

Remote Annex 5391/CT1

Hardware Installation Guide

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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

IC Notice

This digital apparatus does not exceed the class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communication.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numerique de la classe A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Notice to Users of T1 Service

This equipment complies with FCC Rules, Part 68. The FCC Registration Number is located on the label on the front of the unit. You must provide this information to the telephone company if requested.

- (1) All direct connections to T1 lines must be made using standard plugs and jacks.
- (2) Before connecting your unit, you must inform the local telephone company of the following information:

Port ID	REN/SOC	FIC	USOC
T1 Network Interface	6.0Y	04DU9-BN, 04DU9-DN, 04DU9-1KN,	RJ48C
Drop/Insert Interface	6.0P	04DU9-1ZN, and 04DU9-1SN	N/A (XD)

- (3) If the unit appears to be malfunctioning, it should be disconnected from the telephone lines until you learn if your equipment or the telephone line is the source of the trouble. If your equipment needs repair, it should not be reconnected until it is repaired.
- (4) The CSU/DSU has been designed to prevent harm to the T1 network. If the telephone company finds that the equipment is exceeding tolerable parameters, the telephone company can temporarily disconnect service, although they will attempt to give you advance notice if possible.
- (5) Under the FCC Rules, no customer is authorized to repair this equipment. This restriction applies regardless of whether the equipment is in or out of warranty.
- (6) If the telephone company alters their equipment in a manner that will affect use of this device, they must give you advance warning so as to give you the opportunity for uninterrupted service. You will be advised of your right to file a complaint with the FCC.
- (7) In the event of equipment malfunction, all repairs should be performed by our Company or an authorized agent. It is the responsibility of users requiring service to report the need for service to our Company or to one of our authorized agents. For more information, see page xix.

Notice

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

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

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

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

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



Revision Level History

Revision	Description
A	Initial release.



- *Revision Level History*
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This guide describes how to install a Remote Annex 5391/CT1 in a Bay Networks System 5000 Hub.

Refer to the *Remote Annex Software Installation Notes* that come with your Remote Annex 5391/CT1 for a description of the software installation. Refer to the *Remote Annex Administrator's Guide for UNIX* for configuration information.

About this Guide

This guide includes the following chapters and appendices:

- | | |
|------------------|---|
| Chapter 1 | Introduction
Contains an overview of the Remote Annex 5391/CT1, and describes the hardware features and firmware functions. |
| Chapter 2 | Installing the Remote Annex 5391/CT1
Describes how to install the Remote Annex 5391/CT1 in a System 5000 Hub and how to confirm its operating status. |
| Chapter 3 | ROM Monitor Commands
Describes the ROM Monitor commands that modify specific configuration parameters, perform diagnostic tests, and load the operational code. |
| Chapter 4 | Troubleshooting Procedures
Provides troubleshooting and verification procedures. |

- Appendix A** **Port Pins and Signals**
Details the port connectors located on the Remote Annex 5391/CT1.
- Appendix B** **Network Bypass Jumper**
Describes the Network Bypass Jumper settings for the Remote Annex 5391/CT1.

Printing Conventions

This manual uses the following printing conventions:

Convention:	Represents:
<i>special type</i>	In examples, special type indicates system output.
special type	Bold special type indicates user input.
Return	In command examples, this notation indicates that pressing Return enters the default value.
bold	Bold indicates commands, pathnames, or filenames that must be entered as displayed.
<i>italics</i>	In the context of commands and command syntax, lowercase italics indicate variables for which the user supplies a value.
[]	In command dialog, square brackets indicate default values. Pressing Return selects this value. Square brackets appearing in command syntax indicate optional arguments.
{ }	In command syntax, braces indicate that one, and only one, of the enclosed value must be entered.

Convention:	Represents:
	In command syntax, this character separates the different options available for a parameter.
	Notes give you important information.
	Warnings inform you about conditions that can have adverse effects on processing.
	Cautions notify you about dangerous conditions.

Related Documents

Each Remote Annex hardware platform ships with the appropriate hardware guide. The remaining documentation is included with the software.



• *Preface*
•

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Asia/Pacific Region	(612) 9927-8800	(612) 9927-8811
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The message section is monitored by Bay Networks engineers, who provide assistance wherever possible. Customers and resellers holding Bay Networks service contracts also have access to special libraries for advanced levels of support documentation and software. To take advantage of CompuServe's recently enhanced menu options, the Bay Networks Forum has been re-engineered to allow links to our Web sites and FTP sites.

We recommend the use of CompuServe Information Manager software to access these Bay Networks Information Services resources. To open an account and receive a local dial-up number in the United States, call CompuServe at 1-800-524-3388. Outside the United States, call 1-614-529-1349, or your nearest CompuServe office. Ask for Representative No. 591. When you are on line with your CompuServe account, you can reach us with the command **GO BAYNET**.

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To use InfoFACTS in the United States or Canada, call toll-free 1-800-786-3228. Outside North America, toll calls can be made to 1-408-764-1002. In Europe, toll-free numbers are also available for contacting both InfoFACTS and CompuServe. Please check our Web page for the listing in your country.

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Santa Clara, CA	1-800-2LANWAN	(408) 764-1188
Valbonne, France	(33) 92-968-968	(33) 92-966-998
Sydney, Australia	(612) 9927-8800	(612) 9927-8811
Tokyo, Japan	(81) 3-5402-0180	(81) 3-5402-0173

The Remote Annex 5391/CT1 is a T1 remote access server that integrates a T1 interface (composed of a T1 CSU/DSU and a T1 channel bank) and 24 V.34 digital modems in a single dual-slot module for the Bay Networks 5000 Series Hub. The Remote Annex 5391/CT1 also contains a Drop/Insert Interface to accommodate a Fractional T1 configuration. [Figure 1-1](#) illustrates a Remote Annex 5391/CT1.

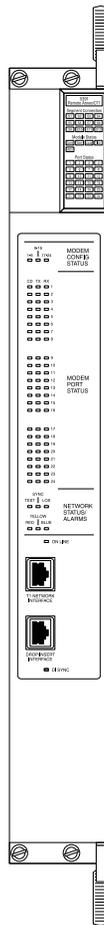


Figure 1-1. Remote Annex 5391/CT1

You can use the Remote Annex 5391/CT1 for:

- ❑ Remote Network Access
- ❑ Dial-up Routing

Remote Network
Access

The Remote Annex 5391/CT1 provides remote network access to the following networks (see [Figure 1-2](#)):

- ❑ Novell Netware
- ❑ TCP/IP
- ❑ AppleTalk

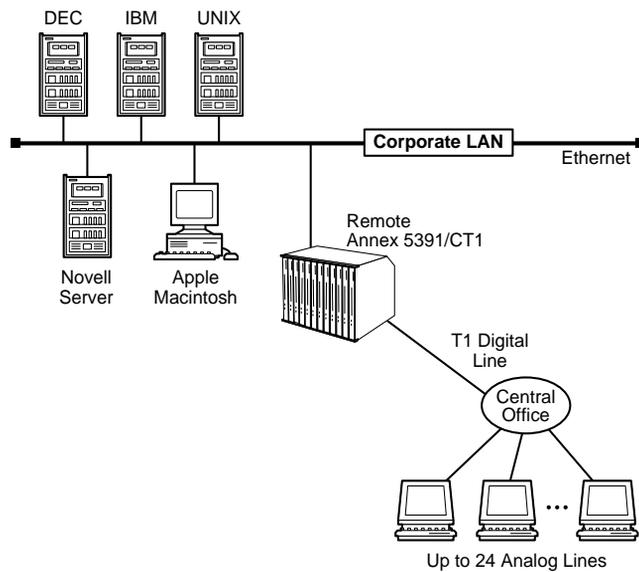


Figure 1-2. The Remote Annex 5391/CT1 as a Remote Access Server

The Remote Annex 5391/CT1 also provides terminal to host connectivity to the following:

- ❑ UNIX hosts (using TCP/IP)
- ❑ VMS hosts (using LAT)
- ❑ IBM hosts (using TN3270)



The Remote Annex 5391/CT1 supports Windows NT[®] host tools. Remote Annex Server Tools for Windows NT[®] allows you to boot and configure the Remote Annex 5391/CT1 on a Windows NT[®] network. For more information, refer to the *Remote Annex Server Tools for Windows NT[®] User Guide*.

Dial-up Routing

The Remote Annex 5391/CT1 provides IP and IPX dial-up routing support for UNIX and Novell networks. Using a Remote Annex CT1, network administrators can connect two or more local area networks (LANs) over a wide area network (WAN) using one DS0 channel from a digital T1 line (see [Figure 1-3](#)).

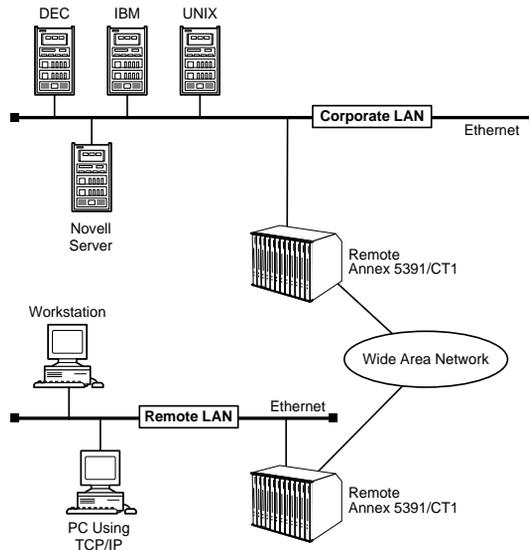


Figure 1-3. The Remote Annex 5391/CT1 as a Dial-up Router

Main Logic Board

Processors	The Remote Annex 5391/CT1 main logic board (MLB) comes with two 80486 SXLC2, 40-Mhz, clock-doubled processors.
Memory	The MLB comes with a minimum of 4 megabytes of DRAM, 2 Megabytes soldered on the MLB and two 1-Megabyte SIMM modules. The MLB can be upgraded to a total of 8 megabytes of memory using two 4-Megabyte SIMM modules.
Flash Memory	The MLB is equipped with 2 megabytes of Flash memory.

T1 Modem Board

Modems	The Remote Annex 5391/CT1 comes with 24 internal V.34 modems. The modems receive data from a TTL serial channel and convert the data to a modulated analog waveform. The analog signal is then presented to a pulse-code-modulated coder/decoder (PCM codec).
PCM Codec	The Remote Annex 5391/CT1 uses PCM codecs to convert the analog signals coming from the modems into 8-bit serial data streams. The data streams are multiplexed and passed to the T1 engine.
T1 Engine	The T1 engine performs the framing, coding, and synchronization required by the T1 Network Interface or the Drop/Insert Interface.

Network Bypass
Jumper

The Remote Annex 5391/CT1 contains two main boards:

- ❑ Main Logic Board (MLB)
- ❑ T1 Modem Board

The Remote Annex 5391/CT1 supports power-down and bypass modes, which are configured with a jumper. The two modes are:

- ❑ Network Loopback Mode
- ❑ Cross Connect Mode

Appendix B describes the jumper settings.

System 5000 Common Management Bus

The management section of the backplane is the common management bus (CMB), a high-speed, multimaster, shared-memory communication channel that connects all modules installed in the hub to one another and to the supervisory module. The modules installed in the hub use the CMB to acquire and distribute configuration and status information.

The supervisory module is an intelligent interface between the Model 5000 chassis and user-installed modules. The supervisory module provides the following services to other modules across the CMB:

- ❑ Maintains chassis component information and environmental status
- ❑ Stores the primary module configurations
- ❑ Restores the module configuration after the module power is cycled or the module is reset

The supervisory module also supports configuration terminal support through the service port on the front panel of the chassis.

System 5000 Backplane Ethernet Segment Banks

The chassis backplane Ethernet bus consists of 12 Ethernet segments, divided into two banks of six segments each: segments 1 through 6 and segments 7 through 12. Each Remote Annex 5391/CT1 module installed in the chassis can be configured to access one bank of six segments, either segments 1 through 6 or segments 7 through 12.

Within a segment bank, the specific segment to which a Remote Annex 5391/CT1 is connected is initially determined by setting the segment selection jumper on the module (used for initial installation power-up). For more information, see *Setting the Backplane Ethernet Segment* on page 2-3.

System 5000 Service Port Management

The service port, located on the front panel of the chassis, provides a switched serial communication link between the service port and any module in the hub, including the supervisory module. By connecting a terminal to this port, you can change the configuration parameter values for the Remote Annex 5391/CT1 installed in the hub.

For more information, see *Connecting a Service Port Terminal* on page 2-15 and *Installing the Remote Annex 5391/CT1* on page 2-3, and *Remote Annex Parameters* on page 2-19.

Firmware and Software

Firmware

The Remote Annex 5391/CT1's ROM contains firmware for performing power-up self-tests and loading operational code. A non-volatile EEPROM stores the configuration parameters.

The Remote Annex 5391/CT1 can boot from the boot image in its Flash memory or can boot from an image received from a device on the network.

ROM Monitor

The ROM monitor is an interactive command interpreter that is used to define configuration parameters. All of the information that the Remote Annex needs to boot an operational image is defined using the ROM monitor and its command set. ROM Monitor commands are issued from a console terminal connected to the service port on the hub chassis. Using the ROM Monitor commands (see Chapter 3), you can:

- ❑ Modify and display a set of configuration parameters stored in EEPROM.
- ❑ Execute interactive diagnostic tests.
- ❑ Receive information and statistics for the hardware configuration and the network.
- ❑ Boot the Remote Annex manually.

Once the Remote Annex has obtained a boot image and is booted, the console leaves the ROM monitor and displays the console monitor (for more details, see Chapter 2).

Supported Configurations

The Remote Annex 5391/CT1 can obtain full operational code over the network from one of the following devices:

- ❑ UNIX host
- ❑ A Remote Annex 5391/CT1 configured as a load server
- ❑ NT host

You can also boot a Remote Annex 5391/CT1 from the image contained in its Flash memory (self-booting).

Watchdog Timer

The Remote Annex 5391/CT1 has a watchdog timer that its software resets at regular intervals. The watchdog timer reboots the Remote Annex in the unlikely event of an internal software error. This feature enables the Remote Annex to run for long periods of time without intervention.

Front Panel

The Remote Annex 5391/CT1's front panel consists of:

- ❑ Annunciator LED
- ❑ Segment Connection LEDs
- ❑ Module Status LEDs
- ❑ Port Status LEDs
- ❑ Modem Configuration Status LEDs.
- ❑ Modem Port Status LEDs
- ❑ Network Status / Alarms
- ❑ On-line LED
- ❑ T1 Network Interface Port
- ❑ Drop/Insert Interface Port
- ❑ DI Sync LED

Figure 1-4 illustrates the Remote Annex 5391/CT1's front panel. The front panel components are described in the following paragraphs.

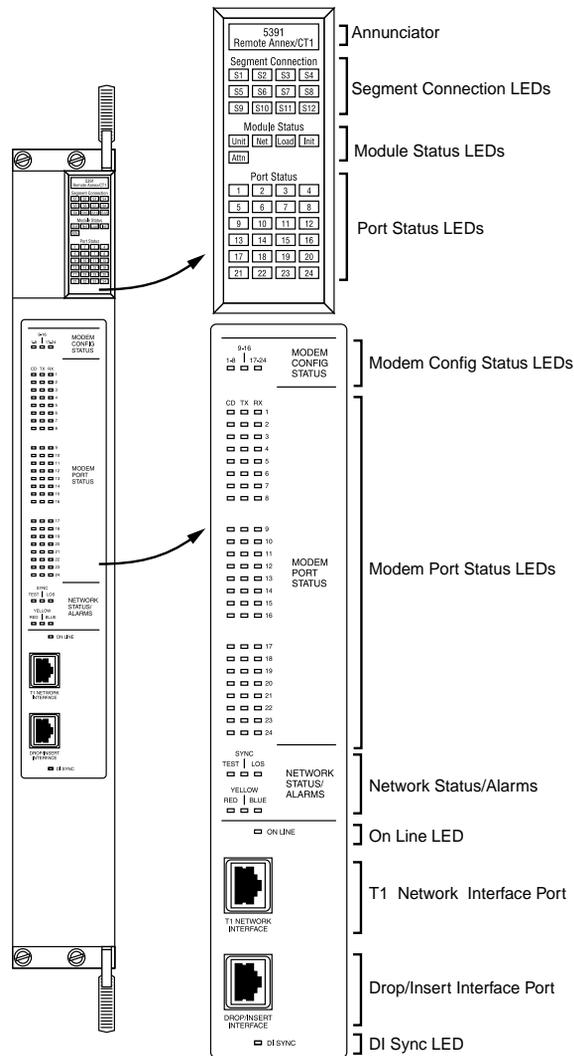


Figure 1-4. Remote Annex 5391/CT1 Front Panel

Front Panel Components

Annunciator

The Annunciator backlights the model number of the module and indicates, by its color, the operational condition of the module. [Table 1-1](#) describes the Annunciator conditions.

Table 1-1. Annunciator Conditions

Color	Operational Condition
Green	The module is performing normally.
Amber	Some portion of the module has failed, or the module is being initialized.
Off	The module is not receiving +5 volt power, or the power level is below the reset limit (4.65 volts).

Segment Connection LEDs

The Segment Connection LEDs indicate which backplane Ethernet LAN segments are being used. There are 12 green LEDs, labeled S1 through S12, for the 12 Ethernet segments. When an LED is illuminated, it indicates that the Remote Annex is connected to the corresponding backplane Ethernet LAN segment; when off it indicates that the corresponding backplane Ethernet LAN segment is not connected.

Module Status LEDs

The Module Status LEDs are a group of five LEDs that display the status of the activity of the Remote Annex. [Table 1-2](#) describes the Module Status LEDs.

Table 1-2. Module Status LEDs

LED	Description
Init	Turns green when the Remote Annex begins the initialization process after a power-up or reset. This is the first LED that lights after power-up or reset. The Init LED turns off after the diagnostics have successfully completed.
Unit	Turns green after the Remote Annex passes the power-up diagnostics. Turns amber if the power-up diagnostics fail.
Net	Turns green after the Remote Annex verifies that a valid Ethernet connection exists.
Attn	Turns amber when the Remote Annex requires operator attention, that is, in monitor mode or when the diagnostic tests fail.
Load	Turns green when the Remote Annex is loading the operational image or dumping a RAM image if there is a failure. The LED turns amber if a load error is detected.

Port Status LEDs

The Port Status LEDs, numbered 1 through 24, display serial port configuration status during normal operations. All the server ports are configured at the factory, therefore all the indicators turn green when the module is booted for the first time. If an error condition exists for a configured port, the LED turns amber. A port status LED is off if the port is not configured for use.

Modem Config Status LEDs

The Modem Config Status LEDs indicate the general status of the modems within a group. There are three groups of eight modems (1-8, 9-16, and 17-24). The LED is green if all the modems within a group are good. An indicator is amber if one or more modems within a group are bad.

Modem Port Status LEDs

The Remote Annex 5391/CT1 has three status indicators for each modem port (1 through 24). The status indicators display modem port status during system operation. [Table 1-3](#) describes the modem port status LEDs.

Table 1-3. Modem Port Status LEDs

LED	Description
CD	CD (Data Carrier Detect) indicator is green and ON when the carrier has been detected on the telephone line on the corresponding modem. There are 24 CD indicators, one LED per channel, on the front of the Remote Annex.
TX	TX (Transmit Data) indicator is green and flashes to indicate the corresponding modem is transmitting data. There are 24 TX indicators, one LED per channel, on the front of the Remote Annex.
RX	RX (Receive Data) indicator is green and flashes to indicate the corresponding modem is receiving data. There are 24 RX indicators, one LED per channel, on the front of the Remote Annex.

Network Status Alarms

The six Network Status Alarms labeled TEST, SYNC, LOS, RED, YEL, and BLU display network activity during system operation. [Table 1-4](#) describes the alarms.

Technical Support personnel can use this information to diagnose problems.

Table 1-4. Network Status Alarms

Alarm	Description
TEST	RED network TEST indicator is ON when the T1 Network Interface is looped back. Loopback tests are activated either locally by the user or by the telephone company.
SYNC	GREEN SYNC indicator is ON when the T1 engine is properly synchronized with the received network signal and is receiving proper framing information.
LOS	RED LOS indicator is ON when the T1 engine is detecting no signal (pulses) on the network interface receiver. When a LOS condition exists, the T1 engine transmits unframed all ones (AIS) to the network.
RED	RED alarm indicator is ON during a locally detected carrier failure. During the RED alarm condition, a YELLOW alarm is transmitted across the telephone network.
YELLOW	YELLOW alarm indicator is ON when receiving a YELLOW alarm condition from the telephone network.
BLUE	BLUE alarm indicator is ON when receiving an unframed, all-ones Alarm Indication Signal (AIS) from the network. This condition exists upon a loss of originating signal, or when any action is taken that would cause a signal disruption.

On-line LED

The On-line LED is green and ON when the T1 engine is connected to the network interface.

T1 Network Interface Port

The T1 Network Interface port comes with an 8-pin, RJ48C port for attaching the T1 Network Interface cable connector. The T1 Network Interface provides access to a digital T1 line.

Drop/Insert Interface Port

The Drop/Insert Interface port comes with an 8-pin, modular jack for attaching the Drop and Insert Interface cable connector. The Drop and Insert Interface provides access to a local Private Branch Exchange (PBX) or other equipment.

DI Sync LED

The DI Sync LED is green and ON when the T1 engine is detecting frame synchronization on the drop and insert interface receiver. The green LED is OFF when there is a loss of frame (LOF) synchronization.

A LOF condition causes the T1 engine to transmit unframed all ones (keep-alive) to the device attached to the Drop and Insert Interface.

Physical Characteristics

The Remote Annex 5391/CT1 module has the following characteristics:

- ❑ **Dimensions:**
 - Height: 19 in.
 - Width: 2.4 in.
 - Depth: 11 in.
- ❑ **Weight:**
 - 10 lbs (4.5 kg).
- ❑ **Electrical Specifications:**
 - ❑ Power Consumption: 125 W at 48 VDC
 - ❑ Thermal Rating: 427 BTU/hr maximum
- ❑ **Environment:**
 - ❑ Operating temperature: 5° to 40°C.
 - ❑ Non-operating temperature: -25° to 65°C.
 - ❑ Operating humidity: 85% maximum relative humidity, non-condensing.

- ❑ Non-operating humidity: 95% maximum relative humidity, non-condensing.
- ❑ Operating shock: 10G peak 1/2 sine wave, 11 ms duration.
- ❑ Operating vibration: random vibration $1.2 * 10^{-3} G^2/Hz$, 12 to 198 Hz.
- ❑ Operating altitude: 0 to 4,000 meters.
- ❑ Storage altitude: 0 to 15,000 meters.
- ❑ Transportation vibration and shock: NSTA project 1A standard in shipping container.
- ❑ **Approvals:**
 - ❑ Meets safety requirements of Underwriters Laboratories for UL 1950 and CSA C22.2 No. 950.
 - ❑ Meets EMI requirements of FCC Class A and EN55022 Class A with shielded and unshielded cables.
 - ❑ Meets US and Canadian Telcom requirements per FCC Part 68 and IC CS-03.
- ❑ **MTBF:**
50,000 hrs. (estimated), calculated @ 25°C (Mil Std 217).
- ❑ **Front clearance requirement (for connectors and cables):**
6 in. (15 cm).

Chapter 2 Installing the Remote Annex 5391/CT1

This chapter describes how to install your Remote Annex 5391/CT1 hardware and software, and connect it to a System 5000 Hub. This chapter provides the following information:

- ❑ *Before you Begin*
- ❑ *Installing the Remote Annex 5391/CT1*
- ❑ *Testing the Installation*
- ❑ *Connecting a T1 Network Interface*
- ❑ *Connecting a Drop/Insert Interface*
- ❑ *Connecting a Service Port Terminal*
- ❑ *Initial Setup and Using the ROM Monitor*
- ❑ *Auto-initializing the ROMs*
- ❑ *Installing the Software and Loading the Operational Image*
- ❑ *Self-booting the Remote Annex 5391/CT1*
- ❑ *Invoking the Console Monitor*

Before you Begin

To successfully install the Remote Annex, you need:

- ❑ A 3/16-inch flat-tip screwdriver
- ❑ An antistatic mat and wrist strap (attached to an antistatic leash)
- ❑ A service port terminal and cable
- ❑ A valid IP address

- ❑ An appropriate subnet mask
- ❑ A host with Remote Annex software installed

The Remote Annex 5391/CT1 can receive its operational image from any one of these sources:

- ❑ A UNIX host
- ❑ FLASH memory
- ❑ Another Remote Annex 5391/CT1 configured as a boot host
- ❑ A Windows NT host



The Remote Annex 5391/CT1 supports Windows NT[®] host tools. Remote Annex Server Tools for Windows NT[®] allows you to boot and configure the Remote Annex 5391/CT1 on a Windows NT[®] network. For more information, refer to the *Remote Annex Server Tools for Windows NT[®] User Guide*.

[Table 2-1](#) outlines the different configurations the Remote Annex 5391/CT1 supports.

Table 2-1. Remote Annex 5391/CT1 Configuration Options

Device on which the Operational Software and Image is installed	Remote Annex Must Be Connected to the Network	Input Device used to Enter Installation Parameters
UNIX Load Host	Yes	Console
Another Remote Annex 5391/CT1 configured as a load server	Yes	Console
Self-boot (from the image contained in Flash memory)	No	Console
Windows NT [®] host	Yes	Console

Installing the Remote Annex 5391/CT1

This section describes how to install the Remote Annex 5391/CT1 in a System 5000 Hub. Installing the Remote Annex 5391/CT1 involves seating the backplane connectors to the Model 5000 Hub backplane and verifying the installation.

Preparing for Hardware Installation

This section explains how to prepare the Remote Annex for installation in the chassis.



System 5000 equipment uses electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can damage these components. You should take all possible precautions to prevent static discharge damage when working with printed circuit boards. If possible, place all printed circuit boards on an antistatic mat until you are ready to install them. If you do not have an antistatic mat, wear a discharge leash to free yourself of static before touching any of the printed circuit boards, or free yourself of static by touching the metal of the chassis before handling a printed circuit card.

Setting the Backplane Ethernet Segment

[Figure 2-1](#) shows the locations of the configuration jumper and DIP switch (on the MLB) that you must set to select an Ethernet segment. They are:

- Backplane Ethernet segment bank selector (J6)
- Backplane Ethernet segment selection DIP switch (S1)

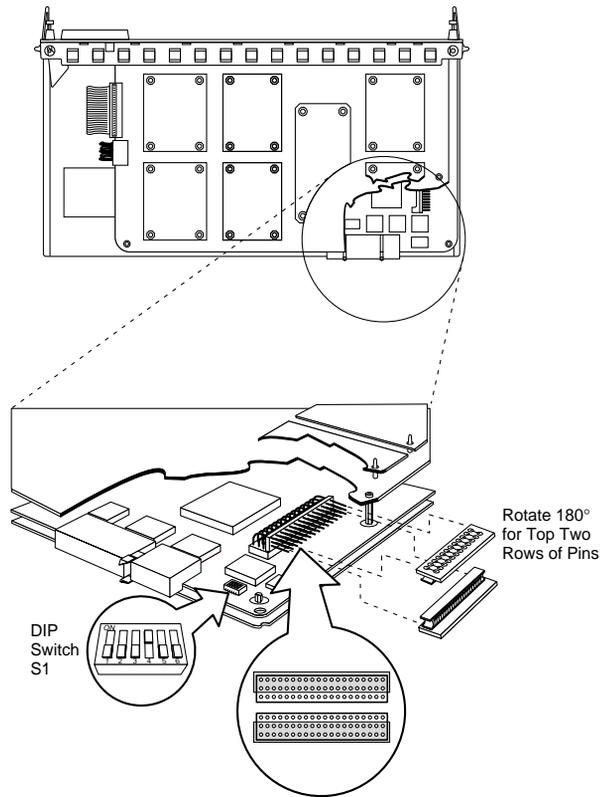


Figure 2-1. Jumper and Connector Locations

Backplane Ethernet Segment Bank Selector

The Ethernet segment bank selector on the MLB (see [Figure 2-1](#)), consisting of three rows of 20 pins (J6) and a jumper, determines whether the module connects to backplane Ethernet segments 1 through 6 or segments 7 through 12 at power up. When the jumper is installed between the bottom and middle rows of pins, the module has access to segments 1 through 6 (the factory default setting); when the jumper is installed between the top and middle rows of pins, the module has access to segments 7 through 12.



When the jumper is installed between the bottom and middle rows of pins, the printed circuit card handle is nearest the MLB. To install the jumper between the top and middle rows of pins, remove the jumper, rotate it 180 degrees (so that the printed circuit card handle is nearest the T1-modem board) and push it onto the pins (see [Figure 2-1](#)).

The specific segment connection for the module is determined by the segment selection DIP switch (described in the next section).



Network management software cannot override the bank selector setting. The setting (segments 1–6 or 7–12) can only be set while the module is outside the chassis.

Segment Selection DIP Switch

DIP switch S1 on the MLB (see [Figure 2-1](#)) is used to set the default segment selections. Segment selection DIP switch settings are listed in [Table 2-2](#). Turning a DIP switch section ON selects a particular segment within the Ethernet segment bank. For example, turning on the 1,7 DIP switch section selects either segment 1 or 7, depending on the position of the Ethernet segment bank selector jumper.



The Remote Annex 5391/CT1 occupies two physical slots in the hub, but this has no bearing on the segment selection process described here. Ethernet segment selection is independent of the physical slots occupied by the module.

Table 2-2. Segment Selection DIP Switch Settings

Position	Segments 1-6	Segments 7-12
1, 7 (default setting)	Segment 1	Segment 7
2, 8	Segment 2	Segment 8
3, 9	Segment 3	Segment 9
4, 10	Segment 4	Segment 10
5, 11	Segment 5	Segment 11
6, 12	Segment 6	Segment 12



Network management software can override this DIP switch setting, so an installed module might connect to a different segment (within the bank) than is indicated by the DIP switch setting.

Installing the Module into the Hub

To install and secure the module into the System 5000 Hub, follow these steps:

- 1 Remove the blank filler panel from the chassis slot where you intend to install the module.
- 2 Verify that the module jumpers are set correctly (see [Setting the Backplane Ethernet Segment](#) on page 2-3).
- 3 Extend the inserter/extractor levers to their fully extended positions (see [Figure 2-2](#)).

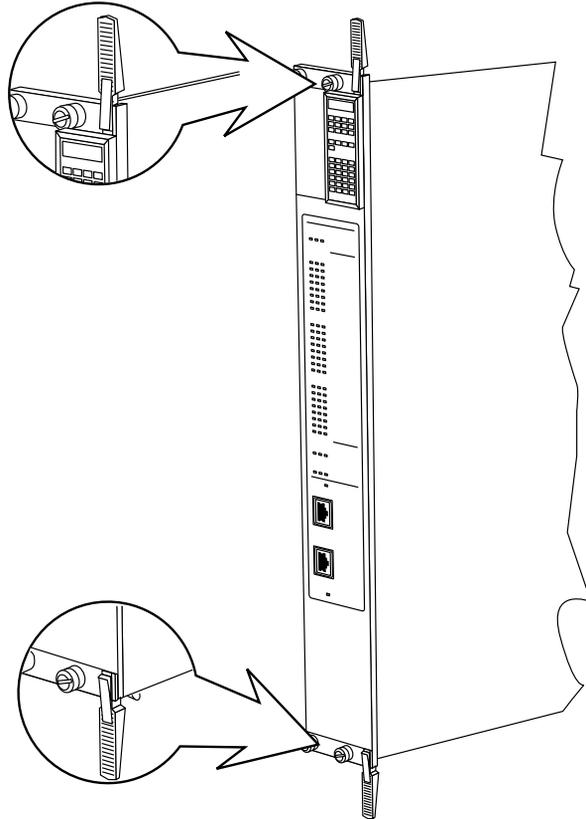


Figure 2-2. Inserter/Extractor Lever

- 4 **Align the top and bottom edges of the module in the card guides of the target slot, and push the module into the chassis until the inserter/extractor levers just engage the front edges of the chassis (see [Figure 2-3](#)).**

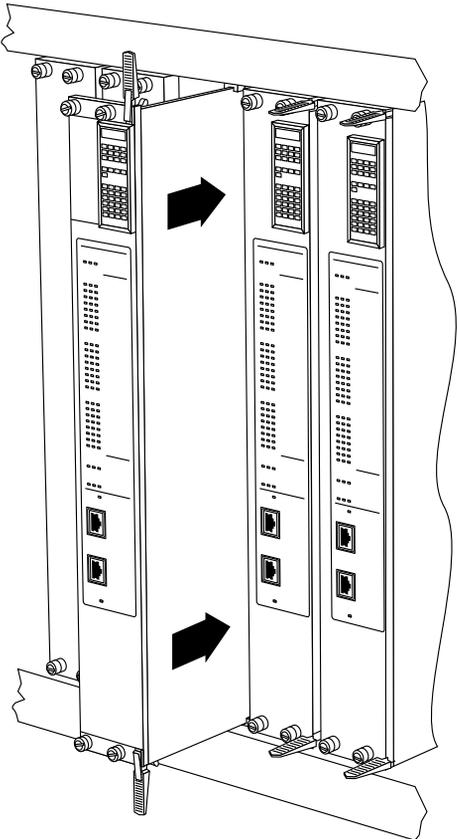


Figure 2-3. Inserting the Module

- 5 Seat the module backplane connectors by simultaneously pushing the inserter/extractor levers toward the center of the module front panel (see [Figure 2-4](#)).



Figure 2-4. Seating Module Connectors

When the front panel of the module is flush with the front of the chassis, the module backplane connectors are properly seated.

- 6 Use the flat-tip screwdriver to tighten the captive retaining screws at both ends of the module front panel.

Testing the Installation

After installing and connecting the Remote Annex, verify that you have performed the installation correctly by observing the LED indicators and system operation displays on the front panel of the Remote Annex (see [Figure 2-5](#)).

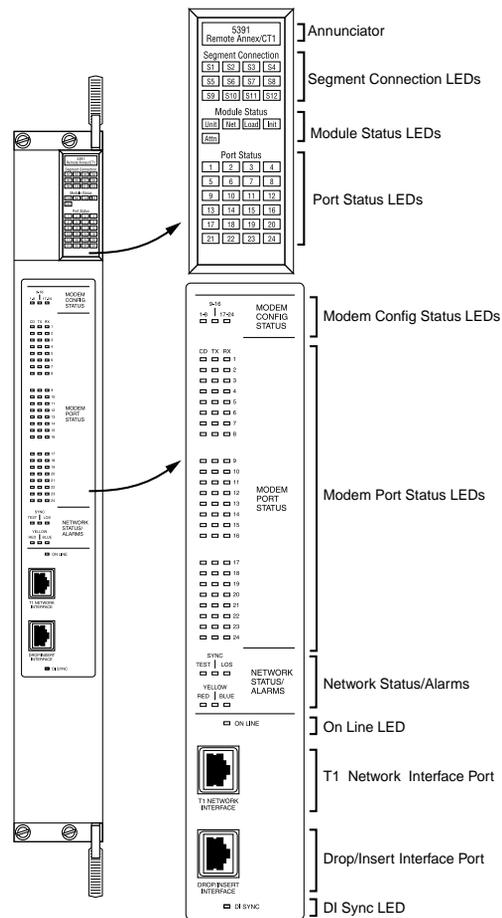


Figure 2-5. Module LED Display



The Remote Annex performs a series of self-test diagnostics each time it is reset or powered up. These tests take about 3 minutes to complete and cannot be deactivated. While these tests are running, the annunciator remains amber. For information about possible error conditions that may occur, see Chapter 4.

LED Indicators

When the Remote Annex is operating correctly, the front-panel LEDs (see [Figure 2-5](#)) should appear as follows:

- ❑ **Annunciator:** The annunciator should be green after the Remote Annex successfully completes the self-tests. If the annunciator remains amber after completing the self-tests, refer to Chapter 4.
- ❑ **Segment Connection LEDs:** A steady green indicates which Ethernet LAN segment the module is using.
- ❑ **Module Status LEDs:**
 - ❑ **Init:** Turns green when the Remote Annex begins the initialization process after a power-up or reset. Typically, this is the first LED that lights after power-up. The Init LED turns off after the initial diagnostics have successfully completed.
 - ❑ **Unit:** Turns green after the Remote Annex passes the power-up diagnostics. If the Unit LED turns amber, refer to Chapter 4.
 - ❑ **Net:** Turns green after the Remote Annex verifies that a valid Ethernet connection exists.

- ❑ **Attn:** The attention LED should be off. The Attn LED turns green if the Remote Annex is in Monitor Mode. If the ATTN LED is amber or flashing, one of the following failures has occurred :
 - ❑ Remote Annex hardware failure. Contact technical support.
 - ❑ Network or network interface failure. Error message displays on the terminal. If a network or network interface failure occurs, typing `q` accesses the ROM Monitor prompt. Check the network connection and then see *net* on page 3-18.
- ❑ **Load:** Turns green when the Remote Annex is loading the operational image or dumping a RAM image if there is a failure.
- ❑ **Port Status LEDs:** All the port status indicators turn green.
- ❑ Verify that the hub front-panel LEDs are properly illuminated.

If the LEDs do not light in the proper manner, or if the system operation displays indicate problems, see Chapter 4 for more details.

Connecting a T1 Network Interface

A T1 Network Interface is used to connect the Remote Annex to the T1 line. Follow the steps in this section to connect the T1 line to the T1 Network Interface port located on the front panel of the Remote Annex.

- 1 Plug the RJ48C connector located on the T1 Network Interface Cable into the T1 Network Interface port located on the front panel of the Remote Annex ([Figure 2-6](#)).

When the connector clicks into place, the connection is secure. Appendix A describes the T1 Network Interface port's signal/pin allocation.

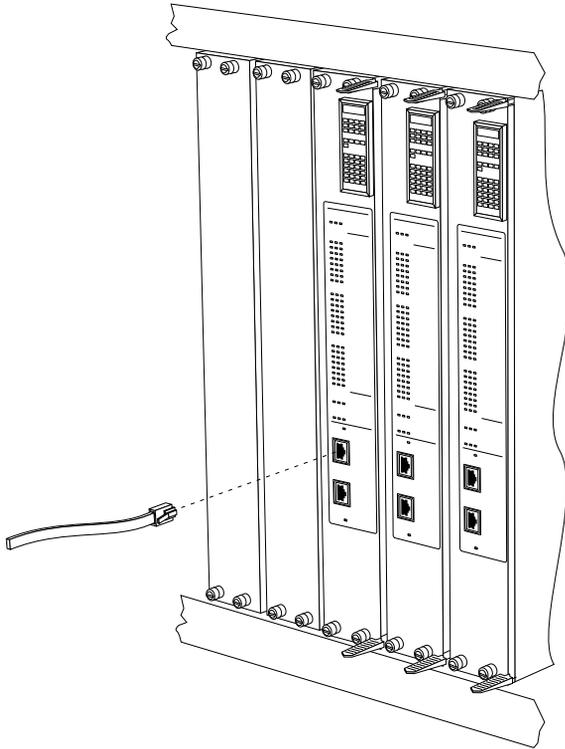


Figure 2-6. Connecting a T1 Network Interface

Connecting a Drop/Insert Interface

A Drop/Insert Interface is used to connect selected DS0 channels from a Remote Annex 5391/CT1 to a local PBX or to other equipment. Follow the steps in this section to connect the cable to the Drop/Insert Interface port located on the front panel of the Remote Annex.

- 1 Plug the Drop/Insert Interface Cable into the Drop/Insert Interface port located on the front panel of the Remote Annex ([Figure 2-7](#)).
When the connector clicks into place, the connection is secure. Appendix A describes the T1 Network Interface port's signal/pin allocation.

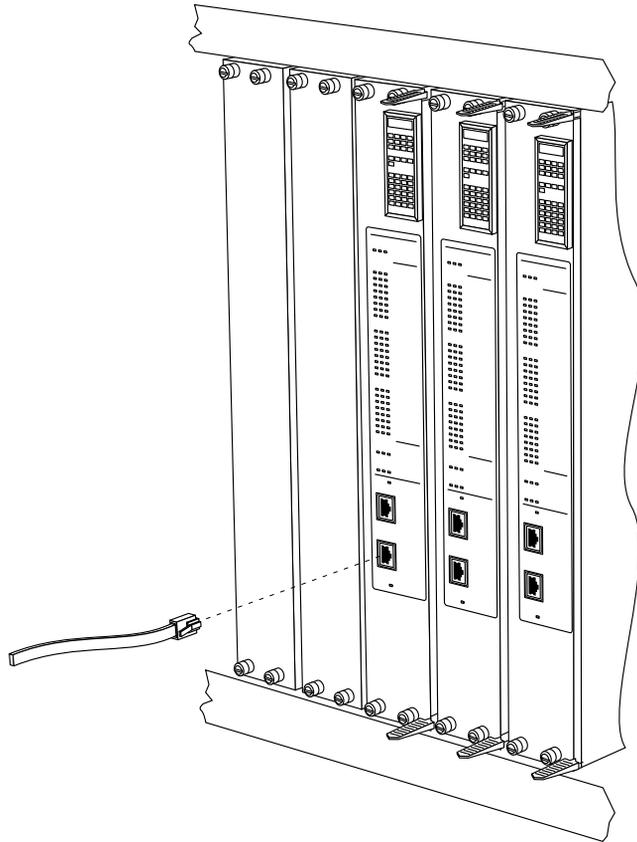


Figure 2-7. Connecting a Drop/Insert Interface

Connecting a Service Port Terminal

If your network does not include a BootP server, you must connect a terminal to the service port on the System 5000 chassis front panel and manually configure the Remote Annex before booting.

To configure the Remote Annex through the chassis service port, you need:

- ❑ A TTY-compatible terminal or a portable computer with a serial port and the ability to emulate a TTY-compatible terminal. The terminal should be set up for:
 - ❑ 9600 b/s (default)
 - ❑ 8 data bits
 - ❑ No parity
 - ❑ 1 stop bit
 - ❑ No handshaking
 - ❑ ASCII
- ❑ An RS-232 modem cable with a female DB-9 connector to connect to the service port on the chassis front panel. The other end of the cable must have a connector appropriate to the serial port on your computer or terminal. (Most terminals or computers use a male DB-9 or DB-25 connector.) The cable should use the pin assignments in [Table 2-3](#).

Table 2-3. Service Port Pin Assignments

Terminal DB-9	DB-25	Function	To Service Port DB-9 Pins	Function
2	3	Receive data	2	Transmit data
3	2	Transmit data	3	Receive data
5	7	Signal ground	5	Signal ground



RS-232 signals on other pins, such as DTR, CTS, and CD, are ignored.

Connecting the Terminal

To connect the terminal to the service port, follow these steps:

- 1 Connect the terminal (or a computer in terminal emulation mode) to the chassis service port with the RS-232 cable.
- 2 Set the terminal protocol. Configure according to the guidelines defined [on page 2-15](#).
- 3 Press **Enter** then **Control** -T to display the Slot Selection menu.

The Slot Selection menu ([Figure 2-8](#)) shows the system date and time, lists the modules installed in the chassis by slot number, and lists the available commands.

```

Model 5391 Slot Selection Menu 07/15/96, 10:19:32 AM

Slot 1      Status:      Module Description:
1           On-line      5310 Ethernet NMM
2           Configuring 5308 Ethernet Host
3           Other      5308 Ethernet Host
4           (removed)  5308 Ethernet Host
5           Off-line   5308 Ethernet Host
6           Booting    5308 Ethernet Host
7           On-line    5308 Ethernet Host
8
9           Off-line   5391 Remote Annex/CT1
10
11
12
13
14

c - Connect to slot (Press CTRL-T to break connection)
s - Select Supervisory Module Main Menu r - Reset module

Enter selection:

```

Figure 2-8. Slot Selection Menu

Use this menu to reset the Remote Annex. For more information, see [Auto-initializing the Remote Annex](#) on page 2-22.



The Remote Annex 5391/CT1 occupies two slots in the hub chassis. The slot number listed for the Remote Annex 5391/CT1 on the Slot Selection menu corresponds to the right-most slot occupied by the module.

Initial Setup and Using the ROM Monitor

After installing the Remote Annex software on the file server host, collect the following information, which is required to determine the unit's boot parameters:

- ❑ The location of the download files on the host (**tftp** only).
- ❑ Whether the Remote Annex and host are on the same subnet or separated by a gateway.
- ❑ Whether the host going to use **tftp** or **erpcd** (requires a UNIX or Windows NT[®] host) to serve the Remote Annex download code.

The Remote Annex needs these parameters to perform an initial boot when loading the software. Enter these parameters into the EEPROM using the ROM monitor commands, which are accessed through a service port terminal. See Chapter 3 for more information about these commands.

The Remote Annex supports the Bootstrap Protocol (BootP) and the Reverse Address Resolution Protocol (RARP) which can be used to obtain some of the information listed. If you have a host running BootP or RARP to serve the Remote Annex the information, the server will boot without user intervention. For more information about using these protocols, see *Auto-initializing the Remote Annex* starting on page 2-22. *Initializing and Booting from a Host System*, starting on page 2-25, describes the procedure for manually booting the server.



The Remote Annex 5391/CT1 supports Windows NT[®] host tools. Remote Annex Server Tools for Windows NT[®] allows you to boot and configure the Remote Annex 5391/CT1 on a Windows NT[®] network. For more information, see the *Remote Annex Server Tools for Windows NT[®] User Guide*.

Remote Annex Parameters

The Remote Annex requires that you set certain parameters from the ROM monitor before booting the unit from a host. Once the Remote Annex is booted, you can change these parameters using the **na** utility. Any changes to these parameters will require the unit to be rebooted. [Table 2-4](#) provides a brief description of these parameters.

Table 2-4. Server Parameters

Parameter	Description
Internet address	A unique 32-bit universal identifier that is specified in dotted-decimal notation.
Subnet mask	Defines which portion of the Internet address is the network (all ones), the subnet (all ones), and the host (all zeros) address.
Preferred load host address	The Internet address of the host from which you want to boot.
Load/dump gateway Internet address	The Internet address of the gateway, for which you will be prompted, if the preferred load host is on a different network.
Broadcast address	An Internet address with a host id of all ones or all zeros (for 4.2 BSD) to which all hosts on a particular network will respond.
Type of IP encapsulation	Specifies the method for accessing the physical and network layer of the transmission media. The default is: ethernet.

Initializing the Remote Annex

This section describes how to set up the Remote Annex, make the connection to the System 5000 Hub for the first time, and enter Monitor Mode to configure the module.

To initialize the Remote Annex and enter Monitor Mode:

- 1 Use a terminal connected to the chassis service port to verify that the Remote Annex is operating properly.

The Slot Selection menu is displayed. The Remote Annex should be listed next to the slot number in which it is installed. Since the module occupies two slot positions, the slot number listed will be that of the right-most slot being occupied.

- 2 Reset the Remote Annex by typing `r` and then entering the slot number of the chassis that contains the server.

The following prompt is displayed:

```
Are you sure you want to RESET this module? (Y/N):
```

- 3 Answer the question by entering `y`.
- 4 Within 10 seconds, connect to the Remote Annex by typing `c` and then entering the slot number of the chassis that contains the server.
- 5 Wait for the following prompt:

```
To enter "Monitor Mode" please depress the SPACE key within 10 seconds.
```

The prompt counts down from 10 seconds.

- 6 Press the space bar within 10 seconds.

After a few seconds, the following messages are displayed:

```
Monitor Mode selected, please wait for Confidence tests to complete.
```

```
System Reset - Entering Monitor Mode
```

Then the monitor prompt is displayed:

```
monitor::
```

To return to the Slot Selection menu from Monitor Mode, press the `Break` key.

- 7 Verify the Remote Annex hardware configuration by typing `config` and pressing `(Return)` at the monitor prompt.

The screen display looks similar to this:

```

REVISION/CONFIGURATION INFORMATION

ROM Software Rev: 100X Board ID/Board Type: 46/5391
CPU Type: 486SXLC2 Ethernet Address: 00-00-81-XX-XX-XX
Memory size: 4 Meg EEPROM size: 65504
Flash size: 2 Meg Flash ID: 8989

T1 Unit Identification: XYLOGICS T1-ENGINE 085234 Rev. A 07/19/95 6343
T1 Network Jumper: Net Loopback Mode
DS0: B8ZS Coding ESF Framing AT&T FDL Format
DSX: B8ZS Coding ESF Framing Line Distance=535 to 635 Feet

Port #      1      2      3      4      5      6      7      8      9      10     11     12
T1 Slot Map N      N      N      N      N      N      N      N      N      N      N      N
Mod ID      2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883
Mod Status  OK     OK

Port #      13     14     15     16     17     18     19     20     21     22     23     24
T1 Slot Map N      N      N      N      N      N      N      N      N      N      N      N
Mod ID      2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883
Mod Status  OK     OK

Hub Slot Position: 13 Hub CMB HW Revision: 01
Hub EEPROM Segment: 01 Hub EEPROM Revision: 0.0
Hub Jumper Segment Selection: 1

```

- 8 To verify and record the unit's Ethernet address for future reference, type `addr -d` and press `(Return)` at the monitor prompt:

The screen display looks similar to this:

```

monitor:: addr -d
Ethernet address (hex): 00-00-81-XX-XX-XX
Internet address: <uninitialized>
Subnet mask: 255.255.0.0
Broadcast address: 0.0.0.0
Preferred Load Host address: <any host>
Preferred Dump Host address: 0.0.0.0
Load/Dump Gateway address: 0.0.0.0
Type of IP packet encapsulation: <ethernet>
Load Broadcast: Y

```

- 9 Verify that the Remote Annex is on-line by entering the net command. The following prompt appears:

```
Enter Segment to be used [1]:
```

A “pass” or “fail” message is displayed. If fail is displayed, try verifying the network from another device.

Once the Remote Annex is on-line, you can download the image software to the server (see [Installing the Operational Software and Loading the Image](#) on page 2-29).

Auto-initializing the Remote Annex

The Remote Annex is distributed without an IP address or preferred load host defined in ROM. When the device is booted, the Remote Annex attempts to auto-initialize itself using BOOTP (bootstrap protocol) and RARP (Reverse Address Resolution Protocol).

The Remote Annex supports the BOOTP and RARP protocols. Use these protocols to obtain boot information from a UNIX host without requiring any manual set-up on the Remote Annex.

- ❑ BOOTP allows a diskless client to determine its IP address, the IP address of the server, and the name of the file to be loaded into memory.
- ❑ RARP maps a hardware address into an IP address.

The ROMs invoke this system of acquiring boot information when a boot is initiated and the Remote Annex is not initialized. Under this condition, the Remote Annex first tries to get boot information via BOOTP or RARP.

If BOOTP and RARP fail, the Remote Annex attempts to load an image by transmitting an IPX Advertisement Request for Service.

If all requests fail, the Remote Annex will return to the ROM monitor (if in Test mode) or continue the auto-initializing procedure indefinitely (if in normal mode).

BOOTP

For a successful BOOTP retrieval, a **bootpd** must be running on a host on the same network as the Remote Annex and must have the appropriate information in the **bootptab** file. The Remote Annex's BOOTP implementation adheres to rfc951, rfc1048, and rfc1084. A sample **bootptab** file entry used to initialize the Remote Annex named *terminator* looks like this:

```
remoteannexdefault:\
    :sm=255.255.255.0:gw=132.245.22.66:\
    :hn:vm=auto:to=-18000:
terminator:\
    :ht=1:ha=00802d004879:ip=132.245.22.226:\
    :tc=remoteannexdefault:
```

In the previous example:

- ❑ *sm* is the subnet mask.
- ❑ *gw* is the load/dump gateway address.
- ❑ *vm* is the Vendor Magic Cookie.
- ❑ *ht* is host type (1=Ethernet).
- ❑ *ha* is the Remote Annex's hardware address (Ethernet Address).
- ❑ *ip* is the Remote Annex's Internet Address.

When the Remote Annex receives a BOOTP response with the *sm*, *gw*, and *ip* set, it sets the respective parameters: **subnet_mask**, **load_dump_gateway**, and **inet_addr**. The Vendor Magic Cookie must be set to **auto**. This indicates that **bootpd** should respond to the client (Remote Annex 5391/CT1 in this case) with whatever format the client requests; the Remote Annex 5391/CT1 (client) always makes requests in the decimal dot notation format (e.g., 99.130.83.99).

The **bootpd** adds the address of the host on which it is running as the *Server Address* in the **bootp** response message. The ROMs use the *Server Address* as the preferred load host and store it in the **pref_load_addr** parameter.



The **bootpd** must be running on the Remote Annex's preferred load host.

RARP

If the Remote Annex does not receive a successful BOOTP response, it uses RARP to get the boot information. For a successful RARP retrieval, TCP/IP must be running on a host that is on the same network as the Remote Annex, and the host's ARP table must be initialized with the Remote Annex's Internet and Ethernet addresses (see the **arp** man page, **arp -s**).

The only boot information that RARP provides is the Remote Annex's Internet address. The ROMs save this information in the **inet_addr** parameter. The ROMs use default information for the subnet mask and preferred load host. This means the ROMs will broadcast their requests.

The host serving the Remote Annex its boot information must be running on the same network as the Remote Annex because the Remote Annex only broadcasts BOOTP and RARP queries.

If BOOTP and RARP fail, the Remote Annex transmits an IPX Advertisement Request for Service.

If all requests fail, the Remote Annex returns to the ROM monitor (if in Test Mode) or continues the auto-initializing procedure indefinitely (if in Normal Mode).

Initializing and Booting from a Host System

You can download the image software (operational software) from a host system or another Remote Annex 5391/CT1. The Remote Annex is configured with default parameters at the factory, so that the first time you boot the server, you load the Remote Annex software. To configure the Remote Annex for your specific needs, use the ROM monitor commands (see Chapter 3).

To load the image software on the Remote Annex, perform the following steps:

- 1 To verify that the EEPROM is clear, enter the erase command at the monitor prompt on the service port terminal.

The system displays information similar to the following:

```

1) EEPROM (i.e. configuration information)
2) FLASH (i.e. self boot image)
Enter 1 or 2::1
Erase all non-volatile EEPROM memory? (y/n) [n]::y
Erasing <16352 or 8160 bytes> of non-volatile memory.
Please wait...

16K->|Data 0x0
.....
.....
.....
.....
Initialized checksum record installed

```



```

Requesting boot from 192.9.200.88 via Ethernet...
Booting BFS file using open delay of 8
Booting BFS file from 192.9.200.88
Header received OK. Received data blocks shown as '.'.
. . . . .
. . . . .
. . . . . ? . . . . .
. . . . . * . . . . .
. . . . . * . . . . .
. . . . .
. . . . . ? . . . . .
. . . . . EOF

```

The download takes between 30 and 60 seconds for a Remote Annex 5391/CT1 booting over the local network. After the download is complete, the Power, Unit, and Net LEDs remain on. If these LEDs do not remain on (indicating a problem), see Chapter 4.

Once the Remote Annex is booted, Monitor Mode is no longer operational. The Remote Annex is up and running, and the following message is displayed:

```
Console monitor ready; Press CR to start
```

Booting Using TFTP

To set up directories and files, and use TFTP to boot the Remote Annex, follow these steps:

- 1 Enter the `image` command at the monitor prompt.

As prompted, enter the following information:

- Appropriate boot image name
- Boot directory
- Dump filename

Once the Remote Annex is booted, Monitor Mode is no longer operational. The Remote Annex is up and running, and the following message is displayed:

```
Console monitor ready; Press CR to start.
```

Booting from a Windows NT[®] Host

To boot the Remote Annex from a Windows NT[®] host, you must have Remote Annex Server Tools for Windows NT[®] installed. Remote Annex Server Tools for Windows NT[®] uses the expedited remote procedure call daemon (**erpcd**) running on a Windows NT[®] server. **Erpcd** responds to all Remote Annex boot and dump requests. Refer to the *Remote Annex Server Tools for Windows NT[®] User Guide* for additional information.

Booting from Another Remote Annex 5391/CT1

Booting from another Remote Annex 5391/CT1 requires you to configure certain parameters both on the Remote Annex 5391/CT1 you are trying to boot, and on the Remote Annex 5391/CT1 you are trying to boot from. See the *Remote Annex Administrator's Guide for Unix* for additional information.

Installing the Operational Software and Loading the Image

Use this section if you have successfully connected the Remote Annex to your LAN.

This section describes:

- ❑ How to install the Remote Annex's operational software and image on a device that resides on a network accessible to the Remote Annex.
- ❑ How to download the operational image from the device to the Remote Annex.

Installing to and Loading from a UNIX Host

This section contains a description of what you need to do to install the Remote Annex's operational software and image to a UNIX host. See the *Remote Annex Administrator's Guide for UNIX* for additional information.

- 1 Install the image on a UNIX host. The software installation notes describe how to do this.



If you have a BOOTP server, boot the Remote Annex. Otherwise, continue to the next step.

- 2 Execute the ROM Monitor `addr` command:
 - ❑ Enter the Remote Annex's Internet address.
 - ❑ Modify any other parameters that the Remote Annex may require for the initial boot, i.e., the preferred load host's Internet address and the subnet mask (see *addr* on page 3-4).
- 3 Execute the `boot` command.

After successful execution of the **boot** command, the Remote Annex is up and running (see *boot* on page 3-7).

Self-booting the Remote Annex

The Remote Annex comes equipped with Flash memory that already contains an operational image. You can use this to self-boot the Remote Annex. You can check your Remote Annex's configuration by entering the **config** command at the monitor prompt. The **config** command displays the current configuration information and revision levels.



Anytime you want to return to the monitor prompt, press

Control-C.

To boot your Remote Annex from Flash memory:

- 1 On the service port terminal, press **Enter** then **Control**-T to display the Slot Selection menu.

- 2 Press 3.

The Supervisory Module Main Menu is displayed.

- 3 Press m to select the Module Information menu.

The following prompt is displayed:

```
Enter slot # (1-14):
```

- 4 Enter the slot number of the Remote Annex you want to boot.

The module information and status are displayed and you are prompted to reset the module, set the module configuration to default, or return to the previous menu.

- 5 Press d to select the module configuration default.

The following message is displayed:

```
Are you sure you want to set module DEFAULT
configuration? (Y/N):
```

- 6 Press y.

The Slot Selection menu is displayed.

- 7 Press **r** to reset the module.

The following message is displayed:

```
Are you sure you want to RESET this module? (Y/N):
```

- 8 Press **y**; then press **Escape** twice.

The Slot Selection menu is displayed.

- 9 Within 10 seconds, press **c** to connect to the Remote Annex.

The following prompt is displayed:

```
Enter slot # (1-14):
```

If you do not make the connection in time, reset the server by pressing **Control-T** to return to the Slot Selection menu and following the prompts.

- 10 Enter the slot number for the Remote Annex you are booting.

- 11 Wait for the following prompt:

```
To enter "Monitor Mode" please depress the SPACE key  
within the next 10 seconds.
```

- 12 Press the space bar within 10 seconds.

If you do not press the space bar within the allotted time, press **Control-T** and reset the server again.

After a few seconds, the following text is displayed:

```
Monitor Mode selected, please wait for Confidence tests  
to complete.
```

```
System Reset - Entering Monitor Mode
```

Then the monitor prompt is displayed:

```
monitor::
```

- 13 Enter the **addr** command at the monitor prompt.

The following prompt is displayed:

```
Enter module IP address::
```

- 14 **Enter the IP address for the Remote Annex.**
You are prompted to enter the server subnet mask, preferred load host, preferred dump host, IP packet encapsulation, and load broadcast. The defaults are listed after each prompt.
- 15 **Enter the information next to each prompt or press to select the default.**
- 16 **Enter the `sequence` command at the monitor prompt.**
The following prompt is displayed:

```
Enter interface sequence [net]::
```
- 17 **Enter the `self` command.**
The monitor prompt is displayed:

```
monitor::
```
- 18 **Boot the Remote Annex by entering the `boot oper.46.enet` command at the monitor prompt.**
Once the Remote Annex has booted, Monitor Mode is no longer active.

Invoking the Console Monitor

After the image boots, you can invoke the Console Monitor by pressing `(Return)` on the service port terminal. The following prompt appears:

```
Console monitor:
```

At the Console Monitor prompt, entering **help** or **?** displays the available options:

- ❑ **dump** (from the Annex to the host and reboots).
- ❑ **help** or **?** (displays the available options).
- ❑ **info** (displays configuration information for the Annex).
- ❑ **leds** (displays the current front panel LED status).
- ❑ **reboot filename** (reboots the Annex).
- ❑ **rom** (returns the Annex to the ROM Monitor).
- ❑ **syslog** (displays syslog messages).

Chapter 3 ROM Monitor Commands

This chapter describes the ROM Monitor commands that are available in Monitor Mode. Access these commands through a terminal connected to the service port (located on the front of the hub chassis).

The ROM Monitor commands allow you to set a subset of the configuration (EEPROM) parameters. Some of these parameters, like the unit's IP address, are required for booting the Remote Annex; some parameters, like the broadcast address, are required if the network configuration differs from the supplied defaults. [Table 3-1](#) lists the ROM Monitor commands.

Other parameters, although not required, are recommended for the Remote Annex's initial boot. Setting these parameters, rather than using the assigned defaults, minimizes errors during the initial boot. For example, setting the parameter that defines the preferred load host enables the Remote Annex to load by requesting assistance from a specific host, rather than by broadcasting that request to all hosts on the subnet.

After the Remote Annex has booted, you can define the same parameters you defined using the ROM Monitor, by using the **na** utility, the local CLI **admin** command, or SNMP. The *Remote Annex Administrator's Guide for UNIX* describes the **na** utility in detail. See Chapter 4 for information on power-up and boot procedures.

ROM Monitor commands generally provide data about a subset of current configuration (EEPROM) parameters. When appropriate, they also display a prompt that allows the operator to change those parameters.

Default or current values for parameters are displayed in brackets. For example:

```
Enter broadcast address [132.245.6.255]:
```

At the prompt, enter a different value, or press **Return** to leave the displayed value unchanged.

You can use unique abbreviations for all ROM Monitor commands except **erase**. For example, enter **boot** as **bo**, and enter **net** as **n**. If you enter an abbreviation that is not unique, an error message describing the command as ambiguous is displayed on the service port terminal.

Command Descriptions

[Table 3-1](#) lists the ROM Monitor commands; the following subsections describe them.

Table 3-1. ROM Monitor Commands

Command	Description	Use
addr [-d]	Displays and sets EEPROM values relevant to IP network addressing, including the unit's IP address.	Changing IP configuration parameters.
boot [-v] [<file>]	Manually boots and loads the unit's operating code.	Changing the address of the boot image.
boot [-l] [<file>]	Erases the existing Flash memory and copies a new image to Flash memory.	Upgrading or replacing the Flash image.

(continued on next page)

Table 3-1. ROM Monitor Commands (continued)

Command	Description	Use
config	Displays the current hardware configuration and revision levels.	Identifying your hardware, memory, and ROM versions.
erase	Erases non-volatile memory.	Loading a new image and need to erase the old image.
help	Displays the list of ROM Monitor commands.	Referencing the ROM monitor commands.
image [-d <file>]	Displays and/or sets the load image and tftp load dump names.	Loading an image that differs from the default.
lat_key [-d]	Sets the LAT key.	Connecting to a DEC VMS host.
net	Executes an Ethernet transceiver loopback test.	Checking your Ethernet connection.
option_key [-d]	Sets or displays the option key.	Checking your option key setting.
ping	Sends ICMP ECHO_REQUEST datagram to a host or gateway.	Checking to see if a host or gateway can be reached.
ports [-d]	Shows the current status of all ports.	Checking a port.
sequence [-d <list>]	Displays and edits the load/dump interface list.	Checking or changing the load/dump interface list.
stats	Displays current network statistics gathered by the ROM.	Checking the network resources.

addr

The **addr** command displays and sets several Remote Annex operating parameters (EEPROM values) relevant to IP network addressing:

- Internet address.
- Subnet mask.
- Broadcast address.
- Preferred Load Host address.
- Preferred Dump Host address.
- Load/Dump Gateway address.
- Type of IP Packet encapsulation.
- Load Broadcast

The **addr -d** command displays the unit's ROM-resident Ethernet address in hexadecimal notation. (For a description of Internet addresses, see the *Remote Annex Administrator's Guide for UNIX*.) The command syntax is:

addr [-d]

If you enter the **addr** command without the **-d** argument, you will be prompted for each Internet address. Enter Internet addresses using the standard decimal dot (.) notation.

The **addr -d** command displays the Remote Annex's Ethernet address, IP address, subnet mask, broadcast address, preferred load host address, preferred dump host address, load/dump gateway address, IP encapsulation type, and Load Broadcast. The **addr -d** command cannot be used to make changes to any of the displayed parameters.

The **addr** command display looks like this:

```
monitor:: addr
Enter Internet address [<uninitialized>]:: 192.9.200.214
      Internet address: 192.9.200.214
Enter Subnet mask [255.255.0.0]::
Enter Broadcast address [0.0.0.0]:: 192.9.200.0
      Broadcast address: 192.9.200.0
Enter Preferred Load Host address [<any host>]:: 192.9.200.88
      Preferred Load Host address: 192.9.200.88
Enter Preferred Dump Host address [0.0.0.0]:: 192.9.200.88
      Preferred Dump Host address: 192.9.200.88
Enter Load/Dump Gateway address [<uninitialized>]:: 192.9.200.10
Load/Dump Gateway address: 192.9.200.88
Select type of IP packet encapsulation (ieee802/ethernet)
[<ethernet>]::
Load Broadcast Y/N [Y]::
```

The **addr -d** command display looks like this:

```
monitor:: addr -d
Ethernet address (hex): 00-00-81-00-18-B6
Internet address: 192.9.200.214
Subnet mask: 255.255.0.0
Broadcast address: 192.9.200.0
Preferred Load Host address: 192.9.200.88
Preferred Dump Host address: 192.9.200.88
Load/Dump Gateway address: 192.9.200.10
Type of IP packet encapsulation: <ethernet>
Load Broadcast: Y
```

The Remote Annex must have an Internet (IP) address in its memory before it can load its operational image across the Ethernet via the IP protocol. Therefore, you *must* enter the IP address before booting the Remote Annex from a UNIX load host. If you do not define a subnet mask, the Remote Annex uses the generic mask for the specified IP address.

The Remote Annex tries to boot from a preferred UNIX load host. If you do not define a preferred load host, the Remote Annex broadcasts its load request and loads software from the first host that responds.

If the part of the IP address containing the network address differs from that of the preferred load or dump host, the host must be reached through a gateway. The **addr** command prompts you for this gateway's IP address.

The Remote Annex uses the broadcast address parameter when loading a file. If this parameter contains a specific address (for example, 132.245.6.255), the Remote Annex uses only that address for broadcast. If the value is all zeroes (0.0.0.0), the ROM Monitor tries various combinations of broadcast addresses and subnet or network broadcasts. The Remote Annex broadcasts its request three times for each possible combination of broadcast addresses.

You can specify the IP encapsulation type as either **ethernet** for Ethernet, or **ieee802** for IEEE 802.2/802.3. The default IP encapsulation is **ethernet**. Many systems have hardware Ethernet interfaces that are IEEE 802.3 compliant, but very few actually do 802.3 IP packet encapsulation.



Do not change this parameter unless you know absolutely that your Ethernet does 802.2/802.3 IP packet encapsulation. An incorrect IP encapsulation type prevents your Remote Annex from booting.

boot

The **boot** command requests the loading of appropriate Remote Annex operating software from a cooperating host. The command syntax is:

boot [-lv | *filename*]



Typing the letter **q** or **Control-C** interrupts the boot.

If you try to boot with a non-existent image file name, the Annex will hang as it searches for the image. You must press the **Reset** button to recover.

A successful boot disables the ROM Monitor.

The **boot** command accepts a file name for the Remote Annex's image. If the file name is not specified, **boot** displays the default file name and prompts for one. If you do not provide a file name, or have not defined one for the Remote Annex, **boot** requests the default **oper.46.enet** file. Optionally, you can enter a file name using the **image** command.

The Remote Annex boots from the defined preferred load host (UNIX/IP or Novell/IPX). If the preferred load host is not defined or does not respond, the Remote Annex broadcasts on the Ethernet and loads from the first host that responds.

To initiate loading, the Remote Annex sends a load request message to the selected host. After receiving a response, the Remote Annex loads its operational code to RAM. When loading is complete, it transfers control to the newly-loaded program. The Remote Annex displays a symbol on the service port terminal for each data block received during the boot.

When the Remote Annex begins to boot, it displays the load server host's Internet address. If the unit does not boot successfully after several attempts, it displays a *boot attempt failed* message; if the unit has opened the boot file and an error occurs during the boot process, it displays a boot error report on the service port terminal and returns to the ROM Monitor. The boot error report can help determine the cause of the boot failure (see *Boot Error Report* on page 4-9).

During a boot, the service port terminal may display four possible status symbols: “.” indicates received data blocks, “?” indicates unanswered requests, “*” indicates transmission errors, and “! ~XXXX~” is a status word from the Ethernet chip on the Annex indicating a gross problem with the Ethernet connection (if this symbol appears in your **boot** command display, contact technical support).

The status word “! ~XXXX~”, where XXXX are four hexadecimal digits, decodes as follows:

8000 = Command complete
 4000 = Chip is busy
 2000 = Command completed without error
 1000 = Command aborted issuance of an ABORT command
 800 = Late collision detected
 400 = Carrier lost
 200 = CTS lost
 100 = DMA underrun
 80 = Transmission deferred because link was busy
 40 = Collision detected during interframe spacing (SQE/Heartbeat detected)
 20 = Excessive collisions
 10 = Reserved

The lowest nibble (bits 3 to 0) are a count of collisions during this transmission. For example:

~8802~ = Complete, Late collision, 2 collisions
 ~8841~ = Complete, Late Collision, SQE detected, 1 collision

The **boot** command display (using **bfs**) looks like this:

```

monitor:: boot
Enter boot file name[(ip) "oper.46.enet", \
(mop) "OPER_46_ENET.SYS"]::
Requesting default boot file "OPER_46_ENET.SYS" for MOP/VM
loads and "oper.46.enet" for all other protocols.
Unanswered requests shown as '?', transmission errors as '*'
Requesting boot from 192.9.200.88 via Ethernet...
Booting BFS file using open delay of 8
Booting BFS file from 192.9.200.88
Header received OK. Received data blocks shown as '.'.
. . . . .
. . . . .
. . . . . ? . . . . .
. . . . . * . . . . .
. . . . . * . . . . .
. . . . .
. . ? . . . . . EOF

```

The next example shows a boot using **tftp**. The Remote Annex always tries to open a file using **bfs** first. If unsuccessful, the Remote Annex uses **tftp** to open the file.

```

monitor:: boot
Enter boot file name [(ip) "oper.46.enet", \
(mop) "OPER_46_ENET.SYS"]::
Requesting default boot file "OPER_46_ENET.SYS" for MOP/VM
loads and "oper.46.enet" for all other protocols.
Unanswered requests shown as '?', transmission errors as '*'
Requesting boot from 192.9.200.88 via Ethernet...
Booting BFS file using open delay of 8
?
Booting TFTP file using open delay of 8
Booting TFTP file from 192.9.200.88
Header received OK. Received data blocks shown as '.'.
. . . . .
. . . . . ? . . . . .
. . . . . * . . . . .
. . . . . * . . . . .
. . ? . . . . . EOF

```

The **boot -l** command downloads and saves the operational image to non-volatile memory, erases the existing Flash memory, copies the new image from non-volatile memory to Flash memory, and then executes the image.



After executing a **boot -l**, the **ls** command may not show the newly-loaded image.

The **boot -l** command display looks like this:

```
monitor:: boot -l
Enter boot file name [(ip) "oper.46.enet", \
(mop) "OPER_46_ENET.SYS"]::

Requesting default boot file "OPER_46_ENET.SYS" for \
MOP/VMS loads and "oper.46.enet" for all other protocols.
Unanswered requests shown as '?', transmission errors as '*'.

Requesting boot from 192.9.200.88 via Ethernet...
  Booting BFS file using open delay of 8

Booting from 192.9.200.88

Header received OK.  Received data blocks shown as `.`.
. . . . .
. . . . .
. . . . .EOF

      Saving image into storage device ...

Erasing device
|-----|
. . . . .
Erase completed
  Storing image .....
  Storage completed
Beginning execution of image...
Annex Command Line Interpreter * Copyright 1991, 1995\
Xylogics, Inc.
```


config

The **config** command displays the current configuration information and revision levels for the Remote Annex. The **config** command displays revision information, the amount of memory installed, T1 configuration information, and a description of the number and type of modems installed. The command syntax is:

config

The **config** command display for a Remote Annex with 24 modems looks similar to this:

```

                                REVISION/CONFIGURATION INFORMATION

ROM Software Rev: 100X Board ID/Board Type: 46/5391
CPU Type: 486SXLC2 Ethernet Address: 00-00-81-XX-XX-XX
Memory size: 4 Meg EEPROM size: 65504
Flash size: 2 Meg Flash ID: 8989

T1 Unit Identification: XYLOGICS T1-ENGINE 085234 Rev. A 07/19/95 6343
T1 Network Jumper: Net Loopback Mode
DS0: B8ZS Coding ESF Framing AT&T FDL Format
DSX: B8ZS Coding ESF Framing Line Distance=535 to 635 Feet

Port #      1      2      3      4      5      6      7      8      9      10     11     12
T1 Slot Map N      N      N      N      N      N      N      N      N      N      N      N
Mod ID      2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883
Mod Status  OK     OK

Port #      13     14     15     16     17     18     19     20     21     22     23     24
T1 Slot Map N      N      N      N      N      N      N      N      N      N      N      N
Mod ID      2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883  2883
Mod Status  OK     OK

Hub Slot Position: 13 Hub CMB HW Revision: 01
Hub EEPROM Segment: 01 Hub EEPROM Revision: 0.0
Hub Jumper Segment Selection: 1

```

erase

The **erase** command erases the contents of non-volatile memory (either EEPROM or Flash memory). Erasing EEPROM restores all parameters to factory default values. Erasing Flash memory erases the self boot image.



Caution should be used concerning the Flash memory. If you don't have an alternate source for the boot image, and you erase the image in Flash memory with the **erase** command, you will not be able to boot your Remote Annex.

The syntax is:

erase

The **erase** command prompts for the non-volatile memory to erase: EEPROM or FLASH. Entering 1 at the prompt causes the Remote Annex to erase the EEPROM (configuration information); entering 2 at the prompt causes the Remote Annex to erase the FLASH memory (self-boot image).



The **erase** command does not erase the Ethernet address.

Since the **erase** command erases the IP address, you *must* use the **addr** command to re-enter the Remote Annex's IP address before reloading any software.

The **erase** command display looks like this:

```
monitor:: erase
  1) EEPROM (i.e. Configuration information)
  2) FLASH (i.e. Self boot image)
Enter 1 or 2:: 1
Erase all non-volatile EEPROM memory? (y/n) [n]:: y
Erasing <65504 or 8160 bytes> of non-volatile memory.
Please wait...
                                     16K->|Data 0x0
.....
.....
.....
.....
Initialized checksum record installed
.
.
.
```

help

Entering **help**, or **?**, displays brief descriptions of the Remote Annex ROM Monitor commands.

image

The **image** command sets and displays the name of the image file containing the Remote Annex's software. The syntax is:

image [-d | *filename*]

The *filename* argument permits up to 100 characters. To return the image name to its default, enter a pair of double-quote characters (""). The default image name is **oper.46.enet**. The **image** command display looks like this:

```
monitor:: image
Enter Image name: [(ip)"oper.46.enet", \
(mop) "OPER_46_ENET.SYS"]::
Enter TFTP Load Directory [""]::
Enter TFTP Dump path/filename ["dump.192.9.200.88"]::
```

The **image -d** command display looks like this:

```
monitor:: image -d
Image name:Default (ip): "oper.46.enet"
      Default (mop):"OPER_46_ENET.SYS"
TFTP Load Directory: ""
TFTP Dump path/filename: "dump.192.9.200.88"
SELF image name: "oper.46.enet"
```



The *SELF image name* appears only if the self-boot image is loaded.

lat_key

The **lat_key** command allows you to set the LAT key from the ROM monitor.



The **lat_key** is optional and may be purchased separately.

The command syntax is:

lat_key [-d]

The **lat_key** command display looks like this:

```
monitor:: lat_key
Enter LAT KEY [<uninitialized>]::
```

The **lat_key -d** command displays the current LAT key setting:

```
monitor:: lat_key -d
Enter LAT KEY [<uninitialized>]::
```

net

The **net** command executes an Ethernet transceiver loopback test on the local area network. The command syntax is:

net

When you enter the net command, the following prompt is displayed:

```
Enter Segment to be used [1]:
```

This transceiver loopback test sends out a short test packet from the Remote Annex through the transceiver to test the integrity of the network.

The Ethernet transceiver loopback test causes the **Net** LED to turn off. If the unit passes this test, the service port terminal displays *PASSED*. If the Remote Annex fails, the service port terminal displays an error message. Failing this test indicates that either the Remote Annex, its transceiver cable, its transceiver, or the Ethernet is bad.

option_key

The **option_key** command loads an option key from the ROM monitor. The command syntax is:

option_key [-d]

The **option_key** command display looks like this:

```
monitor:: option_key
Enter option_key [<uninitialized>]::
```

The **option_key -d** command displays the current settings:

```
monitor:: option_key -d
option_key: <uninitialized>
```

ping

The **ping** command sends an Internet Control Message Protocol (ICMP) mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams (**pings**) have an IP and ICMP header, followed by a structured time value and an arbitrary number of pad bytes that fill out the packet. The syntax for this command is:

ping *host_ip_address* [*data_size*] [*npackets*]

- ❑ The *host_ip_address* entry is the Internet address of the host or gateway from which you wish to elicit a response.
- ❑ The optional *data_size* entry is the number of bytes sent in a datagram packet. The default value is 64 and the maximum value is 1024.
- ❑ The optional *npackets* entry is the number of packets to transmit. If you specify *npackets*, then you must also specify a *data_size*.

The **ping** command display looks something like this:

```
monitor:: ping 132.245.33.69
PING 132.245.33.69: 64 data bytes
```

If you enter the **ping** command without specifying an IP address, the display looks like this:

```
monitor:: ping
IP address required, ie: ping 132.245.33.69\
[data bytes] [npackets]
```

To exit out of **ping** either wait for *npackets* to be transmitted or, at any point, type **q**. The **ping** statistics display upon exit.

ports

The **ports** command tests the internal T1 ports and the external Drop/Insert and T1 Network interface ports. The syntax is:

ports

To test the external ports, the DSX or DS1 network interface must be connected to a loopback plug or a device that is capable of looping data back DS0 channel(s) to the Remote Annex. No external clocking is required.

When invoked, the command displays a menu of options. The following sample screen display is for a Remote Annex with 24 asynchronous serial ports and a printer port.

```
monitor:: ports

T1/Modem Port Tests

Some Important Notes:

- The Modem port test checks selected modem pairs\
  ability to connect and loopback data internal\
  to the T1 box.\

- The T1 Port test checks selected modem pairs\
  ability to connect and loopback data internal\
  to the T1 box.
  This test requires that the selected interface\
  (T1 Network or Drop & Insert) must have a\
  loopback plug installed.
  Warning: DO NOT RUN THIS TEST WHILE CONNECTED\
  TO A LIVE T1 LINE.

1) Modem Ports
2) T1 Tests
Selection (Return to exit)::
```

sequence

The **sequence** command edits the load/dump interface list. This list determines the order of the network interfaces the Remote Annex will use for loading and dumping. The default, **net**, uses the LAN interface. If the Remote Annex fails to boot using the first interface, it will try the next interface. The command syntax is:

sequence [-d] | [interface[,interface]. . .]

Specify the LAN interface by selecting **net**. Separate each interface with a comma or a space. Enter the interface list as an argument to the command, otherwise the service port terminal displays a list of available interfaces and prompts for a new list.

In the following example, interfaces are assigned to the load/dump sequence list.

```
monitor:: sequence

Enter a list of 1 to 4 interfaces to attempt to use for
downloading code or upline dumping. Enter them in the order
they should be tried, separated by commas or spaces.
Possible interfaces are:

    Ethernet:      net
    SELF:          self

Enter interface sequence [net]:: self, net

Interface sequence: self,net
```



The SELF option appears only if the self-boot image is loaded.

The **sequence -d** command displays the current load/dump interface list. You cannot specify both the **-d** argument and the interface list with the same command. The command display looks like this:

```
monitor:: sequence -d  
Interface sequence: self,net
```

stats

The **stats** command displays current network statistics gathered by the ROM. Use **stats** along with the **boot** command to help isolate problems. [Table 3-2](#) describes the network statistics displayed by the **stats** command. The syntax is:

stats

The **stats** command display looks like this:

```
monitor:: stats
Ethernet Statistics
Frames Received:   398   Frames Sent:           3
CRC Errors:        0     Carrier Sense Losses:  0
Alignment Errors   0     Clear to Send Losses:  0
Resource Drops:    0     Collisions Detected:   0
Bus Wait Drops:    0     Excessive Collision Losses: 0
Bad Types/Lengths: 0
```

Table 3-2. Network Statistics

Statistic	Description
Frames Received	The number of frames received.
CRC Errors	The number of CRC checksum errors detected.
Alignment Errors	The number of frames received misaligned with a CRC error.
Resource Drops	The number of packets dropped because the ROM code could not buffer them quickly enough. The ROM code cannot always handle back-to-back incoming packets. The Remote Annex accepts the first response it receives and drops all others. Dropped packets are normal.

(continued on next page)

Table 3-2. Network Statistics (continued)

Statistic	Description
Bus Wait Drops	The number of packets dropped due to waiting too long for a bus to become available.
Bad Types/Lengths	The number of unknown packet types if Ethernet IP encapsulation is being used. The number of packets with illegal lengths if IEEE 802.2/802.3 IP encapsulation is being used.
Frames Sent	The number of frames sent.
Carrier Sense Losses	The number of times packets could not be transmitted because the Remote Annex lost the Carrier Sense signal – usually the result of excessive traffic on the Ethernet.
Clear to Send Losses	The number of times packets could not be transmitted because the Remote Annex lost the Clear to Send signal – usually the result of excessive traffic.
Collisions Detected	The number of times the Remote Annex had to retry transmissions automatically – usually the result of normal Ethernet traffic. These retries do not cause the boot command to display “*.”
Excessive Collision Losses	The number of times the Remote Annex could not transmit packets because there were too many collisions – usually the result of excessive traffic on the Ethernet. The boot command displays these retries as “*.”

This chapter describes front panel alarms and LED indicators, power-up and booting, troubleshooting during booting, and the file created from a Remote Annex dump.

Front Panel Alarms and LED Indicators

The Remote Annex's front panel contains a number of LEDs that provide information about normal operations and about problems that occur. Use these LEDs and the ROM Monitor commands to diagnose problems. [Figure 4-1](#) illustrates the Remote Annex's front panel LEDs.

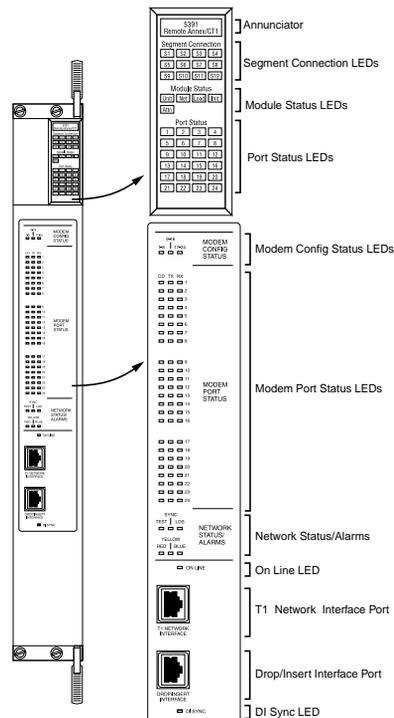


Figure 4-1. Remote Annex 5391/CT1 Front Panel Alarms and LEDs

Refer to [Table 4-1](#) for a description of the LEDs located on the front of the Remote Annex.

Table 4-1. Remote Annex 5391/CT1 Front Panel LEDs

LED(s)	Description
Annunciator	<p>The Annunciator backlights the model number of the module and indicates, by its color, the operational condition of the module. The conditions are:</p> <p>Green - The module is performing normally.</p> <p>Amber - Some portion of the module has failed, or the module is being initialized.</p> <p>Off - The module is not receiving +5 volt power, or the power level is below the reset limit (4.65 volts).</p>
Segment Connection	<p>These LEDs indicate which backplane Ethernet LAN segments are being used. There are 12 green LEDs, labeled S1 through S12, for the 12 Ethernet segments. When an LED is illuminated, it indicates that the Remote Annex is connected to the corresponding backplane Ethernet LAN segment; when off it indicates that the corresponding backplane Ethernet LAN segment is not connected.</p>
Module Status	<p>Init - Turns green when the Remote Annex begins the initialization process after a power-up or reset. This is the first LED that lights after power-up or reset. The Init LED turns off after the diagnostics have successfully completed.</p> <p>Unit - Turns green after the Remote Annex passes the power-up diagnostics. Turns amber if the power-up diagnostics fail.</p> <p>Net - Turns green after the Remote Annex verifies that a valid Ethernet connection exists.</p>

(continued on next page)

Table 4-1. Remote Annex 5391/CT1 Front Panel LEDs (continued)

LED(s)	Description
Module Status (continued)	<p>Attn - Turns amber when the Remote Annex requires operator attention, that is, in Monitor Mode or when the diagnostic tests fail.</p> <p>Load - Turns green when the Remote Annex is loading the operational image or dumping a RAM image if there is a failure. The LED turns amber if a load error is detected.</p>
Port Status	<p>These LEDs, numbered 1 through 24, display serial port configuration status during normal operations. All the server ports are configured at the factory, therefore all the LEDs turn green when the module is booted for the first time. If an error condition exists for a configured port, the LED turns amber. A port status LED remains off if the port is not configured for use.</p>
Modem Config Status	<p>These LEDs indicate the general status of the modems within a group. There are three groups of eight modems (1-8, 9-16, and 17-24). An LED is green if all the modems within a group are good. An LED is amber if one or more modems within a group are bad.</p>
Modem Port Status	<p>The Remote Annex has three status LEDs for each modem port (1 through 24):</p> <p>CD - Data Carrier Detect is a green LED and is on when the carrier has been detected on the telephone line on the corresponding modem.</p> <p>TX - Transmit Data is a green LED that flashes to indicate the corresponding modem is transmitting data.</p> <p>RX - Receive Data is a green LED that flashes to indicate the corresponding modem is receiving data.</p>

(continued on next page)

Table 4-1. Remote Annex 5391/CT1 Front Panel LEDs (continued)

LED(s)	Description
Network/Status Alarms	<p>TEST - RED network TEST LED is ON when the T1 Network Interface is looped back. Loopback tests are activated either locally by the user or by the telephone company.</p> <p>SYNC - GREEN SYNC LED is ON when the T1 engine is synchronized with the received network signal and is receiving proper framing information.</p> <p>LOS - RED LOS LED is ON when the T1 engine is detecting no signal (pulses) on the network interface receiver. When a LOS condition exists, the T1 engine transmits unframed all one (AIS) to the network.</p> <p>RED - RED alarm LED is ON during a locally detected carrier failure. During the RED alarm condition, a YELLOW alarm is transmitted across the telephone network.</p> <p>YELLOW - YELLOW alarm LED is ON when receiving a YELLOW alarm condition from the telephone network.</p> <p>BLUE - BLUE alarm LED is ON when receiving an unframed, all-ones Alarm Indication Signal (AIS) from the network. This condition exists upon a loss of originating signal, or when any action is taken that would cause a signal disruption.</p>
On Line	This LED is green and ON when the T1 engine is connected to a T1 line.
DI Sync	<p>This LED is green and ON when the T1 engine is detecting frame synchronization on the drop and insert interface receiver. The green LED is OFF when there is a loss of frame (LOF) synchronization.</p> <p>A LOF condition causes the T1 engine to transmit unframed all ones (keep-alive) to the device attached to the Drop and Insert Interface.</p>

During power-up and booting, it is more difficult to diagnose problems because they can originate in the Remote Annex, the transceiver, the Ethernet, or the load server host. However, the LEDs provide both a progress report and an error display to assist you in troubleshooting.



If an error occurs, save the status of these LEDs. Technical support personnel can use this information to diagnose problems.

Power-up and Boot Procedures

The Remote Annex has two modes of operation: Normal Mode and Monitor Mode. Normal Mode is the standard operational mode. Monitor Mode is a diagnostic mode provides access to the ROM Monitor commands.

During its power-up and boot sequence, the Remote Annex runs a set of diagnostics. The system LEDs display the diagnostics' status. The pattern of the system LEDs identifies the error condition.

[Table 4-2](#) lists abnormal operating conditions reported by the LED displays, points to possible causes, and recommends corrective actions.

Table 4-2. Troubleshooting Guide

Condition	Possible Cause	Corrective Action
Annunciator is amber.	You reset the module or cycled power by removing the module and reinserting it.	None required. The annunciator should turn green when the module successfully completes the power-up diagnostics.
Annunciator is amber.	Detectable module component failure.	Use a service port terminal to check the self-test diagnostic messages to determine whether you can resolve the problem; otherwise, replace the module.
Annunciator is off; other module annunciators are off; chassis LEDs off.	No power to chassis.	Turn on power to the chassis.
Annunciator is off; other module annunciators are off; chassis LEDs are on.	Chassis power is below required module threshold.	Check chassis power supply LEDs and power supplies.
Annunciator is off; other module annunciators are on; chassis LEDs are on.	Module is not seated properly.	Reseat the module.

(continued on next page)

Table 4-2. Troubleshooting Guide (continued)

Condition	Possible Cause	Corrective Action
Annunciator is off; other module annunciators are on; chassis LEDs are on.	No power to module (blown fuse; failed DC-to-DC converter).	Replace the module.
The Attn and Unit Module Status LEDs are amber.	The Remote Annex did not pass its diagnostics or is not working normally.	Reset the Remote Annex.

Power-Up Diagnostic Messages

Power-up diagnostics run when the Remote Annex is powered up or reset. During the power-up process the following text is displayed on the service port terminal:

To enter "Monitor Mode" please depress the SPACE key within 10 seconds.

If you press the space bar within 10 seconds, the following text is displayed:

Monitor Mode selected, please wait for Confidence tests to complete.

If you do not press the space bar within the time allotted, the following text is displayed:

Defaulting to Normal Boot Mode.

If an error occurs during confidence tests, the following message is displayed:

Fatal Error

BOOT Failures

The procedures for troubleshooting a power-up failure established that:

- ❑ The hardware is functional.
- ❑ The Ethernet interface is functional.
- ❑ The Remote Annex can communicate with the Ethernet.

If the Remote Annex still is not booted, you must pinpoint the problem. The boot error report can help in this process.



The Remote Annex generates a boot error report only if it opens the boot file and an error occurs during the boot process.

Generally, two problems cause boot failures:

- ❑ The Remote Annex is not configured properly.
- ❑ The load server host is not responding.

The Remote Annex requests a boot image from a pre-defined load host or by broadcasting a boot request. When a host responds, the Remote Annex loads its operational image.

The Remote Annex requires setting certain configuration parameters. Enter these parameters using the Monitor Mode commands for the initial boot sequence. See Chapter 3 for more information on these commands.

If the problem is a non-responsive host, the boot error report displays that information under the *Rsp T/O's* field. This field indicates that the Remote Annex timed out while waiting for a response to its boot request; if this field is empty, check the Remote Annex's configuration parameters.

Boot Error Report

If an error occurs, a Remote Annex *boot error report* is generated *only* if the Remote Annex has opened the boot file. The report is displayed using the following format:

```
BOOT ERROR REPORT (for BFS files only)
Boot attempt from host nn.nn.nn.nn:
Errors from Last Open Request:
0 ARP errors 0 ERPC layer errors 0 Aborts rx'd
Errors from Last Read Request:
0 Msgs w/ wrong size 0 ERPC layer errors 0 Aborts rxd
Errors from Last ERPC Layer Invocation:
0 H/W errors 1 Msgs from wrong host 0 Rsp T/O's 0 Msgs of wrong type
```



TFTP error reporting complies with the standard, predefined TFTP error codes.

The Remote Annex generates a boot error report for the Internet address from which it tried, and failed, to boot. [Table 4-4](#) contains a description of the Errors from the Last Read Request; and [Table 4-3](#) contains a description of the Errors from Last ERPC Layer Invocation.

The error count pinpoints the error that caused the boot failure. For example, if the boot failed during a Read Request due to excessive Expedited Remote Procedure Call (ERPC) layer errors, the Errors from Last ERPC Layer Invocation lists only errors that occurred during the failed Read Request (see [Table 4-3](#)). The report does not list errors that occurred during any other Read Request (see [Table 4-4](#)) or during the Open Request (see [Table 4-5](#)).

The Open Request and the Read Request layers communicate with the block file server (BFS) on the host. The ERPC layer resides below the Open Request and the Read Request layers. It is responsible for sending a given message to a specific host UDP port, and for receiving the correct response to that message from the port.

Table 4-3. Errors from Last ERPC Layer Invocation

Error	Description
H/W errors	The Remote Annex sensed a hardware error during message transmission or reception. This error indicates a fault with the Remote Annex LAN interface. Use the net command to isolate the problem (see <i>net</i> on page 3-18).
Msgs from wrong host	The Remote Annex received a message from an incorrect host. This indicates that the Remote Annex received, and ignored, an unsolicited packet.
Rsp T/O's	The Remote Annex never received a correctly formatted response from the correct host, or any response from any load server hosts.
Msgs of wrong type	The correct host sent a message to the Remote Annex, but the message was not a correctly formatted response to the transmitted request.

Table 4-4. Errors from Last Read Request

Error	Description
Msgs with wrong size	The correct host responded to the Read Request, but the data size is incorrect.
ERPC layer errors	See Table 4-3 .
Aborts rx'd	The host's BFS transmitted an abort in response to the Remote Annex's Read Request. Run erpcd -D on the host to obtain more information.

Table 4-5. Errors from Last Open Request

Error	Description
ARP errors	Address Resolution Protocol (ARP) errors indicate that the Remote Annex is configured to boot from a specified host, but the host would not transmit its Ethernet address to the Remote Annex. Possibly, the Remote Annex configuration includes the wrong IP encapsulation.
ERPC layer errors	See Table 4-3 .
Aborts rx'd	The host's BFS transmitted an abort in response to the Remote Annex's Open Request. This often means that the requested file does not exist on that server. Run erpcd -D on the host to obtain more information.

Correcting Remote Annex Parameters

The following parameters must accurately reflect both the Remote Annex and the network environment in which it operates.

Verify the Remote Annex's IP address using the **addr** command. If your network configuration does not support the factory defaults, verify the following parameters using the **addr** command:

- ❑ The broadcast address.
- ❑ The subnet mask.
- ❑ The load/dump gateway address (which must be specified if the preferred load server host is located on another network or subnet).

- ❑ The IP encapsulation type. Many systems have hardware Ethernet interfaces that are IEEE 802.3 compliant, but very few actually do 802.3 IP packet encapsulation. Use the default, Ethernet, unless you know absolutely that your LAN does 802.2/802.3 IP packet encapsulation.

You can use the defaults for the name of the image file containing the Remote Annex's software and the address of the preferred load server host. If the value for the image name is incorrect, the Remote Annex cannot boot. Correct the name using the **image** command. If the address for the preferred load server host is incorrect, the boot takes longer, since the Remote Annex has to broadcast for a host. Correct the load host's address using the **addr** command.

Confirm that the Remote Annex's boot parameters are correct by using the appropriate ROM Monitor commands. Modify any boot parameters that are incorrect or missing. Boot the Remote Annex either by entering the **boot** command at the console, or by resetting the module.

Load Server Host Not Responding

The Remote Annex can boot from one of the following hosts acting as a load server host:

- ❑ A UNIX host on the local area network.
- ❑ Another Remote Annex.
- ❑ Any host (UNIX or non-UNIX) using **tftp**.
- ❑ A Windows NT host.

The following subsections discuss troubleshooting for some of these load server hosts.

UNIX Host on the LAN

When troubleshooting a UNIX host on the LAN, make sure that:

- ❑ The host is booted and functioning properly.
- ❑ The host can communicate with other network nodes using standard UNIX networking features and utilities.
- ❑ All Remote Annex software is installed properly on the host. See the *Software Installation Notes* that come with the Remote Annex software release.
- ❑ The **erpcd** daemon or **tftp** server (which loads the operational image to the Remote Annex) is running.

In Test Mode, **erpcd** on the load server host displays boot progress reports. In Monitor Mode, the Remote Annex displays boot progress reports. The Remote Annex displays its reports on the service port terminal that invokes its Monitor Mode; **erpcd** displays its reports on the UNIX terminal that invokes its Test Mode.

- 1 To place **erpcd** on the load server host into Test Mode, kill the **erpcd** program (requires superuser privileges) and restart it using the **-D** option:


```
# /etc/erpcd -D5
```
- 2 Place the Remote Annex into Monitor Mode. (This resets the Remote Annex, so warn users before you do it.) Then, at the monitor prompt, enter:


```
# boot -v
```

When the Remote Annex boots in Monitor Mode, the service port terminal displays the load server host's Internet address, and indicates whether it receives a response to its Open File Request and to any of its Read File Requests. The host's progress report indicates receipt of any File Server Requests and its responses to such requests.

The host displays `erpc_return 0` if it successfully receives a request and is sending out an affirmative response. If any Remote Annex-related files are missing or cannot be installed, contact technical support.

A PC host running the UNIX operating system has the **erpcd** daemon (provided with the distribution and installed in `/etc`) running in the background on the PC. Put the Remote Annex into Monitor Mode, and the **erpcd** on the load host into Test Mode:

- 1 For **erpcd** on the load server host, as Superuser, kill the **erpcd** program and restart it using the `-D` option:

```
# /usr/annex/erpcd -D5
```
- 2 For the Remote Annex, at the monitor prompt, enter:

```
# boot -v
```

Another Remote Annex 5391/CT1

When troubleshooting a Remote Annex 5391/CT1 configured as a load server host:

- 1 Use the CLI telnet command to access the unit and verify that it is up and running.
- 2 Communicate with the unit on the Ethernet using the Superuser CLI ping command.
- 3 Verify the unit's configuration using `na`.

The *Remote Annex Administrator's Guide for UNIX* provides more information on these commands.

A Remote Annex 5391/CT1 that has been reconfigured as a load server host, but not rebooted, cannot boot another Remote Annex 5391/CT1 on the network. Rebooting the Remote Annex 5391/CT1 load server host ensures that the parameters are set.

Remote Annex Dumps

The Remote Annex dumps its memory image to a host running load server software when certain software or hardware events occur.



Dump files are generated for use by technical support personnel only.

Events that trigger Remote Annex dumps are:

- Non-recoverable hardware or software errors.
- Software fails to reset the Remote Annex's watchdog timer.
- Software fails one or more internal consistency checks.
- Hardware detects an internal fault.

The Remote Annex sends a dump file to a preferred load dump host. If you do not define this host by specifying an address, the Remote Annex broadcasts a request and dumps to the first host that responds.

The Remote Annex sends a dump to the **/usr/spool/erpcd/bfs** directory on the dump host. The **/usr/spool/erpcd/bfs** directory is a default pathname and can be changed. The receiving Remote Annex assigns a unique file name for each device that it receives a dump from but not for each crash dump.



Rename any crash dumps that you want to save. The Remote Annex overwrites crash dumps.

The assigned name depends on the number of characters per file name that the dump host supports. For hosts supporting file names longer than 14 characters (e.g., BSD hosts), dump files are named **dump.addr**. The file extension **addr** is the Remote Annex's IP address.

For hosts that limit file names to 14 characters (e.g., System V hosts), a dump creates two additional directories under `/usr/spool/erpcd/bfs`. The name of the first directory is **dump**; the second directory uses the Remote Annex's IP network address as its name. The dump file uses the Remote Annex's IP host address as its name.



The **tftp** dump names are user-defined. If a name is not specified, the Remote Annex uses the **bfs** convention.

Each dump file contains a complete image of the Remote Annex RAM memory and hardware state. The amount of space required for a dump file varies according to the port configuration. The ROM Monitor **config** command displays the amount of memory for the Remote Annex.

[Table 4-6](#) shows sample dump file names. All pathnames are relative to the file `/usr/spool/erpcd/bfs`.

Table 4-6. Remote Annex 5391/CT1 Dump File Naming Conventions

Remote Annex 5391/CT1 Address	Network Address	BSD Filename	System V Pathname
63.0.0.75	63	dump.63.0.0.75	dump/63/0.0.75
131.140.23.1	131.140	dump.131.140.23.1	dump/131.140/23.1
195.46.2.15	195.46.2	dump.195.46.2.15	dump/195.46.2/15

Conditions for Replacing a Module

Replace a Remote Annex with another module of the same type under any of the following conditions:

- ❑ If the annunciator on the module front panel remains off, indicating that the module is not receiving +5 volt power or that the power level is below the reset limit (4.65 volts) when other modules in the hub are receiving normal operating power. For more information, see [Table 4-2](#).
- ❑ If the annunciator remains amber, indicating that some portion of the module has failed and a check of the self-test messages indicates that the problem cannot be fixed. For more information, see [Table 4-2](#).

Module Configuration Management

Each module installed in a Model 5000 chassis operates according to software parameter values and hardware option settings. You can use these to customize module operation for that particular hub. This combination of software and hardware values is the module configuration, of which there are actually two types:

- ❑ “Primary” configuration, which is the set of base values built into the module at the time it is manufactured. A user cannot change this configuration.
- ❑ “Default” configuration, which is the permanent configuration plus any changes to jumper or switch settings. The default configuration is valid for any hub slot at any time. Each module must have a default configuration. This configuration is stored in two places: on the module itself and on the supervisory module. You can change this configuration through a network management module (NMM) or through a terminal connected to the chassis service port.

The supervisory module, located in slot 0 of the 5000 hub, performs several functions for the hub and the modules installed in the hub. The supervisory module stores the primary configurations of all modules installed in the hub. Each user-installed module also stores a working copy of its configuration information. When a change is made to this working copy, the module stores the new user configuration in its onboard nonvolatile memory.

The supervisory module periodically polls user-installed modules in the hub across the common management bus (CMB). As part of the poll, the NMM collects module configuration information and stores the information in its local nonvolatile memory for use in comparing and/or restoring a module configuration after a power cycle or reset.

What happens to a module when it is inserted in the hub depends on a combination of conditions:

- ❑ If you remove a module, change jumper settings, and reinsert the module in its original slot, the new jumper settings take effect immediately. The supervisory module records the new configuration information in its nonvolatile memory.
- ❑ If you replace a module in a slot with a different type of module, the new module is directed to use its default configuration.
- ❑ If the supervisory module is not operational, a module whose configured slot number matches its installed location can use its own stored configuration; otherwise, the module reverts to its default configuration.

To preserve the configuration parameters of the Remote Annex module you are replacing, follow the procedures in [Preparing for a Hot Swap](#) on page 4-19 and [Completing the Hot Swap](#) on page 4-21.



Verify that the backplane segment bank selector is set for the correct segment bank before installing a replacement module. For more information on jumper and switch settings, see Chapter 2.

Preparing for a Hot Swap

The Remote Annex can be inserted into or removed from a chassis without interrupting service to other modules within the 5000 hub. This ability is referred to as “hot swapping.”

The Remote Annex holds 64KB of configuration information in EEPROM. This information is periodically sent to the host server to be saved in a file. During a hot swap, the new Remote Annex reads in this file at boot time and overwrites its EEPROM with the configuration information from the Remote Annex it is replacing. The new Remote Annex then functions as the previous Remote Annex, except for the option keys, which need to be reprogrammed.



If no EEPROM overwrite is desired when hot swapping, select default values for that slot from the supervisory module on the service port terminal.

There are two methods of writing the EEPROM information to the host file:

- ❑ Whenever a change is made to EEPROM, a 5 minute timer is started. When the timer expires, the contents of the EEPROM memory are copied to an internal buffer in the Remote Annex RAM and encrypted. The file is then transferred to the host specified in the configuration parameter **pref_dump_addr**. The filename used to store the EEPROM information on the host is **params.n.n.n.n** (where **n.n.n.n** is the IP address of the Remote Annex).
- ❑ In addition, writing the EEPROM information to the host can be forced by using the Remote Annex’s superuser **cp -e** command. This can be done at any time and typically is done if you have just completed making changes to one of the configuration files or some of the configuration parameters.

It will be necessary to configure the replacement Remote Annex to define any software options (LAT, Appletalk/ARAP, dynamic networking, tn3270).

The Remote Annex being replaced and the new module must be registered for the same software options for the hot swap to be successful.

Removing a Module

To remove a Remote Annex, follow these steps:

- 1 Using the flat-tip screwdriver, loosen the four captive retaining screws on the module until they pop free of the chassis.
- 2 Push the top and bottom inserter/extractor levers away from the center of the Remote Annex front panel to release the module from the backplane connector.
- 3 Slide the module out of the chassis.
Grip the front panel with one hand while supporting the bottom of the module with the other hand.
- 4 Place the module on an antistatic mat.



If a module is removed from the chassis permanently or for more than a few minutes, you should install a filler panel on the empty chassis slots to maintain the cooling air flow within the chassis.

Completing the Hot Swap

To complete the hot swap of the Remote Annex:

- 1 Verify that the jumper settings on the replacement module are the same as the settings on the original module.
- 2 Use the procedures outlined in Chapter 2 to insert the replacement module into the System 5000 chassis.
- 3 Boot the replacement Remote Annex.

The saved EEPROM information is read by the Remote Annex at boot time only in a hot swap situation. The Remote Annex compares the “board serial number” field (in the supervisory module nonvolatile memory) against its internal serial number. After loading the operational image, the initialization process sets up the network interface and then reads the **params.n.n.n.n** file from the host server, and places it in local memory. The EEPROM file contents are decrypted and written to the EEPROM. The buffer containing the files is then discarded. This process may take several minutes to complete.

- 4 Set the configuration parameters `acp_key`, `vcli_password`, `password`, and the `port` parameter `port_password` to the same values as the original Remote Annex.

Set these parameters manually through the **admin** or the **na** utility, or through some SNMP application, since they cannot be saved and restored by the **na write** and **na read** commands or by the SNMP *get* and *set* commands.

You can set values by using the **na** utility on a UNIX host, using SNMP (if UNIX is configured for it) or enter Monitor Mode from the Remote Annex’s service port terminal, become a superuser, and use the **admin** command.

- 5 If applicable, obtain new option keys and enter them.



This appendix identifies the signals and the associated pins used by the following Remote Annex 5391/CT1 ports:

- ❑ T1 Network Interface
- ❑ Drop/Insert Interface

T1 Network Interface Port

[Figure A-1](#) illustrates a T1 Network Interface port connector. [Table A-1](#) lists the port's pin/signal allocations.

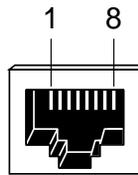


Figure A-1. T1 Network Interface Port Receptacle

Table A-1. T1 Network Interface Port/Pin Signal Allocations

Pin Number	Signal
1	Receive data from Network (RING)
2	Receive data from Network (TIP)
3	Unused
4	Transmit data to Network (RING)
5	Transmit data to Network (TIP)
6	Unused
7	Unused
8	Unused

Drop/Insert Interface Port

[Figure A-2](#) illustrates a Drop/Insert Interface port. [Table A-2](#) lists the port's pin/signal allocations.

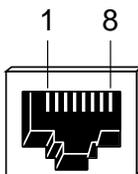


Figure A-2. Drop/Insert Interface Port

Table A-2. Drop/Insert Interface Port Pin/Signal Allocations

Pin Number	Signal
1	Transmit data to DTE receiver (RING)
2	Transmit data to DTE receiver (TIP)
3	Unused
4	Receive data from DTE transmitter (RING)
5	Receive data from DTE transmitter (TIP)
6	Unused
7	Unused
8	Unused

Appendix B Network Bypass Jumper

The Remote Annex 5391/CT1 uses an internal jumper to select a bypass mode for the T1 Engine. The jumper, J24, is located on the T1-Modem board (the upper board). [Figure B-1](#) shows the network bypass jumper's location.

The T1 engine goes into bypass mode when it is powered down, reset, or when the T1 parameter **bypass=Y** (enabled). When the T1 parameter **bypass=Y** (the default setting), the jumper determines the bypass mode that will be used. When the unit is in bypass mode, the On Line LED is off.

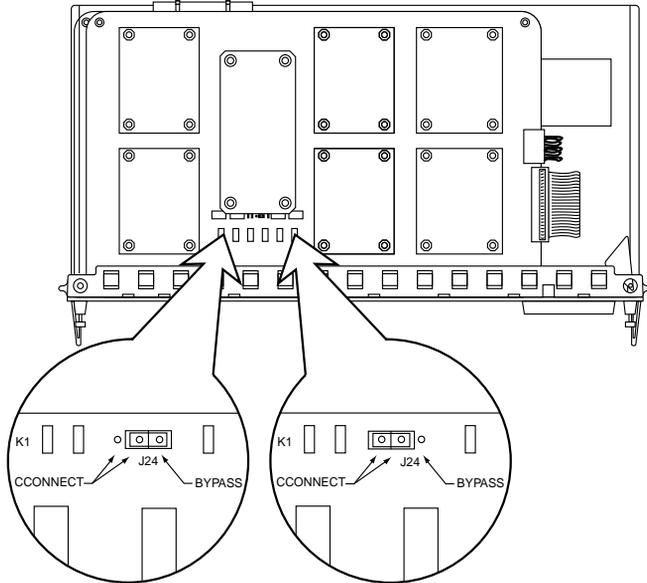


Figure B-1. Network Bypass Jumper Location

There are two bypass modes:

- ❑ Network Loopback Mode
- ❑ Cross Connect Mode

Network Loopback Mode

Network loopback mode loops back all the signals. This is the default mode for the Remote Annex. [Figure B-2](#) shows an example of this mode.

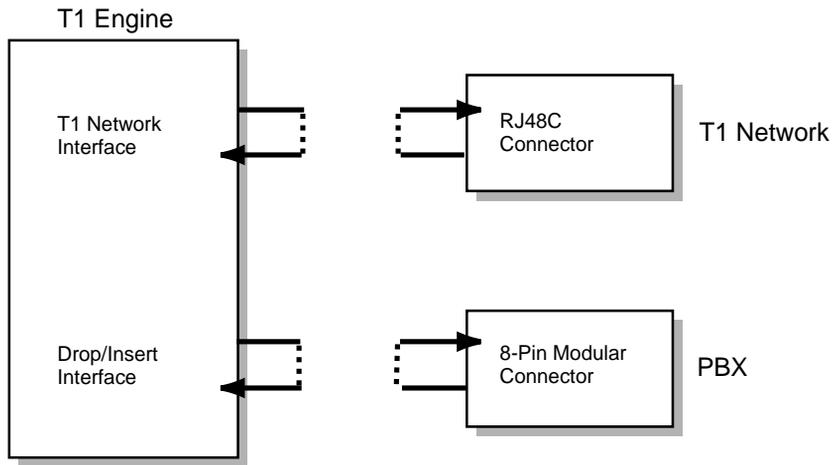


Figure B-2. Network Loopback Mode

Network Loopback Mode Jumper Setting

The internal jumper block must be on pins 2 and 3 to enable Network Loopback mode. [Figure B-3](#) shows an example of this (default) setting.



Figure B-3. Network Loopback Mode Jumper Setting

Cross Connect Mode

Cross Connect mode connects the network to the PBX. This mode forces signals coming from the network to the PBX, and signals coming from the PBX to the network (see [Figure B-4](#)). Cross Connect mode prevents disruption of T1 signal to the Drop/Insert port.

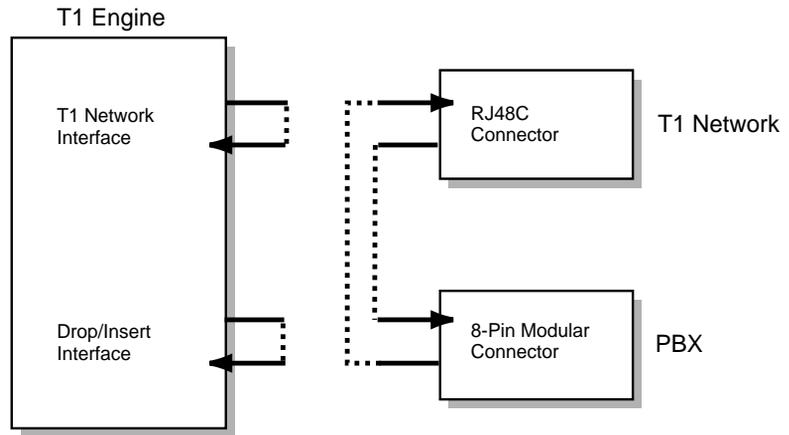


Figure B-4. Cross-Connect Mode

Cross Connect Mode Jumper Setting

The internal jumper block must be on pins 1 and 2 to enable Cross Connect mode (see [Figure B-5](#)).



Figure B-5. Cross-Connect Mode Jumper Setting



• *Appendix B Network Bypass Jumper*
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