Butterfly™ 1000 Maintenance Manual

► User Guide

BBN Advanced Computers Inc.
A Subsidiary of Bolt Beranek and Newman Inc.

GP1000
Maintenance Manual

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BBN Advanced Computers Inc.

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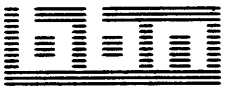

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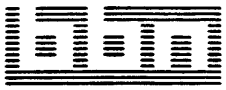


Purpose of the Manual

This manual is a reference for working on the GP1000 hardware. After reading this document, you should be able to change any of the Field Replaceable Units (FRUs) in the GP1000 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:

  Butterfly Bugs
  BBN Advanced Computers Inc.
  10 Fawcett St.
  Cambridge, MA 02238

- 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 Mach 1000 and the GP1000

- The **size** of your GP1000 (number of nodes and amount of memory)
- The **number of nodes** that were in your **cluster**
- The **total number of users** on the GP1000 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 system administrators who are new to Mach 1000 and to the GP1000. 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 GP1000 Document Set is a guide to the entire set of manuals that came with your GP1000. If you're not sure where to look for information, this is a good place to start.

For information on the hardware theory, see *Inside the GP1000*. For information on how to use the diagnostics, see the *GP1000 Diagnostic Guide*.

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 Drive, see *Xylogics Model 451 User's Manual.*

Organization

Chapter one contains an overview of the hardware and maintenance issues. Chapter two describes the steps to defining hardware problems. Chapter three describes how to replace the hardware in the main butterfly card cage.

Chapter four describes how to replace the hardware in the Multibus card cage. Chapter five describes how to replace the hardware in the disk, 1/4", and 1/2" tape subsystems. Chapter six describes how to change hardware in the power delivery subsystem. Chapter seven describes what is needed and when preventative maintenance routines should be done. Appendix A describes the jumper settings for everything in the GP1000. Appendix B describes how switch cabling is done.

Typographic Conventions

This manual uses the following conventions to present information:

bold	Text in **bold** indicates an exact filename, a command, or user input.
italics	Text in *italics* indicates a variable, or a value that the user supplies; for example, *filename* stands for the file under discussion.
`type`	Text in `typewriter` font represents computer output.
bold italics	Text in ***bold italics*** 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.

1

Overview

1.1 Introduction

This chapter contains an overview of GP1000 system components from a system maintenance viewpoint. Each GP1000 can be viewed as consisting of a number of Field Replaceable Units (FRUs). When a component fails and needs to be replaced, the entire FRU is replaced. For example, if a board-level component fails, the entire board is replaced, not the individual device. Or if a disk platter fails, the entire disk drive unit is removed and replaced, not the individual platter.

In addition to a functional overview of FRUs, this chapter describes the various maintenance plans in terms of the specific responsibilities for each FRU.

1.2 GP1000 Functional Overview

Each GP1000 system, no matter what its size, can be viewed as a collection of FRUs. In fact, virtually every component of a GP1000 can be replaced in the field, if need be. From the standpoint of this manual, the various FRUs can be organized as subsystems. There are eight subsystems that make up the GP1000. Instructions for removal and replacement of the FRUs in each subsystem are contained in the subsequent chapters.

The subsystems that make up a GP1000 are:

- Butterfly Card Cage Subsystem
- Multibus Card Cage Subsystem
- Terminal Controller Subsystem
- Ethernet Controller Subsystem
- Disk Subsystem

- 1/4 Inch Tape Subsystem
- 1/2 Inch Tape Drive Subsystem
- Power and Ventilation Subsystem

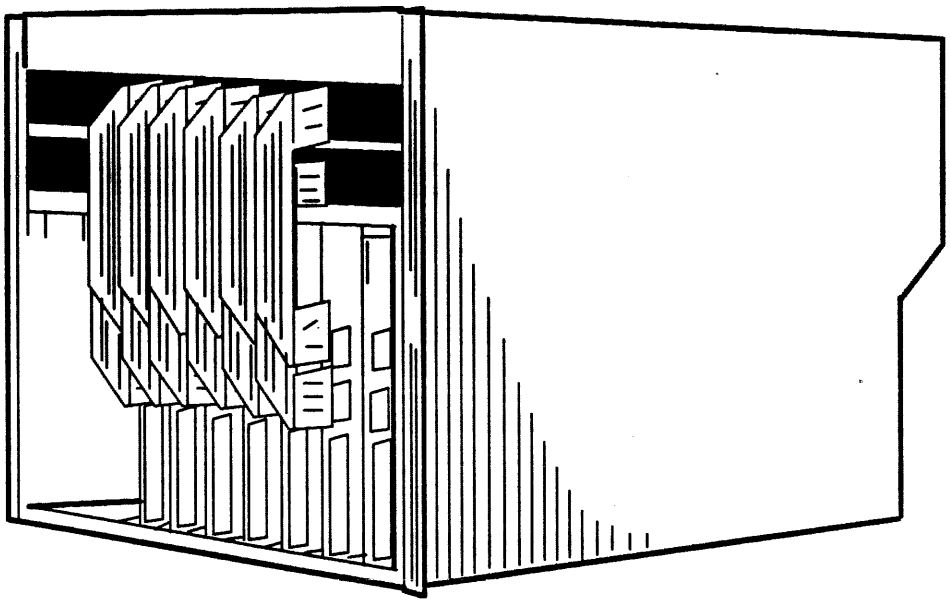
This section of the chapter will discuss each field-replaceable component within these subsystems in turn. For a more detailed and in-depth discussion of the theory of operation of each GP1000 component, refer to *Inside the GP1000.*

1.2.1 Butterfly Card Cage Subsystem

Each GP1000 has one or more Butterfly Card Cages (BCVs). Each BCV contains from two to 16 Butterfly Processor Board (BPNEs), one or two Butterfly VLSI Switch Nodes (BVSNs), and the cables required to connect the components to each other and other components in other subsystems. In addition to BPNEs and BVSNs, a BCV may contain a Butterfly Clock Card (BCLK2). In the rear of the BCV is a power supply that supplies 30VDC to all of the boards in the BCV.

Figure 1-1 is a drawing of a Butterfly Card Cage.

Figure 1-1 Butterfly Card Cage (BCV)



Butterfly Processor Board (BPNE)

The BPNEs are the main processing engine for the GP1000. Each BCV contains a minimum of two and a maximum of 16 BPNEs. The processor boards consist of a MC68020 microprocessor, 68851 and 68882 support chips, four megabytes of main memory, and a processor node controller (PNC). All BPNEs in a GP1000 system can communicate to all other BPNEs through the BVSN switch.

Butterfly VLSI Switch Node (BVSN)

Each BCV contains either one or two BVSNs. These boards distribute all data and control messages among the BPNEs in a system. In addition, the BVSNs also distribute clock and system reset signals. The switch cards are mounted in two horizontal slots directly above the BPNEs. A metal panel mounted at the front of each BVSN has 32 connectors, 16 for switch input, and 16 for switch output. The inputs and outputs are paired together.

Butterfly Clock Board (BCLK2)

GP1000 systems containing up to 16 BPNEs use a single BVSN as their clock source and no BCLK2 is needed. Systems with more than 16 BPNEs depend on a separate clock card and use the switch to distribute the system clock signal throughout the machine. The BCLK2 occupies the rightmost vertical slot in the BCV.

1.2.2 Multibus Card Cage Subsystem

Each GP1000 contains one Multibus Card Cage (BCM2). The BCM2 contains nine horizontal slots for Multibus-compatible controller circuit boards. All slots have identical capabilities except for the bottom slot, which only accommodates slave boards. All control and data signals for GP1000 peripherals are sent through the BCM2.

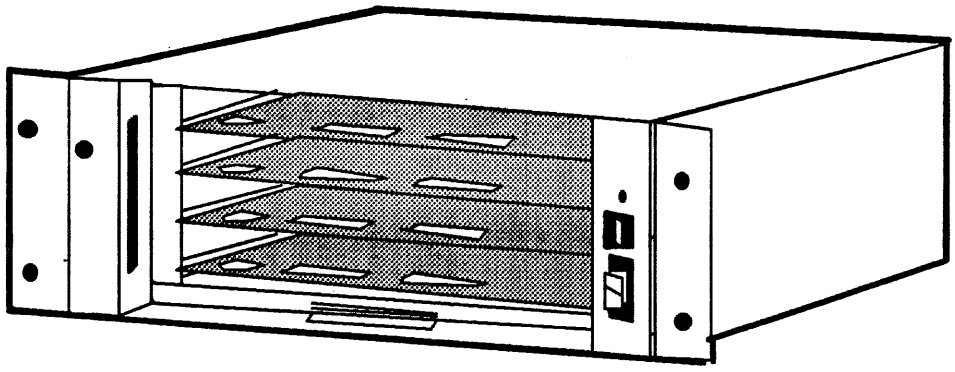
A BCM2 card cage always contains at least five circuit boards: the GP1000 Multibus Adapter board (BMA), the iSBX and SCSI card pair that control the 1/4 inch tape drive, a disk drive controller card, and an Ethernet controller card. In addition to the above circuit cards, a BCM2 can contain a 1/2 inch tape drive controller, a serial terminal cluster controller, and, in some cases, custom boards installed and maintained by users.

Figure 1-2 is a list of the standard slots for Multibus board. Figure 1-3 is a drawing of a Multibus card cage (BCM2).

Figure 1-2 Multibus Standard Slot Assignments

1. BMA
2. SCSI daughter board
3. MB/ISBX mother board
4. MB/TC (1/2 inch tape controller
5. MB/DC
6. MB/TERM
7. Empty
8. MB/EN (Ethernet controller)
9. Empty

Figure 1-3 Multibus Card Cage (BCM2)



Butterfly Multibus Adapter Board (BMA)

The BMA connects the GP1000 processor nodes to I/O devices that conform to the IEEE 796 (Multibus) standard. The BMA is cabled to a single BPNE,

called the king node. All data and control signals into and out of the BCM2 from the BCVs travel over the data link within the king node. (The king node is structurally identical to all other nodes. The only difference between the king node and a normal BPNE is that the king node is connected directly to the BMA. Any BPNE has the potential to be the king node.)

The BMA channels and controls all signals from the GP1000 processing elements to and from the GP1000 peripherals. It must occupy the top slot in the BCM2.

Multibus iSBX/SCSI Boards (MB/ISBX and MB/SCSI)

The Multibus iSBX board is a motherboard that accommodates the Multibus Small Computer System Interface controller board, and also supplies a clock/calendar signal to the BCM2. The two boards act as the controller for the 1/4 inch tape drive. The boards can be plugged into any two adjacent slots of the BCM2 except the top slot (which is reserved for the BMA) and the bottom slot (which only accommodates slave boards).

Multibus Disk Controller Board (MB/DC)

The MB/DC can drive up to four 8–inch winchester disk drives. It can be installed in any slot except the top and bottom slots.

Multibus Ethernet Controller Boad (MBEN2)

The MBEN2 is an IEEE 796 compatible Ethernet controller. It can be installed in any BCM2 slot except for the top and bottom slots. The controller acts as the front–end processor for the IEEE 802.3 local area network (Ethernet version 2).

Multibus Tape Controller Board (MB/TC)

In GP1000 systems configured with a Pertec 1/2 inch tape drive, the BCM2 will contain a tape controller board. The MB/TC should be installed in the 4th slot of the Multibus card cage.

Multibus Terminal Cluster Controller Board (MB/TERM)

The MB/TERM is an optional terminal controller installed in the BCM2 when the GP1000 system is configured with optional RS–232 terminal cluster controllers.

Other Multibus Card Cage Circuit Boards

Some user sites have customized configurations containing Multibus boards other than the standard and optional Multibus peripheral controllers. Support for such configurations is solely the responsibility of the user; they are not maintained by BBN ACI.

1.3 GP1000 Maintenance Programs

There are three different levels of maintenance contracts offered by BBN ACI: Comprehensive Maintenance, Shared Maintenance, and Limited Maintenance. In addition, customers may elect to forgo any maintenance contract, and instead have system problems handled by BBN ACI on a time and materials basis.

This section briefly describes the maintenance responsibilities of customers and of BBN ACI under the respective programs.

NOTE

The contents of this section are informational in nature only and in no way supersede or modify any contractual relationship between any user and BBN ACI. If any discrepancy or ambiguity exists between the express terms of the user's maintenance contract and the contents of this manual, the discrepancy or ambiguity should be resolved in favor of the contractual terms.

1.3.1 Comprehensive Maintenance

Comprehensive Maintenance is BBN ACI's most complete hardware maintenance service. This option provides customers with on-site hardware service delivered by BBN ACI's own Customer Support Engineers.

Features of Comprehensive Maintenance include:

- On-site hardware service
- Hotline number for reporting hardware problems
- Field change order service

How Comprehensive Maintenance Works

If your GP1000 site is covered by Comprehensive Maintenance and you suspect a hardware problem, simply call the BBN ACI Customer Support Hotline at 1-800-4AC-BFLY (1-800-422-2359). Your call is entered in our automated call control system to ensure each problem is tracked and resolved. The BBN

ACI Hotline is manned from 9:00 AM to 5:00 PM EDT Monday through Friday.

Once you call the Hotline you will speak with a BBN ACI Customer Support Engineer. After discussion of the failure symptom, a field engineer will be dispatched to your site to correct the problem. The Hotline procedures ensure that all information needed to resolve the problem is available to the field engineer, and that the person who makes the service call will have the proper parts and test equipment available to fix the problem.

Field Change Order Service

Comprehensive Maintenance includes an automatic hardware update service. Each time a field change order is issued by BBN ACI development or sustaining engineers, a Customer Support Engineer will be dispatched to install the change on your GP1000 hardware. This service ensures that your system is operating with the latest factory-specified hardware. In addition, all parts used in any service call will be at the latest revision level.

1.3.2 Shared Maintenance

The Shared Maintenance program provides a framework whereby customers and BBN ACI share responsibility for correcting system hardware malfunctions. Combining the customer's own resources with the expertise of BBN ACI's engineering staff results in a high level of service at a relatively low cost.

Features of Shared Maintenance include:

- Hotline number for reporting hardware problems
- Unlimited hardware phone support
- Hardware diagnostics
- Overnight parts replacement in the U.S.
- Complete diagnostic documentation
- Field change order service
- Limited on-site service calls
- Complimentary customer training

How Shared Maintenance Works

If your GP1000 site is covered by Shared Maintenance, the maintenance process starts when you call the BBN ACI Customer Support Hotline at 1-800-4AC-BFLY (1-800-422-2359). Your call is entered in our automated call control system to ensure each problem is tracked and resolved. The BBN

ACI Hotline is manned from 9:00 AM to 5:00 PM EDT Monday through Friday.

BBN ACI's trained Customer Support Engineers work with you over the phone to identify and resolve the hardware problem. If necessary, the Customer Support Engineer will use the GP1000's Remote Diagnostic capability to aid in diagnosing the problem. Once the failed FRU is located, your internal system maintenance specialist (Customer Site Representative) can then replace it. If a replacement is not available in your on-site spares kit, BBN ACI will ship the replacement part to you via overnight carrier (limited to U.S. sites only—foreign parts replacement requires more time. See your service agreement for further details). Once your Customer Site Representative replaces the defective FRU, he or she ships the defective part back to BBN ACI.

All replacement parts shipped by BBN ACI will be at the latest revision level.

Unlimited Hardware Phone Support

BBN ACI Customer Support Engineers are available during Hotline working hours to aid in diagnosing hardware problems, help with troubleshooting, and even to walk your Customer Site Representative through the necessary component replacement steps. There is no additional charge for telephone support.

Diagnostic Documentation

Using this manual and the *GP1000 Diagnostic Manual*, customer site representatives can confidently diagnose hardware problems and replace all field replaceable units.

Field Change Order Service

Shared Maintenance includes an automatic hardware update service. Each time a field change order is issued by BBN ACI development engineers, a replacement part will be dispatched for your customer site representative to install on your GP1000 hardware. This service ensures that your system is operating with the latest factory-specified hardware.

Limited On-Site Service Calls

If a hardware problem cannot be resolved through a combination of telephone consultation, remote diagnostics and customer replacement of a field replaceable unit, BBN ACI will dispatch a Customer Support Engineer to correct the malfunction.

Customer Training

BBN ACI provides each Shared Maintenance customer with a complimentary one-time System Administrator/Maintainer course. This course provides the skills necessary to perform the tasks required of the Customer Site Representative. Additional training courses for new customer site representative trainees, or refresher courses for current site representatives, are available for an additional charge.

1.3.3 Limited Maintenance

Customers with on-site service resources can take advantage of BBN ACI expertise by entering into a Limited Maintenance agreement. Limited Maintenance is similar to, but less comprehensive than, Shared Maintenance. Under this form of maintenance, customer site representatives take responsibility for all routine preventative maintenance. Unlimited telephone support is available, as is BBN ACI's remote diagnostic facility, and complimentary system maintenance training.

Features of Limited Maintenance include:

- Hotline number for reporting hardware problems
- Unlimited hardware phone support
- Hardware diagnostics
- Overnight parts replacement in the U.S. for critical FRUs
- Complete diagnostic documentation
- Complimentary customer training
- Automatic revision upgrade on all repaired parts

How Limited Maintenance Works

If your GP1000 site is covered by Limited Maintenance, the maintenance process starts when you call the BBN ACI Customer Support Hotline at 1-800-4AC-BFLY (1-800-422-2359). Your call is entered in our automated call control system to ensure each problem is tracked and resolved. The BBN ACI Hotline is manned from 9:00 AM to 5:00 PM EDT Monday through Friday.

BBN ACI's trained Customer Support Engineers work with you over the phone to identify and resolve the hardware problem. If necessary, the Customer Support Engineer will use the GP1000's Remote Diagnostic capability to aid in diagnosing the problem. Once the failed FRU is located, your internal system maintenance specialist (Customer Site Representative) can then replace it. If a critical replacement part is not available in your on-site spares

kit, BBN ACI will ship the part to you via overnight carrier (limited to U.S. sites only—foreign parts replacement requires more time. See your service agreement for further details). Once your Customer Site Representative replaces the defective FRU, he or she ships the defective part back to BBN ACI.

Critical parts are those which the system cannot function without. Non-critical parts are any that may fail and not stop the system from functioning. For example, a processor board that malfunctions can be removed and replaced without unduly impairing system function. All system options are also considered non-critical. If a non-critical part malfunctions, the customer site representative removes it and ships it to BBN ACI. BBN ACI will repair or replace all non-critical parts within 30 days, then ship them back to be replaced by the Customer Site Representative.

All replacement parts shipped by BBN ACI, whether critical or non-critical, will be at the latest revision level.

Unlimited Hardware Phone Support

BBN ACI Customer Support Engineers are available during Hotline working hours to aid in diagnosing hardware problems, help with troubleshooting, and even to walk your Customer Site Representative through the necessary component replacement steps. There is no additional charge for telephone support.

Diagnostic Documentation

Using this manual and the *GP1000 Diagnostic Manual*, customer site representatives can confidently diagnose hardware problems and replace all field replaceable units.

Customer Training

BBN ACI provides each Limited Maintenance customer with a complimentary one-time System Administrator/Maintainer course. This course provides the skills necessary to perform the tasks required of the Customer Site Representative. Additional training courses for new customer site representative trainees, or refresher courses for current site representatives, are available for an additional charge.

2

Troubleshooting

2.1 Finding the Problem

This chapter contains a chart for diagnosing system problems and a section on halting the system.

To use the chart 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.

Before turning to the appropriate chapter to replace the questionable item be sure that you are familiar with the section on halting the system.

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 2-1 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.

	The cables from the T125 to the PDUs are disconnected or damaged.	Check the connections from the T125 to each PDU.
Console works, but no boot prompt	The king node's card-cage is turned off.	Check that card-cage's circuit breaker (see Chapter 6) and power cord.
	The Multibus is turned off.	Check the Multibus power switch, power cord, and the fuse.
	Console cables are loose or damaged.	Follow the cables from the fan-tail to the console.
	BMA is bad	Turn off all nodes except for the King node, then reset the system.
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.
Booting 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.

All nodes in one cage aren't seen by the rest of the system (i.e. 04, 14, 24, 34, 44...).	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 *System Administrator's Guide* 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.

	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 Multibus.
	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.

2.2 Halting the System

Whether Mach 1000 is running singleuser or multiuser, you must halt the system to avoid possible data loss, instead of either turning the system off or using a hardware reset.

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 they are able to save as much of their work as possible before the halt. If possible, halt the machine using the **/etc/shutdown** command because it gives all users warning of the impending halt.

If you are unable to use the **/etc/shutdown** command, or if the system is booted singleuser so that only the console is in use, one of the halt methods described below is appropriate.

2.2.1 The /etc/halt Command

You must be **root** to use this command. No other user has permission to halt the system. You must use this command from the console, after you first check (using the **who** and **ps** commands, or by asking users) to see if anyone is using the system. If there are users on the system, you should ask them to save their files and log out before you halt the system.

The **/etc/halt** command ***syncs*** the disks by writing out data stored in processor memory to the disk, and halts the system. When you use the **/etc/halt** command to halt the system, filesystem checks are performed automatically when the machine is rebooted multiuser.

CAUTION

You must check the filesystems in all but the most controlled circumstances because an inconsistent filesystem can cause serious, irretrievable loss of data.

2.2.2 The Halt Button

If the console is inaccessible (that is, in a locked room, broken or hung, such that characters cannot echo on it), press the yellow ***halt*** button on the BT125, near the top of the GP1000. Using this button has the same effect as typing **/etc/halt** on the console. It syncs the disks and then halts the system. Filesystem checks will run when you next boot the system multiuser.

If the system is booted singleuser, no one can use the GP1000 remotely or from any terminal other than the console. In that case, you can elect to use the halt button even if the console is simply inconvenient.

2.2.3 The /etc/fasthalt Command

The **/etc/fasthalt** command does the same thing as **/etc/halt**, with one important exception: if the machine is halted with **/etc/fasthalt**, filesystem checks will not be performed when the system is rebooted multiuser. This saves time, and is often the choice of developers when they are programming in a manner that causes them to reboot the system frequently.

CAUTION

You must use this command with discretion. It is very useful under the controlled situation where only one person is using the system, and knows just what he or she is modifying in the system. If there are other people using the system, halting the system without their knowledge may cause a filesystem inconsistency. If you use **/etc/fasthalt**, that inconsistency will not be caught when the system is rebooted and may snowball into a serious inconsistency causing marked loss of data.

To issue the **/etc/fasthalt** command, you must be logged in as **root** and must be very certain that the activity level of the system is sufficiently low. When you type **/etc/fasthalt** at the console, the system will sync the disks and halt the system. As noted above, filesystem checks will not be performed when the system is rebooted automatically.

2.2.4 Halting After Root Filesystem Checks (Singleuser)

Often, as system administrator, 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 filesystems from corruption.

If you boot the system singleuser to do administrative work, you should check the root filesystem for inconsistencies before you begin. Do this by typing (assuming your boot disk is unit 0):

/etc/fsck /dev/xy0a

It takes very little time to determine whether the root filesystem is inconsistent. If the filesystem 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 the usual way (**0j** followed by the boot device, answering the prompts appropriately).

The significant part of either of these commands is the **-n** flag. This signifies that when the system is halted (automatically before the **reboot** command's reboot can occur, or explicitly due to your **halt** command), the disks will *not* be synchronized. This is essential to keep the filesystem consistent, since the **fsck** command corrects the filesystem ***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 filesystem.

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*.

3

Butterfly Card Cage

3.1 Removable Components

In each Butterfly Card Cage(BCV) there can be up to two switch boards, 16 processor boards, and a clock board. All of the boards are supplied power from the main power supply located in the back of the BCV.

Processor Board (BPNE)

The BPNEs do not have a backplane. The only connection to the rest of the GP1000 hardware is through the cables attached to the front of the board. They are a power cable, two switch cables and, if the board is a king node, it has a processor-Multibus cable (BPM) and a Halt cable. The switch turns off power to the board's logic, but the 30 volt power supply remains on.

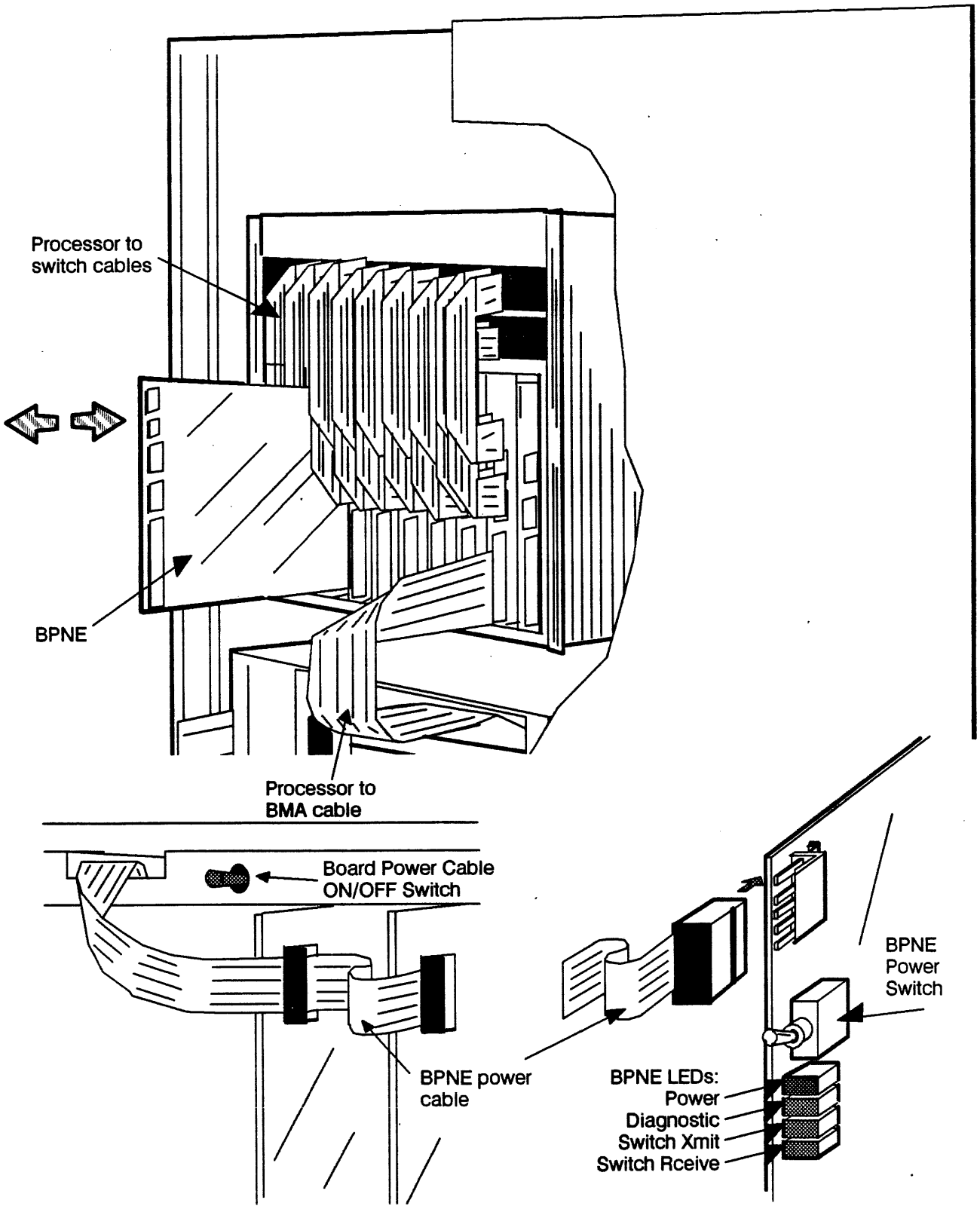
Switch Board (BVSN)

There two spaces for BVSN boards in each BCV although in systems with less than 16 processors may only have on BVSN being used. There is power cable, a pair of cables going to each processor in the BCV, and a cable going to the clock board. The board is secured to the chasis with a screw on each side. So to replace it you may need a screwdriver.

Clock Board (BCLK2)

For every four BVSNs in a system there is one BCLK2. If there are two or more BCLK2s another BCLK2 is needed as a master clock. There is a cable going from the BCLK2 to each BVSN in the rack(up to 4) and one going to the master BCLK2 if used. Note that the switch on the BCLK2 is NOT a power switch.

Figure 3-1 Processor Board Removal/Replacement



3.2 Replacing Components

This section contains the step-by-step procedures for removing and replacing processor boards, switch boards, and clock boards.

3.2.1 Removing a Processor Board (BPNE)

CAUTION

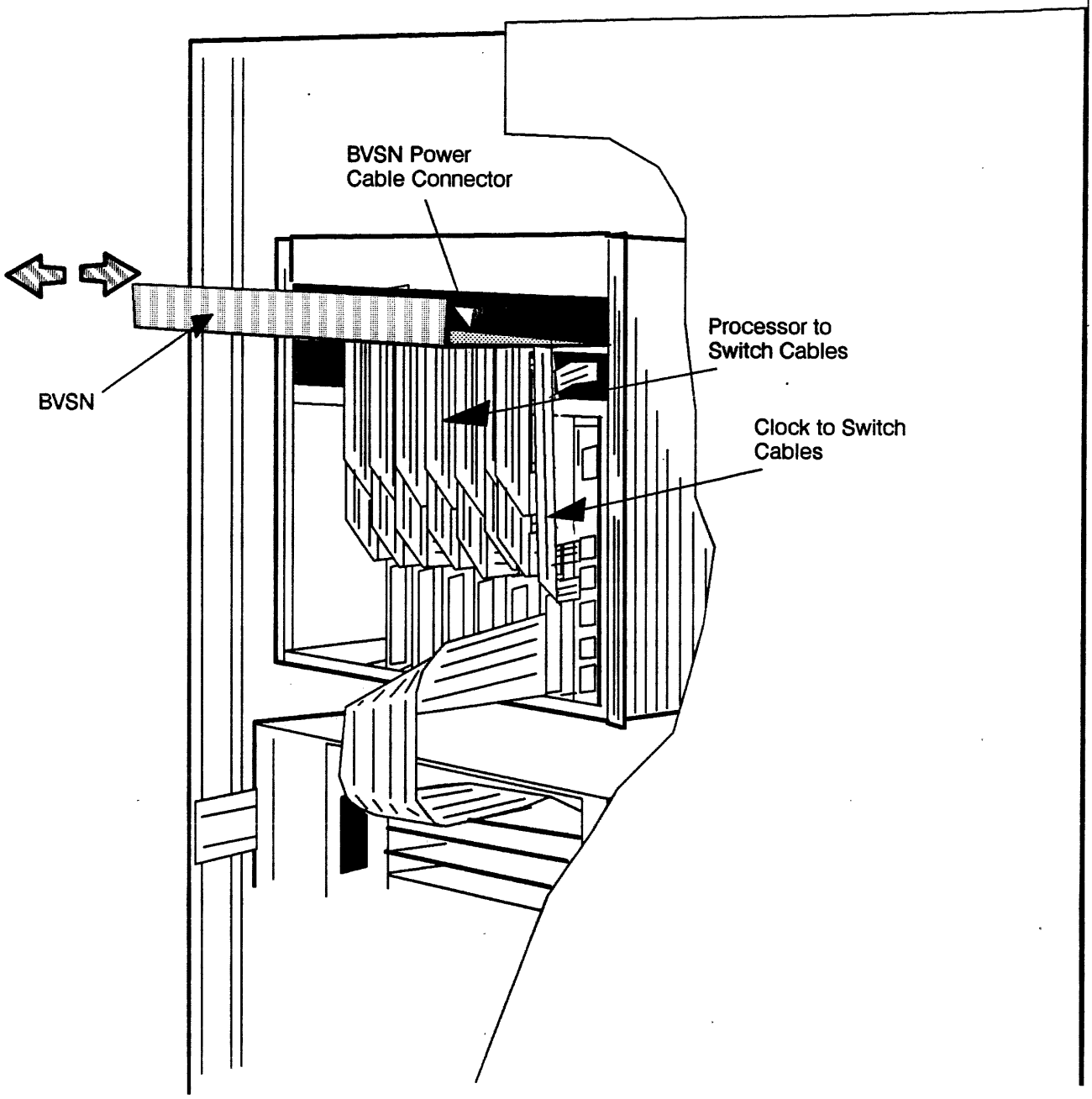
Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

10. Turn off the Main Power Switch.
11. Disconnect the two switch cables.
12. Disconnect the BMA-processor cable (if present).
13. Disconnect the power cable.
14. Remove the shipping bar, if present, that prevents the boards from sliding. There is a screw at each end of the bar.
15. Slide the processor board out, being careful not to damage the cables.

3.2.2 Replacing a BPNE

1. Configure the jumpers on the replacement board to as on the old board.
2. Check that the Main Power Switch is in the off position.
3. Slide the replacement board into the cage.
4. Replace the shipping bar, if you removed it, to prevent boards from sliding out. There is a screw at each end of the bar.
5. Reconnect the power cable. Make sure the connectors match vertically, since they are not keyed.
6. Reconnect the BMA-processor cable (if present).
7. Reconnect the two switch cables.
8. Check that the BPNE power switch is in the up (ON) position.
9. Turn on the Main Power Switch.
10. Watch for the green (power) and red (diagnostic running) lights on the BPNE to come on. The red light turns off to indicate that the BPNE passed its internal diagnostic.
11. Test the replacement BPNE with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 3–2 Switch Board Removal/Replacement



3.2.3 Removing a Switch Board

This board is particularly sensative to static discharge, use extra care when handling. The damaged caused to the board tends to only slow the preformance of the system and not show up as broken.

CAUTION

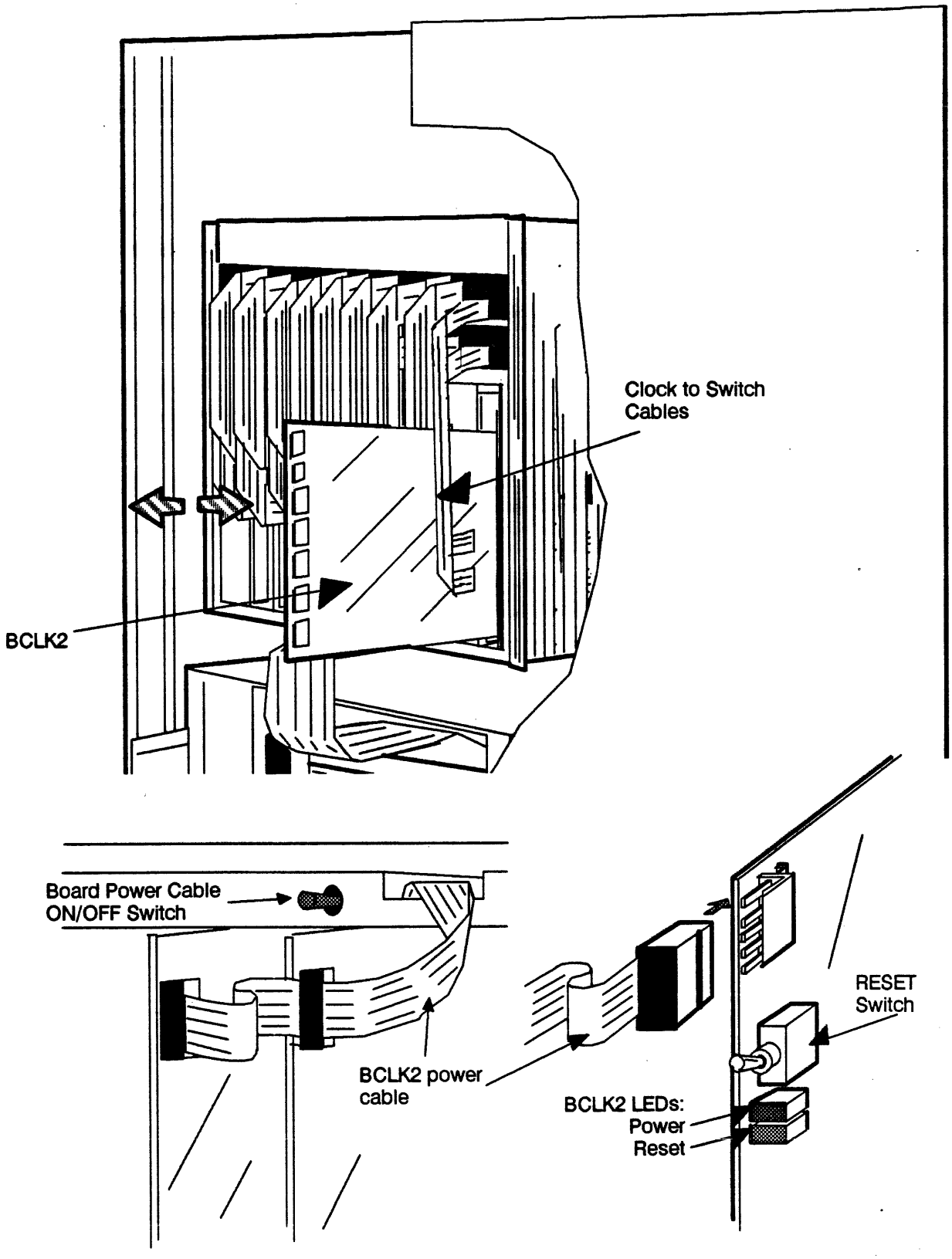
Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the processor-to-switch cables () and switch-to-switch cables ().
3. Disconnect the clock-switch cable (BVLCC).
4. Unscrew the two screws holding the board in.
5. Slowly slide the switch board out halfway, being careful not to damage the surrounding cables.
6. Disconnect the power cable located in the center toward the back of the board.
7. Slide the BVSN board all the way out.

3.2.4 Replacing a Switch Board

1. Configure the jumpers on the replacement board to correspond to the old board.
2. Check that the Main Power Switch is in the off position.
3. Slide the replacement board halfway into the cage.
4. Connect the power cable. Make sure the connectors match, since they are not keyed.
5. Slide the replacement board fully into the cage and secure with the two screws.
6. Reconnect the clock-switch cable.
7. Reconnect the switch cables.
8. Check that the BVSN Reset switch is in the up (OFF) position.
9. Turn on the Main Power Switch.
10. Watch for the green (power) light on the BVSN to come on.
11. Test the replacement BVSN with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 3-3 Clock Board Removal/Replacement



3.2.5 Removing a Clock Board (BCLK2)

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the clock–switch cables (BVLCC).
3. Disconnect any clock–clock cables (BVLCC).
4. Disconnect the T125–clock cable (RESET).
5. Disconnect the power cable.
6. Remove the shipping bar, if present, that prevents the boards from sliding. There is a screw at each end of the bar.
7. Slide the BCLK2 out, being careful not to damage the surrounding cables.

3.2.6 Replacing a Clock Board

1. Configure the jumpers on the replacement board to correspond to the old board.
2. Check that the Main Power Switch is in the off position.
3. Slide the replacement board into the cage.
4. Replace the shipping bar, if you removed it, to prevent boards from sliding out. There is a screw at each end of the bar.
5. Reconnect the power cable. Make sure the connectors match, since they are not keyed.
6. Reconnect the clock–switch cables.
7. Reconnect any clock–clock cables.
8. Reconnect the RESET cable, if present, to the bottom connector.
9. Check that the BCLK2 Reset switch is in the up (OFF) position.
10. Turn on the Main Power Switch.
11. Watch for the green (power) light on the BCLK2 to come on.
12. Test the replacement BCLK2 with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

4

Multibus Card Cage

4.1 Removable Components

This chapter contains a description of the Multibus components and the procedures for removing and replacing them. When replacing any of the Multibus boards be sure that they are firmly inserted into the backplane connectors. You may need to disconnect cables to other Multibus boards to remove the board you want.

Multibus Adapter Board (BMA)

This board is the only connection between the processors and I/O subsystems. It also controls the serial line for the system console. A BPM cable connects it to the King node.

Ethernet Controller Board (MB/EN)

This is an Excelan 301 Ethernet board configured to IEEE 802.3. The Excelan 201 and 301 are functionally the same and are interchangeable.

Terminal Controller Board (MB/TERM)

The MB/TERM is a Systech 6860 HPS Host Adapter. For information on it or any other terminal subsystem hardware refer to the documents in the "How to Use This Manual" section.

Figure 4–1 BMA Removal/Replacement

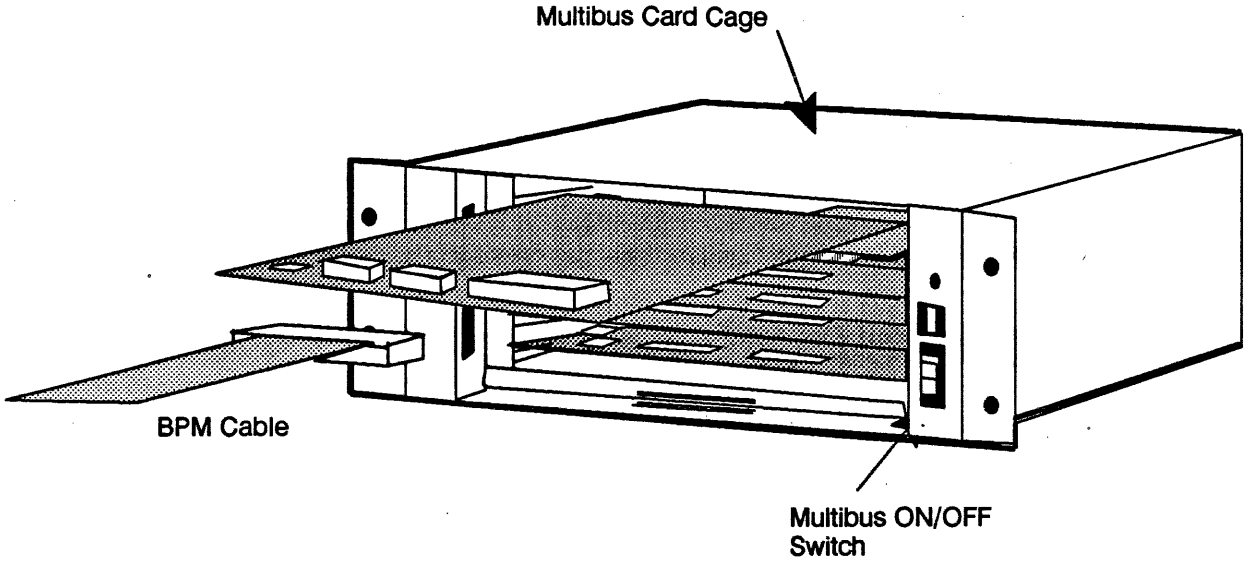
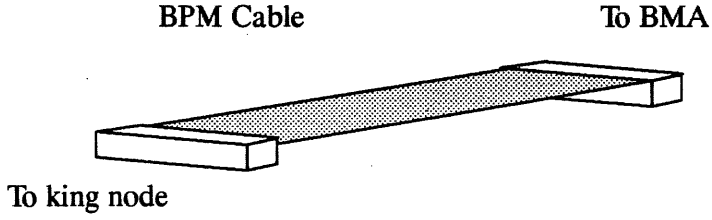


Figure 4–2 Cable for the BMA



4.2 Replacing Components

The following pages contain the procedures for removing and replacing the three Multibus boards mentioned above.

4.2.1 Removing the BMA

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the Processor-BMA cable (BPM).
3. Pull the BMA board out, being careful not to damage the surrounding cables.

4.2.2 Replacing the BMA

1. Configure the jumpers on the replacement board to correspond to the old board.
2. Check that the Main Power Switch is off.
3. Slide the replacement BMA into the cage and push it firmly into the connectors.

NOTE

Be sure to put the BMA board in the top slot of the Multibus. If it is placed in any other slot the GP1000 console will not work.

4. Reconnect the BPM cable.
5. Turn on the Main Power Switch.
6. Observe the white (power) light on the Multibus come on, indicating Multibus power.
7. Observe the green (power) and red (diagnostic running) lights on the king node come on.
   The red light (on the processor connected to the BMA) turns off to indicate that it passed the internal diagnostic.
8. Test the replacement BMA with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 4–3 MB/EN Removal/Replacement

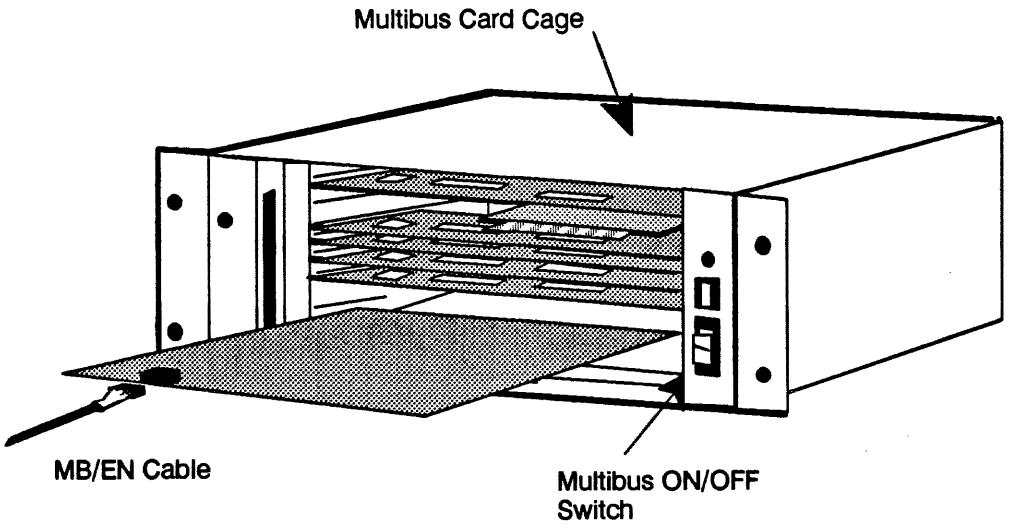
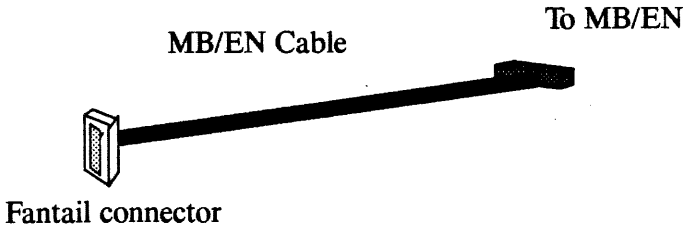


Figure 4–4 MB/EN Cable



4.2.3 Removing the Ethernet Board (MB/EN)

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the MB/EN cable.
3. Pull the MB/EN board out

4.2.4 Replacing the MB/EN

1. Check that the Main Power Switch is off.
2. Configure the jumpers on the replacement board to correspond to the old board.
3. Slide the replacement MB/EN into the cage and push it firmly into the connectors.
4. Reconnect the cable.
5. Turn on the Main Power Switch.
6. Observe the white (power) light on the Multibus come on, indicating Multibus power.
7. Observe the center LED on the MB/EN board pulse on and off.
8. Test the replacement MB/EN with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 4–5 MB/TERM Removal/Replacement

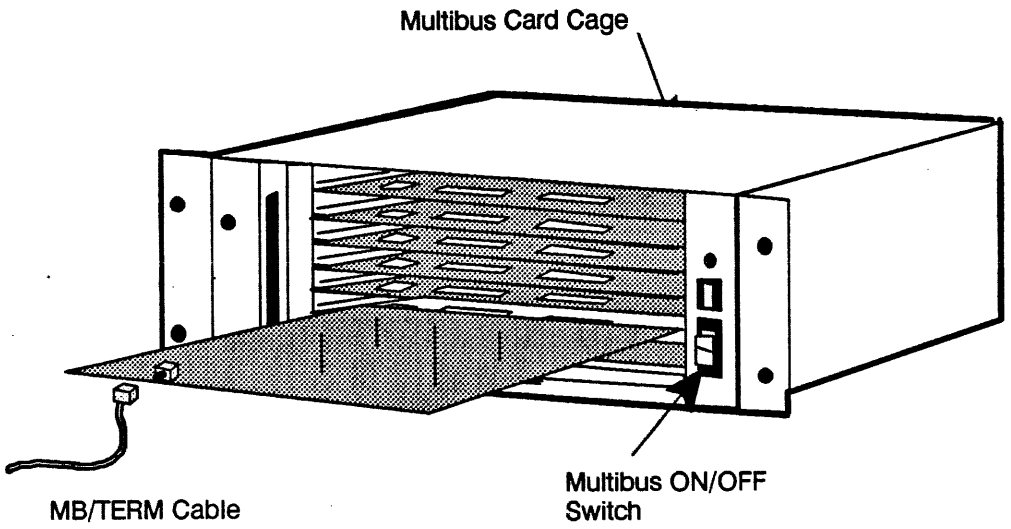
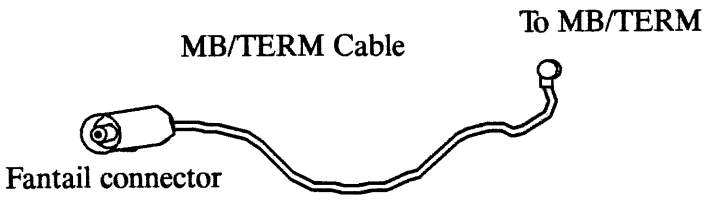


Figure 4–6 MB/TERM Cable



4.2.5 Removing a Terminal Controller Board (MB/TERM)

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

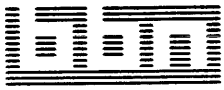
1. Turn off the Main Power Switch.
2. Disconnect the cable.
3. Pull the MB/TERM board out.

4.2.6 Replacing a MB/TERM

1. Configure the jumpers on the replacement board to correspond to the old board.
2. Check that the Main Power Switch is off.
3. Slide the replacement MB/TERM into the cage and push it firmly into the connectors.
4. Reconnect the cable.
5. Turn on the Main Power Switch.
6. Observe the white (power) light on the Multibus come on, indicating Multibus power.
7. The replacement MB/TERM runs its own self-test. The yellow LED on the MB/TERM board will flashes while the self-test is running and remains on if it passes. For more extensive testing refer to the *GP1000 Diagnostics Manual* for diagnostic information.

5

Disk and Tape Subsystems



5.1 Removable Components

This chapter contains a description of the disk and tape components and the procedures for removing and replacing them. When replacing any of the Multibus controller boards be sure that they are firmly inserted into the back-plane connectors. You may need to disconnect cables to other Multibus boards to remove the board you want.

Disk Drive Subsystem

This subsystem consists of the MB/DC controller and the 500 MB or the 850 MB disk drive. The Head/Disk Assembly (HDA) and the Pan Assembly must be separated before shipping. You will need a screwdriver and adjustable wrench to replace the disk drive.

1/4 Inch Tape Drive Subsystem

This subsystem consists of the MB/ISBX controller board, the MB/SCSI daughter board (which sits on the ISBX) and the T125 Tape Drive/Power Box.

1/2 Inch Tape Drive Subsystem

This subsystem consists of the MB/TC controller board and the 1/2 Inch Tape Drive. The two cables are identical.

Figure 5–1 MB/DC Removal/Replacement

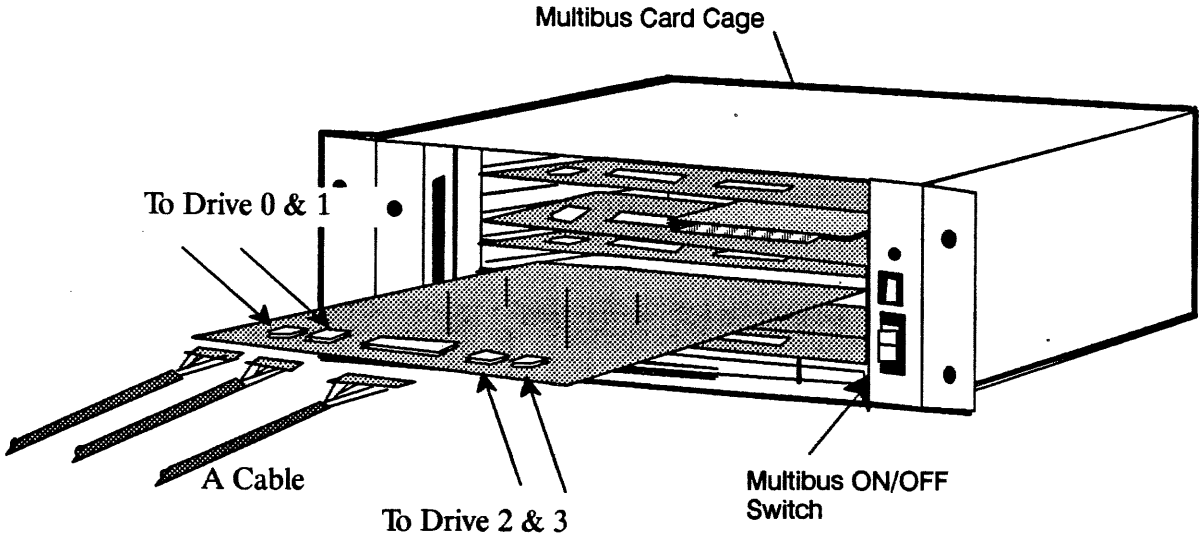
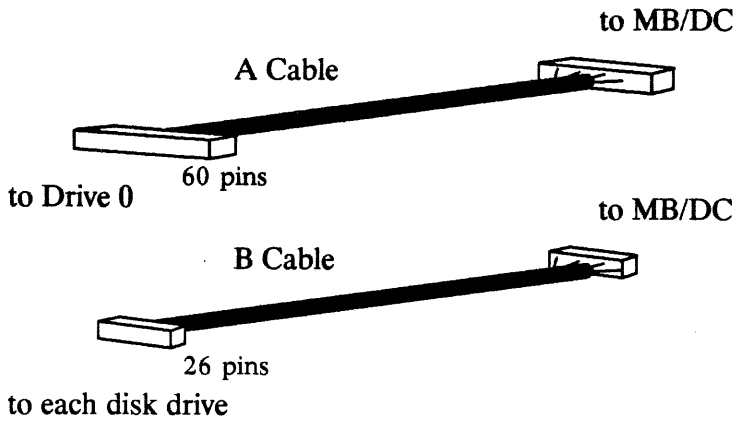


Figure 5–2 MB/DC Cables



5.2 Replacing Components

The following pages contain the procedures for removing and replacing the disk and tape subsystem components mentioned above.

5.2.1 Removing a Disk Controller Board (MB/DC)

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the A and B cables.
3. Pull the controller board out, being careful not to damage the surrounding cables.

5.2.2 Replacing a MB/DC

1. Configure the jumpers on the replacement board to correspond to the old board.
2. Check that the Main Power Switch is off.
3. Slide the replacement MB/DC into the cage and push it firmly into the connectors.
4. Reconnect the A and B cables.
5. Turn on the Main Power Switch.
6. Observe the white (power) light on the Multibus come on, indicating Multibus power.
7. Test the replacement MB/DC with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

NOTE

The cabling shown in Figure 5–1 is not required, it is simply a convention. Your system may be cabled differently.

Figure 5–3 Disk Drive and Pan Assembly

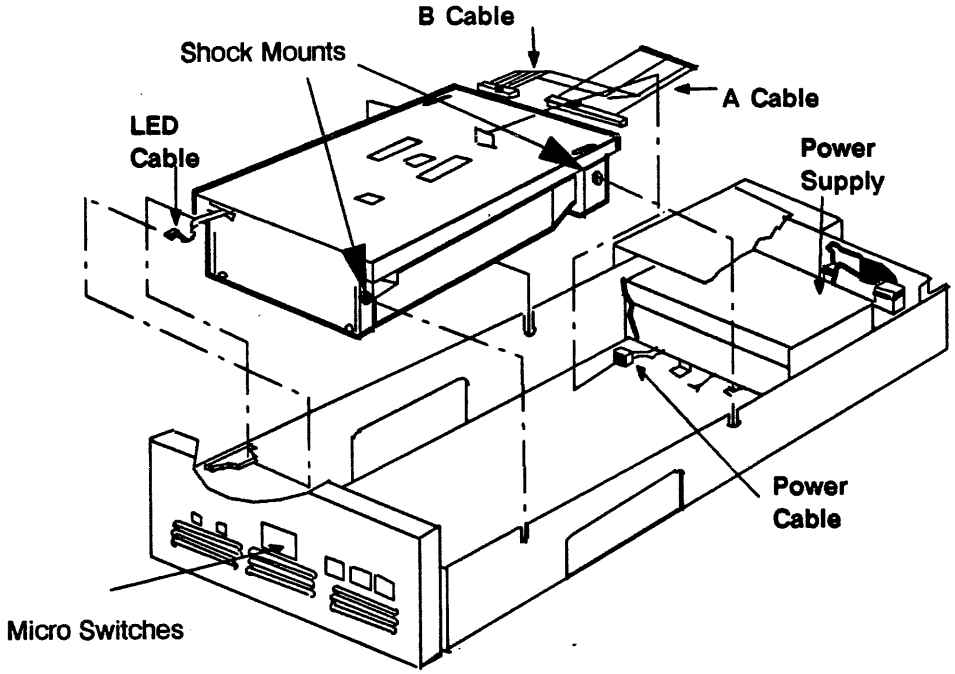
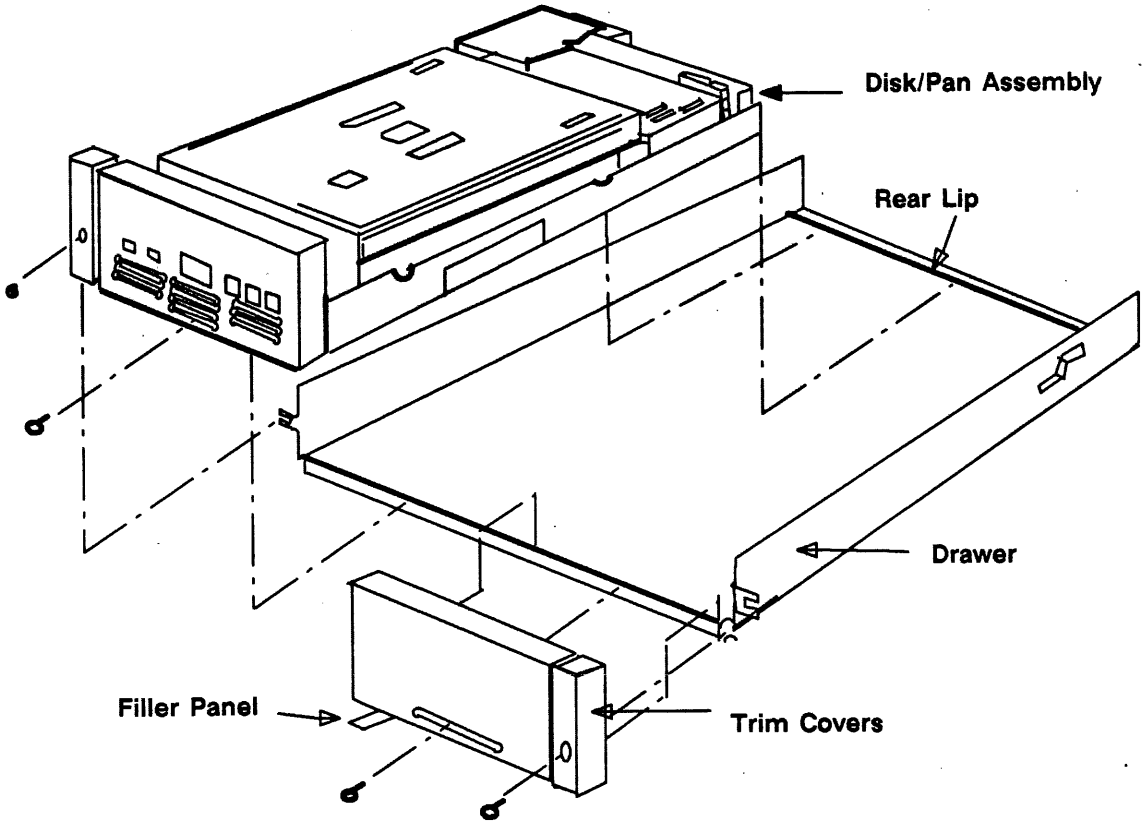


Figure 5–4 Disk Drive Removal/Replacement



5.2.3 Removing a Disk Drive

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the A, B, power, LED, and grounding cables.
3. Pull the tray out.
4. Unscrew the front screw and remove the Disk/Pan Assembly.
5. Remove the HDA from the Pan Assembly if necessary for shipping.

5.2.4 Replacing a Disk Drive

1. Configure the micro switches on the replacement drive to correspond to the old drive.
2. Check that the Main Power Switch is off.
3. Place the new Pan Assembly as shown in NO TAG.
4. Connect the cables to the Disk as shown in NO TAG (Pan Power Supply Cable and A & B Bulkhead Cables).
5. Reconnect the disk ground to the disk ground screw on the frame.
6. Gently place the Disk into the Pan and tighten shock mount screws.
7. Reconnect the LED Cable from the Disk to the Pan.
8. Slide the Disk/Pan Assembly into the drawer by inserting the Pan into the rear lip of the drawer and securing the front screw(see Figure 5–4).
9. Reconnect the external A, B, power and grounding cables. Be sure that all cables are securely grounded.
10. Check that the disk drive power switch is on.
11. Turn on the Main Power Switch.
12. Test the replacement disk drive with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 5–5 Disk Drive Cables

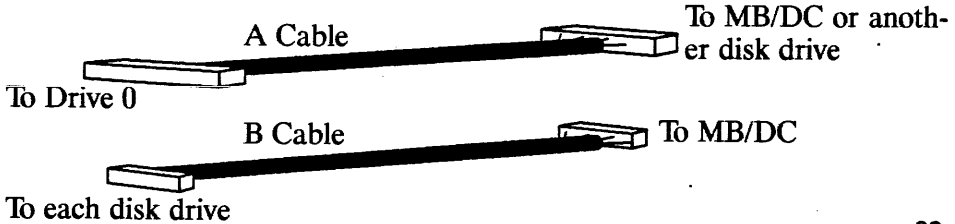


Figure 5-6 MB/ISBX and MB/SCSI Removal/Replacement

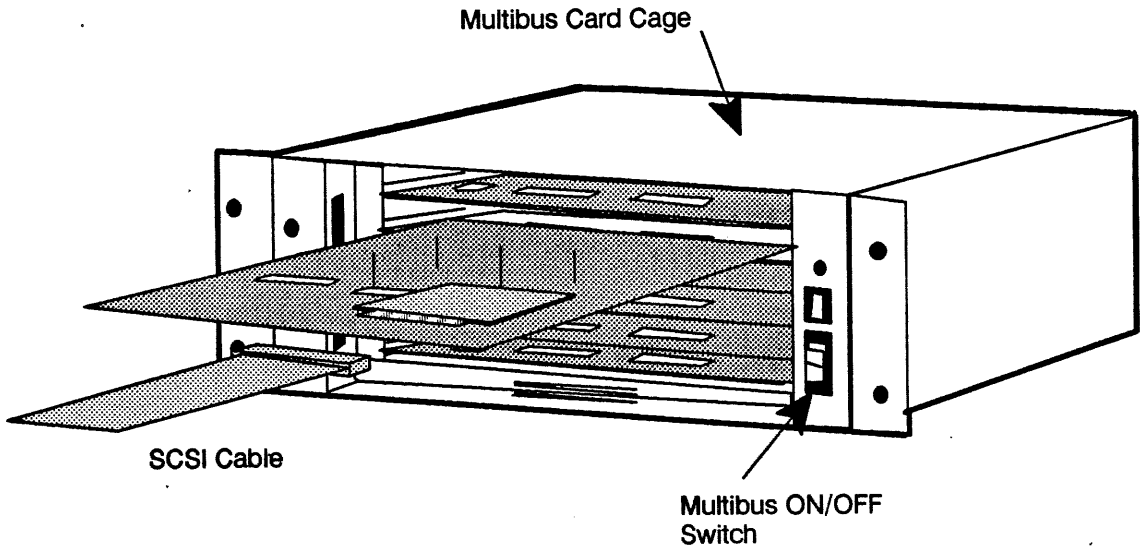
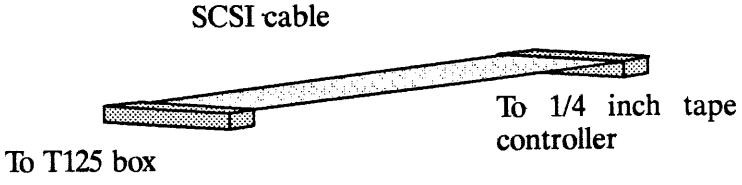


Figure 5-7 SCSI Cable



5.2.5 Removing the 1/4 Inch Tape Controller

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the system with the Main Power Switch.
2. Disconnect the cable.
3. Pull out the controller boards (MB/ISBX and MB/SCSI).

5.2.6 Replacing the MB/ISBX and MB/SCSI

1. Configure the jumpers on the replacement boards to correspond to the old boards.
2. Check that the Main Power Switch is off.
3. Slide the replacement boards into the cage and push it firmly into the connectors.
4. Reconnect the cable.
5. Turn on the Main Power Switch.
6. Observe the white (power) light on the Multibus come on, indicating Multibus power.
7. Test the replacement MB/ISBX and MB/SCSI with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 5-8 1/4 Inch Tape Drive (T125) Removal/Replacement

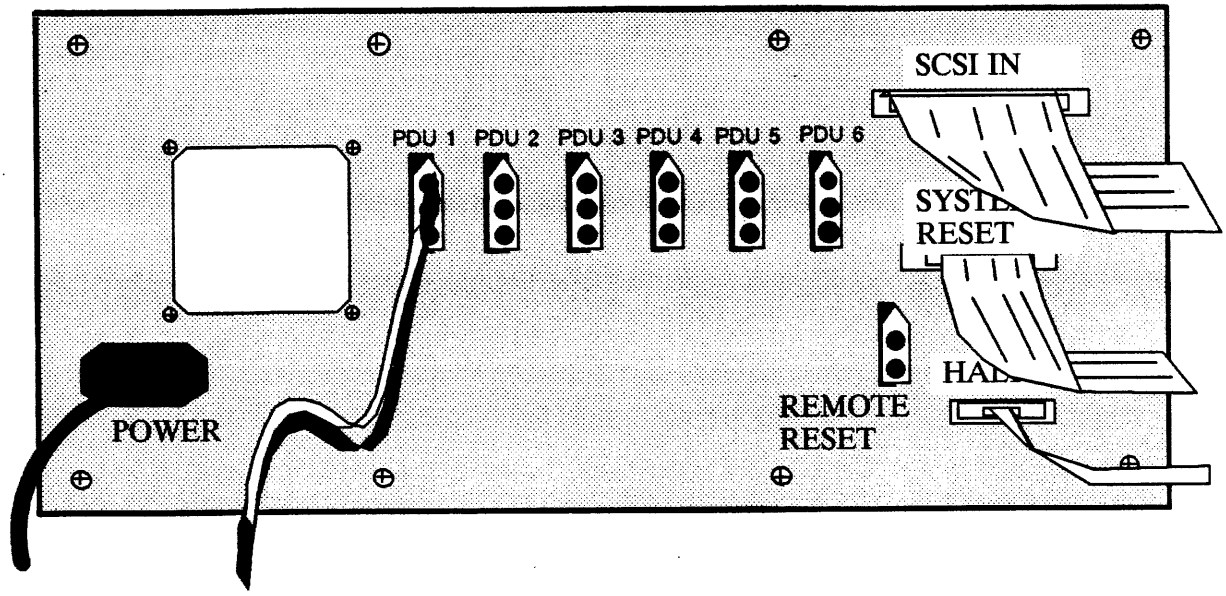
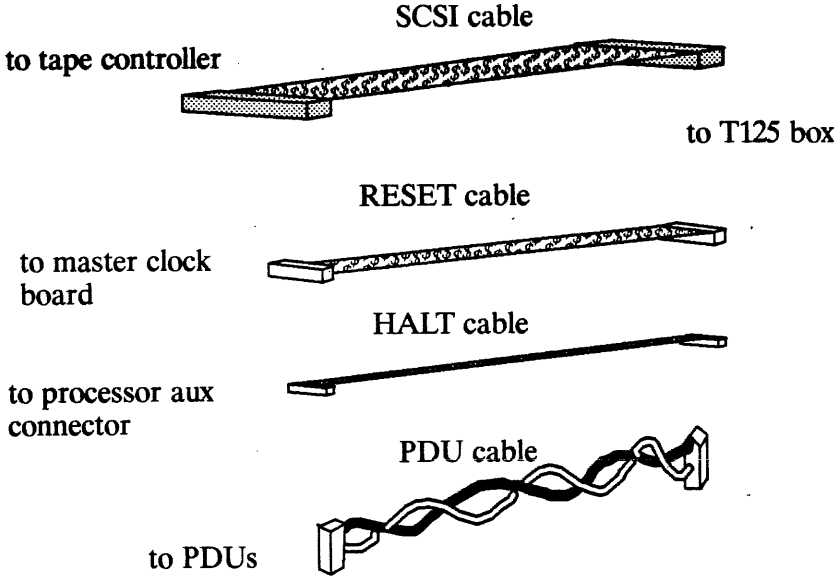


Figure 5-9 T125 Cables



5.2.7 Removing the 1/4 Inch Tape Drive (T125)

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

If you are working on a large system it is a good idea to check that the cables in the back of the T125 box are labelled.

1. Turn off the system with the Main Power Switch.
2. Disconnect the cables from the back of the tape drive. The "SCSI IN" and "HALT" cables may not be keyed, so please note the direction they connect.
3. Remove the bezel surrounding the front of the box by pushing a large paper clip into one of the small holes on the side.
4. Remove the four screws holding it to the rack.
5. Remove the T125 box.

5.2.8 Replacing the T125 Box

1. Check that the Main Power Switch on the replacement T125 is in the off position.
2. Slide the replacement into the rack and line up the screw holes.
3. Replace the four screws.
4. Replace the bezel, which "clicks" when it goes into place.
5. Reconnect the cables to the back of the box.
6. Turn on the Main Power Switch.
7. Observe the green (power) light come on and flash for 8 seconds; to show that all of the PDUs are on.
8. Test the replacement T125 with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

Figure 5-10 1/2 Inch Tape Controller (MB/TC) Removal/Replacement

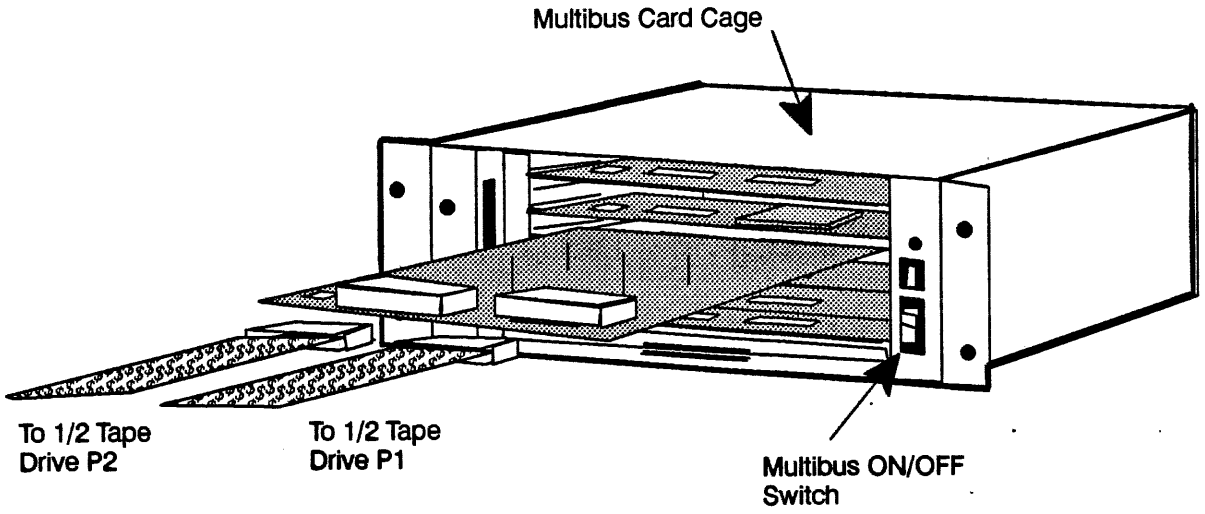
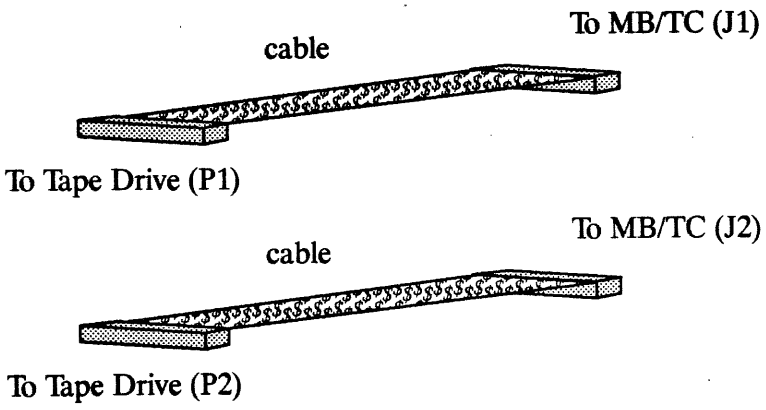


Figure 5-11 1/2 Inch Tape Cables



5.2.9 Removing the 1/2 Inch Tape Controller (MB/TC)

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Disconnect the two cables.
3. Pull the controller board out.

5.2.10 Replacing the MB/TC

1. Configure the jumpers on the replacement board to correspond to those on the old board.
2. Check that the Main Power Switch is off.
3. Slide the replacement MB/TC into the cage and push it firmly into the connectors.
4. Reconnect the two cables.
5. Turn on the Main Power Switch.
6. Observe the white (power) light on the Multibus come on, indicating Multibus power.
7. Test the replacement MB/TC with the diagnostics. Refer to the *GP1000 Diagnostics Manual* for diagnostic information.

NOTE

The 1/2 inch tape drive is not a customer replaceable unit at this time. Check with your BBN ACI customer representative for more information.

6

Power Delivery Subsystem

6.1 Description of Subsystem

The power delivery subsystem has two field replaceable units; the T125 box and the PDUs. Each Power Distribution Unit (PDU) has a connector in the back for remote power switching. This connector is used by the Main Power Switch in the T125 box to turn all PDUs on with one switch.

The flow of power from the wall to the boards as follows:

From the wall, 208VAC 3-phase goes into each of the PDUs.

If both the Main Power Switch and the PDU circuit breakers are on, 120VAC goes to the outlets on the front of the PDU and 208VAC goes to the outlets on the back.

The Multibus card cage and GP1000 peripherals get power from the 120V outlets. The Butterfly card cages (BCVs) get power from the 208V outlets.

If the two circuit breakers on the back of each BCV are both on, the DC power supply inside the BCVs turns on.

If the circuit breakers in the front of the BCV are on, approximately 30VDC is supplied to each of the boards in the BCV.

NOTE

The T125 box must be plugged into the non-switched outlet on the PDU, which is the top right outlet.

6.2 Replacing Components

The procedure for replacing the T125 box is in section 5.2.7. The procedure for the PDU follows:

Figure 6–1 PDU Removal/Replacement

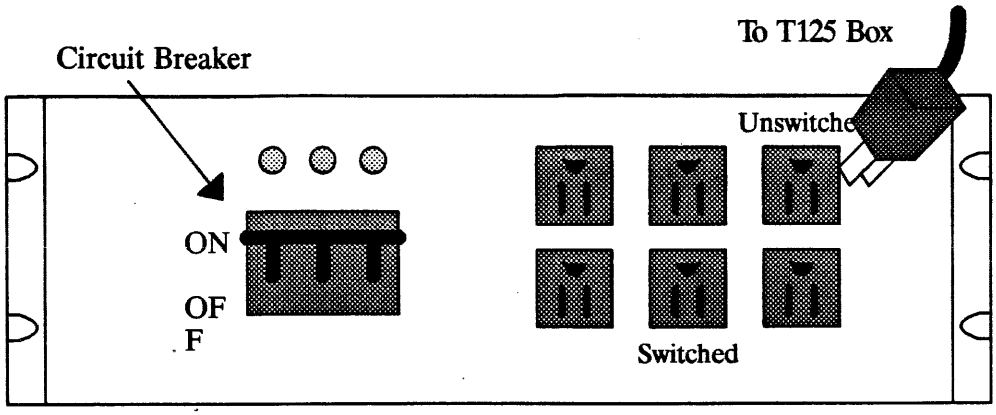
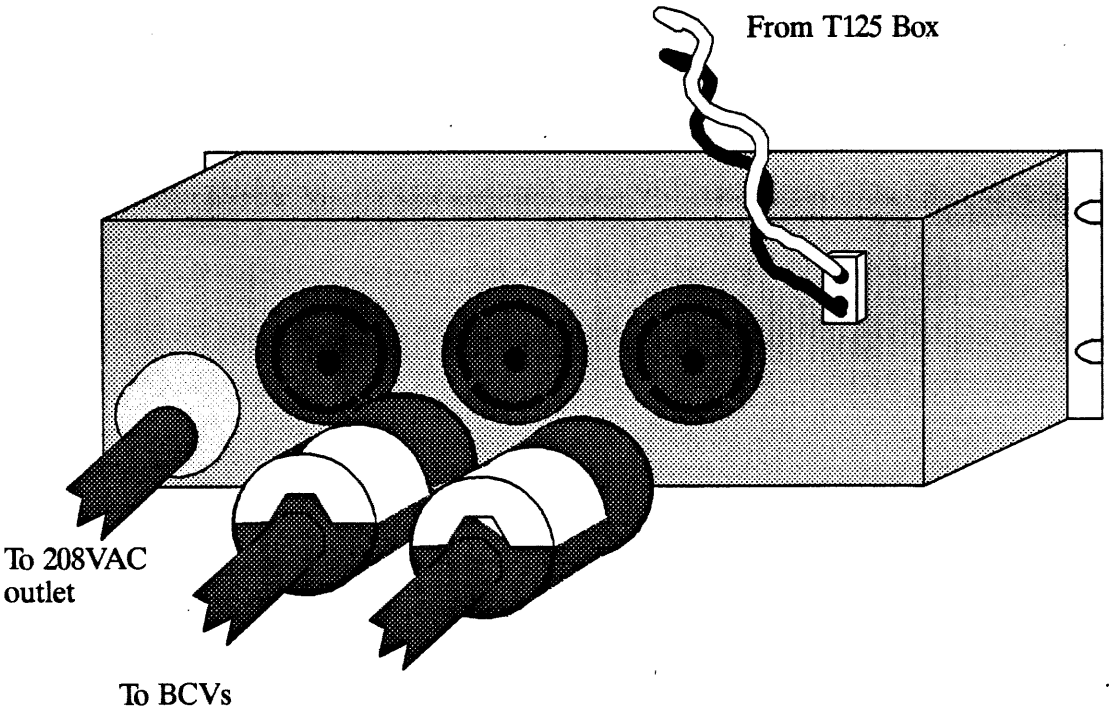


Figure 6–2 PDU Cables



6.2.1 Removing a PDU

CAUTION

Before working on the hardware, be sure to halt the system. Consult chapter 2 for information on halting the Mach 1000 operating system.

1. Turn off the Main Power Switch.
2. Turn off the PDU circuit breaker.
3. Disconnect the power cables from the front.
4. Disconnect the main power cable from the outlet in the wall or floor.
5. Remove the four screws holding the PDU to the rack.
6. Pull the PDU out a few feet.
7. Disconnect the one or two large power cables from the back of the PDU, depending on your system size.
8. Disconnect the small cable that goes to the Main Power Switch.
9. Disconnect the green ground wire on the PDU.
10. Pull the power cable up through the bottom of the rack and out. You may need to tile the machine or roll it over a hole to get the plug to fit under the edge.

6.2.2 Replacing a PDU

1. Check that the Main Power Switch and the PDU circuit breaker are both off.
2. Push the power cable down through the bottom of the rack and toward the power outlet. As above, you may need to tilt the rack or roll it over a hole.
3. Reconnect the small cable that goes to the Main Power Switch.
4. Reconnect the green ground wire on the PDU.
5. Reconnect the one or two large power cables to the back.
6. Put the PDU in place and line up the screw holes.
7. Replace the four screws, making sure the PDU is secure.
8. Reconnect the main power cable to the outlet in the wall or floor.
9. Reconnect the power cables to the front PDU outlets as before.
10. Turn on the PDU circuit breaker and observe the three phase lights on the PDU come on.

11. Turn on the Main Power Switch and observe the green (power) light come on.

7

Preventative Maintenance

7.1 PM Procedures

7.1.1 Disk Drive Maintenance

There is no mainenance to do inside the disk drive. When you are cleaning the heads of the tape drives, check the filters in the back of the disk drive.

7.1.2 Cleaning the 1/4 Inch Tape Unit

To clean the tape unit, use the following procedure after every eight hours of tape drive operation.

1. Remove any tape in the drive, and hold the tape door open.
2. 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 the capstans. If the surfaces are extremely dirty, you may have to use more than one swab.

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 (Trichloro–trifluoroethane).

7.1.3 Cleaning the 1/2 Inch Tape Unit

To clean the tape unit, use the following procedure after every eight hours of tape drive operation.

1. If the power is on, press the bottom of the Power switch/indicator to remove power from the unit.
2. Pull from behind the lower left side of the front panel and slide the unit out of the rack.
3. Slide the unit forward until it is fully extended from the rack.
4. Grasp the lower edges of the top cover and lift.
5. While holding the top cover in the raised position, place the retainer bar in its slot.
6. 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

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 (Trichloro–trifluoroethane).

7. Clean the tachometer roller using the method described in step 6.

CAUTION

If the cleaning solvent seeps into the tachometer housing, it could damage the tachometer. Do not release the tachometer while holding it away from the take–up hub. It will become damaged if it strikes sharply against the hub.

8. Use the felt pads provided in the tape cleaning kit to clean the hub pads, takeup hub and roller guides.
9. Lift the top cover until the retainer bar is clear of its slot.
10. 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.
11. Close the top cover.
12. Press and hold the lock buttons on both slides and slide the unit back into the rack.

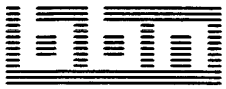
To clean the air filter, use the following procedure after every three months of operation.

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 remove the filter.
3. Shake the filter clean.
4. Replace the filter.

A

Jumper Settings

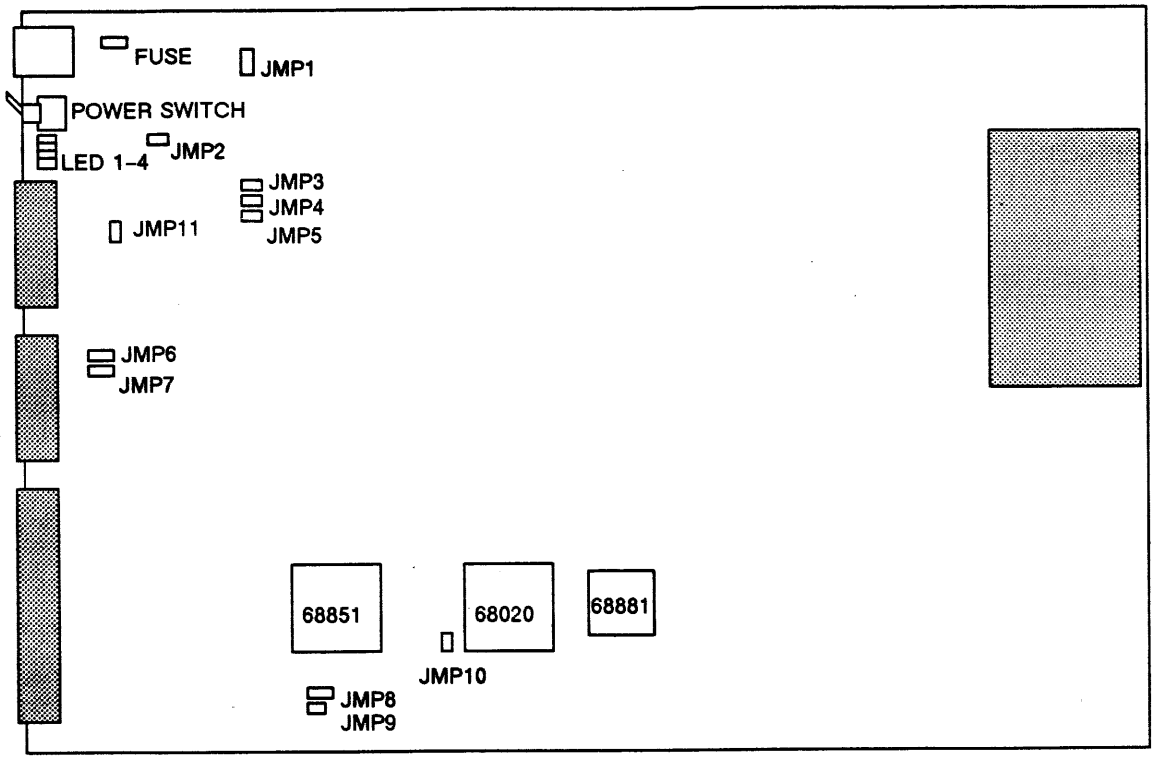


In this appendix you will find a diagram of each board, a listing of jumpers and the default positions.

The jumpers are listed by number. The configuration column lists the default or standard settings. The description column describes the various settings and what they do. The default setting is shown in bolded type.

A.1 Processor Board (BPNE)

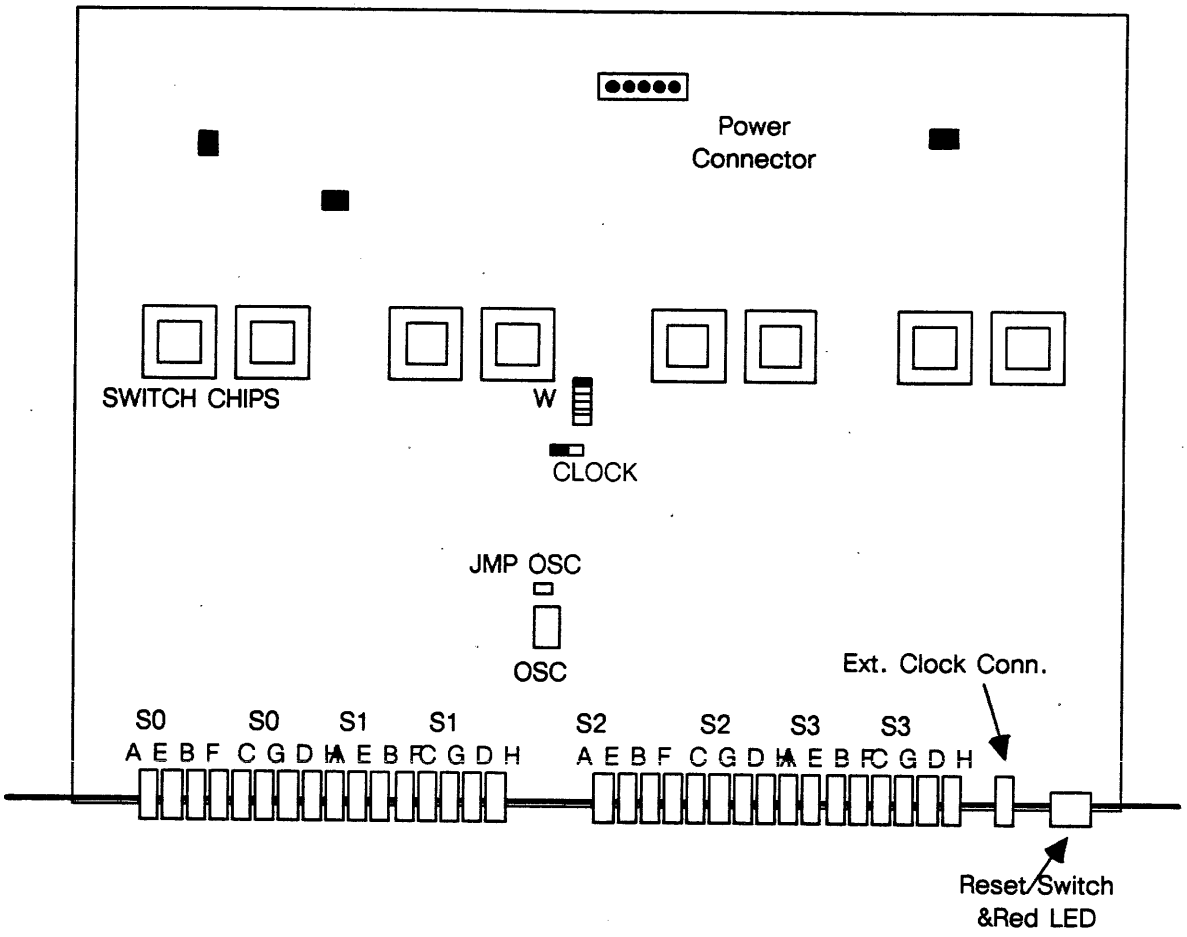
Figure A-1 BPNE Board



Jumper	Configuration	Description
JMP1	bottom	DRAM size 4 meg/**1 meg**
JMP2	on	CPU Enable
JMP3	on	Clock A to B
JMP4	on	Clock B to C
JMP5	on	Clock C to D
JMP6	left	TX Columns 2/**4**
JMP7	right	RX firmware
JMP8	right	512k EPROM enable
JMP9	on	UART crystal enable
JMP10	out	Cache **enable**/disable
JMP11	top	BI/1 support

A.2 Switch Board (BVSN)

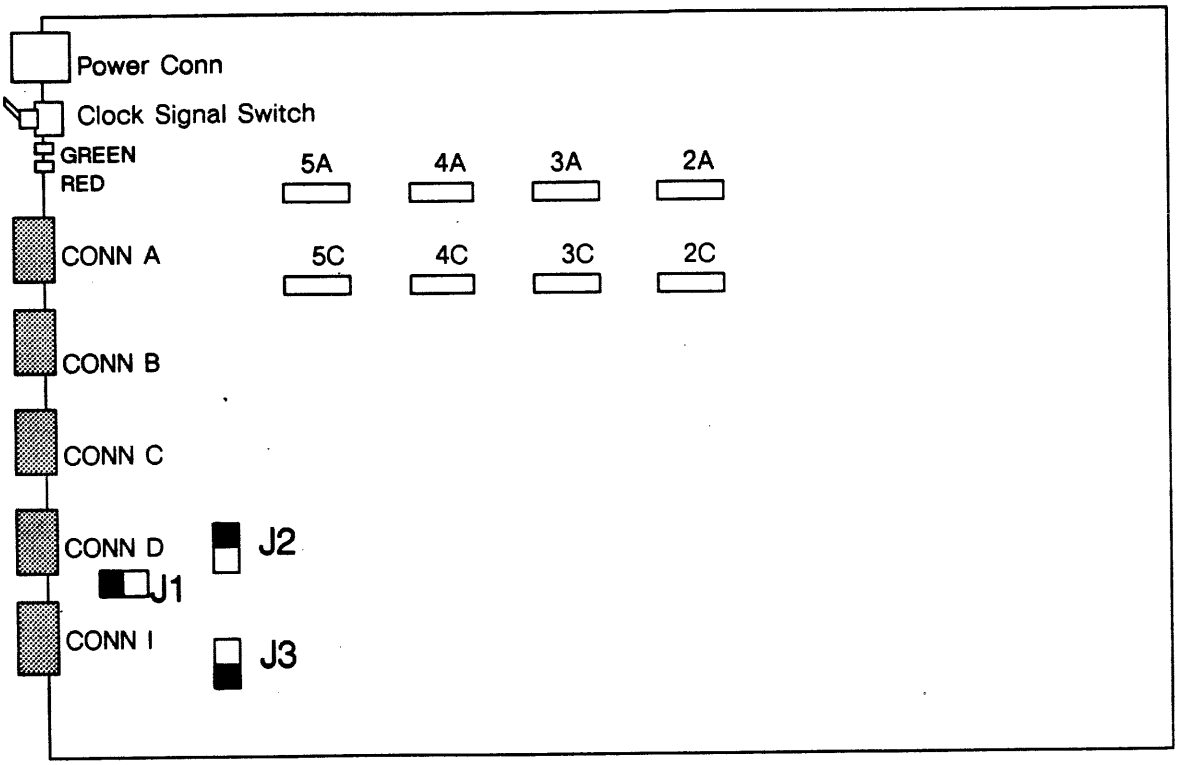
Figure A-2 BVSN Board



Jumper	Configuration	Description
JMP OSC	on	Testing
CLOCK	left	Master/**Slave**
W1	on	Skew delay
W2	off	Skew delay
W3	off	Skew delay
W4	off	Skew delay
W5	off	Skew delay
W6	off	Skew delay

A.3 Clock Board (BCLK2)

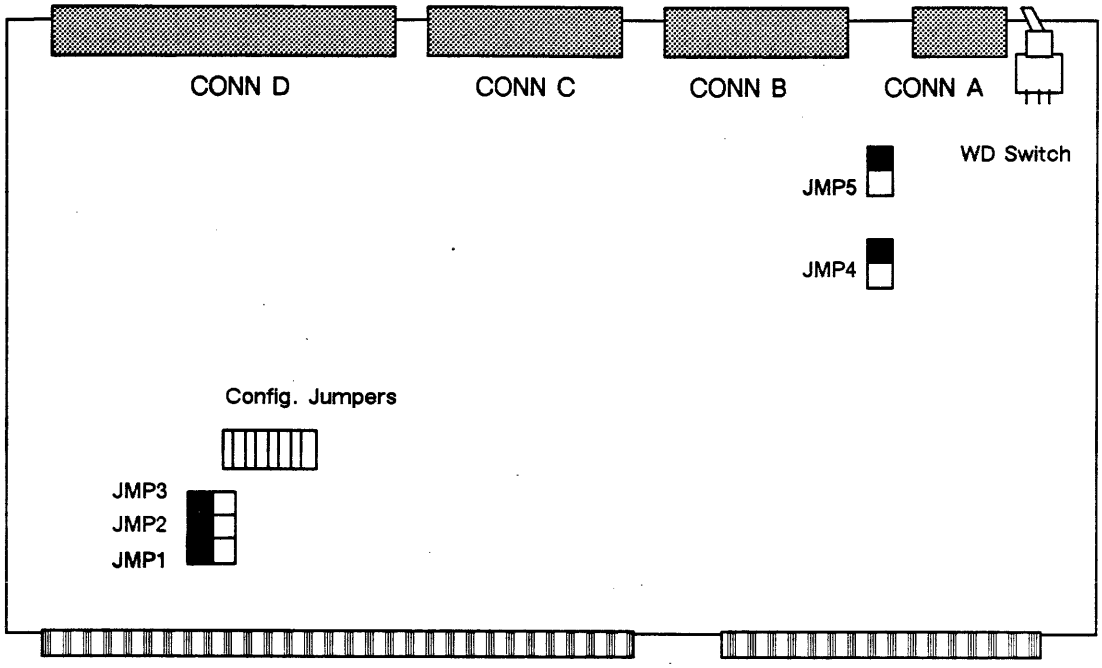
Figure A-3 BCLK2 Board



Jumper	Configuration	Description
J1	left	Clock divider **Master**/Slave
J2	top	Clock phase **internal**/external
J3	bottom	Clock source **internal**/external

A.4 Multibus Adapter Board (BMA)

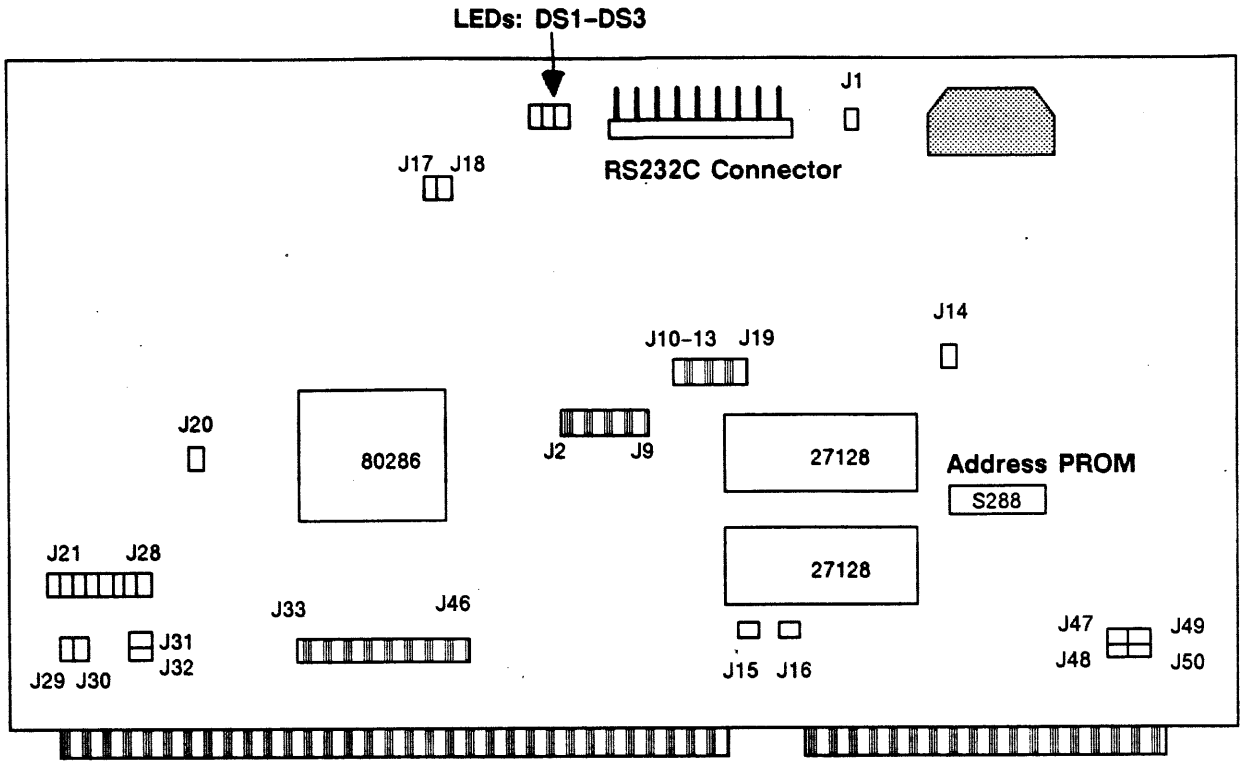
Figure A–4 BMA



Jumper	Configuration	Description
JMP1	left	Source BCLK **on**/off
JMP2	left	Source CCLK **on**/off
JMP3	left	Bus Arbitration **parallel**/serial
JMP4	top	Delay Bus Requests **on**/off
JMP5	top	Delay Bus Grant **on**/off
WD Switch	as in Figure A–4	Watch Dog Timer enable
All other jumpers	bottom	Configuration

A.5 Ethernet Controller (MBEN)

Figure A-5 Ethernet Controller

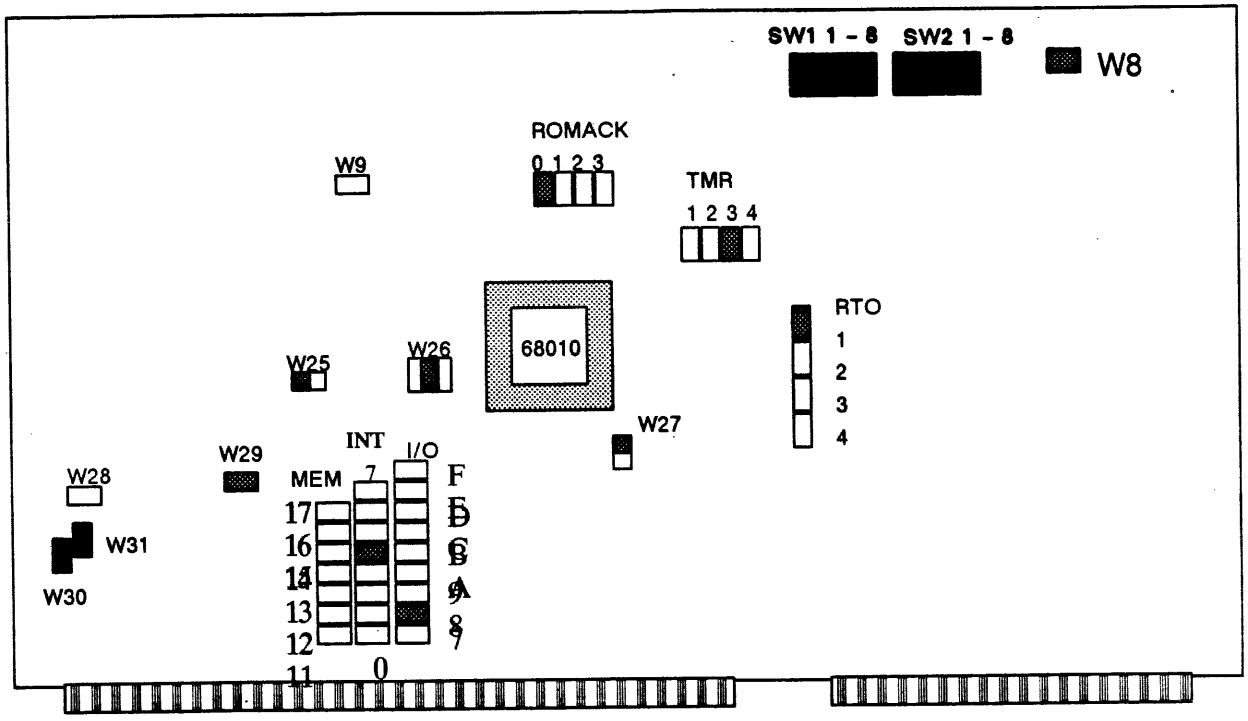


Jumper	Configuration	Location	Description
J1	closed (etch)	1-88	reserved - no jumper near P3
J2	open	43-87	disable carrier sense
J3	closed	43-87	disable SQE (heartbeat check) Ethernet Version 1.0 mode
J4	open	43-87	boot from network
J5	open	43-87	enable diagnostics
J6	open	43-87	reserved
J7	closed	43-87	reserved
J8	open	43-87	enable NX console
J9	open	43-87	enable debugger
J10	open	38-88	reserved
J11	open	38-88	reserved
J12	open	38-88	reserved
J13	open	38-87	reserved
J14	closed	54-88	enable bus timeout
J15 2-3	closed (to left)	77-88	enable 27128 EPROMS

J16 1-2	closed (etch)	77-88	enable 27128 EPROMs - no jumper
J17	closed (etch)	1-86	reserved - no jumper
J18	closed (etch)	1-86	reserved - no jumper
J19	open	38-87	reserved
J20	open	62-84	enable extended port
J21	open	77-84	INT 0
J22	open	77-84	INT 1
J23	open	77-84	INT 2
J24	open	77-84	INT 3
J25	open	77-84	INT 4
J26	closed	77-84	INT 5
J27	open	77-84	INT 6
J28	open	77-84	INT 7
J29	open (must cut etch bottom side)		connect BPRO/ to bus interface
J30	closed (etch)	77-84	connect CBRQ/ to bus interface - no jump
J31 1-2	closed (etch)		16 bit I/O port
J32 1-2	closed (to left)	77-84	release bus when BPRN is true
J33	open	77-85	bit 2 of port address
J34	open	77-85	bit 3 of port address
J35	open	77-85	bit 4 of port address
J36	open	77-85	bit 5 of port address
J37	open	77-85	bit 6 of port address
J38	open	77-85	bit 7 of port address
J39	open	77-85	bit 8 of port address
J40	open	77-85	bit 9 of port address
J41	open	77-85	bit 10 of port address
J42	open	77-85	bit 11 of port address
J43	open	77-85	bit 12 of port address
J44	open	77-85	bit 13 of port address
J45	open	77-85	bit 14 of port address
J46	open	77-85	bit 15 of port address
J47	closed (etch)	77-90	enable upper 4 bits of address - no jumper
J48	closed (etch)	77-90	enable upper 4 bits of address - no jumper
J49	closed (etch)	77-90	enable upper 4 bits of address - no jumper
J50	closed (etch)	77-90	enable upper 4 bits of address - no jumper

A.6 Terminal Controller Board (MB/TERM)

Figure A-6 Terminal Controller



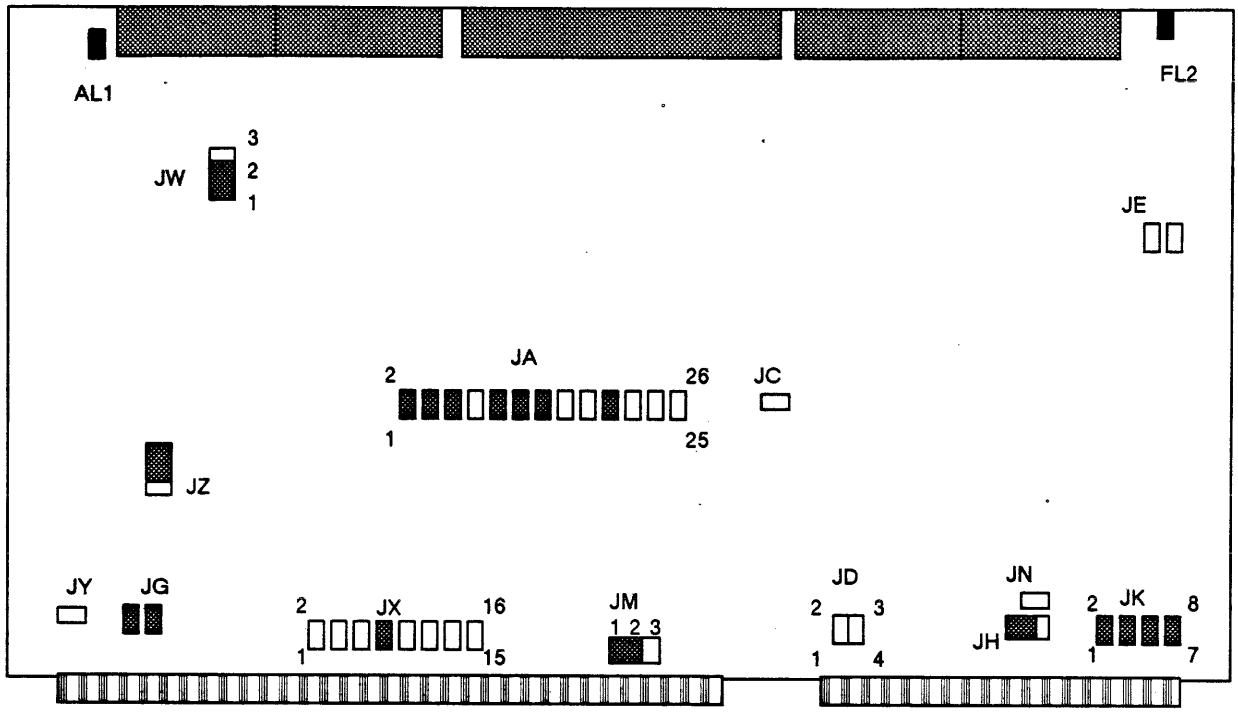
Jumper	Configuration	Location	Description
RT01	on	15-108	CBRQ/ timeout set to 28.8 to 32.4uS
RT02	off	15-108	
RT03	off	15-108	
RT04	off	15-108	
TMR1	off	15-106	50mS time period for RTC Int to 68k
TMR2	off	15-106	
TMR3	on	15-106	
TMR4	off	15-106	
ROMACK0	on	15-102	Zero wait states (150nS EPROM)
ROMACK1	off	15-102	
ROMACK2	off	15-102	
ROMACK3	off	15-102	
INT7	off	98-101	MultiBus INT level

INT6	off	98–101	
INT5	off	98–101	
INT4	on	98–101	
INT3	off	98–101	
INT2	off	98–101	
INT1	off	98–101	
INT0	off	98–101	
MEM–17	off	98–101	MultiBus Memory Address (not I/O)
MEM–16	off	98–101	
MEM–15	off	98–101	
MEM–14	off	98–101	
MEM–13	off	98–101	
MEM–12	off	98–101	
MEM–11	off	98–101	
I/O–F	off	98–101	MultiBus I/O space address
I/O–E	off	98–101	
I/O–D	off	98–101	
I/O–C	off	98–101	
I/O–B	off	98–101	
I/O–A	off	98–101	
I/O–9	off	98–101	
I/O–8	on	98–101	
I/O–7	off	98–101	
SW1–1	off	1–109	reserved
SW1–2	off	1–109	perform primitive RW self–test
SW1–3	off	1–109	perform HS sync/async self–test
SW1–4	off	1–109	perform all stack and RAM test
SW1–5	off	1–109	clear RAM after self–test
SW1–6	off	1–109	reserved
SW1–7	off	1–109	reserved
SW1–8	off	1–109	disable hardware byte swap mode (68k)
SW2–1	on	1–109	set host adapter node address to FF
SW2–2	on	1–109	
SW2–3	on	1–109	
SW2–4	on	1–109	
SW2–5	on	1–109	
SW2–6	on	1–109	
SW2–7	on	1–109	
SW2–8	on	1–109	
W8	on		coax termination; (near coax connector)
W9	off		disable CBRQ/ cut etch on back side; "on top of U21" on comp side
W24	off	77–100	MultiBus LOCK/ disabled
W25	1–2	77–101	16kB EPROMs
W26	1–3	77–101	connect CBRQ/ to timer
W27	1–2	77–105	16kB EPROMs
W28	off	98–98	I/O mapped
W29	on	98–100	I/O mapped

W30	off	98–98	disable BPRO/
W31	on	98–98	I/O mapped

A.7 Disk Controller Board (MB/DC)

Figure A-7 Disk Controller

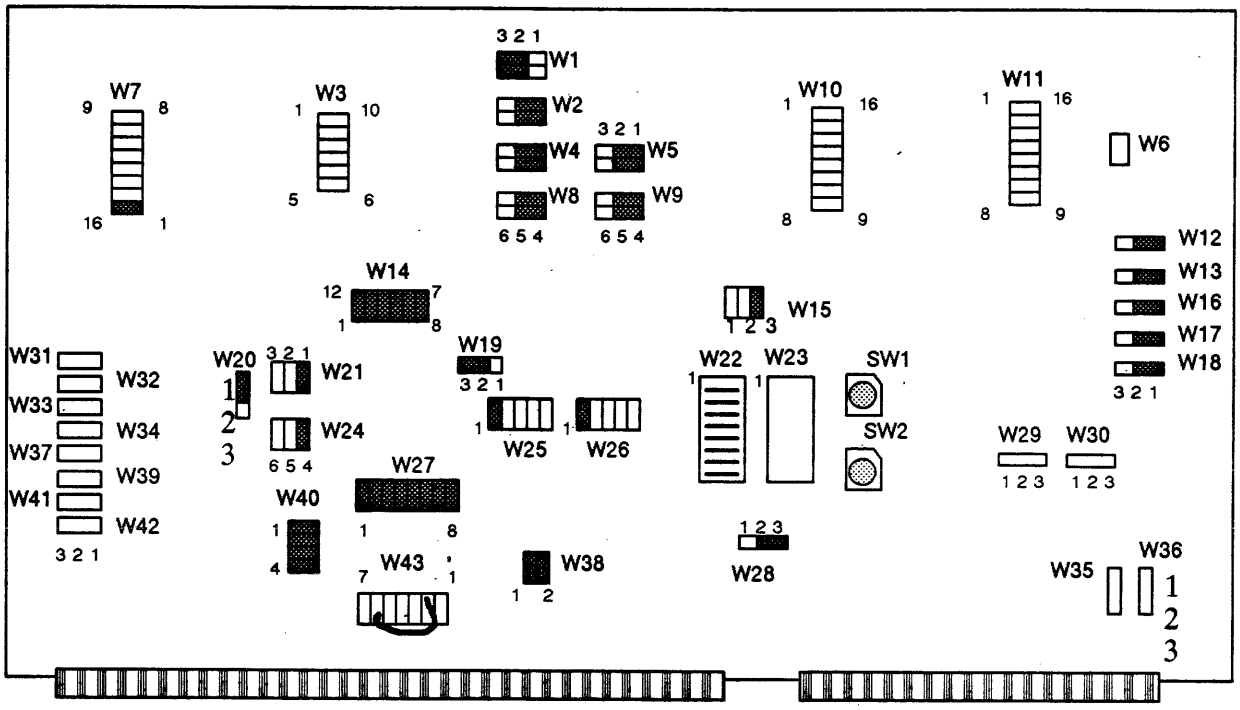


Jumper	Configuration	Location	Description
JA 1–2	closed	J4	address selection (EE40)
JA 3–4	closed	J4	
JA 5–6	closed	J4	
JA 7–8	open	J4	
JA 9–10	closed	J4	
JA 11–12	closed	J4	
JA 13–14	closed	J4	
JA 15–16	open	J4	
JA 17–18	open	J4	
JA 19–20	closed	J4	
JA 21–22	open	J4	
JA 23–24	open	J4	
JA 25–26	open	J4	
JC	open	J5	16 bit addressing

JD 1-2	open	M6	use -5V from backplane
JD 3-4	open	M6	
JE 1-2	open	D7	use -5V from backplane
JE 3-4	open	D7	
JG 1-2	closed	M3	use -5V from backplane
JG 3-4	closed	M3	
JH 1-2	closed	M7	on-board DC power fail detection
JK 1-2	closed	M7	connect upper 4 bits of
JK 3-4	closed	M7	address bus in 24-bit mode
JK 5-6	closed	M7	
JK 7-8	closed	M7	
JM 1-2	open	M5	24 bit addressing mode (bit 3 of CSR)
JN	open	M7	on-board activity indicator
JW 1-2	closed	C3	improved Multibus BUSY/ sync DISABLED
JX 1-2	open	M4	INT0/ (level 0 interrupts)
JX 3-4	open	M4	INT1/ (level 1 interrupts)
JX 5-6	open	M4	INT2/ (level 2 interrupts)
JX 7-8	closed	M4	INT3/ selected (level 3 interrupts)
JX 9-10	open	M4	INT4/ (level 4 interrupts)
JX 11-12	open	M4	INT5/ (level 5 interrupts)
JX 13-14	open	M4	INT6/ (level 6 interrupts)
JX 15-16	open	M4	INT7/ (level 7 interrupts)
JY	open	M3	BPRO/ disabled (parallel arbitration used)
JZ 2-3	closed	K3	CBREQ/ 1-2 conditional 2-3 unconditional release at end of cycle

A.8 1/4 Inch Tape Controller Board (ISBX)

Figure A-8 1/4 Inch Tape Controller



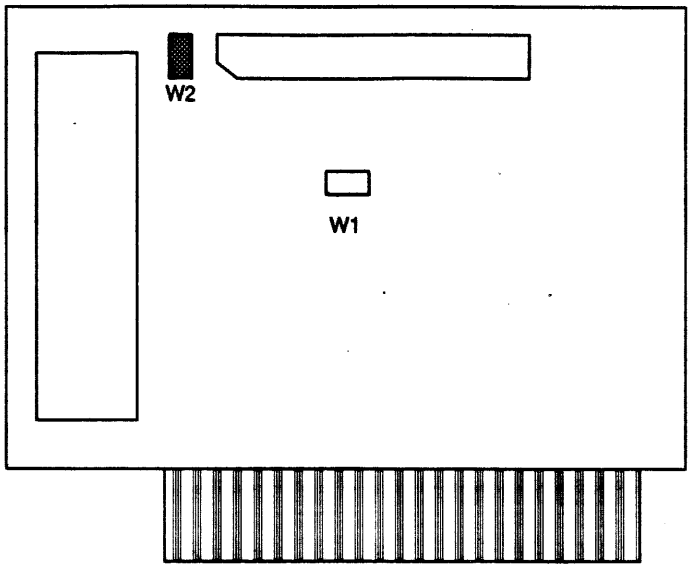
Jumper	Configuration	Location	Description
ZENDEX CARD NEEDS BPRO/ (P1-16) PHYSICALLY CUT ON BOARD			
SW1	A		upper nibble of base address
SW2	0		lower nibble of base address
W1 2-3	closed		J1 8 bit iSBX
W1 5-6	closed		
W2 1-2	closed		J5 16 bit iSBX
W2 4-5	closed		
W3 ALL	open		clocks to iSBX connectors
W4 1-2	closed		J6 16 bit iSBX
W4 4-5	closed		
W5 1-2	closed		J4 16 bit iSBX
W5 4-5	closed		

W6	open	Cut etch on back of board
W7 2-15	closed All Others Open	XACK/ delay select (set to minimum delay) (MWAIT implemented on ZBX-288)
W8 1-2 W8 4-5	closed closed	J2 16 bit iSBX
W9 1-2 W9 4-5	closed closed	J3 16 bit iSBX
W10 All W11 All	open open	device select
W12 W13 W16 W17 W18	1-2 1-2 1-2 1-2 1-2	
W14 All	closed	
W15 1-4 W15 2-5 W15 3-6	open open closed	
W19 2-3	closed	
W20 1-2	closed	
W21 1-4 W21 2-5 W21 3-6	closed open open	
W22 All	closed	
W23 All	open	
W24 1-4 W24 All others	closed open	
W25 1-10 W25 All others	closed open	
W26 1-10 W26 All others	closed open	
W27 All	closed	
W28 2-3	closed	
W29 All	open	
W30 All	open	

W31	All	open	
W32	All	open	
W33	All	open	
W34	All	open	
W35	All	open	
W36	All	open	
W37	All	open	
W39	All	open	
W41	All	open	
W42	All	open	
W38	All	closed	
W40	All	closed	
W43	2-9	closed	(wire wrap)
W43	All others	open	

A.9 SCSI Daughter Board (MB/SCSI)

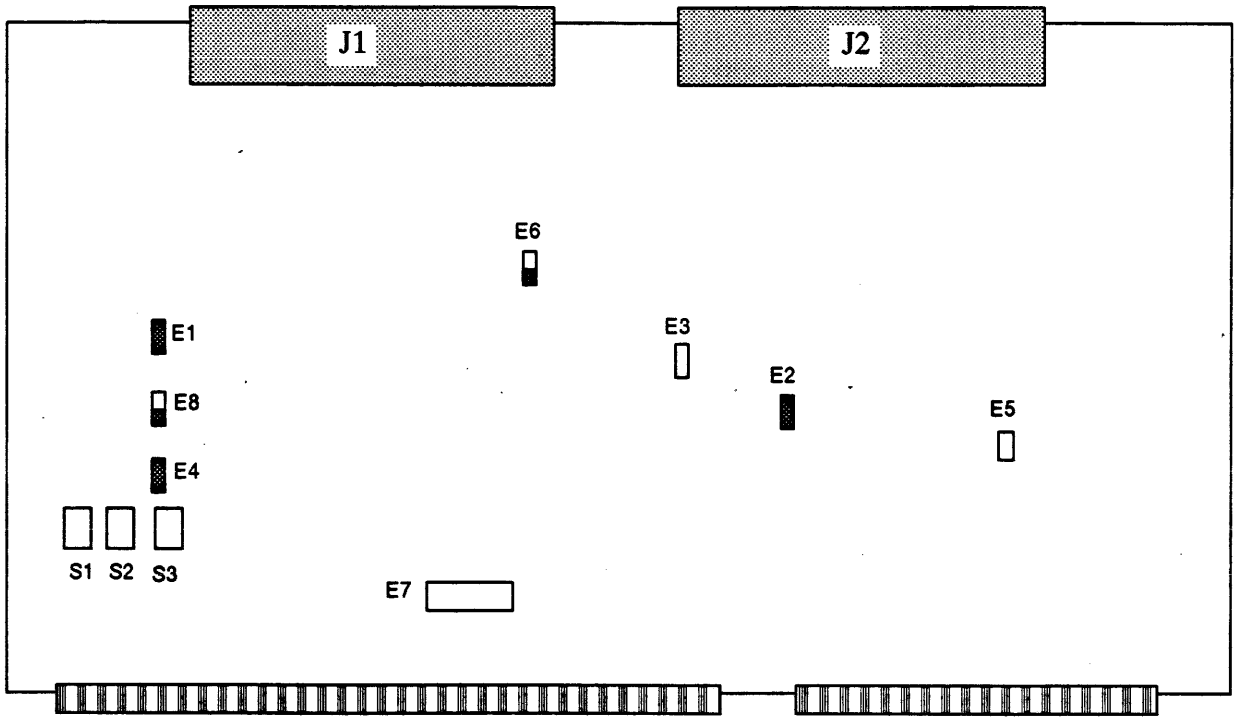
Figure A-9 MB/SCSI Daughter Board



Jumper	Configuration	Location	Description
W1	open		clock/cal interrupt enable
W2	closed		battery enable, REMOVE FOR STORAGE

A.10 1/2 Inch Tape Controller Board (MB/TC)

Figure A–10 1/2 Inch Tape Controller



Jumper	Configuration	Description
S1	F	upper nibble of address
S2	A	address select
S3	8	address select
E1 2–3	closed	required with 4k FIFO RAM option
E2 2–3	closed	controller does not perform Multibus diagnostic (Test 2) during initialization
E3 1–2	open	controller accepts remote diagnostics via
E3 3–4	open	dedicated cable
E4 1–2	closed	controller asserts CBRQ/ during bus xsfer
E5	open	serial bus priority (passes BPRO/) disabled
E6 2–3	closed	required with 4k FIFO RAM option

E7 1-2	closed	controller drives Interrupt line 2
E8 2-3	closed	adaptor decodes 16 bit I/O address

B

Cabling

B.1 Cabling Procedure

To cable a system larger than 16 processors, first determine how many processors are in the system and divide that number by 16. If there is a fractional answer, round upward. For example if you have 50 processors divide that by 16 to get 3 with a remainder of 2 so the answer becomes 4. This is the number of Butterfly card cages (BCVs) required for this system.

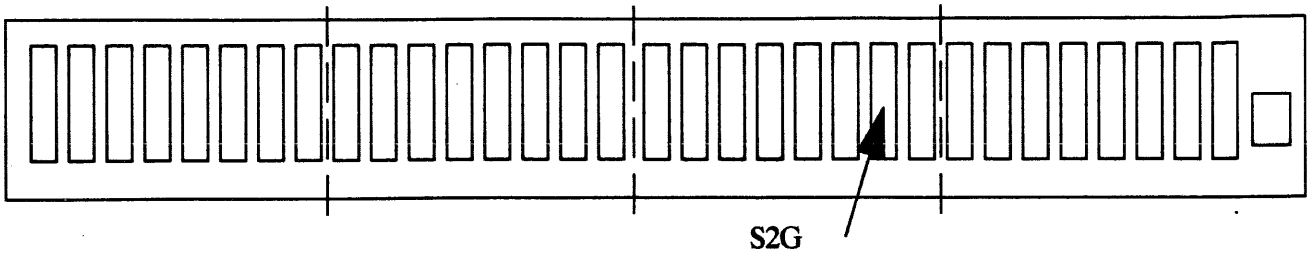
Four column systems use two characters to identify each processor. The first character identifies the processor within the BCV. The second character identifies the BCV. Processor numbered D4 is processor D in BCV 4.

The assignment of BCV numbers follows an established convention.

1st	BCV is address	0	1–16 processors
2nd	BCV is address	4	17–32 processors
3rd	BCV is address	8	33–48 processors
4th	BCV is address	C	49–64 processors
5th	BCV is address	2	65–80 processors
6th	BCV is address	6	81–96 processors
7th	BCV is address	A	97–112 processors
8th	BCV is address	E	113–128 processors

Each BCV in a 4–column system has 2 BVSN Butterfly switches mounted above the the processors.

Figure B-1 BVSN Connector Numbering



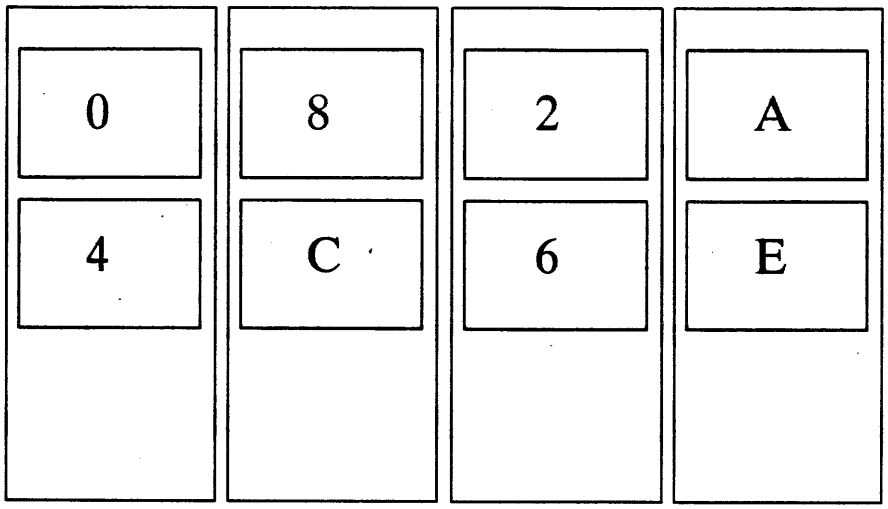
Looking at the front panel of the BVSN you will notice 32 26-pin connectors. Above each connector is an identifying number-letter combination. They all begin with S for switch. The next character divides the switch into 4 groups of 8 connectors each. The last character identifies each of the 8 connectors in a group by the letters A-H. Letters A-D identify the 4 input connectors and E-H identify the output connectors. Example: S2G is in the 3rd group from the left and is the 7th connector from the left within that 3rd group and it is a switch output connector.

On the panel of the lower BVSN beneath the connector at S2G there is a letter "A". Every 2nd connector on either side of this one also has a single character printed beneath it. These are all switch outputs and it is through this connector that a processor receives its identity. So the processor whose receive connector (bottom) is connected to S2G is told by the switch "You are processor A". The processor communicates to the switch through a cable from its transmit connector (top) to a connector in the switch without a character beneath it (in this case it would be S2C).

Each BVSN is a two column switch. To make a four column system, two BVSNs are required. In the above example, the cable from the top connector on the processor would be connected to S2C on the upper switch and the bottom connector on the processor would be connected to S2G on the lower BVSN. Now what is needed is the connection between the 2 switches.

When all the processors are installed, the unlabeled connectors of the upper switch are connected to the upper connectors of the processors. The switch connectors with a character beneath them on the lower BVSN are connected to the lower connectors of the processors. This leaves labeled connectors in the upper switch and unlabeled connectors in the lower switch open. These are the connectors used for switch to switch cables.

Figure B–2 Cage Numbering



The first rack on the left has cage number 0 on the top and cage 4 underneath. Depending on the system size, racks and cages within are added. To give cage 0 its identification connect the upper switch connector with 0 beneath it (S0E) to the unlabeled connector to the left in the lower switch (S0A) using the shortest switch to switch cable. Cage 4 (the BCV below 0) is identified by connecting S0F in the upper BVSN to S0B in the lower BVSN. Cage 8 (top BCV in next rack) has a switch to switch cable connected between S0G in the upper BVSN to S0C in the lower BVSN. Cage C (cage beneath 8) will have a short switch to switch cable between S0H in the upper BVSN and S0D in the lower BVSN.

Notice that all BVSN connector labels we have used begin with S0. That is the section or quadrant used for the primary path. If your system uses 4 BCVs, you can have 3 alternate paths called alternate path 1, 2 and 3 and they correspond to switch sections or quadrants identified as S1, S2 and S3 respectively.

The short switch to switch cables just installed in section S0 define identities on the primary path only. Short switch to switch cables must be installed in BVSN section or quadrant S1 for alternate path 1, S2 for alternate path 2 and S3 for alternate path 3. Cables between cages must also remain in the same quadrant. In other words, alternate path 2 cables in one cage must be connected to the alternate path 2 section of the BVSNs in the cage at the other end. Treat the 4 sections/quadrants/paths of the BVSNs as 4 independent, isolated units.

Each of the 4 cages now has a unique address wired into its primary path by installing a short switch–to–switch cable in the first quadrant of the BVSNs. We are working on the primary path so all cabling is done between the 1st quadrant of the BVSNs (connectors labeled S0*X*).

To connect cage 0 to cage 4 start at cage 0 and find the two corresponding connectors in cage 0 that gave cage 4 its ID character. As an example, cage 4 got its ID from a short cable between S0F in the upper BVSN and S0B in the lower

BVSN, plug one end of a switch-to-switch cable, of correct length, in S0F of the upper BVSN in cage 0 and another cable in S0B of the lower BVSN in cage 0. Neatly arrange the cables down to cage 4 and connect the cable from S0B lower to S0E in cage 4 upper BVSN and the cable from S0F upper to S0A of the lower BVSN in cage 4.

After cabling the primary path, cable the alternate paths using the primary as a guide. Instead of S0*x* use the S1*x*, S2*x*, and S3*x* sections of each BVSN. In large systems, it is useful to bundle the cables from one cage to another.

Dear Customer:

To do a better job of serving you by providing improved documentation, we are asking you to help us. Please take a few minutes to answer the following questions and return them to us by folding up and taping this questionnaire. We value your comments and suggestions and appreciate the time you take to send them to us. Thank you.

5. What is your position/function? ☐ application user ☐ system manager/administrator ☐ programmer ☐ service engineer ☐ other

6. How many years have you been working with computer systems? _____

7. What system are you currently working on? (please check both **hardware** and *software*) ☐ **Butterfly** ☐ **Butterfly Plus** ☐ **GP1000** ☐ *Chrysalis* ☐ *Mach 1000* ☐ *pSOS*

8. What application are you using the product for? _____

9. How much of your time do you spend reading or referring to documents? ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50%

Please answer the following questions about: GP1000 Maintenance Manual

10. Is the information accurate? ☐ always ☐ mostly ☐ seldom ☐ never

11. Is the material clear and logical? ☐ always ☐ mostly ☐ seldom ☐ never

12. Is it easy to find the information you need? ☐ always ☐ mostly ☐ seldom ☐ never

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14. Is the information located where you expect it in the book? ☐ always ☐ mostly ☐ seldom ☐ never

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_____

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After completing the form, **fold this end up to the dotted line**, fold down and tape the top, stamp, and mail. Thank you.

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