Freeway® User Guide

DC 900-1333Q

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Preface

Purpose of Document

This document describes how to install and operate software on Protogate's Freeway server.

Note

The information in this document refers to the Freeway 3000 series models from Protogate that use the BSD operating system. If you are using an older Freeway model from Simpact with the VxWorks operating system, please refer to earlier versions of this document (Revision P and before). If you are having trouble locating earlier versions of this document, contact customer support at Protogate (support@protogate.com).

Intended Audience

This document should be read by users who install and operate the Freeway series of servers. The Freeway server has many utilities that allow you to configure and control the run-time operation of the server.

Required Equipment

Items Supplied by Protogate

- Freeway unit

- Power cord (Freeway models with dual power supplies have two power cords)

- Set of keys (for hinged front panel on Freeway)

- Console cable which can be connected to the Freeway serial console (each end of the cable has both a 9-pin and a 25-pin connector)

- Appropriate serial cables to connect the ICPs to the data communications equipment (ICP2432B)

- Two-headed loopback cable (for protocol loopback testing using internal ICP clock source)

- Software distribution media on CDROM

- Various documentation

Items Supplied by You

- Standard Ethernet local-area network (LAN)

- Computer running TCP/IP to run the client program that will connect to the Freeway server over Ethernet. This computer may also be used to access the Freeway menus (via telnet, rlogin, ssh, etc.)

- Ethernet cables for connecting Freeway to the LAN

- Serial cables for connecting the wide-area network (WAN) ports to a patch panel or modem (if needed)

- Optional - VT100-compatible terminal or terminal emulator (such as HyperTerminal) to be used as the Freeway local serial console.

- Optional - VGA monitor and keyboard to be used as the Freeway local console.

Organization of Document

Chapter 1 gives an overview of the Freeway server.

Chapter 2 describes the Freeway server installation and initial boot up.

Chapter 3 describes how to install the DLI/TSI library and protocol loopback programs on a client system.

Chapter 4 describes the Freeway server interactive menu choices.

Chapter 5 describes the details of the Freeway boot procedure and general operation.

Chapter 6 describes how to customize the Freeway system configuration.

Chapter 7 describes how to install software updates.

Chapter 8 describes how to configure a system as a Freeway boot server.

Appendix A gives an overview of the key files and directories that make up the Freeway system software.

Appendix B lists a summary of BSD shell commands that are useful in the Freeway environment.

The Glossary lists Freeway terminology and acronyms.

Protogate References

The following general product documentation list is to familiarize you with the available Protogate Freeway and embedded ICP products. The applicable product-specific reference documents are mentioned throughout each document (also refer to the "readme" file shipped with each product). Most DC-900 documents are available online at Protogate's web site, www.protogate.com. Document numbers starting with DC-908 are export restricted and are not available on the web site. Please contact Protogate to obtain copies of DC-908 documents.

General Product Overviews

- *ICP2432 Technical Overview*   25-000-0420

Hardware Support

- *Freeway 3112 Hardware Installation Guide*   DC-900-2016
- *Freeway 3212 Hardware Installation Guide*   DC-900-2017
- *Freeway 3412 Hardware Installation Guide*   DC-900-2018
- *Freeway 3612 Hardware Installation Guide*   DC-900-2019
- *ICP2432B Hardware Description and Theory of Operation*   DC-900-2006
- *ICP2432 Electrical Interfaces (Addendum to DC-900-2006)* DC-900-1566
- *ICP2432B Hardware Installation Guide*   DC-900-2009

Freeway Software Installation and Configuration Support

- *Freeway Message Switch User Guide*   DC-900-1588
- *Freeway Release Addendum: Client Platforms*   DC-900-1555
- *Freeway User Guide*   DC-900-1333
- *Freeway Loopback Test Procedures*   DC-900-1533

Embedded ICP Software Installation and Programming Support

- *ICP2432 User Guide for Digital UNIX*   DC-900-1513
- *ICP2432 User Guide for OpenVMS Alpha (DLITE Interface)*   DC-900-1516
- *ICP2432 User Guide for Windows NT (DLITE Interface)*   DC-900-1514

Application Program Interface (API) Programming Support

- *Freeway Data Link Interface Reference Guide*   DC-900-1385
- *Freeway Transport Subsystem Interface Reference Guide*   DC-900-1386
- *QIO/SQIO API Reference Guide*   DC-900-1355

Socket Interface Programming Support

- *Freeway Client-Server Interface Control Document*   DC-900-1303

Toolkit Programming Support

- *Freeway Server-Resident Application (SRA) Programmer Guide* DC-900-1325
- *OS/Protogate Programmer's Guide*   DC-900-2008

- *Protocol Software Toolkit Programmer Guide*   DC-900-2007

Protocol Support

- *ADCCP NRM Programmer Guide*   DC-900-1317
- *Asynchronous Wire Service (AWS) Programmer Guide*   DC-900-1324
- *Bit-Stream Protocol Programmer Guide*   DC-900-1574
- *BSC Programmer Guide*   DC-900-1340
- *BSCDEMO User Guide*   DC-900-1349
- *BSCTRAN Programmer Guide*   DC-900-1406
- *DDCMP Programmer Guide*   DC-900-1343
- *Military/Government Protocols Programmer Guide*   DC-900-1602
- *X.25 Call Service API Guide*   DC-900-1392
- *X.25/HDLC Configuration Guide*   DC-900-1345
- *X.25 Low-Level Interface*   DC-900-1307

Document Conventions

The term "Freeway" refers to any of the Freeway models (for example, 3112, 3212, 3412, or 3612).

Program code samples are written in the "C" programming language.

Earlier Freeway terminology used the term "synchronous" for blocking I/O and "asynchronous" for non-blocking I/O. Some parameter names reflect the previous terminology.

Revision History

The revision history of the *Freeway User Guide*, Protogate document DC 900-1333Q, is recorded below:

Revision	Release Date	Description
DC 900-1333A	May 1994	Original release

Revision	Release Date	Description
DC 900-1333B	September 1994	Added Freeway 1000 information Updated installation procedures Updated operation procedures
DC 900-1333C	November 1994	Updated installation procedures
DC 900-1333D	February 1995	Updated installation procedures
DC 900-1333E	March 1995	Added more detailed Freeway 1000 information
DC 900-1333F	May 1995	Enhanced boot parameters information, updated menus, and added loopback information for AWS and ADCCP NRM
DC 900-1333G	March 1996	Updated for version 2.4 release Removed bootp information Clarified server toolkit information Replaced X.25 loopback test with CS API test Added information on: • DDCMP • ICP6030 • Marketfeed 2000 • TACMIL • Windows NT
DC 900-1333H	May 1997	Updated for version 2.7 server release Added Freeway 8800 information
DC 900-1333I	August 1997	Updated for version 2.7.1 server release; user must now build binary and library files Deleted Freeway 1000 information Added Freeway 1100 information
DC 900-1333J	June 1998	Updated for version 2.8 server release Moved loopback tests to separate document
DC 900-1333K	December 1998	Updated for server toolkit release
DC 900-1333L	February 1999	Updated for ICP_IP virtual devices Added Freeway 1150 information Moved port numbering and cabling and LED appendices to hardware documents
DC 900-1333M	June 1999	Updated for version 2.9 server release Updated menu options Added send and receive buffer size options to the bootcfg.ip file Added Freeway 1200 and 1300 information
DC 900-1333N	July 1999	Added SNMP information (Section 1.2.4 on page 29, Figure 4–15 on page 133, and Figure 4–17 on page 135)

Revision	Release Date	Description
DC 900-1333O	December 1999	Added new boot flag, 0x2000 Added snd_q_size, connect_period, linger_on, and linger_off configuration parameters to Section 3.2.1 Added sock_stream_listen and sock_stream_ connect to socket type parameter
DC 900-1333P	February 2002	Update document with Protogate contact information.
DC 900-1333Q	September 2013	Update for newer Freeway server releases. Update document to reflect the FreeBSD operating system. Update Freeway drawings and references to the Freeway 3xxx series hardware.

Customer Support

If you are having trouble with any Protogate product, call us at (858) 451-0865 Monday through Friday between 8 a.m. and 5 p.m. Pacific time.

You can also fax your questions to us at (877) 473-0190 any time. Please include a cover sheet addressed to "Customer Service."

We are always interested in suggestions for improving our products. You can use the report form in the back of this manual to send us your recommendations.

Freeway Introduction

This manual describes how to install and operate your Freeway server. Before starting the Freeway server, you should familiarize yourself with basic Freeway concepts as described in this introductory chapter. Then you can proceed to Chapter 2 which contains the initial installation and boot procedure. Refer to the Glossary for Freeway terminology and acronyms.

1.1 Freeway Overview

Protogate's Freeway server enables client applications running on a PC or similar system to access multiple serial communication lines on a wide-area network (WAN). The client application connects to the Freeway server via the Ethernet local-area network (LAN).

The Freeway server is a rack-mountable system that has an Intel-based single-board computer (SBC) along with several PCI-bus slots. The Freeway server runs Protogate's Freeway OS which is based on the BSD Unix operating system. The LAN interface is managed by dual Ethernet ports on the SBC. Additional Ethernet ports may be added to the Freeway if needed. The WAN interfaces (serial communication lines) are handled by one or more Protogate Intelligent Communication Processor (ICP) boards. Each ICP boards has its own CPU and memory, and executes the specific communication protocol software required for the WAN lines. The ICP boards run Protogate's real-time operating system (OS/Protogate) and are available in 3 models depending on the number of serial ports: 2-port, 4-port, or 8-port. Each ICP board uses one PCI slot on the Freeway server.

The Freeway server can be any of several models depending on the size and number of PCI slots available. For example, Freeway 3112 (1U), Freeway 3212 (2U), Freeway 3412 (4U), or Freeway 3612 (6U). Figure 1–1 shows a typical Client-Freeway-ICP configuration.
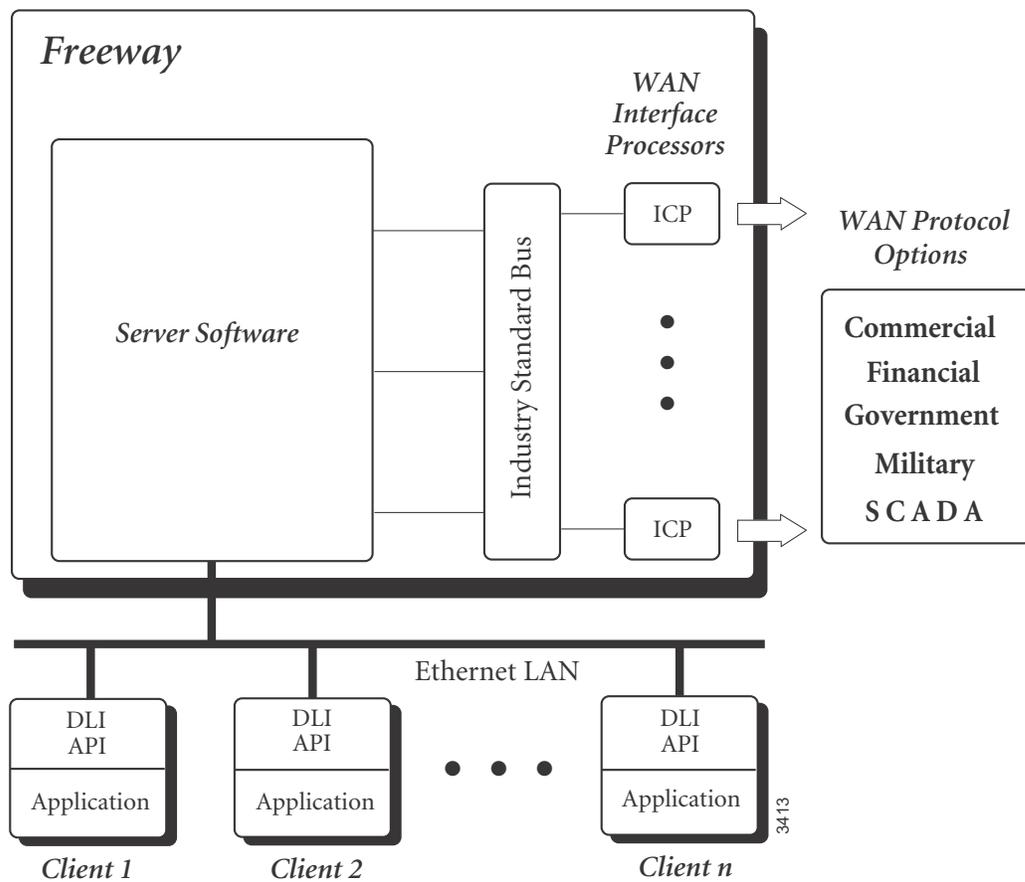
Figure 1–1: Freeway Configuration

Summary of Freeway product features:

- Elimination of difficult LAN and WAN programming and systems integration by providing a powerful and consistent data link interface (DLI)

- Access to communication protocols from multiple different client operating systems and hardware platforms

- Support for multiple WAN communication protocols simultaneously

- Support for multiple ICPs (two, four, or eight communication lines per ICP)

- Creation of customized server-resident application (SRA) software, using on-server software development tools

- Freeway server standard support for Ethernet and Fast Ethernet LANs running the transmission control protocol/internet protocol (TCP/IP)

- Freeway server management interactive menus available through a local console, ssh, telnet, rlogin, or web browser.

- Freeway server performance monitoring with the simple network management protocol (SNMP),

Summary of ICP product features:

- Variety of off-the-shelf communication protocols available from Protogate

- Software selectable electrical interfaces including EIA-232, EIA-449, EIA-530, and V.35

- Creation of customized ICP-resident protocol software, using Protogate's protocol software development toolkit

- Custom protocol software available from Protogate engineering

1.2 Freeway Concepts

The following concepts support the Freeway features described in Section 1.1.

1.2.1 Freeway Services

Freeway can be configured to offer a number of services to clients residing on the LAN. These services are shared among applications designed to operate in the client/server model of today's distributed computing environment.

Freeway offers Protogate's real-time data communication protocols. These services allow clients to connect to primary and consolidated financial feeds, military satellite communications, process control monitoring, telecommunications network monitoring, and similar applications.

1.2.2 User Customization

If one of the standard services offered by Freeway does not meet the requirements of your application, you can develop and integrate customized services into Freeway using Protogate's software development kits. The *Protocol Software Toolkit Programmer Guide* explains how to develop real-time protocols that run on an ICP residing within Freeway. The *Freeway Server-Resident Application (SRA) Programmer Guide* explains how to develop server-resident applications (SRAs) which are programs that run on the Freeway Server itself.

1.2.3 Server Management

Server Management is supported through an interactive menu interface that can be accessed either through a local console serial port, or via remote login using telnet or rlogin facilities. Functions such as physical and service configuration, monitoring of server operation, system shutdown, and system startup are described in Chapter 4.

1.2.4 SNMP Support

Freeway software provides an SNMP v1/v2c/v3-compliant SNMP agent that supports read-only SNMP access to Freeway-supported MIBs. In addition to the usual system-related and IP-network-related SNMP OIDs, additional OIDs which are specific to Freeway and to some ICP protocols are available. These additional SNMP OIDs are specified in these two files located on the Freeway disk drive:

/usr/local/freeway/include/RS-232-MIB.txt

/usr/local/freeway/include/SIMPACTFREEWAY-MIB.txt

1.3 Freeway Server Configurations

The software on each Freeway Server is pre-configured at the Protogate factory to fit individual customer needs. When delivered, a Freeway can have one of two types of configurations: standard and custom. Please read the sections below to determine the type of your Freeway Server.

1.3.1 Standard Freeway

A Freeway configuration is considered "standard" when there is no additional software (SRAs) loaded on the Freeway server besides the Freeway OS. A client program accesses the WAN lines on a standard Freeway via the DLI API. The following features apply to a standard Freeway:

- Freeway disk drive is usually a Flash drive

- Installation CDs are only Freeway OS and protocol software

- Client access to protocols via DLI API library on client system

- Freeway server is passive after boot (no ICP or network connections are started until requested by client)

- Freeway server may be shut down by turning off the power switch

1.3.2 Custom Freeway

A Freeway configuration is considered "custom" when it contains software (SRAs) loaded on the Freeway server in addition to the Freeway OS. On a custom Freeway, the WAN lines are normally accessed by the SRA and the client accesses the SRA by means other than the DLI API. Examples of a custom Freeway are:

- Protogate's Monitor product

- ADIN Message Switch

- UPT Freeway

The following features apply to a custom Freeway:

- Freeway disk drive is usually a rotating hard drive with a read/write partition enabled

- Installation CDs are Freeway OS, protocol software, and SRA software

- Client access to protocols via SRA on Freeway system

- Freeway server may be active after boot depending on configuration (ICP or network connections may be started by SRA at boot time)

- Freeway server must be shut down by executing the "shutdown" command from within the shell.

Chapter

2

Freeway Installation and Initial Boot

This chapter describes how to install and boot the Freeway server for the first time. You must have installed the Freeway hardware as described in the appropriate Freeway hardware installation guide.

2.1 Freeway Server Software and CDROMs

Freeway server and protocol software is almost always pre-installed at the Protogate factory on the Freeway's flash or hard disk drive. Also, the Freeway is configured to boot itself from its hard or flash drive. Therefore, no server software installation is required on new Freeway servers.

> **Note**
>
> Software CDROMs that are shipped along with a new Freeway system are for recovery purposes only. Do not install these CDROMs on a new Freeway system.

With each Freeway system, Protogate includes CDROMs for all the software installed on the system. These CDROMs are for backup only in case something happens to your Freeway disk drive. You should store these CDROMs in a safe place in case you need to use them later. Below are some reasons why you may need to use the CDROMs:

- If you need to install the DLI library on your client system, you will need to use the Freeway Server Software CDROM for this. See Chapter 3 for details.

- If you want to run a specific protocol loopback program on your client system, you can obtain the source code for that loopback program from the CDROM for that specific protocol. See chapter Chapter 3 for details.

- If you need the Freeway to boot over the LAN from a boot server on the network, refer to Chapter 8 for instructions on how to configure a system to act as a "boot server" for the Freeway.

- If the flash drive on your Freeway has been corrupted or you want to reinstall the protocol and/or server software, refer to Chapter 7 for instructions on how to install the server and protocol software from the original CDROM distribution.

2.2 Booting the Freeway

The Freeway system boots itself from its own disk drive at power-up. However, there are three important things you need to do when you boot a Freeway for the first time:

1. Assign an IP address to the Freeway so it can be accessed on your local network.

2. Check to make sure that you can access the Freeway server from another location on your local network.

3. Check to see if the protocols are downloaded and running on the ICP boards.

Some of these steps you may have already done in the hardware installation or may have been done at the Protogate factory, however, you can still use the procedure below to check the configuration and operation of the Freeway.

2.2.1 Initial Boot Summary

Table 2–1 summarizes the steps required when booting a Freeway for the first time. These steps are described in detail later in this section.

Table 2–1: Installation and Initial Boot Steps

Steps	Reference Section(s)
1. Connect a console device to the Freeway.	Section 2.2.2 on page 33
2. Power up the Freeway.	Section 2.2.3 on page 35
3. Stop the Freeway Boot.	Section 2.2.4 on page 36
4. Change the Freeway IP Address.	Section 2.2.5 on page 37
5. Continue the Freeway Boot.	Section 2.2.6 on page 39
6. Connect the Freeway to your network.	Section 2.2.3 on page 35
7. Check the network (Ethernet) connection.	Section 2.2.8 on page 40
8. Check the protocol (serial) connections.	Section 2.2.9 on page 42

2.2.2 Connecting a Freeway Console

The Freeway Console is the primary method of accessing the Freeway operating system and menus. You can set up a Freeway Console connection using one of two methods: with an ASCII terminal connected to the serial console port, or with a VGA monitor and keyboard. The two methods are described below.

2.2.2.1 ASCII Terminal to Serial Port

The Freeway Console serial port is a 9-pin male D-connector at the rear of the Freeway server. This port is connected to a serial ASCII terminal through the Freeway Console Cable which is included with every new Freeway system. The Freeway Console Cable is a serial null modem cable used to access the Freeway menu functions and logs. Each end of the cable has both a 9-pin and a 25-pin female D-connector.

Insert one end of the console cable in the 9-pin connector on the rear of the Freeway. Insert the other end of the console cable into a device that can be used as a serial ASCII display terminal. The following are some examples of serial display devices.

- **Windows-based PC or Laptop:** You can use a Windows-based PC or laptop as a console by connecting the console cable to one of the serial ports (COM1, COM2, etc.) on the back of the PC and running a terminal emulation program such as Putty or HyperTerminal. Connect your emulation program to the serial port and set the line parameters to 9600 bits/sec, no parity, and no flow control. If your laptop does not have a serial port, you can find inexpensive USB-to-serial devices at your local computer store.

- **Unix Platform:** Connect the console cable to one of the serial ports on your Unix system and run a terminal emulation program such as TIP. Set the serial line parameters to 9600 bits/sec, no parity, and no flow control.

- **Compatible ASCII Terminal:** If you have an ASCII "dumb" terminal available (such as a VT-100 or VT-200 type), connect the 25-pin end of the console cable to the rear of the terminal. Set the line parameters to 9600 bits/sec, no parity, and no flow control.

2.2.2.2 VGA Monitor and Keyboard

If you do not have an ASCII terminal device available, you may access the Freeway using a VGA monitor and keyboard. The only disadvantage of using a monitor and keyboard is that you will not be able to stop the boot-up in progress as described in Section 2.2.4. You must allow the Freeway to completely boot, then login to the Freeway and change the Boot Parameters from the main menu.

To access the Freeway with a monitor/keyboard, first connect a VGA-compatible monitor to the 15-pin VGA connector at the rear of the Freeway server. Second, connect a keyboard to the PS2 connector located just below the VGA connector on the Freeway. If you have a USB keyboard, you will need to use a USB-to-PS2 adaptor since the USB

ports on the Freeway are normally disabled after boot-up. The Freeway Console does not require a mouse device.

Caution

Never connect or disconnect the PS2 keyboard while the Freeway server is powered on.

2.2.3 Power up the Freeway

In order to power up the Freeway server, the power switches on the power supply (or both power supplies for redundant power systems) must be turned on. Then turn on the main power switch at the front of the unit. You should start seeing messages displayed on the console device after about 5 to 10 seconds. Figure 2–1 shows an example of what you will see on the console display when the Freeway is powered up.

```
>> FreeBSD/i386 BOOT
Default: 0:ad(0,a)boot/loader
boot:
Uncompressing ... done
                    Console: serial port
BIOS drive A: is disk0
BIOS drive C: is disk1
BIOS 639kB/128960kB available memory

FreeBSD/i386 bootstrap loader, Revision 0.8
(root@nike.protogate.com, Tue Sep 16 01:55:35 PDT 2003)
/kernel text=0x120ab3 data=0x1c4ac+0x6dcb4
syms=[0x4+0x21310+0x4+0x26020]
/
Hit [Enter] to boot immediately, or any other key for command prompt.
Booting [kernel] in 9 seconds...
...
Booting [kernel]...
Copyright (c) 1992-2003 The FreeBSD Project.
```

Figure 2–1: Sample Initial Freeway Boot Display

2.2.4 Stop the Freeway Auto-Boot

While the Freeway is booting up, it will display several lines of information from the BSD operating system. At one point, the boot process will reach the actual Freeway boot. At this point the boot sequence gives you a chance to interrupt the boot process in order to display or change the boot parameters. You must hit the enter (return) at this time in order to stop the boot process. When you hit enter at this point, a 3-item menu will be displayed on the screen. Figure 2–2 shows an example of the screen you will see before and after you hit enter.

```
                      Protogate Freeway

VI-200-3115: FWSER 3.1-0 Sep 19 19:02:12 PDT 2003 Freeway Boot System

Press <Enter/Return> key to stop auto-boot...
  7

VI-200-3115: FWSER 3.1-0 Sep 19 19:02:12 PDT 2003 Freeway Boot System
        Main Menu
-----------------------------

 1) System Boot

 2) Display Boot Parameters

 3) Edit Boot Parameters

Select: 2
```

Figure 2–2: Sample Freeway Initial Boot Menu

If you fail to hit enter in time to stop the Freeway from booting, or if you are using a VGA monitor and keyboard as the console, simply allow the Freeway to boot until you see the "login" prompt. Then login (username:root, password:setup) to get to the Freeway Main Menu, and go on to the next section (Section 2.2.5).

2.2.5 Display and modify the Boot Parameters

Display the Freeway's current boot parameter settings by entering 2 from the initial boot menu, or entering 2, 3, then 4 from the Freeway Main Menu. Unless you have made prior arrangements with Protogate before your Freeway was shipped, you will at least have to change the IP address (and possibly the subnet mask) of the Freeway so that it can appear as a device on your network. You may also want to change the Freeway name as well to make it easier for identification when you log in later.

To modify the boot parameters from the initial boot menu, hit return to get back to the initial boot menu, then enter 3 to edit the boot parameters. From the Freeway menu, hit 1,1 to return to the Main Menu, then hit 3 then 2 to edit the boot parameters.

The Freeway will display the parameters one at a time and give you a chance to change each one. To keep the parameter as is, hit enter. To change a parameter, type in the new value then hit enter. To erase a parameter value type a period (".") then hit enter. Figure 2–3 shows an example of changing the Freeway name and IP address from the initial boot menu. User input is shown in bold.

Note that when the Freeway is configured to boot from its own flash drive (boot device is "ide=0,0"), the following parameters are ignored at boot time:

- FTP User Name

- FTP Password

- Boot Server Name

- Boot server Inet Address

- System Boot Directory

You may either leave this information as is or erase these parameters.

```
  Select: 3

  Freeway System Boot Parameters
  ------------------------------

    Enter '.' to erase parameter
    Enter '<RETURN>' for no parameter change

  Boot Device            : ide=0,0
  Processor Number       : 0
  FTP User Name          : freeway
  FTP Password           : password
  Flags                  : 0x1000
  Freeway Server Name    : freeway_0 devel_fwy
  Freeway Inet Address   : 192.168.1.29 192.168.0.100
  Freeway Subnet Mask    : ffffff00
  Boot Server Name       : gw2
  Boot Server Inet Address: 192.168.1.2
  System Boot Directory  : /usr/home/freeway/boot/
  System Boot File Name   : fwybsd
  Configuration File Name : bootcfg
  Secondary Net Interface : fei
  Gateway Inet Address    :

  Save modifications?

  Enter 'yes <RETURN>' to save modifications
  Enter 'no <RETURN>' to prevent modifications: yes
  copying new boot parameters to BSD partition on hard disk
```

Figure 2–3: Example of Modifying Freeway Boot Parameters

After changing all the desired parameters, you must type "yes" at the "save modifications" prompt in order for the changes to take place.

For more detailed information about the boot parameters, refer to Table 4–2 on page 107.

Note

> The Freeway boot parameters can also be modified by using a boot parameters initialization disk. For more information on this method, see Section 5.1.4 on page 144.

2.2.6 Continue the Freeway Boot

After you have set the correct IP address, hit return to get back to the initial boot main menu and select 1 to boot the Freeway box. From the Freeway menus, hit 1 and return repeatedly until you get to the Shutdown Options. Then hit 2 to reboot the system.

As the Freeway boots, it will display several informational messages on the console and then eventually display the login prompt shown in Figure 2–4.

```
+------------ BSD Freeway (fwybsd) ------------+
|                                              |
| Log in as "root"    (password "setup"),      |
|     or as "freeway" (password "password").   |
|                                              |
| For information regarding this system,       |
| contact support@protogate.com                |
|                                              |
+----------------------------------------------+

PicoBSD (devel_fwy) (ttyd0)

login:
```

Figure 2–4: Freeway Console Login Prompt

Freeway initial boot is now complete. The next sections describe additional procedures that test to see if the Freeway is correctly configured. Once you have determined that the Freeway is successfully connected on your network, you may remove the local console device and cable. The Freeway does not require a local console device to be attached in order to boot up.

Caution

Never connect or disconnect the PS2 keyboard while the Freeway server is powered on.

2.2.7 Connect the Freeway to the Network

Using an RJ-45 cable, connect the Freeway to your network by plugging the connector into one of the RJ-45 jacks at the rear of the Freeway. Although both network connectors can be active on the Freeway, only one of the connectors are configured to run during single-Ethernet operations. That Ethernet connector is marked as "primary". The connector that is not used is marked as "secondary". Note that the Freeway does not need to be connected to the LAN network in order to successfully boot.

2.2.8 Check the Network Connection to the Freeway

Once the Freeway has booted successfully, Protogate recommends that you test the network connection between the Freeway and another system on your network to ensure that the boot parameters are correct. Below are some ways you can do this:

2.2.8.1 Remote Login

The quickest way to test your LAN connection to the Freeway is to remotely log in to the Freeway main menus. On older Freeway systems, you would have done this using rlogin or telnet from any computer on the network. Newer Freeway systems normally have rlogin and telnet disabled for security reasons. However, if your client system has secure shell (ssh), you can use that to remotely log in as in the following example:

```
ssh freeway@192.168.1.28
Password: password
```

The password is not actually displayed on the screen.

Once the Freeway Interactive Menu is displayed, you have confirmed your network settings for the Freeway. If you don't see the Interactive Menu, return to the console interface and re-check your boot parameters.

Chapter 4 describes the Interactive Menu in detail. You can change the Freeway user name and password as described in Section 4.6.2 on page 110.

2.2.8.2 Ping Another System from Freeway

You can also check your network connection by pinging another system from the Freeway. To do this, log in to Freeway from the local console with the username (`freeway`) and password (`password`):

```
Freeway User Login: freeway
Password: password
```

- At the main menu select `Display Options` (2)

- At the Display Options menu select `Display Network Information` (4).

- At the Display Network Information menu select `Ping Another IP Host` (5)

At this point the Freeway will prompt for an IP address. Enter the IP address of another system on your network as shown in Figure 2–5.

```
Ping another IP Host
--------------------
   Enter host to ping
   (dot-separated IP address or hostname):  192.168.0.200

Attempting to ping "192.168.0.200" ...

PING 192.168.0.200 (192.168.0.200): 56 data bytes

--- 192.168.0.200 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.396/0.396/0.396/0.000 ms

    Press RETURN to continue
```

Figure 2–5: Example Ping from Freeway Console

2.2.9 Check the Protocol (serial) Connections

All Protogate protocols and toolkits are supplied with loopback programs that test the serial connections on the ICP boards. These programs can be run from a client system on your network, however, Protogate normally installs executable versions of these programs on the Freeway disk drive as well. This section describes how to run the protocol loopback programs from the Freeway console. If you prefer to run the protocol loopback programs from another system on your network, refer to Chapter 3 regarding installation of the Freeway software on a client machine.

To run the protocol loopback programs from the Freeway's BSD operating system, follow these steps:

Step 1: **Connect the loopback cables**

If you haven't already connected the serial connector cables to the back of your ICP board, do so now. Then connect an internal (two-headed) loopback cable to two adjacent ports of the ICP board. Always use the even port number as the lower port, for example, ports 0 and 1, ports 2 and 3, ports 4 and 5, or ports 6 and 7.

Step 2: **Run BSD Shell from the Freeway console**

1. Log into the Freeway from either the local or remote console.

   ```
   Freeway User Login: root
   Password: setup
   ```

2. At the main menu select `Run FreeBSD Shell` (6). You will see a pound sign (#) prompt.

Note

If you are having problems logging in remotely as a "root" user, refer to Section B.5 on page 215 for instructions on how to log in using the "freeway" account.

3. Change to the directory where the loopback program executable files are kept. Enter the following command at the prompt:

```
cd /usr/local/freeway/client/bsd/bin
```

Step 3: **Run the loopback program**

Look in the /usr/local/freeway/client/bsd/bin directory and find the name of the loopback program associated with the protocol you are using and type the filename then return to start the loopback program. Table 2–2 lists some of the more popular protocols and their associated loopback program names.

Table 2–2: Protocol Loopback Test Programs

AUTODIN (Mode I)	AWS	Milstar	Voice Data (VOX)
autalp	awsalp	mstalp	voxalp
DDCMP	**STD-1300**	**ADCCP NRM**	**Protocol Toolkit**
ddcmpalp	s13alp	nrmalp	spsalp
STD1200B	**Military/Government Protocols**	**X.25**	**HDLC**
s12alp	milalp	x25_svc	hdlc_user

For example, the following command will start the loopback test program for AWS:

```
awsalp
```

Answer the questions asked by the loopback program. Make sure to choose "internal clocking" if you are using a two-headed loopback cable.

The loopback program transfers test data from one port to the other for the amount of time you specify. When the program completes, it will display the statistics of the data transfer.

Step 4:   **Exit the FreeBSD Shell**

After the loopback program completes, you can exit the FreeBSD Unix Shell by typing exit at the prompt. This will take you back to the Freeway main menu.

```
exit
```

Note

For the X.25 and HDLC protocols, you may be required to set the link parameters using the x25_manager program before running the loopback test. Refer to the document *Freeway Loopback Test Procedures (DC 900-1533)* for more details.

2.3 Freeway Server Shutdown

The shutdown procedure for the Freeway server varies depending on whether your Freeway server configuration is "standard" or "custom". A custom configuration is essentially a Freeway with an active read-write partition on the disk drive (see Section 1.3 on page 29 for more details).

If you have a standard Freeway server configuration, you may simply power off the unit at any time using the power switch. All operating files on the Freeway server are stored in a memory disk partition which are re-loaded when the server is powered up again.

If you have a custom Freeway server configuration, you must power off the unit in a controlled manner using a BSD shell command. Otherwise, you risk having file corruption in the read-write partition of the disk drive if you just turn the power off with the switch. To perform a controlled system shutdown, use the following steps:

1. Log into the Freeway from either the local or remote console.

   ```
   Freeway User Login: root
   Password: setup
   ```

2. At the main menu select `Run FreeBSD Shell` (6). You will see a pound sign (#) prompt.

   > **Note**
   >
   > If you are having problems logging in remotely as a "root" user, refer to Section B.5 on page 215 for instructions on how to log in using the "freeway" account.

3. Enter the following command to shutdown the Freeway server. The "-p" in the command indicates that the Freeway will power itself off when the shutdown procedure is complete:

   ```
   shutdown -p now
   ```

You can also use the above command to power off a standard Freeway server when you do not have direct access to the physical unit.

Client Software Installation

This chapter describes how to install the DLI API software library and protocol loop-back software on a client system. This particular client system is a computer on your network that you will use to develop an application program to communicate with the Freeway server and the protocols loaded on the ICP boards. This client system must have the proper development environment (C compiler and linker). Once you develop and create an executable image for this application, it can be moved and used on other systems including systems without a compiler.

Note

This chapter contains examples loading client software on three types of operating systems: UNIX, OpenVMS, and Microsoft Windows. The procedure described in the UNIX example applies to several UNIX-based operating systems such as Linux, Solaris, SGI, HP-UX, and FreeBSD. Contact Protogate customer support if you cannot find a makefile for the operating system you are using.

3.1 Freeway and Protocol Software CDROMs

These are the installation CDROM disks that came with your Freeway server. These are the same CDROMs that we told you *not* to install on your Freeway server in Chapter 2. That is because the software is pre-installed on the Freeway disk drive at the Protogate factory. However, you will need the CDROMs in this chapter in order to load the software on your client system.

3.2 Client Software Installation Summary

The client software installation steps described in this chapter are summarized in Table 3–1.

Table 3–1: Summary of Client Software Installation Steps

Steps	Reference Section(s)
1. Select a computer on the same network as the Freeway that has development tools (C compiler and linker). You will use this computer for client software development and testing with the Freeway.	Section 3.3 on page 48
2. Load the Freeway software from the distribution CDROM onto the system you have selected in Step 1[1].	Section 3.4.2 on page 53 for UNIX Section 3.4.3 on page 54 for VMS Section 3.4.4 on page 56 for Windows
3. Build the DLI and TSI libraries.	Section 3.5.1 on page 57 for UNIX Section 3.5.2 on page 58 for VMS Section 3.5.3 on page 59 for Windows
4. Load the protocol software from the distribution CDROM onto the system you have selected in Step 1[1].	Section 3.6.2 on page 62 for UNIX Section 3.6.3 on page 64 for VMS Section 3.6.4 on page 66 for Windows
5. Build the loopback test(s) using the appropriate make file.	Section 3.7.1 on page 68 for UNIX Section 3.7.2 on page 69 for VMS Section 3.7.3 on page 70 for Windows
6. Boot Freeway.	Section 3.8 on page 71
7. Run the loopback test.	Section 3.9 on page 71

[1] Installing new software overwrites the previous software.

3.3 Select a Client System

In order to build the DLI API library and client application programs, you need to select a client system that has a C compiler installed. After the library and executable images are built, you may copy and use these files on other systems without compilers. The other systems must have the same type of operating system in order for this to work.

3.3.1 Prepare the System for Installation

Make sure you have enough disk space for the software installations. Freeway client software is approximately 25 MB maximum. Protocol software (loopback program) installations are much smaller.

The software installations copy files from the CDROM to the hard drive on your client system. All the files are contained within the "Freeway directory tree" where "freeway" is the top level directory in the tree. You can change the default installation directory if you wish. On UNIX systems, files are normally installed under /usr/local/freeway. On OpenVMS systems, they are normally installed under SYS$SYSDEVICE:[FREEWAY]. On Windows systems, they are normally installed under C:\freeway.

3.3.2 Define the Freeway to the Client System

As an option, you may define a name on your client system that is associated with the Freeway's IP address. This will allow your programs to communicate with Freeway without having to use the dot-separated IP address. You may assign different names to the same IP address. The loopback programs normally use "freeway_0" for the Freeway server name. It would help with testing if you defined "freeway_0" as an alias to one of the server names. The following examples show how to define a name on your client system:

UNIX Systems: The IP addresses and system names of computers on the network are maintained in the /etc/hosts file. If your network is managed by a domain name server, the hosts file should not be edited locally, as it is maintained and distributed by the domain name server. If you are not using a domain name server, this file can be edited on the client system (with the proper file permissions). Figure 3–1 shows a sample UNIX /etc/hosts file in which the client system has an IP address of 192.168.45.1 and a system name of devel.

Open the hosts file for editing. Select a system name for the Freeway server and enter it on a line in the hosts file along with the IP address that was assigned to the Freeway

```
# This is the master Internet address file for XYZ Corporation.
# If you need an address, check here first to make sure it is not
# being used. If it is not, add the address, the system name for the
# device, and the owner. You can then export this file to your device
# if it is appropriate.
#
#
# **************************************************************
#                    TCP/IP HOST TABLE
# **************************************************************
#
# 127.0.0.1  loopback --- do not remove.
#
127.0.0.1    localhost
#
#
#
192.168.45.1 devel            # client development system
192.168.45.2 accnt            # accounting
192.168.45.3 sales            # sales
192.168.45.4 mktg             # marketing
192.168.45.5 prod             # production
192.168.45.6 fwy06 freeway_0  # Freeway system 1 (for loopbacks)
192.168.45.7 fwy07            # Freeway system 2
```

Figure 3–1: Sample UNIX /etc/hosts File

server in Section 2.2.5 on page 37. If you have more than one Freeway server, enter one line for each server. In the sample hosts file in Figure 3–1, two Freeway servers have been defined. In addition, one Freeway server has been given an alias of "freeway_0".

If you are using multiple Ethernet interfaces (dual Ethernet) on your Freeway server, enter a line in the hosts file for each interface. This step is required only if you wish to assign a logical name to each interface. For more information about using multiple Ethernet interfaces, refer to Section 6.3.3 on page 172.

Windows systems: The IP addresses and system names of computers on the network are maintained in a hosts file that is similar to the file used in the UNIX example above. On Windows, the hosts file is normally located in the following directory path:

C:\WINDOWS\system32\drivers\etc\

Once you locate the hosts file, open it for editing and add the Freeway server names and addresses. Refer to the UNIX example above. You will need Administrator privileges to edit the hosts file

OpenVMS systems: Enter HP TCP/IP Services for OpenVMS and use the SET HOST command to add the name and IP address of the Freeway server. This is equivalent to maintaining the hosts file on UNIX systems. Use double quotes ("") around the server name to keep it from defaulting to all capital letters. The following example adds the Freeway server name "fwy07" with IP address 192.168.45.7:

```
TCPIP> set host "fwy07" /address=192.168.45.7
```

You can use the /alias option to add an additional host name to the same IP address as in the following example:

```
TCPIP> set host "fwy06" /address=192.168.45.6 /alias="freeway_0"
```

3.4 Installing the Freeway Software onto a Client Computer

This section describes how to install the Freeway software (which includes the DLI/TSI library) from the Freeway distribution CDROM onto a client computer. You need to install this software on your system if you plan to use this system to compile and run the protocol loopback programs or if you plan to develop your own client program on this system. You will also need to install this software if you plan to use this computer as a boot server to boot the Freeway.

3.4.1 What the Freeway Software CDROM Includes

Freeway software distribution CDROM includes several files designed to assist the programmer in developing a client application that will communicate with the Freeway Server. The files within the Freeway CDROM can be classified into the following major groups:

- Freeway server software

- Client DLI/TSI Library Source Code and make files

- Freeway server and DLI/TSI Documentation

The Freeway server software files are essentially a duplicate of the files that are installed on your Freeway Server's flash or hard disk drive. You will not need to access these files unless you are planning to configure your client system as a Freeway boot server. For more information about configuring a boot server, refer to Chapter 8 after finishing the installing of the Freeway Client Software.

The Client DLI/TSI software consists of the source code for the DLI and TSI API Libraries which you will build later in this chapter. After the installation, all of the files will reside inside the freeway root directory and its corresponding subdirectories. This directory structure is called the "Freeway directory tree".

The Freeway server and DLI/TSI documentation consist User Guides and Reference Manuals in PDF format. These documents are also available on Protogate's web site (www.protogate.com).

Caution

Remember that installing new software overwrites the previous software.

Note

It is recommended that you use the default directory structure. If you install the software in a non-default directory, you must later modify certain files if you plan to use this client as a boot server.

3.4.2 Installing Freeway Software on a UNIX system

The Freeway server/client distribution media is a CDROM labeled Freeway Server Software. Included on the CDROM is a file in tar format for installing the server/client software on UNIX systems. Use the following procedure to install the DLI/TSI software from the distribution media onto your UNIX computer.

Step 1:   On the client system (previously configured as described in Section 3.3), log in to a root or other privileged account.

Step 2:   Change to the default directory called /usr/local. The installation procedure is designed to use this default directory and the directory structure under it.

Step 3:   Insert the Freeway Server Software distribution CDROM into the appropriate drive and mount the CDROM. Below is an example of the mount command (the device name on your system might be different):

```
mount /dev/cdrom
```

Step 4:   The Freeway Software tar file (PF-100-0136.tar) is located in the directory /parts/PF-100/ on the CDROM. You may either copy this file to your local directory (/usr/local/) or leave it on the CDROM and extract the files from there. Below is an example of a command to copy the tar file to your local directory:

```
cp /dev/cdrom/parts/PF-100/PF-100-0136.tar .
```

Step 5:   Use the tar x command to retrieve the Freeway software files from the tar file. You might want to include the v option to display the file names as they are extracted. Some systems require that you use the f option to identify the peripheral device being used. Below are two examples of the tar command. The first assumes that the tar file is in your local directory. The second assumes that the tar file is still on the CDROM. Note that the device name on your system might be different:

```
tar xvf PF-100-0136.tar
tar xvf /dev/cdrom/parts/PF-100/PF-100-0136.tar
```

The tar command creates a directory called freeway in the /usr/local directory and copies the software into it from the distribution media.

Step 6:   Unmount the CDROM. Below is an example of the umount command (the device name on your system might be different):

```
umount /dev/cdrom
```

3.4.3 Installing Freeway Software on a VMS system

The Freeway server/client distribution media is a CDROM labeled Freeway Server Software. Included with some CDROM releases is a file in VMS backup saveset format for

installing the server/client software on VMS systems. Use the following procedure to install the DLI/TSI software from the distribution media onto your VMS computer.

Note

If you can not find the VMS saveset file on your distribution CDROM, please contact Protogate for assistance.

Step 1:   On the client system (previously configured as described in Section 3.3), log in to an account with SYSTEM privileges.

Step 2:   Change directory to a local working directory on same disk where the Freeway software will be installed, for example: SYS$SYSDEVICE:[user.protogate].

Step 3:   Insert the Freeway Server Software distribution CDROM into the appropriate drive and mount the CDROM. Below is an example of the mount command (the device name on your system might be different):

```
$ mount dka400:
```

Step 4:   The Freeway Software saveset file (serfwo025.bck) is located in the directory [parts.PF-200.PF-200-0080] on the CDROM. Copy this file to your local directory then use the set file command to reformat the file. Below is an example of the commands to copy and reformat the saveset file in the local directory:

```
$ copy dka400:[parts.pf-200.pf-200-0080]*.* [user.protogate]
$ set file /attr=(RFM:FIX,RAT:NONE,LRL:32256) serfwo025.bck
```

Step 5:   Use the backup command to retrieve the files from the saveset file. Use one of the two below examples of the backup command.

> **Note**
>
> Do not use VMSINSTAL to open the backup saveset file included
> in the Freeway distribution CDROM.

Use the following command if you want the Freeway directory tree installed as a root
directory on your disk:

```
$ backup/new serfwo025.bck/save [000000...]
```

Use the following command if you want to install the Freeway directory tree as a subdi-
rectory of an already existing directory (in this example [user.protogate]):

```
$ backup/new serfwo025.bck/save [user.protogate...]
```

Step 6:   Dismount the CDROM. Below is an example of the dismount command (the
device name on your system might be different):

```
$ dismount dka400:
```

3.4.4 Installing Freeway Software on a Windows system

The Freeway server/client distribution media is a CDROM labeled Freeway Server Soft-
ware. Included on the CDROM is a compressed zip file for installing the server/client
software on Windows systems. Depending on how your Windows system is configured,
use one of the following procedures to install the Freeway software from the distribu-
tion media onto your Windows computer.

Step 1:   Insert the CDROM into the drive. If your Windows computer is set up to
auto-run CDROMs and you have a browser enabled, the installation page will come up
automatically. If your computer has auto-run disabled, click on the index.html file on the
CDROM to open the installation page.

Step 2:   Click on the Freeway software product name, then right-click on the zip file and select "SaveTarget As" and save the file into a directory where you can find the file later. Close or minimize the browser window.

Step 3:   Go to the directory where you saved the zip file. Right-click on the zip file and select "Extract All...". Browse to the location where you want the Freeway directory tree to start (such as C:\) and click on the "Extract" button.

Step 4:   If your Windows computer does not have a browser enabled, open the readme.txt file on the CD-ROM and follow the instructions.

3.5 Building the DLI/TSI Library

After installing the Freeway Server Software, you must build the DLI/TSI API library on your client system. This library is needed to link with the protocol loopback programs and any other programs that will communicate with the Freeway server. A C compiler is needed to build the library. Once the library is built, it can be moved to other systems for linking with programs on that system. A make file that performs the library build is included for each supported operating system.

3.5.1 Build the DLI/TSI Library on UNIX Systems

Use the following steps to build the DLI/TSI library on UNIX systems:

Step 1:   **Create the bin and lib directories**

1. If it doesn't already exist, create the *op-sys* subdirectory under the /usr/local/free-way/client directory, where *op-sys* is the identifier for the operating system you are using: rs_aix, lnx, bsd, hpux, sgi, solaris, sunos, or dec (Tru64 Unix).

        cd /usr/local/freeway/client
        mkdir op-sys

2. From your *op-sys* directory, create the bin and lib directories if they don't already exist.

```
cd op-sys
mkdir bin
mkdir lib
```

Step 2: **Run the make file**

From the /usr/local/freeway/lib directory, enter one of the following commands depending on the system you are using.

```
cd /usr/local/freeway/lib
make -f Makefile.AIX all          (for an IBM AIX system)
make -f Makefile.LNX all          (for a Linux system)
make -f Makefile.HPUX all         (for an HP/UX system)
make -f Makefile.SGI all          (for an SGI system)
make -f Makefile.SOL all          (for a Solaris system)
make -f Makefile.SUN all          (for a SunOS system)
```

The newly created files will be placed in the proper freeway/client/*op-sys*/bin or freeway/client/*op-sys*/lib directory.

3.5.2 Build the DLI/TSI Library on VMS Systems

Use the following steps to build the DLI/TSI library on VMS systems:

Step 1: **Create the BIN and LIB directories**

1. If it doesn't already exist, create the *op-sys* subdirectory under the [freeway.client] directory, where *op-sys* is the identifier for the type of TCP/IP software you are using: axp_ucx (standard: use for HP TCP/IP services), axp_multinet, or axp_tcpware.

```
set def sys$sysdevice:[freeway.client]
create/dir [.op-sys]
```

2. From your *op-sys* directory, create the bin and lib directories if they don't already exist.

```
set def [.op-sys]
create/dir [.bin]
create/dir [.lib]
```

Step 2: **Run the make file**

From the [freeway/lib] directory, enter one of the following commands depending on the TCP/IP package you are using.

```
set def [freeway.lib]
@make_dli_tsi "" ucx          (for standard TCP/IP)
@make_dli_tsi "" multinet     (for Multinet TCP/IP)
@make_dli_tsi "" tcpware      (for TCPware)
```

The newly created files will be placed in the proper [freeway.client.*op-sys*.bin] and [freeway.client.*op-sys*.lib] directories.

3.5.3 Build the DLI/TSI Library on Windows Systems

Use the following steps to build the DLI/TSI library on Windows systems. A make file is included that performs this operation.

Step 1: Open a **Command Prompt** window by clicking on the following path from your Desktop:

```
Start->Programs->Accessories->Command Prompt
```

Step 2: **Create the bin and lib directories**

1. If it doesn't already exist, create the int_nt directory.

```
cd C:\freeway\client
mkdir int_nt
```

2. From the int_nt directory, create the bin and lib directories if they don't already exist.

```
cd int_nt
mkdir bin
mkdir lib
```

Step 3:   **Run the make file**

From the freeway\lib directory, enter the following command. The newly created files will be placed in the proper freeway\client\int_nt\bin or freeway\client\int_nt\ lib directory.

```
cd C:\freeway\lib
makefwy_NT
```

Step 4:   Dynamic link libraries must reside in the current working directory or in a directory specified in your "PATH" environment variable. Do one of the following:

Add C:\freeway\client\int_nt\lib to your path.

or

Copy the .dll files from C:\freeway\client\int_nt\lib to your bin directory or to another directory in your path.

3.6 Installing the Protocol Software on a Client Computer

This section describes how to install the Protocol software from the Protocol distribution media onto a client computer. You need to install this software on your system if you plan to use this system to compile and run the protocol loopback programs or if you plan to use this computer as a boot server to boot the Freeway.

Protocol software products are distributed on CDROM separate from the Freeway Client Software. The number of protocol CDROMs you need to install depend on what protocols you have purchased with your Freeway server.

3.6.1 What the Protocol Software CDROM Includes

Individual protocol software distribution CDROMs may vary in content depending on the type of protocol. In general, each protocol CDROM includes the following files:

- Protocol software image and load file

- Protocol loopback program source code and make files

- Protocol-specific documentation

The protocol image and load files are used only on the Freeway server. You will not need to access these files unless you are planning to configure your client system as a Freeway boot server.

The Loopback test programs consist of the source code for the loopback, test, demo, and any other program supplied by Protogate with the specific protocol. The program source files are placed in the following directory on your client system:

usr/local/freeway/client/test/**name**   (UNIX example)

where **name** is one of the directory names listed in Table 3–2.

The protocol-specific documentation primarily consists of the Programmer's Guide for the protocol software you are using in PDF format. These documents are also available on Protogate's web site (www.protogate.com), but only for commercial protocols. Most protocols used within the government and military are "export restricted" and the Programmer's Guides for these are not posted on Protogate's public web site. If you have one of these protocols, you need to get the documents from the CDROM.

Table 3–2: Program subdirectory names

Program	Subdirectory Name (*name*)
AUTODIN (Mode I) loopback	autodin
AUTODIN demo program	adndemo
AWS loopback	aws
Milstar loopback	mst
STD1300 loopback	s13
DDCMP loopback	ddcmp
VOX loopback	vox
VOX demo program	voxdemo
ADCCP NRM loopback	nrm
Protocol Toolkit	sps[1]
STD1200B loopback	s12
Military/Government	mil
X.25/HDLC client programs	x25mgr

[1] Source code for the protocol toolkit is in the freeway/icp-code/proto_kit directory.

Caution

Remember that installing new software overwrites the previous software.

3.6.2 Installing Protocol Software on a UNIX System

The Protocol distribution media is a CDROM labeled with the name of the protocol you are using. Included on the CDROM is a file in tar format for installing the protocol software on UNIX systems.

The same protocol files that are contained in the tar file are also located (uncompressed) in the root freeway directory located on the CDROM. If you wish to view the contents of

the protocol distribution or if you just need to extract a few files from the distribution, you can do so using this directory.

Use the following procedure to install the Protocol software from the distribution media onto your UNIX computer.

Step 1:　　On the client system (previously configured as described in Section 3.3), log in to a root or other privileged account.

Step 2:　　Change to the directory that is just above your installed freeway directory tree. The default is /usr/local.

Step 3:　　Insert the Protocol Software distribution CDROM into the appropriate drive and mount the CDROM. Below is an example of the mount command (the device name on your system might be different):

```
mount /dev/cdrom
```

Step 4:　　The Protocol Software tar file (PF-100-*xxxx*.tar) is located in the directory /parts/PF-100/ on the CDROM, where *xxxx* represents a four-digit number that will vary depending on what protocol software you are installing. You may either copy this file to your local directory (/usr/local/) or leave it on the CDROM and extract the files from there. Below is an example of a command to copy the tar file to your local directory:

```
cp /dev/cdrom/parts/PF-100/*.tar .
```

Step 5:　　Use the tar x command to retrieve the Freeway software files from the tar file. You might want to include the v option to display the file names as they are extracted. Some systems require that you use the f option to identify the peripheral device being used. Below are two examples of the tar command. The first assumes that the tar file is in your local directory. The second assumes that the tar file is still on the CDROM. Note that the device name on your system might be different:

```
tar xvf PF-100-xxxx.tar
tar xvf /dev/cdrom/parts/PF-100/PF-100-xxxx.tar
```

Note that *xxxx* represents the four-digit number of the filename you find in the CDROM directory. The tar command creates additional subdirectories within the directory /usr/local/freeway (or whatever your specific Freeway directory tree is) and copies the software into them from the distribution media.

Step 6:   Unmount the CDROM. Below is an example of the umount command (the device name on your system might be different):

```
umount /dev/cdrom
```

3.6.3 Installing Protocol Software on a VMS system

The Protocol distribution media is a CDROM labeled with the appropriate protocol name. Check the CDROM for a file in VMS backup saveset format for installing the protocol software on VMS systems. If there is no backup saveset file on the CDROM, skip ahead to Section 3.6.5. If there is a backup saveset file on the CDROM, use the following procedure to install the protocol software from the distribution media onto your VMS computer.

Note

Do not use VMSINSTAL to open the backup saveset file included in the Protocol Software distribution CDROM.

Step 1:   On the client system (previously configured as described in Section 3.3), log in to an account with SYSTEM privileges.

Step 2:   Change directory to a local working directory on same disk where the Freeway software was installed in Section 3.4.3, for example: SYS$SYSDEVICE:[user.protogate].

```
$ set def sys$sysdevice:[user.protogate]
```

Step 3:   Insert the Protocol Software distribution CDROM into the appropriate drive and mount the CDROM. Below is an example of the mount command (the device name on your system might be different):

```
$ mount dka400:
```

Step 4:   Locate the saveset file for your protocol. Depending on the date of your protocol release, the saveset may be located in a subdirectory under [parts.PF-200] on the CDROM, or under a different location. Also, there may be more than one saveset to install for your particular protocol. Refer to the readme file on the CDROM for more details. A simple way to find the savesets on the CDROM is to do a directory search for them as follows:

```
$ dir dka400:[...]*.bck
```

Once you have located your protocol software saveset(s), copy the file(s) to your local directory then use the set file command to reformat the file(s). Below is an example of the commands to copy and reformat the saveset file in the local directory:

```
$ copy dka400:[...]*.bck [user.protogate]

$ set file /attr=(RFM:FIX,RAT:NONE,LRL:32256) bsc_ba.bck
```

Step 5:   Use the backup command to retrieve the Protocol software files from the saveset file. Use one of the two below examples of the backup command.

Use the following command if you had previously installed the Freeway directory tree as a root directory on your disk:

```
$ backup/new bsc_ba.bck/save [000000...]
```

Use the following command if you had previously installed the Freeway directory tree as a subdirectory of an already existing directory (in this example [user.protogate]):

```
$ backup/new bsc_ba.bck/save [user.protogate...]
```

Step 6:   Dismount the CDROM. Below is an example of the dismount command (the device name on your system might be different):

```
$ dismount dka400:
```

3.6.4 Installing Protocol Software on a Windows system

Insert the CD into the drive. If your Windows computer is set up for auto-run of CDROMs and you have a browser enabled, the installation page will come up automatically. Click on the protocol product you have purchased, then click on Self-extracting Zip/InstallShield and follow the instructions on the screen.

If your Windows computer has a browser enabled, but your computer is not set up for auto-run of CD-ROMs, click on the index.html file on the CD-ROM to open the installation page. Click on the protocol product you have purchased, then click on Self-extracting Zip/InstallShield and follow the instructions on the screen.

If your Windows computer does not have a browser enabled, open the readme.txt file on the CD-ROM and follow the instructions.

3.6.5 Manually Installing Protocol Software on any system

Some of the protocol distribution CDROMs include a Freeway directory at the top level of the CDROM. This directory includes a pre-extracted version of all the protocol software on the CDROM. If for any reason, one of the above installation methods does not work for you, you may manually copy (or FTP) the files from this Freeway directory to your client system. You may copy this entire directory to the existing Freeway directory on your client system. Make sure to use a copy method that does not delete the entire existing Freeway directory first.

The two major subdirectories on a protocol distribution CDROM are:

\freeway\boot\ which contains the actual protocol files, and

\freeway\client\test***name***\ which contains the protocol loopback program

(Where *name* is one of the protocol names in Table 3–2 on page 62.)

When using FTP to copy the protocol software, use BINARY transfer for the protocol (*.mem) files, and ASCII transfer for the other files.

3.7 Build the Loopback Test Programs

All protocols are supplied with one or more loopback test programs. These programs are designed to perform a complete data loop test of your Freeway and ICP. These programs also serve as an example of how you can develop your own client program. A make file is included that builds the loopback program(s) for each protocol.

All client programs use a transport subsystem interface (TSI) configuration file in order to "point" to a particular Freeway. For reference in the following sections, Table 3–3 lists the names of the TSI configuration files for the various loopback programs.

Note

> If the server name and Internet address have not already been added to the /etc/hosts file during hardware installation, refer to Section 3.3.2 on page 49.

Table 3–3: Client TSI Configuration Files

AUTODIN (Mode I)	AWS	STD1300	Milstar
autaltcfg	awsaltcfg	s13altcfg	mstaltcfg
DDCMP	**Voice Data (VOX)**	**ADCCP NRM**	**Protocol Toolkit**
ddcmpaltcfg	voxaltcfg	nrmaltcfg	spsaltcfg
STD1200B	**Military/Government Protocol**	**X.25/HDLC**	
s12altcfg	miltcfg	apitcfg	

3.7.1 Build the Loopback Programs on UNIX systems

Step 1: **Point the TSI configuration files to your Freeway server**

For all protocols and programs (except certain demo programs[1]), you must point the transport subsystem interface (TSI) configuration files in freeway/client/test/*name* to your Freeway server's name or IP address. The TSI configuration file names for each protocol are listed in Table 3–3. The protocol subdirectories (*name*) are listed back in Table 3–2 on page 62. The default value of the Freeway server parameter in the TSI configuration file is freeway_0. To point to your current Freeway server, you must do one of the following:

1. Edit your /etc/hosts file and assign your current Freeway IP address to the host name freeway_0 (refer to Section 3.3.2 on page 49), or

2. Edit the TSI configuration file and change the server parameter freeway_0 to the name or IP address of your current Freeway.

A client TSI configuration file might reference the server parameter more than once, and must be changed at each occurrence.

Step 2: **Run the make file**

From the freeway/client/test/*name* directory, enter one of the following commands depending on the system you are using.

```
make -f makefile.aix all        (for an IBM AIX system)
make -f makefile.lnx all        (for a Linux system)
make -f makefile.hpux all       (for an HP/UX system)
make -f makefile.sgi all        (for an SGI system)
```

---

1. Certain demo programs such as BSCDEMO and ADNDEMO may be designed to prompt you for the Freeway name instead of having you change the TSI configuration file. Check the appropriate User's Guide to see if this applies to the demo program you are using.

```
make -f makefile.sol all          (for a Solaris system)

make -f makefile.sun all          (for a SunOS system)
```

The newly created files will be placed in the freeway/client/*op-sys*/bin directory. For a description of the Freeway files you have just installed onto your client system, refer to Appendix B.

3.7.2 Build the Loopback Programs on VMS systems

Step 1: **Point the TSI configuration files to your Freeway server**

For all protocols and programs (except certain demo programs[1]), you must point the transport subsystem interface (TSI) configuration files in [freeway.client.test.*name*] to your Freeway server's name or IP address. The TSI configuration file names for each protocol are listed in Table 3–3. The protocol subdirectories (*name*) are listed back in Table 3–2 on page 62. The default value of the Freeway server parameter in the TSI configuration file is freeway_0. To point to your current Freeway server, you must do one of the following:

1. Enter the VMS TCP/IP configuration program and assign your current Freeway IP address to the host name freeway_0, or

2. Edit the TSI configuration file and change the server parameter freeway_0 to the name or IP address of your current Freeway.

A client TSI configuration file might reference the server parameter more than once, and must be changed at each occurrence.

---

1. Certain demo programs such as BSCDEMO and ADNDEMO may be designed to prompt you for the Freeway name instead of having you change the TSI configuration file. Check the appropriate User's Guide to see if this applies to the demo program you are using.

Step 2: **Run the make file**

From the [freeway.client.test.*name*] directory, enter one of the following commands depending on the TCP/IP software you are using.

> **@MAKEVMS "" UCX**   (for standard TCP/IP)
>
> **@MAKEVMS "" MULTINET**   (for VMS with Multinet)
>
> **@MAKEVMS "" TCPWARE**   (for VMS with TCPware)

The newly created files will be placed in the [freeway.client.*op_sys*.bin] directory. For a description of the Freeway files you have just installed onto your client system, refer to Appendix B.

3.7.3 Build the Loopback Programs on Windows systems

Step 1: **Point the TSI configuration files to your Freeway server**

For all protocols and programs (except certain demo programs[1]), you must point the transport subsystem interface (TSI) configuration files in freeway/client/test/*name* to your Freeway server's name or IP address. The TSI configuration file names for each protocol are listed in Table 3–3. The protocol subdirectories (*name*) are listed back in Table 3–2 on page 62. The default value of the Freeway server parameter in the TSI configuration file is freeway_0. To point to your current Freeway server, you must do one of the following:

1. Edit your C:\WINNT\SYSTEM32\DRIVERS\ETC\hosts file and assign your current Freeway IP address to the host name freeway_0, or

---

1. Certain demo programs such as BSCDEMO and ADNDEMO may be designed to prompt you for the Freeway name instead of having you change the TSI configuration file. Check the appropriate User's Guide to see if this applies to the demo program you are using.

2. Edit the TSI configuration file and change the server parameter freeway_0 to the name or IP address of your current Freeway.

A client TSI configuration file might reference the server parameter more than once, and must be changed at each occurrence.

Step 2: **Run the make file**

From the \freeway\client\test*name* directory, enter the following command:

```
nmake -f makefile.int all
```

The newly created files will be placed in the \freeway\client\int_nt\bin directory. For a description of the Freeway files you have just installed onto your client system, refer to Appendix B.

3.8 Boot the Freeway

Boot up your Freeway server if it is not already running and attached to your network. If you have not yet booted the Freeway, refer to Chapter 2 for instructions on booting the Freeway for the first time.

3.9 Run the Loopback Test

Once your Freeway server is up and running, go to the "bin" subdirectory of the Freeway directory and run the loopback test depending on your system type as follows:

namealp	(on most UNIX systems)
./namealp	(on some UNIX systems)
run *namealp*	(on a VMS system)
namealp	(on a Windows system)

The string *name* represents the short name of the protocol in most cases and alp stands for "asynchronous loopback program".

Once you start the loopback program it will prompt you for some information before it starts sending data. The loopback program is designed to transfer test data from an odd numbered ICP port to the adjacent even-numbered ICP port (example: ports 0 and 1). make sure that you have the two ports under test connected with a loopback cable, null modem, or modem eliminator. For more detailed information on loopback test programs, refer to Freeway Loopback Test Procedures (DC-900-1533).

3.10 The Next Steps

After you have successfully performed the software installation procedures described in this chapter, proceed as follows:

- Read Chapter 6 to determine whether you need to customize your system configuration. If you have installed more than one protocol, you can customize your installation and run the loopback tests for the additional protocols. Customization is not necessary at most sites.

- You can use the Freeway local console to display or customize server parameters or perform server operations. Alternatively, you can access the Freeway Interactive Menu using telnet or rlogin from the client system or any other computer on the network.

- Familiarize yourself with Freeway operations as described in Chapter 4.

- Connect the WAN cables. Your Freeway server is ready to communicate with its client computers.

Chapter

4

Freeway Interactive Menu

The user interacts with Freeway using a menu-driven interface called the Freeway Interactive Menu. This interface is composed of a series of menus that provide access to statistics, error reports, configuration, and control of server operation. This chapter describes all the choices available using the Freeway Interactive Menu.

4.1 Freeway Menu Access

The Freeway Interactive Menu is available for use once the Freeway system has completely booted up. Users can access the Freeway Interactive Menu through any of the following methods:

- Local serial console port

- Local VGA monitor and keyboard

- Telnet, rlogin, or ssh

- A standard web browser

4.1.1 Local Serial Console Port

Every Freeway server comes with an asynchronous serial port that can be used as a local console port to access Freeway menus. A null modem cable is required to use the console port. Protogate supplies a console cable with every Freeway system for this purpose. You may use this cable or any null modem cable will suffice. The Freeway hardware installation guides describe how to locate and connect to the local console port.

Connect the other end of the console cable to any ANSI or VT200 compatible terminal. You may also use one of the serial COM ports on a PC or laptop as long as you have a terminal emulation program (such as HyperTerminal) available on the system. If you are using a PC with HyperTerminal, use the following settings on the "Port Settings" tab:

```
Bits per second: 9600
Data bits:       8
Parity:          None
Stop bits:       1
Flow control:    None
```

Once connected, hit the Enter key to get to the login prompt.

4.1.2 Local VGA Monitor and Keyboard

In addition to connecting a serial terminal to the serial "console" connector at the back of the Freeway, you can also connect an ordinary VGA monitor and PS/2 keyboard. When the Freeway boots, it first checks to see if a keyboard is connected; if there is a keyboard connected then the Freeway uses the VGA monitor and keyboard as the main system console, and all the boot information is displayed there. If no keyboard is connected, then the serial output console connector becomes the main system console.

In either case, when the boot processing is complete both the serial console port and the VGA monitor/keyboard offer login prompts, allowing users to login and manage the Freeway system using a set of menus or typed-in commands (the same menus and typed-in commands which are available to telnet or rlogin sessions).

Refer to the Freeway Hardware Installation Guide for the location of the VGA monitor port and PS/2 keyboard port for your Freeway model. Protogate supplies a keyboard/mouse splitter cable for the PS/2 port, however, the Freeway Interactive Menu does not require or support mouse functions. The keyboard will work whether or not you use the splitter cable.

4.1.3 Network Access

If the Freeway IP address and subnet mask are set up correctly, you can access the Freeway Interactive Menu over the network by means of Telnet, rlogin, or ssh (secure shell) from a computer system located on the same subnet. If you want to access the Freeway from a system on a different subnet, you must insure that the gateway router address is set up correctly in the Freeway boot parameters.

From a command window on your system, type the appropriate command along with the Freeway name or IP address as in the following example:

> telnet 192.168.1.45

Once the connection to the Freeway is made, the login prompt will appear in your command window.

4.1.4 Web Browser

If you have enabled web support on the Freeway server, you may access the Freeway Interactive Menu using a standard web browser. As in Section 4.1.3, the Freeway IP address, subnet mask, and gateway router address (if applicable) must be set up correctly in order for you to access the Freeway.

To prevent plaintext passwords from being sent across the network, the Freeway server does not allow insecure HTTP access. To access the Freeway menus, always use the Secure HTTP protocol, that is, use "https://" at the beginning of the URL in the Address field of your browser as in the following example:

https://192.168.1.45/

Once the connection to the Freeway is made, the username and password fields will appear in your browser window. For security reasons, access to the FreeBSD shell is not allowed through the web browser interface.

4.2 Freeway Login Access

You must provide a username and password in order to access the Freeway Interactive Menu. Once you make a connection to the Freeway via local or remote console, the following login prompt appears:

>   Freeway User Login:

At this point you can log in to the Freeway using the Freeway user name (default is **free-way**) and password (default is **password**):

>   Freeway User Login: **freeway**
>   Password: **password**

The password is not actually displayed on the screen.

Caution

The Freeway user name and password are used to access the Freeway Interactive Menu. They are not to be confused with the FTP user name and FTP password (which have defaults of **freeway** and **password**). The latter are Freeway system boot parameters which are used between Freeway and the boot server during system boot (see Section 4.6.1 on page 105).

4.2.1 Default Usernames and Passwords

When you first install Freeway, a set of default usernames and passwords are in effect. Table 4–1 lists the default usernames and corresponding passwords.

To change the user names and/or passwords, login in with a root account and use the Modify User Names menu described in Section 4.6.2 on page 110. A good start on securing your Freeway would be to remove the "user", "protogate", and "simpact" accounts, and change the passwords of the 3 accounts that are left ("root", "shell", and "freeway").

Table 4–1: Freeway Default Usernames and Passwords

Username	Password	Access Level
root	setup	root
shell	setup	root
user	PicoBSD	user
freeway	password	user
protogate	password	user
simpact	password	user

The "shell" and "user" accounts are meant as fail-safe entry points which can be used to login even if the Freeway software itself fails to start; they take the user to a plain command shell rather than into the Freeway menus. You should keep at least the "root", "shell" and "freeway" accounts, if possible.

The User/Password table is permanent and is checked each time Freeway is rebooted. If all user names are removed or the table becomes corrupted, the User/Password table will automatically be rebuilt the next time Freeway is rebooted and the default user names and passwords will again be in effect.

4.2.2 Access Levels

Each user account on the Freeway is assigned one of three levels of access. The available levels are listed below:

- **root** -- highest access level

- **user** -- normal access level

- **display only** -- restricted access level

Users at the **root** level are allowed to perform any function on the Freeway including changing passwords, adding and deleting passwords, and other administrative proce-

dures. You must log in as root in order to do many of the higher-level functions in the FreeBSD shell.

Users at the **user** level are allowed to do all functions related to Freeway operations except add and delete user accounts. Also, some BSD functions are restricted.

Users at the **display only** level have access to the display menus and trace functions. Users at this level are not allowed to reboot the Freeway.

4.3 Freeway Main Menu

After you log in as described in Section 4.1.1 on page 73, the Freeway Main Menu is displayed as shown in Figure 4–1. Items 1 through 7 have their own menus as described in the following sections.

If you logout from the Freeway local console, you return to the Freeway User Login prompt. If you logout from an rlogin or telnet session, you return to your system prompt.

```
VI-200-3290: FWSER 3.2-1 Oct 26 2005 FreeBSD Freeway Server
Main Menu
-------------
1)   Shutdown Options

2)   Display Options

3)   Modify Configuration

4)   Trace Functions (Trace Disabled)

5)   Disk Drive Options

6)   Run FreeBSD Shell

7)   Logout

Select:
```

Figure 4–1: Sample Freeway Main Menu

Note

After entering a selection in a Freeway menu, press <return>. For example, to select the first menu choice, enter 1 then press <return>.

4.4 Shutdown Options

To access the Shutdown Options menu as shown in Figure 4–2, enter '1' at the Freeway Interactive Menu.

```
Shutdown Options
----------------
1)    Return to Interactive Menu

2)    Reboot Server

Select:
```
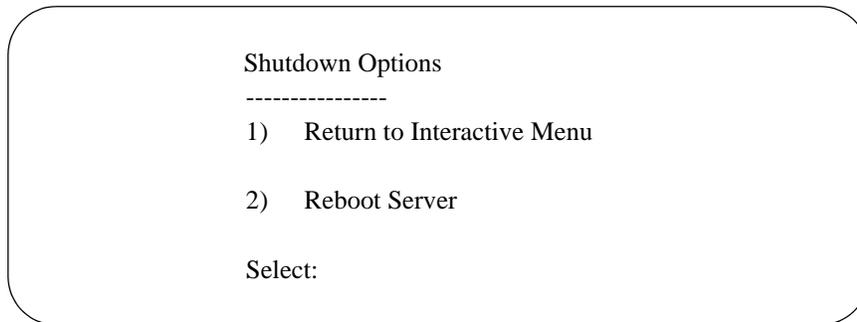
Figure 4–2: Shutdown Options Menu

4.4.1 Reboot Server

To reboot the Freeway server, enter '2' at the Shutdown Options menu. All currently running tasks are terminated immediately.

Note

After power up or during reboot, Freeway first executes system diagnostics. If the diagnostics are successful, the boot process is performed automatically.

During the boot process, the Freeway server loads the operational software from its own flash or hard drive. If the Freeway is configured to load from a boot server across an Ethernet network, it uses TCP/IP and related facilities including the file transfer protocol (FTP) or remote shell (RSH) to get the operational software. During the boot process, status information is available at the local console display, if one is currently installed. If you have used rlogin or telnet to log in to Freeway from another computer

on the network, the connection to Freeway is broken when the boot process begins and you must log in again. The following operations occur during system boot (refer to Chapter 5 for a more detailed description of the boot process):

Step 1: **Determine the Boot Parameters**

Freeway must know its boot parameters in order to download files from its disk drive or a boot server. Freeway obtains the boot parameters from its flash or hard drive. Boot parameters are initially configured during hardware installation, but they can be changed using the Modify Boot Parameters menu (Section 4.6.1 on page 105).

Step 2: **Load and Start the Freeway System File (fwybsd)**

After obtaining the boot parameters, Freeway loads the system boot file (fwybsd) from the disk drive or boot server. The system boot file contains the server's base operating system, networking software, and server management facilities. Freeway receives the system boot file and starts the operating system and network software. Next the server management tasks are started, including SNMP, telnet, rlogin, and the interactive server manager.

Step 3: **Load the Boot Configuration File (bootcfg)**

The boot configuration file (bootcfg) defines the system configuration for physical and virtual devices and services which includes the TSI configuration for Freeway (muxcfg) and the ICP load files.

Step 4: **Configure the System**

Freeway uses the information in the boot configuration file to configure the physical and virtual devices and services, and build the corresponding databases. Freeway then downloads the .mem object files from the boot server to the ICPs based on the download script file defined for each ICP. Freeway then uses the muxcfg file to configure the interface between the server software and the transport subsystem.

4.5 Display Options

To access the Display Options menu as shown in Figure 4–3, enter '2' at the Freeway
Interactive Menu.

```
Display Options
---------------
1)      Return to Interactive Menu

2)      Display Log Messages

3)      Display Configuration

4)      Display Network Information

5)      Display System Information

6)      Display Network Statistics

7)      Display User Names

8)      Display Current System Time

Select:
```
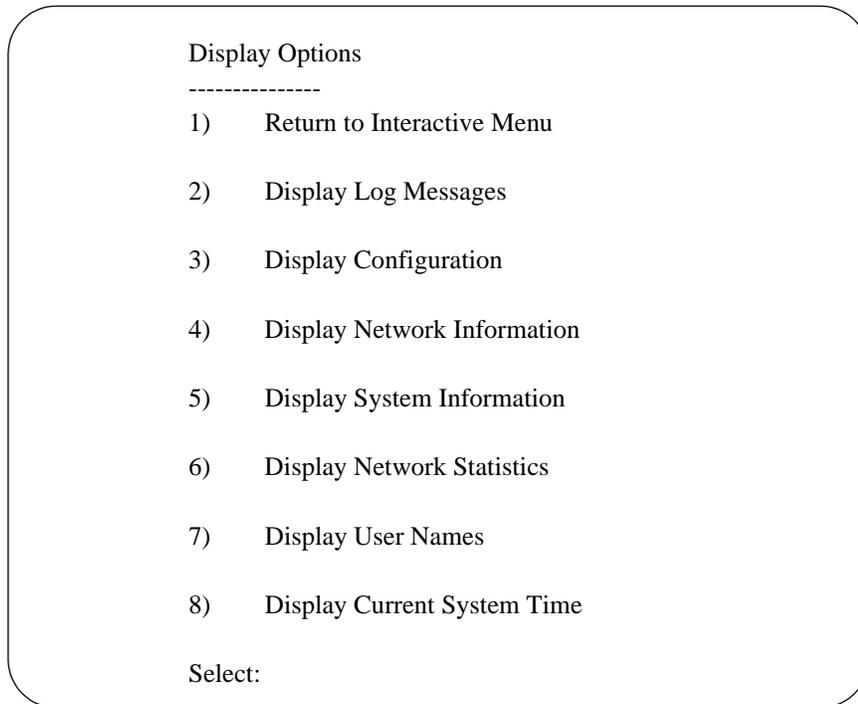
Figure 4–3: Display Options Menu

4.5.1 Display Log Messages

To retrieve and display log messages stored on the message queue, enter '2' at the Display Options menu. The latest status or error messages are displayed in increments of 10 messages. You can quit at any time by pressing 'q' or 'Q', or you can view the next 10 messages by pressing <return>.

Note

Displaying the log messages also purges them from this menu selection. To see a log of older log messages, use the Display Circular Queue of Messages in Section 4.5.4.5.

4.5.2 Display Configuration

To access the Display Configuration menu as shown in Figure 4–4, enter '3' at the Display Options menu.

```
Display Configuration
---------------------
1)      Return to Display Options Menu

2)      Display Physical Configuration

3)      Display Service Provider Configuration

4)      Display Boot Parameters

Select:
```
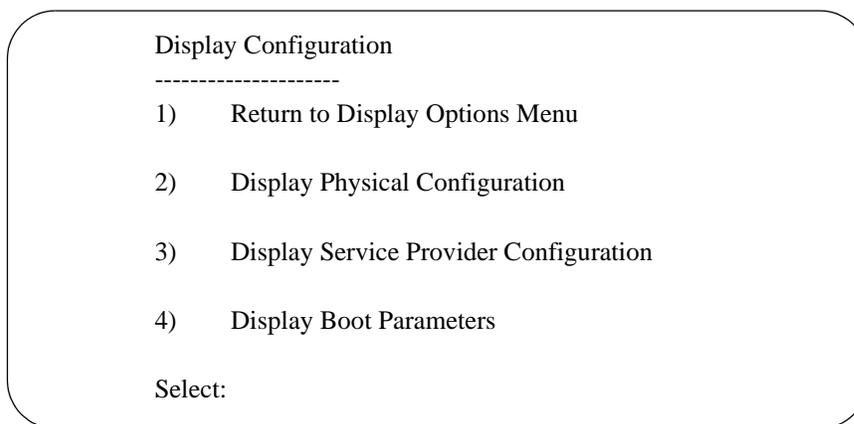
Figure 4–4: Display Configuration Menu

4.5.2.1 Display Physical Configuration

To display the current values for each device in the Freeway server, enter '2' at the Display Configuration menu. Figure 4–5 is a sample display for one device on a Freeway 3100.

Freeway maintains information on each physical device installed in the system. The physical configuration database is initially configured at boot time by Freeway, which reads and parses the boot configuration file described in Chapter 6. This information is then loaded into Freeway's database.

```
Physical Device Configuration
-----------------------------
Device Type              =  icp2432
Device Name              =  icp0
Slave Address            =  0x14
Physical Status          =  DEVICE_AVAILABLE


Enter 'n <RETURN>' to display next device
Enter 'p <RETURN>' to display previous device
Press RETURN to exit display:
```

Figure 4–5: Display Physical Configuration

4.5.2.2 Display Service Provider Configuration

To display the current values for each service provider in the Freeway server, enter '3' at the Display Configuration menu. Figure 4–6 is a sample display for one service provider on a Freeway 3100.

Freeway maintains information on each service provider installed in the system. The service configuration database is initially configured at boot time by Freeway, which reads and parses the boot configuration file described in Chapter 6. This information is then loaded into Freeway's database.

```
System Version  = VI-200-3190: FWSER 3.2-1 Oct 26 2005 FreeBSD Freeway Server (msgmux)


Service Configuration
---------------------
Device Name     = icp0
Service Status  = SERVICE_DOWNLOAD_COMPLETE
Download Script = icp0loadb

Download file 1 = osp_2432b.mem
Version file  1 =  VI-200-3164: OS/PROTOGATE 1.2-6 Oct 13 2004 ICP2432B

Download file 2 = aws_2432b.mem
Version file  2 = VI-200-3167 AWS 4.3-0 Oct 28 2004 Asynchronous Wire Service ICP2432B


Enter 'n <RETURN>' to display next service provider
Enter 'p <RETURN>' to display previous service provider
Press RETURN to exit display:
```

Figure 4–6: Display Service Provider Configuration

4.5.2.3 Display Boot Parameters

To display the current Freeway boot parameters, enter '4' at the Display Configuration menu. Figure 4–7 is a sample display of Freeway boot parameters.

```
Freeway System Boot Parameters
------------------------------
Boot Device               :   ide=0,0
Processor Number          :   0
FTP User Name             :   freeway
FTP Password              :   password
Flags                     :   0x1000
Freeway Server Name       :   fwy29
Freeway Inet Address      :   192.168.1.29
Freeway Subnet Mask       :   ffffff00
Boot Server Name          :   bootmaster
Boot Server Inet Address  :   192.168.1.2
System Boot Directory     :   /usr/local/freeway/boot
System Boot File Name      :   fwybsd
Configuration File Name   :   bootcfg
Secondary Net Interface   :   fei
Gateway Inet Address      :

    Press RETURN to continue
```

Figure 4–7: Display System Boot Parameters

DC 900-1333Q

4.5.3 Display Network Information

To access the Display Network Information menu as shown in Figure 4–8, enter '4' at the Display Options menu.

```
Display Network Information
---------------------------
1)      Return to Display Options Menu

2)      Display IP Network Interface Information

3)      Display IP Network Hosts

4)      Display IP Network Routing Tables

5)      Ping another IP Host

Select:
```

Figure 4–8: Display Network Information Menu

4.5.3.1 Display IP Network Interface Information

To display the IP network interface information as shown in Figure 4–9, enter '2' at the Display Network Information menu. This figure shows the display for a Freeway 3100 booting from the primary Ethernet interface. "elt" in the figure refers to the interface type as defined in the Boot Device parameter of the System Boot Parameters menu described in Section 4.6.1 on page 108. Network information for all attached interfaces is displayed, including the boot device as well as any additional interfaces specified with the added_interface_type parameter in the boot configuration file.

```
IP Network Interface Information
-------------------------------
        em0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0
           mtu 1500
           options=4219b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING,
            VLAN_HWCSUM,TSO4,WOL_MAGIC,VLAN_HWTSO>
           ether 00:0b:ab:6d:15:4c
           inet 192.168.1.111 netmask 0xffffff00 broadcast 192.168.1.255
           inet6 fe80::20b:abff:fe6d:154c%em0 prefixlen 64 scopeid 0x1
           nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>
           media: Ethernet autoselect (100baseTX <full-duplex>)
           status: active
        em1: flags=8c02<BROADCAST,OACTIVE,SIMPLEX,MULTICAST> metric 0
            mtu 1500
           options=4219b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING,
            VLAN_HWCSUM,TSO4,WOL_MAGIC,VLAN_HWTSO>
           ether 00:0b:ab:6d:15:4d
           nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>
           media: Ethernet autoselect
           status: no carrier
        ipfw0: flags=8801<UP,SIMPLEX,MULTICAST> metric 0 mtu 65536
           nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>
        lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> metric 0 mtu 16384
           options=600003<RXCSUM,TXCSUM,RXCSUM_IPV6,TXCSUM_IPV6>
           inet 127.0.0.1 netmask 0xff000000
           inet6 ::1 prefixlen 128
           inet6 fe80::1%lo0 prefixlen 64 scopeid 0x4
           nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>

Press RETURN to continue
```

Figure 4–9: Display IP Network Interface Information

4.5.3.2 Display IP Network Hosts

To display the IP network hosts as shown in Figure 4–10, enter '3' at the Display Network Information menu.

```
IP Network Hosts
----------------
gw2 (192.168.1.2) at 00:e0:81:01:53:00 on em0 [ethernet]
fwy29 (192.168.1.29) at 00:e0:81:11:0a:8a on em0 [ethernet]

   Press RETURN to continue
```

Figure 4–10: Display IP Network Hosts

4.5.3.3 Display IP Network Routing Tables

To display the IP network routes as shown in Figure 4–11, enter '4' at the Display Network Information menu.

```
IP Network Routing Tables
-------------------------
Routing tables

Internet:
Destination        Gateway            Flags    Refs      Use  Netif Expire
default            gw2                UGSc      0         0    fxp0
localhost          localhost          UH        0         0     lo0
192.168.1          link#1             UC        2         0    fxp0
gw2                link#1             UHLW      1         0    fxp0
fwy29              00:e0:81:11:0a:8a  UHLW      0         9     lo0

Internet6:
Destination        Gateway            Flags     Netif Expire
::1                ::1                UH         lo0
fe80::%fxp0        link#1             UC        fxp0
fe80::2e0:81ff:fe1 00:e0:81:11:0b:91  UHL        lo0
fe80::%lo0         fe80::1%lo0        Uc         lo0
fe80::1%lo0        link#3             UHL        lo0
ff01::             ::1                U          lo0
ff02::%fxp0        link#1             UC        fxp0
ff02::%lo0         ::1                UC         lo0

     Press RETURN to continue
```

Figure 4–11: Display IP Network Routing Tables

4.5.3.4 Ping Another IP Host

To ping another IP host as shown in Figure 4–12, enter '5' at the Display Network Information menu. You must enter either an IP address in decimal dot notation (for example, 192.168.123.134) or a hostname known to the Freeway system.

```
Ping another IP Host
--------------------
   Enter host to ping
   (dot-separated IP address or hostname):  192.168.1.201

Attempting to ping "192.168.1.201" ...

PING 192.168.1.201 (192.168.1.201): 56 data bytes

--- 192.168.1.201 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.473/0.473/0.473/0.000 ms

    Press RETURN to continue
```

Figure 4–12: Ping Another IP Host

4.5.4 Display System Information

To access the Display System Information menu as shown in Figure 4–13, enter '5' at the
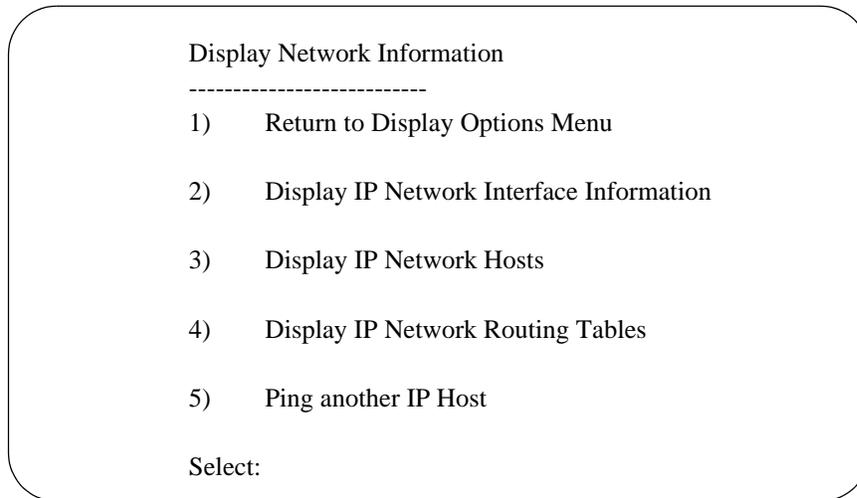Display Options menu.

```
Display System Information
--------------------------
1)      Return to Display Options Menu

2)      List I/O Devices

3)      Display TCB Summary

4)      List Free Memory Blocks

5)      Display Task Stack Usage

6)      Display Circular Queue of Messages

Select:
```
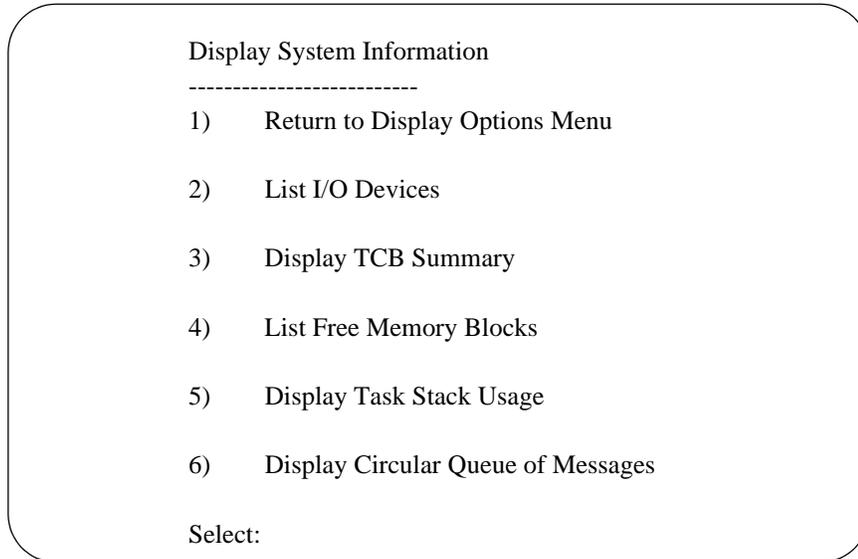
Figure 4–13: Display System Information Menu

4.5.4.1 List I/O Devices

To list the I/O devices as shown in Figure 4–14, enter '2' at the Display System Information menu.

```
I/O Devices
-----------
MAKEDEV
acd0a
acd0c
.
.
. [most devices omitted for brevity]
.
.
tun7
urandom
vga
zero

    Press RETURN to continue
```

Figure 4–14: List I/O Devices

4.5.4.2 Display TCB Summary

To display the task control block (TCB) summary as shown in Figure 4–15, enter '3' at the Display System Information menu.

```
TCB Summary
-----------
USER      PID %CPU %MEM   VSZ   RSS  TT  STAT STARTED      TIME COMMAND
root        0  0.0  0.0     0     0  ??  DLs   8:44PM   0:00.00  (swapper)
freeway  1913  0.0  0.4   628   440  d0  S+    9:02PM   0:00.00 sh -c ps -aux
freeway  1898  0.0  3.3  8452  3800  d0  S+    8:44PM   0:00.04 -bsdfwysh (bsdfw
root     1897  0.0  0.6   960   708  v2  Is+   8:44PM   0:00.01 /usr/libexec/get
root     1896  0.0  0.6   960   708  v1  Is+   8:44PM   0:00.01 /usr/libexec/get
root     1895  0.0  0.6   960   708  v0  Is+   8:44PM   0:00.01 /usr/libexec/get
root     1894  0.0  0.9  1276  1060  d0  Is+   8:44PM   0:00.03 login [pam] (log
root     1858  0.0  1.7  2600  1932  ??  Is    8:44PM   0:00.18 /usr/sbin/sshd
root     1845  0.0  5.1 42392  5868  ??  SN    8:44PM   0:00.12 fwbsd ide=0,0 0
root     1842  1.0  4.0 41980  4624  ??  Ss    8:44PM   0:24.79 fwbsd ide=0,0 0
root     1838  0.0  3.2  4608  3720  ??  SN    8:44PM   0:00.17 /usr/local/sbin/
root     1442  0.0  1.0  1664  1112  ??  Is    8:44PM   0:00.00 inetd
root       15  0.0 12.3 262128 14232  ??  ILs   8:44PM   0:00.26 mfs -o noatime
-
root        7  0.0  0.0     0     0  ??  DL    8:44PM   0:00.03  (syncer)
root        6  0.0  0.0     0     0  ??  DL    8:44PM   0:00.01  (vnlru)
root        5  0.0  0.0     0     0  ??  DL    8:44PM   0:00.01  (bufdaemon)
root        4  0.0  0.0     0     0  ??  DL    8:44PM   0:00.00  (vmdaemon)
root        3  0.0  0.0     0     0  ??  DL    8:44PM   0:00.00  (pagedaemon)
root        2  0.0  0.0     0     0  ??  DL    8:44PM   0:00.00  (taskqueue)
root        1  0.0  0.6  1648   684  ??  ILs   8:44PM   0:00.01 /sbin/init --
root     1914  0.0  0.2   416   220  d0  R+    9:02PM   0:00.00 ps -aux

    Press RETURN to continue
```

Figure 4–15: TCB Summary

4.5.4.3 List Free Memory Blocks

To list the free memory blocks as shown in Figure 4–16, enter '4' at the Display System Information menu.

```
Free Memory Blocks (each block is 4096 bytes)
---------------------------------------------
vm.stats.vm.v_free_count: 15318

TSI buffer size:  1200 bytes

Free / Used TSI buffers:  379 / 133  ( of 512 )

Currently Active Connections:    66  (listening or connected)
Maximum Allowable Connections:   128

Free Connection Control Blocks:  192 ( of 256 )
Free Session Control Blocks:    3968 ( of 3968 )

    Press RETURN to continue
```

Figure 4–16: List Free Memory Blocks

4.5.4.4 Display Task Stack Usage

To display the task stack usage as shown in Figure 4–17, enter '5' at the Display System Information menu.

```
 Task Stack Usage
 ----------------
   PID  TT  STAT      TIME COMMAND
  1898  d0  S+     0:00.05 -bsdfwysh (bsdfwysh)
  1917  d0  S+     0:00.00 sh -c ps

     Press RETURN to continue
```

Figure 4–17: Display Task Stack Usage

4.5.4.5 Display Circular Queue of Messages

To display the circular queue of messages as shown in Figure 4–18, enter '6' at the Display System Information menu. This shows the last 300 messages sent to the Freeway log.

```
Display Circular Log Messages
-----------------------------

050920_204428: STATUS:  Entry to FreeBSD Freeway.  Called with these arguments:
050920_204428: STATUS:    argv[0]: fwbsd.
050920_204428: STATUS:    argv[1]: ide=0,0.
050920_204428: STATUS:    argv[2]: 0.
050920_204428: STATUS:    argv[3]: freeway.
050920_204428: STATUS:    argv[4]: password.
050920_204428: STATUS:    argv[5]: 0x1000.
050920_204428: STATUS:    argv[6]: fwy29.
050920_204428: STATUS:    argv[7]: 192.168.1.29.
050920_204428: STATUS:    argv[8]: ffffff00.

Messages Remaining in Queue = 28

Enter 'q' to quit or Return to continue:

050920_204428: STATUS:    argv[9]: gw2.
050920_204428: STATUS:    argv[10]: 192.168.1.2.
050920_204428: STATUS:    argv[11]: /freeway/boot/.
050920_204428: STATUS:    argv[12]: fwybsd.
050920_204428: STATUS:    argv[13]: bootcfg.
050920_204428: STATUS:    argv[14]: fxp.
050920_204428: STATUS:    argv[15]: 192.168.1.1.
050920_204428: STATUS:  Entry into FreeBSD version of provider.
050920_204428: STATUS:  Reading device configuration file
050920_204428: STATUS:  Processing device configuration file

Messages Remaining in Queue = 18

Enter 'q' to quit or Return to continue:

050920_204428: STATUS:  Reading TSI configuration file
050920_204428: STATUS:  Processing TSI configuration file
050920_204428: STATUS:  Result file: /ram1/muxcfg.bin
050920_204429: STATUS:  Device Configuration Complete
050920_204429: STATUS:  Diagnostics Passed on icp0
050920_204429: STATUS:  icpLoad: Download to device icp0
050920_204429: STATUS:  Processing bscloadb
050920_204429: STATUS:  LOAD osp_2432b.mem at 40100000
050920_204429: STATUS:  Version - VI-200-3164: OS/PROTOGATE 1.2-6 13Oct04 ICP2432B
050920_204429: STATUS:  LOAD b32_2432b.mem at 40120000

Messages Remaining in Queue = 8

Enter 'q' to quit or Return to continue:

050920_204430: STATUS:  Version -  VI-200-3097: BSC3270 V3.1-0 Aug  4 2003
050920_204430: STATUS:  LOAD b37_2432b.mem at 40160000
050920_204430: STATUS:  Version -  VI-200-3097: BSC3780 V3.1-0 Aug  4 2003
050920_204430: STATUS:  icpLoad: INIT procedure at 40120000
050920_204430: STATUS:  icpLoad: Download complete
050920_204430: STATUS:  Entry into FreeBSD version of msgmux.
050920_204430: STATUS:  icp_open: ICP device /dev/icp0 MMAPed to address 0x285e5000
050920_204430: STATUS:  No /tmp/boot/fwymod.so found; proceeding without it.

  [ End of Log Messages ]
```

Figure 4–18: Display Circular Queue of Messages

4.5.5 Display Network Statistics

To access the Display Network Statistics menu as shown in Figure 4–19, enter '6' at the Display Options menu.

```
Display Network Statistics
--------------------------
1)      Return to Display Options Menu

2)      Display TCP Statistics

3)      Display UDP Statistics

4)      Display IP Statistics

5)      Display ICMP Statistics

Select:
```
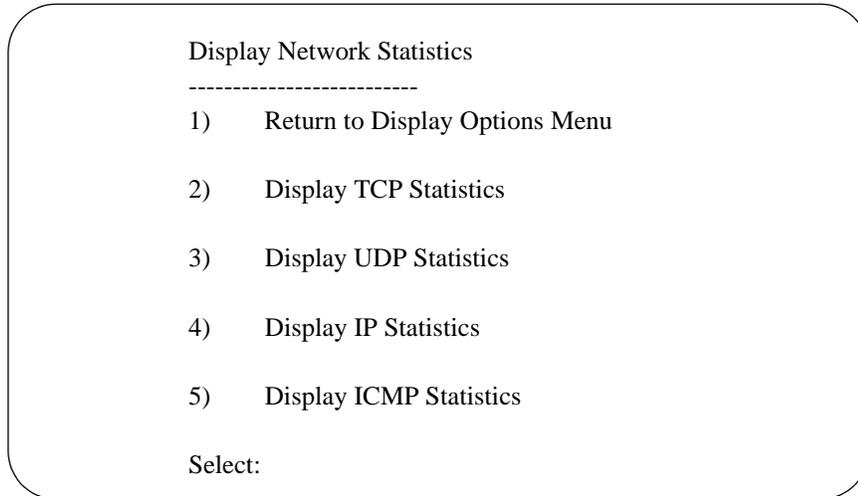
Figure 4–19: Display Network Statistics Menu

4.5.5.1 Display TCP Statistics

To display the transmission control protocol (TCP) statistics as shown in Figure 4–20, enter '2' at the Display Network Statistics menu.

```
TCP Statistics
--------------
TCP:
     1019 packets sent
          632 data packets (64040 bytes)
          0 data packet (0 byte) retransmitted
          254 ack-only packets (184 delayed)
          0 URG only packet
          0 window probe packet
          93 window update packets
          40 control packets
     1138 packets received
          689 acks (for 64056 bytes)
          29 duplicate acks
          0 ack for unsent data
          747 packets (235569 bytes) received in-sequence
          4 completely duplicate packets (0 byte)
          0 packet with some dup. data (0 byte duped)
          3 out-of-order packets (0 byte)
          0 packet (0 byte) of data after window
          0 window probe
          2 window update packets
          4 packets received after close
          0 discarded for bad checksum
          0 discarded for bad header offset field
          0 discarded because packet too short
     5 connection requests
     32 connection accepts
     37 connections established (including accepts)
     44 connections closed (including 0 drop)
     2 embryonic connections dropped
     688 segments updated rtt (of 698 attempts)
     1 retransmit timeout
          0 connection dropped by rexmit timeout
     0 persist timeout
     2 keepalive timeouts
          0 keepalive probe sent
          0 connection dropped by keepalive

  Press RETURN to continue
```

Figure 4–20: Display TCP Statistics

4.5.5.2 Display UDP Statistics

To display the user datagram protocol (UDP) statistics as shown in Figure 4–21, enter '3' at the Display Network Statistics menu.

```
UDP Statistics
--------------
udp:
        2514 datagrams received
        0 with incomplete header
        0 with bad data length field
        0 with bad checksum
        0 with no checksum
        28 dropped due to no socket
       0 broadcast/multicast datagrams dropped due to no socket
        0 dropped due to full socket buffers
        0 not for hashed pcb
        2486 delivered
        2514 datagrams output


     Press RETURN to continue
```

Figure 4–21: Display UDP Statistics

4.5.5.3 Display IP Statistics

To display the Internet protocol (IP) statistics as shown in Figure 4–22, enter '4' at the Display Network Statistics menu.

```
IP Statistics
-------------
ip:
        10384536 total packets received
        0 bad header checksums
        0 with size smaller than minimum
        0 with data size < data length
        0 with ip length > max ip packet size
        0 with header length < data size
        0 with data length < header length
        0 with bad options
        0 with incorrect version number
        0 fragments received
        0 fragments dropped (dup or out of space)
        0 fragments dropped after timeout
        0 packets reassembled ok
        10380467 packets for this host
        28 packets for unknown/unsupported protocol
        0 packets forwarded (0 packets fast forwarded)
        0 packets not forwardable
        0 packets received for unknown multicast group
        0 redirects sent
        10379972 packets sent from this host
        0 packets sent with fabricated ip header
        0 output packets dropped due to no bufs, etc.
        0 output packets discarded due to no route
        0 output datagrams fragmented
        0 fragments created
        0 datagrams that can't be fragmented
        0 tunneling packets that can't find gif
        0 datagrams with bad address in header

Press RETURN to continue
```

Figure 4–22: Display IP Statistics

4.5.5.4 Display ICMP Statistics

To display the ICMP statistics as shown in Figure 4–23, enter '5' at the Display Network Statistics menu.

```
ICMP Statistics
---------------
icmp:
        28 calls to icmp_error
        0 errors not generated in response to an icmp message
        Output histogram:
                destination unreachable: 28
        0 messages with bad code fields
        0 messages < minimum length
        0 bad checksums
        0 messages with bad length
        0 multicast echo requests ignored
        0 multicast timestamp requests ignored
        Input histogram:
                echo reply: 1022
                destination unreachable: 28
        0 message responses generated
        0 invalid return addresses
        0 no return routes
        ICMP address mask responses are disabled

    Press RETURN to continue
```

Figure 4–23: Display ICMP Statistics

4.5.6 Display User Names

To display the user names for the Freeway server as shown in Figure 4–24, enter '7' at the Display Options menu.

```
Users
-----
root
root
shell
freeway
display

Press RETURN to continue
```

Figure 4–24: Display User Names

4.5.7 Display Current System Time

To display the current system time for the Freeway server as shown in Figure 4–25, enter '8' at the Display Options menu. The UTC time is displayed in the following format:

YYYY MM DD HH:MM:SS

```
Current system time:  2007 04 18 21:33:30 UTC


    Press RETURN to continue
```

Figure 4–25: Display Current System Time

4.6 Modify Configuration

To access the Freeway Modify Configuration menu as shown in Figure 4–26, enter '3' at the Freeway Interactive Menu.

```
          Modify Configuration
          --------------------
          1)   Return to Interactive Menu

          2)   Modify Boot Parameters

          3)   Modify User Names

          4)   Modify System Time

          Select:
```

Figure 4–26: Modify Configuration Menu

4.6.1 Modify Boot Parameters

To modify the Freeway boot parameter settings, enter '2' at the Modify Configuration menu. Figure 4–27 shows typical boot parameter settings for a Freeway 2000. Any changes made to these parameters are stored in Freeway's non-volatile memory. Table 4–2 describes each parameter. Three actions are possible as each parameter is displayed:

- To preserve a parameter, press <return>

- To edit a parameter, type in the new alpha-numeric information followed by <return>

- To null out a parameter, press the period key ('.') followed by <return>

After scrolling through all the parameters, type '**yes**' to save the changes or '**no**' to cancel. The System Boot Parameters are then redisplayed as modified.

```
Freeway System Boot Parameters
------------------------------

Enter '.' to erase parameter
Enter '<RETURN>' for no parameter change


Boot Device               :   ide=0,0
Processor Number          :   0
FTP User Name             :   freeway
FTP Password              :   password
Flags                     :   0x1000
Freeway Server Name       :   freeway2
Freeway Inet Address      :   192.168.1.45
Freeway Subnet Mask       :   ffffff00
Boot Server Name          :   gw2
Boot Server Inet Address  :   192.168.1.2
System Boot Directory     :   /usr/local/freeway/boot
System Boot File Name      :   fwybsd
Configuration File Name   :   bootcfg
Secondary Net Interface   :   fei
Gateway Inet Address      :

Save modifications?

Enter 'yes <RETURN>' to save modifications
Enter 'no <RETURN>' to prevent modifications:
```

Figure 4–27: Modify Boot Parameters

Table 4–2: Freeway System Boot Parameter Descriptions

Boot Parameter	Description
Boot Device	**Freeway 31*xx*/32*xx*/34*xx*/36*xx*:** • to boot from the internal IDE or SATA disk drive, set the boot device to **ide=0,0** • to boot over Ethernet from the boot server using the on-board NIC, set the boot device to **fei** **Freeway 1100/1150/1200/1300:** • to boot over Ethernet from the boot server using the primary 3Com Etherlink III network interface card (NIC), set the boot device to one of the following depending on the physical connector you will be using: **elt,1** for AUI, **elt,2** for BNC, and **elt,3** for RJ45 connection • to boot over Fast Ethernet from the boot server using the primary Intel EtherExpress Pro/100 NIC, set the boot device to **fei** • to boot from the internal IDE disk, set the boot device to **ide=0,0**
Processor Number	This parameter is the number of server processors in the Freeway server minus one. Currently, a Freeway server can support only one server processor. *The only valid number for this parameter is 0.*
FTP User Name	If booting from a boot server, Freeway uses this name to log in to its FTP (or RSH). The default is **freeway**. This parameter is ignored if you are booting from the local disk.
FTP Password	If booting from the boot server, Freeway uses this password to log in to its user account. The default is **password**. If a password is given, FTP is used during system boot; if it is cleared, the remote shell (RSH) protocol is used. This parameter is ignored if you are booting from the local disk.
Flags	This parameter specifies whether you want Freeway to: • Autoboot two seconds after system reset, seven seconds after system reset, or not at all • Display the version numbers of the .mem files • Force the primary boot network interface to operate at 10 megabits/second, half duplex Enter the Flags value shown in Table 4–3 on page 109 that matches your configuration requirements. The default Flags value is 0. The Flags word is an inclusive "OR" of the desired bits for the individual functions.

Table 4–2: Freeway System Boot Parameter Descriptions *(Cont'd)*

Boot Parameter	Description
Freeway Server Name	Enter the system name assigned by the system administrator for this Freeway.
Freeway Inet Address	Enter the Internet address assigned by the system administrator for this Freeway in decimal dot notation (for example, 192.168.1.45).
Freeway Subnet Mask	If your Freeway is located on a subnet, enter the subnet mask in hexadecimal format (for example, ffffff00).
Boot Server Name	Enter the name assigned by the system administrator for the boot server. If you are booting from the local disk, this parameter is ignored.
Boot Server Inet Address	Enter the Internet address assigned by the system administrator for the boot server in decimal dot notation (for example, 192.168.1.2). If you are booting from the local disk, this parameter is ignored.
System Boot Directory	If the Freeway boot files will be stored in the home directory of the FTP (or RSH) user account of the bootserver system, clear this field. Otherwise, enter the full path name of the boot directory. The default UNIX directory is /usr/local/freeway/boot. The default VMS directory is sys$sysdevice:[freeway.boot]. For Windows, use the alias you have set up to point to the freeway\boot directory. If you are booting from the local disk, this parameter is ignored.
System Boot File Name	Enter the system boot file name for this Freeway: • For a Freeway 3xxx, the default is **fwybsd** • For a Freeway 1100/1150/1200/1300, the default is **fw486**
Configuration File Name	Enter the name of the file Freeway uses to configure the physical or virtual devices and services. This file name is usually **bootcfg**.
Secondary Network Interface	If the Boot Device is the hard or flash disk, this parameter specifies the local area network device to be used after Freeway boots. The values used to define your network interface device are the same as those defined for the Boot Device parameter on page 107. If the Boot Device is a local area network device (boot server), the Secondary Network Interface parameter should be cleared.
Gateway Inet Interface	If your Freeway and boot server are on the same network, clear this parameter, which is the default. If they are on different networks, enter the IP address of the gateway processor on the Freeway's network that provides access to the boot server's network.

Table 4–3: Flags for Reset Action

Flags Parameter Value	Reset Action
0x0000 (default)	Upon system reset, wait 7 seconds before autobooting.
0x0004	Upon system reset, display the Freeway Boot System Main Menu. Do not autoboot.
0x0008	Upon system reset, wait 2 seconds before autobooting.
0x1000	Display version numbers of .mem files downloaded to an ICP during boot. The Flags word is an inclusive "OR" of the desired bits for the individual functions; for example, 0x1008 waits 2 seconds before auto-booting and displays the version numbers.
0x2000	Force primary boot network interface to operate at 10 megabits/second, half duplex. The Flags word is an inclusive "OR" of the desired bits for the individual functions; for example, 0x2008 waits 2 seconds before autobooting and forces the 10 megabits/second speed.

4.6.2 Modify User Names

To modify the Freeway user names, enter '3' at the Modify Configuration menu. The Modify User Names menu is shown in Figure 4–28. You must be logged in as a "root" level user in order to modify user names. If you are not logged in as a "root" level user, then you are only allowed to change the password on your login account.

```
Modify User Names
-----------------
1)    Return to Modify Configuration Menu

2)    Add User to Login Table

3)    Delete User From Login Table

Select:
```
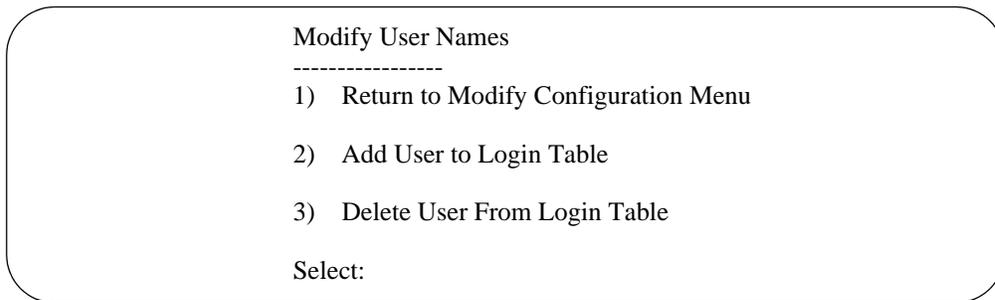
Figure 4–28: Modify User Names

To modify user names, you can select '2' to add a user name or '3' to delete one. In either case, you are prompted to enter the user name, then asked to enter the password twice. There can be up to 10 user names. User names can be up to 128 characters in length and can include spaces. Passwords must be at least 8 characters in length and no more than 128 characters.

When you first install Freeway, the default user name (freeway) and password (password) are in effect. Changes made with the Modify User Names menu modify the permanent User/Password table. This table is checked each time Freeway is rebooted. If all user names are removed or the table becomes corrupted, the User/Password table will automatically be rebuilt the next time Freeway is rebooted and the default user name and password will again be in effect.

Caution

The Freeway user name and password are used to access the Freeway Interactive Menu. They are not to be confused with the FTP user name and FTP password (which have defaults of freeway and password). The latter are Freeway system boot parameters which are used between Freeway and the boot server during system boot (see Section 4.6.1 on page 105).

4.6.3 Modify System Time

To modify the current system time for the Freeway server as shown in Figure 4–29, enter '4' at the Modify Configuration menu and type in the date and time in the same format as shown on the screen.
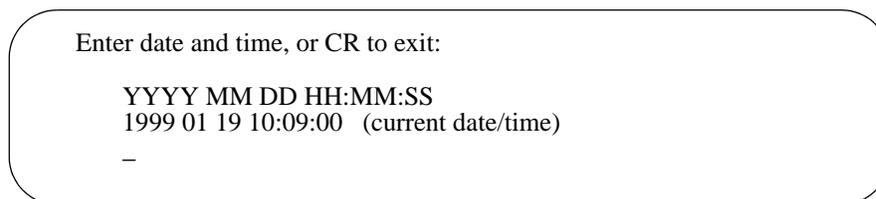
```
Enter date and time, or CR to exit:

    YYYY MM DD HH:MM:SS
    1999 01 19 10:09:00   (current date/time)
    _
```

Figure 4–29: Modify System Time

4.7 Trace Functions

The current trace status is shown in parentheses in the Trace Function option in the Freeway Interactive Menu. To access the Trace Functions menu as shown in Figure 4–30, enter '4' at the Freeway Interactive Menu.

```
Trace Functions
---------------
1)      Return to Interactive Menu

2)      Turn MSGMUX Trace On

3)      Turn MSGMUX Trace Off

4)      Process Trace Data

Select:
```
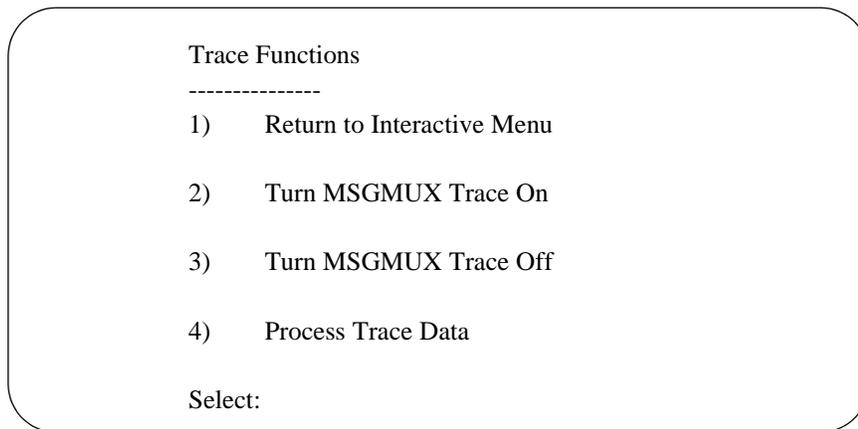
Figure 4–30: Trace Functions Menu

Enter '2' to turn trace on. Freeway then saves messages moving to and from the client in a circular buffer. When trace data fills the buffer, the oldest trace data is overwritten with new trace data.

Enter '3' to turn trace off, then enter '4' to process the trace data. The messages in the trace buffer are in binary form to save space. The messages are converted to ASCII before being written to the Freeway disk drive or boot server.

When you select Process Trace Data, you are prompted for the trace level, (1) TSI or (2) DLI. The difference between the two levels is what information is included in the trace as follows:

- (1) TSI: TSI header and TSI data area

- (2) DLI: TSI header, TSI data area, DLI header, and DLI data area

Note

From most tracing purposes, you should select trace level (2) DLI because it gives you more protocol specific information.

You are then prompted to enter a file name and press <return>. A 'snapshot' of the current trace data is then written to the specified file located in the /tmp directory of the Freeway local disk. Since the /tmp directory is in the ram disk (memory) partition, the trace file will be deleted when the Freeway is rebooted. You can use the File Transfer Protocol (FTP) to move the file from the Freeway ram disk to your local directory. Figure 4–31 shows an example of using FTP on a PC to retrieve a trace file from the Freeway.

```
C:\Protogate>ftp freeway1
Connected to freeway1.
220 BSD Unix (5.1.1) FTP server ready
Name: freeway
331 Password required
Password: password
230 User logged in
ftp> cd /tmp
250 Changed directory to "/tmp"
ftp> get trace1.txt
200 Port set okay
150 Opening ASCII mode data connection
226 Transfer complete
local: trace1.txt remote: trace1.txt
32 bytes received in 0.0053 seconds (5.9 Kbytes/s)
ftp> bye
C:\Protogate>
```

Figure 4–31: File Transfer Protocol Example

If the Freeway was booted from a remote boot server, the trace file will be transferred via FTP to the system boot directory on the boot server. For the path name of this directory,

see the Display Boot Parameters screen (page 86). To capture the trace data to a file on the boot server, the user defined in FTP User Name in the System Boot Parameters menu (page 106) must have write privileges in the system boot directory on the boot server.

4.8 Disk Drive Options

To access the Disk Drive Options menu as shown in Figure 4–32, enter '5' at the Freeway
Interactive Menu.

```
Disk Drive Options
------------------
1)      Return to Interactive Menu

2)      Hard Disk Copy Options

3)      Hard Disk Maintenance Options

4)      Floppy Disk Copy Options

5)      Floppy Disk Maintenance Options

Select:
```
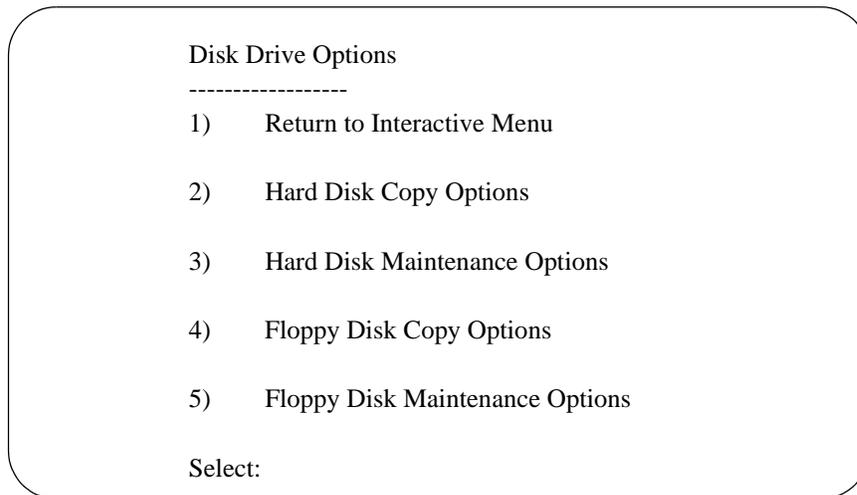
Figure 4–32: Disk Drive Options Menu

4.8.1 Hard Disk Copy Options

To access the Hard Disk Copy Options menu as shown in Figure 4–33, enter '2' at the Disk Drive Options menu.

```
Hard Disk Copy Options
----------------------
1)      Return to Disk Drive Options Menu

2)      Display Hard Disk Directory

3)      Display Hard Disk File

4)      Copy Boot Server File To Hard Disk

5)      Copy Hard Disk File To Floppy Disk

6)      Copy Floppy File To Hard Disk

Select:
```
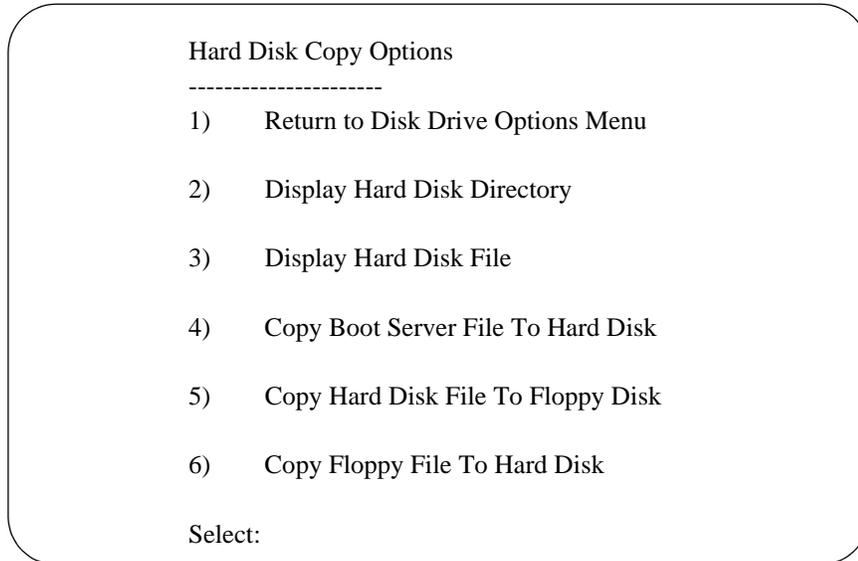
Figure 4–33: Hard Disk Copy Options Menu

4.8.1.1 Display Hard Disk Directory

To display the hard disk directory, enter '2' at the Hard Disk Copy Options menu. When using the normal Freeway console, this menu selection will display only the root directory of the login account as shown in Figure 4–34.

```
Display Disk Devices
--------------------
total 1
drwx------  2 root  wheel  512 Jun 21 02:31 .ssh

   Press RETURN to continue
```

Figure 4–34: Display Hard Disk Directory (serial console)

However, the web browser interface to the Freeway console has a much more flexible method of displaying hard disk directories as shown in Figure 4–35. Using the web browser interface, you can type in which directory you want to display, then click on "Display Directory" and the directory contents will be shown in the text area below.

5. - Hard Disk Copy Options

1. <u>Return to Disk Drive Options Menu</u>

2. Directory: `/usr/local/freeway/client/test/sps`   [Display Directory]

3. Filename: [ ]   [Display File]

4. Filename: [ ]   [Copy File to Hard Disk]

5. Filename: [ ]   [Copy File to Floppy Disk]

6. Filename: [ ]

[Copy File from Floppy Disk]

Contents of hard disk directory: "/usr/local/freeway/client/test/sps"

```
total  640
lrwxrwxrwx  1 freeway   guest        12 Mar 20   2008 Makefile -> makefile.bsd
-rw-rw-r--  1 freeway   guest      1394 Mar 20   2008 makefile.bsd
-rw-rw-r--  1 freeway   guest      2242 Sep 24   2003 makefile.src
-rw-rw-r--  1 freeway   guest     20017 Mar 20   2008 spsaldcfg
-rw-rw-r--  1 freeway   guest     31931 Sep 10   1999 spsaldcfgraw
-rw-rw-r--  1 freeway   guest     80600 Mar 20   2008 spsalp.c
-rw-r--r--  1 root      guest     30204 May  2   2008 spsalp.o
-rw-rw-r--  1 freeway   guest    101509 Sep  4   2003 spsalpraw.c
-rw-r--r--  1 root      guest     36168 May  2   2008 spsalpraw.o
-rw-rw-r--  1 freeway   guest      2280 Mar 28   2008 spsaltcfg
-rw-rw-r--  1 freeway   guest      2197 Apr 29   1999 spsaltcfgraw
```

Figure 4–35: Display Hard Disk Directory (web browser)

4.8.1.2 Display Hard Disk File

To display a hard disk file as shown in Figure 4–36, enter '3' at the Hard Disk Copy Options menu. If you change your mind about displaying a file, simply press <return>, then you will be prompted to press <return> again. You may enter the entire path name of the file to be displayed.

Note

All Freeway file names are case sensitive.

```
 Enter file name to display: /tmp/boot/bootcfg

#------------------------------------------------------------------------#
#  This is the Freeway server boot file for PCI bus ICP2432's. It        #
#  contains tables and examples of various Freeway and Host              #
#  configurations. This file is listed in the Freeway's boot parameters #
#  under the name                                                        #
#     "System Boot File Name"                                            #
#                                                                        #
#  There must be a physical device entry for each ICP installed in the   #
#  Freeway for each ICP to be downloaded                                 #
#                                                                        #
#  Each physical device (ICP) entry currently supports a single service #
#  (usually a protocol) and has the following items                     #
#                                                                        #
#     1) Device Name      (icp0, icp1, icp2, icp3, etc.)                 #
#     2) Device Card Type (ICP2432)                                      #
#     3) Slave Address    (see table below)                             #
#     4) Bus Number       (see table below)                             #
#     5) Download Script File (see text below)                          #
#                                                                        #
#  Server wide parameters are at the bottom of the file (see below)      #

/tmp/boot/bootcfg 26%
```

Figure 4–36: Display Hard Disk File

4.8.1.3 Copy Boot Server File to Hard Disk

This command will copy a file from the remote boot server's Freeway boot directory to the Freeway hard disk. To copy a boot server file to the hard disk as shown in Figure 4–37, enter '4' at the Hard Disk Copy Options menu. If you change your mind

```
Enter file name to copy. If directory not entered, boot directory
is assumed:
```
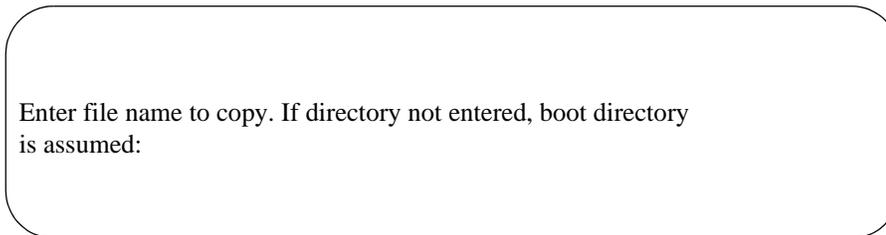
Figure 4–37: Copy Boot Server File to Hard Disk

about copying a file, simply press <return>, then you will be prompted to press <return> again. If the Freeway is not configured to boot from a remote server, this command will return an error.

4.8.1.4 Copy Hard Disk File to Floppy Disk

To copy a hard disk file to the floppy disk as shown in Figure 4–38, enter '5' at the Hard Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

> The Freeway uses the BSD Unix DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway are case sensitive.
>
> The file names bootrom.sys and nvram.txt are reserved for Freeway use and may not be copied to or from any disk. If either of these file names is on the hard disk, using * to copy all files will result in an error when Freeway attempts to copy the reserved file.
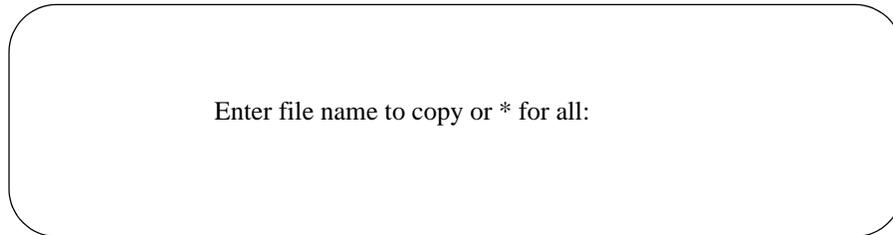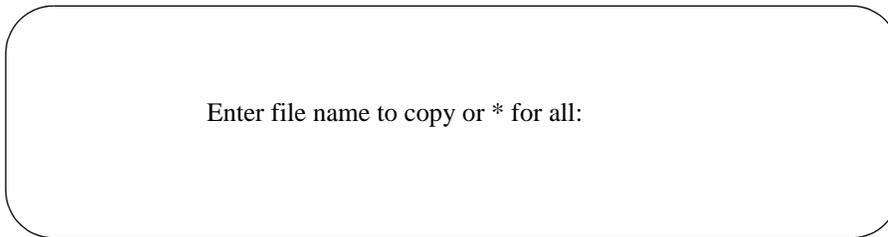
Enter file name to copy or * for all:

Figure 4–38: Copy Hard Disk File to Floppy Disk

4.8.1.5 Copy Floppy File to Hard Disk

To copy a floppy file to the hard disk as shown in Figure 4–39, enter '6' at the Hard Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

> The floppy disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the floppy disk are not case sensitive.

Enter file name to copy or * for all:

Figure 4–39: Copy Floppy File to Hard Disk

4.8.2 Hard Disk Maintenance Options

To access the Hard Disk Maintenance Options menu as shown in Figure 4–40, enter '3' at the Disk Drive Options menu.

```
Hard Disk Maintenance Options
-----------------------------
1)      Return to Disk Drive Options Menu

2)      Display Hard Disk Directory

3)      Build Hard Disk From Boot Server

4)      Delete Hard Disk File

5)      Rename Hard Disk File

Select:
```
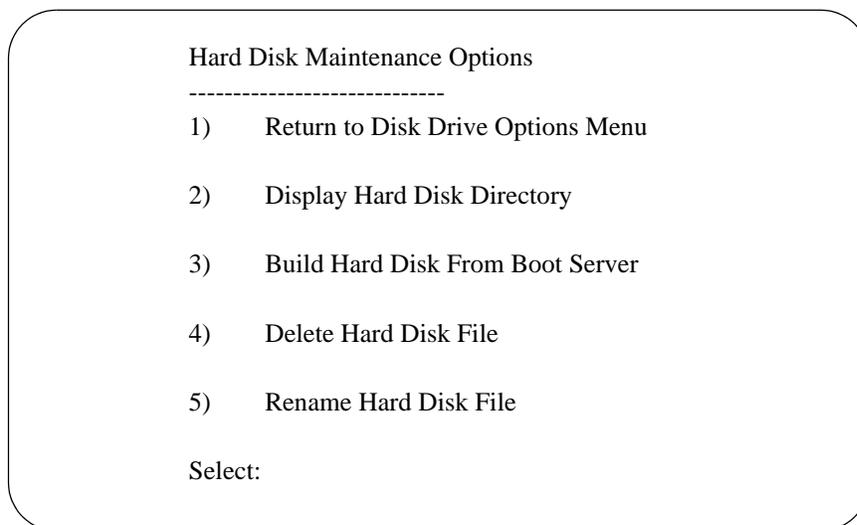
Figure 4–40: Hard Disk Maintenance Options Menu

4.8.2.1 Display Hard Disk Directory

To display the hard disk directory, enter '2' at the Hard Disk Maintenance Options menu. When using the normal Freeway console, this menu selection will display only the root directory of the login account as shown in Figure 4–41.

Note

File names for the Freeway hard drive are case sensitive.
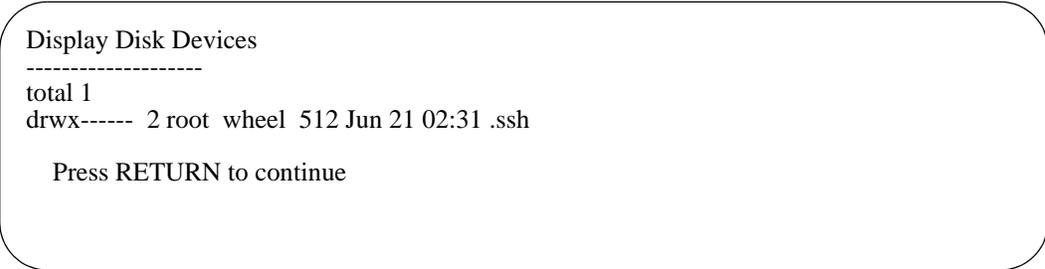
```
Display Disk Devices
--------------------
total 1
drwx------  2 root  wheel  512 Jun 21 02:31 .ssh

   Press RETURN to continue
```

Figure 4–41: Display Hard Disk Directory

The web browser interface to the Freeway console has a much more flexible method of displaying hard disk directories as previously shown in Figure 4–35. Using the web browser interface, you can type in which directory you want to display, then click on "Display Directory" and the directory contents will be shown in the text area at the bottom of the web page.

4.8.2.2 Build Hard Disk from Boot Server

If the Freeway is configured to boot from a remote boot server, this menu option copies all the files from the boot directory on the boot server to the permanent boot directory on the Freeway disk drive (/usr/local/freeway/boot.src). This is usually done in preparation for configuring the Freeway to boot from its own disk drive.

If the Freeway is already configured to boot from its own disk drive, this menu option copies all the files from the working boot directory in ram disk (/tmp/boot) to the permanent boot directory on the Freeway disk drive (/usr/local/freeway/boot.src). This provides a convenient way for users to make changes to Freeway configuration files in the read/write ram disk partition, and then save them to the permanent boot directory on the Freeway.

Table 4–4 shows a summary of the steps that are normally performed in order to manually update any of the boot configuration files on the Freeway disk drive. This method of updating the Freeway files is known as "5-3-3" because of the menu number choices.

Table 4–4: Steps to update boot files using the 5-3-3 method

Step 1: Use FTP to copy files from /tmp/boot to your local system.

Step 2: Edit the text configuration files with your favorite editor.

Step 3: Use FTP to copy the modified files back to /tmp/boot on the Freeway disk.

Step 4: Log on to Freeway to access the Freeway Interactive Menu and select 5, then 3, then 3.

Step 5: When asked to confirm, type "yes", then type ENTER to return to the "Hard Disk Maintenance Options" menu.

Step 6: Select menu options 1, 1, 1, and 2 to return to the main menu and reboot the Freeway.

Step 7: When the Freeway boots up, it will use the modified configuration files.

4.8.2.3 Delete Hard Disk File

To delete a hard disk file as shown in Figure 4–42, enter '4' at the Hard Disk Mainte-
nance Options menu. If you change your mind about deleting a file, simply press
<return>, then you will be prompted to press <return> again. Always include the full
path name when deleting a file.

```
 Select: 4

 Enter file name to remove: /tmp/boot/bootcfg.prev

File /tmp/boot/bootcfg.prev is removed.

    Press RETURN to continue
```

Figure 4–42: Delete Hard Disk File

Note

This menu option will only delete files located in a read-write par-
tition on the Freeway disk drive. To delete files in a read-only par-
tition, see Section 6.2.2 on page 162.

.

4.8.2.4 Rename Hard Disk File

To rename a hard disk file as shown in Figure 4–43, enter '5' at the Hard Disk Maintenance Options menu. If you change your mind about renaming a file, simply press <return>, then you will be prompted to press <return> again. Always include the full path name in the source and destination when renaming a file.

```
Select: 5

 Enter file name to rename: /tmp/boot/swtcfg

 Enter new file name: /tmp/boot/swtcfg.prev

File /tmp/boot/swtcfg has been successfully renamed to /tmp/boot/swtcfg.prev.

    Press RETURN to continue
```

Figure 4–43: Rename Hard Disk File

4.8.3 Floppy Disk Copy Options

To access the Floppy Disk Copy Options menu as shown in Figure 4–44, enter '4' at the
Disk Drive Options menu.

Note

Floppy Disk Copy options will only work on Freeway servers that
are equipped with a physical floppy disk drive.

```
Floppy Disk Copy Options
------------------------
1)      Return to Disk Drive Options Menu

2)      Display Floppy Disk Directory

3)      Display Floppy Disk File

4)      Copy Boot Server File To Floppy Disk

5)      Copy Floppy Disk File To Hard Disk

6)      Copy Hard Disk File To Floppy Disk

Select:
```
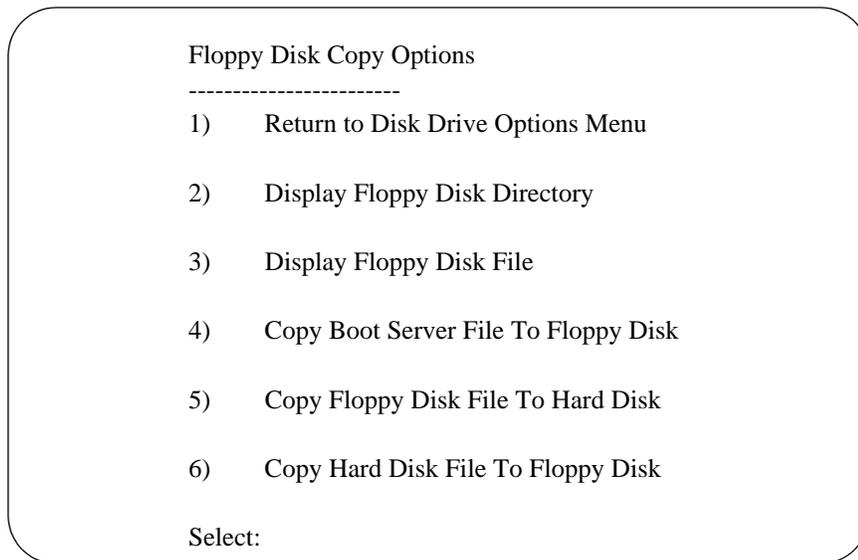
Figure 4–44: Floppy Disk Copy Options Menu

4.8.3.1 Display Floppy Disk Directory

To display the floppy disk directory as shown in Figure 4–45, enter '2' at the Floppy Disk Copy Options menu.

```
 Select: 2

Display Disk Devices
--------------------
total 957
-rwxr-xr-x  1 root  wheel  498988 Jul 12  2005 b32_2432b.mem
-rwxr-xr-x  1 root  wheel  470480 Jul 12  2005 b37_2432b.mem
-rwxr-xr-x  1 root  wheel    6955 Oct 22 10:38 bootcfg
-rwxr-xr-x  1 root  wheel     586 Jul 31 11:37 bootparm.txt
-rwxr-xr-x  1 root  wheel    1350 Jul 11  2003 bscloadb
(END)

    Press RETURN to continue
```

**Figure 4–45:** Display Floppy Disk Directory

4.8.3.2 Display Floppy Disk File

To display a floppy disk file as shown in Figure 4–46, enter '3' at the Floppy Disk Copy Options menu. If you change your mind about displaying a file, simply press <return>, then you will be prompted to press <return> again.

```
Select: 3

 Enter file name to display: bootcfg

Attempting to list contents of file: "bootcfg" ...

#--------------------------------------------------------------------------
#
#  This is the Freeway server boot file for PCI bus ICP2432's. It       #
#  contains tables and examples of various Freeway and Host             #
#  configurations. This file is listed in the Freeway's boot parameters #
#  under the name                                                       #
#     "System Boot File Name"                                           #
#                                                                       #
#  There must be a physical device entry for each ICP installed in the  #
#  Freeway for each ICP to be downloaded                                #
#                                                                       #
#  Each physical device (ICP) entry currently supports a single service #
#  (usually a protocol) and has the following items                     #
#                                                                       #
#     1) Device Name      (icp0, icp1, icp2, icp3, etc.)                #
#     2) Device Card Type (ICP2432)                                     #
#     3) Slave Address    (see table below)                            #
#     4) Bus Number       (see table below)                            #
#     5) Download Script File (see text below)                          #
#                                                                       #
#  Server wide parameters are at the bottom of the file (see below)     #
#--------------------------------------------------------------------------
#
#                                                                       #
#  DOWNLOAD SCRIPT FILE:                                                #
#  -------------------                                                  #
/mnt/bootcfg 25%
```

Figure 4–46: Display Floppy Disk File

4.8.3.3 Copy Boot Server File to Floppy Disk

To copy a boot server file to the floppy disk as shown in Figure 4–47, enter '4' at the Floppy Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.
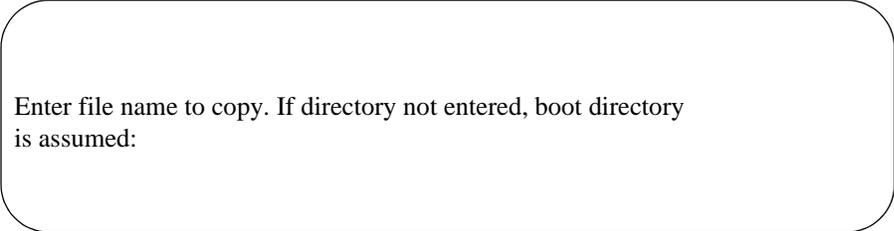
Enter file name to copy. If directory not entered, boot directory
is assumed:

Figure 4–47: Copy Boot Server File to Floppy Disk

4.8.3.4 Copy Floppy Disk File to Hard Disk

To copy a floppy disk file to the hard disk as shown in Figure 4–48, enter '5' at the Floppy Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

.

Enter file name to copy or * for all:
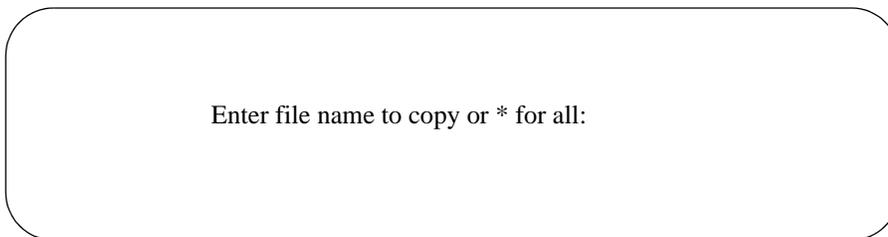
Figure 4–48: Copy Floppy Disk File to Hard Disk

4.8.3.5 Copy Hard Disk File to Floppy Disk

To copy a hard disk file to the floppy disk as shown in Figure 4–49, enter '6' at the Floppy Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again. Always include the full path name in the file to be copied.

```
Floppy Disk Copy Options
    ------------------------
    1)     Return to Disk Drive Options Menu

    2)     Display Floppy Disk Directory

    3)     Display Floppy Disk File

    4)     Copy Boot Server File To Floppy Disk

    5)     Copy Floppy Disk File to Hard Disk

    6)     Copy Hard Disk File To Floppy Disk

    Select: 6

Enter file name to copy or * for all: /tmp/boot/muxcfg


    Press RETURN to continue
```

Figure 4–49: Copy Hard Disk File to Floppy Disk

4.8.4 Floppy Disk Maintenance Options

To access the Floppy Disk Maintenance Options menu as shown in Figure 4–50, enter '5' at the Disk Drive Options menu.

```
Floppy Disk Maintenance Options
-------------------------------
1)      Return to Disk Drive Options Menu

2)      Display Floppy Disk Directory

3)      Delete Floppy Disk File

4)      Rename Floppy Disk File

Select:
```
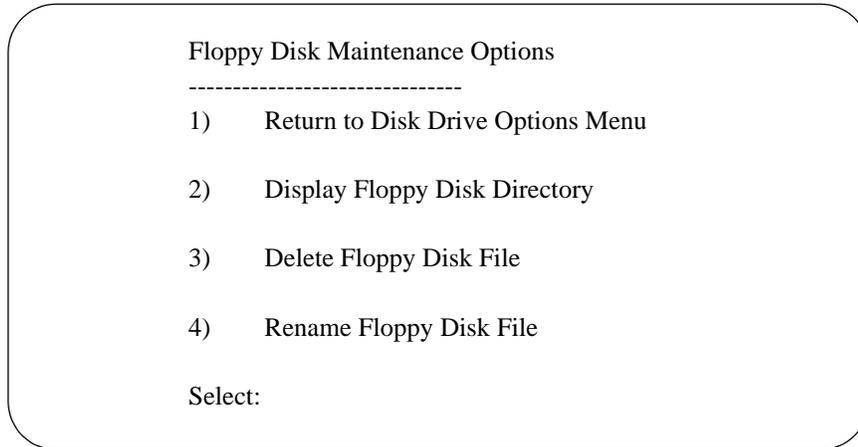
Figure 4–50: Floppy Disk Maintenance Options Menu

4.8.4.1 Display Floppy Disk Directory

To display the floppy disk directory as shown in Figure 4–51, enter '2' at the Floppy Disk Maintenance Options menu.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

```
Display Disk Devices
--------------------
ID LUN VendorID   ProductID    Rev. Type  Blocks  BlkSize pScsiPhysDev
-- --- -------- ---------------- ---- ---- -------- ------- ------------
 2  0  TEAC    FC-1    HF  11 RV J  0R   2880    512   0x00792144
 6  0  MAXTOR  7245-SCSI      1761  0   479656   512   0x00790e50

Directory /fd
-------------
  size      date     time     name
--------    ------   ------   --------
 345534   APR-15-1997 11:57:12  BOOTROM.SYS
  4096    APR-15-1997 12:00:10  NVRAM.TST

  Press RETURN to continue
```

Figure 4–51: Display Floppy Disk Directory

4.8.4.2 Delete Floppy Disk File

To delete a floppy disk file as shown in Figure 4–52, enter '3' at the Floppy Disk Mainte-
nance Options menu. If you change your mind about deleting a file, simply press
<return>, then you will be prompted to press <return> again.

Note

The Freeway floppy disk uses an MS-DOS file system. File names
must follow the DOS convention of having a base name of no more
than eight characters followed by a period and an extension of no
more than three characters.

The file names bootrom.sys and nvram.txt are reserved for Freeway
use and may not be deleted from the floppy disk.

Enter file name to remove:
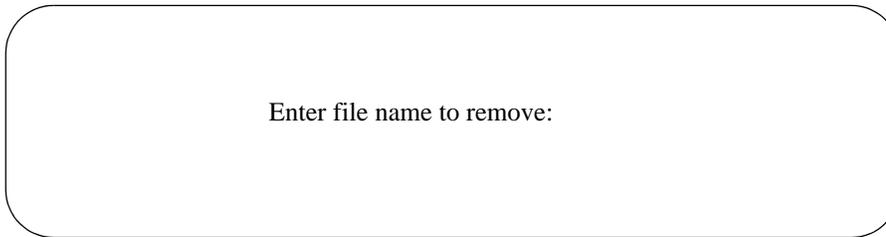
Figure 4–52: Delete Floppy Disk File

4.8.4.3 Rename Floppy Disk File

To rename a floppy disk file as shown in Figure 4–53, enter '4' at the Floppy Disk Main-tenance Options menu. If you change your mind about renaming a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway floppy disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters.

The file names bootrom.sys and nvram.txt are reserved for Freeway use and may not be renamed.

Enter file name to rename:
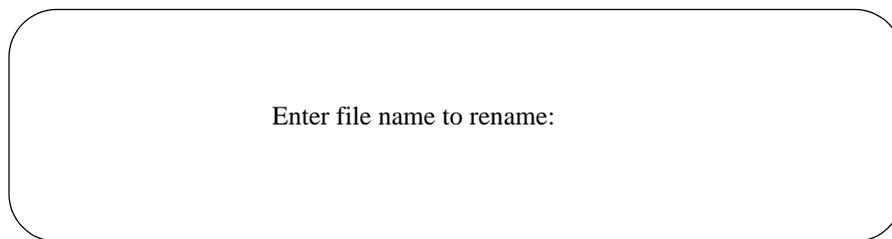
Figure 4–53: Rename Floppy Disk File

4.9 Run BSD Shell

To access the BSD shell as shown in Figure 4–54, enter '6' at the Freeway Interactive Menu. The BSD shell allows you to interactively run BSD Unix commands on the Freeway server. Access to the BSD shell provides a powerful interface that could cause the Freeway to crash if used improperly. Therefore, you should use caution when entering shell commands as a "root" or "shell" user. Protogate recommends that you avoid using shell commands (other than the commands given in this document) unless you have at least a working knowledge of the BSD Unix operating system. To exit the shell, type "exit" at the shell prompt and hit return.

Note

The Run FreeBSD Shell option is not displayed when a user is logged in with "display only" access.

After you enter '6' at the Freeway Interactive Menu, a pound sign (#) prompt will be displayed if you logged in as a "root" user, otherwise a dollar sign ($) prompt will be displayed.

```
VI-200-3290: FWSER 3.2-1 Oct 26 2005 FreeBSD Freeway Server
Main Menu
-------------
1)   Shutdown Options

2)   Display Options

3)   Modify Configuration

4)   Trace Functions (Trace Disabled)

5)   Disk Drive Options

6)   Run FreeBSD Shell

7)   Logout

Select:6

#
```

Figure 4–54: BSD Shell Access

4.10 Logout

To logout of your Freeway session, select the Logout option in the Freeway Interactive Menu. If you logout from a local console, you return to the Freeway User Login prompt. If you logout from a remote session, you return to your system prompt.

Freeway Boot and Operation

This chapter describes the Freeway server boot process in detail and also provides some information on Freeway operation.

Note

Additional information about Freeway operation can be found on the Protogate web site at www.protogate.com/faq.html.

5.1 Freeway Boot Procedure

When the Freeway server is powered up, it follows a certain boot-up procedure that brings it to full operational status. What it does during boot-up depends on several configuration files located on the Freeway disk drive. These configuration files may be customized by the user. Refer to Chapter 6 for information on modifying the Freeway configuration.

The main configuration for the Freeway are the "boot parameters" which are contained in the file nvram.txt on the internal disk drive. The boot parameters point to other configuration files that are used later in the boot sequence. Figure 5–1 shows a "roadmap" of the files used during the Freeway boot sequence.

The Freeway is designed to boot up with or without the serial or VGA console attached. If there is a console attached, the Freeway will display the boot process on the console in real time. Note that more boot information is displayed on the serial console than on the VGA console.
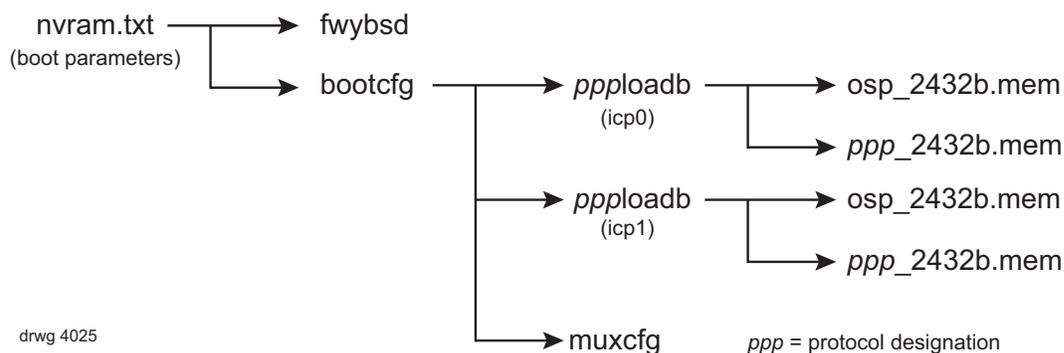
Figure 5–1: Boot File Roadmap

Table 5–1 outlines the steps of the boot process in the order that the Freeway executes them. These steps are defined in sections below.

Table 5–1: Freeway Boot Sequence

Boot Stages	Reference Section(s)
1. Power turned on	Section 5.1.1 on page 143
2. Boot device order: CD/DVD drive, hard drive	Section 5.1.2 on page 143
3. Initial BSD OS boot	Section 5.1.3 on page 143
4. Check for bootparm.txt update (CDROM)	Section 5.1.4 on page 144
5. Boot Parameters (nvram.txt) read	Section 5.1.5 on page 145
6. FreewayOS daemon starts	Section 5.1.6 on page 146
7. Initialize and download ICP boards	Section 5.1.7 on page 146
8. Enable the network (Ethernet) connection.	Section 5.1.8 on page 146
9. Execute commands in rc.startsra.	Section 5.1.9 on page 146
10. Execute commands in command.sh (CDROM)	Section 5.1.10 on page 147
11. Enable user logins	Section 5.1.11 on page 148

5.1.1 Freeway Power-up

The Freeway CPU board has a built-in BIOS similar to most PC systems. The Freeway BIOS settings are pre-configured at the Protogate factory. If you have a VGA monitor and keyboard connected to the Freeway at power-up, you can access the BIOS by typing the DEL key right after power-up. Protogate does not recommend changing any of the Freeway BIOS settings unless you have a special requirement (such as enabling the USB ports).

5.1.2 Boot Device Order

The boot device order is set in the Freeway BIOS as CD/DVD drive first, internal disk drive second. Older Freeways with floppy disk drives may also have the floppy drive in the boot order either before or after the CD/DVD drive.

The CD/DVD drive must contain a "bootable" CD or DVD disk in order for the Freeway to boot from that device. Otherwise, the Freeway will skip the CD/DVD drive and boot from the internal hard drive.

The Freeway software installation CDROM is a bootable disk and will cause the Freeway to boot the FreewayOS entirely from the CDROM rather than the internal hard drive. The FW_BOOT disk (available from Protogate) is also a bootable disk that will cause the Freeway to boot up to a DOS prompt. Non-bootable disks (such as the protocol software installation CDROMs) will not stop the Freeway boot process.

5.1.3 Initial BSD Boot

The FreewayOS is based on the FreeBSD UNIX operating system. When the BSD OS is booted, the Freeway logs several messages on the console relating to the progress loading the OS. Some of these messages may look like errors for missing devices. These error messages are normal for this part of the boot process and you should simply ignore them. The OS is designed to work on many different systems, and as such it adjusts itself by probing to see which devices are actually present on the system.

5.1.4 Check for Update: bootparm.txt

You may change the boot parameters stored in nvram.txt at boot time by creating a text file called bootparm.txt that the Freeway can read during this step of the boot process. To do this, create an ordinary CDROM (non-bootable) containing an ASCII text file named bootparm.txt in the root directory. That file should contain lines which specify any changes you want to make in the boot parameters. The lines must be in the format as shown in Figure 5–2. This is essentially the same format that is displayed when accessing the boot parameters using the Freeway interactive menus except that all the spaces between words are replaced with underscore characters.

```
        Boot_Device                 :   ide=0,0
        Processor_Number            :   0
        FTP_User_Name               :   freeway
        FTP_Password                :   password
        Flags                       :   0x1000
        Freeway_Server_Name         :   fwy29
        Freeway_Inet_Address        :   192.168.1.29
        Freeway_Subnet_Mask         :   ffffff00
        Boot_Server_Name            :   bootmaster
        Boot_Server_Inet_Address    :   192.168.1.2
        System_Boot_Directory       :   /usr/local/freeway/boot
        System_Boot_File_Name       :   fwybsd
        Configuration_File_Name     :   bootcfg
        Secondary_Net_Interface     :   fei
        Gateway_Inet_Address        :
```

Figure 5–2: Format of Text File: bootparm.txt

The field to the right of the colon is the new value for the specified boot parameter. Empty-valued fields will keep the previously-existing boot parameter value, and "." will erase the boot parameter value (make it blank). Lines with "#" as the first non-

whitespace character are taken as comments and have no effect on any boot parameters. Boot parameters without a corresponding line in the bootparm.txt file will remain unchanged.

Below are a few examples of why you would want to use the bootparm.txt file:

- If you maintain two (or more) alternate boot configuration files (example: bootcfg1 and bootcfg2) on the Freeway disk drive, then you can use bootparm.txt to quickly modify the boot parameters to change which boot configuration file is used. This allows you to completely alter the configuration of the Freeway (it could have different protocols loaded into the ICP boards, for instance) by simply rebooting with a different CDROM.

- If you maintain multiple Freeway systems with the same configuration, but with different IP addresses, you could use the bootparm.txt file to quickly program a pre-configured cold spare Freeway unit to replace an active unit. You would create several CDROM disks containing the bootparm.txt file with only the Freeway name and IP address changed in each of the files.

If no bootparm.txt file is found, the Freeway will use the existing boot parameters in nvram.txt and proceed with the boot.

5.1.5 Read Boot Parameters

At this point of the boot, the user is given one more chance to change the boot parameters before the Freeway continues with the boot. If a serial console is connected, the user will be presented with a prompt to stop the boot process within 7 seconds by hitting ENTER at the keyboard. If the user hits ENTER before the time is up, the boot process is paused and the user is presented with the 3-item menu shown in . The user now has the opportunity to display and/or change the current boot parameters before continuing the boot process.

Depending on the value of the boot_device parameter, the Freeway determines whether to continue to boot from the internal disk drive, or boot over the network from a boot server. For more information about booting the Freeway over the network, refer to Chapter 8.

5.1.6 FreewayOS Daemon Starts

The FreewayOS daemon (fwybsd) is started. This file was specified in the boot parameters as System_Boot_File_Name.

5.1.7 Initialize and Download ICP Boards

Each ICP board to be downloaded is specified as a separate entry in the bootcfg file. Each entry contains a protocol download script file (*ppp*loadb) which in turn points to a specific protocol executable image (*ppp*_2432b.mem). Protogate's real-time OS for the ICP (osp_2432b.mem) is also downloaded into each board along with the protocol image.

While the ICP boards are initialized and downloaded, the version string from each protocol image is displayed on the serial console.

5.1.8 Enable the Ethernet connection

The Freeway enables the primary Ethernet port and assigns it the IP address that was placed in the Freeway_Inet_Address line of the boot parameters. If an IP address was specified in the Gateway_Inet_Address line, that address is used as the default gateway router.

5.1.9 Execute Command File: rc.startsra

The Freeway checks for a text file named rc.startsra which is located in the /tmp/boot directory. If this file exists, the Freeway executes any shell script commands listed in this file. If the file does not exist, the Freeway continues with the next step in the boot process.

The rc.startsra file can be used to perform several functions such as:

- Configure and enable the secondary Ethernet port, or set up the secondary Ethernet port as a fail-over for the primary port

- Set up the Freeway to access an NTP server

- Set up a network firewall

- Start a Server Resident Application (SRA)

- Start the system log (syslog) utility

- Use cron to run a shell script at timed intervals

- Start the Freeway web server

Refer to Chapter 6 for information on customizing the Freeway using the rc.startsra file.

5.1.10 Execute Command File: command.sh

Just before the end of the boot procedure, the Freeway checks the CD/DVD drive for the existence of a text file called command.sh at the root level of the CDROM. If this file exists, the Freeway executes any shell script commands listed in this file. If the file does not exist, the Freeway continues with the next step in the boot process.

The command.sh file is used by Protogate for software installation and update CDROMs. You can create your own command.sh file on a CDROM to copy files to the Freeway disk drive or perform any other function that requires a shell script. Since this file is executed only at the end of the boot sequence, any operational file changes you make (such as changing protocol files) will not take effect until you reboot the Freeway once more.

The command.sh file may exist on the same CDROM as the bootparm.txt file.

5.1.11 Enable User Logins

At the end of the boot sequence, Freeway user logins are enabled. If a serial or VGA console is attached, the "Login:" prompt will be displayed on the screen. At this point users may login to access the Freeway interactive menus.

5.2 Freeway Operations

Once a standard Freeway with boots up, it becomes a listening device on the network. That is, it does not attempt to connect to other devices on the network. Instead, the Freeway just waits for other devices to connect to it.

5.2.1 Client Socket Connections

While the Freeway is running it always has a TCP/IP "listen" posted on all enabled Ethernet ports. This is to allow client application programs to connect to the Freeway using the DLI/TSI library. The default TCP port number for listening is 0x2010 (8208 decimal). This number is defined in the wellknownport parameter of the /tmp/boot/muxcfg file and can be modified if necessary.

Once a client application connects to the Freeway, the resulting socket connection is assigned another port number that is different and unique. Then the Freeway posts another listen to the well known port number. This method allows multiple sockets to be established to the Freeway using the same well known port number.

5.2.2 Interactive Menu

Users can access the Freeway interactive menu by logging in at the console or over the network using telnet, rlogin, or ssh. The default username/password logins are root/setup and freeway/password (all lower case). The Freeway interactive menu is the primary tool for users to access tools, display information and change configuration. Chapter 4 of this manual is devoted entirely to the functions available using the interactive menu.

5.2.3 SNMP

SNMP access is available on the Freeway, and is enabled by default. There are also a full set of client SNMP tools, such as snmpwalk. The MIBs which are specific to the Freeway are described in the freeway/include/ directory on your Freeway software CDROM, in the files SIMPACTFREEWAY-MIB.txt and RS-232-MIB.txt . Those files are also installed in the Freeway disk drive in the directory /usr/local/share/snmp/mibs/ . For more information about SNMP, login to your Freeway, select "6" at the Main Menu to enter the BSD shell, and type these commands:

```
man snmpd
man snmp.conf
man snmpd.conf

snmpwalk -v 2c -c public localhost freeway
snmpwalk -v 2c -c public localhost icpName
snmpwalk -v 2c -c public localhost icpType
snmpwalk -v 2c -c public localhost icpProtocol
snmpwalk -v 2c -c public localhost icpProtocolRelease
snmpwalk -v 2c -c public localhost icpOSRelease
snmpwalk -v 2c -c public localhost icpPhysicalStatus
snmpwalk -v 2c -c public localhost icpServiceStatus
snmpwalk -v 2c -c public localhost icpNumberPorts
snmpwalk -v 2c -c public localhost icpSlaveAddress
snmpwalk -v 2c -c public localhost icpDownloadScript
snmpwalk -v 2c -c public localhost rs232PortType
snmpwalk -v 2c -c public localhost rs232PortInSigNumber
snmpwalk -v 2c -c public localhost rs232PortOutSigNumber
snmpwalk -v 2c -c public localhost rs232PortInSpeed
snmpwalk -v 2c -c public localhost rs232PortOutSpeed
snmpwalk -v 2c -c public localhost rs232PortInFlowType
snmpwalk -v 2c -c public localhost rs232PortOutFlowType
snmpwalk -v 2c -c public localhost rs232AsyncPortBits
snmpwalk -v 2c -c public localhost rs232AsyncPortStopBits
snmpwalk -v 2c -c public localhost rs232AsyncPortParity
snmpwalk -v 2c -c public localhost rs232AsyncPortAutobaud
snmpwalk -v 2c -c public localhost rs232AsyncPortParityErrs
snmpwalk -v 2c -c public localhost rs232AsyncPortFramingErrs
snmpwalk -v 2c -c public localhost rs232AsyncPortOverrunErrs
snmpwalk -v 2c -c public localhost rs232SyncPortClockSource
snmpwalk -v 2c -c public localhost rs232SyncPortFrameCheckErrs
snmpwalk -v 2c -c public localhost rs232SyncPortTransmitUnderrunErrs
snmpwalk -v 2c -c public localhost rs232SyncPortReceiveOverrunErrs
snmpwalk -v 2c -c public localhost rs232SyncPortInterruptedFrames
snmpwalk -v 2c -c public localhost rs232SyncPortAbortedFrames
snmpwalk -v 2c -c public localhost rs232SyncPortRole
snmpwalk -v 2c -c public localhost rs232SyncPortEncoding
snmpwalk -v 2c -c public localhost rs232SyncPortRTSControl
snmpwalk -v 2c -c public localhost rs232SyncPortRTSCTSDelay
```

```
snmpwalk -v 2c -c public localhost rs232SyncPortMode
snmpwalk -v 2c -c public localhost rs232SyncPortIdlePattern
snmpwalk -v 2c -c public localhost rs232SyncPortMinFlags
snmpwalk -v 2c -c public localhost rs232InSigState
snmpwalk -v 2c -c public localhost rs232InSigChanges
snmpwalk -v 2c -c public localhost rs232OutSigState
snmpwalk -v 2c -c public localhost rs232OutSigChanges
```

From another machine (not a Freeway), commands like these should work, if "fwy_ip_addr" is the IP address of a Freeway:

```
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.1.1.1
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.2
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.3
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.4
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.5
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.6
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.7
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.8
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.9
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.10
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.4.1.854.1.2.2.1.11
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.2
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.3
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.4
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.5
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.6
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.7
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.2.1.8
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.2
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.3
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.4
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.5
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.6
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.7
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.3.1.8
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.2
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.3
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.4
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.5
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.6
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.7
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.8
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.9
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.10
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.11
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.12
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.13
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.4.1.14
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.5.1.3
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.5.1.4
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.5.1.5
snmpwalk -v 2c -c public fwy_ip_addr 1.3.6.1.2.1.10.33.5.1.6
```

5.3 Maintenance Tools

The following sections list some helpful tools available on the Freeway.

5.3.1 Freeway Log

The basic logging of messages from the Freeway daemon is available through the Freeway interactive menu, which you can get by logging in to the Freeway and selecting these menu items:

   "2) Display Options",   then

   "2) Display Log Messages"

Once viewed, those messages will not be displayed again, so re-entering those menu items will only show new messages (that occurred after the previous message log viewing). To see all messages in the circular buffer, use these menu items (starting from the Freeway Main Menu):

   "2) Display Options",   then

   "5) Display System Information",   then

   "6) Display Circular Queue of Messages"

In addition to the Freeway daemon logs, there is also a system-level log which you can view with the "dmesg" command, from the BSD shell.

5.3.2 MSGMUX Trace

The MSGMUX trace is a tool that traces IP traffic on the network between client system(s) and the Freeway. Specifically, it traces only those packets generated by a client application using the DLI/TSI interface. This makes MSGMUX trace a very useful tool for debugging a new client application program.

MSGMUX trace is accessible through the Freeway interactive menu. To turn tracing on, login to the Freeway and select:

"4) Trace Functions (Trace Disabled)", then

"2) Turn MSGMUX Trace On"

Then start your client program and run your test. While the test is running, trace data is stored in a buffer in Freeway memory. The trace uses a circular buffer, and new data coming in will eventually overwrite the oldest data. Therefore you can test as long as you want and not have to worry about the trace buffer filling up. As soon as the item of interest has occurred (data sent, data received, an error message received, etc.), go back to the interactive menu and in the Trace Functions menu select:

"4) Process Trace Data"

You will be prompted for a trace file name in which case you can type in a filename such as "trace1.txt". Then you will be asked to select between TSI and DLI trace level. Always select "2" for DLI trace level because you get more information for debugging. The trace file will be generated in the /tmp/ subdirectory on the Freeway (or if your Freeway is configured to boot from the network, the trace file will be in the directory where the Freeway booted from). The trace file is in text format. You should be able to use FTP (ASCII transfer) to retrieve it from the Freeway, or you can just go into the BSD shell and use the vi editor to view the file in the /tmp/ directory.

The trace file contains a list of events separated by dashed lines. The latest event is always the last event in the file. A sample trace event is shown below:

```
--------------------------------------------------------------------------
@@@@@ Actual Data offset 291 Size = 83
    000000: 00 00 00 00 00 00 00 00 00 0c 00 14 00 02 00 01   ...............
    000016: 00 32 00 00 00 04 00 00 2c 10 c1 be 6c a1 1c 08   .2.....,...l...
    000032: 14 ea 1d 08 20 00 00 00 00 00 06 00 00 00 00 00   .... ..........
    000048: 00 17 08 05 40 00 06 00 00 00 00 00 88 13 00 00   ....@..........
    000064: 00 00 00 00 04 00 00 00 00 00 00 00 a5 68 b5 0d   .............h..
    000080: bd 25 a4                                          .%.
@@@@@ Decoding begins

<====(READ 83 bytes)Conn 2: Mon Aug 26 00:10:19.272333333  2013


            Freeway header info: length = 44
            Packet Type(2) = FW_DATA Command(1) = FW_ICP_WRITE
            Status(0) = OK Client ID = 0 Freeway ID = 4

                ICP header info:
                OldClientID = 0 OldServerID = 0
                Data length = 23 Cmd(2053) = DLI_ICP_CMD_WRITE
                Status(0) = DLI_ICP_ERR_NO_ERR
                Parms: [0] = 1536 [1] = 0 [2] = 0

                Protocol header info: ( little-endian client )
                Cmd(5000) = DLI_PROT_SEND_NORM_DATA
                Modifier = 0 Link = 0
                Cir = 0 Sess = 4 Seq = 0
                Parms: [0] = 0 [1] = 0

    DATA  : a5 68 b5 0d bd 25 a4                              .h...%.


--------------------------------------------------------------------------
```

The arrows at the start of the packet decoding indicate which direction the packet was going. A packet that shows "<====(READ xx bytes)" is from the client to the Freeway. A packet that shows "====>(WRITE xx bytes)" is from the Freeway to the client.

When you are finished tracing, go back to the interactive menu and in the Trace Functions menu select:

  "3) Turn MSGMUX Trace Off"

If you leave tracing on, it will continue to trace new events into the circular buffer while overwriting the oldest events. Then if another item of interest occurs, you can go back to the Trace Functions menu and select "4) Process Trace Data" again to produce a trace file containing the latest events. MSGMUX tracing is set to "off" by default after a Freeway boot.

5.3.3 ICP Reset Utility

The ICP reset utility is used to reset and download an individual ICP board without affecting the other ICP boards on the Freeway. The ICP reset utility is located in the /tmp/boot directory on the Freeway. To use the utility, login to the Freeway as root/setup and choose "6) Run FreeBSD Shell" from the main menu. Then type the following commands (in bold) and enter the number of the ICP board you wish to reset:

```
# cd /tmp/boot
# icpreset
ICP board to download (0-15) [0]? 0

ICP Reset Program.
   Duration allowed waiting for completion is 1 minute
   ICP board number: 0
   Session Name: B0L0
Download Completed OK
ICP Reset program completed.
#
```

5.3.4 ICP Print Utility

The ICP print utility is used to display information from the ICP console port. The ICP console contains information generated by the protocol software running on the ICP board. Normally you would never need to access this information. However, if you encounter a problem with the protocol software, Protogate customer support may ask you to obtain ICP console information for analysis.

The ICP print utility is located in the /tmp/boot directory on the Freeway. To use the utility, login to the Freeway as root/setup and choose "6) Run FreeBSD Shell" from the main menu. Then type the following commands (in bold) along with the number of the ICP board you wish to access:

```
# cd /tmp/boot
# icpprint 0
icpprint: Console output from /dev/icp_0:

<@@>VI-200-3300: OS/PROTOGATE 1.3-6 May 20 2010
ICP2432B/e with 4 ports and 32 MB
Free space begins at 0x4010b600
```

```
 <@@> SA-100-0190: VOX 1.3-2 Protogate Voice Data (VOX) Protocol
04-Sep-13
        for the ICP2432B (PCI) comm board

 Free buffer pool = 401d7000 to 42000000
 Created 26007 buffers @ 1024 (+ 192 overhead)

 LCT addresses for all links (LCT size = 400 hex):
    LCT0=4012fe7c    LCT1=4013027c    LCT2=4013067c    LCT3=40130a7c


 VOX time stamp: DAY0001 - 07:17:51.518  #
```

Chapter

6

Customizing the System Configuration

This chapter describes how to customize the Freeway system configuration by modifying and/or adding system configuration files.

Note

Additional information on customizing the Freeway system can be found on the Protogate web site at www.protogate.com/faq.html.

The majority of the Freeway system configuration information is contained in three configuration files:

- bootcfg

- muxcfg

- rc.startsra

All three of these files are located in the /tmp/boot directory on the Freeway system. Default versions of these files are shipped with your Freeway software and are sufficient for most sites. If you need to customize the system information in these files, follow the procedures described in this chapter.

The boot configuration file (/tmp/boot/bootcfg) is explained further in Section 6.3. It defines the following:

- Physical devices within the Freeway server, such as the ICPs. Freeway uses this information to configure devices during the boot process.

- Virtual devices within the Freeway server, such as the ICP_IPs. Freeway uses this information to define the characteristics of IP data streams.

- Services or protocols that run on the physical or virtual devices. Freeway uses this information to download the appropriate software to these devices during the boot process.

- Server-wide parameters to be used by the Freeway system service provider to configure Freeway at startup.

The server TSI configuration file (/tmp/boot/muxcfg) defines the parameters that allow the server TSI software to communicate with the client TSI software. It is explained further in Section 6.4 and Section 6.5.

The SRA startup file (/tmp/boot/rc.startsra) does not even exist on most standard Freeway systems, however, you can create this file in order to execute additional shell script commands during the Freeway boot process. Despite the file name, you don't need to run a Server Resident Application (SRA) in order to use the rc.startsra file.

6.1 Determine If You Need to Customize System Configuration

Most sites, especially sites using the default installation and only one protocol, only need to edit the bootcfg file to specify the protocol for each ICP. You might, however, decide to further customize the files for any of the following reasons:

- If you installed more than one protocol (for example, AWS and X.25), you must edit the boot configuration file (bootcfg) to indicate which ICP will be downloaded with which protocol. See Section 6.3.

- If you want to specify error message logging or message tracing, you might want to modify the server TSI configuration file (muxcfg). Be very careful if you modify parameters in the server TSI configuration file that control server resources, such as the TSI buffer pool size or message size, because improper values could adversely affect server operation. See Section 6.4 and Section 6.5.

- If you want to use more than one local area network interface (for example, dual Ethernet), you may edit the boot configuration file (bootcfg) or the SRA startup file (rc.startsra) to indicate which added interface type is to be used, the IP address to assign to that interface, and the subnet mask to set for the interface. See Section 6.3.

- If you want to establish a gateway to a destination network or specify a default gateway, you can do this in the boot configuration file (bootcfg). See Section 6.3.

- If you want to run a server resident application (SRA) at system startup, you can start the executable SRA module as a batch job in the SRA startup file (rc.startsra) See Section 6.3.

- You might need to decrease either the buffer size or number of buffers in the server TSI configuration file (muxcfg) to eliminate memory allocation errors when Freeway boots. See Section 6.4 and Section 6.5.

For example, if you get an error similar to the following when you boot Freeway, you might edit the existing muxcfg file to set maxbuffers = 256. (The value you require for maxbuffers might be different.)

```
0x38ddf8 (msg_mux): memPartAlloc: block too big -
1318912 in partition 0x1d3708.
0x38ddf8 (msg_mux): ERROR: tInit: tserrno = -10
```

- If you are using ICP_IP virtual devices, you must modify the boot configuration file as described in Section 6.3.2.

6.2 Modifying Server Files

The Freeway server makes use of read-only partitions and RAM-disk partitions specifically so the server can be switched off at any time without damage to the disk drive. Operational files are stored in the read-only partitions and copied to the RAM-disk partitions at boot time.

Earlier in this chapter we mentioned that the server configuration files were located in the /tmp/boot/ directory. However, this directory is located in a RAM-disk partition in Freeway memory and only exists when the Freeway is powered on. All the files residing in this directory are copied from a read-only partition on the Freeway disk drive during boot up. Specifically, the files residing in /tmp/boot are copied from the /usr/local/freeway/boot.src/ directory on the Freeway disk drive. (Note: boot.src is a directory, not a file as the name may imply.) If the Freeway was booted over the network, the files in /tmp/boot/ are copied from the boot server via FTP.

The following sections provide information on modifying Freeway server configuration files and saving them in the read-only partition of the disk drive.

6.2.1 File Transfers Across the Network

You may use any network file transfer method (fetch, FTP, NFS, rsync, scp, etc.) to transfer files to the Freeway server, providing that the transfer method is not blocked by a firewall. The most common way of updating files is to transfer the files to the /tmp/boot read-write directory, and using the Freeway menu update method (5-3-3) to copy the updated files to the non-volatile area as described in Section 6.2.2.

You can always transfer files from anywhere on the Freeway server disk drive to another system. However, in order to transfer files from another system directly into a read-only partition on the Freeway server, you must first login to the Freeway BSD shell and temporarily mount the partition as read-write. After transferring the files, remember to mount the partition back to read-only.

6.2.2 Menu Update Method (5-3-3)

The preferred method of manually updating Freeway operational files is to first update
the files in the read-write operational directory (/tmp/boot) and then save the changes to
the non-volatile area (/usr/local/freeway/boot.src). That way if you accidentally overwrite or
delete the wrong file, you can always just reboot the Freeway server and start over. The
most convenient way to save any changes is to go to the Freeway menu and select menu
items 5, 3, and 3 which gets you to the "Build Hard Disk From Boot Server" selection.
Then press "Y" and "<enter>" to save the changes as shown in the following example:

```
Main Menu
    ---------
    1)    Shutdown Options
    2)    Display Options
    3)    Modify Configuration
    4)    Trace Functions (Trace Disabled)
    5)    Disk Drive Options
    6)    Run FreeBSD Shell
    7)    Logout

Select: 5

Disk Drive Options
------------------
    1)    Return to Interactive Menu
    2)    Hard Disk Copy Options
    3)    Hard Disk Maintenance Options
    4)    Floppy Disk Copy Options
    5)    Floppy Disk Maintenance Options

Select: 3

Hard Disk Maintenance Options
-----------------------------
    1)    Return to Disk Drive Options Menu
    2)    Display Hard Disk Directory
    3)    Build Hard Disk From Boot Server
    4)    Delete Hard Disk File
    5)    Rename Hard Disk File

Select: 3
```

```
WARNING: Are you sure you want to rebuild the disk?.
The system was booted from this disk.
If you are sure you want to copy the temporary files back
to the permanent area of the disk, press "y", otherwise
press any other key to continue without copying files: y

   Press RETURN to continue <enter>
```

What this menu item does is copy all of the files in the operational directory (/tmp/boot) back to the non-volatile storage directory (/usr/local/freeway/boot.src) in one action. This saves you from having to type BSD commands to mount the /usr partition as read-write and manually copy each file to non-volatile storage. At this point you normally would want to reboot the Freeway server so that it will use the updated files.

Note that since the 5-3-3 method only copies existing files, it cannot be used to delete files in the non-volatile storage area. For example, if you used FTP or the BSD shell to delete the file /tmp/boot/oldfile.txt and then used the 5-3-3 method, the file oldfile.txt would still return to the /tmp/boot directory after the next reboot. In order to permanently delete files from the /tmp/boot directory, you must use the BSD shell to delete the files directly from the non-volatile storage area as follows:

```
cd /usr/local/freeway/boot.src
ls -l oldfile.txt
-rw-r--r--  1 root  wheel  63 Mar 25 16:13 oldfile.txt
mount -u -o rw /usr
rm oldfile.txt
ls -l oldfile.txt
ls: oldfile.txt: No such file or directory
mount -u -o ro /usr
```

After the next reboot, the file oldfile.txt will no longer appear in the /tmp/boot directory.

6.2.3 CDROM Updates

Another way of updating files on the Freeway server is to create an ordinary (non-bootable) CDROM disk containing a text file called command.sh in the root directory. This file can contain "sh" script commands similar to commands you use when logged into the BSD shell. The Freeway server will execute the commands in this file at the end

of the boot-up sequence. You can use these commands to do anything you want, including making changes to configuration files. When using this method to update files in the operational directory (/tmp/boot), your commands must update the same files in the non-volatile storage directory (/usr/local/freeway/boot.src) in order to make the changes permanent.

The following procedure is an example of updating the bootcfg file on the Freeway server using the CDROM update method.

Step 1: If you have a copy of the original bootcfg file on your client system or PC, edit this file to make the desired changes, or create a new bootcfg file from scratch.

Step 2: Create a text file called command.sh on your client system or PC. Edit the file such that it contains the following text (lines starting with pound sign '#' are ignored by the shell):

```
# update the bootcfg file from cdrom
echo "Updating bootcfg file"
mount -u -o rw /usr
cp -p /cdrom/bootcfg /usr/local/freeway/boot.src
mount -u -o ro /usr
echo "bootcfg file updated"
```

Step 3: Use the CD writing software on your PC to create a CD-R with the two files (bootcfg and command.sh) in the root directory. You may also use a CD-RW if you plan to make several updates. That way you can just erase the CD and use it over again.

Step 4: Place the CDROM in the Freeway's CD/DVD drive and reboot the Freeway server. If you watch the boot-up procedure on the Freeway console, you should be able

to see the "echo" text lines printed on the console at the end of the normal boot sequence.

Step 5:   Remove the CDROM from the Freeway's CD/DVD drive and reboot the Freeway server again. The Freeway server will use the updated bootcfg file during this boot-up procedure.

6.2.4 Text Files: Windows vs. UNIX

The format of text files differs slightly between Windows (DOS) and UNIX operating systems. In Windows, each text line ends with two ASCII characters: line feed and carriage return. However, UNIX uses only a line feed character to end each text line. As a consequence, some Windows text files may not work properly on UNIX systems.

This is especially true with the FreeBSD operating system on the Freeway server. When transferring text files to the Freeway server, care must be taken to make sure that the text files are in UNIX format. Script files, make files, and configuration files will not be executed properly under BSD if they are in Windows format. For example, if the bootcfg file used in the update procedure in Section 6.2.3 was created in Windows format, the Freeway server would fail to boot properly after the update.

To prevent this from happening, use the following precautions when updating text files on the Freeway server:

- When using FTP to transfer files to the Freeway server, be sure the text files are transferred in ASCII format. Most FTP programs will recognize the Freeway server as a UNIX system and automatically remove the carriage return characters from the text files when ASCII format is specified.

- Use a text editor on your Windows PC that allows you to save text files in either UNIX or DOS formats. This is especially helpful when using the CDROM method to update text files.

If you find that a boot or configuration file is not working properly on the Freeway server, you can use the vi editor to check the text file to see if it is in Windows format. The vi editor will display the carriage returns in Windows text files with Ctrl-m (^M) characters at the end of each line. You may also use the vi editor to remove the Ctrl-m characters from the text file using the vi commands in the example below:

```
cd /tmp/boot
vi dostextfile
^M
This text file was created on^M
a Windows PC and transferred^M
to the Freeway server as is.^M
^M
~
:1,$s/^M//g
[Note: To input the ^M character above, press Ctrl-v , and then
press Enter]
:x
dostextfile: 5 lines, 90 characters.
```

After completing the above commands, when you open the file again with the vi editor, you will see that the Ctrl-m characters are gone. If you edited the file in the /tmp/boot/ directory, be sure to save the changes by using the menu (5-3-3) or other method.

6.3 Customizing the Boot Configuration File

The default boot configuration file (bootcfg) is located on the Freeway server in the /tmp/boot/ directory. If you are booting the Freeway from the network, the bootcfg file is normally located in the /freeway/boot directory on the boot server (or whatever directory is specified in the Freeway boot parameters).

During the boot process, Freeway uses the boot configuration file to configure physical and virtual devices, services, and corresponding databases prior to downloading the software to the ICPs. See Section 5.1 on page 141 for a complete description of the boot process.

Figure 6–1 shows a sample boot configuration file that configures two ICPs in a Freeway server. This file enables Freeway to download X.25 software to an ICP with device name icp0 and download AWS software to an ICP with device name icp1. (The introductory comments from the beginning of the file have been omitted.)

The boot configuration file allows comment lines to be entered by placing the pound sign (#) at the beginning of a line of text. All blank lines are skipped. All fields must be delimited with white space. White space between each field can be spaces or tabs.

Following is a description of the parameters in the boot configuration file:

6.3.1 Configuration Parameters for Physical ICP Boards

Device Name   The device_name parameters in the example file in Figure 6–1 are icp0 and icp1. Freeway uses the device names to identify the devices. The device name must be of the form "icp*x*", where *x* corresponds to the BoardNo parameter in the DLI configuration file of the client application program. Each device name entered in the boot configuration file must be unique.

```
#-------------------------------#
# ICP0 Physical Parameters      #
#-------------------------------#
#
device_name      =  icp0
device_type      =  icp2432
slave_address    =  0x14
bus_number       =  0
download_script  =  x25loadb


#-------------------------------#
# ICP1 Physical Parameters #
#-------------------------------#
#
device_name      =  icp1
device_type      =  icp2432
slave_address    =  0x13
bus_number       =  0
download_script  =  awsloadb



#-------------------------#
# Server wide parameters   #
#-------------------------#

tsi_config_file   =  muxcfg
#route_add         =  0 192.192.192.192

vxworks_shell            =  TRUE

#added_interface_type = fei
#added_interface_mask =  ffffff00
#added_interface_addr =  207.207.207.207
```

Figure 6–1: Freeway Boot Configuration File (bootcfg) Example

Device Type   The device_type parameter for both ICPs in the example file is ICP2432. This indicates that the device type is a PCI-based intelligent communications processor model ICP2432 or ICP2432B that can be downloaded with software. All ICP devices installed in a Freeway 3xxx server must be of type ICP2432 or ICP_IP. To avoid confusion with the configuration parameters for physical ICP boards, configuration parameters specific to ICP_IP virtual devices are described separately in Section 6.3.2.

Slave Address   The slave_address parameter for an ICP2432B (PCI board), along with the bus_number parameter, identifies the physical slot in which the board resides. Refer to the *Hardware Installation Guide* for your Freeway model for the slot-to-slave address/bus number mapping. The slave_address can be represented as a decimal or hexadecimal number. When using hexadecimal, be sure to precede the number with "0x".

Bus Number   The bus_number parameter for an ICP2432B (PCI board), along with the slave_address parameter, identifies the physical slot in which the board resides. Refer to the *Hardware Installation Guide* for your Freeway model for the slot-to-slave address/bus number mapping. The bus_number can be represented as a decimal or hexadecimal number. When using hexadecimal, be sure to precede the number with "0x".

Download Script   The download_script parameter define the name of a download script file that can be used by the ICP download utility. A download script file is included on each protocol installation CDROM. This file normally has a name such as ppploadb where ppp represents the protocol to be downloaded. If no path name is provided, Freeway assumes the path is /tmp/boot/. Use a fully qualified path name to the download script file if the file is placed in another directory.

6.3.2 Configuration Parameters for ICP_IP Virtual Devices

ICP_IP virtual devices behave just like physical ICP boards except that they send and receive data via an IP network rather than via a serial line. This section describes the

parameters in the boot configuration file used for ICP_IP devices. These parameters specify the configuration of the IP link implemented by an ICP_IP device (for example, the IP addresses and ports, data format, and so on). Each ICP_IP device may be configured independently of all other ICP_IP devices.

The bootcfg.ip file contains examples of the ICP_IP parameters. This file is preconfigured with the following devices:

icp0   Commented-out examples of an ICP2424, ICP2432, and ICP6000

icp1   ICP_IP stream listening socket (TCP/IP server)

icp2   ICP_IP stream connecting socket (TCP/IP client)

icp3   ICP_IP datagram socket (unicast)

icp4   ICP_IP datagram socket (multicast)

Edit the /tmp/boot/bootcfg.ip file, modifying the following fields as necessary to set up each ICP_IP virtual device:

Device Name   The device_name parameters in the example file in the bootcfg.ip file are icp0 through icp3. Freeway uses the device names to identify the devices. If a Freeway client uses the data link interface (DLI), the device name must be of the form "icpx", where *x* corresponds to the BoardNo parameter in the DLI configuration file of the client program. Each device name entered in the boot configuration file must be unique.

Device Type   The device_type parameter for ICP_IP virtual devices must be icp_ip.

Socket Type   The socket_type parameter must be sock_dgram, sock_stream_listen, or sock_stream_connect. (The sock_stream parameter string can be used in place of sock_stream_connect.) The sock_dgram parameter specifies a UDP/IP packet data stream. The sock_stream_listen parameter specifies a TCP/IP server (listening) socket and the sock_stream_connect parameter specifies a TCP/IP client (connecting) socket.

Local Address The local_address parameter specifies the IP address at which Freeway receives packets. This field may be left blank or set to 0.0.0.0, in which case any configured IP address of Freeway will be used. For devices that will receive multicast packets, this field must be set to the multicast IP address. (Receiving multicast packets requires a special version of Freeway.)

Local Port Base The local_port_base parameter specifies the port number on which Freeway will receive packets when "link 0" is selected. This number must be specified in hex format. The link number is added to local_port_base whenever a "link" is opened, so that a dlOpen on link 7 will open a socket using port local_port_base + 7. If the local_address is set to 0.0.0.0 and the local_port_base is set to 0, Freeway will use any available port, with any configured IP address.

Local Interface Address The local_if_address parameter specifies the IP address of the interface on which Freeway will receive packets. This field is only required for devices which will receive multicast packets on another interface than the default boot IP address. (Receiving multicast packets requires a special version of Freeway.)

Foreign Address The foreign_address parameter specifies the IP address to which Freeway will send packets.

Foreign Port Base The foreign_port_base parameter specifies the IP port number to which Freeway will send packets when "link 0" is selected. This number must be specified in hex format.

Time to Live The ttl parameter specifies the time-to-live of outgoing data packets.

Receive Buffer Size The rcv_buf_size parameter specifies the size of the IP receive buffer in bytes.

Send Buffer Size The snd_buf_size parameter specifies the size of the IP send buffer in bytes.

Send Queue Size   The snd_q_size parameter specifies the number of packets to be queued on a TCP/IP connection if the other side of the connection stops reading. The default is 48 packets.

Connect Period   The connect_period parameter specifies the number of seconds to wait between attempts to connect. (This field applies only to socket_type == sock_stream_connect.)

Linger Off   The linger_off parameter sets the "linger" socket parameter off. This is the default. (This field applies only to socket_type == sock_stream_listen or socket_type == sock_stream_connect.)

Linger On   The linger_on parameter sets the "linger" socket parameter on, and the linger duration to a specified number of seconds. (This field applies only to socket_type == sock_stream_listen or socket_type == sock_stream_connect.)

Internal Protocol   The internal_protocol parameter specifies the protocol name to be used. This name corresponds to the name of a code module which implements a communications protocol using data sent and received on the IP link. These code modules may be built in (ipapi, which is included in all Freeways) or purchased separately from Protogate and loaded with the sra_module command in the server-wide parameters at the end of the boot configuration file. For example, if the sra_module command is used to load ipfmp486.o, the internal_protocol parameter may be set to ipfmp.

6.3.3 Other Boot Configuration Parameters

Server TSI Configuration File   At boot time, Freeway uses the server TSI configuration file to configure the interface between the server software and the transport subsystem. This file name is specified in the tsi_config_file parameter. The default is muxcfg (Section 6.4.2).

Route Add   An optional "route add" parameter can be specified. This field adds a gateway to the Freeway server's routing tables. Freeway does not have a routing dae-

mon, and must be explicitly informed about a gateway. The first parameter indicates the Internet address of a destination network or machine, and the second parameter indicates the Internet address of a gateway to that network or machine. For example:

    route_add   126.0.0.0   207.67.135.10

tells Freeway that the machine with Internet address 207.67.135.10 is the gateway to network 126.0.0.0. To specify a default gateway, the first parameter should be set to "0" and the second parameter should indicate the Internet address of the host to be the default gateway. This parameter may be used multiple times to add gateways for multiple destinations. The Internet address of the default gateway must be the same as the address entered for the Gateway Inet Interface parameter of the System Boot Parameters menu described in Section 4.6.1 on page 105.

VxWorks Shell The vxworks_shell parameter is carried over from older Freeway servers that used the VxWorks operating system. This parameter was formerly used to restrict access to the VxWorks shell. This parameter is now obsolete. On current BSD Freeway models, access to the FreeBSD shell is controlled by the type of user account. For example, a "root" user has access to the shell, but a "display only" user does not.

The vxworks_shell parameter is still accepted by the Freeway as a valid boot configuration file parameter; however, its function is ignored during the Freeway boot process.

Added Interface Type This optional parameter identifies LAN interfaces to be used by Freeway in addition to the primary network interface. The primary network interface is defined in the System Boot Parameters menu (described in Section 4.6.1 on page 105), either with the Boot Device parameter if booting from the network or with the Secondary Network Interface if booting from disk. The types of interfaces supported for the added_interface_type parameter, and the value

to be used to specify each, are as defined for the Boot Device parameter in Table 4–2 on page 107.

The `added_interface_type` parameter may be repeated along with the `added_interface_mask` and `added_interface_addr` parameters to indicate multiple added interfaces.

Added Interface Mask For each `added_interface_type` parameter, the optional `added_interface_mask` parameter may be used to specify the subnet mask to be set for the interface. The parameter must be provided in hexadecimal format. If this parameter is omitted for an added interface, the subnet mask specified in the Subnet Mask parameter of the System Boot Parameters menu (Table 4–2 on page 107) is used for that interface.

Added Interface Address The `added_interface_addr` parameter must be supplied with each `added_interface_type` to indicate the Internet address in decimal format to be assigned to the added interface.

6.4 Server TSI Configuration File (muxcfg)

Client application and loopback test programs use a *client* TSI configuration file in order to access the Freeway server. There is also a *server* TSI configuration file (`/tmp/boot/muxcfg`) for the server TSI software running on Freeway. This section gives an overview of TSI configuration and describes the `muxcfg` file. See the *Freeway Transport Subsystem Interface Reference Guide* for complete details regarding TSI configuration.

6.4.1 TSI Configuration Overview

The information exchange between the server software and the TSI is managed by a TSI *connection.* The TSI connection manages the I/O with the client using the server's socket library and other I/O support functions such as the UNIX signal facility. One TSI connection can be used by multiple server sessions.

TSI connections are defined in a server TSI configuration file (such as muxcfg). Two types of configuration sections are included in the TSI configuration file. The first section (called "main") specifies the TSI configuration for non-connection-specific operations. Subsequent sections define the operational environment for one or more specific connections.

Note

> If you define multiple TSI connections, each should have a unique connection name; otherwise the parameters associated with the first occurrence are used for all sessions with the same name.

All sections of the TSI configuration file have the following format:

```
connection-name
{
        parameter-name = parameter-value; // comments...
                        .
                        .
                        .
}
```

6.4.2 Default Server TSI Configuration File (muxcfg)

When you followed the software installation procedures described in Chapter 3, the default server TSI configuration file named muxcfg (Figure 6–2) was installed in the freeway/boot directory on the boot server. Freeway uses the information in the muxcfg file to set up the server-resident TSI software to listen for incoming client connections on the default well-known port. For most sites, muxcfg can be used "as is."

During the boot process (described in Section 5.1 on page 141), Freeway uses the information in the boot configuration file (Figure 6–1 on page 168) to configure physical or virtual devices, services, and corresponding databases prior to downloading software to the ICPs. One of the parameters in the boot configuration file is the server TSI configuration file name (tsi_config_file = muxcfg). Freeway downloads the muxcfg file and uses it to

```
//
// source control identifier
// @(#)$Id: muxcfg,v 1.6 1998/06/15 21:57:25 jcolston Exp $
//
//---------------------------------------------------------------------------//
//
// This file is for the server resident TSI configuration processor.
// It is used by the TSI interface for msgmux (message multiplexor)
//
//                    Date        Initials      Abstracts
//                    27Jan94     KietD         Original coding...
//                    15Jun98     JColston      PR1172 - maxbuffers back to 512
//
//---------------------------------------------------------------------------//
main
{
                logLev = 0;
                traceLev= 3;
                maxbuffers = 512;                              /* PR1172 */
                tracename = "/ram1/msgmux.trc";
                tracesize = 64000;
                asyncio = "yes";
                maxbufsize = 1200;
                stacksize = 10240;
                maxconns = 128;
}
//
Server1
{
                transport = "tcp-socket";
                logLev = 0;
                traceLev = 3;
                timeout = 63999;
                MaxInQ = 10;
                MaxOutQ = 10;
                asyncio = "yes";
                wellknownport = 0x'2010'; // protocol specifics
}
```

Figure 6–2: TSI Configuration File (muxcfg) for Freeway Server

```
//
Server2
{
                transport = "tcp-socket";
                logLev = 0;
                traceLev = 3;
                timeout = 63999;
                MaxInQ = 10;
                MaxOutQ = 10;
                asyncio = "yes";
                wellknownport = 0x'2011'; // protocol specifics
}
```

Figure 6–2: TSI Configuration File (muxcfg) for Freeway Server *(Cont'd)*

configure the server-resident TSI software so it can communicate (using the Freeway message multiplexor) with the client TSI software. Refer back to Figure 1–1 on page 26 to see how the server TSI software relates to the Freeway message multiplexor.

There is one critical difference between the server TSI software and the client TSI software, namely that the server TSI software *must* use TSI non-blocking I/O support (that is, the AsyncIO parameter in the muxcfg file must be set to "yes", as shown in Figure 6–2). Changing the AsyncIO parameter to "no" or omitting it prevents the server TSI software from operating as designed.

Caution

Before modifying the muxcfg file for the server TSI software, you should be familiar with the parameter descriptions in the *Freeway Transport Subsystem Interface Reference Guide*. Of particular importance are those parameters that control server resources, such as the TSI buffer pool size (MaxBuffers parameter) or message size (MaxBufSize parameter). Improper values could adversely affect server operation.

Keep the following points in mind if you must modify the muxcfg file:

- The Transport parameter for each connection name has no default and must be defined.

- Unlike the client TSI configuration file you modified, the server parameter is not required for muxcfg because the server TSI software automatically uses the address of the machine on which it is running.

- The parameters can appear in any order in the configuration file and can be upper-case, lower-case, or a mixture.

- If a parameter is not explicitly contained in the file, the default is used (defaults are shown in Figure 6–2 on page 176).

6.5 Customizing the Server TSI Configuration File

Use the following procedure to customize the server TSI configuration file (muxcfg):

Step 1:   You can use any ASCII text editor to edit the muxcfg file. If a default parameter value is desired, you can omit the parameter line from the file. Parameters in the "main" section apply to non-connection-specific operations. Parameters in the "connection-dependent" section apply to a single connection only.

Step 2:   If you change the name of the muxcfg file, you must modify the tsi_config_file parameter in the boot configuration file. See Section 6.3 on page 167 for a description of the default boot configuration file.

Step 3:   Reboot Freeway. You can use the Freeway Boot System Main Menu from the local console or the Freeway Interactive Menu from the local console or any computer on the network.

6.6 Customizing the SRA Startup File

Use the following procedure to create or customize the SRA startup file (rc.startsra):

6.6.1 Main SRA Startup File (rc.startsra)

Instructions for starting a Server Resident Application (SRA) normally reside in a file called rc.startsra in the /tmp/boot directory. When the Freeway server boots up, it first executes the instructions in the bootcfg file. Then it looks for the existence of the rc.startsra file. If it exists, the Freeway will treat rc.startsra as an ordinary shell script file and will execute the commands in that file as the root user. You may still find the rc.startsra file useful even if you don't have an SRA because it can also be used to set up additional services on the Freeway (such as syslog, cron, etc.).

If you have the basic server software installed on your Freeway, then the rc.startsra file does not exist. If you are not sure if this file exists on your Freeway server, you can use the following shell commands to check:

```
cd /tmp/boot
ls -al rc.*
ls: rc.*: No such file or directory
```

If the file rc.startsra already exists on your system, then refer to Section 6.6.2 for adding your SRA start commands. If the file doesn't exist (you see the above results), then use the following steps to create this file:

Step 1:   Login to the FreeBSD shell and create the file in the /tmp/boot/ directory:

```
cd /tmp/boot
vi rc.startsra
```

Step 2:   Depending on where you are running your SRA, insert one of the following text blocks in the file to start your SRA. The first line is optional as it just writes the text "Starting my SRA" to the Freeway console. The second line starts the SRA and diverts

any text that the SRA may generate (from printf statements) into the null device (bit bucket). If you are unfamiliar with the vi editor, type **i** to start inserting text, then **<ESC>** to get out of insert mode:

```
[If running your SRA from the operational directory, enter the
following text:]
echo 'Starting my SRA' > /dev/console
cd /tmp/boot
./mysra > /dev/null &
```

Step 3:   Exit the vi editor while saving the file:

```
:x [from inside vi editor]
```

Step 4:   Copy the file to the read-only partition (or you can exit the BSD shell and use the 5-3-3 method from the Freeway Main Menu):

```
mount -u -o rw /usr
cp -p rc.startsra /usr/local/freeway/boot.src/
mount -u -o ro /usr
```

When the Freeway reboots, the rc.startsra file will be copied to the /tmp/boot directory and executed after the bootcfg file is processed.

Rather than use the vi editor, you may also create the rc.startsra file on your PC, then transfer it to the Freeway disk drive. Refer to Section 6.2 on page 161 for further information on this method.

6.6.2 Secondary SRA Startup File (**rc.startsra.local**)

If the rc.startsra file already exists in the /tmp/boot directory, it may be because there is already an SRA running on your system (for example: the Protogate Monitor SRA). In this case you may simply edit the existing rc.startsra file and place the commands for starting your SRA (from Section 6.6.1) at an appropriate place near the end of the file.

However, if you receive later updates to the existing SRA, the updates may overwrite the existing rc.startsra file and your added commands will be deleted.

To prevent this from happening, you can place your SRA start commands in a file named rc.startsra.local. Protogate adds commands in the rc.startsra files it distributes to also check for "local" command files of the form rc.startsra.local*. This is done specifically so that your added SRA commands will not get deleted by future updates of Protogate SRAs.

Look at the existing rc.startsra file to see what local files it calls. Figure 6–3 shows an example of a Protogate rc.startsra file. In this example, there are two locations in the file where local startsra files are executed. The file rc.startsra.local is executed near the start of the file, and rc.startsra.local2 is executed near the end of the file. Using this example, you could put your SRA startup commands in the file rc.startsra.local or in rc.startsra.local2 depending on when you want to start your SRA relative to the other commands within the main rc.startsra file.

```
#!/bin/sh
#
# file name: rc.startsra
# Additional commands for the Monitor Freeway system

            ⋮


   [ startup commands ]

            ⋮


# Allow local configuration overrides (rc.startsra.local can be created by
# customers to customize a specific Freeway, without the risk of being
# overwritten by the next software upgrade -- because software upgrades
# will not overwrite any rc.startsra.local* file).

if [ -f /tmp/boot/rc.startsra/local ]; then
  . /tmp/boot/rc.startsra.local
fi
            ⋮


   [ more startup commands ]

            ⋮


# Allow final local configuration overrides or additions (adding lines to
# /var/crontab, for example). rc.startsra.local2 can be created by customers
# to customize a specific Freeway, just like rc.startsra.local can, without the
# risk of being overwritten by the next software upgrade -- because software
# upgrades will not overwrite any rc.startsra.local* file.

if [ -f /tmp/boot/rc.startsra/local2 ]; then
  . /tmp/boot/rc.startsra.local2
fi


# end of file                                                          4019
```

Figure 6–3: Example rc.startsra file from Protogate

Chapter 7

Software Updates

This chapter describes the process of installing software updates for the Freeway server. Protogate periodically issues software updates for the Freeway to customers who have active software maintenance contracts. Freeway software updates are always delivered in CDROM format. There are three types of software updates:

1. Freeway Server Software

2. Protocol Software

3. Server Resident Application (SRA) Software

Installation instructions for each of these updates are given later in this chapter.

7.1 Determining Whether or Not to Install an Update

When a customer receives a software update CDROM from Protogate, a common question that arises is: "Should I install the update on my Freeway system?" Protogate generally likes customers to upgrade, but we understand that where a Freeway is performing a critical role in a production environment, the risks of downtime make upgrading unwelcome. This is especially true with a Freeway server software update which affects more files than other software updates. In other environments (such as a development lab), however, keeping your Freeway upgraded to the latest Freeway software version will provide you with the latest features and bug fixes, and will help us to support you better.

If you are still undecided, learning what features and bug fixes you will gain by upgrading to the new version may help you decide. If you insert your new Freeway CDROM into any machine with a web browser, you can find the release notes and the release notes history (or take the plain text versions of those files directly from the root of the CDROM; they are the files "relnotes.ser" and "relhist.ser"). Those files will describe the changes that were made since the Freeway version that you are currently running, and should help you decide whether you would benefit from upgrading. (To find the software version you are currently running, look at the version string which appears at the top of the Freeway Main Menu, immediately after you log in to your Freeway).

If you are still unsure about installing the update, you can always contact Protogate customer support and they will recommend the best course of action for you to take.

7.2 Installing Freeway Server Software Updates

Freeway server software updates the FreewayOS, DLI/TSI Library, Web Server, and other components relating to the FreeBSD operating system. The Freeway server software is released when features and functions are added or changed. A server software release may also be prompted when modules within the operating system have been updated for security reasons.

Note

> The recommended procedure for upgrading a Freeway has changed, starting with the "X-B" Freeway release CDROM (based on Freeway 3.1-3), which was released on 12 May, 2004. The previous method should still be used for all Freeway releases prior to that.

Beginning with the 3.1-3 Freeway release, the Freeway install CDROM will by default attempt to save existing configuration files and protocol image files before initializing the Freeway disk, then will restore those files after loading the new software onto the

disk (previous versions had to be explicitly commanded to perform this service by setting "PRESERVE_PARTS=yes"). Another enhancement starting with that version is that now when the Freeway is booted from the CDROM, it determines the IP address which is used by the Freeway when booted normally (from its own disk), and sets an alias to that IP address. So if, for example, your Freeway ordinarily uses IP address 192.168.100.100, then when you boot it from the CDROM it will have two addresses: 192.168.135.1 (the standard address for a CDROM-booted Freeway) and 192.168.100.100 -- and you can telnet to it using either of those addresses. These two enhancements simplify upgrading your Freeway.

Below are the procedures: first the new procedure, then the previous one -- use the section corresponding to your CDROM's Freeway version. And as always, if you have any questions or problems upgrading your Freeway to any Freeway software version, don't hesitate to contact Protogate directly, at (US) 858-451-0865 or support@protogate.com.

7.2.1 Freeway CDROMs "X-B" (3.1-3) or later

First backup anything on your Freeway that you want to preserve (most Freeways do not have anything which must be preserved, but if you are developing code on the Freeway you may have some files on its disk, or if you have altered or created additional configuration files you may wish to save those). Then insert the CDROM into the Freeway's CDROM drive and boot the Freeway. It will boot from the CDROM, and once it has completed booting you should telnet to it (using either its usual IP address or 192.168.135.1), login as root/setup, type "6" to enter the command shell, then type these commands, exactly as shown:

```
cd /etc
. /etc/rc.buildfwy
```

The rc.buildfwy command will warn you that it's going to overwrite things on the disk, but you don't need to type anything more; just give it 10 minutes or so to finish, and then you can remove the CDROM and reboot your Freeway again, and it will be using the new software.

The above command attempts to preserve your boot parameters, configuration files and some programs, but isn't guaranteed not to overwrite any of those (which is why you backed up your own programs earlier). If you want to simply clobber all the permanent storage on the entire Freeway and do a completely clean install, you can use the command

```
PRESERVE_CFG=no ; . /etc/rc.buildfwy
```

instead of the one above. If you do that, you will have to re-enter your boot parameters and re-install any protocols that were on that Freeway before the upgrade.

If for some reason you can't telnet to your Freeway, you can connect a serial terminal to the "Console" connector at the back of the Freeway case and use that to login and enter the upgrade command, or you can connect an ordinary VGA monitor and keyboard to the back of the case, and use that.

7.2.2 Freeway CDROMs "W-A" (3.1-1) or earlier

As described in Section 7.2.1 above, you should first backup anything on your Freeway that you want to preserve. Then connect a serial console terminal to the "Freeway console" port on the back of the Freeway case, insert the CDROM into the Freeway's CDROM drive, and reboot the Freeway. It will boot from the CDROM, and once it has completed booting you should login as root/setup, type "6" to enter the command shell, then type these commands, exactly as shown:

```
cd /etc
PRESERVE_PARTS=yes ; . /etc/rc.buildfwy
```

The rc.buildfwy command will warn you that it's going to overwrite things on the disk, but you don't need to type anything more; just give it 10 minutes or so to finish, and then you can remove the CDROM and reboot your Freeway again, and it will be using the new software.

The above command attempts to preserve your boot parameters, configuration files and programs, but isn't guaranteed not to overwrite any of those (which is why you

backed up your own programs earlier). If you wanted to simply clobber all the permanent storage on the entire Freeway and do a completely clean install, you could use the following command instead of the one above:

```
. /etc/rc.buildfwy
```

If you do that, you will have to re-enter your boot parameters and re-install any protocols that were on that Freeway before (We don't suggest doing it this way; the "PRESERVE_PARTS=yes" command shown above seems to work best for most customers).

If you don't have a serial terminal, you can instead connect an ordinary VGA monitor and keyboard to the back of the case, and use that to enter the commands. You may also be able to telnet to the Freeway; its IP address when booted from the CDROM will be 192.168.135.1 (but it will go back to what it was before, when the upgrade process is complete and you remove the CDROM and reboot).

7.3 Installing Protocol Software Updates

Protocol software products are updated when features and functions are added or changed for a specific protocol. Also, a new release is made after an identified problem within the protocol is fixed. Protocol software updates may change some or all of the following files:

- Protocol image (ppp_2432b.mem)

- Protocol load file (ppploadb)

- ICP OS (osp_2432b.mem)

- Protocol loopback program (pppalp.c)

Protocol software updates are generally the "safest" updates to install because they make the least impact on the Freeway system. Also, if for some reason the update does not

work for a particular environment, it's very quick and easy to revert back to the previous version of the protocol.

To install a protocol software update:

Step 1:   Insert the protocol software CDROM into the CD/DVD drive on the Freeway

Step 2:   Reboot the Freeway

Step 3:   Remove the CDROM from the CD/DVD drive

Step 4:   Reboot the Freeway once more

The installation will save the previous version of the protocol image under a different name and install the new version. The installation process will not overwrite a new version of the ICP OS.

Note

> The installation process will not automatically copy the protocol loopback program files to the Freeway disk drive.

7.4 Installing SRA Software Updates

SRA software updates are releases of special Protogate products that require an SRA to run on the Freeway server as part of the product function. Some examples of products that use SRAs are:

- Freeway Message Switch

- Protogate's Monitor product

- UPT Freeway

- ADIN Message Switch

In general, the installation procedure for SRA software updates is the same as for protocol software updates (see Section 7.3). However, you should always follow the installation instructions on the label of the CDROM as some products may require additional steps.

Chapter

8 | Configuring a Boot Server

This chapter describes how to configure a client system as a "boot server" for one or more Freeway systems on the network.

A "boot server" is essentially a system that acts as an FTP server for the Freeway. When the Freeway server is configured to boot from a boot server, it uses FTP to get all the necessary files from the boot server rather than load the files from it own disk drive.

This method of booting was common many years ago because older Freeway systems did not have adequate storage space to hold the system and protocol files necessary for booting. Today, all Protogate Freeway systems boot up from their own flash or hard drive, which is now the standard method of booting. Also, booting from the internal Freeway disk drive is much faster than booting from the network.

However, if for some reason you need to boot your Freeway system over the network, this chapter is for you. Table 8–1 summarizes the boot server configuration steps. You must have previously installed the Freeway hardware as described in the appropriate Freeway hardware installation guide.

Table 8–1: Summary of Boot Server Configuration Steps

Steps	Reference Section(s)
1. Select a computer on the same network as the Freeway that supports TCP/IP and the file transfer protocol (FTP) or, for UNIX or Windows, remote shell (RSH). You will use this computer as the Freeway boot server.	
2. Configure the computer to act as a boot server.	Section 8.1 on page 194
3. Load the Freeway software from the distribution CDROM onto the boot server[1].	Section 8.2 on page 198
4. Load the Protocol software from the distribution CDROM(s) onto the boot server	Section 8.3 on page 198
5. Create (or copy) the boot configuration file.	Section 8.4 on page 199
6. Modify the Freeway System Boot Parameters.	Section 8.5 on page 203
7. Boot Freeway.	Section 8.6 on page 205
8.	

[1] Installing new software overwrites the previous software.

8.1 Configuring a System as a Boot Server

Before you can boot Freeway from the network, the boot server and Freeway must be configured to communicate with each other. Multiple Freeway servers can be configured to boot from the same boot server. The following steps are required:

1. Create a file transfer protocol (FTP) or remote shell (RSH) user account on the boot server (Section 8.1.2).

2. Define the system names and Internet addresses for Freeway, the boot server, and the gateway processor (if applicable) on the boot server (Section 8.1.3).

Your system administrator might have already completed these steps during the hardware installation procedures described in the hardware installation guide for your Freeway. If so, skip this section and proceed with Section 8.2 on page 198.

During the boot process Freeway is considered a client while it downloads files over the Ethernet from the Freeway boot directory located on the boot server. After the boot process completes, Freeway starts its normal role as a communications server for its clients. Section 5.1 on page 141 describes the boot process.

Freeway supports the FTP or RSH configuration in the boot process (Section 8.1.1 through Section 8.1.3). The default Freeway configuration for booting from the network is set to use FTP.

8.1.1 Configure FTP or RSH

The boot server must support the file transfer protocol (FTP) or remote shell (RSH). RSH is available on UNIX and Windows systems, but possibly not on VMS systems, depending on how your system is configured.

Freeway uses FTP or RSH to request each of its download files from the boot server. To respond to the download requests, the boot server must also have the FTP or RSH daemon process running.

On UNIX systems, the /etc/inetd.conf command file usually starts the FTP or RSH daemon process. Refer to your UNIX user manuals for details.

On VMS systems, if you don't already have a TCP/IP package that supports FTP, you must install one. Refer to the user manuals for the software you are using to find out how to configure the FTP daemon process.

On Windows systems, refer to your Windows administration manuals for details on how to start the FTP or RSH server.

8.1.2 Create the FTP or RSH User Account on the Boot Server

Using FTP or RSH for downloading requires Freeway to log in to the boot server. By default, Freeway logs in with the FTP user name of freeway and an FTP password of password. Create an FTP user account on the boot server to match these values. This

account, freeway, must have read/write/execute access to all installed files in the directories and subdirectories below freeway. For instructions on how to create user accounts, refer to your system administrator's guide or consult your system administrator.

If you prefer to use RSH on your UNIX or Windows NT system, you must still set up a user account, but the password is not used for accessing the boot server through its remote shell daemon.

In UNIX systems, the files to which Freeway requires access are normally in the default /usr/local/freeway directory.

In VMS systems, the files to which Freeway requires access are normally in the default SYS$SYSDEVICE:[FREEWAY] directory.

In Windows systems, the files to which Freeway requires access are normally in the default C:\freeway directory.

You can change the default FTP user name and FTP password that Freeway uses by changing the corresponding boot parameters on the Freeway system as described in Section 4.6.1 on page 105. If you do, remember that you must also change the user name and password of the FTP account on the boot server.

8.1.3 Define Freeway to the Boot Server

In this section you will create names on your boot server system that are associated with the IP address of Freeway. The boot server needs this information so it can communicate with Freeway. You will need this information to configure the Freeway boot parameters. On most systems, the IP addresses and system names of computers on the network are maintained in a /hosts file.

Your system administrator might have already completed this step during the Client software installation procedure described in Chapter 3. If so, skip this section and pro-

ceed with Section 8.2 If not, refer to Section 3.3.2 on page 49 for instructions on how to define names on your client system.

8.2 Install the Freeway Software onto the Boot Server

You need to load the Freeway software onto the boot server in order to create the Freeway directory tree where the Freeway boot files are stored. Your system administrator might have already completed this step during the Client software installation procedure described in Chapter 3. If so, skip this section and proceed with Section 8.3 If not, refer to Section 3.4 on page 52 for instructions on how to install the Freeway software on your client system. Note that unless you plan to also use your boot server as a development system, you do not need to compile the DLI/TSI library on the system.

8.3 Install the Protocol Software onto the Boot Server

You need to load the protocol software onto the boot server for each individual protocol that you plan to use on the Freeway server. Each different protocol comes on its own CDROM distribution media. Your system administrator might have already completed this step during the Client software installation procedure described in Chapter 3. If so, skip this section and proceed with Figure 8.4. If not, refer to Section 3.6 on page 60 for instructions on how to install the protocol software on your client system. Note that unless you plan to also use your boot server as a development system, you do not need to compile the protocol loopback test programs on the system.

8.4 Create (or Copy) the Boot File

The main boot configuration file for the Freeway server is called bootcfg and contains specific information for loading protocol software on the ICP boards. The file is custom created by Protogate for each Freeway server delivery. As such, the bootcfg file specific to your Freeway server is not located on any of the Freeway or Protocol installation CDROMs. It is located only on the Freeway internal disk drive.

In order to boot the Freeway over the network, you need a copy of your specific boot configuration file in the freeway/boot/ directory of the boot server. You can get a copy of this file on your boot server using one of the methods below (listed easiest to hardest):

1. Copy the boot configuration file from the Freeway disk drive to the boot server

2. Obtain the boot configuration file from Protogate customer support

3. Modify an example boot configuration file to match your Freeway setup

8.4.1 Copy the boot configuration file from Freeway

The best way to do this is to use FTP to copy the file over the network from the Freeway to your boot server. The file you need to copy from the Freeway disk is /tmp/boot/bootcfg. You can use any FTP program to do this. Figure 8–1 shows an FTP example from a Command Prompt window on a Windows XP system.

8.4.2 Contact Protogate Customer Support

Protogate maintains records of all the Freeway systems that it ships to customers. If you find you don't have access to the bootcfg file on your Freeway server, contact customer support at Protogate and they will look up the records for your system and email the bootcfg file to you. Be prepared to identify your system to the customer support person by stating the system name, date purchased, quote number, or any other information that will help Protogate recall your system information.

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Admin>cd \freeway\boot

C:\freeway\boot>ftp fwy28
Connected to fwy28.
220 fwy28 FTP server (Version 6.00LS) ready.
User (fwy28:(none)): root
331 Password required for root.
Password: setup          (note: password not echoed)
230 User root logged in.
ftp> cd /tmp/boot
250 CWD command successful.
ftp> ascii
200 Type set to A.
ftp> get bootcfg
200 PORT command successful.
150 Opening ASCII mode data connection for 'bootcfg' (8884 bytes).
226 Transfer complete.
ftp: 9044 bytes received in 0.02Seconds 565.25Kbytes/sec.
ftp> bye
221 Goodbye.
```

Figure 8–1: FTP Example (Windows XP)

8.4.3 Create the Boot Configuration File

You may recreate the boot configuration file (from an example file) if you know which protocols are to be loaded into which ICP boards. The other information you need to know is where the ICP boards are located in the Freeway box. Each PCI-bus slot on the Freeway is identified by a PCI bus number (bus_number) and slot address (slave_address). The boot configuration file needs this information in order to download the protocol software to the ICP boards.

Follow the steps below to create a boot configuration file:

Step 1: **Obtain the PCI bus and slot numbers for each ICP board**

You can obtain the PCI bus and slot numbers from the version of the *Freeway 3xxx Hardware Installation Guide* that matches your model of Freeway server. In each guide there is a drawing of the rear of the Freeway unit with the PCI bus and slot numbers marked for each available PCI slot. Look at that drawing to find the PCI slots occupied by ICP boards on your system, and write down the numbers.

Step 2: **Obtain an example boot configuration file**

If you have no other copies of a file, you can start with one of the example boot configuration files that were installed on your boot server from the Freeway software installation. The best example to use is a file called bootcfg.pci located in the freeway/boot/ directory. Copy this file to bootcfg so that you can edit it.

> **cd /usr/local/freeway/boot**

> **cp -p bootcfg.pci bootcfg**

Step 3: **Edit the boot file (bootcfg)**

The boot configuration file contains a separate entry for each physical ICP on the Freeway server. There are five parameters in each entry. You must edit each entry to match the your Freeway configuration

The download_script parameter in the boot configuration file defines the path name of the load file. The load file contains the commands that download the protocol or protocol toolkit software to the ICP.

Edit the boot configuration file (freeway/boot/bootcfg) as follows:

1. Uncomment the physical parameters associated with each ICP in your Freeway.

Be sure that only one instance of each device_name is used in this file.

2. The device_name represents the ICP number (icp0, icp1, icp2, etc.). You may number the ICP boards in any order, however, Protogate normally starts ICP numbering (icp0) from the lowest board on 1U and 2U Freeways, and the left-most board on 4U and 6U models.

3. The device_type is always icp2432 for PCI-based ICP boards.

4. Modify the slave_address entry of each ICP to match your configuration. This number may be represented in either decimal or hexadecimal. When using hexadecimal, be sure to precede the number with "0x".

5. Modify the bus_number entry of each ICP to match your configuration. This number may be represented in either decimal or hexadecimal. When using hexadecimal, be sure to precede the number with "0x".

6. Modify the name of the load file in each download_script entry to match your protocol you want to use in that ICP board. (for example, x25loadb or mstloadb).

Step 4: **Save the boot configuration file (bootcfg)**

Save the edited file as bootcfg in the freeway/boot directory and exit the editor. Figure 8–2 shows an example of boot configuration file entries for two ICP boards.

> **cd /usr/local/freeway/client**
> **mkdir** *op-sys*

1. From your *op-sys* directory, create the bin and lib directories if they don't already exist.

> **cd** *op-sys*
> **mkdir bin**
> **mkdir lib**

```
#
#--------------------------------#
# ICP0 Physical Parameters       #
#--------------------------------#
#
device_name          =  icp0
device_type          =  icp2432
slave_address        =  0x14
bus_number           =  0
download_script      =  awsloadb


#--------------------------------#
# ICP1 Physical Parameters       #
#--------------------------------#
#
#device_name          =  icp1
#device_type          =  icp2432
#slave_address        =  0x13
#bus_number           =  0
#download_script      =  mstloadb
```

Figure 8–2: Sample ICP Entries for bootcfg file

8.5 Modify the Freeway System Boot Parameters

In the Freeway System Boot Parameters menu, modify the path name for the System Boot Directory. See Section 4.6.1 on page 105 for details on how to modify the boot parameters. Modify the boot parameters as follows:

1. Change the **Boot Device** to fei.

2. Change the **FTP User Name** to the name of the FTP account you set up on the boot server for use by the Freeway.

3. Change the **FTP Password** to the password of the above FTP account.

4. Change the **Boot Server Name** to the name of your boot server

5. Change the **Boot Server Inet Address** to the IP address of your boot server (in dot format)

6. Change the **System Boot Directory** to the directory on your boot server where the boot configuration and load files are located.

During the UNIX default installation, example boot configuration and load files were installed in the /usr/local/freeway/boot directory.

During the VMS default installation, example boot configuration and load files were installed in the SYS$SYSDEVICE:[FREEWAY.BOOT] directory.

During the Windows default installation, example boot and load configuration files were installed in the C:\freeway\boot directory.

8.6 Boot Freeway

After you have configured and saved the Freeway boot parameters as described in the previous section, return to the Freeway Main Menu and select 1, then 2, to reboot the Freeway. When the Freeway reboots, it should download the files from the boot server via FTP.

Note

Protogate recommends having a serial console attached to the Freeway when booting from a boot server for the first time. If any errors occur during the boot process, you can examine the error messages and correct any configuration mistakes.

Freeway File Reference

This Appendix provides a quick reference to directories and files located on the Freeway server.

A.1 Freeway Disk Partitions

The Freeway server disk drive consists of either a flash drive or a rotating disk drive. The disk drive contains a UNIX partition for the Freeway server software. The UNIX partition is divided into several sub-partitions by the FreeBSD OS. The following are the partitions that are most relevant to Freeway users:

/usr This partition contains all the source code for programs developed on the Freeway server. It also contains the DLI and TSI library source code and make files. This partition is always mounted as READ ONLY when the Freeway server boots up and runs. In order to develop software in this partition, it must be mounted as READ/WRITE during any development on the Freeway, then mounted as READ ONLY again when development is complete.

/tmp This partition is created as a RAM DISK partition. That is, it is a section of RAM memory made to look like a disk partition. This partition holds a copy of the boot and executable files used by the Freeway server. This partition is always mounted READ/WRITE. This is a temporary partition that is deleted and recreated each time the Freeway server is booted.

/var   This partition is created as a READ/WRITE partition and is mainly used for system logging, capture data storage, cron, and similar applications. On standard Freeway servers, this partition is created in RAM memory inside the /tmp partition.

/cache   This partition is only available on rotating hard drives. This partition represents the remaining area of the drive that is not used by the Freeway OS (usually hundreds of gigabytes). This partition is available for use as a READ/WRITE partition.

A.2 Software Development Directory Structure

Protogate has provided a directory hierarchy for the development of SRAs and other software on the Freeway. Listed below are the directories that are important for developing software on the Freeway server:

/usr/local/freeway/client/test/sra

This directory includes the source code and make file for the sample SRA (filter.c). The make file invokes the compiler and linker to generate the shared object file (filter.so).

/usr/local/freeway/client/test/*yoursra*

You create this directory to contain the source code and make file for the SRA that you are developing (where *yoursra* is the name of your SRA project). The make file invokes the compiler and linker to generate the object file (*yoursra*.o) and executable file (*yoursra*).

/usr/local/freeway/client/test/*protocol*

This directory includes the source code, DLI/TSI configuration files, and make file for the loopback test program associated with a particular protocol software package (where *protocol* is the name or mnemonic of the

protocol software). An example is the Sample Protocol Software where the subdirectory name is **sps** and the loopback source file name is spsalp.c. The make file invokes the compiler and linker to generate the object file (spsalp.o) and executable file (spsalp). The make file also generates the binary DLI/TSI configuration files, then places them along with the executable file in the /usr/local/freeway/client/bsd/bin directory.

/usr/local/freeway/client/bsd/bin

This directory contains the executable files built as a result of the compilation of each of the source files in the SRA and loopback source directories. It also contains the binary versions of the DLI and TSI configuration files that are used by the loopback and/or SRA executable files. Executable files are normally run from this directory.

/usr/local/freeway/client/bsd/lib

This directory contains the DLI and TSI library files that were generated as a result of building the DLI/TSI library on the Freeway server. These files are used by the makefile during the linking process:

libbsdfw.a   This is the DLI/TSI library file for the BSD operating system.

libbsdcs.a   [Optional] This is the Call Service (CS) API library file for the BSD operating system. The CS API library is only used with programs interfacing with the X.25/HDLC LAPB protocol software.

/usr/local/freeway/include

> This directory contains the source code "include" files (.h files) for the DLI/TSI library. These files are accessed by the C compiler when compiling any program code that uses the DLI API.

/tmp/boot

> This is the main operational directory used by the Freeway during runtime. This directory contains the basic Freeway configuration and executable files. Since this directory is located in the RAM-disk partition, it is always mounted read-write. The files in this directory are copied from the permanent storage directory (/usr/local/freeway/boot.src) each time the Freeway boots. Any files placed in this directory are deleted after a reboot unless they are copied into the permanent storage area.

/usr/local/freeway/boot.src

> This directory contains a non-volatile copy of all the operational files used by the Freeway. At boot time, the Freeway server copies all of the files from this directory to the working directory (/tmp/boot). Note that boot.src is a directory name, not a file name.

1.3 Files Provided for Building Programs on the Freeway

Make files, configuration files, and source code are provided to build the example filter SRA and the protocol loopback test programs. You can use any of these examples and modify the code to create your custom SRA.

> **Note**
>
> The /usr partition is mounted READ_ONLY during normal Free-way operations. You must first mount the /usr partition as READ_WRITE before editing, compiling, and linking files in the /usr partition.

1.3.1 Example Filter SRA

The files provided with the Freeway server distribution that are used to build the example filter SRA are located in /usr/local/freeway/client/test/sra. They are described below:

filter.c   This is the source code for the example message filtering SRA.

Makefile   This is the make file that compiles and links the filter.c file into a shared object file that is later accessed by the Freeway dae-mon. Refer to Chapter 6 for more information about the example filter SRA.

1.3.2 Loopback Test Programs

Each protocol software distribution CDROM includes a loopback test program designed to work with the protocol image. In most cases these files are already installed on the Freeway server disk drive. These files are located in the directory structure /usr/local/freeway/client/test/*protocol* where *protocol* is the name or mnemonic of the specific protocol used. In the following list of files we will use the Sample Protocol Software (SPS) loopback program as an example. These files are located in the directory /usr/local/freeway/client/test/sps. Loopback programs from other protocols have a similar file set except that the three letter mnemonic is different for each protocol and the files reside in different (parallel) subdirectories.

spsalp.c   This is the C source file for the loopback program (in this case Sample Protocol Software). The "alp" stands for "asynchronous

loopback program" which means that it uses non-blocking I/O when interfacing with the DLI API.

spsaldcfg   This is the text version of the DLI configuration file used by the SPS loopback program.

spsaltcfg   This is the text version of the TSI configuration file used by the SPS loopback program.

makefile.bsd   This is the make file that compiles and links the loopback program and creates the executable file (spsalp). The make file also generates the binary versions of the DLI and TSI configuration files (spsaldcfg.bin and spsaltcg.bin). Lastly the make file takes the three files created above and moves them to the bsd binary directory (/usr/local/freeway/client/bsd/bin).

Makefile   This file is a "soft link" that points to the file makefile.bsd. This file simply streamlines the make process such that you only have to type **make** to build the loopback program as opposed to typing **make -f makefile.bsd**. If this file does not exist in your development directory, you can create the link by going to the sub-directory containing the file makefile.bsd and using the following BSD shell command: **ln -s makefile.bsd Makefile**.

Note that there are many other files in the loopback program directory besides just the files listed above. The other files are for building the loopback program on client computers with various operating systems. The files listed above pertain only to building the loopback program under FreeBSD.

Appendix
B Useful Shell Commands

This appendix lists several BSD shell commands that are useful in the Freeway environment. To access the BSD shell, log in to the Freeway as root/setup and select "6) Run FreeBSD Shell" from the main menu.

B.1 Directory Commands

Change default directory to /tmp/boot:

```
cd /tmp/boot
```

Show default directory:

```
pwd
```

List files in directory (with sizes and dates):

```
ls -al
```

B.2 Mount Commands

Mount the /usr partition as read-write:

```
mount -u -o rw /usr
```

Mount the /usr partition as read-only:

```
mount -u -o ro /usr
```

Mount a CDROM in the CD/DVD drive:

```
mount /cdrom
```

Dismount a CDROM in the CD/DVD drive:

```
umount /cdrom
```

Mount the "s2g" filesystem as a read-write partition (rotating hard drives only):

```
mount /cache
```

B.3 File Commands

Copy a file from CDROM to /tmp/boot (preserving date):

```
cp -p /cdrom/filename /tmp/boot/
```

Delete a file:

```
rm filename
```

Rename a file:

```
mv filename1 filename2
```

Display a text file (a page at a time):

```
cat file.txt | more
```

Edit a text file

```
vi file.txt
```

Execute a make (build) file:

```
make -f makefile.bsd
```

B.4 System Commands:

Reboot the Freeway server:

```
reboot
```

Shutdown the Freeway gracefully and power off:

```
shutdown -p now
```

Exit the shell and return to the Freeway Main Menu:

```
exit
```

B.5 Remote Login Commands

The most current Freeway servers do not allow remote logins as root or shell over unsecure applications such as rlogin or telnet. If you need to login to a Freeway as root/shell from a client that only has one of these applications, you can login as "freeway" and then "set user" to shell as shown in the following steps:

Step 1:   Log into the Freeway from the remote console.

Freeway User Login: freeway

Password: password

Step 2:   At the main menu select Run FreeBSD Shell (6). You will see a dollar sign ($) prompt.

Step 3:   Enter the following command to "set user" to the root/shell user and enter the password when prompted (the default password for the "shell" user is "setup").

su - shell

When you have successfully changed to the shell user, you will see a pound sign (#) prompt.

Glossary

The common Freeway terms and acronyms are defined below.

BOOTP   Bootstrap protocol

boot server   A client computer that downloads software onto Freeway (that is, "boots" Freeway). During this operation, Freeway becomes a client of the boot server.

client   An entity on the LAN that uses the services offered by Freeway. To conform with the industry use of this term, a client refers to an application program which is running on a host somewhere on the network and communicates with Freeway through a LAN connection. This term in no way implies usage of a specific LAN host platform, and no assumption is made as to the distribution of clients on the LAN. See also "process."

CD   Compact Disk

CDROM   Compact Disk - Read-only Memory

CPU   Central processing unit

Data Link Interface See DLI/TSI

DLI/TSI   The Data Link Interface (DLI) and Transport Subsystem Interface (TSI) provide a programming library of routines to facili-

tate data transfer to and from Freeway using a standard interface across protocols.

Freeway Freeway refers to the entire server in terms of hardware and software. The hardware includes items such as the server processor board and the ICPs. The software includes functions such as server management, LAN and protocol services, and protocol software executing on the ICPs. For a specific product configuration, the Freeway model numbers are used (for example: Freeway 3112, Freeway 3212, Freeway 3412, and Freeway 3612).

FTP The file transfer protocol, described in RFC-783, is used during the boot process.

ICP Protogate's intelligent communications processor (ICP) board that supports serial protocols. An ICP is also referred to as a "WAN interface processor." The most recent ICP models are the ICP2432B (PCIx-bus) and ICP2432e (PCIe-bus). When the term "ICP2432" is used in current documentation, it almost always refers to the ICP2432B model. The ICP2432 (PCI-bus) model formerly manufactured by Simpact is obsolete. Protogate often refers to this particular ICP model as the "ICP2432A" board. Other obsolete ICP models include the ICP2424 (ISA-bus) and the ICP6000 (VME-bus).

ICP_IP A virtual device which appears to the rest of the Freeway (and to all client applications) just like a physical ICP board except that it transmits and receives data via an IP network rather than via a serial line.

ICP-resident software	Protogate-supplied communication protocol software or user-customized software that runs on the ICP to process the data stream between the ICP and the WAN devices. Refer to the *Freeway Protocol Software Toolkit Programmer's Guide* for customized software.
IP	Internet protocol, described by RFC-791
LAN	Local area network
LAN protocol	The hardware and software which comprise the LAN and form the basis of communications between Freeway servers and clients. An example LAN protocol is TCP/IP running over Ethernet.
MIB	Management information base
NVRAM	Non-volatile random access memory
operating system	Code that provides the necessary scheduling and management functions for tasks and services. The Freeway operating system is based on FreeBSD UNIX and runs on the server processor board. Protogate's OS/Protogate real-time executive runs on the ICP boards.
process	Code executing on a LAN-based host and equivalent to the "client" term.
RAM	Random access memory
resource	A resource available in the Freeway server. Typically, resource refers to an ICP board within the server, a port on a board, or a WAN protocol running on an ICP.

RFC   Request For Comment is a method of establishing requirements for the INTERNET network (formerly, ARPANET). These requirements form the basis for much of the LAN connectivity used with Freeway, including TCP/IP, User Datagram Protocol (UDP), telnet, SNMP, FTP, bootp, etc.

RSH   Remote shell; networking software used during the boot process to transfer files.

SCSI   Small computer systems interface

SDK   Software development kit

server processor   The Freeway server processor board, which is capable of executing the server's operating system and functions such as server management.

server-resident software (SRA) Software that runs on the server processor board and processes the data stream between the LAN and WAN connections. Server-resident software can be either supplied by Protogate or customized by the user.

service   A more generalized view of resource where a grouping is made on a per-protocol basis. For example, the FMP protocol has a number of resources: the ICP, the ports available on the ICP, and the protocol running on the ICP. Collectively, these resources describe the service.

service provider   A task that operates on the Freeway server processor board and provides specific processing related to a particular service. An example is the data link service provider which performs processing on the server processor board to support the AWS protocol operating on an ICP2432B communication board.

service user	An entity that uses server resources by interfacing to a service provider. Service users can be tasks that reside on the server and access the service providers directly or they can be processes, or clients, which reside on other machines and access the service providers across the network.
SMSP	Server management service provider
SNMP	Simple network management protocol
task	"Task" is used to differentiate between code executing on Freeway's server processor board or the ICP, and code executing on a LAN host, which is referred to as a "process".
TCP	Transmission control protocol, described in RFC-793
TCP/IP	Transmission control protocol/internet protocol
Transport Subsystem Interface	See DLI/TSI
TSI	See DLI/TSI
UDP	User datagram protocol, described in RFC-768
WAN	Wide area network
WAN interface processor	A board containing hardware, and possibly software, used to offer a particular communication protocol service. For instance, Protogate's ICP2432B is a WAN interface processor board that supports serial communication protocols such as X.25.

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