MicroVAX 3100 Model 90

Customer Technical Information

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This manual describes technical information about the MicroVAX 3100 Model 90 system. It also gives a list of the console commands and specifications for the system unit and internal SCSI devices.

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Preface

This manual describes technical information about the MicroVAX™ 3100 Model 90 system. It also gives a list of the console commands and specifications for the system unit and internal SCSI devices.

Audience

This manual is intended for experienced users, such as system programmers or system managers.

Structure of This Manual

This manual is divided into four chapters, an appendix, and an index:

- Chapter 1 describes technical information about the Model 90 system.
- Chapter 2 describes the console security feature and how to set system defaults.
- Chapter 3 describes the console commands.
- Chapter 4 gives specifications for the system unit and for internal SCSI devices.
- Appendix A gives information that is specific to the United Kingdom on installing the DSW42-AA synchronous communications option.

Additional Information

See the *MicroVAX 3100 Model 90 Operator Information* manual for the list of associated and related documents.

Conventions

The following conventions are used in this manual:

Convention	Description
MONOSPACE	Text displayed on the screen is shown in monospace type.
boldface type	Boldface type in examples indicates user input. Boldface type in text indicates the first instance of terms defined in the text.
italic type	Italic type emphasizes important information, indicates variables, and indicates complete titles of manuals.
nn nnn.nnn nn	A space character separates 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*.
UPPERCASE	Words in uppercase indicate a command.
lowercase	In format descriptions, words in lowercase indicate parameters or arguments to be specified by the user.
|	In command syntax descriptions, a vertical bar | separates similar options, one of which you can choose.
Note	A note contains information of special importance to the reader.
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.

1
System Description

This chapter gives a technical description of the MicroVAX 3100 Model 90. It includes information on the following:

- Model 90 system
- Internal mass storage devices
- Communications devices

1.1 Model 90 System

The Model 90 system uses the KA50 CPU module. The KA50 CPU module is the primary component in the Model 90 system, and contains the following components:

- NVAX processor chip
- DC244 NVAX memory controller (NMC) memory management chip
- DC243 NVAX CP bus adapter (NCA) and CEAC input/output (I/O) control chip
- SCSI controller and SQWF buffer chip
- Support for a second SCSI adapter
- Time-of-year (TOY) clock SSC chip
- DC541 SGEC chip Ethernet controller for standard or ThinWire Ethernet
- DC7085 (QUART) serial line controller (4 serial lines, one with modem control)
- Support for up to 128M bytes of memory
- Support for optional asynchronous communications devices, which provide either 8 or 16 additional DEC423 ports, or 8 additional asynchronous modem control ports

- Support for optional synchronous communications devices, which provide two synchronous ports

Model 90 VAX Architecture Support

The KA50 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 KA50 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 NVAX 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.

1.2 Internal Mass Storage Devices

The Model 90 system supports a maximum of five internal SCSI devices, only two of which can be removable media devices. One of the RZ-series disks contains factory installed software (FIS). Chapter 4 gives the specifications for each internal SCSI device.

Table 1–1 shows the internal mass storage devices that are supported by the Model 90 system.

Table 1–1 Supported Internal Mass Storage Devices

Device	Size (inches)	Capacity (bytes)	Description
RZ23L	3.5	121M	Hard disk drive
RZ24	3.5	209M	Hard disk drive
RZ24L	3.5	245M	Hard disk drive
RZ25	3.5	426M	Hard disk drive
RZ25L	3.5	635M	Hard disk drive
RZ26	3.5	1.05G	Hard disk drive
RZ26L	3.5	1.05G	Hard disk drive
RZ28	3.5	2.1G	Hard disk drive
TZ30	5.25	95M	Tape drive
TZK10	5.25	320M or 525M	Tape drive
TZK11	5.25	2G or 2.5G	Tape drive
TLZ06	5.25	Up to 4.0G	Tape drive
RX™26	3.5	1.44M or 2.88M	Diskette drive
RRD42	5.25	600M	CD–ROM drive

1.3 External Mass Storage Devices

Each SCSI bus on the Model 90 system supports a total of seven mass storage devices, five of which may be installed internal to the system box. The other two may be installed in an expansion box.

The KZDDA SCSI adapter allows the addition of a second SCSI bus. Seven SCSI devices may be installed in an expander box attached to the second bus, providing a maximum of 14 mass storage devices. See your Digital Sales Representitive for a list of supported external devices.

1.4 Communications Devices

The Model 90 system supports asynchronous and synchronous communications devices.

Asynchronous Communications Devices Table 1–2 lists the asynchronous devices supported by the Model 90 system.

Table 1–2 Supported Asynchronous Devices

Device	Description
DHW42-AA	Eight-line DEC423 asynchronous option
DHW42-BA	Sixteen-line DEC423 asynchronous option
DHW42-CA	Eight-line EIA-232 asynchronous option with modem control
DHW42-UP	Eight-line to 16-line upgrade of the DEC423 asynchronous option

Synchronous Communications Devices Table 1–3 lists the synchronous device supported by the Model 90 system.

Table 1–3 Supported Synchronous Device

Device	Description
DSW42-AA	Two-line EIA-232/V.24 synchronous module

If you order a different synchronous option cable, you can use different interface standards with the synchronous communications module. Table 1–4 lists each standard and the part number of the corresponding option cable.

Table 1–4 Synchronous Communications Option Cable Part Numbers

Standard	Option Cable Part Number
EIA-232/V.24	BC19D-02 (supplied with option)
EIA-423/V.10	BC19E-02
EIA-422/V.11	BC19B-02

2

Console Security Feature and System Defaults

This chapter describes how to set system defaults and how to use the console security feature. It includes information on the following:

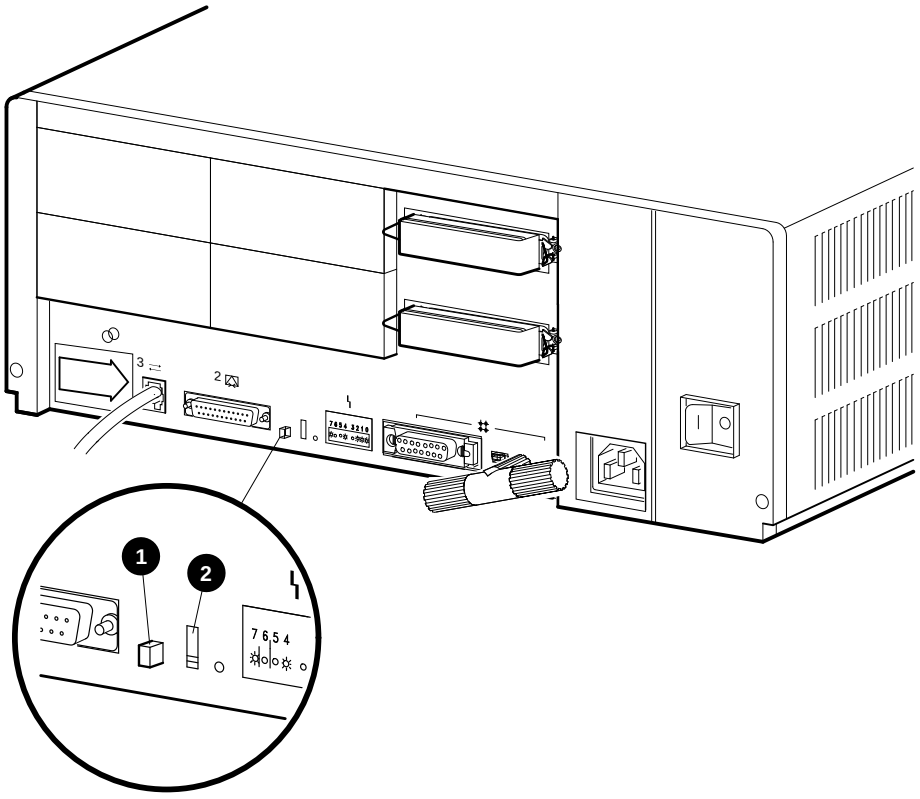
- Returning to console mode
- Console security feature
- Setting the default boot device
- Setting the default recovery action

2.1 Returning to Console Mode

To use the procedures described in this chapter, the system must be in console mode. To return to console mode, press the halt button on the back of the system unit (see Figure 2–1). The system responds with the console prompt (>>>) when it is in console mode.

Alternatively, if the break enable switch is in the up position (see Figure 2–1), press the break key on the keyboard to return to console mode. When the system is shipped, the break enable switch is in the down position.

Figure 2–1 Model 90 System Halt Button



❶ Halt Button

❷ Break Enable Switch — Disable (default) Position Shown

2.2 Console Security Feature

The console security feature allows you to disable most of the system console commands. When the security password is set, there are two types of users: privileged users and unprivileged users. Privileged users know the security password and can use the full range of console commands; unprivileged users can use only the following commands:

- LOGIN—Use this command with the security password to become a privileged user.
- BOOT—Use this command without parameters to boot the operating system.
- CONTINUE—Use this command to return to the operating system after pressing the halt button.

Chapter 3 describes the console commands. The following subsections describe how to do the following:

- Set the security password
- Enable the console security feature
- Log in to privileged console mode
- Change the security password
- Disable the security password
- Exit from privileged console mode

2.2.1 Setting the Security Password

The console security feature is disabled when you receive the system. To set the security password on the system, follow these steps:

1. Enter the following command at the console prompt (>>>):

   ```
   >>> SET PSWD
   ```

   The system responds with the following prompt:

   ```
   PSWD1 :
   ```

Note

- The security password must be a string of exactly 16 hexadecimal characters (0 to 9 and A to F).

- Write down the security password and store it in a safe place. If you forget the security password, you must call your Digital Services representative to disable the console security feature.
- If the recall buffer is enabled when you use the SET PSWD command, you delete all the commands stored in the buffer.

---

2. Enter a security password and press Return.

   The system does not display the security password as you type it. The system responds with the following prompt:

   ```
   PSWD2 :
   ```

3. Verify the security password by entering it a second time.

   The system does not display the security password as you type it. If you enter the same security password at each prompt, the system saves the security password in nonvolatile memory. The system does not lose the security password when you turn off the system.

   If the second security password does not match the first, the system responds with the following error message:

   ```
   ?63 ILLEGAL PASSWORD
   >>>
   ```

4. Repeat steps 1 to 3 if you see an error message.

2.2.2 Enabling the Console Security Feature

When you have set the security password, you must enable the console security feature. To enable the console security feature, enter the following command at the console prompt:

```
>>> SET PSE 1
```

Enter the following command to check whether you have enabled the console security feature:

```
>>> SHOW PSE
```

If you have enabled the console security feature, the system displays the following message:

```
Enabled
```

2.2.3 Logging in to Privileged Console Mode

When the console security feature is enabled, you must enter the security password to log in to privileged console mode. In privileged console mode you can use the full range of console commands. To log in to privileged console mode, follow these steps:

Note

You must set the security password before following these steps (see Section 2.2.1).

1. Enter the following command:

   ```
   >>> LOGIN
   ```

   The system responds with the following prompt:

   ```
   Password:
   ```

2. Enter the security password and press Return.

   The system does not display the security password as you type it. If you enter the correct security password, the system returns you to the console prompt and you become a privileged user. You can now use the full range of console commands.

   If you enter an incorrect security password, the system responds with the following error message:

   ```
   ?63 ILLEGAL PASSWORD
   >>>
   ```

3. Repeat steps 1 and 2 if an error message is displayed.

2.2.4 Changing the Security Password

You must be a privileged user to change the security password. To change the security password, follow these steps:

1. Follow the procedure in Section 2.2.3 using the current security password to log in to the system.
2. Enter the following command:

   ```
   >>> SET PSWD
   ```

The system responds with the following prompt:

```
PSWD1 :
```

Note

- The security password must be a string of exactly 16 hexadecimal characters (0 to 9 and A to F).
- Write down the security password and store it in a safe place. If you forget the security password, you must call your Digital Services representative to disable the console security feature.
- If the recall buffer is enabled when you use the SET PSWD command, you delete all the commands stored in the buffer.

3. Enter a new security password and press Return.

   The system does not display the security password as you type it. The system then responds with the following prompt:

   ```
   PSWD2 :
   ```

4. Verify the new security password by entering it a second time.

   The system does not display the new security password as you type it. If you enter the same new security password a second time, the system saves the new security password in nonvolatile memory. The system does not lose the new security password when you turn off the system.

   If you incorrectly enter the new security password a second time, the system responds with the following error message:

   ```
   ?63 ILLEGAL PASSWORD
   >>>
   ```

5. Repeat steps 1 to 5 if an error message is displayed.

2.2.5 Disabling the Console Security Feature

When you disable the console security feature, all users can use the full range of console commands. To disable the console security feature, follow these steps:

1. Follow the procedure in Section 2.2.3 using the current security password to log in to the system.
2. Enter the following command:

```
>>> SET PSE 0
```

Enter the following command to check whether you have disabled the console security feature:

```
>>> SHOW PSE
```

If you have disabled the console security feature, the system displays the following message:

```
Disabled
```

2.2.6 Exiting from Privileged Console Mode

When you exit from privileged console mode, privileged users must enter the LOGIN command with the correct password before they can use the full range of console commands. To exit from privileged console mode, enter one of the following commands:

- BOOT (with any supplied parameters)
- CONTINUE
- HALT
- START

Chapter 3 describes each of these commands.

2.3 Setting the Default Boot Device

When the system is shipped, it is set to boot from the system disk, DKA300. This RZ-series disk holds the factory installed software (FIS).

You can set the system to boot from a different default boot device that holds the operating system software. Table 2–1 shows the alternative default boot devices and their associated OpenVMS™ device names.

Table 2–1 Alternative Default Boot Devices

Device	OpenVMS Device Name
Hard disk (SCSI ID 0 to 7)	DK*xn*00[1,2]
Network (the system boots from a remote system)	EZA0
Tape drive (SCSI ID 0 to 7)	MK*nx*00[1,2]
Compact disc (SCSI ID 0 to 7)	DK*xn*00[1,2]

[1] *x* represents either A or B, determined by the SCSI port used by the device.

[2] *n* represents the SCSI ID of that device.

To set an alternative default boot device, enter the SET BOOT command using the OpenVMS device name of the alternative default boot device. For example, to set the system to boot over the network, enter the following command:

```
>>> SET BOOT EZA0
```

2.4 Setting the Default Recovery Action

There are five default recovery actions. You can change the default recovery action by entering the SET HALT command and the value or keyword associated with the action you want to set. Table 2–2 shows the five default recovery actions and their associated values. When the system is shipped, the default recovery action is set to halt.

Table 2–2 Default Recovery Actions and Associated Values

Recovery Action Keyword	Associated Value	Result
DEFAULT	0	The default recovery action is HALT.
RESTART	1	The system tries to restart the operating system. If it fails to restart the operating system, it halts.
BOOT	2	The system tries to boot. If it fails to boot, it halts.
HALT	3	The system halts and displays the console prompt.
RESTART_REBOOT	4	The system tries to restart the operating system. If it fails to restart the operating system, it tries to boot. If it fails to boot, it halts.

To set an alternative default recovery action, enter the SET HALT command using the value or keyword associated with the recovery action you want to set. For example, to set the system to halt, enter one of the following commands:

```
>>> SET HALT 3
>>> SET HALT HALT
```

3
Console Commands

This chapter describes the console commands that you can enter when the system is in console mode. The system displays the console prompt (>>>) when it is in console mode. If the system is running the operating system software, see Chapter 2 for information on returning the system to console mode.

If the console security feature is enabled and a security password is set, you must log in to privileged console mode before using most of these commands. See Chapter 2 for information on the console security feature.

The following sections describe all the console commands, give the command format, and describe the significance of each parameter. The *VAX Software Handbook* contains a detailed description of each command and its parameters and qualifiers.

3.1 BOOT

The BOOT command initializes the processor and executes the VMB (virtual memory block) program. The VMB program tries to boot the operating system from the specified device or list of devices, or from the default boot device if none is specified. The console qualifies the bootstrap operation by passing a boot flags bitmap to the VMB program in R5.

Format:

BOOT [qualifier-list] [{boot_device},{boot_device},...]

If you do not enter either the qualifier or the device name, the default value is used. Explicitly stating the boot flags or the boot device overrides, but does not permanently change, the corresponding default value.

When specifying a list of boot devices (up to 32 characters, with devices separated by commas and no spaces), the system checks the devices in the order specified and boots from the first one that contains bootable software.

Note

If you include the Ethernet device, EZA0, in a string of boot devices, it must be placed only as the last device of the string. The system continuously tries to boot from EZA0.

Set the default boot device and boot flags using the SET BOOT and SET BFLAG commands. If you do not set a default boot device, the processor times out after 30 seconds and continuously tries to boot from the Ethernet device, EZA0. To disable the autoboot feature, use three periods in place of the device name for the SET BOOT command (SET BOOT . . .).

Qualifiers:

Command specific:

/R5:{boot_flags}	A 32-bit hexadecimal value passed to the VMB program in R5. The console does not interpret this value. Use the SET BFLAG command to specify a default boot flags longword. Use the SHOW BFLAG command to display the longword.
/{boot_flags}	Same as /R5:{boot_flags}
[device_name]	A character string of up to 17 characters. Longer strings cause a VAL TOO BIG error message. When specifying a list of boot devices, separate the device names using commas. Do not use spaces. The console checks the length of the device name, but does not interpret or validate it. The console converts the string to uppercase, then passes the VMB program a string containing the device name in R0. Use the SET BOOT command to specify a default boot device or list of devices. Use the SHOW BOOT command to display the default boot device. The factory default device is the Ethernet device, EZA0. Table 2–1 lists the boot devices supported by the Model 90 system.

Examples:

```
>>>SHOW BOOT
DKA300
>>>SHOW BFLAG
00000000
>>>B     !Boot using default boot flags and device.
(BOOT/R5:0 DKA300)

  2..
-DKA300
```

3.2 CONTINUE

The CONTINUE command causes the processor to begin instruction execution at the address currently contained in the program counter (PC). This address is the address stored in the PC when the system enters console mode or the address that the user specifies using the DEPOSIT command. The CONTINUE command does not perform a processor initialization.

Format:

CONTINUE

Example:

```
>>>CONTINUE
$                   !OpenVMS DCL prompt
```

3.3 DEPOSIT

The DEPOSIT command deposits data into the address specified. If you do not specify an address space or data size qualifier, the console uses the last address space and data size used in a DEPOSIT, EXAMINE, MOVE, or SEARCH command. After processor initialization, the default address space is physical memory, the default data size is longword, and the default address is zero. If you specify conflicting address space or data sizes, the console ignores the command and issues an error message.

Format:

DEPOSIT [qualifier-list] {address} {data} [data...]

Qualifiers:

Data control: /B, /W, /L, /Q, /N:{count}, /STEP:{size}, /WRONG

Address space control: /G, /I, /M, /P, /V, /U

Arguments:

{address}	A longword address that specifies the first location into which data is deposited. The address can be an actual address or a symbolic address.
{data}	The data to be deposited. If the specified data is larger than the deposit data size, the firmware ignores the command and issues an error response. If the specified data is smaller than the deposit data size, the data is extended on the left with zeros.
[{data}]	Additional data to be deposited (as many as can fit on the command line).

Examples:

```
>>>D/P/B/N:1FF 0 0          ! Clear first 512 bytes of
                           ! physical memory.
>>>D/V/L/N:3 1234 5        ! Deposit 5 into four longwords
                           ! starting at virtual memory address
                           ! 1234.
>>>D/N:8 R0 FFFFFFFF       ! Loads GPRs R0 through R8 with -1.
>>>D/L/P/N:10/ST:200 0 8   ! Deposit 8 in the first longword of
                           ! the first 17 pages in physical
                           ! memory.
>>>D/N:200 - 0             ! Starting at previous address, clear
                           ! 513 longwords or 2052 bytes.
```

3.4 EXAMINE

The EXAMINE command examines the contents of the memory location or register specified by the address. If no address is specified, + is assumed. The display line consists of a single character address specifier, the physical address to be examined, and the examined data.

EXAMINE uses the same qualifiers as DEPOSIT. However, the /WRONG qualifier causes EXAMINE to ignore ECC errors when reading from physical memory. The EXAMINE command also supports an /INSTRUCTION qualifier that disassembles the instructions at the current address.

Format:

EXAMINE [qualifier-list] [address]

Qualifiers:

Data control: /B, /W, /L, /Q, /N:{count}, /STEP:{size}, /WRONG

Address space control: /G, /I, /M, /P, /V, /U

Command specific:

/INSTRUCTION	Disassembles and displays the VAX MACRO–32 instruction at the specified address.

Arguments:

[{address}]	A longword address that specifies the first location to be examined. The address can be an actual or a symbolic address. If no address is specified, + is assumed.

Examples:

```
>>>EX PC                          ! Examine the PC.
  G 0000000F FFFFFFFC
>>>EX SP                          ! Examine the SP.
  G 0000000E 00000200
>>>EX PSL                         ! Examine the PSL.
  M 00000000 041F0000
>>>E/M                            ! Examine PSL another way.
  M 00000000 041F0000
>>>E R4/N:5                       ! Examine R4 through R9.
  G 00000004 00000000
  G 00000005 00000000
  G 00000006 00000000
  G 00000007 00000000
  G 00000008 00000000
  G 00000009 801D9000

>>>EX PR$_SCBB                    !Examine the SCBB, IPR 17
  I 00000011 2004A000                           ! (decimal).

>>>E/P 0                          ! Examine local memory 0.
  P 00000000 00000000

>>>EX /INS 20040000               ! Examine 1st byte of ROM.
  P 20040000   11 BRB     20040019

>>>EX /INS/N:5 20040019          ! Disassemble from branch.
  P 20040019   D0 MOVL    I^#20140000,@#20140000
  P 20040024   D2 MCOML   @#20140030,@#20140502
  P 2004002F   D2 MCOML   S^#0E,@#20140030
  P 20040036   7D MOVQ    R0,@#201404B2
  P 2004003D   D0 MOVL    I^#201404B2,R1
  P 20040044   DB MFPR    S^#2A,B^44(R1)

>>>E/INS                         ! Look at next instruction.
  P 20040048   DB MFPR    S^#2B,B^48(R1)

>>>
```

3.5 FIND

The FIND command searches main memory, starting at address zero for a page-aligned 128K-byte segment of good memory, or a restart parameter block (RPB). If the command finds the segment or RPB, its address plus 512 is left in SP (R14). If it does not find the segment or RPB, the console issues an error message and preserves the contents of SP. If you do not specify a qualifier, /RPB is assumed.

Format:

FIND [qualifier-list]

Qualifiers:

Command specific:

/MEMORY	Searches memory for a page-aligned block of good memory, 128K bytes in length. The search checks only memory that is deemed usable by the bitmap. This command leaves the contents of memory unchanged.
/RPB	Searches all physical memory for an RPB. The search does not use the bitmap to qualify which pages are checked. The command leaves the contents of memory unchanged.

Examples:

```
>>>EX SP                    ! Check the SP.
  G 0000000E 00000000
>>>FIND /MEM                ! Look for a valid 128 Kbytes.
>>>EX SP                    ! Note where it was found.
  G 0000000E 00000200
>>>FIND /RPB                ! Check for valid RPB.
?2C FND ERR 00C00004                      ! None to be found here.
>>>
```

3.6 HALT

The HALT command has no effect. It is included for compatibility with other VAX consoles.

Format:

HALT

Example:

```
>>>HALT    ! Pretend to halt.
>>>
```

3.7 HELP

The HELP command gives information about command syntax and usage.

Format:

HELP

Example:

```
>>>HELP
Following is a brief summary of all the commands supported by the
console:

UPPERCASE  denotes a keyword that you must type in
|          denotes an OR condition
[]         denotes optional parameters
<>         denotes a field specifying a syntactically correct value
..         denotes one of an inclusive range of integers
...        denotes that the previous item may be repeated

Valid qualifiers:
    /B /W /L /Q /INSTRUCTION
    /G /I /V /P /M
    /STEP: /N: /NOT
    /WRONG /U

Valid commands:
    BOOT [[/R5:]<boot_flags>] [<boot_device>]
    CONFIGURE
    CONTINUE
    DEPOSIT [<qualifiers>] <address> <datum> [<datum>...]
    EXAMINE [<qualifiers>] [<address>]
    FIND [/MEMORY | /RPB]
    HALT
    HELP
    INITIALIZE
    LOGIN
    MOVE [<qualifiers>] <address> <address>
    NEXT [<count>]
    REPEAT <command>
    SEARCH [<qualifiers>] <address> <pattern> [<mask>]
    SET BFLG <boot_flags>
    SET BOOT <boot_device>
    SET HALT <0..4 |DEFAULT|RESTART|REBOOT|HALT|RESTART_REBOOT>
    SET LANGUAGE <1..15>
    SET PSE <0..1 | DISABLED | ENABLED>
    SET PSWD <password>
    SET RECALL <0..1 | DISABLED | ENABLED>
    SET SCSI_ID <0..7>
    SHOW BFLG
    SHOW BOOT
    SHOW CONFIG
    SHOW DEVICE
    SHOW ERROR
    SHOW ETHERNET
    SHOW HALT
    SHOW LANGUAGE
    SHOW MEMORY
    SHOW PSE
    SHOW RECALL
    SHOW SCSI
    SHOW SCSI_ID
```

```
    SHOW TRANSLATION <physical_address>
    SHOW VERSION
    START <address>
    TEST [<test_code> [<parameters>]]
    UNJAM
    X <address> <count>
>>>
```

3.8 INITIALIZE

The INITIALIZE command performs a processor initialization.

Format:

INITIALIZE

The following registers are initialized:

Register	State at Initialization
PSL	041F0000
IPL	1F
ASTLVL	4
SISR	0
ICCS	Bits <6> and <0> clear; the rest are unpredictable
RXCS	0
TXCS	80
MAPEN	0
Caches	Flushed
Instruction buffer	Unaffected
Console previous reference	Longword, physical, address 0
TODR	Unaffected
Main memory	Unaffected
General registers	Unaffected
Halt code	Unaffected
Bootstrap-in-progress flag	Unaffected
Internal restart-in-progress flag	Unaffected

The firmware clears all error status bits and initializes the following:

- CDAL bus timer
- Address decode and match registers

- Programmable timer interrupt vectors
- QUART LPR register is set to 9600 baud

Example:

```
>>>INIT
>>>
```

3.9 LOGIN

Allows you to put the system in privileged console mode. When the console security feature is enabled (see Section 2.2) and when you put the system in console mode, the system operates in unprivileged console mode. You can access only a subset of the console commands. To access the full range of console commands, you must enter this command. The format of this command is as follows:

LO[GIN]

When you enter the command, the system prompts you for a password as follows:

```
Password:
```

You must enter the current console security password. If you do not enter the correct password, the system displays the error message, ILL PSWD. When you enter the console security password, the system operates in privileged console mode. In this mode, you can use all the console commands. The system exits from privileged console mode when you enter one of the following console commands:

- BOOT
- CONTINUE
- HALT
- START

3.10 MOVE

The MOVE command copies the block of memory starting at the source address to a block beginning at the destination address. Typically, this command has an /N qualifier so that blocks of data are transferred. The destination correctly reflects the contents of the source, regardless of the overlap between the source and the data.

The MOVE command performs byte, word, longword, and quadword reads and writes to moving the data efficiently. The MOVE command supports physical and virtual address spaces only.

Format:

MOVE [qualifier-list] {src_address} {dest_address}

Qualifiers:

Data control: /B, /W, /L, /Q, /N:{count}, /STEP:{size}, /WRONG

Address space control: /V, /U, /P

Arguments:

{src_address} A longword address that specifies the first location of the source data to be copied.

{dest_address} A longword address that specifies the destination of the first byte of data. These addresses may be an actual address or a symbolic address. If no address is specified, + is assumed.

Examples:

```
>>>EX/N:4 0              ! Observe destination.
P 00000000 00000000
P 00000004 00000000
P 00000008 00000000
P 0000000C 00000000
P 00000010 00000000

>>>EX/N:4 200            ! Observe source data.
P 00000200 58DD0520
P 00000204 585E04C1
P 00000208 00FF8FBB
P 0000020C 5208A8D0
P 00000210 540CA8DE

>>>MOV/N:4 200 0         ! Move the data.

>>>EX/N:4 0              ! Observe moved data.
P 00000000 58DD0520
P 00000004 585E04C1
P 00000008 00FF8FBB
P 0000000C 5208A8D0
P 00000010 540CA8DE
>>>
```

3.11 NEXT

The NEXT command executes the specified number of macro instructions. If no count is specified, 1 is assumed. After the last macro instruction is executed, the console reenters console I/O mode.

Format:

NEXT {count}

The console implements the NEXT command using the trace trap enable and trace pending bits in the PSL and the trace pending vector in the SCB.

The console enters the Spacebar Step Mode. In this mode, pressing the spacebar initiates each single step, and a carriage return forces a return to the console prompt. The following restrictions apply:

- If memory management is enabled, the NEXT command works only if the first page in SSC RAM is mapped in S0 (system) space.
- Overhead associated with the NEXT command affects the execution time of an instruction.
- The NEXT command elevates the IPL to 31 for long periods of time (milliseconds) while single-stepping over several commands.
- Unpredictable results occur if the macro instruction being stepped over modifies either the SCBB or the trace trap entry. This means that you cannot use the NEXT command with other debuggers. You must validate PR$_SCCB before using the NEXT command.

Arguments:

{count} A value representing the number of macro instructions to execute.

Examples:

```
>>>DEP 1000 50D650D4                ! Create a simple program.
>>>DEP 1004 125005D1
>>>DEP 1008 00FE11F9
>>>EX /INSTRUCTION /N:5 1000        ! List it.
  P 00001000   D4 CLRL    R0
  P 00001002   D6 INCL    R0
  P 00001004   D1 CMPL    S^#05,R0
  P 00001007   12 BNEQ    00001002
  P 00001009   11 BRB     00001009
  P 0000100B   00 HALT
>>>DEP PR$_SCBB 200               ! Set up a user SCBB...
>>>DEP PC 1000                     ! ...and the PC.
>>>
>>>N                               ! Single step...
  P 00001002   D6 INCL    R0        ! SPACEBAR
  P 00001004   D1 CMPL    S^#05,R0  ! SPACEBAR
  P 00001007   12 BNEQ    00001002  ! SPACEBAR
  P 00001002   D6 INCL    R0        ! CR
>>>N 5                             ! ...or multiple step the program.
  P 00001004   D1 CMPL    S^#05,R0
  P 00001007   12 BNEQ    00001002
  P 00001002   D6 INCL    R0
  P 00001004   D1 CMPL    S^#05,R0
  P 00001007   12 BNEQ    00001002
>>>N 7
  P 00001002   D6 INCL    R0
  P 00001004   D1 CMPL    S^#05,R0
  P 00001007   12 BNEQ    00001002
  P 00001002   D6 INCL    R0
  P 00001004   D1 CMPL    S^#05,R0
  P 00001007   12 BNEQ    00001002
  P 00001009   11 BRB     00001009
>>>N
  P 00001009   11 BRB     00001009
>>>
```

3.12 REPEAT

The REPEAT command repeatedly displays and executes the specified command. Press Ctrl/C to stop the command. You can specify any valid console command except the REPEAT command.

Format:

REPEAT {command}

Arguments:

{command} A valid console command other than REPEAT.

Examples:

```
>>>REPEAT EX PR$_TODR  !Watch the clock.
  I 0000001B 5AFE78CE
  I 0000001B 5AFE78D1
  I 0000001B 5AFE78FD
  I 0000001B 5AFE7900
  I 0000001B 5AFE7903
  I 0000001B 5AFE7907
  I 0000001B 5AFE790A
  I 0000001B 5AFE790D
  I 0000001B 5AFE7910
  I 0000001B 5AFE793C
  I 0000001B 5AFE793F
  I 0000001B 5AFE7942
  I 0000001B 5AFE7946
  I 0000001B 5AFE7949
  I 0000001B 5AFE794C
  I 0000001B 5AFE794F
  I 0000001B 5^C
>>>
```

3.13 SEARCH

The SEARCH command finds all the occurrences of a pattern and reports the addresses where the pattern was found. If the /NOT qualifier is present, the command reports all addresses in which the pattern did not match.

Format:

SEARCH [qualifier-list] {address} {pattern} [{mask}]

SEARCH accepts an optional mask that indicates bits to be ignored (don't care bits). For example, to ignore bit 0 in the comparison, specify a mask of 1. The mask, if not present, defaults to 0.

A match occurs if (pattern and not mask) = (data and not mask),

where:

Pattern is the target data
Mask is the optional don't care bitmask (which defaults to 0)
Data is the data at the current address

SEARCH reports the address under the following conditions:

/NOT Qualifier	Match Condition	Action
Absent	True	Report address
Absent	False	No report
Present	True	No report
Present	False	Report address

The address is advanced by the size of the pattern (byte, word, longword, or quadword), unless it is overridden by the /STEP qualifier.

Qualifiers:

Data control: /B, /W, /L, /Q, /N:{count}, /STEP:{size}, /WRONG

Address space control: /P, /V, /U

Command specific:

/NOT Inverts the sense of the match.

Arguments:

{start_address} A longword address that specifies the first location subject to the search. This address can be an actual address or a symbolic address. If no address is specified, + is assumed.

{pattern} The target data.

[{mask}] A mask of the bits that the comparison checks for.

Examples:

```
>>>DEP /P/L/N:1000 0 0                ! Clear some memory.
>>>
>>>DEP 300 12345678                   ! Deposit some search data.
>>>DEP 401 12345678
>>>DEP 502 87654321
>>>
>>>SEARCH /N:1000 /ST:1 0 12345678    ! Search for all occurrences
  P 00000300 12345678                 ! of 12345678 on any byte
  P 00000401 12345678                 ! boundary.  Then try
>>>SEARCH /N:1000 0 12345678          ! longword boundaries.
  P 00000300 12345678                 ! Search for all nonzero
>>>SEARCH /N:1000 /NOT 0 0            ! longwords.
  P 00000300 12345678
  P 00000400 34567800
  P 00000404 00000012
  P 00000500 43210000
  P 00000504 00008765
>>>SEARCH /N:1000 /ST:1 0 1 FFFFFFFE  ! Search for odd-numbered
                                      ! longwords on any boundary.
  P 00000502 87654321
  P 00000503 00876543
  P 00000504 00008765
  P 00000505 00000087
>>>SEARCH /N:1000 /B 0 12            ! Search for all occurrences
  P 00000303 12                       ! of the byte 12.
  P 00000404 12
>>>SEARCH /N:1000 /ST:1 /w 0 FE11    ! Search for all words that
>>>                                  ! could be interpreted as
>>>                                  ! a spin (10$: brb 10$).
>>>                                  ! Note that none were found.
```

3.14 SET

The SET command sets the parameter to the value you specify.

Format:

SET {parameter} {value}

Parameters:

BFLAG	Sets the default R5 boot flags. The value must be a hexadecimal number of up to eight digits.
BOOT	Sets the default boot device. The value must be a valid device name or list of device names as specified in the BOOT command description in Section 3.1.

HALT	Sets the user-defined halt action. Acceptable values are the keywords "default", "restart", "reboot", "halt", "restart_reboot", or a number in the range 0 to 4 inclusive.
LANGUAGE	Sets the console language and keyboard type. If the current console terminal does not support the multinational character set (MCS), then this command has no effect and the console message is displayed in English. Values are 1 to 15, as follows: • 1—Dansk • 2—Deutsch (Deutschland/Österreich) • 3—Deutsch (Schweiz) • 4—English (United Kingdom) • 5—English (United States/Canada) • 6—Español • 7—Français (Canada) • 8—Français (France/Belgique) • 9—Français (Suisse) • 10—Italiano • 11—Nederlands • 12—Norsk • 13—Português • 14—Suomi • 15—Svenska
PSE	Allows you to enable or disable the console security feature of the system. The SET PSE command accepts the following values: • 0—Console security disabled • 1—Console security enabled When the console security feature is enabled, only a subset of the console commands are available to the user. These commands are listed in Section 2.2. To enable the complete set of console commands once the console security feature is enabled, you must use the LOGIN command (see Section 3.9).
PSWD	Allows you to set or change the console security password.

RECALL	Sets command recall state to either ENABLED (1) or DISABLED (0).
SCSI_ID	Sets the SCSI ID of the SCSI controller to a number in the range 0 to 7. The SCSI ID of the SCSI controller is set to 6 before the system is shipped.

Qualifiers: Listed in the parameter descriptions above.

Examples:

```
>>>
>>>SET BFLAG 220
>>>
>>>SET BOOT DKA300
>>>
>>>SET LANGUAGE 5
>>>
>>>SET HALT RESTART
>>>
```

3.15 SHOW

The SHOW command displays the console parameter you specify.

Format:

SHOW {parameter}

Parameters:

BFLAG	Displays the default R5 boot flags.
BOOT	Displays the default boot device.

CONFIG	Displays a list of the devices and optional modules present in the system and the status of the hardware.

Note

If you enter this command, the configuration data is read from memory. Under certain conditions the configuration data in memory may become corrupt. You can correct the corrupted configuration data by running the test A1. See Section 3.17 for more information about the TEST command.

DEVICE	Displays all devices in the system.
ERROR	Displays the errors detected during the power-up tests.
ETHERNET	Displays the system hardware Ethernet address.
HALT	Shows the user-defined halt action.
LANGUAGE	Displays console language and keyboard type. See Section 3.14 for more information about the SET LANGUAGE command.
MEMORY	Displays main memory configuration board by board.
PSE	Displays the condition of the console security feature of the system.
RECALL	Shows the current state of command recall, either ENABLED or DISABLED.
SAVED_STATE	Displays the values of non-volatile console parameters, such as BOOT, BFLG, and SCSI_ID.
SCSI	Shows any SCSI devices in the system (tape drives, disk drives, or compact disc drives, for example).
SCSI_ID	Shows the SCSI ID of the SCSI controller(s).
TRANSLATION	Shows any virtual addresses that map to the specified physical address. The firmware uses the current values of page table base and length registers to perform its search. It is assumed that page tables have been properly built.
VERSION	Displays the current firmware version.

Qualifiers: Listed in the previous parameter descriptions.

Examples:

```
>>>
>>>SHOW BFLAG
00000220
>>>
>>>SHOW BOOT
DKA300
>>>SHOW ETHERNET
Ethernet Adapter
-EZA0 (08-00-2B-0B-29-14)
>>>
>>>SHOW HALT
restart
>>>
>>>SHOW LANGUAGE
English (United States/Canada)
>>>
>>>SHOW MEMORY

64 MB RAM, SIMM Set (0A,0B,0C,0D) present
Memory Set 0: 00000000 to 03FFFFFF, 64MB, 131072 good pages, 0 bad pages

64 MB RAM, SIMM Set (1E,1F,1G,1H) present
Memory Set 1: 04000000 to 07FFFFFF, 64MB, 131072 good pages, 0 bad pages

Total of 128MB, 262144 good pages, 0 bad pages, 160 reserved pages
>>>

>>>SHOW SCSI

SCSI Adapter A, SCSI ID 6
-DKA0 (DEC RZ24)
-DKA100 (DEC RZ24)
-DKA300 (DEC RZ24)

>>>
>>>SHOW TRANSLATION 1000
 V 80001000
>>>
>>>SHOW VERSION
KA50-A V1.0 VMB 2.13
>>>
```

3.16 START

The START command starts instruction execution at the address you specify. If no address is given, the current PC is used. If memory mapping is enabled, macro instructions are executed from virtual memory, and the address is treated as a virtual address. The START command is equivalent to a DEPOSIT to PC, followed by a CONTINUE. It does not perform a processor initialization.

Format:

START [{address}]

Arguments:

[address] The address at which to begin execution. This address is loaded into the user's PC.

Example:

```
>>>START 1000
```

3.17 TEST

The TEST command invokes a diagnostic test program specified by the test number. If you enter a test number of 0 (zero), all tests that are allowed to be executed from the console terminal are executed. The console accepts an optional list of up to five additional hexadecimal arguments.

You can see a full listing of all the tests by running test 9E.

Format:

TEST [{test_number} [{test_arguments}]]

Arguments:

{test_number} A two-digit hexadecimal number specifying the test to be executed. Test 9E displays a full list of all the available tests and their parameters.

{test_arguments} Up to five additional test arguments. These arguments are accepted, but the console cannot interpret them.

Example:

```
>>>TEST 0
70..69..68..67..66..65..64..63..62..61..60..59..58..57..56..55..
54..53..52..51..50..49..48..47..46..45..44..43..42..41..40..39..
38..37..36..35..34..33..32..31..30..29..28..27..26..25..24..23..
22..21..20..19..18..17..16..15..14..13..12..11..10..09..08..07..
06..05..04..03..
Tests completed.
```

3.18 UNJAM

The UNJAM command performs an I/O bus reset, by writing a 1 (one) to IPR 55 (decimal).

Format:

UNJAM

Example:

```
>>>UNJAM
>>>
```

3.19 X—Binary Load and Unload

The X command is for use by automatic systems communicating with the console. The X command loads or unloads (that is, writes to memory or reads from memory) the specified number of data bytes through the console serial line (regardless of console type) starting at the specified address.

Format:

X {address} {count} CR {line_checksum} {data} {data_checksum}

Arguments:

{address}	The address to unload data from or load data to.
{count}	Indicates whether to load or unload data, and also indicates the amount of data to load or unload. If bit 31 of the count is clear, data is received by the console and put into memory. If bit 31 is set, data is read from memory and sent by the console. The remaining bits in the count are a positive number indicating the number of bytes to load or unload.
CR	The console accepts a load or unload command when it receives the carriage return.
{line_checksum}	The line_checksum is the next byte the console receives. The line_checksum is not echoed. The line_checksum is verified by adding all the command characters, including the checksum and separating space, into an 8-bit register initially set to zero. The line_checksum does not include the terminating carriage return, rubouts, or characters deleted by a rubout. If no errors occur, the result is zero. If the line_checksum is correct, the console responds with the input prompt and either sends data to the requester or prepares to receive data. If the line_checksum is in error, the console responds with an error message. This prevents the operator from inadvertently entering into a mode where the console accepts characters from the keyboard as data and does not provide an escape mechanism.
{data}	If the command is a load (bit 31 of the count is clear), the console responds with the input prompt (>>>), then accepts the specified number of bytes of data to be put into memory and an additional byte of received data_checksum. The data is verified by adding all data characters and the checksum character into an 8-bit register initially set to zero. If the final content of the register is nonzero, the data or checksum is in error, and the console responds with an error message. If the command is a binary unload (bit 31 of the count is set), the console responds with the input prompt (>>>), followed by the specified number of bytes of binary data. As each byte is sent, it is added to a checksum register initially set to zero. At the end of the transmission, the two's complement of the low byte of the register is sent.
{data_checksum}	If the data_checksum is incorrect on a load, or if memory or line errors occur during the transmission of data, the entire transmission is completed, and the console issues an error message. If an error occurs during loading, the contents of the memory being loaded are unpredictable.

The console represses echo while it is receiving the data string and checksums. The console terminates all flow control when it receives the carriage return at the end of the command line to avoid treating flow control characters from the terminal as valid command line checksums.

3.19.1 Controlling the Console Serial Line

You can control the console serial line during a binary unload using the control keys (Ctrl/C, Ctrl/S, Ctrl/O, and so on). You cannot control the console serial line during a binary load, because all received characters are valid binary data. The console has the following timing requirements:

- It must receive data being loaded with a binary load command at a rate of at least 1 byte every 60 seconds.
- It must receive the command checksum that precedes the data within 60 seconds of the carriage return that terminates the command line.
- It must receive the data checksum within 60 seconds of the last data byte.

If any of these timing requirements are not met, then the console aborts the transmission by issuing an error message and returning to the console prompt.

The entire command, including the checksum, can be sent to the console as a single burst of characters at the specified character rate of the console serial line. The console is able to receive at least 4K bytes of data in a single X command.

3.20 ! (Comment)

The comment character (an exclamation point) is used to document command sequences. It can be placed anywhere on the command line. All characters following the comment character are ignored.

Format: **!**

Example:

```
>>>! The console ignores this line.
>>>
```

4

Hardware Specifications

This chapter lists the hardware specifications of the following:

- System unit
- Internal SCSI device

4.1 System Unit Specifications

The following tables list the specifications for the Model 90 system.

Table 4–1 System Specifications: Model 90

Subject	Description
Processor	KA50 (NVAX).
Boot and diagnostic firmware ROM	512K bytes.
DRAM memory	16M bytes, expandable to 128M bytes, all on MS44 or MS44L memory options.
Hard disk	RZ23L, RZ24, RZ24L, RZ25, RZ25L, RZ26, RZ26L, or RZ28.
Tape drive	TZ30, TZK10, TZK11, or TLZ06.
Diskette drive	RX26.
Compact disc drive	RRD42.
Terminals	Supports the VT series.
Interfaces	Standard: one SCSI port, a ThinWire Ethernet port[1], a standard Ethernet port[1], three MMJ ports, one port with modem control. Optional: A second SCSI port, 8 or 16 additional asynchronous DEC423 MMJ ports or 8 additional asynchronous ports with modem control, 2 additional synchronous ports.
Input voltage	Automatically adjusting ac input. Range: 100 V[2] ac to 120 V ac or 220 V ac to 240 V ac.
Maximum inrush current	36 A[3].
Maximum running current	3.0 A at 110 V ac, 1.5 A at 220 V ac.
Steady state current	1.8 A at 110 V ac, 1.0 A at 220 V ac.
Maximum power consumption	215 W[4].
Frequency	49 Hz to 61 Hz.

[1]Both Ethernet types cannot be used simultaneously.

[2]Volts

[3]Amperes

[4]Watts

Table 4–2 shows the declared values for the ISO 9296 and ISO 7779 standards. The current values for specific configurations are available from Digital representatives.

Note

In Table 4–2, 1 B = 10 dBA.

Table 4–2 Acoustic Levels

	Sound Power Level L_{WAd}, B		Sound Pressure Level L_{pAm}, dBA (bystander positions)	
Product	**Idle**	**Operate**	**Idle**	**Operate**
BA42B diskless system enclosure	4.8	4.8	33	33
Per device when installed in BA42B				
RZ23L	4.0	4.7	28	35
RZ24	4.6	4.9	31	35
RZ24L	4.2	4.3	31	31
RZ25	4.4	4.4	26	26
RZ25L	4.0	4.4	25	31
RZ26	4.3	4.5	28	30
RZ26L	4.2	4.5	32	36
RZ28	4.3	4.6	26	29
RRD42	-	-	-	-
TLZ06	-	3.7	-	25
TZK10	-	6.2	-	48
TZK11	-	5.9	-	46

Table 4–3 System Unit Metrics

System Unit	Weight[1] kg (lb)	Height cm (in)	Width cm (in)	Depth cm (in)
Model 90	20.4 (45)	14.99 (5.90)	46.38 (18.26)	40.00 (15.75)

[1]Depends on the configuration. The value shown in this table is a typical value. Values vary depending on the options that you install.

Table 4–4 System Operating Conditions and Nonoperating Conditions

Operating Conditions	Range or Value
Temperature range	10°C (50°F) to 32°C (90°F) with TZ30 tape drive; otherwise 10°C (50°F) to 40°C (104°F)
Temperature change rate	11°C (20°F) per hour maximum
Relative humidity	10% to 90% noncondensing
Maximum wet bulb temperature	28°C (82°F)
Minimum dew point	2°C (36°F)
Altitude	2400 m (8000 ft) at 36°C (96°F)
Nonoperating Conditions (System in Shipping Container)[1]	
Temperature range	–40°C (–40°F) to 66°C (151°F)
Relative humidity	10% to 95% at 66°C (151°F)
Altitude	4900 m (16 000 ft)
Maximum wet bulb temperature	46°C (115°F)
Minimum dew point	2°C (36°F)

[1]The nonoperating conditions are associated with transport and short-term storage (≤ 60 days).

4.2 Internal SCSI Device Specifications

Digital's hardware and software are fully compatible with the SCSI-2 specifications. The following tables list the specifications for the internal SCSI devices.

The MicroVAX 3100 Model 90 system supports a maximum of five internal SCSI devices.

Table 4–5 RZ23L, RZ24, and RZ24L Hard Disk Drive Specifications

Formatted Storage Capacity	RZ23L	RZ24	RZ24L
Per drive (M bytes)	121	209	245
Blocks per track	39	38	44 to 87
Blocks per drive	237 588	409 792	479 350
Buffer size (K bytes)	64	64	

Performance	RZ23L	RZ24	RZ24L
Transfer rate to or from media (M bytes/s[1])	1.5	1.5	1.87 minimum
Sustained average data transfer rate (M bytes/s)	1.13	1.13	-
Transfer rate to or from buffer, asynchronous (M bytes/s)	3	3	4
Transfer rate to or from buffer, synchronous (M bytes/s)	4	4	5
Average seek time (ms[2])	$\leq$ 19	16	16
Maximum seek time, full stroke (ms)	$\leq$ 35	$\leq$ 35	$\leq$ 30
Average latency (ms)	8.8	8.6	6.97
Average access (ms)	26.8	24.6	-

[1] Megabytes per second

[2] milliseconds

(continued on next page)

Table 4–5 (Cont.) RZ23L, RZ24, and RZ24L Hard Disk Drive Specifications

Functional Specifications	RZ23L	RZ24	RZ24L
Recording density (bits/in[3])	36 250	31 800	38 600
Track density (tracks per inch)	1850	1700	1930
Area density (M bytes per square inch)	67.06	54.06	-
Read/write heads	4	8	4
Disks	2	4	2
Recording mode	CF[4]	CF	ZBR[5]
Power	**RZ23L**	**RZ24**	**RZ24L**
Maximum seeking (W)	4.3	10.4	6.7
Typical seeking (W)	3.8	6.6	4.9
Maximum starting (W)	14.5	27.5	13.5

[3]bits per inch

[4]Continuous frequency

[5]Zone bit recording

Table 4–6 RZ25, RZ26 and RZ26L Hard Disk Drive Specifications

Formatted Storage Capacity	RZ25	RZ26	RZ26L
Per drive (M bytes)	426	1050	1050
Blocks per track	48 to 74	57	59 to 119
Blocks per drive	832 527	2 050 860	2 050 860
Buffer size (K bytes)	60	512	512

(continued on next page)

Table 4–6 (Cont.) RZ25, RZ26 and RZ26L Hard Disk Drive Specifications

Performance	RZ25	RZ26	RZ26L
Transfer rate to or from media (M bytes/s)	2.1 to 3.2	3.3	2.7 to 5.5
Sustained average data transfer rate (M bytes/s)	2.33	2.6	–
Transfer rate to or from buffer, asynchronous (M bytes/s)	4	5	5
Transfer rate to or from buffer, synchronous (M bytes/s)	5	10	10
Average seek time (ms)	$\leq$ 14	9.5	9.5
Maximum seek time, full stroke (ms)	26	20	20
Average latency (ms)	6.8	5.6	5.6
Average access (ms)	20.8	15.1	15.1

Functional Specifications	RZ25	RZ26	RZ26L
Recording density (bits/in)	38 834	56 000	58 000 to 61 500
Track density (tracks per inch)	1760	2756	3256
Area density (M bytes per square inch)	68.28	154	191.4 to 200.3
Read/write heads	9	14	8
Disks	5	7	4
Recording mode	ZBR[1]	RLL[2] 1,7	RLL 1,7

Power	RZ25	RZ26	RZ26L
Maximum seeking (W)	14	16.5	12.3

[1]Zoned Bit Recording

[2]Run Length Limited

(continued on next page)

Table 4–6 (Cont.) RZ25, RZ26 and RZ26L Hard Disk Drive Specifications

Power	RZ25	RZ26	RZ26L
Typical seeking (W)	10	13.8	10
Maximum starting (W)	34.5		29

Table 4–7 RZ25L and RZ28 Hard Disk Drive Specifications

Formatted Storage Capacity	RZ25L	RZ28
Per drive	535 MB	2.1 GB
Blocks per track (512 byte blocks)	94.6 average	59 - 118
Blocks per drive	1 240 000	4 197 520
Buffer size	240 KB	1 MB

Performance	RZ25L	RZ28
Transfer rate to or from media (M bytes/s)	2.6 - 4.4	2.7 - 5.5
Sustained average data transfer rate (M bytes/s)	3.1	
Transfer rate to or from buffer, asynchronous (M bytes/s)	5.0 max. (burst)	5.0
Transfer rate to or from buffer, synchronous (M bytes/s)	10.0 max. (burst)	10.0
Average seek time (ms)	10.5	9.7
Maximum seek time, full stroke (ms)	20	19
Average latency (ms)	5.6	5.6
Average access (ms)	16	15.3

(continued on next page)

Table 4–7 (Cont.) RZ25L and RZ28 Hard Disk Drive Specifications

Functional Specifications	RZ25L	RZ28
Recording density (bits/in)		58.4 - 64.0
Track density (tracks per inch)	2150	3256
Area density (M bytes per square inch)	-	187.6 to 216.11
Read/write heads	7	16
Disks	4	8
Recording mode	ZBR[1]	RLL[2] (1,7)

Power	RZ25L	RZ28
Maximum seeking (W)	10.76	16.62
Typical seeking (W)	8.4	14.88
Maximum starting (W)	22.4	39

[1]Zoned Bit Recording

[2]Run Length Limited

Table 4–8 TZ30 Tape Drive Specifications

Subject	Description
Mode of operation	Streaming
Media	12.77 mm (0.5 in) unformatted magnetic tape
Bit density	2624 bits/cm (6667 bits/in)
Number of tracks	22
Transfer rate (at host)	62.5K bits/s
Tape speed	190 cm/s (75 in/s)
Track format	Multiple track serpentine recording
Cartridge capacity	95M bytes, formatted (approx)

Table 4–9 TZK10 QIC Tape Drive Specifications

Subject	Description
Mode of operation	Streaming.
Media	DC6320, DC6525, or Digital approved equivalent. See the *MicroVAX 3100 Model 90 Operator Information* manual.
Head and track width: write	0.1778 mm +0.0000, -0.0127 mm (0.0070 in +0.0000, -0.0005 in).
Head width: read	0.1270 mm +0.0127, -0.0000 mm (0.0050 in +0.0005, -0.0000 in).
Bit density	16K bits/in.
Number of tracks	26.
Transfer rate	200K bytes/s at average streaming mode, 1.5M bytes /s at SCSI maximum.
Tape speed	305 cm/s (120 in/s).
Track format	Multiple track serpentine recording.
Cartridge capacity	320M or 525M bytes, formatted (approx), depending on the QIC tape used.

Table 4–10 TZK11 QIC Tape Drive Specifications

Subject	Description
Mode of operation	Streaming.
Media	DC9200, DC9200XL, or Digital approved equivalent. See the *MicroVAX 3100 Model 90 Operator Information* manual.
Head and track width: write	0.1778 mm ±0.00038 mm (0.0070 in) ±0.00015 in
Head width: read	0.0762 mm ±0.00038 mm (0.0030 in) ±0.00015 in
Bit density	40,640 bits/in.
Number of tracks	42.
Transfer rate	300K bytes/s at average streaming mode, 3 M bytes/s burst transfer rate.
Tape speed	70.9 inches/sec with QIC-2GB cartridge.
Track format	Multiple track serpentine recording.
Cartridge capacity	2 G or 2.5 Gbytes, formatted (approx), depending on the QIC tape used.

Table 4–11 TLZ06 Cassette Tape Drive Specifications

Subject	Description
Mode of operation	Streaming and start/stop.
Media	TLZ04-CA, TLZ06-CA, or Digital approved equivalent. See the *MicroVAX 3100 Model 90 Operator Information* manual.
Bit density	114M bits/in.
Transfer rate (sustained)	183K bytes/s noncompression
Recording format	Digital Data Storage (DDS, DC)

Table 4–12 RX26 Diskette Drive Specifications

Subject	Description
Diskette size	9 cm (3.5 in)
Diskettes per diskette drive	1
Number of read/write heads	2
Data capacity (formatted)	1.44M bytes—high density (HD) diskettes
	2.88M bytes—extra density (ED) diskettes
Number of bytes per sector	512
Number of sectors per track	18 (HD diskettes)
	36 (ED diskettes)
Number of cylinders	80
Number of tracks per cylinder	2
Transfer rate	500K bits/s (HD diskettes)
	1M bits/s (ED diskettes)

Table 4–13 RRD42 Compact Disc Drive Specifications

Subject	Description
Acceptable discs	CD–ROM mode-1 data discs
	CD–ROM mode-2 data discs
Disc capacity	600M bytes
Rotation speed: innermost track	530 r/min[1] at CLV = 1.4 m/s
Rotation speed: outermost track	200 r/min at CLV = 1.2 m/s
Sustained data transfer rate	150K bytes/s
Burst data transfer rate	1.5M bytes/s
Access time: full stroke	650 ms
Access time: average	380 ms

[1]revolutions per minute

A

DSW42-AA Synchronous Communications Option Installation Information for the United Kingdom

This appendix includes the following installation information, which is required only in United Kingdom:

- Service categories
- Host power rating
- Module isolation
- Safety warnings for UK installations only
- Cable approval
- Supported cables
- Equipment between the approved module and a Digital circuit (PTT)

A.1 Service Categories

Table A–1 lists the specifications for service category 1.

Table A–1 BABT Approved Service Specifications

Service Category	Interface Type (CCITT recommendation)	Service Requirements		Data Rate	Public Telecommunications Operators[1]		
		Electrical	Physical		BT	Hull	MCL
1	X.21bis	V.24/V.28	ISO 2110, BS.6623: part 1, 1985.	2400 bps [2] 4800 bps 9600 bps 19200 bps	Yes Yes Yes No	Yes Yes Yes No	Yes Yes Yes Yes
		Approved adapter cable: BC19V-02 BC19D-02[3] Approved extension cable: BC22F-25 (25 feet)[4]					

[1]BT — British Telecommunications plc.
Hull — Kingston Communications (Hull) plc.
MCL — Mercury Communications Limited.

[2]bits per second

[3]Where two adapter cables are shown, they are electrically identical. The only difference is the angle at which the cable is projected off of the 50-way connector.

[4]The total length of cable used must not exceed 27 feet.

A.2 Host Power Rating

You must ensure that the total power drawn by the approved module, the host, and other auxiliary equipment drawing power from the host, is within the rating of the host power supply.

Digital has designed all permutations of the host configuration to operate within the limits of the host power rating. The module power rating is shown in Table A–2.

Table A–2 Module Power

Input Voltage (Volts DC)	Maximum Input Current (Amperes)
+5	0.6
+12	0.3
-12	0.3

A.3 Module Isolation

Except at the connector that plugs into the host, clearance and creepage distances of Xmm and Ymm, as listed in Table A–3, must be maintained between the approved module and other parts of the host, including expansion cards. Clearance is the shortest distance in air between two points. Creepage is the shortest distance along a continuous surface between those same two points.

Table A–3 Clearance and Creepage Distances

Clearance Xmm	Creepage Ymm	Voltage Used or Generated by Other Parts of the Host or Expansion Card Vrms or Vdc
2.0	2.4 (3.8)[1]	Up to 50
2.6	3.0 (4.8)	Up to 125
4.0	5.0 (8.0)	Up to 250
4.0	6.4 (10.0)	Up to 300

[1]The distances shown in parentheses apply in an uncontrolled environment where heat, humidity, and temperature may fluctuate.

Creepage distances apply when the module is installed in a controlled environment. You can check creepage distances by measuring the distance between adjacent parts.

If in doubt, seek the advice of a telecoms safety engineer. Failure to install the module in accordance with these instructions will invalidate the approval.

A.4 Safety Warnings for UK Installations Only

Ports indicated by the safety warning label do not provide sufficient isolation to satisfy the requirements of the relevant parts of standard BS6301. Therefore, any product connected to this port must meet one of the following conditions:

- Be covered by OFTEL's General Approval NS/G/1234/J/100003

  (All products supplied by Digital comply with this General Approval.)
- Have been approved to the relevant parts of standard BS6301
- Have previously been evaluated against British Telecom (Post Office) Technical Guide 2 or 26 and given permission to attach

Any other use of this product invalidates approval.

If a port has either of the following labels, direct or indirect interconnection of that port, whether the port is marked or not, may produce hazardous conditions on the network:

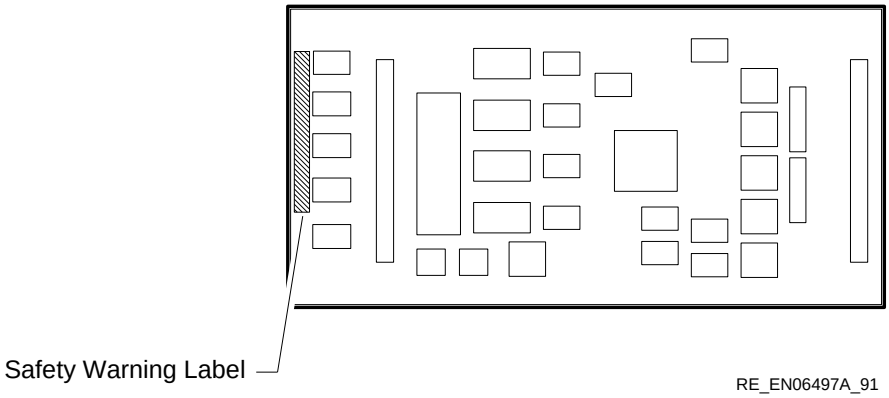
```
SAFETY WARNING --- See Instructions for Use
```

or

```
SAFETY WARNING - See Instructions for Use Before Making Any Connection to This Module
```

Obtain advice from a competent engineer before making such a connection. Figure A–1 shows the location of the safety label on the DSW42-AA synchronous communications option.

Figure A–1 Safety Warning Label



A.5 Cable Approval

The module is approved for direct connection to a particular digital circuit. This approval includes an interconnecting cable with mating connectors that conform to the British standard BS6623, parts 1 and 4. If the module is connected to the service with anything other than its own approved cables, those cables must benefit from relevant general approval NS/G/1235/100009 and/or conform to any other applicable requirements.

A.6 Supported Cables

Digital supports all of the following cables. The approved module may not use all of these cables, so check the instructions for use to determine which interface types are supported.

Table A–4 Cables Supported by the Approved Module

Interface	Cable Type	Name	Molding	Pins
V.36	adapter	BC19B-02	45 degree	50-37
V.36	adapter	BC19U-02	straight	50-37
V.36	extension	BC55D-xx		
V.24	adapter	BC19D-02	45 degree	50-25

(continued on next page)

Table A–4 (Cont.) Cables Supported by the Approved Module

Interface	Cable Type	Name	Molding	Pins
V.24	adapter	BC19V-02	straight	50-25
V.24	adapter	BC23V-02	straight	50-25
V.24	extension	BC22F-xx		
V.24[1]	extension low cap	BC13P-10		
V.10	adapter	BC19E-02	45 degree	50-37
V.10	adapter	BC19W-02	straight	50-37
X.21	adapter	BC19C-02	45 degree	50-15
X.21	adapter	BC20Q-02	straight	50-15
X.21	extension	BC22Z-xx		
Kilostream/X.21	adapter	BC21G-02		37-15
Kilostream	adapter	BC22X-02		50-15

[1]The BC13P-10 is supported only on KN02 (DECstation 5000 Model 120, 125, 133) and KN03A-AA (DECstation 5000 Model 240)

A.7 Synchronous Option Port Pin Specifications

The synchronous option 50-pin port supports the following standards:

- EIA-232/V.24
- EIA-423/V.10
- EIA-422/V.11

Table A–5 lists the signals on each pin of the 25-pin connector on the EIA-232 /V.24 cable (BC19D-02). The connector pins are numbered from left to right and from top to bottom.

Table A–5 Synchronous Option Port Pin Specifications (EIA-232/V.24)

Pin	EIA-232/V.24 Signal Names	Pin	EIA-232/V.24 Signal Names
1	–	14	–
2	Tx DATA	15	Tx CLOCK

(continued on next page)

Table A–5 (Cont.) Synchronous Option Port Pin Specifications (EIA-232/V.24)

Pin	EIA-232/V.24 Signal Names	Pin	EIA-232/V.24 Signal Names
3	Rx DATA	16	–
4	RTS	17	Rx CLOCK
5	CTS	18	LOCAL LOOP
6	DSR	19	–
7	DTE GROUND	20	DTR
8	DCD/I	21	REM. LOOP
9	–	22	RI
10	–	23	SPEED
11	–	24	CLOCK
12	–	25	TEST 1
13	–		

Table A–6 lists the signals on each pin of the 37-pin connectors on the EIA-423 /V.10 cable (BC19E-02) and EIA-422/V.11 cable (BC19B-02). The connector pins are numbered from left to right and from top to bottom.

Table A–6 Synchronous Option Port Pin Specifications

Pin	EIA-423/V.10 Signal Names	EIA-422/V.11 Signal Names
1	–	–
2	–	–
3	–	–
4	Tx DATA	Tx DATA (A)
5	–	Tx CLOCK (A)
6	Rx DATA (A)	Rx DATA (A)
7	RTS	RTS/C (A)
8	Rx CLOCK (A)	Rx CLOCK (A)
9	CTS (A)	CTS (A)
10	LOCAL LOOP	LOCAL LOOP
11	DSR (A)	DSR (A)

(continued on next page)

Table A–6 (Cont.) Synchronous Option Port Pin Specifications

Pin	EIA-423/V.10 Signal Names	EIA-422/V.11 Signal Names
12	DTR	DTR (A)
13	–	DCD/I (A)
14	REM. LOOP	REM. LOOP
15	RI	RI
16	SPEED	–
17	CLOCK	CLOCK (A)
18	TEST 1	TEST 1
19	DTE GROUND	DTE GROUND
20	DCE GROUND	DCE GROUND
21	–	–
22	DTE GROUND	Tx DATA (B)
23	DCD/I (A)	Tx CLOCK (B)
24	Rx DATA (B)	Rx DATA (B)
25	DTE GROUND	RTS/C (B)
26	Rx CLOCK (B)	Rx CLOCK (B)
27	CTS (B)	CTS (B)
28	–	–
29	DSR (B)	DSR (B)
30	DTE GROUND	DTR (B)
31	–	DCD/I (B)
32	DCD/I (B)	–
33	–	–
34	–	–
35	DTE GROUND	CLOCK (B)
36	–	–
37	DTE GROUND	DTE GROUND

A.8 Equipment Between the Approved Module and a Digital Circuit (PTT)

If any other equipment, including cables or wiring, is to be connected between the approved module and the point of connection to any particular digital circuit, that equipment must conform as follows:

- The overall transmission characteristics of all other equipment must not have any material effect on the electrical conditions between the equipment and the digital circuit.
- All other equipment must comprise only the following:
  - Approved equipment, which may be subject to limitations on its use, for the purpose of connection between it and a particular digital circuit
  - Cable or wiring that complies with a code of practice for the installation of equipment covered by this standard or other requirements that may be applicable

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