




TC2000™ Diagnostic Guide

User's Guide

BBN Advanced Computers Inc.

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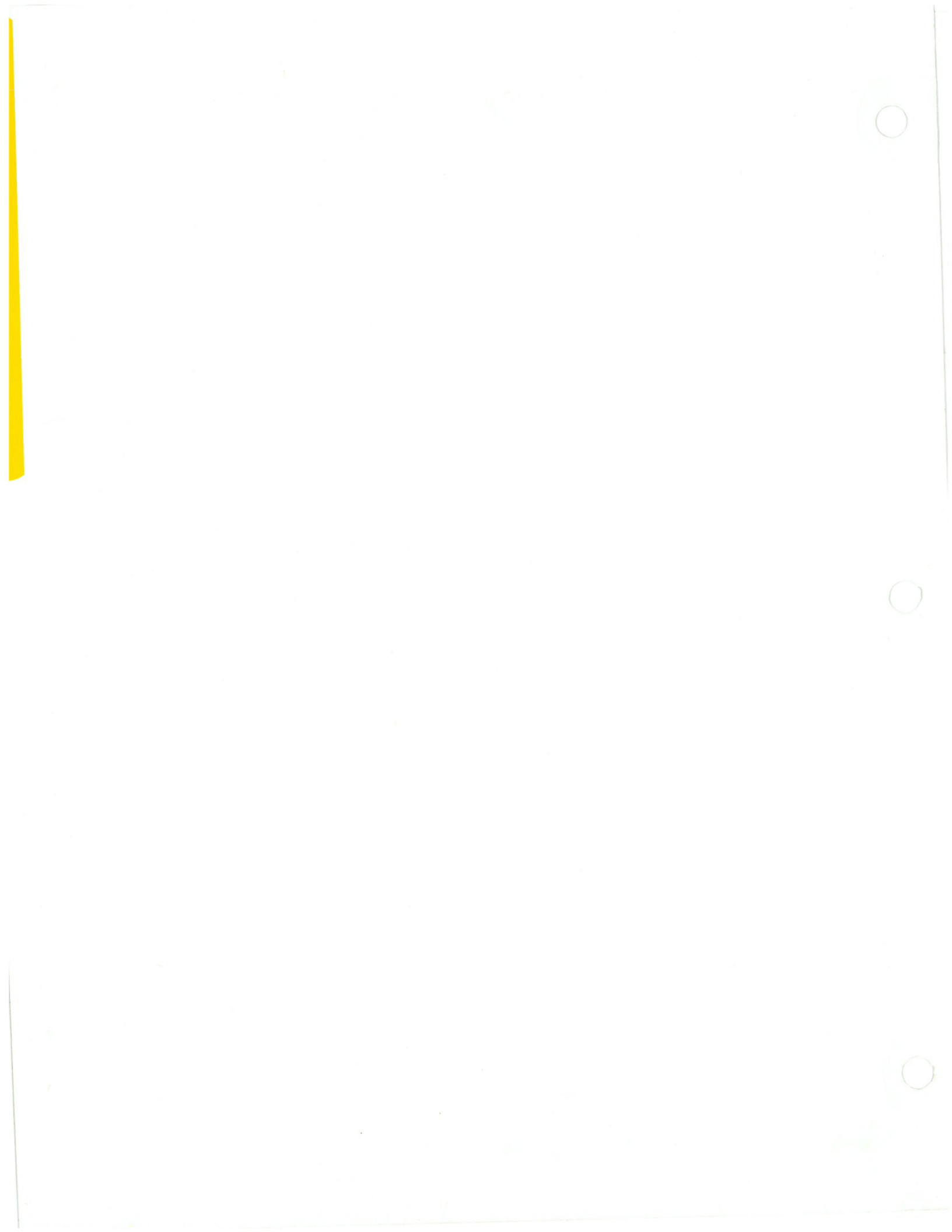
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RELEASE LEVEL

This manual conforms to the Released Version of the nX™ operating system software, released in March of 1990, for the TC2000™ multiprocessor.

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How to Use This Manual



Purpose of the Manual

The manual describes the TC2000 diagnostics and the Test and Control System and how to operate them.

Revision History

This is a first version of the manual; it supports the 2.0 release of the nX Operating System for the TC2000 multiprocessor.

This manual also supports the diagnostic software with the following versions:

<u>Diagnostic</u>	<u>Version</u>	<u>Date</u>
TEX.EXE	4.003	Nov 22 1989?
B2SWITCH.EXE	2.6	Aug 12 1989
B2CLK.EXE	2.6	Aug 12 1989
B2VME.88	2.106	Apr 21 1989
B2VME2.88	2.189	Nov 13 1989
TCFPV.88	2.737	Jan 17 1990
STP.88	6.400	Nov 22 1989
VMEDIAG.88	1.346	Jan 12 1990
B2MDM.EXE	1.200	Aug 12 1989
DISKTOOL.88	1.003	Dec 8 1989
periph_diag	1.078	Jan 11 1990
stress	1.015	Aug 20 1989

Other Places to Find Answers

If you experience any problems with our product, or if you have questions or suggestions, please do one of the following:

- Send electronic mail from anywhere on the Internet to:

aci-questions@bbn.com

- Send mail to:

ACI Bugs

BBN Advanced Computers Inc.

10 Fawcett St.

Cambridge, MA 02138

- If you are under warranty, or have a software maintenance contract, you can also call our hotline number:

1-800-4AC-BFLY (1-800-422-2359) in the United States

1-617-873-8660 from any other location

If you are reporting a problem, please include as much information as you can, as follows:

- The operating system **version** and multiprocessor **model name**
- The **size** of your multiprocessor (number of function cards and amount of memory)
- The **number of nodes** that were in the cluster when the problem occurred (if relevant)
- The **total number of people** using the system when the problem occurred
- An **example** that illustrates the problem
- A **record** of the sequence of events that led to the problem; especially a stack backtrace (see the system administration guide)

We are also interested in your evaluation of our documentation. We would appreciate it if you would fill out the form at the back of this manual and return it to us.

Audience Level

This manual is written for system administrators, field service engineers, and technicians.

Other References

For more information on using the nX operating system, refer to *Getting Started with nX O.S.*, *TC2000 System Administration Guide* or the *nX System Software Installation Guide*. For more information on the hardware, refer to the *TC2000 Maintenance Manual* and *Inside the TC2000*.

Organization

This manual is organized into seven chapters. The first three describe the diagnostics and the TCS and how to use them. The last four describe the four groups of diagnostic tests.

- Chapter 1 is a brief introduction
- Chapter 2 describes the TCS and how to use it
- Chapter 3 shows how to run the diagnostics
- Chapter 4 describes the processor diagnostics and how to use them
- Chapter 5 describes the Switch Diagnostics and how to use them
- Chapter 6 describes the Sinister Test Program (STP) and how to use it
- Chapter 7 describes the standalone Peripheral Diagnostics and how to use them
- Chapter 8 describes the nX Peripheral Diagnostics and how to use them
- Chapter 9 describes the Stress Test and how to use it
- Chapter 10 describes basic usage of Disktool
- Chapter 11 describes the Modem Diagnostic and how to use it
- Appendix A contains lists of error codes for the various I/O subsystem controllers and devices

Typographic Conventions

This manual uses the following conventions to present information:

bold	Text in bold indicates an exact filename, a command, or user input.
<i>italics</i>	Text in <i>italics</i> indicates a variable, or a value that the user supplies; for example, <i>filename</i> stands for the file under discussion.
type	Text in typewriter font represents computer output.
<i>bold italics</i>	Text in <i>bold italics</i> indicates an emphasized word or phrase.

- <Delete> Names enclosed in angle brackets indicate keyboard keys; for example, <Delete>, <Esc>, and <Return>.
- <Control-Z> Two key names enclosed in angle brackets indicate that you should press the keys simultaneously; for example, <Control-Z> means that you should hold down the Control key and press the Z key. < >
- <Esc> Z A single key name enclosed in angle brackets followed immediately by another key name indicates that you should press the first key and *then* the second; for example, <Esc> Z means that you press the Escape key and *then* press the Z key.
- ↵ This symbol represents the <Return> key in computer dialog examples.
- [] In command syntax descriptions, square brackets enclose optional items.
- ... A horizontal ellipsis indicates a repetition of the previous command or input string.
- .
. A vertical ellipsis indicates that irrelevant portions of a program have been omitted.

Introduction



This guide describes the characteristics and operation of the software that performs diagnostics on the hardware components of the TC2000 multiprocessor. It also provides an overview of the Test and Control System (TCS).

1.1 System Diagnostics

There are five categories of TC2000 diagnostics:

- processor exclusive: B2VME, B2VME2, and TCFPV
- processor to switch: B2SWITCH
- memory and system-level hardware: the STP and **stress**
- standalone VMEbus peripheral: VMEDIAG and DISKTOOL
- system peripheral: **periph_diag**

Each of these diagnostics is described in its own chapter (4-9).

1.1.1 Processor Diagnostics

The processor diagnostics (B2VME, B2VME2, and TCFPV) test:

- Processor memory
- Processor switch interface gate array (SIGA)
- Processor registers

1.1.2 Processor to Switch Diagnostics (B2SWITCH)

The processing and switching subsystems tested are:

- Processor boards (B2VME, TC/FPV)
- Butterfly switch (TC/SR, TC/SS)

1.1.3 STP Diagnostic (STP)

STP tests the memory partitions on each processor and the capability of the processor nodes to talk to each other over the switch.

1.1.4 Standalone Peripheral Diagnostics (VMEDIAG)

The peripheral subsystems tested are:

- 1/4 Inch SCSI Tape Subsystem
 - Interphase 4210 SCSI controller (Jaguar board)
 - B2T125 (Tandberg TDC 3640 1/4 inch cartridge tape drive)
- 1/2 Inch SCSI Tape Subsystem
 - Interphase 4210 SCSI controller (Jaguar board)
 - TC/T6250-2 (Cipher M990 GCR CacheTape® 1/2 inch tape drive)
- Terminal Controller Subsystem
 - TC/TERM-1 or -2 (Systech HPS 6840 host adapter)
 - TC/CC16 (Systech HPS 7088 remote cluster controllers)
- Ethernet Interface Subsystem
 - TC/ETH (Excelan 301 Ethernet controller)
- SMD Fixed Disk Subsystem
 - TC/DC (Xylogics 451 disk controller)
 - TC/DSM81 (Northern Telecom NT 8414 disk drive)

1.1.5 System Peripheral Diagnostics (periph_diag)

These diagnostics run under the nX operating system and exercise the major functional operations of each peripheral device, such as reading and writing blocks of data to tapes and disks, and erasing and rewinding tapes.

1.1.6 SCSI Disk Exercising (DISKTOOL)

This utility program can be used in troubleshooting a SCSI disk problem. There are two versions one running under TEX and another under the nX OS.

1.2 Diagnostic Interface

The TC2000 diagnostics are part of the TCS. The TCS consists of its own power supply, a separate processor running DOS, and the master program called the TCS Executive (TEX). The TCS acts as the local TC2000 system console. An operator issues commands and makes menu selections to execute the diagnostics. See Chapter 2 for information on the TCS; see Chapter 3 for instructions on running the diagnostics.

1.3 Definition of Terms

Some definition of terminology used in this guide is necessary:

- Each line on a menu is a menu *item*.
- **Highlighting** a menu item refers to using the arrow keys and moving the cursor up or down to a particular menu item which is then displayed in reverse video.
- Menu items are selected by highlighting the menu item and pressing <Return>. The menu can also be used in "command mode", where the menu item can be typed in as a command.

Test and Control System Overview



2.1 Introduction

This chapter is an overview of the Test and Control System (TCS). It describes software usage, TCS executive functions, and available commands and menus.

The TCS is a separate subsystem consisting of its own power supply, processor, and software. The TCS can control the hardware and run programs on the TC2000. The TCS software consists of an operating system (DOS), the master program, and the diagnostics. The master program, called the TCS Executive (TEX), is the main TCS software with which the user will interact.

This chapter is an overview of the TCS. It provides all the information you need to run diagnostics, but not all the information on using the TCS. For detailed information on the TCS, see the system administration guide.

2.2 TCS Executive (TEX)

TEX provides power on/off, reset, bootstrap, memory examine/deposit and TTY simulation functions, as well as direct access to the low-level TCS slave functions. It also contains routines to scan the system configuration and to report that information to the operating system software.

TEX provides a "console terminal" interface for the operating system running on the TC2000. Characters are passed between the TCS's console and the TC2000. TEX also provides a number of services to the TCS operating system at its request. These allow the TCS and the nX operating systems to cooperate in controlling the halting, reloading, reconfiguring and monitoring of the TC2000 hardware. In addition, TEX contains diagnostic routines for testing a processor.

TEX can be loaded from a hard or a floppy disk, running under DOS. The installation procedure is described in the *TC2000 System Software Installation*

Guide. TEX takes commands from either the system console or through the serial port and modem interface. It will execute a script of commands from a file if that file name is included on the DOS command line that starts TEX. Additionally, TEX will execute a script file by using the DOS input redirection mechanism.

2.3 Using the TCS

The TCS can be in one of four states:

- serving the operating system (with operating system prompt displayed)
- DOS (with the DOS prompt displayed)
- TEX (with the TEX prompt displayed)
- running diagnostics (with diagnostic menus or screens displayed) or application programs such as **sacopy** or **boot**

CAUTION

While the operating system is running, you can get to the TCS by typing back-quote period `.. However, using TEX while still running the nX operating system can destroy the file system if you use any TEX commands that interfere with the nX operating system. It is advised that, when possible, you use **/etc/shutdown** to warn other system users that you are shutting down the system. Then use **/etc/halt** to synchronize the disks and halt the operating system. You will then be in TEX, from which you can perform necessary operations, such as checking or reconfiguring the hardware. You can reboot the system from TEX.

At boot-up, the TCS displays its top-level menu:

```

Menu:  TEX
      1. Quit-to-Dos
      2. Help
      3. Application/           System mode is application
      4. Boot/
      5. Configuration/
      6. Hardware/
      7. Log/
      8. Memory/
      9. Slave/
     10. Terminal-Type/       Hardcopy, Menu-On
     11. Utility/
          TC2000  TEX [7.7.7] version x.x.x
                          where 7.7.7 is the address of the master node

TEX ->
    
```

2.3.1 Using the TEX Menu System

TEX is a hierarchical menu-driven system, with a main menu, labelled as the TEX Menu. It accepts "words" on command lines, where each word can pop up the next level of the menu, prompting you for the next input.

Menu items can be selected by:

1. Typing a menu item number and <Return> ,
2. Typing enough of the menu item to distinguish it from the other menu items and <Return> ,
3. Highlighting the menu item with the arrow keys and pressing <Return> .

TEX is at the main menu when the top line is: Menu: TEX.

Because of the nested-level nature of the TEX menu package some commands will be executed, and others at the same level will have another menu pop up. If you are familiar with the sub-menus, you can also type a string of commands without being prompted by subsequent menus. The following two examples show how you can quicken your use of the TEX menu system.

Both examples describe how to change a terminal type to a VT320. The first example takes you through each menu. You always type commands at the end of the menu prompt (->).

Figure 2-1 Terminal-Type Selection with menus

TEX -> t ↵

Typing **t** at the main menu for the **Terminal-Type** menu brings up the following menu:

Menu: TEX Terminal-Type

1. Quit
2. VT320
3. VT100
4. Sun
5. X
6. PC
7. Hardcopy
8. Menu
9. More

Terminal-Type -> vt3 ↵

Typing **vt3** as the unique identifier for **vt320**.

The system then returns to the Main menu with a line that the terminal is now set to a VT320 terminal setup.

```

Menu:  TEX
      1. Quit-to-Dos
      2. Help
      3. Application/           System mode is application
      4. Boot/
      5. Configuration/
      6. Hardware/
      7. Log/
      8. Memory/
      9. Slave/
     10. Terminal-Type/       VT320, Menu-On
     11. Utility/
          TC2000  TEX [7.7.7] version x.x.x
TEX ->

```

The second example shows that the TEX menu system also allows you to type all commands at one menu, without being prompted through the menu system. For example, if you know that you are changing your terminal to a VT320 configuration, and you know the required menu commands, you could type everything on one line at the TEX-> menu prompt. For example:

Figure 2-2 Terminal-Type Selection by Command

```
TEX -> t vt32
```

Typing **t** at the main menu for the **Terminal-Type** menu and **vt32** as the minimum amount of letters for **vt320**. will change the terminal type. This returns the following menu automatically:

```

Menu:  TEX
      1. Quit-to-Dos
      2. Help
      3. Application/           System mode is application
      4. Boot/
      5. Configuration/
      6. Hardware/
      7. Log/
      8. Memory/
      9. Slave/
     10. Terminal-Type/       VT320, Menu-On
     11. Utility/
          TC2000  TEX [7.7.7] version x.x.x
TEX ->

```


Becoming comfortable with the TEX menu system so that you can type most of the commands at one menu prompt is a technique well worth mastering.

Menu Command Line Editor

The menu package also includes a full command-line editor and history mechanism. The history buffer allows you to repeat a command or correct a mistyped command. Note that the use of ! has nothing to do with the history mechanism and the control sequences are **not** case sensitive. Figure 2-3 contains a list of these commands.

Figure 2-3 **TEX Menu Line Editor**

< Control-M > or < Control-J >	Execute command-line or menu-item
< Control-L >	Redisplay
< Control-N >	Get <u>n</u> ext command-line entry
< Control-P >	Get <u>p</u> revious command-line entry
< Control-G >	Abort command
< Control-K >	<u>K</u> ill to end of line from cursor
< Control-U >	<u>U</u> ndo the whole line
< Control-A >	Go to beginning of line
< Control-E >	Go to <u>e</u> nd of line
< Control-F >	Go <u>f</u> orward one character
< Control-B >	Go <u>b</u> ack one character
< Control-D >	<u>D</u> elete this character (under cursor)
< Control-H >	Delete the previous character
< Control-I >	<u>I</u> nsert < Tab >
< Control-X >	Execute a menu item
< Escape > b	<u>B</u> ackward one word
< Escape > f	<u>F</u> orward one word
< Escape > n	<u>N</u> ext menu item
< Escape > p	<u>P</u> revious menu item
up-arrow	Previous menu-item
down-arrow	Next menu-item
left-arrow	Go to previous character
right-arrow	Go to next character
vt220/vt320 "do key"	Execute a menu-item
< filename	Invokes command re-direction
! <i>command-name</i>	Invokes looping until error
!! <i>command-name</i>	Invokes looping regardless of errors

Note that looping may be stopped by hitting any key.

2.3.2

Moving Around in the TCS

You can move easily between DOS, TEX, the diagnostics software, the kernel debugger **kdb**, and the operating system once the TCS is running. You will see relevant screen displays according to the following:

- When the TCS is serving the nX operating system, the login prompt, shell prompt, or an application (if running) will be displayed.
- When in DOS, the prompt is `C:` followed by the directory and a `>`. For example, `C:\TCS>`.
- When in TEX at the main menu level, the prompt is `TEX->`. The prompt is shown with a TEX menu, if the menu display option is ON. The menu system is described in Section 2.3.
- When using TCS for diagnostics, the screen will display a menu or test results, depending on the diagnostic.

Using DOS

When DOS is running, the console will display the DOS prompt:

```
C:\directory>
```

where *directory* is the name of the DOS directory. In the root directory, the prompt is: `C:\>`

To get to the TEX prompt, type:

```
C:\> CD \TCS ↵
C:\TCS > TEX ↵
```

The TCS banner and prompt will be displayed:

```
Menu:  TEX
      1. Quit-to-Dos
      2. Help
      3. Application/           System mode is application
      4. Boot/
      5. Configuration/
      6. Hardware/
      7. Log/
      8. Memory/
      9. Slave/
     10. Terminal-Type/       VT320, Menu-On
     11. Utility/
TC2000  TEX [7.7.7] version x.x.x
TEX ->
```

From this point you could boot the system, by using the appropriate TEX command as described in section 2.3.4.

Using TEX

When TEX is running, the console will display the current TEX menu:

```

Menu:  TEX
      1. Quit-to-Dos
      2. Help
      3. Application/           System mode is application
      4. Boot/
      5. Configuration/
      6. Hardware/
      7. Log/
      8. Memory/
      9. Slave/
     10. Terminal-Type/       VT320, Menu-On
     11. Utility/
          TC2000  TEX [7.7.7] version x.x.x
TEX ->

```

To return to DOS, type **q**, **quit**, or **8** at the menu system prompt.

If you reached this TEX menu by typing **‘.** at the nX console, you can return to the nX operating system (if it is still running) by typing **Application Tty** or **a t**.

To boot the operating system if it is no longer running, follow the steps shown in Section 2.3.4. To run diagnostics follow the steps in Chapter 3.

Entering the kernel debugger (kdb)

kdb is the kernel debugger that analyzes the kernel of the nX operating system. You can access **kdb** from TEX as well as from the nX operating system. You can only access **kdb** if the following are true:

- **kdb** was initialized at bootup time
- you are using the console terminal from which the machine was booted

If the **kdb** option was not selected during bootup, you will not be able to access its kernel debugging capabilities later in that session. The bootup line which enables **kdb** is:

```
Start KDB [y]? y
```

You must specify **y** or a <Return> (uses default) to enable **kdb**. Once you have enabled **kdb** and the kernel is finished booting, you can enter **kdb** through TEX by typing **‘.** to get into TEX and then typing the appropriate commands:

TEX -> hard nmi ↵	Sets the NMI flag allowing entry to kdb
TEX -> app run ↵	Starts the “application”

To exit the **kdb** session, type:

:c ↵

to allow the kernel to continue from where it left off. For further information on **kdb**, refer to *System Administration* Appendix E, “Using **kdb**”.

2.3.3

Booting the nX Operating System from DOS

NOTE

Do not attempt to boot the nX operating system when it is already running. Shut down the operating system with **/etc/shutdown** and **/etc/halt** first, then boot up when you wish. If the operating system is already running, type **Application Tty** from the TEX prompt to resume it.

To boot the operating system in a system with autoboot disabled, follow the steps shown in Figure 2-4. Using autoboot you can setup the system to boot directly on power-up or to boot without operator intervention as soon as “start” is typed. See the description of **BOOTCFG.TCS** in section 2.4.4 for more details on configuring the system.

Figure 2-4 Booting the nX Operating System from DOS

C: \TCS > **TEX -AUTO** ↵

or you can type

C: \TCS > **START** ↵

(miscellaneous messages as system boots and loads the nX software)

Boot: **(xy0,0,0)** ↵

This causes the nX operating system to boot from Xy-logics disk controller 0, disk drive 0, partition 0 (root partition).

Specify Boothowto flags[y]? **n** or **y**

Typing **y** causes the system to prompt for single/multi user boot up, and asks for **kdb** startup (see following lines). Typing **n** causes rebooting to begin without the next three queries. Defaults are in brackets: [].

Come up Single User[y]? y or n	Type y for single user, n for multiuser.
Start KDB[y]? y or n	Type y to enable kdb for possible later use, type n to disable kdb .
Read Machine Configuration [y]? y or n	Type y to read machine configuration, type n to skip.

2.3.4 Booting the nX Operating System from TEX

NOTE

Do not attempt to boot the nX operating system when it is already running. Shut down the operating system with **/etc/shutdown** and **/etc/halt** first, then boot up when you wish.

Before booting the operating system, be sure that you are at the top-level of the TEX menu, then follow the steps shown in Figure 2-5.

Figure 2-5 Booting the nX Operating System from TEX

TEX-> c ↵	From the Main menu, this moves to the Configuration menu.
Configuration-> f ↵	Clears the last configuration (Forget).
Configuration-> r ↵	Reread BOOTCFG.TCS and SLOTCFG.TCS .
Configuration-> q ↵	Quit back to the Main menu.
TEX-> a r ↵	Enters the Application menu and runs in automatic, which in this case boots the system as though tex -auto or start had been used, at the DOS prompt.

2.4 Using TEX

You can enter into the TEX program at any time if you are at the TC2000 console or you are connected to the TCS serial port (possibly through a remote system). To enter the TEX program from DOS, type **tex** (see section 2.3.2). Once in the TEX program, you can enter TEX commands directly at the keyboard, or you can create a DOS file of commands to be accessed from TEX (such as configuration files). TEX accepts some command-line switches which can be typed in full or uniquely abbreviated (e.g., **tex -auto**). The currently available switches are:

- autoboot** This causes TEX automatically to read the bootstrap configuration file **BOOTCFG.TCS** and the slot configuration file **SLOTCFG.TCS** before executing any other commands. These files configure TEX for a particular installation hardware and operational characteristics. Refer to Section 2.4.4 for descriptions of **SLOTCFG.TCS** and **BOOTCFG.TCS**. TEX then begins to operate the system as described for the **Application Run** command.

NOTE

~~~~~  
 Entering the DOS command **start** will boot the same way as **tex -autoboot**.  
 ~~~~~

In addition to **-autoboot** there are four additional “boot” switches which modify the actions of **-autoboot** for specific situations. They act similarly to **-autoboot** but act as though different settings of the **BOOTCFG.TCS** file are active, thus modifying the bootstrap process.

- MultiUser** causes TEX to set the bootstrap variables so that the nX bootstrap, **BOOT.88**, brings up the nX OS in multi-user mode.
- SingleUser** causes TEX to set the bootstrap variables so that the nX bootstrap, **BOOT.88**, brings up the nX OS in single-user mode.
- PromptedBoot** causes TEX to set the bootstrap variables so that the nX bootstrap, **BOOT.88**, prompts the console user for answers to its startup questions rather than using the values in the **BOOTCFG.TCS** file.
- Uniprocessor** is exactly like **-PromptedBoot** except that TEX marks all processors other than the master node as “disabled”. This is for faster booting of single processor diagnostics.

There are also these switches:

- TCS-Addr** *hex address*
 This sets the default slave address. This is equivalent to the **Utility Slave** command at the TEX command level, but is provided for use in batch files.
- help** This switch displays the list of command line switches.
- filename* TEX also accepts a file name on the same command line. This causes TEX to execute the commands contained in *filename*.

At the TEX prompt, you can type any TCS command described in this section. Many TEX commands take one or more arguments. If these arguments are card addresses, they need to follow a predefined format, as described in section 2.4.3. Refer to section 2.3.1, “Using the TEX Menu System” for a description of how to use the menu system to enter and edit commands.

2.4.1

TEX Commands

The following is a list of menu items that may also be entered as commands at the TEX prompt with associated arguments. You may need these commands in the course of testing the system. Section 2.4.2 contains a summary list of these commands.

? Displays the list of TEX commands.

Application Configuration

Writes configuration information for the system into the memory of the current slave (which should be a processor, not a switch or clock card). The information must have been previously obtained, either by a **Configuration Scan** or **Utility Preview** command or automatically as a result of a **Boot** or **Application Run** command. This information is written in a predefined format in the processor's memory. The serial number of the current slave is also read from its TCS EEPROM and stored in the processor's memory.

In automatic operation, the configuration information is written to each node after the microboot successfully completes and again before the application bootstrap starts.

Application Examine-Card

Displays information about the selected TC2000 card or cards. The card's type, serial number and revision levels are displayed (from the EEPROM on the card). The current use, goal and state information are also shown.

Application File-Select a|p|u filename

Specifies a *filename* to be used by **Application Run**. *filename* must exist on the TCS's DOS file system. This file is usually named **BOOT.88** for bootstrapping the operating system, but may be a specific diagnostic or other program.

a specifies that *filename* will be used as an application (or its bootstrap). *filename* here is usually **BOOT.88**.

p specifies that *filename* will be used as the POST (Power-On Self Test). *filename* here is usually **POST.88**.

u specifies that *filename* is to be loaded into TEX. It will later be used as microboot. *filename* here is usually **UBOOT.88**.

Application King-Node card_address

Specifies the *card_address* of the king (master) node.

Application Mode idle|application|boot|off

Sets the "system mode" that directs TEX's operation under the **Application Run** command.

idle directs TEX to discover cards in the system, and to turn on their power and initialize them, but not load application programs. TEX will run the microboot and POST programs on processor nodes.

application directs TEX to first initialize the system as for **idle**. It then loads and runs the application (or its bootstrap) as specified in the **Application File-Select a** command into the current king node as specified by the **Application King-Node** command. The bootstrap and king node are also specified in the **BOOTCFG.TCS** file (see **reconfigure**).

boot directs TEX to halt all processors and then restart the initialization and bootstrap procedures as described in the **application** option.

off directs TEX to halt all processors and then turn off power to all processors, switches, and clocks.

Application Run

Places TEX in automatic operation as selected by the **Application Mode** command. It performs such operations as initialization, running microboot, and loading applications into the king node. Once the king node is operational, TEX acts as the console terminal for it.

If TEX is running an application, typing **‘.** returns you to the TEX prompt.

Application System-Status

Displays the state of the clock cards and any switch and processor cards.

The states will depend on the current system mode and on whether the cards have successfully been initialized and whether their bootstraps and POST have run.

Application TTY

This command enters the console TTY protocol routine. Characters are passed to and from the TC2000 processor at the default address over the TCS bus, using ring buffers in the processor's memory. The escape sequence to return to the TEX prompt, is backquote period **‘.** (Backquote is generally an unshifted tilde, so this is similar to an escape in **tip**, but different, so that TEX can be run from a **tip** line.)

TEX Boot auto | multi-user | prompt | single-user | uniprocessor

The other selections in the **Boot** menu are variations of this operation, to override this default action in various ways.

The order of this is as follows:

TEX scans the machine for all existing clock, switch and processor cards. It reads the **BOOTCFG.TCS**, **SLOTCFG.TCS**

and **DRIVERCFG.TCS** files. It reports any inconsistencies between the **SLOTCFG.TCS** file and the actual machine.

It checks to see whether all cards are on and running, and if so it goes directly to servicing the king node. Otherwise, **TEX** initializes all cards in the machine (except those disabled by the **BOOTCFG.TCS** file). It then runs the micro-boot program and the **POST** program on each node, supplying them with configuration information as required.

Finally it reports configuration and test results to the king node and loads and runs the application (or, usually, its bootstrap, **BOOT.88**). The bootstrap variables and bootstrap file string are supplied to the king node from the **BOOTCFG.TCS** file to control the bootstrap operation.

- automatic** causes **TEX** to bring up the TC2000 computer according to the configuration information in the file **BOOTCFG.TCS** in the current directory.
- multi-user** causes **TEX** to bring up the TC2000 computer as described for **automatic**, but with the following changes:
- After reading the **BOOTCFG.TCS** file, **TEX** forces the bootstrap variable settings to those which cause **BOOT.88** to boot the operating system in multi-user mode, without asking any questions at the console terminal.
- prompt** causes **TEX** to bring up the TC2000 computer as described for **automatic**, but with the following changes:
- After reading the **BOOTCFG.TCS** file, **TEX** forces the bootstrap variable settings to those which cause **BOOT.88** to prompt the operator for mode settings from the console terminal. The operator can specify the bootstrap file string and the other choices provided by **BOOT.88** such as single- versus multi-user operation.
- single-user** causes **TEX** to bring up the TC2000 computer as described for **multi-user**, except that a bootstrap parameter is set to force the operating system into single-user operation.
- uniprocessor** causes **TEX** to bring up the TC2000 computer as described for **prompt**, except that **TEX** disables all processors except for the king node. This is used to speed the booting process when only one processor is to be used. This is typically used to load a diagnostic program for an I/O device that is accessed from just one node.
- Configuration** **Card-use off | isolate | system | auxiliary | forget** *card_address*
Sets the configuration state for one or more cards.

If **off**, **TEX** will treat the card as *disabled* and, in addition, will leave its power turned off.

If **isolate**, TEX turns on the card, but leaves its switch port turned off so that it cannot interact with other cards in the system. This is intended to allow power-on servicing of TC2000 cards.

If **system**, TEX makes the card available for normal operational use any disabling done by **BOOTCFG.TCS**, or a previous **card-use isolate**, is removed.

If **auxiliary**, TEX will use the card normally (**system**), until TEX receives a service request to use the card for special application such as nodes running under pSOS.

If **forget**, TEX will not make use of the card and will forget that it was in **SLOTCFG.TCS**.

Configuration Forget

Clears the configuration found by the **Configuration Scan** and **Application Run** commands, so that it will be rediscovered by the next **Application Run** command.

NOTE

Under normal use of **Configuration Forget**, all nodes should be halted or powered down before rebooting the operating system. Otherwise, running nodes may interfere with the bootstrap process.

Configuration Reconfigure

Makes TEX reread the two configuration files **BOOTCFG.TCS** and **SLOTCFG.TCS**. **SLOTCFG.TCS** contains a record of the cards found within the machine when the system was last configured explicitly scanned and written. **BOOTCFG.TCS** contains bootstrap parameters for the boot process. See section 2.4.4 for more information on these configuration files.

Configuration Scan file | small | medium | large

Causes TEX to contact all TCS slaves for the configuration parameter that is specified and record and display what it finds.

If **file** is specified, all cards mentioned in the **SLOTCFG.TCS** file are scanned. If **large** is specified, all eight midplanes in all eight bays are scanned. If **medium** is specified, all eight midplanes in bay 7 are scanned. If **small** is specified, only midplane 7 of bay 7 is scanned.

As the scan is done, the card type, serial number, and revision levels are displayed. The card types are also saved in the TCS for further use of the **Application Configuration** command. See also the **Utility Preview** command.

Configuration Terminal-Driver Show

Displays the current settings of configuration parameters related to the serial terminal driver which communicates with the console port and the TCS's dial-up modem.

The parameters displayed are: Version number, Terminal XON/XOFF flow control, dialup modem access, Initialization string, and dialup port active.

Configuration Terminal-Driver Dialup-Access

Sets the parameter which allows or disallows access via the dialup modem port. With this parameter enabled, dialup access is available.

Configuration Terminal-Driver Dialup-Password

Sets the password required for access via the dialup modem. This password can also be set by the configuration file DRIVERCF.TCS.

Configuration Terminal-Driver Modem-Init-String

Sets the initialization string which is sent to the dialup modem at startup and between dialup calls. This string can also be set by the configuration file DRIVERCF.TCS.

Configuration Terminal-Driver XON/XOFF

Sets the parameter which enables or disables use of XON/XOFF flow control on the console serial port. This parameter can also be set by the configuration file DRIVERCF.TCS.

Configuration Write Boot-Configuration *filename*

Creates a bootstrap-time configuration file. Normally, **BOOTCFG.TCS** is used, but a different file name can be specified to create other copies or versions of the configuration. The contents of the **BOOTCFG.TCS** file are described in section 2.4.4. This command is typically used as follows:

Read in the existing **BOOTCFG.TCS** file by **Configuration Forget** followed by **Configuration Reconfigure**. Change a configuration item, such as **Configuration Card Use OFF** or **Configuration Set AutoBoot Yes**. Finally, write the new **BOOTCFG.TCS** file using this command.

Configuration Write Driver-Configuration

Creates a configuration file for the parameters which control the serial device driver. The file used by TEX is DRIVERCF.TCS, but a different file name can be used. Typical use would look similar to **Boot-Configuration** above.

Configuration Write Slot-Configuration *filename*

Creates a slot configuration file. The default *filename* is **SLOTCFG.TCS**, but can be a different name as well. If you enter a *filename*, TEX automatically places this information into *filename*.

Hardware Initialize *card-address*

Performs a card-specific initialization sequence for a processor, switch, or clock card. *card_address* may have wildcards.

For the processor, the sequence reads and displays the card status, turns on the power, asserts processor and card resets, and turns on the LED blinker. It then waits a while and removes the card reset. The processor remains halted. Then it checks and reports the card status register again.

For the switch cards, the sequence is similar, except that the switch gate arrays are initialized and all eight function card ports are enabled.

For the clock card, the card is reset and powered on and the phase-locked loop is set to the frequency specified by a previous **Hardware Frequency** command (standard 38 MHz).

Hardware Blink 0|1|2|3 *card_address*

Sets the "blinking" state of the yellow LED on one or more cards. These states are:

0: off 1: slow blink 2: fast blink 3: on

In normal operation the yellow LED indicates the following:

ON:	not yet initialized or cannot be
Blinking:	initializing or in need of service
OFF:	operational

Hardware Diagnostic

This command runs one of a set of builtin diagnostic routines. Test number zero means to run all of the tests in order. The following tests exist:

- 1 Write/Read floating 0 and floating 1 patterns to the TCS slave's action register 7 (a RAM register for testing Master-to-Slave communication path).
- 2 Write/Read floating 0 and floating 1 patterns to SIGA-A on the current default slave's board. This tests the communication path from the TCS Master to the SIGA.
- 3 Write/Read floating 0 and floating 1 patterns to location zero (32-bits) of the processor's RAM. This tests the path from the SIGA through the T-bus to the RAM.
- 4 Write/Read the values 00 through FF to locations 00 through FF of the processor's RAM. Then write/read the complement of those values. This tests the addressing of processor's RAM, but only the low eight address lines.
- 5 Test that the 88K processor can be started and that it can access memory. This test loads a short program into memory. If the program ran, the test passes.

Hardware Go *address*

Starts processor at memory *address*. If the address specified is zero or omitted, the last start address from a loaded file is used.

Hardware Halt *card_address*

Halts processor node. Refer to section 2.4.3 for a description of how card addresses are defined.

Hardware PDU on|off 1|2|both

Be sure to write-protect the disk drives before using this command. If you execute the command without protecting the disks you can lose data.

Turns **on/off** bulk power supplies for the system by controlling main power relays **1** and **2**. If TEX is started with a command file or with the **-Autoboot** switch, it will turn on both PDUs when starting.

Hardware NMI-Flag

This command is a shorthand for **Memory Deposit Word 0x01F60004 1**. Writing a "one" to this location asserts the non-maskable interrupt flag in the processor. This is used by the operating system to force entry into its debugger (**kdb**).

Hardware Power on|off *card_address*

Turns **on/off** power at a card or group of cards. If **off** is specified with *card_address* "all", all cards are turned off. **Hardware Power On All** is the same as **Hardware Initialize** and is used to sequentially power on and initialize all cards.

Hardware Temperature *card_address*

Displays a report of the temperature found at the sensor(s) on specified card(s).

Hardware Voltage *card_address*

Displays a report of the various voltages on specified card(s).

Memory Deposit **b|h|w** *address data*

Performs one write of **data** into the processor memory space. This command should be run while the system is halted.

b, **h**, and **w** indicate byte, halfword, or word cycle respectively.

address is the memory space to which *data* is to be written. *address* does not have to be in local RAM.

Memory Load-File *filename*

Loads *filename* into the current default node, which should be a processor (not a switch or clock).

Header information is summarized on the console and periods are displayed as the loading proceeds (one period per 256 bytes). The default starting address for **Hardware Go** is set from *filename*'s entry vector. Note **Memory Load-File** does not start the processor, for that you must use **Hardware Go**.

Memory UBWait *card_address*

Causes system to wait for microboot to finish. This command should be used in a script file to allow the microboot to finish. It knows where the microboot's state register lives in processor memory and monitors that cell for completion. It will time out after a while in case the boot fails.

Use **Memory UBWait** to wait for the microboot to finish before loading the next application or bootstrap program.

Terminal-Type *vt320|vt100|sun|x|pc*

Tells TEX menu interface what type of terminal is in use so that it can properly maintain what appears on your terminal screen. The *x* is used for X windows and *pc* for a standard PC monitor.

Terminal-Type *hardcopy*

Tells TEX to not display the menus to save paper while using a hardcopy-based console.

Terminal-Type *menu on|off*

Turns *on* or *off* the TEX menu displays on the terminal. You can always type a question mark *?* to display the current menu.

Utility Do *filename*

Executes command(s) contained in *filename* located on the TCS hard disk.

Utility Preview-Cards

Scan all possible card addresses for any response. It reports the number of cards of each type that are present. This also allows TEX to build its internal table of existing cards which is used by the *** form of card addresses and by the **Application Run** command.

Utility Slave

Sets the default address for those commands which allow a default. See also the **king** command. The **king** or **master** node can be set differently from this default slave address. The **king** and **default** addresses apply to different sets of commands.

Utility Version

Displays current version number and compilation date.

Quit

Quits from the current menu and to DOS if at the main menu.

Quit-to-DOS Quits to DOS from any menu.

2.4.2 Menu-Item/Command Summary

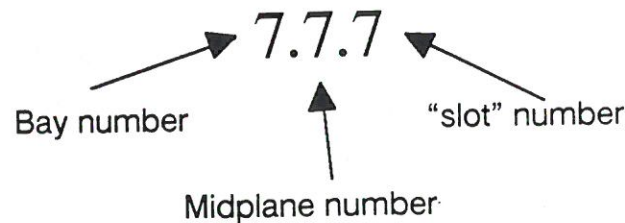
This is a summary of some important TEX menu-items which you may also use as commands.

Menu-Item/Command	Arguments	Description
?		Displays current menu-items with usage.
Application Configuration		Writes config table into node
Application Examine-Card	<i>card_address</i>	Displays information on the specified card(s).
Application File-Select	<i>u p a filename</i>	Selects file for bootstraps: u loads microboot; p loads power-on tests; a loads the application
Application Kir. ode	<i>card_address</i>	Defines king node for application
Application Mode	<i>i a r o</i>	Sets system mode: idle , application , reboot , off
Application Run		Start program or bootstrap system
Application System-Status		Displays the state of nodes in system
Application TTY	<i>card_address</i>	Performs console TTY protocol
Configuration Card-use	<i>e d f o card_address</i>	enable/disable/forget/off
Configuration Forget		Forgets configuration info
Configuration Reconfigure		Re-reads configuration files
Configuration Scan	<i>file large medium small</i>	Scans system looking for TCS slaves
Configuration Write Slot	<i>filename</i>	Creates slot configuration file
Configuration Write Boot	<i>filename</i>	Creates bootstrap configuration file
Hardware Blink	<i>0-3 card_address</i>	Controls LED on a card
Hardware Go	<i>address</i>	Starts node at memory address
Hardware Halt	<i>card_address</i>	Stops a node
Hardware Initialize	<i>card_address</i>	Initializes a card
Hardware NMI-Flag		Sets the NMI flag allowing entry to kdb
Hardware PDU	<i>on off 1 2 both</i>	Turns on or off main power supplies
Hardware Power	<i>on off card_address</i>	Turns power on or off at card(s)
Hardware Temperature	<i>card_address</i>	Reports temperature of card(s)
Hardware Voltage	<i>card_address</i>	Reports voltage(s) on card
Memory Deposit	<i>b h w address data</i>	Writes data into node main memory at <i>address</i> . b , h , and w indicate byte, halfword, or word cycle respectively.
Memory Uawait	<i>card_address</i>	Waits for microboot to finish
Terminal-Type	<i>vt320 vt100 sun x pc hardcopy menu-on menu-off</i>	Tells TEX menu interface what type of terminal is in use so that it can properly maintain what appears on your terminal screen.
Utility Do	<i>filename</i>	Executes script of commands in <i>filename</i>
Utility Slave		Sets default target TCS address for commands which allow defaults or take no address argument.
Utility Version		Reports the version number of TEX
Quit		Quit to the previous menu or to DOS
Quit-to-DOS		Quit to the previous menu or to DOS

2.4.3 Card Addresses

Many of TEX's commands refer to a specific TC2000 card or a group of cards. In the descriptions below, the term *card address* means a description of this address argument to a TEX command. The simplest case of a *card address* is a group of three numbers separated by periods. For example, the command **blink 0 7.7.7** turns off the yellow LED on the processor node card which is located in bay 7, midplane 7, slot 7 of the machine.

Figure 2-6 Card Address Format



The third field of a card address, the "slot" number, can also refer to a switch or clock card. The "slots" SA, SB, RA, RB, CA and CB refer to the A and B Switch Server cards, Switch Requestor cards and Clock generator cards respectively (these can be upper- or lower-case). For example, the command **Hardware Blink 0 7.7.RA** turns off the yellow LED on the Requestor card of the A switch in bay 7, midplane 7.

For the clock cards, the Bay and Midplane fields should be omitted. The command **Hardware Blink 0 CA** turns off the yellow LED on Clock card A.

The *card address* field can also be replaced by the letter **g** and a hex number from **0** to **FF**. This indicates that the system is to use a target address containing a "Group address". The command **Hardware Blink 0 G4** sends a command to all slaves which respond to group address 4 (normally all processor nodes). The special address "ALL" is recognized as the "broadcast" group address. Not all commands will accept a group address.

Card addresses can also contain "wildcards" (* or !). These cause a command to be executed for each of a number of addresses. For example, **Hardware Blink 0 6.*** performs a **Hardware Blink 0** command for each existing node in bay 6. The command **Hardware Blink 0 *.*R*** turns off the yellow LED on each existing Switch Requestor card connected to the machine switch. The slots **C***, **R*** and **S*** mean both A and B clock, switch receiver or switch sender cards respectively.

In the preceding paragraph, "existing" means that a card was mentioned in the not configuration file or that it has responded to a message from TEX since TEX was started. This speeds operations up by skipping cards which are not

actually in the machine. If the * is replaced by a !, however, the wild card will be taken to include all cards in the described range, even if they have not been heard from and are not in the slot configuration file.

2.4.4 Configuration Files

When TEX is invoked with the **-autoboot** switch, it automatically reads the two configuration files, **SLOTCFG.TCS** and **BOOTCFG.TCS**, in the current directory. **SLOTCFG.TCS** is a machine-dependent file that is generated during the TCS installation. **BOOTCFG.TCS** is a default bootstrap configuration file. Both files are described in the following sections.

SLOTCFG.TCS

The **SLOTCFG.TCS** file is generated during the installation of TCS. It has one line for each card with its card address, type, serial number, and revision levels. You should never have to manually edit this file. If your configuration changes, you can generate a new **SLOTCFG.TCS** file with the command sequence (make sure you start TEX from the \TCS directory):

```
TEX -> Config scan medium ↵
```

```
TEX -> write s slotcfg.tcs ↵
```

This creates a new **SLOTCFG.TCS** file with the current configurations.

The cards listed in this file are used in the "*" wildcard arguments that some of the commands described in section 2.4.1 can accept. For example, the command sequence **Hardware Temperature *.*** will report the temperatures of all the processor cards contained in **SLOTCFG.TCS**. **SLOTCFG.TCS** helps TEX to avoid polling cards which are disabled or isolated. Similarly, the **run** command, which initializes all the cards in the machine, will attempt to initialize cards only if they are contained in **SLOTCFG.TCS**.

BOOTCFG.TCS

The **BOOTCFG.TCS** file delivered with the TC2000 TCS software contains default bootstrap commands. Different versions of this file are kept in the different directories of the TCS software hierarchy. For example, the directory for diagnostics usually has a different **BOOTCFG.TCS** from the one for booting in \TCS. **BOOTCFG.TCS** contains a number of boot parameters, including automatic boot up of the nX operating system, and specifies what cards should be disabled (non-initialized), etc. Figure 2-7 illustrates the default **BOOTCFG.TCS** file in the \TCS directory.

Figure 2-7

Default BOOTCFG.TCS File

```

bootparam: 0: 0
bootparam: 1: 5
bootparam: 2: 1
bootstring: (xy0,0,0)/vmunix
autoboot: Yes
primaryclock: A
primarynode: 7.7.7
switchfreq: 38
ubootfile: uboot.88
postfile: post.88
bootfile: boot.88
alternatepaths: A: Yes
; End of BOOTCFG.TCS

```

A number of commands can be contained in **BOOTCFG.TCS**. Each command line has the command name followed immediately by a colon, optional spaces, and the command argument. The commands are **not** case-sensitive. The following is a description of the commands that **BOOTCFG.TCS** can use. Normally, you do not need to edit this file.

- alternatepaths** Tells TEX whether or not to set up the processor cards to use available Butterfly switch alternate paths. A redundant system contains two switch paths. By default, the alternate paths of both switches are enabled for improved switch performance in the \TCS directory **BOOTCFG.TCS** file. To simplify debugging, the alternate paths are disabled in the \DIAG directories.
- This command takes two arguments. The first argument can be either **A** or **B**, specifying one of the switches in the redundant system. This argument is followed immediately by a colon. The second argument is either **Yes** or **No**, specifying whether or not the switch path is used.
- autoboot** Takes one argument, either **Yes** or **No**. **Yes** causes TEX to boot an application automatically. **No** halts TEX after reading configuration files, and waits at the TEX prompt.
- bootfile** Takes one argument, a *filename* for a file on the TCS master's disk. This file is run on the primary node after the microboot and POST programs have been run on all nodes.
- bootparam** Takes two arguments, both decimal numbers. The first number selects one of sixteen bootstrap variables. The second number is what the variable is set to.

Currently, only variable numbers 0, 1, and 2 mean anything (panic count, panic limit, and multiuser). These are as follows:

0: 0	Set the current panic count to 0.
1: 10	Tells TEX to try rebooting the machine 10 times before halting.
2: 0	Prompts the nX boot program to ask the user if he/she wants to boot single or multiuser after the tex -auto or start commands.
2: 1	Prompts the nX boot program to automatically come up multiuser at tex -auto or start .
bootstring	Takes anything following the colon (:) as the string argument. The default string is <i>(xy,0,0,0)/vmunix</i> . This allows you to simply press the <Return> key at the BOOT: prompt.
carduse	Takes two arguments, a card group address and a "use" definition. The "use" may be one of "system", "auxiliary", "isolated", or "off". See the Configuration Card-Use command for further details.
disabledcards	Causes each listed card to be marked as disabled so that it will not be brought up automatically, even though it can respond to TCS commands and can be included in SLOTCFG.TCS . It takes one argument, a card address, possibly containing "!"-type wildcards. There can be multiple disabledcards commands in BOOTCFG.TCS . This command can be overridden by the TEX commands Configure card-use system and forget .
postfile	Specifies the file which will be run on each node which successfully completes the microboot. It uses <i>filename</i> as its only argument.
primaryclock	Specifies whether TC/CLK card A or B is to be used if both are present. [Currently not implemented.]
primarynode	Specifies which node is to be used for the application bootstrap (bootfile command) if it is working. Takes a specific <i>card address</i> as its argument. It is also known as "king" or "master"
switchcolumns	Takes one argument, a decimal number, representing the number of columns in the switch. This number must be either 2 or 3. [Currently, only two switch columns have been implemented.]
switchfreq	Takes one argument, a decimal number, representing the frequency (in Megahertz) of the Butterfly switch. These switches were designed to operate only at 38 MHz. Do not change the switch frequency to anything else.

ubootfile Specifies the file which will be run on each node listed in **SLOTCFG.TCS** which has not been disabled by a **disabled-cards** command. It uses *filename* as its only argument.

2.4.5 BOOTCFG.TCS File Parameters

Instead of editing the configuration file **BOOTCFG.TCS** using the DOS text editor **EDLIN**, you can change and/or add commands and parameters in this file through the **TEX** menu. The procedures to change and add **BOOTCFG.TCS** file commands are different. This section describes both.

Changing BOOTCFG.TCS File Parameters

While performing **TEX** operations on the TC2000, you can change the values of parameters that are already contained in and set up by the **BOOTCFG.TCS** file. This can be done by reading the current file into **TEX**, performing typical **TEX** operations like resetting the state of card use, then writing any changes into the back to the file. The following example shows how to change a card's use. The first step is to read in the **BOOTCFG.TCS** file. You can do this with the command sequence of **Configuration Forget** followed by **Configuration Reconfigure**.

Figure 2-8 Changing BOOTCFG.TCS

```
TEX-> c ↵
Configuration-> f ↵
Configuration-> r ↵
```

Go to the **Configuration** menu.
Clear (**forget**) the configuration.
Reread (**reconfigure**) **BOOTCFG.TCS** and **SLOTCFG.TCS**. At this time, you can leave the Configuration menu and perform other **TEX** operations, such as changing card-use state:

```
Configuration-> c ↵
Function: Card-Use
```

To select a **card-use** state.

```
off|isolate|system|auxiliary|forget
                                <String>
Card group.                      <Node-Group>      7.1.2
Card use
```

```
Enter off|isolate|system|auxiliary|forget-> o ↵
```

This would then tell **TEX** to keep card 7.1.2 turned off and ignored even when the system reboots. This is useful for known defective cards.

```
Configuration-> w ↵
Write-> b ↵
```

Go to the **Write** menu.
Write the appropriate changes made during this **TEX** session to the **BOOTCFG.TCS** file.

The next time you boot the system, the new **BOOTCFG.TCS** is used. Note that this procedure can only be used to change parameters that already exist in the **BOOTCFG.TCS** file. If you want to add parameters that do not exist in **BOOTCFG.TCS**, or parameters that are not normally changed by normal TC2000 operations, but which are available for **BOOTCFG.TCS**, see the following section.

Adding **BOOTCFG.TCS** File Parameters

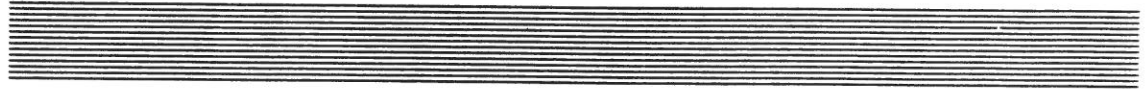
In the course of performing **TEX** operations on the TC2000 machine, you can add new parameters to the current **BOOTCFG.TCS** file, or change some that you did not change during other TC2000 **TEX** operations. You can do this by reading the current **BOOTCFG.TCS** file into **TEX**, using the **Configuration set** command to set **BOOTCFG.TCS** parameters, then writing any changes into the **BOOTCFG.TCS** file. The following illustrates an example of what to do if you disable the Autoboot parameter of the **BOOTCFG.TCS** file. The first step is to read in the **BOOTCFG.TCS** file. You can do this with the command **Configuration Forget** followed by **Configuration Reconfigure**.

Figure 2-9 Adding **BOOTCFG.TCS parameters**

<pre> TEX-> c ↵ Configuration-> f ↵ Configuration-> r ↵ Configuration-> s ↵ Set-> au ↵ Function: AutoBoot Set Autoboot Flag to Yes or No. Yes or No <String> -> AutoBoot Enter Yes or No <String> -> No ↵ </pre>	<p>Go to the Configuration menu. Clear the configuration. Reread BOOTCFG.TCS and SLOTCFG.TCS. At this time, you can leave the Configuration menu and perform other TC2000 operations, <i>e.g.</i>, turn processors on and off, check voltage levels, setting new configuration parameters, etc. One of these operations can then be setting up the Autoboot state of the machine. Select the BOOTCFG.TCS set option. To set the Autoboot parameter.</p> <p>This disables automatic reboots after the BOOTCFG.TCS is read during a tex -a or start command to boot the system. If you want to change parameters that do not exist in the Set menu with TC2000 TEX operations, see the previous section.</p>
--	--

The next time you boot the system, the new **BOOTCFG.TCS** is used.

Running the Diagnostics



3.1 Overview

This chapter describes how to use the diagnostic software:

- considerations
- strategy
- entering and exiting diagnostics
- starting diagnostic tests

The five sets of diagnostics are described in the chapters that follow.

3.2 Considerations

Before running the diagnostics:

- If the system crashed or panicked, be sure to dump the system to tape, as described in Section 3.3.4.
- Be sure that the operating system is shut down properly (see Section 3.4)
- Be sure that the tests match the revision levels of the boards (test descriptions specify the board revision levels).
- Check the revision level of the TCS Executive software; this guide applies to revision levels listed in the 'How to Use This Manual' section. The revision is displayed at the main TEX menu.

3.3 Diagnostic Strategy

This section discusses the sequence of diagnostics and how to find problems quickly. It is especially useful for anyone who is unfamiliar with the diagnos-

tics. It deals with two general situations: running diagnostics to verify an installation and running diagnostics to find problems.

3.3.1 Running Diagnostics to Verify an Installation

After installing the system, you should run the five diagnostic suites to ensure that it is operating properly. The fastest way to find problems is to run the tests in the following order:

1. Processor diagnostics establish a reliable base for interpreting the other diagnostic results; they find most problems that are specific to the processors.
2. Switch diagnostics verify that the paths through the machine are working.
3. STP diagnostics provide a good overall test of the processor/switch interaction. Their results also allow you to find most problems if you have already ruled out the processor and the switch. For an 8-node system, run STP for 80 passes. This takes about an hour. For a 16-node system, run STP for 400 passes (5 hours). For a 24-node system, run STP for 800 passes (10 hours). For a 32-node system, run STP for 1600 passes (20 hours).
4. Standalone Peripheral Diagnostics test the controllers and peripheral devices; you should run the first three diagnostics before running this one.
5. The "all tests" option of the nX Operating System Peripheral Diagnostics (**periph_diag**) provides a system-level test of the peripherals. This test takes about five hours.

3.3.2 Running Diagnostics to Find Problems

If the system has crashed, dump the system to tape, as described in Section 3.3.4. If you are trying to find an intermittent problem or cannot dump the system to tape:

1. Run the first four diagnostics in the order defined in Section 3.3.1.
2. If all tests pass, reboot the system. If any test fails, refer to the appropriate chapter on that test to diagnose the problem.
3. If system crashes persist and hardware is suspected, the same diagnostics can be run to give the system a more thorough test.

3.3.3 Diagnosing System Problems

The first step in finding problems is to dump the system to tape (if possible) as described in Section 3.3.4. Return this to BBN ACI for analysis; it could prove essential in finding some problems.

System Panics in kdb

Most problems with the system result in a panic message and leave the system in the **kdb** debugger (assuming **kdb** was activated). If the system is in **kdb**, follow the crashdump procedure in Section 3.3.4.

System Panics without kdb

If the system does not end up in **kdb**, try to enter **kdb** through TEX by typing backquote period (`.) to get into TEX and then typing the appropriate commands:

TEX -> hard nmi ↵	Sets the NMI flag allowing entry to kdb
TEX -> app run ↵	Starts the "application"

Then follow the crashdump procedure in Section 3.3.4.

System Hangs

If the system is hung and will not respond to <Control>C, <Control>Z, <Control>D, <Control>Q, or <Return> check the RECEIVE light on the master node. If it is on, look for the SEND light on one of the slaves. If it is on, unplug this slave from the system. This will cause the system to panic and leave the system in the **kdb** debugger (assuming **kdb** was activated). Then follow the crashdump procedure in Subsection 3.3.4.

System Crashes

If the system crashes and the TCS does not respond to the keyboard, try to reset the TCS and get into **kdb**. To reset the TCS, use the system reset switch.

If this does not work, try shutting down the system and rebooting. *This should be your last resort, since rebooting destroys all system information that might be helpful in diagnosing the problem.*

3.3.4 Dumping a System to Tape (crashdump)

NOTE

~~~~~  
 If you have no time to produce a crash dump tape of all the nodes in your system panic (nodes take about 4 minutes each to dump) call BBN ACI at 1-800-4AC-BFLY. The customer support staff may be able to help you to identify a subset of the nodes that you need to dump to tape.

Note also that one SCSI cartridge tape cannot accommodate more than 32 nodes of crash dump information. If your tape runs out before all the nodes are dumped, simply send to BBN ACI what was actually saved on that single tape.  
 ~~~~~

To dump a system to tape, **kdb** must be running. If **kdb** is running follow the procedure in Figure 3-1. If not, try to activate **kdb** by using one of the methods described in Subsection 3.3.3. (For more information on dumping the system, see the *TC2000 System Administration Guide*.)

Figure 3-1 Crashdump Procedure

# \$% ↵	Starts the dump session
Please put a tape in the tapedrive, type 'y' to start dump...	
y	Insert the tape into the 1/4" tape drive. Type y to start the dump.
Do you wish to dump all nodes? Please type 'y' or 'n'...	
y	You should respond with a y "yes". The system then proceeds to dump all nodes, displaying miscellaneous messages.
Dumping all nodes. Dumping node 0 = (physical node 0x8) 512 pages Dumping node 1 = (physical node 0x9) 512 pages . . .	
Dump completed...	If you typed an n "no", you would be prompted for each node.

To exit the **kdb** session, type:

:c

3.4

Entering and Exiting Diagnostics

The diagnostics are started from one of three places: the DOS prompt, the TEX prompt, or the nX OS prompt. If you are running diagnostics for the first time after a system installation (or re-installation), follow the instructions in Subsection 3.3.1. If the operating system is running, you must halt it first. If the system is crashed, the console may display the **kdb**, TEX or DOS prompt (see Chapter 2).

DOS-based Diagnostics:

B2SWITCH	for switch diagnostics
B2CLK	for TC/CLK diagnostics
B2MODEM	for modem diagnostics

TEX-based Diagnostics:

B2VME2	for B2VME diagnostics
TCFPV	for TC/FPV diagnostics
STP	for STP diagnostics
VMEDIAG	for peripheral diagnostics
DISKTOOL	for SCSI disk exercising

B2MDM requires rebooting from the second diagnostic floppy disk (See Chapter 10).

nX OS-based Diagnostics:

periph_diag	for peripherals diagnostics
stress	for peripheral and system exercising
disktool	for SCSI disk exercising

periph_diag and **stress** are a separate programs that run from the nX Operating System (see Chapters 8 and 9).

3.4.1

Starting Diagnostics from DOS

To start a diagnostic from the DOS prompt, type the following:

```
C:\TCS>CD \DIAG\diagname ↵ Changes to the desired directory, where
                             diagname is one of the DOS-based or TEX-
                             based diagnostics as listed above.
```

```
C:\diag\diagname>START ↵ Initializes the system and displays the diag-
                             nostic's prompt.
```


3.4.2

Starting Diagnostics from TEX

To start a TEX-based diagnostic from the TEX main menu, follow the example in Figure 3-2. Although abbreviations have been used you may wish to type the full command name or use the menus. The **BOOTCFG.TCS** file in the current directory will be used; that file may differ from the one in the **diag** directory. For instance, the **diag** directory **BOOTCFG.TCS** file disables alternate paths by default.

Figure 3-2

Starting Diagnostics from TEX

```

TEX -> c r ↵                               Configure Reconfigure; Reconfigures the system
TCS: Previewing machine state...
.
.
; End of BOOTCFG.TCS
TEX -> a f a ↵                               Application File-Select Application; Load the fol-
                                          lowing application

Function: Application
Application Bootstrap File.
  Filename                               <String>
-> Application
Enter Filename -> \diag\diagname\diagname.88  This is the diagnostic to load, where diag-
                                          name is one of the TEX-based diagnostics.
TEX -> a r ↵                               Application Run; Starts the loaded application.

Clock card CA already running.

.
.
TCS: Switching console terminal to application.
Clearing bss (0x33860 -> 0x33940)...Done

```

3.4.3

Running Diagnostics

Most of the diagnostics start by prompting you for the type of terminal you are currently using. At the terminal-type menu prompt, select the terminal type that is the closest to the type you are using, by typing in the appropriate number and pressing <Return>.

If you are using a printer or dumb terminal, type **6**<Return>. The diagnostics won't use screen refreshes, highlighting, or automatic menus display (to save paper). You can type **?<Return>** to display menu choices.

You may need to quit from the terminal-type menu to get to the diagnostics main menu. You can then select the tests you want to run. The terminal type is listed on the same line as the Terminal Type menu item.

See the appropriate chapter for details of the desired diagnostic.

```
Menu: Terminal-Type
  1. Quit
  2. VT320
  3. VT100
  4. Sun
  5. X
  6. PC
  7. Hardcopy
  8. Menu
  9. More

ver x.xx

Terminal-Type ->
```

3.4.4

Exiting Diagnostics

To exit from the diagnostics, you must first return to the TEX prompt, as described in Chapter 2.

When the TEX diagnostic has finished, return to the TEX prompt by typing a backquote, period (`.). Note that the backquote is not echoed on the screen until you type the period. You can then quit out of TEX or start the next diagnostic.

Processor Diagnostics



4.1 Selecting the Diagnostic

This chapter includes information on processor diagnostics, for B2VME and TC/FPV processors. There are two processor diagnostics, one for each of the two processor types. To find out which type of processors are in the system, type the following at the TEX prompt:

```
TEX -> c scan    Configure: Scan
```

When TEX prompts for size use **small** for systems with 8 or less, **medium** for systems with 9-32, and **large** for systems with greater than 32 processors. TEX displays the processor type and revision levels as below.

```
7.7.0:  Type: '8' B2VME-B, (Processor node) Ser #: H946-18
7.7.0:  Type: 'G' TC/FPV-4, (Processor node) Ser #: C007-03
```

TC2000 systems may have more than one type of processor. Use the appropriate diagnostic for the processor in the system:

<u>Processor</u>	<u>Card type</u>	<u>Diagnostic to use</u>	<u>Section to turn to</u>
B2VME	8 or A	B2VME2.88	4.2
TC/FPV	G or H	TCFPV.88	4.5

4.2 B2VME2 Overview

This section describes the diagnostics for the TC2000 B2VME card (type 8 or A). This diagnostic is useful for verifying an installation, locating a possible processor fault, or confirming that a particular processor is bad.

The purpose of these tests are to fully test the hardware on the B2VME card. There are a number of script files that save the time of loading the diagnostic in each processor.

4.3 How to use the B2VME2 Diagnostics

Run the B2VME2 diagnostics on each B2VME; first the master node and then each slave node. After initializing and loading the diagnostic, the system displays the terminal-type menu. Select your terminal. The diagnostic menu is displayed. To exit from the diagnostics, type a backquote and a period (`. `) or type **quit** at the B2VME2 main menu. This brings up the TEX prompt.

4.3.1 Run Times

The typical time to run the system script on a 4 MB B2VME is 15 minutes and on a 16 MB B2VME it is about one hour.

4.3.2 Initializing the System and Loading Diagnostics

The B2VME2 diagnostics are started from the DOS or TEX prompt (see Chapter 3). From DOS by type:

```
C:\ CD \DIAG\B2VME2 ↵    Changes to the B2VME directory.
C:\DIAG\B2VME2 > START ↵  Initializes the system.
```

This brings up the initial (terminal type) menu. Select your terminal type. This brings up the B2VME2 diagnostic main menu:

```
Menu:  B2VME2                                Node Number = 7.7.7

1. Memory-Systems
2. Siga-Tests
3. Local-Registers
4. Augmentation-Tests
5. Board-Options
6. Software-Options
7. Execute-Scripts
8. Terminal-Type
9. Quit                                       vt320, Menu-On
```

4.3.3 Executing the Test Scripts

Select the Execute-Scripts menu (type **Ex**). This brings up the Power-Up and Field-Level Diagnostic menu. (The rest of the diagnostics are for board-level testing and should only be used at BBN.)

1. Power-up-Diagnostics
2. Bench-Power-up-Diagnostics
3. 4 Power-up-Diagnostics_REV_A4
4. Manufacturing-Diagnostics
5. Bench-Manufacturing-Diagnostics
6. Field-Diagnostics
7. Quit

To execute the B2VME2 diagnostics, type **1** or **6**. Currently, both of these tests are the same. The end results are something similar to the following:

```
Ram-Data-Test: Test Passed
Field Diagnostics: Test Passed
```

At this point you may rerun tests or go back to the TEX menu.

4.4 Executing on Multiple B2VMEs

There are several scripts included in the diagnostic directory to assist you in loading all the B2VMEs in the system at once. The scripts are set up to load eight nodes at once, in one of 4 configurations (midplanes 7, 6, 5 and 4) or 32 nodes all at once. To run one of these scripts, first initialize the system (see Subsection 4.3.2). Then type:

```
TEX -> do load7.tex
```

This loads and start all of the B2VMEs associated with mid-plane 7 (7.7.0 through 7.7.7), but you still need to still need to run the actual diagnostic on each loaded node. When it finishes loading, the TEX prompt is displayed.

You can then run the diagnostics on the master node by typing **a tty** this displays the terminal-type menu (shown in Subsection 11.2.2). To test another B2VME, go back to TEX by typing backquote and a period (‘.) then type the following commands:

```
TEX -> u slave x.y.z      where x.y.z is the number of another slave
                             started by the script
TEX -> a tty
```

Proceed until all nodes are tested in the 7.7.x midplane series.

There are 4 other load files. These are:

```
load6.tex (7.6 midplane)
load5.tex (7.5 midplane)
load4.tex (7.4 midplane)
load32.tex (7.all midplanes)      This takes about 1/2 hour to load.
```


4.5 TCFPV Overview

This section describes the diagnostics for the TC2000 TC/FPV card (type G or H). This diagnostic is useful for verifying an installation, locating a possible processor fault, or confirming that a particular processor is bad.

The purpose of these tests are to fully test the hardware on the TC/FPV card. There are a number of script files that save the time of loading the diagnostic in each processor.

4.6 How to use the TCFPV Diagnostics

Run the TCFPV diagnostics on each TC/FPV: first the master node and then each slave node. After initializing and loading the diagnostic, the system displays the terminal-type menu. Select your terminal type. The TC/FPV menu is displayed. Select the Execute-Scripts menu item, then choose a script to run. To exit from the diagnostics, type a backquote and a period (`.) or type **quit** at the TC/FPV main menu. This brings up the TEX prompt.

4.6.1 Run Times

The typical time to run the system script on a 4 MB TC/FPV is 7 minutes and on a 16 MB it is about one half hour. The typical time for the Fast-System-Script is two minutes, since it only uses a small amount (8 kb) of memory for testing.

4.6.2 Initializing the System and Loading Diagnostics

The TC/FPV diagnostics are started from the DOS or TEX prompt (see Chapter 3). From DOS type:

```
C:\ CD \DIAG\TCFPV ↵      Changes to the TCFPV directory.  
C:\DIAG\TCFPV > START ↵  Initializes the system.
```

Once loaded, the initial (terminal type) menu is displayed. Select your terminal type. This brings up the TC/FPV diagnostic main menu.

```

Menu:  TC/FPV                               Node Number = 7.7.7
  1. Memory-Systems
  2. Cpu-88k-Tests
  3. Siga-Tests
  4. Local-Registers
  5. Board-Options
  6. Software-Options
  7. Execute-Scripts
  8. Terminal-Type
  9. Debugger
 10. Quit
vt320, Menu-On

```

4.6.3

Executing the Test Scripts

Select the Execute-Scripts menu (type **Ex**). This brings up the Diagnostic Scripts menu:

```

Menu:  TC/FPV Script-Menu
  1. Fast-System-Diags
  2. Fast-Bench-Diags
  3. System-Diags
  4. Bench-Diags
  5. Manufacturing-Diags
  6. Manufacturing-Bench-Diags
  7. Run-All-Scripts
  7. Quit

```

To execute the TC/FPV test script, type **3** for a complete board test or type **1** for a quick test. The rest of the diagnostics are for board-level testing and should only be used at BBN. The results for **1** or **3** are similar to the following:

```

Ram-Data-Test: Test Passed
Field Diagnostics: Test Passed

```

At this point you may rerun tests or go back to the TEX menu. If you want to stop the current script type a <Control-C>.

4.7

Executing on Multiple TC/FPVs

There are several scripts included in the diagnostic directory to assist you in loading all the TC/FPVs in the system at once. The scripts are set up to load eight nodes at once, in one of 4 configurations (midplanes 7, 6, 5 and 4) or 32 nodes all at once. To run one of these scripts, first initialize the system (see Subsection 4.6.2). Then type

TEX -> **u do load7.tex**

This loads and starts all of the TC/FPVs associated with mid-plane 7 (7.7.0 through 7.7.7), but you still need to run the actual diagnostic on each loaded node. When it finishes loading, the TEX prompt is displayed.

You can then run the diagnostics on the master node by typing **a tty** this displays the terminal-type menu (shown in Subsection 11.2.2). To test another TC/FPV, go back to TEX (‘) and type the following commands:

TEX -> **u slave x.y.z** where x.y.z is the number of another slave
started by the script

TEX -> **a tty**

You may now run the diagnostics on the next node.

Exit the TCFPV diagnostic by typing backquote and a period (‘). You can then run another script or specify and test another TC/FPV.

Proceed until all nodes are tested in the 7.7.x midplane series.

There are 8 other load files. These are:

load6.tex (7.6 midplane)
load5.tex (7.5 midplane)

·
·
·

load0.tex (7.0 midplane)
load32.tex (7.all midplanes)

This file takes about 1/2 hour to load.

Switch Diagnostics



5.1 Overview

This chapter describes the diagnostic for the TC2000 Switch Cards. This diagnostic is useful for verifying an installation, locating a possible switch fault, or confirming that a particular switch card is bad.

The purpose of these tests are to fully test the hardware on the TC/SS and TC/SR cards.

5.2 How to use the Switch Diagnostics

After initializing, start with the Switch Status Function, then select the Connectivity tests on the whole system to help isolate any problems. To exit from the diagnostics type **quit** at the Switch Main Menu. This returns you to the DOS prompt.

5.2.1 Run Times

The typical time to run the Switch test is 10 to 15 minutes per TC2000 Switch.

5.3 Executing the Switch Diagnostics

To run the switch diagnostics, you must be at the DOS prompt. After initializing and loading the diagnostic, the system displays the terminal-type menu. From this menu set up your terminal and then quit. This will bring up the diagnostic menu.

5.3.1 Initializing the System and Loading Diagnostics

The switch diagnostics can only be started from the DOS prompt:

```
C:\> CD \DIAG\B2SWITCH ↵ Changes to the B2SWITCH
                           directory.
C:\DIAG\B2SWITCH> START ↵  Initializes the system.
```

This brings up the initial (terminal type) menu. After selecting your terminal type the switch diagnostic main menu is displayed.

Typing **quit** at the main menu prompt returns you to the DOS prompt because the switch diagnostics execute in the TCS and do not use TEX.

5.4 Switch Diagnostic Main Menu

The switch diagnostic main menu give you the following choices:

```
Menu: TCS
      1. TC/SS-Diags                BE SURE SYSTEM IS INITIALIZED
      2. Initialize-System
      3. Display-Switch-Configuration
      4. Logging-On/Off            Logging Off
      5. Terminal-Type            Hardcopy, Menu-On
      6. Quit
```

Always begin by initializing the system (2), then select the TC/SS-Diags (1).

5.5 Initialize System

If you are not sure that the system is initialized, it is recommended that you do so. This resets all boards and should not be executed while the system is running the nX operating system.

After selecting this item from the main menu, you are presented with the following prompts:

```

Function: Initialize-System
Initialize Clock
  Clock (a/b) or Test Jig (t)
                                <String>           A
  Frequency                      <Number>         40
-> Initialize-System
Enter Clock (a/b) or Test Jig(t) <String> -> (A)␣

-> Initialize-System A
Enter Frequency <Number> -> (40)38␣

-> Initialize-System A 38
This will completely re-initialize the system!!!
Do you want to continue (y or n) y

```

[typing y results in the following messages]

```

Scanning System for Processors and switch Cards
.
.
.
Scanning System for Processors and switch Cards
.
.
.
Initialize System: Test Passed

```

The defaults are “A” for the clock and “40” (40MHz) for the frequency. Currently, you **must** change the frequency to 38MHz or the system will not operate correctly. Pressing any key returns you to the main menu.

5.6 Display Switch Configuration

The Display-Switch-Configuration function is a configuration aid. It is executed by selecting item **3** from the Diagnostic Main Menu. Once that item is selected, the menu is displayed.

This menu displays the connections from switch to switch for the number of midplanes. It prompts you to enter the number of midplanes in the system and then a table of connections is displayed (and logged if logging is turned on).

```

Function: Display-Switch-Configuration
Switch Configuration
    Midplanes                <Number>
-> Display-Switch-Configuration
Enter Midplanes <Number> -> ()7d
-> Display-Switch-Configuration 7
Displaying Configuration for 7 Midplanes

Connect Midplane 7 connector 7 to Midplane 7 connector 7
Connect Midplane 7 connector 6 to Midplane 6 connector 7
Connect Midplane 7 connector 5 to Midplane 5 connector 7
.
.
.
more messages
.
.
.
Connect Midplane 1 connector 3 to Midplane 3 connector 1
Connect Midplane 1 connector 2 to Midplane 2 connector 1
Connect Midplane 1 connector 1 to Midplane 1 connector 1

```

5.7 Logging On/Off

The logging function saves results of a test into a file. To turn on logging select item **4** from the Diagnostic Main Menu. You are prompted for a filename; if the file exists you may overwrite it or append the results to the end of it. To turn off logging select item **4** and don't enter a filename (press <Return>).

5.8 TC/SS Diagnostics

Selecting item **1** from the Diagnostic Main Menu displays a sub-menu that prompts you for the type of testing you plan to do.

```

Menu: TCS TC/SS(SR)-Switch-Diags
  1. Board-Level-Diags
  2. System-Level-Diags
  3. Command-Level-Diags
  4. Quit

```

5.8.1 Board Level Diagnostics

These diagnostics are used for 'burning in' data into the EEPROMs on the switch boards. This is unlikely to be used in normal testing and troubleshooting operations, and is not covered in this guide.

5.8.2 System Level Diagnostics

The System Level Diagnostics Menu is displayed by selecting item 2 from the TCS TC/SS(SR)-Switch-Diagnostics Menu shown in Section 5.8. Once that item is selected, the following screen is displayed.

```
Menu: TCS TC/SS(SR)-Switch-Diags System-Level-Diags
      1. Switch-Status
      2. Connectivity-Test
      3. Margin-Power
      4. Bulk-Voltage-Read
      5. Temperature-Read
      6. Quit
```

Switch Status Function

Selecting item 1 from the System Level Menu brings up the Switch Status menu. Running this test reports the activity status of the specified switch boards. The test prompts you to specify which switches to test as shown in the following screen:

```
Menu: TCS TC/SS(SR)-Switch-Diags System-Level-Diags Switch-
      Status
      1. Add-a-Path
      2. Delete-a-Path
      3. Test-for-all-Paths
      4. Logging-On/Off           Logging Off
      5. Run-Test
      6. Quit
```

To check all the paths, select item 3. To check individual paths, or a subset of paths, add and delete paths with items 1 and 2. When editing paths the current list of addresses will be displayed between the menu and the prompt line. After you have entered all the addresses select item 5 (Run-Test).

NOTE

The b2switch status test always reports that the clock signal is bad; ignore this message if your system boots and runs.

For each switch requestor and server the following information is displayed:

```

Serial Number C937-05   Address 7.7.9   Server
Clock Signal Bad   Temperature OK   Voltage Levels OK   Slave Processor OK

INPUT PORT         0   1   2   3   4   5   6   7
Activity           0   0   0   0   0   0   0   0

OUTPUT PORT        0   1   2   3   4   5   6   7
Activity           0   0   0   0   0   0   0   0
Priority           0   0   0   0   0   0   0   0

Revisions
  Artwork           A
  Electrical        A
  TCS Slave        B1

```

Test Passed

Connectivity Tests

Selecting item **2** from the System Level Menu displays the Connectivity Tests Menu. This tests the connections between the processors and the switch and between the server and the requestor. This does not test out all the paths or the switch board logic.

When the connectivity test is selected the following menu is displayed:

```

Menu:  TCS TC/SS(SR) ... System-Level-Diags Con-Tests
      1. Processor-To-Switch-Test
      2. Switch-To-Switch-Test
      3. Switch-To-Clock-Test
      4. Full-System-Test
      5. Quit

```

The first three tests are very similar in operation. Item **1** tests the control and data lines from the processor to the switch (both requestor and server). Item **2** tests the control and data lines from the requestor to the server. The path sub-menu for both tests is similar to the Switch Status Function. The number of entries that make up a path is slightly different. Turning off Verbose mode allows you to get a simple pass/fail type test instead of the complete information from the test.

1. Processor-to-Switch-Test

To run the processor-to-switch test, type **1** at the menu prompt. The processor-to-switch test menu is displayed:

```

Menu:  TCS TC/SS(SR)-Switch-Diags ... Proc-to-Switch-Test
       1. Add-a-Path
       2. Delete-a-Path
       3. Test-for-all-Paths
       4. Logging-On/Off           Logging Off
       5. Verbose-On/Off         Verbose Mode On
       6. Run-Test
       7. Quit
  
```

Type **3** to test for all paths, and then **6** to run the tests. Then respond to the queries as follows:

```

This will interrupt traffic on the switch
Do you want to continue? (y or n) y      Don't type a <Return>.
  
```

Scanning System for Processors and Switch Cards

more messages.

```

Checking data paths; sent 64 received 64
Checking data paths; sent 128 received 128
Press any key to continue
  
```

4. Full-System-Test

Item **4** (Full-System-Test) tests all paths for both the Switch to Switch connections and the Processor to Switch connection. Select **4** to display the menu:

```

Menu:  TCS TC/SS(SR)-Switch-Diags ... Full-System-Test
       1. Logging-On/Off           Logging Off
       2. Verbose-On/Off         Verbose Mode On
       3. Run-Test
       4. Quit
  
```

Full-System-Test ->

The Full-System-Test tests all paths for both the Switch-to-Switch connections and the Processor-to-Switch connection. On the Full-System-Test menu

you may toggle both logging and verbose mode. After setting the paths you want to test, select item 3 (Run-Test). Then respond as follows:

```

This will interrupt traffic on the switch
Do you want to continue? (y or n) y  Don't type a <Return>.

```

```

Scanning System for Processors and Switch Cards

```

more messages.

```

Press any key to continue
Checking communications from . . .

```

System will return with many screens of messages, each of which end with Press any key to continue. Press any key to continue. The main menu is displayed when the test is completed.

```

Press any key to continue

```

Changing Verbosity Mode

You can change the verbosity mode in any of the switch tests. Select verbosity with (option 5) followed by 0 (zero for verbosity mode **off**) or 1 (one for verbosity mode **on**). You can also just type the verbose menu item number and respond to the prompt. Note, however, that you can do this for any of the tests with the verbosity option.

```

Proc-to-Switch-Test -> 5 0

```

The 5 selects the Verbose-On/Off option, and the 0 indicates verbosity mode off. The dialog then returns you to the main menu.

5.8.3

Command Level Diagnostics

These diagnostics are used for debugging an individual switch board. They are unlikely to be used in normal testing and troubleshooting operations at the system level, and are not covered in this guide.

Sinister Test Program (STP) Diagnostics



6.1

Overview

The Sinister Test Program (STP) was not initially intended for use outside BBN, so it is not user-friendly. You can follow the sample session in Section 6.3 and analyze the results by referencing sections starting with Section 6.5.7.

This diagnostic is used to exercise multiple-processor TC2000 systems. It runs on TC2000 function cards, and its operation is manually controlled via the TCS console. STP consists of a user-level command interpreter, and a set of canned exercise procedures. In this sense, it is very similar to the board level diagnostic program in the processor diagnostics (Chapter 4). However, STP organizes all of the nodes in a system so that they can communicate among themselves, and so that they can perform various exercises simultaneously. This environment allows testing for:

1. A function card's ability to generate switch transactions to remote nodes.
2. A function card's ability to service switch transactions from remote nodes.
3. The switching network's ability to carry transactions between nodes.
4. A function card's ability to support intermixed transactions by the local CPU and the switch.

While other programs can perform a limited amount of this form of testing, STP is the most comprehensive multiprocessor testing program.

6.2

How to use the STP Diagnostics

The following section (6.3) has an example of how to run STP on a 7-processor machine using the TCS. It shows the results of one node failing. The steps are:

1. load and start STP via the TCS
2. initialize the STP master with parameters appropriate for that machine
3. bootstrap slave nodes
4. set up one or more nodes to run a test function
5. start the tests running
6. check for errors
7. display results
8. halt the tests

These steps are described in more detail in following the example.

6.2.1

Run Times

For an 8-node system, run STP for 0x80 passes. This takes about an hour. For a 16-node system, run STP for 0x400 passes (5 hours). For a 24-node system, run STP for 0x800 passes (10 hours). For a 32-node system, run STP for 0x1600 passes (20 hours).

The amount of time required for a system to complete a given number of passes will vary with the number of processors, the speed of the switch, and the availability of alternate paths. Large machines usually run passes faster than small machines. If you believe that you have a system that has faulty hardware, but does not fail in 30 minutes, run the test longer—one or two hours. In the worst case, let it run all night. The most convenient way to do timed tests is to set the slaves up with a pass count of 0, and abort the test after its time is up.

6.2.2

Basic Operation

STP sets up memory partitions on each processor and then writes data patterns into memory and verifies them. Essentially three types of errors may occur. These are either processors that cannot write specific data transfers, processors that cannot receive specific data transfers, or a switch that cannot process specific data transfers.

STP tests all the alternate paths, but it is difficult to isolate alternate switch path problems, if a failure occurs.

NOTE

~~~~~

**Before running STP on any board or machine:** be sure that the processor diagnostics have run to completion and run the Switch Connectivity test in the switch diagnostics to guarantee that all the cables and B2Loops are in place.

~~~~~

6.3 Running a Sample Session

Below is an example of how to run STP on a 4-processor machine using the TCS. It shows the results of one node failing.

6.3.1 Loading and Starting

The STP diagnostic is started from the DOS or TEX prompt (see Chapter 3). From DOS type:

```
C:\TCS> CD \DIAG\STP ↵          Changes to the STP directory.
C:\DIAG\STP> TEX -A ↵          Automatically loads and starts STP.
TCS: Previewing machine state...
TCS: Number of clocks found = 1, disabled = 0.

                            .
                            .
                            .
                               more messages

Data of stp.88 loaded.
Node 7.7.7 has been loaded
Program entry point is 0x1c000.
TCS: Switching console terminal to application starting

*** STP - Sinister Test Program ***
      version 6.300, compiled Oct 13 1989.  Type ? for help
->
```

6.3.2 Initializing

After loading the diagnostic initialize the system:

```
-> stp i ↵                       Initialize using default parameters
Using POST alternate path randomizer
found 8 (decimal) processors in 1 midplane

Attention: this processor [7] will be master
Sinister Test Program  initialized master
```

6.3.3 Booting up Slaves

After initializing, boot up the slaves:

```
-> stp b ↵          Loads and starts the STP kernel on slave
                    nodes.

booting slaves . . .
0x01  0x02  0x03  0x04  0x05  0x06  0x07
boot done
```

6.3.4 Setting Up Nodes

After booting, set up the nodes:

```
-> stp s d 1 101 0 ↵      Setup a slave to run a certain test.

Setting up test 0xD: scattered write-verify

-> stp v 1 ↵             Spread test parameters from one node
                        throughout the system.
```

6.3.5 Starting the Tests

After setting up the nodes, start the tests:

```
-> stp g ↵             Start tests which have been previously set up.
```

6.3.6 Checking for Errors

After setting up the nodes, check for errors:

```
-> stp f ↵             Find processors with test faults.

total: 1 faults on 7 active nodes
checking watchdog counters..
done
```


6.3.7 Displaying Results

If you find an error, use the edify command to see a digested version of the results:

```

-> stp e 1 ↵
----- STP node 0x1
destination node: 0x00
fast path: ON      cache: OFF
NODE HAS HAD 3 MEMORY VERIFY ERRORS
first error was at address 87EFA84
expected value was: 0000A0AB
actual value was: 00001689
destination node: 0x01
fast path: ON      cache: OFF

1 is the node that failed above (normally shown)
CURRENT pass in 0x42 -----
transaction: xmem word
short cut: ON      concurrency: ON
[node 1, local address 3EFA84]
transaction: halfword
short cut: OFF     concurrency: OFF

```

6.3.8 Halting the Tests

After displaying the results, halt the test:

```

-> stp a ↵
Stops a test in progress. Allows for new test to
be set up.

sending abort signals . . . .
0x01 0x02 0x03 0x04 0x05 0x06 0x07
done

-> stp u ↵
Pushes all slaves into the microboot loop and
uninitializes the master.

Sinister Test Program deactivated

```

To get back to TEX type a backquote followed by a period (`.).

6.4 Introduction to “Scatter-Verify”

The example STP session used test 0xd (“scatter-verify”), which is the most important tool for stressing a multiprocessor system. Whenever you are attempting to qualify a system, this is the test you should run. The rest of this chapter often uses “STP” to mean the STP scatter-verify test.

STP's scatter-verify exercises many components at once. When something malfunctions, you must figure out which of the many possibilities caused the problem. STP catches and holds information when errors occur, and you must use this information to isolate the fault. Sometimes this requires sophisticated detective work.

6.4.1 Overview of Scatter-Verify

In essence, the scatter-verify test is a high-intensity memory exerciser. During operation it systematically writes and reads memory all over the machine. In the STP environment, there is a division in the memory of a processor. On every processor, the first one megabyte of memory is reserved for use by STP code, STP data, and memory management page tables. The remainder of memory (3 MB on the B2VME) is known as the STP "target zone". It is this region of memory that is energetically written and read in the scatter-verify test. This target zone is divided up into 4 KB slices. Each processor "owns" a number of slices on every processor in the system.

6.4.2 Basic Operation

The basic unit of STP operation is the "pass". A pass by one node consists of writing, then reading and verifying, all of its slices on a fixed destination node. The data transfers in a given pass are performed using a fixed type of bus transaction. For example, here is a snapshot of one node's activity during this test. The **edify** command provides information about what an STP slave is doing:

```

-> stp e 1 ↵      Displays a digested version of results for node 1.
-----          STP node 0x1      current pass = 0x20      -----

destination node: 02      transaction:      byte
fastpath:         ON      code cache:      ON
switch short cut: ON      88K concurrency: ON
  
```

This informs us that:

- node 1 is on scatter-verify pass 0x20
- its current destination node is node 2
- it is using byte transactions

The number of passes to perform, as well as the kind of transactions to use are specified in the test setup command:

```
-> stp s d node type passes ↵
```

The very first pass a slave makes is always directed at its own memory. Successive passes are made to successively higher numbered nodes. For example, node 1 makes its first pass in its own memory, its second pass in the memory of node 2, and third in node 3. When the highest node is done, the pattern starts again at node 0. The memory exercise is made into every node which has been booted with STP, regardless of whether that particular node is running the scatter-verify test itself. There is no way to restrict the test to operate on a subset of the booted nodes.

When the prescribed number of passes have been completed, the test stops. If the number specified was 0, the test will run forever unless it is stopped manually. The ordinary transaction types are listed below:

0	bytes
1	half words
2	full words
3	quad words
4	Xmem words
5	augmented locked full words

Thus,

```
-> stp s d 1 3 100 ↵
```

Sets up test 0xD on node 1, using transaction type quad words, for 0x100 passes. And,

```
-> stp s d 2 5 0 ↵
```

Sets up test 0xD on node 2, using type locked words, for an infinite number of passes.

NOTE

When a slave has been set up to run an infinite number of passes, it may be stopped at any time with the abort-test command (**stp a**).

6.4.3

Super Transaction Types

While this test provides the capability to restrict transaction types, it is normally desirable to use every kind possible. Towards this end, STP supports a pair of "super" transaction types. The first is type 0x100:

```
-> stp s d 1 100 0 ↵
```

When type 0x100 is specified, the node running the test cycles through all the different transaction types. This is done by picking a new transaction type at the beginning of each pass. The entire pass is made with that type. For the very first pass, each processor chooses a transaction type as a function of its

node number. In successive passes, the types are used in the numerical order listed above.

In addition, another level of behavior modification is available. It is the second "super" type, number 0x101

-> **stp s d 1 101 0** ↵

Looking again at the sample test results in Section 6.4.2:

```

-> stp e 1 ↵           Displays a digested version of results for node 1.
----- STP node 0x1      current pass = 0x20 -----
destination node: 02      transaction:          byte
fastpath:          ON      code cache:          ON
switch short cut: ON      88K concurrency:  ON

```

Option 0x101 uses the same cycling transaction types as option 0x100 but also affects the use of the last four features listed in the **edify** command:

B2VME fast path enable
 88K instruction cache enable
 switch short cut enable
 88K concurrency enable.

These are features STP is free to turn on or off as it likes. STP runs with any of them on or off, but it runs a little differently. Normally, they are all enabled, as shown in the status message above. However, when transaction type 101 is specified, the scatter-verify procedure regularly turns each of these features on and off. When the test is done, they are returned to their normal states.

6.5 Using and Analyzing STP

This section goes through a sample STP diagnostic in detail, including analysis of the test results. When running STP, you should follow the seven steps described in this Section.

6.5.1 Step 1: Load and Start STP via the TCS

The Sinister Test Program is stored on the hard disk of the TCS master. It is kept in the directory C:\DIAG\STP. This directory also contains the necessary TCS configuration files to initialize the system and load STP.

To load and start STP:

```
C:\TCS> CD \DIAG\STP ↵           Changes to the STP directory.
C:\DIAG\STP> TEX -A ↵           Starts the diagnostic.
.
        more messages
.
starting

*** STP - Sinister Test Program ***
        version 6.300, compiled Oct 13, 1989.  Type ? for help
```

If your “start” does not get this far, something has malfunctioned. There are three most likely causes:

- The boot configuration file in \diag\stp is broken or missing.
- An executable file is missing (eg: uboot, post or stp)
- The system is broken in such a way that the TCS cannot initialize it.

You can check the first two using the TCS (see Chapter 2); for the last one call BBN ACI.

6.5.2

Step 2: Initialize STP Master Node Parameters

The node on which STP is first loaded serves as the STP “master”. This node need not be the same as the nX OS master node. If circumstances require it, the BOOTCFG.TCS file can be set to load STP on any node in the machine.

You can set up to three system parameters during STP initialization. In most cases, however, you will not need to specify any of them. The following command is sufficient:

```
-> stp i ↵
Using POST alternate path randomizer
found 8(decimal) processors in 1 midplanes
Attention: this processor [0] will be master
Sinister Test Program initialized
```

The complete form of this command is described later in Section 6.6.3.

6.5.3

Step 3: Bootstrap Slave Nodes

The objective of this phase is to get the STP kernel running on all the slave nodes in the machine. For each node, the STP master first checks that the slave is ready to accept an application program. It then copies itself onto the slave and tells the slave node to start. Once all of the slaves have been loaded, the master goes back and checks that each one has successfully completed initializing its STP environment. No explicit initialization command is needed for the slaves.

```
-> stp b ↵
booting slaves...
      0x01  0x02  0x03  0x04  0x05  0x06  0x07
boot done
```

This is the first place where problems can show up. If the switch is not functioning correctly, or if a slave node is seriously broken, the bootstrap may fail.

The Switch

A typical switch problem may produce error messages like:

```
booting slaves...      0x01  0x02
unexpected trap - Bus error .....
berr_vec .....
Data CMMU caused this trap
Pipeline: .....
Bus error cause: Sw Reject Timeout
Data CMMU fault code: Bus Error
```

The problem here is that the master node went to read the memory of a slave node (node 2, in this case) and got a bus error. It may be due to a switch reject timeout, a switch wait timeout, a switch checksum error, etc. The key is that the cause is identified as a switch ("Sw") induced bus error of some sort.

An error like this can occur if STP attempts to boot a node which is not present. This should never happen when the automatic TEX start-up is used. However, if you something unusual (like turning a node off out from under STP), this is possible.

This error can also occur if the switch itself is not working. This might be because the switch hardware is broken, or because it is not being properly initialized (e.g. the switch frequency specified in **BOOTCFG.TCS** is wrong).

Lastly, this can occur when STP attempts to use alternate paths in a machine which does not have them. Use of these paths is controlled by the bootcfg.tcs file. If your machine does not have ALL of its alternate paths working, the configuration command controlling the use of alternate paths must disallow them.

Processors

When STP goes to boot a slave node, it has some assurance that the processor is at least partly working. It will have run both the micro-boot and power-on self test successfully (otherwise, the TCS deletes the node from the configuration list). It is possible, however, that a node getting this far still refuses to start STP properly.

Faults of this kind may still be indicated by bus errors during bootstrap. A bus error like "Downstream Late", or "Downstream OTL", or any other error not of "Sw" type is more likely indicative of a processor problem than a switch problem. The most effective way to differentiate between a switch error and a processor error is to swap processor nodes around. If the error travels with the board, then the switch is probably okay. If the error stays with the slot into which news boards are installed, then the switch is the likely culprit.

When STP attempts to boot a node, it makes three explicit checks on that slave's activity. First, before the bootstrap begins, the master verifies that the micro-boot state flag indicates that the board is "ready". This flag indicates that both **uboot** and **post** ran to completion and that the node is ready to receive an application. If this flag is in the wrong state, STP says:

```
slave 0x04 micro boot is not ready, state = s
```

Where s is the (wrong) state which was found. When you use the automatic TCS start-up, this error should not happen. Reaching the "ready" state is a prerequisite for TCS listing a node as present and useable. It is possible to get this error after STP has been shut down and then restarted. If an STP slave is busy before the master is initialized, it will be in the wrong state when the master is restarted. The master then complains. When this happens, just restart STP from scratch.

Once the STP kernel has been loaded on a slave, the processor is given a "go" signal. After this is done, the master again checks the node's state flag. This time it verifies that the flag has gone to state 6 ("gone"). If this does not happen, the master complains:

```
slave 0x4 has not started: micro-boot state= 5
```

This usually indicates a processor node malfunction.

The last bootstrap check made is for the completion of STP initialization. The master checks the STP state flag on every node to ensure that they are ready. If this does not happen, the master says:

```
giving up on slave 0x04 .....
```

This, usually, is also indicative of a processor node malfunction.

Master and Slave Nodes

The distinction between master and slave is somewhat arbitrary. The master node talks to the TCS console, and it is responsible for organizing slaves to run tests. But in actual execution of the tests, there is very little difference. The master node is capable of running all the same tests as the slaves. When the master node issues a system-wide start signal, it also sends a start to itself. It then enters “slave mode” and begins executing the very same code as the slave nodes. If no test has been set up on the master, it returns from slave mode to the STP command interpreter. Otherwise, it performs the indicated test function.

6.5.4

Step 4: Setting Up STP Tests on One or More Slaves

Once a slave node has been booted, it sits in an idle loop, waiting for instructions to do something. These “instructions” take the form of a test number and a list of arguments. To make a slave run the test, first perform an explicit set-up from the master. For example:

```
-> stp s d 1 101 200 ↵
```

This sets up test 0xD on node 1 with transaction type 101 for 0x200 passes. Test 0xD and test 0x17 are the primary tools for field use, and their semantics are the same.

You will usually not be using other test functions. If you do, keep in mind that the input parameter after the test number is *always* the node upon which the test is to run. It is *not* an argument to the test.

In a fully working system, the scatter-verify test should run indefinitely without errors. STP will detect a seriously malfunctioning processor node very quickly—in 0x40 passes or less. A board with subtle flaws may run for 0x1000 passes or more before failing. An overnight run without errors is a good indicator that the processor boards are functioning properly.

The test setup command prepares a test on only a single processor node. Obviously, doing a per-node setup in a large machine would be rather painful. The **viralize** command exists to handle the task of preparing an entire machine for a test run:

```
-> stp v 1 ↵
```

or

```
-> stp v 1 2 3 4 5 6 7 ↵
```

The first argument to **viralize** is the node whose setup information is to be spread. The remaining arguments are the nodes that are to receive the setup. If no list is given, all nodes except the master receive the setup.

If your slave nodes booted successfully, you should have no errors performing test setups. Both **setup** and **viralize** check to see that the node(s) upon which a setup is being attempted is not already busy doing something. No setup is performed on a slave that is busy.

Because running a test on the master limits the operator's ability to control the machine, the scatter-verify test is often run only on the slave nodes. In this case, the master will not be exercised as thoroughly as the slaves. *To fully qualify the master node set the master up to run the test.* To do this, you can use **viralize** to set up all the slaves to run forever, then issue a separate command to set up the master to run with a finite pass count. When the master is running test "do", it will announce its pass count periodically. The master can be stopped by striking any key on the console.

6.5.5

Step 5: Start the Tests Running

When a test setup has been received by a slave, it enters an "eager" state, waiting for a start signal. The test does not actually run until this signal is received.

The tests are started by either one of these commands:

```
-> stp g ↵
```

```
-> stp g 1 2 3 4 5 6 ↵
```

If a node list is given, those nodes receive a start signal. If no node list is given, a start signal is sent to every node. No harm is done in trying to start a node that has no test prepared, or one that is already running a test.

6.5.6

Step 6: Check for Errors

Each STP node keeps a small collection of memory locations for the results of the various functions it performs. There are 10 32-bit words reserved for this purpose. These words can be inspected by the STP **results** command, and the specialized **edify** command.

```
-> stp r 4 ↵
slave 04 completed test 0x3 (initialization)
results:      0      0      0      0
```

Identifying Results

Two words of the results are reserved for identifying the last test which was run, and whether that test completed normally. The **results** command decodes these two values and displays them in the first output line (“completed” = completed normally). The remaining eight words of results record various types of information, depending upon the test being run. The **results** command always shows the first words of results, but only displays the last four if one or more of them is non-zero. If the node has experienced a bus error, some information pertaining to that error is displayed.

Interpreting Results

Because the interpretation of these results varies widely with the test that is running, it is unwise for the inexperienced user to casually inspect them. For the purposes of interpreting the results from the scatter-verify test, use the special decoding function, STP **edify**.

```
-> stp e 6 ↵
----- STP node 0x6          CURRENT pass is 0x301 -----
destination node: 0x4          transaction: word
fast path: ON    cache: ON     short cut: ON    concurrency: ON
```

The results edified above are indicative of a node which has not had any errors. If STP encounters a problem of some sort, it will not report “cpu 5 is bad” or “midplane 0 is miscabled”. In the course of this test, STP identifies only three explicit kinds of failures:

1. memory verify failure
2. bus error
3. processor failure

Memory Verify Failure: The first kind error occurs when the data from a memory read does not match the data which was previously written. When a node gets a memory verify failure, its edified results look like this:

```

----- STP node 0x6          CURRENT pass is 0x301 -----
destination node: 0x4          transaction: byte
fast path: ON   cache: ON      short cut: ON   concurrency: ON

NODE HAS HAD 3 MEMORY VERIFY ERRORS
first error was at address 9512ABE      [node 5, local address 112ABE]

expected value was: 0000CC2E
actual value was:   00000001
destination node: 0x5          transaction: half word
fast path: ON   cache: ON      short cut: ON   concurrency: ON

```

When a verify error occurs, the STP node continues to run. The pertinent information for that error is saved. When subsequent errors occur, STP increments its error count, but no additional information is saved. In the above case, node 6 had three errors. The first happened when it was attempting to write half-words to node 5. The address 9512ABE is the STP global address at which the error occurred. The decoding of this global address into a node and a local address on that node is also given.

Bus Error: A bus error occurs when the hardware is fatally unable to service either a read or write request. When STP gets a bus error, the test *stops*. The results resemble:

```

----- STP node 0x6          FINAL pass was 0x85 -----
destination node: 0x1          transaction: byte
fast path: ON   cache: ON      short cut: ON   concurrency: ON

NODE GOT A BUS ERROR at address 8505000  [node 01, local address 105000]
bus error type:  switch reject timeout

```

Note that the herald says "final pass".

Processor Failure: The last kind of STP error, a hung or failed processor node, does not show up on either a "results" or "edify" output. By definition, the node failed so badly that it could not record what happened. A hung node will appear to be running normally, except that its pass count never grows.

To help detect this situation, use the “fault finder” command:

```
-> stp f ↵
fault on processor 1
fault on processor 5
total 2 faults on 7 active nodes
checking watchdog counters....
*** PROCESSOR 06 IS HUNG ***
done
```

This command checks for all three kinds of errors. A “fault” may be either a verify error or a bus error. The “watchdog” counters are numbers kept on each node; they are incremented several times during the course of a pass. This command checks that each node’s counter is advancing. If the counter is not advancing, the tests assumes that the node is bad and indicates this.

In a typical field situation, you would use the **find faults** command to determine if any errors have occurred, and then use the **edify** command to get details from the nodes which have failed.

6.5.7

Step 7: Isolate the Faults

When you encounter a fault, isolate the board that caused it. The errors that occur when running STP almost always take place during bus cycles that are exercising the memory of some node. When a fault occurs, you are given two crucial pieces of information: the identity of the source node (what processor reports the fault), and the identity of the destination node (contained in the fault report). The specific type of fault encountered (i.e., what kind of bus error, what kind of memory transaction, which bits didn’t verify) is also important. But the first priority is to establish not how the source processor failed, but to whom it was talking when the failure occurred. A failure can occur in one of three places:

1. the source node
2. the destination node
3. the switch nodes in between them

It will *always* be the source node that reports the error—even when the error occurs on the destination or in the switch. You must use the error information to determine which component is actually at fault. As a matter of practice, it has been observed that switch hardware rarely fails. When isolating a fault, concentrate first on the processor nodes involved.

For example, suppose you repeatedly run STP and node 1 fails like this:

```

----- STP node 0x01          FINAL pass was 0x1 -----
destination node: 0x2          transaction: word
fast path: ON      cache: ON    short cut: ON      concurrency: OFF

NODE HAS HAD 2 MEMORY VERIFY ERRORS
first error was at address 8901000 [node 02, local address 101000]

expected value was: 89488C6DB
actual value was: 07AF00001

```

Node 1 is having trouble talking to node 2. The most direct way to isolate the failure in this situation is to swap boards. Put a known good board in place of either the source or destination node, and run the test again. If the failure goes away, the board you removed is probably defective. If the failure is still present, the other board is probably defective. To be *certain* of this second case, return the previously-removed board to its slot, and put the believed good board in place of the new suspect. The test should, of course, now run successfully; if it does not, then something else is malfunctioning.

Sometimes the fault data immediately suggests which node is failing:

```

----- STP node 0x01          FINAL pass was 0x1 -----
destination node: 0x2          transaction: word
fast path: ON      cache: ON    short cut: ON      concurrency: OFF

NODE GOT A BUS ERROR at address 8901000 [node 02, local address 101000]
bus error type: Downstream OTL

----- STP node 0x03          FINAL pass was 0x9 -----
destination node: 0x2          transaction: word
fast path: ON      cache: ON    short cut: ON      concurrency: OFF

NODE GOT A BUS ERROR at address 8903000 [node 02, local address 103000]
bus error type: Downstream OTL

----- STP node 0x04          FINAL pass was 0x8 -----
destination node: 0x2          transaction: word
fast path: ON      cache: ON    short cut: ON      concurrency: OFF

NODE GOT A BUS ERROR at address 8904000 [node 02, local address 104000]
bus error type: Downstream OTL

```


Notice that three different nodes report errors while conversing with node 2. Node 2 is almost certainly defective. This kind of failure is quite common—one node goes bad and causes errors in any processor that attempts to access it. Over time, every node in the machine touches that node and gets an error.

6.5.8 Dealing with Multiple Failures

The examples given in Section 6.5.7 are classic cases of a mostly-working system, with one or maybe two malfunctioning processor nodes. Inspection of the STP error messages gave a quick indication of where the problems were. A system with major problems may display many errors, scattered all over the place. In this situation, you must pare the machine down to some subset of processors that runs reliably. If necessary, remove or deconfigure processors until you have a stable base to work from. Then add in questionable nodes slowly. In some situations, you may find it helpful to run the scatter-verify test on only one node at a time, rather than on every node at once.

In a machine that is failing badly, it is sometimes helpful to run the scatter-verify test with a restricted transaction type. If a system has a lot of trouble with option 101, try using option 100. This exercises fewer parts of the system. You may also use one of the fixed transaction types (0, 1, 2, 3, 4, or 5). If you do use a restricted type, remember to re-test with option 101 before declaring a machine healthy.

6.5.9 Additional Considerations

The system activity provoked by STP is complicated and dynamic. Consequently, some errors are hard to characterize and isolate. Boards tested with STP should have passed single-node diagnostics. This means that any failures you see are caused by the interactions of two or more processors touching the same memory module. The failure modes in this case can be quite subtle.

An important point to remember is that altering the number of processors in a machine alters STP's traffic patterns. A machine with only half its complement of processors will not be stressed as heavily as it would be when fully configured. Also, removing a node may cause a fault occurring on one processor to re-appear somewhere else. In general, deconfiguring a node is *not* equivalent to replacing it. As a practical matter, you can isolate many faulty boards by taking them in and out of a machine's active processor set. But the final demonstration that a node is malfunctioning is made by substituting another processor in its place, and running the test without errors.

Be careful if you deconfigure a large number of boards in a machine which has more than one midplane. If all the boards in a midplane are disabled, STP reconfigures itself to act as though that midplane did not exist at all. For example, if boards 0 to 7 are pulled out of a 16-processor system, STP would run

as though it were in an 8 processor machine, and the 8 nodes will be numbered 0 to 7, **not** 8 to 15.

Keep in mind that if you run STP and get bus errors, memory verify errors, or hung processors, something basic is wrong. You should go back to a more specific diagnostic. STP may not always be helpful about isolating problems, but it does not raise false alarms.

6.6 STP Commands

This section contains a command summary, a list of frequently used commands, a more complete command reference, and a list of test functions.

6.6.1 Summary

This is a summary of the STP commands. The **stp** command and a space must precede each modifier. For a more detailed description, see Section 6.6.3. Note that for each command that follows only the first letter (in bold) needs to be typed.

abort	stops a test in progress. Allows for new test to be set up.
boot	loads and starts the STP kernel on slave nodes.
continue	frees a hung slave that has halted due to a bus error.
dump	displays a bunch of STP, processor, and SIGA state information. See also the node-list command.
edify	Displays a digested version of results from the "scatter-verify" system exerciser. See also the results command.
faults	Find processors with test faults.
go	start tests which have been previously set up.
initialize	initializes master node, enables alternate paths, and selects memory mapping options.
microboot	return slaves to micro-boot wait loop.
node-list	Displays a summary of the processor node configuration.
poll	display a slave's state and test parameters.
Repeat	Sets up each slave with the parameters used in the previous test.
results	get results of the current (or previous) test.
setup	setup a slave to run a certain test.
tty	enable/disable TCS console output on slave nodes.
uninitialize	Pushes all slaves into the microboot loop and uninitialized master.
viralize	spread test parameters from one node throughout the system.
xyzy	removes the setup of a slave.
zero	zeroes all STP exercise memory on every node.
?	Displays a list of the function numbers/function names available via "setup test".

6.6.2 Frequently-Used Commands

Remember to give the node number after commands that require it; otherwise you might get an error message.

stp a	Stops the scatter-verify test on all slaves. Also terminates bus error wait loops (slave goes to idle state).
stp e <i>node_list</i>	Provides English language details on the progress of the scatter verify test.
stp f	Identifies nodes with faults.
stp g	Starts the slave nodes running the test.
stp p	Polls the slave nodes running the test for status.
stp r <i>node_list</i>	Displays the raw results from any test.
stp s d 0 101 0	Prepares node 0 to run the scatter-verify test. A pass count of 0 makes the test run in an infinite loop.
stp v 0	Copies test setup from node 0 to the rest of the nodes in the system.

6.6.3 Command Reference

This is a summary of (most) of the STP functions available from the command line interpreter. All STP commands are of the form “stp *x y z*”, where *x y z* are function specifics. Optional arguments are in square brackets “[]”.

NOTE

Commands cannot accept argument lists of more than 8 nodes. You must issue multiple commands to treat more nodes (e.g. **stp r 0 1 2 3 4 5 6 7** and **stp r 8 9**).

abort test

```
stp a [node-list]
```

Stops a test in progress. If no node specified, every non-idle processor receives an abort. The abort signal must be polled for: if the slave is running a test which does not check for it, the abort has no effect. Aborts terminate bus error wait loops (slave goes to idle state).

boot slave

```
stp b [node-list]
```

Loads and starts stp on the specified slave nodes. If no list is given, every node listed in the TCS config structure is booted.

continue after trap

```
stp c node
```

Pushes a slave out of a bus error wait loop and into the normal idle loop.

dump configuration information

```
stp d
```

Displays a bunch of STP, processor, and SIGA state information. See also the node list command.

edify test results

```
stp e node-list
```

Displays a digested version of results from the “scatter-verify” system exerciser. See also the results command. If no node list is specified, every eligible node is edified.

find faulted processors

```
stp f
```

Checks for fault indication on all booted slaves. A fault is typically indicative of a bus error or a memory verify mismatch. If some of the slaves are running the scatter-verify test, this function checks their watchdog counters to make sure that they are still running the test and are not wedged.

go (start)

```
stp g [node-list]
```

Sends a start-test signal to each node in the list. If no list specified, every booted node receives a start signal.

initialize stp master

```
stp i [path-randomizer] [page-table-option] [midplane-override-flag
      midplane-number]
```

Initializes the master node. This must be done before any other STP command. This command controls the settings of hardware functions, and the manner in which various parts of memory are mapped. If no arguments are specified, STP uses the settings already in place and uses the standard memory mapping scheme.

The *path randomizer* is a 3-bit quantity. A **1** in any bit position allows the SIGA to randomize that bit position in the “midplane number” in the switch route. If no *path randomizer* is specified, it defaults to **0**.

There are five *page-table options*, primarily controlling how local memory is mapped. Option **1** (all local) maps all of a processor’s local memory using local addresses. Option **2** (part global) maps the first 1 MB of the local STP target zone as local and maps the upper 2 MB of target space using the global address for that node. Option **3** (part VMEbus), the first 2 MB are mapped as in option **2**, and the upper 1 MB is mapped as VMEbus space memory. Option **4** (interleaved) creates page tables for interleaving the entire 3 MB target zone. This option must be used in conjunction with the interleaver enable test (#0x13). Option **5** (all VME) maps all 3 MB of a node’s local memory through the VMEbus mappers. If no option is specified, option **2** will default.

The *optional midplane* argument allows an 8 slot system to run as though it were on a different midplane than the one set in the hardware. This option is used by specifying a **1** in the override flag, and the desired midplane number in the last argument. This operation currently has a limitation: in order to run on a non-standard midplane number, it is first necessary to initialize on the standard midplane, boot all the slaves, then uninitialize.

put slave into micro-boot

```
stp m [node-list]
```

Makes the specified slaves exit STP and return to the micro-boot wait loop. If no list is specified, all booted nodes, except the master are affected.

node list

```
stp n
```

Displays a summary of the processor node configuration.

poll slave

```
stp p node-list
```

Displays current state of the slaves in the list, including the test parameter list. This is different from the information garnered from the **results** command. Be sure to give a node number.

query

```
stp ?
```

Displays a list of the function numbers/names available via "setup test".

repeat test

```
stp R slave-list
```

Sets up each slave with the parameters used in the previous test.

results of slave(s)

```
stp r slave-list
```

Displays the current state and the result words for each slave in the list. If the last 4 (of 8) result words are zero, they are not displayed. Extra information is given if the slave has a bus error. If no slave list is given, results are displayed for every node.

setup test

```
stp s test-function-number [arguments]
```

Set up an STP slave function. Be sure to give a test number (see Section 6.6.4).

slave tty inhibit on/off

```
stp t slave 0
```

Changes the state of the "tty_inhibit" flag on a slave. Character output is normally suppressed on slave nodes. Clearing this flag by typing **stp t slave 0** allows output to take place. To see this output, the TCS console must be instructed to connect to that slave.

uninitialize stp

```
stp u [force-flag]
```

Pushes all slaves into the micro-boot loop and uninitializes the master. If the force flag is not specified, or is **0** (zero), the shutdown is aborted if the master finds a node that is not in the idle state. If the flag is **1** (one), shutdown continues even if a slave is not ready.

viralize

```
stp v node
```

Copies the test parameters from the specified node to every booted node in the system (except the master).

xyzy (escape from test)

```
stp x node
```

Removes the set up test parameters on the specified node. Allows you to change your mind after setting up a test but *before* issuing the “go” command.

zero memory

```
stp z
```

Makes the master clear the target zone memory of every booted node.

6.6.4**STP Test Functions**

The test functions now range from 0x4 to 0x17 (0x18 is listed, but empty). Here is a summary of the more useful ones:

“fast write”

```
stp s 7 slave-node source-node passes
```

This function writes full words into the entire target memory of the destination node. The data written will be: upper 16 bits = upper 16 bits of RTC at start of test, lower 16 bits = source node (this is NOT a memory copy loop).

“fast read”

```
stp s 9 slave-node source-node passes
```

Reads every full word in the source’s target memory; nothing is done with the data read.

timing uniformity test

```
stp s b node option
```

Checks the regularity of the real time clock by running a series of timing loops. The options (**0**, **1**, **2** or **3**) select from a progressively longer series of tests. The shortest, **0**, runs about 40 short timing loops. For each loop, two data are displayed: the value of the RTC at the beginning of the loop, and the elapsed RTC time computed after the end of the loop. For a healthy RTC, all the elapsed times should be very nearly equal (within 1 microsecond). The first loop is usually slow since it must be loaded into the instruction cache.

With option **1**, the processor runs the short test above, then runs a long timing loop of one million iterations. This loop is a “calibration”. The same timing loop is then run four more times, for 16 million iterations. The reported time is be 16 times the elapsed time for the calibration run. With option **2**, two additional timing runs are made, each of $16*16 (= 256)$ million loops. Option **3** is total: 1 run of $16*16*16 (= 4096)$ million loops [this takes 20–30 minutes].

“write-verify”

```
stp s c source-slave-node destination-slave-node passes option
```

Writes, then reads every word in the destination target memory. The data word starts as (RTC & 0xFFFF0000) and is incremented for each location. This is the behavior for the default option, **0**. With option **1**, the data word is starts at 0xPP000000, where PP = node number. With option **2**, no memory is written, but a verify pass is made. This pass expects to find the data left from option **1**. The result codes for this test are as follows:

- 0: elapsed RTC time
- 1: RTC at start of test
- 2: RTC at end of test
- 4: number of verify errors
- 5: location of first verify error
- 6: expected value at location
- 7: actual value at location

“scattered write-verify”

`stp s d slave-node transaction-type passes`

Writes, then reads selected portions of memory on every node in a system. For the purpose of this test, memory on each node is “allocated” in 4 KB stripes. A stripe is reserved for each slot in the system, even if some slots are empty. Starting with itself, the source node writes, then reads all of its stripes on successive destination nodes. Writing and reading one node constitutes a “pass”. There are several options for *transaction-type*:

0	bytes
1	half words
2	full words
3	quad words
4	Xmem words
5	augmented locked full words
100	cycle through all above types
101	cycle through all above types and other parameters

If **101** is specified, the transaction types cycle, but other system parameters will also change. In particular, the code cache gets turned off and on, the switch short cut is turned off and on, concurrence is turned off and on, and the fast path is turned off and on. The normal state of these parameters in STP are:

code cache:	on	fast path:	on
short cut:	on	concurrency:	on

If *passes* is **0** (zero), the test loops forever until stopped manually.

The results for this test are updated on every pass; their meaning are as follows:

2:	RTC start time
3:	last pass performed
4:	destination (upper word) + transaction type (medium low byte) + misc bits (low byte)
5:	misc bits of first verify error
6:	number of verify errors
7:	location of first error
8:	expected value at location
9:	actual value at location

Results 3 and 4 are updated on every pass. The misc bits control the cache, short cut and fast path.

Bit 0 = 0	short cut enabled
Bit 1 = 0	cache enabled
Bit 2 = 0	fast path DISabled
Bit 3 = 0	concurrency ON (serialize off)

xmem-locked atomic add

```
stp s f source-slave-node destination-slave-node passes
```

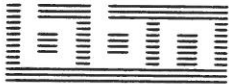
This is an atomic add function based upon an xmem lock. The source node uses the first two words in the target nodes memory: the first word is the lock, the second is the running total. The lock protocol is bit 31 = 0 (not locked) or 1 (locked). When the source node gets the lock, it adds one to the sum word, then releases the lock. Neither the lock nor the sum is initialized; they are used as they are found.

interleaver enable/disable

```
stp s 13 node option
```

Option **1** (enabled), causes a slave node to initialize its interleaver modulus RAM, and to set the "interleaver enable" bit in the SIGA. Option **0** (disable) causes the SIGA interleaver enable to be cleared. This function is only useful with the interleaved page tables (see **stp i**). When the interleaver on a given node is enabled, all of the STP target memory in the system is accessed in an interleaved fashion. To make every node use interleaved access, the enable function must be run on each.

Peripheral Diagnostics



7.1 Overview

TC2000 Standalone Peripheral Diagnostics are designed to test the functional and operational integrity of both the TC2000 peripheral device controller boards and the peripheral devices themselves. The standalone diagnostics run without the support of an operating system. They are intended to verify that I/O devices and I/O controller boards on the TC2000 are connected properly and are in good working order.

They are also intended to assist field/sustaining/manufacturing engineering personnel in the diagnosis of failed devices down to a Field Replaceable Unit (FRU) level. The peripheral diagnostics attempt to localize failures as much as possible to the smallest possible component. In some instances though, the diagnostics will only be able to determine that an I/O device or I/O controller board has simply failed.

The peripheral diagnostics are designed to test and exercise the TC2000 peripheral subsystems only. No attempt is made to do any testing or diagnosing of processor node cards or other hardware.

7.2 Typical Symptoms

The typical symptoms are listed under each peripheral subsection.

7.3 How to use the Peripheral Diagnostics

After selecting a terminal type, the system will display the main menu. Run the tests on each peripheral. If the device passes all of these tests, try the nX based peripheral tests or try Stress test. Verbose comments can be shut off

by selecting **Verbose Off** at the main menu. To exit from the diagnostics, type a backquote and a period (`.). Do not use the **quit** menu item, it stops the test, but won't go back to TEX.

7.3.1 Run Times

The typical times are listed under each peripheral subsection.

7.4 TC2000 Peripheral Tests

The TC2000 peripherals consist of both Multibus/VMEbus controller cards and the actual peripherals attached to these cards. Both controller cards and peripherals are tested. All of the diagnostics for the peripherals will be downloaded to the appropriate B2VME from the TCS. The diagnostics are downloaded to the B2VME node connected to the VMEbus where they execute in that node's RAM.

7.5 TC2000 Peripheral Controllers

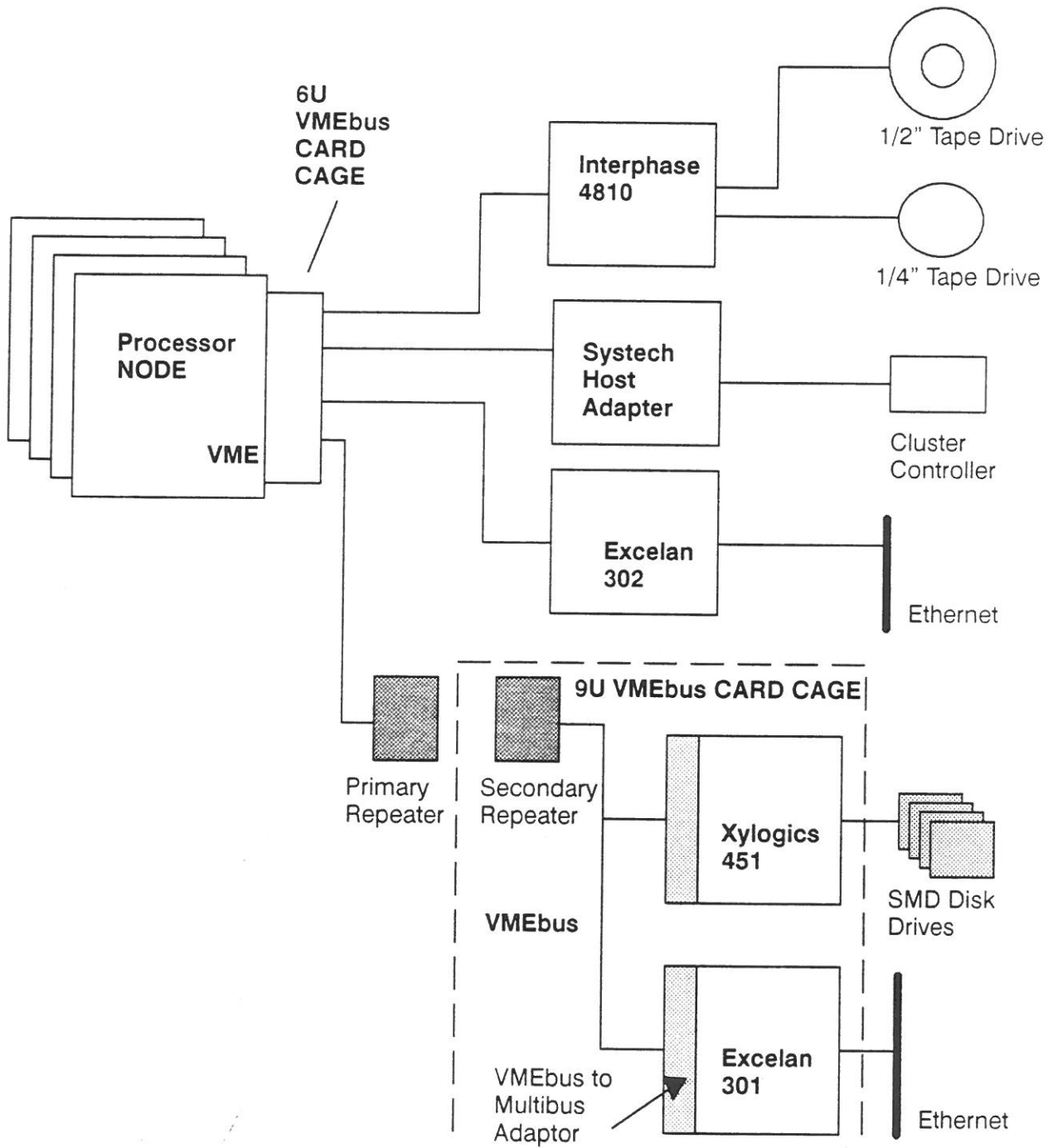
The TC2000 I/O devices and controller boards are listed in Figure 7-1 and shown in a block diagram in Figure 7-2. Figure 7-2 includes all I/O interconnections and some devices not directly related to I/O. These devices are the Sun VME-to-Multibus Adaptor cards and the HVE Primary/Secondary VMEbus Repeater cards. These are transparent to VMEbus software.

Figure 7-1

TC2000 Peripheral Subsystems

1/4" SCSI Tape Subsystem	Interphase 4810 VMEbus SCSI controller Tandberg 3640 1/4" Tape Drive
1/2" Tape Drive Subsystem	Interphase 4810 VMEbus SCSI controller Cipher M990 1/2" Tape Drive
Terminal Controller Subsystem	Systech 6840 Host Adapter Systech 7088 Cluster Controller Various CRT's, Printers, etc.
Ethernet Interface Subsystem	Excelan 301 Ethernet Controller(Multibus) or Excelan 302 Ethernet Controller (VMEbus)
SMD Fixed Disk Subsystem	Xylogics 451 Disk Controller NT 8414 Disk

Figure 7-2 TC2000 Peripheral Set Block Diagram



7.6 Starting the Diagnostics

The peripheral diagnostics are started from the DOS or TEX prompt (see Chapter 3). From DOS type:

```
C:\> CD \DIAG\VMEDIAG ↓ Changes to the vmediag directory.
C:\DIAG\VMEDIAG> START ↓ Initializes the system.
```

When the TC2000 Standalone Diagnostics are downloaded to the processor node and started, a terminal type menu is displayed.

Select the appropriate terminal type or item **6** if you intend print the output. After making your selection, the main menu will be displayed.

7.7 Standalone Peripheral Diagnostics Main Menu

At this level, you can go to the peripheral submenu, start the automatic tests, change your terminal type, or change the verbose mode:

```
Menu: STANDALONE-PERIPHERAL-DIAGNOSTICS
  1. Peripheral-Diagnostics          TC2000, B2VME-B/TCFPV Nodes
  2. VME-bus-Diagnostics
  3. Automatic-Mode
  4. Terminal-Type                  Hardcopy, Menu-On
  5. Verbose-Mode-On-Off           On
  6. Help
  7. Quit

                                ver x.xx
STANDALONE-PERIPHERAL-DIAGNOSTICS -> 1
```

Entering a **1** at the menu above displays the peripheral diagnostics submenu:

```
Menu: STANDALONE-PERIPHERAL-DIAGNOSTICS (TC2000)
  1. 1/4"-Tape-Subsystem            Controller
  2. 1/2"-Tape-Subsystem            responds at      0x1000800
  3. Disk-Drive-Subsystem           Controller responds at 0x100ee40
  4. Multibus-Ethernet-Subsystem    Controller doesn't respond
  5. VMEbus-Ethernet-Subsystem      Controller responds at 0x1010000
  6. Terminal-Controller-Subsystem  Controller responds at 0x1020000
  7. System-Configuration
  8. Quit
```

1/4" & 1/2" Tape Drives share the same Controller

7.8 Automatic Mode

You can perform tests in automatic mode. Entering a **3** at the main menu displays the automatic mode dialog:

```

Function: Automatic-Mode
qrtr|disk|ethr|half|term|<string> -> all

--> Automatic-Mode

Enter qrtr|disk|ethr|half|term|all <string> -> ↵ You can hit <Return> for all the
tests, or enter one.

Do you wish to continue? (y or n) y↵

```

7.9 1/4" Tape Drive Tests

Entering a **1** displays the 1/4" Tape Drive Menu:

```

Menu: STANDALONE-PERIPHERAL-DIAGNOSTICS (TC2000) 1/4"-Tape-Drive
 1. Power-On-Self-Test           Controller
 2. Configure-Controller-Test   Controller: *not* configured
 3. Extended-Self-Test          Controller
 4. Dump-Initialization-Params Controller
 5. Interrupt-Test              Controller
 6. Inquiry-Test                Tape Drive
 7. Erase-Test                  Tape Drive
 8. Media-Removal-Test          Tape Drive
 9. Data-Buffer-Mem-Test        Tape Drive
10. Low-Level-R/W-Test          Tape Drive
11. Block-Address-Test          Tape Drive
12. Rewind-Test                  Tape Drive
13. Seek-Test                    Tape Drive
14. Space-Test                    Tape Drive
15. Filemark-Test                Tape Drive
16. First-Self-Test              Tape Drive
17. Second-Self-Test            Tape Drive
18. Quit

Jaguar      = Interphase 4210 SCSI Controller
TANDBERG    = SCSI Tape Drive
1/4"-Tape-Drive ->

```

Be sure to initialize the controller (menu item **2**) before running any of the tests.

7.9.1 Jaguar SCSI Controller Power Up Self-Test

Entering a **1** starts the Jaguar SCSI Controller Power-Up Self-Test. The screen displays the following messages, and ends with a prompt.

```
Jaguar SCSI Controller Power Up Self-Test.

Setting RESET bit on Jaguar board...
Clearing RESET bit on Jaguar board...
Absolute value of status register = 0x0002

<Board OK> BIT IS SET: POWER ON DIAGNOSTICS PASSED.
<Controller Not Available> BIT IS CLEAR (OK).
CONTROLLER BOARD AVAILABLE FOR COMMANDS.

Attempting to Read CONTROLLER SPECIFIC SPACE:
Jaguar Product Code           = 077
Jaguar Product Variation Code = 0
Jaguar Firmware Revision Level = XAC
Jaguar Firmware Release Date  = 03/21/1989
JAGUAR POWER ON SELF-TEST PASSED.
Power-On-Self-Test: Test Passed
```

7.9.2 Jaguar SCSI Controller Configuration Test

Entering a **2** starts the Jaguar SCSI Controller Configuration Test. The screen displays the following messages, and ends with a prompt:

```
Setting RESET bit on Jaguar board...
Clearing RESET bit on Jaguar board...

Controller Card has reset GO-BUSY bit, indicating it has
acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
Starting 'Initialize Work Queue' Command...

About to set 'Start Queue Mode' in Master Cntrl Register...
Current state of Cmd Rsp Blk status word = 0x0000
Command Response Block status word = 0x0021
CONTROLLER HAS BEEN SUCCESSFULLY INITIALIZED.
Configure-Controller-Test: Test Passed
```


7.9.3 Jaguar SCSI Controller Extended Self-Test

Typing a **3** executes the Jaguar SCSI controller extended self-test. This test is set up for executing on controller boards with revision 'XAJ' PROMs or later. (The system returns with the message "FAILED" otherwise.) To check the controller board revision, run the power-up self-test.

According to the Interphase/Jaguar documentation, the extended self-test results should all be '0xffff' to indicate that the test has passed. You may see a 0001 for the ROM test on an older board. You may also see the SCSI secondary port test returning a '0x0000', because there is no attached daughterboard.

```
Controller Card has reset GO-BUSY bit, indicating it has
acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
ROM TEST RESULT                = 0x0001          should be a 0xffff
SCRATCHPAD RAM TEST RESULT     = 0xffff
BUFFER RAM TEST RESULT         = 0xffff
EVENT RAM TEST RESULT          = 0xffff
SCSI PRIMARY PORT REGISTER TEST RESULT = 0xffff
SCSI SECONDARY PORT REGISTER TEST RESULT = 0x0000

JAGUAR EXTENDED SELF TEST PASSED.
Extended-Self-Test: Test Passed
```

7.9.4 Jaguar SCSI Controller Dump Initialization Parameters Test

Typing a **4** executes the Jaguar SCSI dump initialization parameters test.

```
Executing 'Dump Initialization Parameters' Command first...
```

more messages.

```
Initialization Parameters as returned by Controller:
```

```
Number of command queue slots = 10
Primary SCSI Bus ID           = 8
Command Response Block Offset = 0x073c
```

```
Number of slots in Work Queue #1: 5
Work Queue #1 Priority Level   : 1
DUMP INITIALIZATION PARAMETERS TEST PASSED.
Dump-Initialization-Params: Test Passed
```

7.9.5 SCSI Interrupt Test

Typing a **5** executes the SCSI interrupt test.

SCSI Controller Interrupt Test

```
VMEbus INTERRUPT OCCURRED!
VMEbus INTERRUPT LEVEL = 3
VMEbus INTERRUPT VECTOR = 0x55
SCSI Controller returned NORMAL INTERRUPT VECTOR.
Number of Work Queue Zero Entries flushed = 0
Interrupt-Test: Test Passed
```

7.9.6 SCSI Inquiry (Revision Level) Test

Typing a **6** executes the SCSI inquiry test. This test requires that you insert a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) into the tape drive. Without a scratch tape, the test will fail.

Starting tape load...

more messages.

Inquiry Data Table:

Peripheral Device Type code	= 1 (0x01)
Device Type Qualifier	= 0 (0x00)
ISO Version (2 bits)	= 0x0
ECMA Version (3 bits)	= 0x0
ANSI Version (2 bits)	= 0x01
Additional Length field	= 46
Vendor Identification field	= >TANDBERG<
Product Identification field	= > TDC 3600<
Product Revision Level	= >-04.<
Option Level	= >02<
Software Identification	= >CREATED<
Timestamp field:	
Month	= >04
Day	= >22
Year	= >89

Starting tape unload...

more messages.

Inquiry-Test: Test Passed

7.9.7 1/4" Tape Drive Erase Test

Typing a 7 executes the Erase test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive. Without a scratch tape, the test will fail. This test will take a few minutes while it erases the tape.

Test requires scratch tape to be loaded into tape drive.
Starting tape load...

Controller Card has reset GO-BUSY bit, indicating it has
acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

more messages.

Polling of 'Command Complete' bit commencing...
ERASE TEST PASSED.
Erase-Test: Test Passed

7.9.8 1/4" Tape Drive Media Removal Command Test

Typing a 8 executes the Media Removal Command test. This test will attempt to blink the TANDBERG Drive Front Panel LED on and off 10 times by issuing 'Prevent/Allow Media Removal' commands.

Quarter-Inch Tape Drive Media Removal Test
This test will attempt to blink the TANDBERG Drive Front Panel
LED on and off 10 times by issuing 'Prevent/Allow Media Removal' commands.
Turning TANDBERG Front Panel LED on...

Controller Card has reset GO-BUSY bit, indicating it has
acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
Turning TANDBERG Front Panel LED off...

more messages.

Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

7.9.9 1/4" Tape Drive Data Buffer Diagnostic Read/Write

Typing an **9** executes the Data Buffer Diagnostic Read/Write test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

Starting tape load...

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
R/W DIAGNOSTIC BUFFER TEST PASSED.
Data-Buffer-Mem.-Test: Test Passed

7.9.10 1/4" Tape Drive Low-Level Read/Write Test

Typing a **10** executes the Low-Level Read/Write test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

Starting tape load...

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

Starting WRITE portion of R/W Test...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
R/W TEST PASSED.
Low-Level-R/W-Test: Test Passed

7.9.11 1/4" Tape Drive Request Current Block Address Test

Typing an **11** executes the Request Current Block Address test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

Starting tape load...

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
Block Address returned by tape drive = 0x0000
REQUEST BLOCK ADDRESS COMMAND PASSED.
Block-Address-Test: Test Passed

7.9.12 1/4" Tape Drive Rewind Test

Typing a **12** executes the Rewind test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

Starting tape load...

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
REWIND COMMAND PASSED.
Rewind-Test: Test Passed

7.9.13 1/4" Tape Drive Seek Test

Typing a **13** executes the Seek test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

Starting tape load...

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
SEEK TEST PASSED.
Seek-Test: Test Passed

7.9.14 1/4" Tape Drive Space Test

Typing a **14** executes the Space test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

NOTE

~~~~~  
This test has not been fully implemented. Do not run this test.  
~~~~~

Starting tape load...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
SPACE TEST PASSED.
Space-Test: Test Passed

7.9.15 1/4" Tape Drive Write Filemark Test

Typing a **15** executes the Write Filemark test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

Test requires PRESENCE of scratch tape: 3M/600A or DEI/Series II Gold tape or equivalent.
Starting tape load...

more messages.

Controller Card has reset GO-BUSY bit, indicating it has acknowledged receipt of command and is starting to process it.
Polling of CRBV bit commencing...
Polling of 'Command Complete' bit commencing...
WRITE FILEMARK TEST PASSED.
Filemark-Test: Test Passed

7.9.16 1/4" Tape Drive Self Test #1

Typing a **16** executes the Self Test #1 test. This test requires a scratch tape (3M/600A or DEI/Series II Gold tape or equivalent) to be loaded in the tape drive.

If the test passes it displays appropriate messages:

TANDBERG SELF TEST #1 PASSED.
First-Self-Test: Test Passed

7.9.17 1/4" Tape Drive Self Test #2

Typing a **17** executes the TANDBERG Self Test #2 test. This test writes data to the tape cartridge and requires the use of a scratch tape. TANDBERG Self Test #2 is a very stringent test allowing a very limited number of retries when exercising the read and write capabilities of the drive. For this reason, this test may fail on occasion if the tape is new or of poor quality, or if the tape has been overused.

For the first 40 seconds of this test the tape will not spin. After that time, the tape medium will be accessed and the tape will spin for 5-7 minutes worth of testing.

If the test passes it displays appropriate messages:

TANDBERG SELF TEST #2 PASSED.
Second-Self-Test: Test Passed

7.10 1/2" Tape Drive Diagnostics

The Jaguar/CIPHER Diagnostics Menu is displayed by selecting item **5** 1/2" Tape Drive from the Peripheral Diagnostics Menu shown in Section 7.7. Once that item is selected, the following screen is displayed:

```

Menu:  STANDALONE-PERIPHERAL-DIAGNOSTICS (TC2000) 1/2"-Tape-Drive
      1. Power-On-Self-Test                Controller
      2. Configure-Controller-Test        Controller: *not* configured
      3. Extended-Self-Test               Controller
      4. Dump-Initialization-Params      Controller
      5. Interrupt-Test                   Controller
      6. Mode-Select-Test                  Drive *not* configured
      7. Inquiry-Test                     Tape Drive
      8. Test-Unit-Ready-Test             Tape Drive
      9. Erase-Test                       Tape Drive
     10. Rewind-Test                      Tape Drive
     11. Short-R/W-Test                   Tape Drive
     12. Long-R/W-Test                    Tape Drive
     13. Read-in-Reverse-Test            Tape Drive
     14. Filemark-Test                    Tape Drive
     15. Space-Records-Test               Tape Drive
     16. Diagnostic-Send-Receive-Test    Tape Drive
     17. Extended-Status-Test             Tape Drive
     18. Manual-Cipher-Self-Test          Tape Drive
     19. Quit

```

```

Jaguar   = Interphase 4210 SCSI Controller
CIPHER   = SCSI Tape Drive
1/2"-Tape-Drive ->

```

The controller tests (menu items 1-6) are the same as those under the 1/4" Tape Drive Diagnostics menu. Please refer to sections 7.9.1 through 7.9.5 for information on these tests.

Before running any of the controller tests (menu items 1-6), the Configure-Controller-Test must be run. Before running any of the tape drive tests (menu items 6-17), the Mode-Select-Test must be run.

NOTE

~~~~~  
 If any of the 1/2-inch tape (drive or controller) tests fail, every 1/2-inch tape test run after that fails. Re-run tests **2** and **6** to reset this condition.  
 ~~~~~

7.10.1 Mode Select Test

Selecting item 6 from the 1/2" Tape Drive Diagnostic menu executes the Mode Select Test.

If the test passes it displays appropriate messages:

```
Polling of `Command Complete' bit commencing...  
Mod-Select-Test: Test Passed
```

7.10.2 Inquiry Test

Selecting item 7 from the 1/2" Tape Drive Diagnostic menu executes the Inquiry Test.

If the test passes it displays appropriate messages:

```
Model Name           = >M990-64K           <  
  
Inquiry-Test: Test Passed
```

7.10.3 Test Unit Ready Test

Selecting item 8 from the 1/2" Tape Drive Diagnostic menu executes the Test Unit Ready Test. The tape unit must be **on-line**.

If the test passes it displays appropriate messages:

```
Test-Unit-Ready-Test: Test Passed
```

7.10.4 Erase Test

Selecting item 9 from the 1/2" Tape Drive Diagnostic menu executes the Fixed Erase Test. This is a variation of the Security Erase Test and can be used as a quick check of erase capability, as it erases a short length of tape, approximately 4 inches. Erasure begins from the current tape position. This test requires a scratch tape to be loaded in the tape drive. The tape unit must be **on-line**.

If the test passes it displays an appropriate message:

```
Erase-Test: Test Passed
```


7.10.5 **Rewind Test**

Selecting item **10** from the 1/2" Tape Drive Diagnostic menu executes the Rewind Test. This verifies that the tape drive can rewind the tape. This test requires a scratch tape to be loaded in the tape drive. The tape unit must be **on-line**.

If the test passes it displays an appropriate message:

```
Rewind-Test: Test Passed
```

7.10.6 **Short Read/Write Test**

Selecting item **11** from the 1/2" Tape Drive Diagnostic menu executes the Short Read/Write Test. This verifies that the tape drive can write data to and then read data back from the magnetic tape. This test performs a low-level write and read, comparing data written with data read (about 1K bytes). This test requires a scratch tape to be loaded in the tape drive. The tape unit must be **on-line**.

If the test passes it displays an appropriate message:

```
*** Starting Write Portion of R/W Test ***  
*** Starting COMPARE of data WRITTEN with data READ back ***  
Short-R/W-Test: Test Passed
```

7.10.7 **Long Read/Write Test**

Selecting item **12** from the 1/2" Tape Drive Diagnostic menu executes the Long Read/Write Test. Data written is compared with data read. Data will be written (at both high and low speed) at 1600, 3200, and 6250 CPI. This test requires a scratch tape to be loaded in the tape drive.

If the test passes it displays an appropriate message:

```
Long-R/W-Test: Test Passed
```

7.10.8 **Read In Reverse Test**

Selecting item **13** from the 1/2" Tape Drive Diagnostic menu executes the Read In Reverse Test. Data written is compared with data read. Data will be written at 1600, 3200, and 6250 CPI. This test requires a scratch tape to be loaded in the tape drive.

If the test passes it displays an appropriate message:

```
Read-in-Reverse-Test: Test Passed
```


7.10.9 Filemark Test

Selecting item **14** from the 1/2" Tape Drive Diagnostic menu executes the Filemark Test. This verifies that the drive can distinguish file starting and ending points. The tape unit must be **on-line**.

Tape filemarks separate one file from another on the tape medium. The Write Filemark test commands the tape drive to write filemarks on the selected tape drive at the current tape position.

If the test passes it displays appropriate pass messages.

7.10.10 Space Records Test

Selecting item **15** from the 1/2" Tape Drive Diagnostic menu executes the Space Records Test. This verifies that the drive can space over filemarks in both directions and can space over data records in both directions.

If the test passes it displays appropriate pass message.

7.10.11 Diagnostic Send Receive Test

Selecting item **16** from the 1/2" Tape Drive Diagnostic menu executes the Diagnostic Send Receive Test. The tape unit must be **on-line**.

If the test passes it displays appropriate pass message.

7.10.12 Extended Status Test

Selecting item **17** from the 1/2" Tape Drive Diagnostic menu executes the Extended Status Test. This test requests more status information from the 1/2" tape drive. The drive then sends 64 bytes of status information, such as density and error history. The tape unit must be **on-line**.

7.10.13 Manual Cipher Self-Test

Selecting item **18** from the 1/2" Tape Drive Diagnostic menu displays the Cipher Self-Test instructions. The instructions are displayed on the screen. The self-test will test most of the electro-mechanical components.

This is a summary of the text on the screen and should be used as an aid to understanding. The numbers in the summary refer to keys on the front panel on the Cipher 1/2" tape drive and are numbered as follows:

1. "LOAD REWIND" switch

2. "UNLOAD" switch
3. "ON-LINE" switch
4. "WRT EN TEST" switch
5. "DENSITY SELECT" switch

Manual Test Summary

TEST 111 OSCILLATE SERVOS

Press 451115 to start
Press 1 to start oscillation.
Press 5 then 4 to end.

TEST 124 VOLTAGE DISPLAY

Press 451245 to start.
Watch for "VOLTAGE".
Press 4 to end.

TEST 131 FILE PROTECT AND REEL SEAT

Put tape in drive.
Press 451315 to start
Press 5 to end.

TEST 132 DOOR AND HUB LOCK

Press 451325 to start.
Watch for drive to unlock or lock as you open or
close door.
Press 4 to end.

TEST 133 DOOR OPEN

Press 451335 to start.
Watch for "DOOR OPEN" on display.

TEST 134 BLOWER MOTOR

Press 451345 to start.
Press 1 to turn motor on and off.
Press 4 to end.

TEST 212 READ/WRITE DATA

Put tape in drive.
Press 1 and wait for tape to load.
Press 452125 to start.
Watch for "WRITING" on display.
Press 5 to switch tape direction.
Watch for "READ REV".
Press 4 to end.

TEST 222 TAPE SHUTTLE

Press 452225 to start.
Press 1, 2, or 3 to select the amount of time for
the runs.
Press 5 to start the selected test.
Press 4 to end.

TEST 223 READ/WRITE TEST

Press 452235 to start.
Press 4 to enter status mode, then press each of
1,2, then 3 to display the various status mes-
sages (each button will display one message).
Press 5 to end.

7.11 Disk Drive Diagnostics

The Xylogics 451/SMD-Interface Disk Diagnostics menu is displayed by selecting item 2 from the Peripheral Diagnostics Menu shown in Section 7.9.

NOTE

Notice the message next to item 6 that indicates the drive is not initialized. To execute any disk test from six through ten, you must first initialize with item 6 (Initialize-Disk-Type).

```
Menu:  STANDALONE-PERIPHERAL-DIAGNOSTICS (TC2000) Hard-Disk-Drive
      1. Xylogics-Self-Test                      Controller
      2. Register-Test                          Controller
      3. DMA-Test                               Controller
      4. Chained-Command-Test                  Controller
      5. Interrupt-Test                        Controller
      6. Initialize-Disk-Type                  Disk Drive: *not* initialized
      7. Reset-Test                            Disk Drive
      8. Read-Status-Test                      Disk Drive
      9. Short-R/W-Test                        Disk Drive
     10. Long-R/W-Test                          Disk Drive
     11. Seek-Test                             Disk Drive
     12. Quit
```

```
[Allowable Drives:  (#Heads  #Cylinders  #Sectors)
NT 8408 (500)         8          1496        65
NT 8414 (850)        14          1511        65
```

```
Current drive is set to: None
Unit number: None
```

All subsequent menus, except those for the Short and Long Read/Write Tests, will suggest that the WRITE PROTECT switch be set on with the following message:

```
ALTHOUGH THIS DIAGNOSTIC SHOULD NOT DESTROY DISK DRIVE
DATA UNDER NORMAL CONDITIONS, IT IS RECOMMENDED THAT ANY
ATTACHED DISK DRIVES HAVE THEIR **WRITE PROTECT** SWITCHES
ENABLED (ON) WHILE RUNNING THIS TEST.
```

CAUTION

The Short and Long Read/Write tests destroy disk data. Neither should be used on a disk containing data you wish to keep.

7.11.1 Disk Controller Self-Test

Selecting item **1** from the Disk Drive Diagnostic menu executes the Xylogics Self-Test. This verifies that the Xylogics 451 Controller passes the same self-test that occurs on power up; it does not read, write, or otherwise affect the disk(s). Note that the WRITE PROTECT switch on the disk drive should be ON.

If the test passes it displays appropriate messages:

```
Command issued to controller passed  
DISK CONTROLLER SELF-TEST PASSED
```

7.11.2 Disk Controller Register Test

Selecting item **2** from the Disk Drive Diagnostic menu executes the Register Test. This verifies that the 451 Controller responds properly to writing and reading a walking-ones pattern through each of the six internal registers. Note that the WRITE PROTECT switch on the disk drive should be ON.

If the test passes it displays appropriate messages:

```
CONTROLLER REGISTER TEST PASSED.  
CONTROL/STATUS REGISTER PORTION OF  
DISK CONTROLLER REGISTER TEST PASSED.  
FIXED DISK CONTROLLER REGISTER TEST PASSED.
```

7.11.3 Disk Controller DMA Test

Selecting item **3** from the Disk Drive Diagnostic menu executes the DMA Test. This verifies that the 451 Xylogics Controller can successfully DMA to and from system (TC2000) memory. Note that the WRITE PROTECT switch on the disk drive should be on.

This function must work properly before any reading or writing to disk can take place. If disk drive read/write tests fail, this test can be used to determine whether it's the controller's fault and whether or not the controller can perform even a minimum communication with the host.

If the test passes it displays an appropriate message:

```
CONTROLLER DMA TEST PASSED
```

7.11.4 Chained Command Test

Selecting item **4** from the Disk Drive Diagnostic menu executes the Chained Command Test. This verifies that the disk controller is able to execute several disk controller command (IOPB's) each of which is linked to the next com-

mand in a list. This tests writes data from system memory into a controller FIFO and back then compares it against the original data. This disk is **not** accessed during this test. Note that the WRITE PROTECT switch on the disk drive should be ON.

If the test passes it displays an appropriate message:

```
Command issued to controller passed
FIFO DATA GOOD...
CONTROLLER BUFFER LOAD/DUMP TEST PASSED
```

7.11.5 Interrupt Test

Typing a **5** executes the disk drive interrupt test.

If the test passes it displays an appropriate message:

```
Interrupt-Test: Test Passed
```

7.11.6 Initialize Disk Type

Selecting item **6** from the Disk Drive Diagnostic menu initializes the disk type for the diagnostics.

The following screen is displayed and you are prompted for the Unit Number and Drive Type. If the defaults are appropriate, just press <Return>.

```
Function: Initialize-Disk-Type
Initialize Disk Type.
  Drive-Unit#           <Number>           0
  Drive-Type            <String>           NT-8414
-> Initialize-Disk-Type
Enter Drive-Unit# <Number> -> (0)↵

-> Initialize-Disk-Type 0
Enter Drive-Type <String> -> (NT-8414)↵

-> Initialize-Disk-Type 0 NT-8414
Resetting Disk Controller Board
Checking Control/Status Register...
```

If the test passes it displays an appropriate message:

```
Command issued to controller passed
SET DRIVE SIZE COMMAND PASSED
```


7.11.7 Reset Test

Selecting item 7 from the Disk Drive Diagnostic menu executes the Reset Test. This verifies that the ability of the Disk Drive under test to recalibrate its disk heads and seek them to the zero position. Note that the WRITE PROTECT switch on the disk drive should be ON.

If the test passes it displays an appropriate message:

```
DRIVE RESET TEST PASSED
```

7.11.8 Read Status Test

Selecting item 8 from the Disk Drive Diagnostic menu executes the Read Status Test. This test reports on the disk drive status (ONLINE, READY, etc.) and the disk label parameters (disk drive ID, maximum number of sectors, maximum number of cylinders, etc.). This test does not write to the disk drive. The disk drive must be formatted. Note that the WRITE PROTECT switch on the disk drive should be ON.

Disk Drive Read Status/Label Test.

```
Resetting Disk Controller Board
Checking Control/Status Register...
Control/Status register, after reset = 0x09
Starting execution of controller board command...
```

```
Execution of I/O Parameter Block (IOPB) follows:
Disk Controller Control/Status Register = 0x09
Absolute address of IOPB                 = 0x4d9b0
Idle count                               = 1116
```

```
Command issued to controller passed
Control/Status register = 0x09
iobpctr->byte[STAT1]    = 0x05
iobpctr->byte[STAT2]    = 0x00
Read Drive Status test passed.
Results from status command:
Drive Status byte: 0x00
```

```
Sector offset of start of partition #[08] = 0
Number of sectors in partition          #[08] = 0
```

7.11.9 Short Read/Write Test

Selecting item **9** from the Disk Drive Diagnostic menu executes the Short Read/Write Test. This verifies that the disk drive can write data to and then read data back from the disk platter. Only a few sectors are used. The data read back will be compared with the data written. Note that for this test, the WRITE PROTECT switch must be OFF. If you leave the WRITE PROTECT switch on by mistake, this test fails with a "write protect error". To run this test, you must use a **formatted** disk.

CAUTION

.....
 This test destroys data on the disk. Do not use it on a disk containing information you want to retain.

.....
 If the test passes it displays an appropriate message:

```
Starting compare of READ data with WRITE data
DISK READ/WRITE TEST (SHORT VERSION) PASSED
```

7.11.10 Long Read/Write Test

Selecting item **10** from the Disk Drive Diagnostic menu executes the Long Read/Write Test. This verifies that the disk drive can write data to and then read data back from the disk platter. This test is more stressful on the drive, the drive interface, and the VMEbus than the short version by attempting to read and write almost every sector on the disk, similar to the disk formatter utility. Disk data will be lost. This test takes about 8 minutes. To run this test, you must use a **formatted** disk.

CAUTION

.....
 This test destroys data on the disk. Do not use it on a disk containing information you want to retain.

.....
 If the test passes it displays appropriate messages:

```
Command issued to controller passed
'READ LABEL' WAS SUCCESSFUL...
DISK DRIVE LONG READ/WRITE TEST PASSED
```

7.11.11**Seek Test**

Selecting item **11** from the Disk Drive Diagnostic menu executes the Disk Drive Seek Test. This verifies that the disk drive can perform explicit seek commands. If the disk drive fails the read/write test, this test can be used to check a more basic function. Inherent in every read and write is a hidden seek. The diagnostics issues explicit seeks to complement the read/write tests.

If the test passes it displays appropriate messages:

```
Command issued to controller passed  
'READ LABEL' WAS SUCCESSFUL...  
SEEK TEST PASSED
```

7.12 Multibus Ethernet Controller Diagnostics

The Multibus Ethernet Controller Menu is displayed by selecting item 4 'Multibus-Ethernet-Controller' from the Peripheral Diagnostics Menu shown in Section 7.7. Once that item is selected, the Ethernet Controller Diagnostics Menu is displayed. The Ethernet card must be plugged into a transceiver for the diagnostics to pass, otherwise the self-test will fail its loopback test.

```
Menu:  STANDALONE-PERIPHERAL-DIAGNOSTICS (TC2000) Multibus-Ethernet-Cntrlr
       1. Self-Test
       2. Link-Level-Mode-Test
       3. Quit
```

```
Excelan Multibus 301 Card
```

```
Ethernet-Controller ->
```

7.12.1 Ethernet Controller Self-Test

Selecting item 1 from the Ethernet Controller Diagnostic menu executes the Excelan 301 Self-Test. This verifies that the EXOS 301 Intelligent Ethernet Controller is functioning properly. The communication capability over the Ethernet itself is not tested.

If the test passes it displays an appropriate message:

```
EXCELAN: SELF TEST PASSED.
```

7.12.2 Link Level Mode Test

Selecting item 2 from the Ethernet Controller Diagnostic menu executes the Link Level Mode Test. This verifies that the host computer can download small packets of commands to the Excelan controller in link-level mode to test sending and receiving data. The test does NOT exercise the Ethernet itself.

If the test passes it displays an appropriate message:

```
Link-Level-Mode-Test: Test Passed
```

7.13 VMEbus Ethernet Controller Diagnostics

The Ethernet Controller Diagnostics Menu is displayed by selecting item 5 'Ethernet-Controller' from the Peripheral Diagnostics Menu shown in Section 7.7. Once that item is selected, the Ethernet Controller Diagnostics Menu is displayed. The Ethernet card must be plugged into a transceiver for the diagnostics to pass, otherwise the self-test will fail its loopback test.

```
Menu:  STANDALONE-PERIPHERAL-DIAGNOSTICS (TC2000) VMEbus-Ethernet-Cntrlr
      1. Self-Test
      2. Link-Level-Mode-Test
      3. Quit
```

```
Excelan VMEbus 302 Card
```

```
Ethernet-Controller ->
```

7.13.1 Ethernet Controller Self-Test

Selecting item 1 from the Ethernet Controller Diagnostic menu executes the Excelan 302 Self-Test. This verifies that the EXOS 302 Intelligent Ethernet Controller is functioning properly. The communication capability over the Ethernet itself is not tested.

If the test passes it displays an appropriate message:

```
EXCELAN: SELF TEST PASSED.
```

7.13.2 Link Level Mode Test

NOTE

~~~~~  
If the system contains the old Systech Controller (mutlibus), the test will run as noted, else the test may fail.  
~~~~~

Selecting item 2 from the Ethernet Controller Diagnostic menu executes the Link Level Mode Test. This verifies that the host computer can download small packets of commands to the Excelan controller in link-level mode to test sending and receiving data. The test does **NOT** exercise the Ethernet itself.

If the test passes it displays an appropriate message:

```
Link-Level-Mode-Test:  Test Passed
```


7.14 Terminal Driver Diagnostics

The Terminal Driver Diagnostics Menu is displayed by selecting item 4 from the Peripheral Diagnostics Menu shown in Section 7.7. Once that item is selected, the following screen is displayed:

```

Menu:  STANDALONE PERIPHERAL DIAGNOSTICS  (TC2000) CRT-Terminal-Controller
      1. Handshake-HA-Self-Test           Host Adapter
      2. HA-RAM-Test                     Host Adapter
      3. HA-LED-Test                     Host Adapter
      4. Interrupt-Test                  Host Adapter
      5. Get-Error-Log-Table             Host Adapter
      6. Get-System-Address-Table       Host Adapter
      7. Quit

```

HA = Systech HPS 6840 Host Adapter

CC = Systech Cluster Controller

Terminal ->

7.14.1 Handshake Host Adapter Self-Test

Selecting item **1** from the Terminal Controller Diagnostic menu executes the Handshake Systech Host Adapter Self-Test. The sixteen self-tests are comprehensive and are intended to catch and diagnose almost all errors short of catastrophic ones such as a no clock or no power to the Host Adapter board. In addition to executing the previous self-test this test performs a "handshake" with the host computer to check the Multibus data bus interface. The test also performs a DATA LOOPBACK TEST and an INTERRUPT LOOPBACK TEST.

Check the jumpers with the instructions for correct position. For only this test to successfully complete, the E22 jumper pins **3** and **4** must be **out**.

If the test passes it displays an appropriate message:

```
HOST ADAPTER HANDSHAKE VERSION OF SELF TEST PASSED.
```

7.14.2 Host Adapter RAM Test

Selecting item **2** from the Terminal Controller Diagnostic menu executes the Systech Host Adapter RAM Test. This verifies that the Multibus-accessible RAM on the Adapter board (96 bytes worth) is present and working. Pattern and fill RAM tests are used.

If the test passes it displays an appropriate message:

Pass Message...

7.14.3 Host Adapter LED Test

Selecting item 3 from the Terminal Controller Diagnostic menu executes the Systech Host Adapter Self-Test. The manufacturer's self-tests do not provide an LED test for the Host Adapter. This diagnostic will exercise the on-board tri-color LED, which is used during power-up and self-test. This diagnostic will cause the Host Adapter LED to flash.

When indicated by the test, check the LED on the Host Adapter (terminal controller). There are no pass or failure messages displayed.

7.14.4 Interrupt Test

Typing a 4 executes the disk drive interrupt test. The TC2000 has the controller card generate an interrupt. This exercises the interrupt cycle with the controller.

If the test passes it displays an appropriate message:

```
Interrupt-Test: Test Passed
```

7.14.5 Get Error Log Table

Selecting item 5 from the Terminal Controller Diagnostic menu executes the Get Error Log Table function. This function displays a table of board information and network statistics.

7.14.6 Get System Address Table

Selecting item 7 from the Terminal Controller Diagnostic menu executes the Get System Address Table function. This function displays a list of vector and routing table addresses.

nX Based Peripheral Diagnostics (periph_diag)



8.1 Overview

Unlike the standalone peripherals test described in Chapter 7, the nX based diagnostics test (**periph_diag**) is a separate program that runs from the nX operating system. **periph_diag** exercises the major functional operations of each peripheral device, such as reading and writing blocks of data to tapes and disks, formatting tapes and disks, erasing and rewinding tapes, and sending data over serial port and network connections. Refer to Figure 7-1 for a block diagram of the system peripherals and their connections.

Because **periph_diag** does more substantial testing of each component than the standalone peripherals diagnostics and transfers large amounts of data back and forth, the **periph_diag** tests are correspondingly longer, sometimes up to one hour each.

Like the standalone peripherals test, **periph_diag** is designed to assist in the diagnosis of failed devices. Failures are localized to the smallest possible component. (In some cases the tests may only determine that a device or controller board has failed.) Information from these tests enables field service personnel to pinpoint the necessary Field Replaceable Unit (FRU) and replace it.

In addition to performing substantive testing of the peripherals, **periph_diag** checks that all peripheral-to-system connections are operational by means of its system configuration test.

8.2 Typical Symptoms

If a test fails, the error message is often obvious. If the error message is obvious (like 'tape door open' or 'is tape loaded?'), fix the problem and re-run the test.

If the message is not obvious, follow the instructions in the section describing the test. If these approaches fail, call BBN ACI for assistance.

The typical symptoms are listed under each peripheral subsection.

8.3 How to Use the `periph_diag` Diagnostics

After selecting a terminal type, the system will display the main menu. Run the tests on each peripheral. If you have problems, but the device passes all of these tests, try Stress test and call BBN ACI. To exit from the diagnostics, select the **Quit** menu item. This brings up the nX OS prompt.

8.3.1 Run Times

The run times are listed under each peripheral subsection.

8.4 TC2000 Peripherals

The TC2000 peripherals consist of controller cards and the actual devices attached to these cards. Both controller cards and peripherals are tested. Refer to Figure 8-1 for the list of peripherals tested by `periph_diag`. Refer to Figure 7-1 for a block diagram of these devices and controller cards.

Figure 8-1 TC2000 Peripheral Subsystems

1/4" SCSI Tape Subsystem	Interphase 4810 VMEbus SCSI controller Tandberg 3640 1/4" Tape Drive
1/2" Tape Drive Subsystem	Interphase 4810 VMEbus SCSI controller Cipher M990 1/2" Tape Drive
Terminal Controller Subsystem	Systech 6840 Host Adapter Systech 7088 Cluster Controller Various CRT's, Printers, etc.
Ethernet Interface Subsystem	Excelan 302 Ethernet Controller (VMEbus)
SMD Fixed Disk Subsystem	Xylogics 451 Disk Controller NT 8414 Disk

8.5 Starting the Tests

The following conditions are required for running **periph_diag**:

- The nX operating system must be running.
- TCS must be running (refer to Chapter 2 for more information).

If the nX OS has been booted successfully on your TC2000, you may run the nX based diagnostics. If you are unable to boot the nX OS, you must run the standalone diagnostics first to determine if a peripheral is preventing successful boot up of the operating system. Chapter 7 describes the procedure for running standalone diagnostics.

Start the nX based diagnostics by completing the following steps at the system prompt:

```
nX (challenger.bbn.com) (console)
```

```
login: root ↵
```

Log in to the system as superuser ("root").

```
Password: password ↵
```

Enter password for "root".

```
Last login: Thu May 4 18:29:15 on console
```

```
*****
```

```
For systems with post-sales hardware/software support, the  
BBN Butterfly Hotline number is:
```

```
1-800-4AC-BFLY (in US)
```

```
1-617-873-8660 (outside US)
```

```
*****
```

```
# cd /stand ↵
```

Change to the appropriate directory.

```
# ./periph_diag ↵
```

Execute the diagnostics.

When the **periph_diag** Diagnostics have started, a terminal type menu is displayed.

Select the appropriate terminal type or item **6** if you intend print the output. After making your selection, the main menu will be displayed.

8.6 periph_diag Main Menu

At this level, you can go to the peripheral submenu, start the automatic tests, change your terminal type, or change the verbose mode:

```
Menu:  nX BASED-PERIPHERAL-DIAGNOSTICS
       1. Peripheral-Diagnostics          TC2000, nX based
       2. Automatic-Mode
       3. Terminal-Type                  Hardcopy, Menu-On
       4. Verbose-Mode-On-Off           On
       5. Help
       6. Quit

                               ver x.xx
nX BASED-PERIPHERAL-DIAGNOSTICS -> 1
```

Entering a **1** at the menu above displays the peripheral diagnostics submenu:

```
Menu:  nX BASED-PERIPHERAL-DIAGNOSTICS (TC2000)
       1. 1/4"SCSI-Tape-Cartridge
       2. Hard-Disk-Drive                SMD only, not SCSI
       3. Ethernet-Controller
       4. CRT-Terminal-Driver
       5. 1/2"-Tape-Drive
       6. System-configuration
       7. Quit

(TC2000) ->
```

You can test the peripherals in any order. In the following sections, the tests are described in the order they appear in the menus.

The System configuration menu item displays the current state of the peripherals and some peripheral specific information.

8.7 1/4" Tape Drive Tests

The 1/4" tape drive diagnostic has eight tests, as shown in the menu:

```
Menu:  nX BASED-PERIPHERAL-DIAGNOSTICS (TC2000) 1/4"-Tape-Drive
      1. Raw-Device-R/W-Test
      2. Block-Device-R/W-Test
      3. Short-Tar-Test
      4. Long-Tar-Test
      5. Convert-&-Copy-Test
      6. Retension-Test
      7. Write-Protect-Test
      8. Erase-Rewind-Test
      9. Quit
```

```
Jaguar    = Interphase 4210 SCSI Controller
TANDBERG  = SCSI Tape Drive
```

```
1/4"-Tape-Drive ->
```

To run the tests, type the appropriate number followed by a <Return>. The following subsections display the results of a successful run.

Error Message Interpretation

Possible non-obvious error messages are described in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI.

If Kernel Driver error message:

1. Verify that the tape cable is not plugged in backwards; if it is, reorient cable and re-run the test.
2. Replace cable and re-run test.
3. Open tape door, close, verify that tape winds to the beginning, re-run the test.
4. Halt the nX OS and run the standalone tests on the tape drive; if they fail, replace drive and/or Controller board; if they pass, reboot the nX OS and re-run tests; if the nX OS test still fails, call BBN ACI.

If Open/Write/Read error:

1. Verify that the tape cable is not plugged in backwards; if it is, reorient cable and re-run test.
2. Make sure that the device (e.g., 'rsmt1') exists in the /dev directory and is of the proper type (char, block, etc.); if it doesn't exist, use MAKEDEV to create it and reboot the machine.
3. If test still fails, try opening another device by running the 'system configuration' test; if this fails on all devices, there is either an nX problem (call BBN ACI) or an HVE repeater problem: replace both repeaters and re-run tests (after halting nX).
4. If system configuration passes on all devices but the SCSI drive, replace the cable first, then the tape drive.

If Data miscompare error:

1. Try a new tape; tape must be of type 3M/600A, 3M/600 XTD or DEI Series II Gold (*not* 'Gold Plus') or equivalent.
2. If 1) doesn't fix the problem, clean tape heads and re-run test.
3. If 1) and 2) don't fix the problem, replace tape cable and re-run test.
4. If all else fails, replace tape drive.

If Kernel panic:

1. Do crashdump analysis (see Section 3), if possible.
2. Run standalone diagnostics; replace controller/tape drive if either fail.
3. Reboot the nX OS; verify that the correct version of the nX OS is installed.
4. Reboot the nX OS and re-run test; if panic re-occurs, first try a different king node, then a different tape drive. If it repeats, Call BBN ACI.

If timeout/hang error:

1. Quit out of the diagnostics (<Control>C). Type 'reset' at the console to restore the console to its original state.
2. Type ps to find the PID of the running process; use 'kill' to kill it. If it remains alive, halt the nX OS; else re-run the test.
3. If test still hangs or times out: run standalone diagnostics; if they pass, reboot the nX OS and retry the nX OS tests.
4. If test still hangs/times out, try a different king node, and if it still fails, call BBN ACI.

Failures

Possible non-obvious error messages are described in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI. Many of the error messages are the same as for Block-Device-Read/Write and Long-tar tests (Subsections 8.7.2 and NO TAG), with the following differences:

1. If you forgot to enable the SAFE write-protect mechanism, do so and re-run the test.
2. If the test still fails, try a new tape.
3. If the test still fails, replace the tape drive cable, then the tape drive, if necessary.

Failures

Possible non-obvious error messages are described in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI. Many of the error messages are the same as for Block-Device-Read/Write tests (Section 8.7.2), with the following differences:

1. First, quit out of the diagnostics on any failures and type the following at the shell level prompt: **tar cvf /dev/xxxx <filename>**, where *xxxx* is the name of the drive and *<filename>* is a file of your choice. Note the pass/fail status of this shell command. If this shell level command passes, but the diagnostics still fail, try a new tape; if this doesn't fix the problem, run the diagnostics on the disk; if they pass, most likely there is a software bug in the diagnostics; report it.
2. If the shell-level command fails, run the disk diagnostics; if they pass, try a new tape drive; if the test still fails, there is either an nX problem or a diagnostic software problem; report it.
3. Otherwise, make sure the **/usr/tmp** directory exists; if not create it and re-run the test.

C&C test Failures

1. First, quit out of the diagnostics on any failures and type the following at the shell level prompt: **dd if=/dev/rxy0b of=/dev/xxxx** where *xxxx* is the name of the drive. Note the pass/fail status of this shell command. If this shell level command passes, but the diagnostics still fail, try a new tape; if this doesn't fix the problem, run the diagnostics on the disk; if they pass, most likely there is a software bug in the diagnostics; report it.
2. If the shell-level command fails, run the disk diagnostics; if they pass, try a new tape drive. If the test still fails, there is either an nX problem or a diagnostic software problem; report it.

Failures

If all other 1/4" tests pass but this one fails, most likely the tape cartridge is at fault. Try a different tape.

8.7.1 Tape Drive Raw Device Read/Write Test

This test writes data to the tape drive and requires the use of a scratch tape. It takes about five minutes to finish, starting at buffer #1 and ending with buffer #1000.

A successful run displays a test passed message.

If the test fails, try to run the rest of the tape tests, recording the results. Then call BBN ACI.

8.7.2 Tape Drive Block Device Read/Write Test

This test writes blocks of data to the tape drive and requires the use of a scratch tape. Press <Return> after **smt1** to start the test. Buffer #1-#1000

Enter 1/4" Block Tape Device <String> -> **smt1** ↵

A successful run displays a test passed message.

8.7.3 Tape Drive Short tar Test

This test briefly (about ten minutes long) exercises the **tar** command. The default device is **smt1**; press <Return> after the prompt to start the test. It requires the use of a scratch tape.

A successful run displays a test passed message.

8.7.4 Tape Drive Long tar Test

This test, which takes about thirty minutes transferring 100 megabytes, exercises the **tar** command. The default device is **smt1**; press <Return> after the prompt to start the test. It requires the use of a scratch tape.

A successful run displays a test passed message.

8.7.5 Tape Drive Convert and Copy Test

This test dumps data to the tape drive and requires the use of a scratch tape. It takes 15 to 20 minutes, and the tape must rewind after the test is completed. The default device is **rsmt1**; press <Return> after the prompt to start the test.

NOTE

~~~~~  
 This test may fail if run while booted from a SCSI disk.  
 ~~~~~

```
Enter 1/4" Raw Tape Device <String> -> (rsmt1) ↵
-> Convert-&-Copy-Test rsmt1
```

A successful run displays a test passed message.

8.7.6 Tape Drive Retension Test

This test exercises the **retension** command and the tape drive's response. It requires the use of a scratch tape. The default device is **smt1**; press <Return> after the prompt to start the test.

```
-> Retention-Test
Enter 1/4" Raw Tape Device <String> -> (smt1) ↵
```

A successful run displays a test passed message.

8.7.7 Tape Drive Write-Protect Test

This test requires the use of a scratch tape. You must put the Write protect ring on the tape reel before starting. The default device is **smt1**; press <Return> after the prompt to start the test.

```
-> Write-Protect-Test
Enter 1/4" Block Tape Device <String> -> (smt1) ↵
```

A successful run displays a test passed message.

8.7.8 Tape Drive Erase/Rewind test

This test erases **all** data on the tape and requires the use of a scratch tape. The default device is **smt9**; press <Return> after the prompt to start the test. The test takes about five minutes.

```
Enter 1/4" Tape Device (no rewind) <String> -> (smt9) ↵
```

A successful run displays a test passed message.

8.8

Hard Disk Drive Diagnostics

The disk drive diagnostic tests perform the following operations:

1. Seeks to ten random sectors on every head on every tenth cylinder and does a quick read on raw disk device.
2. Seeks to ten random sectors on EVERY cylinder and EVERY head and does a quick read on raw device.
3. Reads defect list off disk and controller address.
4. Reads every tenth sector on every tenth cylinder on block device.
5. Reads EVERY sector on block device.
6. Reads and displays disk label.
7. Reads and displays data from user-specified sector.
8. Reads and displays track header info from user specified track.
9. Copies a large directory to scratch area of disk; compares original files with copies.

CAUTION

.....

The write-protect switch on the disk should *never* be enabled while the nX OS is running multi-user, since that will crash the system when it writes to the disk.

.....

The disk drive diagnostic main menu displays the following:

```
Menu: nX BASED-PERIPHERAL-DIAGNOSTICS (TC2000) Hard-Disk-Drive
```

1. Fast-Seek-Test
2. Extensive-Seek-Test
3. Raw-Device-Test
4. Short-Block-Device-Test
5. Long-Block-Device-Test
6. Label-Read-Test
7. Read-Sector-Test
8. Track-Hdr-Test
9. File-Copy-Test
10. Quit

```
Allowable Drives: (#Heads #Cylinders #Sectors)
  NT 8408 (500)      8      1496      65
  NT 8414 (850)     14      1511      65
Hard-Disk-Drive ->
```

Failures

Possible non-obvious error messages are described in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI.

1. Halt the nX OS, run standalone diagnostics, and replace either the disk or the controller if either is suspect; reboot the nX OS and re-run nX disk diagnostics.
2. Otherwise, halt the nX OS, try a new disk cable, then reboot the nX OS.
3. Else, if non-fatal error occurs on a small subset of the sectors, check those sectors against the bad sector table (defect list) using **diskutil**, and ignore those sectors that match; if a sector fails in the seek test that doesn't show up in the defect list, you have a bad drive; replace it.

Possible non-obvious error messages are described in Subsection 8.8.2 (seek tests) and in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI.

1. Replace disk if the same sectors keep failing, if those sectors are not found in the defect list.
2. Or, use **diskutil** to add the sectors to the defect list, and re-install and reboot the nX OS.

Kernel Driver error message:

1. Try a different king node.
2. Halt the nX OS, re-seat controller board and try different cables.
3. Reformat disk or try a new disk.
4. Replace controller board.
5. Call BBN ACI.

Open/Write/Read error:

If the disk boots without problems, but you get open/read/write/close errors during disk tests, there probably is a diagnostic software bug; report it.

Timeout or hang error:

If the nX OS boots ok, but you get timeout errors during disk tests, there probably is a diagnostic software bug; report problem.

Kernel panic:

1. Replace king board and re-try test.
2. Re-format disk and reinstall the nX OS.
3. Try a new disk.
4. Try new cables.
5. Replace Controller board.
6. Call BBN ACI.

8.8.1**Disk Drive Seek Test (Short Version)**

This test takes about 15 minutes to finish, going from cylinder 0 to 1510.

To run the disk drive fast seek test, type **1** at the main menu prompt and type in the drive number at the prompt:

```
-> Fast-Seek-Test
Enter Disk Drive Unit Number -> (0) ↵    Press <Return> if 0.
```

```
Enter Disk Drive Type -> (NT-8414) ↵    Press <Return> if NT8414.
```

A successful run displays a test passed message.

8.8.2**Disk Drive Seek Test (Long Version)**

The long version of the disk drive seek test takes about one and one half hours.
0 - 1510.

```
Disk Drive Unit Number <string> 0
Disk Drive Type NT-8414
-> Extensive-Seek-Test
Enter Disk Drive Unit Number
-> (0) ↵                                Press <Return> if 0.
-> Extensive-Seek-Test 0
Enter Disk Drive Type
-> (NT-8414) ↵                            Press <Return> if NT8414.
-> Extensive-Seek-Test 0 NT-8414
```

A successful run displays a test passed message.

8.8.3 Disk Drive Raw Device Test

This test will read and display the disk controller's address and the disk-resident defect list. At the prompt type the disk drive number or <Return> if 0.

```
Disk Drive Unit Number <number> (0) ↵
```

A successful run displays a table of information and a test passed message.

Possible non-obvious error messages are described below. If you get a non-obvious message that is not described, call BBN ACI.

1. Run the 'system configuration' test: if disk doesn't respond, replace controller (after halting nX).
2. Halt the nX OS and run standalone tests; if they fail, replace controller.
3. Call BBN ACI.

8.8.4 Block Device Test (Short Version)

The short version of the Block Device test takes about 15 minutes. Certain sectors may fail; you should declare those sectors bad using the **diskutil** program. A successful pass displays the following:

```
Disk Drive Unit Number <number> (0) ↵           Press <Return> if 0.
Disk Drive Type      NT-8414
Reading every tenth sector on cylinder 0
.
.
.
              more messages.
.
.
Reading every tenth sector on cylinder 1510
SHORT BLOCK DEVICE TEST PASSED.
Short-Block-Device-Test: Test Passed
```

8.8.5 Block Device Test (Long Version)

This test reads every sector on the disk; it takes about five hours. Certain sectors may fail; these sectors should be mapped into the bad sector table by the **diskutil** program. Press <Return> if you want to test disk #0:

```
Disk Drive Unit Number <number> (0) ↵
Disk Drive Type      NT-8414
```

A successful run displays a test passed message.

8.8.6 Label Read Test

This test will read and display the disk-resident label. At the prompt type the disk drive number or <Return> if 0.

```
Disk Drive Unit Number <number> (0) ↵
```

A successful run displays a table of information and a test passed message.

Possible non-obvious error messages are described in Subsection 8.8.2 (seek tests) and below. If you get a non-obvious message that is not described, call BBN ACI.

1. Check to see if cylinder 0, track 0, sector 0 is in defect list; if so, don't run this test.
2. Re-format disk and re-install the nX OS.
3. There probably is a diagnostic bug: report failure symptoms.

8.8.7 Read Sector Test

This test will read and display the contents of a specific sector. Use the prompt responses below as an example.

```
Enter Disk Drive Unit Number -> <number> (0) ↵
Enter Disk Drive Type -> <string> (NT-8414) ↵
Enter Cylinder Number -> <number> (0) 1 ↵
Enter Head Number -> <number> (0) 1 ↵
Enter Sector Number -> <number> (0) 5 ↵
-> Read-Sector-Test 0 NT-8414 1 1 5
```

A successful run displays a table of information and a test passed message.

Possible non-obvious error messages are described in Subsection 8.8.2 (seek tests) and below. If you get a non-obvious message that is not described, call BBN ACI.

1. Sector may be a 'slipped' sector: check against **diskutil** defect list and ignore error if sector is in list.
2. Run Short-Block-Device and Quick-Seek tests: if they pass, reformat your disk.
3. Replace cable.
4. Call BBN ACI.

8.8.8 Track Header Test

A successful pass displays the following:

```
-> Track-Hdr-Test 0 NT-8414 2 3

Disk Drive Read Track Header Test

Disk Drive Unit Number <number> (0) ↵      Press <Return> if 0.
Disk Drive Type          NT-8414

Cylinder: 2
Head      : 3

Track Header Data:

0200033f  02400300  dddddddd  02000300
02000301  02000302  02000303  02000304
.
      more messages.
.
02000339  0200033a  0200033b  0200033c
0200033d  0200033e

READ TRACK HEADER TEST PASSED.
Track-Hdr-Test: Test Passed
```

If all other tests pass but this one fails, there probably is a diagnostic software bug: report symptoms of failure.

8.8.9 File Copy Test

A successful run displays a test passed message.

Possible non-obvious error messages are described in Subsection 8.8.2 (seek tests) and in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI.

1. Make sure **/usr/tmp** directory exists; if not create it and re-run test.
2. Run standalone diagnostics (after halting nX).
3. Re-format or replace disk; re-run test.
4. Replace cables and/or controller.

8.9 Ethernet Controller Test

The Ethernet controller test performs the following:

1. Ping test: **pings** (echoes back and forth) blocks of data to user specified host computer on network.
2. Statistics: prints collection of communication statistics on ethernet device. Not implemented yet.
3. Data transfer test: transfers data to specified system on network.

The Ethernet controller menu displays the following:

```
Menu:  nX BASED-PERIPHERAL-DIAGNOSTICS (TC2000) Ethernet-Controller
      1. Ping-Test
      2. Statistics-Test
      3. Data-Transfer-Test
      4. Quit
```

Excelan 302 Card

Ethernet-Controller ->

Possible non-obvious error messages are described in the following paragraphs. If you get a non-obvious message that is not described, call BBN ACI.

1. Check cable; replace if suspicious.
2. Try a different ping host.
3. Reboot the nX OS and retry.
4. Quit out of the diagnostics and attempt to **ftp** to known slave host; then re-run test.
5. If tests on other devices fail, replace HVE repeaters.
6. Replace Ethernet board.

8.9.1 Ethernet Controller Ping Test

This test takes about three minutes to complete. Enter the name of a system on **your** network at the prompt.

A successful pass displays a table of information with no errors listed.

8.9.2 Ethernet Controller Statistics Display Test

The kernel Excelan statistics are only updated every 25 minutes. You must wait at least this long after booting the kernel before the first statistics are available.

A successful pass displays a table of information with no errors listed.

8.9.3 Ethernet Data Transfer Test

Select the Ethernet data transfer test from the Ethernet-Controller menu. This test transfers a file from a host computer to the TC2000 using **ftp**.

A successful pass displays the following:

```

Ethernet Data Transfer.
  Remote Host      <String>      bfly-vax.bbn.com
  Remote login     <String>      guest
  Path name        <String>      /vmunix
-> Data-Transfer-Test
Enter Remote Host  <String> -> (bfly-vax.bbn..com)  wheat.bbn.com ↵
-> Data-Transfer-Test  wheat.bbn.com
Enter Remote login <String> -> (guest)  rpreston ↵
-> Data-Transfer-Test  wheat.bbn.com  rpreston
Enter Path name    <String> -> (/vmunix)  /nfs/wheat/u1/rpreston/temp/zndx.addr ↵
-> Data-Transfer-Test wheat.bbn.com rpreston /nfs/wheat/u1/rpreston/zndx.addr

Ethernet-Controller Data-Transfer-Test...
Enter remote host password:  ↵          < = Note: echo disabled here!
Connected to wheat.bbn.com
220 wheat.bbn.com FTP server (Version 4.12 Thu May 11 16:52:09 EDT 1989) ready
Password required for login rpreston

.  More messages.

Comparing /usr/tmp/dummy10 with /usr/tmp/dummy1
Ethernet Data Transfer Test Passed

```


8.10 CRT Terminal Driver Diagnostics

The CRT Terminal Driver diagnostics perform the following:

1. Tests the host adapter card using the on-board diagnostic
2. Tests the cluster controller connection.
3. Displays the adapter log or the remote controller log.
4. Exercises a single or multiple terminal lines.
5. Dumps all displayable characters to a terminal for a specified time.

```
Menu:  nX-BASED-PERIPHERAL-DIAGNOSTICS (TC2000) CRT-Terminal-Controller
      1. Host-Adapter-Loopback-Test
      2. Cluster-Controller-Loopback-Test
      3. Adapter-Log-Test
      4. Remote-Cntrlr-Log-Test
      5. Tty-Line-Loopback-Test
      6. Multiple-Tty-Loopback-Test
      7. Character-Screen-Dump
      8. Quit
```

8.10.1 Host Adapter Loopback Test

The sixteen self-tests are comprehensive and are intended to catch and diagnose almost all errors short of catastrophic ones such as a no clock or no power to the Host Adapter board. In addition to executing the previous self-test this test performs a “handshake” with the host computer to check the Multibus data bus interface. The test also performs a DATA LOOPBACK TEST and an INTERRUPT LOOPBACK TEST.

Check the jumpers with the instructions for correct position. For only this test to successfully complete, the E22 jumper pins **3** and **4** must be **out**.

If the test passes it displays a table with no errors.

8.10.2 Cluster Controller Loopback Test

This tests the connection from the host adapter to the cluster controller. It prompts for the controller number:

```
-> Cluster-Controller-Loopback-Test 1
```

If the test passes it displays a table with no errors.

8.10.3 Host Adapter Log Display Test

This test displays a table of information from the host adapter card. It prompts for the controller number:

```
-> Cluster-Controller-Loopback-Test 1 ↵
```

8.10.4 Remote Controller Log Test

This test displays a table of information from the cluster controller. It prompts for the controller number:

```
-> Cluster-Controller-Loopback-Test 1 ↵
```

8.10.5 TTY Line Loopback Test

This tests a single TTY line and requires a loopback connector on the line under test. It prompts for the TTY line (default tty00):

```
Enter Tty Line. <String> -> /dev/tty00 ↵
```

If the test passes it displays a test passed message.

8.10.6 Multiple TTY Loopback Test

This tests multiple TTY lines and requires a loopback connector on each of the lines under test. It prompts for the first and last TTY line:

```
Enter first tty Line. <String> -> /dev/tty00 ↵
```

```
Enter second tty Line. <String> -> /dev/tty07 ↵
```

If the test passes it displays a test passed message.

8.10.7 Character Screen Dump

This test dumps all displayable characters to a terminal for a specified time. It prompts for the tty line and duration:

```
Enter first tty Line. <String> -> /dev/tty00 ↵
```

```
Enter Burn-in time (seconds) <Number> -> 20 ↵
```

If the test passes it displays the pattern on the selected terminal.

8.11 1/2" Tape Drive Diagnostics

The 1/2" tape drive diagnostics perform the following:

1. Tests the drive as a raw device: writes out 1000 buffers, reads them back, compares data.
2. Tests the drive as a block device (buffered I/O).
3. Does a short or a long **tar** test.
4. Does a 'convert and copy' test.
5. Writes 20 filemarks to tape, backspaces over each one of them one at a time.
6. Tests the write protect detect mechanism on the tape drive.
7. Rewinds tape.

Most of the 1/2" tape drive tests are the same as the tests for the 1/4" SCSI tape (in Section 8.7). If you encounter an error, check the descriptions in the SCSI tape section. Only differences are described in this Section. The 1/4" tape is **rsmt1** while the 1/2" tape is **rmt0**, or **rmt8**, for low or high density respectively.

```
Menu:  nX BASED-PERIPHERAL-DIAGNOSTICS (TC2000) 1/2"-Tape-Drive
1. Raw-Device-RW-Test
2. Block-Device-RW-Test           Not implemented
3. Short-Tar-Test
4. Long-Tar-Test
5. Convert-&-Copy-Test
6. EOF-Search-Test
7. Write-Protect-Test
8. Rewind-Test
9. Quit
```

```
Jaguar = Interphase 4210 SCSI Controller
CIPHER = SCSI Tape Drive
```

NOTE

```

////////////////////////////////////
To run the SCSI or 1/2-inch tape periph_diag tar tests, be sure to change (cd) to
the /stand directory. Otherwise the tests will fail.
////////////////////////////////////

```

Failures

If a test is unsuccessful:

1. Try a different tape.
2. Halt the nX OS; run the standalone diagnostics—specifically, the 1/2” Magnetic Tape diagnostic that leads one through the front-panel driven self-tests on the tape drive itself.
3. Try a different tape drive.
4. Try a different controller.

8.11.1 Raw Device Read/Write Test

This test writes data to the tape drive and requires the use of a scratch tape. It will take 15–20 minutes to finish, starting at buffer #1 and ending at buffer #1000. Press <Return> at the prompt:

```
Enter 1/2" Raw Tape Device <String> -> (rmt0) ↵
```

A successful run displays a test passed message.

8.11.2 Block Device Read/Write Test

This test writes data to the tape drive and requires the use of a scratch tape. It takes about five minutes to complete.

NOTE

```

////////////////////////////////////
This test has not been fully implemented and should not be used.
////////////////////////////////////

```

A successful run displays a test passed message.

8.11.3 Short or Long tar Test

This test writes data to the tape drive and requires the use of a scratch tape. The short tar takes about five minutes and the long tar takes about 30 minutes to complete. Press <Return> at the prompt:

```
Enter 1/2" Raw Tape Device <String> -> (rmt0) ↵
```

A successful run displays a test passed message.

8.11.4 Convert and Copy Test

This test writes data to the tape drive and requires the use of a scratch tape. This test requires a 2400' tape if it is run at 1600 bpi (rmt0). A 1200' tape is fine if using 6250 bpi (rmt8).

If you run out of tape (*e.g.* using rmt0 and a 1200' tape), you will get a controller error 3 (end-of-tape), but the test will still pass since nothing was wrong.

Enter 1/2" Raw Tape Device <String> -> (rmt0) ↵

A successful run displays a test passed message.

8.11.5 Tape Drive End-of-File (EOF) Search Test

This test writes data to the tape drive and requires the use of a scratch tape.

NOTE

.....
 This test has not been fully implemented and should **not** be used.

Enter 1/2" Raw Tape Device <String> -> (rmt0) ↵

A successful run displays a test passed message.

8.11.6 Tape Drive Write-Protect Test

This test has the potential to destroy the magnetic tape data and requires the use of a scratch tape.

Enter 1/2" Block Tape Device <String> -> (mt0) ↵

If you run this test with a write ring, the test fails as it should with the following message:

WRITE PROTECT MECHANISM FAILED

A successful run displays a test passed message.

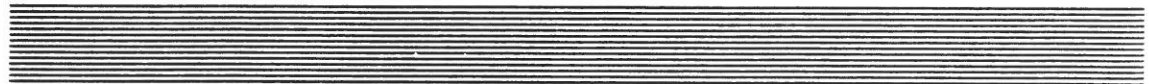
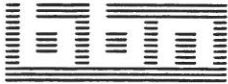
8.11.7 Tape Drive Rewind test

Typing an 8 executes the Rewind test. This test requires a scratch tape to be loaded in the tape drive.

Enter 1/2" Tape (no rewind) <String> -> (rmt8) ↵

A successful run displays a test passed message.

Stress Test



9.1 Overview

Execution of the TC2000 I/O Stress Test can be entirely automatic or defined by the user (to test particular parameters or possible failure modes). While this is not intended to diagnose problems it might indicate problems in particular subsystems.

Stress Test is designed to place a heavy burden on the I/O subsystems. It exercises I/O in ways that a typical customer in the field may not encounter.

If stressing a marginal peripheral subsystem causes a system crash, loss of disk data could occur. Avoid running the stress test while users are on the system, since their work will be jeopardized.

Ethernet stress testing during normal working hours is likely to place a load on the network that may affect other users and may therefore alarm people responsible for network maintenance. We advise that Ethernet stress testing proceed only after consulting with network maintenance personnel. Even on a perfectly fine system, the stress test will make system response unacceptably slow for users.

Just prior to starting, the Stress Test attempts to add all available free nodes to the Public cluster, in order to fork processes on remote nodes later on. In most instances, not every node is available. This results in a non-fatal error message, and Stress Test continues with the available nodes.

9.2 How to use Stress Test

Use Stress Test in automatic mode. Once started, errors may be checked from the command prompt using the **kill ?** command. To exit Stress test type **exit**.

9.2.1 Run Times

The typical run time is dependent on how many subsystems tested, but it should be run for at least one half hour.

9.3 Automatic Mode

When the Stress Test is first invoked (Figure 9-1), it prompts to select automatic or command mode. Invoking automatic mode starts a standard suite of stress test functions involving all five I/O subsystems (disk, Ethernet, 1/4" tape, 1/2" tape, and terminal). Several other I/O activities are also started which will loop until explicitly killed. To exercise the tape drives, load the drives with scratch tapes and put the half-inch tape drive online before starting.

Figure 9-1 Stress Test Automatic Startup

```
# cd /stress ↵
# ./stress ↵
ADDING ALL NODES TO PUBLIC CLUSTER; PLEASE WAIT...
.
.
.
Enter choice (by number):
  1. Start standard stress test without user intervention
  2. Start stress test 'command enter' mode
1 ↵
Test disk?      [y/n] y ↵
Test 1/4" tape? [y/n] y ↵
Test tty?       [y/n] y ↵
Test 1/2" tape? [y/n] y ↵
Test ethernet?  [y/n] n ↵
Wait...
Execution of standard Stress Test has begun...
ENTER 'kill ?' FOR A LIST OF ALL STRESS TEST PROCESSES RUNNING IN AUTO-MODE...
```

After logging in as 'root', change directories to /stress and start Stress Test.

Type 1 for automatic mode.

It is not recommended to use the Ethernet exercises.

After the tests are started, the command prompt is displayed.

You may also use any of the commands listed below:

quit or exit	Leave Stress Test
help [command]	Displays a help list or specific help
kill [?]	Displays a list of all known child processes
sst	Runs a standard stress test on all five I/O systems
ver	Displays the <u>version</u> number

9.4 Command Mode

The various Stress Test commands are described below with optional arguments in brackets:

'cc' command

```
cc [-f] [-r]
```

The **cc** command starts a child process that invokes the C compiler to compile and link a moderately-sized C program. C compilation involves a moderate amount of disk I/O, depending upon the size of the program being compiled.

- f** run in a loop forever (can be stopped with the **kill** command)
- r** run remotely on a node other than the Master Node

'combine' command

```
combine [-rf] disk_io scsi_io
combine [-rf] disk_io scsi_io ethr_io
combine [-rf] disk_io scsi_io ethr_io tape_io
```

The **combine** command starts one or more child process that exercises two, three, or four I/O subsystems in isolation of the other I/O subsystems. The allowable subsystems are: "disk_io", "scsi_io", "tape_io", "ethr_io", and "term_io" (tty I/O). Thus, for example, **combine disk_io ethr_io scsi_io** will start I/O activity on the disk, the ethernet, and the scsi tape drive all at the same time. The particular I/O subsystems can be specified in any order.

- f** run in a loop forever (can be stopped with the 'kill' command)
- r** run remotely on a node other than the Master Node

'do' command

```
do filename
```

The **do** command executes a series of stress test commands that are located in a file, as if the commands were typed in at the keyboard. This allows custom Stress Test command scripts to be stored and duplicated.

'exec' command

```
exec [-w] nX-command
```

The **exec** command executes any valid nX Operating System shell-level command. This feature allows you to write your own I/O intensive commands and execute them from stress test, so that your custom commands and standard stress test commands can be executed simultaneously.

-w Makes stress test wait for the command to completed. Without the **-w** flag, the command will be queued, but the command parser will return immediately allowing several commands to be active at once.

'fork' command

```
fork [-rf] disk_io
fork [-rf] scsi_io
fork [-rf] ethr_io
fork [-rf] tape_io
fork [-axf] term_io
```

The **fork** command creates a child process that exercises a specific I/O subsystem by itself. The allowable I/O subsystems are: **disk_io**, **scsi_io**, **tape_io**, **ethr_io**, and **term_io** (tty I/O). For example, the command **fork disk_io** starts intensive disk I/O activity. Depending upon the I/O device, many forks can be issued, one after the other: **fork -f disk_io** commands can be issued ad infinitum, until either the number of open files allowed by one process is exceeded or the allowable number of child processes that can be forked by one processes has been exceeded. This will not work with other devices, such as the SCSI tape drive, which will return a 'device busy' error upon the issuance of a second **fork scsi** command. In this case, the second fork must await the completion of the first.

-f run in a loop forever (can be stopped with the **kill** command)
-r run remotely on a node other than the Master Node
-a (term_io only) run tty I/O on 8 terminals instead of just /dev/tty00 (/dev/tty00 through /dev/tty07)
-x (term_io only) run tty I/O assuming getty is 'off' on each tty; without the **-x** flag, getty is assumed 'on';

'help' command

```
help [command]
```

The **help** command displays help on a particular command (syntax, usage) or displays a list of all available commands. If no command name is given as an argument to the **help** command, a list of all available commands is given. If a valid stress test command is given as an argument, a more extensive help message on that particular command is displayed. Typing a **?** is also accepted.

'kill' command

```
kill [?] [pid] [all]
```

The **kill** command will stop a child process that was invoked by a previous stress test command which used the **-f** loop forever flag.

- ?** displays a list of all known child processes for 'kill'ing. A process id number (pid) will kill that particular process.
- all** kills all known child processes that have been issued with the **-f** loop forever flag set.

'nroff' command

nroff [-f] [-r]

The **nroff** command starts a child process that executes an nroff text formatter session on a moderately-sized nroff text document.

- f** run in a loop forever (can be stopped with the **kill** command)
- r** run remotely on a node other than the Master Node

'quit' command

quit

The **quit** or **exit** commands exits the stress test and returns the user to the shell command level.

'sst' command

sst

The **sst** command runs a standard stress test designed to activate all five TC2000 I/O subsystems simultaneously, as well as a large amount of switch traffic. The same effect can be achieved by entering **do sst_script** or by bypassing 'command enter' mode and entering 'automatic mode' at the time of Stress Test invocation.

'sys_call' command

sys_call [system-call]

The **sys_call** command invokes nX system calls found in the *nX Programmers Reference Volume II*. Some of the calls are invoked more than once with different parameters. Since the stress test is first and foremost an I/O stress test, only those system calls that are expected to engage in a lot of I/O activity are invoked.

With no arguments, all major system calls are invoked sequentially. With a valid system call argument, only that system call is invoked.

'mm' command

mm [-f]

The **mm** command is designed to create lots of switch traffic by exercising Uniform System Matrix Multiplies.

-f run in a loop forever (can be stopped with the **kill** command)

'ver' command

ver

The **ver** command displays the stress test version number.

9.4.1 Notes on use of Commands

Usage

Commands can be abbreviated, as long as it remains unique enough to identify the command. Arguments to commands generally cannot be abbreviated.

Although terminal I/O stress testing will work without actual CRT's connected to ports tty00 through tty07, you will be able to actually see the I/O only if the CRT's are connected (obviously). The cluster controller(s) must be hooked up or errors will result.

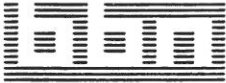
The stress test is used most effectively when many activities are ongoing at the same time. Issuing a single **fork disk_io** is not very interesting. On the other hand, issuing five or six **fork -f disk_ios**, several **compiles** (loop forever), several **nroffs** (loop forever), several **forks** on other I/O subsystems, a couple of **combines**, and several matrix multiplies, will generally stress the system to its limit or beyond. 'Automatic mode' (standard Stress Test) represents a middle ground.

The **help** command, followed by a valid stress test command as an argument, displays (on-line) all a user needs to know to correctly invoke a stress test command.

Kill is to be used only on commands that have been (previously) invoked with the **-f** (loop forever) flag. It cannot be used on commands that have been issued without the **-f** flag, since these commands will die of their own accord when they have completed. When issuing a **kill** command, the process to be killed may loop one more time after issuance of the **kill** command before it dies.

The filename containing commands for the **do** command must contain valid stress test commands, not nX shell script commands.

SCSI Disk Tool



10.1 Overview

DISKTOOL is a utility for formatting, labelling, partitioning, and troubleshooting SCSI disks. It has been designed for use with all SCSI disks. There are two versions of DISKTOOL; a standalone version located on the TCS that runs under TEX and another version that runs under the nX OS. This chapter describes the standalone version.

This chapter only covers those functions that might be used in testing or diagnosing problems. For a more complete description of the functions in DISKTOOL refer to the *TC2000 System Administration Guide*.

10.2 How to Use DISKTOOL

DISKTOOL is useful for checking the some of the basic SCSI disk functions. Before doing anything you must attach to the disk drive, which if successful indicates some functionality of the subsystem. Typical use for testing might be to check the label, the geometry, the partitions and try some of items on the **Exercise-disk** menu. To exit DISKTOOL test type **quit** at the main menu.

10.2.1 Run Times

The typical run times for the suggested functions are mostly under one minute. Depending on the disk drive vendor, the time some functions take may vary.

10.2.2 Attaching and Specifying

A disk must be **attached** or **specified** before any meaningful function can be used. A disk is **specified** if DISKTOOL has been able to find the device. A disk is **attached** if DISKTOOL has been able to send an inquiry, mode sense.

and capacity commands to the disk. These commands are used to indicate vendor type and disk geometry. DISKTOOL then tries to read and verify the label on an attached disk.

All DISKTOOL functions can be performed on an attached disk. If the disk is **specified**, but not **attached**, then you will not be able to format or label the disk. This is because the disk or disk controller has not been able to respond to the SCSI inquiry, mode sense, or get capacity commands. DISKTOOL is unable to label a disk without this information. The disk or disk controller probably also has a serious hardware problem. However, you will be able to run some simple disk tests on a specified disk (**self-test**, **spin-up**, **spin-down**, and other tests in the **Exercise** menu). These may help you find the problem.

The **Attach-to-disk** menu item uses two arguments; the SCSI bus number (0 or 1) and the device number on the SCSI bus (0-6). After you enter the disk's bus and device number, DISKTOOL prompts for confirmation. It then sends four SCSI commands: inquiry, mode sense (once for format and once for geometry), and read capacity. If all of the commands succeed, the disk is considered **attached**, and DISKTOOL tries to read the label from the disk. If it finds the disk but one or more of the SCSI commands fail, then the disk is considered **specified**, not **attached**.

If **Attach-to-disk** fails to even specify the disk, try using the **Specify-disk** function on the **Fix-disk-problems** menu (Figure 10-1).

The **Display-label** menu reads the label from the disk. If the read succeeds, and if there is a label on the disk, the contents of the label are displayed. The label contains the disk name, disk partitioning, and disk geometry.

If DISKTOOL failed to verify the label geometry it means that the geometry on the label does not match the geometry reported by the disk. This is usually an indication that the label is corrupted or wrong, although it may mean that a disk DIP switch setting has changed. If the geometry is correct, you can fix the label by writing it back to the disk. If it is the geometry that is incorrect, refer to the *TC2000 System Administration Guide* to make the changes.

```
Menu: SCSI disktool
      1. Attach-to-disk           <scsi bus (0-1), dev (0-6)>
      2. Display-label
      3. Show-disk-geometry
      4. Change-partitioning-on-label/
      5. Name-disk (changes label)
      6. Fix-disk-problems/
      7. Exercise-disk/
      8. Terminal-type/         Hardcopy, Menu-On, More-Off
      9. Quit
```

```
SCSI disktool ->
```

Figure 10-1 Fix Disk Problems Menu

```
Menu: SCSI disktool Fix disk problems
  1. Show-defects-on-disk/      <log|phys>
  2. Reassign-block-on-disk    <logical block number>
  3. Format-disk/
  4. Verify-format             <optional starting block>
  5. Drive-ready-test
  6. Quit-to-prev-menu
```

```
Fix disk problems ->
```

10.2.3 Exercising the Disk

There are a few simple tests in DISKTOOL that can be used in troubleshooting disk subsystems. These tests are available from the **Exercise-disk** menu:

```
Menu: SCSI disktool Exercise disk
  1. Specify-disk              <scsi bus (0-1), dev (0-6)>
  2. Spin-disk-up-or-down/    <up | down>
  3. Drive-ready-test
  4. Self-test
  5. Quit-to-prev-menu
```

```
Exercise disk ->
```

Specify-disk

This command has two arguments; the bus number and the device number. See the section on Attaching and Specifying Disks for more details.

Spin-disk-up-or-down

This command has one argument; **up** or **down**. It sends a SCSI command to the disk to spin it up or down. This command will only take effect if the drive supports the command, and if the DIP switches are set enable it. It is common for the DIP switches to be set to disable this command.

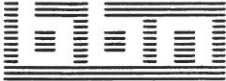
Drive-ready-test

This command sends a SCSI drive ready command to the disk, and displays the results of the test. Do not assume that the disk is spun up if this command completes successfully. The precise meaning of this command is vendor-dependent.

Self-test

This command sends a SCSI self-test command to the disk and displays the results of the test. It will probably take between 2 and 10 minutes to complete, although the complexity of the self-test, and thus the time it takes, is vendor-dependent.

Modem Testing



11.1 Overview

This program provides a menu based interface to the configuration data and internal diagnostics of the UDS FasTalk 2400 PC modem card for the TCS Master. It provides the ability to check and set modem configuration data as well as running the diagnostic tests. For the diagnostics it also interprets the return codes and displays the information in a useful format.

This chapter provides information on the configuration parameters and tests available from the menu. It provides explanations of the various configuration parameters, and descriptions of the tests that can be selected (including the significance of the tests, how to invoke them, and more detailed explanations of the result messages).

11.2 How to use the B2MDM Diagnostics

Once it is loaded and the terminal type has been selected, initialize the modem from the main menu (2). Go to the Modem-Diags menu. Check the commonly changed parameters on the System-Level-Diagnostics menu. Finally run the tests on the Board-Level-Diagnostics menu. There are more parameters on the Commands menu.

11.2.1 Run Times

The modem interface is a simple unit and therefore the tests are very brief. To complete all of the test should take less than five minutes.

11.2.2 Initializing the System and Loading Diagnostics

The B2MDM diagnostics are started from the DOS prompt (see Chapter 3). From DOS by type:

```
C:\ CD \DIAG\B2MDM ↵    Changes to the B2MDM directory.
C:\DIAG\B2MDM> START ↵  Initializes the system.
```

This brings up the initial (terminal type) menu. Select your terminal type. After you make your selection the B2MDM diagnostic main menu is displayed.

11.3 Modem Diagnostics Menu System

The main menu provides access to all of the sub-menus for the modem diagnostics. The main menu is shown below:

```
Menu: TC/MOD-D
      1. Port-Modem          Port 1
      2. Init-Modem         MODEM MUST BE INITIALIZED!
      3. Modem-Diags
      4. Logging-On/Off     Logging Off
      5. Terminal-Type     Hardcopy, Menu-On
      6. Quit
                               ver x.xxx
TC/MOD-D ->
```

After initializing (item 2) select item 3 to change settings or run tests.

```
Menu: TC/MOD-D Modem-Diags
      1. Board Level Diagnostics
      2. System Level Diagnostics
      3. Commands
      4. Quit
Modem Diags ->
```

11.4 Board Level Diagnostics

Selecting item 1 from the Modem-Diags menu displays the Board-Level-Diagnostics menu. This menu has all of the internal tests available on the Fas-Talk 2400 PC Modem Card, and interprets and displays the results.

```
Menu: TCS Modem-Diags Board-Tests
  1. Internal-Memory-Test
  2. Analog-Loopback-Test
  3. All-Internal-Tests
  4. Verify-Phone-Line
  5. Dial-Out-Test
  6. Quit
```

```
Board-Tests ->
```

Internal Memory Test

This test verifies that all of the memory on the modem card is good. It returns either `Good` or `Failed`. It is possible that the modem will still operate after some of its memory tests as failed, but it cannot be regarded as reliable or safe to use.

Analog Loopback Test

This test generates a test pattern and then loops it back from the modem's transmitter to its receiver instead of transmitting the signal through the telephone line. This test will only report failure after several attempts. If it does report failure, there is a hardware problem associated with the modem card.

When this test fails, the user should determine if the modem card is secure in its slot, and that it is addressed as `COM2`. If the card is properly installed, then the problem is with the card itself, and should be replaced.

If the modem passes this test, all of the hardware on the card is good, and any problem must be with the connectors, cable, or further along the phone circuit.

? Digital Loopback Test?

This test must first establish a link to a distant modem. Once it does, it then requests that the remote modem loop back the signal for line testing purposes. This test can fail in one of three ways. If it is impossible to connect to a remote modem, the test cannot be run. If the remote modem is not configured to grant the loopback, the test cannot be run. Finally, if the loopback is set up but fails, the line quality is inadequate for reliable data transmission. The test will actually return one of `No Connection`, `No Loopback Privilege`, `Fail`, or `Good`.

All Internal Tests.

This menu item runs the memory and analog loopback tests, and will return one of Memory Bad, Loopback Fail, or Card Good.

Verify Phone Line**Dial Out Test****11.5 System Level Diagnostics**

This menu permits the user to inspect and modify the most commonly changed parameters of the modem's configuration. It also provides a single step command for resetting the modem to the configuration most commonly need for use with the TCS Master.

```

Menu: TC/MOD-D Modem-Diags System-Tests
  1. Originate/Autoanswer           Autoanswer
  2. Answer-On-Ring                 1
  3. Action-On-DTR-Drop            Ignore
  4. DCD-Setting-Toggle             Constant On
  5. Modem-Speed                    2400 bps
  6. Line-Type-Toggle               Public
  7. Jack-Type-Toggle               RJ11
  8. Quit

```

System-Tests ->

1. Reset Modem to TCS Defaults

? Reset Modem to TCS Master Defaults

This menu selection will force all of the configuration information of the modem to the default values for use with the TCS Master, store these values in the default profile, and set it for use on power up initialization.

Originate/Autoanswer

This parameter will be set to either Originate or Autoanswer. When the modem is in originate mode it initiates connections to other machines. When it is in autoanswer mode it answers the phone line and connects to machines attempting to contact it. The default value for this parameter for use with the TCS Master is Autoanswer.

Answer on Ring

When the modem is in autoanswer mode, this parameter determines the number of rings it will wait before answering the phone line. The default value for this parameter for use with the TCS Master is 1.

Action on DTR Drop

This parameter can be set to one of four values: `Ignore`, `Command Mode`, `Hang Up`, `Reset`. When it is set to `Ignore`, a drop in the DTR signal will not have any effect on the modem's operation. When it is set to `Command Mode`, the modem will return to command mode, but without hanging up the phone line. When it is set to `Hang Up`, the modem hangs up the phone line and returns to command mode. It also disables auto-connection until DTR comes back on. When it is set to `reset`, the modem hangs up the line, and returns to its initial power-up state. The default value of this parameter for use with the TCS Master is `Ignore`.

DCD Setting Toggle

This parameter has two possible values, `Constant On` and `Carrier`. When it is set to `Constant On`, the modem will hold DCD on all of the time. When it is set to `Carrier`, DCD will be on when a carrier is present on the line, and off at all other times. The default value of the parameter for use with the TCS Master is `Constant On`.

Modem Speed

This parameter is the speed, in bits per second, at which the modem sends and receives data. It can be either 2400, 1200, 600, or 0-300. The last value is a range because, due to the way data is encoded for lower speeds, all speeds of 300 bps or less are handled in the same way. The default value of this parameter for use with the TCS Master is 2400. This parameter will almost always be inspected but not set, since the modem adapts to the speed and data format of whatever is being sent to it.

Line Type Toggle

This parameter can either be `Public` or `Leased`. It is set to `Public` for ordinary, dial-up access, telephone lines; and `Leased` for dedicated, permanently connected circuits leased from the telephone company. The default value of this parameter for use with the TCS Master is `Public`.

Jack Type Toggle

The modem has software support for two types of jacks; RJ11, which is an ordinary phone, and RJ12 which is typical of PBX systems. The RJ11 designation also includes RJ41 and RJ45 jacks, and the RJ12 designation also includes RJ13 jacks. The default value of this parameter for use with the TCS Master is RJ11.

11.6 Commands

This menu permits the user to inspect and set additional parameters for the modem, that are less likely to require modification than those on the system menu for the modem. This menu also makes it possible for a user to save the current profile, along with whatever changes may have been made to it, and to use either this saved profile or the default one for the TCS Master.

```

Menu:  TC/MOD-D Modem-Diags Commands
       1. Local-Echo-On/Off           On
       2. Speaker-Volume             medium
       3. Speaker-Mode               On Until Connect
       4. Pause-for-Carrier-Detect   30 Seconds
       5. Carrier-Detect-Interval    .6 Seconds
       6. Carrier-Loss-Disconnect    1.4 Seconds
       7. Grant/Deny-Remote-Loop     Granted
       8. Quit

```

Commands ->

Local Character Echo

This will be set to either *On* or *Off*. When it is *On*, the modem will echo any characters typed in command mode. When it is *Off*, the mode will not. The default value for this parameter for use with the TCS Master is *On*.

Speaker Volume

The modem is equipped with a speaker to permit the user to monitor call progress. The volume of this speaker can be set to one of three levels, *Low*, *Medium*, and *High*. The default value of this parameter for use with the TCS Master is *Medium*.

Speaker Mode

This parameter controls which portions of a call are sent to the speaker for monitoring purposes. It has four possible values: Off, Until Connect, Entire Call, and Call Progress. When it is set to Off, nothing is ever sent to the speaker. When it is set to Until Connect, the user will be able to listen to the progress of the call from the time the line goes off hook until connection to another modem is accomplished. When it is set to Entire Call, the speaker is active for the entire duration of the call, from the time the line goes off hook until hang-up. This mode is generally only used for trouble shooting. Finally, when it is set to Call Progress, the speaker is active from the time dialing is completed until connection to another modem is accomplished. The default value of this parameter for use with the TCS Master is Until Connect.

Pause for Carrier Detection

This parameter determines how long the modem will look for a carrier when the telephone line type is Public. The default value of this parameter for use with the TCS Master is 30 seconds.

Carrier Detect Interval

When DCD is set to follow the carrier, this parameter determines how long the carrier must be present before the modem brings up the DCD signal. The default value of this parameter for use with the TCS Master is .6 seconds.

- 7. Grant/Deny-Remote-Loop Granted
- 8. Quit

Commands ->

Carrier Loss Disconnect Delay

When the modem is set to disconnect on carrier loss, this parameter determines how long the carrier signal must be missing before the modem treats it as lost. This delay helps prevent disconnection due to noise or other line problems. The default value of this parameter for use with the TCS Master is 1.4 seconds.

Grant/Deny Remote Loop

This parameter controls whether or not a remote modem can successfully request that the local modem loop signals back to it for testing purposes. The parameter can be set to either Granted or Denied. The default value of this parameter for use with the TCS Master is Granted.

Error Codes for Peripherals



A.1 1/4" SCSI Tape Drive Subsystem

This subsection lists the error codes for the Interphase 4210 Jaguar SCSI controller and the command completion and error codes for the Tandberg drive.

A.1.1 Interphase 4210 Jaguar SCSI Controller Error Codes

0x00 "Good Status: no error detected"
 0x01 "Queue Full: specified work queue is full"
 0x02 "Work Queue initialization error: specified work queue hasn't been init."
 0x03 "First Command Error: first command issued must be Init. Cntrlr command"
 0x04 "Command Code Error: invalid command in queue entry"
 0x05 "Queue Number Error: invalid work queue number specified"
 0x06 "Queue Already Initialized: cannot initialize a work queue twice"
 0x07 "Queue un-initialized: specified work queue hasn't been initialized"
 0x08 "Queue Mode not ready: Init. Cntrlr must be issued before starting queue mode"
 0x09 "Unavailable Command: unknown IOPB type; check IOPB format"
 0x0a "Priority Error: the priority specified for the work queue is invalid"
 0x10 "Reserved Field Error: a reserved IOPB field has a non-zero in it"
 0x11 "SCSI RESET IOPB has executed successfully"
 0x12 "Jaguar Port 2 was used, but is unavailable"
 0x13 "SCSI ID Error: invalid SCSI ID used for TANDBERG Drive; check IOPB"
 0x14 "SCSI BUS Stuck in Reset state"
 0x15 "SCSI Command Aborted by spurious SCSI Bus Reset"
 0x20 "VME Bus Error: bus error occurred during the DMA transfer of VME data"
 0x21 "VME Bus Timeout occurred during data transfer"
 0x23 "Illegal VME Bus Address (odd boundary) detected"
 0x24 "Illegal VME Bus Memory Type specified; check IOPB"
 0x25 "Illegal transfer count specified (odd count); check IOPB"
 0x30 "SCSI Selection Timeout Error"
 0x31 "SCSI Disconnect Timeout Error"
 0x32 "SCSI Bus Hardware Error"
 0x34 "SCSI Transfer Count Exception"

A.1.2 Tandberg Drive Command Completion Codes

0x00 "Good Status: the requested operation was completed successfully"
0x02 "Check Condition: an abnormal condition has occurred. Issue Request Sense"
0x08 "Busy Status: TANDBERG Drive is busy executing a previous command"
0x10 "Intermediate Status: TANDBERG Drive executing series of linked commands"
0x18 "Reservation Conflict: Jaguar has attempted to access TANDBERG drive when it was reserved by another Initiator (host)"

A.1.3 Tandberg Drive Error Status

0x00 "No sense: no info available (Filemark or End-of-Media possibly detected)"
0x01 "Tape Drive is hung"
0x02 "Tape Drive is not ready (cartridge not inserted or loaded)"
0x03 "Unrecoverable media data error occurred"
0x04 "Hrdwr error: power-up selftest failed or parity error detected"
0x05 "Illegal request: bad parameter detected in cmd issued to drive"
0x06 "Unit attention (door opened?)"
0x07 "Write protect error"
0x08 "Logical End-of-Media (end of recorded area) detected"
0x09 "Reserved error code (no info available)"
0x0a "Copy command aborted because error detected on src/destdevice"
0x0b "Command aborted by Tape Drive for unspecified reason"
0x0c "Reserved error code (no info available)"
0x0d "Volume overflow: attempt to append data after EOM detected"
0x0e "Verification failure: data miscompare on verify command"
0x0f "Reserved error code (no info available)"

A.1.4 Tandberg Drive Extended Error Codes

0x00 "No error: extended error code = 0x00"
0x01 "Append Error"
0x02 "Bad Command Block"
0x03 "Bad Parameter Block"
0x04 "Bus Parity Error"
0x05 "Busy"
0x06 "Capstan Servo Error"
0x07 "Tape Cartridge Removed"
0x08 "Compare Error"
0x09 "Copy Data Error"
0x0A "Copy Management Error"
0x0B "File Mark Error"
0x0C "Head Servo Error"
0x0D "Illegal Command"
0x0E "Illegal Copy"
0x0F "Illegal Length"
0x10 "Inappropriate request"
0x11 "Latch Error"
0x12 "No Cartridge"
0x13 "Not Loaded"
0x14 "Power-on request"

0x15 "QIC; no data detect."
0x16 "Read after Write Error"
0x17 "Read EOM logical"
0x18 "Read EOM physical"
0x19 "Reserved conflict"
0x1A "Sensor Error"
0x1B "Tape runout"
0x1C "Unit Attention"
0x1D "Write EOM warning"
0x1E "Write EOM"
0x1F "Cartridge Write Protect"
0x20 "16 rewrite errors"
0x21 "24 rereads; block found"
0x22 "24 rereads; block not found"
0x23 "Illegal Copy Function"
0x24 "Illegal Header"
0x25 "No Header"
0x26 "Too Large Address"
0x27 "Bad ID or LUN"
0x28 "Partial Description"
0x29 "Bad Target Status"
0x2A "Check Condition"
0x2B "Data Transfer Error"
0x2C "Selection Failure"
0x2D "Sequence Error"
0x2E "Illegal Block Size"
0x31 "Buffer Size Error"
0x32 "Rereads Outside Limits"
0x33 "Rewrites Outside Limits"
0x34 "Buffer Error Low Nibble"
0x35 "Buffer Error High Nibble"
0x36 "Unspecified Fatal Error"
0x37 "Timeout Error"
0x38 "Buffer RAM Error"
0x39 "Drive contr. Error"
0x3A "EEPROM Verification"
0x3B "EEPROM Error"
0x3C "External RAM Error"
0x3D "SCSI contr. Error"
0x3E "Spurious interrupt"
0x3F "Stack Overflow"

A.2 Disk Drive Subsystem

As the disk drive diagnostics execute commands, they poll the status return values from the Xylogics Disk Drive Controller Board. Any anomalies are reported to the user:

A.2.1 Xylogics Controller Error Codes (hex)

CODE	DESCRIPTION
01	Interrupt Pending
03	Busy Conflict
04	Operation Timeout
05	Header not Found
06	Hard ECC error
07	Illegal Cylinder Address Error
0A	Illegal Sector Address
0D	Last Sector too small
0E	Slave ACK Error (non-existent memory)
12	Cylinder and Head/Header Error
13	Seek retry required
14	Write protect error
16	Drive not ready
17	Sector count zero
18	Drive Faulted
19	Illegal Sector Size
1A	Self Test A Error
1B	Self Test B Error
1C	Self Test C Error
1E	Soft ECC Error
1F	Soft ECC Error Recovered
20	Illegal Head Error
21	Disk Sequencer Error
25	Seek Error

A.3 Ethernet Subsystem

Possible error codes returned by the Excelan Controller running the self-test are listed below:

A.3.1 Excelan Controller Error Codes (hex)

0x70	Transceiver fuse failed or not present
0x71	Transceiver loopback test failed
0x72	Negative 12 volt supply failed
0x91	Positive 12 volt supply failed
0xa0	Invalid Address for config message
0xa4	Invalid operation mode parameter
0xa5	Invalid host data format test pattern
0xa7	Invalid configuration message format

0xa8 Invalid movable data block parameter
0xa9 Invalid number of processes parameter
0xaa Invalid number of mailboxes parameter
0xab Invalid number of address slots parameter
0xac Invalid number of hosts parameter
0xad Invalid host queue parameter
0xae Improper objects allocation
0xaf Net boot failed
0xb0 Checksum on NX300 EPROM failed
0xb1 Memory test failed for 0-128k
0xb2 Memory test failed for 128k up to the highest address
0xb3 Counter test failed
0xb4 Interrupt test failed
0xb5 Transmission test failed
0xb6 Receiver test failed
0xb7 Local loopback data path test failed
0xb8 CRC test failed
0xb9 Checksum on physical address EPROM failed
0xba Bus timeout
0xbb Ethernet chip initialization failed
0xbc Ethernet chip self-test failed
0xbd Ethernet chip resource counter failed
0xbe External loop-back test alignment error
0xbf iSBX board not in place
0xc0 Specified time exhausted
0xc1 Host memory read/write test failed
0xc8 Parity hardware logic failed
0xc9 NMI interrupt for bus timeout failed
0xca Host interrupt test failed
0xcb Command unit test failed
0xcc Divide error exception
0xcd Undefined interrupt type
0xce Command not executed by the CU of the 82586
0xcf Command block sync failed between HW and SW
0xf0 Crossed 80286 segment boundary

A.4 Terminal Subsystem

The two-digit hex code identifies which part of the test failed. The error codes range in value from 81 hex to B1 hex and can also be found in the Host Adapter Technical Manual no. 80-000136-8-00, Revision A., Appendix D. The special error code value of 01 implies that the self-test never started, indicating a catastrophic Host Adapter error such as power failure, CPU failure, etc., or that Host Adapter/Host communications have failed.

A.4.1 Systech Controller Error Codes (hex)

CODE	DESCRIPTION
0x80	No HPS error
0x81	Rom checksum error
0x82	Stack data test error
0x83	Stack address test error
0x84	Stack checkerboard test error
0x85	Zero stack test error
0x86	Stack addressing conflicts error
0x87	Watchdog timeout test error
0x88	No real time clock present
0x89	Bad clock pulse width
0x8b	Dynamic RAM address test error
0x8c	Dynamic RAM checkerboard test error
0x8d	Zero dynamic RAM test error
0x8e	High-speed serial reset state test error
0x8f	High-speed serial DMA asynchronous lpbk err
0x90	High-speed serial interrupt-driven async. lpbk err
0x92	Network RAM test error
0x93	Network RAM location addressability test error
0x94	Network RAM checkerboard test error
0x95	Zero network RAM test error
0x96	COM 9026 test: status register incorrect value
0x97	COM 9026 test: network ID DIP switch set to zero
0x98	COM 9026 test: network interrupt test error
0x99	68440 DMA chip detected error
0x9f	PANIC error
0xb0	Network interrupt error: an interrupt occurred when not expected
0xb1	A COM 9026 interrupt occurred but the interrupt was not enabled
0xb2	The POR bit of the COM 9026 is not set during an interrupt
0xb6	Dynamic RAM parity error
0xb7	Watchdog timeout error
0xb8	Watchdog timeout occurred too early in the self-test sequence
0xc0	Host to HPS I/F test: data wrap test error
0xc1	Host to HPS I/F test: flag byte interrupt test error
0xc2	Host to HPS I/F test: host interrupt bit will not reset
0xc4	Host to HPS I/F test: data returned != data send
0xc5	Host to HPS I/F test: host not ready for more data error
0xf0	Bus exception error

0xf1	Address exception error
0xf2	Illegal instruction error
0xf3	Interrupt exception error
0xf4	Trap exception error
0xf5	Other exception error
0xff	Initialization complete

A.4.2 Adaptor Hardware Error Codes

80	Local memory error
81	Parameter latch empty error
82	Parameter latch full error
83	PROM checksum error
84	Parameter/FIFO test error
85	FIFO RAM test error
86	Tape side test error
87	Underrun test error A
88	Underrun test error B
89	Overrun test error A
8A	Overrun test error B
8B	Tape prescale test error A
8C	Tape prescale test error B
8D	Tape prescale test error C
8E	Bus prescale test error A
8F	Bus prescale test error B
90	Bus timeout hardware error
91	Parameter latch hardware error

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**TC2000™
Maintenance
Manual**

User's Guide

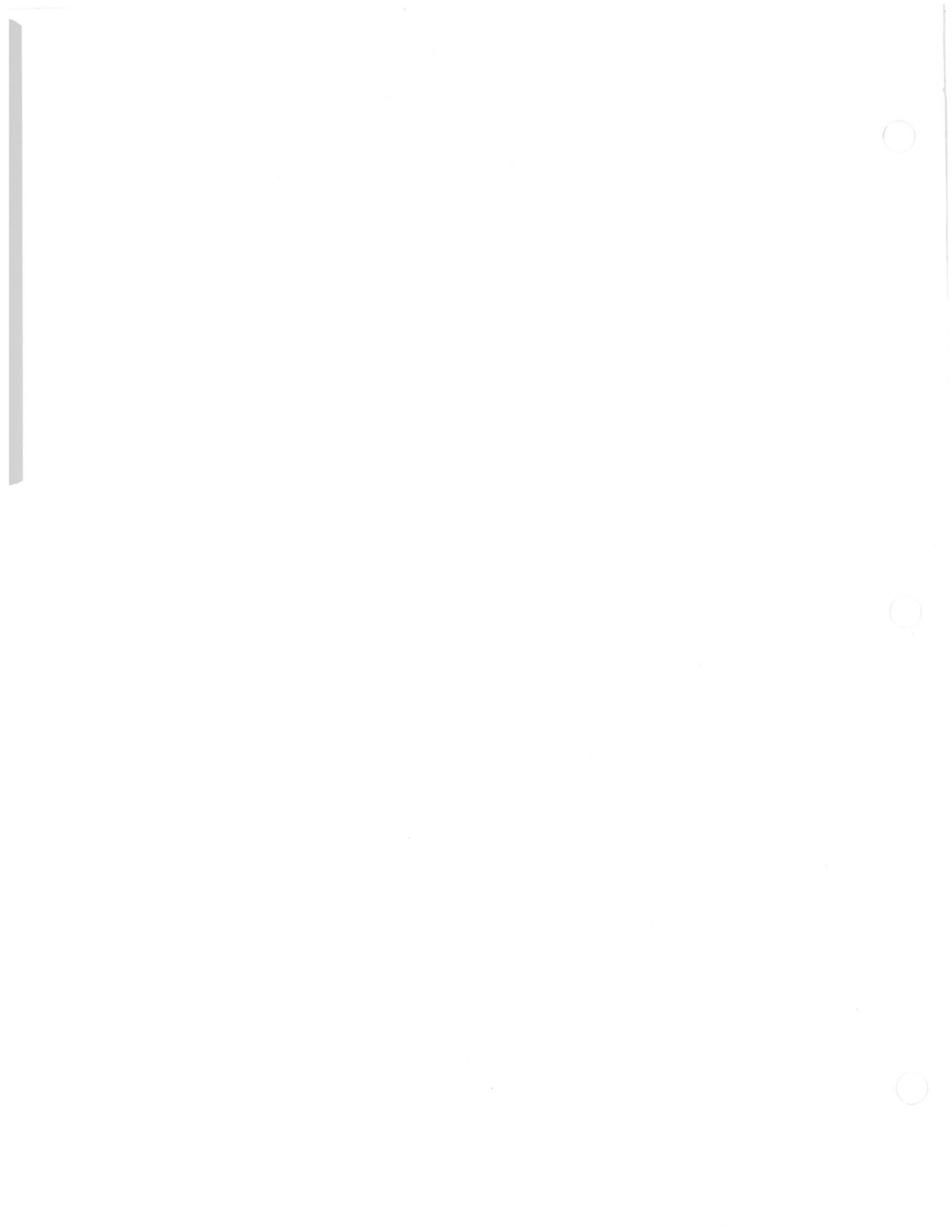
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How to Use This Manual



Purpose of the Manual

This manual is a reference for working on the TC2000 hardware. After reading this document, you should be able to change any of the Field Replaceable Units (FRUs) in the TC2000 computer and peripherals.

Other Places to Find Answers

If you experience any problems with our product, or if you have questions or suggestions, please do one of the following:

- Send electronic mail from anywhere on the ARPAnet to:

bf-questions@bbn.com

- Send mail to:

TC2000 Bugs
BBN Advanced Computers Inc.
10 Fawcett St.
Cambridge, MA 02138

- If you are under warranty, or have a software maintenance contract, you can also call our hotline number:

1-800-4AC-BFLY in the United States
1-617-873-8660 from any other location

If you are reporting a problem, please include as much information as you can, as follows:

- Your **version** of the nX operating system and the TC2000 system.

- The **size** of your TC2000 system (number of nodes and amount of memory)
- The **number of nodes** that were in your **cluster**
- The **total number of users** on the TC2000 system at that same time
- An **example** that illustrates the problem
- A **record** of the sequence of events that led to the problem; especially a **stack backtrace** (see the system administration guide)

We are also interested in your evaluation of our documentation. We would appreciate it if you would fill out the form at the back of this manual and return it to us.

Audience Level

The primary audience for this document consists of field service personnel who are new to the TC2000. The document does not assume that you have used a UNIX operating system before, but it does assume that you have used some operating system and that you are familiar with common computer terms, such as files and directories.

Other References

Using the TC2000 Document Set is a guide to the entire set of manuals that come with your TC2000 system. If you're not sure where to look for information, this is a good place to start.

For information on hardware functionality, see *Inside the TC2000 Computer*; on how to use the diagnostics, see the *TC2000 Diagnostic Guide*.

For information on the system console, see *Installing and Using the VT320 Video Terminal*. For information on the system printer, see *Installing and Using the LA75 Companion Printer*.

For information on the 1/2" magnetic tape unit, see the *M990 GCR CacheTape® Unit Technical Manual*.

For information on the Systech Terminal Controller Hardware, see *HPS Installation and Troubleshooting Reference Guide*, *HPS Host Adapter Technical Manual*, *HPS Cluster Controller Technical Manual*, and *HPS Remote Cluster Installation Guide*.

For information on the Excelan Ethernet Controller, see *EXOS 301 Reference Manual*.

For information on the Disk Controller, see *Xylogics Model 451 User's Manual*.

Organization

The manual is organized as follows:

- Chapter one contains an overview of the TC2000 system and the Field Replaceable Units (FRUs).
- Chapter two contains instructions for replacing each FRU in the Expansion cabinet.
- Chapter three contains instructions for replacing each of the FRUs in the Utility cabinet.
- Chapter four contains instructions for replacing the hardware in the Peripheral cabinet.
- Chapter five contains instructions for replacing the console.
- Chapter six describes when preventive maintenance routines should be performed and what is needed to perform them.
- Chapter seven describes how to troubleshoot for system problems.
- Appendix A describes the jumper locations and switch settings for everything in the TC2000.
- Appendix B contains power and data flow diagrams for referencing during repair procedures.
- Appendix C contains a list of all the FRUs in the system, including the part numbers.
- Appendix D contains the wiring diagrams for the expansion and utility cabinets.

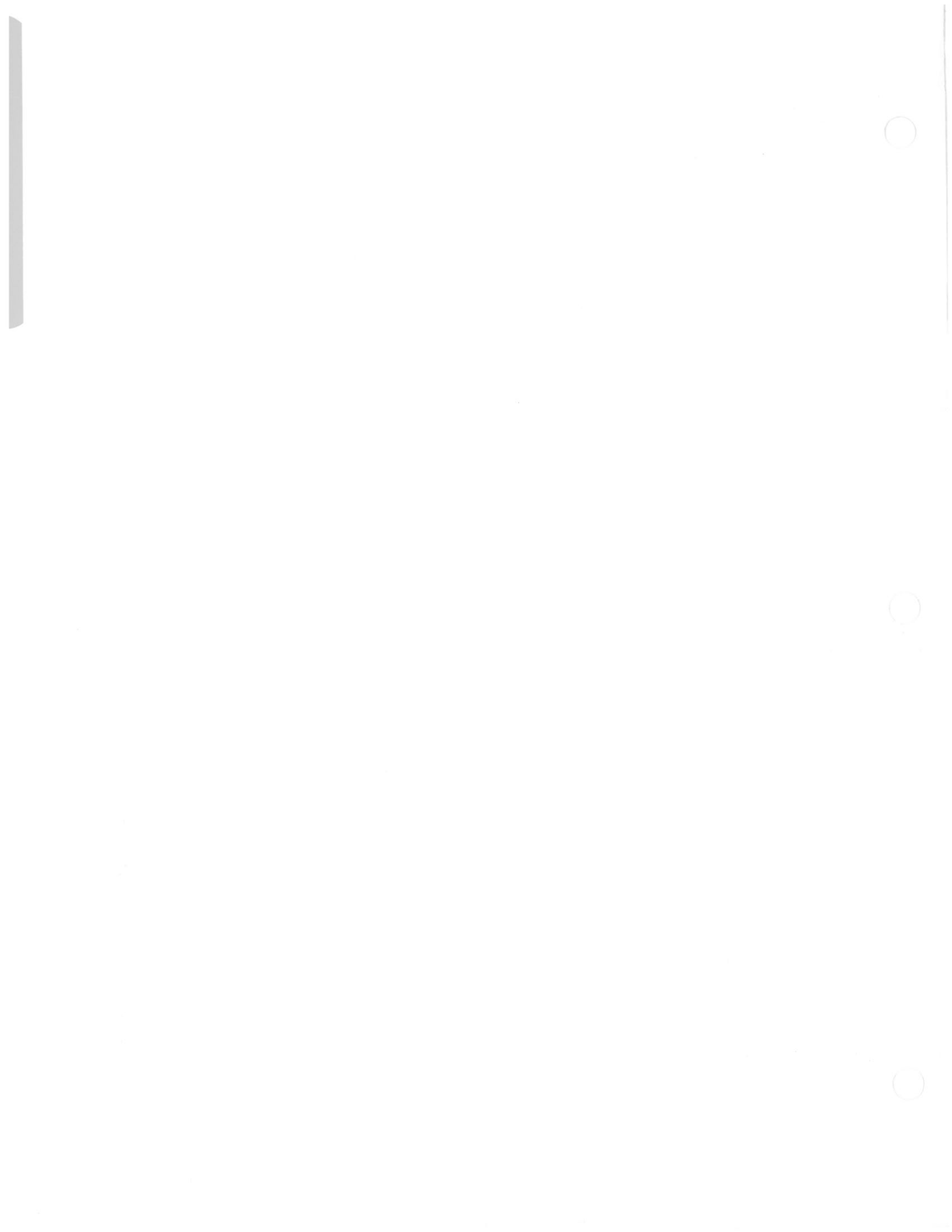
Typographic Conventions

This manual uses the following conventions to present information:

- | | |
|----------------------------|--|
| bold | Text in bold indicates an exact filename, a command, or user input. |
| <i>italics</i> | Text in <i>italics</i> indicates a variable, or a value that the user supplies; for example, <i>filename</i> stands for the file under discussion. |
| type | Text in typewriter font represents computer output. |
| <i>bold italics</i> | Text in <i>bold italics</i> indicates an emphasized word or phrase. |
| <Delete> | Names enclosed in angle brackets indicate keyboard keys; for example, <Delete>, <Esc>, and <Return>. |
| <Control-Z> | Two key names enclosed in angle brackets indicate that you should press the keys simultaneously; for example, |

- <Control-Z> means that you should hold down the Control key and press the Z key. <>
- <Esc> Z A single key name enclosed in angle brackets followed immediately by another key name indicates that you should press the first key and *then* the second; for example, <Esc> Z means that you press the Escape key and *then* press the Z key.
- ↵ This symbol represents the <Return> key in computer dialog examples.
- [] In command syntax descriptions, square brackets enclose optional items.
- ... A horizontal ellipsis indicates a repetition of the previous command or input string.
- .
. A vertical ellipsis indicates that irrelevant portions of a program have been omitted.





Overview



The TC2000 system, BBN's powerful new multiprocessor, is designed to execute many tasks rapidly, individually and efficiently. Because it uses shared memory, any one of its processors can access main memory as needed. This access to memory is enabled by means of an interconnection network called a Butterfly switch. This switch not only provides a fast and efficient access path, but also avoids bus saturation, thereby increasing the speed with which data can be sent and received.

The TC2000 system comprises three main units (refer to Figure 1-1 and Figure 1-2):

- Expansion Cabinet
- Utility Cabinet
- Peripheral Cabinet

Additionally, the system has a connection for a VT320 terminal that is used to run diagnostics software and also serves as a console.

Because of its increased sophistication, many of the components that make up a TC2000 system are small and/or difficult to access. Therefore, when a component fails and needs to be replaced, the larger unit of which it is a part is replaced. This larger, easier to access unit is called a Field Replaceable Unit, or FRU. For example, if a card-level component fails, the entire card is replaced. Or, if a disk platter fails, the entire disk drive is replaced.

In terms of its maintenance, the TC2000 system can be seen as a collection of Field Replaceable Units (FRUs), each of which has a certain location and function.

This chapter provides the location and a brief functional description of each FRU.

Figure 1-1 System Overview: Front

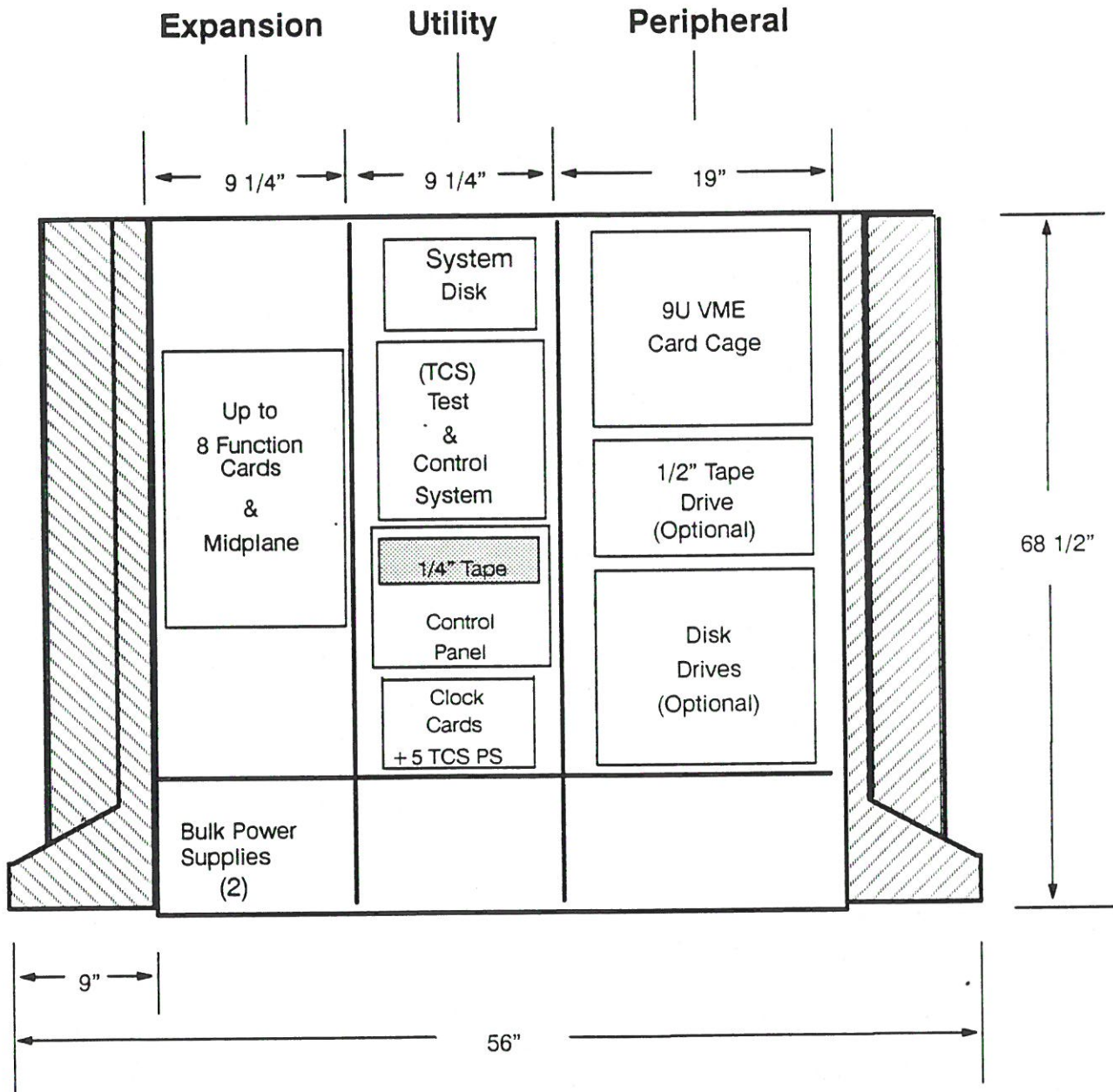
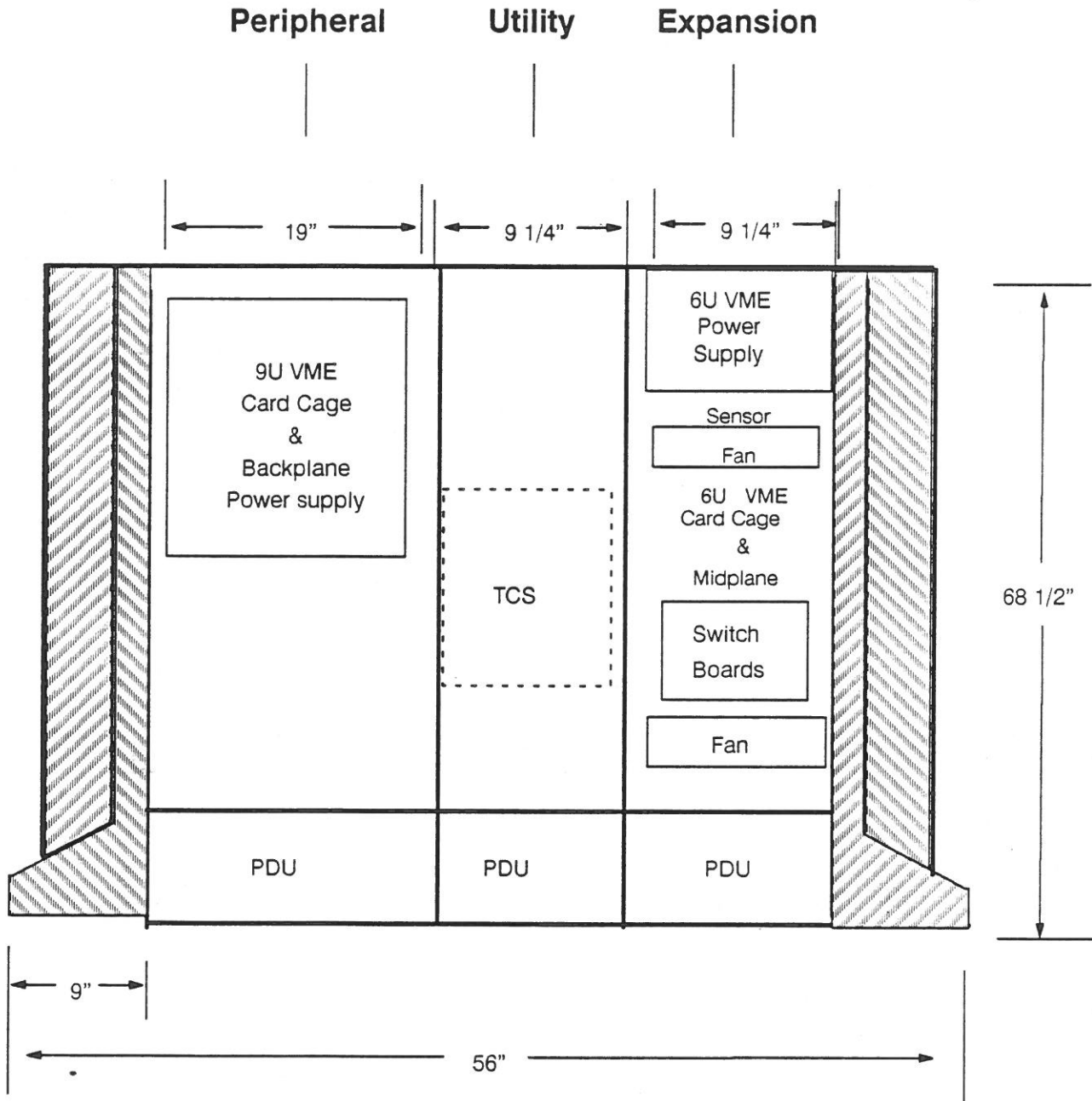


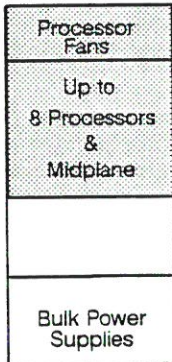
Figure 1-2 System Overview: Back



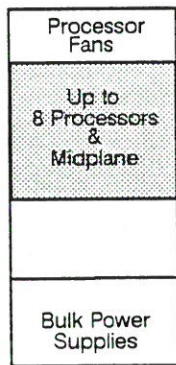
1.1 Expansion Cabinet

One expansion cabinet can accommodate up to function cards; however, the system can be expanded up to a total of 63 processors by adding up to seven more expansion cabinets. See Figure 1-3 and Figure 1-4.

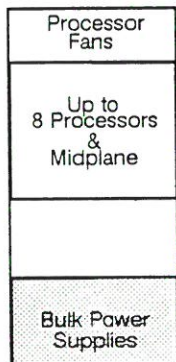
A description of each FRU in the expansion cabinet follows.



Front View



Front View



Function Card Fans

There are two fans located in the front topmost section of the expansion cabinet. They are automatically activated when the system power is turned on.

Function Cards

The function cards are located in the front middle section of the expansion cabinet. There can be a total of eight per cabinet. Based on the Motorola 88000 RISC microprocessor family, the TC2000 processor provides a particular capability in the system, such as processing power, I/O interfacing, and memory. The function card known as the TC/TPV currently provides all the essential features of a computer system.

Midplane

The TC2000 Midplane (TC/MP), located in the front middle section, corresponds to a conventional backplane except that it has connectors on both sides instead of one, making it possible for cards to be connected on either side. The Midplane provides the signal connections among the switch cards, processors, and clock card cables. The Midplane also distributes power to the switch cards and processors.

Each Midplane connects processors, switch cards, and switch and clock cables.

Bulk Power Supply

The Bulk power supply unit takes 208V three-phase, five-wire power, converts the AC to DC (+/- 24 volts) and distributes it to the function cards and switch cards in its cabinet via the midplane. There are two bulk power supply units located in the expansion cabinet.

For more detailed electrical specifications, see the site preparation guide.

Figure 1-3 Expansion Cabinet: Front

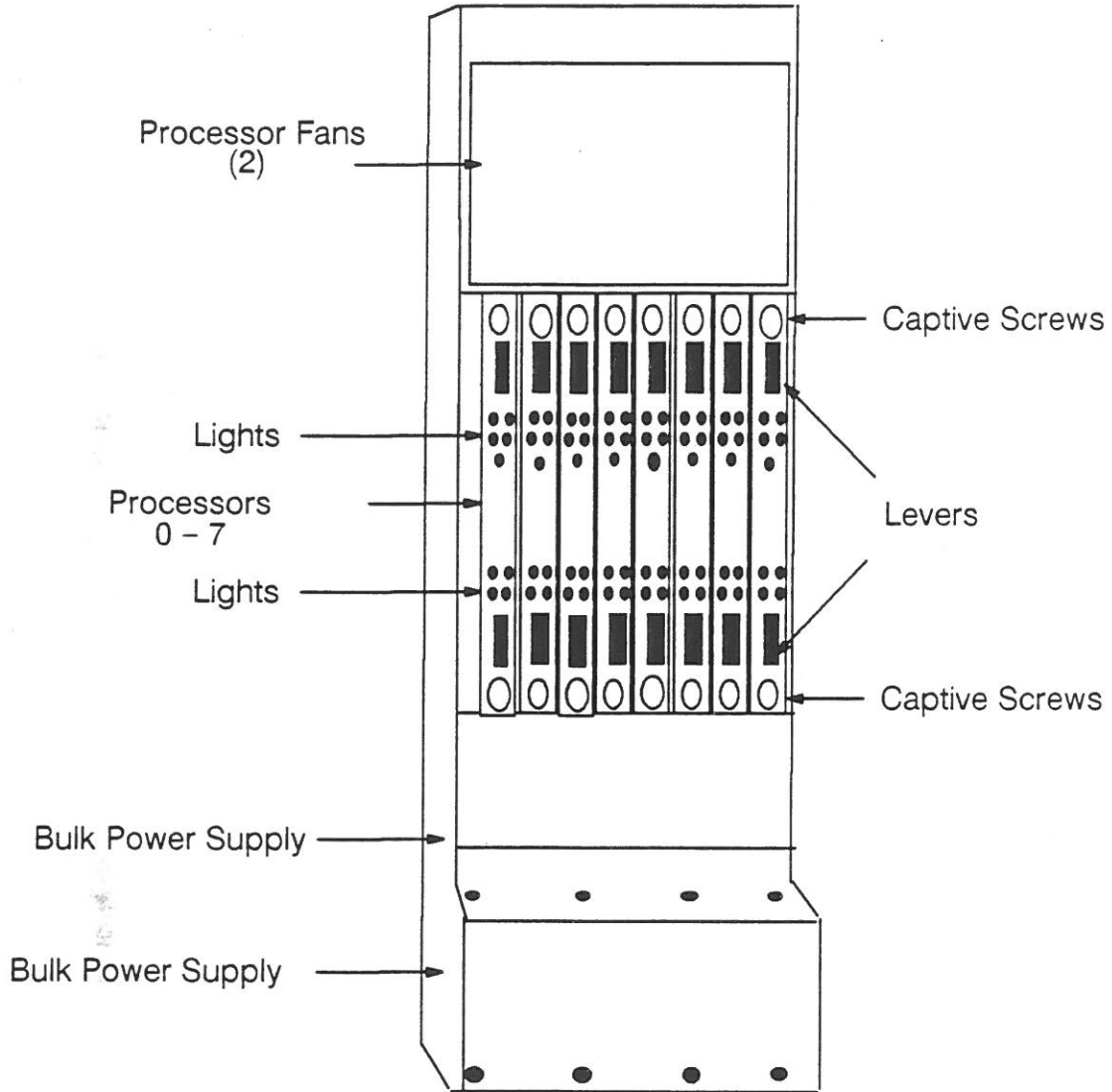
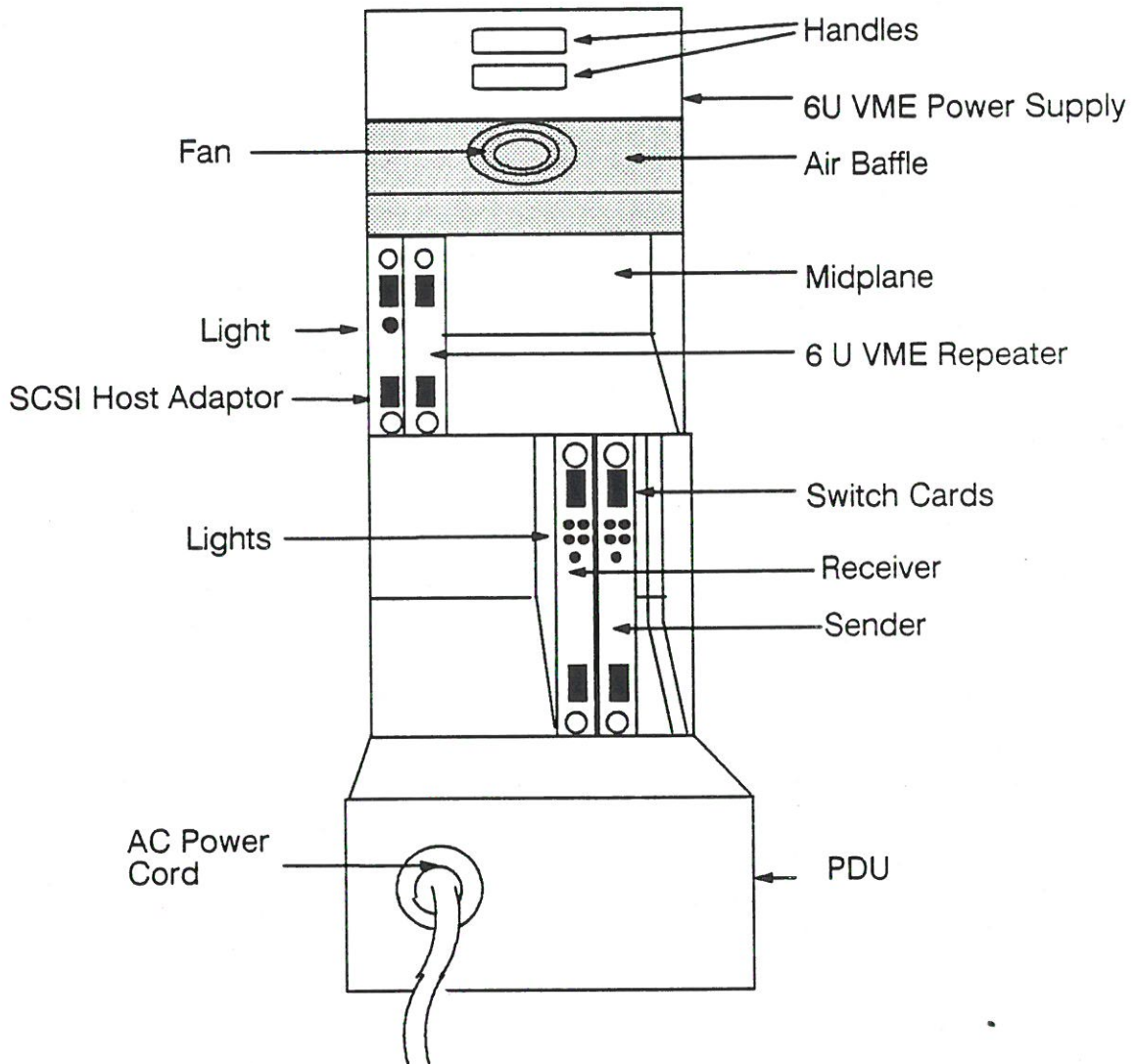
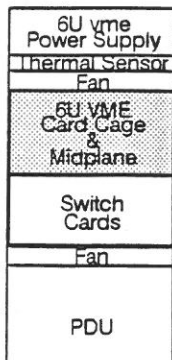


Figure 1-4 Expansion Cabinet: Back



6U VME Card Cage

The 6U VME card cage, located in the back middle section of the expansion cabinet, holds up to eight 6U VME cards. Currently, this card cage contains an Interphase SCSI VME Controller and a VMEbus Repeater.



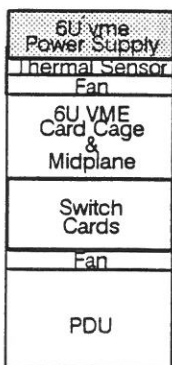
Back View

6U VME Repeater

The Repeater provides the connection between the peripheral controllers contained in the 9U VME card cage and the TC/FPV card in the expansion cabinet. It is always the rightmost card in the 6U card cage while the 9U Repeater is always the leftmost card in its card cage (in the Peripheral cabinet). The Peripheral Controllers in the 9U VME card cage are thereby connected to the computer via the Repeater card in the 6U VME card cage.

6U VME I/O Power Supply

This power supply is located in the back top section of the expansion cabinet. It provides power to the 6U VME cards in the 6U VME card cage.



Back View

6U VME Fan

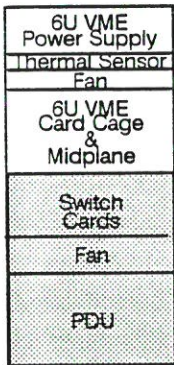
The 6U VME fan is located just below the I/O power supply and is automatically activated when the system power is turned on via the TCS.

Thermal Sensor

Located on the back wall behind the fan, the thermal sensor monitors temperature for the 6U VME card cage.

Switch Cards

The Switch cards, located in the back middle section of the expansion cabinet, are connected to the back side of the midplane. There is one pair, consisting of a server (TC/SS) and a requestor (TC/SR). Each of the eight function slots on the midplane is wired to each of the four switch card slots on the other side of the midplane. For communication with the rest of the system, each switch card has connectors that mate with the midplane, on which the signals are routed to connectors that accept cables.



Back View

Switch Card Fan

This fan is located just under the switch cards and is automatically activated when the system power is turned on.

Power Distribution Unit (PDU)

The Power Distribution Unit (PDU), located at the bottom rear of the expansion cabinet, takes 3-phase 208 VAC power from the wall outlet and distributes it as single-phase power. It has a 30 amp plug.

1.2 Utility Cabinet

See Figure 1-5 and Figure 1-6 for locating FRUs in the utility cabinet. The following subsections describe the FRUs in the Utility Cabinet.

Hard Disk Drive

The hard disk drive is located at the front top of the Utility cabinet. It is an 850MB (686MB formatted) 8" Winchester disk drive. Additional (up to three more) Winchester disk drives are located in the Peripheral cabinet.

Disk
TCS
1/4" Tape
Control Panel
Clock Cards
+ 5 TCS Power Supply
PDU

Test and Control System (TCS)

The Test and Control System (TCS) is a separate subsystem consisting of its own power supply, processor, disks, and software. The TCS controls, monitors, and tests the hardware components of the TC2000 system. It also boots the nX operating system on the TC2000 computer. The TCS software consists of an operating system (DOS), the master program, and the diagnostics. The master program, called the TCS Executive (TEX), controls the TCS and runs the diagnostics.

Front View

When power first comes on via the keyswitch, only the TCS gets power. The TCS, under operator control, then turns on the bulk power supplies and system fans, turns on the system circuit cards, tests the machine's components, and starts the load of system software.

For complete instructions on shutting down the operating system and powering on or off the system, refer to Chapter 7, *Troubleshooting*.

Having a separate CPU and disk enables the TCS to continue running diagnostic software when portions of the TC2000 system are down.

Disk
TCS
1/4" Tape
Control Panel
Clock Cards
+ 5 TCS Power Supply
PDU

Front View

Figure 1-5 Utility Cabinet: Front

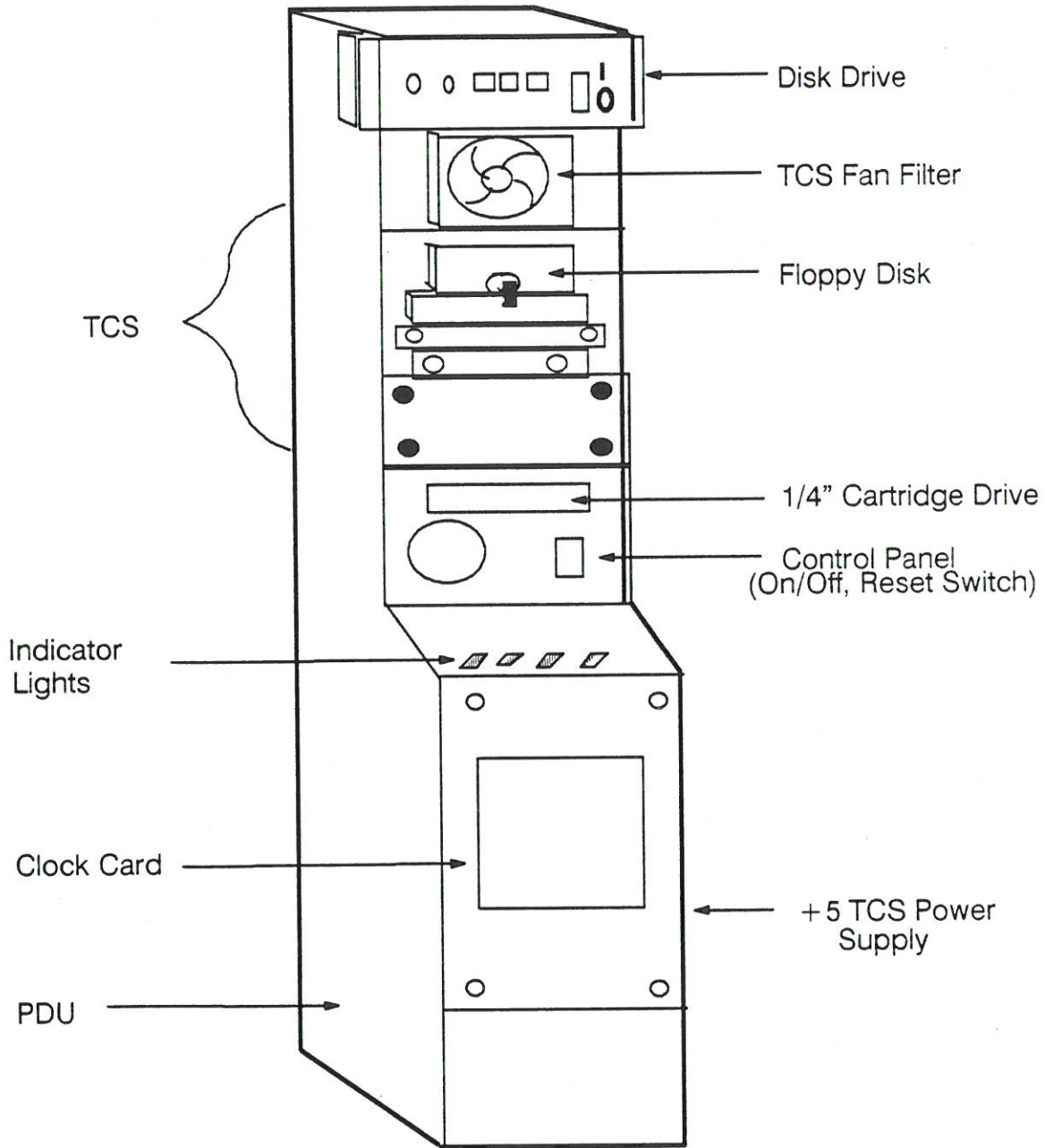
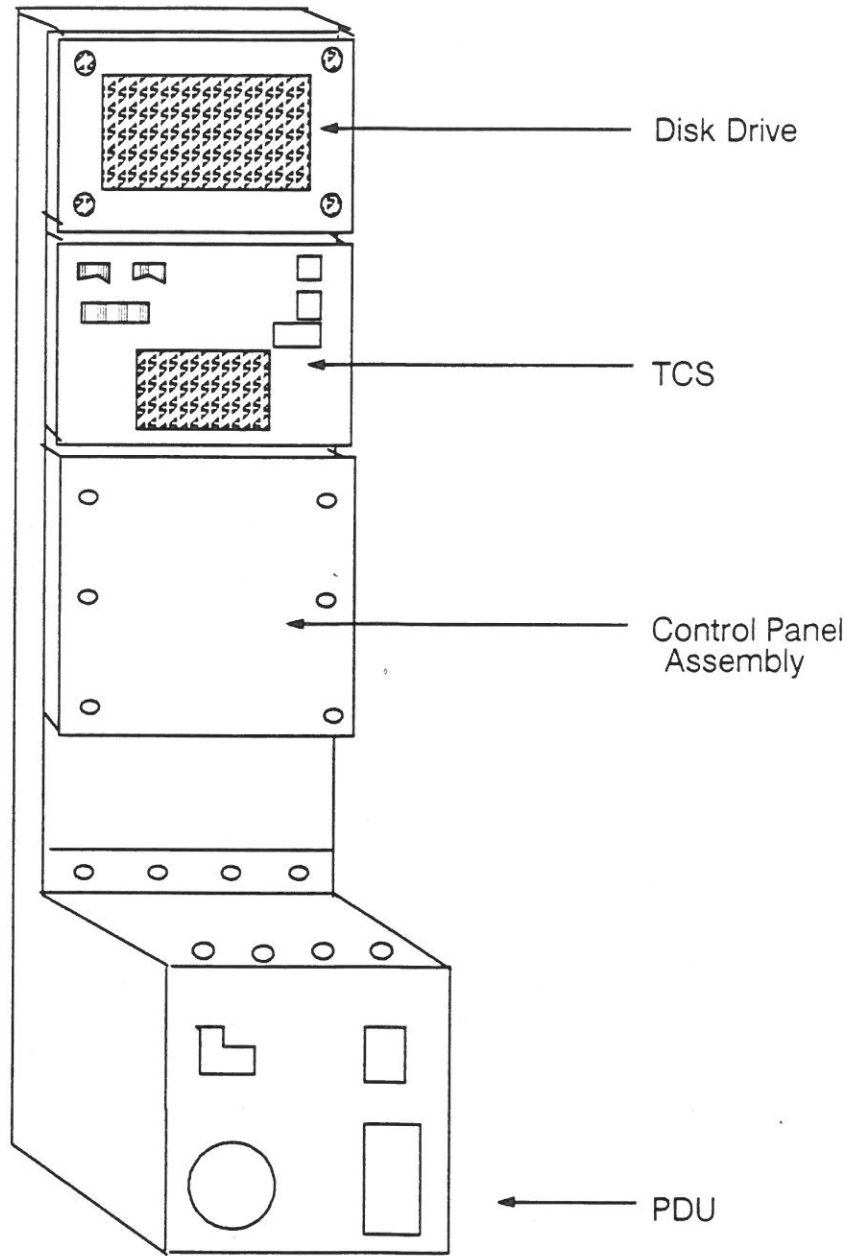


Figure 1-6 Utility Cabinet: Back



- **Master Function Card**

The TCS master function card controls the system support devices, including the hard disk and floppy disk ports, two serial ports, the real time clock/calendar, and the keyboard interface.

- **Modem Card**

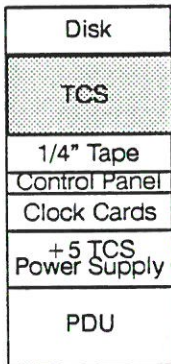
The modem card is connected to the TCS rear panel phone jack with a cable. If the TC2000 system needs service from BBN, the system operator checks that the local phone line is connected, BBN Field Service calls the auto-answer modem, and TCS applications and function card diagnostics are used to diagnose the machine.

- **TCS Floppy Disk Drive**

The 1.2MB floppy drive is located at the bottom left-hand corner of the PC chassis.

- **TCS Hard Disk Drive**

The hard drive is located at the bottom left-hand corner of the PC chassis just above the floppy drive.



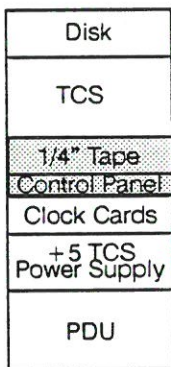
Front View

1/4" Tape Drive

The 1/4" Tape Drive is located just under the TCS and is part of the Control Panel Assembly.

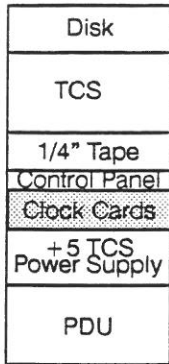
Control Panel Assembly

The Control Panel Assembly is located just below the TCS on the front of the cabinet. It contains the 1/4" Tape Drive, keyswitch, indicator lights, reset button and associated power and data cables.



Front View

Clock Card(s)

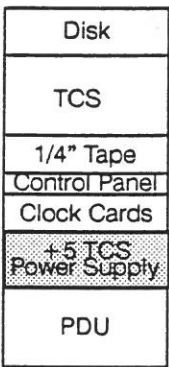


The clock card (TC/CLK) is located at the front of the Utility cabinet under the Control Panel. It provides the switch clock signals and other timing signals for a system of up to 63 processors.

The clock signal is generated by a clock master card. The distribution of the clock signals is from the clock master card, through clock slave cards as needed for larger systems, to switch cards where it is used and also passed on to the function cards and TCS subsystem.

Front View

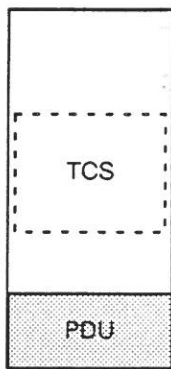
+ 5 TCS Power Supply



This power supply, located in the same section as the clock cards at the front of the Utility cabinet, provides + 5 volt power directly to the TCS logic on the function, clock, and switch cards.

Front View

Power Distribution Unit (PDU)



The PDU, located in the bottommost back section of the cabinet, distributes single-phase 208 VAC power from the wall outlet. Input is a 30 amp, 3-phase 208 VAC.

Back View

1.3 Peripheral Cabinet

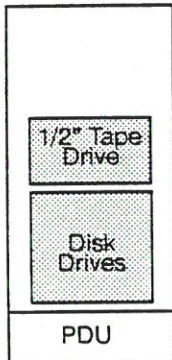
See Figure 1-7 and Figure 1-8. The following subsections describe the FRUs in the Peripheral Cabinet.

Eight-Inch Disk Drives

Up to three optional eight-inch disk drives are located at the front of the Peripheral cabinet.

1/2" Tape Drive

The optional 1/2" Tape Drive is located in the Peripheral cabinet above the disk drives. The system supports tape operation at 1600bpi, 3200bpi, and 6250bpi.



Front View

9U VME Card Cage Chassis

Located at the top back of the Peripheral cabinet is the 9U VME card cage. The card cage is an enclosure that contains the components of the 9U VME subsystem: the controller and repeater cards as well as the 9U VME backplane and the 750W switching power supply. Each of the Controller cards and the Repeater card is considered to be a separate FRU. The entire card cage, including the power supply and backplane, is considered to be another separate FRU.

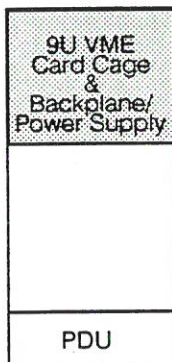
The following cards are in the card cage:

- Disk Controller

Controls the disk drives (up to four)

- Ethernet Controller

Allows communication to the Ethernet network



Back View

Figure 1-7 **Peripheral Cabinet: Front**

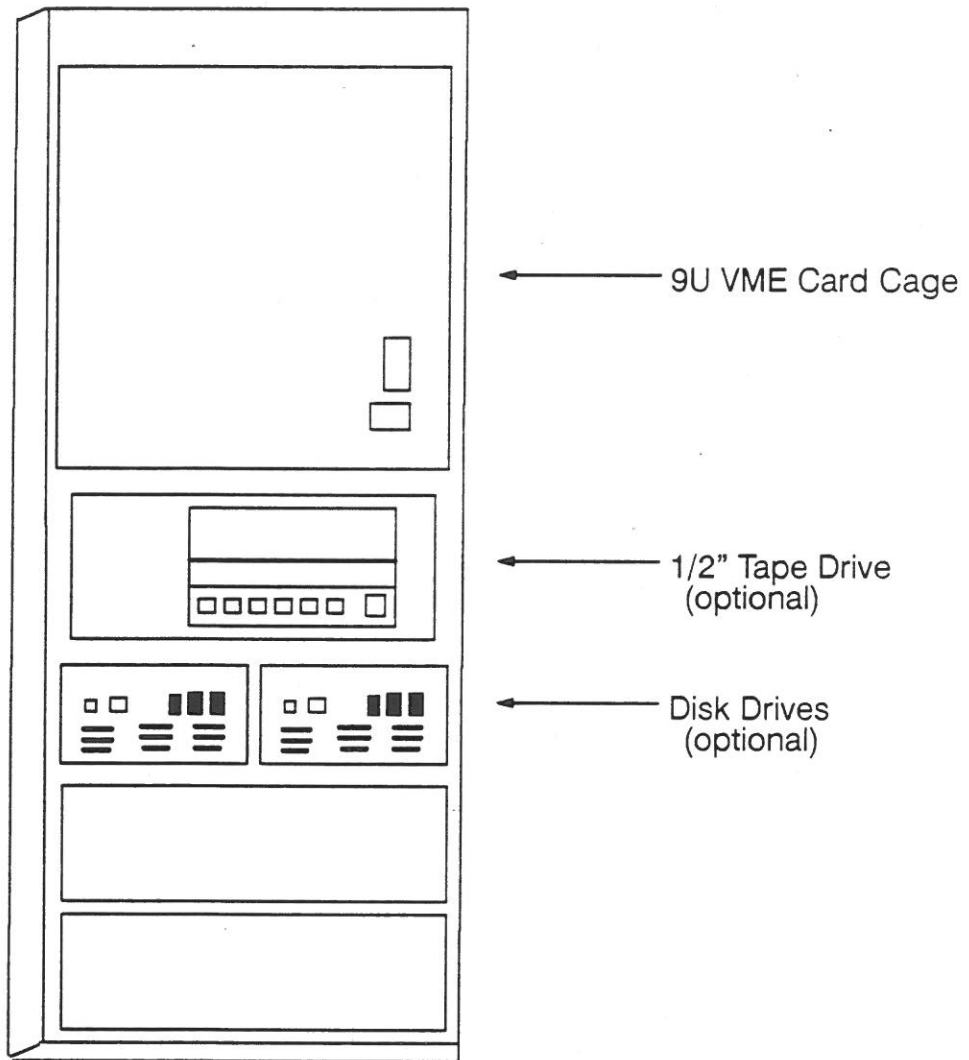
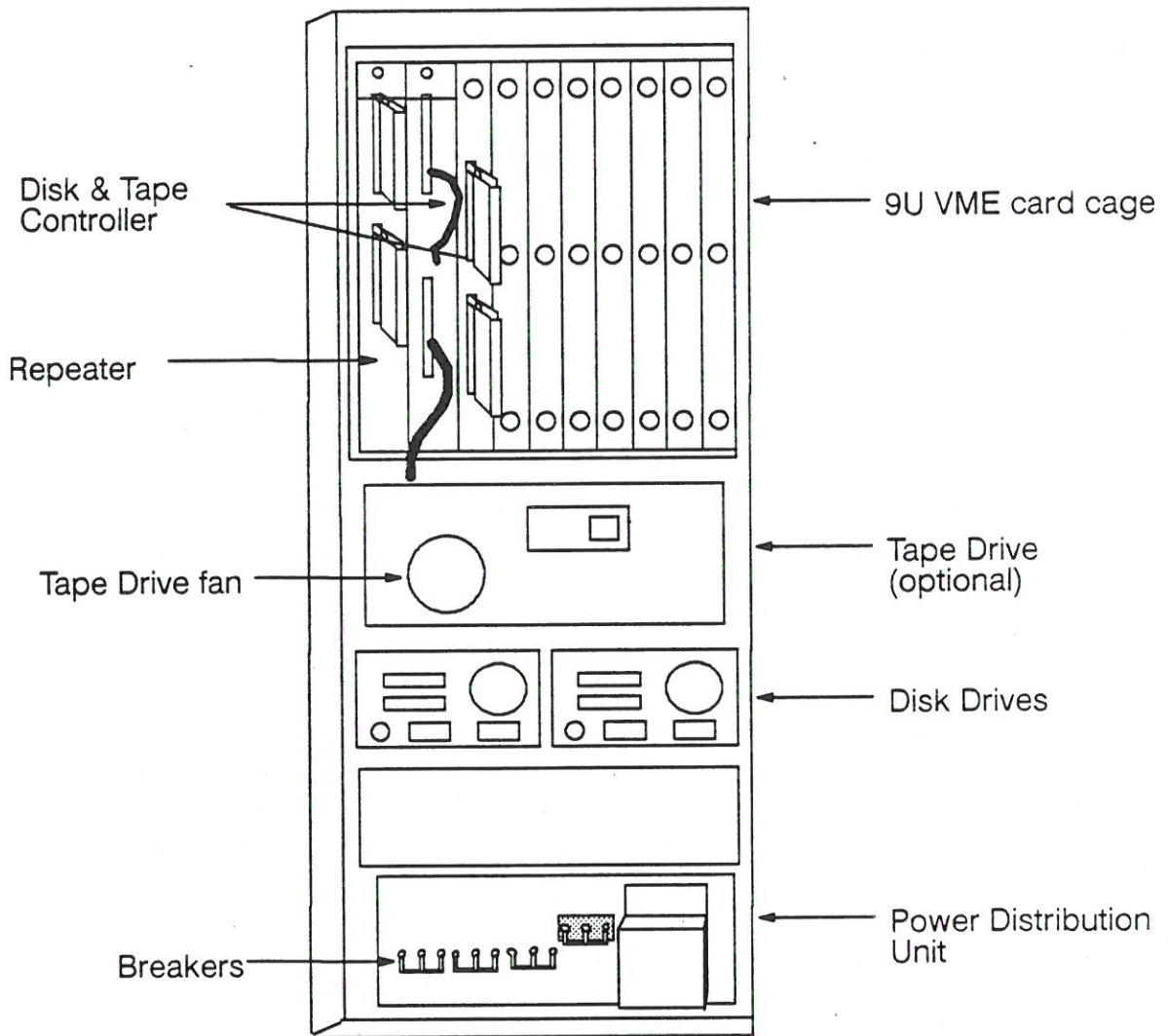


Figure 1-8 **Peripheral Cabinet: Back**



- 32-Port Terminal Controller (Optional)

Supplies multiple serial lines connected to the TC2000 computer

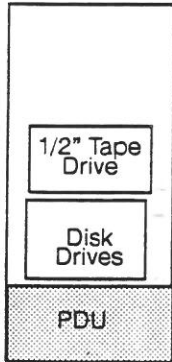
- VME Repeater

Cabled to the 6U VME Repeater to extend control from the TC2000 master function card to the 9U card cage.

Peripheral PDU

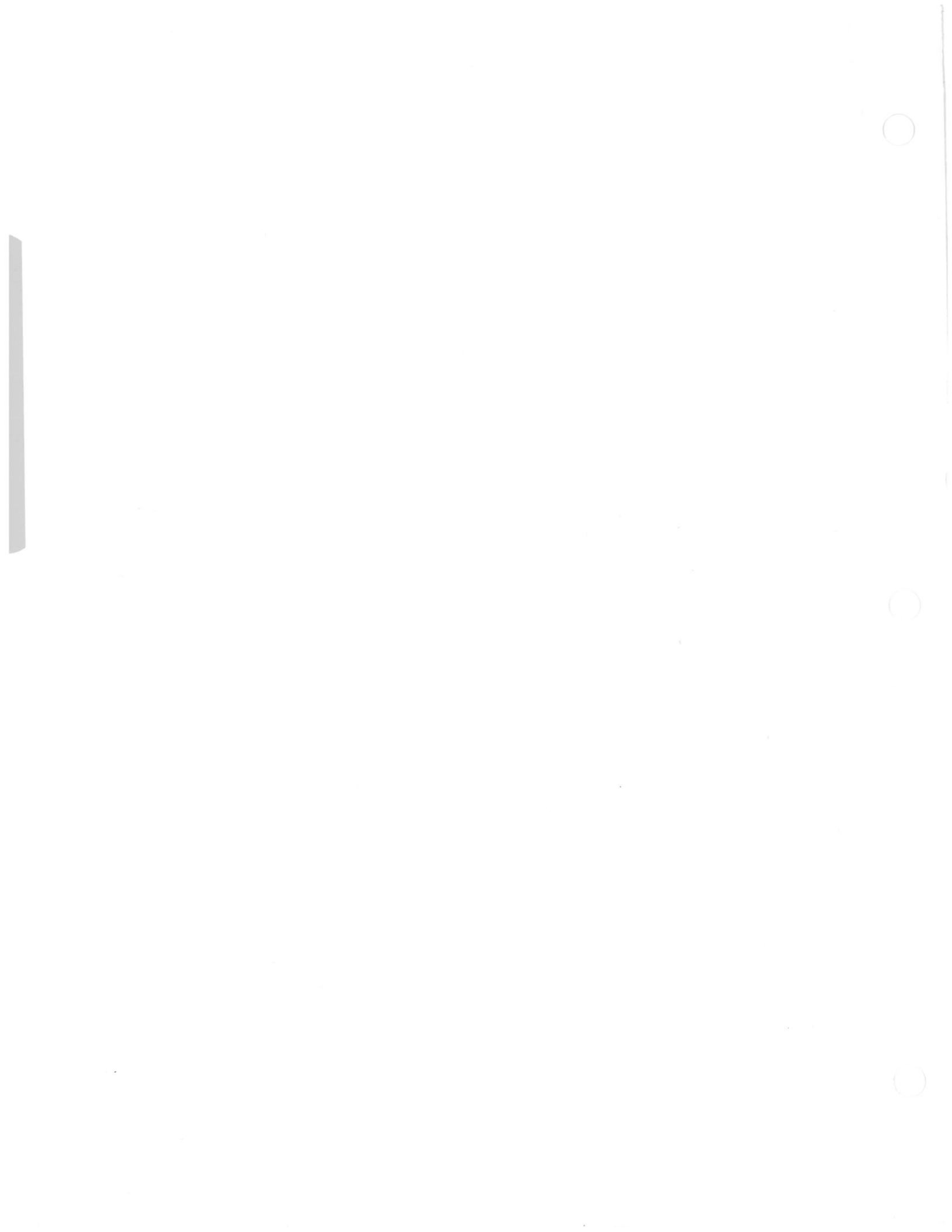
The peripheral Power Distribution Unit (PDU), located at the bottom rear of the Peripheral cabinet, outputs 208 VAC single-phase for the 9U VME card cage, the disk drives (optional), and the 1/2" tape drive (optional). The Peripheral PDU has a 20 amp plug and requires 208 3-phase VAC input.

See the *Site Preparation Guide* for more detailed electrical information.



Front View





Expansion Cabinet



The expansion cabinet is located on the left end of the TC2000 system. (Refer to Figure 2-1 for a front view and Figure 2-2 for a back view.) This cabinet can contain as many as eight processors. There can be up to eight expansion cabinets per system. The first expansion cabinet is called the system base module.

The following sections provide instructions for the removal and replacement of each Field Replaceable Unit (FRU) in the expansion cabinet, as follows:

- Processor Fan
- Processor
- Midplane
- 6U VME Subsystem
 - I/O Power Supply
 - Card Cage/Midplane
 - 6U VME Repeater
 - SCSI Controller
- 6U VME Fan Assembly
- 6U VME Thermal Sensor
- Switch Cards
- Switch Card Fan Assembly
- Power Distribution Unit (PDU)
- Bulk power supplies

Figure 2-1 **Expansion Cabinet--Front**

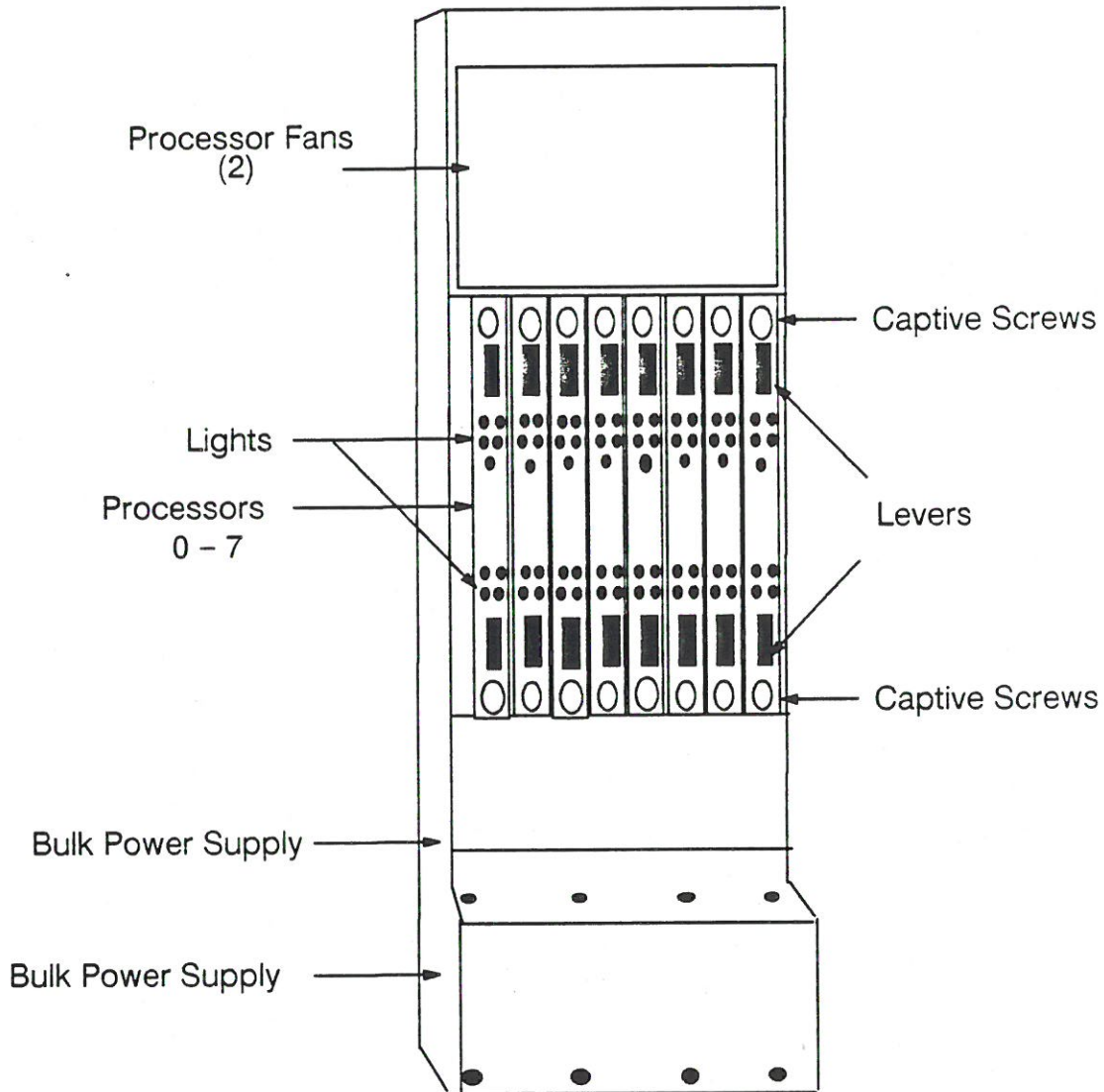
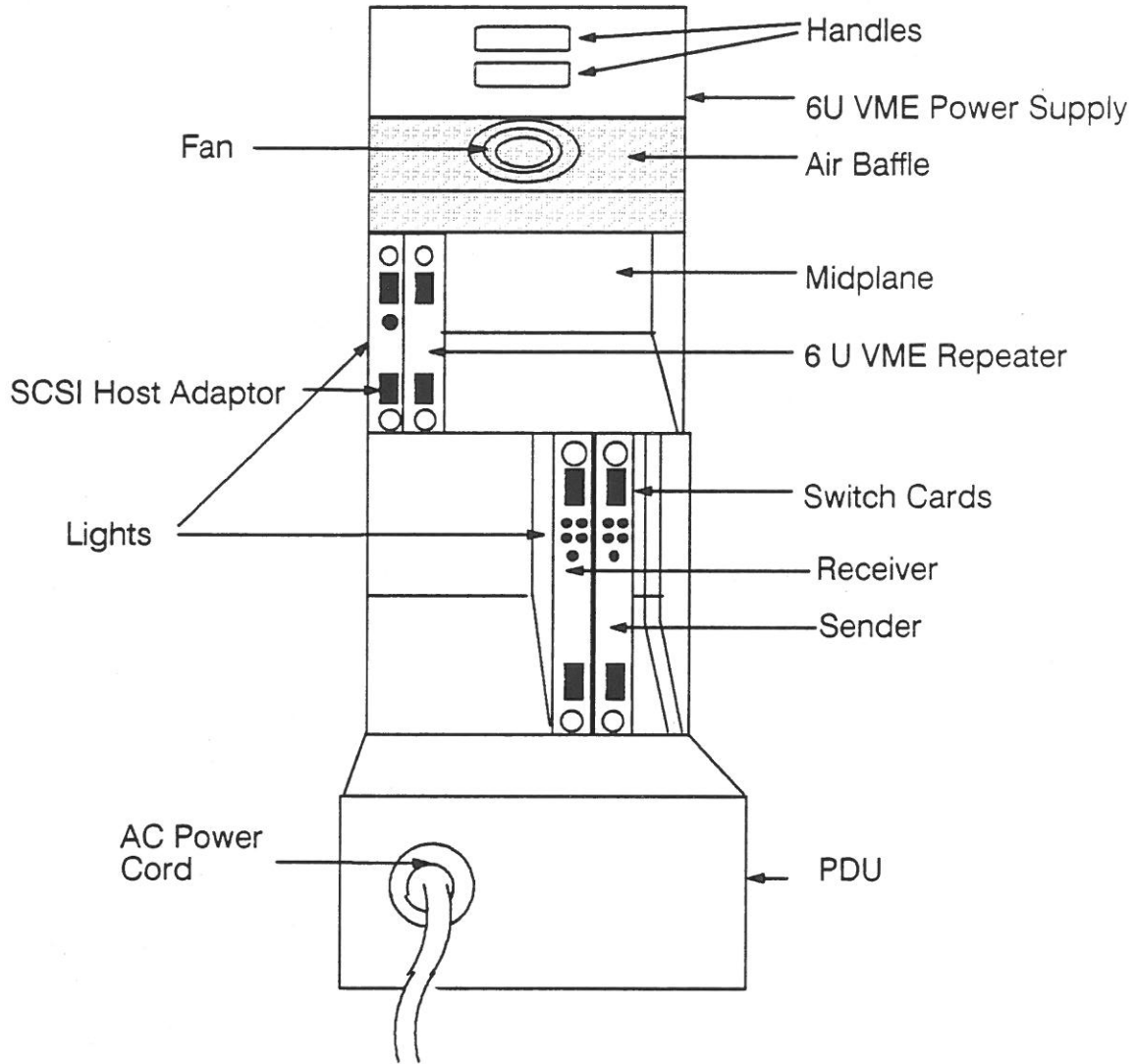


Figure 2-2 Expansion Cabinet -- Back



2.1 Removing the System Panels

Before you can begin working on the expansion cabinet FRUs, you need to remove the cabinet's outer panels ("skins") as follows (see Figure 2-3):

1. Using a 1/8-inch screwdriver, unscrew the two screws at the top of the panel.
2. Remove the panel by pulling the panel out at the top and lifting upwards.

CAUTION

.....

Before removing power be sure to shutdown the operating system (Section 7.3).

.....

WARNING

Unplug the system from the wall outlet before proceeding. Otherwise you risk severe electrical shock.

You can now access the Processor fans and cards. To access the bulk power supply:

3. Unscrew the two screws on the bottom left and right of the bulk power supply panel.
4. Lift the panel off.

NOTE

~~~~~

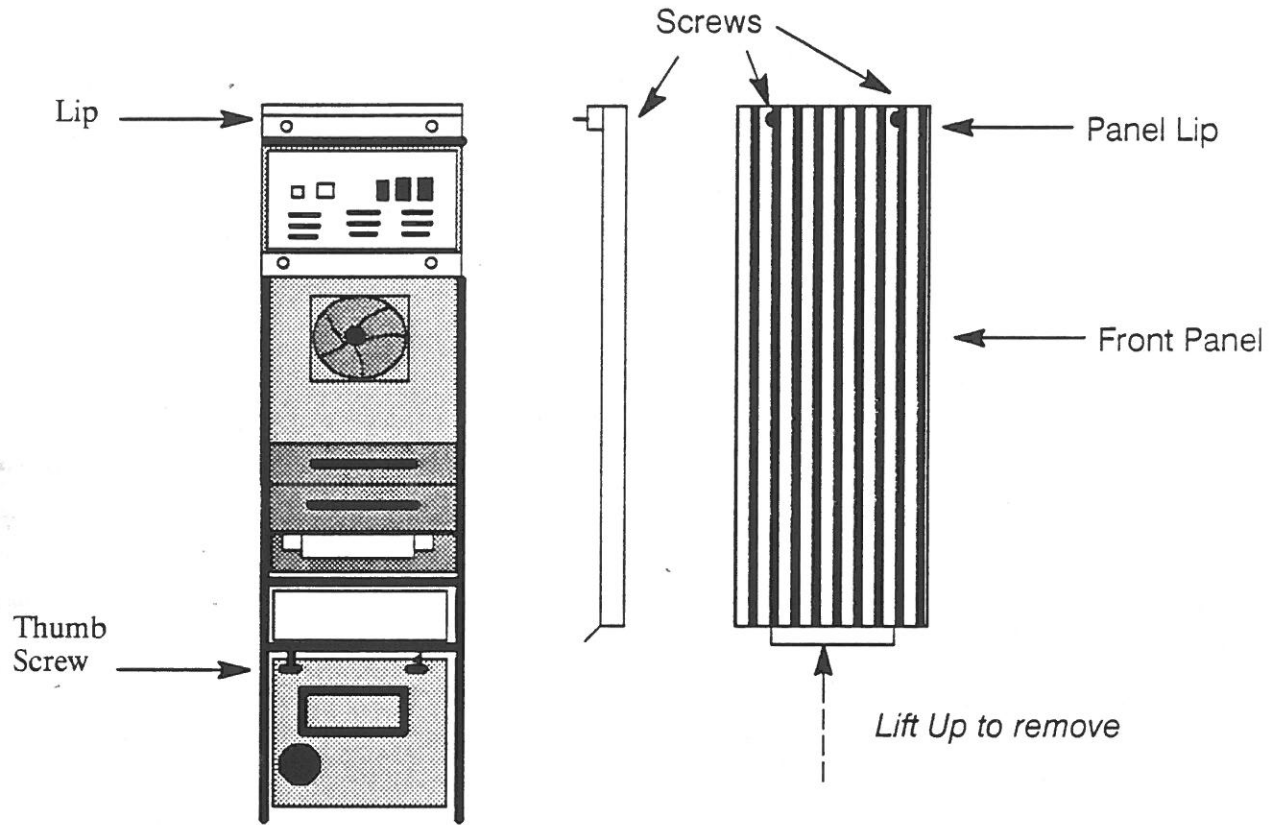
If you wish, you can easily access the bulk power supply filter at this time. Unscrew the two Phillips screws under the panel and slide the filter out for cleaning or changing.

~~~~~

To access the components in the back of the cabinet (the I/O 6U VME power supply, 6U VME card cage, Switch cards and fan, PDU) you first need to remove the back panel as follows:

1. Unscrew the bottom two thumb screws.
2. Lift the entire piece up until the top two pins are free of their holes, then lift the panel off and put it aside.

Figure 2-3 **Removing System Panels**

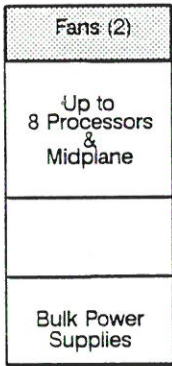


2.2 Processor Fans

There are two Processor fans per expansion cabinet. They are located at the front in the topmost section.

You need the following tools:

- Large slotted screwdriver
- Phillips (#1 or #2) screwdriver



Front View

2.2.1 Removing a Processor Fan

To remove a processor fan:

CAUTION

.....
 Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the utility cabinet, turn the key in the control panel counterclockwise to the OFF position.
2. Remove the four screws from the Processor fan panel and lift it off.
3. Remove the four screws—two front and two on the back wall—from the fan bracket.
4. Cut all tie wraps.
5. Unplug each of the plugs connected to the fans.
6. Lift out the whole fan assembly as far as it will go.

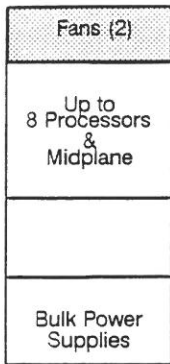
NOTE

.....
 The plugs on the back wall are one-way and cannot come out.

7. You can now access either fan for removal.

2.2.2

Replacing a Processor Fan



Front View

To replace a fan:

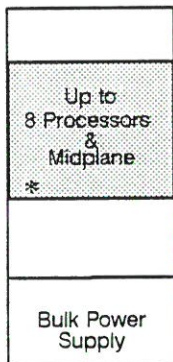
1. At the front of the utility cabinet, check that the key in the control panel is turned counterclockwise to the OFF position.
2. Place the new fan on the mounting bracket and tighten all screws.
3. Move the two cords out of the way and put the entire assembly back into the rack.
4. Connect the two fan plugs—the shorter cord to the back fan and the longer cord to the front fan.
5. Replace the four bracket screws.
6. Put the front panel in place and tighten the four panel screws.

2.3 Processor Cards

There can be up to eight processors per expansion cabinet. The Processors are located in the middle of the cabinet and are accessed from the front.

You need the following tool:

- Large slotted screwdriver



Front View

2.3.1 Removing a Processor Card

To remove a processor:

CAUTION

.....

Before removing power be sure to shutdown the operating system (Section 7.3).

.....

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).

CAUTION

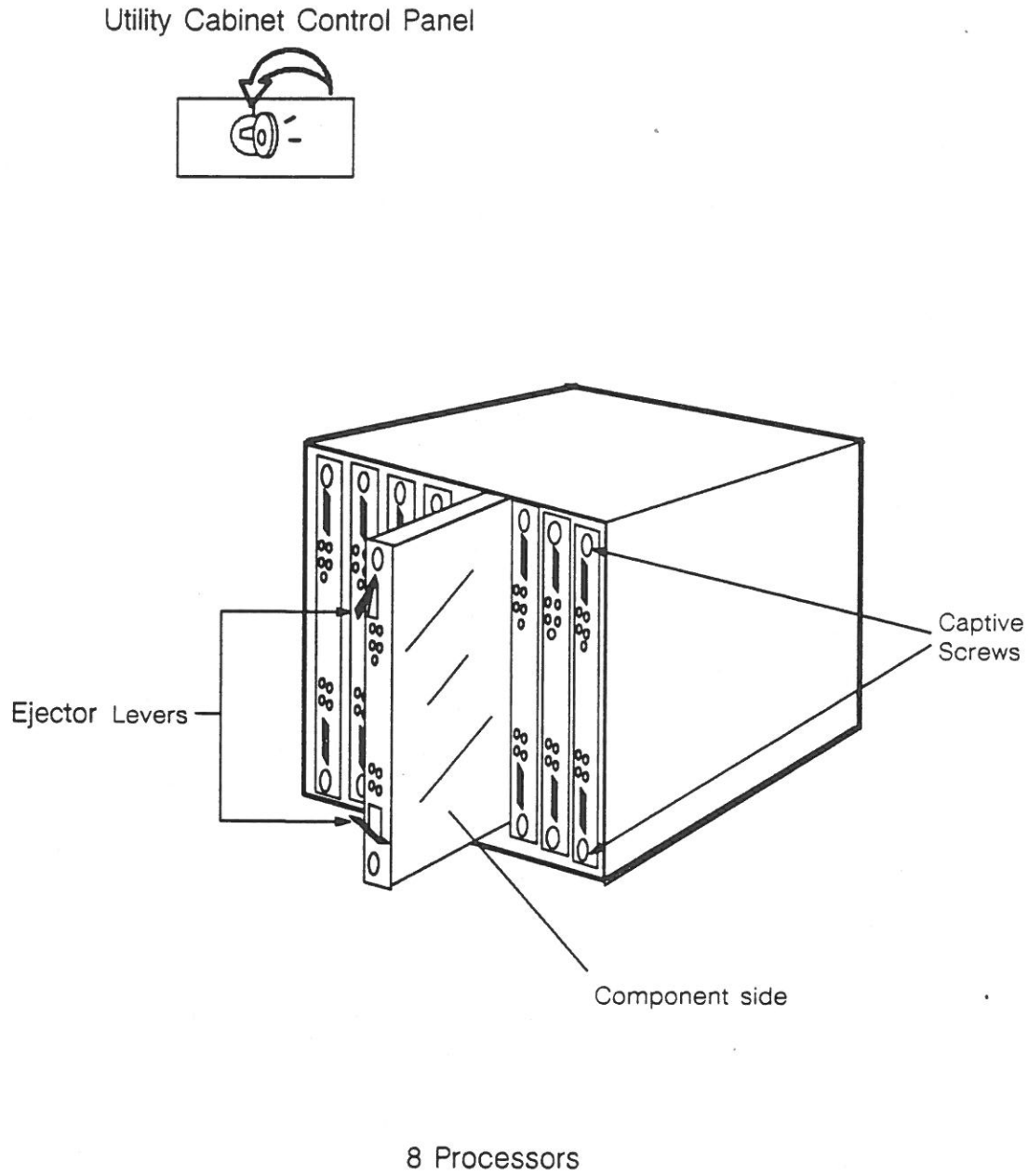
.....

Be sure to put a ground strap on your wrist and plug the end into the ground socket (* on diagram.) This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

.....

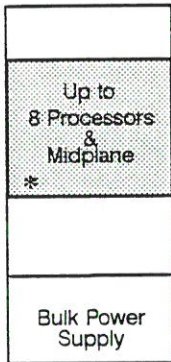
2. Loosen each captive screw at the top and bottom of the processor enough to release it.
3. Grasp the top and bottom black levers and pull them out simultaneously — the top lever goes out and up; the bottom lever out and down.
4. Slide the processor out. If a processor sticks, rock it gently up and down.
5. Place the processor in the protective, static-free package provided.

Figure 2-4 **Removing/Replacing a Processor Card**



2.3.2

Replacing a Processor



Front View

To replace a Processor:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Remove the Processor from its special packaging.

CAUTION

.....

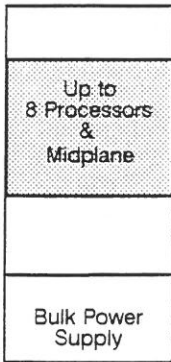
Be sure to put a ground strap on your wrist and plug the end into the ground socket (see * on diagram.) This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

.....

3. Configure the jumpers on the new Processor to match those on the old Processor. (Refer to Appendix A to verify the jumper/switch settings.)
4. Hold the Processor so that the five lights—Bulk, TCS, Vcc, Vee and Flag— are at the top and facing you.
5. Holding the Processor straight, place it carefully into the slot at the bottom of the bay. Hold the ejector levers horizontal so that they do not interfere with the seating.
6. Push the Processor in slowly until it connects to the Midplane.
7. Simultaneously push the top lever down and in, and the bottom lever up and in to lock the Processor in place.
8. Push and turn the captive screws then secure each with the screwdriver.

2.4

Midplane



The Midplane holds the Processors on one side (front) and the Switch cards on the other side (back). The Midplane may need to be replaced (refer to Chapter 7, *Troubleshooting*, for possible reasons). The Midplane is located in the middle of the expansion cabinet and is accessed from the front of the cabinet.

You need the following tools to work on the Midplane:

- Phillips (#1) screwdriver
- 9/64 Allen wrench

Front View

2.4.1

Removing a Midplane

NOTE

~~~~~  
 The VME Midplane is not currently a Field Replaceable Unit.  
 ~~~~~

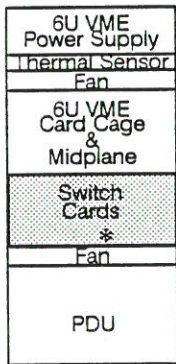
2.4.2

Replacing a Midplane

NOTE

~~~~~  
 The VME Midplane is not currently a Field Replaceable Unit.  
 ~~~~~

2.5 Switch Server/Switch Requestor Cards



The Switch Server (TC/SS) and Switch Requestor (TC/SR) cards are located midway down the back of the expansion cabinet.

You need the following tool to work on the Switch cards:

- Large slotted screwdriver

Back View

2.5.1 Removing a Switch Card

To remove a Switch Server or Switch Requestor card (see Figure 2-5):

CAUTION

.....

Before removing power be sure to shutdown the operating system (Section 7.3).

.....

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).

CAUTION

.....

Be sure to put a ground strap on your wrist and plug the end into the ground socket (see * on the diagram). This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

.....

2. Loosen the card fasteners until each captive screw is released.
3. Grasp the top and bottom black levers and pull out simultaneously — the top goes out and up; the bottom out and down.
4. Slide the card out.

NOTE

.....

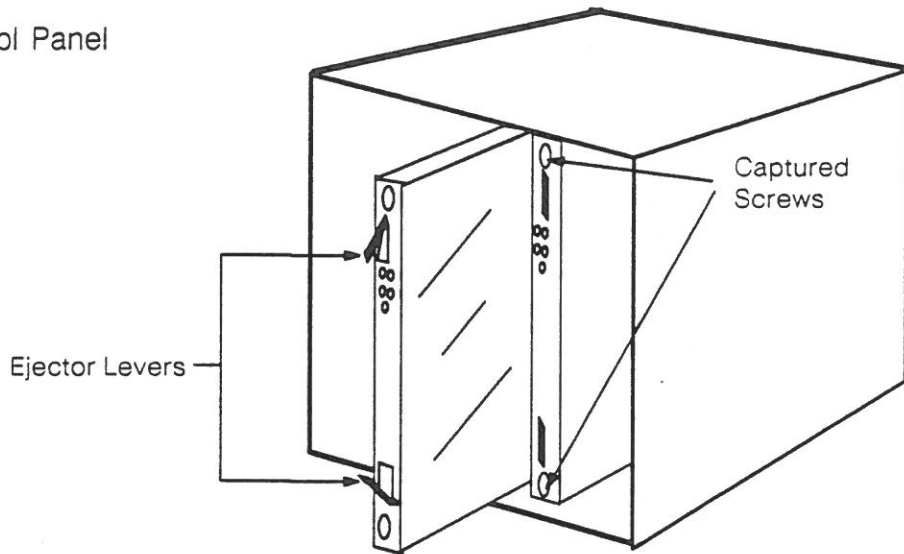
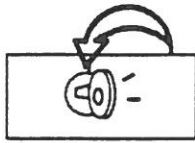
Be sure to note the slot location of the card.

.....

5. Place the card in the protective, static-free package provided.

Figure 2-5 Removing/Replacing a Switch Card

Utility Cabinet Control Panel



2.5.2 Replacing a Switch Card

CAUTION

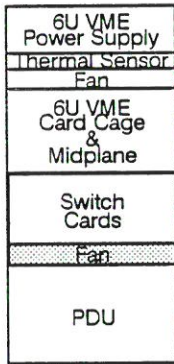
6U VME Power Supply
Thermal Sensor Fan
6U VME Card Cage & Midplane
Switch Cards *
Fan
PDU

Be sure to put a ground strap on your wrist and plug the end into the ground socket (see * on the diagram) to prevent static electricity build up and discharge across a card. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

To replace a Switch Server or Switch Requestor card:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Remove the card from its protective packaging.
3. Configure the jumpers on the new card to match those on the old card. (Refer to Appendix A to verify the jumper/switch settings.)
4. Make sure the five lights—Bulk, TCS, Vcc, Vee and Flag are at the top of the card and facing you.
5. Holding the card straight, place it carefully into the slot at the bottom of the bay. Hold the ejector levers horizontal so that they do not interfere.
6. Push the card in slowly until it connects to the Midplane.
7. Grasp the black levers at the top and bottom of the card and simultaneously push the top lever down and in and the bottom lever up and in.
8. Push and turn the captive screws manually, then with the screwdriver.

2.6 Switch Card Fan Assembly



The Switch Card Fan Assembly is located at the back of the expansion cabinet just under the Switch cards.

You need the following tool:

- 3/16 or 1/4-inch slotted screwdriver

Back View

2.6.1 Removing a Card Fan Assembly

To remove a Switch Card Fan Assembly:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Loosen the four screws holding the assembly in place.
3. Unplug the connector.
4. Lift the assembly out.

2.6.2 Replacing a Card Fan Assembly

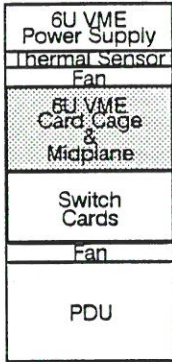
To replace a Switch Card Fan Assembly:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Put the assembly in place and plug in the connector.
3. Screw in the four screws that hold it in place.
4. Plug in the two AC power cords.

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2.7

6U VME Repeater



The 6U VME Repeater is located in the 6U VME card cage at the top back of the expansion cabinet.

You need the following tool to work on the VME Repeater:

- 1/8-inch slotted screwdriver

Back View

2.7.1

Removing a 6U VME Repeater

To remove a VME Repeater:

CAUTION

.....
 Before removing power be sure to shutdown the operating system (Section 7.3).

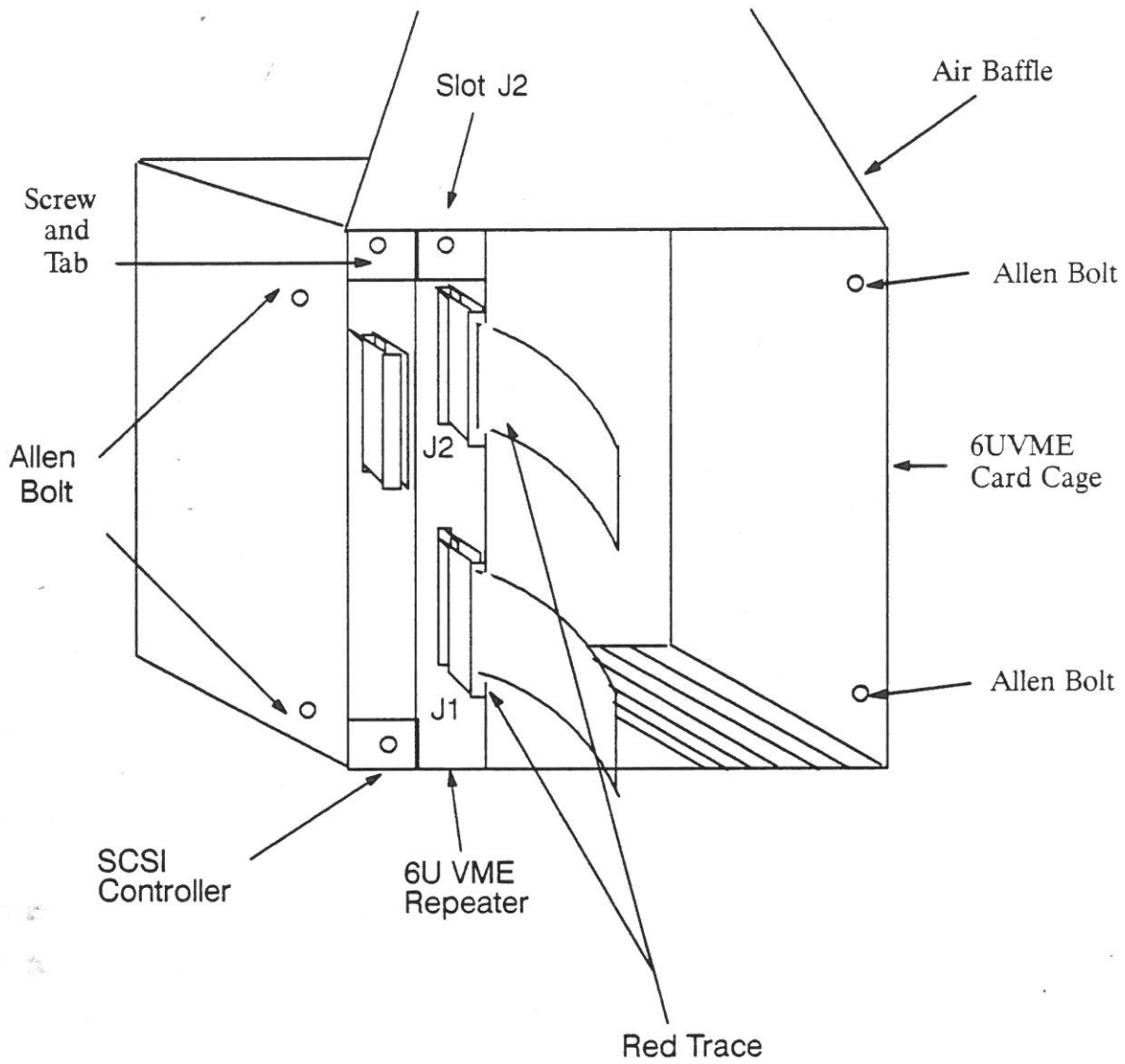
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Locate the appropriate card. It is in the second slot from the left (Slot J2) and has cables to the 9U VME card cage.
3. Loosen the two screws — one at the top and one at the bottom of the card.
4. Disconnect the cables J1 (bottom) and J2 (top) by spreading the cable clips and pulling forward.

NOTE

.....
 As you remove the cables, note the red trace on the bottom of each. This should always be down when the cables are connected. Also, remember which cable was J1 and which was J2.

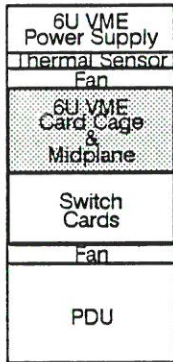
5. Grasp the top and bottom tabs and pull them straight out simultaneously. These are not ejector tabs, so removing the card requires some force.
6. Slide the Repeater out.
7. Place the card in the protective, static-free package provided.

Figure 2-6 6U VME Card Cage



2.7.2

Replacing a 6U VME Repeater



Back View

To replace a VME Repeater:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Remove the Repeater from its special packaging.
3. Configure the jumpers on the new Repeater to match those on the old. (Refer to Appendix A to verify the jumper/switch settings.)
4. Make sure the components are on the right side of the card.
5. Holding the card straight, place it carefully into the leftmost empty slot (immediately to the right of the Interphase Controller).

CAUTION

.....
 The Repeater *must* be inserted into the first open slot (just to the right of the last card), in order for the system to operate.

-
6. Grasp the black tabs at the top and bottom of the card and push them straight in simultaneously .
 7. Secure the top and bottom screws.
 8. Connect the cables, making sure that the red trace is down and the J1 and J2 cables go into the correct connectors on the card.

2.8 SCSI Controller

The SCSI Controller is located in the 6U VME card cage at the top back of the expansion cabinet. It is always in the leftmost slot of the card cage.

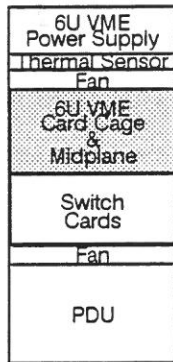
You need the following tool to work on this card:

- 1/8-inch slotted screwdriver

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

2.8.1 Removing a SCSI controller

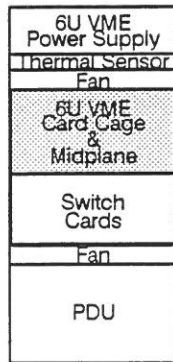


To remove a Controller:

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Locate the appropriate card; it will always be in the leftmost slot.
3. Loosen the two screws—one at the top and one at the bottom of the card.
4. Disconnect the only cable, which is located at the top of the card.
5. Pull the two black ejector levers away from the center simultaneously.
6. Slide the card out and place the card in the protective, static-free package provided.

Back View

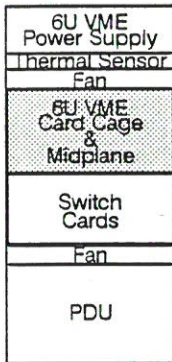
2.8.2 Replacing a SCSI controller



To replace a Controller:

1. Check that the key in the control panel is turned all the way to the left.
2. Remove the card from its special packaging.
3. Configure the jumpers and switches on the new card to match those on the old card. (Refer to Appendix A to verify the jumper/switch settings.)
4. Check that the ejector levers won't interfere with the seating, place the card carefully into the leftmost empty slot.
5. Push the card in slowly until it connects to the backplane.
6. Connect the cable at the top.
7. Secure the top and bottom screws.

2.9 6U VME Card Cage



Back View

The 6U VME card cage is located at the back of the expansion cabinet just under the 6U VME power supply. **Be prepared to spend about one hour on this task.** Also, make sure that there is enough room at the back of the cabinet to work; i.e., that the cabinet is not too close to the wall.

You need the following tools to work on the card cage:

- 1/8-inch Allen wrench
- 3/16-inch Phillips screwdriver
- 1/8-inch slotted screwdriver

In order to remove the card cage you need to remove other FRUs as well. These FRUs are:

- Processors
- 6U VME Repeater
- SCSI Controller
- 6U VME Fan assembly
- 6U VME Power Supply

Instructions for their removal can be found in this chapter under the appropriate name.

2.9.1 Removing a 6U VME Card Cage

To remove the card cage:

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the front of the expansion cabinet, remove all the Processors. See *Processors, Remove* in this chapter.

NOTE

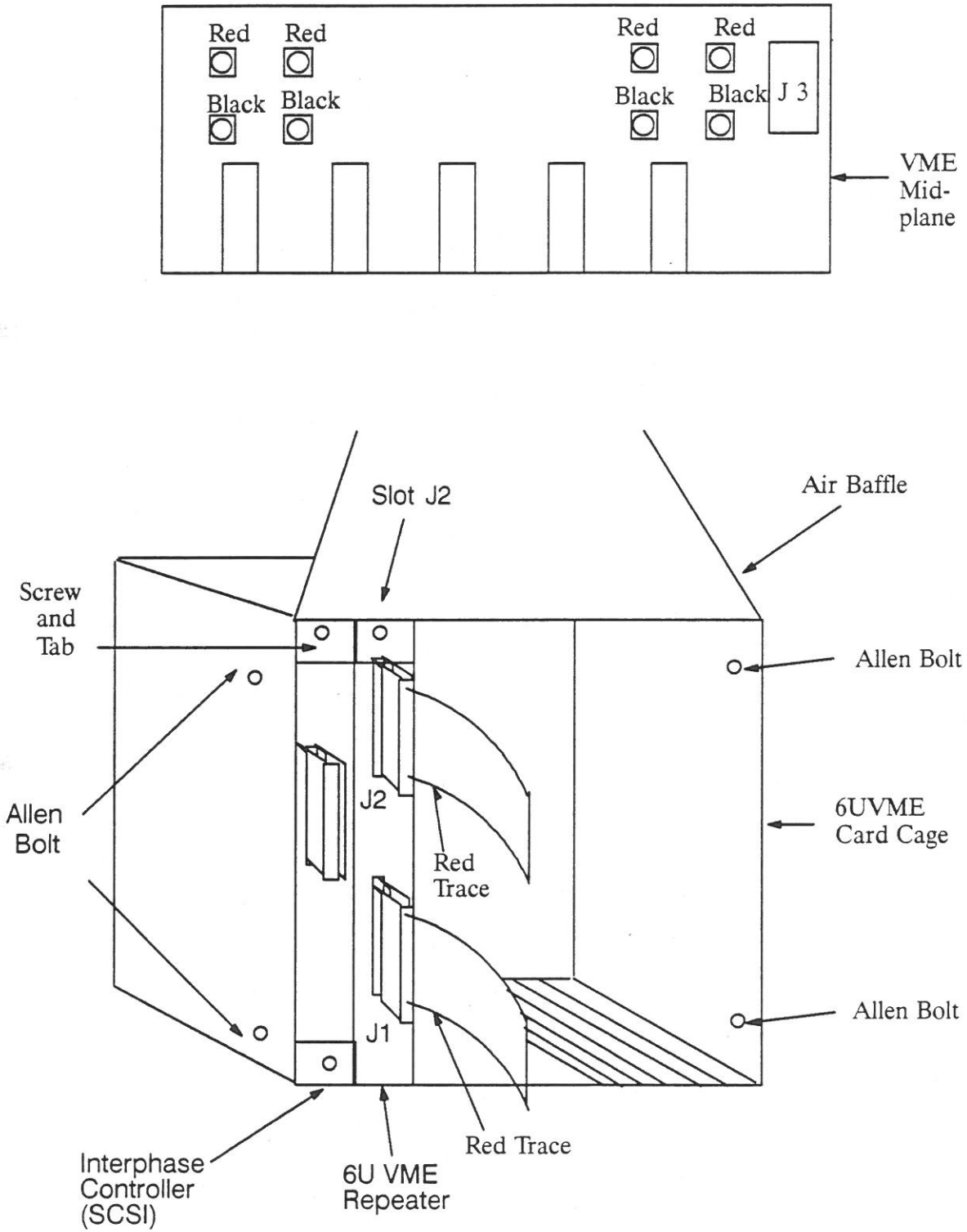
~~~~~

Before removing the Processors, make sure that you have a place to keep them while you are working; i.e., they should not be stacked up, but instead put separately into protective, static free bags.

~~~~~

3. Reach through the Processor card cage to unscrew the two Phillips screws on the left and right bottom corners of the VME Midplane.

Figure 2-7 Removing/Replacing the 6U VME Card Cage



NOTE

Be sure to keep track of all hardware that you remove and remember where it came from.

4. At the back of the expansion cabinet, remove the VME cards from the 6U VME card cage (refer to for instructions).
5. Loosen the two Allen bolts on each side of the card cage.
6. The air baffle panel is just above the 6U VME card cage. Unscrew the air baffle panel and lift it out.
7. Loosen the top two slotted screws on the power supply panel so that the entire power supply can be lifted up and out.

NOTE

The power supply does not come out easily; you need to lift it up in order to unhook its sides from the pins on the rack before you can lift it out.

8. On the left side of the power supply, loosen the two lug nuts holding two power cables and disconnect the wires. This gives enough slack to the remaining cables (connected to the Midplane and back wall) so that you can lift the power supply all the way out and rest it on top of the expansion cabinet.
9. You can now remove the VME fan assembly (refer to for instructions).

NOTE

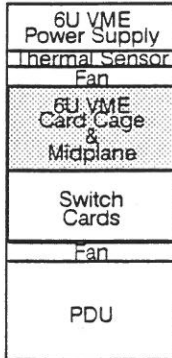
When disconnecting cables remember where they connect.

10. Disconnect the eight power cables for the power supply from the VME Midplane.
11. Remove the two power cables from the back wall by squeezing the sides of each plug and pulling it out.
12. Disconnect the power supply plug (J3) from the VME Midplane.
13. Unscrew the two top screws in the top back of the Midplane.
14. Lift out the VME card cage, being careful not to catch any of the cables.

2.9.2

Replacing a 6U VME Card Cage

In order to replace the card cage you need to replace other FRUs as well. These FRUs are: the Processors, the 6U VME Repeater and Controller cards, the 6U VME Fan assembly, and the 6U VME Power Supply. Instructions for their replacement can be found in this chapter under the FRU name.



Back View

To replace the 6U VME card cage:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Check inside the section of the rack for the 6U VME card cage to ensure that the AC power and thermal sensor cables are vertically dressed to the left of the cage so that the cage will not catch them as you insert it.
3. Push the cage partway in, then go to the front of the expansion cabinet.
4. Reach through the Processor card cage to push the cables around the edge (right corner) of the rack.
5. At the back of the expansion cabinet, pull the cables around the cage as you push the cage all the way in.
6. Lift the cables and check that they are free of the card cage.
7. Make sure that the card cage is pushed all the way forward and lifted so that the bottom of it overlaps the front screw tabs.
8. Align the two top screw holes in the top back of the Midplane.
9. Put the two top screws back in loosely.

NOTE

~~~~~  
 Hang the back bottom of the card cage over the screw holes on the back of the Processor cage in order to properly align the holes and replace the screws.  
 ~~~~~

10. Go to the front of the cabinet and replace the two screws on the back of the VME card cage.
11. Insert processor card into the left and right side of the processor cage.
12. Go to the back and tighten the top two screws on the VME card cage.
13. Go to the front, remove the left processor card, and tighten the left bottom screw. Repeat with the processor card on the right.
14. Replace the 6U VME Fan assembly.
15. Replace the 6U VME power supply.
16. Replace the 6U VME Repeater and Controller cards.
17. At the front of the cabinet, replace the Processors.

2.10 6U VME I/O Power Supply

The 6U VME I/O power supply is accessed from the back of the expansion cabinet and is located in the topmost section.

You need the following tools to work on the 6U VME power supply:

- Large slotted screwdriver
- Phillips (#2) screwdriver

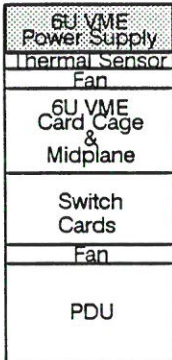
CAUTION

.....

Before removing power be sure to shutdown the operating system (Section 7.3).

.....

2.10.1 Removing a 6U VME Power Supply



To remove the power supply (see Figure 2-8):

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. Additionally, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. The air baffle panel is just under the 6U VME power supply. Unscrew the air baffle panel and lift it off.
4. Loosen the top two slotted screws on the power supply panel and lift the entire power supply up and out. Rotate the power supply toward you so that the top can rest on the VME cage, which allows you to work on it.

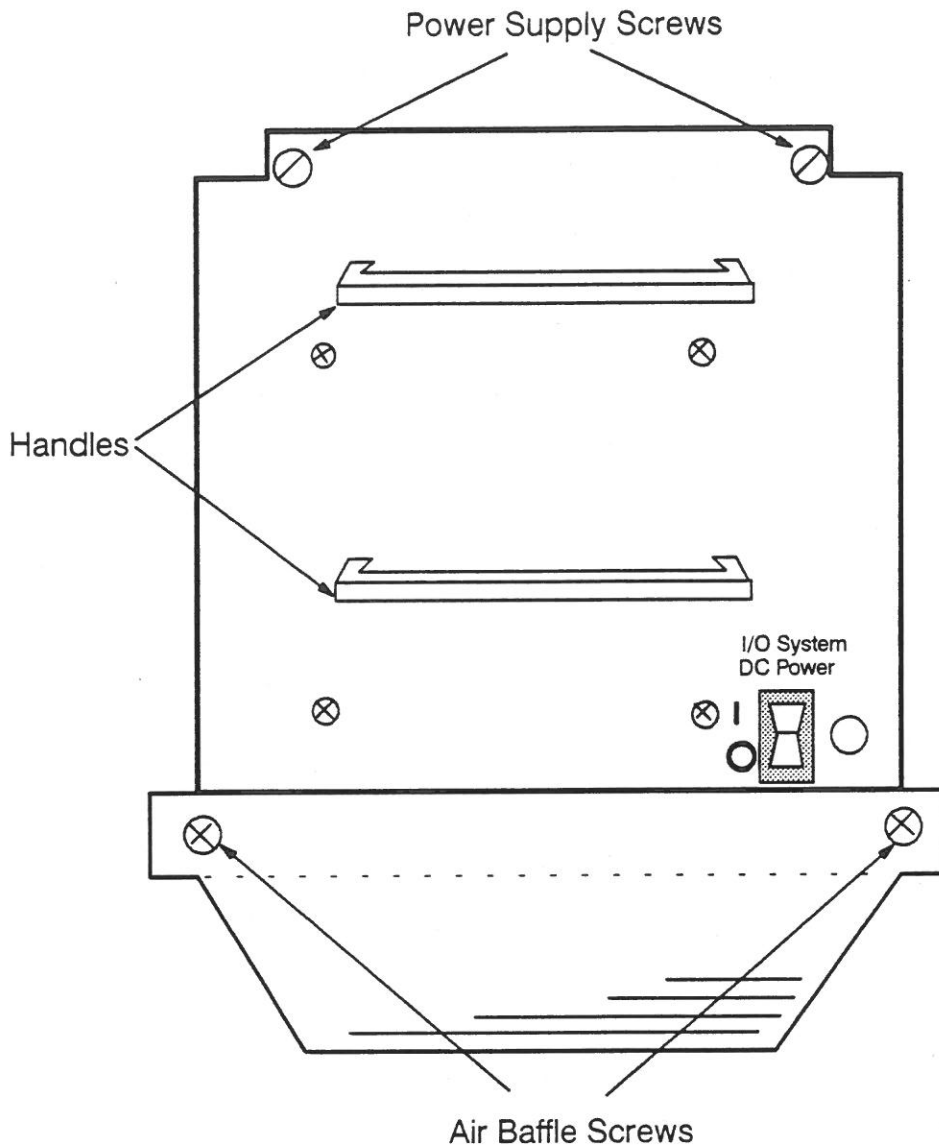
NOTE

.....

The power supply does not come out easily; you need to lift it up in order to unhook its sides from the pins on the rack before you can lift it out.

.....

5. Remove the four screws holding down the fan plate, disconnect the fan cable, and remove the fan assembly.
6. On the left side of the power supply, loosen the two lug nuts holding power cables and disconnect the wires. This gives enough slack to the remaining cables so that you can lift the power supply out and rest it on top of the expansion cabinet while you remove the remaining connections.
7. Disconnect the two right-hand ground wires (black).
8. Disconnect the two right-hand 5V wires (red).

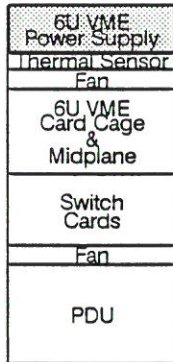
Figure 2-8 Removing/Replacing the 6U VME Power Supply**NOTE**

Remember where the cables come from.

9. Remove the two power cables from the back wall by squeezing the sides of each plastic plug and pulling it out.
10. Disconnect the power supply plug (J3) from the VME Midplane.
11. Remove plate on the back of the power supply.
12. Unscrew the six wires as in Figure 2-9.

2.10.2

Replacing a 6U VME Power Supply



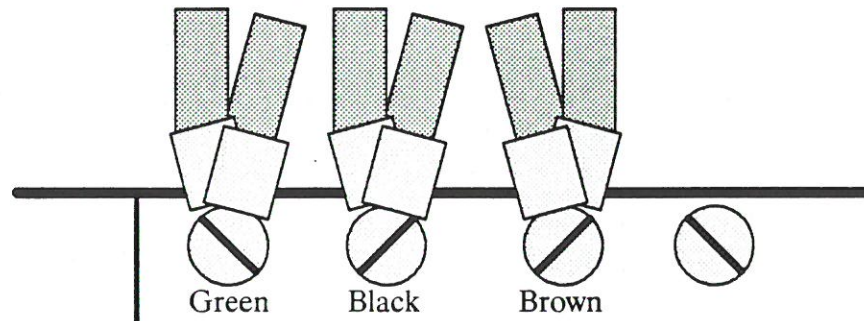
To replace the power supply:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), that the circuit breakers for all PDUs are down and that the AC power plug is disconnected.
2. Connect the power supply plug (J3) to the VME Midplane making sure that it is keyed correctly before connecting.
3. Remove plate on the back of the power supply.
4. Secure the six wires to the appropriate connections as in Figure 2-9.
5. Connect the two right-hand ground wires (black) as in Figure 2-7.
6. Connect the two right-hand 5V wires (red) as in Figure 2-7.
7. Connect the two power cables into the back wall.
8. Tuck the cables into the back so that they are out of the way.
9. Check that the LED wires on the right of the power supply are connected.
10. Replace the power supply unit by lifting it up by the handles, engaging the top side slots on the rack pins first, then hooking the bottom, and pushing it firmly into the rack.
11. Put the panel in place and tighten the two screws on the top of the panel.
12. Replace the air baffle.
13. Plug in the AC power cord.
14. Push the circuit breakers up (on).

Back View

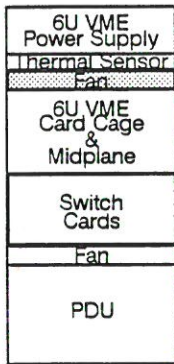
Figure 2-9

6U VME Power Supply Wiring



Intentionally blank.

2.11 6U VME I/O Fan Assembly



Back View

The 6U VME I/O fan assembly is located at the back of the expansion cabinet just under the I/O power supply and behind the air baffle panel.

You need the following tools:

- Phillips screwdriver

2.11.1 Removing a 6U VME Fan Assembly

To remove the 6U VME fan assembly (see Figure 2-10):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

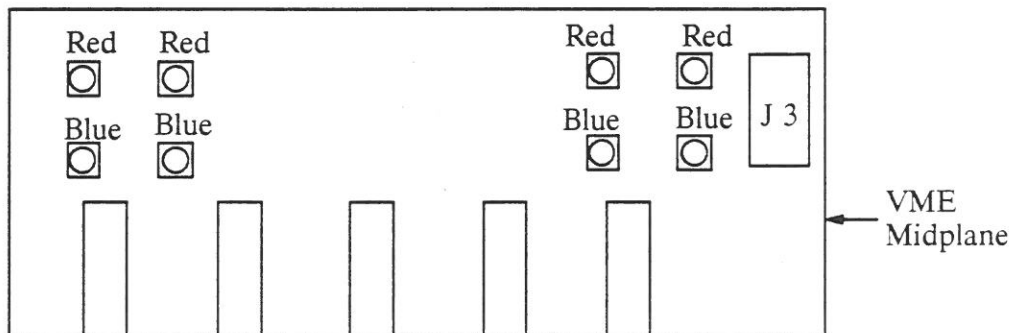
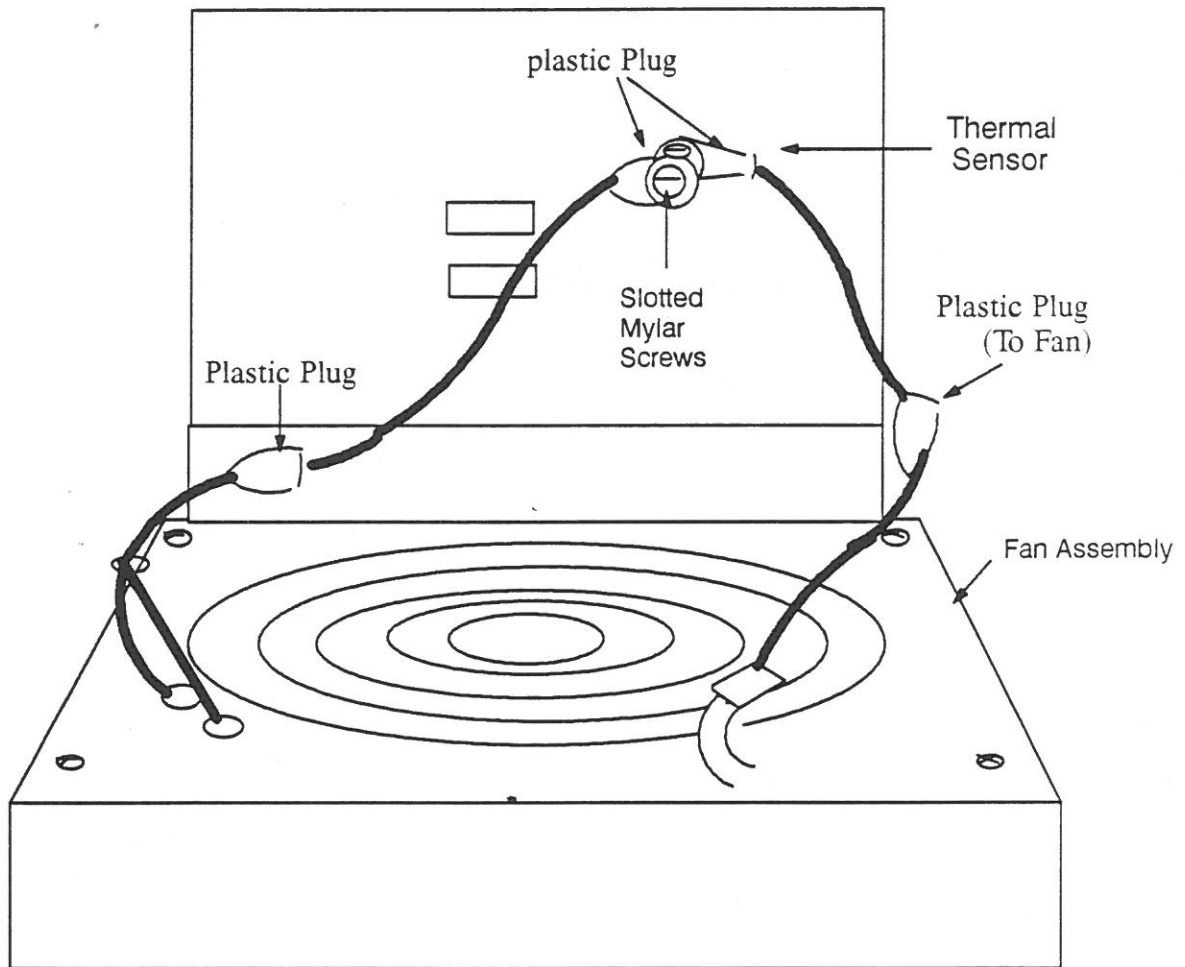
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. Additionally, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. The air baffle panel is just under the 6U VME power supply. Unscrew the air baffle panel and lift it off.
4. Remove the power supply as described in *6U VME I/O Power Supply, Remove* but only enough to rest it on top of the cabinet and keep it out of the way while you work on the fan assembly.
5. Unscrew the four Phillips screws holding the fan assembly in place.

NOTE

Be sure to keep track of all hardware that you remove and where it came from.

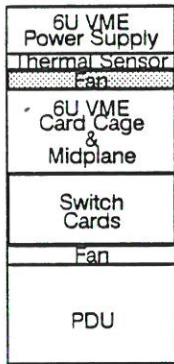
6. Unplug the plastic connector on the right (AC input cord).
7. Unplug the J3 connector from the back wall (VME Midplane).
8. Lift the assembly out.

Figure 2-10 Removing/Replacing the I/O 6U VME Fan Assembly



2.11.2

Replacing a 6U VME Fan Assembly



Back View

To replace the 6U VME fan assembly:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), and that the circuit breakers for all PDUs are down.
2. Plug the J3 connector into the back wall (VME Midplane).
3. Put the fan assembly in at a 45-degree angle with the side up, then put it into place.
4. Replace the four fan assembly screws.
5. Plug the fan into the plastic connector on the right.
6. Replace the power supply as described in *6U VME I/O Power Supply, Replace*.
7. Replace the air baffle panel.
8. Plug the AC power plugs back into the wall and push the PDU circuit breakers up (on).

2.12 6U VME Thermal Sensor

The 6U VME thermal sensor is located at the back of the expansion cabinet on the back wall just behind and above the 6U VME fan assembly.

You need the following tool:

- Medium slotted screwdriver

2.12.1 Removing a 6U VME Sensor

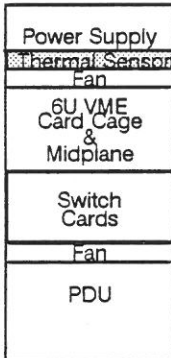
To remove the 6U VME thermal sensor:

CAUTION

.....

Before removing power be sure to shutdown the operating system (Section 7.3).

.....



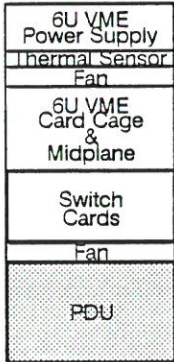
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. In addition, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. At the back of the expansion cabinet, remove the air baffle.
4. Remove the power supply (see *6U VME I/O Power Supply, Remove*).
5. Unplug the two connectors from the sensor.
6. Unscrew the two plastic screws.
7. Lift the sensor out.

2.12.2 Replacing a 6U VME Sensor

To replace the 6U VME thermal sensor:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), and that the circuit breakers for all PDUs are down.
2. Position the new sensor on the back wall and screw in the plastic screws.
3. Plug in the two sensor connectors.
4. Replace the power supply (see *6U VME I/O Power Supply, Replace*).
5. Replace the air baffle.
6. Plug the AC power plugs back into the wall and push the PDU circuit breakers up (on).

2.13 Power Distribution Unit (PDU)



The PDU is located at the back bottom of the expansion cabinet above the bulk power supply.

You need the following tool:

- #2 Phillips screwdriver

Back View

WARNING

Be sure to unplug the AC cord before removing the PDU cover. Failing to do so exposes you to live 208VAC terminals inside the PDU.

2.13.1 Removing a PDU

To remove the PDU (see Figure 2-11):

CAUTION

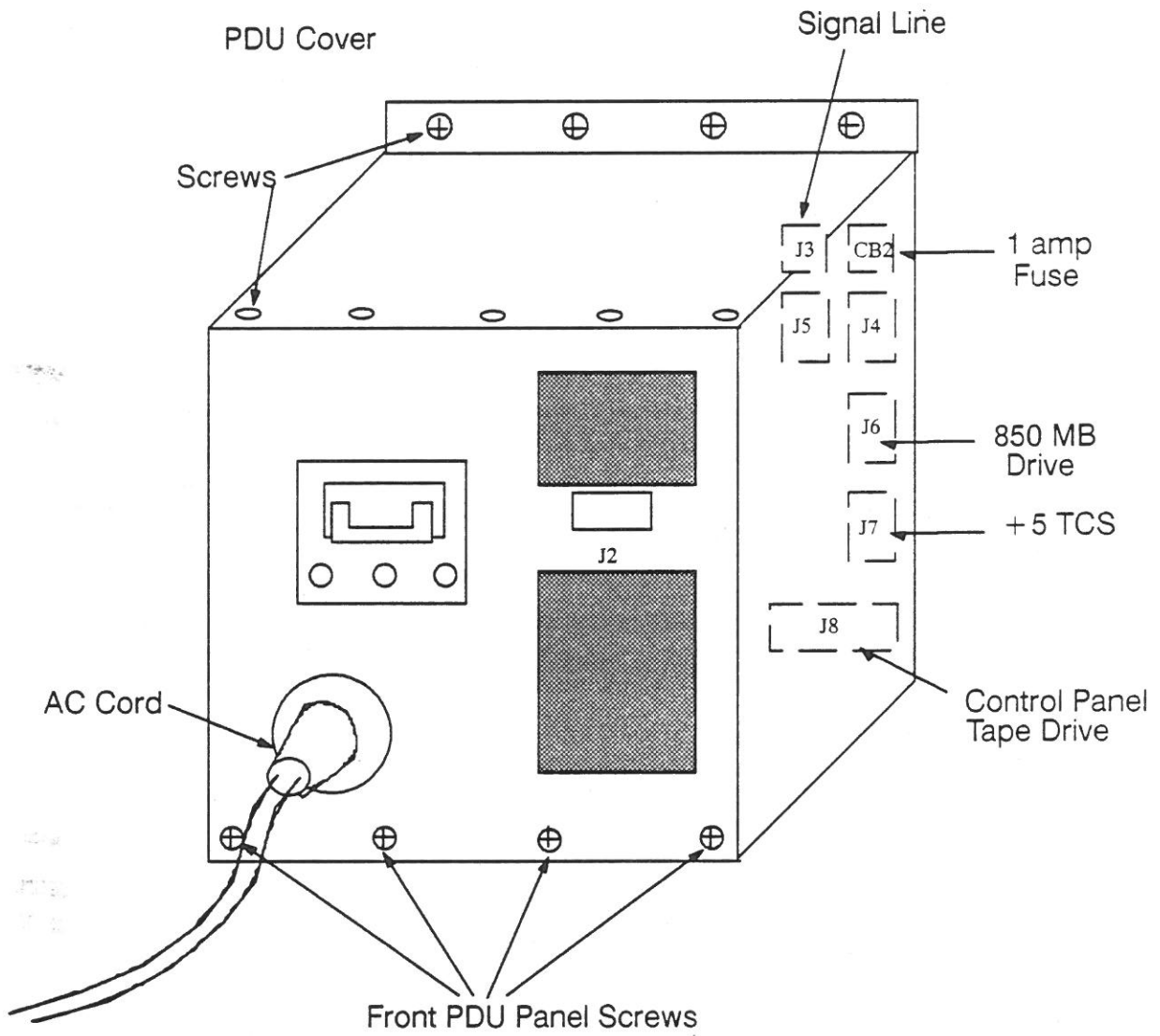
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Before removing power be sure to shutdown the operating system (Section 7.3).

.....

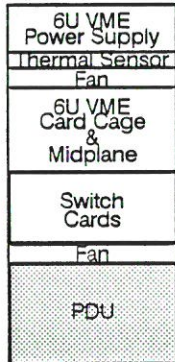
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. In addition, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. Unscrew the bottom four screws on the PDU drawer.
4. Unscrew the four screws at the top of the PDU panel.
5. Remove the PDU cover.
6. Unscrew the four screws holding the front PDU panel.
7. Reach in behind and disconnect J8, J7, J6, J5.
8. Slide the PDU out.

Figure 2-11 **Removing/Replacing the PDU**



2.13.2**Replacing a PDU****WARNING**

Be sure that the PDU cover is closed before you plug in the AC cord. Failing to do so exposes you to live 208VAC terminals inside the PDU.

**Back View**

To replace the PDU:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), that the AC power cords are unplugged, and that the circuit breakers for all PDUs are down.
2. Slide the PDU in.
3. Reach in behind and connect J8, J7, J6, J5. (These connectors are keyed.)
4. Screw in the four front PDU panel screws.
5. Screw in the four screws at the top of the PDU panel .
6. Replace the PDU cover.
7. Screw in the bottom four screws on the PDU drawer.
8. Plug in the AC cords and push the circuit breakers up (on).

2.14 Bulk Power Supply

Two bulk power supplies are located at the front of the expansion cabinet.

You need the following tools:

- Large slotted screwdriver
- Allen wrench
- Phillips screwdriver

WARNING

Be sure that the power is turned off to avoid exposure to live 208VAC.

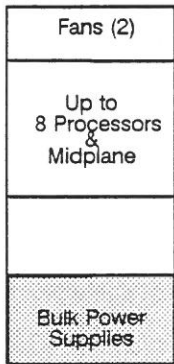
2.14.1

Removing a Bulk Power Supply

To remove a bulk power supply:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Front View

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. In addition, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. At the front bottom of the cabinet, remove the panel in front of the bulk power supply section.
4. Remove the two lug nuts on the left-hand side of the power supply in order to take off the wires.

NOTE

Remember their placement—the positive (orange) wire is on the bottom, and the negative (blue) wire is on the top.

5. Disconnect the white plastic plug above the lug nuts.
6. Remove the two hex screws just above the plastic connector.
7. Remove the four screws holding the wires grouped into four.

NOTE

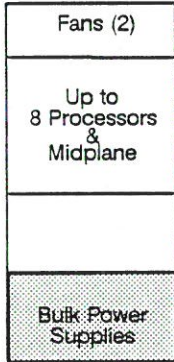
Remember their order (from left to right): green, black, red, and orange.

- 8. Loosen the two captive screws on the left and right corners of the mounting card and slide the bulk power supply out.

2.14.2

Replacing a Bulk Power Supply

To replace a bulk power supply:



Front View

- 1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), that the AC power cords are unplugged, and that the circuit breakers for all PDUs are down.
- 2. Lift the wires out of the way and slide the new bulk power supply in.
- 3. On the left-hand side of the power supply, put the positive and negative output wires in place and replace the two lug nuts.

NOTE

Remember their placement—the positive (orange) wire is on the bottom, and the negative (blue) wire is on the top.

- 4. Connect the white plastic plug above the lug nuts.
- 5. With a Phillips screwdriver, replace the two screws just above the plastic connector.
- 6. Replace the four screws holding the wires grouped into four.

NOTE

Remember their order—from left to right the wires are green, black, red, and orange.

- 7. Tighten the two captive screws on the left and right corners of the mounting card
- 8. Replace the front panel.
- 9. Plug in the AC-cords and push the circuit breakers up (on).

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Utility Cabinet



The Utility cabinet is located between the Expansion cabinet and the Peripheral cabinet. (Refer to Figure 3-1 and Figure 3-2.) The following sections provide instructions for the replacement of each Field Replaceable Unit (FRU) in the Utility cabinet, as follows:

- Eight-inch Disk Drive
- Test and Control System (TCS)
- Control Panel Assembly
- Clock Card
- Clock Card Fan
- +5 TCS Power Supply
- Power Distribution Unit (PDU)

Figure 3-1 Utility Cabinet: Front

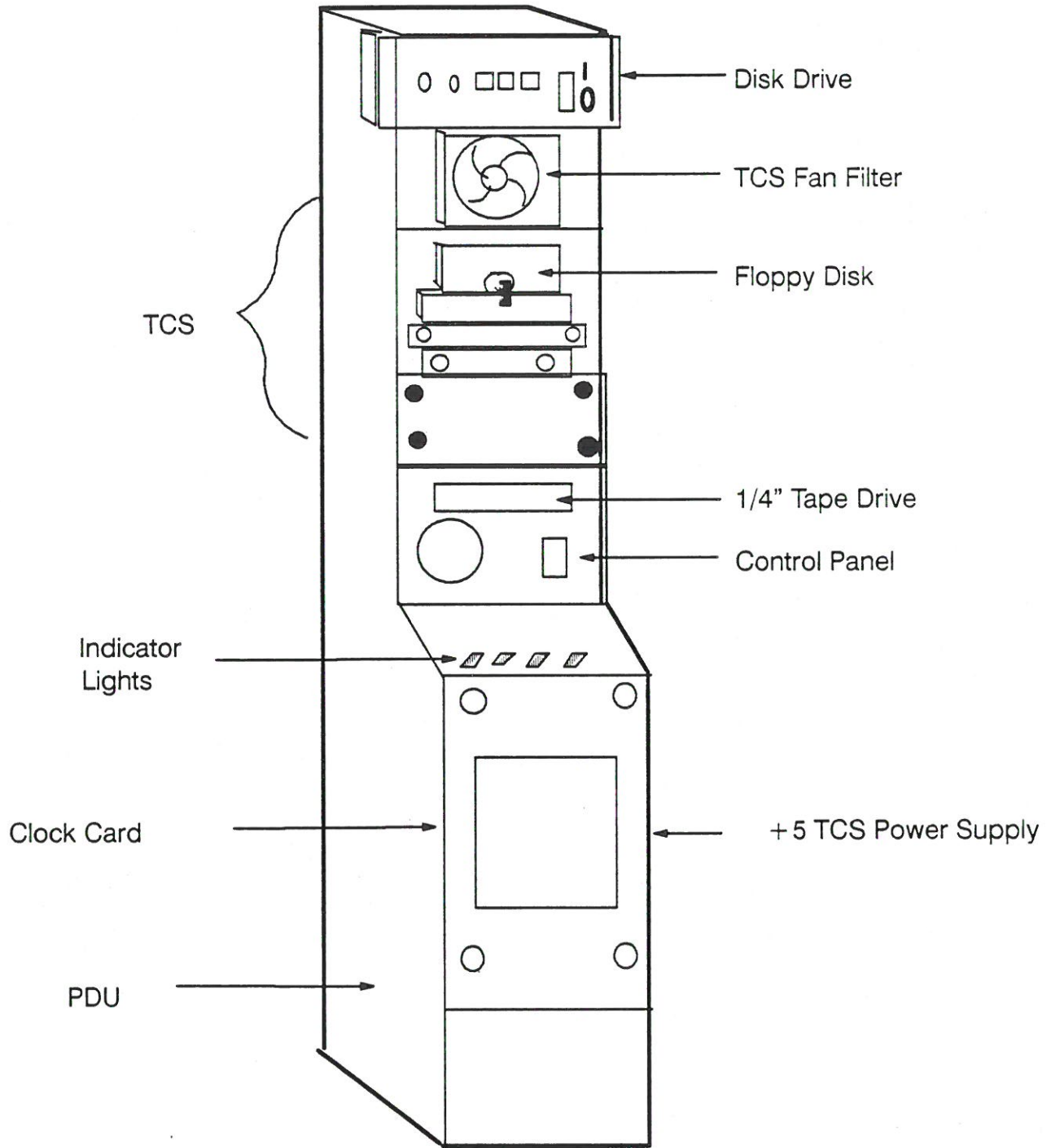
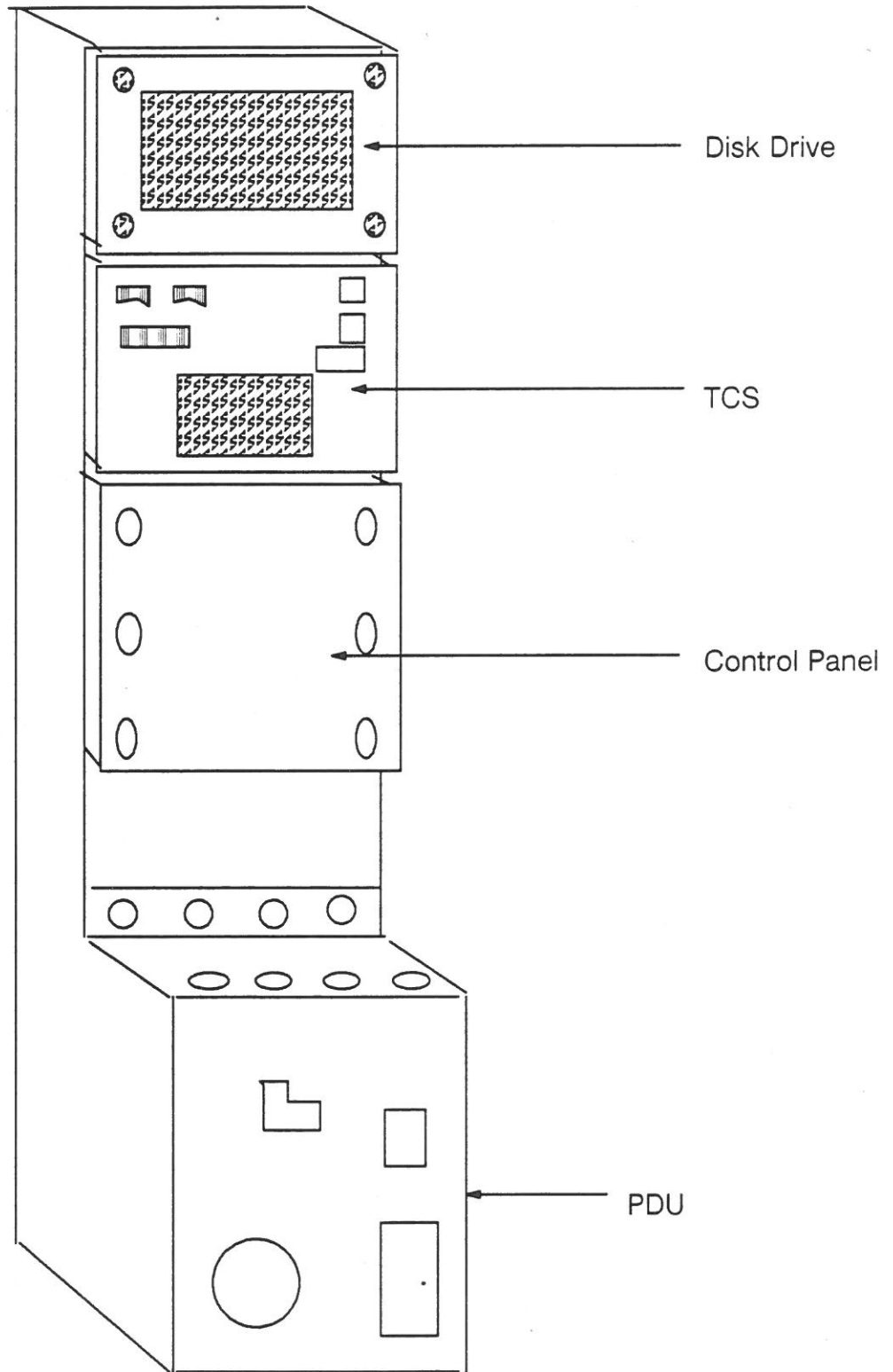


Figure 3-2 Utility Cabinet: Back



3.1 Removing the Utility Cabinet Panels

Before you can begin working on the Utility cabinet FRUs, you need to remove the cabinet's outer panels ("skins") as follows (see Figure 3-3):

1. Loosen the captive thumb screws at the bottom of the control panel.
2. Push gently on the panel to release the spring clip.
3. Lift off the entire piece.

To access the Bulk power supply:

4. Unscrew the two Phillips screws on the bottom left and right of the bulk power supply panel.
5. Lift the panel off.

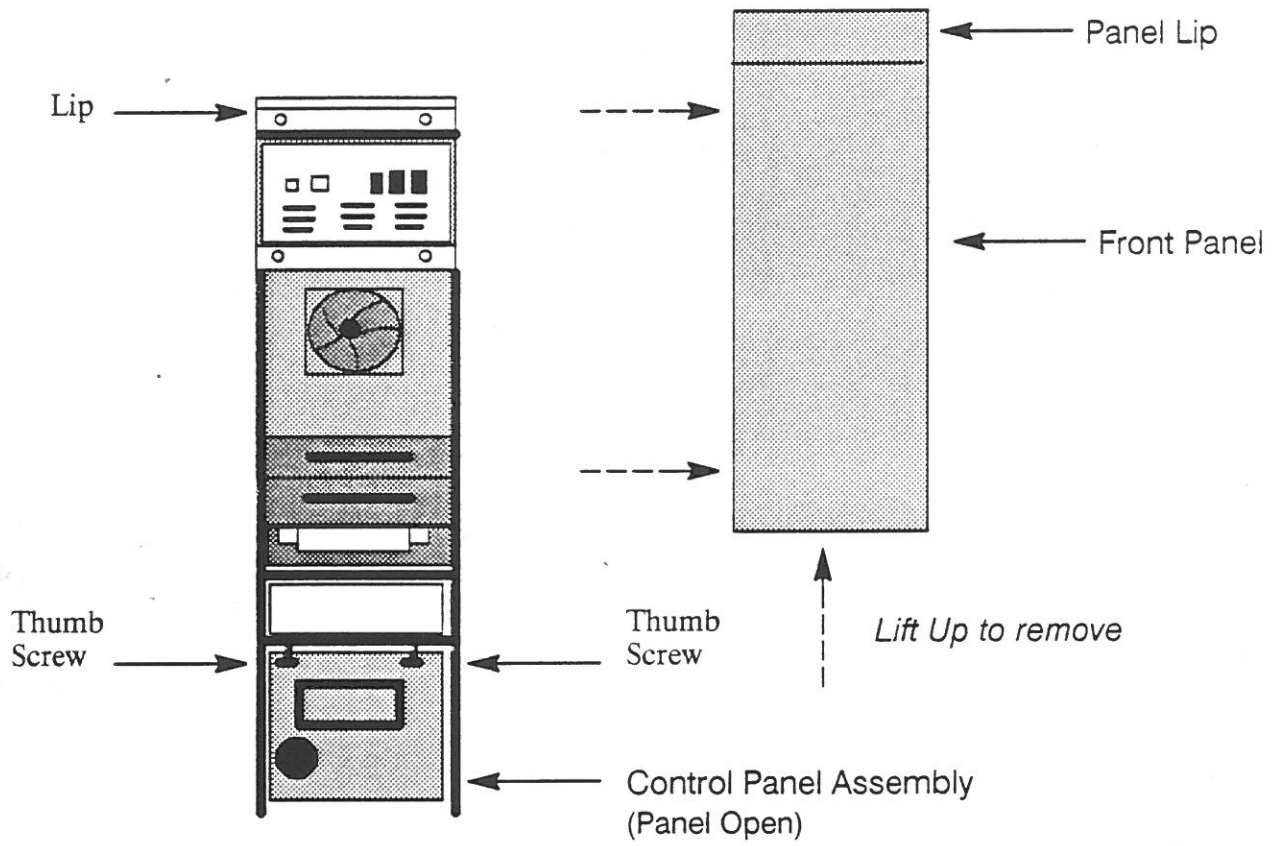
NOTE

~~~~~  
If you wish, you can easily access the bulk power supply filter at this time. Unscrew the two Phillips screws under the panel and slide the filter out for cleaning or changing.  
~~~~~

To access the components in the back of the cabinet you need to first remove the back panel as follows:

1. Unscrew the bottom two thumb screws.
2. Lift the entire piece up until the top two pins are free of their holes, then lift the panel off and put it aside.

Figure 3-3 **Removing the Utility Cabinet Front Panel**



3.2 Eight-Inch Disk Drive

Disk
Test & Control
1/4" Tape
Control Panel
Clock Cards
+ 5 TCS Power Supply
PDU

Front View

An eight-inch disk drive is located at the top front of the Utility cabinet. This drive is accessed from the front of the cabinet.

You need the following tools:

- #1 or #2 Phillips screwdriver
- 9/64" Allen wrench
- Large slotted screwdriver

3.2.1 Removing the Disk Drive

To remove the disk drive (see Figure 3-4):

CAUTION

.....
 Before removing power be sure to shutdown the operating system (Section 7.3).

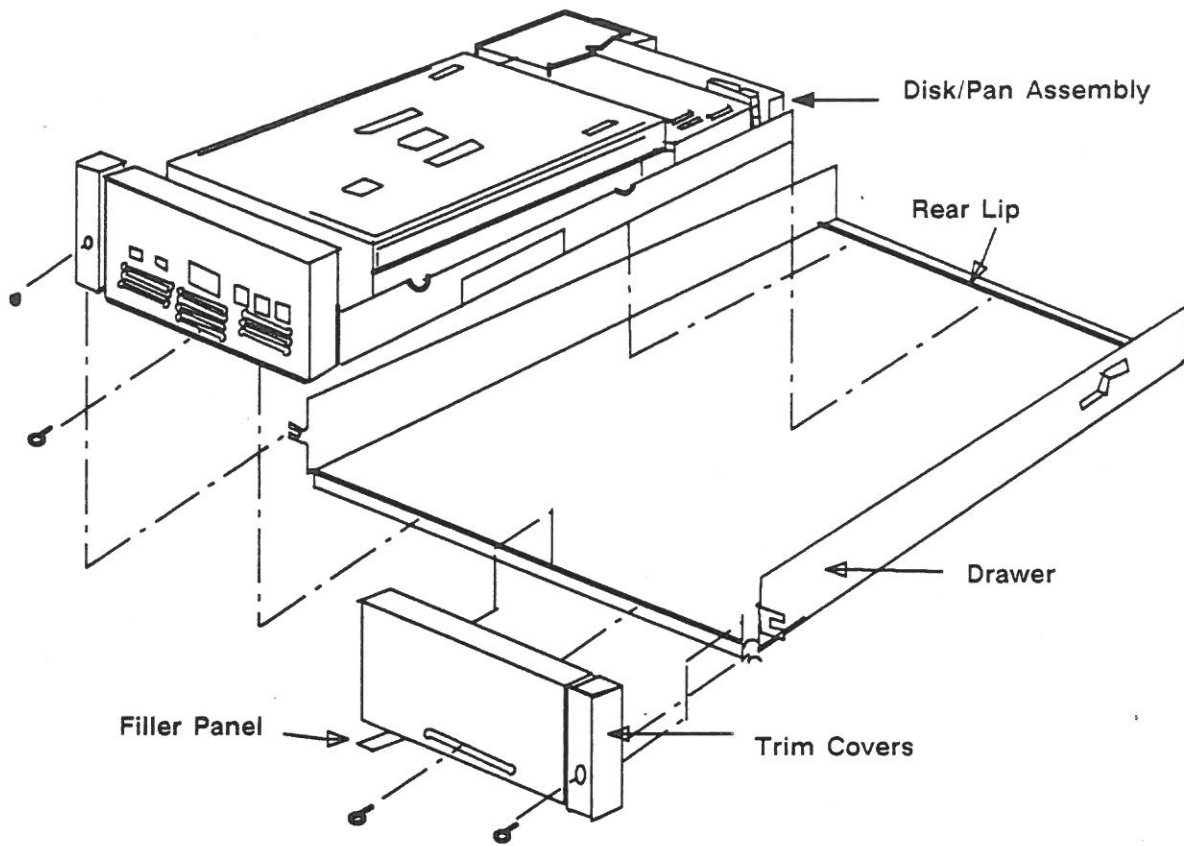
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all the circuit breakers down.
3. At the back of the Utility cabinet, remove the four screws from the screen panel.
4. Lift the panel off.
5. Disconnect the SMD A cable (top) and the SMD B cable (bottom).
6. Disconnect the power cord.
7. Return to the front and, using an Allen wrench, remove the Allen screw from the middle of the disk mounting bracket.

NOTE

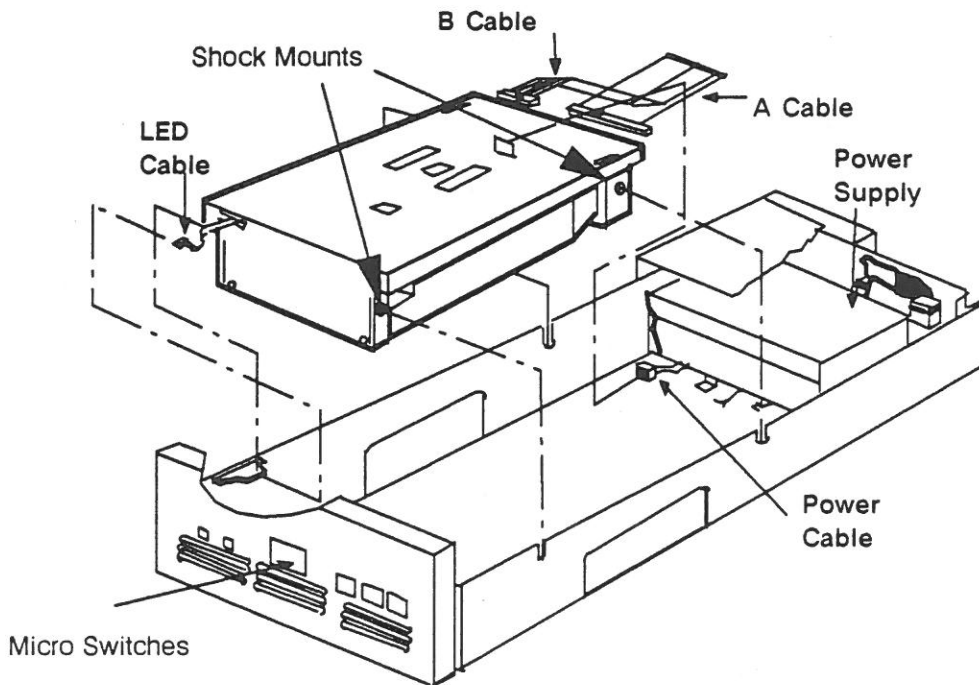
.....
 The bracket stays behind.

8. Loosen the remaining two slotted screws from the bracket.
9. Slide the disk drive all the way towards you and lift it out.

Figure 3-4 Disk Drive Removal/Replacement

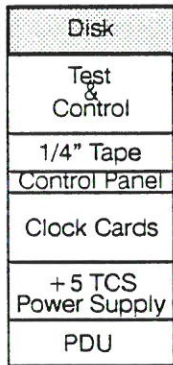


Disk Drive and Pan Assembly



3.2.2

Replacing the Disk Drive



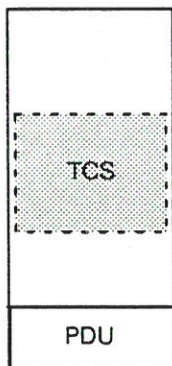
Front View

To replace the disk drive:

1. Check that the key in the control panel is turned all the way to the left and that the circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).
2. At the front of the Utility cabinet, slide the disk drive in.
3. At the back of the Utility cabinet, connect the data and power cables.
4. Mount the screen panel and secure the four screws.
5. Return to the front of the cabinet.
6. Replace the hex nut in the middle of the disk mounting bracket.
7. Replace the remaining two slotted screws in the mounting bracket.
8. Push the circuit breakers up (on).

3.3

Test and Control System (TCS)



Back View

The TCS is a separate subsystem consisting of its own power supply, processor, and software. The TCS is accessed from the back top bay of the Utility cabinet. The TCS controls, monitors, and tests the hardware components of the TC2000 system.

The entire TCS is one FRU. See Figure 3-5 for a top view of the TCS and Figure 3-6 for processor-TCS connections.

Figure 3-5 TCS (Top View)

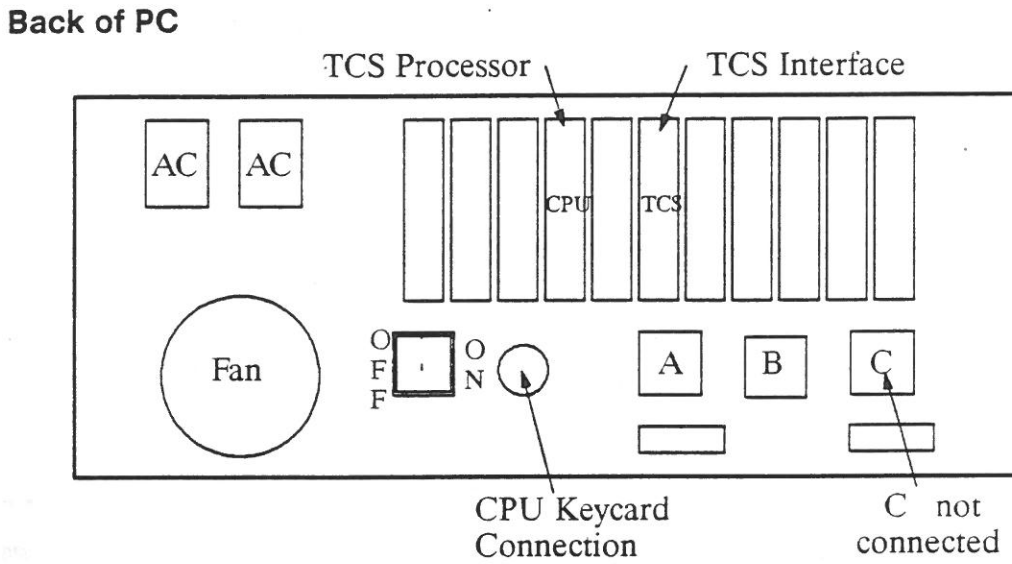
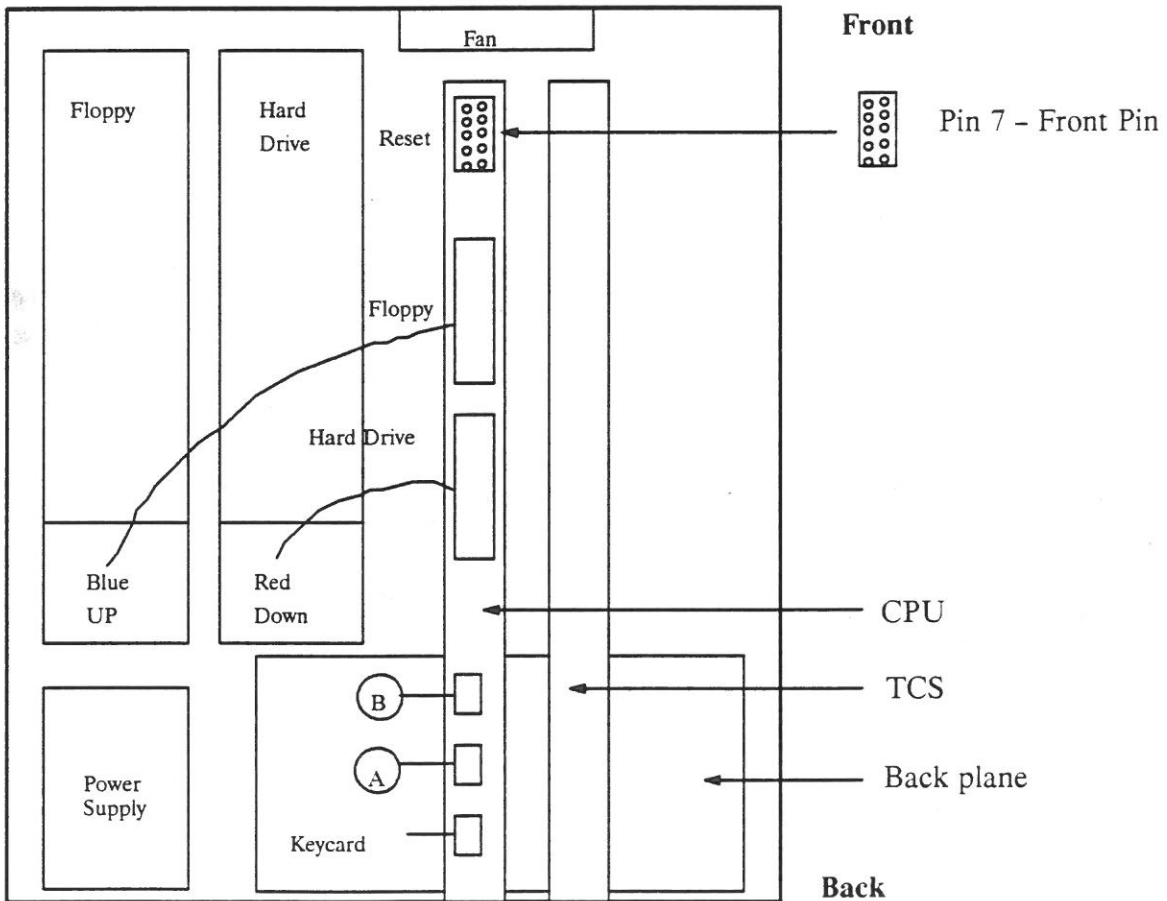


Figure 3-6 TCS Processor – Data Cables



3.4 PC Chassis

You need the following tools:

- Large slotted screwdriver
- # 2 Phillips screwdriver

3.4.1 Removing the PC Chassis

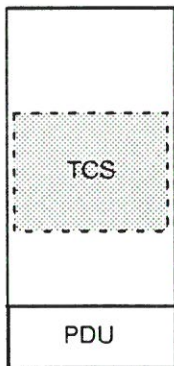
To remove the chassis (see Figure 3-7):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all the circuit breakers down.
3. At the front of the Utility cabinet, loosen, but do not remove, the two screws at the bottom of the TCS chassis.
4. At the back of the Utility cabinet, remove the six screws holding the chassis' back panel in place.
5. Take the panel off and disconnect the power cable.
6. Disconnect the upper left (clock) cable and the system console cable.
7. Slide the chassis out.

3.4.2 Replacing the PC Chassis

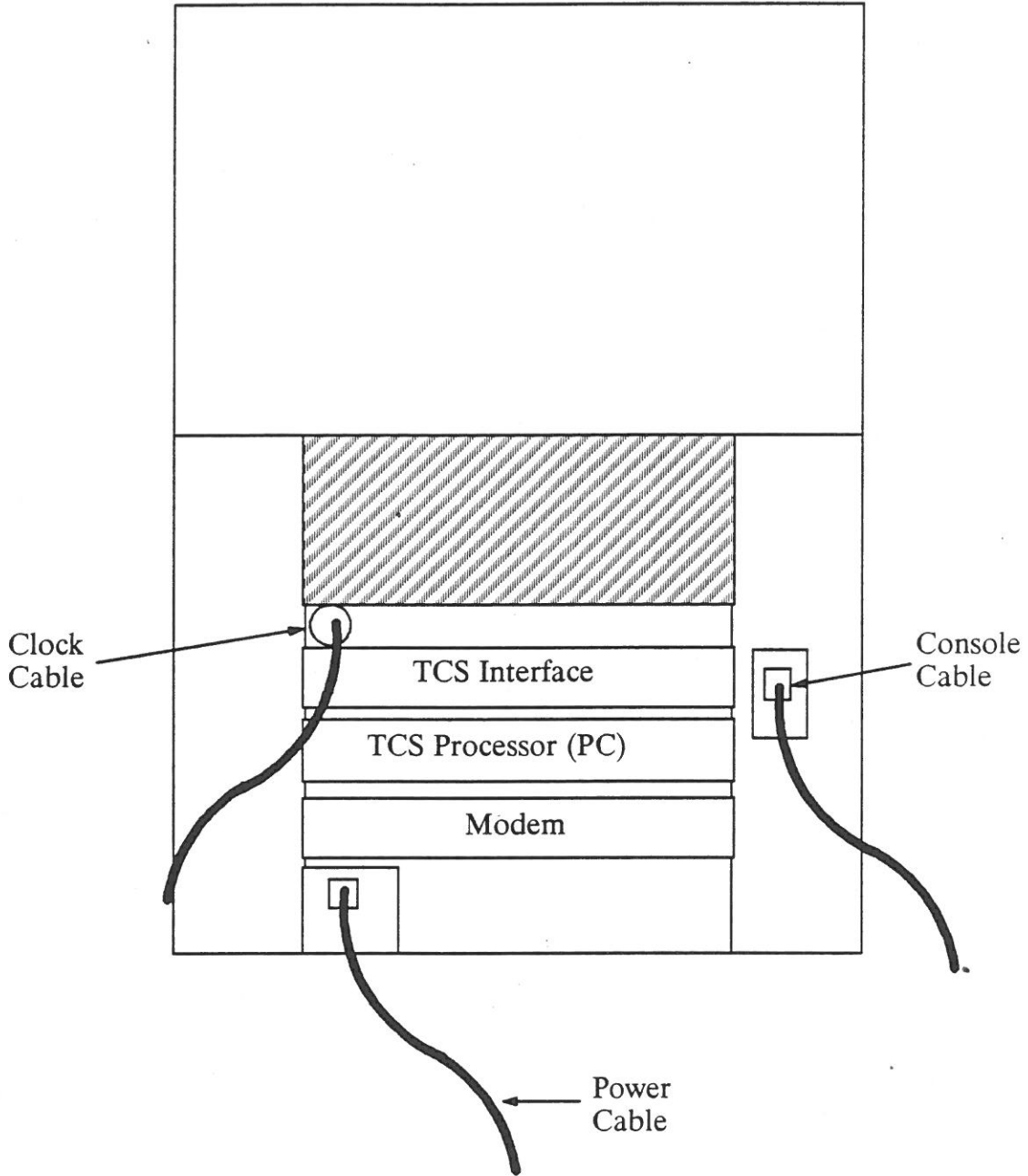


Back View

To replace a chassis:

1. Check that the key in the control panel is turned all the way to the left and that the circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).
2. At the back of the Utility cabinet, slide the chassis into the rack.
3. Connect the system consol, clock, and power cables.
4. Put the back panel on and replace the six screws that hold it in place.
5. Go to the front of the cabinet and tighten the two screws at the bottom of the chassis.

Figure 3-7 PC Chassis (Back View)



3.5 1/4-Inch Tape/Control Panel Assembly

Disk
Test & Control
1/4" Tape
Control Panel
Clock Cards
+ 5 TCS Power Supply
PDU

The 1/4-inch tape and control panel assembly is located at the front of the Utility cabinet just under the TCS.

You need the following tools:

- Large slotted screwdriver
- Phillips screwdriver

Front View

3.5.1 Removing the 1/4-Inch Tape/Control Panel Assembly

To remove the assembly:

1. Remove any media from the tape drive.

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

2. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
3. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all circuit breakers down.
4. Remove the four corner screws, being careful to hold onto the front unit.
5. Lift out the assembly far enough to reach the connectors.
6. Disconnect the power cable on the righthand side by pushing under the white plug with your thumb and pulling out.
7. Disconnect the data cable on the righthand side.
8. Disconnect the other power and data cables (to power supply).
9. Go to the back of the Utility cabinet. The back of the control panel assembly can be accessed through the third panel down.
10. Remove the six screws—three on each side—holding the back panel.
11. Lift off the panel and put it aside.
12. Remove the access hole plate and put it aside.

13. Remove the next panel down by removing the nine screws holding it, and put that panel aside.

NOTE

~~~~~  
 Be sure to keep track of all hardware that you remove and where it came from.  
 ~~~~~

14. Remove the PDU partway; that is, far enough to access the control panel cables behind it. See *PDU, Remove* for instructions.
15. Disconnect the cables from J8 at the back of the PDU. (See Figure 3-10.)
16. Reach in behind the PDU to the control panel cables, and cut all the tie wraps holding them.
17. Pull the cables up, threading them through the access hole, and out to the front of the Utility cabinet.
18. At the front of the Utility cabinet, lift out the control panel assembly.

3.5.2

Replacing the 1/4-Inch Tape/Control Panel Assembly

To replace the assembly:

1. Pull the control panel assembly's cables forward.
2. Lift the assembly partway into place, take the power cable and, reaching back, thread it through to the back.
3. Connect the front panel ribbon cables to the assembly.
4. Connect the 1/4-inch tape drive data cable.
5. Connect the front panel plastic connector.
6. Make sure that the power connector is plugged in.
7. Slide the assembly into place taking care not to pinch any of the cables.
8. Lift the assembly to align its front panel with the screwholes on the rack.
9. Holding the panel in place, replace the four screws.
10. At the back of the utility cabinet, thread the power cable through.
11. Replace the access hole plate.
12. Thread the power cable down and plug it into J8 at the back of the PDU.
13. Replace the PDU. See *PDU, Replace* for instructions.
14. Replace the panel above the PDU.
15. At the front of the Utility cabinet, replace any media in the tape drive.
16. Push all circuit breakers up (on).

3.6 Clock Card

There can be one or two clock cards per system. These cards are located at the front of the Utility cabinet just under the 1/4 inch tape drive/control panel.

You need the following tools:

- 1/8-inch slotted screwdriver
- #1 Phillips screwdriver

3.6.1 Removing a Clock Card

To remove a clock card (see Figure 3-8):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion and Utility cabinets by flipping both circuit breakers down.

CAUTION

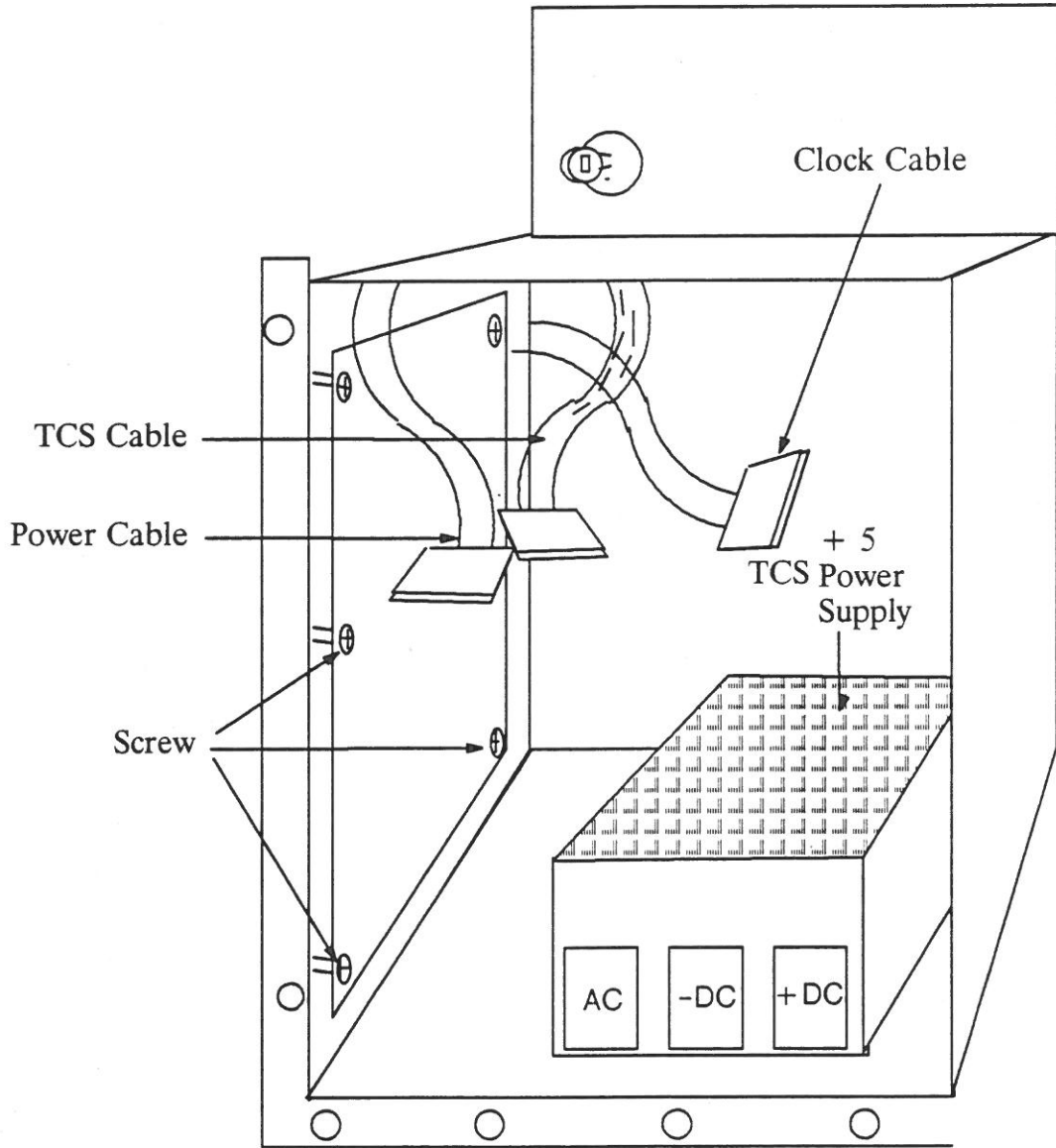
Put a ground strap on your wrist and plug the end into the ground socket at the bottom right of the Processor section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

Disk
TCS
1/4" Tape
Control Panel
Clock Cards
+ 5 TCS Power Supply
PDU

Front View

3. At the front of the Utility cabinet, remove the panel on the clock card section.
4. Disconnect the power cable on the top front (first of two).
5. Disconnect the TCS cable (top middle).
6. Disconnect the clock cable (bottom back). **This cable is keyed.**
7. Disconnect any switch cables.
8. Remove the five screws holding the card.
9. Pull the clock card out.
10. Place the card in its protective packaging.

Figure 3-8 **Removing/Replacing a Clock Card**



3.7 Clock Card Fan

There is one clock card fan. It is located in the same section as the clock card(s) on the inside of the front panel door.

You need the following tools:

- 1/8-inch slotted screwdriver
- #1 Phillips screwdriver
- Allen wrench

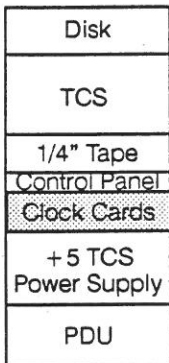
3.7.1 Removing a Clock Card Fan

To remove a clock card fan:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. On the front panel of the clock card section, loosen the two captive screws on the top and bottom corners of the panel.
3. Pull the panel out and to your right—it opens like a door.
4. The fan is mounted on the inside of the panel door. Unplug any cables connected to the fan so that you can lift it out.
5. Remove the four hex nuts that hold the mounting and lift the mounting out.
6. Remove the four screws holding the fan to the mounting and lift it off.



Front View

3.7.2 Replacing a Clock Card Fan

To replace a clock card fan:

1. Check that the key in the control panel is turned all the way to the left.
2. Place the new fan on the mounting with the four screws.
3. Position the mounted fan on the inside of the panel door and secure the four hex nuts.
4. Reconnect the cable(s).
5. Close the panel door and secure the two captive screws.

3.8 + 5 Volt TCS Power Supply

The + 5 volt TCS Power Supply is located at the bottom of the Utility cabinet and is accessed from the front (see Figure 3-9).

You need the following tool:

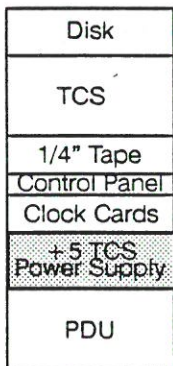
- 1/4-inch slotted screwdriver

3.8.1 Removing a TCS Power Supply

To remove the TCS power supply:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Front View

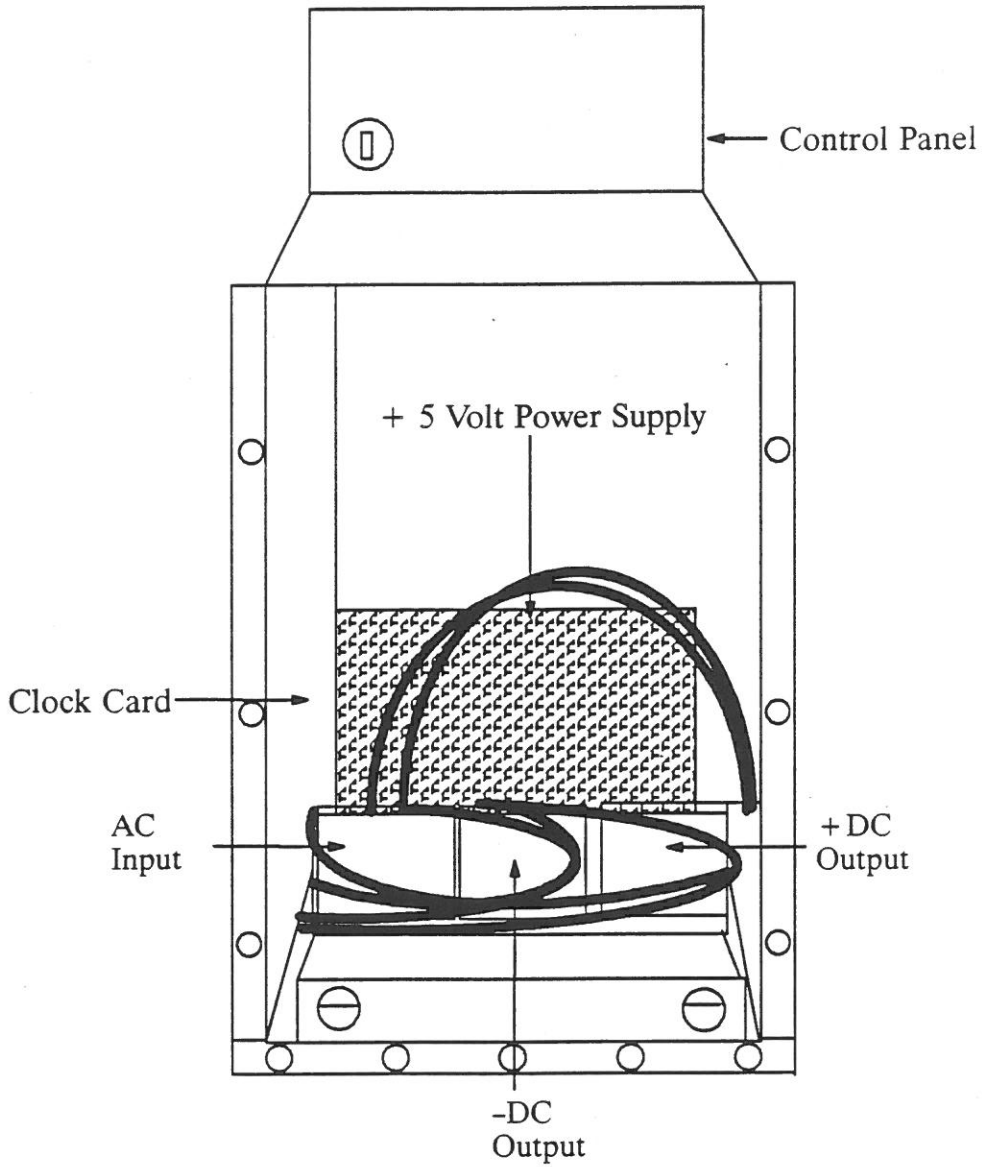
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping both circuit breakers down.
3. Remove the bottommost front panel of the Utility cabinet.
4. Disconnect all three connectors on the power supply: AC input (left), - DC output (middle), and + DC output (right).
5. Loosen the two screws at the front.
6. Slide the power supply out.

3.8.2 Replacing a TCS Power Supply

To replace the TCS power supply:

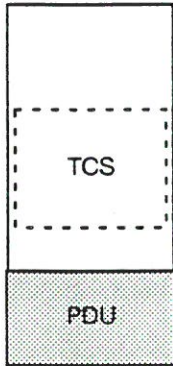
1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on the PDUs are down (off).
2. Slide the power supply unit partway into the rack.
3. Connect all three connectors on the power supply: AC input (left), - DC output (middle), and + DC output (right).
4. Tighten the two screws at the front.
5. Replace the panel.
6. Push the circuit breakers back up (on).

Figure 3-9 **Removing/Replacing the + 5 TCS Power Supply**



3.9

Power Distribution Unit (PDU)



Front View

The PDU is located at the back bottom of the Utility cabinet.

You need the following tool:

- #1 Phillips screwdriver

3.9.1

Removing the PDU

To remove the PDU:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

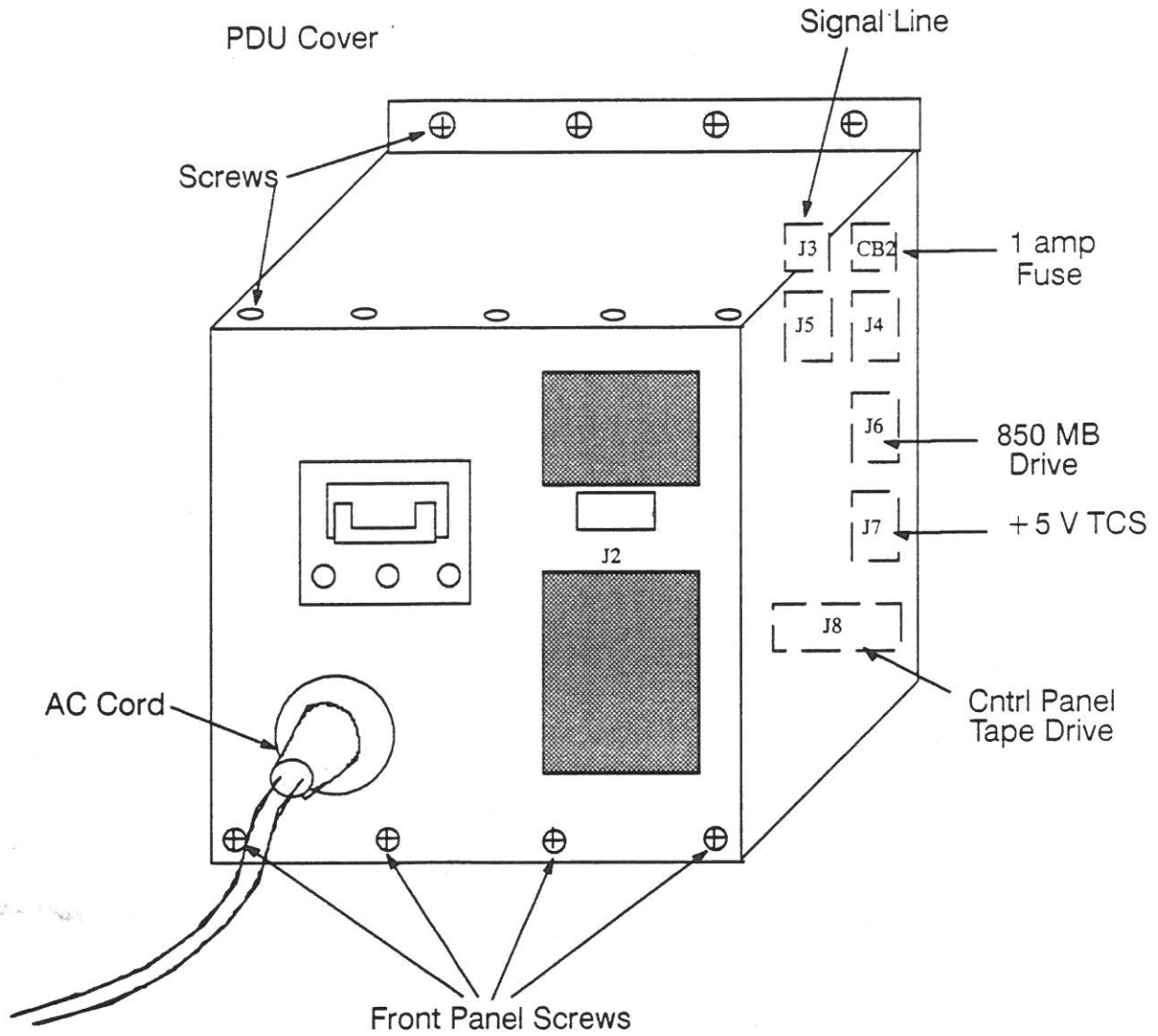
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion and Utility cabinets by flipping both circuit breakers down.
3. Unplug the AC cord.

WARNING

Be sure to unplug the AC cord before removing the PDU cover. Failing to do so exposes you to live 208V terminals inside the PDU.

4. Unscrew the four bottom screws on the PDU drawer.
5. Unscrew the four screws at the top of the PDU panel.
6. Remove the PDU cover.
7. Unscrew the four screws holding the front panel.
8. Disconnect J8, J7, J6, J5.
9. Slide the PDU out.

Figure 3-10 **Removing/Replacing the PDU**



3.9.2 Replacing the PDU

To replace the PDU:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).

WARNING

Be sure to unplug the AC cord before removing the PDU cover. Failing to do so exposes you to live 208V terminals inside the PDU.

2. Slide the PDU into the rack.
3. Connect J8, J7, J6, J5. (See Figure 3-9.)
4. Screw in the four front panel screws.
5. Screw in the four screws at the top of the PDU panel .
6. Replace the PDU cover.
7. Screw in the four bottom screws on the PDU drawer.
8. Plug in the AC cord.
9. Push the circuit breakers back up (on).





Peripheral Cabinet



This chapter contains the procedures for removing and replacing all replaceable components in the Peripheral cabinet, as follows (see Figure 4-1 and Figure 4-2 for diagrams):

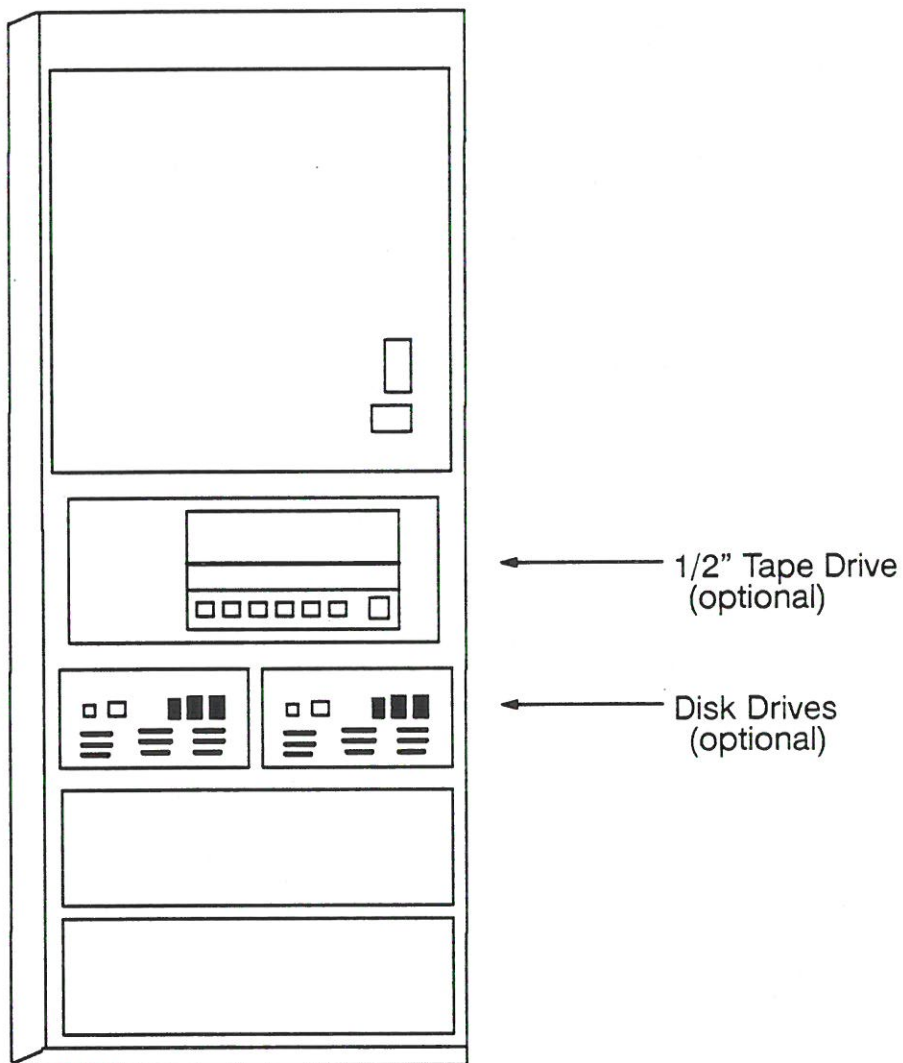
- 9U VME Card cage
 - 9U VME Chassis (including power supply and fans)
 - Disk Controller
 - Ethernet Controller
 - 32-Port Terminal Controller (Optional)
 - 9U VME Repeater
- Three 8-inch Disk Drives (Optional)
- 1/2-inch Tape Drive (Optional)
- PDU

4.1

Removing the System Panels

Before you can begin working on the Peripheral cabinet FRUs, you need to remove the cabinet's outer panels ("skins") as follows:

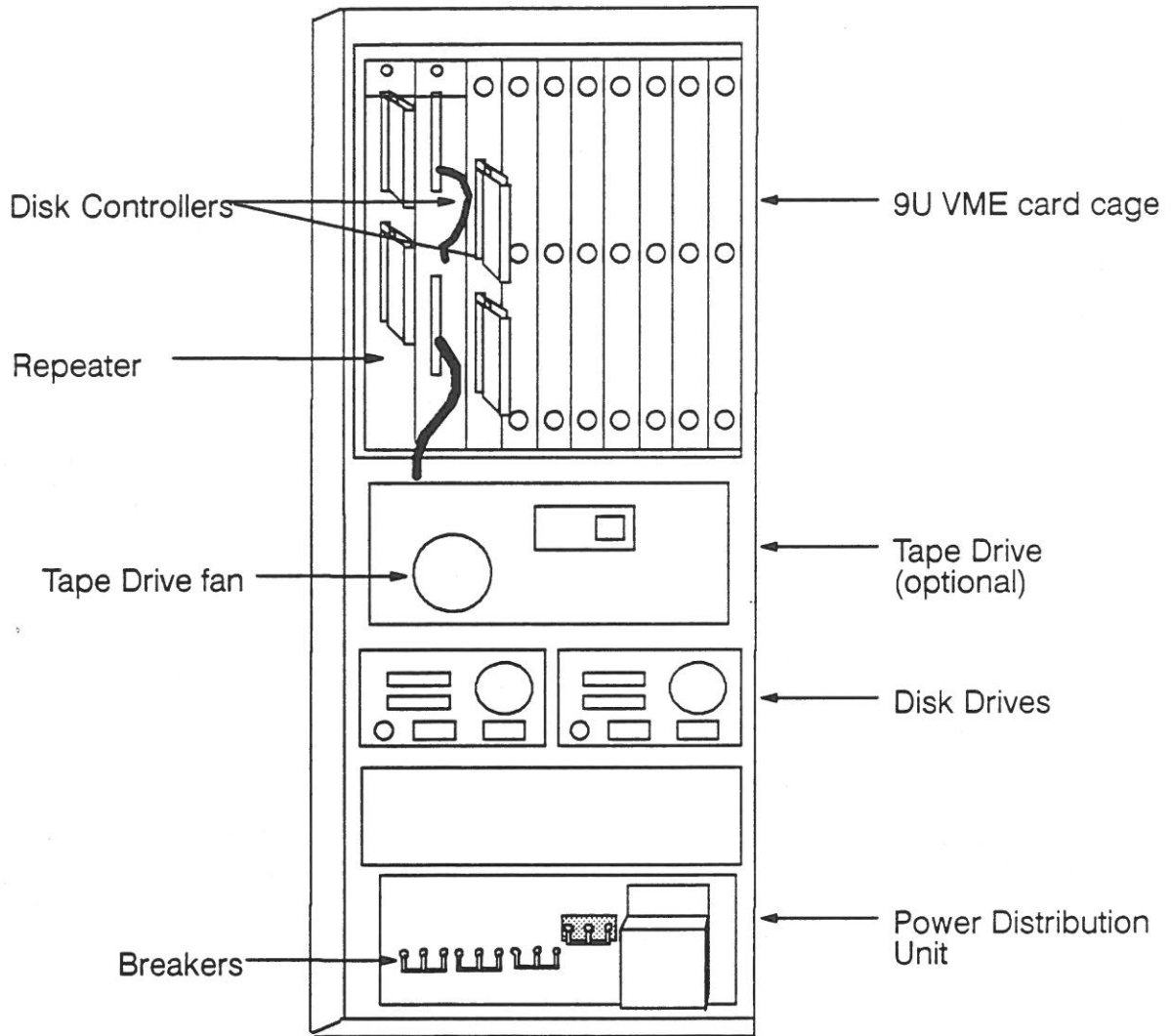
1. At the front of the Peripheral cabinet, reach up and pull the panel towards you. It will swing open like a door.
2. To access the front bottom half, push on the bottom panel until it clicks. Now this panel also swings open.

Figure 4-1 **Peripheral Cabinet: Front**

To access the components in the back of the cabinet you need to first remove the back panel as follows (see Figure 4-2):

1. Unscrew the bottom two thumb screws.
2. Lift the entire piece up until the top two pins are free of their holes, then lift the panel off and put it aside.

Figure 4-2 Peripheral Cabinet: Back



4.2 9U VME Card Cage



Back View

Located at the top back of the Peripheral cabinet is the 9U VME card cage.

The 9U VME card cage contains the components of the 9U VME subsystem—the controller and repeater cards, the 750W switching power supply, and the fans. The following cards are located in this cage:

- Disk Controller
- Ethernet Controller
- 32-Port Terminal Controller (Optional)
- 9U VME Repeater

You need these tools to work on the 9U VME card cage:

- 3/16 or 1/8-inch slotted screwdriver
- #2 Phillips screwdriver

4.2.1 Removing the 9U VME Card Cage

CAUTION

.....
 Lifting the card cage requires two people.

To remove the card cage:

CAUTION

.....
 Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all the circuit breakers down (off).
3. Disconnect the twist off plugs from the Expansion and Utility cabinet PDUs and move the cords out of the way.
4. At the back of the Peripheral cabinet, unplug the AC cord from the PDU.
5. At the top back section of the Peripheral cabinet is the 9U VME card cage. Remove all the cards from the card cage (see *9U VME Card, Remove*).

- 6. At the back of the cabinet, loosen the twelve Phillips screws holding the card cage in place.
- 7. Lift the card cage out from the front.

4.2.2 Replacing the 9U VME Card Cage

NOTE

~~~~~  
 Lifting the card cage requires two people.  
 ~~~~~



To replace a card cage:

- 1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on all the PDUs are down (off).
- 2. Check that the AC cords in the back of the PDUs are unplugged.
- 3. Position the card cage into the top of the rack.
- 4. At the back of the cabinet, replace the twelve screws.
- 5. Install the VME cards into the new card cage. (Refer to the section entitled *9U VME Card, Replace* for instructions on replacing a board.)
- 6. Plug the AC cords back in.
- 7. Push the circuit breakers up (on).

4.2.3 Removing the 9U VME Card

To remove a 9U VME card:

CAUTION

~~~~~  
 Before removing power be sure to shutdown the operating system (Section 7.3).  
 ~~~~~

- 1. Turn the key in the control panel all the way to the left (counterclockwise).

CAUTION

~~~~~  
 Put a ground strap on your wrist and plug the end into the ground socket at the bottom middle of the Switch card section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working.  
 ~~~~~

- 2. Loosen each captive screw at the top and bottom of the card.
- 3. Pull the two black levers away from the center.

4. Slide the card out partway to access the cables.
5. Disconnect the cables.
6. Slide the card out the rest of the way. If it sticks, move it gently from top to bottom, not side to side, to prevent damage to the card components.
7. Place the card in the protective, static-free package provided.

4.2.4 Replacing the 9U VME Card

To replace a 9U VME card:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on all the PDUs are down (off).
2. Check that the AC cords in the back of the PDUs are unplugged.
3. Remove the card from its special packaging.

CAUTION

Put a ground strap on your wrist and plug the end into the ground socket at the bottom middle of the Switch card section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the board can destroy components, or weaken components so that they work briefly and then fail.)



Back View

4. Configure the jumpers on the new card to match those on the old card. (Refer to Appendix A to verify the jumper/switch settings.)
5. Make sure the card has the component side to the right.
6. Holding the board straight, line it up in the slots at the top and bottom of the card cage. Hold the ejector levers horizontal so that they do not interfere with the card seating.
7. Reconnect the cables to the card. (See Figure 4-3.)
8. Push the card slowly and firmly until it seats in the midplane.
9. Grasp the black levers at the top and bottom of the card and simultaneously push the top lever down and in and the bottom lever up and in.
10. Push and turn the captive screws then secure each with the screwdriver.

Figure 4-3 9U VME Card Cabling

To be supplied

4.3 Eight-Inch Disk Drives

The three optional SMD 850MB eight-inch disk drives are located at the front of the Peripheral cabinet just under the 9U VME Subsystem.

You need the following tools:

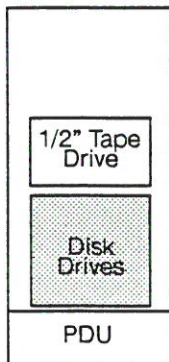
- Medium slotted screwdriver
- Allen wrench

4.3.1 Removing a Disk Drive

To remove a disk drive (see Figure 4-4):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Back View

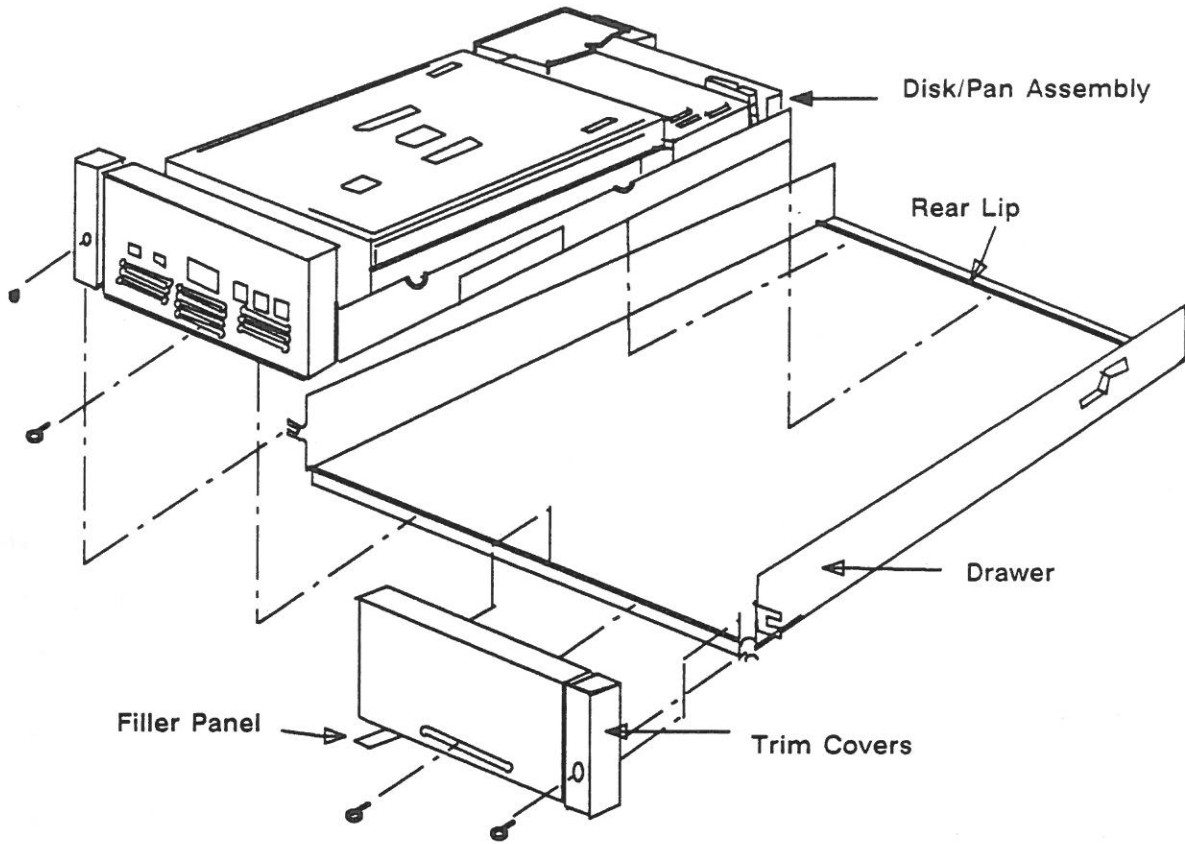
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinet by flipping the circuits breakers down (off).
3. Unplug the twist off plugs from the Expansion and Utility cabinet PDUs and move the cords out of the way.
4. Go to the disk drive section's back panel.
5. Remove the panel screws and lift the panel off.
6. Disconnect the control, data, daisy chain, grounding cables, and terminator cables (if present).

NOTE

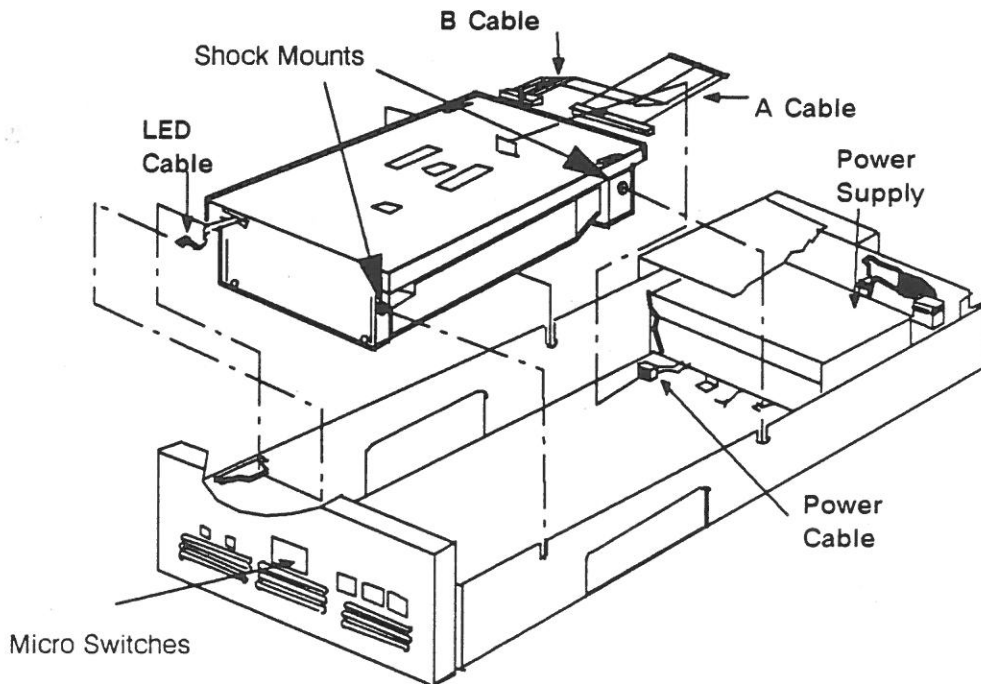
Remember where the cables come from!

7. Return to the front and, using an Allen wrench, remove the allen nut from the middle of the disk mounting bracket.
8. Remove the remaining two slotted screws from the bracket.
9. Slide the disk drive out.
10. Unscrew the front screw and remove the Disk/Pan Assembly.
11. Remove the Head Disk Assembly from the Pan Assembly if necessary for shipping.

Figure 4-4 Disk Drive Removal/Replacement

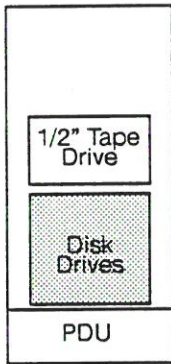


Disk Drive and Pan Assembly



4.3.2

Replacing a Disk Drive



Back View

To replace the eight-inch disk drive (see Figure 4-4):

1. Check that the key in the control panel is turned all the way to the left and that all PDU circuit breakers are down (off).
2. Configure the front panel switches on the replacement drive to correspond to the old drive.
3. Gently place the Disk into the Pan.
4. Attach the LED cable, the power connector, and the ground wire.
5. Tighten the ground wire screws.
6. Slide the Disk/Pan Assembly into the drawer by inserting the Pan into the rear lip of the drawer and securing the front screw.
7. Reconnect the control, data, daisy chain, grounding cables, and the terminator (if present).

Intentionally blank.

4.4 1/2 Inch Tape Drive

This drive is at the bottom front of the Peripheral cabinet just under the three optional eight-inch disk drives.

You need the following tools:

- Medium slotted screwdriver

4.4.1 Removing the 1/2 Inch Tape Drive

To remove the 1/2-inch tape drive:

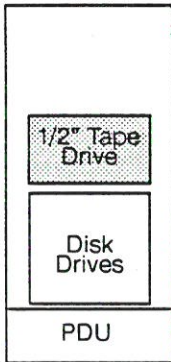
CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDU at the back bottom of the Peripheral cabinet by flipping the circuit breakers down.
3. At the back, disconnect any cables from the drive.

WARNING

Two people are necessary for this operation; the drive weighs about 110 lbs.



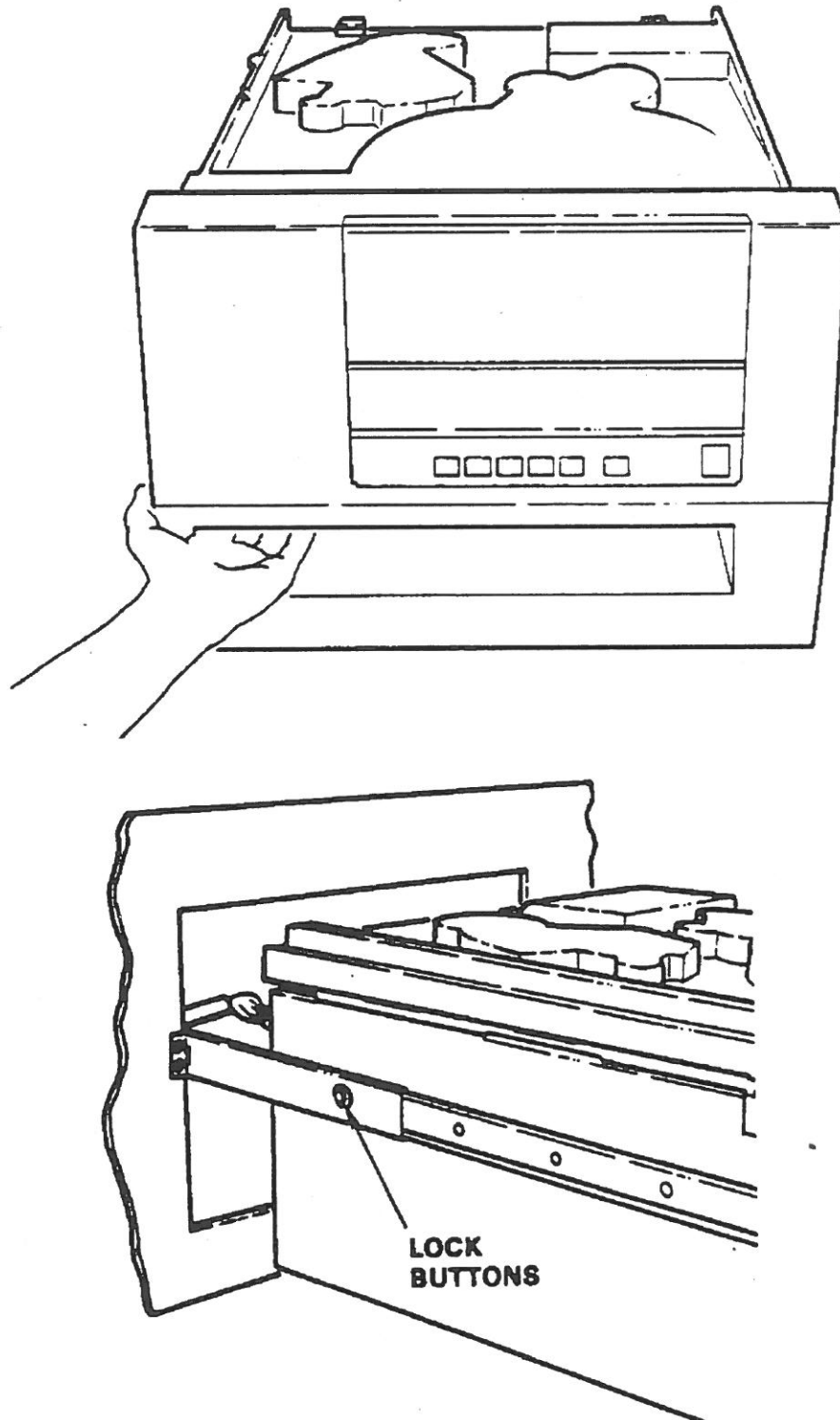
Back View

4. At the front of the Peripheral cabinet, release the rack latch just inside the lower left corner of the drive's control panel.
5. Grasp under the tape drive unit and slowly pull it out (see Figure 4-5).
6. Continue pulling the unit out on its slides until it is clear of the rack.
7. Push down on the locking lever of the slides to release the lock.
8. Pull the drive out another 1/2 inch.
9. Press and hold the round lock button (see Figure 4-5) on each slide and pull the drive completely out of the system rack.
10. Lift up the unit, off the rack sliders and set it on a workspace.

NOTE

As a precaution, always lift the drive from the bottom. If any of the top screws have been left out, lifting it from the top could cause it to open.

Figure 4-5 **Removing/Replacing the 1/2-inch Tape Drive**



11. Remove the remaining slide pieces from the drive by pressing inward on the leaf spring and moving the slide so that the hole towards the back is directly over the rear screw on the stationary part of the slide (see Figure 4-6).
12. Remove the rear screw, then move the slide hole as necessary to access the other two screws.
13. The tape unit, including slides and mounting hardware, is now ready to be packed and returned to BBN.

NOTE

Be sure to place the styrofoam “donut” inside the drive to prevent the tachometer arm from banging on the takeup hub during shipping.

For complete information on packing the 1/2-inch Tape Drive, refer to the repacking instructions contained in Chapter 1 of the *M990 GCR CacheTape Unit Technical Manual*.

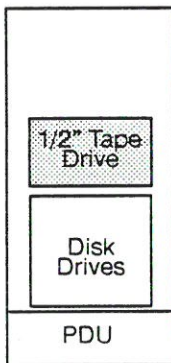
4.4.2

Replacing the 1/2 Inch Tape Drive

To replace the 1/2-inch tape drive, do the following (refer to Figure 4-6):

1. Check that the key in the control panel is turned all the way to the left and that the peripheral PDU circuit breakers are down (off).

WARNING

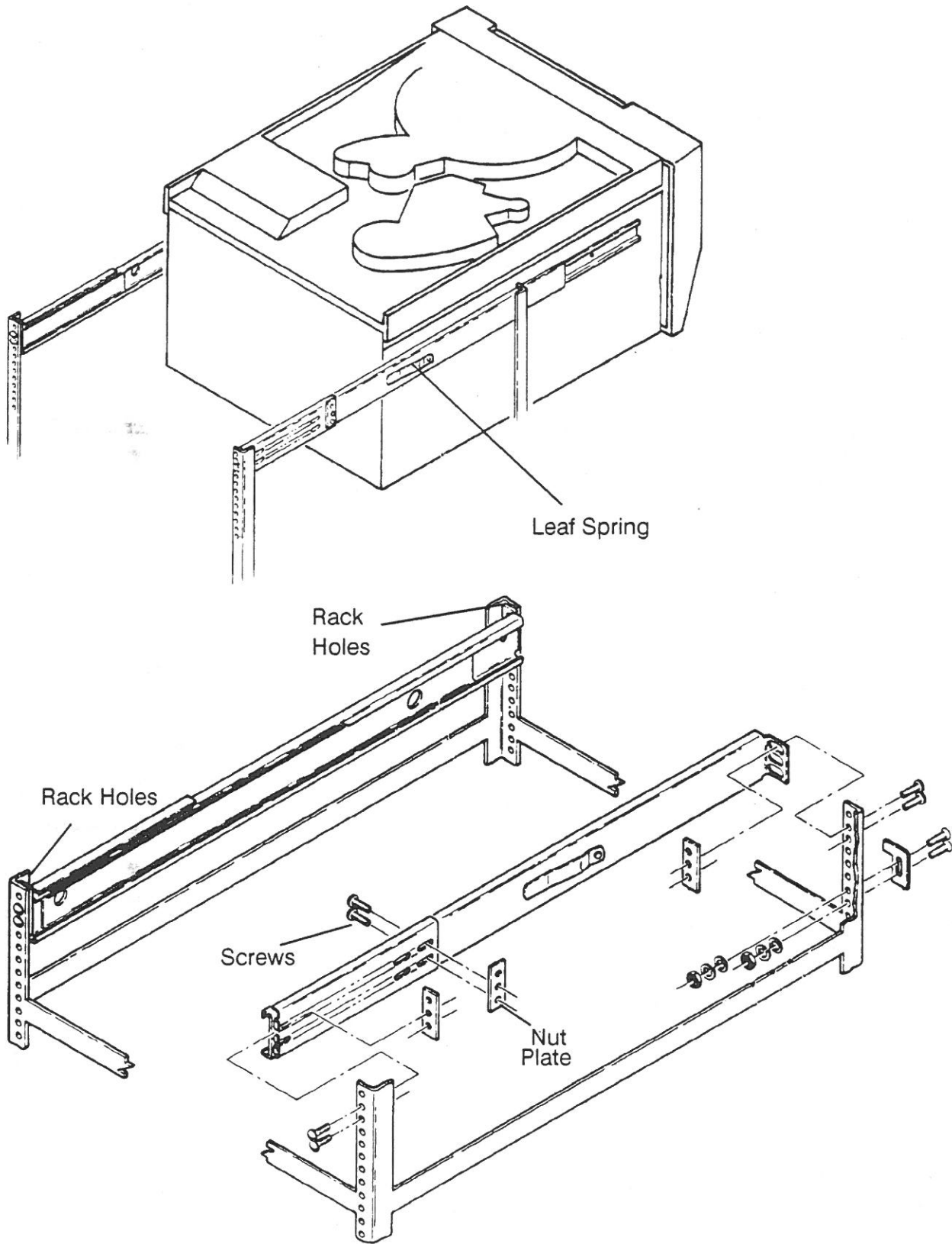


Back View

Two people are necessary for this operation; the drive weighs about 110 lbs.

2. Line up the disk drive slides with the rack slides.
3. Carefully slide the unit into the rack until it locks.
4. Reconnect the cables to the tape drive.

Figure 4-6 1/2-inch Tape Drive Slide Assembly



4.5 Peripheral PDU

The Power Distribution Unit (PDU) is located at the bottom back of the Peripheral cabinet.

You need the following tools:

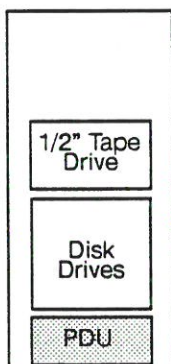
- #1 Phillips screwdriver

4.5.1 Removing the Peripheral PDU

To remove the PDU, do the following:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Back View

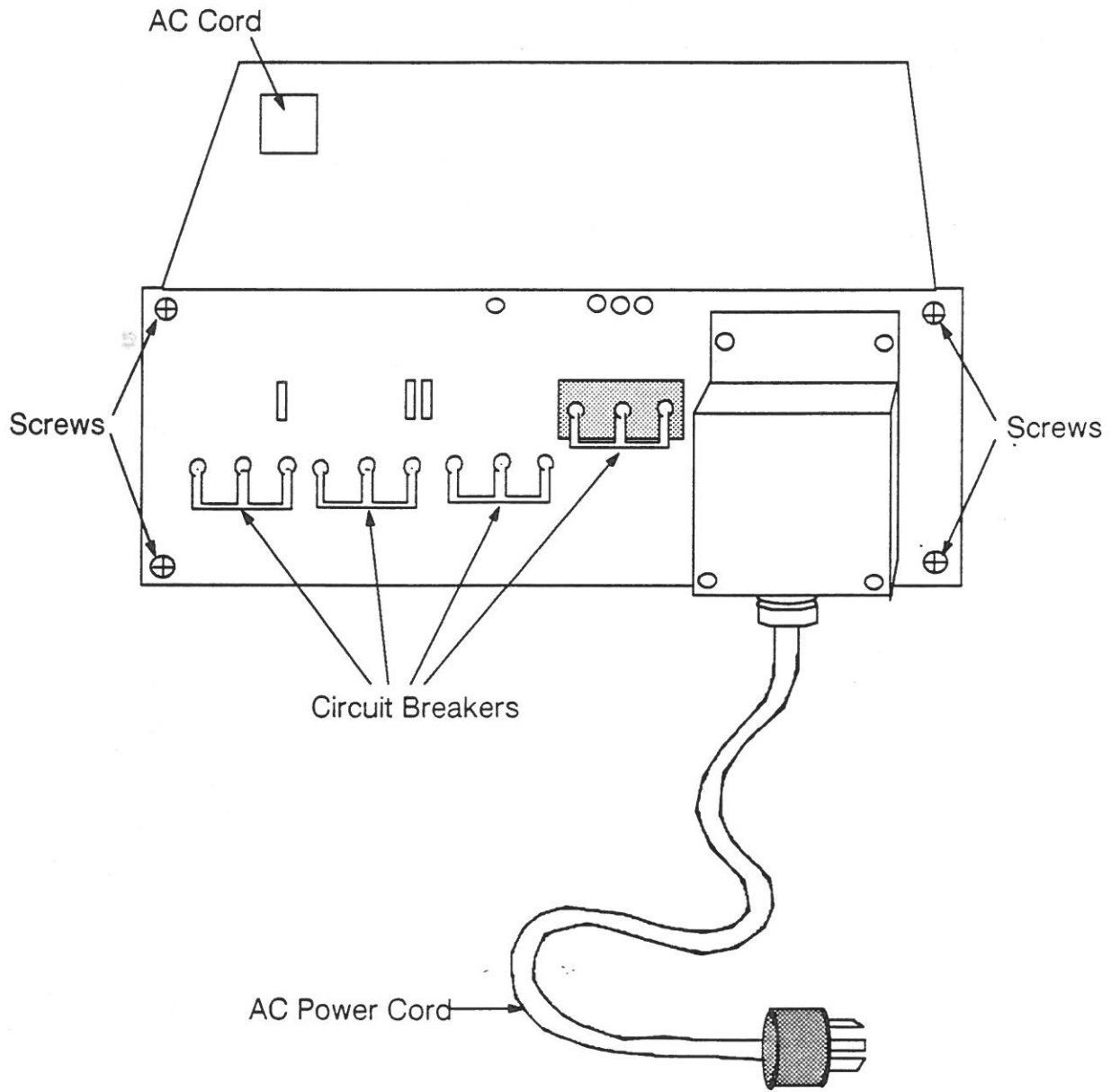
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinet by flipping the circuit breakers down (off).
3. Unplug the twist off plugs from the Expansion and Utility cabinet PDUs and move the cords out of the way.
4. Disconnect all of the AC power cables at the front of the PDU.
5. Loosen and remove the four screws holding the unit in place.
6. Slide the PDU out.

4.5.2 Replacing the Peripheral PDU

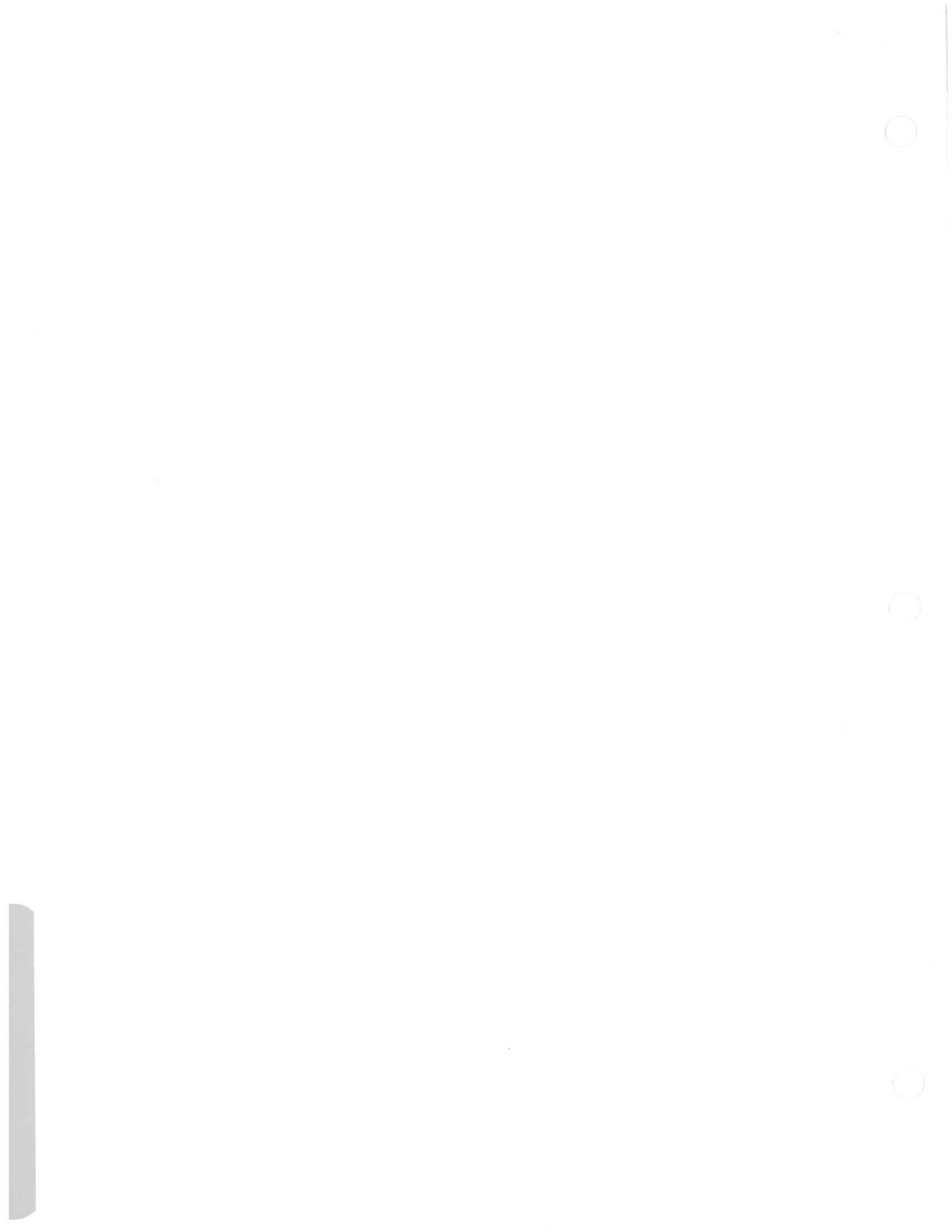
To replace the PDU, do the following:

1. Check that the key in the control panel is turned all the way to the left and that all PDU circuit breakers are down (off).
2. Slide the PDU into the bottom section at the back of the cabinet.
3. Connect the AC cords at the back of the unit.
4. Connect the control cables at the front of the unit.
5. Replace and secure the four screws.

Figure 4-7 Peripheral PDU







System Console



The TC2000 system console is a VT320 video terminal. The VT320 is composed of two units, as follows:

- Terminal
- Keyboard

The terminal uses a monochrome screen that can display 24 lines of text in 80 or 132 columns. You can also connect a printer directly to the terminal.

The keyboard has four groups of keys and four indicator lights. The main keypad is similar to a typewriter keyboard. The keyboard cable connects to the right side of the terminal.

You may need to replace the console. Replacement is actually a three-part process:

- Removal
- Replacement
- Changing Defaults

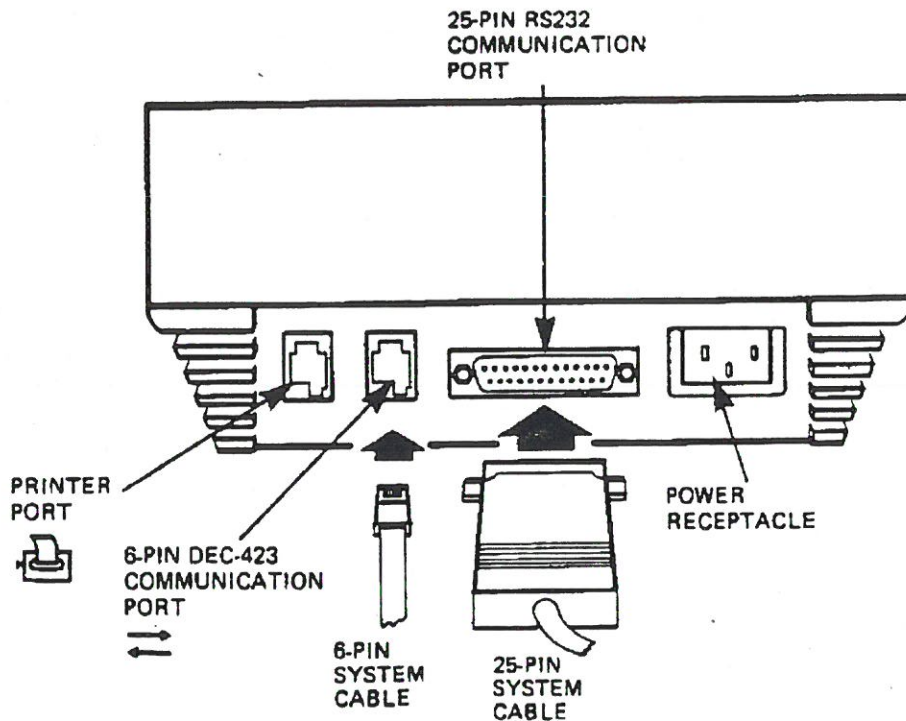
Each of these is discussed in the sections that follow.

5.1 Removing the System Console

To remove the system console (see Figure 5-1):

1. Disconnect the system cable from its communication port on the rear of the terminal.
2. Turn the terminal power switch off (to 0).
3. Unplug the power cord from the wall outlet and from the rear of the terminal.
4. Disconnect the keyboard from the terminal.

Figure 5-1 System Console Connections



5.2 Replacing the System Console

To replace the system console (see Figure 5-1):

1. Connect the keyboard to the terminal by inserting the other end of the keyboard cable into the connector on the right side of the terminal.

NOTE

Use the short groove on the keyboard to route the cable to the left, and the long groove to route the cable to the right (see Figure 5-1).

2. Make sure that the power switch on the lower rear left side of the terminal is off (to 0).
3. Plug the power cord into the terminal and into the wall outlet.
4. Turn on the terminal by turning the power switch on (to 1).
5. Listen for a bell tone from the keyboard. Then wait about 15 seconds for a "VT320 OK" message to appear on the screen.
6. Set the terminal's brightness and contrast controls to maximum.
7. Decrease the brightness until the background (raster) disappears.
8. Decrease the contrast to the desired intensity.
9. Adjust the viewing angle by grasping the terminal and raising the screen to the desired viewing angle.
10. Connect the system cable to the 25-pin RS232 connector.
11. Connect the printer cable (if used) to the printer port.

The console is now connected and ready for operation. However, before you can use the terminal, you must change some of the terminal settings from defaults to coincide with the TC2000 host system.

5.3 Changing Console Settings

Several changes must be made to the terminal's settings before you replace it. You must change the terminal settings from the defaults to coincide with the host system. Press the <Set-Up> key (the third key from the left on the top left of your keyboard). The Set-Up Directory menu appears on the bottom third of your screen.

To select another option, press the arrow keys on the editing keypad. To change a selected menu option, press <Enter> (*do not* press <Return>).

(Underlined text represents reverse video.)

Set-Up Directory Menu

```

Set-Up Directory                               VT320  V1.0
Display  General  Comm  Printer  Keyboard  Tab
On Line  Clear Display  Clear Comm  Reset Terminal  Recall  Save
Set-Up English                North American Keyboard          Default  Exit
Copyright © 1987, Digital Equipment Corporation -      All Rights Reserved.

```

Select the Default option by pressing the arrow keys until that option appears in reverse video and press <Enter>.

Set-Up Directory Menu

```

Set-Up Directory                               VT320  V1.0
Display  General  Comm  Printer  Keyboard  Tab
On Line  Clear Display  Clear Comm  Reset Terminal  Recall  Save
Set-Up English                North American Keyboard          Default  Exit
Copyright © 1987, Digital Equipment Corporation -      All Rights Reserved.

```

Select the Display option by pressing the arrow keys until that option appears in reverse video and press <Enter>. The Display Set-Up menu appears on the bottom of your screen:

Display Set-Up Menu

```

Display Set-Up                               VT320  V1.0
To Next Set-Up      To Directory      80 Columns  Interpret Controls
No Auto Wrap        Smooth Scroll     Light Text, Dark Screen
Cursor              Block Cursor Style      No Status Display

```

1. Select the No Auto Wrap option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until Auto Wrap appears.
2. Select the Smooth Scroll option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the Jump Scroll option appears.
3. Select the To Next Set-Up menu option by pressing the arrow keys until that option appears in reverse video and press <Enter>. The General Set-Up menu appears on the bottom of your screen:

General Set-Up Menu

```

General Set-Up                               VT320  V1.0
To Next Set-Up      To Directory  VT300 Mode, 7Bit Controls  VT220 ID

User Defined Keys Unlocked      User Features Unlocked      8 Bit Characters

Numeric Keypad      Normal Cursor Keys      No New Line

UPSS DEC Supplemental
    
```

1. Select the VT300 Mode, 7Bit Controls option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the VT 100 Mode option appears.
2. Select the VT320 ID option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the VT100 ID option appears.
3. Select the 8 Bit Characters option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the 7 Bit Characters option appears.
4. Select the To Next Set-Up menu option by pressing the arrow keys until that option appears in reverse video. Press <Enter>. The Communications Set-Up menu appears on the bottom of your screen:

Communications Set-Up Menu

```

Communications Set-Up                                VT320   V1.0
To Next Set-Up      To Directory   Transmit = 9600      Receive=Transmit

XOFF at 64          8 Bits, No Parity   1 Stop Bit          No Local Echo

RS232, Data Leads Only  Disconnect, 2 s Delay          Limited Transmit

No Auto Answerback   Answerback=                          Not Concealed
  
```

1. Select the Transmit = 9600 option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the Transmit = 2400 option appears.
2. Select the XOFF at 64 option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the No XOFF option appears.
3. Select the To Next Set-Up menu option by pressing the arrow keys until that option appears in reverse video. Press <Enter>. The Printer Set-Up menu appears on the bottom of your screen:

Printer Set-Up Menu

```

Printer Set-Up                                       VT320   v1.0
To Next Set-Up      To Directory   Speed=4800   No Printer to Host

Normal Print Mode  XOFF 8 Bits, No Parity   1 Stop Bit

Print Full Page     Print National Only      No Terminator
  
```

NOTE

~~~~~

This manual recommends that you install your printer and leave the printer on to document any problems that may occur during the installation.

~~~~~

1. Select the Normal Print Mode option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the Auto Print option appears.

- Return to the Set-Up Directory by pressing the arrow keys until the To Directory option appears in reverse video. Press <Enter>. The Set-Up menu appears on the bottom of your screen:

Set-Up Directory

```

Set-Up Directory                               VT320  V1.0
Display  General  Comm  Printer  Keyboard  Tab
On Line  Clear Display  Clear Comm  Reset Terminal  Recall  Save
Set-Up English                               North American Keyboard  Default  Exit
Copyright © 1987, Digital Equipment Corporation - All Rights Reserved.

```

- To save your changes, select the Save option by pressing the arrow keys until the Save option appears in reverse video and press <Enter>.
- After saving your changes, press the <Set-Up> key on the top left of your keyboard to continue with the installation. The text that was on the screen before entering Set-Up format appears on the screen.

The text that was on the screen before entering Set-Up appears on the screen.

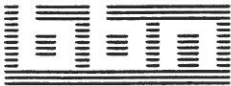
If you need further information on the VT320, see *Installing and Using The VT320 Video terminal*.

For information on installing the diagnostics software for the TC2000 system, see *The TC2000 System Installation Guide*.





Preventive Maintenance Procedures



Certain procedures should be followed on a regular basis to ensure that your system continues to operate properly. Such procedures include checking that voltages are in tolerance and keeping the tape units and heads clean.

6.1 Checking Voltages

The following power checks should be made every three months to ensure that the system is wired correctly and that it has voltage.

6.1.1 Checking AC Power

Check for AC power at power cords feeding the bulk power supply in back of the Expansion cabinet.

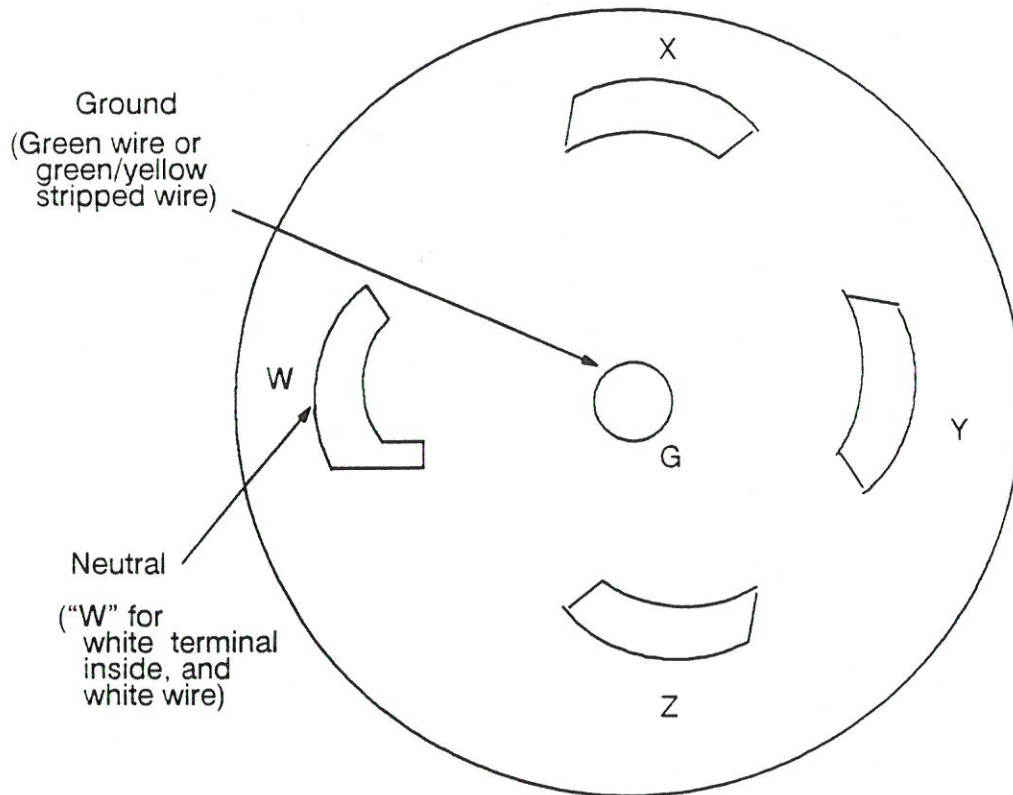
With the AC power cords unplugged, see Figure 6-1 for this procedure.

1. Set the meter for "Volts AC".
2. Place the black probe in the center of the receptacle (G).
3. With the black probe in the center (G), check all slots on the receptacle: these should all be between 115-120v (117v average):

- G - X
- G - Y
- G - Z

This should be less than 1v:

- G - W

Figure 6-1 **Checking AC Power**

4. After checking the receptacles, reconnect the power cords to the plugs at the back of the system.
5. Push up the circuit breaker switch on each PDU. The three orange lights on each should light indicating that AC power is going to the system.

6.1.2 **Checking DC Power**

Check for DC power at the back of the Expansion cabinet on the portion of the midplane that can be accessed through the Switch Board section.

1. Set the meter to "Volts DC".
2. With the black probe on the midplane's RETN, and the red probe on the midplane's +48, you should read +48V.
3. With the black probe on the midplane's GND, and the red probe on the midplane's +5v, you should read +5V.

The +48v on the midplane supplies power to the Switch Boards and Processor Boards.

The +5v on the midplane supplies voltage to the TCS.

6.1.3 Checking Power to the TCS

Check the TCS for power beside the switching power supply unit in the PC chassis in the Utility cabinet. In order to do this, you first need to remove the PC chassis from the system and open the chassis to access the power supply unit. (Refer to *Chapter 3, PC Chassis, Remove* for instructions.)

1. The TCS Interface Board should have a -12 and +5 voltage.
2. The TCS Processor Board has +5V only.

If there is no voltage, check the AC power on the cord supplying the TCS, as follows:

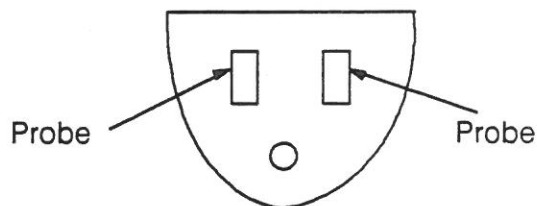
3. Unplug the power cord from the TCS.
4. Set the meter for "Volts AC".
5. Insert the probes into the power cord plug's two symmetrical slots, as shown in Figure 6-2.

You should read about 208V. If the cord has power, but when plugged in, the TCS still has no power, then the chassis may need to be replaced. (Refer to *Chapter 7, Troubleshooting* for more information.)

If there is no power in the cord, there is a problem with either the cord itself, or with the PDU supplying it.

Figure 6-2

TCS Voltage Check



6.2 Checking Fans

Fans should be checked on a regular basis by feeling for airflow and listening for any squealing sounds (indicating that the fan is wearing out and will soon need replacement).

To replace a fan, refer to the instructions according to its location in the system in the appropriate chapter.

6.3 Cleaning the 1/4 Inch Tape Drive

The 1/4-inch tape drive/control panel assembly is located on the front of the Utility cabinet.

After every eight hours of tape drive operation, clean the tape unit by following the instructions in the cartridge tape drive cleaning kit.

CAUTION

Use only the cleaning fluid supplied in the cartridge cleaning kit to clean the drive.

When you insert the cartridge and close the door of the drive, the characteristic "shoeshine" action will clean the heads.

NOTE

Do not attempt to clean the heads using swabs. Due to the head retraction mechanism in the drive, you will be unable to reach the write head.

6.4 Cleaning the 1/2 Inch Tape Drive

The 1/2-inch tape drive is located on the front of the Peripheral cabinet, just under the three 8-inch disk drives.

After every eight hours of tape drive operation, clean the tape unit by doing the following :

1. Turn off the tape drive.
2. Release the rack latch just inside the lower left corner of the front panel.
3. Grasp underneath the front panel and pull the unit towards you.

NOTE

Make sure the power cord is long enough. If not, unplug it from the back of the unit.

4. Slide the unit forward until it is fully extended from the rack.
5. Grasp the lower edges of the top cover and lift.
6. While holding the top cover in the raised position, place the retainer bar in its slot.

CAUTION

Rough or abrasive materials can scratch sensitive surfaces of the head resulting in permanent damage. Other cleaners, such as alcohol-based types, can cause read/write errors or load failures. USE ONLY FREON TF (Trichlorotrifluoroethane).

7. To clean the unit, use the Cipher tape drive cleaning kit (Part 960855-001). Moisten a swab applicator with tape drive cleaner and carefully swab the surface of the read/write head and tape cleaner. If the surfaces are extremely dirty, you may have to use more than one swab.

CAUTION

Hold the tachometer away from the take-up hub while cleaning the hub: if the cleaning solvent seeps into the tachometer housing, it could damage the tachometer. Also, do not release the tachometer suddenly while holding it away from the take-up hub since it will become damaged if it strikes sharply against the hub.

8. Clean the tachometer roller using the method described in step 8.
9. Use the felt pads provided in the tape cleaning kit to clean the hub pads, takeup hub and roller guides.
10. Lift the top cover until the retainer bar is clear of its slot.
11. While holding the top cover in the raised position, push the retainer bar back and up so that it lies flat against the underside of the top cover.
12. Close the top cover.
13. Press and hold the lock buttons on both slides and slide the unit back into the rack.

6.5 Cleaning Filters

Filters should be checked about every three months and either cleaned or replaced, as appropriate.

6.5.1 1/2-inch Tape Drive Filter

To clean the air filter, use the following procedure (see Figure 6-3).

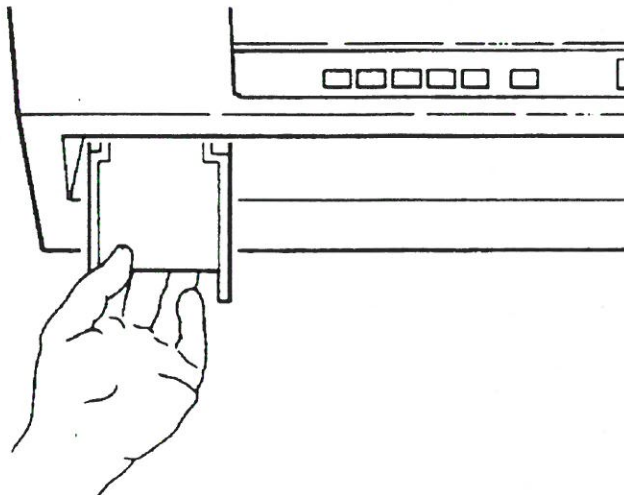
1. If the power is on, press the bottom of the Power switch/indicator to remove power from the unit.
2. The filter is located just behind the Rack Latch at the lower left side of the front panel. Feel for the filter tab and gently slide it down to remove.
3. If there is dust on the filter, vacuum or rinse it clean.
4. Return it to its proper location.

6.5.2 Processor Filter

The filter is under the processor card cage in the expansion cabinet.

1. Loosen the two slotted screws on the mounting bracket.
2. Remove the bracket and put it aside.
3. Reach underneath and pull the frame-mounted filter all the way out.
4. Take the filter out of the frame by loosening the sides of the frame.
5. You can either vacuum the filter or rinse it clean. If you want to replace it, the entire unit—filter and frame—is a FRU.

Figure 6-3 Cleaning the 1/2-inch Tape Drive Filter







Troubleshooting



This chapter is intended to aid you in finding a system problem. It contains a troubleshooting chart, a section on turning off and turning on the system; and a sample problem and its solution.

7.1 Finding the Problem

The instructions in the diagnostic guide deal with most problems you are likely to encounter. Your first step should be to collect as much information as you can about the system: LEDs, system console, crashdumps, etc. Then use the chart shown in Figure 7-1, look for the symptom that most closely represents your situation and check for each of the possible problems. The symptoms are listed from most critical to least critical. The possible problems are listed with the most likely first and least likely last for that particular symptom. If the problem is not easily identifiable, consult the diagnostic guide.

Before turning to the appropriate chapter to replace the questionable item, be sure that you are familiar with the section on turning the system off and on.

If the problem can't be fixed by a simple swap from on-site spare parts kits, call the BBN ACI Hotline listed in the front of this manual.

Figure 7-1 Troubleshooting Chart

Symptom	Possible problem	Action
System won't turn on	208VAC is not present.	Check the main power cords.
	The PDUs are turned off.	Turn on the PDUs. The three orange lights on each PDU must be on.
	Main Power Switch or Key Switch is off.	Turn on the switch and look for the green power indicator next to it to light up.
Console works, but no boot prompt	Console cables are loose or damaged.	Follow the cables from the fan-tail to the console.
System doesn't boot from the disk.	Disk drive is turned off (green light on disk drive is off).	Check the disk drive's power cord, circuit breaker, and the power switch.
	Disk controller board not active or bad.	Run the diagnostics on the disk controller board.
	Disk drive fails self-test (red light on disk is on.)	Call BBN ACI.
Bootting fails with with DISK ERROR 14.	The disk drive's write protect switch is on.	Turn off the write protect switch.
Some nodes aren't seen by the rest of the system.	Nodes are turned off	Turn on nodes and check that its self-test passes (red LED goes out).
	Nodes are failing self-test	If the red LED on the node is on after a minute try resetting and then call BBN ACI. Also may fail self-test if cables are bad.
	Bad switch-processor cables	Try swapping the cables with those of a neighboring node that you know works.

Symptom	Possible problem	Action
All nodes in one cage aren't seen by the rest of the system	Card cage or nodes are turned off.	Check that green LED on each node is on and red LED is off.
	Clock board turned off or bad.	Check that green LED is on and red LED is off.
	Clock signal isn't getting to nodes.	Check for disconnected or damaged clock cables.
	Switch cables going from one cage to another are disconnected or damaged.	Check that the switch cables are all plugged in and none are damaged.
	Switch board is in reset mode or is bad.	Check that the rocker switches are in the up position and the green lights are lit on the two switch boards for that cage.
Ethernet isn't working	Ethernet cables are disconnected or damaged.	Check the connections from the Ethernet controller board to the fantail to the transceiver cable to the transceiver box.
	Ethernet controller board is not seen or is bad.	Run diagnostics on the Ethernet controller board.
	Ethernet controller board is hung.	Check the LEDs on the front of the board for an error code; restart the system and check again.
Non-console terminals don't work.	Terminal control software has not been configured to support MB/TERM board.	Consult the <i>System Administrator's Guide</i> for configuration instructions.
	Terminal cables are disconnected or damaged.	Check the connections from the board to the fantail to the coax cable to the cluster box to the terminals.
	Coax cables are bad or unterminated.	Check terminators and run diagnostics on the terminal controller board.

Symptom	Possible problem	Action
	Terminal Controller board is turned off or is bad.	Run diagnostics on the terminal controller board.
1/4 inch tape doesn't read.	SCSI cable is loose, plugged in backwards, or damaged.	Check the connections from the back of the tape drive to the tape controller in the Multi-bus.
	1/4 inch tape controller is bad.	Run the diagnostics on the 1/4 inch tape controller.
	The tape heads are dirty.	Clean the tape heads.
1/2 inch tape doesn't load	Packing material is still in the tape drive	Remove the "donut" from the take-up reel.
1/2 inch tape doesn't read	Cables are loose, backwards, or damaged.	Check all of the connections from the controller to the tape drive.
	The tape heads are dirty.	Clean the tape heads.
	1/2 inch tape controller is bad.	Run the diagnostics on the 1/2 inch tape controller.

7.1.1 Halting the System

Whenever possible, the system should be halted using the procedures outlined in sections 7.3 and 7.4. This will prevent loss of data. Turning off power to the machine will certainly stop the system, but is not advisable because of the likelihood that the data will be lost.

There are several ways to halt the system. The particular halt method you choose must be based on the circumstances that make a system halt desirable. In all cases, try to make sure users have been warned the system will be halted so that they can save as much of their work as possible before the halt.

7.1.2

TCS

During system operation, you will be interacting with the Test and Control System (TCS). In a broad sense, the TCS consists of the TC2000 hardware, a separate processor, software, and the slave processors. You may have encountered this system if you read the *TC2000 System Installation Guide*. The TCS lets you perform many functions, including booting the system, powering processor cards on and off, and performing diagnostics (for a discussion of diagnostics with the TCS, refer to the *TC2000 Diagnostics Manual*). The TCS has a master program, TEX (TCS Executive).

The TCS machine allows you to perform a number of monitoring and maintenance functions (such as system halting, reloading, and reconfiguring). In particular, you use the TCS software to:

You can only communicate to the TCS through its serial port. This is usually done through the TC2000 console, which is shipped as a VT320/LA75 printer. The TCS in turn communicates with the TC2000 processor card (B2VME) and the Butterfly switch.

The *TC2000 Software Installation Guide* has a description of how to format disks for the PC-AT compatible system on which the TCS software resides.

This chapter describes how to use the TCS software to reboot the system. Chapter 2 in the *TC2000 Diagnostics Manual* describes TCS in more detail, including the menu system and the commands you can issue.

7.2

The Power On/Off Procedure

It is important to power your system on and off correctly. Perform the following procedures in the given order. Refer to Chapter 1 for the locations of the components.

7.2.1

Step by Step Process for Powering On

Use the following steps to power on your system:

1. Turn on the Power Distribution Unit. The light on the cassette tape drive will come on. When the system is completely powered on, the processor card FLAG lights go OFF.
2. Turn the Key Switch to ON. The first indicator at the bottom of the control panel lights. This means that the TCS subsystem has received power and is turned on.
3. Turn the Key Switch in the SECURE position to disable resets.
4. Turn on the Disk Drive(s).

5. Turn on the ½ inch Tape Drive (if any).
6. Check that the built-in VME card cage ("6 UVME card cage") switch at the back of the TC2000 is ON.
7. Look at the Processor card lights. The Flag light on each of the cards should be on until it finishes the self-tests, then all lights *except* Flag should turn on.

When power is restored, the TCS proceeds to boot up. The TCS attempts to boot from the floppy disk first, and then from the hard disk.

As the system powers up, the TCS scans to see that every component is present and operating correctly. Check the console monitor while this diagnostic scan is taking place. It is useful source of information about any system problem.

NOTE

~~~~~  
Remove the floppy disk from the TCS to allow it to boot from its hard disk.  
~~~~~

7.2.2

Step by Step Process for Powering Off

Use the following steps to power off your system safely **after** you have halted the operating system:

1. Halt the nX operating system as described in sections 7.3 and 7.4.
2. At the terminal you should have the TEX-> prompt. Type **h po of a** (Hardware Power off all) at this prompt to turn off power to all the processors.

TCS -> **h po of a** ↵

3. Turn the Key Switch to OFF. This also removes power from all individual peripherals.

NOTE

~~~~~  
You can leave the machine in this state. Go to the next step *only* if you intend to disconnect the Main Power Cord.  
~~~~~

4. The PDU breakers should also have been turned OFF by the Key Switch. After checking that these breakers have been turned OFF, disconnect the Main Power Cord. Leave the PDU breakers down for at least 15 seconds before powering up according to section 7.2.1, "Step by Step Process for Powering On".

7.3 Shutting Down the System

When shutting down the system, perform the following procedures

1. Check (using the **who** and **ps** commands, or by asking users) to see if anyone is using the system.
2. If there are other users on the machine, use **/etc/shutdown** as root to send a system warning message to users. If there were no other users on the system, or if the system is booted singleuser so that only the console is in use, go to step 3.

If you are using **/etc/shutdown**, you can specify a time span in minutes before the system actually shuts down, plus send a message. For example

```
# /etc/shutdown +2 Halting to install new disk ↵
```

specifies that the system will halt in two minutes, and sends the message "Halting to install new disk" to all users logged onto the system. Users on the system then have to save their files and log out before the system shuts down to single user mode. When that is done, continue to step 3.

NOTE

You can also specify the **/etc/shutdown** command to halt or reboot the system all in one command. To reboot the system after shutting it down, use the **-r** option. For example:

```
# /etc/shutdown -r +2 Rebooting to clear stuck processors ↵
```

To halt the system after shutting it down, use the **-h** option. For example:

```
# /etc/shutdown -h +2 Halting to install new disk ↵
```

3. Use **/etc/halt** as described in section 7.4.

7.3.1 The Reset Switch

If your system is hung, press the **reset** switch (see Figure 7-2). This switch takes the system to the pre-boot state and brings up the TCS. From here you would reboot the system as described in section 7.6.

7.4 Halting the System

The `/etc/halt` command synchronizes the disks by writing out data stored in processor memory to the disks, and halts the system. When you use the `/etc/halt` command to halt the system, file system checks are performed automatically when the machine is rebooted multiuser.

CAUTION

You must check the file systems at every reboot in all because an inconsistent file system can cause serious, irretrievable loss of data.

To use `/etc/halt`, simply type the following command at the super user prompt:

```
# /etc/halt ↵
```

You can then reboot the system as described in section 7.6, "Bootting/Rebooting the System".

7.5 Halting the System After Root File System Checks (Singleuser)

Often, while testing, you may use the system in singleuser mode to be certain no one can use the system remotely while you are working. This saves boot time and protects the unmounted file systems from corruption.

If you boot the system singleuser to do administrative work, you should check the root file system for inconsistencies before you begin. Do this by typing the following at the prompt (assuming your boot disk is unit 0):

```
# /etc/fsck /dev/xy0a ↵
```

It takes very little time to determine whether the root file system is inconsistent. If the file system is inconsistent, this message appears, followed by a prompt:

```
file system has been modified -- reboot using /etc/reboot -n
```

Following the instructions in this message will cause the system to boot multiuser, which is not desirable when you need to use the system in singleuser mode. Instead, type the command

```
# /etc/halt -n ↵
```

and then reboot the system singleuser as described in section 7.6, "Bootting/Rebooting the System".

The significant part of either of these commands is the `-n` flag. This signifies that when the system is halted (automatically before a reboot can occur, or ex-

explicitly due to your **halt** command), the disks will *not* be synchronized. This is essential to keep the file system consistent, since the **fsck** command corrects the file system *directly on the disk*, not in the processor's memory. If you sync the disk before halting, the *uncorrected* image stored in the processor memory will be written over the corrected image on the disk, thereby re-corrupting the root file system.

7.6 Booting/Rebooting the System

If you **/etc/halted** the system, and the system gracefully halted, you are placed in TEX. You can then reboot the system by first pressing <Return> on the keyboard. This brings up the prompt TCS[7.7.7]->.

This puts you into the TCS, from which you can reboot the system with the following dialog:

If you **/etc/fasthalted** the system, file system check will not be performed on system boot (such as **/etc/fastboot**). (However, it is advised that you do not use **/etc/fasthalt** to halt the system.)

Look at the description of **fastboot(8)** in the list of system administration commands in the back of the *TC2000 System Administration Guide*. **/etc/fastboot** will perform a default boot without file system checking (**fsck**).

NOTE

~~~~~  
 You can use **/etc/fastboot** as long as the TCS file **BOOTCFG.TCS** has the *bootparam* switch set correctly. By default, the TC2000 machine is shipped so that one of the lines in **BOOTCFG.TCS** reads:

**bootparam: 1: 5**

which sets the boot parameter 1 (the number of consecutive reboots the TCS will initiate) to 5. This should be sufficient for your needs. If you must change this value, you will have to edit the file using a text editor, such as EDLIN, and propagate this change for all the various directories in the TCS (except **\DIAG\BOOT**), and then reboot the system.

~~~~~  
 For more information on halting and rebooting the GP1000, see **shutdown(8)**, **halt(8)**, **fasthalt(8)**, **reboot(8)**, **fastboot(8)**, **sync(8)**, and **fsck(8)** in the list of system administration commands in the *GP1000 System Administration Guide*.

7.7 Interpreting the LEDs

The TC2000 computer has three sets of LEDs:

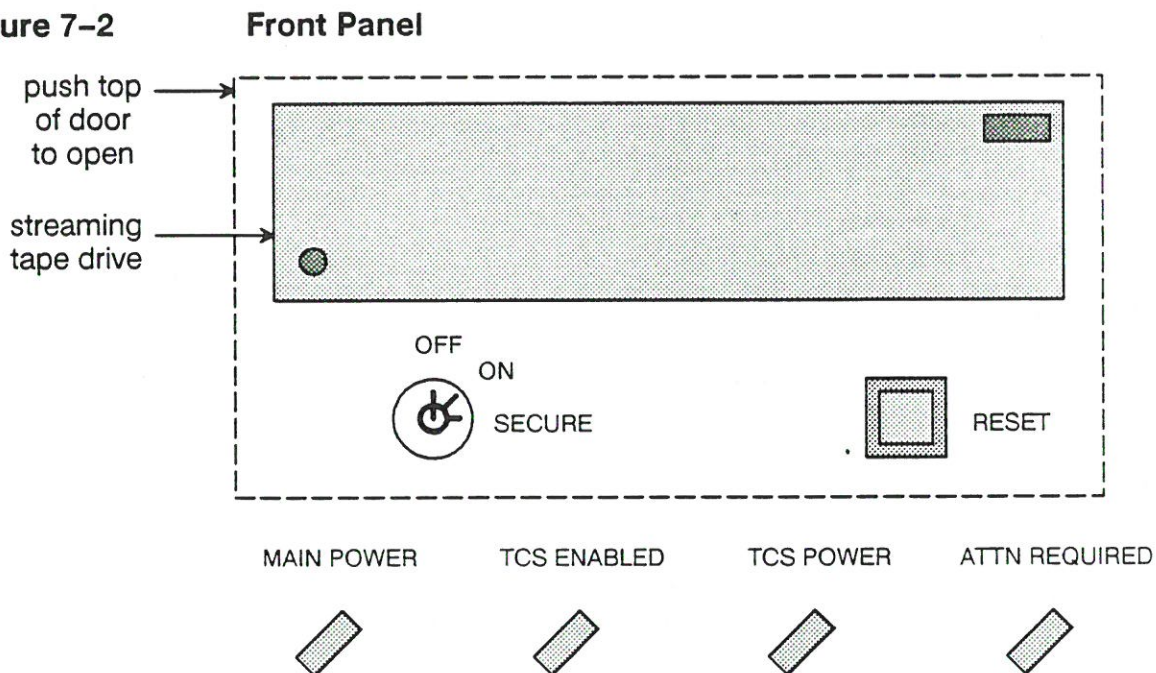
- front panel display
- processor card LEDs
- switch card LEDs

7.7.1 Front Panel Display

The front panel has four LEDs:

TCS POWER	indicates that the TCS has power.
MAIN POWER	turned on by the TCS master when the TCS master senses power.
TCS ENABLED	indicates that the TCS bus is available.
ATTN REQUIRED	also controlled by the TCS; see the diagnostic guide for more details.

Figure 7-2



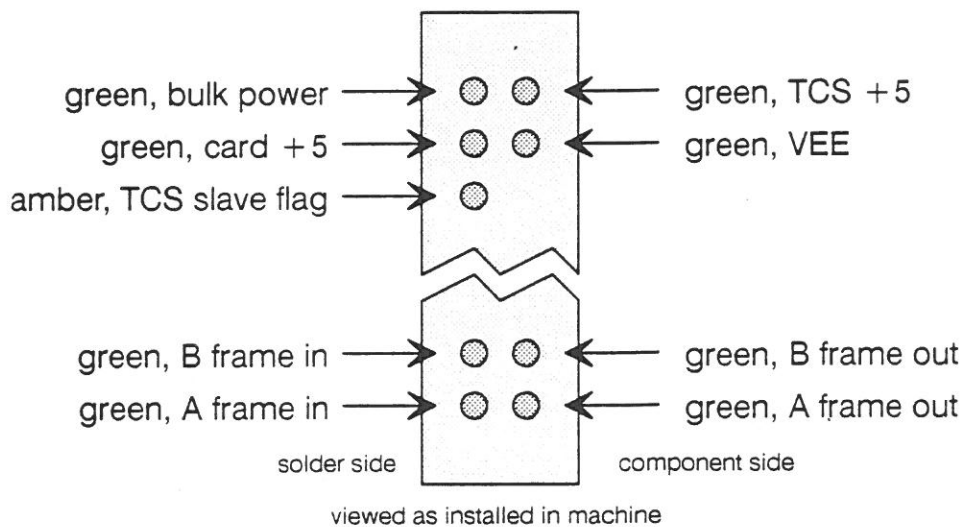
7.7.2 Processor card LEDs

An assortment of LEDs are visible on each processor card installed in the card cage, typically indicating (see Figure 7-3):

- TCS VCC present (green)
- Bulk 48 VDC (± 24 VDC) present (green)
- Card VCC present (green)
- Card VEE present (green)
- TCS flag (amber)
- Card-specific data (four green LEDs indicate “frame” and “reverse” for each switch port)

Of these, two are directly controlled by the TCS. One indicates “card TCS power on” and is connected with a resistor to the card’s TCS VCC power. The other is controlled by the TCS slave and can be set on, off, or blinking. Blinking the LED on and off is one of the TCS slave’s tasks, and does not require further intervention from the TCS master. Two blink rates are defined in the original design, fast (about 3 Hz) and slow (about 1 Hz).

Figure 7-3 Processor Indicators



The TCS flag amber LED is intended to point out cards that fail diagnostics, and as an aid to a service person in locating a particular card in a large system. The convention for use of this LED is as follows:

- on = dead card
- slow blink = diagnostic in progress, or failure
- off = passed diagnostic
- fast blink = card locator signal

A hardware reset causes the LED to turn on. The slave should be programmed to leave the LED on at startup, so that an uninitialized or totally broken card will have its light on continuously.

The TCS master should start the LED blinking at the slow rate when it begins testing or configuration discovery. This indicates that the TCS has discovered the card, but has not yet approved it for use.

Once the TCS has completed diagnostics, the LEDs on cards that pass should be turned off. Cards that fail or become non-communicative will continue to blink at the slow rate.

The TCS master should provide a command that causes the LEDs on one or more slaves to blink at the fast rate to help a service person locate a particular card. The command should be arranged so that leaving the LED blinking indefinitely is difficult, probably by starting it blinking and then waiting for a carriage return to stop it again.

If the TCS discovers a failed card in the course of normal operation, it should try to set the LED blinking at the slow rate.

7.7.3 Switch Card LEDs

The switch card has the same five LEDs that as the top of a function card. It does not have the four bottom LEDs (see Figure 7-3). The LEDs indicate:

green:	VEE power-on indicator
green:	VTT power-on indicator
green:	TCS VCC power-present indicator
green:	main power (± 24 volts) power-present indicator
amber:	TCS flag, to aid field service in locating the card

See subsection 7.7.2 for a detailed explanation of these LEDs.

Finally, note that the LEDs on each B2SS/B2SR pair of switch cards are both controlled by the same slave, on the B2SS. This hardware connection should be masked by the TCS master. The two switch cards should be treated as separate entities, and their LEDs controlled independently as described above.

7.8 Problems With the Midplane

Various system problems could be midplane-based. For example, the diagnostic scan does not find one or more of the Processors, or shows Processors in the wrong bay, midplane, or slot. First, check that all cards are completely connected to the midplane. If so, and the problem persists, do the following:

1. Power down the system. (Refer to NO TAG)
2. Remove the TC/FP (or TC/FPV) from the indicated Expansion cabinet.

3. Look at Figure 7-4 to orient yourself to the pin locations.
4. Look at the midplane section indicated by the figure; that is, the bottom-most, or J4, portion (start of this portion is indicated by the white line and number 1 on the left and 5 on the right on the green silkscreened portion of the midplane).
5. Figure 7-1 shows the pin numbers for each row of pins. These numbers are the same for the J4 portion of pins in every slot.

To verify the presence of the processor cards, the diagnostic software checks each slot in each specified bay and midplane. For an 8-slot system, the bay location, midplane ID and Slot ID are as follows:

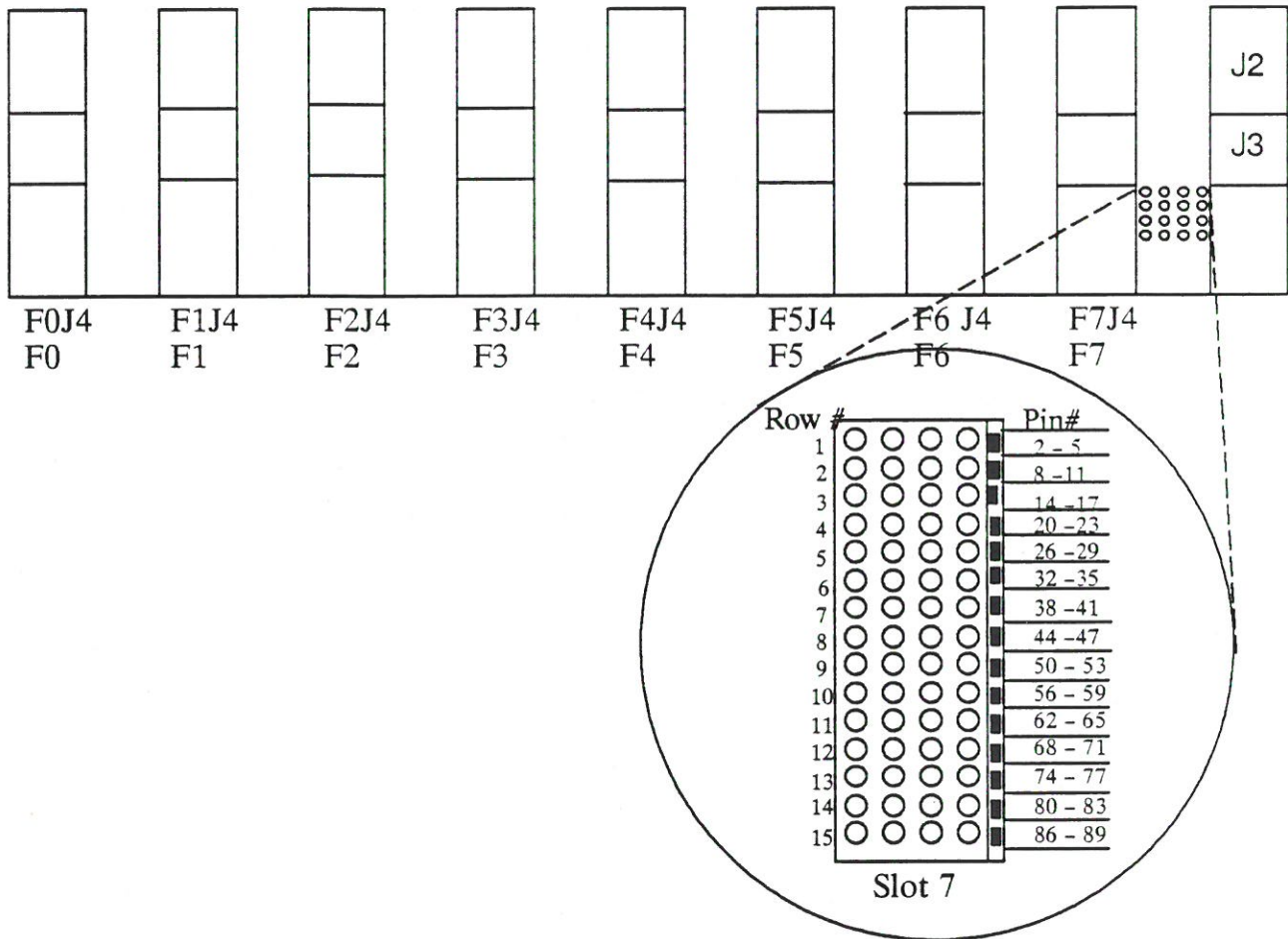
BAY	MIDPLANE	SLOT	(n)
111	001	000	(0)
111	001	001	(1)
111	001	010	(2)
111	001	011	(3)
111	001	100	(4)
111	001	101	(5)
111	001	110	(6)
111	001	111	(7)

The pins representing the midplane ID are 53, 50, 51, and the slot ID are 45, 47, 40. Therefore, with 0 = ground and 1 = open, the following should hold true:

MIDPLANE			SLOT (n)		
Pin 53	50	51	Pin 45	47	40
Grnd	Grnd	Open	Grnd	Grnd	Grnd (0)
Grnd	Grnd	Open	Grnd	Grnd	Open (1)
Grnd	Grnd	Open	Grnd	Open	Grnd (2)
Grnd	Grnd	Open	Grnd	Open	Open (3)
Grnd	Grnd	Open	Open	Grnd	Grnd (4)
Grnd	Grnd	Open	Open	Grnd	Open (5)
Grnd	Grnd	Open	Open	Open	Grnd (6)
Grnd	Grnd	Open	Open	Open	Open (7)

6. Check the midplane and slot IDs.

Figure 7-4 Pin Locations on the Midplane

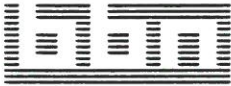






A

Jumper Settings



The following figures show the correct jumper settings for the TC2000 boards. Orientation for all boards is the top left corner as you are looking at the component side of the board. To find the jumper and switch locations on the actual board, measure from the top down and the left across using the same coordinates as those given on the figure. In addition, the Location column of the table that follows each figure provides the coordinates, in inches, needed to locate a jumper, switch, or fuse.

Figure A-1 Processor Board (Part Number: 2112472G01)

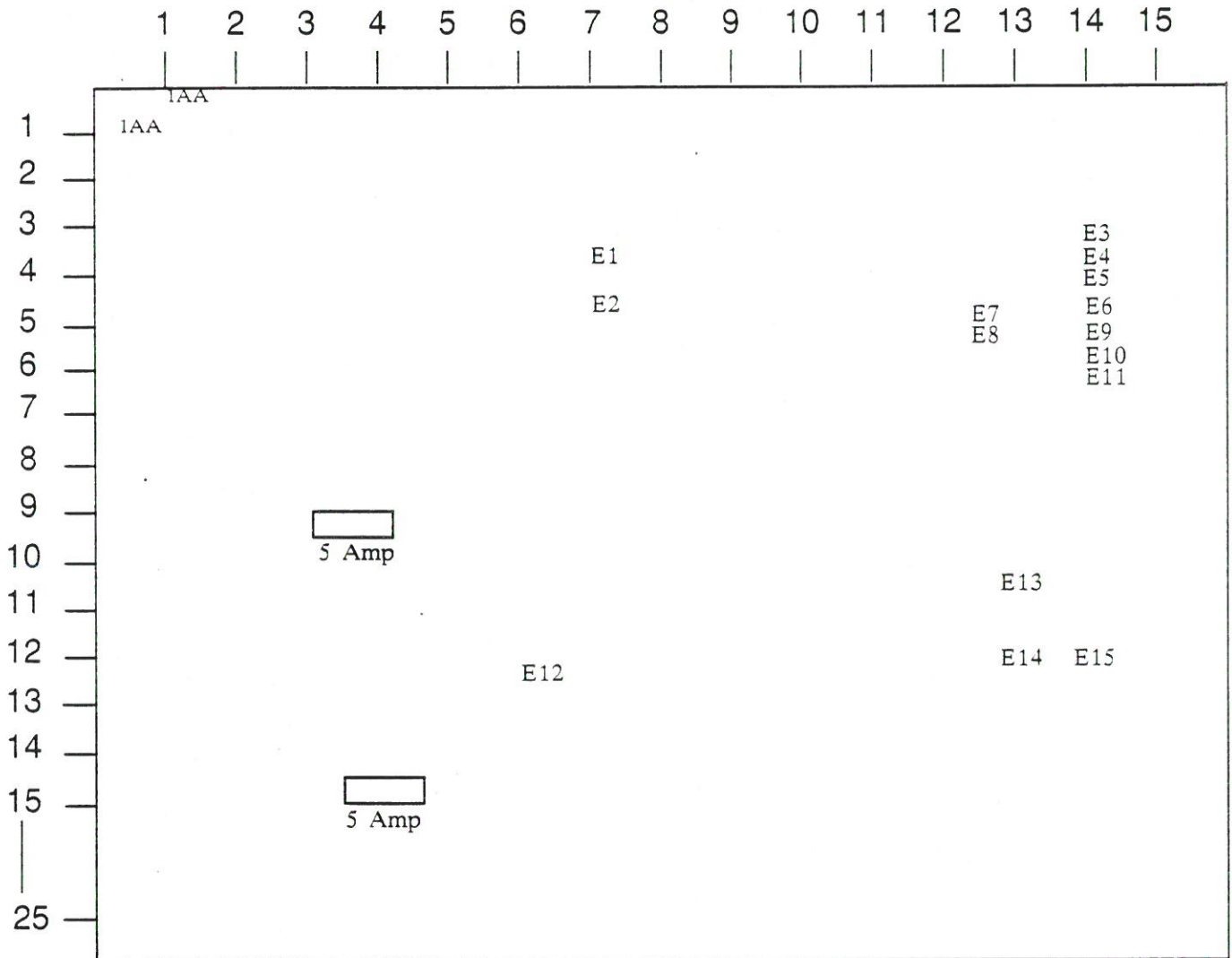


Figure A-2 Processor Board Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
E1	○ ○ ○	3 3/4 down, 7 over	
E2	○ ○ ○	4 1/2 down, 7 over	
E3,4,5	All Open	3 3/4 down, 14 over	

Figure A-2 Processor Board Jumper/Switch Table (cont)

E6	○ ○	4 1/2 down, 14 over	
E7	○ ○ ○	5 down, 12 1/2 over	
E8	○-○	5 1/4 down, 12 1/2 over	
E9,10,11	○ ○ ○ ○ ○ ○ / ○ ○ ○	5 1/2 down, 14 over	
E12	○-○ ○	12 1/2 down, 6 3/4 over	For a 32 MHZ crystal at 11BD (88000 running at 16 MHZ.
E12	○ ○-○	12 1/2 down, 6 3/4 over	For a 40 MHZ crystal at 11BD (88000 running at 20 MHZ.
E13	○ ○	10 1/2 down, 13 over	
E14	○-○	12 down, 13 over	
E15	○ ○ ○	12 down, 14 over	

Fuse	Configuration	Location (inches)	Description
5 Amp	Handbag	at F1; 9 1/4 down, 3 3/4 over	
5 Amp	Handbag	at F2; 15 down, 4 over	

Figure A-3 Clock Card (Part Number: 2114872G01)

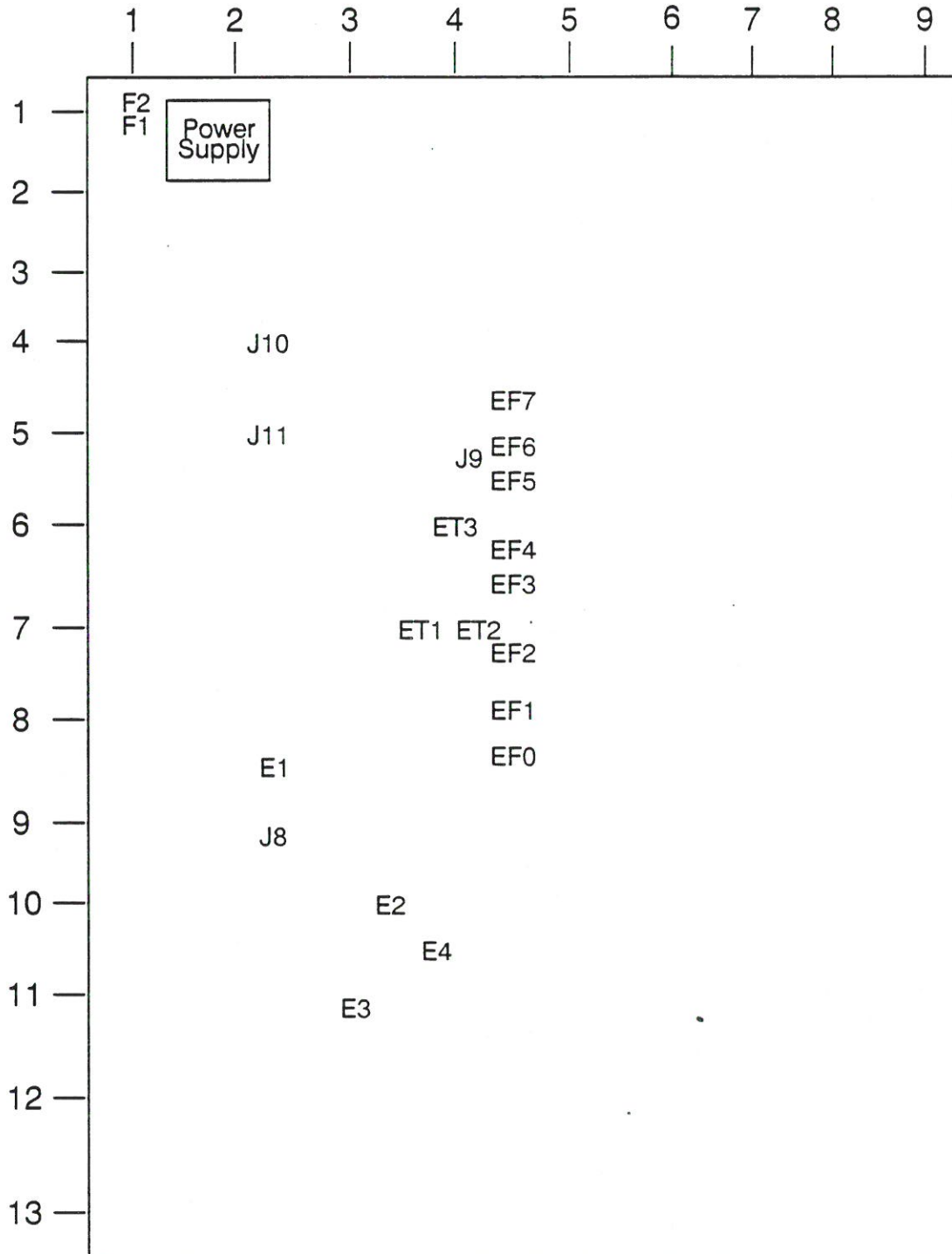


Figure A-4 Clock Card Jumper/Switch Table

Fuse	Configuration	Location (inches)	Description
F2		1/2 down, 1 over	1 1/2 amp
F1		1 down, 1 over	1 1/2 amp

Jumper	Configuration	Location (inches)	Description
ET1	○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○	7 down, 3 1/2 over	
ET2	○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○	7 down, 4 over	
ET3	○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○ ○-○ ○	6 down, 4 over	
EF7	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	4 3/4 down, 4 1/4 over	
EF6	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	5 1/4 down, 4 1/4 over	
EF5	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	5 3/4 down, 4 1/4 over	

Figure A-4 Clock Card Jumper/Switch Table (cont)

Fuse	Configuration	Location (inches)	Description
EF4	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	6 1/4 down, 4 1/4 over	
EF3	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	6 3/4 down, 4 1/4 over	
EF2	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	7 1/4 down, 4 1/4 over	
EF1	○-○ ○ ○-○ ○ T ○-○ ○ N M ○-○ ○ T	7 3/4 down, 4 1/4 over	
EFO	○ ○-○ ○ ○-○ T ○ ○-○ N M ○ ○-○ T	8 1/4 down, 4 1/4 over	
E1	○-○	8 1/2 down, 2 over	
E2	○-○	10 down, 2 1/2 over	
E3	○ ○	11 1/4 down, 2 3/4 over	
E4	○-○ ○	10 1/2 down, 3 1/2 over	

Connector	Configuration	Location (inches)	Description
J9	Plug	4 down, 5 1/2 over	
J8	Plug	9 down, 2 over	
J10	Plug	4 down, 2 over	
J11	Plug	5 down, 2 over	

Figure A-5 Switch Card (TC/SS) (Part Number: 2112470G01)

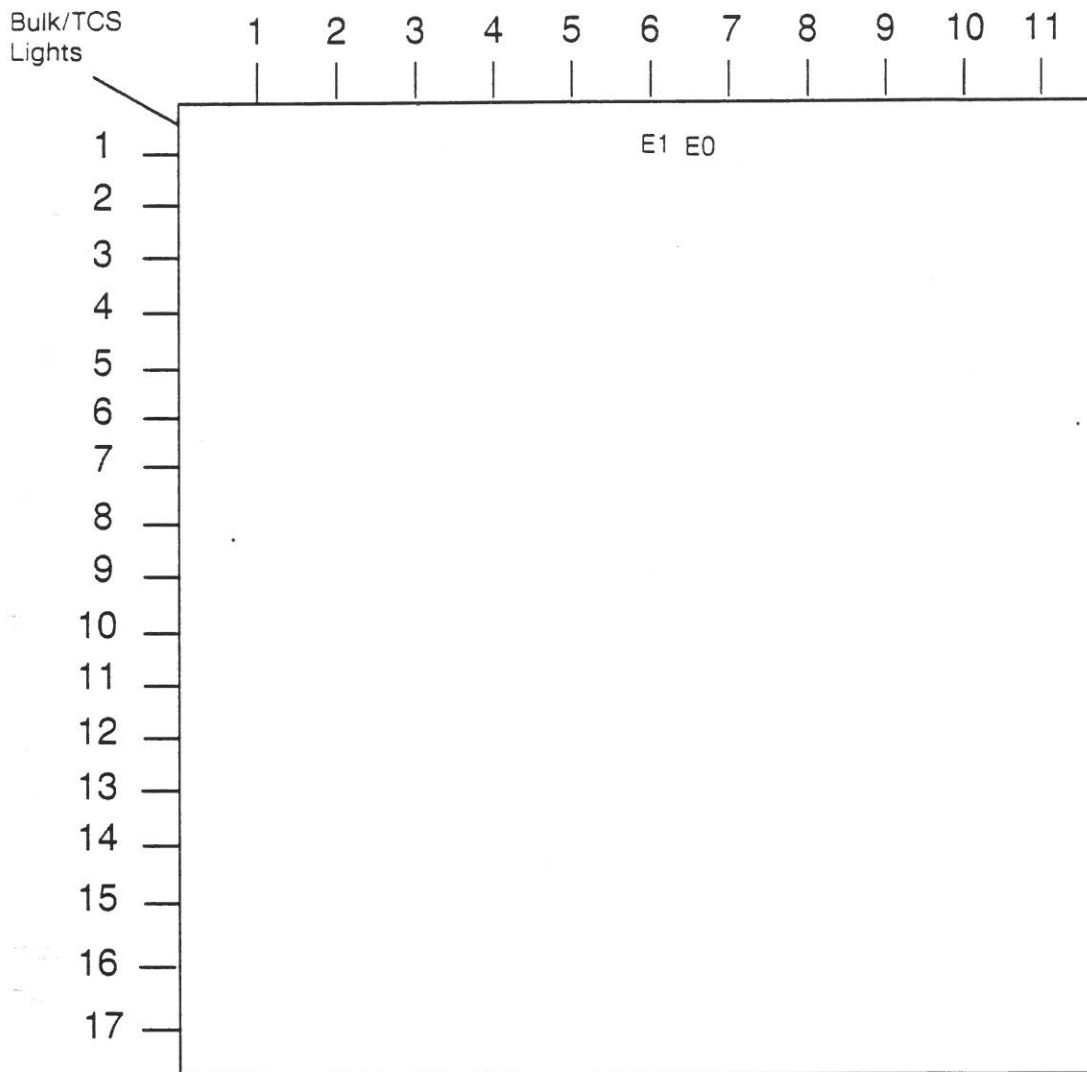


Figure A-6 Switch Card (TC/SS) Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
E1	○-○ ○	1 down, 6 over	
E0	○ ○	1 down, 6 1/2 over	

Figure A-7 6U VME Repeater (Part Number: A101019G01)

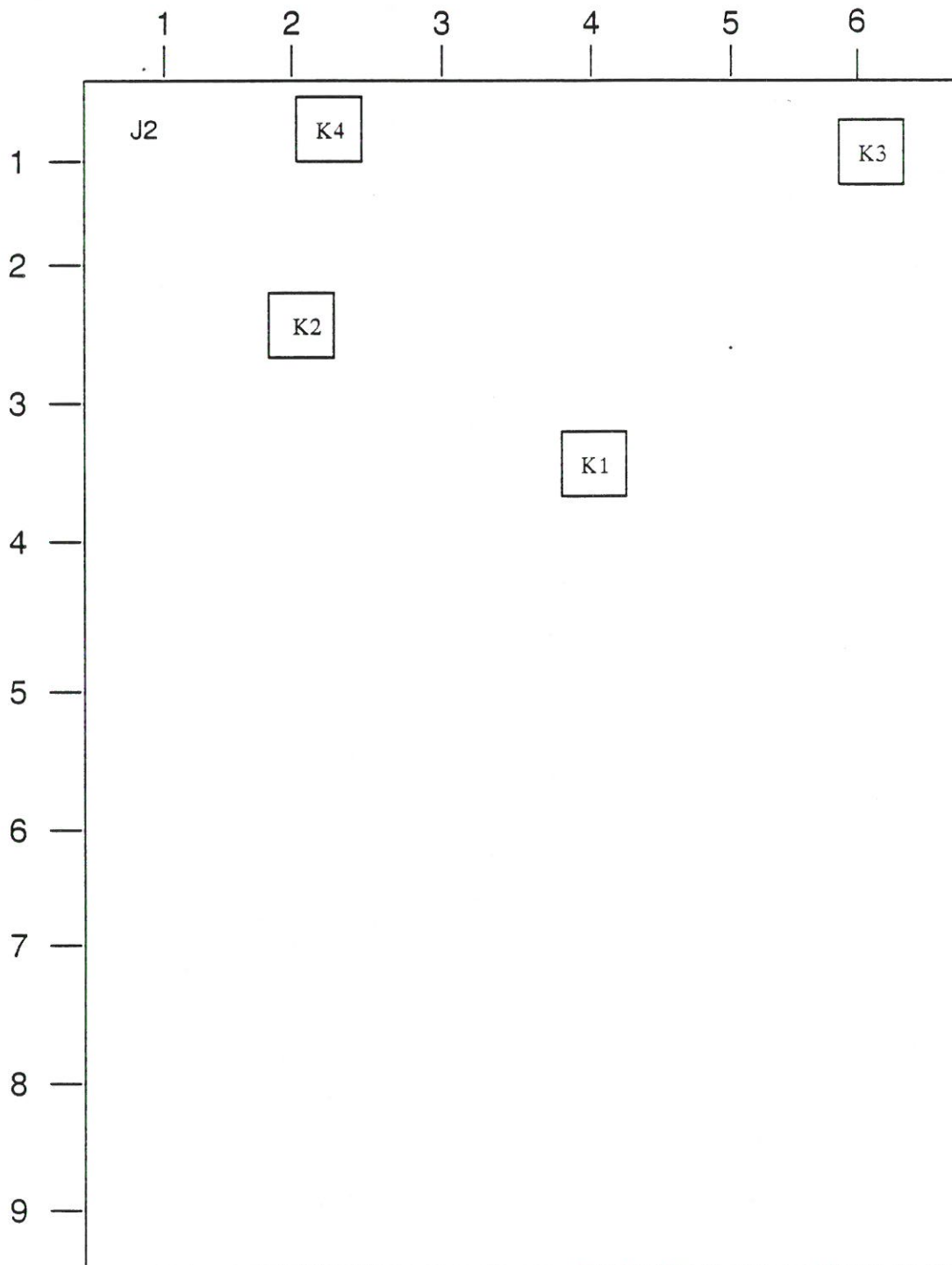


Figure A-8 6U VME Repeater Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
K4		1/4 down, 2 1/4 over	
K3		1 down, 6 over	
K1		3 1/2 down, 4 over	
K2		2 1/2 down, 2 over	

Figure A-9 9U VME Repeater (A117009601)

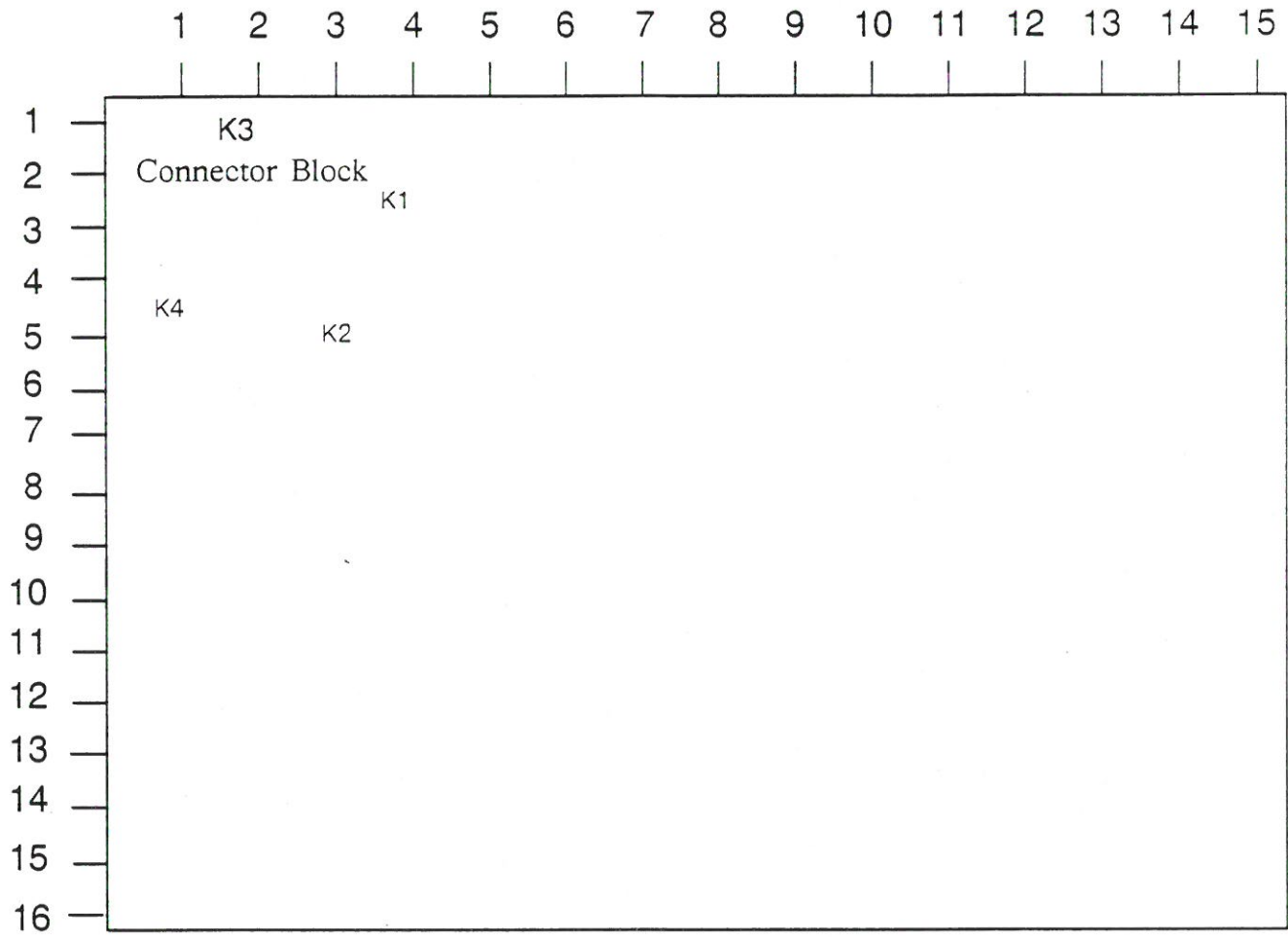


Figure A-10 9U VME Repeater Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
K3	○○-○○-○○-○○○○ ○○○○○○○○○○○○	1 down, 1 1/2 over	
K4	1 ○-○ 2 3 ○○ 4 5 ○○ 6 7 ○○ 8 9 ○○ 10	4 1/2 down, 1/4 over	
K2	1 ○○ 2 3 ○○ 4 5 ○○ 6 7 ○-○ 8 9 ○○ 10	5 down, 2 3/4 over	
K1	19 ○○○○○○○○○○○○ 1 20 ○○○○○○○○○○○○ 2	2 1/2 down, 3 1/2 over	

Figure A-11 Ethernet Controller

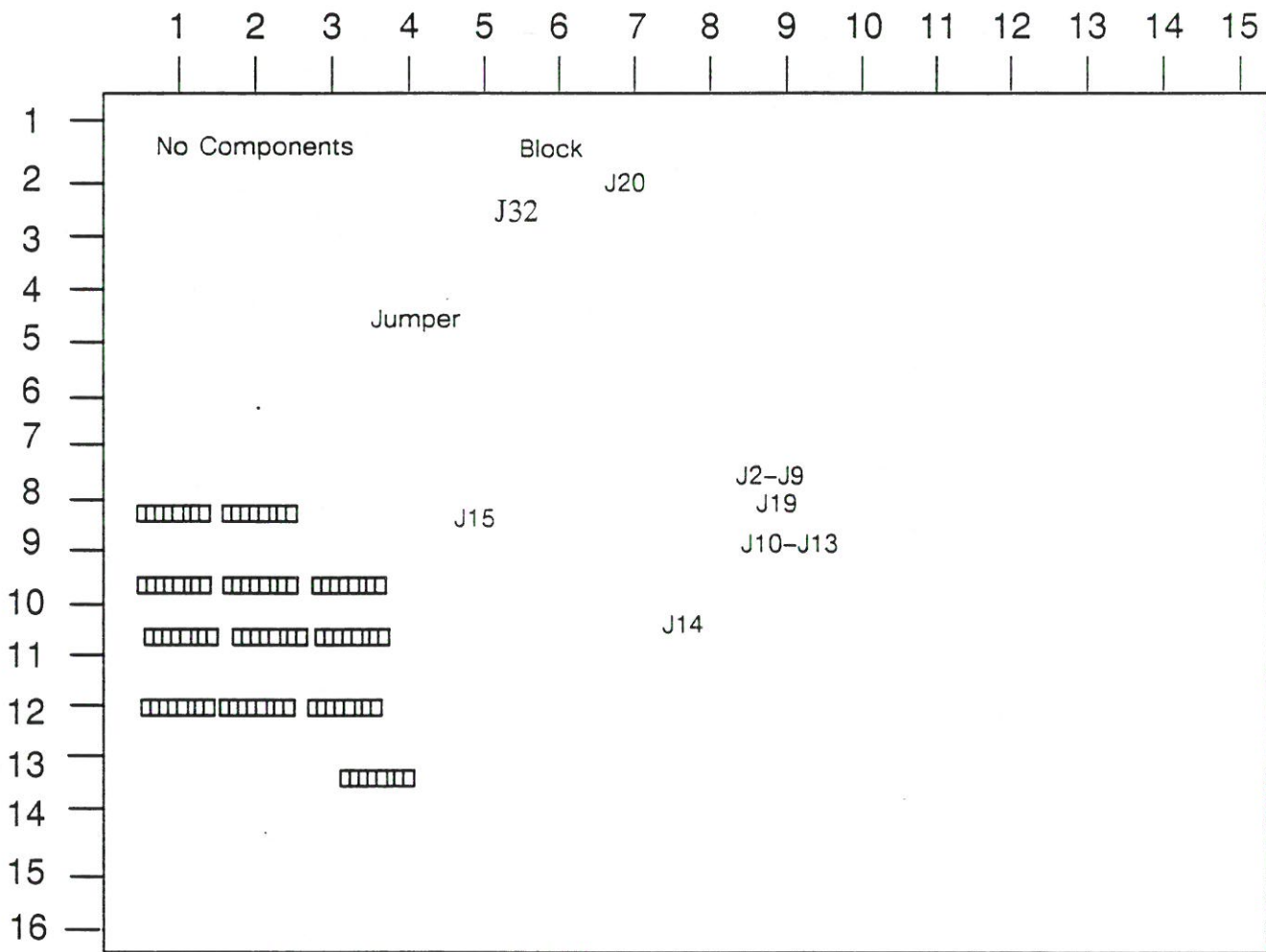


Figure A-12 Ethernet Controller Jumper/Switch Table

Switch	Configuration	Location (inches)	Description
S1-S8	OFF	8 1/4 down, 1 over	
S1-S8	OFF	8 1/4 down, 2 over	
S1-S8	S1,S8 = OFF S2-S7 = ON	9 3/4 down, 1 over	
S1-S8	S1,S8 = OFF S2-S7 = ON	9 3/4 down, 2 over	
S1-S8	ON	9 3/4 down, 3 over	

Figure A-12 Ethernet Controller Jumper/Switch Table (cont)

Jumper	Configuration	Location (inches)	Description
S1-S8	OFF	10 3/4 down, 1 1/4 over	
S1-S8	ON	10 3/4 down, 2 1/4 over	
S1-S8	ON	10 3/4 down, 3 1/2 over	
S1-S8	S1 = OFF, S2 = ON, S3 = OFF, S4 = ON S5 = OFF, S6-S8 = ON	13 1/2 down, 3 1/2 over	
J32	○ ○ ○	2 down, 5 over	
Block	0 ○ ○ J21 1 ○ ○ J22 2 ○ ○ J23 3 ○ ○ J24 HOST 4 ○ ○ J25 INT 5 ○ ○ J26 6 ○ ○ J27 7 ○ ○ J28	1 3/4 down, 5 1/2 over	
J20	○-○ J20 EXT ST AT	2 1/4 down, 6 3/4 over	
J2-J9	○ ○ J2 ○ ○ J3 ○ ○ J4 ○ ○ J5 ○ ○ J6 ○ ○ J7 ○ ○ J8 ○ ○ J9	7 1/2 down, 8 1/4 over	
J15	○ ○ ○	8 1/2 down, 4 1/4 over	
J19	○ ○	8 down, 8 1/2 over	
J10-J13	○ ○ J10 ○ ○ J11 ○ ○ J12 ○ ○ J13	8 1/2 down, 8 1/2 over	
J14	○ ○		

Figure A-13 **SCSI Controller Board (Part Number: A101015601)**

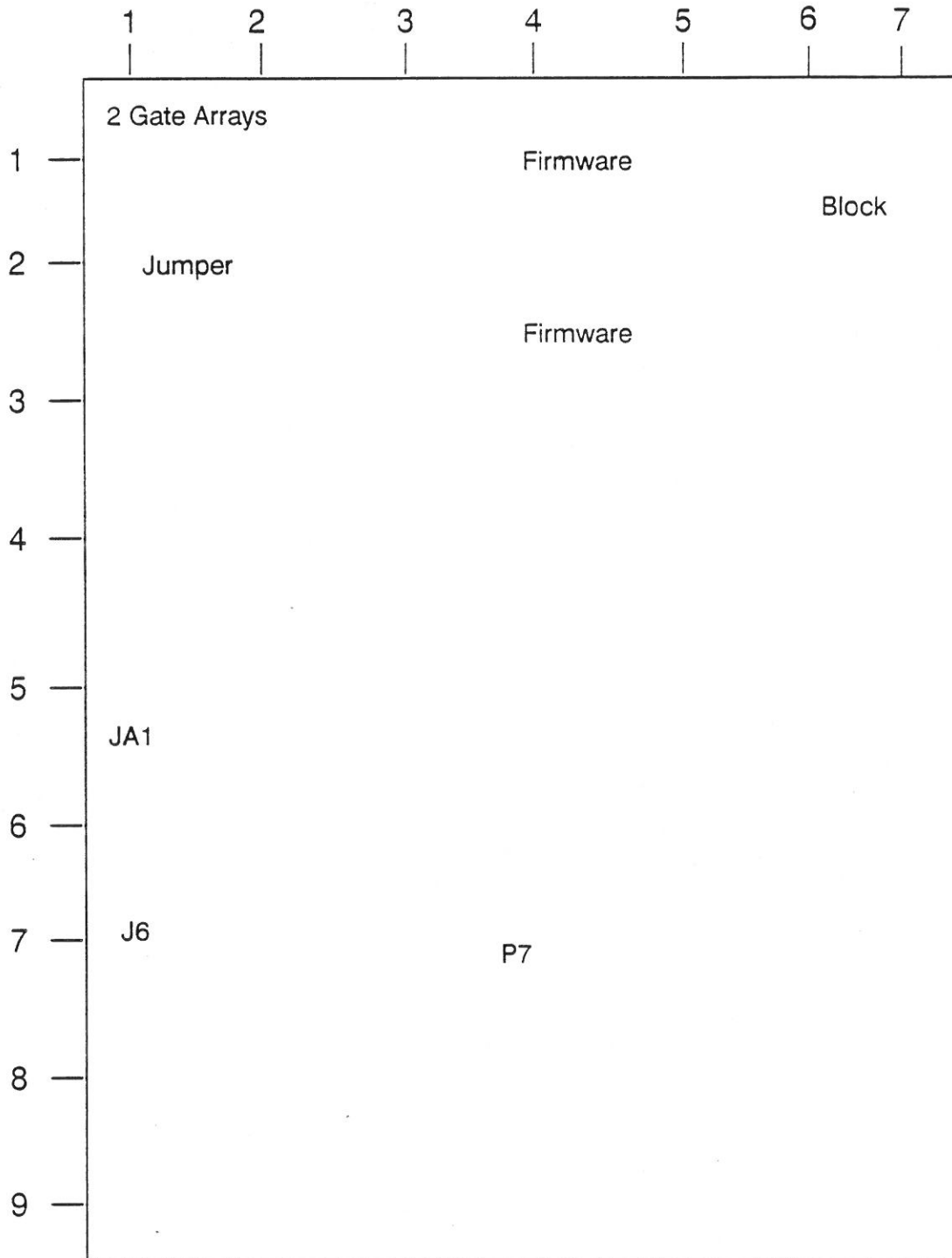


Figure A-14 SCSI Controller Board Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
	<pre> ○ ○ ○ ○ </pre>	2 down, 1 1/4 over	
JA1	<pre> ○ ○ </pre>	5 1/4 down, 1/2 over	
	<pre> ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ </pre>	1 3/4 down, 6 over	
J6 Connector	<pre> 60 ○ ○ 59 58 ○ ○ 57 56 ○ ○ 55 54 ○ ○ 53 52 ○ ○ 51 50 ○ ○ 49 48 ○ ○ 47 46 ○ ○ 45 44 ○ ○ 43 42 ○ ○ 41 40 ○ ○ 39 38 ○ ○ 37 36 ○ ○ 35 34 ○ ○ 33 32 ○ ○ 31 30 ○ ○ 29 28 ○ ○ 27 26 ○ ○ 25 24 ○ ○ 23 22 ○ ○ 21 20 ○ ○ 19 18 ○ ○ 17 16 ○ ○ 15 14 ○ ○ 13 12 ○ ○ 11 10 ○ ○ 9 8 ○ ○ 7 6 ○ ○ 5 4 ○ ○ 3 2 ○ ○ 1 </pre>	7 down, 3/4 over	

Figure A-14 SCSI Controller Board Jumper/Switch Table (cont)

FIRMWARE		1 down, 4 over	
FIRMWARE		2 1/2 down, 4 over	

Figure A-15 Terminal Controller (Part Number: 2217224G04)

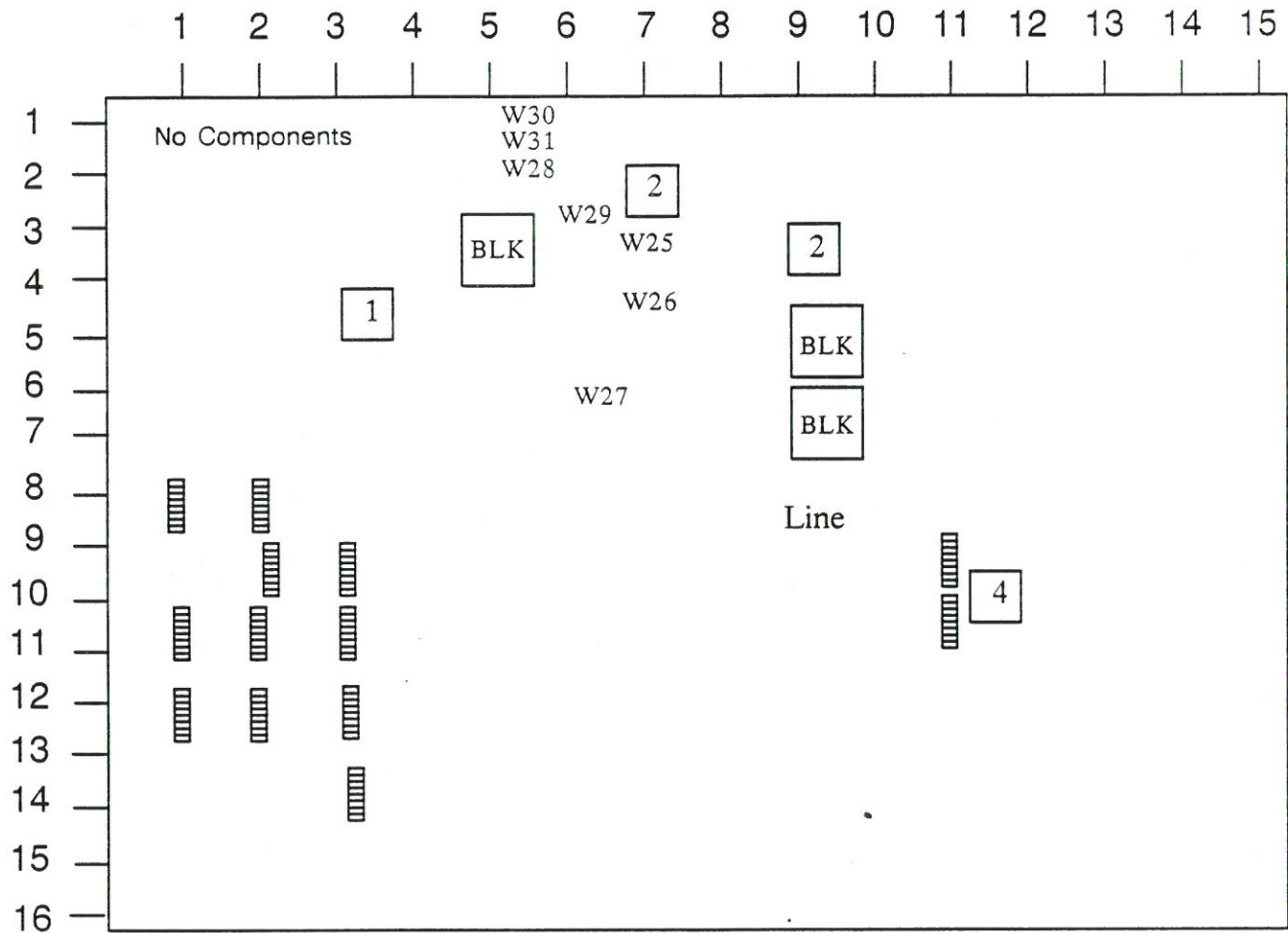


Figure A-16 Terminal Controller Switch/Jumper Table

Switch	Configuration	Location (inches)	Description
S1-S8	OFF	8 1/4 down, 1 over	
S1-S8	OFF	8 1/4 down, 2 over	
S1-S8	S1 = ON S2 = ON S3-S8 = OFF	9 1/2 down, 2 over	
S1-S8	S1-S7 = ON S8 = OFF	9 1/2 down, 3 over	
S1-S8	OFF	10 3/4 down, 1 1/4 over	
S1-S8	ON	10 3/4 down, 2 1/4 over	
S1-S8	ON	10 3/4 down, 3 1/2 over	
S1-S8	OFF	12 down, 1 1/4 over	
S1-S8	ON	12 down, 2 1/4 over	
S1-S8	S1-S4 = OFF S5-S8 = ON	12 down, 3 1/2 over	
S1-S8	S1,S2,S4,S6,S7,S8 = ON S3,S5 = OFF	14 down, 3 1/2 over	
S1-S8	S2 = ON S1 = OFF S3-S8 = OFF	9 down, 11 1/4 over	
S1-S8	S1-S8 = ON	10 1/4 down, 11 1/4 over	
1	○-○ ○-○	4 1/2 down, 3 1/2 over	
W30 W31 W28	○-○ ○ ○-○ ○ ○	1 1/2 down, 5 3/4 over	

Figure A-16 Terminal Controller Jumper/Switch Table (cont)

Jumper	Configuration	Location (inches)	Description
W29	<pre> ○ ○ </pre>	2 3/4 down, 6 over	
Block	<pre> ○○○○○○○○○ MEM ○○○○○○○○○ 11 12 13 14 15 16 17 ○○○○○○○○○ INT ○○○○○○○○○ 0 1 2 3 4 5 6 7 ○○○○○○○○○ I/O ○○○○○○○○○ 7 8 9 A B C D E F </pre>	3 1/4 down, 5 1/2 over	
2	<pre> ○ ○ </pre>	2 3/4 down, 7 over	
Block	<pre> 0 ○-○ 1 ○○ 2 ○○ 3 ○○ </pre>	5 down, 9 3/4 over	
W25	<pre> ○ ○ </pre>	3 1/4 down, 7 over	
Block	<pre> 1 ○○ 2 ○○ 3 ○-○ 4 ○○ </pre>	7 down, 9 3/4 over	
W26	<pre> ○ ○-○ ○ </pre>	4 down, 7 over	
Line	<pre> ○○○○○ ○-○ 4 3 2 1 </pre>	8 1/2 down, 9 over	
W27	<pre> ○ ○-○ 3 2 1 </pre>	6 1/2 down, 6 3/4 over	
3	<pre> ○ ○ </pre>	3 3/4 down, 9 3/4 over	
4	<pre> ○ ○ </pre>	11 1/4 down, 11 over	

Figure A-17 Disk Controller (Part Number: A101016G01)

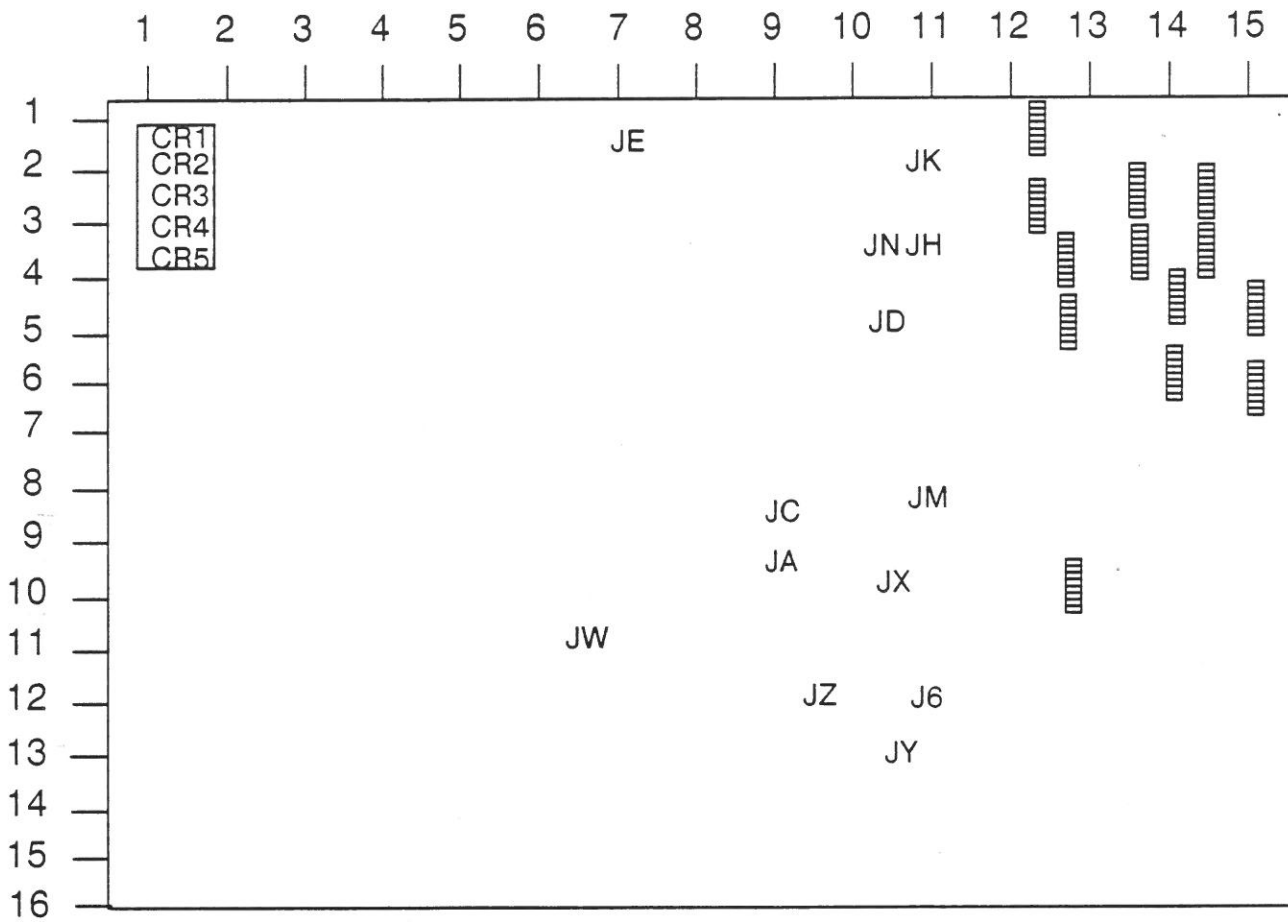


Figure A-18 Disk Controller Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
JE	4 ○-○ 3 2 ○-○ 1	1 1/2 down, 7 over	
JW	○ ○-○	11 down, 6 1/2 over	
JC	○ 2 ○ 1	8 1/2 down, 9 over	

Figure A-18 Disk Controller Jumper/Switch Table (cont)

JA	26 ○ ○ 25 24 ○ ○ 23 22 ○ ○ 21 20 ○-○ 19 18 ○ ○ 17 16 ○ ○ 15 14 ○-○ 13 12 ○-○ 11 10 ○-○ 9 8 ○ ○ 7 6 ○-○ 5 4 ○-○ 3 2 ○-○ 1	9 1/2 down, 9 over	
JZ	○-○ ○ 3 2 1	12 down, 9 1/2 over	
JK	8 ○-○ 7 6 ○-○ 5 4 ○-○ 3 2 ○-○ 1	2 down, 10 3/4 over	
JN	○ 2 ○ 1	3 1/2 down, 10 1/2 over	
JH	○ 3 ○ 2 ○ 1	3 1/2 down, 10 3/4 over	
JD	3 ○-○ 4 2 ○-○ 1	5 down, 10 1/2 over	
JM	○ 3 ○ 2 ○ 1	8 1/2 down, 10 3/4 over	
JX	16 ○ ○ 15 14 ○ ○ 13 12 ○ ○ 11 10 ○ ○ 9 8 ○-○ 7 6 ○ ○ 5 4 ○ ○ 3 2 ○ ○ 1	10 down, 10 1/2 over	
JG	4 ○ ○ 3 2 ○ ○ 1	12 1/4 down, 10 3/4 over	
JY	○ 2 ○-1	13 down, 10 1/2 over	

Figure A-18 Disk Controller Jumper/Switch Table (cont)

Switch	Configuration	Location (inches)	Description
S1-S8	S1-S3 = OFF S4 = ON S5 = OFF S6-S8 = ON	1 down, 12 1/4 over	
S1-S8	S1-S4 = OFF S5-S8 = ON	2 1/2 down, 12 1/4 over	
S1-S8	ON	3 3/4 down, 12 1/2 over	
Jumper	○-○ ○-○	10 down, 12 1/2 over	
S1-S8	S1-S3 = OFF S4 = ON S5-S7 = OFF S8 = ON	5 down, 12 3/4 over	
S1-S8	ON	2 1/2 down, 13 1/2 over	
S1-S8	ON	3 3/4 down, 13 1/2 over	
S1-S8	S1,S2 = ON S3 = OFF S4-S6 = ON S7, S8 = OFF	4 3/4 down, 14 over	
S1-S8	OFF	6 down, 14 over	
S1-S8	OFF	2 1/2 down, 14 1/2 over	
S1-S8	OFF	3 1/2 down, 14 1/2 over	
S1-S8	S1-S6 = ON S7, S8 = OFF	4 3/4 down, 15 over	
S1-S8	OFF	6 down, 15 over	

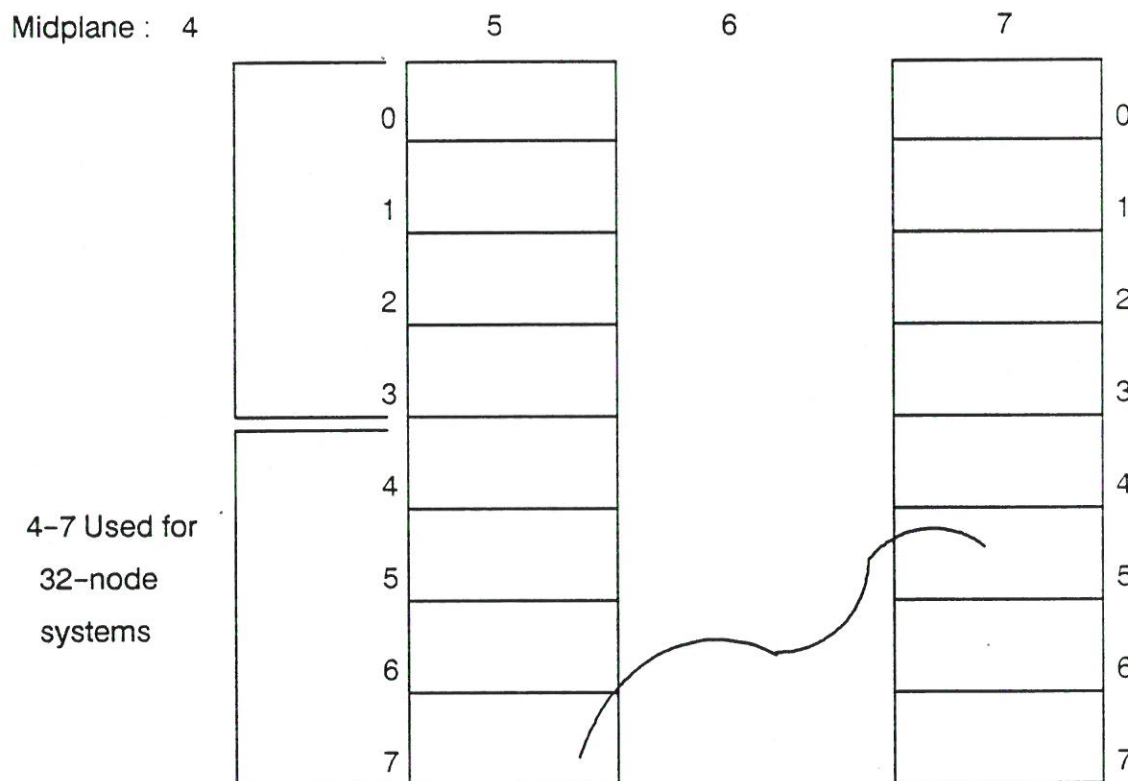
B

Cabling



The following describes the cabling used for a 32-processor TC2000 system.

- **TCS + 5 power supply/midplane cable**—This is a pair of cables, black and red, that runs from the midplane to the TCS + 5 power supply. There is one pair for each midplane in the system. For more than one midplane, the cables are tie-wrapped together.
- **Midplane/midplane data cable**—This is an intercabinet data cable that is connected according to the midplane identification number. In a 32-processor (4-expansion cabinet) system the midplanes are numbered from highest to lowest; i.e., 7 through 4. (If a new midplane is added, it becomes 3, etc.) The intercabinet midplane cable is always connected so as to correspond to its two midplane identifiers. For example, Figure B-1 illustrates a data cable connection between midplane 7 and midplane 5:

Figure B-1 Midplane to Midplane Connection

- **Midplane/Clock card data cable**—This cable connects to the same plug number on the clock card as the midplane number to which it is connected; e.g., midplane 7 connects to clock card plug 7. The clock card plugs are located on the bottom right of the clock card.
- **Midplane/Bulk Power Supplies**—There are two sets of cables per bulk power supply. One set
- **PDU/PDU**—One wire, daisy-chained, connects all the PDUs in the system together.
- **Peripheral PDU/TCS**—There is a control-out cord from the top of the TCS to the peripheral PDU.
- **SCSI Controller/1/4-inch Tape Drive**—There is one cable from the SCSI controller in the 6U VME Card Cage to the 1/4-inch tape drive in Control Panel assembly portion of the Utility cabinet.
- **6U VME Repeater/9U VME Repeater**—Two cables, one at the top and one at the bottom of each repeater, connects them to one another. (One cable is wider than the other.)

Field Replaceable Unit (FRU) Part Numbers



The following table lists the TC2000 Field Replaceable Units along with their part numbers.

Table C-1

TC2000 FRUs

Item	Part Number
scsi board kit	A101015G01
ethernet kit	A101004G03
b2vme, rprr kit	A101019G01
vme i/o option, 9u	A117009G01
b2loop kit	A101013G01
850 mb disk kit #1	A105004G01
1/4" tape & pwr cntrl	A107003G01
pdu	2214874G01
vme cardcage assy	2217303G01
i/o pwr supply assy	2217428G01
fan, 220/230 V	7014753-01
cable assy, fan ac	2417408G01
emi spring clips	8817286-01
disk controlr kit	A101016G01
tape controlr kit	A101018G01
term controlr kit	A101017G01
1/2" tape drive kit	A107004G01
perph cab pdu, domestic	2517355-01

pcb assy, modem, pc/ at domestic	2514600-01
4 1/2" fan	7017373-01
tcs pc chassis, domes- tic	2214880G01
neon lamp, pdu	6015012-01
emi spring clips	8817286-01
air filter, slant area	8817411-01
air filter, drip screen	8817412-01
switch, drip screen, in- terlock	6717413-01
switch, thermal	6717414-01
pwr supply, 1500 W switcher	2517422-01
emi spring clips	8817286-01
base air filter	8814999-01
i/o pwr supply assy	2217428G01
vme cardcage assy 6U	2217303G01
850 mb disk kit #2	A105004G02
850 mb disk kit #3	A105004G03
850 mb disk kit #4	A105004G04
850 mb disk kit #5	A105004G05
16 port term kit	A113003G02
cable assy, clock	2414965-01
cable assy, b2clk power	2417372G01
cable assy, domestic pwr crd	2417369G01
cable assy, midplane tcs power	2417368G01
cable assy, logic to chassis gnd	2417370G01
cable assy, ground, bulk	2417494G01
cable assy, configura- tion, 14"	2414966-01
cable assy, configura- tion, 24"	2414966-02
cable assy, configura- tion, 35"	2414966-03
cable assy, clock	2414965-01
cable assy, midplane tcs power	2417368G01

cable assy, pdu daisy chain	2417371G01
cable assy, domestic pwr crd	2417369G01
cable assy, pertec, flat shielded	2417479G01
cable assy, telco, tcs to rear panel	2414731G01
cable assy, telco, external	2417367G01
cable assy, uc internal ac dist.	2417374G01
cable assy, b2fp to pdu's	2417376G01
cable assy, tcs to fp	2414738G01
cable assy, ground jumper	2417480G01
cable assy, b2fp to switches	2417446G01
cable assy, uc pdu to bulkhead	2417473G01
cable assy, 1/4" tape scsi	2417448G01
cable assy, tcs to b2clk	2414732G01
cable assy, rs232, tcs to rear pnl	2415051G01
cable assy, tcs + 5 power	2417375G01
cable assy, tcs + 5 rtn	2417429G01
cable assy, 1/4" tape power	2417378G01
cable assy, upper fans ac dist.	2417447G01
cable assy, fan & i/o ac input	2417405G01
cable assy, safety control	2417407G01
cable assy, fan ac	2417408G01
cable assy, parallel	2417423G01
cable assy, jumper, bulk ac input	2417424G01

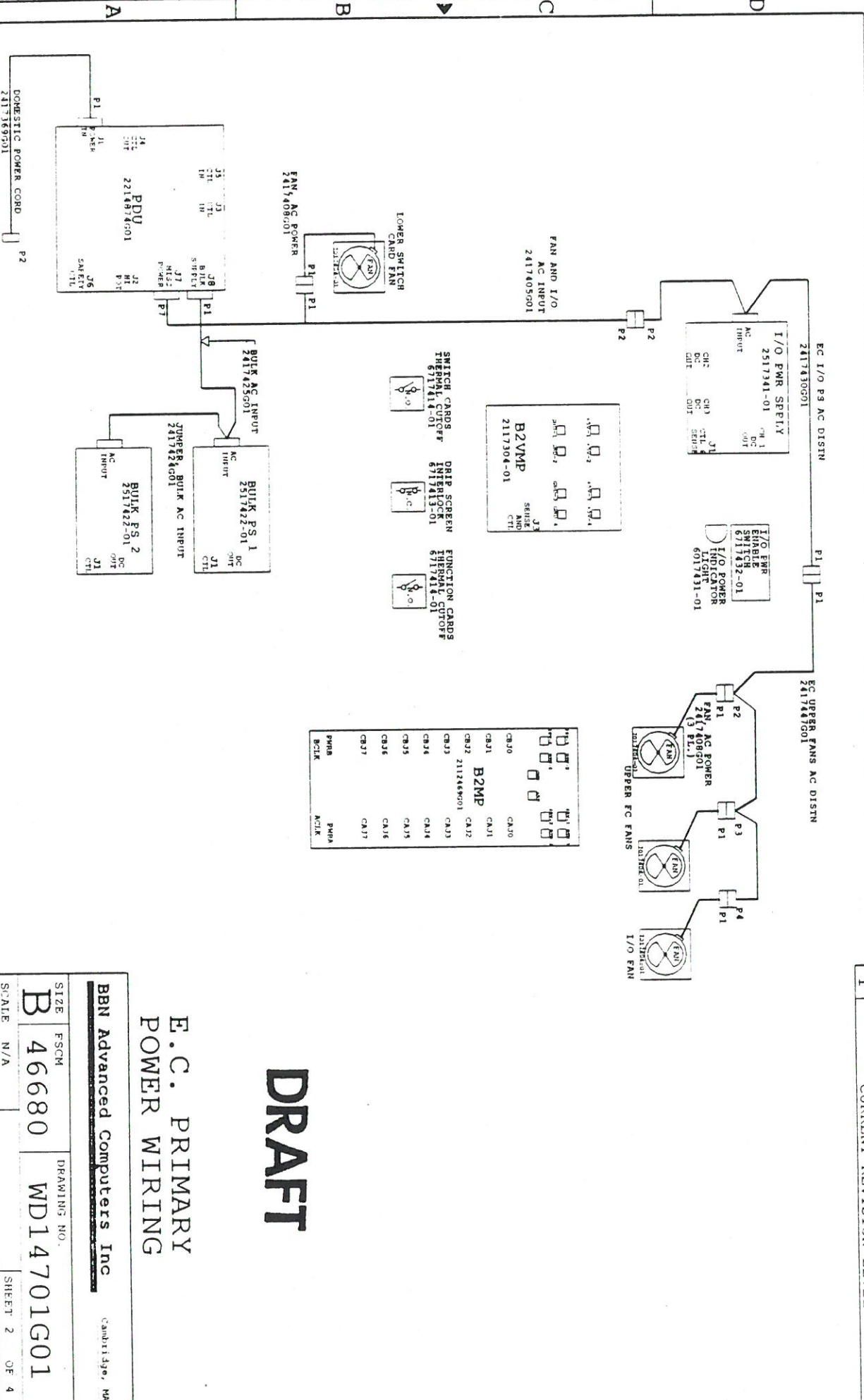
cable assy, bulk ac input	2417425G01
cable assy, i/o pwr & control	2417437G01
cable assy, i/o p/s ac	2417430G01
cable assy, bulk DC out	2417106G01
cable assy, i/o p/s, dc output	2417436G01
cable assy, smd a, flat, shld	2417477Gxx
cable assy, smd b, flat, shld	2417478Gxx
cable assy, repeater, J1	2417343-01
cable assy, repeater, J2	2417344-01
cable assy, rs232, 20' shielded	2417495G01
cable assy, uc to periph PDU	2417449G01
B2SS Assembly Rev A	2112470G01
B2SR Assembly Rev A	2114594G01
B2VME Assembly Rev A	2112472G01
B2CLK Assembly Rev B	2114872G01
B2MP Rev A SCD	A107004G01

Wiring Diagrams



This appendix contains wiring diagrams for the expansion and utility cabinets:

- Expansion cabinet primary power wiring
- Expansion cabinet secondary control and power wiring
- Expansion cabinet data wiring
- Utility cabinet primary power wiring
- Utility cabinet secondary control and power wiring
- Utility cabinet data wiring



DRAFT

**E.C. PRIMARY
POWER WIRING**

BBN Advanced Computers Inc Cambridge, MA

SIZE	FSCM	DRAWING NO.
B	46680	WD14701G01
SCALE	N/A	SHEET 2 OF 4

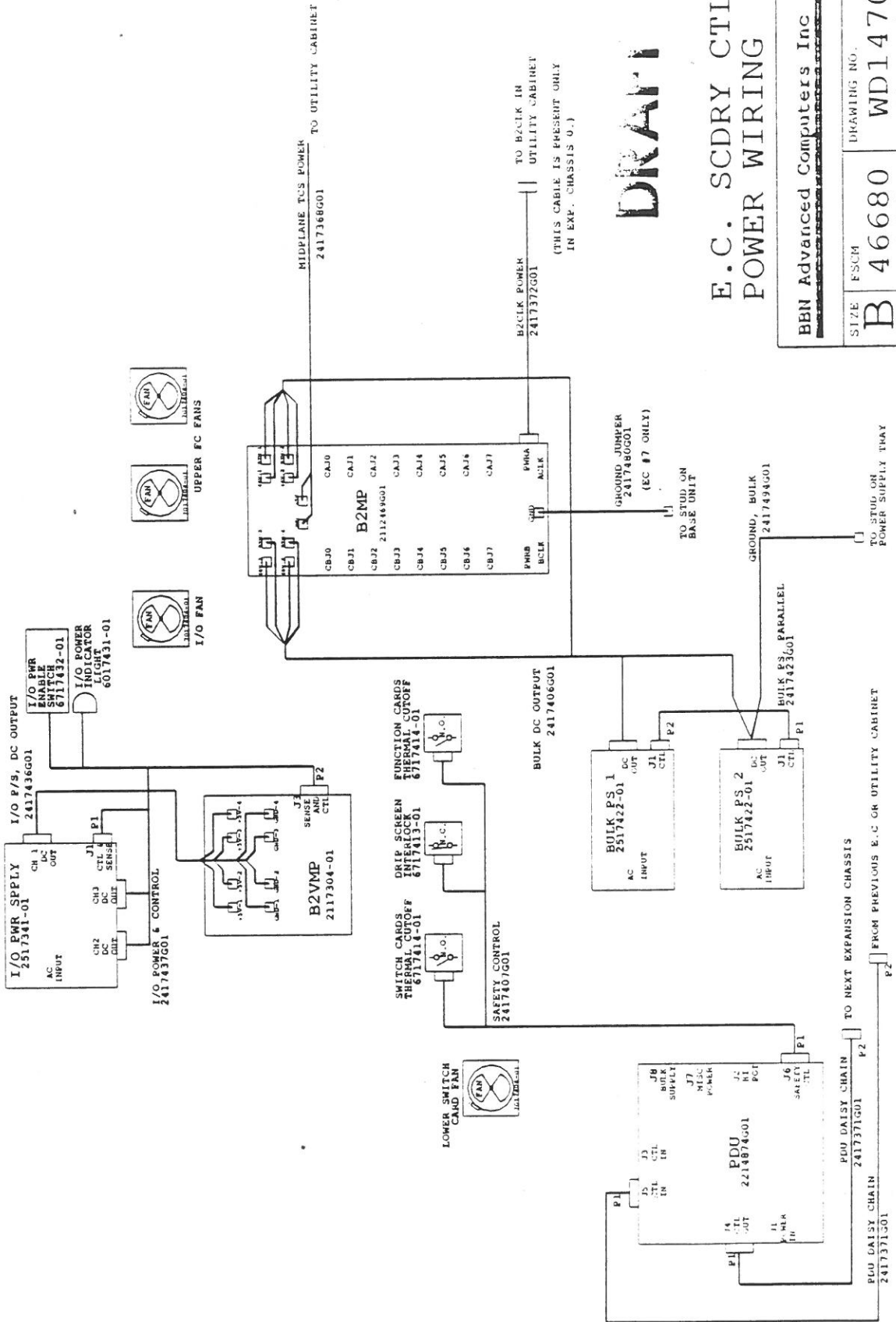
CURRENT REVISION LEVEL

1

2

3

4



DRAFT

E.C. SCDRY CTL & POWER WIRING

BBN Advanced Computers Inc
Cambridge, MA

SIZE FSCM
B 46680

DRAWING NO.
WD14701G01

SCALE 1/4" = 1"

SHEET 3 OF 4

TO STUD ON BASE UNIT

TO STUD ON POWER SUPPLY TRAY

TO NEXT EXPANSION CHASSIS

TO NEXT EXPANSION CHASSIS

FROM PREVIOUS E.C OR UTILITY CABINET

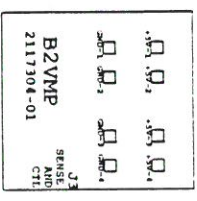
FROM PREVIOUS E.C OR UTILITY CABINET



UPPER SWITCH
CARD FAN



LOWER SWITCH
CARD FAN



SWITCH CARDS
THERMAL CUTOFF



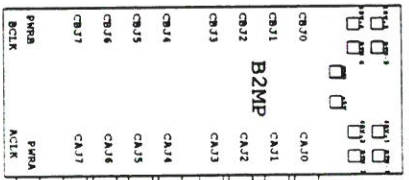
DRIP SCREEN
INTERLOCK



FUNCTION CARDS
THERMAL CUTOFF



UPPER FC FANS



- CA30 CONFIGURATION, 32* 2414966-03 TO MIDPLANE 4
- CA31 CONFIGURATION, 23* 2414966-02 TO MIDPLANE 5
- CA32 CONFIGURATION, 13* 2414966-01 TO MIDPLANE 6
- CA33 B2LOOP A101013901 TO MIDPLANE 6
- CA34 CONFIGURATION, 32* 2414966-03 TO MIDPLANE 4
- CA35 CONFIGURATION, 23* 2414966-02 TO MIDPLANE 5
- CA36 CONFIGURATION, 13* 2414966-01 TO MIDPLANE 6
- CA37 B2LOOP A101013901 TO MIDPLANE 6

B2LOOP CARDS AND CONFIG CABLES ARE SHOWN FOR A REPRESENTATIVE CASE: MIDPLANE 7 IN A 32 SLOT (4 MIDPLANE) SYSTEM.

DRAFT

E.C. DATA WIRING

BBN Advanced Computers Inc Cambridge, MA

SIZE	FSCM	DRAWING NO.	SHEET 4 OF 4
B	46680	WD14701G01	
SCALE	N/A		



LOWER FC FANS

CURRENT REVISION LEVEL

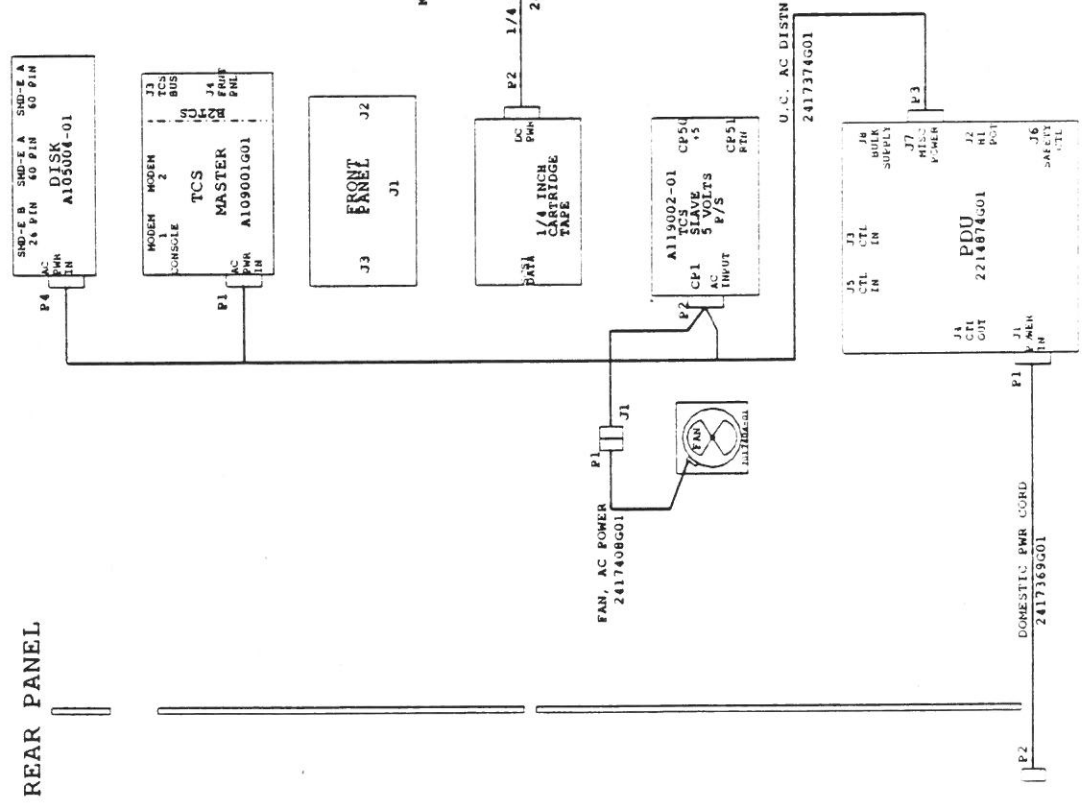
1

2

3

4

REAR PANEL



DRAFT

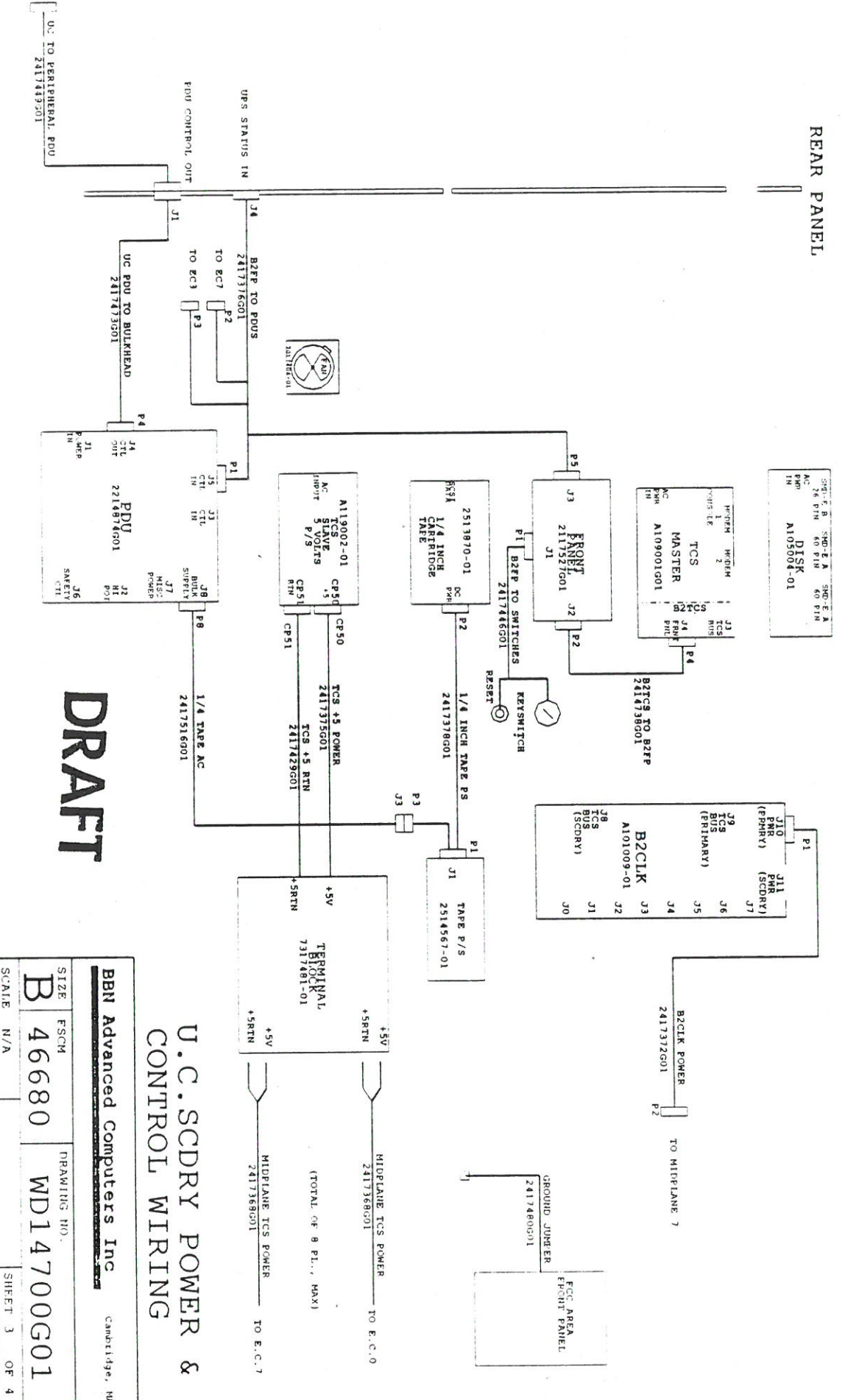
U.C. PRIMARY POWER WIRING

BBN Advanced Computers Inc. Cambridge, MA

SIZE: ESEM DRAWING NO. **B 46680** WD14700G01

SCALE: H/A SHEET 2 OF 1

REAR PANEL



DRAFT

U.C. SCDRY POWER & CONTROL WIRING

BBN Advanced Computers Inc Cambridge, MA

SIZE	ESCM	DRAWING NO.
B	46680	WD14700G01
SCALE	N/A	SHEET 3 OF 4

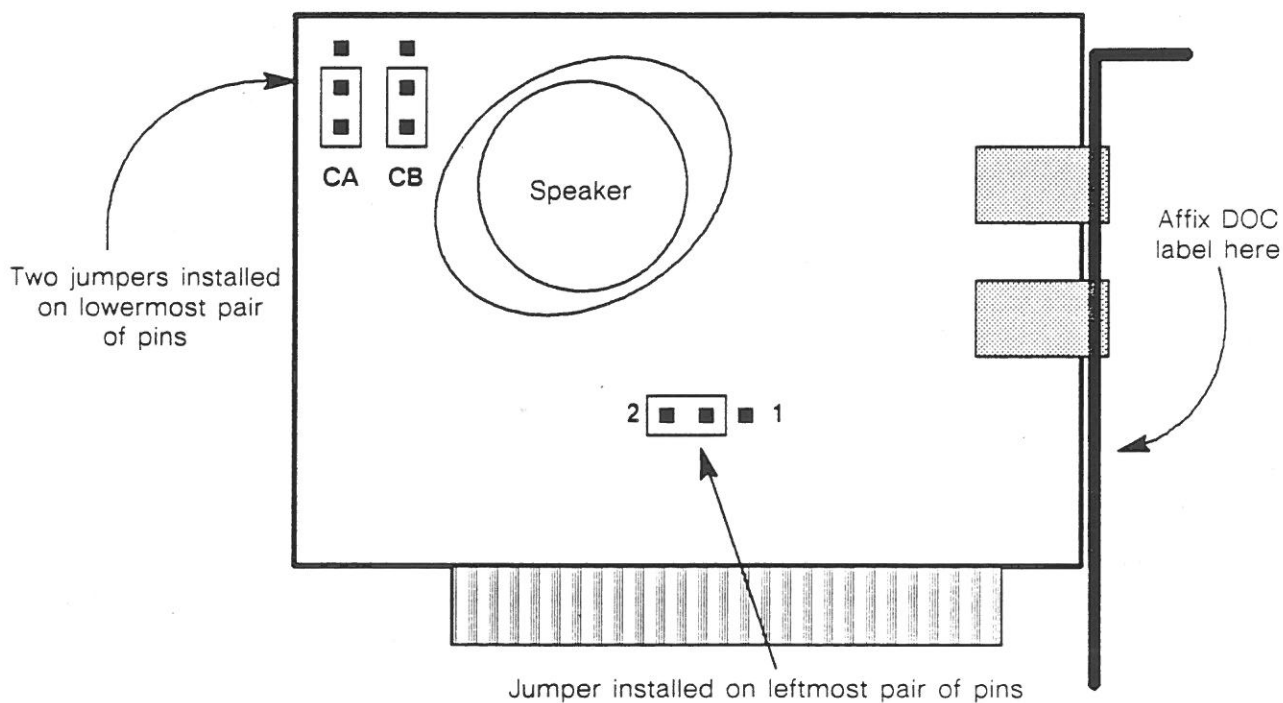
Modem Installation



E.1 Pre-Installation Modem Set Up

The modem for the TCS Master is a Universal Data Systems "FasTalk 2400 PC". It must be configured to respond as the PC's COM1 communication device. Set the three jumpers as shown in Figure E-1 below. Affix the Canadian DOC label to the modem's metal bracket in the location as indicated.

Figure E-1 View of Component Side of FasTalk 2400 Modem Card



E.2 Modem Installation

Modem installation may occur during TC2000 site installation or at the factory.

In the case of on site installation the TCS Master enclosure will already be mounted in the TC2000's Utility Cabinet. The enclosure must be removed from the Utility Cabinet to install the modem.

1. Remove the cover from the TCS Master enclosure.
2. Remove the blank bracket from the 8th slot over from the power supply. Keep the original screw.
3. Install the modem card (SEQ# 1) in the 8th slot over from the power supply. Use the slot's original screw to secure.
4. Replace the TCS Master's cover using the original screws.
5. Replace the TCS Master enclosure into the TC2000 Utility Cabinet.

E.3 Cable Installation

There are three telephone cables in the Modem Kit. The modem comes with one, and BBNACI adds two more. The two short ones are installed between the modem and the Utility Cabinets rear panel.

1. Plug the cable that came with the modem into the modem's phone jack. Plug into the modem telephone jack that is farthest away from the TCS Master enclosure D connectors, labeled "WALL".
2. Plug the other end of this cable into the uppermost telco-jack in the Utility Cabinet rear panel labeled: "TELCO LINE". (This jack is a PC board assembly bolted onto the sheet metal rear panel. The cable is plugged into the jack on the *inside* of the cabinet.)
3. Plug the other short cable (SEQ# 3) into the modem. Plug into the telephone jack nearest the TCS Master enclosure D connectors, labeled "PHONE".
4. Plug the other end of this cable into the lowest telco-jack in the Utility Cabinet rear panel labeled: "PHONE". (This jack is a PC board assembly bolted onto the sheet metal rear panel. The cable is plugged into the jack on the *inside* of the cabinet.)
5. Plug the long telephone cable (SEQ# 2) into the Utility Cabinet telephone jack label "TELCO LINE" on the outside of the cabinet.
6. This completes the modem installation.

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3. What system are you currently working on? GP1000 TC2000
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