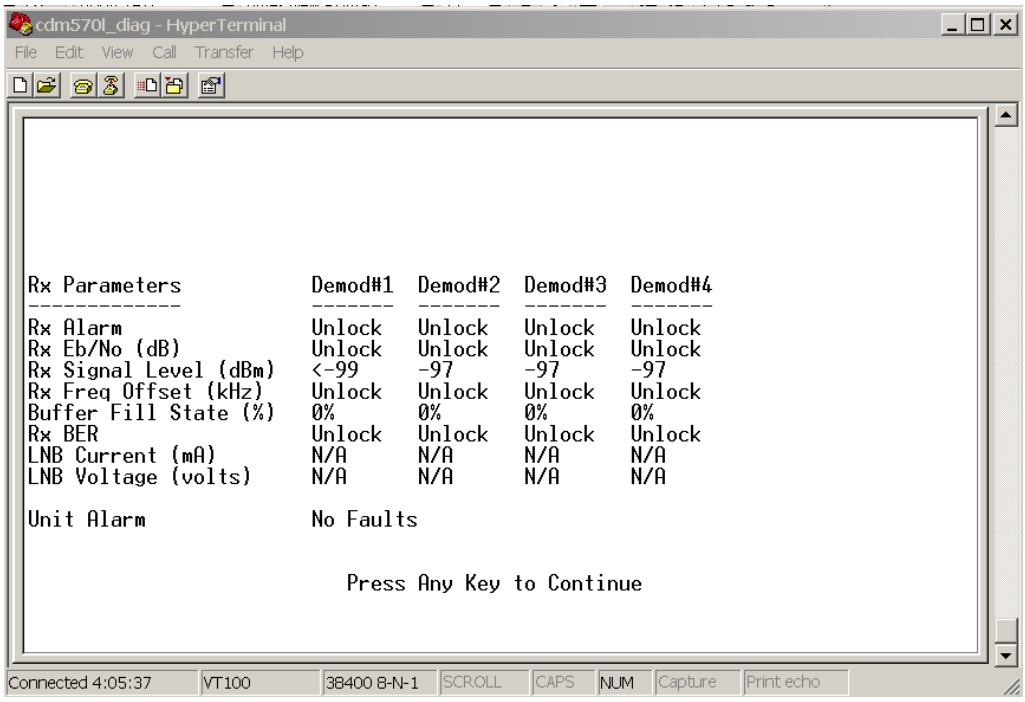


The Monitor page contains the following options/fields:

Menu Options/Fields	Entry	Description
Rx Parameters	R	Activates *Receive Parameters* page.
Stored Events	E	Activates *Stored Events* page.
Link Statistics	L	Activates *Link Statistics* page.
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any of these configurations.
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.

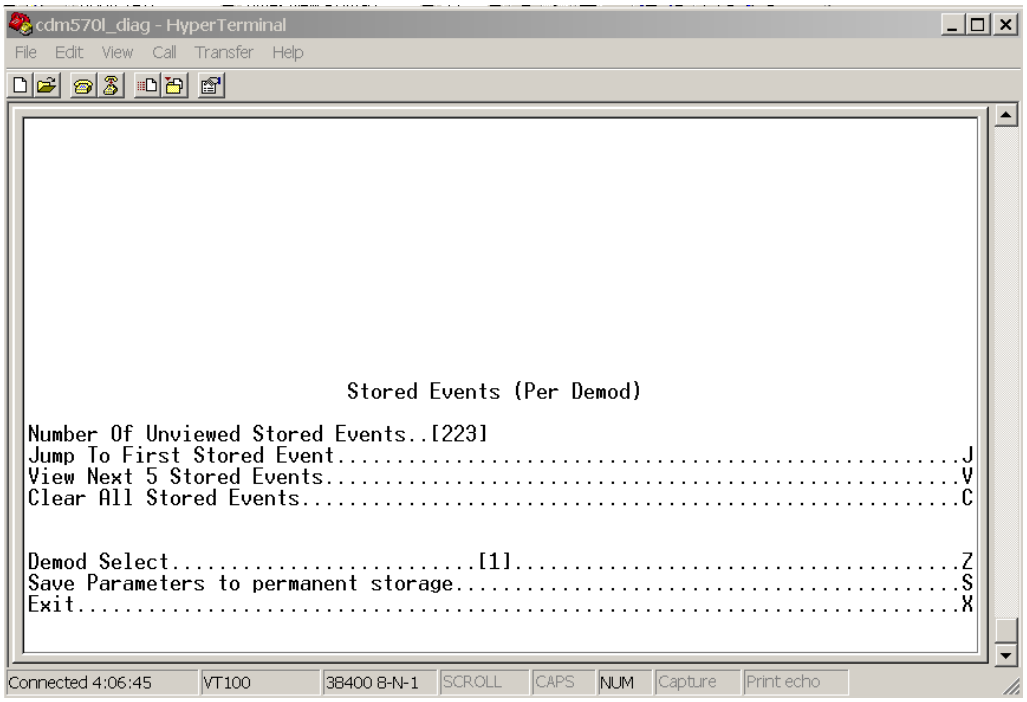
10.2.6.2.1 Rx Parameters Page

The *RxParameters* page is activated from the *Monitor* page.



10.2.6.2.2 Stored Events Page

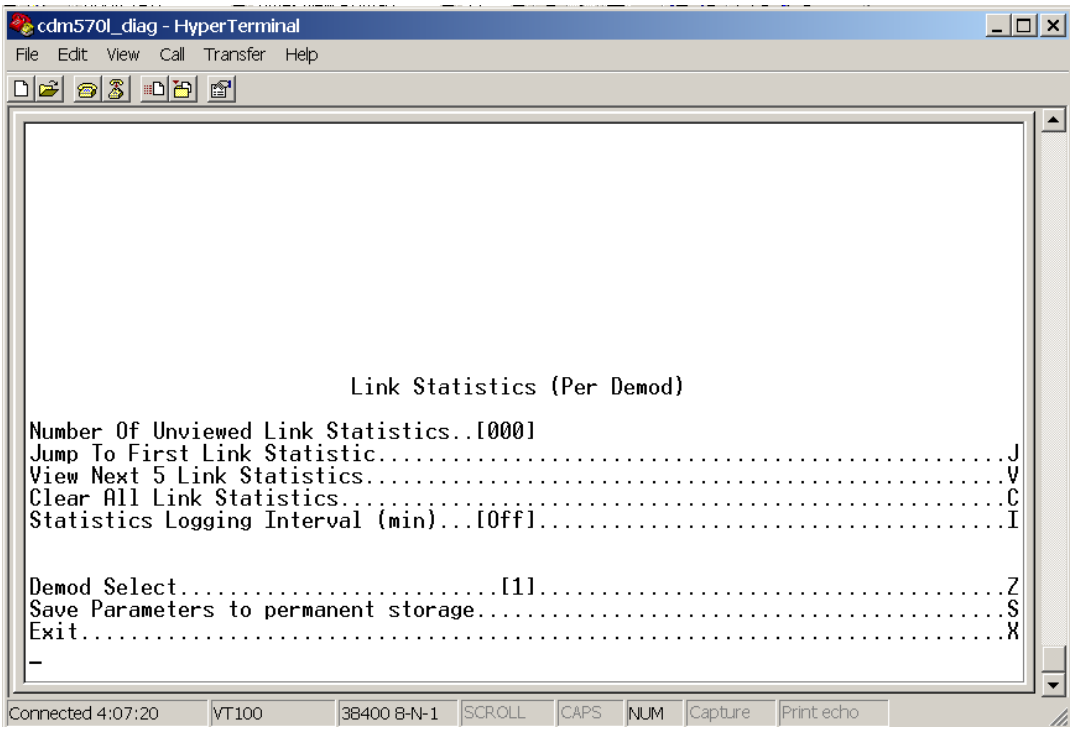
The *Stored Events* page is activated from the *Monitor* page.



Menu Options/Fields	Entry	Description
Number of Unviewed Stored Events	Read Only	Displays the number of events not viewed so far. Once the user views the events [5 at a time], the number get down.
Jump to First Stored Event	J	Resets the internal event index to 1. So, user can browse through those previously viewed events.
View Next 5 Stored Events	V	Displays the next 5 events, starting from the event index.
Clear All Stored Events	C	Clears all stored events, on the NVRAM.
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any of these configurations.
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.

10.2.6.2.3 Link Statistics Page

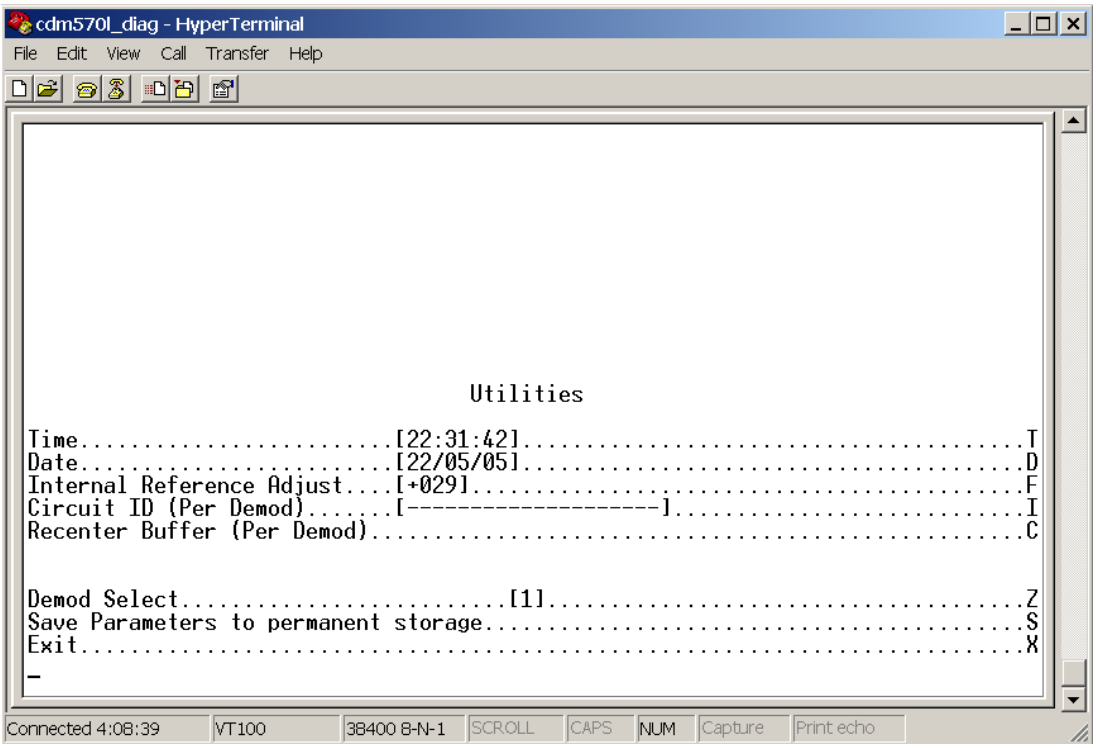
The *Link Statistics* page is activated from the *Monitor* page.



Menu Options/Fields	Entry	Description
Number of Unviewed Link Statistics	Read Only	Displays the number of statistics not viewed so far. Once the user views the statistics [5 at a time], the number goes down.
Jump to First Link Statistics	J	Resets the internal Statistics index to 1. So, user can browse through those previously viewed Statistics.
View Next 5 Link Statistics	V	Displays next 5 statistics, starting from the internal statistics index.
Clear All Link Statistics	C	Clears all Link Statistics, on the NVRAM.
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any of these configurations.
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.

10.2.6.3 Utility

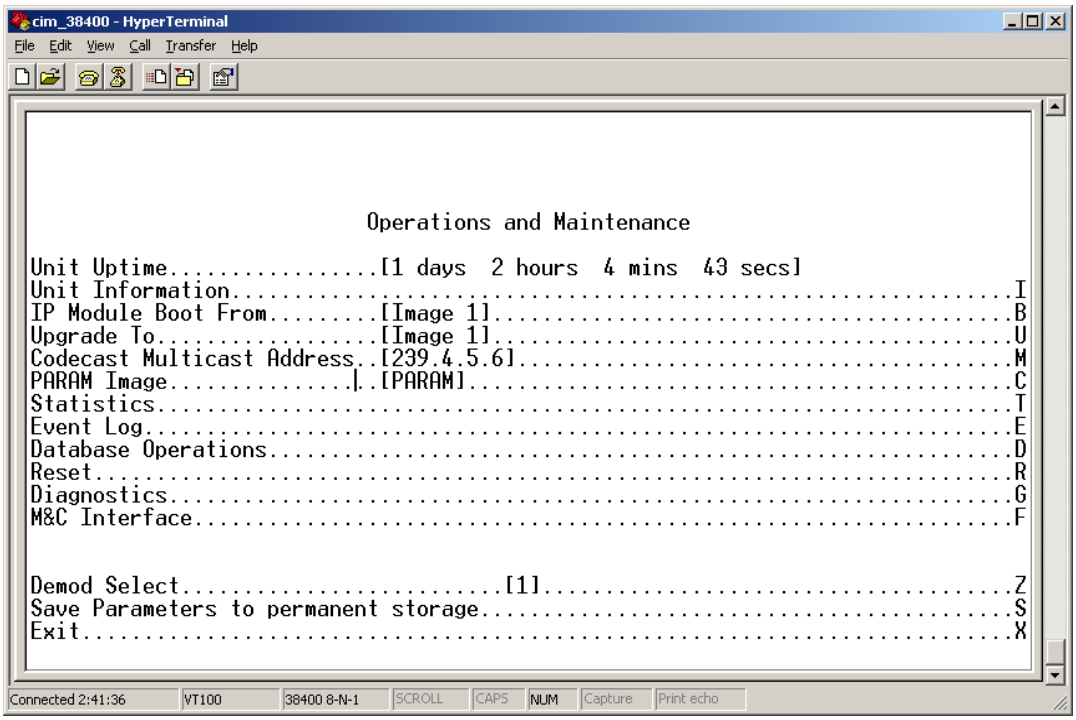
The *Utility* page is activated from the *Satellite Demod* page.



Menu Options/Fields	Entry	Description
Time	T	Allows user to set the Time on the Unit, in 24-Hour Format as HH:MM:SS
Date	D	Read/Set the Date in DD/MM/YY format. Where, DD – Day, MM – Month, YY – Year.
Internal Reference Adjust	F	Adjust the Internal Reference Clock Frequency, in the range of –999 to +999.
Circuit ID (Per Demod)	I	Sets the Circuit Identifier per receive channel. This can be any text upto 24 – Characters in length.
Recenter Bufer (Per Demod)	C	Recenter the internal receive data buffer. [per demod basis]
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any of these configurations.
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.

10.2.7 Operations and Maintenance Page

The *Operations and Maintenance* page is activated from the *Main Menu* page.

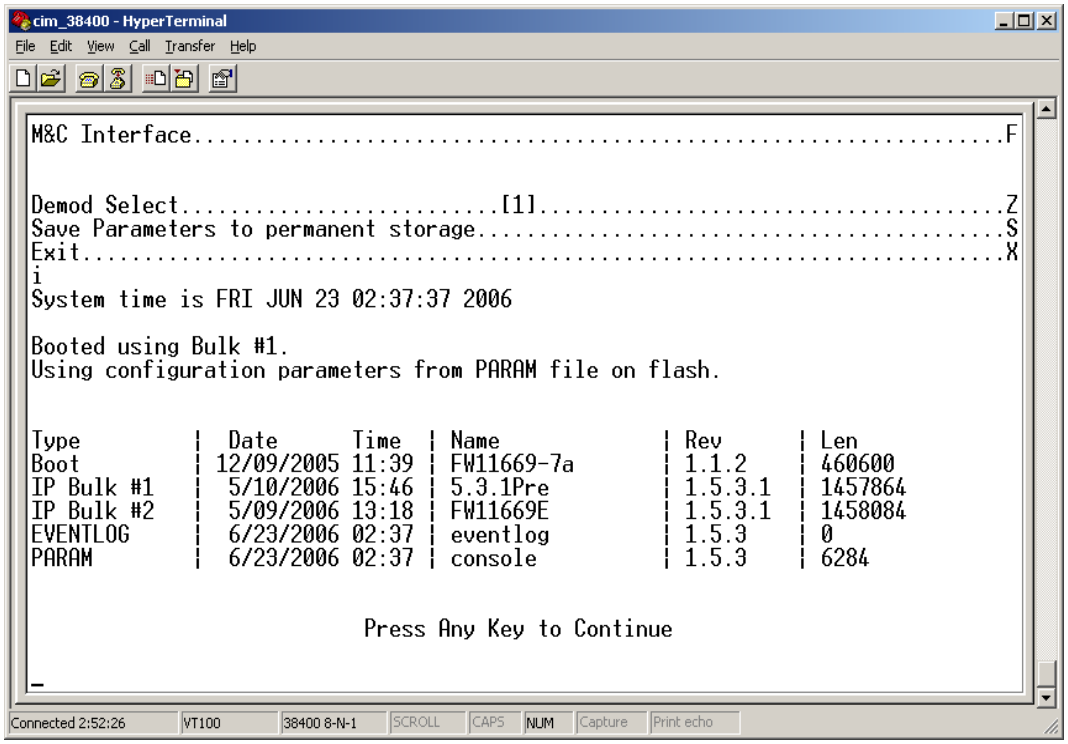


The *Operations and Maintenance* page contains the following options/fields:

Menu Options/Fields	Entry	Description
Unit Up Time	**Read only**	Displays the time, the unit has been running continuously since last reboot.
Unit Information	**I**	Displays unit current operational Software information.
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.
Upgrade To	**U**	Determines which installed software package (includes Application, FPGA, and FFPGA) that the IP Module 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**	Configure the IP Multicast Address for the Codecast protocol. The IP Module has the ability to get the software updates installed on multiple units using the Codecast protocol, making the upgradation of the units easy in bigger networks.
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 *Administrative Database Operations* page.
Reset	**R**	Allows user to reboot the Unit. 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.

10.2.7.1 Unit Information Page

The *Unit Information* page is activated by entering "**I**" from the *Operations and Maintenance* page.

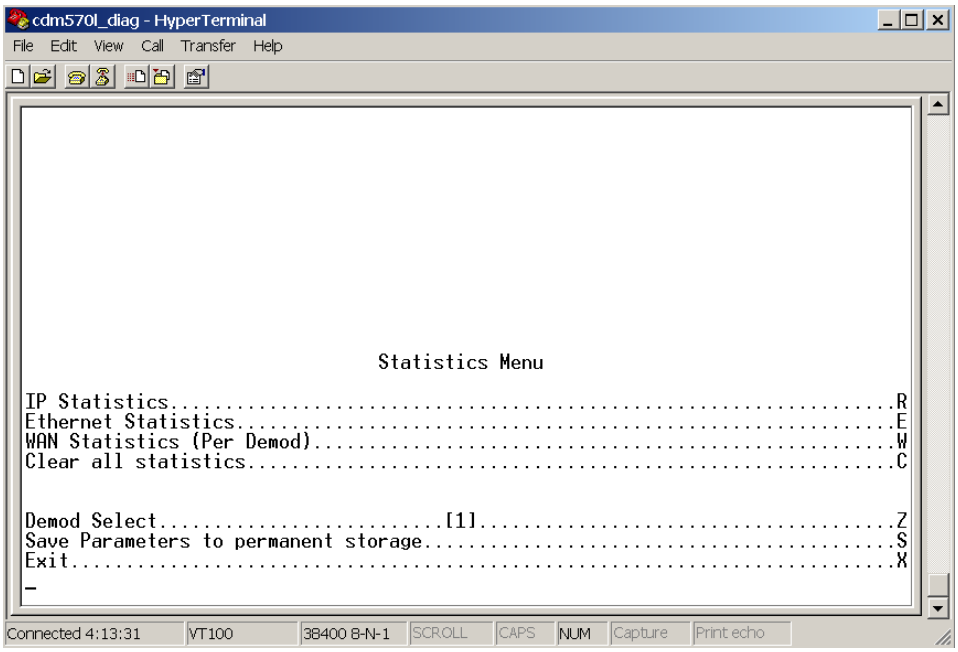


The *Unit Information* page contains the following informatiom:

Current System time	**DAY MONTH DATE hh:mm:ss YEAR**
Image # that the CDD-564L is currently booted from	By default will be the Latest, unless “Boot From” is set to Image #1 or Image #2
PARAM file that the CDD-564L is currently configured from	Will be PARAM file from Flash or Factory Default If no parameter file is found in flash memory.
Currently Loaded demodulator SW Boot Bulk #1 Bulk #2	Will display Build Date, CEFD FW#, Revision #, and size of each demodulator SW file. There will be a single Boot SW file. The Bulk file contains all of the SW files for the CDD-564L and there are two slots available. The FPGA files are subsets of the Bulk SW.
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/saved. It will also show what user interface was used to update/save the PARAM file last time. From CLI will display ‘console’ From Web will display ‘http’ From Telnet will display the Telnet user login name From SNMP will display ‘snmp

10.2.7.2 Statistics Page

The *Statistics Menu* page is activated from the *Operations and Maintenance* page. All updates for Statistics information will occur once every 6 seconds.

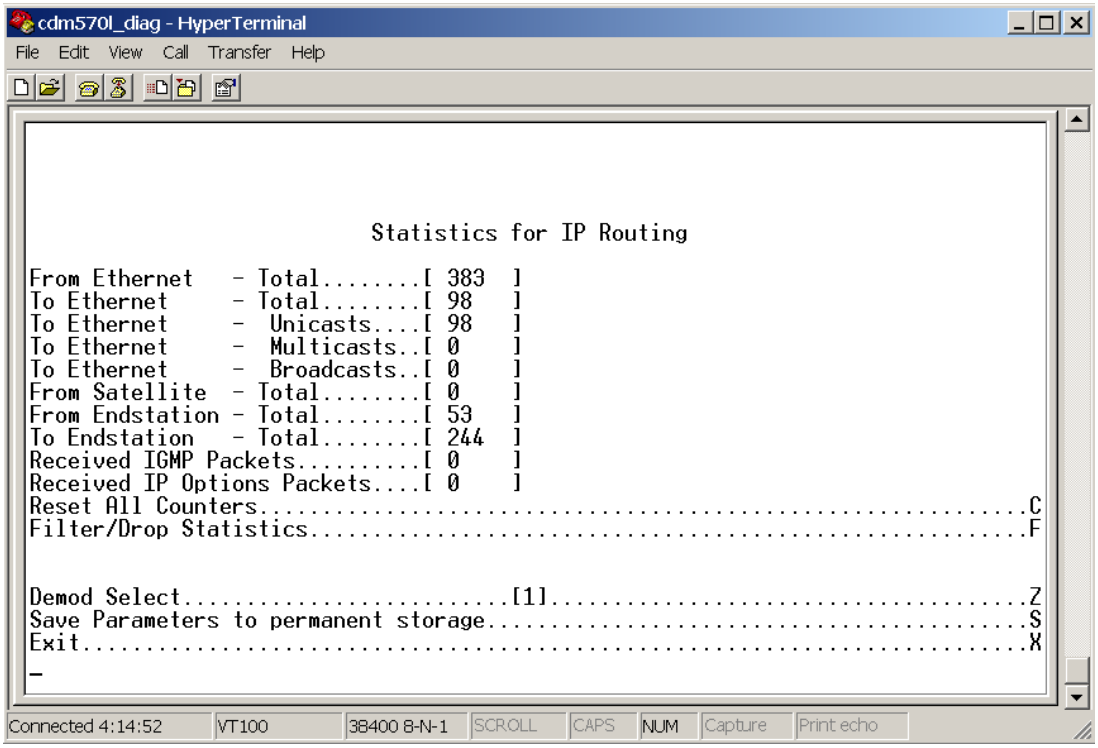


The *Statistics Menu* page contains the following options/fields:

Menu Options/Fields	Entry	Description
IP Statistics	R	Displays Statistics for IP Routing and allows counters to be reset.
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. These statistics are displayed per receive interface. So, to see the WAN stats of Rx Channel – 2, you need to first set “Demod Select” to ‘2’, then view the statistics.
Demod Select	Z	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before applying any configurations changes.
Clear all statistics	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.

10.2.7.2.1 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.

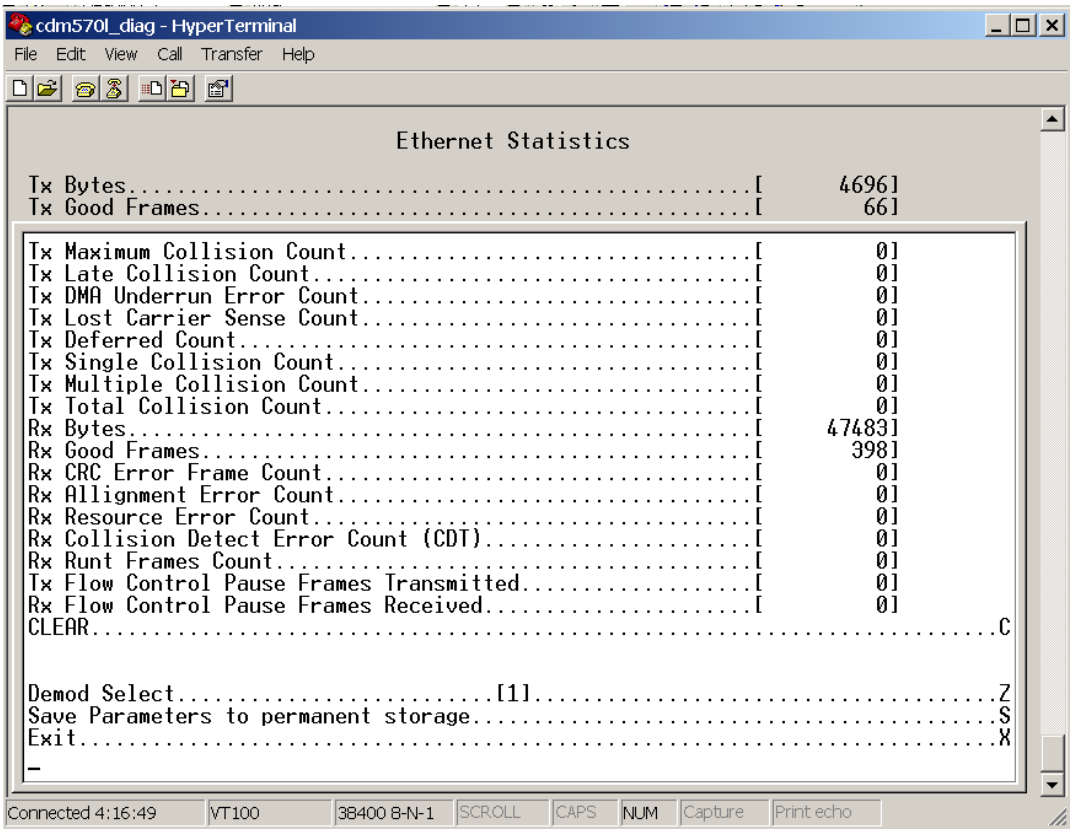


The *IP Statistics* page contains the following options/fields:

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
From Endstation - Total		Packets sent from demodulator
To Endstation - Total		Packets directed to demodulator
Received IGMP Packets		Internet Group Management Packets received (used for management of multicast traffic).
Received IP Options Packets		Number of IP Options packets received.
Reset Packet Counters (Clears WAN, Ether, IP stats)	C	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.

10.2.7.2.2 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.

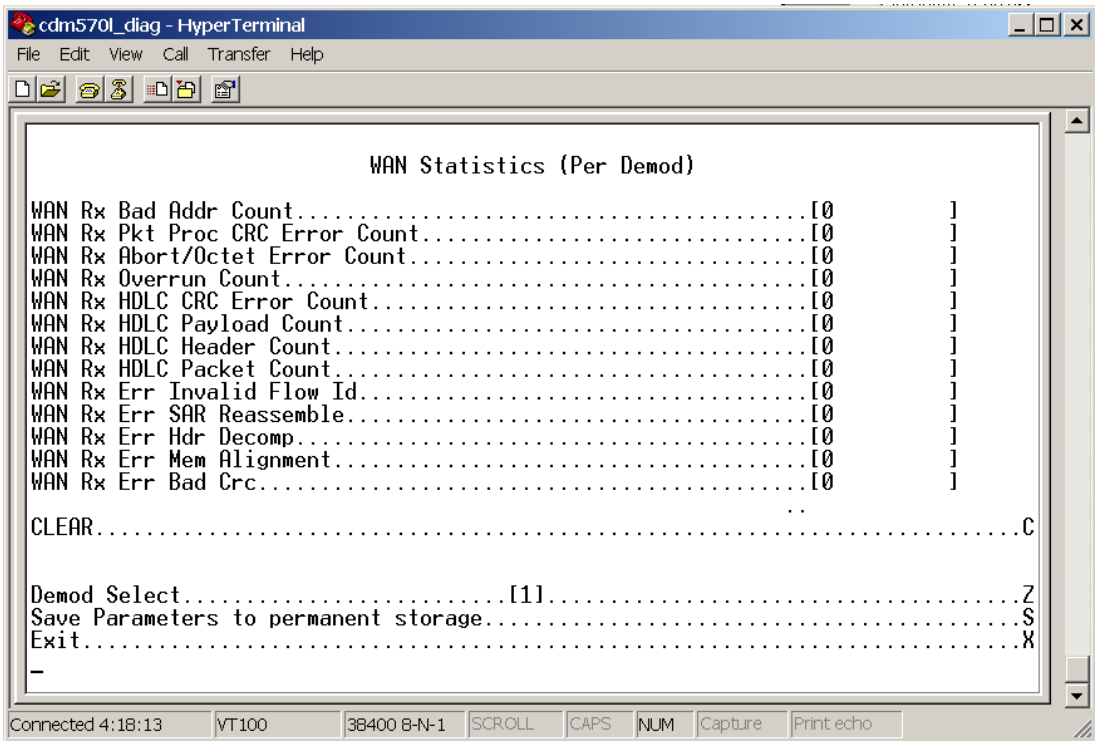


The *Ethernet Statistics* page contains the following options/fields . The Ethernet Statistics presents the total packets transmitted and received for the Ethernet Port of the IP Module.

Menu Options/Fields	Entry	Description
Tx Bytes	**Read Only**	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 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.

10.2.7.2.3 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. These statistics are provided on per Demod [Receive Channel] basis. Set the "Demod Select" before viewing the statistics.

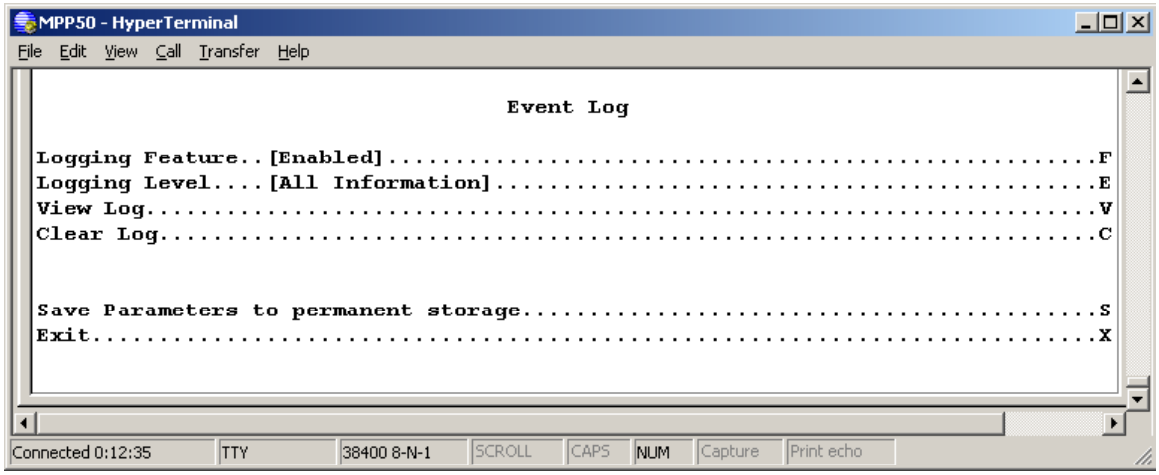


The *WAN Statistics* page contains the following options/fields:

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, configured for this Receive channel
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.
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.
Clear	**C**	Resets all WAN statistics for this demod.
Demod Select	**Z**	Used to select Demodulator. Set the “Demod Select” to the desired receive channel, before viewing/applying any configuration changes.
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.

10.2.7.3 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 and 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
```

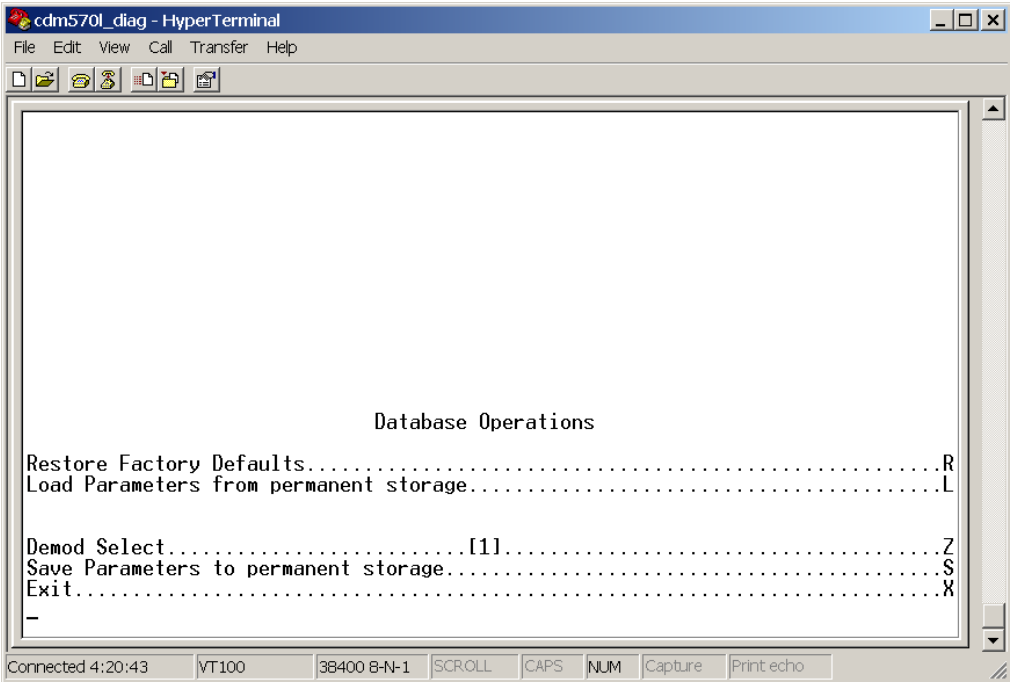
```
40        Information    05/21/2004 06:23:07 C:/Comtech/ftp/ftpCallbacks.c
540       FTP                 FTP Transfer complete


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
```

10.2.7.4 Administrative Database Operations Page

Administrative Database Operations is opened from *Operations and Maintenance.*



The Database Operations option allows the user to view, save, or erase an existing user configuration of the demodulator. A demodulator uses these types of configuration files to initialize itself on power-up.

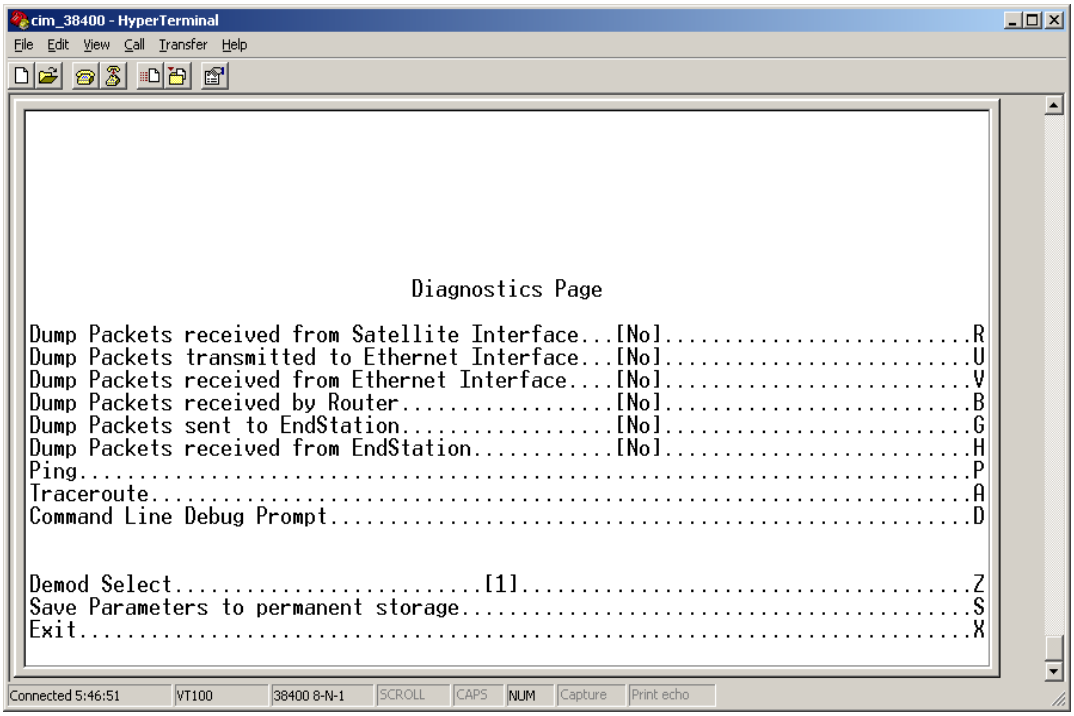
The User Configuration File allows a user to overwrite the values defined in the Factory Configuration File. This allows full customization of a demodulator without erasing a set of parameters defined from the factory. The User Configuration File also can be retrieved or overwritten via FTP by specifying the filename ‘param1’.

The Administrative Database Operations page contains the following options/fields:

Menu Options/Fields	Entry	Description
Restore Factory Default	**R**	Restores the demodulator settings to “safe” values as defined by the factory.
Load Parameters from permanent storage	**L**	This option overwrites the current configuration of the demodulator with the configuration last saved to permanent storage. It allows the user to perform an “Undo” type operation if the demodulator is put into an undesirable state by the user[provided the undesired configuration is not saved.].
Save Parameters	**S**	This option allows a user to save the current configuration of the demodulator 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.

10.2.7.5 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 the demodulator is 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:

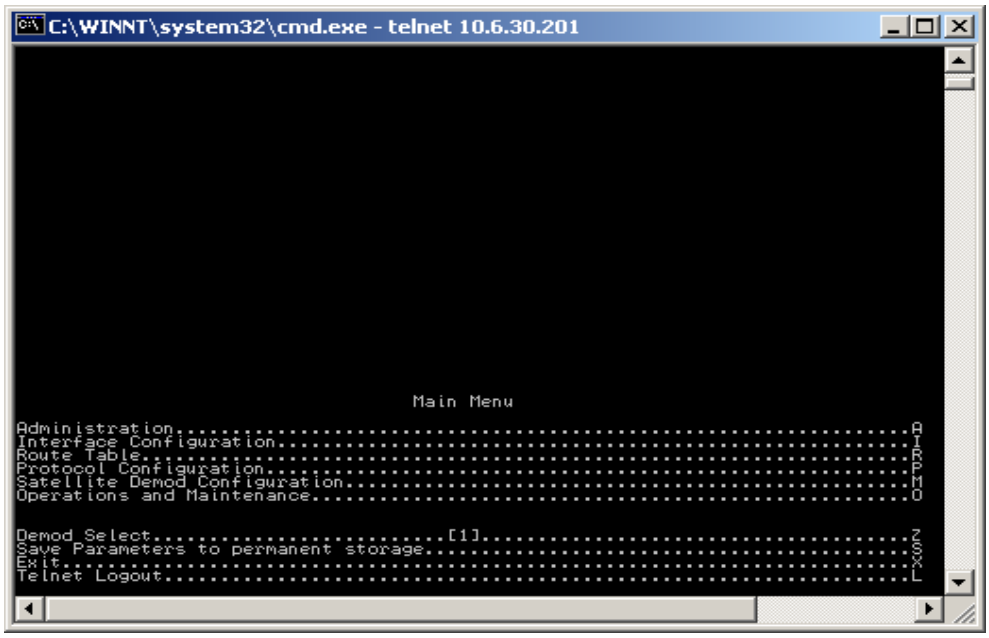
Menu Options/Fields	Entry	Description
Dump Packets received from Satellite Interface	**R**	Toggles [Yes] and [No] Executing this menu option forces the IP Module to dump a hexadecimal representation of each packet that it receives from the Satellite Interface.
Dump Packets transmitted to Ethernet Interface	**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.
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/destined for the demodulator only.
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 Unit and destined for some other device. This allows a user to see what type of packets this unit is generating internally.
Ping	**P**	Enter the ip address in aaa.bbb.ccc.ddd format to ping, on the same subnet as CDD 564 unit.
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.

10.2.7.6 M&C Interface

This interface is reserved for test & development. This is not intended for customer use. This is Monitor & Control interface for system test tools. If by chance, happen to enter Into this menu, Type ‘x’ [for Exit] to come out of it and goto parent menu.

M&C CLI INTERFACE
(X=Exit) # x

10.2.8 Telnet - Logout Option



When connecting to the demodualtor 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.

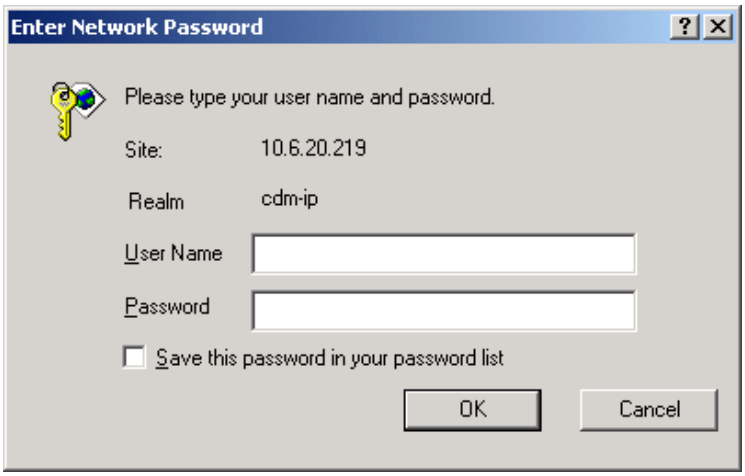
IMPORTANT

The demodulator does not allow concurrent access to the menu via telnet and the console port. If a user connects via telnet, demodulator 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 demodulator will automatically end a Telnet session after a period of inactivity (configurable from 1 to 60 minutes).

Chapter 11. Web Management

11.1 Web Management Usage

The easy-to-use Web interface provides the user with the ability to configure and monitor all aspects of the demodulators. These web pages have been designed for optimal performance when using Microsoft's Internet Explorer 6.0 or higher. By typing http://xxx.xxx.xxx.xxx" (where xxx.xxx.xxx.xxx =CDD-564L/564/562 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 Web pages pages	No Access to Admin Web pages
		Full Access for all other Web pages	View Only Access for all other Web Pages; able to reset Statistics

Default Name/Passwords are:

- Admin comtech/comtech
- Read/Write opcenter/1234
- Read Only monitor/1234

IMPORTANT

1. ***Any changes made to the demodulators will be lost upon reset or power loss unless the changes are saved to permanent storage. This applies to all of the demodulator and IP parameters. Selecting "Save Parameters to Flash" on the Maintenance/IP Dbase web page saves the demodulator parameters.***
2. ***See Chapter 10 CLI and Telnet Interface section for a more detailed explanation of demodulator functions.***

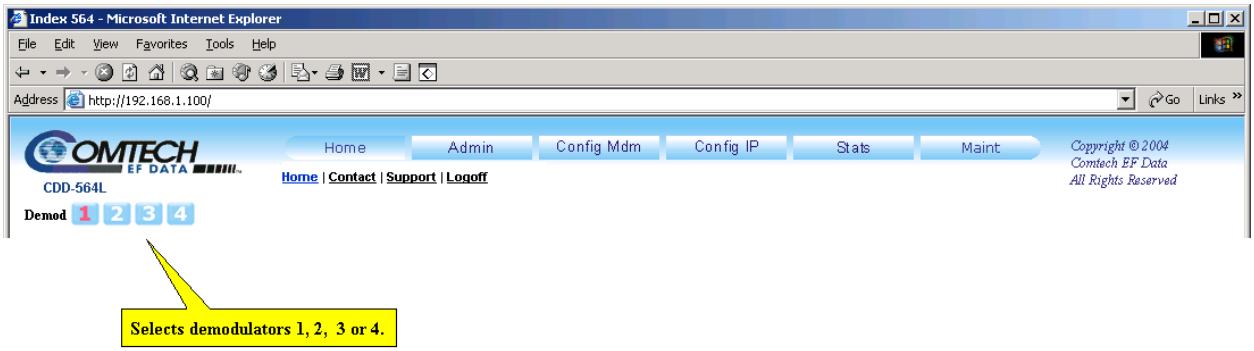
11.1.1 Web Management Menus

Table 11-1. Web Management Menus

Level 1	Level 2	Per Demod
Home	Home	No
	Contact	No
	Support	No
	Logoff	No
Admin	Summary	No
	Access	No
	Features	No
	SNMP	No
	Decryption	**Yes**
Demod	Demod	**Yes**
	Utilities	**Yes**
	Status	**Yes**
	Events	**Yes**
	Statistics	**Yes**
	LNB	**Yes**
IP	Ethernet	No
	HDLC	**Yes**
	Routes	No
	Multicast	No
	ARP	No
	IGMP	No
Stats	Ethernet	No
	IP	No
	WAN	**Yes**
Maint	Unit Info	No
	Operations	No
	Save	No
	Reboot	No

11.2 Selecting Demodulators

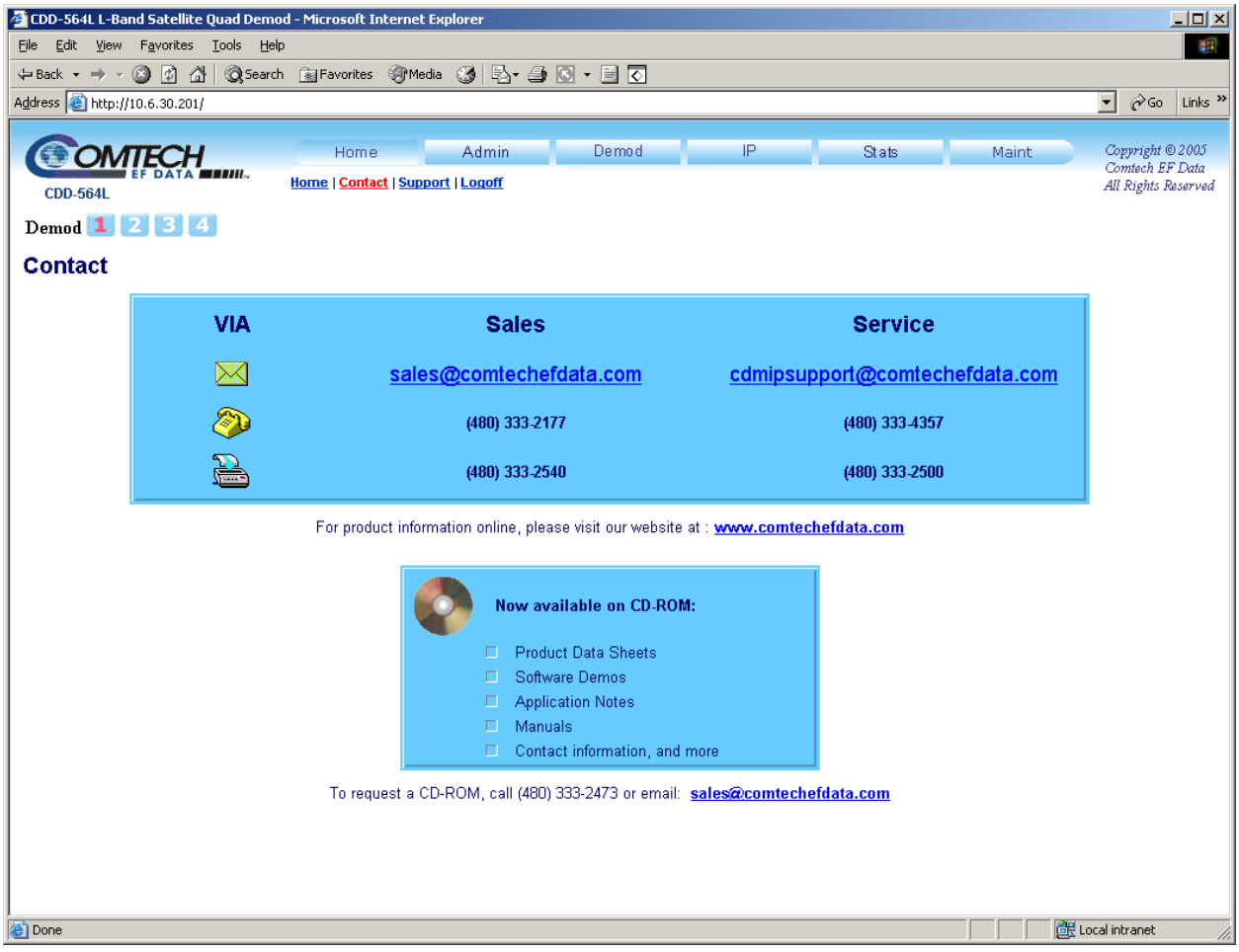
Select the individual demodulator number, located in the upper left hand corner of every web page, to address that demodulator. Web pages that do not include demodulator parameters (routes, administrative pages, etc.) are not affected by changes in the addressed demodulator.



11.3 Home Page

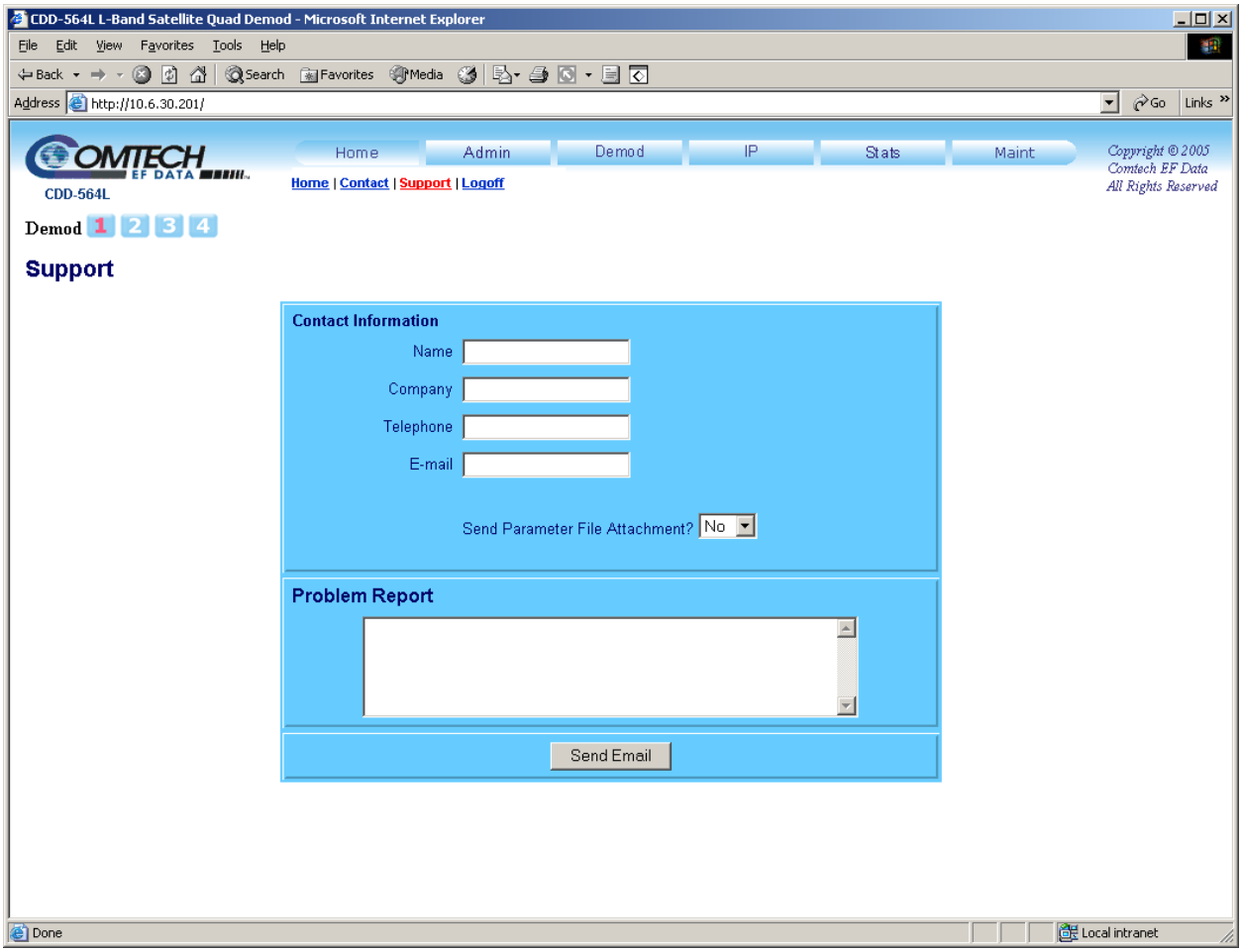
Welcome to the Web Interface. The following sections will describe the functionality that is unique to the Web Interface.

11.3.1 Contact Information



This page provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone or automated e-mail links.

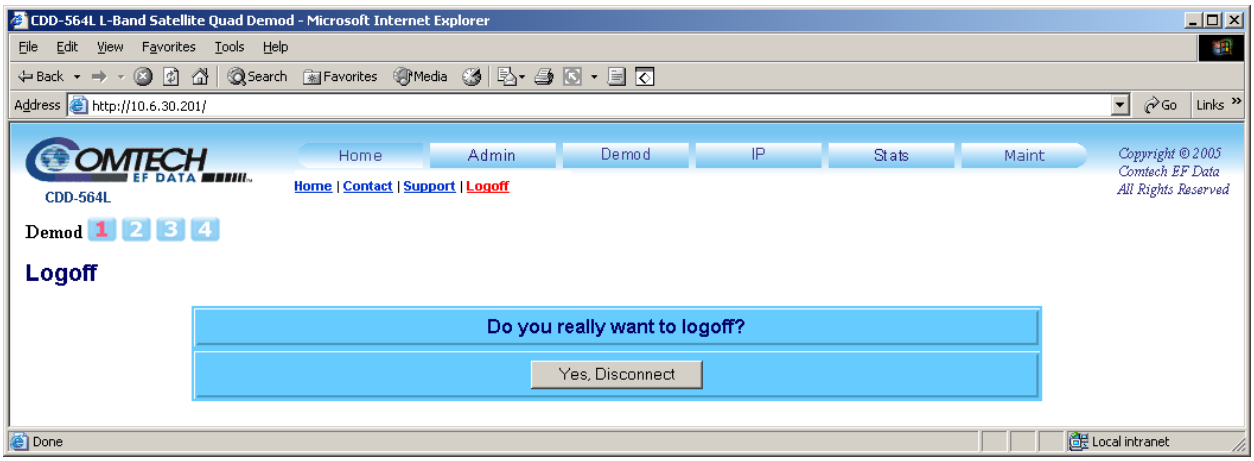
11.3.2 Support



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 thedemodulators. The user can also select to automatically attach the domdulators' parameter file (which will contain the unit'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 2000 characters maximum.

The CDD-564L/564/562L uses SMTP (Simple Mail Transport Protocol) to send email and will require the unit's administrator to specify the SMTP server, domain name and destination name on the Administration Screen for SMTP to operate correctly (see Chapter 12 for details on Administration SMTP Configuration).

11.3.3 Logoff

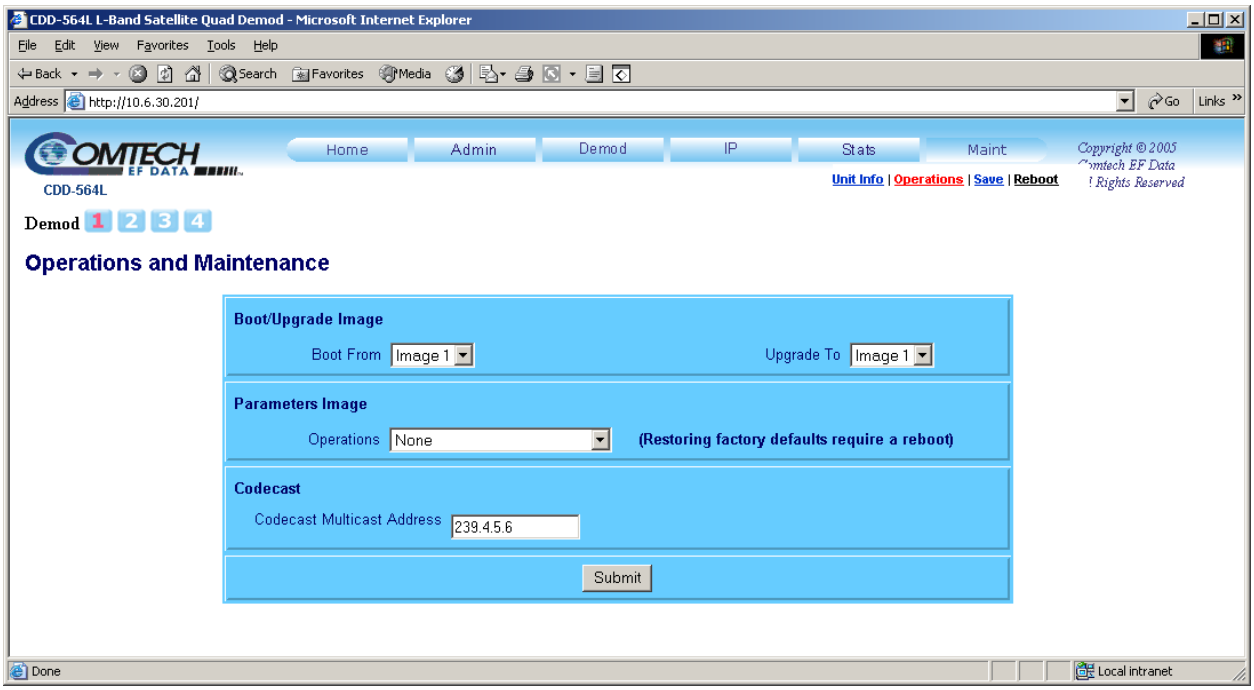


Currently the demodulator only allows one connection to the CLI or the Web Interface. Use this option to formally disconnect from the Web Interface.

IMPORTANT

Upon disconnection, you will be required to close the Web Browser so as to delete the security cookie to the modem.

11.3.4 Operations and Maintenance



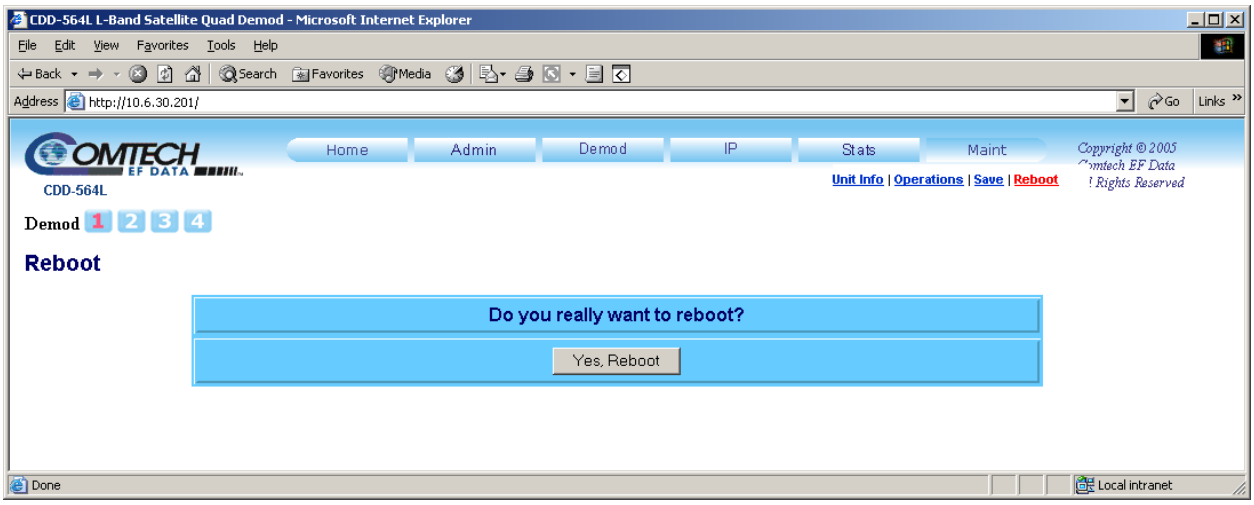
IMPORTANT

Any changes made to the demodulator will be lost if it is reset or loses power, unless the changes are saved to permanent storage. This applies to all of the demodulator parameters. Selecting "Save Parameters to Flash" on the Maintenance/IP Dbase web page saves the demodulator parameters.

Table 11-2. Operations and Maintenance Fields

Field	Description
Parameter Image	Select from: Save Parameters to Flash - When changes are made to the demodulator's parameters, the Flash Save must be selected in order for these settings to be valid through a power cycle. Without using this option, settings will revert back to their previous state as indicated by the last time the flash was saved. Load Parameters from Flash – Reloads the parameters from Flash. This may overwrite changes that have not yet been saved to Flash. Restore Factory Defaults – uses the internal, hard-coded factory default parameters.
Boot From	Determines which version of the Software Package (includes Application, FPGA, and FFPGA) will be loaded upon boot-up. The options are: Latest - boot the newest Software Package based upon date. Image1 - boot the Software Package loaded into the first slot in permanent storage. Image2 - boot the Software Package loaded into the second slot in permanent storage.
Upgrade To	Determines which installed Software Package (includes Application, FPGA, and FFPGA) that the demodulator will overwrite when upgrading with a new Software Package. The options are: Oldest - overwrite the oldest Software Package based upon date. Image1 - overwrite the Software Package loaded into the first slot in permanent storage. Image2 - overwrite the Software Package loaded into the second slot in permanent storage.
Codecast Multicast Address	Set the multicast address used to upgrade the Software Packages using Vload.

11.3.5 Reboot



The last item on the left-hand menu is “Reboot”. This option will force the demodulator to reboot.

Note: Rebooting does not remove the web browser’s name/password cookie. Therefore, it is recommended that after clicking on “Yes, Reboot”, the user close the web browser.

Notes:

Chapter 12. SNMP Management

12.1 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 demodulator SNMP agent supports both SNMPv1 and v2c.

For proper SNMP operation, the demodulator MIB files must be used with the associated version of the software. Please refer to the SW Release Notes for information on the required FW/SW compatibility.

12.2 CDD-564L 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 three MIB files associated with the demodulator:

MIB File/Name	Description
FW11669-2-.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 OID: 1.3.6.1.4.1.6247 Path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247)
FW11669-3B.mib MIB file	CDD-564 MIB file consists of all of the OID's for management of the demodulators functions.
FW11669-4-.mib Traps MIB file	CDD-564 Traps MIB file is provided for SNMPv1 traps.

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.

Any changes made to the IP Parameters will be lost if the demodulator is reset or loses power unless the changes are saved to permanent storage. The IP Parameters can be saved by a SET of the cdd564SaveParamToFlash OID within the MIB.

12.3 SNMP Community Strings

The unit uses community strings as a password scheme that provides authentication before gaining access to the 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

12.4 SNMP Traps

The demodulator has the ability to send out SNMP traps when certain events occur in the unit . For example, when the demodulator boots, it sends out a coldstart trap and a linkup trapfor each interface that is brought up. The unit also sends out traps when an alarm or a fault occurs in the unit. These include Unit faults, Rx faults, and LNB faults. A trap is sent both when a fault occurs and is cleared.

The demodulator supports both SNMPv1 traps and SNMPv2 notifications.
Which style of traps the unit sends can be configured by the user using the cdd564SNMPTrapVersion OID.

The following are the MIB2 v1traps/v2 notifications that the demodulator supports.

MIB2 SNMPv1 traps:

Cold Start	1
Link Up	4
Authentication Failure	5

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 supports.

Alarms and Faults SNMPv1 traps:

cdd564UnitAlarmTrap	6247251
cdd564RxAlarmTrap	6247252
cdd564LNBAlarmTrap	6247253

Alarms and Faults SNMPv2 notifications:

cdd564UnitAlarmNotification	1.3.6.1.4.1.6247.25.2.0.1
cdd564RxAlarmNotification	1.3.6.1.4.1.6247.25.2.0.2
cdd564LNBAlarmNotification	1.3.6.1.4.1.6247.25.2.0.3

12.5 MIB-II

The 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 12-1. 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 deprecated in MIB-II
EGP	Not applicable

12.6 Private MIB

The MIB holds all the security, feature selection, IP related parameters and all the demodulator specific parameters. For detailed OID information please refer to the actual MIB file.

12.6.1 Administration Group

This group contains system security, administration, and feature configuration parameters.

12.6.1.1 Access Lists Subgroup

The Access Client List allows a user to define which remote clients can connect to a demodulator when the Access List Enforcement is enabled. Each entry allows a user to specify an IP address and a subnet mask to define a unique class of clients that are allowed access to the unit.

12.6.1.2 Features Subgroup

This subgroup allows a user to enable/disable a Standard or FAST feature.

Standard features (ping reply, telnet, , IGMP, and multicast forwarding) can be enabled or disabled by sending a 1 (enable) or 0 (disable).

Header decompression can be enabled or disabled on a per demodulator basis via the FeaturesTable.

Peter TODO – Need to describe Working Mode!!!!!!

Changing the Working mode between Point-to-Point Mode, Small Network Mode, Large Network Mode, and Vipersat Mode forces the system to reboot. System configuration will be saved before re-booting. Please make sure you are setting the correct value.

12.6.1.3 3xDES Decryption Subgroup

This subgroup controls the parameters for the triple DES (3xDES) feature. Each Receive key is of 192-bit length. The Rx DES keys can be entered through the DESRxKeyTable.

12.6.1.4 SMTP Subgroup

The cdd564SMTP subsection sets up the unit to use a SMTP mail server to send a problem report back to Comtech EF Data Modem Support. Along with the problem report, the unit sends the equipment serial number and configuration, which is attached to the email message. By default, the problem report is sent to: cdmipsupport@comtechefdata.com.

In order for this to work, the user is required to enter the IP address of their outgoing SMTP mail server. Also the user should enter their email username (text before the @ in an email address) and email domain name (text after the @ in an email address).

12.6.1.5 SNMP Traps Subgroup

This cdd564SNMP subgroup controls where SNMP traps are sent and the community string used in sending traps. Either SNMPv1 or SNMPv2 traps can be sent.

12.6.2 Interface Group

This group controls the parameters of the unit's's Ethernet and demodulator interfaces.

12.6.2.1 Ethernet Interface Subgroup

This subgroup defines the unit's Ethernet interface. These include parameters for setting the Ethernet speed, IP address, and IP address subnet prefix length.

12.6.2.2 Demodulator Interface Subgroup

This subgroup defines the Demodulator's interfaces each demodulator's HDLC addresses.

HDLC Address Mode has been changed to be read-only. This parameter is now settable through the Working Mode OID (cdd564WorkingMode) in the Features subgroup.

12.6.3 Route Table Group

The **cdd564RouteTable** allows a user to define how the packets that the unit receives are routed.

12.6.4 Protocols Group

The protocols groups allows user to control networking protocols such as IGMP.

12.6.4.1 IGMP Subgroup

This subgroup controls the IGMP, Internet Group Management Protocol, which is the standard for IP multicasting in the Internet.

12.6.5 Maintenance Group

This group contains several miscellaneous operations for the demodulator, including the unit information, bulk database configuration (allows the user to define which image to boot from and into which image to save a new bulk file), and IP PARAM file configuration. Rebooting the unit also is possible from this group.

12.6.6 Statistics Group

This group collects various statistics on Ethernet interface, satellite interfaces, and IP routing.

12.6.6.1 IP Routing Statistics Subgroup

The cdd564IPRoutingStatistics reports statistics collected by the IP router mechanism.

12.6.6.2 Ethernet Statistics Subgroup

The cdd564EthernetStatistics section collects statistics reported on the Ethernet network card.

12.6.6.3 Satellite Statistics Subgroup

The cdd564SatelliteStatistics section collects statistics reported on the WAN (satellite interface) FPGA.

12.7 Demodulator Configuration

Whenever modifying the 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. Demodulation
3. Code Rate
4. Data Rate

For detailed OID information please refer to the actual MIB file.

This group allows the user to configure the demodulator parameters, alarm masks, and internal reference adjustment. LNB units attached to the demodulator can also be configured.

12.7.1.1 Rx Parameters

The cdd564Rx section allows the user to configure the demodulators' parameters.

12.7.1.2 Alarm Mask Parameters

This section allows the user to mask the AGC, Eb/No, and LNB alarms..

12.7.1.3 Reference Parameters

The section allows the user to change the internal reference adjustment.

12.7.1.4 LNB Parameters

The section allows a user to configure LNB parameters when a LNB is attached to the demodulator .

12.7.2 Monitor Group

This groups reports the demodulator's status, including alarms, receive parameters, event log entries, statistics entries, and LNB parameters.

12.7.2.1 Unit Monitor

The section reports serial number, software revision, model number, and temperature. Any alarms that have been raised for the unit are also available.

12.7.2.2 Rx Monitor

The cdd564RxMonitor section reports the demodulator's bit error rate (BER), buffer fill state, frequency offset, receive signal level, and Eb/No value. Alarms that have been raised on a specific demodulator are also reported.

12.7.2.3 LNB Monitor

This section reports LNB unit status, including LNB current, LNB voltage, and any alarms.

12.7.2.4 Stored Events Log

The event log is a table that informs the user of any faults that have occurred in the demodulators. Event entries may also include informational items, such as power on/off.

12.7.2.5 Stored Statistics

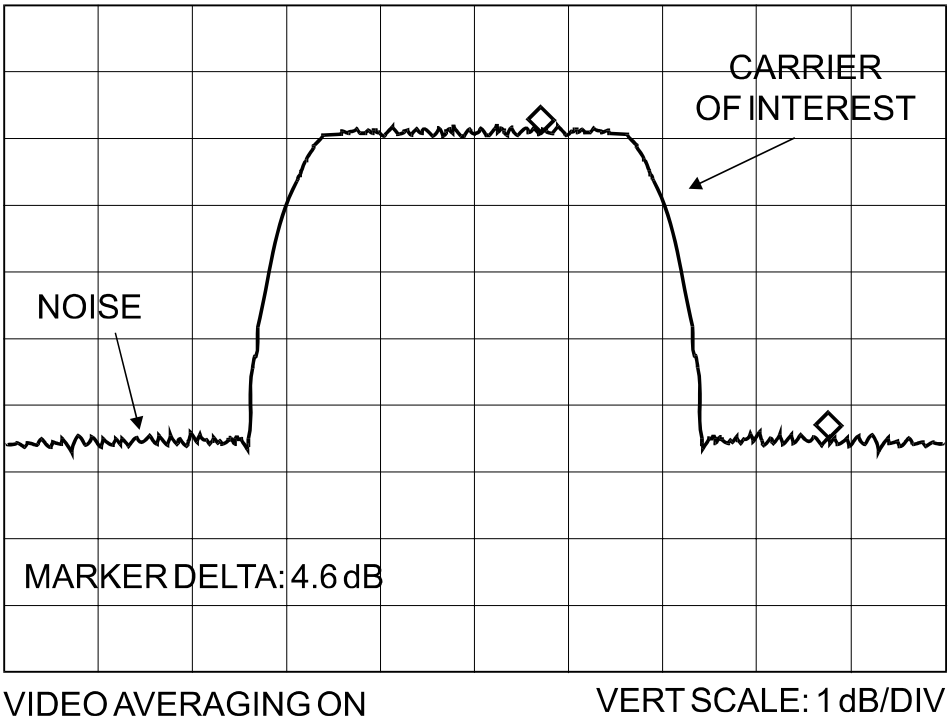
The statistics log is a table that gathers data concerning receive Eb/No. The user can decide to collect these statistics on intervals ranging from 10 minutes to 90 minutes.

12.7.3 Utilities Group

The cdd564Util group allows the user set the unit's time and date, and set the circuit ID string per demodulator.

Appendix A. Eb/No Measurement

Although the demodulator calculates the value of receive Eb/No and makes it available through the remote port 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 0.2dB.
- 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: 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:

$$\text{Eb/No} = 10\log_{10}(10^{(\text{Co+No/No})/10} - 1) - 10\log_{10}(\text{FEC Code Rate}) - 10\log_{10}(\text{bits/symbol})$$

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
- Bits/symbol = 4 for 16-QAM
- Code Rate for ‘uncoded’ = 1
- Pay close attention to the sign of the middle term

The following table contains information for the available modulation and code rates and others.

(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 B. FAST Activation Procedure

B.1 Introduction

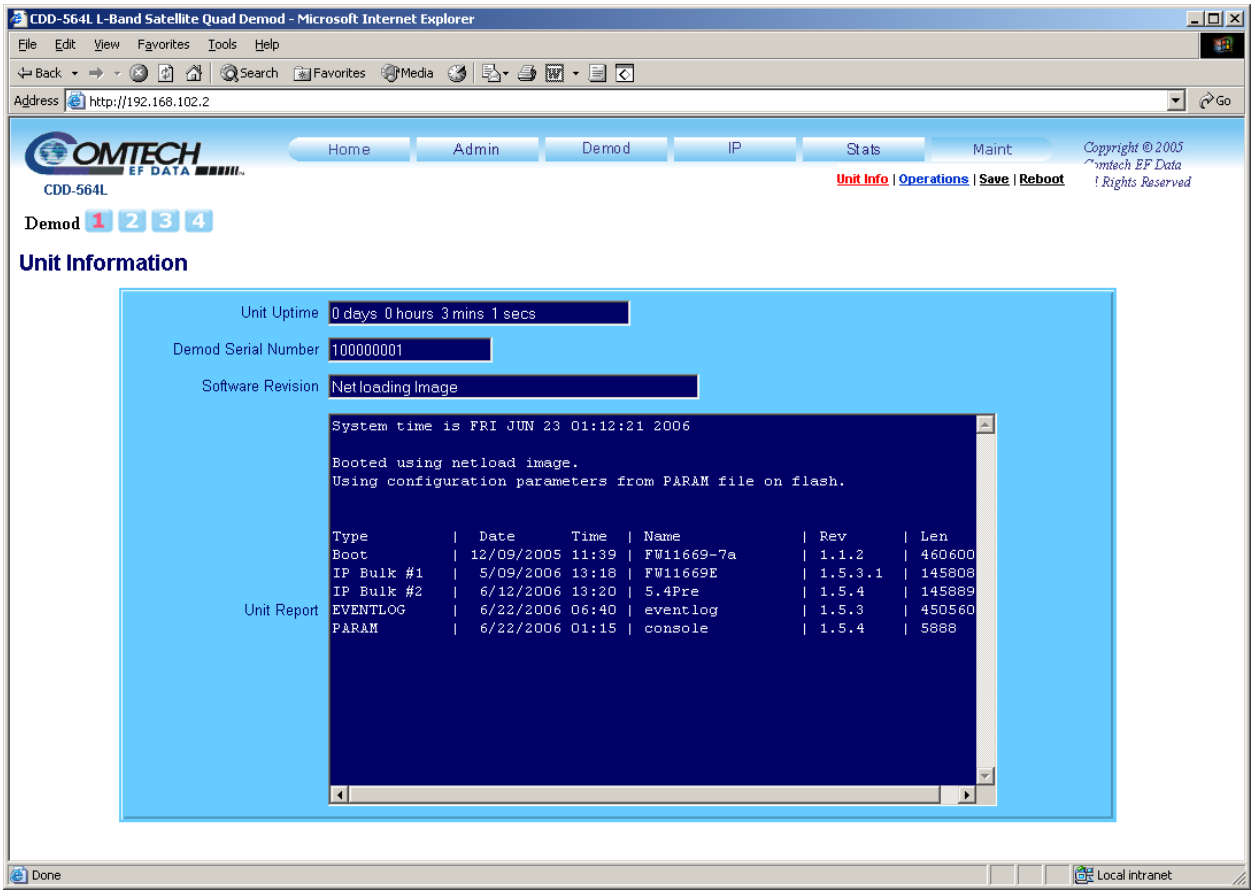
FAST is an enhancement feature available in Comtech EF Data products, enabling on-location upgrade of the operating feature set—in the rack—without removing a modem from the setup. This accelerated upgrade can be accomplished only because of FAST's extensive use of programmable devices incorporating 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 console (RJ-11) port.

B.2 Activation Procedure

Refer to the Chapter 10- CLI And Telnet Operation for information on using the command line interface (CLI) for this procedure.

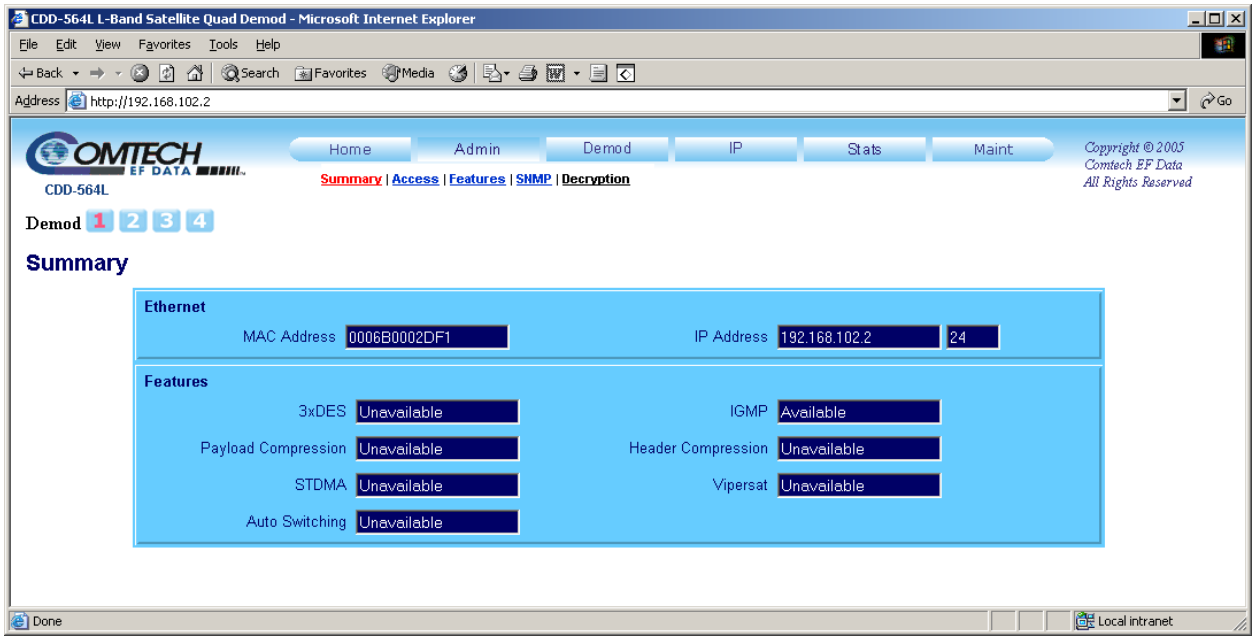
B.2.1 Serial Number

Obtain the Demod serial number from the Unit Info web page:



B.2.2 View Currently Installed Features

The Summary web page provides the currently installed features.

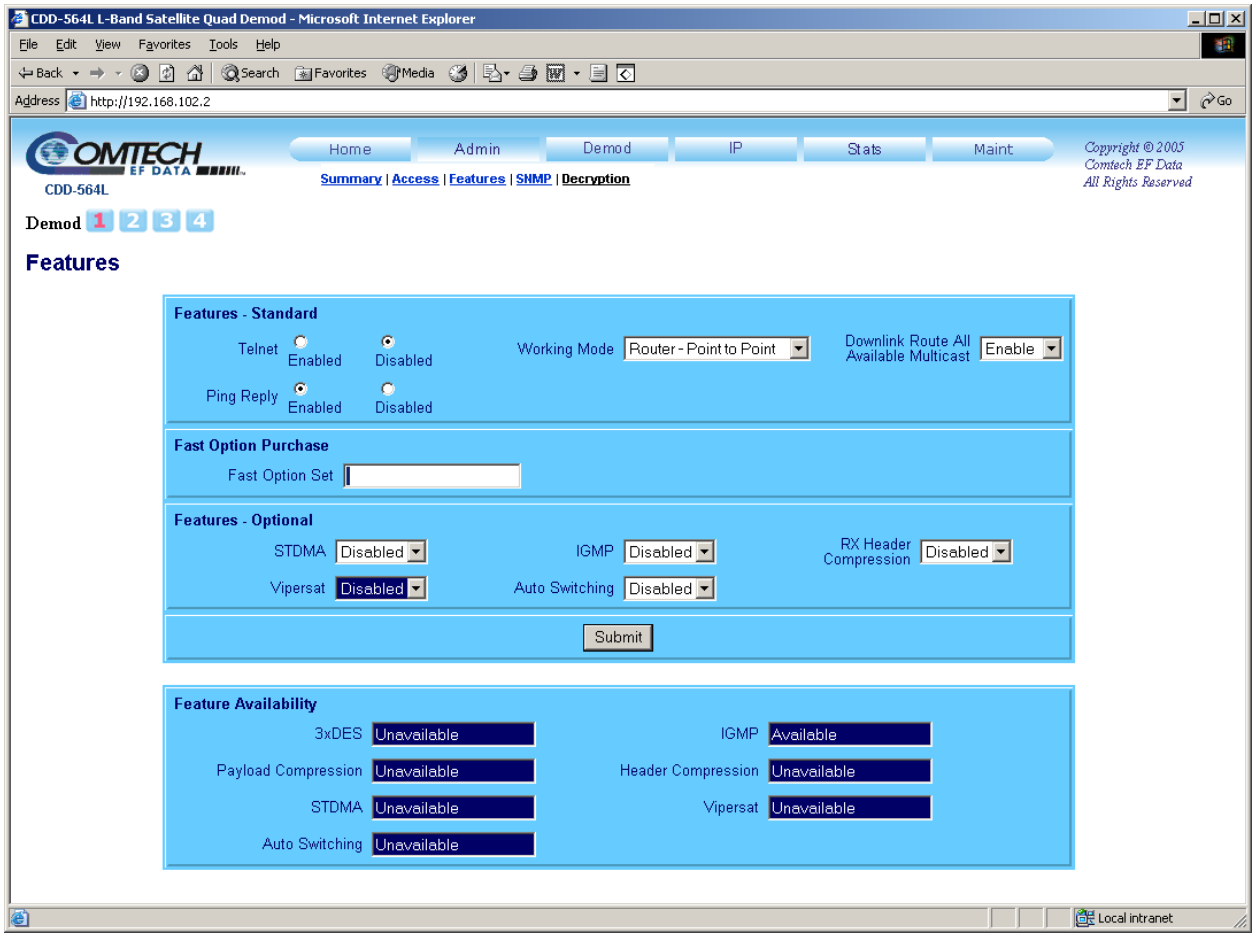


The “Features” web page also provides the currently installed features.

B.2.3 Enter FAST Option Purchase Code

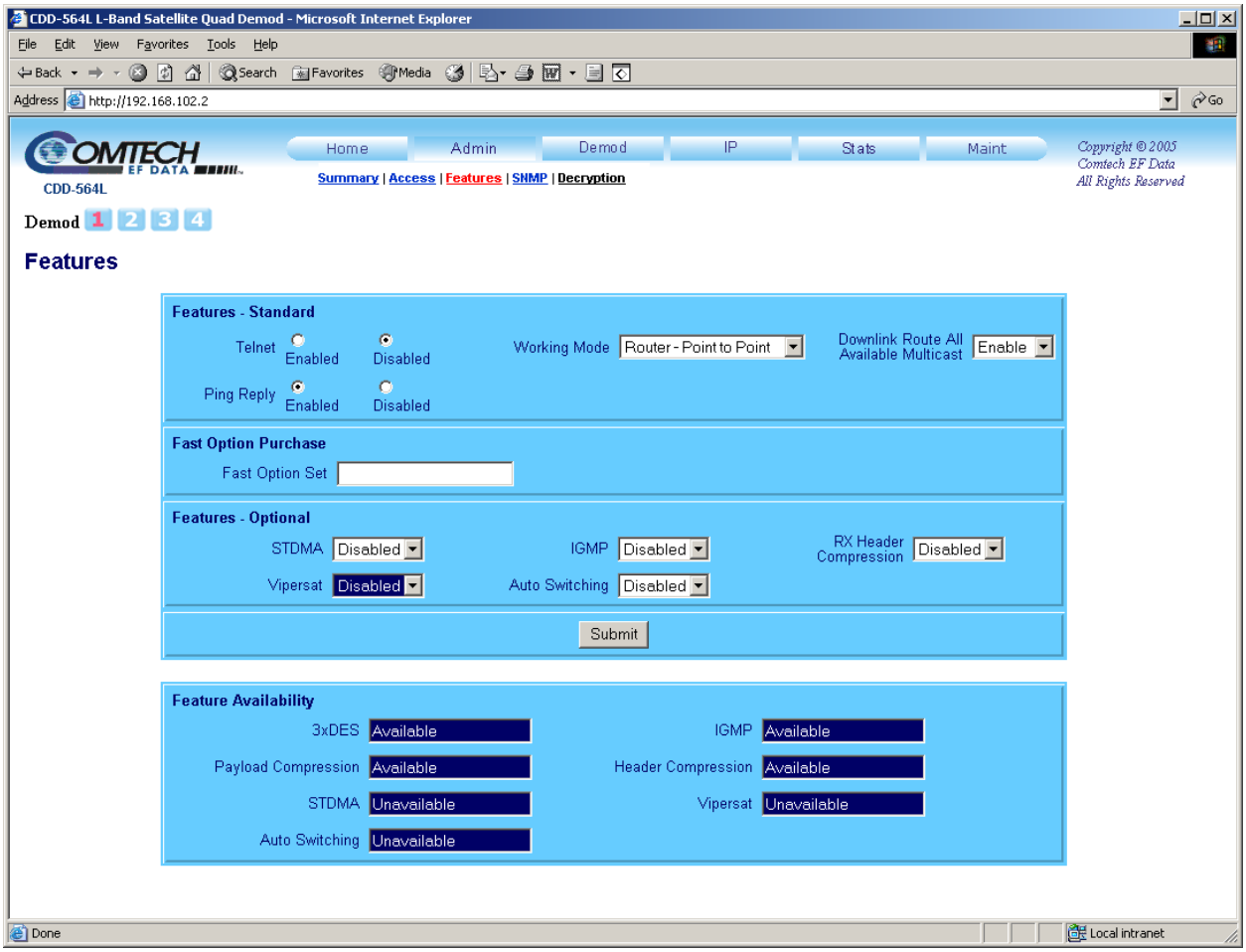
Contact a Comtech EF Data sales representative to order features. You will be asked to provide the Modem Serial Number. Comtech EF Data Customer Support personnel will verify the order and provide an invoice and instructions, including a 20-character FAST Option code.

Enter the FAST Option code in the "FAST Option Set" field in the "Features" web page as follows:



B.2.4 Verify Feature Availability

Check the “Feature Availability” section on the bottom of the “Features” web page to verify that the new features are now available.



Notes:

Appendix C. Quick-Start Guide

C.1 Introduction

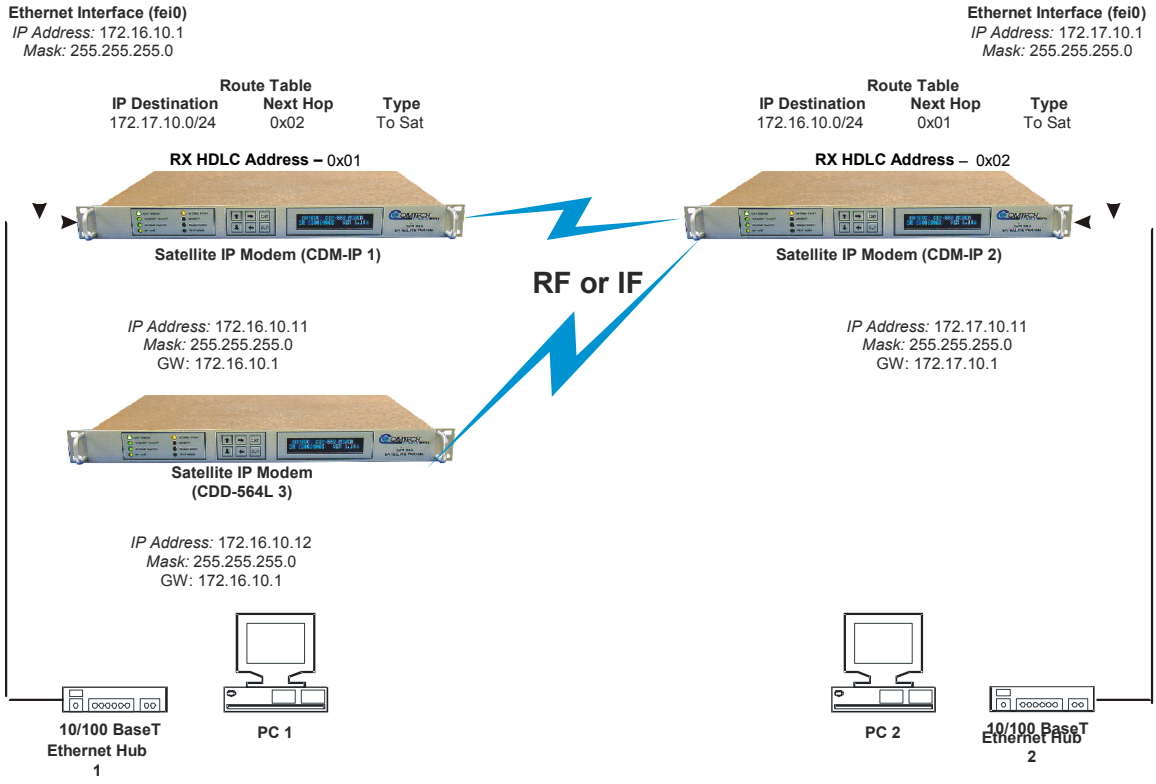
This quick start guide will allow a user to configure a pair of CDM-570Ls (referred to as CDM-IP modems in this section) and CDD564/562 as a demodulators. Begin with the factory default settings) and be able to pass traffic within minutes. It is assumed that the user is familiar with the configuration of the base satellite modem.

C.1.1 Equipment List

Following equipment is required:

Item	Equipment	Quantity	Comments
1	CDM-IP Modem CDD564/562	2 1	CDM-570/570L w/ IP Module, CDM-IP 550, CDM-IP 300L and Demodualtor **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.)

C.1.2 Equipment Setup



CDD564 Unit is displaying CDMIP570 modem picture. Need to be replaced with correct CDD564 picture. Catch one of the CDMIP team member to help with the correct IP Addresses for each of these units.

Figure C-1. Router Mode Point-to-Point System Configuration

Step	Description
1	Connect CDM-IP 1 and demodulator 3 to PC1 via Hub 1 and CDM-IP 2 to PC2 via hub 2
2	Connect the TX IF on CDM-IP 1 to RX IF of CDM-IP 2 and Tx IF on CDM-IP 2 to the RX1 IF of the CDD564/562 [RX-1 First Demodulator].
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, CDM-IP 2 and the demodulator to suitable power supply and turn them ON.

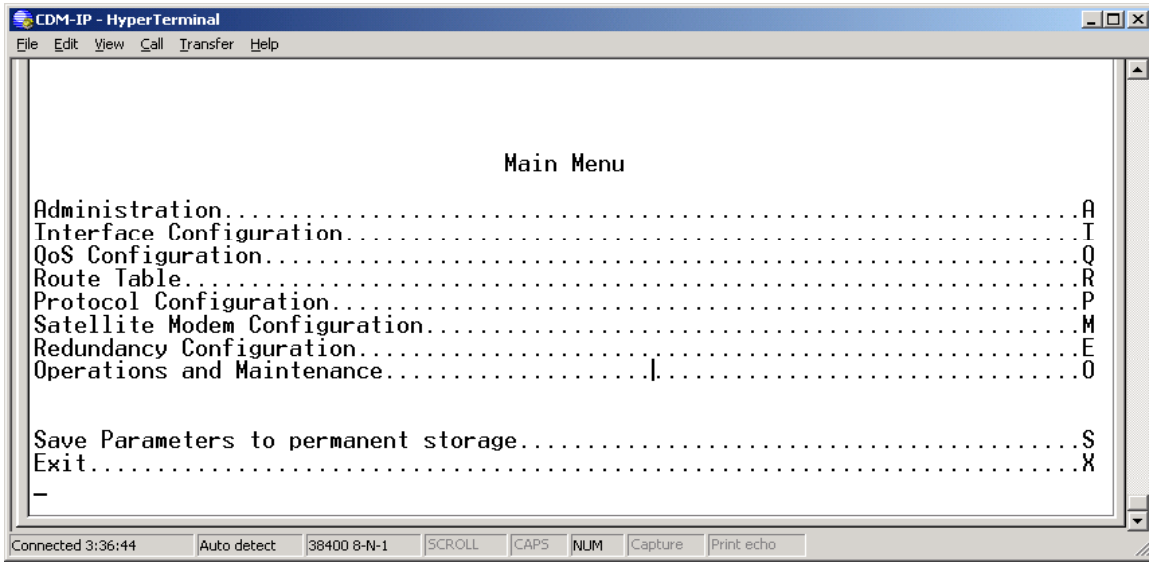
C.1.3 Transmit and Receive IF Configuration

Step	Description
1	Configure the transmit and receive IF parameters on CDM-IP 1, CDM-IP 2 and the CDD564 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 1 is appropriately carrier-locked to the other CDM-IP 2 , and CDM-IP 2 to the CDD564 demodulator.

C.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.

C.1.5 Main Menu



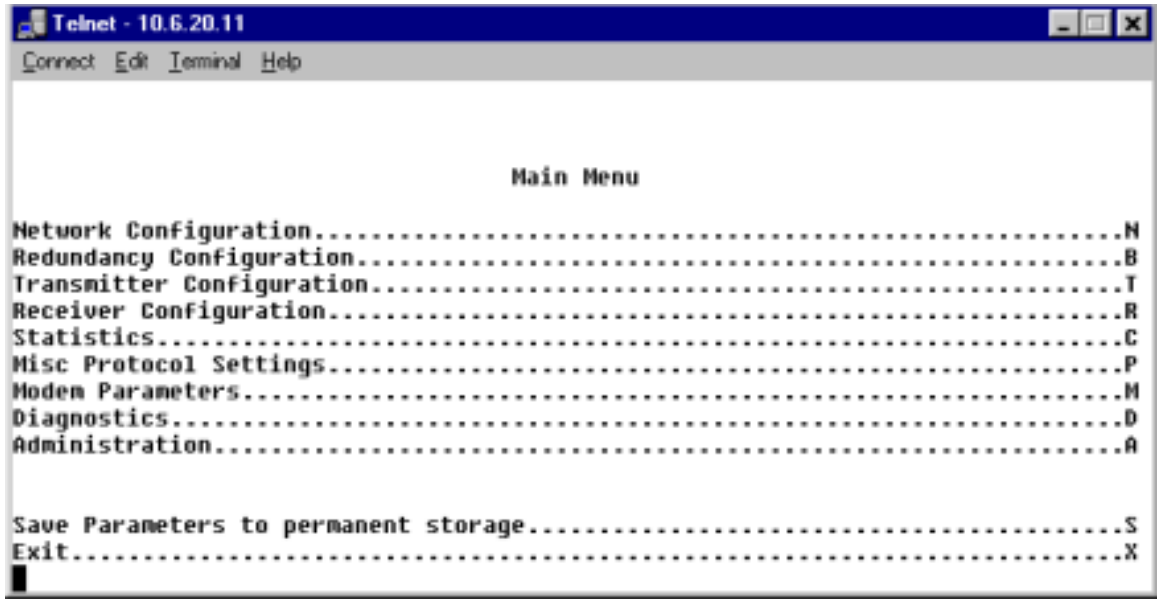


Figure C-2. Main Menu

To use the 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.

C.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 CDD-564 L to factory default configuration. Proceed to Section C.2 to perform the Router Mode configuration.

C.2 Router Mode Point-to-Point System Configuration

The steps in this guide will lead to the following configuration: use Figure C-1. Router Mode Point-to-Point System Configuration

C.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**. 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**
3	Reboot the PCs (if required).

C.2.2 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 – Small Network Mode**.

4	Allow CDM-IP to reboot, then select **Interface Configuration** [**I**] from **Main Menu**.
5	From the **Interface Configuration** menu, select **Receive HDLC Channel Addresses** [**H**].
6	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 [1] 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.
7	Repeat **Steps 1 - 4** on **CDM-IP 2**. Also, set **HDLC Addr 1** to **0x02**.

Follow these configuration steps for CDD564.

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 – Small Network Mode**.

4	Allow CDM-IP to reboot, then select **Interface Configuration** [**I**] from **Main Menu**.
5	From the **Interface Configuration** menu, select **Receive HDLC Channel Addresses** [**H**].
6	Set "Demod Select" to 1.
6	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 [1] 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.

Both CDM-IP modems and CDD564/562 are now in Router/Small Network Mode, which means that the CDM-IP1 & CDD564/562 are on 172.16.10.xxx subnet and CDMIP2 is on 172.17.10.xxx subnet . 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.

C.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** **CDD564/562** to **172.16.10.2CDM-IP 2** to **172.17.10.1**
4	Set **Ethernet Subnet MaskSubnet Prefix Length** [**M**] to **24.**

C.2.4 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.**
7	For **HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0000>:** select **2.**

8	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]`

9	Goto “Per Route” by pressing ‘E’, and disable ‘HdrCompression’, ‘PayloadCompression’ and ‘3xDES’ by selecting ‘No’ [‘Clear’ for 3xDES] to each of these.

Perform the following steps on **CDM-IP 2**

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 **172.16.10.0**
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**
7	For **HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0000>:** select **1**
8	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]`
9	Goto “Per Route” by pressing ‘E’, and disable ‘HdrCompression’, ‘PayloadCompression’ and ‘3xDES’ by selecting ‘No’ [‘Clear’ for 3xDES] to each of these.

Perform the following steps on **CDD564/562**

Step	Description
1	From **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 **E**
7	**Set the Next-hop IP Address to 172.16.10.1**

8	CDD564/562 Route Table should display the following:
	`Route Name  Dest IP/SNet Bits  Next Hop MultiCast State`
	`Route001...[ToCDMIP2  172.17.10.0/24 172.16.10.1 N/A  toEth]..1`

9	If HeaderCompression Feature is available on this modem, do the following. From Main Menu goto “Adminstration[A]→Features Configuration[F] → RxHeaderCompression[H]” and press ‘1’ to disable the Header Compression on 1st Demod.

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 172.16.10.2 (**CDD564/562**)

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 172.16.10.2 (**CDD564/562**)

Ping 172.16.10.11 (**PC 1**)

C.3 Troubleshooting the IP Module

The CDM-IP & CDD564/562 come with a variety of diagnostic tools to aid in identifying the traffic path going into and out of the modems. 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

C.3.1 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/CDD-564L Ethernet port. ICMP response is 'Request timed out'.	a) Verify correct IP address/subnet on PC and CDM-IP/CDD-564.
		b) Verify Ethernet connection – cables, hub, etc. PC, hub, and CDM-IP/CDD-564L 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/CDD-564L Ethernet port senses an Ethernet connection, the CLI will display:
		`Ethernet Interface UP`
		If the connection is broken, the CLI will display:
		`Ethernet Interface DOWN`

2	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, CDD-564L Route Tables are correct. b. Verify the hdrcomp and decomp both are either enabled or disabled. **Note:** Go to the route table and then options page is hdrcomp is enabled or disabled. And on the remote modem go the main menu, press "a" administration, and F for feature, hdrdecomp sould be same as hdrcomp (both sould be enabled or diabled).

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Appendix D. Upgrading Firmware

The CDD-564L/564/562L eliminates the need for updating firmware by physically replacing EPROMs. Instead, the unit uses 'flash memory' technology internally, and new firmware can be uploaded to the unit from an external PC.

This makes software upgrading very simple, and updates can now be sent via the Internet, e-mail, or on CD. The upgrade can be performed without opening the unit, by simply connecting the unit to the Ethernet port of a computer.

D.1 Ethernet FTP Upload Procedure

1. Identify the reflashable product, firmware number, and version to be downloaded.

    a. From Telnet via the 10/100 Ethernet Traffic port, view the unit information by selecting Operations and Maintenance/ Unit Information.

    a. From HTTP via the 10/100 Ethernet Traffic port, view the unit information by selecting Operations/Unit Information.

2. Download the correct firmware file to a temporary folder.

    a. Access the download server with the flash firmware data files link,
        Go to: http://www.comtechefdata.com
        Click on: Downloads
        Click on: Software
        Click on: Flash Update Files
        Click on: CDD564L

    b. The flashable files on the download server are organized by product first, then by firmware number, (make sure you know the correct firmware number) version, if applicable, and release date. The CDD-564L/564/562L firmware for the demodulators will be FW11669*_*_* (where the asterisks show revision, version and date).

c. 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.

d. The downloadable files are stored in two formats: *.exe (self extracting) and *.zip (compressed).

e. Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.

f. 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.

a. At least three files should be extracted:

- FWxxxxxx.bin, where "x" is the version (bulk image file).
- FWxxxxxx.txt, where "x" is the version (history notes).
- README.TXT installation notes.

5. Connect the client PC to the demodulator unit's 10/100 Ethernet port via a hub or a switch, or directly to a PC with a crossover cable.

- To PING and FTP from DOS, press the "**Start**" button on the Windows toolbar, and select the "**Run**..." option
- To PING and FTP from Win95 or Win98, type "**command**"
- To PING and FTP from WinNT, Win2K or WinXP, type "**cmd**"

- ***As an alternate, use the "DOS Prompt" or "Command Prompt" icons in the Start Menu.***
- ***Change to the download directory created earlier".***
- ***A quick "dir" will show the downloaded files.***

6. Initiate an FTP session with the unit. 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 demodulator.

   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.

   a. Type "put FW FW11669*.bin" to begin the file transfers. It will take several minutes to transfer and write the files to flash memory. View the unit information by selecting Operations and Maintenance/Unit Information and verify that the new Version is now loaded.

   b. The unit will need to be configured to boot to the new Version. By default, the demodulator will boot to the version with the latest date (Boot to - Latest). “Boot to” also can be set to force the demodulator to boot to either Image #1 or #2.

8. Verify the file transfer.

   a. The PC should report that the file transfer has occurred, and serial console or Telnet can view the status of the upgrade. The FTP login and the file transfer status will be displayed. When the upgrade image has been received, the image will be written to flash memory.

   b. Terminate the FTP session by typing "bye" and closing the DOS window.

9. Reboot CDD-564L/564/562L for new firmware image to become active. Reboot the unit by the serial console, Telnet, or Web for the firmware upgrade to become active.

Notes:

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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