(Ether/Mono/Ring FRADs and Webrouter) Installation Guide

A companion to the FRAD Reference Guide

FASTCOMM

Document History

FRAD Installation Guide
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REVISION LEVEL	SOFTWARE RELEASE	PUBLICATION DATE	CHANGES
A	4.0.2	December '95	Original Installation Guide for FRADs.
B	4.0.2	March 1996	Updated section references in flow charts.
C	4.3.3A	January 1999	Incorporated "procedure" approach to content; reformatted book. Added T-1/E1. Auto detection of CSU/DSU, Logical Ports, Global Paths.
D	5.0.3A	June 2000	Update includes addition of all addendums (1-3), menu updates, bug correction and feature additions to bring document up to current software version level.

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Publication Notice

This manual contains information intended for use by operators and technicians to assist with the software and hardware configuration of FastComm products.

The manual has been carefully compiled and checked for accuracy. The information in the manual does not, however, constitute a warranty of performance. FastComm Communications Corporation reserves the right to revise the contents of this manual at any time without notice. Further, FastComm Communications Corporation assumes no liability for losses incurred as a result of any out-of-date or incorrect information this manual might contain.

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Getting Parts, Product Support, & Information

To order parts, obtain a current price list, or to speak to a representative or Product Support technician, please contact FastComm Communications Corporation at our Corporate Headquarters in Virginia. If you have questions or comments concerning this product, please contact FastComm Communications Corporation at the following address or phone number:

Corporate Headquarters:
FastComm Communications
45472 Holiday Drive
Dulles, VA 20166
Tel: 703-318-7750
Fax: 703-787-4625
Support Phone: 703-318-4350
E-mail: Support@Fastcomm.com

Safety Standards

US & International

This equipment has been tested and verified to comply with CSA950, UL-1950 and EN60950 safety requirements.

Symbol Definitions

Below are definitions of symbols used throughout the technical manuals.

Indicates that the network connection is network approved for use in the European Community (CE).

International CAUTION symbol. Advises the user to look for CAUTION information pertaining to the task being discussed.

International ELECTRIC SHOCK HAZARD symbol. Advises the user that opening a unit while connected to power or while connected to the network may present a shock hazard.

Safety Information

Caution! **If the unit is connected to an Electrical Outlet that has been incorrectly connected to the building wiring, serious shock could result.**

WARNING! **Use only with a CSA certified and UL listed Class 2 transformer with an output rated at 20-24V AC, 20 VA.**

WARNING! **This equipment, if not installed and used properly, may cause interference to radio and television reception. Although the unit complies with Class B limits, there is no guarantee that interference will not occur. If interference to reception occurs, which can be determined by turning the unit off and on, the following measures can be taken to attempt to correct the problem:**

- Reorient the receiving antenna
- Relocate the equipment with respect to the receiver
- Move the equipment away from the receiver
- Plug the equipment into a different outlet so that it is on a different branch circuit from the receiver

The equipment manufacturer is not responsible for correcting interference.

Regulations

US: FCC Regulations

This equipment has been approved by the Federal Communications Commission (FCC) as not being harmful to the telephone network when connected directly to the telephone lines. Customers must, upon request from the telephone company, provide the necessary information from the table below to the telephone company.

FCC Approval Information for F9x00-D Models

FCC Registration Numbers: EMSUSA-23144-DE-N

Universal Service Order Code (USOC): RJ-48S (RJ-11C modem units only)

Facility Interface Codes (FIC); 04DU5-56, 04DU5-64

(02LS2 .8B modem units only)

Service Order Code: 9.0F, 6.0F

Ringer Equivalent Number (REN): .8B (modem units only)

FCC Approval Information for F9x00-T Models

Federal Registration Numbers: EMSUSA-23144-DE-N

Universal Service Order Code (USOC): RJ-48C

Facility Interface Codes (FIC): 04DU9-DN, 04DU9-1SN

Service Order Code: 6.0F

Ringer Equivalent Number (REN): N/A

FCC Approval Information for F9x00 Models with ISDN U BRI

FCC Registration Numbers: EMSUSA-32377-DE-N

Facility Interface Codes (FIC): 021S5

Service Order Code: 6.0N

Ringer Equivalent Number (REN): N/A

WARNING! You cannot connect the S/T connection to the ISDN network directly. The S/T connection must be connected to an NT-1 device, which should be supplied by the service provider. Failure to do this may result in damage to the equipment. The T1 interface has DSX functionality and, if installed as DSX, must be installed behind a Part 68 registered CSU/DSU.

The FCC registration number can be found on the product label, located on the bottom of the unit. The Ringer Equivalency Number (REN) determines the maximum number of devices that can be connected to your local telephone line and still ring properly when your number is called. In most but not all areas, the sum of the RENs for all devices connected should not exceed five (5). For more specific information concerning connection requirements, contact your local telephone company.

If any of your telephone equipment causes harm to the telephone network, the telephone company may temporarily discontinue service to your lines. If possible and practical, the company notifies you in advance. If not, the company notifies you as soon as possible. With the notification, you are advised of your right to complain to the FCC.

The telephone company may make changes to its facilities, equipment, operations and procedures which could affect the operation of your equipment. Before these changes are made, the telephone company will provide advance notice that communications service will be interrupted.

FCC regulations prohibit the connection of customer-provided equipment to coin services (central office implemented systems). Connection to party lines is subject to tariffs; contact your state public service commission for information.

This unit has been verified to meet the requirements for a Class A or Class B computing device (depending on the model you have) pursuant to Subpart J Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses and can radiate radio frequency energy which may cause harmful interference to radio communications. Operation of Class A devices in a residential area is likely to cause harmful radio interference to televisions, radios, computers, etc. If it does, the user is required to correct the interference at the user's expense. See Safety Information, in this chapter, if interference to reception is suspected.

See the label on the bottom of the unit to determine whether it is classified as Class A or Class B. In order to comply with Class B requirements, you must use FastComm data cables or cables made with equivalent specifications.

Canada: Communications Regulations

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network requirements for protection, operation and safety. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing the equipment, users should seek permission to be connected to local telecommunications company facilities. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

The standard connecting arrangement code for a DDS DSU/CSU is CA 48S.

The standard connecting arrangement code for a DDS-SC DSU/CSU is CA 81A.

The standard connecting arrangement code for T1 is CA 48C.

The standard connecting arrangement code for ISDN is CA-A11.

Repair to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any equipment repair or alterations made by the user or equipment malfunctions may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Ringer Equivalence Number (REN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device to prevent overloading. The termination of a loop may consist of any combination of devices subject only to the requirement that the total REN of all devices does not exceed 5.

The REN for both F9100 and F9200 is 0.3 for units with 33.6 modems.

This Digital apparatus does not exceed the requirements for Class A limits for emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Product Warranty

FastComm Communications Corporation

FastComm warrants that the Product shall be free from defects in material and workmanship for a period of twelve (12) months from the date of shipment to the end user, or fifteen (15) months from date of manufacture, whichever is shorter. Proof of delivery may be required prior to warranty repair.

FastComm's liability shall be limited to either repair or replacement of the defective product, at FastComm's option.

FastComm shall incur no obligation under this warranty if (1) the allegedly defective goods are not returned to FastComm within 30 days of the discovery of the alleged defect, or (2) if FastComm's verifiable tests disclose that the alleged defect is not due to defects in material or workmanship.

FASTCOMM MAKES NO EXPRESS OR IMPLIED WARRANTIES REGARDING THE QUALITY, MERCHANTABILITY, OR FITNESS OF THE PRODUCT FOR A PARTICULAR PURPOSE. FASTCOMM SHALL NOT BE RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE DAMAGES, INCLUDING, BUT NOT LIMITED TO LOSS OF PROFITS, OR DAMAGES TO BUSINESS OR BUSINESS RELATIONS. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

FastComm will process requests for the repair of products sold pursuant to this agreement according to the following policy:

No Product will be returned without prior authorization.

All requests for return of Product should be made to FastComm. FastComm's Technical Support Administrator will obtain all necessary information from the customer for processing the return and issuing a Return Authorization (RA) number.

Defective Product must be returned in static protective material, securely packaged to prevent damage in transit, and shipped prepaid with the RA number written on the outside of the package to:

FastComm Communications Corp
14120-A Sullyfield Circle
Chantilly, VA 20151RA #:_____
Phone: 703-449-6012
Fax: 703-803-2956

FastComm will use commercially reasonable efforts to either repair or, at its option, replace defective Products covered under warranty within fifteen (15) working days of receipt. The warranty period for repaired or replaced Products shall be the remainder of the original warranty or ninety (90) days, whichever is greater. Product will be returned to the customer prepaid via UPS Groundtrac service. Expedited freight is at customer's expense.

Products found to be operable after testing (e.g., no trouble found) according to FastComm's current manufacturing standards will be subject to a bench fee per unit.

FastComm will use commercially reasonable efforts to either repair or replace, at its option, defective Products not covered under warranty, within fifteen (15) working days of receipt. The warranty on serviced Products is ninety (90) days measured from the date of service. Out-of-Warranty repair charges vary according to model and are subject to change without notice.

FastComm will use its best efforts to ship replacement Product within 24 hours of request from the Dealer/Distributor in emergency situations. The Dealer/Distributor must contact FastComm within thirty (30) days of receipt of defective Product to initiate (D.O.A) advance replacement procedures.

Overnight and express shipments from FastComm to the customer will be at the customer's expense.

Service Policy

FastComm Communications Corporation provides technical assistance for all FastComm products. *FastComm's Technical Support Department can be reached by calling 703-449-6464*. When the call is answered, the Administrator will request the following information:

- Customer Name
- Customer Location
- Distributor Name and point-of-contact
- Telephone Number
- Equipment Description
- Problem

Repair Policy

In the event that repairs to the equipment are required, you must obtain a Return Authorization number (RA) from FastComm in order to return the equipment to the factory. The RA can be obtained by phone, fax or letter by contacting the Repair Department at the following address:

FastComm Communications Corporation

Customer Service

14120-A Sullyfield Circle

Chantilly, VA 201651-1627

Tel: 703-449-6012 Fax: 703-803-2956

Return Merchandise Authorization Policy

Please follow these instructions to ensure proper service of your product(s) and customer account.

Return Policy & Procedures

- All returns, including returns for credit, must be shipped freight pre-paid. FastComm will return ship all repairs UPS ground, or a similar service, pre-paid to the customer.
- **All returns MUST display a valid Return Authorization (RA) number on the outside of the package**. Any product returned without an RA number will be refused.
- RA numbers are valid for ninety (90) days from the date of issuance.
- Product returned without accessories (i.e., manual, cables) will be replaced "as new" on request by the Distributor for an additional fee.

Return Policy & Procedures for Credit

In addition to meeting the above criteria for all products, returns for credit must follow these rules:

- All Return for Credit RA numbers are issued by the Accounting Department.
- The model being returned must be a current stocking product.
- To receive credit, all returns must be in new condition with the original box and contents, including cables and manuals.
- The product must be received no later than thirty (30) days from the date of invoice.
- All authorized and acceptable returns, other than those covered by the D.O.A. or Warranty Return Policy (below) will be subject to an inspection and restocking fee.
- All returns for credit must be approved by FastComm's Accounting Department (703-318-4369). This must be coordinated before an RA number will be issued. Equipment returned without a valid RA number will automatically be refused.

D.O.A. and Warranty Return

In addition to meeting the above criteria for all products, D.O.A. and Warranty Returns must follow these rules:

- D.O.A. is defined by the manufacturer as any product which experiences a failure directly out of the factory box or fails within thirty (30) days *from the date of purchase by the distributor*.
- All warranties are for factory repair, not replacement, of the product. This applies to dealers and distributors, as well as direct customers. Equipment meeting the D.O.A. definition as listed in item (A) will be replaced or repaired upon receipt of the defective equipment. All D.O.A. replacements should be coordinated through the distributor.
- At the discretion of the manufacturer, when a product is deemed non-repairable it may be replaced with an equivalent model during the warranty period.
- If a product is deemed to have failed for reasons other than those covered by the warranty, the standard repair charge will be assessed for services rendered to the product. A basic charge will apply when the customer decides not to repair the product.
- If a product is returned for repair and found to be in operating order (i.e., no problem found), a bench charge will be assessed for testing and materials. The Technical Support Department hours are Monday through Friday, 8:30 AM to 6:00 PM (EST). The Support number is 703-318-4350. Contact the FastComm salesperson for your account/region to order replacement power supplies, firmware upgrades and like items.

How to Use this Book

This book has been organized, bookmarked, and indexed to help you find the information you need as quickly as possible. Its content has also been cross-referenced extensively to provide you with speedy access to additional information on the referenced material. Below is a description of how the content of the book is organized and tips on using hyperlinks in the online version.

If you have suggestions on how to improve this manual, or if you have any comments about the content of this book, please contact the Technical Publications Department at (703) 318-4309.

Contents

The book should be used in conjunction with the Ether/Mono/Ring FRAD and Web.router Reference Guide. This book uses a functional approach to content, describing the entire process of configuring ports and routing schemes, monitoring, system administration, and remote management. The book's content is organized as follows:

The book begins with a notice of FCC regulations, a set of safety guidelines, warranty information, and the return policy.

The Installation and Testing chapter carries you through the basic process for planning your network, installing and cabling the equipment, testing back-to-back, and monitoring statistics during set up. This chapter also discusses how to quickly configure units for initial connectivity; how to configure internal CSU/DSUs; and how to set up a Cypress Chassis and Distributed Routing System, should any of these last three options apply to you.

The Getting Familiar with the System chapter describes how to use passwords and navigate the menu system, while explaining basic concepts such as the use of port types.

The Specification and Pinouts appendices provide tecnical information such as environmental concerns and cable pinouts.

The Sample Network Applications chapter provides a sample network diagram along with completed port and routing configurations.

Online Documentation

Using Bookmarks

When you open the book through Adobe Acrobat Reader™ 3.0, you can view a list of Bookmarks, which outline of the book's main topics. If you click on an arrow in the Bookmark list, you can display additional sub-topics for that heading. When you click on a topic in the Bookmark list, you are automatically taken to the first page of that section within the book. The Bookmarks remain on the side of the open page so you can quickly jump from one topic to another without ever closing the book.

Using Entries in the Contents, List of Illustrations, & Index

All entries in the Table of Contents, List of Illustrations, and Index are hyperlinked to their respective reference points within the text. If you move the cursor over the entry until it turns into a hand figure with a pointing finger, and then click, you will be taken to the place within the text where that topic or illustration is discussed.

Using Cross-References

When you see a blue, underlined title or step number within the text of the book, you can click on it and automatically be taken to related material.

Using Headers & Footers

- Page Numbers - Throughout the book, you can find the page number at the bottom of the page in the corner.
- Title & Firmware Release Number - On odd-numbered pages, the title of the book appears in the lower left corner, and on even-numbered pages, the release number of the relevant firmware appears in the lower right corner.
- Chapter Name & Main Heading - At the top of each page, you will find the name of the chapter and the title of the top level heading of the section being discussed.

Printed Documentation

Using Entries in the Contents, List of Illustrations, & Index

An extensive Table of Contents, List of Illustrations, and Index have been provided to help you find a given topic quickly and easily. You will notice in the Table of Contents that the sections on port protocol configurations and protocol statistics are listed in alphabetical order, according to the name of the protocol.

Using Cross-References

An underlined title or procedural step number within the text indicates that you can find information in the referenced section that relates to the subject at hand.

Using Headers & Footers

- Page Numbers - Throughout the book, you can find the page number at the bottom of the page in the corner.
- Title & Firmware Release Number - On odd-numbered pages, the title of the book appears in the lower left corner, and on even-numbered pages, the release number of the relevant firmware appears in the lower right corner.

- Chapter Name & Main Heading - At the top of each page, you will find the name of the chapter and the title of the top level heading of the section being discussed.

Additional Documentation

The companion to this book is the FRAD Reference Guide which provides the following chapters:

The Introduction chapter describes the FRAD, Frame Relay, IP, and IPX.

The Getting Started on Configurations chapter discusses the steps you must go through before configuring protocol parameters, such as assigning the unit a name and address or defining a routing path. It discusess the concept of logical ports and describes how hot select one, and it carries you through the steps involved in linking logical ports to phyical ports.

The Configuring Ports and Routing chapters provide procedures on configuring each protocol and port interface and routing functionalities, such as NAT and IP Filtering.

The Monitoring Statistics chapter provides a display of each statistics screen, along with a definition of each field on the screen.

The System Administration, Managing the System Remotely, and Downloading & Upgrading Software chapters offer procedures for performing the administrative tasks within the system, such as copying configurations or downloading firmware, and provide useful information and procedures for using using Telnet, SNMP, and ICMP.

A full Glossary and complete Index is also provided.

Documentation Conventions

The following conventions are used throughout the manual:

CONVENTION	DESCRIPTION
Small bold text	Represents the text and numerals that are displayed on the unit's screens.
Step 1	Used before steps in a procedure.
1a	Used before a step in a procedure when a numbered procedural step is broken into sub-steps.
***CONFIGURATION MENU*.**	Used at the beginning of a procedural step to introduce the name of the menu or field that is being defined or discussed in this step.
STARTING PATH . . .	Specifies the path you must take to reach a particular menu option.
Section 5.12, IP RIP	Denotes a cross-reference to a related topic.
!! Caution	Alerts you to situations in which you can cause minor damage to configurations, data, or equipment.
Warning	Alerts you to situations in which you can cause serious damage to data or equipment, or that can cause bodily harm.
NOTE	Represents additional information that you may need to complete your task. May also say *FOR EXAMPLE, HELPFUL HINTS, TROUBLESHOOTING TIP,* and *IMPORTANT*.

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1 Introduction

Welcome to the world of Frame Relay networking. With your new Frame Relay Access Device (FRAD) you can now access this cost-efficient and high-performance networking service. The FRAD family includes the EtherFRAD™, MonoFRAD™, RingFRAD™ and web.router™, models, which come with a variety of features and options. This guide, in addition to describing Frame Relay and many other networking principles, provides detailed information on the installation, configuration and operation of these products.

1.1 Features

These models, that can be expanded or upgraded in the field, provide many convenient features:

1. Optional LAN-only protocol suite consisting of Frame Relay, PPP, SLIP and Telnet Terminal (IP and IPX on the EtherFRADs) with SNMP capability.
2. PVC management standards: American National Standards Institute (ANSI) T1.617 Annex D, ITU Q.933 Annex A and the Local Management Interface (LMI).
3. Auto-detects DLCIs and management scheme via FastCONNECT™ and FastCONFIG™.
4. Interoperability with other manufacturers' standards-based equipment via Internet Engineering Task Force (IETF) RFC 1294 (which replaces RFC 1490).
5. Auto-detects the IP addresses of connected routers automatically via RIP routing capabilities.
6. Network access via an integral Digital Data Service (DDS) compatible CSU/DSU (DDS connector for use in North America only), T1 CSU/DSU, E1 (G.704 interface) or a Fastick™ serial connector.
7. Software control of clock source (internal clocking or loop-timed clocking) from the network, if purchased with an integral CSU/DSU.
8. Supports RS-232, RS-422, X.21/V.11, and V.35 (with EIA-530 pinout) interfaces (DCE or DTE) on all serial ports.

9 Supports direct Ethernet connection via 10Base-T or AUI (EtherFRAD models only).

10 Routes data over DLCIs according to a physical user port when using encapsulation. Routes specific protocols over DLCs according to protocol addresses.

11 Dedicated local supervisor port with menu-driven interface.

12 Remote configuration and management via Telnet or SNMP, accessed through any IP data stream into the unit.

13 Multiple levels of password protection.

14 Reception and transmission of PING in IP environments.

15 Maintains configuration in non-volatile memory to recover from power outages.

16 Contains Flash memory to allow easy upgrades.

17 Built-in, low-voltage switching power supply for adaptability to 115V a.c. or 230V a.c. sources.

These features permit virtually all data communications equipment to access Frame Relay network services so that users can take advantage of the substantially lower cost and higher performance supplied by Frame Relay technology. In addition, users can extend the useful life of installed applications and equipment that could not otherwise be directly connected to Frame Relay networks.

1.2 What Does a FRAD Do?

Most existing data communications equipment was designed prior to the development of Frame Relay technology and cannot be connected directly to a Frame Relay network. This equipment is referred to as *legacy* equipment, and the older protocols this equipment supports are called *legacy* protocols.

The FRAD provides a cost-efficient means for connecting legacy equipment to a Frame Relay network by “translating” its protocols into a format that can be transmitted over a Frame Relay network. After the unit translates the data, it routes the data across the Frame Relay network to another unit or Frame Relay-compatible device. When it reaches this destination device, the data is normally translated back to the original protocol. The units are capable of supporting most commonly used protocols and many legacy protocols.

The unit can also concentrate and switch multiple sources of Frame Relay traffic simultaneously.

1.3 What is Frame Relay?

Frame Relay is a networking standard used in both public and private networks. A Frame Relay network is a packet-oriented, statistically-multiplexed network providing multiple virtual circuits through a single physical connection. More formally, Frame Relay is a connection-oriented Frame Mode Bearer Service defined within the international standards for Integrated Services Digital Network (ISDN). It is similar in many respects to an X.25 network, but with better performance and lower costs.

The key benefits of Frame Relay are:

- Carries many connections across a single line.
- Shares bandwidth with multiple applications and/or call sessions.
- Handles bursty traffic.
- Has high-speed and low-delay characteristics similar to Time Division Multiplexing (TDM).
- Accesses public Frame Relay services (not based on usage) that are usually lower cost than those for leased lines.

1.4 Using DLCIs for Frame Relay

Because a single physical connection to a Frame Relay network can support a large number of applications or sessions, some method is required to uniquely identify the data flow associated with each application or session. This is done in Frame Relay by way of logical connections or Virtual Circuits (VCs). In Frame Relay, VCs are called Data Link Connections (DLCs). Each DLC has an identifying number, known as a Data Link Connection Identifier (DLCI). This DLCI is used in the Frame Relay packet header as an address for the data contained in the packet.

Although Frame Relay supports switched service that allows connections to be temporarily established, most Frame Relay services (and equipment used to provision the services) implement DLCs as Permanent Virtual Circuits (PVCs), i.e., the connections are preconfigured by the network operator at the time of subscription. Therefore, the same DLCIs must be configured for your unit. It is important to note that a DLCI has local significance only; the other end of a PVC probably has a different DLCI.

For example, two PVCs have been provisioned for a subscriber; one between Site A and Site B, and one between Site A and Site C. The first PVC is assigned a DLCI of 100 at Site A, and a DLCI of 500 at Site B. Therefore, data sent from Site A with a DLCI of 100 is carried over the first PVC to arrive at Site B. Similarly, data sent from Site B must use a DLCI of 500 to arrive at Site A.

The Frame Relay interface standard defines a maximum of 1024 possible DLCIs. Of these, two DLCIs (0 and 1023) have been reserved for signaling, and 30 DLCIs (1 to 15 and 1008 to 1022) have been reserved for future use. That leaves 992 DLCIs (16 to 1007) available for subscriber use on each physical interface to the network.

1.5 Networking Environment

The FRAD can operate in a broad range of communications environments and can support a wide variety of applications. For example:

- Users with IBM equipment using Synchronous Data Link Control (SDLC) protocol can enjoy the benefits of higher speed, greater reliability and substantially reduced line costs inherent in Frame Relay networks.
- Sites with polled protocols such as IBM's Systems Network Architecture (SNA) or Unisys (Burroughs Poll/Select) can also realize the cost/performance benefits of Frame Relay with the added capability of having idle polling sequences filtered from the Frame Relay network. This improves performance while making more bandwidth available for other applications.
- Local Area Network (LAN) users can take advantage of built-in IP and IPX routing which allows the unit to serve as a router. Multi-port units allow legacy applications such as SNA and Asynchronous traffic to be carried along with LAN internetworking traffic through a single Frame Relay network interface.
- Equipment using asynchronous protocols through dial-modems, such as Unix to Unix Copy Program (UUCP), can now be connected through a highly reliable digital Frame Relay interface which can be configured for much higher speeds (up to 115.2 kbps). Significant performance increases are usually the result.
- Users with an investment in X.25 networking equipment have two options. First, they can use X.25 as a network protocol in the unit, assigning VCs to DLCIs to direct data through the network.
- Second, they can replace the actual underlying X.25 network with lower cost, higher performance Frame Relay service by using the unit to maintain an X.25 compatible interface to the terminal equipment (using Annex G capability provided in the unit).

1.6 Encapsulation, Routing, & Protocol Emulation

The FRAD provides three levels of support (encapsulation, routing and protocol emulation) depending on the particular protocol being carried.

1.6.1 Encapsulation

Encapsulation is a method of sending data in a given protocol over a Frame Relay network by adding Frame Relay formatting to the data. Encapsulation works with a wide variety of protocols because the unit is not required to have "knowledge" of the protocol; it is not using any of the information contained in the original protocol to route the information.

To perform encapsulation, the unit:

1. Accepts data from a terminal device,
2. Encapsulates it with a Frame Relay compatible packet header and trailing CRC,
3. Transmits the data over a Frame Relay network, and
4. Removes the Frame Relay envelope at the remote end to result in the original protocol.
5. Encapsulation results in a point-to-point circuit in which data cannot be routed. A multi-port unit can carry several of these point-to-point circuits over a single Frame Relay interface. With encapsulation, the unit determines which PVC to use based on the physical user port carrying the data.

1.6.2 Routing

Routing is another method of relaying data over a Frame Relay network using addresses to determine the destination. For certain protocols, the unit examines the addressing information contained in the original data to determine which PVC is to carry the data. As a result, the unit can emulate multipoint networks by routing information according to the protocol address.

Routing of the following protocols is supported in the unit:

PROTOCOL	COMMENTS
IP (SLIP, PPP, ETHERNET)	Routing by IP address to support meshed LAN environments
IPX (PPP, ETHERNET)	Routing by IPX Network Number to support meshed Novell LAN environments

SDLC/SNA	Routing by SDLC address to emulate multi-drop lines
BURROUGHS POLL/SELECT	Routing by polling address to emulate multi-drop lines
X.25	Routing by X.121 address to emulate a switched X.25 environment
FRAME RELAY	Routing by DLCI to act as a Frame Relay concentrator or Frame Relay switch (feeding Frame Relay streams to other Frame Relay compatible devices)

1.6.3 Protocol Emulation or "Spoofing"

Protocol Emulation or "Spoofing" is a means by which the unit acts as a polling device when relaying traffic. Polled protocols were developed in the late 1960s as a way to use communications lines more efficiently, often using multi-drop architectures. In order to allow multiple devices to relay traffic through a single communications line, one device was configured as a "master" which controlled communications with all other devices on the line (the "slaves"). In this configuration, the master "polls" the slaves to see if they have any data to transmit. The master also selects slaves to receive its information.

The unit supports protocol emulation for SNA environments (simulating PU2 and PU4 devices) and for Burroughs Poll/Select environments by using address routing. This means that the unit simulates the polling process locally before any data is sent to the network. Since much of the polling activity consists of idle polling sequences containing no real data, the unit filters out the idle polls before data is sent across the Frame Relay network. This results in better overall performance (faster polling responses) and more available bandwidth on the network for other applications.

1.7 FRADs and IBM SDLC

Synchronous Data Link Control (SDLC) is the link control protocol used by the majority of IBM and IBM compatible systems in a wide area networking environment. SDLC is a Bit Oriented Protocol (BOP) that includes a frame structure and a link access procedure for establishing, maintaining and closing communications.

The unit can process the IBM SDLC Protocol (as described in IBM document GA27-3093) in four different ways:

1. The Bit Sync Encapsulation option causes the unit to encapsulate all SDLC frames from a given user port within a single pre-configured DLC on the Frame Relay network. This method allows maximum flexibility in that no assumptions are made regarding SDLC. This approach supports SDLC (but not loop mode), High Level Data Link Control (HDLC) or any other BOP which:

~ uses a “7E” flag character as a frame delimiter,

~ includes automatic zero insertion within the data stream to prevent more than six consecutive one bits, and

~ uses a ITU CRC16 redundancy checksum at the end of the frame.

Because there are no internationally accepted standards for encapsulating BOP protocols, a unit must be used on both ends of the connection to ensure compatibility. A F8150 or F8110 Channelized Link Controller can also be used to pass SDLC traffic on multiple DLCs.

2. The SNA 1490 feature is fully standards-based (RFC-1490), ensuring compatibility with any device using the same standard. This routing feature enables the unit to reduce the traffic over Frame Relay by spoofing SDLC supervisory traffic locally. It also allows the unit to extend the seven-hop limitation in the Token Ring architecture by another six hops by terminating each Token Ring connection locally. These six hops are added in the Token Ring network connected to the remote side of the Frame Relay network.

3. SDLC Protocol Emulation supports SDLC Primary to Secondary communications. This approach uses a proprietary transport layer to provide end-to-end data integrity. Each controller on the line uses a separate “transport session” within a DLC. Only information frames and transport related control information are transmitted across the Frame Relay network. Polling sequences are generated and answered locally. This approach also requires a unit at both ends of the PVC.

4. SDLC Routing supports the transport of SDLC frames over Frame Relay DLCIs. SDLC traffic corresponding to the configured controllers are carried as is, over the configured DLCIs. SDLC Routing does not spoof the SDLC traffic. With SDLC Routing, the SDLC controllers of the same SDLC port can be carried over different DLCIs. This is not possible with Bit Sync Encapsulation.

1.8 TCP/IP Environments

FRADs accept both native IP traffic from a direct Ethernet connection and IP data encapsulated in async/sync PPP (RFC 1331) or SLIP (RFC 1055). IP traffic is encapsulated according to the RFC 1490 standard. The encapsulated packets are then routed based on IP addressing. The FRAD has the ability to convert “IP over PPP” to “IP over Frame Relay," which provides non-Frame Relay routers with a means of accessing Frame Relay networks.

ARP Usage

The FRAD supports the Address Resolution Protocol (ARP) on the Ethernet. ARP is an acronym for Address Resolution Protocol. Let’s review how ARP works. When you want to make an IP connection between your host and another, you must specify in the configuration the IP Address of the destination host. However, the unit must also be given the address that is physically encoded on a chip in the destination device. This hardware-encoded address is the Medium Access Control, or MAC, address. The software-configured IP Addresses are mapped to their corresponding hardware-encoded MAC addresses in an ARP Table of addresses.

When you attempt to send data to a given IP address, the unit looks at its ARP Table to find the MAC address associated with that address. If no match is found, the unit broadcasts an ARP Request to the network, asking if any device in the network knows the MAC address for the IP Address you have specified. If your device receives a response (ARP Response) identifying the MAC address that corresponds to the IP Address, your unit enters this information into its ARP Table and initiates the connection you requested.

The updated information in the ARP Table remains intact for a configured number of seconds or minutes. The reason the information is not held indefinitely is that if the chip that holds the MAC address in a given device is replaced with a new chip (and new hardware-encoded MAC address), the ARP Table will be out of date. By dropping entries from the ARP Table every X number of seconds or minutes, the device is forced to constantly update the information.

The unit’s ARP table stores up to 500 entries. Entries are aged and deleted after 20 minutes of inactivity. If the table is full, a new entry is written over the oldest entry.

Inverse ARP Usage

The unit also responds to Inverse ARP requests on the Frame Relay network port per RFC 1293. This means that when an Inverse ARP request is sent to one of the unit’s DLCIs, the unit responds with its configured IP address. The unit does not generate Inverse ARP requests.

1.9 IPX Environments

The unit accepts Novell IPX packets, which it encapsulates first in a PPP format, using Frame Relay encapsulation. As a result, the unit can interoperate with standards-based routers to carry IPX traffic along with IP data. IPX data can be delivered to the unit via an Ethernet interface (on an EtherFRAD) or a PPP interface connecting your PC with a unit serial port that is configured for PPP. (IPX data can be sent through a PC serial port in PPP format instead of through a traditional LAN Network Interface Card.) IPX traffic is routed in the unit according to the Novell Network Number. The unit supports router-to-router communication (RIP and SAP) so that network locations and servers can be learned automatically. SAP messages are cached and filtered to reduce traffic on the Frame Relay network.

2 Installation & Testing

This chapter provides basic information on planning your network, installing units and components, monitoring LEDs, and testing back-to-back.

2.1 Planning

This section provides helpful tips and worksheets to help with planning and the various aspects of your setup.

2.1.1 Worksheets

Before you begin the installation process, make sure you know exactly:

- what your network will look like
- how your model fits into the network
- what equipment, cabling, and tools you must have to install the unit properly

Following is a set of worksheets to help ensure that you have the necessary information and tools to make your installation a smooth one.

NOTE: Some of the information needed to complete the worksheet can be supplied by your service provider.

NETWORK PLANNING CHECKLIST

TRUNK

Network Interface **RS-232** ☐ **RS-422** ☐ **V.35** ☐ **V.11** ☐

RJ-48C ☐ **RJ-48S** ☐

CSU/DSU **56/64** _____ **Serial** _____

T-1 **ESF:** ____ **D4:** ____ **AMI:** ____ **B8ZS:** ____ **PRI:** ____

E-1 **CCS:** ____ **CAS:** ____

Node Number _____ **Node Name** _____

Clock Source _____ **Network Speed** _____

INT _____ **EXT** _____

Frame Relay Protocol **Annex A** _____ **Annex D** _____ **LMI** _____

DLCI _____ **CIR** _____ **Bc** _____ **Be** _____

DLCI _____ **CIR** _____ **Bc** _____ **Be** _____

DLCI _____ **CIR** _____ **Bc** _____ **Be** _____

Circuit Numbers _____ _____ _____ _____

Notes

Passwords & Authorized Password Holders

SUPERVISORY PASSWORD

Default: **fastcomm**

New Password: _____

Authorized User(s) _____ _____

LOCAL PASSWORD

Default: **(No default)**

New Password: _____

Authorized User(s) _____ _____

REMOTE PASSWORD

Default: **(No default)**

New Password: _____

Authorized User(s) _____ _____

2.2 Unpacking Equipment

Parts Checklsit

Series	Unit	Installation Guide	Power Transformer 115v or 230v* 230v requires power cables	Power Cable for 230v transformer	8 Pin Mod Sup Cable	8 Pin Mod - DB-9 Adapter
9100-S						
9100-D					2 per box	
9200-S						
9200-D					2 per box	
9200-T					2 per box	
9200-E					2 per box	

The unit is shipped in a shock absorbing container. If it must be returned for any reason, the original shipping container must be used. Failure to comply may result in voiding the equipment warranty. Inspect all items for damage that may have occurred during shipment. If damage is noted, contact the carrier. If any items are missing, notify us for replacement parts.

Before you start !! Adapter cables may be required to use V.35, X.21/ V.11, and RS-422 on the unit ports. These cables may also be necessary for DSU/CSU network ports and either 10 Base-T or AUI Ethernet ports. Adapter cables can be ordered separately.

2.3 Finding a Permanent Location

Selecting an appropriate location for the unit includes environmental and atmospheric considerations.

The environmental conditions should meet the following criteria:

1 Area must be physically stable, free of excessive shock and vibration

2 Area must be free of excessive dust, corrosive gases or harmful vapors

3 Within the specified limits of temperature and humidity (listed in Appendix A, Specifications, Section A-8, Environmental).

4 Confirm that all cables involved have the proper amount of slack for ease of adjustment and configuration

5 The unit must be in a well lit area with sufficient room around the unit for cabling connections

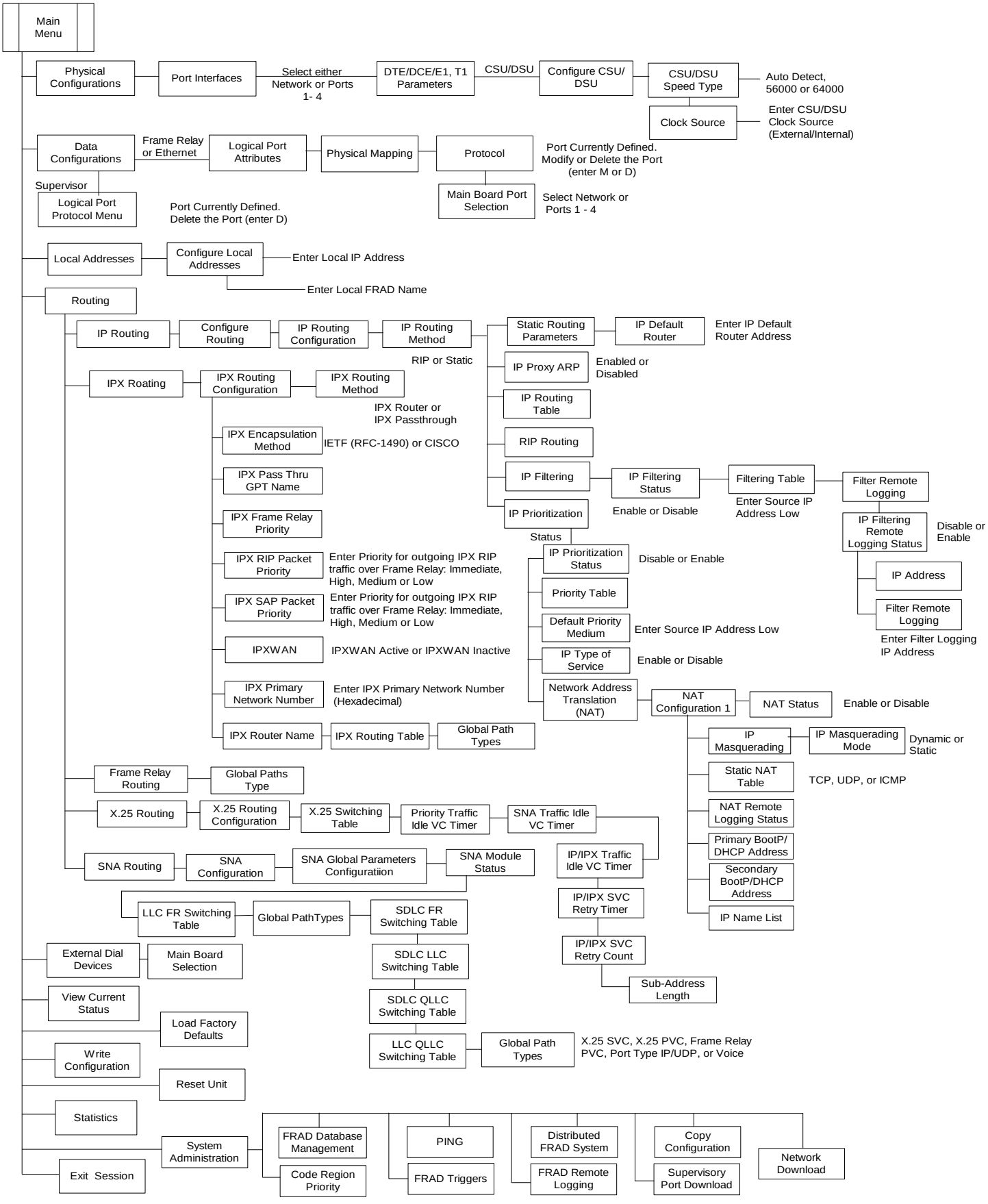
6 To avoid crosstalk, physically separate network and user cables

7 The unit must be near a grounded, unswitched AC/DC outlet and telephone ground bar.

8 The unit must be near a service provider' s network jack and telephone cross connect or punch down board.

2.4 Using the Menu System

Before you start !! To begin configuring the unit after you have powered up for the first time, depress <ENTER> to display the Main Menu. A flow chart of the entire menu system can be found on the following page.


Main Menu
Physical Configurations
Port Interfaces
Select either Network or Ports 1- 4
DTE/DCE/E1, T1 Parameters
CSU/DSU
Configure CSU/ DSU
CSU/DSU Speed Type
Auto Detect, 56000 or 64000
Clock Source
Enter CSU/DSU Clock Source (External/Internal)
Data Configurations
Frame Relay or Ethernet
Logical Port Attributes
Physical Mapping
Protocol
Port Currently Defined. Modify or Delete the Port (enter M or D)
Main Board Port Selection
Select Network or Ports 1 - 4
Supervisor
Logical Port Protocol Menu
Port Currently Defined. Delete the Port (enter D)
Local Addresses
Configure Local Addresses
Enter Local IP Address
Enter Local FRAD Name
Routing
IP Routing
Configure Routing
IP Routing Configuration
IP Routing Method
RIP or Static
Static Routing Parameters
IP Default Router
Enter IP Default Router Address
IP Proxy ARP
Enabled or Disabled
IP Routing Table
RIP Routing
IP Filtering
IP Filtering Status
Enable or Disable
Filtering Table
Enter Source IP Address Low
Filter Remote Logging
IP Filtering Remote Logging Status
Disable or Enable
IP Address
Filter Remote Logging
Enter Filter Logging IP Address
IP Prioritization
Status
IP Prioritization Status
Disable or Enable
Priority Table
Default Priority Medium
Enter Source IP Address Low
IP Type of Service
Enable or Disable
Network Address Translation (NAT)
NAT Configuration 1
NAT Status
Enable or Disable
IP Masquerading
IP Masquerading Mode
Dynamic or Static
Static NAT Table
TCP, UDP, or ICMP
NAT Remote Logging Status
Primary BootP/ DHCP Address
Secondary BootP/DHCP Address
IP Name List
IPX Roating
IPX Routing Configuration
IPX Routing Method
IPX Router or IPX Passthrough
IPX Encapsulation Method
IETF (RFC-1490) or CISCO
IPX Pass Thru GPT Name
IPX Frame Relay Priority
IPX RIP Packet Priority
Enter Priority for outgoing IPX RIP traffic over Frame Relay: Immediate, High, Medium or Low
IPX SAP Packet Priority
Enter Priority for outgoing IPX RIP traffic over Frame Relay: Immediate, High, Medium or Low
IPXWAN
IPXWAN Active or IPXWAN Inactive
IPX Primary Network Number
Enter IPX Primary Network Number (Hexadecimal)
IPX Router Name
IPX Routing Table
Global Path Types
Frame Relay Routing
Global Paths Type
X.25 Routing
X.25 Routing Configuration
X.25 Switching Table
Priority Traffic Idle VC Timer
SNA Traffic Idle VC Timer
IP/IPX Traffic Idle VC Timer
IP/IPX SVC Retry Timer
IP/IPX SVC Retry Count
Sub-Address Length
SNA Routing
SNA Configuration
SNA Global Parameters Configuratiion
SNA Module Status
LLC FR Switching Table
Global PathTypes
SDLC FR Switching Table
SDLC LLC Switching Table
SDLC QLLC Switching Table
LLC QLLC Switching Table
Global Path Types
X.25 SVC, X.25 PVC, Frame Relay PVC, Port Type IP/UDP, or Voice
External Dial Devices
Main Board Selection
View Current Status
Load Factory Defaults
Write Configuration
Reset Unit
Statistics
System Administration
FRAD Database Management
Code Region Priority
PING
FRAD Triggers
Distributed FRAD System
FRAD Remote Logging
Copy Configuration
Supervisory Port Download
Network Download
Exit Session

The Main Menu is the top level of a hierarchy of menus you will use to configure the FRAD. Depending on what modules you have in your unit, the Main Menu may differ slightly from other models. Displayed below are the Main Menus as they would appear in a unit with internal CSU/DSUs and with a unit that has been configured as ISDN with external dial devices.

Main Menu for units that have internal CSU/DSUs:

```
FastComm F9200-DR-FNL -- Ver. 5.0.3a
Copyright FastComm Communications Corporation, 1993-2000.
-------------------------------------------------------------------------------------------
Main Menu
---------------
1) Physical Configurations
2) Data Configurations
3) Local Addresses
4) Routing
5) Global Paths
6) External Dial Devices

V) View Current Unit Status
L) Load Factory Defaults
W) Write Configuration
R) Reset Unit
X) eXit Session
S) Statistics
Y) sYstem Administration

Enter Choice :
```

Main Menu for units that have been configured as ISDN with External Dial Devices:

```
FastComm F9200-EL-FNL -- Ver. 5.0.3a
Copyright FastComm Communications Corporation, 1993-2000.
-------------------------------------------------------------------------------------------
Main Menu
-----------------
1) Physical Configurations
2) Data Configurations
3) Local Addresses
4) Routing
5) Global Paths
6) External Dial Devices

V) View Current Unit Status
L) Load Factory Defaults
W) Write Configuration
R) Reset Unit
X) eXit Session
S) Statistics
Y) sYstem Administration

Enter Choice :
```

If you select Physical Configurations (1), the following menu will be displayed:

```
Port Interfaces
-----------------------
N) NETWORK    : DTE -- CSU/DSU
1) PORT  1    : Active = RS-232 DCE        Inactive = RS-232 DTE
2) PORT  2    : Active = RS-232 DCE        Inactive = RS-232 DTE
3) PORT  3    : Active = RS-232 DCE        Inactive = RS-232 DTE
4) PORT  4    : Active = RS-232 DCE        Inactive = RS-232 DTE

Enter Choice:
```

IMPORTANT !! The "Port Interfaces" menu is actually the "Physical Configurations" menu and will be changed accordingly in the next software release.

This option (Physical Configurations) allows you to read the configuration of the Fasticks. The active setting is the one currently being used in the unit. The inactive setting can only be used by inverting the Fastick in the unit. These settings cannot be changed in this menu. The menu for units with fewer than four ports displays only the number of ports they support.

If you select Data Configurations (2) from the Main Menu, the following is displayed:

```
-------------------------------------------------------------------------------
Logical Port Protocol                Port Interfaces
-------------------------------------------------------------------------------
S) Supervisor                        DCE
N) Frame Relay                       DTE -- CSU/DSU
1) UNDEFINED                         RS-232 DCE
2) UNDEFINED                         RS-232 DCE
3) UNDEFINED                         RS-232 DCE
4) UNDEFINED                         RS-232 DCE
E) EtherNet
M) More Ports...
Enter Port :
```

This option allows you to define the protocol characteristics of all data ports on the unit.

If you select Local Addresses (3), the following menu will be displayed:

```
Configure Local Addresses
-------------------------
1) IP Address : 0.0.0.0
2) FRAD Name :

Enter Choice :
```

This option allows you to enter the IP Address and a Name. The IP Address is used as the Local Address for our proprietary Transport Layer Protocol supporting legacy protocols. The IP Address is also used as the unit's node address for switching and in-band Telnet and SNMP network management. Every unit must be assigned an IP Address.

When you select Routing (4), the following menu is displayed:

```
Configure Routing
-----------------
1) IP Routing
2) IPX Routing
3) Frame Relay Routing
4) X.25 Routing
5) SNA Routing

Enter Choice :
```

The Routing option allows you to perform address mapping, or routing by establishing routing tables that are used to guide packets on their path through the network. A unit can route packets conforming to the IP, IPX, Frame Relay, X.25, Annex G, and SNA protocols.

When you select Global Paths (5) the following is displayed:

```
Empty Global Path Table
Add Global Path Table Entry

Enter Path Name (1 to 10 Characters):
```

The Global Paths option provides a central place to configure the parameters necessary to route data. These parameters may include all or some of the following: logical port number, protocol, circuit type, channel numbers, DLCIs or X.121 addresses.

2.5 Installing & Connecting Hardware

2.5.1 Selecting & Installing Fasticks

All units contain special modules called Fasticks which determine whether the port interface is DTE or DCE. Fasticks are normally factory configured to customer specifications and do not require alteration. However, you may need to change this configuration if your requirements change. The Fasticks correspond to the serial User and Network ports. This section describes the various Fasticks and explains how to install them.

There are five different kinds of Fasticks as listed in the table below:

TYPE	DESCRIPTION
V.35	Five ICs* on front, SMT** on rear
RS-232	Three ICs on front, no SMT on rear
RS-422	Four ICs on front, no SMT on rear
V.35/RS-232, DCE only	Six ICs on front, SMT on rear
X.21	Four ICs on front, no SMT on rear

*Integrated Circuit

** Surface Mount Technology

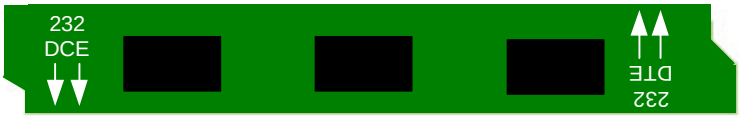


Illustration 2-1: RS-232 Fastick

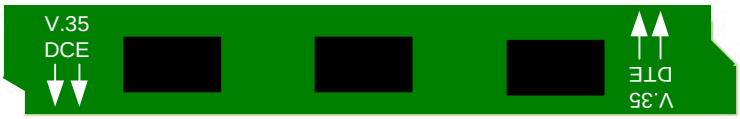


Illustration 2-2: V.35 Fastick

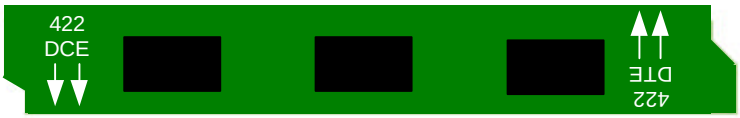


Illustration 2-3: RS-422 Fastick

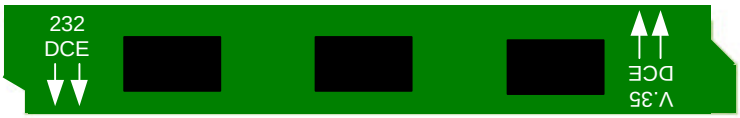


Illustration 2-4: RS-232/V.35 Fastick

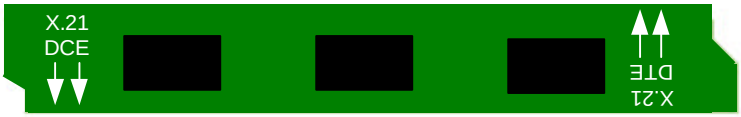


Illustration 2-5: X.21 Fastick

2.5.2 How Fasticks Work

The Fastick terminal interface is a small Input/Output (I/O) module that converts between Transistor Transistor Logic (TTL) levels and datacomm levels. It provides a mechanical configuration of the ports for DTE or DCE. The Fastick may be used on any of our products that supports I/O sticks and conforms to the pinout requirements of this revision of Fastick.

A Fastick module supports either DCE or DTE depending on the position of the stick in the socket. This setting is reflected in the Physical Configurations selection in the Main Menu. As a DCE, the Fastick supports the delivery of "Transmit and Receive Clock" and reception of "External Transmit Clock" (from the DTE). As a DTE, it supports the transmission of "External Transmit Clock" and reception of "Transmit and Receive Clock" (from the DCE). The physical interface for the Fastick is a DB-25 conforming to EIA-530 pinout. The default settings for the User port is DCE. The default for the Network Port is DTE.

2.5.3 Changing Fastick Setup

This section describes the process of accessing, removing and replacing Fasticks inside the unit. Disconnect power before opening the unit. Wear an anti-static wrist strap or otherwise ensure proper grounding.

The MonoFRAD circuit boards are shown below. The F9100-D has one Fastick; the F9100-S has two. The F9200 series boards are similar in layout to the boards shown below.

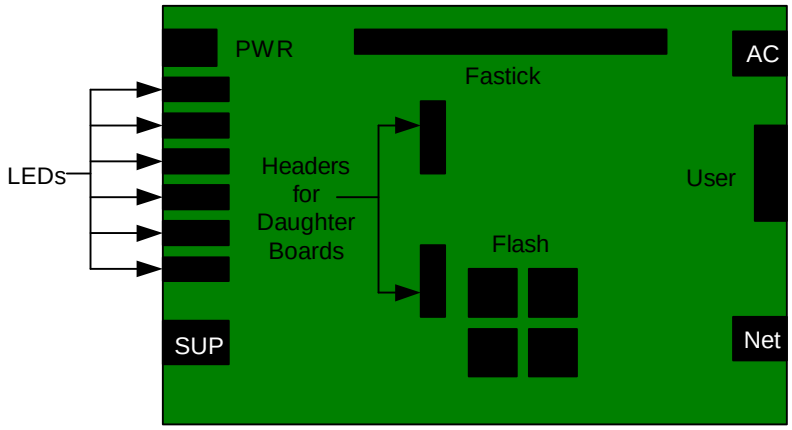


Illustration 2-6: F9100-D Board

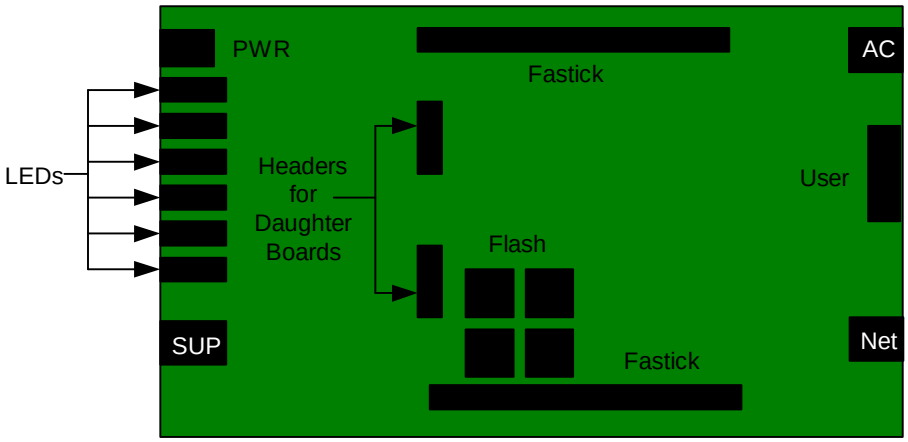


Illustration 2-7: F9100-S Board

The Fastick on the left side of the unit (when looking at the front panel) corresponds to Port 1. The Fastick on the right side (of a F9100-S) corresponds to the Network port.

Step 1 Fasticks can be accessed by opening the case in the following manner:

1a Remove the four screws on the back of the unit.

1b Remove the screw on the bottom of the unit.

1c Slide the casing forward until the unit slides out the rear of the casing.

Step 2 To remove a Fastick, pull back the mounting tabs on either side of the Fastick and tilt the stick outward at a 45 degree angle. Then pull the Fastick out of the socket.

Illustration 2-8: Fastick socket with Fastick

Step 3 To insert a Fastick, first examine it to determine which side is to be inserted in the socket, keeping in mind that the stick is labeled with arrows indicating which side is DCE and which is DTE (or RS-232 and V.35, both DCE, as shown above). The active configuration is the side whose text is upright with arrows pointing down towards the Fastick socket.

Step 4 Insert the Fastick into the socket at a 45 degree angle with the ICs facing into the unit. Press down firmly to make sure that the stick is fully seated in the socket.

Step 5 Rotate the top of the stick towards the tabs until the locking clips snap in behind the stick to hold it in place. The tabs should also engage with the tab holes on the stick. If you are experiencing problems getting the stick to lock in place, check to see that it is pushed all the way into the connector.

Step 6 Replace the casing by sliding it from the rear of the unit towards the front. Insert and secure the four screws on the back and the bottom of the unit.

2.6 Getting Connected

Installation of the unit starts with the connection of cables as described in this section. A list of port interface pinouts can be found in Chapter Appendix B, Interface Pinouts.

!! **CAUTION!** Do not connect the unit to an analog telephone line. Should you incorrectly attach the unit to a telephone line, thereby causing harm to the telephone network, the telephone company will notify you that a temporary interruption in your service on that line is required.

2.6.1 Physical Connection Requirements by Model

Eight basic models are listed in the table on the following page. The F9200 series differs from the F9100 series in that the F9200 series has an Ethernet user port as the standard, while the F9100 series has a serial user port as the standard. See also Chapter Appendix A, Specifications and Chapter Appendix B, Interface Pinouts for more detailed information.

Using the "Connection Reference by Model" table, you will notice that model numbers are immediately followed by one or more letters. These letters indicate the type of network port the model has. The following key identifies the type of network ports these letters represent:

- D = Built-in DDS CSU/DSU
- S = Serial
- T = T1
- E = E1

The following key identifies the number of ports that some letters represent:

- DV = one port (DSU) unit
- DW = four port (DSU) unit
- SV = one port (serial) unit
- SW = four port (serial) unit

Connection Requirements by Model

MODEL NO.	PORT	PORT TYPE	CONNECTORS	LINE RATES
F9100-S (MonoFRAD - serial)	1 Supervisor 1 Network 1 User	RS-232 RS-232, V.35, RS-422, X.21 RS-232, V.35, RS-422, X.21	8 Pin Modular DB-25 DB-25	2.4-38.4 Kbps 2.4-768 Kbps 2.4-768 Kbps
F9100-D (MonoFRAD - DSU)	1 Supervisor 1 Network 1 User	RS-232 DDS RS-232, V.35, RS-422, X.21	8 Pin Modular RJ-48S DB-25	2.4-38.4 Kbps 56/64 Kbps 2.4-768 Kbps
F9100-SV F9100-SW (MonoFRAD - (serial)	1 Supervisor 1 Network 1 User (SV only) 3 Users (SW only) 1 TokenRing	RS-232 RS-232, V.35, RS-422, X.21 RS-232, V.35, RS-422, X.21 RS-232, V.35, RS-422, X.21 Token Ring	8 Pin Modular DB-25 DB-25 DB-25 DB9, RJ-45	2.4-38.4 Kbps 2.4-768 Kbps 2.4-768 Kbps 2.4-768 Kbps 4 or 16 Mbps
F9100-DV F9100-DW (MonoFRAD - DSU)	1 Supervisor 1 Network 1 User (DV only) 3 Users (DW only) 1 TokenRing	RS-232 DDS RS-232, V.35, RS-422, X.21 RS-232, V.35, RS-422, X.21 Token Ring	8 Pin Modular RJ-48S DB-25 DB-25 DB9, RJ-45	2.4-38.4 Kbps 56/64 Kbps 2.4-768 Kbps 2.4-768 Kbps 4 or 16 Mbps

Connection Requirements by Model				
MODEL NO.	**PORT**	**PORT TYPE**	**CONNECTORS**	**LINE RATES**
F9200-S (EtherFRAD - serial or Webrouter)	1 Supervisor 1 Network 1,2,4 User 1 Ethernet	RS-232 RS-232, V.35, RS-422, X.21 RS-232, V.35, RS-422, X.21 AUI or 10Base-T	8 Pin Modular DB-25 DB-25 DB-15, RJ-45	2.4-38.4 Kbps 2.4-768 Kbps 2.4-1024 Kbps 10 Mbps
F9200-D (EtherFRAD - DSU or Webrouter)	1 Supervisor 1 Network 1,2,4 User 1 Ethernet	RS-232 DDS RS-232, V.35, RS-422, X.21 AUI or 10Base-T	8 Pin Modular RJ-48S DB-25 DB-15, RJ-45	2.4-38.4 Kbps 56/64 Kbps 2.4-1024 Kbps 10 Mbps
F9200-T (EtherFRAD - T-1)	1 Supervisor 1 Network 1,2,4 User 1 Ethernet	RS-232 T-1 RS-232, V.35, RS-422, X.21 AUI or 10Base-T	8 Pin Modular RJ-48C DB-25 DB-15, RJ-45	2.4-38.4 Kbps 1.544 Mbps 9.6-1024 Kbps 10 Mbps
F9200-E (EtherFRAD - E-1)	1 Supervisor 1 Network 1,2,4 User 1 Ethernet	RS-232 E-1 RS-232, V.35, RS-422, X.21 AUI or 10Base-T	8 Pin Modular RJ-Type Modular DB-25 DB-15, RJ-45	2.4-38.4 Kbps 2.048 Mbps 2.4-1024 Kbps 10 Mbps

2.6.2 Connecting an Async Supervisory Terminal

The unit's Supervisor port can be connected to an Async Terminal, a PC running terminal emulation software or a modem using the Supervisory (8 Pin Modular) cable and one of three types of cable adapters. An 8 Pin Modular to DB-9 adapter is standard for connection to most PCs. This is the adapter that is shipped with a unit. An 8 Pin Modular to DB-25 adapter is optionally available for connection to most terminals.

An 8 Pin Modular to DB-25 modem adapter is optionally available to connect a modem for out-of-band management or remote configuration. For pinouts of these cables, see Chapter Appendix B, Interface Pinouts.

Connect the Supervisory cable and selected adapter between the unit's Supervisor port and your PC, terminal or modem in order to access the unit's menu system.

Autobaud For Supervisory Terminal

The unit's Supervisor port autobauds to an attached terminal if you depress <ENTER> twice. The unit autobauds to most standard speeds from 300 bps to 38400 bps (along with 8 data bits, no parity, and 1 stop bit). Once the unit is configured, select eXit Session from the Main Menu before removing the terminal.

The Supervisor port supports the BREAK function to reset the baud rate. If the unit uses the incorrect baud rate because something other than <ENTER> was depressed when establishing Autobaud, press <BREAK> (or send a BREAK from your terminal emulation software) to reset the Autobaud procedure. Then depress <ENTER> twice to initiate the Autobaud feature.

2.6.3 Cable Connection for F9100-S/D MonoFRAD™

The basic F9100 series MonoFRAD™ can be ordered with two different types of network ports. The F9100-S series has a standard DB-25 (25 pin connector) network connector which is displayed on the following page:

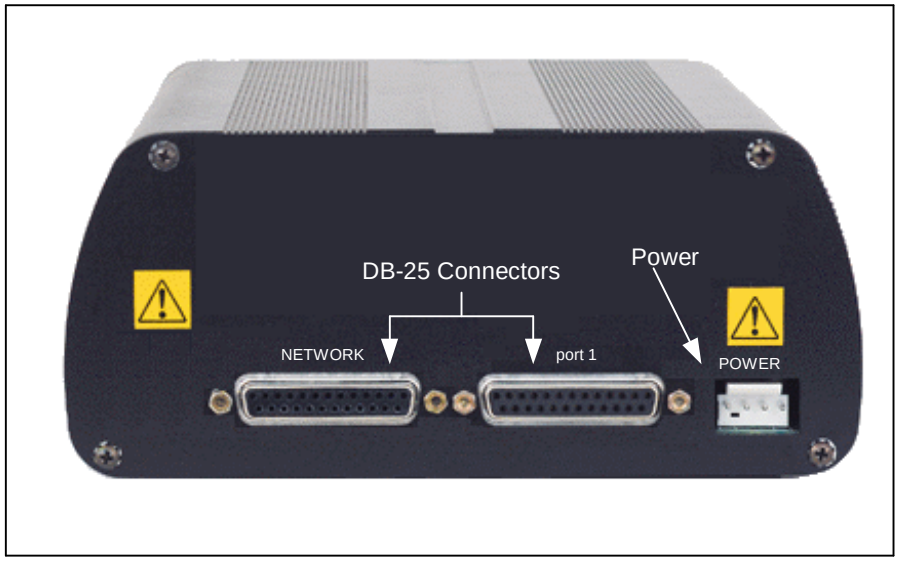


Illustration 2-9: F9100-S Series (MonoFRAD) Rear Panel

The F9100-D series MonoFRAD has an RJ-48S connector which is displayed on the following page.

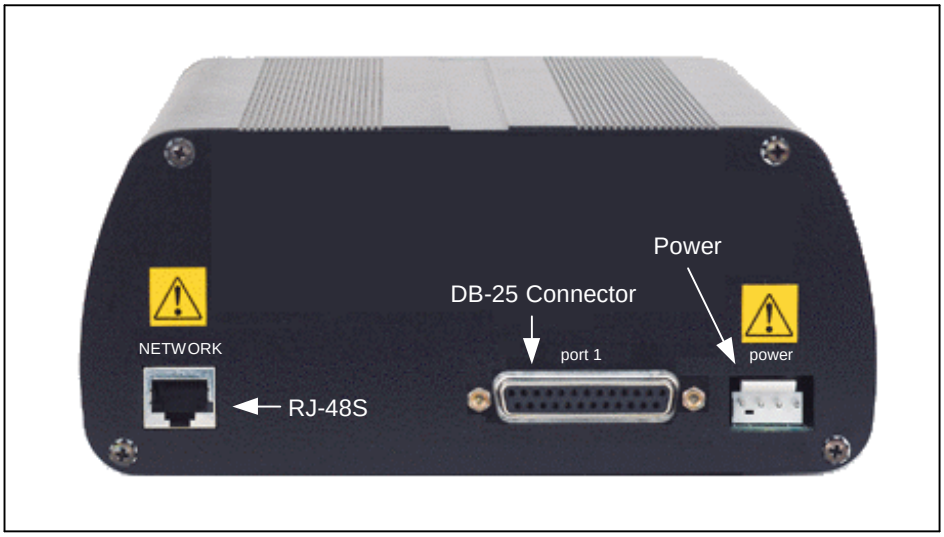


Illustration 2-10: F9100-D Series (MonoFRAD) Rear Panel

NOTE: DDS inteface for use in North America only.

Step 1 Connect the Network port on the unit to your network using the appropriate cable for the model and interface you are using.

Step 2 Connect your Data Terminal Equipment (DTE) to port 1 using a DB-25 interface cable.

Step 3 Plug the cable from the wall-mount transformer into the connector marked "Power" on the rear of the unit. Plug the transformer into an AC outlet. The LEDs will cycle, leaving on the green power LED on when the unit is operational.

2.6.4 Cable Connection for F9200-S/D EtherFRAD (2 ports)

The basic EtherFRAD can be ordered with four different types of network ports. The F9200-S has a standard DB-25 network connector which is displayed on the following page.

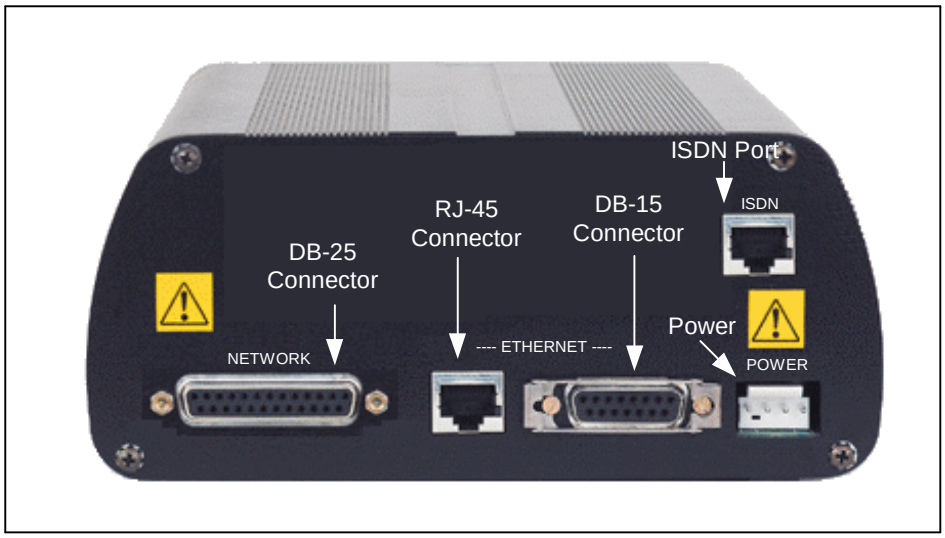


Illustration 2-11: F9200-S Series (EtherFRAD) Rear Panel

The F9200-D, F9200-T and F9200-E model series EtherFRAD have an RJ-48S connector which is displayed below:

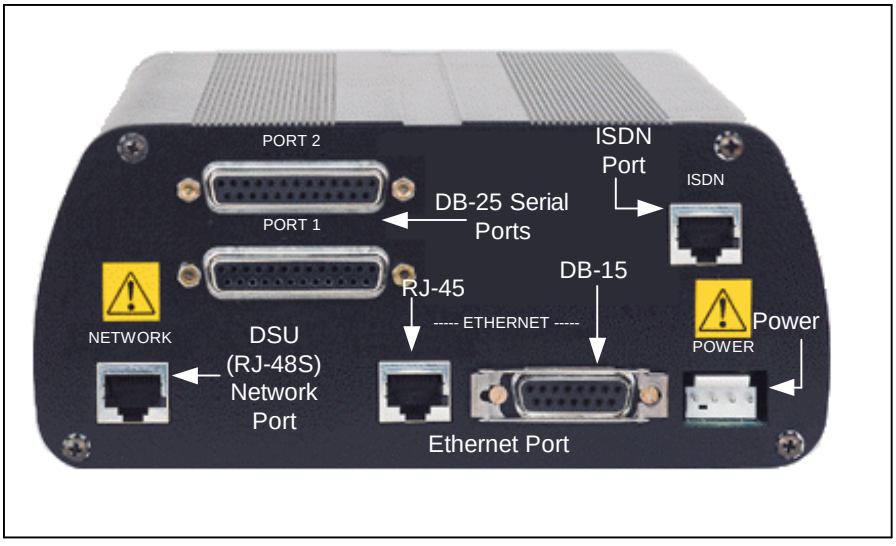


Illustration 2-12: F9200-D/T/E Series (EtherFRAD) Rear Panel

2.6.5 Cable Connection for F9200-S/D EtherFRAD (5 port)

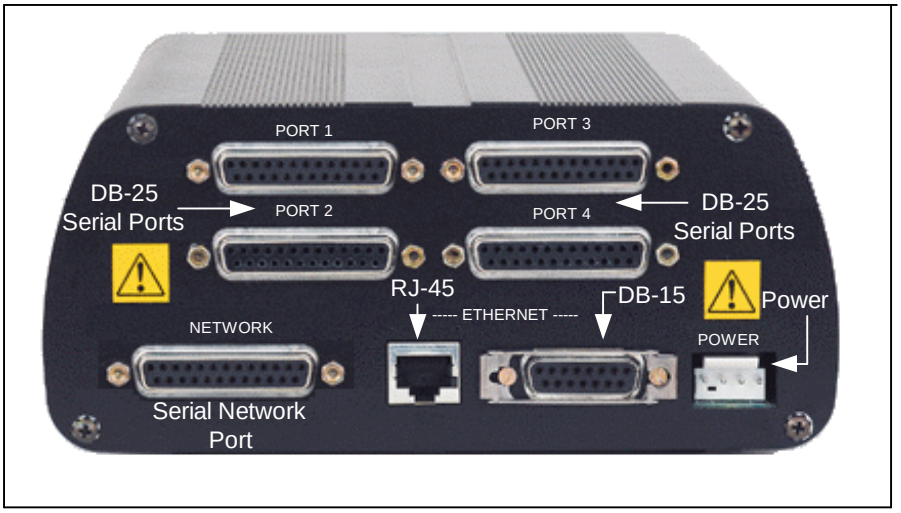


Illustration 2-13: F9200-S Series (EtherFRAD-5) Rear Panel

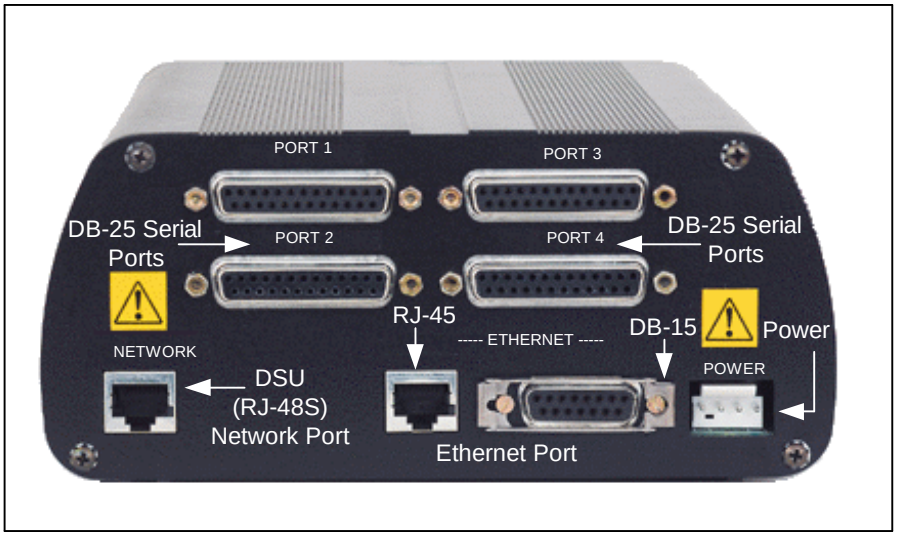


Illustration 2-14: F9200-D Series (EtherFRAD-5) Rear Panel

Step 1 Connect the Network port on the unit to your network using the appropriate cable for whichever model you are using. The F9200-SM uses an optional cable to connect to an external CSU and the F9200-DM uses an RJ-48S to RJ-48S cable connected directly to the network.

Step 2 Plug the LAN cable into the 10 Base-T port or the AUI port depending on which wiring system you are using. The AUI port has a slide-lock connector to ensure that the cable does not disconnect accidentally.

Step 3 For units with user ports, connect up to three Serial interface cables to the DB-25 connectors marked Port 1, 2, 3 or 4.

Step 4 Plug the cable from the transformer into the connector marked POWER on the rear of the unit. Plug the transformer into an AC outlet. The LEDs cycle, leaving only the green power LED on when the unit is operational.

2.6.6 Optional Adapter Cables

Several cables and adapters can be ordered separately if required for a particular installation.

- DB-25 to DB-15 adapter cable (F0002-11) may be required when using X.21 on a serial port.
- A DB-25 to M-34 adapter cable (F0002-5 and/or F0002-6) may be required when using V.35 on a serial port.
- A DB-25 to DB-37 adapter cable (F0002-7 and/or F0002-8) may be required when using RS-422 on a serial port to adapt to EIA-449 connector standards.
- An 8 Pin Modular to DB-25 adapter (F0003-2 or F0003-3) may be needed for connecting the supervisor port to a terminal or modem.

NOTE: To comply with Class B requirements, you must use FastComm data cables or cables made with equivalent specifications.

2.7 Connecting Units via Software

See also . . . Chapter 9, Managing the System Remotely in the FRAD (Ether/Mono/Ring FRAD and webrouter) Reference Guide .

2.8 FastCONNECT™

The FastCONNECT™ feature allows an administrator to configure any number of remote units from a single host site. This eliminates the need to have an administrator visit each remote site to configure the unit. This saves both money and time. To use the FastCONNECT™ feature, follow the steps on the following page.

NOTE: FastCONNECT™ can only be used on new units that have never been configured.

Step 1 Ensure that the host site is configured with a management address and a complete routing table with routes to each of the remote sites.

Step 2 Ship the units to their respective locations and have them unpacked, and powered up.

Step 3 From the host site, telnet to each unit.

Step 4 The remote unit, once powered up, assumes that the first call it receives is from the host, and it accepts the call. The remote unit's Main Menu is displayed on your screen.

Step 5 The remote unit auto-detects its own address from the first incoming Telnet call, PING request, or SNMP message. Frame Relay is the default protocol for the Network port. Adaptive Management-User is the default Frame Relay management setting, allowing the unit to determine whether Annex A, Annex D or LMI is being used.

Step 6 Configure the rest of the unit, ensuring that a routing path back to the host site is configured.

! **CAUTION!** If you fail to do this, you will not be able to telnet into the unit again, and the unit will have to be configured locally by someone on-site.

Step 7 Save and reset the remote unit. If you do not save and reset, the configuration will be lost.

SAVE & RESET . . . Save the configuration into memory by selecting Write and then Reset from the Main Menu.

2.9 T1 FastCONNECT™

NOTE: This option is only available on FRADs equipped for T1 interfacing (i.e., F9x00-T).

T1 FastCONNECT™ also allows a remote user to access an unconfigured FRAD connected to the network via a T1 line. A number of configuration assumptions must be made to bring the T1 trunk into service using FastCONNECT™. Following is a list of T1 parameter settings (see Section 2.15, Configuring CSU/DSUs for configuration procedures), which should guarantee successful FastCONNECT™ operation:

1) Frame Format	ESF
2) Line Code	B8ZS
3) Bit Stuffing	Disabled
4) Line Build-Out	0 db
5) Clocking	External
6) Line Loop Back	Disabled
7) Data Rate	64 k
8) Data Type	Normal

The channels to be used must be defined. An assumption is made that unused T1 channels are filled with 1's in all eight bit positions. At power-up, the unit checks to see if the Time-slots configuration has been set by the user. If not, the unit assumes FastConnect mode and continues to determine the incoming line's used channels. Since this function can only be successful if the T1 line is active and connected to the unit, the unit performs this function only after detecting a carrier on the incoming port. The unit then runs though its FastConnect algorithm up to ten times (once a second) until it successfully detects channels used.

2.10 E1 FastCONNECT™

NOTE: This option is only available on units equipped for E1 interfacing (i.e., F9x00-E).

E1 FastCONNECT™ allows a remote user to access an unconfigured unit connected to the network via a high speed (2.048 Mbps) E1 line. A number of configuration assumptions must be made to bring the E1 trunk into service using E1 FastCONNECT™.

The following is a list of E1 configuration parameters that should guarantee successful E1 operation:

1) Frame Format:	Framed
2) CRC4:	Disabled
3) Clocking :	Line
4) Time Slots:	1-32
5) Data Type:	Normal
6) Distance Frame Alarm	Disabled
7) AIS Transmission	Disabled

The channels to be used must be defined. An assumption is made that unused E1 channels are filled with 1's in all eight bit positions. At power-up, the unit checks to see if the Time-slots configuration has been set by the user. If not, the unit assumes FastConnect mode and continues to determine the incoming line's used channels. Since this function can only be successful if the E1 line is active and connected to the unit, the unit performs this function only after detecting a carrier on the incoming port. The unit then runs though its FastConnect algorithm up to ten times (once a second) and then runs through it every four minutes until it successfully detects channels used.

2.11 Monitoring Status via LEDs

All units have red and green Data and Err LEDs which represent different conditions, depending on the protocol being used on that port. These LED indications are described in Table 2-1. Some general rules apply, however:

- When the Pwr LED is GREEN, the unit is being supplied with power.
- When the green data LED is flashing on the Ethernet (Enet) port, data is passing on the port. When the data LED is solid red on the Ethernet port, there is no connection.
- There is also a ***RESET*** button which restarts the unit. This button provides the same function as selecting the Reset option on the Main Menu when configuring the unit. It is useful if, for any reason, the unit's menu system cannot be accessed.

For the protocols listed below, the Green LED and Red LED is activated for whenever the conditions listed in the corresponding columns are present.

Table 2-1: Significance of Green vs Red LED Lights (per Protocol)

PROTOCOL	GREEN LED, DATA	RED LED, ERROR
FRAME RELAY	If a Network Management protocol is selected and a connection is made, the LED lights after 15-20 secs. If no protocol is selected, it is always on.	If a Network Management protocol is selected, but none is present, this LED lights after 15-20 seconds
ASYNC ENCAPSULATION	Characters, bi-directional TD/RD	No control Signals (DTR or DSR)

BIT SYNC ENCAPSULATION	Frames in either direction	Error in TD in from DTE. No control signals (DTR or DSR)
ASYNC/SYNC PPP	Frames to/from port	Data Error in PPP from DTE. No control signals (DTR or DSR)
SLIP	Frames to/from port	No control signals (DTR or DSR)
SDLC EMULATION-TERMINAL	Sending or receiving data	CRC Errors or connection with remote protocol timeout
SDLC EMULATION-HOST	The host has a transport layer connection with a terminal listed in the device table	Protocol CRC Errors or timeouts. If any configured device is not polled for 15 secs., LED lights for 0.5 sec.
A/S BURROUGHS POLL SELECT	Flashes 0.5 secs. for good data	Same as SDLC
SDLC ROUTING	Frames to/from port	Error in TD from DTE
ANNEX G	Good frames passing through	Data Errors or no DTR
BYTE SYNC ENCAPSULATION	Good frames passing through	No DTR
X.25	Level II connection exists	No DTR or receiving Error packets from remote device
TELNET TERMINAL	Data Transfer in either direction	No DTR

TroubleShooting Tip . . . If the transmit and receive pairs are accidentally reversed at the service provider's connector, the red Err LED lights up on the Network port. This is because the reversed connection reverses the sealing current and puts the unit into a test mode (Analog Loopback - F9100-D and F9200-D only). When using spoofed protocols such as SDLC, both red and green LEDs can be lit simultaneously. On a Terminal Unit, both lights may be lit if some terminals are responding and some are not. On a Host unit, both LEDs may be lit if some terminals are being polled and some are not.

NOTE: For more detailed information on LEDs, see the pertinent section in Chapter 7, Monitoring Statistics in the FRAD (Ether/Mono/Ring FRAD and webrouter) Reference Guide.

2.12 Testing Back-to-Back

This section describes a testing procedure that can be used to verify communications passing through the unit. The objective of this test is to ensure that the FRAD' user interfaces (RS-232, V.35, RS-422, 10 Base-T, and AUI) are installed and configured properly. Pre-testing also tests the interface cables.

A data generator, that may be a PC, must be attached to each of the two units, which are then connected to one another via the Network port.

The most effective way to pre-test units is to connect two units back-to-back with one unit configured as a DCE and the other as a DTE on the Network port. If the units being tested contain DSU/CSU interfaces, the option switches on one of the units must be set for internal clocking. The other unit must be set for external clocking (See Section 2.15.1, 56/64K CSU/DSUs, Section 2.15.2, Configuring the T1 CSU/DSU and Section 2.15.3, Configuring the E1 CSU/DSU). The cable between them must be a CSU crossover (F0002-3).

The configuration shown in the pre-test procedure uses Asynchronous Encapsulation. Other protocols may be used if the proper data communications test equipment is available.

To conduct pre-testing, follow the procedure described on the following page.

Step 1 Connect the equipment being tested, as shown in the example below. If you are using a unit with DSU/CSU, use an RJ-48S to RJ-48S crossover cable (F0002-3) to connect them. If you are using a non-DSU/CSU unit, use a DB-25 to DB-25 straight through ribbon cable.

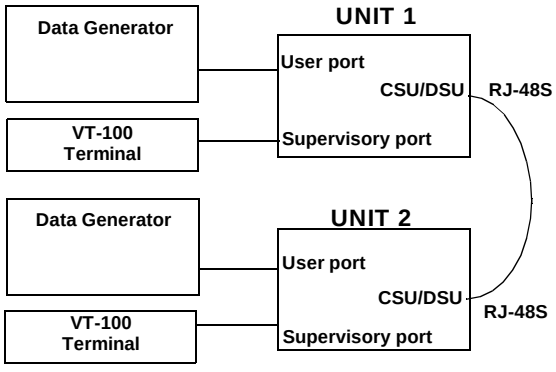


Illustration 2-15: Back-to-Back Setup

Step 2 Configure each unit's Network port for Frame Relay as described below.

FRAME RELAY PARAMETERS *DEFAULTS ARE USED EXCEPT WHERE INDICATED BY AN ASTERISK (*).			
UNIT 1		**UNIT 2**	
Speed	56k	Speed	56k
Protocol	Annex D User	Protocol	Annex D Network*
Value N1	6	Value N1	6
Value N2	3	Value N2	3
Value N3	4	Value N3	4
Timer T1	10	Timer T1	10
Timer T2	15	Timer T2	15
CSU/DSU Clocking	External	CSU/DSU Clocking	Internal*

Step 3 Configure the network interface Fastick as a DTE on one unit, and configure the network interface Fastick on the other as DCE. If the network interface is X.21, you must use cables 0200-0028-0310 (Assy., Cable, EIA-530 to X.21 DB-25 Male DB-15 Male {1 foot}) and 0200-0028-0311 (Assy., Cable, EIA-530 to X.21 DB-25 Male DB-15 Male {6 foot}).

Step 4 Configure the user ports on each unit for Asynchronous Encapsulation (see Section 4.2, Asynchronous Encapsulation of the FRAD Reference Guide) using a terminal connected to the Supervisory port to accommodate the test equipment as shown on the following page.

ASYNCHRONOUS ENCAPSULATION PARAMETERS			
UNIT 1		**UNIT 2**	
Speed	19200	Speed	19200
Data Bits	8	Data Bits	8
Parity	None	Parity	None
Stop Bits	1	Stop Bits	1
Frame Relay Port	Network	Frame Relay Port	Network
DLCI	300	DLCI	300
Destination Port	1	Destination Port	1

Step 5 Connect cables between each user port and the test equipment data generator, which may be a PC.

Step 6 Configure the test generators to operate in the Asynchronous mode and connect the test equipment to both units as shown on the previous page. Conduct the following data test:

MODE OF OPERATION	
EMULATION	DTE
CLOCKING	Asynchronous
CLOCK SOURCE	Interface (when required)
DATA GENERATOR	
PSEUDORANDOM	2047/511/QRSS/FOX
CHARACTER FORMAT	8 bits, No parity, 1 Stop Bit, Speed 19200 bps

Bit Error Rate (BER) testing sends a known pattern through the equipment and records the errors that occur. During this test, you should also observe the interface and network statistics to be sure that they work properly. Once you have tested the equipment, proceed with the instructions in Section 2.6, Getting Connected.

2.13 Configuring CSU/DSUs

NOTE: This option is available only on units with internal CSU/DSUs.

STARTING PATH . . . From the Main Menu, select Physical Configurations, then N (Network) then **CSU/DSU (1)**.

The CSU/DSU option allows you to set the clocking configuration. When set for External, the unit receives clocking from the network. When testing back-to-back, one unit must be set to Internal clocking (See Section 2.12, Testing Back-to-Back). When set to Auto Detect, the unit learns the speed the first time the port is connected to the network.

2.13.1 56/64K CSU/DSUs

Select CSU/DSU and the following menu options are displayed.

```
Configure CSU / DSU
-------------------------------
1) Clock Source          External
2) CSU/DSU Speed         Auto Detect

Enter Choice:
```

Step 1 **CLOCK SOURCE** This option allows you to choose between external and internal clocking. Select Clock Source and the following prompt is displayed.

```
Enter CSU/DSU Clock Source ((E) External or (I) Internal):
```

Select the clocking source you want to use. The CSU/DSU supports both 56k and 64k DDS compatible circuits.

Step 2 **CSU/DSU SPEED** This option allows you to specify the speed at which traffic will pass through the CSU/DSU. Select CSU/DSU Speed. You may either select a speed or select Auto Detect to force the unit to detect the speed the first time the port is connected to the network.

The following menu options are displayed.

```
CSU/DSU Speed Type
1) Auto Detect
2) 56000
3) 64000

Enter Choice :
```

NOTE: If the Clock Source is Internal, the Auto Detect option is not applicable.

Select the speed you want to use.

Step 3 Press ***ESC*** four times to return to the Main Menu.

2.13.2 Configuring the T1 CSU/DSU

NOTE: This option is available only on units equipped for T1 interfacing (i.e., F9x00-T).

STARTING PATH . . . From the Main Menu, select T-1 CSU/DSU

The unit's T1 interface provides a high speed (1.544Mbps) CSU/DSU connection to the service provider. The T1 CSU is connected to the network port of the unit. This design also supports fractional T1 functionality.

Full T1 vs Fractional T1

T1 is used primarily in the United States to provide a high speed interface to the network. This option provides a line speed of 1.544Mbps.

Fractional T1 operation is very useful to customers who require network speeds between 64k and T1 speeds. The unit can support the use of any combination of the 24 channels in a T1 interface.

T1 CSU/DSU Configuration

The CSU/DSU option allows you to set the network interface, time slot, and data types, each of which is addressed below. Most T1 configurations are done via the Network Interface Menu. The Time Slots Menu allows you to set selected channels for fractional T1 installations. The Alarms Menu allows you to configure the T1 Alarm. When you select T-1 CSU/DSU, the following menu is displayed.

```
T-1 CSU/DSU Configuration
1) Network Interface
2) Time Slots
3) Alarms
Enter Choice :
```

2.13.2.1 Configuring the Network Interface

STARTING PATH . . . Select Network Interface from the T1 Configuration Menu.

Step 1 **NETWORK INTERFACE** Select Network Interface and the following menu will be displayed:

```
Network Interface Setting
-------------------------------------
1) Frame Format          D4
2) Line Code             B8ZS
3) Bit Stuffing          Disabled
4) Line Build-Out        0 db
5) Clocking : Line
6) Line Loop Back        Disabled
Enter Choice :
```

Step 2 **FRAME FORMAT** Select Frame Format and the following menu options are displayed:

```
Frame Format
1) D4
2) ESF
3) Unframed
Enter Choice:
```

2a **D4 FRAMING** This option allows you to configure the port for D4 framing. The term D4 Framing stems from the way framing is performed in the D-series of channel banks from AT&T. There are 12 separate 193-bit frames in a super-frame. The D4 framing bit is used to identify both the channel and the signaling frame.

2b **ESF FRAMING** ESF (Extended Superframe Format) is a T-1 format that uses the 193rd bit as a framing bit. It provides frame synchronization, cyclic redundancy checking and data link bits. Frames consist of 24 bits instead of the previous 12 bits as the D4 format. The standard allows error information to be stored and retrieved easily, facilitating network performance monitoring and maintenance.

2c **UNFRAMED** This option allows you to configure a 1.54 Mbps raw link without framing.

Step 3 **LINE CODE** This option allows you to enable the B8ZS line balance feature. Select Line Code and the following options are displayed:

```
Line Code
1) AMI
2) B8ZS
Enter Choice :
```

3a **AMI** This option prevents the insertion of bipolar violation transitions. This mode is mostly used in voice applications.

3b **B8ZS** This option ensures that a T1 line always maintains synchronization to avoid transmitting excessive numbers of zeros. It does this by inserting additional transitions called bipolar violations, which help synchronization.

Step 4 **BIT STUFFING** This option is a process where a string of "one" bits is broken by an inserted "zero". This inserted zero is added by the sender and stripped by the receiver. This process allows you to enable or disable Bit Stuffing**.** Select Bit Stuffing and the following menu options are displayed:

```
Bit Stuffing
1) Enable
2) Disable
Enter Choice :
```

4a **ENABLE** This option forces a bit to a "one" in every byte. Only seven bits per byte can be used for data. Valid only when Line Code is set for AMI.

4b **DISABLE** This option turns this function off.

Step 5 **LINE BUILD-OUT** This option allows the user to configure the amount of energy applied to the transmit signal. Select Line Build-Out and the following options are displayed:

```
CSU/DSU
Line Build-Out
1)  0   db
2) - 7.5 db
3) -15   db
4) -22.5 db
```

Step 6 **CLOCKING** This option enables the use of the units in a back-to-back test set-up. Select Clocking and the following options are displayed:

```
Clocking
1) Line
2) Internal
Enter Choice :
```

6a **LINE** This option enables external clocking. It is used to accept clock from the service provider's line.

6b **INTERNAL** This option enables the unit's T1 interface to generate clocking.

Step 7 **LINE LOOPBACK** This option controls the operation of the line loopback command. Select Line Loop Back and the following options are displayed:

```
Line Loop Back
1) Enable
2) Disable
Enter Choice :
```

7a **ENABLE** This option allows a remote device to command the unit to enter line loopback, so that the next incoming frame will be looped back to the transmitting device.

7b **DISABLE** This option causes loopback commands from the remote device to be ignored.

Step 8 Press ***ESC*** to return to the menu.

2.13.2.2 Configuring Time Slots (T1)

STARTING PATH . . . Select **Time Slots** from the T1 Configuration Menu.

Step 1 **TIME SLOTS SETTING MENU** From the T-1 CSU/DSU Configuration Menu, select Time Slots and the "Time Slots Setting" menu will be displayed as follows:

```
Time Slots Setting
1) Data Rate : 64 k
2) Time Slots : 1-24
3) Data Type : Normal
```

Step 2 **DATA RATE** This option allows you to select the amount of bandwidth to be used within each T1 channel. Select Data Rate and the following options are displayed:

```
Data Rate
1) 48 k
2) 56 k
3) 64 k
Enter Choice :
```

Step 3 **TIME SLOTS** This option allows you to select any combination of channels to carry data. A hyphen (-) represents a range of time slots and a comma (,) separates entries. Select Time Slots and the following prompt is displayed:

```
Enter Time Slot (format: 1,2-5,17 [max = 24]): 1-24
```

For Example: To use channels 2 through 8, channel 10, and channels 15 through 19, you would use the following notation: 2-8,10,15-19.

Step 4 **DATA TYPE** This option allows you to choose either Normal or Inverted data type. Select Data Type and the following options are displayed:

```
Data Type
1) Normal
2) Invert
Enter Choice :
```

4a **NORMAL** This option allows you to send data over a T1 as-is.

4b **INVERT** This option allows you to send data over a T1 by inverting it. This inversion is a data bit level inversion. It does not alter the T1 signaling scheme and is mainly used for "one's" density.

Step 5 Press ESC to return to the menu.

2.13.2.3 Configuring Alarms (T1)

STARTING PATH . . . Select **Alarms** from the T1 Configuration Menu.

Step 1 **ALARMS SETTING MENU** From the T-1 CSU/DSU Configuration Menu, select Alarms and the following menu option is displayed:

```
Alarm Setting
1) Yellow : Disabled
Enter Choice :
```

Step 2 **ALARM** This option allows the user to control the sending of Yellow alarms by the unit. Based on T1 standards, when a Red Alarm is declared within the unit (based on certain error conditions received from the line), a Yellow alarm must be transmitted back. Select Yellow and the following options are displayed:

```
Yellow Alarm
1) Enable
2) Disable
Enter Choice :
```

2a **ENABLE** This option allows the unit to send a Yellow alarm in response to a Red Alarm.

2b **DISABLE** This option stops the unit from sending a Yellow alarm in response to a Red Alarm.

Step 3 Press ***ESC*** to return to the menu.

2.13.3 Configuring the E1 CSU/DSU

STARTING PATH . . . From the Main Menu, select **E-1 CSU/DSU**.

The unit's E1 interface provides a high speed (2.048 Mbps) CSU/DSU connection to the service provider. The E1 CSU is connected to the network port of the unit. This design also supports fractional E1 functionality.

NOTE: This option is available only on units equipped for E1 interfacing (i.e., F9x00-E).

Full E1 vs Fractional E1

E1 is used throughout Europe and many other parts of the world to provide a high speed (2.048 Mbps) interface to the network.

Fractional E1 operation is very useful to customers who require network speeds less than the full E1's 2.048 Mbps. The are 32 channels in an E1 interface, each consisting of 64Kbps. One channel is reserved for signalling, and the remaining 31 channels are used for data.The unit can support any combination of the 31 channels available for data.

E-1 CSU/DSU Configuration

The CSU/DSU option allows you to set up the network interface, time slot, and alarms. Most E1 configurations are done via the Network Interface Menu. You can set up selected channels for fractional E1 installations and specify data types via the Time Slots Menu, and you can configure E1 Alarms on the Alarms Menu.

The following menu is displayed.

```
E -1 CSU/DSU Configuration
1) Network Interface
2) Time Slots
3) Alarms
4) Line LoopBack
Enter Choice :
```

2.13.3.1 Configuring the Network Interface

STARTING PATH . . . Select **Network Interface** from the E1 Configuration Menu.

Step 1 **NETWORK INTERFACE** This option allows you to edit the network interface settings. Select Network Interface and the following options are displayed:

```
Network Interface Setting
1) Frame Format : Framed
2) CRC4 : Disabled
3) Clocking : Line
Enter Choice :
```

Step 2 **FRAME FORMAT** Select Frame Format and the following options are displayed:

```
Frame Format
1) Framed
2) Unframed
Enter Choice :
```

2a **FRAMED** To use a bit to delimit where frames begin and end, which is useful in maintaining synchronization of frames, select Framed. If you want to assign time slots to particular applications, you must select Framed format.

2b **UNFRAMED** To configure a raw link without delimiting where frames begin and end, select UnFramed.

Step 3 Press ESC to return to the Network Interface Menu.

Step 4 **CRC4** If you selected "Framed" from the "Frame Format" menu, select "CRC4" and the following menu is displayed:

```
CRC (Framed Operation Only)
1) Enable
2) Disable
Enter Choice :
```

4a **ENABLE** This option enables the unit to check and transmit Type 4 Cyclic Redundancy Check errors.

4b **DISABLE** This option prevents the unit from checking and transmitting CRC4 errors.

Step 5 Press ESC to return to the Network Interface Menu.

Step 6 **CLOCKING** Select Clocking and the following menu is displayed:

```
Clocking
1) Line
2) Internal
```

6a **LINE** This option enables external clocking, allowing the unit to accept clock from the service provider's line, select Line**.**

6b **INTERNAL** This option enables the unit's E1 interface to generate clocking, which is useful in a back-to-back test set-up, select Internal**.**

Step 7 Press ESC twice to return to the E-1 CSU/DSU Configuration Menu.

2.13.3.2 ConfiguringTime Slots (E1)

Before you start !! The options on the "Time Slot Setting Menu" are applicable only if you selected Framed Format. This option can be left blank if you are using Unframed Format.

STARTING PATH . . . Select Time Slots from the E1 Configuration Menu.

Step 1 **TIME SLOTS SETTING MENU** From the E-1 CSU/DSU Configuration Menu, select "Time Slots" and the following options are displayed:

```
Time Slots Setting
1) Time Slots : 1-32
3) Data Type : Normal
Enter Choice :
```

Step 2 **TIME SLOTS** This option allows you to select any combination of channels to carry data. When the unit is in Framed mode, Time Slot 1 is always reserved for signalling. When specifying a combination of channels, a hyphen (-) represents a range of time slots and a comma (,) separates entries. Select Time Slots and the following prompt is displayed:

```
Enter Time Slot (Format: 2-5,17 [Time Slot 1 Reserved, max = 32]) :  1-32
```

For Example: To use channels 2 through 8, channel 10, and channels 15 through 19, you would use the following notation: 2-8,10,15-19.

Enter the channels you want to use and press <ENTER>. Press ESC to return to the Time Slots Setting Menu.

Step 3 **DATA TYPE** This option allows you set the data type. Select "Data Type" and the following options are displayed:

```
Data Type
1) Normal
2) Invert
Enter Choice :
```

3a **NORMAL** This option is used to send data over the E-1 as-is.

3b **INVERT** This option allows data to be sent over E-1 line by inverting it at the bit level. Inversion does not alter the E-1 signaling scheme and is mainly used for 1's density.

Step 4 Press ESC twice to return to the E-1 CSU/DSU Configuration Menu.

2.13.3.3 Configuring Alarms (E1)

STARTING PATH . . . Select **Alarms** from the E1 Configuration Menu.

Step 1 **ALARMS** From the E-1 CSU/DSU Configuration Menu, select Alarms and the following menu is displayed:

```
Alarm Settings
1) Distance Frame Alarm : Disabled
2) AIS Transmission     : Disabled
Enter Choice :
```

Step 2 **DISTANCE FRAME ALARM** Select Distance Frame Alarm and the following menu is displayed:

```
Distance Frame Alarm (Framed Operation Only)
1) Enable
2) Disable
Enter Choice :
```

2a **ENABLE** This option allows you to send a "Distance Frame Alarm" in response to a remote Alarm condition.

2b **DISABLE** This option prevents the unit from sending a "Distance Frame Alarm" alarm in response to a remote Alarm condition.

Step 3 Press ESC to return to the Alarm Settings Menu.

Step 4 **AIS TRANSMISSION** If you selected "Framed" from the "Alarm Settings" menu, select "AIS Transmission" and the following options are displayed:

```
AIS Transmission (Framed Operation Only)
1) Enable
2) Disable
```

4a **ENABLE** This option sends an "AIS Transmission Alarm" when an "Unframed All Ones code" is received.

4b **DISABLE** This options prevents the unit from sending an "AIS Transmission Alarm" in response to an "Unframed All Ones code.

Step 5 Press ESC twice to return to the E-1 CSU/DSU Configuration Menu.

2.13.3.4 Configuring Line Loopback (E1)

STARTING PATH . . . Select Line Loopback from the E1 Configuration Menu.

Step 1 **LINE LOOPBACK** From the E-1 CSU/DSU Configuration Menu, select Line LoopBack and the following fields are displayed:

```
Line LoopBack
1) Activate LoopBack
2) Remove LoopBack
Enter Choice:
```

1a **ACTIVATE LOOPBACK** This option enables the LoopBack feature so that the next incoming frame is looped back to the transmitting unit.

1b **REMOVE LOOPBACK** This option disables the LoopBack feature so that incoming frames are received and processed by the receiving unit.

Step 2 Press ESC until you return to the Main Menu.

Appendix A Specifications

This section provides details on the various specifications that govern the operation of the units and their CSU/DSUs.

A.1 9X00-D - Network Port

DATA RATES	56000/64000 bps synchronous standard four-wire CSU/DSU interface
OPERATING RANGE (WITH UNLOADED TWISTED-PAIR CABLES, 24 AWG):	
SPEED	56000/64000
DISTANCE	4.5 miles Range on heavier gauge cables exceeds the distances above.

A.2 Network Port - DTE

The F9x00-D CSU/DSU network port for DTE has an RJ-48S connector with the following pinout.

RJ-48S PIN	FUNCTION
1	Tx Ring (to Network)
2	Tx Tip (to Network)
3	Unused
4	Unused
5	Unused
6	Unused
7	Rx Tip (from Network)
8	Rx Ring (from Network)

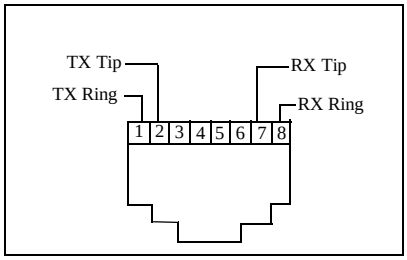


Illustration A-1: Front of Jack Port

A.3 ISDN Network Ports

A.3.1 ISDN Interface Pinouts

There are two types of ISDN connectors: the S/T interface, used in North America, and the U Interface, used internationally. The Following are the pinouts for each, as viewed from the rear panel, looking into the connector. Pin one is on the left and pin eight is on the right.

ISDN S/T Interface Pinout:

ISDN S/T	FUNCTION
PIN 1	N/C
PIN 2	N/C
PIN 3	TX+
PIN 4	RX+
PIN 5	RX-
PIN 6	TX-
PIN 7	N/C
PIN 8	N/C

ISDN U Interface Pinout:

ISDN U	FUNCTION
PIN 1	N/C
PIN 2	N/C
PIN 3	N/C
PIN 4	TX/RX
PIN 5	TX/RX
PIN 6	N/C
PIN 7	N/C
PIN 8	N/C

A.4 T-1/E-1 Network Ports

The following pinouts are for T-1 and E-1 Ports:

PIN NUMBER	FUNCTION
PIN 1	Rx Tip
PIN 2	Rx Ring
PIN 3	N/C
PIN 4	Tx Tip
PIN 5	Tx Ring
PIN 6	N/C
PIN 7	N/C
PIN 8	N/C

A.5 ISDN Port - U

CODING	2 Binary, 1 Quartenary on RJ49C
OPERATING RANGE:	
SPEED	64000
DISTANCE	18,000 feet

A.6 ISDN Port - S/T

CODING	Pseudoternary
OPERATING RANGE:	
SPEED	64000
DISTANCE	200-1000 meters, depending on location, devices, quality of cables, and other factors.

A.7 User, Supervisor and 9X00-S Network Ports

The unit's data ports can be remotely configured in the software. The data rates, in bit/s, of synchronous and asynchronous data ports are as follows:

SYNCHRONOUS	ASYNCHRONOUS
1024000	115200
768000	57600
512000	48000
256000	38400
192000	19200
128000	9600
96000	4800
64000	2400
56000	1200
48000	
38400	
19200	
9600	
4800	
2400	

A.8 Interfaces

CSU/DSU NETWORK PORT	Bipolar Return-to-Zero using an 8-position modular RJ-48S (US) or CA 48S (Canada) jack to allow easy installation.
USER PORTS AND NON-CSU/ DSU NETWORK PORT (WAN)	X.21/V.11, V.35, RS-232, or RS-422 on a DB-25 with EIA-530 pinout
ETHERNET PORT (LAN)	10Base-T (RJ-45) and AUI
TOKEN RING PORT (LAN)	STP (DB9) and UTP (RJ-45)
ISDN PORT (WAN)	two 64Kbps B-channels and one 16 Kbps D-channel

A.9 Operating Mode and Format

MODE	FORMAT
RS-232	Serial
V.35	Binary
RS-422	Synchronous Data
X.21 following EIA 530 on DB-25 with an optional adapter cable to M-34	Asynchronous Data
DB-37	
DB-15 connector	
Ethernet on AUI or 10Base-T (RJ-45)	

A.10 Power Requirements

Input voltage	115v A.C., 60 Hz Cypress: 115v or 230v AC or -48v DC
Output voltage	20-24v A.C., 20 v AC -48v DC (factory installed option)
Input Connector	Two prong with ground
Output Connector	Four prong molex
Certifications	UL, CSA

The Power Transformers meet the following requirements:

NORTH AMERICA	EU
Class 2 wall transformer	Double insulated, power limited, Safety Extra Low Voltage (SELV) transformer
20-24VAC	20-24 VAC
20VA	20VA
60Hz	50Hz

A.11 Environmental

AMBIENT TEMP	0 to 50 °C
RELATIVE HUMIDITY	20% to 90% non condensing at 24
ALTITUDE	10,000 Feet max. (3,000 m)
WEIGHT	MonoFRAD: 1 lb. EtherFRAD: 3 lbs. Cypress (empty): 30 lbs.
DIMENSIONS	3 x 7 x 9 1/2 Cypress: 10 1/2" x 19 1/4" x 14 3/4"

A.12 Protocols Supported

ASYNC AND SYNC PPP	**FRAME RELAY**	**SLIP**
ASYNC ENCAPSULATION	**SDLC SPOOFING**	**IP**
BIT SYNC ENCAPSULATION	**SDLC ROUTING**	**IPX**
ANNEX G (X.25 OVER FRAME RELAY)	**SNMP/TELNET**	**X.25**
POLL/SELECT SPOOFING	**ISDN**	**LLC**
BYTE SYNC ENCAPSULATION	**RIP ROUTING**	
X.25 SWITCHING	**SNA RFC-1490**	

A.13 Specifications Supported

GA27-3093 (SDLC)	1097805 (3/80) (Burroughs-TD)
RFC 0793 (TCP)	RFCs 0854, 0857, 0858 (Telnet)
RFC 1055 (SLIP)	RFCs 1331, 1332, 1378 (PPP)
1086956 (1/76) (Burroughs)	RFC 1294/1490 (Frame Relay) and SNA

A.14 Standards Publications

AT&T	41458	Special Access Connections to the AT&T Communications Public Switched Network for New Service Application
AT&T	41021	Digital Data System - Channel Interface Specifications
AT&T	62310	Digital Data System Channel Interface Specifications
AT&T	54075	Subrate Data Multiplexing - A Service Function of Digital Data Service
MIL-STD	188-114	Electrical Characteristics of Digital Interface Circuits
AT&T	41021A	Addendum to 41021
TIA/EIA	596	Net. Channel Terminating Equipment for Public Switched Digital Service - Type 1
AT&T	TR62411	ACCUNET(R) T1.5 Service: Description and Interface Specifications
AT&T	TR54016	Requirements for Interfacing Digital Terminal Equipment to Services Employing the Extended Superframe Format
ANSI	T1.403-1995	Network-to-Customer Installation-DS1 Metallic Interface
ANSI	T1.601	ISDN Basic Access: Interface for Use on Metallic Loops: for Application on the Network Side of the NT (Layer 1 Specification)
ANSI	T1.605	ISDN Basic Access: Interface for S and T Reference Points (Layer 1 Specification)
Bellcore	SR-NWT-001937	National ISDN-1
Bellcore	SR-NWT-002661	National ISDN Generic Guidelines for ISDN Terminal Equipment
CCITT	1.430	ISDN User-Network Interfaces-Layer 1 Specification (S/T)
CCITT	Q.921	ISDN User-Network Interface, Data Link Layer Specification
CCITT	Q.931	ISDN User-Network Interface, Layer 3 Specification
ITU	G.703	Physical/Electrical Characteristics of Hierarchical Digital Interfaces
ITU	G.704	Synchronous Frame Structures Used at Primary and Secondary Hierarchical Levels
ITU	G.732	Characteristics of Primary PCM Multiplex Equipment Operating at 2048 kbit/s
ITU	G.775	Loss of Signal (LOS) and Alarm Indication Signal (AIS) Defect Detection and Clearance Criteria
ITU	O.162	Equipment to Perform In-Service Monitoring on 2048,8448, 34 368, and 139 264 Kbit/s Signals

A.15 Technical Publications

ANSI	T1.601	ISDN Basic Access: Interface for use one Metallic Loops: for Application on the network side of the NT (Layer 1 specs).
ANSI	T1.601	ISDN Basic Access: Interface for S and T Reference Points (Layer 1 - specs).
Bellcore	SR-NWT-001937	National ISDN -1
Bellcore	SR-NWT-002261	National ISDN Generic Guidelines for ISDN Terminal Equipment
CCITT	1.430	ISDN - User Network Interfaces Layer 1 specification (S/T)
CCITT	Q.921	ISDN - User Network Interfaces Data Link Layer specifications
CCITT	Q.931	ISDN User Network Interface, Layer 3, specification
ITU	G.732	Characteristics of Primary PCM Multiplex Equipment Operating at 2048 Kbps
ITU	O.162	Equipment to Perform In-Service Monitoring on 2048, 8448, 34 368, and 139 264 kbps/signals.

Appendix B Interface Pinouts

B.1 Serial Ports with Fastick Pinouts

The serial user ports (Ports 1-4) on all F9x00 units and the Network port on the F9x00-S unit have several interface options which are determined by the Fasticks they contain. The pinouts for these options, which include X.21, V.35, RS-232, and RS-422 are described in the tables on the following pages.

B.2 X.21 Fastick Interface

DB-25 (MALE)	SIGNAL DESIGNATIONS	DTE	DCE	X.21/V.11	DB-15 (MALE/ FEMALE)
1	Frame Ground	----------	----------	Frame Gnd	1
2	Transmit Data A	→		Transmit Data A	2
3	Receive Data A		←	Receive Data A	4
4	Request To Send (RTS) A*	→			
5	Clear To Send (CTS) A*		←		
6	Unused/No Connect				
7	Signal Ground	----------	----------	Signal Gnd	8
8	Data Carrier Detect (DCD) A		←	Indication	5
9	Receive /Timing (RXC-) B		←	Signal Element Timing B	13
10	Data Carrier Detect (DCD) B		←	Indication	12
11	Unused/No Connect				
12	Unused/No Connect				
13	Clear to Send (CTS) B**		←		
14	Transmit Data B	→		Transmit Data B	9
15	Unused/No Connect				
16	Receive Data B		←	Receive Data B	11
17	Receive/Timing (RXC+) A		←	Signal Element Timing A	6
18	Unused/No Connect			Unused/No Connect	7
19	Request to Send (RTS) B**	→			
20	Data Terminal Ready (DTR) A	→		Control A	3
21	Unused/No Connect			Unused/No Connect	14
22	Unused/No Connect			Unused/No Connect	15
23	Data Terminal Ready (DTR) B	→		Control B	10

*DB-25 pins 4 & 5 are jumpered together.
**DB-25 pins 13 & 19 are jumpered together.

To adapt the serial interface to an X.21 DB-15 interface, one of the following adaption cables are required:

FRAD INTERFACE	USER DEVICE	PART NUMBER	DESCRIPTION
DB-25P	DB-15S	F0002-11	X.21 12 inch Adapter Cable
DB-25P	DB-15P	F0002-12	X.21 72 inch Adapter Cable

B.2.1 EIA-530 / V.35 Fastick Interface

DB-25 (MALE)	SIGNAL DESIGNATIONS	DTE	DCE	V.35	M-34 (MALE/ FEMALE)
1	Shield	----------	----------	Frame Gnd	A
2	Transmit Data A	→		SD A	P
3	Receive Data A		←	RD A	R
4	Request To Send (RTS)	→		RTS	C
5	Clear To Send (CTS)		←	CTS	D
6	Data Set Ready (DSR)		←	DSR	E
7	Signal Ground	----------	----------	Signal Gnd	B
8	Received Line Signal Detector		←	RLSD	F
9	Serial Clock Receive B		←	SCR B	X
10	Unused/No Connect				
11	Serial Clock Transmit External B	→		SCTE B	W
12	Serial Clock Transmit B		←	SCT B	AA
13	Unused/No Connect				
14	Transmit Data B	→		SD B	S
15	Serial Clock Transmit A		←	SCT A	Y
16	Received Data B		←	RD B	T
17	Serial Clock Receive A		←	SCR A	V
18	Unused/No Connect				
19	Unused/No Connect				
20	DTE Ready (DTR)	→		DTR	H
21	Unused/No Connect				
22	Unused/No Connect				
23	Unused/No Connect				
24	Serial Clock Transmit External A	→		SCTE A	U
25					

To adapt the EIA-530 V.35 interface to an M-34 V.35 interface, one of the following adaption cables are required:

FRAD INTERFACE	USER DEVICE	PART NUMBER	DESCRIPTION
DB-25P	M-34S	F0002-5	V.35 12 inch Adapter Cable
DB-25P	M-34P	F0002-6	V.35 72 inch Adapter Cable

B.2.2 RS-232 DB-25 Fastick Interface

DB-25 (MALE)	RS--232 FUNCTION	DTE	DCE	DB-25 (MALE/FEMALE)
1	Frame Ground	---------	---------	1
2	Transmit Data	→		2
3	Receive Data		←	3
4	Request To Send (RTS)	→		4
5	Clear To Send (CTS)		←	5
6	Data Set Ready (DSR)		←	6
7	Signal Ground	---------	---------	7
8	Data Carrier Detect (DCD)		←	8
9	Unused			9
10	Unused			10
11	Unused			11
12	Unused			12
13	Unused			13
14	Unused			14
15	Transmitter Clock		←	15
16	Unused			16
17	Receiver Clock		←	17
18	Unused			18
19	Unused			19
20	Data Term. Ready (DTR)	→		20
21	Unused			21
22	Unused			22
23	Unused			23
24	External Transmitter Clock	→		24
25	Unused			25

NOTE: An RS-232 cable is a long-term standard, and FastComm does not generally provide or stock this cable. Ensure that the cable you are using is properly shielded and does not exceed the recommended length for RS-232.

B.2.3 EIA-530 / RS-422 Fastick Interface

DB-25 (MALE)	SIGNAL DESIGNATIONS	DTE	DCE	RS-422	DB-37 (MALE/ FEMALE)
1	Shield	---------	---------	Shield	1
2	Transmitted Data A	→		Send Data A	4
3	Received Data A		←	Receive Data A	6
4	Request To Send (RTS) A	→		Request to Send A	7
5	Clear To Send (CTS) A		←	Clear to Send A	9
6	DCE Ready A		←	Data Mode A	11
7	Signal Ground	---------	---------	Signal Gnd	19
8	Received Line Signal Detector A		←	Receiver Ready A	13
9	RX Element Timing B		←	Receive Timing B	26
10	Received Line Signal Detector B		←	Receiver Ready B	31
11	TX Element Timing B	→		Terminal Timing B	35
12	TX Element Timing B		←	Send Timing B	23
13	Clear to Send (CTS) B		←	Clear to Send B	27
14	Transmitted Data B	→		Send Data B	22
15	TX Element Timing A		←	Send Timing A	5
16	Received Data B		←	Receive Data B	24
17	RX Element Timing A		←	Receive Timing A	8
18	Unused/No Connect				
19	Request to Send B	→		Request to Send B	25
20	DTE Ready A	→		Terminal Ready A	12
21	Unused/No Connect				
22	DCE Ready B		←	Data Mode B	29
23	DTE Ready (DTR) B	→		Terminal Ready B	30
24	TX Element Timing (DTE Source)	→		Terminal Timing A	17
25	Unused/No Connect				

To adapt EIA-530 to EIA-449, one of the following adaption cables are required:

FRAD INTERFACE	USER DEVICE	PART NUMBER	DESCRIPTION
DB-25P	DB-37S	F0002-7	V.35 12 inch Adapter Cable
DB-25P	DB-37P	F0002-8	V.35 72 inch Adapter Cable

B.3 Supervisor Port - DCE

The Supervisor port is always RS-232 on an EIA-561/ 8 Pin Modular connector.

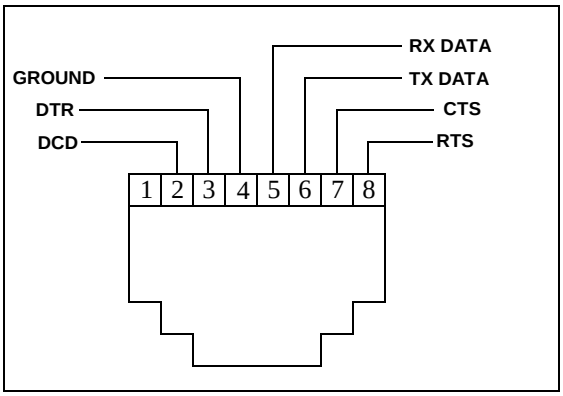


Illustration B-1: Socket View of 8 Pin Modular Supervisory Port

The three types of adapter cables used to connect the Supervisor port are as follows:

- For PC connection, use an eight Pin Modular to DB-9
- For async terminal connection, use an eight Pin Modular to DB-25
- For a modem connection, use a different eight Pin Modular to DB-25

Pinouts for these adapter cables are provided below:

Table 2-2: 8 Pin Modular to DB-9 Terminal Adapter Cable

8 PIN MODULAR PIN	FUNCTION	OUT	IN	DB-9 PIN
1	Unused			9
2	DCD	→		1
3	DTR		←	4
4	Common Ground			5
5	Receive Data	→		2
6	Transmit Data		←	3
7	CTS	→		8
8	RTS		←	7

Table 2-3: 8 Pin Modular to DB-25 Terminal Adapter Cable

8 PIN MODULAR PIN	FUNCTION	OUT	IN	DB-25 PIN
1	Unused			22
2	DCD	→		8
3	DTR		←	20
4	Common Ground			7
5	Receive Data	→		3
6	Transmit Data		←	2
7	CTS	→		5
8	RTS		←	4

Table 2-4: 8 Pin Modular to DB-25 Modem Adapter Cable

8 PIN MODULAR PIN	PORT FUNCTION	OUT	IN	DB-25 PIN	MODEM FUNCTION
1	Unused			22	Not Connected
2	DCD	→		8	Not Connected
3	DTR		←	20/6	DTR/DSR
4	Common Ground			7	Common Ground
5	Receive Data	→		2	Transmit Data
6	Transmit Data		←	3	Receive Data
7	CTS	→		4	RTS
8	RTS		←	5	CTS

B.4 Ethernet Ports

There are two types of Ethernet connectors on the EtherFRAD™, the Attachment Unit Interface (AUI) and the 10Base-T.

B.4.1 AUI Connection

The EtherFRAD™ provides an AUI on a rear panel mounted DB-15 socket connector with the following pinout.

DB-15 PIN	FUNCTION	SIGNAL SOURCE
1	Shield	Common
2	Collision +	MAU
3	Transmit +	EtherFRAD
4	Reserved	-
5	Receive +	MAU
6	Ground	Common
7	Reserved	-

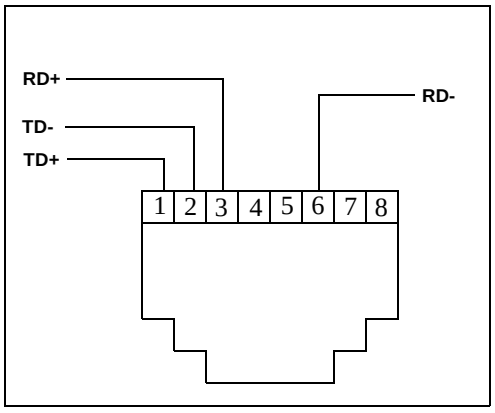
8	Reserved	-
9	Collision -	MAU
10	Transmit -	EtherFRAD
11	Reserved	-
12	Receive -	MAU
13	+12v	EtherFRAD
14	Reserved	-
15	Reserved	-

B.4.2 10 Base-T Connection

10 Base-T is implemented over Unshielded Twisted Pair (UTP) wire. The connector is a standard RJ-45 connector.

The pinout of the RJ-45 connector and a view of the connector (looking into the connector) are shown below.

PIN	DESCRIPTION
1	TD+
2	TD-
3	RD+
4	---
5	---
6	RD-
7	---
8	---



In the 10 Base-T environment there are two types of pinouts: hubs and everything else. These pinouts have their RD and TD pairs reversed so that a straight cable is used to connect a hub to any other non-hub 10 Base-T equipment.

Since the EtherFRAD^{TM} is not a hub, it does not use a hub pinout. Therefore the EtherFRAD^{TM} does not connect directly to a router or PC without a crossover cable.

To build a 10 Base-T crossover cable for the EtherFRAD™, use the following pinout:

10BASE-T CROSSOVER CABLE	
CONNECTOR 1	CONNECTOR 2
1	3
2	6
3	1
6	2

B.5 Token Ring Ports

The Token Ring module provides four connectors and include two Token Ring connectors (DB9 and RJ45), and two DB-25 connectors for various serial interfaces. The pinouts of all connectors are as follows:

Following is the RJ45 Pinout:

PIN	DESCRIPTION
1	Reserved
2	Reserved
3	Transmit-
4	Receive-
5	Receive+
6	Transmit+
7	Reserved
8	Reserved

Below is the DB-9 Pinout:

PIN	DESCRIPTION
1	Receive+
2	Ground
3	+5V feed
4	Ground
5	Transmit-
6	Receive-
7	Ground
8	Ground
9	Transmit+

B.5.1 S/T Jumpers

The S/T interface has two associated jumpers: P4 and P5. They are located behind the ISDN J1 connector, which is on the top board of the unit. The P4 and P5 jumpers are shipped in the OPEN position.

These jumpers are required to terminate the S/T bus if the unit is the only device on the bus. If there are multiple devices on the bus, only one device terminates it. To set up the unit to terminate the bus, both jumpers must be installed in the "CLOSED" or shorted position. If the jumpers are in the "OPEN" position, the unit will not terminate the bus.

B.6 -48v DC Power Option Cable

The F9x00 FRAD with a built-in -48v DC power option requires a special cable for connection to the power supply. Power may be supplied on either or both pairs 2-3 and/or 5-6.

The pinout for this cable is as follows:

PIN NUMBER	COLOR	FUNCTION
PIN 1	Green	Chassis Ground
PIN 2	Black	-48v
PIN 3	White	Return for Pin 2
PIN 4	Blue	Chassis Ground
PIN 5	Red	-48v
PIN 6	Orange	Return for Pin 5

NOTE: The cable can be ordered from FastComm using Order Code F0002-10.

B.7 Testing with RJ-48S to RJ-48S Crossover Cables

Back-to-back testing requires an RJ-48S to RJ-48S crossover cable (56/64k), shown in the figure below (See Section 2.12, Testing Back-to-Back).

CONNECTOR 1	CONNECTOR 2
1	8
2	7
7	2
8	1

OR

CONNECTOR 1	CONNECTOR 2
1	8
2	7
3	6
4	5
5	4
6	3
7	2
8	1

T1/E1:

CONNECTOR 1	CONNECTOR 2
1	4
2	5
4	1
5	2

B.8 Cabling Adjacent Units Together

There are many ways to connect adjacent units together. The two most common methods are the hub connection and the daisy chain connection. These connection methods are outlined on the following page.

B.8.1 Connecting to a Hub

This method can be used for units in a non-chassis Distrbitured FRAD System, although a chassis is generally preferred.

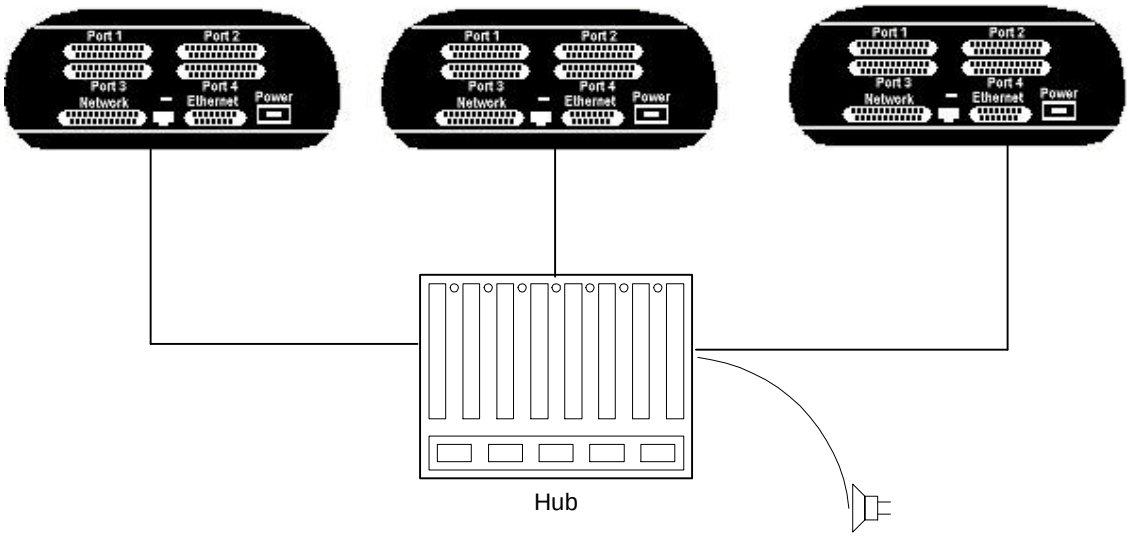


Illustration B-2: Cabling Units to a Hub

To connect units to a hub, follow the steps outlined below:

Step 1 Align the units to be connected so that they may be connected to the hub.

Step 2 Connect a 10 Base T cable to the Ethernet on one unit.

Step 3 Connect the opposite end of this cable to the ports on the hub.

Step 4 Repeat this process for each unit.

Step 5 Connect the Power Connector on each unit to an AC outlet via the power cord.

Step 6 Connect the Power Connector on the hub to an AC outlet.

B.8.2 Daisy-Chain Cabling

This method can be used for units in a non-chassis Distributed FRAD System, although a chassis is generally preferred. To connect units together in a daisy-chain fashion, follow the steps outlined below.

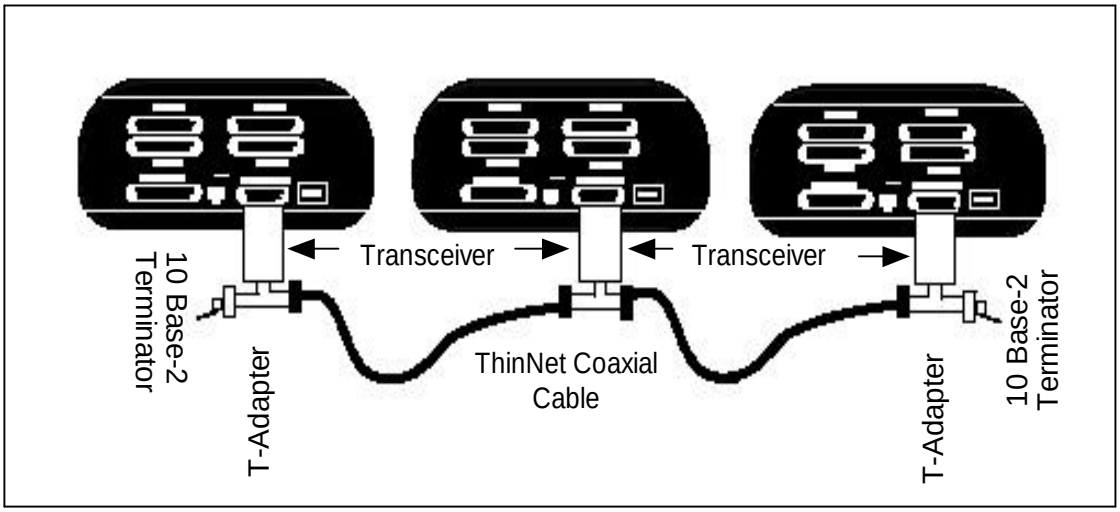


Illustration B-3: Cabling Units Together in a Daisy Chain

Step 1 Align the units to be connected so that they may be connected to an Ethernet backbone

Step 2 Connect a 10 Base 2 ThinNet transceiver to the Ethernet port on each unit

Step 3 Connect a BNC T-adapter to each transceiver

Step 4 Connect the first unit to the second unit via an 18" ThinNet coaxial cable by following the procedure below:

4a With the T-adapter aligned vertically, connect the lower end of the first unit's T-adapter to the top end of the second unit's T-adapter in a daisy-chain format.

4b Repeat this process until all units are connected to the units adjacent to them

Step 5 Connect a BNC 10 Base 2 terminator to the two remaining open ends of the T-adapters. One open end is on the first unit you connected via cable, and the other open end is on the last unit

Step 6 Connect the Power Connector on each unit to an AC outlet via the power cord

B.9 Special Options

B.9.1 Setting Up a Cypress Chassis

The Cypress rackmount chassis can hold up to five units.

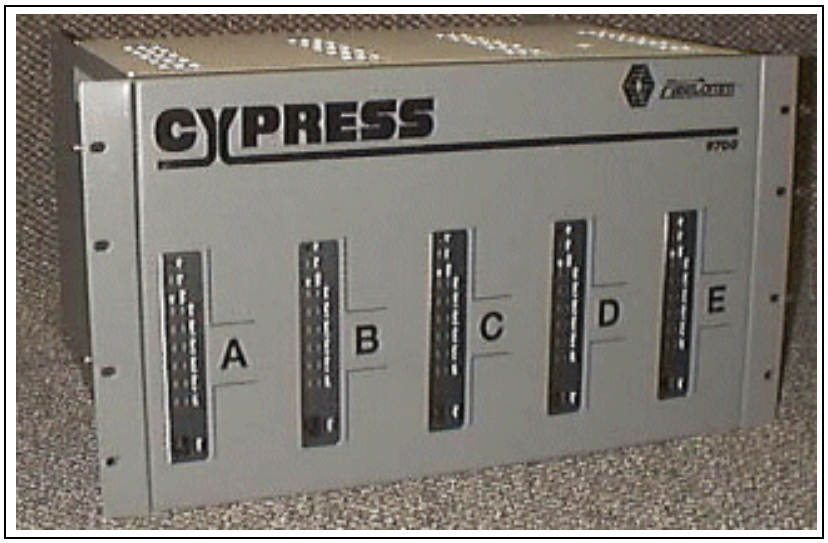


Illustration B-4: Chassis System with Five Units: Front View

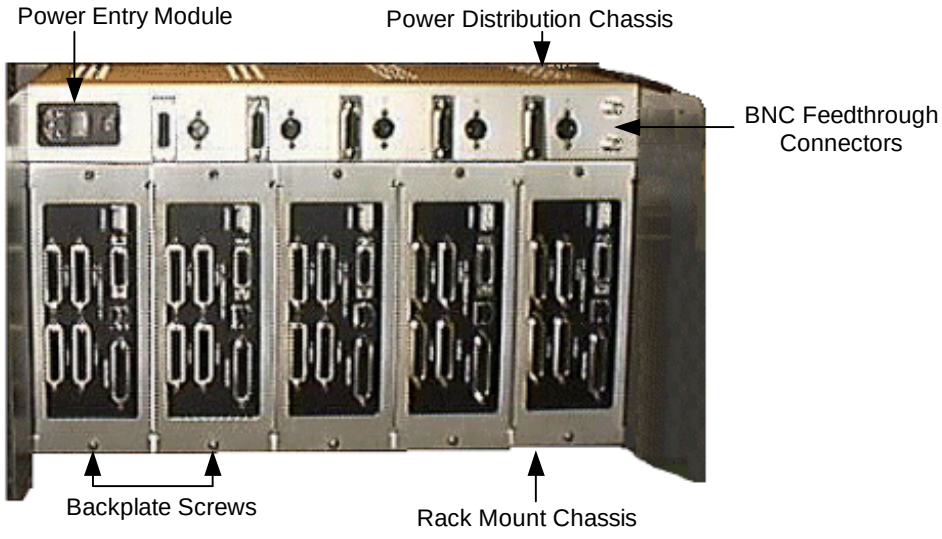


Illustration B-5: Uncabled Units within a Cypress Chassis: Rear View

The image above shows the back of the chassis. The chassis is comprised of two main parts: the Power Distribution Chassis and the Rack Mount Chassis. The Power Distribution Chassis is what drives the chassis itself. It is the strip that runs along the top of the chassis, which holds the main power connector for the Cypress; the fuse holder; the chassis' AUI connectors and power connectors that attach to each unit; and two BNC feedthrough connectors that allow you to chain two or more chassis together. The Rack Mount Chassis holds the units themselves.

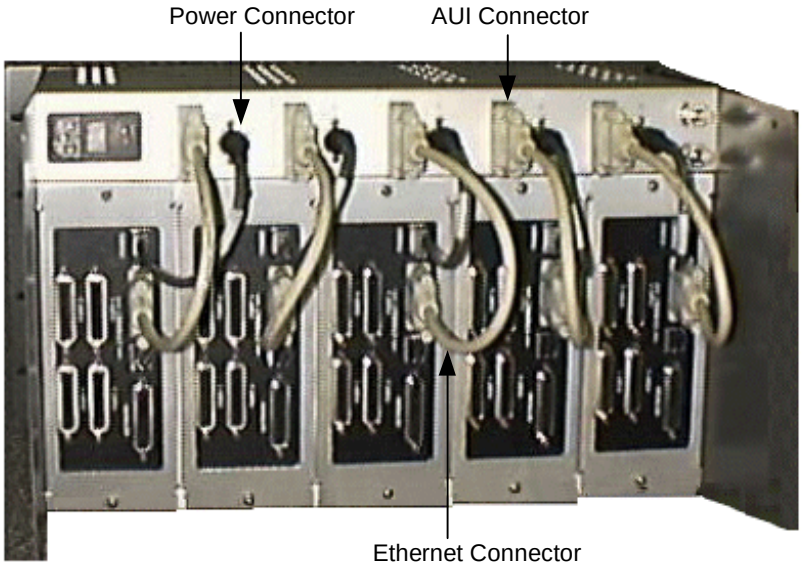


Illustration B-6: Cabled Units within a Chassis: Rear View

The Cypress Chassis has a cable support rod (not pictured) that runs along the bottom of the unit to support the DB-25 Connector cables.

Step 1 Units are generally preinstalled and precabled in the chassis when shipped.

Step 2 Ensure that each unit's individual power connector is connected to its corresponding power connector located on the Power Distribution Chassis above the unit.

Step 3 If you are connecting a Distributed FRAD System or require that the Ethernet connectors be cabled together, ensure that each unit's Ethernet port is attached via an AUI cable to its corresponding AUI connector located on the Power Distribution Chassis above the unit.

Step 4 If you have only one chassis, attach a BNC terminator to each BNC Feedthrough connector.

Step 5 If you are connecting two chassis systems together, attach a ThinNet coaxial cable to the bottom BNC Feedthrough connector on the first chassis, and connect it to the top Feedthrough connector on the second chassis. Attach a BNC terminator to the two open Feedthrough connectors, the top one on the first chassis, and the bottom one on the second chassis.

Step 6 If you need to add or remove a unit to/from the chassis, unhook all cables going to that unit. Next, you must remove the backplate that covers the periphery of the unit(s) to which you need access. To do so, simply loosen the screw at the top and bottom of the unit(s)'s backplate and gently pull the plate off. To insert a unit, make sure the front of the unit is lined up with the other units, and push it into the slot. If you are removing a unit, press on the face place from the front until the unit extends from the rear far enough to grasp with your hands. Pull firmly.

Step 7 Connect the power cord from the Power Entry Module to an AC outlet.

Step 8 If you need to change the Power Entry Module from 115v to 230v, or vice versa, use a thin flathead screwdriver to lift the tab of the Power Entry Module's cover. The top of the Fuse Holder is exposed. Use the screwdriver to gently lift the Fuse Holder out of the Power Entry Module.

For Example: Assume that you want to change the fuse from 115v to 230v. You will know the voltage is set to 115 because "115v" will show through the window in the cover of the Power Entry Module. Using the screwdriver, gently lift the Fuse Holder out of the Power Entry Module. Dispose of the 115v fuse, and replace it with the 230v fuse, which fits on the side of the Fuse Holder. Reinsert the Fuse Holder into the Power Entry Module. See the illustration on the following page.

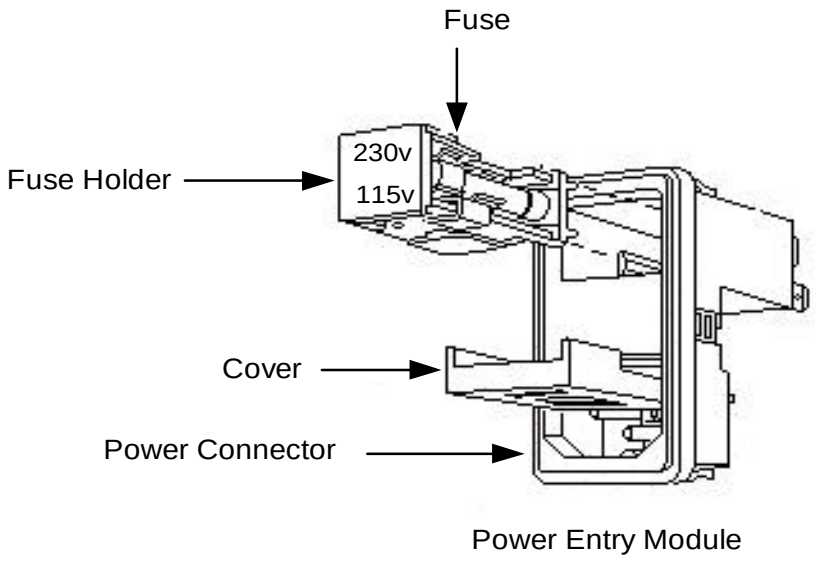


Illustration B-7: Power Entry Module, Cover, & Fuse Holder (Top View)

B.9.2 Configuring DRA for the Cypress

STARTING PATH . . . From the Main Menu, select System Administration **>>** Enter Password >> Distributed FRAD System.

Statistics . . . For information on the connection status between the Master unit and each Slave unit, see Section 7.20, Board Statistics in the FRAD Reference Guide. For statistics on a given port within the system, see Section 7.2, Logical Ports Statistics in the FRAD Reference Guide.

Overview

The Distributed FRAD System is a method whereby you may join up to five FRADs into a single unit, providing up to 25 physical ports. It may be used *only* for a single site, as it is connected via an Ethernet backplane. You may have more than one Distributed FRAD System on the same Ethernet backplane. The system consists of one Master unit and up to four Slave units. Masters and Slaves are linked with one another with the software by completing a table, within each unit, that specifies the MAC address(es) of their Masters and Slaves. This must be done at the onset of the process of setting up the Distributed FRAD System.

The system may be set up within a chassis or by simply aligning the designated units within close proximity to one another for cabling purposes.

When the units have been completely cabled and configured, the Master unit is able to automatically detect what type of hardware is connected to it, how many ports are connected to it, and what parameters have been configured in each of its slave units. Once the Distributed FRAD System is set up, all further configuration of the system must be done through the Master unit.

B.9.3 Configuring Units as Master or Slaves

Before you start !! You must connect the units in the Distributed FRAD System together physically (see Section B.9.1, Setting up a Cypress Chassis and Section B.8, Cabling Adjacent Units Together).

Helpful Hint . . . Connect to each unit and select View Current Unit Status to obtain the unit's MAC address. Designate a name for the unit, and determine whether it will be the Master unit or a Slave unit. Label the units accordingly, and write the unit's name and MAC address on a piece of paper. Repeat this for each unit.

Step 1 **DISTRIBUTED FRAD SYSTEM** This option allows you to specify whether the unit is a Master or a Slave, and it provides a table wherein you may specify the MAC address(es) of a Master and any Slaves this unit may have. Select Distributed FRAD System and the following menu is displayed:

```
Distributed FRAD System
1) FRAD Role : MASTER
2) FRAD Board Table
Enter Choice :
```

Step 2 **FRAD ROLE** This option allows you to specify whether this unit is to function as the Master unit or a Slave unit. Select Role and the following prompt is displayed:

```
Enter FRAD Role(M-Master, S-Slave, N-None)[N]:
```

Type M if the unit is to function as Master. Configuration for all ports and modules within the Master and the Slaves are done through this unit.

Type S if the unit is to function as Slave.

Type N if the unit is to function as a standalone unit and is not to be a part of the Distributed FRAD System.

NOTE: Only one Master unit is allowed for each Distributed FRAD System.

Step 3 **FRAD BOARD TABLE** You must complete a Board Table within each physical unit to be included in the Distributed FRAD System. When you configure the Master unit, you must enter the MAC address of each Slave unit. When you configure each Slave unit, you must enter the MAC address of the Master unit. The MAC address is the identification that is hardcoded into each physical board, and is the number that can be mapped to a logical address for routing purposes.

NOTE: The Slave units' Board Tables should not contain the MAC addresses of any other Slaves.

Helpful Hint . . . You can get the MAC address of each unit by connecting to each unit separately and selecting View Current Unit Status from its Main Menu.

Select Board Table and the following menu is displayed:

```
Num  Board Name      MAC Address
1    free
2    free
3    free
4    free
```

```
Board Table is Empty
Add an Entry
```

Select the first free slot. The following menu is displayed:

```
1) Board Name                                                    :
2) Board MAC Address(Hex) :
Enter Choice :
```

3a **BOARD NAME** This option allows you to assign a name to the unit. Select Board Name and the following prompt is displayed:

```
Enter Board Name(Maximum 15 characters):
```

Enter a name that will help you identify this board later and press <ENTER>. In our example, we will name the first slave Slave1.

3b **BOARD MAC ADDRESS** This option allows you to specify the MAC address of a Master or Slave. Select Board MAC Address and the following prompt is displayed:

```
Enter Board MAC Address(12 Hex Digits):
```

If you are configuring the Master unit, enter the MAC address of one of the Slave units. The MAC address is encoded on the hardware of the Slave and can be obtained from the View Current Unit Status option on the Main Menu. Remember to enter each Slave's MAC address into the Master Board Table.

If you are configuring a Slave unit, enter the Master unit's MAC address into the Slave's Board Table. Do not enter any other MAC addresses into the Slave unit.

IMPORTANT

!!

You must complete this table on each unit, *individually*. This means you must *physically connect the Supervisor cable to each unit, one at a time, and configure the table on each*. When each unit has its own Board Table, you may cable the units together and begin configuring the Master unit. See Section B.13, Setting Up a Cypress Chassis.

The following confirmation is displayed:

```
Save Changes to Selected Entry? (Enter Y or N):
```

3c If you are configuring a Master unit, you may continue to enter names and MAC addresses of other Slaves. When you have finished, press ESC.

Step 4 Once a Slave unit has been set up within the Master, the Slave's *Main Menu is truncated* as displayed on the following page. Only the Master unit retains the full Main Menu. This may serve as a check if you are ever in doubt as to which type of unit you are connected to.

```
Main Menu
----------------------------------------

V) View Current Unit Status
L) Load Factory Defaults
W) Write Configuration
R) Reset Unit
X) eXit Session
S) Statistics
Y) sYstem Administration

Enter Choice :
```

SAVE & RESET . . . You must save and reset each unit before moving on to set up names and MAC addresses in the next unit (See Section 2.3.9, Writing (Saving) Configurations and Section 2.3.10, Resetting the Unit of the FRAD Reference Guide).

B.9.4 Configuring Ports within the Distributed FRAD System

STARTING PATH . . . From the Main Menu, select Data Configurations.

Once the Board Tables have been completed for each unit, and the units have been properly cabled with the Supervisor cable connected to the Master unit. The Master automatically detects that the Slave units exist. It automatically detects their hardware configurations, the number and types of ports on each board, and any other parameters that have already been configured on the slave boards.

Now, you may begin configuring ports as usual. This section guides you through the steps involved in configuring a slave port *while working from the Master unit*.

When you select Data Configurations from the Master unit's Main Menu, the "Logical Port Protocol" menu is displayed as follows:

```
-------------------------------------------------------------------------------
Logical Port Protocol                    Port Interfaces
-------------------------------------------------------------------------------
S) Supervisor                            DCE
N) Frame Relay                           DTE -- CSU/DSU
1) UNDEFINED                             RS-232 DCE
2) UNDEFINED                             RS-232 DCE
3) UNDEFINED                             RS-232 DCE
```

```
4) UNDEFINED                    RS-232 DCE
E) EtherNet
M) More Ports...
```

Step 1 Select a logical port. In this example, we will select Port 1. The Logical Port Attribute Menu is displayed:

```
-------------------------------------------------------------------------------
Logical Port Attribute Menu
-------------------------------------------------------------------------------
1) Protocol                     UNDEFINED
2) Physical Mapping
3) Path
4) Dialup  Configuration
5) Undefine Current Logical Port

Enter Choice :
```

NOTE: Slave ports cannot be connected to a physical port on the Master unit.

Step 2 Select Physical Mapping and the "Physical Mapping Menu" is displayed:

```
Physical Mapping Menu
1) Main Board

U) Undefine Current Physical Mapping
Enter Choice:
```

The Main Board represents the physical ports in the Master unit.

Step 3 From the "Physical Mapping Menu", select "Main Board" (1), select the "Slave board", or unit, to which you want to link the Master unit's logical port. In this example, we will link Logical Port 1 of the Master unit to Slave 1. When you select Main Board, the "Main Board Port Selection" menu is displayed:

```
Board 1  Port Selection
-------------------------------------------------------
N) Network              DTE - - CSU/DSU
1) Port 1               RS-232 DCE
2) Port 2               RS-232 DCE
3) Port 3               RS-232 DCE
4) Port 4               RS-232 DCE

Enter Choice :
```

Step 4 From the "Main Board Port Selection" menu, select the *physical* port to which you want to link Logical Port 7. In this example, we will link Logical Port 7 to Slave 1's Port 1. When you select Port 1, the main "Physical Mapping" menu is re-displayed.

Step 5 Press ESC until you return to the "Logical Port Attribute Menu", as displayed below:

```
Logical Port Attribute Menu
-------------------------------------------
1) Protocol                  : UNDEFINED
2) Physical Mapping
3) Path
4) Dialup  Configuration
5) Undefine Current Logical Port
Enter Choice
```

Step 6 Continue configuring Port 1 by following the next three steps:

6a Select and define a protocol (see Chapter 4, Setting Protocol & Interface Parameters in the FRAD (Ether/Ring/Mono FRAD and Webrouter) Reference Guide).

6b Enter the appropriate path information (see section 3.4, Defining Global Paths in the FRAD (Ether/Ring/Mono FRAD and Webrouter) Reference Guide).

6c Set up any necessary dialup configurations (see Section 3.10.1, Backup & Primary Link Procedures for Modems & ISDN).

NOTE: Not all protocols are valid on slave units. Check with your distributor to learn which protocols are currently available.

Appendix C Sample Network Applications

Before you configure ports and set up call routing, make sure you have diagramed the network and made decisions on node numbering, DLCIs, clocking, routing and addressing schemes, and other specifications required to configure the network.

Review the configurations in this chapter, paying particular attention to the samples provided for the protocols you are using. The sample network configurations presented here include a diagram of the network, sample port configurations, and sample routing schemes. A typical network is illustrated on the following page (Illustration 2-24) and specific points relating to it are discussed on this page.

The Typical Network

The Voice Compression, on the MetroLAN and GlobalStack, "defaults to the most efficient voice transmission for both Voice Over IP (VoIP) and Voice over Frame Relay (VoFR), which is 8 kB/s.

The Frame Relay Network will also "default" to "Adaptive User", which will automatically detect the Network protocol.

When programming the MetroLAN's and GlobalStack's for "default" Voice and Data operation requires a minimum of programming.

Network Operation

Phones located at the remote locations may contact the memphis PBX, and connect to any extension, or connect to the "Local Exchange" by dialing "9" to access the local trunks.

Any phone within the network should be able to connect to any other phone within the network.

Extensions connected to the Memphis PBX, or any other phone should be capable of accessing the Local Exchanges at Little Rock or Tulso, by dialing the Trunk Access numbers for the applicable local offices.

All remote MetroLANs or EtherFRADs must be capable of Transmitting and Receiving "IP Data Traffic" to and from the "host" or from any remote units.

The complete Network must be accessible from the Memphis Office, via the Supervisor's Terminal port or via the server.

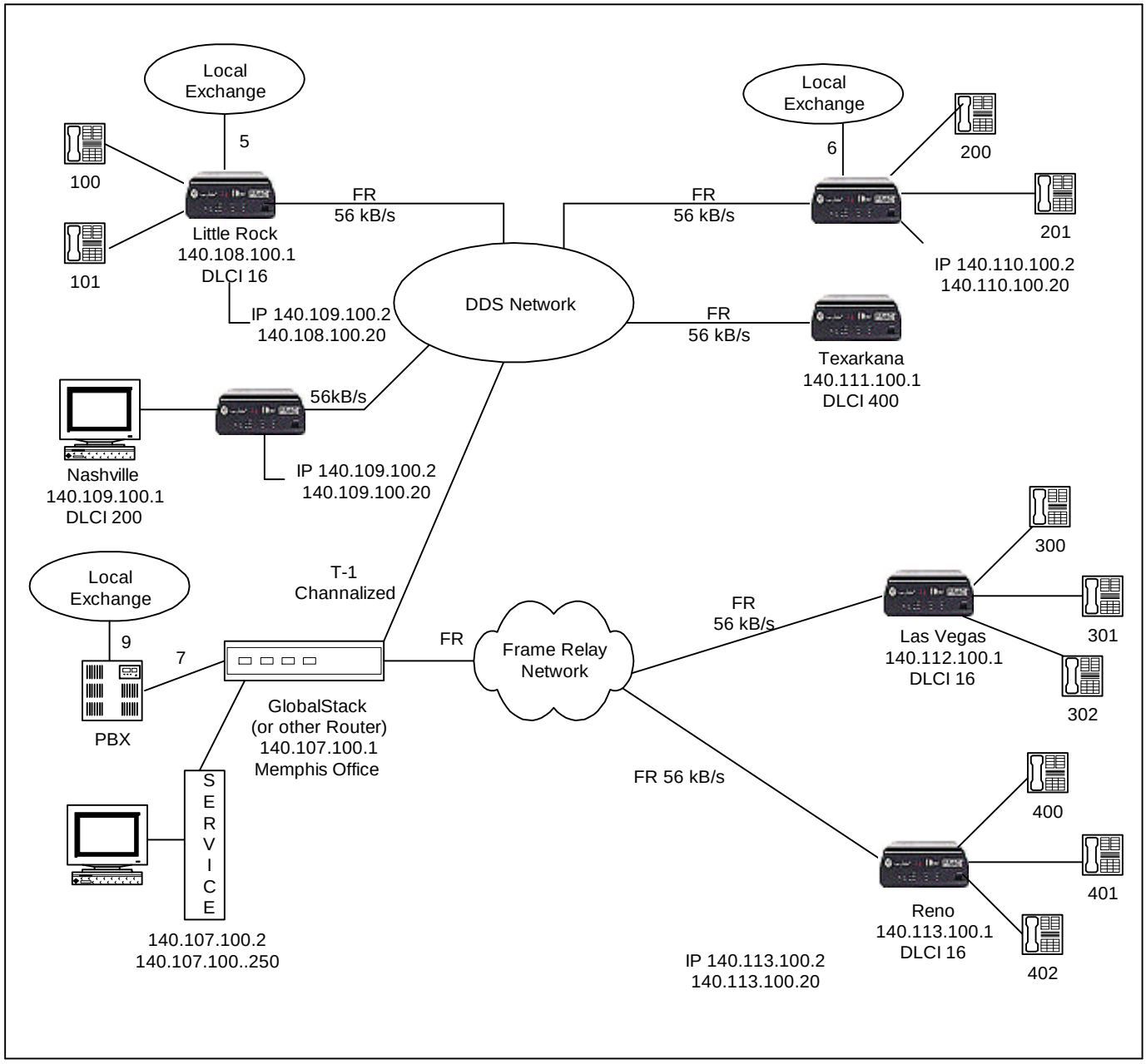


Illustration C-1: Typical Network

C.1 Async Encapsulation Application

This configuration allows Async traffic to be dispersed from a UNIX host to three remote terminals.

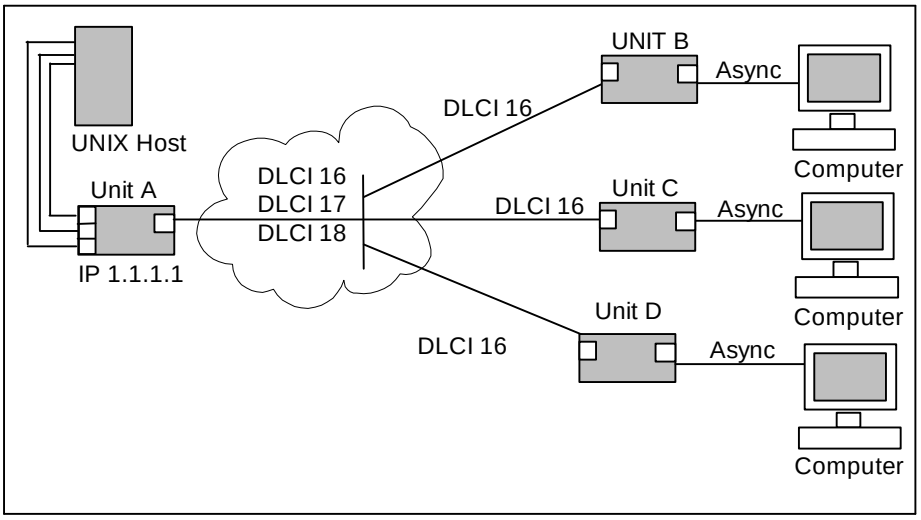


Illustration C-2: Configuration for Asynchronous Encapsulation

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NOTE: To save the new configuration once you have entered it, select Write Configuration then Reset Unit from the Main Menu to put the new configuration into effect.

Step 1 From the Main Menu, select Data Configurations >> Logical Port 2 >> Protocol >> Asynchronous Encapsulation and enter the following parameters:

```
Asynchronous Encapsulation Parameters : Port 2
------------------------------------------------------------------------------
1) Speed : 9600
2) Data Bits : 8
3) Parity : None
4) Stop Bits : 1
5) Flow Control : OFF
6) Flow Control Type : RTS/CTS
7) Break Length : 200 ms.
8) GPT Name :
9) Priority : Medium
A) Destination Port : Port 2
Enter Choice :
```

Step 2 **SPEED** This option allows you to specify a synchoronous clock speed (measurement of computer speed) for units configured for DCE. Select Speed and the following list of speeds is displayed:

```
Asynchronous Clock Speed
------------------------------------------
1) 1200
2) 2400
3) 4800
4) 9600
5) 19200
6) 38400
7) 48000
8) 57600
9) 115200

Enter Choice :
```

Step 3 **DATA BITS** This option allows you to select the number of Data Bits to be transmitted in each character. Select Data Bits and the following options are displayed:

```
Configure Asynchronous Number of Data Bits
-------------------------------------------------------------------
1)  7
2)  8
Enter Choice:
```

NOTE: You must obtain this information from your workstation hardware/ software vendor

---

Select the number of data bits your system uses.

Step 4 **PARITY** This option allows you to select the type of parity you need. Parity is a process for detecting whether bits of data have been altered during transmission of that data. Select Parity and the "Configure Asynchronous Parity" menu is displayed:

```
Configure Asynchronous Parity
-------------------------------------
1) Odd
2) Even
3) Mark
4) Space
5) None
Enter Choice:
```

NOTE: You must obtain this information from your workstation hardware/ software vendor.

Select the correct parity. The corresponding parity is displayed on the screen.

Step 5 **STOP BITS** This option allows you to select the number of Stop Bits you want. Stop Bits are intervals at the end of each Asynchronous Character that allows the receiving computer to pause before the start of the next character. Select Stop Bits and the "Confgigure Asynschronous Number of Stop Bits" menu is displayed:

```
Configure Asynchronous Number of Stop Bits
-----------------------------------------------------
1) 1
2) 2
Enter Choice:
```

NOTE: You must obtain this information from your workstation hardware/ software vendor.

Select the correct number of stop bits.

Step 6 **FLOW CONTROL** This option allows you to set the Flow Control. Flow Control is the hardware/software and procedure for controlling the transfer of messages or characters between two points in a data network. Select Flow control and the following prompt is displayed:

```
Configure Asynchronous Flow Control Type
-----------------------------------------------------
1) RTS/CTS
2) XON/XOFF
Enter Choice:
```

Both RTS/CTS hardware flow control and XON/XOFF software flow control are supported. Enter the number of the item you want to select. The corresponding setting is displayed on the screen.

Step 7 **BREAK LENGTH** This option allows you to set the length of the break in an asynchronous data stream that occurs after receipt of a break character, which is used to separate streams of traffic. Enter the number corresponding to Break Length and the following options are displayed:

```
Configure Asynchronous Break Length
-----------------------------------
1) 200 ms.
2) 400 ms.
3) 600 ms.
4) 800 ms.
5) 1000 ms.

Enter Choice :
```

The standard break length is 200 milliseconds. However, if a particular Host application is slow, it may require a longer break length to accomodate the speed of the unit. Select Break Length you need.

Step 8 **GPT NAME** This option allows you to identify the Global Path entry that corresponds to the path this traffic will take through the network. You accomplish this by entering the name you assigned to the Global Path.

Helpful Hint . . . A Global Path entry contains information such as port numbers, path types, channel numbers, DLCIs, and X.121 addresses. This option is accessed from the Main Menu.

Select GPT Name and the following prompt is displayed:

Enter Path Name (1 to 10 characters):

Enter the Global Path Name, and press <Enter>. If you entered a name that is not already associated with a Global Path, you are prompted to enter the path now:

```
Path Name Does Not Exist in GPT Table.
To Add Global Path Entry, Press "Y".  Press Escape otherwise.
```

Type "Y" to open the Global Path option and configure a path with that name. Press ESC to return to the GPT prompt and enter a different name. You cannot save this configuration if a valid GPT name has not been entered.

Step 9 **PRIORITY** This option allows you to assign a priority level to a DLCI, so that traffic using a particular DLCI is sent before or after other traffic on a given ratio. See Step 9 in Section C.5, Frame Relay for a detailed discussion of the Priority function.

To assign a priority level to traffic using this DLCI, select Priority and the following options are displayed:

```
Enter Priority ( default = Medium )
   for outgoing traffic on DLCI 65535, port: Port 1

      (1) Immediate
      (2) High
      (3) Medium
      (4) Low

Enter Choice :
```

Select the priority level you want traffic on this DLCI to have. If you have no preference, use Medium, which is the default, and press <Enter>. The following confirmation is displayed:

```
Priority set to Medium for DLCI 65535 on port:  Port 1
```

Step 10 **DESTINATION PORT** This option allows you to select the port on the remote unit to which you are transmitting the asynschronous traffic. Select the Remote Destination Port.

```
Enter Encapsulation Destination Port (N (Network), or 1-16 (Ports)):
```

Enter the port and depress <Enter>

C.2 Async Burroughs Poll Select:

Procedure

Step 1 When you select Async Burroughs Poll/Select (8) from the Logical Port Protocol Selection Menu, the following menu is displayed:

```
Asynchronous Burroughs Parameters     Port 1
1) Line Speed                         9600
2) Locally Connected Device(s)        TERMINAL
3) Response Timeout                   1
4) Transmit Delay                     0
5) Devices
Enter Choice :
```

Step 2 **LINE SPEED** This option allows you to specify a clock speed. Select Speed and the following list of speeds is displayed:

```
Configure Asynchronous Clock Speed
1) 1200
2) 2400
3) 4800
4) 9600
5) 19200
6) 38400
7) 48000
8) 57600
9) 115200

Enter Choice:
```

Step 3 **LOCALLY CONNECTED DEVICE(S)** This option allows you to configure the unit's port as Terminal if it is connected to a host, or Host if the port is connected to a terminal. If the port you are configuring is connected to a host, select Host End. This indicates that the unit is acting as a terminal. If you If the port is connected to a terminal, select Terminal End. This indicates that the unit is acting as a host. Select Locally Connected Device. The following prompt is displayed:

```
Configure Polling Emulation Type
--------------------------------
1) Host End
2) Terminal End

Enter Choice :
```

Step 4 **RESPONSE TIMEOUT** This option allows you to specify the number of seconds the unit may wait for a response to a command before timing out and moving on to the next device. Select Response Timeout and the following prompt is displayed:

Enter Response Timeout (1 - 255 seconds):

Enter the number of seconds you want the unit to wait before timing out, and press <ENTER>.

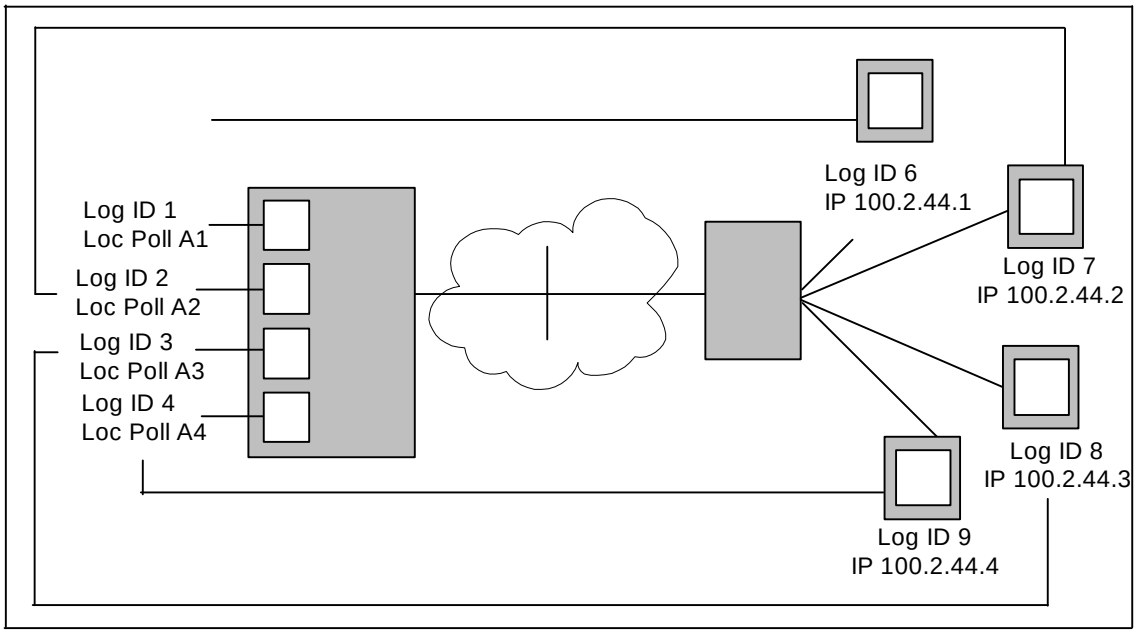
Step 5 **TRANSMIT DELAY** This option allows you to set the amount of time a transmission can be delayed. This parameter setting prevents the unit from overrunning slower devices. Select Transmit Delay and the following prompt is displayed:

Enter Transmit Delay (0 - 255 Hundreths of a second):

Enter the hundredths of a second you want the unit to wait before polling or responding to a poll, and press <ENTER>.

Step 6 **DEVICES** With this protocol, the unit must know about every device to which it is connected. Within each unit are logical units, each of which serves as an internal address which is mapped to a given device. This internal logical address is called the Local Logical ID. The address of the local physical devices is called the Local Poll Address.

This Device Table maps the local host's logical IDs to the local poll addresses; the remote logical IDs to the remote IP addresses; and the local logical IDs to the remote logical IDs. In the diagram below, Local Poll Address A1 is mapped to Local Logical ID 1; IP address 100.2.44.1 is mapped to Remote Logical ID 6; and Local Logical ID 1 is mapped to Remote Logical ID 6.



Select Devices and the following prompts are displayed:

```
Empty Device Table
Add Device Table Entry

Enter Local Logical ID (1 - 99):
```

6a **LOCAL LOGICAL ID** This option allows you to enter a Local Logical ID for a logical unit in the host which will be be mapped to a remote unit. This can be any number from 1 to 99.

Enter the logical ID number and press <ENTER>.

6b **LOCAL POLL ADDRESS** This option allows you to enter the address of the logical device that is represented by this host by the above local logical ID. The poll addressis two characters in length. A typical example might be B3 or C5. The following prompt is displayed:

```
Enter Local Poll Address:
```

Enter the address and press <ENTER>.

6c **LOCAL GROUP POLL ADDRESS**. Dvices can be referred by a group address if that device belongs to a configured group. When a group address is used in a poll, any device in that group is allowed to answer. The following prompt is displayed:

```
Enter Local Group Poll Address <Enter for None> :
```

Enter the Local Group Poll Address and press <ENTER>.

6d **REMOTE IP ADDRESS** This option allows you to enter the IP address of the remote controller. The following prompt is displayed:

```
Enter Remote IP Address (N.N.N.N) :
```

Enter the Remote IP Address and press <ENTER>.

6e **REMOTE LOGICAL ID NUMBER** This option allows you to enter the Logical ID Number associated with the remote terminal. The following prompt is displayed:

```
Enter Remote Logical ID Number (1 - 99):
```

Enter the Remote Logical ID Number and press <ENTER>.

C.3 Bit Sync Encapsulation

From the Main Menu, select Data Configuration (2), Undefined Port (1), Protocol (1), then select Bit Sync. Encapsulation (4).

Before you start !! If have not already done so, follow the instructions in Section 4.14 (X.25) or Section 4.6 (Frame Relay) of the FRAD (Ether/Mono/ Ring FRADs and Web.router) Reference Guide.

Overview

Bit Sync. Encapsulation may be used to transparently carry on HDLC based protocol across a Frame Relay network. This configuration allows Bit Sync Encapsulated traffic (any HDLC-like frame) to be conveyed between a unit port at the host and a unit port at a remote site. Each PVC (DLCI) carries one connection.

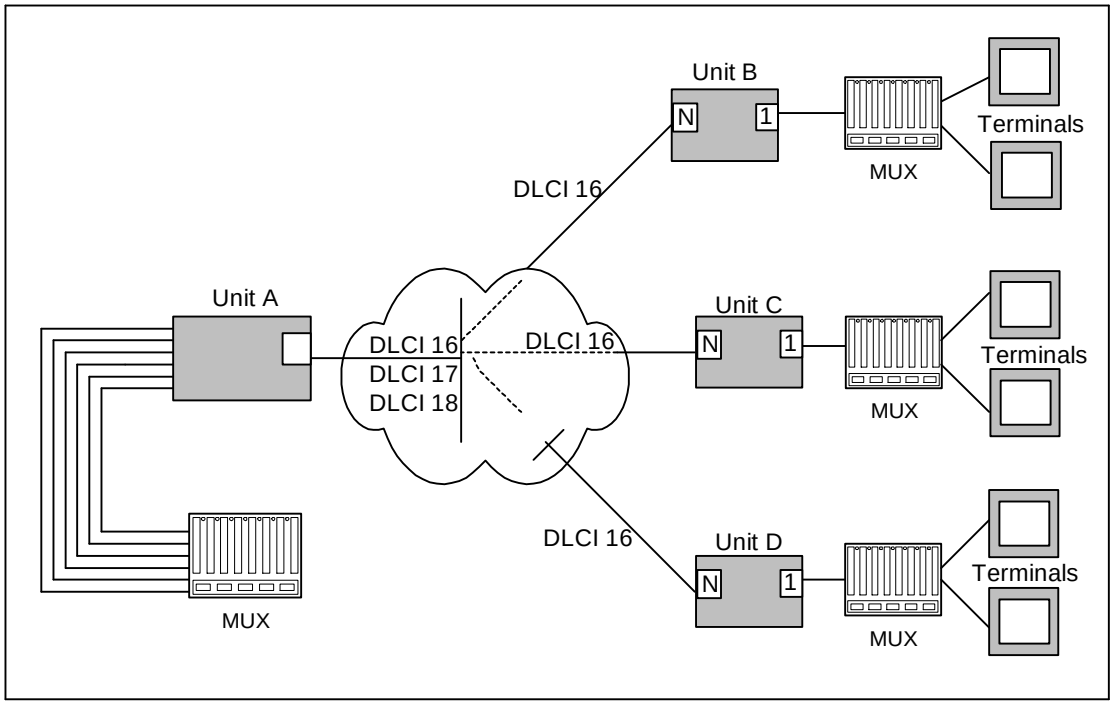


Illustration C-3: Configuration for Bit Sync Encapsulation

Procedure

When you select Bit Sync. Encapsulation from the "Logical Port Protocol Selection Menu", the following is displayed:

```
Synchronous Encapsulation Parameters : Port 1
-----------------------------------------------------
1) Speed : 9600
2) Data Format : NRZ
3) DCD : FORCED
4) Idle Character : FLAG
5) GPT Name :
6) Priority : Medium

Enter Choice :
```

Step 1 **SPEED** This option allows you to specify a synchronous clock speed for units configured for DCE. Select Speed and the following menu is displayed:

```
-------------------------------------------------------------------------------
Configure Synchronous Clock Speed
-------------------------------------------------------------------------------
1) 2400
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000

Enter Choice :
```

NOTE: When the port is configured as DTE, as opposed to DCE, the parameters menu reflects that the speed is provided by the device connected to the unit. In this case, you do not need to configure the speed. If you attempt to do so, the following message is displayed and you are returned to the parameters menu: "Port is DTE, Can Not Change Speed".

Step 2 **DATA FORMAT** This option allows you to specify whether the data format should be Non-Return-to-Zero (NRZ) or Non-Return-to-Zero Inverted (NRZI). Select Data Format and the following options are displayed:

```
Configure Data Format
-------------------------
1) NRZ
2) NRZI
Enter Choice:
```

Step 3 **DCD** This option allows you to specify whether Data Carrier Detect (DCD) is forced or switched. The SWITCHED option allows you activate DCE only when valid data is sent to the port. The FORCED option allows you activate DCE at all times. Select DCD and the following options are displayed:

```
Configure DCD
---------------------
1) SWITCHED
2) FORCED
Enter Choice:
```

NOTE: DCD is effective only on ports with DCE interfaces.

Step 4 **IDLE CHARACTER** This option allows you specify whether MARK or FLAG characters (7E) should be transmitted between frames. MARK indicates the binary digit "1" (one) in most coding schemes. FLAG is a pattern of six consecutive "1" bits used to mark the beginning and end of a "Frame" (packet). Select Idle Character and the following options are displayed:

```
Configure Idle Character
-----------------------------------
1) MARK
2) FLAG
Enter Choice:
```

Enter the number of the option you want.

Step 5 **GPT PATH NAME** This option allows you to identify the Global Path entry that corresponds to the path this traffic will take through the network. This is accomplished by entering the name you assigned to the Global Path.

Helpful Hint . . . A Global Path entry contains information such as port numbers, path types, channel numbes, DLCIs and X.121 addresses. This option is accessed from the Main Menu.

Select GPT Name, depress <Enter> and the following prompt is displayed:

```
Enter Path Name (1 to 10 characters):
```

Enter the Global Path Name and press <Enter>. If you entered a path name that is not already associated with a Global Path, you are prompted to enter the path now:

```
Path Name Does Not Exist in GPT Table.
To Add Global Path Entry, Preee "Y". Press Escape Otherwise.
```

Type "Y" to open the Global Path option and configure a path with that name. Press ESC to return to the GPT prompt and enter a different name (you cannot save this configuration if a valid GPT name has not been entered).

Step 6 **PRIORITY** This option allows you to assign a priority level to a DLCI, so that traffice using a particular DLCI is sent before or after other traffic in a given ratio. See Step 9, Section C.5, Frame Relay for a detailed discussion of the Priority function.

To assign a priority level to traffic using this DLCI, select Priority and the following options are displayed:

```
Enter Priority ( default = Medium )
   for outgoing traffic on DLCI 65535, port: Port 1

      (1) Immediate
      (2) High
      (3) Medium
      (4) Low

Enter Choice :
```

Select the priority level you want traffic on this DLCI to have. If you have no preference, use Medium, which is the default. Depress <Enter> and the following confirmation is displayed:

```
Priority set to Medium for DLCI 65535 on port:  Port 1
```

To save the new configuration, you must Write and Reset (see Section 2.3.9 (Writing (Saving) Configurations) of the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide).

C.4 Byte Sync Encapsulation Application

From the Main Menu, select Data Configurations >> select a Port >> Protocol >> Byte Sync Encapsulation.

Before you start !! Configure Section 3.4, Defining Global Paths of the FRAD (Ether/Mono/Ring FRADs and webrouter) Reference Guide.

If you have not already done so, follow the instructions in Section C.14, X.25 or Section C.6, Frame Relay to configure the port that will carry encapsulation traffic.

Overview

There are several synchronous protocols that use a Byte Synchronous transmission method rather than a Bit Synchronous method. These protocols use a special character, known as SYN, to synchronize the transmitter and receiver. They use special control characters to designate the start and end of a frame. ASCII variants of these protocols usually use a seven data-bit character with Odd parity and a Longitudinal Redundancy Check (LRC) character as a Block Check Character.

EBCDIC variants use an eight data-bit character and a 16-bit CRC for error checking. The EBCDIC protocols also allow a special mode known as "Transparency" for transmission of all types of data.

The unit supports these protocols on a point-to-point basis using Byte Synchronous Encapsulation. Multiple ports on a unit can share a DLCI if the ports are going to a common destination. CRC or BCC is transmitted along with the data to allow the user equipment to perform error checking.

This configuration allows Byte Sync Encapsulated traffic (e.g., Bisync) to be transmitted between a unit port at the host and a unit port at a remote site.

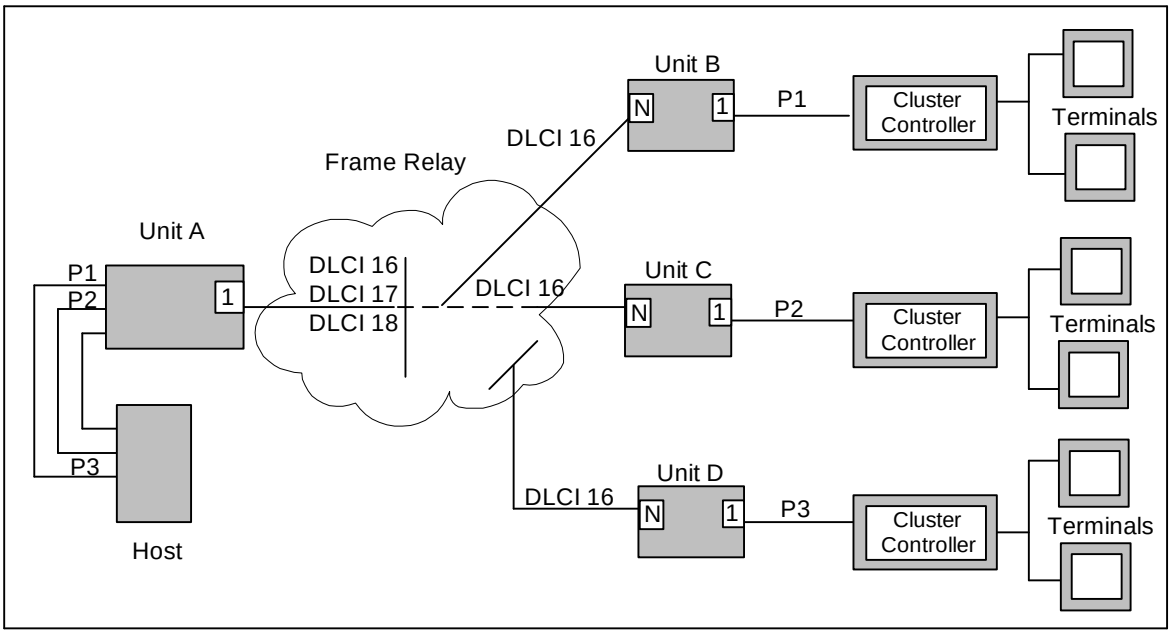


Illustration C-4: Sample Network for Byte Sync Encapsulation

Procedure

When you select Byte Sync Encapsulation from the Logical Port Protocol Selection menu, the following menu is displayed:

```
Byte Synchronous Encapsulation Parameters : Port 1
-------------------------------------------------------------------
1) Speed                    9600
2) GPT Name
3) Priority                 Medium
4) Destination Port         Port 2
5) Code Set                 EBCDIC
Enter Choice:
```

Step 1 **SPEED** This option allows you to specify a synchronous clock speed for units configured for DCE. Select Speed and the following list is displayed:

```
Configure Synchronous Clock Speed
1) 2400
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
```

```
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000
Enter Choice:
```

NOTE: When the port is configured as DTE, as opposed to DCE, the parameters menu reflects that the speed is provided by the device connected to the unit. In this case, you do not need to configure the speed. If you attempt to configure the speed, the following message is displayed and you are returned to the parameters menu: Port is DTE, Can Not Change Speed

Step 2 **GPT PATH NAME** This option allows you to identify the Global Path entry that corresponds to the path this traffic will take through the network. This is accomplished by entering the name you assigned to the Global Path.

Helpful Hint . . . A **Global Path** entry contains information such as port numbers, path types, channel numbers, DLCIs, and X.121 addresses. This option is accessed from the Main Menu.

Select GPT Name and the following prompt is displayed:

```
Enter Path Name(1 to 10 Characters):
```

Enter the Global Path Name and press <***ENTER***>. If you enter a name that is not already associated with a Global Path, you are prompted to enter the path now:

```
Path Name Does Not Exist In GPT Table.
To Add Global Path Entry, Press 'Y'.  Press Escape Otherwise.
```

Type Y to open the Global Path option and configure a path with that name. Press ***ESC*** to return to the GPT prompt and enter a different name (you cannot save this configuration if a valid GPT name has not been entered.

Step 3 **PRIORITY** This option allows you to assign a priority level to a DLCI, so that traffic using a particular DLCI is sent before or after other traffic in a given ratio. See Step 9 in Section C.6, Frame Relay for a detailed discussion of the Priority function.

To assign a priority level to traffic using this DLCI, select the Priority field. The following options are displayed:

```
Enter Priority ( default = Medium )
   for outgoing traffic on DLCI 300, port: Port 1
        (1) Immediate
        (2) High
        (3) Medium
        (4) Low
Enter Choice:
```

Select the priority level you want traffic on this DLCI to have. If you have no preference, use Medium, which is the default. Press <***ENTER***> and the following confirmation is displayed:

```
Priority set to Medium for DLCI 300 on port: Port 1
```

Step 4 **DESTINATION PORT** This option allows you to select the port on the remote unit to which you are transmitting traffic. Select Idle Character and the following prompt is displayed:

```
Enter Encapsulation Destination Port (N (Network) or 1-16 (Ports)):
```

Enter the number and press <***ENTER***>.

Step 5 **CODE SET** This option allows you to choose the Code Set to be used. Select Code Set and the following menu is displayed:

```
Configure Byte Synchronous Code Set
1) ASCII
2) EBCDIC
Enter Choice:
```

Enter the number that corresponds to the code you want to use (IBM equipment normally requires EBCDIC; most other equipment uses ASCII).

To save the new configuration, you must *WRITE* and *RESET*. This is accomplished by selecting "Write Configuration" then reset the unit from the Main Menu to implement the new configuration. The destination port is the port on the remote unit through which data will be passed to the end user equipment (See Section 2.3.9, Writing (Saving) Configurations in the FRAD (Ether/Mono/Ring FRADs and webrouter) Reference Guide).

C.5 Ethernet

From the Main Menu, select Data Configurations (2), Select Ethernet (E), Protocol (1) and the unit will display the following message :

Port Currently Defined. Modify or Delete the Port? (Enter M or D)

Choose M (Modify) and the unit will display the EtherNet Port Parameters menu.

Routing . . . To successfully switch data through the unit, you must complete either the IP, IPX, or SNA Routing Table. If you are using IPX Routing, you must use the IPX Router Mode, and define other IPX networks in the routing table. If you are using SNA Routing, configure LLC-FR or SDLC-LLC switching tables. See either Section 5, Routing with IP and IPX or Section 6.3, SNA Routing for 1490 in the EtherFRAD, Mono/RingFRAD and Web.router Reference Guide.

Address . . . If you are using IP routing, you must also enter the local IP address (see Section 3.3, Assigning a Local Unit Name & Address in the EtherFRAD Reference Guide).

Statistics . . . See Section 7.7, Ethernet Statistics, in the EtherFRAD Reference Guide for a description of the statistics used to monitor this protocol.

Procedure

When you select Protocol: Ethernet (1) from the Logical Port Attribute Menu, the will display a message as follows:

Port Currently Defined. Modify or Delete the Port? (Enter M or D) :

Type M (Modify) and the unit will display the following menu:

```
EtherNet Port Parameters
------------------------------------
1) IPX Encapsulation                IEEE 802.3 Encapsulation (Novell)
2) IPX Net Number (Hexadecimal)     0
3) SAP Mode                         On
4) SmartARP                         Enabled
Enter Choice:
```

Step 1 **IPX ENCAPSULATION** This option defines the encapsulation envelope to be used for IPX data on the Ethernet port. There are currently four encapsulation options on the unit. Novell Encapsulation (IEEE 802.3) is the default. Ethernet encapsulation is the only type of encapsulation currently supported for IP packets. This parameter must be set to match your Ethernet configuration.

- **NOVELL ENCAPSULATION (IEEE 802.3)** uses a header consisting of a 6-byte destination address, a 6-byte source address, and a 2-byte data length field.
- The **ETHERNET II** header uses a header consisting of a 6-byte destination address, a 6-byte source address, and a type field (0x8137 for IPX packets).
- **IEEE 802.2 ENCAPSULATION** uses a header similar to 802.3 with 1 byte DSAP, SSAP and Control fields.
- **IEEE 802.2/SNAP ENCAPSULATION** is the same as IEEE 802.2 with a 3-byte Organization Code and a 2-byte Ethernet Type field.

TroubleShooting Tip . . . IEEE 802.2 and 802.3 frames should not be mixed on the same Ethernet. When frames are mixed, they are discarded as non-routable frames.

This option allows you to select the IPX Encapsulation type. Select IPX Encapsulation. The following screen is displayed:

```
Configure EtherNet IPX Encapsulation
1) IEEE 802.3 Encapsulation (Novell)
2) IEEE 802.2 Encapsulation
3) IEEE 802.2/SNAP Encapsulation
4) EtherNet II Encapsulation
Enter Choice:
```

Select the number of the Encapsulation type you are using.

Step 2 **IPX NET NUMBER** This option is the network number associated with the local LAN that is physically connected to the unit's Ethernet port. It is usually defined on a Server connected to the LAN; however, even if you are not using a server, you must define the Net Number in the unit. Assigning these numbers should be coordinated with your Network Administrator to assure that each number is unique to your network.

Every IPX port on the unit must be assigned a *unique* IPX Net Number (IPX network address). You can have as many IPX ports as you have serial ports, although you can have only one Ethernet IPX port because the unit has only one Ethernet port.

This option allows you to specify the Local IPX Network Number. Select IPX Net Number. The following prompt is displayed:

```
Enter Local Network Number (Hexadecimal):
```

This must be a legitimate eight-digit number. Enter the Net Number and press ***<ENTER>***.

Step 3 **SAP MODE** This option (Service Access Points) refer to the addresses of individual devices and applications on the network. It allows you to specify which SAP mode should be activated in this unit. Select SAP Mode and the following prompt is displayed:

```
Enter Sap Mode  ((1) On)  ((2) Send)  ((3) Listen)  ((4) Off) :
```

Enter the number that represents the mode you want to set for the port. The SAP mode choices are as follows:

- ON enables the unit to listen for and learn, as well as transmit, SAP information.
- SEND enables the unit only to send SAP information.
- LISTEN enables the unit only to receive SAP information.
- OFF disables both the Send and the Listen functions.

Step 4 **SMART ARP** This option, when Enabled allows the unit to automatically detect ARP (MAC address to IP address mapping) information from incoming IP data packets and ARP responses on Ethernet networks. When this option is Disabled, the unit automatically detects ARP information only from ARP responses. The default is Enabled. Select SmartARP and the following options are displayed.

```
SmartARP - Ethernet
1) Enabled:  ARP data learned from data packets and ARP responses
2) Disabled: ARP data learned from ARP responses only
Enter Choice:
```

Select the option you want and depress ESC to return to the menu.

C.6 Frame Relay

From the Main Menu, select Data Configurations >> Logical Port >> Protocol >> Frame Relay.

Routing . . . If you are using the Frame Relay port for Frame Relay passthrough or Frame Relay-to-Frame Relay Switching, you must complete the Frame Relay Routing Table (see Section 6.1, Frame Relay Routing in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide).

Statistics . . . See Section 7.8, Frame Relay Statistics in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide for a description of the statistics used to monitor this protocol.

C.6.1 Heartbeat Polling

Heartbeat polling is the procedure by which the user device requests PVC status information and detects faults in the network connection or the user-to-network interface as follows:

NOTE: This information can be acquired from the Frame Relay carrier. The defaults set in the unit are appropriate for most networks.

---

1. Every T^1 seconds (time value 1 seconds), the user device sends a STATUS_ENQUIRY message to the network. The STATUS_ENQUIRY message is typically a request for the Sequence Number Exchange Only (report type="00000001").
2. Every N1 polling intervals, the user device sends a Full Status Message request (report type="00000000") to the network.
3. The network responds to the STATUS_ENQUIRY message with a STATUS message. The STATUS report type matches the report type of the STATUS_ENQUIRY message; i.e., either Sequence Number Exchange Only or Full Status Message.
4. The unit examines the STATUS message and update its internal database based on the PVC Status Information Element (IE).

5 An error has occurred if:

- the report type of the STATUS message does not match the report type of the most recently transmitted STATUS_ENQUIRY request.
- the unit does not receive a STATUS message within T1 seconds after sending the STATUS_ENQUIRY message.
- the network device does not receive a STATUS_ENQUIRY message within T2 seconds of the last STATUS_ENQUIRY.

Procedure

When you select Frame Relay from the Logical Port Protocol Selection Menu, the following menu is displayed:

```
Frame Relay Management Parameters : Port 1
-----------------------------------------------------------
1) Type                         Synchronous Frame Relay
2) Speed                        56000
3) Protocol                     Adaptive Management - User
4) Value N1:                    6
5) Value N2                     3
6) Value N3                     4
7) Timer T1                     10
8) Timer T2                     15
9) Priority                     Traffic Priority Disabled
A) High to Medium Ratio         4:1
B) Medium to Low Ratio          4:1
C) DLCI CIR Information
D) FRF-12 Fragmentation         Disabled

Enter Choice :
```

Step 1 **TYPE** This option allows you to specify whether the clock type is synchronous or asynchronous. Select Type and the following options are displayed:

```
Frame Relay Type
1) Synchronous
2) Asynchrounous
Enter Choice :
```

Select the type of clocking you want.

Step 2 **SPEED** This option allows you to set the synchronous clock speed. The synchronous clock speed is used to determine which units configured as DCE will be used to provide clocking to the user's equipment. Select Speed and the following speeds are displayed:

```
Configure Synchronous Clock Speed
1) 2400
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000

Enter Choice:
```

NOTE: When the port is configured as DTE, as opposed to DCE, the parameters menu reflects that the speed is provided by the device connected to the unit. In this case, you do not need to configure speed. If you attempt to configure the speed, the following message is displayed and you are returned to the parameters menu:

```
Port is DTE, Can Not Change Speed
```

Step 3 **PROTOCOL** This option allows you to select the Frame Relay management protocol you are using. Select Protocol and the following menu is displayed:

```
Frame Relay Management Protocol
1) ANSI T1.617 Annex D - User
2) CCITT Q.933 Annex A - User
3) LMI - User
4) Adaptive Management - User
5) ANSI T1.617 Annex D - Network
6) CCITT Q.933 Annex A - Network
7) LMI - Network
8) Adaptive Management - Network
```

9) None

Enter Choice:

Frame Relay can also be run without management protocol. Your Frame Relay carrier or Network Administrator can tell you which protocol to use. The factory default is Adaptive Management - User.

Enter the number of the protocol you want to use. Press <ENTER> and the new protocol is displayed on the "Frame Relay Management Parameters" menu.

The Frame Relay Management protocol provides access procedures for the detection and notification of:

- Addition of a PVC
- Deletion of a PVC
- Availability (active state) of a configured PVC
- Unavailability (inactive state) of a configured PVC
- Local In-channel Signaling link reliability errors
- Local In-channel Signaling link protocol errors

Currently there are three management standards and two additional options. The management standards include:

- ITU Q.933 Annex A
- ANSI T1.617 Annex D
- Frame Relay Forum's Local Management Interface (LMI)

Annex A and Annex D are quite similar; however, they are incompatible with LMI. Annex A and Annex D use DLCI 0, whereas LMI uses DLCI 1023. Our products can support either the Network or User side of these protocols.

There are two additional Frame Relay network management options: Adaptive Management /User and Adaptive Management/Network. These protocols allow the unit to automatically detect whether ANSI T1.617 Annex-D or LMI is being used. Once LMI or Annex D has been identified, the port continues to use that protocol until the unit is reset. If in Network mode, the unit determines its actual protocol from the first received Status Enquiry. If in User mode, the unit alternates between issuing Annex-D and LMI Status Enquiries until a Status Response is received. The Frame Relay statistics screen indicates which protocol is being used.

Step 4 **VALUE N1**. This option allows you to determine the number of Status Inquiry/ Status Polling Cycles that occur before a Full Status Polling Cycle is initiated. Select Value N1. The following prompt is displayed:

Enter Desired Frame Relay Value N1 (1 - 255):

Helpful Hint . . . The Value and Timer defaults were set to match the Frame Relay Forum standards. They should not be changed unless necessary. N1 (LMI) or N391 (T1.617 Annex D or A) are the N parameters that require a "Full Status Message" in STATUS_ENQUIRY Heartbeat Polling process. LMI, Annex A and Annex D Defaults = 6 intervals.

Enter the Frame Relay value you want to use and press <***ENTER***>. This changes the value to the number you typed and returns you to the "Frame Relay Management Parameters" menu.

Step 5 **VALUE N2** This option allows you to set the error threshold count (N2). The error threshold count (N2) reflects the number of Local In-channel Signaling Link Reliability Errors that are allowed to occur during a Sliding Monitored Events Window before the link is considered down. Select Value N2 and the following prompt is displayed:

```
Enter Desired Frame Relay Value N2 (1 - 10):
```

NOTE: A Monitored Event, from the network's perspective, is an event such as the expiration of a timer, the receipt of a Status Enquiry message, etc. The Value and Timer defaults were set to match the Frame Relay Forum standards. They should not be changed unless necessary.

Enter the Frame Relay value you want to use and press <***ENTER***>. This changes the value to the number you typed and returns you to the "Frame Relay Management Parameters" menu.

Note: LMI Default = 2 errors
Annex D N392 Default = 3 errors
Annex A N392 Default = 3 errors

Step 6 **VALUE N3**. This option allows you to specify the size of the Sliding Monitored Events Count (a Monitored Event, from the network's perspective, is an *event*. Select Value N3. The following prompt is displayed:

```
Enter Desired Frame Relay Value N3 (1 - 10):
```

Helpful Hint . . . The Value and Timer defaults were set to match the Frame Relay Forum standards. They should not be changed unless necessary.

Value N3 is the number of monitored events (such as the expiration of a timer, the receipt of a Status Enquiry message, etc.) within which a predetermined number of N2 errors must be detected before the link is considered down. This value also reflects the number of monitored events that must occur with no N2 errors before the link is considered back up.

Enter the Frame Relay value you want to use and press <***ENTER***>. This changes the value to the number you typed and returns you to the "Frame Relay Management Parameters" menu.

Note: LMI Default = 4 events
Annex D N393 Default = 4 events
Annex A N393 Default = 4 events

Step 7 **TIMER T1** This option allows you to set the Link Integrity Verification Timer, which indicates how frequently the unit should initiate a Status Inquiry Message. Select Timer T1 and the following prompt is displayed:

```
Enter Desired Frame Relay Timer T1 (5 - 30):
```

Helpful Hint . . . The Value and Timer defaults were set to match the Frame Relay Forum standards. They should not be changed unless necessary.

When N2 errors of the last T1 number of monitored events contains an error, the device declares a failed link.

For example: Assuming the default values of N2 = 2 and T1 = 10 seconds, it takes 20 seconds to detect a failed link. All PVCs on the failed link are set to inactive.

T1 is the length of the time spent waiting for a STATUS message after sending STATUS_ENQUIRY (user devices)

The device continues to send STATUS_ENQUIRY messages. The link is removed from the failed state after receiving N3 consecutive messages without an error.

For example: Assuming the default values of N3 = 4 and T1 = 10, it would take 40 seconds for the link to restore to active status.

When the link is restored to active status, the network device immediately sets all PVCs on the link to active. The user device sets the PVCs to the status indicated by the first PVC status Information Element that is successfully received.

Enter the Frame Relay value you want to use and press <***ENTER***>. This changes the value to the number you typed and returns you to the "Frame Relay Management Parameters" menu.

Note: LMI Default = 10 seconds
Annex D T391 Default = 10 seconds
Annex A T391 Default = 10 seconds

Step 8 **TIMER T2** This option allows you to set the Polling Verification Timer, which indicates the length of time the network should wait between Status Inquiry messages. Select Timer T2 and the following prompt is displayed:

```
Enter Desired Frame Relay Timer T2 (5 - 30):
```

Helpful Hint . . . The Value and Timer defaults were set to match the Frame Relay Forum standards. They should not be changed unless necessary.

If no Status Inquiry message is received within T2 seconds, the network records an error.

Enter the Frame Relay value you want to use and press <***ENTER***>. This changes the value to the number you typed and returns you to the "Frame Relay Management Parameters" menu.

Note: LMI Default = 15 seconds
Annex D T392 Default = 15 seconds
Annex A T392 Default = 15 seconds

Step 9 **PRIORITY** This option allows you to enable or disable priority queuing on the Frame Relay port. Priority queuing allows you to assign Immediate, High, Medium, or Low priority to data being transmitted. Priorities can be set for a given DLCI's protocol or address range, or for an entire DLCI, without restrictions.

For example, you can assign a priority to particular protocol. In this way, you might assign SNA traffic a high priority level, IPX traffic a medium priority, and IP traffic a low priority.

You can assign different priority levels to distinct address ranges going out the same DLCI. You might do this in the IP Routing Table when configuring IP traffic. For instance, you might assign high priority to IP traffic with a given address range going to users and assign low priority to IP traffic with a different address range going to a printer. This feature cannot be used with routing protocols that automatically build their own routing tables, such as IP RIP, IPX, or AppleTalk, unless you configure the priority on their interfaces, individually.

In some cases, you can assign a priority to a given DLCI, so that any traffic traveling through that DLCI maintains the assigned priority, regardless of data type or address. For example, you might set up a Frame Relay routing table, assigning a high priority to a Network DLCI being used to send traffic to an ATM machine and a low priority to a different Network DLCI used to send traffic to a server. In this table, you cannot assign two or more priorities to the same DLCI as you can in the IP Routing Table example above.

When buffer space is low, as in the case of a network malfunction, data may be discarded in the following order: low, medium, high and then immediate priority. This phenomenon occurs regardless of whether the queuing function is enabled or disabled in the Priority field.

You can monitor data throughput and the reception of BECN bits, which indicate congestion in the Frame Relay cloud, on an overall or DLCI basis. Statistics for available and excess bandwidth are maintained and recalculated as needed for each DLCI.

To select either Traffic Priority Disabled or Traffic Priority Enabled, select Priority. The following options are displayed:

```
Frame Relay Traffic Priority
1) Enable
2) Disable
Enter Choice :
```

Select the option you want.

Step 10 **HIGH TO MEDIUM** and **MEDIUM TO LOW PRIORITY** This option allows you to define a byte ratio of high-to-medium and medium-to-low traffic. The Priority level is set according to average ratio of bytes. However, all transmissions are sent in whole frames.

For Example: Suppose a transmission contains 230 bytes, and these 230 bytes are comprised of:

2 frames at 160 and 10 bytes, respectively, of High priority
40 bytes of Medium priority traffic
20 bytes of Low priority traffic.

If the high-to-medium ratio is set to 4:1, and the medium-to-low ratio is set to 2:1, the transmission would rotate between priority levels in an order similar to the following:

160 bytes of High priority traffic is transmitted first
40 bytes of Medium priority traffic is transmitted next
20 bytes of Low priority traffic is transmitted next
10 bytes of High priority traffic is transmitted next.

With every transmission, the unit checks for traffic of all priority levels in order to apply the ratio you have specified; however, if all of the traffic in queue is set at the same priority level, this traffic is sent continually until traffic with another priority level requests transmission. At this point, the unit applies the ratio to the existing traffic in queue.

To select a ratio for High to Medium or Medium to Low priority traffic, select the appropriate option. The following ratio options are displayed:

```
High To Medium Priority Ratio Selection
1) 1:1
2) 2:1
3) 4:1
4) 8:1
5) 16:1
6) 32:1
7) 64:1
Enter Choice :
```

OR

```
Medium To Low Priority Ratio Selection
1) 1:1
2) 2:1
3) 4:1
4) 8:1
5) 16:1
6) 32:1
7) 64:1
Enter Choice :
```

Select the ratio you want to use.

NOTE: The cycle of ratios is High-to-Medium-to-Low and then to High again. This allows lower priority level traffic from the first transmission to be sent before more higher priority level traffic.

Step 11 **DLCI CIR INFORMATION** When configuring DLCIs, you can allocate a designated amount of committed bandwidth to a DLCI, as long as this bandwidth does not exceed the speed of the Frame Relay line. This committed bandwidth, called Committed Information Rate(CIR) is the amount of bandwidth a DLCI is guaranteed to have available at all times for transmitting data. If the DLCI attempts to send more data than can be carried within the boundary of its CIR, such as in the case of bursty traffic, there is no guarantee that this excess data is sent.

You must configure an excess bandwidth range for the DLCI. If traffic is within the excess bandwidth range, it is delivered as long as the Frame Relay line has space available to carry it. Both CIR and excess bandwidth is negotiated with the service provider and must be agreed upon and purchased before you configure the unit with these values.

Any traffic *exceeding* the excess bandwidth range (B_e) can be automatically discarded by the service provider, regardless of available bandwidth.

The priority queuing function monitors each DLCI's committed and excess CIR. Traffic being transmitted within its CIR is transmitted before traffic using any allotted excess bandwidth.

Transmissions are made in the following order of priority:

CIR Immediate ⟶ CIR High ⟶ CIR Medium ⟶ CIR Low ⟶
Excess Immediate ⟶ Excess High ⟶ Excess Medium ⟶ Excess Low

NOTE: Immediate priority data, as long as it is within its allocated CIR, preempts all other traffic in queue (except management traffic).

11a **DLCI CIR INFORMATION** This option allows you to configure CIR and excess bandwidth for each DLCI. Select the DLCI CIR Information field on the Frame Relay Management Parameters Menu.

The following prompts are displayed:

```
Table Is Empty.
Add Table Entry
Add DCLI Information
Enter DLCI Number (16 - 1007):
```

Enter the first DLCI number and press <***ENTER***> and the following prompt is displayed:

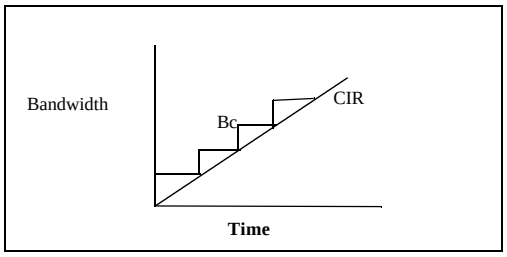
```
Enter CIR (committed information rate) in bits per second:
```

11b **CIR** This option allows you to enter the CIR you negotiated with the service provider. Enter the CIR, and press <***ENTER***> and the following prompt is displayed:

```
Enter Bc (committed burst size) in bits:
```

11c **COMMITTED BURST SIZE (BC)** This option allows you to enter the Burst Size that you negotiated with the service provider. Bc is the number of bits you can transmit within a given time (T) in seconds. T usually equals one second, but can equal more. Bc/T = CIR.

For Example: If T = 1 second, you can transmit X number of bits (Bc), wait one second and transmit another X number of bits (Bc). In this manner, the number of bps transmitted never exceeds the amount of bandwidth the DLCI has been allocated.



If T = 2 seconds, however, you can transmit twice as many bits per second, but you must wait twice as long before you can transmit more bits.

Enter the Committed Burst Size (Bc), and press <***ENTER***> and the following prompt is displayed:

```
Enter Bc (excess burst size) in bits:
```

11d **BURST EXCESS RATE (BE)** This option allows you to enter the Burst Excess rate that you negotiated with the service provider. B(e) is the number of bits you can transmit within a given time (T) in seconds. B(e)/T = CIR. The value for B(e) is typically the line speed less the CIR and Bc.

For Example: If the line speed is 56000 bps and the CIR and is 4000 bps, the B(e) is 52000 bits, assuming T = 1.

Enter the B(e) value. When all values for a DLCI are entered, the following prompt is displayed and you have the opportunity to enter values for additional DLCIs:

```
Entry Added
Enter DLCI Number (16 - 1007):
```

11e When you are finished entering values for all DLCIs, press ***ESC*** to view the table of DLCI entries. You are given the opportunity to add, change, or delete any entry.

11f After you review the table and make any necessary changes, press ***ESC*** again to return to the Frame Relay Management Parameters Menu.

SAVE & RESET . . . To save the new configuration, you must *WRITE* and *RESET* (See Sections 2.3.9 (Writing/Saving Configurations) **and** 2.3.10 (Resetting the Unit) in the FRAD (Ether/Mono/Ring FRADs and webrouter) Reference Guide).

Step 12 **FRF-12 FRAGMENTATION** Fragmentation of data packets on Frame Relay to allow for proper voice and data quality while sharing the same port.

C.6.2 FastPROTECT™ with Priority

FastPROTECT™ is a congestion management feature that allows traffic to be discarded to protect the unit from memory overload. In the congestion management scheme, only data going out a Frame Relay port is subject to discarding. The discard algorithm discards packets, based on the number of memory buffers available and according to the priority assigned to that packet. At 25% of available buffers, both Low and Medium priority data are discarded. At 10% of available buffers, High priority traffic is discarded. At 20 or fewer buffers, Immediate priority data is also discarded.

C.7 Point-to-Point (PPP)

From the Main Menu, select Data Configurations (2), Logical Port (1) >> Protocol (1) >> Point to Point (PPP) (5).

Routing . . . To successfully switch data through the unit, you must complete either the IP or IPX Routing Table (see Section 5.0, Routing with IPand IPX in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide). Define other IPX networks in the routing table.

Address . . . If you are using IP routing, you must also enter the local IP address (see Section 3.3, Assigning a Local Unit Name & Address in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

Overview of PPP

The Point-to-Point Protocol (PPP) provides a standard method for encapsulating and transporting multiple protocols between two peers, such as IP and IPX, in a *point-to-point* link. Links can be established, using modem lines or dedicated synchronous or asynchronous links.

PPP has a Link Control Protocol (LCP) that is used to establish the link, negotiate the link level configuration parameters with the other end, detect a looped-back link and other common misconfiguration errors, and terminate the link when it is no longer needed. An authentication facility is also provided to verify the identity of its peer on the link.

It also has a family of Network Control Protocols (NCPs) that help manage problems that when they arise with the network-layer protocols. For example, the assignment and management of IP addresses may be particularly troublesome for circuit-switched point-to-point links, such as links through dial-up modem servers. The NCPs would help to resolve any problems with the link. IPCP and IPXCP are currently supported.

In a PPP link, each side of the link must send LCP packets to the other side to configure and test the link. After the link has been established, the peer is authenticated through a process involving secret information. NCP packets are then sent between peers, enabling one or more network-layer protocols to be configured. Once configured, datagrams using the configured protocols can be sent over the link.

Typical Applications

The following illustrations show PPP being used in a variety of different scenarios.

Dedicated Link

Illustration C-2 below, shows an Ethernet LAN connected to a remote router over a dedicated link, such as that provided by a T1 carrier going through a 56K CSU/DSU. The T1 line transports PPP packets between the peers, which in this case are the router and the unit.

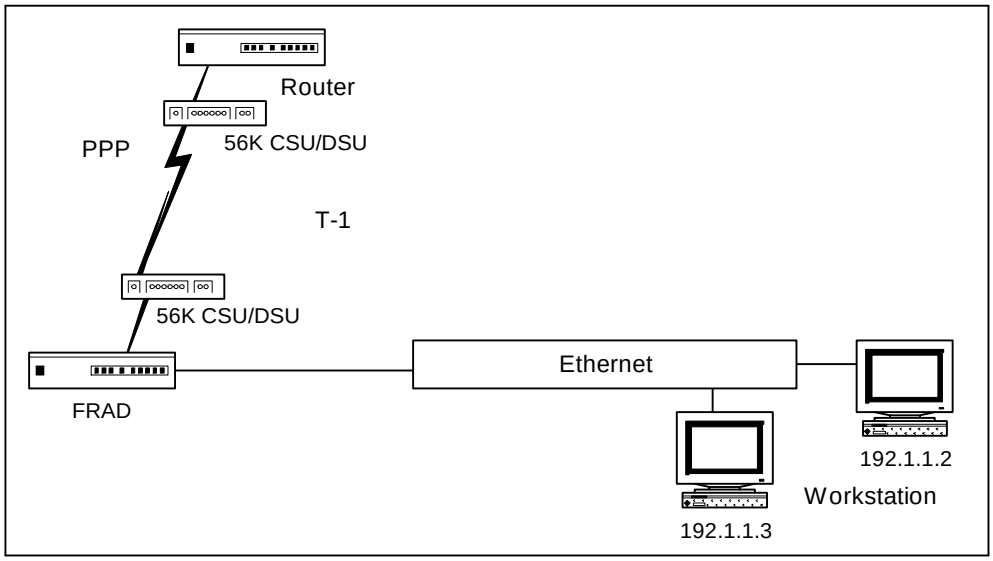


Illustration C-5: PPP over a Dedicated Link

Remote Access via Dial-up Connection

In this scenario, users can access an office LAN via dial-up connections using a modem or a terminal adapter. The network could be a POTS network. If desired, the unit can then carry the PPP traffic over Frame Relay to the ISP.

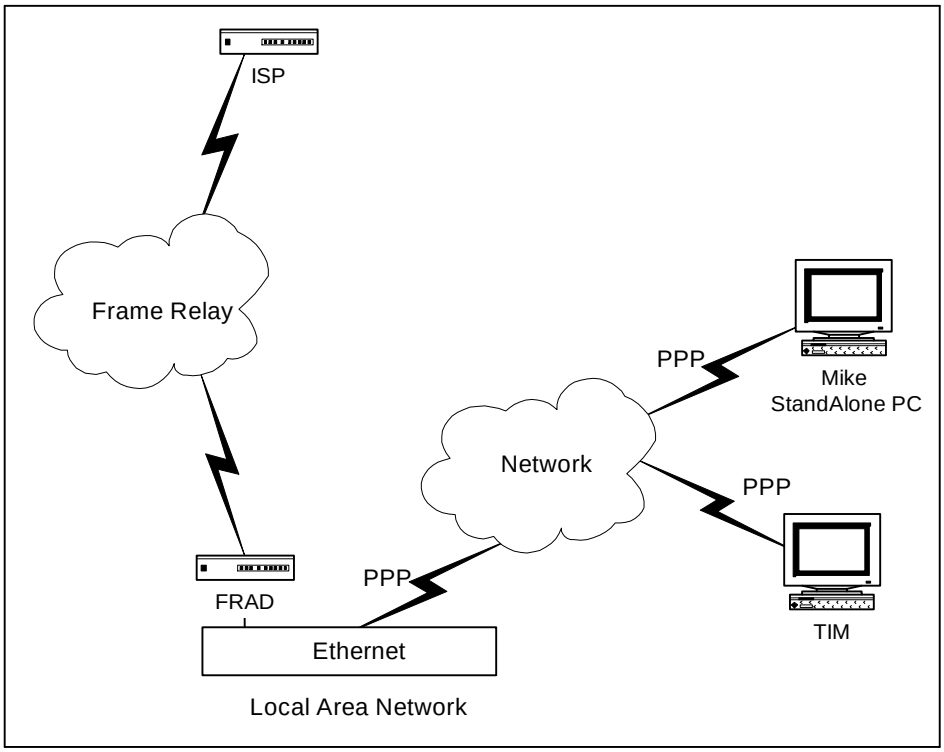


Illustration C-6: Remote Access via Dial-up Connection

Serving as RIP Interface

PPP can act as a RIP Interface to detect new routes from a router.

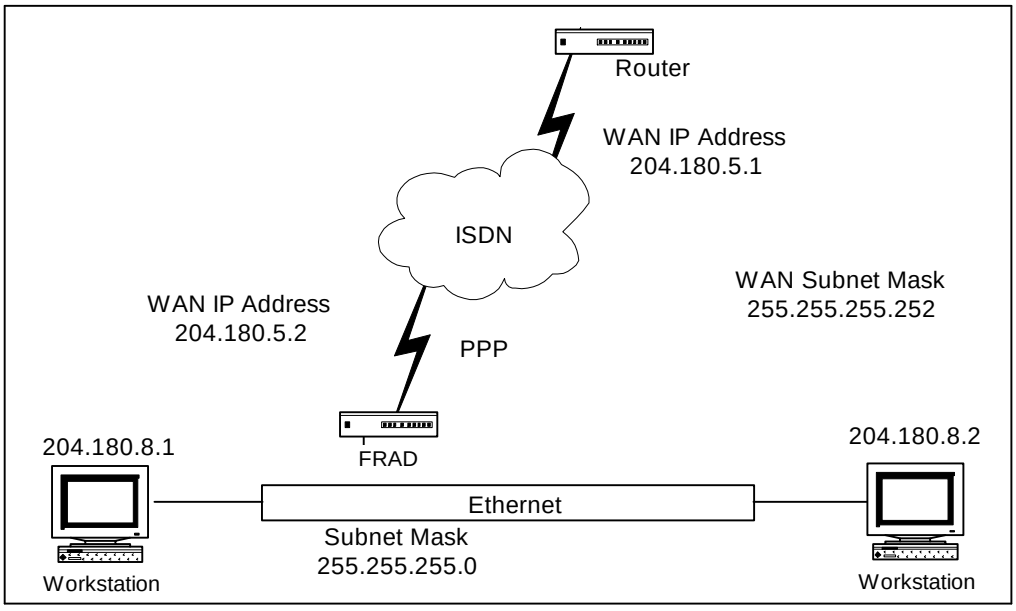


Illustration C-7: PPP as RIP Interface

Procedure

After you have selected a port on which to configure PPP, and selected Point-to-Point (PPP) as the protocol, the following menu is displayed:

```
PPP Config Parameters : Port 1
--------------------------------------------------
1) Type                          Synchronous PPP
2) Synchronous Speed             9600
3) LQM Monitoring                Disable
4) LQM Percentage                70
5) LQM Timer                     120
6) IPX Net Number                0
7) IPX Node Number               000000000000
8) SAP Mode                      On
9) PPP LCP Configuration
A) PPP IPCP Configuration
B) PPP Authentication Configuration

Enter Choice :
```

Step 1 **TYPE** This option allows you to specify whether the PPP connection should be Asynchronous or Synchronous. Select Type and the following menu is displayed:

```
Point-to-Point Type
1) Synchronous
2) Asynchrounous
Enter Choice :
```

Select the type of speed you want.

NOTE: If you are configuring a modem, the Type setting should be Async.

Step 2 **SYNCHRONOUS SPEED** This option allows you to specify a synchronous or asynchronous clock speed. If you selected SYNC above, only the synchronous speeds are displayed here. If you selected ASYNC above, only the asynchronous speeds are displayed here. Select Speed and a list of speeds will be displayed as follows:

```
Synchronous Speed            Asynchronous Speed
-------------------------    -------------------------
1) 2400                      1) 1200
2) 4800                      2) 2400
3) 9600                      3) 4800
4) 19200                     4) 9600
5) 38400                     5) 19200
6) 48000                     6) 38400
7) 56000                     7) 48000
8) 64000                     8) 57600
9) 96000                     9) 115200
A) 128000                    Enter Choice:
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000
Enter Choice:
```

Select the speed you need.

Step 3 **LQM (LINK QUALITY MONITORING)** This option allows you to enable or disable Link Quality Monitoring. The Link Quality Monitoring (LQM) Protocol tracks the quality of the point-to-point links. Each peer in the link maintains a count of the number of octets per packet that are successfully transmitted or received. These counts are periodically exchanged between the peers in a Link Quality Report. Each side compares its own count with the value received in the Link Quality Report transmitted by its peer and, based on these statistics, it calculates the link quality in

terms of packet loss in percentage. If this value exceeds the LQM percentage, the link is suspended and the Network Control Protocols (IPCP and IPXCP) are brought down. While the link is suspended, LQM packets continue to pass between peers, monitoring the status of the link. When the link has regained stability, IPCP and IPXCP is permitted to begin negotiating connections again, and traffic can one again be passed over the link. Select LQM and the following prompts are displayed:

```
LQM Monitoring
1) Enable
2) Disable
Enter Choice:
```

Step 4 **LQM PERCENTAGE** This option allows you to specify the maximum percentage of packets that may be lost over an interval (LQM Timer) before the network control protocols (IPCP, IPXCP) are brought down. Select LQM Percentage and the following prompt is displayed:

```
Enter LQM Acceptable Packet Loss Rate(in Percentage) :
```

Enter the percentage of packets that can be lost before the connection is brought down.

Step 5 **LQM TIMER** This option allows you to specify the Line Quality Monitoring Period. Select LQM Timer and the following prompt is displayed:

```
Enter Link Quality Report Period (10-300 seconds) :
```

Enter the Link Quality Report Period

Step 6 **IPX NET NUMBER** This option allows you to specify the Local IPX Network Number. Select IPX Net Number and the following prompt is displayed:

```
Enter Local Network Number (Hexadecimal):
```

NOTE: This parameter applies to IPX only when you select IPX Router as the Routing Method (See section 5.9, IPX Routing in the FRAD (Ether/ Mono/Ring FRADs and webrouter) Reference Guide). If you are using IP, disregard this option.

The IPX (Novell) Network Number is a hexadecimal number with up to eight characters that is assigned by your Network Administrator. It is associated with the network segment(s) that terminates in the file server. Each network number *must be unique* on a Novell network since Novell file servers perform a routing function for IPX packets. If router errors appear on your Novell Network after connecting a unit, disconnect the device from the network and check to be sure that the network number is unique.

Enter an appropriate number and press <***ENTER***>.

NOTE: If you enter an invalid number, the following message is displayed and you must enter a new number.

Invalid Network Number Entered!

Step 7 **IPX NODE NUMBER** This option allows you to specify the 12-character Local Node Address. Select IPX Node and the following prompt is displayed:

Enter Local Node Address (12 Characters: 0-9 & A-F):

NOTE: This parameter applies to IPX only when you select IPX Passthrough as the Routing Method (see Section 5.9, IPX Routing of the EtherFRAD Ref. Guide). If you are using IP, disregard it.

Step 8 **SAP MODE** This option allows you to specify which SAP mode should be activated in this unit. Select SAP Mode**.** Service Access Points (SAPs) refer to the addresses of individual devices and applications on the network. The following prompt is displayed:

Enter Sap Mode ((1) On) ((2) Send) ((3) Listen) ((4) Off) :

Select the appropriate mode you want to set for the port. The SAP mode choices are as follows:

- ON enables the unit to listen for and detects, as well as transmit, SAP information.
- SEND enables the unit only to send SAP information.
- LISTEN enables the unit only to receive SAP information.
- OFF disables both the Send and the Listen functionality.

Step 9 **PPP LCP CONFIGURATION** This option allows you to specify how large the information field within the PPP frame can be when it is received. This is called the Maximum Receive Unit (MRU). If the information field exceeds the specified size, it is discarded. Select LCP Configuration and the following prompt is displayed:

```
1) MRU - 1500
Enter Choice:
```

When you select MRU, the following prompt is displayed:

```
Enter Desired MRU value:
```

Step 10 **PPP IPCP CONFIGURATION** This option allows you to specify certain conditions in relation to the IPCP negotiations. IPCP (IP Control Protocol) is responsible for configuring, enabling and disabling the IP protocol modules on both ends of the point-to-point link. It negotiates the connection between both ends, and once the negotiation is successful, it allows the IP traffic over the established PPP link to commence. Select IPCP Configuration and the following prompt is displayed:

```
1) PPP Interface IP Address Configuration
Enter Choice:
```

When you select PPP Interface IP Address Configuration, the following options are displayed:

```
1) Negotiation Method : Do Not Negotiate IP Addr
2) User Specified IP Address : N/A
```

10a **NEGOTIATION METHOD** This option allows you to select a method of negotiation. Select Negotiation Selection and the following menu is displayed:

```
Negotiation Method
1) Get IP Address Dynamically
2) Negotiate User Specified IP Address
3) Do not Negotiate IP Addr
Enter Choice:
```

- The "Get IP Address Dynamically" option allows you to obtain an IP address dynamically from the remote system. This option is useful when connecting to an ISP. (PPP negotiates an IP address of 0.0.0.0.)
- The "Negotiate User Specified IP Address" option allows you to specify a particular IP address. To implement this option, you must complete the User-Specified IP Address to be Negotiated option.
- The "Do not Negotiate IP Address" option prevents the system from negotiating any IP address.

10b **USER-SPECIFIED IP ADDRESS TO BE NEGOTIATED** If you selected Negotiate User Specified IP Address above, this option allows you to specify a particular IP address. Select User-Specified IP Address to be Negotiated. The following options are displayed:

```
User Specified IP Address (N.N.N.N) :
```

Enter the IP address and press <***ENTER***>.

Step 11 **PPP AUTHENTICATION CONFIGURATION** This option allows you to establish the parameters necessary for the unit to authenticate the peer on the opposite end of the link. This provides an effective way of achieving security. The unit can act either as the authenticator—the one verifying the peer's access rights—or as the end unit—the one whose access rights are being verified. When the unit acts as the authenticator, the users allowed to access the unit are specified in the Remote User Information Table. When the unit acts as the end unit, the username and password are specified in the Local User Name and Password fields.

Select PPP Authentication Configuration (B) and the following menu is displayed:

```
PPP Authentication Configuration:  Port 1
1) Local User Name
2) Local User Password
3) Remote Authentication Protocol
4) Remote User Information
Enter Choice:
```

The following authentication protocols are supported:

- Password Authentication Protocol (PAP)
- Challenge Handshake Authentication Protocol (CHAP)

The Password Authentication Protocol (PAP) provides a simple way for the peer to establish its identity using a 2-way handshake. The peer end system sends its ID and password to the authenticator. If the authenticator recognizes the ID/password pair, it allows the remote peer to access its system. If the authenticator does not recognize the ID and password, it terminates the link. *Because the ID and password are sent over the link, this method is not secure*.

The Challenge Handshake Authentication Protocol (CHAP) offers a more secure method of authenticating the peer through a 3-way handshake. With this protocol, the authenticator sends a CHALLENGE message to the peer. The peer responds with a value that has been calculated through a hash function, using the CHALLENGE message and the password. The authenticator then calculates a value as well, based on the CHALLENGE message and the password, and compares its value with the one sent by the peer. If the values match, the remote peer is allowed access to the system. If they do not match, the connection is terminated.

11a **LOCAL USER NAME** This option allows you to select a name to be sent when the local port is being authenticated by the remote system. This option also specifies the system/user name when the local user is the CHAP authenticator.

11b **LOCAL USER PASSWORD** This option allows you to select a password to be sent when the local port is being authenticated by the remote system.

11c **REMOTE AUTHENTICATION PROTOCOL** This option allows you to specify the authentication protocol when this local port is the authenticator. Authentication methods include:

```
CHAP
PAP
CHAP or PAP: (CHAP attempted first; if not supported by remote side, PAP is tried).
PAP or CHAP: (PAP attempted first; if not supported by remote side, CHAP is tried).
NONE
Enter Choice:
```

Select the protocol you want to use.

11d **REMOTE USER INFORMATION** This option allows you to complete a table that lists the remote user names and passwords that are allowed to access this unit's port. This information is used when the local port is the authenticator and is receiving this information remotely. The information received is compared to the table entries. If there is a match, authentication is successful. If there is a discrepancy, authentication is a failure and PPP brings down the link.

C.8 MultiLink Point-to-Point (MLP)

From the Main Menu, select Data Configurations (2) >> Logical Port (1) >> Protocol (1) >> Multi-Link PPP (MLP) (6).

Routing . . . To successfully switch data through the unit, you must complete either the IP or IPX Routing Table.(See Section 5.0, Routing with IP and IPX in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide). Define other IPX networks in the routing table.

Address . . . If you are using IP routing, you must also enter the local IP address (see Section 3.3, Assigning a Local Name & Address of the FRAD, (Ether/Mono/Ring FRADs and Webrouter) Reference Guide).

Overview

With the vast amount of data being transmitted from one point to another, it is becoming more common to link two sites together with multiple lines. Multi-link PPP allows several physical lines to be logically bound together so that they appear as one line. This allows two or more devices at the same site to use the additional bandwidth, while increasing cost-efficiency.

When a unit that supports MLP detects impending congestion on one link, it can dial up a second connection to temporarily add additional capacity. Multiple lines also allow you to purchase, for example, two 56 kbps links rather than one T1 link, which allows you to transmit the same amount of data for less money.

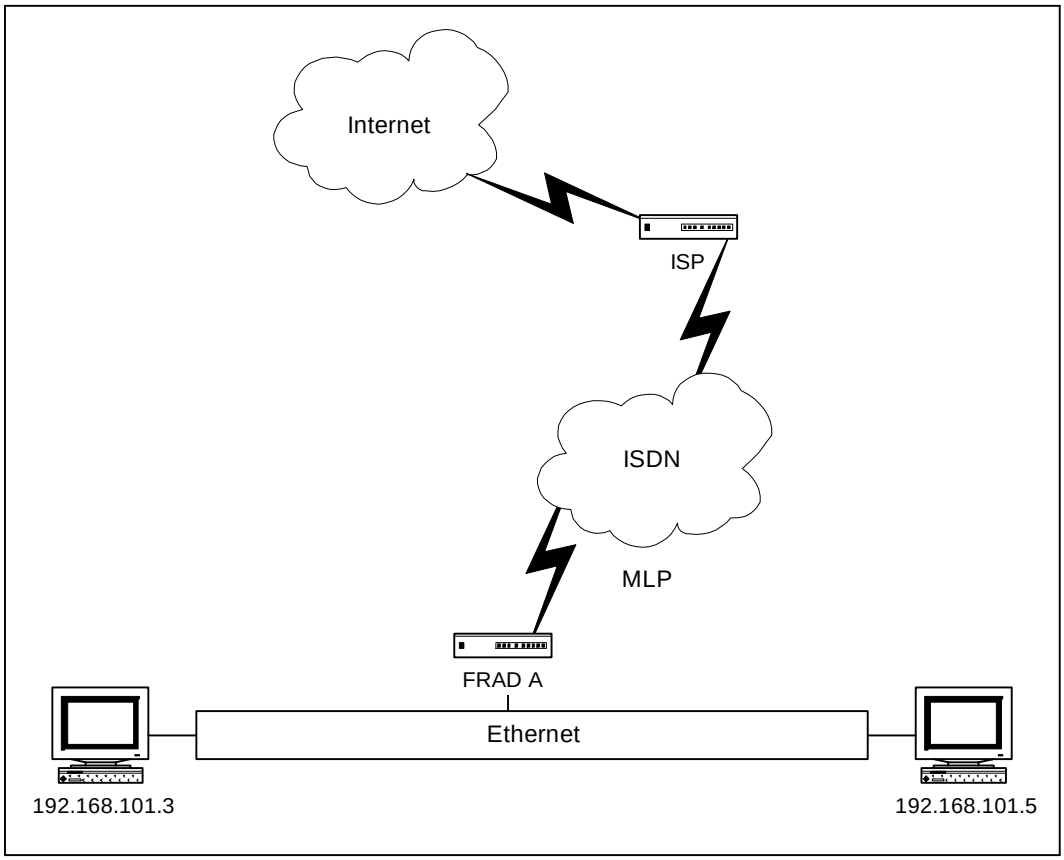


Illustration C-8: Sample Network *for PPP over Modem*

Procedure

When you select Multi-Link PPP (Point to Point), the following menu is displayed:

```
1) IPX Net Number
2) IPX Node Number
3) SAP Mode
4) PPP Authentication Configuration
5) PPP IPCP Configuration
6) Bundle Configuration
Enter Choice:
```

Step 1 For instructions on completing the first five options of this menu, see Section C.7, Point-to-Point (PPP). For information on the Bundle Configuration option, see the next page.

Step 2 **BUNDLE CONFIGURATION** This option allows you to specify which ports should be combined within this port for multiplexing. Select Bundle Configuration and the following menu is displayed:

```
Bundle Configuration : Port 1
---------------------------------------------
1) MRRU                    3000
2) MP Header               MUST
3) MemberLink Table
Enter Choice:
```

Step 1 **MRRU** This option allows you to specify the maximum size of a reassembled packet (Maximum Receive Reconstructed Unit or MRRU) on a multi-link port. If a packet exceeds the specified size, it is discarded. Select MRRU and the following prompt is displayed:

```
Enter Desired MRRU Value :
```

Enter the desired value and press <***ENTER***>.

Step 2 **MEMBERLINK TABLE** This option allows you to complete a table listing the other ports that should be included in this multi-linked port. The Multi-link Protocol performs load balancing by distributing the packets evenly among the member ports.

2a **LOGICAL MEMBER PORT NO** This option allows you to enter the ports to be included on this multi-port link. All ports to be included here must already be configured for the appropriate protocols. Select Memberlink Table and the following prompt is displayed:

```
Add Member Link Entry

Enter Logical Member Port No:
```

Enter the number of the port to be included in the bundle, and depress <***ENTER***>. You may continue adding PPP ports, or depress ***ESC*** to view the table of entries. Depress ***ESC*** again to return to the menu. For example: suppose you want Port 15 to be configured for MLP, and you want to add Ports 1 and 2 to Port 15's bundle. You must first configure Ports 1 and 2 for PPP and map each of them to a physical port. Then configure Port 15 for MLP. In the MemberLink Table, enter Port 1 and then Port 2. Now they are linked. Do not map Port 15 to a physical port.

Depress ***ESC*** to return to the menu. When the PPP port is part of a bundle, the authentication, IPCP configuration, IPX Net Number, and IPX Node Number of the PPP member ports are ignored.

C.9 SDLC 1490 Configuration

From the Main Menu, select Data Configurations (2) >> Port (1) >> Protocol (1), SDLC 1490 Configuration (E).

Routing . . . You must complete the SNA Routing Table with the addresses of all units in your network (see Section 6.3, SNA Routing for 1490 in the FRAD (Ether/Mono/Ring FRADs and webrouter) Reference Guide).

Statistics . . . See section 7.11, SDLC 1490 Configuration Statistics, in the FRAD (Ether/Mono/Ring FRADs and webrouter) Reference Guide).

Overview

The SDLC 1490 Configuration option provices connectivity between SDLC devices as per the IBM recommended SDLC protocol standards. SNA devices are defined as IBM SNA Host/Terminal/Router/Bridge devices or IBM SNA compatible Host/ Terminal/Router/Bridge devices.

You can use the SDLC 1490 Configuration option to make the following connections:

- Local SDLC Terminal to Remote SDLC/Frame Relay host
- Local SDLC host to Remote SDLC/Frame Relay terminal

The diagram on the following page illustrates Local SDLC terminals connected to Remote SDLC/Frame Relay hosts. A host is typically an IBM compatible 3745 or an AS400.

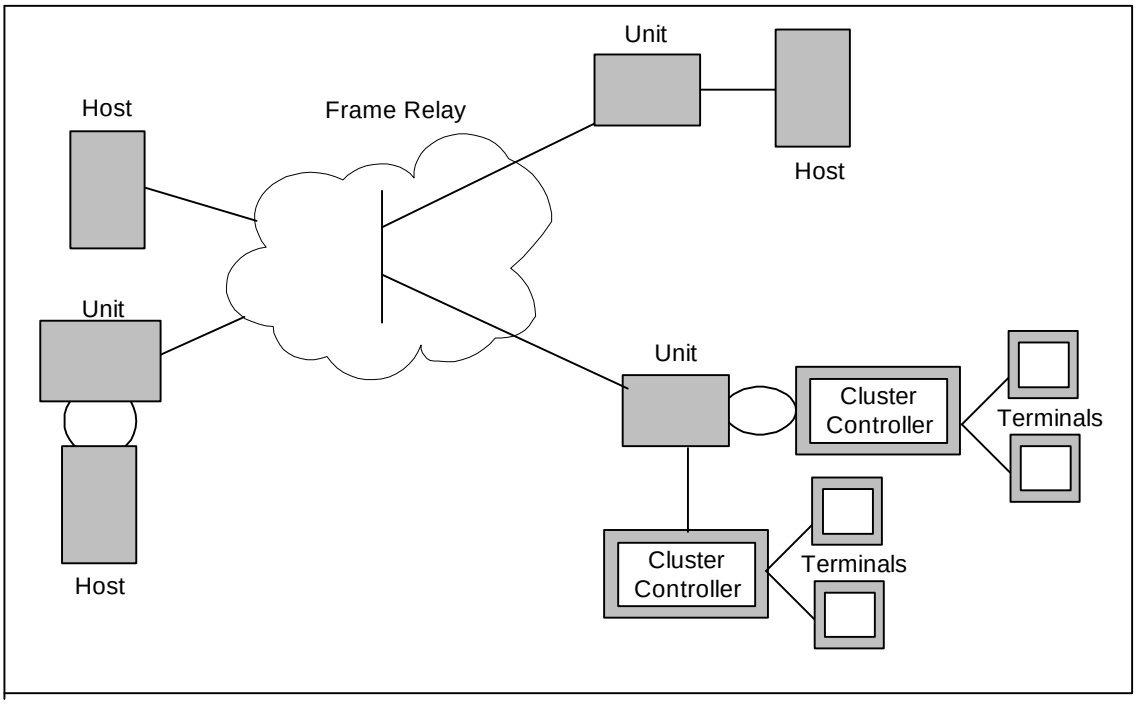


Illustration C-9: SDLC Terminals Connected to Remote Hosts

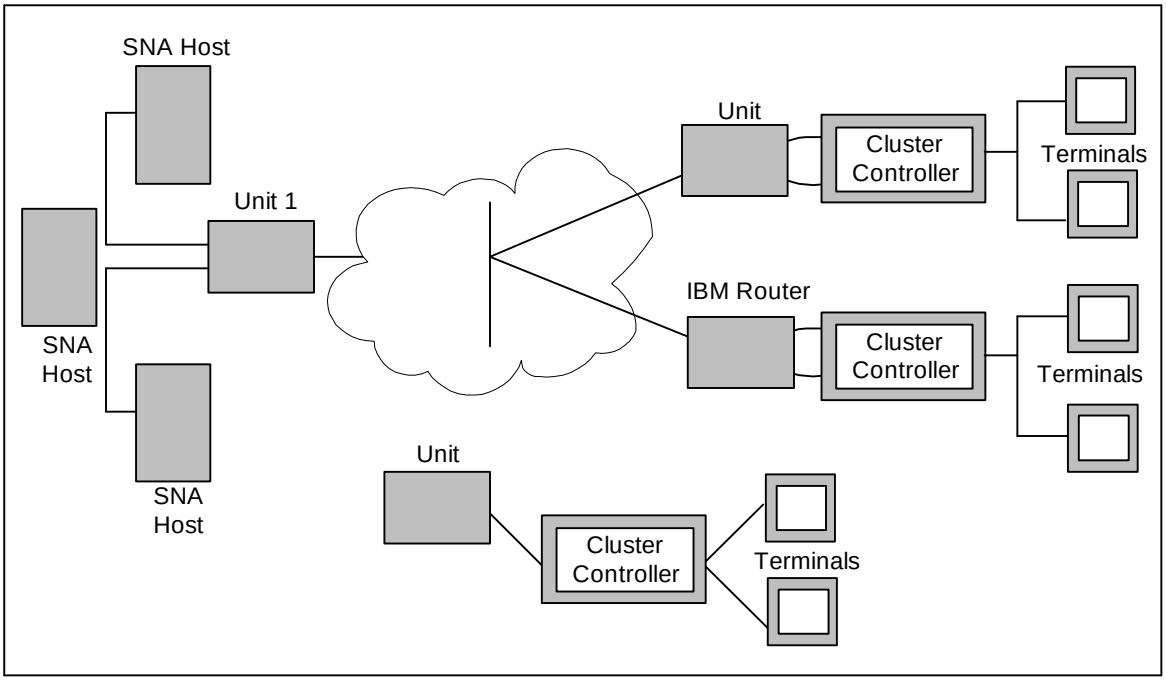


Illustration C-10: Local SDLC Host Connected to Remote Terminals

The above diagram illustrates a Local SDLC host connected to Remote SDLC terminals.

Procedure

When you select SDLC 1490 Configuration (E) from the Logical Port Protocol Selection menu, the following menu is displayed:

```
SDLC 1490 Config. Parameters: Port 1
------------------------------------------------------------
1)  Speed                       9600
2) Polling Emulation Type       TERMINAL
3) Data Format                  NRZ
4) Idle Character               FLAG
5) DCD                          FORCED
6) User Buffers HWM             18
7) User Buffers LWM             12
8) SDLC 1490 Controllers
Enter Choice:
```

Step 1 **SPEED** This option allows you to set the synchronous clock speed that units configured as DCE will use to provide clocking to the user's equipment. Select Speed and the following menu will be displayed.

```
Configure Synchronous Clock Speed
------------------------------------------------------------
1) 2400
```

```
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000

Enter Choice:
```

NOTE: When the port is configured as DTE, as opposed to DCE, the parameters menu reflects that the speed is provided by the device connected to the unit. In this case, you do not need to configure speed. If you attempt to configure the speed, the following message is displayed and you are returned to the parameters menu: Port is DTE, Can Not Change Speed 44

Step 2 **POLLING EMULATION TYPE** This option allows you to specify whether the unit port is connected to a terminal or to a host. Select "Polling Emulation Type" from the SDLC 1490 Configuration menu.

```
Configure SDLC2 Type (HOST/TERMINAL)
------------------------------------------------------------
1) Host End
2) Terminal End
Enter Choice:
```

If the unit is connected to a Host, select Host. If the unit is connected to a Terminal, select Terminal.

Step 3 **DATA FORMAT** This option allows you to specify whether the data format should be Non-Return-to-Zero (NRZ) or Non-Return-to-Zero Inverted (NRZI). Select Data Format, depress <ENTER> and the following options are displayed:

```
Configure Data Format
-----------------------
1) NRZ
```

```
2) NRZI
Enter Choice:
```

Type the number of the format your host/terminal expects to receive.

Step 4 **IDLE CHARACTER** This option allows you to specify whether Mark or Flag characters (7E) should be transmitted between frames. Select "Idle Character", depress <ENTER> and the following menu is displayed:

```
Configure Idle Character
------------------------
1) MARK
2) FLAG
Enter Choice:
```

4a **MARK** This option allows you to configure the unit to send solid Mark characters (all binary ones) in the idle state, except when the Poll/Final (P/F) bit (bit 0x10 of the second byte of the frame) is clear (off). If you want to do this, select "MARK". This exception was explicitly designed for compatibility with IBM AS400's. However, it does not reflect the actual state of an HDLC line over half-duplex modems.

4b **FLAG** This option allows you to configure the unit to send HDLC Flag characters (0x7e with no zero insertion) in the idle state, which is the normal state. If you want to do this, select "FLAG".

Type the number of the option you want and depress <ENTER>.

Step 5 **DCD** This option allows you to specify whether Data Carrier Detect (DCD) is FORCED or SWITCHED. Type the number corresponding to DCD, depress <ENTER> and the following options are displayed:

```
Configure DCD
-------------------
1) SWITCHED
2) FORCED
Enter Choice:
```

NOTE: DCD is effective only on ports with DCE interfaces.

5a **SWITCHED** This option allows you to activate DCD only when valid data is sent to the port. If you want to do this, select "SWITCHED".

5b **FORCED** This option allows you to activate DCD at all times. If you want to do this, select "FORCED".

Step 6 **USER BUFFERS HWM & LWM** The High Water Mark and Low Water Mark settings control the flow of traffic through the SDLC link. For example, suppose traffic is being passed from a high speed Frame Relay link through an SDLC link. When the buffers in the SDLC link are filled to the level you specified in the High Water Mark setting and the SDLC link is in danger of becoming congested. The SDLC link sends a message to the high speed link, requesting that it slow down the flow of traffic.

When the SDLC link has emptied its buffers to the level you specified in the Low Water Mark setting, the SDLC link sends another message to the high speed link asking it to resume its normal flow.

6a **HIGH WATER MARK** To enter the User Buffers High Water Mark, type select User Buffers HWM and the following prompt is displayed:

```
Enter User Buffer HWM(16 to 31)[18]:
```

Type the high water mark buffers you want to use and depress <ENTER>. It is strongly recommended that the default value be used.

6b **LOW WATER MARK** To enter the User Buffers Low Water Mark, select User Buffers HWM option and the following prompt is displayed:

```
Enter User Buffer LWM(10 to 15)[12]:
```

Type the low water mark buffers you want to use and depress <ENTER>. It is strongly recommended that the default value be used.

Step 7 **SDLC 1490 CONTROLLERS** Controllers are the SNA terminal devices with control unit (CU) addresses.

7a **SDLC CONTROLLER ADDRESS** To make entries into the Controller table, select SDLC 1490 Controller and the following prompts are displayed:

```
Empty Controller Table
Add Controller Table Entry
Enter SDLC Controller Address(2 Hex Digits):
```

Type an SDLC Controller address with two hexadecimal digits and depress <ENTER> and the following prompt is displayed:

```
Do you want rest of the parameters to be default?(y/n)
```

1 **USE DEFAULT PARAMETERS? YES** If you select "Y", you are given the opportunity to add more SDLC Controller Addresses to the table. For every address you add, you are prompted again if you want the rest of the parameters to be default.

2 **USE DEFAULT PARAMETERS? NO** If you select "N", the following prompts are displayed:

```
For the following, press <Enter> for default value[xxx]
Enter Receive Window Size(1 to 7)[7]:
```

7b **RECEIVE WINDOW SIZE** This option reflects the SDLC Sliding Window protocol.

Type the Receive Window Size you want, depress <ENTER> and the following prompt is displayed.

```
Enter Transmit Window Size(1 to 7)[7]:
```

7c **TRANSMIT WINDOW SIZE** This option reflects the SDLC protocol transmit window size. Type the size you want to use, depress <ENTER> and the following prompt will be displayed.

```
Enter Acknowledge Timer T1(Seconds)(1 to 60)[3]:
```

7d **ACKNOWLEDGE TIMER T1** This option reflects the amount of time the system waits for acknowledgement of transmitted frames. Type the Acknowledge Timer T1 (time in seconds), depress <ENTER> and the following prompt is displayed:

```
Enter Maximum Retries N2(0 to 60)[5]:
```

7e **MAXIMUM RETRIES N2** This option reflects the number of times the system tries to retrieve an acknowledgement. Type the Maximum Retries N2, depress <ENTER> and the unit will display a message confirming that the entry was added and then prompts you for the next SDLC Controller Address as follows:

```
Entry Added

Enter SDLC Controller Address (2 Hex Digits):
```

7f When you have completed entering SDLC addresses, depress ESC to return to the SDLC 1490 Configuration Parameters menu or depress ESC three additional times to return to the Main Menu.

C.10 SDLC Routing

From the Main Menu, select Data Configurations (2) >> Logical Port (1) >> Protocol (1) then, SDLC Routing (7).

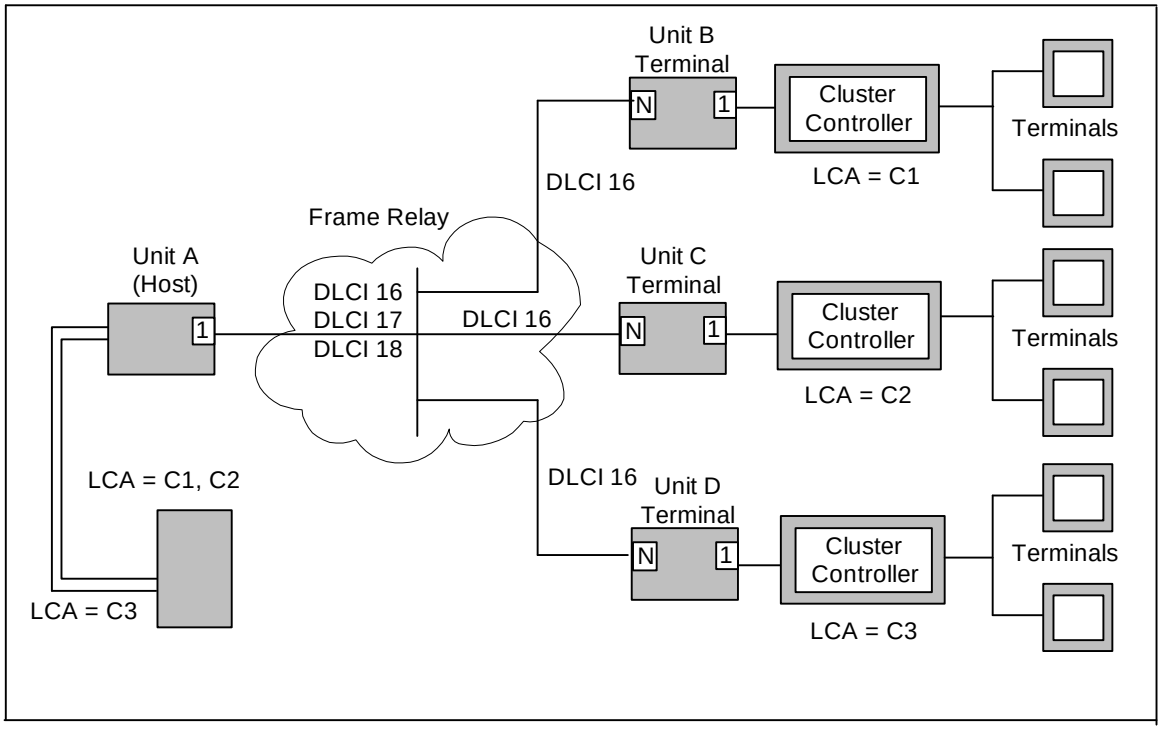
Statistics . . . See Section 7.12, SDLC Routing Statistics, of the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide for a description of the statistics used to monitor this protocol.

Overview

In addition to Protocol Emulation (Spoofing), Bit Sync Encapsulation, and SNA 1490, you can configure the unit to support SDLC using SDLC Routing. When a unit port is configured for SDLC Routing, it reads only the addressing portion of the SDLC frame. This is a more efficient method of transmitting SDLC than SNA RFC 1490.

Before you start !! Make sure you configure a Frame Relay port with a matching DLCI. This protocol is proprietary and requires a unit at both ends of the link.

The DCD (SWITCHED) and Idle Character (MARK) options are intended primarily for use with half-duplex SNA/SDLC applications, particularly in conjunction with the IBM AS400.



LCA = Local Controller Address Configuration for SDLC Routing

Illustration C-11: Sample Network for SDLC Routing

Procedure

When you select SDLC Routing (7) from the "Logical Port Protocol Select Menu", the following menu is displayed:

```
SDLC Routing Parameters:  Port 1
---------------------------------------
1) Speed:  9600
2) Data Format:  NRZ
3) DCD:  FORCED
4) Idle Character:  FLAG
5) Routing Entries
Enter Choice:
```

Step 1 **SPEED** This option allows you to specify a synchronous clock speed for units configured for DCE. Select Speed (1) and the following menu of speeds is displayed (when the port is configured as DTE, as opposed to DCE, the parameters menu reflects that the speed is provided by the device connected to the unit. In this case, you do not need to configure speed. If you attempt to configure the speed, the following message is displayed and you are returned to the parameters menu: Port is DTE, Can Not Change Speed):

```
Configure Synchronous Clock Speed
---------------------------------------------------------
1) 2400
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000
Enter Choice:
```

Step 2 **DATA FORMAT** This option allows you to specify whether the data format should be Non-Return-to-Zero (NRZ) or Non-Return-to-Zero Inverted (NRZI). Select Data Format (2) and the unit will display the menu below:

```
Configure Data Format
---------------------------------
1) NRZ
2) NRZI
Enter Choice:
```

Enter the number of the format your host/terminal expects to receive.

Step 3 **DCD** This option allows you to specify whether Data Carrier Detect (DCD) is FORCED or SWITCHED. Select DCD (2) from the SDLC Routing Parameters menu and the unit will display the following menu:

```
Configure DCD
---------------------
1) SWITCHED
2) FORCED
Enter Choice:
```

NOTE: DCD is effective only on ports with DCE interfaces.

3a **SWITCHED** This option allows you to activate DCD only when valid data is sent to the port. If you want to do this, select SWITCHED (1) and the unit will redisplay the SDLC Routing Parameters menu.

3b **FORCED** This option allows you to activate DCD at all times. If you want to do this, select FORCED (2) and the unit will redisplay the SDLC Routing Parameters menu.

Step 4 **IDLE CHARACTER** This option allows you to specify whether MARK or FLAG characters (7E) should be transmitted between frames. Select Idle Character (4) and the following menu is displayed:

```
Configure Idle Character
---------------------------------
1) MARK
2) FLAG
Enter Choice:
```

4a **MARK** This option allows you to configure the unit to send solid Mark characters (all binary ones) in the idle state, except when the Poll/Final (P/F) bit (bit 0x10 of the second byte of the frame) is clear (off). If you want to do this, select MARK (1) from the "Configure Idle Character" menu. This exception was explicitly designed for compatibility with IBM AS400's. However, it does reflect the actual state of an HDLC line over half-duplex modems.

4b **FLAG** This option allows you to configure the unit to send HDLC Flag characters (0x7e with no zero insertion) in the idle state (normal state). If you want to do this, select FLAG (2) from the "Configure Idle Character" menu and type the number of the option you want.

Step 5 **ROUTING ENTRIES** This option allows you to create a routing table that maps the controller addresses, DLCIs, and ports. Select Routing Entries (5) and the following prompt is displayed:

```
Add SDLC Routing Table Entry
Enter SDLC Address:
```

Type the SDLC Address, depress <ENTER> and the unit will display the following prompt:

```
Enter Path Name (1 to 10 Characters):
```

Step 6 **PATH NAME** This option allows you to identify the Global Path entry that corresponds to the path this traffic will take through the network. You do this by entering the name you assigned to the Global Path. A global path entry contains information such as port numbers, path types, channel numbers, DLCIs, and X.121 addresses. This option is accessed from the Main Menu. Select GPT Name and the following prompt is displayed:

```
Enter GPT Name:
```

Enter the Global Path Name and depress <***ENTER***>. If you enter a name that is not already associated with a Global Path, you are prompted to enter the path now:

```
Path Name Does Not Exist In GPT Table.
To Add Global Path Entry, Press "Y".  Press Escape Otherwise.
```

Depress <ENTER> or type "Y" and the unit will display the folloing menu:

```
Global Path Types
-----------------
1) X25 SVC
2) X25 PVC
3) Frame Relay PVC
4) Port Type
5) IP/UDP
6) Voice

Enter Choice : (1 to 6)[1] :
```

NOTE: YOU CANNOT SAVE THIS CONFIGURATION IF A VALID GPT NAME HAS NOT BEEN ENTERED.

Step 7 Depress ESC to view the table of entries you have made. You can add, delete, or change the entries as necessary. When you have finished making changes, depress ESC four times to return to the Main Menu.

C.11 Serial Line IP (SLIP)

From the Main Menu, select Data Configurations (2) >> Logical Port (1) >> Protocol (1) >> Serial Line IP (SLIP) (3).

Routing . . . You must complete the IP Routing Table. see Section 5.0, Routing with IP & IPX, in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide

Address . . . If you are using IP routing, you must also enter the local IP address see Section 3.3, Assigning a Local Unit Name & Address in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide

Statistics . . . See Section 7.13, SLIP Statistics, in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide for a description of the statistics used to monitor this protocol.

Procedure

When you select SLIP (3) from the "Logical Port Protocol Selection Menu", the following menu is displayed

```
SLIP  Config Parameters
----------------------------------
1) Speed:  9600
Enter Choice:
```

Step 1 **SPEED** This option allows you to specify an asynchronous clock speed. Select Speed and the following menu of speeds is displayed:

```
Configure Asynchronous Clock Speed
-----------------------------------------------------
1) 1200
2) 2400
3) 4800
4) 9600
5) 19200
6) 38400
7) 48000
8) 57600
9) 115200

Enter Choice :
```

LCA = Local Controller Address
LLID = Local Logical ID

C.12 Sync Burroughs Poll/Select

Procedure

When you select Sync Burroughs Poll/Select (9) from the Logical Port Protocol Selection Menu, the following menu is displayed

```
Synchronous Burroughs Parameters : Port 1
-----------------------------------------
1) Line Speed                    9600
2) Locally Connected Device(s)   TERMINAL
3) Response Timeout              1
4) Transmit Delay                0
5) Devices

Enter Choice :
```

Step 2 **LINE SPEED** This option allows you to specify a clock speed. Select Speed and the following menu of speeds is displayed:

```
Configure Synchronous Clock Speed
---------------------------------------------------------
1) 2400
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000

Enter Choice:
```

Step 3 **LOCALLY CONNECTED DEVICE** This option allows you to configure the unit's port as Terminal if it is connected to a host, or Host if the port is connected to a terminal. Select "Locally Connected Device" and the following menu is displayed:

```
Configure Polling Emulation Type
--------------------------------------------------
1) Host End
2) Terminal End

Enter Choice :
```

3c **HOST END** If the port you are configuring is connected to a host, select "Host End". This indicates that the unit is acting as a terminal.

3d **TERMINAL END** If the port is connected to a terminal, select "Terminal End". This indicates that the unit is acting as a host.

Step 4 **RESPONSE TIMEOUT** This option allows you to specify the number of seconds the unit may wait for a response to a command before timing out and moving on to the next device. Select "Response Timeout" and the following prompt is displayed:

```
Enter Response Timeout (1 - 255 seconds):
```

Enter the number of seconds you want the unit to wait before timing out, and depress <ENTER>.

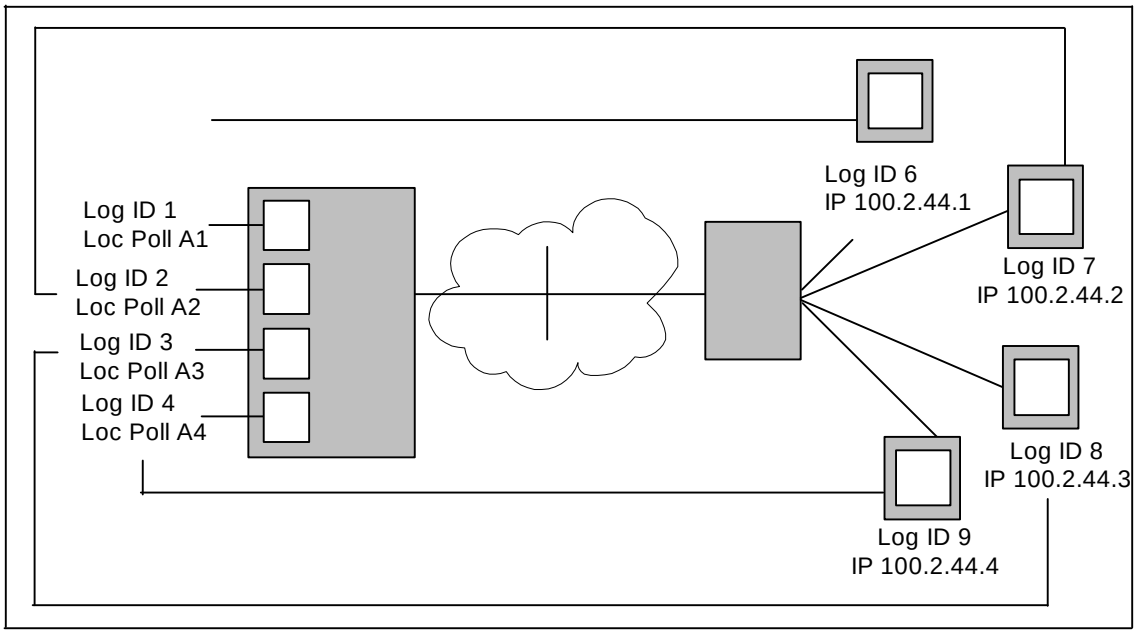
Step 5 **TRANSMIT DELAY** This option allows you to set the amount of time a transmission can be delayed. This parameter setting prevents the unit from overrunning slower devices. Select "Transmit Delay" and the following prompt is displayed:

```
Enter Transmit Delay (0 - 255 Hundreths of a second):
```

Enter the hundredths of a second you want the unit to wait before polling or responding to a poll, and depress <ENTER>.

Step 6 **DEVICES** With this option, the unit must know about every device to which it is connected. Within each unit are logical units, each of which serves as an internal address that is mapped to a given device. This internal logical address is called the "Local Logical ID". The address of the local physical devices is called the "Local Poll Address".

This Device Table maps the local host's logical IDs to the local poll addresses; the remote logical IDs to the remote IP addresses; and the local logical IDs to the remote logical IDs. In the diagram on the next page, Local Poll Address A1 is mapped to Local Logical ID 1; IP address 100.2.44.1 is mapped to Remote Logical ID 6; and Local Logical ID 1 is mapped to Remote Logical ID 6.



Select Devices and the following prompts are displayed:

```
Empty Device Table
Add Device Table Entry

Enter Local Logical ID (1 - 99):
```

6a **LOCAL LOGICAL ID** This option allows you to enter a Local Logical ID for a logical unit in the host that will be be mapped to a remote unit. This entry can be any number from 1 to 99. Enter the logical ID number and depress <ENTER>.

6b **LOCAL POLL ADDRESS** This option allows you to enter the addressof the logical device that is represented in this host by the above local logical ID. The poll address is two characters in length. A typical example might be B3 or C5. The unit will prompt you for the Local Poll Address as follows:

```
Enter Local Poll Address:
```

Enter the address and depress <ENTER>.

6c **LOCAL GROUP POLL ADDRESS** This option allows the user to define the Local Group Poll Address. Devices can be referenced by a group address if that device belongs to a configured group. When a group address is used in a poll, any device in that group is allowed to answer. The following prompt is displayed:

```
Enter Local Group Poll Address <Enter for None> :
```

Enter the Local Group Poll Address and depress ***<ENTER>***.

6d **REMOTE IP ADDRES** This option allows you to enter the IP Address of the remote controller. The following prompt is displayed:

Enter Remote IP Address (N.N.N.N) :

Enter the Remote IP Address and depress <ENTER>.

6e **REMOTE LOGICAL ID NUMBER** This option allows you to enter the Logical ID Number associated with the remote terminal. This configuration provides Burroughs spoofing within the units to allow Burroughs traffic to be transmitted between the host and three cluster controllers. The following prompt is displayed:

Enter Remote Logical ID Number (1 - 99):

Enter the Remote Logical ID Number and depress ***<ENTER>***.

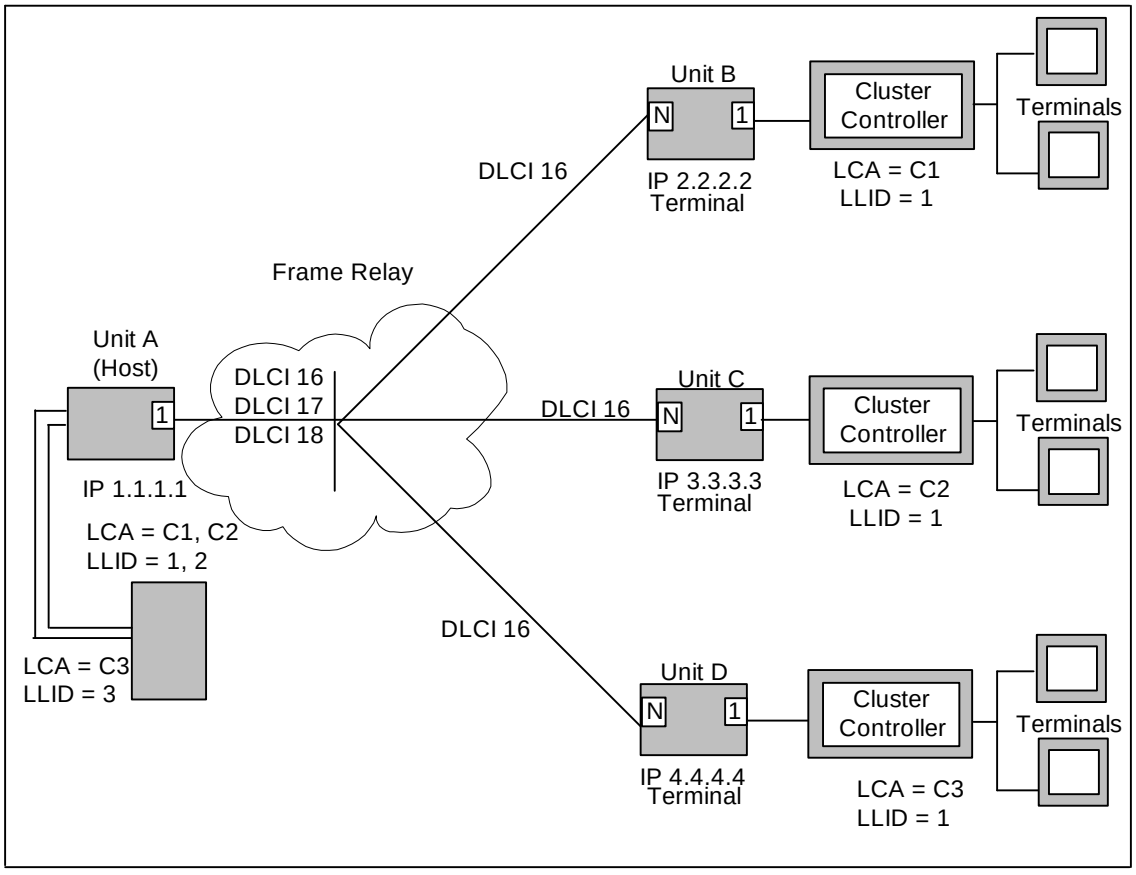


Illustration C-12: Sample Network for Burroughs Poll/Select

When defining the Burroughs port on the unit, the following parameters must be set. The default values are shown below where applicable.

HOST (Connected to Mainframe)	TERMINAL (Connected to Controller)
Speed	**Speed**
Polling Emulation Type: Host	**Polling Emulation Type: Terminal**
Disconect on Error: True	**Disconnect on Error: True**
Terminal Timeout: 3	**Terminal Timeout: 3**
Host Timeout: 10	**Host Timeout: 10**
Devices	**Devices**

When setting up the Device Table for Burroughs, the following rules apply:

- A device connected to the unit is identified by its IP Address and its Local Logical ID.
- The Local Logical IDs must be unique within a unit but not within the network.
- Up to 32 devices can be linked to a single port on a unit.

NOTE: To save the new configuration, select Write Configuration then Reset Unit from the Main Menu to implement the new configuration.

C.13 Telnet Terminal

From the Main Menu, select **Data Configurations (2)** >> **Logical Port (1)** >> **Protocol (1) >> Telnet Terminal (B)**.

Routing . . . To successfully switch data through the unit, you must complete the IP Routing Table. (See Section 5.0, Routing with IP & IPX, in the FRAD (Ether/Mono/Ring FRADs and Webrouter Reference Guide.)

Address . . . If you are using IP routing, you must also enter the local IP address (see Section 3.3, Assigning a Local Unit Name & Address, of the EtherFRAD, Mono/RingFRAD and Web.router Ref. Guide).

Statistics . . . See Section 7.15, Telnet Terminal Statistics, of the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide for a description of the statistics used to monitor this protocol.

Overview

The Telnet Terminal option provides a way for the unit to connect a standard asynchronous terminal to an IP network using the Telnet protocol over TCP. A Telnet port can be configured as either a Server or a Client, answering or issuing calls, respectively. Calls can be issued automatically to a fixed address or manually to any IP Address.

The Modem control signal options are designed to enhance the use of the DTR, DCD and DSR signals. These options are not necessary under normal circumstances. However, any of these signals can be forced "On" if needed to facilitate the use of Telnet. For instance, it is advantageous to force control signals "On" if a terminal device is not capable of providing the necessary controls to the Telnet module.

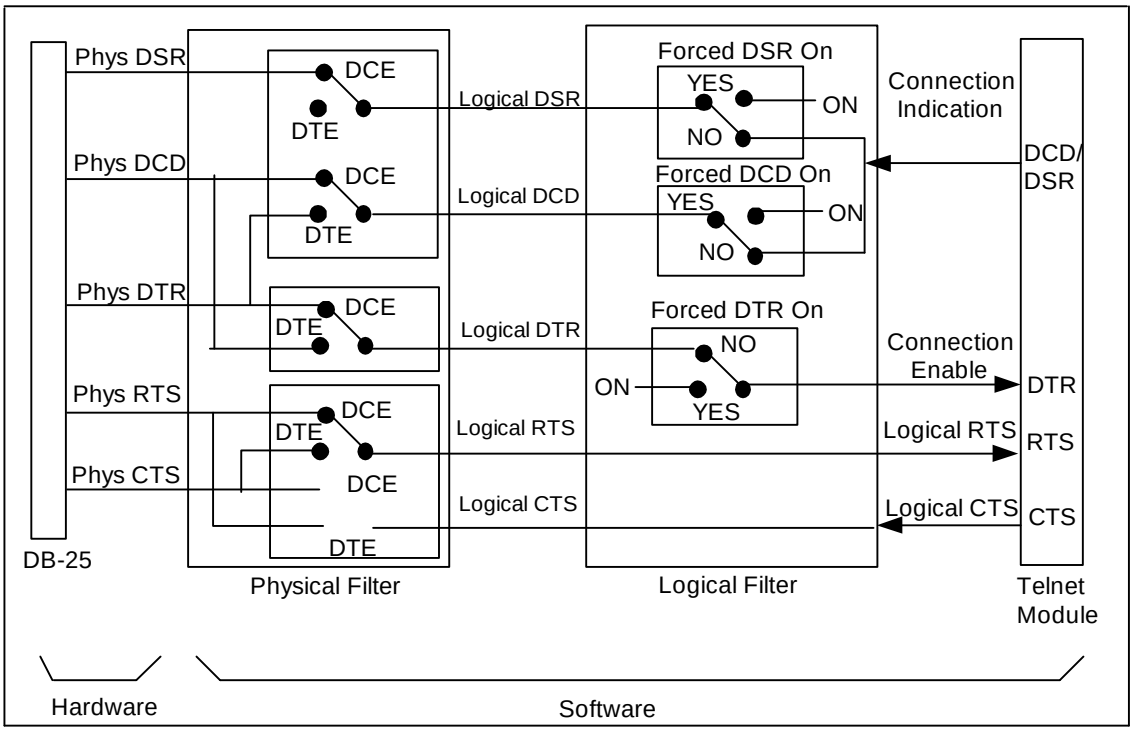


Illustration C-13: Telnet Logical Diagram

DTE/DCE control of the physical filter (displayed above) is determined by the orientation of the Fastick in the unit. The physical filter maps the physical port control signals to their logical counterparts in the logical filter. In effect, this process acts as a software multiplexer for modem control signals. The logical filter allows you to use the Telnet Terminal Menu options to gain better control over the port control signals. The default for Local TCP Port, is 256 plus the port number.

TroubleShooting Tip . . . In order for two units to interact properly as Telnet Server and Client, only one unit can be set up to call the other. Therefore:

1) One unit must have Answer mode On
2) Only one unit can be set for automatic dialing. The other unit must be set for Manual mode for the units to establish a connection with each other. If both units are in either DTR Dial or Continuous mode, they will both be attempting to call one another and neither unit will answer.

Before you start !! Be sure the following four settings (speed, data bits, parity, stop bits) match your terminal (or terminal emulator) communications parameters.

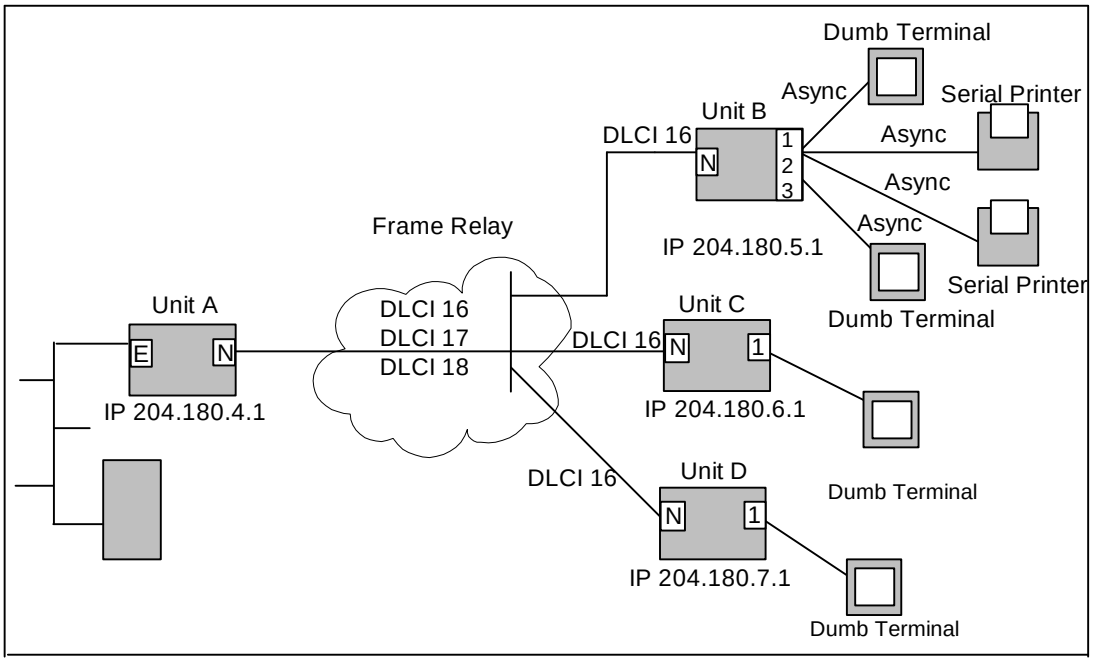


Illustration C-14: Sample Network for Telnet Terminal

Procedure

When you select Telnet Terminal from the "Logical Port Protocol Selection" menu, the following menu is displayed:

```
Telnet Terminal Parameters : Port 1
----------------------------------------
1) Speed : 9600
2) Data Bits : 8
3) Parity : None
4) Stop Bits : 1
5) Flow Control : OFF
6) Flow Control Type : RTS/CTS
7) Connection Type : Manual
8) Answer Mode : OFF
9) Data Mode : Normal
A) Null Insertion Mode : Normal
B) Exit Session Key : CTRL-X
C) Menu Quiet Mode : OFF
D) Local Echo : Auto
E) Store and Forward : Auto
F) Force DTR ON : No
G) Force DCD ON : No
H) Force DSR ON : No
```

```
I) Local TCP Port : 257
J) Remote TCP Port:  0
K) Remote IP Address : 0.0.0.0
L) XXXPAD Logical Port : N/A

Enter Choice :
```

Step 1 **SPEED** This option allows you to specify an asynchronous clock speed. Select Speed (1) and the following menu is displayed:

```
Configure Asynchronous Clock Speed
----------------------------------------------------------
1) 1200
2) 2400
3) 4800
4) 9600
5) 19200
6) 38400
7) 48000
8) 57600
9) 115200

Enter Choice :
```

If the Supervisory port is redefined as a Telnet Terminal server from the Supervisory port, the Telnet port defaults to the current speed of the Supervisory port instead of 9600 bps. However, if you define any other port for Telnet or if you set the Supervisory port for Telnet from a remote Telnet session, the default speed is still 9600 bps.

Step 2 **DATA BITS** This option allows you to specify the number of data bits to be transmitted in each character. Select Data Bits and the following screen is displayed:

```
Configure Asynchronous Number of Data Bits
-------------------------------------------------------------------
1) 7
2) 8
Enter Choice:
```

Enter the number of the item you want to select. The corresponding value is displayed on the screen.

Step 3 **PARITY** This option allows you to select the type of parity to be used. Select **Parity** and the following screen is displayed:

```
Configure Asynchronous Parity
-----------------------------------------
1) Odd
2) Even
3) Mark
4) Space
```

```
5) None
Enter Choice:
```

Enter the number of the item you want to select. The corresponding parity is displayed on the screen.

Step 4 **STOP BITS** This option allows you to select the number of Stop Bits. Select Stop Bits and the following screen is displayed:

```
Configure Asynchronous Number of Stop Bits
------------------------------------------------------------------
1) 1
2) 2
Enter Choice:
```

Enter the number of the item you want to select. The corresponding value is displayed on the screen.

Step 5 **FLOW CONTROL** This option allows you to set the Flow Control. It can be enabled for transmit only, receive only or both directions for either of the two Flow Control Types. Select Flow Control and the following menu is displayed:

```
Configure Asynchronous Flow Control ON / OFF
-------------------------------------------------------------------
1) Off
2) TX Only
3) RX Only
4) ON
Enter Choice:
```

Enter the number of the item you want to select. The corresponding setting is displayed on the screen.

Step 6 **FLOW CONTROL TYPE** This option allows you to set the Flow Control Type. BOth RTS/CTS hardware flow control and XON/XOFF software flow control are supported. Select Flow Control Type and the following prompt is displayed:

```
Configure Asynchronous Flow Control Type
-----------------------------------------------------------------
1) RTS/CTS
2) XON/XOFF
Enter Choice:
```

Enter the number of the item you want to select. The corresponding setting is displayed on the screen.

Step 7 **CONNECTION TYPE** This option allows you to specify how the Telnet Client terminal initiates a connection with the Telnet Server. Select **C**onnection Type and the following prompt is displayed:

```
Enter Connection Type (M (Manual) or D (DTR Dial)):
```

You can select manual connection or DTR Dial. Enter the letter of the item you want to select.

- In the "manual mode", you must manually enter an IP Address to connect to a Telnet Server by using the Telnet Terminal Commands Menu (see Section 4.13, Telnet Terminal in the FRAD (Ether/Mono/Ring FRADs and webrouter) Ref. Guide) on the local terminal. This menu can also be used to PING a remote Server. To end the Telnet session, press <CTRL> X. You can also end it from the remote end.
- In the "DTR Dial mode", Telnet Terminal initiates a Telnet connection to a remote Telnet Server immediately after the port's DTR is set. The remote TCP port and remote IP address configured in the Telnet Terminal Commands Menu is used to make the connection. (see Section 4.13, Telnet Terminal of the EtherFRAD Ref. Guide). The connection is closed when DTR is off. Note that DTR can be forced ON. For two units to interact properly as Telnet Server and Client, only one unit can be set up to call the other. Therefore, only one unt can be set for automatic dialing. The other unit must be set for Manual mode for the units to establish a connection with each other. If both units are in either DTR Dial or Continuous mode, they will both be attempted to call each other and neither unit will answer.

Step 8 **ANSWER MODE** This option allows you to set the port to act as a Telnet Server by turning on the Answer Mode. Select Answer Mode and the following prompt is displayed:

```
Enter Telnet Terminal Answer Mode (1 (OFF) or 2 (ON)):
```

The port then responds to Telnet Clients attempting to make a connection. If the Answer Mode is off, the port does not answer Telnet calls.

Enter the number of the item you want to select.

Once a Telnet connection has been established, it can be broken by typing <CTRL> "X" on the terminal at either end of the connection. If the Connection type has been set to Manual, the Telnet Terminal Commands Menu is refreshed after you press <ENTER>.

TroubleShooting Tip . . . For two units to interact properly as Telnet Server and Client, only one unit can be set up to call the other. Therefore, one unit must have the Answer mode set to ON.

DATA MODE This option allows you to set the Data Mode. There are two modes: normal and binary. The Normal data mode uses "Control X " as an escape character. It allows parameter handshaking after connection. The binary data mode is in accordance with RFC 856. When in Binary Data mode, the only available method for dropping a connection is to drop the DTR control signal on either end of the connection (note that dropping DTR drops the connection in Normal mode as well). The default for this parameter is Normal.

Select Data Mode and the following prompt is displayed:

```
Configure Telnet Terminal Data Mode
---------------------------------------------------
1) Normal
2) Binary
Enter Choice:
```

Enter the number of the mode you want to select. The Telnet Terminal Parameters Menu is redisplayed with the Data Mode Updated per your selection.

Step 9 **NULL INSERTION MODE** This option allows you to enable or disable the insertion or removal of null characters in the Telnet terminal protocol. To enable Null Insertion Mode, select Null Insertion Mode. The following prompts are displayed:

```
Configure Telnet Terminal Null Insertion Mode
-------------------------------------------------------------
1) Normal
2) Disable
Enter Choice:
```

If you select Normal (1) mode, null characters are added wherever needed to conform to standard telnet protocol. If you select Disable (2) mode, null characters are not added. Select the mode you want to use.

Step 10 **EXIT SESSION KEY** This option allows you to change the key combination you press on the keyboard when you want to cancel a telnet session. Select Exit Session Key and the following menu is displayed:

```
Configure Telnet Terminal Exit Session Key
------------------------------------------------------------
1) CTRL-W
2) CTRL-X
3) CTRL-Y
4) CTRL-Z
Enter Choice:
```

Select the key combination you want to use.

Step 11 **MENU QUIET MODE** This option allows you to disable this display. This capability is useful if a host machine or printer connected to the Telnet port does not tolerate the menu characters being received from the Telnet port. The default for this option is Off. When the Telnet Module Connection Type is configured as "Manual" and there is no active Telnet session on a given port, the Telnet Command Menu is displayed on the associated terminal.

Select Quiet Mode (C) from the "Telnet Terminal Parameters" menu. Then select the number for OFF (1) or ON (2). The Telnet Terminal Parameters Menu is redisplayed.

```
Configure Telnet Terminal Quiet Mode
------------------------------------------------------
1) OFF
2) ON
Enter Choice:
Enter the number for OFF (1)  or ON (2).
```

LOCAL ECHO This option is a mechanism for displaying data that can be configured in the unit. The Local Echo option has three possible settings. You can Enable, Disable or implement an Auto setting for the Echo function. If it is enabled, the unit always echos characters received from the terminal back to the terminal. If Local Echo is disabled, the unit does not echo received characters back to the terminal. When Local Echo is set to Auto, the unit echos characters back to the local terminal only if the remote echo option has *not* been successfully negotiated between the local and remote Telnet modules (the unit is performing the Store and Forward option). Select Local Echo Mode and the following prompt will be displayed:

```
Enter Local Echo Mode (A (Auto), E (Enable) or D (Disable)):
```

Enter the letter of the setting you want. The parameters menu is then redisplayed.

Step 12 **STORE AND FORWARD** This option is directly linked to the Remote Echo function. Remote Echo, or the Telnet Echo option, is a means for displaying data on the originating terminal screen by echoing it back from the remote host (see diagram below).

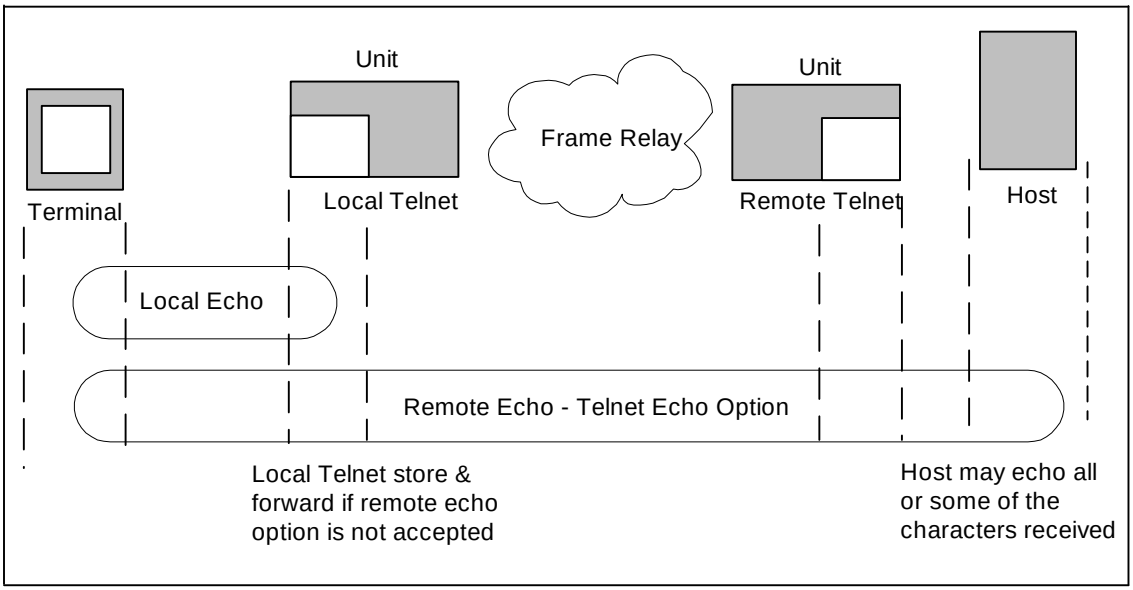


Illustration C-15: Local and Remote Echo

Remote Echo not only provides a display of characters, but it also allows data to be forwarded immediately from the local unit instead of being stored in a buffer and forwarded when <ENTER> is depressed or the buffer limit (200 bytes) is reached.

Either type of forwarding can be selected in the unit regardless of whether the host is set up to actually echo characters. In other words, the Store and Forward options determine the method for forwarding data from the terminal to the host whether or not a character display is returned to the terminal.

The Remote Echo, or the Telnet Echo option, involves a negotiation between the terminal and host as to whether characters are echoed. The host configuration determines whether characters are echoed. At the same time, a negotiation between the units affect how data is handled. The Local unit requests the remote host, via the remote unit, to echo data back to the terminal. The Telnet module in the remote unit responds to the request as far as forwarding methods are concerned. This response is determined by the configured setting for Store and Forward. Both units must be configured the same way for the negotiation to be successful. If the negotiation is successful, data is forwarded immediately to the host upon receipt from the terminal. If the negotiation fails, data is stored and forwarded upon depression of the <ENTER> key or a full buffer.

There are three settings for this option.

- **AUTO (A)**: The unit attempts to negotiate the Telnet echo option and implements it if requested. If the negotiation fails, the unit stores and forwards data. If the negotiation succeeds, the unit forwards all data received from the local terminal immediately.
- **ENABLED (E)**: The unit does not attempt to negotiate the Telnet echo option and refuses to implement it even if the remote Telnet module requests it to do so. The unit always stores data from the local terminal until the <ENTER> key is depressed or the buffer is filled, then forwards it to the host.
- **DISABLED (D)**: The unit attempts to negotiate the Telnet echo option and implement it if requested by the remote Telnet module. The unit forwards all received data immediately to the host even if the remote Telnet module refused the negotiation.

To control the negotiation of remote echoing and to select data forwarding methods, select Store and Forward. The following prompt is displayed:

```
Enter Store & Forward Mode (A (Auto), E (Enable) or D (Disable)):
```

Enter the letter corresponding to the mode you want, and press <ENTER>.

NOTE: This option supports both binary and ASCII (Normal) Data Modes. If binary is being used, the Telnet Terminal function tries to negotiate a binary connection with the remote Telnet Server. If it is refused, the Telnet function reverts to using ASCII. In binary mode, the unit does not accept <CTRL>+X to disconnect the Telnet session. Only a change in the DTR port signal can disconnect the session.

Step 13 **FORCE DTR ON** This option allows you to force DTR to be "On". Select Force DTR On (F) and the following prompt is displayed:

```
Force DTR ON (N (No) or Y (Yes)):
```

Forcing a DTR signal is useful if the terminal equipment connected to the unit port fails to supply DTR. This also prevents a Telnet session from being disconnected if DTR is dropped. Select Force DTR "On" (F) from the "Telnet Terminal Parameters" menu.

Enter the letter of the desired setting and the parameters menu will be redisplayed.

Step 14 **FORCE DCD ON** This option allows you to force DCD to be "On". Select Force DCD On (G) and the following prompt is displayed:

Force DCD ON (N (No) or Y (Yes)):

The Telnet module raises and lowers this control signal to indicate the connection status of its Telnet session. Forcing the signal On is useful if the varying DCD signal has a negative effect on the operation of the attached terminal.

Enter the letter of the desired setting and the parameters menu is redisplayed.

Step 15 **FORCE DSR ON** This option allows you to force DSR to be On. Select Force DSR On (H) and the following prompt is displayed:

Force DSR ON (N (No) or Y (Yes)):

The Telnet module raises and lowers this control signal to indicate the connection status of its Telnet session. Forcing the signal On is useful if the varying DSR signal has a negative effect on the operation of the attached terminal.

Enter the letter of the desired setting and the parameters menu is redisplayed.

Step 16 **LOCAL TCP PORT** This option allows you to enter the Local TCP Port. Select Local TCP Port and the following prompt is displayed:

Enter Local TCP port (0 - 65535):

Enter the port number and depress <ENTER>. The "Telnet Terminal Parameters" menu is redisplayed.

Step 17 **REMOTE TCP PORT** This option allows you to enter the Remote TCP Port number. Select Remote TCP Port (J). The following prompt is displayed:

Enter Remote TCP port (0 - 65535):

If you are using the DTR Dial or Continuous Connection Types, the number entered here is used to establish a Telnet session. If you are using the Manual Connection Type, you do not need to enter this number.

Enter the Remote TCP port number and depress ENTER. The "Telnet Terminal Parameters" menu is redisplayed.

NOTE: The remote TCP port number and remote IP address together define a destination (socket). This information can be obtained from your Network Administrator.

Step 18 **REMOTE IP ADDRESS** This option allows you to enter the Remote IP Address. Select Remote IP Address (K). The following prompt is displayed:

```
Enter Remote IP Address (N.N.N.N):
```

If you are using the Data Terminal Ready (DTR) Dial or Continuous Connection Types, the value entered here is used to establish a Telnet session. If you are using the Manual Connection Type, you do not need to enter a value here.

Enter the address, press <***ENTER***>. The "Telnet Terminal Parameters" menu is displayed again. If you have typed an address in the wrong format, you the following message is displayed and you are returned to the "Telnet Terminal Parameters" menu. You can then select this option and try again.

```
Invalid IP Address Entered
```

Step 19 **XXX PAD LOGICAL PORT** This option allows you to specify which logical port is configured for XXX PAD. Select XXX PAD Logical Port and the following prompt is displayed:

```
Enter XXX PAD Logical Port :
```

Enter the number of the logical port configured (or to be configured) for XXX PAD, according to the XXX PAD Port Definition, and depress <ENTER>.

NOTE: If you configure a logical port for Telnet Terminal, you MUST CONFIGURE another logical port for XXX PAD. See Section 4.15 , XXX PAD of the FRAD (Ether/Mono/Ring FRADs and webrouter) Ref. Guide).

Step 20 **TELNET TERMINAL COMMANDS MENU** If the Telnet Terminal Connection Type is configured as Manual, and a Telnet session is not active on a given user port, a Telnet Command Menu is displayed on the associated terminal. This menu allows users to establish Telnet sessions from their terminals. It can also be used to PING a remote Server (referred to as Host in the menu).

Once a terminal is connected to a unit port configured for Telnet Terminal, press <***ENTER***> and the Telnet Command Menu is displayed.

```
FASTCOMM COMMUNICATIONS CORP
Telnet Terminal Control Commands
Telnet Remote Host ==> t <IP address> <TCP port>
Ping Remote Host   ==> p <IP address>
Telnet Last        ==> tl
Ping Last          ==> pl
```

Enter the Telnet command (t, p, tl, pl) and remote socket (IP Address, TCP port) in the given format: t <IP Address> <TCP Port>. For example: t 192.200.2.4 23.

The connection is established if the remote socket is available. To connect with the same remote socket that you most recently used, simply type "tl" and press ***<ENTER>***. If you type an incorrect IP address, the following message is displayed.

```
Invalid IP Address
```

If the remote socket information is valid you the following prompt is displayed, indicating that a connection is being established.

```
Attempting Connection..... (timeout period is 35 seconds)
```

If the remote Telnet Host (Server) has not responded within the timeout period, the following message is displayed. Press <ENTER> to return to the Telnet Terminal Control Menu.

```
Telnet Connection Timeout
Press ENTER for Main Menu
```

If the TCP port is not entered, the default value of 23 (an often used port number for Telnet Servers) is assumed. To connect to the local unit Supervisory port, enter only the unit's IP Address.

To PING a remote Server, enter the PING command and remote IP address (p <IP Address>). A message is displayed indicating elapsed time. To PING the same remote socket that you most recently PINGed, simply type "pl" and press ***<ENTER>***. If the PING is not successful, the following message is displayed and you can try again.

```
Timeout—remote node did not respond to PING
```

SNMP Support

Telnet is supported by the onboard SNMP agent. All the parameters listed in the "Telnet Terminal Parameters" menu can be accessed by a remote SNMP management station. SNMP parameters must be set through the SNMP manager. No SNMP paraemters are accessible from the unit menu.

SAVE & RESET . . . To save the new configuration, you must WRITE and RESET. (See Sections 2.3.9 and 2.3.10 of the FRAD (Ether/Mono/Ring FRADs and webrouter) Reference Guide).

C.14 X.25

From the Main Menu, select Data Configurations (2) >> Logical Port (1) >> Protocol (1) >> X.25+ (C).

Routing . . . You must complete the X.25 Routing Table with the addresses of all units in your network(see Section 6.2, X.25 Routing in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

Statistics . . . See Section 7.17, X.25 Statistics, in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide for a description of the statistics used to monitor this protocol.

C.14.1 X.25 Level-1 Configuration

The X.25 protocol can be used for switching or for carrying QLLC, IP, or IPX traffic. When you select X.25+ (C) from the "Logical Port Protocol Selection Menu", the following menu is displayed:

```
X.25 Parameters : Port 1
-------------------------
1) X.25 Level-1 Configuration
2) X.25 Level-2 (LAPB) Configuration
3) X.25 Level-3 (PLP) Configuration

Enter Choice :
```

Enter the number of the X.25 level you want to configure. The corresponding menu is displayed on the screen. Make sure at least one X.25 port is enabled when Frame Relay is not available.

Step 1 **X.25 LEVEL-1 CONFIGURATION MENU** This option allows you to configure the physical level of X.25. Select X.25 Level-1 Configuration (1) and the following menu is displayed:

```
X.25 Level-1 Parameters : Port 1
---------------------------------
1) Speed : 9600
2) Frame Relay Global Path Name : N/A

Enter Choice :
```

Step 2 **SPEED** This option allows you to set the synchronous clock speed that units configured as DCE will use to provide clocking to the user's equipment. Select Speed (1). The Speed field is applicable only if you are configuring a physical port. If you are configured a local port, proceed to **Step 3**.

The following menu is displayed:

```
Configure Synchronous Clock Speed
---------------------------------
1) 2400
2) 4800
3) 9600
4) 19200
5) 38400
6) 48000
7) 56000
8) 64000
9) 96000
A) 128000
B) 192000
C) 256000
D) 384000
E) 512000
F) 768000
G) 1024000
H) 1536000
I) 2048000

Enter Choice :
```

NOTE: When the port is configured as DTE, as opposed to DCE, the parameters menu reflects that the speed is provided by the device connected to the unit. In this case, you do not need to configure speed. If you attempt to configure the speed, the following message is displayed and you are returned to the parameters menu:

Port is DTE, Can Not Change Speed

Step 3 Depress ***ESC*** to return to the "X.25 Parameters" menu.

C.14.2 X.25 Level-2 Configuration

Step 1 **X.25 LEVEL-2 PARAMETERS (LAPB) MENU** This option allows you to configure the link level of the X.25 protocol. Select X.25 Level-2 Parameters (LAPB) Configuration (2) and the following menu is displayed:

```
X.25 Level-2 Parameters : Port 1
---------------------------------
1) Interface Mode(DTE/DCE)                  DTE
2) Link Activator(DTE/DCE)                  DTE
3) Acknowledgement Timer (T1)(seconds)      3
4) Response Timer (T2)(tenths of a second)  2
5) Disconnect Timer (T3)(seconds)           20
6) Retry Count (N2)                         10
7) Frame Sequencing                         Modulo 8
8) Transmit Window Size                     7
9) Receive Window Size                      7

Enter Choice :
```

Step 2 **INTERFACE MODE** This option allows you to specify whether the Interface Mode of the link level is DCE or DTE. Select Interface Mode (DTE/DCE). In X.25, the Interface Mode must be opposite the mode of the network or device to which the unit is connected.

When the unit is connecting to a public network, the unit must be in DTE mode. If local unit is connected to an X.25 device, which is configured for DCE, then the local unit should be configured for DTE. If the X.25 device is configured for DTE, then the local unit should be configured for DCE.

The following option is displayed:

```
Enter IF Mode value    1->DTE or 2->DCE : (1 to 2)[1] :
```

Select the correct mode and depress <ENTER>.

Step 3 **LINK ACTIVATOR (DTE/DCE)** This option allows you to specify which node (the node configured as DCE or the node configured as DTE) will initiate or activate the link. Select Link Activator (DTE/DCE). If the Interface Mode matches the Link Activator mode, this unit will send SABMs. If the two modes do NOT match, this unit will wait for SABMs.

The following option is displayed:

```
Enter Link Activator 1->DTE or 2->DCE : (1 to 2)[1] :
```

Helpful Hint . . . This default value is set to a universally accepted value. If you change the default value, make sure the new setting is consistent with the device or network to which the unit is connected.

Select the mode (DCE (2) or DTE (1)) of the node that will initiate the link, press <***ENTER***> and the "X.25 Parameters" menu is redisplayed.

Step 4 **ACKNOWLEDGEMENT TIMER (T1)** This option allows you to set the maximum number of seconds that the Level 2 protocol must wait for acknowledgment of receipt of a transmitted frame. Select Acknowledgement Timer (T1) (seconds). If no acknowledgement is received, the unit will resend the frame a configured number of times (see Retry Count N2 in step 7 below to set the configured number of times the unit will resend). If an acknowledgement is not received after N2 retries, the link is disconnected. The following option is displayed:

```
Enter T1 Timer value(1 to 10)[3] :
```

Enter the number of seconds to wait for acknowledgement and depress <ENTER>.

Step 5 **RESPONSE TIMER (T2) (TENTHS OF A SECOND)** This option allows you to set the maximum number of tenths of a second to wait before sending an acknowledgement for a sequenced I-frames that has been received. Select Response Timer (T2). A value of zero means there will be no delay in acknowledgement generation. The following option is displayed:

```
Enter T2 Timer(0 to 100)[2] :
```

Enter the number of tenths of a second and depress <ENTER>.

Step 6 **DISCONNECT TIMER (T3)** This option allows you to set the number of seconds to wait before the link is considered disconnected. Select Disconnect Timer (T3) (seconds) and the following option is displayed:

```
Enter  T3 Disconnect Timer(30 to 180)[60] :
```

Enter the number of seconds and depress <ENTER>.

Step 7 **RETRY COUNT (N2)** This option allows you to set the number of times a frame is retransmitted when no acknowledgement is received and when the T1 timer has expired. Select Retry Count (N2). If an acknowledgement is not received after N2 retries, the link is disconnected. The following option is displayed:

```
Enter N2 Retransmit Count(1 to 30)[10] :
```

Enter the number of retries allowed and depress <***ENTER***>. The "X.25 Parameters" menu is redisplayed.

Step 8 **FRAME SEQUENCING** This option allows you to set the frame sequencing number. All frames must be assigned a number that designates the individual frame's proper sequential placement within a stream of data to ensure that they arrive at their destination in their original order and are not shuffled. The X.25 protocol allows two measures of consecutive frame numbers: Modulo 8 and Modulo 128. Modulo 8 allows frame numbers to start at 0 and end at 7. After frame number 7 is received at its destination, the number assignments of frames begins again at 0. Modulo 128 allows frame numbers to start at 0 and end at 127. After frame number 127 is received at its destination, the number assignments of frames begins again at 0. Select Frame Sequencing (7) from the "X.25 Level-2 Parameters" menu and the following prompt is displayed:

```
Enter the Sequence Number  Modulo 8 --> 1 , Modulo 128 --> 2(1 to 2)[1] :
```

Enter the sequence number and depress <***ENTER***>. The "X.25 Level-2 Parameters" menu is redisplayed.

Step 9 **TRANSMIT WINDOW SIZE** This option allows you to set the maximum number of sequenced I-frames this unit is allowed to have outstanding (outstanding frames are frames that have been sent but not acknowledged). Select Transmit Window Size. For Example: Suppose you assign a value of three (3) in the Transmit Window Size field. This unit can transmit up to three (3) frames without receiving acknowledgement for any of them. Once it has three (3) acknowledged frames outstanding, the window is considered blocked and it cannot transmit any more frame untils at least one frame is acknowledted. As each frame is acknowledged, another frame can be sent, as long as the total number of frames that have been sent, but not acknowledged (the total number of frames outstanding) does not exceed three. It is important, then, that the Transmit Window Size of a given unit port MATCH the Receive Window Size of the connected device.

If selected either Modulo 8 or Modulo 128 in the Frame Sequencing field, you can select any Window Size number from 1 to 127. The Transmit Window Size cannot be greater than or equal to the sequence number. The following option is displayed:

```
Enter Transmit Window Size(1 to 127)[7] :
```

Enter the transmit window size and depress <***ENTER***>.

Step 10 **RECEIVE WINDOW SIZE** This option allows you to set the maximum number of sequenced I-frames this unit is allowed to receive before it must send an acknowledgement. Select Receive Window Size.

For Example: Suppose the device*to which this unit is connected* has been configured with a Transmit Window Size of 7. The connected device in this example, then, can have a maximum of seven unacknowledged frames outstanding (outstanding frames are frames that have been sent but not acknowledged).

The unit for which you are configuring the Receive Window Size can withhold acknowledgement, then, for up to seven frames. If it receives seven frames and does not acknowledge any of them, the window is considered blocked and it cannot receive more frames until it acknowledges at least one of those frames. As this unit acknowledges each frame, it can receive another frame, as long as the total number of frames that have been received but not unacknowledged (the total number of frames outstanding) does not exceed seven.

It is important, then, that the Receive Window Size of a given unit port MATCH the Transmit Window Size of the connected device. If you selected either Modulo 8 or Modulo 128 in the Frame Sequencing field, you can select any number from 1 to 127.

The following option is displayed:

```
Enter Receiver Window Size(1 to 127)[7] :
```

Enter the receiver window size and depress ***ENTER***. The "X.25 Level-2 Parameters" menu is redisplayed.

Step 11 Depress ***ESC*** to return to the "X.25 Parameters" menu.

C.14.3 X.25 Level-3 Configuration

Step 1 **X.25 LEVEL-3 PARAMETERS (PLP) MENU** To configure the packet level of the X.25 protocol, select X.25 Level-3 Parameters (PLP) Configuration (3). The following menu is displayed:

```
X.25 Level-3 Parameters : Port 1
-----------------------------------
1) Interface Mode(DTE/DCE)                  DTE
2) Transmit Packet Size                     128
3) Receive Packet Size                      128
4) Packet Sequencing                        Modulo 8
5) Transmit Window Size                     2
6) Receive Window Size                      2
7) Packet Restart Timer (T20)(seconds)      60
8) Packet Call Request Timer (T21)(seconds ) 60
9) Packet Reset Request Timer (T22)(seconds) 60
A) Packet Clear Request Timer (T23)(seconds) 60
B) Incoming Call Facility Options           PASS THROUGH FACILITIES
C) Outgoing Call Facility Options           PASS THROUGH FACILITIES
D) High SVC Channel Number                  10
E) Low SVC Channel Number                   1
F) High PVC Channel Number                  0
G) Maximum Number of Active SVCs Permitted  10

Enter Choice :
```

Default values are set to universally accepted values. If you change a default value, make sure the new setting is consistent with the device or network to which the unit is connected.

Step 2 **INTERFACE MODE** This option allows you to set the packet level Interface Mode as DCE or DTE. Select Interface Mode (DTE/DCE). In X.25, the Interface Mode must be opposite the mode of the network or device to which the unit is connected.

For example, if local unit is connected to an X.25 device, which is configured for DCE, then the local unit should be configured for DTE. If the X.25 device is configured for DTE, then the local unit should be configured for DCE. The DTE/DCE selection governs the selection of LCNs as calls are placed. DTE starts at the highest LCN and uses LCNs in descending order. DCE starts at the lowest LCN and uses LCNs in ascending order. LCN 0 is reserved for RESTART packets that use LCN 0. LCNs are allocated in this manner to prevent call collision. The following option is displayed:

```
Enter IF Mode value   1->DTE or 2->DCE : (1 to 2)[1] :
```

Select the mode you want and depress <***ENTER***>. The "X.25 Level-3 Paremeters" menu is redisplayed.

Step 3 **TRANSMIT PACKET SIZE** This option allows you to set the maximum length (in octets) of packets that can be sent on the line. Select Transmit Packet Size and the following option is displayed:

```
Enter Transmitting Packet Size(128 to 4096)[128] :
```

Enter the size of the transmitting packet and depress <***ENTER***>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 4 **RECEIVE PACKET SIZE** This option allows you to set the maximum length (in octets) of packets that can be received on the line. Select Receive Packet Size and the following option is displayed:

```
Enter Receiving Packet Size(128 to 4096)[128] :
```

Enter the size of the receiving packet and depress <***ENTER***>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 5 **PACKET SEQUENCING** All packets must be assigned a number that designates the individual packets's proper sequential placement within a stream of data to ensure that they arrive at their destination in their original order and are not shuffled. The X.25 protocol allows two measures of consecutive packets numbers: Modulo 8 and Modulo 128. Modulo 8 allows packets numbers to start at 0 and end at 7. After packets number 7 is received at its destination, the number assignments of packets begins again at 0. Modulo 128 allows packets numbers to start at 0 and end at 127. After packets number 127 is received at its destination, the number assignments of packets begins again at 0.

This option allows you to set the packet sequencing number. Select Packet Sequencing and the following options are displayed:

```
Enter the Sequence Number  Modulo 8 --> 1 , Modulo 128 --> 2(1 to 2)[1] :
```

Enter the sequence number and depress <***ENTER***> and the "X.25 Level-3 Parameters" menu is redisplayed.

NOTE: Default values are set to universally accepted values. If you change a default value, make sure the new setting is consistent with the device or network to which the unit is connected.

Step 6 **TRANSMIT WINDOW SIZE** This option allows you to set the maximum number of sequenced packets this unit is allowed to have outstanding (outstanding packets are packets that have been sent but not acknowledged). Select Transmit Window Size.

For Example: Suppose you assign a value of 2 in the Transmit Window Size field. This unit can transmit up to two packets without receiving acknowledgement for any of them. Once it has two unacknowledged packets outstanding, the window is considered blocked and it cannot transmit any more packets until at least one packet is acknowledged. As each packets is acknowledged, another packets can be sent, as long as the total number of packets that have been sent but not unacknowledged (the total number of packets outstanding) does not exceed three.

It is important, then, that the Transmit Window Size of a given unit port MATCH the Receive Window Size of the connected device. If you selected either Modulo 8 or Modulo 128 in the Packet Sequencing field, you can select anu Window Size number between 1 and 127. However, the Transmit Window Size at the link level normally matches the sequence number.

The Transmit Window Size cannot be greater than the maximum sequence number.

The following option is displayed:

```
Enter Transmitting Window Size(1 to 127)[2] :
```

Enter the transmitting window size and depress ENTER. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 7 **RECEIVE WINDOW SIZE** This option allows you to set the maximum number of sequenced packets this unit is allowed to receive before it must send an acknowledgement.

For Example: Suppose the device*to which this unit is connected* has been configured with a Transmit Window Size of 7. The connected device in this example, then, can have a maximum of seven unacknowledged packets outstanding (outstanding packets are packets that have been sent but not acknowledged). The unit for which you are configuring the Receive Window Size can withhold acknowledgement, then, for up to seven packets. If it receives seven packets and does not acknowledge any of them, the window is considered blocked and it cannot receive more packets until it acknowledges at least one of those packets. As this unit acknowledges each packet, it can receive another packet, as long as the total number of packets that have been received but not unacknowledged (the total number of packets outstanding) does not exceed seven. It is important, then, that the Receive Window Size of a given unit MATCH the Transmit Window Size of the connected device. If you selected either Modulo 8 or Modulo 128 in the Packet Sequencing field you can select any number from 1 to 127. However, the Transmit Window Size at the link level normally matches the Modulo.

The following prompt is displayed:

```
Enter Receiving Window Size(1 to 127)[2] :
```

Enter the receiving window size and depress <***ENTER***>. The "X.25 Level-3 Paramenters" menu will be redisplayed.

Step 8 **PACKET RESTART TIMER (T20)** This option allows you to set the number of seconds that the Level 3 protocol must wait for a restart confirmation after issuing a Restart Packet. Select Packet Restart Timer (T20) (seconds). When this timer expires, another Restart is issued and the following prompt is displayed:

```
Enter Restart timer value(10 to 600)[60] :
```

Enter the number in seconds and depress <***ENTER***>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 9 **PACKET CALL REQUEST TIMER (T21)** This option allows you to set the number of seconds allowed between issuing Packet Call Requests and receiving either a Call Confirmation or a Call Clear for SVC links. Select Packet Call Request Timer (T21) (seconds). If this timer expires, a Clear is generated and the LCN is freed. The following prompt is displayed:

```
Enter Call Request Timer(10 to 600)[60] :
```

Enter the number in seconds and depress <***ENTER***>. The X.25 Level-3 Parameters" menu is redisplayed.

Step 10 **PACKET RESET REQUEST TIMER (T22)** This option allows you to set the number of seconds allowed between issuing a Packet Reset Request and receiving either a Reset Confirmation or a Clear. Select Packet Reset Request Timer (T22) (seconds). If this timer expires, the Reset Packet is retried the number of times configured in the R22 parameter, which is currently set at three retries. R22 is a system default that cannot be configured by the user. The value currently set for R22 is 3. The following prompt is displayed:

```
Enter Reset Request Timer(10 to 600)[60] :
```

Enter the number in seconds and depress <ENTER>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 11 **PACKET CLEAR REQUEST TIMER (T23)** This option allows you to set the number of seconds allowed between issuing a Packet Clear Request and receiving a Clear Confirmation. Select Packet Clear Request Timer (T23) (seconds). If a Clear Confirmation is not received before this timer expires, a Clear Request is generated. If a Clear Confirmation is still not received, a Clear Request is generated again. The Clear Request message can be generated up to the number of times specified in the R23 value, which is currently set at three requests. R23 is a system default that cannot be configured by the user. The value currently set for R23 is 3. The following prompt is displayed:

```
Enter Clear Request Timer(10 to 600)[60] :
```

Enter the number in seconds and depress ***<ENTER>***. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 12 **INCOMING CALL FACILITY OPTIONS** This option allows you to control the manner in which this port responds when presented with any incoming Call Packet containing facilities that are not actively supported by the system. Select Incoming Call Facility Options. The following menu is displayed:

```
Options for Incoming Call Received with Facilities:
1. PASS THROUGH FACILITIES
2. REMOVE FACILITIES
3. CLEAR CALL
Enter Choice:(1 to 3)[1] :
```

12a **PASSTHROUGH FACILITIES** If you select Passthrough Facilities, facilities (such as Reverse Charging, NUI Passwords, etc) that are not supported by the receiving unit are passed through the system unchanged.

When a packet is received by the unit, the unit checks the negotiation facilities (Window Size Negotiation and Packet Size Negotiation) in the incoming packet. If the parameters being negotiated in the incoming packet match the parameters configured for the packet level in the unit, the unit strips the negotiation facilities from the packet and passes the remaining facilities to their destination.

If the parameters being negotiated in the incoming packet DO NOT MATCH the parameters configured for the packet level in the unit, the unit clears the call with a specific Cause and Diagnostic code (Cause 03; Diagnostic 142 for Window Size Mismatch and Cause 03; Diagnostic 141 for Packet Size Mismatch).

12b **REMOVE FACILITIES** If you select Remove Facilities, all facilities are stripped from incoming packets, and then the incoming packet is passed through to its destination.

12c **CLEAR CALL** If you select Clear Call, all incoming calls that have facilities are cleared by the system with the Invalid Facility Clear Cause and Diagnostic Code combination (Cause 83hex; Diag 90hex).

Enter the number of the option you want to use and depress ***<ENTER>***. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 13 **OUTGOING CALL FACILITY OPTIONS** This option allows you to control the manner in which this port responds when presented with any output Call Packet containing facilities that are not actively supported by the system. Select Outgoing Call Facility Options and the following options are displayed:

```
Options for Outgoing Call Facilities:
1. PASS THROUGH FACILITIES
2. REMOVE FACILITIES
3. CLEAR CALL
Enter Choice:(1 to 3)[1] :
```

13a **PASSTHROUGH FACILITIES** If you select Passthrough Facilities, facilities (such as Reverse Charging, Passwords, etc) that are not supported by the transmitting unit are passed through the system unchanged.

13b **REMOVE FACILITIES** If you select Remove Facilities, all facilities are stripped from outgoing packets, and then the outgoing packet is passed through to its destination.

13c **CLEAR CALL** If you select Clear Call, all outgoing calls that have facilities are cleared by the system with the Invalid Facility Clear Cause and Diagnostic Code combination (Cause 03; Diagnostic 65).

Enter the number of the option you want and depress <ENTER>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 14 **HIGH SVC CHANNEL NUMBER** This option allows you to set the highest SVC channel number allowed in the SVC range. Select High SVC Channel Number.

Before you start !! When assigning the highest SVC number, be certain to select a number that is higher than all the SVC numbers you plan to assign, and that is also higher than all of the PVC numbers you want to configure.

For Example: If you plan to configure a range of 5 SVCs and you also want to congire PVCs on logical channel numbers (LCNs) 15-25, the High SVC Channel Number must be set at 30 or higher because it must be, obviously, higher than the lowest SVC number, and the lowest SVC number must be higher than any PVC.

The following option is displayed:

Enter High SVC Number(1 to 4095)[10] :

Enter the highest SVC number allowed in the SVC range and depress <***ENTER***>. The "X.25 Level-3 Parmeters" menu is redisplayed.

NOTE: If you change a default value, make sure the new setting is consistent with the device or network to which the unit is connected. The DTE/DCE mode governs the selection of Logical Channel Numbers as calls are placed. Calls placed from a device or network configured as DTE use the highest LCN available, with each successive call using LCNs in descending order. Calls placed from a device network configured as DCE use the lowest LCN first, with each successive call using LCNs in ascending order. LCN 0 is reserved for RESTART packets taht use LCN 0. LCNs are allocated in this manner to prevent call collision.

Step 15 **LOW SVC CHANNEL NUMBER** This option allows you to set the lowest SVC number allowed in the SVC range. Select Low SVC Channel Number.

When you set the high end of the SVC range, the system automatically adjusted the range of channel numbers offered in the Low SVC Channel Number option so that the lowest SVC number cannot be higher than the High SVC Channel Number.

Before you start !! Notice that the highest SVC and the lowest SVC can be the same number. If you configure the lowest and highest SVC fields with the same number, only one SVC is permitted.

The following prompt is displayed:

```
Enter Low SVC Number(1 to 10)[1] :
```

Enter the lowest SVC number allowed in the range and depress <***ENTER***>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 16 **HIGH PVC CHANNEL NUMBER** This option allows you to set the maximum number of PVCs that can be configured for this port. Select High PVC Channel Number and the following prompt is displayed:

```
Enter High PVC Number (0 to 0) [0] :
```

Enter the highest number of PVCs to be configured on this port, and depress <***ENTER***>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 17 **MAXIMUM NUMBER OF ACTIVE SVCS PERMITTED** This option allows you to set the highest number of SVC channels that can be active at any one time. Select Maximum Number of Active SVCs Permitted and the following prompt is displayed:

```
Enter High SVC Number(0 to 100)[10] :
```

Enter the number of SVCs allowed and depress <ENTER>. The "X.25 Level-3 Parameters" menu is redisplayed.

Step 18 Press ESC four times to return to the Main Menu.

C.15 XXX PAD

From the Main Menu, select Data Configurations (2) >> Logical Port (1) >> Protocol (1) >> XXX PAD (D).

Routing . . . To configure destination addresses that can be reached from the PAD terminal, you must enter the appropriate information in the X.25 Switching Table. (See Section 6.2, X.25 Routing in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

Routing . . . To properly configure routing for XXX PAD, you must assign mnemonic names for the X.121 addresses in your network. (See Section 3.4, Defining Global Paths in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

Statistics . . . See Section 7.18, XXX PAD Statistics, of the Section 3.4, Defining Global Paths of the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide for a description of the statistics used to monitor this protocol.

Before you start !! If you configure a logical port for XXX PAD, you MUST FIRST CONFIGURE a virtual port for Telnet Terminal (See Section 4.13, Telnet Terminal in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

Overview

The universal terminal protocol referred to as XXX is comprised of three individual protocols: X.3, X.28, and X.29, which work together to provide a facility, known as a Packet Assembler/Disassembler. The Packet Assembler/Disassembler, or PAD, serves as a translator between X.25 devices/networks and non-X.25 devices. The PAD, then, enables asynchronous terminals and devices not supporting X.25 to communicate with X.25 devices and networks.

Each protocol forming the PAD facility supports one dimension of the service:

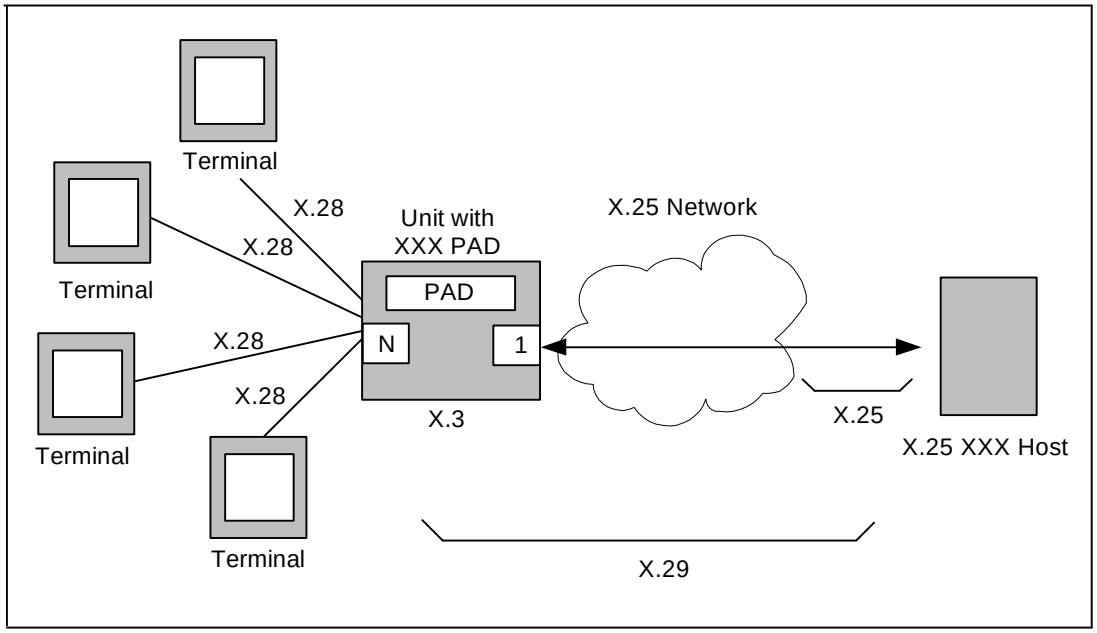
The X.3 protocol defines the functions of the PAD and the parameters used to control it. In general, the parameters configured in X.3 determine how the PAD behaves.

The X.28 protocol defines the interaction between the asynchronous terminal and the PAD to which it is connected.

The X.29 protocol defines the interaction between the PAD and remote PAD or X.25 Host with which the asynchronous terminal is attempting to communicate. This protocol also governs the interaction between one PAD and another PAD.

C.15.1 The XXX PAD Process

To send a message from an asynchronous terminal through a PAD to an X.25 host, consider the following drawing:



Using the X.28 protocol, the asynchronous terminal communicates with the PAD by sending it one character at a time. The terminal and the PAD can use character strings to exchange simple commands, such as those needed to set parameters or establish virtual circuits. The individual characters sent by the terminal are *assembled* and stored in a buffer within the PAD.

The X.3 protocol specifies parameters that define how the data is processed. X.3 configuration parameters might include such specifications as timeout values, echo parameters, and flow control settings.

As these data packets travel through the network, the PAD exchanges messages with the host, according to the specifications of the X.29 protocol. These messages might include, among other things, error information, a request to set up or clear a call, or a request for the remote host to set a particular parameter.

When the PAD receives a packet destined for the asynchronous terminal from an X.25 device, the PAD disassembles the user data fields of the X.25 packet into individual characters and sends one character at a time to the terminal. In this manner, the asynchronous terminal is able to use the resources of the X.25 device. Without the facility of the PAD, this communication would not be possible.

C.15.1.1 Configuring Basic Parameters

When you select XXX PAD from the Logical Port Protocol Selection Menu, the following menu is displayed:

```
XXXPAD Configuration : Port 1
--------------------------------
1) Speed                    9600
2) Data Bits                8
3) Stop Bits                1
4) Flow Control             ON
5) Flow Control Type        XON/XOFF
6) PAD Sub-address
7) Allow Mnemonics          YES
8) Idle VC Timer            180
9) PAD Profile              User-Configured
A) Telnet Term Logical Port N/A
B) User Profile Config

Enter Choice :
```

If you are configuring XXX PAD on a Logical Port, proceed to Step 6.

Step 1 **SPEED** If you are configuring XXX PAD on a physical port (Port 1, 2, 3, or 4), you must set the asynchronous clock speed. Units configured as DCE use this speed when providing clocking to the user's equipment. To configure the port for DCE or DTE, select the Physical Configurations (1) option from the Main Menu.

Select Speed and the following menu is displayed:

```
Configure XXXPAD Asynchronous Clock Speed : Port 1
-------------------------------------------------
1) 1200
2) 2400
3) 4800
4) 9600
5) 19200
6) 38400
7) 48000
8) 57600
9) 115200

Enter Choice :
```

Step 2 **DATA BITS** This option allows you to specify the number of data bits to be transmitted in each character. Select Data Bits. This field is configured only for Ports 1, 2, 3, or 4. If you are configuring a Logical Port, proceed to Step 6. The following prompt is displayed:

```
Enter Databits [7,8][8] :
```

NOTE: Depending on the code used, seven to eight data bits are transmitted after the start bit of each character. ASCII uses a 7-bit character, and EBCDIC uses an 8-bit character.

Enter the number of data bits and depress <ENTER>. The "XXX PAD Configuration" menu is redisplayed.

Step 3 **STOP BITS** This option allows you to specify the minimum length of a stop bit. A stop bit must be transmitted at the end of each character and is identified by its length. Select Stop Bits. This field is configured only for Ports 1, 2, 3, or 4. If you are configuring a Logical Port, proceed to Step 6. The following prompt is displayed:

```
Enter Stopbits [1,2][1] :
```

Type 1 if the duration of the stop bit should be the same as that of a regular bit; type 2 if the duration of the stop bit should be twice the duration of a regular bit. Depress <***ENTER***> and the "XXX PAD Configuration" menu is redisplayed.

Step 4 **FLOW CONTROL** This allows you to configure aysnchronous flow control to support TX Only, RX Only or to turn it "on" or "off". Select Flow Control (4) and the unit will display the following menu:

```
Configure Asynchronous Flow Control ON / OFF
-------------------------------------------
1) Off
2) TX Only
3) RX Only
4) ON

Enter Choice :
```

Step 5 **FLOW CONTROL TYPE** The Flow Control option allows you to configure the asynchronous flow control type to support RTS/CTS or XON/XOFF. Depress 5 (Flow Control Type) and the unit will display the menu on the following page.

```
Configure Asynchronous Flow Control Type
----------------------------------------
1) RTS/CTS
2) XON/XOFF

Enter Choice :
```

Step 6 **PAD SUB-ADDRESS** This option allows you to assign a unique sub-address to each async terminal attached to the unit containing the XXX PAD. The sub-address must be the user-defined number of digits in length. All sub-addresses must have the same number of digits. If the first sub-address assigned consists of 2 digits, then All sub-addresses you assign must consist of exactly 2 digits.

When a call is received, the system will look at the last N (number of) digits in the address (N represents the number of digits you use in assigning sub-addresses), and will check the sub-address for a match within the system. To enter this sub-address, select PAD Sub-Address. and the following prompt is displayed:

```
Enter Local Sub-address("n" digits):
```

Enter the sub-address assigned to the first DTE.

Step 7 **ALLOW MNEMONICS?** This option allows you to enable the terminal to use an alias in place of an address, such as using the mnemonic name "Chicago" to refer to the address of the node located in Chicago. Select Allow Mnemonics.

The following option is displayed:

```
Allow Mnemonics :(0 to 1)[1] :
```

Enter the number corresponding with whether or not you want the ability to use mnemonics, depress <***ENTER***> and the "XXX PAD Configuration" menu will be redisplayed.

Step 8 **IDLE VC TIMER** This option allows you to specify the number of seconds the X.25 SVC may remain up without any traffic being transmitted, before the call is dropped. Select Idle VC Timer. The following prompt is displayed:

```
Enter Idle VC Timer (in seconds) (0 to 600)[180] :
```

Enter the number of seconds, depress <***ENTER***> and the "XXX PAD Configuration" menu is redisplayed.

Step 9 **PAD PROFILE** This option allows you to specify whether the X.28 PAD parameters to be configured in the User Profile Configuration Menu should conform to the standard CCITT Simple profile, used for user-to-PAD interfaces; the standard CCITT Transparent profile, used for device-to-PAD interfaces; or a uniquely defined User-configured profile. Select PAD Profile and select one of the following options:

```
Enter Profile [1->Simple, 2->Transparent, 3->User-configured] :
Enter Profile :(1 to 3)[3]
```

For Example: If a user who is operating a terminal connected to a local PAD requires access to a mainframe database connected to a remote PAD, you could:

ž configure the interface between the local terminal and PAD with Simple profile, which is commonly used for user-to-PAD interfaces, and

ž configure the interface between the remote mainframe computer and the remote PAD with a Transparent profile, which is commonly used for device-to-PAD interfaces.

Enter the profile you want to use, depress <ENTER> and the "XXX PAD Configuration" menu is redisplayed.

Step 10 If you are configuring a physical port (Port 1, 2, 3, or 4), proceed to Step 12 (User Profile Configuration).

Step 11 **TELNET TERMINAL VIRTUAL PORT** If you are configuring a Logical Port for XXX PAD, you must specify which other Logical Port will be used for the Telnet Terminal. If you configure a virtual port for XXX PAD, you must configure another virtual port for Telnet Terminal (See Section 4.13, Telnet Terminal in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

To specify the number of the virtual port to be used for the telnet terminal, select Telnet Term Logical Port. The following prompt is displayed:

```
Enter Telnet Terminal Logical Port :
```

Enter the number of the virtual port configured (or to be configured) for Telnet Terminal, according to the Telnet Terminal Port Definition, and press <ENTER>.

Step 12 **USER PROFILE CONFIG** This option allows you to configure the X.3 parameters pertinent to the PAD. Select User Profile Configuration and proceed to Section C.15.2

C.15.2 Configuring the X.3 PAD User Profile

Before you start !! Configure the parameters on the PAD Profile Configuration Menu ONLY if you selected User-Configured Profile in Step 9, (PAD Profile) on page C-96

If you selected *Simple* or *Transparent* profile, the options in this section are not applicable. If you need to change any parameter or set of parameters for a given call, you can use the X.28 Commands that appear on the Help Menu. (See Section 4.15.3 Using X.28 Commands to View/Change X.3 Parameters in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Ref. Guide).

After you select XXX PAD from the Logical Port Protocl Selection menu, choose "User Profile Configuration" (B) from the XXX PAD menu and the PAD Profile Configuration Menu is displayed with the following defaults:

```
PAD Profile Configuration : Port 1
------------------------------------------------------------
1) Recall Character          CTRL-P
2) Echo                      YES
3) Data Forwarding Char      All Unprintable Chars
4) DTE Idle Timer            10
5) Ancillary Device Ctrl     Use of X-ON/X-OFF (Data Transfer)
6) PSS Ctrl                  All Service Signals
7) Action on Break Signal    Reset of VC
8) Discard Output            Normal Data Delivery to DTE
9) Padding After CR          0
A) Line Folding              0
B) Flow Ctrl By DTE          Use of X-ON/X-OFF
C) LF Insertion After CR     4
D) Padding After LF          0
E) Editing                   No Editing in Data Transfer State
F) Character Delete          8
G) Line Delete               24
H) Line Display              18
I) Editing PSS               Editing PSS for Display Terminals
J) Echo Mask                 No Echo of Char-Del,Line-Del,Line-Display Chars
K) Parity                    No Parity Checking or Generation
L) Page Wait                 0

Enter Choice :
```

Step 1 **RECALL CHARACTER** This option allows you to enable the terminal to escape from the data transfer state, and to specify how the terminal is to notify the PAD before sending the PAD a command. Select Recall Character and select one of the following options:

```
1. No Recall Char                    [0]
2. CTRL-P                            [1]
```

```
3. Any Graphic Char[32-126]
Enter Recall Character :
```

For Example: When the terminal requires a call setup, it must send the PAD a signal. When the PAD receives the signal, which you configure in this step, the PAD stops transferring data and awaits the incoming command from the terminal.

1a **NO RECALL CHAR** This option allows you to disallow the terminal from sending a command to the PAD. Select No Recall Char (1) and the unit will redisplay the PAD Profile Configuration menu as seen on the previous page.

1b **CTRL-P** This option allows you to assign the CTRL and P key combination as the terminal's signal to the PAD to enter the PAD command mode.

1c **ANY GRAPHIC CHAR** This option allows you to assign a graphic character as the terminal's signal to the PAD to enter the PAD command mode. Select Any Graphic Char (3) and the unit will prompt:

```
Enter value between [32 - 126]:
```

Step 2 **ECHO** This option allows you to enable characters sent by the terminal to be interpreted by the PAD and transmitted back to the terminal. Select Echo and select one of the following options:

```
1. NO
2. YES
Echo Enable? :
```

For Example: Echo is used for interactive applications, such as accessing unit menus or accessing remote applications that require echo characters. If the Echo Mask function is implemented, the selection of characters that can be echoed is dependent on the selection you make in the Echo Mask field (see Step 19, Echo Mask on page C.106).

2a **ECHO? NO** This option allows you to prevent characters from being transmitted back (echoed) to the initiating terminal. If you want to do this, select "NO" and depress <ENTER>.

2b **ECHO? YES** This option allows you to enable characters to be transmitted back (echoed) to the initiating terminal. If you want to do this, select "YES" and depress <ENTER>.

Step 3 **DATA FORWARDING CHAR** This option allows you to specify a character or set of characters to signal the PAD to complete the assembly process and forward a complete X.25 packet sequence on to the destination X.25 device. Select Data Forwarding Char and select one of the options from the following menu:

```
1. No Data Fwd Char          [0]
2. All Alphanumeric Chars    [1]
3. CR                        [2]
4. All Unprintable Chars     [126]
5. All Chars                 [127]
Enter Choice :
```

3a **NO DATA FWD CHAR** This option allows you to prevent the terminal from having the ability to request the PAD to stop assembling characters and to transmit a packet. If you want to do this, select No Data Fwd Char.

3b **ALL ALPHANUMERIC CHARS** This option allows you to enable the terminal to send an upper or lower case alpha character (A-Z, a-z) or a numeric character (0-9) to request the PAD to stop assembling characters and to transmit a packet. If you want to do this, select All Alphanumeric Chars and depress <ENTER>.

3c **CR** This option allows you to enable the terminal to send a carriage return character to request the PAD to stop assembling characters and to transmit a packet. If you want to do this, select CR and depress <ENTER>.

3d **ALL UNPRINTABLE CHARS** This option allows you to enable the terminal to send any one of the following control characters:

Delete (DEL)	Horizontal Tab (TAB)	End of Transmission (CTRL-D)
Cancel (CTRL-X)	Vertical Tab (CTRL-K)	Device Control 2 (CTRL-R)
Linefeed (CTRL-J)	Acknowledge (CTRL-F)	End of Text (CTRL-C)
Bell (CTRL-G)	Enquiry (CTRL-E)	Form Feed (CTRL-L)
Escape (ESC)		

(which have ASCII values from 1-31) to request the PAD to stop assembling characters and to transmit a packet. If you want to do this, select All Unprintable Chars and depress <ENTER>.

3e **ALL CHARS** This option allows you to enable the terminal to send any of the characters listed in options 3b, 3c, and 3d above to request the PAD to stop assembling characters and to transmit a packet. If you want to do this, select All Chars and depress <ENTER>.

Step 4 **DTE IDLE TIMER** This option allows you to specify the length of time, in 20ths of a second, that is allowed between assembling characters from the terminal and transmitting the assembled characters to the destination device. Select DTE Idle Timer. The length of time specified in the DTE Idle Time field may be affected by flow control constraints, which are discussed in the following step.

NOTE: If you deactivate the Editing function in Step 14, on page C105 by selecting option1 " No Editing in Data Transfer State" , the DTE Idle Timer function will also be disabled, even if you have entered a value in this field. This option is operational only if the Editing function is enabled.

The following option is displayed:

Enter Idle Timer Value (0 to 255)[10] :

NOTE: A value of Zero (0) indicates that no data is forwarded when the timer expires.

Enter the length of time, in 20ths of a second, and depress <ENTER>.

Step 5 **ANCILLARY DEVICE CTRL** This option allows you to activate or prevent flow control initiated by the PAD and, if it is activated, to specify what type of transmissions the flow control mechanism will affect. Select "Ancillary Device Ctrl" and select one of the options from the following:

1) No Use of X-ON/X-OFF [0]
2) Use of X-ON/X-OFF (Data Transfer) [1]
3) Use of X-ON/X-OFF (Data Transfer & Command) [2]

Enter Ancillary Device Control :

5a **NO USE OF X-ON/X-OFF** This option allows you to prevent flow control from being activated. If you want to do this, select No Use of X-ON/X-OFF and depress <ENTER>.

5b **USE OF X-ON/X-OFF (DATA TRANSFER)** This option allows you to enable the PAD to activate flow control only for data transfers. If you want to do this, select Use of X-ON/X-OFF (Data Transfer) and depress <ENTER>.

5c **USE OF X-ON/X-OFF (DATA TRANSFER & COMMAND)** This option allows you to enable the PAD to activate flow control for data transfers as well as commands. If you want to do this, select Use of X-ON/X-OFF (Data Transfer & Command) and depress <ENTER>.

Step 6 **PSS CTRL** This option allows you to enable the terminal to allow or disallow the PAD to transmit service signals and to specify the format of service signals if they are allowed. Select PSS Ctrl and select one of the following options:

```
1) No Service Signals                          [0]
2) Service Signals other than PAD Prompt       [1]
3) All Service Signals                         [5]

Enter PAD Service Signals Control :
```

6a **NO SERVICE SIGNALS** This option allows you to disallow the PAD from sending service signals to the terminal. If you want to do this, select No Service Signals and depress <ENTER>.

6b **SERVICE SIGNALS OTHER THAN PAD PROMPT** This options allows the PAD to transmit all service signals EXCEPT the Prompt PAD Service Signal. If you want to do this, select Service Signals other than PAD Prompt [*]and depress <ENTER>.

6c **PAD PROMPT SERVICE SIGNAL** This option allows you to allow the PAD to transmit only PAD prompt service signals. If you want to do this, select PAD Prompt Service Signal [*] and depress <ENTER>.

6d **SERVICE SIGNALS 2 & 3 ABOVE** To allow any service signals to be transmitted. If you want to do this, select Service Signals (2) & (3) above and depress <ENTER>.

Step 7 **ACTION ON BREAK SIGNAL** This option allows you to specify what the PAD does when it receives a BREAK signal from the terminal. Select Action on Break Signal and select one of the following options:

```
1) No Action to be taken                [0]
2) Reset of VC                          [2]
3) Escape From Data Transfer State      [8]

Enter Break Signal Action :
```

7a **NO ACTION TO BE TAKEN** This option allows you to prevent the PAD from performing any action. If you want to do this, select No Action to be taken and depress <ENTER>.

7b **RESET OF VC** This option allows you to allow the PAD to initiate an X.25 RESET on the virtual circuit. If you want to do this, select Reset of VC and depress <***ENTER***>.

7c **ESCAPE FROM DATA TRANSFER STATE** This option allows you to allow the PAD to stop transferring data and enter a PAD command mode. If you want to do this, select Escape From Data Transfer State and depress <ENTER>.

Step 8 **DISCARD OUTPUT** This option allows you to specify whether the PAD must always disassemble the user data fields from incoming packets and transmit them to the terminal, or can discard the content of the user data fields. Select Discard Output and select one of the following options:

```
1) Normal Data Delivery to DTE     [0]
2) Discard Output to DTE           [1]

Discard Output ? :
```

!! **CAUTION!** If you enable the PAD to discard data, you might lose data that you did not intend to lose.

8a **NORMAL DATA DELIVERY TO DTE** This option allows you to force the PAD to always disassemble the user data fields from X.25 packets and transmit them to the terminal. If you want to do this, select Normal Data Delivery to DTE and depress <ENTER>.

8b **DISCARD OUTPUT TO DTE** This option allows you to allow the PAD to discard the content of incoming packets' user data fields. If you want to do this, select Discard Output to DTE and depress <ENTER>.

Step 9 **PADDING AFTER CR** This option allows you to configure the PAD to insert the appropriate number of padding (null) characters to ensure compatibility to enable the terminal's printing mechanism to correctly handle a carriage return being sent by the PAD. To specify the number of padding characters the PAD is to insert, select Padding After CR. The following option is displayed:

```
Enter Padding-After-CR Value(0 to 255)[0] :
```

NOTE: A value of zero (0) prevents the PAD from inserting any padding characters.

Enter the number of padding characters and depress <ENTER>.

Step 10 **LINE FOLDING** This option allows you to specify the value of a graphic character that the PAD is to insert at the end of each line in the transmission. Select Line Folding. The following prompt is displayed:

```
Enter Line Folding Value (0 to 255)[0] :
```

NOTE: A value of zero (0) allows the PAD to insert a carriage return and a linefeed character instead of a graphic character.

Enter the ASCII value of the graphic character and depress <ENTER>.

Step 11 **FLOW CTRL BY DTE** This option allows you to activate or prevent the processing of flow control initiated by the terminal. Select Flow Ctrl By DTE and the following menu is displayed:

```
1) No Use of X-ON/X-OFF        [0]
2) Use of X-ON/X-OFF           [1]

Flow Control By DTE ? :
```

11a **NO USE OF X-ON/X-OFF** To prevent flow control characters from the terminal from being processed by the PAD, select No Use of X-ON/X-OFF and depress <ENTER>.

11b **USE OF X-ON/X-OFF** To enable flow control characters from the terminal to be processed by the PAD, select Use of X-ON/X-OFF and depress <ENTER>.

Step 12 **LF INSERTION AFTER CR** Whenever the PAD receives a carriage return, you can enable the PAD to insert linefeed characters into transmissions going to or coming from the terminal while in the data transfer mode. This option allows you to specify the condition under which the PAD inserts linefeed characters. Select LF Insertion After CR and the following prompt is displayed:

```
Enter Linefeed-After-CR Value (0 to 7)[4] :
```

NOTE: A value of zero (0) prevents the PAD from inserting line feed characters.

12a **VALUE 1** A value of 1 enables the PAD to insert a Line Feed character after a carriage return into the PAD's transmission to the terminal whenever the PAD receives a carriage return from the remote X.25 device.

12b **VALUE 2** A value of 2 enables the PAD to insert a Line Feed character after a carriage return into the PAD's transmission to the remote X.25 device whenever the PAD receives a carriage return from the terminal.

12c **VALUE 4** A value of 4 enables the PAD to insert a Line Feed character after a carriage return into the PAD's echo back to the terminal whenever the PAD receives a carriage return from the terminal which is in echo mode.

12d **VALUE 5** A value of 5 enables the PAD to insert a Line Feed character after a carriage return whenever the conditions for value 1 or value 4 are met.

12e **VALUE 6** A value of 6 enables the PAD to insert a Line Feed character after a carriage return whenever the conditions for value 2 or value 4 are met.

12f **VALUE 7** A value of 7 enables the PAD to insert a Line Feed character after a carriage return whenever the conditions for values 1, 2, or 4 are met.

Enter the value and depress <ENTER>.

Step 13 **PADDING AFTER LF** Whenever the PAD receives a linefeed character, you can ensure that the terminal's printing mechanism can perform the linefeed function correctly, by enabling the PAD to insert padding characters into transmissions going to the terminal while in the data transfer mode. This option allows you to specify the number of padding characters the PAD is to insert. Select Padding After LF and the following prompt is displayed:

```
Enter Linefeed Padding Value (0 to 255)[0] :
```

Enter the number of padding characters the PAD is to insert after each linefeed character and depress <ENTER>.

Step 14 **EDITING** This option allows you to enable the terminal to perform editing functions while in the data transfer state. Select Editing and the following prompts are displayed:

```
1) No Editing in Data Transfer State      [0]
2) Use of Editing in Data Transfer State  [1]

Editing :
```

NOTE: The terminal always has editing capability while in the PAD command state.

14a **NO EDITING IN DATA TRANSFER STATE** To prevent the terminal from having editing capability while in the data transfer mode, select No Editing in Data Transfer State and press <***ENTER***>. If option 1 "No Editing in Data Transfer State" is enabled, the DTE idle Timer function (see Step 4, Stop Bits on page C-165) will be disabled.

14b **USE OF EDITING IN DATA TRANSFER STATE** To enable the terminal to have editing capability while in the data transfer mode, select Use of Editing in Data Transfer State and depress <ENTER>.

Step 15 **CHARACTER DELETE** This option allows you to define the character to be used for deleting characters, using the binary representation of the decimal value according to Recommendation T.50. Select Character Delete and the following prompt is displayed:

```
Enter Character Delete Value (0 to 127)[8] :
```

NOTE: A value of zero (0) indicates that no character is defined for deleting characters. When the PAD receives a Character Delete command, it deletes the last character in the editing buffer. If you enabled editing capability on the terminal in Step 14, Editing on the previous page, you can use the character defined in this field to delete characters in the data transfer mode and in the PAD command mode.

If you did not enable editing capability on the terminal, you can use the character defined in this field to delete characters only in the PAD command mode. You can specify the format in which the PAD responds to an editing command in Step 18, Editing PSS on page C-108.

Enter the value of the character you want to use to delete characters and depress <ENTER>.

Step 16 **LINE DELETE** This option allows you to define the character to be used for deleting lines, using the binary representation of the decimal value according to Recommendation T.50. Select Line Delete and the following prompt is displayed:

```
Enter Line Delete Char Value (0 to 127)[24] :
```

NOTE: A value of Zero (0) indicates that no character is defined for deleting lines.

When the PAD receives a Line Delete command, it deletes the content currently in the editing buffer.

NOTE: If you enabled editing capability on the terminal in Step 14, Editing on page C-105, you can use the character defined in this field to delete lines in the data transfer mode and in the PAD command mode.

If you did not enable editing capability on the terminal, you can use the character defined in this field to delete lines only in the PAD command mode. You can specify the format in which the PAD responds to an editing command in Step 18, Editing PSS on page C-108.

Enter the value of the character you want to use to delete lines and press <ENTER>.

Step 17 **LINE DISPLAY** This option allows you to define the character to be used for displaying lines, using the binary representation of the decimal value according to Recommendation T.50. Select Line Display and the following option is displayed:

```
Enter Line Display Char Value (0 to 127)[18] :
```

NOTE: A value of Zero (0) indicates that no character is defined for displaying lines.

When the PAD receives a Line Display character, it sends the terminal a format effector followed by the characters currently stored in the editing buffer.

NOTE: If you enabled editing capability on the terminal in Step 14, Editing on page C-105, you can use the character defined in this field to display lines in the data transfer mode and in the PAD command mode.

If you did not enable editing capability on the terminal, you can use the character defined in this field to display lines only in the PAD command mode. You can specify the format in which the PAD responds to an editing command in Step 18, Editing PSS below.

Enter the value of the character you want to use to display lines and depress <ENTER>.

Step 18 **EDITING PSS** This option allows you to specify if and how the PAD is to respond when it receives an editing command from the terminal. Select Editing PSS and the following menu options are displayed:

```
1) No Editing of PSS                    [0]
2) Editing PSS for Printing Terminals   [1]
3) Editing PSS for Display Terminals    [2]
4) Editing PSS Using a Graphic Char     [8, 32-126]

PSS Editing :
```

18c **NO EDITING OF PSS** This option prevents the PAD from responding when "*editing PAD service signals"* are sent, select No Editing of PSS and depress <ENTER>.

18d **EDITING PSS FOR PRINTING TERMINALS** This option allows the PAD to respond to *editing PAD service signals* in the format used for printers, select Editing PSS for Printing Terminals and depress <ENTER>.

18e **EDITING PSS FOR DISPLAY TERMINALS** This option allows the PAD to respond to *editing PAD service signals* in the format used for display terminals, such as a PC or dumb terminals, select **E**diting PSS for Display Terminals and depress <ENTER>.

18f **EDITING PSS USING A GRAPHIC CHAR** This option allows the PAD to respond to *editing PAD service signals* by sending a graphic character, select Editing PSS Using a Graphic Char and depress <ENTER>.

Step 19 **ECHO MASK** This option allows you to specify character(s) that are not to be transmitted back to the terminal when Echo is enabled (see Step 2, Data Bits on page C-68). Select Echo Mask and the following options are displayed:

```
1) No Echo Mask (All Chars Echoed)                    [0]
2) No Echo of CR                                      [1]
3) No Echo of LF                                      [2]
4) No Echo of VT, HT, FF                              [4]
5) No Echo of BEL, BS                                 [8]
6) No Echo of ESC, ENQ                                [16]
7) No Echo of ACK, NAK, STX, SOH, EOT, ETB, ETX       [32]
8) No Echo of Char-Del,Line-Del,Line-Display Chars     [64]
9) No Echo of Non-graphic Characters                  [128]

Enter Echo Mask :
```

19a **NO ECHO MASK (ALL CHARS ECHOED)** This option enables all characters to be transmitted back to the terminal when Echo is enabled, select No Echo Mask (All Chars Echoed) and depress <***ENTER***>.

19b **NO ECHO OF CR** This option prevents Carriage Returns from being transmitted back to the terminal when Echo is enabled, select No Echo of CR and depress <ENTER>.

19c **NO ECHO OF LF** This option prevents Linefeed Characters from being transmitted back to the terminal when Echo is enabled, select No Echo of LF and depress <ENTER>.

19d **NO ECHO OF VT, HT, FF** This option prevents Vertical Tab, Horizontal Tab, and Form Feed characters from being transmitted back to the terminal when **Echo** is enabled, select **No Echo of VT, HT, FF** and depress **<**ENTER**>.**

19e **NO ECHO OF BEL BS** This option prevents Bell (20 Hz signal of about 90 volts) and Back Space characters from being transmitted back to the terminal when Echo is enabled, select No Echo of BEL, BS and depress <ENTER>.

19f **NO ECHO OF ESC, ENQ** This option prevents Escape and Enquiry characters from being transmitted back to the terminal when Echo is enabled, select No Echo of *ESC,* ENQ and depress <ENTER>.

19g **NO ECHO OF ACK, NAK, STX, SOH, EOT, ETB, ETX** This option prevents "Acknowledge", "Negative Acknowledge", "Start of Text", "Start of Heading", "End of Transmission", "End of Transmission Block", and "End of Text characters" from being transmitted back to the terminal when Echo is enabled, select No Echo of ACK, NAK, STX, SOH, EOT, ETB, ETX and depress <ENTER>.

19h **NO ECHO OF CHAR-DEL, LINE-DEL, LINE-DISPLAY CHARS** This option prevents "Character Delete", "Line Delete", and "Line Display" characters from being transmitted back to the terminal when Echo is enabled, select No Echo of Char-Del, Line-Del, Line-Display Chars and depress <ENTER>.

19i **NO ECHO OF NON-GRAPHIC CHARACTERS** This option prevents "Non-Graphic" characters from being transmitted back to the terminal when Echo is enabled, select No Echo of Non-graphic Characters and depress <ENTER>.

PARITY This option allows you to enable the PAD to check parity in the data stream coming from the terminal or to generate parity in the data stream being sent to the terminal. The Parity process involves checking the sum of all binary digits in the character and adding a *parity bit* when necessary to make the sum either always even or always odd. Select Parity and the following menu options are displayed:

```
1) No Parity Checking or Generation      [0]
2) Parity Checking AND Generation        [3]

Parity Treatment :
```

For Example: This is a simple error checking mechanism; if the sum is expected to be even, for example, when it reaches the destination, and the sum is actually odd when it arrives, it is assumed that an error has occurred. This is not a fail-safe error check. There could be two errors in the character, for example, which cause the sum of the digits to be even, as anticipated, thus making it appear that there are no errors, when in fact there *are* errors.

19j **NO PARITY CHECKING -OR- GENERATION** This option omits parity checking and the adding of a parity bit when necessary, select No Parity Checking or Generation and depress <ENTER>.

19k **PARITY CHECKING -AND- GENERATION** This option enables both parity checking and the adding of a parity bit when necessary, select Parity Checking and Generation and depress <ENTER>.

Step 20 **PAGE WAIT** This option enables the PAD to stop the transmission of additional characters to the terminal after a specified number of linefeed characters have been transmitted by the PAD, and to specify the number of linefeed characters that must be transmitted by the terminal before the transmission is stopped. Select Page Wait and the following prompt is displayed:

```
Enter Page Wait Value (0 to 255)[0] :
```

NOTE: A value of Zero (0) prevents the PAD from suspending the transmission of additional characters to the terminal, regardless of whether or not the terminal sends any linefeed characters.

Enter the number of linefeed characters to be transmitted before the transmission is stopped and depress <ENTER>.

C.15.3 Using X.28 Commands to View/Change X.3 Parameters

You can view and modify X.3 parameters, use on-line help to view a description of selected parameters and value options, or set up and take down calls by executing X.28 commands from a PC or terminal. Below is a discussion of valid commands and the procedures for using them.

X.28 commands can be used with commands in the Help screen to view or modify an X.3 parameter, obtain information about a parameter, or to establish or clear a call. For a list of X.28 parameters, which correspond directly with the X.3 parameters, see Section 4.15.3, Using X.28 Commands to View/Change X.3 Parameters of the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide.

C.15.3.1 X.28 Parameter Descriptions

The following table lists X.28 parameters and their descriptions. The table also specifies the CCITT parameter settings for Simple and Transparent Profiles.

PARAMETER REFERENCE NUMBER	DESCRIPTION	PARAMETERS FOR CCITT STANDARD PROFILES	
		TRANSPARENT PROFILE	SIMPLE PROFILE
1	PAD recall using a character	Not Possible (0)	Possible (1)
2	Echo	No Echo (0)	Echo (1)
3	Selection of data forwarding signal	No Data Forwarding Signal (0	All Characters in Columns 0 and 1 and Character 7/15 (DEL) of the International Alphabet No. 5 (126)
4	Selection of Idle Timer Delay	One Second (20)	No Time Out (0)
5	Ancillary device	No Use of X-ON and X-OFF (0)	Use of X-ON and X-OFF (1)
6	Control of PAD Service signals and PAD Command signals	No Service Signals Sent to the Start-stop Mode DTE (0)	Service Signals are Sent (1)
7	Selection of operation of PAD on receipt of Break signal from the start-stop mode DTE	Reset (2)	Reset (2)
8	Discard output	Normal Data Delivery (0)	Normal Data Delivery (0)
9	Padding after carriage return [CR]	No Padding after CR (0)	No Padding after CR (0)
10	Line folding	No Line Folding (0)	No Line Folding (0)
11 (READ ONLY)	Binary speed of start-stop mode DTE	Indicate speed of DTE	Indicate speed of DTE
12	Flow control of the PAD by the start-stop mode DTE	No Use of X-ON and X-OFF (0)	Use of X-ON and X-OFF (1)
13	Linefeed insertion after carriage return	No Linefeed Insertion (0)	No Linefeed Insertion (0)
14	Linefeed Padding	No Padding after Linefeed (0)	No Padding after Linefeed (0)
15	Editing	No Editing in Data Transfer State (0)	No Editing in Data Transfer State (0)
16	Character Delete	Character 7/15 DEL (127)	Character 7/15 DEL (127)
17	Line Delete	Character 1/8 CAN (24)	Character 1/8 CAN (24)
18	Line Display	Character 1/2 DC2 (18)	Character 1/2 DC2 (18)

PARAMETER REFERENCE NUMBER	DESCRIPTION	PARAMETERS FOR CCITT STANDARD PROFILES	
		TRANSPARENT PROFILE	SIMPLE PROFILE
19	Editing PAD Service Signals	Editing PAD Service Signals for Printing Terminals (1)	Editing PAD Service Signals for Printing Terminals (1)
20	Echo Mask	Echo all Characters (0)	Echo all Characters (0)
21	Parity Treatment	No Parity Detection or Generation (0)	No Parity Detection or Generation (0)
22	Page Wait	Page Wait Disabled (0)	Page Wait Disabled (0)

C.15.3.2 Accessing the X.28 Help Menu

When the terminal you are using is connected to a XXX PAD, the following logo and PAD command prompt [*****] is displayed whenever you boot the terminal:

```
*** FASTCOMM PAD ***

*
```

To reach the Help Menu from this prompt, you can type any of the following:

[**?**]: a question mark

[**h**]: the first letter in the word **help**

[**he**], [**hel**], [**help**]: the first letter plus any consecutive letters that follow

When you gain access to the Help Menu by typing a valid Help command (**?**, **h**, **help**, etc) at the PAD command prompt [*], the following screen is displayed:

```
*?
Port No: 3

set  [ref]:[Value] [,[ref]:[Value]]
Set local X.3 parameter(s)
set? [ref]:[Value] [,[ref]:[Value]]
Set and Read local X.3 parameter(s)
par? [[ref] [,[ref]]]
Read local X.3 parameter(s)
pad? [ref] [,[ref]]
For parameter help
prof [prof no]
Assign X.3 profile
clr
Clear Call
reset
Send Reset
[call] [facilities]-[address] [Ddata] - Request Call
facilities:  R | N<NUI String>
```

The **Port No** field at the top displays the number of the port that is connected to the XXX PAD. The menu is comprised of eleven command lines, which are discussed in detail below, and a PAD command prompt [*****] at the bottom. It is at this prompt that you will type a command.

C.15.3.3 X.28 Command Line Variables

Most of the command lines in the Help Menu have variables in brackets. Two of these variables, [ref] and [Value] appear in several command lines. Below is a description of these two variables. (All other variables are discussed in Section 4.16.4, Using X.28 Commands to View/Change X.3 Parameters, in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide).

1. **[REF]** This variable is an abbreviation for Reference and refers to the reference numbers of a given X.3 parameter.
2. **[VALUE]** This variable refers to the value you want to assign to the X.3 parameter specified in the Ref position of the command line. For a list of X.28 parameters, which correspond directly with the X.3 parameters, see Section 4.16.4, Using X.28 Commands to View/Change X.3 Parameters in the FRAD (Ether/Mono/Ring FRADs and Webrouter) Reference Guide.

For Example: If the variables in a default command line are **[ref]:[Value]**, you must specify an X.3 parameter, such as **2** (Echo), and a value for the Echo option, such as **0**, which disables the Echo function. The variables portion of the command line, then, would read **2:0**.

C.15.3.4 X.28 Commands

Command 1 **VIEWING X.3 PARAMETERS** The "pad?" command allows you to specify one or more parameter reference number(s) and view all of the possible values associated with each parameter.

If you want information on only one parameter, type "pad?" and the CCITT X.3 reference number associated with the parameter. Then depress ***<ENTER>***.

If you want information on more than one parameter, type "pad?", the reference number associated with the first X.3 parameter, a comma (,) and the next reference number for which you need information.

For example, if you want to view the values of the Echo, Idle Timer Delay, and Editing parameters, type the following command:

pad? 2, 4, 15 and depress <ENTER>

The following screen is displayed, beginning with the command line and ending with the command prompt [*] as:

```
*pad?2,4,15
par.2
0      - Echo Off
1      - Echo On

par.4 Data forwarding timeout
0      - None
1-255    - 1-255 x 1/20 seconds

par.15 Editing
0      - Editing Off
1      - Editing On
*
```

The presence or absence of spaces in the command line does not affect this function.

Command 2 **VIEWING X.3 PARAMETERS WITH CURRENT VALUES** The "par?" command allows you to view one or more parameter reference number(s) and the value currently assigned to it.

If you want to view the current value of only one parameter, type "par?" and the CCITT X.3 reference number associated with the parameter. Then depress ***<ENTER>***.

If you want to view the current value of more than one parameter, type "par?", the reference number associated with the first X.3 parameter, a comma (,), and the next reference number you want to view. The presence or absence of spaces in the command line does not affect this function.

For example, if you want to view the current values, assigned to the "Line Folding", "Binary Speed of DTE", and "Flow Control" parameters, type the following command:

par? 10, 11, 12 and depress <ENTER>.

The following screen is displayed, beginning with the command line and ending witht the command prompt[*]:

```
*par? 10, 11, 12
PAR 10:0, 11:20, 12:1
```

The values currently assigned to parameters 10, 11, and 12 in this example are 0, 20, and 1, respectively.

Command 3 **VIEWING REMOTE X.3 PARAMETERS AND VALUES** The "rpar?" command allows you to view one or more parameter reference number(s) and the value currently assigned to it on the *remote* node. To use the "rpar?" command, there must be an active call to the remote end.

The "**rpar?"** command is typed and executed with the same procedures and rules as the "**par?"** command discussed above.

Command 4 **SETTING VALUES FOR X.3 PARAMETERS** The "set" command allows you to set new values for one or more parameters by entering the reference number(s) for each parameter and assigning a value to it.

If you want to set only one parameter, type "set", then enter the CCITT X.3 reference number associated with the parameter, type a colon (:), and then enter the value of the option you want to assign to that parameter. Depress ***<ENTER>*** (see the example on the following page).

If you want to set more than one parameter, type "set", followed by the CCITT X.3 reference number associated with the first parameter, a colon (:), and then the value of the option you want to assign to that parameter. Insert a comma (,) and then enter the next reference number, colon, and value. Continue this format until you have set all the parameters you want. The presence or absence of spaces in the command line does not affect this function.

For example, if you want to set the value for the Echo parameter to "*No Echo"*, the value for the Idle Timer Delay parameter to "21-254", and the value for the Editing parameter to "*On"*, type the following command:

set **2:0, 4:20, 15:1** and depress ***<ENTER>***.

The following screen is displayed, beginning with the command line and ending with the command prompt [*]:

***set2:0, 4:20, 15:1**

*****

NOTE: If you set the Echo parameter to OFF, you will not be able to see what you type.

The "**set"** command changes the existing parameters in the PAD to the values you assign. However, it does not show you the parameters and new values after you have set them. If you want to view the parameters with their new values, use the "**set?**" command.

Command 5 **SETTING AND VIEWING VALUES FOR X.3 PARAMETERS** The "**set?"** command allows you to set and view new values for one or more parameters by entering the reference number(s) for each parameter and assigning a value to it.

The "*set?"* command is typed and executed with the same procedures and rules as the *"set"* command above and on the previous page. Refer to the "*set"* command for procedures.

For example, if you want to set and view the value for the Echo parameter to "*Echo On"*, the value for the Idle Timer Delay parameter to *"1-19"*, and the value for the Editing parameter to *"On"*, type the following command:

set? **2:1 ,4:0, 15:1** and depress ***<ENTER>***

The following screen is displayed, beginning with the command line and ending with the command prompt [*]:

*set?2:1,4:0,15:1

PAR 2:1, 4:0, 15:1

*

The "set?**"** command changes the existing parameters in the PAD to the values you typed. However, it also shows you the parameters and new values after you have set them.

Command 3 **SETTING X.3 PARAMETER VALUES ON THE REMOTE END** The rset? command allows you to set and view new values for one or more parameters on the *remote* node by entering the reference number(s) for each parameter and assigning a value to it. To use the "rset?" command, there must be an active call to the remote end.

The "rset?**"** command is typed and executed with the same procedures and rules as the **"set"** command (Command 5) on the previous pages.

Command 4 **CHANGING THE PAD PROFILE** The "**prof"** command allows you to change the Profile setting on the PAD. There are three values applicable to the Profile setting: (1) Simple, (2) Transparent, and (3) User-defined.

If the Profile is currently set to "*User Defined"*, and you want to change it to "*Simple",* type the following command:

prof 1 and depress <ENTER>.

The Following screen is displayed, beginning with the command line and ending with the command prompt [*]:

If the Profile is currently set to*prof1

*

C.15.4 Establishing a Call

The [**CALL][facilities-] [address] [Ddata]** entry on the Help Menu reflects the options, variables, and formats that a call can have. You can place a call, with or without facilities or data, to a destination X.121 address, with or without the word **"call"** or an abbreviation of it preceding the address.

The **[address]** position in the command line is the only portion of the line that must be present. A call cannot be placed without an address. The **address** position can contain an X.121 address, a sub-address assigned to a local unit, or a mnemonic assigned to an address.

The presence or absence of the command word **"call"** in the **[call]** position of the command line is optional. "**Call**" can be typed in full, abbreviated, or completely omitted from the line.

When it is present, it precedes the address, any facilities, and any data. When it is omitted, the command line begins with the facility(ies) if any facilities are applied to the call. If no facilities are applied, the command line begins with the calling address or a mnemonic for the address (Mnemonics are assigned in the **Global Paths** option of the Main Menu). The calling address may be the X.121 address of a unit, the sub-address of a local unit, or a mnemonic assigned to an address.

For example, a call establishment command line that contains a valid address can BEGIN with any of the following:

[c]: the first letter in the command word call

[ca], [cal], [call]: the first letter in the command word call plus any consecutive letters that follow

[facility(,facility)-]: one or more facilities plus a hyphen to separate the facilities from the address

The following five examples of established calls demonstrate the user of an omission of the command word "call" and abbreviations of it; the application of and omission of facilities and data; and the various forms an address may have. Each example begins with the command line and ends with the confirmation that the call has been established. The presence or absence of spaces between words or abbreviations does not affect this command line.

The first example uses the command word "**call"** and an X.121 address:

```
*call3333
Connected to Called Address : 3333
COM
```

The second example uses the abbreviation "c" as the "call" command and the sub-address for a local unit:

```
*c 22
Connected to Called Address : 22
COM
```

The third example omits the command word "**call"** and uses a mnemonic that has been assigned to X.121 address **1111**.

```
*New York
Connected to Called Address : 1111
COM
```

Notice that even though you place the call by typing the mnemonic "**New York**", the call confirmation displays the actual X.121 address.

The fourth example uses the abbreviation "c" for the command word "**call"**, applies one facility and uses a sub-address:

```
*c R-33
Connected to Called Address : 33
FAC: R
COM
```

The fifth example omits the command word "**call"**, applies two facilities, adds data, and uses an X.121 address:

```
*R,N- 2222 D Hello
Connected to Called Address : 2222
FAC: R,N
COM
```

NOTE: Any dynamic parameters you configure using X.28 commands take effect as soon as a call is placed. Once you have a connection with another node, if you depress <ENTER>, the Telnet Terminal menu is displayed with a greater than sign prompt [>] at the bottom. If you want to execute an X.28 command, you must depress CTRL-P to get the command prompt [*].

C.15.5 Establishing a Call with Facilities

The **[facilities-]** variable allows you to add a facility to the call, if necessary. It is possible to reverse the billing on the call so that the recipient pays for the call or you can include a Network User Identification String (password) in the call. To Reverse Charges, type an "**R"** in the **facilities** position of the command line; To insert a password, type an "**N"** in the **facilities** position of the command line. You must also type a hyphen [-] after the last facility to separate the facilities from the address.

Before you start !! You must type a comma (,) between any two facilities you want to apply to the call.

If you enter an "NUI" String, or password, you will not see the password when you type it. Neither will the recipient of the call be able to view it. Only the Host can read it. When you enter the command line and include a password, you must enter the **"N"** and then immediately enter the password. When the password has been entered, proceed with typing the next portion of the command line.

NOTE: Do not forget to type a hyphen [-] after the last facility you apply.

Below are two examples of call command lines with facilities. The first example has two facilities, separated by a comma; the mandatory hyphen following the last facility; and the address. The second command line has one facility; the mandatory hyphen following the last facility; and a sub-address.

```
*call R,N-4444
Connected to Called Address : 4444
FAC: R,N
COM

*R-05
Connected to Called Address : 05
FAC: R
COM
```

C.15.6 Sending User Data with a Call

The variable **[Ddata]** allows you to type data that the user at the remote end can view when the call is received. Data entries may have a maximum of 12 characters or digits. Any data must be preceded by an upper case "**D**" or lower case "**d**".

To place a call with reverse charges, a password, an X.121 address, and a greeting to the remote user, you might type:

c R,N[enter password]-2222 dGood morning

C.15.7 Clearing a Call

Before you start !! To execute a command once a call is up, you must press CTRL-P to get the [*] prompt, and then enter the command.

The "**clr"** command allows you to clear a call after it has been established. When you enter the Clear command at the prompt, the following Clear Confirmation is displayed on the screen:

```
*clr
CLR CONF

*
```

NOTE: Once a call is cleared, any dynamic parameters you have set are cleared and the defaults are restored.

C.15.8 Resetting the Logical Circuit

The **reset** command allows you to send a "RESET" frame to reset the virtual circuit of an active call. When the circuit is reset, no confirmation is displayed on the screen.

```
*reset
```

C.15.9 Requesting a Clear Call from the Remote End

The "**iclr"** command allows you to request the remote end to clear an active call. When you enter the Request for Clear command "**iclr"** at the prompt, the following Clear Confirmation is displayed, citing the Cause and Diagnostic Codes:

```
*iclr
CLR DTE C:0 D:153

*
```

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