Vipersat CDD-56X Series

Satellite Network Demodulator Router

User Guide

CDD-562L
CDD-564/564L

Part Number MN/22137 Revision 0

Vipersat CDD-56X Series

CDD-562L, CDD-564/564L
Version 1.5.x

User Guide

Part number MN/22137
Document Revision 0

Firmware Version 1.5.x

March 10, 2008

COMTECH EF DATA

VIPERSAT Network Products Group
3215 Skyway Court
Fremont, CA 94539
USA

Phone: (510) 252-1462
Fax: (510) 252-1695
www.comtechefdata.com

Part Number MN/22137
Manual Revision 0

Firmware Version 1.5.x

©2008 by Comtech EF Data, Inc. All rights reserved. No part of this manual may be copied or reproduced without prior written permission of Comtech EF Data, Inc.

Comtech reserves the right to revise this publication at any time without obligation to provide notification of such revision. Comtech periodically revises and improves its products and, therefore, the information in this document is subject to change without prior notice. Comtech makes no warranty of any kind with regard to this material, including but not limited to the implied warranties of mechantability and fitness for a particular purpose. No responsibility for any errors or omissions that may pertain to the material herein is assumed. Comtech makes no commitment to update nor to keep current the information contained in this document.

All products, names, and services are trademarks or registered trademarks of their respective companies.

Printed in the United States of America

Document Revision History

Revision	Date	Description
0	3/10/08	**Initial Release** *Note*: This new document part number, MN/22137, supercedes the previous CDD-56X User Guide part number, 22137. **New functionality in v1.5.4**: New DPC Enhancements; STDMA Power Hunt; Hitless Switching; New VMS Registration and Managing Address Method; UDP Port Base Address selection; Auto Home State Failsafe; SOTM

{ *This Page is Intentionally Blank* }

Table of Contents

Chapter 1
General

Chapter 2
Quick Start Configuration

Chapter 3
Using the Command Line Interface (CLI)

Appendix A
Network Addressing

Appendix B
Automatic Switching

Appendix C
Dynamic Power Control

Appendix D
Network Migration

Appendix E
Glossary

{ *This Page is Intentionally Blank* }

List of Figures

Chapter 2 Figures

Chapter 3 Figures

Appendix A Figures

Appendix B Figures

Appendix C Figures

Appendix D Figures

List of Tables

Chapter 2 Tables

Appendix B Tables

Appendix C Tables

{ *This Page is Intentionally Blank* }

CHAPTER

1

GENERAL

How to Use This Manual

This manual documents the enhanced Vipersat features and functions of the CDD-56X Series (CDD-562L, CDD-564, and CDD-564L) of Satellite Network Demodulator Routers, and guides the user in how to configure these products for use in a Vipersat network. The material covered addresses only those areas specific to a CDD-56X running in Vipersat mode, and complements the universal features and functions described in the *CDD-564L Installation and Operation Manual*.

Earth station engineers, technicians, and operators responsible for the configuration and maintenance of the CDD-56X are the intended audience for this document.

Manual Organization

This User’s Guide is organized into the following sections:

Chapter 1 — General

Contains CDD-56X product description, customer support information, and manual conventions and references.

Chapter 2 — Quick Start Configuration

Covers the initial basic steps that are necessary for configuring the CDD-56X from a factory default state to a functional network element.

Chapter 3 — Using the Command Line Interface (CLI)

Describes the use of the CLI for configuring and monitoring the CDD-56X in a Vipersat network. Each CLI screen is presented along with a detailed description and related commands.

Appendix A — Network Addressing

Supplemental reference information on binary math and network addressing to assist with integrating the CDD-56X into a Vipersat network.

Appendix B — Automatic Switching

Supplemental reference information on the Vipersat feature that provides load switching (response to network traffic load), application switching (response to traffic type) functions, and Entry Channel Mode switching functions.

Appendix C — Dynamic Power Control

A description of Vipersat's DPC and its relationship to a CDD-56X configuration.

Appendix D — Network Migration

Procedural instructions for upgrading a network of CDM-570/CDD-56X series modems to firmware version 1.5.3.

Appendix E — Glossary

A glossary of terms that pertain to Vipersat satellite network technology.

Conventions and References

The following conventions are utilized in this manual to assist the reader:

Note: Provides important information relevant to the accompanying text.

Tip: Provides complementary information that facilitates the associated actions or instructions.

Caution: Explanatory text that notifies the reader of possible consequences of an action.

The following documents are referenced in this manual, and provide supplementary information for the reader:

- *CDD-564L L-Band Quad Demodulator with IP Module Installation and Operation Manual* (Part Number MN/CDD564L.IOM)
- *CDM-570/570L Modem Installation and Operation Manual* (Part Number MN/CDM570L.IOM)
- *Vipersat CDM-570/570L User Guide* (Part Number MN/22125)
- *Vipersat Management System User Guide* (Part Number MN/22156)
- *Vload Utility User Guide* (Part Number MN/22117)

Product Description

Introduction

The Vipersat CDD-56X Satellite Network Demodulator Router is ideal for operators wishing to supply mesh connectivity between sites, while keeping network infrastructure costs down. The CDD-564 and CDD-564L provide four separate demodulators (the CDD-562L provides two) and an integrated router in a compact, cost-effective 1RU package.

The CDD-56X simplifies Hub site installations by reducing rack space and cost with 2/4 independent demodulators in a single chassis. A bank of CDD-56X demodulators is ideal for a star network consisting of a single outbound carrier at the Hub with multiple carriers returned from the remote sites.

The CDD-56X can be used at Hub sites where multiple burst controllers are needed. Demodulator roles are defined via software, configurable either as a burst controller in STDMA (Selective Time Division Multiple Access) mode, or as dedicated SCPC (Single Channel per Carrier) inbounds from remote terminals.

At remote sites, the CDD-56X supports mesh connectivity between multiple sites. Operating in mesh topology with links directly between sites eliminates double-hops through the Hub, conserving bandwidth and reducing latency.

Demodulator Features

- 50–90 MHz or 100–180 MHz IF Range, each Demodulator (CDD-564)
  950–1950 MHz IF Range, each Demodulator (CDD-562L/564L)
- QPSK, 8-PSK, and 16-QAM Operation

- Data Rate Range from 16 kbps up to 9.98 Mbps, depending on modulation and FEC used (with FAST feature upgrade)
- Turbo Product Coding (TPC) FEC
- Fast Acquisition Demodulator
- Simultaneous STDMA (burst) and dSCPC modes (configurable on a per demodulator basis)
- LNB Support: 10 MHz Reference and LNB Power
- N:M Hub Modem Redundancy Schemes

Router Features

- Fully Integrated Network Management using Vipersat Management System (VMS)
- Single Hop On Demand (SHOD) functions
- 10/100BaseT Ethernet LAN/WAN Interface
- Static IP Routing for Unicast or Multicast
- Header Decompression
- Payload Decompression
- 3xDES Decryption

Network and Bandwidth Management

A Vipersat-powered network solution integrates this advanced demodulator/ router with the powerful network management tool, the Vipersat Management System (VMS). The VMS provides for traditional monitor and control of the CDM-570/570L modems and the CDD-56X demodulators, but more than just an M&C package, the VMS offers unique bandwidth management that is ideal for IP-switched networks. Short data transfers are typically executed using a shared Selective Time Division Multiple Access (STDMA) channel, and when large amounts of data transfer, voice, and/or video communications are needed, these units can be automatically switched to a dedicated SCPC channel.

Dynamic SCPC (dSCPC)

The VMS provides for dynamic bandwidth allocation while in SCPC mode, automatically altering the bandwidth based on traffic conditions. This effectively enables the network to better handle connection-oriented applications and reduce network congestion, jitter, and latency.

In a typical Vipersat application used in conjunction with CDM-570/570L modems, the CDD-56X demodulators are drawn from a pool for assignment to a connection-oriented link.

Traffic inbounds from remotes can be switched manually or automatically, application or load triggered, or scheduled, from shared STDMA (burst) mode to a dedicated SCPC connection. The VMS automatically assigns a free demodulator at the Hub to a desired remote inbound, completely eliminating manual intervention. At remote sites, the CDD-56X simplifies Single Hop On Demand (SHOD) applications with direct remote-to-remote connections that do away with double-hops. Once the session is completed, the remote is automatically reverted back to its home state.

In addition, the CDD-56X simplifies Single Hop On Demand (SHOD) applications with direct remote-to-remote connections that do away with double-hops.

The result is an economical and flexible network with bandwidth shared and directed where it is needed for any mix of IP voice, video, and data traffic.

STDMA

The addition of STDMA capability to a Vipersat network allows multiple terminals to share the same satellite resources that would be dedicated to a single terminal in an SCPC configuration. This means that more terminals can be added to the network with minimal additional cost in either satellite bandwidth or Hub Terminal hardware.

Vipersat STDMA thus provides a low cost solution for medium to large sized networks with generally moderate bandwidth requirements, while at the same time providing all the features of the existing Vipersat systems, including the availability of a switched pool of SCPC channels for occasional high bandwidth traffic such as video conferences and large file transfers. Each STDMA upstream channel from the remote terminals to the Hub uses an STDMA frame operating at an aggregate data rate of from 16 kbps to 9.98 Mbps and can support up to hundreds of remote terminals with multiple burst channel inbounds.

Configured as a Hub terminal, the CDD-564/564L provides one demod for receiving an upstream STDMA channel from the remotes, and three demods for receiving three SCPC channels.

Single Hop On Demand

The CDD-56X is ideal for mesh applications such as Vipersat's Single Hop On Demand (SHOD). With the CDD-56X, SHOD (meshed) circuits are easily and economically established between remotes. SHOD provides significant and dynamic connectivity between latency connections without suffering the high costs associated with multiple carriers and/or 1-to-1 multi-receiver links.

Turbo Product Coding

The Comtech Vipersat CDD-56X incorporates a Turbo Product Codec (TPC) error correction, delivering significant performance improvement when compared to Viterbi with concatenated Reed-Solomon. TPC simultaneously offers increased coding gain, lower decoding delay, and significant bandwidth savings.

Header Decompression

Header compression reduces the required Voice over Internet Protocol (VoIP) bandwidth by as much as 60%. Example: a G.729 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. The CDD-56X demods perform header decompression prior to passing the data onto the LAN.

Payload Decompression

Payload compression condenses the size of data frames and reduces the satellite bandwidth required to transmit across the link. Configurable on a per route basis, Payload Compression provides traffic optimization and reduces bandwidth up to 40%. The CDD-56X demods perform payload decompression prior to passing the data onto the LAN.

Data Decryption

The CDD-56X decrypts 3xDES data that it receives. Data encryption, configurable on a per route basis, is used to prevent unauthorized access to data over the satellite link.

New in This Release

The following firmware version incorporates a number of additional features and enhancements.

1.5.4 Release

New DPC (Dynamic Power Control) Enhancements

Higher Order Modulation BER Waterfall Mapping

DPC target E_b/N_o values are automatically adjusted using the BER waterfall curves stored in the modems. The calculations are based on the received VMS multi-command message configuration (i.e., bit rate, modulation, FEC) look-up per BER table and used to modify the tatget E_b/N_o to sustain an acceptable bit performance over all possible waveform configurations.

Delta Rain Fade Power Compensation

DPC offsets in modem power that are necessary during rain fade conditions are now applied to incoming switch commands from the VMS. This prevents possible link failures due to power value changes associated with these switch commands.

STDMA Power Hunt

Should link reception from a Remote be incorrect or impaired (e.g., poor environmental conditions), the STDMA Power Hunt feature is an option on the Remote modem that automatically adjusts the Remote transmit power to ensure that burst map acknowledgements from that unit are received by the Hub burst controller.

Hitless Switching

Data outages can occur during transitional switching in the satellite network. New hitless switching parameters allow for fine tuning the switching process to account for satellite propagation delay, command processing, and demodulator re-acquisition.

VMS Registration and Managing Address

The 1.5.4 release introduces new methods for handling the managing address and modem registration with the VMS. Unless a modem is registered with a VMS, traffic will not pass either LAN-to-SAT or SAT-to-LAN. Also, Remotes now receive a periodic update message from the VMS for setting the managing address. This new message will update any Remote unit that is a new arrival, is incorrectly set, or following VMS change-overs (redundancy switched).

UDP Port Base Address

It is now possible to change the assigned UDP base port address when an application conflicts with the default address.

Auto Home State Failsafe

A revert flag can now be added to the burst map on a per remote basis. This provides a more reliable means of forcing a Remote—stuck in SCPC mode, for example—that fails to respond to a standard VMS revert command to return to the home state. As soon as the Remote sees the flag, it will transition from SCPC mode to STDMA mode and send an acknowledgement to the burst controller.

SOTM (Satellite On The Move)

Features supporting SOTM required for maritime and other mobile applications are now incorporated in this firmware release. Working in conjunction with the ROSS (Roaming Oceanic Satellite Server), these features include the TEK (Transmit Enable Keep-alive) message, a satellite ID, and an SOTM enable/disable flag.

Customer Support

Contact Information

Contact Comtech Vipersat Networks Customer Support for information or assistance with product support, service, or training on any Vipersat product.

Mail: 3215 Skyway Court
Fremont, CA 94539
USA

Phone: 1+510-252-1462

Fax: 1+510-252-1695

Email: supportcvni@comtechefdata.com

Web: www.comtechefdata.com

Return Material Authorization

Any equipment returned to Vipersat must have a Return Material Authorization (RMA) issued prior to return. To return a Comtech Vipersat Networks product for repair or replacement:

- Obtain an RMA form and number from Vipersat Customer Support.
- Be prepared to supply the product model number and serial number of the unit.
- To ensure safe shipping of the product, pack the equipment in the original shipping carton.

Reader Comments / Corrections

If the reader would like to submit any comments or corrections regarding this manual and its contents, please forward them to a Vipersat Customer Support representative. All input is appreciated.

{ *This Page is Intentionally Blank* }

CHAPTER

2

QUICK START CONFIGURATION

Introduction

This chapter describes the minimum configuration of a Vipersat CDD-56X Series Demodulator Router that is necessary in order for the equipment to function in a Vipersat network.

The Vipersat CDD-56X Demodulator Router stores its configuration in an ASCII file named the **PARAM** file. Equipment Configuration is typically performed through the use of the Command Line Interface (CLI), particularly the initial configuration. Once the equipment is functioning in the network, additional configuration can be performed via the VMS.

Refer to Chapter 3, "Using the Command Line Interface (CLI)", for a detailed description on the usage of this feature.

This manual covers the configuration specifics of the CDD-56X when used in a Vipersat network. Refer to the *CDD-564L L-band Quad Demodulator Installation and Operation Manual* for general instruction on setting up, installing and configuring this equipment.

NOTE

Note: Before attempting to configure a CDD-56X to be used in a Vipersat network, make certain it has the Vipersat option installed and enabled.

Initial Configuration

NOTE

Note: Many of the settings required for equipment configuration are based on the LAN/WAN and Satellite network design, and should be obtained from the network administrator.

Terminal Connection

These procedures are performed using the CLI from a workstation connected to the CDD-56X either via a direct connection to the **Console** port (a console cable is shipped with each unit), or via a telnet connection to the **Traffic 100** port. Alternatively, HyperTerminal or any of the other connection methods described in the *CDD-564L L-band Quad Demodulator Installation and Operation Manual* may be used.

Make a terminal connection to the target CDD-56X demodulator/router. If connecting via the Traffic 100 Ethernet port (do **not** use the M&C port), enter the IP address of the unit. The factory default IP address for a Vipersat enabled unit is **192.168.254.2**. Configure the terminal for VT-100 emulation mode. Once a terminal connection has been made, the CDD-56X will respond with a Login prompt. The factory defaults are:

Login: **comtech**

Password: **comtech**

Once the operator has logged in, the **Main Menu** shown in figure 2-1 is displayed.

Network Role

The first and most important step prior to configuring the CDD-56X is to define its network role.

The CDD-56X is a flexible network component able to perform different functions depending on how it is used in a network. The role that is defined for each CDD-56X will determine what functions are available for each unit to fill its role. Refer to the section “Unit Role” on page 3-35, and the following section “Expansion Unit”, for details on setting a CDD-56X’s network role. Table 2-1 lists the network roles and the corresponding network functions for which the CDD-56X can be configured.

Table 2-1 CDD-56X Network Roles and Functions

		Demod			
Role / Location	**Expansion**	**1**	**2**	**3**	**4**
Hub	No	STDMA	SCPC	SCPC	SCPC
Hub	Yes	SCPC	SCPC	SCPC	SCPC
Remote	Yes	SCPC	SCPC	SCPC	SCPC

Setting Vipersat CDD-56X Operating Parameters

The following is an example of using the CLI to bring a Vipersat CDD-56X with factory default settings to the configuration which allows the Vipersat functions to be accessible.

Set the Feature Configuration

The operating parameters that will be configured in the target CDD-56X are, in part, determined by the role the CDD-56X is to fill in the network, as shown in table 2-1 and table 2-2.

Use the following procedure to configure a CDD-56X to the network role it is to fill in a Vipersat network.

1. From the **Main Menu** shown in figure 2-1, select the **Administration** command by entering **A** at the command prompt.

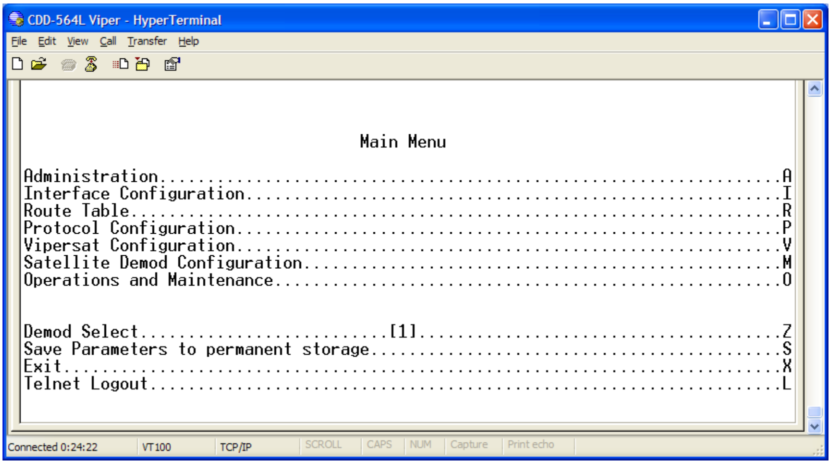


Figure 2-1 Main Menu screen

2. From the **Administration** screen shown in figure 2-2, select the **Features Configuration** command by entering **F** at the command prompt.

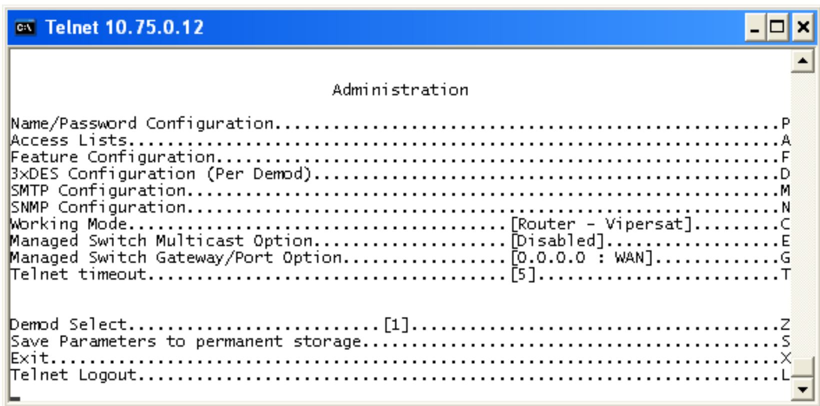


Figure 2-2 Administration screen

3. From the **Feature Configuration** menu shown in figure 2-3, verify whether or not the Vipersat Feature Codes are **Available** (appears as shown in the figure). These codes are entered prior to shipment from the factory; however, if the codes display as **Unavailable**, they will have to be re-entered.

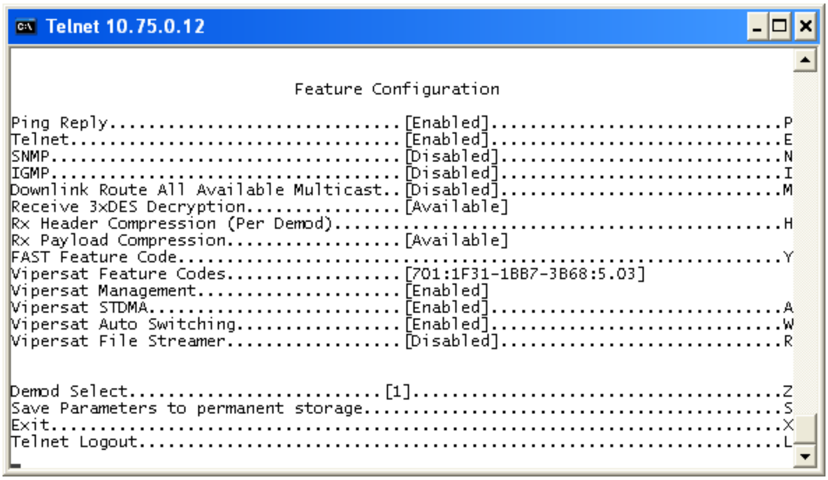


Figure 2-3 Feature Configuration screen

To enter the feature code, enter **Y** at the command prompt, then enter the 20 digit **FAST Feature Code**, as shown in figure 2-4.

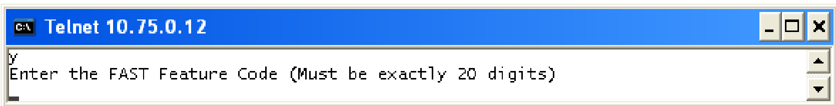


Figure 2-4 FAST Feature Code dialog

Tip: The network administrator will have the FAST Feature codes. These are generated and stored by the unit serial number for the target CDD-56X. The target unit's serial number can be found on the rear of the unit chassis.

4. After entering the FAST Feature code, return to the Administration screen, shown in figure 2-2, and ensure that the **Working Mode** is set to **Router-Vipersat**.

   If it is not, enter **C** and change the setting by selecting **4**, as shown in figure 2-5. The unit will reboot automatically in order to implement the change for this setting.

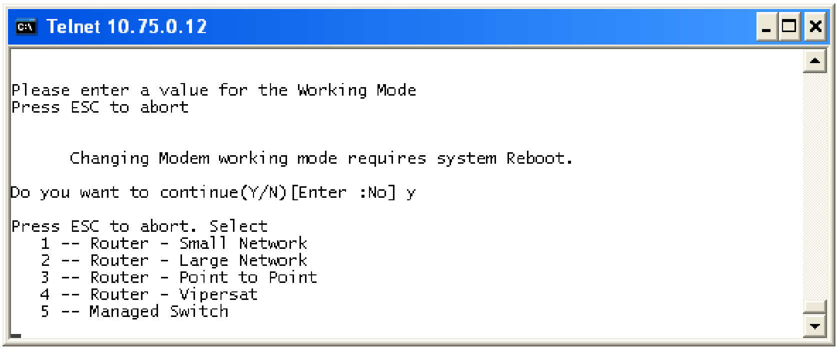


Figure 2-5 Working Mode dialog

5. When the reboot is completed, return to the Feature Configuration menu and configure the settings for **Vipersat STDMA** and **Auto Switching** according to the table below.

Table 2-2 Vipersat Feature Configuration

Unit Role	Vipersat	STDMA	Auto Switching
Hub	Enabled	Enabled	(optional) Enabled
Hub Expansion	Enabled	Disabled	Disabled
Remote Expansion	Enabled	Disabled	Disabled

6. Save the settings to flash by entering **S** at the command prompt.

Set the IP Address

1. From the Main Menu, enter **I** to access the **Interface Configuration** menu screen, then enter **E** to access the **Ethernet Interface** screen.

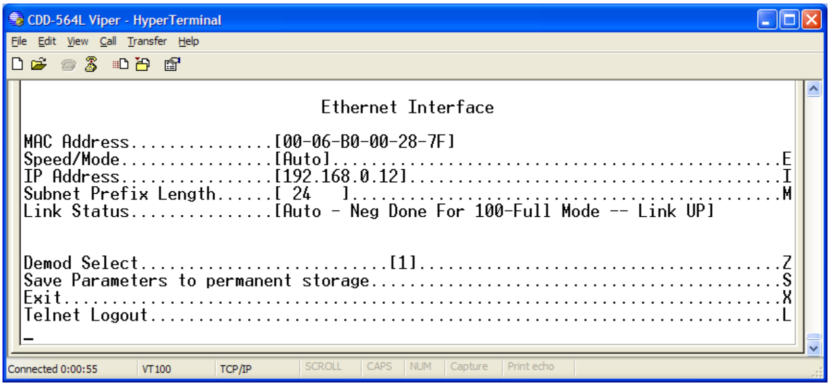


Figure 2-6 Ethernet Interface screen

2. Enter **I** at the command prompt, and enter the **IP address** for this unit.

3. Save the settings to flash by entering **S** at the command prompt.

Configure the Route Table

Routing in a Vipersat Network

CDD-56X Demodulator Routers operating in Vipersat mode do not use the small or large network described in the *CDD-564L Installation and Operation Manual*. There is no HDLC address in a Vipersat network; instead, the CDD-56X role designation — Hub or Remote, Expansion unit or not — determines routing rules that prevent multicast loops. This simplifies the configuration of a Vipersat network.

Because satellite networks are often used as extensions for access to services such as the Internet or the PSTN, they lend themselves quite readily to private addressing. For example, to provide Internet access to the satellite network, only the Hub requires a public IP address in order for the entire satellite network that is controlled by the Hub to have access to the Internet backbone. Utilizing Network Address Translation (NAT), the administrator can effectively address the network using a minimum number of static route statements.

Example:

The IP address 172.16.0.0 is the private address network number for class B networks. If there is a router at the Hub with a connection to the Internet, the operator can define the local network as a class B. If the operator splits the Class B in half and points the upper half toward the satellite there will be over 16000 usable addresses at the Hub as well as at the Remotes. For details on IP addressing, refer to Appendix A, "Network Addressing".

By putting the one route statement “Remotes 172.16.128.0/17 Wan to Sat” in the TDM Hub modem, and by using the route statement “GW 0.0.0.0/0 Wan to Sat” at each of the remote modems, the network will successfully route packets. The remotes can then be sub-netted as class C networks or below. Additional routers at the remotes can be added for unusually large sites, allowing an additional layer of NAT without requiring any more explicit routing within the Vipersat Modem/Routers.

Refer to the *CDD-564L Installation and Operation Manual* for additional information on entering routes.

Creating the Routes

The following procedure outlines the basic route structure that the target CDD-56X will require for its role in the network. One of the key routes that must be created is a gateway address for routing the data traffic that is received by the unit.

1. From the **Main Menu** shown in figure 2-1, select **Route Table** by entering **R** at the command prompt.

2. From the **Configuring the Route Table** screen shown in figure 2-7, enter **1** at the command prompt to set the first route that will define the default gateway.

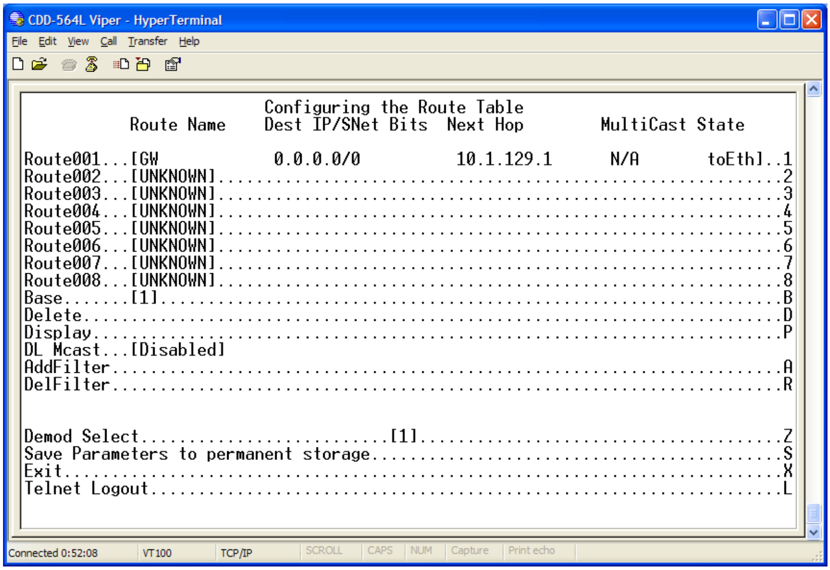


Figure 2-7 Configuring the Route Table screen

In a Hub configuration, the default gateway will typically point to a router on the same LAN as the CDD-56X Hub unit.

In a Remote configuration, the default route will typically point to the satellite modem used for communications back to the Hub.

3. When prompted, enter the **Route Name** (GW), the **IP Address**, the **Number of Bits** in the subnet mask, the **Route Interface** (Ethernet or Satellite), and the **Next Hop** address. The system administrator can supply this information, if necessary.

   In a Hub role, for example, enter the name of the route (e.g., GW), enter **0.0.0.0** for the destination IP address and **0** for the mask, enter **E** for Ethernet interface, then enter the **IP address** of the appropriate router or modem for the next hop.

4. Enter **S** at the command prompt in figure 2-7 to save the settings to flash.

Set the Satellite Demod Configuration

1. Enter **M** from the **Main Menu**, then enter **C** from the **Satellite Demodulator** menu to access the **Configuration** screen.

2. Enter **R** to access the **Rx Configuration** screen shown in figure 2-8. Set the Rx parameters for **Frequency**, **Data Rate**, **FEC**, **Code Rate**, and **Modulation** as specified by the network administrator.

   The Receive parameters must be set for each Demod. Enter **Z** at the command prompt to select the desired Demod, then set the Receive parameters for that Demod. Repeat for each Demod.

Note: Only **Turbo** Product Coding is acceptable for FEC when the CDD-56X is running in Vipersat mode.

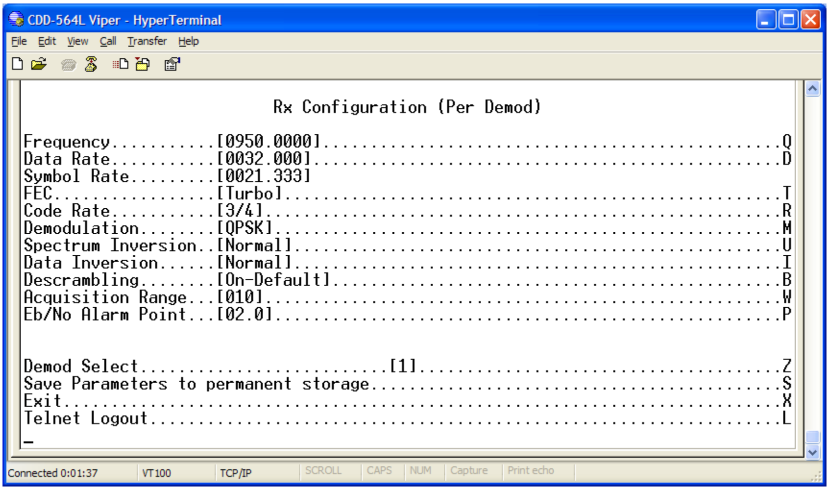


Figure 2-8 Rx Configuration screen

3. Save the settings to flash by entering **S** at the command prompt.

Set the Vipersat Configuration

1. Enter **V** at the **Main Menu** command prompt (figure 2-1) to select the **Vipersat Configuration** menu shown in figure 2-9.

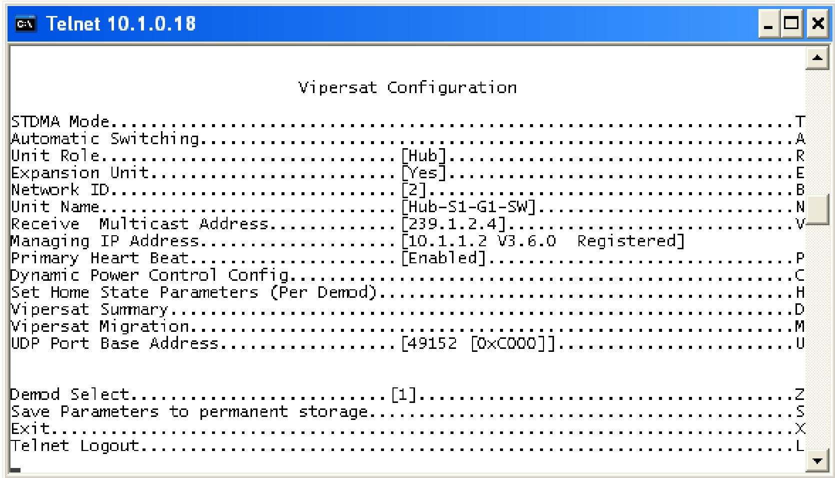


Figure 2-9 Vipersat Configuration screen (Hub)

2. Enter **R** at the command prompt to toggle the **Unit Role** to either **Hub** or **Remote**.
   This parameter will determine the role the target CDD-56X will perform in the network and what type of commands and functions it will receive from the VMS.

3. Enter **E** to set the **Expansion Unit** value to either **Yes** or **No**.
   When configured as an Expansion unit, either as a Hub (switched) or as a Remote (mesh), the CDD-56X is set up so that all Demods are in SCPC mode and available as resources for dedicated communications with the other end of the satellite link.

4. Enter **B** at the command prompt to set the **Network ID**.
   The Network ID that is assigned to the unit defines to what network the target CDD-56X will belong. All units used in a network will have the same Network ID. This parameter is used by the VMS to identify units common to a network and allows the VMS to manage multiple networks, each with its own unique network ID number.

5. Enter **N** at the command prompt to set the **Unit Name**.

6. Enter **V** at the command prompt to set the **Receive Multicast Address**.
   This IP address is the multicast address assigned to the VMS and to all units in the network that are managed by the VMS. The Receive Multicast Address of this CDD-56X must match the Transmit Multicast Address that has been assigned to the VMS.

7. Enter **I** at the command prompt to set the **Managing IP Address**. The Managing IP Address is the IP address of the VMS server.

8. Enter **H** to go to the **Home State Configuration** menu screen, then enter **W** to set the current configuration as the Home State.

9. Save the settings to flash by entering **S** at the command prompt.

This completes the initial configuration of a CDD-56X from the factory default settings to a functioning, Vipersat-enabled unit. Additional configuration parameters must be set depending on the network requirements for a specific application.

Refer to Chapter 3, “Using the Command Line Interface (CLI)”, for additional details on configuring the target Vipersat CDD-56X.

CHAPTER

3

USING THE COMMAND LINE INTERFACE (CLI)

General

This chapter describes the use of the CLI for configuring and monitoring the CDD-56X Demodulator/Router in a Vipersat network. Each CLI screen related to a CDD-56X operating in Vipersat mode is presented, along with a detailed description of the available commands. For descriptions of all other screens, refer to the *CDD-564L L-Band Quad Demodulator Installation and Operation Manual*.

Access to the CLI is provided through either the **Console** port (local, RS-232) or the 10/100BaseT Ethernet **Traffic** port (Telnet, IP). Access via Telnet requires login with password, Console access does not require login. The screens presented in this document are as they appear when the CDD-56X is accessed using Telnet.

When a Telnet terminal connection is made, the CDD-56X responds with a Login prompt. The factory defaults are:

Login: **comtech**

Password: **comtech**

Once the operator has logged in, the **Main Menu** shown in figure 3-1 is displayed.

Common Screen Commands

The following commands appear on each of the menu screens:

Demod Select

Some feature configurations apply to the CDD-56X as a unit, others are set on a **per Demod** basis. This command (enter **Z**) allows the selection of one of the two (CDD-562L) or four (CDD-564/564L) Demodulators.

Save Parameters to Permanent Storage

To **Save** the current parameter settings to permanent storage, enter **S** at the command prompt. This command saves all data that has been entered from any of the CLI screens since the last save was executed. Exiting a screen without saving after parameters have been changed does not mean that the changes are not applied. However, if these changes are not saved prior to a system reset or power cycle, they will be lost.

Exit

To **Exit** the current menu screen and return to the previous screen in the menu tree, enter **X** at the command prompt.

Telnet Logout

Enter **L** at the command prompt to **Logout** of the Telnet session. This command appears only when connected via Telnet.

Menu Descriptions

This section details the CLI menus and associated screens, and briefly discusses the function of each of the commands available on each menu.

Main Menu

The **Main Menu**, shown in figure 3-1, allows configuring both the Demodulator and Router functions of the target CDD-56X.

Note: The menu item **Vipersat Configuration** shown in figure 3-1 will only be displayed if the target CDD-56X has had the Vipersat option enabled as described in the section “Setting Vipersat CDD-56X Operating Parameters” on page 2-3.

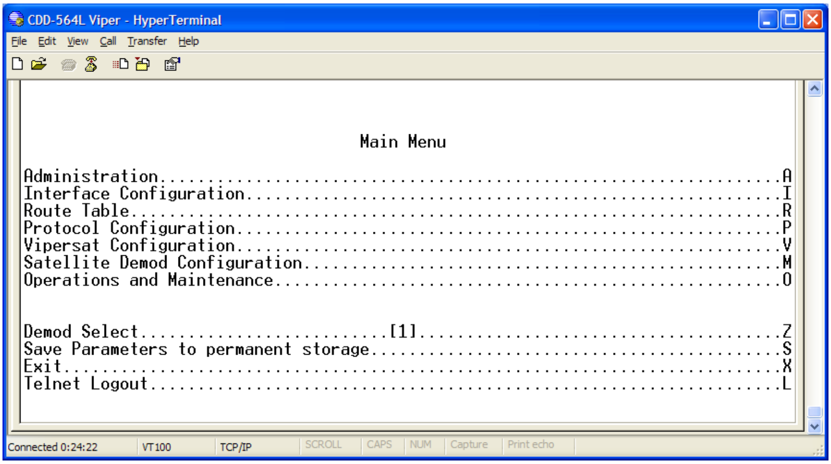
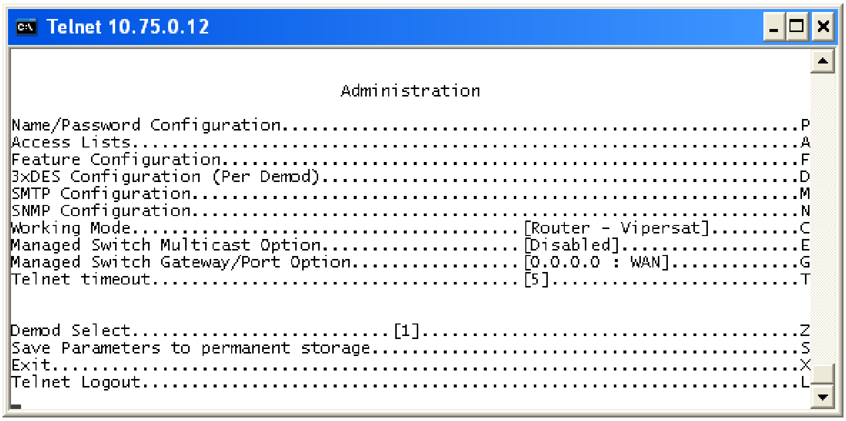


Figure 3-1 Main Menu screen

A Vipersat CDD-56X is normally shipped with the Vipersat option enabled. The CDD-56X configuration can be determined by whether or not the command line **Vipersat Configuration** is displayed on the menu, as shown in Figure 3-1.

Administration

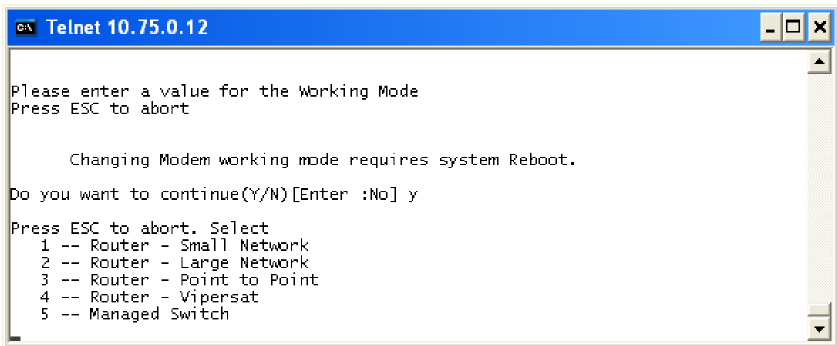
The **Administration** menu provides access to the major Vipersat CDD-56X features and commands. Entering an **A** at the prompt in the **Main Menu**, shown in figure 3-1, displays the **Administration** screen shown in figure 3-2.



```
Telnet 10.75.0.12

                                   Administration

Name/Password Configuration.....................................................P
Access Lists....................................................................A
Feature Configuration...........................................................F
3xDES Configuration (Per Demod).................................................D
SMTP Configuration..............................................................M
SNMP Configuration..............................................................N
Working Mode.....................................[Router - Vipersat].........C
Managed Switch Multicast Option..................[Disabled]..................E
Managed Switch Gateway/Port Option...............[0.0.0.0 : WAN].............G
Telnet timeout...................................[5]..........................T


Demod Select..........................[1]......................................Z
Save Parameters to permanent storage............................................S
Exit............................................................................X
Telnet Logout...................................................................L
```

Figure 3-2 Administration screen

Ensure that the **Working Mode** is set to **Router-Vipersat**. If it is not, enter **C** at the command prompt and change the setting by selecting **4**, as shown in figure 3-3. The unit will reboot automatically in order to implement the change for this setting.



```
Telnet 10.75.0.12

Please enter a value for the Working Mode
Press ESC to abort


      Changing Modem working mode requires system Reboot.

Do you want to continue(Y/N)[Enter :No] y

Press ESC to abort. Select
   1 -- Router - Small Network
   2 -- Router - Large Network
   3 -- Router - Point to Point
   4 -- Router - Vipersat
   5 -- Managed Switch
```

Figure 3-3 Working Mode dialog

Note: If the Router-Vipersat option does not appear as a selection, the Vipersat Feature Code has not yet been entered into this unit. Input the Vipersat code as described in the next section..

From the Administration menu, enter an **F** at the prompt to display the **Feature Configuration** screen shown in figure 3-4.

Feature Configuration

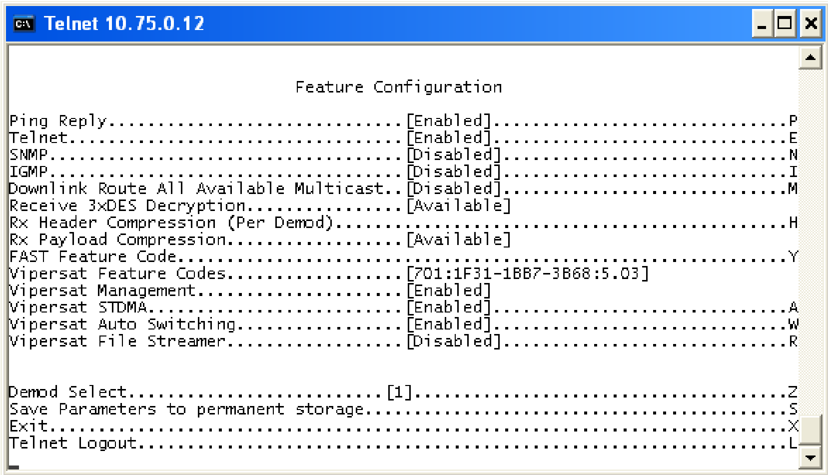


Figure 3-4 Feature Configuration screen

The **Feature Configuration** screen shown in figure 3-4 allows the **Enabling** and **Disabling** of the major Vipersat CDD-56X features.

Use this screen to enable and disable Vipersat features such as:

- **Vipersat STDMA** — Burst mode operation
- **Vipersat Auto Switching** — Allows switching to SCPC mode
- **Vipersat File Streamer** — Rapid file transfers over satellite network

NOTE

Note: These Vipersat features must be Enabled or Disabled using this menu. They are not accessible from the Vipersat Configuration menu.

Vipersat Feature Codes

From the Feature Configuration menu, verify whether or not the Vipersat Feature Codes are **Available** (appears as shown in figure 3-4). These codes are entered prior to shipment from the factory; however, if the codes display as **Unavailable**, they will have to be re-entered. To enter the FAST Feature code, enter **Y** at the command prompt.

The Vipersat FAST Feature Codes can be entered as 20 hexidecimal digits at the command prompt as shown in figure 3-5.

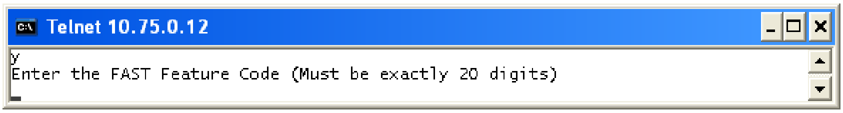


Figure 3-5 FAST Feature Code dialog

Tip: Contact either the network administrator or Comtech Vipersat Networks Customer Support to obtain the Feature codes. A convenient option is to use the Vipersat Vload utility to manage Feature codes.

Vipersat Management

This item is an information-only display, and indicates whether **Vipersat Management** is Enabled or Disabled in the target CDD-56X. Activation of the Vipersat Feature Code automatically enables the Vipersat Management feature.

Caution: This command must be **Enabled** in order to utilize any of the Vipersat capabilities of the CDD-56X.

Vipersat STDMA

In order to utilize the **Vipersat STDMA** feature (burst mode) in the target Vipersat CDD-56X, this feature must be **Enabled**. Enter **A** at the command prompt to toggle On or Off.

Refer to table 2-2 for the relationship between Unit Role and STDMA. This feature should only be enabled for a unit that is used as a Hub with no expansion (i.e., a Burst Controller).

NOTE

Note: Although the CDD-56X has multiple demods, STDMA is configurable for only one demod. When this parameter is enabled, Demod 1 is set for STDMA mode and the remaining demods are set for SCPC mode.

Vipersat Auto Switching

The **Vipersat Auto Switching** feature allows the CDD-56X to automatically adjust to varying bandwidth demands in the Vipersat network by switching between STDMA and SCPC connections. This feature should only be enabled for a unit that is used as a Hub with no expansion, and that will be required to send switching requests to the VMS in response to either traffic type (Application switching) or network traffic loads (Load switching). Refer to table 2-2 for the relationship between Unit Role and Auto Switching.

To activate the Vipersat Auto Switching capabilities of the target CDD-56X, toggle the Auto Switching command to **Enabled** by entering **W** at the command prompt.

See the section “STDMA/SCPC Automatic Switching” on page 3-29 for more details on the use of this feature. For additional information, refer to Appendix B, “Automatic Switching”.

Vipersat File Streamer

Vipersat File Streamer (VFS) is an optional feature that allows rapid file transfers over the satellite network between host PCs that are running the client VFS application. To activate the Vipersat File Streaming capabilities of the CDD-56X, toggle this command to **Enabled** by entering **R** at the command prompt.

Once the parameters on the Feature Configuration screen have been set as desired, return to the Main Menu and enter the **V** command to display the **Vipersat Configuration** screen shown in figure 3-6.

Vipersat Configuration

Entering **V** at the prompt from the CDD-56X **Main Menu** shown in figure 3-1 displays the **Vipersat Configuration** menu shown in figure 3-6.

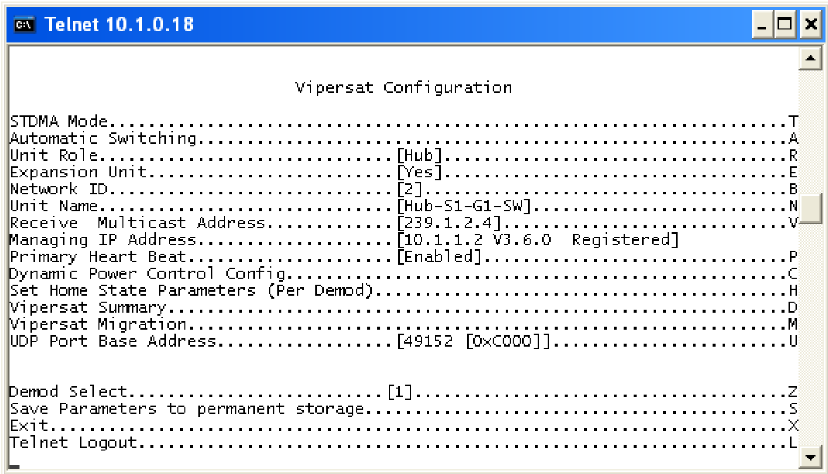


Figure 3-6 Vipersat Configuration screen (Hub)

This menu lists the available commands for configuring a Vipersat CDD-56X. Note that for the Hub unit only, the command **Primary Heart Beat** is displayed in the Vipersat Configuration screen. For the Remote unit only, the status of the **Home State Revert** setting is displayed.

Each of these commands is explained in the following sections.

STDMA Mode

The **STDMA Mode** parameters for this CDD-56X are accessed by entering **T** at the **Vipersat Configuration** screen command prompt.

The items in the **STDMA** menu will vary depending on the function the target CDD-56X performs in the network. The STDMA screen shown in figure 3-7 is from a CDD-56X serving as a Hub with STDMA in the network.

For comparison, the STDMA screen for a CDD-56X operating in SCPC mode (either as a Hub expansion unit or as a Remote mesh unit) is shown in figure 3-8. Note that many of the options available for a CDD-56X operating with STDMA are not available when configured for SCPC. This is because STDMA is disabled for these two role configurations and the options displayed on this screen do not apply.

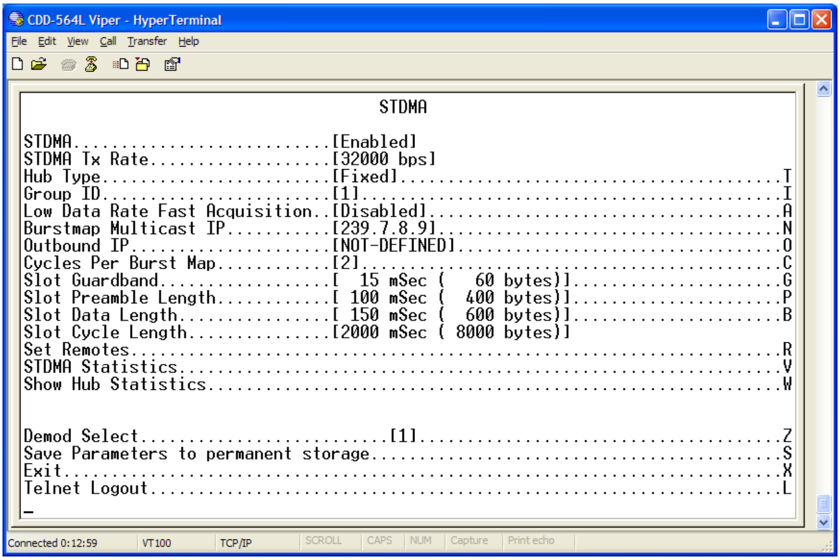


Figure 3-7 STDMA screen (Hub, STDMA, Fixed type)

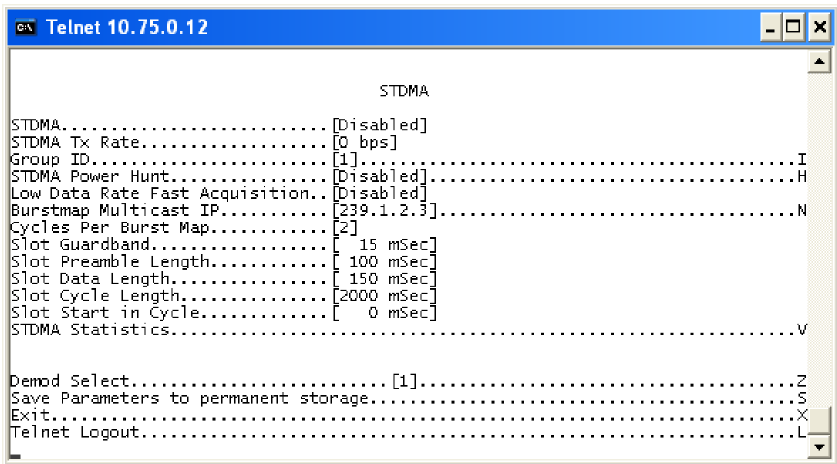


Figure 3-8 STDMA screen (Hub/Remote, SCPC)

STDMA

This menu item is read-only and shows the current state of **STDMA** in the CDD-56X. In order to change the STDMA state, refer to the section “Feature Configuration” on page 3-5.

STDMA Tx Rate

This menu item shows the STDMA Transmit Rate (in bps) of data that the CDD-56X receives. This item is read-only and cannot be modified in this menu.

Hub Type

This menu item is only displayed if the CDD-56X is being used as a Hub in the network, and provides the functionality for the STDMA Burst Controller. Vipersat STDMA has five modes of operation:

- **Fixed** — all remotes get the same data slot time (slot size) in the cycle, regardless of activity. Cycle time is fixed also.
- **Dynamic Slot** — data slot time of remotes vary according to activity, cycle time does not.
- **Dynamic Cycle** — slot time and cycle time vary according to activity of remotes.
- **GIR** (Guaranteed Information Rate) — each remote always has at least the minimum data slot size when needed, and cycle time is variable up to a maximum of one second.
- **Entry Channel** — remotes run in SCPC mode, but STDMA is used for maintenance and control channel.

The Hub can be configured to operate as one of the five types by entering a **T** at the command prompt to display the dialog shown in figure 3-9.

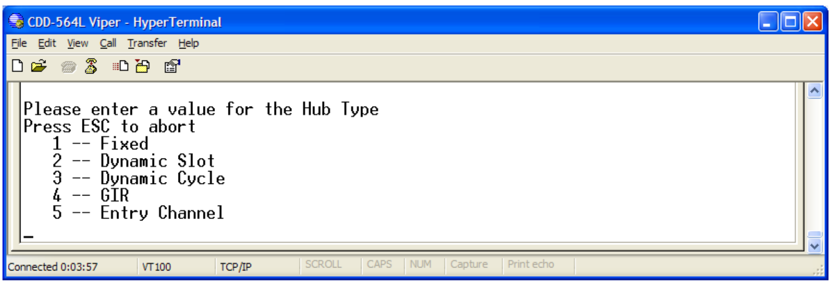


Figure 3-9 Hub Type prompt

This selection determines whether available bandwidth will be a static (fixed) assignment, or whether bandwidth allocation will be dynamic with automatic switching to dynamically optimize bandwidth utilization.

1 – Fixed

In the **Fixed** mode, all remotes have the same data slot size regardless of type of traffic or load. This mode minimizes the amount of jitter between remote transmission times, and is useful for tuning STDMA as well as for troubleshooting purposes.

2 – Dynamic Slot

In the **Dynamic Slot** mode, slot size is adjusted each cycle depending on the activity during the previous cycle. The slot size for each remote is computed based on the time (at the current data rate) needed to transmit all the bytes in queue. If the result is less than the minimum slot size or more than the maximum slot size, the slot is adjusted accordingly. This mode allows the burst controller to provide additional slot time in the cycle to remotes with higher traffic demands, and helps to alleviate congestion.

3 – Dynamic Cycle

In the **Dynamic Cycle** mode, available bandwidth is allocated to remotes proportionally based on their current bandwidth needs. The bandwidth requirements are determined by the number of bytes in queue for each remote divided by the total number of bytes in queue for all remotes to determine the percentage of bandwidth to allocate for each remote. This mode provides improved efficiency of STDMA due to faster cycle times during periods of light traffic demands, thus providing minimum latency for the current load.

4 – GIR

In the **GIR** mode, the initial computed slot size value is the same as in the Dynamic Cycle mode except there is no maximum limit. After all remotes have been assigned slots, the burst map is checked to see if the total cycle length exceeds one second. If not, then all requirements are satisfied and the burst map is complete. However, if the cycle is greater than one second, then the slots are adjusted proportionally so that all remotes receive at least their guaranteed rate plus whatever excess is still available.

GIR mode allows guaranteed information rates to be set for each remote in the group. When the one second restriction is exceeded, remotes without a specified GIR are reduced to the global minimum slot size and the remaining bandwidth is distributed to remotes that have been assigned a GIR rate, thus ensuring additional bandwidth to these units when needed.

NOTE

Note: GIR allocations are restricted so that assigned GIR totals cannot exceed the available bandwidth to insure proper bandwidth allocation when the network is overloaded.

The GIR setting for each Remote is specified using the STDMA Remote Policies screen (refer to the section “Set Remote Policies” on page 3-21). When combined with Auto switching, GIR allows trigger points to be set where the Remote will jump out into SCPC mode. This is done using the Load Switch setting. Note that, for this function, Auto switching must be Enabled on this Hub unit, and corresponding Remote modems must be configured with Auto switching and Load switching Enabled. Also, the settings for Step Up and Step Down Threshold values should be adjusted as necessary for the application.

5 – Entry Channel

The **Entry Channel** mode provides remotes in the group with a shared channel in which they can gain initial access to the network. Since very small STDMA data rates are required in this configuration, a larger number of remotes can share the cycle. As soon as the Hub receives an STDMA ACK from the Remote, it initiates an immediate switch to SCPC mode based on the policy set for that Remote. Note that the switch occurs as soon as the Hub receives an ACK even though there may not be traffic at that time. The persistence of the link will be determined by the unit’s flag settings.

When choosing Entry Channel as the Hub type for the STDMA Controller, the Auto switching feature must be Enabled on this Hub unit, and switching policies for the remotes must be configured (refer to the section “Set Remote Policies” on page 3-21). Corresponding Remote modems must be configured with Auto switching and Load switching Enabled. Note that the settings for Step Up and Step Down Threshold values should be adjusted as necessary for the application.

This mode is designed to accommodate the needs of a Remote that will not be continuously connected to the network, but which has the need to be able to make an on-demand connection when required, such as in a mobile application. In the event of a power outage, Entry Channel provides a bandwidth-efficient method for remotes with low latency requirements to re-enter the network once power is restored.

Refer to Appendix B, “Automatic Switching”, for additional information on how each of the bandwidth allocation modes functions and the parameters used to calculate the commands for each mode.

Group ID

The STDMA **Group ID** number defines a group of equipment (including CDD-56X Hub and Remote units) that will respond to the output of a single STDMA burst controller. This group is addressable within a network which, in turn, is defined by the Network ID number assigned to the CDD-56X.

Allocation of bandwidth is shared among the remotes in an STDMA group. Depending on the number of remotes in a network, a Hub may have multiple burst controllers, each with its own set of remotes. This is accomplished by assigning a unique Group ID number to each controller and its associated remotes.

Note: The STDMA Group ID number and the Network ID number are independent. There can be multiple STDMA groups within a single network.

The target CDD-56X Group ID can be modified by entering an **I** at the command prompt to display the dialog shown in figure 3-10.

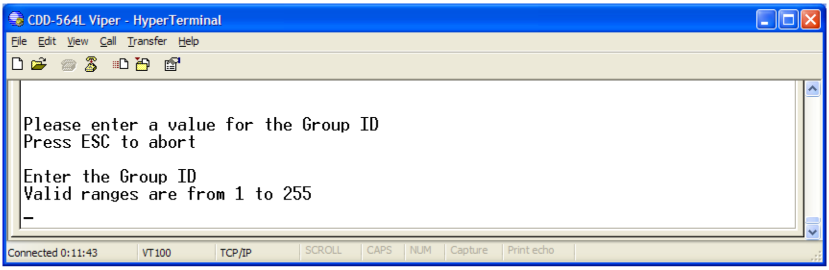


Figure 3-10 Group ID prompt

STDMA Power Hunt

This menu item appears for Remote modems only.

Should link reception from a Remote be incorrect or impaired (e.g., poor environmental conditions), the **STDMA Power Hunt** feature is an option on the Remote modem that automatically adjusts the Remote transmit power to ensure that burst map acknowledgements from that unit are received by the Hub burst controller. When enabled, the burst controller sets a flag in the burst map that indicates it is not receiving acknowledgements from an enabled Remote. When the Remote receives the burst map, it will see the flag and automatically increase power by 3 dB above the default or Home State setting. If this closes the link, the burst controller will clear the flag. Note that if the 3 dB increase is more than is necessary, DPC will make a down adjustment to the appropriate level and this adjustment will be added to the DPC Offset.

This feature option is Enabled/Disabled by entering **H** at the command prompt.

Low Data Rate Fast Acquisition

This parameter is operator configurable only for units that are *Hub with STDMA* (No Expansion). The menu item is a toggle used to Enable or Disable the Vipersat **Burst Fast Acquisition Timing (BFAT)** feature that functions at low data rates (64 kbps to 256 kbps). This feature allows for significantly faster acquisition times at these data rates, even with higher noise, resulting in improved efficiency of the shared STDMA channel. Since signal lock is faster at higher data rates, BFAT is not active above 256 kbps.

Entering **A** at the command prompt will toggle this feature On or Off.

This feature requires Router firmware version 1.5.3 or later. The unit configuration must be set for operation at either 3/4 QPSK or .95 QPSK in order to utilize BFAT.

Burstmap Multicast IP

This menu item is used to define the IP address for the Burstmap Multicast that is sent out by the STDMA burst controller at the Hub to all of the associated remotes in that group. This address must be the same for all members of the goup. The burstmap is a proprietary message sent from the Hub to all remotes, at regular intervals, specifying the relative start time and duration for each terminal to transmit.

To change the current address, enter **N** at the command prompt to display the dialog shown in figure 3-11.

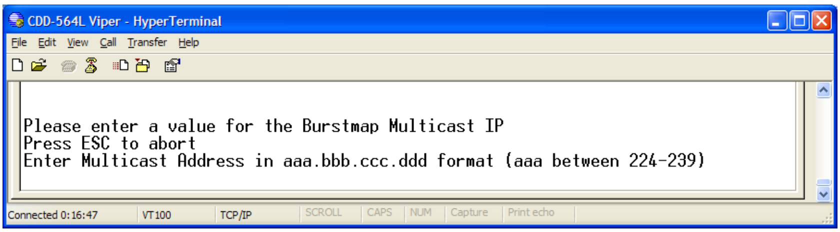


Figure 3-11 Burstmap Multicast IP prompt

Outbound IP

This menu item, which appears for all Hub configurations, displays the current Outbound IP address. This specifies the Hub device that is supplying the TDM outbound to the satellite (typically a CDM-570L). Specifying this address is necessary for Hub configurations that utilize a burst controller (such as the CDD-56X) that is a separate device from the TDM modem.

This address must also be defined when the DPC feature is to be used. The Outbound IP address will be the same as the burst controller IP address when the burst controller and the TDM modem are the same device.

To define the TDM outbound address, enter **O** at the command prompt to display the dialog shown in figure 3-12.

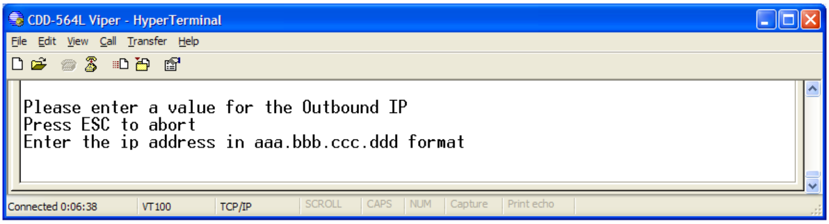


Figure 3-12 Outbound IP prompt

Cycles Per Burst Map

This menu item, which appears for all Hub types *except Dynamic Cycle and GIR*, displays the number of spin cycles that will occur prior to each broadcast of the Burst Map by the burst controller to the remotes. One cycle is the amount of time it takes for all remotes in a group to burst on the common channel. The burst map provides each remote with its allocated bandwidth and position in the cycle.

For Dynamic Cycle and GIR configurations, the number of cycles is automatically set to one in order to ensure optimum performance for these Hub types.

This parameter can be modified by entering a **C** at the command prompt to display the dialog shown in figure 3-13.

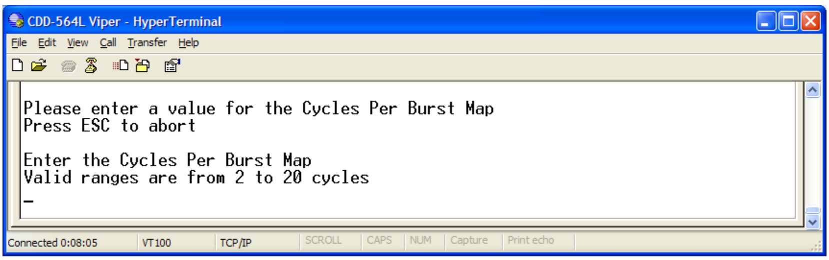


Figure 3-13 Cycles per Burst Map prompt

Slot Guardband

This menu item, which appears for all Hub configurations, displays the current length of the Slot Guardband in milliseconds and in bytes for the remotes in the group. The Slot Guardband is the amount of time between the point when one remote completes transmitting data and the point when the next remote in the cycle begins transmitting. This prevents the remote from overrunning the next terminal in the cycle. The setting for this parameter should be obtained using the Vipersat STDMA calculator.

This value can be modified by entering a **G** at the command prompt to display the dialog shown in figure 3-14 and entering a new value.

Figure 3-14 Slot Guardband prompt

Note: The value entered at the command line in figure 3-14 is in milliseconds. The corresponding value expressed in bytes is calculated by the CDD-56X based on the STDMA transmit bit rate as shown in the menu in figure 3-7.

Slot Preamble Length

This menu item, which appears in all Hub configurations, displays the current Slot Preamble size in milliseconds and bytes for the remotes in the group. The Slot Preamble is the period between when the remote begins to transmit (sends an ACK) to the Hub and when the first data packet is sent. This allows time for signal lock to occur before data is sent, thus preventing data loss. Higher data rates allow for a shorter preamble, since it is easier to achieve signal lock. The setting for this parameter should be obtained using the Vipersat STDMA Calculator.

Note: When the BFAT feature is enabled, the preamble length is set automatically for the unit.

Entering a **P** at the command prompt allows changing the preamble duration in milliseconds.

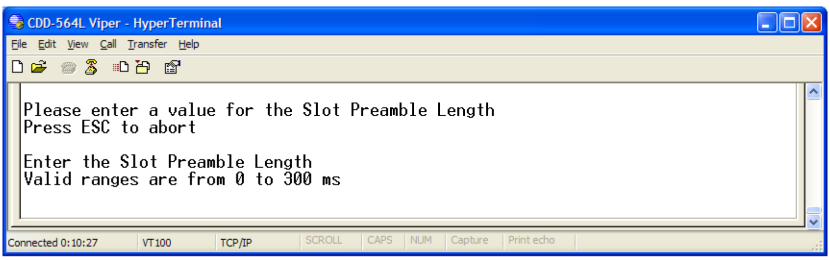


Figure 3-15 Slot Preamble Length prompt

Tip: Refer to the Viper Calculator for determining Slot Preamble Length values to enter at the command prompt. For a copy of the latest Viper Calculator, contact a Comtech Vipersat Networks representative.

Slot Data Length

This menu item, which appears for *Fixed and Entry Channel* Hub types, displays the current **Slot Data Length** in milliseconds and bytes for the remotes in the group, and represents the amount of data that can be transmitted or received in one spin of the STDMA cycle by each of the remotes belonging to that group. This is the amount of time that the remote is provided to send data in the cycle.

To change this setting, enter **B** at the command prompt to display the dialog shown in figure 3-16.

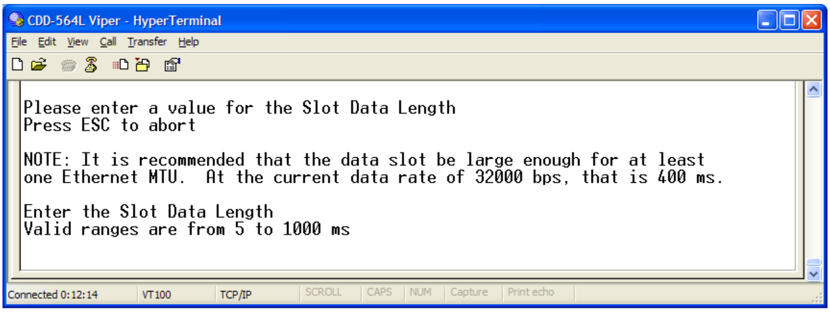


Figure 3-16 Slot Data Length prompt

Nominal Data Length

This menu item, which appears for *Dynamic Slot* Hub type, displays the **Nominal** slot **Data Length** in milliseconds and bytes for the remotes in the group, and represents the approximate amount of data that can be transmitted or received in one spin of the STDMA cycle by each of the remotes belonging to that group. This is the amount of time that the remote is provided to send data in the cycle.

Entering a **B** at the command prompt brings up the dialog shown in figure 3-17 allowing changing the nominal data length, in milliseconds, for the target CDD-56X.

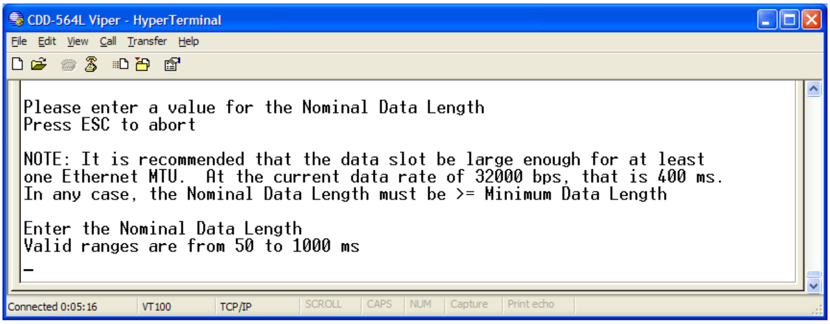


Figure 3-17 Nominal Data Length prompt

Maximum Data Length

This menu item, which appears for *Dynamic Cycle* Hub type, displays the current **Maximum Data Length** in milliseconds and bytes for the remotes in the group, and represents the maximum amount of data that can be transmitted or received in one spin of the STDMA cycle by each of the remotes belonging to that group. This is the maximum amount of time that the remote is provided to send data in the cycle.

To change this setting, enter **B** at the command prompt to display the dialog shown in figure 3-18.

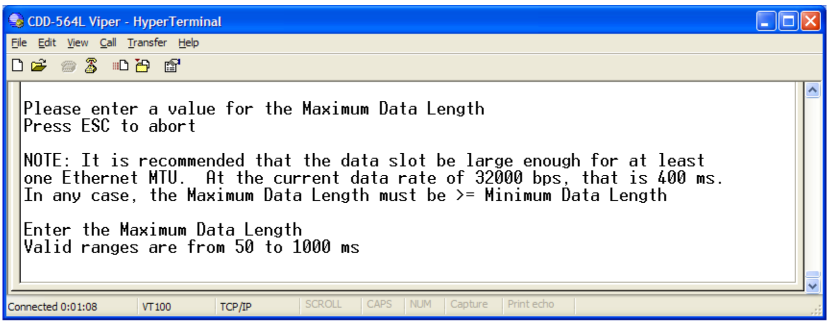


Figure 3-18 Maximum Data Length prompt

Minimum Data Length

This menu item, which appears for all Hub types *except Fixed*, displays the current **Minimum Data Length** in milliseconds and bytes for the remotes in the group, and represents the minimum amount of data that can be transmitted or received in one spin of the STDMA cycle by each of the remotes belonging to that group. This is the minimum amount of time that the remote is provided to send data in the cycle.

Entering an **M** at the command prompt brings up the dialog shown in figure 3-19 allowing the minimum data length, in milliseconds, to be changed for the target CDD-56X.

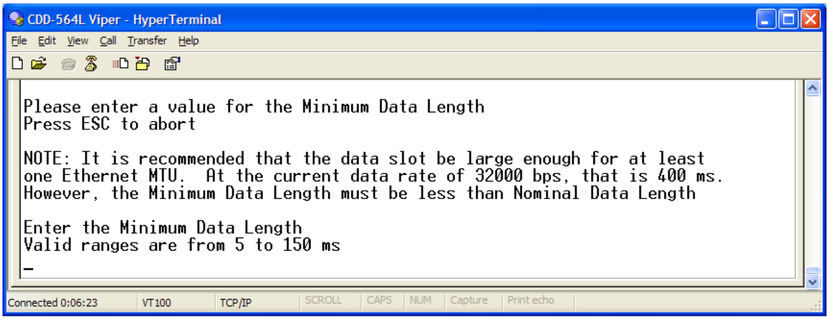


Figure 3-19 Minimum Data Length prompt

Slot Cycle Length

This menu item is for information only and displays the **Slot Cycle Length** in milliseconds and bytes for the remotes in the group. This value represents the total amount of time—preamble, data length, and guardband—allocated to the Remote terminal during one spin cycle.

Slot Start in Cycle

This menu item appears in the STDMA screen when the Unit Role is Remote; however, it is not relevant since a Remote configuration does not enable STDMA.

Set Remotes

This menu item appears in the STDMA screen when the Unit Role is **Hub** with **No Expansion**.

Entering an **R** at the command prompt displays the **STDMA Remotes Menu** as shown in figure 3-20. This screen is used to define and make modifications to the Remotes that belong to the STDMA group for the Hub burst controller, as well as to display the burst map status information for each Remote.

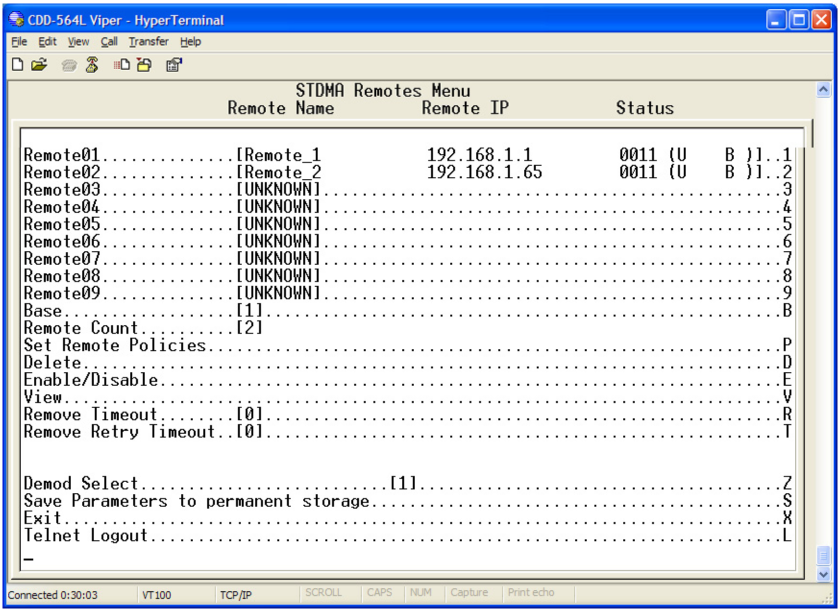


Figure 3-20 STDMA Remotes Menu screen

Adding a Remote to the STDMA Group

Entering the item number for the Remote demodulator/router brings up the dialog shown in figure 3-21. A prompt to enter the **Name** to assign to the Remote unit appears, followed by a prompt to enter the **IP Address** for this unit.

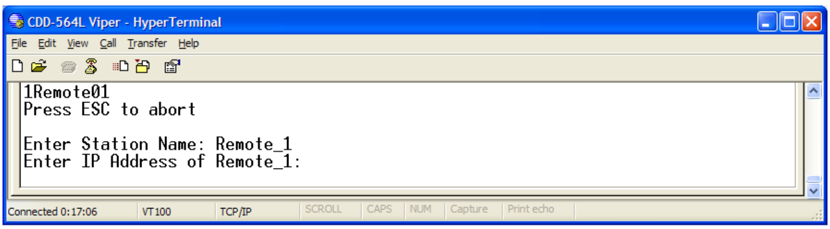


Figure 3-21 Remote Name and IP Address prompt

Once a Remote has been added to the group, its Status in the group is displayed by the use of the following letters:

- **U** = **Used** – This Remote is being used in the burstmap.
  Once a remote has been added to the STDMA group, this status will always be displayed.
- **B** = **Burstmap** – This Remote is currently in the burstmap.
  This status will be displayed unless the remote has been removed (R), disabled (D), or switched (S) out of the STDMA burstmap.

- **R** = **Removed** – This Remote is currently removed from the burstmap. When displayed, this status indicates that the Hub has removed this remote from the burstmap due to a communications fault.
- **D** = **Disabled** – This Remote is currently disabled and is not in the burstmap.
  This status will be displayed when a remote is manually disabled by the operator or administrator.
- **S** = **Switched** – This Remote is currently switched into SCPC mode. When displayed, this status indicates that the VMS has automatically switched the remote out of the burstmap and into SCPC operation.
- **H** = **Home** State Revert – This Remote is not currently receiving burst maps. When a remote, stuck in SCPC mode by failure to receive a VMS revert command, sees the burst map with this flag set, it will automatically revert to its home state and STDMA mode.
- **CF** – This Remote has not sent an acknowledgement to the burst controller since it was enabled.

Base

Entering a **B** at the command prompt in figure 3-20 allows entering the Remote number to start displaying remotes in this menu screen. Entering the number 1, as shown in figure 3-20, displays nine remotes, 1 through 9. If the number 4 had been entered, the display would show the nine remotes starting with Remote 4 (i.e., remotes 4 through 12).

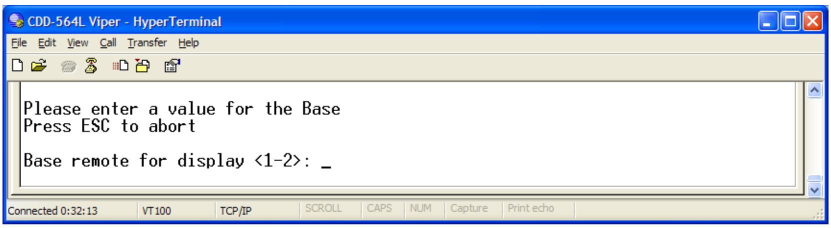


Figure 3-22 Base Remote Display prompt

Remote Count

The **Remote Count** menu item in figure 3-20 is an information-only display showing the total number of Remotes that currently belong to the STDMA group for this Hub burst controller.

Set Remote Policies

This menu item, which appears for *GIR and Entry Channel* Hub types, allows each Remote to be configured for specific data switching conditions. Entering **P** at the **STDMA Remotes Menu** command prompt displays the **Remote Policies** screens shown in figure 3-23 (GIR Hub) and figure 3-25 (Entry Channel Hub).

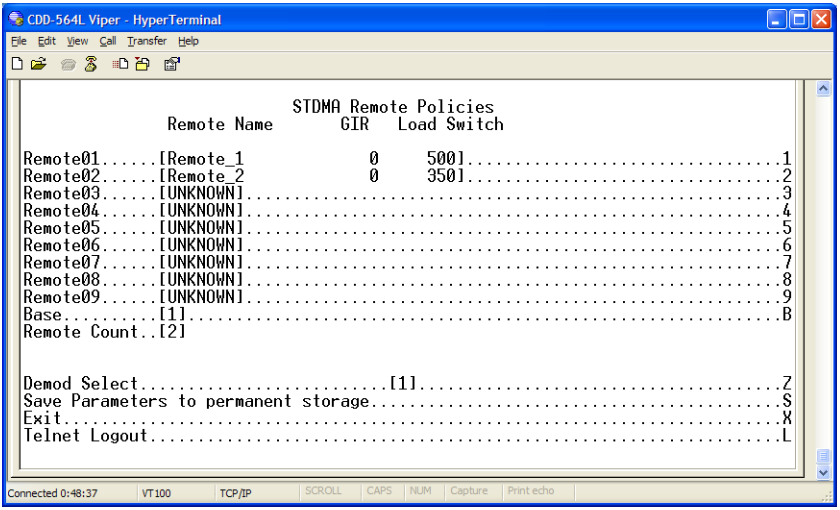


Figure 3-23 STDMA Remote Policies screen (GIR Hub)

Entering the Remote number at the command prompt in figure 3-23 allows the **Guaranteed Information Rate** and the **Automatic Load Switch Rate** for that Remote to be set, as shown in figure 3-24. Note that the Available Bandwidth is displayed for reference in this screen to assist with entering the appropriate rates. The cycle length for GIR is limited to a maximum of one second.

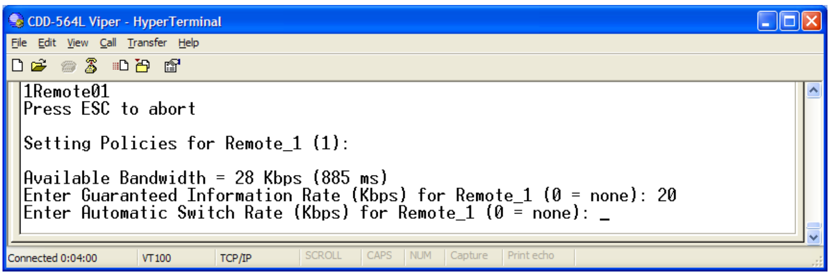


Figure 3-24 GIR Remote Policies prompt

Set the Automatic Load Switch Rate to a value greater than the GIR to allow the Remote to be automatically switched out of STDMA and into SCPC mode when traffic exceeds the GIR. A Switch Rate of **0** will prevent the Remote from being switched out of STDMA and into SCPC mode.

The Remote Policies screen for an Entry Channel Hub type allows the SCPC data rates and switch types to be specified for when the Remotes will switch and the desired starting points for communications.

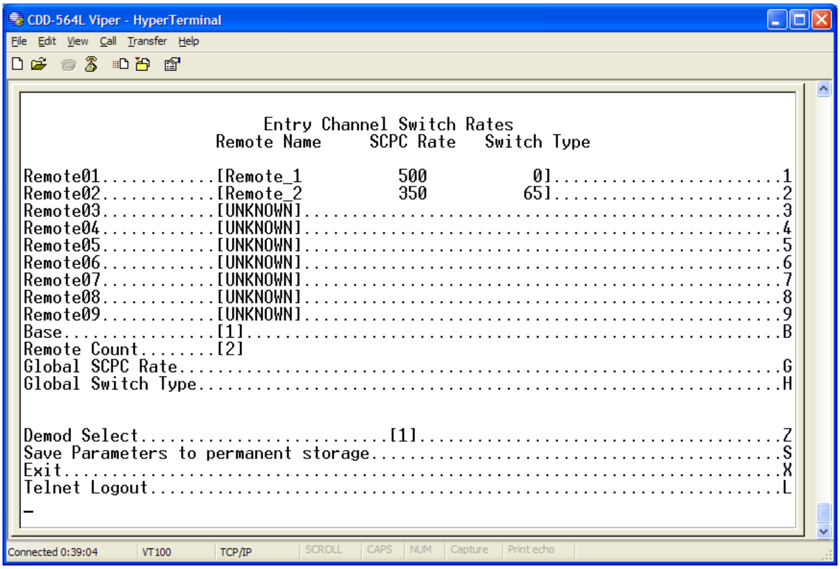


Figure 3-25 Entry Channel Switch Rates screen

Entering the Remote number at the command prompt in figure 3-25 allows the **SCPC Data Rate** and the **Switch Type** for that Remote to be set, as shown in figure 3-26. Switch type **0** corresponds to Load Switching; switch types **64** through **255** are user-defined, and must match VMS policies. When choosing Load Switching as the Switch Type, the associated Remote must have the Load Switching feature Enabled (see the section “STDMA/SCPC Automatic Switching” on page 3-29).

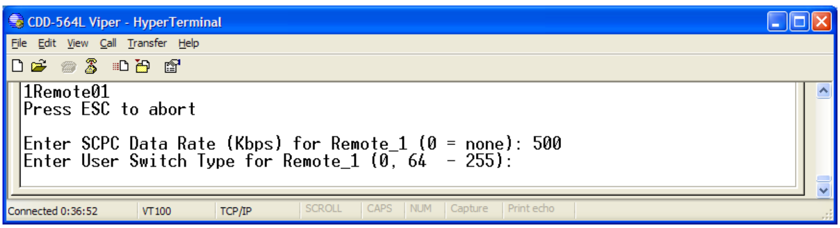


Figure 3-26 Remote SCPC Data Rate prompt

The **Global SCPC Rate** command can be used to set the data rate for all or a majority of the Remotes. This allows the rate to be entered just once instead of entering the rate for each Remote individually. Enter **G** at the command prompt in figure 3-25.

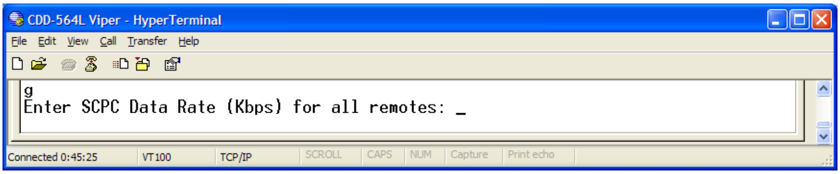


Figure 3-27 Global SCPC Data Rate prompt

Similarly, the **Global Switch Type** command can be used to set the switch type for all or a majority of the Remotes. Enter **H** at the command prompt.

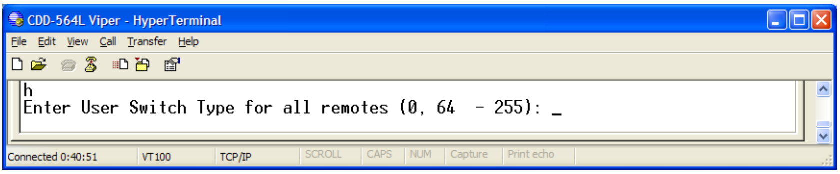


Figure 3-28 Global Switch Type prompt

Delete Remote

Entering **D** at the command prompt shown in figure 3-20 brings up the **Delete Remote** dialog shown in figure 3-29.

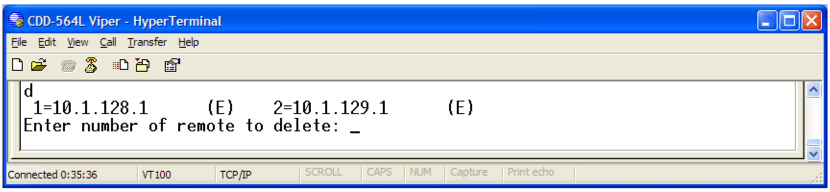


Figure 3-29 Delete Remote prompt

Enter the number of the Remote CDD-56X at the command prompt to delete it from the STDMA group for this Hub burst controller.

Enable/Disable Remote

Enter **E** at the command prompt in figure 3-20 to display the dialog shown in figure 3-30. The Remotes in the network are displayed, indicating whether each is currently **Enabled** (E) or **Disabled**.

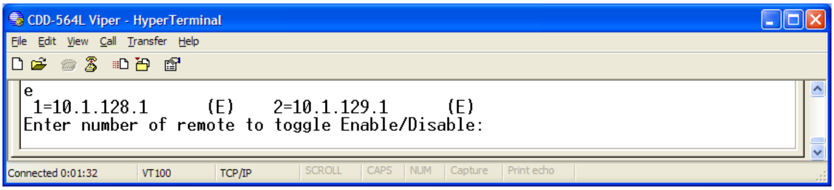


Figure 3-30 Enable/Disable Remote prompt

Enter the number of the Remote at the command prompt to toggle the Remote from its current Enable/Disable configuration.

In the example screen shown above, both Remotes 1 and 2 are Enabled.

View Remote(s)

Entering **V** at the command prompt shown in figure 3-20 will display the listing of Remote(s) that belong to the STDMA group for this Hub burst controller, and their status, as shown in figure 3-31.

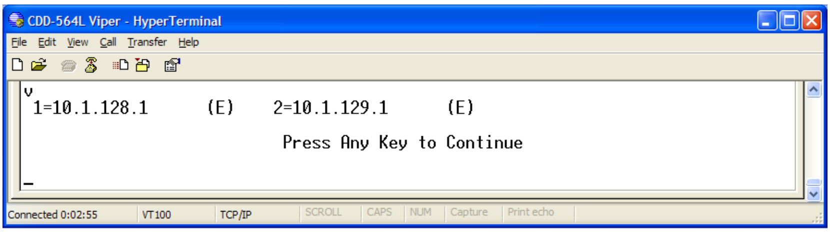


Figure 3-31 View Remote(s) screen

The display is for information only and pressing any key will return the screen to the menu shown in figure 3-20.

Remove Timeout

Entering **R** at the command prompt shown in figure 3-20 will display the **Remove Timeout** dialog shown in figure 3-32. Note that this menu item shows the current setting (in seconds) for this parameter.

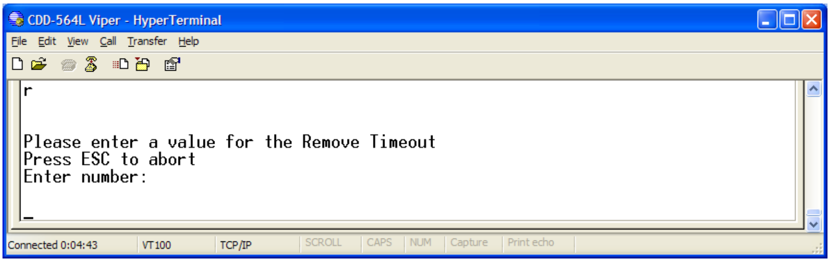


Figure 3-32 Remove Timeout prompt

The value entered at the command prompt defines the amount of time (in seconds) with no communication from a Remote to the Hub before that Remote is removed from the Burst Map. If communications are lost for this specified period of time, the Remote is removed from the STDMA group, and the bandwidth resources it had been allocated are then made available for use by the other remotes remaining in the group.

This feature is useful, for example, in an SNG application where a mobile Remote has finished its assignment and has shut down.

Remove Retry Timeout

Entering **T** at the command prompt in figure 3-20 will display the **Remove Retry Timeout** dialog shown in figure 3-33. Note that this menu item shows the current setting (in seconds) for this parameter.

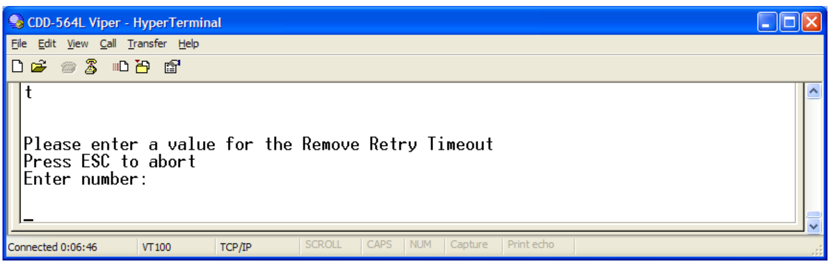


Figure 3-33 Remove Retry Timeout prompt

When a Remote is removed from the group Burst Map, as described in the section “Remove Timeout” above, entering a value in the Remove Retry Timeout dialog defines the amount of time (in seconds) that is allowed to pass before a retry attempt is made to return the removed Remote to the group. The Remote is re-entered into the burst map cycle; if the Remote does not burst back (ACK) to the Hub burst controller, it is again removed from the Burst Map.

This allows, again using a mobile Remote as an example, shutting down the Remote at one location, moving it to a new location, and then automatically re-establishing a connection to the satellite network.

STDMA Statistics

Entering **V** at the command prompt in the **STDMA** screen displays the **STDMA Statistics** screen as shown in either figure 3-34 (Hub) or figure 3-35 (Remote).

Note that statistics will only be accumulated for a CDD-56X that is configured as a Hub with No Expansion, since that is the only configuration that provides STDMA functionality (on Demod 1). Because a Remote unit is SCPC mode only, the STDMA Statistics screen will display all values as 0.

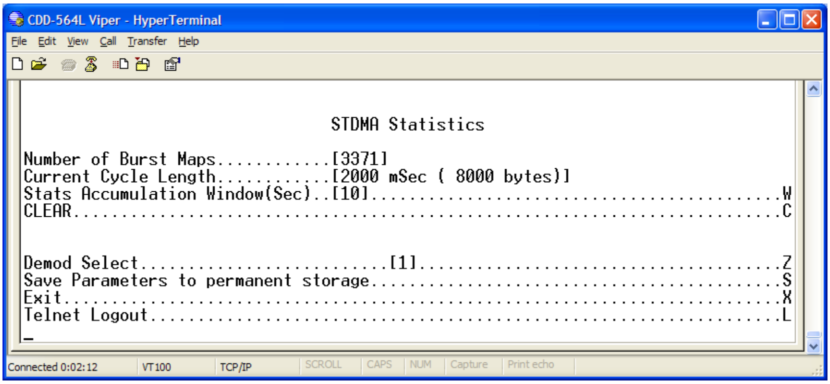


Figure 3-34 STDMA Statistics screen (Hub)

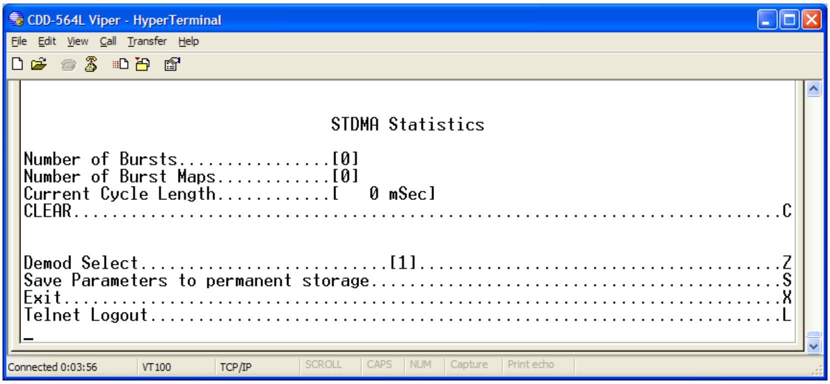


Figure 3-35 STDMA Statistics screen (Remote)

Stats Accumulation Window

Entering **W** at the command prompt displays the **Stats Accumulation Window** as shown in figure 3-36. The time period, in seconds, for capturing STDMA statistics can be specified.

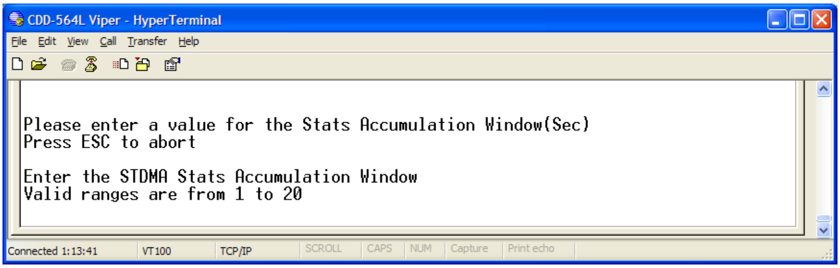


Figure 3-36 Stats Accumulation Window prompt

Clear

The STDMA statistics can be **Clear**ed (reset) by entering a **C** at the command prompt in figure 3-34.

Show Hub Statistics

Entering a **W** at the command prompt in the **STDMA** screen displays the current statistics for the target CDD-56X Hub as shown in figure 3-37.

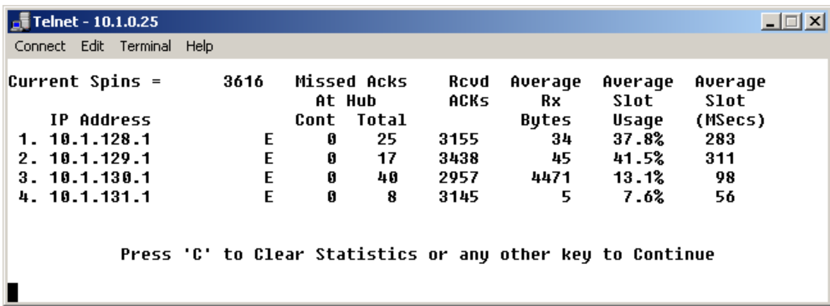


Figure 3-37 Show Hub Statistics screen

The Burst Controller monitors statistics in the received ACK from each Remote. The statistics report the fill status of the STDMA buffers. The Burst Controller builds a table of the group and calculates the relative buffer fill for each Remote. It then calculates the length of the Data Slot for each Remote based on the Minimum Slot Size plus a percentage of the Available Bandwidth. Idle remotes would receive a Data Slot equal to the Minimum Slot Size.

In figure 3-37, Remote 1 with IP address 10.1.128.1 had activity during the averaging period. It captured 37.8% of the total slot time and had an average slot length of 283 ms. Remotes 2, 3, and 4 had 41.5%, 18.1% and 7.6% respectively. The dynamic range of STDMA is a function of the difference between the nominal Data Slot Size and the Minimum Data Slot Size parameters. These parameters are operator selectable. The speed with which STDMA reacts to changes in dynamic load is a function of the Statistics Accumulation Window parameter and the Cycles per New Burst Map parameter, both of which are also operator selectable.

The Hub statistics are useful for tuning the Burst Controller. Preamble adjustments, up or down, are made using the missed ACKs statistic; a preamble and/or guardband that is too short will result in an accumulation of missed ACKs. The “Cont” column represents continuous—the number of sequential ACKs missed.

An informative indicator in the Hub Statistics screen is the STDMA status of the Remotes that appears in the first column to the right of the IP Address list. The Remote status is displayed in one of three possible modes:

- **E** – Remote is **E**nabled and active in the STDMA group; the Hub burst controller is receiving ACKs from this Remote.
- **ER** – Remote is **E**nabled but has been **R**emoved from the STDMA group due to missed ACKs at the Hub burst controller.
- (Blank) – Remote either has been manually Disabled, such as through the STDMA Remotes Menu Enable/Disable command, or has been switched out of STDMA to SCPC mode by the VMS.

STDMA/SCPC Automatic Switching

One of the most powerful features of the Vipersat Network system is the capability to perform Automatic switching between STDMA mode and SCPC mode based on bandwidth demand. The configuration options that are available to meet customer-specific requirements are extensive, and include switching based on Load, Application (Voice and Video RTP), ToS, and QoS.

For additional information, refer to Appendix B, “Automatic Switching”, in this document.

NOTE

Note: Care must be taken when configuring the Auto Switching features of the Vipersat system to ensure that there is no duplication or overlap of switching functions between Application, ToS, and QoS for a particular traffic flow. Only one of these switching methods should be utilized for any one flow requirement.

Automatic Switching for the CDD-56X is an option that is available only when configured as an STDMA Hub unit (burst controller). Note that Automatic switching does not apply to either a *Hub with Expansion* or a *Remote with Expansion*; these configurations operate in dedicated SCPC mode and all switching control is performed by the VMS. As is shown in table 2-2, Auto Switching should be Disabled for these two configurations.

The **Auto Switching** feature must be Enabled (as described in the section “Feature Configuration” on page 3-5) in order to allow any associated Remote modems to perform STDMA/SCPC switching. In order for a Remote modem in the group to be automatically switched between STDMA and SCPC modes, the Auto Switching feature of that Remote must be Enabled as well.

Selecting **Automatic Switching** from the **Vipersat Configuration** menu shown in figure 3-6 (enter **A**) for a CDD-56X operating as a network Hub will display the menu shown in figure 3-38.

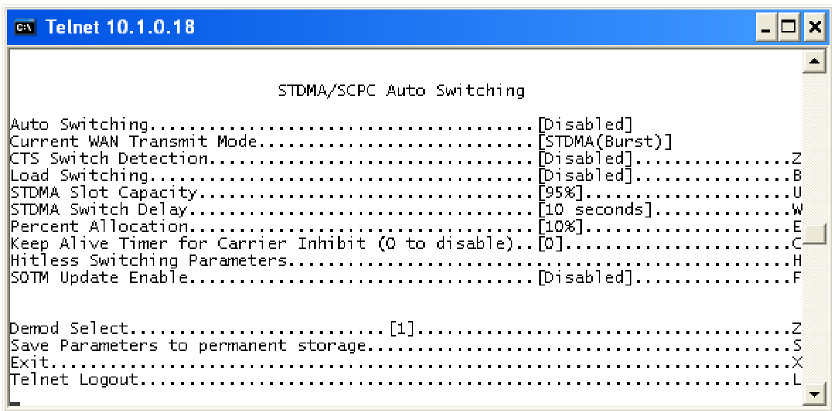


Figure 3-38 Automatic Switching screen

The following sections describe the menu items of the **STDMA/SCPC Auto Switching** screen shown in figure 3-38.

Auto Switching

The **Auto Switching** item on the menu shown in figure 3-38 is for information only and shows the current configuration of the Hub CDD-56X. This feature is Enabled and Disabled as described in the section “Feature Configuration” on page 3-5. Auto Switching must be **Enabled** in order to utilize any of the related features/commands in this menu.

Note that Auto Switching must be Enabled on a Hub STDMA Controller that is configured for Entry Channel mode.

Current WAN Transmit Mode

The **Current WAN Transmit Mode** item on the menu in figure 3-38 is information only and reflects the current transmit status of a unit. In the case of the CDD-56X, there is no transmit function (no modulator) and this parameter is not applicable.

Load Switching

The **Load Switching** command on the menu in figure 3-38 is a toggle Enabling and Disabling Load Switching on the target Hub CDD-56X. The system will detect variations in data rate and can be configured to switch from STDMA to SCPC based on bandwidth requirements.

The initial switch for a Remote Vipersat terminal from STDMA mode to SCPC mode is determined by the Hub Burst Controller. Once the Remote is switched into SCPC, any requests to meet additional switching requirements within SCPC (Step Up or Step Down) are made by the Remote modem.

Entering a **B** at the command prompt will toggle this feature On or Off for the target CDD-56X.

Note: Load switching must be Enabled for any Hub CDD-56X burst controller that will experience changing load conditions in order for the VMS to dynamically optimize network performance on these circuits.

Application switching by the VMS (Voice and/or Video) is not affected by this setting. However, using Load switching for real-time applications is not recommended.

STDMA Slot Capacity

The **STDMA Slot Capacity** command, shown in figure 3-38, allows setting the threshold or level of slot capacity at which the Burst Controller sends a switch request to the VMS to switch the Remote from STDMA mode to SCPC mode.

Enter **U** at the command prompt to display the dialog shown in figure 3-39.

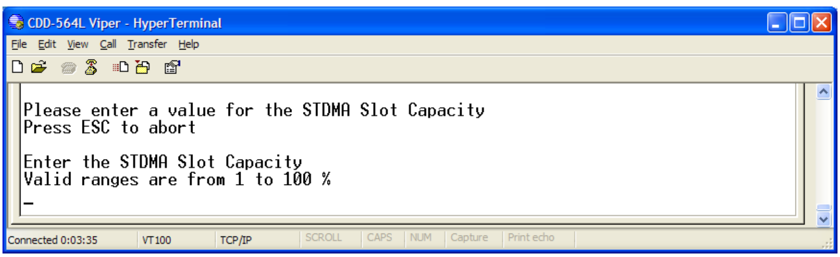


Figure 3-39 STDMA Slot Capacity prompt

Typically the default settings will be optimum, but there may be unique network configurations which require modifying the STDMA Slot Capacity value.

STDMA Switch Delay

In order to minimize unnecessary switching from STDMA to SCPC due to transient conditions, such as a temporary spike in network traffic for example, a switch delay parameter is provided. This setting is used to specify a delay before a switch occurs.

Typically the default values will be optimum, but this value can be changed to accommodate a unique network configuration or application. To change this setting, enter **W** at the command prompt in figure 3-38 to display the screen shown in figure 3-40.

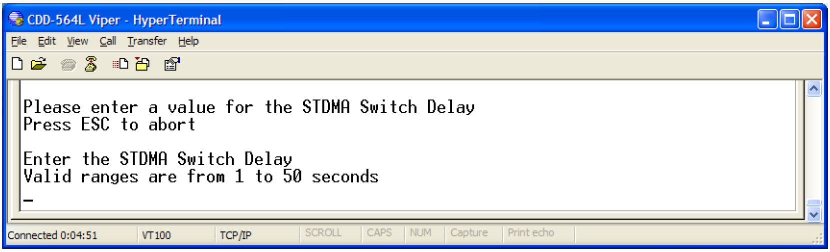


Figure 3-40 STDMA Switch Delay prompt

Percent Allocation

The **Percent Allocation** menu item, shown in figure 3-38, allows adding a fixed percentage to the channel bandwidth request to accommodate additional bandwidth requirements which may occur after a switch is made from STDMA to SCPC mode.

To change this setting, enter **E** at the command prompt to display the screen shown in figure 3-41.

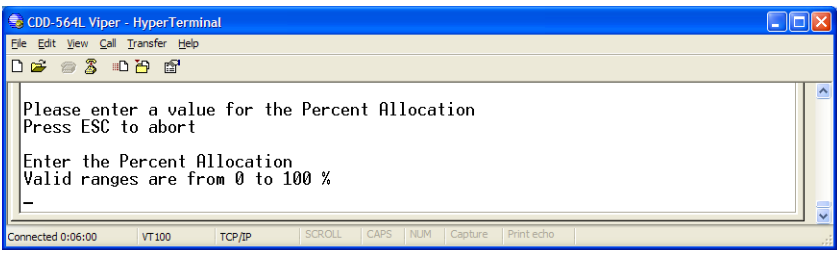


Figure 3-41 Percent Allocation prompt

Typically the default value will be optimum, but if there may be a larger bandwidth requirement after the switch, the percent allocation value can be increased. In choosing a value for this allocation, future bandwidth requirements for the channel must be balanced against efficient bandwidth utilization.

Keep Alive Timer for Carrier Inhibit

This parameter applies to a **Hub** unit only. Note that, although this menu item also appears for a Remote unit, it does not apply to a switched demod unit at a remote site.

The **Keep Alive Timer for Carrier Inhibit** parameter provides a fixed setting that can be specified for the keep alive message sent to the Remotes from the Hub. This provides an alternate to the burst map which is variable and may become excessively long in certain applications. An example of this is a burst map containing a large number (up to 100) of remotes running in ECM mode where the burst period exceeds the Remote carrier inhibit timer.

When implemented, this parameter is set at either the TDM outbound unit or a switched demod, not at the STDMA Controller, in order to prevent a problem should the burst controller be rebooted.

Enter **C** at the command prompt in the **Auto Switching** screen to display the dialog shown in figure 3-42.

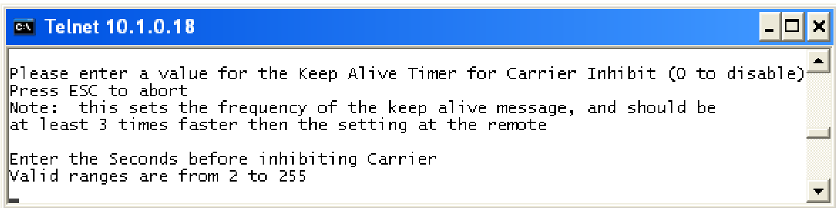


Figure 3-42 Keep Alive Timer for Carrier Inhibit prompt

Note that this timer setting should be at least three times faster (shorter in duration) than the timer setting at the Remote(s) to ensure that network links are maintained.

Hitless Switching Parameters

Unless inherent delays in configuring both ends of a satellite bandwidth link during dynamic switching are accounted for, transmitted data may be lost during the transition. The time for a switch command to be sent across the satellite link (~ 250 ms), the command processing time, as well as receiver acquisition time must be considered. The Vipersat **Hitless Switching** feature provides a means to coordinate timing and utilize buffering to eliminate these data outages.

To access the Hitless Switching screen, enter **H** from the STDMA/SCPC Auto Switching screen (see figure 3-38).

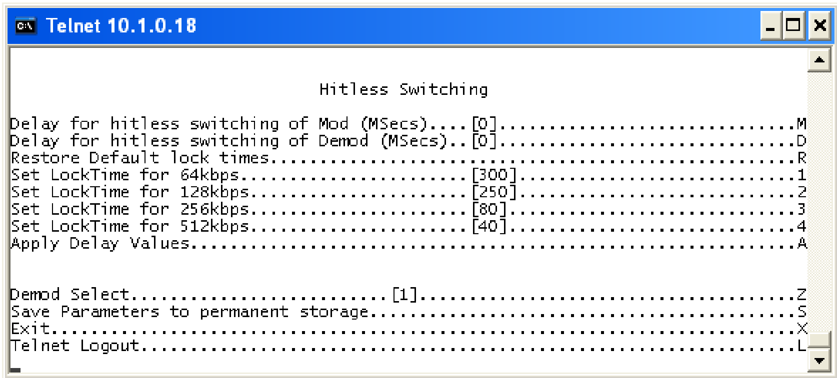


Figure 3-43 Hitless Switching screen

This screen will initially display all lock times as -1, indicating that Hitless Switching is currently disabled. To enable the Hitless Switching feature, enter **R** at the command prompt to restore default lock times.

Delay for Mod

This parameter allows the operator to insert additional delay to buffer more data after modulator transmission is ceased. Enter **M** to modify this parameter.

Delay for Demod

This parameter allows the operator to insert additional delay to account for the tuning of the demodulator. Enter **D** to modify this parameter.

LockTimes

LockTime settings for the four data rates displayed can be adjusted either up or down, but default settings based on satellite testing should be used as a starting point. These defaults are stored in each modulator/demodulator unit and are restored by entering **R** at the command prompt.

Once restored, the lock time for each data rate can be modified by entering the corresponding number.

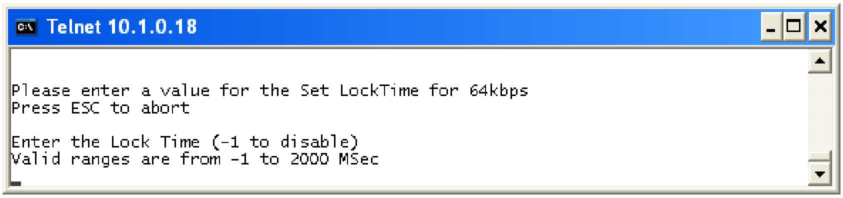


Figure 3-44 Set LockTime prompt

To disable Hitless Switching, enter **-1** for all lock times.

Apply Delay Values

To implement any modifications to the Hitless Switching parameters, enter **A** at the command prompt to apply these values to the modem.

SOTM Update

This menu item appears for both the Hub unit and the Remote unit. However, this feature is not applicable to the CDD-56X.

Unit Role

The **Unit Role** configuration determines whether the target CDD-56X is to function as a **Remote** or as a **Hub** in the Vipersat satellite network. From the **Vipersat Configuration** screen (figure 3-6), enter **R** to display the dialog shown in figure 3-45.

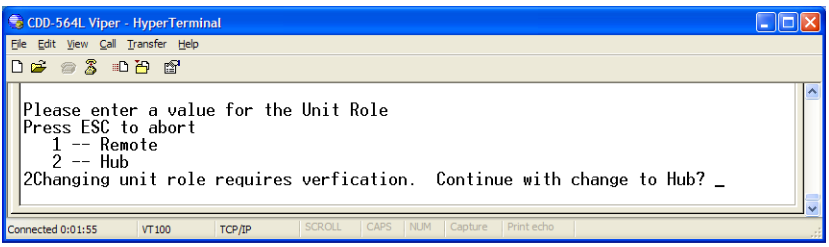


Figure 3-45 Unit Role prompt

The setting for this parameter, together with the setting for the Expansion Unit, will determine the role the target CDD-56X will perform in the network and what type of commands and functions it will receive from the VMS. See table 2-1 and table 2-2 for a breakdown of network roles and related functions and features.

Expansion Unit

The **Expansion Unit** menu item in the **Vipersat Configuration** screen (figure 3-6) defines whether the target CDD-56X is to function as an Expansion unit (all demods configured to operate in SCPC mode) or not. Entering **E** at the command prompt will display the dialog shown in figure 3-46.

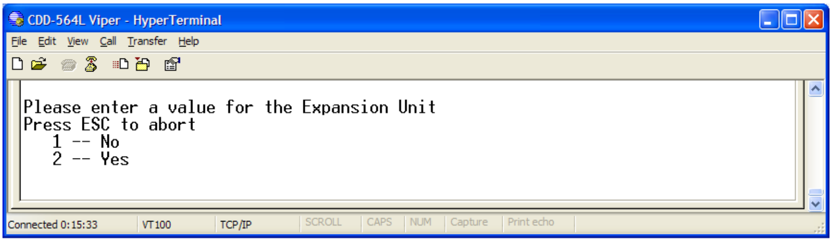


Figure 3-46 Expansion Unit prompt

The VMS uses this data when monitoring and controlling the network to determine the target CDD-56X's function. For example, in a Hub configuration that has STDMA enabled for the first demod, Expansion Unit should be set to **No**.

When configured as an Expansion unit, either as a Hub (switched) or as a Remote (mesh), the CDD-56X is set up so that all demods are in SCPC mode and available as resources for dedicated communications with the other end of the satellite link.

For a Remote configuration, this parameter must be set to Yes. For a Hub configuration, this parameter can be set to either No or Yes. Refer to table 2-1 and table 2-2 for a breakdown of network roles and related functions and features.

Note: Setting Vipersat STDMA to Disabled alone will not force the demods into an SCPC role—the Expansion Unit parameter must be set to Yes for this function. Likewise, Expansion Unit must be set to No together with STDMA Enabled for proper STDMA function.

Network ID

The **Network ID** that is assigned to the unit defines to what network the target CDD-56X will belong. All units used in a network will have the same Network ID. Enter **B** at the command prompt in the **Vipersat Configuration** screen (figure 3-6) to display the dialog shown in figure 3-47.

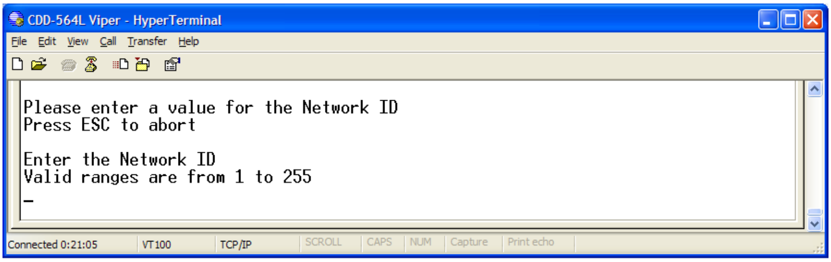


Figure 3-47 Network ID prompt

The Network ID is used by the VMS to identify units that are common to a network and allows the VMS to manage multiple networks, each with its own unique Network ID number.

Unit Name

The **Unit Name** command in the **Vipersat Configuration** screen (figure 3-6) is used to assign a name to the target CDD-56X. Enter **N** at the command prompt to display the dialog shown in figure 3-48 . Any name, up to 16 characters, can be entered for the unit.

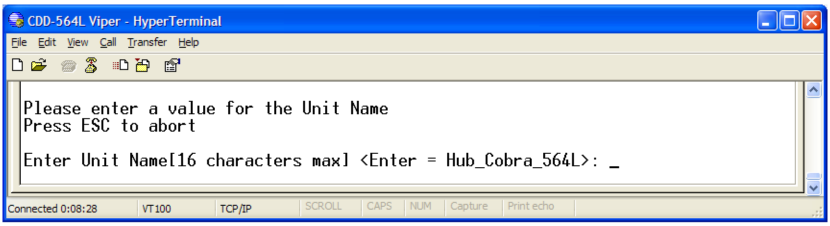


Figure 3-48 Unit Name prompt

This name is displayed by the VMS and identifies the unit in Network Manager, the graphical network display.

Receive Multicast Address

The **Receive Multicast Address** is the multitcast IP address assigned to all CDD-56X units in the Vipersat network that are managed by the VMS server. This address must match the VMS Transmit Multicast Address.

When the CDD-56X receives a multicast from the VMS server, it receives maintenance and control packets, including the server's IP address. The

CDD-56X responds to the VMS server with a unicast containing its current configuration data, including the CDD-56X's IP address. When the VMS receives the unicast response, it registers the CDD-56X on the network.

Enter **V** at the command prompt in the **Vipersat Configuration** screen (figure 3-6) to display the dialog shown in figure 3-49.

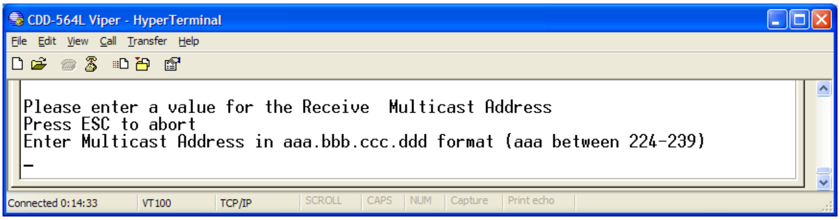


Figure 3-49 Receive Multicast IP Address prompt

Switch requests can be unicast to the VMS server and unicast switch commands received from the VMS by the CDD-56X. For more information on this process, refer to the *VMS User Guide*.

Managing IP Address

The **Managing IP Address** command in the **Vipersat Configuration** screen (figure 3-6) allows the IP address for the server running VMS to be entered. Enter **I** at the command prompt to display the dialog shown in figure 3-50.

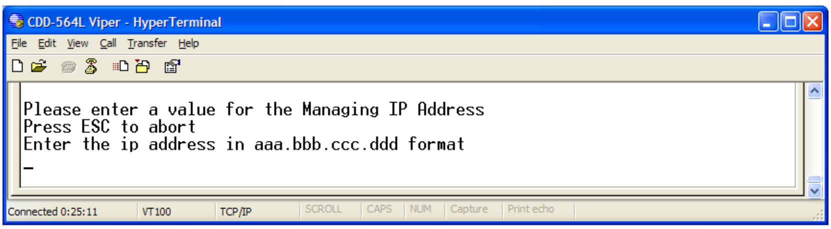


Figure 3-50 Managing IP Address prompt

The Managing IP Address of the VMS is sent out with the multicast to all of the Vipersat units and will be automatically updated during the registration process. If available, this is the IP address to which the CDD-56X sends a unicast registration request every 60 seconds when requesting initial registration on the VMS network. Later the CDD-56X uses this address to send switch requests, network health messages, etc. to the managing VMS server.

NOTE

Note: The managing address will be set automatically if the Receive Multicast Address is set correctly and the unit is receiving the announcement multicast message. However, the modems WILL NOT send their registration messages until this address is set.

Once the unit is registered, the **I** command is removed from the Vipersat Configuration menu.

This managing address is automatically updated on a periodic basis for units that are newly enabled, incorrectly set, or following VMS changeovers (redundancy switching). The status of the registration process is displayed for this parameter as follows:

- **NOT-DEFINED** — unit has booted up, but is unaware of the managing address.
- **No STDMA Xmit Grant** — operator has entered managing address, but unit (Remote) is not currently receiving burst maps.
- **Sending Registration (n)** — unit is receiving burst maps and the number of registration attempts (n) is displayed.
- **Registered** — unit is registered with the VMS. For VMS v3.6.0 and later, the VMS version number is also displayed (as shown in figure 3-6).

Primary Heart Beat

This menu item appears for the Hub terminal only.

The **Primary Heart Beat** feature is a redundancy heart beat message for primary Hub units that provides the option for a periodic communications check message to be sent from the Hub modem to the VMS for backup recovery in N:M redundancy (protected) configurations. The message interval is hard-coded in the demod.

Enter **P** at the command prompt in the **Vipersat Configuration** screen (figure 3-6) to toggle this feature between **Enabled** and **Disabled**.

Home State Revert

This menu item appears for the Remote terminal only.

The **Home State Revert** feature allows automatic resource recovery to be performed on SCPC connections when a communications failure occurs between the VMS and a Remote, such as a rain fade condition, a Remote unit power down, or a hardware failure. The period of time (in minutes) for a failure is configured in the VMS for each Remote in the network. Should communications be lost for more than the specified time period, the Remote will automatically revert to its Home State settings and the VMS will remove all allocated resources (bandwidth, demod(s)), freeing them for use by any other Remote in the Vipersat network.

Because this feature is configured in the VMS, the status (Disabled, or the time period in minutes) appears as an information-only display in the **Vipersat Configuration** menu (figure 3-6).

Dynamic Power Control Configuration

Dynamic Power Control (DPC) is a Vipersat feature that acts to regulate the transmit power of the Vipersat satellite modem, such that the specified receive signal level (E_b/N_o) is met for the receiving Vipersat units in the group. DPC is driven by the receiver demod, which notifies the transmitting modem of the current E_b/N_o value.

Refer to Appendix C, “Dynamic Power Control”, in this document for additional information on the DPC feature.

The **Dynamic Power Control Configuration** screen (enter **C** in the Vipersat Configuration menu) allows for setting the parameters for the CDD-56X power levels. The information and commands in the menu will vary depending on the function the target CDD-56X performs in the network. The screen shown in figure 3-51 is from a unit serving as a Hub with STDMA (burst controller). Note, however, that the only parameter settings that apply to the CDD-56X are **DPC Enabled**, **Speed Up EbNo**, and **Target DPC Address**. Because all of the remaining settings shown in this screen are redundant to those configured in the satellite modem, they do not apply to the CDD-56X and can be disregarded.

For comparison, the DPC Configuration screen for a unit operating as a Hub or Remote with Expansion (SCPC mode) is shown in figure 3-52. Note that only the applicable settings appear in this screen.

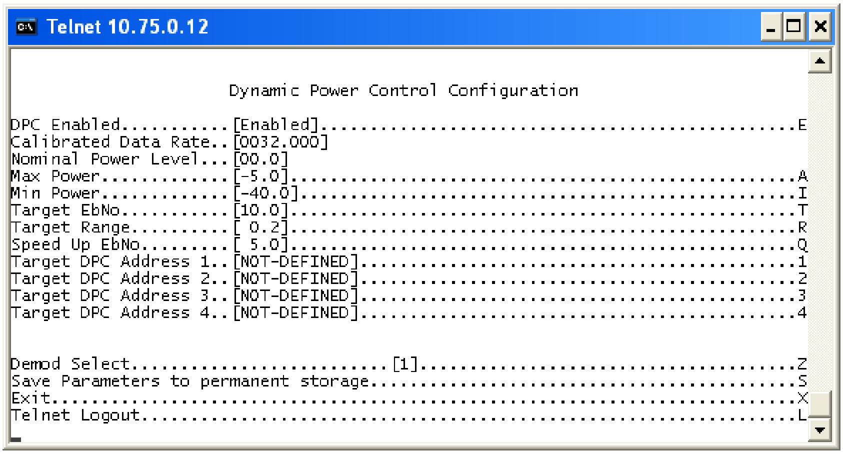


Figure 3-51 DPC Configuration screen (Hub, STDMA)

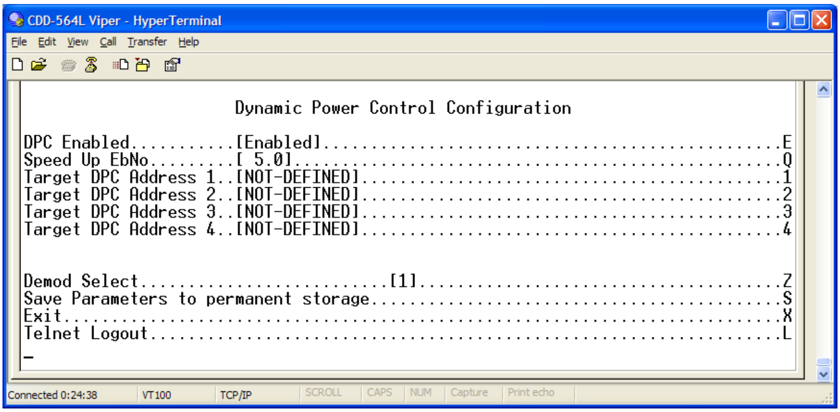


Figure 3-52 DPC Configuration screen (Hub/Remote, SCPC)

Tip: The DPC feature will not function unless the Outbound IP address is defined in the STDMA screen for the Hub BC modem.

DPC Enabled

The **DPC Enabled** command (enter **E**) is a toggle that allows the Dynamic Power Control feature to be either **Enabled** or **Disabled**. The CDD-56X is shipped with the DPC Enabled menu item turned off (Disabled) to allow entrance link levels calibration during terminal setup.

Speed Up EbNo

Normally, the DPC message is sent every 60 seconds from each terminal in the network. If the current E_b/N_o value of the terminal drops below the **Speed Up EbNo** set value, the corresponding terminal increases its message send rate to every 15 seconds until the current value becomes greater than the set value. This provides a loop speed up to rapidly regain link quality.

Enter **Q** at the command prompt in the DPC Configuration screen to access the Speed Up EbNo dialog shown in figure 3-53. The default value for this parameter is 5 dB.

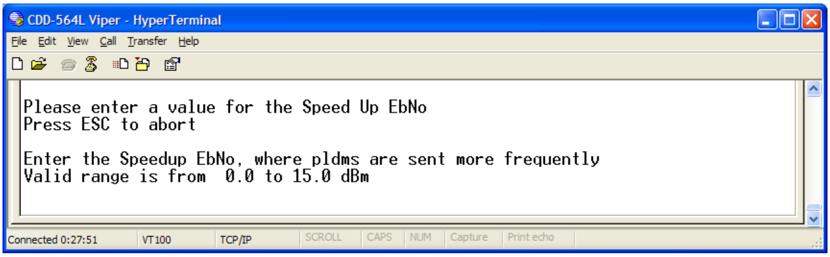


Figure 3-53 Speed Up EbNo prompt

Target DPC Address

The **Target DPC Address** identifies the modem that is transmitting to this CDD-56X Demod, and will be receiving the DPC messages that provide the current E_b/N_o value for this Demod. Typically, all Remotes will specify the Hub modem that is supplying the TDM outbound carrier.

For STDMA Remotes, the Outbound IP address is sent out via the Burst Map, and the DPC Target for these Remotes is automatically mapped to that address.

The Target DPC Address command is used only for units that are Out-of-Band and will be utilizing the DPC feature. For In-Band units, the target addresses are handled automatically by the VMS.

To manually configure the target address for an Out-of-Band unit, enter the number corresponding to the appropriate Demod (1, 2, 3, or 4) at the command prompt to display the Target DPC Address dialog shown in figure 3-54.

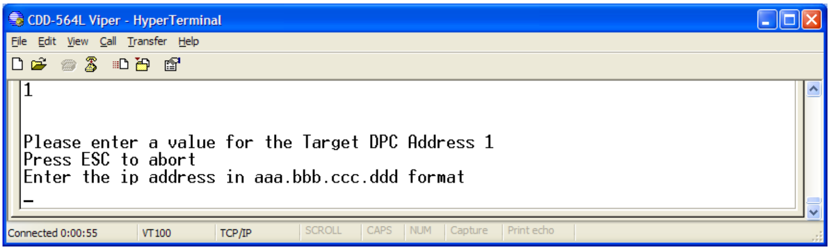


Figure 3-54 Target DPC Address prompt

The STDMA Burst Controller (Demod 1 on a CDD-56X configured as Hub with No Expansion) is not permitted to specify a DPC Target because the demodulator is receiving multiple bursts very rapidly from all Remotes in the group and is unable to utilize DPC to control the transmit power of the Remote modems. However, the transmit power of the Burst Controller adjusts to meet the target E_b/N_o values for the Remotes in the group. These Remotes and their status and E_b/N_o values are displayed in the Vipersat Summary screen, DPC details (see “Vipersat Summary” on page 3-47).

Set Home State Parameters

A CDD-56X’s **Home State** consists of those parameters which provide a known RF configuration that the CDD-56X will return to, either as the result of a command by the VMS, or as it comes back on line from a reset or a power cycle.

Enter **H** at the command prompt in the **Vipersat Configuration** screen to display the **Home State Configuration** screen shown in figure 3-55.

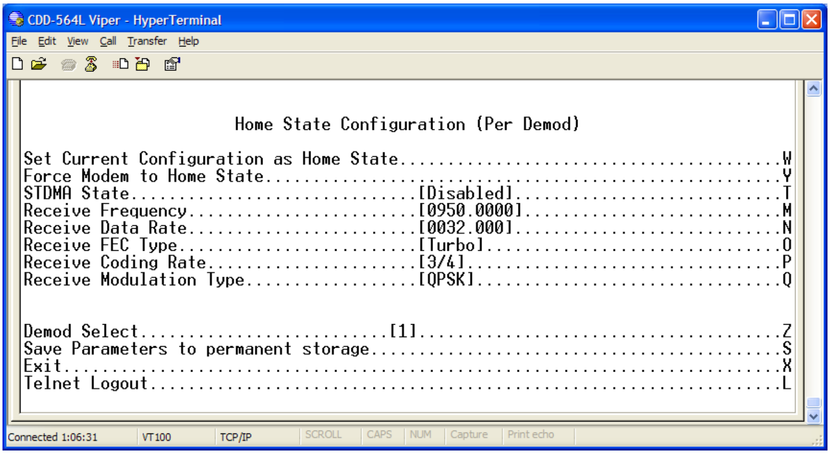


Figure 3-55 Home State Configuration screen

A CDD-56X’s Home State settings are typically selected so that it goes to a configuration which is optimum for its function in the network. These parameters are configured on an individual, per demod basis.

Note that each of these Receive parameters are the same as found in the **Rx Configuration** screen that is in the **Satellite Demod Configuration** menu.

Set Current Configuration as Home State

This command sets the selected Demod’s current configuration as its Home State settings. Assuming the Demod has been properly configured using the **Satellite Demodulator Configuration** menu (Rx parameters) and the **Feature Configuration** menu (Vipersat STDMA setting), these parameter values will be copied into the Home State configuration. Rather than entering each of these values individually, this command can be used as a shortcut for establishing the Home State settings.

Enter **W** at the command prompt in the **Home State Configuration** screen to execute this command. Once saved, the modem will be configured with the Home State settings at boot time and when manually reset with the **Force Modem to Home State** command.

Tip: This command is useful when a CDD-56X’s initial set up is completed and the unit is functioning as desired in a network.

Force Modem to Home State

If at any time it is desired to have a CDD-56X return to its Home State, this command (enter **Y**) can be executed. A warning message is displayed as shown in figure 3-56, requiring the command to be confirmed before it is executed.

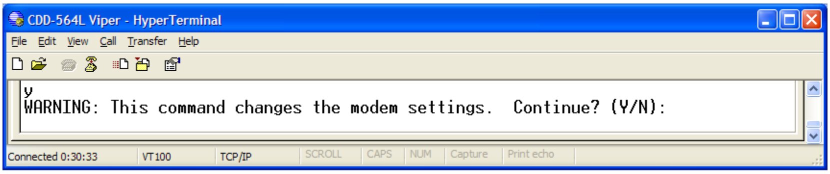


Figure 3-56 Force Modem to Home State warning

This command will force the selected Demod to its Home State configuration, replacing its current configuration.

STDMA State

This command (enter **T**) toggles the setting of STDMA in the target CDD-56X's Home State between **Enabled** and **Disabled**. This is the same feature that is set from the **Feature Configuration** menu screen shown in figure 3-4. Setting the STDMA State to Enabled is only applicable for a CDD-56X that is configured as a Hub burst controller.

NOTE

Note: Only one demod can be set with STDMA enabled. Vipersat recommends that Demod 1 be utilized for applications calling for STDMA.

Receive Frequency

Enter **M** to use the dialog shown in figure 3-57 to set the **Receive Frequency** for the selected Demod's Home State.

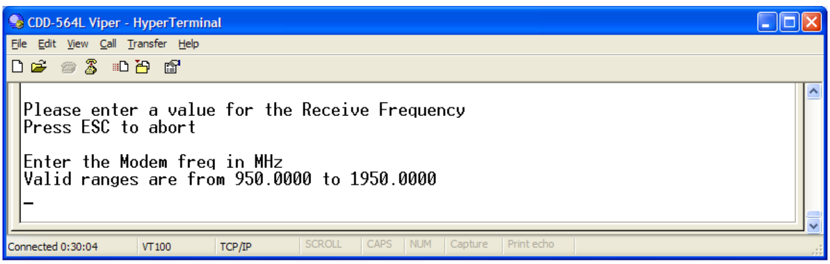


Figure 3-57 Receive Frequency prompt

Note that this screen dialog example displays the frequency range for a CDD-562L/564L L-Band Demodulator/Router. For a CDD-564, the range displayed will be either 50 to 90 MHz or 100 to 180 MHz.

Receive Data Rate

Enter **N** to use the dialog shown in figure 3-58 to set the **Receive Data Rate** for the selected Demod's Home State.

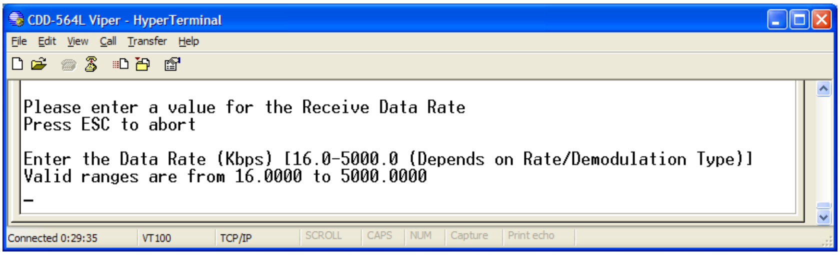


Figure 3-58 Receive Data Rate prompt

Note that the valid range for this parameter will vary depending on the Demodulation Type, Coding Rate, and FAST feature Data Rate.

Receive FEC Type

Enter **O** to use the dialog shown in figure 3-59 to set the **Receive FEC Type** for the selected Demod's Home State. **Turbo** must be selected when operating in Vipersat mode.

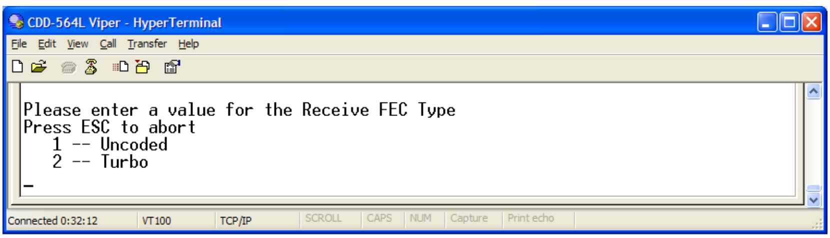


Figure 3-59 Receive FEC Type prompt

Receive Coding Rate

Enter **P** to use the dialog shown in figure 3-60 to set the **Receive Coding Rate** for the selected Demod's Home State.

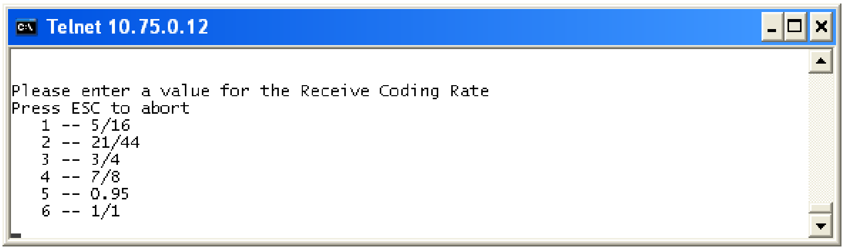


Figure 3-60 Receive Coding Rate prompt

Note that Coding Rate **6** (1/1) is not a valid selection when operating in Vipersat mode with Turbo Product Coding.

Receive Modulation Type

Enter **Q** to use the dialog shown in figure 3-61 to set the **Receive Modulation Type** for the selected Demod's Home State.

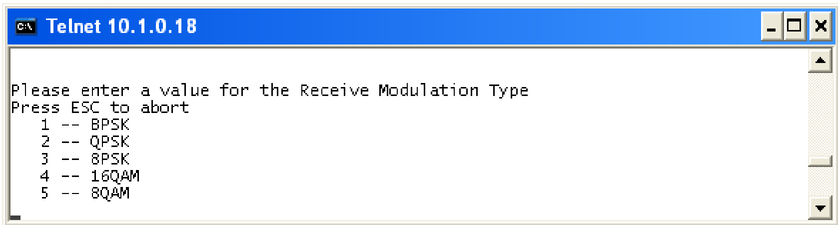
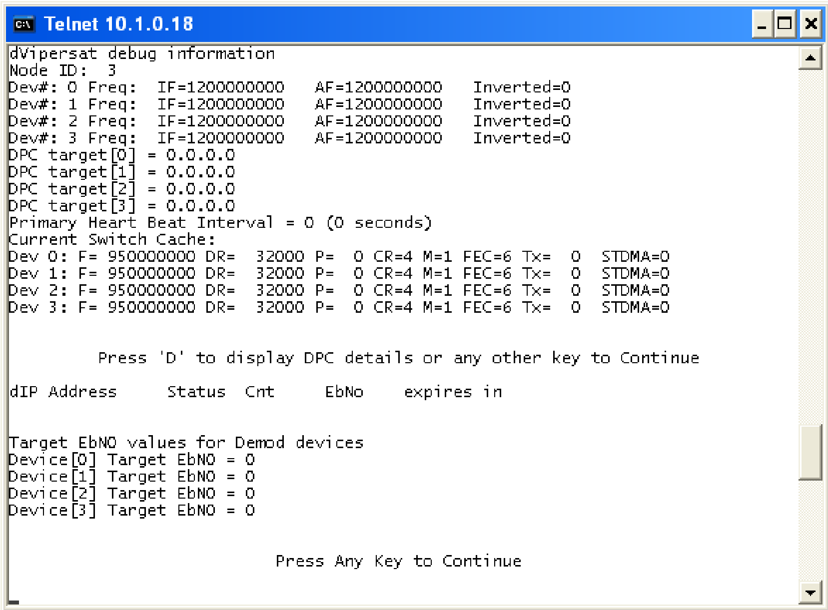


Figure 3-61 Receive Modulation Type prompt

Vipersat Summary

The **Vipersat Summary** screen can be viewed by entering **D** at the command prompt in the **Vipersat Configuration** screen (figure 3-6).



```
Telnet 10.1.0.18
dVipersat debug information
Node ID:  3
Dev#: 0 Freq:  IF=1200000000   AF=1200000000   Inverted=0
Dev#: 1 Freq:  IF=1200000000   AF=1200000000   Inverted=0
Dev#: 2 Freq:  IF=1200000000   AF=1200000000   Inverted=0
Dev#: 3 Freq:  IF=1200000000   AF=1200000000   Inverted=0
DPC target[0] = 0.0.0.0
DPC target[1] = 0.0.0.0
DPC target[2] = 0.0.0.0
DPC target[3] = 0.0.0.0
Primary Heart Beat Interval = 0 (0 seconds)
Current Switch Cache:
Dev 0: F= 950000000 DR=  32000 P=  0 CR=4 M=1 FEC=6 Tx=  0  STDMA=0
Dev 1: F= 950000000 DR=  32000 P=  0 CR=4 M=1 FEC=6 Tx=  0  STDMA=0
Dev 2: F= 950000000 DR=  32000 P=  0 CR=4 M=1 FEC=6 Tx=  0  STDMA=0
Dev 3: F= 950000000 DR=  32000 P=  0 CR=4 M=1 FEC=6 Tx=  0  STDMA=0

         Press 'D' to display DPC details or any other key to Continue

dIP Address     Status  Cnt     EbNo    expires in


Target EbNO values for Demod devices
Device[0] Target EbNO = 0
Device[1] Target EbNO = 0
Device[2] Target EbNO = 0
Device[3] Target EbNO = 0


                           Press Any Key to Continue
```

Figure 3-62 Vipersat Summary screen

The **Node ID** number that appears in this screen verifies that the unit is registered with the VMS and is active in the network. This number is automatically assigned by the VMS.

Note that the four Demods of the CDD-56X are designated as **0** through **3** on this screen. The **IF** values represent the Intermediate Frequency (Hz) that this unit is currently using. The **AF** values represent Adjusted Frequency (Hz), a translation of the IF that is used by the VMS for internal tracking of switching commands.

The **DPC target** entries are the IP addresses of the modulators that are to receive the Dynamic Power Control messages from the Demods for this unit.

The **Primary Heart Beat Interval** represents the time period between the communication check message that is sent from the primary Hub CDD-56X to the VMS in an N:M redundancy configuration. This interval is specified in the VMS.

Data for the **Current Switch Cache** reflects either the Home Satae information immediately after the unit boots, or the last switch command from the VMS (the last command sent to the base modem).

DPC details provide the status and E_b/N_o values for active Remotes in the group.

Vipersat Migration

The **Vipersat Migration** command is used to set the compatibility mode for the Hub Burst Controller when conducting a firmware upgrade on the associated Remotes. Although this command appears in the menu for both the Hub modem and the Remote modem, it only applies to STDMA Controllers and TDM Outbound modems at the Hub.

Enter **M** at the command prompt in the **Vipersat Configuration** screen to display the Vipersat Migration dialog shown in figure 3-63.

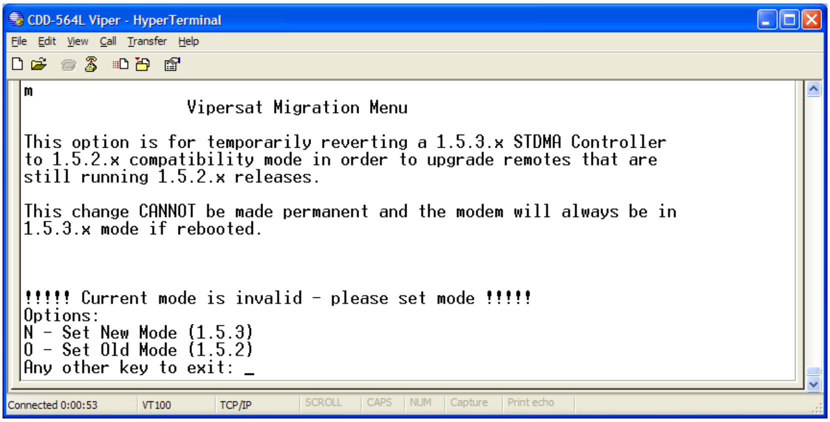


Figure 3-63 Vipersat Migration prompt

Refer to Appendix D, “Network Migration”, in this document for additional information on the use of this command.

UDP Port Base Address

Should a particular network application require a specific **UDP port base address** be used, the default address can be changed by entering **U** at the command prompt in the **Vipersat Configuration** screen (figure 3-6).

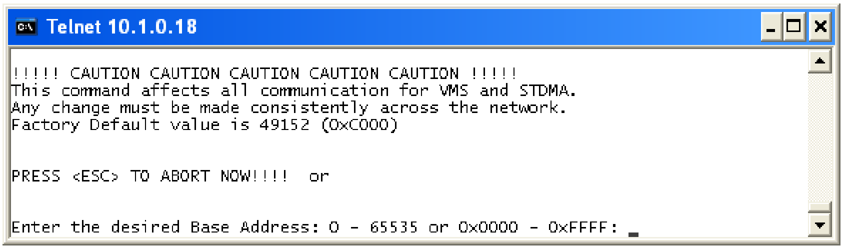


Figure 3-64 UDP Port Base Address prompt

Caution: This command affects all communications for the VMS and STDMA. If the base address is changed, it must be changed in the VMS as well as in all modems in all networks controlled by the VMS. The base address must also be changed when using VLOAD with this network.

APPENDIX

A

NETWORK ADDRESSING

Introduction

This Appendix is an overview of network addressing and how it applies to configuring the CDD-562L/564/564L for use in Vipersat Networks. The subjects covered are:

- OSI Model
- Binary Math
- IP Addressing
- Network Address Translation
- Subnets
- Network Segments
- Default Gateways
- MAC Addresses

The OSI Reference Model

OSI is an acronym for Open Systems Interconnection. This is a network model created by ISO (the International Standardization Organization.) The OSI model is the basic standard which forms the basis for all networking protocols.

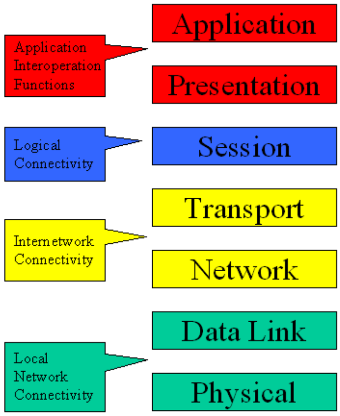


Figure A-1 The Seven OSI Protocol Layers

The OSI model defines the building blocks used to construct a working network protocol as shown in Figure A-1. The blocks on the right show the individual layers which make up the OSI model and the blocks on the left show the layer's functional grouping.

Each layer, as defined by the OSI model, is only aware of the layers directly above and below it.

Layers 1 – 3

Layer 1 / Physical – Layer 1 defines the physical means by which actual bits are sent and received. This layer, for example, is where connectors, cable lengths, and signaling specifications are defined.

Layer 2 / Data Link – Layer 2 consist of two sub-layers:

- Logical Link Control (LLC) – The LLC packages bytes received from the MAC into a format readable by the Network Layer above it.
- Media Access Control (MAC) – The MAC is concerned with obtaining access to the network at an appropriate time; i.e., when no other machines are communicating or when permission has been granted.

Together, these two sub-layer protocols are responsible for moving packets on and off the network.

Layer 3 / Network Layer – Layer 3 is responsible for routing packets through multiple networks. The Layer 3 protocol operates without regard to the underlying protocols in use. For example, routers operate at Layer 3.

Binary Math

Network devices communicate using BITS, where a bit is a single digit represented by a 1 or a 0, or by using BYTEs, where a byte is made up of eight bits in any combination of 1's or 0's. A byte is also referred to as an octet.

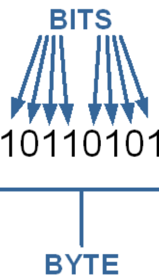


Figure A-2 Bits and Bytes

An octet can be converted to or from binary using the technique shown in the decimal conversion chart in Figure A-3. The conversion chart also shows the decimal equivalent of the binary number.

128	64	32	16	8	4	2	1		
1	0	1	0	0	1	0	1	=	165
1	1	0	0	0	0	1	0	=	194
1	1	1	1	1	1	1	1	=	255

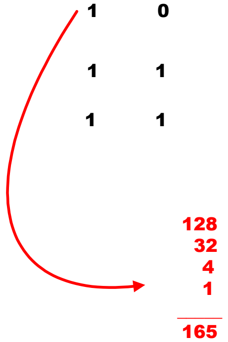


Figure A-3 Binary to Decimal Conversion

Bits containing a **1** in Figure A-3 determine which decimal values should be added. These decimal values, when added together, determine the decimal equivalent for the binary number.

This is an example of changing a number expressed in binary (base 2) to its decimal equivalent (base 10). The numeric value is the same, you have only changed the numbering base (radix.) All digital processes are done in binary. The conversion to decimal is done whenever binary values need to be read or entered by humans as their decimal equivalents.

IP Addressing

An IP (Internet Protocol) address is a unique set of numbers assigned to a device on a network to uniquely identify that device (by its IP address).

An IP address is a unique number composed of four octets, with each octet separated by a dot. This notation style is called dotted decimal notation.

Each IP address can be broken down into two parts, as shown in the example below:

Example: **128.121.188.201**

The first two octets are the network ID:	**128.121**
The second two octets are the host ID:	**188.201**

- **Network ID -** In this example, the 128.121 portion of the IP address defines the network that a host belongs to, and is equivalent to a street name in a mailing address.
- **Host ID -** The 188.201 portion of the IP address specifies a unique number assigned to the host on the network, and is equivalent to a house number in a mailing address.

IP Address Classes

IP addresses are assigned to classes according the schedule shown in Figure A-4. IP address classes are assigned as follows:

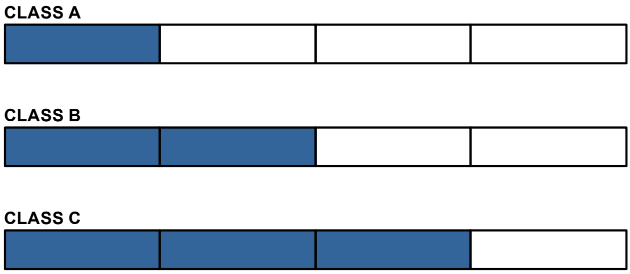
Class A

- 1.x.x.x to 126.x.x.x (0 and 127 are reserved)
- 126 Class As exist
- Can have 16,777,214 hosts on each Class A
- 8-bit network number
- 24-bit node number

Class B

- 128.0.x.x to 191.254.x.x
- 16,384 Class Bs exist
- Can have 65,354 hosts on each Class B

- 16-bit network number
- 16-bit node number



Address Class	High-Order-Bits	1st Octet Decimal Range	Networks Available	Hosts Available
Class A	0	1-126.x.y.z	126	16,777,214
Class B	10	128-191.x.y.z	16,384	65,534
Class C	110	192-223.x.y.z	2,097,152	254

Figure A-4 IP Address Classes A, B, C

Class C

- 192.0.1.x to 223.255.254.x
- 2,097,152 Class Cs exist
- Can have 254 hosts on each Class C
- 24-bit network number
- 8-bit node number

Class D

- 224.0.0.0 to 239.255.255.255
- Reserved for Multicast (messages sent to many hosts).

Class E

- 240.0.0.0 to 255.255.255.255
- Reserved for experimental use and limited broadcast

Private Network IP Addresses

RFC 1918 defines blocks of addresses for use on private networks:

- 10.0.0.0 – 10.255.255.255
- 172.16.0.0 – 172.31.255.255
- 192.168.0.0 – 192.168.255.255

Network Address Translation (NAT)

Private networks can only connect to the public Internet by using a Network Address Translation (NAT) device (a router, for example) or a proxy server which has been assigned a public IP address. These network devices use a public IP address to request information from the Internet on behalf of the private IP addressed devices on the associated private network.

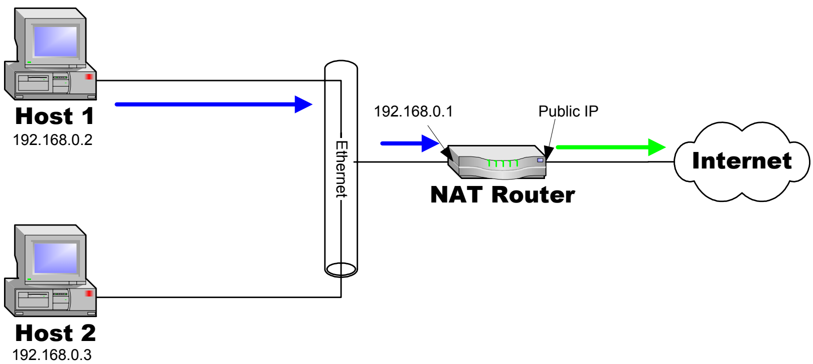


Figure A-5 NAT Router Example

This use of private addresses helps to conserve public IP addresses.

Subnets

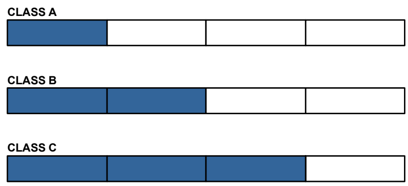
Subnets can be defined as the further segmentation of the InterNIC assigned Network ID IP address. The amount and type of subnetting performed by the organization is determined by the network layout.

In the process of subnetting, bits are borrowed from the host ID portion of an IP address and are then given to the network ID. Then a "Subnet Mask" gets assigned to the host along with the IP address.

Subnetting is required if the network is segmented.

Subnet Mask

The Subnet Mask is used by the host to determine if a destination IP address is on the local or on a remote network segment. The table in Figure A-6 shows the default subnet mask used for each class of IP address.



Address Class	Mask Decimal Value	Mask Binary Value
Class A	255.0.0.0	11111111.00000000.00000000.00000000
Class B	255.255.0.0	11111111.11111111.00000000.00000000
Class C	255.255.255.0	11111111.11111111.11111111.00000000

Figure A-6 Default Subnet Masks for IP Classes

The IP address and subnet mask work with each other to identify a network element or device. The subnet mask, like an IP address, contains 4 octets separated by a dot (.) and looks similar to an IP address.

The subnet mask determines what bits in the IP address are being used to determine the network ID by using the Boolean math operator **and** in a process called **and**ing. **And**ing compares each bit value in the IP address with the bit value in the subnet mask. The result of the **and**ing process determines which subnet the IP address is on. The Boolean **and** operator works as follows:

0 and 0 = **0**
1 and 0 = **0**
1 and 1 = **1**

The table shown in Figure A-7 shows the **and**ing of two binary values and the corresponding decimal equivalents for each of the values.

	Dotted Decimal Address	Binary Values
IP Address	192.168.2.66	11000000.10101000.00000010.01000010
Subnet Mask	255.255.255.0	11111111.11111111.11111111.00000000
ANDing Result	192.168.2.0	11000000.10101000.00000010.00000000

Figure A-7 ANDing an IP address and a subnet mask

A calculator, available from SolarWinds, performs these IP and subnet mask calculations and can be found at:

http://www.solarwinds.com/products/freetools/index.aspx

Network Segments

A “Network Segment” is a portion of a network that is bordered by two router interfaces as shown in Figure A-8.

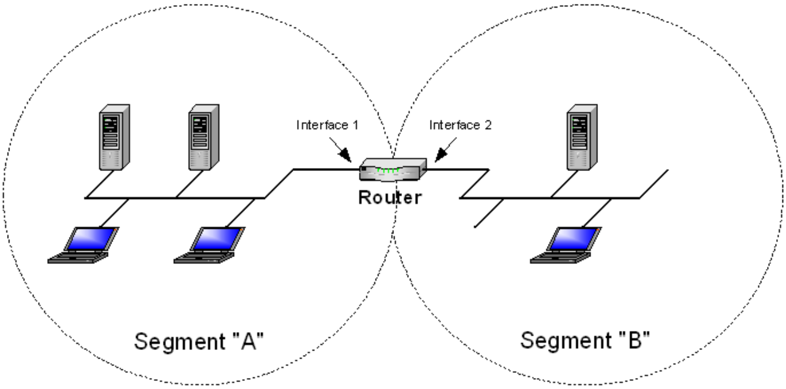


Figure A-8 Network Segments

Each network segment must either be on a different network or a different subnet. For example, if you have a single IP address available, you can change the default mask from 255.255.255.0 to 255.255.255.192. The resulting calculation yields four subnets:

- 192.168.100.0
- 192.168.100.64
- 192.168.100.128
- 192.168.100.192

Each of the four subnets can, in turn, support 64 members.

The example subnet used above yielded 4 subnets, but you can use a different mask to meet the specific requirements of your network.

Default Gateways

A default gateway is a network device, usually a router, that is responsible for routing data packets out of the local network segment.

The address of the gateway is entered into the devices on the local network, providing them with a location to send data that is destined for another segment.

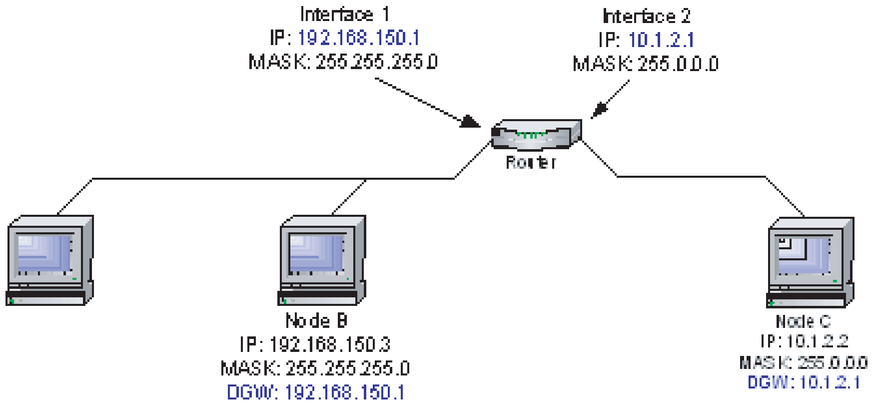


Figure A-9 Router as Default Gateway

MAC Addresses

A MAC address is a physical hardware address that gets assigned to the interface of a networking device. This address is typically created and burned into a device's ROM during the manufacturing process. MAC addresses are unique to the device and are not typically user-assignable.

The MAC address is used for Layer 2 (Data Link) communications between networking devices, and consists of 12 alpha-numeric characters as shown in the example below:

Example: **00-3f-bf-00-01-45**

- The first six characters are issued to the organization.
- The second six characters are assigned to the hardware interface by manufacturing.

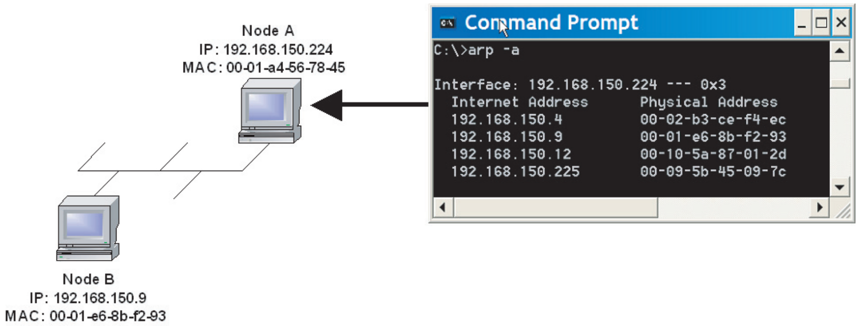


Figure A-10 Network Node MAC Addresses

APPENDIX B

AUTOMATIC SWITCHING

General

Automatic switching is a feature of the VMS that allows dynamically changing the network configuration in response to changes in either traffic type (Application switching) or network traffic loads (Load switching.)

The following material applies to the Vipersat CDM-570/570L, CDD-562L/564/564L, and CDM-600. For purposes of simplicity, these units shall be referred to as modem/routers.

The basic signal topology in a Vipersat network is TDM (Time Division Multiplex) outbound and Vipersat's proprietary STDMA (Selected Time Division Multiple Access) inbound. The STDMA slots can have their duration and bandwidth allotments varied to tailor bandwidth allocation to meet the bursty traffic load of a typical data network.

When required, a network is switched from STDMA to SCPC. SCPC bandwidth is allocated from a bandwidth pool by the VMS to meet QoS or other requirements for the duration of a connection. When the SCPC connection is no longer required, the bandwidth is returned to the pool for use by another client.

This basic structure gives the VMS-controlled network its flexible, automated network utilization and optimization capability.

The VMS has the intelligence to interpret the constantly changing statistics gathered by the Vipersat modem/routers and uses this data to issue commands back to these intelligent modem/routers, effectively managing the Vipersat network operation in real time, and optimizing each user's bandwidth usage to meet their QoS and cost requirements within their bandwidth allocation. The result is a stable satellite network connection that automatically responds to the customer's requirements while continuously monitoring and reacting to changing load, data type, and QoS requirements.

Bandwidth Allocation and Load Switching

Load Switching is the mechanism by which the Vipersat network switches a Remote terminal from STDMA to SCPC mode based on traffic levels at the Remote. There are two components of load switching in a Vipersat system: the VMS (network management) and the CDM (Comtech Data Modem). The VMS component receives switch requests from the CDM, and based on policy settings and available resources, either grants or denies the request. Within the CDM component, load switching is managed at either the Hub or the Remote, based on the current mode of operation. When a Remote is in STDMA mode, load switching for that Remote is managed by the Hub STDMA Controller. After a Remote has been switched to SCPC mode, it manages its own switching (or Step Up/Step Down) requests.

The basic concept for all load switching is that a running average of current utilization is maintained, and when that utilization exceeds a pre-set threshold, a switch is initiated. The data rate for the switch is computed by determining the current bandwidth requirement of the Remote, and adding some percentage of excess margin. The main difference between switching from STDMA to SCPC and adjusting within SCPC is that in STDMA mode, the current available bandwidth is constantly changing, while in SCPC mode, it is constant between switches. Furthermore, switches from STDMA to SCPC mode are always caused by the traffic level exceeding the switch threshold. Within SCPC mode, switches can be caused by traffic exceeding an upper threshold or dropping below a lower threshold. However, in both cases the new data rate is based on the actual traffic requirements adjusted up by the margin percentage. Also, based on policies set in the VMS, if a Remote requests less than some threshold amount of bandwidth, the Remote is put back into STDMA mode.

NOTE

Note: If the Hub STDMA mode is GIR (Guaranteed Information Rate) or Entry Channel, normal load switching is automatically disabled. In GIR mode, the Remote is switched to SCPC as soon as the GIR threshold is reached, if there is a switch rate defined. In Entry Channel mode, the Remote is switched to SCPC as soon as the Hub receives the first transmission from the Remote.

Load Switching

The next sections describe the principles behind Load Switching and Rate Adjustment (Step Up/Step Down).

Bandwidth Allocation and Load Switching by the STDMA Controller

As part of normal STDMA processing, the Hub monitors the traffic levels from each of the Remotes for which it is allocating bandwidth. This is done using the STDMA ACK management message (table B-1) that is transmitted at the beginning of each burst from the Remote. The STDMA ACK contains two metrics that are used by the Hub:

1. The number of bytes received for transmission (Queued Bytes) since the last cycle.
2. The number of bytes currently waiting to be transmitted (Bytes In Queue).

These metrics are used by the Hub for three purposes:

1. Determine the amount of STDMA bandwidth (slot size) to allocate in the next cycle.
2. Provide statistics of the amount of activity at each Remote (Average Bytes Received).
3. Determine if a load switch is needed.

Table B-1 STDMA ACK Message

Data Type	Size in Bytes	Description	Unit of Measure	Notes:
IP	4	IP address of Remote	N/A	Used by Remote to identify itself
Unsigned	4	Queued Bytes	Bytes	Total number of bytes queued since last cycle (includes possible buffer overflow)
Unsigned	4	Bytes in Queue	Bytes	Number of bytes currently queued
Unsigned	1	Group Number	N/A	
Unsigned	1	Dropped Buffers	Packets	Number of packets dropped (due to limited bandwidth)

If there is adequate upstream bandwidth available, the values of these two metrics will be the same. However, if there is not enough bandwidth to satisfy the traffic requirements of the Remote, or if the Remote has exceeded the maximum allocation, some data will be held for the next cycle. In this case, the number of Bytes in Queue will start to grow and will exceed the Queued Bytes. (In other words, the Bytes in Queue is the sum of the data not yet transmitted plus the new data received.)

If the condition is due to a short burst of data, the backlogged data will eventually be transmitted and the system will return to a sustainable rate. However, if the overload condition is due to long term increased activity, then the backlog condition will continue to grow and eventually trigger an SCPC switch. If the overload condition lasts long enough, buffer capacity will eventually be exceeded and some data may have to be discarded.

NOTE

Note: This is not necessarily bad, as it is often more effective to discard old data than transmit it after it has become 'stale'.

The "Bytes in Queue" metric is used to determine the STDMA bandwidth allocated (slot size) for the next cycle; the goal being to keep the data backlog to zero. The Hub uses this metric to compute the slot size for each Remote in the next cycle as follows:

- **Fixed Mode -** All Remotes get the same slot regardless of need; i.e. the metric is not used.
- **Dynamic Slot Mode -** The slot size for each Remote is computed based on the time (at the current data rate) needed to transmit all the "Bytes in Queue". If the result is less than the minimum slot size or more than the maximum slot size, the slot is adjusted accordingly.
- **Dynamic Cycle Mode -** Available bandwidth is allocated to Remotes proportionally, based on current need. The Bytes in Queue for each Remote is divided by the total Bytes in Queue for all Remotes to give the percentage allocation of bandwidth for each Remote.
- **GIR (Guaranteed Information Rate) Mode -** Initially computed the same as Dynamic Cycle, except there is no maximum limit. After all Remotes have been assigned slots, the Burst Map is checked to see if the total cycle length exceeds one second. If not, then all requirements are satisfied and the Burst Map is complete. However, if the cycle is greater than one second, then the slots are adjusted proportionally so that all Remotes receive at least their guaranteed rate plus whatever excess is still available.

  In the current design, when the one second restriction is exceeded, Remotes without a specified GIR are reduced to the global minimum slot size and the remaining bandwidth is distributed amongst Remotes that have been assigned a GIR rate. This approach is based on the assumption that Remotes that have been assigned a GIR are paying a premium and should benefit from available excess bandwidth when needed.

Note that the GIR allocations are restricted so that the assigned GIR totals cannot exceed available bandwidth. If this restriction is somehow violated, then it will not be possible to properly allocate bandwidth when the network is overloaded.

- **Entry Channel Mode -** This is the same as Dynamic Cycle, except that as soon as the Hub receives an STDMA ACK, it initiates a switch to SCPC mode based on the policy set for that Remote.

The important thing to understand about “Bytes in Queue” is that any data that is not transmitted (i.e. does not fit) in the next slot will be reported again in the next STDMA ACK. Thus the “Bytes in Queue” is not necessarily an accurate measure of the actual traffic being passed through the Remote.

The “Queued Bytes” on the other hand, reflects only the data that was received in the last cycle and thus is never duplicated (not including TCP retransmissions). This is the metric that is used for computing average load and initiating a load switch as needed.

Before discussing how load switching is determined, it is necessary to explain the modem/router parameters that control the switch. The screen shown in figure B-1 shows the entries in the Automatic Switching menu at the Hub that are used to control load switching.

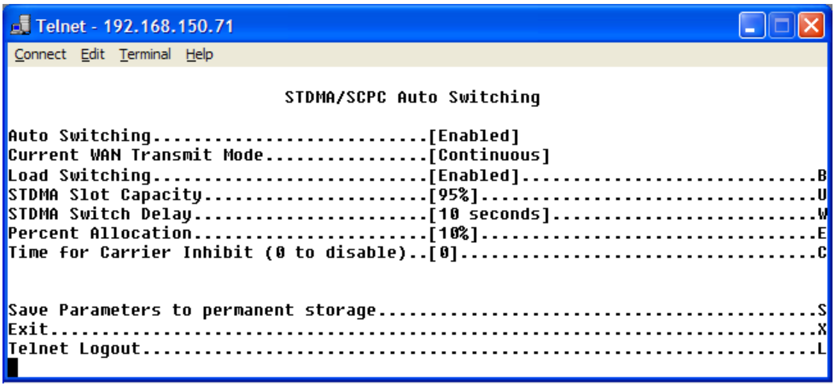


Figure B-1 Auto Switching menu (Hub)

- **Auto Switching -** This is a Vipersat Feature which is enabled in the CDM Features Menu. If Auto Switching is not enabled, Load Switching will be ignored.

- **Load Switching -** This is a type of Automatic Switching that is based on the amount of traffic at a Remote. If this mode is not set, then no Remote will be switched based on load.
- **STDMA Slot Capacity -** This is a threshold value. When the amount of outbound traffic at a Remote exceeds this percentage of the current STDMA slot capacity, a load switch is initiated. It is important to understand that in most STDMA modes, the amount of bandwidth allocated to a Remote varies with need and thus from cycle to cycle. Thus the amount of traffic that constitutes X% will also vary from cycle to cycle.
- **STDMA Switch Delay-** This is a built-in latency that forces a Remote to maintain an average load over some number of seconds after reaching a switch condition before the switch is actually initiated. This prevents switches due to momentary traffic bursts.
- **Percent Allocation -** This is an excess amount of bandwidth that is allocated beyond the current traffic rate when the switch to SCPC is made. For example, if the current average traffic at the time of the switch is 60K, and the **Percent Allocation** is 10%, then the allocation will be for 60K + 6K = 66K.

  Note that the Hub always allocates bandwidth in 16K blocks, so 66K rounded up will actually be 80K in this example.

Load Switching Process

Each time the Hub receives an STDMA ACK, it computes the average load for that Remote. This average is then compared to the bandwidth currently allocated to the Remote.

For example, if a Remote gets a 50 ms slot in an upstream that is running at 512000 bps, then it can transmit 0.050 * 512000 = 25600 bits = 3200 bytes. If the Queued Bytes was 3000, then for that cycle, the Remote was at 3000/3200 = 93.75% of capacity. If the current cycle time is exactly 1 second, then the effective data rate of the Remote is also 25600 bits per second. However, if the cycle time is only 500 milliseconds, then the effective data rate is actually 25600 / .5 = 51200 bits per second.

The effective data rate is important for calculating switch data rates. If the average bandwidth used exceeds the threshold percentage of available bandwidth, then a flag is set indicating a switch is pending. At this point, the statistics are reset and the traffic load is then computed for the time period specified by the switch delay. At the end of this delay, if the threshold is still exceeded, a switch is initiated. The data rate specified for the switch is determined by taking the current load, as indicated by the bytes queued during the delay period, multiplying it by the percent allocation and rounding up to the next 16 Kbps.

A key point is that in most of the STDMA modes, the bandwidth allocated to each Remote is constantly being adjusted to the needs of the network. As long as the network is running below capacity, most Remotes will get the bandwidth they need and a switch will not be required. Only when a Remote requires more bandwidth than is available in STDMA will a switch occur.

In Dynamic Cycle mode, each Remote will always appear to be running at near 100% capacity, even when there is actually excess bandwidth available. This is because in Dynamic Cycle mode, the Remotes are almost never given more bandwidth than they need. As a result, the algorithm for this mode uses a maximum allowed slot size rather than the actual allocated slot size to calculate the effective data rate. This results in a more accurate estimate of the available STDMA bandwidth.

Load Switching by a Remote

Once a Remote has been switched from STDMA mode to SCPC mode, it checks its bandwidth requirements once per second to see if a change is needed. The menu for controlling the Step Up/Step Down switches are set in the menu shown in figure B-2.

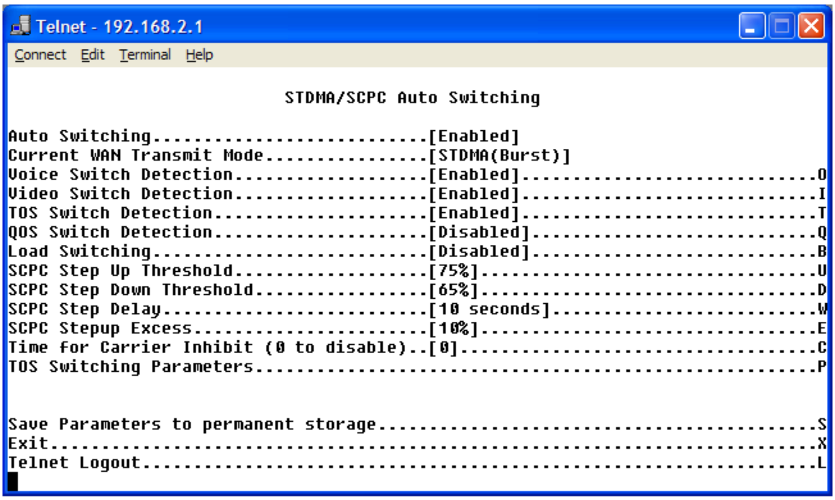


Figure B-2 Auto Switching menu (Remote)

- **Auto Switching -** Same as for Hub.
- **Load Switching -** Same as for Hub.
- **SCPC Step Up Threshold -** Same as **STDMA Slot Capacity** at Hub.

- **SCPC Step Down Threshold -** Similar to **STDMA Slot Capacity** at Hub, except **Step Down** is used to trigger a switch if the average load falls below this value.
- **SCPC Step Delay -** Same as **STDMA Switch Delay** at Hub.
- **SCPC Stepup Excess -** Same as **Percent Allocation** at Hub. Note that the value applies to both **Step Up** and **Step Down** switches, and if computed against the average traffic load at the time the switch is intiated.

Determining Need-for-Change

The following process is used to determine if bandwidth utilization warrants a need-for-change.

The operator defines both a Step Up and Step Down threshold in terms of percent utilization, a bandwidth margin value, and a latency or averaging period. Once per second, the CDM router software determines the current percent utilization by dividing the bits transmitted by the current transmit data rate.

If the percent utilization exceeds the step up threshold or is less than the step down threshold for the entire latency period, then an ASR (Automatic Switch Request) is sent to the VMS. The bandwidth requirement for the ASR is computed by taking the average percent utilization over the latency period and multiplying that by the current data rate to determine the actual data rate used over the measured interval. This number is multiplied by the margin value and rounded up to the nearest 8 Kbps to determine the requested bandwidth.

Load Switch Example

An automatic load switching example, illustrated in the schematic diagram in figure B-3, illustrates how a network can respond to changes in traffic volume or load conditions. The network’s capability and method of response to load changes is determined by the setting and capability of each of the components in the system, such as the transmitter power output, the antenna capabilities for each of the sites in the network, and the policies set in VMS.

The elements for determining policies and their interactions are covered in this section.

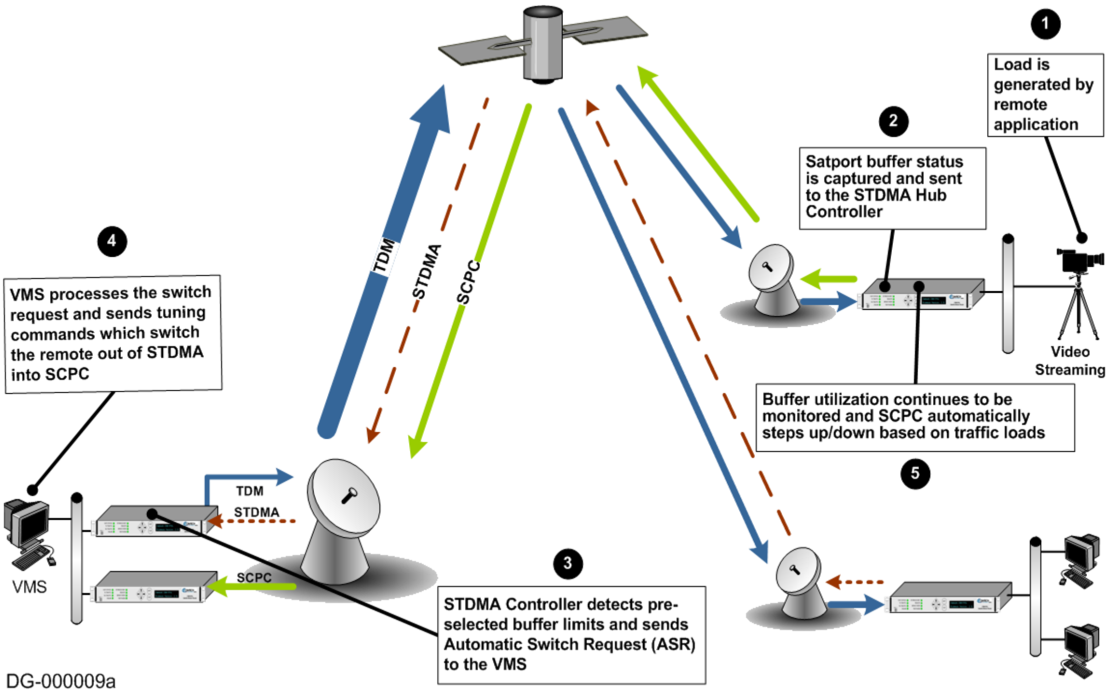


Figure B-3 Load Switching diagram

A load switch is illustrated in figure B-3 using the following process:

1. A load is generated by an application that is running at a Remote. In this example, the application is a video stream.

2. The data is connected to the Remote modem/router over an ethernet link for transmission to the satellite. While the data-stream transmission is in progress, the Satport buffer status is captured and the Remote's buffer status is sent to the STDMA Hub Controller.

3. The STDMA Controller compares the Remote's pre-selected buffer limits with its buffer status and, if the buffer status exceeds the preselected limits, the STDMA Controller increases the time-slot allocated to that channel. If this brings the buffer status within established limits, no further changes are made.

4. If the buffer status continues to exceed the preselected limits, the STDMA Controller sends an ASR to the VMS.

5. The VMS processes the switch request by checking for available resources by determining if there is a free demodulator, and then determining the

channel space (bandwidth) requirements to accommodate the data flow requested by the STDMA Controller.

6. If the VMS finds available resources, it processes the switch request and sends tuning commands that switch the Remote out of STDMA and into SCPC mode.

The modem/router continuously monitors traffic flow volume. Whenever a preset upper or lower limit is exceeded, the modem/router sends a request to the VMS to change bandwidth by the amount needed to meet the new requirement. By this process, the bandwidth is continuously optimized in real time, precisely accommodating circuit traffic volume.

The ideal condition is for utilization of the channel to reach approximately 90%, thus optimizing the use of available bandwidth. The ability to actually accomplish this is limited by the currently available carrier bandwidth and, ultimately, the power output and antenna size available at the transmitting Remote site.

If the requested bandwidth is not available, the STDMA Controller will continue to receive buffer status reports from the Remote indicating that buffer flow is continuing, and the STDMA Controller will, in turn, continue to request additional bandwidth from the VMS. When bandwidth becomes available, the VMS will perform the switch the next time that the STDMA Controller makes the request.

If the video data stream ends before the switch in bandwidth is completed, the channel is closed, the bandwidth which had been allocated is made available again to the pool, and no further action is taken.

Reduced Data Flow in Switched Mode (SCPC)

In the event the data flow is reduced—for example, a streaming file transfer terminates—the SCPC switched demodulator detects the reduced flow and notifies the VMS. The VMS will then send a switch command to reduce the size of the carrier bandwidth to the newly calculated requirement.

This entire process is automatic, following the policies established for the network. The network is dynamically modified, changing configuration to automatically respond to changes to the network's load.

The Home Threshold is the bit rate set to trigger a return to the home condition. This function is used when bandwidth has been allocated to meet load requirements, and then the load has been either removed or partially removed. The Home Threshold is used to determine whether the current bit rate has fallen below this preset level and, if so, the channel is switched back to its home condition (STDMA mode, for example).

Application Switching

Application switching, illustrated in figure B-4, also is capable of changing bandwidth use, but the change is determined entirely by the type of application being requested, ignoring load requirements.

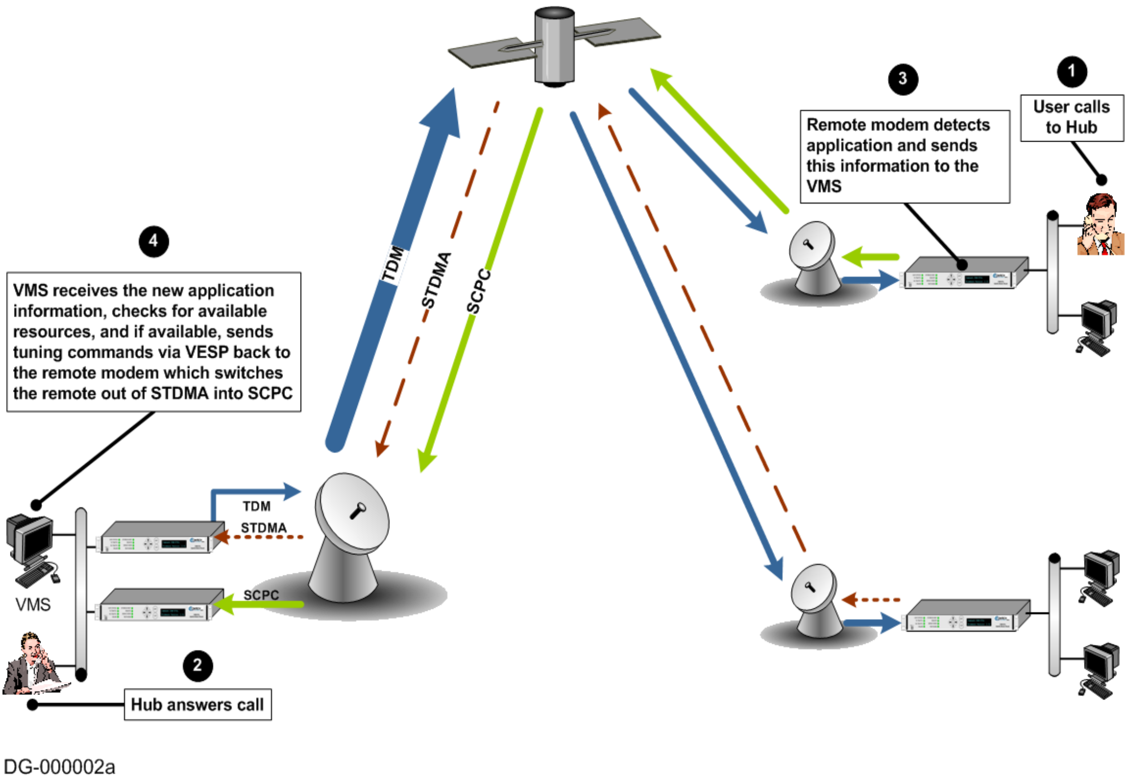


Figure B-4 Application Switching diagram

In a system configured for application switching, the Remote site modem/router looks for a packet in the data stream coming from the LAN that is configured using the H.323 stack protocol and containing an H.225 signaling protocol. In the illustration shown in Figure B-4, the signal is a voice call initiated at the Remote site.

The packet is examined to determine the port number, then, from the allocated port ranges, the modem/router determines the type of application being sent.

The modem/router sends a switch request to the VMS requesting a carrier for the application type. Typical applications include:

- Video

- Voice over IP (VoIP)

Each application type will have been assigned a bandwidth allocation when the policy for the Remote is established. The voice application, for example, might have had the bandwidth set in the policy to handle three simultaneous voice connections. When a VoIP protocol is detected in the H.225 signaling protocol, the modem/router requests the VMS to switch the bandwidth to accommodate three voice circuits.

The same process applies if the protocol detected is Video.

When *both* VoIP and Video are requested, the bandwidth required for the Video is used and the VoIP, which has priority, shares the SCPC with the Video.

Once the VMS receives the request to switch, it determines if there is a free demodulator and if there is bandwidth space available to handle the requested application. If the resources are available, the VMS then performs the switch.

Applications are streaming data. The Remote looks at the streaming data flow until it sees a break in the data exceeding 10 seconds. Once a break is detected the modem/router presumes that the application is terminated (or has malfunctioned), drops the carrier, and makes the bandwidth resources available for another service.

Type of Service (ToS) Switching

Type of Service (ToS) Switching is typically used on circuits carrying encrypted traffic where the packets cannot be examined to determine the type of traffic being carried. Normally, in a non-encrypted Vipersat network, packets are classified by the Remote modem/router using protocol classification detection and the results are forwarded to the VMS via ASR messages. The VMS switch detector service then applies the required or requested bandwidth using policies which have been pre-configured in the VMS.

ToS switching can also be utilized in non-encrypted networks. One advantage for this is that each packet associated with the application will have ToS set, thus making ToS switching extremely reliable. A drawback, however, is that unless each application can set a different ToS value, resolution is lost.

For example, in a non-encrypted network, if a voice application service connection is started, the Remote's classifier analyzes signaling and data protocols (H.323, SIP, & Data RTP) being routed through the modem/router. After connection detection, the process waits for data (RTP). Data is normally sent after the receiving party answers, which then triggers the system to process an ASR.

Using the ToS classification, detection function allows application-based switching in encrypted networks where the signaling protocols are encrypted or effectively hidden. ToS adds the type of service to the un-encrypted Quality of Service byte (QoS) in the header which then can be analyzed to determine the type of service being transmitted. Once the type of service is determined, the VMS uses this information to perform switching, following the policies established for the detected traffic type.

NOTE

Note: Load switching by the VMS is not affected by enabling ToS detection.

Applying a ToS value to an application (VoIP, IPVC, or priority data) through either preservation or classification packet stamping allows the VMS to function in an encrypted network.

Entry Channel Mode (ECM) Switching

STDMA Entry Channel Mode provides a method for Remotes requiring SCPC access channels to enter/re-enter the network initially or after a power or other site outage. The switch time will be variable based on the burst rate (bps) of the STDMA group, the number of Remotes with slots in the group, and where in the burst cycle the Remote is when it acknowledges receipt of the Burst Map.

Initial SCPC rates are settable for each Remote in the STDMA group(s). Upon detection of a Burst Map acknowledgement from a Remote, the STDMA Burst Controller will send a switch request to the VMS with the operator-specified initial SCPC rate. Upon determining that there is an available demodulator and pool bandwidth, the VMS will send a multi-command to remove the Remote from the STDMA group, tune it and the switched demodulator to the specified initial bit rate and selected pool frequency. The Remote will stay at this initial rate unless an application (such as VTC) or consistent load cause it to request additional bandwidth from the VMS.

Entry Channel Mode is not driven by the presence or absence of customer traffic. Once in ECM, the switched initial data rate becomes the new temporary Home State. This temporary Home State sets the low limit data load threshold, where the Remote will stop sending load switch request commands. Remotes no longer require Burst Maps to maintain SCPC transmission.

After all Remotes are processed into ECM, the Burst Controller drops into sanity mode, sending a keep alive map to service Remotes which may have their SCPC carrier inhibit flag set. The keep alive message is sent once every two seconds until re-entry is invoked.

Fail-Safe Operation

For Entry Channel Mode switching, it is useful to describe the fail-safe mechanism used for freeing pool bandwidth.

If the VMS loses communications with a switched Remote for more than three minutes, it will attempt to return the Remote to its Home State. If the Revert-to-Home State command succeeds (restoring communications), Entry Channel Mode will cause the Remote to switch to its initial SCPC bit rate.

If the Revert-to-Home State command fails, the VMS will send a command to return the Remote and the Hub demodulator to the state where they were prior to losing communications, but leave the Remote enabled in the STDMA Burst Controller. This provides the Remote with 2 paths to rejoin the network:

1. If the outage was the result of power outage at the site, the Remote will reboot in its Home State (STDMA), then acknowledge the receipt of the first

Burst Map causing it to rejoin the network through ECM. The VMS will park the demodulator previously in use and free the bandwidth slot.

2. If the outage was due to an extended rain fade or other communications blockage with no loss of power, the Remote will rejoin the network via the previously assigned SCPC channel. When the VMS receives a PLDM it will send a Revert-to-Home State command and free the bandwidth slot and burst demodulator. The Remote will then rejoin the network through ECM.

Since it is not possible to know which of the above scenarios caused the communications outage, the VMS will not free the bandwidth slot except through operator intervention.

Figure B-5 and figure B-6 diagram the time state differences and the process of recovery. Note that the times referenced in the diagrams are approximate.

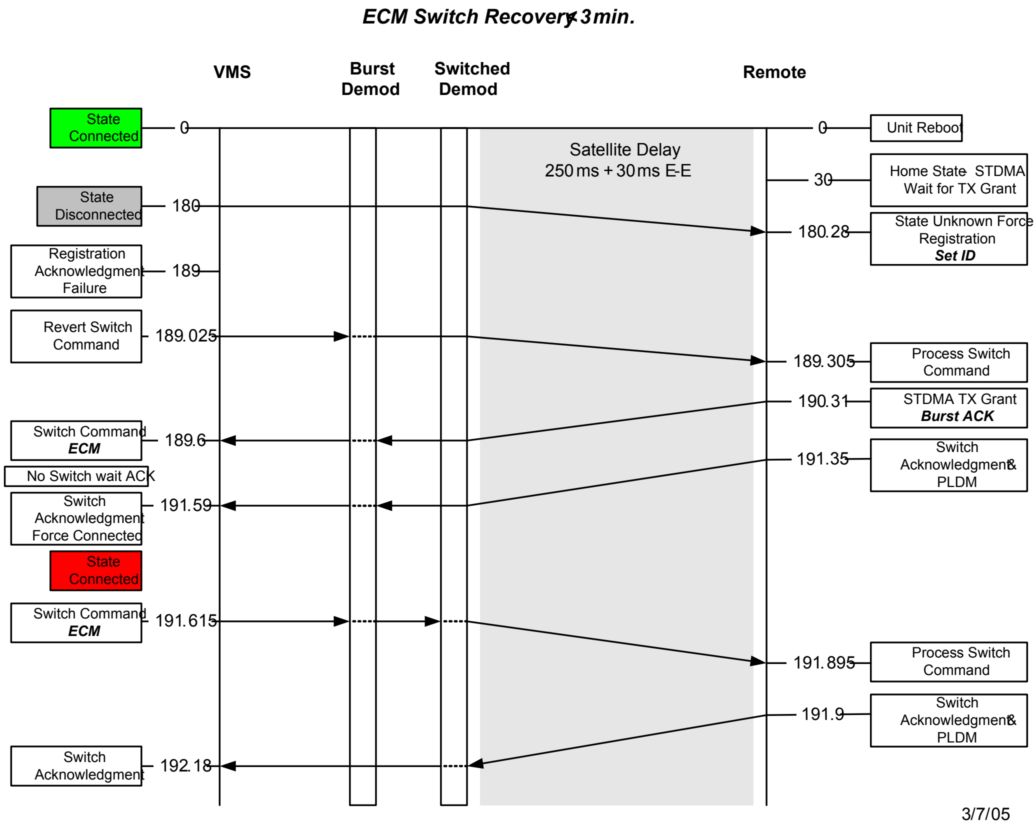


Figure B-5 ECM Switch Recovery: < 3 minutes

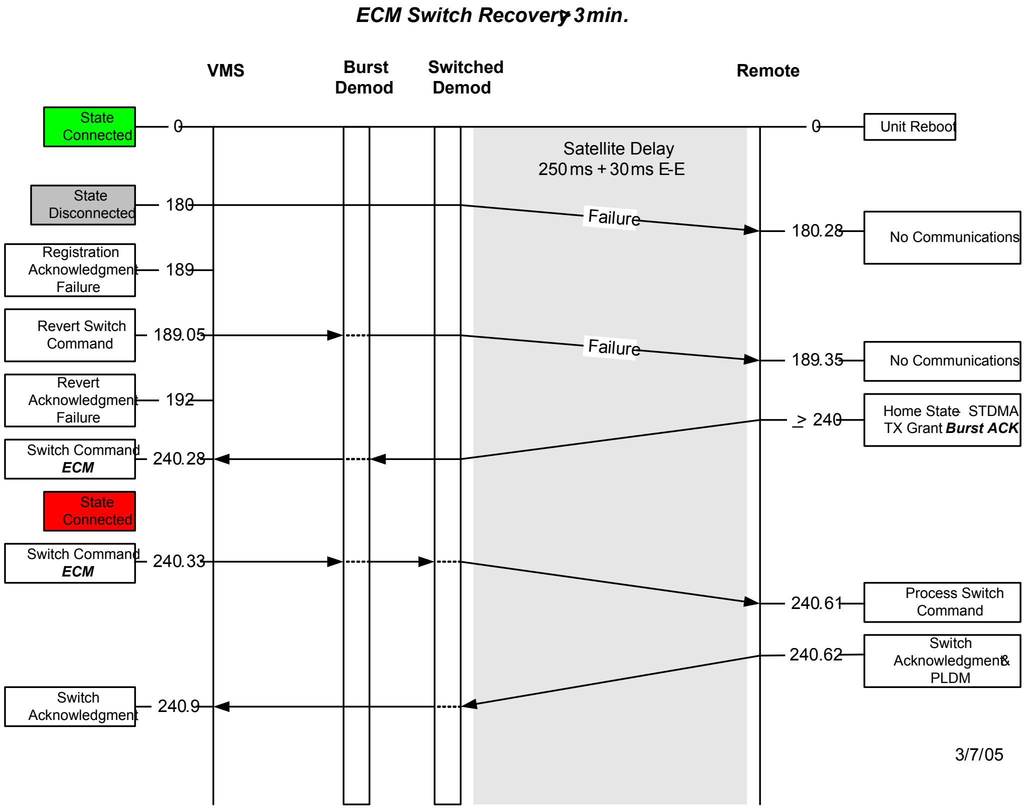


Figure B-6 ECM Switch Recovery: > 3 minutes

Appendix C

Dynamic Power Control

Introduction

Dynamic Power Control (DPC) provides a mechanism whereby VIPERSAT satellite links have their transmit power levels adjusted in order to optimize the receive signal quality (as measured by the demodulator E_b/N_o). This optimization process acts to either increase or decrease transmitted signal levels in order to:

- Achieve a minimum level of received E_b/N_o consistent with providing an error free link.
- Reduce transmit power where sufficient link margin exists in order to optimize station uplink and satellite transponder power usage.

DPC can be selectively enabled and disabled on a link-by-link basis and works on both point-to-point as well as point-to-multipoint links. DPC relies on the passing of an IP message between the receive site (where the receive quality is being measured) and the transmit site (where the power level is to be adjusted). These DPC packets are IP unicast messages, and only the transmit site whose frequency and Network ID number matches that contained in the IP message will act on the message.

The Vipersat CDM (modulator) units have an algorithm that, when activated, automatically adjusts the modulator transmit power to maintain a constant nominal receive signal quality (E_b/N_o) at the corresponding receive station(s). This provides a mechanism to compensate for varying signal levels caused, for example, by the use of different antenna sizes in a mesh network, or if Ku band is being used as a means to compensate for rain fade conditions. The power control algorithm is a closed loop servo-mechanism with the received E_b/N_o values as the input function and the modulator's transmit power as the output function. Only modulator transmit power is controlled by the algorithm since the receive chain has its own automatic gain control. DPC can be applied to any or all of the modems with the exception of the STDMA burst control demodulators. Since the STDMA burst demodulators are SCPC fast acquisitions receivers they cannot provide stable signal quality measurements (E_b/N_o). This value is critical in closing the power loop control mechanism.

NOTE

Note: STDMA is not susceptible to bursts at different power levels since it is a standard SCPC demodulator — as long as the input C/N burst power ranges comply with the performance specifications of the modem. An example is an operation using meshed video carriers.

DPC is a modulator function that cannot be enabled in remotes operating in STDMA mode. DPC is automatically turned on when the remote switches to SCPC mode.

Description

Operation of the DPC algorithm is controlled by the parameters shown in table C-1, below.

Table C-1 Dynamic Power Control Parameters

Parameter	Default	Significance
Nominal Power Level	-25 (IF) -40 (L-Band) dBm	Power used for scaling Maximum power after switching
Calibrated Data Rate	System Specific	Data Rate which is used for scaling Maximum power after switching
Maximum Power Level	System Specific	Maximum transmit power level permitted based on link/satellite parameters
Minimum Power Level	System Specific	Minimum transmit power level permitted based on link/satellite parameters
BaseLine Power Level	-25 (IF) -40 (L-Band) dBm	Function of the power given to the modem by the VMS for the last switch command based on link budget calculations
DPC Offset	0 dB	Power adjustment to account for changes in the environment (rain fade) or other factors in order to maintain link connectivity
SOTM Offset	0 dB	Power adjustment received from ROSS based on current location of modem within the satellite footprint
Target Eb/No	10 dB	Target E_b/N_o value for which DPC is aiming
Target Range	0.2 dB	Target range for no power adjustment; No adjustment occurs when power is within this range
Speed Up Eb/No	5 dB	DPC and PLDM process speeded up from default (1/min) if E_b/N_o is below this amount
Target DPC Address	0.0.0.0	Identifies the modem that is transmitting to this device and will receive Eb/No values

The start point for all enabled modulators is the Nominal Power Level. This level is measured during initial system turn-up and is the power level at which all modems will initially transmit when a call is established. Once communication is established and data starts to flow, the modulator begins receiving DPC packets from the demodulator and adjusting its transmit power level accordingly.

The transmit power level is compared to the received E_b/N_o. Depending on whether the transmit power is high or low, the modulator transmit output level is adjusted until the E_b/N_o is within the range set by the Target Range for no power adjustment.

If the received E_b/N_o should, for any reason, fall below a minimum value set by the Speed Up Eb/No parameter, then the DPC messages will be transmitted at a faster rate until the nominal level is restored.

Higher Order Modulation BER Waterfall Mapping

DPC target E_b/N_o values are automatically adjusted using the BER waterfall curves stored in the CDM-570/570L modems. The calculations are based on the received VMS multi-command message configuration (i.e., bit rate, modulation, FEC) lookup per BER table and used to modify the target E_b/N_o to sustain an acceptable bit performance over all possible waveform configurations. This feature is an embedded function and is automatic.

Delta Rain Fade Power Compensation

DPC offsets in modem power that are necessary during rain fade conditions are now applied to incoming switch commands from the VMS. This prevents possible link failures due to power value changes associated with these switch commands.

A parameter called *BaseLine Power* is a function of the power given the modem by the VMS for the last switch command. At boot-up, and prior to receiving switch commands from the VMS, this parameter will match the *Nominal Power Level* value. If DPC adjusts due to changes in environment or other factors, the adjustment will appear in the *DPC Offset*, and will remain until environmental conditions change or a unit reset occurs. The resultant modem power will be the addition of the BaseLine Power and the DPC offset.

Example

A Remote modem has the home state bit rate set at 128 kbps, with a BaseLine Power value of -15 dBm. When the VMS sends a switch command for a new bit rate of 256 kbps, it will send a corresponding power value of -12 dBm (new BaseLine) to compensate for the additional energy required to maintain C/N.

If, prior to a switch, a fade condition causes the power to increase by 2 dB at the home state bit rate, the resulting modem power will be -13 dBm, creating a DPC Offset value of 2 dB. Now when the VMS sends a switch command to 256 kbps, the modem power will be adjusted to -10 dBm (-12 dBm plus

2 dB). This prevents loss of the link due to power value changes based on fade conditions.

This feature is automatic and requires no operator intervention.

Adjustment for Data Rate

The maximum output power level is scaled according to the data rate at which the modulator is transmitting. Consider, for example, a system that normally runs at a data rate of 512 kbps with a Nominal Power Level of -10 dBm and a Maximum Power Level of -5 dBm. If a voice switch occurs that sets the data rate to 32 kbps, the power requirements are much lower than the nominal -10 dBm level. With the above process, it is theoretically possible for the power to be raised all the way to -5 dBm, which is past the saturation point for such a small data rate. To prevent the use of excessive power that will drown out the signal and cause damage to the satellite, the modulator calculates a maximum power that is appropriate for its current data rate.

The net result of the DPC algorithm is that the transmit power of all video carriers is adjusted such that the receiving modems see a constant Eb/No value. This optimizes receive signal quality and use of system resources since it can lead to a reduction in power amplifier intermodulation and also a conserving of satellite transmit power.

DPC Scaling Function

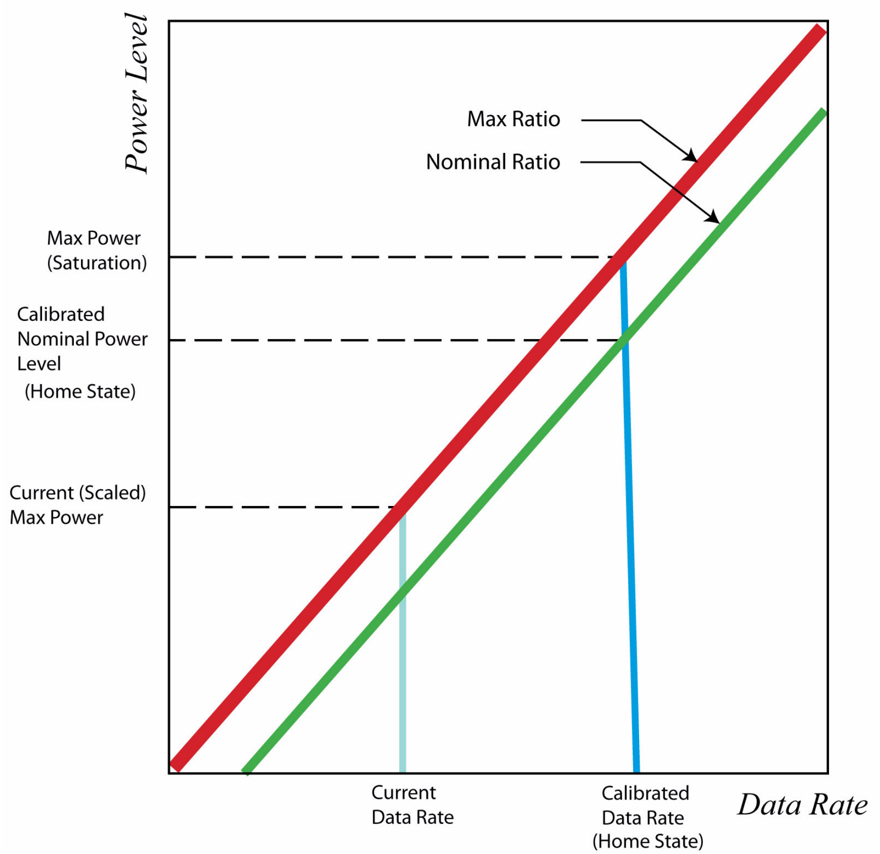


Figure C-1 DPC Scaling Function

Figure C-1 illustrates the scaling function, based on the ratio of power level to data rate, of the DPC system. Once this ratio is mapped out for the system, the DPC scaling function will automatically determine the appropriate power level for any given data rate. Three parameters are essential for this scaling function:

- Calibrated Data Rate
- Calibrated Nominal Power Level
- Maximum Power Level

As determined during initial system turn-up, the Calibrated Data Rate and the Calibrated Nominal Power Level values for the CDM are entered into the VMS *Home State* menu. The Maximum Power Level (the point at which the signal reaches saturation) for the Calibrated Data Rate is then determined, and entered into the VMS *DPC* menu (or the CLI *Dynamic Power Control Configuration* menu). If these home state parameters have not been entered, DPC will not be able to function and will disable itself, resulting in an error message that is displayed in the CLI.

Under most circumstances, the system will be running at the Calibrated Data Rate, at the Calibrated Nominal Power level. When the VMS sends a switch command to the CDM, the modem will go to a different data rate, and will calculate a nominal power level for the transmitter. Communication is established, data starts to flow, and the modulator begins receiving DPC packets from the demodulator and adjusting its transmit power level accordingly. When changing its power, the CDM will calculate a scaled maximum power based on its current data rate and certain other values in the home state. This calculated maximum is what insures that the modulator is not transmitting with more power than is necessary, thus preventing problems such as over-saturation.

DPC parameters can be set from either the VMS or the CLI. After enabling the DPC feature for a unit, a reset is not necessary. However, when enabling DPC in a Remote expansion unit that is currently being used for a mesh connection, that connection must terminate (e.g., revert the Remote) and a new switch occur before the DPC function will become active. After switching, once the first DPC packet from the demodulator(s) is received, the DPC state will begin tracking and start adjusting the modulator power output.

{ *This Page Intentionally Blank* }

APPENDIX

D

NETWORK MIGRATION

Upgrading CDM-570/CDD-56X Series Modems to Firmware Version 1.5.3

General

This document covers the migration of networks with CDM-570 and CDD-56X series modems to IP Router firmware version 1.5.3 from any earlier versions of code. It addresses the issues customers will face when migrating their networks and provides a step-by-step plan to facilitate the process.

Comtech Vipersat Networks strives to make firmware migrations as painless as possible by maintaining backward compatibility with prior versions of code. Only under unavoidable circumstances where it is absolutely necessary will backward compatibility be broken. To provide a considerable increase in performance and reliability, the 1.5.3 firmware changes the HDLC over-the-air frame from 16 to 24 bit Cyclic Redundancy Check (CRC). In this case, backward compatibility with all previous versions has been broken.

Migration of existing networks to the new version of code must be carefully planned. As soon as the Hub units are rebooted to the new v1.5.3 code, they will lose communications with any Remote data units that are running v1.5.2.2 or earlier code. The Hub operator must take care to insure that all online Remote data units have the new v1.5.3 code in the slot to which they will reboot.

Note that the main concern is for any Remotes that are offline during the migration phase, and then come back online sometime afterwards.

Since it is not possible to guarantee that all Remote sites will be online during the initial upgrade to v1.5.3, a migration completion tool and procedure is provided to facilitate picking up new or offline units. This migration tool includes temporary control parameters for Hub units that allow the operator to select an operation mode that is compatible with Remotes running v1.5.2 (or earlier) firmware. When this operation mode is chosen for the TDM outbound and the appropriate Burst Controller(s), communications with v1.5.2 (or earlier) straggler/offline Remotes will be restored. At this point they can be upgraded to v1.5.3, restoring total network-wide communications.

Note that communications with all Remotes with the upgraded firmware version will be lost when this backwards compatibility migration control is initiated. Until migration is completed, this will represent a temporary network outage to all Remotes connected to the TDM outbound. In networks with a DVB outbound, only those Remotes associated (grouped) with the Burst Controller set to v1.5.2 compatibility will lose communications.

Great care should be exercised in following these steps as outlined in this document. It is important to remember that network communications will not be effected until the units are rebooted to v1.5.3 router code. The last section of this document addresses recovering stragglers/offline remotes.

Firmware Upgrade

Upgrade Overview

This procedure describes the v1.5.3 firmware upgrade process using both the Vipersat Vload Utility and a Telnet connection. For detailed information on using Vload, refer to the *Vload Utility User Guide*.

Caution: This firmware installation procedure requires the modem to be rebooted which, in turn, will cause a satellite circuit to drop momentarily. Firmware installation should be done when it will not cause disruption of a live circuit carrying customer traffic.

Required Support Utilities and Firmware

- PC Running Microsoft Windows (Latest OS)
- VLoad v3.1.6
- VLOAD Utility 3.1.x User Guide
- ParamEdit-5.3.dll – Configuration Editor v1.5.3.6
- Telnet (Windows Program)
- FW10805P.bin – Base Modem Firmware v1.4.5 (if upgrading from v1.3.3)
- FW10805U.bin – Base Modem Firmware v1.5.1
- FW10875J.bin – IP Option Firmware v1.5.3, CDM-570/570L
- FW11669D.bin – Unit Firmware v1.5.3, CDD-564/564L

Basic Steps

The Vipersat CDM-570/570L modems are comprised of two main parts, the Base Modem and the IP Router Module. These two parts function with different firmware code, each of which must be upgraded using the sequence of steps below.

The Vipersat CDD-56X modems utilize a single firmware code, and therefore only the Router must be upgraded to v1.5.3. The Base Modem upgrade procedure can be disregarded. Perform steps 1 through 4 and step 8 only for these modems.

1) "Get Information" from all units using VLOAD; this will retrieve currently loaded image versions.

2) Upgrade Bulk Image location #1 on the Router to v1.5.3 firmware.

3) Save to Flash on all units and reset them to Latest/Oldest.

4) "Get Information" (VLOAD needs current information before performing each step).

5) Upgrade Bulk Image location #1 on the Base Modem to v1.4.5 and reset all boxes to "Latest" code. Note this is only necessary if unit is running < v1.4.4.

6) "Get Information" and load v1.5.1 Base Modem code to "Oldest" and reset all the modems to "Latest".

7) Load v1.5.1 Base Modem code to "Oldest" (replacing the older image in the other location).

8) Load v1.5.3 Router firmware to the "Oldest" Bulk Image.

CDM570 Router Card		CDM570 Base Modem		
Bulk #1	Bulk #2	Bulk#1	Bulk #2	
1.5.2.2	1.5.2.2	1.3.3	1.3.3	After 1
1.5.3	1.5.2.2	1.3.3	1.3.3	After 4
1.5.3	1.5.2.2	1.4.5*	1.3.3	After 5
1.5.3	1.5.2.2	1.4.5	1.5.1	After 6
1.5.3	1.5.2.2	1.5.1	1.5.1	After 7
1.5.3	1.5.3	1.5.1	1.5.1	After 8

- Note: 1.4.5 will originally load into the inactive slot, which could be either 1 or 2.

Figure D-1 Firmware Migration Stages—CDM-570

Migration Procedure

Configure Upgrade Image

Telnet into each unit and use the CLI to set the **Upgrade Image** to “Oldest”:

1. From the Main Menu, enter **O** for Operations and Maintenance.

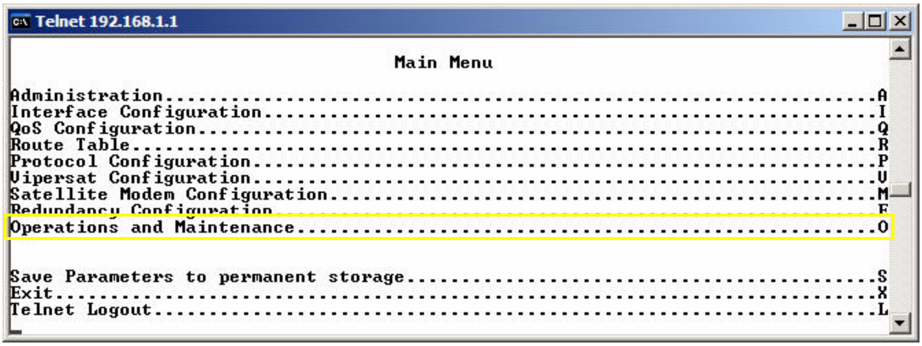


Figure D-2 Main Menu, Telnet

2. Ensure that the Upgrade To setting is **Oldest**; if not, enter **U** to modify the setting.

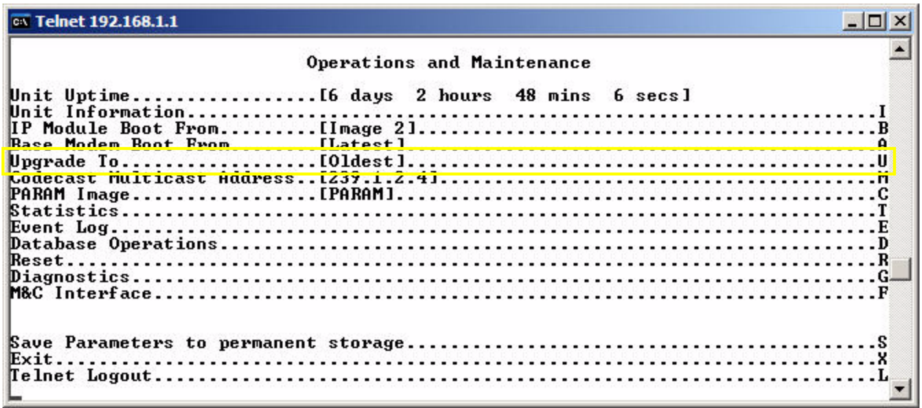


Figure D-3 Operations and Maintenance Menu

3. Enter **S** to save the setting.

Repeat the above steps for each unit.

Getting Information with VLOAD

1. The first step in getting information is to discover the units in the network. Do this by performing either an **Add** or an **Add All** with Vload, as shown in the figures below.

If the IP addresses of the units are known, and there are only a select number of these units to upgrade, click on **Add** to manually enter these units.

Note that **Add All** will find all units on the network, which for a large network will result in an extensive list. Once the list is generated, units can be removed individually.

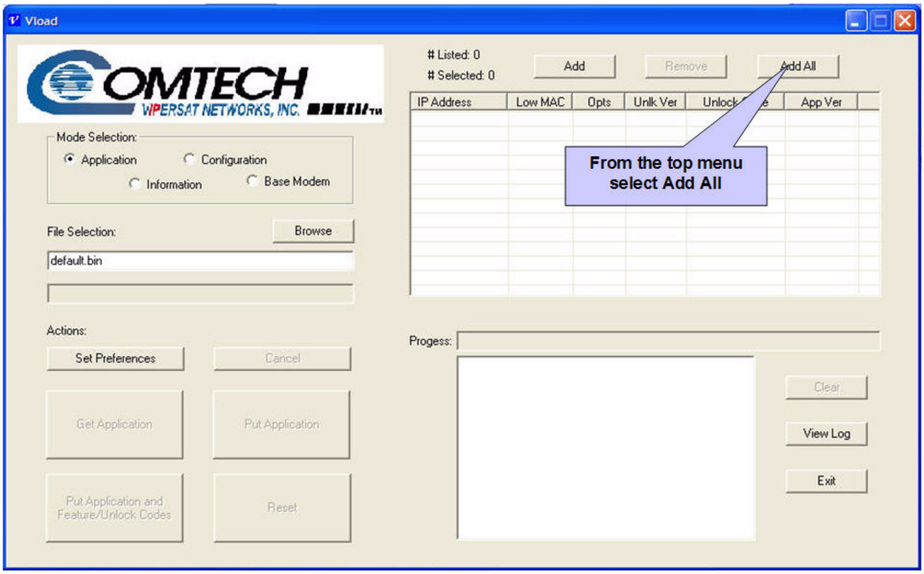


Figure D-4 Initial Vload screen

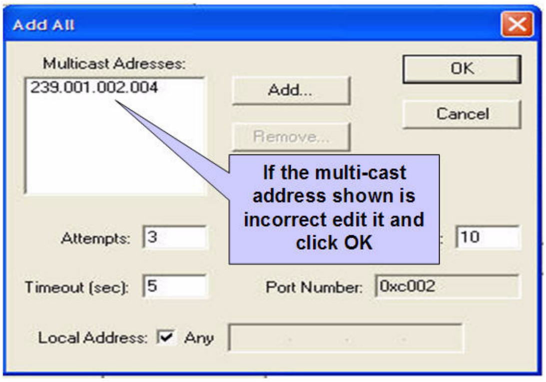


Figure D-5 Add All dialog

Note that the Receive Multicast Address for the modem/routers is the same as the Transmit Multicast Address for the VMS. This IP address can be found under the VMS ViperView tree view "Vipersat Manager"/Properties.

2. Select, Edit, or Add the desired Multicast address(es) in the Add All dialog, then click **OK**. The list of units appears in the main Vload window, along with the progress status of connecting and retrieving information for each unit.

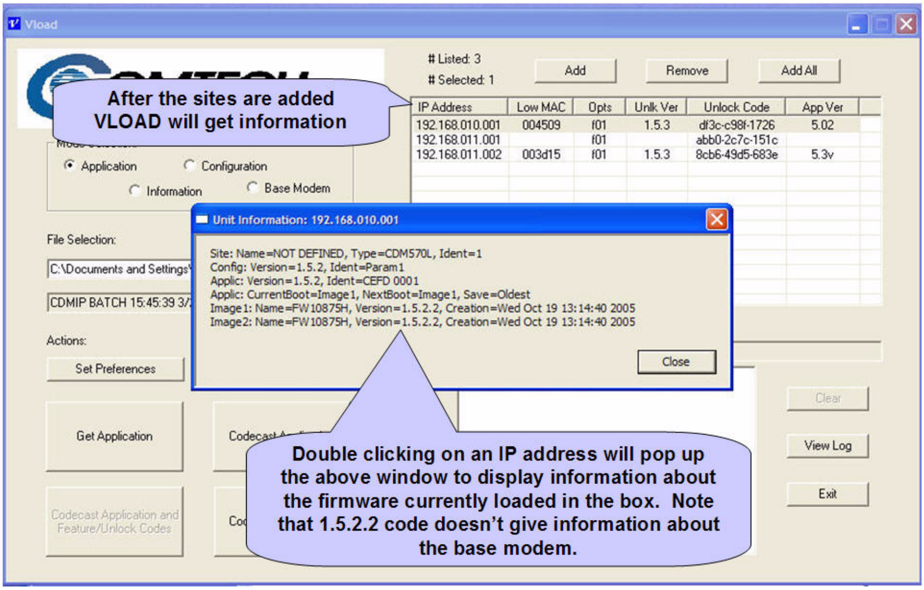


Figure D-6 Get Information for IP Address

It is very important to continue to get information after each step. VLOAD needs to be aware of the current configuration of the modem/routers when making decisions about “Oldest” and “Latest.”

3. Select the units to be upgraded by clicking on them to highlight them in the list.

Upgrade Router to v1.5.3

This step will upgrade the Bulk Image location 1 of the Router Card to version 1.5.3 firmware. The Vload **Set Preferences** provides 3 methods of loading code:

- **Consecutive** - Vload will download each IP address consecutively. Useful if loading 1 or 2 units, but very slow for loading networks.
- **Concurrent** - Vload will download all selected IP addresses simultaneously. Useful if loading multiple units over a Local Area

Network or installed networks with large TDM or DVB Outbound Carriers. Take care not to over-run the outbound (TDM) transmission rate.

- **CodeCast** - Vload will multicast to all selected IP addresses. The units must all have the same CodeCast address. CodeCast is useful for large networks that have limited bandwidth available on the TDM outbound.

Refer to the *Vload Utility User Guide* for a description of each type and to determine which suits your network best. Below is an example of the screen displayed for "Consecutive."

1. Click **Application**, then **Browse** button. Browse for the new firmware file and select it.

2. Click on **Put Application** after highlighting the desired modem(s).

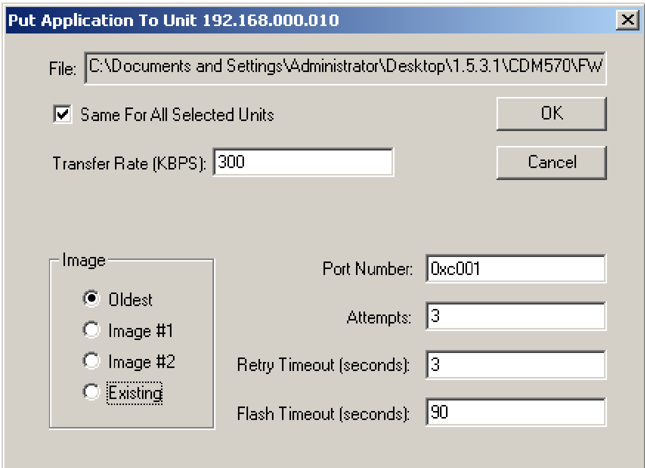


Figure D-7 Put Application screen (Consecutive Load)

3. Select the *Same For All Selected Units* check box.

4. Ensure that the *Transfer Rate* does not exceed the outbound data rate on the Hub TDM, and the *Image* is set to "Oldest", then click **OK**.

5. Observe the main Vload window; the Progress area will display status bars for each unit, as shown in the figure below. Wait until process is completed before proceeding to the next step.

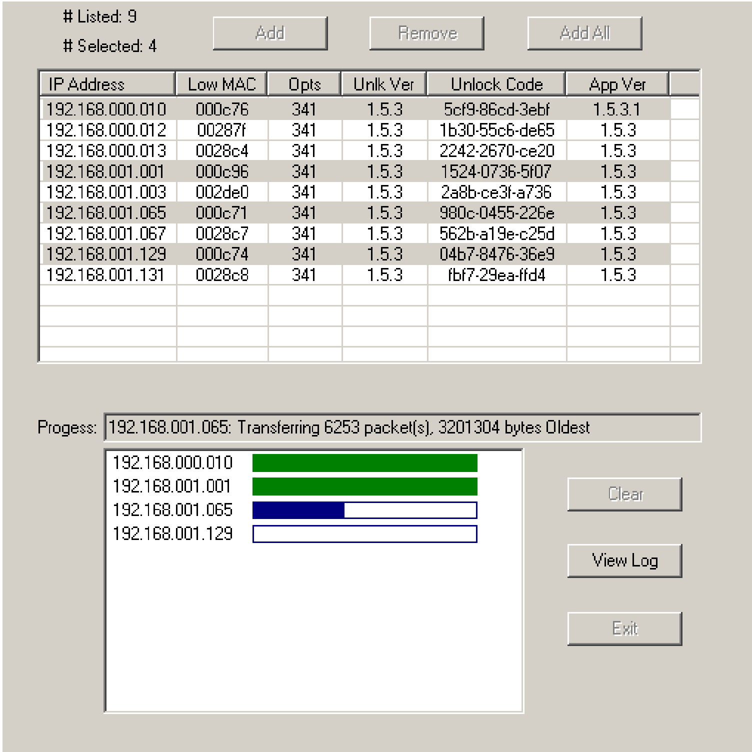


Figure D-8 Progress Status, Put Application

Save and Reboot to Latest

1. Using either VMS or CLI, **Save** the parameters for each unit to flash. Then, using Vload, reboot with **Hard Reset** to **Latest**.

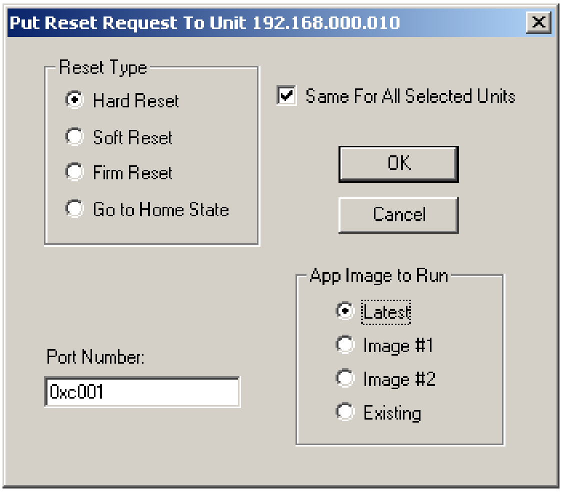


Figure D-9 Hard Reset screen

2. Observe the main window again to monitor the progress status for successful completion of this Put operation.

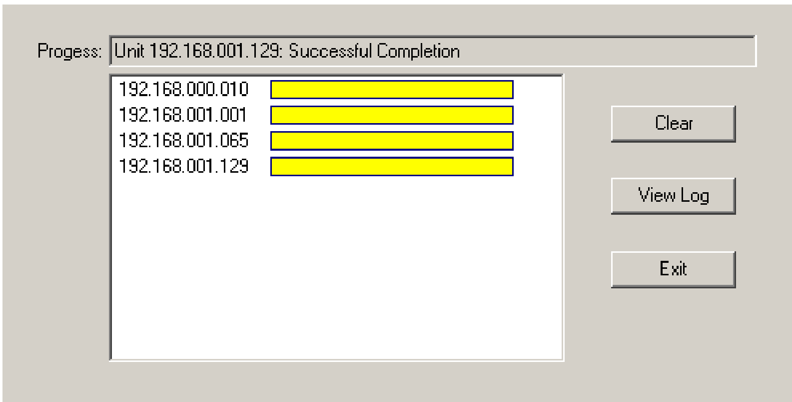


Figure D-10 Progress Status, Put Completion

Get Information for Router v1.5.3

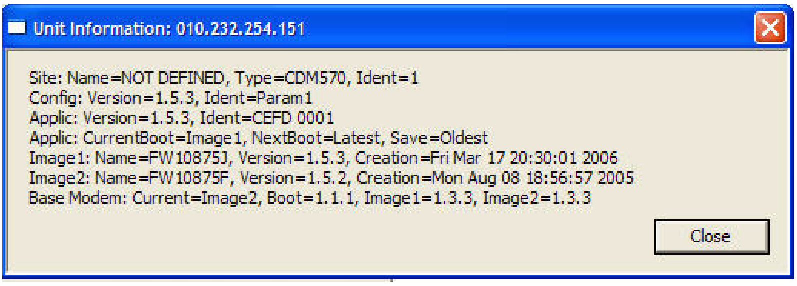


Figure D-11 Unit Information screen (Router)

The new unit information will show that Image 1 Version=1.5.3 and that the Application Version=1.5.3. The application CurrentBoot should = the image slot location of 1.5.3, and NextBoot=Latest and Save=Oldest.

The next part of this step is very important. Prior to version 1.5.3 code, the configuration files did not include all modem parameters or any Out Door Unit (ODU) parameters. These parameters are stored in 2 lines in the configuration file. If they are not saved, the modem will go to the default settings, causing the BUC and LNB to turn Off. As a result, the Remote will be lost when the modem firmware is updated.

1. Select "Configuration" in mode selection and "Get Configuration".

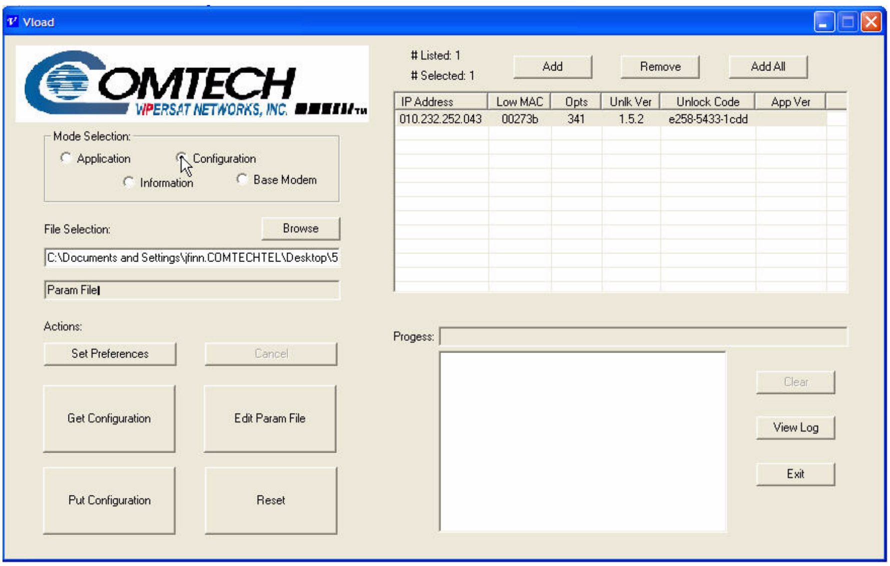


Figure D-12 Select Configuration screen

2. Save the configuration file. Open it using WordPad. Insure that the lines shown in figure D-13 are in the configuration near the bottom of the file.

```
MGC_SAVE#0          = 0001432.05656140128.0001223.02010009.960xxxxxxx0970.05456140128.00002003202
OGC_SAVE#0          = 010000xxxx1000200015450-xxxxxx0101060011300+xxxxxx
```

Figure D-13 Configuration File Text

3. If this text is not displayed, **Save** to flash again, get the configuration and check for them in the configuration file once more. Note that the contents of the text lines will differ based on the actual configuration and modem type.

Upgrade Base Modem to v1.5.1 (CDM-570 Only)

For units with v1.3.3 firmware, the Base Modem upgrades have to be done in 2 steps. This is necessary because the memory map changed with the v1.4.x firmware, and v1.3.3 is not capable of writing directly to v1.5.x firmware.

Upgrade Image 1 on Base Modem to v1.4.5

1. Select **Base Modem** under Mode Selection, then click **Browse**. Two files named FW10805 will appear. Select the file name that ends with "P"; this is the v1.4.5 firmware file.

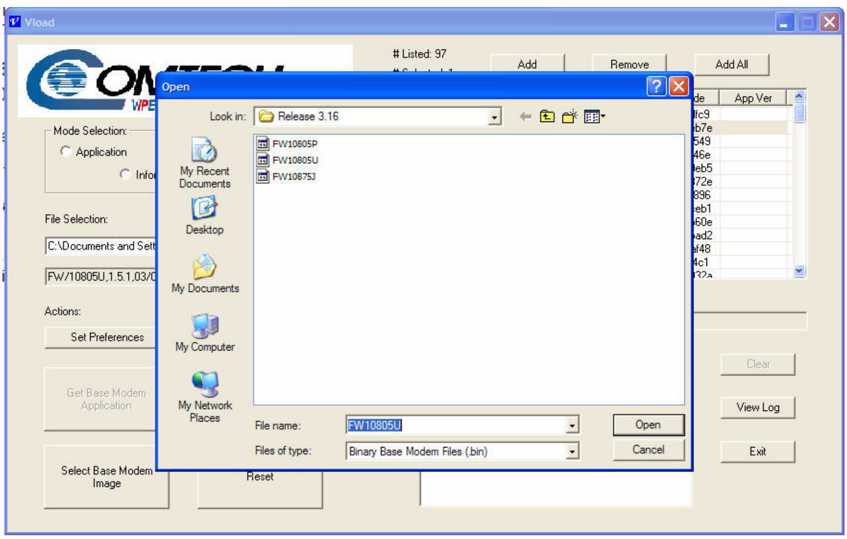


Figure D-14 Browse for Firmware File

2. Put the v1.4.5 modem firmware using the appropriate selected mode (Consecutive, Concurrent, or CodeCast).

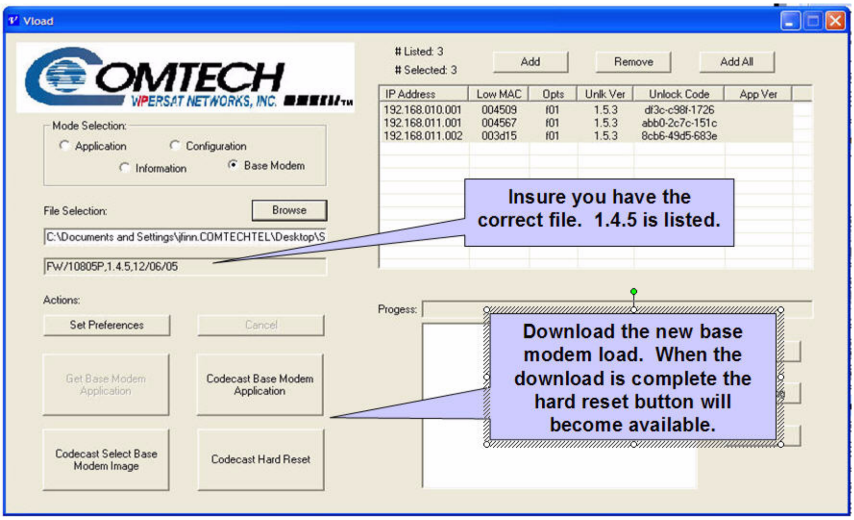


Figure D-15 Download v1.4.5 and Hard Reset screen

3. When the file transfer is completed, Hard Reset the Modem(s).

Upgrade Image 1 on Base Modem to v1.5.1

4. Get Unit Information to show that v1.4.5 modem code is loaded in Image 1 and that the Base Modem Current Image = Image 1. Which image this is will depend on which image was running in the modem; it will automatically select the offline image to upgrade.

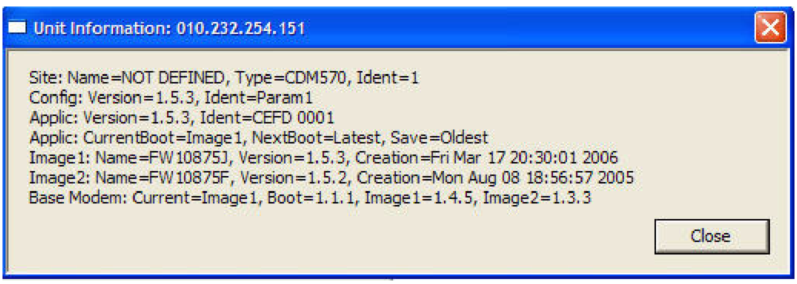


Figure D-16 Unit Information screen (Base Modem Image 1)

5. Browse for the v1.5.1 Base Modem firmware. The file name is **FW10805U**.

If the file can not be found, it can be downloaded from the *Comtech EF Data* web site:

http://www.comtechefdata.com/

The FW10805U.bin file can be found under Downloads, Flash Upgrades.

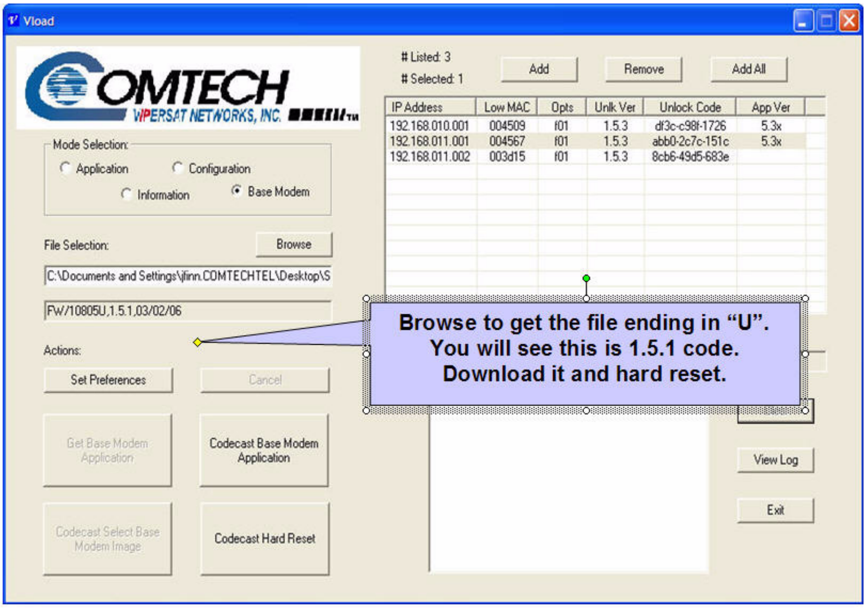


Figure D-17 Download v1.5.1 and Hard Reset screen

Download Base Modem v1.5.1 to Image 2

1. Get Unit Information to show that the current Base Modem image is Image 2, which is v1.5.1 firmware.

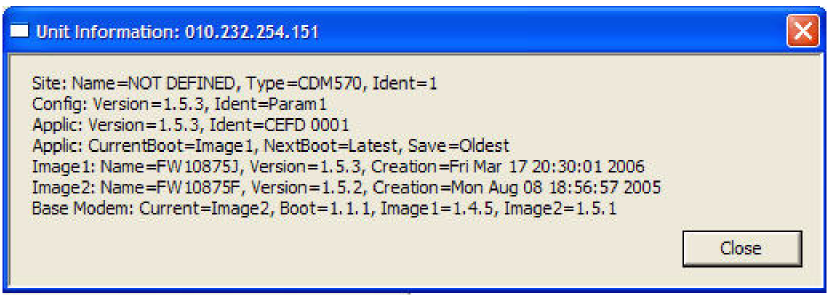


Figure D-18 Unit Information screen (Base Modem Image 2)

2. Repeat the Download procedure for the Base Modem v1.5.1 firmware file, but do not perform a Hard Reset; it is not necessary to reboot the modem again. This will insure that the v1.5.1 firmware is in both images in the Base Modem, as shown in figure D-19.

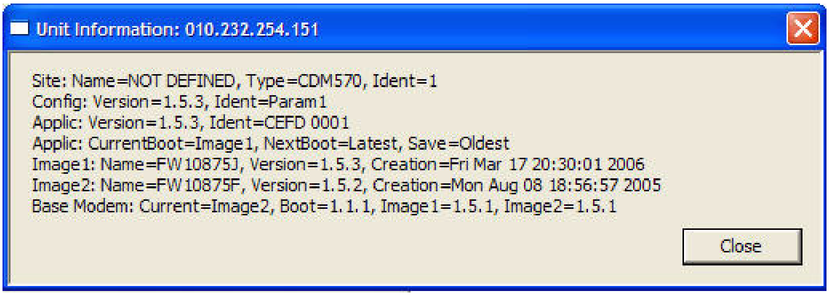


Figure D-19 Unit Information screen (Base Modem v1.5.1)

Download Router v1.5.3 to Image 2

1. Download the v1.5.3 firmware file to the Router Image 2. This insures that the latest firmware code is loaded in all images.

2. Get Unit Information one last time and **Save** the file when prompted. This file can be used to maintain a record of unlock codes and sent to Comtech Vipersat if additional features are required. The final "get Information" should look like the one displayed below.

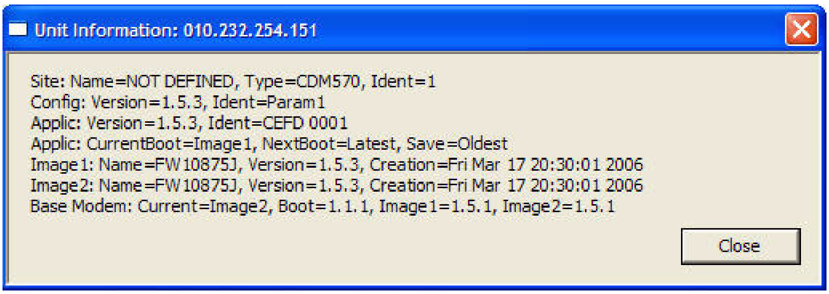


Figure D-20 Unit Information screen (final status)

Completing Migration

Picking Up Straggler/Offline Remotes

Ideally, all Remote units will be online during the migration phase. However, in a live network this cannot be guaranteed. Therefore, Vipersat provides a way to temporarily revert the TDM outbound and Burst Controller(s) to v1.5.2 HDLC WAN Framing compatibility mode. Remotes that had lost power or otherwise were offline during the upgrade can be recovered at this time. Remotes running the v1.5.3 firmware will lose communications during this time, so a planned maintenance outage is necessary.

It is only necessary to download 1 image of the Router to v1.5.3 and reset the Remotes in order for them to rejoin the network, unless the associated Burst Controller is running BFAT. If that is the case, it is suggested that BFAT be disabled, and that the STDMA Preamble be increased. This will allow restoration of communications to all Remotes, with reduced performance. Once the straggler Remote(s) have v1.5.1 modem code loaded, BFAT can be re-enabled. The appropriate Preamble length will be reset automatically when BFAT is running.

Setting v1.5.2 Compatibility in Hub Modems

Telnet into the TDM Outbound and Burst Controller Hub units associated with the straggler Remote(s) and follow the steps below.

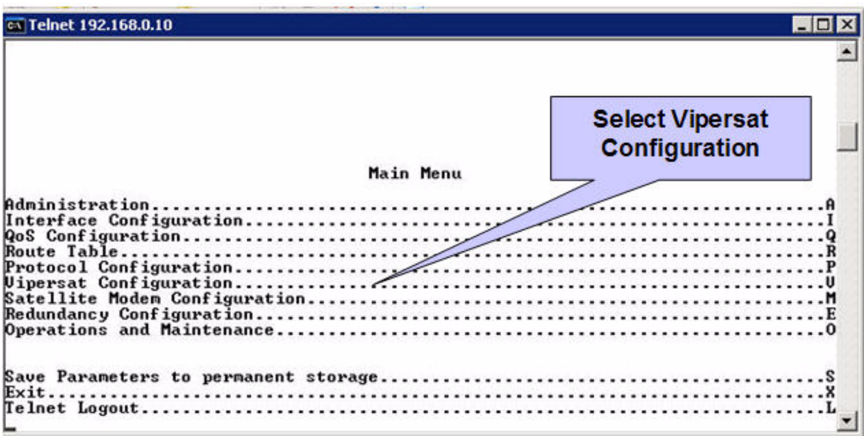


Figure D-21 Main Menu screen, CLI

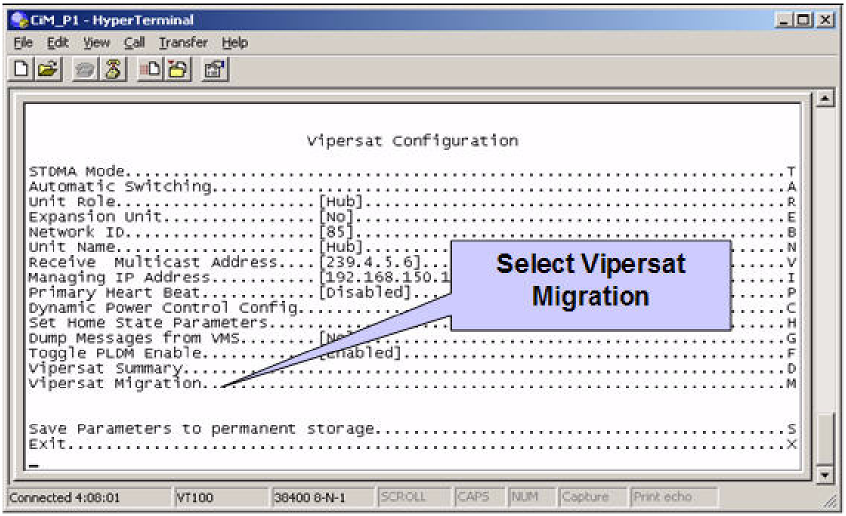


Figure D-22 Vipersat Configuration screen

The Vipersat Migration Parameter "M" is available only on Hub non-expansion units.

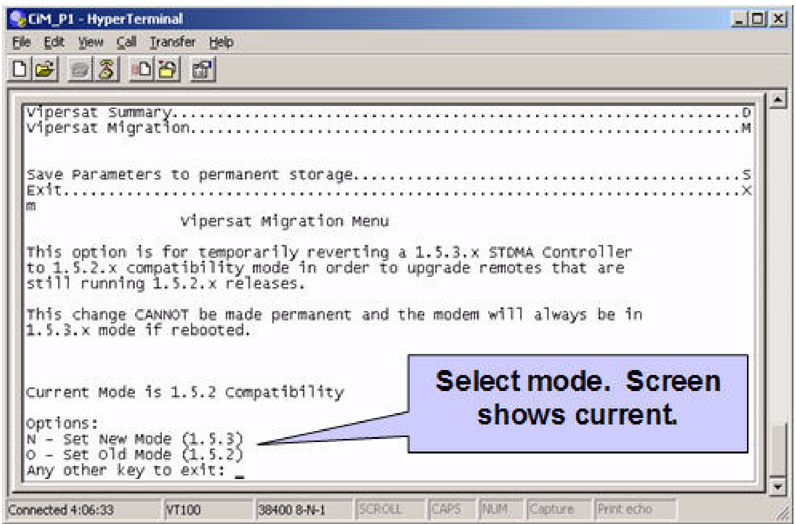


Figure D-23 Vipersat Migration prompt

Select **O** to set the old framing mode to v1.5.2 or earlier. This parameter must be set in both outbound and inbound units to properly transmit/receive to/from Remote units.

The straggler Remotes will now frame on the TDM outbound signal. The associated Burst Controller(s) will frame on the inbound signals from these Remotes ONLY.

Download the v1.5.3 Router firmware and Reset the straggler Remotes.

Return the network to **N** (1.5.3) compatibility.

E

GLOSSARY

A

ALC **A**utomatic **L**imit **C**ontrol – A closed loop mechanism controlling the gain stabilization of the HPA's RF output power.

APL **A**synchronous **P**arty **L**ine – A VIPERSAT term for RS-485 multi-drop bus used for control of indoor equipment. See also SPL.

ARP **A**ddress **R**esolution **P**rotocol – A protocol for a LAN device to determine the MAC address of a locally connected device given its IP address. See also MAC.

ASR **A**utomatic **S**witch **R**equest – A switch request message for bandwidth adjustment sent by a VIPERSAT modem to the VMS when Automatic Switching is enabled.

ATM **A**synchronous **T**ransfer **M**ode

B

BER **B**it **E**rror **R**ate (sometimes **R**atio) – A measure of the number of data bits received incorrectly compared to the total number of bits transmitted.

BUC **B**lock **U**p **C**onverter

BPS **B**its **P**er **S**econd – A measure of transmission speed. See also kb/s & Mb/s.

BPSK **B**inary **P**hase **S**hift **K**eying – A modulation technique in which the carrier is phase shifted +/-180 degrees. See also QPSK.

C

C-Band A frequency band commonly used for satellite communications (and sometimes terrestrial microwave). For terrestrial earth stations the receive frequency band is 3.7-4.2 GHz and transmit 5.925-6.425 GHz. See also Ku-band.

CRC **C**yclic **R**edundancy **C**heck – A method of applying a checksum to a block of data to determine if any errors occurred during transmission over communications links.

CXR Carrier – A radio frequency transmission bearer linking points and over which information may be carried.

D

DAMA **D**emand **A**ssigned **M**ultiple **A**ccess – A process whereby communications links are only activated when there is an actual demand.

dBm **D**eci**b**el referenced to 1 **m**illiwatt.

DHCP **D**ynamic **H**ost **C**onfiguration **P**rotocol – An Internet protocol for automating the configuration of computers that use TCP/IP.

DNA **D**ynamic **N**ode **A**nnouncement – In VIPERSAT satellite networks a process whereby remote sites periodically announce their presence to facilitate network setup and monitoring.

DPC **D**ynamic **P**ower **C**ontrol

DRAM **D**ynamic **R**andom **A**ccess **M**emory

DSP **D**igital **S**ignal **P**rocessor – A microprocessor chip optimized for signal processing applications.

DVB **D**igital **V**ideo **B**roadcast

DVP **D**igital **V**oice **P**rocessor – The VIPERSAT voice card used in packet voice applications.

E

E_b/N_o **E_b/N_o** Ratio **E_b** = energy per bit **N_o** = noise power density per Hz. The bit error rate (BER) for digital data is a decreasing function of this ratio. **E_b** is the energy of an information bit. **E_b** is measured in Joules, or equivalently in Watts per Hertz.

E&M **E**ar **&** **M**outh (literally) – The signaling leads used to carry telephone circuit signaling or indicate circuit activity or status.

F

FDMA **F**requency **D**ivision **M**ultiple **A**ccess – A technique where multiple users can access a common resource (e.g. satellite) by each being allocated a distinct frequency for operation. See also TDMA.

FEC **F**orward **E**rror **C**orrection – A process whereby data being transmitted over a communications link can have error correction bits added which may be used at the receiving end to determine/correct any transmission errors which may occur.

FIFO **F**irst **I**n **F**irst **O**ut – A simple buffer or queue technique whereby data queued the longest is transmitted first.

FTP **F**ile **T**ransfer **P**rotocol – An application for transferring computer files over the Internet. See also TFTP.

FXO **F**oreign e**X**change **O**ffice – a 2 wire telephone interface that looks like a line originating from a telephone exchange. See also FXS.

FXS **F**oreign e**X**change **S**ubscriber – a 2 wire telephone interface that looks like a line coming from a telephone instrument. See also FXO.

G

G.729 ITU standard for **LD-CELP** (**L**ow **D**elay – **C**ode **E**xcited **L**inear **P**rediction) voice encoding at 8 kb/s.

GIR **G**uaranteed **I**nformation **R**ate

Group ID A number assigned to equipment which defines it as a member of a group when addressed by the burst controller.

GUI **G**raphical **U**ser **I**nterface – A form of graphical shell or user interface to a computer operating system.

H

HDLC **H**igh Level **D**ata **L**ink **C**ontrol – A standard defining how data may be transmitted down a synchronous serial link.

HPA **H**igh **P**ower **A**mplifier – The amplifier used in satellite communications to raise the transmit signal to the correct power level prior to transmission to satellite. See also SSPA.

HTTP **H**yper **T**ext **T**ransfer **P**rotocol – The Internet standard for **W**orld **W**ide **W**eb (**WWW**) operation.

Hub The central site of a network which links to a number of satellite earth sites.

I

ICMP **I**nternet **C**ontrol **M**essage **P**rotocol

Installation Wizard A program which guides the user through the process of installing an application.

IF **I**ntermediate **F**requency – In satellite systems, IF frequencies are usually centered around 1200 MHz (L-band), or 70/140 MHz (video/TV).

IP **I**nternet **P**rotocol – A format for data packets used on networks accessing the Internet.

ISP **I**nternet **S**ervice **P**rovider – A company providing Internet access.

ITU **I**nternational **T**elecommunications **U**nion

K

Kb/s **K**ilo **b**its per **s**econd – 1000 bits/second. A measure of transmission speed. See also bps & Mb/s.

Ku-Band A frequency band used for satellite communications. For terrestrial earth stations the receive frequency band is in the range 10.95 – 12.75 GHz and transmit 14.0 – 14.5 GHz. See also C-band.

L

L-Band A frequency band commonly used as an IF for satellite systems using block up/down conversion. Usually 950-1450 MHz.

LAN **L**ocal **A**rea **N**etwork

LLA **L**ow **L**atency **A**pplication

LNA **L**ow **N**oise **A**mplifier – An amplifier with very low noise temperature used as the first amplifier in the receive chain of a satellite system.

LNB **L**ow **N**oise **B**lock – A downconvertor so called because it converts a whole band or “block” of frequencies to a lower band. It is similar to LNA.

LNC **L**ow **N**oise **C**onverter – A combined low noise amplifier and block down converter, usually with an L-band (typically 950-1450 MHz) IF.

LO **L**ocal **O**scillator

M

M&C **M**onitor **&** **C**ontrol

MAC **M**edia **A**ccess **C**ontrol – A protocol controlling access to the physical layer of an Ethernet network.

Mb/s **M**ega **B**its per **S**econd – 1 Million bits/second. A measure of transmission speed. See also bps & kb/s.

Modem **Mod**ulator and **Dem**odulator units combined.

Multicast Transmitting a single message simultaneously to all.

N

NAT **N**etwork **A**ddress **T**ranslation – An Internet standard that enables a local-area network (LAN) to use one set of IP addresses for internal (private) traffic and a second set of addresses for external (public) traffic.

NOC **N**etwork **O**peration **C**enter – Has access to any earth station installed using the VIPERSAT Network Control System (VNCS). An NOC can remotely interrogate, control, and log network activities.

O

ODU **O**ut**d**oor **U**nit – In a VSAT system the RF components (transceiver) are usually installed outdoors on the antenna structure itself and are thus referred to as an ODU.

OSPF **O**pen **S**hortest **P**ath **F**irst – A common routing algorithm.

P

PLDM **P**ath **L**oss **D**ata **M**ulticast message is sent every sixty seconds and contains information on messages received or lost.

POP3 **P**ost **O**ffice **P**rotocol **3** – A protocol for exchanging e-mail messages between host computers. See also SMTP.

PMUX **P**ort **Mu**ltiple**x**ing – Each port of the SDMS is individually configured from the NMS port (hub) to port (remote) multiplexing.

PSTN **P**ublic **S**witched **T**elephone **N**etwork – Refers to the world's public circuit-switched telephone network governed by technical standards created by the ITU-T, using telephone numbers for addressing. A mixture of digital and analog telephone systems, the network includes mobile as well as fixed (land-line) telephones.

Q

QPSK **Q**uaternary **P**hase **S**hift **K**eying – A modulation technique in which the carrier is phase shifted +/-90 or +/-180 degrees. See also BPSK.

R

RF **R**adio **F**requency – A generic term for signals at frequencies above those used for baseband or IF.

RFC **R**equest **F**or **C**omment – The de-facto Internet standards issued by the Internet Engineering Task Force (IETF).

RIP **R**outing **I**nformation **P**rotocol

RS-232 A common electrical/physical standard issued by the IEEE used for point to point serial communications up to approximately 115kb/s.

RS-485 A common electrical/physical standard issued by the IEEE used for multi-drop serial communications.

Rx **R**eceive

S

SCPC **S**ingle **C**hannel **P**er **C**arrier – A satellite communications technique where an individual channel is transmitted on the designated carrier frequency. Some applications use SCPC instead of burst transmissions because they require guaranteed, unrestricted bandwidth.

SMTP **S**imple **M**ail **T**ransfer **P**rotocol – A protocol for exchanging e-mail messages between host computers. See also POP3.

SNMP **S**imple **N**etwork **M**anagement **P**rotocol – A protocol defining how devices from different vendors may be managed using a common network management system.

SPL **S**ynchronous **P**arty **L**ine – An electrically isolated interface between indoor and outdoor equipment used in VIPERSAT satellite systems. See also APL.

Star Topology A network topology which, if drawn as a logical representation, resembles a star with a hub at the center.

STDMA **S**elective **T**ime **D**ivision **M**ultiple **A**ccess – A multiple access technique where users time-share access to a common channel with selective sized time slots allocated on usage.

T

TCP/IP **T**ransmission **C**ontrol **P**rotocol / **I**nternet **P**rotocol – A standard for networking over unreliable transmission paths. See also UDP.

TDMA **T**ime **D**ivision **M**ultiple **A**ccess – A multiple access technique where users contend for access to a common channel on a time-shared basis. See also FDMA and STDMA.

TFTP **T**rivial **F**ile **T**ransfer **P**rotocol – A simple file transfer protocol used over reliable transmission paths. See also FTP.

TPI **T**rans**P**arent **I**nterface – As a message arrives at its destination, the SDMS-II decodes the token and forwards the data to a port known as TPI

Tx **T**ransmit

U

UDP **U**ser **D**atagram **P**rotocol – A standard for networking over reliable transmission paths.

UDP Multicast A multicast transmission using the UDP protocol.

V

VESP **V**ipersat **E**xternal **S**witching **P**rotocol – A switch-request protocol which allows external VPN equipment and Real-Time proprietary applications to negotiate bandwidth requests between any two subnets on a Vipersat network.

VMS **VIPERSAT M**anagement **S**ystem – A comprehensive M&C tool providing rapid and responsive control of Vipersat satellite networks.

VoIP **V**oice **o**ver **IP –** The routing of voice communications over the Internet or through any IP-based network.

VOS **V**ipersat **O**bject **S**ervice

W

Wizard A specialized program which performs a specific function, such as installing an application (installation wizard).

WRED **W**eighted **R**andom **E**arly **D**etection – A queue management algorithm with congestion avoidance capabilities and packet classification (QoS) providing prioritization.

{ *This Page is Intentionally Blank* }