
KA47

MicroVAX 3100 Platform

KA47 CPU System Maintenance

Order Number: EK-A0514-MG.001

November 1991

This manual gives maintenance information for systems that use the KA47 CPU module.

Revision Information: This is a new manual.

Digital Equipment Corporation
Maynard, Massachusetts

November 1991

This document was prepared using VAX DOCUMENT, Version 2.0.

Contents

Preface vii

1 KA47 CPU Module Description

1.1 KA47 CPU Module 1–1
1.2 MS44 and MS44L Memory Modules 1–9
1.3 MS44 or MS44L Memory Option Installation 1–11

2 Configuration

2.1 Memory Configurations 2–1
2.2 Mass Storage Devices 2–1
2.2.1 Internal Mass Storage Devices 2–1
2.2.2 External Mass Storage Devices 2–2
2.2.3 SCSI ID Numbers 2–4
2.3 Communications Options 2–4
2.3.1 Asynchronous Communications Options 2–5
2.3.2 Synchronous Communications Options 2–5

3 KA47 Firmware

3.1 Power-Up Test and Initialization 3–1
3.2 Console Program 3–4
3.2.1 Console Device 3–4
3.2.2 Console Commands 3–6
3.2.3 Console Mode 3–6
3.2.4 Console Security 3–7
3.2.5 Console Command Conventions 3–9
3.3 Self-Test 3–11
3.3.1 Additional Error Information for Self-Tests 3–14

3.3.2 Test Environments . . . 3–15
3.3.2.1 Customer Environment . . . 3–15
3.3.2.2 Digital Services Environment . . . 3–15
3.3.2.3 Manufacturing Environment . . . 3–16
3.4 Utilities . . . 3–16
3.4.1 SCSI Utilities . . . 3–17
3.4.2 COMM Utilities . . . 3–19
3.5 System Exerciser . . . 3–19
3.5.1 Selective System Exerciser Test (T 106) . . . 3–23
3.5.2 Summary Screens . . . 3–24
3.5.3 Additional Error Information for System Exerciser Tests . . . 3–29

4 Testing and Troubleshooting

4.1 General Troubleshooting Information . . . 4–1
4.2 No Display on the Console Terminal . . . 4–3
4.2.1 Troubleshooting Procedure . . . 4–4
4.3 NVR Test (Test 1) . . . 4–6
4.4 DZ Test (Test 3) . . . 4–7
4.5 CACHE Test (Test 4) . . . 4–8
4.6 MEM Test (Test 5) . . . 4–9
4.7 FPU Test (Test 6) . . . 4–10
4.8 IT Test (Test 7) . . . 4–11
4.9 SYS Test (Test 8) . . . 4–11
4.10 NI Test (Test 9) . . . 4–12
4.11 SCSI Test (Test 10) . . . 4–14
4.11.1 Troubleshooting an RRD42 CDROM Drive . . . 4–17
4.11.2 Troubleshooting an RX26 Diskette Drive . . . 4–18
4.11.3 Troubleshooting an RZ23L, an RZ24, or an RZ25 Disk Drive . . . 4–18
4.11.4 Troubleshooting a TZ30 Tape Drive . . . 4–18
4.11.5 Troubleshooting a TZK10 Tape Drive . . . 4–18
4.11.6 Troubleshooting an External SCSI Device . . . 4–19
4.12 COMM Test (Test 12) . . . 4–19
4.12.1 Troubleshooting a DSW41 or a DSW42 Synchronous Communications Option . . . 4–20
4.13 ASYNC Test (Test 14) . . . 4–21
4.13.1 Troubleshooting a DHW41 or a DHW42 Asynchronous Communications Option . . . 4–23
4.14 Troubleshooting Procedures for the Power Supply . . . 4–24

A Troubleshooting Flowchart

B Memory Map

C FRU Numbers

C.1 FRU Number Assignments C–1
C.1.1 FRU Numbers of SCSI Devices C–2

D KA47 CPU Module Jumper Wires

Glossary

Index

Figures

1–1 KA47 CPU Module 1–2
1–2 KA47 CPU Module Block Diagram 1–4
1–3 KA47 Controls, Indicators, Ports, and Connectors 1–6
1–4 Memory Expansion Connectors 1–10
1–5 Memory Module Installation 1–12
2–1 SZ Expansion Box Numbering System 2–3
3–1 Successful Power-Up Test Display 3–2
3–2 Unsuccessful Power-Up Test Display 3–3
3–3 Location of the Console-Related Ports and Switches 3–5
3–4 Location of the NVR Contacts for Clearing the Password . . . 3–9
3–5 Successful Self-Test Display 3–13
3–6 Unsuccessful Self-Test Display 3–13
3–7 Additional Error Information for Self-Tests 3–14
3–8 Successful System Exerciser Test 3–21
3–9 Unsuccessful System Exerciser Test 3–22
3–10 Selective System Exerciser Test (T 106) Example 3–23
3–11 Summary Screen for System Exerciser DZ Test 3–25
3–12 Summary Screen for System Exerciser NI Test 3–26
3–13 Summary Screen for System Exerciser SCSI Test 3–27
3–14 Summary Screen for System Exerciser COMM Test 3–28

3–15	Summary Screen for System Exerciser ASYNC Test	3–29
3–16	Additional Error Information for System Exerciser Tests	3–30
4–1	Flowchart for Normal System Power-Up	4–4
4–2	Cable Loopback Connectors for the DSW41 and DSW42 Options	4–21
4–3	Cable Loopback Connectors for DHW41 and DHW42 Options	4–24
4–4	Flowchart for Troubleshooting the Power Supply	4–25
4–5	KA47 CPU Module Power Connector Pin Voltages	4–26
4–6	Drive Power Connector Pin Voltages	4–26
A–1	Troubleshooting Flowchart (Page 1 of 4)	A–2
A–2	Troubleshooting Flowchart (Page 2 of 4)	A–3
A–3	Troubleshooting Flowchart (Page 3 of 4)	A–4
A–4	Troubleshooting Flowchart (Page 4 of 4)	A–5
B–1	Memory Connectors	B–3
D–1	KA47 CPU Module Jumper Wires	D–2

Tables

1–1	Functions of Controls, Indicators, Connectors	1–7
1–2	KA47 CPU Module Memory Configurations	1–11
2–1	KA47 Internal Mass Storage Devices	2–2
2–2	Supported External Mass Storage Devices	2–3
2–3	Recommended SCSI ID Numbers for Devices	2–4
2–4	Supported Asynchronous Communications Options	2–5
2–5	Supported Synchronous Communications Options	2–5
2–6	DSW41-AA and DSW42-AA Communications Support	2–6
3–1	Console Device Port Selection	3–4
3–2	Terminal Settings	3–6
3–3	Console Mode Control Keys	3–10
3–4	Device Numbers and Mnemonics	3–11
3–5	Typical TEST Command Lines	3–12
3–6	Predefined System Exerciser Tests	3–20
4–1	Troubleshooting Procedures	4–3
4–2	SCSI Device Troubleshooting Procedures	4–17
B–1	Memory Map	B–2
C–1	FRU Numbers	C–1

Preface

This manual describes the KA47 CPU module used in the MicroVAX™ 3100 Model 80 system. It provides the configuration guidelines, ROM-based diagnostic information, and troubleshooting information for systems containing the KA47 CPU module.

Audience

This manual is for Digital™ Services personnel who provide support and maintenance for systems that use the KA47 CPU module. It is also for customers who have a self-maintenance agreement with Digital Equipment Corporation.

Structure of This Manual

This manual is divided into four chapters, four appendixes, a glossary, and an index:

- Chapter 1 describes the KA47 CPU module.
- Chapter 2 describes the KA47 system configurations.
- Chapter 3 describes the structure and operation of the KA47 firmware.
- Chapter 4 describes the ROM-based diagnostic testing and troubleshooting procedures for the KA47 systems.
- Appendix A gives a flowchart of the procedure used to troubleshoot KA47 systems.
- Appendix B gives a memory map for a KA47 system.
- Appendix C gives the FRU numbers of the devices in MicroVAX 3100 platform systems.
- Appendix D gives the location and the function of the jumper wires on the KA47 CPU module.

Associated Documents

The following documents contain more information about the MicroVAX 3100 platform systems:

- *MicroVAX 3100 Model 40 and Model 80 Cover Letter, EK-A0517-CL*
- *MicroVAX 3100 Model 40 and Model 80 Installation Information, EK-A0523-IN*
- *MicroVAX 3100 Model 40 and Model 80 Operator Information, EK-A0524-UG*
- *MicroVAX 3100 Model 40 and Model 80 Customer Technical Information, EK-A0525-TD*
- *MicroVAX 3100 Model 40 and Model 80 Troubleshooting and Diagnostic Information, EK-A0518-TM*
- *VMS™ Factory Installed Software User Guide, EK-A0377-UG*

Related Documents

The following documents contain additional maintenance information about the KA47 CPU systems:

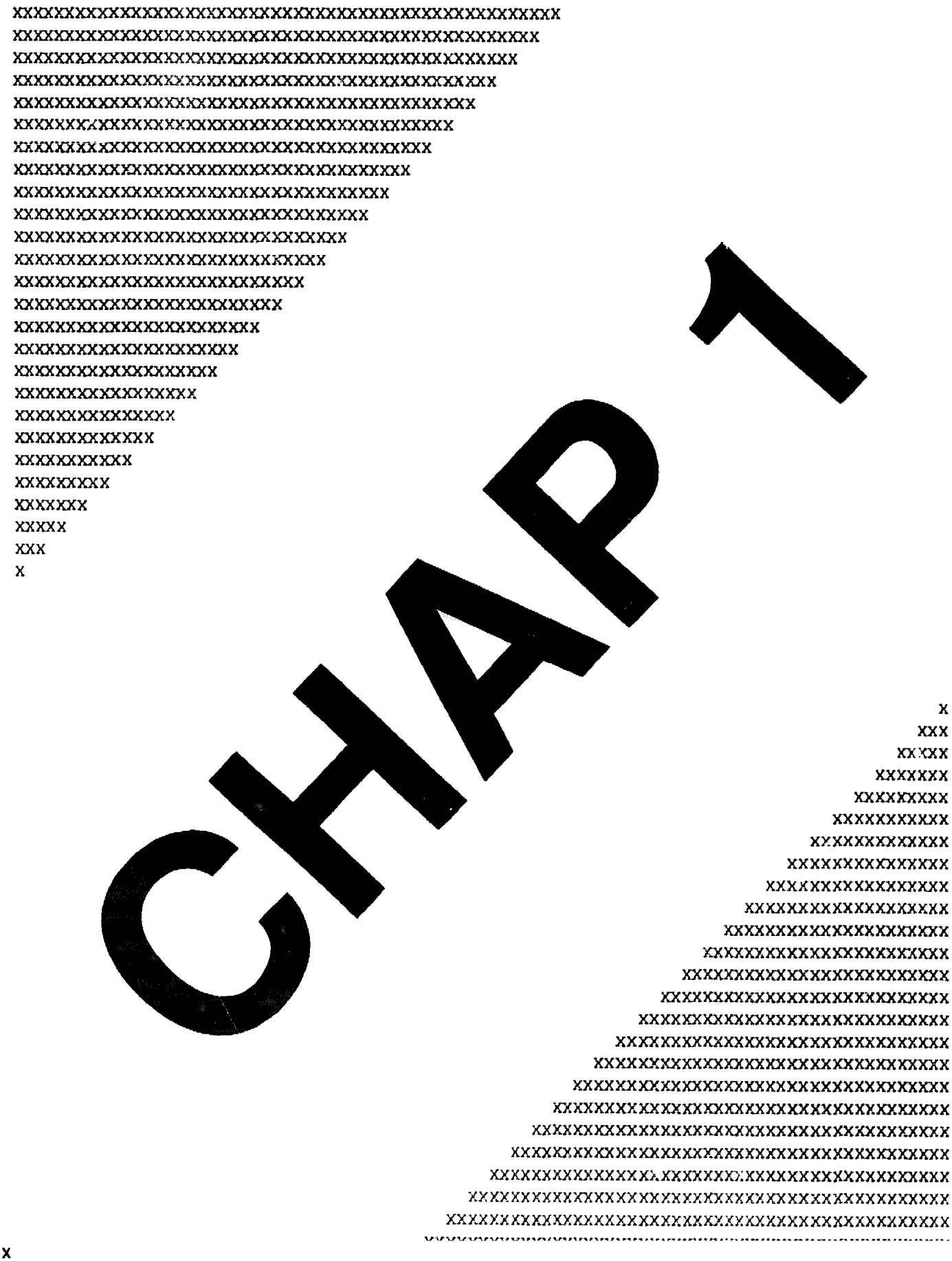
- *Guide to MicroVAX 3100 Platform Maintenance Information Kit, EK-A0512-MG*
- *CPU Reference Information, EK-A0574-HR.001*
- *BA42-B Enclosure Maintenance, EK-A0511-MG.001*
- *IPB, EK-MV310-IP*
- *Options, EK-A0519-MG*
- *TZ30 Cartridge Tape Drive Service Manual, EK-OTZ30-SV*

Conventions

The following conventions are used in this manual:

Convention	Description
Ctrl/*x*	Ctrl/*x* indicates that you hold down the Ctrl key while you press another key or mouse button (indicated here by *x*).
x	A lowercase italic *x* indicates the generic use of a letter. For example, *xxx* indicates any combination of three alphabetic characters.
n	A lowercase italic *n* indicates the generic use of a number. For example, 19*nn* indicates a 4-digit number in which the last 2 digits are unknown.
{}	In format descriptions, braces indicate required elements. You must choose one of the elements.
[ ]	In format descriptions, brackets indicate optional elements. You can choose none, one, or all of the options.
( )	In format descriptions, parentheses delimit the parameter or argument list.
...	In format descriptions, horizontal ellipsis points indicate one of the following: • An item that is repeated • An omission such as additional optional arguments • Additional parameters, values, or other information that you can enter
|	In format descriptions, a vertical bar separates similar options, one of which you can choose.
italic type	Italic type emphasizes important information, indicates variables, and indicates the complete titles of manuals.
boldface type	Boldface type in examples indicates user input. Boldface type in text indicates the first instance of terms defined either in the text, in the glossary, or both.
nn nnn.nnn nn	A space character separates groups of 3 digits in numerals with 5 or more digits. For example, *10 000* equals *ten thousand*.
n.nn	A period in numerals signals the decimal point indicator. For example, *1.75* equals *one and three-fourths*.
MONOSPACE	Text displayed on the screen is shown in monospace type.

Convention	Description
Radix indicators	The radix of a number is written as a word enclosed in parentheses, for example, 23(decimal) or 34(hexadecimal).
>>>	Three right angle brackets indicate the console prompt.
UPPERCASE	A word in uppercase indicates a command.
Note	A note contains information that is of special importance to the user.
Caution	A caution contains information to prevent damage to the equipment.


CHAP 1

1

KA47 CPU Module Description

This chapter describes the KA47 **central processing unit** (CPU) module that is used in the MicroVAX 3100 Model 80 systems. It gives information on the following:

- KA47 CPU module
- MS44 or MS44L memory modules
- MS44 or MS44L memory option installation

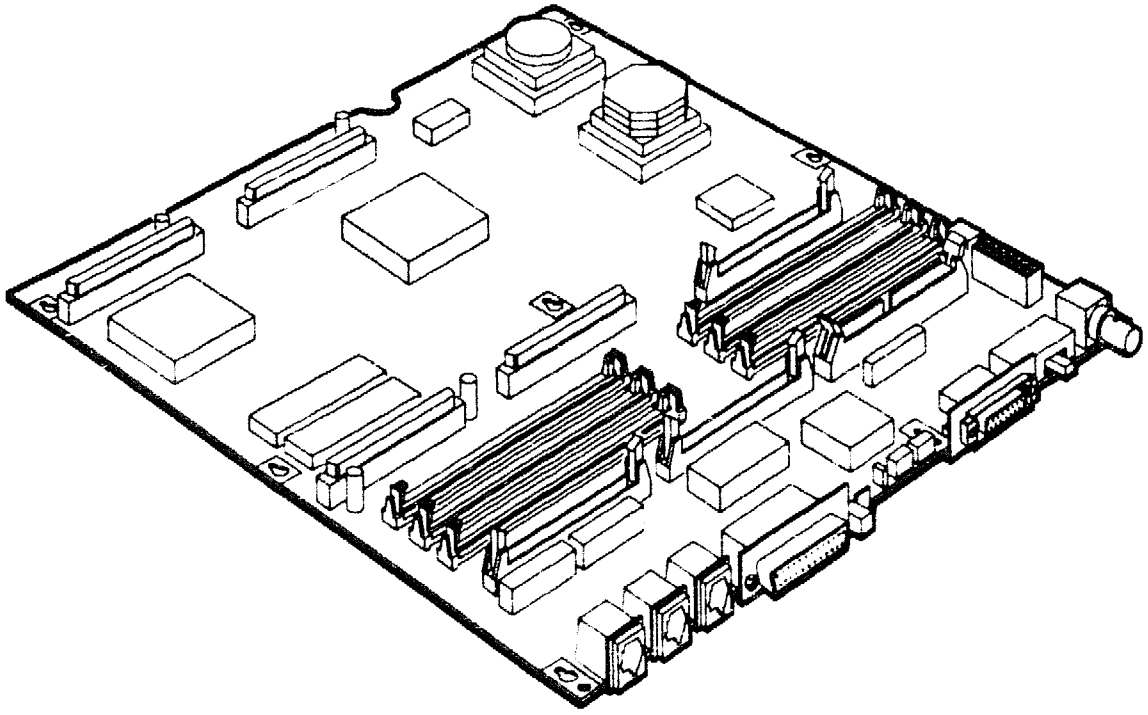
1.1 KA47 CPU Module

The KA47 CPU module is based on the Mariah chip set. It uses MS44 or MS44L memory modules and a set of supported **small computer system interface** (SCSI) devices. Figure 1–1 shows the KA47 CPU module.

The KA47 CPU module is the primary component of the MicroVAX 3100 system in which it is installed. The KA47 CPU module contains the following components:

- The DC595 processor chip—This chip is a complementary metal oxide semiconductor (CMOS) virtual memory microprocessor. The key features of the chip are as follows:
  - Support for the MicroVAX chip subset of the VAX™ instruction set
  - Support for the MicroVAX chip subset of the VAX data types
  - Full VAX memory management
  - 30-bit and 32-bit physical memory addressing

Figure 1–1 KA47 CPU Module



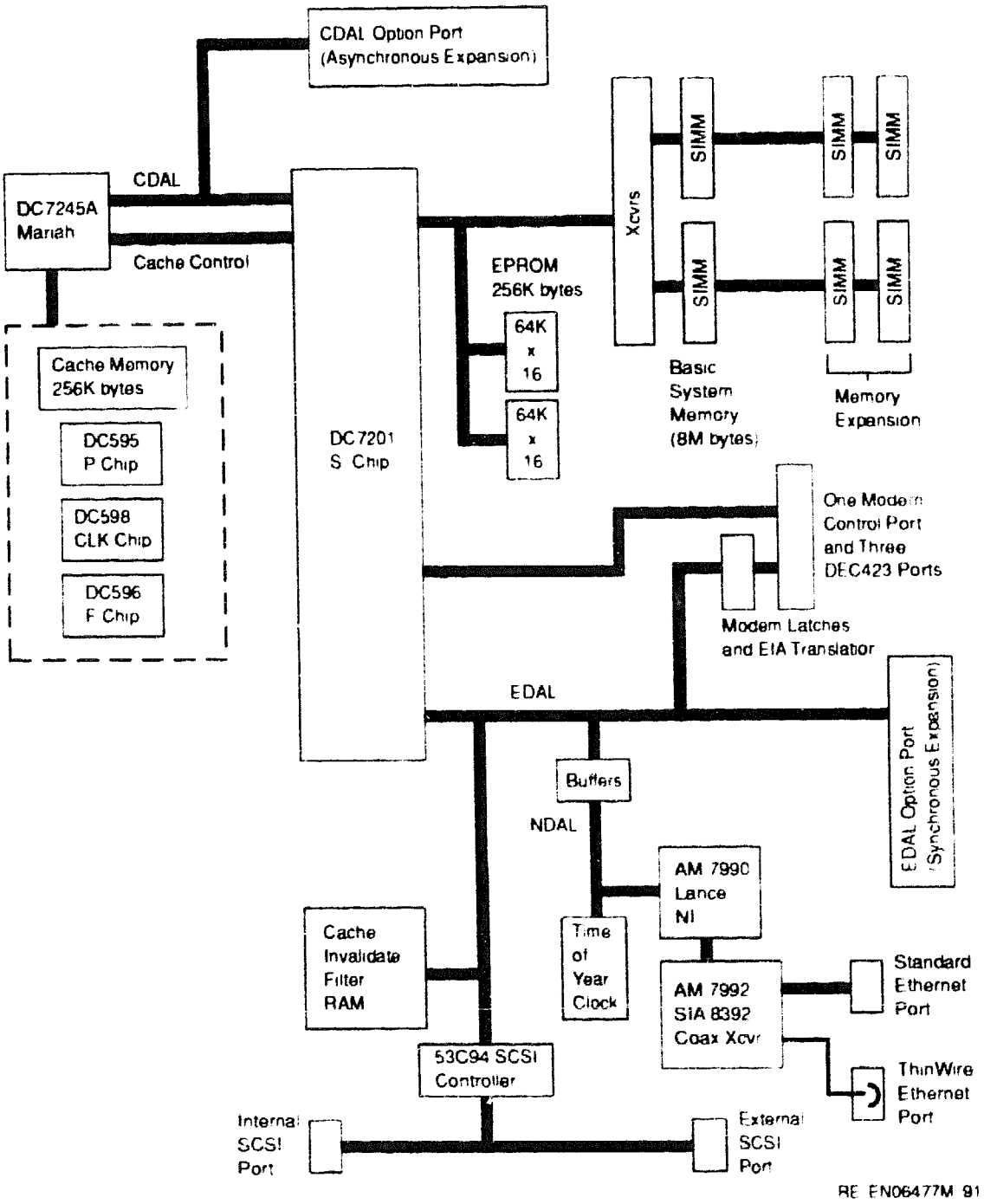
RE-EN06464A-91

- The DC598 clock chip
- The DC596 floating-point accelerator chip
- The DC7201 **S-chip**—This chip is the primary interface between the CDAL bus and all memory and input/output circuits. It contains the following primary logic circuits:
  - Memory system control
  - Cache invalidate assist
  - Single SCSI controller interface
  - **Direct memory access** DMA control
  - Input/output address decode and control for design specific features
- 256K bytes of second level write-through cache memory
- Gate arrays DC7201 and DC7254A

- Basic system memory (8M bytes of **random-access memory** [RAM] consisting of two MS44-AA or MS44L-AA memory modules)
- Support for up to 72M bytes of RAM
- 256K bytes of **read-only memory** (ROM)—This ROM contains the boot and diagnostic firmware for the system.
- 32-byte network address ROM
- Time-of-year clock that includes 50 bytes of nonvolatile RAM
- Four asynchronous communications ports as follows:
  - Three DEC423 ports—These ports are **modified modular jack** (MMJ) connectors.
  - One modem control port—This port is a D-sub 25-way connector.
- Ethernet controller for standard or ThinWire™ Ethernet
- SCSI controller, NCR 53C94
- Provision for asynchronous communications options that provide one of the following:
  - Eight or sixteen additional DEC423 ports
  - Eight additional modem ports
- Provision for synchronous communications options that provide:
  - Two synchronous ports

Figure 1–2 is a block diagram of the KA47 CPU module.

Figure 1–2 KA47 CPU Module Block Diagram



The KA47 CPU module supports the following VAX™ data types:

- byte, word, longword, quadword
- character string
- variable-length bit field
- absolute queues
- self-relative queues
- f_floating-point, d_floating-point, and g_floating-point

The operating system uses software emulation to support other VAX data types. The KA47 CPU module supports the following VAX instructions:

- integer, arithmetic and logical
- address
- variable-length bit field
- control
- procedure call
- miscellaneous
- queue
- character string instructions:
- MOVC3/MOVC5
- CMPC3/CMPC5
- LOCC
- SCANC
- SKPC
- SPANC
- operating system support
- f_floating-point, d_floating-point, and g_floating-point

The DC595 processor chip provides special microcode assistance to aid the macrocode emulation of the following instruction groups:

- Character string (other than those mentioned previously)
- Decimal string

- CRC
- EDITPC

The operating system uses software emulation to support other VAX instructions. Figure 1–3 shows the controls, indicators, ports, and connectors on the KA47 CPU module. Table 1–1 describes the functions of the controls, indicators, ports, and connectors.

Figure 1–3 KA47 Controls, Indicators, Ports, and Connectors

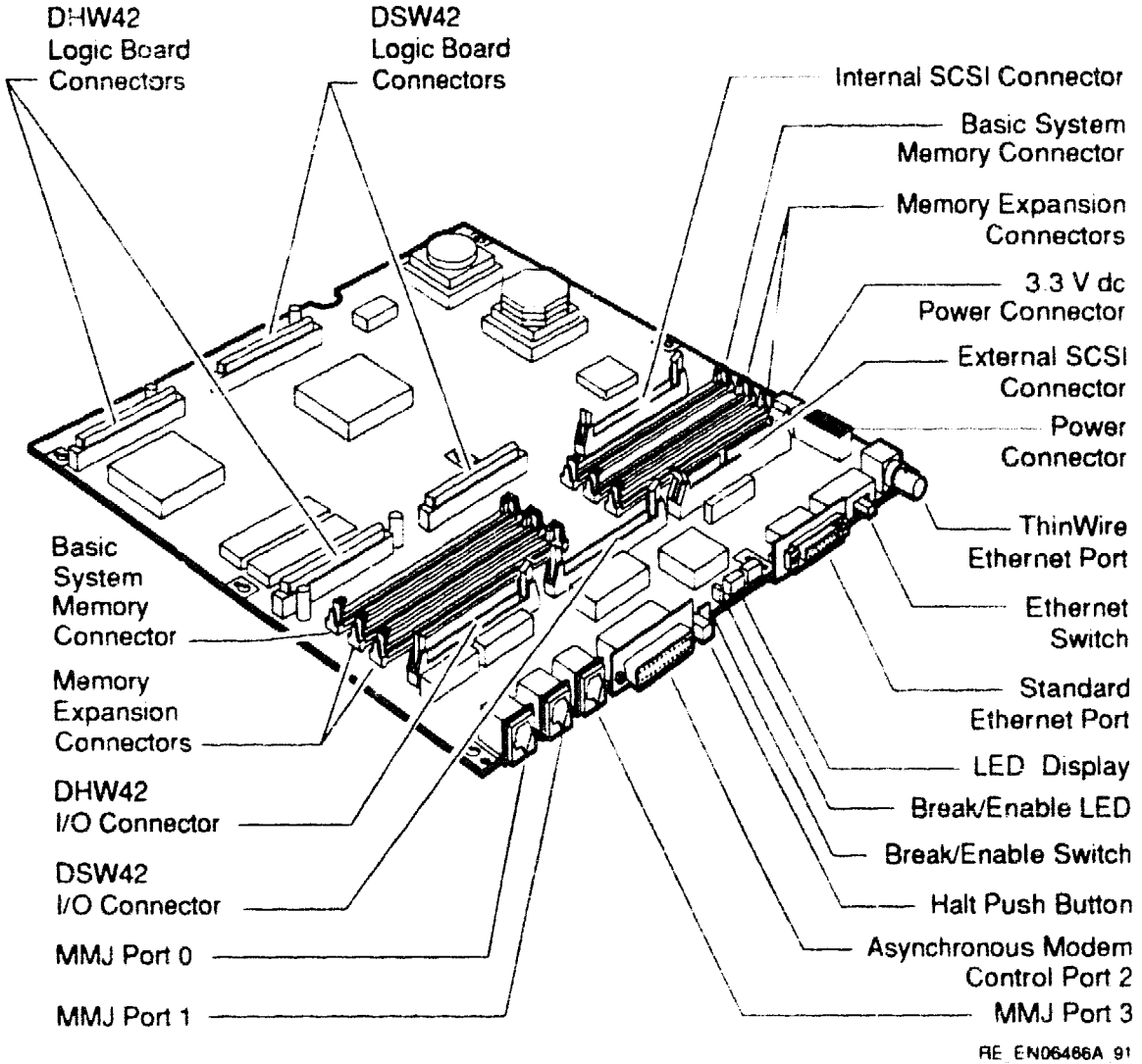


Table 1–1 Functions of Controls, Indicators, Connectors

Component	Description
Internal SCSI connector	A connector that provides a connection for SCSI devices mounted inside the system enclosure.
Basic system memory connectors	Two connectors for the basic system memory modules.
Memory expansion connectors	Two pairs of connectors for memory options.
3.3 V direct current (dc) power connector	A connector that provides a connection for 3.3 V dc power.
External SCSI connector	A connector that provides a connection to SCSI devices that are external to the system enclosure.
Power connector	A connector for dc power.
ThinWire Ethernet port	A port that provides a connection to a ThinWire Ethernet network.
Ethernet switch	A two-position switch that determines the type of Ethernet that the system uses as follows: • Left position—selects the standard Ethernet type • Right position—selects the ThinWire Ethernet type
Standard Ethernet port	A port that provides a connection to a standard Ethernet network.
LED display	A set of eight LEDs that provides power-up and self-test diagnostic code information.
Break/Enable LED	A LED indicator that shows the function of MMJ port 3 as follows: • On—MMJ port 3 functions as a console port. • Off—MMJ port 3 functions as a communications port.

(continued on next page)

Table 1–1 (Cont.) Functions of Controls, Indicators, Connectors

Component	Description
Break/Enable switch[1]	A two-position switch that determines the function of MMJ port 3 as follows: • Up position—MMJ port 3 functions as a console port. In this state, you can press the Break key on the keyboard of a terminal connected to MMJ port 3 to put the system in console mode • Down position—MMJ port 3 functions as a normal communications port. MMJ port 0 functions as the console port.
Halt push button	A momentary-contact push button that puts the system in console mode.
Asynchronous modem control port 2	EIA-232 compatible asynchronous port with modem control.
MMJ port 3	DEC423 compatible asynchronous port. This port functions as an alternate console port when the Break/Enable switch is set to the up position when you turn on the system.
MMJ port 1	DEC423 compatible asynchronous port.
MMJ port 0	DEC423 compatible asynchronous port. This port is the primary console port.
DSW42 I/O connector	A connector that provides a connection for the DSW42 input /output cable.
DHW42 I/O connector	A connector that provides a connection for the DHW42 input /output cable.
DSW42 logic board connectors	Two connectors that provide connections for a DSW42 logic board.
DHW42 logic board connectors	Two connectors that provide connections for a DHW42 logic board.

[1]The system recognizes the position of this switch only when the system is turned on.

1.2 MS44 and MS44L Memory Modules

The MS44 and the MS44L memory modules provide memory expansion for the KA47 CPU module. The KA47 CPU module supports two variants of the MS44 memory option and one variant of the MS44L option as follows:

- The MS44L-BA (8M-bytes), which contains two MS44L-AA (4M-bytes) memory modules
- The MS44-BA (8M-bytes), which contains two MS44-AA (4M-bytes) memory modules
- The MS44-DA (32M-bytes), which contains two MS44-CA (16M-bytes) memory modules

Note

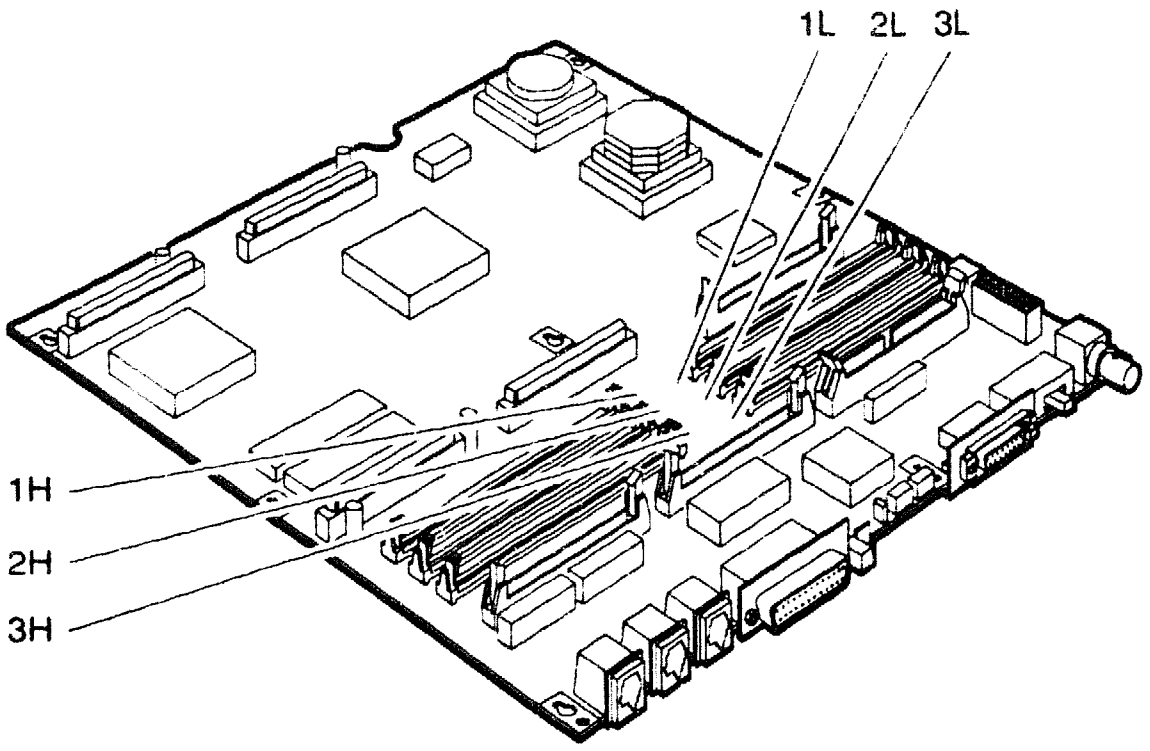
Use only MS44 or MS44L memory modules qualified by Digital.

The rules for adding MS44 or MS44L memory options are as follows:

- You must install both memory modules of a memory option. This means that you can expand memory in 8M-byte or 32M-byte increments only.
- You must install memory options in the next available connector pair in ascending numerical order.

Figure 1–4 shows the location of the basic memory (8M bytes) and the memory expansion connectors. Table 1–2 lists the memory configurations.

Figure 1–4 Memory Expansion Connectors



Note: 1H and 1L are identifiers for the basic system memory connectors.

RE_EN06467A_91

Table 1–2 KA47 CPU Module Memory Configurations

Total Memory (bytes)	Basic System Memory 1H[1] (bytes)	1L	Increment 2 2H	2L	Increment 3 3H	3L
8M	MS44-AA[2]	MS44-AA				
16M	MS44-AA	MS44-AA	MS44-AA	MS44-AA		
24M	MS44-AA	MS44-AA	MS44-AA	MS44-AA	MS44-AA	MS44-AA
40M	MS44-AA	MS44-AA	MS44-CA[3]	MS44-CA		
48M	MS44-AA	MS44-AA	MS44-AA	MS44-AA	MS44-CA	MS44-CA
72M	MS44-AA	MS44-AA	MS44-CA	MS44-CA	MS44-CA	MS44-CA

[1] 1H, 1L, 2H, 2L, 3H, 3L are connector identifiers (see Figure 1–4)

[2] The MS44-AA memory module is a 4M-byte memory module. The MS44-BA memory option consists of two MS44-AA memory modules. You can use MS44L-AA memory modules instead of MS44-AA memory modules.

[3] The MS44-CA memory module is a 16M-byte memory module. The MS44-DA memory option consists of two MS44-CA memory modules.

1.3 MS44 or MS44L Memory Option Installation

The MS44 and MS44L memory options consist of two memory modules. Install an MS44 or MS44L memory option on the KA47 CPU module as follows:

1. Position the KA47 CPU module, component side up, so that the edge connectors are facing you.
2. Identify the connectors on the KA47 CPU module into which you must install the memory option (see Figure 1–4 and Table 1–2).
3. Insert the first memory module, with the side containing the bar code facing you, into the connector on the KA47 CPU module (see Figure 1–5).

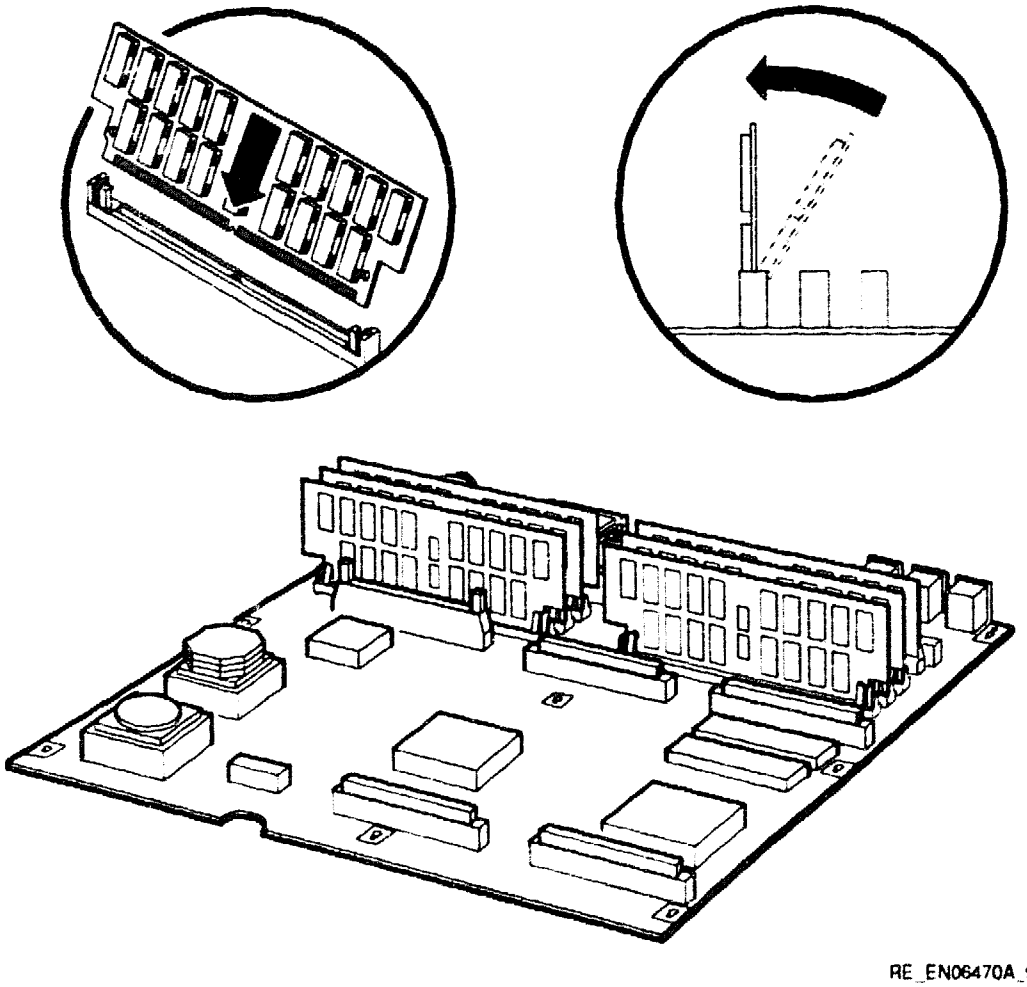
Caution

The connectors are keyed to ensure that you install the memory modules with the correct orientation. Do not force the modules into the connectors with an incorrect orientation.

Caution

Make sure that you fully install the memory module into the connector before you tilt the module towards the front of the enclosure.

Figure 1–5 Memory Module Installation



4. Tilt the memory module towards the front of the enclosure until the metal locking clips on the connector lock the memory module in position.
5. Repeat the procedure in step 1 for the second memory module. Insert it into the other connector for that memory increment on the KA47 CPU module.

6 Run the MEM diagnostic test (see Section 4.6) after you reinstall the KA47 CPU module into the system enclosure to check that the memory is working correctly.

Caution

When removing memory modules, you must release the metal clips on the connectors of the CPU module.


CHAP 2

2

Configuration

This chapter describes the KA47 system configurations. It gives information on the following:

- Memory configurations
- Mass storage devices
- Communications options

2.1 Memory Configurations

A KA47 system has a basic memory of 8M bytes. This consists of two MS44L-AA memory modules. You can add memory in 8M-byte or 32M-byte increments, up to a maximum of 72M bytes. See Section 1.2 for information on the memory configurations.

2.2 Mass Storage Devices

A KA47 system supports mass storage devices in the following categories.

- Internal mass storage devices—These devices are mounted inside the system enclosure.
- External mass storage devices—These devices are self-contained units that you can connect to the system externally.

2.2.1 Internal Mass Storage Devices

Table 2–1 shows the internal mass storage devices that a KA47 system supports.

Table 2–1 KA47 Internal Mass Storage Devices

Option Name	Description	Size[1] (in)	Capacity
RZ23L	Disk drive	3.5	120M bytes
RZ24	Disk drive	3.5	209M bytes
RZ25	Disk drive	3.5	400M bytes
TZ30[4]	Tape drive	5.25	95M-byte cartridge
TZK10[4]	Tape drive	5.25	Range of cartridges[2]
RX26[4]	Diskette drive	3.5	Range of diskettes[3]
RRD42[4]	CDROM drive	5.25	600 Mbytes

[1] Size of half-height device.

[2] Supports 320-Mbyte and 525-Mbyte cartridges.

[3] Supports 1.4-Mbyte and 2.8-Mbyte diskettes.

[4] Removable media device.

The system enclosure determines the combinations of internal mass storage devices in a KA47 system. See the *BA42-B Enclosure Maintenance* manual for more information.

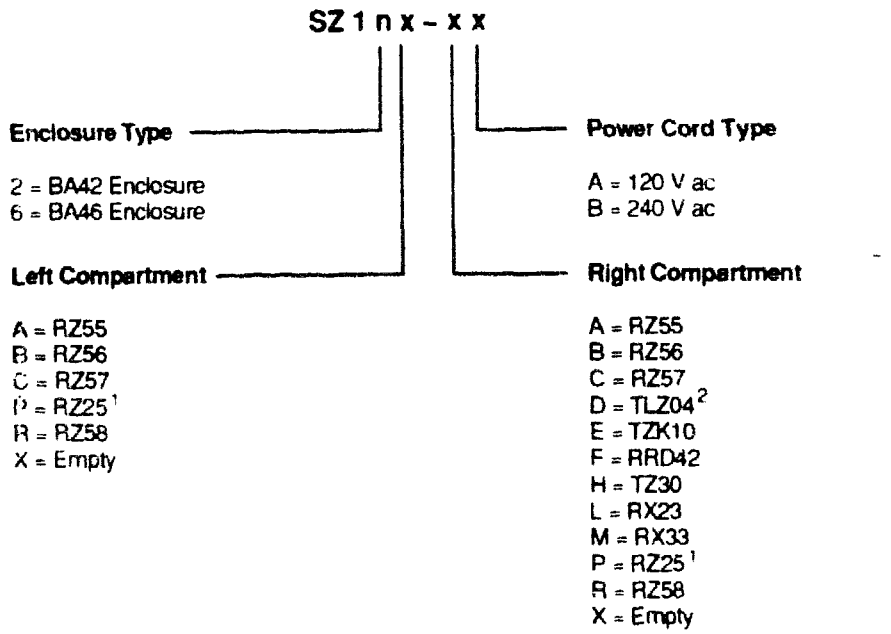
2.2.2 External Mass Storage Devices

The external mass storage devices connect to KA47 systems via the SCSI connector on the back of the system enclosure. In KA47 systems, the SCSI bus supports a maximum of seven mass storage devices. Therefore, the number of external mass storage devices that you can connect depends on the number of mass storage devices that are mounted inside the system enclosure.

The maximum number of mass storage devices in the system enclosure is five. This means that you can connect at least two external mass storage devices.

A KA47 system supports the SZ series of mass storage expansion boxes. The SZ number defines the contents of each expansion box. Figure 2–1 shows the numbering system for SZ expansion boxes.

Figure 2–1 SZ Expansion Box Numbering System



[1] The RZ25 disk drive fits in the BA42 enclosure only
[2] The TLZ04 tape drive fits in the BA46 enclosure only

A KA47 system also supports other types of external mass storage devices. Table 2–2 gives the other external mass storage devices that a KA47 system supports.

Table 2–2 Supported External Mass Storage Devices

Device	Description
RRD42-DA	RRD42 CDROM tabletop
TLZ04-FA	TLZ04 tape drive tabletop
TK50Z-GA/G3	TK50Z tape drive tabletop

The following rules apply when you are adding mass storage devices:

- You can add a maximum of four external SCSI devices. A fully configured SZ12 enclosure contains two SCSI devices.
- You can add a maximum of two SCSI tape devices. Depending on the configuration, the system may support two TLZ04 tape drives.
- The BA40 single drive expansion box contains one SCSI device.

- The RRD42 CDROM drive is a single SCSI device. You can add a maximum of three RRD42 CDROM drives.
- Terminate the SCSI bus correctly. Failure to do this can cause a system failure or corrupt data.
- Digital recommends that you connect all SCSI devices to the same ac power source.
- Do not add or remove devices that are connected to the SCSI bus while the power is on.
- Digital does not guarantee the correct operation of a SCSI bus that does not use the cables supplied by Digital or is not configured in accordance with Digital recommendations.

2.2.3 SCSI ID Numbers

Each mass storage device must have a unique SCSI ID number. Table 2–3 gives the recommended SCSI ID numbers for the different types of internal and external mass storage devices.

Table 2–3 Recommended SCSI ID Numbers for Devices

SCSI ID	Device
0	
1	RZ2* [1]
2	RZ2* [1]
3	RZ2* [1] (system disk)
4	RRD42
5	TZ30 or TZK10 (system backup device)
6	SCSI controller (INITR)
7	

[1]The asterisk (*) indicates that these devices can be RZ23L, RZ24, or RZ25 disk drives.

2.3 Communications Options

A KA47 system supports the following types of communications options:

- Asynchronous communications options
- Synchronous communications options

Each communications option has components that are installed in the system enclosure and components that connect to the system externally.

2.3.1 Asynchronous Communications Options

Table 2–4 gives the asynchronous communications options that KA47 systems support.

Table 2–4 Supported Asynchronous Communications Options

Option	Description
DHW42-AA	Eight-line DEC423 asynchronous option
DHW42-BA	Sixteen-line DEC423 asynchronous module option
DHW42-CA	Eight-line EIA-232 modem asynchronous module option
DHW42-UP	Eight-line to 16-line DEC423 asynchronous upgrade option

2.3.2 Synchronous Communications Options

Table 2–5 gives the synchronous communications options that KA47 systems support.

Table 2–5 Supported Synchronous Communications Options

Option	Description
Model 30	
DSW41-AA[1]	One-line EIA-232/V.24 synchronous option with one external cable, BC19D-02 (17-01110-01)
Model 40	
DSW42-AA[2]	Two-line EIA-232/V.24 synchronous option with two external cables, BC19D-02 (17-01110-01)

[1]This option is supplied with one external cable that supports the EIA-232/V.24 interface.

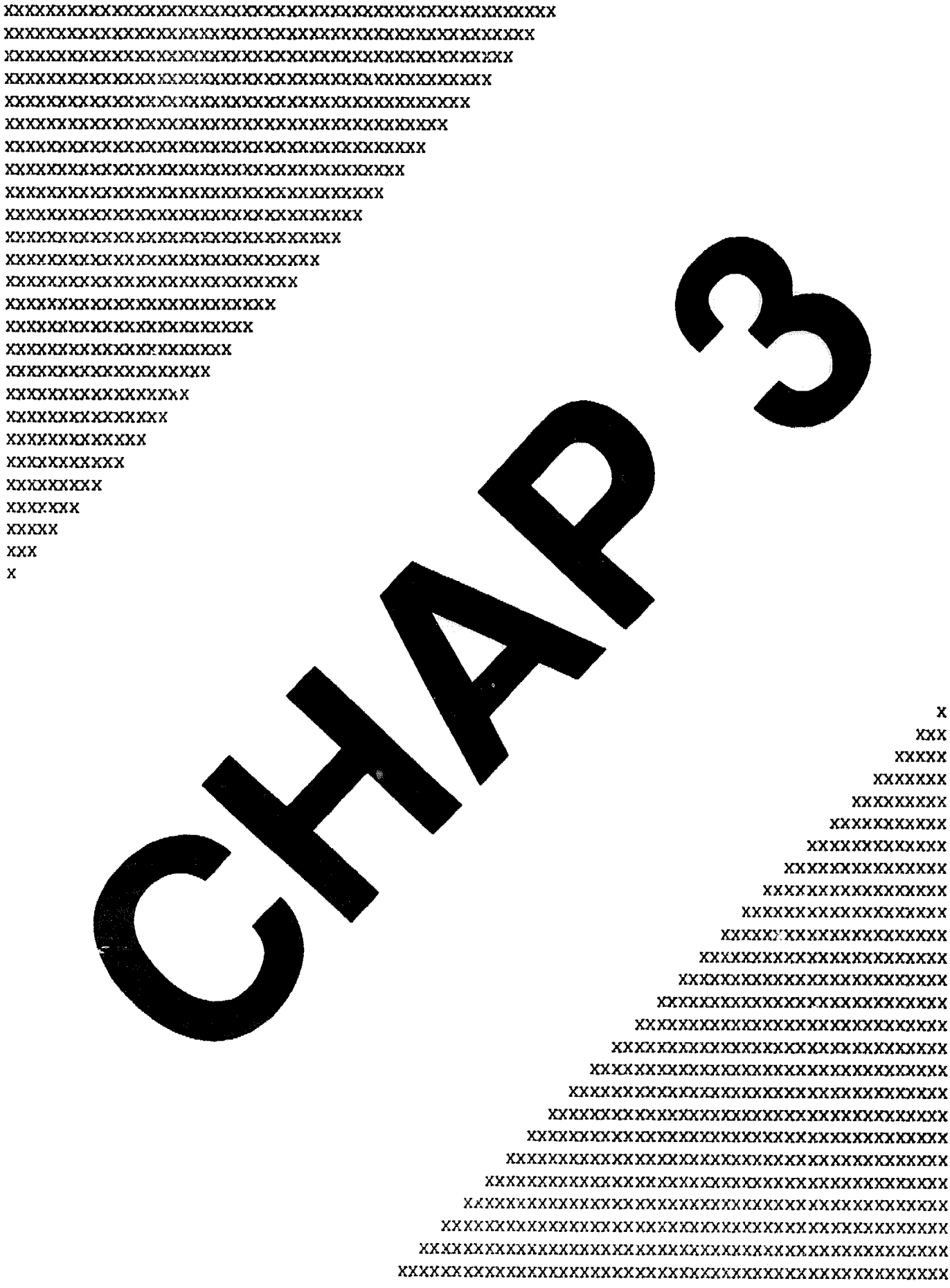
[2]This option is supplied with two external cables that support the EIA-232/V.24 interface.

The DSW41-AA and the DSW42-AA options also support the communications interfaces listed in Table 2–6, but you must order the external cables separately.

Table 2–6 DSW41-AA and DSW42-AA Communications Support

Communications Interface	External Cable
EIA-423/V.10	BC19E-02[1] (17-01111-01)
EIA-422/V.11	BC19B-02[1] (17-01108-01)

[1]Two required for DSW42-AA


CHAP 3

3

KA47 Firmware

This chapter describes the structure and operation of the KA47 firmware. It gives information on the following:

- Power-Up test and initialization—This code tests and initializes all the devices in a KA47 system.
- Console program—This program parses and executes all the commands entered at the console prompt (>>>).
- Self-Test—This code executes when a user runs a diagnostic self-test by entering the command TEST at the console prompt. This code also executes when a user runs tests in the Manufacturing test environment.
- Utilities—This code provides device-specific functions that are not provided by the other KA47 firmware functions.
- System exerciser—This code tests the operation of devices in the system concurrently. The purpose of this code is to provide a high level of DMA and interrupt activity for devices in the KA47 system.

3.1 Power-Up Test and Initialization

When you turn on the system, the system executes the power-up test and initialization code, which builds a power-up test display on the console terminal that is connected to the system unit. When the default recovery action is set to 3 (see *CPU Reference Information*, Section 1.11.5), the system is in console mode when the power-up test and initialization code is completed. Figure 3–1 shows a successful power-up test display. The display differs slightly depending on the type of console terminal you use.

Figure 3–1 Successful Power-Up Test Display

```
KA47-A V1.0 ❶
08-00-2B-04-03-12 ❷
32MB ❸
+--------------------------------------------------+
 ################################################## ❹

>>> ❺
```

A–On a Standard ASCII Terminal

```
KA47-A V1.0 ❶
08-00-2B-04-03-12 ❷
32MB ❸
[solid bar] ❹

>>> ❺
```

B–On a Graphics Display Terminal

❶ The CPU name and the version of the KA47 firmware. The character V indicates the version of the system firmware. The number 1.0 indicates the release number.

❷ The Ethernet address of the system.

❸ The size of the internal system memory.

❹ The status bar shows the progress of the test. When the status bar reaches the completion mark, the test is completed successfully.

❺ The console prompt.

Figure 3–2 shows an unsuccessful power-up test display. In Figure 3–2, the incomplete status bar shows that the power-up test did not complete because of an error. The system displays the error information under the status bar.

Figure 3–2 Unsuccessful Power-Up Test Display

```
KA47-A V1.0 (1)
08-00-2B-04-03-12 (2)
32MB (3)
+-----------------------------------------------------+ (5)
 ############################################ (4)

?? 001   9      NI   0066 (6)

>>> (7)
```

A–On a Standard ASCII Terminal

```
KA47-A V1.0 (1)
08-00-2B-04-03-12 (2)
32MB (3)
                                              (4)     | (5)

?? 001   9      NI   0066 (6)

>>> (7)
```

B–On a Graphics Display Terminal

1. The CPU name and the version of the KA47 firmware. The character V indicates the version of the system firmware. The number 1.0 indicates the release number.
2. The Ethernet address of the system.
3. The size of the internal system memory.
4. Incomplete status bar.
5. Completion mark.
6. An error message—The elements are as follows:
   - Two question marks (??) indicate a hard error, that is, an error that you must correct before you boot the system. A single question mark (?) indicates a soft error, that is, an error that you do not have to correct before you boot the system.
   - 001 is the **field replaceable unit** (FRU) number of the device that fails. See Appendix C for the list of FRU numbers.
   - 9 is the test number (in this example, the Ethernet test number).
   - NI is the test mnemonic (in this example, the Ethernet test mnemonic).

- 0066(decimal) is an error code (see *CPU Reference Information*, Table 3–11).

❼ The console prompt.

Note

The rest of the console screen illustrations in this manual show the system output only on an **American Standard Code for Information Interchange** (ASCII) terminal. The system output on a graphics display terminal is slightly different from a standard ASCII terminal; a solid status bar replaces the line of number signs (#).

3.2 Console Program

The console program is firmware code that controls a device (the console device). This device allows you to enter diagnostic test commands (console commands) when the system is in a halt state (console mode).

The console program also contains the input and output routines that control the transfer of data to and from the console device. The power-up tests, extended self-tests, utilities, system exerciser, and **virtual machine bootstrap** (VMB) program also use these routines to transfer data to and from the console device.

3.2.1 Console Device

When you turn on the system with the default recovery action set to 3 (see *CPU Reference Information*, Section 1.11.5), the system is in console mode after the power-up tests are completed. Depending on the position of the break/Enable switch on the back of the system unit, the terminal connected to either MMJ port 0 or MMJ port 3 is the console device (see Table 3–1).

Table 3–1 Console Device Port Selection

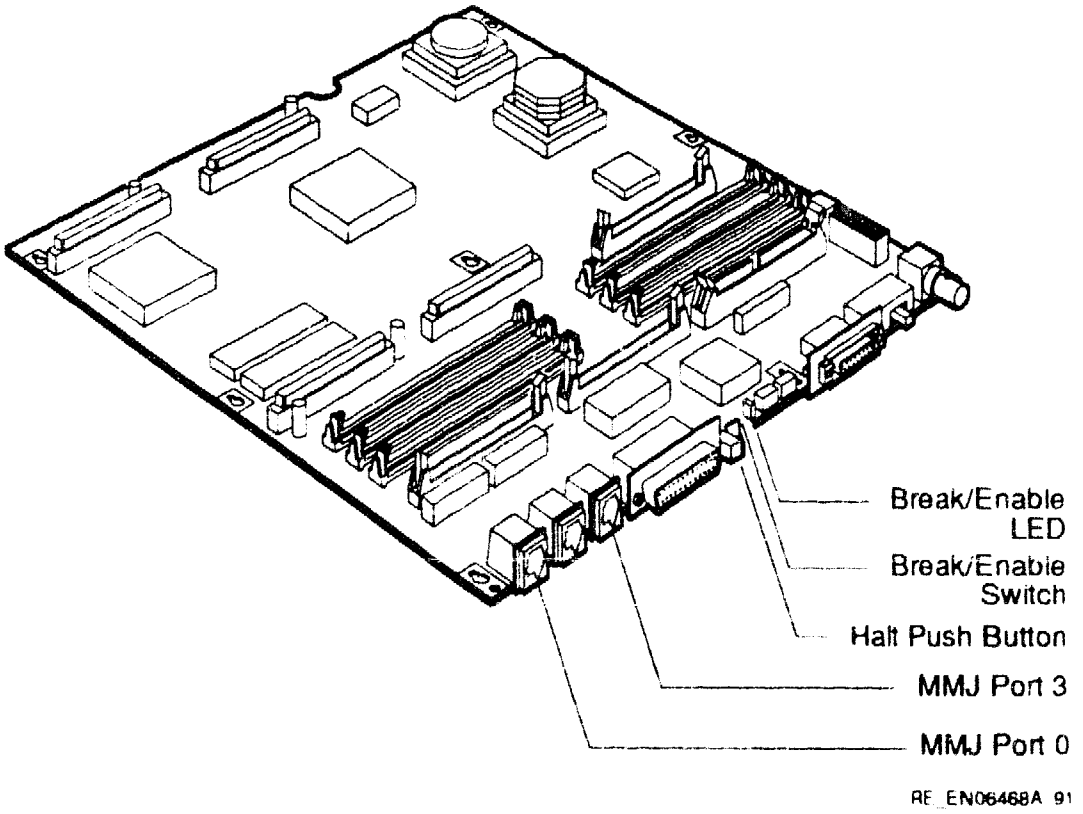
Break/enable Switch Position[1]	Console Terminal Port
Down	MMJ Port 0
Up	MMJ Port 3[2]

[1]The system recognizes the position of the switch only when you turn on the system.

[2]On a terminal connected to MMJ port 3, you can press the Break key to put the system in console mode.

Figure 3–3 shows the location of the MMJ ports on the system module.

Figure 3–3 Location of the Console-Related Ports and Switches



When a system is delivered, the break/enable switch is set to the down position, therefore MMJ port 0 is the console terminal port. To use MMJ port 3 as the console terminal, follow these steps:

1. Turn off the system unit.
2. Set the break/enable switch to the up position.
3. Turn on the system unit.

MMJ port 3 is now the console port terminal. You can connect one of the following console devices to this port:

- A VT™ series type terminal (for example, VT330™)
- A printer (for example, LA34)

- A host computer that runs special test software (for example, APT)

If you connect a VT series type terminal to MMJ port 3, you can press the Break key on the keyboard to put the system in console mode. To ensure the correct operation of the terminal, you must set the communication parameters for a terminal connected to MMJ port 3. Table 3–2 gives the correct terminal settings.

Table 3–2 Terminal Settings

Feature	Setting
Terminal mode	VTnnn-7bit
Transmit speed	9600 baud
Receive speed	receive = transmit
Character format	8 bits, no parity
Stop bits	1
Comm1 port	DEC-423 (data-leads-only)

3.2.2 Console Commands

You can enter console commands from a console device. *CPU Reference Information,* Chapter 1, describes the console commands that you can enter. When you enter a command at the console prompt, the console program parses and executes the command. If the console program detects an error, it displays an error message. *CPU Reference Information,* Chapter 2, gives the console messages for KA47 systems.

3.2.3 Console Mode

The system is in console mode when one of the following conditions occurs:

- System power-up—When you turn on the system, and the recovery action flag is set to halt the system.
- External halt—You can initiate an external halt in one of two ways:
  - Press the halt push button on the back of the system unit.
  - Press the Break key on the keyboard of a console device that is connected to MMJ port 3 on the back of the system unit. This function is effective only when the break/enable switch is set to the break (up) position before you turn on the system.
- Boot failure—The system fails to boot correctly.

- Critical CPU condition—The system forces a CPU restart or a reboot when it detects an event that it interprets as a severe corruption of its operating environment. The VMS sysgen parameter, BUGREBOOT, determines if the system restarts or reboots. If BUGREBOOT is 0, the system restarts; if BUGREBOOT is 1, the system reboots.
- Kernel program mode—The system processes a halt instruction in kernel program mode. The recovery action flag is set to halt the system.

When the system is in console mode, it displays the console prompt. You can enter console commands at this prompt (see *CPU Reference Information*, Chapter 1).

3.2.4 Console Security

The KA47 systems have a console security feature that you can use to restrict the use of certain console commands to authorized users. You use the SET PSE command to enable the security system (see *CPU Reference Information*, Section 1.11.8), and you use the SET PSWD command to enter a console security password (see *CPU Reference Information*, Section 1.11.9). Users must know this password to access the full range of console commands. When the console security feature is enabled, there are two console modes in which the system operates as follows:

- Unprivileged console mode
- Privileged console mode

When you put the system in console mode, and the console security system is enabled, the system operates in unprivileged console mode. You can enter only the following console commands:

- LOGIN
- BOOT (without parameters)
- CONTINUE
- ! (Comment)

When you enter a command other than the four commands shown previously while the system is in unprivileged console mode, the system displays an error message as follows:

```
?23 ILL CMD
```

You can use the LOGIN command (see *CPU Reference Information*, Section 1.9) to enter privileged console mode. To use this command, you must know the current console security password. When you enter the correct password, you can use all of the console commands.

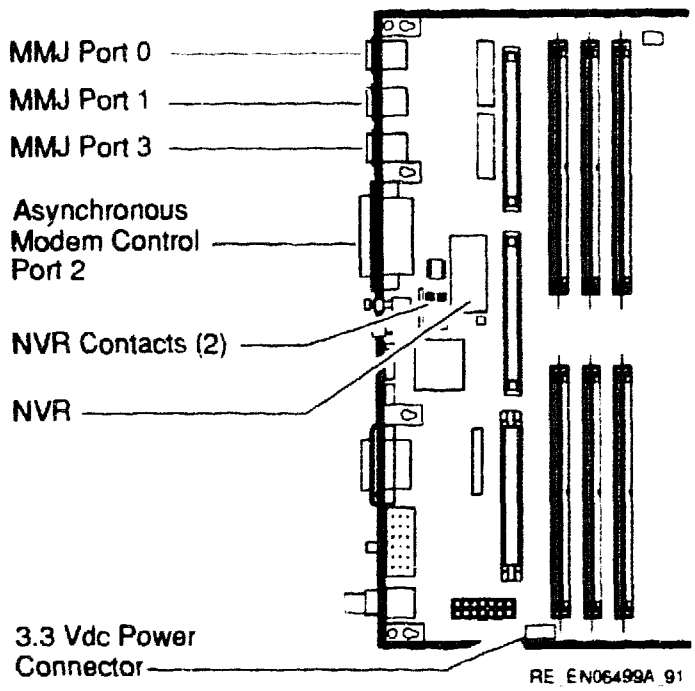
In privileged console mode, you can use the SET PSE command to disable the console security feature (see *CPU Reference Information*, Section 1.11.8). When the system is in privileged console mode, you can enter one of the following commands to return the system to unprivileged console mode:

- BOOT
- CONTINUE
- HALT
- START

If the system owner forgets the password, you can clear the password in the **nonvolatile RAM** (NVR) as follows:

1. Set the on/off switch on the system unit to the off (O) position.
2. Remove the enclosure cover. See the *BA42-B Enclosure Maintenance* manual for more information.
3. Use a screwdriver to short-circuit two NVR contacts on the CPU module (see Figure 3–4).

Figure 3–4 Location of the NVR Contacts for Clearing the Password



4. Install the enclosure cover.
5. Turn on the system unit.

When the console prompt is displayed, the owner can use the SET PSWD command (see *CPU Reference Information*, Section 1.11.9) to enter a new password.

3.2.5 Console Command Conventions

When entering console commands, the following rules apply:

- Commands cannot be more than 80 characters long.
- The command interpreter is not sensitive to case. The command interpreter treats lowercase ASCII characters as uppercase ASCII characters.
- The command parser rejects the characters that have ASCII codes greater than 7FH. You can, however, include these characters in comments.
- Type-ahead text entry is not supported. The command interpreter checks characters that it receives before it displays the console prompt, but ignores all other characters except control characters (see Table 3–3).

In console mode, certain keys have special control functions. Table 3–3 lists these keys and control functions.

Table 3–3 Console Mode Control Keys

Key	Function
Return key	Ends a command line.
Delete key	Deletes the previously typed character. On VT series terminals, press this key to delete a character from the screen. On hard copy terminals, the system prints a slash (/) before and after the deleted character.
Break key [1]	On a console device connected to MMJ port 3, press the Break key to put the system in console mode.
Ctrl/C	Causes the console program to abort processing a command. The console program displays Ctrl/C as ^C.
Ctrl/O	Causes the console program to discard output until you enter the next Ctrl/O sequence or until the console program receives the next console prompt or error message. Ctrl/C also cancels Ctrl/O. The console program displays Ctrl/O as ^O.
Ctrl/Q	Resumes the console output that is suspended when you press Ctrl /S.
Ctrl/R	Causes the current command line to be displayed, without the deleted characters.
Ctrl/S	Suspends the current command line that the console program displays until the next Ctrl/Q sequence.
Ctrl/U	Discards all the characters on the current command line. The console program does not abort a command if it receives this control character while processing the command. The console program displays this control key as ^U.

[1] Applies only if the break/enable switch on the back of the system unit is set to the break (up) position before you turn on the system.

Note

During X command data transfers, the command interpreter treats the codes for the control keys as binary data.

3.3 Self-Test

The KA47 firmware provides a set of diagnostic tests that you can access using the console command, TEST (see *CPU Reference Information*, Section 1.14). The console program passes a list of the device numbers (or device mnemonics) and test parameters to the test command dispatcher. The test command dispatcher is the code that runs the self-test for each device that the console program passes. The tests run until all the tests complete successfully or an error occurs.

When you use the TEST command, you must specify a device. Table 3–4 gives the device number and device mnemonic for all the devices in KA47 systems.

Table 3–4 Device Numbers and Mnemonics

Device Number	Device Mnemonic	Description
1	NVR	Nonvolatile RAM
2		Reserved for future use
3	DZ	Serial line controller
4	CACHE	Cache system
5	MEM	Memory
6	FPU	Floating-point unit
7	IT	Interval timer
8	SYS	Miscellaneous CPU module hardware
9	NI	Network interface
10	SCSI	SCSI controller
11		Reserved for future use
12	COMM	Synchronous communications option
13		Reserved for future use
14	ASYNC	Asynchronous communications option
15 to 99		Reserved for future use

When you use the TEST command to test a device, you can specify either the device number or the device mnemonic. You can enter a command to test the following:

- A single device
- Multiple devices
- A range of devices

- A combination of the three previous options

Table 3–5 gives some typical TEST (T) command lines.

Table 3–5 Typical TEST Command Lines

Type	Command Using Device Numbers	Command Using Device Mnemonics	Description
Single device	T 5	T MEM	Runs the self-test on memory.
Multiple devices	T 3,4	T DZ,CACHE	Runs the self-test on the serial line controller and the cache system.
Device range	T 5:7	T MEM:IT	Runs the self-test on the memory in the system, the floating-point unit, and the **interval timer** (IT).
Combination	T 1,3,8:10	T NVR,DZ,SYS:SCSI	Runs the self-test on the nonvolatile RAM, serial line controller, miscellaneous CPU module hardware, network interface, and SCSI controller.

You can include device numbers and device mnemonics on the same TEST command line. The following command is an example of a TEST command that has device numbers and device mnemonics on the command line:

```
>>> T 10:8,6,MEM:DZ
```

When you enter the test commands, the following rules apply:

- You can specify device numbers and mnemonics in any order on the command line.
- You can include a device number or a device mnemonic many times on the same command line.
- The maximum number of tests specified on a single command line must not exceed fifteen.

In the example shown previously, although the combined number of device mnemonics and device numbers on the command line is five, the number of tests specified is seven. This means that you can specify only eight more tests on this command line. Figure 3–5 shows a successful self-test display.

Figure 3–5 Successful Self-Test Display

```
>>> T 9:7
+----------+
 ########## ❶

OK❷

>>>
```

❶ Complete status bar.

❷ A console status message that indicates a successful test.

Figure 3–6 shows an unsuccessful self-test display.

Figure 3–6 Unsuccessful Self-Test Display

```
>>> T 9:7
+----------+
 ##### ❶
❷ ❸  ❹ ❺  ❻
?? 001 07 FP 22

  84 FAIL❼

>>>
```

❶ Incomplete status bar.

❷ Two question marks (??) indicate a hard error, that is, an error that you must correct before you boot the system. One question mark (?) indicates a soft error, that is, an error that you do not have to correct before booting the system.

❸ The FRU number of the device that fails.

❹ The device number of the device that fails.

❺ The device mnemonic of the device that fails.

❻ An error code that corresponds to a specific device error.

❼ A console error message that indicates a test failure (see *CPU Reference Information*, Chapter 2).

CPU Reference Information, Chapter 3, lists the error codes and messages that the KA47 diagnostic tests generate.

3.3.1 Additional Error Information for Self-Tests

When a test fails, you can get more error information about the test using the following command:

```
>>> SHOW ERROR
```

Figure 3–7 is an example of the information that this command displays.

Figure 3–7 Additional Error Information for Self-Tests

```
❶ ❷  ❸     ❹   ❺
?? 001   3       DZ  0050
001 000B 00000051 00000220 00001E08 00000000 00000000 00000000❻

>>>
```

❶ Two question marks (??) indicate a hard error, that is, an error that you must correct before booting the system. One question mark (?) indicates a soft error, that is, an error that you do not have to correct before you boot the system.

❷ The FRU number of the device that fails.

❸ The device number of the device that fails.

❹ The device mnemonic of the device that fails.

❺ An error code that corresponds to a specific device error.

❻ A line of error information that is related to the device name (or test number) on the line immediately preceding it. In the example, the additional error information line is related to the DZ test (test 3). See *CPU Reference Information*, Chapter 3, for information about the formats and meaning of the additional error information for the various tests.

3.3.2 Test Environments

You can run diagnostic self-tests in three different environments as follows:

- Customer environment
- Digital Services environment
- Manufacturing environment

The test environment determines the level of device testing. For example, testing in the Customer environment is minimal, whereas testing in the Digital Services environment and the Manufacturing environment is more extensive.

3.3.2.1 Customer Environment

This is the default test environment in which the user tests the operation of the system. To return the system to the Customer environment from another test environment, enter the following command:

```
>>> SET DIACENV 1
```

3.3.2.2 Digital Services Environment

This is the test environment that Digital Services personnel use to test the system.

Note

You must connect a loopback connector (29-24795-00) to the asynchronous modem control port 2 on the back of the system unit before you can put the system in the Digital Services environment.

The firmware verifies that the loopback connector is present by checking that pin 12 and pin 18 of asynchronous modem control port 2 are looped. To put the system in the Digital Services environment, enter the following command:

```
>>> SET DIAGENV 2
```

In this test environment, certain tests and utilities require loopback connectors (see Chapter 4).

3.3.2.3 Manufacturing Environment

This is the test environment that Manufacturing personnel use to test the system. Running tests in this environment is also known as *extended self-test*.

Note

You must connect a loopback connector (29-24795-00) to the asynchronous modem control port 2 on the back of the system unit before you can put the system in the Manufacturing environment.

The firmware verifies that the loopback connector is present by checking that pin 12 and pin 18 of asynchronous modem control port 2 are looped. To put the system in the Manufacturing environment, enter the following command:

```
>>> SET DIAGENV 3
```

In this test environment, certain tests require loopback connectors and media with special keys (see Section 3.4) to which the system can write data (see Chapter 4).

3.4 Utilities

The KA47 firmware provides utilities for the following devices:

- SCSI
- COMM

You invoke a utility using a TEST command that has the following format:

```
>>> T[EST]/UT[ILITY] <devnam | devnbr>
```

where:

- *T[EST]* is the TEST command
- */UT[ILITY]* is the utility qualifier
- *devnam* is the device mnemonic
- *devnbr* is the device number

If an error occurs or you press Ctrl/C to interrupt a utility, the console generates a display similar to the following:

```
SCSI_E_err  196❶

84 FAIL❷

>>>
```

❶ Utility error message and code (see *CPU Reference Information*, Chapter 4)

❷ Console error message (see *CPU Reference Information*, Chapter 2)

3.4.1 SCSI Utilities

To get a list of the utilities available for SCSI devices, enter the following command:

```
>>> TEST/UTIL SCSI
```

The system displays the following menu:

```
1 - SCSI-flp_key
2 - SCSI-tp_key
3 - SCSI-hd_dsk_eras
4 - SCSI-flp_fmt

SCSI_util>>>
```

The functions of these utilities are as follows:

- SCSI-flp_key—Puts a special diagnostic key on a floppy diskette that enables the firmware to write data to the diskette during tests in the Manufacturing environment.

  Note

  This utility works only in the Digital Services environment. To put the system in the Digital Services environment, see Section 3.3.2.2.

- SCSI-tp_key—Puts a special diagnostic key on a tape cartridge that enables the firmware to write data to the tape cartridge during tests in the Manufacturing environment.

  Note

  This utility works only in the Digital Services environment. To put the system in the Digital Services environment, see Section 3.3.2.2.

Caution

You can use the SCSI-hd_dsk_eras utility in the Customer environment.

- SCSI-hd_dsk_eras—Erases the contents of a disk drive.
- SCSI-flp_fmt—Formats a floppy diskette.

For example, to erase the data on a hard disk, enter 3 at the SCSI_util>>> prompt as follows:

```
SCSI_util>>> 3
```

The KA47 firmware prompts you for the SCSI ID of the disk drive from which you want to erase the data. If the SCSI ID of the disk drive is 1, for example, enter 1 in response to the prompt as follows:

```
SCSI_id(0-7)>>> 1
```

The KA47 firmware prompts you for the logical number of the drive, usually 0, unless there is another SCSI controller in the system. Enter 0 in response to the prompt as follows:

```
SCSI_lun(0-7)>>> 0
```

The KA47 firmware displays a status message, then a prompt. You must enter OK in response to this prompt as follows:

```
SCSI HD_DSK_ERAS_UTIL

DKA100  OK? OK
```

The KA47 firmware displays a status bar, indicating that the erasing of the disk is progressing. This operation takes several minutes. When the operation is complete, the KA47 firmware displays a complete status bar and status messages as follows:

```
+--------------------+
 ####################

SCSI_bb_repl 0

SCSI_util_succ
```

3.4.2 COMM Utilities

The KA47 firmware includes some utilities for synchronous communications devices. These utilities are not intended for use by Digital Services personnel.

3.5 System Exerciser

The KA47 firmware has a system exerciser that tests the simultaneous operation of multiple devices in a KA47 system. The system exerciser tests the interaction of devices in the system by causing maximum DMA and interrupt activity. You invoke the system exerciser by entering a TEST command that has a test number in the range 100 to 106. For example:

```
>>> T 100
```

The KA47 firmware causes the VMB program to load the system test kernel and monitor. The system test monitor determines which TEST command caused it to load. Control then passes to the system test kernel, which defines the appropriate operating environment. You can run the system exerciser in any of the following environments:

- Customer environment
- Digital Services environment
- Manufacturing environment

Table 3–6 gives the predefined system exerciser commands and the test environments in which they run.

Caution

The system exerciser tests, T 102 and T 104, are destructive tests. When you run these tests, the data on the disk drives (excluding the system disk that contains VMS) and the data on the removable media, which are installed in tape drives and diskette drives, are deleted.

Table 3–6 Predefined System Exerciser Tests

Command	Action	Environment	Code
T 100	Runs two passes of the system exerciser.	Customer environment	CU
T 101	Runs two passes of the system exerciser.	Digital Services	CS
T 102	Runs the system exerciser until you press Ctrl/C.	Digital Services	CS
T 103	Runs the system exerciser until you press Ctrl/C.	Manufacturing	MU
T 104	Runs the system exerciser until you press Ctrl/C.	Special[1]	
T 106	Runs the system exerciser on selected tests. The firmware prompts you to choose the tests you want to run.	Digital Services or Manufacturing[2]	

[1]This is a special environment used by Manufacturing.

[2]Use the SET DIAGENV command to put the system in the environment you want (see *CPU Reference Information*, Section 1.11.3).

Figure 3–8 shows a successful system exerciser test.

Figure 3–8 Successful System Exerciser Test

```
>>> T 101
❶                          ❷                          ❸
KA45/47 V1.0   System Test CS                  0 00:00:59
     3    DZ ### ❶
     9    NI #######
    10    SCSI #
    12    COMM #####                                    0
    14    ASYNC #####

***** SYT_DISPLY_SUMRY (('1'=Y), ('0'=N))..................? ❺
```

❶ The CPU name and the version of the console program. The character V indicates the version of the system firmware. The number 1.0 is the release number.

❷ CS is the Digital Services environment (see Table 3–6).

❸ The duration of the test in the format: days hours:minutes:seconds.

❶ A status bar for each device that the system exerciser tests.

❺ A prompt for summary screens (see Section 3.5.2)—Enter 1 to display the summary screens; enter 0 to display the console prompt.

Figure 3–9 shows an unsuccessful system exerciser test.

Figure 3–9 Unsuccessful System Exerciser Test

```
>>> T 101
❶                    ❷                              ❸
KA45/47 V1.0   System Test CS                  0 00:00:59

     3    DZ #
     9    NI #
    10    SCSI #
    12    COMM #                                        0
❹ ❺   ❻    ❼     ❽                    ❾
??  14    ASYNC  40     0305          0 00:01:26

***** SYT_DISPLY_SUMRY (('1'=Y), ('0'=N)) . . . . . . . . . . . . . . . . . ? ❿
```

❶ The CPU name and the version of the console program. The character V indicates the version of the system firmware. The number 1.0 is the release number.

❷ CS is the Digital Services environment (see Table 3–6).

❸ The duration of the test in the format: days hours:minutes:seconds.

❹ Two question marks (??) indicate a hard error, that is, an error that you must correct before booting the system. One question mark (?) indicates a soft error, that is, an error that you do not have to correct before booting the system.

❺ The device number of the failing device.

❻ The device mnemonic of the failing device.

❼ The number of the most suspect FRU.

❽ A device-specific error code (a decimal number, see *CPU Reference Information*, Section 5.3).

❾ The time when the test failure occurred.

❿ A prompt for the summary screens (see Section 3.5.2). Enter 1 to display the summary screens; enter 0 to display the console prompt.

3.5.1 Selective System Exerciser Test (T 106)

In the Digital Services and Manufacturing environments, you can use the command T 106 to select devices that you want to include in the system exerciser test. When you enter this command, the system prompts you to choose if you want to include or exclude any of the devices in the system exerciser. Figure 3–10 is an example of the display that the system exerciser command T 106 produces.

Figure 3–10 Selective System Exerciser Test (T 106) Example

```
>>> T 106

-PRAO
TST DEV - DZ        ? 1
TST DEV - NI        ? 1
TST DEV - SCSI      ? 0
TST DEV - COMM      ? 0
TST DEV - ASYNC     ? 1
```

In Figure 3–10, you must enter 1 or 0 after each prompt. Enter 1 to include the device in the system exerciser test; enter 0 to exclude it. In Figure 3–10, the system exerciser runs on the devices DZ, NI, and ASYNC.

Note

When you run test T 106 and if you do not include the DZ test, you cannot press Ctrl/C to stop the test. When a console terminal is connected to MMJ port 3, you can press the Break key to stop the test. When a console terminal is connected to MMJ port 0, you can press the Halt button on the back of the system unit to stop the test.

When the test is finished, you can enter the SHOW ESTAT command to display the summary screens that test T 106 generated.

3.5.2 Summary Screens

The system exerciser generates summary screens that show the progress or results of the most recent system exerciser test. The system displays a summary screen when one of the following conditions is satisfied:

- When the system exerciser test completes and you choose to view the summary screens
- When you press Ctrl/C to interrupt a system exerciser test and you choose to view the summary screen
- When you enter the command SHOW ESTAT (see *CPU Reference Information*, Section 1.12.7)

The summary screens are displayed in the order in which the tests were performed. When the system exerciser test is complete, it displays a prompt at the bottom of the screen as follows:

```
***** SYT_DISPLY_SUMRY (('1'=Y), ('0'=N)).................. ?
```

Enter 1 to view the first summary screen or 0 to display the console prompt.

Figure 3–11 is an example of a summary screen for the DZ test that was performed during a system exerciser test. The summary screen formats of the individual tests are the same in all test environments.

Figure 3–11 Summary Screen for System Exerciser DZ Test

```
                    ❶          ❷          ❸
********** FST EXT_ERRPT   3DZ      0 00:01:25 **********
   ❹    ❺       ❻          ❼            ❽
  Line  L_Param  Chr_Xmt   Chr_Rec         Error
  ----  -------  --------  --------  ----------------------

    0           00000780  00000780  ***** No Err    *****
    1           00000780  00000780  ***** No Err    *****
    2           00000780  00000780  ***** No Err    *****
    3           00000000  00000000  *Not Tstd - Cons_lin*
```

```
********** SYSTST_NXT_SCR ((' (('1'=Y), ('0'=N)).......  ? ❾
```

❶ Summary screen identifier.

❷ Test number and mnemonic.

❸ The time taken to complete the test.

❹ The number of the line being tested as follows:

- 0 represents MMJ port 0
- 1 represents MMJ port 1
- 2 represents asynchronous modem control port 2
- 3 represents MMJ port 3

❺ The communication line parameters (displayed only when an error occurs).

❻ The number of characters transmitted.

❼ The number of characters received.

❽ A comment denoting the type of error.

❾ A prompt for the next summary screen. Enter 1 to display the next summary screen; enter 0 to display the console prompt.

Figure 3–12 is an example of a summary screen for the NI test that was performed during a system exerciser test.

Figure 3–12 Summary Screen for System Exerciser NI Test

```
                    ❶        ❷          ❸
********** FST EXT_ERRPT   9NI      0 00:01:35 **********

********** SYSTST_NXT_SCR (('  (('1'=Y), ('0'=N)).......... ? ❶
```

❶ Summary screen identifier.

❷ Test number and mnemonic.

❸ The time taken to complete the test.

❶ A prompt for the next summary screen. Enter 1 to display the next summary screen; enter 0 to display the console prompt.

Figure 3–13 is an example of a summary screen for the SCSI test that was performed during a system exerciser test.

Figure 3–13 Summary Screen for System Exerciser SCSI Test

```
                    ❼        ❷          ❸
********** FST EXT_ERRPT  10SCSI      0 00:01:31 **********
❶    ❺       ❻       ❼   ❽  ❾   ❿  ⓫   ⓬        ⓭
ADR   RDS      WRTS    ERR FRU CMD  PHS INF LBNSTRT  XFERSIZ
--- -------- -------- --- --- ---- --- --- -------- -------
1/0 00010987 00000000
3/0 00005643 00005643                  36    1378      119
4/0 00000028 00000028 160 150  28    1
-------------------------------------------------------------

********** SYSTST_NXT_SCR (('  (('1'=Y), ('0'=N)) ..... ? ⓮
```

❶ Summary screen identifier.

❷ Test number and mnemonic.

❸ The time taken to complete the test.

❶ The SCSI ID and the logic unit number of each device.

❺ The number of read operations (decimal) performed on each device.

❻ The number of write operations (decimal) performed on each device.

❼ The error code (hexadecimal).

❽ The field replaceable unit number.

❾ The SCSI command (hexadecimal) that was executing at the time of failure.

❿ The SCSI bus phase (hexadecimal) at the time of failure.

⓫ Error information code (see *CPU Reference Information*, Section 3.9.1).

⓬ The starting logical block-number of the data transfer that failed.

⓭ The size (in blocks) of the data transfer that failed.

⓮ A prompt for the next summary screen—Enter 1 to display the next summary screen; enter 0 to display the console prompt.

Figure 3–14 is an example of a summary screen for the COMM test that was performed during a system exerciser test.

Figure 3–14 Summary Screen for System Exerciser COMM Test

```
                    ❶        ❷          ❸
********** FST EXT_ERRPT  12COMM      0 00:01:29 **********

    COMM Test Summary Screen.....................
❹   ----❺---------❻---------❼-------------------
CH1 TX:00000030 RX:00000030 ERR:00000000
CH2 TX:00000030 RX:00000030 ERR:00000000
CH3 TX:0000000C RX:0000000C ERR:00000000
    ---------------------------------------------
    COMM Test Status Block  .....................
FRU: 0014  FTY: 0006 ❽
CSR: 0A04  STA: 0001
HWV: 0003  SWV: 000D
CC1: 0000  CC2: 0000
MOD: 0001  CNT: 0002
CHN: 0002  SEL: 0003
PROT:0002  SCM: F0C2
AHI: 0002  ALO: 4000
BPS: 5214  SIZ: 0008
EXP: 0000  ACT: 0000
    ---------------------------------------------

********** SYSTST_NXT_SCR (('  (('1'=Y), ('0'=N)).......  ? ❾
```

❶ Summary screen identifier.

❷ Test number and mnemonic.

❸ The time taken to complete the test.

❹ The number of the channel being tested as follows:

- CH1 corresponds to synchronous port 1.
- CH2 corresponds to synchronous port 0.
- CH3 is not used.

❺ The number of transmit operations performed on each channel.

❻ The number of receive operations performed on each channel.

❼ The number of errors detected on each channel.

❽ The contents of relevant status registers.

❾ A prompt for the next summary screen—Enter 1 to display the next summary screen; enter 0 to display the console prompt.

Figure 3–15 is an example of a summary screen for the ASYNC test that was performed during a system exerciser test.

Figure 3–15 Summary Screen for System Exerciser ASYNC Test

```
                    ❶          ❷              ❸
********** FST EXT_ERRPT  14ASYNC      0 00:02:02 **********

    ASYNC Test Summary Screen.....................
    ---------------------------------------------


    ASYNC Test Status Block.......................

FRU: 0028  STA: 0000❹
CSR: 0101  LPR: FF18
EXT: 0000  MOD: 0000
PRT: 0000
BPS: 000F
EXP: 0000  ACT: 0000


    ---------------------------------------------


SYT_EXT_STATUS - PRNT_NXT_SCRN ? ❺
```

❶ Summary screen identifier.

❷ Test number and mnemonic.

❸ The time taken to complete the test.

❹ The contents of relevant status registers.

❺ A prompt indicating that the last summary screen is displayed. Press Return to display the console prompt.

3.5.3 Additional Error Information for System Exerciser Tests

When the system exerciser test is complete, you can get more information about the test using the following command:

```
>>> SHOW ERROR
```

Figure 3–16 is an example of the information that this command displays.

Figure 3–16 Additional Error Information for System Exerciser Tests

```
❶ ❷  ❸     ❹    ❺
?  000   1       NVR  0003

?? 130  10      SCSI  0018
130 000E 00000003 00120012 00180000 FFFF001B 00000000 00000000 FFFFFFFF❻
```

❶ One question mark (?) indicates a soft error, that is, an error that you do not have to correct before you boot the system. Two question marks (??) indicate a hard error, that is, an error that you must correct before you boot the system.

❷ The FRU number of the device that fails.

❸ The device number of the device that fails.

❹ The device mnemonic of the device that fails.

❺ An error code that corresponds to a specific device error.

❻ A line of error information that is related to the test name (or test number on the line immediately preceding it). In the example, the additional error information line is related to the SCSI test (test 10). See *CPU Reference Information*, Chapter 3, for information about the formats and meaning of the additional error information for the various tests.


СНАР 4

4

Testing and Troubleshooting

This chapter describes how to troubleshoot a MicroVAX 3100 system that uses the KA47 CPU module. It gives information on the following:

- General troubleshooting information
- No display on the console terminal
- NVR test (test 1)
- DZ test (test 3)
- CACHE test (test 4)
- MEM test (test 5)
- FPU test (test 6)
- IT test (test 7)
- SYS test (test 8)
- NI test (test 9)
- SCSI test (test 10)
- COMM test (test 12)
- ASYNC test (test 14)
- Power supply troubleshooting procedures

4.1 General Troubleshooting Information

You perform troubleshooting procedures while the system is in console mode, that is, while the operating system software is in a halt state. The troubleshooting procedures are based on the diagnostic test firmware provided with the system. When you turn on the system, it runs the power-up test and initialization. This test runs the individual diagnostic tests that check the various components in the system. Table 4–1 lists the diagnostic tests and the FRUs on which each diagnostic test focuses.

The system runs the power-up test and initialization automatically when you turn on the system. If the power-up and initialization test fails, follow these steps:

1. Read the console terminal display or read the code on the LED display (see *CPU Reference Information*, Chapter 6).
2. Note the test number and mnemonic of the failing device or use the LED code that you read during step 1 to identify the test number and mnemonic of the failing device (see Table 4–1).
3. See Table 4–1 for a reference to a section in this chapter that provides the testing and troubleshooting information for the failing device.

The testing and troubleshooting procedures that Table 4–1 references, describe the procedures for isolating a fault to FRU level.

In general, it is recommended that you run the individual self-test (see Section 3.3) on the failing device when the system is in the Digital Services environment.

Note

You must connect a loopback connector (29-24795-00) to the asynchronous modem control port 2 before you can put the system in the Digital Services environment.

To put the system in the Digital Services environment, enter the following command at the console prompt:

```
>>> SET DIAGENV 2
```

CPU Reference Information, Section 1.11.3, lists all the test environments. In the Digital Services environment, you must use loopback connectors, terminators, or test media to run certain tests successfully. The sections that Table 4–1 references describe the requirements of each test.

For more comprehensive testing and to check the interaction of devices in the system, you can run the system exerciser (see Section 3.5). The system exerciser is also useful for troubleshooting intermittent errors in the system.

Table 4–1 Troubleshooting Procedures

Failing Test	Device Mnemonic	LED Display Indication	Most Suspect FRUs	Section Reference
1	NVR	0001 xxxx [1]	CPU module	4.3
3	DZ	0011 xxxx	CPU module	4.4
4	CACHE	0100 xxxx	CPU module	4.5
5	MEM	0101 xxxx	MS44 or MS44L memory option	4.6
			CPU module	4.6
6	FPU	0110 xxxx	CPU module	4.7
7	IT	0111 xxxx	CPU module	4.8
8	SYS	1000 xxxx	CPU module	4.9
9	NI	1001 xxxx	CPU module	4.10
10	SCSI	1010 xxxx	RZ2* [2] disk drive	4.11
			TZ30 tape drive	4.11
			TZK10 tape drive	4.11
			RX26 diskette drive	4.11
			RRD42 CDROM drive	4.11
			CPU module	4.11
12	COMM	1100 xxxx	DSW41 or DSW42 synchronous communications option	4.12
			CPU module	4.12
14	ASYNC	1110 xxxx	DHW41 or DHW42 asynchronous communications option	4.13
			CPU module	4.13

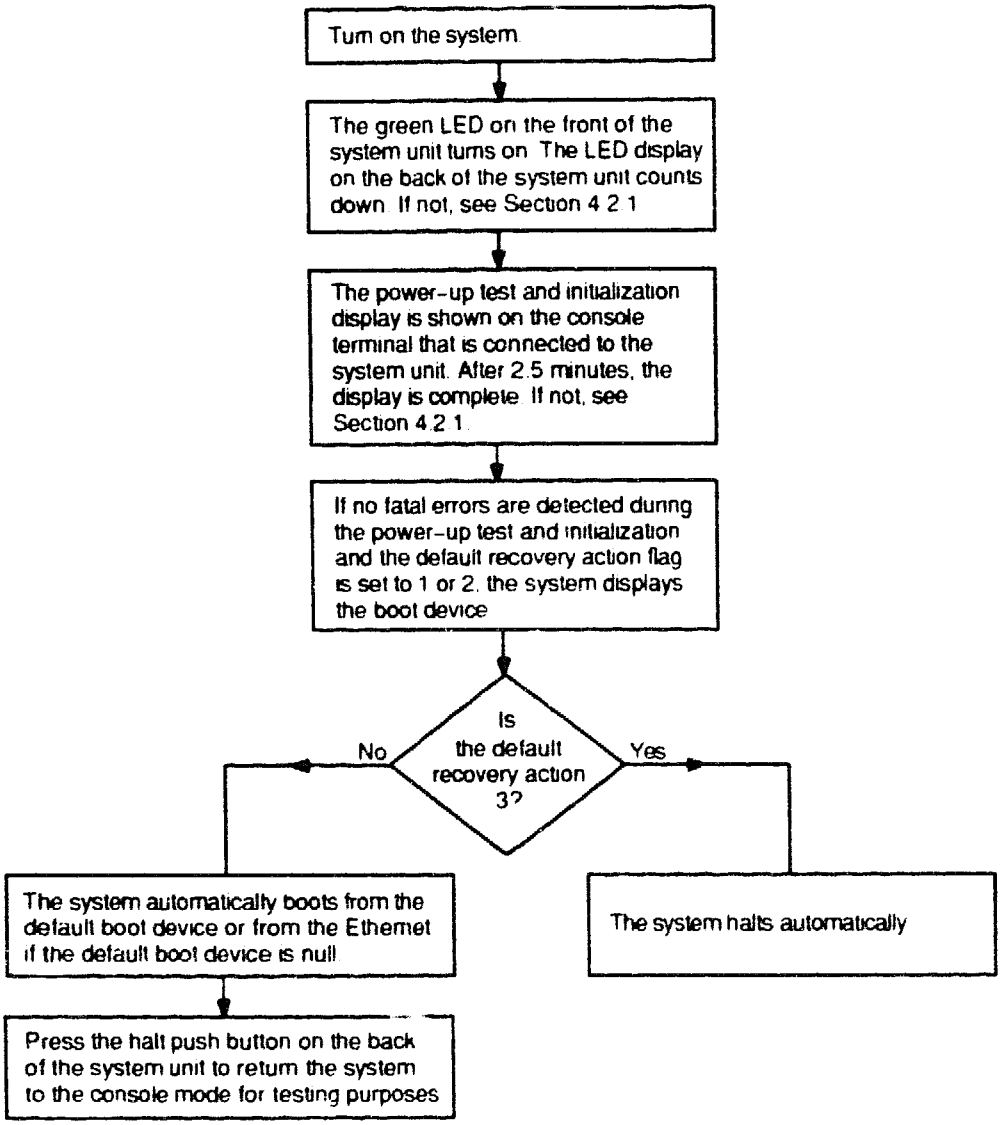
[1] xxxx represents device-specific codes.

[2] This device can be RZ23L, RZ24, or RZ25.

4.2 No Display on the Console Terminal

Figure 4–1 shows the sequence of events that occurs when you turn on the system. Follow the procedure in Section 4.2.1 if the console terminal does not show any display.

Figure 4–1 Flowchart for Normal System Power-Up



4.2.1 Troubleshooting Procedure

Follow these steps to locate the failing FRU:

1. Ensure that the terminal is properly connected to the system unit. Make sure that the terminal is on. The LED indicator on the terminal turns on when the terminal is turned on. Check the terminal setup. The correct setup values for the terminal are as follows:

   - DEC423 operation

- Transmit = Receive = 9600 baud
- Eight bits
- One stop bit
- No parity

If you do not know how to change the terminal setup, see the terminal documentation. Turn the brightness control until the raster scan is shown on the terminal display. When the terminal does not display a raster scan, see the terminal troubleshooting documentation.

2. Turn off the system unit. Check the position of the break/enable switch on the back of the system unit. The switch must be set to the down position before you turn on the system if you want to use the terminal that is connected to MMJ port 0 as the console device. Ensure that the switch is in the up position before you turn on the system if you want to use the terminal connected to MMJ port 3 as the console device. Confirm that the terminal does not produce a display when it is connected to either port.

Note

The system reads the position of the break/enable switch only when you turn on the system.

3. Turn on the system unit. Check that the green LED on the front of the system unit is on and that you can hear the sound of the fans operating. If this does not occur, follow the procedure in Section 4.14.
4. Turn off the system unit, and remove the upper and lower drive-mounting shelf combination. See the *BA42-B Enclosure Maintenance* manual for more information.
5. Remove the logic boards of the asynchronous communications options (DHW41 or DHW42) and the synchronous communications options (DSW41 or DSW42) from the CPU module (if connected).
6. Remove the MS44 or MS44L memory modules from connectors 2H, 2L and 3H, 3L on CPU module (if connected). Do not remove the memory modules from the connectors 1H, 1L. This is the basic system memory. The system cannot operate without this memory.

7. Turn on the system. If the terminal produces a display, one of the components that you disconnected is causing the problem. Install the components, one at a time in the order you removed them, and test the system each time. If the terminal does not produce a display, the component that you installed last is the cause of the problem.

   If the terminal does not produce a display, turn off the system unit, replace the CPU module, and go to step 8.

8. Turn on the system unit. When the terminal produces a display, reassemble the system unit.

4.3 NVR Test (Test 1)

The NVR test checks the **nonvolatile RAM** (NVR) and the **time-of-year** (TOY) clock on the CPU module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This NVR test performs the following subtests:

- NVR subtest—This subtest checks the NVR for valid data. When the NVR is not initialized, this subtest checks all NVR locations and initializes the NVR. When the NVR is initialized, this test checks the temporary NVR locations only.
- TOY subtest—This subtest checks that the TOY clock contains a valid time entry. If not, this subtest checks all TOY registers by writing and reading values to the TOY registers.

If the test fails during a power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3), and run the NVR test as an individual self-test. To run the NVR test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 1
```

```
>>> T NVR
```

If the NVR test fails, the LED display on the back of the system unit displays an error code in the range 10 to 11(hexadecimal) (see *CPU Reference Information*, Table 6–2), and the console terminal displays a hard error code as follows:

```
?? 001 1 NVR 0004
```

The error code, 0004(decimal) in this example, indicates a battery fault.

CPU Reference Information, Table 3–1, describes the error codes that the NVR test produces. If this test fails, you must replace the CPU module.

4.4 DZ Test (Test 3)

The DZ test checks the asynchronous MMJ ports 0,1, and 3 and the modem control port (2) on the CPU module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This test performs the following subtests:

- Reset subtest—This subtest resets the DZ chip and sets the communication parameters of the serial lines to their default values. When the device does not reset or the communication parameters of the serial lines cannot be set correctly, this subtest generates an error.
- Polled subtest—This subtest configures the DZ chip in polled mode and checks each serial line in internal loopback mode.
- Interrupt subtest—This subtest configures the DZ chip in interrupt mode and checks each serial line in internal loopback mode. Interrupts are enabled and characters are transmitted on all serial lines excluding the serial line that the console device uses. The subtest compares the characters returned with the characters transmitted. It signals an error if the characters are not equal.

If the DZ test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3), and run the DZ test as an individual self-test.

Note

In the Digital Services environment, you must connect the H3103 loopback connectors to MMJ ports 0,1, and 3, excluding the port to which the console terminal connects. You must also connect a loopback connector (29-24795-00) to the asynchronous modem control port (2). The test fails if you do not install the loopback connectors.

To run the DZ test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 3
```

```
>>> T DZ
```

If the DZ test fails, the LED display on the back of the system unit displays an error code in the range 30 to 34(hexadecimal) (see *CPU Reference Information*, Table 6–3), and the console terminal displays a hard error code as follows:

```
?? 001 3 DZ 0064
```

The error code, 0064(decimal) in this example, indicates that the polled test failed. *CPU Reference Information*, Table 3–2, describes the error codes that the DZ test produces. To get additional information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.2.1, gives the formats and describes the additional error information that the DZ test produces. The additional error information indicates which serial line is faulty.

To troubleshoot intermittent failures, you can run the system exerciser (see Section 3.5). *CPU Reference Information*, Section 5.1, gives the error messages that the system exerciser produces for this test. If this test fails repeatedly, you must replace the CPU module.

4.5 CACHE Test (Test 4)

The CACHE test checks the cache memory on the CPU module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This test performs the following subtests:

- Data store subtest—This subtest checks the data store of the primary cache memory. The subtest includes read, compare, complement, and write operations in the forward and reverse direction. The subtest accesses the data store through the I/O address space.
- Tag store subtest—This subtest checks the tag store of the primary cache memory. The subtest includes read, compare, complement, and write operations in both the forward and reverse direction. The subtest accesses the tag store through the I/O address space.

If the CACHE test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3) and run the test as an individual self-test.

To run the CACHE test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 4
```

```
>>> T CACHE
```

If the CACHE test fails, the LED display on the back of the system unit displays an error code in the range 41 to 4C(hexadecimal) (see *CPU Reference Information*, Table 6–4), and the console terminal displays a hard error code as follows:

```
?? 001 4 CACHE 0512
```

The error code, 0512(decimal) in this example, indicates that the test failed on a read/write operation to the data store. *CPU Reference Information*, Table 3–4 describes the error codes that the CACHE test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.3.1, gives the formats and describes the additional error information that the CACHE test produces. If this test fails, you must replace the CPU module.

4.6 MEM Test (Test 5)

The MEM test checks the system memory, that is, the memory on the system module and the MS44 or MS44L memory options. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This test performs the following subtests:

- Byte mask subtest—This subtest checks the byte mask signals that the CPU generates. The subtest operates on each page boundary. When the subtest is complete, all free memory locations contain the number AA(hexadecimal).
- Forward pass memory subtest—This subtest includes read, compare, complement, and write operations to all memory locations in the forward direction.
- Reverse pass memory subtest—This subtest includes read, compare, complement, and write operations to all memory locations in the reverse direction.
- Final parity subtest—This subtest fills all the memory locations with the pattern 01h. The subtest then reads the contents of each location and checks that the parity bit is set. If the parity bit of any location is not set, the subtest generates an error. The unused memory locations are set to the pattern 01010101h.

If the MEM test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3), and run the MEM test as an individual self-test. To run the MEM test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 5
```

```
>>> T MEM
```

If the MEM test fails, the LED display on the back of the system unit displays an error code in the range 50 to 54(hexadecimal) (see *CPU Reference Information*, Table 6–5), and the console terminal displays a hard error code as follows:

```
?? 001 5 MEM 0770
```

The error code, 0770(decimal) in this example, indicates that the test failed a comparison check while performing the reverse pass memory test. *CPU Reference Information*, Table 3–5, describes the error codes that the MEM test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.4.1, gives the formats and describes the additional error information that the MEM test produces. The additional error information gives an FRU number that identifies which memory module is faulty.

4.7 FPU Test (Test 6)

The FPU test checks the **floating-point unit** (FPU) on the CPU module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. The FPU test performs instruction tests on the FPU. If an instruction produces unexpected results or an exception occurs during the execution of an instruction, this test generates an error. If the FPU test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3) and run the FPU test as an individual self-test. To run the FPU test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 6
```

```
>>> T FPU
```

If the FPU test fails, the LED display on the back of the system unit displays the error code 60(hexadecimal), and the console terminal displays a hard error code as follows:

```
?? 001 6 FPU 0258
```

The error code, 0258(decimal) in this example, indicates that the test failed during the MOVF instruction. *CPU Reference Information*, Table 3–7, describes the error codes that the FPU test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.5.1, gives the format and description of the additional error information that the FPU test produces. If the FPU test fails, replace the CPU module.

4.8 IT Test (Test 7)

The IT test checks the interval timer (IT) on the CPU module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. The IT test enables interval timer interrupts. If there are too many or too few interrupts within a 30 millisecond (ms) interval, the test generates an error.

If the IT test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3) and run the IT test as an individual self-test. To run the IT test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 7
```

```
>>> T IT
```

If the IT test fails, the LED display on the back of the system unit displays the error code 70(hexadecimal) and the console terminal displays a hard error code as follows:

```
?? 001 7 FPU 0002
```

The error code, 0002(decimal) in this example, indicates that the test failed because the IT is not interrupting at the correct rate. *CPU Reference Information*, Table 3–7, describes the error code that the IT test produces. Additional error information is not available for this test. If the IT test fails, replace the CPU module.

4.9 SYS Test (Test 8)

The SYS test checks the system ROMs and the invalidate filter RAM on the CPU module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This test performs two subtests as follows:

- System ROM subtest—This subtest checks each byte of the system ROMs to ensure that they contain the correct Manufacturing check data and the correct checksum.
- Filter RAM subtest—This subtest performs two passes on the invalidate filter RAMs. The subtest detects address locations that cannot be changed and data faults.

If the SYS test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3) and run the SYS test as an individual self-test. To run the SYS test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 8
```

```
>>> T SYS
```

If the SYS test fails, the LED display on the back of the system unit displays an error code in the range 80 to 82(hexadecimal) (see *CPU Reference Information*, Table 6–6), and the console terminal displays a hard error code as follows:

```
?? 001 8 SYS 0128
```

The error code, 0128(decimal) in this example, indicates that the test failed the invalidate filter RAM subtest. *CPU Reference Information*, Table 3–10, describes the error code that the SYS test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.7.1, gives the format and describes the additional error information that the SYS test produces. If the SYS test fails, replace the CPU module.

4.10 NI Test (Test 9)

The NI test checks the network interconnection circuitry on the system module. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This test performs nine subtests as follows:

- Network address ROM subtest—This subtest checks the 32-byte network address ROM, which contains the unique 6-byte network address, a 2-byte checksum, and the test data type. The subtest checks for a null or multicast address, calculates and compares the checksums, and verifies the test data bytes.
- LANCE register subtest—This subtest checks the address and data paths to the LANCE **register address port** (RAP) and the **register data port** (RDP) for each of the four **control status registers** (CSRs).
- LANCE initialization subtest—This subtest sets up the LANCE data structures and initializes the LANCE chip, which causes the LANCE circuit to perform a single word DMA read operation on the system memory.

- LANCE internal loopback subtest—This subtest verifies the correct operation of the LANCE transmit and receive circuitry in internal loopback mode. The subtest also verifies burst-mode DMA read and DMA write operations on non-word-aligned data buffers for data packets of varying length and different data patterns.
- LANCE interrupt subtest—This subtest enables, forces, and services the LANCE interrupts for initialization, transmission, and reception in internal loopback mode.
- LANCE CRC subtest—This subtest checks the LANCE **character recognition code** (CRC) generation during data transmission. The subtest also performs incorrect CRC detection during data reception in internal loopback mode.
- LANCE receive MISS/BUFF subtest—This subtest checks the LANCE circuits for any missed data packets and buffer errors during a data reception in internal loopback mode.
- LANCE collision subtest—This subtest verifies a collision detection and retry activity during a data transmission in the internal loopback mode.
- LANCE address filtering subtest—This subtest checks the LANCE receiver address filtering for the broadcast, promiscuous, and null destinations in the internal loopback mode.

If the NI test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3) and run the NI test as an individual self-test.

Note

1. When the network select switch is set for a ThinWire Ethernet operation, the NI test generates an error if you do not connect the system to a ThinWire Ethernet network or install the ThinWire Ethernet T-connector and terminators.
2. When the network select switch is set for a standard Ethernet operation, the NI test generates an error if you do not connect the system to a standard network or install the standard Ethernet loopback (12-22196-01).

To run the NI test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 9
```

```
>>> T NI
```

If the NI test fails, the LED display on the back of the system unit displays an error code in the range 90 to 9B(hexadecimal) (see *CPU Reference Information,* Table 6–7), and the console terminal displays a hard error code as follows:

```
?? 001 9 NI 0166
```

The error code, 0166(decimal) in this example, indicates that the test produced a packet comparison failure in the external loopback mode. *CPU Reference Information,* Table 3–11, describes the error codes that the NI test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.8.1, gives the format and describes the additional error information that the NI test produces. If the NI test fails and the system is connected to a network, disconnect the system from the network, and connect either the ThinWire Ethernet terminators or the standard loopback connector depending on the type of network to which the system connects.

Run the NI test again. If the system passes the NI test, something in the network is causing the problem; contact the network co-ordinator. If the system fails the NI test, replace the CPU module.

To troubleshoot intermittent failures, you can run the system exerciser (see Section 3.5). The system exerciser runs this test when testing the interaction of components in the system. *CPU Reference Information,* Section 5.2, gives the error messages that the system exerciser produces for this test. If this test fails repeatedly, replace the CPU module.

4.11 SCSI Test (Test 10)

The SCSI test checks the SCSI controller on the CPU module and its interface with all the SCSI devices on the SCSI bus. This test runs automatically as part of the power-up test and initialization when you turn on the system. The SCSI test performs three subtests as follows:

- Register subtest—This subtest verifies that the SCSI controller registers are fully operational.

- Interrupt subtest—This subtest checks the SCSI bits in the interrupt mask register, the interrupt request register, and the interrupt clear register. The subtest forces a SCSI interrupt when the SCSI bit in the interrupt mask is set to 1, then set to 0. The subtest repeats this operation for both high-priority interrupts and low-priority interrupts.
- Data transfer subtest—This subtest verifies the SCSI bus communication between the SCSI controller and SCSI devices on the SCSI bus. It also checks the data path between the SCSI controller, the system chip (S-chip), and memory. The subtest issues four inquiry commands to each SCSI device in four different modes as follows:
  - Programmed input/output mode
  - Asynchronous mode with DMA
  - Asynchronous mode with DMA, starting on a nonword-aligned boundary and crossing a page boundary
  - Synchronous mode with DMA

If the test fails during the power-up test and initialization, put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3), and run the SCSI test as an individual self-test.

To run the SCSI test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 10
```

```
>>> T SCSI
```

If the SCSI test fails, the LED display on the back of the system unit displays an error code in the range A0 to A5(hexadecimal) (see *CPU Reference Information*, Table 6–8), and the console terminal displays a hard error code as follows:

```
?? 150 10 SCSI 0050
```

The error code, 0050(decimal) in this example, indicates that the SCSI minimal device test failed. *CPU Reference Information*, Table 3–12, describes the error codes that the SCSI test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.9.1, gives the format and describes the additional error information that the SCSI test produces. If the SCSI test fails, the problem may be the CPU module or one of the SCSI devices connected to the SCSI bus.

Note

In the Digital Services environment, you must install test media in the removable media devices.

Enter the command SHOW DEVICE (see *CPU Reference Information*, Section 1.12.4) or SHOW CONFIG (see *CPU Reference Information*, Section 1.12.3) to check that the SCSI controller on the CPU module acknowledges all the SCSI devices on the SCSI bus. If the display does not show all the SCSI devices in the system, check the following:

- Each SCSI device has a unique SCSI ID. See Table 2–3 for the recommended SCSI ID numbers for devices.
- The internal power cable and the internal SCSI cable are correctly connected to each internal SCSI device.
- The power cable and the SCSI cable are correctly connected to each external SCSI device.

When you are sure that all the SCSI devices have unique SCSI IDs and that the cables are connected correctly, run the SCSI test again. When the SCSI controller acknowledges all the SCSI devices on the SCSI bus, but the fault persists, disconnect any external SCSI devices from the system unit, and connect the SCSI terminator to the SCSI port.

Run the SCSI test again. When the test passes, the fault is in one of the external devices connected to the system unit or the last SCSI device on the SCSI bus is not terminated correctly.

Run the SCSI test. If the test fails, replace the CPU module. When the test passes, reconnect the internal SCSI cable to the CPU module.

Run the SCSI test again. If the test passes, the internal SCSI cable or the connection to the CPU module is faulty. If the test fails, enter the command SHOW ERROR (see *CPU Reference Information*, Section 1.12.6) to get more information about the SCSI error. *CPU Reference Information*, Section 3.9.1, gives the format and description of the additional error information that the SCSI test produces. The additional error information gives you the SCSI ID of the failing SCSI device. The SCSI ID also indicates the type of failing SCSI device. Table 4–2 lists the subsections in this chapter that describe the troubleshooting procedures for each type of SCSI device.

Table 4–2 SCSI Device Troubleshooting Procedures

SCSI Device Type	Section
RRD42 CDROM drive	4.11.1
RX26 diskette drive	4.11.2
RZ23L, RZ24, RZ25 disk drives	4.11.3
TZ30 tape drive	4.11.4
TZK10 tape drive	4.11.5
External SCSI devices	4.11.6

To perform a more comprehensive test on the SCSI devices, put the system in the Digital Services environment (see Section 3.3.2.2), and enter the following command:

```
>>> T 106
```

The system prompts you for the devices you want to test (see Section 3.5.1). Select the SCSI device you want to test. If the test is successful, the display shows the following:

```
10 SCSI #
```

If the test is not successful, the display shows the following:

```
?? 10   SCSI  150    0160        8:18:41
```

The error code, 0160(decimal) in this example, indicates a device test failure. *CPU Reference Information*, Table 5–4, describes the error codes that the system exerciser produces for the SCSI test.

The system exerciser generates a summary screen. When the test completes, press Return to display the summary screen. Section 3.5.2 gives examples of the summary screens that the system exerciser generates. The system exerciser summary screen shows which SCSI device is faulty. Replace the faulty SCSI device.

4.11.1 Troubleshooting an RRD42 CDROM Drive

The RRD42 CDROM drive is a single FRU. When the SCSI test (test 10) isolates the fault to an RRD42 CDROM drive, you must replace the RRD42 CDROM drive (RRD42-AA). See the *BA42-B Enclosure Maintenance* manual for information about removing and replacing FRUs.

4.11.2 Troubleshooting an RX26 Diskette Drive

When the SCSI test (test 10) isolates the fault to an RX26 diskette drive, you must identify the faulty FRU. The RX26 diskette drive contains three FRUs:

1. SCSI/FDI board (54-20764-02)
2. RX26 diskette drive unit (RX26-AA)
3. RX26 ribbon cable (17-00285-00)

To identify the faulty FRU, replace each FRU in turn, in the order shown previously, and run the SCSI test (test 10) again until the test passes. See the *BA42-B Enclosure Maintenance* manual for information about removing and replacing FRUs. The last FRU that you replace is the faulty FRU.

4.11.3 Troubleshooting an RZ23L, an RZ24, or an RZ25 Disk Drive

The RZ23L, RZ24, and RZ25 disk drives are single FRUs. When the SCSI test (test 10) isolates the fault to an RZ23L, an RZ24, or an RZ25 disk drive, you must replace the disk drive. See the *BA42-B Enclosure Maintenance* manual for information about removing and replacing FRUs.

4.11.4 Troubleshooting a TZ30 Tape Drive

When the SCSI test (test 10) isolates the fault to a TZ30 tape drive, you must identify the faulty FRU. The TZ30 tape drive contains two FRUs:

- Take-up leader (74-34273-01)
- TZ30 tape drive unit (TZ30-AX)

To identify the faulty FRU, inspect the take-up leader for damage. If necessary, replace the take-up leader according to the instructions in the *TZ30 Cartridge Tape Drive Service* manual (EK-OTZ30-SV). If the take-up leader is not damaged or incorrectly aligned, replace the TZ30 tape drive. See the *BA42-B Enclosure Maintenance* manual for information about removing and replacing the FRUs.

4.11.5 Troubleshooting a TZK10 Tape Drive

The TZK10 tape drive is a single FRU. When the SCSI test (test 10) isolates the fault to a TZK10 tape drive, you must replace the TZK10 tape drive (TZK10-AA). See the *BA42-B Enclosure Maintenance* manual for information about removing and replacing the FRUs.

4.11.6 Troubleshooting an External SCSI Device

When the SCSI test (test 10) isolates the fault to an external SCSI device, replace the external SCSI device according to the maintenance information for that device.

4.12 COMM Test (Test 12)

The COMM test checks the operation of the synchronous communications option (DSW41 or DSW42) in the system. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. This test performs eight subtests as follows:

- Subtest 1—This subtest verifys the checksum of the 128K-byte read-only memory (ROM).
- Subtest 2—This subtest checks the 256K-byte static RAM. The operations performed include write, verify, complement, verify.
- Subtest 3—This subtest performs a self-test on the MC68302 processor.
- Subtest 4—This subtest checks the RAM dual access.
- Subtest 5—This subtest checks the electrically programmable read-only memory (EPROM) dual access.
- Subtest 6—This subtest checks that the synchronous communications option can interrupt the system CPU.
- Subtest 7—This subtest checks the host buffer loopback and interrupt. The test transfers data from the CPU to the synchronous communications option, returns it, and waits for an interrupt.
- Subtest 8—This subtest resets the synchronous communications option and waits for an interrupt.

If the COMM test fails during the power-up test and initialization, follow these steps:

1. Disconnect all the external cables from the synchronous communications ports on the back of the system unit.
2. Put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3).

3. Run the COMM test as an individual self-test.

Note

In the Digital Services environment, you must connect one H3199 loopback (DSW41) or two H3199 loopback connectors (DSW42) to the synchronous communications ports on the back of the system unit. The test fails on ports that do not have loopback connectors fitted.

To run the COMM test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 12
```

```
>>> T COMM
```

If the COMM test fails, the LED display on the back of the system unit displays an error code in the range C0 to C8(hexadecimal) (see *CPU Reference Information*, Table 6–9), and the console terminal displays a hard error code as follows:

```
?? 020 12 COMM 0274
```

The error code, 0274(decimal) in this example, indicates that the synchronous communications option diagnostic test did not complete. *CPU Reference Information*, Table 3–15, describes the error codes that the COMM test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.10.2, gives the format and describes the additional error information that the COMM test produces. The system exerciser runs this test when testing the interaction of components in the system. *CPU Reference Information*, Section 5.4, gives the error messages that the system exerciser produces for this test. See Section 4.12.1 to identify the faulty FRU.

4.12.1 Troubleshooting a DSW41 or a DSW42 Synchronous Communications Option

The DSW41 and DSW42 synchronous communications options contain the following FRUs:

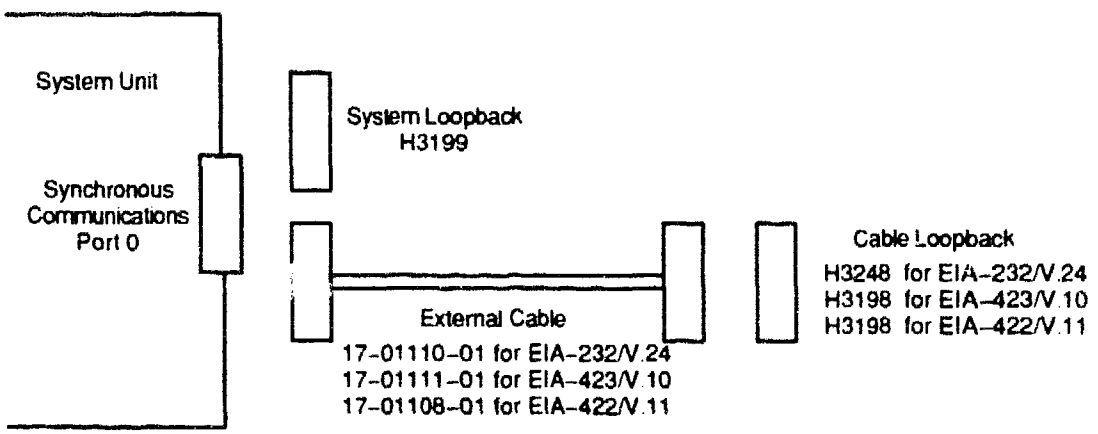
1. Input/output module
2. Logic board
3. Ribbon cable

4. External cables

To identify the faulty FRU, run the COMM test (test 12) repeatedly as an individual self-test, replacing the FRUs, one at a time in the order shown previously, until you find the faulty FRU.

To check the external cables, you can connect cable loopback connectors and run the test again. The external cable loopback connectors that you must connect depend on the communications interface you are using. Figure 4–2 shows the loopback connectors for the different communications interfaces that the DSW41 and DSW42 synchronous communications options support.

Figure 4–2 Cable Loopback Connectors for the DSW41 and DSW42 Options



Note: You must also connect loopback connectors to synchronous communications port 1.

4.13 ASYNC Test (Test 14)

The ASYNC test checks the operation of the asynchronous communications option (DHW41 or DHW42) in the system. This test runs automatically, as part of the power-up test and initialization, when you turn on the system. If the ASYNC test fails during the power-up test and initialization, follow these steps:

1. Disconnect all the external cables from the asynchronous communications ports, which the option provides on the back of the system unit.
2. Put the system in the Digital Services environment (see *CPU Reference Information*, Section 1.11.3).

3. Run the ASYNC test as an individual self-test.

Note

In the Digital Services environment, you must connect loopback connectors to the asynchronous ports on the back of the system unit as follows:

- If a system has one eight-channel data only port, connect a H3101 loopback connector.
- If a system has two eight-channel data only ports, connect two H3101 loopback connectors.
- If a system has one four-channel modem control port, connect a H4081-A loopback connector.
- If a system has two four-channel modem control ports, connect two H4081-A loopback connectors.

To run the ASYNC test as an individual self-test, enter one of the following commands at the console prompt:

```
>>> T 14
```

```
>>> T ASYNC
```

If the ASYNC test fails, the LED display on the back of the system unit displays an error code in the range E0 to EE(hexadecimal) (see *CPU Reference Information,* Table 6–10), and the console terminal displays a hard error code as follows:

```
?? 021 14 ASYNC 1280
```

The error code, 1280(decimal) in this example, indicates that the asynchronous communications option failed the receiver interrupt test. *CPU Reference Information,* Table 3–17, describes the error codes that the ASYNC test produces. To get more information about the error, enter the command:

```
>>> SHOW ERROR
```

CPU Reference Information, Section 3.11.1, gives the formats and describes the additional error information that the ASYNC test produces. If the ASYNC test fails, enter the SHOW ERROR command to get more information about the error. The additional error information indicates which asynchronous communications channel is faulty. See Section 4.13.1 to identify the faulty FRU.

The system exerciser (see Section 3.5) runs this test when testing the interaction of components in the system. *CPU Reference Information*, Section 5.5, gives the error messages that the system exerciser produces for this test.

4.13.1 Troubleshooting a DHW41 or a DHW42 Asynchronous Communications Option

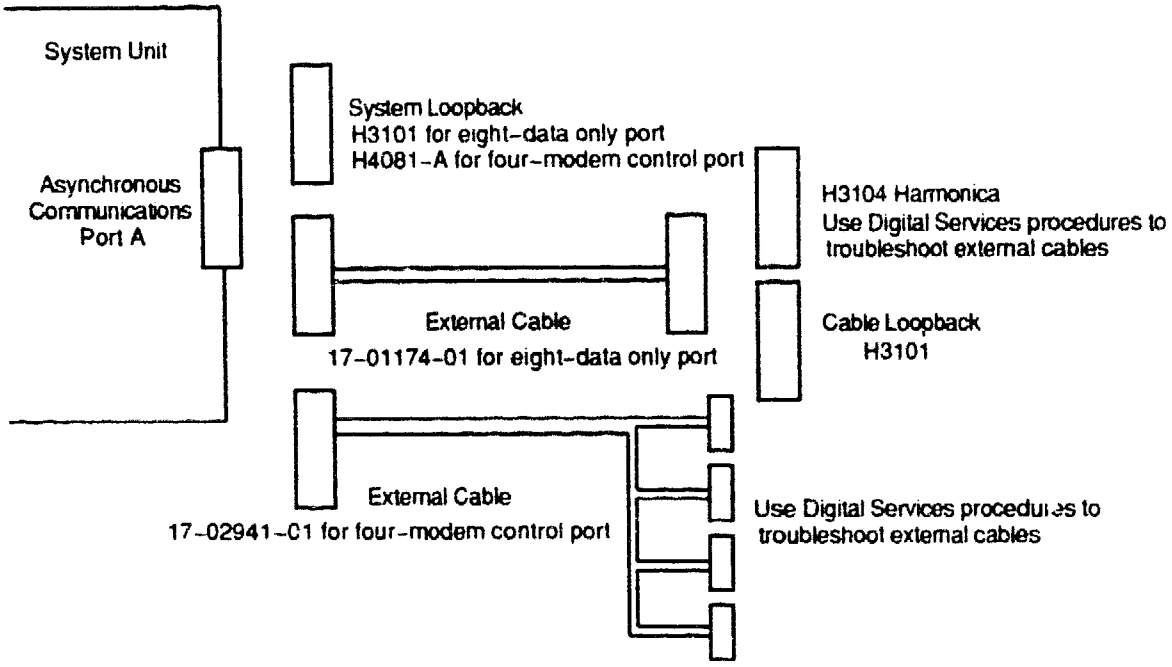
The DHW41 and DHW42 asynchronous communications options contain the following FRUs:

1. Input/output module
2. Logic board
3. Ribbon cable
4. External cables
5. Harmonicas (DHW42-AA, DHW42-BA only)

To isolate the faulty FRU, run the ASYNC test (test 14) repeatedly as an individual self-test, replacing the FRUs, one at a time in the order shown previously, until you find the faulty FRU.

To check the external cables, you can connect cable loopback connectors and run the test again. The external cable loopback connectors that you must connect depend on the communication type (data only or modem control) that you are using. Figure 4–3 shows the loopback connectors for the different communication types that the DHW41 and DHW42 asynchronous communications options support. Use Digital Services procedures to troubleshoot the operation of the harmonicas or the 4-way modem cables.

Figure 4–3 Cable Loopback Connectors for DHW41 and DHW42 Options



Note: You must also connect external cables and loopback connectors to asynchronous communications port B

4.14 Troubleshooting Procedures for the Power Supply

Figure 4–4 is a flowchart for troubleshooting the power supply in a KA47 system.

Figure 4–4 Flowchart for Troubleshooting the Power Supply

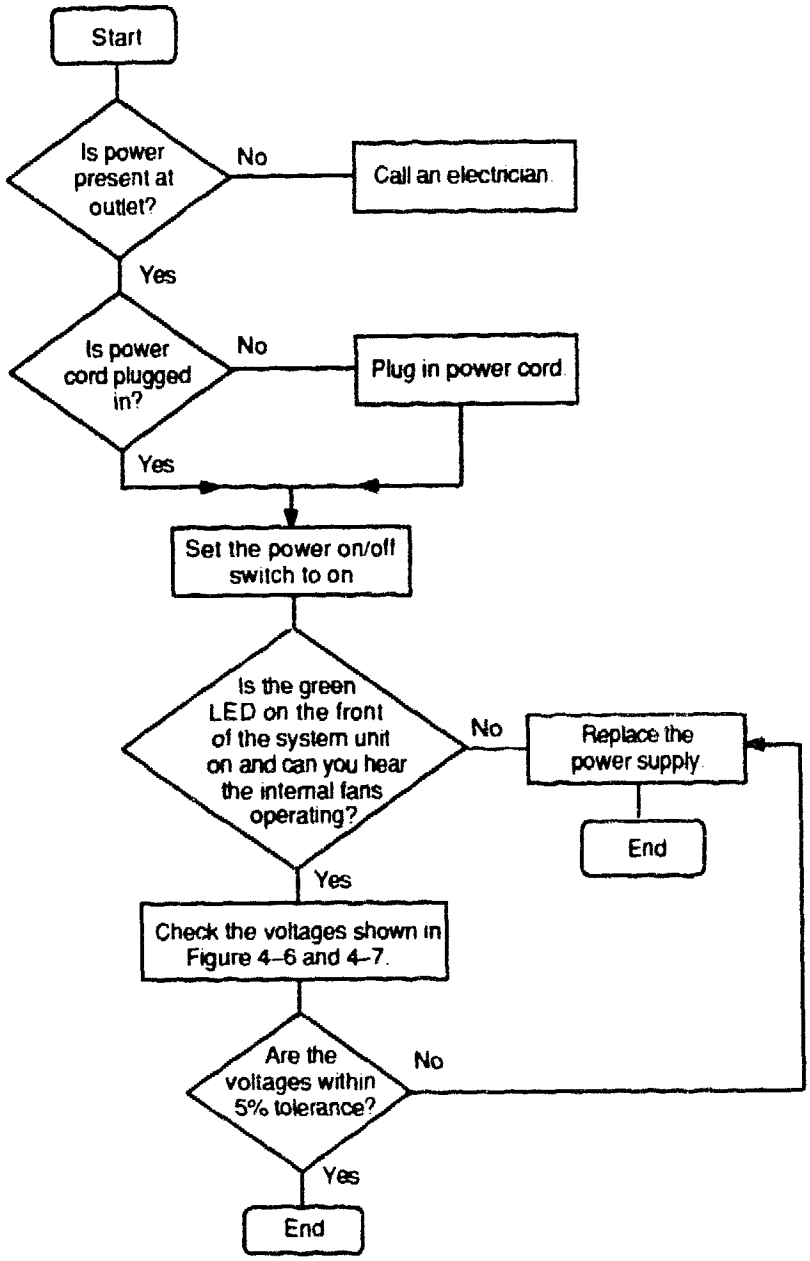
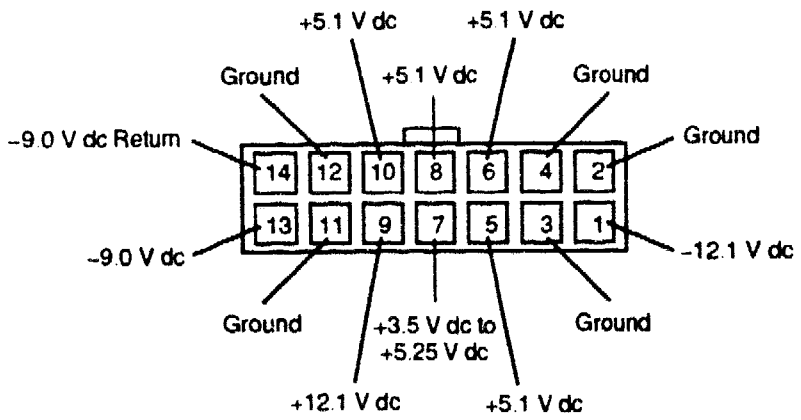


Figure 4–5 shows the voltages on the pins of the power connector (see Figure 1–3), which is next to the ThinWire Ethernet connector on the KA47 CPU module. See the *BA42-B Enclosure Maintenance* manual for more information on power distribution.

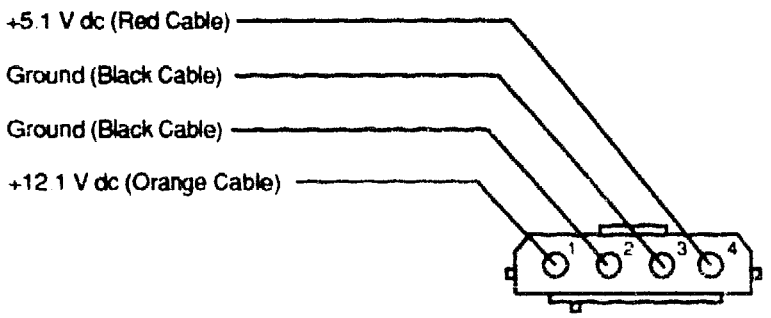
Figure 4–5 KA47 CPU Module Power Connector Pin Voltages

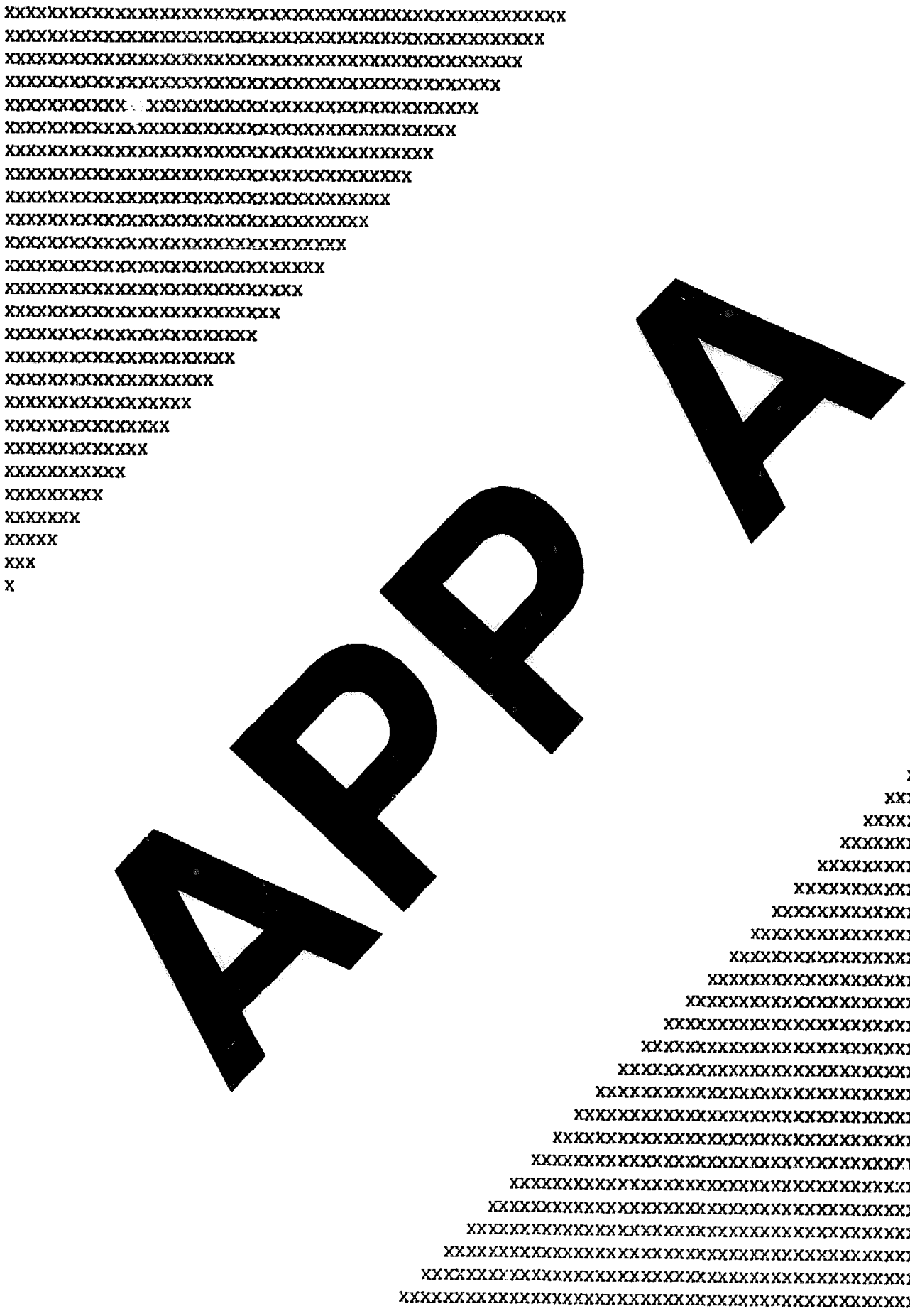


Note: The -9.0 V dc supply is an isolated supply.

Figure 4–6 shows the voltages on the pins of the connectors on the power cables that provide power to the internal mass storage device. See the *BA42-B Enclosure Maintenance* manual for more information on power distribution.

Figure 4–6 Drive Power Connector Pin Voltages



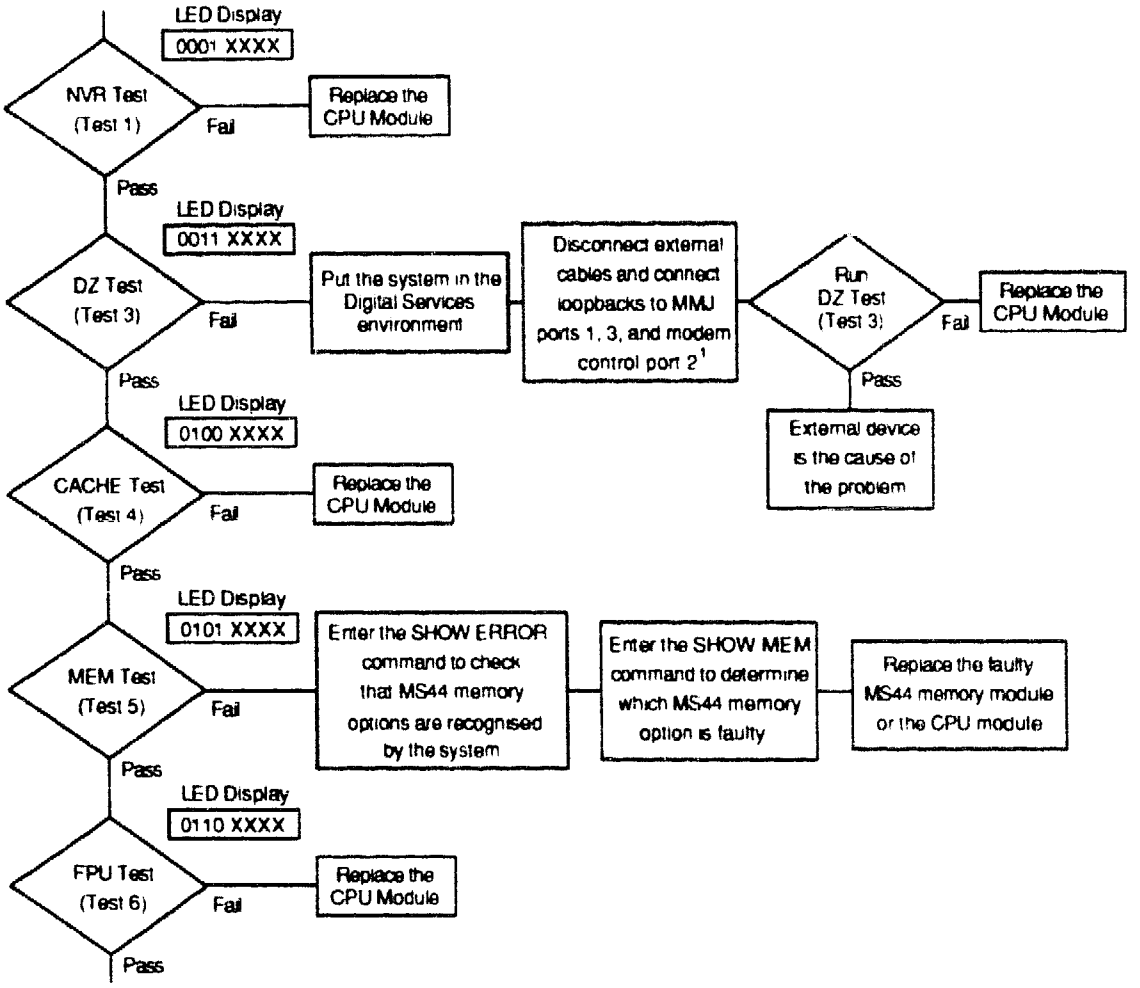

APP A

A

Troubleshooting Flowchart

This appendix shows a flowchart of the procedure used to troubleshoot KA47 systems.

Figure A–1 Troubleshooting Flowchart (Page 1 of 4)



[1] This assumes that the console terminal is connected to MMJ port 0.

Figure A–2 Troubleshooting Flowchart (Page 2 of 4)

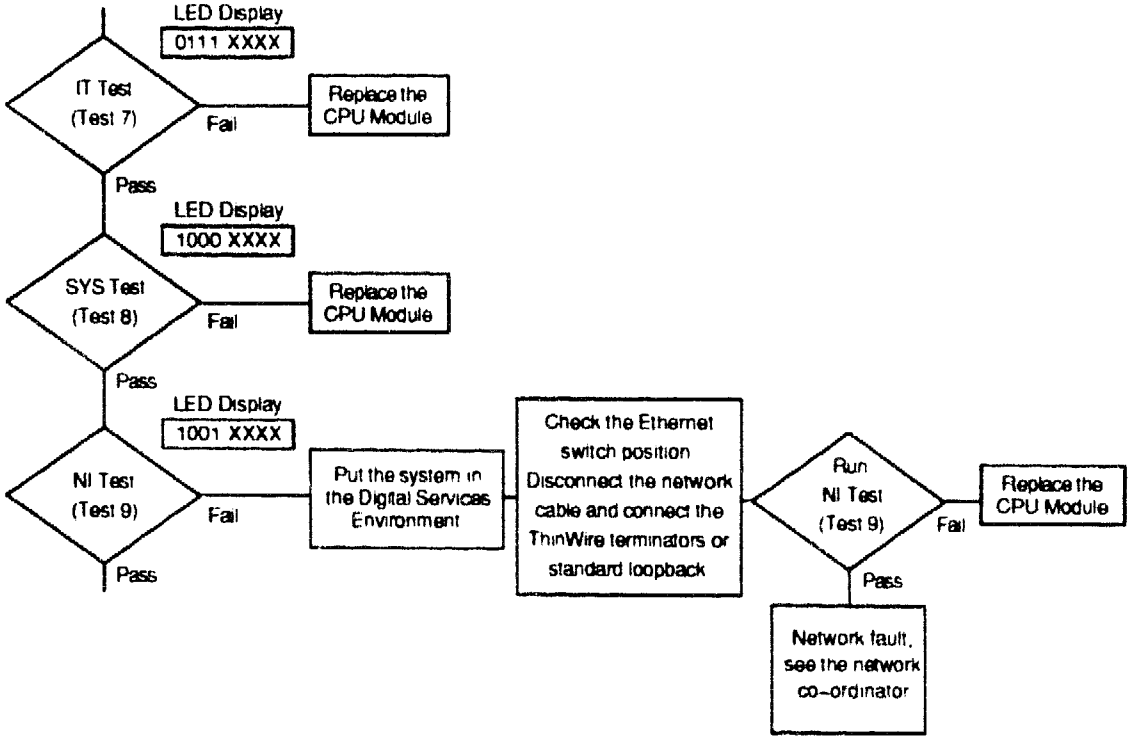


Figure A–3 Troubleshooting Flowchart (Page 3 of 4)

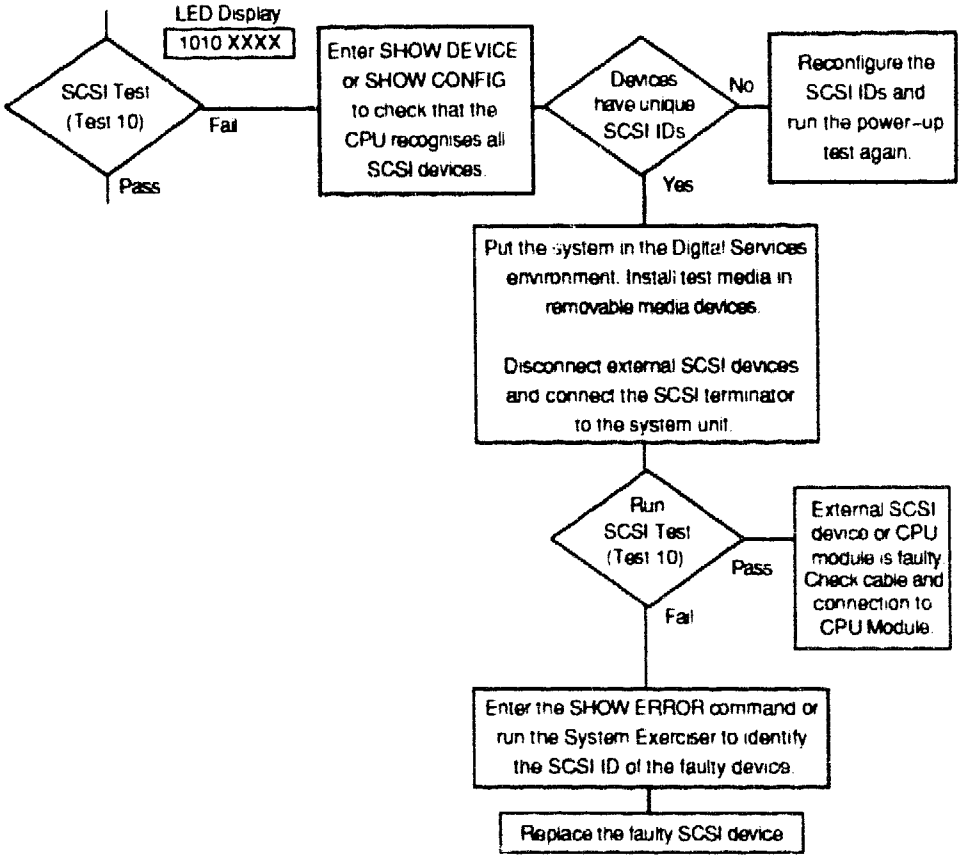
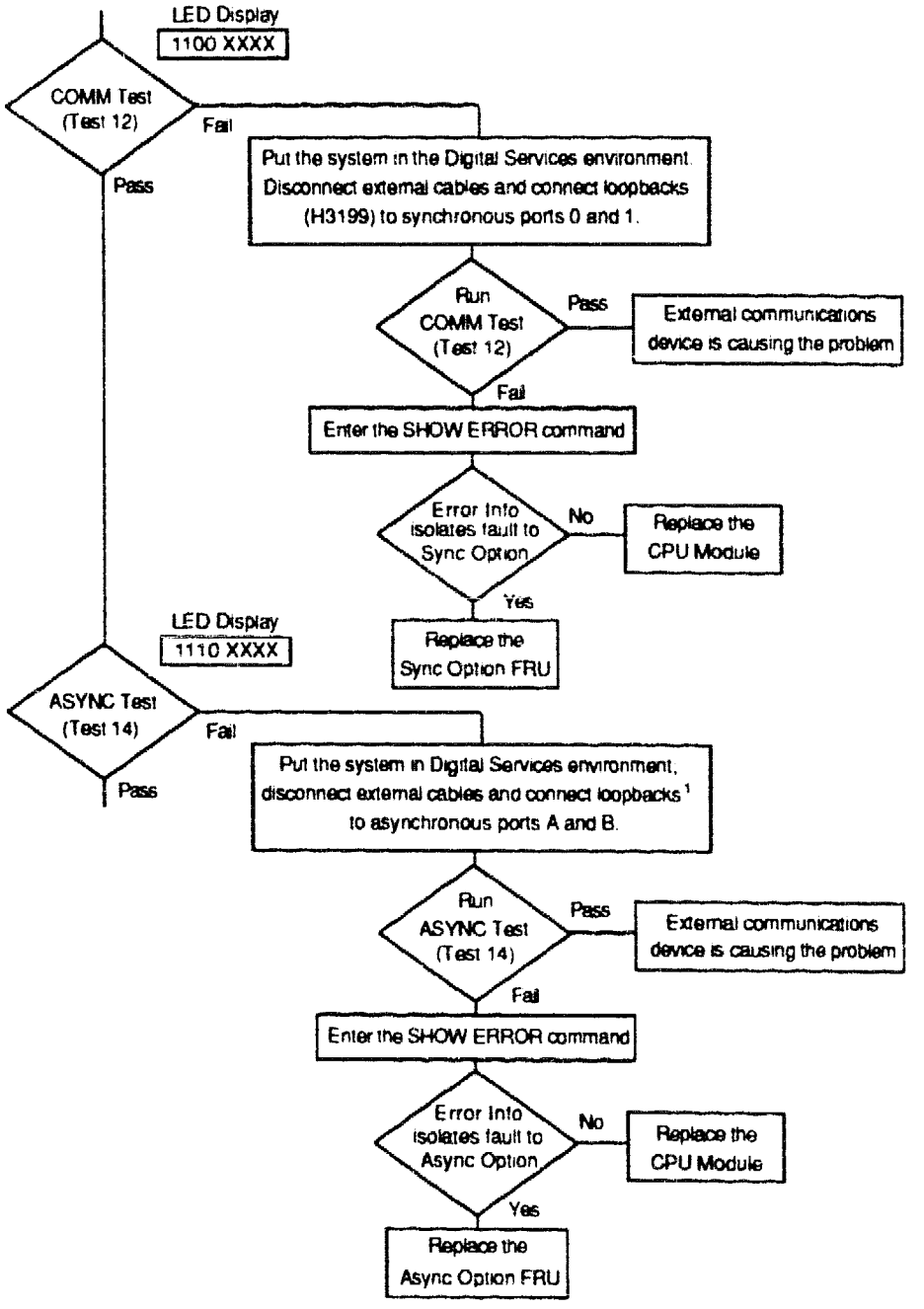
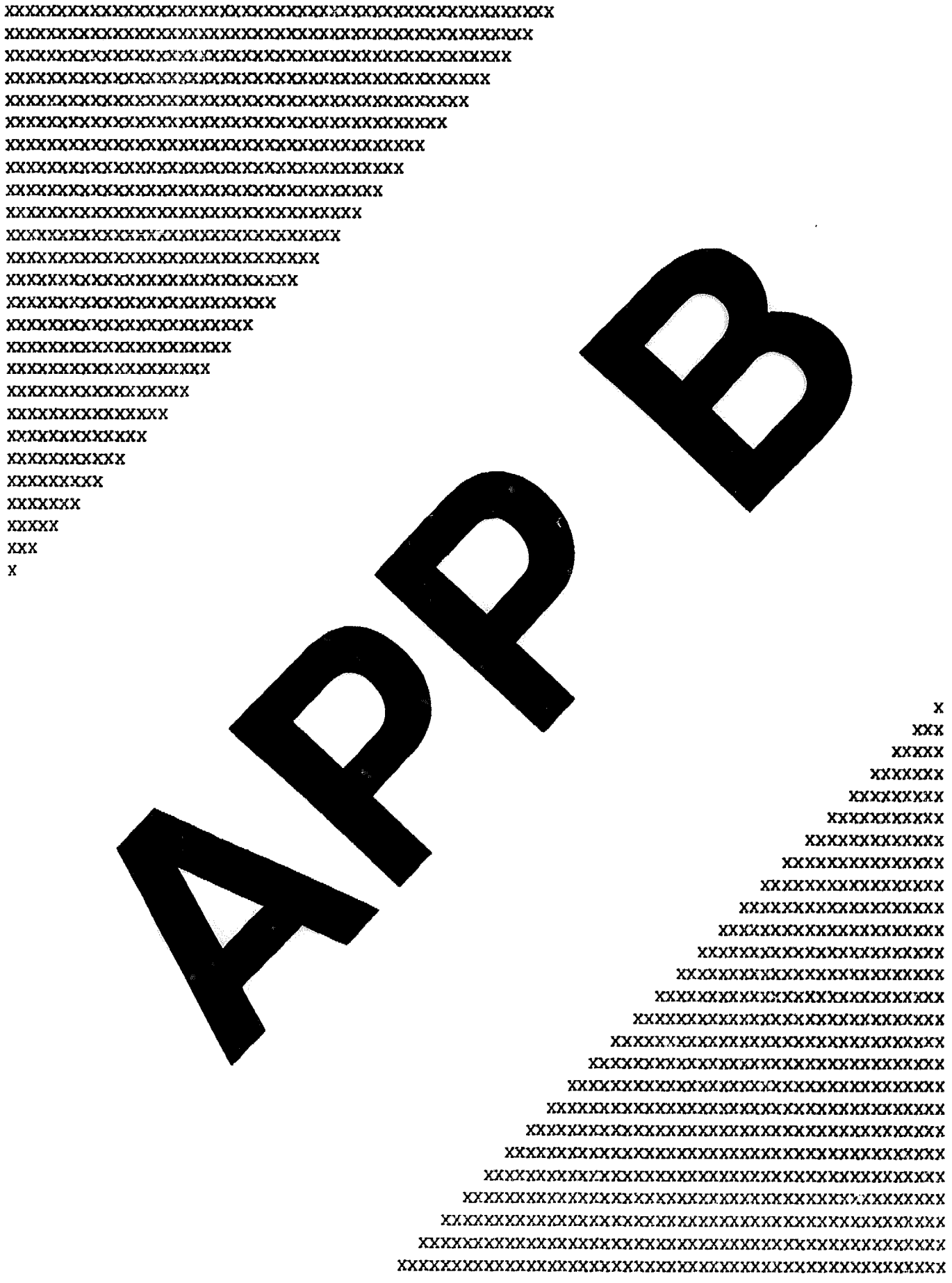


Figure A–4 Troubleshooting Flowchart (Page 4 of 4)



[1] For data only ports use H3101.
For modem control ports use H4081–A.


APP B

B

Memory Map

Table B–1 is a memory map for MicroVAX 3100 systems that use the KA47 CPU module (Model 80).

Table B–1 Memory Map

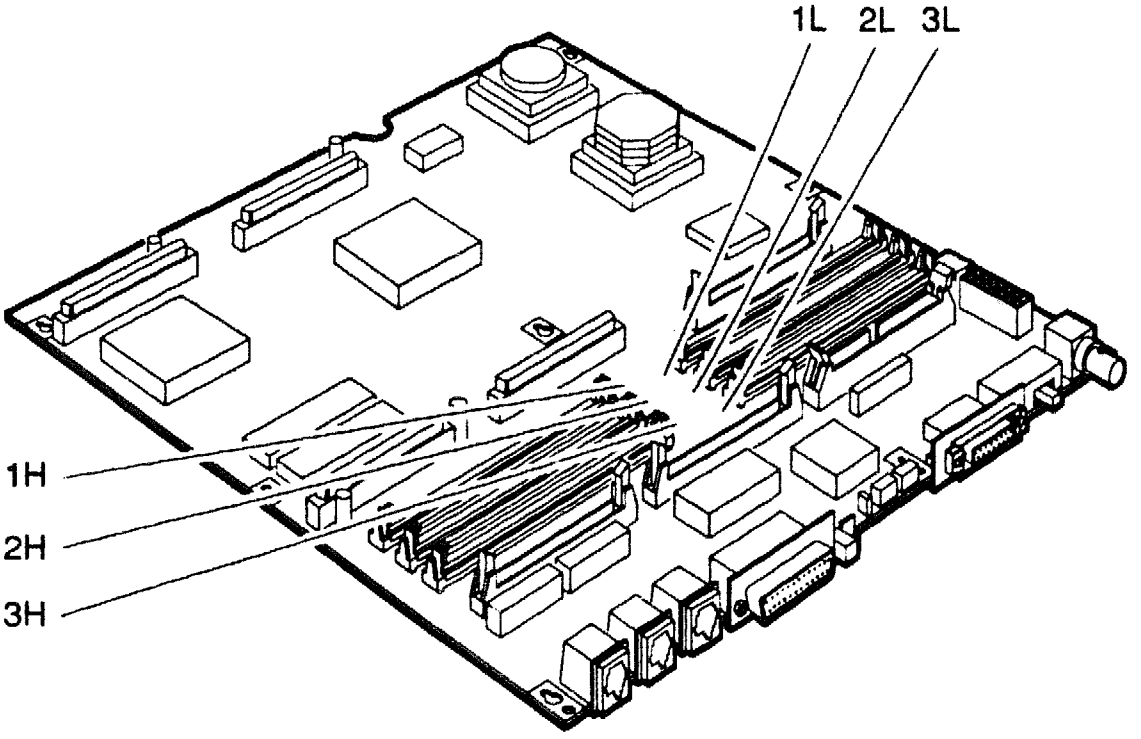
Address Range	System Memory Size (M bytes)					
	8	16	24	40	48	72
00000000 to 003FFFFF	Bas[1]	Bas	Bas	Bas	Bas	Bas
00400000 to 007FFFFF	Bas	Bas	Bas	Bas	Bas	Bas
00800000 to 00BFFFFF	—	1st[2]	1st	1st	1st	1st
00C00000 to 00FFFFFF	—	1st	1st	1st	1st	1st
01000000 to 013FFFFF	—	—	2nd[3]	1st	2nd	1st
01400000 to 017FFFFF	—	—	2nd	1st	2nd	1st
01800000 to 01BFFFFF	—	—	—	1st	2nd	1st
01C00000 to 01FFFFFF	—	—	—	1st	2nd	1st
02000000 to 023FFFFF	—	—	—	1st	2nd	1st
02400000 to 027FFFFF	—	—	—	1st	2nd	1st
02800000 to 02BFFFFF	—	—	—	—	2nd	2nd
02C00000 to 02FFFFFF	—	—	—	—	2nd	2nd
03000000 to 033FFFFF	—	—	—	—	—	2nd
03400000 to 037FFFFF	—	—	—	—	—	2nd
03800000 to 03BFFFFF	—	—	—	—	—	2nd
03C00000 to 03FFFFFF	—	—	—	—	—	2nd
04000000 to 043FFFFF	—	—	—	—	—	2nd
04400000 to 047FFFFF	—	—	—	—	—	2nd

[1] Bas indicates the basic system memory (connectors 1H and 1L; see Figure B–1).

[2] 1st indicates the first memory increment (connectors 2H and 2L; see Figure B–1).

[3] 2nd indicates the second memory increment (connectors 3H and 3L; see Figure B–1).

Figure B–1 Memory Connectors

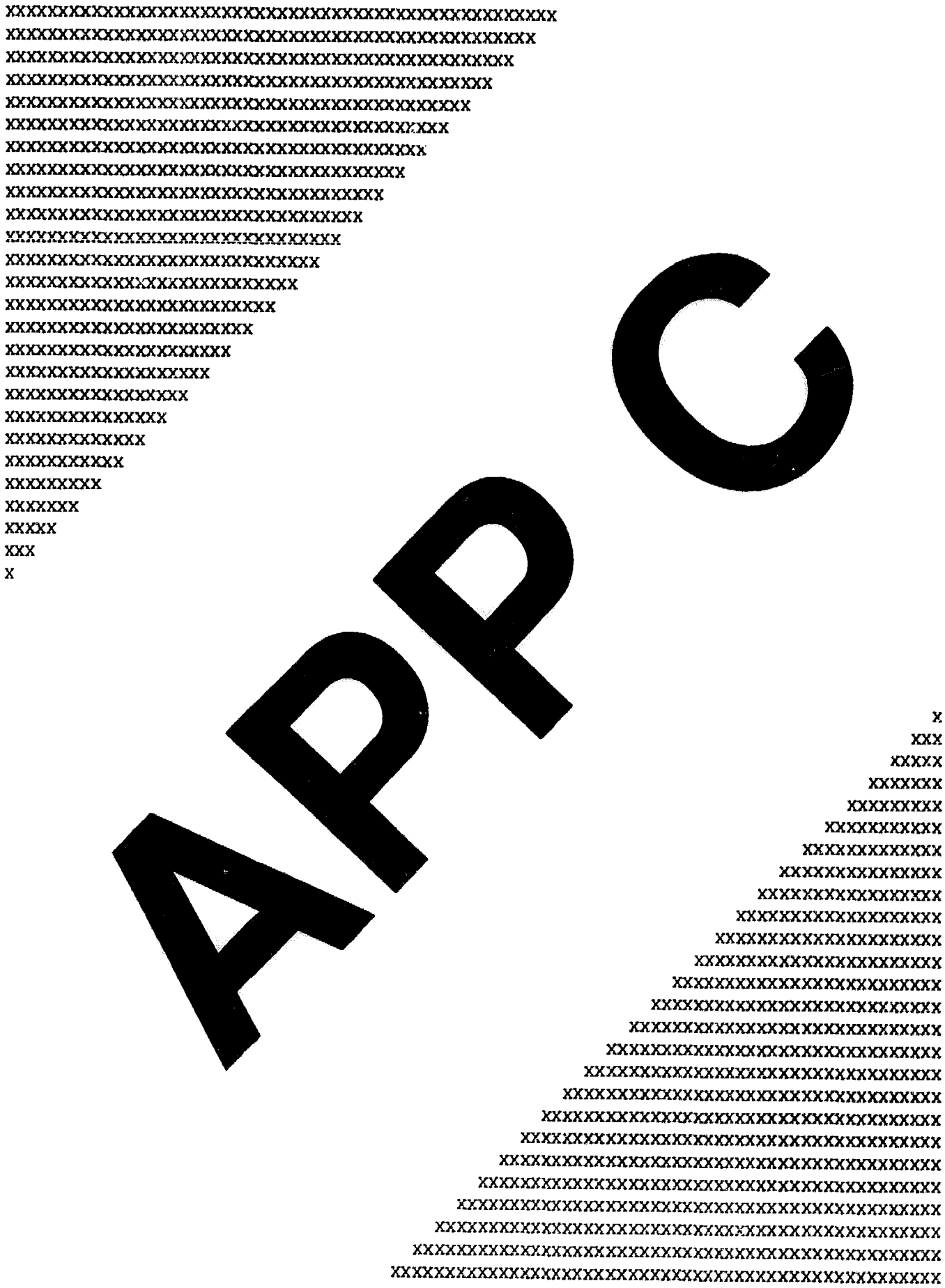


Note: 1H and 1L are identifiers for the basic system memory connectors.

RE_EN06467A_91

Note

A failing address ending in 0 or 8 indicates that the memory module in connector 1H, 2H, or 3H is faulty. A failing address ending in 4 or C indicates that the memory module in connector 1L, 2L, or 3L is faulty.


APP C

C

FRU Numbers

This appendix gives the FRU numbers of devices in MicroVAX 3100 platform systems.

C.1 FRU Number Assignments

Table C–1 lists the FRU numbers of devices in MicroVAX 3100 platform systems.

Table C–1 FRU Numbers

FRU Number (Decimal)	Definition
001	CPU module
020	Synchronous communications module DSW42
021	Asynchronous communications module DHW42
040	Memory module in connector 1L
041	Memory module in connector 1H
042	Memory module in connector 2L
043	Memory module in connector 2H
044	Memory module in connector 3L
045	Memory module in connector 3H
100-199	SCSI devices (see Section C.1.1)

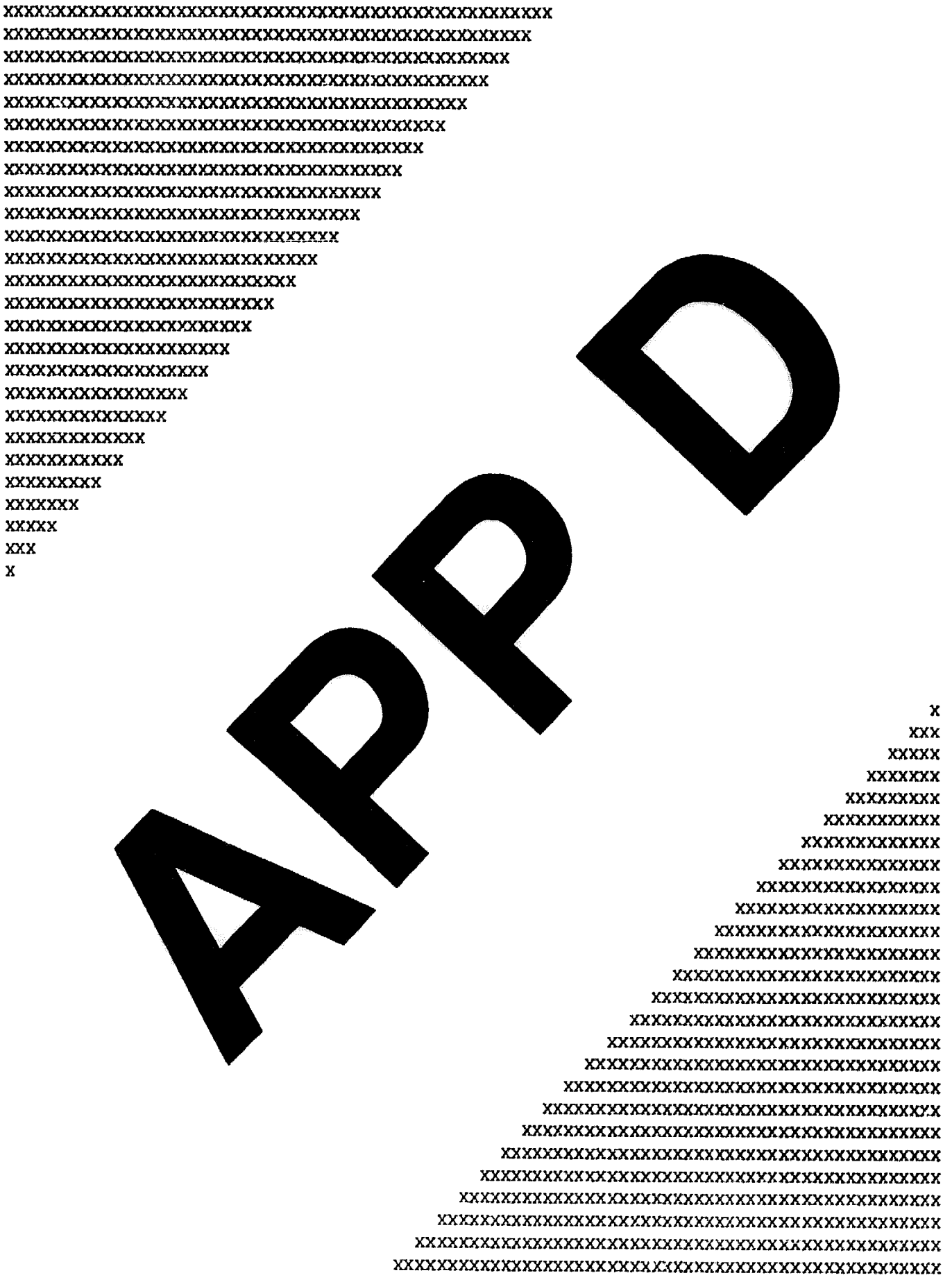
C.1.1 FRU Numbers of SCSI Devices

The FRU numbers of SCSI devices have the following format:

$x_1 x_2\ x_3$

where:

- x_1 is the SCSI controller number. This number is always 1 because there is only one SCSI controller in the system.
- x_2 is a number in the range 0 to 7. This number is the SCSI ID number of the SCSI device.
- x_3 is a number in the range 0 to 8. This number is the logical unit number.

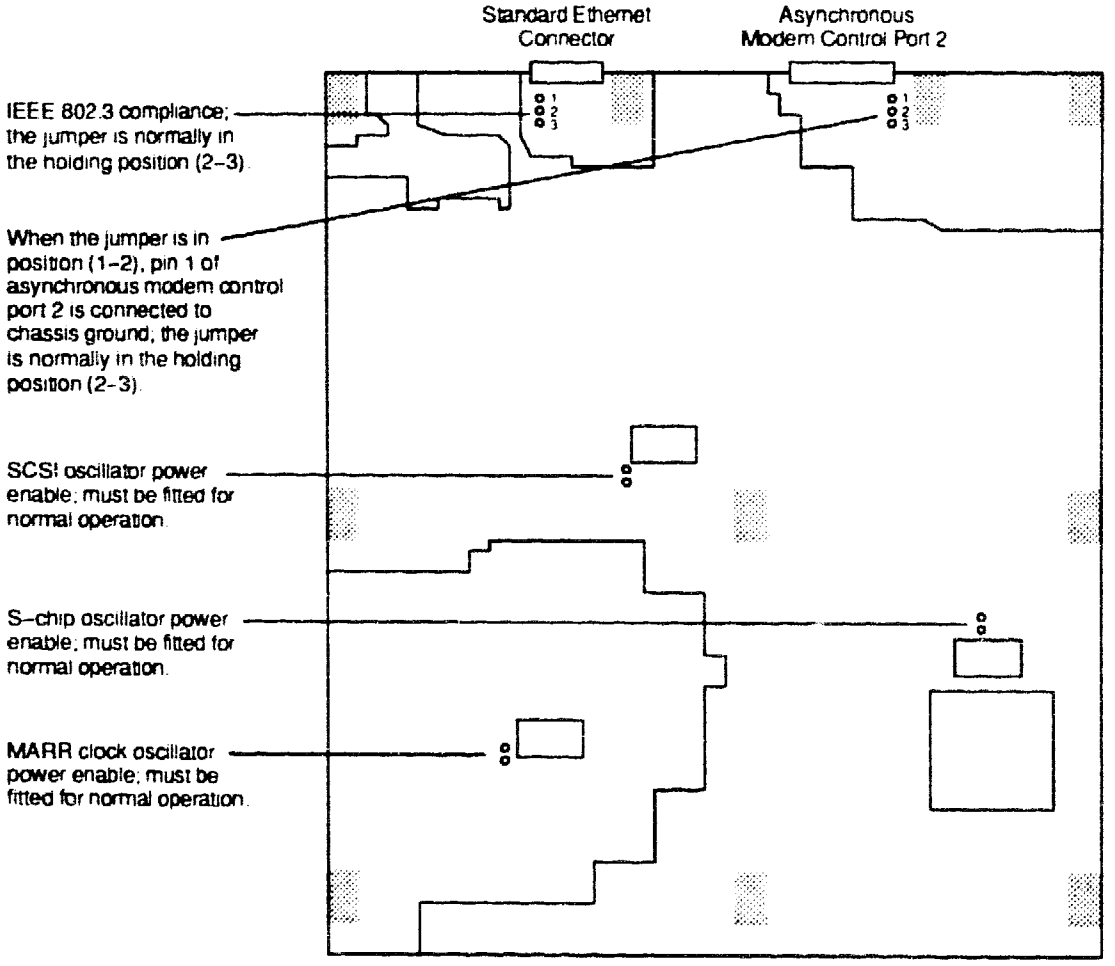

APP D

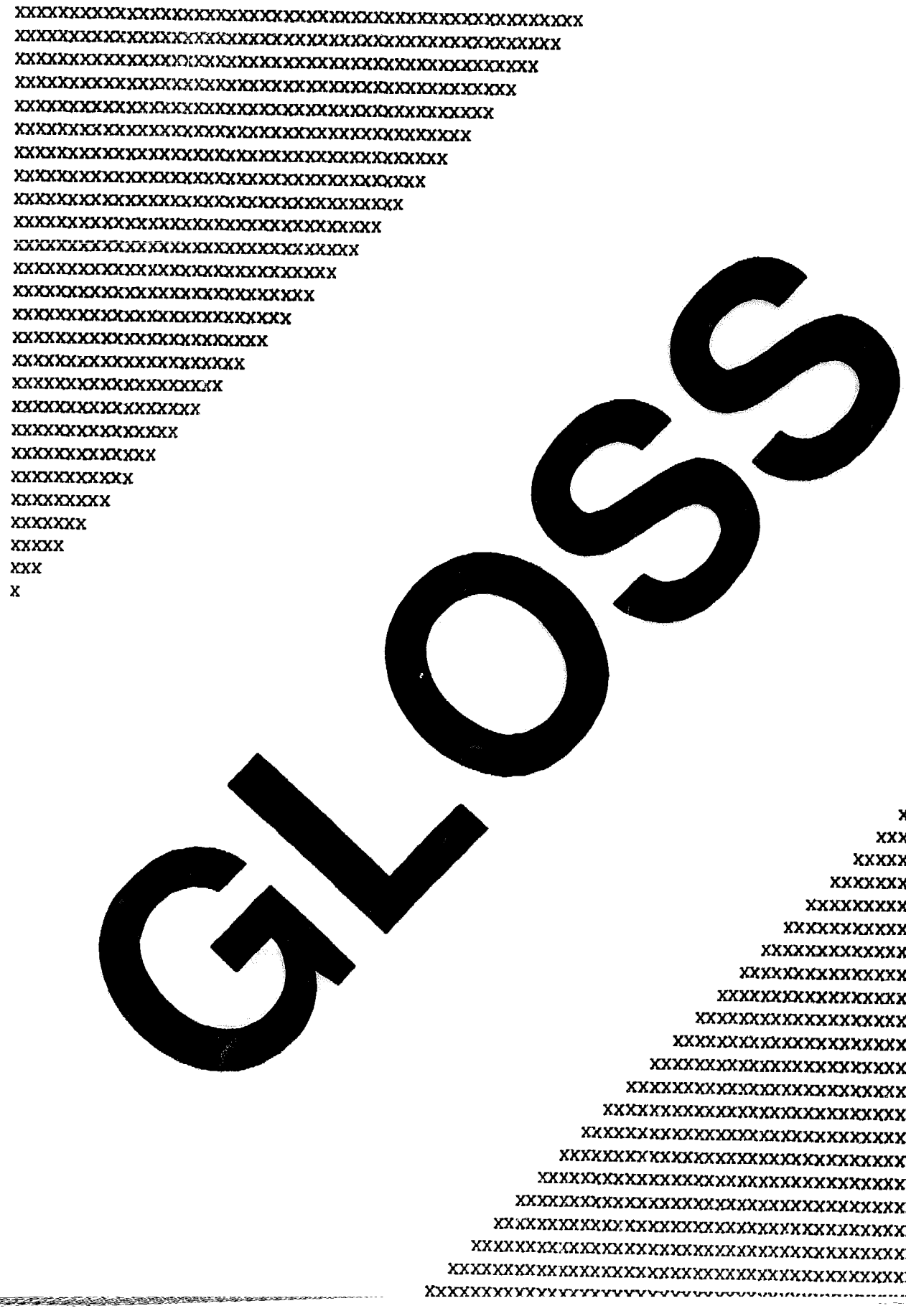
D

KA47 CPU Module Jumper Wires

This appendix describes the functions of the jumper wires on the KA47 CPU module. Figure D–1 identifies the location of each jumper wire and describes the function of each jumper wire on the KA47 CPU module.

Figure D–1 KA47 CPU Module Jumper Wires




GLOSS

Glossary

The glossary defines some of the technical terms used in this manual.

ASCII

American standard code for information interchange.

CMOS

Complementary metal oxide semiconductor.

CPU

Central processing unit. The main unit of a computer containing the circuits that control the interpretation and execution of instructions. The CPU holds the main storage, arithmetic unit, and special registers.

CRC

Character code recognition. The use of pattern recognition techniques to identify characters by automatic means.

CSR

Control status register. A register used to control the operation of a device and record the status of an operation or both.

DMA

Direct memory access. A method of accessing a device's memory without interacting with the device's CPU.

EPROM

Erasable programmable read-only memory. EPROM is a type of read-only memory that can be erased and so returns the device to a blank state.

FPU

Floating-point unit. A unit that handles the automatic positioning of the decimal point during arithmetic operations.

FRU

Field replaceable unit.

IT

Interval timer.

LED

Light emitting diode.

MMJ

Modified modular jack.

NVR

Nonvolatile random access memory. A memory device that retains information in the absence of power.

RAM

Random access memory. A read/write memory device.

RAP

Register address port.

RDP

Register data port.

ROM

Read-only memory. A memory device that cannot be altered during the normal use of the computer.

S-chip

System chip. A single integrated circuit containing most of the system's functionality.

SCSI

Small computer system interface. An interface designed for connecting disks and other peripheral devices to computer systems. SCSI is defined by an American National Standards Institute (ANSI) standard.

SOC

System-on-a-chip. An integrated circuit design architecture.

TOY

Time of year.

VMB

Virtual machine bootstrap. The VMB program loads and runs the operating system.

VMS

Virtual memory system. The operating system for a VAX computer.


INDEX

Index

A

ASYNC test, 4–21
Asynchronous communications device
  testing, 4–21
  troubleshooting, 4–23
Asynchronous communications interfaces
  support for, 2–5
Asynchronous communications options
  list of, 2–5

B

Block diagram, 1–3
Break/Enable switch
  function of, 3–5

C

Cache memory test, 4–8
CACHE test, 4–8
Clearing the password, 3–8
COMM test, 4–19
Communications devices, 2–4
Communications options, 2–4
Configuration
  memory, 1–9
Connectors
  function of, 1–7
  identification of, 1–6
Console commands
  overview of, 3–6
Console devices
  communication parameters, 3–6
Console devices (cont'd)
  function of, 3–4
  types of, 3–5
Console mode, 3–6
  control keys, 3–10
  privileged, 3–7
  unprivileged, 3–7
Console port, 3–4
Console program
  function of, 3–4
Console security, 3–7
Controls
  function of, 1–7
  identification of, 1–6
Customer environment, 3–15

D

Device mnemonics
  list of, 3–11
Device names
  list of, 3–11
Device numbers
  list of, 3–11
DHW41
  troubleshooting, 4–23
Diagnostic test environment
  setting, 3–15
Diagnostic tests, 3–11
Digital Services test environment, 3–15
  loopback requirement, 3–15
DSW41
  troubleshooting, 4–20
DSW42
  troubleshooting, 4–20, 4–23

DZ serial line controller test, 4–7
DZ test, 4–7

E

Environment
  testing, 3–15
Error information, 3–14, 3–29
Ethernet circuit test, 4–12
Extended self-test, 3–16
External mass storage devices, 2–2
  list of, 2–3

F

Firmware overview, 3–1
Floating-point unit
  See FPU, 4–10
FPU, 4–10
FPU test, 4–10
FRUs
  numbers for, C–1

H

Halt state, 3–4

I

Indicators
  function of, 1–7
  identification of, 1–6
Initialization, 3–1
Internal mass storage devices
  list of, 2–1
Interval timer
  See IT, 4–11
IT, 4–11
IT test, 4–11

K

KA47 CPU module
  block diagram of, 1–3
  features of, 1–1
KA47 system
  communications options, 2–4
  configurations of, 1–1, 2–1
  mass storage device configurations, 2–1
  memory configurations, 2–1

M

Manufacturing test environment, 3–16
  loopback requirement, 3–16
Mass storage devices, 2–1
  external, 2–2
  internal, 2–1
  SCSI ID assignments, 2–4
MEM test, 4–9
Memory
  configurations, 1–11
  expansion connector identification, 1–9
  expansion of, 1–9
  rules for adding, 1–9
Memory configuration
  KA47 system, 2–1
Memory modules, 1–9
Memory option
  installation of, 1–11
Memory test, 4–9
Miscellaneous system test, 4–11
Modem communications, 4–7, 4–22
Modes
  for diagnostic tests, 3–15
MS44 memory modules, 1–9

N

NI test, 4–12
Nonvolatile RAM
  See NVR, 4–6
NVR, 4–6
  clearing the password, 3–8

NVR test, 4–6

O

Onboard memory
  location of, 1–9

P

Password
  clearing, 3–8
Ports
  function of, 1–7
  identification of, 1–6
Power supply
  troubleshooting, 4–24
Power-up test, 3–1
  display format, 3–1
  error format, 3–3
  successful, 3–1
  unsuccessful, 3–3
Privileged console mode, 3–7

R

RRD42
  troubleshooting, 4–17
RX26
  troubleshooting, 4–18
RZ23L
  troubleshooting, 4–18
RZ24
  troubleshooting, 4–18
RZ25
  troubleshooting, 4–18

S

SCSI ID assignments
  recommendations for, 2–4
SCSI test, 4–14
Security, 3–7
Self-test
  display format, 3–13
  error format, 3–13
  overview of, 3–11
Serial line controller test, 4–7
Status bar
  complete, 3–1
Synchronous communications device
    troubleshooting, 4–20
Synchronous communications devices
  testing, 4–19
Synchronous communications options
  list of, 2–5
Synchronous communications standards
  support for, 2–5
SYS test, 4–11
System exerciser
  display format, 3–21
  error format, 3–22
  overview of, 3–19
  predefined tests, 3–19
  TEST command format, 3–19
  test results, 3–24
System initialization, 3–1
System test kernel
  function of, 3–19
System test monitor
  function of, 3–19

T

Terminal settings, 3–6
TEST command
  rules, 3–12
  variations of, 3–11
Test command dispatcher
  function of, 3–11
TEST command lines
  typical examples, 3–11
Test environments
  customer environment, 3–15
  Digital Services environment, 3–15
  list of, 3–15
  Manufacturing environment, 3–16
Test results
  for system exerciser, 3–24
TOY clock, 4–6
Troubleshooting

Troubleshooting (cont'd)
asynchronous communications devices, 4–23
DHW41, 4–23
DHW42, 4–23
DSW41, 4–20
DSW42, 4–20
external SCSI devices, 4–19
general procedures, 4–1
no screen display, 4–3
RRD42, 4–17
RX26, 4–18
RZ23L, 4–18
RZ24, 4–18
RZ25, 4–18
synchronous communications devices, 4–20
TZ30, 4–18
TZK10, 4–18
TZ30
troubleshooting, 4–18
TZK10
troubleshooting, 4–18

U

Unprivileged console mode, 3–7
Utilities
error format, 3–16
overview of, 3–16
TEST command format, 3–16

V

VAX data types
support of, 1–5
VAX instructions
support of, 1–5