INSTALLATION AND OPERATION MANUAL

Vmux-210

Analog Voice Trunking Gateway

Version 1.1

TDMoIP® Driven

RAD data communications

Innovative Access Solutions

Vmux-210

Analog Voice Trunking Gateway

Version 1.1

Installation and Operation Manual

Notice

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Limited Warranty

RAD warrants to DISTRIBUTOR that the hardware in the Vmux-210 to be delivered hereunder shall be free of defects in material and workmanship under normal use and service for a period of twelve (12) months following the date of shipment to DISTRIBUTOR.

If, during the warranty period, any component part of the equipment becomes defective by reason of material or workmanship, and DISTRIBUTOR immediately notifies RAD of such defect, RAD shall have the option to choose the appropriate corrective action: a) supply a replacement part, or b) request return of equipment to its plant for repair, or c) perform necessary repair at the equipment's location. In the event that RAD requests the return of equipment, each party shall pay one-way shipping costs.

RAD shall be released from all obligations under its warranty in the event that the equipment has been subjected to misuse, neglect, accident or improper installation, or if repairs or modifications were made by persons other than RAD's own authorized service personnel, unless such repairs by others were made with the written consent of RAD.

The above warranty is in lieu of all other warranties, expressed or implied. There are no warranties which extend beyond the face hereof, including, but not limited to, warranties of merchantability and fitness for a particular purpose, and in no event shall RAD be liable for consequential damages.

RAD shall not be liable to any person for any special or indirect damages, including, but not limited to, lost profits from any cause whatsoever arising from or in any way connected with the manufacture, sale, handling, repair, maintenance or use of the Vmux-210, and in no event shall RAD's liability exceed the purchase price of the Vmux-210.

DISTRIBUTOR shall be responsible to its customers for any and all warranties which it makes relating to Vmux-210 and for ensuring that replacements and other adjustments required in connection with the said warranties are satisfactory.

Software components in the Vmux-210 are provided "as is" and without warranty of any kind. RAD disclaims all warranties including the implied warranties of merchantability and fitness for a particular purpose. RAD shall not be liable for any loss of use, interruption of business or indirect, special, incidental or consequential damages of any kind. In spite of the above RAD shall do its best to provide error-free software products and shall offer free Software updates during the warranty period under this Agreement.

RAD's cumulative liability to you or any other party for any loss or damages resulting from any claims, demands, or actions arising out of or relating to this Agreement and the Vmux-210 shall not exceed the sum paid to RAD for the purchase of the Vmux-210. In no event shall RAD be liable for any indirect, incidental, consequential, special, or exemplary damages or lost profits, even if RAD has been advised of the possibility of such damages.

This Agreement shall be construed and governed in accordance with the laws of the State of Israel.

Product Disposal

To facilitate the reuse, recycling and other forms of recovery of waste equipment in protecting the environment, the owner of this RAD product is required to refrain from disposing of this product as unsorted municipal waste at the end of its life cycle. Upon termination of the unit's use, customers should provide for its collection for reuse, recycling or other form of environmentally conscientious disposal.

General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

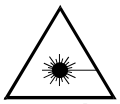
Safety Symbols

Warning

This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.

Protective earth: the marked lug or terminal should be connected to the building protective earth bus.



Warning

Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached.

Please observe the following precautions:

- Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.
- Do not attempt to adjust the laser drive current.
- Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.
- The use of optical devices with the equipment will increase eye hazard.
- Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.

ATTENTION: The laser beam may be invisible!

In some cases, the users may insert their own SFP laser transceivers into the product. Users are alerted that RAD cannot be held responsible for any damage that may result if non-compliant transceivers are used. In particular, users are warned to use only agency approved products that comply with the local laser safety regulations for Class 1 laser products.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective earth terminal. If an earth lug is provided on the product, it should be connected to the protective earth at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Connecting AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

In cases when the power distribution system is IT type, the switch must disconnect both poles simultaneously.

Connecting DC Mains

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC mains systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

If the DC mains are floating, the switch must disconnect both poles simultaneously.

Connecting Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status	
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV	Safety Extra Low Voltage: Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1	Telecommunication Network Voltage-1: Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2	Telecommunication Network Voltage-2: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3	Telecommunication Network Voltage-3: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The earthing and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk,

there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

Caution To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

Attention Pour réduire les risques s'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good earth connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the earth bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching earth ground or wear an ESD preventive wrist strap.

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Warning per EN 55022 (CISPR-22)

Warning	This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.
Avertissement	Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.
Achtung	Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkströrungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Declaration of Conformity

Manufacturer's Name: RAD Data Communications Ltd.

Manufacturer's Address: 24 Raoul Wallenberg St.
Tel Aviv 69719
Israel

Declares that the product:

Product Name: **Vmux-210**

conforms to the following standard(s) or other normative document(s):

EMC:	EN 55022:1998 + A1:2000, A2:2003	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.
	EN 55024:1998 + A1:2001, A2:2003	Information technology equipment – Immunity characteristics – Limits and methods of measurement.
Safety:	EN 60950-1:2001	Information technology equipment – Safety – Part 1: General requirements.

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC, the Low Voltage Directive 73/23/EEC and the R&TTE Directive 99/5/EC for wired equipment. The product was tested in a typical configuration.

Tel Aviv, 14 March, 2006

Haim Karshen
VP Quality

European Contact: RAD Data Communications GmbH, Otto-Hahn-Str. 28-30, 85521 Ottobrunn-Riemerling, Germany

Quick Start Guide

Installation of Vmux-210 should be carried out only by an experienced technician. If you are familiar with Vmux-210, use this guide to prepare the unit for operation.

1. Installing Vmux-210

Connecting the Interfaces

Refer to *Appendix A* for pinouts and further information regarding interface connections.

➤ To connect the interfaces:

1. Connect FXS voice interface to the connector on the Vmux-210 rear panel labeled Channels 1-x.
2. Connect the main link using the appropriate connector, as follows:
   - Ethernet main link: Connect the IP uplink to the RJ-45 connector designated NET ETH.
   - Serial main link: Connect the serial V.35/X.21/RS-530 link to the DB-25 connector designated LINK using the appropriate adapter cable.
   - E1/T1 main link: Connect the E1/T1 main link to the RJ-45 connector on the Vmux-210 rear panel, designated E1/T1.
3. Connect the user LAN to the RJ-45 connector designated ETH USER.
4. Connect the control terminal to the CONTROL connector using CBL-RJ45/D9 adapter cable.

   or

   Connect a Telnet host to the user LAN port.

Connecting the Power

➤ To connect the power:

- Connect the power cable to the power connector on the Vmux-210 rear panel.

  The unit has no power switch. Operation starts when the power is applied to the rear panel power connector.

2. Configuring Vmux-210

Configure Vmux-210 to the desired operation mode via an ASCII terminal connected to the rear panel CONTROL port. Alternatively, you can manage Vmux-210 over Telnet.

Starting a Terminal Session for the First Time

➤ **To start a terminal session:**

1. Connect a terminal to the CONTROL connector of Vmux-210.
2. Turn on the control terminal PC and set its port parameters the default communication parameters:
   - One start bit
   - Eight data bits
   - No parity
   - One stop bit
   - No flow control
   - VT100 emulation (for optimal view of system menus).
3. Power up Vmux-210.
4. After the boot sequence (approximately 50 seconds), press ‹**Enter**› several times.

   The rate is detected automatically.
5. Proceed with the management session.

Configuring Basic Parameters

The host IP address, subnet mask and default gateway IP address must be configured via an ASCII terminal.

➤ **To configure basic parameters:**

1. From the Main Menu, select **Configuration › Quick Setup**.

   The Quick Setup menu appears (see *Figure 1*).
2. Configure the desired parameters (see *Table 1*).
3. Select **Save**.
4. Type '**@**' and press ‹**Enter**›.

   The following message is displayed:

   ```
   Are you sure you want to update data base?
   Press  Y/N :
   ```

5. Type **Y** to update the database.

   The database is updated and the following message is displayed:

   Data base was changed. Press any key to continue.

```
Quick Setup

 1. Host IP Address … (0.0.0.0)
 2. Host Subnet Mask … (0.0.0.0)
 3. Default Gateway … (0.0.0.0)
 4. Destination IP … (0.0.0.0)
 5. Destination Bundle [1 – 30] … (1)
 6. Save
```

Figure 1. Quick Setup Menu

Table 1. Quick Setup Parameters

Parameter	Description	Possible Values/ Reference
Host IP Address	Defines Vmux-210's IP address (for both management and voice traffic)	Default: **0.0.0.0**
Host Subnet Mask	Defines Vmux-210's subnet mask	Default: **0.0.0.0**
Default Gateway	Defines default gateway	Default: **0.0.0.0**
Destination IP	IP address of the destination Vmux-2100 group or Vmux-210/110	Default: **0.0.0.0**
Destination Bundle	Number of the destination bundle	**1..30** Default: **1**
Save	Configures a basic voice application in the temporary DB, including a single bundle (according to the specified Destination IP and Destination Bundle); all other parameters retain default values, including the analog ports connected to this bundle ***Notes:*** • *The Save command erases previously configured bundles (in the event that bundles were configured manually through the Bundles menu).* • *In addition to selecting Save, you must press @ to save the changes in the database. Otherwise, all changes will be lost.*	

Contents

Chapter 1
Introduction

1.1 Overview

Vmux-210 is a voice trunking gateway that enables several analog voice channels to be compressed and extended over a serial, E1/T1 or 10/100BaseT uplink. Vmux-210 implements G.723.1, G.729 A, G.711 compression and TDMoIP or AAL2oMPLS multiplexing algorithms to send 12, 15, 24 or 30 analog voice channels over an IP, E1/T1 or n x 64 kbps network.

Vmux-210 utilizes voice activity detection, silence suppression, echo cancellation and other techniques to improve voice quality and bandwidth utilization. The gateway detects, generates and relays DTMF signaling. In addition, Vmux-210 supports fax relay, modem relay and voice band data.

The built-in router supports NAT, firewall, static and dynamic routing, RIP1 and RIP2. To facilitate the integration of new devices into a DHCP IP network, the router also supports DHCP client, server and relay.

Vmux-210 can be managed locally via an ASCII terminal or remotely via Telnet or RADview (RAD's SNMP-based network management application).

Product Options

Vmux-210 can be ordered with the following options:

Voice port options:

- 12 FXS ports for up to 12 channels
- 15 FXS ports for up to 15 channels
- 24 FXS ports for up to 24 channels
- 30 FXS ports for up to 30 channels.

Uplink options:

- E1 uplink
- T1 uplink
- Serial
- Ethernet.

Cable options for the Serial Link:

- V.35, DCE
- V.35, DTE
- X.21, DCE
- X.21, DTE
- RS-530, DTE.

Note *An adapter cable is not required for connecting to RS-530 equipment when Vmux-210 operates in DCE clock mode.*

Applications

The following figures show a central Vmux-2100 operating opposite remote Vmux-2100 and Vmux-210 units in point-to-multipoint applications over an IP network.

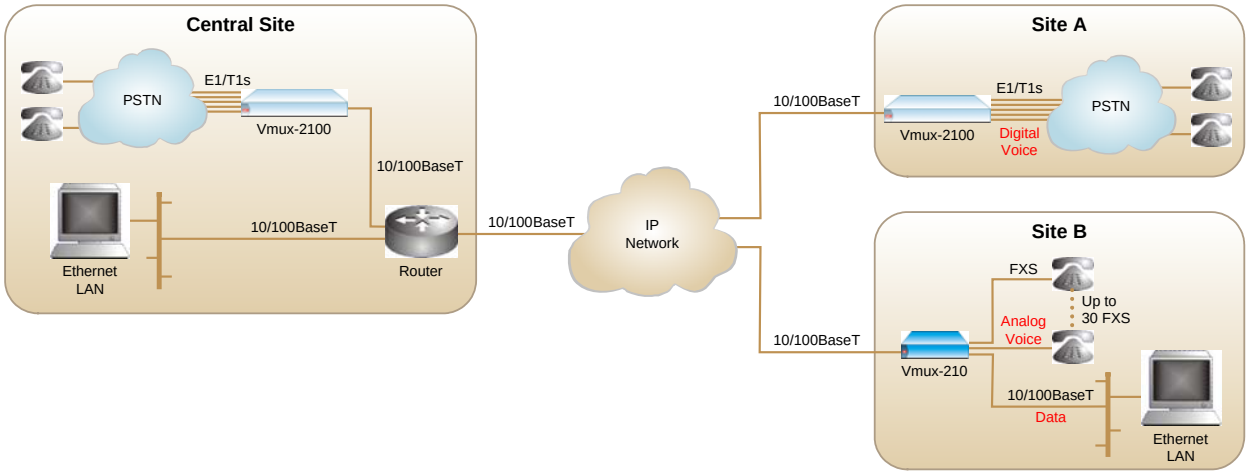


Figure 1-1. Transmitting LAN Data and Compressed Digital/Analog Voice over an IP Network

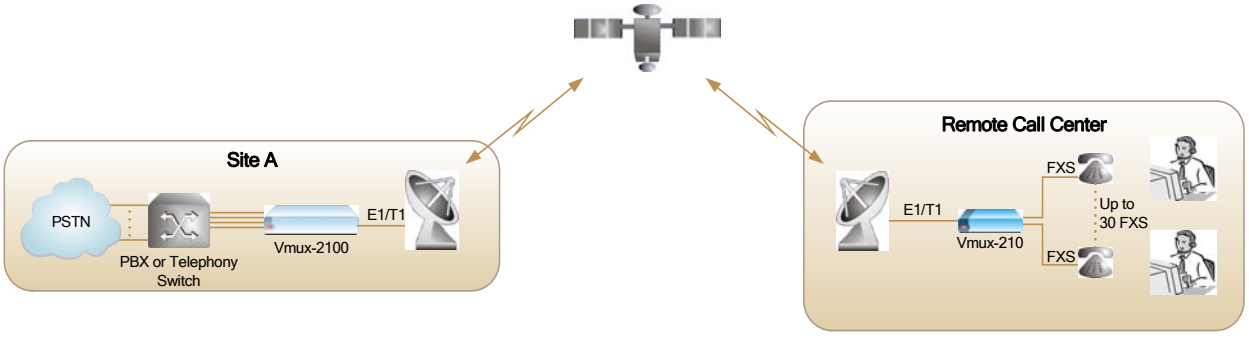


Figure 1-2. Data and Compressed Digital/Analog Voice for Call Center Application

Features

Ethernet Links

Vmux-210 provides two half/full duplex, 10/100BaseT Ethernet ports, each with autonegotiation support. One port can function as the uplink to the IP network, while the other is provided for connecting the user Ethernet LAN to the Vmux-210 unit. Together with the Vmux-210's integral Ethernet switch, this allows integrating the user LAN traffic with the compressed voice, over a single uplink to the network.

If autonegotiation is disabled, the Ethernet ports can be configured to any of the following operation modes:

- 10BaseT – half or full duplex
- 100BaseT – half or full duplex.

The main link Ethernet port supports direct and indirect connection to the IP network.

Serial Main Link

Vmux-210 has a single TDM Serial Link with a RS-530/DCE interface. This serial port supports n x 64 kbps data rates, from 64 to 2048 kbps. Additional serial interfaces are supported via adapter cables. For more information, see *Product Options* on page *1-1*.

Voice Interfaces

Vmux-210 is ordered with 12, 15, 24, or 30 analog voice interfaces.

Voice Activity Detection mechanism allows optimizing bandwidth utilization, as Vmux-210 generates traffic only when voice activity is detected. Vmux-210 uses the G.723.1 and G.729A voice compression techniques, silence suppression and the G.168 standard for echo cancellation (echo tail up to 32 ms per channel). Vmux-210 detects, relays, and generates DTMF signals. In addition, Vmux-210 supports Group III fax relay (4.8, 9.6, 14.4 kbps), modem relay (up to V.34), and voiceband data.

TDMoIP Multiplexing

Vmux-210 encapsulates the payload bytes in a UDP frame that is transferred over IP and over Ethernet.

The maximum number of TDM bytes in a multiplexed frame and maximum packetizing interval are user-configurable.

A destination IP address is configured for each bundle (see *Bundling* on page *1-4*).

AAL2oMPLS Multiplexing

When using non-IP based Ethernet networks or the E1/T1/Serial uplink, the AAL2oMPLS format can be used instead of TDMoIP. The AAL2oMPLS header is

smaller than the TDMoIP header, saving about 5% in bandwidth (depending on the actual frame size).

Bundling

A bundle is a logical internal Vmux-210 port, containing up to 30 timeslots. Vmux-210 supports 12 bundles. A bundle is routed to a defined remote IP address. Each timeslot can be included in any bundle. At the remote site, it can be connected to any timeslot within a destination bundle.

Bundle QoS supports:

- Labeling IP level priority (ToS).
- VLAN tagging and priority labeling according to IEEE 802.1D&Q.

The user can configure the ToS (Type of Service) of the outgoing IP packets. This allows an en-route layer 3 router or switch that supports ToS to give higher priority to Vmux-210 traffic for delay-sensitive and secure applications.

Vmux-210 allows you to configure the whole ToS byte field, since different vendors may use different bits to tag packets for traffic prioritization. This also enables you to work according to various RFC definitions (for example RFC 2474, RFC 791).

Internal Switch and VLAN Tagging for Security and QoS

All traffic between:

- Ethernet ports
- Ethernet port and voice port
- Ethernet port and E1/T1/Serial Uplink
- Ethernet port and the host

is routed through the Vmux-210's built-in Ethernet switch. This switch enables optional VLAN tagging of the various traffic, as well as blocking unrecognized traffic.

VLAN Table

Vmux-210 includes a VLAN table, which can contain up to 64 entries. Each entry defines the egress and tagging policies for packets with a specific VLAN ID, for each port. Packets with a particular VLAN ID can be blocked.

Internal Router

Vmux-210 includes an internal router, which supports the following features:

- DHCP server, client, or relay
- NAT
- Firewall
- Static and dynamic routing
- RIP1 and RIP2.

When the internal router is enabled, it performs the routing between the Ethernet ports and the E1/T1/Serial Link (whichever is defines as the main link), or between the two Ethernet ports. If the internal router is disabled, the Ethernet switch performs the Ethernet switching, while voice traffic is routed directly from the Host to the DSPs. The various features of the internal router are configurable.

Diagnostics

Vmux-210 supports remote loopback activation on the analog voice channels. The user can also perform tone injection towards the remote PBX or local/remote analog equipment. In addition, a ping utility is included to confirm IP connectivity to the remote units.

Statistics Collection

Vmux-210 provides extensive statistics collection capabilities, which include Ethernet (as per RFC 3638) and HDLC statistics, voice, signaling, bundles, and CPU utilization.

Management

Vmux-210 can be managed via a local terminal, HTTP Web browser, Telnet or RADview (RAD's network management system). Vmux-210 has a DB-9 port for the direct terminal connection.

Software download and configuration upload/download can be performed via the local terminal or TFTP (using a TFTP server). Remote units are managed via Telnet or RADview over an inband management link.

Vmux-210 supports a four-level security and user-authentication system:

- Administrator – Allowed to configure all the Vmux-210 parameters.
- Operator – Allowed to perform all operations in the system except for user administration (adding/deleting users, changing user definitions).
- Technician – Allowed to test Vmux-210 and monitor its operation (for example, monitoring alarms).
- Monitor – Allowed to monitor the Vmux-210 operation.

When Vmux-210 is managed over Telnet or a Web browser, up to five simultaneous management sessions are allowed, as follows:

- One administrator or operator
- Up to four monitors.

Access to the Vmux-210 software can be limited to the ASCII terminal and RADview management by disabling Telnet/Web access.

1.2 Physical Description

Vmux-210 is a 1U high, easy-to-install standalone device. *Figure 1-3* shows a 3D view of the unit.

The front panel includes LEDs that indicate when the power is ON, when a test is being performed, and when an alarm is present in the system. LEDs are described in greater detail in *Chapter 3.*

Figure 1-3. Vmux-210, Front Panel 3D

The rear panel varies depending on the port and power supply options. *Figure 1-5* shows the rear panel of a Vmux-210 with the AC power supply option.

Figure 1-4. Vmux-210, Rear Panel 3D

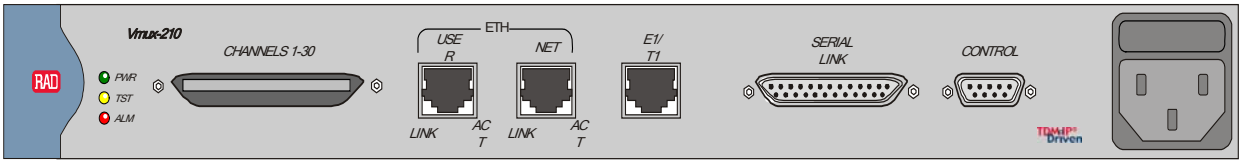


Figure 1-5. Rear Panel of Vmux-210 with AC Power Supply

The Vmux-210 rear panel includes the following:

- One of the following voice interfaces:
  - 12 FXS analog voice ports
  - 15 FXS analog voice ports
  - 24 FXS analog voice ports
  - 30 FXS analog voice ports
- Two Ethernet ports (one for the main link, one to connect to the user LAN)
- One E1/T1 Uplink port (RJ-45)

- One serial uplink (DB-25 interface; used to connect to a TDM link via a serial adapter cable)
- One control port (DB-9 interface; used to connect to a management terminal)
- One power supply (either AC or DC)

1.3 Functional Description

The following figures illustrate block diagrams of Vmux-210 for various applications, as indicated.

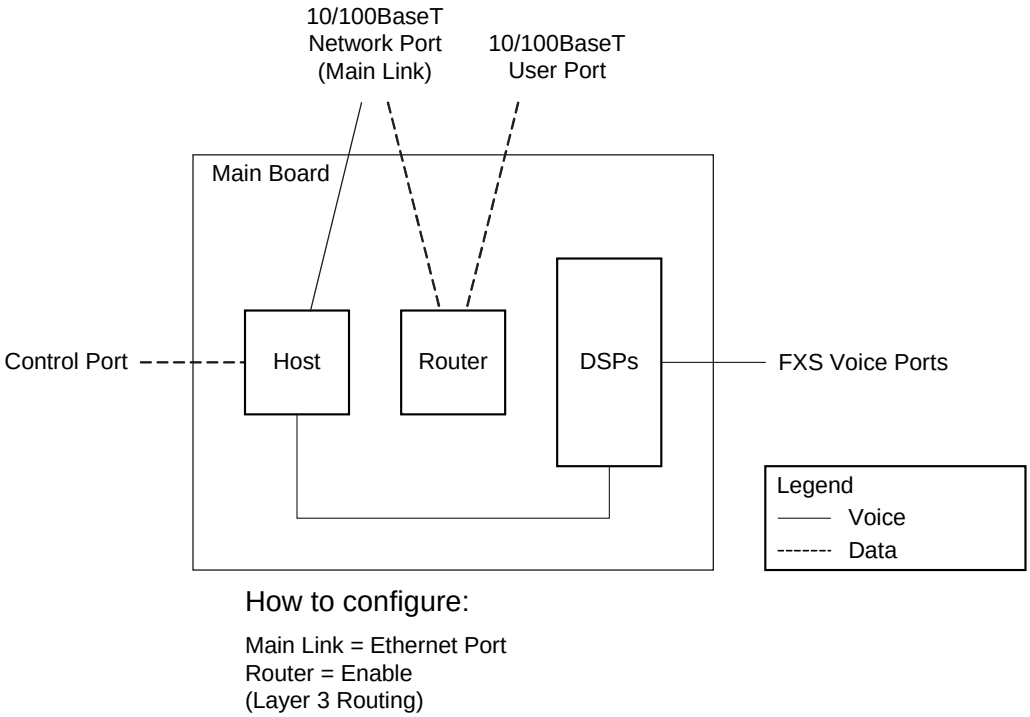


Figure 1-6. Vmux-210 Block Diagram: Routing Between the Network and the User Ports

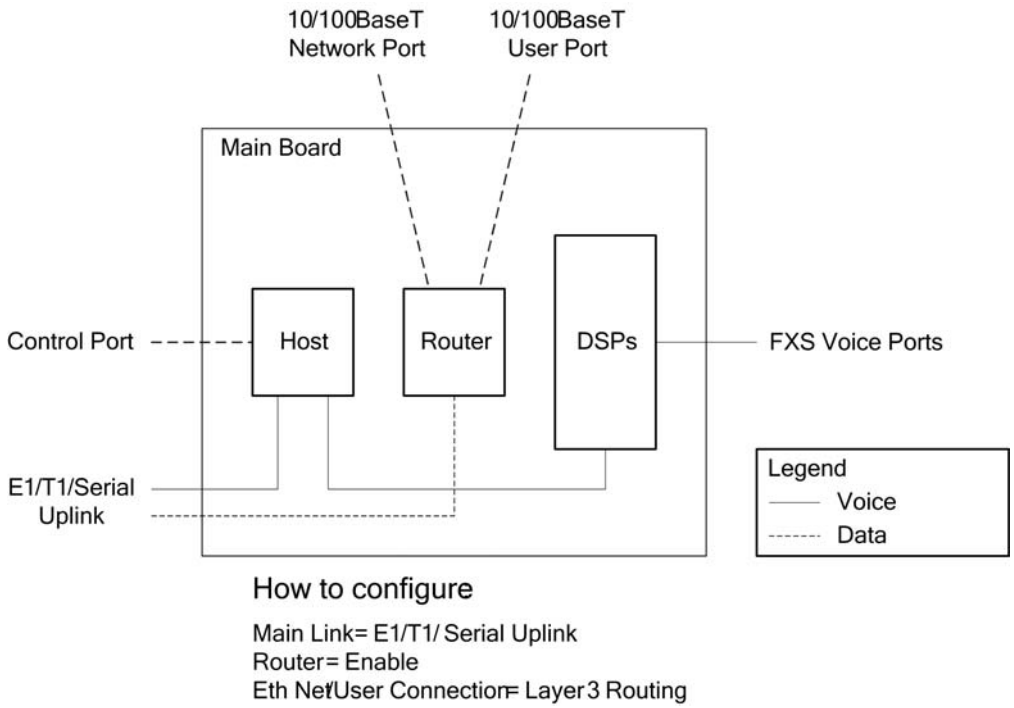


Figure 1-7. Vmux-210 Block Diagram: 3-Way Routing – Routing Between Network Port, User Port, and E1/T1/Serial Uplink

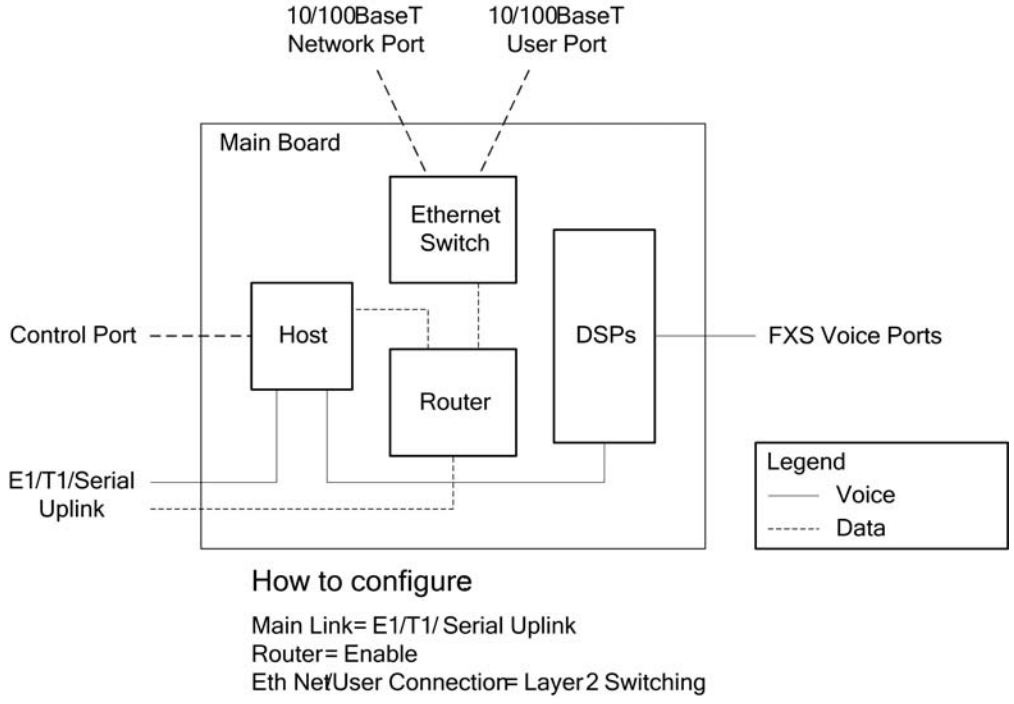


Figure 1-8. Vmux-210 Block Diagram: Routing Between the E1/T1/Serial Port and the Ethernet Switch

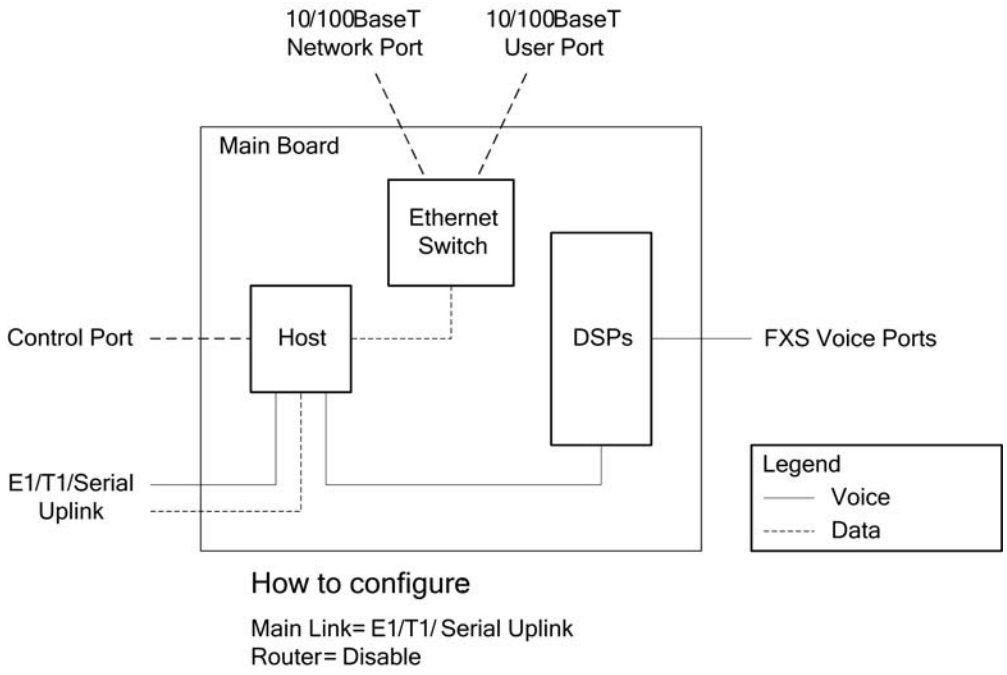


Figure 1-9. Vmux-210 Block Diagram: Router Disabled

Voice Interface

The voice interface includes 12, 15, 24, or 30 FXS analog voice ports that connect to POTS or faxes.

Signaling

Signaling information is processed according to the CAS signaling mode.

Analog ports translate the physical signal to ABCD bits. The user configures this translation, for example, the user may define the value "1101" to indicate "ONHOOK".

Compression

The DSPs handle the voice traffic by compressing it according to G.723.1 (6.4 or 5.3 kbps) and G.729 A (8 kbps), or digitizes it according to the G.711 requirements (A-law and μ-law). Compression methods are user-selectable. G.711 A-law and μ-law configuration must be the same on both the local and remote devices.

Voice Activity Detection, Silence Suppression, and Comfort Noise generation are applied for all coder rates, including G.711.

Note *All bundles must be configured with the same coder rate.*

Voice Activity Detection

Voice Activity Detection (VAD) uses digital signal processing techniques to distinguish between silence and speech on a voice connection. VAD reduces the bandwidth requirements of a voice connection by generating traffic only during periods of active voice conversation. With Comfort Noise Generation (CNG) supported at the remote site, VAD significantly reduces bandwidth consumption without degrading voice quality. VAD achieves additional bandwidth savings when combined with voice compression techniques.

TDMoIP Multiplexing

Compressed voice payload is multiplexed by using the TDMoIP technique. The multiplexing is performed by the Vmux-210 software. The DSPs send a continuous stream of voice packets; which are multiplexed into a TDMoIP frame by adding AAL2 headers and a TDMoIP header. *Figure 1-10* illustrates the TDMoIP frame structure.

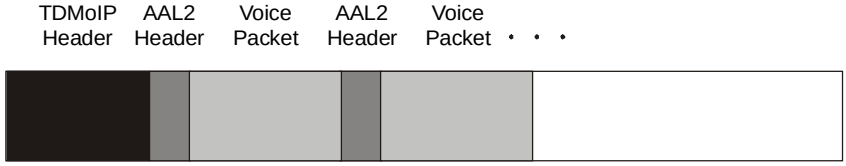


Figure 1-10. TDMoIP Frame Structure

The size of the TDMoIP frame is determined by the following parameters:

- Packetizing interval – The maximum time interval allocated for the TDMoIP frame aggregation (10 to 90 msec).
- Maximum bytes per multiplexed frame – The maximum size of each frame (100 to 1461 bytes).

The Vmux-210 continues filling the TDMoIP frame until one of the conditions defined by the above parameters is met.

Ethernet Frame

At a later stage, the TDMoIP frame becomes a part of the standard Ethernet frame, which also includes a UDP header, IP header and MAC. The Ethernet frames are forwarded to the CPU, which sends them to the Ethernet or E1/T1/Serial main links.

Figure 1-11 illustrates the structure of the Vmux-210 Ethernet frame. *Table 1-1* describes the fields of the Vmux-210 Ethernet frame.

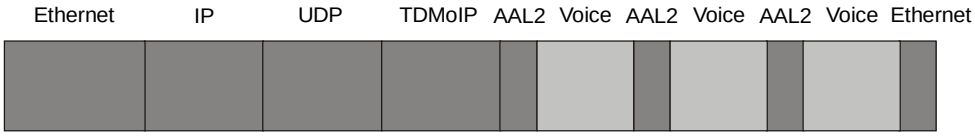


Figure 1-11. Ethernet Frame Structure

When AAL2oMPLS multiplexing is used, the IP and UDP headers are not included in the Ethernet frame.

Note *When using the E1/T1/Serial main link, an additional 4 bytes are added to the packet (HDLC framing).*

Table 1-1. Ethernet Frame Fields

Layer	Field Length [bytes]	Field	Note
MAC Layer	7	Preamble	
	1	SFD	
	6	Destination MAC Address	
	6	Source MAC Address	
LLC Layer	2	Type	IEEE 802.1D&Q VLAN Tagging (additional 4 bytes if enabled)
IP Layer	1	Vers/HLEN	
	1	Service Type	
	2	Total Length	
	2	Identification	
	1	Flags/Fragment Offset (most)	
	1	Fragment Offset (least)	
	1	Time to Live	
	1	Protocol	
	2	Header Checksum	
	4	Source IP Address	
	4	Destination IP Address	
UDP Layer	2	UDP Source Port	*The UDP source port field is used to transfer a destination bundle number.*
	2	UDP Destination Port	*Fixed value of 2142 (decimal). Assigned to RAD by the IANA*
	2	UDP Message Length	
	2	UDP Checksum	
Data Layer	...	Payload	
MAC Layer	4	CRC	

Table 1-2. Ethernet Frame Fields (AAL2oMPLS Multiplexing)

Layer	Field Length [bytes]	Field	Note
MAC Layer	7	Preamble	
	1	SFD	
	6	Destination MAC Address	
	6	Source MAC Address	
LLC Layer	2	Type	IEEE 802.1D&Q VLAN Tagging (additional 4 bytes if enabled)
Data Layer	...	Payload	
MAC Layer	4	CRC	

VLAN Support (per bundle)

Vmux-210 supports VLAN, according to IEEE 802.1D&Q. When VLAN support is enabled, Vmux-210 adds four bytes to the MAC layer of the Ethernet frame. The content of these bytes, MAC layer priority and VLAN ID, can be set by the user. In this mode, only VLAN format frames are sent and received by Vmux-210. The following figure describes the VLAN tag format.

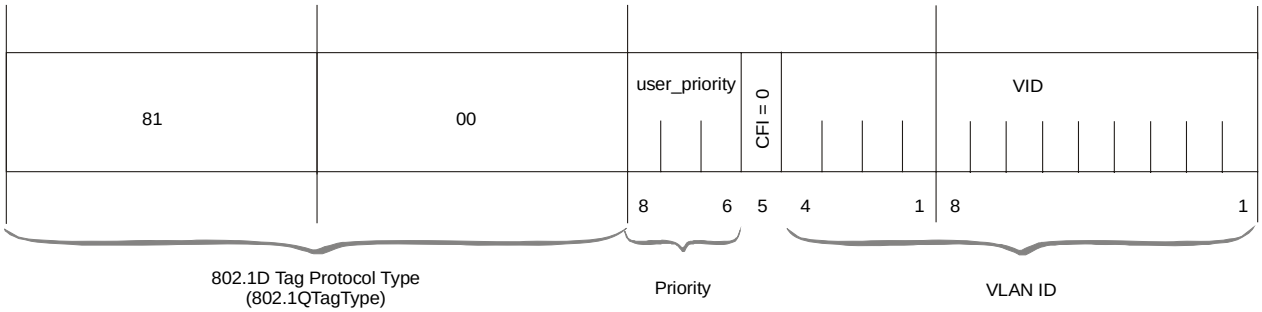


Figure 1-12. VLAN Tag Format

UDP Support

Table 1-3. UDP Source Port as Destination Voice Port

Field Length	Field Description	Value
2 bytes	UDP Source Port*	2 – 497d
2 bytes	UDP Destination Port	2142d

* – The MSB of this field can be either 1 or 0 for inband end-to-end proprietary signaling.

Note *The UDP Source Port field is used for destination voice bundle indication.*

For more information about VLAN tagging, see IEEE Std 802.1D&Q.

E1/T1/Serial Main Link

The E1/T1/Serial main links receive Ethernet frames from the CPU and forward them to the remote device over a TDM network or a leased line.

The E1/T1/Serial Links normally transmit the HDLC data transparently. However, a special mode to support applications opposite certain Cisco-manufactured equipment is provided. This mode uses a Cisco HDLC header format.

Ethernet Main Link (ETH NET Port)

The 10/100BaseT main link receives Ethernet frames from the CPU via the Ethernet switch and forwards them to the remote device over the IP network. The 10/100BaseT main link supports full duplex transmission with autonegotiation and half duplex with the backpressure option.

Ethernet User LAN (ETH USER Port)

The 10/100BaseT user LAN port receives Ethernet frames from the user's LAN via the internal Ethernet switch and forwards them to the remote device over the main link. This port supports full duplex transmission with autonegotiation and half duplex with the backpressure option.

Rate Limiting on Ethernet ports

To solve the problem of transferring voice as well as 10/100 Mbps Ethernet data over a TDM/Serial uplink with small bandwidth (for example, 256 kbps), the ingress data rate on either Ethernet ports can be limited to one of several values between 128 kbps and 8 Mbps, plus fragmentation of the packets.

Integral Ethernet Switch

All traffic between the voice ports, the Ethernet ports and the Serial Link is routed through the Vmux-210's built-in Ethernet switch. This switch provides the capability for VLAN tagging of the various traffic, as well as the capability for discarding unrecognized traffic.

VLAN Tagging on Ethernet and E1/T1/Serial Ports

The VLAN tagging feature enables adding a VLAN tag to the traffic coming out of a certain port, in order to identify its source, as well as offering the ability to remove the VLAN tag from all traffic coming out of a certain port. In addition, a "Double Tagging" mode is available to always add a tag to packets, even if one already exists. The VLAN ID and priority level of the added tag are given according to the port from which the packet *entered* (ingress) the integral Ethernet switch.

For untagged packets, or packets tagged with an unrecognized ID, two possible security policies can be set per port: ON (broadcast all) or OFF (discard all).

Each VLAN tag contains a Priority field. The Ethernet switch in the Vmux-110 decides the transmission priority of a packet based on this field.

A packet whose VLAN ID appears in the VLAN table will *exit* (egress) the switch based on the policy in the VLAN table (see next section).

VLAN Table

Vmux-210 includes a VLAN table, which can contain up to 64 entries, in which packet egress policies are defined for different VLAN ids. A policy for a certain VLAN ID determines which ports will transmit packets tagged with this ID, how the ports will transmit them (tagged/untagged), and which ports will discard packets tagged with this ID.

DHCP Client Support

To facilitate integration of a new device into a DHCP IP network, if the DHCP client is enabled, but no IP address has been manually configured, Vmux-210 will automatically request one from the DHCP server upon booting. Once an address has been assigned by the DHCP server, it will be saved in the database. In order to request a new address, the current one must be deleted (0.0.0.0).

Calculating Approximate Bandwidth Utilization

The following formula is used to calculate the approximate bandwidth utilization:

$$\left\{ \frac{[(\text{Header size} \times \text{packets per second}) + (\#\ \text{timeslots} \times \text{size of compressed G.732 packet} \times 1000/30 \times \text{actual transmission time (\% non-silence)})] \times 8\ \text{bytes per bit}}{1000\ \text{bits per kilobit}} \right\} + \text{rate converted to kbps}$$

Note *A Vmux Bandwidth Calculator tool is included on the Technical Documentation CD.*

Bandwidth Utilization when using TDMoIP

By using TDMoIP multiplexing and the voice activity detection, Vmux-210 supports a higher number of voice channels over TDM than it is possible by utilizing conventional compression methods alone. TDMoIP multiplexing and grouping the timeslots of compressed voice together into bundles with a common IP address reduces the actual bandwidth used per channel to as low as 4 kbps (up to 16:1), when all channels are active. Better compression, up to 20:1, is achieved when some of the voice channels are idle.

Note *The actual compression achieved at any time depends on the voice activity on the network, the signaling system in use, and the number of modem/fax calls.*

The actual bandwidth utilization is determined by the following factors:

- Header sizes:
  - Ethernet – 18 bytes
  - IP – 20 bytes
  - UDP – 8 bytes
  - TDMoIP – 4 bytes
  - VLAN (if exists) – 4 bytes.
- Size of the voice packet:
  - G.723 – 31 bytes (AAL2 header [3 bytes] + voice header [4 bytes] + compressed voice payload [24 bytes])
  - G.729 – 17 bytes (AAL2 header [3 bytes] + voice header [4 bytes] + compressed voice payload [10 bytes])
  - G.711 – 47 bytes (AAL2 header [3 bytes] + voice header [4 bytes] + compressed voice payload [40 bytes]).
- Packet interval:
  - G.723.1 – 30 msec
  - G.729 – 10 msec
  - G.711 – 5 msec.
- Number of timeslots in a bundle
- Silence percentage. Studies show that an average person speaks only 40% of the time during a telephone conversation. 50% of the time is spent listening to the other party, while the remaining 10% is spent quietly contemplating.
- Connectivity packets – 64 bytes per minute.

Calculating Approximate Bandwidth Utilization (TDMoIP):

Let us calculate an approximate bandwidth for 30 timeslots in one bundle with G.723.1 compression, 60 % of silence:

$$\left\{ \frac{[(50 \times 1000/40) + (30 \times 31 \times 1000/30 \times 0.4)] \times 8}{1000} \right\} + 0.00853 = 109.208 \text{ kbps}$$

where:

- 50 – size of Ethernet, IP, UDP, TDMoIP headers
- 1000/40 – packet per seconds (pps) transmission rate, calculated according to the packetizing interval chosen (40 msec in this example)
- 30 – number of timeslots
- 31 – size of the compressed G.723 packet plus AAL2 header and voice payload
- 0.4 – 60% of silence
- 8 – conversion from bytes to bits

- 1000 in the denominator – conversion from bits to kilobits
- 0.00853 – connectivity packets rate (64 bytes per minute) converted to kbps.

Note *A Vmux Bandwidth Calculator tool is included on the Technical Documentation CD.*

Bandwidth Utilization when using AAL2oMPLS

When using non-IP based Ethernet networks or the Serial uplink, the AAL2oMPLS format can be used instead of the TDMoIP multiplexing format. The AAL2oMPLS header is smaller than the TDMoIP header (23 rather than 50 bytes), saving about 5% in bandwidth when compared to TDMoIP multiplexing (depending on the actual size of the multiplexed frames).

The actual bandwidth utilization is determined by the following factors:

- Header sizes:
  - Ethernet – 18 bytes
  - AAL2oMPLS – 5 bytes
- Size of the voice packet:
  - G.723 – 31 bytes (AAL2 header [3 bytes] + voice header [4 bytes] + compressed voice payload [24 bytes])
  - G.729 – 17 bytes (AAL2 header [3 bytes] + voice header [4 bytes] + compressed voice payload [10 bytes]).
- Packet interval:
  - G.723.1 – 30 msec
  - G.729 – 10 msec.
- Number of timeslots in a bundle
- Silence percentage. Studies show that an average person speaks only 40% of the time during a telephone conversation. 50% of the time is spent listening to the other party, while the remaining 10% is spent quietly contemplating.
- Connectivity packets – 64 bytes per minute.

Calculating Approximate Bandwidth Utilization (AAL2oMPLS):

The approximate bandwidth for 30 timeslots in one bundle with G.723.1 (6.4 kbps) compression, 60 % of silence is calculated as follows:

$$\left\{ \frac{[(23 \times 1000/40) + (30 \times 31 \times 1000/30 \times 0.4)] \times 8}{1000} \right\} + 0.00853 = 103.80853 \text{ kbps}$$

where:

- 23 – size of Ethernet and AAL2oMPLS headers
- 1000/40 – packets per second (pps) transmission rate, calculated according to the packetizing interval chosen (40 msec in this example)
- 30 – number of timeslots

- 31 – size of the compressed G.732 packet plus AAL2 header and voice payload
- 0.4 – 60% of silence
- 8 – conversion from bytes to bits
- 1000 in the denominator – conversion from bits to kilobits
- 0.00853 – connectivity packets rate (64 bytes per minute) converted to kbps.

Note *A Vmux Bandwidth Calculator tool is included on the Technical Documentation CD.*

1.4 Technical Specifications

Ethernet Links	*Number of Ports*	2 (NET and USER)
	Standards	IEEE 802.3, 802.3u, Ethernet 802.1D&Q
	Data Rate	10 or 100 Mbps, half duplex or full duplex, autonegotiation support
	Statistics	According to RFC 3638 or RFC 3635: • Received frames – Total Frames, good Frames, Broadcast Frames, Multicast Frames, Undersize, Oversize, CRC, Fragments, Jabber, Filtered, Discarded, Total Bytes, Bytes • Transmitted frames – Correct Frames, Broadcast Frames, Multicast Frames, Collision, Bytes
	Range	Up to 100m (328 ft) over UTP Cat.5 cable
	Connectors	RJ-45 per port
Serial Link	*Function*	Main Link
	Interface	• RS-530 • V.35 (requires adapter cable) • X.21 (requires adapter cable)
	Data Rate	n x 64 kbps, for rates from 64 to 2048 kbps
	Timing	• DCE • DTE (requires adapter/cross cable)
	Connector	DB-25, female

Voice Ports	*Configuration*	*Choice of one of the following:* • 12, 15, or 24 FXS analog voice ports using a Telco-50 proprietary connector • 30 FXS analog voice ports using a Telco-64 proprietary connector
Router	*Features*	• Maximum of three interfaces • Maximum 4000 pps • Static routing • DHCP server • DHCP relay • NAT • Firewall
E1 Link	*Number of Ports*	One
	Data Rate	2.048 Mbps
	Standards	ITU-T Rec. G.703, G.704, G.706, G.732, G.823
	Framing	G.732N with or without CRC-4, in compliance with ITU-T Rec. G.703, G.704, G.732 requirements
	Line Code	HDB3
	Receive Signal Level	0 to -43 dB with LTU 0 to -12 dB without LTU
	Transmit Signal Level	±3V (±10%)
	Jitter Performance	Per ITU-T G.823
	Line Impedance	120Ω, balanced
	Connector	RJ-45, balanced CBL-RJ45/2BNC/E1 adapter cable converts to a pair of BNC coaxial connectors, unbalanced
T1 Link	*Number of Ports*	One
	Data Rate	*1.544 Mbps*
	Standards	*ANSI T1.403, ITU-T Rec. G.703*
	Line Code	*AMI*

	Zero Suppression	*B8ZS, AMI*
	Framing	*D4, ESF*
	Receive Signal Level	*0 to -36 dB with CSU* *0 to -13 dB without CSU*
	Transmit Signal Level	*0, -7.5, -15, or -22.5 dB with CSU* *±2.7V (±10%) at 0–655 ft without CSU*
	Jitter Performance	*Per AT&T TR-62411, G.824*
	Line Impedance	*100Ω, balanced*
	Connector	*RJ-45*
FXS Ports	*Number of Ports*	12, 15, 24, or 30
	Analog Parameters	ITU-T standards: G.713, 2-wire for voice and signaling Nominal level: 0 dBm Nominal impedance: 600Ω Return loss (300 to 3400 Hz): better than 20 dB Frequency response (Ref: 1020 Hz): • 300 to 3000 Hz: ±0.5 dB • 250 to 3400 Hz: ±1.1 dB Level Adjustment, soft selectable: • TX: +5 dBm to -4 dBm • RX: +5 dBm to -10 dBm • Steps: 1 dB (±0.1 dB), nominal Signal to Total Distortion, G.712, G.713 method 2: • 0 to -30 dBm0: better than 33dB • +3 to -45 dBm0: better than 22dB Idle channel noise: better than -70 dBm0 (+20 dBrnc)
	Connectors	Telco-50 or Telco-64 connector
	Signaling	Signaling type: EIA RS-464 Loop-Start On-Hook/Off-Hook Threshold: • 3V to 38V between TIP and RING at off-hook state • Higher than 40V between TIP and RING at on-hook state

		Feed Current: 24 mA ±10% Ringer: • Voltage: 50 VRMS (±10%), overload protected • Frequency: 25 Hz (±10%) • Cadence: 1 sec ON / 3 sec OFF (default), user-configurable Reverse Polarity Generation Pulse Metering Generation: 16 KHz or 12 KHz (user selectable)
Voice Processing	*Compression Algorithms*	G.723.1, G.729 A, G.711 (a-law/μ-law)
	Silence Suppression	G.723.1A, G.729B
	Echo Cancellation	32 ms per channel as per G.168
	Modem Relay	All common rates and standards
	Fax Relay	Group III: 4.8, 9.6, 14.4 kbps
	Voice-Band Modem	Transparent transfer
	MF Signaling Support	DTMF detection, generation and relay
	Caller ID Relay	Conforms to U.S. standard (Telcordia Bellcore type 1), as well as to European standard (V.23), user-selectable. Available only with G.729A (8 kbps) codec.
Control Port	*Standard*	V.24/RS-232 (DCE)
	Data Rate	9.6, 19.2, 38.4, 57.6 or 115.2 kbps
	Connector	DB-9
Diagnostics	*Tests*	Ethernet Ports: • Performance monitoring • LAN statistics • PING FXS Voice Ports: • Remote loops per channel • Tone injection per channel towards local and remote side

	Statistics Collection	• Ethernet • CPU utilization • HDLC • Bundles • Voice • Voice Rx and Tx signaling
Indicators	*PWR (green)*	Power
	TST (green)	Test status
	ALM (red)	Alarm status
Power Supply	*Input*	AC Source: 100 to 240 VAC, 50/60 Hz DC Source: -40 to -72 VDC (-48 VDC, nominal)
	Consumption	**12FXS:** • AC: 40.0 W • DC: 44.0 W **15FXS:** • AC: 41.6 W • DC: 45.6 W **24FXS:** • AC: 56.0 W • DC: 61.0 W **30FXS:** • AC: 63.0 W • DC: 69.0 W
Physical	*Height*	4.3 cm/1.7 in
	Width	44.0 cm/17.3 in
	Depth	24.0 cm/9.5 in
	Weight	3.5 kg /7.7 lb
Environment	*Operating Temperature*	0 to 50°C/32 to 122°F
	Storage Temperature	-20 to 70°C/-4 to 158°F
	Humidity	Up to 90%, non-condensing

Chapter 2

Installation and Setup

2.1 Introduction

The Vmux-210 unit is designed for desktop or bench installation and is delivered as a fully assembled unit. No provisions are made for bolting the unit to a tabletop. For installation of one or two units in a 19″ rack, refer to the *Rack Mounting Kit for 19-inch Racks Guide* that comes with the rack mounting kit.

The following is a summary of the installation steps. These steps are described in more detail later in this chapter.

➤ **To install Vmux-210:**

1. Prepare the installation site in accordance with your application. See *Site Requirements and Prerequisites* on page *2-2*.
2. Review the package contents, and verify that all items are present. See *Package Contents* on page *2-2*.
3. Connect the cables:
   - Connect the main link to the 10/100BaseT (NET Ethernet) port or the E1/T1/Serial port.
   - Connect the LAN to the USER Ethernet port.
   - Connect an ASCII terminal or a PC running a terminal emulation software.
   - Connect power to the unit.

After installing the unit:

- See *Chapter 3* for the operating instructions.
- See *Chapter 4* for the detailed system configuration procedures using an ASCII terminal connected to the Vmux-210 control port.
- If a problem is encountered, see *Chapter 6* and *Chapter 7* for testing and diagnostic instructions.

Warning

Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved.

Always observe standard safety precautions during installation, operation, and maintenance of this product.

2.2 Site Requirements and Prerequisites

The AC-powered Vmux-210 unit should be installed within 1.5 m (5 ft) of an easily accessible, grounded AC outlet capable of furnishing the voltage in accordance with Vmux-210 nominal supply voltage.

The DC-powered Vmux-210 unit requires a -48 VDC power source, which must be adequately isolated from the main supply.

Allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature of Vmux-210 is 0 to 50°C (32 to 122°F), at a relative humidity of up to 90%, non-condensing.

2.3 Package Contents

The Vmux-210 package includes the following items:

- One Vmux-210 unit
- Technical Documentation CD
- AC power cord or DC power supply connector kit
- RM-34 kit.

2.4 Equipment Needed

Vmux-210 standalone unit is designed for desktop or bench installation and is delivered fully assembled. No provisions are made for bolting the unit to a tabletop.

Mounting Vmux-210 in a 19-inch rack, however, requires a 3 mm Phillips screwdriver and an RM-34 kit. For the rack installation instructions, refer to the Rack Mounting Kit for 19-inch Racks guide that comes with the RM kit.

Power Cable

AC-powered Vmux-210 is equipped with an appropriate power cord (country or region dependent) to be connected from the mains to the power socket of the power unit (accessible from the front panel).

DC-powered Vmux-210 is equipped with an appropriate DC connector kit, which should be used for preparing the DC cable connection.

Table 2-1. Required Interface Cables

Interface	Cable Type
Terminal Control	DB-9 to DB-9, RS-232/V.24 compliant cable for ASCII-based terminal control
Ethernet	Cat. 5, RJ-45 to RJ-45, IEEE 802.3 compliant cable
Balanced E1	RJ-45 to RJ-45 E1 compliant cable
Unbalanced E1 interface	Adapter cable, CBL-RJ45/2BNC/E1, which has one RJ-45 plug for connection to the Vmux-420 E1 connector and two BNC female connectors at the other end.
FXS (12, 15, 24 channel versions)	Telco-50 cable
FXS (30 channel versions)	Telco-64 cable

2.5 Mounting the Unit

Vmux-210 is designed for installation on a desktop, or in a 19" rack.

- For rack mounting instructions, refer to the RM-34 Installation Kit Manual.
- If Vmux-210 is to be used as a desktop unit, place and secure the unit on a stable, non-movable surface.

Refer to the clearance and temperature requirements in Site Requirements and Prerequisites.

2.6 Connecting to the FXS Voice Port

The FXS voice interface terminates in a Telco-50 or Telco-64 proprietary connector. *Appendix A* specifies the pinout of the FXS connectors.

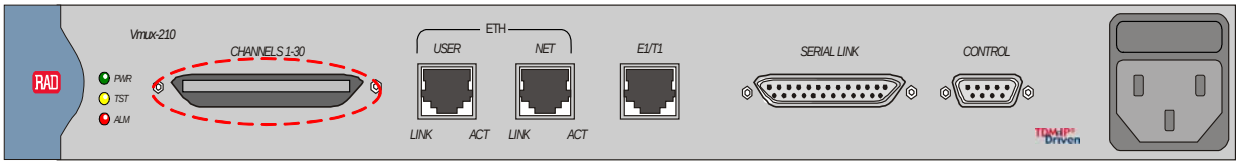


Figure 2-1. FXS Connector

➤ **To connect the FXS voice interface:**

- Connect FXS voice interface to the connector on the Vmux-210 rear panel labeled Channels 1-x.

2.7 Connecting to the Main Link

The Vmux-210 main link may be either the Ethernet NET interface or the E1/T1/Serial main link interface.

Connecting to the Ethernet Main Link

The Vmux-210 Ethernet NET main link interface terminates in an 8-pin RJ-45 connector. *Appendix A* specifies the pinout of the Ethernet connector. The Ethernet main link port supports connection via straight and cross cables.

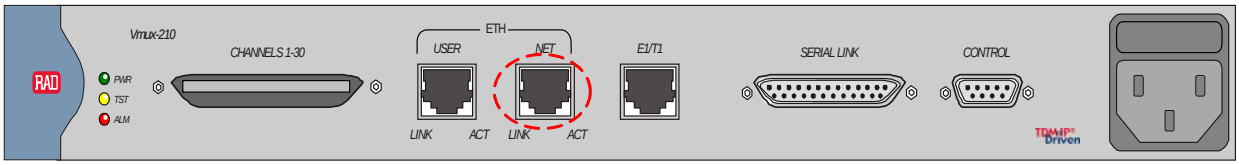


Figure 2-2. ETH NET Connector

➤ **To connect to the Ethernet main link:**

- Connect the IP uplink to the RJ-45 connector designated ETH NET.

Connecting to the Serial Main Link

The serial main link interface terminates in a female DB-25 connector. *Appendix A* specifies the pinout of the serial connector.

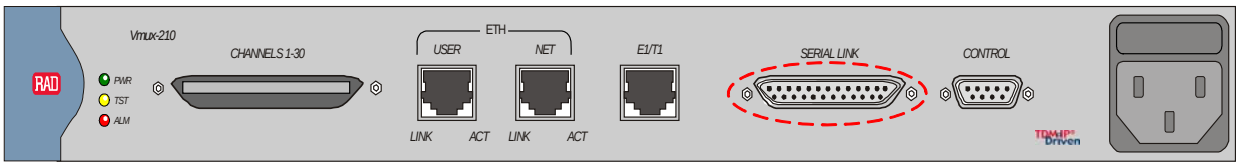


Figure 2-3. SERIAL LINK Connector

➤ **To connect the Serial main link:**

- Connect the serial V.35 link to the DB-25 connector designated SERIAL.

Connecting to the E1 Link

The E1 link terminates in an RJ-45 balanced connector. *Appendix A* specifies the pinout of the E1 connector.

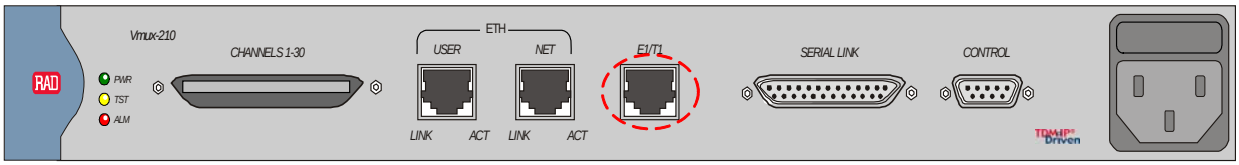


Figure 2-4. E1 Connector

➤ **To connect the balanced E1 interface:**

- Connect the incoming E1 link to the RJ-45 connector on the Vmux-210 rear panel, designated E1.

➤ **To connect the unbalanced E1 interface:**

1. Connect the receive line to the connector labeled RX of the CBL-RJ45/2BNC/E1 adapter cable, using a 75Ω coaxial cable.
2. Connect the transmit line to the connector labeled TX of the CBL-RJ45/2BNC/E1 adapter cable, using a 75Ω coaxial cable.
3. Connect the CBL-RJ45/2BNC/E1 adapter cable to the RJ-45 connector on the Vmux-210 rear panel, designated E1.

Connecting to the T1 Link

The T1 link terminates in an RJ-45 balanced connector. *Appendix A* specifies the pinout of the T1 connector.

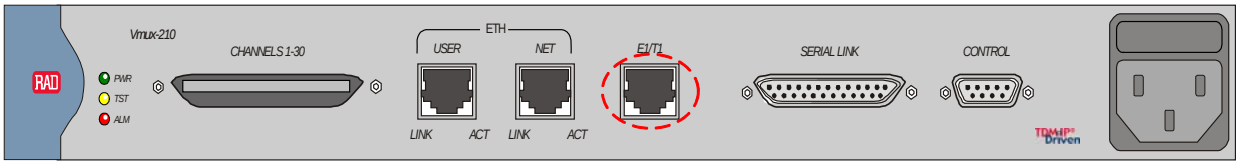


Figure 2-5. T1 Connector

➤ **To connect the T1 interface:**

- Connect the T1 link to the RJ-45 connector on the Vmux-210 rear panel, designated T1.

2.8 Connecting to the User LAN Port

The user LAN can be connected to the Ethernet USER port. *Appendix A* specifies the pinout of the Ethernet connectors.

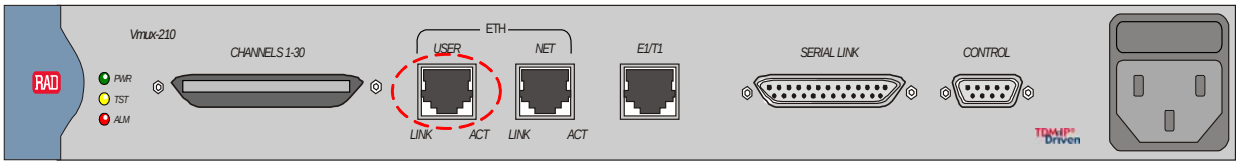


Figure 2-6. USER ETH Connector

➤ **To connect the user LAN port:**

- Connect the user LAN to the RJ-45 connector designated ETH USER.

2.9 Connecting to the ASCII Terminal

The Vmux-210 control port terminates in a DB-9 connector. *Appendix A* specifies the pinout of the control port connector.

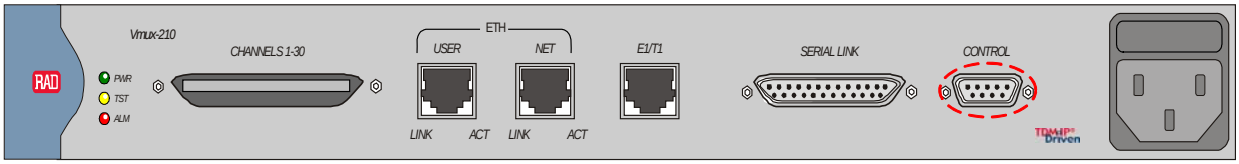


Figure 2-7. CONTROL Connector

➤ **To connect to an ASCII terminal:**

- Connect the DB-9 connector (designated CONTROL) to the ASCII terminal, or PC running a terminal emulation software.

2.10 Connecting to Power

Vmux-210 includes AC or DC power supply. To connect Vmux-210 to the power source, see the appropriate section below, depending on your version of the unit (AC or DC).

Warning

Before switching on this unit and connecting or disconnecting any other cable, the protective earth terminals of this unit must be connected to the protective ground conductor of the mains (AC or DC) power cord. If you are using an extension cord (power cable) make sure it is grounded as well.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

Connecting to AC Power

AC power is supplied to Vmux-210 through a standard 3-prong plug.

AC power should be supplied through the 1.5 m (5 ft) standard power cable terminated by a standard 3-prong plug. The cable is provided with the unit.

➤ **To connect Vmux-210 to AC power:**

1. Connect the power cable to the power connector on the Vmux-210 rear panel.
2. Connect the power cable to the electricity outlet.

   The unit will turn on automatically upon connection to the electricity supply.

Connecting to DC Power

DC power is supplied to Vmux-210 through a special 3-prong plug.

➤ To connect Vmux-210 to DC power:

- Refer to the DC power supply connection supplement, located on the Technical Documentation CD or at the back of the official printed version of this manual. Also, refer to the safety instructions at the beginning of this document.

Chapter 3

Operation

This chapter provides the following information for Vmux-210:

- Vmux-210 front-panel indicators
- Operating procedures (turn-on, front-panel indications, performance monitoring and turn-off).

The installation procedures given in *Chapter 2* must be completed and checked before attempting to operate the Vmux-210.

3.1 Turning On the Unit

➤ **To turn on the unit:**

- Connect the power cable to the electricity outlet.

  The PWR indicator lights up and remains lit as long as Vmux-210 receives power.

Table 3-1 shows the correct status of the indicators a few seconds after power-up.

Table 3-1. Vmux-210 Indicator Status

Indicator	Status
PWR	ON
TST	OFF
ALM	OFF

If the above LED indications do not appear following initial power turn-on, see *Chapter 6* for the diagnostic test instructions.

3.2 Indicators

The Vmux-210 front panel includes a series of LED indicators that show the current operating status of the unit (see *Figure 3-1*).

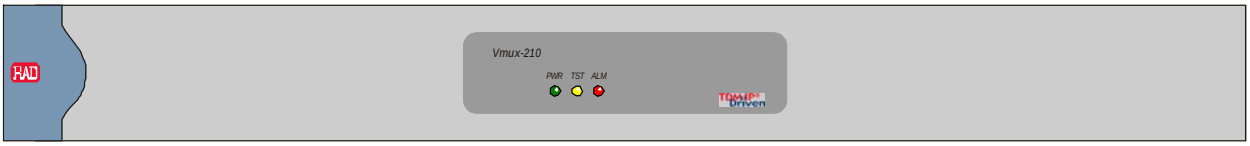


Figure 3-1. Vmux-210, Front Panel

Table 3-2 lists and describes Vmux-210 indicators.

Table 3-2. Vmux-210 LEDs

Name	Function
PWR (green)	ON – Power supply is ON
TST (yellow)	ON – Test is in progress
ALM (red)	ON – Alarm is present

3.3 Default Settings

Vmux-210 is managed by an ASCII terminal or PC running a terminal emulation program via menu-driven embedded software. The following tables list the default settings of the Vmux-210 configuration parameters.

Table 3-3. System Default Settings

Parameter	Default Value
Configuration > System	
Main Link	Ethernet
Router	Disable
Ethernet Net/User Connection	Layer 2 Switching
Configuration > System > Management	
Host Mux Name	None
Telnet/Web Access	Enable
Auto Logout Time	3 minutes

Table 3-3. System Default Settings (Cont.)

Parameter	Default Value
Configuration > System > Management > Host IP	
IP address	0.0.0.0
Subnet Mask	0.0.0.0
Default Gateway	0.0.0.0
DHCP Client	Disable
Read	public
Write	private
Trap	public
Configuration > System > Management > Manager List	
Manager list	No managers defined
Configuration > System > Alarm Operations	
Alarm LED Severity	Event

Table 3-3. Physical Port Default Settings

Parameter	Default Value
Configuration > Physical Ports > Ethernet	
Port	Network
Auto Negotiation	Enable
Ingress Rate Limit	No Limit
Configuration > Physical Ports > Serial Uplink	
Interface Type	V35
Connect	No
Speed (N*64)	1
Clock Mode	DTE
Control Signals	Ignore
Fragmentation	610
HDLC Mode	Transparent HDLC
Loop Detect	Disable

Table 3-3. Physical Port Default Settings (Cont.)

Parameter	Default Value
Configuration > Physical Ports > E1/T1 Uplink > T1 Parameters	
Connect	No
Frame Type	ESF
Clock Mode	LBT
Interface Type	CSU
Restoration Time	1 Second (Fast)
Idle Code	FF
Line Code	B8ZS
Rx Sensitivity	LOW (-15 dB)
Tx Gain Level	0 dB
Line Length	0-133
Fragmentation	610
HDLC Mode	Transparent HDLC
Loop Detect	Disable
Configuration > Physical Ports > E1/T1 Uplink > E1 Parameters	
Connect	No
Frame Type	G732N
Clock Mode	LBT
Interface Type	DSU
Restoration Time	1 Second (Fast)
Idle Code	FF
Line Termination	Balanced
Fragmentation	610
HDLC Mode	Transparent HDLC
Loop Detect	Disable
Configuration > Physical Ports > E1/T1 Uplink > Time Slot Table	
Timeslots	No timeslots connected
Configuration > Physical Ports > Analog > Timeouts	
Ring Timeout (sec)	120
On Hook Duration in Flash (msec)	700

Table 3-3. Physical Port Default Settings (Cont.)

Parameter	Default Value
Configuration > Physical Ports > Analog > Ringer Profiles	
Period #1: Ring (x 100 msec)	10
Period #1: Silence (x 100 msec)	30
Period #2: Ring (x 100 msec)	0
Period #2: Silence (x 100 msec)	0
Configuration > Physical Ports > Analog > Gains	
Tx Gain (dB)	0
Rx Gain (dB)	-4
Configuration > Bundles > Configure	
Bundles	No bundles defined
Configuration > Bundles > Configure > Edit Bundle > Routing Parameters	
Destination IP	0.0.0.0
Destination Bundle	1
TOS Byte	0x00
Configuration > Bundles > Configure > Edit Bundle > Routing Parameters > VLAN Parameters	
VLAN Tagging	No
Configuration > Bundles > Configure > Edit Bundle > Connectivity Parameters	
Connectivity Mode	With Ping
Connectivity Packet Rate (sec)	60
Connectivity Timeout Cycles	3
Configuration > Bundles > Configure > Edit Bundle > Voice Parameters	
Coder/Rate	G.723.1/6.4
Noise Level for VAD	Low
Echo Canceller	Enable
Caller ID Tx Delay (msec)	400
Configuration > Bundles > Configure > Edit Bundle > Voice Parameters > Fax/Modem	
Modem	Modem Relay
Fax	Enable
Fax Rate (kbps)	14.4
Configuration > Bundles > Configure > Edit Bundle > Signaling Parameters	
Ringback	Enable
Reverse Polarity	Disable
Pulse Metering	Disable

Table 3-3. Physical Port Default Settings (Cont.)

Parameter	Default Value				
Configuration > Bundles > Configure > Edit Bundle > Signaling Parameters > Signaling Bits					
Signaling Bits		A Bit	B Bit	C Bit	D Bit
	On Hook	0	1	0	1
	Off Hook	1	1	0	1
	Ring I	1	1	0	1
	Ring II	1	1	0	1
	Reverse Polarity	1	0	0	1
	Pulse Metering	1	0	0	1
Configuration > Bundles > Channel Distribution > Configure					
Port Distribution	All ports are not connected				

Table 3-3. Bridge Default Settings

Parameter	Default Value
Configuration > Applications> Bridge > Bridge Port	
Bridge Port	Network
Ingress Filtering	Disable
Port VID	1
Default Priority Tag	0
Egress Tag Handling	None
Ingress Tag Handling	None
Configuration > Applications> Bridge > VLAN Membership	
VLAN Table	No VLAN entries

Table 3-3. Router Default Settings

Parameter	Default Value
Configuration > Applications > Router > Interfaces > Uplink Port Configuration	
IP	0.0.0.0
Mask	0.0.0.0
ARP Table Aging Time (minutes)	5
DHCP Relay	Disable
Relay to DHCP Server IP	0.0.0.0

Table 3-3. Router Default Settings (Cont.)

Parameter	Default Value
Configuration > Applications > Router > Interfaces > Network Port Configuration	
IP	0.0.0.0
Mask	0.0.0.0
DHCP Client	Disable
ARP Table Aging Time (minutes)	5
DHCP Relay	Disable
Relay to DHCP Server IP	0.0.0.0
Configuration > Applications > Router > Interfaces > User Port Configuration	
IP	0.0.0.0
Mask	0.0.0.0
ARP Table Aging Time (minutes)	5
DHCP Relay	Disable
Relay to DHCP Server IP	0.0.0.0
Configuration > Applications > Router > Interfaces > Uplink/Network/User Port Configuration > RIP	
RIP Status	Disable
Send RIP type	None
Receive RIP type	None
Configuration > Applications > Router > Interfaces > Uplink/Network/User Port Configuration > Firewall	
Firewall Status	**Disable**
Firewall Direction	**Outbound**
Active FTP	**No**
Forged IP Protection	**No**
Configuration > Applications > Router > Default Gateway	
Default Gateway	Disable
Default Gateway IP	0.0.0.0
Configuration > Applications > Router > DHCP Server	
DHCP Server	Disable
Configuration > Applications > Router > NAT	
NAT	No address translations defined

Table 3-3. Router Default Settings (Cont.)

Parameter	Default Value
Configuration > Applications > Router > Firewall Global Parameters	
All Fragments	No
TCP Aging (seconds)	15
UDP Aging (seconds)	15
ICMP Aging (seconds)	15
Default Aging (seconds)	15
Configuration > Applications > Router > Firewall Global Parameters > Define Rules	
Firewall Rules	No rules defined

3.4 Configuration and Management Alternatives

Vmux-210 has several management options:

- ASCII Terminal – connected to Vmux-210 via the RS-232 control port
- Telnet – access to the configuration screens via any Telnet application
- ConfiguRAD – access to the configuration screens via Web browser
- RADview – RAD's user-friendly SNMP-based GUI application, or by other SNMP-based management applications.

Working with an ASCII Terminal

Vmux-210 configuration and monitoring operations can be performed locally, using an ASCII terminal connected to the control port, or remotely via Telnet or a Web browser. The following functions are available:

- Viewing system information
- Modifying configuration and operation settings
- Viewing statistics and status
- Performing diagnostics.

Vmux-210 configuration can also be performed remotely using an SNMP application (for example, RADview).

Initiating a Control Session

Any standard ASCII terminal (a "dumb" terminal or a personal computer running a terminal emulation application) equipped with a V.24/RS-232 communication interface can be used to configure Vmux-210.

Vmux-210 automatically adjusts to the terminal rate, for any rate between 9.6-115.2 kbps.

➤ **To initiate a control session:**

1. Connect the terminal cable to the CONTROL connector on the Vmux-210 back panel.
2. Connect the terminal cable to the serial port of the control terminal.
3. Turn the control terminal on.
4. Configure the terminal to the default communication parameters: one start bit, eight data bits, no parity, one stop bit, no flow control, VT100 emulation.
5. Turn Vmux-210 on.
6. After Vmux-210 completes the boot sequence (approximately 50 seconds), press ‹**Enter**› several times.

   The rate is detected automatically.

Logging In

You have to enter a user name and password in order to start the Vmux-210 management software (see *Figure 3-2*).

```
  USER NAME:
  PASSWORD:


ESC - clear; & - exit
```

Figure 3-2. Password Request Screen

➤ **To enter the user name and password:**

1. Type your user name, and press **‹Enter›**.
2. Type your password (up to eight characters), and press **‹Enter›**.

   The Main Menu appears (see *Figure 3-3*).

```
Main Menu
 1. Inventory[]
 2. Configuration>
 3. Monitoring>
 4. Diagnostics>
 5. File Utilities>
>
Please choose item <1 to 5>
@ - Db Update; # - Db Undo
ESC-prev.menu; !-main menu; &-exit
```

Figure 3-3. Main Menu

Navigating the Management Menus

This section provides a general description of the software menu operation and conventions for navigating the menus. *Menu Map* on page *3-15* lists all menus of the Vmux-210 management software.

Selecting Parameters

➤ To select an option:

- Type the number corresponding to the option, and press **<Enter>**.

  The screen for the chosen option appears.

➤ To correct an erroneous entry:

- Press **<Backspace>** to clear the error, and then enter the correct characters.

  Alternatively, press **<Esc>** to exit the current menu, and then return to the menu to re-enter the required value.

Saving and Aborting Configuration Changes

You must save the configuration changes by updating the Vmux-210 database. If the database is not updated, Vmux-210 discards all the user settings when it is reset. You can save changed values at any stage of the configuration procedure. Alternatively, you can abort the new settings and return to the previous values.

➤ To save the changes:

1. Type **@** (**Shift+2**) and press **<Enter>**.

   Vmux-210 displays the following confirmation message:

   ```
   Are you sure you want to update data base?
   Press  Y/N :
   ```

2. Type **Y** to save the changes.

   Vmux-210 displays the following message:

   ```
   Data base was changed. Press any key to continue.
   ```

3. Press any key to continue the management session.

Note *Each time you update the Vmux-210 database, the management software analyzes the changes. If a major error is detected, Vmux-210 aborts the database update and displays the following message, followed by the list of detected configuration errors:*

```
Data base update failed. Sanity Error Occurred.
```

➤ To undo the changes:

1. Type **#** (**Shift+3**) and press **<Enter>**.

   Vmux-210 displays the following confirmation message:

   ```
   Are you sure you want to undo data base?
   Press  Y/N :
   ```

2. Type **Y** to abort the changes and use the previous database settings.

Using Terminal Hot Keys

Terminal hot keys are provided per screen to enhance the functionality that is required of that screen. The available hot keys are listed in the lower part of each screen. The following hot keys are system keys, available on screens:

- **Esc** – Return to previous menu
- **!** – Return to the Main Menu
- **&** – Exit to password screen (to prevent unauthorized access after completing the session)
- **@** – Update database
- **#** – Undo database (only changes since last update)
- **Ctrl+D** – Scroll down (read-only tables)
- **Ctrl+U** – Scroll up (read-only tables)
- **Arrow Keys, Tab** – Scroll (read-write tables)
- **G <row number>,<column number>** – Go to cell (read-write tables)
- **?** – Help screen

The path at the top of the screen indicates the menu path for reaching the currently displayed menu from the Main Menu (for example: **Main>Configuration>System**).

Sample Help Screen

The following figure shows a typical Help screen, which summarizes the keyboard shortcuts that are available in the functional screen from which the Help screen was invoked.

The Help screen is invoked by pressing SHIFT-/ (the '**?**' symbol) from the relevant functional screen. However, not all functional screens have Help available.

```
Table Hot Keys

Right Arrow – move right
Down Arrow – move down
TAB - select next changeable cell
G <row number>,<col number> - go to cell
```

Figure 3-4. Typical Help Screen

Security Levels

Vmux-210 supports a four-level security and user authentication system:

- **Administrator** – Allowed to configure all the parameters of Vmux-210.
- **Operator** – Allowed to perform all operations in the system, except for user administration (adding/deleting users, changing user definitions).
- **Technician** – Allowed to test Vmux-210 and monitor its operation (for example, monitoring alarms.

- **Monitor** – Allowed to monitor the Vmux-210 operation.

The maximum number of users supported by Vmux-210 is 20. When managing Vmux-210 over Telnet, up to five simultaneous management sessions are permitted. Only one administrator or operator is allowed to enter the management session at a time. The other four users may enter the session as monitors.

Vmux-210 displays the management menus in accordance with a user's access rights. For example, configuration screens dealing with the unit configurations are not available to users who logged in as technicians or monitors.

Default Security Configuration

Vmux-210 is supplied with two administrator accounts:

- Account 1:
  - User name: admin
  - Password: 12345.
- Account 2:
  - User name: su
  - Password: 1234.

When the first management session is initiated, it is recommended to create a new administrator account, and delete the default one.

Note *If the password is lost, consult your local RAD distributor.*

Working with Telnet

Telnet provides remote access to the same menu-driven embedded software used to configure the Vmux-210 from the local console. Vmux-210 accesses Telnet via the MNG Ethernet port, which provides management access through the LAN.

➤ **To login via a Web browser:**

1. Connect the MNG Ethernet port of Vmux-210 to the LAN.
2. Enter the IP address of the Vmux-210 in the address field of the browser in the following format: **http://'IP address'** and then press **<Enter>** to command the browser to connect (**'IP address'** stands for the actual Vmux-210 IP address which has been pre-configured via an ASCII terminal).
3. Enter your user name and password.

   The Main menu is displayed.

Working with ConfiguRAD

ConfiguRAD is the RAD Web-based management application. Vmux-210 accesses ConfiguRAD via the MNG Ethernet port, which provides inband management access through the LAN.

Web Browser Requirements

The following Web browsers can be used to access the Vmux-210 supervision utility from any location that enables access to the Vmux-210 using Internet protocols.

- Internet Explorer 6.0, running on Windows™ 98, Windows™ 2000, Windows™ XP
- Netscape Communicator 7.1, running on Windows™ NT or Unix.

Logging in via a Web Browser

➤ To login via a Web browser:

1. Connect the MNG Ethernet port of Vmux-210 to the LAN.
2. Open the Web browser.
3. Disable any pop-up blocking software, such as Google Popup Blocker.
4. Enter the IP address of the Vmux-210 in the address field of the browser in the following format: http://'IP address' and then press <Enter> to command the browser to connect ('IP address' stands for the actual Vmux-210 IP address which has been pre-configured via an ASCII terminal).
5. After the opening window is displayed, click LOGIN.
6. Enter your user name and password.

   The Main menu is displayed.

Navigating the ConfiguRAD Menus

ConfiguRAD is Web-based remote access management software. It provides a user-friendly interface for configuring, collecting statistics and performing diagnostic tests on the Vmux-210 units.

➤ To choose an option:

1. Click a link in the ConfiguRAD screen to display the next menu.
2. Once the target screen is displayed, select a value from the drop-down box or enter it in a text box.

Navigating the Management Menus

This section provides a general description of the conventions for navigating the software menus accessible from either the local console or via Telnet.

Choosing Parameters

➤ **To choose an option:**

- Type the number corresponding to the option, and press **<Enter>**.

  The screen for the chosen option is displayed.

➤ **To correct an erroneous entry:**

- Press **<Backspace>** to clear the error, and then enter the correct characters.

  Alternatively, press **<Esc>** to exit the current menu, and then return to the menu to re-enter the required value.

Saving and Aborting Configuration Changes

To save configuration changes, you must update the Vmux-210 database. If the database is not updated, Vmux-210 discards all the user settings when it is reset. You can save changed values at any stage of the configuration procedure. Alternatively, you can abort the new settings and return to the previous values.

➤ **To save the changes:**

1. Type **@** (**Shift+2**) and press **<Enter>**.

   Vmux-210 displays the following confirmation message:

   ```
   Are you sure you want to update data base ?
   Press  Y/N :
   ```

2. Type **Y** to save the changes.

Note *Each time you update the Vmux-210 database, the management software analyzes the changes. If a major error is detected, Vmux-210 aborts the database update and displays "ERROR" on the upper right side. In this case, check the sanity error, as described in Chapter 6, and re-enter the erroneous values.*

If sanity errors were detected, the errors will appear on the screen, and the database will not be changed.

➤ **To undo the changes:**

1. Type **#** (**Shift+3**) and press **<Enter>**.

   Vmux-210 displays the following confirmation message:

   ```
   Are you sure you want to undo data base ?
   Press  Y/N :
   ```

2. Type **Y** to abort the changes and use the previous database settings.

Menu Map

This section lists all menus of the Vmux-210 management software.

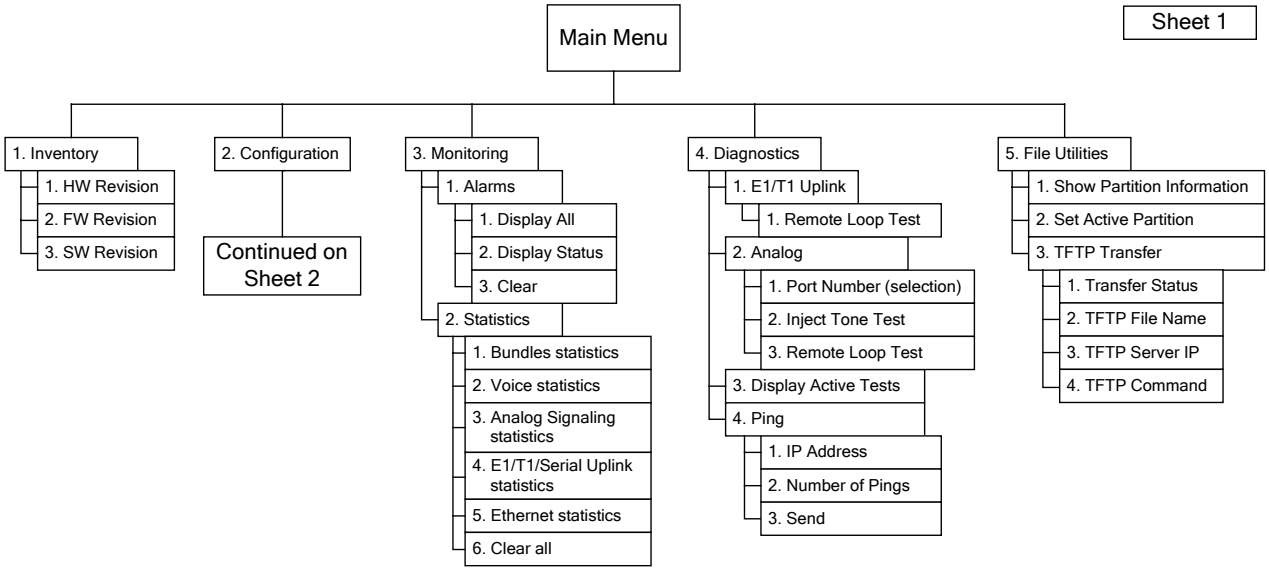


Figure 3-5. Vmux-210 Menu Tree, Main Menu

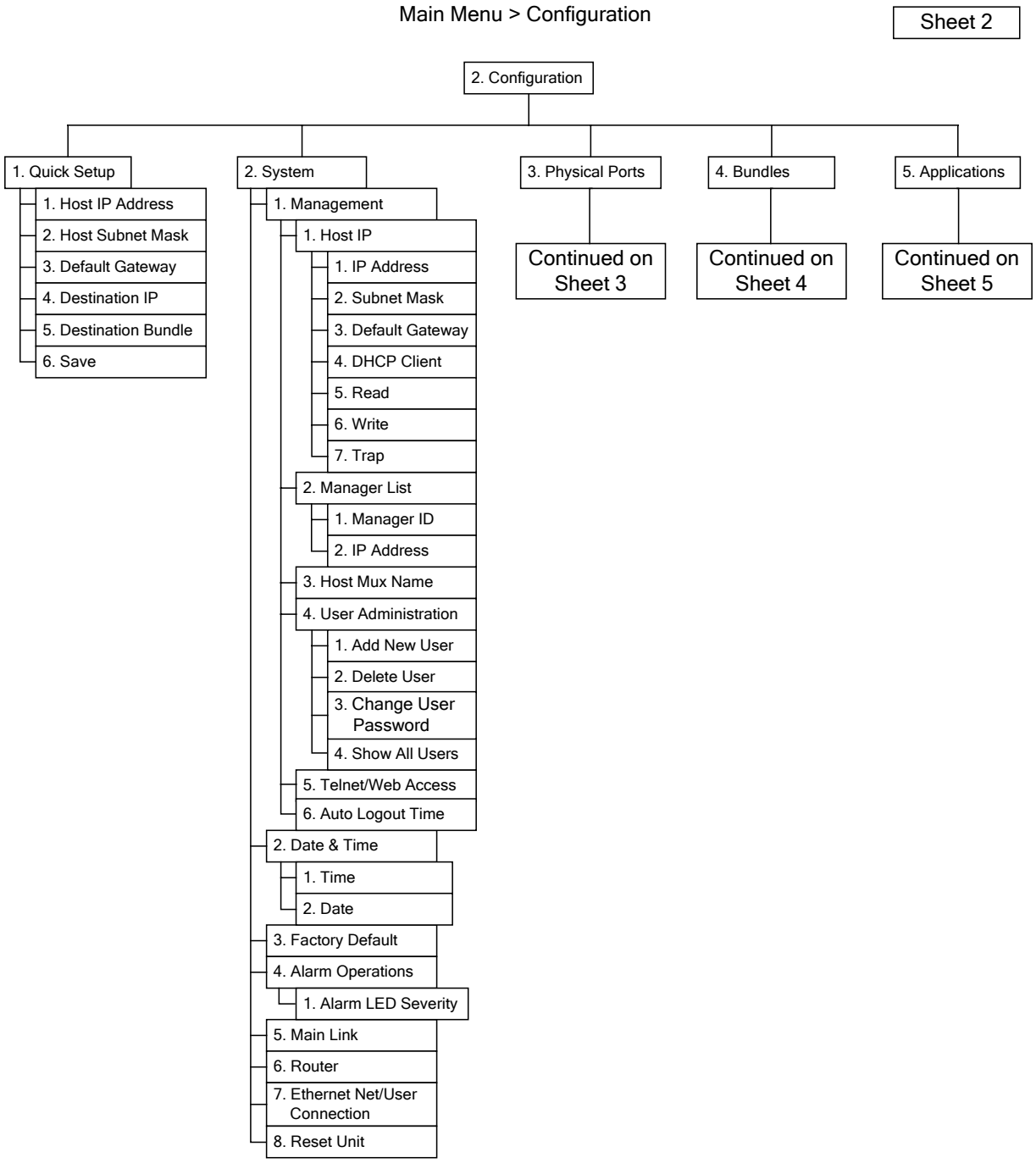


Figure 3-6. Vmux-210 Menu Tree, Configuration Menu

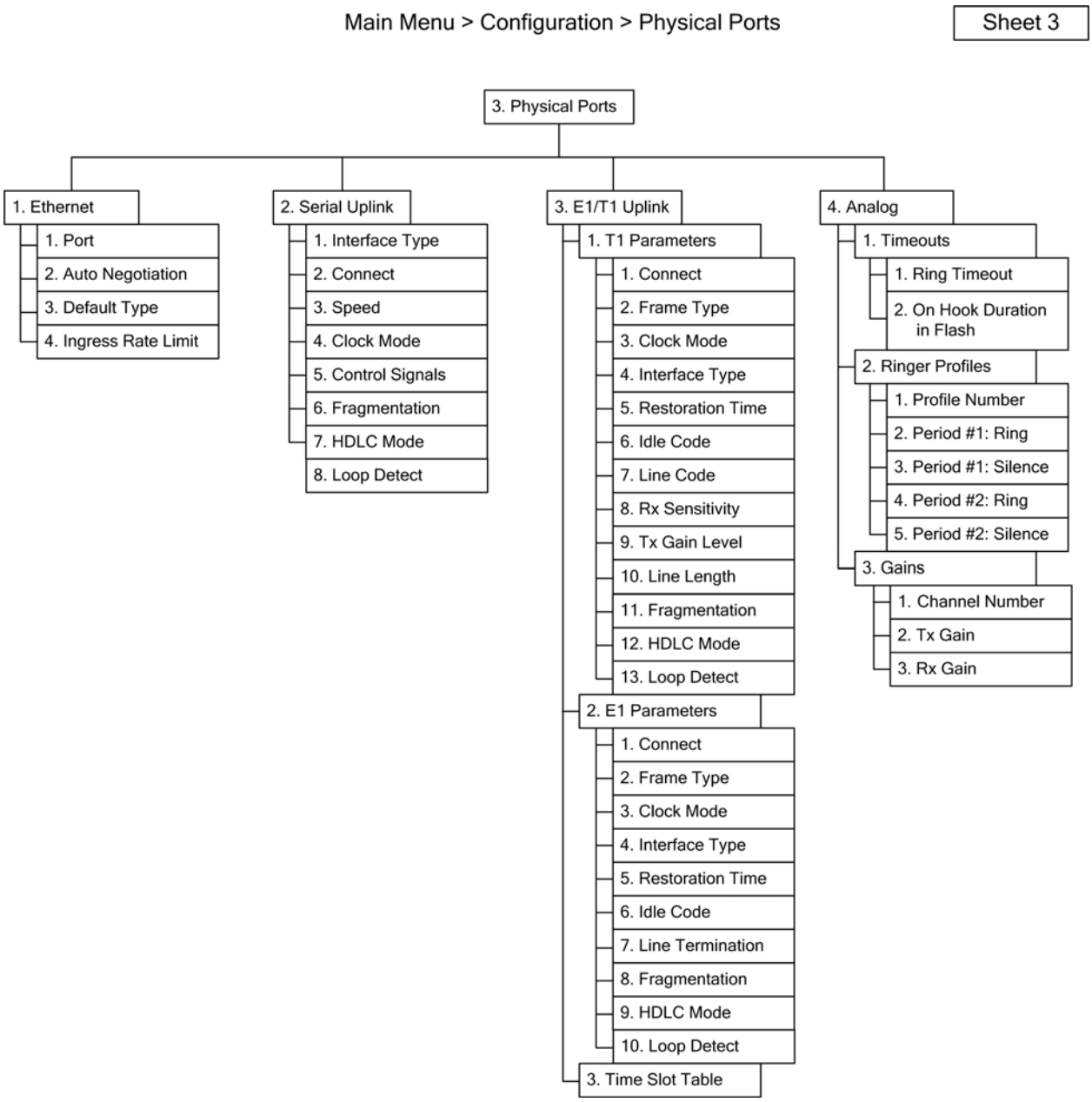


Figure 3-7. Vmux-210 Menu Tree, Configuration › Physical Ports

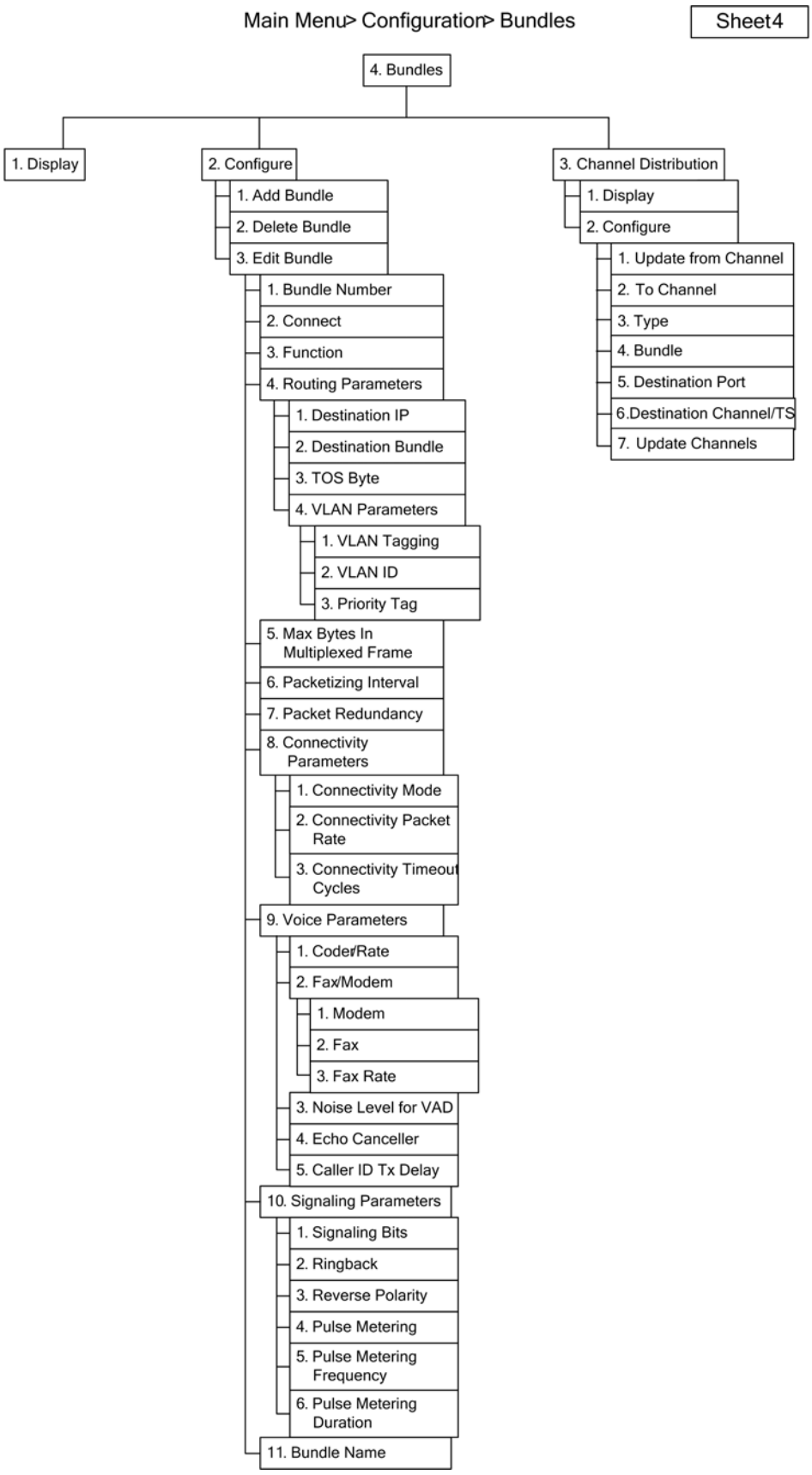


Figure 3-8. Vmux-210 Menu Tree, Configuration > Bundles

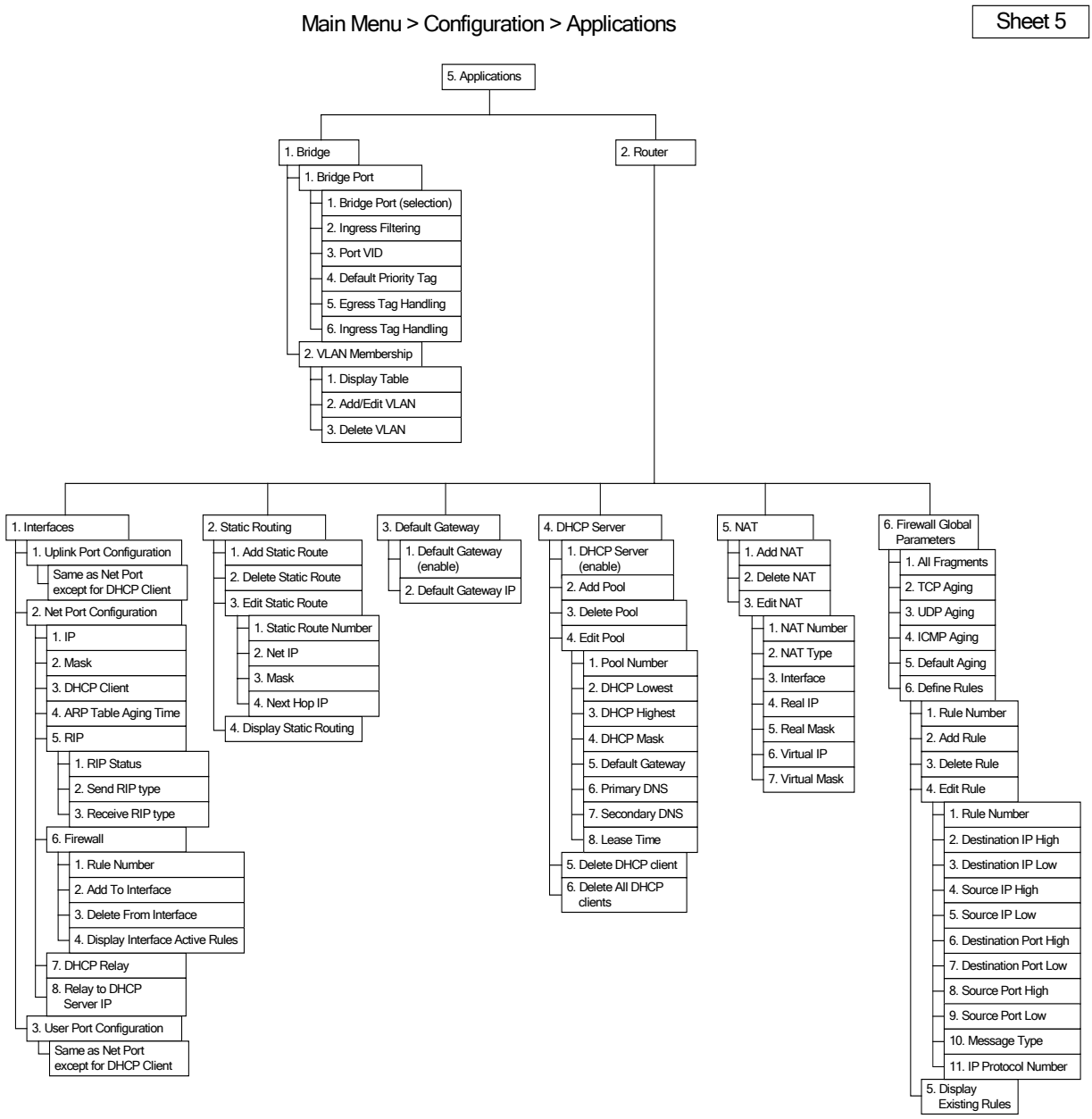


Figure 3-9. Vmux-210 Menu Tree, Configuration › Applications

3.5 Turning Off the Unit

➤ **To turn off the unit:**

- Disconnect the power cable from the electricity outlet.

Chapter 4

Configuration

This chapter describes how to configure Vmux-210 via menu-driven embedded software, using a standard ASCII terminal connected to the rear panel CONTROL port, or via Telnet or Web browser. Telnet/Web management is performed remotely via an inband management link to the unit.

Note

For configuration via RADview, refer to the RADview-SC/Vmux-210 User's Manual.

4.1 Configuring for Management

- From the Main Menu, select **Configuration > System**.

```
System

 1. Management>
 2. Date & Time>
 3. Factory Default>
 4. Alarm Operations>
 5. Main Link>   (Ethernet)
 6. Router    (Disable)
 7. Ethernet Net/User Connection>   (Layer 2 Switching)
 8. Reset Unit
```

Figure 4-1. System Menu

Table 4-1. System Parameters

Parameter	Description	Possible Values/ Reference
Management	Opens the Management menu	See *Figure 4-2*
Date & Time	Opens the Date & Time menu	See *Figure 4-68*
Factory Default	Resets Vmux-210 to factory default settings ***Note:*** *Select* ***Without Management*** *to clear only bundles and voice ports.*	**All** **Without Management**
Alarm Operations	Opens the Alarm Operations menu	See *Figure 4-69*
Main Link	Main link interface (uplink); all voice frames exit the device through the main-link ***Note:*** *The device resets automatically (upon update of the database) when this parameter is modified.*	**Ethernet** **Serial** **E1/T1** Default: **Ethernet**
Router	Enables the Router ***Note:*** *The device resets automatically (upon update of the database) when this parameter is modified.*	**Enable** **Disable** Default: **Disable**
Ethernet Net/User Connection	Type of connection between Ethernet ports in Router mode ***Notes:*** • *This parameter is available only when the router is enabled and the Main Link is defined as E1/T1 or Serial. When the Main Link is defined as Ethernet and the Router is enabled, the value is automatically set to Layer 3 Routing.* • *The device resets automatically (upon update of the database) when this parameter is modified.*	**Layer 2 Switching** **Layer 3 Routing** Default: **Layer 2 Switching**
Reset Unit	Resets Vmux-210	

➤ **To configure Management parameters:**

- From the Main Menu, select **Configuration > System > Management**.

```
Management

 1. Host IP>
 2. Manager List[]>
 3. Host Mux Name... ()
 4. User Administration>
 5. Telnet/Web Access>   (Enable)
 6. Auto Logout Time (min) [3-10]...(3)
```

Figure 4-2. Management Menu

Table 4-2. Management Parameters

Parameter	Description	Possible Values/ Reference
Host IP	Opens the Host IP menu	See *Figure 4-3*
Manager List	Opens the Manager List menu	See *Figure 4-4*
Host Mux Name	Screen display name; the name that appears at the top of each terminal screen	
User Administration	Opens the User Administration menu	See *Figure 4-5*
Telnet/Web Access	Enables access via Telnet/Web	**Enable** **Disable** **Enable Managers Only** Default: **Enable**
Auto Logout Time (min)	Idle time before management session (Terminal/Telnet/Web) automatically logs out	**3..10** Default: **3**

Setting Host IP Parameters

➤ To set the Host IP parameters:

- From the Main Menu, select **Configuration > System > Management > Host IP**.

```
Host IP

 1. IP Address... (172.17.172.191)
 2. Subnet Mask...     (255.255.255.0)
 3. Default Gateway... (172.17.172.1)
 4. DHCP Client    (Disable)
 5. Read... (public)
 6. Write... (private)
 7. Trap... (public)
```

Figure 4-3. Host IP Menu

Table 4-3. Host IP Parameters

Parameter	Description	Possible Values/ Reference
IP Address	Vmux-210's IP address ***Note:*** *Only available when Router is disabled.*	Default: **0.0.0.0**
Subnet Mask	Vmux-210's subnet mask ***Note:*** *Only available when Router is disabled.*	Default: **0.0.0.0**
Default Gateway	Vmux-210's default gateway ***Note:*** *Only available when Router is disabled.*	Default: **0.0.0.0**
DHCP Client	Enables DHCP client for obtaining IP addresses	**Enable** **Disable** Default: **Disable**
Read	Read Community for SNMP	Default: **public**
Write	Write Community for SNMP	Default: **private**
Trap	Trap Community for SNMP	Default: **public**

Configuring the Manager List

You can define the network management stations to which the SNMP agent of the Vmux-210 will send traps. You can define up to ten managers. In addition, you can configure Vmux-210 to accept Telnet/Web management traffic only from the management stations defined in the Manager List.

➤ To configure the Manager List:

- From the Main Menu, select **Configuration > System > Management > Manager List**.

```
Manager List

    Manager ID                    IP Address
         1                         0.0.0.0
         2                         0.0.0.0
|        3                         0.0.0.0
v        4                         0.0.0.0
         5                         0.0.0.0

 1. Change cell                      ... (0.0.0.0)
```

Figure 4-4. Manager List

Table 4-4. Manager List Parameters

Parameter	Description	Possible Values/ Reference
Manager ID	Index number of the manager	1..10
IP Address	IP address of the manager	Default: 0.0.0.0

Managing Users

Use the Users menu to add and delete users, and to modify user details.

➤ To manage users:

- From the Main Menu, select **Configuration > System > Management > User Administration**.

```
User Administration

 1. Add New User>
 2. Delete User>
 3. Change User Password>
 4. Show All Users[]
```

Figure 4-5. User Administration Menu

Table 4-5. User Administration Parameters

Parameter	Description	Possible Values/ Reference
Add New User	Adds a new user	
Delete User	Deletes a user	
Change User Password	Changes a user's password	
Show All Users	Lists all defined users	

4.2 Configuring for Operation

Configuring Physical Ports

This section discusses configuring physical port parameters.

➤ **To configure the Physical Ports:**

- From the Main Menu, select **Configuration > Physical Ports**.

```
Physical Ports

 1. Ethernet>
 2. Serial Uplink>
 3. E1/T1 Uplink>
 4. Analog>
```

Figure 4-6. Physical Ports Menu

Table 4-6. Physical Ports Parameters

Parameter	Description	Possible Values/ Reference
Ethernet	Opens the Ethernet menu	See *Figure 4-7*
Serial Uplink	Opens the Serial Uplink menu	See *Figure 4-8*
E1/T1 Uplink	Opens the E1/T1 Uplink menu	See *Figure 4-9*
Analog	Opens the Analog menu	See *Figure 4-14*

Configuring the Ethernet Port

➤ To configure Ethernet parameters:

- From the Main Menu, select **Configuration > Physical Ports > Ethernet**.

```
Ethernet

 1. Port… (Network)
 2. Auto Negotiation     (Disable)
 3. Default Type >   (10baseT Half Duplex)
 4. Ingress Rate Limit >   (No Limit)
```

Figure 4-7. Ethernet Menu

Table 4-7. Ethernet Parameters

Parameter	Description	Possible Values/ Reference
Port	Selects Ethernet port to configure	**Network** **User** Default: **Network**
Auto Negotiation	Enables auto-negotiation on this port ***Note:*** *Modifying this parameter may cause the NMS to disconnect.*	**Enable** **Disable** Default: **Enable**
Default Type	Default speed and duplex of the Ethernet port ***Notes:*** • *This parameter is available only when auto-negotiation is disabled.* • *Modifying this parameter may cause the NMS to disconnect.*	**10baseT HD** **10baseT FD** **100baseT HD** **100baseT FD** Default: **10baseT HD**
Ingress Rate Limit	Forced ingress rate for this Ethernet port	**No Limit** **128K** **256K** **512K** **1M** **2M** **4M** **8M** Default: **No Limit**

Configuring the Serial Uplink

➤ To configure the Serial uplink:

- From the Main Menu, select Configuration > Physical Ports > Serial Uplink.

```
Serial Uplink

 1. Interface Type >   (V35)
 2. Connect>   (No)
 3. Speed (N*64)[1 - 32]... (64)
 4. Clock Mode >   (DTE)
 5. Control Signals>   (Ignore)
 6. Fragmentation [200 - 1550]... (610)
 7. HDLC Mode >   (Transparent HDLC)
 8. Loop Detect >  (Disable)
 9. Fragmentation [200 - 1550]... (610)
10. HDLC Mode >   (Transparent HDLC)
11. Loop Detect >  (Disable)
```

Figure 4-8. Serial Uplink Menu

Table 4-8. Serial Uplink Parameters

Parameter	Description	Possible Values/ Reference
Interface Type	Physical interface type of the Serial port	**V35** **X21** **EIA-530** **EIA-530-A** Default: **V35**
Connect	Administrative status of the Serial port	**Yes** **No** Default: **No**
Speed (N*64)	Speed of the Serial port	**1..32** Default: **1**
Clock Mode	Clock mode of the serial port	**DCE** **DTE** Default: **DTE**
Control Signals	Whether to ignore control signals ***Note:*** *This parameter is available only when the Interface Type is defined as V35 and the Clock Mode is defined as DTE.*	**Ignore** **Obey** Default: **Ignore**
Fragmentation	Maximum size (in bytes) of frames that are not to be fragmented before mounting Serial port; frames at are below this size are not fragmented	**200..1550** Default: **610**
HDLC Mode	Type of header added to HDLC frames	**Transparent HDLC** **Cisco Bridged Eth** Default: **Transparent HDLC**
Loop Detect	Enables detection of loops in the TDM network. When a loop is detected, a corresponding alarm is recorded in the alarm log, and all Ethernet frames being looped back from the TDM uplink are blocked, and prevented from being sent back to the user's LAN. This mechanism prevents the occurrence of undesired broadcast storms and IP loops in the user's LAN due to a loop on the TDM network.	**Enable** **Disable** Default: **Disable**

Configuring the E1/T1 Uplink

➤ To configure the E1/T1 uplink:

- From the Main Menu, select **Configuration > Physical Ports > E1/T1 Uplink**.

```
E1/T1 Uplink

 1. T1 Parameters>
 2. Time Slot Table>
```

Figure 4-9. T1 Uplink Menu

```
E1/T1 Uplink

 1. E1 Parameters>
 2. Time Slot Table>
```

Figure 4-10. E1 Uplink Menu

Table 4-9. T1 Uplink Parameters

Parameter	Description	Possible Values/ Reference
T1 Parameters	Opens the T1 Parameters menu	See *Figure 4-11*
Time Slot Table	Opens the Time Slot Table	See *Figure 4-13*

Table 4-10. E1 Uplink Parameters

Parameter	Description	Possible Values/ Reference
E1 Parameters	Opens the E1 Parameters menu	See *Figure 4-12*
Time Slot Table	Opens the Time Slot Table	See *Figure 4-13*

Configuring T1 Parameters

➤ To configure T1 parameters:

- From the Main Menu, select **Configuration > Physical Ports > E1/T1 Uplink > T1 Parameters**.

```
T1 Parameters

 1. Connect>   (Yes)
 2. Frame Type>   (ESF)
 3. Clock Mode>   (LBT)
 4. Interface Type>   (DSU)
 5. Restoration Time>   (1 Second (Fast))
 6. Idle Code[1 - ff]... (ff)
 7. Line Code>   (B8ZS)
 8. Rx Sensitivity>   (LOW (-15dB))
 9. Tx Gain Level>   (0 dBm)
10. Line Length>   (0-133 Feet)
11. Fragmentation [200 - 1550]... (610)
12. HDLC Mode >   (Transparent HDLC)
13. Loop Detect >  (Disable)
```

Figure 4-11. T1 Parameters Menu

Table 4-11. T1 Parameters

Parameter	Description	Possible Values/ Reference
Connect	Administrative status of the T1 port	Yes No Default: No
Frame Type	Frame type of the T1 port	ESF SF (D4) Default: ESF
Clock Mode	Clock mode of the T1 port	Internal LBT LBT from Sublink Default: LBT
Interface Type	Interface type of the T1 port	CSU DSU Default: CSU
Restoration Time	Restoration time of the T1 port	1 Second (Fast) 10 Seconds (62411) Default: 1 Second (Fast)

Table 4-11. T1 Parameters (Cont.)

Parameter	Description	Possible Values/ Reference
Idle Code	Idle Code of the T1 port	**1..FF** Default: **FF**
Line Code	Line Code of the T1 port	**B8ZS** **AMI** Default: **B8ZS**
Rx Sensitivity	Rx sensitivity of the T1 port ***Note:*** *This parameter is available only when the Interface Type is defined as CSU.*	**LOW (-15 db)** **HIGH (-36 db)** Default: **LOW (-15 db)**
Tx Gain Level	Tx gain level of the T1 port ***Note:*** *This parameter is available only when the Interface Type is defined as CSU.*	**0 db** **-7.5 db** **-15 db** **-22.5 db** Default: **0 db**
Line Length	Line length of the T1 port ***Note:*** *This parameter is available only when the Interface Type is defined as DSU.*	**0-133** **133-266** **266-399** **399-533** **533-655** Default: **0-133**
Fragmentation	Maximum size (in bytes) of frames that are not to be fragmented before mounting Serial port; frames at are below this size are not fragmented	**200..1550** Default: **610**
HDLC Mode	Type of header added to HDLC frames	**Transparent HDLC** **Cisco Bridged Eth** Default: **Transparent HDLC**
Loop Detect	Enables detection of loops in the TDM network. When a loop is detected, a corresponding alarm is recorded in the alarm log, and all Ethernet frames being looped back from the TDM uplink are blocked, and prevented from being sent back to the user's LAN. This mechanism prevents the occurrence of undesired broadcast storms and IP loops in the user's LAN due to a loop on the TDM network.	**Enable** **Disable** Default: **Disable**

Configuring E1 Parameters

➤ To configure E1 parameters:

- From the Main Menu, select **Configuration > Physical Ports > E1/T1 Uplink > E1 Parameters**.

```
E1 Parameters

 1. Connect>   (No)
 2. Frame Type>   (G.732N)
 3. Clock Mode>   (LBT)
 4. Interface Type>   (DSU)
 5. Restoration Time>   (1 Second (Fast))
 6. Idle Code[1 - ff]... (ff)
 7. Line Termination> (Balanced)
 8. Fragmentation [200 - 1550]... (610)
 9. HDLC Mode >   (Transparent HDLC)
10. Loop Detect >  (Disable)
```

Figure 4-12. E1 Parameters Menu

Table 4-12. E1 Parameters

Parameter	Description	Possible Values/ Reference
Connect	Administrative status of the E1 port	**Yes** **No** Default: **No**
Frame Type	Frame type of the E1 port	**G732N** **G732N-CRC** **Unframed** Default: **G732N**
Clock Mode	Clock mode of the E1 port	**Internal** **LBT** **LBT from Sublink** Default: **LBT**
Interface Type	Interface type of the E1 port	**DSU** **LTU** Default: **DSU**
Restoration Time	Restoration time of the E1 port	**1 Second (Fast)** **10 Seconds (62411)** **CCITT** Default: **1 Second (Fast)**

Table 4-12. E1 Parameters (Cont.)

Parameter	Description	Possible Values/ Reference
Idle Code[1 - ff]	Idle Code of the E1 port	**1..FF** Default: **FF**
Line Termination	Line termination type of the E1 port	**Balanced** **Unbalanced** Default: **Balanced**
Fragmentation	Maximum size (in bytes) of frames that are not to be fragmented before mounting Serial port; frames below this size are not fragmented	**200..1550** Default: **610**
HDLC Mode	Type of header added to HDLC frames	**Transparent HDLC** **Cisco Bridged Eth** Default: **Transparent HDLC**
Loop Detect	Enables detection of loops in the TDM network. When a loop is detected, a corresponding alarm is recorded in the alarm log, and all Ethernet frames being looped back from the TDM uplink are blocked, and prevented from being sent back to the user's LAN. This mechanism prevents the occurrence of undesired broadcast storms and IP loops in the user's LAN due to a loop on the TDM network.	**Enable** **Disable** Default: **Disable**

Configuring the Time Slot Table

➤ **To configure the Time Slot Table:**

- From the Main Menu, select **Configuration > Physical Ports > E1/T1 Uplink > Time Slot Table**.

```
Time Slot Table

      1     2     3     4     5     6     7     8     9    10    11    12
     Yes   Yes   No    No    No    No    No    No    No    No    No    No

     13    14    15    16    17    18    19    20    21    22    23    24
     No    No    No    No    No    No    No    No    No    No    No    No

     25    26    27    28    29    30    31
     No    No    No    No    No    No    No

 1. No
 2. Yes
```

Figure 4-13. Time Slot Table

Table 4-13. Time Slot Table Parameters

Parameter	Description	Possible Values/ Reference
TS# 1..31	Connection state of E1/T1 Uplink timeslots ***Note:*** *The number of timeslots varies according to E1/T1.*	Yes No Default: No

Configuring Analog Ports

➤ To configure analog ports:

- From the Main Menu, select Configuration > Physical Ports > Analog.

```
Analog

 1. Timeouts>
 2. Ringer Profiles>
 3. Gains>
```

Figure 4-14. Analog Menu

Table 4-14. Analog Parameters

Parameter	Description	Possible Values/ Reference
Timeouts	Opens the Timeouts menu	See *Figure 4-15*
Ringer Profiles	Opens the Ringer Profiles menu	See *Figure 4-16*
Gains	Opens the Gains menu	See *Figure 4-17*

Configuring Ring Timeouts

➤ To configure ring timeouts:

- From the Main Menu, select **Configuration > Physical Ports > Analog > Timeouts**.

```
Timeouts

 1. Ring Timeout (sec)[60 - 600]... (120)
 2. On Hook Duration in Flash (mSec)[10 - 2000]... (700)
```

Figure 4-15. Timeouts Menu

Table 4-15. Timeouts Parameters

Parameter	Description	Possible Values/ Reference
Ring Timeout (sec)	Amount of time the phone rings when unanswered	**60..600** Default: **120**
On Hook Duration in Flash (msec)	Maximum number of on-hook milliseconds considered to be "Flash"	**10..2000** Default: **700**

Configuring Ringer Profiles

The ringer profile determines the length of the ring tone. Use this menu to configure the ring tone to match the standard ring tone at the location. To define a ringer profile, set the first two, or all four, parameters (specify **0** to **50**, in units of 100 msec).

➤ To configure ringer profiles:

- From the Main Menu, select **Configuration > Physical Ports > Analog > Ringer Profiles**.

```
Ringer Profiles

 1. Profile Number>  (Profile #1)
 2. Period #1: Ring (100 mSec)[1 - 50]... (10)
 3. Period #1: Silence (100 mSec)[1 - 50]... (30)
 4. Period #2: Ring (100 mSec)[0 - 50]... (0)
 5. Period #2: Silence (100 mSec)[0 - 50]... (0)
```

Figure 4-16. Ringer Profiles Menu

Table 4-16. Ringer Profiles Parameters

Parameter	Description	Possible Values/ Reference
Profile Number	Selected profile to display/configure	**Profile #1** **Profile #2** Default: **Profile #1**
Period #1: Ring (100 msec)	Duration of the ring tone; when using a double ring tone, this is the duration of the first half of the ring tone	**1..50** Default: **10**
Period #1: Silence (100 msec)	Length of the silence period after the first ring tone; for locations that have only a single ring tone, this is the period of silence between rings; for locations that have a double ring tone, this is the period of silence between the two ring tones	**1..50** Default: **30**
Period #2: Ring (100 msec)	Duration of the second ring tone	**0..50** Default: **0**
Period #2: Silence (100 msec)	Length of the silence between each set of double ring tones	**0..50** Default: **0**

Note

Profile #2 is only used when the Ring II signaling bits received from the network are different than the Off Hook and Ring I bits. For more information, see Configuring a Bundle's Signaling Bits on page 4-30.

Configuring Gains

➤ To configure the Gains:

- From the Main Menu, select **Configuration > Physical Ports > Analog > Gains**.

```
Gains

 1. Channel Number[1 - 30]... (1)
 2. Tx Gain (db)>  (0)
 3. Rx Gain (db)>  (0)
```

Figure 4-17. Gains Menu

Table 4-17. Gains Parameters

Parameter	Description	Possible Values/ Reference
Channel Number	Selected channel to configure	**1..30** Default: **1**
Tx Gain (db)	Gain level from PBX or handset towards the Vmux-210 analog port; Vmux-210 automatically adjusts according to this gain level (for example, if the PBX amplifies by 4 dB, set the Tx Gain to +4 dB, and Vmux-210 will reduce the input signal level by 4 dB)	**–4 .. +5** Default: **0**
Rx Gain (db)	Gain level applied by the Vmux-210 towards the PBX or handset	**–10 .. +5** Default: **-4**

Configuring Bundles

Voice timeslots are grouped together into bundles. Vmux-210 supports 12 bundles, with a maximum of 30 timeslots per bundle. Before configuring bundles, you must add at least one bundle.

➤ **To display/configure Bundles:**

- From the Main Menu, select **Configuration > Bundles**.

```
Bundles

 1. Display[]
 2. Configure >
 3. Channel Distribution >
```

Figure 4-18. Bundles Menu

Table 4-18. Bundles Parameters

Parameter	Description	Possible Values/ Reference
Display	Displays all configured bundles	See *Figure 4-19*
Configure	Opens the Bundle Configuration menu	See *Figure 4-20*
Channel Distribution	Opens the Ports Distribution menu	See *Figure 4-32*

Displaying all Bundles

➤ To display all bundles:

- From the Main Menu, select **Configuration > Bundles > Display**.

```
Display Bundles

    Bundle#     State        Name       Dest IP       Dest Bundle
    Bundle 1    Connect                 172.17.172.191     1
    Bundle 2    Not Exist               0.0.0.0            1
    Bundle 3    Not Exist               0.0.0.0            1
    Bundle 4    Not Exist               0.0.0.0            1
    Bundle 5    Not Exist               0.0.0.0            1
    Bundle 6    Not Exist               0.0.0.0            1
    Bundle 7    Not Exist               0.0.0.0            1
    Bundle 8    Not Exist               0.0.0.0            1
```

Figure 4-19. Display Bundles

Table 4-19. Display Bundles Parameters

Parameter	Description	Possible Values/ Reference
Bundle #	Index number of the bundle	**1..12**
State	Current administrative status of the bundle	
Name	User-defined name for the bundle	
Dest IP	Destination IP address of the bundle	
Dest Bundle	Index number of the destination bundle	**1..30**

Adding, Editing and Deleting Bundles

➤ To add, modify, or delete a bundle:

- From the Main Menu, select **Configuration > Bundles > Configure**.

```
Bundle Configuration

 1. Add Bundle[1 - 12]... (1)
 2. Delete Bundle[1 - 12]... (1)
 3. Edit Bundle>
```

Figure 4-20. Bundle Configuration Menu

Table 4-20. Bundle Configuration Parameters

Parameter	Description	Possible Values/ Reference
Add Bundle	Adds a bundle. ***Note:*** *To configure the bundle, see Editing a Bundle on page 4-21.*	
Delete Bundle	Deletes an existing bundle	**1..12**
Edit Bundle	Opens the Edit Bundle menu	See *Figure 4-21*

Adding a Bundle

➤ To add a bundle:

1. From the Main Menu, select **Configuration > Bundles > Configure > Add Bundle**.
2. Type the number of the bundle you want to add, and then press **<Enter>**.

Editing a Bundle

➤ To modify a bundle:

- From the Main Menu, select **Configuration > Bundles > Configure > Edit Bundle**.

```
Edit Bundle

 1. Bundle Number[1 - 12]... (1)
 2. Connect>   (Yes)
 3. Function>   (TDMoIP)
 4. Routing Parameters>
 5. Max Bytes In Multiplexed Frame[100 - 1461]... (500)
 6. Packetizing Interval (msec)[10 - 90]... (30)
 7. Packet Redundancy[1 –4]…(1)
 8. Connectivity Parameters>
 9. Voice Parameters>
10. Signaling Parameters>
11. Bundle Name... ()
12. CAS Redundancy
```

Figure 4-21. Edit Bundle Menu

Table 4-21. Edit Bundle Parameters

Parameter	Description	Possible Values/ Reference
Bundle Number	Number of the bundle to be modified	1..12
Connect	Administrative status of the bundle	Yes No
Function	Bundle multiplexing mode	TDMoIP AAL2oMPLS
Routing Parameters	Opens the Routing Parameters menu	See *Figure 4-22*
Max Bytes In Multiplexed Frame	Maximum number of bytes per bundle frame	100..1461 Default: 500
Packetizing Interval (msec)	Maximum number of milliseconds be*4*een bundle frames	10..90 Default: 30
Packet Redundancy	Number of times each voice frame is transmitted (for improved voice quality and signaling integrity in networks with high packet loss rates) ***Note:*** *Redundant packets are not sent when the Main Link is defined as E1/T1/Serial.*	1..*4* Default: 1

Table 4-21. Edit Bundle Parameters (Cont.)

Parameter	Description	Possible Values/ Reference
Connectivity Parameters	Opens the Connectivity Parameters menu	See *Figure 4-25*
Voice Parameters	Opens the Voice Parameters menu	See *Figure 4-26*
Signaling Parameters	Opens the Signaling Parameters menu	See *Figure 4-30*
Bundle Name	User-defined name of the bundle	
CAS Redundancy	Determine whether or not to duplicate CAS packets for the TS assigned to the bundle	**Disable** **Enable** Default: Disable

Configuring a Bundle's Routing Parameters

➤ **To configure a bundle's routing parameters:**

- From the Main Menu, select **Configuration › Bundles › Configure › Edit Bundle › Routing Parameters**.

```
Routing Parameters

 1. Destination IP... (172.17.172.193)
 2. Destination Bundle[1 - 8063]... (1)
 3. TOS Parameters ... (0)
 4. VLAN Parameters>
```

Figure 4-22. Routing Parameters Menu

Table 4-22. Routing Parameters

Parameter	Description	Possible Values/ Reference
Destination IP	Destination IP address of the bundle	Default: **0.0.0.0**
Destination Bundle	Index number of the destination bundle	**1..8063**
TOS Parameters	Opens the TOS parameters menu	See *Figure 4-23*
VLAN Parameters	Opens the VLAN parameters menu	See *Figure 4-24*

Configuring a Bundle's TOS Parameters

➤ **To configure a Bundle's TOS Parameters:**

- From the Main Menu, select **Configuration › Bundles › Configure › Edit Bundle › Routing Parameters › TOS Parameters**.

```
TOS Parameters

 1. Signaling TOS >
 2. Media TOS >
```

Figure 4-23. TOS Parameters Menu

Table 4-23. TOS Parameters

Parameter	Description	Possible Values/ Reference
Signaling TOS	The hexadecimal byte to be inserted to the Signaling TOS field of all the frames of this bundle – all non-media frames will be set with Signaling TOS ***Note**: the two least significant bits must be 00*	0x00...0xFC Default: 0x00
Media TOS	The hexadecimal byte to be inserted to the Media TOS field of all the frames of this bundle – all multiplexed frames that contain at least one media packet will be set with Media TOS ***Note**: the two least significant bits must be 00*	0x00...0xFC Default: 0x00

Configuring a Bundle's VLAN Parameters

➤ To configure a bundle's VLAN parameters:

- From the Main Menu, select Configuration › Bundles › Configure › Edit Bundle › Routing Parameters › VLAN Parameters.

```
VLAN Parameters

 1. VLAN Tagging >   (Yes)
 2. VLAN ID [26 - 4094]... (26)
 3. Priority Tag [0 - 7]... (0)
```

Figure 4-24. VLAN Parameters Menu

Table 4-24. VLAN Parameters

Parameter	Description	Possible Values/ Reference
VLAN Tagging	Whether all frames of this bundle should contain a VLAN tag	**Yes** **No** Default: **No**
VLAN ID	VLAN ID number in the tag added to frames of this bundle ***Note:*** *This parameter is available only when VLAN Tagging is set to Yes.*	**26..4094** Default: **26**
Priority Tag	VLAN priority in the tag added to frames of this bundle ***Note:*** *This parameter is available only when VLAN Tagging is set to Yes.*	**0..7** Default: **0**

Configuring a Bundle's Connectivity Parameters

➤ To configure a bundle's connectivity parameters:

- From the Main Menu, select **Configuration › Bundles › Configure › Edit Bundle › Connectivity Parameters**.

```
Connectivity Parameters

 1. Connectivity Mode>   (With Ping)
 2. Connectivity Packet Rate (sec)[1 - 60]... (5)
 3. Connectivity Timeout Cycles[1 - 5]... (2)
```

Figure 4-25. Connectivity Parameters Menu

Table 4-25. Connectivity Parameters

Parameter	Description	Possible Values/ Reference
Connectivity Mode	Method of determining a bundle's connectivity state	**With Ping** **Without Ping** Default: **With Ping**
Connectivity Packet Rate (sec)	Rate of connectivity packets for this bundle	**1..60** Default: **60**
Connectivity Timeout Cycles	Number of times the Vmux-210 tries to transmit connectivity frames for this bundle before timing out	**1..5** Default: **3**

Note

The Vmux at the remote end of this bundle must use the same connectivity mode.

Configuring a Bundle's Voice Parameters

➤ To configure a bundle's voice parameters:

- From the Main Menu, select **Configuration › Bundles › Configure › Edit Bundle › Voice Parameters**.

```
Voice Parameters

 1. Coder/Rate (kbps)>   (G.723.1/6.4)
 2. Caller ID Type
 3. Caller ID Tx Delay (msec) [0 – 3000] … (400)
 4. Volume (To Line)     >  (0 db)
 5. Volume (From Line) >  (0 db)
 6. Fax/Modem>
 7. VAD>
 8. CNG Mode>    (On)
 9. Echo Canceller>   (Enable)
10. Advanced voice Parameters>
```

Figure 4-26. Voice Parameters Menu

Table 4-26. Voice Parameters

Parameter	Description	Possible Values/ Reference
Coder/Rate (kbps)	Type of coder used by the DSP (Digital Signal Processor) for this bundle ***Note:*** *The value of this parameter must be the same for all bundles.*	**G.723.1/6.4** **G.723.1/5.3** **G.729A/8** **G.711 A-law** **G.711 U-law** Default: **G.723.1/6.4**
Caller ID Type	Type of Caller ID type used by DSP for this bundle ***Note****: this parameter is available only when Coder/Rate = G.729A/8*	**Bellcore type 1** **V.23** Default: **Bellcore type 1**

Table 4-26. Voice Parameters (Cont.)

Parameter	Description	Possible Values/ Reference
Caller ID Tx Delay (msec)	Time delay before transmitting caller ID for this bundle ***Note:*** *This parameter is available only when Coder/Rate is defined as G.729A/8.*	**0..3000** Default: **400**
Volume (To Line)	The volume gain transmitted to the DSP (from network towards the PBX). ***Note:*** *This parameter is available only for E1/T1 device*	**-6 dB..6 dB in steps of 1 dB** Default: **0 dB**
Volume (From Line)	The volume gain transmitted from the DSP (from the PBX towards the network) ***Note:*** *This parameter is available only for E1/T1 device*	**-6 dB..6 dB in steps of 1 dB and 12 dB** Default: **0 dB**
VAD	Opens the VAD menu	See *Figure 4-28*
CNG Mode	Determines Comfort Noise Generation for this bundle	**Off** **On** Default: **On**
Echo Canceller	Enables echo cancellation for the bundle	**Enable** **Disable** Default: **Enable**
Advanced Voice parameters	Opens the Advanced Voice parameters menu	See *Figure 4-29*

Configuring a Bundle's Fax/Modem Parameters

➤ **To configure a bundle's fax/modem parameters:**

- From the Main Menu, select **Configuration** > **Bundles** > **Configure** > **Edit Bundle** > **Voice Parameters** > **Fax/Modem**.

```
Fax/Modem

 1. Modem>    (Relay)
 2. VBD Rate  > (G711 64k 5 msec)
 3. Fax    (Enable)
 4. Fax Rate (kbps)>   (14.4)
 5. Max VBD Modem Calls
 6. Max Relay Modem Calls
```

Figure 4-27. Fax/Modem Menu

Table 4-27. Fax/Modem Parameters

Parameter	Description	Possible Values/ Reference
Modem	Type of modem transport for this bundle **VBD Modem** – transparent transport (requires 80 kbps per active modem call) **Modem Relay** – termination of modem protocol and regeneration at remote Vmux ***Note 1:*** *This parameter is available except when coder is LBRAD/2.66, G726 32k & G726 24k are disabled.* ***Note 2:*** *Modem cannot be in Relay mode when the chosen coder is LBRAD.*	**Disable** **Voice Band Data** **Relay** Default: **Relay**
VBD Rate	Transmitting rate in case of VBD ***Note:*** *This parameter is available except when coder is LBRAD/2.66, G726 32k & G726 24k are disabled.*	**G711 64k 5 msec** **G711 64k 10 msec** **G726 32k** **G726 24k** Default: **G711 64k 5 msec**
Fax	Enables fax relay for this bundle	**Enable** **Disable** Default: **Enable**
Fax Rate (kbps)	Rate of fax transmission for this bundle **VBD Fax** – transparent transport of fax (requires 280 kbps per active fax session) ***Note:*** *This parameter is available only when Fax is set to Enable.*	**4.8** **9.6** **14.4** **VBD Fax** Default: **14.4**
Max VBD Modem Calls	Maximum VBD modem calls for this bundle ***Note****: this parameter is available only when modem relay is selected.*	**No. of Channels** Default: **Max**
Max Relay Modem Calls	Maximum Relay modem calls for this bundle ***Note****: this parameter is available only when modem relay is selected.*	**No. of Channels** Default: **Max**

Configuring VAD (Voice Activity Detection)

➤ To configure VAD:

- From the Main Menu, select **Configuration > Bundles > Configure > Edit Bundle > Voice Parameters > VAD**.

```
VAD

 1. VAD Method           (Generic)
 2. Noise Level For VAD> (low)
```

Figure 4-28. VAD Menu

Table 4-28. VAD Parameters

Parameter	Description	Possible Values/ Reference
VAD Method	Generic/Internal VAD – Determine which of the VAD algorithms will be operated	**Generic** **Internal** Default: **Generic**
Noise Level for VAD	Determines sensitivity of VAD to noise ***Note:*** *This parameter is available only when Generic VAD is selected.*	**Low** **High** Default: **Low**

Configuring Advanced Voice Parameters

➤ To configure Advanced Voice Parameters:

- From the Main Menu, select **Configuration > Bundles > Configure > Edit Bundle > Voice Parameters > Advanced Voice Parameters**.

```
Advanced Voice Parameters

 1. DTMF Detection
 2. NLP Cutoff Level
 3. DTD ERL Cutoff Level
```

Figure 4-29. Advanced Voice Parameters Menu

Table 4-29. Advanced Voice Parameters

Parameter	Description	Possible Values/ Reference
DTMF Detection	Enable/Disable DTMF detectors for this bundle	**Enable** **Disable** Default: **Enable**
NLP Cutoff Level	Non Linear Processor Cutoff Level for this bundle	**0..1023** Default: **512**
DTD ERL Cutoff Level	Double Talk Detection ERL Cutoff for this bundle	**0..96** Default: **15**

Configuring a Bundle's Signaling Parameters

➤ To configure a bundle's signaling parameters:

- From the Main Menu, select **Configuration > Bundles > Configure > Edit Bundle > Signaling Parameters**.

```
Signaling Parameters

 1. Signaling Bits[]
 2. Ringback> (Enable)
 3. Reverse Polarity> (Disable)
 4. Pulse Metering> (Enable)
 5. Pulse Metering Frequency (khz)> (16)
 6. Pulse Metering Duration (ms) [100 – 250]  … (150)
```

Figure 4-30. Signaling Parameters Menu

Table 4-30. Signaling Parameters

Parameter	Description	Possible Values/ Reference
Signaling Bits	Opens the Signaling Bits screen	See *Figure 4-31*
Ringback	Enables remote ringback for this bundle	**Enable** **Disable** Default: **Enable**
Reverse Polarity	Enables reverse polarity synthesis for this bundle ***Note:*** *Sanity check does not allow polarity and metering on the same bundle.*	**Enable** **Disable** Default: **Disable**
Pulse Metering	Enables pulse metering synthesis for this bundle ***Note:*** *Sanity check does not allow polarity and metering on the same bundle.*	**Enable** **Disable** Default: **Disable**
Pulse Metering Frequency (kHz)	Frequency of synthesized pulse metering for this bundle ***Note:*** *This parameter is available only when Pulse Metering is enabled.*	**12** **16** Default: **16**
Pulse Metering Duration (ms)	Duration of synthesized pulse metering for this bundle ***Note:*** *This parameter is available only when Pulse Metering is enabled.*	**100..250** Default: **150**

Note

When working opposite Vmux-110/FXO, Ringback should be disabled to allow passing of CLID.

Configuring a Bundle's Signaling Bits

Use the Signaling Bits screen to configure the ABCD bits that represent On Hook, Off Hook, Ring I, Ring II, Reverse Polarity and Pulse Metering.

On Hook and **Off Hook** – these ABCD bits determine (1) how to interpret the On Hook/Off Hook signals coming from the network, and (2) which ABCD bits are sent to the network upon detection of an On Hook/Off Hook physical indication from the analog line. For example, when the On Hook bits are defined as 0101 and the incoming ABCD bits are 0101, this means the remote side is On Hook. When the Off Hook bits are defined as 1101 and the user connected to the Vmux-210's local analog line takes the phone off the hook, Vmux-210 sends the ABCD bits 1101 toward the remote Vmux.

Ring I, **Ring II**, **Reverse Polarity** and **Pulse Metering** – these ABCD bits determine which ABCD bit combinations coming from the network (that is, from the remote Vmux) should trigger the generation of these analog signals towards the analog device connected locally to the Vmux-210's analog port.

Notes

- *When working opposite a PBX that sends a different indication for OFF-HOOK and Ring, the RING1 bits should be configured according to the PBX Ring bits.*
- *RING2 should be used when the PBX can identify a different ringer profile to be used by sending different ABCD bits.*

➤ **To configure a bundle's signaling bits:**

1. From the Main Menu, select **Configuration** › **Bundles** › **Configure** › **Edit Bundle** › **Signaling Parameters** › **Signaling Bits**.

   The Signaling Bits screen appears (see *Figure 4-31*).

2. Press **<Tab>** to select the value to be changed, and then select the appropriate menu option below to make the desired setting.

Signaling Bits

	A Bit	B Bit	C Bit	D Bit
On Hook	0	1	0	1
Off Hook	1	1	0	1
Ring I	1	1	0	1
Ring II	1	1	0	1
Reverse Polarity	1	0	0	1
Pulse Metering	1	1	1	1

Figure 4-31. Signaling Bits Screen

Table 4-31. Signaling Bits Parameters

Parameter	Description	Possible Values/ Reference
On Hook	On Hook signaling event ***Note:*** *Cannot be the same value as Off Hook.*	**0** **1** (each bit)
Off Hook	Off Hook signaling event ***Note:*** *Cannot be the same value as On Hook.*	**0** **1** (each bit)
Ring I	Ring I signaling event	**0** **1** (each bit)
Ring II	Ring II signaling event	**0** **1** (each bit)
Reverse Polarity	Reverse Polarity signaling event	**0** **1** (each bit)
Pulse Metering	Pulse Metering signaling event	**0** **1** (each bit)

Deleting a Bundle

➤ **To delete a bundle:**

1. From the Main Menu, select **Configuration** › **Bundles** › **Configure** › **Delete Bundle**.
2. Type the number of the bundle you want to delete, and then press **<Enter>**.

Configuring a Bundle's Channel Distribution

➤ **To display/configure channel distribution:**

- From the Main Menu, select **Configuration** › **Bundles** › **Channel Distribution**.

```
Channel Distribution

 1. Display[]
 2. Configure >
```

Figure 4-32. Channel Distribution Menu

Table 4-32. Channel Distribution Parameters

Parameter	Description	Possible Values/ Reference
Display	Displays the Channel Distribution	See *Figure 4-33*
Configure	Opens the Configure Channels menu	See *Figure 4-34*

Displaying Channel Distribution

➤ To display channel distribution:

- From the Main Menu, select **Configuration > Bundles > Channel Distribution > Display**.

```
Display Channel Distribution

   Ch #    Type     Bundle       Dest Port       Dest Ts
    1      Voice      1             1              1
    2      Voice      1             1              2
    3      Voice      1             1              3
    4      Voice      1             1              4
    5      Voice      1             1              5
    6      Voice      1             1              6
    7      Voice      1             1              7
    8      Voice      1             1              8
```

Figure 4-33. Display Channel Distribution

Table 4-33. Display Ports Distribution

Parameter	Description	Possible Values/ Reference
Ch #	Index number of the port	1..30
Type	Service type of this timeslot range	N.C. Voice
Bundle	Port on the remote device to which these timeslots are destined	1..12
Dest Port	Port on the remote device to which these timeslots are destined ***Note:*** *The Dest Port must be defined as 1 when the remote device is not a Vmux-2100.*	1..4
Dest TS	Timeslot on the remote device to which these timeslots are destined	1..31

Configuring Channel Distribution (Timeslots)

➤ To configure ports distribution:

- From the Main Menu, select **Configuration > Bundles > Channel Distribution > Configure**.

```
Configure Channel Distribution

 1. Update from Channel [1 - 30]... (1)
 2. To Channel [1 - 30]... (1)
 3. Type >   (N.C)
 4. Bundle[1 - 12]... (1)
 5. Destination Port ID[1 - 4]... (1)
 6. Destination Time Slot ID[1 - 31]... (1)
 7. Update Time Slot
```

Figure 4-34. Configure Channel Distribution Menu

Table 4-34. Configure Channel Distribution Parameters

Parameter	Description	Possible Values/ Reference
Update from Channel	Start of timeslot range to configure	**1..30**
To Channel	End of timeslot range to configure	**1..30**
Type	Service type of this timeslot range	**N.C.** **Voice** Default: **Voice**
Bundle	Bundle to which these timeslots are associated	**1..12** Default: **1**
Destination Port ID	Port on the remote device to which these timeslots are destined ***Note:*** *The Dest Port must be defined as 1 when the remote device is not a Vmux-2100.*	**1..4** Default: **1**
Destination Time Slot ID	Timeslot on the remote device to which these timeslots are destined	**1..31** Default: **1**
Update Time Slot	Applies the changes	

Configuring the Bridge

Note *The Bridge menu is only available when:*

- *Router is disabled*

  Or

- *The Main Link is not defined as Ethernet* ***and*** *Ethernet Net/User Connection is defined as Layer 2 Switching.*

➤ To configure Bridge parameters:

- From the Main Menu, select Configuration > Applications> Bridge.

```
Bridge

 1. Bridge Port>
 2. VLAN Membership>
```

Figure 4-35. Bridge Menu

➤ To configure Bridge port parameters:

- From the Main Menu, select Configuration > Applications> Bridge > Bridge Port.

```
Bridge Port

 1. Bridge Port> (Network)
 2. Ingress Filtering> (Disable)
 3. Port VID [1 - 4094] … (1)
 4. Default Priority Tag [0 – 7] ... (0)
 5. Egress Tag Handling> (None)
 6. Ingress Tag Handling> (None)
```

Figure 4-36. Bridge Port Menu

Table 4-35. Bridge Port Parameters

Parameter	Description	Possible Values/ Reference
Bridge Port	Bridge port to configure ***Note:*** *Internal port is not available when Router is enabled.*	**Network** **User** **Internal** Default: **Network**
Ingress Filtering	Enables the filtering of frames with unknown VLAN IDs ***Note:*** *Modifying this parameter may disconnect NMS.*	**Enable** **Disable** Default: **Disable**
Port VID	Default VLAN ID attached to frames entering from this bridge port ***Note:*** *Modifying this parameter may disconnect NMS.*	**1..4094** Default: **1**
Default Priority Tag	Default priority level attached to frames entering from this bridge port	**0..7** Default: **0**
Egress Tag Handling	Determines whether or not to always add a VLAN tag on egress, even when one already exists ***Note:*** *Modifying this parameter may disconnect the NMS.*	**None** **Stacking** Default: **None**
Ingress Tag Handling	Determines whether or not to always remove a VLAN tag on ingress	**None** **Stripping** Default: **None**

Configuring VLAN

➤ To display/configure VLAN membership:

- From the Main Menu, select **Configuration > Applications> Bridge > VLAN Membership**.

```
VLAN Membership

 1. Display Table[]
 2. Add/Edit VLAN>
 3. Delete VLAN [1 - 4094]... (1)
```

Figure 4-37. VLAN Membership Menu

Table 4-36. VLAN Membership Parameters

Parameter	Description	Possible Values/ Reference
Display Table	Displays the VLAN Table	See *Figure 4-38*
Add/Edit VLAN	Opens the Add/Edit VLAN menu	See *Figure 4-39*
Delete VLAN	Deletes a VLAN	

Displaying the VLAN Table

➤ To display the VLAN table:

- From the Main Menu, select Configuration > Applications> Bridge > VLAN Membership > Display Table.

```
Display Table

    VLAN ID     Network Port       User Port     Internal Port
         4      Transparent        Untagged      Tagged
         38     Transparent        Untagged      Tagged
```

Figure 4-38. Display VLAN Table

Adding and Editing a VLAN

➤ To add or modify a VLAN:

- From the Main Menu, select Configuration > Applications> Bridge > VLAN Membership > Add/Edit VLAN.

```
Add/Edit VLAN

 1. VLAN ID [1 - 4094]... (4)
 2. Network Port>   (Tagged)
 3. User Port>         (Untagged)
 4. Internal Port >   (Transparent)
```

Figure 4-39. Add/Edit VLAN Menu

Table 4-37. Add/Edit VLAN Parameters

Parameter	Description	Possible Values/ Reference
VLAN ID	ID of the VLAN being added or modified	**1..4094** Default: **1**
Network Port	Network port egress policy for frames with this VLAN ID ***Note:*** *Modifying this parameter may disconnect NMS.*	**Transparent** **Forbidden** **Tagged** **Untagged** Default: **Transparent**
User Port	User port egress policy for frames with this VLAN ID ***Note:*** *Modifying this parameter may disconnect NMS.*	**Transparent** **Forbidden** **Tagged** **Untagged** Default: **Transparent**
Internal Port	Internal port egress policy for frames with this VLAN ID ***Note:*** *Modifying this parameter may disconnect NMS.*	**Transparent** **Forbidden** **Tagged** **Untagged** Default: **Transparent**

Deleting a VLAN

➤ **To delete a VLAN:**

1. From the Main Menu, select **Configuration** › **Applications** › **Bridge** › **VLAN Membership** › **Delete VLAN**.
2. Type the number of the VLAN you want to delete, and then press **<Enter>**.

Configuring the Router

Note *The Router menu is only available when Router is enabled.*

➤ To configure the Router:

- From the Main Menu, select **Configuration > Applications > Router**.

```
Router

 1. Interfaces>
 2. Static Routing>
 3. Default Gateway>
 4. DHCP Server>
 5. NAT>
 6. Firewall Global Parameters>
```

Figure 4-40. Router Menu

Table 4-38. Router Parameters

Parameter	Description	Possible Values/ Reference
Interfaces	Opens the Interfaces menu	See *Figure 4-41*
Static Routing	Opens the Static Routing menu	See *Figure 4-48*
Default Gateway	Opens the Default Gateway menu	See *Figure 4-51*
DHCP Server	Opens the DHCP Server menu	See *Figure 4-52*
NAT	Opens the NAT menu	See *Figure 4-54*
Firewall Global Parameters	Opens the Firewall Global Parameters menu	See *Figure 4-60*

Configuring Router Interfaces

➤ To configure Router interfaces:

- From the Main Menu, select **Configuration > Applications > Router > Interfaces**.

```
Interfaces

 1. Uplink Port Configuration>
 2. Net Port Configuration>
 3. User Port Configuration>
```

Figure 4-41. Interfaces Menu

Table 4-39. Interfaces Parameters

Parameter	Description	Possible Values/ Reference
Uplink Port Configuration	Opens the Uplink Port Configuration menu ***Note:*** *The Uplink Port Configuration menu is available only when the Main Link is not defined as Ethernet.*	See *Figure 4-42*
Net Port Configuration	Opens the Net Port Configuration menu	See *Figure 4-43*
User Port Configuration	Opens the User Port Configuration menu ***Note:*** *The User Port Configuration menu is not available when the Main Link is not defined as Ethernet* ***and*** *the Ethernet Net/User Connection is defined as Layer 3 Routing.*	See *Figure 4-44*

Configuring the Router Uplink Port

Note *The Uplink Port Configuration menu only appears when Main Link is not defined as Ethernet.*

➤ To configure the Router uplink port:

- From the Main Menu, select **Configuration › Applications › Router › Interfaces › Uplink Port Configuration**.

```
Uplink Port Configuration

 1. IP... (172.17.172.191)
 2. Mask... (255.255.255.0)
 3. ARP Table Aging Time (minutes) [1 – 99] … (5)
 4. RIP>
 5. Firewall>
 6. DHCP Relay    (Enable)
 7. Relay to DHCP Server IP... (0.0.0.0)
```

Figure 4-42. Uplink Port Menu

Table 4-40. Uplink Port Parameters

Parameter	Description	Possible Values/ Reference
IP	IP Address of the Router uplink port ***Note:*** *Modifying this parameter may disconnect NMS.*	Default: **0.0.0.0**
Mask	Subnet mask of the Router uplink port	Default: **0.0.0.0**
ARP Table Aging Time (minutes)	The aging time for the ARP table of the Router uplink port	**1..99** Default: **5**
RIP	Opens the RIP menu	See *Figure 4-45*
Firewall	Opens the Firewall menu	See *Figure 4-45*
DHCP Relay	Whether or not the Router uplink port acts as a DHCP proxy ***Note:*** *This parameter is not available when DHCP server is enabled on the Router.*	**Enable** **Disable** Default: **Disable**
Relay to DHCP Server IP	IP address of the DHCP server to which requests are relayed ***Note:*** *This parameter is available only when DHCP Relay is enabled.*	Default: **0.0.0.0**

Configuring the Router Network Port

➤ To configure the Router network port:

- From the Main Menu, select **Configuration > Applications > Router > Interfaces > Network Port Configuration**.

```
Network Port Configuration

 1. IP... (172.17.172.191)
 2. Mask... (255.255.255.0)
 3. DHCP Client   (Disable)
 4. ARP Table Aging Time (minutes) [1 – 99] … (5)
 5. RIP>
 6. Firewall>
 7. DHCP Relay    (Enable)
 8. Relay to DHCP Server IP... (0.0.0.0)
```

Figure 4-43. Network Port Menu

Table 4-41. Network Port Parameters

Parameter	Description	Possible Values/ Reference
IP	IP Address of the Router network port ***Note:*** *Modifying this parameter may disconnect NMS.*	Default: **0.0.0.0**
Mask	Subnet mask of the Router network port	Default: **0.0.0.0**
DHCP Client	Enables the Router network port to act as a DHCP Client ***Note:*** *This parameter is available only when the Main Link is defined as Ethernet.*	**Enable** **Disable** Default: **Disable**
ARP Table Aging Time (minutes)	The aging time for the ARP table of the Router network port	**1..99** Default: **5**
RIP	Opens the RIP menu	See *Figure 4-45*
Firewall	Opens the Firewall menu	See *Figure 4-46*
DHCP Relay	Whether or not the Router network port acts as a DHCP proxy ***Note:*** *This parameter is not available when DHCP server is enabled on the Router.*	**Enable** **Disable** Default: **Disable**
Relay to DHCP Server IP	IP address of the DHCP server to which requests are relayed ***Note:*** *This parameter is available only when DHCP Relay is enabled.*	Default: **0.0.0.0**

Configuring the Router User Port

Note *The User Port Configuration menu is not available when the Main Link is not defined as Ethernet **and** the Ethernet Net/User Connection is defined as Layer 3 Routing.*

➤ **To configure the Router user port:**

- From the Main Menu, select **Configuration › Applications › Router › Interfaces › User Port Configuration**.

```
User Port Configuration

 1. IP... (172.17.172.191)
 2. Mask... (255.255.255.0)
 3. ARP Table Aging Time (minutes) [1 – 99] … (5)
 4. RIP>
 5. Firewall>
 6. DHCP Relay    (Enable)
 7. Relay to DHCP Server IP... (0.0.0.0)
```

Figure 4-44. User Port Menu

Table 4-42. User Port Parameters

Parameter	Description	Possible Values/ Reference
IP	IP Address of the Router user port ***Note:*** *Modifying this parameter may disconnect NMS.*	Default: **0.0.0.0**
Mask	Subnet mask of the Router user port	Default: **0.0.0.0**
ARP Table Aging Time (minutes)	The aging time for the ARP table of the Router user port	**1..99** Default: **5**
RIP	Opens the RIP menu	See *Figure 4-45*
Firewall	Opens the Firewall menu	See *Figure 4-46*
DHCP Relay	Whether or not the Router user port acts as a DHCP proxy ***Note:*** *This parameter is not available when DHCP server is enabled on the Router.*	**Enable** **Disable** Default: **Disable**
Relay to DHCP Server IP	IP address of the DHCP server to which requests are relayed ***Note:*** *This parameter is available only when DHCP Relay is enabled.*	Default: **0.0.0.0**

Configuring RIP Parameters

➤ To configure RIP parameters:

- From the Main Menu, select one of the following:
  - **Configuration > Applications > Router > Interfaces > Uplink Port Configuration > RIP**
  - **Configuration > Applications > Router > Interfaces > Network Port Configuration > RIP**
  - **Configuration > Applications > Router > Interfaces > User Port Configuration > RIP**.

```
RIP

 1. RIP Status    (Enable)
 2. Send RIP type>   (None)
 3. Receive RIP type>   (None)
```

Figure 4-45. RIP Menu

Table 4-43. RIP Parameters

Parameter	Description	Possible Values/ Reference
RIP Status	Enables RIP for this router port	**Enable** **Disable** Default: **Disable**
Send RIP type	Type of RIP messages to be sent by this router port ***Note:*** *This parameter is available only when RIP is enabled.*	**None** **RIP1** **RIP2** **RIP1 & RIP2** Default: **None**
Receive RIP type	Type of RIP messages to be received by this router port ***Note:*** *This parameter is available only when RIP is enabled.*	**None** **RIP1** **RIP2** **RIP1 & RIP2** Default: **None**

Configuring the Firewall for a Router Port

This section describes configuration of the firewall for an individual Router port. For general firewall configuration, see *Setting Global Firewall Parameters* on page *4-55*.

➤ **To configure the firewall for a Router port:**

- From the Main Menu, select one of the following:
  - **Configuration > Applications > Router > Interfaces > Uplink Port Configuration> Firewall**
  - **Configuration > Applications > Router > Interfaces > Network Port Configuration> Firewall**
  - **Configuration > Applications > Router > Interfaces > User Port Configuration> Firewall.**

```
Firewall

 1. Firewall Status    (Enable)
 2. Firewall Direction    (Outbound)
 3. Active FTP    (No)
 4. Forged IP Protection    (No)
 5. Rules>
```

Figure 4-46. Firewall Menu

Table 4-44. Firewall Parameters

Parameter	Description	Possible Values/ Reference
Firewall Status	Enables the firewall for this router port	**Enable** **Disable** Default: **Disable**
Firewall Direction	Direction of firewall protection for this router port ***Note:*** *This parameter is available only when the firewall is enabled.*	**Inbound** **Outbound** Default: **Outbound**
Active FTP	Allows FTP sessions through the firewall for this router port ***Note:*** *This parameter is available only when the firewall is enabled.*	**Yes** **No** Default: **No**
Forged IP Protection	Detects and protect against forged IP frames for this router port ***Note:*** *This parameter is available only when the firewall is enabled.*	**Yes** **No** Default: **No**
Rules	Opens the Rules menu ***Note:*** *The Rules menu is available only when the firewall is enabled.*	See *Figure 4-47*

Defining Firewall Rules for Router Ports

This section discusses adding and removing firewall rules from a Router port, and displaying all rules applied to the port. For information on defining or modifying firewall rules.

➤ **To display/configure firewall rules for Router ports:**

- From the Main Menu, select one of the following:
  - **Configuration > Applications > Router > Interfaces > Uplink Port Configuration> Firewall > Rules**
  - **Configuration > Applications > Router > Interfaces > Network Port Configuration> Firewall > Rules**
  - **Configuration > Applications > Router > Interfaces > User Port Configuration> Firewall > Rules.**

```
Rules

 1. Rule Number[1 - 50]... (1)
 2. Add To Interface
 3. Delete From Interface
 4. Display Interface Active Rules[]
```

Figure 4-47. Rules Menu

Table 4-45. Rules Parameters

Parameter	Description	Possible Values/ Reference
Rule Number	Number of the rule to add to, or remove from, this router port	1..50
Add To Interface	Applies the selected rule to this router port	
Delete From Interface	Removes the selected rule from this router port	
Display Interface Active Rules	Displays all active rules for this router port	

Configuring Static Routing

➤ To display/configure Static Routing:

- From the Main Menu, select Configuration > Applications > Router > Static Routing.

```
Static Routing

 1. Add Static Route>
 2. Delete Static Route>
 3. Edit Static Route>
 4. Display Static Routing[]
```

Figure 4-48. Static Routing Menu

Table 4-46. Static Routing Parameters

Parameter	Description	Possible Values/ Reference
Add Static Route	Adds a static route ***Note:*** *To configure the static route, see Editing a Static Route on page 4-47.*	
Delete Static Route	Deletes a static route	
Edit Static Route	Opens the Edit Static Route menu	See *Figure 4-50*
Display Static Routing	Displays all static routes	See *Figure 4-49*

Displaying all Static Routes

➤ To display all static routes:

- From the Main Menu, select Configuration > Applications > Router > Static Routing > Display Static Routing.

```
Display Static Routing

 #        Net IP          Mask Next          Hop IP
 1   192.168.121.100   255.255.255.64    192.168.121.1
 2   192.168.122.0     255.255.255.0     192.168.122.1
```

Figure 4-49. Display Static Routing

Table 4-47. Display Static Routing Parameters

Parameter	Description	Possible Values/ Reference
#	Number of the static route	1..10
Net IP	Network IP address of this static route	
Mask	Subnet mask of this static route	
Next Hop Ip	Next hop IP address of this static route	

Adding a Static Route

➤ To add a static route:

1. From the Main Menu, select Configuration > Applications > Router > Static Routing > Add Static Route.
2. Type the number of the static route you want to add, and then press <Enter>.

Editing a Static Route

➤ To modify a static route:

- From the Main Menu, select Configuration > Applications > Router > Static Routing > Edit Static Route.

```
Edit Static Route

 1. Static Route Number [1 - 10]... (1)
 2. Net IP... (0.0.0.0)
 3. Mask... (0.0.0.0)
 4. Next Hop IP... (0.0.0.0)
```

Figure 4-50. Edit Static Route

Table 4-48. Edit Static Route Parameters

Parameter	Description	Possible Values/ Reference
Static Route Number	Number of the static route to be edited	1..10 Default: 1
Net IP	Network IP address of this static route	
Mask	Subnet mask of this static route	
Next Hop IP	Next hop IP address of this static route	

Deleting a Static Route

➤ To delete a static route:

1. From the Main Menu, select Configuration > Bundles > Configure > Delete Static Route.
2. Type the number of the static route you want to delete, and then press <Enter>.

Configuring the Default Gateway

➤ To configure Management parameters:

- From the Main Menu, select From the Main Menu, select **Configuration > Applications > Router > Default Gateway**.

```
Default Gateway

 1. Default Gateway    (Enable)
 2. Default Gateway IP... (172.17.172.1)
```

Figure 4-51. Default Gateway Menu

Table 4-49. Default Gateway Parameters

Parameter	Description	Possible Values/ Reference
Default Gateway	Enables the use of default gateway by the router	**Enable** **Disable** Default: **Disable**
Default Gateway IP	IP Address of the router's default gateway ***Note:*** *This parameter is available only when Default Gateway is enabled.*	Default: **0.0.0.0**

Configuring DHCP Server

➤ To configure DHCP Server:

- From the Main Menu, select **Configuration > Applications > Router > DHCP Server**.

```
DHCP Server

 1. DHCP Server    (Enable)
 2. Add Pool>
 3. Delete Pool>
 4. Edit Pool>
 5. Delete DHCP client>
 6. Delete All DHCP clients>
```

Figure 4-52. DHCP Server Menu

Table 4-50. DHCP Server Parameters

Parameter	Description	Possible Values/ Reference
DHCP Server	Enables DHCP server on router ***Note:*** *Setting this field to Enable, automatically disables DHCP relay on all ports.*	**Enable** **Disable** Default: **Disable**
Add Pool	Adds a server pool ***Note:*** *To configure the server pool, see* *Editing a DHCP Server Pool* on page *4-49.*	
Delete Pool	Deletes a DHCP server pool	
Edit Pool	Opens the Edit Pool menu	See *Figure 4-53*
Delete DHCP client	Deletes a DHCP client	
Delete All DHCP clients	Deletes all DHCP clients	

Adding a DHCP Server Pool

➤ To add a DHCP server pool:

1. From the Main Menu, select **Configuration** > **Applications** > **Router** > **DHCP Server** > **Add Pool**.
2. Type the number of the server pool you want to add, and then press **<Enter>**.

Editing a DHCP Server Pool

➤ To modify a DHCP server pool:

- From the Main Menu, select **Configuration** > **Applications** > **Router** > **DHCP Server** > **Edit Pool**.

```
Edit Pool

 1. Pool Number [1 - 5]... (1)
 2. DHCP Lowest IP... (0.0.0.2)
 3. DHCP Highest IP... (0.0.0.8)
 4. DHCP Mask... (0.0.0.0)
 5. Default Gateway... (0.0.0.0)
 6. Primary DNS... (0.0.0.0)
 7. Secondary DNS... (0.0.0.0)
 8. Lease Time (Minutes, 0 for infinite)[0 - 60000]... (0)
```

Figure 4-53. Edit Pool Menu

Table 4-51. Edit Pool Parameters

Parameter	Description	Possible Values/ Reference
Pool Number	Number of pool to be modified	**1..5** Default: **1**
DHCP Lowest IP	Lowest IP address in this pool	
DHCP Highest IP	Highest IP address in this pool	
DHCP Mask	Subnet mask for all addresses in this pool	
Default Gateway	Default gateway for all addresses in this pool	
Primary DNS	IP addresses of primary DNS server for this pool	
Secondary DNS	IP addresses of secondary DNS server for this pool	
Lease Time (Minutes, 0 for infinite)	Lease time for this pool	**0..60,000** (**0** = infinite)

Deleting a DHCP Server Pool

➤ **To delete a DHCP server pool:**

1. From the Main Menu, select **Configuration** › **Applications** › **Router** › **DHCP Server** › **Delete Pool**.
2. Type the number of the server pool you want to delete, and then press **<Enter>**.

Configuring Network Address Translation (NAT)

➤ **To Network Address Translation:**

- From the Main Menu, select **Configuration** › **Applications** › **Router** › **NAT**.

```
NAT

 1. Add NAT>
 2. Delete NAT>
 3. Edit NAT  >
```

Figure 4-54. NAT Menu

Table 4-52. NAT Parameters

Parameter	Description	Possible Values/ Reference
Add NAT	Adds a NAT ***Note:*** *To configure the NAT, see Editing a NAT* on page *4-51.*	
Delete NAT	Deletes a NAT	
Edit NAT	Open the Edit NAT menu	See *Figure 4-55*

Adding a NAT

➤ **To add a NAT:**

1. From the Main Menu, select **Configuration** > **Applications** > **Router** > **NAT** > **Add NAT**.
2. Type the number of the NAT you want to add, and then press **<Enter>**.

Editing a NAT

Note *NAT parameters vary depending on the selected NAT type: Single, Static, Dynamic or Transparent.*

➤ **To modify a NAT:**

- From the Main Menu, select **Configuration** > **Applications** > **Router** > **NAT** > **Edit NAT**.

  The Edit NAT screen appears.

  - For Single, see *Figure 4-55*
  - For Static, see *Figure 4-56*
  - For Dynamic, see *Figure 4-57*
  - For Transparent, see *Figure 4-58*

```
Edit NAT

 1. NAT Number [1 - 5]... (1)
 2. NAT Type>   (Single)
 3. Interface>   (Net Eth Port)
 4. Real IP... (132.124.12.2)
 5. Virtual Lowest IP... (192.168.122.10)
 6. Virtual Highest IP... (192.168.122.80)
 7. Static Pat Table>
```

Figure 4-55. Edit NAT Menu for Single NAT Type

```
Edit NAT

 1. NAT Number [1 - 5]... (1)
 2. NAT Type>   (Static)
 3. Interface>   (Net Eth Port)
 4. Real IP... (132.124.12.2)
 5. Virtual IP... (192.168.122.10)
```

Figure 4-56. Edit NAT Menu for Static NAT Type

```
Edit NAT

 1. NAT Number [1 - 5]... (1)
 2. NAT Type>   (Dynamic)
 3. Interface>   (Net Eth Port)
 4. Real Lowest IP... (132.124.12.2)
 5. Real Highest IP... (132.124.12.2)
 6. Virtual Lowest IP... (192.168.122.10)
 7. Virtual Highest IP... (192.168.122.80)
```

Figure 4-57. Edit NAT Menu for Dynamic NAT Type

```
Edit NAT

 1. NAT Number [1 - 5]... (1)
 2. NAT Type>   (Transparent)
 3. Interface>   (Net Eth Port)
 4. Real Lowest IP... (132.124.12.10)
 5. Real Highest IP... (132.124.12.80)
```

Figure 4-58. Edit NAT Menu for Transparent NAT Type

Table 4-53. Edit NAT Parameters for Single NAT Type

Parameter	Description	Possible Values/ Reference
NAT Number	Number of NAT to be modified	**1..5** Default: **1**
NAT Type	Type of NAT	**Single** **Static** **Dynamic** **Transparent**
Interface	Interface on which this NAT is defined ***Notes:*** • *Uplink Port is only available when uplink is not Ethernet.* • *User Port is only available when Ethernet Net/User Connection is defined as Layer 3 Routing.*	**Net Eth Port** **User Eth Port** **Uplink Port**
Real IP	Real IP address of this NAT ***Note:*** *Only available for Single and Static NAT Type.*	
Real Highest IP	Highest real IP address of this NAT ***Note:*** *Only available for Dynamic and Transparent NAT Type.*	
Real Lowest IP	Lowest real IP address of this NAT ***Note:*** *Only available for Dynamic and Transparent NAT Type.*	
Virtual IP	Virtual IP for this NAT ***Note:*** *Only available for Static NAT Type.*	
Virtual Lowest IP	Lowest virtual IP for this NAT ***Note:*** *Only available for Single and Dynamic NAT Type.*	
Virtual Highest IP	Highest virtual IP for this NAT ***Note:*** *Only available for Single and Dynamic NAT Type.*	
Static PAT Table	Opens the Static PAT Table ***Note:*** *Only available for Single NAT Type.*	See *Table 4-54*

Configuring the Static PAT Table

Use the Static PAT Table to configure translations for a specific range of ports that must remain unchanged.

➤ To configure the Static PAT Table:

- From the Main Menu, select Configuration > Applications > Router > NAT > Edit NAT > Static PAT Table.

```
Static PAT Table

        Real IP        Virt IP        Min Port     Max Port       Protocol
   1    10.10.10.15  172.17.160.23       20           20             11
   2      0.0.0.0      0.0.0.0           0            0              0
   3      0.0.0.0      0.0.0.0           0            0              0
   4      0.0.0.0      0.0.0.0           0            0              0
   5      0.0.0.0      0.0.0.0           0            0              0
   6      0.0.0.0      0.0.0.0           0            0              0
   7      0.0.0.0      0.0.0.0           0            0              0
   8      0.0.0.0      0.0.0.0           0            0              0
   9      0.0.0.0      0.0.0.0           0            0              0

1. Change cell                ... (10.10.10.15)
```

Figure 4-59. Static PAT Table

Table 4-54. Static PAT Table Parameters

Parameter	Description	Possible Values/ Reference
Real IP	IP address on real IP network	
Virt IP	IP address on virtual IP network	
Min IP	Lowest port number to which this translation applies	1..65535
Max IP	Highest port number to which this translation applies	1..65535
Protocol	Protocol number (in IP header) to which this translation applies	1..255

Deleting a NAT

➤ To delete a NAT:

1. From the Main Menu, select Configuration > Applications > Router > NAT > Delete NAT.
2. Type the number of the NAT you want to delete, and then press <Enter>.

Setting Global Firewall Parameters

➤ To configure global firewall parameters:

- From the Main Menu, select **Configuration > Applications > Router > Firewall Global Parameters**.

```
Firewall Global Parameters

 1. All Fragments    (No)
 2. TCP Aging(seconds) [1 - 10000]... (15)
 3. UDP Aging(seconds) [1 - 10000]... (15)
 4. ICMP Aging(seconds) [1 - 10000]... (15)
 5. Default Aging(seconds)[1 - 10000]... (15)
 6. Define Rules>
```

Figure 4-60. Firewall Global Parameters Menu

Table 4-55. Firewall Global Parameters

Parameter	Description	Possible Values/ Reference
All Fragments	Whether to examine all fragments of an original frame or just the first fragment	**Yes** **No** Default: **No**
TCP Aging (seconds)	Aging time of cache for TCP frames	**1..10000** Default: **15**
UDP Aging (seconds)	Aging time of cache for UDP frames	**1..10000** Default: **15**
ICMP Aging (seconds)	Aging time of cache for ICMP frames	**1..10000** Default: **15**
Default Aging (seconds)	Aging time of cache for all other frames	**1..10000** Default: **15**
Define Rules	Opens the Define Rules menu	See *Figure 4-61*

Configuring Firewall Rules

➤ **To display/configure firewall rules:**

- From the Main Menu, select **Configuration > Applications > Router > Firewall Global Parameters > Define Rules**.

```
Define Rules

 1. Rule Number[1 - 50]... (1)
 2. Add Rule
 3. Delete Rule
 4. Edit Rule>
 5. Display Existing Rules[]
```

Figure 4-61. Define Rules Menu

Table 4-56. Define Rules Parameters

Parameter	Description	Possible Values/ Reference
Rule Number	Number of the rule to display/define	1..50
Add Rule	Add a firewall rule ***Note:*** *To configure the firewall rule, see* Editing Firewall Rules on page 4-57.	
Delete Rule	Deletes a Rule	
Edit Rule	Opens the Edit Rule menu	See *Figure 4-63*
Display Existing Rules	Displays all existing firewall rules ***Note:*** *This screen shows which firewall rules are in use. For information on firewall rules for individual ports, see Defining Firewall Rules for Router Ports on page 4-44.*	See *Figure 4-62*

Displaying Existing Rules

➤ To display which firewall rules are in use:

- From the Main Menu, select Configuration > Applications > Router > Firewall Global Parameters > Define Rules > Display Existing Rules.

```
Display Existing Rules

 Rule #   1   2   3   4   5   6   7   8   9  10  11  12  13
         Yes Yes Yes
 Rule #  14  15  16  17  18  19  20  21  22  23  24  25  26

 Rule #  27  28  29  30  31  32  33  34  35  36  37  38  39

 Rule #  40  41  42  43  44  45  46  47  48  49  50
```

Figure 4-62. Display Existing Rules

Adding Firewall Rules

➤ To add a firewall rule:

1. From the Main Menu, select Configuration > Applications > Router > Firewall Global Parameters > Define Rules > Add Rule.
2. Type the number of the firewall rule you want to add, and then press <Enter>.

Editing Firewall Rules

➤ To define a firewall rule:

- From the Main Menu, select Configuration > Applications > Router > Firewall Global Parameters > Define Rules > Edit Rule.

```
Edit Rule

 1. Rule Number[1 - 50]... (1)
 2. Destination IP High... (0.0.0.0)
 3. Destination IP Low... (0.0.0.0)
 4. Source IP High... (0.0.0.0)
 5. Source IP Low... (0.0.0.0)
 6. Destination Port High[1 - 65535]... (1)
 7. Destination Port Low[1 - 65535]... (1)
 8. Source Port High[1 - 65535]... (1)
 9. Source Port Low[1 - 65535]... (1)
10. Message Type[0 - 255]... (0)
11. IP Protocol Number [1 - 255]... (1)
```

Figure 4-63. Edit Rule Menu

Table 4-57. Edit Rule Parameters

Parameter	Description	Possible Values/ Reference
Rule Number	Number of rule to be modified	**1..50** Default: **1**
Destination IP High	Highest destination IP address to be accepted by the firewall	
Destination IP Low	Lowest destination IP address to be accepted by the firewall	
Source IP High	Highest source IP address to be accepted by the firewall	
Source IP Low	Lowest source IP address to be accepted by the firewall	
Destination Port High	Highest destination TCP/UDP port to be accepted by the firewall	**1..65535**
Destination Port Low	Lowest destination TCP/UDP port to be accepted by the firewall	**1..65535**
Source Port High	Highest source TCP/UDP port to be accepted by the firewall	**1..65535**
Source Port Low	Lowest source TCP/UDP port to be accepted by the firewall	**1..65535**
Message Type	Type of specific protocol message to be accepted by the firewall	**0..255**
IP Protocol Number	Number of IP Protocol to be accepted by firewall	**1..255**

Deleting Firewall Rules

➤ **To delete a firewall rule:**

1. From the Main Menu, select **Configuration** › **Applications** › **Router** › **Firewall Global Parameters** › **Define Rules** › **Delete Rule**.
2. Type the number of the firewall rule you want to delete, and then press **‹Enter›**.

4.3 Additional Tasks

This section discusses the following additional tasks:

Displaying the Vmux-210 Inventory

The Inventory screen displays Vmux-210 hardware, firmware and software information.

➤ **To display the Vmux-210 inventory:**

- From the Main Menu, select **Inventory**.

```
Inventory

                        HW Revision  FW Revision  SW Revision
          Vmux-210/30FXS    15.00        1.40         4.00A3
```

Figure 4-64. Inventory Screen

Note *The actual information shown in the Inventory screen depends on the Vmux-210 model in use.*

Downloading Software via XMODEM or TFTP

This section describes the Vmux-210 boot software and provides instructions for software downloading via XMODEM or TFTP applications.

New application software releases are distributed as ***.img** files, which are downloaded to Vmux-210 using the XMODEM protocol or client TFTP application from the File System menu of the boot software. Alternatively, you can download a new software release via TFTP protocol, when the Vmux-210 management software is already running.

The TFTP protocol can also be used for uploading/downloading configuration files that contain the Vmux-210 database to the management station. Administrators can use this capability to distribute verified configuration files to all other units that use the similar configuration.

The Vmux-210 software is stored in the flash memory in two sections: boot and file system. The boot sector holds a boot program that calls up the rest of the program from the file system.

The file system can hold two compressed copies of the Vmux-210 application software. One copy is referred to as **active partition** (usually partition 1), the

other – as **backup partition** (usually partition 0). The active partition is decompressed and loaded into the Vmux-210 RAM upon power-up. The backup file is used whenever the active file is missing or corrupted.

Boot Sequence

Vmux-210 boots up automatically. After power-up, no user intervention is required, except when the user wants to access the file system to modify or update the Vmux-210 application software.

The following is a description of the boot sequence. If the system is working normally, the entire process is completed within two minutes.

1. The boot program searches for the active partition in the file system. If the file exists, the program continues.

   If the file does not exist, the boot program searches for the backup file. If the backup is found, it is used instead of the active partition, and the boot process continues.

   If there is no backup file, you must download a file via the XMODEM protocol. The received file is saved as the active file in the file system.

2. Active and backup partitions are compressed and automatically decompressed into the RAM before execution begins.

3. After decompression, the Vmux-210 software starts to execute and the user can begin working.

Accessing the File System

The file system menu is an option that allows the user to perform basic file transfer operations. These operations are all optional.
When working with the File System menu, configure the ASCII terminal rate to 115.2 kbps.

➤ **To access the File System menu:**

- Press **<Enter>** several times immediately after powering Vmux-210 up.

```
VMUX boot version 1.00 (Dec 27 2004)
 Boot manager version 7.02 (Dec 27 2004)
0 – Exit boot-manager
1 – Dir
2 – Set active software copy
3 – Delete software copy
4 – Download an application by XMODEM
5 – Format Flash
6 – Show basic hardware information
7 – Reset board
8 – System configuration
9 – Download an application by TFTP
Press the ESC key to return to the main menu

Select:
```

Figure 4-65. File System Menu

From the File System menu, you can:

- Show the partition information.
- Set the active partition.
- Erase a partition.
- Download an application via XMODEM application (see the *Uploading/Downloading Files via XMODEM* section below).
- Select a partition for a temporary (one-time) use.
- Erase all partitions.
- Display the basic hardware information (RAM, ROM size etc)
- Assign IP values to Vmux-210 for the client TFTP application (see the *Downloading Application Files using a TFTP* section below).
- Download application software via client TFTP application (see the *Downloading Application Files using a TFTP* section below).

Note *You can also exchange the active and backup partitions via the 'Set the Active Application' menu (**Main Menu › Configuration › System › Set the Active Partition**).*

Uploading/Downloading Files via XMODEM

Downloading application files using the XMODEM protocol is performed from the File System menu of the boot software.

➤ **To download an application file via XMODEM:**

1. Configure your ASCII terminal or terminal emulation utility running on your PC to the 115.2 kbps data rate.
2. Access the File System menu (see *Accessing the File System* on page *4-60*).

The File System menu appears (see *Figure 4-65*).

3. From the File System menu, select **Download an application by XMODEM**.

   Vmux-210 displays the following message:
   `Select partition to download`

4. Select the backup partition by typing its number, **1**.

   Vmux-210 requires confirmation of the partition deletion:
   `The partition is full. Do you want to erase it (y/n)`

5. Type **Y**.

   Vmux-210 displays the following message:
   `Please start the XMODEM download.`

6. Send the ***.img** file to Vmux-210 using the XMODEM utility of you terminal application.

   Once the downloading is completed, Vmux-210 saves the new release as an active partition, the former active partition turns into backup, and the boot sequence continues normally.

   If a failure occurs during the download, the partially downloaded software is erased. In this case, only active software is left in the Flash memory.

Downloading Application Files using a TFTP Server

Downloading application files using a TFTP server application is performed from the File System menu of the boot software. A TFTP server application must be running on the management station.

➤ **To download an application file via TFTP Server:**

1. Access the File System menu (see *Accessing the File System* on page *4-60*).

   The File System menu appears (see *Figure 4-65*).

2. From the File System menu, select **System configuration**.
3. Enter IP address of Vmux-210, and press **‹Enter›**.
4. Enter IP mask of Vmux-210, and press **‹Enter›**.
5. Enter default gateway of Vmux-210, and press **‹Enter›**.
6. Reset Vmux-210.
7. Access the File System menu.
8. From the File System menu, select **Download an application by TFTP**.
9. Enter the application file name (**vmux210.img**), and press **‹Enter›**.
10. Enter IP address of the TFTP server, and press **‹Enter›**.

    Vmux-210 starts downloading application software.
    Vmux-210 automatically erases the backup partition (it takes about 25 seconds). Once the downloading is completed, Vmux-210 saves the new release as an active partition; the former active partition turns into backup.

11. Restart the unit.

Uploading/Downloading Files from the System Menu

You can download application files or upload/download configuration files from the System menu, which eliminates the shut down and reboot necessary to access the boot menu. A TFTP server application must be running on the management station.

➤ **To download an application file or upload/download a configuration file from the system menu:**

1. From the Main Menu, select **File Utilities > TFTP Transfer**.

   The TFTP Transfer menu appears (see *Figure 4-66*).

2. Configure the parameters according to *Table 4-58*.

3. Use the TFTP Command to activate the download.

```
TFTP Transfer


 1. Transfer Status... (No operation)
 2. TFTP File Name... (File Name)>
 3. TFTP Server IP... (0.0.0.0)>
 4. TFTP Command  >

>

Please choose item <1 to 4>
@ - Db Update; # - Db Undo
ESC-prev.menu; !-main menu; &-exit
```

Figure 4-66. TFTP Transfer Menu

Table 4-58. TFTP Transfer Parameters

Parameter	Description	Possible Values/ Reference
Transfer Status	Last status reported from TFTP session	**No operation** **Connecting** **Transferring data** **Ended timeout** **Ended OK** **Error**
TFTP File Name	Name of the file to be transferred	Example: **vmux210.img**
TFTP Server IP	IP address of the TFTP server	Default: **0.0.0.0**
TFTP Command	Selects the type of TFTP transfer to activate: • SW Download – download software • Cnfg Download – download configuration file • Cnfg Upload – prepare for upload by the TFTP server; the actual operation will be initiated by the TFTP server	**SW Download** **Cnfg Download** **Cnfg Upload**

Note *The system and the main link values do not change when you download the new configuration and update the database.*

Restoring Default Settings

You can restore Vmux-210 to the factory default settings. When restoring defaults, you have the option of restoring all defaults, or restoring all defaults except for management-related settings. When choosing the second option, voice port settings, bundles and assigned timeslots are restored to default settings. The management parameters are not affected. For a list of all factory defaults, see *Default Settings* in *Chapter 3*.

➤ **To restore all default settings:**

1. From the Main Menu, select **Configuration** › **System** › **Factory Default**.

   The Factory Default menu appears. See *Figure 4-67*.

2. Type **1**, and then press **<Enter>**.

   The following message appears:

   `Are You Sure You Want to Clean the Entire DB (Y/N)?`

3. Type **Y**, and then press **<Enter>**.

   Vmux-210 restores all default settings.

4. Type **@** (**<Shift+2>**) to update the database.

```
Factory Default

 1. All
 2. Without Management
```

Figure 4-67. Factory Default Menu

➤ **To restore all default settings except for management settings:**

1. From the Main Menu, select **Configuration** > **System** > **Factory Default**.

   The Factory Default menu appears. See *Figure 4-67*.

2. Type **2**, and then press **<Enter>**.

   The following message appears:

   Are You Sure You Want to Clean the Voice DB (Y/N)?

3. Type **Y**, and then press **<Enter>**.

   Vmux-210 restores default settings for voice ports, and leaves management-related settings unchanged.

4. Type **@** (**<Shift+2>**) to update the database.

Setting the Date and Time

➤ **To set the date and time:**

- From the Main Menu, select **Configuration > System > Date & Time**.

```
Date & Time

 1. Time (hh:mm)... (07:13)
 2. Date (dd/mm/yyyy)... (6/7/2004)
```

Figure 4-68. Date & Time Menu

Table 4-59. Date & Time Parameters

Parameter	Possible Values/Remarks	Possible Values/ Reference
Time	Vmux-210 system time	Format: **hh:mm**
Date	Vmux-210 system date	Format: **dd/mm/yyyy**

Configuring Alarm LED Activation Level

➤ **To configure alarm parameters:**

- From the Main Menu, select **Configuration > System > Alarm Operations**.

```
Alarm Operations

 1. Alarm LED Severity> (Event)
```

Figure 4-69. Alarm Operations Menu

Table 4-60. Alarm Operations Parameters

Parameter	Description	Possible Values/ Reference
Alarm LED Severity	Minimal alarm severity level for Alarm LED activation	**Event** **Minor** **Major** Default: **Event**

You can configure the alarm severity level that will cause the ALM LED to turn. The following levels are available:

- **Event**. The LED will turn on whenever there is an "ON" alarm in the system, or whenever an event has occurred. Since events are not state alarms, they do not switch to the "OFF" state as soon as the problem that caused them is solved, and you will have to clean the alarm buffer in order to turn the LED off.
- **Minor**. At this level, events do not turn the LED on. As long as there are "ON" alarms in the device (minor or major) the LED will be on, but as soon as **all** the state alarms are turned off, the LED will automatically turn off (no need to clean events from buffer).
- **Major**. At this level, neither events nor minor alarms turn the LED on. As long as there are major "ON" alarms in the device the LED will be on, but as soon as the **major** alarms are turned off, the LED will automatically turn off. There is still no need to clean events from buffer.

➤ **To set the Alarm LED severity:**

1. From the Main Menu, select **Main > Configuration > System > Alarm Operations > Set Alarm LED Severity**.

   The Set Alarm LED Severity menu appears (see *Figure 4-70*).

2. Select an alarm severity level; alarms at or above this level will turn on the LED.

```
Set Alarm LED Severity (Minor)

 1. Event
 2. Minor
 3. Major
```

Figure 4-70. Set Alarm LED Severity Menu

Resetting Vmux-210

The Vmux-210 management software allows you to re-initialize the main board CPU of the unit.

➤ To reset the Vmux-210 components:

1. From the Main Menu, select Configuration › System › Reset Unit.

   Vmux-210 displays the following message:

   Are you sure you want to reset the Vmux? Press Y/N

2. Type Y, and then press ‹Enter›.

   The unit is re-initialized; its active software is decompressed and loaded into the RAM.

Chapter 5

Configuring Vmux-210 for a Typical Application

This chapter gives detailed instructions for configuring Vmux-210 for a typical application in which two Vmux-210 units operate opposite a central Vmux-2100 unit over an IP network.

5.1 Application Requirements

Figure 5-1 illustrates a typical TDM application, in which two Vmux-210 units operate opposite a central Vmux-2100 over an IP network.

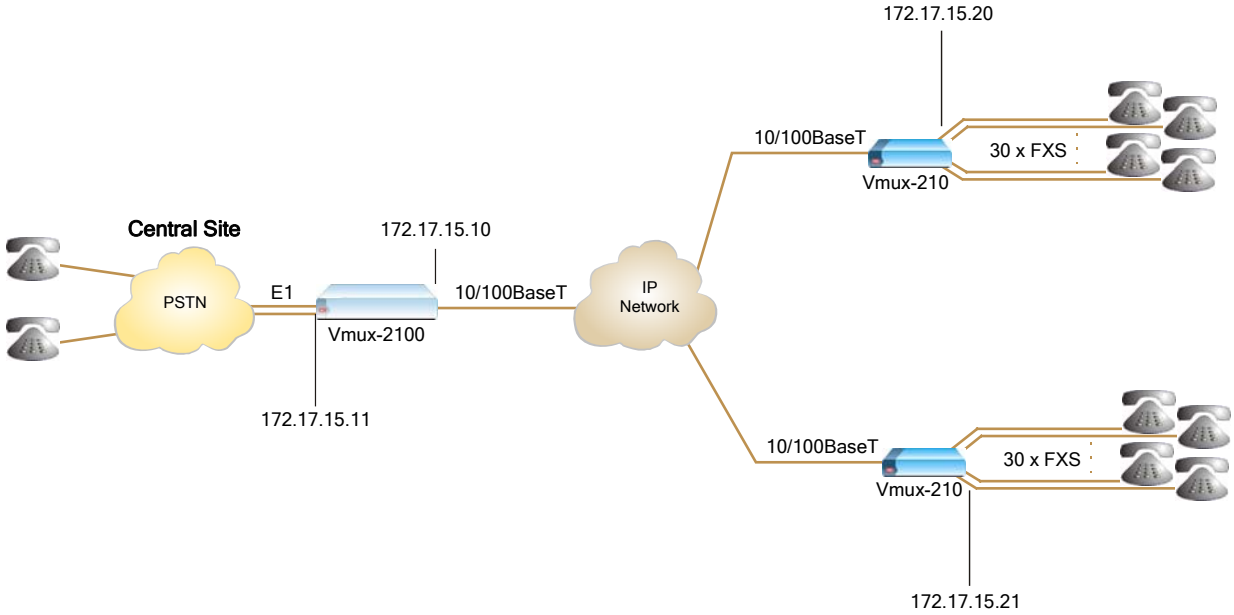


Figure 5-1. Typical Application

The following network requirements exist:

- Two E1 trunks are transmitted by the central Vmux-2100 over IP network to two remote Vmux-210 units.
- CAS signaling
- G.732S framing mode, without CRC-4 bits generation
- G.723.1A/6.4 voice compression
- Loopback timing
- Fax relay at 9.6 kbps

5.2 Configuration Sequence

The recommended configuration procedure for this application includes the following steps:

1. Configure the local Vmux-2100.
2. Configure the IP host parameters for both remote Vmux-210 units via an ASCII terminal connection.
3. Install the two Vmux-210 units at their locations.
4. Configure one of the Vmux-210 units.
5. On the management station, save the configuration file (**cnfg210.dat**) of the configured Vmux-210 unit. This is done by running a TFTP server application on the management station.
6. Download the configuration file to the second Vmux-210 unit. This is done by running a TFTP server application on the management station.
7. Modify the relevant parameters on the second Vmux-210 unit.

5.3 Configuring the Local Vmux-2100

This section provides only a summary of the parameters necessary for the voice E1 configuration of the central Vmux-2100. See the appropriate sections of the *Vmux-2100 Installation and Operation Manual* for more detailed instructions.

➤ **To configure the central Vmux-2100:**

1. Assign the 172.17.15.11 IP address to the E1 group 1.
2. Add two bundles and configure them as follows:
   - Connect – Yes
   - Function – TDMoIP
   - Destination IP:
     - Bundle 1 – 172.17.15.20
     - Bundle 2 – 172.17.15.21
   - Destination Bundle – 1
   - Packetizing Interval – 30
   - Coder Rate – G723.1/6.4
   - Fax – Enable at 9.6 kbps.
3. Configure E1 parameters of the first external E1 bundle:
   - Connect – Yes
   - Frame – G.732S
   - Restoration – CCITT

- Clock Source – Lbt
- Interface Type – Dsu
- Idle Code – 7E
- Profile – 1.

4. Repeat this step for the second E1 (second bundle).
5. Assign voice timeslots of the first bundle (first E1):
   - Update from Time Slot – 1
   - To Time Slot – 15
   - Type – Voice
   - Bundle – 1
   - Destination Port ID – 1
   - Destination Time Slot ID – 1
   - Update Time Slot
   - Update from Time Slot – 17
   - To Time Slot – 31
   - Type – Voice
   - Bundle – 1
   - Destination Port ID – 1
   - Destination Time Slot ID – 16.

Note *Configuration is divided into two parts (timeslots 1-15 and 17-31), since E1 timeslot 16 is reserved for signaling. At the second Vmux-210, timeslots 17-31 should be mapped to channels 16-30 respectively.*

6. Assign voice timeslots of the second bundle (second E1):
   - Update from Time Slot – 1
   - To Time Slot – 15
   - Type – Voice
   - Bundle – 2
   - Destination Port ID – 1
   - Destination Time Slot ID – 1
   - Update Time Slot
   - Update from Time Slot – 17
   - To Time Slot – 31
   - Type – Voice
   - Bundle – 2
   - Destination Port ID – 1

- Destination Time Slot ID – 16.

Now you can proceed with configuration of remote Vmux-210 units.

5.4 Configuring Vmux-210

Most of the configuration procedures are performed on one of the units, except for defining IP parameters of the remote Vmux-210.

Configuration procedure is divided into two main stages:

- Defining system parameters.
- Setting analog voice parameters.

Note *You must save the selected values by updating the Vmux-210 database. If the database is not updated, Vmux-210 discards all the user settings when it is reset. You can save selected values at any stage of the configuration procedure.*

Configuring System Parameters

➤ **To configure the Vmux-210 system parameters:**

1. Configure an ASCII terminal to:
   - One start bit
   - Eight data bits
   - No parity
   - One stop bit
   - No flow control
   - VT100 emulation.
2. Connect the terminal to the Vmux-210 CONTROL port.
3. Press ‹**Enter**› several times (to allow Vmux-210 to detect the rate).
4. Initiate the control session by entering the user name and password.
5. Display the Host IP menu and enter the IP address (172.17.15.20), its subnet mask and default gateway values (**Main Menu** › **Configuration** › **System** › **Management** › **Host IP**).
6. Repeat step 2 to step 4 for the second Vmux-210 unit, and assign the 172.17.15.21 IP address to it.

Note *The rest of the configuration procedure refers to the first unit. Information applicable to both units (or only to the second Vmux-210) is explicitly identified.*

Configuring Analog Voice Parameters

➤ **To configure the analog voice parameters:**

1. Display the Bundle Configuration menu, and add bundle 1 to the system (**Main Menu** › **Configuration** › **Bundles** › **Configure** › **Add Bundle**).
2. Display the Edit Bundle menu, and configure the bundle 1 parameters to the following values (**Main Menu** › **Configuration** › **Bundles** › **Configure** › **Edit Bundle**):
   - Connect – Yes
   - Function – TDMoIP
   - Destination IP – 172.17.15.11
   - Destination Bundle – 1
   - Packetizing Interval – 30
   - Coder/Rate – G723.1A/6.4
   - Fax – Enable at 9.6 kbps.
3. Display the Signaling Parameters menu (**Main Menu** › **Configuration** › **Bundles** › **Configure** › **Edit Bundle** › **Signaling Parameters**), and configure the ABCD bits to represent the ON-HOOK/OFF-HOOK state according to the remote PBX.
4. Display the Ports Distribution menu, and configure the voice timeslots belonging to the first Vmux-2100 bundle (**Main Menu** › **Configuration** › **Bundles** › **Channel Distribution** › **Configure**):
   - Update from Time Slot – 1
   - To Time Slot – 15
   - Type – Voice
   - Bundle – 1
   - Destination Port ID – 1
   - Destination Time Slot ID – 1
   - Update Time Slot
   - Update from Time Slot – 16
   - To Time Slot – 30
   - Type – Voice
   - Bundle – 1
   - Destination Port ID – 1
   - Destination Time Slot ID – 17.

Note *Timeslot 16 on the remote E1 interface is reserved for signaling.*

5. Press '**@**' to update the database.

5.5 Transferring Database to the Second Vmux-210

➤ **To transfer the database to the second Vmux-210:**

1. Upload the configuration file from the first Vmux-210 to the management station via the TFTP protocol.
2. Download the configuration file to the second Vmux-210 via the TFTP protocol.

   See *Appendix B* for information on TFTP client/server operations for the Vmux-210.
3. Establish a Telnet connection to the second Vmux-210 unit.
4. Display the Edit Bundle menu and set the **Destination Bundle Number** to **2**.
5. Display the Ports Distribution menu, and configure the voice timeslots belonging to the second Vmux-2100 bundle (**Main Menu** > **Configuration** > **Bundles** > **Channel Distribution** > **Configure**):
   - Update from Time Slot – 1
   - To Time Slot – 15
   - Type – Voice
   - Bundle – 1
   - Destination Port ID – 2
   - Destination Time Slot ID – 1
   - Update Time Slot
   - Update from Time Slot – 16
   - To Time Slot – 30
   - Type – Voice
   - Bundle – 1
   - Destination Port ID – 2
   - Destination Time Slot ID – 17.
6. Update the second Vmux-210 database by typing **@**.

   Now both remote Vmux-210 units are ready for operation.

Note *The host IP and the default gateway values do not change when you download the new configuration and update the database.*

Chapter 6

Troubleshooting and Diagnostics

This chapter describes the alarms, sanity checks (configuration errors and warnings), and the uplink and voice module statistics supported by Vmux-210.

This chapter includes the following sections:

6.1 Monitoring Performance

This section explains how to display performance data collected on the Vmux-210 ports.

Viewing Statistics

➤ To display the Statistics menu:

- From the Main Menu, select **Monitoring > Statistics**.

```
Statistics

 1. Bundles>
 2. Voice TS>
 3. Analog Signaling
 4. E1/T1/Serial Uplink>
 5. Ethernet>
 6. Clear All
```

Figure 6-1. Statistics Menu

Monitoring Bundles

The management software enables you to evaluate the performance of each of the 12 Vmux-210 bundles by displaying bundle statistics and tracking packets.

```
Bundles

 1. Bundle Number[1 - 12]... (1)
 2. Display Statistics[]
 3. Display Packets Tracking
```

Figure 6-2. Bundles Statistics Menu

Displaying Bundle Statistics

Each bundle may have one of the following states:

- **Connect** – The bundle is connected
- **Disconnected** – The bundle is disconnected
- **Echo Wait** – There is physical connection, but the remote bundle is not active. This might indicate a Layer 4 connectivity problem (UDP).
- **IP OOS** – There is no physical connection between the bundles. The reason for this may be an illegal IP address of the destination E1/T1 group, or a duplicate IP address in the network.

➤ **To display bundle statistics:**

1. From the Main Menu, select **Monitoring** › **Statistics** › **Bundles**.

   The Bundles Statistics menu appears (see *Figure 6-2*).

2. From the Bundles Statistics menu, select a **Bundle Number**, and then select **Display Statistics**.

   The Bundle Statistics screen appears (see *Figure 6-3*).

3. Press **‹Enter›** to refresh the display.
4. Press '**C**' to clear the statistics.
5. Press **‹Esc›** to exit the Bundle Statistics screen.

```
Bundle: 1, State: IP OOS

Rx    Tot Frames: [      0]  Tot Bytes:[      0]
      60s Frames: [      0]  60s Bytes:[      0]
      Tot Voice:  [      0]  Tot HDLC: [      0]  Tot CAS:[  0]
      60s Voice:  [      0]  60s HDLC: [      0]  60s CAS:[  0]
Tx    Tot Frames: [      0]  Tot Bytes:[      0]
      60s Frames: [      0]  60s Bytes:[      0]
      Tot Voice:  [      0]  Tot HDLC: [      0]  Tot CAS:[  0]
      60s Voice:  [      0]  60s HDLC: [      0]  60s CAS:[  0]
      Tot Timeout:[      0]  Tot Size: [      0]
      60s Timeout:[      0]  60s Size: [      0]

      Tx Silence pct: [ 100] Rx Silence pct: [ 100]
```

Figure 6-3. Bundle Statistics

Table 6-1. Bundle Statistics Values

Field	Description
Rx Total Frames	Total number of packets received from network
Rx Total Bytes	Total number of data octets of all packets received from network
Rx 60 sec Frames	Number of packets received from network during the last 60 seconds
Rx 60 sec Bytes	Number of data octets received from network during the last 60 seconds
Tx Total Frames	Total number of packets transmitted toward network
Tx Total Bytes	Total number of data octets of all packets transmitted toward network
Tx 60 sec Frames	Number of packets transmitted toward network during the last 60 seconds
Tx 60 sec Bytes	Number of data octets transmitted toward network during the last 60 seconds
Tx on Timeout	Number of packets transmitted toward network as a result of reaching the maximum packetizing interval
Tx Max Size	Number of packets transmitted toward network as a result of reaching the maximum frame size
60 sec Timeout	Number of packets transmitted toward network as a result of reaching the maximum packetizing interval during the last 60 seconds
60 sec Max Size	Number of packets transmitted toward network as a result of reaching the maximum frame size during the last 60 seconds
Total - Rx CAS	Total number of signaling packets received from network
Total - Rx Voice	Total number of voice packets received from network
Total - Rx Hdlc	Total number of HDLC packets received from network
60 sec - Rx CAS	Number of signaling packets received from network during last 60 seconds

Table 6-1. Bundle Statistics Values (Cont.)

Field	Description
60 sec - Rx Voice	Number of voice packets received from network during last 60 seconds
60 sec - Rx Hdlc	Number of HDLC packets received from network during last 60 seconds
Total - Tx CAS	Total number of signaling packets transmitted toward network
Total - Tx Voice	Total number of voice packets transmitted toward network
Total - Tx Hdlc	Total number of HDLC packets transmitted toward network
60 sec - Tx CAS	Number of signaling packets transmitted toward network during last 60 seconds
60 sec - Tx Voice	Number of voice packets transmitted toward network during last 60 seconds
60 sec - Tx Hdlc	Number of HDLC packets transmitted toward network during last 60 seconds
Silence percent on bundle Rx	Average percentage of silence on all the received timeslots connected to the bundle
Silence percent on bundle Tx	Average percentage of silence on all the transmitted timeslots connected to the bundle

Tracking Packets

You can use packet tracking to trace problems in IP, TDM, or serial networks connecting Vmux devices to each other.

The sequence number is stamped in the 16-bit "seq-num" field in the TDMoIP header. Consecutive packets will have consecutive sequence numbers. When the sequence number reaches the maximum value (65535), it resets to 0.

The voice card in the remote Vmux device receives the packets from the network, and analyzes the seq_num. The results of this analysis are summarized into 3 counters that appear in the 'Bundle Statistics' screen:

- **Missing**: The number of missing received packets. Only the total number of missing packets is relevant, not which specific packets are missing. If the network is 100% fine, then this field should be 0.

  For example, if the received packets are numbered 1,2,3,5,6,7,8 then packet no.4 is missing, and the "missing" counter is increased by 1.

- **Longest Series**: The largest burst of consecutive missing packets. This field helps to identify a "bursty" network that drops bursts of packets.

  For example, if the received sequence is: 36,41,42,43,44,45,46.... the longest burst is 4 (because we missed 37,38,39,40, which is 4 consecutive packets.

- **Freed: T**he number of duplicated packets that were received. Duplicate sequence numbers are dropped by the receiving voice card, so a large number of dropped, or freed, packets gives an indication of a 'duplicating network'.

  For example, if the received sequence is: 6,7,8,9,6,6,10,11.... then packet no.6 was duplicated twice by the network. The duplications are dropped by the voice card, and the 'Freed' counter is increased by 2.

The 'Tracing Window' is 30 packets deep. Missing packets and duplicated packets will be recognized correctly only if their Seq_Num is within this trace window.

For example, if a received sequence is 96,97,98,99,100,75... then packet no. 75 is recognized as a duplicate (100 - 75 < 30 = inside the window) and **freed,** so now the card expects packet no.101 to arrive from the network. However, if the received sequence is 96,97,98,99,100,65... then packet no.65 is not recognized as a duplicate and is **accepted**, (100- 65 > 30 = outside the window). Now the card expects packet no.66 to arrive, and if packet no. 101 arrives instead, then a **Longest Burst** of 35 will be detected.

➤ **To display packet tracking:**

1. From the Main Menu, select **Monitoring** > **Statistics** > **Bundles**.

   The Bundles Statistics menu appears (see *Figure 6-2*).

2. From the Bundles Statistics menu, select a **Bundle Number**, and then select **Display Packets Tracking**.

   The Display Packets Tracking screen appears (see *Figure 6-4*).

3. Press **<Enter>** to refresh the display.
4. Press '**C**' to clear the statistics.
5. Press **<Esc>** to exit the Bundle Statistics screen.

```
Bundle: 1. State: DISCONNECT

Num of Freed Packets                              ... (0)
Num of Missing Packets                            ... (0)
Longest Series of Missing Packets                 ... (0)
Num of Series With 1 Missing Packet               ... (0)
Num of Series With 2 Missing Packets              ... (0)
Num of Series With 3 Missing Packets              ... (0)
Num of Series With 4 Missing Packets              ... (0)
Num of Series With 5 Missing Packets              ... (0)
Num of Series With more than 5 Missing Packets    ... (0)
```

Figure 6-4. Packets Tracking

Table 6-2. Packets Tracking

Field	Description
Num of Freed Packets	Number of duplicate packets that were received and dropped (indicates duplicate problem in the network or packet reordering)
Num of Missing Packets	Number of packets that did not arrive in time according to sequence number (either lost in the network or reordered)
Longest Series of Missing Packets	Largest series of consecutively numbered missed packets (a large value indicates a bursty problem in the network)

Table 6-2. Packets Tracking (Cont.)

Field	Description
Num of Series With 1 Missing Packet	Number of series of consecutive packets with one missing packet
Num of Series With 2 Missing Packets	Number of series of consecutive packets with two missing packet
Num of Series With 3 Missing Packets	Number of series of consecutive packets with three missing packet
Num of Series With 4 Missing Packets	Number of series of consecutive packets with four missing packet
Num of Series With 5 Missing Packets	Number of series of consecutive packets with five missing packet
Num of Series With more than 5 Missing Packets	Number of series of consecutive packets with more than five missing packet

Note *Bundle statistics must be cleared after the bundle has gone up, or the Seq Num mechanism will be irrelevant.*

This is due to the fact that Seq Num fields are meaningless during the bundle set-up time (that is, the time it takes the bundle to go into "connected" state).

Displaying Timeslot Voice Statistics

The Vmux-210 software enables you to evaluate performance of a separate timeslot and the DSP used by it (see *Figure 6-6*). *Table 6-3* describes the timeslot voice statistics values.

➤ **To display the timeslot voice statistics:**

1. From the Main Menu, select **Monitoring** › **Statistics** › **Voice TS**.

   The Voice Statistics menu appears (see *Figure 6-5*).

2. From the Voice Statistics menu, select a **Time Slot**, and then select **Display**.

   The Voice Statistics Timeslot screen appears (see *Figure 6-6*).

3. Press **<Enter>** to refresh the display.
4. Press '**C**' to clear the statistics.
5. Press **<Esc>** to exit the Voice Statistics Timeslot Statistics screen.

```
Voice TS

 1. Time Slot[1 - 30]... (1)
 2. Display[]
```

Figure 6-5. Voice Statistics Menu

```
Time Slot: 1 Dsp Mode: VOICE
  Rx   Tot Voice: [          6]    Tot Sid:[         1]
       Tot Modem: [          0]    Tot Fax:[         0]

  Tx   Tot Voice: [          0]    Tot Sid:[         0]
       Tot Modem: [          0]    Tot Fax:[         0]

       Underrun:  [          0]    Overrun:[         0]
       Heartbeat: [     214971]

       Rx Silence pct: [ 100]     Tx Silence pct: [ 100]
```

Figure 6-6. Voice Statistics Timeslot Screen

Table 6-3. Voice Statistics Timeslot Values

Field	Description
DSP Mode	• IDLE – DSP is idle • VOICE – DSP is transmitting voice packets • DATA – DSP is relaying modem signal • FAX –DSP is relaying fax signal • VOICEBAND – DSP is transmitting voiceband data (modem/fax)
Total Rx Voice	Total number of voice packets received from the local PBX/switch
Total Tx Voice	Total number of voice packets transmitted toward the local PBX/switch
Total Rx Sid	Total number of silence packets received from the local PBX/switch
Total Tx Sid	Total number of silence packets transmitted toward the local PBX/switch
Total Rx Fax	Total number of fax packets received from the local PBX/switch
Total Tx Fax	Total number of fax packets transmitted toward the local PBX/switch
Total Rx Modem	Total number of modem packets received from the local PBX/switch
Total Tx Modem	Total number of modem packets transmitted toward the local PBX/switch
Total Underrun	Total underrun of the jitter buffer (in packets)
Total Overrun	Total overrun of the jitter buffer (in packets)
Silence percent since last clear: Rx	Average percentage of silence carried by the received timeslot since buffer was last cleared
Silence percent since last clear: Tx:	Average percentage of silence carried by the transmitted timeslot since buffer was last cleared

Displaying Analog Signaling Statistics

Vmux-210 records statistics about the FXS analog voice ports.

➤ **To display the analog signaling statistics:**

- From the Main Menu, select **Monitoring › Statistics › Analog Signaling**.

  The Analog Signaling Statistics screen appears. Press **‹Enter›** to refresh the display. Press **‹Esc›** to exit the Analog signaling statistics screen.

```
Analog Signaling Statistics

Ts#     Type      Bundle      Dest Port      Dest Ts     State       Last Rx Bits
1       Voice       1             1            1      BOTH_ON_HK       0101
2       Voice       1             1            2      BOTH_ON_HK       0101
3       Voice       1             1            3      BOTH_ON_HK       0101
4       Voice       1             1            4      BOTH_ON_HK       0101
5       Voice       1             1            5      BOTH_ON_HK       0101
6       Voice       1             1            6      BOTH_ON_HK       0101
7       Voice       1             1            7      BOTH_ON_HK       0101
8       Voice       1             1            8      BOTH_ON_HK       0101
```

Figure 6-7. Analog Signaling Statistics Screen (FXS)

The State of the analog FXS port can be one of the following:

- BOTH_ON_HOOK (both local and remote handsets are on-hook)
- RINGBACK (ring-back signal is being sent from remote handset)
- ACTIVE_CALL (call is in progress)
- LOCAL_ON_HOOK (local handset is on-hook, remote handset is not on-hook)
- REMOTE_ON_HOOK (remote handset is on-hook, local handset is not on-hook)
- RINGING (local handset is ringing)

Note *Last Rx Bits are the last ABCD bits received from the network.*

Displaying E1/T1 and Serial Uplink Statistics

The E1/T1 and Serial uplink statistics values are identical and described in *Table 6-4*. *Figure 6-8* shows the E1/T1/Serial port statistics screen.

Note *For Ethernet uplink port statistics, see* *Displaying Ethernet Statistics* on page *6-10*.

➤ **To display the E1/T1/Serial Uplink statistics:**

1. From the Main Menu, select **Monitoring › Statistics › E1/T1/Serial Uplink › Display**.

   The E1/T1/Serial Uplink Statistics screen appears (see *Figure 6-8*).

2. Press <Enter> to refresh the display.
3. Press 'C' to clear the statistics.
4. Press <Esc> to exit the Serial Port Statistics screen.

```
                E1/T1/Serial Uplink Statistics
Rx  Tot Frames: [        0]   Tot Bytes:[        0]
    60s Frames: [        0]   60s Bytes:[        0]
    Length:     [        0]   NonOctet: [        0]
    CRC:        [        0]   Abort:    [        0]
    Overrun:    [        0]   Freed:    [        0]
Tx  Tot Frames: [        0]   Tot Bytes:[        0]
    60s Frames: [        0]   60s Bytes:[        0]
    Underrun:   [        0]   Freed:    [        0]
    CU  Voice Q:[        0]   Data Q:   [        0] MNG Q: [ 0]
    MX  Voice Q:[        0]   Data Q:   [        0] MNG Q: [ 0]

    Avg BW:     [        0]   Max BW:   [        0]
```

Figure 6-8. E1/T1/Serial Uplink Statistics Screen

Table 6-4. E1/T1/Serial Uplink Statistics Values

Field	Description
Rx Total Frames	Total number of HDLC packets received from the link
Rx Total Bytes	Total number of data octets of all packets received from the link
Rx 60 sec Frames	Number of HDLC packets received from the link during last 60 seconds
Rx 60 sec Bytes	Number of data octets received from the link during last 60 seconds
Rx Length Error	Number of frames received from the link with length violations
Rx NonOctet Aligned	Number of frames received from the link that contain a number of bits not divisible by eight
Rx Aborted Frames	Number of aborted sequences. The counter is incremented by one when at least seven consecutive ones are received from the link during frame reception
Rx CRC Error	Number of frames received from the link with CRC errors
Rx Overrun	Number of HDLC packets received from the link that were discarded due to lack of buffer resources
Freed RX Frames	Number of frames discarded from the FIFO buffer when the number of stored frames exceeded buffer capacity
Tx Total Frames	Total number of HDLC packets transmitted toward the link
Tx Total Bytes	Total number of data octets of all packets transmitted toward the link
Tx 60 sec Frames	Number of HDLC packets transmitted toward the link during last 60 seconds

Table 6-4. E1/T1/Serial Uplink Statistics Values (Cont.)

Field	Description
Tx 60 sec Bytes	Number of data octets transmitted toward the link during last 60 seconds
Tx Underrun	Number of transmitted HDLC packets discarded due to lack of buffer resources
Freed Tx Frames	Number of frames discarded from the FIFO buffer when the number of stored frames exceeded buffer capacity
Tx Voice Q - Current Frames	Current number of the transmitted HDLC voice packets in the FIFO buffer ***Note:*** *In this screen,* ***CU*** *stands for Current.*
Tx Voice Q - Max Frames	Maximum number of the transmitted HDLC voice packets ever accumulated in the FIFO buffer ***Note:*** *In this screen,* ***MX*** *stands for Maximum.*
Tx Data Q - Current Frames	Current number of the transmitted HDLC data packets in the FIFO buffer
Tx Data Q - Max Frames	Maximum number of the transmitted HDLC data packets ever accumulated in the FIFO buffer
Tx Mng Q - Current Frames	Current number of the transmitted HDLC management packets in the FIFO buffer
Tx Mng Q - Max Frames	Maximum number of the transmitted HDLC management packets ever accumulated in the FIFO buffer

Displaying Ethernet Statistics

Vmux-210 evaluates performance of the 10/100BaseT Ethernet Network and User ports (see *Figure 6-10*). *Table 6-5* describes the Ethernet statistics values.

➤ **To display the Ethernet statistics:**

1. From the Main Menu, select **Monitoring** › **Statistics** › **Ethernet**.

   The Ethernet Statistics menu appears (see *Figure 6-9*).

2. Select one of the following:
   - **Network Port**
   - **User Port**

   The selected statistics appear (see *Figure 6-10*).

3. Press **<Enter>** to refresh the display.
4. Press '**C**' to clear the statistics.
5. Press **<Esc>** to exit the Ethernet Port Switch Statistics screen.

```
Ethernet statistics

 1. Network Port>
 2. User Port>
```

Figure 6-9. Ethernet Statistics Menu

```
                        Network Port
Rx  Tot Frames: [     7961] OK Frames:[     7961]
    Tot Bytes:  [   591279] OK Bytes: [   591279]
    Brdcst:     [     5003] Mltcst:   [     2584]
    Undersize:  [        0] Oversize: [        0]
    Fragments:  [        0] Jabber:   [        0] CRC:[    0]
    Discarded:  [        0] Filter:   [        0]
Tx  Tot Frames: [      153] Tot Bytes:[    14797]
    Brdcst:     [        2] Mltcst:   [        0]
    Collisions: [        0]

SZ      64:     [     6885]  65-127:  [      963] 128-255:[108]
    256-511:    [      155] 512-1023: [        3] 1024-Max:[0]
```

Figure 6-10. Ethernet Port Statistics Screen

Table 6-5. Ethernet Port Statistics Values

Field	Description
Rx Statistics	
Total Frames	Total number of frames received from the network
Total Bytes	Total number of octets received from the network
Frames	Number of good frames received from the network
Bytes	Number of good octets received from the network
Brdcst Frames	Number of good broadcast frames received from the network
Multicast Frames	Number of good multicast frames received from the network
Undersize	Number of good frames received from the network with length less than 64 bytes
Oversize	Number of good frames received from the network with length more than MaxSize
CRC	Number of frames received from the network with invalid CRC
Fragments	Number of frames received from the network with invalid CRC and length less than 64 bytes
Jabber	Number of frames received from the network with invalid CRC and length more than MaxSize
Discarded	Number of frames discarded due to a lack of buffer space
Filtered	Number of frames discarded due to an unknown VLAN ID
Tx Statistics	
Frames	Number of good frames transmitted toward the network
Bytes	Number of good octets transmitted toward the network

Table 6-5. Ethernet Port Statistics Values (Cont.)

Field	Description
Brdcst Frames	Number of good broadcast frames transmitted toward the network
Multicast Frames	Number of good multicast frames transmitted toward the network
Collisions	Number of collisions during frame transmission
Frame Size Statistics	**(Rx+Tx)**
64b	Number of frames received and transmitted with a length of 64 bytes
65b – 127b	Number of frames received and transmitted with a length of 65 to 127 bytes
128b – 255b	Number of frames received and transmitted with a length of 128 to 255 bytes
256b – 511b	Number of frames received and transmitted with a length of 256 to 511 bytes
512b – 1023b	Number of frames received and transmitted with a length of 512 to 1023 bytes
1024b - Max	Number of frames received and transmitted with a length of 1024 to MaxSize bytes

Clearing all Statistics

➤ **To clear all statistics:**

- From the Main Menu, select **Monitoring > Statistics > Clear All**.

  All statistics are cleared.

6.2 Detecting Errors

Configuration errors and mismatches are rendered by the Vmux-210 management software as sanity checks. Their main purpose is to maintain the database validity. Vmux-210 supports two types of the sanity check messages:

- **Error** – major configuration error, which prevents the Vmux-210 database from updating and saving changes.
- **Warning** – minor configuration error, which allows the user to update the database and save the changes.

Every time you update the Vmux-210 database, the management software analyses the changes. If errors or warnings are detected, Vmux-210 aborts the database update and displays the errors/warnings. *Table 6-6* lists all sanity errors and warnings generated by Vmux-210, in alphabetical order.

Table 6-6. Sanity Errors and Warnings

Display	Type	Description	Remark
BUNDLE DOES NOT EXIST	Error	A TS is assigned to a bundle that does not exist	
BUNDLE IS NOT CONNECTED	Warning	A timeslot is assigned to a bundle which is not connected	
CODER PROBLEM	Error	All bundles must have the same coder rate	
DOUBLE ROUTE	Error	More than one timeslot is connected to the same destination timeslot	
EMPTY ADMINISTRATOR LIST	Error	The last administrator account is deleted from the user database	
ILLEGAL DEFAULT GATEWAY	Warning	In router mode, the default gateway is enabled, but no address has been defined	Only if Router Enabled
ILLEGAL DESTINATION IP ADDRESS	Error	Destination IP address for a bundle is not defined	
ILLEGAL DESTINATION TS	Error	Destination TS is out of range	
ILLEGAL RINGER PROFILE PERIOD #2	Error	One of the parameters in the second ringer period is set to zero; either both parameters must be set to zero, or both parameters must be set to non-zero values The first parameter represents the ring period of the second ring; the second parameter represents the silence period that follows the second ring	
ILLEGAL VLAN ID	Error	VLAN ID for a bundle is out of the legal range	
IN HDLC CISCO MODE - DISABLE UPLINK LOOP DETECTION	Error	In the Cisco HDLC mode, the uplink loop detection must be disabled	Uplink is Serial or E1/T1
MAIN LINK ROUTER'S INTERFACE HAS NO IP ADDRESS	Error	No IP address or a non-existent IP address has been assigned to the Main Link	Only if Router Enabled
MAIN LINK ROUTER'S INTERFACE HAS ILLEGAL MASK	Error	In router mode the main link's subnet mask is illegal	Only if Router Enabled
OFF HOOK AND ON HOOK BITS MUST BE DIFFERENT	Error	The same ABCD bits have been defined for On-hook and Off-hook modes	
PACKET REDUNDANCY GREATER THAN 2 IN G.711	Warning	If the Packet Redundancy value is greater than 2, when working with the G.711 coder, performance problems may occur.	
POLARITY AND METERING CAN'T BE ENABLED SIMULTANEOUSLY	Error	A connected bundle can use either reverse polarity or pulse metering, but not both	
TOO MANY CONFIGURED TS	Error	Number of timeslots assigned to carry voice exceeds the number of timeslots supported by the unit	

6.3 Handling Alarms

Vmux-210 detects fault conditions and initiates alarms and events to alert the user:

- **Alarms,** or **state alarms** have two statuses, ON and OFF. The alarm status changes to OFF, when a fault condition that caused it is cleared. Alarms have two levels of severity, minor or major: major alarms are more critical/dangerous to the system functionality.
- **Events,** or **event alarms** have only ON status and serve to notify the user that something important had happened, but not as dangerous to damage the system functionality.

The user can control the alarm severity that causes the ALM LED to turn on.

Alarm Buffer

Vmux-210 maintains two alarm buffers:

- **Temporary buffer**, represented as the Display All Alarms screen. All alarms, including active alarms, can be deleted from this display.
- **Permanent buffer**, represented as the Alarm Status screen. Only inactive alarms can be deleted from the Alarm Status screen.

An alarm simultaneously enters both the Display All Alarms log and the Alarm Status log, and the ALM LED lights to indicate the condition. In addition, Vmux-210 displays the ALARM ON indication in the top right-hand corner of the terminal screen. When the event that caused the alarm is cleared, the alarm status changes to OFF, enabling the alarm to be deleted from the permanent buffer.

Working with the Temporary Alarm Buffer

The temporary alarm buffer is represented as the Display All Alarms screen.

➤ **To display all alarms:**

- From the Main Menu, select **Monitoring > Alarms > Display All**.

  Vmux-210 displays the temporary alarm buffer. The display includes the alarm identification code, its severity, its status, and the generation date and time.

➤ **To display all alarms in the permanent buffer:**

- From the Main Menu, select **Monitoring > Alarms > Display Status**.

➤ **To delete all alarms from the temporary buffer and all inactive alarms from the permanent alarm buffer:**

- From the Main Menu, select **Monitoring > Alarms > Clear**.

List of Vmux-210 Alarms

Table 6-7 lists the Vmux-210 alarms according to their identification codes.

Table 6-7. Vmux-210 Alarms

ID Code	Terminal Message	Description	Severity
3	SWITCH OF DB Occurred	The Vmux-210 database has been replaced	Event
18	DB UPDATE Occurred	The Vmux-210 database has been updated	Event
44	FAN No. 1 FAILURE	Fan no. 1 not working	Major
45	FAN No. 2 FAILURE	Fan no. 2 not working	Major
60	DEFAULT DB LOADED ON STARTUP	No db or incompatible db existed in NVRAM on startup	Event
80	BPV ERROR HAS OCCURRED	A bipolar violation error has been detected on the E1/T1 port	Event
81	EXCESSIVE ERROR RATIO	The bit error rate of the port exceeds 1×10^{-3}	Major
82	ALARM INDICATION SIGNAL	AIS is being detected at the E1/T1 port	Major
83	EXCESSIVE BIPOLAR VIOLATION	Excessive BPVs at the E1/T1 port	Major
84	T1/E1 FRAME SLIP HAS OCCURRED	A frame slip occurred at the E1/T1 port	Event
87	T1/E1 SIGNAL LOSS	Loss of input signal at the E1/T1 port	Major
88	AIS RED ALARM	Local loss of frame synchronization at the E1/T1 port caused by AIS condition	Major
89	LOC SYNC LOSS (RED ALARM)	Local loss of frame synchronization at the E1/T1 port	Major
90	REM SYNC LOSS (YELLOW ALARM)	Remote loss of frame synchronization at the E1/T1 port	Major
92	NETWORK LLB	T1 uplink port entered Local Loopback mode following FDL command from network	Minor
93	NETWORK PLB	T1 uplink port entered Payload Loopback mode following FDL command from network	Minor
97	LOCAL MULTIFRAME ALARM	Local loss of multiframe synchronization at the E1 port	Minor
98	REMOTE MULTIFRAME ALARM	Remote loss of multiframe synchronization at the E1 port	Minor
100	CRC ERROR OCCURRED	CRC-4 error in the E1 port receive signal	Minor
130	MAIN LINK OVERFLOW	The required bandwidth exceeds the available bandwidth on E1/T1/Serial uplink	Major
131	TRUNK IS DOWN	A fault exists on the line. This alarm applies only to the serial main link port with the DTE clock mode configured and control signals enabled.	Major
132	UPLINK LOOP DETECTED	When working with E1/T1 or Serial uplink, a loop exists in the TDM network.	Major
195	BUNDLE IS OOS	Bundle is out of service due to the network connectivity problems	Major

6.4 General Troubleshooting

Table 6-8. General Troubleshooting

Trouble Symptoms	Possible Cause	Recommended Course of Action
All front panel indicators are OFF	The unit is not receiving power	Check that power is supplied to the unit. Check the fuse and replace it if necessary.
Intermittent voice	Low input voice may be intermittently identified as silence, and consequently suppressed by the DSP	Adjust gain levels (Tx and Rx).
Poor voice quality, garbled speech	1. Check if there is packet loss in the network (Monitoring›Statistics› Bundles›Packets Tracking)	Check why network is discarding packets. (Some possibilities are: excessive network jitter, massive mis-ordering, faulty network equipment, mismatch in Ethernet rates somewhere in the network (e.g. the Vmux is set to Auto Negotiate while the switch/router is forced to a specific rate that is not 10MbpsHalf, the default fallback in case the other party does not Auto Negotiate as well).
	2. Look for HDLC layer errors (CR, AB, NO etc.) on uplink if Serial/E1/T1 (TDM/Serial Uplink Statistics).	Check clocking, cabling, and physical interfaces between Vmux and the TDM network.
	3. Verify that the uplink bandwidth is sufficient. For Serial/E1/T1 uplink, check the Maximum Bandwidth under TDM/Serial Uplink Statistics. For Vmux-2100 with Serial/E1/T1, retrieve the stat.dat file (by TFTP) and examine the 4-day uplink bandwidth graph using the VmuxStat.exe application.	Adjust Bandwidth Control parameters (Vmux-2100). Increase uplink bandwidth if possible.
Voice is distorted and undergoes an extremely high delay (several seconds), syllables are excessively prolonged	Serial uplink bandwidth may be insufficient	Increase Serial uplink bandwidth.
Frequent single clicks are heard	Check the clocking configuration between the PBX and the remote Vmux-2100/110	Set the PBX to provide clock and Vmux-2100/110 voice module to LBT, or set the PBX to receive clock and Vmux-2100/110 voice module to INTERNAL.

Table 6-8. General Troubleshooting (Cont.)

Trouble Symptoms	Possible Cause	Recommended Course of Action
Problems when testing voice frequency tones using an external testing equipment	1. Verify that the tested tone is not one of the set of tones that is detected, relayed and regenerated by Vmux. These tones are: 1100/2100Hz (Fax & Modem tones), 2000Hz (if Custom Tone Detection parameter in the Vmux Voice Parameters configuration is enabled), DTMF tones, MFR2 tones (if MFR2 Relay is enabled on Vmux-2100).	Change the testing tome.
	2. If you are looping the transmitted test tone back from the remote Vmux using a loop, the Echo Canceller may be detecting this return signal and canceling it.	Disable the Echo Canceller during this test, or connect additional test equipment at the remote end instead of looping back to the tester at the local end.
Fax/Modem doesn't pass through	1. Fax/Modem relay may be disabled	Enable Fax/Modem relay. (Edit Bundle›Voice Parameters›Fax/Modem)
	2. Problems on physical layer of E1/T1 between remote Vmux-2100/110 and its local PBX	Verify that the clock source is correctly configured on the remote Vmux-2100/110, and that it does not report any physical layer E1/T1 alarms

6.5 Testing Vmux-210

The Vmux-210 diagnostic functions include:

- Tone injection on analog ports
- Remote loopbacks on analog ports or E1/T1 uplink
- Ping utility.

Tone Injection

The test tone is a data sequence at a rate of 1 kHz. This data sequence is identical to the data sequence that would have been generated if a 1 kHz signal having a nominal level 0 dBm were applied to the input of the channel speech processor. The tone should be received clearly by the corresponding subscriber connected to the PBX at the nominal receive level.

The tone injection is activated individually per timeslot. However, multiple tone injections can be run at the same time. Vmux-210 allows you to set the tone injection timeout causing the tone relay to deactivate automatically after the desired period of time.

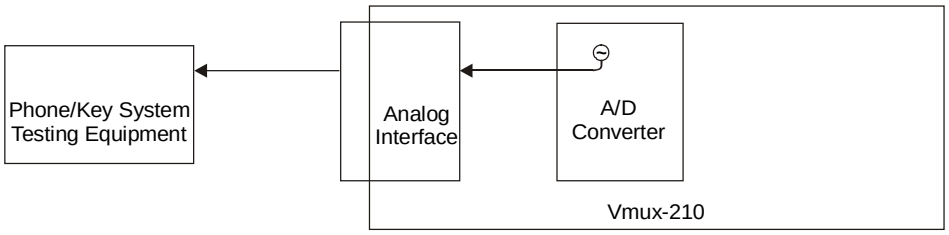


Figure 6-11. Local Tone Injection on the Voice Ports

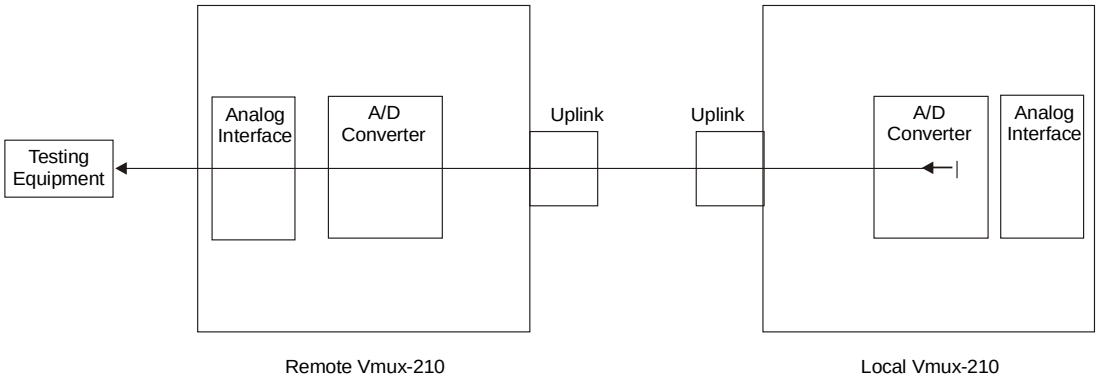


Figure 6-12. Remote Tone Injection on the Voice Ports

➤ **To activate tone injection:**

1. From the Main Menu, select **Diagnostics › Analog**.

   The Analog menu appears (see *Figure 6-13*).

2. From the Analog menu, select the port for the tone injection, and then select **Inject Tone Test**.

   The Inject Tone Test menu appears (see *Figure 6-14*).

3. Configure the desired parameters, according to *Table 6-9*.
4. Select **Activate**, then select **Yes**.
5. Repeat the procedure for all timeslots that you intend to test.

Note *You can display information on all tests running at a time by selecting Display Active Tests from the Diagnostics menu.*

```
Analog

 1. Inject Tone Test>
 2. Remote Loop Test>
```

Figure 6-13. Analog Menu

```
Inject Tone Test

 1. Channel [1 - 30] ... (1)
 2. Direction>   (Local)
 3. Time Out(seconds, 0=forever)[0 - 60]... (0)
 4. Activate>
```

Figure 6-14. Inject Tone Test Menu

Table 6-9. Inject Tone Test Parameters

Parameter	Description	Possible Values/ Reference
Channel	Selected channel for test	**1..30**
Direction	Direction of the tone injection	**Local** (see *Figure 6-11*) **Remote** (see *Figure 6-12*) Default: **Local**
Time Out (seconds, 0=forever)[	Tone injection timeout; period of time after which the tone injection stops automatically	**0..60** Default: **0** (no timeout)
Activate	Activates the tome injection test	

Loopback Tests

Vmux-210 supports the activation of remote loopbacks. The purpose of these tests is to determine the source of a break in the data flow.

Remote loopbacks on the voice ports test the internal connection between the voice port and the uplink. In this mode, data coming from the IP network is looped back to the network (to the remote side). See *Figure 6-15*.

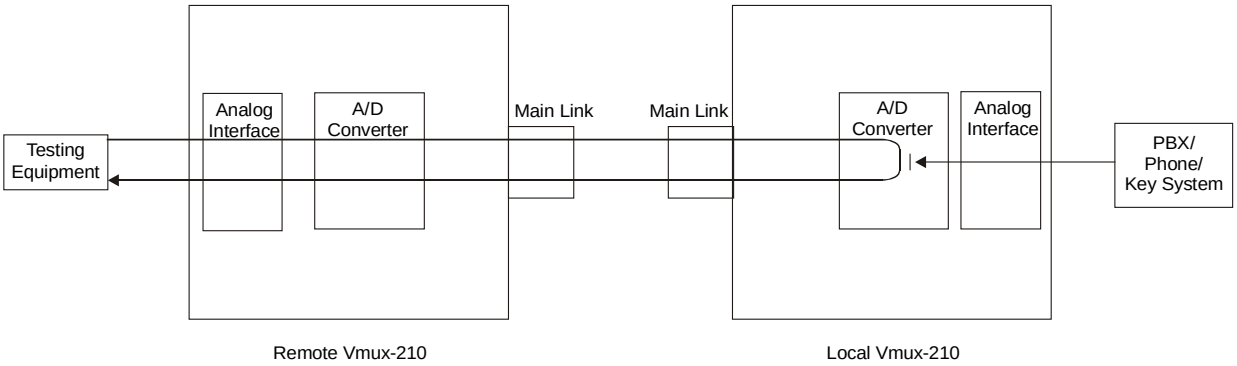


Figure 6-15. Remote Loopback on the FXS Analog Voice Ports

Remote Loopbacks on an Analog Channel

➤ **To perform a remote loopback on an Analog channel:**

1. From the Main Menu, select **Diagnostics** > **Analog** > **Remote Loop Test**.

   The Remote Loop Test menu appears (see *Figure 6-15*).

2. Select the desired port, and then select **Activate**.

```
Remote Loop Test

1. Channel[1 - 30] ... (1)
2. Activate>
```

Figure 6-16. Remote Loop Test Menu for Analog Channels

Table 6-10. Remote Loop Test Parameters

Parameter	Description	Possible Values/ Reference
Channel	Selected channel for test	1..30
Activate	Activates the loopback test	

Remote Loopbacks on an E1/T1 Uplink

➤ **To perform a remote loopback on an E1/T1 Uplink:**

- From the Main Menu, select **Diagnostics** > **E1/T1 Uplink** > **Remote Loop Test** > **Activate**.

Pinging Remote Devices

The ping utility is used to confirm IP connectivity by pinging other IP hosts. The connectivity is confirmed be receiving a reply from the remote (pinged) hosts.

➤ **To ping a host:**

1. From the Main Menu, select **Diagnostics** > **Ping**.
2. Configure the desired parameters, according to *Table 6-11*, and then select **Activate**.

```
Ping

 1. IP Address... (0.0.0.0)
 2. Number Of Pings[1 - 10]... (1)
 3. Send
```

Figure 6-17. Ping Menu

Table 6-11. Ping Parameters

Parameter	Description	Possible Values/ Reference
IP Address	Host IP address	Default: **0.0.0.0**
Number Of Pings	Desired number of pings	**1..10**
Send	Activates the ping test	

Displaying the Active Tests

The Vmux-210 management software allows you to display tone injection and loopbacks currently in progress.

➤ **To display all active tests:**

- From the Main Menu, select **Diagnostics > Display Active tests**.

  Vmux-210 displays a list of active tests, specifying the port being tested.

6.6 Frequently Asked Questions

Q: What is the meaning of BPV error, and what can be the reason for such an error?

A: A BPV error event on AMI-coded signal is the occurrence of a pulse of the same polarity as the previous pulse. A BPV error event for a B8ZS- or HDB3-coded signal is the occurrence of a pulse of the same polarity as the previous pulse without being a part of the zero substitution code.

A normal DS-1 signal uses Alternate Mark Inversion as the line code.

Q: Can the Vmux-210 Bundle Coder be changed remotely via Telnet? Will I have downtime while implementing this change?

A: Yes, the change can be done remotely via Telnet without any problem, although the bundle will be temporarily down for the period of change. The management connection in case of inband management is done over the main link and the bundles have no influence on this connection.

Q: I would like to use Vmux-210 over low quality TDM uplink (10^3 - 10^5); will I have a service problem using it?

A: The Vmux-210 application will work when using a low quality TDM uplink, but we cannot promise that service will not be affected. In case of a link of 10^3, there are two possible scenarios:

- The bundle will go down (depending on the setting of the connectivity parameters). Then there will be no service available (AIS will be generated on both sides) until the Bundle is re-established.

- The bundle will be up, but some packets will be lost. In this case the voice quality will be degraded and we will have temporary voice degradation. In addition, fax and modem transmission can be affected as well in case of packet loss.

In summary, we cannot guarantee in the worst-case scenario (10^3) that the Vmux-210 will be completely functional

Q: Can I use Signal-to-Noise ratio to measure voice quality in the Vmux-210?

A: When using IP traffic to pass voice, you cannot use the difference between the peak signal and the noise floor (i.e. SNR) to determine quality. You must use voice quality tests, such as MOS.

See also next question

Q: Why do I get poor results when measuring voice quality over Vmux-210 using PSQM?

A: PSQM (Perceptual Speech Quality Measurement) is not a suitable voice quality measurement technique for VoIP and voice compression systems that implement VAD (Voice Activity Detection) and Silence Suppression mechanisms. PSQM is not able to synchronize between the reference and recorded files when there are gaps of silence, hence the poor results.

Acceptable voice quality techniques for this purpose are PAMS (Perceptual Analysis Measurement System) and PESQ (Perceptual Evaluation of Speech Quality).

Q: After placing a loop on the E1/T1/Serial main link port of my Vmux-210, some IP problems started to appear. What is the reason for this behavior?

A: Due to the loop on the main link, all ETH/IP traffic sent out by the Vmux-210 is looped back into the internal switch and via the Vmux-210 ETH port to any LAN possibly connected to this Vmux. This erroneous condition will result in broadcast storms, which might cause:

- Bundle disconnections (on this Vmux-210 and on any other Vmux connected locally to the same LAN).
- Severe IP connectivity problems on the LAN connected to the ETH port of this Vmux-210.
- Blocking of the Vmux-210 ETH port by a Router/Switch on the local network, that has detected this loop.

In order to prevent the last two phenomena, it is advisable to enable the **Loop Detect** feature on both Vmux units.

Q: Can I test a Vmux-210 link using Voice Frequency test equipment?

A: Yes, with the following considerations:

- Since Vmux-210 applies compression on the voice traffic, there is no guarantee of single tone quality, hence the transmitted tones might suffer amplitude and/or phase distortions.
- Special tones that are detected by Vmux-210 relay mechanisms must be avoided:

- 1100 Hz (CNG) will cause the Vmux-210 to switch into fax-relay mode (if fax relay is enabled).
- 2100 Hz (fax/modem CED) will cause the Vmux-210 to switch into VBD (if modem relay is enabled).

Important: The above tones may be detected in the range of +/- 50 Hz (e.g. 1080 Hz can be detected as 1100 Hz). Therefore when testing voice frequency across Vmux-210, you should AVOID the following frequency ranges: 1050-1150 Hz, 1950-2150 Hz.

Q: Pressing the Flash button of the telephone set connected to the FXS port of the Vmux-210 does not result in the expected function of the PBX/PSTN. What is the problem?

A: The problem could be related to the Vmux-210 FXS ports setting.

The Flash signal is actually a short on-hook signal, used for many kinds of PBX/PSTN features. For example, in the call-waiting feature, during an ongoing conversation, pressing the flash will switch the subscriber to a waiting call.

Another example is the conference call. A subscriber engaged in a call can press the Flash button in order to put his remote party on hold and to call a second remote party. Once the second remote party answers the call, pressing the flash again will create a bridge enabling the three parties to have a conference call.

You can define the period of an On-hook/Off-hook action that will be recognized by the Vmux-210 as a Flash.

- From the Main Menu select **Configuration -> Physical Ports -> Analog -> Timeouts**

  The following screen appears:

```
Timeouts
---------



 1. Ring Timeout (sec)[60 - 600]... (120)
 2. On hook duration in Flash (msec)[10 - 2000]... (700)
```

Option number 2 is the on-hook duration for the Flash. The default value is 700 msec, meaning that during a call, if an on-hook state lasts between 0 and 700 msec, it will be handled as a Flash and the call will not be disconnected.

Q: What is the meaning of the fragmentation function in the Vmux-210?

A: By default, voice packets get priority over data packets arriving from the LAN user port. The transmission of frames through the main link (E1/T1/Serial only) is made in accordance with their priority. However, the prioritization mechanism cannot ensure a low transmission delay in case a high-priority packet (voice) arrives after the transmission of a long, lower priority packet (data) has begun.

In order to overcome this situation, the Vmux-210 uses the fragmentation feature. The fragmentation function enables the Vmux-210 to halt the transmission of a long, lower priority packet, and begin the transmission of a higher priority packet without waiting to finish the transmission of the lower-priority packet. The transmission of the lower priority packet is then resumed automatically after the transmission of the higher priority packet is completed. In essence, fragmentation allows the Vmux-210 to "chop" long packets in order to give higher priority to voice packets.

The size of the fragment packets is user-selectable.

Q: What is the end-to-end processing delay contributed by the Vmux-210 when working with different compression algorithms (Coders)?

A: The end-to-end processing delay contributed by the Vmux-210 is as follows:

- G723.1A (5.3/6.4 kbps) - 120-150 msec (depending on packet interval)
- G729.A/8 kbps - 70 msec
- G711.A/64 kbps - 45 msec

Please note that when used in an IP network, the Vmux-210 uses jitter buffers in order to compensate for packet delay variation. The jitter buffers are implemented in the Vmux-210 DSPs (Digital Signal Processors), and they are adaptive to the packet delay variation. Each timeslot has its own jitter buffer.

The size of the Vmux-210 jitter buffers is not user-configurable (with the exception of jitter buffers for transparent timeslots). The jitter buffer size is changed according to the packet delay variation, which is detected by the DSP. Each voice packet that is sent out of the DSP includes a time stamp. The DSP analyzes the time stamps on the received packets and controls the size of the jitter buffer according to the delay between the received packets. The delay variation tolerance is from 10 msec up to 300 msec.

Example: When using G.723.1 compression, the DSP expects to receive a packet every 30 msec. If the delay between the received packets is higher than 30 msec, the DSP will increase the size of the jitter buffer so that data will not be lost.

Q: What files can be transferred to/from Vmux-210?

A: See the following table.

Table 6-12. Vmux File Transfers

Vmux-2100	Vmux-110	Vmux-210	Direction	Purpose	Remarks
cnfg.dat	cnfg110.dat	Cnfg210.dat	From/To Vmux	Upload/Download configuration database	Requires DB UPDATE after file transfer.
vmux.img	vmux110.img	Vmux210.img	To Vmux	Update software version	Requires reset (or power cycle) after file transfer.
stat.dat	N/A	N/A	From Vmux	E1/T1/Serial main link BW statistics (constantly collected, saves 4 past days)	Statistics file can be displayed by VmuxStat.exe application.

Q: What UDP ports are used by Vmux-2100/110/210?

A: The value of the UDP ports in Vmux traffic are determined as follows:

1. DESTINATION Port: always 0x085E (=2142d)
2. SOURCE Port: composed of a combination of 3 bits (MSB) that depend on the Vmux model, and 13 bits (LSB) that reflect the destination bundle number.
   - Vmux-110: 001 (=1d) + Destination Bundle Number
   - Vmux-2100: 110 (=6d) + Destination Bundle Number

NOTE: Unlike IPmux - once set, the value of the source port does not change according to the bundle state.

Example:

Vmux-110/Bundle 1 opposite Vmux-2100/Bundle 3

In this case the UDP Source Port will be set as follows:

- Packets transmitted from the Vmux-110 (Dest. Bundle=3): 0010000000000011 = 8195d = 0x2003
- Packets transmitted from the Vmux-2100 (Dest. Bundle=1): 1100000000000001 = 49153d = 0xC001

Q: Which is more tolerant of network packet loss, TDMoIP or VoIP?

A: With VoIP, each IP packet holds voice samples from a single call, whereas TDMoIP bundles voice samples from multiple calls into larger packets. It would seem, therefore, that packet loss in the network would reduce voice quality with TDMoIP more than VoIP.
However, it appears that the truth is quite the contrary: TDMoIP will typically provide higher quality, lower latency voice and much better bandwidth efficiency than VoIP. The reasons are threefold:

1. Packetization delay is smaller with TDMoIP, so the effect of losing a packet is much less noticeable to the users.

2. TDMoIP requires significantly less bandwidth per voice call than VoIP, thus avoiding network congestion and the resulting packet loss.
3. When routers handle a large volume of small VoIP packets, a great deal of processing power is consumed. This introduces latency; and if the routers are overrun, then packets will be dropped and voice quality will suffer.

Q: Can I configure the Alarms LED to turn off automatically when there are no current active alarms?

A: Yes.

Starting from SW version 3.0x, the user can configure the alarm severity level that will activate the ALM LED. The following levels are available:

Event - The LED will turn ON whenever there is an "ON" alarm in the system, or whenever an event has occurred. Since events are not State alarms, they do not switch to the "OFF" state as soon as the problem that caused them is solved, and you will have to clean the alarm buffer in order to turn OFF the LED.

Minor - At this level, events do not turn ON the LED. As long as there are "ON" alarms in the device (minor or major) the LED will be ON, but as soon as all the state alarms are turned OFF, the LED will automatically turn OFF (no need to clean events from buffer).

Major - At this level, neither events nor minor alarms turn ON the LED. As long as there are major "ON" alarms in the device the LED will be ON, but as soon as the major alarms are turned OFF, the LED will automatically turn OFF. There is still no need to clean events from buffer.

The alarm severity is configured at the following path: **Configuration** › **System** › **Alarm Operations**. By setting the Alarm LED Severity to “Minor” instead of the default “Event”, the LED will remain turned ON only as long as there is an actual active alarm (whether it is Minor or Major).

6.7 Technical Support

Technical support for Vmux-210 can be obtained from the local distributor from whom it was purchased.

For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide.

This information can be found at RAD's Web site: http://www.rad.com/ (for offices location, click **About RAD** › **Worldwide Offices**; for distributors location, click **Where to Buy** › **End Users**).

Appendix A
Connector Pinouts

A.1 E1/T1 Uplink

Balanced E1/T1 Interface Connector

The balanced interface of the E1/T1 uplink terminates in an RJ-45 connector. *Figure A-1* illustrates the pin location in an RJ-45 connector, and *Table A-1* lists the E1/T1 connector pin assignment.

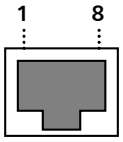


Figure A-1. RJ-45 Connector Pin Location

Table A-1. E1/T1 Balanced Connector Pinout

Pin	Function
1, 2	Receive (input)
4, 5	Transmit (output)

Unbalanced E1 Interface

When Vmux-210 is configured to operate with unbalanced E1 interfaces, it is necessary to convert each Vmux-210 RJ-45 connector to the standard pair of BNC female connectors used by unbalanced E1 interfaces.

For this purpose, RAD offers a 15-cm long adapter cable, CBL-RJ45/2BNC/E1, which has one RJ-45 plug for connection to the Vmux-210 E1/T1 connector and two BNC female connectors at the other end. Cable wiring is given in *Figure A-2*.

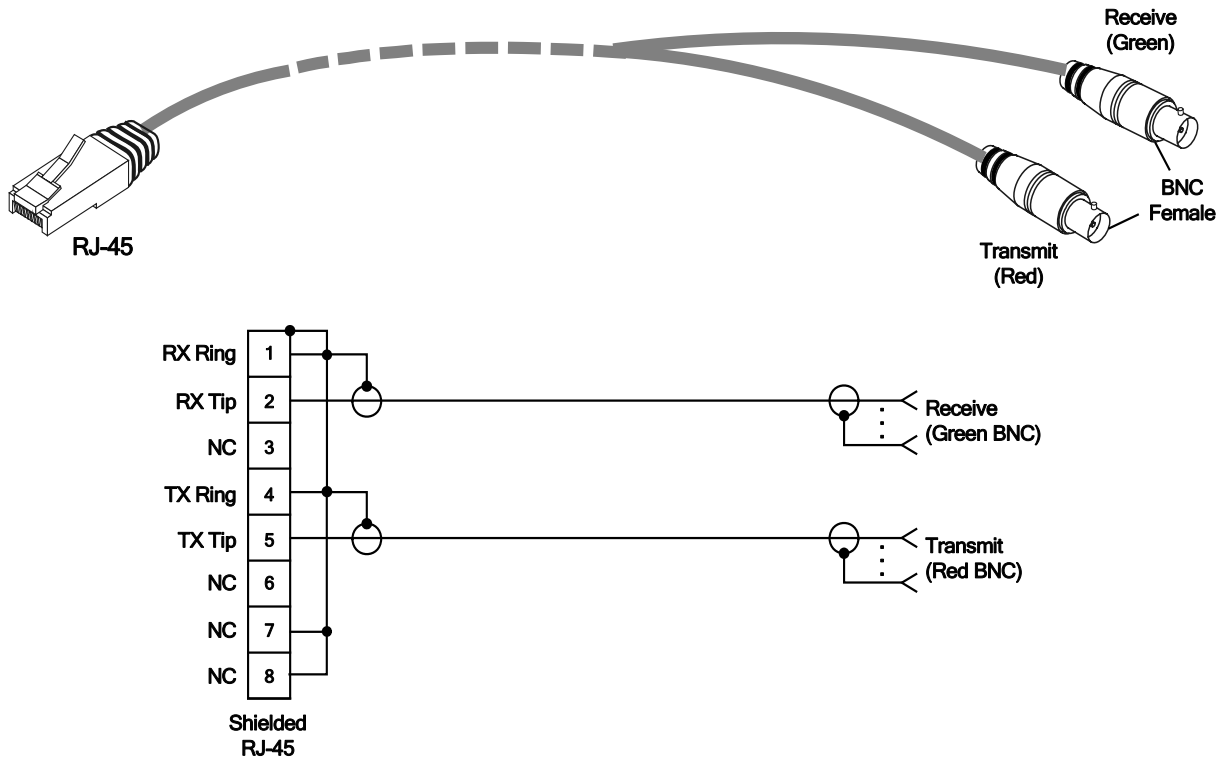


Figure A-2. E1 Adapter Cable, CBL-RJ45/2BNC/E1, Wiring Diagram

A.2 CONTROL Connector

The control terminal interface terminates in a V.24/RS-232 9-pin D-type female DCE connector. *Table A-2* lists the CONTROL connector pin assignments.

Table A-2. CONTROL Connector Pinout

Pin	Function	Direction
1	NC	
2	Receive Data (RD)	Out
3	Transmit Data (TD)	In
4	NC	
5	Ground (GND)	–
6	NC	
7	NC	
8	NC	
9	NC	

A.3 FXS Interface Connectors

The FXS interface of the 12-, 15-, and 24-channel versions terminates in a proprietary Telco-50 connector (ordering option). The interface of the 30-channel version terminates in a proprietary Telco-64 connector (ordering option). *Table A-3* and *Table A-4* list the pin assignment for the Telco-50 and Telco-64 connectors, respectively.

Table A-3. Telco-50 Connector Pinout

Pin Function	Pin Number	Pin Function	Pin Number
Tip Channel 1	26	Tip Channel 13	38
Ring Channel 1	1	Ring Channel 13	13
Tip Channel 2	27	Tip Channel 14	39
Ring Channel 2	2	Ring Channel 14	14
Tip Channel 3	28	Tip Channel 15	40
Ring Channel 3	3	Ring Channel 15	15
Tip Channel 4	29	Tip Channel 16	41
Ring Channel 4	4	Ring Channel 16	16
Tip Channel 5	30	Tip Channel 17	42
Ring Channel 5	5	Ring Channel 17	17
Tip Channel 6	31	Tip Channel 18	43
Ring Channel 6	6	Ring Channel 18	18
Tip Channel 7	32	Tip Channel 19	44
Ring Channel 7	7	Ring Channel 19	19
Tip Channel 8	33	Tip Channel 20	45
Ring Channel 8	8	Ring Channel 20	20
Tip Channel 9	34	Tip Channel 21	46
Ring Channel 9	9	Ring Channel 21	21
Tip Channel 10	35	Tip Channel 22	47
Ring Channel 10	10	Ring Channel 22	22
Tip Channel 11	36	Tip Channel 23	48
Ring Channel 11	11	Ring Channel 23	23
Tip Channel 12	37	Tip Channel 24	49
Ring Channel 12	12	Ring Channel 24	24

Table A-4. Telco-64 Connector Pinout

Pin Function	Pin Number	Pin Function	Pin Number
Tip Channel 1	36	Tip Channel 13	48
Ring Channel 1	4	Ring Channel 13	16
Tip Channel 2	37	Tip Channel 14	49
Ring Channel 2	5	Ring Channel 14	17
Tip Channel 3	38	Tip Channel 15	50
Ring Channel 3	6	Ring Channel 15	18
Tip Channel 4	39	Tip Channel 16	51
Ring Channel 4	7	Ring Channel 16	19
Tip Channel 5	40	Tip Channel 17	52
Ring Channel 5	8	Ring Channel 17	20
Tip Channel 6	41	Tip Channel 18	53
Ring Channel 6	9	Ring Channel 18	21
Tip Channel 7	42	Tip Channel 19	54
Ring Channel 7	10	Ring Channel 19	22
Tip Channel 8	43	Tip Channel 20	55
Ring Channel 8	11	Ring Channel 20	23
Tip Channel 9	44	Tip Channel 21	56
Ring Channel 9	12	Ring Channel 21	24
Tip Channel 10	45	Tip Channel 22	57
Ring Channel 10	13	Ring Channel 22	25
Tip Channel 11	46	Tip Channel 23	58
Ring Channel 11	14	Ring Channel 23	26
Tip Channel 12	47	Tip Channel 24	59
Ring Channel 12	15	Ring Channel 24	27
Tip Channel 28	61	Tip Channel 25	33
Ring Channel 28	29	Ring Channel 25	1
Tip Channel 29	62	Tip Channel 26	34
Ring Channel 29	30	Ring Channel 26	2
Tip Channel 30	63	Tip Channel 27	60
Ring Channel 30	31	Ring Channel 27	28

A.4 Ethernet Interface Connectors

The 10/100BaseT user and network port interfaces also terminate in RJ-45 connectors (previously illustrated in *Figure A-1*). *Table A-5* lists the Ethernet connector pin assignment.

Table A-5. Ethernet Connector Pinout

Pin	Signal	Function
1	TD (+)	Transmit Data (positive)
2	TD (-)	Transmit Data (negative)
3	RD (+)	Receive Data (positive)
6	RD (-)	Receive Data (negative)

Note

Ethernet ports support connection via straight and cross cables.

A.5 Serial Port

Serial Port Connector

The Vmux-210 Serial port terminates in an RS-530/DCE interface with a female DB-25 connector. *Table A-6* lists the pin assignment of the Serial port DB-25 connector.

Note the differences in the signal direction of the following pins, depending on whether the interface is configured by the user to DCE or DTE mode:

- Pins 8, 10, 12, 15

The Vmux-210 serial port is physically a DCE interface, and does not support an external Receive Clock. Therefore, when configured to DTE mode, the following pins are used in order to transmit/sample information to/from the modem:

- Pins 11 and 24 (External clock B, External clock A): Clock used for sampling the data signal received from the modem.
- Pins 12 and 15 (Transmit clock B, Transmit clock A): Clock used for transmitting data to the modem.

Table A-6. DB-25 Serial Port Connector Pin Assignment

Pin Number	Function	Direction
1	Ground Signal	–
2	TXDa	In
3	RXDa	Out
4	RTSa	In
5	CTSa	Out
6	DSRa	Out
7	Ground Signal	–
8	DCDa	Out (DCE) / In (DTE)
9	RXCb	Out
10	DCDb	Out (DCE) / In (DTE)
11	E-CLKb	In
12	TXCb	Out (DCE) / In (DTE)
13	CTSb	Out
14	TXDb	In
15	TXCa	Out (DCE) / In (DTE)
16	RXDb	Out
17	RXCa	Out
18	–	–
19	RTSb	In
20	DTRa	In
21	–	–
22	DSRb	Out
23	DTRb	In
24	E-CLKa	In
25	–	–

Additional interfaces are supported via interface adapter cables that convert the Vmux-210 Serial port's RS-530/DCE interface to the target Serial interface. *Table A-7* lists the supported Serial interfaces and the name of the associated Serial interface cable. The pin assignment of the Serial interface adapter cables are provided in the sections that follow.

Table A-7. Serial Interfaces Supported by Vmux-210

Serial Interface	Adapter Cable	Interface Adapter Cable Pin Assignment
RS-530/DCE	none required	–
RS-530/DTE	CBL-VM110/530/DTE	*Table A-8*
RS-530A/DCE	none required	–
RS-530A/DTE	CBL-VM110/530/DTE	*Table A-8*
V.35/DCE	CBL-VM110/V35/DCE	*Table A-9*
V.35/DTE	CBL-VM110/V35/DTE	*Table A-10*
X.21/DCE	CBL-VM110/X21/DCE	*Table A-11*
X.21/DTE	CBL-VM110/X21/DTE	*Table A-12*

RS-530/DTE Interface Adapter Cable

The CBL-VM110/530/DTE interface adapter cable converts the Vmux-210 Serial port into an RS-530/DTE Serial interface. The interface adapter cable terminates in a female D-25 connector. *Table A-8* lists the pin assignment at each end of the interface cable.

Table A-8. RS-530/DTE Interface Cable Pin Assignment

Pin on DB-25 Connector (Vmux-210 Serial Port Side)	Pin on DB-25 Connector (User Equipment Side)
1	1
7	7
22	23
6	20
23	22
20	6
10	10
8	8
19	13
4	5
13	19
5	4
11	9
24	17
12	12

Table A-8. RS-530/DTE Interface Cable Pin Assignment (Cont.)

Pin on DB-25 Connector (Vmux-210 Serial Port Side)	Pin on DB-25 Connector (User Equipment Side)
15	15
9	11
17	24
14	16
2	3
16	14
3	2

V.35/DCE Interface Adapter Cable

The CBL-VM110/V35/DCE interface adapter cable converts the Vmux-210 Serial port into a V.35/DCE Serial interface. The interface cable terminates in a male V.35 connector. *Table A-9* lists the pin assignment at each end of the interface cable.

Table A-9. V.35/DCE Interface Cable Pin Assignment

Pin on DB-25 Connector	Pin on V.35 Connector
1	A
3	R
16	T
2	P
14	S
24	U
11	W
17	V
9	X
15	Y
12	AA(a)
5	D
4	C
20	H
7	B
8	F
6	E

V.35/DTE Interface Adapter Cable

The CBL-VM110/V35/DTE interface adapter cable converts the Vmux-210 Serial port into a V.35/DTE Serial interface. The interface cable terminates in a male V.35 connector. *Table A-10* lists the pin assignment at each end of the interface cable.

Table A-10. V.35/DTE Interface Cable Pin Assignment

Pin on DB-25 Connector	Pin on V.35 Connector
1	A
3	P
16	S
2	R
14	T
24	V
11	X
17	U
9	W
15	Y
12	AA(a)
5	C
4	D
20	E
7	B
8	F
6	H

X.21/DCE Interface Adapter Cable

The CBL-VM110/X21/DCE interface adapter cable converts the Vmux-210 Serial port into an X.21/DCE Serial interface. The interface cable terminates in a female D-15 connector. *Table A-11* lists the pin assignment at each end of the interface cable.

Table A-11. X.21/DCE Interface Cable Pin Assignment

Pin on DB-25 Connector	Pin on D-15 Connector	Comments
1	1	
7	8	
4	3	Twisted
19	10	
8	5	Twisted
10	12	
15	6	Twisted
12	13	
2	2	Twisted
14	9	
3	4	Twisted
16	11	
24	7	Twisted
11	14	

X.21/DTE Interface Adapter Cable

The CBL-VM110/X21/DTE interface adapter cable converts the Vmux-210 Serial port into an X.21/DTE Serial interface. The interface cable terminates in a male D-15 connector. *Table A-12* lists the pin assignment at each end of the interface cable.

Table A-12. X.21/DTE Interface Cable Pin Assignment

Pin on DB-25 Connector	Pin on D-15 Connector	Comments
1	1	
7	8	
8	3	Twisted
10	10	
4	5	Twisted
19	12	
24	6	Twisted
11	13	
3	2	Twisted
16	9	
2	4	Twisted
14	11	

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Manual Name: Vmux-210 Ver. 1.1

Publication Number: 392-200-01/07

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