VCX-150

System Administrator's Manual

60X154A01-07 Rev. A

VCX-150

X.11 ⇒

2 25 STRAIGHT THRU TO CRT

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VCX-150 System Administrator's Manual

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Chapter 1

General Information

Introduction

The VCX (Virtual Circuit eXchange) system is a modular data communications system. The basic function of a VCX system is to allow terminal users to communicate with host computers. A VCX system consists of one or more chassis populated with hardware and software modules. The modular design of the VCX system allows for open-ended expansion in both system size and function. With a basic complement of modules, a single chassis functions as an expandable intelligent data switch. With additional hardware and software modules, VCX can be linked to form a data communications network in which each chassis functions as a switching multiplexer (see figure 1-1).

Using This Manual

This *VCX-150 System Administrator's Manual* describes how to install, configure, and use a VCX-150 system. Some familiarity with data communications is required to understand this manual. It is not intended that you read this manual from start to finish. New users should first read the following chapters of this manual: Chapter 1 – *General Information*; Chapter 2 – *System Overview;* Chapter 3 – *Installation*; and Chapter 4 – *Getting Started.* The rest of this manual is a detailed reference to the VCX system.

Concepts and Terminology

The terms *port*, *node*, and *network* can vary in meaning. In this manual, the following definitions apply:

A **port** is a VCX interface to other data processing equipment. Computers, terminals, and modems are examples of equipment that can be connected to a port. A port can be an asynchronous interface or a synchronous interface (trunk). Note that other data processing devices may also have a port or ports; however, in this manual the unmodified term *port* refers specifically to a VCX port, and the ports of other equipment are distinguished as *computer ports*, *terminal ports*, and so on.

A ***node*** is a group of ports at one location. Physically, a node consists of a VCX chassis with the hardware and software necessary to make the system work.

A ***network*** consists of nodes at different locations. Synchronous trunk lines interconnect nodes in a VCX network. Typically, a network allows multiple terminals to communicate with one or more remote computers.

Organization

The following information summarizes the contents of the ***VCX System Administrator's Manual:***

Chapter 1 – General Information

This chapter discusses the organization of the manual, presents examples of VCX networks, and lists the features of the VCX data communications system.

Chapter 2 – System Overview

This chapter contains a technical description of the VCX system and reference sections with data and specifications on the VCX chassis subassemblies.

Chapter 3 – Installation

This chapter describes the procedure for setting up a VCX system and preparing for configuration.

Chapter 4 – Getting Started

This chapter describes how to enter commands, set your terminal type, and enter a sample configuration consisting of one originating and one answering port.

Chapter 5 – Controlled Services

This chapter describes VCX services or functions that are generally used by a limited number of individuals such as the node or network supervisor. Restricting access is accomplished by security provisions discussed later in this manual.

The VCX services include:

- **AB Service.** The AB Service allows the system administrator to force all dual auto-connect users to either the A destination or the B destination. It also allows the system administrator to busy-out an entire chassis.
- **Broadcast Service.** The Broadcast Service allows the system administrator to transmit a message of up to 1000 characters or 23 lines to a port, to a group of ports, or to the entire network.
- **Busy Service.** The Busy Service allows the system administrator to render a port or series of physically contiguous ports out-of- service.
- **Configuration Service.** The Configuration Service allows the system administrator to define node operating characteristics. Through the Configuration Service, the system administrator specifies global

parameters (such as the installation name), port parameters (such as whether ports are for connection to user terminals or to another node), and access control parameters (which connection paths are allowed). A substantial portion of chapter 5 is dedicated to this extensive service.

- **Diagnostic Service**. The Diagnostic (Diag) Service allows the network administrator to place any port or trunk in a loopback state, send *Fox messages*, and to monitor data traffic.
- **Forward Service**. The Forward Service allows the system administrator to reroute connection attempts for a designated destination port to a different port or route through the network.
- **Greeting Service.** The Greeting Service allows the system administrator to enter a sign-on message for the node.
- **Load/Dump Service.** The Load/Dump Service allows the system administrator to load or dump the memory contents of a configuration module. A dump occurs when the memory of the module is transferred to a PC floppy, hard disk, another configuration module, or other third party media for storage. A load occurs when the stored configuration is transferred from storage media to a configuration module.
- **Logging Service.** The logging service reports all network activity for network monitoring, administration, and planning purposes. The Logging Service allows the system administrator to designate any port in a network to accumulate logged events and to select classes of events to be logged.
- **Mode Service.** A quick method to obtain current data on the name of the node, name of the active configuration, and PM slot location of the active configuration where applicable.
- **Performance**. Monitors trunk(s) quality and utilization, and reports at prescribed intervals to the system logger.
- **Print Service.** A versatile system to print all or part of a Configuration Storage Module and all or part of a target configuration to any printer connected to the network.
- **Reset Service**. The Reset Service allows the system administrator to reset a VCX port, virtual circuit, card, or chassis from a terminal.
- **Revision Service**. The Revision (Rev) Service allows the network administrator to list all of the cards and PMs in a chassis along with the card KOS revision and checksums.
- **Settime Service**. The Settime Service allows the system administrator to set the date and time for the node.
- **Status Service.** The Status Service allows the system administrator to monitor chassis and port activity.
- **Setup Service.** Provides a rapid configuration of a point-to-point statistical multiplexer.

Chapter 6 – User Services

This chapter describes VCX services that are intended for general use and that are usually granted open access.

User services include:

- **Fox Service**. The Fox Service continuously transmits a *quick brown fox* test message from the port to the attached terminal.
- **Loopback Service**. The Loopback Service echoes received data back to the attached terminal for test purposes.
- **Set Service**. The Set Service allows users to alter a subset of the configured parameters of their local port for the duration of a session. The changed parameters revert to their configured states when the user terminates the session or after a reset.
- **Time Service.** The Time Service displays the system date and time.
- **TM (Transparent Mode) Service**. The TM Service allows transparent uploading and downloading of binary files.
- **Who Service**. The Who Service displays the installation, port name, slot, and port number.

Appendixes

The appendixes include a summary of interface specifications, an ASCII code chart, configuration worksheets, and X.3/X.28 parameters, commands, X.21, PSTN and responses.

Conventions

This manual uses the following conventions:

User entries are shown in contrast to surrounding material. Within plain text, what you should enter is shown in ***boldface***. Within examples that contain system menus or prompts in boldface, what you should enter is shown in plain text, i.e., Prompt: response<CR>. *Italics* (with or without boldface depending on where they appear) are used for a generic descriptive sample entry such as *user_name*.

<CR> indicates a carriage return. The carriage return key may be labeled *RETURN*, *NEW LINE*, or *ENTER* on different terminals.

^ indicates a control character. To enter a control character, hold down the control key while pressing the character key. For example, *enter* ***^H*** means: (1) hold down the control key; (2) press the H key; and, (3) release the H key and the control key. The control key may be labeled *CTRL*, *CTL*, *CONTROL*, or *ALT* on different terminals.

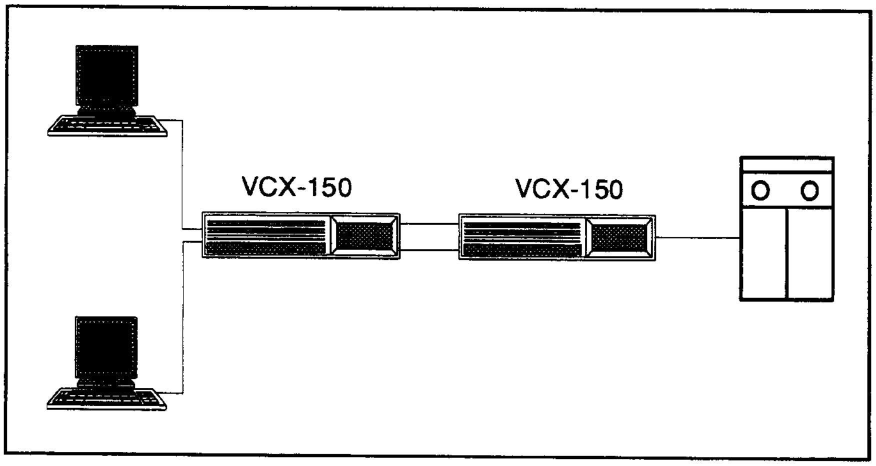
<BS> is the backspace key. The backspace deletes the previous character, allowing you to retype it. This key may be labeled *DEL*, *RUBOUT*, or *BACK-SPACE* on different terminals. **^H** can also be used as a backspace key.

<ESC> is the escape key. The escape key may be labeled *ESC*, *ESCAPE*, or *ALT* on different terminals.

Connect to: indicates the system connect prompt. The system displays the connect prompt when it is ready for you to enter a command. The default connect prompt is *Connect to:*; however, the system administrator can change or delete the connect prompt. For example, the actual connect prompt displayed could be "Next Request? or —>.

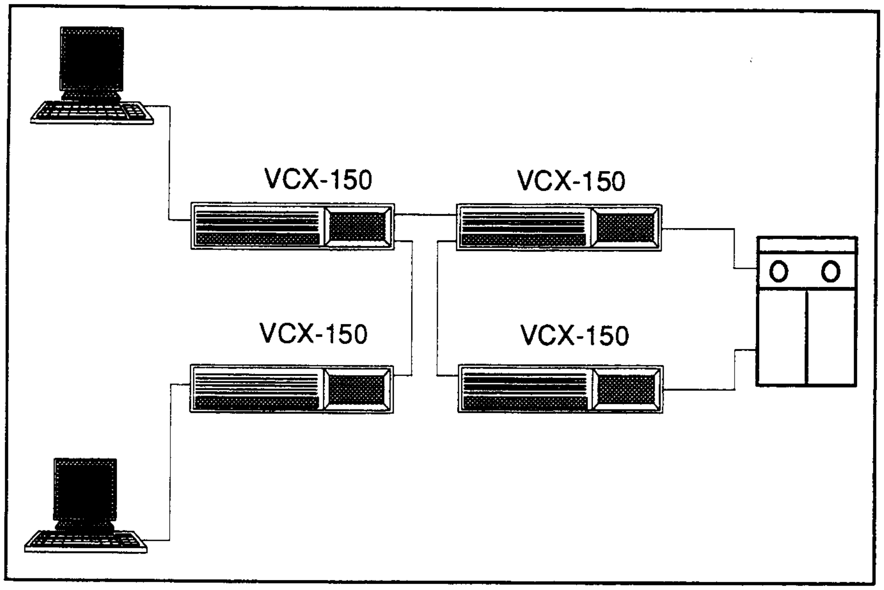
Network Examples

1) Point-to-Point Multiplexing with Dual Link Load Balancing - In this example, a pair of VCX-150s are interconnected providing a 'transport' of 16 channels between two nodes. This is a small but powerful network allowing user switching and contention. You can alternatively utilize the second trunk for security (i.e., if a port goes down) or for additional through-put. The two nodes depicted could be located within the same building or in different cities. This is illustrated in figure 1-1.



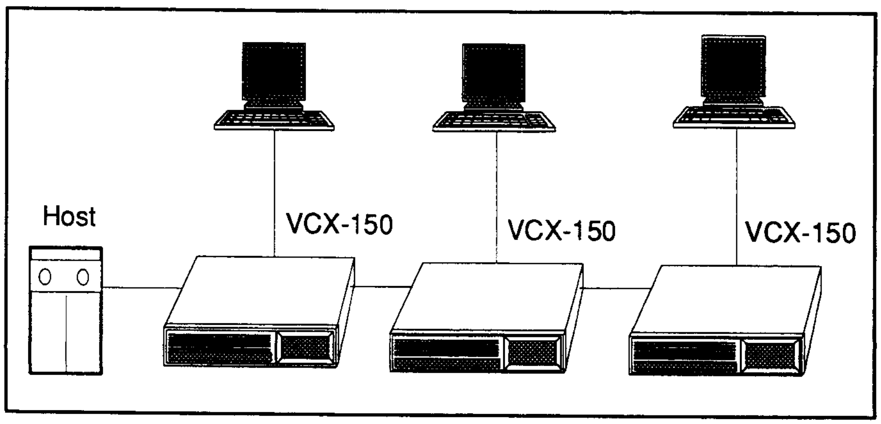
1-1. Point-to-point multiplexing w/balanced loading

2) Point-to-point Multiplexing With Larger Clusters - You may want more than 16 ports at a node. If so, the second trunk line can be used to link two local VCX-150s together, as shown in figure 1-2, thereby expanding each node to 32 ports. User switching and contention exist in these larger clusters as well.



1-2. Point-to-point multiplexing w/larger clusters

3) Multipoint Multiplexing - Instead of two nodes, you can have three or more within a network. Three nodes are linked to a single host in figure 1-3. The configuration might be: 4 ports at each VCX-150 connected to 12 host ports. Note: This is Multipoint Multiplexing, *not* multidrop.



1-3. Multipoint multiplexing

4) Feeders Into a Larger VCX Network - Larger networks are possible if VCX-150s feed into 5 or 19 slot VCX's, as illustrated in figure 1-4. The VCX-150s are totally *link compatible* with the VCX's, allowing for network expansion whenever the need arises.

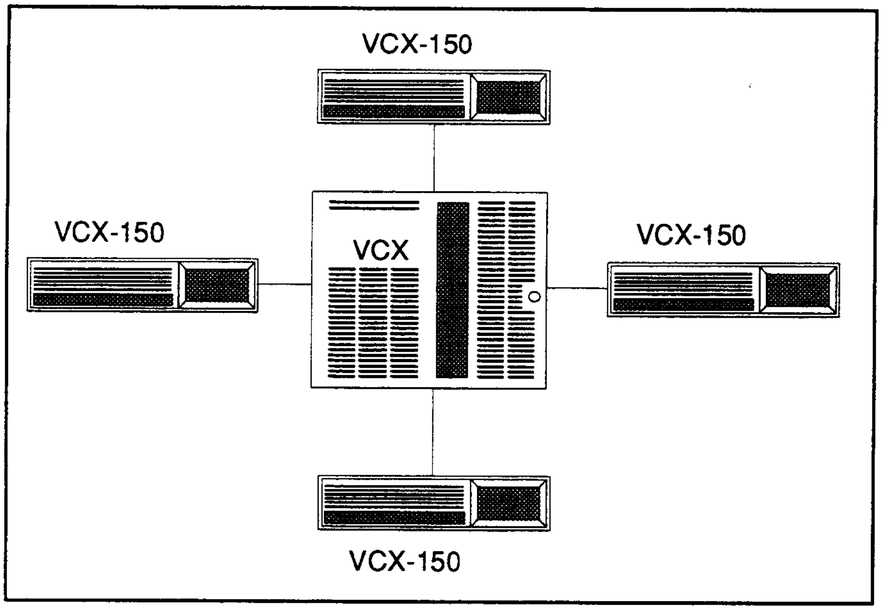
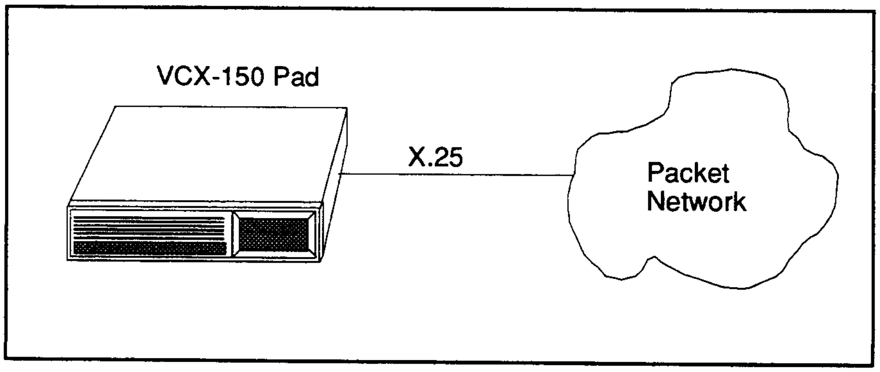


Figure 1-4. Feeders into a larger network

5) Interface to Packet Network - The VCX-150 has a X.25 software module that allows you to configure one or both of the trunk lines with X.25 handling capability. Once configured as X.25 compatible the VCX-150 can directly connect to a Packet Network such as Telenet, Tymnet, or Uninet. Connection to a Packet network is shown in figure 1-5.



1-5. Interface to a packet network

VCX Features

Port Selection (Switching)

A terminal user can request a connection to any destination port in the network, terminal ports can connect to other terminal ports, and computer ports can connect to other computer ports. Only the system administrator can restrict the user port connectivity using security provisions.

Single or Dual Sessions

A terminal user can establish two simultaneous connections and switch between destinations using the connect hold function.

Port Contention and Queuing

Originating ports can contend on a first-come-first-served basis for a limited number of destination ports. When all available ports for a computer are in use, the user is informed by placing the session in a queue and advising queue position. The terminal user can then wait for automatic connection when a computer port becomes free, or escape from the queue to go elsewhere.

Access Control

The system administrator can limit access to resources to any desired subset of originating ports in the network.

Distributed Switching

Originating ports can use various routes through the network to a destination. Distributed switching enhances network reliability by allowing connections to be routed around inoperative or congested parts of the network.

Line Card Intelligence

Each line card contains a 32/16-bit 68000 microprocessor. The processing capabilities of the 68000 assure fast program execution and system responsiveness.

Statistical Multiplexing

The synchronous line cards running proprietary multiplexing or X.25 protocol link the nodes in the VCX network. Hardware interfacing options include RS-232 (V.24), V.11, and V.35. Link transmission is error-free, using an HDLC protocol with a 16-bit Cyclical Redundancy Check and ARQ (Automatic Retransmission reQuest) error correction.

Virtual Circuits

Multiplexed trunk lines support up to 250 virtual circuits or communications channels each.

Public Network Access

The X.25 PAD (Packet Assembler/Disassembler) implementation is certified for connection to the Canadian Datapac, UK PSS , and US Tymnet and Telenet and other major worldwide Public Data Networks. Also, X.25 can be used for any application requiring X.25 compatibility, such as direct connection to X.25-compatible CPU ports. The X.25 trunk can support up to 64 logical channels.

Soft Configuration

The system administrator configures a node or network from a control terminal. There are no DIP (Dual In-line Package) switches to set or configuration PROMs (Programmable Read-Only Memory chips) to replace.

Remote Network Control

System administrator services for any node are accessible from any terminal in the network. Access via a dial-up modem is also possible; however, for security reasons, access to network control can be limited to any desired subset of ports in the network.

Security

Access rights can be assigned to answer ports, originate ports, trunk lines, and system services. They can serve as a security measure, allowing the system administrator to restrict the access of a user to specific services, computer ports, and trunk lines.

Menu-Driven Services

Services feature user-friendly menu-driven operation.

Programmable Directories

Programmable directories can be created that are automatically displayed when a user attaches to the system.

Programmable Help Resources

One or more programmable help screens can be created that can be called up by any user.

Broadcast Service

The Broadcast Service allows the system administrator to transmit a message of up to 1000 characters to any Originate or Both port. There are two types of broadcast messages: (1) a routine message, which is delivered to a selected port but may be filtered out by that port, and (2) an urgent message, which can not be refused by a port and is always delivered.

Logging

The logging function reports nodal activity for monitoring, administration, and planning purposes. A printer is usually connected to the logging port. The printer provides for hard copy of the system log. Logging information from all nodes in the network can be merged onto one logging printer; this is a powerful feature, giving the system administrator a means of monitoring events throughout the network. Alternatively, a logging printer can also be assigned to each node.

Status

The Status Service allows selective monitoring of chassis, card, or port activity from any terminal in the network.

Terminal User Diagnostics

The Fox Service transmits a test message to the terminal. The Loopback Service echoes received data for test purposes.

System Administrator Diagnostics

Ports and trunks can be placed in local/remote loopback to diagnose network problems. Any asynchronous port can be monitored to troubleshoot user application problems.

Load/Dump

This utility allows the system administrator to store the contents of a configuration module on a PC and subsequently to read it back into a configuration storage module anywhere in the network.

Port Busy

The system administrator can render a port or series of ports temporarily out-of-service. This feature allows parts of the network to be taken down for maintenance without physically disconnecting equipment.

Call Forwarding

The Forward Service reroutes all connection attempts for a designated destination port to a different port or route through the network. This service is especially useful if the network has compatible computers, one of which is down. Terminal users will be transparently connected to the backup computer.

Remote Reset

The Reset Service allows the system administrator to reset a port, card, or an entire chassis from a terminal located anywhere in the network.

Speed Connect

The system administrator can create speed connect names for users to simplify complex routes through the network.

High Speed Asynchronous Ports

These ports communicate at speeds up to 19,200 baud.

Transparent Operation

Binary ASCII data can be uploaded or downloaded between asynchronous ports, employing a user-specified escape sequence to revert to normal data transfer mode.

Autobaud

Upon user entry of one or two carriage returns, the asynchronous ports can automatically detect the following baud rates: 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600 and 19,200 bps (bits per second).

Echo

The asynchronous ports can provide a local echo to the terminal.

Flow Control

Supports XON/XOFF, DC1/DC2, RTS/CTS, ENQ/ACK, HEX 91/93, FF/FE, HEX 94/93, Data General, and T-pause flow control protocols.

Inter-Port Conversions

When a connection is established between async ports using different baud rate, parity, flow control or stop bit settings, inter-port conversions of these parameters are automatically performed.

Modem Support

Dial-in or dial-out modems are fully supported.

Automatic Connection

A terminal port, upon attachment, can be automatically routed to a given destination. Dual auto-connection can also be configured to allow the user to hot-key between two fixed computer ports.

Channel Priority

The system administrator assigns one of four composite line channel priorities to each Originate port. Higher priorities enhance system responsiveness for interactive devices such as terminals.

Break Key Pass-Through or Intercept

A BREAK can pass through to the other end of a connection, or can be intercepted. Ports can be individually configured to ignore a BREAK or to interpret it as a command.

Inactivity Disconnect

Automatic terminal disconnection can occur after a specified period of inactivity. This feature prevents destination ports from being monopolized by users who fail to disconnect. The system administrator can set the inactivity timeout from 1 to 255 minutes, or select *0* to disable inactivity timeout.

Attach/Detach Strings

The system administrator has the option of transmitting a string to an Answer or Originate port when a specific port is either attached or detached. The string can contain alphanumeric characters and/or control codes such as CR, LF, etc. Such strings can be used for automatic logging onto computer applications, dialing a remote modem, etc.

Alarms

Thresholds can be set to trigger minor and major alarms, and to be recorded at a user-selectable logging port.

Trunk Monitor

Utilization and error statistics can be automatically gathered on any trunk or set of trunks in a node.

Configuration Control

Software and hardware can be interrogated for type, revision, and checksums.

Chapter 2

System Overview

Introduction

The hardware and software components selected for a VCX-150, determines its capabilities. Components that are available for a VCX-150 include:

Hardware

- VCX-150 Base Unit
- 6 port expander
- Low speed trunk
- High speed trunk

Software

- Multiplexing software module
- X.25/muxing software module
- XNET/multiplexing software module
- XNET/multiplexing/X25 software module

These components are described on the following pages.

Hardware

VCX-150 Base Unit (Product No. 4601-01)

The VCX-150 Base Unit consists of an enclosure, a main card with 4 asynchronous ports, 2 RS-232 trunk I/O's, a cooling fan and an internal power supply. The main card contains 512K of RAM for configuration storage and the down loading of ROM tasks. It requires a low or high speed trunk card and software to function as a switching multiplexer.

6 Port Expander (Product No. 4604-01)

The expander consists of a card with 6 asynchronous ports. Either one or two expanders can added to a VCX-150 Base Unit. Since the Base Unit has 4 asynchronous ports, the addition of one expander increases the available ports to 10; two expanders increases the available *async* ports to 16. The expanders draw their power from the Base Unit as well as use its unit processor.

Dual Low Speed Trunk (Product No. 4603-01)

This is a single card which draws power from the Base Unit and uses the Base Unit's processor for the multiplexing and de-multiplexing of data. It provides the logic which allows the proper operation of two RS-232 trunks.

Dual High Speed Trunk (Product No. 4603-02,-03,-04,-05)

This is a single card with its own processor, drawing power from the Base Unit. Any one of four types of dual high speed trunk ports can be used with the Base Unit:

- 4603-02 - one V.35 / one RS-232 trunk I/O
- 4603-03 - two V.35 trunk I/O's
- 4603-04 - one V.11 / one RS-232 trunk I/O
- 4603-05 - two V.11 trunk I/O's

Rack Mount Installation Kit (Product No.4610-01)

The Rack Mount kit contains complete materials to install a VCX-150 into any standard 19 inch equipment rack. (See chapter 3 *Installation*, instructions.)

Software

Multiplexing Software Module (Product no. 4602-02).

The Multiplexing Module contains the aggregator/deaggregator, multiplexing manager, and other software to be run on synchronous cards of different types.

X.25/Muxing Software Module (Product No. 4602-03)

The X.25/Muxing Software Module has all the muxing capabilities of the Multiplexing Module plus the software necessary to allow a trunk to be X.25 Level 3 compatible.

XNET/Muxing Software Module (Product No. 4602-04)

This module contains all of the Multiplexing Module software plus the network management features of XNET.

XNET/Muxing/X.25 Software Module (Product No. 4602-05)

This module contains all of the X.25/Muxing Module software plus the network management features of XNET.

VCX-150 Technical Specifications

Ports:

Number 4, 10, 16
Interface RS-232/V.24, DCE, Async
Control signals DTR, DSR, RTS, CTS, DCD
Speed 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600, 19,200 bps fixed; AUTOBAUD to 19,200 bps

Trunks:

Number 2
Interface RS-232/V.24, DTE, Sync
V.11, DTE, Sync
V.35, DTE, Sync
Control signals DTR, DSR, RTS, CTS, DCD
Protocol HDLC proprietary; compatible with VCX series, X.25 (level 3) with X.25 software
Speed Internal RS-232 1200, 2400, 3600, 4800, 7200, 9600, 19,200 bps;
V.11/V.35 1200, 2400, 3600, 4800, 7200, 9600, 19,200, 38,400, 56,000, 64,000 bps
External speed 0 – 72,000 bps

General:

Voltage 110 VAC (220 VAC optional), 47 through 63 Hz
Power 100 WATTS (fully loaded with 16 ports)
Weight 18 lbs. (8.2 kg)
Size 3.95"H x 17.25"W x 16.45"D
Environmental 0 to 40 degrees C operating; -20 to 70 degrees C storage

Table 2-1. VCX-150 LED Indicators

LED Indicator	Description
RDY (Ready)	Power on indicator
CHK (Check)	Card down indicator
LED 1—CON (Connection)	ON when a connection is active on the card
LED 2—PR3 (Priority 3)	ON for a priority 3 task running on the card
LED 3—PR2 (Priority 2)	ON for a priority 2 task running on the card
LED 4—PR1 (Priority 1)	ON for a priority 1 task running on the card
LED 5—ERR (Error)	ON for system bus error
LED 6—BUS	ON for system bus input/output
LED 7—MSG (Message)	ON for message activity
LED 8—IDL (Idle)	ON for task idle
TRUNK 1	ON when trunk is not operational
TRUNK 2	ON when trunk is not operational

Table 2-2. Async Port Interface (DB-25S–25)

RS-232C	Interface
1	Frame ground
2	TXD (input)
3	RXD (output)
4	RTS (input)
5	CTS (output)
6	DSR (output)
7	Signal ground
8	DCD (output)
9	+12V
10	–12V
20	DTR (input)

Table 2-3. Trunk Interface RS-232/V.24 (DB-25S–25)

RS-232	Interface
1	Frame ground
2	TXD (output)
3	RXD (input)
4	RTS (output)
5	CTS (input)
6	DSR (input)
7	Signal ground
8	DCD (input)
9	+12V
10	–12V
15	TXC (input)

RS-232	Interface
17	RXC (input)
20	DTR (output)
24	EXT TXC (output)

Trunk Interface V.11

The adapter cable (Product No. 4864-01) is supplied with the High Speed Trunk card. The cable with pinouts is shown in figure 2-0.

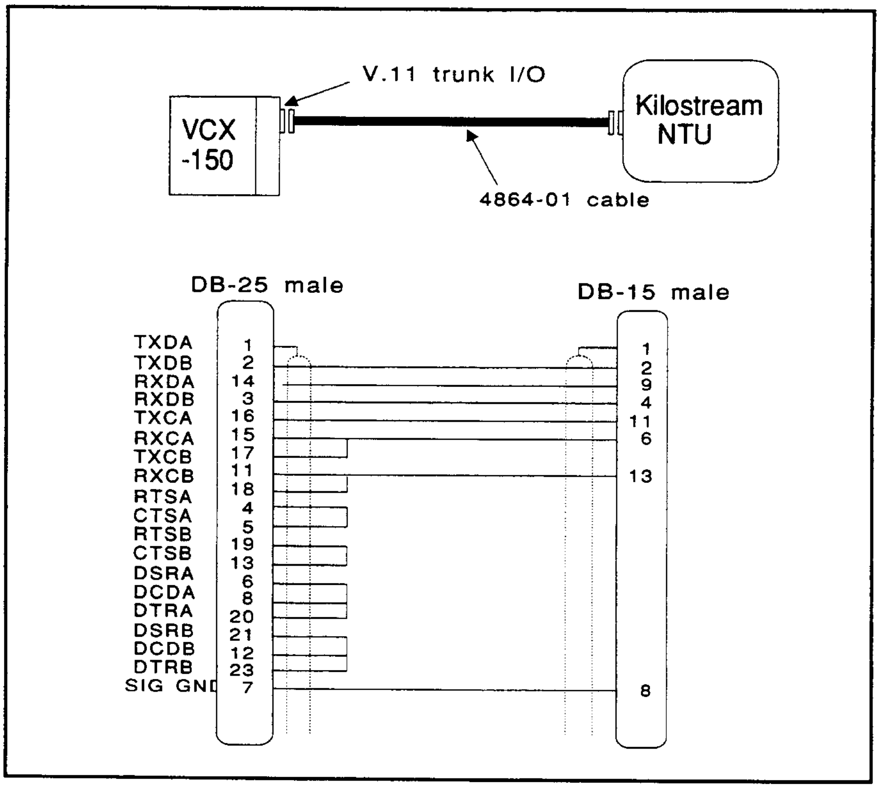


Figure 2-1. V.11 trunk interface cable with pinouts

Trunk Interface V.35

The adapter cable (Product No. 4865-01) is supplied with the High Speed Trunk card. This cable and pinouts are shown in figure 2-2.

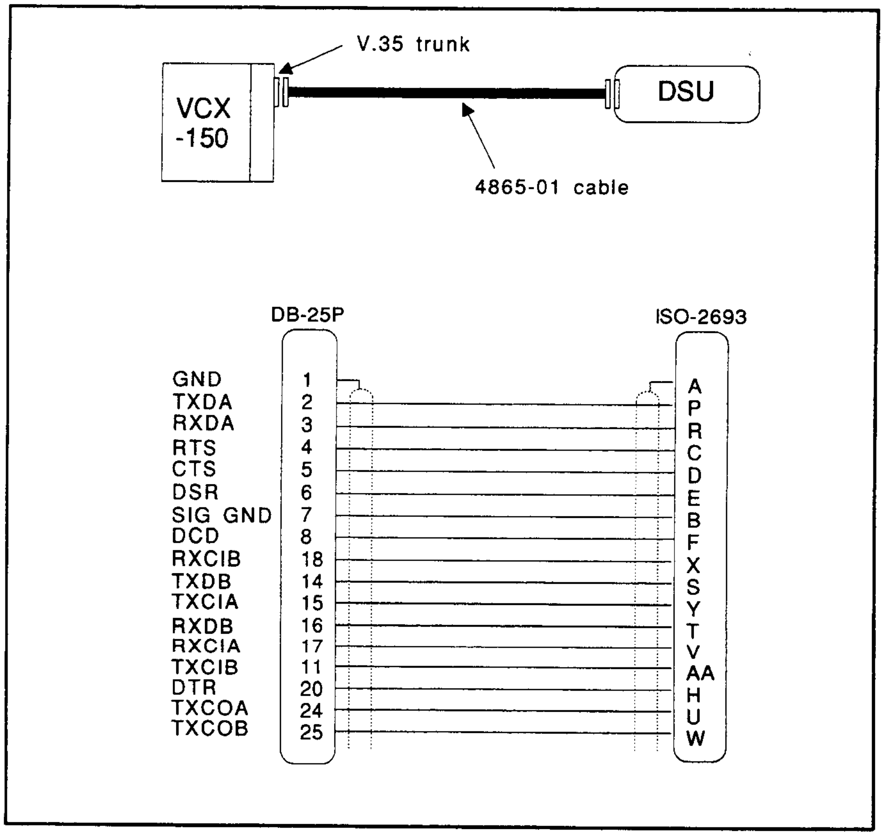


Figure 2-2. V.35 trunk interface adapter w/pinouts

Chapter 3

Installation

Unpacking

The VCX-150 is shipped with proper shock insulation material. If the unit must be returned for any reason, the original shipping carton should be used. Failure to comply may result in voiding the equipment warranty.

Is Everything There? After opening the shipping carton, check the contents. Besides this Manual, there should be all of the items that were ordered. Verify with your ordering information. NOTE: If a high speed trunk card was ordered, the appropriate adapter cables will be included (see *Page 2-7).*

Is The VCX-150 Damaged? Inspect all the items for damage that may have occurred during shipment. If there is damage, contact the shipping agent. If further questions exist regarding damage or missing parts, contact Penril Data-Comm.

Operating Environment

The VCX-150 is designed to work in regular office environments without any special temperature compensation or air filtration equipment. A grounded (3 prong) plug is attached to the unit for connection to a 120 VAC branch circuit. Export units, available as an option for 220 VAC operation, are supplied with an unterminated power cord allowing a host country plug cap to be attached.

In addition, the rear panel is marked just below the port connectors with the following message:

> **"WARNING: Connect only apparatus complying with BS6301 to the ports."**

The following message applies to UK installations only.

> **This apparatus has been tested and found to comply with BS6301, and thus does not in itself constitute a hazard to the telecommunications network. However, it is necessary to warn users that interconnection directly, or by way of other apparatus, of ports marked "WARNING: Connect only apparatus complying with BS6301 to the ports", with ports not so marked may produce hazardous conditions on the public telecommunications system and advice should be obtained from a competent engineer before such a connection is made.**

Installation Steps

The installation of the VCX-150 is straight-forward. Note that the VCX-150, when powered up, will self test RAM, EPROM, UARTS and the USART. The results of this test can be displayed using the "Status Service", as discussed in chapter 5 of this manual.

Step 1) Set your terminal/monitor to the following parameters: DC1/DC3 flow control, 8 data bits, no parity and a bit rate of 75 - 19,200 bps.

Step 2) Connect your terminal/monitor to port 1 on the VCX-150 using the terminal manufacturer's cable.

Step 3) Connect the VCX-150's power cord to a properly grounded AC outlet (Do not use a 3-prong to 2-prong cheater). Then turn the rear panel power switch ON.

Step 4) A button must be used to set the VCX-150 to the default configuration. To reach the button, remove the VCX-150's front panel (bezel). It is located on the lower right corner of the VCX-150. Hold the button in, while you power down the VCX-150 and power it back on again. Keep it depressed (approximately 5 secs) until three characters appear on the terminal monitor.

> **Note:** The bezel is removed by firmly holding either side of the front panel and pulling the panel directly toward you.

Step 5) When configuring the VCX-150 for the first time, it is wise to initialize it, erasing any configurations which may have been written into RAM during the factory test. How is this done? The first menu displayed after you enter the Configuration Service looks like the following example:

1) ADD/ MODIFY configurations, user lists or texts
2) INITIALIZE configuration
Enter selection [or ESC to exit]

You should select option *2* to *initialize* the configuration.

Step 6) Proceed with the remainder of the configuration. Once you have configured and then selected a configuration on the VCX-150, it will automatically boot with that new configuration. Both the *Getting Started* chapter and the *Configuration Service* chapter discuss the *how to* of configuration.

Step 7) Connect the remaining trunk and terminal/modem cables to the appropriate VCX-150 port connectors. Note: See the next subsection *Cable Requirements*.

Note: *If the VCX-150 is to be connected to an X.25 Packet Network, then the VCX-150 must have a X.25 software module installed (Product No. 4602-03).*

Cable Requirements

Each VCX-150 trunk interface always appears as DTE (Data Terminal Equipment). While each VCX-150 *async* port interface always appears as DCE (Data Communication Equipment). Due to these differences, different cables are required to attach the interfaces to modems, terminals, and other VCX- 150's. There are four cabling arrangements that are used with the VCX-150. They are:

1) A cable that links the trunk port of one VCX-150 to a trunk port of another VCX-150, thereby allowing two VCX-150s to communicate (Product No. 4859-01). See *figure 3-1*.

2) A cable that links the trunk port of a VCX-150 to an external modem (Product No. 4852-XX). See *figure 3-2*.

3) A cable that links the asynchronous port of a VCX-150 to an external modem (Product No. 4854-XX). See *figure 3-3*.

4) A cable that links the asynchronous port of a VCX-150 to a terminal/monitor (Product No. 4852-XX). See *figure 3-2*.

Figure 3-1 illustrates a VCX-150 to VCX-150 3-foot crossover cable, (product no. 4859-01 - 3 feet.).

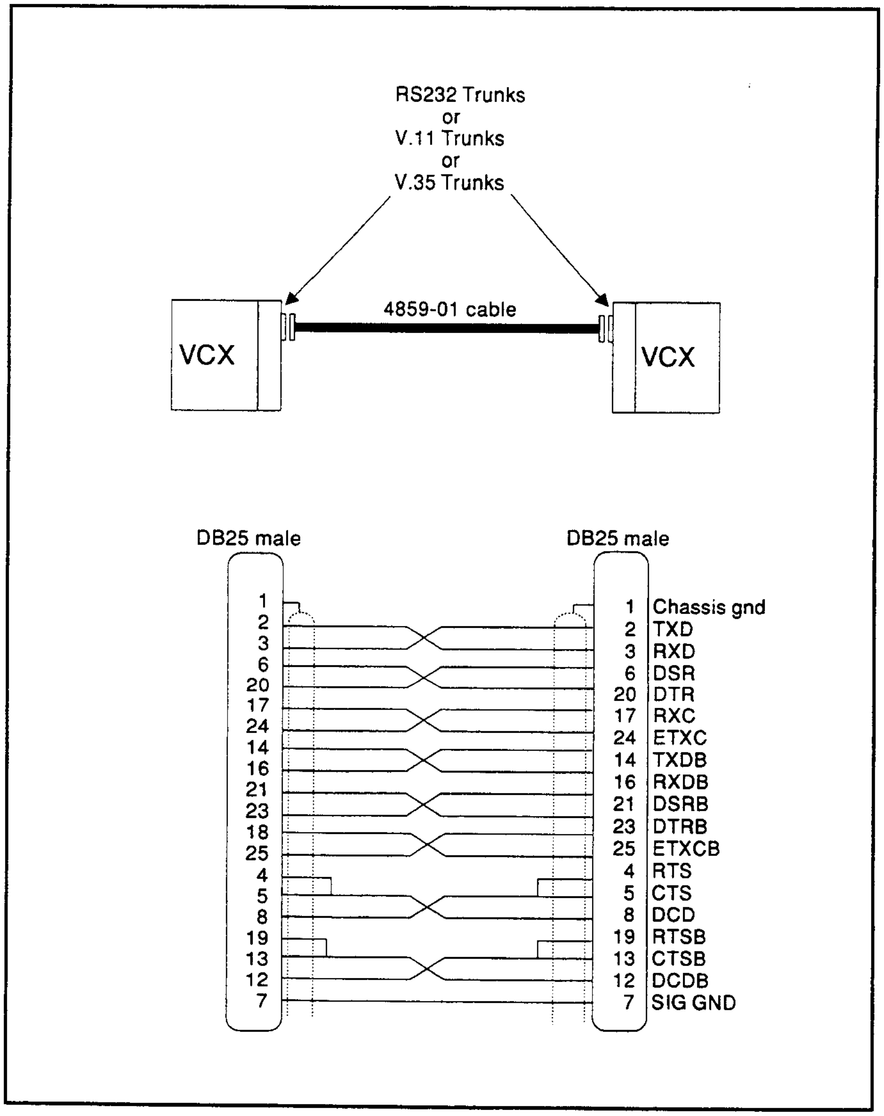


Figure 3-1. Crossover cable w/pinouts

A DTE to DCE cable is shown in figure 3-2. Product no. 4852-01 is a 10 foot cable, Product no. 4852-03 is a 30 foot cable and Product no. 4852-05 is a 50 foot cable.

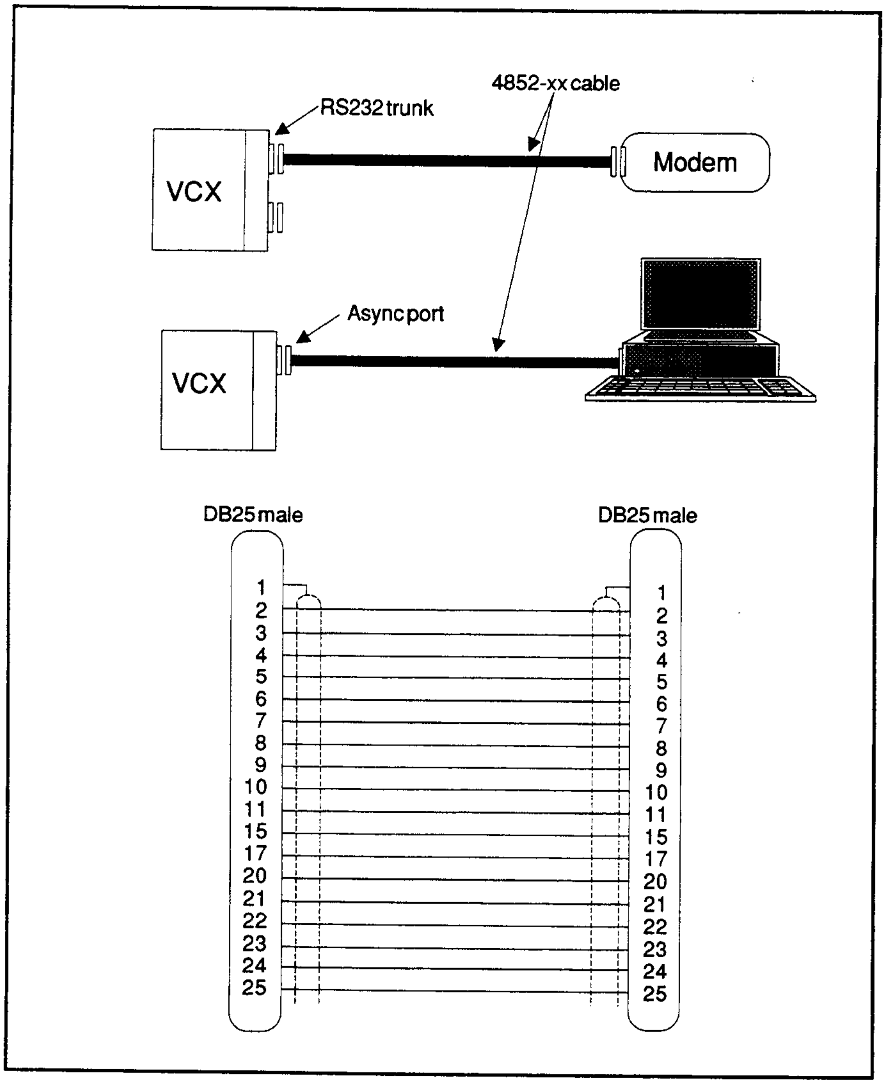


Figure 3-2. Async port extention cable with pinouts

Figure 3-3 illustrates an Asynchronous Port Crossover cable, which is Product No. 4854-01 for a 10 foot cable, Product No. 4854-03 for a 30 foot cable, and Product No. 4854—05 for a 50 foot cable.

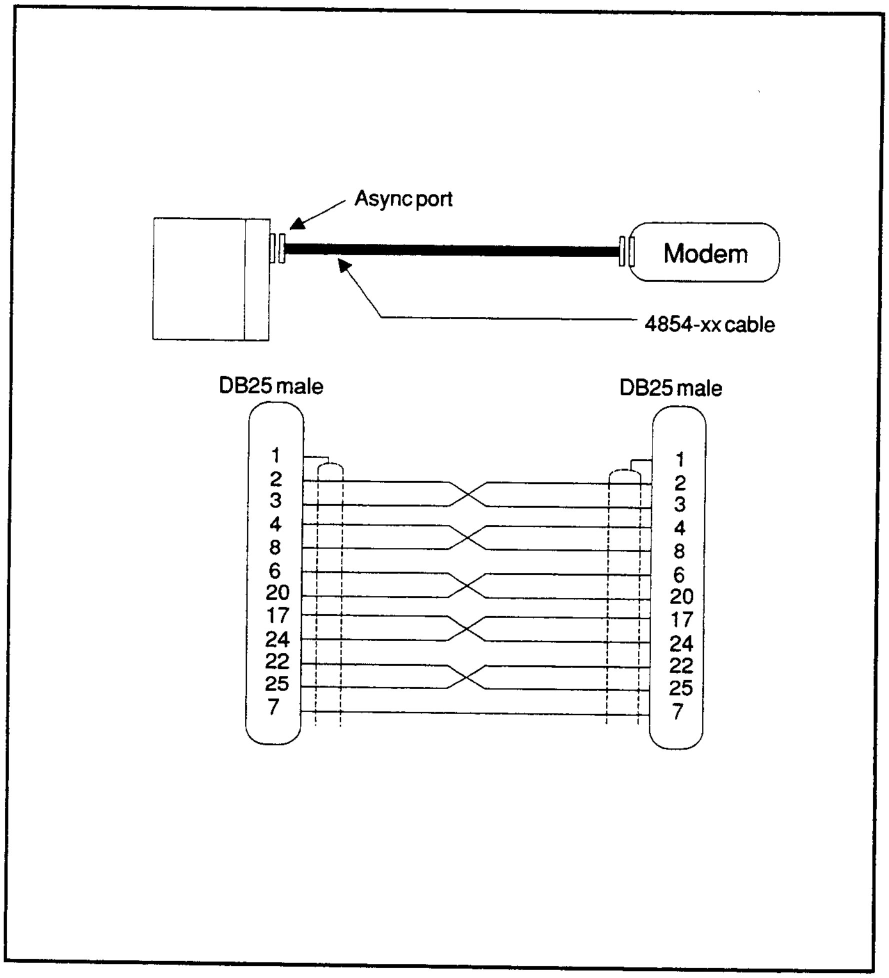


Figure 3-3. Async port crossover cable with pinouts

VCX-150 Rack Mount Installation

The VCX-150 may be rack mounted using product 4610-01 rack mount kit. The assembled kit is shown in figure 3-4. Installation steps follow.

Note: This installation kit is designed to accommodate a variety of rack cabinet depths. The rear support brackets shown in figure 3-4 should be mounted to the right and left mounting brackets to produce an over-all length which matches the depth of the rack to be used.

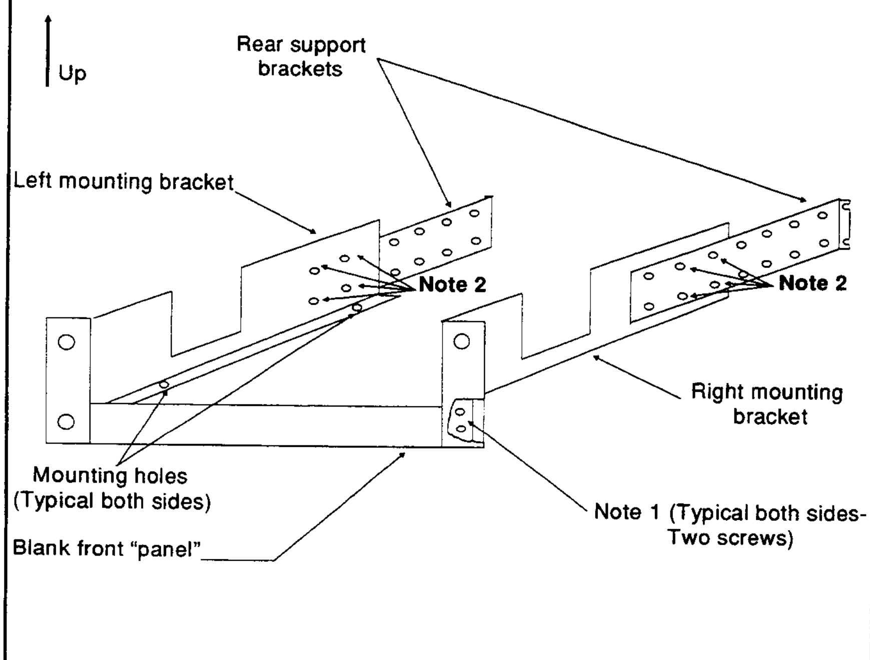


Figure 3-4. Rack mounting kit after assembly

1. Bolt the left and right side brackets to the front "panel" of the mounting kit, using four (furnished) #6-32 X 5/16" long screws. (See NOTE 1 in figure 3-4.)

2. Measure the approximate depth of the rack to be used and install a rear support bracket to each rack mount side support, using four supplied #8-32 screws and flat washers. Note 2 in figure3-4 illustrates four screws in each side. Be sure that the rear support bracket orientation is the same as that shown in the figure (*ears out*). Leave the support bracket screws somewhat loose until final assembly, to allow movement.

3. Place the VCX-150 upside-down on a flat surface. Remove the four screws and lockwashers from the VCX-150 base and discard these screws. Place the assembled Rack Mount adapter assembly on the bottom of the VCX-150, (blank front panel toward the front of the VCX-150). Adjust the position of the Rack Mount adapter so that the four VCX-150 mounting holes (as shown in figure 3-4), line up with the holes in the bottom of the VCX-150. Install the four #6-32 X 1/2" screws and lockwashers supplied, to secure the adapter and VCX-150 together.

4. Using "rack" screws supplied by the rack manufacturer, mount the front of the Rack Mount adapter (with VCX-150), to the front of the rack cabinet. Secure the rear of the adapter to the rear of the rack cabinet. Then complete the installation by tightening the four screws in each side mounting bracket, securing the rear support brackets.

Chapter **4**

Getting Started

This chapter is intended for the new user. It describes how to set your terminal type, initialize a Configuration Storage module, and create a simple test configuration. This chapter assumes that the chassis is installed, that a terminal is cabled to port 1, and that the factory configuration is running (see the *Installation* section for details). This tutorial does not attempt to explain every feature of the VCX Configuration Service. Rather, it is intended to familiarize system administrators with the basic process of configuring a node. For a complete reference to the Configuration Service, see *Configuration Service* in this manual.

Entering Commands

You can enter commands in upper case, lower case, or any combination of the two. The VCX system echoes data as entered. Note, however, that VCX converts most upper case entries to lower case for internal use. For example, typing

Connect to: NEWYORK<CR>

is equivalent to typing

Connect to: newyork<CR>

You can edit incorrect entries using the **<BS>** key. However, note that in the factory configuration, VCX assumes that your terminal is a printing terminal. Therefore, the system handles backspacing as follows:

1.When you press <BS> again, the system displays a slash (/), followed by the last character you typed before the <BS>. This character is now deleted. For example, suppose you type:

Connect to: newoyrk

Seeing your misspelling of *newyork*, you press **<BS>.**

Your terminal displays:

Connect to: newoyrk/k

2.If you press <BS> again, the system displays the next-to-last character you typed; this next-to-last character is now *erased*. Subsequent **<BS>**s continue to display the *erased* characters in reverse order. Continuing the above example, you press **<BS>** three more times. Your terminal now shows:

Connect to: newoyrk/kryo

3. When you have *erased* the incorrect character or characters, type in your correction. The system then displays another slash, followed by the correct entry. Continuing the above example, you type the spelling correction york. Your terminal displays:

Connect to: newoyrk/kryo/york

The system interprets your entry as *newyork*.

Once you set your terminal type, the system handles backspacing conventionally. The system deletes the character to the left of the cursor and repositions the cursor in that space. The following section describes how to set your terminal type.

Setting Your Terminal Type

To set your terminal type, first invoke the Set Service by entering **set<CR>** from the connect prompt:

Connect to: set<CR>

The system then displays the Set Service Main Menu shown in figure 4-1.

Enter **7<CR>**. The Set Service displays the Terminal Type Form illustrated in figure 4-2.

Enter the number displayed beside the type of terminal you are using. For example, to set the cursor control for a Televideo 925, enter **30<CR>**. Do *not* select 1 (Unsupported) for the system administrator's terminal in the factory setting. If you cannot find your terminal listed, try selecting **27** (Televideo 925) or **14** (DEC VT-52). After you select a terminal, the Set Service returns you to the Set Service Main Menu. Enter **15<CR>** The Set Service then prompts:

Set your terminal, then enter<*CR*>:

Press **<CR>**. The Set Service re-displays the Set Service Main Menu. Enter **1<CR>** to exit.

The display seen next is:

Connect to:

```
**** Set Terminal Characteristics ****

                              Current                 Requested
 1. Exit
 2. Baud rate                 - 9600                  - 9600
 3. Character length          - 8 bits                - 8 bits
 4. Parity                    - None                  - None
 5. Stop bits                 - 1 stop bit            - 1 stop bit
 6. Echo                      - CPU & VCX services    - CPU & VCX services
 7. Terminal type             - DEC VT-100/VT-100     - DEC VT-100/VT-100
 8. Device flow control       - XON/XOFF              - XON/XOFF
 9. Port flow control         - XON/XOFF              - XON/XOFF
10. Messages                  - All                   - All
11. BREAK key                 - Pass through          - Pass through
12. Control state key         - ^A                    - ^A
13. Connect hold key          - ^B                    - ^B
14. Broadcast option          - Ignore routine        - Ignore routine
15. Apply changes

Enter selection:
```

Figure 4-1. Set service menu

```
Change Terminal Type

 1. Unsupported            12. Datapoint 8220/4240   23. MDCSC
 2. ADDS Regent series     13. DEC VT-100/VT-100     24. Perkin Elmer 550
 3. ADDS Viewpoint         14. DEC VT-52             25. PE 1251/1245 Super Owl
 4. ADM-3A                 15. Hazeltine 1500        26. QuickScreen
 5. ADM-31                 16. Hazeltine 1510        27. VDB 8024
 6. Ann Arbor 400D         17. Honeywell             28. Tandberg 2215
 7. ANSI Std; Ambassador   18. H19 / Z19             29. Teleray
 8. Control Data CD110     19. HP 2621               30. TeleVideo
 9. Control Data CD722     20. IBM Displaywriter     31. Wyse WY-100
10. DG Dasher 211/411      21. IBM 3101              32. Xerox 820
11. Datamedia              22. M9400

Enter selection or <CR> to return:
```

Figure 4-2. Terminal type form

Enter **configure<CR>**. The system displays the first Configuration Service Menu that can be seen in figure 4-3. If you wish to initialize the configuration storage module, enter **2<CR>**.

```
 1) ADD/MODIFY configurations, user lists or texts
 2) INITIALIZE configuration storage
Enter selection [or ESC to exit]: 1
```

Figure 4-3. First Configuration service submenu

Configuration Tutorial

A configuration is a set of parameters. These parameters describe a node to system software. Some of the parameters in a configuration are global. Others apply specifically to a port or to a port series. Examples of parameters are: the installation name, the system password, the name of a port, the physical location of a port in a chassis, and the type of port. In our example configuration, there is only one type of port: *asynchronous* or *asynchronous line*. Terminals, computer ports, and other RS-232C devices can be cabled to asynchronous ports.

Equipment

Assume that a terminal is cabled to port 1. This port will be the originating port. Port 2 will be the answering port. To simulate a CPU, connect a breakout box with pins 2 and 3 jumpered or a loopback connector to this port. The terminal port will be configured for the following characteristics:

baud rate: 9600
character length: 8 bits
stop bits: 1
parity: none
echo mode: appropriate for full-duplex terminal
flow control: XON/XOFF

Adding the Configuration

After you initialize the Configuration Storage as described previously, the Configuration Service redisplays this menu the first level Configuration menu, shown in figure 4-4.

You wish to add a configuration. If you enter <ESC>, you will exit the configuration service. <ESC>generally means *back up* to the level you came from.

HINT: If you get *lost* in the Configuration Service, continue entering <ESC>'s. You will eventually return to a familiar menu or exit the service entirely.

Select 1, as shown in figure 4-4.

```
 1) ADD/MODIFY configurations, user lists or texts
 2) INITIALIZE configuration storage
Enter selection [or ESC to exit]: 1
```

Figure 4-4. First Configuration service submenu

When you select 1, *ADD/MODIFY configurations, user lists or texts*, the Configuration Service will display the Level 2 Menu shown in figure 4-5.

Take a moment to examine this display. Had one or more configurations been stored, the Configuration Service would list the stored configurations, along with any descriptions entered by the system administrator. Since no configuration is stored, the Configuration Service so informs you. The bracketed fraction in the upper right-hand corner displays the amount of memory used and the amount of memory available in the Configuration Storage. This display helps you to avoid running out of memory if you build large configurations or store a number of small configurations. Note that 4 blocks are reserved in an initialized Configuration Storage for use by the system. Since no configuration is stored, only selections *1) ADD a new configuration*, *2) ADD a new user list* and *3) ADD a new text* are valid.

Selection 2 is used to create a name for a new user list. User lists are created, when for reasons of security, you want the users to enter their name and password. After the user list name is defined, then Selection 3, *EXAMINE/MODIFY a configuration, user list or text* allows you to add the actual names to the list.

Selection 1 is used when defining and entering a new configuration. To continue with the configuration example, enter a *1* from the seven choices, which are:

```
No configurations defined.









 1) ADD a new configuration
 2) ADD a new user list
 3) ADD a new text
 4) EXAMINE/MODIFY a configuration, user list or text
 5) DELETE a configuration, user list or text
 6) LIST existing configurations, user lists and texts
 7) SELECT configuration to run
Enter selection [or ESC to exit]:
```

Figure 4-5. Level 2 Configuration menu

1) ADD a new configuration
2) ADD a new user list
3) ADD a new text
4) EXAMINE/MODIFY a configuration, user list or text
5) DELETE a configuration, user list or text
6) LIST existing configurations, user lists and texts
7) SELECT configuration to run

Enter selection [or ESC to exit]:*1<CR>*

The Configuration Service prompts you for the name of the new configuration, as illustrated in figure 4-6.

As an example, select the name *simple* and type that in.

Entering Global Parameters

The Configuration Service immediately routes you to the Global Parameters Form. On this form you enter configuration-wide parameters, as opposed to port-specific parameters. The Global Parameters Form shown in figure 4-7 then appears on the monitor screen.

Note the instruction line:

— <CR>=next field — ^E=previous field — <ESC>=accept screen—

```
Enter configuration name: simple <CR>
```

Figure 4-6. Prompt for name

```
Config: dons                                  [8/32 used]
           Description:>
      Installation name:
         Connect prompt:
  Default Access Rights:
           Logging port:
        Logging enabled: No     Binary output: No     Logging mask:
Modem network mgr port:
                   addr: 1
  IOX log message timer: 0
              Node name:
         User list name:
        Local time zone:
   Local time when it is midnight Greenwich Mean Time -
                  Hours: 0          Minutes: 00
         Display format: U.S. (mm/dd/yy hh:mm:ss)
Queue length threshold: 30
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------


Description:
```

Figure 4-7. Global parameters form

This line generally accompanies a display of parameters in the upper part of your screen. A pointer character (>) indicates which parameter is the current field. In this case the *Description* field is indicated. In the lower part of your screen, the Configuration Service prompts you to enter a value into the current field. The instruction line indicates that you can enter <CR> to accept the entry in the current field and move the pointer to the next field. Therefore, if the value currently displayed is correct, press <CR>to confirm the entry and move on. To change an entry, type the new value, then press <CR>. To return to a previous field, enter ^*E*. Entering <ESC>accepts currently displayed values for the entire form and steps to the next form or menu. Also, you can use <BS> to correct mistakes in the current field.

To examine a form without editing it, press <CR>.The following example shows how to enter, then change a comment:

Recall that the Level 2 Configuration Menu shown previously displays stored configurations with associated descriptions. The description consists of what you enter into the *Description* field here. Suppose that you wish to enter two ports as the comment for *simple*. You enter:

Description: two ports

The Description field accepts up to thirty characters. You can use any printable letters, digits, or symbols. As soon as you enter <CR>, the monitor menu shown in figure 4-8 appears.

```
Config: dons                                [9/32 used]
           Description: two ports
     Installation name:>
        Connect prompt:
 Default Access Rights:
          Logging port:
       Logging enabled: No    Binary output: No    Logging mask:
Modem network mgr port:
                  addr: 1
  IOK log message timer: 0
             Node name:
        User list name:
       Local time zone:
   Local time when it is midnight Greenwich Mean Time -
                 Hours: 0          Minutes: 00
        Display format: U.S. (mm/dd/yy hh:mm:ss)
Queue length threshold: 30
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



(for logon banner)
Installation name:
```

Figure 4-8. Global parameters form

Should you decide *test configuration* is a better comment. Enter *^E*. The pointer moves back to the *Description* field. Now type:

Description: test configuration

As soon as you press <CR> the new comment is displayed and stored.

NOTE: Once in the Global Parameters Form (or in any other form), you must complete it. Pressing <ESC>will exit the form. However, pressing <ESC>also means you write all entries displayed for that form into the Configuration Storage module.

The Configuration Service again prompts you for an entry in the *Installation name* field. The installation name is part of the logon banner displayed when a user logs onto the node. The entire logon banner consists of:

Attachment string
Text
Day, Date, Time*
Installation name
Greeting line 1*
Greeting line 2*
Connect prompt.

*The time display and greeting lines are entered via the Settime Service and the Greeting Service, respectively. Refer to the Settime and Greeting Service sections in this manual for additional information.

If your company were the Acme Balloon Company, you might wish to enter the following:

Acme Balloon Co. - Boston Node as the installation name

For a prompt you could use just **Prompt:,** or you can leave it *connect to*:, as it is.

To make the changes, you would enter:

(for logon banner)
Installation name: Acme Balloon Co. - Boston Node

(user prompt in control state)
Connect prompt: Prompt:>>> <CR>

The next prompt allows you to set the default access rights. These are the access rights that any port (answer, originate or trunk) will default to, before they are configured for any access rights or password override. When the prompt first appears, the numerical value of one is displayed as the default. Press *<CR>* to enter 1.

Default Access Rights: 1

The next prompt requests the name of the logging port. The logging function collects significant events (for example, connections and disconnections) and reports these events to the logging port. A printer can be connected to the logging port for a hardcopy of chassis activity. The only acceptable entries are <CR>for no logging, the name of a local port, or the name of a trunk over which events will be sent to merge with events of another node. While the example configuration does not require a logging port, enter 8 for port 8, then press **<CR>**.

> **(blank for logging disabled)**
> **Logging port:** 8<CR>

The next field is used to enable or disable the logging port. Select either *1* for disabling or *2* for enabling the logging function. For example enter *2* <CR> to select logging enable.

> **1) No**
> **2) Yes**
> **Logging enabled:** 2<CR>

The next field is Binary output and determines whether logging data is in binary or ASCII format. The added benefit of binary is more compact data and configuration data for auto building hardware inventory records. Enter **1** for *No* or **2** for *Yes* and enter **<CR>** to set binary or ASCII output from the logging port. (Note that No is chosen when the logging port is connected to a printer; Yes is chosen when connected to a NMS.)

> **Binary output:** 1) No
> 2) Yes

A mask can be entered at the prompt to filter logging classes and prevent them being forwarded a NMS. For example, *N,P* would prevent *normal* and *performance* events from being output from the logging port.

(Discard A-major, I-minor, E-exceptions, N-normal, X-Protocol-P-performance logs)

> **Logging Mask:**

The next two fields apply when a Master NetMux is used in managing a modem network. If not used, these two fields can be ignored. The first field is that of the Modem network manager port. This refers to the path to the management center. The path may be an asynchronous port, multiplexing trunk or an X.25 path. If X.25, it must be followed by a T.4 profile specification and an X.121 address. If no management path is needed, press <CR>.

> **Modem network manager port:** <CR>

The second management parameter is that of Addr, the management center address which can be any number from 0001 to 9999. If no Master NetMux system is being used, press **<CR>**.

> **Add:**<CR>

Next is the *IOK log message timer*: listing on the menu. When logging is enabled, a time in the range of 0 to 15 minutes may be entered for the parameter. This is the rate at which the logging timer will report to the Network Management System (if so equipped). Entering 0 disables the message timer. Enter the time desired or press **<CR>** to continue to the next menu item.

> **Range: 0-15**
> **(0 will disable the message)**
> **IOK log message timer:** 0<CR>

The next prompt allows you to enter the node name of your present VCX-150 unit. The node name you select will show up in the logging report, should a logging port be used.

> **Node name:** Boston <CR>

The next prompt concerns the user list name. If you want the VCX-150 users to enter their names during log-in, you will need to enter a list of user names under another configuration menu. This user list should in turn be given a name like *ourgang*. This particular prompt is asking for the name of the user list.

> **User list name:** ourgang

The next four fields require you to enter data used for system timekeeping. Suppose you are in Boston in the summer of 1985. For the time zone abbreviation you enter *EDT* (Eastern Daylight Time):

> **Local time zone:** EDT <CR>

Now enter the local time at midnight Greenwich Mean Time. You must enter the time in military format. Since the time is 7:00 PM or 1900 hours in Boston when it is 12:00 AM GMT, you enter:

> **Range: 0 - 23**
> **Hours:** 19<CR>

The next prompt requests a minutes displacement from midnight GMT. Enter**<CR>** to accept the default displacement of 0 minutes:

> **1) 0**
> **2) 15**
> **3) 30**
> **4) 45**
> **Minutes:** <CR>

Now you select the date format. In the United States, the date is written as month/day/year hours:minutes:seconds. In European countries the date is written day-month-year hours.minutes.seconds. You wish to select the U.S. display format:

> **1) U.S. (mm/dd/yy hh:mm:ss)**
> **2) European (dd-mm-yy hh.mm.ss)**
> **Display format:** <CR>

BPE alarm threshold, next prompt on the list, is not used on the VCX-150.

The last prompt is the Queue length threshold. The queue length is the number of people waiting to be serviced on the VCX. The threshold for the queue length is the level that if exceeded will generate a logging error message. The default for the threshold is 30, out of a range of 1 to 299. Enter <CR>to select the default. Figure 4-9 illustrates the Global Configuration menu before the final <CR>.

You have completed the Global Parameters Form. Every time you add a configuration, the Configuration Service displays the Global Parameters Form. If you later wish to change a global parameter, you can find this form at a Configuration menu you have not yet seen—the Level 3 Menu. This is the Level 3 menu which will be described shortly.

```
Config: dons                                [9/32 used]
            Description: test configuration
      Installation name: Acme Ballon Co. - Ballon Mode
         Connect prompt: Prompt>>>
  Default Access Rights:>
           Logging port:
        Logging enabled: No    Binary output: No    Logging mask:
Modem network mgr port:
                   addr: 1
   IOX log message timer: 0
              Node name:
         User list name:
        Local time zone:
   Local time when it is midnight Greenwich Mean Time -
                  Hours: 0            Minutes: 00
         Display format: U.S. (mm/dd/yy hh:mm:ss)
Queue length threshold: 30
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



(default is 1 out of 1 - 64)
Default Access Rights:
```

Figure 4-9. Completed Global parameters form

```
Config: simple                                  [5/16 used]

        Name  Type               Description

        simple Configuration     test configuration








1) ADD a new configuration
2) ADD a new user list
3) ADD a new text
4) EXAMINE/MODIFY a configuration, user list or text
5) DELETE a configuration, user list or text
6) LIST existing configurations, user lists and texts
7) SELECT configuration to run
Enter selection [or ESC to exit]:
```

Figure 4-10. Second configuration added to form

After you complete the Global Parameters form, the Configuration Service redisplays the Level 2 Menu with the added configuration, as illustrated in figure 4-10.

Adding a Name Definition

To enter the name definitions for the ports in *simple*. Select 4) EXAMINE/ MODIFY a configuration, user list or text to do so:

> **1) ADD a new configuration**
> **2) ADD a new user list**
> **3) ADD a new text**
> **4) EXAMINE/MODIFY a configuration, user list or text**
> **5) DELETE a configuration, user list or text**
> **6) LIST existing configurations, user lists and texts**
> **7) SELECT configuration to run**
>
> **Enter selection [or ESC to exit]:** 4<CR>

The Configuration Service prompts:

> **Terminate with:**<CR>

ESCape - exit <CR> - current name ^E - previous name ^C - next name

> **Configuration or user list name:** simple

```
      Name   Type                          Brief Description

   No names defined.










    1) ADD new name(s)
    2) EXAMINE/MODIFY a name
    3) DELETE a name
    4) LIST existing names
    5) EXAMINE/MODIFY global configuration parameters
    6) MERGE all names with those from another configuration
   Enter selection [or ESC to exit]:
```

Figure 4-11. Second configuration added to form

Press <CR>. The Configuration Service displays the Level 3 Menu (figure 4-11).

Since no name definition exists in the configuration, only selection 1, *ADD new name(s)*, and selection 5, *EXAMINE/MODIFY global configuration parameters*, are valid. You wish to add name definitions to the configuration. Select item 1 from the menu.

1) ADD new name(s)
2) EXAMINE/MODIFY a name
3) DELETE a name
4) LIST existing names
5) EXAMINE/MODIFY global configuration parameters
6) MERGE all names with those from another configuration.
Enter selection [or ESC to exit]: 1<CR>

The Configuration Service then prompts for the *New entry name*. Name the originating port *org*: <CR>

[Hit ESCape key to exit]
New entry name: org: <CR>

Configuring the Originating Port

The Configuration Service then displays the Name Type Form shown in figure 4-12. Depending on which name type you select, the Configuration Service presents different forms to collect information about the name. You wish to define an asynchronous line, so enter *1<CR>* or *<CR>*since this is the default.

```
Config: simple      Name: org          [5/64 used]
   Name type:>Asynchronous line(s)    (Slot 1)
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ----





 1) Asynchronous line(s)      (Slot 1)  5) Services, controlled access
 2) Trunk line                (Slot 2)  6) X.25 port               (Slot 2)
 3) Speed connect                       7) String
 4) Group
Name type:
```

Figure 4-12. Name type form

Now the Configuration Service displays the Asynchronous Line(s) Main Form which is shown in figure 4-13. The values shown on the form are default values for asynchronous lines.

Note the instruction line is the same as that displayed by the Global Parameters Form. The same rules apply to moving through all forms. To assign the name ***org*** to port 1, respond to the two prompts as follows:

```
Config: dons        Name: async         [9/32 used]
   Name type: Asynchronous line(s)    (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
       Starting port:>1              Attachment control: Unqualified
         Ending port: 1             Device flow control: None
           Baud rate: Autobaud        Port flow control: None
    Character length: 8 bits             Timeout (mins): 0
           Stop bits: 1 bits                  Direction: Originate
              Parity: None
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------







Range: 1 - 16
Starting port:
```

Figure 4-13. Asynchronous lines main form

Range: 1 - 16
Starting port: 1 <CR>

Range: 1 - 16
Ending port: 1 <CR>

Starting and ending port entries allow you to configure a series of asynchronous ports in the chassis using the same name. To configure just one port, enter the same values for the starting and ending port, as that used as before.

The next parameter determines the baud rate of the port. The baud rate can be fixed or automatically sensed when a user logs on to the system (autobaud). A fixed baud rate is appropriate for terminals cabled directly to the port. Autobaud is appropriate for ports connected to speed-switching modems. To select 9600 baud as the baud rate for *org*, enter:

1) Autobaud	**6) 300**	**11) 4800**
2) 75	**7) 600**	**12) 9600**
3) 110	**8) 1200**	**13) 19200**
4) 134.5	**9) 1800**	**14) 75/1200**
5) 150	**10) 2400**	**15) Reserved**

Baud rate: 12 <CR>

The next three parameters, *Char length*, *Stop bits* and *Parity*, determine the asynchronous data format. Set these parameters to match the settings of the equipment cabled to the port. To select an 8 bit character length, 1 stop bit, and no parity, enter:**<CR>**

1) 8 bits
2) 7 bits
3) 6 bits
4) 5 bits
Character length: <CR>

1) 1 bits
2) 2 bits
3) 1.5 bits
(usually 1)
Stop bits: <CR>

1) None
2) Odd
3) Even
4) Mark
5) Space
Parity: <CR>

Attachment control determines whether the port engages in RS-232C control line handshaking with the external device. Unqualified attachment means that the port does not require handshaking to communicate with the external device. DTR-Toggle means that the external device hooked to the port must toggle DTR when it is disconnected from the port or the port will go out of service. Modem attachment means that the port uses modem control lines (Ring Indicator, Data Set Ready, Data Carrier Detect, and Clear-to-Send) for handshaking with the external device. DTR-No toggle means any originate port can connect to the port as long as DTR remains high.

Note: This description of attachment control is extremely simplified. Users should refer to the Configuration Service section is this manual for details regarding attachment control.

1) Unqualified
2) DTR-toggle
3) Modem
4) DTR-No toggle
Attachment control: <CR>

Flow control allows the port and device to signal each other that the flow of data is to be temporarily halted. It is important to configure flow control whenever possible to prevent the possibility of data loss. Although the Configuration Service allows the VCX-150 port to generate one type of flow control and to respond to another, most applications require incoming and outgoing data flow to be identically controlled. XON/XOFF is a common flow control protocol. To select XON/XOFF flow control, respond to the next two prompts as follows:

1) None
2) XON/XOFF
3) DC1/DC2
4) RTS/CTS
5) ENQ/ACK
6) T-Pause
7) HEX 91/93
8) HEX FE/FF
9) HEX 94/93
10)DG XON/XOFF (for Data General)
(generated by the device to slow the port's output)
Device flow control: 2 <CR>

1) None
2) XON/XOFF
3) DC1/DC2
4) RTS/CTS
5) ENQ/ACK
6) T-Pause
7) HEX 91/93
8) HEX FE/FF
9) HEX 94/93
10)DG XON/XOFF (for Data General)
(recognized by the device)
Port flow control: 2<CR>

Connection timeout breaks connections that are not in use after a specified interval of inactivity. To disable the inactivity timeout, enter 0 minutes for the timeout period:

Range: 0 - 255
(0 to disable disconnect-on-timeout)
Timeout (mins.): <CR>

Note: Most VCX-150 prompts are self-explanatory. If you did not understand a prompt, complete the entry as shown. Later you can refer to the Configuration Service section in this manual, which explains each prompt in detail.

The pointer should now be positioned at the last field, *Direction*, on the Asynchronous Line(s) Main Form. This parameter determines whether a port originates connections, answers connections, or does both. Enter *2 <CR>* to configure *org* as an originate port and complete this form.

1) Answer
2) Originate
3) Both
(terminals are normally ORIGINATE)
Direction: 2 <CR>

After completing the Asynchronous Line(s) Main Form, you must complete subforms. There are different subforms for originate and answer ports. Since *org* is an originate port, the Configuration Service displays the automatic connect subform immediately below the Asynchronous Line(s) Main Form. This is shown in figure 4-14.

At this point, try entering *^E*. Note that nothing happens. ^E allows you to step to the previous field on the same form. Since the pointer is now on the Logon Subform, you cannot return to the Asynchronous Line(s) Main Form. You might wonder how to correct or change an entry after you complete the Main Form. Editing is accomplished through Level 3 Menu selection *3) EXAMINE / MODIFY a name*. To continue, enter <CR> to select the default value of manual

```
Config: simple      Name: org          [5/64 used]
   Name type: Asynchronous line(s)     (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 1               Attachment control: Unqualified
          Ending port: 1              Device flow control: XON/XOFF
            Baud rate: 9600             Port flow control: XON/XOFF
     Character length: 8 bits              Timeout (mins): 0
            Stop bits: 1 bits                   Direction: Originate
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Auto connect A:>
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------







(blank entry is a manual connection)
Auto connect A:
```

Figure 4-14. Auto connect subform

connect. The Configuration Service then displays the Terminal Characteristics Subform shown in figure 4-15.

Complete the Terminal Characteristics Form by responding to the following prompts.

Generally, terminals are set for full-duplex (no local echo). In this case the CPU provides an echo of user input. The VCX-150 port must also supply an echo when users connect to VCX-150 services. To select this setting, you enter:

1) CPU and VCX services echo
2) VCX local port echo
3) Terminal echo
Echo: <CR>

The next prompt allows you to disable the port from sending certain classes of messages to the user. To display all messages, enter:

1) All
2) Prompt
3) Service
4) None
Messages: <CR>

```
Config: simple      Name: org            [5/64 used]
   Name type: Asynchronous line(s)      (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 1                 Attachment control: Unqualified
          Ending port: 1                Device flow control: XON/XOFF
            Baud rate: 9600               Port flow control: XON/XOFF
     Character length: 8 bits                Timeout (mins): 0
            Stop bits: 1 bits                     Direction: Originate
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Auto connect A:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                 Echo:>CPU & VCX services           BREAK key: Ignore
             Messages: All                  Control state char: 1
   Confirm connections: No                      Hold character: 0
        Login required: No                    Channel priority: 1
 Ignore routine bcasts: No             Detach after disconnect: Yes
-------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen --------


 1) CPU & VCX services
 2) VCX local port
 3) Terminal
Echo:
```

Figure 4-15. Terminal characteristics subform

You can choose, via the next prompt, to confirm when a connection with another port has been made by displaying a message. Enter 2 for yes if you want a message displayed.

> **1) No**
> **2) Yes**
> **Confirm connections:** 2 <CR>

The next prompt allows you to require the user to enter a user name and password during login. If you want these login requirements to exist then enter 2 for yes:

> **1) No**
> **2) Yes**
> **(Should port prompt user for name and password?)**
> **Login required:** 1 <CR>

With the next prompt, you have the option to *filter out* or *pass through* any routine broadcast messages sent to your port. Select *Yes* if you want to block the routine messages.

> **1) No**
> **2) Yes**
> **(Should routine broadcasts be blocked?)**
> **Ignore routine bcasts:** 1<CR>

The next prompt determines how the port reacts when it receives a BREAK. The port can: 1) pass the BREAK through to the remote port, 2) do nothing, 3) enter the control state, or 4) toggle to a secondary connection. Select the first option; NOTE: If you just type <CR>, the default *Ignore* is selected.

1) Pass through 4) Connect hold
2) Ignore
3) Enter control state
BREAK key: <CR>

The next prompt requests the decimal equivalent of the ASCII control state character. For example, to set the control state character to *^A*, you enter *1 <CR>*. When the configuration you are now entering runs, the user can establish a connection, then enter *^A* to communicate with VCX-150, rather than the remote CPU or other device.

Range: 0 - 127
(ASCII code or 0 for none — 0..4 or 20..31 recommended?)
Control state char: 1 <CR>

If the user then establishes another connection, entering the connect hold character toggles the user between his primary and secondary connections. The next prompt requests the decimal equivalent of the connect hold character. Since our example configuration has only one destination port, a connect hold character is unnecessary. Therefore, enter:

Range: 0 - 127
(ASCII code or 0 for none)
Hold character: <CR>

The next prompt applies only to ports that use multiplexing trunk lines. Port priority determines which ports receive the fastest response in the event of trunk congestion. Since our example configuration does not include a multiplexing trunk line, what you enter here does not matter.

Range: 1 - 4
1 is highest priority
Channel priority: <CR>

You can select, with the next prompt, to have the originate port automatically detach from the switch after disconnecting from the answer port. Entering 2 for Yes will select for the automatic detachment.

1) No
2) Yes
(yes detach user after exit from first connection)
Detach after disconnect: 2 <CR>

Once you complete the Terminal Characteristics Subform, the Configuration Service displays the Terminal Type Subform. The Terminal Type Subform resembles the Set Service Terminal Type form, except that it is separated into two parts. The first screen of this subform is illustrated in figure 4-16.

```
Config: simple      Name: org            [5/64 used]
   Name type: Asynchronous line(s)     (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  Terminal type:>Unsupported
-------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen --------

 1) Unsupported         17) Honeywell
 2) ADDS Regent series  18) H19 / Z19
 3) ADDS Viewpoint      19) HP 2621
 4) ADM-3A              20) IBM Displaywriter
 5) ADM-31              21) IBM 3101
 6) Ann Arbor 400D      22) M9400
 7) ANSI Std: Ambassador 23) MDCSC
 8) Control Data CD110  24) Perkin Elmer 550
 9) Control Data CD722  25) PE 1251/1245 Super Owl
10) DG Dasher 211/411   26) QuickScreen
11) Datamedia           27) VDB 8024
12) Datapoint 8220/4240 28) Tandberg 2215
13) DEC VT-100/VT-180   29) Teleray
14) DEC VT-52           30) TeleVideo
15) Hazeltine 1500      31) Wyse WY-100
16) Hazeltine 1510      32) Xerox 820
Terminal type:
```

Figure 4-16. Terminal type subform

If you see your terminal type listed, enter the number displayed beside the terminal name and followed by <CR>. This will lead to the next menu which prompts for the *originate attachment string name.*

The *originate attachment string name* prompt, allows you to define a name for a string which will be displayed at the originate port at the time of attachment. The actual string is defined using Selection 7, *String*, from the Name Type Form. You are only asked at this point for the name of the string. Press <CR> to exit this prompt. This menu is shown in figure 4-17.

Originate attachment string name: <CR>

Likewise, the next prompt *originate detachment string name* allows you to define a name for a string that will be displayed at the originate port at the time of detachment.

Originate detachment string name: Orgdet <CR>

```
Config: simple      Name: org          [5/64 used]
   Name type: Asynchronous line(s)     (Slot 1)

 Originate attachment string name:
 Originate detachment string name: orgdet
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Attachment text name:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Originate access rights:>
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------










(Access rights the user must have to gain access)
Originate access rights:
```

Figure 4-17. Asynchronous lines subform

Your are then asked for the name of the text file that is to be displayed when a device attaches to that port. Press <CR>to exit this prompt.

Attachment text name: <CR>

After completing the originate attachment, detachment string and attachment text name prompts, you are prompted for the *access rights*.

You are now asked to define the access rights of the originating port. The originate port access rights are the rights the users must have to use the originate port. Or in other words, the originate port access rights limit the use of the port to users with specific access rights. NOTE: Access rights are more fully explained in the manual's next section, *Configuration Service*, under the sub-headings of *Security*, *Access Control*, *Administrative Protection* and *Access Rights*. For more details you are referred to these sections.

The access rights defined for the originate port can be listed as a series of numbers with commas as delimiters (i.e., 1,2,3,4,5,6,7) or as a range (i,e., 1- 7). If for example, you wanted to grant the originate port the access rights four through eight, you would enter the following:

Originate access rights: 4-8 <CR>

You have now completed the forms and subforms for the name *org*. The Configuration Service redisplays the menu shown in figure 4-18.

```
Config: simple                                   [5/64 used]




New entry name:
```

Figure 4-18. Prompt for entry name

Press *(ESC)* to exit.
New Entry Name:

Configuring The Answer Port

At this point, you are still in the process of adding name definitions to the configuration. The Configuration Service is prompting for the next name to add. You can add another name or enter to exit the name addition process. Our *simple* configuration requires one more name. Name the answering port ans, as shown in figure 4-18, followed by a <CR>.

The Configuration Service then displays the Name Type Form. Enter *<CR>* because *ans* is an asynchronous line.

1) Asynchronous line(s)(Slot 1)	**5) Services; controlled access,**
2) Trunk line(Slot 2)	**6) X.25 port (Slot 2)**
3) Speed connect	**7) String,**
4) Group	

Name type: 1<CR>

After entering <CR> the service displays the menu shown in figure 4-19.

The Asynchronous Line(s) Main Form is identical for originating and answering ports. Therefore, we simply list the prompts and the responses needed to configure *ans* at port 2:

Range: 1 - 16
Starting port: 2 <CR>

Range: 1 - 16
Ending port: 2 <CR>

```
Config: simple      Name: ans          [6/64 used]
   Name type: Asynchronous line(s)     (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port:>2              Attachment control: Unqualified
          Ending port: 2             Device flow control: XON/XOFF
            Baud rate: 9600            Port flow control: XON/XOFF
     Character length: 8 bits             Timeout (mins): 0
            Stop bits: 1 bits                  Direction: Answer
               Parity: None
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------








Range: 1 - 16
Starting port:
```

Figure 4-19. Asynchronous line subform

1) Autobaud	**6) 300**	**11) 4800**
2) 75	**7) 600**	**12) 9600**
3) 110	**8) 1200**	**13) 19200**
4) 134.5	**9) 1800**	**14) 75/1200**
5) 150	**10)2400**	**15) Reserved**

Baud rate: 12 <CR>

1) 8 bits
2) 7 bits
3) 6 bits
4) 5 bits
Character length: <CR>

1) 1 bits
2) 2 bits
3) 1.5 bits
(usually 1)
Stop bits: <CR>

1) None
2) Odd
3) Even
4) Mark
5) Space
Parity: <CR>

1) Unqualified
2) DTR-Toggle
3) Modem
4) DTR-No Toggle
Attachment control: <CR>

1) None
2) XON/XOFF
3) DC1/DC2
4) RTS/CTS
5) ENQ/ACK
6) T-Pause
7) HEX 91/93
8) HEXFE/FF
9) HEX94/93
10) DG XON/XOFF

(generated by the device to slow the port's output)
Device flow control: 2 <CR>

1) None
2) XON/XOFF
3) DC1/DC2
4) RTS/CTS
5) ENQ/ACK
6) T-Pause
7) HEX 91/93
8) HEXFE/FF
9) HEX94/93
10) DG XON/OFF
(recognized by the device)
Device flow control: 2 <CR>

Range: 0 - 255
(0 to disable disconnect-on-timeout)
Connection timeout (mins.): <CR>

Your entry in the *Direction* field distinguishes originating and answer ports, thereby determining which submenus the Configuration Service displays. Enter *1 <CR>* to configure the port named *ans* as an answer port.

1) Answer
2) Originate
3) Both
(terminals normally originate)
Direction: 1 <CR>

For answering ports, the Configuration Service displays the Access Subform, shown in figure 4-20, immediately below the Asynchronous Line(s) Main Form.

You are asked in the first prompt to define the access rights for the answer port. These are rights that an incoming call must have to gain access and attach to the resource. NOTE: Access rights are more fully explained in the manual's next section, *Configuration Service*, under the sub-headings of *Security*, *Access Control*, *Administrative Protection* and *Access Rights*. For more details you are referred to these sections.

The access rights defined for the answer port can be listed as a series of numbers with commas as delimiters (i.e., 1,2,3,4,5,6,7) or as a range (i.e.,1-7). If for example, you wanted to grant the answer port all 64 access rights, you would enter the following:

Answer access rights: 1-64 <CR>

```
Config: simple      Name: ans               [5/64 used]
   Name type: Asynchronous line(s)         (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 2                  Attachment control: Unqualified
          Ending port: 2                 Device flow control: XON/XOFF
            Baud rate: 9600                Port flow control: XON/XOFF
     Character length: 8 bits                 Timeout (mins): 0
            Stop bits: 1 bits                      Direction: Answer
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:>
    Password override: No
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------




(Access rights the user must have to gain access)
Answer access rights:
```

Figure 4-20. Access subform

The next entry concerns password override access restrictions. If the access rights of the originate port and the answer port don't match, you are being asked whether a password will be allowed to override the access restriction. If you answer no, a password cannot be used to override any access restrictions. While a yes answer means a password can be used as an override. If you answer yes, you will also be asked for the actual password. Let's assume, however, that you don't want any password override capability:

> **1) No**
> **2) Yes**
> **(Can password override access restrictions?)**
> **Password override:** 1 <CR>

After the previous two entries are answered, three more prompts are displayed on the screen. This is shown in figure 4-211.

The *answer attachment string name* prompt, allows you to define a name for a string which will be transmitted to the answer port (i.e., host computer) at the time of attachment. Note that you are not asked to define the actual string at this point, only the name for the string. Since an attachment string normally isn't sent to the host, let's exit this prompt, without entering an attachment string name. Exit by pressing <CR>:

```
Config: simple      Name: ans            [5/64 used]
   Name type: Asynchronous line(s)      (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
       Starting port: 2               Attachment control: Unqualified
         Ending port: 2              Device flow control: XON/XOFF
           Baud rate: 9600             Port flow control: XON/XOFF
    Character length: 8 bits              Timeout (mins): 0
           Stop bits: 1 bits                   Direction: Answer
              Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights: 1-64
    Password override: No
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer attachment string name: >
 Answer detachment string name:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer disconnect string:
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



Answer attachement string name:
```

Figure 4-21. Subforms of the Asynchronous lines form

Answer attachment string name: <CR>

Likewise, the next prompt *answer detachment string name* allows you to define a name for a string that will be transmitted to the answer port at the time of detachment. Again, you are not being asked for the actual string only it's name. Exit this prompt as well by pressing <CR>.

Answer detachment string name: <CR>

The *answer disconnect string* prompt allows you to define a string, up to 10 characters long, which if transmitted to an answer port from a host, will cause the VCX to disconnect that answer port. The *answer disconnect string* is designed to accommodate 3 wire host systems and allow the host to initiate the disconnect.

If an answer disconnect string name is specified, configuration now prompts for enter out of service state. The *Enter out of service state* prompt defaults to *no*. The System Administrator can have the answer port go out of service should the user disconnect before the host has issued the disconnect string. This prevents tail-ending into an open session with possible security breach consequences. Selecting *yes* for this option requires the host to issue the disconnect string before the answer port can accept another call. Exit this prompt by pressing <*CR*>.

Answer disconnect string: <CR>

```
Config: simple                          [5/64 used]

         Name   Type            Description

         simple Configuration   test configuration




1) ADD a new configuration
2) ADD a new user list
3) ADD a new text
4) EXAMINE/MODIFY a configuration, user list or text
5) DELETE a configuration, user list or text
6) LIST existing configurations, user lists and texts
7) SELECT configuration to run
Enter selection [or ESC to exit]:
```

Figure 4-22. Level 3 Configuration form

Press *<ESC>* to exit this screen and return to the Level 3 Menu. This will cause the menu shown in figure 4-22 to be displayed.

Note that the Configuration Service displays the names you just entered in alphabetical order. Press *<ESC>* to return to the Level 2 Menu, shown in figure 4-23.

```
Config: simple                                [5/64 used]

      Name  Type                          Brief Description

       ans  Asynchronous line(s)          01\02 - 01\02
       org  Asynchronous line(s)          01\01 - 01\01





 1) ADD new name(s)
 2) EXAMINE/MODIFY a name
 3) DELETE a name
 4) LIST existing names
 5) EXAMINE/MODIFY global configuration parameters
 6) MERGE all names with those from another configuration
Enter selection [or ESC to exit]:
```

Figure 4-23. Level 2 Configuration form

Configuring an X.25 Port

A X.25 Software Module (Product No. 4602-03 or 4602-05) must be used before the VCX-150 will communicate with a Packet Network. Assuming the X.25 Software Module has been inserted into the VCX-150, you would configure an X.25 port as follows:

Using the level 2 menu (shown in figure 4-24), select number 5 *Examine / Modify*. Then the Name Type Form will be displayed (figure4-24). Select option 6, the X.25 port.

After X.25 is selected (option 6) from the Name Type Form, the X.25 Main Form will be displayed. An example of a completed X.25 Main Form is shown in figure 4-25. The X.25 Main Form parameters are described in the Configuration Service section.

```
Config: simple      Name: org          [10/64 used]
   Name type:>Asynchronous line(s)     (Slot 1)
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------









 1) Asynchronous line(s)       (Slot 1)  5) Services, controlled access
 2) Trunk line                 (Slot 2)  6) X.25 port               (Slot 2)
 3) Speed connect                        7) String
 4) Group
Name type: 6<CR>
```

Figure 4-24. Name type subform

```
Config: example1    Name: pad          [11/120 used]
   Name type: X.25 port                (Slot 2)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
           Port: 1        Port view, clocking: DTE, supplies no clock
                                    Baud rate: **

              Network ID: Datapac 76          I frame window (k): 1
         Network address: 123456789          Frame response (T1): 3
          Login required: No                  Max. retrans. (N2): 10
        X.25 DTE or DCE?: X.25 DTE             Link idle polling: No

     No. of incoming LCNs: 0                         Window size: 2
       First incoming LCN: 1                  Restart timer (T20): 100
      No. of bothway LCNs: 12             Call request timer (T21): 60
       First both way LCN: 20              Accept reverse charging: Yes
     No. of outgoing LCNs: 10             Reverse charges on calls: Yes
       First outgoing LCN: 40             Make high priority calls:>No
             Packet size: 128 bytes          Utilization Threshold: 75
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen ----

 1) No
 2) Yes
Make high priority calls:
```

Figure 4-25. X.25 Main form

To make an X.25 call or use the PAD command mode, the X28/29/X3 compatibility section in the *Configure Service* section and the manual *Appendix A* and *B* (which contain information on X.3, X.21 parameters and X.28 commands) should be read thoroughly.

Selecting the Configuration to Run

To select *simple* as the configuration to run on chassis power-up or reset, enter *6 <CR>*. The Configuration Service displays:

Select the configuration to run:

Type *simple* and press <CR>. The Configuration Service redisplays the Level 2 Menu.

Exiting the Configuration Service

Press <ESC>to return to the Level 1 Menu. Press again to exit the Configuration Service. VCX-150 displays:

Connect to:

Running the Configuration

The test configuration is ready to run. Verify that your terminal is cabled to port 1 and set as follows:

baud rate: 9600
character length: 8 bits
stop bits: 1 <CR>
parity: none
echo mode: full-duplex
flow control: XON/XOFF

To reset the chassis, turn the power off, then on again, or run the Reset Service. After the chassis initializes press <CR> and you will see the logon banner displayed:

Acme Balloon Co. - Boston Node
Prompt:>>>

Place a loopback connector or a breakout box with pins 2 and 3 jumpered together on port 2. Type:

Prompt:>>> ans <CR>

Now you should see whatever you type echoed on your terminal screen, as data are transmitted to the answer port, then looped back to your port. Recall that you configured the control state character for *org* to decimal 1. Decimal 1 has the ASCII equivalent ^A. Enter ^A at your terminal keyboard to return to the control state. VCX-150 displays your connection and the connect prompt:

Primary:ans
Prompt:>>>

To break the connection to *ans*, type *quit <CR>* or *bye <CR>* 2. To modify *simple* or create a new configuration, you invoke the Configuration Service again. Entering name definitions for trunk lines and other name types follows the same basic procedure as defining an asynchronous port. The forms are different, however. Refer to the *Configuration Service* section in this manual for a complete description of each menu and form selection.

Changing a Configuration (Dynamic Reconfiguration)

Configuration changes to VCX are dynamic, that is, they are incurred on the fly. The exact time of change to new parameters varies according to the following:

Groups, speed connects, controlled services, strings, text, user lists, and global parameters assume new values when configure is executed. The only exception is that the chassis must be reset to change the logging port in the global parameter set.

Trunks, including X.25, must be reset to incur changes.

Async port changes occur upon exiting configure to currently detached originate ports and currently attached/detached answer ports. Connected ports are reconfigured when they detach.

Connecting a Printer

When connecting a printer to a VCX it is important to know exactly what control signals are needed by the printer (i.e., DTR, RTS, CTS, ...). When using the VCX termination panel (4801-01), the VCX will give active signals on pins 6 and 8. The VCX expects to see an active signal from the device on pin 20 of the termination panel when configured for DTR attachment.

Running Dual Sessions

At the *connect prompt*, type in the destination.

Example:

Connect to: VAX

Next, type in the Control State Character, which is ^A in this example.

Example:
(CTRL) A

The VCX will respond as shown in the following example:

Example:

Primary: VAX
Connect to: HP

Then, type in the next destination at the *connect prompt*.

Example:
Primary: VAX
Connect to: HP

In the above example, you have now connected to HP. To return to the VAX without dumping HP, type the Hold character which is ^B in the following example.

Example:

(CTRL) B

The screen would indicate:

Connecting to: VAX

The next CTRL B entered would indicate:

Connecting to: HP

Note that a Hold Character allows you to toggle between the primary and secondary sessions.

To terminate any of the calls, do a Control State Character and then BYE or QUIT. If the prompt points to the secondary connection, then the BYE or QUIT will only drop that connection. And if the prompt points to the primary connection, then BYE or QUIT will drop both connections.

Example:

Primary: VAX
Secondary:HP
Connect to: Quit

In the above example, only the HP connection will be dropped.

Chapter **5**

Controlled Services

AB Service

The AB service gives the Network Administrator a rapid ability to change the destination of any or all dual auto-connects in a single node or an entire VCX network. A typical application is a network with a primary host and a backup host. Should the primary host fail, or maintenance be required, switchover can occur within a fraction of a second. When the network Administrator changes the position from A to B, or vice-versa, all affected ports receive a message regarding location (provided the port is configured to receive system messages). For example, the message *connecting to A* or *connecting to B* is sent to affected ports.

The AB service offers the opportunity to *set to A*, *set to B*, or to turn the VCX *off*. A and B were previously discussed. The *off* command suspends the node and no processing of connections, no auto-connects, no dual auto-connects, and no user switched connections will occur. This can be useful when trouble shooting a live network where remote users may be accessing resources causing uncontrolled behavior.

Accessing the Service

To access the AB service enter *AB* in response to the system prompt.

connect to: AB <CR>

The menu displayed is shown in figure 5-1.

Selecting 1 will return to the system prompt. Selecting *2* will result in the prompt shown in figure 5-2.

Enter the name of a port, a series of ports, a group, a speed connect or $ALL. The $ALL entry will take the appropriate action on all dual auto-connect ports in the node. A name has been entered for this example which results in the following prompt being displayed.

```
          *****  NETWORK AB SERVICE  *****

      1.  Exit AB Service
      2.  Enter name to be switched

      Enter selection:
```

Figure 5-1. Main Network AB service menu

```
          *****  NETWORK AB SERVICE  *****

      1.  Exit AB Service
      2.  Enter name to be switched

      Enter selection: 2


      Enter name to be switched
      (or $ALL for all ports this node): anyname
```

Figure 5-2.

Appears to be in the A position

1] Exit
2] Set to A position
3] Set to B position
4] Set to OFF position
5] Set to A/Disable B position
6] Set to B/Disable A position
Enter selection:

Notice that the service makes a determination of the current position by sampling the position of the first port of the name specified. (Note: if users are given a toggle character, different ports can be in different positions at any point in time. Therefore, it is impossible to know the exact status and display it in simple terms. The first port is shown in the example.)

If the selection is 3, VCX further prompts:

Are you sure you want the B position?

If this change is NOT desired, an *n* for no can be entered, returning the main menu. With *y* entered, after completion of the switching and producing messages, the VCX responds to the affected ports with:

Sending messages......

DONE

In addition to the affected terminals receiving a *connecting to* ... message, the system logger outputs a toggle event for each port.

When option 2 (set to A position) or 3 (set to B position) are selected, the non-active destination will still accept data and generate or respond to flow control characters. In some applications this behavior is not desirable. Therefore option 5 or 6 should be selected which connects the originate port to the A or B destination while disabling the non-active answer port. For example, if A/Disable B is selected, the originate port will be connected to the A destination and the B answer port will not take in data, or generate flow control characters or respond to flow control characters.

It is possible to use the AB service and enter action arguments in a single command line without dialogue with the AB service. This is particularly useful if a CPU is to initiate the AB switchover. The command syntax is:

AB(sp)[name](sp)[A or B or O or AD or BD] where,

name = a port, port series, a group, or a speed connect

A=position A
B=position B
O=turn off
AD=position A/Disable B
BD=position B/Disable A

If the name is a group which consists of one or more speed connects, it is possible to switch more than one node in a single command line. For example a name network can be defined in configure to permit simultaneous switching of all nodes in a 4-node network.

network=$ALL,t1.$ALL,t2.$ALL,t3.$ALL

Broadcast Service

The Broadcast Service allows the System Administrator to transmit a message of up to 1000 characters or 23 lines to any Originate port or Both port.

The Main Menu for the Broadcast Service is entered by typing *broadcast* after the Connect prompt. NOTE: One can by-pass the Main Menu by using the fast entry. See the description of the fast entry at the end of this section.

Connect to: broadcast <CR>

After doing so the Broadcast Service's Main Menu shown in figure 5-3 will be displayed:

```
     *****  BROADCAST  *****

 1.   Exit Broadcast Service
 2.   Enter message class
 3.   Enter destination of broadcast message
 4.   Enter broadcast message
 5.   Broadcast message to destination


 Enter selection:
```

Figure 5-3. Broadcast service main menu

Each of the options in the menu are discussed in the following paragraphs..

1. Exit Service

To exit the Broadcast Service, type *1 <CR>*, which returns you to the connect prompt.

2. Enter Message Class

There are two classes or levels of messages that are broadcast: a routine or an urgent message. The System Operator must define into which class his message falls by selecting option 2 from the Broadcast Service Main Menu. The selection of option 2 generates the following prompt.

Enter message class routine(1) or urgent(2):

If the broadcast message is to be classified as routine, *1* is entered. A routine message is one which is delivered to a port but may or may not be accepted by the port. A port will block a routine message if the message port parameter (set within Configure or Set Service) has been configured to ignore routine messages. Note: a routine message that is blocked at a port is simply dropped.

If *2* is entered, the broadcast message is classified as urgent. An urgent message is one that can not be refused by a port and therefore will always be delivered.

3. Enter Destination of Broadcast Message

Selecting option 3 from the Broadcast Service's Main Menu allows one to define the message's destination. The following prompt is displayed when option 3 is selected:

Enter message destination:

Only one name can be entered for the destination. However depending on the name selected, from between one port to virtually all Originate ports can be chosen as the destination. The various types of names that can be used are:

1) a single async port name

2) a trunk (or X.25) name with a valid extension

3) a group name (previously defined in Configuration), where the members in the group represent all of the selected destination ports. Note: This is the most common approach to defining the destination ports. Groups can be nested up to five levels deep.

4) or, the special name $ALL, which designates all of the existing async originate ports on the local node. Example: Let's assume you wanted to broadcast a message to all the originate ports on the local node and a remote node which is across a trunk named t1. You could define the name of all the destination ports as follows:

$ALL,t1.$ALL

4. Enter Broadcast Message

When you are ready to input the broadcast message, select option 4 from the Broadcast Service's Main Menu and the following prompt will appear:

Enter broadcast message text:

Note: If you forget to define the message's class (routine or urgent) or its destination, you will be prompted to provide that necessary data.

The broadcast message can be no longer than 1,000 characters or 23 lines. If the user exceeds this upper character limit or line number, the input mode will automatically abort. Normally, however, for a message that is less than 1,000 characters, the user ends the input mode by hitting the Escape <ESC> key.

The text of the message can include both alphanumeric characters and control characters. Control characters are entered by typing a caret (^) followed by the proper upper case letter. For example, the control code for a carriage return is represented as ^M.

5. Broadcast Message to Destination

When you select option 5 from the Broadcast Service's Main Menu, the message is actually sent to the destination defined earlier (in option 3). After option 5 is selected, the following will be displayed,

BROADCASTING MESSAGE

The broadcast message will be transmitted and the user returned to the system prompt.

When the message is transmitted to a port, it is announced by a BELL, a banner stating the time of day and the introduction:

**** BROADCAST MESSAGE ****

followed by the actual broadcast message and then the prompt,

Hit Return To Continue

Fast Entry: The Broadcast Service's Main Menu can be superseded if you enter the message class (1 for routine, 2 for urgent) and the destination group name at the time you call up the Broadcast Service. For example, suppose your message destination is defined by a group called mygroup and you consider the message to be routine. In this case you could enter broadcast 1 mygroup to call-up Broadcast, by-pass the Main Menu, and jump directly into the Message Input Mode.

Busy Service

The Busy Service renders a port or series of ports, trunk, or trunks out-of-service, allowing non-disruptive equipment maintenance. If the port/trunk is currently in use, the port/trunk remains in service until detachment occurs. Therefore, busying a port/trunk does not interrupt a user session in progress. The busied status of a port/trunk *is* retained if the chassis is powered down or reset.

To invoke the Busy Service, enter:

Connect to: busy <CR>

VCX-150 displays the Busy Service Main Menu illustrated in figure 5-4. Menu options are:

```
***** Busy Service *****

1. Exit
2. Busy a port or port series
3. Remove busy status from a port or series

Enter selection:
```

Figure 5-4. Busy service main menu

1. Exit

Type *1 <CR>* to exit the Busy Service and return to the connect prompt.

2. Busy a Port Or Port Series

Type *2 <CR>* to designate the port, ports, trunk, or trunks to be busied. For example, to busy the port *org*, enter:

Enter Selection: 2<CR>

This menu is shown in figure 5-5.

Should you decide not to busy a port, ports, trunk, or trunks, enter <CR>. The Busy Service redisplays the Busy Service Main Menu. If you enter the name of a port or trunk series, the Busy Service displays the Port Range Submenu. The details are:

```
***** Busy Service *****

1. Exit
2. Busy a port or port series
3. Remove busy status from a port or series

Enter selection: 2
Enter port or series name: org
"org" now busied.
```

Figure 5-5. Busy service menu with 2 selected

3. Remove Busy Status From a Port Or Series

Type *3 <CR>* to allow busied ports trunks to resume normal operation. For example, having busied the port *org*, you restore it to normal operation as shown in figure 5-6.

```
***** Busy Service *****

1. Exit
2. Busy a port or port series
3. Remove busy status from a port or series

Enter selection: 3
Enter port or series name: org
Busy removed from "org".
```

Figure 5-6. Busy service menu with "org" entered

If you decide not to change the busy status of a port or turnk, enter <CR>. The Busy Service redisplays the Busy Service main menu. If you enter the name of a port series, the Busy Service displays the Port Range Submenu.

Port Range Submenu

If you wish to busy or unbusy a port or turnk series, the busy Service displays the Port Range Submenu. This submenu allows you to select all the ports/trunks defined under the name or a range of ports/trunks within the series. The Port Range Submenu is shown in figure 5-7.

```
** Select Port Range **

1. Exit
2. All ports in series
3. Port range relative to start of series
4. Physical port range

Enter selection:
```

Figure 5-7. Port range submenu before selection

1. Exit

Type *1* <*CR*> to exit the Port Range Submenu and return to the Busy Service Main Menu.

2. All Ports In Series

Type *2* <*CR*> to busy or unbusy all ports defined under the name.

3. Port Range Relative To Start Of Series

Type *3* <*CR*> to busy or unbusy a range of ports within the series. This selection allows you to specify the range as beginning and ending ports relative to the first port in the series. For example, suppose that you had a series of asynchronous ports called *series* which included ports 6-16. And you want to busy out five ports, (6-10). You would enter data in the menu as shown in figure 5-8.

VCX-150 then displays the Busy Service Main Menu. Unbusying a port range relative to the starting port of a series works in exactly the same way as busying the ports. If you enter a port range that exceeds that of the named series of ports, VCX-150 displays the error message:

Name does not include all ports requested.

and returns you to the Busy Service Main Menu.

4. Physical Port Range

Type *4* <*CR*> to busy a range of port 23

This selection allows you to specify the range as absolute port numbers. For example, suppose we have configured seven ports, numbers 2-8 with the name *series* and we want *to busy* out ports 4-8. Figure 5-9 details how this is accomplished .

```
** Select Port Range **

1. Exit
2. All ports in series
3. Port range relative to start of series
4. Physical port range

Enter selection: 3

Number must be relative to first port in series.
Enter starting port number (1-13): 6

Number must be relative to first port in series.
Enter ending port number (6-13): 10
"s1" now busied
```

Figure 5-8. Port range submenu

```
** Select Port Range **

1. Exit
2. All ports in series
3. Port range relative to start of series
4. Physical port range

Enter selection: 4

Number must be physical position in chassis.
Enter starting port number (2-8): 4

Number must be physical position in chassis.
Enter ending port number (2-8): 8
"s1" now busied.
```

Figure 5-9. Physical port range submenu

VCX-150 then displays the Busy Service Main Menu. Unbusying a physical port range works in approximately the same way as busying the ports. If you enter a port range which exceeds that of the named series of ports, VCX-150 displays the error message:

Name does not include all ports requested.

and returns you to the Busy Service Main Menu.

Configuration Service

This section is a reference to the Configuration Service. It contains an overview of the Configuration Service, general rules for using the Configuration Service, and sections describing each menu and form of the Configuration Service with item-by-item descriptions of the menu selections and fields. New users may wish to *walk through* the *Configuration Tutorial* in this manual before proceeding.

Before you can configure or define the operating parameters of a node, you must complete the system installation procedure. (See the *Installation* chapter.) The system installation procedure describes how to enter the Configuration Service and initialize the Configuration Storage software.

Configuration Service Overview

A configuration is a set of operating parameters for a node. Some parameters are global, such as the installation name. Others are specific to a port, such as whether the port is an asynchronous line or a synchronous trunk line.

You can define several configurations for a node and store them in the Configuration Storage. However, only one configuration is active at a time. Alternate configurations can be stored for future expansion or for use in special circumstances, such as CPU failure or holidays.

User Lists

A collection of user names with applicable passwords, account ID and access rights.

Text

Free text can be created by the System Administrator and then called up by the user or automatically displayed when a device attaches to the VCX.

Name Types

A *name definition* is a label for a set of parameters that describe the functions of a logical port. A logical port is anything that can connect or be connected to. Examples of logical ports are:

- asynchronous port
- a collection of asynchronous ports
- a trunk line
- a VCX control service
- a pathname
- a X.25 port
- a character string

To each name definition you create, you must assign one of the following name types:

- **Asynchronous line(s)** Asynchronous ports can be connected to computers, terminals, asynchronous modems (dial-up or dedicated), printers, or virtually any other device with an EIA RS-232C interface. A name of this type can refer to one asynchronous port or to a series of physically contiguous asynchronous ports. Note that ports in a series have identical parameters.
- **Trunk line** A trunk line is a single synchronous line for point-to-point statistical multiplexing to another node. One of the two synchronous ports on the VCX-150 must be used for the trunk line.
- **Speed connect** A speed connect name is a one-name abbreviation for a more complex pathname through the network.
- **Group** A group name represents several logical ports. For example, suppose the names *vax1*, *vaX2*, and *vax3* have been created for ports connected to a VAX minicomputer. These ports can be collected under the group name *vax*. VCX routes users who attempt to connect to *vax* to either *vax1*, *vax2*, or *vax3*, or VCX-150 queries users for connection if all ports in the group are currently connected. Note that the ports in a group need not be contiguous or similarly named.
- **Services, controlled access** This name type allows you to limit access to VCX-150 services to a desired subset of ports.
- **X.25 port** An X.25 functions as a PAD (Packet Assembler/Disassembler) and is commonly used for connection to a public data network. Currently, the VCX- 150 X.25 implementation is certified for the Canadian Datapac, U.K. PSS (Packet SwitchStream), and the U.S. Tymnet and Telenet X.25 networks.
- **String** An ASCII string which is output at attachment or detachment time for both the originate and answer ports.

Security

Security functionality in the VCX-150 is a combination of *access control* and *auditing*. Access control is the mechanism that allows a system administrator to create and enforce policies for use of a system. The administrator sets up rules which control each user's access to the system resources. A resource is defined as anything that a terminal user can connect to, i.e., a service, a port, or a trunk line. VCX treats all three types of resource in the same manner.

Auditing is the means by which the system administrator keeps track of the actual uses of the system resources. Auditing is used to detect attempts to violate access control, to evaluate the damage done by the violations, and to account for resource usage. The system administrator uses access control to specify what users can do, and auditing to determine what they have in fact done.

There is a conflict between ease of use and access control. Access control is intended to make life difficult for intruders and to force intended users to do only what they ought to. The more secure a system is, the more burdensome the user ID procedures are, and the more difficult it is to do anything unusual.

Access Control

User Perspective: To the terminal user, access control is straightforward. A user starts a session and depending on the security configuration may be asked to provide his user name and password. If the password is correct, the switch logs him on, generates a logging message, and starts a user session running. The user then attempts connection to a resource and there are three possible outcomes:

1) The terminal may be allowed access to the desired resource, and is duly connected.

2) If access is not allowed, the user may be prompted for a password associated with that particular resource. Proper password entry results in a connection to the resource.

3) Last of all, access may be prohibited and the switch will not allow connection.

Administrator Perspective: Access control is set up with the configuration utility. You can view the security function as a multipoint filter. You can apply this filter to any one or more of the following points to narrow down the access. The:

- User
- Originating port
- Trunk lines
- Destination port

If you do not specify a filter at any of the above points, then the security access allowed previous to that prevails.

The user security is enabled by requiring the user to submit name and password prior to attachment to the VCX-150. This is particularly useful to limit hacker access, screening some of them out prior to dialogue with the switch.

Further security is achieved by assigning access levels to the originating port. Only user access levels (defined in the user list along with name, password, and account ID) that match the originating port access levels can go any farther. The user list is a configuration like any other, allowing the system administrator to add, modify, or delete names. The user list is referenced in the global configuration to allow the VCX-150 to associate the proper set of users with the running configuration.

The trunk lines and destination port provide additional filtering to permit only desired users access to the network resources. Resources again, are any VCX-150 services, interconnecting trunk lines, and ports (usually an answering port attached to a computer port). Should access rights not match somewhere during this sequential check, it is still possible for users with the proper password(s) to override the access block. This override capability is set up during configuration for any answering port, including trunks and originate/answer ports.

Access Rights

Access rights and resources are given to the user in the form of numbers from 1 to 64, placed in the configuration menus in a variety of ways, i.e.,

1-5, 6, 8, 33-35

1-6, 8, 33, 34-35

1, 2, 3, 4, 5, 6, 8, 33, 34, 35

All of the above examples mean the same thing. The user, originate ports, services trunks, and answer ports are all given access rights. By way of example , a user with access rights 1-10 is attached to an originate port with access rights 8-33, so the connection can utilize any remaining resource in the range 8-10. If the requested computer port is connected to an answer port with access rights 1-20, the request for connection to that computer is granted, no questions asked.

If, however, the answer port had access rights of 11-20, the connection could be flatly denied or the user prompted for a password to override the block. Which scenario prevails is set up at configuration time.

User Lists

User lists are configurations, but unlike running configurations they merely allow the VCX-150 to control access to the switch by screening out intruders and non-qualified users. Unless a name and password match are found in the user list designated to control the security (found in the global configuration), access to the switch is denied, unless of course logon has not been enabled for that port. Denial is in the form of allowing three attempts to present the proper name and password, otherwise communication with the VCX-150 is terminated for 30 seconds before another attempt can be made. The idea is to slow down the intruders trying to play a guessing game. Combine this with the logging of a violation message, and the system administrator can zero in on the source of attempted intrusion.

Password Override

Any answering port can be optioned to permit password override in the event of an access rejection. Normally this is only to allow someone that is not the usual terminal operator to perform tasks on a foreign terminal, i.e., a roving network troubleshooter. The configuration service stores access rights for all resources and override passwords where applicable.

VCX-150 Services

A VCX-150 service is a special case of a destination port where the resource is in fact stored internal to the VCX-150. When beginning from a cold start, all services are given a 1 access right just like everything else in the VCX-150. However, it is not wise to allow any user access to all services, some of which can be catastrophic to network performance. More reasonably, user services like the following can be given to all. They affect only the user.

- Fox
- Loopback
- Set
- Time
- TM (transparent mode)
- Who

However, controlled services that affect overall network performance such as shown below, should have restricted access.

- AB
- Broadcast
- Busy
- Configure
- Diagnostic
- Forward
- Greeting
- Load/dump
- Logging
- Performance
- Reset
- Revision
- Settime
- Setup
- Status

Access Rights Assignments

As received, a VCX-150 node will not have a security system established. All users and resources have an access right of *1* for a default and the global default access right field will have no entry. The only remaining concern would be a user off of a X.25 PDN using a foreign PAD. An incoming call request packet will not have any access rights information. To avoid such users from being locked out of a

VCX-150 network, an access right of *1* is given to them. In addition under normal security filtering, a user whose access rights have been diminished to *0* will be given a *1* access right.

To avoid potential conflicts, when establishing a security system, use only the access rights of 2 though 64 inclusive; *0* and *1* are reserved for the proper handling of VCX-150 and PDN users where no security system is desired.

X.28, X.29, and X.3 Compatibility

The VCX X.25 software module provides a CCITT X.25 level 3 compatible protocol that can operate on any synchronous card. Installed in a VCX, it makes available up to 64 virtual circuits over a single trunk, at up to 64,000 bps. The software can operate as either DCE or DTE in an X.25 environment.

X.25 software provides a gateway between a VCX network and a X.25 packet network or an X.25 packet host. Speed connections can be configured in the VCX so that in most cases the user is completely transparent to issues such as X121 addresses and VCX routing. The user simply keys in a mnemonic name and is connected to a PDN resource.

X.25 allows communication between asynchronous terminals and X.25 devices by implementing CCITT recommendations X.3, X.38, and X.39 which in combination define the operation of a PAD (packet assembler/disassembler). A PAD collects information (characters) from an async terminal or host port, organizes it into properly formatted data packets, and transmits the packets through a network (PDN). At the other end, the PAD works in reverse, receiving packets, disassembling them, and passing them onto the attached terminal or host.

The CCITT developed guidelines or recommendations on how the packets should be formatted (X.25), what PAD parameters should be catered for (X.3), how the terminal should communicate with the PAD (X.28), and how an X.25 network should communicate with the PAD (X.29). All of these recommendations, X.25 with X.3, X.28, and X.29 are implemented in the VCX. The latter three are referred to as the triple-X recommendations.

X.3

X.3 defines a set of 22 parameters (for the 1984 recommendations) which can provide services to an async terminal. Examples are: parameter 2 can provide a local echo, parameter 3 defines the character to trigger a packet to be forwarded to the network, etc. Appendix E lists the X.3 parameters supported and their values.

X.28

The commands to and responses from a PAD are defined by X.28. This command and response set are the means for communication between the PAD and a terminal. Some commands are those for modifying X.3 parameters, to establish calls, to take down calls, etc. Responses from the PAD advise the user as to the establishment of a connection, reasons for the call being cleared, etc. Appendix A is a list of commands and responses used to communicate with the PAD. In addition to the mandatory list in recommendation X.28, user-friendly commands and expanded responses are included.

X.29

X.29 defines the commands and responses for communication between the PAD and the remote DTE. The X.29 commands from a remote DTE can change local parameters, invite the PAD to clear the connection, and inquire into the current values of the X.3 parameters. The VCX supports all of the X.29 commands. Since they are largely invisible to the terminal user, there will be no detailed discussion of them.

Operation

A PAD has two modes of operation, the data transfer mode and the command mode. In the command mode, the VCX will accept the commands transmitted from the terminal. In the data transfer mode, any character keyed in at the terminal will be transmitted to the network. The only exceptions are the escape to command mode character and a break. Keying either of these characters can cause entry into the command mode (under the conditions described below). The ways you can enter the command mode are as follows:

X.3 parameter 1 determines whether the terminal operator can enter the command mode. If its value is 0, the terminal operator cannot escape to the command mode. If the value is 1, then a ^P (control P) will cause entry into the command mode. Once in command mode it is possible to change the escape to command mode character to any ASCII character in the numerical range of 32-126.

If the escape character is followed by another escape character, a single escape character will be transmitted and the X.25 virtual circuit will remain in the data transfer mode. If an escape character is followed by a carriage return, nothing is transmitted and the virtual circuit remains in the data transfer mode. However, if the escape character is followed by any other character, the command mode is entered.

There is one other way the operator can enter the command mode. If the X.3 parameter 7 is set to 8, a break key will permit escape to the command mode. This action occurs regardless of the setting of parameter 1.

Once in the command mode, a carriage return on a line by itself returns the terminal operator to the data transfer mode.

In the example shown in figure 5-10, a terminal user is connected to VCX which has a X.25 trunk named PAD. Placing a call over the packet network to a host at address 3019218600 can be achieved in several ways. In the first method, a pathname can be input, PAD.3019218600 in response to a VCX prompt where PAD is the name of the X.25 trunk connection going to the PDN. NOTE: User facilities can also be set from the VCX command line. The general format being: PAD.(facility).(facility).(address).(call user data) Any number of facilities can be set if they are each separated by the dot (.) delimiter. For more information on the facilities, see Appendix A.

A second method would be to have a speed connect defined in the configuration with a useful name like VAX3. This is particularly helpful if the VAX3 resource will be frequently accessed. In this case all the terminal user does is key VAX3 in response to the VCX prompt.

A third method would be to connect to the X.25 trunk, named PAD, which places the terminal operator in the PAD command mode, noticeable by the PAD banner and prompt. The operator can now place a call to VAX3 by entering CON 30119218600.

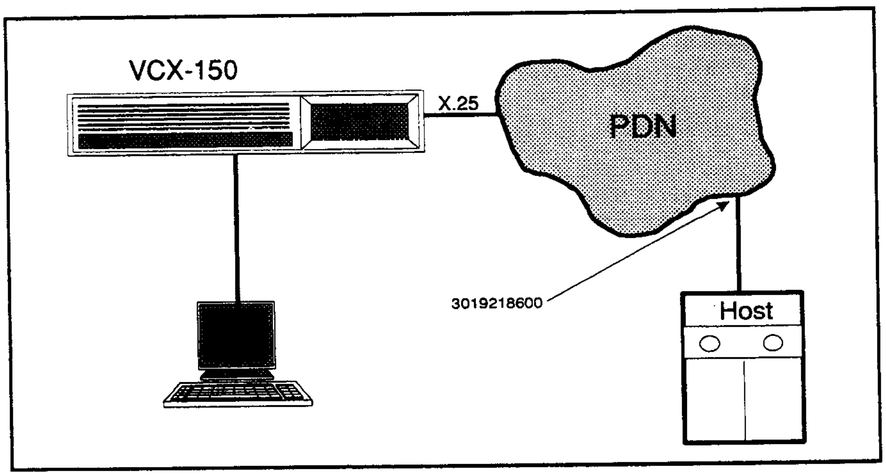


Figure 5-10. Example 1

Regardless of which method is used, a successful connection will result in a call connected message on the user terminal. When the session is complete, the host may be programmed to initiate a call takedown in response to the operator logging off the host, whereupon the terminal operator will receive a PAD call cleared, remote DTE originated message. Alternatively, the terminal operator can escape to the command mode and type clr or clear. The virtual circuit will be taken down with a clear confirmed message sent to the terminal operator.

In the example 2, shown in figure 5-11 a user, connected to VCX A, wishes to use a resource connected to VCX B. The two VCX's are interconnected via a packet network. The terminal user on VCX A places a call to VCX B using the network address, 3019218600. It can be done using any of the methods described in example 1. If a speed connect exists in VCX B that matches the network address, the call is automatically routed to the answer port at the host.

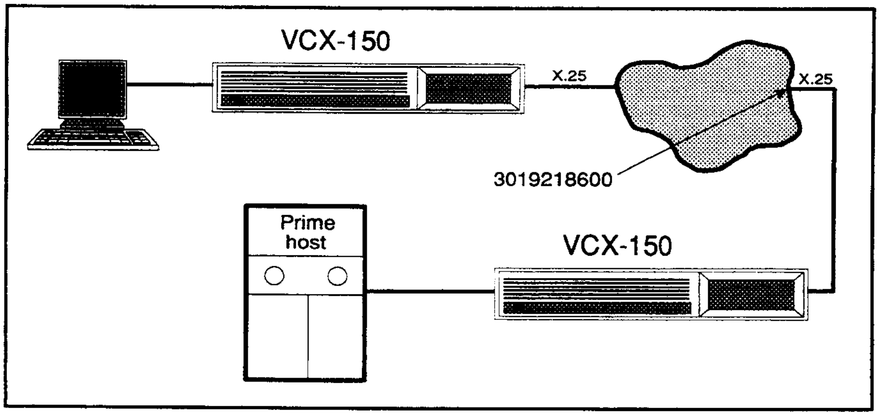


Figure 5-11. Example 2

If a speed connect matching that address does not exist, a prompt from VCX B is issued. The terminal user would respond in the normal manner with the host name to complete the connection.

In this example a VCX is talking to another VCX through a PDN. The terminal user can enter c.address in response to a VCX PAD A prompt and VCX B will pick-up the call and issue a prompt.

A third scheme would permit the terminal user to connect to the host by sending call user data in the call request packet. In response to a VCX A PAD prompt the user enters c.3019218600.prime. VCX B then accepts the call and if the name prime exists, it automatically connects the user to the host. If the name doesn't exist, the call request is refused.

A fourth method of connection is to enter 3019218600.prime in response to VCX A PAD prompt. The PDN routes the call through the network to VCX B which in turn attempts connection to a speed connect with the name 3019218600. (NOTE: If there are more than 10 digits in the name, the VCX will consider the 10 least significant digits. If there are 10 digits or less in the name, the VCX will consider the entire name.) If no match exists, connection to a name matching the call user data, prime, is attempted. If that is unsuccessful, the call is refused.

In the third example shown in figure 5-12, an X.25 Host wishes to make a call to several terminals connected to Telenet and poll for data. Connection to the PDN is through an intermediate VCX which fronts the Host. The Telenet addresses for the terminals are 123, 456, and 789. The X.25 trunk connecting to the PDN is called Telenet in the VCX configuration and speed connects have been created with the names 123, 456, and 789. Speed connect 123 = telenet.123, 456 = telenet.456, and 789 = telenet.789. The Host can initiate a call to any of the terminals by using any address for the VCX, but with call user data matching the terminal it wishes to connect to through Telenet. The VCX will match the call user data to the appropriate speed connect and initiate a call request packet through Telenet with the terminal address of choice.

Alternatively, each terminal can be called by the host without call user data. The host places a call to the terminal at address 123, and the VCX matches that to Telenet.123 and a call request packet goes out over the network to the terminal at 123.

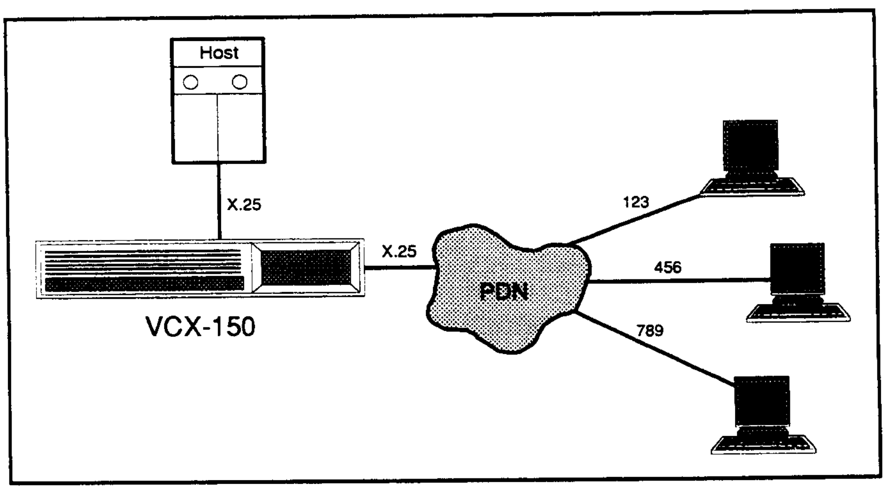


Figure 5-12. Example 3

Using the Configuration Service

Menus

The Configuration Service is menu-driven; you configure a node by responding to prompts. There are three levels of Configuration menus. You must step through the menus from Level 1 to Level 2 to Level 3. Similarly, to exit the Configuration Service from the third menu, you must *back out* from Level 3 to Level 2 to Level 1.

The Configuration Service Level 1 Menu functions include initializing and adding or modifying configurations.

The Level 2 Menu functions include: adding, copying, deleting, and displaying configurations. Also, at the Level 2 Menu you select the configuration that runs on power-up or reset.

The Level 3 Menu functions include: adding, modifying, deleting, and displaying name definitions within a configuration. Also, at the Level 3 Menu you modify global configuration parameters.

Forms

When you wish to add or modify a name definition, you fill out forms to describe the characteristics of the logical port. Examples of these characteristics include: the name type, the baud rate of the port (if applicable), and the list of ports that have access rights (if applicable).

Each of the name types —

Asynchronous lines
Trunk line
Speed connect
Group
Services, controlled Access
X.25 port
Strings

— represents different forms (and subforms, if necessary) to collect the required information about the name being defined. There are also forms for global configuration parameters.

In using the Configuration Service, you will find that one distinction between a menu and a form is that you cannot back out of a form. That is, once you enter a form, you must complete it, either by entering new values or accepting the current values.

Name Selection

When several configurations have been created and stored in the Configuration Storage, you must select the name of the configuration you wish to examine or edit. The Configuration Service prompts for a configuration name as in the example below:

> **Terminate with:**
> **ESCape-exit <CR>-current name ^E-previous name ^C-next name**
> **Enter Configuration name:** anyname

When this prompt appears, your options are to:

- press <ESC> to abort the command sequence
- press <CR> to examine or modify the configuration name currently displayed under the cursor
- enter ^*E* to scroll back to the previous configuration name
- enter ^*C* to scroll forward to the next configuration name
- directly type the name of the configuration you want to examine or modify.

When the name of the configuration you wish to examine or modify appears under the cursor (whether via scrolling or direct entry), enter <CR> to accept the configuration name.

Similar prompts allow scrolling through name definitions in a configuration.

Field Selection

Similar to the above *name-scrolling* prompt is this instruction line:

—<CR>=next field — ^E=previous field — ESC=accept screen —

This line generally accompanies a display of parameters in the upper part of your screen. A pointer character (>) indicates which parameter is the current field. In the lower part of your screen, the Configuration Service prompts you to enter a value into the current field.

The instruction line above indicates that you can enter <CR> to step forward one field or a ^*E* to step backward one field. Entering <ESC> accepts currently displayed values and steps to the next form or menu.

Hint: To examine a form without editing it, avoid entering data. Press <ESC> to accept the displayed data when you are ready to move on.

Configuration Service Menu Summary

The following summarizes the Configuration Service menus:

Level 1 Menu

Selection: 1) ADD/MODIFY configurations, user lists or texts in a module
Selection: 2) INITIALIZE configuration storage

Level 2 Menu

Selection: 1) ADD a new configuration
Selection: 2) ADD a new user list
Selection: 3) ADD a new text
Selection: 4) EXAMINE/MODIFY a configuration, user list or text
Selection: 5) DELETE a configuration, user list or text
Selection: 6) LIST existing configurations, user lists or texts
Selection: 7) SELECT configuration to run

Level 3 Menu (Configurations)

Selection: 1) ADD new name(s)
Selection: 2) EXAMINE/MODIFY a name
Selection: 3) DELETE a name
Selection: 4) LIST existing names
Selection: 5) EXAMINE/MODIFY global configuration parameters
Selection: 6) MERGE all names with those from another configuration

Level 3 Menu (Users Lists)

Selection: 1) ADD new user(s)
Selection: 2) EXAMINE/MODIFY a user
Selection: 3) DELETE a user
Selection: 4) LIST existing users
Selection: 5) EXAMINE/MODIFY user list description
Selection: 6) MERGE all users with those from another user list

Level 3 Menu (Text)

Selection: 1) EXAMINE/MODIFY text description
Selection: 2) EDIT text

The menu selections are explained in detail below.

Configuration Service Level 1 Menu

To invoke the Configuration Service, enter *configure* at the prompt. This will display the menu shown in figure 5-13.

```
 1) ADD/MODIFY configurations, user lists or texts
 2) INITIALIZE configuration storage
Enter selection [or ESC to exit]:
```

Figure 5-13. Main Network AB service menu

Connect to: *configure <CR>*

Exiting the Configuration Service

Press <ESC> at the Level 1 Menu to exit the Configuration Service and return to the connect prompt.

1. ADD/MODIFY configurations, user lists or text

Type *1 <CR>* at the Level 1 Menu to add a configuration or modify an existing configuration.

In the upper right corner of your screen, the Configuration Service displays the number of memory blocks available in the Configuration Storage you select. The format of this display is: [x/y used] where x is the number of blocks used and y is the number of blocks available in a VCX-150. One block is equivalent to 256 bytes of memory. Older units have y = 16 (4K bytes of storage) and newer units have y = 64 (16K bytes of storage).

The Configuration Service also displays the configurations, if any. If more than 12 configurations are stored, the Configuration Service displays configuration names twelve at a time in alphabetical order, then prompts:

— more names — continue? (y/n) [n]

Enter *y <CR>* to view the additional configuration names. When all the stored configurations have been displayed, or if you enter <CR>or *n <CR>* in response to the *more names* prompt, the Configuration Service displays the Level 2 Menu. See below under *Level 2 Menu* for instructions on adding, examining, and modifying configurations.

2. INITIALIZE Configuration Storage

Type *2 <CR>* at the Level 1 Menu to initialize the Configuration Storage —a process analogous to formatting a disk. You must initialize a Configuration Storage if you have not yet configured the node. You may wish to initialize a Configuration Storage to erase the data stored in it.

The Configuration Service displays a *second chance* prompt:

> Are you sure you want to initialize entire module (y/n)? [n]

Enter *<CR>* or *n <CR>* to abort the initialization process. If you enter *y<CR>*, the initialization process reformats the RAM in the Configuration Storage, erasing the stored data.

Configuration Service Level 2

The level 2 menu is shown in figure 5-14.

```
Config: ourgang                                  [7/32 used]

       Name   Type              Description

   example1 Configuration     Manual Example 1
   example2 Configuration     Manual Example 2
    ourgang User List







 1) ADD a new configuration
 2) ADD a new user list
 3) ADD a new text
 4) EXAMINE/MODIFY a configuration, user list or text
 5) DELETE a configuration, user list or text
 6) LIST existing configurations, user lists and texts
 7) SELECT configuration to run
Enter selection [or ESC to exit]:
```

Figure 5-14. Second level configuration service menu

NOTE: If no configuration exists in the Configuration Storage, only selection 1, *ADD a new configuration*, is valid.

Exiting To Level 1

Press <ESC> to exit the Level 2 Menu and return to the Level 1 Menu.

Options available at the second level configuration service menu are:

1. ADD a New Configuration

Type *1 <CR>* at the Level 2 Menu to add a new configuration name. The Configuration Service then prompts you for the name of the configuration:

New configuration name:

To abort the name addition process, press *<ESC>*. To proceed, type the name you wish to use and press carriage return. The name can consist of up to ten alphanumeric characters. For example, to name a configuration *anyname*, you enter:

New configuration name: anyname <CR>

The Configuration Service immediately routes you to the global configuration parameters form, shown in figure 5-15.

See *Level 3 Menu—Selection 5:EXAMINE/MODIFY configuration parameters* for details on this form.

```
Config: dons                                     [8/32 used]
           Description:>
      Installation name:
         Connect prompt:
  Default Access Rights:
           Logging port:
        Logging enabled: No    Binary output: No    Logging mask:
Modem network mgr port:
                   addr: 1
    IOK log message timer: 0
              Node name:
         User list name:
        Local time zone:
    Local time when it is midnight Greenwich Mean Time -
                  Hours: 0            Minutes: 00
         Display format: U.S. (mm/dd/yy hh:mm:ss)
Queue length threshold: 30
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



Description:
```

Figure 5-15. Configuration service global form

2. ADD a New User List

If for security reasons, you want the VCX-150 users to log-in their name and a password, you will need to enter into the VCX-150, an actual list of user names. The user names are added using selection 3 from the menu, EXAMINE/MODIFY a configuration, user list or text. However, before this can be done, you must give a name to your new user list. This is accomplished with menu selection 2. When *2 <CR>* is typed, the following prompt will be displayed:

New user list name: ourgang <CR>

You are asked by the prompt to enter the name for the user list, i.e., *ourgang*. The name can be no more than eight characters in length. After naming the user list, the screen display will change to the menu shown in figure 5-16.

```
Config: ourgang                         [8/64 used]
        Description:>
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------




Description:
```

Figure 5-16. User list name subform

Your description of the user list can be no longer than 30 characters. After entering a description, you are returned to the Level 2 Menu. To actually add names to the user list, use Selection 3, *EXAMINE / MODIFY a configuration, user list, or text*. Remember, when you are prompted in Selection 3 for a Configuration name, enter your new user list name.

3. ADD a New Text

If you want to have text describing a particular VCX function accessible to the user or if you want to display text when a device attaches to the VCX, you can use the text function. However, before you actually compose the text (Selection 4, *EXAMINE / MODIFY a configuration, user list or text*) you need to give the text file a name.

Selecting *ADD a new text*, option 3, from the Level 2 menu will generate a prompt which asks for the name of the text file:

new text name: salutation <CR>

After the name has been entered (*salutation* in this example), the screen shown in figure 5-17 is displayed.

```
Config: salutation                        [9/64 used]
          Description:>
        Access Rights:
------ <CR>=next field --- ^E=previous field --- ESC=accept screen ------




Description:
```

Figure 5-17. New text description subform

You can now enter a brief description about the text file, 30 characters or less in length.

Following the *description*, you can select the access rights associated with the text file. These are rights the user must have before they can display and read the text. If there are no restrictions, just hit <CR>.

4. EXAMINE/MODIFY a Configuration, User List, Or Text

Type *4 <CR* at the Level 2 Menu to go to the Level 3 Menu. The Configuration Service prompts you for the name of the configuration, user list or text you wish to examine or change:

Configuration, user list, or text name:

Enter *<ESC>* to return to the Level 2 Menu. To continue, scroll to or type the configuration name, followed by <CR>. The Configuration Service then displays the name definitions for the selected configuration. If more than 12 names are defined, the Configuration Service displays the names twelve at a time in alphabetical order, then prompts:

— more names — continue? (y/n) [n]

Enter *y <CR>* to view the additional names. When all the names have been displayed, or if you enter <CR> or *n <CR>* in response to the more names prompt, the Configuration Service displays the Level 3 Menu. See below under *Level 3 Menu* for instructions on editing name definitions and global configuration parameters.

Note: If you are adding user names and passwords to a user list, all alphanumeric characters must be entered in lower case.

5. DELETE a Configuration, User List Or Text

Type *5<CR>* at the Level 2 Menu to delete a configuration, user list or text. The Configuration Service displays:

Configuration, user list or text name to be deleted: anyname

To abort the deletion process, press *<ESC>*. To delete the displayed configuration, press <CR>. To delete a configuration other than the one initially displayed, scroll to or type the name of the configuration you wish to delete, then press *<CR>*. The Configuration Service then displays the second chance prompt:

Do you really want to delete this configuration/user list/text? (y/n) [n]

Enter *<CR>* or *n <CR>* to abort the deletion process. If you truly want to delete the configuration, enter *y <CR>*. The configuration will be erased— with all its associated port, trunk, and group names.

6. LIST Existing Configurations, User Lists Or Texts

Type *6 <CR>* at the Level 2 Menu to display existing configurations or user lists, (figure 5-18).

The Configuration Service displays up to twelve configuration names in alphabetical order with their associated comments. If more than twelve configurations are stored, the Configuration Service displays them twelve at a time and prompts:

— more names — continue (y/n)?

Enter *y <CR>* to view additional names. Enter *n <CR>* to return to the Level 2 Menu.

7. SELECT Configuration To Run

Level 2 menu selection 7 determines which configuration will run and become active with the next power-up or reset. The prompt is:

Configuration to run:

Enter the name of the configuration to be used, then press <CR>.

```
Name              Type              Description
anyname           Configuration     Run normally
backup1           Configuration     Run if CPU goes down
backup2           Configuration     Run if trunk line goes down




 1) ADD a new configuration
 2) ADD a new user list
 3) ADD a new text
 4) EXAMINE/MODIFY a configuration, user list or text
 5) DELETE a configuration, user list or text
 6) LIST existing configurations, user lists and texts
 7) SELECT configuration to run
Enter selection [or ESC to exit]:
```

Figure 5-18. Existing configurations

Configuration Service Level 3

The level three menu is displayed as shown below:

1) ADD new name(s)
2) EXAMINE/MODIFY a name
3) DELETE a name
4) LIST existing names
5) EXAMINE/MODIFY global configuration parameters
6) MERGE all names with those from another configuration
Enter selection [or ESC to exit]:

NOTE: If no name definition exists in the configuration, only selection 1, *ADD a new name*, and selection 5, *EXAMINE / MODIFY global configuration parameters*, are valid.

EXITING TO LEVEL 2

Press *<ESC>* to exit Level 3 and return to the Level 2 Menu.

1. ADD New Name*(s)*

A name definition is a label for a set of parameters associated with a logical port. Type *1 <CR>* at the Level 3 Menu to add a name definition. This prompt appears:

New entry name:

To abort the name addition process, press *<ESC>*. To proceed, type the name you wish to use and press *<CR>*. The name can consist of up to ten alphanumeric characters. The Configuration Service then displays the Name Type Form:

> **1) Asynchronous line(s) (Slot 1) 5) Services; controlled access**
> **2) Trunk line (Slot 2) 6) X.25 port (Slot 2)**
> **3) Speed connect 7) String**
> **4) Group**
> **Name type:**

You must select a name type, then complete the form(s) associated with that name type. (See the sections describing the forms for details.) After you complete the form(s) for the name type you select, the Configuration Service again displays the prompt:

> **New entry name:**

You can then add another name or press *<ESC>* to exit to the Level 3 Menu. For example, to name an asynchronous VCX-150 port cabled to a port on a VAX minicomputer *vax1*, you enter: *VAX1*

[Hit ESCape key to exit]

> **New entry name:** vax1 <CR>

> **1) Asynchronous line (Slot 1) 5) Services; controlled access**
> **2) Trunk line (Slot 2) 6) X.25 port (Slot 2)**
> **3) Speed connect 7) String**
> **4) Group**
> **Name type:** 1<CR>

The Configuration Service then displays the forms for Asynchronous Line(s).

HINT: Once entered, **forms do not allow you to back out of them**. Should you decide not to add the name after pressing <CR>, enter <ESC>'s until the Configuration Service redisplays the Level 3 Menu. You can then use Level Menu selection 3, *DELETE a name* to erase the added name. See section *3. Delete a Name* later in this chapter.

2. EXAMINE/MODIFY a Name

Type *2 <CR>* at the Level 3 Menu to change the characteristics of a logical port. First, the Configuration Service prompts for the name of the logical port:

> **Terminate with:**
>
> **ESCape-exit <CR>-current name ^E-previous name ^C-next name**
>
> **Entry to modify:** name1

To return to the Level 3 Menu, press <ESC>. To proceed, scroll to or type the name you wish to examine or modify, then press *<CR>*. The Configuration Service then displays the Name Type Form:

1) Asynchronous line(s) (Slot 1) **5) Services; controlled access**
2) Trunk line (Slot 2) **6) X.25 port (Slot 2)**
3) Speed connect **7) String**
4) Group
Name type: ,

You must select a name type, then complete the form(s) associated with that name type. (See the sections describing the forms for details.) After you complete the form(s) for the name type you select, the Configuration Service again displays the prompt:

Terminate with:
ESCape-exit <CR>-current name ^E-previous name ^C-next name

Entry to modify: name1

You can then examine/modify another name or press *<ESC>* to exit to the Level 3 Menu.

3. DELETE a Name

Type *3 <CR>* at the Level 3 menu to delete a name definition. A prompt similar to the example below will appear:

Terminate with:
ESCape-exit <CR>-current name ^E-previous name ^C-next name

Entry to delete: name1

To abort the deletion process and return to the Level 3 Menu, press <ESC>. To proceed, scroll to or type the name you wish to delete, then press <CR>. The Configuration Service then displays the second chance prompt:

Do you really want to delete this entry? (y/n) [n]

Enter <CR> or ***n*** <CR> to abort the deletion process. If you truly want to delete the name definition, enter *y <CR>*. After deleting the name, the Configuration Service displays the Level 3 Menu.

You can then delete another name or press *<ESC>* to exit to the Level 3 Menu.

4. LIST Existing Names

Level 3 selection 4 displays a summary chart of name definitions, as shown in figure 5-19.

```
Config: simple                                  [11/64 used]

      Name  Type                            Brief Description

       ans  Asynchronous line(s)            01\02 - 01\02
       org  Asynchronous line(s)            01\01 - 01\01
       pad  X.25 trunk                      02\01
    series  Asynchronous line(s)            01\03 - 01\10
      vax1  Asynchronous line(s)            01\02 - 01\02







 1) ADD new name(s)
 2) EXAMINE/MODIFY a name
 3) DELETE a name
 4) LIST existing names
 5) EXAMINE/MODIFY global configuration parameters
 6) MERGE all names with those from another configuration
```

Figure 5-19. List of name definitions

Up to ten names are displayed at a time. If there are more names, the Configuration Service prompts:

— more names — continue (y/n)? [n]

Respond *y* <*CR*> to view the additional names. Respond <*CR*>or *n* <*CR*> to return to the Level 3 menu.

5. EXAMINE/MODIFY Global Configuration Parameters

Global configuration parameters are those parameters not specific to a logical port. When you first add a configuration, the Configuration Service automatically routes you to the Global Parameters Form. To examine or change the global parameters of a configuration, enter *5* <*CR*> from the Level 3 Menu. The Global Parameters Form appears, which is shown in figure 5-20.

The following paragraphs describe the fields of the Global Parameters Form.

Description

The description field can be used to comment on the configuration. The length of your entry is limited to thirty characters. You can use any printable letters, digits, or symbols. For example, you might choose to enter:

Description: Run normally <CR>

```
Config: dons                                [8/32 used]
          Description:>
     Installation name:
        Connect prompt:
 Default Access Rights:
          Logging port:
       Logging enabled: No    Binary output: No    Logging mask:
Modem network mgr port:
                  addr: 1
  IOK log message timer: 0
             Node name:
         User list name:
        Local time zone:
   Local time when it is midnight Greenwich Mean Time -
                 Hours: 0          Minutes: 00
        Display format: U.S. (mm/dd/yy hh:mm:ss)
Queue length threshold: 30
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



Description:
```

Figure 5-20. Global parameters form

This could be your description about a configuration to be run except in the event of CPU failure. The description field accepts upper and lower case letters in your input just as you enter them. To delete an entered comment, press the spacebar followed by <CR>.

Installation Name

The installation name appears as the first line of the node logon banner. You can enter any combination of printable upper and lower case characters, up to 60 characters. VCX-150 stores the string just as you enter it. For example, you might enter:

Installation name: Acme Balloon Co. - Boston Node <CR>

To delete an entered installation name, press the *spacebar* followed by <*CR*>.

Connect Prompt

The connect prompt appears to the terminal user as the last line of the logon banner; it reappears any time the user enters the control state. Throughout VCX-150 documentation the connect prompt shown is the default:

Connect to:

However, you can change this prompt to any combination of up to thirty printable characters. VCX-150 retains upper and lower case within the string just as you enter it. The prompt is:

Connect prompt:

Enter the connect prompt just as you wish it to appear (including a colon or any other desired punctuation).

Default Access Rights

The next prompt allows you to set the default access rights. These are the access rights that any port (answer, originate, or trunk) will default to, before they are configured for any access rights or password override. Enter 1 - 64 to allow access to any resource.
The prompt is:

Default access rights: 1 - 64 <CR>

Logging Port

You can request VCX-150 to collect usage data (for example, connection attempts, successful connections, disconnections) and continuously route these data to the logging port. A printer or computer port is usually connected to the logging port, although a CRT may also be used for demo or for non-permanent logging. The name you enter for the logging port must correspond to a configured port on the node. It is also possible to output logging information to a remote destination by entering a trunk name. To disable logging, press <CR> without naming the port. If you already have a logging port named, pressing the space bar then <CR> erases it, leaving you with no logging.

For example, if you wish to configure a printer as a logging terminal and name it *logger*, enter:

(blank for logging disabled)
Logging port: logger <CR>

See the *Logging Service* section in this manual for a detailed description of the logging function, and information presented.

Logging card: 0<CR>

The next field is Binary output and determines whether logging data is in binary or ASCII format. The added benefit of binary is more compact data and configuration data for auto building hardware inventory records. Enter **1** for *No* or **2** for *Yes* and enter **<CR>** to select binary output from the logging port. No is chosen when the logging port connects to a printer. Yes is chosen when connected to a nms.

Binary output: 1) No
2) Yes

A mask can be entered at the prompt to filter logging classes and prevent them being from being forwarded to a management center. For example, *N,P* would prevent normal and performance events from being output from the logging port.

(Discard A-major, I-minor, E-exceptions, N-normal, X-Protocol-P-performance logs)
Logging Mask:

Modem Network Manager Port

The next two fields apply when a Master NetMux is used in managing a modem network. If not used, these two fields can be ignored. The first field is that of the Modem network manager port. This refers to the path to the management center. The path may be an asynchronous port , multiplexing trunk or an X.25 path. If X.25, it must be followed by a T.4 profile specification and an X.121 address. If no management path is needed, press **<CR>.**

Modem network manager port: <CR>

Addr

The second management parameter is that of Addr, the management center address, which can be any number from 0001 to 9999. If no Master NetMux system is being used, press **<CR>**.

Addr: <CR>

IOK Log Message Timer

This allows setting a timer to inform a management system of the active presence of the node.

Node Name

The next prompt allows you to enter the node name of your present VCX-150 unit. The node name you select will show up in the logging report. It can be no more than ten characters in length.

Node name: New York

User List Name

The next prompt concerns the user list name. If you want the VCX-150 users to enter user names and passwords during log-in you will need to enter a list of user names under another configuration menu. This user list should in turn be given a name like *ourgang*. This particular prompt is asking for the name of the user list. If you don't plan to have a user's list just hit <CR>.

User list name: <CR>

Local Time Zone

The nodes in a network frequently lie in different time zones. For VCX-150 to display the local time at each node, you must identify the time zone. Time zones usually have universally accepted abbreviations. For example, EST stands for

Eastern Standard Time, PDT for Pacific Daylight Time, and GMT for Greenwich Mean Time. The Configuration Service prompts you to enter the abbreviation for your local time zone:

Local time zone:

Enter the abbreviation you want VCX-150 to display along with the time of day. Your response can be up to four characters long. Entering just <CR> causes no time zone abbreviation to be displayed. Local time when it is midnight Greenwich Mean Time

Global Parameters Form

VCX-150 must adopt a single standard time internally to monitor and report usage statistics. Greenwich Mean Time is that standard. You must indicate the difference between the local time at your node and Greenwich Mean Time so VCX-150 can display local time for your users. The Configuration Service prompts you to enter the local time in military format relative to midnight (0:00) GMT. Some examples are shown in table 5-1.

Table 5-1. Global View of GMT Time Relationship

Place	Hours/min	Place	Hours min
Australia		Israel	02 00
Adelaide	08 00	Italy	01 00
Brisbane	09 30	Jamaica	19 00
Perth	10 00	Japan	0900
Austria	01 00	**Mexico**	
Bahamas	19 00	Hermosillo	17 00
Belgium	01 00	Mexico City	18 00
Bermuda	20 00	Netherlands	01 00
Brazil	21 00	New Zealand	12 00
Canada		Norway	01 00
Calgary	17 00	Panama	19 00
Halifax	20 00	Peru	19 00
Toronto	19 00	Philippines	08 00
Victoria	16 00	Saudi Arabia	03 00
Winnipeg	18 00	Scotland	00 00

Place	Hours/min	Place	Hours min
Chile	20 00	Singapore	0730
Denmark	01 00	Spain	01 00
Egypt	02 00	Sweden	01 00
England	00 00	Switzerland	01 00
Finland	02 00	Tahiti	14 00
France	01 00	Taiwan	8 00
Germany	01 00	**United States**	
Greece	02 00	Anchorage	14 00
Guam	10 00	Denver	1700
Hong Kong	08 00	Honolulu	1400
Iceland	00 00	Houston	1800
Inda	0530	New York	1900
Indonesia	0700	San Francisco	1600
Ireland	00 00	Virgin Islands	2000

(Times shown are local Standard time.)

The hours prompt is:

Range: 0 - 23
Hours:

Enter the hours portion of the local time when it is midnight Greenwich Mean Time. For example, if the node is located in Boston, enter *19 <CR>* to indicate that the local time is 7:00 PM or 19:00. Entering <CR> accepts the default value of 0 (or midnight).

The minutes prompt is:

1) 00
2) 15
3) 30
4) 45
Minutes:

Enter the number displayed beside the minutes portion of this node's local time when it is midnight Greenwich Mean Time. For example, in the case of a node located in Boston, enter *1 <CR>* (or just *<CR>*, since the default value is 0 minutes).

Display Format

Different countries employ different formats for displaying dates. In the United States dates are displayed month first, then day, then year. In most European countries dates are displayed day first, then month, then year. To make the dates displayed by VCX-150 understandable, you must specify the format.

The prompt reads:

> **1) U.S. (mm/dd/yy hh:mm:ss)**
> **2) European (dd-mm-yy hh.mm.ss)**
> **Display format:**

Enter the number displayed beside the display format of your choice. For dates in mm/dd/yy form, enter ***1 <CR>***. You may also enter just *<CR>* to default to U.S. display format. For dates in dd-mm-yy form, enter *2 <CR>*.

Queue Length Threshold

The queue length is the number of people waiting to be serviced on the VCX. The threshold for the queue length is the level that if exceeded will generate a logging message. The default for the threshold is 30, out of a range of 1 to 299. Enter *<CR>* to select the default.

> **Range: 1 - 299**
> **Queue length threshold:** 30 CR

6. MERGE All Names With Those From Another Configuration

To merge the names from one configuration with another, type *6 <cr>* at the Level 3 Menu (Users Lists). The following information will then be displayed:

Terminate with:
ESCape=exit <CR>=current name ^E=previous name ^C=next name

> **Configuration to copy from:**

Enter the name of the configuration you wish to copy from. What configuration will you be copying into? The one you selected, when you entered the Level 3 Menu. NOTE: If duplicate names exist in both lists (i.e., trunk names, port names, etc.), they will be recognized, and only one name will remain in the combined list.

Entering the name of the configuration, then <CR> returns to the Level 3 Main Menu.

Configuration Service Level 3 - Users Lists

If after selecting the *EXAMINE / MODIFY a configuration, user list or text* option from the Level 2 Menu, a user list is chosen, the following Level 3 Menu will be displayed:

1) ADD new user(s)
2) EXAMINE/MODIFY a user
3) DELETE a user
4) LIST existing users
5) EXAMINE/MODIFY user list description
6) MERGE all users with those from another user list
Enter selection [or ESC to exit]:

Note: If no users exist under the user list name, only selection 1, *ADD a new user*, and selection 5, *EXAMINE / MODIFY user list description*, are valid.

The six menu options of the level 3 menu are described next.

Exiting To Level 2

Press <*ESC*> to exit Level 3 and return to Level 2 Menu.

1. ADD New User(s)

To add a new user to a user list, type *1* <*CR*> at the Level 3 Menu. The following prompt will appear:

New user name:

To abort this option, just press <ESC>. To proceed, type the name you wish to use and press <CR>. For example, you might enter the name *Tom*.

New user name: Tom <CR>

After entering a name the following information will be displayed:

Name: Tom
Account Id:
Password:
User access rights:
=next field————^E=previous field————ESC=accept screen—

Account id:

The account id. is the identity tag that will be printed in any logging message. Up to ten alphanumeric characters can used. You can use a name, a number or some combination for the account id.

The next prompt: if you want the user to enter a password during sign-on, then enter that password. If not, enter <CR>.

User access rights: the access rights you want that particular user to have should be entered at this prompt. Access rights can be entered as a series of single digits such as *1,5,6,7*, as a range *1-32* or as a combination, *1,5,6,7-32*. If total access rights were granted, the range would be 1-64. For details on access rights read the introduction of Configuration.
To return to the Level 3 Menu (Users Lists), press the ESCape key (<ESC>).

2. EXAMINE/MODIFY a User

To modify the account id., password, or access rights of a user, type *2 <CR>* at the Level 3 Menu. The following information will appear on the screen.

Terminate with:
ESCape=exit <CR> =current name ^E=previous name ^C=next name

User to modify: Tom

This screen allows you to select a user. Page through the user list using either ^E or ^C or enter the name. When the user you are interested in is displayed, press <CR>. The screen seen earlier when *ADD new user(s)* was used, is once again displayed:

Name: Tom
Account id: ID. 17
Password: Zap
User access rights: 1-54

<CR>=next field———^E=previous field———ESC=accept screen—

Account id:

You can now modify or change the account id., password, or user access rights for that particular user. When you have completed the modifications, press the ESCape key.

3. DELETE a User

To delete a user name, type *3* at the Menu. The terminate prompt appears:

Terminate with:
ESCape=exit<CR>=current name ^E=previous name
^C=next name

Entry to delete:

Page through the existing names, using ^E or ^C, until the name you wish to delete appears on the screen or enter the name, then press <CR>. The Configuration Service then displays the second chance prompt:

Do you really want to delete this entry (y/n)? n
Entry to delete: John

Enter <*CR*> or *n* <*CR*> to abort the deletion process. If you truly want to delete the name definition, enter *y* <*CR*>. After deleting the name, the Configuration Service again displays the Level 3 Menu.

4. LIST Existing Users

To select a summary chart that shows the existing user names, type *4* <*CR*> at the Level 3 Menu. A screen similar to the example shown screen shown in figure 5-21 will be displayed.

Up to ten user names are displayed at a time. If there are more names, the Configuration Service prompts:

— more names — continue (y/n)? [n]

Respond *y* <*CR*> to view the additional names. Respond <CR>or *n* <*CR*> to return to the Level 3 Menu.

5. EXAMINE/MODIFY User List Description

To change the user list description, type *5* <*CR*> at the Level 3 Menu. A prompt similar to the example shown below will be displayed:

```
                                              [11/64 used]

     Name   Brief Description                Password      Access

   george   Private                                        1-64
      tom   Private                                        1-64









 1) ADD new user(s)
 2) EXAMINE/MODIFY a user
 3) DELETE a user
 4) LIST existing users
 5) EXAMINE/MODIFY user list description
 6) MERGE all users with those from another user list
```

Figure 5-21. Listing of existing user names

Description:
<CR>=next field———^E=previous field———ESC=accept screen—

Description: The 8:00 To 5:00 Shift

Once you have entered the new user list description, press the ESCape key to return to the Level 3 Menu.

6. MERGE All Users With Those From Another User List

To merge the names of one user list with another, type *6 <CR>* at the Level 3 Menu (Users Lists). The following information will be placed on the screen:

Terminate with:
ESCape=exit <CR>=current name ^E=previous name ^C=next name

User list to copy from:

Enter the name of the user list you wish to copy from. What list will you be copying into? The user list you selected, when you entered the Level 3 Menu.

Note: If duplicate user names exist in both lists, they will be recognized, and only one name will remain in the combined list.

Once you have entered the name of the list, press <CR> and you will be returned to the Level 3 Main Menu (Users Lists).

Text Service Level 3 Menu

If after selecting the *EXAMINE / MODIFY a configuration, user list or text* option from the Level 2 Menu, text is chosen, the following Level 3 Menu will be displayed:

1) EXAMINE/MODIFY text description
2) EDIT text
Enter selection [or ESC to exit]:

The two menu options will now be described:

Exiting To Level 2
Press *<CR>* to exit Level 3 and return to Level 2 Menu.

1. EXAMINE/MODIFY Text Description

When this option is selected, the text's description and access rights are displayed and the user can the change that information if desired. The changes made to the screen display are illustrated in figure 5-22.

When the description and/or access rights are completed, the service returns to the Level 2 menu.

```
          Description:>
        Access rights:

------ <CR>=next field --- ^E=previous field --- ESC=accept screen ------



Description:
```

Figure 5-22. Access rights entry

```
Config: salutation                          [11/64 used]
--------------------------------------------------------------------------------












--------------------------------------------------------------------------------
1) ADD Line(s)     3) REPLACE Line     5) NEXT Screen  7) REDISPLAY Screen
2) INSERT Line(s)  4) REMOVE Line(s)   6) PREV Screen  8) DISPLAY Line
```

Figure 5-23. Existing text (when present)

2. EDIT Text

The figure 5-23 will be displayed if the *edit text* option is chosen.

At this point, the user by choosing the appropriate options (seen at the bottom of the screen), can add, delete, replace or display free text lines. The user can also exit the screen by hitting the ESC character.

Each of the *edit text* options are discussed in the following paragraphs.

EDIT Option 1: ADD Line(s)

New lines of free text can be added using this option.

Note: Each line of free text can't be any longer than 75 characters and must contain printable ASCII characters; the tab character, for example, can't be used. Blank lines can also be entered. Also, the first entry made in a blank screen will cause the lines to be automatically numbered down the left side of the screen.

If text is on the screen when using *add line*, the following prompt will be displayed:

Add line(s) after which line number?

There are a number of ways this prompt can be answered. You can enter a line number, such as 11 and new line(s) will be added after it. You can also enter *F* or *f* for *first line* and L or *l* for the *last line* and line(s) will be added at those locations.

If no text lines exist, then line 1 is assumed and no prompt will be displayed.

A blank line can be entered by either a carriage return (<CR>) or a line feed.

To exit option 1, use ESC. ESC will return you to the text screen display.

Edit Option 2: INSERT Line(s)

This option allows you to insert text between existing text lines.

If, when using the *INSERT Line(s)* option, text lines already exist on the screen, the following prompt will be displayed:

Insert line(s) before which line number?

As in the *add line* option, permissible answers include an actual line number, *F* or *f* for *first line* and *L* or *l* for *last line*.

If no free text lines exist, then line 1 is assumed and no prompt will be displayed.

A blank line can be entered by hitting either a carriage return <CR>or a line feed.

To exit option 2, just hit the ESC key. ESC will return you to the text screen display.

EDIT Option 3: REPLACE Line

Using this option, an entire text line can be replaced within another. The chosen line is essentially erased and a new line inserted in its place. The following prompt appears when you select this option:

Replace which line number?

Like the first two options, permissible answers include an actual line number, *F* or *f* for *first line* and *L* or *l* for *last line*.

If no free text lines exist, then a message to that effect will be displayed.

A blank line can be entered by hitting either a carriage return <CR>or a line feed.

To exit option 3, just hit the ESC key. ESC will return you to the text screen display.

EDIT Option 4: REMOVE Line(s)

Multiple lines of text can be removed using this option. When the option is first selected, two prompts are displayed:

Remove starting line number?

Remove ending line number?

Like the first three options, permissible answers include an actual line number, *F* or *f* for *first line* and *L* or *l* for *last line*.

If no free text lines exist, then a message to that effect will be displayed.

After the lines are removed, the user is returned to the text screen and it is redisplayed to 'close the gaps' created by the deletions.

EDIT Option 5: NEXT Screen

A *screen* is defined as a contiguous group of 18 lines of text (blank or filled) displayed at any one time. The user can flip from one SCREEN (one group of 18 text lines) to another SCREEN (another group of text lines) using this option. If there is no next group, the display will not change.

EDIT Option 6: PREV Screen

The previous *screen* (group of contiguous text lines) will be displayed when this option is used. If there is no previous group, the display will not change.

EDIT Option 7: REDISPLAY Screen

The current SCREEN will be cleared and redisplayed when this option is used. This option is useful when the screen becomes overwritten or fouled, i.e., by a broadcast message, and difficult to read.

EDIT Option 8: DISPLAY Line

This option allows the user to go the SCREEN associated with a particular line number. The following prompt appears when this option is used:

Display screen containing which line number?

Permissible answers include an actual line number, F or f for first line and L or l for last line.

If the specified line is not currently defined in text, then a message to that effect will be displayed.

```
Config:simple        Name: ans              [11/64used]
   Name type: Asynchronous line(s)         (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port:>1                Attachment control: Unqualified
          Ending port: 4               Device flow control: XON/XOFF
            Baud rate: 9600              Port flow control: XON/XOFF
     Character length: 8 bits               Timeout (mins): 0
            Stop bits: 1 bits                    Direction: Answer
               Parity: None
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------








Range: 1 - 16
Starting port:
```

Figure 5-24. Asynchronous main form

Name Type 1–Async Line(s) Main Form

Entering *1 <CR>* at the Name Type Form displays the Asynchronous Line(s) Main Form. This form is shown in figure 5-24.

NOTE: You can configure a series of asynchronous ports simultaneously under the same name, provided the devices connected to these ports all use the same character length, type of flow control, etc.

The fields of the main Asynchronous Line(s) Form are:

Starting Port/Ending Port

A given name definition can encompass several physically contiguous asynchronous ports. The starting and ending port parameters specify which port or ports are defined under the name. Contiguous ports are adjacent ports on the same card.

> **Range: 1 - 16**
> **Starting port:** 1

> **Range: 1 - 16**
> **Ending port:** 4

Baud Rate

Baud rate is the speed of data transmission in bits per second (bps). For a terminal or computer to communicate, its baud rate must match the baud rate of the port to which it is cabled.

Autobaud is frequently used when terminals of different speeds dial into a port. The users of ports set to autobaud must first enter one or two <CR>'s before the port will display the connect prompt. The <CR>s allow the port to sense the baud rate of the terminal automatically. A port set for autobaud can sense the following baud rates: 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19,200. Users with terminals set to 1200 baud or greater must type one <CR>. Users with terminals set below 1200 baud must type two or more <CR>'s.

When in the detached state and a character other than <CR> is entered, the port may sense the wrong speed. In this case, entering BREAK restarts the autobaud routine, allowing the user to retry autobaud. The re-autobaud action only works in the detached state, (i.e., if attachment or a connection is made, the device must detach to re-invoke autobaud).

The split baud rate 75/1200 means that the terminal sends data at 75 baud but receives data at 1200 baud. The European service Viewdata uses the 75/1200 split baud rate. The *Direction* parameter on the Asynchronous Line(s) Main Form determines the transmit and receive baud rate. Originating ports receive at 75 baud and transmit at 1200 baud. Answering ports receive at 1200 baud and transmit at 75 baud.

The baud rate prompt is:

1) Autobaud	**6) 300**	11) 4800
2) 75	**7) 600**	**12) 9600**
3) 110	**8) 1200**	**13) 19200**
4) 134.5	**9) 1800**	**14) 75/1200**
5) 150	**10)2400**	**15) Reserved**

Baud rate: 12 <CR>

Note that a port set for one baud rate can connect to a port set for a different baud rate. VCX-150 performs the baud rate conversion automatically, buffering data input from the higher speed port as needed.

Character Length

Character length refers to the number of data bits in a character, exclusive of start, stop, or parity bits.

The majority of terminals and computers in use today require character lengths of seven or eight bits. For example, to set the character length to seven bits for a port cabled to an ASCII terminal, you enter:

1) 8 bits
2) 7 bits
3) 6 bits
4) 5 bits
Character length: 2<CR>

NOTE: The character length setting correlates with the parity setting (see below). Generally for asynchronous devices with no parity, set the character length to eight bits and the parity to none. Generally, for asynchronous devices that use parity, set the character length to seven bits and the parity to match that of the device. An exception to this rule is some Wang equipment that uses eight data bits plus a parity bit. The more common setting for ASCII terminals is seven data bits plus parity or eight bits without parity. Also, for character lengths of 5 or 6 bits, configure originating ports for automatic logon and no messages as described subsequently.

Stop Bits

A stop bit allows an asynchronous device to detect the end of a character. Most terminals and computer ports use one stop bit. Some older devices (particularly mechanical ones such as teletype machines) require two stop bits. You must specify the number of stop bits used by the terminal or computer plugged into the asynchronous port you are configuring. The prompt is:

1) 1 bit
2) 2 bits
3) 1.5 bits
(usually 1)
Stop bits:

Enter *1 <CR>* to set the port to a single stop bit. Enter *2 <CR>* to set the port to two stop bits. If you set the character length to eight bits and the parity (see below) to anything other than *none*, then VCX-150 generates one stop bit regardless of how you set the number of stop bits. If you set the character length to five bits, then setting the stop bits to *2* actually causes the port to generate and expect 1.5 stop bits.

Parity

The parity bit is typically appended to a seven-bit character and used for error-checking. Parity can be set to: none, odd, even, mark, or space. Set the parity to match that of the device plugged into the asynchronous port that you are configuring.

The prompt is:

1) None
2) Odd
3) Even
4) Mark
5) Space
Parity:

Attachment Control

The attachment control prompt is:

1) Unqualified
2) DTR toggle
3) Modem
4) DTR-No toggle
Attachment control:

You must enter the number displayed beside the type of attachment control you wish to implement. A comprehensive and lengthy explanation of attachment control follows.

Attachment Concepts and Terminology

Attachment control is the means by which the VCX-150 system distinguishes session boundaries. *Attachment control* and the *direction* parameter combine to provide several forms of EIA control lead manipulation; allowing the VCX-150 to be compatible with a wide variety of applications.

Explanations of the terms *direction*, *attachment*, *connection*, *disconnection*, *detachment*, and *reverse detachment* follow.

The *direction* parameter determines whether a port originates connections, answers a connection request, or does both.

Attachment marks the beginning of a session. Attachment occurs when a VCX-150 port recognizes that an external device has become active. For example, attachment can be accomplished via RS-232C control line handshaking. In the case of an originating port, the device may raise one or more RS-232C control lines to signal that it is active and requires attention. The port responds by raising its control lines to complete the handshake. In the case of an answering port, the port receives an internal connection request and raises its control lines. The port then tests the control lines of the external device.

Connection occurs when a virtual circuit is established between an originating port and a destination port. For example, when a user types connect to: vax <CR>and can then log onto a VAX minicomputer, a connection is established between the terminal user's port and the vax port.

Disconnection occurs when a virtual circuit is broken. For example, when a user quits a connection.

Detachment marks the end of a session. The following examples serve to distinguish detachment and disconnection:

- without having established a connection, a user enters *quit* at the connect prompt.
- A user quits a primary connection. In this case the user disconnects from the primary destination and detaches when the response is *yes* to the disconnect from switch prompt.
- A user quits a secondary connection. In this case the user disconnects from the secondary destination but maintains the primary connection. From the user's standpoint, the session continues. From the standpoint of the port that was the secondary destination, however, the session is over. Therefore, an *internal session* with the secondary destination terminates, and the port detaches.

Reverse detachment occurs when the answering port or the virtual circuit initiates the detachment sequence, rather than the originating port doing so.

Types of Attachment Control

The Configuration Service provides three types of attachment control: unqualified, DTR, and modem. Each form of attachment control depends on:

- whether the port is an *originate*, *answer*, or *both (originate / answer)*
- whether outband flow control is configured for the port
- if the attached host toggles DTR (i.e., drops DTR to acknowledge completion of a session, and then raises DTR when ready to begin another session) or does not toggle DTR

There are several other definitions that are appropriate.

The *neutral state* are conditions that exist at the EIA interface with no connection and no attachment. The port is considered to be detached.

A *service request* are the events that must take place at an originate port to attach to a VCX. The end result is a *connect to* prompt from the VCX-150.

A *connection request* is a request from within the VCX-150 to establish a virtual circuit to an answering port.

Control refers to CTS and DSR. The DCD signal is maintained high in VCX.

When EIA *controls toggle*, a high-to-low-to-high transition occurs, the low period being from 500 ms. to 1500 ms.

Unqualified Originate

NEUTRAL STATE	CONTROLS are high
SERVICE REQUEST	User types <CR>
CONNECTION DENIED	User re-prompted
CONNECTED	Connect request granted
USER QUITS	CONTROLS toggle returning to the neutral state
REVERSE DETACHMENT	User re-prompted

Unqualified Answer

NEUTRAL STATE	All CONTROLS are low
CONNECTED	Connect request granted and CONTROLS are raised
USER DISCONNECTS	CONTROLS return to the neutral state

Unqualified Both

Originate sequence	
NEUTRAL STATE	CONTROLS are high
SERVICE REQUEST	User types <CR>
CONNECTION DENIED	User re-prompted
CONNECTED	Connect request granted
USER QUITS	CONTROLS toggle returning to the neutral state
REVERSE DETACHMENT	User re-prompted

Answer sequence	
CONNECTED	Connect request granted
USER QUITS	CONTROLS toggle returning to the neutral state

DTR Originate

NEUTRAL STATE	CONTROLS are high
SERVICE REQUEST	DTR is high and user types<CR>
CONNECTION DENIED	User re-prompted
CONNECTED	Connect request granted
USER QUITS or DTR DROPS at ORIGINATE END	CONTROLS toggle returning to the neutral state
REVERSE DETACHMENT	Connection broken and user is re-prompted

DTR Answer

NEUTRAL STATE	All CONTROLS are low
CONNECTION REQUEST	CONTROLS are raised and wait for1 00ms. and check for DTR high. If high, the connection is established; if not the connection is denied.
CONNECTED	Connect request granted

USER DISCONNECTS	DTR toggle: CONTROLS drop and port goes to the out-of-service state. If DTR drops, it returns to the neutral state If DTR does not drop, all subsequent connection requests are denied. When host raises DTR, answer port will make connections. DTR no toggle: CONTROLS drop and return to the neutral state. The answer port will make connections regardless of whether the host has dropped and then raised DTR or not.
ANSWER END DROPS	CONTROLS return to neutral state DTR

DTR Both

Originate sequence	
NEUTRAL STATE	CONTROLS are high
SERVICE REQUEST	DTR is high and user types <CR>
CONNECTION DENIED	User re-prompted
CONNECTED	Connect request granted
USER QUITS or DTR DROPS at ORIGINATE END	CONTROLS toggle returning to the neutral state.
REVERSE DETACHMENT	User re-prompted
Answer sequence	
CONNECTED	Connect request granted
USER DISCONNECTS	CONTROLS toggle returning to the neutral state.
(ANSWER DISCONNECT IS NOT POSSIBLE)	

Modem Originate

NEUTRAL STATE	CONTROLS are high
SERVICE REQUEST	User types <CR>
CONNECTION DENIED	User is re-prompted
CONNECTED	Connect request is granted
USER QUITS or DTR DROPS or USER DISCONNECTS	CONTROLS toggle returning to the neutral state

Operation is the same as the DTR ORIGINATE except that DTR High is not required to initiate a connection (the state of DTR is *don't care*).

Modem Answer

NEUTRAL STATE	All CONTROLS are low
CONNECTION REQUEST	CONTROLS are raised/connection granted (DTR state doesn't matter)
CONNECTED	Connect request granted
ANSWER END DROPS DTR or USER DISCONNECTS	CONTROLS return to the neutral state

Modem Both

Originate sequence

NEUTRAL STATE	CONTROLS are high
SERVICE REQUEST	User types <CR>
CONNECTION DENIED	User is re-prompted
CONNECTED	Connect request granted

USER QUITS or DTR DROPS at ORIGINATE END	CONTROLS toggle returning to the neutral
REVERSE DETACHMENT	User re-prompt
CONNECTED	Connect request granted
Answer sequence	
USER DISCONNECTS or DTR DROPS at ANSWER END	CONTROLS toggle returning sequence to the neutral state.
Operates as DTR BOTH except that the state of DTR doesn't matter in the originate mode. In an answer mode, falling DTR disconnects/toggle controls.	

Attachment Control Applications

Given these 9 types of attachment control behavior, how are they applied? That is the purpose of this section, but first a word of caution. DO NOT cable a modem to a port with outband flow control. Such an application is inconsistent. Outband flow control only works when cabled directly to DTE.

Typical Applications

Unqualified originate - The terminal user attaches by simply typing a <CR>. Detachment can be made by *quitting* a connection or by logging off the host (provided that the answer port is configured as DTR answer), whereby the user is re-prompted for his next choice of a destination.

Unqualified both - Desired behavior is the same as above except terminal-to-terminal communication is also required.

DTR originate - The terminal is required to have DTR high while typing <CR> to attach. Detachment occurs when the terminal user *quits* or drops DTR. Logging off the host can cause disconnection and re-prompt for the next destination (provided that the answer port is configured as DTR answer).

Modem originate - A dial-in modem pool is used to allow VCX-150 resources to be used by remote users via the DDD network. VCX-150 port controls are high so that the modem can answer the call. If the terminal user *quits* a connection, VCX-150 port controls drop to allow the modem to go back on- hook, but return high allowing the next call to be answered. Should the terminal user require connection to other resources without redialing, then logging off the host can cause a virtual circuit disconnect and a re-prompting of the user.

Modem both - A dial-in and dial-out modem pool is used to allow remote users access to VCX-150 resources as well as providing VCX-150 users access to resources off the DDD network. Dial-in behavior is the same as above. In the dial-out mode, the VCX-150 port becomes an answer port with its controls high, allowing the VCX-150 user to talk to the auto-dialer and set up a call over the DDD. The VCX-150 user can detach causing controls to toggle low causing the modem to go back on-hook, or the host resource off the DDD network can go on-hook causing a falling DTR at the port and VCX-150 detachment to be completed.

Unqualified answer - A CPU port is required to answer calls only from the VCX-150. The user will always terminate the connection after logging off the host.

DTR answer with toggle - A CPU answers calls from the VCX-150 network which are only accepted by the VCX-150 if the host DTR is high. Upon user disconnection VCX-150 drops its controls but will not go back high unless the host acknowledges by dropping its DTR. This prevents tail-ending on someone else.

Modem answer - A CPU answers calls from the VCX-150 network which are accepted only if the host's DTR is high. Upon user disconnection, VCX-150 controls are dropped. The next incoming call will again raise the VCX-150 controls.

DTR both - A dial-in/out modem pool connects to the VCX-150. A VCX-150 user can place a call over the DDD network to other resources. However, the only way to break the VCX-150 connection is for the VCX-150 user to detach. The host off the DDD cannot initiate a sequence to break the VCX connection. The originate mode is identical to DTR originate behavior.

Returning to the Asynchronous main form fields, the next field is:

Device/Port Flow Control

Flow control is a protocol for stopping and starting data transmission. Typically, a device receiving data exerts flow control to prevent the transmitter from sending data faster than the receiver can process the data. For example, printers often use flow control to stop a computer from sending data until the printer catches up with the output of the computer.

Inband flow control uses control characters in the data stream to start and stop data transmissions. XON/XOFF and DC1/DC2 are examples of inband flow control. *Outband* flow control uses control line signaling to start and stop data transmissions. RTS/CTS and T-Pause are examples of outband flow control.

The VCX-150 supports the following flow control options:

- **None**. No flow control is exercised, and ***loss of data can occur*** if transmissions exceed the capacity of the device to buffer and print them.
- **XON/XOFF**. XON/XOFF employs two ASCII characters to start and stop transmission. XON (ASCII DC1; also CTRL Q) starts flow. XOFF (ASCII DC3; also CTRL S) stops flow.
- **DC1/DC2**. DC1/DC2 is similar to XON/XOFF but uses a different ASCII flow stop character. DC2 stops flow. DC1/DC2 flow control is most frequently associated with older Hewlett-Packard systems.
- **RTS/CTS**. RTS/CTS refers to the RS-232 interface control signals Request- to-Send and Clear-to-Send. The DCE asserts CTS TRUE to start flow. The DCE asserts CTS FALSE to stop flow. The DTE asserts RTS TRUE to start flow. The DTE asserts RTS FALSE to stop flow.
- **ENQ/ACK**. ENQ/ACK employs an ASCII character pair to implement flow control. However, ENQ/ACK differs significantly from start/stop protocols such as XON/XOFF. The ENQ/ACK protocol is a relatively complex pacing mechanism used with block mode transmissions on Hewlett-Packard (HP) systems. In the ENQ/ACK environment, the HP host computer functions as the master and the terminal functions as a slave. If the VCX-150 system is between the master and the slave, the VCX-150 port cabled to the terminal emulates the master as follows:

  1. After initializing, the port transmits an ENQ every 15 seconds until it receives an ACK from the terminal.

  2. The port inserts an ENQ into the data stream every 60 characters, then stops flow until the terminal transmits an ACK. If the port does not receive an ACK within 15 seconds, the port restarts flow by default.

  3. The terminal employs XON/XOFF within the ENQ/ACK protocol to control flow. If the terminal transmits XOFF, the port immediately suspends data flow. The port resumes flow upon receiving XON.

  The VCX-150 port cabled to the CPU emulates the slave as follows:

  1. The port transmits an ACK in response to every ENQ from the master unless the input buffer of the port is full.

  2. The port ACKnowledges ENQs, then discards them. To implement

HP Terminal Type 10 flow control, set flow control as follows:

At the port cabled to the terminal:
Device flow control = ENQ/ACK
Port flow control = XON/XOFF

At the port cabled the CPU:
Device flow control = XON/XOFF
Port flow control = ENQ/ACK

- **T-Pause** (also called Tandem Inverse). T-Pause is similar to RTS/CTS flow control, but the sense of the signal is reversed. Asserting the control line FALSE starts flow. Asserting the control line TRUE stops flow.
- **HEX 91/93**. HEX 91/93 is a type of XON/XOFF flow control used with an extended ASCII character set.
- **HEX FE/FF** Used for Datapoint equipment.
- **94/93** Used with Siemens computer equipment.
- **DG XON/XOFF** Used for Data General Equipment. Differs from XON/XOFF in 3 respects. 1) If data continues to flow from the attached device after XOFF has been issued, XOFFs will continue to be sent; 2) port flow control is modified to not insert a flow control character following an $1E_{HEX}$ or 10_{HEX} in the data stream; 3) device flow control is modified to not interpret XON and XOFF as flow control characters when they immediately follow $1E_{HEX}$ or 10_{HEX}

Device flow control refers to the control characters or signals sent by the external device to the VCX-150 port. The prompt is:

1) None
2) XON/XOFF
3) DC1/DC2
4) RTS/CTS
5) ENQ/ACK
6) T-Pause
7) HEX 91/93
8) FE/FF
9) HEX 94/93
10)DG XON/XOFF (for Data General)
(generated by the device to slow the port's output)
Device flow control:

Port flow control refers to the flow control characters or signals sent by the VCX-150 port to the external device.

The prompt is:

1) None
2) XON/XOFF
3) DC1/DC2
4) RTS/CTS
5) ENQ/ACK
6) T-pause
7) HEX 91/93
8) HEX FE/FF
9) HEX94/93
10)DG XON/XOFF (for Data General
(recognized by the device)
Port flow control:

Timeout

Establishing a connection timeout limit causes VCX-150 to monitor a connected port and disconnect the port automatically after a specified period of inactivity. The timer is reset uni-directionally (sensing input to the port from the attached device), whether terminal or computer. The timeout prompt is:

Range: 0 - 255
(0 to disable disconnect-on-timeout)
Timeout (mins.):

Enter the number of minutes of inactivity which will provoke an automatic disconnection. If you enter *0<CR>*, the VCX-150 never times the port out.

Direction

For a device at one port to connect to a device at another port, one port must originate the connection, and the other port must answer it. The *Direction* parameter specifies whether the port originates connections, answers connections, or does both. Ports cabled to terminals generally originate connections. Ports cabled computers generally answer connections. Some ports need to both originate and answer connections. The prompt is:

1) Answer
2) Originate
3) Both
(terminals are normally originate)
Direction:

Subforms

The value assigned to the *Direction* parameter determines which Asynchronous Line(s) Subforms must be completed for the port.

Access Subform. If you define the port direction as *answer*, the Configuration Service displays the Access Subform. The Access Subform allows you to permit unrestricted access to the port or to restrict access to a desired subset of originating ports. This is accomplished by assigning answer access rights to the port. The Access Subform then allows you to define attach and detach string names, and a host disconnect ASCII string.

Automatic Connection Subforms. If you define the port direction as *originate*, the Configuration Service displays the Auto Connect Subform. The Auto Connect Subform allows you to specify manual or automatic connection. Manual connection requires the user to type the destination port name upon attachment (or to program the port device to transmit the destination name automatically upon attachment). With automatic connection, the port, upon attachment, immediately attempts to connect to a specified destination. You enter the name or the pathname of the automatic connection into the Automatic Connection Subform.

Terminal Characteristics and Terminal Type Subforms. If you define port direction as *originate*, you must also complete the Terminal Characteristics and Terminal Type Subforms. The Terminal Characteristics Subform allows you to select: local echo, the system messages which are displayed, the type of BREAK processing, the control state character, the connect hold character, the channel priority for the port and automatic detach (from the switch) after disconnect. The Terminal Type Subform selects the type of cursor addressing for the port.

Note: You must select a terminal type other than *unspecified* to enable normal backspacing for users of video display terminals. However, the terminal type you select need not correspond in most instances to the actual terminal used, unless the user is granted access to the Configuration Service. Only the Configuration Service employs cursor addressing.

Note: If you define a computer port as an *originate* port, the Configuration Service assumes the computer is to be treated as a terminal and displays the Terminal Characteristics and Terminal Type Subforms. Generally, selecting the terminal type *unspecified* is appropriate for originating computer ports. See below for details.

If you define the port direction as *both* originate/answer, the Configuration Service displays all of the above forms, the terminal characteristics subform, the terminal type subform, then allowing definition of originate attachment and detachment string names, an attachment text name, and originate access rights.

Access Subform

The Access Subform appears below the Asynchronous Line(s) Main Form as shown in figure 5-25.

```
Config: simple      Name: vax1          [11/64 used]
   Name type: Asynchronous line(s)      (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 2               Attachment control: Unqualified
          Ending port: 2              Device flow control: XON/XOFF
            Baud rate: 9600             Port flow control: XON/XOFF
     Character length: 8 bits              Timeout (mins): 0
            Stop bits: 1 bits                   Direction: Answer
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:>
    Password override:
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------






(Access rights the user must have to gain access)
Answer access rights:
```

Figure 5-25. Asynchronous lines access subform

Answer access rights are those rights that incoming calls (users) must have to complete a connection to the answer port being defined. The answer access rights can be listed as a series of numbers with commas (used as delimiters, i.e., 1,2,3,4,5) or as a range (i.e., 1-5). NOTE: Access rights are more fully explained in the beginning of the Configuration Service, under the sub-headings of *Security*, *Access Control*, *Administrative Protection*, and *Access Rights*. For more details, you are referred to these sections.

One could provide unlimited answer access rights by entering the following data:

> Answer access rights: 1 - 64

In the case where the access rights of the originate port do not match the access rights of the answer port (access restriction), should the user be prompted for a password to override the access restriction.

```
Config: simple        Name: ans            [11/64 used]
   Name type: Asynchronous line(s)        (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 2                 Attachment control: Unqualified
          Ending port: 2                Device flow control: XON/XOFF
            Baud rate: 9600               Port flow control: XON/XOFF
     Character length: 8 bits                Timeout (mins): 0
            Stop bits: 1 bits                     Direction: Answer
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights: 1-64
    Password override: No
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer attachment string name:
 Answer detachment string name:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer disconnect string:>
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



Answer disconnect string:
```

Figure 5-26. Asynchronous form, password prompt

If 2 is chosen, a prompt for the password will be presented:

> **1) No**
> **2) Yes**
> **(Can password override access restrictions?)**
> **Password override:**

After answering the *answer access rights* and *password override* prompts, two more prompts are added to the screen, as shown figure 5-26.

The *answer attachment string name* prompt provides you the option of defining a name for a string which will be transmitted to the answer port (i.e., host computer) at the time of attachment. The name can be no longer than ten characters in length. The actual string is recorded using selection 7, *String*, from the Level 3 Menu. At this point you are merely asked for the string's name. Normally, however, one would not transmit an answer port attachment string. To exit this prompt just press <CR>.

Likewise, the next prompt, the *answer detachment string name* allows you to define a name of a string that will be displayed at the answer port (i.e., host) at the time of detachment. Again, the name can be no longer than ten characters in length. The actual string is recorded using selection 7, *String*, from the Level 3 Menu. You are merely asked for the name of the string at this point. Of course, if you don't wish to define a string, just hit <CR>.

The *answer disconnect string* prompt allows you to define a string, up to 10 characters long, which if transmitted to an answer port from a host, will cause the VCX to disconnect that answer port. The *answer disconnect string* is designed to accommodate 3 wire host systems allowing the host to initiate the disconnect.

If an answer disconnect string name is specified, configuration now prompts for *enter out of service state*. A representation of these last two prompts of the Configuration menu is shown below.

Answer disconnect string:
Enter out of service state:

——<CR>=next filed——^E=previous field——ESC=accept screen—

The *Enter out of service state* prompt defaults to *no*. However, the System Administrator can have the answer port go out of service should the user disconnect before the host has issued the disconnect string. This prevents tail-ending into an open session with possible security breach consequences. Selecting*yes* for this option requires the host to issue the disconnect string before the answer port can accept another call.

Auto Connect

If a port is defined as an originate port under the *Direction* parameter the *Auto Connect* prompt is displayed and must be answered. The Automatic Connection Subform is illustrated in figure 5-27.

```
Config: example1    Name: port1          [11/120 used]
   Name type: Asynchronous line(s)      (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 1               Attachment control: Unqualified
          Ending port: 1              Device flow control: DG XON/XOFF
            Baud rate: 9600             Port flow control: DG XON/XOFF
     Character length: 8 bits              Timeout (mins): 10
            Stop bits: 1 bits                   Direction: Originate
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Auto connect A: name1
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Auto connect B:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Autocon. limit:>0
------- <CR>=next field --- ^E=previous field --- ESC=accept screen -------
```

Figure 5-27. Automatic connection subform

The Auto connect Subform allows you to specify an automatic connection path upon attachment, or allow the terminal user switched service (that is, the user enters the destination port name or pathname).

If no entry is made to the Auto connect prompt, and a carriage return is used, the VCX will assume switched service for the port. However, if a destination port or pathname is entered, VCX will automatically attempt to make that connection on behalf of the terminal user. Destination names are limited to 10 characters and a pathname to sixty characters including periods.

When a name is entered for Auto connect A, but none entered for B, the Autoconnection limit feature is available. Enter in this field the number of times (0-255 tries, where 0 is unlimited) to try the automatic connection. (For example, if a trunk were down, how many times should the VCX try the automatic connection before giving up.) If the limit of retries is reached, the port must be reset before it will restart.

Whether switched or automatic service should be designated for a port depends on the type of access desired for the terminal user. Several types of access can be configured: dedicated, contended, dedicated with switch option, and switched.

- **Dedicated access**. When a particular originating port has access to a unique destination port. In this case there is no need for VCX to prompt for a desired connection, and autoconnect to a destination port is appropriate.
- **Dual dedicated**. Same as above except the user is given two destination ports that are toggled between by using the control state character.
- **Contended access**. When several originating ports have access to a single resource destination, and that resource has fewer ports than necessary if all originating ports were active at once, the originating port is said to have contended access. Each originating port must contend with the others on a first- come-first-served basis for connection to that destination. As with dedicated access, autoconnection is appropriate for this application and a single destination pathname is entered.
- **Dedicated with switch option** (control state out of autoconnect). In this application a terminal user to a large extent uses a dedicated resource, but on occasion must access another. The autoconnect pathname is entered to accommodate the usual connection, but a control state character is defined (see terminal characteristics subform which follows).

  The entry of the control state character by the terminal user causes VCX to leave the autoconnect and prompt the user for a destination. When the switched sessions complete and the user quits the connection, the autoconnection is restored. If a connect hold character is also defined for the port, the user can toggle between an autoconnect and the selected switched connection until the user has quit the latter.

If the network administrator does not want a particular port to have any switched service, i.e. contended or dedicated as described in the previous paragraphs, then a control state character must not be defined for the autoconnect port.

- **Switched access**. When the port being configured is to have access to several destinations, the originating port has switched service. When the switched port attaches or disconnects from the previous session, VCX prompts for the desired destination. VCX then attempts connection to the designated name. (NOTE: Switched access may also be contended if connection is attempted to a group having all available ports occupied.)

  In summary, when the connection is auto, VCX knows where to attempt the connection. When the connection is attempted from a switched service port, VCX does not know the desired address and must prompt for it.

  For example, referring to the example network in *General Information*, suppose that you are the administrator of the Boston node. Suppose also that you wish to provide autoconnection for the port at Terminal 3 (named *terminal3*) to the port named *pdp11* in Philadelphia. Further suppose that the Boston-to-New York link is named *newyork* and that the New York-to-Philadelphia link is named *phil*.

  You enter the following pathname:

  Auto connect to: newyork.phil.pdp11<CR>

Terminal Characteristics Subform

If you define a port as *originate* or *both* originate/answer under the *Direction* parameter, you must complete the Terminal Characteristics Subform.

The Terminal Characteristics Subform appears below the Asynchronous Line(s) Main Form. If the Logon Subform and/or the Automatic Connection Subform are displayed, the Terminal Characteristics Subform which is shown in figure 5-28.

The fields of the Terminal Characteristics Subform are discussed next.

Echo

Echo is the retransmission of received data. Echo allows users to see what they type. The VCX-150 system supports the following echo options:

- **CPU echo**. The setting is appropriate when the CPU or host system supplies a remote echo to the terminal.

```
Config: simple      Name: ans          [11/64 used]
   Name type: Asynchronous line(s)     (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        Starting port: 2               Attachment control: Unqualified
          Ending port: 2              Device flow control: XON/XOFF
            Baud rate: 9600             Port flow control: XON/XOFF
     Character length: 8 bits              Timeout (mins): 0
            Stop bits: 1 bits                   Direction: Originate
               Parity: None
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Auto connect A:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                 Echo:>CPU & VCX services          BREAK key: Pass through
             Messages: All                  Control state char: 1
  Confirm connections: Yes                      Hold character: 0
       Login required: No                     Channel priority: 1
 Ignore routine bcasts: Yes             Detach after disconnect: Yes
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------

 1) CPU & VCX services
 2) VCX local port
 3) Terminal
Echo:
```

Figure 5-28. Terminal characteristics subform

- **VCX-150 local port echo**. The setting is appropriate for applications where the terminal does not supply its own echo (the terminal does not support half-duplex) and the CPU does not supply remote echo.
- **Terminal echo**. Appropriate when the terminal is set for half-duplex.

Select the type of echo from the prompt:

> **1) CPU and VCX services echo**
> **2) VCX local port echo**
> **3) Terminal echo**
> **Echo:**

Messages

The *messages* parameter determines the type of messages transmitted by the port in the control state. The system supports the following options:

- **All**. The port transmits all user messages.
- **Prompt**. The port transmits only those messages that require a response from the port device or operator of the port device.
- **Service**. The port transmits only those messages that are informative but require no response. For example, *Disconnecting from secondary destination* is a service message.

- **None**. The port transmits no user messages. Use this setting with caution.

Select the messages setting from the prompt:

1) All
2) Prompt
3) Service
4) None
Messages:

Confirm Connections

Confirm connection messages with a destination can be displayed at a port.

- **No**. No messages confirming connections will be displayed.
- **Yes**. Messages confirming connections will be displayed.

1) No
2) Yes
Confirm connections:

Login Required

A user can be required to enter a user name and password during login. The prompt displayed is:

1) No
2) Yes
(should port prompt user for name and password?)
Login required:

Ignore Routine Bcasts

You can choose to accept or ignore routine messages transmitted via the Broadcast Service to the port.

- **No**. Routine messages will not be blocked, which is to say they will be accepted.
- **Yes**. Routine messages will be ignored.

1) No
2) Yes
(should routine broadcasts be blocked?)
Ignore routine bcasts:

Break Key

This parameter determines how VCX-150 processes a BREAK. The system supports the following options:

- **Pass through**. The system sends a BREAK through to the destination. The choice is useful if the device at the destination port responds to a BREAK.
- **Ignore**. The system does not pass the BREAK through, nor does it take any action in response to a BREAK.
- **Enter control state**. BREAK functions similarly to the control state character. See the following section for information on the control state character.
- **Connection hold**. BREAK functions similarly to the connect hold character. See the following section for information on the connect hold character.

Select the type of BREAK key processing from the prompt

1) Pass through
2) Ignore
3) Enter control state
4) Connect hold
BREAK key:

Control State/Connect Hold Characters

The control state character is a reserved character that the system does not send to the destination port. Instead, entering the control state character suspends the connection in progress and allows the user to communicate with the VCX-150 system. For example, the control state character is commonly used to initiate disconnection. If you define the control state character as ^\, and the terminal user enters ^\ while connected, VCX-150 displays the connect prompt. The user can then type:

Connect to: quit<CR>

to disconnect. Without a control state character configured for the port, the terminal must drop Data Terminal Ready to disconnect or rely on an inactivity timeout.

Like the control state character, the connect hold character is a reserved character that the system does not send to the destination port. Instead, if the user has two connections active at once, entering the connect hold character toggles from one to the other connection. If only one connection is active, the connect hold character works like the control state character does.

Note: Enabling flow control at the destination port prevents data loss from occurring when the user enters the control state or connect hold character.

The prompt for the control state character is:

> **Range: 0 -127**
> **(ASCII code or 0 for none — 0..4 or 20..31 recommended)**
> **Control state char:**

The prompt for the connect hold character is:

> **Range: 0 - 127**
> **(ASCII code or 0 for none)**
> **Hold character:**
> You must enter the ASCII decimal equivalents to the characters you wish to use. For example, entering *28<CR>* at the control state prompt sets the control state character to ^\. Entering *0* at the control state prompt indicates that the port has no control state character unless you select that meaning for the BREAK key (see under *BREAK key* above). Entering a connect hold character works in exactly the same way.

Note: Avoid entering identical control state and connect hold characters. Also, avoid entering characters that are used for other purposes by the host computer system. For example, a printable character is generally not a good choice for the control state or connect hold character. The less often-used ASCII characters listed below are recommended candidates. If you wish to use other ASCII characters, refer to Appendix B for a complete list of ASCII characters and their decimal equivalents. table 5-2 list the recommended control state/connect hold characters table 5-3 list control state connect hold characters to avoid.

Table 5-2. Recommended Characters

DEC	Entry	ASCII	Meaning
1	^A	SOH	start of header
2	^B	STX	start of text
3	^C	ETX	end of text
4	^D	EOT	end of transmission
14	^N	SO	shift out
15	^O	SI	shift in
16	^P	DLE	data link escape
20	^T	DC4	device control 4
21	^U	NAK	Negative acknowledge

DEC	Entry	ASCII	Meaning
22	^V	SYN	synchronous idle
23	^W	ETB	end of transmission block
24	^X	CAN	cancel
25	^Y	EM	end of medium
26	^Z	SUB	substitute
28	^\	FS	file separator
29	^]	GS	group separator
30	^^	RS	record separator
31	^_	US	unit separator

Table 5-3. Characters To Avoid

DEC	Entry	ASCII	Meaning
5	^E	ENQ	used for ENQ/ACK flow control
6	^F	ACK	used for ENQ/ACK flow control
17	^Q	DC1	used for XON/XOFF/XOFF and DC1/DC2
18	^R	DC2	used for DC1/DC2 flow control
19	^S	DC3	used for XON/XOFF flow control
27	<ESC>	ESC	used by VCX services

WARNING: Do not choose a control state or connect hold character that can interact with other functions.

Channel Priority

Channel priority applies only to asynchronous ports granted access to trunk lines. This parameter determines how VCX-150 allocates trunk line bandwidth. If higher and lower-priority ports simultaneously have data to transmit, data from higher-priority ports are transmitted on the composite link first. Priority 1 is the highest priority and priority 4 the lowest. The channel priority prompt is:

Range: 1 - 4
1 is highest priority
Channel priority:

Detach After Disconnect

You can choose, using this parameter, to have your terminal automatically detach from the switch when the destination end disconnects. The following prompt appears:

1) No
2) Yes
(yes detaches user after exit from first connection)
Detach after disconnect:

Name Type 1—Asynchronous Line(s)

Once you complete the Terminal Characteristics Subform, the system displays the Terminal Type Subform shown in figure 5-29.

If you see your terminal type listed, enter the number displayed beside the terminal name and press <CR>.

NOTE: If you cannot find your terminal listed, try entering ADM-3A since many terminals use cursor control identical to the ADM-3A.

After you have selected your terminal type, the screen shown in figure 5-30 is displayed.

The *originate attachment string name* prompt allows you to define a name for a string which will be displayed at the originate port at the time of attachment. The actual string is defined using Selection 7, *String*, from the Name Type Form. You are only asked at this point for the name of the string. Press <CR> to exit this prompt.

The next prompt, *originate detachment string name*, allows you to define a name for a string that will be displayed at the originate port at the time of detachment. Again, the actual string is defined using Selection 7, *String*, from the Name Type Form. You only provide the name of the string.

```
Config: simple       Name: org          [5/64 used]
  Name type: Asynchronous line(s)     (Slot 1)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Terminal type:>Unsupported
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------


 1) Unsupported           17) Honeywell
 2) ADDS Regent series    18) H19 / Z19
 3) ADDS Viewpoint        19) HP 2621
 4) ADM-3A                20) IBM Displaywriter
 5) ADM-31                21) IBM 3101
 6) Ann Arbor 400D        22) M9400
 7) ANSI Std; Ambassador  23) MDCSC
 8) Control Data CD110    24) Perkin Elmer 550
 9) Control Data CD722    25) PE 1251/1245 Super Owl
10) DG Dasher 211/411     26) QuickScreen
11) Datamedia             27) VDB 8024
12) Datapoint 8220/4240   28) Tandberg 2215
13) DEC VT-100/VT-180     29) Teleray
14) DEC VT-52             30) TeleVideo
15) Hazeltine 1500        31) Wyse WY-100
16) Hazeltine 1510        32) Xerox 820
Terminal type:
```

Figure 5-29. Terminal characteristics subform

```
Config: simple       Name: ans          [11/64 used]
  Name type: Asynchronous line(s)     (Slot 1)

 Originate attachment string name:>terminal3
 Originate detachment string name: orgdet
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen




Originate attachment string name:
```

Figure 5-30. Originate attachment string subform

After completing the originate and detachment string prompts, the screen shown in figure 5-31 is displayed.

You are now asked for the *attachment text name*. If you want to have text displayed whenever a user attaches to the VCX, then you should enter the name of the text file at this point. This is not the actual text, only the name of the file that contains the text. This facility essentially becomes a programmable directory.

```
Config: simple      Name: ans          [11/64 used]
   Name type: Asynchronous line(s)     (Slot 1)

 Originate attachment string name:>terminal3
 Originate detachment string name: orgdet
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Attachment text name:>
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Originate access rights:
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------


 (Access rights the user must have to gain access.)





Originate attachment string name:
```

Figure 5-31. Originate attachment string subform

Next, you are asked to define the access rights of the originating port. The originate port access rights are the rights the users must have to use the originate port.

The access rights defined for the originate port can be listed as a series of numbers with commas as delimiters (i.e., 1,2,3,4,5,6,7) or as a range (1-7).

Name Type 2—Trunk Line

Main Form

A trunk line is a single synchronous line used for point-to-point statistical multiplexing to a single remote node.

Type *2 <CR* from the Name Type form to display the Trunk Line Main Form. The Trunk Line Main Form appears, shown in figure 5-32.

The fields of the Trunk Line Main Form are discussed next.

Port

This field asks for the port number which is to support the trunk line (only two ports are available). For example, to select port 2, enter:

> **Range: 1 - 2**
> **Port:** 2<CR>

(As viewed from the rear of the chassis, ports are numbered left to right).

```
Config: don          Name: don2          [5/120 used]
   Name type: Trunk line                 (Slot 2)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
           Port:>1       Port view, clocking: DTE, supplies no clock
                                   Baud rate: **
                            Virtual circuits: 0
                       Multiplexing protocol: X21
                              Login required: No
                        Trunk Timeout (secs): 60
                       Utilization Threshold: 75
                    Retransmission Threshold: 25
                     Statistics Logging Timer: 0
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------




Range: 1 - 2
Port:
```

Figure 5-32. Trunk line main form

Port View, Clocking

This field determines the source of the clock signal used to synchronize data transmissions between the VCX-150 port and external device, typically a synchronous modem. Two clock signals are required: transmit and receive. Either the VCX-150 port or the modem can supply transmit clocking. Clocking can also be split, so that the DTE port supplies transmit clocking with receive clocking supplied by the modem. The options are:

- DTE, supplies no clock. The port is DTE. The modem supplies both transmit clocking and receive clocking. This selection is appropriate for ports connected to most modems, line drivers, and Digital Data Services.
- DTE, supplies transmit clock. The port is DTE. The port supplies transmit clocking to the modem. The modem supplies receive clocking to the port. This selection is required in some multiport modem and TDM applications.

  For example, to configure the synchronous port for modem-supplied transmit and receive clocking, you enter:

  1) DTE, supplies no clock
  2) DTE, supplies transmit clock
  Port view, clocking: 1<CR>

Baud Rate

This field specifies the baud rate of the synchronous port. Set the port baud rate to match that of the modem. For port-supplied clocking (see *Port view, clocking* above), this value determines the frequency of the clock signals generated by the port. Also, the baud rate entry is used to calculate retransmission timeouts, regardless of the clock source. For modems using 14.4K, 16K, and 16.8K baud, configure the Port view, clocking to *DTE, supplies no clock* and select 9600 as the port baud rate, as shown below:

1) 1200	**7) 19.2K**
2) 2400	**8) 38.4K**
3) 3600	**9) 56K**
4) 4800	**10) 64K**
5) 7200	**11) 128K**
6) 9600	**12) 256K**

Baud rate: 6<CR>

Number of Virtual Circuits

Connections between VCX-150 ports at different nodes are multiplexed onto a common trunk line. This field determines the maximum number of multiplexed connections or virtual circuits the trunk line supports. A VCX-150 trunk line supports from 1 to 250 virtual circuits. If you select 250 virtual circuits, the trunk line supports up to 250 simultaneous connections. If a port attempts to originate the 251st connection, VCX-150 queues that port for connection until a virtual circuit is freed by a disconnection or the user decides to exit the queue.

It is strongly recommended that you select only as many virtual circuits as needed. The number of virtual circuits required for a particular application depends on the bandwidth of the trunk line (or modem speed), the maximum number of simultaneous connections expected between nodes, and the amount of channel activity.

For example, suppose the trunk line modems operate at 19,200 baud. Suppose also that an application requires sixteen channels to be used for intercomputer file transfers, so that the channels are active almost continuously. Specifying sixteen virtual circuits provides each port with an effective bit rate of 1200 bps (19,200 divided by 16).

Now suppose instead that the application involves data entry clerks filling out screen forms. Suppose also that, for this reason, the channels are one- fifth as active as in the file transfer application described above. Therefore, given the same trunk line baud rate (19,200 bps), 80 (5 X 16) virtual circuits would be a reasonable choice for the data entry application.

Also, buffer allocation for each virtual circuit is fixed. Specifying a large number of virtual circuits reduces the amount of buffer space allocated to each circuit. Insufficient buffering per circuit results in frequent transmission interruptions due to flow control or, for ports which do not support flow control, data loss.

Enter the maximum number of multiplexed connections in response to the prompt:

Range: 0 - 250
Virtual circuits:

Note: If the local and remote synchronous ports are configured for a different number of virtual circuits, the system selects the lower number of virtual circuits as the maximum.

Multiplexing Protocol

This field permits selection of a multiplexing protocol. Enter 1 for muxing, 2 for X.21, or 3 for X.21 PSTN protocol and **<CR>**. (See Appendix B for discussion of X.21 and X.21 PSTN.)

1) Muxing
2) X.21
3) X.21 PSTN
Multiplexing protocol:

Login Required

If for security reasons, you would like to have the user to enter a password and a user name before accessing the trunk line then answer Yes to this prompt.

1) No
2) Yes
(Should port prompt user for name and password?)
Login required: 1 <CR>

Trunk Timeout

The Trunk timeout field serves a dual function. When the trunk is configured for muxing protocol it represents the number of seconds the trunk can remain inoperative before it is declared out of service. Typically this means carrier detector at the interface has disappeared or a constant state of retransmissions for that time period has occurred. When the trunk protocol is set for X.21 or X.21/PSTN, it represents a configurable inactivity timeout parameter. In either case, DTR at the interface is dropped to put a modem on-hook in the X.21/PSTN mode or to go idle in the X.21 mode.

Range: 1-250
Trunk timeout (secs): 60 <CR>

Utilization Threshold

With this parameter, a threshold level is set for trunk utilization, that if exceeded will generate a minor alarm. The trunk utilization threshold is entered as a percentage of the maximum bytes that can be transmitted over the trunk.

The default for the utilization threshold is 75 percent.

> **Range: 1 - 100**
> **(Percent of utilization)**
> **Utilization Threshold: 75**

Retransmission Threshold

This option allows you to set a threshold level for frame retransmissions, that if exceeded will generate a minor alarm. The threshold level is expressed as a percentage, i.e., the number of frame retransmissions per 100 frames transmitted/received. A higher percentage indicating a lower line quality. The default is 0, which disables the timer.

> **Range: 1 - 100**
> **(Retransmissions per 100 frames)**
> **Retransmission Threshold:**

Statistics Logging Timer

This option is provided for entry of the time interval between statistics log messages. The interval range is 0 to 15 minutes. Entering 0 <CR>disables the timer. (Default is 0.)

Access Subform

The access subform for trunk lines appears below the Trunk Line Main Form. The subform is similar to asynchronous line(s) and is shown in figure 5-33.

Trunk line answer access rights are those rights that out-going calls must have to use the trunk. The answer access rights can be listed as a series of numbers with commas (used as delimiters, i.e., 1,2,3,4,5) or as a range (i.e., 1-5). If you, for example, wanted to define the trunk line as having the answer access rights of one through sixty four, you would enter: 1 - 64.

The next entry asks whether you would like a password override when access restrictions are in effect. That is, in the case where the access rights of the originate port do not match the access rights of the answer port (access restriction), should someone be allowed to enter a password which will override the access restriction. If you choose 2, the password is required.

> **1) No**
> **2) Yes**
> **Can password override access restrictions?)**
> **Password override:** 1 <CR>

```
Config: example1    Name: anyname        [11/120 used]
   Name type: Trunk line                 (Slot 2)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
          Port: 1       Port view, clocking: DTE, supplies no clock
                                  Baud rate: 19.2K
                           Virtual circuits: 0
                      Multiplexing protocol: Muxing
                             Login required: No
                        Trunk Timeout (secs): 60
                      Utilization Threshold: 75
                   Retransmission Threshold: 25
                   Statistics Logging Timer: 0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:
   Password override: No
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Originate access rights:>
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------



Originate access rights:
```

Figure 5-33. Trunk line - Access subform (partial)

After answering the last two prompts, a third prompt, shown in figure 5-34 will be displayed.

The originate access rights prompt allows you to define which originate ports are to have access to the node. Those ports which you want to allow access can be listed as a series of numbers, separated by commas (i.e., 1,2,3,4) or as a range (i.e., 1 - 4).

Originate access rights:

Note: Access rights are more fully explained in the beginning of the Configuration Service, under the sub-headings of *Security*, *Access Control*, *Administrative Protection*, and *Access Rights*. For more details you are referred to these sections.

Name Type 3—Speed Connect

A speed connect name is a one-word abbreviation for a complex pathname. The purpose of Speed Connect names is to make remote connections easier for the terminal user. Recalling the example network in *General Information*, suppose a Boston terminal user frequently connects to the PDP 11/34 in Philadelphia. When presented with the connect prompt, he must respond:

Connect to: newyork.phil.pdp11

```
                    Virtual circuits: 8
               Multiplexing protocol: Muxing
                      Login required: No
                 Trunk Timeout (secs): 60
               Utilization Threshold: 75
              Retransmission Threshold: 25
              Statistics Logging Timer:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:
    Password override: No
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Originate access rights:>
——— <CR>=next field —— ^E=previous field —— ESC=accept screen ———



Originate access rights:
```

Figure 5-34.Originate access rights (partial screen)

You can create a speed connect name to make this process easier for the user. For example, you can create the speed connect name *pdp11* to stand for the pathname *newyork.phil.pdp11*. The Speed Connect Form appears similar to the example shown in figure 5-35.

Enter the pathname that the speed connect name is to represent. In the example described above, you enter:

Routing name: newyork.phil.pdp11

```
Config: simple      Name:Pdp11          [11/64 used]
   Name type: Speed connect
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   Routing name:> newyork.phil.pdp11
——— <CR>=next field —— ^E=previous field —— ESC=accept screen ———




Routing name:
```

Figure 5-35. Speed connect form

Name Type 4—Group

A group name represents several logical port names. A group can contain any combination of:

- Asynchronous lines: originate ports, answer ports, *both* originate/answer ports, port series
- Trunk lines
- Speed connect names
- Pathnames
- VCX services

A group differs from a port series as follows:

- A port series consists of physically contiguous, identical, asynchronous ports. Group members need not be physically contiguous or identical.
- Configuring a port series conserves memory in the Configuration Storage module, since only one set of parameters is stored for the entire series. Group members have individual name definitions, so memory is not conserved.
- You can restrict access to a port series. You can restrict access to a group only by separately restricting access to members of the group.

Type *4* <*CR*> from the Name Type Form to display the Group Form. The Group Form as shown in figure 5-36.

The fields of the group name form are:

Names

The group can include both simple names and pathnames. Simple names consist of up to ten alphanumeric characters. Pathnames consist of two or more valid simple names separated by periods. Pathnames describe complex routing through the network. The pathname *newyork.phil.pdp11* might describe a connection path from the Boston node through New York to a PDP 11/34 in Philadelphia. In entering the names which comprise the group, separate each simple name or pathname from the next with a comma. The string you enter can contain no spaces, and its length cannot exceed sixty characters. You can enter up to three strings of names for a total of 180 characters.

```
Config: simple      Name: vax          [11/64 used]
   Name type: Group
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A comma-delimited list of pathnames:

          Names:> vax1,vax2,vax3
     more names:
     more names:
Line allocation: Sequential
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------








Names:
```

Figure 5-36. Group form

To define a group consisting of *vax1*, *vax2*, and *vax3*, you need enter only one string, as shown below:

> **Names:** vax1,vax2,vax3 <CR>
> **more names:**<CR>
> **more names:**<CR>

Line Allocation

It is possible to create a group of alternate pathnames to a remote node. Suppose for example that the name *phil* represents the link from the New York node to Philadelphia. Assume also that the pathname *dc.phil* represents the New York to Washington, D.C., to Philadelphia route.

The VCX can allocate connections between these grouped routes using a sequential or round robin algorithm. Sequential allocation means that VCX adds new connections to the *phil* route until the maximum number of virtual circuits for that link is reached. VCX then assigns connections to the *dc.phil* route. If more than two routes are grouped, VCX allocates connections to the third route when the first and second are fully utilized, and so on. Round robin allocation means that VCX allocates the first connection to the first route, the second connection to the second route, and so on, starting over with the first route when the number of connections exceeds the number of routes.

Choosing sequential allocation implies that the pathname named first is the primary or most efficient route. Other routes should be used only when the first is unavailable, and they are named in decreasing order of efficiency. Choosing round robin allocation implies all routes are equally efficiency.

The prompt is:

1) Sequential
2) Round robin
Line allocation:

Enter *<CR>* to have VCX utilize all virtual circuits on a given route before using the next route. Enter *2 <CR>* to have VCX alternate connections between or among the various routes.

Name Type 5–Services, ControlledAccess

This name type allows you to restrict access to VCX services (both system administrator and user services) to a desired subset of ports. The Services, Controlled Access Form is similar to the Access Subform for Asynchronous Lines configured as *answer* or *both* originate/answer ports. For example, suppose that you wanted to restrict access to the Fox Service. You first create the name *fox* and define the name type as Services, Controlled Access.

The form for the name appears as illustrated in figure 5-37.

Answer access rights are those rights that incoming calls must have to gain access to the service. Answer access rights can be listed as a series of numbers with

```
Config: simple      Name: FOX          [11/64 used]
   Name type: Services, controlled access
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:>1-64
    Password override: No
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------




(Access rights the user must have to gain access)
Answer access rights:
```

Figure 5-37. Controlled access form

commas (used as delimiters, i.e., 1,2,3,4,5) or as a range (i.e., 1-5). Assume only the answer access rights 4, 5, 6, and 10 will be granted connection. In that case one would enter:

Answer access right: 4 - 6, 10

Note: Access rights are more fully explained in the beginning of the Configuration Service, under the sub-headings of *Security*, *Access Control*, *Administrative Protection*, and *Access Rights*. For more details you are referred to these sections.

The next entry permits you to allow password override when access restrictions are in effect. That is, in the case where the access rights of the originate port do not match the access rights of the answer port (access restriction), should someone be allowed to enter a password which will override the access restriction. If you choose 2 for Yes, you will be asked for the password.

1) No
2) Yes
(Can password override access restrictions?)
Password override: 2 <CR>

Password: Zap

Name Type 6—X.25 Port

An X.25 port functions as a PAD (Packet Assembler/Disassembler) allowing access to an X.25 network or to an X.25 CPU port. Naming an X.25 trunk requires the line card in the designated slot to support synchronous operation.

Type *6<CR>* at the Name Type Form to display the X.25 Main Form. The default X.25 Main Form is shown in figure 5-38.

NOTE: An X.25 port can fail to initialize because its configured settings consume more RAM than the card has available. Therefore certain settings are recommended. Exercise caution when configuring the following parameters: the number of logical channels, the packet size, and the window size.

The fields of the X.25 Main Form are:

Port

This field requires the port number on the synchronous card that supports the X.25 trunk.

For example, to select port 1, enter:

Range: 1 - 2
Port: 1 <CR>

```
Config:anyname      Name: pad            [17/64 used]
   Name type: X.25 port
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                         Port view, clocking: DTE, supplies no clock
          Port: 1                  Baud rate: **

             Network ID: Datapac 76            I frame window (k): 7
        Network address: 123456789             Frame response (T1): 3
         Login required: No                    Max. retrans. (N2): 10
       X.25 DTE or DCE?: X.25 DTE               Link idle polling: No

    No. of incoming LCNs: 0                           Window size: 2
      First incoming LCN: 1                   Restart timer (T20): 100
     No. of bothway LCNs: 12             Call request timer (T21): 60
      First both way LCN: 20              Accept reverse charging: Yes
    No. of outgoing LCNs: 10             Reverse charges on calls: Yes
      First outgoing LCN: 40             Make high priority calls: No
             Packet size: 128 bytes         Utilization Threshold: 75
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------


Range: 1 - 19
Slot:
```

Figure 5-38. X.25 Main form

As viewed from the rear of the chassis, ports are numbered from left-to- right.

Port View, Clocking

This field determines the source of the clock signals used to synchronize data transmissions between the port and the external device, typically a synchronous modem. Two clock signals are required: transmit and receive. Either the port or the modem can supply clocking. Clocking can also be split, so that the DTE port supplies transmit clocking with receive clocking supplied by the modem, or so that the port supplies receive clocking with transmit clocking supplied by an external device. Refer to the *Product Description* for the synchronous card you are configuring to determine clock pin assignments. The options are:

- **DTE, supplies no clock**. The port is DTE. The modem supplies both transmit clocking and receive clocking. This section is appropriate for ports connected to most modems, line drivers, and Digital Data Services.

- **DTE, supplies transmit clock**. The port is DTE. The port supplies transmit clocking to the modem. The modem supplies receive clocking to the port. This selection required in some multipoint modem and TDM applications.

For example, to configure the synchronous port for modem-supplied transmit and receive clocking, you enter:

1) DTE,supplies no clock
2) DTE,supplies transmit clock
Port view, clocking: 1<CR>

Baud Rate

This field specifies the baud rate of the synchronous port. For ports using modem-supplied clocking (see *Port view, clocking* above), this parameter does not apply. For port-supplied clocking, this value determines the frequency of the clock signals generated by the port. For example, to set the port clocking for 9600 baud, enter:

1) 1200	**5) 7200**	**9) 56K**
2) 2400	**6) 9600**	**10) 64K**
3) 3600	**7) 19.2K**	**11) 128K**
4) 4800	**8) 38.4K**	**12) 256K**

Baud rate: 6<CR>

Network ID

Currently, the VCX X.25 implementation is certified for connection to a variety of international networks. This option allows VCX to implement minor variations appropriate for each network.

The Datapac 76 and Datapac 80 selections conform to the X.25 1976 and X.25 1984 standards offered by Datapac, respectively. For example, to select Datapac 76 enter:

1) Datapac 76	**6) Transpac**	**11) Austpac**
2) TeleNet	**7) TymNet**	**12) Compuserve**
3) Datapac 80,	**8) Generic**	**13) DCS**
4) PSS	**9) Datapak**	
5) Datex-P	**10) Datanet 1**	

Network ID: 1<CR>

Network Address

The user doesn't need to define the *network address* unless he wants the called address (the destination) to know his address. The *network address* entered is used in the call request packet in the calling address field. Once specified, the user cannot call himself. Up to 14 numeric characters (0-9) can define the network address. The prompt looks like the following:

(Up to 14 characters 0 - 9)
Network address: ***123456789***

Login Required

With this field, you can choose to have the port display both a name and password prompt. For example, if you wanted these prompts displayed for security reasons, you would enter 2 for Yes:

1) No
2) Yes
(Should port prompt user for name and password?)
Login required: 2<CR>

X.25 DTE or DCE?

This parameter selects X.25 Levels II and III DTE/DCE operation. Generally, the X.25 DTE is the PAD, and the X.25 DCE is the PSE. For connection to an X.25 DTE (for example, another VCX X.25 port), the X.25 port can be assigned to X.25 DCE. Note that this parameter differs from the *Port view, clocking* parameter discussed above, which is a hardware (Level 1) parameter. For example, to configure the port as X.25 DTE, enter:

1) X.25 DTE
2) X.25 DCE
X.25 DTE or DCE?: 1<CR>

I Frame Window (K)

Recommended setting 7

This field determines the maximum number of outstanding unacknowledged I (information) frames. For example, to set the maximum number of unacknowledged I frames to 7, enter:

Range 1 - 7
(normally 7)
Max. outstanding I frames (k): 7<CR>

Frame response timer (T1)

Recommended setting: 3

This field determines the elapsed time in seconds after which retransmissions of an unacknowledged frame occurs. For example, to set the frame level response timer to 3 seconds, enter:

Range: 1 - 15
value in seconds (normally 3)
Frame level response timer (T1): 3<CR

Max. Retransmissions (N2)

This field selects the maximum number of frame transmissions and retransmissions following the expiration of timer T1 (see below).

For example, to set the maximum number of transmissions to 10 frames, enter:

> **Range: 1 - 15**
> **(normally 10)**
> **Max. frame retransmissions (N2):** 10<CR>

Link Idle Polling

This field permits making link idle polling active or inactive. When set to *Yes* and the link is idle, an RR with the poll bit set will be sent to the distant end. If set to *No*, it is up to the distant end to send an RR and force the link active.

Logical Channel Numbers (LCN's)

LCN's are the following types: one way incoming, two way (bothway), and one way outgoing. Note that one way LCN's are full-duplex channels; the direction refers to call establishment. The types of LCN's are assigned ranges within the overall range of 1-4096. The following are entries of the subform shown in figure 5-38.

No. of Incoming LCN's

You can select from a range of 0-64, the number of Logical channels available for only incoming calls.

> **Range: 0-64**
> **No. of incoming LCN's:** 10<CR>

First Incoming LCN

You can designate the start of the range of Logical Channel Numbers (LCN's) for only incoming calls.

> **Range: 1 - 4096**
> **First incoming LCN:** 1<CR>

No. of Bothway LCN's

You can select from a range of 0 - 64, the number of Logical channels available for two way calls.

> **Range: 0 - 64**
> **No. of bothway LCN's:** 12<CR>

First Bothway LCN

You can designate the start of the range of Logical Channel Numbers (LCN's) for two way calls.

> **Range: 1 - 4096**
> **First bothway LCN:** 20<CR>

No. of Outgoing LCN's

You can select from a range of 0 - 64, the number of Logical channels available for only outbound calls.

> **Range: 0 - 64**
> **No. of outgoing LCN's:** 10<CR>

First Outgoing LCN

You can designate the start of the range of Logical Channel Numbers (LCN's) for only outbound calls.

> **Range: 1 - 4096**
> **First outgoing LCN:** 40<CR>

Packet Size

Recommended setting: 128 bytes

In the absence of packet size negotiation with the PSE, this field determines the number of user data bytes in a packet. For example, to set the default packet size to 128 bytes, enter:

> **1) 128 bytes**
> **2) 256 bytes**
> **(normally 128)**
> **Default packet size:** 1<CR>

Window Size

Recommended setting: 2

Window here refers to a set of n consecutive data packet send sequence numbers N(S). In the absence of window size negotiation with the PSE, this field determines the number of outstanding unacknowledged data packets permitted. For example, to select a default window size of 2, enter:

> **Range: 1 - 7**
> **Packet window size:** 2<CR>

Restart Timer Value (t20)

The restart procedure clears all virtual calls. This field determines the elapsed time in seconds the DTE will wait for a DCE restart confirmation packet after sending a restart request.

For example, to set the restart timer to 180 seconds, enter:

Range: 30 - 180
value in seconds
Restart timer value (T20): 180<CR>

Call Request Timer (t21)

This field determines the elapsed time in seconds the port waits for a response to a virtual circuit call request. For example, to set the outgoing call request timer to 60 seconds, enter:

Range: 30 - 200
value in seconds
Call request timer (T21): 60<CR>

Accept Reverse Charging

This field allows use of the reverse charging facility on all incoming calls. For example, to allow the MUX PAD to accept calls that reverse charges, enter:

1) No
2) Yes
Accept reverse charging: 2<CR>

Reverse Charges On Calls

This field enables the reverse charging facility on all outgoing calls. For example, to select reverse charging, enter:

1) No
2) Yes
Reverse charges on calls: 2<CR>

Make High Priority Calls

Datapac offers a high priority calling facility that increases throughput at additional charge. To enable high priority calling on all outgoing calls, enter:

1) No
2) Yes
Make high priority calls: 1<CR>

Utilization Threshold

Here, a threshold can be set for trunk utilization, that if exceeded will generate a log message. The trunk utilization threshold is entered as a percentage of trunk use:

Range: 1 - 100
(Percent of utilization)
Utilization Threshold: 75<CR>

```
Config:anyname     Name: pad          [17/64 used]
   Name type: X.25 port
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                         Port view, clocking: DTE, supplies no clock
               1                   Baud rate: **

            Network ID: Datapac 76              I frame window (k): 7
       Network address: 123456789               Frame response (T1): 3
        Login required: No                      Max. retrans. (N2): 10
     X.25 DTE or DCE?: X.25 DTE                  Link idle polling: No

   No. of incoming LCNs: 0                               Window size: 2
     First incoming LCN:                      Restart timer (T20): 100
   No. of bothway LCNs: 12                 Call request timer (T21): 60
     First both way LCN: 28                  Accept reverse charging: Yes
   No. of outgoing LCNs: 10                Reverse charges on calls: Yes
     First outgoing LCN: 40                Make high priority calls: No
           Packet size: 128 bytes            Utilization Threshold: 75
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------


Range: 1-2
Port:
```

Figure 5-39. X.25 main form

The completed Main form is shown in figure 5-39. The items on the form are discussed next.

X.25 Terminal Pad Profile Menus

A X.25 Terminal Pad Profile is used when an operator makes a connection over a X.25 trunk. The Profile defines the X.3 parameters used during transmission. Four Terminal Pad Profiles are available. Initially all four profiles are set to the same default values. However, the profiles can be altered to suit your individual needs. When making an X.25 call, you are asked which T Pad Profile you want to use. If you do not select one, then T Pad 1 will be selected for you by default.

Except for Menu numbers seen in the heading, all four of the X.25 Terminal Pad Profile Menus look similar to the screen shown in figure 5-40.

The X.3 parameters listed in the T Pad Profile are explained in Appendix D (Table of X.3 Parameters) including the proper values to use with the X.3 parameters. The Appendix D REF numbers for the X.3 parameters are listed in table 5-4, for each of the T Pad parameters for ease in cross-referencing. Note: Parameter 11 is not listed because it is *read only*

As you line through each parameter on the menu, you will be told those values to be supported by the PAD. Those values not being supported, but within the range, will disable the parameter. For example, in the case of the recall character:

```
Config:anyname      Name: pad           [19/64 used]
   Name type: X.25 port
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

              X25 Terminal Pad Profile 1 Menu

    Recall character:>1              Pad flow control: 1
          Echo state: 0                  LF insertion: 0
     Data forwarding: 126                  LF padding: 0
  Timeout forwarding: 20                      Editing: 0
 Device flow control: 1              Character delete: 0
     Service signals: 5                   Line delete: 24
        Break action: 21                 Line display: 20
      Discard output: 0                Ed SVC signals: 0
          CR padding: 0                     Echo mask: 0
        Line folding: 0                     Page wait: 0
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------



Range: 0 - 126
(2-31 disable parameter)
Recall character:
```

Figure 5-40. X.25 terminal pad form

Range: 0 - 126
(2-31 disable parameter)
Recall character:

If then, you select 2 through 31, the recall parameter is disabled. However, the remaining supported values of 0, 1, and 32-126, will enable recall. The significance of the parameter values can be found in Appendix A.

X.25 Host Pad Profile Menu

The X.3 parameters in the X.25 Host Pad Profile are described in Appendix A. To assist in cross-referencing, the Appendix A REF numbers are listed in table 5-4.

The X.25 Host Pad Profile holds the X.3 parameters used to modify data coming back from the host. The Host Pad Menu is shown in figure 5-41.

As in the previous T Pad Menu, as you line through each parameter on the menu, you will be told those values to be supported by the PAD. Those values not being supported, but within the range, will disable the parameter. Refer to Appendix A to study the proper values to use with the X.3 parameters.

Table 5-4. Reference Numbers for the X.3 Parameters

Reference number	X.3 parameter	Reference number	X.3 parameter
1	Recall character	12	Pad flow control
2	Echo state	13	LF insertion
3	Data forwarding	14	LF padding
4	Timeout forwarding	15	Editing
5	Device flow control	16	Character delete
6	Service signals	17	Line delete
7	Break action	18	Line display
8	Discard output	19	Editing Service Sig.
9	CR padding	20	Echo Mask
10	Line folding	22	Page Wait

```
Config:anyname      Name: pad           [19/64 used]
   Name type: X.25 port
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

              X25 Host Pad Profile Menu

   Recall character:>0              Pad flow control: 1
         Echo state: 0                  LF insertion: 0
    Data forwarding: 0                    LF padding: 0
 Timeout forwarding: 1                       Editing: 0
Device flow control: 1              Character delete: 0
    Service signals: 0                   Line delete: 0
       Break action: 0                  Line display: 0
     Discard output: 0                Ed SVC signals: 0
         CR padding: 0                     Echo mask: 0
       Line folding: 0                     Page wait: 0
——— <CR>=next field —— ^E=previous field —— ESC=accept screen ———



Range: 0 - 126
(2-31 disable parameter)
Recall character:
```

Figure 5-41. X.25 Host pad profile menu

X.25 X.29 Set Profile Menu

The X.25 X.29 Set Profile Menu is similar to the X.25 Host Pad Profile Menu and is shown in figure 5-42.

The X.25 X.29 Set Profile are those X.3 parameters immediately sent from an H-PAD to a T-PAD after a *call accept*. The parameters are sent (via a set & read packet) to *adjust* the originating end, so that it is compatible with the receiving end application.

Only valid X.3 parameters are built into the transmitted X.29 packet. As you page through the menu, the invalid values are indicated for each parameter.

For example:

> **Range: 0-126**
> **(2-31 indicate do not send in X.29 packet)**
> **Recall character:**

If invalid values are selected for the parameter, then the parameter will not be built into the X.29 packet sent to the originating end. Further, if all the parameters have invalid values, the X.29 set & read packet will not be sent at all.

```
Config:anyname      Name: pad           [19/64 used]
   Name type: X.25 port
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

              X25 X29 Set Profile Menu

   Recall character:>1              Pad flow control: 2
         Echo state: 0                  LF insertion: 0
    Data forwarding: 126                  LF padding: 254
 Timeout forwarding: 1                       Editing: 0
Device flow control: 3              Character delete: 128
    Service signals: 5                   Line delete: 128
       Break action: 22                 Line display: 128
     Discard output: 2                Ed SVC signals: 3
         CR padding: 01                    Echo mask: 3
       Line folding: 0                     Page wait: 0
------ <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------



Range: 0 - 126
(2-31 indicate do not send in X29 packet)
Recall character:
```

Figure 5-42. X.29 Set profile menu

Access Subform

The access subform for X.25 trunks is similar to the one for asynchronous line(s). The monitor display screen is shown in figure 5-43.

```
Config: simple      Name: pad            [11/64 used]
   Name type: X.25 port                 (Slot 2)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:>
    Password override: No
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen ----



(Access rights the user must have to gain access)
Answer access rights:
```

Figure 5-43. X.25 originate access rights subform

Answer port access rights on a X.25 trunk are the rights that an outgoing call must have to gain access and use the trunk. Answer access rights for the trunk line can be listed as a series of numbers with commas (used as delimiters, i.e., 1,2,3,4,5) or as a range (i.e., 1-5). If you, for example, wanted to define the trunk line as having all sixty four answer access rights, you would enter: 1 - 64.

The next entry asks whether you would like a password override when access restrictions are in effect. That is, in a case where the access rights of the originate port do not match the access rights of the answer port (access restriction), should someone with a password be allowed to override the access restriction. Selecting 2 for Yes, you are asked for the password.

1) No
2) Yes
(Can password override access restrictions?)
Password override:

After answering the last prompt, a third prompt is displayed (figure 5-44).

```
Config: simple      Name: pad          [11/64 used]
   Name type: X.25 port                (Slot 2)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Answer access rights:
    Password override: No
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Originate access rights:>
------- <CR>=next field ---- ^E=previous field ---- ESC=accept screen -------




(Access rights the user must have to gain access)
Originate access rights:
```

Figure 5-44. X.25 trunk access submenu

Originate access rights on a X.25 trunk are the rights that incoming calls must have to gain access to a node. The originate access rights to be defined for the X.25 trunk can be listed as a series of numbers, separated by commas (i.e., 1,2,3,4) or as a range (i.e., 1 - 4).

Originate access rights:

NOTE: Access rights are more fully explained in the beginning of the Configuration Service, under the sub-headings of *Security*, *Access Control*, *Administrative Protection*, and *Access Rights*. For more details you are referred to these sections.

Name Type—7-String

Attach and detach strings are defined using this menu selection. (See figure 5-45.)

```
Config: simple      Name: ans          [11/64 used]
   Name type: String
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
String name contents:> off
  ---- <CR>=next field ---- ^E=previous field ---- ESC=accept screen ------




String name contents: Off
```

Figure 5-45. String attach and detach submenu

The attach or detach string that you would like to have displayed, should be defined after the *String name contents* prompt. The string can be up to sixty characters in length and contain control codes. If a control code character is to be entered, place an up-caret first, ^, (usually a shift 6) then a character. For example, a line feed (LF) would be entered as a ^J and a carriage return (CR) as a ^M (see appendix B). Keep in mind that a control character requires two characters to be entered to fully define it, and therefore consume 2 of the possible 60 characters possible in a string.

A break can be programmed into the string by using *\B*. A pause is programmed into the string using *\Pnn*, where nn is the pause time in tenths of a second. For example, 99 is 9.9 seconds. Multiple \P entries can be strung together to produce pauses greater than 9.9 seconds up to a 14 second maximum pause.

In the above sample menu, the name of a detach string is *ans* and its contents are *Off*.

NOTE: It is recommended that all strings output to a display terminal begin and end with a <CR>, (carriage return, line feed, line feed) to avoid overwriting information previously displayed on the screen as well as to start the string at the left hand margin of the monitor.

Diagnostic Service (XNET)

The Diagnostic Service allows the System Administrator to conduct tests on asynchronous ports and multiplexing/X.25 ports to determine if data is being properly communicated within a VCX node or network. The asynchronous diagnostic tests include: internal loopback, external loopback, fox message, and data monitor.

The multiplexing/X.25 port diagnostics include local loopback and remote loopback.

Most loopbacks permit either the insertion of a VCX generated fox message to be propagated to the target port UART/USART and looped back to the diagnostic terminal user; or the diagnostic terminal user to have TX data sent to the target port, looped back and returned to RX data for display on the terminal.

The terminology internal/external and local/remote need explanation. Local and remote loopbacks are performed on sync ports which, by definition, have a permanent circuit in place. Async switched ports, on the other hand, are merely attached to the switch prior to virtual circuit setup. Therefore, if the target async port is unconnected, a loopback can be performed externally, TX data to RX data toward the terminal; or internally, TX data to RX data toward VCX. NOTE: For clarity as to signal paths for the various tests, review the figures at the end of the Diagnostic Service.

It should be remembered, with the exception of data monitor, diagnostic tests are disruptive to either the port under test, or the trunk/composite under test. Therefore, one or many users can potentially be affected.

To select the Diagnostic Service, enter *Diag* after the prompt.

Connect to: diag<CR>

This will display the Diagnostic Port Selection menu shown in figure 5-46. The Diagnostic Service can be exited by entering 1. To continue on within the Diagnostic Service enter 2, *Select a port*. This action will generate two prompts: *Enter 1 for Async or 2 for Sync:* and *Enter port number*. After the specific async/sync type and port number are entered, the Diagnostic Service determines whether an asynchronous or multiplexing/X.25 port has been selected. Depending on the type of port, different menus are displayed. The menus for an asynchronous port are presented first.

```
***** Diagnostic Port Selection *****

1. Exit
2. Select a port

Enter selection: 2


Enter 1 for Async or 2 for Sync: 1
Enter port number: 2
```

Figure 5-46. Diagnostic service main menu

```
***** Asynchronous Diagnostics *****

Node: Boston      Card: 1     Port: 2     Port name: Term1

1. Exit
2. Internal loopback
3. External loopback
4. Transmit fox
5. Data monitor

Enter selection:
```

Figure 5-47. Asynchronous diagnostics main menu

Asynchronous Port Diagnostics

Assume that the port to be selected to test is an asynchronous port. The menu shown in figure 5-47 is then displayed. If you enter 1 you will be returned to the previous menu. Options 2-4 allow you to select specific tests for the async port and option 5 allows you to monitor the data at the port. Let's review each of these options, beginning with *Internal loopback*. Selecting 2, *Internal loopback*, generates another menu illustrated in figure 5-48.

This menu is necessary since there are two internal loopback tests that can be chosen: internal fox and internal echo. The active choice is marked (Current); and whenever 4 is selected, the loopback test marked (Current) will be started. For example, to select the fox test, you enter 2. This will move the (Current) status up to Fox. Then selecting 4, will begin the Fox test, which appears as shown in figure 5-49.

```
***** Internal loopback *****

Node: Boston      Card: 1     Port: 2     Port name: Term1

1. Exit
2. Fox
3. Echo           (Current)
4. Begin Loopback

Enter selection:
```

Figure 5-48. Internal loopback menu

```
***** Internal loopback *****

Node: newyork    Card: 1     Port: 2     Port name: Term1

1. Exit
2. Fox            (Current)
3. Echo
4. Begin Loopback

Enter selection: 4

Hit <ESC> to exit.

 The quick brown fox jumped over a lazy dog's back 1 times.
 The quick brown fox jumped over a lazy dog's back 2 times.
 The quick brown fox jumped over a lazy dog's back 3 times.
 The quick brown fox jumped over a lazy dog's back 4 times.
 The quick brown fox jumped over a lazy dog's back 5 times.
 The quick brown fox jumped over a lazy dog's back 6 times.
 The quick brown fox jumped over a lazy dog's back 7 times.
 The quick brown fox jumped over a lazy dog's back 8 times.
 The quick brown fox jumped over a lazy dog's back 9 times.
 The quick brown fox jumped over a lazy d
```

Figure 5-49. Internal loopback of fox message

To exit the Fox test and reactivate the menu, hit the ESC> key. During the internal fox loopback, the test message *The quick brown fox jumped......times* is routed to target UART (Universal Async Receive and Transmit chip) and then back to the terminal. This tests the UART's ability to receive and retransmit data, as well as tests all intervening circuitry to the diagnostic port.

To select the second internal loopback option, echo, enter 3 to make echo (Current), and then enter **4** to start the test. A screen like that shown in figure 5-50.

```
Node: newyork     Card: 1     Port: 2     Port name: vax1

1. Exit
2. Fox
3. Echo          (Current)
4. Begin Loopback

Enter selection: 4


Hit <ESC> to exit.

"This is a test of internal loopback.
```

Figure 5-50. Selection "4" entered

In the case of echo, anything typed on the diagnostic terminal will be routed through the target UART and retransmitted back to the terminal. In our example, the sentence *This is a test of internal loopback* was typed and echoed back. As in the previous fox test, this is a way of checking the functioning of the VCX's UART.

Completing the internal echo test, you can exit and return to the previous menu by selecting 1.

External loopback can be selected as shown in figure 5-51. The external loopback test can be conducted by selecting option 3, as shown above. In this particular test, data is transmitted from an external terminal to the VCX's UART and is then sent back to the terminal. The external loopback mode can be exited by hitting <ESC>.

```
Node: newyork     Card: 1     Port: 2     Port name: Term1

1. Exit
2. Internal loopback
3. External loopback
4. Transmit fox
5. Data monitor

Enter selection: 3


Hit <ESC> to exit external loopback mode.
```

Figure 5-51. Selection "3" entered

```
***** Asynchronous Diagnostics *****

Node: newyork     Card: 1     Port: 2     Port name: Term1

1. Exit
2. Internal loopback
3. External loopback
4. Transmit fox
5. Data monitor

Enter selection: 4

Hit <ESC> to exit.
```

Figure 5-52. Asynchronous diagnostics, select 4

The option *Transmit fox* can be started by selecting 4. This screen is illustrated in figure 5-52.

Transmit fox sends the fox message to the selected port and displays it on the user terminal but will not display the message on the diagnostic terminal. The <ESC> key should be used to exit the *Transmit fox* mode.

Selecting option 5, Data Monitor, will generate the screen shown in figure 5-53.

The Data Monitor can programmed to show the data being received at a port, the data being transmitted at a port, or both directions. The Data Monitor can also be set to an ASCII or HEX display as well as be set to start with or without a trigger character. The parameters current at the moment are displayed via the statement: "current is ____".

```
***** Data Monitor *****

Node: newyork     Card: 1     Port: 2     Port name: Term1

1. Exit
2. Direction          (current is BOTH)
3. Format             (current is ASCII)
4. Trigger            (current is NO TRIGGER)
5. Begin Monitoring

Enter selection:
```

Figure 5-53. Data display monitor submenu

These are the options available at the Data display submenu:

Selecting option 1, (exit) will return you to the previous menu. Selecting option 2, (Direction) will take you to the Monitor Direction menu, as seen in figure 5-54.

```
***** Monitor Direction *****

Node: newyork    Card: 1    Port: 2    Port name: Term1

1. Exit
2. Receive
3. Transmit
4. Both

Enter selection:
```

Figure 5-54. Monitor direction menu

If you just want to see the port's received data on the Data Monitor, select option 2. Option 3, will cause only the port's transmitted data to appear on the Data Monitor. While option 4, will cause both the received and transmitted data to be displayed. Once you have made your choice, select option 1, *exit*, to return to the previous Data Monitor menu.

Returning to the previous Data Monitor Menu and then selected Format, option 3, from that menu, results in the monitor display shown in figure 5-55.

```
***** Monitor Format *****

Node: newyork    Card: 1    Port: 2    Port name: Term1

1. Exit
2. ASCII
3. HEX

Enter selection:
```

Figure 5-55. Monitor format menu

Option 2 will cause all of the monitor's data to be displayed in ASCII, while all the data is displayed in HEX with option 3. Once your choice has been made, select option 1, *exit*, to return to the previous menu.

Assuming that you have returned to the previous *Data Monitor* menu and have selected the *Trigger* option from that menu; you would see a screen like that shown in figure 5-56.

```
***** Data Monitor *****

Node: newyork     Card: 1     Port: 2     Port name: vax1

1. Exit
2. Direction           (current is BOTH)
3. Format              (current is ASCII)
4. Trigger             (current is NO TRIGGER)
5. Begin Monitoring

Enter selection: 4

Enter printable character or a two digit hex number
or hit <RETURN> to continue.
```

Figure 5-56. Data monitor menu, Trigger selected

Notice that you are asked for a printable character or a two digit hex number for the trigger. After hitting <CR>the Diagnostic Service checks to see whether a character or hex number has been entered. If not, the Diagnostic Service assumes a NO TRIGGER state exists.

```
Rx ^M^J The quick brown fox jumped over a lazy dog's back 328 times.^M^J The qu
Tx
Rx ick brown fox jumped over a lazy dog's back 329 times.^M^J The quick brown f
Tx
Rx ox jumped over a lazy dog's back 330 times.^M^J The quick brown fox jumped o
Tx
Rx ver a lazy dog's back 331 times.^M^J The quick brown fox jumped over a lazy
Tx
Rx dog's back 332 times.^M^J The quick brown fox jumped over a lazy dog's back
Tx
Rx 333 times.^M^J The quick brown fox jumped over a lazy dog's back 334 times.
Tx
Rx ^M^J The quick brown fox jumped over a lazy dog's back 335 times.^M^J The qu
Tx
Rx ick brown fox jumped over a lazy dog's back 336 times.^M^J The quick brown f
Tx
Rx ox jumped over a lazy dog's back 337 times.^M^J The quick brown fox jumped o
Tx
Rx ver a lazy dog's back 338 times.^M^J The quick brown fox jumped over a lazy
Tx
Rx dog's back 339 times.^M^J The quick brown fox jumped over a lazy dog's back
Tx
Rx 340 times.^M^J The quick
```

Figure 5-57. Data monitor set to ASCII/no trigger

Option 5 of the Data Monitor menu starts the actual data monitoring. Two examples of Data Monitor screens follow:

This screen is an example of a Data Monitor set to ASCII and No Trigger. This monitor screen is shown in figure 5-57.

The monitor screen shown in figure 5-58 is an example of a Data Monitor set to Both, HEX, and No Trigger.

```
Rx 70 65 64 20 6F 76 65 72 20 61 20 6C 61 7A 79 20 64 6F 67 27 73 20 62 61 63
Tx
Rx 6B 20 31 32 32 39 20 74 69 6D 65 73 2E 0D 0A 20 54 68 65 20 71 75 69 63 6B
Tx
Rx 20 62 72 6F 77 6E 20 66 6F 78 20 6A 75 6D 70 65 64 20 6F 76 65 72 20 61 20
Tx
Rx 6C 61 7A 79 20 64 6F 67 27 73 20 62 61 63 6B 20 31 32 33 30 20 74 69 6D 65
Tx
Rx 73 2E 0D 0A 20 54 68 65 20 71 75 69 63 6B 20 62 72 6F 77 6E 20 66 6F 78 20
Tx
Rx 6A 75 6D 70 65 64 20 6F 76 65 72 20 61 20 6C 61 7A 79 20 64 6F 67 27 73 20
Tx
Rx 62 61 63 6B 20 31 32 33 31 20 74 69 6D 65 73 2E 0D 0A 20 54 68 65 20 71 75
Tx
Rx 69 63 6B 20 62 72 6F 77 6E 20 66 6F 78 20 6A 75 6D 70 65 64 20 6F 76 65 72
Tx
Rx 20 61 20 6C 61 7A 79 20 64 6F 67 27 73 20 62 61 63 6B 20 31 32 33 32 20 74
Tx
Rx 69 6D 65 73 2E 0D 0A 20 54 68 65 20 71 75 69 63 6B 20 62 72 6F 77 6E 20 66
Tx
Rx 6F 78 20 6A 75 6D 70 65 64 20 6F 76 65 72 20 61 20 6C 61 7A 79 20 64 6F 67
Tx
```

Figure 5-58. Data monitor set to HEX and no trigger

The Multiplexing/X.25 Port Diagnostics

If, during the first menu of the Diagnostic Service, a synchronous port is selected rather than an asynchronous port, a different set of menus will be seen. The first menu displayed, if a synchronous port is selected, the screen shown in figure 5-59 is displayed. As can be seen, local loopback (option 2) or remote loopback (option 3) diagnostic tests can be selected for a multiplexing port. While option 1, exit, will return you to the *Diagnostic Port Selection* menu.

Assume you selected option 2, Local loopback. monitor will display the menu shown in figure 5-60.

There are two local loopback tests that can be conducted: Fox and Echo. The loopback test that is active and ready to run is denoted by the word (Current). When option 4, Begin Loopback, is selected, the (Current) test is started.

```
***** Multiplexing Port Diagnostics *****

Node: newyork     Card: 2     Port: 2     Port name: Tsun

1. Exit
2. Local loopback
3. Remote loopback

Enter selection: 2
```

Figure 5-59. Multiplexing port diagnostics

```
***** Local loopback *****

Node: newyork     Card: 2     Port: 2     Port name: Tsun

1. Exit
2. Fox
3. Echo            (Current)
4. Begin Loopback

Enter selection:
```

Figure 5-60. Local loopback menu

If you selected the Fox test, option 2, and then selected *Begin Loopback*, you will see a screen like that shown in figure 5-61. To exit the fox test, you must use the <ESC>key. You can now conduct the local loopback echo test. The screen for the local loopback echo test is illustrated in figure 5-62.

Data typed at the terminal is sent to the VCX's USART and then echoed back to the terminal's screen (i.e., "This is a test of local loopback"). To escape the local loopback echo mode, press the <ESC>ape key.

Let's assume you have conducted both the fox and echo test and wish to exit the local loopback menu. Selecting option 1, exit, will return you to the previous *Multiplexing Port Diagnostics* menu, shown in figure 5-63.

```
***** Local loopback *****

Node: newyork    Card: 2    Port: 2    Port name: Tsun

1. Exit
2. Fox
3. Echo           (Current)
4. Begin Loopback

Enter selection: 4


 The quick brown fox jumped over a lazy dog's back 1 times.
 The quick brown fox jumped over a lazy dog's back 2 times.
 The quick brown fox jumped over a lazy dog's back 3 times.
 The quick brown fox jumped over a lazy dog's back 4 times.
 The quick brown fox jumped over a lazy dog's back 5 times.
 The quick brown fox jumped over a lazy dog's back 6 times.
 The quick brown fox jumped over a lazy dog's back 7 times.
 The quick brown fox jumped over a lazy dog's back 8 times.
 The quick brown fox jumped over a lazy dog's back 9 times.
 The quick brown fox jumped over a lazy dog's back 10 times.
 The quick brown fox jumped
```

Figure 5-61. Local loopback of fox message

```
***** Local loopback *****

Node: newyork    Card: 2    Port: 2    Port name: Tsun

1. Exit
2. Fox
3. Echo           (Current)
4. Begin Loopback

Enter selection: 4


Hit <ESC> to exit.

"This is a test of the local loopback service available."
```

Figure 5-62. Local loopback echo test

```
***** Multiplexing Port Diagnostics *****

Node: newyork     Card: 2     Port: 2     Port name: Tsun

1. Exit
2. Local loopback
3. Remote loopback

Enter selection: 2
```

Figure 5-63. Multiplexing port diagnostic menu

Remote loopback diagnostic tests can be selected from this menu. Selecting Remote loopback, option 3, displays the menu shown in figure 5-64.

```
*****          loopback *****

Node: Houston  Card: 2     Port: 2     Port name: Tsun

1. Exit
2. Generate fox messages
3. Echo user characters only


Enter selection:
```

Figure 5-64. Remote loopback diagnostic tests menu

In remote loopback, as in local loopback, two types of tests are available: fox and echo. During these tests the local VCX communicates using a virtual circuit on the synchronous port's trunk line to the remote VCX; it is therefore non-disruptive. The remote VCX's fox or loopback service is turned on and then sent back to the local VCX.

Displays on the diagnostic terminal for fox and echo in remote loopback are identical to those in local loopback.

Illustrations of External Loopback, Local trunk loopback with echo, and remote trunk loopback with fox, are shown in figures 5-65, 5-66 and 5-67.

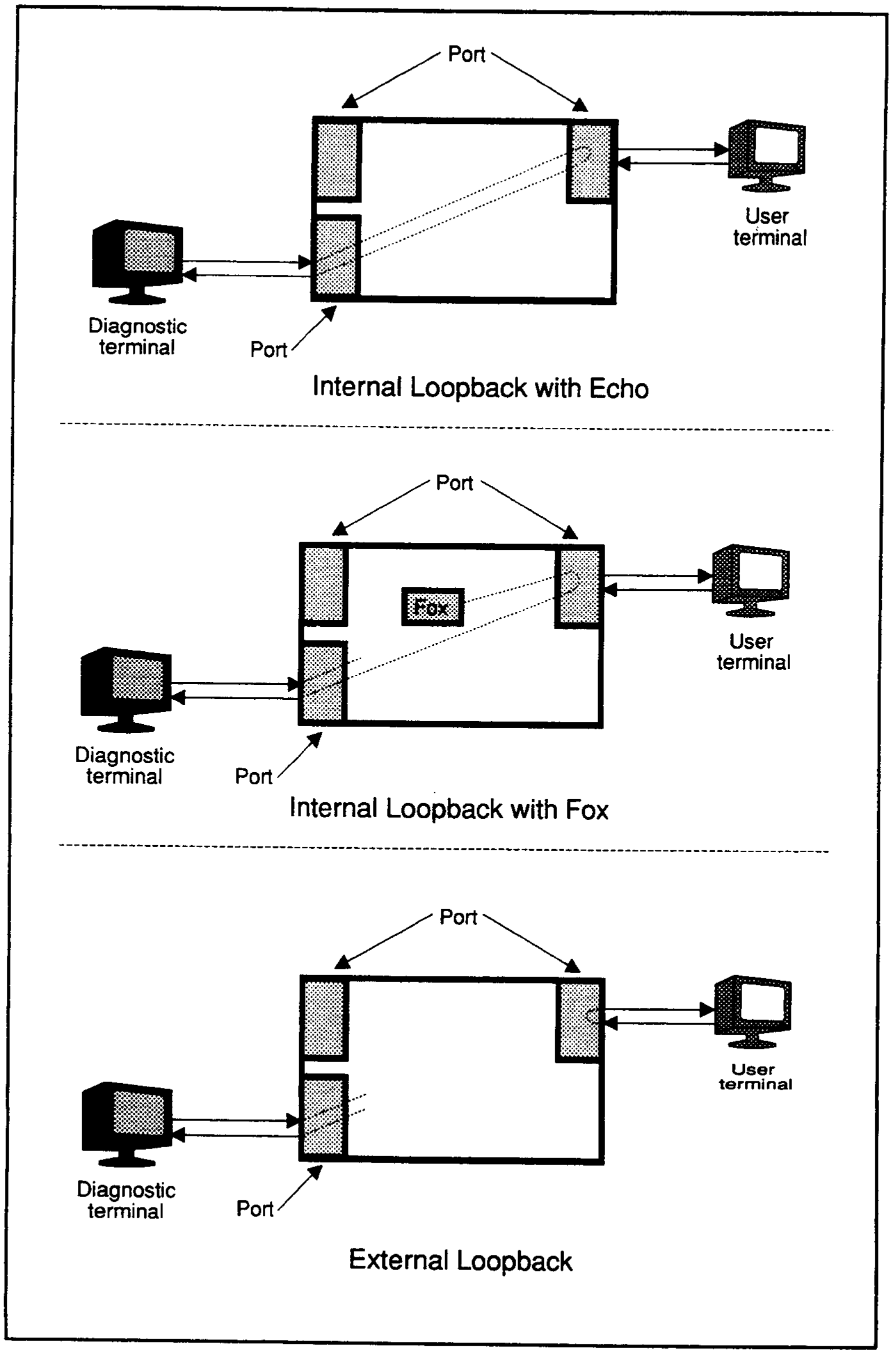


Figure 5-65. Loopback operation examples

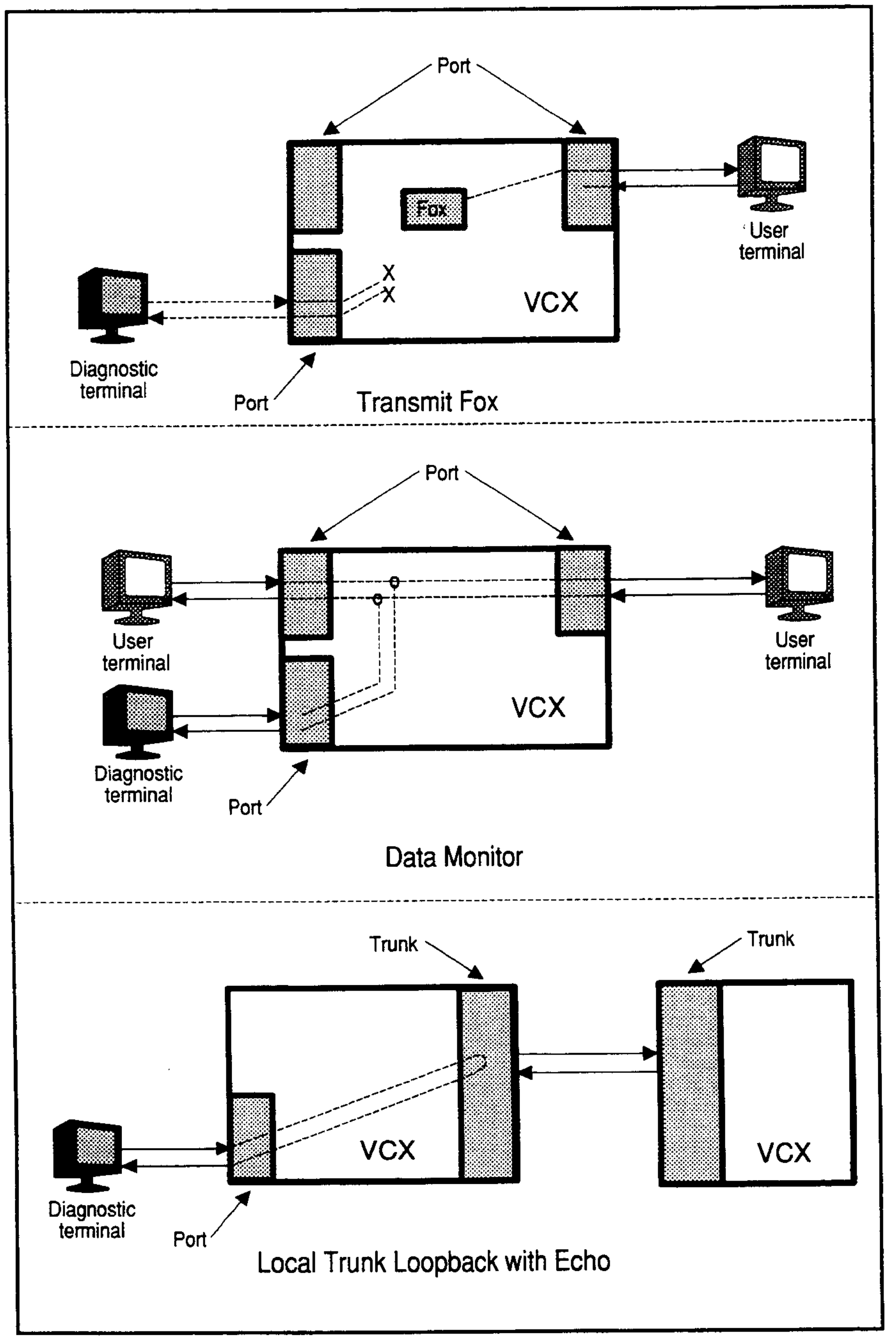
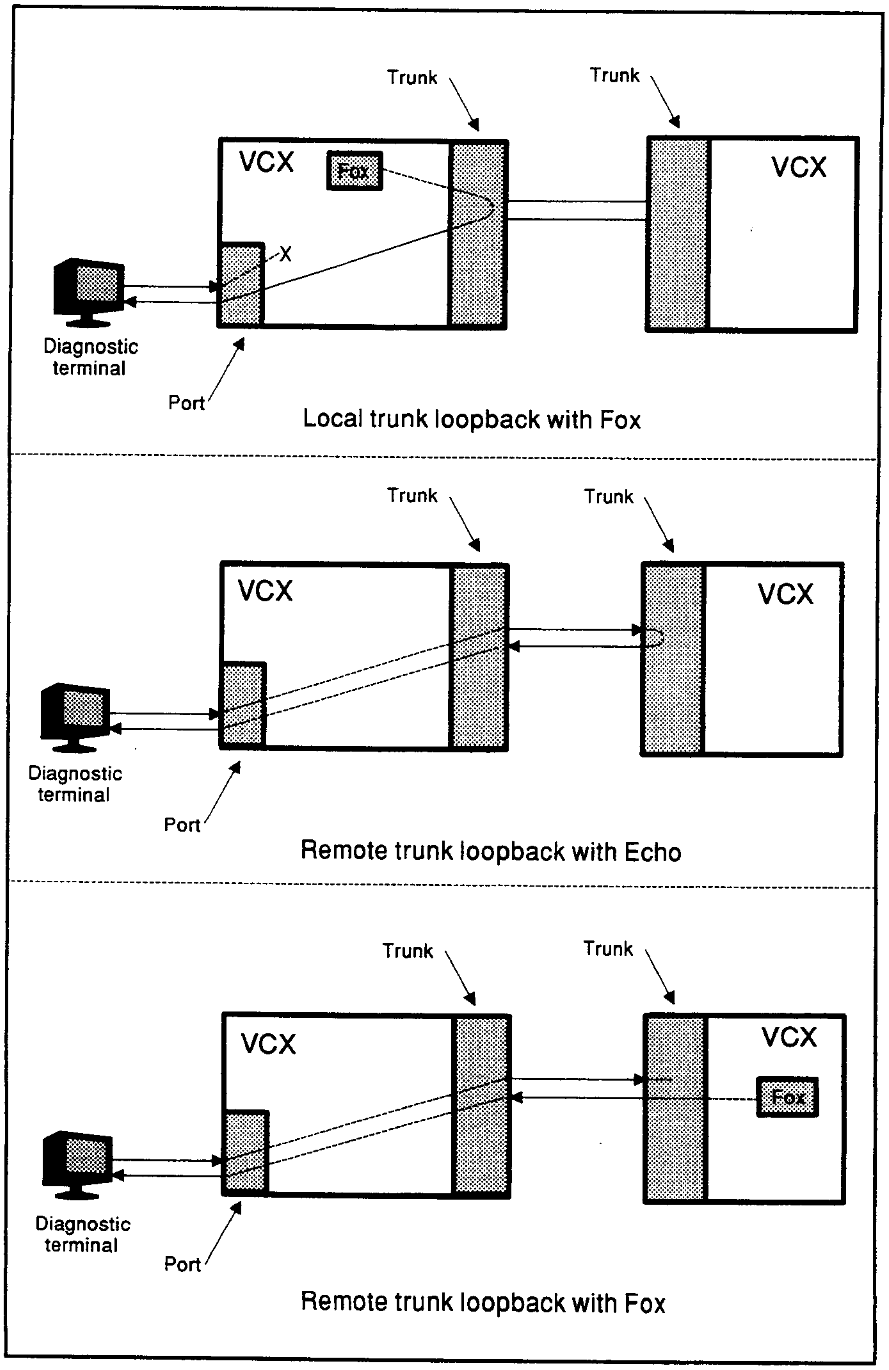


Figure 5-66. Additional line configurations



5-67. Additional line configurations

Forward Service

The Forward Service allows connection requests for one destination to be routed to a different destination. Connection forwarding is particularly useful if your network has two compatible computers, and one is down. Users requesting the off-line computer can be routed to an alternate functioning unit.

To invoke the Forward Service enter:

Connect to: forward <CR>

The Forward Service displays the Forward Service Menu, shown in figure 5-68.

```
***** Forward Service *****

1. Exit
2. Display forwarded connections
3. Forward connection
4. Remove connection forwarding

Enter selection:
```

Figure 5-68. Forward service main menu

1. Exit

Type *1 <CR>* to exit the Forward Service and return to the connect prompt.

2. Display Forwarded Connections

Type *2 <CR>* for a display of currently forwarded connections, similar to the example illustrated in figure 5-69.

```
Name          Pathname


vax1          node1.node2.othervax1
vax2          node1.node1.othervax2
vax3          node1.node2.othervax3
```

Figure 5-69. Current forwarded connections

3. Forward Connection

Type *3 <CR>* to enter a forwarding name or pathname. For example, to forward *vax* connection attempts through remote node *node1* to *node 2* and *other vax*, enter:

Forward to: Node1.node2.otherwise <CR>

(As shown in figure 5-70.)

```
***** Forward Service *****

1. Exit
2. Display forwarded connections
3. Forward connection
4. Remove connection forwarding

Enter selection: 3 <CR>

Forward from: vax <CR>
Forward to: node1.node2.othervax <CR>
```

Figure 5-70. Forwarding service, 3 selected

4. Remove Connection Forwarding

Type *4 <CR>* to delete a forwarding pathname. For example, having forwarded connection attempts to *vax* to a remote port, you restore *vax* to its normal routing as shown in figure 5-71.

The Forward Service menu is then redisplayed.

```
***** Connection Forwarding *****

1. Exit
2. Display existing forwarded connections
3. Forward connection
4. Delete forwarded connection

Enter selection:4<CR>


Enter name forwarded from: vax<CR>
Forward removed from "vax"
```

Figure 5-71. Forwarding service, 4 selected

Greeting Service

The Greeting Service allows you to enter one or two strings to be displayed as part of the node logon banner. The logon banner consists of the date and time (entered via the Settime Service), the installation name and connect prompt (entered via the Global Parameters Form in the Configuration Service), and any greeting lines to be displayed. Greeting lines are not retained if the node is powered down or reset.

To invoke the Greeting Service, enter:

Connect to: greeting: <CR>

The Greeting Service displays the menu shown in figure 5-72.

```
**** Set Greeting ****

Current greeting:

Welcome! Acme Ballon Co.


Greeting OK (y/n)?
```

Figure 5-72. Greeting service main menu

If the current greeting is satisfactory, enter *y <CR>* to exit the Greeting Service and return to the connect prompt. To change or add a greeting message, enter *n <CR>* Your message can consist of one or two lines with up to sixty characters each. Any printable character can be included in the greeting, and upper and lower-case are retained as entered. For example, suppose you wish to inform users of CPU downtime with the messages: *VAX going down for maintenance 11:00 PM* and *VAX back up 7:00 AM tomorrow*. You enter:

Greeting OK (y/n)? n <CR>
Enter new greeting line 1:
VAX going down for maintenance 11:00 PM <CR>

Enter new greeting line2:
VAX back up 7:00 AM tomorrow

The Greeting Service then displays the greeting message illustrated in figure 5-73.

```
Current greeting:

VAX going down for maintenance 11:00 PM
VAX back up 7:00 AM tomorrow

Greeting OK (y/n)?
```

Figure 5-73. Greeting menu for proofing greeting

Enter *y* <*CR*> to accept the new greeting. The Greeting Service displays:

Greeting Service complete

and returns you to the connect prompt.

Load/Dump Service

This utility allows the user to either Load or Dump the contents (memory) of a configuration module. A Dump occurs when the contents of a configuration module are transferred to a mini-computer, a configuration module located in another node, or some other third party media for storage. A Load occurs when a configuration is transferred to the configuration module. The module contents can be transferred to or from any asynchronous answer port or transmitted to your originating port (where the load/dump service is being run), regardless whether it is local or remote. An additional feature allows verification of a dumped configuration to guarantee error free transfers.

Note: If a VCX-150 is the source of a configuration dump or the destination of a configuration load, the load/dump service does not prompt for the storage module location since there is only one.

To allow for ASCII transmission through async ports, the binary formatted data within the configuration module is translated into an S-record (S1) format.

Load/dump can be requested to occur at the user's VCX port or at any other VCX async answer port. However, the load/dump service must be initiated on the node which contains the configuration module. Examples follow to illustrate usage of the Load/Dump facility.

Example: Dump to a Sun Minicomputer and Verify

To initiate the load/dump utility, just enter *ld* after the system prompt.

connect to: ld <CR>

The load/dump utility first checks to see if any configuration modules exist in the VCX's PM bays. If no modules exist, the message *NO CONFIGURATION STORAGE MODULE* appears on the user's screen and the service exits. However, if one or more configuration modules do exist, the following menu is displayed:

****** LOADDUMP ******

1. Exit
2. Load configuration
3. Dump configuration
4. Verify dumped configuration

In our example, we are assuming that the configuration is to be *dumped* from a VCX node to a remote Sun System, so option 3 would be selected:

Enter selection: 3 <CR>

If, after selecting load or dump, the utility discovers more than one configuration module, a prompt will appear asking the user which config module to use:

Which configuration store module is source: 1 4 6 ?

Enter selection: 1

In our example, three configuration modules exist; located in PM slots 1, 4, and 6. The config module in PM slot 1 is selected.

After a configuration module is selected, the next prompt displayed, asks whether a port other than the user's port is the Destination of the Configuration. Our example involves a Dump to a remote Sun System, so we would answer *yes*, (it is a port other than the user's port).

Is the destination of configuration other than your port? y<CR>

Answering Yes will generate a prompt asking the path to the Destination. Often a name of a port is all that is necessary. However, if the port can only be reached over trunk lines, then the trunk names would also have to included in the path, i.e., t1. t2. SUN

Enter path: t1. t2. SUN <CR>

A connection to the path name is now attempted. If the connection is not successful, the user is told of the failure and prompted again for a path name. If the user hits return in response to this prompt, the previous menu is redisplayed.

However, if the connection to the path name is successful, the following prompts appear:

Enter commands to prime receiving device
Enter "~~~" to end pass through mode

The passthrough mode is now in effect. This mode allows the user to carry on a dialogue and give instructions to the receiving device in order to prepare it to receive the configuration file. Once the preparation is complete, the user need only type "~~~" to exit the passthrough mode.

Let's assume for our example that we are in the passthrough mode and are now communicating with the SUN System where we plan to dump the config file. The SUN System will ask for user name and a password, which of course need to be correctly answered.

Login: user name<CR>

Password: strange name<CR>

After the SUN System accepts the entries, a SUN prompt will appear (/u/user name in our example). Unique to the UNIX language on the SUN System, you would enter the following after the prompt: ***cat> filename***. The *cat* command is an abbreviation for *catalog*, a function similar to TYPE in MS DOS. In short, the catalog function accepts data from a *standard input device* (in this case, the port communicating with the VCX) and inputs it to a file. The ">" in the command string is equivalent to *into*, the *filename* you want the config data stored in.

/u/user name: cat > filename<CR>

After entering the command string and hitting <CR>, you exit the passthrough mode by inputting "~~~".

A prompt now appears:

Hit return to begin download . . .

After hitting <CR> and beginning the download, a counter will appear just below the prompt. The numbers that flash on the counter indicate the current HEX memory address offset into the config module.

At some point during the download, the following message will appear:

Almost Finished

You should not hit any keys at this point, just let the download continue. Eventually, the following prompts will be displayed:

DOWNLOAD IS NOW COMPLETE

Enter commands to terminate listening mode of receiving device and to initiate transmitting downloaded file for verification.

After the down load is complete, the passthrough mode is once again entered so that the user can communicate with the receiving device. The user at this point should enter commands that will stop the receiving device from receiving data and inputting it to a file. In our example, the UNIX commands you would use to close a SUN System file would be: CTRL D (a Control D). Note, that although you have closed the file, you have not exited the SUN System.

<CTRL>D

If you want to exit the receiving device (the Sun System in our example), hit the "~~~". The VCX will disconnect from the receiving device, and the main load/dump menu will be displayed.

However, if you want to verify your data, you need to *tell* the receiving device to send the data file back to the port which is linked with the VCX. In this manner the VCX can compare the data file's S-record checksums. To accomplish this on the UNIX based Sun System, you would use the command: cat filename, where *cat* as described earlier means catalog and filename is the name of the file to be transferred.

/u/username: cat filename <CR>

After hitting <CR>, the file is uploaded to the VCX and verification begins. During this process, a counter appears just below the prompt which indicates the current HEX memory address offset being sent to the VCX.

When the verification is successful, you will get a message to that effect:

VERIFICATION IS NOW COMPLETE

Enter commands to end session with the external device.
Enter "~~~" to end pass through mode.

If there has been a verification error, a prompt will appear informing you of the error:

ERROR ENCOUNTERED DURING VERIFICATION

Enter commands to end session with external device.
Enter "~~~" to end pass through mode.

In all likelihood you will want to repeat the load/dump by logging off the CPU , entering "~~~" and returning to the Load/Dump main menu.

Example: Load A Configuration From A Sun Minicomputer

Initiate the load/dump facility by entering *ld* after the system prompt.

connect to: ld <CR>

If one or more configuration store modules exists in node, the main menu is displayed:

****** LOADDUMP ******

1. Exit
2. Load configuration
3. Dump configuration
4. Verify dumped configuration

Enter selection: 2 <CR>

In this example a configuration will be loaded from the Sun to a Configuration Store Module, therefore we need to enter 2, load configuration.

If after selecting a load the utility discovers more than one configuration store module a prompt will appear to which we respond with a 1.

Which configuration store module is destination: 1 4 6?

Enter selection: 1 <CR>

The service will then ask for the configuration source to which we respond yes and then enter a path:

Is the source of your configuration other than your port? y

Enter path: t1.t2.SUN <CR>

The SUN responds with a prompt for login and password.

Login: username<CR>

Password: strange name <CR>

After a system prompt from the SUN the file to be dumped is designated.

/u/username cat> filename <CR>

After hitting the <CR> and beginning a load, a counter will appear just below the command line. When the load is complete a message appears:

LOAD IS NOW COMPLETE

Enter commands to end the session with the external device
Enter "~~~" to end pass through mode

It is not necessary to verify a load since the load task running in the target node checks each S-record, and if a checksum fails, the service will terminate the load and output a message indicating a load failure.

Example: Load And Dump Between Configuration Store Modules In Two Nodes

To obtain a copy of a Configuration Store Module on a remote Configuration Store Module can be easily accomplished using the load/dump service.

Run the load/dump utility by entering *ld* to a system prompt on the local node to obtain the Main menu and select 2 to load.

****** LOADDUMP ******

1. Exit
2. Load configuration
3. Dump configuration
4. Verify dumped configuration

Enter selection: 2<CR>

The service responds with

Which configuration store module is destination: 1 4 6?

After entering the module you are asked:

Is the source of your configuration other than your port? y <CR>

A response of *y* for yes gets the prompt:

Enter path: t1.t3.ld <CR>

The above is the path to the remote node which is the source of the configuration and we want to run load/dump in that node.

The first part of the prompt is from the first node and the main menu from the remote node. We respond with a 3 since it is desired to dump the remote configuration to the local node.

Enter commands to prime transmitting device

**** LOADDUMP ****

1. Exit
2. Load configuration
3. Dump configuration
4. Verify dumped configuration
Enter selection: 3 <CR>

The remote node may prompt with a target configuration module if it is a VCX-1000. If the remote node is a VCX-100, VCX-150 orVCX -250, this prompt does not occur.

Which configuration store module is source: 2 5 7?

After entering the number for the storage module to be dumped we are prompted for the destination to which we answer *n* for no:

Is the destination of your configuration other than your port? n <CR>

The service asks for a start

Hit return to begin download.....

After entering <CR> a counter will appear below the last command line. When the dump is complete, the service responds with:

LOAD IS NOW COMPLETE

Enter commands to end session with external device.
Enter "~~~" to end pass through mode.

It is not necessary to verify in this case since the act of loading continuously checks the S-records for correct receipt and will terminate the load/dump if a record is received in error. Action is completed by entering "~~~" and then exiting the load/dump on the local node.

To dump from the local node and load into the remote node, reverse the process.

Example: Dump a Configuration To a PC and Verify

A typical use for the load/dump service will be to store configurations on a PC diskette. Vterm is a software package offered by Coefficient Systems Corporation that can be used, but there are many others. For purposes of discussion Vterm has been chosen.

The first step is to run the application and set up the parameters so that they match the modem you may be accessing the VCX through or match the VCX async port parameters the PC may be attached to. Next setup 2 of Vterm is optioned as follows:

file name:	**conf.vcx**
direction:	**receive**
protocol:	**ASCII text**
remove escape sequence:	**no**
stop upon receiving:	
remove characters:	

The important entries are to make sure that ASCII text is selected and that the PC will receive since we desire to dump the configuration from the storage module to the PC.

An <ESC> is now entered to place the PC in the terminal mode. The load/dump service is initiated by entering *ld* to a VCX system prompt and the main menu appears. A *3* is selected since it is desired to dump the configuration store to the PC.

****** LOADDUMP ******

1. Exit
2. Load configuration
3. Dump configuration
4. Verify dumped configuration
Enter selection: 3<CR>

The service prompts with:

Which configuration store module is source: 1 4 6?

Enter selection: 4 <CR>

After selecting the storage module, VCX prompts for the destination. Respond with an *n* for no since the destination is in the PC.

Is the destination of the configuration other than your port? n <CR>

Hit return to begin download....

An <ALT>T is now entered to set Vterm in the PC to read to disk followed by a <CR> to begin the download. While the download is occurring the PC monitor will display the S-records. When the S-9 record is received, the dump is complete. For Vterm an <ALT>K is now used to close the file.

To verify, escape to the Vterm setup 2 screen and change the direction to *send*. A <ALT>T begins the dump to the configuration storage module for verification. When done the load/dump service responds with:

VERIFICATION IS NOW COMPLETE

Example: Load A Configuration From A PC

Setup Vterm to send and <ESC> to the terminal mode. Initiate the load/dump service by responding to a VCX system prompt with a *ld*. The main menu will appear and load will be selected.

****** LOADDUMP ******

1. Exit
2. Load configuration
3. Dump configuration
4. Verify dumped configuration

Enter selection: 3 <CR>

The service will ask for the destination and source. Answer *n* for no source since it is, in fact, the PC.

Which configuration store module is destination?

Is the source of your configuration other than your port? n <CR>

<ALT T> is now entered to start Vterm sending the configuration to the target Configuration Storage Module. When the transfer is complete, the service responds with:

LOAD IS NOW COMPLETE

The main menu is then displayed to allow exit from the service.

Logging Service

Logging Overview

The logging function collects significant events in 7 class codes from the node and reports these events to a designated asynchronous port or to other system software for processing. The log format is in readable ASCII.

Logging Port

The system administrator can create a logging port (system logger) by entering a port name as the logging port on the Global Parameters Form of the Configuration Service or by creating an autoconnect to the log service. In the former case the designated port must be a single answer port with no attach or detach strings and have no access by users nor a password override capability. The system logger is filtered as specified by the log service.

The autoconnect to the log service must be an originate port autoconnected to log(sp)argument, where the argument designates the classes to be logged (see the last section Log Monitor: Quick Logging Method). Any number of loggers can be set up using autoconnects to capture different event classes. It can be useful to separate X.25 connection activity from normal connection activity and from alarm activity.

Do not name the logging port *log*. This creates confusion when using the Log service available to monitor, make entries, and filter event classes.

Remote Logging Merging

Logging from remote nodes can be merged into a single logging stream and output to a terminal/printer device. Remote logging to be merged to a central node is accomplished by entering the trunkname to be taken toward the central node as the logging port name in the Global Configuration Form. For example, node A has a logging port and is connected in a string to remote node B and then to remote node C. The trunk between A and B is Tab and the trunk between B and C is Tbc. Enter Tab in the Global Configuration for B in the *logging port* field and enter Tbc in the Global Configuration for C.

Earlier versions of the VCX-250 software required both the system logger and the log service port to have each node, in a multi-node network set to filter event classes, when central logging was used. The present software continues with the system logger operating as before, but the log service port class filtering effect is global, rather than local. For example, a single point of class filtering affects all remote nodes as well as the central node. These filtering choices allow flexible network logging suitable for a variety of applications.

Logging Service

The Logging Service allows the system administrator to direct logging output to the local port as well as to the system logger. The Logging Service also allows the system administrator to enable and disable logging by classes of loggable events. The term *system log* refers to the stream of information directed to the logging port. The term *log* refers to a stream of logging information directed to a port running the logging service.

Loggable Event Classes

The logging software assigns all loggable events to one of seven classes: (E) Exception, (N) Normal, (M) Mandatory, (X) X.25, (A) Major Alarms, (I) Minor Alarms and (P) Performance. Explanations of the logging event classes follow.

- **Exception**. Events in this class are unusual but do not affect the reliability of the node. Exceptions request attention, while Major alarms demand attention.

  IPC Inconsistent port configuration
  TON Diagnostic test ON
  TOF Diagnostic test OFF

- **Normal**. Events in this class are generated by normal use.

  DSC Disconnection of originating port
  ON Connection of originating port
  ENQ User placed in queue
  DEQ User escapes from queue
  DET Port detached
  ATT Port attached
  TGL Connect hold
  SST Sync session start
  SEN Sync session end

- **Mandatory**. Logging software always reports events in this class. The system administrator cannot disable the reporting of mandatory events.

  CUP Card up
  LOS Lost messages
  REM User log entry
  SYS System error logged
  CRS Card reset
  TUP Trunk up
  IOK Configuration running

- **X.25**. Call request and call clear packets with network addresses, connect time, and packets transferred for billing.

  CRQ Call request
  CLR Call clear
  TCC Telnet mnemonics (client connection)
  TCD Telnet mnemonics (client disconnection)
  TSC Telnet mnemonics (server connection)
  TSD Telnet mnemonics (server disconnection)

- **Major alarms**. Events that must be investigated.

  CCR Card crash
  TDN Trunk down

- **Minor alarms**. Events that require attention.

  TUX Trunk utilization threshold exceeded
  TRX Trunk retransmission rate threshold exceeded
  QLX Queue length threshold exceeded
  DLS Data lost
  VIO Security violation

- **Performance**. Planning data for internodal trunks.

  MGT Raw data for management center
  UTL Peak/average trunk utilization, line quality

General Logging Message Format

Whenever a loggable event happens, the logging software can write an entry to the system log and to each additional log started by the Logging Service. If an event belongs to a class for which logging is disabled, that event is not logged. Since the Logging Service allows the system administrator to enable and disable event classes on a per-log basis, events can be reported in one log but not another. For example, the system administrator could enable and then disable the logging of security events at his terminal without disturbing the system log.

The general logging message format is:

#<class ><time><node name><event mem><Slot\port><other data>

To simplify computer analysis, a pound sign (#) prefixes each entry. In addition, logged alarms have increased visibility. Major and minor alarms are highlighted by the addition of three asterisk on a line before the alarm data and three asterisk on the next line below the report. Note that the 5 space area for the slot\port, is dedicated space. That is, the space remains in the log even if a slot\port is not given or is not applicable. A log example is illustrated in the following pages.

***

#A 03:31:00<node name>CLR 04\01 ilcon 28 21125497

***

The class code specifies the event class. This is illustrated in table 5-5.

Table 5-5. General Logging Message Format Event Classes

Class code	Description
E	Exception
N	Normal
M	Mandatory
X	X.25/LAN
A	Major alarms
I	Minor alarms
P	Performance

A space delimits each field following the class code.

If system time is set via the Settime Service, the entry contains the time the event occurred. Otherwise, the time is reported as "00:00:00". In a multi- mode environment, all events are recorded using the logging port's time.

The node name display is useful when a single logging port is configured to allow events from all nodes to be output at a single port. An event can then be attributed to the proper node.

The event mnemonic indicates the type of entry. For example, the mnemonic *CON* indicates a connection attempt. For details on the types of entries and event mnemonics, refer to the *Logging Messages Summary* below. Supplemental information follows the event mnemonic. For example, supplemental information for a *CON* event indicates the originating port, the requested destination, and whether the attempt succeeded or failed. Note that supplemental information can continue to the next line. If an entry is split into two or more lines, the continuation is indented to align with the event mnemonic.

Logging Messages Summary

This section describes messages for each loggable event in alphabetical order by mnemonic.

Event: **Port Attached**
Mnemonic: **ATT** Class: Normal (N)
Description: A session is started when an originating port successfully attaches. The log entry specifies the port at which the session was started. In this example, a session was started on card 1 port 1 by 'fred' whose account id is 81326.

Event: **Card Crash**
Mnemonic: **CCR** Class: Major Alarm (A)
Description: Indicates a card has crashed. Event: **Call Clear**

Mnemonic: **CLR** Class: X.25 (X)
Description: Both incoming and outgoing calls that have been cleared are recorded on the logger. The first example is of a cleared incoming call on LCN 1 of trunk 2 on card 2 named PAD. 14 packets were transmitted during the session and 179 characters were transferred. The second example is of a cleared outgoing call on LCN 1 of trunk 2 on card 2 named PAD. The originating port was named FRED, port 1 of card 1 on the WASH node. Packet and character counts are given.

Event: **Connection**
Mnemonic: **CON** Class: Normal (N)
Description: This message logs a connection. In the example above, port one on card one successfully connected to *vaxport* at port six on card one. Note: Protection violations are not treated as connection failures but are logged separately as a Minor Alarm. Possible keywords for a CON event are:
FAILURE. The connection attempt was unsuccessful.
SUCCESS. The connection attempt was successful.
INVALID. The connection attempt used an invalid syntax.

Event: **Call Request**
Mnemonic: **CRQ** Class: X.25 (X)
Description: Either an outgoing or an incoming call request packet is logged. In the first example, a call request packet was sent on LCN 1 of trunk 2 of card 2, named PAD, to the address 7654321. The originating port was named FRED and was port 1 of card 1 in the WASH node. In the second example, an incoming call request on the PAD trunk, port 2 of card 5 has been assigned to LCN 1.

— —

Event: **Card Reset**
Mnemonic: **CRS** Class: Mandatory (M)
Description: This message logs a card reset. The possible keywords for a CRS event are:
FAILED. The reset occurred because the card failed to respond to polling.
RESET. The system administrator reset the card via the Reset Service.

— —

Event: **Card Up**
Mnemonic: **CUP** Class: Mandatory (M)
Description: This message logs card initialization. If a card re-initializes after crashing, the message contains several lines of internal status information. This information includes the crash code, register values, and the identity of the crashed routine. The example above indicates that card 3 came up at 3:30 PM.

— —

Event: **Dequeued**
Mnemonic: **DEQ** Class: Normal (N)
Descriptions: This message logs a queue exit (the user enters <ESC> while queued). The message shows the originating port, the pathname to which the user is attempting to connect, and the initial queue position (not the actual position).

— —

Event: **Port Detached**
Mnemonic: **DET** Class: Normal (N)
Description: This message indicates that an asynchronous port detached. The two numbers are the counts of characters received and transmitted by the port since it was last attached.

— —

Event: **Data Lost Message**
Mnemonic: **DLS** Class: Minor Alarms (I)
Description: A buffer overflow occurred at the receiving end of either an answer port or an originate port. The message *Data Loss* will also appear on the user's terminal when this error occurs. In the above example, the indicated port 13 of card 1 is the port, originate or answer, that incurred the lost data.

— —

Event: **Disconnection**
Mnemonic: **DSC** Class: Normal (N)
Description: This message logs a disconnection. If a NORMAL disconnect occurs then the total session connect time is displayed (hours:minutes:seconds). In the example above, the user at port one of card 1 typed *quit* to disconnect. The possible keywords for a DSC event are:
NORMAL. The user entered *quit* to disconnect.
RESET. A port reset forced the disconnection.
TIMED OUT. The inactivity timer expired.
OUT OF SERVICE. An unexpected detachment broke the connection.

Event: **Enqueued**
Mnemonic: **ENQ** Class: Normal (N)
Description: This message logs a queued connection attempt. The message shows the originating port, the pathname to which the user is attempting to connect, and the queue position.

Event: **Notice to Management Center that Node is Alive**
Mnemonic: **IOK** Class:Mandatory(M)
Description: This message is output at a programmable frequency to indicate to the management center that the node is alive. Information contained in the supplementary data is the configuration running, the time and the date.

Event: **Inconsistent Port Configuration**
Mnemonic: **IPC** Class: Exception (E)
Description: This message occurs when a port fails to boot because its configuration is inconsistent. The example above shows that port 13 of card 1 has a problem. Note that resetting an inconsistently configured port does not log an IPC message, but that resetting a card containing an inconsistently configured port does log an IPC message. Furthermore, overlapping port series are not detectable.

Event: **Lost Messages**
Mnemonic: **LOS** Class: Mandatory (M)
Description: Under conditions of extreme congestion, logging messages can be discarded. If this event occurs, logging software maintains a count of lost messages and reports the count when the situation improves. Lost messages are extremely unusual and suggest that something else may be wrong as well.

Event: **Management**
Mnemonic: **MGT** Class: Performance (P)
Description: This message is output at a programmable rate for each trunk. Information includes card and port number, trunk speed, peak utilization transmitted and received, characters transmitted and received.

Event: **Queue Length Exceeded**
Mnemonic: **QLX** Class: Minor Alarms (I)
Description: The queue length threshold set in the global configuration has been exceeded. In the above example, the queue length threshold was set to 4 and a measured queue length of 5 triggered the alarm.

Event: **User Log Entry**
Mnemonic: **REM** Class: Mandatory (M)
Description: Through the Logging Service system administrators can insert arbitrary text into the system log by generating a remark such as the one above.

Event: **End Session**
Mnemonic: **SEN** Class: Normal (N)
Description: The message logs the end of a synchronous session. A session at the end of a trunk ends when a connection is established or the user quits.

Event: **Start Session**
Mnemonic: **SST** Class: Normal (N)
Description: A session is started when a partial trunk connection (for example, a connection to *boston* rather than *boston.port*) is established. For example, each of several calls on an incoming dial-up line are separate sessions. The log entry specifies the port at which the session was started. Only an incoming session of a trunk is logged. In the above example, a session was started on trunk 1 of card 2.

Event: **System Error Log**
Mnemonic: **SYS** Class: Mandatory (M)
Description: When the software detects an operating problem, information is logged rather than causing a fatal crash.

Event: **Trunk Down**
Mnemonic: **TDN** Class: Major Alarms (A)
Description: This message occurs when a trunk line goes down. In the example above, the trunk at port 1 of card 2 is down.

Event: **Connect Hold**
Mnemonic: **TGL** Class: Normal (N)
Description: This message indicates a user toggled between a primary and a secondary connection on port 1 of card 1.

Event: **Entered Test Mode**
Mnemonic:**TON** Class: Exception (E)
Description: Used for purposes of reporting to a network management system, that **the specified card/port has entered a test mode.**

Event: **Leave Test Mod**e
Mnemonic: **TOF Class: Exception (E)**
Description: Indicates that the specified card/port entered for a test has left the test mode.

Event: **Trunk Retransmission Rate Threshold Exceeded**
Mnemonic: **TRX** Class: Minor Alarms (I)
Description: Whenever the retransmission rate threshold for a trunk is exceeded, an alarm is logged with the trunk identity.

Event: **Trunk Up**
Mnemonic: **TUP** Class: Mandatory
Description: This message occurs when a trunk comes up. In the example above, the trunk at port 1 of card 2 has gone from down to up.

Event: **Trunk Utilization Exceeded**
Mnemonic: **TUX** Class: Minor Alarms (I)
Description: Whenever the trunk utilization threshold is exceeded, an alarm is logged with trunk identity.

Event: **Peak/Average Trunk Utilization, Line Quality**
Mnemonic: **UTL** Class: Performance (P)
Description: When running the performance service, each sampling appears as above. In this example, the trunk utilization on trunk 1 of card 2 has an average Rx utilization of 20% and a peak of 35%; and an average Tx utilization of 0% with a peak of 10%. The quality can be good or bad, but in this case it is good.

Event: **Security Violation**
Mnemonic: **VIO** Class: Minor Alarms (I)
Description: When a user attempts to attach, a user name and password are requested. If a wrong entry is made is made three times in succession then a logging message will be generated, recording a violation at the indicated port.

Complete Log of Events

The following section provides a complete listing of each event of the events log. The correct format is displayed for every case.

```
***

#A 22:14:03  NewYork      TDN 02\02

***

#E 22:14:02 NewYork       TON 01\02

#E 22:14:11 NewYork       TOF 01\02

#E 22:14:38 NewYork       IPC 01\12

***

#I 22:13:58 NewYork       TUX 01\01

***
```

```
***
#I 22:14:02 NewYork      DLS 01\04
***
***
#I 22:14:28 London       TRX 01\01
***
#M 22:14:17 NewYork      TUP 01\02
#N 22:13:33 NewYork      SST 01\01
#N 22:14:11 NewYork      TGL 01\01
#N 22:13:34 NewYork      SEN 01\01
***
#I 22:13:33 LondonVIO 01\10
***
***
#I 22:13:33 LondonVIO 01\10 t1.t3.vax
***
#N 22:13:33 NewYork      ATT 01\16
#N 22:13:33 NewYork      ATT 01\16 FRED 81326
#N 22:13:34 NewYork      DEQ 01\14 POSITION 14 QUEPORT
#N 22:13:34 London       DET 01\10 1000 1000
#N 22:13:33 NewYork      ENQ 01\14 POSITION 14 QUEPORT
#N 22:13:33 London       DSC 01\01 OUT_OF_SERVICE
#N 22:13:33 London       DSC 01\01 TIMED_OUT
#N 22:13:33 London       DSC 01\01 RESET
#N 22:13:33 London       DSC 01\01 NORMAL 00:19:33
#N 22:13:33 NewYork      CON 01\05 01\02 SUCCESS NY1
#N 22:13:33 NewYork      CON 01\05 01\03 INVALID VAX3
```

#N 22:13:33 NewYork	CON 01\05 01\04 FAILURE IBM
#M 22:13:57 London	CUP 01
#M 22:14:18 NewYork	CUP 01 DO: XXXXXXXX D1: YYYYYYYY
#P 22:13:33 NewYork	UTL 01\02 Av/Pk%: Rx 60 85 Tx 59 92 good
#X 22:13:34 NewYork	CLR 01\01 ilcn 28 211 25497
#X 22:14:15 NewYork	CLR 01\01 olcn 31 5000 125009
#X 22:13:57 NewYork	CRQ 01\01 ilcn 29
#X 22:14:0 NewYork	CRQ 01\01 olcn 30 123456789 for 01\01 in NewYork

***

#A 22:13:35 NewYork	CCR 01

***

***

#I 22:14:54 NewYork	QLX 11

***

#M 22:13:34 NewYork	LOS	18 MSGS
#M 22:14:17 NewYork	CRS 02	FAILED
#M 22:14:17 NewYork	CRS 02	RESET
#M 22:13:57 NewYork	REM	(Up to 50 characters)
#M 22:14:15 NewYork	SYS 02	****** XXXX YYYY ******
#P 22:15:33 New York	MGT 05\02	pktx pkrx speed chtx chrx
#M22:17:28 NewYork	IOK	<Config running>on Fri, 04-02-90 - 22:17:28

(This message is output at a programmable rate (set at the Global Configuration menu) to indicate, to the management center, that the node is alive. Information contained in the supplementary data is the configuration running, the time and the date.)

#P 22:15:33 NewYork MGT 01\02 pktx pkrx speed chtx chrx

(This message is output at a programmable rate, set at the Trunk configuration menu, to present raw data to the management center for report generation. Supplementary Data is the peak transmit and receive utilization since the last MGT event, speed of the trunk, running transmit and receive character count since last reset.)

Notes

1. The Status Service shows the logging port as connected on the chassis status and port status displays. The port status display shows the logging port connected to a task.

2. Resets performed by the node manager are reported. This information implies the card manager did not respond to an "are you up?" poll from the node manager. The crash code contains specific information regarding card failure. After the logging mechanism initializes, it generates CUP (Card Up) entries with crash codes.

3. If the system fails so that the node manager or logging cannot run, logging is restarted when the system recovers. Logging initializes with all logging event classes enabled. As with any changes made via services other than the Configuration Service, Logging Service changes are lost when the system boots.

4. The maximum number of simultaneous logs (that is, logs generated via Logging Service invocations) is five.

Logging Service Description

To invoke the Logging Service from any port other than the logging port enter:

Connect to: log<CR>

The Logging Service then displays the Logging Service Main Menu illustrated in figure 5-74.

Selection 1: Exit

Enter *1<CR>* to exit the Logging Service and return to the connect prompt.

Selection 2: Manipulate System Log

Enter *2<CR>* to display which messages are reported to the system logging port and to enable or disable the logging of event classes. The Logging Service displays the submenu shown in figure 5-75.

Enter 1<CR> to exit this submenu and return to the Logging Service Main Menu.

```
***** Logging Service *****

1. Exit.
2. Manipulate System Log.
3. Monitor Log.
4. Add User Entry to System Log.

Enter selection:
```

Figure 5-74. Logging service main menu

```
***** Manipulate System Log *****


E. Exception       (enabled)
N. Normal          (enabled)
A. Major           (enabled)
I. Minor           (enabled)
X. X25/LAN         (enabled)
P. Performance     (enabled)

(Mandatory class permanently enabled in System Log)

1. Exit.
2. Enable Logging by Class.
3. Disable Logging by Class.
4. Apply Changes.

Enter selection:
```

Figure 5-75. System log submenu

Enter *2<CR>* at the Manipulate System Log Submenu to request system logging of an event class. The Logging Service prompts:

Enter Class to Enable:

Enter the letter of the event class you wish to enable, followed by <CR>. If you want to enter all the classes, enter 'T'. For example, to request system logging of Major events, enter m<CR>.

Enter *3<CR>* at the Manipulate System Log Submenu to request that system logging of an event class be disabled. The Logging Service prompts:

Enter Class to Disable:

Enter the letter of the event class you wish to disable, followed by <CR>. For example, to request that system logging of Normal events be disabled, enter *n<CR>*. If you wish to disable all the classes, enter *T*. Note that you cannot disable the logging of Mandatory events.

Enter *4<CR>* at the Manipulate System Log Submenu to apply the changes you have requested. For example, if you request that logging messages of the Normal class be disabled, then apply this change, the system log status shows that no events of the Normal class are reported to the system logging port.

Selection 3: Monitor Log

Enter 3<CR> from the Logging Service Main Menu to display logging information at the local port. This selection also allows you to select which event classes you wish to monitor. Note that disabling logging of certain events at the local port does not affect the system log. The Logging Service displays the submenu shown in figure 5-76.

```
****** Monitor Log *******

E. Exception        (disabled)
N. Normal           (disabled)
M. Mandatory        (disabled)
A. Major            (disabled)
I. Minor            (disabled)
X. X25calls         (disabled)
P. Performance      (disabled)


1. Exit.
2. Enable Logging by Class.
3. Disable Logging by Class.
4. Start Log Monitor.

Enter selection:
```

Figure 5-76. Logging service monitor submenu

Enter *1<CR>* to return to the Logging Service Main Menu.

Enter *2<CR>* to enable logging of an event class. The Logging Service prompts:

Enter Class to Enable:

Enter the letter of the event class you wish to enable, followed by <CR>. For example, to enable the logging of X.25 calls, enter *x<CR>*. If you want to enable the logging of all events, enter a *T*.

Enter *3<CR>* to disable logging of an event class. The Logging Service prompts:

Enter Class to Disable:

Enter the letter of the event class you wish to disable, followed by <CR>. For example, to disable the logging of Normal events, enter *n<CR>*. If you want to disable all events enter a *T*. Note that log monitoring does permit disabling of the Mandatory class.

Enter *"4<CR>"* to monitor logging messages. The Logging Service displays:

Starting Log Monitor.

Enter ESC to exit.

then directs logging information to your port until you enter <ESC>. The Logging Service then redisplays the Main Menu.

Selection 4: Add User Log Entry

Enter *4<CR>* from the Logging Service Main Menu to log a REMark. The Logging Service prompts:

Enter text of entry:

Type the REMark. REMarks are limited to 60 characters in length. You can use to edit the REMark. Entering *<CR>* terminates text entry and returns you to the Logging Service Main Menu.

Note: The Logging Service replaces pound signs (#) in REMarks with spaces.

Log Monitor: Quick Logging Method

A quick method of logging one or more classes of events can be used, where the logged events are displayed on a monitor. After you have become acquainted with the letter codes that denote each of the event categories (i.e., the letter X for X.25 calls or the letter *N* for Normal events), type the word *log*, leave a space and then type the letter code of the event category (or the multiple categories) you are interested in seeing. For example:

Log (space) X (space) N

The Log Service will then prompt you:

Starting Log Monitor

Enter ESC to exit.

In the above example all X.25 calls or Normal events will be displayed on the monitor. Enter <ESC> to escape from this quick logging method.

Mode Service

Mode service provides a quick method for the System Administrator to get three items of current data on the active configuration of a node. Included is: the name of the node; name of the active configuration; and PM slot location of the node where applicable.

One monitor screen is provided by the Mode service, as illustrated in figure 5-77.

```
You are currently in node           : newyork

The running configuration is called : simple

Which can be located in PM slot     : 1
```

Figure 5-77. Mode service display

The Mode service is activated by typing ***Mode***. Note that the information will appear on the monitor screen at the position of the cursor.

Performance Service (with XNET)

Configuring the Data Port

The Performance Service allows the System Administrator to analyze the utilization and quality of any or all of the trunks in a network. The results can be output to the system logger or any other port running the log service. The usual choice is a port designated to receive performance events only so as not to imbed such data among the many other events occurring on the system logger. A convenient means of achieving this is to configure an originate port that autoconnects to log p. This autoconnects the device attached to the originate port (usually a printer) to the log service and captures all **p** class events (p stands for performance).

The System Administrator can specify the start and stop times along with the sampling interval, 1-99 minutes. Once enabled the service is automatic and outputs a line of data per trunk which summarizes the average and peak utilization in both the transmit and receive directions along with a line quality indicator of good or bad. The distinction between good and bad is a 1 in 10,000 bit error rate detection threshold.

The service allows multiple trunks to be quickly configured with the same performance measurement criteria.

Using the Performance Service

To enter the Performance Service, type *perform* after the prompt.

Connect: perform<CR>

The following menu shown in figure 5-78 will then be displayed.

To exit, enter a <CR>, otherwise specify at this point, the card and port number you want analyzed for performance. After entering this information, the form shown in figure 5-79 is displayed, which is used to select start and stop times, sampling interval and enable the selections.

```
Connect to: perform

******   Performance Service    ******
Enter trunk card number: 2
Enter port number      : 1
```

Figure 5-78. Performance service main menu

```
                    ******   Performance Service    ******

Node: nexus          Card: 2        Port: 1       Port name: t1

Option                Current Values                    Requested Values

1. Exit
2. Start time             None                              None
3. End time               None                              None
4. Sampling               None                              None
5. Enable
6. Disable
7. Select trunk

Enter option:
```

Figure 5-79. Performance service data menu

Exit, option 1, will return you to the previous menu. Options 2 and 3 define the start and stop times; and option 4, sampling, allows you to select the sampling interval (1-99 mins). If these parameters have not been defined previously, the current and requested values will be listed as *None* (as shown in the above screen). Once you have chosen the performance parameters in options 2, 3, and 4, you can enable your selection with option 5. Option 7 allows you to assign the same parameters to multiple ports. And option 6, disable, allows you to *turn off* the parameter settings made earlier for a particular card/port. Let's review the options in the menu, beginning with option 2. If option 2 is selected, the prompt *Start date and time* will appear, as shown in figure 5-80.

Enter the start date in the format of *month day year* and the start time in terms of *hours minutes* where the hours are expressed in 24 hour military time. Note that you should enter spaces as delimiters between the date and time values. After you have entered those values, i.e., 11 14 1989 and 09 50, they will appear in the *Requested Values* column of the screen.

Selecting option 3, End time, will generate a prompt that is similar to the start time prompt:

End date and time
Enter date (MM DD YY): 11 14 89
Enter time (HH MM)   : 21 00

Again, once you have entered the end date and time values, they will appear in the *Requested Values* column.

```
                 ******  Performance Service  ******

Node: nexus        Card: 2      Port: 1      Port name: t1

Option             Current Values                Requested Values

1. Exit
2. Start time          None                          None
3. End time            None                          None
4. Sampling            None                          None
5. Enable
6. Disable
7. Select trunk

Enter option: 2


Start date and time
Enter date (MM DD YY)  : 11 14 89
Enter time (HH MM)     : 09 50
```

Figure 5-80. Performance service service submenu

When option 4 is selected, the *Sampling interval* prompt illustrated in figure 5-81 is displayed.

```
                 ******  Performance Service  ******

Node: nexus        Card: 2      Port: 1      Port name: t1

Option             Current Values          Requested Values

1. Exit
2. Start time          None           Tue, 11/14/89 - 09:50:00 EST
3. End time            None           Tue, 11/14/89 - 21:00:00 EST
4. Sampling            None                  None
5. Enable
6. Disable
7. Select trunk

Enter option: 4

Sampling interval (1-99 minutes): 5
```

Figure 5-81. Performance service sampling interval

```
                    ******  Performance Service  ******

Node: nexus           Card: 2       Port: 1       Port name: t1


Option                Current Values              Requested Values

1. Exit
2. Start time            None             Tue, 11/14/89 - 09:50:00 EST
3. End time              None             Tue, 11/14/89 - 21:00:00 EST
4. Sampling              None             5  min
5. Enable
6. Disable
7. Select trunk

Enter option: 5
```

Figure 5-82. Performance service - sampling

Here you can choose the sampling interval to be from 1 up to 99 minutes in length. Once you have selected the time interval, it will appear in the *Requested Values* column as shown in the display of figure 5-82.

Option 5, Enable, will activate the requested values copying them to the current values as shown on the next screen. Many times when using other VCX Administrator facilities it is desirable to determine whether the Performance Service was enabled at setup. A quick method of verification is to observe if the requested and current values are identical. (See figure 5-83.)

```
                    ******  Performance Service  ******

Node: nexus         Card: 2       Port: 1       Port name: t1

Option                Current Values              Requested Values

1. Exit
2. Start time    Tue, 11/14/89 - 09:50:00 EST  Tue, 11/14/89 - 09:50:00 EST
3. End time      Tue, 11/14/89 - 21:00:00 EST  Tue, 11/14/89 - 21:00:00 EST
4. Sampling      5  min                        5  min
5. Enable
6. Disable
7. Select trunk

Enter option:
```

Figure 5-83. Performance service - Enabled selected

```
                  ******   Performance Service   ******

Node: nexus       Card: 2      Port: 1      Port name: t1

Option             Current Values              Requested Values

1. Exit
2. Start time          None            Tue, 11/14/89 - 09:58:00 EST
3. End time            None            Tue, 11/14/89 - 21:00:00 EST
4. Sampling            None            5  min
5. Enable
6. Disable
7. Select trunk

Enter option: 7

Enter trunk card number: 2
Enter port number      : 2
```

Figure 5-84. Performance service - option "7"

Option 7 is used when you take existing *Requested Values* and apply it to a different card/port. Selecting option 7 generates two prompts, asking for the new card/port that you want to configure (figure 5-84).

In our example, the new port to be configured is port 2 on card 2. Once the card/port data has been entered, the screen will show that the new *Requested Values* are the same as the previous port's *Requested Values*, illustrated in figure 5-85.

```
                  ******   Performance Service   ******

Node:             Card: 2      Port: 2      Port name: t1

Option            Current Values              Requested Values

1. Exit
2. Start time          None              Tues. 11/14/91 - 09:58:00 EST
3. End time            None              Tues. 11/14/91 - 21:00:00 EST
4. Sampling            None              5  min
5. Enable
6. Disable
7. Select trunk

Enter option:
```

Figure 5-85. Performance service with changes

All that has to be done now is to select 5 to enable the second port's Requested Values. This process can continue to sample as many ports as desired.

Finally, option 6 allows one to disable active values set earlier for a particular card/port.

Log Monitoring

Once enabled, the trunk(s) can be monitored by either the system logger or more preferably by a separate logger via the log service. The log service can be enabled very quickly using a log p response to a system prompt if done on a terminal with a keyboard. This activates the log service with *p* class events only. Alternatively, a hard copy printer (receive only) can be used by creating an originate port with an autoconnect to log *p*. The resulting events are formatted as shown in table 5-6.

Table 5-6. Formatted Resulting Events

#p	08:40:00	node name	UTL	2\1	av/pk/%:Rx	0	2	Tx	11	11	Qtty good
#p	08:40:00	node name	UTL	2\1	av/pk/%:Rx	0	2	Tx	11	11	Qtty good
#p	08:40:00	node name	UTL	2\1	av/pk/%:Rx	0	2	Tx	11	11	Qtty good
#p	08:40:00	node name	UTL	2\1	av/pk/%:Rx	0	2	Tx	11	11	Qtty good
#p	08:40:00	node name	UTL	2\1	av/pk/%:Rx	0	2	Tx	11	11	Qtty good
#p	08:40:00	node name	UTL	2\1	av/pk/%:Rx	0	2	Tx	11	11	Qtty good

If a single trunk is monitored (as illustrated) the peak and average utilization readings are neatly stacked in a column for quick trend analysis. Another sample can be taken at any time, by resetting the statistics using the Reset Service and re-establishing the start/end/interval times for the trunk.

Print Service (with XNET)

Print service offers a versatile system to print all or part of a Configuration Storage Module and all or part of a target configuration. (Note that a printer must be connected to an answer port to print the data.) The service is selected by typing ***Print*** at the system prompt. This will result in the first level monitor menu shown in figure 5-86.

```
**** Configuration Print     ****

**** Printer Port Selection ****

1. Exit
2. Select Printer Path


Enter Selection:
```

Figure 5-86. First level Print service menu

Two choices are available from this menu. Selection 1, *Exit* will return to the system prompt and take the user out of the Print service. Selection 2, *Select Printer Path* adds two additional lines, producing the menu shown in figure 5-87.

```
**** Configuration Print     ****

**** Printer Port Selection ****

1. Exit
2. Select Printer Path


Enter Selection: 2
Enter Printer Path (<CR> only to send output to this terminal)
Enter :
```

Figure 5-87. Configure Print - select printer path

```
*** PM SLOT: 1  Printout ***

Name              Type              Description

dons              Configuration
node4             Configuration     node4

1. Exit
2. Print This List
3. Print Whole Configuration Module
4. Print a User List
5. Print a Text Name
6. Select Configuration

Enter Selection: 6
```

Figure 5-88. Configuration module - Printout

Two choices are available at this menu. The prompt requests entry of the printer path. Typing the path plus a <CR> will enter the path. The other choice is entering ONLY a <CR>, causing all data to be sent to the monitor screen. Following entry of a pathname <CR> or a <CR> only, the monitor display shown in figure 5-88 is obtained.

Listed in this screen are the names, types and descriptions of all configurations, user lists and texts files. This menu has 6 selections:

1.**Exit** results in return to the previous menu.

2.**Print This Lis**t prints the list shown on the monitor.

3. **Print Whole Configuration Module** prints the complete configuration module contents.

4.**Print a User List** causes a prompt for the user list name and when entered prints the user list.

5. **Print a Text Name** causes a prompt for the text name and when entered, prints the text.

6. **Select Configuration** causes a prompt for the Configuration name to be printed.

```
*** Configuration: standard  Printout ***
Name             Type            Description

all1             Group Name
b                Speed Name
b00              Asynchronous      6/1        6/1
b01              Asynchronous      6/2        6/2
b02              Asynchronous      6/3        6/3
b03              Asynchronous      6/4        6/4
b04              Asynchronous      6/5        6/5
b05              Asynchronous      6/6        6/6
b06              Asynchronous      6/7        6/7
b07              Asynchronous      6/8        6/8

List more names (y/n) ? n
```

Figure 5-89. Selected configuration name list

In the example, selection 6 was chosen and at the prompt, (as shown in figure 5-88), *Standard* configuration was entered. The Print service then produces the monitor screen shown in figure 5-89.

The bottom of the menu in figure 5-89 prompts with, "List more names?" This may be answer *Y* or *N*. A *Y* will result in more names to be listed (if more are available). An *N* will result in the monitor display shown in figure 5-90.

```
*** Configuration: standard  Printout ***
Name             Type            Description

all1             Group Name
b                Speed Name
b00              Asynchronous      6/1        6/1
b01              Asynchronous      6/2        6/2
b02              Asynchronous      6/3        6/3
b03              Asynchronous      6/4        6/4
b04              Asynchronous      6/5        6/5
b05              Asynchronous      6/6        6/6
b06              Asynchronous      6/7        6/7
b07              Asynchronous      6/8        6/8

List more names (y/n) ? n

1. Exit
2. Print this list
3. Print this Configuration
4. Print Global Parameters
5. Select Configuration Type to Print
6. Select Individual Name to Print

Enter Selection:
```

Figure 5-90. Configuration listing submenu

Six choices are available from the menu shown in figure 5-90. These are:

1.**Exit** which returns the user to the previous menu.

2. **Print this list**, prints this list of names.

3. **Print this Configuration** prints the entire Configuration, first the global, then the name list, and finally each name parameter set.

4. **Print Global Parameters** prints the Global Parameters.

5.**Select Configuration Type to Print** allows selection of the Configuration Type to be printed and results in a new monitor screen shown in figure 5-91.

6.**Select Individual Name to Print** allows selection of an individual Name to be selected for printing.

```
*** Configuration: standard  Printout ***
Name              Type            Description

t1                Trunk            2/1

1. Exit                              6. Controlled Service
2. Asynchronous                      7. X25 Trunks
3. Trunks                            8. String
4. Speed Connect
5. Group

Enter Configuration Type:
```

Figure 5-91. Submenu - Select configuration type

Again there is a choice of *List more names (y/n) ?* Eight options are available for selection in addition to *Exit* selection number 1. These are shown in figure 5-91. Typing any of the numbers between 2 and 9 causes all of the names in the type selected to be printed.

The last selection on this menu is number 6, which allows the user to *Select Individual Name to Print*. When selection is made, the service prompts:

Printing please wait.

When complete, the Service prompts:

Enter <CR> to continue

Pressing enter will cause the Service to accept more entries of items to print.

Reset Service

The Reset Service allows resetting chassis, cards, individual ports, virtual circuits, or port statistics from a terminal. To invoke the Reset Service, enter:

Connect to: reset<*CR*>

The Reset Service displays the Reset Service Menu, which is shown in figure 5-92.

```
***** Reset *****

1. Exit
2. Chassis
3. Port
4. Virtual Circuit
5. Statistics


Enter selection:
```

Figure 5-92. Reset service main menu

1. Exit

Type *1<CR>* to exit the Reset Service and return to the connect prompt.

2. Chassis

Type *2<CR>* to reset the entire chassis. The Reset Service displays a second chance prompt:

Reset entire chassis? Are you sure? (y/n)

Enter *n<CR>* or *<CR>* to abort the chassis reset and return to the Reset Service Menu. To proceed, enter *y<CR>*.

3. Port

If you type "3<CR>", the Reset Service displays:

Enter 1 for Async or 2 for Sync:

Enter <CR> to abort reset and return to the Reset Service Menu. Entering *1 or 2 <CR>*presents the prompt for port number. Enter either the Async or Sync port number or a range of ports. (i.e., ports *2-6<CR>* for ports 2 through 6.)

The service will confirm the reset with:

Port N on card 1 reset:

4. Virtual Circuits

To reset a specific virtual circuit, enter 5<CR>. VCX prompts:

Enter Card No.: 2<CR>

Enter the number of the card that contains the virtual circuit to be reset, such as 2<CR> in this example. VCX prompts:

Enter VC number (from card status): 2<CR>

The card status display lists all virtual circuit numbers, and you are prompted to get the number from that display if you don't already know the number. Then enter the number of the virtual circuit to be reset, such as 2<CR> in this example. VCX then resets the selected virtual circuit and you are returned to the menu shown in figure 5-92.

5. Statistics

To reset statistics type *4 <CR>*. The menu shown in figure 5-93 will be displayed.

```
***** Reset Statistics *****

1. Exit
2. Chassis
3. Async or sync
4. Port

Enter selection:
```

Figure 5-93. Reset statistics menu

The options are:

1. Exit

To exit the Statistics Reset Menu and return to the Reset Service Menu, enter *1<CR>*.

2. Chassis

If option *2* is selected, the statistics for the entire chassis will be reset.

3. Async Or Sync

Selecting option 3 causes the following option to be displayed:

Enter 1 for Async or 2 for Sync:

If you select Async, this message appears:

Now resetting async statistics:

The Reset Statistics menu is then displayed.

If you select Sync, you will be immediately told about the reset:

Now resetting sync statistics

4. Port

When option *4* is selected, the user is asked which type of port is to be reset and prompts:

Enter 1 for Async or 2 for Sync

If you select Async, then a second prompt appears:

Enter port number:<CR>

After the port number (#) have been entered, the following prompt is displayed:

Now resetting statistics for async port (#)

If you selected sync for the type of port to reset statistics, the VCX displays the following message:

Now resetting sync port statistics

Statistics

Which statistics are reset? This depends on whether the port is asynchronous or synchronous. An asynchronous card will have the following parameters reset:

Characters transmitted
Characters received
Errors
Buffer utilization
Buffer peak utilization

While these parameters are reset on a synchronous card:

Characters transmitted
Characters received
Messages transmitted
Messages received
Message errors
Retransmissions
BER indicator
Peak transmit utilization
Peak receive utilization

Revision Service (With XNET)

Using the Revision Service, the Network Administrator can determine the hardware and software contents of any node in a VCX network. The card listing identifies every card in the unit. The software listing includes calculated EPROM checksums for both card KOS and software modules. The service is an invaluable tool for trouble-shooting.

To enter the Revision Service, type *rev* after the prompt.

Connect to: rev

The first screen displayed is that shown in figure 5-94.

```
     **** Revision  ****

     1. Exit
     2. Card list
     3. PM list
     4. PM checksum

  Selection:
```

Figure 5-94. Revision service main menu

Option 1, exit, will take you out of the Revision Service and return you to the main prompt.

When option 2, Card list, is selected, the monitor display appears as shown in figure 5-95.

```
Card     Type       Ports    KOS          KOS Checksums
                             Revsion      Odd       Even

1        Main       16       n/a          n/a       n/a
2        HIGHSPEED  2        3.1          4416      2765

    Enter  <CR>  to continue.
```

Figure 5-95. Revision service - card list

```
PM Includes            Software Revision

64K Config
Muxing                 3.4
Switching              2.4
Bnet                   1.2

         Enter  <CR>  to continue.
```

Figure 5-96. Revision service PM list

Each of the existing cards in the VCX are displayed. The card's type, number of ports on the card, the KOS revision number, and KOS checksums are shown. The service is intelligent enough to know how many port expander cards are included and reports 4, 10, or 16 for the number of port for the 0, 1, 2 expander cards, respectively. The *rev* numbers change with each new upgrade in the software. Entering <CR> will return you to the previous Revision Menu.

When option 3, the PM list is selected, a monitor screen like that illustrated in figure 5-96 is displayed.

All major portions of software, contained in the software module, are listed to allow correlation with any VCX chassis that may exist in the network. Entering <CR> will return you to the previous Revision Menu.

```
     PM Includes          Software Revision

     Muxing               3.4
     Switching            2.4
     XNET                 1.1
     BNET                 1.2.1

The checksum for this PM are:
U1       U2       U3       U4       U5       U6       U7       U8

303a     7511     7c23     d533     52b      8092     de84     c875

         Enter  <CR>  to continue.
```

Figure 5-97. Revision service PM checksum display

Selecting option 4, PM checksum, from the Main Menu will generate the message:

Calculating checksums for PM.
Please wait

A monitor screen like that shown in figure 5-97 will then be displayed.

The U numbers, U1-U8, represent the specific chips in the software module. If there are eight chips in the PM module, it can take up to a 1/2 minute before the PM checksums are calculated and displayed. Running a checksum on a software module is usually done to see whether a problem actually exists in the software.

Settime Service

The Settime Service sets the date and time for the node. The date and time is retained if the node is powered down or reset. To invoke the Settime Service, enter:

Connect to: settime<CR>

The Settime Service presents one of two displays, depending on whether the date and time have been set since the last power-up or reset. If the system date and time are currently set, the Settime Service displays the time-of- day as in the example shown in figure 5-98.

```
**** Set Date and Time ****


Tue, 11/07/89 - 17:12:59 EST
Do you wish to change it? (y/n)
```

Figure 5-98. Settime menu

If the date and time are correct, enter *n<CR>* to exit the Settime Service and return to the connect prompt. If you wish to reset the date and/or time, enter *y<CR>*. If the date and time are not currently set, the Settime Service displays (figure 5-99):

To set or reset the date and time, you respond to a series of prompts. For example, to set the date and time to Sunday, January 1, 1989 at 12:01 AM, you respond as follows:

```
**** Set Date and Time ****

No current date and time set in system.
```

5-99. Settime menu for date/time entry

Enter date (MM DD YY): 1 1 89<CR>
Enter time (HH MM): 0 1<CR>

Time has been set to:
Sunday, 01/01/89 - 00:01:00 EST

Do you wish to change it (y/n)?

Respond ***n<CR>*** to accept the displayed date and time and return to the connect prompt. System time-keeping starts when you press **<CR>**.

Notes

1.Entry of leading zeroes and zero values is optional.

2.The Settime Service displays the date and time in the configured American or European format with the configured time zone abbreviation (see *Configuration Service, Level 3 Menu Selection 5: EXAMINE / MODIFY global configuration parameters*). Also, the *Settime Service* performs range checks on your entries. For example, if you enter:

Enter date (MM DD YY): 15 6 89<CR>

Settime responds:

Invalid value for month (MM)
Enter month (MM):

Setup Service

CAUTION: Setup Service destroys all existing configuration.

The Setup Service, using predefined configurations, allows the System Administrator to quickly establish a 16 channel point-to-point multiplexer system with two interconnected VCX-150's. This saves the Administrator from having to build configurations for the two VCX-150's within the Configuration Service.

Setup defines one VCX-150 as having 15 originating ports which are auto-connected via a trunk line to the second VCX-150 which has 15 answer ports. The originating port #2 (on first VCX-150) is connected to answer port #2 (on the second VCX-150), originating port #3 to answer port #3, etc. Port #1 on each unit is a *both* port, to allow services (Configure in particular) to be used. A connection between port #1 at the originate end and port #1 at the answer end can be established by responding with 't1.p1' to a ***connect to:*** prompt.

Note: The Setup service creates 16 originate and answer ports regardless of whether the VCX-150 is a 4, 10, or 16 port unit. The configuration can be left as it is (it will cause no operational problems) or the auto generated configuration can be modified. To modify, delete the proper number of ports from the originate and answer end configurations after running the Setup service.

Setup is initiated within factory configuration by entering either *setup o*, *setup a*, *setup on*, or *setup an* after the connect prompt, where each option represents a different setup. See table 5-7.

Table 5-7. Setup Service - Setup Types

Setup type	Details of operation
Setup o	This option sets a VCX-150 up with 1 asynchronous both port, 15 asynchronous originate ports, autoconnected across a trunk line. The trunk supplies TX clock.
Setup a	This option sets a VCX-150 up with 1 asynchronous both port, 15 asynchronous answer ports, and a synchronous trunk. The trunk supplies TX clock.
Setup on	This option is the same as setup o, except that the trunk supplies no clock. It accepts both transmit and receive clock from the attached modem.
Setup an	This option is the same as setup a, except that the trunk supplies no clock. It accepts both transmit and receive clock from the attached modem.

Note: Once a VCX-150 has been configured using Setup, the new configuration's prompt ***ORIG*** or ***ANS*** will replace the ***connect to:*** prompt.

Here is an example of how Setup is used:

Step 1) Assume two new VCX-150's have arrived. They should be unpacked and their power cords plugged into electrical outlets.

Step 2) A trunk line cable (Part No. 4859-01) or other suitable crossover cable should be connected from trunk #1 on the first VCX-150 to trunk #1 on the second VCX-150 for a local interconnection.

Step 3) After determining which of the two VCX-150's will be at the originate end, a terminal/monitor should be connected to port #1 of that VCX-150.

Step 4) Both VCX-150's should be in factory configuration when Setup is used. If the two VCX-150's are new, fresh out of their packing cartons, they will most likely be in factory configuration. However, if VCX-150's have been pre-configured, they need to be reset to the factory configuration. To reset the VCX-150 to the default factory configuration, a button must be pressed while the VCX-150 is being powered-up. To reach the button, remove the VCX-150's front panel, by holding the panel firmly on either side, and pulling it directly toward you. Once the panel is removed, the button can be seen on the lower right-hand corner of the VCX-150. Hold the button in for five seconds while you power up the VCX-150, this should reset the VCX-150 to the factory configuration. It is recommended that both VCX-150's be set to factory configuration, even if new.

Step 5) After the VCX-150's have been powered up and placed in factory configuration (see previous step), hit the RETURN key on the terminal/monitor (which was installed in Step 3). The ***connect to:"*** prompt appears on the screen.

Step 6) Enter *setup o* after the ***connect to:*** prompt:

> **connect to:** setup o

This initiates the configuration of 15 autoconnect originate ports and a trunk line on the VCX. After 10 seconds press **Return**. The new prompt ***ORIG*** appears, indicating setup configuration is complete.

Step 7) Place a terminal/monitor on port #1 of the second VCX-150. The terminal/monitor that was used on the first VCX-150 could be removed and connected to the second VCX-150. Hit the RETURN key on the terminal. The ***connect to:*** prompt will appear.

Step 8) Enter *setup a* after the ***connect to:*** prompt:

connect to: setup a

This will initiate the configuration of 15 answer ports and a synchronous trunk line on the second VCX-150. After 10 seconds hit the RETURN key. The prompt ***ANS*** will appear, indicating that the second configuration is complete. Both VCX-150's should be communicating.

NOTE: Another approach to initiate configuration in the second VCX, (the second VCX is a remote unit, (linked to the first via modems and telephone line). Once *setup on* is entered, and the first VCX responds ***ORIG***, enter *t1.setup an* as follows:

ORIG >t1.setup an

This causes the setup service to run on the remote VCX-150 over the trunk line (called t1) and to initiate the configuration of the answer ports in the second unit.

Step 9) The remaining or 16th point-to-point channel can be established by responding with *t1.p1* to the prompt.

Step 10) The setup configuration can now be confirmed by entering the Status Service mode. The status of each port will be shown with a *C* within Status Service, meaning the port is connected.

Parameters automatically configured in Setup are shown in table 5-8.

Table 5-8. Automatically Configured Parameters In the Originate VCX-150

Configuration name	Originate
Port names	p1 through p16
Trunk names	t1
Port parameters (ports 2-16):	
Speed	9600
Bits	8
Stop bits	1
Parity	None
Attachment	Unqualified
Port flow control	XON/XOFF

Configuration name	Originate
Device flow control	XON/XOFF
Timeout	None
Attach/detach strings	None
Access rights	Default
Autoconnect	T1.p2 through t1.p16
Break key	Passthrough
Port parameters (port 1) - same as above except:	
Control state	1
Connect hold	2
Connect confirmation	Yes
Terminal type	VT-100
Trunk parameters for t1:	
Speed	9600
Clocking	Selection o: provides TX clock Selection on: provides no TX clock
Timeout	60 seconds
TUX threshold	75%
TRX threshold	25%
Virtual circuits	17
Access rights	Default
Prompt	ORIG>

The Answer VCX-150

The parameters are identical to the originate VCX-150 (ports 2-16) except that the direction is *answer*, port #1 is a both port instead of an originate port, and the prompt is ***ANS>***.

The *n* Option, No Clocks

When *on* or *oa* is selected, the originate and answer end agree with the above parameters. The only difference is that the VCX provides no clocks.

Status Service

The Status Service monitors overall chassis activity and the activity of individual ports. The chassis display reports: detached, attached, connected, out-of-service, busy and under test ports. The screen display is refreshed approximately every 10 seconds, maintaining an up to date display of the status. For individual ports the Status Service displays: connection status, configured and current port characteristics, hardware interface status, and usage statistics. To invoke the Status Service, enter:

Connect to: status<CR>

The Status Service displays the Status Service Main Menu illustrated in figure 5-100.

```
***** Status *****

1. Exit
2. Chassis
3. Card
4. Port
5. Name definition
6. Power up diagnostic results

Enter selection:
```

Figure 5-100. Status service main menu

1. Exit

Type *1<CR>* to exit the Status Service and return to the connect prompt.

2. Chassis Status

Type *2<CR>* to display a report of overall chassis activity, which produces a monitor screen like that shown in figure 5-101.

A letter shows the current status-detached, attached, connected, out-of- service, in test or busied of each configured asynchronous port in the chassis. The letter *S* indicates a synchronous trunk line with a caret (^) indicating trunk up and a *v* indicating trunk down. The chassis status display shows unconfigured ports in the chassis as blank. Busying a currently attached or connected port does not force detachment or disconnection. Therefore, the chassis status display shows the compound states BD (busy/detached), BA (busy/attached), and BC (busy/connected). When you finish examining the chassis status display, enter <CR>. The Status Service redisplays the Status Service Main Menu.

```
                              Port Status
Card Type       1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16
1    V150       D  D  D  D  D  D  D  D  D  D  D  D  D  D  D  D
2    V150TR    ^S ^S


D =Detached,A =Attached,C =Connected,O =Out of service,B =Busied,TST =Test
S =Statmux    X =X.25    ^ =Trunk up     v =Trunk down
Enter <CR> to continue:
```

Figure 5-101. Status service main menu

3. Card Status

The status of a particular card can obtained by entering *3<CR>* from the Status Service Main Menu. The prompt *Enter 1 for Async or 2 for Sync* is displayed. Entering a 1 illustrates the screen shown in figure 5-102.

There is a lot of information displayed on this screen. All 16 ports are configured. Some ports are originate and some answer. Port 1, named *b00* is connected to

```
Card: 1  Type: V150  Configuration: simple  Node: newsun

Port Name       Type Primary Connection          Secondary Connection

 1   b00        Ans  pcroom-1/3-ptnash
 2   b01        Ans
 3   b02        Ans  pcroom-1/3-ptcorona
 4   b03        Ans
 5   b04        Ans
 6   b05        Ans
 7   b06        Ans
 8   b07        Ans
 9   Lab        Org
10   Lab        Org   newsun-2/1/1/-X25trunk
11   Lab        Org   newsun-1/13-quansut         newsun
12   Lab        Org   pcroom-1-status             newsun-1-status
13   quansut    Ans   newsun-1/11-Lab
14   Labqume    Org
15   Labgtek    Ans
16   Labscc
Connection info: Nodename-Card/Port-Portname   Nodename-Card/Port/Vc-Portname
                 Nodename-Card-Taskname

Enter <CR> to exit:
```

Figure 5-102. Status service card status

port 13 of card 1 named *ptnash* at a node called the *pcroom*. Port 12, named *lab* has a primary connection to *status* on card 1 of the *pcroom* node; and a secondary connection to *status* on the local node, newsun. Port 10, also named *lab*, is connected to virtual circuit 1 of the X.25 trunk, port 2 on the *newsun* node.

If the card type is a multiplexing trunk, a screen like that shown in figure 5-103 is displayed.

```
Card: 2   Card type: V150HS  Configuration: simple        Node:newsun

Port   : 1
Name   : t1
Type   : mux
Speed  : 64K
No Vcs: 20

Vc          Connection


Trunk idle









Connection info: Card-Taskname,   Card/Port-Portname,   Card/Port/Vc.
Enter <CR> to continue:
```

Figure 5-103. Status service - Multiplexing trunk

This snapshot also contains a lot of information. Both ports of the of the card are available, but only one port is shown in each screen. Note in figure 5-103 that the bottom prompt states, *Enter <CR> to continue*. Pressing the Enter key causes the other port to be displayed. (Not shown here.)

If the card type is an X.25 trunk, a new menu (figure 5-104) is displayed. In the example shown in figure 5-104, a pair of X.25 trunks are configured for connection to *Telenet* and *Tymnet*. The Telenet trunk has two outgoing calls connected to a port named *ptsq* on port 4, and a port named *ptcwh* on card 15/port 8. An incoming call is connected to port 8 called *vax*. Note that you can only see port 1. Press <CR> to display port 2.

```
Card: 2   Card type: V150HS  Configuration: node4        Node: node4

Port   : 1
Name   : tr1
Type   : X25 DTE
Speed  : 9600
No Vcs: 16

Vc          Connection

2    1    15/8ptcw6
3    2    15/4-ptsq7
4    16   2/8-vax




Connection info: Card-Taskname,   Card/Port-Portname,   Card/Port/Vc.
Enter <CR> to continue:
```

Figure 5-104. Status service - X.25 trunk

The Tymnet trunk has an incoming call connected to port 2 called *fred*. In addition an incoming call is connected to a VCX service status loaded on the main card.

4. Port Status

To obtain detailed status information for a particular port, enter *4<CR>* from the Status Service Main Menu. The Status Service prompts,

> **Enter 1 for Async or 2 for Sync:** 1<CR>

> **Enter port number:** 4<CR>

The Status Service then displays the Port Status Submenu. See paragraphs **Port Status Submenu** for additional information.

5. Name Definition

This selection allows you to obtain information about a name. If the name corresponds to a port, the Status Service displays the type of port and the slot and port numbers. If the name does not correspond to physical port, the Status Service displays the type of port (for example, speed connect or group name) and provides other relevant information. For example, if you enter *5<CR>* from the Status Service Main Menu, the Status Service prompts:

> **Enter name:**

To obtain information for the port named *fred*, you enter:

Enter name: fred<CR>

Name: fred
Type: Asynchronous line(s)
Starting slot: 1
Starting port: 4
Ending slot: 1
Ending port: 4
Enter <CR> to exit:

6. *Powerup Diagnostic Results*

When item *6* is selected from the status service main menu, the power up test result screen illustrated in figure 5-105 is displayed.

When you finish examining the display, enter *<CR>* to return to the Status Service Main Menu.

```
**** Power Up Test Results ****


Main memory          : Pass
Configuration memory : Pass

Rom    : Block  1:  Pass  U1 - 0e1c  U2 - 78dc
       : Block  2:  Pass  U3 - 4094  U4 - 946f
       : Block  3:  Pass  U5 - 273c  U6 - a007
       : Block  4:  Void  U7 - 0000  U8 - 0000
Trunk 1 : Pass              Trunk 2 : Pass

Port  1 : Pass              Port  9 : Fail
Port  2 : Pass              Port 10 : Pass
Port  3 : Pass              Port 11 : Pass
Port  4 : Pass              Port 12 : Pass
Port  5 : Pass              Port 13 : Pass
Port  6 : Pass              Port 14 : Pass
Port  7 : Pass              Port 15 : Pass
Port  8 : Pass              Port 16 : Pass

Enter <CR> to continue:
```

Figure 5-105. Powerup test results

Port Status Submenu

The port status submenu is shown in figure 5-106.

```
***** Port Status *****

1. Exit
2. Connection information
3. Port characteristics
4. Modem control signals / usage statistics

Enter selection:
```

Figure 5-106. Port status submenu

1. Exit

Type *1<CR>* to return to the Status Service Main Menu.

2. Connection Information

Port Status Menu selection 2 displays the current connection status of the port you have selected. The example illustrated in figure 5-107 shows the connection status display for an asynchronous port.

```
                          Card: 1  Port:4   Name: Fred

Direction               : Both
Attachment control      : Unqualified
State                   : Connected

Primary connection to   : card 1 port 2 VCD in node <newsum>
Path taken              : telenet.123456.x25out

Last connection         : Wednesday, 01/06/90 - 09:30:00 EST
Last disconnection      : Wednesday, 01/06/90 - 09:29:00 EST

Secondary connection to: card 1 port 2 named <vax 1> in node <nessun>
Path taken              : <vax 1>

Last connection         : Wednesday, 01/06/90 - 09:45:00 EST



Enter <CR> to exit:
```

Figure 5-107. Connection status of the selected port

This example shows that port 4 of card 1 named *fred* currently has established an X.25 outgoing call on port 2 using virtual circuit 0. The path taken was via the X.25 interface named "Telenet" with the address 123456. The connection was established at 9:30 AM on Wednesday, Jan. 6, 1992. *Fred* quit his previous primary connection one minute prior to the *Telenet* connection. *Fred* also has an active secondary connection to port 2 named *vax 1* that was established at 9:45 AM on Wednesday, Jan. 6, 1992.

Figure 5-108 shows a connection status display for a trunk line.

```
                        Card: 2  Port: 2  Name:  t2

                     Multiplexing Trunk Connection Status

                                    Priority
                        1       2       3       4      Total

Current connections     8       3      12       0       23
Peak connections       10       3      13       0       26

Configured maximum number of trunk connections: 32

Enter <CR> to exit:
```

Figure 5-108. Status for a trunk line

A connection status display for an X.25 trunk line appears in figure 5-109.

When finished examining the connection status display, press <CR>to return to the Port Status Submenu.

```
                       Card: 2  Port: 1  Name:  tr1

                           X.25 Trunk Connection Status

                                   Priority
                       1       2       3       4      Total

Current connections    0       0       0       0       0
Peak connections       0       0       0       0       0

Configured maximum number of trunk connections: 12

Enter <CR> to continue:
```

Figure 5-109. Port status - X.25 trunk line

3. Port Characteristics

Port Status Menu selection 3 displays both the configured and the current port characteristics. This display allows you to monitor any changes that users may have made via the Set Service. The example in figure 5-110 illustrates port characteristics display for asynchronous ports.

```
                        Card: 1  Port: 1  Name:  org

                         Configured                     Current

Baud rate              : 9600                           9600
Stop bits              : 1 stop bit                     1 stop bit
Character length       : 8 bits                         8 bits
Parity                 : None                           None
Device flow control    : XON/XOFF                       XON/XOFF
Port flow control      : XON/XOFF                       XON/XOFF
Terminal type          : DEC VT-100/VT-100              DEC VT-100/VT-100
Control state char     : ^A                             ^A
Connection hold char   : ^@                             ^@
BREAK key              : Pass through                   Pass through
Messages               : All                            All
Broadcast option       : Accept routine                 Accept routine
Channel priority       : 1
Connection timeout     : 0
Originate access rights : 1-64

Enter <CR> to exit:
```

Figure 5-110. Port status - Async port

Note that *org* is a *both* originate/answer port. For originate-only ports, the Status Service displays no access list. For answer-only ports, the Status Service displays no terminal characteristics.

The following example, shown in figure 5-111, shows the port characteristics display for a trunk line.

The example illustrated in figure 5-112 shows the port characteristics display for an X.25 trunk line.

4. Modem Control Signals / Usage Statistics

Port Status Submenu selection 4 displays interface control line status and usage statistics. The example of figure 5-113 illustrates the statistics display for an asynchronous port.

The example shows that flow is not currently stopped either *In* (the port has not exerted flow control to stop the external device from transmitting) or *Out* (the external device has not exerted flow control to stop the port from transmitting).

```
Card: 2  Port: 1  Name:  t2

Multiplexing Trunk Configuration Data

Baud rate                   : 9600
Clocking                    : DTE - supplies transmit clocks
Number of virtual circuits  : 10
Trunk timeout (secs)        : 75
Utilization threshold       : 25
Retransmission threshold    : 25
Statistics logging timer    : 30
Originate access rights     : 1-64
Answer access rights        : 1-64

Enter <CR> to exit:
```

Figure 5-111. Port statistics - multiplexing trunk

```
                    Card: 2  Port: 2  Name:  PSS

                    X.25 Trunk Configuration Data

Network id:                  PSS   Clocking:            DTE. supplies no clock
Network addresxs:              9   Baud rate:                     9600
Login required:               No

X25 DTE or DCE:              DTE   1 Frame window (k):               7
Frame response time (T1):      3   Max. retransmissions (N2):       10

No. of income LCNs:            1   Window size:                      2
First incoming LCN:            1   Restart time value (T29):        80
No. of bothway LCNs:          12   Call request time (T21):         60
First bothway LCN:S           20   Make reverse charges:            No
No. of outgoing LCNs:         10   High priority calls:             No
First outgoing LCN:           40   Accept reverse charges:          No
Packet size:           128 bytes   Utilization threshold:           75

Originate access rights:     164   Answer access rights:          1-64

Enter <CR> to exit:
```

Figure 5-112. Port statistics - X.25 trunk

The *Errors* statistic is the total of received data errors (usually parity errors) detected by the port. The Buffer Size parameter refers to the per port buffers. The Buffer Utilization is the instantaneous measure of the buffer's use in bytes. Buffer Peak Utilization measures the buffer's use from the time the async card was initialized/reset.

```
Card: 1  Port: 1  Name: Tom

Modem signals

RTS   : High      CTS: High
DTR   : High      DSR: High
                  DCD: High

Flow stopped : (in)No     (out)No

Characters transmitted      : 6828
Last character transmitted  : <CR>
Characters received         : 125
Last character received     : <CR>
Errors                      : 0
Buffer Size                 : 2800
Buffer Utilization          : 0
Buffer Peak Utilization     : 1

Enter <CR> to exit:
```

Figure 5-113. Port statistics - Asynchronous display

A synchronous port statistics display is shown in figure 5-114.

```
Card: 2  Port: 1  Name:  t2

Modem signals

CTS    : High     RTS: High
DSR    : High     DTR: High
DCD in: High

Characters transmitted     : 297158714
Characters received        : 114089730
Messages transmitted       : 6159895
Messages received          : 4167485
Errors                     : 74
Retransmissions            : 21
BER exceeded 1 in 10,000   : No

Trunk Utilization    :      Receive             Xmit

Past 5 seconds       :       0.9%               4.4%
Peak                 :      20.8%              83.1%
Enter <CR> to exit:
```

Figure 5-114. Port statistics - synchronous port

In this example, the *Messages transmitted* and *Messages received* indicate the number of packets transmitted and received. The *Errors* statistic indicates the number of received data packets with errors. The *Retransmissions* statistic indicates the number of retransmitted packets, that is, the number of packets not received correctly by the remote site. And BER represents the Bit Error Rate. If BER exceeds 1 in 10,000, then *Yes* will be displayed.

The average trunk utilization, over the past 5 seconds, the peak trunk utilization since the trunk came up, and the date of the peak utilization are also displayed. This information can be used to determine whether the trunks are being overworked. If peak utilization is near 100% you may want to consider a faster trunk or an additional trunk line.

Notes

1.If the system time is not set via the Settime Service, the Status Service accumulates usage statistics but displays no date in the *Statistics since:* field.

2.If you run Status on your own port, the *Characters transmitted* and *Last character transmitted* statistics show the character count and the character transmitted at the time the statistical accounting routine was called, not necessarily the character most recently transmitted from the port.

Chapter 6

User Services

These are services available to all users and are not restricted. Each User service is discussed individually on the following pages.

Fox Service

The Fox Service transmits a test message continuously at the baud rate, character length, parity, and number of stop bits set for your home port.

Connect to: *fox<CR>*

Entering FOX at the prompt results in the Fox message (figure 6-1).

If you enter a printable character while the test is running, the Fox Service prepends the character to the fox message.

```
Hit <ESC> to exit.

 The quick brown fox jumped over a lazy dog's back 1 times.
 The quick brown fox jumped over a lazy dog's back 2 times.
 The quick brown fox jumped over a lazy dog's back 3 times.
 The quick brown fox jumped over a lazy dog's back 4 times.
 The quick brown fox jumped over a lazy dog's back 5 times.
 The quick brown fox jumped over a lazy dog's back 6 times.
 The quick brown fox jumped over a lazy dog's back 7 times.
 The quick brown fox jumped over a lazy dog's back 8 times.
 The quick brown fox jumped over a lazy dog's back 9 times.
 The quick brown fox jumped over a lazy d
```

Figure 6-1. Fox message display

For example, if you type # the displayed message becomes:

#The quick brown fox jumped over a lazy dog's back n times.

The Fox Service continues sending the **fox** message until you press <ESC>

Note: The Fox Service responds to the currently set device flow control protocol (see the *Set Service* section). If the device flow control is set to *none*, or if it is set to a different protocol than the one actually used by your equipment, portions of the test message may be lost.

Loopback Service

The Loopback Service echoes received data. If invoked at a remote node, the Loopback Service tests the communications path to and from the remote node.

Connect to: :loopback<CR>

Typing ***loopback*** will display the menu shown in figure 6-2.

```
***** Loopbaack Test  *****
Enter ESC to exit:
```

Figure 6-2. Loopback submenu

Type a test message. The message should be displayed on your terminal screen or printer exactly as entered. Your port remains in loopback mode until you press ***<ESC>***.

Note: If your terminal is set to half-duplex, each character typed appears twice. This double-echo occurs because the terminal echoes once, and the Loopback Service provides a second echo. Also, the Loopback Service echoes data (except for <ESC>) exactly as received. The service does not add line feeds when echoing <CR>.

Set Service

The Set Service alters the configured characteristics of a port. For this reason, use the Set Service with caution. Changes remain in effect until you quit the session. Then the port returns to its configured characteristics. To display the Set Service Main Menu, shown in figure 6-3, enter:

Connect to: set<CR>

```
Connect to: set

**** Set Terminal Characteristics ****

                           Current                  Requested
 1. Exit
 2. Baud rate              - 9600                   - 9600
 3. Character length       - 8 bits                 - 8 bits
 4. Parity                 - None                   - None
 5. Stop bits              - 1 stop bit             - 1 stop bit
 6. Echo                   - CPU & VCX services     - CPU & VCX services
 7. Terminal type          - DEC VT-100/VT-100      - DEC VT-100/VT-100
 8. Device flow control    - XON/XOFF               - XON/XOFF
 9. Port flow control      - XON/XOFF               - XON/XOFF
10. Messages               - All                    - All
11. BREAK key              - Pass through           - Pass through
12. Control state key      - ^A                     - ^A
13. Connect hold key       - ^@                     - ^@
14. Broadcast option       - Ignore routine         - Ignore routine
15. Apply changes

Enter selection:
```

Figure 6-3. Set service main menu

Each of the items on the menu is discussed in the following chapters.

1. Exit

Type *1<CR>* to exit the Set Service and return to the connect prompt.

2. Baud rate

Baud rate is the speed of data transmission. Type *2<CR>* to request a new baud rate setting.

The Set Service displays:

Change Baud Rate

1. 75
2. 110
3. 134.5
4. 150
5. 300
6. 600
7. 1200
8. 1800
9. 2400
10. 4800
11. 9600
12. 19200
13. 75/1200

Enter selection or <CR>to return:

Enter the number for the baud rate you wish to select. For example, to request 1200 baud enter *7<CR>*. The system redisplays the Set Service Menu with ***1200*** as the baud rate in the *Requested* column. To return to the Set Service Menu without requesting a new baud rate, press *<CR>*.

3. Character Length

The character length (also called *word length*) setting determines how many bits of data comprise a meaningful group. Type *3<CR>* to request a new character length. The Set Service displays:

Change Character Length

1. 5 bits
2. 6 bits
3. 7 bits
4. 8 bits

Enter selection or <CR>to return:

Enter the number for the character length you wish to select. For example, to request a seven bit word length, enter *3<CR>*. The system redisplays the Set Service Menu with 7 bits as the character length in the *Requested* column. To return to the Set Service Menu without requesting a new character length setting, press *<CR>*.

4: Parity

Parity is an extra bit (typically an eighth bit appended to a seven-bit word) used for error-checking. Type *4<CR>* to request a new parity setting.

The Set Service displays:

Change Parity

1. None
2. Odd
3. Even
4. Mark
5. Space

Enter selection or <CR> to return:

Enter the number for the type of parity you wish to select. For example, to request even parity, enter *3<CR>*. The system redisplays the Set Service Menu with *Even* as the parity in the Requested column. To return to the Set Service Menu without requesting a new parity setting, press *<CR>*.

5. Stop Bits

Stop bits mark the end of a transmitted character. Type *5<CR>* to request a new stop bit setting. The Set Service displays:

Change Stop Bits

1. 1 stop bits
2. 2 stop bits
3. 1.5 stop bits

Enter selection or <CR> to return:

Enter the number for the stop bit setting you wish to select. For example, to request a two stop bits, enter *2<CR>*. The system redisplays the Set Service Menu with 2 stop bits as the stop bit setting in the Requested column. To return to the Set Service Menu without requesting a new stop bit setting, press *<CR>*.

6: Echo

Echo is the retransmission of received data. Echo allows you to see what you type on your terminal display. The VCX system supports the following echo options:

- **CPU and VCX services.** The setting is appropriate when the CPU or host system supplies a remote echo to the terminal.
- **VCX local port.** The setting is appropriate for applications in which the terminal does not supply its own echo (the terminal does not support half-duplex), and the CPU does not supply a remote echo.
- **Terminal.** This setting is appropriate when the terminal is set for half-duplex.

Type *6<CR>* to request a new echo setting. The Set Service displays:

Change Echo

1. CPU & VCX services
2. VCX local port
3. Terminal

Enter selection or <CR> to return:

Enter the number for the echo setting you wish to select. For example, to select the Terminal echo option, enter *3<CR>*. The system redisplays the Set Service Menu with Terminal as the echo setting in the Requested column. To return to the Set Service Menu without requesting a new echo setting, press *<CR>*.

7. Terminal Type

Type *7<CR>* to request a new terminal type setting. The Set Service then displays the menu shown in figure 6-4.

```
Change Terminal Type

 1. Unsupported              12. Datapoint 8220/4240   23. MDCSC
 2. ADDS Regent series       13. DEC VT-100/VT-180     24. Perkin Elmer 550
 3. ADDS Viewpoint           14. DEC VT-52             25. PE 1251/1245 Super Owl
 4. ADM-3A                   15. Hazeltine 1500        26. QuickScreen
 5. ADM-31                   16. Hazeltine 1510        27. VDB 8024
 6. Ann Arbor 400D           17. Honeywell             28. Tandberg 2215
 7. ANSI Std; Ambassador     18. H19 / Z19             29. Teleray
 8. Control Data CD110       19. HP 2621               30. TeleVideo
 9. Control Data CD722       20. IBM Displaywriter     31. Wyse WY-100
10. DG Dasher 211/411        21. IBM 3101              32. Xerox 820
11. Datamedia                22. M9400

Enter selection or <CR> to return:
```

Figure 6-4. Terminal type selection menu

Enter the number for the terminal type you wish to select. For example, to select a DEC VT-52, enter 13<CR>. The system redisplays the Set Service Menu with DEC VT-52 as the terminal type in the Requested column. To return to the Set Service Menu without requesting a new terminal type, press *<CR>*.

8. Device Flow Control/

9: Port Flow Control

Flow control is a protocol for starting and stopping data transmissions. Flow control allows one device to prevent another from sending data too quickly. The VCX system supports the following flow control options:

- **None.** No flow control is exercised. Loss of data can occur if transmissions exceed the capacity of the terminal to buffer and print them.
- **XON/XOFF**. XON/XOFF employs two ASCII characters to start and stop transmission. XON (ASCII DC1) starts flow. XOFF (ASCII DC3) stops flow.
- **DC1/DC2**. DC1/DC2 is similar to XON/XOFF but uses a different ASCII flow stop character. DC1 starts flow. DC2 stops flow. DC1/DC2 flow control is most frequently associated with older Hewlett- Packard systems.
- **RTS/CTS**. RTS/CTS refers to the RS-232 interface control signals Request-to-Send and Clear-to-Send. Actually, CTS is the signal used to start and stop flow. Asserting CTS TRUE starts flow. Asserting CTS FALSE stops flow.
- **ENQ/ACK**. ENQ/ACK employs an ASCII character pair to implement flow control. However, ENQ/ACK differs significantly from start/stop protocols such as XON/XOFF. The ENQ/ACK protocol is a relatively complex pacing mechanism used with block mode transmissions on Hewlett-Packard (HP) systems. In the ENQ/ACK environment, the HP host computer functions as the master and the terminal functions as a slave. If the VCX system is between the master and the slave, the VCX port cabled to the terminal emulates the master as follows:

  1. After initializing, the port transmits an ENQ every 15 seconds until it receives an ACK from the terminal.

  2. The port inserts an ENQ into the data stream every 60 characters, then stops flow until the terminal transmits an ACK. If the port does not receive an ACK within 15 seconds, the port restarts flow by default.

  3. The terminal employs XON/XOFF within the ENQ/ACK protocol to control flow. If the terminal transmits XOFF, the port immediately suspends data flow. The port resumes flow upon receiving XON.

To implement HP Terminal Type 10 flow control at the port cabled to the terminal, set flow control as follows:

Device flow control = ENQ/ACK
Port flow control = XON/XOFF

- **T-Pause** (also called Tandem Inverse). T-Pause is similar to RTS/CTS flow control. CTS is the signal used to start and stop flow, but the sense of the signal is reversed. Asserting CTS FALSE starts flow. Asserting CTS TRUE stops flow.
- **HEX 91/93**. HEX 91/93 is a form of XON/XOFF which can be selected if you have an extended ASCII set.
- **HEX FF/FE**. HEX FF/FE is used with Datapoint equipment.
- **HEX 94/93**. HEX 94/93 is used with Siemens computer equipment.
- **DG XON/XOFF.** Used for Data General Equipment differs from XON/XOFF in three respects: (1) if data continues to flow from the attached device after XOFF has been issued, XOFFs will continue to be sent; (2) port flow control is modified to not insert a flow control character following $1E_{HEX}$ or 10_{HEX} in the data stream; and, (3) device flow control is modified not to interpret XON and XOFF as flow control control characters when they immediately follow $1E_{HEX}$ or 10_{HEX}.

Type *8<CR>* at the Set Service Menu to request a new device flow control setting. Device flow control refers to the flow control characters or signals exerted by the external device to stop and start data transmissions from the port. The Set Service displays:

Change Flow Control Generated by Device to Slow Switch's Output

1. None
2. XON/XOFF
3. DC1/DC2
4. RTS/CTS
5. ENQ/ACK
6. T-pause
7. HEX 91/93
8. HEX FF/FE
9. HEX 94/93
10. DG XON/OFF

Enter selection or <CR> to return:

Enter the number for the type of device flow control you wish to select. For example, to request XON/XOFF device flow control, enter *2<CR>*. The system redisplays the Set Service Menu with XON/XOFF as the flow control protocol in the Requested column. To return to the Set Service Menu without requesting a new device flow control setting, press .

Type *9<CR>* at the Set Service Menu to request a new port flow control setting. Port flow control refers to the flow control characters or signals exerted by the system port to stop and start data transmissions from the external device.

The Set Service displays:

Change Flow Control Generated by Switch to Slow Device's Output

1. **None**
2. **XON/XOFF**
3. **DC1/DC2**
4. **RTS/CTS**
5. **ENQ/ACK**
6. **T-pause**
7. **HEX 91/93**
8. **HEX FF/FE**
9. **HEX 94/93**
10. **DG XON/XOFF**

Enter selection or <CR>to return:

Enter the number for the type of port flow control you wish to select. For example, to request XON/XOFF port flow control, enter *2<CR>*. The system redisplays the Set Service Menu with XON/XOFF as the flow control protocol in the Requested column. To return to the Set Service Menu without requesting a new port flow control setting, press *<CR>*.

Note: The *inband* types of flow control, XON/XOFF, DC1/DC2, and ENQ/ACK, employ special characters in the data stream. The *outband* types of flow control, RTS/CTS and T-pause, manipulate hardware interface control lines. The port configuration can specify that these lines be used for other purposes. Therefore, changing outband flow control settings can cause unpredictable interactions with the port configuration in certain circumstances.

10: Messages

The *messages* parameter determines the type of messages transmitted by the port in the control state. The system supports the following options:

- **All**. The port transmits all user messages.
- **Prompt**. The port transmits only those messages that require a response from the port device or operator of the port device.
- **Service**. The port transmits only those messages that are informative but require no response. For example, *Disconnecting from secondary destination* is a service message.
- **None**. The port transmits no user messages. Use this setting with caution.

Type *10<CR>* at the Set Service Menu to request a new messages setting.

The Set Service displays:

Change Messages Displayed

1. All
2. Prompt
3. Service
4. None

Enter selection or <CR> to return:

Enter the number for the messages setting you wish to select. For example, to disable user messages, enter *4<CR>*. The system redisplays the Set Service Menu with *None* as the messages setting in the Requested column. To return to the Set Service Menu without requesting a new messages setting, press *<CR>*.

11: Break Key

This parameter determines how the system processes a BREAK. The system supports the following options:

- **Pass through.** The system sends a BREAK through to the destination. This choice is useful if the device at the destination port responds to a BREAK.
- **Ignore.** The system does not pass the BREAK through, nor does it take any action in response to a BREAK.
- **Enter control state**. BREAK functions similarly to the control state character.
- **Connection hold**. BREAK functions similarly to the connect hold character.

Type *11<CR>* at the Set Service Menu to request a new BREAK key setting. The Set Service displays:

Change BREAK Key

1. Pass through
2. Ignore
3. Enter control state
4. Connection hold

Enter selection or <CR> to return:

Enter the number for the BREAK key setting you wish to select. For example, to set the port to ignore a BREAK, enter *2<CR>*. the system redisplays the Set Service Menu with *Ignore* as the BREAK key setting in the Requested column. To return to the Set Service Menu without requesting a new BREAK key setting, press *<CR>*.

12: Control State Key
13: Connection Hold

Type *12<CR>* at the Set Service Menu to request a new control state key. The Set Service displays:

Change Control State Key

Enter selection or <CR> to return:

Enter the decimal equivalent for the control state key you wish to select. For example, to select ^A as the control state key, enter 1<CR>. The system redisplays the Set Service Menu with *^A* as the control state key in the Requested column. To return to the Set Service Menu without requesting a new control state key setting, press *<CR>*.

Type *13<CR>* at the Set Service Menu to request a new connect hold key. The Set Service displays:

Change Connect Hold Key

Enter selection or <CR> to return:

Enter the decimal equivalent for the connect hold key you wish to select. For example, to select ^B as the connect hold key, enter *2<CR>*. The system redisplays the Set Service Menu with *^B* as the connect hold key in the Requested column. To return to the Set Service Menu without requesting a new connect hold key setting, press ***<CR>.***

Note: It is desirable that the control state and connect hold characters not be used for other purposes by the host computer system. For example, a printable character is generally not a good choice for these special characters. The less often-used ASCII characters listed below are recommended candidates for control state and connect hold characters. If you wish to use other ASCII characters, refer to Appendix A for a complete list of ASCII characters and their decimal equivalents. Table 5-1 in Chapter 5 provides a list of recommended/connect hold characters. (Table 6-1 below provides a list of control state/connect characters to avoid.)

WARNING: Do not choose a control state or connect hold character that can interact with other functions. Avoid the characters shown in table 6-1.

Table 6-1. Control State Characters to be Avoided.

Decimal	Entry	ASCII	Comments
5	^E	ENQ	Used for ENQ/ACK flow control
6	^F	ACL	Used for ENQ/ACK flow control
17	^Q	DC1	Used for XON/XOFF and DC1/DC2
18	^R	DC2	Used for DC1/DC2 flow control
19	^S	DC3	Used for XON/XOFF flow control
27	<ESC>	ESC	Used by VCX services

14. Broadcast Option

If 14<CR> is entered the following menu will be displayed:

1. Accept routine
2. Ignore routine

Enter selection or <CR> to return:

With this menu, you can choose to either accept or ignore routine messages transmitted to the port via the Broadcast Service. If you choose to ignore routine messages, they will "drop" off the line, becoming irretrievable.

15. Apply Changes

To enable the requested settings, enter *15<CR>* The Set Service prompts:

Set your terminal, then enter *<CR>:*

After responding with a <CR> the port implements the requested settings and responds with the screen shown in figure 6-5, indicating the changed parameters.

```
**** Set Terminal Characteristics ****

                         Current                  Requested
 1. Exit
 2. Baud rate            - 9600                   - 9600
 3. Character length     - 8 bits                 - 8 bits
 4. Parity               - None                   - None
 5. Stop bits            - 1 stop bit             - 1 stop bit
 6. Echo                 - CPU & VCX services     - CPU & VCX services
 7. Terminal type        - DEC VT-100/VT-100      - DEC VT-100/VT-100
 8. Device flow control  - XON/XOFF               - XON/XOFF
 9. Port flow control    - XON/XOFF               - XON/XOFF
10. Messages             - All                    - All
11. BREAK key            - Pass through           - Pass through
12. Control state key    - ^A                     - ^A
13. Connect hold key     - ^@                     - ^@
14. Broadcast option     - Ignore routine         - Ignore routine
15. Apply changes

Enter selection:
```

Figure 6-5. Set service main menu

Be sure to set your terminal so that it is compatible with the new settings before you press <CR>. In the example above, if you pressed <CR> without setting your terminal properly, communication between the port and your terminal would be impossible because of incompatible baud rates, parity settings, etc. If this problem occurs, try powering your terminal down, then back up again. If your port is DTR-controlled, this action restores the port to its configured settings. If your port is not DTR-controlled, contact the system administrator for assistance.

Time Service

The Time Service displays the date and time. For example, suppose you are at your terminal on the Boston node at 12:01 AM on January 1, 1989. If you enter:

Connect to: time<CR>

The Time Service responds: with this menu:

Tuesday, 01/01/89 - 00:01:00 EST

and redisplays the connect prompt.

Note: The clock has a battery back-up that will last over five years should the power be disconnected.

TM (Transparent Mode) Service

The TM Service allows unidirectional or bi-directional binary file transfer between connected ports. Transparent communication between ports has several implications:

- The devices at both ends of the connection must use a word length of eight bits.
- Transmitting binary data implies that the local port should not respond to inband flow control (XON/XOFF or DC1/DC2) if these characters appear in the data stream.
- Receiving binary data implies that the remote port should not respond to inband flow control (XON/XOFF or DC1/DC2) if these characters appear in the data stream.
- The control state and connect hold characters cannot be used. Therefore, exiting transparent mode requires a special escape sequence.

To invoke the TM Service:

1. Establish a connection.
2. Enter the control state character.
3. Enter tm<CR>.

The TM Service responds with the menu shown in figure 6-6.

```
***** Transparent Mode *****

Will you receive binary data (y/n)?
```

Figure 6-6. Transparent mode main menu

Enter y<CR> or n<CR>.

The TM Service prompts with figure 6-7.

Enter y<CR> or n<CR>.

If you receive but do not transmit binary data, the local port can still respond to inband flow control. If you transmit but do not receive binary data, the remote port can still respond to inband flow control exerted by the remote device. For

```
***** Transparent Mode *****

Will you transmit binary data (y/n)?
```

Figure 6-7. Transparent mode - binary prompt

high speed file transfers, flow control may be required to prevent data loss by the device receiving the file. If you elect both to send and receive binary data, you disable inband flow control.

The TM Service then prompts:

Enter escape sequence:

The escape sequence allows you to exit transparent mode. The escape sequence should be a character string that is unlikely to occur as a bit pattern in the binary data. The escape sequence can be up to 32 characters long and can contain any character except the command characters <CR> and comma (,). Entering <CR> terminates the escape sequence entry and immediately enables transparent operation. Entering a comma in the escape sequence specifies 0.5 seconds of quiet, in which no data transmission occurs, as part of the escape sequence. You can use multiple commas for longer delays. You can also enter a commas-only escape sequence so that a quiet line terminates TM. The TM Service monitors both transmitted and received data for the escape sequence regardless of the binary transfer direction selected.

Note that the TM Service buffers any data matching characters in the escape sequence until the complete escape sequence occurs or until it finds a mismatch. For example, if you enter the escape sequence fred, the TM Service buffers each occurrence of *f*, waiting to see if the next character will be an *r* If the next character is an *r*, the TM Service buffers the *r*, waiting for an *e*. If, however, the next character is an *x*, the TM Service transmits the buffered *f* and *r*, then the *x*.

For example, if you enter ***,fred <CR>***, when prompt, TM monitors both transmitted and received data for one second of quiet, followed by the characters *fred*, followed by one second of quiet. If these criteria are met, the system displays:

TM service complete [1.10]

and returns you to the control state with the connection still established.

Who Service

The Who Service displays the installation and port names. It also displays the slot and port number. For example, suppose the installation is:

1. Named Acme Balloon Co.- Boston Node.
2. The port is named term.
3. The slot number is 1.
4. And the port number is 1.

If you enter Who:

Connect to: who<CR>

The Who Service responds as shown in figure 6-8 and redisplays the connect prompt.

Notice that the slot number is shown to the left of the slash (\) and the port number is shown to its right.

```
who
Acme Ballon Co. - Boston Node
org    1\1
```

Figure 6-8. Who service main menu

Appendix **A**

Tables, Worksheets, X.3 and X.28 Commands

Introduction EIA RS-232C Interface

The EIA (Electronic Industries Association) Recommended Standard 232C defines the interface between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE). RS-232C signals are named with respect to the DTE. For example, the DTE transmits data at pin 2 and receives data at pin 3. The DCE receives data at pin 2 and transmits at pin 3. RS-232C specifies that logical 0 be represented by a voltage between -5 and -15 volts and that logical 1 be represented by a voltage between +5 and +15 volts. The data lines use negative-true logic. Other signals are positive-true. The pinout data is given in table A-1.

Table A-1. EIA RS-232C Interface Pinouts

Pin	Mnemonic	Circuit	Function
1		AA	Chassis ground
2	TxD	BA	Transmit Data
3	RxD	BB	Receive Data
4	RTS	CA	Request to Send
5	CTS	CB	Clear to Send
6	DSR	CC	Data Set Ready
7		AB	Signal ground
8	DCD	CF	Data Carrier Detect
9			Positive test voltage
10			Negative test voltage
11			Unassigned
12		SCF	Secondary carrier detect

Pin	Mnemonic	Circuit	Function
13		SCB	Secondary clear to send
14		SBA	Secondary transmit data
15	TxC	DB	Transmit Clock
16		SBB	Secondary receive data
17	RxC	DD	Receive Clock
18			Unassigned
19		SCA	Secondary request to send
20	DTR	CD	Data Transmit Ready
21		CG	Signal quality detect
22	RI	CE	Ring indicator
23		CH/CI	Data rate detect (DTE/DCE)
24		DA	External transmit clock
25			Unassigned

ASCII Code Chart

Table A-2. ASCII Code Chart With Definitions

DEC	HEX	Entry	ASCII	Definition
0	0	^@	NUL	Null
1	1	^A	SOH	Start of header
2	2	^B	STX	Start of text
3	3	^C	ETX	End of text
4	4	^D	EOT	End of transmission
5	5	^E	ENQ	End of transmission
6	6	^F	ACK	Acknowledge
7	7	^G	BEL	Bell
8	8	^H	BS	Backspace
9	9	^I	HT	Horizontal tab
10	A	^J	LF	Line feed
11	B	^K	VT	Vertical tab
12	C	^L	FF	Form feed
13	D	^M	CR	Carriage return
14	E	^N	SO	Shift out
15	F	^O	SI	Shift in
16	10	^P	DLE	Data link escape
17	11	^Q	DC1	Device control 1 (XON)
18	12	^R	DC2	Device control 2
19	13	^S	DC3	Device control 3 (XOFF)
20	14	^T	DC4	Device control 4
21	15	^U	NAK	Negative acknowledge

DEC	HEX	Entry	ASCII	Definition
22	16	^V	SYN	Synchronous idle
23	17	^W	ETB	End of transmission block
24	18	^X	CAN	Cancel
25	19	^Y	EM	End of medium
26	1A	^Z	SUB	Substitute
27	1B	^[	ESC	Escape
28	1C	^\	FS	File separator
29	1D	^]	GS	Group separator
30	1E	^^	RS	Record separator
31	1F	^–	US	Unit separator
32	20	Spacebar	SP	Space
33	21	!	!	Exclamation mark
34	22	“	”	Double quotation mark
35	23	#	#	Pound sign
36	24	$	$	Dollar sign
37	25	%	%	Percentage sign
38	26	&	&	Ampersand
39	27	’	'	Single quote
40	28	(	(	Open parenthesis
41	29	)	)	Close parenthesis
42	2A	*	*	Asterisk
43	2B	+	+	Plus sign
44	2C	,	,	Comma
45	2D	-	-	Hyphen
46	2E	.	.	Period
47	2F	/	/	Slash

DEC	HEX	Entry	ASCII	Definition
48	30	0	0	Zero
49	31	1	1	One
50	32	2	2	Two
51	33	3	3	Three
52	34	4	4	Four
53	35	5	5	Five
54	36	6	6	Six
55	37	7	7	Seven
56	38	8	8	Eight
57	39	9	9	Nine
58	3A	:	:	Colon
59	3B	;	;	Semicolon
60	3C	<	<	Open angle bracket
61	3D	=	=	Equal sign
62	3E	>	>	Close angle bracket
63	3F	?	?	Interrogation mark
64	40	@	@	At sign
65	41	A	A	Upper-case A
66	42	B	B	Upper-case B
67	43	C	C	Upper-case C
68	44	D	D	Upper-case D
69	45	E	E	Upper-case E
70	46	F	F	Upper-case F
71	47	G	G	Upper-case G
72	48	H	H	Upper-case H
73	49	I	I	Upper-case I
74	4A	J	J	Upper-case J

DEC	HEX	Entry	ASCII	Definition
75	4B	K	K	Upper-case K
76	4C	L	L	Upper-case L
77	4D	M	M	Upper-case M
78	4E	N	N	Upper-case N
79	4F	O	O	Upper-case O
80	50	P	P	Upper-case P
81	51	Q	Q	Upper-case Q
82	52	R	R	Upper-case R
83	53	S	S	Upper-case S
84	54	T	T	Upper-case T
85	55	U	U	Upper-case U
86	56	V	V	Upper-case V
87	57	W	W	Upper-case W
88	58	X	X	Upper-case X
89	59	Y	Y	Upper-case Y
90	5A	Z	Z	Upper-case Z
91	5B	[	[	Open square bracket
92	5C	\	\	Backslash
93	5D	]	]	Close square bracket
94	5E	^	^^	Caret
95	5F	—	—	Underscore
96	60	’	’	Back tick
97	61	a	a	Lower-case a
98	62	b	b	Lower-case b
99	63	c	c	Lower-case c
100	64	d	d	Lower-case d
101	65	e	e	Lower-case e

DEC	HEX	Entry	ASCII	Definition
102	66	f	f	Lower-case f
103	67	g	g	Lower-case g
104	68	h	h	Lower-case h
105	69	i	i	Lower-case i
106	6A	j	j	Lower-case j
107	6B	k	k	Lower-case k
108	6C	l	l	Lower-case l
109	6D	m	m	Lower-case m
110	6E	n	n	Lower-case n
111	6F	o	o	Lower-case o
112	70	p	p	Lower-case p
113	71	q	q	Lower-case q
114	72	r	r	Lower-case r
115	73	s	s	Lower-case s
116	74	t	t	Lower-case t
117	75	u	u	Lower-case u
118	76	v	v	Lower-case v
119	77	w	w	Lower-case w
120	78	x	x	Lower-case x
121	79	y	y	Lower-case y
122	7A	z	z	Lower-case z
123	7B	{	{	Open brace
124	7C	|	|	Vertical bar
125	7D	}	}	Close brace
126	7E	~	~	Tilde
127	7F	DEL	DEL	Delete/rubout

Equipment/Cabling List

Network/Node	
Equipment Type/Serial No.	
Site	

Card Type **Cabling/Equipment Description**

Table A–3. Global Configuration Parameter Form

Network/Node	
Equipment Type/Serial No.	
Configuration name	
Description	
Installation name	
Connect prompt	
Default access rights	
Logging port	
Logging card	
Binary output logging mask	
Modem network manager port	
IOK log timer	
Addr	
Node name	
User list name	
Local time zone	
Local time when it is midnight	
Greenwich Mean Time	
Date display format	
BPE alarm threshold	
Queue length threshold	

Table A–4. Controlled Services Form

Service name	Password	Access	Service name	Password	Access
AB			Perform		
Broadcast			Print		
Busy			Reset		
Configure			Rev		
Diag			Settime		
Forward			Status		
Greeting					
Load/dump					
Log					

Table A–5. Worksheet For An Asynchronous Line

Network/Node	
Equipment Type/Serial No.	
Answer access rights	
Answer attachment string	
Answer detachment string	
Answer disconnect string	
Attachment control	
Attachment text name	
Auto connect to	
Baud rate	
Break key	
Channel priority	
Character length	
Confirm connections	
Control state character	
Detach after disconnect	
Device flow control	
Echo	
Hold character	
Ignore routine broadcasts	
Login required	
Messages	
Number of stop bits	
Originate access rights	
Originate attachment string	
Originate detachment string	
Parity	
Port flow control	
Port name	
Starting/port to Ending/port	
Terminal type	
Timeout	

Table A–6. Worksheet For A Trunk Line

Network/Node	
Equipment Type/Serial No.	
Trunk name	
Range/port	
Port view clocking	
Baud rate	
Virtual circuits	
Multiplexing protocol	
Login required	
Trunk timeout	
Utilization threshold	
Retransmission threshold	
Statistics logging timer	
Answer access rights	
Password override	
Password	
Originate access rights	

Table A–7. Worksheet For An X.25 TRUNK

Network/Node	
Equipment Type/Serial No.	
Trunk name	
Range/port	
Port view, clocking	
Baud rate	
Network ID	
Network address	
Login required	
X.25 DTE or DCE	
Link window size	
Frame response timer	
Max retransmissions	
Link idle polling	
# incoming LCNs	
first incoming LCN	
# bothway LCNs	
first bothway LCN	
# outgoing LCNs	
first outgoing LCN	
Packet size	
Packet window size	
Restart timer	
Call request timer	
Accept reverse charging	
Reverse charges on calls	
Make high priority calls	
Utilization threshold	

Table A–8. A Form Which May Be Used for Other Names

Network/Node		
Equipment Type/ Serial No.		
Name	**Name type**	**Description**

Note: A port configuration chart and a multi-card configuration sheet, which may be photocopied, appear at the end of this appendix.

X.3 Parameters

Table A-9. X.3 Parameters

Ref	Name	Values	Description
1	PAD recall	0	Escape to Command Mode is not possible.
		1	Terminal can escape to the PAD command mode using CNTRL-P (DLE).
		32-126	Terminal can escape to the PAD command mode using this character.
2	Echo	0	PAD does not echo.
		1	PAD echos.
3	Selection of data forwarding characters	0	No data forwarding character.
		2	Forward on CR.
		6	Forward on CR, ESC, BEL, ENQ, ACK
		18	Forward on CR, EOT, ETX
		126	Forward on all control characters including DEL.
4	Selection of idle timer	0	Idle timer disabled.
		1-253, 255	The value of the idle timer in 20ths of a second. A partially filled packet will be forwarded if nothing is received from the terminal for this period of time.
		254	Disable X.29 set packet forwarding
5	PAD to terminal flow control	0	No use of flow control.
		1, 2	Flow control is ON (type XON/XOFF, CTS, ENQ/ACK, etc. is determined by the port parameters on ALC cards).
6	Control of service signals	0	PAD messages are suppressed.
		1	PAD messages are sent to terminal.
		5	The PAD's messages and prompts are allowed.

Ref	Name	Values	Description
7	PAD action on receipt of BREAK from terminal	0	Do nothing.
		1	Send Interrupt packet on receipt of BREAK from terminal
		2	Send Reset Request packet.
		5	Send Interrupt and Indication of Break packet
		8	Escape to PAD command mode.
		21	Interrupt and flush: Change parameter 8 to value 1, send Interrupt packet, and send Indication of BREAK packet.
8	Discard Output	0	Normal Data delivery.
		1	Discard output destined for terminal.
9	Padding after CR	0	No padding.
		1-80	Send the specified number of nul characters to terminal after sending CR.
10	Line folding	0	No line folding.
		1-253, 255	The number of graphic characters which will fit on a line. The PAD counts all characters following a CR and will insert CR and LF characters if the count exceeds this value. Non-printing characters are not counted. BS decrements the count.

Ref	Name	Values	Description
11	Binary speed (baud rate) a read-only parameter	5	75 baud
		11	75/1200 baud
		0	110 baud
		1	134.5 baud
		6	150 baud
		2	300 baud
		4	600 baud
		3	1200 baud
		7	1800 baud
		12	2400 baud
		13	4800 baud
		14	9600 baud
		15	19.2K baud
12	Terminal to PAD flow control	0	No use of flow control
		1	Flow Control is ON (type XON/XOFF, CTS, ENQ/ACK, is determined by port parameters on ALC cards).
13	LF insertion after CR	0	No line feed insertion.
		1	Insert LF after each CR sent to terminal from receive packet.
		2	Insert LF into packet to be transmitted after each CR received.
		3	Both 1 and 2 above.
		4	Insert LF after each CR echoed by the PAD.
		5	Both 1 and 4 above.
		6	Both 2 and 4 above.
		7	1, 2 and 4 above.

Ref	Name	Values	Description
14	Padding after LF	0	No padding.
		1-253, 255	Send the specified number of NUL characters after each LF to the terminal.
15	Editing	0	Editing is not used.
		1	The idle timer (parameter) is disabled; the user at terminal can make corrections and display the ending buffer which contains the characters which will be sent out in a packet to the remote terminal when a forwarding character (see parameter 3) is finally received. Characters used for corrections and to cause a display are defined by the following parameters:
16	Character delete	0-127 (Any ASCII char except NUL)	The character which when received with parameter 15 set to 1 deletes the preceding character in the buffer.
17	Line delete	0-127 (Any ASCII char except NUL)	The character which when received with parameter 15 set to 1 deletes all the characters in the buffer.
18	Line display	0-127 (Any ASCII char except NUL)	The character which when received with parameter 15 set to 1 displays the buffer and leaves the cursor ready to accept the next new character.

Ref	Name	Values	Description
19	Editing pad service signal	0	No editing service signals
		1	Editing PAD service signals for printing terminals
		2	Editing PAD service signals for display terminals
		8, 32 - 126	Editing PAD service signals using one character from range of IA5
20	Echo mask (Values may be formed by combin- ation of basic values)	0	No echo Mask
		1.	No echo of CR
		2	No echo of LF
		4	No echo of VT, HT, FF
		8	No echo of BEL, BS
		16	No echo of ESC, ENQ
		32	No echo of ACK, NAK, STX, SOH, EOT, ETB, ETX
		64	No echo of editing characters as designated by parameters 16, 17, 18
		128	No echo of all other characters in column 0 and 1 not mentioned above and DEL
21	Parity treatment	0	No parity checking or generation
22	Page wait	0	Page wait disabled
		1-253, 255	Number of line feed characters considered by the PAD for the Page Wait function

X.28 Commands and Responses

Table A-10. X.28 Commands

X.28 command	VCX command	Description
CON (sp)[facilities] .[address] .[call user data] OR C(sp)[facilities] .[address] .[call user data]		Facilities are optional. When two or more are specified they are separated with a period (.). All combinations are valid "cxxxxx" is throughput class negotiation. Valid choices are 75, 150, 300, 600,1200, 2400, 4800, 9600 or 19200 "axx" is subaddress identification. Valid values are 00 through 99. It is appended to the calling address specified in the main X25 menu "f" is included if fast select is desired. 'pxxx' is included when the packet size is to be negotiated. XXX becomes128 "r"256. "r" is included to place a reverse charge call. "u" is included to convert all data in the called user data field to uppercase. "tx" specifies a particular Terminal Pad Profile where x is the Pad's number; a value between 1 - 4. If "tx" is omitted, then TPAD Profile 1 will be used by default.

X.28 command	VCX command	Description
		(Continued) "wx" is included to negotiate window size.x is a single digit from the range 1 - 7. The address field is numeric and contains up to 15 digits representing the destination address. The call user data field defines the data to be included in a call request packet. Normal data packets can have up to 12 characters. Fast select calls can have up to 128 characters.
CLR	CLEAR	Clears an established connection.
INT	INTERRUPT	Sends an Interrupt packet.
PAR?		Causes all local parameters and their values to be displayed.
PAR? p1,p2		Causes the specified parameters and their values to be displayed.
RESET		Sends a Reset packet.
SET p1:n1,p2:n2		Changes the specified parameters to the specified values. If none are,specified, all are reset to the defaults.
SET? p1:n1,p2:n2		Same as SET but the parameters and their values are printed out for visual confirmation after they are changed.

X.28 command	VCX command	Description
STAT	STATUS	Displays "FREE" when no call is in progress. Displays "ENGAGED" when a connection is in progress.
SET		Resets parameters to their default values.
SET?		Resets parameters to their default values and displays those values.
SET 2:1	ECHO	Enables local echo.
SET 2:0	NOECHO	Disables local echo.
SET 12:1;5:1	FLOW	The terminal can use Flow Control as selected on the ALC to control the flow of data from the PAD and the PAD can use Flow Control as selected on the ALC to control the flow of data from the terminal.
SET 12:0;5:0	NOFLOW	The PAD passes Flow Control characters transparently to and from the destination.
RMCLR		An invitation to CLEAR is sent to the remote destination.
RMPAR? p1,p2, etc.		A request is made to read selected X.3 parameters (p1,p2, etc.) from the remote (p1,p2, etc.) from the remote destination. (SEE NOTE)*
RMPAR?		All eighteen X.3 parameters are requested to be read from the remote destination. (SEE NOTE)*
RMSET p1:nn, p2:mm, etc.		Selected X.3 parameters (p1:nn,p2:mm, etc.) are sent to the remote destination to be implemented at that site.

X.28 command	VCX command	Description
RMSET? p1:nn, p2:mm, etc.		Selected X.3 parameters (p1:nn,p2:mm, etc.) are sent to the remote destination to be implemented at that site. Then, as a 'double check', these same parameters are requested to be read from the remote site. (See note.)

Note:

If these commands are executed before data transfer is complete, some data may be lost.

Table A-11. X.28 Response, VCX Expanded Response,Explanation

X.28 response	VCX expanded response	Explanation
CLR (CNF)	CLEAR CONFIRMED	The call has been terminated at the request of the destination or by the terminal user.
CLR cause 00 (DTE)	REMOTE DTE ORIGINATED?	The call has been terminated, by the destination or by the network with no reason given.
CLR cause 01 (OCC)	NUMBER BUSY	The call can't be completed because the destination is fully engaged with other calls.
CLR cause 03 (INV)	INVALID FACILITY REQUESTED	The call can't be established, because the facilities requested are not available from the network, the called number was improperly formed, or too much data was typed into the CON command.
CLR cause 05 (NC)	NETWORK CONGESTION	The call can't be made because of a network problem.
CLR cause 09 (DER)	DTE IS OUT OF ORDER	The call could not be established because the destination is out of order.

X.28 response	VCX expanded response	Explanation
CLR cause 11 (NA)	ACCESS BARRED	The call can't be completed because the destination will not take calls from your number (access code violation)
CLR cause 13 (NP)	DESTINATION NETWORK ADDRESS IS NOT ASSIGNED	The call can't be made because the number you typed is invalid or is not in service.
CLR cause 17 (RPE)	REMOTE PROC ERR	The call has been terminated or could not be established because an error was detected at the destination.
CLR cause 19 (ERR)	LOCAL PROC ERR	The call has been terminated or could not be established because of an error which has been detected between the PAD (VCX) and the network.
CLR cause 25 (NRC)	REVERSED CHARGING ACCEPTANCE NOT SUBSCRIBED	The call can't be established, because the destination will not accept reverse charges. Place the call again without Reverse charging.
CLR cause 33 (ICD)	INCOMPATIBLE DESTINATION	The call can't be established because the destination is incompatible with the local terminal.

X.28 response	VCX expanded response	Explanation
CLR cause 41 (NFS)	NO FAST SELECT	The call can't be completed because the network or destination will not accept the "called user data".
CLR cause 128 (XIP)	LINK DISCONNECTED	The trunk line is down and unable to communicate with X25.
CLR cause 129 (XIP)	UNRECOGNIZED PKT RCVD	The VCX received an unrecognized or out of context packet from the line.
CLR cause 135 (XIP)	CHAN WENT OUT OF ORDER	The virtual circuit channel, being used for communications, just became inoperative.
CLR cause 136 (XIP)	CALL TIMER EXPIRED	The local timer has expired for call request.
CLR cause 137 (XIP)	BAD LEN CALL, INT, OR DATA PKT MESSAGE SENT TO PKT	An invalid message was sent from the interface level to the packet level and was sent back by the LEVEL packet software.
CLR cause 138 (XIP)	CALL COLLISION	Both a local and remote call were sent simultaneously n the same virtual circuit.

X.28 response	VCX expanded response	Explanation
CLR cause 139 (XIP)	CALL REQ FORMAT ERR	An incorrect format request was sent from the interface level to the packet level and was sent back by the packet software.
CLR cause 144 (XIP)	CLEAR CONF TIMER EXPIRY	Another CLEAR is being sent because the first one was not received.
CLR cause 145 (XIP)	OUTGOING CALLS BARRED	Calls cannot be made to the network but you may be able to receive calls.
CLR cause 147 (XIP)	INV FACILITY IN CLR REQUEST	There was an attempt to set facilities not allowed in CLEAR packets or for a trunk that wasn't configured.
CLR cause 148 (XIP)	CLR CONF FROM INTERFACE HAS INV FACILITY	The facilities specified are invalid within a CLEAR confirmed packet.
CLR cause code: xx [Diag code: xx]		When the VCX doesn't understand the cause code sent by the remote unit, this message will be displayed.

Notes:

1. All CLEAR (CLR) generated messages are preceded by the statement: PAD: CALL CLEARED.

2. VCX internal errors are identified by the code **XIP**.

Table A-12. X.28 Responses Generated by Resets

X.28 Response	VCX expanded response	Explanation
RES cause 00 (DTE)	REMOTE DTE ORIGINATED	Communications were disturbed and data in transit in either direction may have been lost because of a reset by the destination or by the network with no reason given.
S cause 01 (ERR)	DTE IS OUT-OF-ORDER	The destination selected is inoperative.
RES cause 03 (RPE)	REMOTE PROC ERR	An invalid procedure has just been attempted. The error was noted at the remote end.
RES cause 05 (LPE)	LOCAL PROC ERR	An invalid procedure has just been attempted. The error was noted at the local end.
RES cause 17 (ERR)	INCOMPATIBLE DESTINATION	Communications were disturbed and data in transit in either direction may have been lost because of an error detected between the VCX and the network.
RES cause 129 (XIP)	UNRECOGNIZED PKT RCVD	A packet was received but not understood, causing the connection to be reset.

X.28 Response	VCX expanded response	Explanation
RES cause 130 (XIP)	PKT SEQ NO. ERR RCVD	Packets were received in the wrong sequence, causing the connection to be reset.
RES cause 131 (XIP)	INT/CONF SEQ ERR RCVD (LINE)	An interrupt sequence error was noted, causing the connection to be reset.
RES cause 132 (XIP)	OUT OF CONTEXT PKT SENT TO PKT LEVEL	The packet level received a packet it did not ,expect from the interface.
RES cause 133 (XIP)	UNEXPECTED RR/DATA PKT RCVD	The VCX received an unexpected Data Packet or Received Ready (RR) which caused the connection to be reset.
RES cause 134 (XIP)	INT/CONF SEQ ERR (PAD	The sequencing of the interrupt or confirmation packets is in error.
RES cause 137 (XIP)	BAD LEN CALL, INT, OR DATA PKT SENT TO PKT LEVEL	The packet level was sent an interrupt packet, data packet, or call request with a bad length field.
RES cause 143 (XIP)	RESET CONF TIMER EXPIRY	Another RESET is being transmitted because the first one was not received.

X.28 Response	VCX expanded response	Explanation
RES cause code: xx [Diag code: xx]		When the VCX doesn't understand the cause code sent by the remote unit, this message will be displayed.

Notes:

1. All RESET (RES) generated messages are preceded by the statement: **PAD: CALL RESET**.
2. VCX internal errors are identified by the code **XIP**.

Appendix **B**

X.21 - PSTN Information

General

A VCX trunk can be set to run multiplexing protocol, X21 protocol or PSTN protocol. The latter two involve connection to a Public Data Network (PDN) or a Public Switched Telephone Network (PSTN) and are discussed in this appendix. The benefit of switched connection for the trunk is charges only occur when the connection is active.

X.21 (PDN)

PDN circuits are designed for carrying medium speed (9600 bps) synchronous data traffic, with very low error rates. They offer an economical and flexible alternative to leased lines, particularly for low to medium usage.

Auto Direct Call

The implementation of call procedures is confined to Automatic Direct Call (ADC) over a standard V.24 interface. ADC operates by circuitry sensing when there is data flow for the trunk, and translating this into a Call Request. The Call Request is signalled to the PDN which establishes the call routing through an internally stored destination address. At the remote end the PDN signals an incoming call to the attached VCX and following an acceptable response, link setup proceeds. Transparent link operation is then achieved and the data transfer phase will exist until clear down. The Call Request-to-Data-Transfer-state-time, will typically be 0.1 seconds, which is imperceptible to the user.

Note 1:

Full implementation of the X.21 specification involves storage of a directory of numbers and dialing into the PDN. This feature is not supported by the X.21 software.

Note 2:

In this document and elsewhere X.21" is treated as synonymous with X.21 bis". To be strictly accurate all X.21" references should really be X.21 bis" as the implementation only covers working through a V.24/RS-232C interface.

Operational Details

When a VCX in the X.21 mode is operating over a switched circuit link, it appears as though it was connected via a direct link. The following X.21 features and operating specifications are supported:

- Receive Incoming Call
- Initiate Outgoing Call
- Remote (Network DCE) Cleardown
- Local (No activity)
- Cleardown Automatic Retry
- Retrycounter Overflow

Receive Incoming Calls

When in the Idle state, RI (Ring Indicate - pin 22) becomes active, VCX will turn on DTR (Data Terminal Ready - pin 20) to accept the call. It will then wait for DSR and CTS to come on before attempting synchronization and entering the Data Transfer state.

Initiate Outgoing Calls

When in the Idle state, and data for the link is detected, VCX will assert DTR and start a 6 second Call Request timer. If the Call Request timer expires without the VCX seeing DSR and CTS go high, the VCX will enter the retry loop. When DSR and CTS are asserted, the VCX will proceed and establish synchronization with the remote VCX.

Remote (Network DCE) Cleardown

When in the Data Transfer state, and either CTS or DSR drop, the VCX will Drop DTR to confirm the network clearing, and enter the Idle state. If the VCX still has data to send it will enter the retry loop.

Automatic Retry

When in the Data Transfer state, no data is detected for a period of 10 seconds (after the initial minimum 10 seconds), then VCX will issue a Clear Request by dropping DTR and entering the Idle state. Any virtual circuits established across the link will be maintained. When subsequent data is sensed, VCX will enter the Call Request state, and upon successful link setup will continue to pass data to the same virtual circuit.

When attempting a call setup and the Call Request timer expires (2 seconds), the VCX will drop DTR and wait for a random time between 1 and 19 seconds, before re-attempting the Call Request. The purpose of waiting a random period is to minimize the possibility of Call Request collisions from both ends of the link.

Retry Counter Overflow

When the VCX is unable to establish a link within 3 attempts, it will stop trying, flash the SYNC light and declare the link down. It will also break down any virtual circuits made and tell any connected users that the requested port is out of service. Subsequent user attempts to connect across the link will result in a message saying that the requested port is out of service. This condition will be reset by an incoming call, or by resetting the trunk/unit.

Timer Settings (X.21)

Timer settings for X.21 are given in table B-1.

Table B-1. Timer Settings for X.21.

Parameter	Timer setting
Call request:	6 seconds
Call collision backoff timer:	Random at 1, 5, 9, or 13 seconds
Minimum call duration:	10 seconds
Inactivity timeout:	10 seconds
Maximum Number of retries:	3 attempts (2 retries)

Configuration

The X.21 interface should be configured as a trunk line and normally set to DTE, supplies no clock and operate with a baud rate of 9600 bps.

X.21 PSTN

An alternative interface selection is available which will enable VCX to be used across the PSTN with a pair of V.32 modems.

PSTN software provides the capability to have VCX control a pair of V.32 modems, allowing them to initiate and answer calls, totally transparent to the user. This allows users who do not need to access the remote end very often, to have transparent access to the remote ports without the expense of a leased line or X21. Local switching between ports may be accomplished without dialing across the PSTN, therefore not incurring any call charges.

Operational Details

When data for the trunk is sensed, the local VCX will raise DTR, causing the local modem to dial the number stored manually (through the front panel pushbutton switches). When the remote V32 detects the ringing signal, it will raise RI on its interface. When the remote VCX senses RI raised, it raises DTR, enabling the V.32 modem to answer the call. The two VCX's will then synchronize and are ready for data transfer.

VCX will wait 1 min from asserting DTR to handshake completion, prior to entering the Data Transfer phase. The line will be maintained until there has been no data flow for 5 minutes, after which time DTR will be dropped and the VCX will go back to Idle state. Any virtual circuits made across the link will be maintained and data flow will continue as necessary following subsequent link setups.

Timer Settings (PSTN)

Timer settings for PSTN are given in table B-2.

Table B-2. X.21 PSTN Timer Settings

Parameter	Timer Setting
Call request:	90 seconds
Call collision backoff timer	Random, 1, 31, 61, 91, 121 seconds
Minimum Call Duration:	5 Minutes
Inactivity timeout:	5 minutes
Maximum number of retries:	3 attempts (2 retries)

Configuration

The VCX trunk interface should be configured as DTE, supplies no clocks and have a baud rate of 9600 bps. The V.32 modems should be powered up and configured by selecting the "2-Wire Dial (Dumb)" Quick Setup. (See V.32 manual for more details.) Use the front panel pushbuttons and LCD to select the following option settings:

Data type:	Set to SYNC
Dialer:	Set to DTR
CTS (EIA) setups:	Set to Normal (Norm)
Phone screen:	Store remote modem phone number

Trunk Cable/Pinouts

The trunk for X21 or PSTN operation requires a DB25 male-to-DB25 male cable (part number 16D166A11-01). Cable pinouts are shown in Figure B-1.

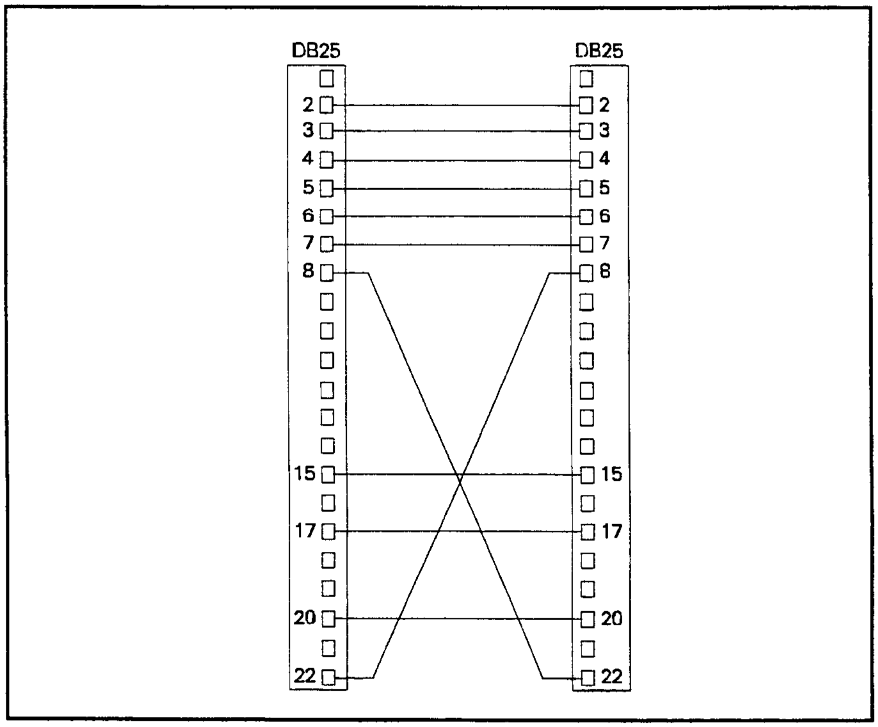


Figure B-1. X21 Trunk Cable pinouts

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