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GP1000 Diagnostic Guide

► User Guide

BBN Advanced Computers Inc.
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Diagnostics Manual

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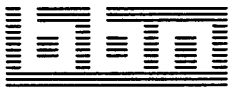

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RELEASE LEVEL

This manual conforms to the Release 1.0 Version of the Mach 1000 operating system software for the Butterfly™ GP1000 Parallel Processor released in October of 1988.

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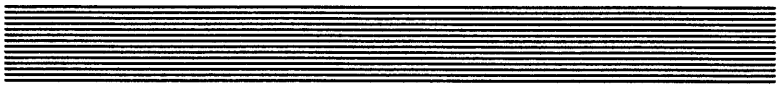


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How to Use This Manual

Purpose of the Manual

This manual is a reference for using the GP1000 Diagnostics. After reading this document, you should be able to test the GP1000 system hardware and peripherals.

Other Places to Find Answers

We are interested in your reactions to our documentation and software. If you have questions or suggestions, or find any problems, 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 still under warranty or have a software maintenance contract, you can also call our hotline number: 1-800-4AC-BFLY in the United States and 1-617-873-8660 from any other location.

If you are reporting a problem, please include as much information as you can. This will help us to resolve problems quickly. Include the version of Mach 1000 you are running, the size of the machine you are using, how many nodes were in your cluster, whether or not anyone else was using the GP1000 at the time, and, if possible a stack backtrace and an example to illustrate the problem.

If you have any problems with the documentation, please let us know. Write to us at the address listed on the form at the back of this manual. We would appreciate it if you would fill out this form 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 explanation of how to service the hardware, see the *GP1000 Maintenance Manual*.

For complete reference information about all the Mach 1000 commands, library routines, and utilities, see the *Mach 1000 Programmer's Reference*, the *Mach 1000 Software Tools* manual, and the *Mach 1000 Supplementary Documents*.

Organization

Chapter one contains an outline of the hardware covered by the diagnostics. Chapter two describes the diagnostics used for the processing and switching subsystems. Chapter three describes the peripheral diagnostics available at the Mach level. Chapter four describes the peripheral self-tests that are used when Mach is not running. There is an appendix which list the various error codes that may be displayed by the diagnostics

Typographic Conventions

This manual uses the following conventions to present information:

- **Bold** indicates an exact file name, command, or user input.
- *Italics* are used to indicate a variable; for example, *filename* stands for the file under discussion.
- `Typewriter` font represents computer output.
- ***Bold italics*** are used to emphasize a word or phrase.
- Keys on the keyboard are spelled out and enclosed in angle brackets, as in the following example:

  <Return>

  To indicate that two (or more) keys are pressed at the same time, both keys are enclosed in brackets and separated with a hyphen:

  <Control-c>

  To indicate that two (or more) keys must be pressed one after another, each key (except the usual single-character keys such as numbers, letters, and punctuation) is enclosed in brackets, as in:

  <Escape>K

  or:

  <Control><Escape>

- The <Return> key is often represented by the symbol ↵ in computer dialog examples.
- Square brackets indicate options in command strings, such as:

  tar [-c] [-v]

- An ellipsis (. . .) indicates a repetition of the previous command or input string.

1 Introduction

1.1 Introduction

The GP1000 Diagnostic Manual describes the characteristics and operation of the software packages that perform diagnostics on the hardware components of the GP1000 parallel processor. There are two broad categories of GP1000 system diagnostics; software that diagnoses hardware problems in the processing and switching subsystems, and software that diagnoses hardware problems in the GP1000 peripherals subsystem. The processing and switching subsystems tested are:

- Processor boards
- Processor memory
- BIOLINK bus (tested indirectly)
- Multibus Adapter Board (BMA) (tested indirectly)
- Butterfly switch

The peripheral subsystems tested are:

- 1/4 Inch SCSI Tape Subsystem
  - MB/iSBX (Zendex Corporation ZX564 Multibus I/O board)
  - MB/SCSI (Zendex Corporation ZX-288 SCSI/Clock-Calendar Board)
  - BT125 (Tandberg Data Corporation TDC 3640 1/4 Inch cartridge tape drive)

- 1/2 Inch Tape Drive Subsystem
  - MB/TC (Ciprico TM1000 Tape Controller)
  - BT270 (Cipher Data Products Inc. M990 GCR CacheTape® 1/2 Inch tape drive)
- Terminal Controller Subsystem
  - MB/TERM (SYSTECH Corporation HPS 6840 host adapter)
  - BTERM-8/BTERM-16 (SYSTECH Corporation HPS 7080 or 7088 remote cluster controller)
- Ethernet Interface Subsystem
  - MB/EN (Excelan Corporation 301 Ethernet controller)
- Fixed Disk Subsystem
  - MB/DC (Xylogics Corporation Model 451 disk controller)
  - BD500/BD850 (Northern Telecom NT 8408 and 8414 disk drives)

All GP1000 diagnostic software is menu-driven. Using the system console or other VT100-compatible terminals, the operator accesses the diagnostics menus, scrolls through them, and selects highlighted options. If a non-VT100-compatible terminal is used to access the diagnostic programs, the software considers it to be a dumb, hardcopy terminal. In these cases, menu options are printed out and selected via numbers typed in by the user.

Processing and Switching Subsystem Diagnostics

2

2.1 Introduction

This chapter describes the diagnostics that test the GP1000 processing and switching subsystems. It first describes the method by which the operating system, on top of which the diagnostics run, is booted, and then describes the diagnostics themselves, including how they're first started and how to use the interactive menus. The diagnostics run on the Chrysalis operating system. This operating system must be booted before the diagnostics will execute.

This chapter first describes the Main Menu and the Run-Time Options Menu, then goes on to describe the tests conducted by selecting options from the Main Menu.

2.2 Booting the Diagnostics

Before running the diagnostics themselves, the Chrysalis operating system must first be booted. This is accomplished by doing the following:

a. Make sure the machine is in USD mode. Make sure the disk drive is attached properly and up and running. At the USD boot prompt(xx?), type the following if your disk drive is configured as unit 0:

```
xx? 0j
Boot: (xy0,0,0)/stand/ramdisk/bootramdisk ↲
```

If your disk drive is configured as unit 1 type the following:

```
xx? 0j
Boot: (xy0,1,0)/stand/ramdisk/bootramdisk ↲
```

Press a <Return> in response to the next prompt.

```
booting type=3, ctrlr=0, drive=0, partition=0
kernel = "/stand/ramdisk/bootramdisk", args = ""
Read 32768 bytes of PNC microcode. Load it [y]? ↲
```

Chrysalis boots and displays messages, Figure 2–1, indicating the initialization files are loading. The message "Input timed out on Larva after 2 seconds" is normal, and should be ignored.

```
Number of bytes read from secondary boot file = xxx
x.a_magic  = xxx
x.a_text   = xxx
             :
             :
loadpoint(after addition of a_data) = XXXXXXXX
Starting secondary boot program at XXXXXXXX
Loading RAMDISK file to ram...
             :
Finished loading RAMDISK...
Checking directory header checksum...
             :
Checksum OK...
Looking for "chrys.68"...
Found "chrys.68"...
Checking "chrys.68" checksum...
             :
"Chrys.68" checksum OK...
Magic number = xxx
Magic number OK...
Loading Chrysalis to virtual execution space...
Adjusting Memory Map bits...
Memory map structure address = XXXXXXXX
```

Figure 2–1. Chrysalis Boot Messages

At the USD prompt, type the following:

```
xx? G
```

A window-manager program starts and displays a Chrysalis prompt. Type the following to start the diagnostic:

```
(cluster x) [xx] diag ↲
Loading diag...
```

After loading the diagnostic prompts you for type of terminal you are using:

```
 Terminal type
1) VT100
2) BITGRAPH
3) Unknown
Select Terminal Type:
```

A diagnostic Main Menu appears as described in the next section.

2.3 Diagnostics Main Menu

The Diagnostics Main Menu is the user interface to GP1000 processing and switching subsystem diagnostics. Upon accessing the diagnostic software, the menu shown in Figure 2-2 is displayed.

```
        Butterfly Plus (BPNE) Diagnostics Ver. 1
                      MAIN MENU

System Configuration Menu                Exit diagnostic
Switch Menu
Node Menu
Multibus Menu
Monitor Log
```

Figure 2-2 Diagnostics Main Menu

2.4 Using the Menus

The menu-option cursor is highlighted in reverse video. You can move the cursor by scrolling up and down with the arrow keys, to a menu option you wish to select. You select/activate a particular menu entry either by scrolling to the desired option and pressing <Return>, or by entering the number key associated with the test.

2.5 Run-Time Options Menu

The Run-Time Options Menu, shown in Figure 2-3, is a parameter set-up menu not directly related to executing any particular test. This menu allows you to set up an infinite loop for a test, halt on errors during loops, or log the results of a test session in a file. Should you set up a diagnostic to execute in a loop, entering q<Return> terminates the test loop. Exiting the Run-Time Options Menu returns the user to the previous menu that was displayed. Once you set the parameters in the Run-Time Options Menu and exit, those options are valid for all subsequent diagnostic menus that are invoked, until the configuration parameters are changed by re-invoking this menu and changing the parameters. The Run-Time Options Menu option appears on all processing and switching subsystem diagnostic menus and can be invoked any time a diagnostic is not active.

```
Butterfly Plus (BPNE) Diagnostics Ver. 1
                RUN OPTIONS
              Halt on Fault      :ON
              Loop Forever       :OFF
              Scope Loop         :OFF
              Interactive        :ON
              Exit Menu
```

Figure 2-3 Run-Time Options Menu

2.6 System Configuration Menu

The System Configuration Menu contains tests that report on the current operational configuration of the GP1000 system. You can select the following configuration tests:

- Processor node configuration
- Memory configuration
- Switch configuration

```
Butterfly Plus (BPNE) Diagnostics Ver. 1
          CONFIGURATION MENU

Node Configuration                    Exit Menu
Memory Configuration
Switch Configuration
Monitor Log
Run Options
```

Figure 2-4. System Configuration Menu

2.6.1 Processor Node Configuration

Processor Node Configuration generates a system report on all the processor nodes present in the GP1000. The test also reports on if the node is running the Chrysalis operating system. The report is generated in a tabular format, that uses the following symbols:

- OK - Node is healthy and running the Chrysalis operating system.
- OK? - Node is healthy and running Chrysalis, but the node's PNC Status Register is non-zero.
- *dn* - Node is present, but not running Chrysalis. (Recommend restart of the node)

- cfg - Node is in configuration table, but not present (Bus error).
- -- - Node exists but is deconfigured.
- <blank> - No node exists at this address.
- ?? - May be a switch or processor node problem.

See Figure 2-5 for an example of an output screen for the Processor Node Configuration diagnostic.

```
10
20
30
40
50
60 OK
70
80
90
a0 OK
b0
c0
d0
e0
f0
```

Figure 2-5. Processor Node Configuration Diagnostic Output

2.6.2 Memory Configuration

Running the Memory Configuration diagnostic generates a system report on the amount of memory present in each node, a summation of the total node memory present in the GP1000, and the total memory available in each Butterfly card cage (BCV). Figure 2-6 shows sample output from the Memory Configuration diagnostic.

```
Executing test Memory Configuration
Scanning.............
Switch:  4 columns, 4 paths
Memory: 8.00M
    0   1   2   3   4   5   6   7   8   9   A   B   C   D   E   F
00
10
20
30
40
50
60  4
70
80
90
a0  4
b0
c0
d0
e0
f0

2  4M nodes
2 Nodes
Cage: 0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
      2
```

Figure 2–6. Memory Configuration Diagnostic Output

2.6.3 Switch Configuration

The Switch Configuration diagnostic program generates a system report on the processor nodes' Butterfly switch addresses. The node number and the Butterfly switch address of that node are compared. If they equal each other, the node and Butterfly switch are configured correctly, and '+ +' is displayed in the field that specifies that node in the report. If the node number and the Butterfly switch address do not equal each other, the node number is displayed. (This normally indicates either a mis-connected switch cable, or a defective node). See Figure 2-7 for sample Switch Configuration output.

```
00
10
20
30
40
50
60 ++
70
80
90
a0 ++
b0
c0
d0
e0
f0

Memory: 8.00M
2  4M nodes
2 Nodes
Cage: 0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
      2
```

Figure 2–7. Switch Configuration Diagnostic Output

2.7 Switch Menu

The Switch Menu contains tests and a sub-menu related to the Butterfly switch. The Switch Menu allows you to invoke the following options:

- Connectivity Test
- Single Word Transfer Test
- Block Transfer Test
- Switch Path Menu
- System Test

```
        Butterfly Plus (BPNE) Diagnostics Ver. 1
                       SWITCH MENU
Connectivity Test                        Run Options
Single Word Transfer Test                Exit Menu
Block Transfer Test
Switch Paths Menu
System Test
```

Figure 2–8. Switch Menu

2.7.1 Connectivity Test

Selecting Connectivity Test from the Switch Menu runs a test that verifies the connectivity of the nodes in the GP1000. The information generated by the test is displayed on the terminal. If a processor node exists, its node number is displayed along with its current status. If no node exists, '..' is displayed. The table is updated every two seconds to provide the latest status information on the connectivity test. Any fault messages generated by the test are displayed at the bottom of the screen.

Typical output from the Connectivity Test diagnostic program is shown in Figure 2-9.

```
start: skipping master node (xx)
start: nodes started: xx,xx
SYSTEST> connect from $all to $all count 100 wait 20
connect: skipping master node (xx)
(This is command # 2)
SYSTEST>

Test =: Connectivity Test
Run =: 1        Pass =: 1       Fault =: 0
```

Figure 2-9. Connectivity Test Diagnostic Output

2.7.2 Single Word Test

Selecting Single Word Transfer Test from the Switch Menu runs a diagnostic that checks whether the processing and switching subsystem can transfer data in single word form across the Butterfly switch. The Single Word Transfer Test transmits and receives a single word from all the nodes to all other nodes 200 times.

Output from a Single Word Test run is shown in Figure 2-10.

```
Test =: Single Word Transfer Test
Run =: 1        Pass =: 1       Fault =: 0
```

Figure 2-10. Single Word Test Diagnostic Output

2.7.3 Block Transfer Test

Selecting Block Transfer Test from the Switch Menu runs a diagnostic test that verifies the operation of the PNC block transfer function. During the diagnostic the Block Transfer Test transmits and receives a 1K block of data from all nodes to all other nodes for 200 times.

Figure 2-11 shows sample Block Transfer Test output.

```
Test =: Block Transfer Test
Run =: 1        Pass =: 1       Fault =: 0
```

Figure 2-11. Block Transfer Test Diagnostic Output

2.7.4 Switch Paths Menu

Selecting the Switch Paths Menu from the Switch Menu brings up a submenu from which you can enable or disable the alternate path logic of the GP1000. The Switch Paths Menu will not work on systems smaller than 17 or larger than 128 nodes, as there are no alternate paths on such systems. Figure 2-12 shows the menu generated when the Switch Paths Menu option is selected.

```
        Butterfly Plus (BPNE) Diagnostics Ver. 1
                    SWITCH PATHS MENU

                      Primary path 0    :ON
                      Alternative path 1:ON
                      Alternative path 2:ON
                      Alternative path 3:ON
                      Exit Menu
```

Figure 2-12. Switch Paths Menu

2.7.5 System Test

Selecting the System Test option from the Switch Menu provides access to a number of tests that dynamically test the Butterfly switch and the processor nodes. The System Test consists of a master process and slave processes. The master process takes commands from you, and orders the slave processes to execute the command. To get a help screen with a command list, type "help" followed by a <Return>.

See Figure 2-13 for an example of System Test output.

```
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
60   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..   ..
a0
Status: *: running, A: Start, B: unserviced kill, C: Block Transfer test
        D: Single word transfer test, E: Polled, F: Connectivity test
SYSTEST>
```

Figure 2–13. System Test Diagnostic Output

2.8 Node Menu

The Node Menu provides access to a series of tests that diagnose faults on the GP1000 processor nodes. The available tests are listed below:

- Message Test
- Node Memory Test

```
Butterfly Plus (BPNE) Diagnostics Ver. 1
NODE TEST MENU
 Message Test
 Node Memory Test
 Monitor Log
 Run Options
 Exit Menu
```

Figure 2–14. Node Test Menu

2.8.1 Message Test

Message Test verifies the node's ability to create and delete processes and memory objects on remote nodes. The primary function of this test is to perform normal run time operation on the GP1000 system. The test prompts you with the following questions:

`Loop on error?` **n** ↵ (used only for scope loops)

`Test all nodes in the Butterfly?` **y** ↵

If you do not want to test all the nodes in the GP1000, reply n < Return > , then type the node numbers (hex) of the nodes to be tested with a space as a delimiter.

2.8.2 Node Memory Test

Node Memory Test tests the processor nodes' RAM memory. The memory test will not test any of the 'SYSTEM' nodes, or the local node that you are currently running on. The test prompts you with the following question:

```
Executing test Node Memory Test
Test all nodes in the Butterfly?          y↵
```

If you do not want to test all the nodes in the GP1000, reply n < Return > , then type the node numbers (hex) of the nodes to be tested.

NOTE

You must restart all nodes that have been memory tested after the testing is complete.

Remember, in order to break out of a loop simply type q < Return > .

If any unexpected exceptions occur during the execution of the above mentioned tests, they will be reported at the completion of the test.

2.9 Multibus Menu

The Multibus Menu contains the memory test for the ramboot board. If any faults or exceptions are encountered they will be displayed at the completion of the test.

```
Butterfly Plus (BPNE) Diagnostics Ver. 1
          MULTIBUS TEST MENU
             Ramboot Test
             Scope
             Monitor Log
             Run Options
             Exit Menu
```

Figure 2–15. Multibus Test Menu

2.9.1 Ramboot Test

Ramboot Test tests the Multibus Ramboot board's RAM memory. The test prompts you with the following question:

```
27
Executing test Ramboot Test
Enter memory size of the Ram Boot board? (1M-4M)  ?      1↵
```

Enter the size of the Ramboot board to be tested and press <Return>. The test displays its progress during testing and results at the end:

```
Multibus RAM Board Address   c00000, Memory 1024 _K
Ramboot Memory Test with pattern 0
Ramboot Memory Refresh circuitry test.
Ramboot Refresh Test with pattern 0
Ramboot Memory word transfer test.
Ramboot Memory word transfer test with pattern 55555555
Ramboot Memory Test with pattern 5a
Ramboot Memory Refresh circuitry test.
Ramboot Refresh Test with pattern 5a
Ramboot Memory word transfer test.
Ramboot Memory word transfer test with pattern aa00ff55
Ramboot Memory Test with pattern a5
Ramboot Memory Refresh circuitry test.
Ramboot Refresh Test with pattern a5
Ramboot Memory word transfer test.
Ramboot Memory word transfer test with pattern ffffffff
Test =: Ramboot Test
Run =: 1        Pass =: 1       Fault =: 0
```

Figure 2-16. Sample Ramboot Test Output

Peripheral Diagnostics Using Mach 1000

3

3.1 Introduction

There are two basic categories of GP1000 peripheral diagnostics, ***Mach 1000-based*** diagnostics and ***Standalone*** diagnostics.

- Mach 1000-based Diagnostics. These diagnostics run under Mach, and exercise 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.
- Standalone Diagnostics. These tests are basic diagnostics running on raw hardware that invoke all built-in peripheral self-tests supplied by our OEM peripheral (and peripheral controller) manufacturers, in addition to testing Multibus-accessible on-board internal registers and controller RAM space.

This chapter describes the Mach 1000 diagnostics. Chapter 4 details the Standalone diagnostics. Both chapters begin with instructions for accessing the diagnostic suites, and then describe how to run each test.

All peripheral diagnostics are loaded either from the $^1/_4$-inch SCSI tape, the hard disk, or from a serial port. If one of these subsystems fails, the other can serve as a backup. The diagnostics are uploaded to a node in the GP1000, where they execute in that node's RAM.

3.2 Starting the Mach 1000 Diagnostics

If Mach 1000 has been booted successfully on your GP1000, you may run the Mach-based diagnostics. If you are unable to boot Mach, you must run the standalone diagnostics first to determine if a peripheral is preventing successful boot up of the operating system. Chapter 4 describes the procedure for running standalone diagnostics.

Start the Mach 1000-based diagnostics by completing the following steps at the system prompt:

% **login root** ↵	Log in to the system as "root"
password: *password* ↵	Enter password for "root" (you must be root to run this diagnostic or a number of tests will fail).
% **cd /stand** ↵	Execute the diagnostics.
% **./machdiag** ↵	Execute the diagnostics.

Once the above commands have been entered, you are prompted by the following screen (Figure 3-1):

Figure 3-1 Terminal Prompt Screen

```
GP1000 Peripheral Diagnostics (running on MACH) Ver.1.1

Enter type of terminal you are using, by number:
      1. Hardcopy terminal/dumb terminal
      2. VT100 compatible terminal
      3. SUN
```

Enter the number that corresponds to the type of terminal you are using, and press <Return>. The Main Menu appears on your screen (see Figure 3-2), and you can begin to run the Mach-based diagnostics described below.

3.3 Mach 1000 Diagnostics Main Menu

The diagnostics Main Menu is the user interface to GP1000 peripheral diagnostics. The menu is shown in Figure 3-2.

If you are using a VT100-compatible terminal or a Sun terminal, the menu option selected is highlighted in reverse video. The selection can be changed by moving the selection cursor up or down with the arrow keys, pressing the space bar, or pressing the "u" (up) or "d" (down) letter keys. You execute a selected menu option by pressing <Return>. Refer to Table 3-1 for the complete command list.

Table 3-1. Menu Command List

<Space>	Moves selection cursor down (or wrap around to the top)
<Arrows>	Moves selection cursor up or down (or wrap around)
u	Moves selection cursor up (or wrap around to the bottom)
d	Moves selection cursor down (or wrap around to the top)
<Return>	Execute the currently selected menu option
4<Return>	Execute the menu option number 4
s	Select/deselect the menu option for multiple test execution
?	Display a help screen for the currently selected menu option. In the main menu this displays software revisions.

If you are using a hardcopy or any non-VT100 terminal, the Main Menu program is the same as described above for VT100 terminals except menu options are not highlighted and do not scroll. There is also no capability of executing two or more tests via the "s" key. Refer to Table 3-2 for the non-VT100 command list.

Table 3-2. Non-VT100 Menu Command List

4<Return>	Execute the menu option number 4
?	Display a help screen for the currently selected menu option. In the main menu this displays software revisions.

```
GP1000 Peripheral Diagnostics (running on MACH) Ver.2.0

                    MAIN MENU

      1. SCSI TAPE CARTRIDGE SUBSYSTEM
      2. FIXED DISK SUBSYSTEM
      3. ETHERNET CONTROLLER SUBSYSTEM
      4. TERMINAL CONTROLLER SUBSYSTEM
      5. 1/2-inch TAPE DRIVE SUBSYSTEM
      6. DISPLAY SYSTEM CONFIGURATION
      7. ALL TESTS
      8. RUN-TIME OPTIONS
      9. EXIT
```

Figure 3–2. Mach 1000 Peripheral Diagnostics Main Menu

3.3.1 Display System Configuration

Selecting the option 6 from the Main Menu shown in Figure 3-2 displays the device I/O configuration of the GP1000. All devices that appear "alive" and respond to polling via the BMA at the time of the diagnostic boot are considered part of the configuration. Figure 3-3 shows a sample output from selection of this menu option.

```
          .
          .
        (status information)
          .
          .
BBNACI GP-1000
bma0 at processor node 0xb
xyc0 on bma at node 11 at csr ee40
nt-8408 Unit 1 trk 8, sect 65, cyl 1496
xy1 at xyc0 slave 1
ex0 on bma at node 11 at csr ffe40000
ex0: 8:0:14:10:82:84 [nx/101 5.3, exos/101 0.0]
smt0 on bma node 11 at csr ff00a000
tmt x on bma node xx
          .
          .
```

Figure 3–3. Display System Configuration Sample Output

The line beginning `xyc0` indicates that a disk controller board is mounted and alive. The line beginning `ex0` shows that the Ethernet board is configured (the next line gives address information). The line beginning `smt0` indicates the

SCSI tape controller is present in the configuration, and the line beginning `tmt x` indicates the same is true for the MB/TC tape controller board. The above display contains no entry for a MB/TERM terminal controller board, indicating that this board is not present in the configuration.

3.3.2 The All Tests Option

The `All Tests` selection, which is option 7 on the Main Menu, appears in most menus. Selecting this option invokes all of the tests listed in that menu automatically, without further input from you.

In addition, you can make several selections at once by scrolling to two or more options and press "s" (select) for each option. Pressing the "s" key causes an asterisk (*) to be placed beside those tests selected. Scrolling to an option already marked by an asterisk and pressing "s" de-selects the option and removes the asterisk. All tests marked by an asterisk can then be executed by pressing <Return>. They will execute in the order selected.

NOTE

Multiple options cannot be selected from a menu if you are running with a hardcopy terminal.

3.3.3 Run-Time Options Menu

The Run-Time Options menu, which is option 8 on the Main Menu, appears on all menus and can be invoked any time a test is not active. If selected, it displays a set-up menu (Figure 3-4) that applies to all tests subsequently run.

This menu allows you to set loop count parameters. Exiting the Run-Time Options Menu returns you to the last menu that was displayed. Once you set the parameters they are valid for all tests subsequently run, until you return to this menu and change them. The only exception to this is the LOOP COUNT parameter which is independently settable for each diagnostic. If you set a test to execute in a loop, entering <Control-c> <Return> terminates the loop.

NOTE

The **result logging** option is currently not implemented.

```
GP1000 Peripheral Diagnostics (running on MACH) Ver.2.0


                RUN-TIME OPTIONS MENU

        1. HALT ON ERROR             = ON
        2. LOOP COUNT                = 001
        3. LOG TEST SESSION          = OFF
        4. SUPPRESS ERROR REPORTING = OFF
        5. ENTER DEFAULT DEVICE NAMES
        6. EXIT
```

Figure 3–4. Run–Time Options Menu

3.4 1/4 Inch SCSI Tape Diagnostics

The $^1/_4$ Inch SCSI Tape Cartridge Diagnostics are executed by selecting option 1 from the Main Menu shown in Figure 3–2. Once that option is selected, the following screen is displayed (Figure 3–5).

```
GP1000 Peripheral Diagnostics (running on MACH) Ver.2.0


   SCSI TAPE CARTRIDGE OPERATIONAL DIAGNOSTICS

      1. 1/4" Tape Drive Programmed I/O Test
      2. 1/4" Tape Drive Normal/Block DMA Test
      3. 1/4" Tape Drive Read/Write Test
      4. 1/4" Tape Drive EOM Test
      5. 1/4" Tape Drive Write Protect Test
      6. 1/4" Tape Drive Rewind/Erase Test
      7. ALL TESTS
      8. RUN-TIME OPTIONS
      9. EXIT
```

Figure 3–5. 1/4 Inch SCSI Tape Diagnostic Menu

3.4.1 1/4 Inch Tape Drive Programmed I/O Test

Selecting option 1 from the above menu executes the 1/4 Inch Tape Drive Programmed I/O Test. This tests the ability of the SCSI interface and the tape cartridge to transfer small blocks of data without using DMA. It tests the following subsystem components:

- Registers of MB/SCSI and MB/ISBX controllers
- SCSI interface
- BT125 read/write capability

The test first prompts you with the following screen:

```
SCSI Programmed I/O Test

This test writes data to the tape cartridge and requires
the use of a scratch tape; 'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the previous menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed as you type. If the password is correct, you are prompted as shown below:

```
Enter name of tape drive (default: 'rsmt1'):
Enter 8 characters of random data: "
Insert scratch tape and hit alphanumeric key to continue;
(Note: the tape MUST be an XTD [Xtra Track Density] tape)
```

Press <Return>, enter a test pattern, and insert a scratch tape for the test and press a key.

If the test passes, the screen displays test pattern data, then the message:

```
PROGRAMMED I/O TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
PROGRAMMED I/O TEST FAILED:
OPEN ERROR ON DEVICE UNDER TEST
WRITE ERROR ON SCSI DEVICE
CLOSE ERROR ON DEVICE UNDER TEST
HANG (TIMEOUT) DURING OPEN/WRITE/CLOSE OF TAPE DEVICE (CHECK CABLE CONNEC-
TIONS)
READ ERROR ON SCSI DEVICE
DATA MISCOMPARE ON SCSI DEVICE
```

3.4.2 1/4 Inch Tape Drive Normal/Block DMA test

Selecting option 2 from the SCSI Diagnostics menu starts the 1/4 Inch Tape Drive Normal/Block DMA Test. This tests the ability of the SCSI tape cartridge subsystem to read and write large blocks of data using DMA (Direct Memory Access). It tests the following subsystem components:

- SCSI interface
- BT125 tape cartridge read/write ability
- MB/SCSI DMA controller

The test first prompts you with the following screen:

```
SCSI DMA data test

This test writes data to the tape cartridge and requires
the use of a scratch tape;
'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the tape diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below. Please note that tapes may be XTD, DC600A or Series II Gold.

```
Enter name of tape device (default: 'rsmt1'):

Insert scratch tape and strike key to continue
(Note: the tape MUST be an XTD [Xtra Track Density] tape)
```

If the test passes, the screen displays test pattern data, then the message:

```
NORMAL/BLOCK DMA TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
NORMAL/BLOCK DMA TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
WRITE ERROR ON DEVICE UNDER TEST
READ ERROR ON DEVICE UNDER TEST
DATA MISCOMPARE ON READ/WRITE VALUES ($5A,$A5,$0F,$F0,$00,$FF,$29,$60)
HANG (TIMEOUT) DURING OPEN/WRITE/CLOSE OF TAPE DEVICE (CABLE CONNECTIONS?)
```

3.4.3 1/4 Inch Tape Drive Read/Write Test

Selecting option 3 from the SCSI Diagnostics menu starts the 1/4 Inch Tape Drive Read/Write Test. This test alternates reads and writes to the SCSI Tape, transferring approximately 100K-byte blocks with each operation. One read operation and five write operations are executed using the UNIX **tar** command.

The test first prompts you with the following screen:

```
SCSI tape archive read/write test

This test writes data to the tape cartridge and requires
the use of a scratch tape;
'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the tape diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rsmt1'):
Insert scratch tape and strike key to continue...
(Note: the tape MUST be an XTD [Xtra Track Density] tape.)
```

If the test passes, the screen displays UNIX **tar** status messages, then the message:

```
READ/WRITE TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
READ/WRITE TEST FAILED
TAR WRITE ERROR
TAR READ ERROR
FILE COMPARE ERROR
HANG (TIMEOUT) DURING TAPE ARCHIVE (CHECK CABLE CONNECTIONS)
```

3.4.4 1/4 Inch Tape Drive EOM (End-Of-Media) Test

Selecting option 4 from the SCSI Diagnostic menu executes the 1/4 Inch Tape Drive EOM Test. The end-of-media test checks to make sure that the tape drive can recognize EOM by issuing a retention command. This diagnostic tests the following BT125 components:

- BT125 End-Of-Media verify circuitry
- BT125 read circuitry

The test first prompts you with the following screen:

```
SCSI End-Of-Media test

Insert scratch tape and hit alphanumeric key to continue
(Note: the tape MUST be an XTD [Xtra Track Density] tape)
```

When you press a key, the next screen appears (no password is required for this test):

```
Enter name of tape device (default: 'rsmt1'):

This test takes about 4 minutes...
```

If the test passes, the screen displays the message:

```
1/4-INCH TAPE DRIVE EOM DETECT TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/4-INCH TAPE DRIVE EOM DETECT TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
RETENTION COMMAND FAILED
HANG (TIMEOUT) DURING RETENTION OF TAPE DEVICE (CHECK CABLE CONNECTIONS)
```

3.4.5 1/4 Inch Tape Drive Write Protect Test

Selecting option 5 from the SCSI Diagnostics menu executes the 1/4 Inch Tape Drive Write Protect Test. This tests that the tape cannot be overwritten with the write protection mechanism in place.

The test first prompts you with the following screen:

```
SCSI write protect test

This test has the potential to destroy tape cartridge
data and requires the use of a scratch tape;
'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the previous menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rsmt1'):

Set the write protect mechanism on the scratch tape
cartridge to the SAFE position, insert the tape, and hit
any alphanumeric key to continue:
(Note: the tape MUST be an XTD [Xtra Track Density] tape)
```

If the test passes, the screen displays the message:

```
1/4-INCH TAPE WRITE PROTECT TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/4-INCH TAPE WRITE PROTECT TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
WRITE PROTECT ERROR: WRITE PROTECT MECHANISM DID NOT WORK
HANG (TIMEOUT) DURING WRITE PROTECT TEST (CHECK CABLE CONNECTIONS)
```

3.4.6 1/4 Inch Tape Drive Rewind/Erase test

Selecting option 6 from the SCSI Diagnostic menu executes the 1/4 Inch Tape Drive Rewind/Erase Test. This tests the rewind and erase features of the BT125. The diagnostic tests the following subsystem components:

- BT125 erase circuitry
- BT125 rewind circuitry

The test first prompts you with the following screen:

```
SCSI Rewind/Erase test

This test erases ALL data on the tape cartridge and requires
the use of a scratch tape;
'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the tape diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rsmt1'):

Insert scratch tape and hit alphanumeric key to continue
(Note: the tape MUST be an XTD [Xtra Track Density] tape)
```

If the test passes, the screen displays the message:

```
ERASE TEST PASSED
REWIND TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
ERASE TEST FAILED: STATUS = 0xXX
REWIND TEST FAILED: STATUS = 0xXX
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
HANG (TIMEOUT) DURING ERASE (CHECK CABLE CONNECTIONS)
HANG (TIMEOUT) DURING REWIND (CHECK CABLE CONNECTIONS)
```

3.5 Fixed Disk Drive Diagnostics

The BD500/BD850 (500- or 850-megabyte fixed disk subsystem) diagnostics are executed by selecting option 2 (FIXED DISK SUBSYSTEM) from the Main Menu shown in Figure 3-2. Once that option is selected, the following menu is displayed (Figure 3-6):

```
GP1000 Peripheral Diagnostics (running under MACH) Ver.2.0

FIXED DISK OPERATIONAL DIAGNOSTICS

1. Disk Drive Seek Test
2. Disk Read/Write Block Test
3. Disk Drive Reset Test
4. Disk Drive Read Label Test
5. Read/Write Specified Sector
6. File Copy/Compare Test
7. ALL TESTS
8. RUN-TIME OPTIONS MENU
9. EXIT
```

Figure 3-6. Fixed Disk Subsystem Diagnostic Main Menu

3.5.1 Disk Drive Seek Test

Selecting option 1 from the above menu executes the Disk Drive Seek Test. This test moves the heads of the selected disk drive to the beginning sector and then to the end sector, repeating the process five times. This tests the following subsystem components:

- MB/DC controller Multibus interface
- BD500/BD850 disk drive seek capability

The test first prompts you with the following screen:

```
Disk Drive Seek Test

WARNING: although this test does not intentionally write
to the disk, disk data may nonetheless be lost when
testing a marginal drive...
'A' to abort, 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the disk drive diagnostic menu.

If you press a "C", you are prompted for the unit number of the disk drive:

```
Enter disk drive unit number [0-3] (default = 0):
```

After entering the desired drive number, followed by <Return>, you are presented with a list and prompted for disk type:

```
                    Heads  Cylinders  Sectors
 1. FUJI-EAGLE       20       842       46
 2. CDC 9720-500     10      1217       66
 3. CDC 9720-850     15      1217       66
 4. NT 8408 (500)     8      1496       65
 5. NT 8414 (850)    14      1496       65

 Enter disk drive type number [1-5] (default = 4):
```

After entering the desired drive type number, followed by <Return>, the test begins to run. If the test passes, the screen displays the message:

```
DISK DRIVE SEEK TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
DISK DRIVE SEEK TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
DISK IOCTL READ ERROR
HANG (TIMEOUT) DURING DISK SEEKS (CHECK CABLE CONNECTIONS)
```

Figure 3-7 Seek Test Error Messages

3.5.2 Disk Read/Write Block Test

Selecting option 2 from the Fixed Disk Diagnostic Menu executes the Disk Read/Write Block Test. This test writes a sector's worth of data to the disk, reads it back, and checks the returned data with the original data. The sector used is located near the end of the disk space. This tests the following subsystem components:

- MB/DC controller Multibus interface
- MB/DC controller DMA circuitry
- MB/DC controller internal RAM
- MB/DC controller internal FIFO
- Disk read/write capability

The test first prompts you with the following screen:

```
Disk Drive Read/Write selected data pattern test

This test writes and reads data to and from the specified disk drive on or near
the last sector. While it makes every attempt to restore the original data on
the disk, data loss may nonetheless occur on a marginal drive.
'A' to abort, 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the disk drive diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted for the unit number of the drive to be tested:

```
Enter disk drive unit number [0-3] (default = 0):
```

Enter the desired drive number and press <Return>. You are then presented with a list of disk drive types and prompted for the drive type:

```
                    Heads  Cylinders  Sectors
1. FUJI-EAGLE         20       842       46
2. CDC 9720-500       10      1217       66
3. CDC 9720-850       15      1217       66
4. NT 8408 (500)       8      1496       65
5. NT 8414 (850)      14      1511       65

Enter drive type [1-5] (default = 4):
```

Enter the drive type number and press <Return>. If the test passes, the screen displays the message:

```
DISK READ/WRITE TEST PASSED
```

If the test fails, one or more of the following error messages are displayed (Figure 3-10):

```
DISK READ/WRITE TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
DISK IOCTL READ ERROR
DISK IOCTL WRITE ERROR
DISK DRIVE READ ERROR
DISK DRIVE WRITE ERROR
DISK DRIVE DATA MISCOMPARE ERROR
HANG (TIMEOUT) DURING XYREAD
```

Figure 3–8 Read/Write Block Test Error Messages

3.5.3 Disk Drive Reset Test

Selecting option 3 from the Fixed Disk Diagnostic Menu executes the Disk Drive Reset Test. This test clears any drive fault and returns the drive to Cylinder 0 (or recalibrates the drive). This tests the following subsystem components:

- MB/DC controller Multibus interface
- MB/DC controller DMA circuitry
- BD500/850 disk drive reset/recalibration capability

The test first prompts you with the following screen:

```
Disk Drive Reset Test

WARNING: drive reset should be done on a disk drive
that does not contain any actively mounted file systems.
Not heeding this warning may result in loss of data on
the drive that has the root file system mounted.
'A' to abort, 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the disk drive diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted for the unit number of the drive to be tested:

```
Enter disk drive unit number [0-3] (default = 0):
```

After entering the desired drive number, followed by <Return>, the test begins to run. If the test passes, the screen displays the message:

```
DISK DRIVE RESET PASSED;
```

If the test failed, one or more of the following error messages are displayed:

```
DISK DRIVE RESET FAILED;
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
HANG (TIMEOUT) DURING DRIVE RESET
DISK IOCTL RESET ERROR
```

Figure 3-9 Reset Test Error Messages

3.5.4 Disk Drive Read Label Test

Selecting option 4 from the Fixed Disk Diagnostic Menu executes the Disk Drive Read Label Test. Executing this test returns the following information (if the test is successful):

- Disk label checksum
- Label version id (magic #)
- Number of read/write heads and cylinders
- Number of sectors/track (less spares)
- Number of bytes/sector (overhead inc.)
- Number of spare sectors and tracks for slipping
- Number of alternate cylinders
- Interleave factor
- Sector offset of defect list, bad sector list, unslippable sector map
- Disk id string
- Partition sizes

The diagnostic tests the following subsystem components:

- MB/DC controller Multibus interface
- MB/DC DMA circuitry
- BD500/BD850 read drive status capability

The test first prompts you with the following:

```
Enter disk drive unit number [0-3] (default = 0):
```

After entering the desired drive number, followed by <Return>, the test begins to run. If the test passes, the program displays screens similar to the samples shown in Figure 3-10 and Figure 3-11.

```
Disk label checksum                      = 0x974f
Label version id (magic #)               = 0x0
Number of read/write heads               = 8
Number of cylinders                      = 1496
Number of sectors/track (less spares)    = 65
Number of bytes/sector (overhead inc.)   = 633
Number of spare sectors for slipping     = 1
Number of spare tracks for slipping      = 0
Number of alternate cylinders            = 2
Interleave factor                        = 0
Sector offset of defect list             = 1
Sector offset of bad sector list         = 0
Sector offset of unslippable sector map  = 1
Disk id string                           = NT-8408

Hit key to continue...
```

Figure 3-10. Sample Label Test Output - Screen Number One

The second output screen created by this diagnostic contains information about partitions. By pressing any key, in response to the above prompt, partition information is displayed similar to the information shown on the sample screen in Figure 3-11.

```
Sector offset of start of partition #0 = 0
Number of sectors in partition      #0 = 40040
Sector offset of start of partition #1 = 40040
Number of sectors in partition      #1 = 20280
Sector offset of start of partition #2 = 0
Number of sectors in partition      #2 = 776880
Sector offset of start of partition #3 = 60320
Number of sectors in partition      #3 = 30160
Sector offset of start of partition #4 = 0
Number of sectors in partition      #4 = 0
Sector offset of start of partition #5 = 0
Number of sectors in partition      #5 = 0
Sector offset of start of partition #6 = 90480
Number of sectors in partition      #6 = 686400
Sector offset of start of partition #7 = 0
Number of sectors in partition      #7 = 0

Hit key to continue...
```

Figure 3-11. Sample Label Test Output - Screen Number Two

If the test fails, one or more of the following error messages are displayed:

```
READ DRIVE LABEL FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
HANG (TIMEOUT) DURING READ LABEL TEST
DISK IOCTL READ ERROR
```

Figure 3–12 Read Label Test Error Messages

3.5.5 Read/Write Specified Sector Test

Selecting option 5 from the Fixed Disk Diagnostic Menu executes the Read/Write Specified Sector Test. This test allows you, if privileged, to test the sector of your choice using a test pattern of your choice. This tests the following subsystem components:

- Disk read/write circuitry
- MB/DC controller Multibus interface
- Disk seek capability
- Integrity of specific sector(s)

The test first prompts you with the following screen:

```
Disk Drive user-specified sector read/write test

WARNING: THIS DIAGNOSTIC WRITES AND READS DATA TO AND
FROM THE SPECIFIED DISK DRIVE ON A USER-SPECIFIED SECTOR
WITH USER-SPECIFIED DATA. WHILE IT MAKES EVERY ATTEMPT
TO RESTORE THE ORIGINAL DATA ON THE DISK, DATA LOSS MAY
NONETHELESS OCCUR ON A MARGINAL DRIVE.
'A' TO ABORT, 'C' TO CONTINUE:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the disk drive diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted for the unit number of the drive to be tested:

```
Enter unit number [0-3] (default = 0):
```

After entering the desired drive number, followed by <Return>, you are then presented with a list of disk drive types, as shown below, and are asked to enter which type is currently mounted:

```
                    Heads  Cylinders  Sectors
1. FUJI-EAGLE         20       842       46
2. CDC 9720-500       10      1217       66
3. CDC 9720-850       15      1217       66
4. NT 8408 (500)       8      1496       65
5. NT 8414 (850)      14      1496       65

Enter drive type [1-5] (default = 4):
```

After the drive type is entered, the screen prompts for the cylinder, head, and section to be tested:

```
Enter cylinder:
Enter head:
Enter sector:
```

If you enter a sector on or near the root partition, the following warning appears:

```
WARNING: TEST WILL READ/WRITE IN OR NEAR ROOT PARTITION.
DO YOU WISH TO CONTINUE [y/n]?
```

If you enter "y" (for "yes"), the system prompts for the data pattern to be

```
Enter hex data pattern (1 byte, i.e., 2 hex digits):
```

If the test passes, the screen displays the message:

```
USER-SPECIFIED SECTOR READ/WRITE TEST PASSED
```

If the test fails, one or more of the error messages in Figure 3-13 are displayed.

```
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
DISK DRIVE READ ERROR
DISK DRIVE WRITE ERROR
DISK DRIVE IOCTL READ ERROR
DISK DRIVE IOCTL WRITE ERROR
HANG (TIMEOUT) DURING SECTOR READ/WRITE
DISK DRIVE DATA MISCOMPARE ERROR
```

Figure 3-13 Read/Write Sector test Error Messages

3.5.6 File Copy/Compare Test

Selecting option 6 from the Fixed Disk Diagnostic Menudisk drive diagnostic menu executes the File Copy/Compare Test. This test copies a file already on disk to a separate second file and compares them. The test is best executed when set up to run in a loop. This tests the following subsystem components:

- Disk controller FIFO register
- MB/DC controller Multibus interface
- Disk seek capability

The test first prompts you with the following screen:

If the test passes, the screen displays the message:

```
FILE COPY/COMPARE TEST PASSED
```

If the test fails, one or more of the error messages in Figure 3-14 are displayed.

```
COPY FAILURE
FILE COMPARE FAILURE
INTERRUPTED SYSTEM CALL
HANG (TIMEOUT) DURING FILE COPY/COMPARE
```

Figure 3-14 File Copy/Compare test Error Messages

3.6 Ethernet Subsystem Diagnostics

The Ethernet subsystem diagnostics are executed by selecting option 3 (ETHERNET CONTROLLER SUBSYSTEM) from the Main Menu shown in Figure 3-2. When that option is selected, the following menu is displayed:

```
GP1000 Peripheral Diagnostics (running under MACH) Ver.2.0


        ETHERNET CONTROLLER OPERATIONAL DIAGNOSTICS

    1. Ping test, send IP messages
    2. Get Excelan board statistics
    3. ALL TESTS
    4. RUN-TIME OPTIONS
    5. EXIT
```

Figure 3-15. Ethernet Controller Diagnostic Menu

3.6.1 Ping Test

Selecting option 1 from the Ethernet Controller Diagnostics menu executes the Ping Test. This test sends messages to and from another machine across the network. This tests the MB/EN Ethernet driver/receivers.

The test first prompts you with the following:

```
Enter a machine to send packets to, [<cr> for default: bfly-vax.bbn.com]
```

If the test passes, the diagnostic displays a screen similar to the sample shown in Figure 3-16:

```
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms
72 bytes from 128.89.0.157: icmp_seq=0. time=10 ms

----bfly-vax.bbn.com PING Statistics----
10 packets transmitted, 10 packets received, 0% packet loss
round-trip (ms) min/avg/max = 10/11/20
ETHERNET PING TEST PASSED.
```

Figure 3-16. Sample Ping Test Output Screen

If the test fails, a similar screen of statistics is displayed, followed by the error message:

```
ETHERNET PING TEST FAILED
```

3.6.2 Get Excelan Board Statistics

Selecting option 2 from the Ethernet Controller Diagnostics menu executes a test that tries to retrieve Ethernet controller statistics. This exercises the Ethernet controller RAM and capability to execute remote commands. The test displays Ethernet statistics on the number of packets transmitted without error, the number of re-transmitted messages, the number of failed transmissions due to priority delay, and other useful information. This diagnostic tests the following subsystem components:

- Excelan controller board RAM
- Excelan board Multibus interface

There are no prompts in this test. Selecting the option immediately executes the diagnostic.

If the test passes, the program displays a screen similar to the one shown in Figure 3-17:

```
NOTE: The kernel Excelan stats are only updated every 25 minutes 0 seconds.
You must wait at least this long after booting the kernel, before the first
statistics are available.

Last 1500      Total
  Seconds
        8       2519 frames TRANSMIT without error.
        0          0 frames aborted on transmission with excess collisions.
        0          0 frames sent suffering heart beat failure.
     2244     753637 frames received without error.
        0         19 frames received with alignment error.
        0          5 frames received with CRC error.
        2      13968 frames dropped on reception for want of buffer.
        8          0 (Excelan reserved field)
ETHERNET STATS TEST PASSED.
```

Figure 3-17. Sample Output From Excelan Board Statistics Diagnostic

If the test fails, the following error message are displayed:

```
(UNIX system error) followed by:
ETHERNET STATS TEST FAILED
```

3.7 Terminal Controller Diagnostics

The diagnostics for the MB/TERM subsystem (terminal controllers) are executed by selecting option 4 (TERMINAL CONTROLLER SUBSYSTEM) from the Main Menu shown in Figure 3-2. When that option is selected the following menu is displayed:

```
GP1000 Peripheral Diagnostics (running under MACH) Ver.2.0


      TERMINAL CONTROLLER OPERATIONAL DIAGNOSTICS

   1. CLUSTER CONTROLLER hardware LPBK Test
   2. Multiple line hardware LPBK Test
   3. HOST ADAPTER software LPBK Test
   4. CLUSTER CONTROLLER software LPBK Test
   5. ALL TESTS
   6. RUN-TIME OPTIONS
   7. EXIT
```

Figure 3-18. Terminal Controller Diagnostic Menu

3.7.1 Terminal Configuration

There are some configuration items that must be checked before running the Terminal Controller Diagnostics. If you haven't done the following, exit the diagnostics and do so.

Edit the /etc/ttys File

The `/etc/ttys` file must be edited to activate the following lines by removing the "#" character:

```
tty00 "/etc/getty std.9600" unknown off secure
tty01 "/etc/getty std.9600" unknown off secure
                      :
                      :
tty07 "/etc/getty std.9600" unknown off secure
```

Note that each line must read `off secure` instead of `on secure`. When running diagnostics, each line must be OFF; when configured to login to a remote terminal, that particular line must be ON. Kernel panic crashes *may* result if this procedure is not followed.

Link the /etc/hps/hpsloop File

The file `/etc/hps/hpsloop` must be linked with `hpsrloop` and `hpsdloop`. Enter the following commands at the system prompt:

% cd /etc/hps ↵

% ln hpsloop hpsrloop ↵

% ln hpsloop hpsdloop ↵

Edit the /etc/rc.local File

The file `/etc/rc.local` will have to be edited (one time only) to activate the following lines by removing the "#" character. These lines pertain to downloading Systech software to the Host Adapter Board.

```
#if [ -f /etc/hpsload ]; then
#       echo -n "downloading Systech terminal code..." > /dev/console
#       /etc/hpsload c /dev/rhp0 /etc/hps_asynch_c.dnl > /dev/console
#fi
```

If these lines are not uncommented, **none** of the terminal diagnostics will work. After editing this file, you must reboot MACH.

Use 93-ohm Cables

Check that only 93-ohm RG62 coax cables are used for the cluster controllers.

3.7.2 Cluster Controller Hardware Loopback Test

Selecting option 1 from the Terminal Controller Diagnostics menu executes the Cluster Controller Loopback Test. This tests the path from a remote cluster controller port to the GP1000 and back by sending out a burst of characters to a particular port and reading back the results. This tests the following subsystem components:

- Specified remote cluster controller under test
- Host adapter
- Path from remote cluster controller to GP1000

The test first prompts you with the following screen:

```
Enter tty line to test, [<cr> for default: /dev/tty00]
```

If you enter a non-default port address, you must enter the entire device name including the `/dev`. After you enter the full port address, the screen displays the message:

```
Insert loopback plug into tty line /dev/ttyXX.
Hit any key to continue
```

Insert loopback plug and press <Return>. This test may hang the first time, re-starting the test usually clears the problem.

If the test passes, the screen displays the message:

```
(Series of all ASCII printable characters) followed by:
HARDWARE LOOPBACK TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
HARDWARE LOOPBACK TEST FAILED
THE FILE TTYxx ISN'T A CHAR-SPECIAL DEVICE
HANG DURING OPEN/SETTING OF TTYxx
SENT CHAR 0xXX, RECEIVED CHAR 0xXX
LOST CHAR: SENT N CHARS, GOT M BACK
OPEN ERROR ON DEVICE UNDER TEST
```

Figure 3-19 Hardware Loopback test Error Messages

3.7.3 Multiple Line Hardware Loopback Test

Selecting option 2 from the Ethernet Controller Diagnostic menu executes the Multiple Line Hardware Loopback Test. This test is similar to the previous test (Cluster Controller Hardware Loopback Test), except that a series of remote terminal lines are tested sequentially. This tests the following subsystem components:

- Remote cluster controller under test
- Host adapter
- Path from remote cluster controller to GP1000

The test prompts you for the address number of the first tty line in the series to be tested. Enter only the tty number such as "03."

```
Enter first tty line to test, [<cr> for default: 0]
```

The test prompts for the last line in the series (all lines inclusive of the first and last line are tested), as shown below.

```
Enter last tty line to test, [<cr> for default: 10]
```

The test displays the following instructions to set up the hardware for testing:

```
Insert loopback plugs into tty lines /dev/tty0xXX to /dev/tty0xXX
Hit any key to continue
```

Insert the loopback plugs and press <Return>. This test may hang the first time, re-starting the test usually clears the problem.

While loopback testing is being conducted, the diagnostic program displays the following message:

```
Testing /dev/tty0xXX...
```

If the test passes, the screen displays the message:

Series of all ASCII printable characters
```
LOOPBACK TEST (ON /dev/tty0xXX) PASSED.
```

If all tty lines pass, the screen displays the message:

```
MULTI-LINE LOOPBACK TEST PASSED.
```

If the test fails, the following error message are displayed:

```
LOOPBACK TEST (ON /dev/tty0xXX) FAILED.
```

If any tty line fails, the following error message is displayed:

```
MULTI-LINE LOOPBACK TEST FAILED
```

3.7.4 Host Adapter Software Loopback Test

Selecting option 3 from the Terminal Controller Diagnostic menu executes the Host Adapter Software Loopback Test. This tests the loopback path from the GP1000 to the MB/TERM host adapter without actually sending characters out to the remote cluster controller (internal loopback to host adapter). This tests the host-adapter internal path to remote cluster controllers.

There are no prompts or screen messages displayed while this test is running.

If the test passes, the screen displays the message:

Message referring to number of characters sent and average speed of transmission
```
HOST ADAPTER LOOPBACK TEST PASSED
```

If the test fails, the following error message is displayed:

```
HOST ADAPTER LOOPBACK FAILED.
```

3.7.5 Cluster Controller Software Loopback Test

Selecting option 4 from the Terminal Controller Diagnostics menu executes the Cluster Controller Software Loopback Test. This tests the integrity of the remote cluster controller port without actually sending characters out the port (internal cluster-controller loopback test). This tests the following subsystem components:

- Path from GP1000 to host adapter
- Path from host adapter to remote cluster controller and back

The screen first prompts you for the address number of the controller to be tested.

```
Enter Cluster Controller to test, [<cr> for default: 1]
```

If the test passes, the screen displays the message:

Message referring to number of characters sent and average speed of transmission
```
CLUSTER CONTROLLER LOOPBACK TEST PASSED
```

If the test fails, the following error message is displayed:

```
CLUSTER CONTROLLER LOOPBACK TEST FAILED.
```

3.8 BT270 Tape Subsystem Diagnostics

The diagnostics for the BT270 1/2 Inch Tape Drive Subsystem are executed by selecting option 5 (1/2 Inch TAPE DRIVE SUBSYSTEM) from the Main Menu shown in Figure 3-2. When that option is selected the following menu is displayed (Figure 3-20):

```
GP1000 Peripheral Diagnostics (running under MACH) Ver.2.0


     1/2-INCH TAPE DRIVE OPERATIONAL DIAGNOSTICS

          1. 1/2" Tape Drive Read/Write Test
          2. 1/2" Tape Archive Test
          3. 1/2" Tape Drive EOF Test
          4. 1/2" Tape Drive Write Protect Test
          5. 1/2" Tape Drive Rewind Test
          6. ALL TESTS
          7. RUN-TIME OPTIONS
          8. EXIT
```

Figure 3-20. BT270 Tape Drive Diagnostic Menu

3.8.1 1/2 Inch Tape Drive Read/Write Test

Selecting option 1 from the 1/2 Inch Tape Drive Diagnostic menu executes the 1/2 Inch Tape Drive Read/Write Test. This tests that the 1/2 inch tape drive can read and write blocks of data. This tests the following subsystem components:

- MB/TC tape controller on-board DMA
- Parameter block system memory transfer
- BT270 tape drive interface logic
- BT270 tape drive

The test first prompts you with the following screen:

```
MAGNETIC TAPE READ/WRITE TEST

This test writes data to the tape reel and requires
the use of a scratch magnetic tape;
'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the previous menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rmt0'):
Insert scratch magtape and hit key to continue:
```

If the test passes, the screen displays the message:

```
1/2" TAPE DRIVE READ/WRITE TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE READ/WRITE TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
TAPE DRIVE READ ERROR
TAPE DRIVE WRITE ERROR
DATA MISCOMPARE ERROR ($A5,$5A,$0F,$F0,$00,$FF,$29,$60)
HANG (TIMEOUT) DURING OPEN/IOCTL/CLOSE OF TAPE DEVICE
```

Figure 3-21. Read/Write Test Error Messages

3.8.2 1/2 Inch Tape Archive Test

Selecting option 2 from the 1/2 Inch Tape Drive Diagnostic menu executes the 1/2 Inch Tape Archive Test. This test **tars** large files to and from the tape reel. This tests the following subsystem components:

- Multibus interface
- Read/Write capability of tape drive
- Status lines between tape drive and BMA

The test first prompts you with the following screen:

```
Magnetic Tape Archive Test

This test writes data to the device and requires the use
of a scratch tape.
'A' to abort; 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the previous menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rmt0'):
Insert scratch magtape and hit key to continue:
```

If the test passes, the screen displays the message:

TAR output messages

```
1/2" TAPE ARCHIVE TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

TAR error message

```
1/2" TAPE ARCHIVE TEST FAILED

TAR READ ERROR
TAR WRITE ERROR
FILE COMPARE ERROR
```

Figure 3-22. Archive Test Error Messages

3.8.3 1/2 Inch Tape Drive EOF Test

Selecting option 3 from the 1/2 Inch Tape Drive Diagnostic menu executes the 1/2 Inch Tape Drive EOF Test. This tests that the 1/2 inch tape drive can write and detect end-of-file marks. This tests the MB/TC controller end-of-file detection circuitry.

The test first prompts you with the following screen:

```
MAGNETIC TAPE END-OF-FILE TEST

This test writes a series of file marks to a tape and requires
the use of a scratch tape.

Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rmt0'):
Insert scratch magtape and hit key to continue:
```

If the test passes, the screen displays the message:

```
1/2" TAPE DRIVE EOF TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE EOF TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
TAPE DRIVE READ EOF ERROR
TAPE DRIVE WRITE EOF ERROR
TAPE DRIVE EOF SEARCH ERROR
HANG (TIMEOUT) DURING OPEN/IOCTL/CLOSE OF TAPE DEVICE
```

Figure 3-23. EOF Test Error Messages

3.8.4 1/2 Inch Tape Drive Write Protect Test

Selecting option 4 from the 1/2 Inch Tape Drive Diagnostic menu executes the 1/2 Inch Tape Drive Write Protect Test. This tests that the 1/2 inch tape drive and controller will not write to the tape with the write protect mechanism in place. This tests the write protect mechanism. The test first prompts you with the following screen:

```
Magnetic Tape Write Protect Test

This test has the potential to destroy Mag Tape
data and requires the use of a scratch tape;
'A' to abort or 'C' to continue:
```

If you press an "A", the prompt below appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the previous menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

The password is not echoed. If it is correct, you are prompted as shown below.

```
Enter name of tape device (default: 'rmt0'):
Remove the write-enable ring on the magnetic tape
and place the tape in the tape drive; hit any key to
continue:
```

If the test passes, the screen displays the message:

```
1/2" TAPE WRITE PROTECT TEST PASSED
```

If the test fails, the system software displaya a P00 message indicating the failure. This indicates that the test passed. Sometimes one or more of the following error messages are displayed:

Figure 3–24 Write Protect Test Error Messages

```
1/2" TAPE WRITE PROTECT TEST FAILED
WRITE PROTECT ERROR
HANG (TIMEOUT) DURING OPEN OF TAPE DEVICE (CHECK CABLE CONNECTIONS)
```

3.8.5 1/2 Inch Tape Drive Rewind Test

Selecting option 5 from the 1/2 Inch Tape Drive Diagnostic menu executes the 1/2 Inch Tape Drive Rewind Test. This tests particular electro-mechanical components of the tape drive and further tests the controller/drive interface. This tests the following subsystem components:

- BT270 tape drive
- Tape drive interface

The test first prompts you with the following screen:

```
Magnetic Tape Rewind/Erase Test

Enter name of tape device (default: 'rmt0'):
```

Once you have entered the device name, the screen displays another prompt:

```
Insert tape and hit alphanumeric key to continue:
```

Insert a scratch tape and press <Return>. If you entered an incorrect device name, the system displays the following message:

```
Non-existent device: enter new device name or <CR> to abort:
```

If the test passes, the screen displays the message:

```
1/2" TAPE DRIVE REWIND TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE REWIND TEST FAILED
OPEN ERROR ON DEVICE UNDER TEST
CLOSE ERROR ON DEVICE UNDER TEST
HANG (TIMEOUT) DURING REWIND
WRITE ERROR
```

Figure 3-25. Rewind Test Error Messages

Standalone Diagnostics for GP1000 Peripherals

4

4.1 Introduction

As mentioned in Chapter 3, there are two separate suites for peripheral diagnostics on the GP1000. That chapter described the diagnostic tests that run under the Mach 1000 operating system. This chapter details the Standalone diagnostics. The differences between the two sets of diagnostics are discussed in Chapter 3. Briefly, Mach-based diagnostics test the major I/O functions of the peripherals, while the Standalone set runs the raw hardware tests developed by OEM suppliers, as well as board-level controller and Multibus functions. This chapter begins with instructions for accessing the diagnostic suite, and then describes how to run each test.

All peripheral diagnostics are loaded either from the BT125 $^1/_4$-inch tape, the BD500/BD850 hard disk, or from a serial port. If one of these subsystems fails, the other can serve as a backup. The diagnostics are uploaded to a node in the GP1000, where they execute in that node's RAM.

4.2 Starting the Standalone Diagnostics

The Standalone diagnostics are started from the GP1000 system prompt displayed when the system is booted via the Ultra-Simple Debugger (USD). A typical system prompt is shown below:

```
00?
```

If you are running under Mach 1000 (that is, if Mach has already been booted), you must halt the operating system before bringing up the USD system. The following command must be entered at the system prompt:

% /etc/fasthalt ↲

NOTE

You must be logged in as **root** in order to issue the **fasthalt** command.

CAUTION

Do not power down the system without halting Mach 1000. Failure to issue the **fasthalt** or **halt** command can result in irretrievable loss of data.

Start the standalone diagnostics (from tape or disk) by completing the following steps:

00? **0j ↲**	Enter the USD boot command
00?Boot: **(st0,1,0)/stand/standdiag ↲**	Enter this command if you are booting diagnostics from the tape.
00?Boot: **(xy0,0,0)/stand/standdiag ↲**	Enter this command if you are booting diagnostics from the disk.

Once the above commands have been entered, the following screen appears:

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0

Enter type of terminal you are using, by number:
      1.  Hardcopy terminal/dumb terminal
      2.  VT100 compatible terminal
      3.  SUN
```

Figure 4–1. Terminal Prompt Screen

Enter the number that corresponds to the type or terminal you are using, and press <Return>. The Main Menu appears on your screen, and you can begin to run the Standalone diagnostics described in the following sections.

4.3 Standalone Diagnostics Main Menu

The Standalone Diagnostics Main Menu is the user interface to the standalone set of GP1000 peripheral diagnostics. The menu is shown in Figure 4–2.

If you are using a VT100–compatible terminal or a Sun terminal, the menu option selected is highlighted in reverse video. The selection can be changed by moving the selection cursor up or down with the arrow keys, pressing the space bar, or pressing the "u" (up) or "d" (down) letter keys. You execute a selected menu option by pressing <Return>. Refer to Table 4–1 for the complete command list.

Table 4–1. Menu Command List

<Space>	Moves selection cursor down (or wrap around to the top)
<Arrows>	Moves selection cursor up or down (or wrap around)
u	Moves selection cursor up (or wrap around to the bottom)
d	Moves selection cursor down (or wrap around to the top)
<Return>	Execute the currently selected menu option
4<Return>	Execute the menu option number 4
s	Select/deselect the menu option for multiple test execution
?	Display a help screen for the currently selected menu option. In the main menu this displays software revisions.

If you are using a hardcopy or any non–VT100 terminal, the Main Menu program is the same as described above for VT100 terminals except menu options are not highlighted and do not scroll. There is also no capability of executing two or more tests via the "s" key. Refer to Table 4–2 for the non–VT100 command list.

Table 4–2. Non–VT100 Menu Command List

4<Return>	Execute the menu option number 4
?	Display a help screen for the currently selected menu option. In the main menu this displays software revisions.

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0

                    MAIN MENU

      1. SCSI TAPE CARTRIDGE SUBSYSTEM
      2. FIXED DISK SUBSYSTEM
      3. ETHERNET CONTROLLER SUBSYSTEM
      4. TERMINAL CONTROLLER SUBSYSTEM
      5. 1/2-inch TAPE DRIVE SUBSYSTEM
      6. DISPLAY SYSTEM CONFIGURATION
      7. MEMORY TEST
      8. ALL TESTS
      9. RUN-TIME OPTIONS
      10.EXIT
```

Figure 4–2. Standalone Peripheral Diagnostics Main Menu

4.3.1 Display System Configuration

Selecting the sixth option from the Main Menu shown in Figure 4–2 displays the device I/O configuration of the GP1000. All devices that appear "alive" and respond to polling via the BMA at the time of the diagnostic boot are considered part of the configuration. Figure 4–3 shows a representative output from selection of this menu option.

```
Terminal Controller Board not responding
Ethernet Controller Board acknowledges query
Disk Controller Board acknowledges query
Mag Tape Controller Board acknowledges query
SCSI Controller Board acknowledges query
```

Figure 4–3. Display System Configuration Sample Output

4.3.2 The All Tests Option

The `All Tests` selection, which is option 8 on the Main Menu, appears in most menus. Selecting this option runs all of the tests listed in that menu automatically, without further input from you.

In addition, you can make several selections at once by scrolling to two or more options and press "s" (select) for each option. Pressing the "s" key causes an asterisk (*) to be placed beside those tests selected. Scrolling to an option already marked by an asterisk and pressing "s" de-selects the option and removes the asterisk. All tests marked by an asterisk can then be executed by pressing <Return>. They will execute in the order selected.

NOTE

Multiple options cannot be selected from a menu if you are running with a hardcopy terminal.

4.3.3 Run-Time Options Menu

The Run-Time Options Menu, which is option 9 on the Main Menu, appears on all menus and can be invoked any time a test is not active. If selected, it activates a parameter set-up menu (Figure 4-4) that applies to all tests subsequently run.

This menu allows you to set up a loop count for a test or set of tests, suppress of error messages, halt on errors during loops, log the results of a test session in a file, or enter default device names applicable to all tests. Exiting the Run-Time Options Menu returns you to the previous menu that was displayed. Once you set the parameters in the Run-Time Options Menu and exit, those parameters are valid for all subsequent tests, until the parameters are changed by returning to this menu and changing them. The only exception to this is the LOOP COUNT parameter which is independently settable for each diagnostic. If you set a test to execute in a loop, entering <Control-c> <Return> terminates the loop.

NOTE

The **result logging** option is not yet implemented.

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0

                RUN-TIME OPTIONS MENU

      1. HALT ON ERROR             = ON
      2. LOOP COUNT                = 001
      3. LOG TEST SESSION          = OFF
      4. SUPPRESS ERROR REPORTING = OFF
      5. ENTER DEFAULT DEVICE NAMES
      6. EXIT
```

Figure 4-4. Run-Time Options Menu

4.4 MC/SCSI and MC/ISBX Tape Controller Diagnostics

The tape controller subsystem diagnostics are invoked by selecting option 1 (SCSI TAPE CARTRIDGE SUBSYSTEM) from the Main Menu shown in Figure 4-2. Once that option is selected, the following screen is displayed (Figure 4-5).

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0


     SCSI TAPE CARTRIDGE SELF-TEST/BASIC DIAGNOSTICS

     1. Motherboard General Purpose Test
     2. Dghtrbrd SCSI-chip Register Test
     3. Dghtrbrd Clock-chip Register Test
     4. Dghtrbrd Clock Read/Write Test
     5. 1/4" Tape Drive Self-Test #1
     6. 1/4" Tape Drive Self-Test #2
     7. ALL TESTS
     8. RUN-TIME OPTIONS
     9. EXIT
```

Figure 4-5. SCSI/iSBX Tape Controller Diagnostic Menu

4.4.1 Motherboard General Purpose Test

Selecting option 1 from the SCSI Tape Controller Diagnostic menu starts the Motherboard General Purpose Test. This test verifies that the board is "alive" and can be subsequently configured. The diagnostic tests the top-level components of the motherboard by reading and writing data patterns from and to onboard components. The components involved in the read/write testing are the 8259A Interrupt Controller and 8237 DMA Controller internal registers, and the external, standalone Status/Control and Address Extension registers.

NOTE

The MB/ISBX motherboard is located inside the Multibus card cage. It houses the MB/SCSI daughterboard. See the manual entitled *Inside the GP1000* for further technical information regarding the relationship between the MB/ISBX and MB/SCSI boards, and the Multibus interface.

No screen prompts are displayed while the test is running.

If the test passes, the screen displays the message:

```
MOTHERBOARD GENERAL PURPOSE TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
SCSI CONTROLLER BOARD NOT RESPONDING
CONTROLLER BOARD UNDER TEST NOT RESPONDING
DMA CHANNEL 0 ADDRESS REGISTER READ/WRITE FAILURE: $5A5A
DMA CHANNEL 0 ADDRESS REGISTER READ/WRITE FAILURE: $A5A5
DMA CHANNEL 0 ADDRESS REGISTER READ/WRITE FAILURE: $0F0F
DMA CHANNEL 0 ADDRESS REGISTER READ/WRITE FAILURE: $F0F0
DMA CHANNEL 0 WORD COUNT REGISTER READ/WRITE FAILURE: $5A5A
DMA CHANNEL 0 WORD COUNT REGISTER READ/WRITE FAILURE: $A5A5
DMA CHANNEL 0 WORD COUNT REGISTER READ/WRITE FAILURE: $0F0F
DMA CHANNEL 0 WORD COUNT REGISTER READ/WRITE FAILURE: $F0F0
STATUS-TEMPORARY READ/WRITE REGISTER FAILURE
```

Figure 4–6 General Purpose Test Error Messages

4.4.2 Daughterboard SCSI–Chip Internal Register Test

Selecting option 2 from the SCSI Tape Controller Diagnostic menu starts the Daughterboard SCSI–chip Internal Register Test. This tests that the SCSI chip on the daughterboard can answer when polled.

No screen prompts are displayed while the test is running.

If the test passes, the screen displays the message:

```
DAUGHTERBOARD SCSI CHIP TEST PASSED
```

If the test fails, one of the following error messages are displayed:

```
SCSI MODE REGISTER READ/WRITE FAILURE
SCSI PARITY/INTERRUPT REGISTER READ FAILURE
```

4.4.3 Daughterboard Clock–Chip Internal Register Test

Selecting option 3 from the SCSI Tape Controller Diagnostic menu starts the Daughterboard Clock–chip Internal Register Test. This tests that the clock/calendar chip on the SCSI daughterboard can be read by the GP1000 via the Multibus, and verifies that the chip is operational. The internal clock chip registers are written and read with specific data patterns.

No screen prompts are displayed while the test is running.

If the test passes, the screen displays the message:

```
DAUGHTERBOARD INTERNAL REGISTER CLOCK TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
0xXX WRITE FAILURE ON ONE SECOND REGISTER
0xXX WRITE FAILURE ON TEN SECOND REGISTER
0xXX WRITE FAILURE ON ONE MINUTE REGISTER
0xXX WRITE FAILURE ON TEN MINUTE REGISTER
0xXX WRITE FAILURE ON ONE HOUR   REGISTER
0xXX WRITE FAILURE ON TEN HOUR   REGISTER
0xXX WRITE FAILURE ON ONE DAY    REGISTER
0xXX WRITE FAILURE ON TEN DAY    REGISTER
0xXX WRITE FAILURE ON ONE MONTH  REGISTER
0xXX WRITE FAILURE ON TEN MONTH  REGISTER
0xXX WRITE FAILURE ON ONE YEAR   REGISTER
0xXX WRITE FAILURE ON TEN YEAR   REGISTER
0xXX WRITE FAILURE ON WEEK       REGISTER
```

Figure 4–7 Clock Test Error Messages

4.4.4 Daughterboard Clock Read/Write Test

Selecting option 4 from the SCSI Tape Controller Diagnostic menu runs the Daughterboard Clock Read/Write Test. This test actually sets the system clock and reads it back.

The test prompts you with the following series of questions:

```
Enter date in following format: mm/dd/yy :: 10/31/88 ↲
Enter day of week (numerically --> 0-Sun, 1-Mon, 2-Tue...): 1 ↲
Enter time in following format: hh:mm:ss ::11:59:59 ↲
```

If the test passes, the screen displays the message:

```
CLOCK READ/WRITE TEST PASSED
Date = 10/31/88 11:59:59
```

If the test fails, one of the following error messages are displayed:

```
SCSI CONTROLLER BOARD NOT RESPONDING
CONTROLLER BOARD UNDER TEST NOT RESPONDING
```

4.4.5 1/4 Inch Tape Drive Self-Test #1

Selecting the option 5 from the SCSI Tape Controller Diagnostic menu starts the 1/4 Inch Tape Drive Self-Test #1. This test does not overwrite the tape itself. This diagnostic tests the following subsystem components:

- BT125 EPROM
- BT125 scratch pad RAM
- BT125 drive controller
- BT125 SCSI controller
- BT125 data buffer

The test first prompts you with the following:

```
This test, although it does not read or write data to the tape cartridge,
requires the presence of a scratch tape.  Insert scratch tape and hit any
alphanumeric key to continue:
```

If the test passes, the screen displays the message:

```
1/4-INCH TAPE DRIVE SELF-TEST #1 PASSED
```

If the test fails, the following error message is displayed:

```
1/4-INCH TAPE DRIVE SELF-TEST #1 FAILED
COMMAND STATUS = 0xXX;
Several bytes of unit status follow:...
```

The notation "XX" represents a two-digit hex value used as an error code. The error codes can be found in Appendix A, section A.1, "Tape Cartridge Error Codes."

4.4.6 1/4 Inch Tape Drive Self-Test #2

Selecting option 6 from the SCSI Tape Controller Diagnostic menu runs the 1/4 Inch Tape Drive Self-Test #2. This test first executes Self-Test #1 and then a specially designed worst-case quality tape read/write test. This tests the following subsystem components and features:

- Tape track integrity
- Drive backspace capability
- BT125 erase circuitry
- Rewrite limit
- Rewind circuitry
- Streaming mode capability
- No rereads
- BT125 CRC circuitry

The test first prompts you with the following screen:

```
This test writes data to the tape cartridge and requires the use of a
scratch tape; 'A' to abort or 'C' to continue:
```

If you press an "A", the following prompt appears:

```
Hit key to continue...
```

Pressing any key at this point returns you to the SCSI Tape Diagnostic menu.

If you press a "C", the password prompt appears as shown below:

```
Enter password:
```

If the password is correct, you are prompted as shown below:

```
Insert scratch tape and strike key to continue...
```

If the test passes, the screen displays the message:

```
1/4-INCH TAPE DRIVE SELF-TEST #2 PASSED
```

If the test fails, the following error message is displayed:

```
1/4-INCH TAPE DRIVE SELF-TEST #2 FAILED
COMMAND STATUS = 0xXX;
Several bytes of unit status follow:...
```

The notation "XX" represents a two-digit hex value used as an error code. The error codes can be found in Appendix A, section A.1, "Tape Cartridge Error Codes."

4.5 MB/DC Fixed Disk Controller Diagnostic

The MB/DC fixed disk controller diagnostics are invoked by selecting option 2 (FIXED DISK SUBSYSTEM) from the Main Menu shown in Figure 4–2. Once that option is selected, the following menu is displayed (Figure 4–8):

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0


     FIXED DISK SELF-TEST/BASIC DIAGNOSTICS

       1. Disk Cntrlr Internal Register Test
       2. Disk Cntrlr Self-Test
       3. Disk Cntrlr DMA Self-Test
       4. Disk Cntrlr Maintenance Buffer Test
       5. Disk Drive Read Status Test
       6. Disk Drive Reset Test
       7. Disk Drive  Self-Test
       8. Formatter Utility
       9. ALL TESTS
      10. RUN-TIME OPTIONS
      11. EXIT
```

Figure 4–8. Fixed Disk Controller Diagnostic Menu

4.5.1 Disk Controller Internal Register Test

Selecting option 1 from the Fixed Disk Self-test Diagnostic menu starts the Disk Controller Internal Register Test. This test tries to read and write the six internal registers of the MB/DC disk controller to determine if the controller is alive. This tests the following subsystem components:

- MB/DC controller Multibus interface
- MB/DC controller internal registers

The test first prompts you with the following:

```
Set the WRITE PROTECT switch on the disk drive under test
to the ENABLE (ON) position and hit key to continue:
```

When a key is pressed, a message regarding **csr** contents is displayed after the above prompt. The screen then displays the following:

```
Set the WRITE PROTECT switch on the disk drive under test
to the ENABLE (ON) position and hit key to continue: csr_contents after
 cntrlr reset=0x09
```

If the test passes, the screen displays the message:

```
FIXED DISK CONTROLLER INTERNAL REGISTER TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
DISK CONTROLLER INTERNAL REGISTER TEST FAILED
CONTROLLER RESET ERROR
RELOCATION REGISTER (LOW) FAILED READ/WRITE
RELOCATION REGISTER (HIGH) FAILED READ/WRITE
ADDRESS REGISTER (LOW) FAILED READ/WRITE
ADDRESS REGISTER (HIGH) FAILED READ/WRITE
CONTROL/STATUS REGISTER SET AACK BIT ERROR
CONTROL/STATUS REGISTER CLEAR AACK BIT ERROR
DISK CONTROLLER BOARD NOT RESPONDING
```

Figure 4–9 Internal Register Test Error Messages

4.5.2 Disk Controller Self–Test

Selecting option 2 from the Fixed Disk Self-test Diagnostic menu runs the Disk Controller Self Test. This is the same self-test for the MB/DC controller that occurs on system power up; it does not read, write, or otherwise affect the disk(s). This tests the following subsystem components:

- MB/DC controller microprocessor
- MB/DC controller internal RAM
- MB/DC controller header shift register
- MB/DC controller buffer RAM

The test first prompts you with the following screen:

```
Set the WRITE PROTECT switch on the disk drive under
test to the ENABLE (ON) position and hit key to continue:
```

If the test passes, the screen displays several additional lines of status information similar to that shown in Figure 4–10, as well as a message indicating the test was passed.

```
Set the WRITE PROTECT switch on the disk drive under test
to the ENABLE (ON) position and hit key to continue: csr_contents after
 cntrlr reset=0x09
In 'exec_iopb': csr_contents = 0x09
big_addr = 0xfe036d90
idl-cnt = 124
After execution
csr_contents            = 0x09
iopbptr->byte[STAT1]    = 0x05
iopbptr->byte[STAT2]    = 0x00
CONTROLLER-TYPE CODE THAT WAS RETURNED = 0x1
CONTROLLER SELF-TEST PASSED
```

Figure 4-10. Sample Disk Controller Self-Test Output Screen

If the test fails, one or more of the following error messages are displayed:

```
DISK CONTROLLER SELF-TEST FAILED
     STATUS REGISTER    = 0xXX
     STATUS BYTE 2 CODE = 0xXX
CONTROLLER RESET FAILED
IOPB EXECUTION TIMED OUT
DISK CONTROLLER BOARD NOT RESPONDING
```

The notation "XX" represents a two-digit hex value used as an error code. The error codes can be found in Appendix A, section A.2, "Disk Controller Error Codes."

4.5.3 Disk Controller DMA Self-Test

Selecting option 3 from the Fixed Disk Self-test Diagnostic menu starts the Disk Controller DMA Self-Test. This tests whether the MB/DC can successfully perform DMA transfer to and from GP1000 system memory. This tests the following subsystem components:

- MB/TC controller Multibus interface
- MB/TC controller DMA circuitry

The test first prompts you with the following screen:

```
Set the WRITE PROTECT switch on the disk drive under
test to the ENABLE (ON) position and hit key to continue:
```

If the test passes, the screen displays several additional lines of status information similar to that shown in Figure 4–11, as well as a message indicating the test was passed.

```
Set the WRITE PROTECT switch on the disk drive under test
to the ENABLE (ON) position and hit key to continue: csr_contents after
 cntrlr reset=0x09
big_addr = 0xfe036de4
idl-cnt = 146
After execution
csr_contents            = 0x08
iopbptr->byte[STAT1]    = 0x05
dma_buf[04] = 0x5a
dma_buf[05] = 0x5a
dma_buf[06] = 0x5a
dma_buf[07] = 0x5a
dma_buf[08] = 0x5a
dma_buf[09] = 0x5a
dma_buf[10] = 0x5a
dma_buf[11] = 0x5a
dma_buf[12] = 0x5a
dma_buf[13] = 0x5a
dma_buf[14] = 0x5a
CONTROLLER DMA TEST PASSED
```

Figure 4–11. Sample Disk Controller DMA Self-Test Output Screen

If the test fails, one or more of the following error messages are displayed:

```
DISK CONTROLLER DMA SELF-TEST FAILED
     STATUS REGISTER    = 0xXX
     STATUS BYTE 2 CODE = 0xXX
CONTROLLER RESET FAILED
CONTROLLER DMA ATTEMPT FAILED
CONTROLLER DMA DATA MISCOMPARE
DISK CONTROLLER BOARD NOT RESPONDING
IOPB EXECUTION TIMED OUT
```

The notation "XX" represents a two-digit hex value used as an error code. The error codes can be found in Appendix A, section A.2, "Disk Controller Error Codes."

4.5.4 Disk Controller Maintenance Buffer Test

Selecting option 4 from the Fixed Disk Self-test Diagnostic menu runs the Disk Controller Maintenance Buffer Test. This tests the chaining ability of the MB/DC controller by transferring 200K bytes of DMA data from system memory into an MB/DC FIFO and back again. This tests the following subsystem components:

- MB/DC controller Multibus interface
- MB/DC controller DMA circuitry
- MB/DC controller FIFO buffer
- MB/DC controller chaining ability

The test prompts you with the following:

```
Set the WRITE PROTECT switch on the disk drive under test to the ENABLE
(ON) position and hit key to continue:
```

If the test passes, the screen displays several additional lines of status information similar to that shown in Figure 4-12, as well as a message indicating the test was passed.

```
Set the WRITE PROTECT switch on the disk drive under test
to the ENABLE (ON) position and hit key to continue: csr_contents after
 cntrlr reset=0x08
In 'exec_iopb': csr_contents = 0x08
big_addr = 0xfe036d90
idl-cnt = 375
After execution
csr_contents            = 0x09
iopbptr->byte[STAT1]    = 0x05
iopbptr->byte[STAT2]    = 0x00
buf_ld_dmp.data[00] = 0x0f
buf_ld_dmp.data[01] = 0x0f
buf_ld_dmp.data[02] = 0x0f
buf_ld_dmp.data[03] = 0x0f
buf_ld_dmp.data[04] = 0x0f
CONTROLLER BUFFER DUMP/LOAD TEST PASSED
```

Figure 4-12. Sample Maintenance Buffer Test Output Screen

If the test fails, one or more of the following error messages are displayed:

```
MAINTENANCE BUFFER TEST FAILED
     STATUS REGISTER     = 0xXX
     STATUS BYTE 2 CODE = 0xXX
CONTROLLER RESET FAILED
CONTROLLER MAINTENANCE BUFFER TEST DATA MISCOMPARE
CONTROLLER BOARD NOT RESPONDING
IOPB EXECUTION TIMEOUT
```

The notation "XX" represents a two-digit hex value used as an error code. The error codes may be found in Appendix A, section A.2, "Disk Controller Error Codes."

4.5.5 Disk Drive Read Status Test

Selecting option 5 from the Fixed Disk Self-test Diagnostic menu starts the Disk Drive Read Status Test. This test tries to read the drive status; it then reads the disk label parameters to compare to the status parameters. This tests the following subsystem components:

- Label sector disk integrity
- Controller DMA capability
- Multibus interface

The test prompts you with the following:

```
Set the WRITE PROTECT switch on the disk drive under test to the ENABLE
(ON) position and hit key to continue:
```

If you choose to continue, you are prompted to enter the unit number of the drive to be tested:

```
Enter unit number [0-3] (default = 0):
```

After entering the drive number, followed by <Return>, you are presented with a list and promted for disk type:

```
1. FUJI-EAGLE
2. CDC-9720-500
3. CDC-9720-850
4. NT 8408 (500)
5. NT 8414 (850)

Enter drive type [1-5] (default = 4):
```

After entering the desired drive type number, followed by <Return>, the test begins to run. If the test passes, the program displays screens similar to the samples shown in Figures 4–9 and 4–10.

```
Read Drive Status passed
Drive Status:
On Cylinder status                          = 0
Disk Ready status                           = READY
Disk Write Protect status                   = WRITE PROTECTED
Disk Seek status                            = NO SEEK ERROR
Disk Fault status                           = NO DISK FAULT
Maximum head value                          = 7
Maximum sector value                        = 64
Maximum cylinder value                      = 1495
Head offset value                           = 0
Sector size                                 = 512
Total # of sectors per track                = 66
Controller Firmware Revision Level          = 33
Hit any key to continue
```

Figure 4–13. Sample Label Test Output – Screen One

The second output screen contains information about the disk label contents. By pressing any key, in response to the above prompt, disk label information is displayed similar to the information shown on the sample screen in Figure 4–14.

```
Label Contents

Disk label checksum                       = 0x974f
Label version id (magic #)                = 0x0
Number of read/write heads                = 8
Number of cylinders                       = 1496
Number of sectors/track (less spares)     = 65
Number of bytes/sector (overhead inc.)    = 633
Number of spare sectors for slipping      = 1
Number of spare tracks for slipping       = 0
Number of alternate cylinders             = 2
Interleave factor                         = 0
Sector offset of defect list              = 1
Sector offset of bad sector list          = 0
Sector offset of unslippable sector map   = 1
Disk id string                            = NT-8408

Hit key to continue...
```

Figure 4–14. Sample Label Test Output – Screen Two

If the test fails, one or more of the following error messages are displayed:

```
DISK DRIVE READ STATUS TEST FAILED
     STATUS REGISTER     = 0xXX
     STATUS BYTE 2 CODE = 0xXX
DISK CONTROLLER BOARD NOT RESPONDING
IOPB EXECUTION TIMEOUT
CONTROLLER RESET FAILED
```

The notation "XX" represents a two-digit hex value used as an error code. The error codes may be found in Appendix A, section A.2, "Disk Controller Error Codes."

4.5.6 Disk Drive Reset Test

Selecting option 6 from the Fixed Disk Self-test Diagnostic menu runs the Disk Drive Reset Test. This tests the ability of the disk drive to recalibrate its disk heads and seek them to the zero position. This tests the following subsystem components:

- Disk drive recalibration circuitry
- Controller Multibus interface

The test prompts you with the following:

```
Set the WRITE PROTECT switch on the disk drive under test to the ENABLE
(ON) position and hit key to continue:
```

If the test passes, the screen displays several additional lines of status information similar to that shown in Figure 4–15 below, as well as a message indicating the test was passed.

```
Set the WRITE PROTECT switch on the disk drive under test
to the ENABLE (ON) position and hit key to continue: csr_contents after
 cntrlr reset=0x09
In 'exec_iopb': csr_contents = 0x09
big_addr = 0xfe036d90
idl-cnt = 185
After execution
csr_contents              = 0x09
iopbptr->byte[STAT1]      = 0x05
iopbptr->byte[STAT2]      = 0x00
DRIVE RESET TEST PASSED
```

Figure 4–15. Sample Disk Drive Reset Test Output Screen

If the test fails, one or more of the following error messages are displayed:

```
DISK DRIVE RESET TEST FAILED
     STATUS CODE   = 0xXX
     STATUS 2 BYTE = 0xXX
CONTROLLER RESET FAILED
IOPB EXECUTION TIMEOUT
CONTROLLER BOARD NOT RESPONDING
```

Figure 4–16 Disk Drive Reset Test Error Messages

The notation "XX" represents a two-digit hex value used as an error code. The error codes may be found in Appendix A, section A.2, "Disk Controller Error Codes."

4.5.7 Disk Drive Self–Test

Selecting option 7 from the Fixed Disk Self-test Diagnostic menu runs the Disk Drive Self-Test. This invokes the self-test resident on the disk itself (as opposed to the controller), and tests the general hardware of the disk.

The test prompts you with the following:

```
Disk Drive self-tests can only be run on CDC drives.
Enter 'C' to continue or 'S' to stop:
```

In lieu of invoking the disk drive self-test remotely from the host, you are presented with a series of prompts whereby you can invoke a series of self-tests manually via the drive front panel interface. LEDs on the drive front panel interface indicate the pass/fail status of manually invoked diagnostics.

4.6 Formatter Utility

Selecting option 8 from the fixed disk controller diagnostic menu invokes the Formatter Utility. The Formatter Utility is a separate program that formats the disk, marks bad sectors, and other similar functions. A password is required to invoke this utility. Refer to the *GP1000 System Software Installation Guide* for more information.

4.7 Ethernet Controller Diagnostics

The Ethernet Controller (MB/EN) subsystem diagnostics are invoked by selecting option 3 (ETHERNET CONTROLLER SUBSYSTEM) from the Main Menu shown in Figure 4–2. Once that option is selected, the following menu is displayed (Figure 4–17):

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0


  ETHERNET CONTROLLER SELF-TEST/BASIC DIAGNOSTICS

1. Ethernet Controller Self-Test
2. ALL TESTS
3. RUN-TIME OPTIONS
4. EXIT
```

Figure 4–17. Ethernet Controller Diagnostic Menu

4.7.1 Ethernet Controller Self–Test

Selecting option 1 from the Ethernet Controller Diagnostic menu invokes the Ethernet Controller Self-Test. This tests and exercises the hardware and firmware components of the MB/EN Ethernet Controller, ensuring that the board is functioning properly. Communication capability over the Ethernet itself is not tested. The diagnostic tests the following subsystem components:

- + 12 V supply
- EPROM checksum
- RAM test
- Counter test
- Interrupt test
- Transmission test
- Receive test
- Local loopback data path test
- CRC test
- Bus timeout test
- Ethernet chip test
- iSBX connector hardware test
- Transceiver test

While the tests are running, the screen displays the following message:

```
Excelan test: still waiting
```

If the test passes, the screen displays the message:

```
EXCELAN SELF TEST PASSED.
```

If the test fails, one or more of the following error messages are displayed:

```
EXCELAN: SELF TEST FAILED.
EXCELAN: SELF TEST FAILED: BOARD NOT RESPONDING.
```

4.8 MB/TERM Diagnostics

The diagnostics for the MB/TERM host adapter controller board are invoked by selecting option 4 (TERMINAL CONTROLLER SUBSYSTEM) from the Main Menu shown in Figure 4–2. Once that option is selected, the following menu is displayed (Figure 4–18):

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0


  TERMINAL CONTROLLER SELF-TEST/BASIC DIAGNOSTICS

    1. HOST ADAPTER Self-Test
    2. HOST ADAPTER RAM Test
    3. HOST ADAPTER LED Test
    4. ALL TESTS
    5. RUN-TIME OPTIONS
    6. EXIT
```

Figure 4–18. MB/TERM Controller Board Diagnostic Menu

4.8.1 Host Adapter Self–Test

Selecting option 1 from the MB/TERM Diagnostic menu starts the Host Adapter Self-Test. The invokes the MB/TERM's firmware-resident self-tests and reports pass/fail results back to you. The self-tests are comprehensive and are intended to catch and diagnose almost all errors short of catastrophic ones (such as a non-operating on-board crystal oscillator or malfunction of power to the MB/TERM board). This tests the following subsystem components:

- EPROM
- RAM
- Token bus network RAM

- Token bus network COM-9026 controller chip
- Real-Time clock/master oscillator
- DMA controller chip (6860 only)
- MPCC/RS232 interface (6860 only)

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays a series of messages along the following order:

```
HOST ADAPTER self-test PASSED: CODE 0xXX..., followed by:
HOST ADAPTER self-test PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
HOST ADAPTER self-test FAILED: Code 0xXX
HOST ADAPTER self-test FAILED: Board not responding
```

The notation "XX" is a two-digit hex value used as an error code identifying which part of the test failed. The error codes range in value from 81 hex to B1 hex and can be found in Appendix A, section A.3, "MB/TERM Controller Error Codes." The special error code value of 01 implies that the self-test never actually began, indicating a catastrophic host adapter error such as power or CPU failure or that host adapter/host communications have failed.

4.8.2 Host Adapter RAM Test

Selecting option 2 from the MB/TERM diagnostic menu starts the Host Adapter RAM Test. This exercises the Multibus-accessible RAM on the adapter board (not all of the RAM is Multibus-accessible). This tests the following subsystem components:

- Host adapter Multibus interface logic
- Host adapter Multibus-accessible RAM

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays the following message:

```
HOST ADAPTER Multibus-accessible RAM Test PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
HOST ADAPTER Multibus-accessible RAM Test FAILED
RAM LOCATION: XXXXXX; EXPECTED: XXXX ACTUAL: XXXX
                    -or-
RAM LOCATION: XXXXXX; EXPECTED: XXXX  ACTUAL: BUS ERROR
```

4.8.3 Host Adapter LED Test

Selecting option 3 from the MB/TERM diagnostic menu starts the Host Adapter LED Test. This exercises the on-board tri-color LED, used during power-up and self-test, causing the MB/TERM LED to flash. This tests the following subsystem components:

- MB/TERM tri-color LED
- MB/TERM Multibus interface

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays the following message:

```
PLEASE CHECK IF THE LED IS NOT FLASHING
```

If the test fails, one or more of the following error messages are displayed:

```
PLEASE CHECK IF THE LED IS NOT FLASHING
HOST ADAPTER LED TEST FAILED: Board not responding
```

4.9 1/2-Inch Tape Controller Diagnostics

The MB/TC tape controller board diagnostics are invoked by selecting option 5 (1/2-inch TAPE DRIVE SUBSYSTEM) from the Main Menu shown in Figure 4-2. Once that option is selected, the following menu is displayed (Figure 4-19):

```
GP1000 Peripheral Diagnostics (Standalone) Ver.2.0


  1/2-INCH TAPE DRIVE SELF-TEST/BASIC DIAGNOSTICS

       1. 1/2" Tape Controller Self-Test #1
       2. 1/2" Tape Controller Self-Test #2
       3. 1/2" Tape Drive Reset Test
       4. 1/2" Tape Drive Security Erase Test
       5. 1/2" Tape Drive Read Status Test
       6. 1/2" Tape Drive Rewind Test
       7. 1/2" Tape Drive Self-Test
       8. ALL TESTS
       9. RUN-TIME OPTIONS
      10. EXIT
```

Figure 4-19. 1/2-Inch Tape Controller Board Diagnostic Menu

4.9.1 1/2 Inch Tape Drive Controller Self-Test #1

Selecting option 1 from the 1/2 Inch Tape Controller Diagnostic menu starts the 1/2 Inch Tape Drive Controller Self-Test #1. This exercises about half of the tape controller's hardware functions. This tests the following subsystem components:

- MB/TC local RAM
- Checksum of PROM
- On-board FIFO
- BT270 tape drive interface logic.

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays the following message:

```
1/2" TAPE DRIVE CONTROLLER SELF-TEST #1 PASSED
```

If the test fails, one or more of the following error messages are displayed (Figure 4-20) :

```
1/2" TAPE DRIVE CONTROLLER SELF-TEST #1 FAILED
ERROR BIT SET IN IOPB GATE FIELD OR ADAPTER STATUS REG.
     ERROR CODE: IOPB GATE FIELD = 0xXX
     ERROR CODE: ERROR CODE REG  = 0xXX
TAPE CONTROLLER TIMED OUT ON RESET
TAPE CONTROLLER REPORTED ILLEGAL BUSY STATUS
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK ACKNOWLEDGE
GATE COMPLETE BIT NOT SET ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER IOPB EXECUTION ERROR
MAG TAPE CONTROLLER BOARD NOT RESPONDING
CONTROLLER BOARD UNDER TEST NOT RESPONDING
```

Figure 4-20 Self-Test #1 Error Messages

The notation "XX" is a two-digit hex value used as an error code. The error codes range in value from 01 hex to 24 hex and from 80 hex to 91 hex and can be found in Appendix A, section A.4, "MB/TC Controller Error Codes."

4.9.2 1/2 Inch Tape Drive Controller Self-Test #2

Selecting option 2 from the 1/2 Inch Tape Controller Diagnostic menu starts the 1/2" Tape Drive Controller Self-Test #2. This exercises additional tape controller hardware functions beyond those tested by Self-Test #1. This tests the following subsystems:

- Parameter block and internal register testing
- Board error register
- Board status register
- Tape status register
- Multibus interface

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays the following message:

```
1/2 TAPE DRIVE CONTROLLER SELF-TEST #2 PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2 TAPE DRIVE CONTROLLER SELF-TEST #2 FAILED
ERROR BIT SET IN IOPB GATE FIELD OR ADAPTER STATUS REG.
     ERROR CODE: IOPB GATE FIELD = 0xXX
     ERROR CODE: ERROR CODE REG  = 0xXX
TAPE CONTROLLER TIMED OUT ON RESET
TAPE CONTROLLER REPORTED ILLEGAL BUSY STATUS
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK ACKNOWLEDGE
GATE COMPLETE BIT NOT SET ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER IOPB EXECUTION ERROR
MAG TAPE CONTROLLER BOARD NOT RESPONDING
CONTROLLER BOARD UNDER TEST NOT RESPONDING
```

Figure 4-21 Self-Test #2 Error Messages

The notation "XX" is a two-digit hex value used as an error code. The error codes range in value from 01 hex to 24 hex and from 80 hex to 91 hex and can be found in Appendix A, section A.4, "MB/TC Controller Error Codes."

4.9.3 1/2 Inch Tape Drive Reset Test

Selecting option 3 from the 1/2 Inch Tape Controller Diagnostic menu starts the 1/2 Inch Tape Drive Reset Test. This tests the ability of the tape controller to reinitialize the tape drive to a quiescent state. This tests the following subsystem components:

- Multibus interface
- Tape drive interface logic

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays the following message:

```
1/2" TAPE DRIVE RESET TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE RESET TEST FAILED
ERROR BIT SET IN IOPB GATE FIELD OR ADAPTER STATUS REG.
     ERROR CODE: IOPB GATE FIELD = 0xXX
     ERROR CODE: ERROR CODE REG  = 0xXX
TAPE CONTROLLER TIMED OUT ON RESET
TAPE CONTROLLER REPORTED ILLEGAL BUSY STATUS
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK ACKNOWLEDGE
GATE COMPLETE BIT NOT SET ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER IOPB EXECUTION ERROR
TAPE CONTROLLER BOARD NOT RESPONDING
```

Figure 4–22 Reset Test Error Messages

The notation "XX" is a two-digit hex value used as an error code. The error codes range in value from 01 hex to 24 hex and from 80 hex to 91 hex and can be found in Appendix A, section A.4, "MB/TC Controller Error Codes."

4.9.4 1/2 Inch Tape Drive Security Erase Test

Do not use a 2400' tape for this test; the test might time out if a long tape is used. Selecting option 4 from the $^1/_2$ Inch Tape Controller Diagnostic menu starts the 1/2 Inch Tape drive Security Erase Test. This tests the ability of the tape controller and tape drive to perform an erase of the entire tape to several feet beyond end-of-tape (EOT). This tests the following subsystem components:

- Multibus interface
- Tape drive erase circuitry
- Tape drive interface logic

After the test starts, the following messages and prompt are displayed:

```
Security Erase in progress: ERASE to beyond EOT.
The Tape Controller should now be indicating 'ACTIVE' on the
front panel. If it isn't, the test has probably failed.
If the Controller IS indicating 'ACTIVE', wait for seven minutes
or wait for the 'ACTIVE' signal to go out, whichever comes first,
before entering a keystroke to continue. If the Controller
ISN'T indicating 'ACTIVE', hit a key now.
```

If the test passes, the screen displays the following message:

```
1/2" TAPE DRIVE ERASE TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE ERASE TEST FAILED
ERROR BIT SET IN IOPB GATE FIELD OR ADAPTER STATUS REG.
     ERROR CODE: IOPB GATE FIELD = 0xXX
     ERROR CODE: ERROR CODE REG  = 0xXX
TAPE CONTROLLER TIMED OUT ON RESET
TAPE CONTROLLER REPORTED ILLEGAL BUSY STATUS
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK ACKNOWLEDGE
GATE COMPLETE BIT NOT SET ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER IOPB EXECUTION ERROR
TAPE CONTROLLER BOARD NOT RESPONDING
```

Figure 4-29 Figure 4-22 Security Erase Test Error Messages

The notation "XX" is a two-digit hex value used as an error code. The error codes range in value from 01 hex to 24 hex and from 80 hex to 91 hex and can be found in Appendix A, section A.4, "MB/TC Controller Error Codes."

4.9.5 1/2" Tape Drive Read Status Test

Selecting option 5 from the 1/2 Inch Tape Controller Diagnostic menu starts the 1/2" Tape Drive Read Status Test. This tests the ability of the tape controller to read the tape drive status. This tests the following subsystem components:

- Multibus interface
- Tape drive interface logic
- Internal registers of controller and drive

No screen prompts are displayed while the tests are running.

If the test passes, the screen displays the following message:

```
1/2" TAPE DRIVE RESET TEST PASSED
```
followed by these parameters:
- *Drive Ready Status*
- *Beginning of Tape indication*
- *End of Tape indication*
- *Rewind Status*
- *On-Line Status*
- *Density select status*
- *Speed select status*
- *Write Protect status*
- *Data Encode status*
- *Gap Head Status*

Figure 4–24 Tape Drive Status

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE RESET TEST FAILED
ERROR BIT SET IN IOPB GATE FIELD OR ADAPTER STATUS REG.
     ERROR CODE: IOPB GATE FIELD = 0xXX
     ERROR CODE: ERROR CODE REG  = 0xXX
TAPE CONTROLLER TIMED OUT ON RESET
TAPE CONTROLLER REPORTED ILLEGAL BUSY STATUS
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK ACKNOWLEDGE
GATE COMPLETE BIT NOT SET ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER IOPB EXECUTION ERROR
TAPE CONTROLLER BOARD NOT RESPONDING
```

Figure 4–25 Read Status Test Error Messages

The notation "XX" is a two-digit hex value used as an error code. The error codes range in value from 01 hex to 24 hex and from 80 hex to 91 hex and can be found in Appendix A, section A.4, "MB/TC Controller Error Codes."

4.9.6 1/2 Inch Tape Drive Rewind Test

Selecting option 6 from the 1/2 Inch Tape Controller Diagnostic menu starts the 1/2 Inch Tape Rewind Test. This tests the ability of the tape to rewind. The diagnostic tests the following subsystem components:

- Multibus interface
- Rewind and Blower motors

NOTE

Executing the Security Erase test prior to this test ensures that the tape is at the end-of-tape (EOT), forcing the Rewind to actually take place.

After the test starts the following messages and prompt are displayed:

```
"REWIND now in progress.
The BT270 should be flashing the message "REWIND'G" on the front panel,
unless the test has already finished. If "REWIND'G" is currently flashing,
wait for it to stop before hitting a key to continue; otherwise, hit a key
now."
```

If the test passes, the screen displays the following message:

```
1/2" TAPE DRIVE REWIND TEST PASSED
```

If the test fails, one or more of the following error messages are displayed:

```
1/2" TAPE DRIVE REWIND TEST FAILED
ERROR BIT SET IN IOPB GATE FIELD OR ADAPTOR STATUS REG.
     ERROR CODE: IOPB GATE FIELD = 0xXX
     ERROR CODE: ERROR CODE REG  = 0xXX
TAPE CONTROLLER TIMED OUT ON RESET
TAPE CONTROLLER REPORTED ILLEGAL BUSY STATUS
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER REPORTED TIMEOUT ON PARAMETER BLOCK ACKNOWLEDGE
GATE COMPLETE BIT NOT SET ON PARAMETER BLOCK EXECUTION
TAPE CONTROLLER IOPB EXECUTION ERROR
TAPE CONTROLLER BOARD NOT RESPONDING
```

Figure 4–26 Read Status Test Error Messages

The notation "XX" is a two-digit hex value used as an error code. The error codes range in value from 01 hex to 24 hex and from 80 hex to 91 hex and can be found in Appendix A, section A.4, "MB/TC Controller Board Error Codes."

4.9.7 1/2 Inch Tape Drive Self-Test

Selecting option 7 from the 1/2 Inch Tape Controller Diagnostic menu starts the 1/2 Inch Tape Drive Self-Test. This test starts the self-test resident on the BT270 tape drive itself. This tests the following subsystem components:

- Supply and take-up motors along with related servo circuits
- Analog ARM output voltage
- File protect/reel seat
- BOT, EOT, and Tape-in-Path sensor circuits
- Door lock and hub lock solenoids
- Front panel and top cover lock solenoids
- Blower motor
- Tape drive read/write capability

When the test begins, you are prompted to start the self-test manually via screen directions and the tape drive front panel:

```
Remove tape prior to running the following tests!

Check to see that the On-Line indicator is off. If the
indicator is on, press the On-Line switch to switch the unit
to an off-line mode
Hit key when ready:
```

When you press a key in response to the above screen, the next screen appears, as shown below:

```
TEST 111 -- OSCILLATE SERVOS

This test checks both the supply and take-up motors and their
related servo circuits.
Press the WRT EN/Test switch number 4, followed by the DENSITY
SELECT SWITCH number 5 to go into test mode.
Press the LOAD/REWIND switch number (three times)(i.e., sequence '111').
Press the DENSITY SELECT switch 5 to start the test.
Switch numbers 1, 2, and should be lit: press switch under 1
and check for the AUTO OSC message on the front panel.
Stop the test by first pressing switch 5, then 4.
Enter 'C' to go on to the next test or 'S' to stop test set:
```

The front display panel on the BT270 tape drive indicates the pass/fail status of each separate diagnostic. See the *Cipher M990 GCR CacheTape® Unit Operator's Guide* for an explanation of BT270 display panel messages.

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