



Burroughs

B 27 Systems Diagnostics

Operations
Guide

Relative to Release Level 4.0
Priced Item
May 1986

Distribution Code SA
Printed in U S America
1201076



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Introduction

How This Guide Works

This guide assumes that you've experienced a problem with your B 27 system, a problem that you think is not caused by any error in a program you've been running but by the machinery itself. The guide asks you a series of questions about your system, leading you along a diagnostic path to the discovery of the failing part of your system or to a point when you know you need the services of a trained technician. Be patient as you proceed through the flow diagram. You are involved in a task of elimination: you must begin the task at the first step of the flowchart and continue through exactly as you are directed until you find the failing module. Because some sections in the guide test several different modules, the sections are generically titled A, B, C, and so on. When you've found the failing module or know you need technical help, call your Burroughs customer support center or the dealer from which you purchased your B 27.

This guide tests two types of B 27 workstations: B 27-CPU and B 27-CLS. The B 27-CPU is a fully featured workstation that uses disk modules for file storage and can use any of the other modules of the B 27 family, such as graphics and four-port data comm. The B 27-CLS is comprised of a video monitor, keyboard, and CPU module. It can operate only as a cluster workstation under the control of a master workstation.

In addition to this guide, the B 27 Diagnostic Kit contains a set of programs on a floppy disk. Depending on your path through this guide, you may or may not need to use the disk.

The Diagnostic Kit

The diagnostic kit contains one manual and one floppy disk diagnostic program. It also contains loopback plugs. These plugs are to be used with the diagnostic program (RS232 Communication Diagnostics) that tests the circuitry involved with this kind of communication.

What You Should Have on Hand

This kit contains everything you need for most situations. However, you may be directed to clean the heads of your floppy disk drive using a disk cleaning kit. You should be doing this anyway after about 40 hours of drive operation. It is important that you use a Burroughs authorized disk cleaning kit; otherwise, you risk serious damage to your drive. Call your Burroughs office to get the correct kit. See Section P for the proper head cleaning procedure.

You may also be asked to use a keyboard or a memory expansion module that you know to be good or to insert blank disks into all floppy drives at some point in the task. If no functioning B 27 is available from which you can borrow these components, call Burroughs or your dealer.

The B 27 System

The complete B 27-CPU system consists of the following pieces or modules (see Figure 1). Your B 27-CPU system has all or some of these. If you have a B 27-CLS, you will have only a video module, keyboard, and CPU module.

- CPU (Central Processing Unit) module
- Keyboard
- Video monitor (monochrome or color)
- Power module(s)
- Graphics module (monochrome or color) (optional)
- Main disk module: dual floppy or hard/floppy disk module
- 1/4-Inch Tape Streamer (optional)
- Disk on Desk module (optional)
- Disk expansion module or disk upgrade module (optional)

- Four-port data comm module (optional)
- Memory expansion module (optional)
- Mouse (optional)
- LAN (Local Area Network) module (optional)

The Diagnostic Flow Diagram isolates a faulty module of a B 27-CLS or a faulty module of the basic B 27-CPU system. The basic system represents the minimum amount of equipment needed to have a functioning standalone B 27-CPU and includes a CPU module, main disk module, keyboard, and video monitor. If you have a B 27-CPU system other than this, you may have to do some swapping around of modules as you move through the flow diagram. If you have a cluster B 27-CPU or a B 27-CLS workstation, refer to Appendix A for information on how to use the master workstation's diagnostic software to run diagnostic tests on the cluster workstation.

Copying the Diagnostics onto a Hard Disk

If you want to put the floppy disk diagnostics onto the hard disk of a B 27-CPU, refer to the procedure in Appendix A. Copying the diagnostics onto the hard disk of a master workstation allows the members of the cluster to share the diagnostics. Copying the disk diagnostics onto the hard disk of a standalone workstation allows you to use the diagnostics if your floppy drive becomes inoperable.

Figure 1 The B 27 System

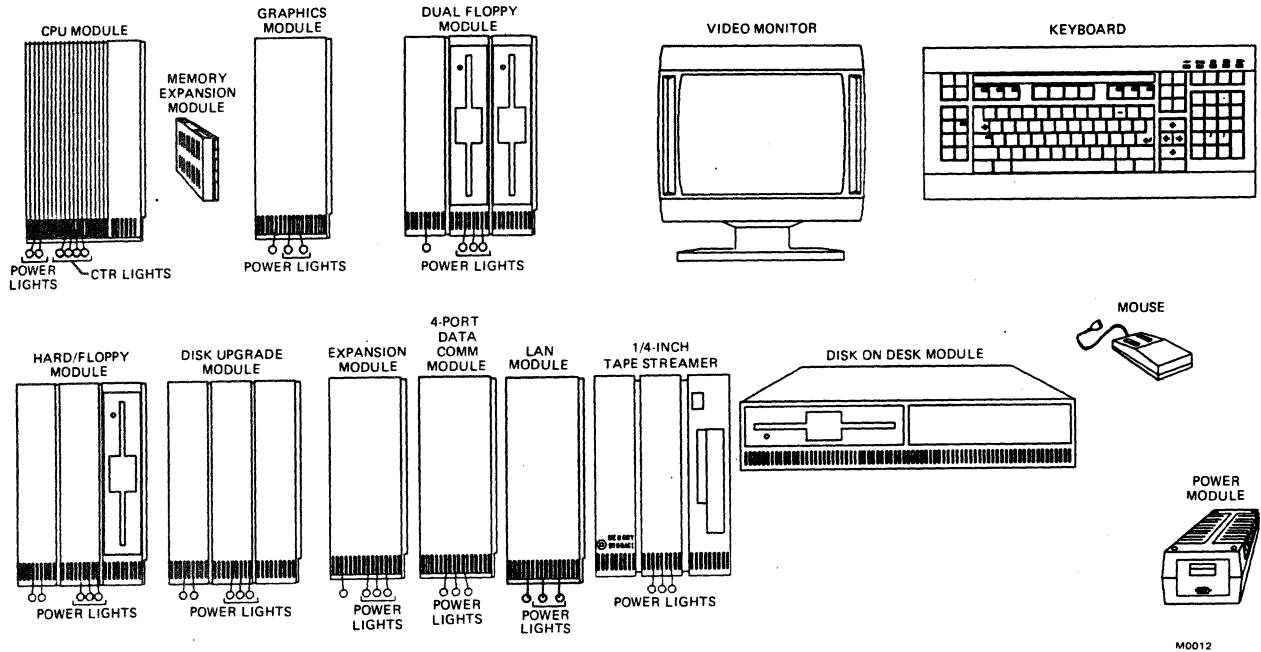


Figure 2 Error Message Example

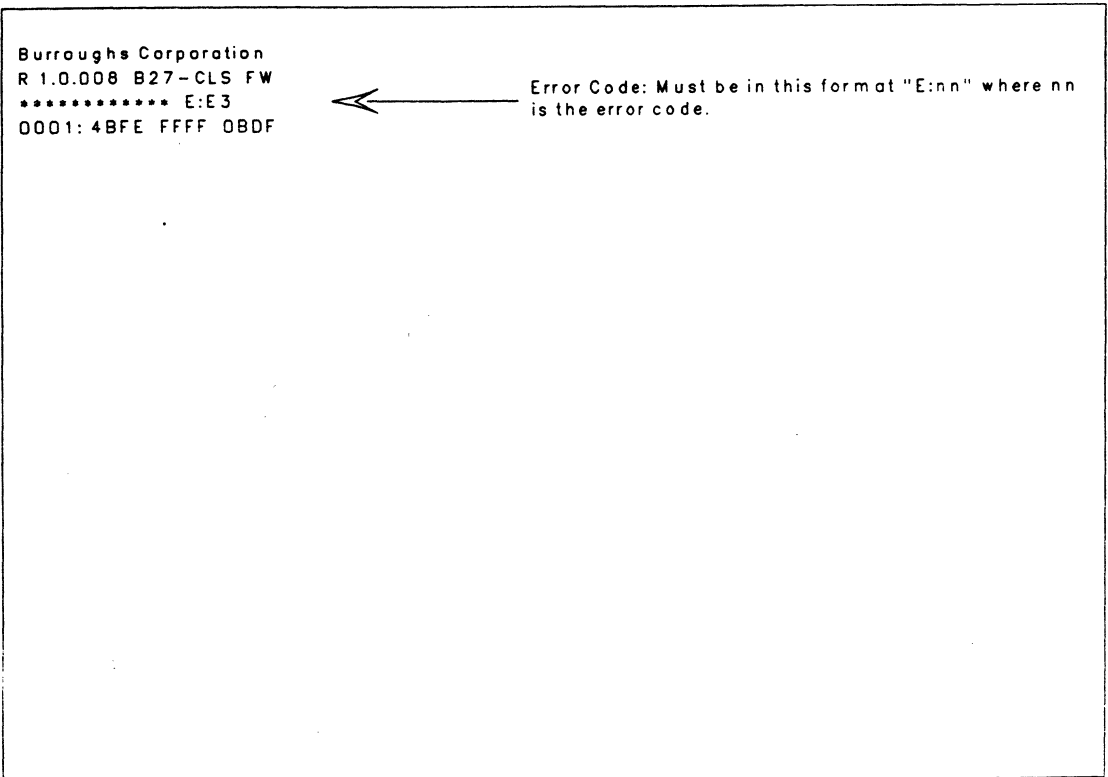


Figure 3 Diagnostic ID

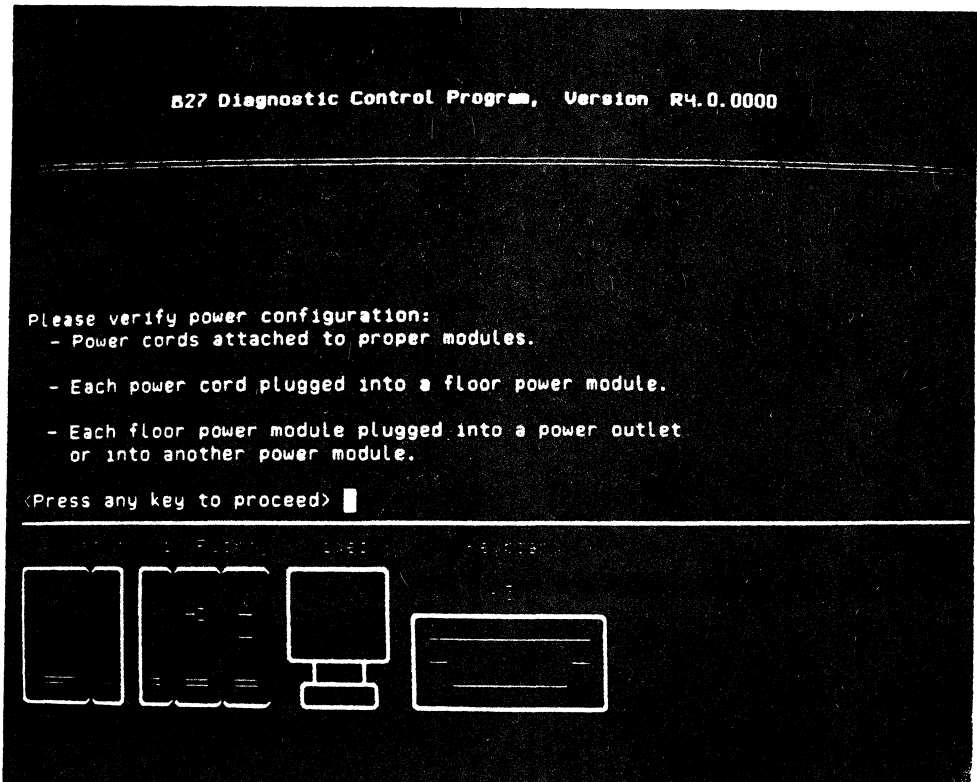
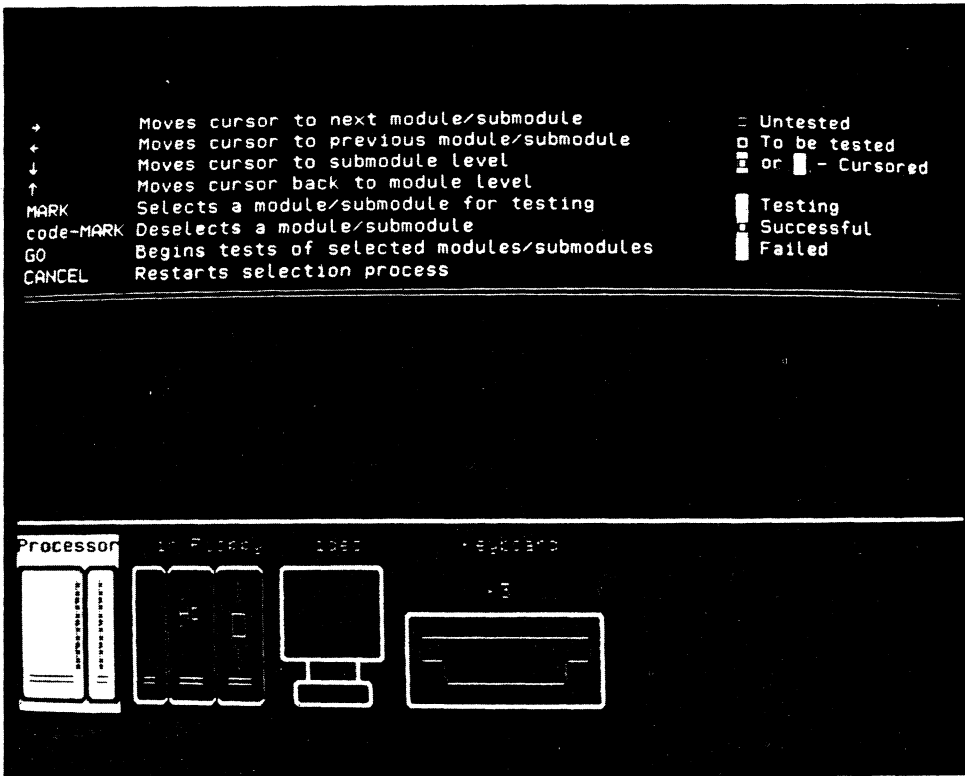


Figure 4 Diagnostic Menu



Terms to Know

There is a glossary at the end of this guide to help you understand terms with which you may be unfamiliar. Here are five terms that you'll want to know before you begin the flow diagram.

main disk module. Disk unit closest to the CPU module (or to the graphics module if one is installed). It can be a dual floppy or a hard/floppy disk unit. If both a disk on desk module and a dual floppy module are installed, you should assume that the disk on desk module is the main disk module.

upgrade disk module. Any disk unit used in addition to the main disk module that increases the storage capacity of your system. This document assumes that the upgrade disk module is installed to the right of the main disk module.

expansion disk module. A hard disk unit that adds to the storage capacity of your system but must be paired with a main disk (not a dual floppy) or upgrade module.

mouse. A manual device by which the user controls the cursor movement on the screen.

CTR. Confidence Test Routines are performed by the boot ROM when the system is first turned on. Four consecutive LEDs on the CPU light up when the CTR test is being performed. As you face the CPU, these LEDs are the second set of LEDs from the left on the bottom. (The first set contains two LEDs).

Before You Begin

If the B 27 Diagnostic software can be loaded and the screen displays the diagnostic ID (see Figure 3), you can bypass the diagnostic flow diagram and proceed to Section O.

The Diagnostic Flow Diagram assumes that for B 27-CPU's no module is ever connected between the CPU and a disk module other than an optional graphics module. Any module attached to the system but not displayed in the Diagnostic ID or the Diagnostic Menu is considered a faulty module. If the faulty module is not critical to the basic operation of the system, you may not want to go through the flow diagram to verify the proper functioning of the rest of the modules. The Diagnostic Flow Diagram also assumes that for a B 27-CLS the master workstation is working and a cluster cable is connected between the master and the B 27-CLS.

Make sure that the modules in your system are connected in the correct sequence and that all cables and cords are plugged in at the appropriate places. The *BTOS Systems Hardware Installation Guide* provides you with this information. Check to make sure that the fans for each module are operating: listen for their operation or place your hand at the rear of each module to feel for air flow and vibration. If a fan is not running there will be no air current and the module is considered faulty. The monitor, keyboard, graphics, and power modules have no fan.

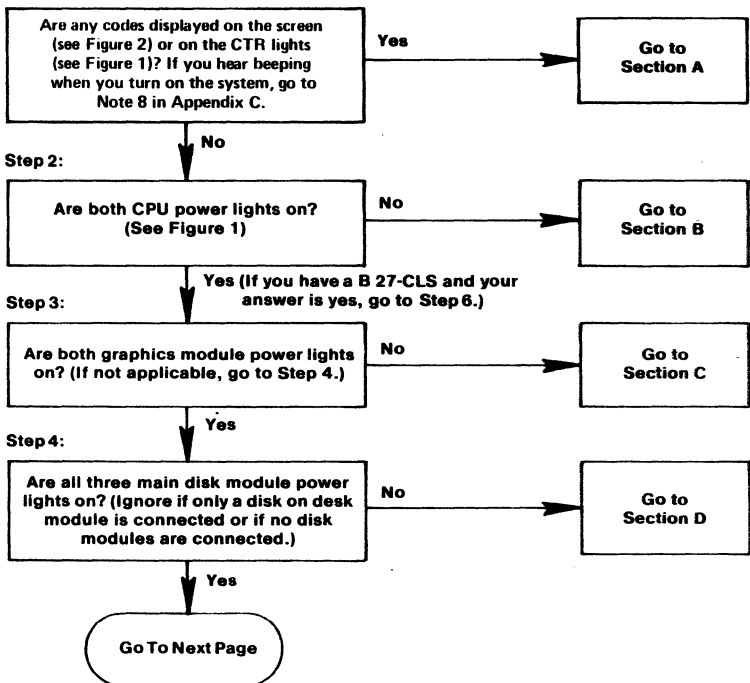
Refer to your systems installation guide for information about disk handling procedures, maintenance tips, and the location of the connectors, controls, and switches.

Now begin the flow diagram.

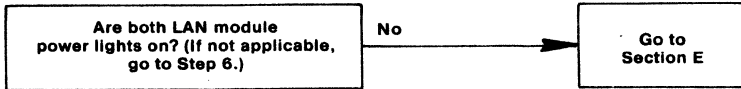
Caution: Always turn the system off and unplug the power supply from the AC wall outlet before detaching or attaching modules, cords, or cables.

Step 1:

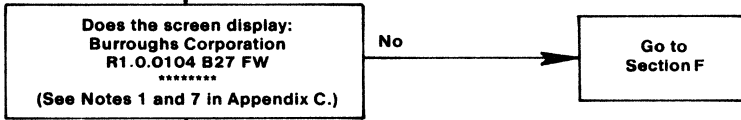
- A. Insert the diagnostic disk with write-protect notch up in drive F0, which is usually the floppy drive closest to the CPU in a dual floppy module. If you have a disk on desk module, insert the diagnostic disk with the write-protect notch to the left. If you have a cluster workstation without a main disk module, turn to Appendix A for information on how to load the diagnostic software from the master workstation.
- B. Plug in power supply to the AC wall outlet.
- C. Turn the system on and close the drive door.
- D. Adjust the screen brightness to a comfortable level by turning the brightness control.



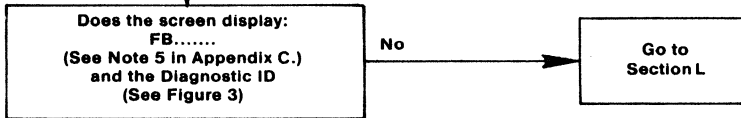
Step 5:



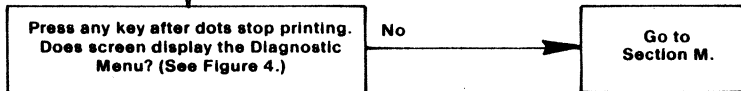
Step 6:



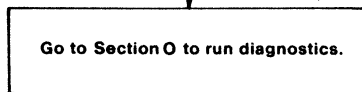
Step 7:

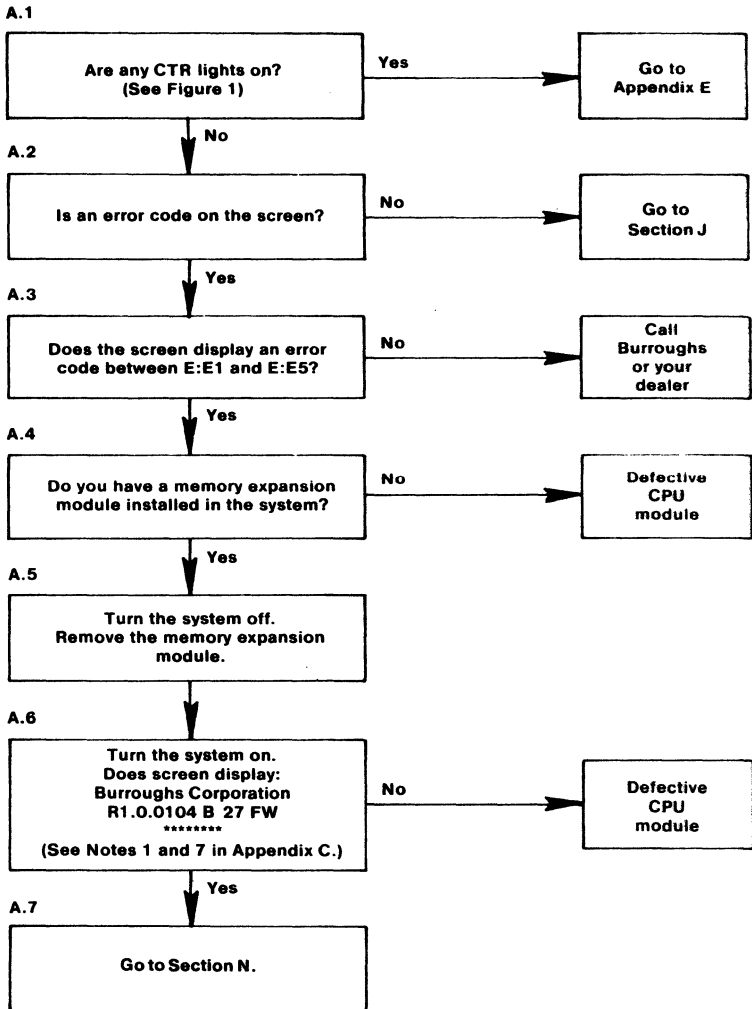


Step 8:



Step 9:





B.1

- A.** Turn the system off. Unplug line cord(s) from AC wall outlet.
- B.** Test AC wall outlet by plugging in and turning on a known good electrical device, such as a lamp.
- C.** Ensure the connection from wall outlet to power module(s) and connection from power module to CPU module.

B.2

Plug in line cord. Turn the system on. Are both CPU power lights on?

Yes

Go to Step 3, first page of flow diagram

No

B.3

Is only the right power light on? (See Note 6 in Appendix C.)

Yes

Defective CPU module

No (If you have a B 27-CLS and your answer is no, go to Step B.8.)

B.4

Turn the system off. Unplug line cord from AC wall outlet. Remove the main disk module and all other modules to the right of the main disk module (including the disk on desk module, if installed).

B.5

Plug in line cord. Turn the system on. Is the CPU module's right power light on?

Yes

Defective main disk module. See Note 3, Appendix C.

No (both off)

B.6

Turn the system off. Unplug line cord from AC wall outlet. Remove the graphics module (if not applicable, go to Step B.7). Remove video cable from graphics module. Connect video cable into CPU module.

B.7

Plug in line cord. Turn the system on. Is the CPU module's right power light on?

Yes

Defective graphics module

No

Go To Next Page

B.8

Remove keyboard (and mouse if installed). Is the CPU module's right light on?

Yes

Defective keyboard

No

B.9

Turn the system off. Unplug line cord from AC wall outlet. Disconnect the video monitor.

B.10

Plug line cord into the AC wall outlet. Is the CPU module's right power light on?

Yes

Defective video monitor

No

B.11

Unplug line cord from AC wall outlet. Reconnect the video monitor and keyboard.

B.12

Plug in line cord. Turn the system on. Listen. Can you hear the fan running on the back of the CPU module?

Yes

Defective CPU module

No

B.13

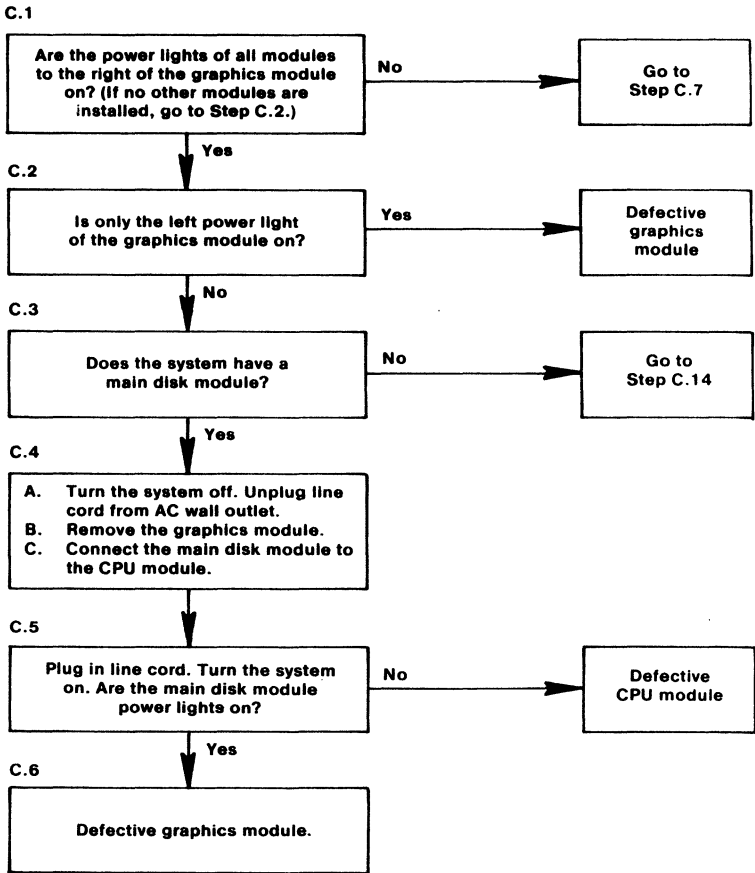
Turn the system off and on while watching the screen. Was the screen flickering and were any keyboard lights on?

Yes

Defective CPU module

No to both questions

Defective power supply module.



Section C continues on next page, but flow diagram is not continuous.

C.7

Turn the system off. Unplug line cord from AC wall outlet. Remove all modules to the right of the graphics module (and the disk on desk module, if installed).

C.8

Plug in line cord. Turn the system on. Are the graphics module power lights on?

No

Go to Step C.3

Yes

C.9

A. Turn the system off. Unplug line cord from AC wall outlet.
B. Remove the graphics module.
C. Connect the main disk module to the CPU module.

C.10

Plug in line cord. Turn the system on. Are the main disk module power lights on?

No

Defective main disk module

Yes

C.11

Turn the system off. Unplug line cord from AC wall outlet. Connect the disk on desk module (if installed).

C.12

Plug in line cord. Turn the system on. Are the main disk module power lights on?

No

Defective disk on desk module

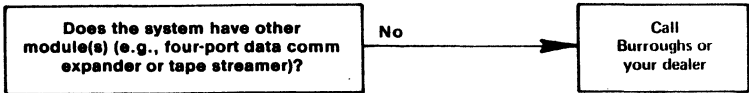
Yes

C.13

Defective graphics module.

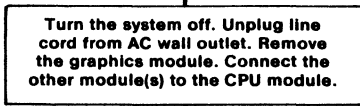
Section C continues on next page, but flow diagram is not continuous.

C.14



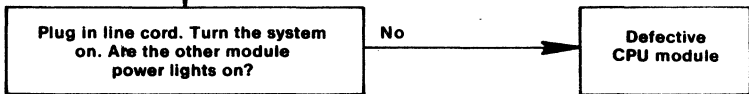
Yes

C.15



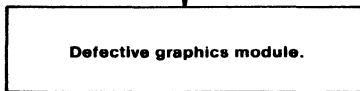
↓

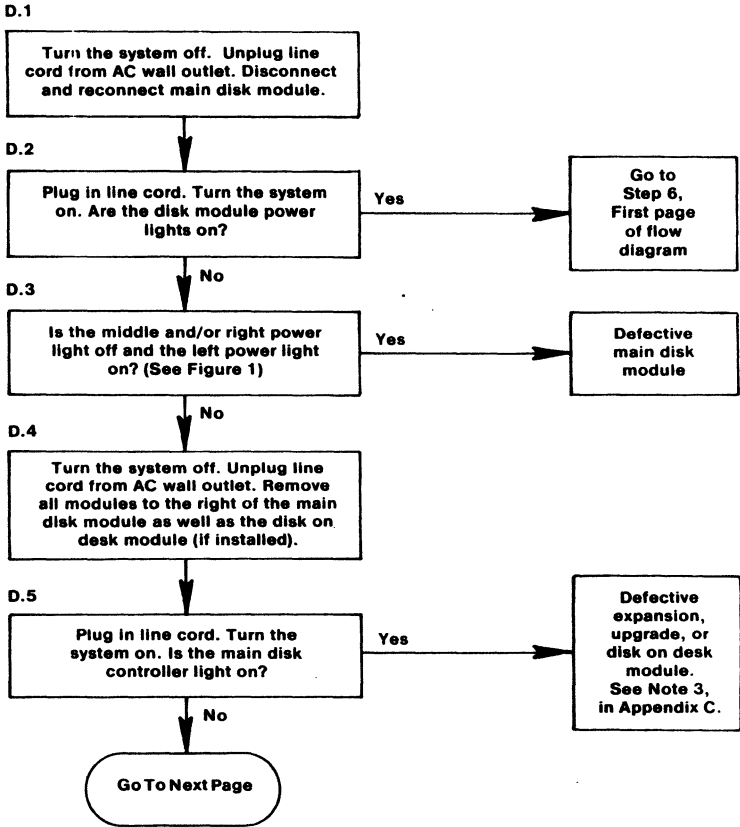
C.16



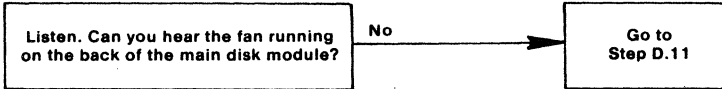
Yes

C.17

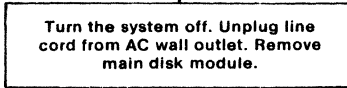




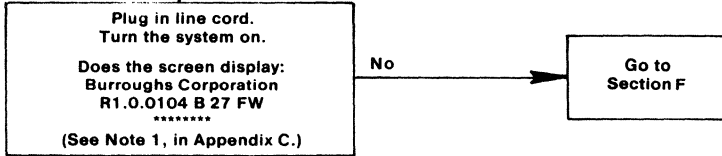
D.6



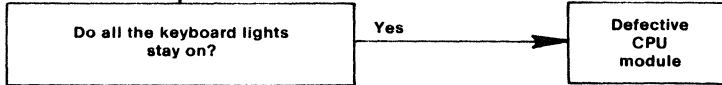
D.7



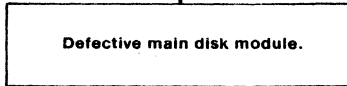
D.8



D.9



D.10



Section D continues on next page,
but flow diagram is not continuous.

D.11

Turn the system off. Unplug line cord from AC wall outlet. If applicable, disconnect the power supply module from the main disk module.

D.12

Plug in line cord. Turn the system on. Is main disk module light on?

Yes

Removed power module is defective

No

D.13

Listen. Can you hear the fan running on the back of the main disk module?

No

Defective main disk module

Yes

Go to Step D.7.

E.1

Are the power lights of all modules to the right of the LAN module on? (if there are no other modules to the right of the LAN, answer yes.)

Yes

Defective LAN module

No

E.2

a. Turn the system off.
b. Remove the modules to the right of the LAN module.
c. Turn the system on.

E.3

Are both LAN module power lights on?

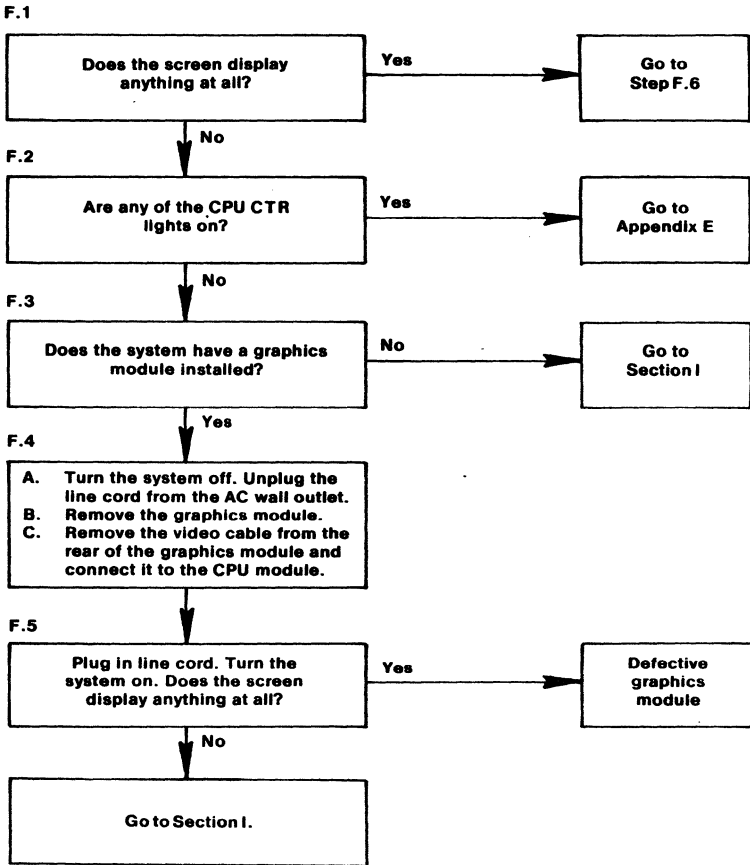
No

Defective LAN module

Yes

E.4

See Note 3 in Appendix C.



Section F continues on next page, but flow diagram is not continuous.

F.6

Does the screen display:
Burroughs Corporation
R1.0.0104 B 2 FW
and an incorrect number of asterisks?
(See Note 1 in Appendix C.)

No

Go to
Section G

Yes

F.7

Do you have memory expansion
module installed?

No

Defective
CPU
module

Yes

F.8

Turn the system off. Unplug line
cord from AC wall outlet. Remove
the memory expansion module.

F.9

Plug in line cord. Turn the
system on.
Does the screen display:
Burroughs Corporation
R1.0.0104 B 27 FW

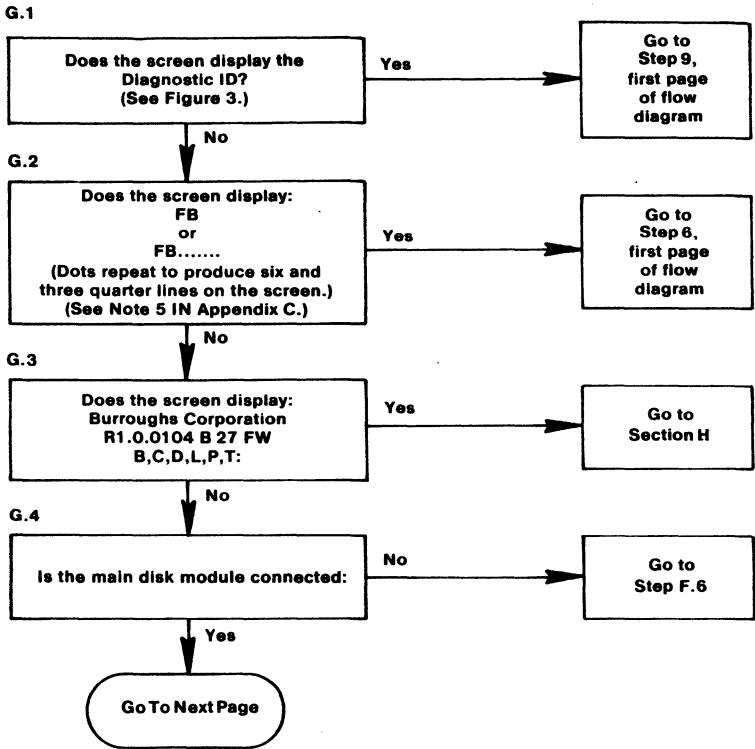
No

Defective
CPU
module

Yes

F.10

Go to Section N.



G.5

Turn the system off. Unplug the line cord from the AC wall outlet. Remove the main disk module and the disk on desk module (if installed).

G.6

Plug in line cord. Turn the system on. Does the screen display:
Burroughs Corporation
R1.0.0104 B 27 FW

(See Note 1 in Appendix C.)

Yes

Go to Step G.8

No

G.7

Does the screen display:
Burroughs Corporation
R1.0.0104 B 27 FW
and an incorrect number of asterisks?
(See Note 1 in Appendix C.)

Yes

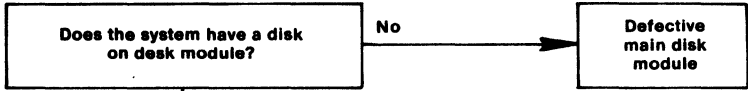
Go to Step F.7

No

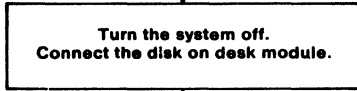
Defective CPU module.

Section G continues on next page, but flow diagram is not continuous.

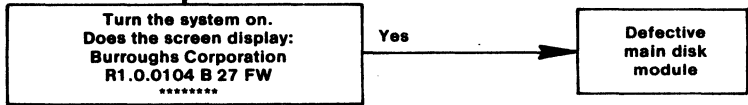
G.8



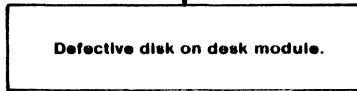
G.9

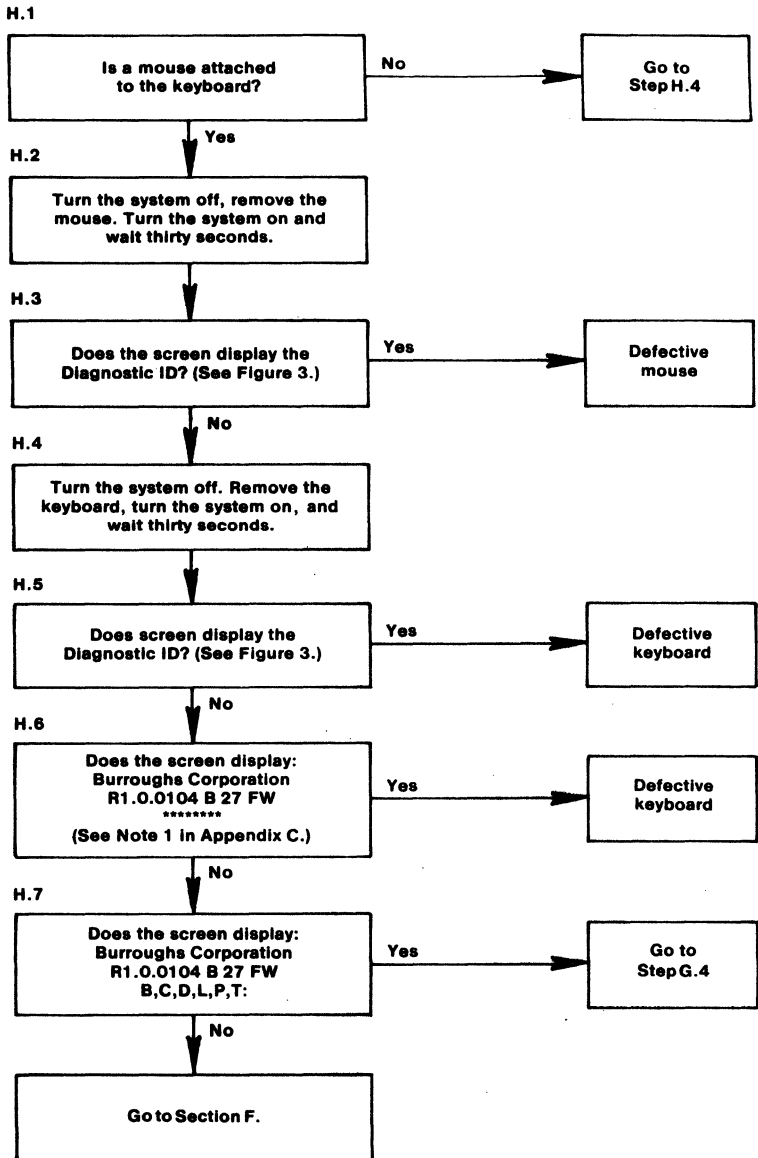


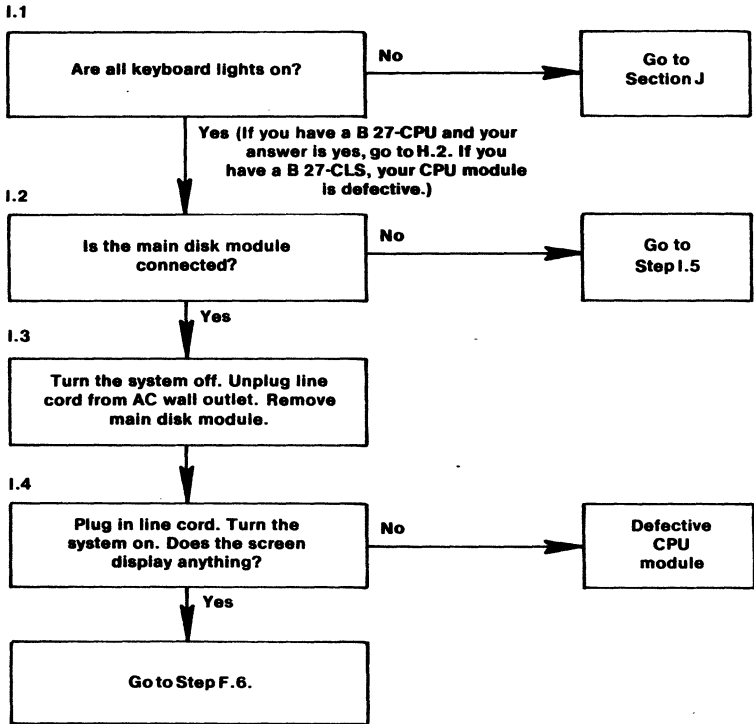
G.10



G.11

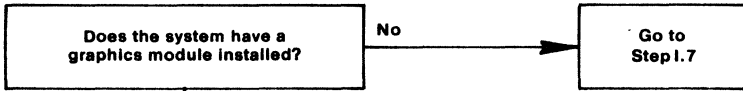






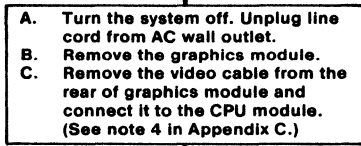
Section I continues on next page, but flow diagram is not continuous.

I.5

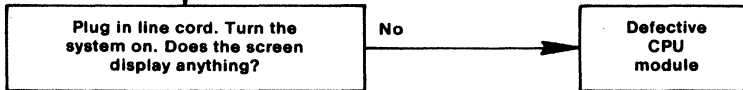


Yes

I.6



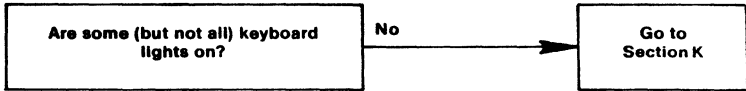
I.7



Yes



J.1



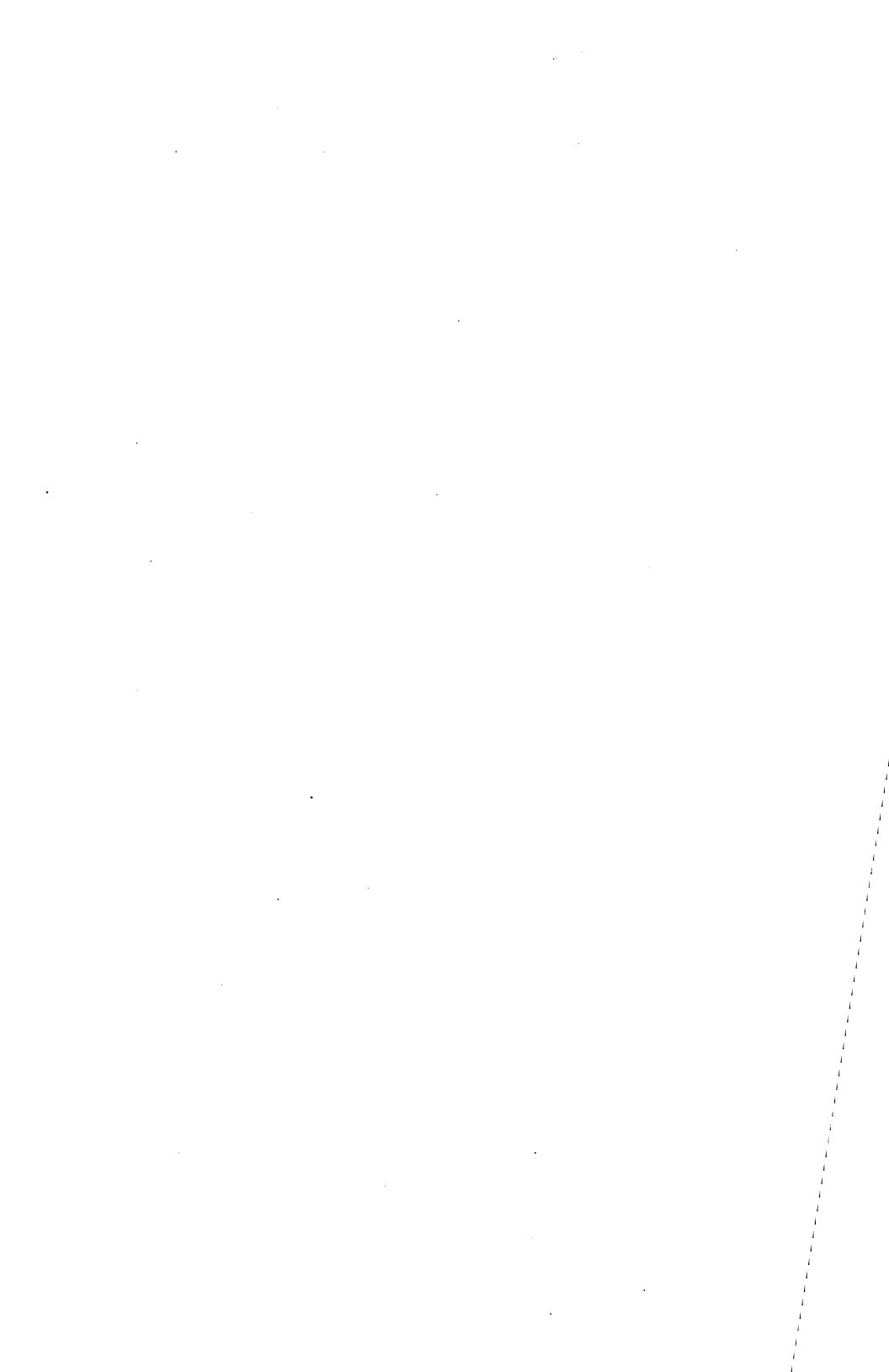
J.2

The lights on the keyboard represent an error code. A light that is on is a 1; a light that is off is a 0. Use the binary code table in Appendix F to find the most likely failing module (primary) and the second most likely failing module (secondary). For example, this sequence of lights:

Overtime key	Off	0
Lock key	Off	0
f1 key	On	1
f2 key	On	1
f3 key	On	1
f8 key	On	1
f9 key	On	1
f10 key	On	1

indicates a failure to read from or write to a disk, "a read or write fault." The primary failing module is the disk module; the secondary is the CPU module.

If the keyboard lights display a code that is not listed in Appendix F, call Burroughs or your dealer.



K.1

Turn the system off and on.

K.2

Do all keyboard lights come on and then go off?

No

Go to Step K.8

Yes

K.3

Memory will be tested for approximately 2 to 10 seconds. Wait 30 seconds.

K.4

Turn the system off while watching the screen. Was there a momentary flash on the screen?

No

Defective video monitor

Yes

K.5

Does the system have a graphics module installed?

No

Defective CPU module

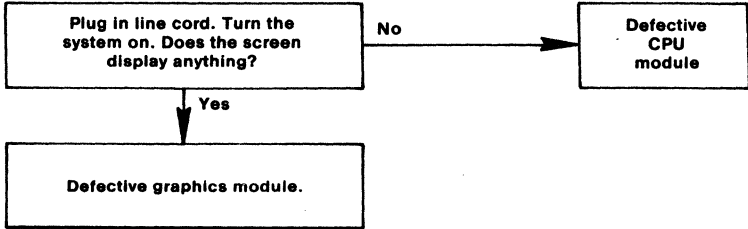
Yes

K.6

A. Turn the system off. Unplug line cord from AC wall outlet.
B. Remove the graphics module.
C. Remove the video cable from the rear of the graphics module and connect it to the CPU module.
(See Note 4 in Appendix C.)

Go To Next Page

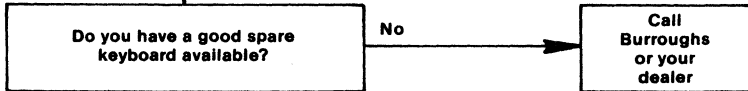
K.7



K.8

All keyboard lights either stay off or on.

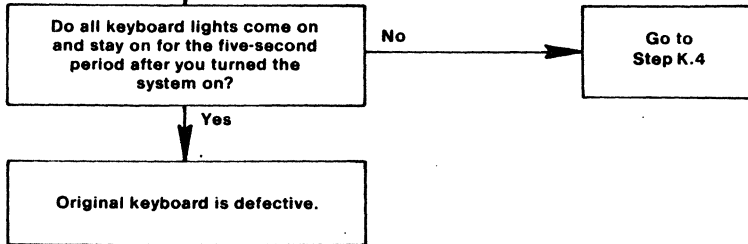
K.9



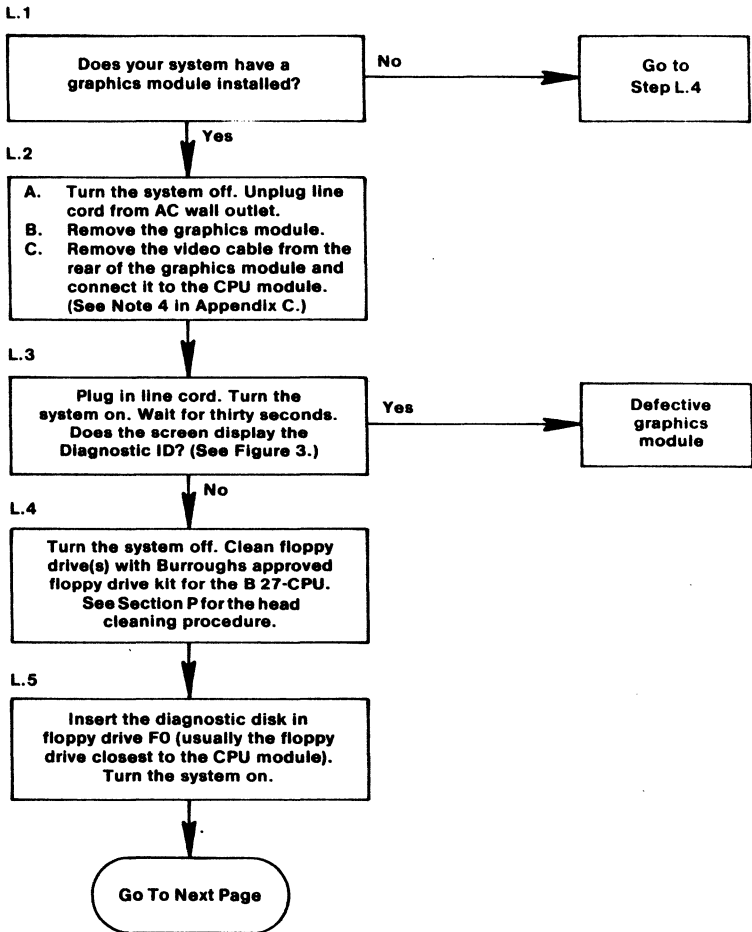
K.10

Replace the keyboard. Turn the system off and on.

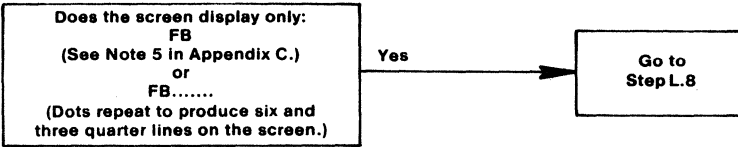
K.11



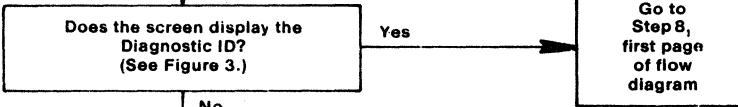
Note: If your system is a B 27-CPU, proceed as usual with the flow diagram beginning at Step L.1. If your system is a B 27-CLS, refer to Note 7 in Appendix C. If all conditions discussed in Note 7 are met, your CPU module is defective.



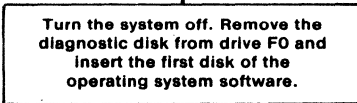
L.6



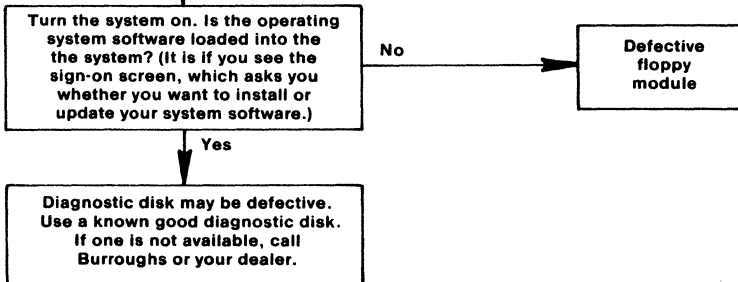
L.7

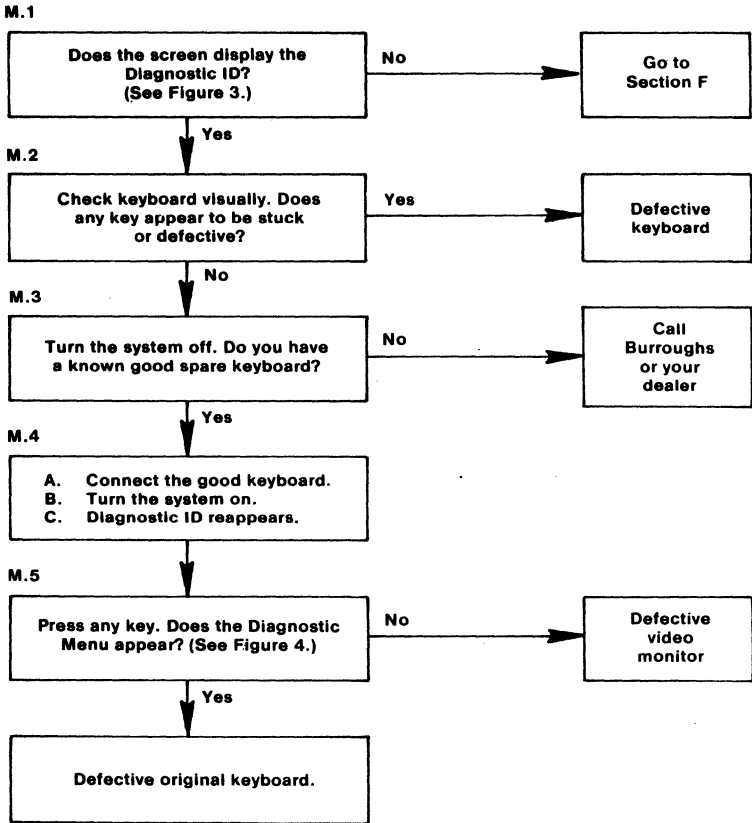


L.8



L.9





Screen should display:

Burroughs Corporation
R1.0.0104 B 27 FW

***** (8 asterisks) with no memory expansion module installed.

***** (15 asterisks) with memory expansion module installed.

N.1

- A. Turn the system off.
- B. Remove the memory expansion module.
- C. Remove the main disk module and all other modules to the right of the main disk module.

N.2

Do you have a known good spare memory expansion module?

No

Call Burroughs or your dealer

Yes

N.3

Insert the good spare memory expansion module.

N.4

Turn the system on.
Does the screen display:
Burroughs Corporation
R1.0.0104 B 27 FW
***** (15 asterisks)

No

Defective CPU module

Yes

Original memory expansion module is defective.

Running Diagnostics

The diagnostic programs contained on the floppy disk that came with this kit test the internal circuitry of the modules in your B 27 system. The diagnostics run automatically. A few modules ask you to answer some questions first. These questions are technical. Don't panic. You'll be helped in answering them. You have the option of recording your answers permanently in a customized diagnostic package (see Appendix B). This simplifies running the diagnostics in the future.

Before you begin, if you want to test the hard disks in floppy/winchester, disk upgrade, or disk expansion modules, turn off the system and look on the bottom of the module that contains the hard disk. The label there gives the disk type (a circled letter) and media defect information (rows of numbers corresponding to the categories: cylinder, head, and sector). Write down this information because the hard disk test will ask you to enter it.

After you put the diagnostic disk in drive f0 (usually drive closest to the CPU in dual floppy module) and turn the system on (or load the diagnostics from a master workstation), you'll see graphic symbols displayed on the screen that represent the modules in your B 27 system. These symbols appear in the lower third of the screen and are individually illuminated at various times to let you know what part of the system is being tested or has been selected for testing.

If, during the course of a test, the diagnostics detect a failure, the symbol representing the module flashes. You may also be informed of a failure by a screen message. Although the error message may be technical in nature, you'll have no difficulty in recognizing it as an error message. Another way you may become aware of a failure is by comparing what you see on the screen with the illustrations in Appendix D. If a failing module is found, call Burroughs or your dealer. If you have an obvious problem (such as a flickering screen) but the diagnostics do not detect a failure in your system, call Burroughs or your dealer.

Step 1

- a Turn the system off.
- b Insert the diagnostic disk with the write-protect notch up into drive FO (usually the floppy drive closest to the CPU module).

Step 2

- a Turn the system on and observe the symbols that represent your system. (See Figure 3).
If the display does not correspond to the actual configuration, check to see that you have the appropriate number of power modules. A specific number of power modules must be used to meet the power requirements of your system. Use the *BTOS Systems Hardware Installation Guide* to determine the number of power modules your system needs. The system may ignore one or a group of modules if you have too few power modules. If you have met the power requirements and yet a symbol is missing, the module whose symbol is not displayed is defective.
- b Check for an error message.
If a configuration rule has been violated, such as exceeding the allowed number of modules, a message describing the violation appears on the screen. If a such a message is displayed, refer to *BTOS Systems Hardware Installation Guide* to resolve your problem.

Step 3

- a Remove the diagnostic disk from the floppy drive and put it in its protective jacket.
- b Put a blank disk into each of the floppy drives.
- c Insert one RS-232 loopback plug into each of the RS-232 ports (channel A and channel B), which are located on the left side of the CPU module. If you have only one loopback plug, check each channel independently by running the diagnostics twice — once with the plug on channel A, once with the plug on channel B.

Step 4

Press any key to continue. The screen displays the Diagnostic Menu (see Figure 4). This display is divided into three parts, or windows. (Note: The symbol of the CPU module is half-bright, indicating that the cursor is on it.)

- The top window contains a menu describing the user's options and the meaning of symbols displayed in the bottom window.
- The middle window displays questions pertaining to the test routines. This window scrolls up as the diagnostics proceed.
- The bottom window displays the symbols representing the modules in your system and the current state of the test. Errors, if any, are written under each module after the test has been run completely. Also, failed modules are indicated by flashing symbols.

Step 5

Do the following to select the modules to be tested:

- a** Press **MARK** to select the CPU module. (The symbol representing the module to be tested becomes full bright.)
- b** Press **RIGHT ARROW** to move the cursor to the next module.
- c** Press **MARK** to select that module. You can hold **CODE** and press **MARK** to deselect a module.
- d** Repeat steps **b** and **c** for each module to be tested.
- e** When you have selected all the modules you want to test, press **GO** to start the diagnostic tests.

The video test displays images on the screen that describe themselves or require you to compare them with the illustrations in Appendix D. If you want to hold an image to examine it, press **PREV PAGE** when the image appears. Press **NEXT PAGE** to continue the test.

You can select an entire module to be tested, and you can test submodules, that is, groups of circuitry that make up a module. You can use the procedure that follows to go to any submodule level. Some modules, such as the keyboard, have no submodular levels.

- a Press RIGHT ARROW to position the cursor over the CPU module.
- b Press DOWN ARROW to descend to the submodule level.
- c Press MARK to select a submodule. Notice that the Xs representing this submodule are now illuminated.
- d Use MARK and RIGHT ARROW to select the remaining submodules.
- e Press UP ARROW to return to the module level.
- f Press RIGHT ARROW to move to the next module to be selected or press GO to begin test.

Step 6

The diagnostics tests discussed below are based on a system that contains a CPU module, graphics module, hard/floppy disk module, monochrome (single color, usually green) video monitor, and keyboard. If you have other types of disk modules, you can substitute the answers that follow for your particular disk configurations.

When you have selected all the modules to be tested and pressed GO, the middle window displays the following:

MEMORY DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostics on a memory error?

Press N and then RETURN. Another question appears on the screen.

Do you want to run Galpat test rather than the standard memory test?

Press N and then RETURN. A series of question will now be asked by the diagnostic program.

Proceed through the questions associated with each module. Fill in the answers (Y for Yes and N for No) that are supplied in the text and press RETURN after each answer. Ignore the Ys and Ns that appear on your screen. (They appear in angle brackets next to the questions.) They are default values and aren't necessarily the answers you should give. If you enter the wrong answer and have not pressed RETURN, backspace and type in the correct answer. If you have pressed RETURN, then you must start the selection procedure from the beginning. Press FINISH and go to Step 1.

RS232 COMMUNICATION DIAGNOSTIC PRELIMINARY DIALOG

Is loopback plug connected to channel A? [N]

Is loopback plug connected to channel B? [N]

If the answer to the query is no, then only the access test to the communication controller chip will be performed. These queries allow part of the RS232 test to run even without a loopback plug. If the loopback plug is connected to the system, then the RS232 ports will be tested.

Do you want to run:

Asynchronous mode test? [Y]

Character sync crc-16 test? [Y]

Bit sync data transfer test? [N]

Bit sync abort/idle test? [N]

Stop on communications error? [N]

RS422 CLUSTER DIAGNOSTIC PRELIMINARY DIALOG

Do you want to run:

Cluster maintenance mode test? [Y]

The next test requires that two workstations be taken off the cluster master and connected to each other via a cluster cable.

Note: You must press FINISH to interrupt the next test and reset the system.

Interprocessor data transfer test? [N]

Stop on communications error? [N]

Fast cluster communications? [Y]

EXTERNAL TIMER DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on timer error? [N]

PARALLEL PRINTER PORT DIAGNOSTIC PRELIMINARY DIALOG

Do you want to run:

Barber pole test(without interrupts)? [N]

Barber pole test(with interrupts)? [N]

Max printer wait time (ms)? Press RETURN

Printer paper width (80/132 columns)? [132]

Software debug? [N]

Bypass any error and continue with diagnostics? [Y]

80186 PROCESSOR DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on IAPX 186 CPU error? [N]

EXTERNAL DMA DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on DMA error? [N]

REAL TIME CLOCK DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on RTC error? [N]

GRAPHICS DIAGNOSTIC PRELIMINARY DIALOG (B 27-CPU only)

The graphics test displays images on the screen that you can compare with the illustrations in Appendix D. If you want to hold an image on the screen to examine it, press PREV PAGE when the image appears. Press NEXT PAGE to continue the test.

List all errors found? [Y]

Delay (1-10)? [10]

FLOPPY DIAGNOSTIC PRELIMINARY DIALOG (B 27-CPU only)

Note: Make sure that the diagnostic disk is removed and blank floppy disks are in the floppy drives being tested. Any information that may be contained on these disks will be lost!

- Stop Diagnostic on a disk error?** [N]
- Run quick verification?** [N]
- Run full verification?** [Y]
- Change detail parameters?** [N]

HARD DISK DIAGNOSTIC PRELIMINARY DIALOG (B 27-CPU only)

Caution: You must give the questions below especially close attention because a wrong answer—Y instead of N to destructive tests—will result in the loss of all the information on your hard disk!

This test checks the hard disks in floppy/winchester, disk upgrade, and disk expansion modules.

Drive vendor code . . . Press letter corresponding to the circled letter on bottom of disk module.

- Stop diagnostic on a disk error?** [N]
- Run quick verification?** DESTRUCTIVE [N]
- Run full verification?** DESTRUCTIVE [N]
- Recalibrate test** [Y]
- Sequential seek test** [Y]
- Format disk** DESTRUCTIVE [N]
- Random seek with ID scan test** [Y]
- Write/read all tracks** DESTRUCTIVE [N]

Sequential write/read single sectors	DESTRUCTIVE . . .	[N]
Random write/read single sectors	DESTRUCTIVE . . .	[N]
Sequential write/read multiple sectors . . .	DESTRUCTIVE . . .	[N]
Function-Display/modify sector		[N]
Function-Read boot ROM		[N]
Function-loop on track format		[N]
Function-loop on sector read		[N]
Function-loop on sector write		[N]
Function-read sequential tracks		[Y]
Function-loop on full track read		[N]
Change detail parameters?		[N]

You will now be asked to enter hard disk defect information. Follow the instructions on the screen.

1/4-INCH TAPE STREAMER BACKUP PRELIMINARY DIALOG (B 27-CPU only)

Run quick verification?		[N]
Stop diagnostics on error?		[Y]

4-PORT I/O DIAGNOSTIC PRELIMINARY DIALOG (B 27-CPU only)

Is loopback plug connected at Port 1?		[N]
Is loopback plug connected at Port 2?		[N]
Is loopback plug connected at Port 3?		[N]
Is loopback plug connected at Port 4?		[N]

If the answer to the next query is Y then "X 21 Port will not be tested." message will be displayed.

Is loopback plug connected at X.21 Port? [N]

Asynchronous test-Quick verification [Y]

Stop on communication error? [Y]

LAN 80186 PROCESSOR DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on LAN CPU error? [N]

LAN MEMORY DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on a LAN memory error? [N]

Do you want to run the Galpat test rather than the standard memory test? [N]

82586 LAN COPROCESSOR DIAGNOSTIC PRELIMINARY DIALOG

Stop diagnostic on LAN coprocessor error? [N]

Are both terminators connected to the LAN module? [N]

If you answer yes to this last LAN query, you must attach terminators to the ports of the LAN module for the test to run successfully. You can obtain these terminators from your Burroughs representative.

VIDEO DIAGNOSTIC PRELIMINARY DIALOG

The video test displays images on the screen that describe themselves or that require you to compare them with the illustrations in Appendix D. If you want to hold an image on the screen to examine it, press PREV PAGE when the image appears. Press NEXT PAGE to continue the test.

List all errors found? [Y]

KEYBOARD DIAGNOSTIC PRELIMINARY DIALOG

- Do you want to run keyboard echo test? [N]**
- Perform status lights test?. (K3 keyboard only) [N]**
- Stop diagnostics on keyboard error? [N]**
- Display all hex codes that come from the keyboard? [N]**

MOUSE DIAGNOSTICS PRELIMINARY DIALOG

Use [PREVIOUS PAGE] and [NEXT PAGE] keys to alternate between resolution test and data echo test.
Press [PREVIOUS PAGE] and then [FINISH] keys to exit.

Continue? [N]

Enter **Y** to this query to continue. If the default value is kept then the previously displayed message is repeated.

EXITING TEST SELECTION

Enter the number of times to run the diagnostics [1]

Diagnostic tests are performed automatically after you enter the last response. If the diagnostics detect a failure, a message appears on the screen or a module symbol flashes. A failure may also become apparent after you compare the screen with the screen illustrations at the end of this guide. If you encounter an error, call Burroughs or your dealer.

Floppy Drive Head Cleaning Instructions

Follow the instructions supplied with the floppy drive head cleaning kit or use the instructions that follow.

- 1** Remove perforated tab of cleaning disk to expose porous cleaning material.
- 2** Soak the cleaning material with the solution.
- 3** Insert the cleaning disk into the floppy drive with index (small) hole facing up.
- 4** Turn the system on, wait 15 seconds, and then turn the system off. Repeat this step.
- 5** Remove the cleaning disk. Make a mark on the label each time you use the cleaning disk.

Copying the Diagnostics onto a Hard Disk

Use the following procedures to copy the floppy disk diagnostics onto a hard disk of a master or standalone B 27-CPU. If you want to copy from a volume other than [f0] to a volume other than [!D0] or to a directory other than <sys>, make those substitutions in the appropriate places.

Enabling Cluster B 27-CPU's and B 27-CLSs to Share a Master B 27-CPU's Diagnostics

- 1 Copying from B 27-CPU floppy disk to B 27-CPU master hard disk

Command COPY

```
Copy
  File from           [F0]<sys>sysimage.sys
  File to             [!D0]<sys>ws100>sysimage.sys
  [Overwrite ok] no
  [Confirm each] no
```

- 2 Running the diagnostics from a cluster B 27-CPU or B 27-CLS workstation

- a Hold down the space bar when you turn on the cluster machine.

- b B,C,D,L,P,T: T RETURN

- c OS: 125 100 RETURN

- d B,C,D,L,P,T: B RETURN

The diagnostics are now loaded.

Running Diagnostics from Your Standalone Hard Disk

- 1 Copying from floppy disk to workstation hard disk

Command COPY

```
Copy
  File from           [F0]<sys>sysimage.sys
  File to             [D0]<sys>cp.run
  [Overwrite ok] no
  [Confirm each] no
```

2 Running the diagnostics

Command **BOOT**

Bootstrap

File name [D0]<sys>cp.run

The diagnostics are now loaded.

Diagnostics Selection Program

The diagnostic Selection Program (SP) is a program that came on your diagnostic disk. It allows you to preconfigure the diagnostics so that they test your B 27 system in a prescribed way, using some or all of the diagnostic tests.

Specifically, SP can be used to:

- Change the default responses to diagnostic prompts, so that the most frequently used responses can be selected by simply pressing RETURN.
- Completely suppress some or all diagnostic queries, so that the default values you specify will always be used. The tests can then be run without your input.
- Replace the normal module selection process with a preselection program arranged by module type. In this way, the preconfigured diagnostics tests any number of preselected modules, without requiring you to mark them for testing.

Step 1

Before running SP it is necessary to copy it over to the hard disk of a master or standalone system. You must copy it to the same volume and directory as you copied cp.run, as described in Appendix A.

1 Copying from floppy disk to hard disk

a Copying from floppy disk to master hard disk

```
Command COPY
Copy
  File from          [F0]<sys>sp.run
  File to            [!D0]<sys>sp.run
  [Overwrite ok]    no
  [Confirm each]    no
```

b Copying from floppy disk to workstation hard disk

```
Command COPY
Copy
  File from          [F0]<sys>sp.run
  File to            [D0]<sys>sp.run
  [Overwrite ok]    no
  [Confirm each]    no
```

2 Running SP

```
Command RUN
Run
  Run file  [D0]<sys>sp.run
```

SP is now running.

Step 2

At the beginning of the program, SP asks you to specify both input and output files. The input file is called [sys]<sys>CP.run. It is the name of the standard diagnostic programs that you copied over in Appendix A. The output file, called cp.run-new, is the custom diagnostics designed by you. You use this name in the Boot command (See Step 6). The SP does not change the standard programs of cp.run in any way. You may still use it by using its name in the Boot command of Step 6.

Input file spec: [sys]<sys>cp.run RETURN

Output file spec: [cp.run-new] RETURN

Step 3

SP then displays the following questions:

Do you want the custom diagnostic to:

Stop on a configuration violation? Y or N and RETURN

Allow user to do his own selections? Y or N and RETURN

If you want to create custom diagnostics that will not pause for an overall check of the configuration of your system (such as a check of whether too many disk modules are being used), press N.

The second question affects the manner in which the modules are chosen for testing. The default, Y, lets you select the modules to be tested. If you answer N, the user is not given the opportunity to select modules; instead, only modules of a type already selected are tested.

Step 4

After you enter the final RETURN in Step 3, you are shown a display similar to that of the standard diagnostics. However, SP shows all the various types of hardware modules available for the system, not just those present at the time you run the diagnostics.

There are more modules in the SP display than fit across the bottom of the screen, as indicated by three dots (...) at the right edge. The display scrolls when the cursor is moved off the right edge; revealing more modules. When the cursor is moved off the left edge, the display scrolls back.

SP allows modules to be marked and the questions answered as in the standard diagnostics.

After you mark the modules and press GO, SP proceeds with the initial dialogue for each marked module. Instead of running tests, however, SP merely records the responses to the questions in an output file. When you answer all of the questions, SP writes your choices to the output file and then exits the program.

Step 5

SP provides the ability to eliminate user intervention for one or all of the diagnostic questions. This feature is invoked by pressing CODE-S instead of RETURN as the response to any of the questions. The result is the suppression of any query during the execution of the custom diagnostics. For example:

Enter the number of times to run the diagnostic: [10]

If you press CODE-S, the diagnostic runs 10 times without asking you for permission. Properly used, this feature makes it possible to set up custom diagnostics that run entirely unattended. This is particularly useful in systems that do not have a keyboard.

Caution: *Since any question can be suppressed with CODE-S, potentially dangerous custom diagnostics can be created. If used unknowingly, they could destroy important disk data. Be careful with the distribution of these custom diagnostics so that data accidents do not occur.*

CODE-S can be used at any time, including during the standard diagnostics. Used in this way, CODE-S means "do not ask me this prompt again." However, rebootstrapping the diagnostics restores the original default values, unaffected by CODE-S.

Step 6

To run your customized diagnostics use the following command:

```
Command BOOT  
Bootstrap  
File name [d0]<sys>cp.run-new
```

Your customized diagnostics are now running.

Notes

Note 1:

The screen displays eight asterisks (*****) when no memory expansion module is installed in the system. It displays 15 asterisks if a memory expansion module is installed. The "R1.0.0104" value, which is the firmware level of your workstation, may be different. For the purposes of the test, it is only necessary that a firmware level be displayed.

Note 2:

A specific number of power modules must be used to meet the power requirements of your system. Make certain that the proper number is maintained when subtracting or adding modules to the system. Use the *BTOS Systems Hardware Installation Guide* to determine the number of power modules your system needs.

Note 3:

The B 27-CPU system can have many combinations of main disk module(s), upgrade unit(s), expansion module(s), and other modules to the right of the CPU. If the B 27-CPU system contains optional modules, they should be removed and added back one at a time to determine the faulty module. Use the following procedure:

- 1 Turn the system off. Remove optional modules. (See the introductory section "The B 27 System" for a list of optional modules.)
- 2 Unplug the line cord from the wall.
- 3 Add one optional module.
- 4 Plug the line cord into the wall and turn the system on.
- 5 Check light(s) on front of the module. If the light is not on, or the disk diagnostics do not load, the module is defective.
- 6 Repeat steps 1 through 4 until the defective module is found.

Note 4:

Connecting a video cable of a color monitor to a CPU module, rather than to a graphics module, is not a normal operating configuration. However, for the purpose of this flow diagram it can be done without damage to the system. The screen display in this configuration is green.

Note 5:

FB indicates FLOPPY BOOT. This means diagnostics are being loaded from the floppy disk. HB indicates HARD DISK BOOT. CB indicates CLUSTER BOOT. The Boot ROM will first try to load the diagnostics from a floppy disk. If unsuccessful, it will then try to load from a hard disk. If it is still unsuccessful, it will try to load from the master workstation via the cluster communication line. The B 27-CLS workstations will always attempt to boot from the master workstations.

Note 6:

If the power lights on all modules other than the CPU are not on, or if any are dim or flickering, then perform the following procedures:

- 1 Switch power off and unplug the line cord from the wall outlet.
- 2 Remove the rightmost module.
- 3 Plug in the line cord and switch power on. Do all the power lights come on for the remaining modules? If not, then repeat steps 1 through 3 until all the power lights come on. If the problem still exists after all modules other than the CPU have been removed, then the CPU module is defective.
- 4 If the power lights come on, then confirm the faulty module by:
 - a Switching power off and unplugging the line cord from the wall outlet.
 - b Reconnecting all but the most recently removed module.
 - c Checking the power lights--they should all be on.

Note 7:

If you are loading the diagnostics from a master workstation, run through this checklist before replacing a module.

- 1 Insure that the master workstation is on.
- 2 Insure that the cluster cable is attached between the master and your workstation.
- 3 Insure that all cluster connections in your master-cluster network are secure and that the last cluster workstation has a terminator plug.
- 4 If possible, replace the cluster cable with one that is known to be good or move your B 27-CLS to a place in the network with a working system; then connect the cable and try to load the diagnostics.

Note 8:

If there are no error codes displayed on the screen or keyboard, switch the power off, wait a second, then switch the power on and listen for beeps. These beeps are an error code, and they convey information in a way similar to Morse code. There will be eight beeps: a long beep is the equivalent of a 0; a short beep is the equivalent of a 1. When you have recorded the long and short beeps, use the binary code column in Appendix F to find the most likely failing module (primary) and the second most likely failing module (secondary). For example, this sequence of beeps

long	long	short	short	short	short	short	short
(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)

indicates a failure to read from or write to a disk, a "read or write fault." The primary failing module is the disk module; the secondary is the CPU module.

**Figure 7 Pincushion Test Pattern #1
(Monochrome Video Monitor Test)**

Pincushion describes a malfunction of the monochrome video monitor where the image bows at the edges. The image is no longer rectangular but takes on the shape of a pincushion or pillow. Check for this distortion.

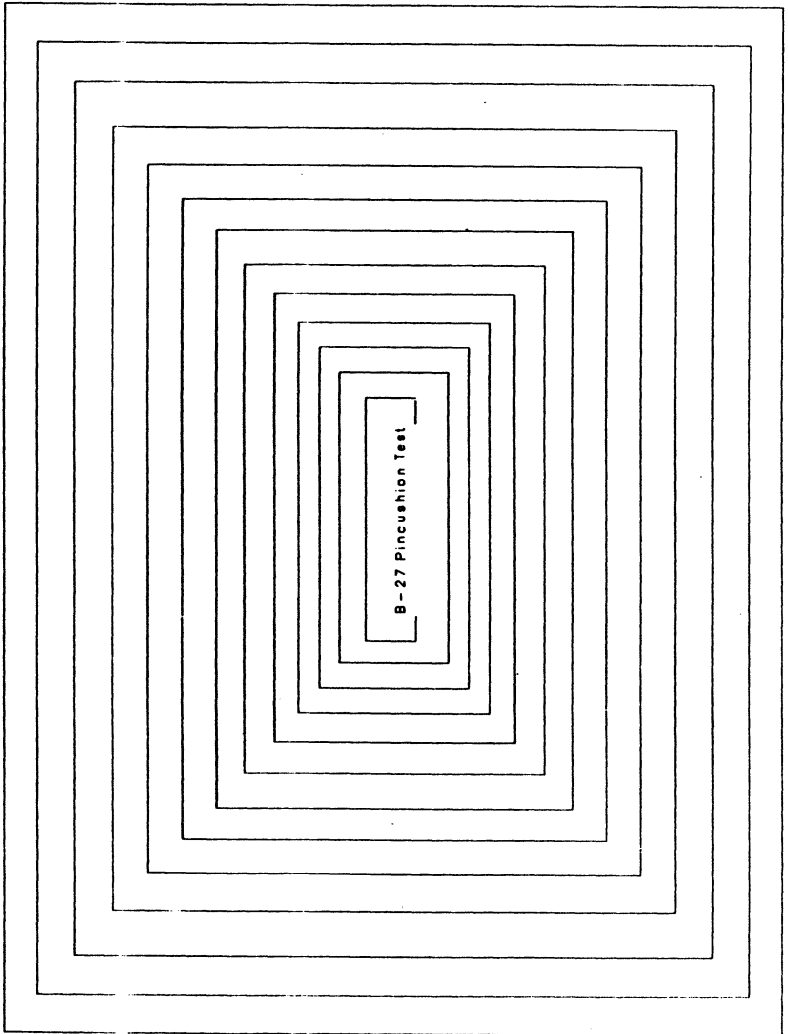


Figure 8 Pincushion Test Pattern #2
(Monochrome Video Monitor Test)

Pincushion describes a malfunction of the monochrome video monitor where the image bows at the edges. The image is no longer rectangular but takes on the shape of a pincushion or pillow. Check for this distortion.

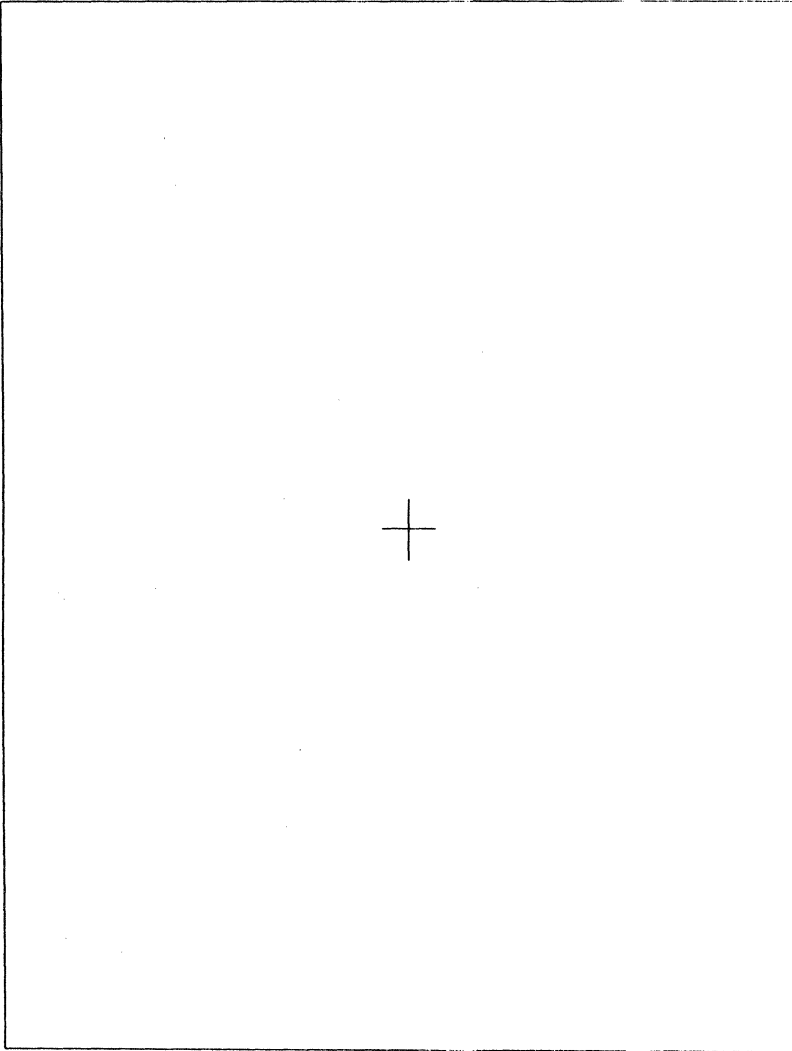


Figure 10 Concentric Rectangles
(Monochrome and Color Graphics Modules Test)

Check that you screen matches this photo.

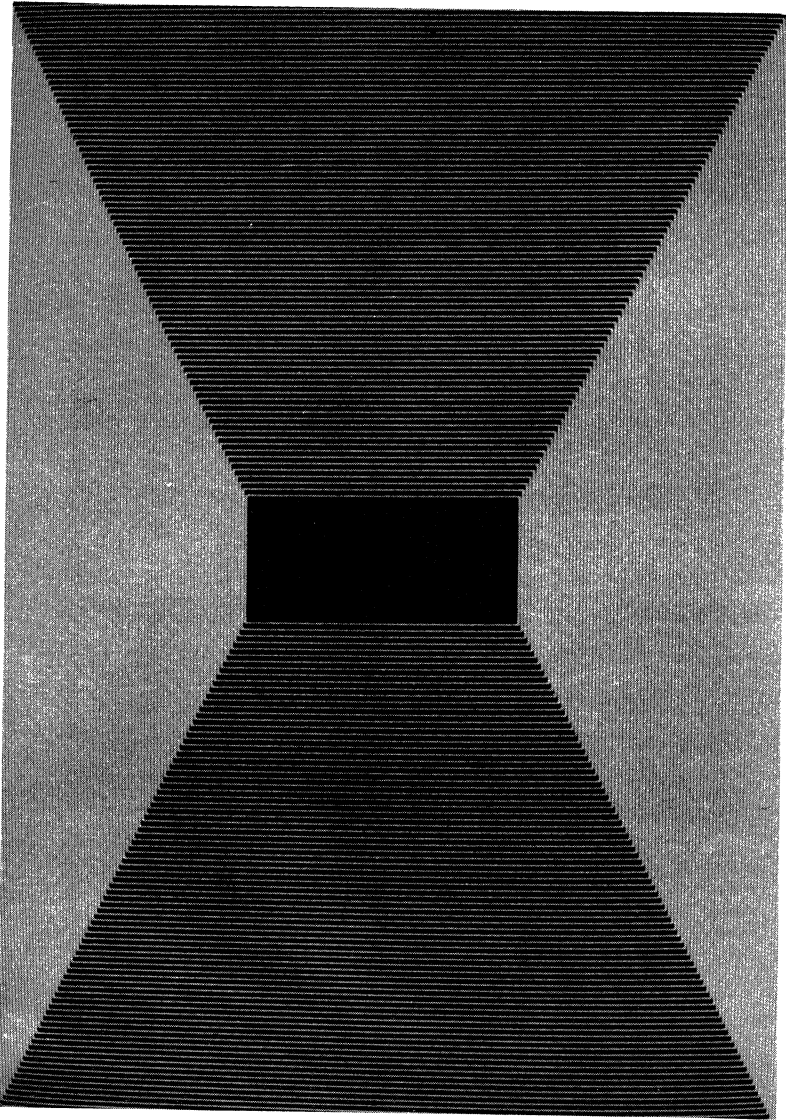


Figure 11 Overlapping Lines
(Monochrome and Color Graphics Modules Test)

Check that you screen matches this photo.

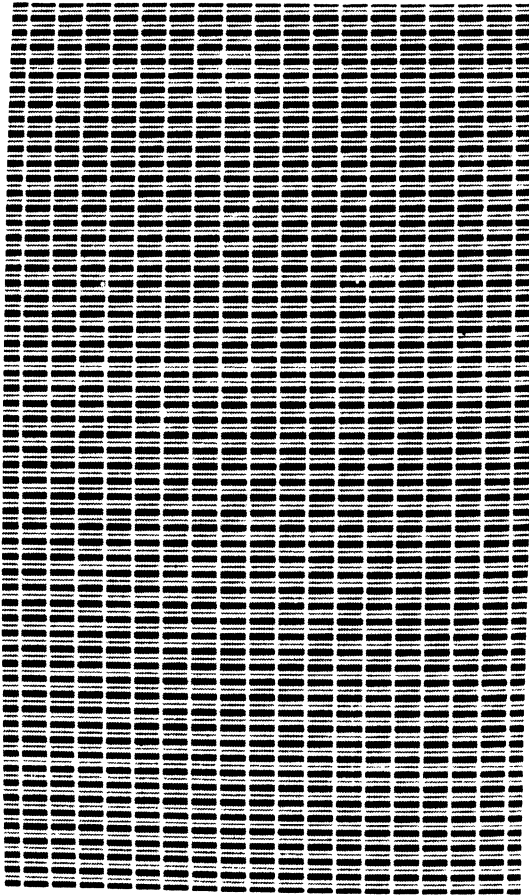
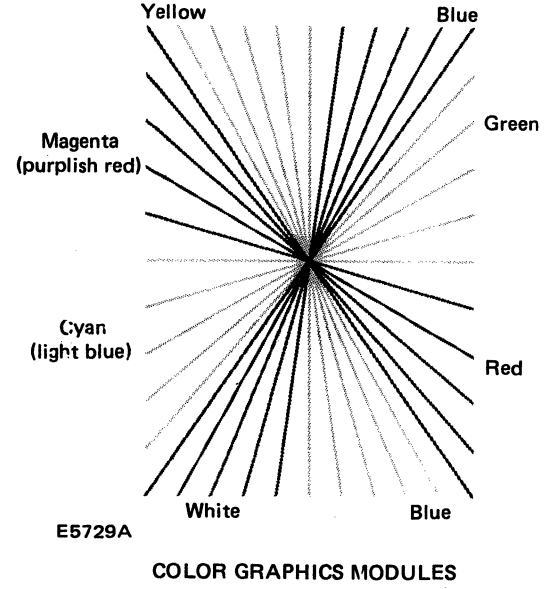
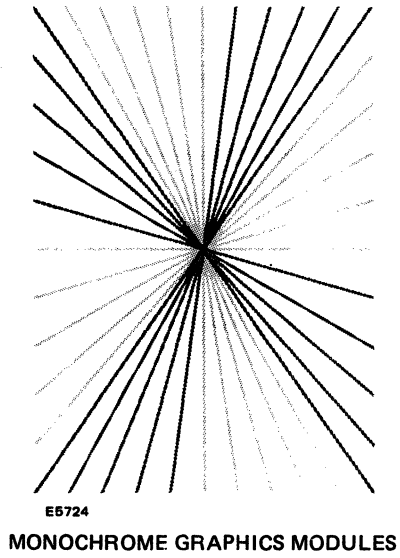


Figure 12 Line Drawing
(Monochrome and Color Graphics Modules Test)



Check that your screen matches the appropriate photo.

**Figure 13 Pattern and Vector Mode
(Monochrome and Color Graphics Modules Test)**

Check that your screen matches this photo.

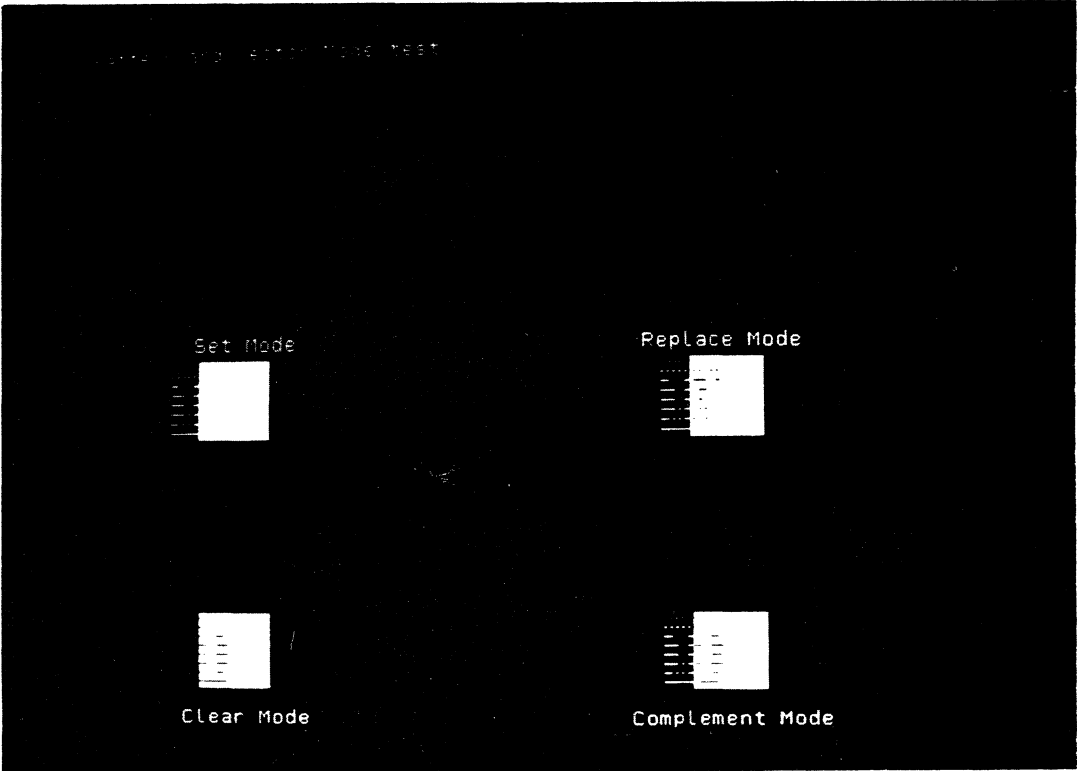


Figure 14 **Color Palette**
(Color Graphics Module Tests)

This display should cycle through full brightness, half brightness, and minimum brightness.

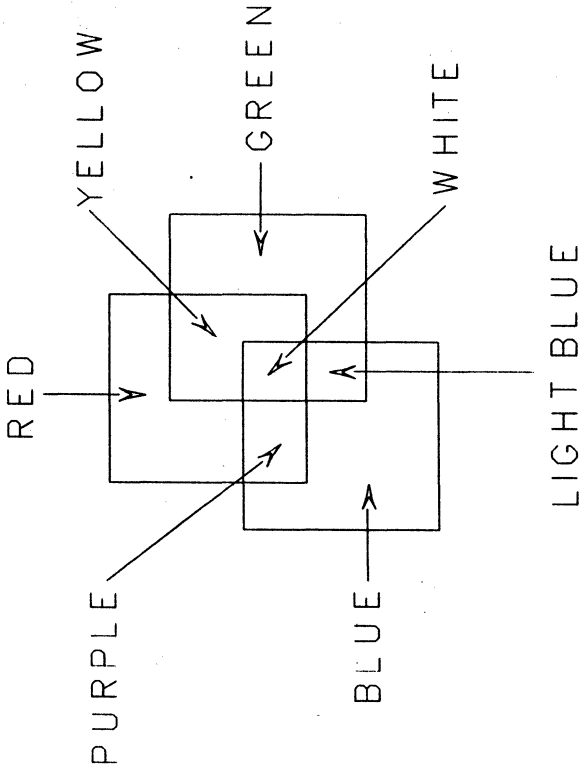
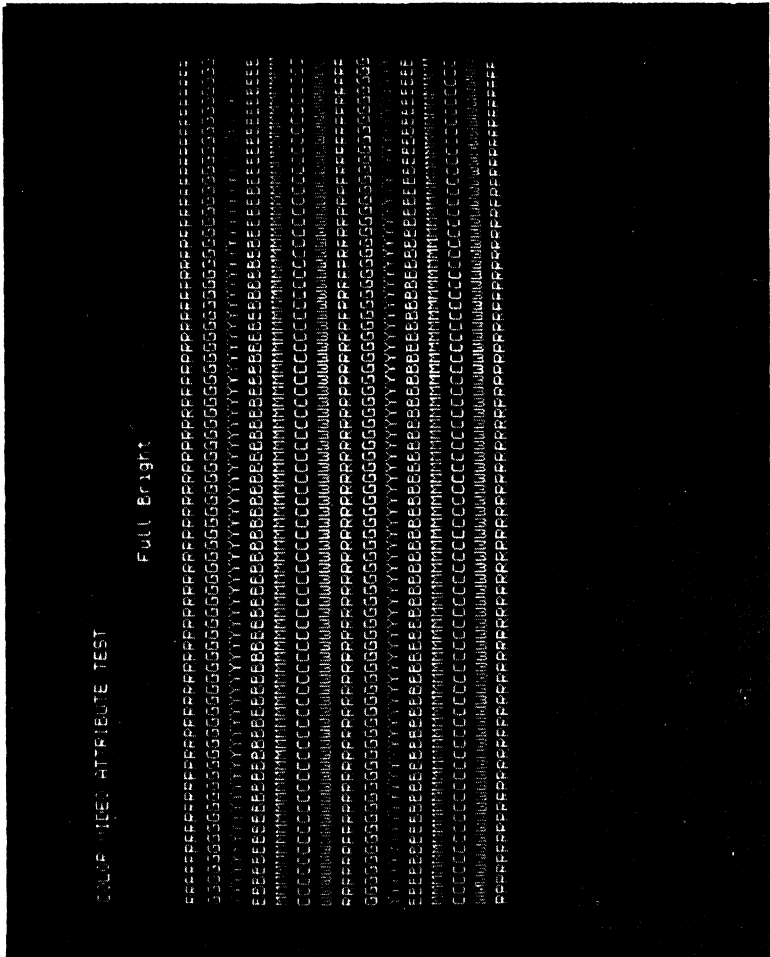


Figure 15 Color Video Attribute
(Color Graphics Module Test)

This display should cycle through the colors red, green, yellow, blue, magenta (purplish red), cyan (light blue), and white at full brightness, half brightness, and minimum brightness.





CPU CTR Test Indicators and LAN CTR Error Codes

CPU CTR Test Indicators

LEDs* (1=ON, 0=OFF)	CTR Test	Primary Cause of Failure	Secondary Cause of Failure
LEDS 1 1 1 1	Microprocessor	CPU	
LEDS 1 1 1 0	FW memory (0-19FFh)	CPU	
LEDS 1 1 0 1	ROM checksum	CPU	
LEDS 1 1 0 0	Bus timeout	CPU	
LEDS 1 0 1 1	Parity controller	CPU	
LEDS 1 0 1 0	8259 interrupt controller	CPU	
LEDS 1 0 0 1	Video and font buffer	CPU	
LEDS 1 0 0 0	Video	CPU	
LEDS 0 1 1 1	8251 USART	CPU	
LEDS 0 1 1 0	Keyboard	Keyboard	Video monitor
LEDS 0 1 0 1	8254 baud rate timer	CPU	
LEDS 0 1 0 0	8237 DMA	CPU	
LEDS 0 0 1 1	Real time clock	CPU	
LEDS 0 0 1 0	Basic RAM memory	CPU	
LEDS 0 0 0 1	Expanded RAM memory	Expansion RAM	CPU
LEDS 0 0 0 0	Passed		

*These LEDs appear on the front of the CPU. They are the group of four LEDs on the right.

These CTR Test Indicators are valid only for a basic system configuration (CPU module, main disk module, keyboard, and video monitor). If you have optional modules, remove them and turn the system on. If no CTR test indicator appears, see Note 3 in Appendix C.

LAN Confidence Test Routine (CTR) Error Codes

Error Codes	Explanation
1	Chip select and relocation register fault
2	RAM fault
3	ROM fault
4	RAM data fault
5	RAM address fault
6	Parity port fault
7	Parity test fault
8	No interrupt received fault
9	Interrupt in service fault
10	Timer maximum count bit not set fault
11	Timer count not zero fault
12	DMA count not zero fault
13	DMA transfer fault
14	LAN chip fault
15	No LAN interrupt 0 occurred fault
16	LAN busy bit not cleared
17	LAN command not cleared fault
18	LAN invalid dump
19	LAN invalid address in dump
20	LAN internal loopback not complete
21	LAN internal loopback receive data error
22	LAN external loopback not complete
23	LAN external loopback receive data error
24	Hardware non-maskable interrupt (NMI) fault
25	Software NMI
26	Both parity and F-bus timeout NMI fault
27	Memory parity NMI fault
28	F-bus timeout NMI fault
29	Invalid interrupt fault
30	Lost the mailbox fault
31	Invalid command
32	Invalid destination address fault
33	Invalid source address fault
34	Invalid destination address fault
35	Operating system checksum fault
36	Address PROM checksum error
37	Address PROM error
40	82530 channel B with DMA fault
41	82530 channel A with I/O fault
42	82530 channel B with I/O fault
43	82530 channel A and B with I/O fault

Eight-Bit Error Codes

Hex Code	Binary Code	Interpretation	Primary Failing Module	Secondary Failing Module
02	00000010	Floppy controller is never ready	disk	CPU
03	00000011	Floppy controller never came ready	disk	CPU
06	00000110	DMA not done	CPU	disk
07	00000111	VHB checksum error	disk	CPU
08	00001000	No dump or system image file	disk	none
09	00001001	Bad sysimage.sys checksum	CPU	disk
0A	00001010	Bad sysimage.sys signature	disk	CPU
0B	00001011	Controller status inconsistent	disk	CPU
0C	00001100	Controller not ready after seek	disk	CPU
0F	00001111	Drive fault, seek error bit set	disk	CPU
10	00010000	Abnormal termination	disk	CPU
11	00010001	Drive became not ready	disk	CPU
13	00010011	Controller not ready	disk	CPU
15	00010101	End of cylinder, record not found	disk	CPU
16	00010110	Data error in data field	disk	CPU
17	00010111	Data error in ID field	disk	CPU
18	00011000	Data late/lost data/overrun	CPU	disk
1C	00011100	Drive write protected	disk	none
1F	00011111	Read or write fault	disk	CPU
23	00100011	Floppy controller never came ready	disk	CPU
26	00100110	DMA not done	CPU	disk
27	00100111	No valid VHB	disk	none
28	00101000	No dump or system image file	disk	none
29	00101001	Bad sysimage.sys checksum	disk	CPU
2A	00101010	Bad sysimage.sys signature	disk	CPU
2B	00101011	Controller status inconsistent	disk	none
31	00110001	Drive became not ready	disk	CPU
33	00110011	Floppy controller not ready	disk	CPU
35	00110101	End of cylinder/record not found	disk	none
36	00110110	Data field/CRC/data error	disk	none
38	00111000	Data late/lost data/overrun	disk	CPU
3C	00111100	Drive write protected	disk	none
3F	00111111	Read or write fault	disk	CPU
A1	10100001	Comm dump wait UA	CPU	none
A2	10100010	Comm init SRP down - never polled	CPU	none
A3	10100011	Comm init SIO error	CPU	none
A9	10101001	Find ID search fail	CPU	none
AA	10101010	Find ID failure, too many collisions	CPU	none
AB	10101011	Comm read ID timeout	CPU	none
AC	10101100	Comm dump bad address	CPU	none
AD	10101101	Comm disconnected in dump	CPU	none
AE	10101110	Comm dump no UP, SNRM	CPU	none
AF	10101111	Comm dump no UP, REJ	CPU	none
B0	10110000	Comm dump no UP, unknown frame	CPU	none
B1	10110001	Comm boot read UI error	CPU	none
B2	10110010	Comm boot SRP went down or timed out	CPU	none
B3	10110011	Comm disconnected in boot	CPU	none
B4	10110100	Comm boot bad checksum	CPU	none
B5	10110101	Comm read frame size error	CPU	none
B6	10110110	Comm read timeout	CPU	none
B7	10110111	Comm write bad DMA count	CPU	none
B8	10111000	Comm write SRP went down during boot	CPU	none
BA	10111010	Set up comm DMA error	CPU	none

E0	11100000	Bad ROM checksum	CPU	none
E1	11100001	Bad work area	CPU	none
E2	11100010	Memory error clear	CPU	none
E3	11100011	Memory error set	CPU	none
E4	11100100	Memory error address	CPU	none
E5	11100101	Memory error verify	CPU	none
E6	11100110	RAM parity error	CPU	none
E7	11100111	Bad parity controller	CPU	none
E8	11101000	Bad 8251	CPU	keyboard
E9	11101001	Bad 8259	CPU	none
EA	11101010	Keyboard timeout, inoperative	keyboard	CPU
EB	11101011	Bad video RAM	CPU	none
EC	11101100	Keyboard loopback failure	keyboard	CPU
ED	11101101	Bad font RAM	CPU	none
EE	11101110	No F-bus timeout	CPU	none
EF	11101111	Bad 8254	CPU	none
F4	11110100	DMA data error	CPU	none
F5	11110101	DMA status error	CPU	none
FA	11111010	Bad video horizontal retrace	CPU	none
FB	11111011	Bad video vertical retrace	CPU	none
FC	11111100	Bad video blanking	CPU	none
FD	11111101	Bad video pixel	CPU	none
FE	11111110	Bad real time clock	CPU	none
FF	11111111	No real-time-clock interrupt	CPU	none

B 27-CPU. A fully featured workstation that uses disk modules for file storage and can use any of the other modules of the B 27 family such as graphics and four-port data comm.

B 27-CLS. A workstation comprised of a video monitor, keyboard, and CPU module. It can operate only as a cluster workstation under the control of a master workstation.

bad spot. Any part of a hard disk drive that is faulty and cannot record information.

bad spot data. Information written on the bottom of the hard disk module that is entered into the diagnostics to prevent an unnecessary failure of the tests. The diagnostics skips over the known bad spots when they are encountered, allowing a diagnostic test to fail only on a previously undiscovered flaw.

bit map. A memory location storing a graphics image inside the graphics module.

bootstrap. Loading the diagnostics into your workstation through a power-up or reset of your system. The diagnostics can be bootstrapped from a floppy disk drive or from a workstation where it has been previously installed.

character attribute. Special features of a character, such as blinking.

cluster workstation. Local resource-sharing network consisting of a master workstation and one or more cluster workstations.

color mapper. Hardware inside the graphics controller module that selects the colors available for display during the diagnostics.

configuration. Arrangement of the modules, submodules, and hardware that make up your workstation. The configuration determines which tests can be run with the diagnostics and which icons appear on the screen.

configuration rule. A guideline for the proper operation of your workstation. If a configuration rule is violated and not corrected, your workstation may malfunction.

CPU (Central Processing Unit) module. The primary module responsible for processing of information in a B 27 system.

cyan. A light blue color.

cylinder. A set of tracks on a storage device that can be accessed together as a unit.

default. A value that is assumed by the diagnostics when no other value is given. A default remains in effect until it is changed or until the diagnostics is rebootstrapped.

diagnostics. A collection of tests designed to detect malfunctions of your workstation.

dialogue. A sequence of questions and answers initiated by the diagnostics before, during, and after the tests are run. The dialogue consists of queries and prompts. See also **query** and **prompt**.

disk on desk. A module that contains one floppy disk drive and is connected by cable to the CPU module.

DMA (Direct Memory Access). Hardware that allows a peripheral device to transfer data to or from memory without using the CPU.

dual floppy module. A module that contains two floppy disk drives.

error. Any mistake registered by the diagnostics. There are two kinds of errors. Soft errors occur intermittently; hard errors occur every time a test is run.

error code. See **status code**.

error message. A message containing information about specific errors during the diagnostics. It contains the applicable status codes, the controller status, and the number of hard and soft errors.

expansion disk module. A single hard disk unit that must be used with a main disk or an upgrade module.

four-port data comm module. A module that provides for physical connection between the B 27 and printers, plotters, and communication equipment.

galpat test. A galloping pattern test. An extensive test of system memory (RAM), which can take several hours to run.

graphics module. A module that allows you to display non-textual images on the screen, such as pie charts and bar graphs.

hard disk. A device that functions similarly to a floppy disk, but it cannot be removed from the disk unit and stores much more data.

icon. A pictorial representation of a module or submodule in your workstation configuration. See also **configuration**.

icon menu. A pictorial representation of all the modules and submodules in your workstation configuration. You use the icon menu to select the tests and display the attribute states of the diagnostics. See also **icon** and **attribute state**.

initialize. Placing a module or device in its initial (start-up) state.

LAN (Local Area Network) module. A module that enables workstations to communicate directly with one another, without the need of a master workstation.

LEDs (Light Emitting Diodes). Electronic components that light up red. They are used on the front of modules and on the keyboard to report status.

legend. A chart describing the attribute states, cursor movement keys, and type of CPU module used in the diagnostics. The legend is located in the top window of the screen.

loopback connector. An interface plug wired to specific pins so that an external port can be looped back to itself, completing a circuit. A loopback connector is necessary in order to run certain diagnostic tests.

magenta. A purplish red color.

main disk module. The disk unit closest to the CPU module. It can be a dual floppy or a hard/floppy disk unit.

master workstation. The workstation in a master-cluster network that supervises network communication and that provides file storage and processing resources.

memory expansion module. A module that contains a RAM memory expansion module. One memory expansion module can be added to a CPU module to provide it with 1M byte of RAM.

menu. A screen display that provides a choice of commands or operations that are available at a given time.

mode. The state of an application system or device set up to perform a specialized function. Each mode generally excludes the characteristics of any other mode.

module. Any one of several separate, identifiable units that connect your workstation and make up its configuration.

monochrome. A term applied to monitors and graphics modules meaning that they are capable of displaying only one color.

mouse. A manual device by which the user controls the cursor movement on the screen.

parallel (printer) I/O. An 8-bit parallel port used for I/O communications between your workstation and high-speed devices, such as high-speed printers.

parameter. A condition that defines the extent and nature of a test. For example, if you type "10" in response to the question "Enter the number of times to run the diagnostics," then 10 is the parameter.

program. A set of instructions to a computer for accomplishing a task.

prompt. A message from the diagnostics that tells you what actions to take before, or while running, the diagnostic tests. See also **dialogue**.

query. Any question asked by the diagnostics. See also **dialogue**.

RAM (Random Access Memory). A collection of internal components that the B 27 uses to store information.

ROM (Read-Only Memory). A program contained in a hardware component.

register. A temporary memory location for data.

RS-232-C. A designation that refers to an industry specification developed to standardize the interface between different types of communications equipment.

RS-422. A high-speed communications standard used to link cluster workstations.

scratch disk. Any blank or unneeded disk that can be erased or written to by the diagnostics. A scratch disk is placed in a floppy disk drive during the floppy disk drive tests.

sector. The smallest addressable portion of a track or band on a hard or floppy disk.

status code. A code number that reports the success or failure of a diagnostics operation. It appears on the screen as a two-, three-, or four-digit number and acts as a key to a technically trained person to the type of error or malfunction that is encountered.

submodule. A module within a module that can be identified and tested independently of other components. An example is an RS-232 port, which can be tested independently of other ports or submodules inside the CPU module. See also **module** and **RS-232-C**.

tape streamer module. A module that provides magnetic tape backup of disk information.

terminator plug. A thumb-sized connector that is put on the cluster communication port of the last workstation in a master-cluster network. It insures data integrity.

upgrade disk module. A single hard disk unit. It is assumed throughout this document that the upgrade disk module is installed to the right of the main disk module.

winchester/floppy module. A module that contains a hard disk and a floppy disk.

window. A distinct portion of the screen that is used to display a particular item or carry out a specific task. The diagnostics screen contains three windows.

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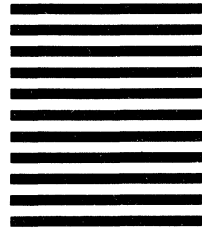
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