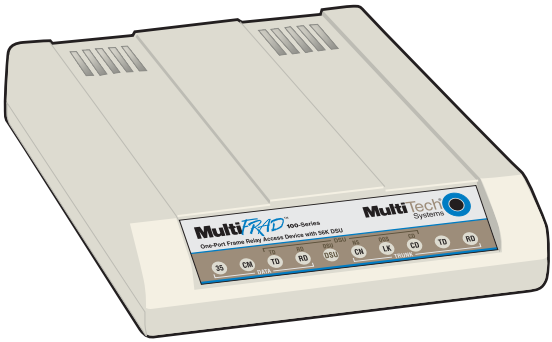

Model FR111

Single Port Frame Relay Access Device with 56K DSU

Owner's Manual

MultiTech® Systems

NOTE: This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced raido/TV technician for help.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The CE mark is affixed to the enclosed MultiTech product to confirm compliance with the following European Community Directives:

Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

both amended by

Council Directive 93/68/EEC of 22 July 1993 on the harmonization of CE marking requirements.

Owner's Manual

82067401 Revision B

MultiFRAD™ 100-Series (Model No FR111)

Record of Revisions

Revision	Description
A (7/21/97)	Manual released. All pages at revision A.
B (5/28/98)	General Update. All pages at revision B.

Patents

This Product is covered by one or more of the following U.S. Patent Numbers: ***5.301.274; 5.309.562***; ***5.355.365; 5.355.653; 5.452.289; 5.453.986***. Other Patents Pending.

TRADEMARKS

Trademark of Multi-Tech Systems, Inc. are as follows: MultiFRAD[100], and the Multi-Tech logo.

Windows is a registered trademark of Microsoft.

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Contents

Appendices

1

Introduction and Description

1.1 Introduction

The Multi-Tech Systems MultiFRAD™ 100-Series, Model number FR111, is a one-port Frame Relay Access Device (FRAD) with 56K DSU that encapsulates non-packetized data from a serial device into frame relay frames and is responsible for framing that data with header and trailer information prior to transmission to a frame relay network. The Multi-FRAD allows a non-frame relay device to connect to a common carrier frame relay network service or private frame relay network. The access device is designed with an internal 56K Data Service Unit (DSU) that allows a single frame relay permanent virtual circuit (PVC) to be connected to a 56K DDS circuit. On the receiving end of the communication link, the MultiFRAD serves to strip away the frame relay control information in order that the target device is presented with the data packaged in its original form.

The versatility of the MultiFRAD provides for a smooth integration with existing equipment; e.g., multiplexers, routers, legacy equipment such as cluster controllers, and asynchronous devices such as PCs running remote control software. The non-frame relay device connects to the data port on the back of the MultiFRAD and is capable of synchronous data transmission up to 56K bps or asynchronous data transmission up to 57.6K bps. The network connection is provided by the trunk port which directly connects to the frame relay network.

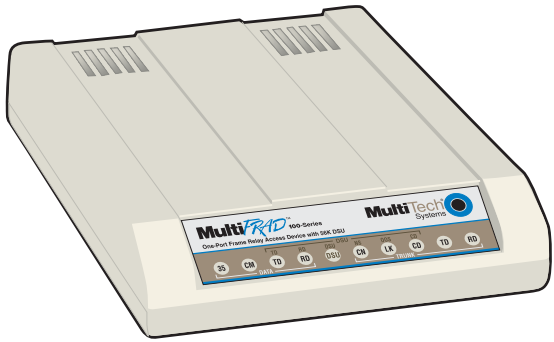


Figure 1-1. MultiFRAD 100-Series

1.2 About This Manual

This manual describes the MultiFRAD, and tells you how to install and configure the unit. The information contained in each chapter is as follows:

Chapter 1 - Introduction and Description

Chapter 1 introduces the MultiFRAD 100-Series. A typical application is presented with a discussion on ordering a frame relay line and how to configure a MultiFRAD. A list of relevant specifications are provided at the end of the chapter.

Chapter 2 - Front and Back Panel Descriptions

Chapter 2 describes the front panel indicators and back panel connectors. The front panel contains the LEDs for the data and trunk status. The back panel provides cable connections to the data port, trunk port, and a power connection for an external power supply.

Chapter 3 - Setup

Chapter 3 provides unpacking instructions, a setup procedure for connecting cables and direction as to when you should configure the unit. Also, after the unit is configured and if a V.35 interface is needed for the data device, a procedure for changing the shunt to the V.35 position is provided.

Chapter 4 - Software Loading and Configuration

This chapter provides procedures on how to load the software utility and configure the unit when a pc with a Windows application is connected to the MultiFRAD. If a dumb terminal is connected to the MultiFRAD, the unit can still be configured using the ASCII terminal menu system that is present in the memory of the unit.

Chapter 5 - Software Utility Descriptions

This chapter provides a complete description of the Windows based software used on the MultiFRAD 100-Series. From an icon in the MultiFRAD program group, the Main menu is displayed. From the Main menu, the data Port and trunk can be configured. Trunk statistics, diagnostics, and the download feature are also described.

Chapter 6 - ASCII Terminal Menu System

Chapter 6 provides a description of the ASCII terminal menu system. The ASCII terminal menu system is used when a dumb terminal is connected to the data port. These menus allow you to configure the data port and trunk, view statistics, reset the unit, and enable diagnostics.

Chapter 7 - Service, Warranty and Tech Support

Chapter 5 provides instructions on getting service for your MultiFRAD at the factory, a statement of the limited warranty, information about our user bulletin board service, and space for recording information about your MultiFRAD prior to calling Multi-Tech's Technical Support. The final three sections explain how to use our bulletin board service (BBS), and get support through CompuServe and the Internet.

1.3 A Typical Application

A typical application for a MultiFRAD 100-Series is connecting a single non-frame relay device to a frame relay network. The MultiFRAD 100-Series is usually used at a remote site where a single DLCI and a single device needs to be connected to a frame relay network. A MultiFRAD 100-Series can connect any existing synchronous or asynchronous non-frame relay device to a frame relay network.

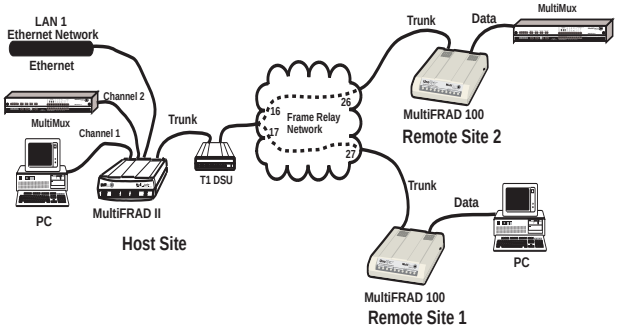


Figure 1-2. Typical Frame Relay Network

A MultiFRAD is easily connected to a frame relay network. One Data Link Connection Identifier (DLCI) is required and it is provided by your local network service provider when you request (subscribe) for a local telephone line connection. When your local network service provider engineers your connection, a virtual circuit is established between your location and the destination of your connection. This virtual circuit is called a permanent virtual circuit (PVC).

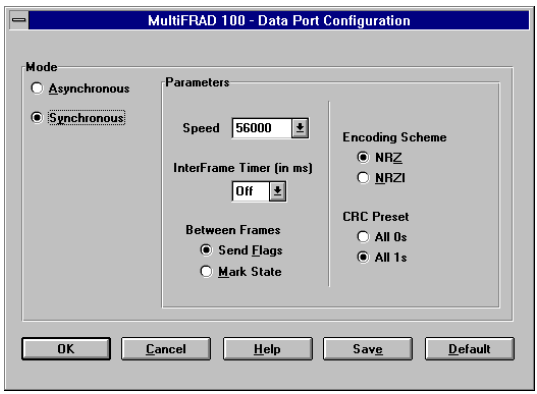
1.3.1 Ordering a Frame Relay Line

Ordering frame relay services from your local telephone company involves connecting the physical line, defining the port connection, configuring the PVC through the network, and assigning the Data Link Connection Identifier (DLCI). The DLCI is a number between 16 and 1007 that identifies the PVC between your MultiFRAD and the phone company's switch. The DLCI is assigned at the same time your local service provider defines the permanent virtual circuit (PVC) that is the path to your destination. When a PVC is assigned, an average guaranteed throughput is negotiated with the service provider. The guaranteed throughput is called committed information rate (CIR) and is based on

your capability to present data to the local telephone switch. Your capability to present data is determined by the internal DSU (Data Service Unit) that can transfer digital data at a maximum rate of 56,000 bits-per-second to the network. A general rule of thumb in this scenario is to assign a CIR of 32K bps and an excess burst rate (Be) of 24K bps. The sum of the CIR and Be can not exceed your capability to present data to the network. Finally during subscription, the management type is defined by the local frame relay service provider. The management type is a mechanism for communicating the status of the PVC and is dependent upon which type is running on the telephone switch. Three types of management are supported by the MultiFRAD: local management interface (LMI), Annex A, and Annex D.

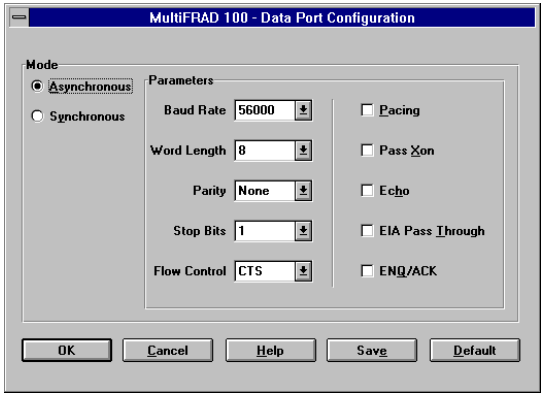
1.3.2 How to Configure a MultiFRAD

Configuring a MultiFRAD is a simple process of defining the data port device and the trunk parameters for frame relay. To configure a MultiFRAD, a pc has to be connected to the Data port on the MultiFRAD and the MultiFRAD software loaded. To define the data port, the type of device that is connected to it has to be defined. If the device is a synchronous device such as a multiplexer, then the clocking and speed of the device have to be defined in the Data Port Configuration dialog box. A couple of other parameters also have to be set in order for the multiplexer to communicate with the MultiFRAD.

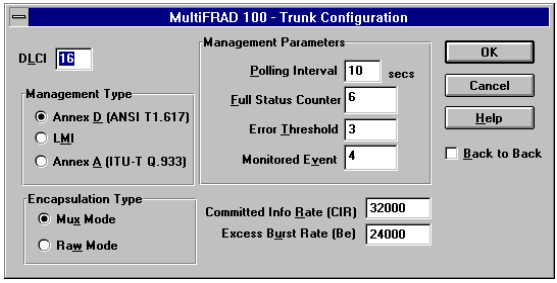


If the data device is an asynchronous device, the Asynchronous Mode option button changes the dialog box to display the asynchronous parameters. The async parameters are the normal baud rate, word

length, parity, stop bits, and flow control. The Async Data Port Configuration dialog box displays the default parameters that may apply to a majority async devices.



When the data device is defined, then the trunk configuration needs to be defined. The trunk configuration is displayed in the Trunk Configuration dialog box. Most of the trunk information is supplied by your network service provider.



For example, if the MultiFRAD at remote site 2 in our typical Frame Relay network in Figure 1-2 is being configured, the DLCI is 26, the Access Rate is 56000, and generally a Committed Info Rate of 32000 with a Excess Burst Rate (Be) of 24000 would allow the multiplexer at remote site 2 to communicate with the host site. These parameters can be added to the Trunk Configuration dialog box with a Management Type defined by your network service provider, lets say for this example that it is LMI. The default Management Parameters in the Trunk Configuration dialog box for the most part should work for this typical applica-

tion. The trunk configuration would be complete by clicking on the Save button and returning to the Main menu. In the Main menu, click on the download button to transfer the configuration to the MultiFRAD. Within a few seconds the new configuration is downloaded to the MultiFRAD and it is ready for operation.

1.4 FCC Regulations for Telephone Line Interconnection

1. This equipment complies with Part 68 of the FCC rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company.

2. As indicated below the suitable jack (USOC connecting arrangement) for this equipment is shown. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.

3. The ringer equivalence number (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the telephone company to determine the maximum REN for the calling area.

4. If this equipment causes harm to the telephone network, the telephone company will notify you in advance. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.

6. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

7. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.

8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service

commission or corporation commission for information.)

9. If so required, this equipment is hearing aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Model Number:	MultiFRAD 100-Series
FCC Registration Number:	AU7USA-24704-XD-N
Ringer Equivalence:	N/A
Modular Jack (USOC)	RJ48
Service Center in U.S.A.	Multi-Tech Systems Inc. 2205 Woodale Drive Mounds View, MN 55112 USA (612) 785-3500 or (800) 328-9717 U.S. Fax (612) 785-9874

1.5 Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination of a interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, 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.

1.6 Specifications

Data Port

- Single data port with synchronous or asynchronous data format
- Async data rate up to 57.6K bps or sync data rate up to 56K bps
- RS232C and ITU-T V.35 interface using an adapter cable
- Internal shunt plugs to configure RS232C or ITU-T V.35 interface
- Async data format of 5,6,7, or 8 bits; 1, 1½, or 2 stop bits; odd, even, or no parity
- Sync data format is HDLC/SDLC
- Data port connector is a DB-25 female

Trunk

- Single trunk port with synchronous DDS or compatible data format
- Sync data rate of 56k bps
- DDS interface with an RJ-48 keyed jack
- Full duplex over LADS (Local Area Data Set) or two-pair non-loaded metallic wire

Electrical/Physical/Environmental

- Voltage - 115v AC, 50/60 Hz
- Power - 2 watts
- Dimensions - 4.3" W x 1" H x 5.6" L
  - 10.8 cm x 2.5 cm x 14.2 cm
- Weight - 8 oz. (224 g)
- Temperature - 32° to 120° F (0° to 50° C)
- Humidity - 20 - 90% non-condensing

Compatibility

- Link management via ANSI T1.617 Annex D, ITU-T Q.933 Annex A or LMI

2

Front and Back Panel Descriptions

2.1 Introduction

This chapter describes the front panel LEDs and back panel connectors. The front panel has one row of LEDs for both the data channel and trunk status. Two back panel connectors provide the data and trunk connections. A circular power connector is provided to connect the external power supply.

2.2 Front Panel

The front panel contains two sets of LEDs that provide the status of the data and trunk connections. The data LEDs display the activity of the data port, if V.35 interface signaling is used, and whether command mode is active. The trunk LEDs display status whether the trunk is transmitting or receiving frames, link status, and congestion.

Figure 2-1. Front Panel

Data

35 Lights when the data port is configured for a V.35 interface. That is, the data shunt is in the V.35 position.

CM Command Mode (CM) LED lights when the Data/ Command mode switch is in the Command mode position and blinks when the unit is in test mode.

TD Transmit Data (TD) LED blinks when data is being transmitted - on for a space and off for a mark.

RD Receive Data (RD) LED blinks when data is being received - on for a space and off for a mark.

DSU

TD Transmit Data (TD) LED blinks when data is being transmitted - on for a space and off for a mark.

RD Receive Data (RD) LED blinks when data is being

received - on for a space and off for a mark.

DSU Data Service Unit (DSU) LED lights when the unit is in the DSU-only mode.

NS The No Signal (NS) LED lights when no signal is received from the network or when the signal is too weak for normal operation.

OOS The Out Of Service (OOS) LED lights when an outage condition occurs. This happens when there is a failure in the digital service that is detected by the network and the telco sends a repetitive OOS sequence.

CD The Carrier Detect (CD) LED lights when a carrier signal is received from the network.

Trunk

CN Congestion (CN) LED lights when congestion is detected on the trunk.

LK Link (LK) LED blinks slowly when there is no link management connection with the network. Blinks quickly when link management is established with the network. Remains solid ON when the network indicates the PVC is active.

CD Carrier Detect (CD) LED lights when a carrier signal is detected from the network.

TD Transmit Data (TD) LED blinks when data is being transmitted - on for a space and off for a mark.

RD Receive Data (RD) LED blinks when data is being received - on for a space and off for a mark.

2.3 Back Panel

The cable connections for the MultiFRAD are made at the back panel. Two cable connections are provided and one power supply connection. The Data connector allows the MultiFRAD to be connected to a non-frame relay device and the Trunk connector connects to a common carrier frame relay network service or private frame relay networks. The cable connections are shown in Figure 2-2 and defined in the following sections.

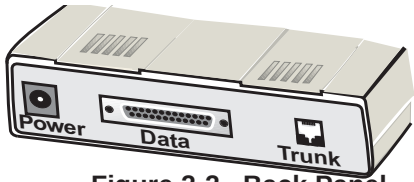


Figure 2-2. Back Panel

Power Connector

The Power connector is used to connect the external wall type transformer power supply to the MultiFRAD. The wall transformer plugs directly into an AC outlet.

Trunk Connector

The Trunk connector is used to connect the MultiFRAD to a 56K DDS circuit that provides the local access to the frame relay service. This connector is a RJ48-keyed jack on the back panel of the unit.

Data Connector

The Data connector is used to connect the MultiFRAD to a non-frame relay device, such as, multiplexers, routers, or legacy equipment such as cluster controllers, or an asynchronous device such as a PC running remote control software. A second use of this connector is to configure the MultiFRAD. The Data connector is a DB-25 female connector located on the back panel of the MultiFRAD.

The Data connector interface can be either an RS-232C or V.35 interface. When the V.35 interface is used, the data shunt has to be moved from the default RS232 position to the V.35 position. Refer to "Shunt" in this chapter for changing the data shunt. Refer to Appendix A for cabling requirements in V.35 mode.

2.4 Switch Settings

The 8-position DIP switch located on the right side of the MultiFRAD only uses the first four positions. The DIP switches are shown in Figure 2-3 and their settings are described in Table 2-1.

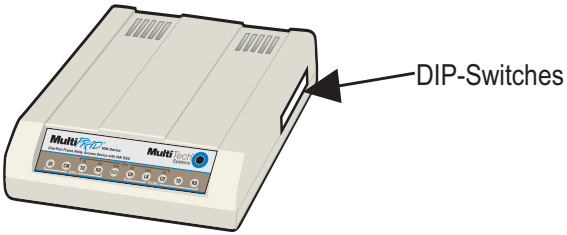


Figure 2-3. Switch Settings

Table 2-1. Switch Settings

Switch	Mode	Position	Description
1	Cmd/Data	UP*	Data
		DOWN	Command
2	Clocking	UP*	DDS
		DOWN	Internal
3	Loopback	UP*	Normal
		DOWN	Loopback
4	DSU	UP	FRAD
		DOWN*	DSU
5-8	Not Used		

*Factory default setting

2.5 Shunts

V.35 signal levels are generally more reliable for high speed data and/or longer cable distances. EIA-232D signal levels are intended for data rates of 19,200 bps or less and cable lengths of 50 feet or less. For higher speeds and/or longer distances, V.35 is generally preferred.

There are two shunt positions on the printed circuit board that configure the data port for either RS232 or V.35 interface. Both DIP sockets for the shunts are shown in Figure 2-4.

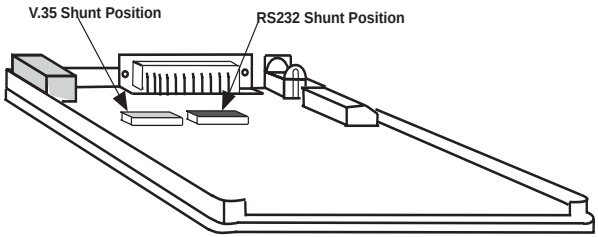


Figure 2-4. Shunts

In Figure 2-3, the shunt is shown in the RS232 (default) position (i.e., in the right-hand DIP socket - the one closest to the DIP switches. To change the location of the shunt, refer to the V.35 Shunt procedure in Chapter 3.

3

Setup

3.1 Introduction

This chapter describes the unpacking of the MultiFRAD, cable connections depending on whether EIA-232D or ITU-T V.35 interface signaling is used on the data port, and how to configure the unit dependent on your site situation. Once the MultiFRAD is configured, then the data port can be connected to your data port device.

3.2 Unpacking

The shipping box contains the MultiFRAD, power adapter, and your owner's manual. Inspect the contents for signs of any shipping damage. If damage is observed, do not power up the unit, contact Multi-Tech's Technical Support for advice (refer to Chapter 7 - Warranty). If no damage is observed, place the MultiFRAD in its final location and verify the signal levels (EIA-232D or ITU-T V.35) for the data port, and connect your cables, phone lines, and power supply.

3.3 Safety Warnings

1. Never install telephone wiring during a lightning storm.
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
4. Use caution when installing or modifying telephone lines.
5. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.
6. Do not use the telephone to report a gas leak in the vicinity of the leak.

3.4 Setup

Use the following steps to setup your MultiFRAD. If V.35 electrical interface signaling is required on the data port, but a pc with EIA-232D signaling is being used to configure the MultiFRAD, the unit has to be configured before you change to V.35 signaling. Perform the following procedure to connect your cables, configure the unit, and then change to V.35 signaling on the data port.

1. Ensure that the DIP-Switch settings on the side of the unit are set for a command mode of operation. Refer to the Switch Settings in Chapter 2.

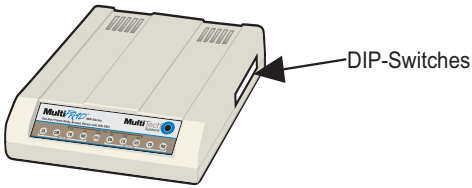


Figure 3-1. DIP-Switch Settings

2. Connect the external wall transformer power supply to the Multi-FRAD and plug it into a live AC outlet. The MultiFRAD does not have a power switch. When power is applied to the unit, the front panel LEDs will light.

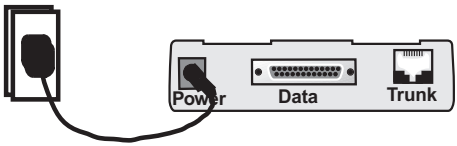


Figure 3-2. Power Connection

3. Connect a pc running Windows® to the **Data** connector on the back of the MultiFRAD. Use an appropriate EIA-232D cable. Refer to Appendix A for EIA-232D cable details.

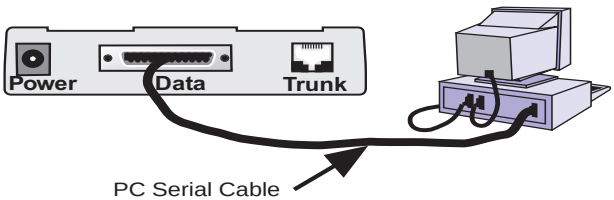


Figure 3-3. Data Connection

4. Connect an RJ48 phone cable to the **Trunk** connector on the back of the MultiFRAD. Connect the other end of the phone cable to the local access line jack.

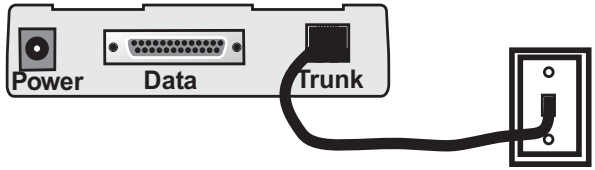


Figure 3-4. Trunk Connection

5. The MultiFRAD can be configured in two ways: If a pc running a Windows software is being used to configure the unit, refer to the Software Loading procedure in Chapter 4.

   If a terminal running a communications software is being used to configure the unit, refer to Configuring your MultiFRAD using a dumb terminal in Chapter 5.

6. Once the MultiFRAD is configured for your application, you can disconnect the pc and connect your data port device. If the data port device contains an EIA-232D interface, the same serial cable can be used. If the data port device contains a V.35 interface, the data port shunt must be moved to the V.35 position and a V.35 adapter cable must be connected to the data port connector. Refer to Section 3.5 for procedures on moving the shunt to the V.35 position. Refer to Appendix A for cable details.
7. Place the Command Mode switch (Switch 1) on the side of the MultiFRAD in the UP position for the data mode operation.

3.5 V.35 Shunt

Either EIA-232D or ITU-T V.35 electrical signal interface can be selected on the data port. Units are shipped with EIA-232D signal levels selected. Use the following procedure to select V.35.

CAUTION

This procedure requires opening the unit. Like most products of this type, this product contains components that are sensitive to static and static discharge. Please use your best efforts to avoid static discharge when contacting the components inside this unit.

WARNING:

Always disconnect the power cord before opening the enclosure to avoid any chance of electric shock.

1. Unplug the power cord.
2. The enclosure consists of two halves. Using a Phillips screwdriver, remove the two screws from the bottom of the unit. Remove the top half.
3. Pry the data port shunt out of its RS232 socket and insert it into the V.35 socket.

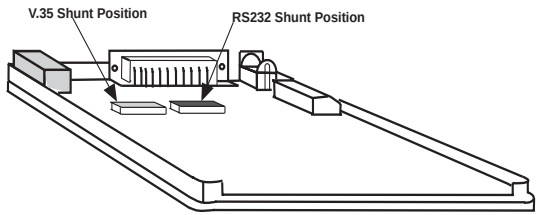


Figure 3-5. Shunts

4. Carefully reassemble the unit, making sure that no foreign objects are accidentally left inside.
6. The data port is now configured with V.35 signal levels. The cable pin designations are shown in Appendix A. To connect to a device equipped with a V.35 34-pin connector, you must obtain an adapter cable. Using the signal pin designations in Appendix A, you may make or order a cable from most any cable vendor.

4

Software Loading and Configuration

4.1 Introduction

This chapter covers the loading of the software utility and then the configuration of the unit from either a Windows based pc or a dumb terminal. When a Windows based pc is used, the software utility is loaded using the procedures in section 4.2 and then the unit is configured using the procedures in section 4.3. If a dumb terminal is used, the MulitFRAD 100 can be configured using the ASCII terminal menu system present in memory of the unit.

4.2 Loading Software

1 Turn on your PC connected to the Data Port of your MultiFRAD and run Windows®.

2 Create a backup copy of your MultiFRAD software diskette before you install the software. Store the master diskette in a safe place and install the MultiFRAD software using the backup copy.

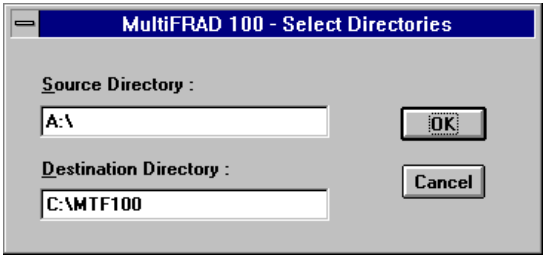
3 Insert the backup disk for the MultiFRAD into the floppy drive.

4 Click on the File Menu in your Program Manager.

5 Click on Run. The Run dialog box is displayed.

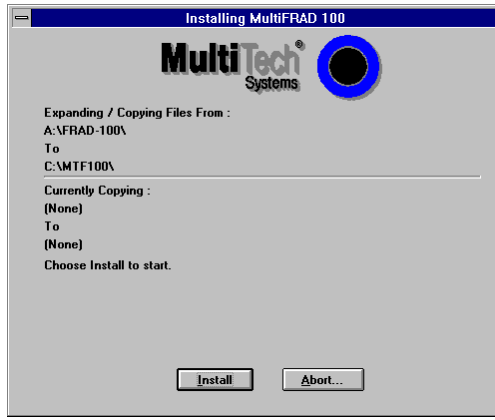
6 Type **a:\install** or **b:\install** (depending on the location of your floppy disk drive) in the Command Line field, and then click on **OK**.

7 The MultiFRAD 100 - Select Directories dialog box is displayed.



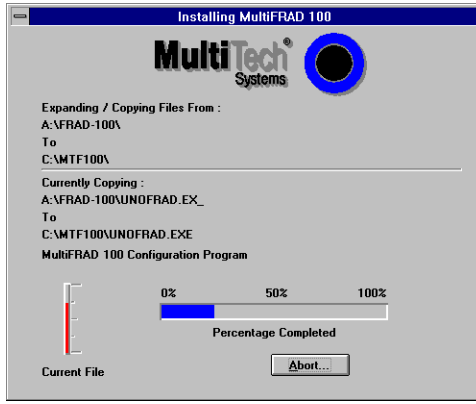
If you are installing the software from drive A and your Destination Directory is the default directory, click on OK to continue

8 The Installing MultiFRAD dialog box is displayed.

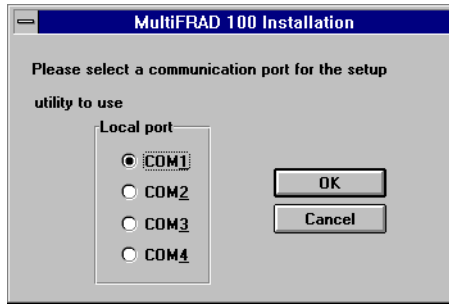


Click on **Install** to continue installation, at any time you may click on **Abort** if you wish to cancel the install immediately.

9 The Expanding/Copying Files From: dialog box is displayed. You can view the progress of the installation from this dialog box. You can click on **Abort** at any time to cancel the install.



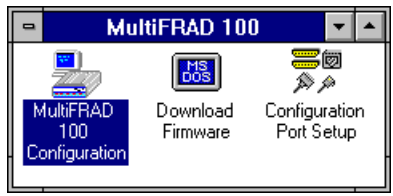
11 The MultiFRAD 100 Installation dialog box asks "Please select a communication port for the setup utility to use" dialog box is displayed. In other words, select which COM port on your PC that is connected to the Command Port of the MultiFRAD.



Select the **COM** port (**COM1,COM2,COM3, or COM4**) for the setup utility. The default port is COM1. Click on **OK** when you are satisfied with your selection.

12 When the setup installation is successful, a system message is displayed stating "MultiFRAD 100 Installation Successful. Click on OK to continue.

13 Your are returned to the Program Manager where the MultiFRAD program group and icons are created.

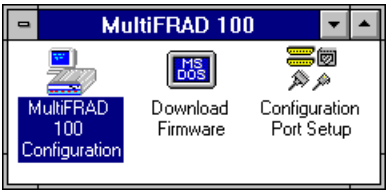


This completes the software loading. Now, proceed to configuring your MultiFRAD.

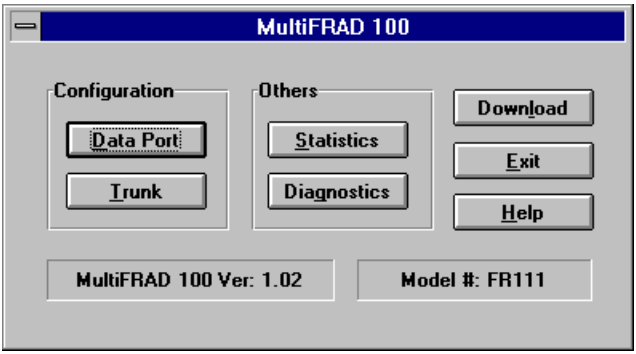
4.3 Configuring Your MultiFRAD using Windows

Configuration of your MultiFRAD using Windows starts after the software is loaded and program group is displayed in the Program Manager.

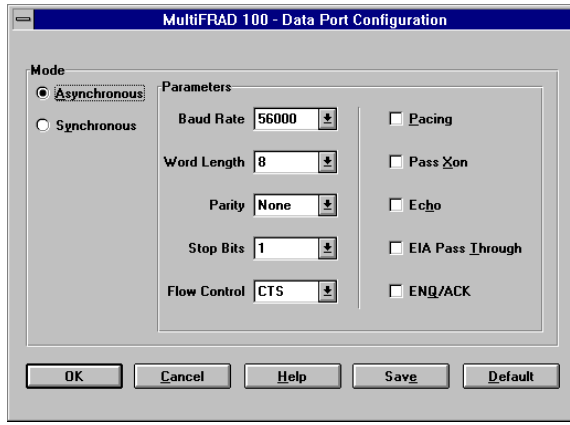
1 Double click on the MultiFRAD 100 Configuration icon.



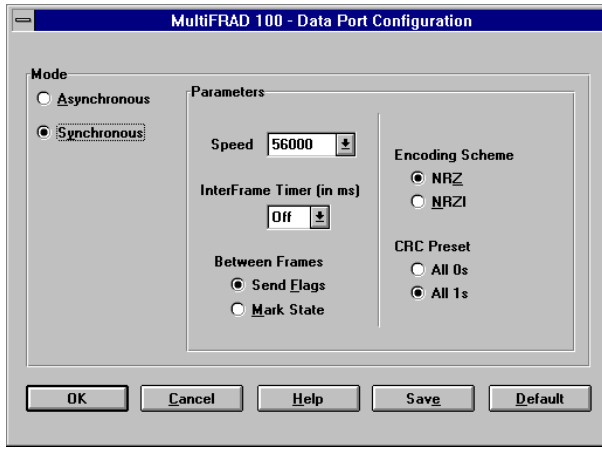
2 When the MultiFRAD 100 dialog box is displayed, click on the Data Port button to display the Data Port Configuration dialog box.



3 The Data Port Configuration dialog box is displayed with the Mode set to **Asynchronous**. If your data device is an Asynchronous device, refer to the User documentation to set the async parameters that meet the conditions of your installation.

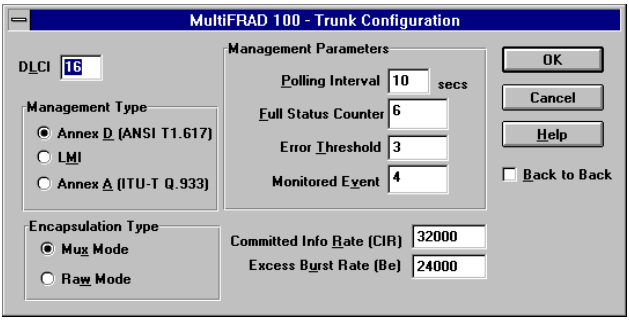


If your data device is a synchronous device, click on the **Synchronous** option button and the parameters for the synchronous mode are displayed. Refer to the User documentation to set the sync parameters that meet the conditions of your installation.



4 When you are satisfied with your selections, click on the **Save** button to save your new parameters. Then click on the **OK** button to return to the main menu.

5 From the Main menu, click on the **Trunk** button to display the Trunk Configuration dialog box.



6 Click on the **DLCI** numeric dialog box. Enter the DLCI number that was provided by your service provider at subscription time. To change the DLCI, click on the DLCI numeric dialog box and back space through the default number and then enter your DLCI.

7 Click on the **Management type** option button supported by your Frame Relay network. The Management type is supplied by your service provider at subscription time.

For most applications, the default **Management Parameters** should be adequate.

Polling Interval is the number of seconds for a polling cycle (i.e., the time period between each status enquiry message sent from the MultiFRAD).

Full Status Counter displays a number between 1 and 255 that is the number of polling cycles (minus one) before a full status is requested from the network.

Error Threshold displays a number between 1 and 10 that is less than or equal to the Monitored Event count.

Monitored Event displays a number that is between 1 and 10 that is greater than or equal to the Error Threshold.

8 Click on the **Committed Info Rate** numeric box and enter the CIR value provided by your service provider at subscription time.

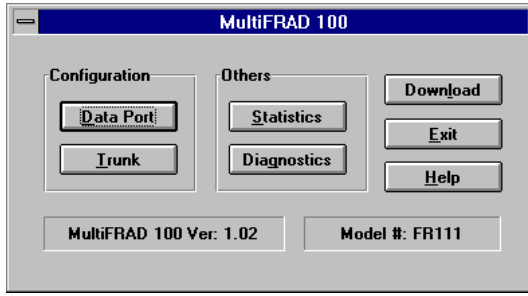
9 Click on the **Excess Burst Rate (Be)** numeric box and enter the Be value provided by your service provider at subscription time.

10 The **Back to Back** check box should normally remain unchecked.

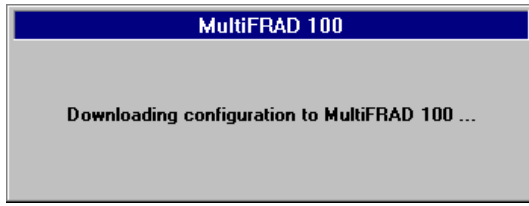
11 Click on the Encapsulation Type you need. Mux Mode encapsulation can be used only if the FRAD at the other end of the PVC is

another MultiFRAD 100. Raw Mode encapsulation can be used for any type of FRAD at the other end.

12 Click on the **OK** button to return to the Main menu.



13 Click on the **Download** button to write the new configuration to the MultiFRAD.



14 The Configuration dialog box is displayed.

The Configuration downloaded successfully. Reset the unit for configuration to take effect and put dip switch number 1 in the up position. Click on **OK** to proceed.

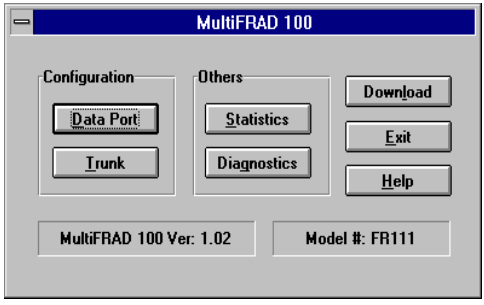
15 You are returned to your Program Manager where the MultiFRAD 100 Program Group and Program Item (the Windows icons) have been created.

Your MultiFRAD 100 is fully operational at this time.

4.4 Configuring your MultiFRAD using a Dumb Terminal

To configure your MultiFRAD, power up a terminal or pc running communications software and hit the ENTER key. The Main menu appears on your screen, configure the data port for sync or async mode of operation and the trunk for the frame relay parameters. The Multi-FRAD configuration is contained in the following procedure.

1 Apply power to your terminal or pc. After the terminal or pc boots up, run the communications software. Setup your communications software for a speed between 2400 and 115.2K bps, 8-bits, no parity, and 1-stop bit. Press the **ENTER** key to display the MultiFRAD Main Menu.



2 Enter option **1** and press the **ENTER** key to display the Configuration menu.

```
Configurations

1  - Data Port Configuration
2  - Trunk Configuration
3  - Factory Default Configuration Options
S  - Store All Configurations
M  - Main Menu
P  - Previous Menu
Selection: _
```

3 If your Data port is being setup for **Async** mode of operation, proceed to step 4 to configure your data port.

If your Data port is being setup for a **sync** mode of operation, enter option **1** in the Configuration menu and press **ENTER**. Enter 1 again and the Data Port Async/Sync submenu is displayed. Enter option **2** for Sync mode of operation. Then proceed to step 5 to configure your data port.

4 If the data port is being setup for Async mode of operation and a port speed of 57.6K, initially the data port does not have to be changed, proceed to step 6 to configuring the Trunk.

```
Data Port Configuration

1  - Async/Sync:               Async
2  - Speed:                    57600
3  - Word Length:              8
4  - Stop Bits:                1
5  - Parity:                   None
6  - Flow Control:             CTS
7  - Enq/Ack Flow Control:     Off
8  - Echo:                     Off
9  - Pacing:                   Off
10 - EIA Pass Through:         Off
11 - Pass Xon:                 Off
S  - Store All Configurations
M  - Main Menu
P  - Previous Menu

Selection : _
```

If the data port configuration needs to be changed, enter the option number to be changed and a submenu is displayed. Change the option to meet the conditions of your installation. When the data port is configured to meet your site requirements, proceed to step 6 to configure the Trunk.

5 Change the Sync Data Port Configuration to meet the conditions of your installation by selecting the option needing change and a submenu is displayed with your selections.

```
Data Port Configuration

1 - Async/Sync:               Sync
2 - Speed:                    57600
3 - Idle Condition:           Flags
4 - NRZ/NRZI Encoding:        NRZ
5 - CRC Preset:               All 1s
6 - Inter-frame Timer:        Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _
```

When the Sync Data Port is configured to meet your site requirements, enter the letter S and press ENTER to store all configurations. Then enter the letter P and press ENTER to return to the Configuration menu.

6 From the Configuration menu, enter ***2*** and press **ENTER**. The Trunk Configuration menu is displayed.

```
Trunk Configuration

1 - Access rate:                56000
2 - RTS Signal Status:          Follows input from DTE
3 - Back to Back:               Off
4 - DLCI:                       16
5 - Committed Info Rate(CIR): 32K
6 - Excess Burst Rate (Be):     24K
7 - Management type:            Annex A
8 - Polling Interval:           10Sec
9 - Full Status Counter:        6
10- Error Threshold:            3
11- Monitored Event Count:      4
12- Encapsulation Mode:         Mux
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

In the Trunk Configuration menu, the Access rate option (1) displays the data rate of the trunk. This rate can not be changed. Option 2 should remain in the default condition (Follows input pin from DTE) when used in a frame relay network. Option 3, the Back to Back option should normally remain off. Options 4 thru 6 are supplied by your service provider at the time the trunk was provisioned. These values have to be the same as the provisioned values. Options 8 thru 11 modify the management protocol and for the most part should remain unchanged. Option 12 Encapsulation Mode depends on the type of device at the other end of the frame relay network. If a MultiFRAD is at the other end of the network, then the Mux mode needs to be selected. If a non-MultiFRAD 100 is at the other end of the network, then Raw mode needs to be selected.

7 To enter the **DLCI** for your trunk, enter **4** and press **ENTER**. A DLCI submenu is displayed.

```
Enter the DLCI(Data Link Connection Identifier).
Valid values are between 0016 to 1007.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter the number that corresponds to the DLCI for your trunk. A two-digit number can be entered and the zeros will proceed the digits. The DLCI is supplied by your network service provider at the time the trunk was provisioned.

When you have entered your DLCI, the Trunk Configuration menu is displayed.

8 From the Trunk Configuration menu, enter option **5 Committed Info Rate** (**CIR**) and the CIR menu is displayed.

```
Enter the CIR (Committed Information Rate), in
units of 1000 (1K).  Valid values are between 0K
and 128K.  The CIR should be equal to or less
than the Trunk access rate.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter the number that corresponds to the CIR in units of 1K for your trunk. The CIR range is from 0 to 128K and should be equal to or less than the trunk access rate which can not exceed 56K. The CIR is supplied by your network service provider at the time the trunk was provisioned.

When you have entered your CIR, the Trunk Configuration menu is displayed.

9 From the Trunk Configuration menu, enter option **6 Excess Burst Rate** (**Be**) and the Be menu is displayed.

```
Enter the Be (excess Burst Rate), in units of 1000
(1K).  Valid values are between 0K and 128K.  The
sum of Be + CIR should be equal to or less than
the Trunk access rate.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter the number that corresponds to the Be in units of 1K for your trunk. The Be range is from 0 to 128K and the sum of Be plus CIR should be equal to or less than the trunk access rate.

The Be is supplied by your network service provider at the time the trunk was provisioned.

When you have entered your Be, the Trunk Configuration menu is displayed.

10 From the Trunk Configuration menu, enter option **7 Management Type** and the Management Type menu is displayed.

```
Management Type

1 - Annex D (ANSI T1.617)
2 - LMI
3 - Annex A (ITU-T Q.933)
P - Previous Menu

Selection : _
```

Enter the number that corresponds to the Management Type for your trunk. The Management Type is supplied by your network service provider at the time the trunk was provisioned.

Options 8 thru 11 modify the management protocol between the MultiFRAD and the network switch. For most applications, the default values should be adequate. If you do not need to change any of them, proceed to step 15.

11 From the Trunk Configuration menu, enter option **8 Polling Interval** and the Polling Interval menu is displayed.

```
Enter the Polling Interval, in units of seconds.
Valid values are between 5 and 30 seconds.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter the number of seconds for a polling cycle (i.e., the time period between each status enquiry message sent from the MultiFRAD).

12 From the Trunk Configuration menu, enter option **9 Full Status Counter** and the Full Status Counter menu is displayed.

```
Enter the Full Status Counter.
Valid values are between 1 and 255.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter the number between 1 and 255 that is going to be the number of polling cycles (minus one) before a full status is requested from the network.

13 From the Trunk Configuration menu, enter option **10 Error Threshold** and the Error Threshold menu is displayed.

```
Enter the Error Threshold.
Valid values are between 1 and 10.  The Error
Threshold must be less than or equal to the
Monitored Event Counter.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter a number that is less than or equal to the Monitored Event Count.

14 From the Trunk Configuration menu, enter option **11 Monitored Event Count** and the Monitored Event Count menu is displayed.

```
Enter the Monitored Event Count.
Valid values are between 1 and 10.  The Monitored
Event Count must be greater than or equal to the
Error Threshold.

x  - Enter Number, or
P  - Previous Menu

Selection : _
```

Enter a number between 1 and 10 that is greater than or equal to the Error Threshold.

15 Enter the letter **S** and press **ENTER** to store all configurations. Then enter the letter **M** and press **ENTER** to return to the Main Menu. Enter **5** to Exit Command Mode.

16 Place the Command Mode switch (Switch 1) on the side of the MultiFRAD in the UP position and return to step 6 in the Setup procedure in Chapter 3.

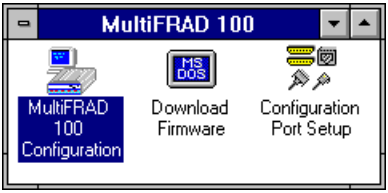
5

Software Utility Descriptions

5.1 Introduction

This chapter describes the MultiFRAD software which is designed for the Microsoft® Windows® environment. The MultiFRAD 100 Program Group has three icons that allow you to launch the software, download a firmware update, and configure the console pc port in order to communicate with the MultiFRAD.

The MultiFRAD 100 Configuration icon allows you to configure the data port for either a synchronous or asynchronous device, configure the trunk for a frame relay network, view statistics of the data port, perform diagnostic test of the unit, and download a new configuration to the unit. The Download Firmware allows new operating code (firmware) to be transferred to the MultiFRAD. The Configuration Port Setup icon establishes the parameters for which the console pc communicates with the MultiFRAD.



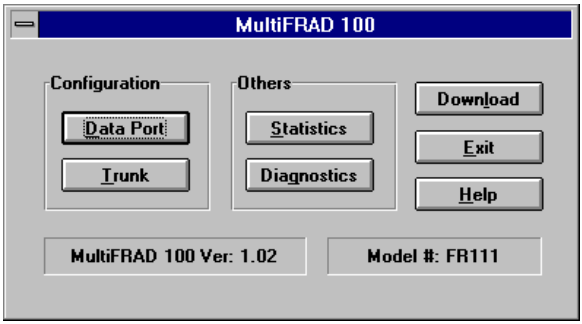
You may also start the MultiFRAD 100 Configuration from the File Manager by selecting the unofrad directory and double clicking on the *unofrad.exe* program in the file list.

You may also run MultiFRAD 100 Configuration from either the Program Manager or the File Manager by clicking on the Run command in the File Menu, then typing: C:*unofrad**unofrad.exe* in the Command Line field.

5.2 MultiFRAD Main Menu

The MultiFRAD 100 Main menu organizes your configuration process into the Data Port and Trunk configurations, allows you to view statistics, initiate Diagnostics, download a new configuration, exit the application, and view help screens.

The following sections describe each button in the main menu and each field and button in each dialog box.



5.2.1 Configuration

Data Port

This button allows you configure the data port for either synchronous or asynchronous mode of operation.

Trunk

This button lets you define the frame relay parameters.

5.2.2 Others

Statistics

This button allows you to view statistics of the trunk port.

Diagnostics

This button allows you to run two loopback tests, a memory test, and watch dog test.

5.2.3 Download

You can update the MultiFRAD setup on the target. This will bring the MultiFRAD down for updating the setup. Then, reboot the MultiFRAD.

5.2.4 Exit

This will end your MultiFRAD session and return you to the Program Manager.

5.2.5 Help

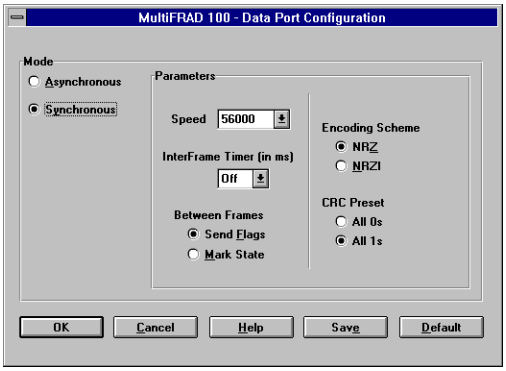
A thorough On-line Help system is provided with abbreviated information on the dialog boxes and the buttons within a dialog box.

5.2.6 MultiFRAD Version

The current version number of the MultiFRAD firmware is displayed in this field.

5.3 Data Port Configuration

This dialog box allows you to configure the data port. You will be able to set the parameters required for the successful operation of the port.



Mode Asynchronous/Synchronous

This allows you to set synchronous or asynchronous parameters required for transferring data between the MultiFRAD and the data port device. The data port can operate either in Asynchronous (UART) mode or Synchronous (HDLC) mode. Choose the Mode option that meets your site requirements. Both data port modes are discussed in the following sections.

Sync Mode Parameters

The following parameters are modifiable when the device connected to the data port connector on the back of the MultiFRAD 100-Series is a synchronous device. To change a parameter, click on the option button to be activated. To change a parameter using a drop down menu, click on the drop down arrow and a drop down menu displays the new parameters. Click on the desired parameter.

Speed

The Speed parameter needs to be set to match the speed of the sync device. When the data port is connected to a synchronous device, the baud rate is from 300 bps to 56K bps. The default port speed is 56K bps.

Note: The MultiFRAD always provides the clocking signal to the sync device. The MultiFRAD 100's data port can not be set to external clocking, it is always internal clocking.

Between Frames

The Between Frames parameter must be set to match the idle condition of the synchronous device connected to the data port. The Between Frames determine what happens when the synchronous data line is idle (i.e., no data frames are being transmitted). The default condition is to continuously send SDLC flags (Flags). The other condition is the mark state (Mark). The transmit LED will be off during idle time if the synchronous device is in the mark state during idle conditions.

Encoding Scheme

The Encoding Scheme parameter refers to the fact that synchronous data can be encoded by using either NRZ (Non-Return to Zero) or NRZI (Non-Return to Zero Inverted) method. This parameter must match the synchronous device's encoding. The default is NRZ. With NRZ encoding, the data is represented normally. With NRZI encoding, a logical one is represented by no transmission and a zero is represented by a transition at the beginning of the bit. Most synchronous devices can be configured for either NRZ or NRZI. If a synchronous device is not configurable, it most likely is set to NRZ. Refer to the device's user documentation for the encoding method.

InterFrame Timer (in mS)

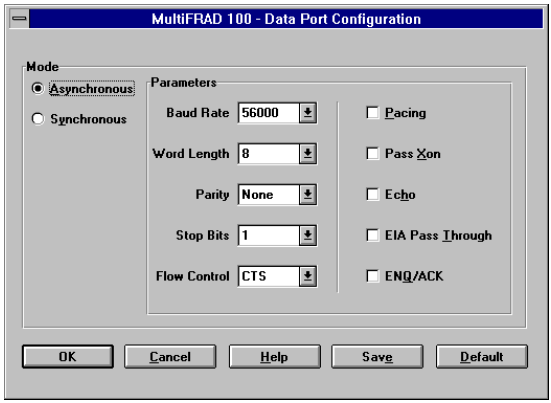
The InterFrame Timer parameter can be changed to make the MultiFRAD wait a specified length of time between frames. You can choose Off and delay times of 2,5,10 and 15 milliseconds. A typical use for this parameter is to simulate transmission delays encountered with equipment that toggles hardware signals after transmission of each frame, like PC cards used to connect to legacy systems. The following options can be specified for the timer: Off, 2mS, 5mS, 10mS, and 15mS. The default is off.

CRC Preset

The CRC Preset parameter allows the user to specify whether the polynomial used to calculate the CRC for each frame is preset to all 1s or all 0s. This option must match the synchronous device's CRC-preset setting. The default is All 1s.

Async Mode Parameters

Following Parameters are modifiable when the device connected to the data connector on the back of the MultiFRAD 100-Series is an asynchronous device. To change a parameter using a drop down menu, click on the drop down arrow and a drop down menu displays the new parameters. Click on the desired parameter. To change an option parameter, click on the option box. An "x" appears in the option box if the option is active.



Baud Rate

The Baud Rate parameter needs to be set to match the speed of the async device. The baud rate ranges from 300 bps to 57.6K bps. The default port speed is 19.2k bps.

Word Length

The Word Length parameter sets the number of bits in a word. The word length range is 5 to 8 bits. The default is 8 bits.

Parity

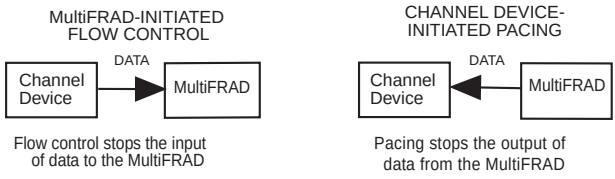
The Parity parameter sets parity for odd, even or none. Under normal conditions, parity is set to none. The default is none.

Stop Bits

The Stop Bits parameter sets the number of stop bits. The number of stop bits can be 1, 1.5, or 2. The default is 1 bit.

Flow Control

The Flow Control parameter allows for two types of flow control: the software-based XON/XOFF and the hardware-based Clear to Send (CTS). The default is CTS. Flow control is the means by which data flow from the device into the MultiFRAD is controlled. Flow control is necessary when the data handling capacity of the data port cannot keep up with the volume of data sent to it. When the data device controls data flow to itself, it is called pacing (see Pacing). The combination of flow control from the port device and pacing to the data device is how data transfers are regulated so that no data is lost.



Pacing

The Pacing parameter controls the data flow to the data device. Pacing is necessary when the flow of data to a device operating on the data port is more than it can process. If the device cannot process the volume of data sent to it, then the pacing option should be turned on. The pacing method used is determined by the type of flow control. The default condition is for this option to be turned off.

Pass Xon

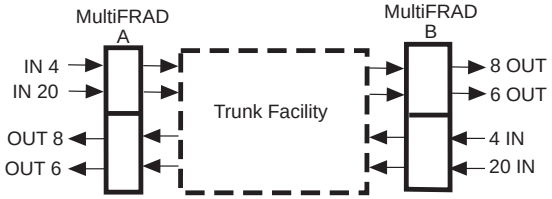
The Pass Xon parameter enables the XON/XOFF flow control signals to be passed on to the data device. This option has to be used in conjunction with the software-based XON/XOFF flow control option. The default condition is for this option to be turned off, and normally it should remain off.

Echo

The Echo parameter enables data entered on the data device keyboard to be returned to the device's monitor. The purpose of this option is so that an operator will not experience undue delays in seeing entered data appear on their monitor. The default condition for the echo option is off.

EIA Pass Through

The EIA Pass Through parameter allows the data device to receive EIA control signals through the MultiFRAD. Since, in normal interactive operation, the existence of a MultiFRAD should be transparent to the user, the EIA pass through option allows a terminal to operate as if it were connected directly to a communications line and not through a MultiFRAD. This is done by allowing selected pins (signals) on one MultiFRAD to be passed through to selected pins on a remote MultiFRAD. The default condition is for this option to be turned off. The following diagram shows how the EIA pass through option routes the selected signals:



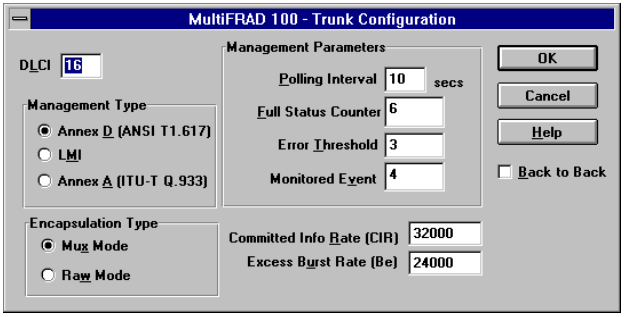
ENQ/ACK

The Enq/Ack parameter is a special flow control protocol used in Hewlett Packard computer systems. This option is sometimes referred to as Enquire/Acknowledge flow control because it's based on the computer sending an enquiry (ENQ) and then expecting an acknowledgment (ACK).

5.4 Trunk Configuration

This dialog box allows you to configure the trunk. You will be able to set the parameters required for the successful operation of the trunk.

Frame Relay is a multiplexing protocol designed to operate over transmission facilities that are virtually error free. In Frame Relay, frames are routed through the network on the basis of an attached label called a Data Link Connection Identifier (DLCI). Frame Relay combines the bandwidth efficiency of packet switching with end-to-end protocol transparency, increased speed and performance.



Data Link Connection Identifier (DLCI)

The DLCI is the identification of a particular logical link in the Frame Relay network and has local significance only. The DLCI is assigned by the frame relay service provider for the PVC (Permanent Virtual Circuit) that is on your access circuit. As the logical link traverses the Frame Relay network, input DLCI will be mapped to an output DLCI at every node. Access DLCIs for permanent logical links are assigned at subscription time. Trunk DLCIs are allocated dynamically. The valid value for a DLCI ranges from 16 to 1007 with a default of 16.

Management Type

The Management Interface defines a set of procedures and messages to manage a PVC and the physical link at the user network interface. Three management types are used: Local Management Interface (LMI), Annex A, or Annex D. The management type is determined by the network service provider at subscription time.

LMI describes a protocol and associated procedures operating on the local interface between the user and the network. It notifies the user of the addition, deletion, and presence of the PVC in the network. It also notifies the user of the end-to-end availability or unavailability of a PVC. Basic LMI protocol is based on a synchronous polling scheme where the user polls the network to obtain status information on the PVCs configured on the interface. LMI simply augments the ANSI/CCITT standard Frame Relay protocol and in no way interferes with the normal operation of user PVCs on the interface.

Annex D provides additional procedures for permanent virtual connections using unnumbered information frames. Annex D describes the means for notification of outage of a permanent virtual connection and recovery from such a condition. This follows the ANSI T1.617 standards.

Annex A provides additional procedures for permanent virtual connections using unnumbered information frames. Annex A describes the means for notification of outage of a permanent virtual connection and recovery from such a condition. This follows the ITU-T Q.933 standard

Encapsulation Type

The Encapsulation Type depends on the type of device that is connected at the other end of the trunk. If another MultiFRAD 100 is connected at the other end of the trunk, then the Mux mode is used. If a non-MultiFRAD 100 is at the other end of the trunk, then the Raw mode is used.

Management Parameters

Polling Interval

The Polling Interval defines a time period in which a status enquiry message is sent from the MultiFRAD to the network. The Status Enquiry message requests the status of the PVC(s) or verification of the status of a physical link. When the Status Enquiry message is sent by the MultiFRAD, the Polling Interval is restarted. The network responds with a status message that reports the status of the PVC or verifies the integrity of the physical link. The polling interval is 5 to 30 seconds with a default of 10 seconds.

Full Status Counter

The Full Status Counter determines how may Polling Intervals take place before a full status is requested from the network. A full status enquiry message is sent from the MultiFRAD to the network requesting a status report of the PVC on the physical link. The Full Status Counter can range from 1 to 255, with a default of 6.

Error Threshold

The Error Threshold is used to indicate the threshold number of errors occurring during a full cycle of the Monitored Event. After each full cycle of the Monitored Event Counter, if the actual number of errors equals or exceeds the error threshold, the trunk status is brought down and no data may be sent. The error count is reset at the beginning of each cycle of the Monitored Event Counter. The Error Threshold Count can range from 1 to 10 with a default of 3 and should be less than or equal to the Monitored Event Counter.

Monitored Event

The Monitored Event determines the number of Polling Intervals that have to take place before the User Network Interface is operational. It is also used with the error threshold count to determine if the trunk should be brought down. The range of this counter is from 1 to 10 events with a default of 4 events

Committed Info Rate (CIR)

The Committed Info Rate (CIR) determines the data transfer rate at which the network is committed to handle under normal conditions. This rate is the average over a minimum increment of time. The CIR may be less than or equal to the Access Rate. When the CIR is exceeded, but the data rate is below the Excess Burst Rate (Be), there is a possibility that data may be discarded. When the Be is exceeded, data will most likely be discarded. The default CIR is 32K.

Back to Back

The Back to Back is used to test the port by connecting two MultiFRADs together without a frame relay network in between them. Back-to-back mode still requires the use of DSU/CSUs, but they should not be connected over the frame relay network. The options are On and Off with a default of Off.

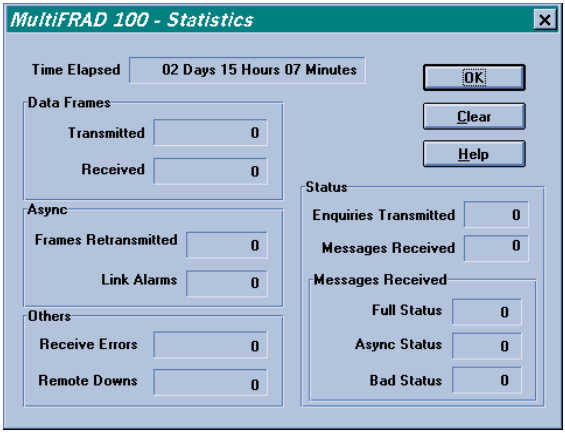
Back-to-back mode is useful when two MultiFRADs are at the same location and they are connected via DSUs for testing. Back-to-back mode can also be used to connect two MultiFRADs over a private leased line.

Excess Burst Rate (Be)

The Excess Burst Rate (Be) defines the maximum allowable data transfer rate the MultiFRAD can exceed the Committed Info Rate (CIR) during a time interval. The Be is the maximum additional data rate at which the MultiFRAD can present to the network during a time interval. The default Be is 24K.

5.5 Statistics

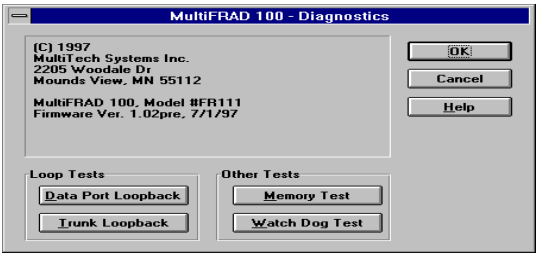
This dialog box allows you to view status of the trunk. Its possible to view signal status and other characteristics like data frames transmitted or received, status of enquiries transmitted and messages received and the status of the messages received.



If you want to clear the statistics so that you can have fresh statistics, then you should click on the clear button.

5.6 Diagnostics

The MultiFRAD Diagnostics dialog box allows you to run two loopback tests, a memory test, and watch dog test. The Diagnostics dialog box is displayed by clicking on the Diagnostic button in the MultiFRAD dialog box.



Loop Tests

The loop tests provide a short and long loop test. The short loop test is the data port loopback test which loops back the data from the data port to the sending device (DTE). The long loop test is the trunk loopback test which again receives data from the DTE device and loops it back from the internal DSU.

The data port loopback test has two modes which depend on the device connected to the data port. If the data port device is an async device, then the Command Mode switch (DIP-Switch position 1) can be in either position in order for the data to be looped back to the sending (DTE) device. If the data port device is a sync device, the Command Mode switch must be in the up position (Data mode) in order for the device to receive the looped back data.

The trunk loopback test requires that DIP-Switch position 3 (Loopback Test Mode) be in the DOWN position in order for the internal DSU to loop back the data received from the DTE device.

Other Tests

The memory test checks the on-board memory. A warning will be displayed that "The unit will be reset now and the factory defaults will be restored.

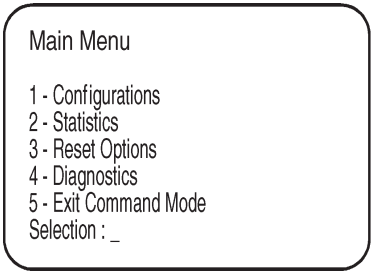
The watch dog test will reset the unit. A "Warning: This watchdog test will reset the unit. Do you wish to continue?" A brief message will be displayed stating that the watch dog test passed.

6

ASCII Terminal Menu System

6.1 Introduction

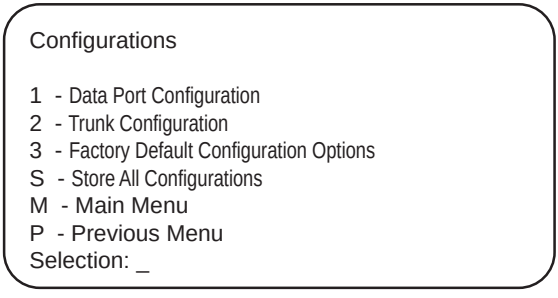
The menu system for the MultiFRAD provides a set of user-friendly configuration menus that are accessible from a main menu. The Main Menu contains five options that allow you to configure your MultiFRAD; display statistics; reset the unit or data port; run diagnostic tests, and exit the command mode.



To select one of the options from the Main Menu, enter the number corresponding to the option and press ENTER. A submenu is displayed that allows you to configure your MultiFRAD, display statistics, or run one of many diagnostics tests.

6.2 Configurations Menu

From the Configurations menu you can configure the data port or trunk, restore factory defaults; store all current configurations; or return to the Main Menu.



To configure the data port or trunk, enter the corresponding option number and press ENTER. To change to factory defaults, enter number 3 and press enter. You can set factory defaults for the entire unit or for either the data port or trunk. Select the option you wish to change, and

a message will appear on your screen saying to wait for 3 seconds. Then press ENTER to return to the Main Menu. To store the current configuration, enter **S** and press ENTER. To return to the Main Menu, enter **M** and press ENTER.

6.2.1 Async Data Port Configuration

The Async Data Port Configuration menu allows you to configure the data channel for either asynchronous or synchronous operation, depending on the type of device connected to the data port. If the port is configured for synchronous operation, refer to Sync Data Port Configuration.

When the port is configured for asynchronous operation, options such as speed, flow control, and pacing may need to be changed. The following Data Port Configuration menu displays the default parameters for async mode of operation:

```
Data Port Configuration

1  - Async/Sync:               Async
2  - Speed:                    57600
3  - Word Length:              8
4  - Stop Bits:                1
5  - Parity:                   None
6  - Flow Control:             CTS
7  - Enq/Ack Flow Control:     Off
8  - Echo:                     Off
9  - Pacing:                   Off
10 - EIA Pass Through:         Off
11 - Pass Xon:                 Off
S  - Store All Configurations
M  - Main Menu
P  - Previous Menu

Selection : _
```

The **Async/Sync** option configures the port for either asynchronous or synchronous operation. When an asynchronous device such as a PC or a host computer is connected to the port, the data port needs to be configured for asynchronous operation. The default for this option is Async.

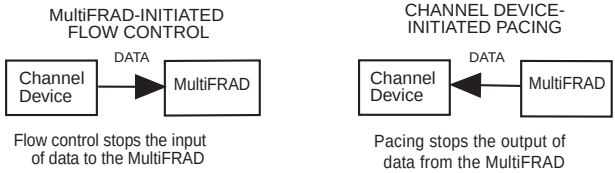
The **Speed** option needs to be set to match the speed of the async device. When the data port is connected to an asynchronous device, the baud rate can range from 300 bps to 57.6K bps. The default port speed is 57.6K bps.

The **Word Length** option sets the number of bits in a word. The word length range is 5 to 8 bits. The default is 8 bits.

The **Stop Bits** option sets the number of stop bits. The number of stop bits can be 1, 1.5, or 2. The default is 1 bit.

The **Parity** option sets parity for odd, even or none. Under normal conditions, parity is set to none. The default is none.

The **Flow Control** option allows for two types of flow control: the software-based XON/XOFF and the hardware-based Clear to Send (CTS). The default condition is CTS. Flow control is the means by which data flow from the device into the MultiFRAD is controlled. Flow control is necessary when the data handling capacity of the data port cannot keep up with the volume of data sent to it. When the data device controls data flow to itself, it is called pacing (see Pacing option). The combination of flow control from the port device and pacing to the data device is how data transfers are regulated so that no data is lost.

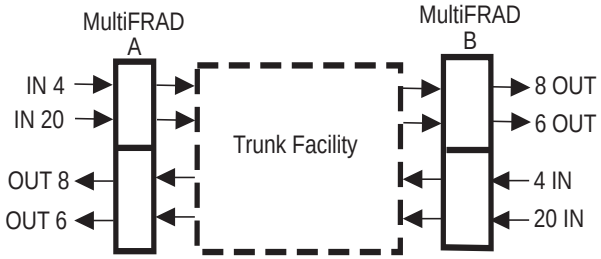


The **Enq/Ack Flow Control** option is a special flow control protocol used in Hewlett Packard computer systems. This option is sometimes referred to as Enquire/Acknowledge flow control because it's based on the computer sending an enquiry (ENQ) and then expecting an acknowledgment (ACK). The default condition for this option is off.

The **Echo** option enables data entered on the data device keyboard to be returned to the device's monitor. The purpose of this option is so that an operator will not experience undue delays in seeing entered data appear on their monitor. The default condition for the echo option is off.

The **Pacing** option controls the data flow to the data device. This option only applies to the async mode of operation. Pacing is necessary when the flow of data to a device operating on the data port is more than it can process. If the device cannot process the volume of data sent to it, then the pacing option should be turned on. The pacing method used is determined by the type of flow control. The default condition is for this option to be turned off.

The **EIA Pass Through** option allows the data device to receive EIA control signals through the MultiFRAD. This option only applies during the async mode of operation. Since, in normal interactive operation, the existence of a MultiFRAD should be transparent to the user, the EIA pass through option allows a terminal to operate as if it were connected directly to a communications line and not through a MultiFRAD. This is done by allowing selected pins (signals) on one MultiFRAD to be passed through to selected pins on a remote MultiFRAD. The default condition is for this option to be turned off. The following diagram shows how the EIA pass through option routes the selected signals:



The **Pass Xon** option enables the XON/XOFF flow control signals to be passed on to the data device. This option only applies during the async mode of operation. This option has to be used in conjunction with the software-based XON/XOFF flow control option. The default condition is for this option to be turned off, and normally it should remain off.

6.2.2 Sync Data Port Configuration

The Sync Data Port Configuration menu allows you to configure the data port for either asynchronous or synchronous operation, depending on the type of device connected to the port.

When the port is configured for synchronous operation, the following Data Port Configuration menu displays the default parameters:

```
Data Port Configuration

1 - Async/Sync:                Sync
2 - Speed:                     57600
3 - Idle Condition:            Flags
4 - NRZ/NRZI Encoding:         NRZ
5 - CRC Preset:                All 1s
6 - Inter-frame Timer:         Off
S - Store All Configurations
M - Main Menu
P - Previous Menu
Selection : _
```

The **Async/Sync** option configures the port for either asynchronous or synchronous operation. When a synchronous device such as a LAN bridge or router is connected to the port, the data port needs to be configured for synchronous operation.

The **Speed** option needs to be set to match the speed of the sync device. When the data port is connected to a synchronous device, the baud rate is from 300 bps up to 128K bps. The default channel speed is 56K bps.

The **Idle Condition** option must be set to match the idle condition of the synchronous device connected to the data port. The idle condition determines what happens when the synchronous data line is idle (i.e., no data frames are being transmitted). The default condition is to continuously send SDLC flags (Flags). The other idle condition is the mark state (Mark). The transmit LED will be off during idle time if the synchronous device is in the mark state during idle conditions.

The **NRZ/NRZI Encoding** option refers to the fact that synchronous data can be encoded by using either the NRZ (Non-Return to Zero) or NRZI (Non-Return to Zero Inverted) method. This option must match the synchronous device's encoding. The default is NRZ. With NRZ encod-

ing, data is represented normally. With NRZI encoding, a logical one is represented by no transition and a zero is represented by a transition at the beginning of the bit. Most synchronous devices can be configured for either NRZ or NRZI. If a synchronous device is not configurable, it most likely is set to NRZ. Refer to the device's user documentation for the encoding method.

The **CRC Preset** option allows the user to specify whether the polynomial used to calculate the CRC for each frame is preset to all 1s or all 0s. This option must match the synchronous device's CRC-preset setting. The default is All 1s.

The **Inter-frame Timer** option can be changed to make the MultiFRAD wait a specified length of time between frames being transmitted on the data port. The user can choose delay times of 2,5,10 and 15 milliseconds. A typical use for this parameter is to simulate transmission delays encountered with equipment that toggles hardware signals after transmission of each frame, like PC cards used to connect to legacy systems. The following options can be specified for the timer: Off, 2mS, 5mS, 10mS, and 15mS. The default is off.

6.2.3 Trunk Configuration

The Trunk Configuration menu allows you to configure the trunk. The default parameters are displayed in the following menu:

```
Trunk Configuration

1 - Access rate:                  56000
2 - RTS Signal Status:            Follows input from DTE
3 - Back to Back:                 Off
4 - DLCI:                         16
5 - Committed Info Rate(CIR):     32K
6 - Excess Burst Rate (Be):       24K
7 - Management type:              Annex A
8 - Polling Interval:             10Sec
9 - Full Status Counter:          6
10- Error Threshold:              3
11- Monitored Event Count:        4
12- Encapsulation Mode:           Mux
S - Store All Configurations
M - Main Menu
P - Previous Menu

Selection : _
```

The **Access Rate** option displays the maximum data rate of the trunk. The Access Rate determines the speed of the access channel (trunk). The Access Rate can not be changed.

The **RTS (Request-To-Send) Signal Status** of Follows input from DTE enables the DTE to control the carrier on status on the trunk. The RTS Forced ON option is used in the DSU-only mode when a multi-drop application is used and is only used by the host unit. The default is Follows input from DTE.

The **Back to Back** option is used to test the port by connecting two MultiFRADs together without a frame relay network in between them. Back-to-back mode still requires the use of DSU/CSUs, but they should not be connected over the frame relay network. The options are On and Off with a default of Off.

Back-to-back mode is useful when two MultiFRADs are at the same location and they are connected via DSUs for testing. Back-to-back mode can also be used to connect two MultiFRADs over a private leased line.

The **DLCI** option (Data Link Connection Identifier) is assigned by the frame relay service provider for the PVC (Permanent Virtual Circuit) that is on your

access circuit. Set the DLCI to indicate the PVC to terminate the trunk. The range of DLCIs is from 16 to 1007 with a default of 16.

The **Committed Info Rate (CIR)** option determines the data transfer rate at which the network is committed to handle under normal conditions. This rate is the average over a minimum increment of time. The CIR may be less than or equal to the Access Rate. When the CIR is exceeded, but the data rate is below the Excess Burst Rate (Be), there is a possibility that data may be discarded. When the Be is exceeded, data will most likely be discarded. The default CIR is 32K.

The **Excess Burst Rate (Be)** option defines the maximum allowable data transfer rate the MultiFRAD can exceed the Committed Info Rate (CIR) during a time interval. The Be is the maximum additional data rate at which the MultiFRAD can present to the network during a time interval. The default Be is 24K.

The **Management Type** option defines a set of procedures and messages to manage PVCs and the physical link at the user network interface. Three management types are used: Local Management Interface (LMI), Annex A, Annex D. The management type is determined by the network at subscription time.

The **Polling Interval** option defines a time period (T391) in which a Status Enquiry message is sent from the MultiFRAD to the network. The Status Enquiry message requests the status of the PVC(s) or verification of the status of a physical link. When the Status Enquiry message is sent by the MultiFRAD, the Polling Interval is restarted. The network responds with a status message that reports the status of the PVC or verifies the integrity of the physical link. The polling interval is 5 to 30 seconds with a default of 10 seconds.

The **Full Status Counter** option determines how many Polling Intervals take place before a full status (N391) is sent from the network. A Full Status Enquiry message is sent from the MultiFRAD to the network requesting status reports of all the PVCs on the physical link.

The **Error Threshold Count** option is used to indicate the threshold number of errors occurring during a full cycle of the Monitored Event Counter. After each full cycle of the Monitored Event Counter, if the actual number of errors equals or exceeds the error threshold, the trunk status is brought down and no data may be sent. The error count is reset at the beginning of each cycle of the Monitored Event Counter. The Error Threshold Count can range from 1 to 10 with a default of 3 and

should be less than or equal to the Monitored Event Counter.

The **Monitored Event Counter** option determines the number of Polling Intervals that have to take place before the User Network Interface is operational. It is also used with the error threshold count to determine if the trunk should be brought down. The range of this counter is from 1 to 10 events with a default of 4 events.

The **Encapsulation Mode** option depends on the type of device that is connected at the other end of the trunk. If another MultiFRAD 100 is connected at the other end of the trunk, then the Mux mode is used. If a non-MultiFRAD 100 is at the other end of the trunk, then the Raw mode is used.

6.3 Statistics

The Statistics menu allows you to view or clear statistics, or return to the previous menu or to the Main Menu.

```
Statistics
1  - View Statistics
2  - Clear Statistics
M  - Main Menu
P  - Previous Menu

Selection : _
```

To view or clear statistics, enter the corresponding option number and press **ENTER**. To return to the previous menu, enter **P** and press **ENTER**. To return to the Main Menu, enter **M** and press **ENTER**.

Two Trunk Statistics Menus are provided depending on how the data channel is configured. If the data channel is configured for an asynchronous mode of operation, then the Async Data Frames Retransmitted and Link Alarms statistics are presented. If the data channel is configured for synchronous mode of operation, then the Async Data Frames Retransmitted and Link Alarms statistics are not presented. The Trunk Statistics Menus provide information concerning the operation of the MultiFRAD that can aid you in testing for problems.

```
                    Trunk Statistics

Elapsed Time                    :00 Days 06 Hours 59 Minutes
Data Frames Transmitted         :      0
Data Frames Received            :      0
Receive Errors                  :      0
Remote Downs                    :      0
Async -
  Data Frames Retransmitted     :      0
  Link Alarms                   :      0
Status Enquiries Transmitted    :      0
Status Messages Received        :      0
Full Status Messages Received   :      0
Async Status Messages Received  :      0
Bad Status Messages Received    :      0
```

In Async mode, comparing the number of frames transmitted with the number of retransmits needed to get data over the link can indicate a line problem. Comparing the data frames received and receive errors can also indicate a problem with the trunk. Comparative numbers that

you might encounter could be 10,000 frames transmitted (or received) with 500 or 1000 retransmits (or receive errors). Link alarms simply tell you that there is some sort of problem on the trunk in async mode. You will find that the link alarms number will correspond to the retransmit and received frames numbers. Specifically, a link alarm means that it has been 10 seconds since the MultiFRAD has received an acknowledgment. Normally, three acknowledgments are received during a 10-second period.

The **Remote Downs** entry means that the MultiFRAD has sent data 30 times and could not get it through (the link between the two MultiFRADs is broken).

The **Status Enquiries Transmitted** count shows how many enquiries the MultiFRAD has sent to the network. An enquiry is sent every time the Polling Interval Timer expires (default of 10 seconds).

There are 4-counts of status messages received from the network. Status messages are sent by the network in response to the status enquiries from the MultiFRAD. The sum of the status messages received count and the full status messages received count should equal the status Enquiry Transmitted count.

The **Status Messages Received** count indicates the number of Keep-Alive status messages the network has sent.

The **Full Status Messages Received** count indicates the number of Full Status Messages (messages that include the PVC status - either new or active) received in response to a status enquiry.

The **Async Status Messages Received** count indicates the number of PVC status messages that were received independently, not as a response to an enquiry from the MultiFRAD.

The **Bad Status Messages Received** count indicates the number of status messages received that were bad due to a frame-level error (a bad CRC or an aborted frame) or a protocol error (due to the wrong management type, etc.)

6.4 Reset Options

The Reset Options menu allows you to reset the unit, the data channel, or return to the previous menu or to the Main Menu.

```
Reset Options

1 -  Reset Unit
2 -  Reset Data Channel
M -  Main Menu
P -  Previous Menu

Selection : _
```

To reset the unit, enter **1** and press **ENTER**. To reset the data channel, enter **2** and press **ENTER**. To return to the previous menu, enter **P** and press **ENTER**. To return to the Main Menu, enter **M** and press **ENTER**.

6.5 Diagnostic Tests

The Diagnostic menu allows you to run two loopback tests, a watch dog test, display the product and firmware identification or return to the previous menu or the Main Menu.

```
Diagnostics

1 - Loop Tests
2 - Memory Tests
3 - Watch Dog Test
4 - Product and Firmware ID
5 - Flash Firmware Upgrade
M - Main Menu
P - Previous Menu

Selection : _
```

6.5.1 Loop Tests

The Loop Tests menu allows for selection of two loopback tests, or return to the previous menu or to the Main Menu. The Data Port Loopback Test tests the interface between the data device and the Multi-FRAD. The Trunk Loopback Test tests can be used both locally and remotely. When it is used locally, the internal DSU should be set to

loopback mode (DIP-Switch 3 DOWN). This tests the complete path through the MultiFRAD up to the line circuitry and back to the data port. When it is used in a remote trunk loopback test mode, the remote DSU (or the telephone company's central office, CO) would be put into loopback mode. This tests the integrity of the local data device, Multi-FRAD, and the frame relay network. The Remote Trunk Loopback test is the most sophisticated of the two tests.

```
Loop Tests

1 - Data Port Loopback
2 - Trunk Loopback
M - Main Menu
P - Previous Menu

Selection : _
```

The **Data Port Loopback Test** puts the MultiFRAD's data port in loopback mode. This means that any data that comes into the data port is immediately looped back out to the user device. Use this test to verify that the data port cable and its connections are OK, and that the MultiFRAD's data port settings are correct.

The **Trunk Loopback Test** is selected when the internal DSU is set for loopback mode (DIP-Switch 3 is DOWN). This tests the data port circuitry and the MultiFRAD's trunk circuitry up the DDS line circuit.

The methodology for all of the tests is the same:

1. Put the MultiFRAD (either the local or remote one) into the desired test mode.
2. Connect the user device to the data port of the local MultiFRAD.
3. Send data from the user device.
4. Verify that the data received from the MultiFRAD matches exactly what was sent.
5. If the data received is the same as the data sent, then the test passed. If the data received is corrupted or no data is received, then the test failed. A failed test indicates a problem either with the cables, connections, or one of the units involved in the test. If the cause of the failure is not readily apparent, try using the process of elimination to isolate the trouble spot(s). The tests are listed in order of complexity. If the Remote Trunk Loopback fails,

try going back to the Local Trunk Loopback, and then even the data port loopback which is the most basic test. If there is still no clear cause of the problem, follow the steps in section 7.3, contacting Tech support.

6.5.2 Memory Test

The memory test verifies that each memory chip on the circuit board is working. The memory test destroys all stored parameters.

6.5.3 Watch Dog Test

The watch dog is a special circuit designed to reset the unit in case of a catastrophic error in the firmware. The watch dog test verifies that the watch dog circuitry is working.

6.5.4 Product and Firmware ID

This option displays the product identification and firmware version number.

6.5.5 Flash Firmware Upgrade

The flash firmware upgrade option is used to upgrade the firmware code in the PROM. Refer to Chapter 7, section on upgrading the flash PROM for detailed procedures.

7

Service, Warranty and Tech Support

7.1 Introduction

This chapter begins with your MultiFRAD 100-Series 2-year warranty. Read carefully the next section, “Tech Support,” if you have questions about or problems with your MultiFRAD. It includes the technical support telephone numbers, space for recording your product information, and an explanation of how to send in your MultiFRAD should you require service. The final three sections explain how to use our bulletin board service (BBS), and get support through CompuServe and the Internet.

7.2 Limited Warranty

Multi-Tech Systems, Inc. (“MTS”) warrants that its products will be free from defects in material or workmanship for a period of two years from the date of purchase, or if proof of purchase is not provided, two years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS’s written authorization, or used in any manner inconsistent with MTS’s instructions.

MTS’s entire obligation under this warranty shall be limited (at MTS’s option) to repair or replacement of any products which prove to be defective within the warranty period, or, at MTS’s option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS’s factory transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

7.3 Tech Support

Multi-Tech has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, call 1-800-972-2439. Please fill out the MultiFRAD information form below and have it available when you call. If your MultiFRAD requires service, the tech support specialist will guide you on how to send it in (see section 7.3.2).

7.3.1 Recording MultiFRAD Information

Please fill in the following information on your Multi-Tech MultiFRAD. This will help Tech Support in answering your questions. (The same information is requested on the Warranty Registration Card.)

Model Number: _____

Serial Number: _____

Firmware Version: _____

The model and serial numbers are on the bottom of your MultiFRAD. The Diagnostics menu displays the PROM firmware version number.

Before calling Tech Support, please note in the space below if your MultiFRAD is connected to a synchronous or asynchronous device on the data port. Also note status information about your MultiFRAD, including LED indicators, screen messages, diagnostic test results, or problems with a specific application, etc.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

7.3.2 Service

If your tech support specialist decides that service is required, your MultiFRAD may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems.

Include the following with your MultiFRAD:

- A description of the problem.
- Return billing and shipping addresses.
- Contact name and phone number.
- Check or purchase order number for payment if the MultiFRAD is out of warranty. (Check with your technical support specialist for the standard repair charge for your MultiFRAD).
- If possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent (see section 7.3.1).

Send your MultiFRAD to this address:

MULTI-TECH SYSTEMS, INC.
2205 WOODALE DRIVE
MOUNDS VIEW, MINNESOTA 55112
ATTN: SERVICE OR REPAIRS

You should also check with the supplier of your MultiFRAD on the availability of local service and/or loaner units in your part of the country.

7.4 About the Multi-Tech BBS

Multi-Tech Systems maintains a Bulletin Board Service (BBS) for its customers. The information available via the BBS includes new product information, product upgrade data, problem-solving tips, and a message service you can use to obtain additional information about Multi-Tech products, including the ones you own. The phone number for the Multi-Tech BBS is (612) 785-3702 or (800) 392-2432 (U.S.A. and Canada).

The BBS can be accessed by any asynchronous modem operating at 1200 bps to 33,600 bps at a setting of 8 bits, no parity, and 1 stop bit (8-N-1).

7.4.1 Logging on to the Multi-Tech BBS

To log on to the Multi-Tech BBS, perform the following steps.

1. Set your communications program to **8-N-1**.
2. Dial our BBS at (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).
3. At the prompts, type your first name, last name, and password; then press ENTER. If you are a first time caller, the BBS will ask if your name is spelled correctly. If you answer yes, a questionnaire will appear. You must complete the questionnaire to use the BBS on your first call.
4. Press ENTER until the Main Menu appears. From the Main Menu you have access to three main areas: the Files Menu, the Message Menu, and Bulletins. For help on menu commands, type **?**.

7.4.2 Downloading a File

If you know the file name

1. From the Main Menu, type **F** to access the Files Menu, then type **D**.
2. Enter the name of the file you wish to download from the BBS.
3. If a password is required, enter the password.
4. Answer **Y** or **N** to the automatic logoff question.
5. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
6. If you select Zmodem, the transfer will begin automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most datacomm programs, the PAGE DOWN key initiates the download.)
7. When the download is complete, press ENTER to return to the File Menu.
8. To exit the BBS, type **G** and press ENTER.

If you don't know the file name

1. From the Main Menu, type **F** to access the Files Menu. For a list of file areas, type **L**, press ENTER, then type **L** and press ENTER again. (If you do not type the second *L*, you will list all of the files on the BBS.)
2. Mark each file area you would like to examine by typing its list number and pressing ENTER.
3. Enter **L** to list all the files in the selected file areas. Enter **C** to go forward in the file list and **P** to go back.
4. To mark one or more files for download, type **M**, press ENTER, type the list numbers of the files, and press ENTER again.
5. Enter **D**. You will see a list of the files you have marked. Enter **E** if you would like to edit the list; otherwise enter **D** again to start the download process.
6. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
7. If you select Zmodem, the file will transfer automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
8. When the download is complete, press ENTER to return to the File Menu.
9. To exit the BBS, type **G** and press ENTER.

7.5 About CompuServe

In addition to the BBS, Multi-Tech provides support through CompuServe's Modem Vendor Forum (GO MODEMVEN). Refer to your CompuServe documentation for special operating procedures.

7.6 About the Internet

Multi-Tech is a commercial user on the Internet, and we retrieve messages from our customers on a periodic basis. Multi-Tech's presence includes a Web site at:

http://www.multitech.com

and an ftp site at:

ftp://ftp.multitech.com

Multi-Tech's presence includes a Web site at:

7.7 About the Multi-Tech Fax-Back Service

Multi-Tech's fax-back system provides 24-hour access to sales, marketing, and technical literature. Dial 612-717-5888, follow the voice prompts, and request document number 10 for a catalog of available documents. For convenience, have your fax number handy: _____. From the catalog of available documents, you can order newsletters, white papers, press releases, etc. from the sales and marketing index (pages 1-4), or order basic modem operation and troubleshooting guides from the technical support and engineering index. Just enter the applicable FB Doc. # from the left column of the catalog.

7.8 Upgrading the Flash PROM

Your MultiFRAD has a Flash PROM which contains firmware code for the hardware. At various times, Multi-Tech may add enhancements and/or fixes to the firmware. The Flash technology used in your MultiFRAD allows these upgrades to be loaded directly into the PROM chip through the serial port.

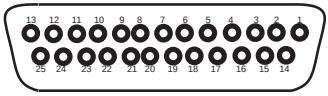
7.8.1 Using FlashPro to Upgrade MultiFRAD Firmware

1. Download FLASHPRO.ZIP and a new .HEX file from the Multi-Tech BBS.
2. Unzip the FLASHPRO.ZIP file. Place this unzipped file and the .HEX file in the same directory.
3. Run FlashPro by typing FLASHPRO and hitting ENTER at the DOS prompt.
4. Highlight the "Configure" option in the MAIN MENU and hit ENTER. Highlight "Active Port" and select the COM port to which you have your MultiFRAD attached. Highlight "Baud Rate" and select the rate at which you want to program. Hit ESC when finished.
5. Highlight the "Select File to Program" option in the MAIN MENU. Highlight the .HEX file. Hit ESC when finished.
6. Highlight "Program Firmware" option in the MAIN MENU. When you are prompted to confirm the file to program, press "Y".
7. If you have not successfully programmed FlashPro, return to step 3. To call Multi-Tech's Technical Support or BBS, refer to section 7.4.

Appendices

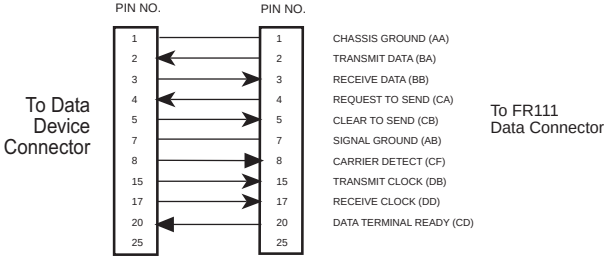
Appendix A
Cabling Diagrams

Data Cables

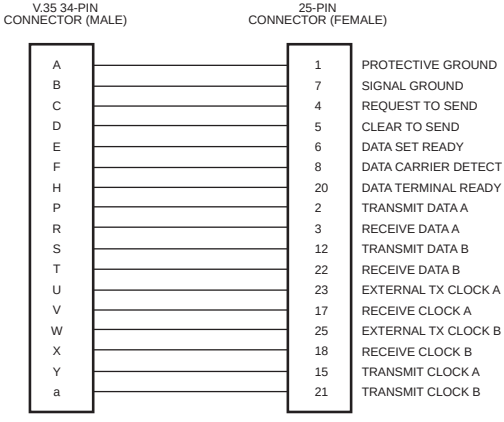


Data connector

RS232C/V.24 * Cable



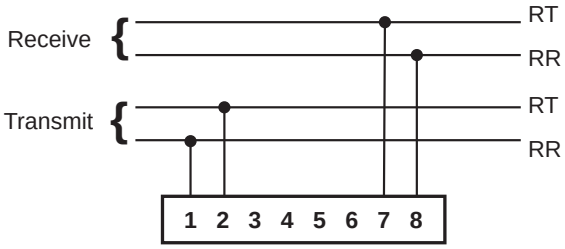
V.35 Adapter Cable**



* The FR111 RS232C interface circuits have been designed to meet the electrical specifications given in EIA (Electronic Industries Association RS232C and CCITT (Consultative Committee International Telegraph and Telephone) V.24 Standards.

** When configured for V.35 interface operation, the V.35 adapter cable should be used. This cable uses a 25-pin female connector at one end and a 34-pin Winchester male connector at the other end.

Trunk Cable



RJ-48 Cable

Pin Identification

Pin	Description	Destination
1	Transmit Pair	To Line
2	Transmit Pair	To Line
3	N/C	
4	N/C	
5	N/C	
6	N/C	
7	Receive Pair	From Line
8	Receive Pair	From Line

Back-To-Back Cable