

DECsystem 5900

Owner's Guide

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Preface

Product Description

The DECsystem 5900 computer system is designed for server applications, including file servers, compute servers, and network servers. It is a midrange system that uses a modular approach, based on industry standard 47.5 cm (19 in) rackmount components.

DECsystem 5900 servers use a high-performance single-board computer based on the MIPS R3000A processor (KN03) or the MIPS R4400 processor (KN05). The DECsystem 5900 cabinet contains a power controller, a single CPU drawer, and up to four additional mass storage drawers. There can be a second optional CPU drawer, and only up to three mass storage drawers.

Document Description

This guide describes the DECsystem 5900 server configurations, explains console commands used to operate the system, describes the system options that are available, and explains troubleshooting procedures.

Any service or upgrades to the DECsystem 5900 system must be done by a Digital Service representative or a qualified self-maintenance customer.

Audience

The *DECsystem 5900 Owner's Guide* is for system managers or technical users who are responsible for operating the system on a daily basis.

Document Structure

The *DECsystem 5900 Owner's Guide* contains three chapters and three appendixes, as follows:

Chapter 1	DECsystem 5900 Overview This chapter provides a physical description of the DECsystem 5900 product and an overview of the system's cables and power switches.
Chapter 2	Operating the DECsystem 5900 System This chapter explains how to turn the DECsystem 5900 drawers on and off, and describes console commands.
Chapter 3	Troubleshooting Tools and Error Messages This chapter includes an ULTRIX command summary, and explains how to solve system problems and interpret system error messages.
Appendix A	Hardware Specifications This appendix contains DECsystem 5900 hardware and options specifications.
Appendix B	Associated Documents This appendix lists all DECsystem 5900 documentation.
Appendix C	United Kingdom Regulatory Information This appendix provides regulatory information required for the United Kingdom.

Conventions Used in This Document

The *DECsystem 5900 Owner's Guide* uses the following conventions:

Convention	Indicates
boldface type	User input.
Caution	Information to prevent damage to equipment or software. Read these carefully.
<i>italic type</i>	Important information, variables, and complete titles of manuals.
Note	General information about the current topic.
Return	Press the named key.

1

DECsystem 5900 Overview

The DECsystem 5900 RISC/ULTRIX system applications includes file servers, compute servers, and network servers. It is a highly modular system that has many configuration capabilities. The basic configuration is a single-cabinet uniprocessor. The DECsystem 5900 high-performance, single-board computer utilizes either the MIPS R3000A processor or the MIPS R4400 processor.

The DECsystem 5900 product provides the following:

- Up to fourteen 32-Mbyte memory modules
- 1-Mbyte NVRAM memory for Prestoserve™ support
- Internal storage for up to 28 SCSI devices
- Support for all TURBOchannel devices that conform to the TURBOchannel specification

This chapter describes the DECsystem 5900 cabinet hardware:

- Cabinet contents
- CPU drawer and mass storage drawer contents
- Power controller
- Network and power cables
- Power switches

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1.1 The DECsystem 5900 Cabinet

The DECsystem 5900 rackmounted cabinet can be rolled to its operating position. Once in position, the cabinet must be made stationary by turning down the four leveling feet.

Warning

You must extend the stabilizing bar from the underside of the front of the cabinet for additional support when the drawers are opened for servicing or upgrades.

You can access the cabinet from both the front and rear doors. Use the front door to power down the system, and to access removable media. Use the rear door to check your console or Ethernet cable connection.

Both doors have magnetic latches that keep the doors closed. They can be locked and unlocked with a hex wrench.

The DECsystem 5900 cabinet contains:

- Room for six drawers (6 slots)
 - One CPU drawer
 - Four mass storage drawers
 - One drawer reserved for optional second CPU
- System power controller
- Network and power cables

Table 1–1 describes the weight and size of the DECsystem 5900 CPU drawer and four mass storage drawers.

Table 1–1 DECsystem 5900 Cabinet Dimensions

Weight	Height	Width	Depth
436.5 kg	170 cm	61 cm	86.4 cm
970 lb	66.9 in	24 in	34 in

The DECsystem 5900 trim panels, called skirts, attach to the bottom of the cabinet to enhance its appearance. Skirts are assembled and attached by your Digital service representative at installation time. The cabinet comes with filler panels that cover any empty drawer slot.

See Table 1–2 for DECsystem 5900 service clearance.

Table 1–2 Service Clearance Requirements

Front	90 cm (36 in)
Rear	56 cm (22 in)
Side	None

The Drawer Numbering Scheme

DECsystem 5900 drawers are referred to by their position (slot) in the cabinet in this owner's guide. Drawers are numbered from the bottom, the bottommost drawer being number 1. Storage drawers go in slots 4, 5, 1, and 6, in that order. This configuration provides the safest weight distribution throughout the cabinet.

Table 1–3 lists the DECsystem 5900 drawer contents.

Table 1–3 DECsystem 5900 Cabinet Slots

Slot Number	Contents
6 (Top)	Mass storage
5	Mass storage
4	Mass storage
3	CPU
2	Reserved for optional second CPU
1	Mass storage
0 (Bottom)	Power controller only

Using reserved slot (2)

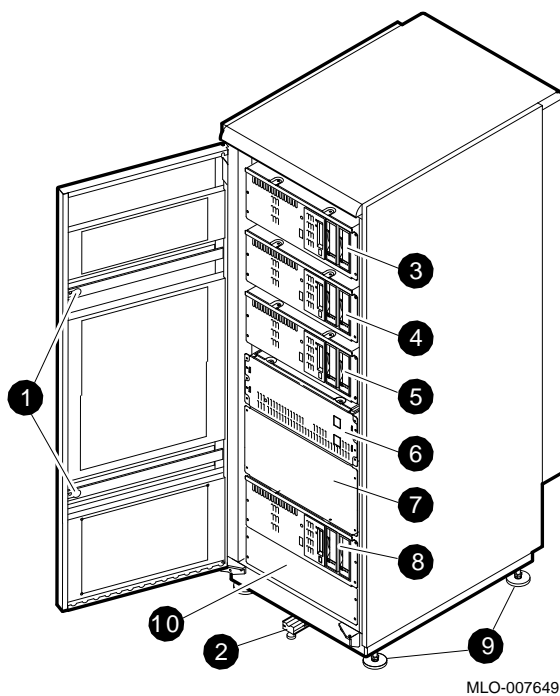
Using slot 2:

- Use reserved slot 2 to install the optional second CPU.
- Slots 1 and 2 are used to install the StorageServer 100 (it requires two slots) when slot 2 is empty and there is no second CPU.

When there is a second CPU in slot 2, the StorageServer 100 is installed in slots 5 and 6.

See Figure 1-1 for the DECsystem 5900 front view, and Figure 1-2 for the DECsystem 5900 rear view.

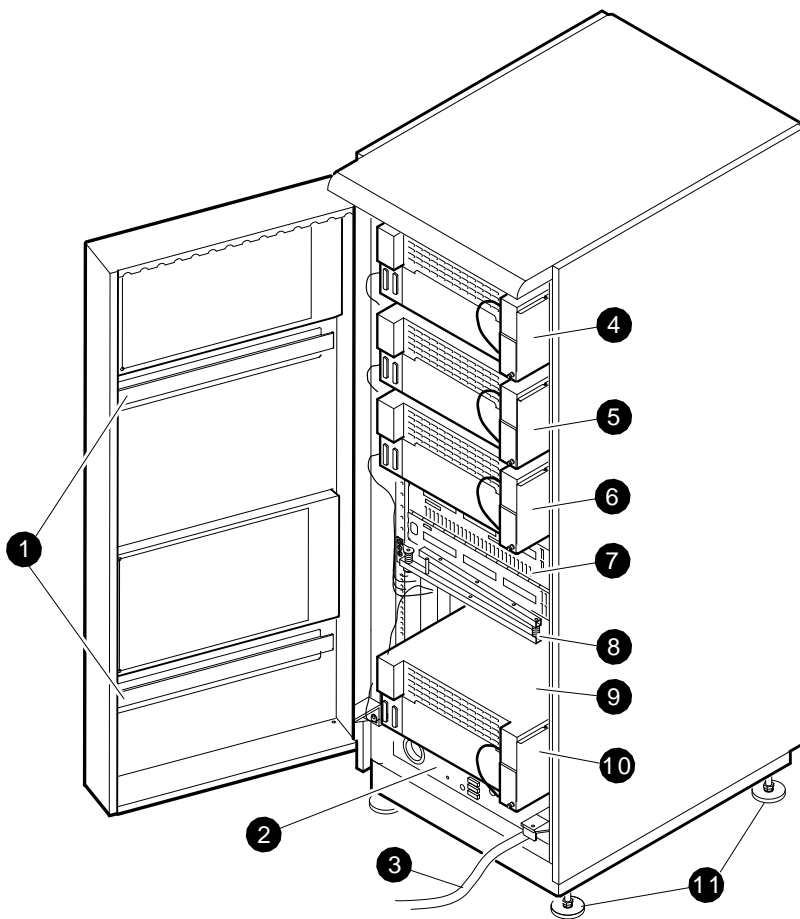
Figure 1-1 The DECsystem 5900 Front View with Door Open



- ❶ Door latches
- ❷ Stabilizer bar (use when extending a drawer)
- ❸ Slot 6–mass storage drawer
- ❹ Slot 5–mass storage drawer
- ❺ Slot 4–mass storage drawer
- ❻ Slot 3–CPU drawer
- ❼ Slot 2–filler panel covering empty slot (reserved for CPU upgrades)
- ❽ Slot 1–mass storage drawer
- ❾ Screw-down leveling feet

⑩ Slot 0–filler panel covering power controller

Figure 1–2 The DECsystem 5900 Rear View with Door Open



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- ① Door latches
- ② Slot 0–power controller
- ③ Power cable
- ④ Slot 6–mass storage drawer
- ⑤ Slot 5–mass storage drawer

- ⑥ Slot 4–mass storage drawer
- ⑦ Slot 3–CPU drawer
- ⑧ Cable arm
- ⑨ Slot 2–empty drawer slot
- ⑩ Slot 1–mass storage drawer
- ⑪ Screw-down leveling feet

1.2 DECsystem 5900 Drawers

The following sections provide an overview of the CPU and mass storage drawers used in the DECsystem 5900 system.

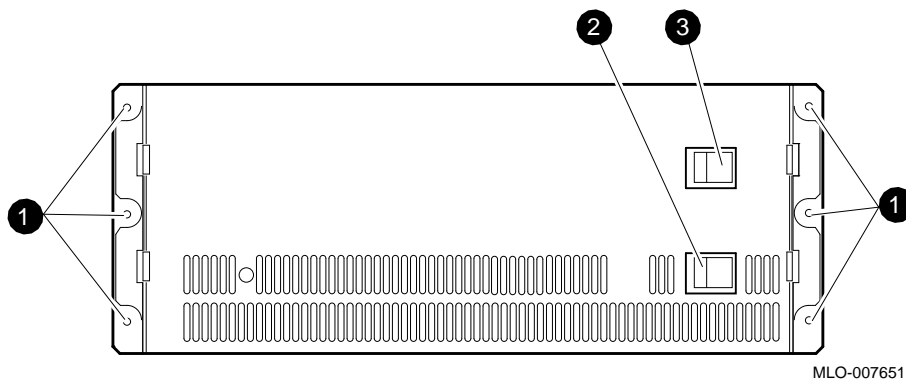
1.2.1 CPU Drawer

The DECsystem 5900 CPU drawer provides:

- R3000A processor or R4400 processor
- 64- to 448-Mbyte main memory
- Ethernet controller with DMA (thickwire connector)
- SCSI controller with DMA
- Four serial lines
 - Keyboard (15-pin connector, reserved for future use)
 - Two synchronous/asynchronous (25 pin RS232)
- Three TURBOchannel slots at 25 MHz
- 1-Mbyte Prestoserve(tm) nonvolatile RAM
- TURBOchannel Extender Adapter module (in TURBOchannel slot 0)
- TURBOchannel Extender module

Figure 1-3 shows the front panel of a CPU drawer, and identifies each component.

Figure 1-3 CPU Drawer Front Panel

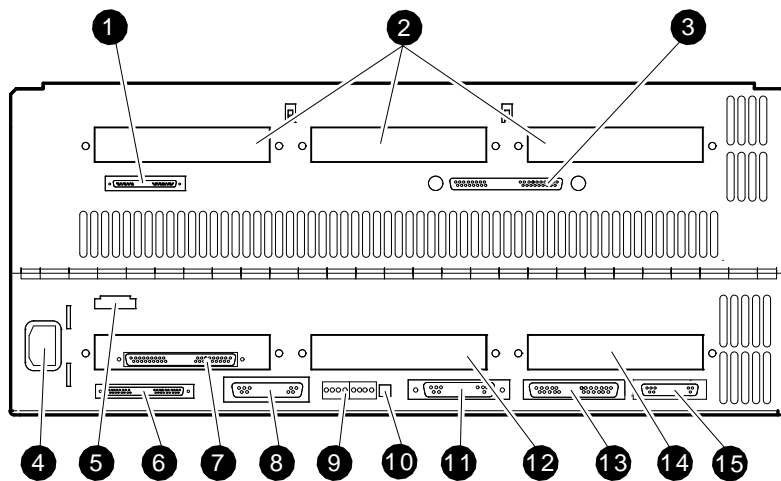


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- ❶ 5/16-inch hex screws that secure the drawer to the cabinet
- ❷ CPU drawer power switch (should normally be left on)
- ❸ System power switch (should normally be left on)

Figure 1-4 shows the rear panel of a CPU drawer.

Figure 1-4 CPU Drawer Rear Panel

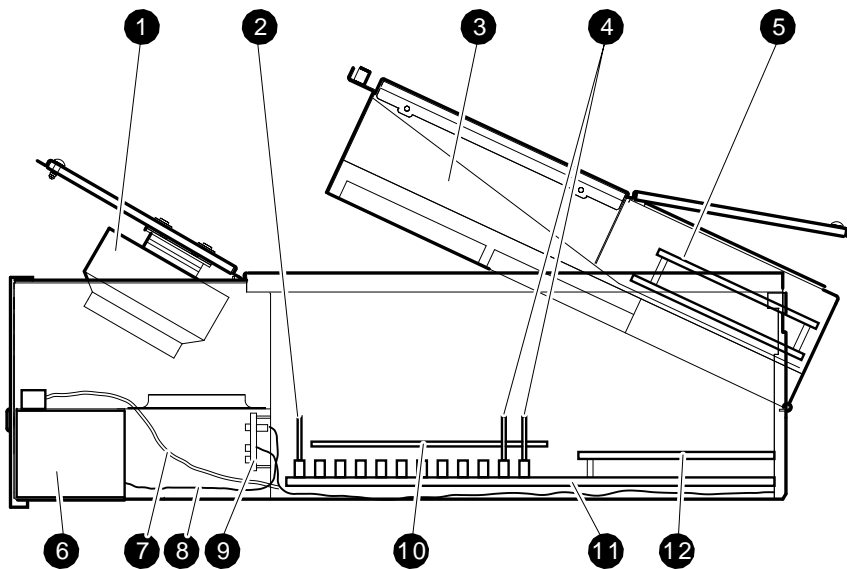


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- ❶ Not used
- ❷ TURBOchannel Extender module slots
- ❸ TURBOchannel Extender I/O (connected to ❷)
- ❹ AC power input
- ❺ Remote power sequence connector
- ❻ System module SCSI port
- ❼ TURBOchannel Extender Adapter module (in option slot 0, connected to ❸)
- ❽ Standard Ethernet
- ❾ Diagnostic LEDs
- ❿ Halt switch
- ⓫ System console port
- ⓬ TURBOchannel option slot 1
- ⓭ Communications port
- ⓮ TURBOchannel option slot 2
- ⓯ Not used

Figure 1-5 is an interior side view of a CPU drawer with the three covers slightly raised to provide a perspective on the relative location of CPU drawer components.

Figure 1-5 CPU Drawer



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- ❶ Blower for temperature control
- ❷ 1-Mbyte NVRAM (SIMM in slot 14 of the memory array)
- ❸ Air plenum
- ❹ 32-Mbyte memory modules (2 shown)
- ❺ TURBOchannel Extender Module
- ❻ 244 W drawer power supply
- ❼ Remote system switch power cable
- ❽ Power supply cable
- ❾ Power distribution module
- ❿ CPU/daughter card (on the CPU system board)
- ⓫ System module
- ⓬ TURBOchannel Extender Adapter module

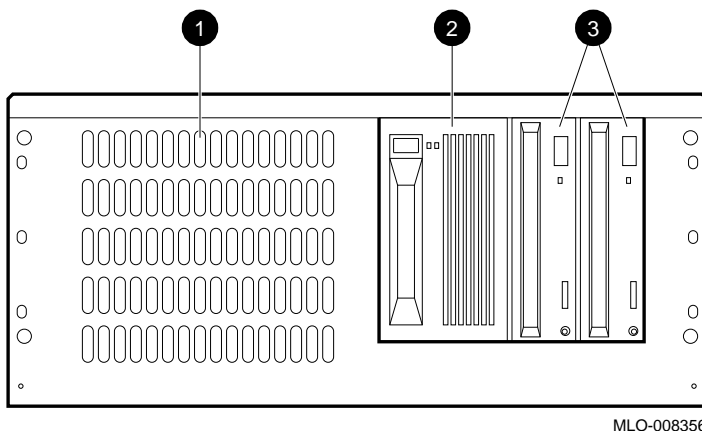
1.2.2 Mass Storage Drawers

The DECsystem 5900 cabinet has at least one drawer devoted to storage devices (and possibly up to four drawers, depending upon the configuration). These are called *mass storage drawers*.

1.2.2.1 Mass Storage Drawer

Figure 1–6 shows the front panel of a mass storage drawer, and identifies each component.

Figure 1–6 Mass Storage Drawer Front Panel



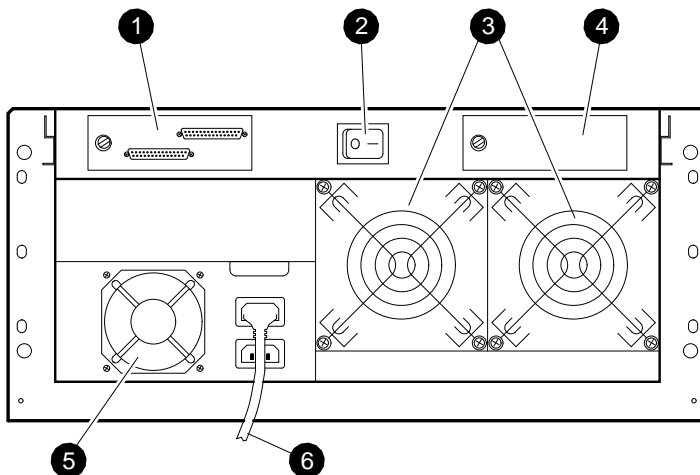
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- ❶ Air inlet
- ❷ Optional full-height removable media device (TLZ06 shown)
- ❸ Optional half-height removable media devices (RRD42s shown)

1.2.2.2 Mass Storage Drawer Rear Panel

Figure 1-7 shows the rear panel of a mass storage drawer.

Figure 1-7 Mass Storage Drawer Rear Panel



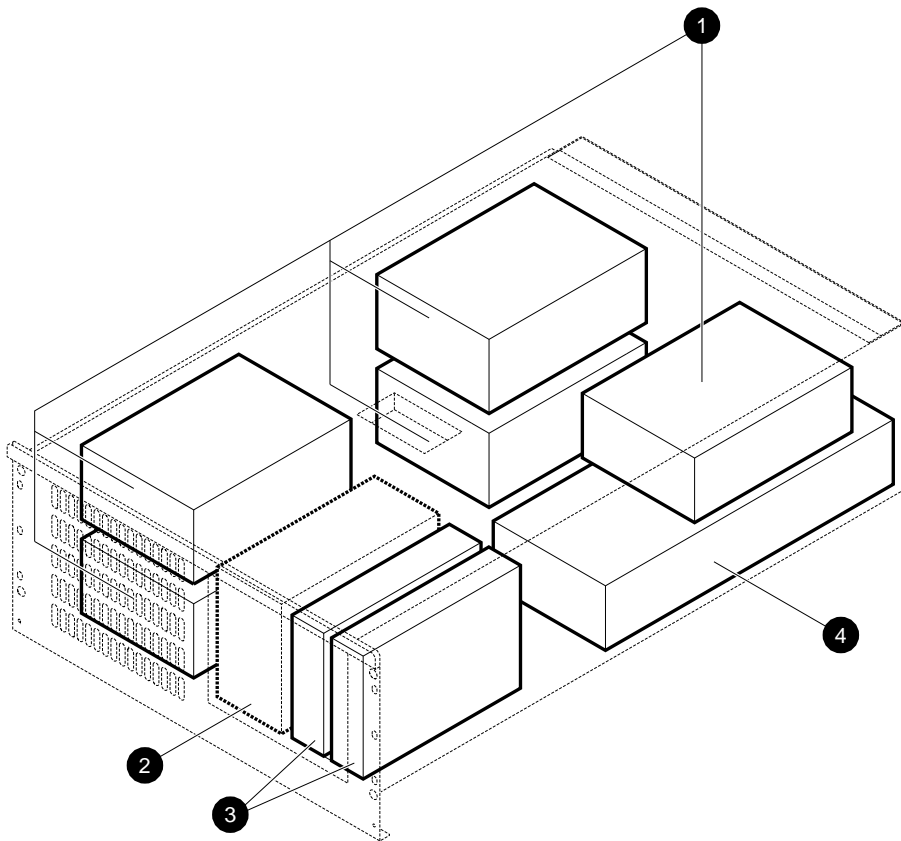
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- ❶ Port for SCSI bus cable that connects to the SCSI controller(s)
- ❷ Power switch (should normally be left on)
- ❸ Fans
- ❹ Optional connector panel
- ❺ Power supply
- ❻ Power cable that connects to main power controller

1.2.2.3 Mass Storage Drawer Interior Compartments

Each mass storage drawer provides mounting, power and cooling for up to seven 13 cm (5.25 in) SCSI devices. The two right front device positions are designed to mount either fixed or removable media devices. The far right-hand position can mount either one full-height device or two half-height devices, as shown in Figure 1-8. The drawers contain both SCSI-IN and SCSI-OUT ports, and can be configured for either one or two (split) SCSI buses.

Figure 1-8 Internal View of Mass Storage Drawer with Devices



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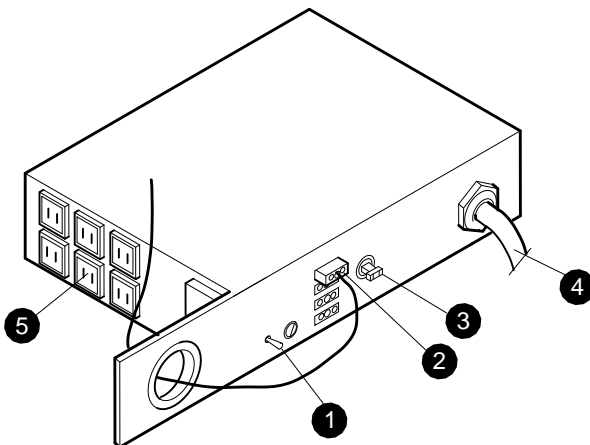
- ❶ Full-height nonremovable storage media options
- ❷ Full-height removable storage media option
- ❸ Half-height removable storage media options
- ❹ Drawer power supply

1.3 DECsystem 5900 System Power Controller

The DECsystem 5900 single-phase ac power controller is located at the bottom of the system cabinet, as shown in Figure 1-2. Each drawer in the cabinet plugs into the system power controller, which provides a single point of system power control. The power controller provides power to the CPU and mass storage drawers and is normally configured to remotely (from the front of the system) power the system off/on. The non-U.S. version has a detachable power cable (see Table 1-6).

See Figure 1-9 for the rear view of the power controller.

Figure 1-9 System Power Controller



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- ❶ Remote/Manual toggle switch (up is remote) should be set to the remote position to enable the system to be turned on by the upper switch on the front panel of the CPU drawer.
- ❷ Power controller cable to CPU drawer upper front switch (connects to the back of the CPU drawer)
- ❸ Circuit breaker (up is on)
- ❹ System ac power cable (see Table 1-6)
- ❺ Outlets for drawer power cables

1.4 DECsystem 5900 Network and Power Cables

This section lists the DECsystem 5900 network and power cables.

1.4.1 Drawer Cables

Table 1-4 lists the cables that are external to the drawers, and internal to the enclosure.

Table 1-4 Drawer Cables

Cable	Function
Power cable	Connects each drawer to the main power controller
SCSI cables	Connect each mass storage drawer to the CPU drawer (SCSI controller)

1.4.2 System Cables

Table 1-5 describes the cables that extend outside the system cabinet.

Table 1-5 System Cables

Cable	Function
Console interface	Connects the system to a console terminal (25-pin RS-232 connector).
Ethernet cable	Connects the system to the local network.
FDDI	Connects the system to the local FDDI network.
Power cable	Connects the system to a power outlet (see Table 1-6). Measures 36.7 cm (14.7 ft).
SCSI cable	Connects to tabletop devices and other external devices.

1.4.3 DECsystem 5900 Power Cable and Plug Numbers–230 Vac

Table 1–6 lists the DECsystem 5900 power cables and plug numbers used in each country.

Table 1–6 Power Cables and Plug Numbers by Country

Country	Cable Number	Plug Number
Australia	BN18D–4E (17–00198–05)	AS 3112–1981
Central Europe	BN18C–4E (17–00199–10)	CEE7/7
Denmark	BN18P–4E (17–01255–01)	IEC 309
Europe	BN18P–4E (17–01255–01)	IEC 309
India	BN18H–4E (17–00456–06)	BS546
Ireland	BN18P–4E (17–01255–01)	IEC 309
Israel	BN18F–4E (17–00457–06)	S.I.32
Italy	BN18E–4E (17–00364–06)	CEI 23–16
Japan	BN18R–4E (17–01256–01)	IEC 309
South Africa	BN18H–4E (17–00456–06)	BS546
Switzerland	BN18P–4E (17–01255–01)	IEC 309
United Kingdom	BN18P–4E (17–01255–01)	IEC 309
United States	BN18R–4E (17–01256–01)	IEC 309

1.5 DECsystem 5900 Switches

There is a single power switch on the rear panel of the mass storage drawer. On the front panel of the CPU drawer there are two power switches. Table 1–7 explains the location and function of each DECsystem 5900 switch.

Table 1–7 DECsystem 5900 Switches

Switch	Location	Function
Circuit breaker	Rear of the system power controller	Limits the current into the cabinet; can be used for main power switch.
Mass storage drawers	Rear panel of each drawer	Turns the mass storage drawer on and off.
Drawer 3 (CPU)	Lower front panel of drawer	Turns the CPU drawer on and off.
Drawer 2 (second optional CPU)	Lower front panel of drawer	Turns the CPU drawer on and off.
Halt	Rear panel of the CPU drawer	Stops the software from running and the system enters console mode.
Remote/Manual toggle	Rear of the system power controller	Sets the power control mode.
Enable power on switch	Upper switch on the front of the CPU drawer	Turns the system on and off—dependent on remote (manual) switch.

2

Operating the DECsystem 5900 System

This chapter contains the following sections explaining how to prepare and operate the system, including descriptions of the console commands:

- Preparing Your DECsystem 5900
- SCSI ID Switch/Jumper Settings
- Turning On the DECsystem 5900 Drawers
- Shutting Down the System
- Console Commands
- Environment Variables
- Console Command Error Messages

2.1 Preparing Your DECsystem 5900

Your order should be shipped with the options and other devices you ordered already installed. It is recommended that you check your system to ensure that this has been done. If an item is missing, contact your Digital Services representative.

Before powering up your system, ensure that all options, cables, console terminals, and other peripherals are properly connected. Make certain that the system is in a location which follows all site environment guidelines. Refer to the *DECsystem 5900 Installation Guide* and *DECsystem 5900 Site Preparation* guide for further details.

2.2 SCSI ID Switch/Jumper Settings

The Small Computer Systems Interface, or SCSI, is an interface designed for connecting drives and other peripheral devices to computer systems. Each device has a set of switches or jumpers that are set for a specific SCSI ID.

Up to seven SCSI devices can share a SCSI controller. Each of the seven SCSI devices are identified by a number from 0 to 6, called SCSI ID. Each SCSI controller has a unique ID.

Note

No devices should use SCSI ID 7, as this is reserved for the SCSI controller.

Digital sets each SCSI device to a default SCSI ID setting before the equipment leaves the factory.

SCSI default settings are listed in Table 2-1. The settings listed give optimal performance on most systems.

Table 2-1 DECsystem 5900 SCSI ID Default Settings

Device	ID
CPU SCSI adapter	7
First removable device	5
Boot device or first device	0
Remaining devices, in order	1,2,3,4,6
Remaining removable devices	6,4,3,2,1

Note

Digital recommends that you use Digital-supplied cables for interconnecting SCSI devices. Digital also recommends that you power all units on the SCSI controller from a common power source. The proper operation of any SCSI controller that uses cable assemblies not supplied by Digital, or not configured in accordance with Digital's recommendations, is not guaranteed.

The maximum length of each SCSI bus (up to four SCSI buses per cabinet) must not exceed 6 meters (19.8 feet). In calculating SCSI bus length, the external SCSI cabling and the SCSI cabling within the drive(s) must be considered. Exceeding this length may cause data integrity problems.

2.3 Turning On the DECsystem 5900 Drawers

It is assumed that the system has already been plugged in and connected to the console terminal. In addition, the following is also assumed:

- The front and rear cabinet doors are open.
- The circuit breaker on the system power controller (lower rear of the cabinet) is in the on position (up).
- The Remote/Manual toggle switch, located on the back of the system power controller (lower rear of the cabinet) is in the remote (up) position.
- Power switches, located on the rear panels, are on for each mass storage drawer.

Once your system is properly set, turn on the system power switch, located on the upper front panel of the CPU drawer (slot 3). If there is a second optional CPU in slot 2, turn on the system power switch on the upper front panel of that CPU drawer.

Close the front and rear cabinet doors.

2.3.1 Power-Up Self-Tests

Note

For proper loading and booting procedures, see the *Guide to Installing ULTRIX*. If your system does not automatically boot, refer to Section 2.5.5 in this chapter.

When you turn on the system power, the system automatically runs a power-up self-test script. The test names display on the console terminal as they perform. Results of the tests are shown in hexadecimal values on the pair of four LEDs at the back of the CPU drawer. These tests do not test the drives in the drawers. Addresses and functions of the installed devices can be verified when running extended tests.

See Chapter 3 for further details on running the power-up self-tests.

Refer to the *DECsystem 5900 Service Guide* for extended testing of mass storage devices, I/O options, and troubleshooting procedures.

2.4 Shutting Down the System

To shut down the system, refer to Section 2.5.3 in this chapter.

Caution

Do not turn off, halt, or restart the system without first notifying the network group members and bringing down ULTRIX in an orderly fashion.

2.5 Console Commands

This section describes the various DECsystem 5900 console commands and how to use them. Specifically explained are:

- The rules to follow when you type console commands.
- Terms commonly used in this discussion of console commands.
- The command format and purpose of each console command.
- Possible console command error messages.

2.5.1 Console and Operating Modes

Your two DECsystem 5900 modes are: console mode and operating mode. When your system is in console mode, you are using the setup and testing firmware that is built into the system. When your system is in operating mode, you are using your system software.

This section explains how to use the ULTRIX operating system in console mode. Your system software manuals explain how to use the system in operating mode.

2.5.2 Using Console Mode

The system starts in console mode and stays in that mode until you start your system software. While you are in console mode, you can use the console commands, which are the commands of the built-in setup and testing software. The prompt for console mode is >>.

Use console mode and the console commands for such tasks as:

- Running system self-tests
- Displaying system hardware configurations
- Setting system environment variables
- Booting (starting) the operating system

2.5.3 To Enter Console Mode

To enter console mode, do one of the following:

- If the system is powered off, power it up to achieve console mode, assuming the autoboot is not set.
- If the ULTRIX operating system is up, notify users and perform an orderly shutdown by typing the following command **etc/shutdown -h now** (-h is time and time can be minutes, hour:min, or now) at the ULTRIX prompt and press Return.

2.5.4 Console Prompts: Privileged and Nonprivileged

When you are in console mode, the system displays one of these two prompts on your console screen: >> or R>.

- The privileged console prompt (>>) means that you can execute all console commands at the console prompt.
- The nonprivileged console prompt (R>) indicates that someone has set up a password requirement to restrict access to the console prompt. At the nonprivileged console prompt, the user can use only the boot and passwd console commands until the correct password is entered.

To change to the privileged console prompt (>>), type **passwd** and press `[Return]`. Then enter the console password and press `[Return]` again. If you do not know the password, contact your system manager or your Digital Services representative. See Section 2.5.19 for more information on the passwd command.

2.5.5 Booting the DECsystem 5900 System

To enter operating mode, boot (start) the operating system in any of these ways:

- At the console prompt, type **boot path**, where *path* is the path specification for the operating system. For example:

```
>> boot 3/rz0 vmunix -a
```

- If you have previously set the boot path with the **setenv bootpath** environment variable:

At the console prompt, type **boot** and press `[Return]`.

- If you have previously set the boot path with the boot environment variable, and you have set the **haltaction** environment variable to b:

Turn on your system. The operating system boots automatically.

2.5.6 Rules for Typing Console Commands

You can use all console commands when the system terminal displays the console prompt (>>). A restricted console prompt (R>) indicates that someone has set up a password requirement. You can use only the boot and passwd commands at the restricted console prompt until you enter the correct password. Then the normal console prompt (>>) appears.

To use a console command, type the command as shown, add appropriate options and arguments, and press `[Return]`.

Follow these rules:

- Type uppercase and lowercase letters exactly as they appear in the guide. The DECsystem 5900 console, like the ULTRIX operating system, recognizes the difference between uppercase and lowercase letters.
- Press `[Return]` after typing a command.
- Use these handy key combinations:
 - `[Ctrl-s]` freezes the screen display.
 - `[Ctrl-q]` releases a frozen screen display.
 - `[Ctrl-c]` aborts a command.
 - `[Ctrl-u]` erases a partially typed command line.
 - `[DEL]` erases the last character typed.
- To type a hexadecimal number, precede the number with 0x (zero x). To type an octal number, precede the number with 0 (zero). To type a decimal number, do not precede the number with any leading 0s (zeros).
- To use the `[Ctrl]` commands, hold down the `[Ctrl]` key while you type the letter of the command. For example, to use `[Ctrl-s]`, hold down `[Ctrl]` while you type `s`.

2.5.7 Conventions

- **Letters in boldface type like this** should be typed exactly as they appear.
- *Words in italic type like this OR LIKE THIS* are options or arguments for the commands. You must replace them with the appropriate information. For example, the script command has a *scriptname* argument. When you type the command, you replace *scriptname* with the name of the script you are creating.
- Options are read by the console programs. Arguments are read by the system software.
- When options and arguments are shown in brackets, you should use them only if they are appropriate. When they are not in brackets, you must use them all the time. For example, the `printenv` command is shown like this:

```
printenv [env]
```

Because `[env]` is enclosed in brackets, you should use it only when it is appropriate, which in this case is when you want to display the setting of one environment variable.

The script command is shown like this:

```
script scriptname
```

Because *scriptname* is not shown in brackets, you must use it in every script command.

Do not enclose options and arguments in brackets when you type them. The brackets are just a way of showing you when to use them.

- When an argument is followed by an ellipsis, you can use more than one argument with the command.

2.5.8 Console Command Functions, Options, and Syntax

This section explains all of the console commands for DECsystem 5900 system managers and other technical specialists.

Table 2–2 lists the console commands.

Table 2–2 Console Commands

Command	Function
?	Displays a list of console commands and formats
boot	Boots the system
cat	Displays scripts
cnfg	Displays system configuration information
d	Deposits (that is, writes) data into memory
e	Examines memory contents
erl	Displays a log of error messages
go	Transfers control to a specific address
init	Resets the system
ls	Displays a list of files present in a module ROM
passwd	Sets and clears the console password
printenv	Prints environment variables
restart	Restarts the system software
script	Enters a short script at the console
setenv	Sets environment variables
sh	Starts a script
t	Starts module diagnostic tests
unsetenv	Deletes environment variables

To display the help menu, type a question mark (?) and press `Return`. The console commands appear in the help menu on the screen as follows:

```
boot [[-z #] [-n] #/path [ARG...]]
cat SCRPT
cnfg [#]
d [-bhw] [-S #] RNG val
e [-bhwcdox] [-S #] RNG
erl [-c]
go [ADR]
init [#] [-m] [ARG...]
ls [#]
passwd [-c] [-s]
printenv [EVN]
restart
script SCRPT
setenv EVN STR
sh [-belvS] [SCRPT] [ARG...]
t [-l] #/STR [ARG...]
unsetenv EVN
```

The following sections describe each console command in detail. Note that the command descriptions do not always use the format that appears in the help menu.

2.5.9 ?

```
>>? [command]
```

The `?` command displays the help menu. If you enter the name of a specific command after the `?`, the screen displays the help message for that command only.

2.5.10 boot

```
>>boot [OPTIONS] [#/path]
[argument...]
```

Options are:

- a** Use a multiuser bootstrap.
- n** Load but do not execute *path* program.
- z *number*** Wait for *number* seconds, then boot.

The `boot` command loads and executes the program specified by `#/path`, where `#` is the slot number of the device that you are booting from, and `path` is the file specification of the program. The `-a` argument boots for a multiuser environment; to perform a single-user boot, enter the `boot` command without the `-a` argument. The `-n` option suppresses execution of the program after it is loaded. The `-z` option

causes the system to wait before booting. When you enter the command with no options, path, or argument, it uses the options, path, and argument in the boot environment variable.

The following example of the boot command uses the options and arguments that you set in the boot environment variable:

```
boot
```

The following command boots from a tape drive in base slot 3 (tz is the device code of the drive, and 5 is its SCSI ID number):

```
boot 3/tz5
```

The following command boots from the network that is connected to your system through the built-in Ethernet controller:

```
boot 3/mop
```

The following command performs a multiuser boot (-a) using the file vmunix on an external drive (rz1) in base slot 3 (rz1 is the device code and SCSI ID for the drive):

```
boot 3/rz1 vmunix -a
```

2.5.11 cat

```
>>cat #/scriptname
```

The cat command displays the contents of the script specified by *scriptname*. The # option indicates the number of the slot where the script is stored.

2.5.12 cnfg

```
>>cnfg [#]
```

The cnfg command displays important information about the configuration of your system. The information tells you what kind of hardware is in the system and connected to it. If you type a slot number for #, the command displays configuration information for that slot. Otherwise, it displays general information for all the slots.

The following example shows the display for a cnfg command in which the specific slot number was not specified. This information shows what kind of modules are in the base system slot (base slot 3) and in the option slots. The system has option modules in slots 2 and 1. The numbers in black circles correspond to the descriptions that follow.

```

>>cnfg
❶   ❷
3:  KN05      DEC    V1.0a    TCF0    ( 32 MB)
                                     (enet: 08-00-2b-24-5b-79)
                                     (SCSI = 7)
2:  PMAZ-AA   DEC    V5.3c    TCF0    (SCSI = 7)
1:  PMAZ-AA   DEC    V5.3c    TCF0    (SCSI = 7)

```

❶ Slot number.

❷ Model code. This code indicates the model of the hardware item. For example, KN05 is the model code of the system module for the R4400. KN03-AA is the model code for the R3000A.

❸ Module code. This code shows what kind of module is installed in the slot. Slot 3 is the system module slot (often referred to as base slot 3). It always contains the memory (MB) modules, a base system Ethernet (enet) controller, and a base system SCSI (SCSI) controller. The MB code shows the total amount of memory installed in the system (in this case, 32 megabytes). The SCSI code (in this case, 7) is the SCSI ID of the SCSI controller for the slot. The enet code is the Ethernet address for the Ethernet controller in that slot.

Table 2-3 lists the module codes that may appear in item 3 of the cnfg display:

Table 2-3 Module Codes

Module Code	Description
enet :	Ethernet controller. A ThickWire Ethernet controller is built into the base system. Other Ethernet controllers may be installed in the TURBOchannel option slots. The long number after enet: is a unique Ethernet station address that identifies the controller for the network software.
MB	Memory module. The number indicates the megabytes of memory installed in the base module (up to 448 megabytes).
NVRAM	Nonvolatile random-access memory (RAM) module. An NVRAM module is a module that is preinstalled in the system. It provides 1 megabyte of battery backed-up memory for use with Prestoserve NFS accelerator software that will retain data during a power failure.
SCSI	SCSI controller. One is built into base slot 3; others may be installed in the TURBOchannel option slots.

The next example shows a configuration display for a specified option slot. In this case, it is for the base system slot (slot 3).

The numbers in black circles correspond to the item descriptions in the table that follows. Notice that the first three numbered pieces of information have already been described in the previous example.

The rest of the display provides details regarding the devices and memory that are installed in the base slot (three devices and three memory modules).

```

1   2           3
3:  KN05      DEC      V1.0a      TCF0      ( 32 MB,  1 MB NVRAM)
                                           (enet: 08-00-2b-24-5b-79)
                                           (SCSI = 7)

      4   5           6
-----
DEV  PID                VID      REV      SCSI DEV
=====
rz0  RZ57      (C) DEC  DEC      5000  DIR
rz1  RZ57      (C) DEC  DEC      5000  DIR
tz4  TLZ04     (C) DEC  DEC      1615  SEQ

dcache ( 64 KB), icache ( 64 KB)
7
mem( 0): a0000000: a1ffffff      ( 32 MB)
mem( 1): a2000000: a3ffffff      ( 32 MB)
mem( 4): a8000000: a9ffffff      ( 32 MB)
mem(14): bc000000: bc0ffffff      ( 1 MB)      Presto-NVR
      8
      9
mem(14): clean, batt OK, armed
>>

```

- 1** Slot number.
- 2** Model code.
- 3** Memory size, NVRAM, Ethernet address, SCSI controller address.
- 4** Device code with SCSI ID number of the device. For example, in `rz1`, the SCSI ID number is 1.
- 5** Product ID. Some devices show a product ID in this column, but others do not.
- 6** Device descriptor, which provides a general description of the device. `DIR` indicates direct access drives (diskette and fixed disk drives), `SEQ` indicates sequential access drives (tape drives), and `CD--ROM` indicates optical compact disc drives.
- 7** Memory slot number.
- 8** Amount of memory in the slot. The amount is 32 megabytes for SIMMs, and 1 megabyte for NVRAM (in memory slot 14 only). All the slots must have the same amount of memory, except for the NVRAM module.

9 Status of the NVRAM module.

Table 2-4 shows the device codes and device descriptors of SCSI devices, as indicated in items 4 and 6 of the cnfg display.

Table 2-4 SCSI Device Codes and Descriptors

Device Code	Device Descriptor	Type of Drive
rx	DIR	Diskette
rz	CD-ROM	Optical compact disc
rz	DIR	Fixed disk
tz	SEQ	Tape

2.5.13 d

```
>>d [OPTIONS]  
RANGE value
```

Options can be:

-w Word (default).
-h Halfword.
-b Byte.
-S count Repeat deposit *count* times.

Ranges can be:

address Single address.
address:address Start and end address.
address#count Start address and count.
range,range More than one range.

The **d**, or deposit, command writes values to memory. Values can be stored as words, halfwords, or bytes. The default option is word. The command writes the specified *value* through the range of specified addresses. No intervening blanks are allowed in an address range. You can specify the address range as follows:

- A single address (*address*).
- A starting and an ending address (*address:address*).
- A starting address and the number of addresses (*address#count*).
- Multiple address ranges separated by commas (*range,range*). Note that no space follows the comma in an address range.

The -S option causes a value to be stored repeatedly in memory. The value is stored *count* times at each address in the address range.

2.5.14 e

>>e [OPTIONS] RANGE

Options can be:

-w	Word (default).
-h	Halfword.
-b	Byte.
-S <i>count</i>	Repeat examine <i>count</i> times.
-x	Display in hexadecimal format.
-o	Display in octal format.
-u	Display in unsigned decimal format.
-d	Display in decimal format.
-c	Display as ASCII characters.

Ranges can be:

<i>address</i>	Single address.
<i>address:address</i>	Start and end address.
<i>address#count</i>	Start address and count.
<i>range,range</i>	More than one range.

The e, or examine, command examines the contents of memory. Memory can be examined as words, halfwords, or bytes. The default option is word. The e command examines values in the range of addresses specified. You can specify the address range in these ways:

- A single address (*address*).
- A starting and an ending address (*address:address*).
- A starting address and the number of addresses (*address#count*).
- Multiple address ranges separated by commas (*range,range*). Note that no intervening space follows the comma in an address range.

You can choose how to display the memory data with format options: -x, -o, -u, -d, and -c. You can use more than one option, in which case the data is displayed in every format that you choose. If you do not indicate a format, the system displays the data in hexadecimal format.

The -S option fetches the contents of each address in the address range *count* times. The screen displays only the final value in each range.

2.5.15 erl

```
>>erl [-c]
```

The erl command displays the log of console error messages (see Section 2.7). The system records console error messages in a special error log buffer, and the erl command displays the contents of this buffer. If you specify -c, the buffer is cleared. The system stops recording error messages when the buffer is full and resumes when the buffer is cleared.

2.5.16 go

```
>>go [address]
```

The go command transfers control of the system to the specified address. If you do not specify an address, go uses the execution address returned by the last boot -n command. If the boot -n command has not been executed and no address is specified, the system ignores the go command.

2.5.17 init

```
>>init [#] [argument...]
```

The init command initializes module hardware. If you specify a slot number (#), the command initializes the modules in that slot only.

Arguments are specific to each module.

2.5.18 ls

```
>>ls [#]
```

The ls (list) command displays a list of the files in a module ROM. If you do not specify a slot number (#), the command lists the files for all modules.

2.5.19 passwd

```
>>passwd [OPTIONS]
```

Options can be:

- s Set a new console password.
- c Clear the console password.

Use the passwd command to enter, set, or clear your console password.

The console password keeps unauthorized people from using the console commands on your system. You do not need to use the password if security is not an issue in your workplace.

When you first set up your system, you do not need a console password. The only way that a console password can be required is if you choose to start using one.¹

To enter a console password, type **passwd -s** and press `[Return]`. The system displays a prompt (`pwd:`) asking you to type the password that you want to use. Type a word with at least six characters. You can use letters and numbers; the system recognizes the difference between uppercase and lowercase letters.

The system displays the `pwd:` prompt twice. Type the same password each time. For the sake of security, the screen does not display what you type, so type something that is easy to remember.

To enable the restricted console, type **passwd** and then press `[Return]`. When the `pwd:` prompt appears, the restricted console looks like this:

```
R>
```

At this prompt, you can only boot your system software or enter your console password.

- Boot your system software. Type **boot** and press `[Return]`. This is the only boot command that you can use. It has no options or arguments. It uses the values that you set in the boot environment variable (see Section 2.6). If you have not set the variable, the command does not work.
- Enter your console password. Type **passwd** and press `[Return]`. Then type your console password at the `pwd:` prompt. For the sake of security, the screen does not display what you type.

After you enter your console password, the prompt changes to the standard console prompt (`>>`). You can now use all the console commands that are described in this chapter.

To stop using your console password, type **passwd -c** at the standard console prompt and press `[Return]`. Afterwards, you will have unrestricted access to the console commands.

Clearing a Forgotten Password

If the system is in restricted mode and you forget the password, you must clear the contents of the nonvolatile RAM (NVR), which contains

¹ The console password is not the same as the passwords required by your system software or networks. The console password protects your system hardware by controlling access to the console commands.

the password. To clear the NVR, use the Clear NVR jumper pins. See the *DECsystem 5900 Service Guide* or contact your Digital Services representative.

2.5.20 printenv

```
>>printenv [env]
```

The `printenv` command displays the values of environment variables. If you specify the name of an environment variable, the command displays the value of only that variable. See Section 2.6 for more information.

2.5.21 restart

```
>>restart
```

The `restart` command attempts to restart the system software. This command relies on a restart facility that you have to enable in the system software.

2.5.22 script

```
>>script scriptname
```

The `script` command allows you to write a short temporary script at the system console. A script is a miniprogram. After you write the script, you can run it with the `sh` command, or you can type the name (*scriptname*) of the script by itself at the console prompt to execute the script. This command is commonly used during testing of the system by Digital Services representatives.

To write a script, type **script** followed by a name for the script and press Return. Then write the script line by line. When you are done, go to a new line and press Return.

2.5.23 setenv

```
>>setenv env value
```

The `setenv` command sets the value of an environment variable. Note that you must enclose the command in double quotation marks if *value* contains blank spaces. See Section 2.6 for more information.

2.5.24 sh

```
>>sh [OPTIONS] [#!/scriptname]
[argument...]
```

Options can be:

- e** Exit on error.
- b** Branch to script.
- v** Verbose; echo to console.
- S** Suppress script-not-found errors.
- l** Execute in a loop. (This option is the letter "el," not the number one.)

The sh, or shell, command activates, or runs, a script. Replace # with the slot number of the module that contains the script.

If you specify a script name for the *scriptname* option, the script is used as the input. Otherwise, what you type at the console is the input, and a subshell is created. When you run a shell script, environment variable 0 is set to the script name, 1 is set to the first argument in the script, 2 is set to the second argument, and so on.

The -e option directs the shell to exit when an error occurs. Normally, the shell ignores errors. The -b option executes the script specified by *scriptname* instead of creating a subshell. The -v option causes the script to be echoed to the console when it is executed. The default setting is no echo. The -S option suppresses any error message if the script is not found and causes the sh command to return a status that indicates success. The -l option causes a script to be executed continuously until a system reset occurs or you press Ctrl-C.

2.5.25 t

```
>>t [OPTIONS] #/testname
[argument...]
```

Options can be:

- l** Execute in a loop.

The t, or test, command is used to execute extended system testing by Digital Services representatives.

2.5.26 unsetenv

```
>>unsetenv env
```

The `unsetenv` command deletes the value of an environment variable. See Section 2.6 for more information.

2.6 Environment Variables

Environment variables store system parameters and scripts and pass information to the operating system. Some environment variables stay in memory, but others are lost when you turn off the power.

Table 2–5 summarizes the console commands for setting environment variables. Table 2–6 lists the standard environment variables that you can set.

Table 2–5 Console Commands for Environment Variables

Command	Description
printenv	Displays the value of environment variables
setenv	Sets the value of an environment variable
unsetenv	Deletes the value of an environment variable

Table 2–6 Environment Variables Set by the User

boot ¹	Specifies arguments for the <code>boot</code> command.
console ¹	<p>Chooses the system console. You normally do not set this variable. Setting this variable to s selects the terminal connected to the system console port (see Figure 1–4). Setting this variable to any value other than s causes the console to automatically select the console device using the following algorithm:</p> <ol style="list-style-type: none">1. Select the graphics adapter in the lowest-numbered TURBOchannel slot.2. If there are no graphics adapters in the system, use the system console port. <p>If more than one terminal is connected to the system unit, the terminal in the lowest-numbered slot is the system console.</p>

¹These environment variables persist until you delete them.

(continued on next page)

Table 2–6 (Cont.) Environment Variables Set by the User

haltaction ¹	Specifies what happens when you press the halt button or turn on the power: b Boots the system software, as specified by the boot environment variable. h Halts the system software and displays the console prompt. r Restarts the system software. If the restart fails, it boots the software.
more	Specifies the greatest number of lines of text that can fit on the terminal screen at one time. When text scrolls on the screen, the system stops the scrolling at the number of lines that you set. If you set the number to zero, the text scrolls continuously.
testaction ¹	Used only by Digital Services representatives.
#	The number of the module that contains the current script. If no script is active, the system module is assumed.

¹These environment variables persist until you delete them.

There are other environmental variables. Some, like **oconsole**, should not be changed. Others can be set as implementation-specific side effects of various bootstrap and test procedures.

2.7 Console Command Error Messages

Table 2–7 lists the error messages that the console commands can return.

Table 2-7 Console Command Error Messages

Error Message	Meaning
?IO: <i>slot/device</i>	An I/O device reported an error. <i>slot</i> represents the I/O device slot number. <i>device</i> represents an additional message about the error.
?IO: <i>slot/device</i>	Module with the slot number represented by <i>slot</i> does not recognize the device represented by <i>device</i> .
PDE3: <i>slot</i>	Module with the slot number represented by <i>slot</i> contains an early ROM chip version. The ROM chip may need to be upgraded. Contact your Digital Services representative.
?SNF: <i>script</i>	System did not find the script that was to be run.
?TXT:	Name specified in the script command is not a valid script name.
?STX: <i>usage</i>	Console command entered contained a syntax error. The <i>usage</i> parameter is the correct syntax.
?STX: <i>error</i>	Console command contained entered a syntax error. The <i>error</i> parameter is the incorrect portion of the command.
?EV: <i>ev_name</i>	Specified environment variable does not exist.
?EVV: <i>value</i>	Specified environment variable value is invalid.
?TFL: <i>slot/test</i>	Test failure occurred. <i>slot</i> represents the slot number of the module that reported the error. <i>test</i> represents the name of the failed test.

3

Troubleshooting Tools and Error Messages

This chapter describes the DECsystem 5900 troubleshooting tools and error messages. The following sections include:

- Basic Troubleshooting
- Running Power-Up Self-Tests
- Interpreting Test Error Messages
- ULTRIX-32 Exerciser and uerf Command Summary
- Using Error Logs

3.1 Basic Troubleshooting

Table 3-1 lists some problems which you can encounter during operation. Some solutions are also given with these problems. For those problems which involve certain tests procedures and physical entry into the system, please contact your Digital Services representative first.

Note

It is assumed in the following table that the system has been properly installed and connected as described in Chapter 2.

Table 3–1 Some Solutions to System Problems

Problem	Solution
The system does not activate when the system power switch is turned on.	<ol style="list-style-type: none">1. Check to see if the system's site power is on.2. Check to see if the system power conditioner is on.3. Move the Remote/Manual switch from remote to on to see if this will activate the CPU drawer. If this works, then the problem is with the power controller. Call your Digital Services representative. If the On switch also does not work, call your Digital Services representative.
The power-up self-test fails.	<ol style="list-style-type: none">1. Check the LEDs on the back of the CPU drawer. If all of them are lit, call your Digital Services representative.
The system is powered on, but nothing appears on the terminal screen.	<ol style="list-style-type: none">1. Check the terminal power.2. Check to see if the terminal is properly connected to the system at the console port.3. Check to see if the terminal parameters are set up properly (9600 baud, 8-bit parity).4. If you have completed the previous checks and the terminal is still not working, call your Digital Services representative.

(continued on next page)

Table 3–1 (Cont.) Some Solutions to System Problems

Problem	Solution
A device does not appear in the cnfg display.	<ol style="list-style-type: none">1. Check to make sure you specified the correct slot number for the missing device in the cnfg command.2. Make sure the drawer in which the missing drive is located is turned on and is connected to an active power source (switch LED on).3. Make sure the missing device has a unique SCSI ID from 0 to 6.4. Try the cnfg command again. If the device is still missing, call your Digital Services representative.
You cannot connect to your network, and you know the system and network software are functioning.	<ol style="list-style-type: none">1. Shut down your system software and turn off the system.2. Make sure the Ethernet connectors on the system unit are attached correctly. If you are using adapters to connect ThinWire or twisted-pair Ethernet cable to your system, check those connectors, too.3. Turn on the system.

3.2 Running Power-Up Self-Tests

The server runs a power-up self-test when you turn on the system power. The console and diagnostic LEDs report any errors the power-up self-test detects. To find the corrective action for any error codes the power-up self-test reports, refer to the *DECsystem 5900 Service Guide*.

Note

If the console displays the message PDE3: *x*, where *x* represents an option module slot number, the system may contain incompatible ROM chips. Contact your Digital Services representative.

You can specify a quick or thorough power-up self-test script to run when the system powers up.

- The quick test script is a limited script that minimizes the time until the system boots.
- The thorough script runs an extensive check of system hardware. The thorough power-up self-test script is most useful for Digital Services representative troubleshooting.

To select a power-up self-test script, use the `setenv` command to set the `testaction` environment variable. Type **setenv testaction (q | t)** and press `Return`.

- Specify `q` to select the quick test.
- Specify `t` to select the thorough test.

3.3 Interpreting Test Error Messages

For every error that a self-test detects, an error message appears on the screen. Error messages appear in the following format:

- `?TFL slot/test (code: description) [module]`.
- `?TFL` indicates that an error occurred.
- `slot` represents the slot number of the module that reported the error.
- `test` represents the individual test that failed.
- `code` represents a code that indicates which part of the test failed.
- `description` represents a possible message that describes the failure.
- `module` represents the module identification number.

For an explanation of individual system module and memory module error messages, refer to the *DECsystem 5900 Service Guide*.

3.4 ULTRIX-32 Exerciser and uerf Command Summary

This section contains a summary of ULTRIX-32 exerciser and uerf commands to help you troubleshoot and diagnose DECsystem 5900 errors.

See the following documents for detailed information on the commands:

- *ULTRIX-32 Guide to System Exercisers*
- *ULTRIX-32 Guide to the Error Logger System*

3.4.1 On-Line ULTRIX Exerciser

The ULTRIX exercisers perform functional system and device testing. The exercisers are run in single- or multiuser mode from an account with *root* privileges.

The exercisers log status information in *LOG* files. Normal device errors are handled by the error log and *uerf*. You can run each of the exercisers in the background by ending each command line with an *&*. This allows many (the same or different) exercisers to be run concurrently, enhancing your ability to perform system testing.

To run the exercisers, your current directory must be the *field* account. To terminate the exercisers, enter Ctrl/C if the job is in the foreground, or `kill -15 pid` if in the background. When you run an exerciser in the background, *pid* if the job is displayed when the command is invoked.

A time stamp entry is made in the system error log each time you stop or start an exerciser. Use the *uerf* option `-r 350` to include these in an error report. All the system exercisers, except *netx*, have the `-o` option. The `-o` option allows you to specify a file where diagnostic output is saved when the exerciser terminates.

3.4.2 Exercising More Than One Part of the System

You can run more than one exerciser at the same time. Keep in mind, however, that the more processes you have running, the slower the system performs. Before exercising the system extensively, make sure there are no other users on the system.

To exercise more than one part of the system simultaneously, use the **syscript** maintenance command. The **syscript** command asks you which exercisers you want to run, how long you want to run each exerciser, and how many exercisers you want to run at one time. The **syscript** command allows you to exercise a device, a subsystem, or the entire system.

You can start each exerciser by using either of the following methods:

- Manually, by specifying the time parameter (`-t` option) and by placing each command in the background before executing the next command
- By typing the **syscript** command as follows:

```
# syscript
```

Once the **syscript** command is running, answer the questions displayed on the console. The **syscript** command then executes the individual exercisers and creates a file called *testsuite*, which contains all the answers you entered. You can reexecute the commands in the *testsuite* file by entering the following, which

causes testsuite to execute using the original commands and parameters that you specified:

```
# sh testsuite
```

3.4.3 Communications Exerciser (Asynchronous Serial Lines)

The communications exerciser writes, reads, and validates random data and packet lengths on communication lines as specified.

Syntax

```
cmx [-h] [-ofile] [-t n] -lline#
```

Options

-h	Prints a help message.
-o<i>file</i>	Writes run-time statistics to <i>file</i> . Default file is <i>#LOG_CMX_##</i> .
-t<i>n</i>	Runs the exerciser for <i>n</i> minutes. Default is run continuously.
-l<i>line</i>#	Specifies the line number to exercise. For example, if the line to be exercised is <i>/dev/tty03</i> , <i>line#=03</i> .

Usage

Any line to be exercised must have a loopback connector on the communication option's bulkhead panel or the end of the cable. Any line to be exercised must be disabled in the *letc/ttys* file by setting the *status* to off.

Exercise line tty01 and tty03 for 10 minutes in the background:

```
cmx -t10 -l 01 03
```

3.4.4 Disk Exerciser

Caution

This exerciser can DESTRUCTIVELY WRITE on a disk. Do not use this exerciser on any portion of a disk that contains irreplaceable data.

The **-p** and **-c** options destroy data on a disk. The **-rdev** command does not overwrite data.

Syntax

```
dskx [options] -rdev  
dskx [options] -pdevpart  
dskx [options] -cdev
```

Arguments

rdev	Random read-only test on all but the c partition.
-pdevpart	Writes, reads, and validates on device <i>dev</i> on partition <i>part</i> .
-cdev	Writes, reads, and validates on device <i>dev</i> on all but the c partition.

Options

-h	Prints a help message.
-ofile	Writes run-time statistics to <i>file</i> . The default file is <i>#LOG_DSKX_##</i> .
-tm	Runs the exerciser for <i>m</i> minutes. The default is run continuously.

Test (read only) the first RA disk in the system (ra0) for 20 minutes in the background. Diagnostics display every five minutes:

```
dskx -rra0 -t20 -d5 &
```

3.4.5 File System Exerciser

The file system exerciser initiates multiple processes and creates, writes, closes, opens, and reads a test file of random data.

Syntax

```
fsx [-h] [-ofile] [-t n] [-fpath] [-pm]
```

Options

-h	Prints a help message.
-ofile	Writes run-time statistics to <i>file</i> . The default file is <i>#LOG_FSX_##</i> .
-tn	Runs the exerciser for <i>n</i> minutes. The default is run continuously.
-fpath	Path name of the file system directory to test. Default is /usr/field .
-pm	Number of <i>fsx</i> processes to spawn. Maximum is 250. Default is 20.

Usage

This test writes and reads data on the disk; it is not destructive to the customer's data. The file system exerciser can also be used on an NFS-mounted file system.

Exercise the */usr/tmp* file system continuously using 10 processes in the background:

```
fsx -p10 -f/usr/tmp &
```

3.4.6 Line Printer Exerciser

Syntax

lpx [-h] [-ofile] [-tn] -fpath [-pm]

Arguments

-ddev Printer device name to exercise.

Options

-h Prints a help message.

-ofile Writes run-time statistics to *file*. Default file is *#LOG_LPX_##*.

-tn Runs the exerciser for *n* minutes. Default is run continuously.

-fpath Path name of the file system directory to test. Default is **/usr/field**.

-pm To save paper, pauses printing for *m* minutes and only exercises the controller. Default is 15. A value of 0 indicates no pause.

Exercise **lp1**: `lpx -dlp 1`

3.4.7 Memory Exerciser

Syntax

memx [-h] [-s] [-ofile] [-tn] [-mj] [-pk]

Options

-h Prints a help message.

-s Disables shared memory testing. Shared memory is software functionality, not hardware.

-ofile Writes run-time statistics to *file*. Default file is *#LOG_MEMX_##*.

-tn Runs exerciser for *n* minutes. Default is run continuously.

-mj Memory size in *j* bytes to be tested by each spawned process. Default is (total memory)/20.

-pk Number of *memx* processes to spawn. Maximum is 20. Default is 20.

Usage

The memory exerciser is restricted by available swap space. Errors like out of memory generally indicate swap space was used up. If you have more physical memory than swap space, you may see this problem. If so, reduce the number of spawned processes and/or the size of memory you are testing. Running the memory exerciser can also cause other users to have the same memory problem.

Exercise all of memory and the shared memory functionality for 10 minutes in the background:

```
memx -t10 &
```

3.4.8 Magtape Exerciser

The magtape exerciser reads, writes, and validates random data from the beginning of the tape (BOT) to the end of the tape (EOT).

Syntax

```
mtx [options] -adev  
mtx [options] -sdev  
mtx [options] -ldev  
mtx [options] -vdev
```

Arguments

-a <i>dev</i>	Use short-, long-, and variable-length record tests on raw device <i>dev</i> .
-s <i>dev</i>	Use short records on raw <i>dev</i> .
-l <i>dev</i>	Use long records on raw <i>dev</i> .
-v <i>dev</i>	Use variable records on raw <i>dev</i> .

Options

-h	Prints a help message.
-o <i>file</i>	Writes run-time statistics to <i>file</i> . Default file is <i>#LOG_MTX_##</i> .
-ti	Runs exerciser for <i>i</i> minutes. Default is run continuously.
-rj	Record length for long record test. Range is 1 to 20480. Default is 10240.
-tk	Size of file in <i>k</i> number of records. Default: -1, go to EOT.

Run all record lengths on tape drive rmt0h for five minutes in the background:

```
mtx -armt0h -t5 &
```

3.4.9 TCP/IP Network Exerciser

Syntax

```
netx [-h] [-tn] [-pm]nodename
```

Arguments

<i>nodename</i>	Node name of target system to test. May also be the host system name.
-----------------	-----------------------------------------------------------------------

Options

- h** Prints a help message.
- tn** Runs exerciser for *n* minutes. Default is run continuously.
- pm** Port number.

Usage

The **TCP** echo service defined in the */etc/inetd.conf* file must not be commented out (# at start of line) on the host and target systems.

Exercise the network from the local host to the remote node **max** continuously in the background:

```
netx max &
```

3.4.10 uerf Error Log Commands

The uerf utility generates error log reports and does bit-to-text translation for hardware device registers and messages. Syntax is case sensitive. If no options are specified, all errors are reported.

To disable error logging to an error log file, type:

```
# /etc/eli -d
```

To enable error logging in multiuser mode, type:

```
# /etc/eli -e
```

Syntax

```
/etc/uerf [options...]
```

Options

- | | |
|-------------------------------|--------------------------------------|
| -A <i>adapter_type</i> | <i>Example: /etc/uerf -A uba,nmi</i> |
| aie | BVP controller |
| aio | BVP controller |
| bia | BI LESI adapter |
| bu | BI UNIBUS adapter |
| nmi | NMI errors |
| uba | VAX UNIBUS adapter |
| <i>default</i> | Report all error types |
-

-c <i>classes</i>	<i>Example: /etc/uerf -c oper</i>
err	All hardware and software errors
maint	Maintenance events
oper	System status; startup/shutdown; configuration
<hr/>	
-D	Reports errors for MSCP disks (<i>ra, rd</i>). Default: all MSCP disks are reported. <i>Example: /etc/uerf -D ra60</i>
-f	Specifies the error log file to be used to generate the report. <i>Example: /etc/uerf -f old.errorlog</i>
-h	Displays a brief help message.
-H	Selects errors only for the specified system name. <i>Example: /etc/uerf -H guru</i>
<hr/>	
-M <i>mainframe_errors</i>	<i>Example: /etc/uerf -M mem</i>
cpu	Reports CPU errors and machine checks.
mem	Reports memory errors (SBE and DBE).
<i>default</i>	Reports all error types.
<hr/>	
-n	Uerf runs. Waits for errors to be logged and immediately reports them.
<hr/>	
-o <i>output</i>	<i>Example: /etc/uerf -o full</i>
brief	Reports errors in brief format (<i>default</i>).
full	Reports all information for each error.
terse	No bit-to-text translation for register values.
<hr/>	

-O <i>operating_system_events</i>	<i>Example: /etc/uerf -O seg,raf</i>
aef	Arithmetic exception faults
ast	Asynchronous trap exception faults
bpt	Breakpoint instruction faults
cmp	Compatibility mode faults
pag	Page faults
pif	Privileged instruction faults
pro	Protection faults
ptf	Page table faults
raf	Reserved address faults
rof	Reserved operand faults
scf	System call exception faults
seg	Segmentation faults
tra	Trace exception faults
xfc	Reports xfc instruction faults

-R Reports errors in reverse chronological order.

-r *record_type* *Example: /etc/uerf -r 102,210,250*

Hardware Detected Error Types:

100	Machine check
101	Memory CRD/RDS errors
102	Disk errors
103	Tape errors
104	Device controller errors
105	Adapter errors
106	Bus errors
107	Stray interrupts
108	Asynchronous write errors
109	Exceptions/faults
112	Stack dump

Software Detected Error Types:

200 Panics (bug checks)

201 CI pdd information

Informational ASCII Message Types:

250 Informational

Operational Message Types:

300 Startup

301 Shutdown

310 Time change

350 Diagnostic information

351 Repair information

-s *sequence numbers* Reports errors for the specified sequence numbers.
EXAMPLE: /etc/uerf -s 1011,1320

-S Summarizes error information.
Example: /etc/uerf -S -o full

-t *s:dd-mmm-yyyy,hh:mm:ss e:dd-mmmm-yyyy,hh:mm:ss*
Example: /etc/uerf -t s:25-jun-1991:12:30:00

s Starting date and time

e Ending date and time

dd Day

mmm Month

yyyy Year

hh Hour

mm Minute

ss Second

-T Reports errors for TMSCP tapes (*tk, tu*). Default: all TMSCP tapes are reported.
Example: /etc/uerf -T tu81

-x Excludes specified error types from the report.
Example: /etc/uerf -x -r 102,103

-z Displays the entire error record as hexadecimal data.
Used only for debugging.

3.5 Using Error Logs

The system records events and errors in the ULTRIX error logs. Use the error logs to verify proper system and device subsystem operations.

Note

The ULTRIX error logs are not the same as the test error logs that appear when you use the `erl` console command. The test error log is a record of errors reported by tests run in console mode.

The following paragraphs describe ULTRIX error log formats and error log parts useful in troubleshooting.

3.5.1 Examining Error Logs

You must be in ULTRIX to examine error logs. At the ULTRIX prompt, type `/etc/uerf -R | more` and press `Return`. A full display of error log entries appears on the console.

The first part of each error log describes the type of error and system conditions in effect when the error occurred. The last part of each log provides specific information about the error and its location.

The first part of all error logs is similar to this:

```
----- EVENT INFORMATION -----
EVENT CLASS                OPERATIONAL EVENT
OS EVENT TYPE              300.    SYSTEM STARTUP
SEQUENCE NUMBER            0.
OPERATING SYSTEM           ULTRIX 32
OCCURRED/LOGGED ON         Tue Jun 25 09:06:16 1991
OCCURRED ON SYSTEM        GRANITE
SYSTEM ID                  x82020120    HW REV: x20
```

FW REV: x1
CPU TYPE: R4400
KN05/R4400

PROCESSOR TYPE

In this display:

- EVENT CLASS lists the error log's general category. Possible EVENT CLASS categories are:
 - Operational events, which are changes in system operation that are not errors.
 - Error events, which are actual errors in system operation.
- OS EVENT TYPE describes the type of error or event recorded in the log. For information about memory, error and status register, and overheat error logs, refer to Section 3.5.2 and to the discussion of the particular log in which you are interested.
- SEQUENCE NUMBER lists the order in which the system logged the event.
- OPERATING SYSTEM lists the system's version of ULTRIX.
- OCCURRED/LOGGED ON shows the time the error occurred.
- OCCURRED ON SYSTEM lists the individual system that reported the error.
- SYSTEM ID includes several listings:
 - The first number to the right of SYSTEM ID is the system ID.
 - HW REV lists the system hardware revision number.
 - FW REV lists the system firmware revision number.
 - CPU TYPE shows the type of CPU used in the system.
- PROCESSOR TYPE lists the type of processor chip used in the system.

The remaining error log entry is different for each error log event type.

3.5.2 Distinguishing Event Types

The second line of each error log lists the code number and name of the error log event type.

The following sections describe memory, error and status, and system overheat error logs. For a detailed explanation of other error logs that involve the system unit, refer to the ULTRIX documentation.

Memory Error Logs

Memory error logs record errors that occur in the memory modules. The following is a sample of the error log sections that are unique to memory error logs.

```
----- UNIT INFORMATION -----
UNIT CLASS                MEMORY
UNIT TYPE                 KN05 MEMORY
ERROR SYNDROME            MEMORY CRD ERROR

----- ERROR & STATUS REGS -----
EPC                       x8006DF4C
KN05 STAT REG             x07C20001      IO INT 0 PENDING
                                     19,200 BAUD
                                     8 MB MEM MODULE
                                     ECC CMD x0

                                     IO INT 1 ENABLED
                                     IO INT 6 ENABLED
                                     IO INT 7 ENABLED
                                     NORMAL MODE
                                     REFRESH EVEN MEM MODULES

ERROR ADDR REG            xD01B37BA      UNSECURE
                                     CPU MEM READ ECC

PHYSICAL ERROR ADDR      x006CDEE8
CHECK SYNDROME            x00108884      SYND BITS x4
                                     SINGLE BIT ERROR

                                     CHECK BITS x8
                                     MODULE NUM. x0
                                     ERROR COUNT 1.
                                     INVALID PC MEMINTR

----- ADDITIONAL INFO -----
CONTROLLER NO.           1.
ERRS ON THIS ADDR        1.
```

The UNIT INFORMATION section describes the type of module that reported the error.

- UNIT CLASS shows that the error occurred in a memory module.
- UNIT TYPE lists the particular type of memory module in which the error occurred.
- ERROR SYNDROME describes the nature of the error.

The ERROR & STATUS REGS section lists the error and status register contents followed by phrases that describe the register contents.

- EPC indicates that this is an exception program counter.
- KN05 STAT REG lists the contents of the CPU status register (CSR).
- ERROR ADDR REG describes the specific error type.
- PHYSICAL ERROR ADDR is the address in the hardware where the error occurred.
- CHECK SYNDROME entries describe the actual error and the module where it occurred.
 - SYND BITS lists the bits in the check syndrome register.
 - The second line states whether this is a single bit or a multibit error.
 - The third line shows the check bits.
 - MODULE NUM shows the slot number of the module that reported the error.
 - ERROR COUNT shows the total number of errors that have occurred in this module since the last time the software was booted.
 - The last line shows whether this is a bus error or memory interrupt error.
- The ADDITIONAL INFO section lists the controller number and total number of errors that have occurred at this address.

Error and Status Register Error Logs

Error and status register error logs record nonmemory errors. The following is a sample of the error log sections that are unique to error and status register error logs.

```
----- ERROR & STATUS REGS -----
CAUSE          x80002000          EXCEPTION CODE EXTERNAL
INTERRUPT
                HW INTERRUPT 3 PENDING
                BRANCH DELAY SET
STATUS         x0000FE04          CURRENT INTERRUPT STATE DISABLED
                CURRENT MODE KERNEL
                PREVIOUS INTERRUPT STATE ENABLED
                PREVIOUS MODE KERNEL
```



```

                                OLD INTERRUPT STATE DISABLED
                                OLD MODE KERNEL
                                SW INTERRUPT 1 ENABLED
                                HW INTERRUPT 0 ENABLED
                                HW INTERRUPT 1 ENABLED
                                HW INTERRUPT 2 ENABLED
                                HW INTERRUPT 3 ENABLED
                                HW INTERRUPT 4 ENABLED
                                HW INTERRUPT 5 ENABLED
                                CACHE STATE NORMAL
SP                                xFFFFDC58
KN05 STAT REG                    x05C20001  IO INT 0 PENDING
                                      19,200 BAUD
                                      8 MB MEM MODULE
                                      ECC CMD x0
                                      IO INT 1 ENABLED
                                      IO INT 6 ENABLED
                                      IO INT 7 ENABLED
                                      NORMAL MODE
                                      REFRESH ODD MEM MODULES
                                      UNSECURE
ERROR ADDR REG                  xE7B00000  CPU I/O WRITE TIMEOUT
PHYSICAL ERROR ADDR x1EC00000

```

The **ERROR & STATUS REGS** section lists the error and status register contents followed by phrases explaining these values:

- **CAUSE** lists the type of event that caused the error.
- **STATUS** lists various system settings in effect when the error occurred.
- **SP** is a stack pointer that identifies where the CPU contents were sent when the error occurred.
- **KN05 STAT REG** lists the contents of the CPU status register.
- **ERROR ADDR REG** describes the specific error type.
- **PHYSICAL ERROR ADDR** indicates where in the hardware the error occurred. Refer to the *DECsystem 5900 Service Guide* for possible physical error address values and the hardware they indicate.

System Overheat Error Messages

If the system overheats, **ULTRIX** records the error and the following message on the console:

```
"System overheating - suggest shutdown and power-off"
```

3.5.3 For Further Error Log Information

To determine how to respond to a specific error message, refer to the *DECsystem 5900 Service Guide*.

To interpret memory, error and status register, and overheat logs, refer to the *DECsystem 5900 Service Guide*.

For an explanation of other error logs, refer to the ULTRIX documentation for the uerf function.

For an explanation of error logs for SCSI devices, refer to the documentation for the SCSI device that the error log discusses.

A

Hardware Specifications

This appendix contains the hardware specifications for the following devices:

- DECSYSTEM 5900 system
- RZ57 fixed disk drive
- RZ58 fixed disk drive
- RRD42 compact disc
- RX26 diskette drive
- StorageServer 100
- TKZ09 Cartridge Tape Subsystem
- TLZ04 cassette tape drive
- TLZ06 cassette tape drive
- TZ30 cartridge tape drive
- TZ85 cartridge tape drive
- TZK10 cartridge tape drive
- TSZ07 cartridge tape drive
- TKZ08 cartridge tape drive

A.1 DECsystem 5900 Hardware Specifications

This section provides the following information about the DECsystem 5900 dimensions (Table A-1), operating conditions (Table A-2), and nonoperating conditions (Table A-3).

Table A-1 DECsystem 5900 Dimensions

Weight	Height	Width	Depth
440 kg (970 lb)	170 cm (66.9 in)	61 cm (24.0 in)	86.4 cm (34.0 in)

Table A-2 DECsystem 5900 Operating Conditions

Acoustics	7.2 LNPE (bels)
Air flow	Intake: front Exhaust: back
Altitude	0 to 3,000 m 0 to 10,000 ft
Humidity	20% to 80%
Maximum heat dissipation	5325 Btu/h 1560 W
Temperature	0° to 32°C 32° to 90°F

Table A-3 DECsystem 5900 Nonoperating Conditions

Altitude	0 to 15,000 m 0 to 50,000 ft
Humidity	10% to 95%
Temperature	-40° to 66°C -40° to 151°F

A.2 RZ57 Fixed Disk Drive

This section provides the following information about the RZ57 fixed disk drive:

- Dimensions, Table A-4
- Operating conditions, Table A-5
- Nonoperating conditions, Table A-6
- Specifications, Table A-7

Table A-4 RZ57 Fixed Disk Drive Dimensions

Weight	Height	Width	Depth
3.8 kg (8.4 lb)	8.2 cm (3.25 in)	15 cm (5.75 in)	20 cm (8 in)

Table A-5 RZ57 Fixed Disk Drive Operating Conditions

Operating temperature ¹	10°C to 55°C (50°F to 131°F)
Operating humidity	20% to 80%
Maximum wet bulb temperature	25.6°C (78°F), noncondensing
Minimum dew point temperature	2°C (36°F)
Altitude	-304 m to 4600 m (-1000 ft to 15,000 ft) at 36°C (96°F)

¹Reduce maximum temperature by 1.8°C (3.24°F) for each 1000-meter (3300-foot) increase in altitude.

Table A-6 RZ57 Fixed Disk Drive Nonoperating Conditions

Operating temperature	-40°C to 66°C (-40°F to 151°F)
Operating humidity	8% to 95%, packaged
Maximum wet bulb temperature	46°C (115°F), packaged, noncondensing
Minimum dew point temperature	2°C (36°F)
Altitude	-304 m to 12,300 m (-1000 ft to 40,000 ft) at 36°C (96°F)

Table A-7 RZ57 Fixed Disk Drive Specifications

Subject	Description
Formatted capacity per drive	1.0 GB
Formatted capacity per surface	66.7 MB
Formatted capacity per track	35,976 bytes
Formatted capacity per block	512 bytes
Formatted blocks per track	71
Formatted blocks per drive	1,954,050
Formatted capacity spare blocks per cylinder	11
Formatted capacity spare blocks per drive	96,009
Transfer rate to/from media	20 MB/s
Performance bus asynchronous mode	1.6 MB/s
Performance bus synchronous mode	4 MB/s
Performance seek time track to track	≤ 4 ms
Performance seek time average	≤ 14.5 ms
Performance seek time maximum	≤ 33 ms
Average rotational latency	8.3 ms
Rotational speed	3600 rpm
Start time	20 s maximum
Stop time	20 s maximum
Interleave	1:1
Bus latency	600 μ s
Input current	2.4 A @ 100–120 Vac
Frequency	50–60 Hz
Power	32 watts

A.3 RZ58 Fixed Disk Drive

This section provides the following information about the RZ58 fixed disk drive:

- Dimensions, Table A-8
- Operating conditions, Table A-9
- Nonoperating conditions, Table A-10
- Specifications, Table A-11

Table A-8 RZ58 Fixed Disk Drive Dimensions

Weight	Height	Width	Depth
3.8 kg (8.4 lb)	8.2 cm (3.25 in)	15 cm (5.75 in)	20 cm (8 in)

Table A-9 RZ58 Fixed Disk Drive Operating Conditions

Operating temperature ¹	10°C to 55°C (50°F to 131°F)
Operating humidity	8% to 80%
Maximum wet bulb temperature	25.6°C (78°F), noncondensing
Minimum dew point temperature	2°C (36°F)
Altitude	-304 m to 4600 m (-1000 ft to 15,000 ft) at 36°C (96°F)

¹Reduce maximum temperature by 1.8°C (3.24°F) for each 1000-meter (3300-foot) increase in altitude.

Table A-10 RZ58 Fixed Disk Drive Nonoperating Conditions

Operating temperature	-40°C to 66°C (-40°F to 151°F)
Operating humidity	8% to 95%, packaged
Maximum wet bulb temperature	46°C (115°F), packaged, noncondensing
Minimum dew point temperature	2°C (36°F)
Altitude	-304 m to 12,300 m (-1000 ft to 40,000 ft) at 36°C (96°F)

Table A–11 RZ58 Fixed Disk Drive Specifications

Subject	Description
Formatted capacity per drive	1.38 GB
Formatted capacity per surface	10,209,360 bytes
Formatted capacity per track	48,640 bytes
Formatted capacity per block	512 bytes
Formatted blocks per track	95
Formatted blocks per drive	2,698,061
Formatted capacity spare blocks per cylinder	8
Formatted capacity spare blocks per drive	16,792
Transfer rate to/from media	20 MB/s
Performance bus asynchronous mode	1.6 MB/s
Performance bus synchronous mode	5 MB/s
Performance seek time track to track	≤2.5 ms
Performance seek time average	≤12.5 ms
Performance seek time maximum	≤25 ms
Average rotational latency	5.6 ms
Rotational speed	5400 rpm
Start time	30 s maximum
Stop time	30 s maximum
Interleave	1:1
Bus latency	600 μsec
Power	33 watts

A.4 RRD42 Compact Disc Drive

This section provides the following information about the RRD42 compact disc drive:

- Dimensions, Table A-12
- Operating conditions, Table A-13
- Nonoperating conditions, Table A-14
- Specifications, Table A-15

Table A-12 RRD42 Compact Disc Drive Dimensions

Weight	Height	Width	Depth
1.3 kg (2.87 lb)	4.17 cm (1.63 in)	4.48 cm (1.75 in)	20.51 cm (8.0 in)

Table A-13 RRD42 Compact Disc Drive Operating Conditions

Maximum rate of temperature change	10°C to 50°C (50°F to 122°F)
Temperature range ¹	5°C to 50°C (41°F to 122°F)
Relative humidity	10% to 90%, noncondensing
Maximum wet bulb temperature	29°C (84°F)
Minimum dew point temperature	2°C (36°F)
Altitude	2400 m (8000 ft) at 36°C (96°F)

¹Reduce maximum temperature by 1.8°C (5.24°F) for each 1000-meter (3300-foot) increase in altitude.

Table A-14 RRD42 Compact Disc Drive Nonoperating Conditions

Temperature range	-30°C to 55°C (-22°F to 131°F)
Relative humidity	10% to 90%, noncondensing
Maximum wet bulb temperature	46°C (115°F), packaged
Minimum dew point temperature	2°C (36°F)
Altitude	13,600 m (44,600 ft) at 36°C (96°F)

Table A–15 RRD42 Compact Disc Drive Specifications

Subject	Description
Capacity per disc	600 MB (maximum)
Access time	Full stroke 650 ms (typical) Average (1/4 stroke) 380 ms (typical)
Data transfer rate	Sustained rate 150 KB/s Burst rate 1.5 MB/s

A.5 RX26 Diskette Drive Specifications

This section provides the following information about the RX26 diskette drive:

- Dimensions, Table A–16
- Operating conditions, Table A–17
- Nonoperating conditions, Table A–18
- Specifications, Table A–19

Table A–16 RX26 Diskette Drive Dimensions

Weight	Height	Width	Depth
425 g (0.94 lb)	2.5 cm (1.00 in)	10 cm (4.00 in)	14.77 cm (5.91 in)

Table A–17 RX26 Diskette Drive Operating Conditions

Temperature range ¹	5°C to 50°C (40°F to 122°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	8% to 80%, noncondensing
Maximum wet-bulb temperature	25.6°C (78°F)
Altitude	–300 to 3050 m (–1000 to 10,000 ft) maximum

¹Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft increase in altitude.)

Table A–18 RX26 Diskette Drive Nonoperating Conditions

Temperature range	–40°C to 66°C (–40°F to 151°F)
Relative humidity	5% to 95%, noncondensing
Maximum wet-bulb temperature	46°C (115°F), packaged
Altitude	–300 to 12,200 m (–1000 to 40,000 ft) maximum

Table A–19 RX26 Diskette Disk Drive Specifications

Number of cylinders	80
Number of heads	2
Track density	135 tracks/in
Diskette size	8.89 cm (3.50 in)
Recording surfaces per diskette	2
MFM data bit rate	250, 500, 1000 kHz
Sectors per track	9 double density 18 high density 36 extra density
Capacity	2.88 KB
– Bytes per drive	737,280 double density 1,474,560 high density
– Bytes per track	2,949,120 extra density
– Bytes per track	4608 double density 9216 high density 18,432 extra density
Data transfer rate	250 Kbits/second double density 500 Kbits/second high density 1000 Kbits/second extra density
Seek time	3 ms minimum 15 ms average
Average latency	100 ms
Operating power	1.25 watts (read/write) 4.60 watts (seeking)
Standby power	0.30 watts

A.6 StorageServer 100

This section provides the following information about the StorageServer 100:

- Operating Conditions, Table A-20
- Dimensions, Table A-21
- Voltage range, Table A-22
- Specifications, Table A-23

Table A-20 StorageServer 100 Operating Conditions

Temperature range	10°C to 35°C (50°F to 95°F)
Maximum rate of temperature change	10°C (18°F) per hour
Operating room temperature	18°C to 24°C (65°F to 75°F)

Table A-21 StorageServer 100 Dimensions

Weight	Height	Width	Depth
52 kg (115 lbs)	40 cm (15.75 in)	48.26 cm (19 in)	76.2 cm (30 in)

Table A-22 Voltage Range with 46-66 HZ

90 to 125 V (120 V nominal)	198 to 250 V (240 V nominal)
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Table A-23 StorageServer 100 Specifications

Subject	Description
Optical disks capacity	297 MB
Optical disks	6.35 cm (2.5 in)
Storage slots	32
Storage capacity	20.8 GB
Latency	12.5 ms
Bit transfer rate	7.40 Mbps

(continued on next page)

Table A-23 (Cont.) StorageServer 100 Specifications

Subject	Description
Optical disk drives	Two 10.35 cm (2.5 in)
SCSI Interface cable	3.6 m (12 ft)

A.7 TKZ09 Cartridge Tape Subsystem

This section contains the following information about the TKZ09:

- Characteristics, Table A-24
- Dimensions, Table A-25
- Capacity, Table A-26
- Operating environment, Table A-27

Table A-24 TKZ09 Cartridge Tape Subsystem Characteristics

Subject	Description
Mode of operation	Streaming and start/stop
Drive interface	Small computer system interconnect (SCSI)
File-search tape speed-forward	83.1 centimeters/second (32.7 inches/second)
File-search tape speed-backward	83.1 centimeters/second (32.7 inches/second)
Rewind tape speed 376 meters (376 feet)	180 seconds
Configurations	Tabletop and rackmount

Table A-25 TKZ09 Cartridge Tape Subsystem Dimensions

Subject	Description
Width	14.94 cm (5.88 in)
Height	8.23 cm (3.25 in)
Depth	20.83 cm (8.20 in)

Table A–26 TKZ09 Cartridge Tape Subsystem Capacity

Subject	Description
Data transfer rate	Up to 4.0 Mbyte/second synchronous burst Up to 1.5 Mbyte/second asynchronous burst Up to 500 Kbyte/second sustained transfer
Maximum capacity	Up to 112 Mbyte

Table A–27 TKZ09 Cartridge Tape Subsystem Operating Environment

Subject	Description
Temperature	15°C to 32°C (59°F to 90°F)
Relative humidity	20 to 80% noncondensing

A.8 TLZ04 Cassette Tape Drive

This section provides the following information about the TLZ04 cassette tape drive:

- Dimensions, Table A–28
- Operating conditions, Table A–29
- Nonoperating conditions, Table A–30
- Specifications, Table A–31

Table A–28 TLZ04 Cassette Tape Drive Dimensions

Weight	Height	Width	Depth
7.7 kg (17 lb)	1.8 cm (4.5 in)	4.8 cm (12.0 in)	5.6 cm (14 in)

Table A–29 TLZ04 Cassette Tape Drive Operating Conditions

Operating temperature	10°C to 35°C (50°F to 95°F)
Operating humidity	20% to 80% RH maximum, noncondensing
Altitude	0 m to 4600 m (0 ft to 15,000 ft) at 36°C (96°F)

Table A–30 TLZ04 Cassette Tape Drive Nonoperating Conditions

Operating temperature	–45°C to 45°C (–49°F to 113°F)
Operating humidity	5% to 95% RH maximum, noncondensing
Altitude	0 m to 14,200 m (0 ft to 50,000 ft) at 36°C (96°F)

Table A–31 TLZ04 Cassette Tape Drive Specifications

Subject	Description
Mode of operation	Streaming and start/stop
Drive interface	Small computer system interface (SCSI)
Media	TLZ04 cassette tape
Bit density	Area density = 114 MB per square inch
Transfer rate (media)	156 KB/sec
Track format	Digital Data Storage (DDS)
Cassette capacity	1.2 GB
Passes per cassette tape	300
Power consumption drive	230 watts

A.9 TLZ06 Cassette Tape Drive

This section contains the following information about the TLZ06:

- Characteristics, Table A–32
- Dimensions, Table A–33
- Capacity, Table A–34
- Operating environment, Table A–35
- Nonoperating environment, Table A–36
- Miscellaneous specifications, Table A–37

Table A–32 TLZ06 Cassette Tape Drive Characteristics

Subject	Description
Mode of operation	Streaming, and start/stop
Drive interface	Small computer system interface (SCSI)

Table A–33 TLZ06 Cassette Tape Drive Dimensions

Subject	Description
Dimensions	22.5 mm × 12 mm × 29.5 mm (9 in × 5 in × 3.25 in)
Weight	2.2 kg (4.7 lbs)
Media (4mm x 60m)	TLZ04–CA cassette tape
Media (4mm x 90m)	TLZ06–CA cassette tape

Table A–34 TLZ06 Cassette Tape Drive Capacity

Subject	Description
Bit density	114 Mbits per square inch
Transfer rate (sustained)	183 Kbyte/s noncompression
Recording format	Digital Data Storage (DDS, DC)
Cassette capacity (typical)	2 Gbyte normal 90 meter tape 4 Gbyte with 90 meter tape and compression enabled.

Table A–35 TLZ06 Cassette Tape Drive Operating Environment

Subject	Description
Operating temperature	10°C (50°F) to 35°C (95°F)
Operating humidity	20% to 80% RH maximum, noncondensing
Operating altitude	0 km to 4.6 km (0 to 15,000 ft)

Table A–36 TLZ06 Cassette Tape Drive Nonoperating Environment

Subject	Description
Nonoperating temperature	–40°C (–40°F) to 70°C (158°F)
Nonoperating humidity	5% to 95% RH maximum, noncondensing
Nonoperating altitude	0 km to 15.2 km (0 to 50,000 ft)

Table A–37 TLZ06 Cassette Tape Drive Miscellaneous Specifications

Subject	Description
Internal SCSI cable length (TLZ06-DA)	130 mm
Passes per cassette tape	300
Power consumption	9 W
Power requirements	100 to 240 V 200 to 240 V, 1.0 A

A.10 TZ30 Cartridge Tape Drive

This section provides the following information about the TZ30 cartridge tape drive:

- Dimensions, Table A–38
- Operating conditions, Table A–39
- Nonoperating conditions, Table A–40
- Specifications, Table A–41

Table A–38 TZ30 Cartridge Tape Drive Dimensions

Weight	Height	Width	Depth
1.50 kg (3.31 lb)	4.14 cm (1.63 in)	14.48 cm (5.7 in)	21.59 cm (8.5 in)

Table A–39 TZ30 Cartridge Tape Drive Operating Conditions

Temperature range ¹	10°C to 35°C (50°F to 95°F)
Maximum rate of temperature change	11°C (20°F) per hour
Relative humidity	20% to 80% noncondensing
Maximum wet-bulb temperature	25°C (77°F)
Minimum dew point temperature	2°C (36°F)
Altitude	0 m to 2400 m (0 ft to 8000 ft) maximum

¹Reduce maximum temperature by 1.8°C (5.24°F) for each 1000-meter (3300-foot) increase in altitude.

Table A–40 TZ30 Cartridge Tape Drive Nonoperating Conditions

Temperature range	–40°C to 66°C (–40°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	10% to 95%
Maximum wet-bulb temperature	2°C (36°F)
Altitude	0 m to 9100 m (0 ft to 30,000 ft)

Table A–41 TZ30 Cartridge 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)	62.5 KB/s at average streaming mode
Tape speed	190 cm/s (75 in/s)
Track format	Multiple track serpentine recording
Cartridge capacity	~95 MB, formatted
Power requirements	1.0 A (2.0 A surge) at +12 Vac 1.2 A (1.8 A surge) at +5 Vac 20 watts nominal 33 watts peak

A.11 TZ85 Cartridge Tape Drive

This section provides the following information about the TZ85 tape drive:

- CompacTape III specifications, Table A-42
- TZ85 tape drive subsystem specifications, Table A-43

Table A-42 CompacTape III Specifications

Subject	Description
Length	36,000 cm (1200 ft)
Width	10.8 cm (4.25 in)
Number of tracks	24 pairs (48)
Speed	100 inches per second
Bit density	42,500 bits per inch
Track density	96 tracks/in (48 tracks)
Track format	Two-track parallel, serpentine recording
Maximum transfer rate	800 Kbytes, formatted
Specified media	12.7 mm (1/2-inch)
Track format	Two-track parallel, serpentine recording

Table A-43 TZ85 Tape Subsystem Specifications

Subject	Description
Cartridge capacity	2.6 GB, formatted
Power consumption	40 W maximum
Power requirements	12 V $\pm 5\%$ @ 1.2 A (1.5 A surge), 75 mV ripple peak-to-peak +5 V $\pm 5\%$ @ 3.5 A, 75 mV ripple peak-to-peak
Height	15.2 cm (6 in)
Width	22.8 cm (9 in)
Length	33 cm (13 in)

A.12 TZK10 Cartridge Tape Drive

This section provides the following information about the TZK10 cartridge tape drive:

- Dimensions, Table A-44
- Operating conditions, Table A-45
- Nonoperating conditions, Table A-46
- Specifications, Table A-47

Table A-44 TZK10 Cartridge Tape Drive Dimensions

Weight	Height	Width	Depth
1.1 kg (2.4 lb)	4.4 cm (1.7 in)	14.6 cm (5.25 in)	20.8 cm (8.2 in)

Table A-45 TZK10 Cartridge Tape Drive Operating Conditions

Operating temperature ¹	5°C to 35°C (41°F to 95°F)
Operating humidity	20% to 80%, noncondensing
Maximum wet bulb temperature	26°C (79°F)
Minimum dew point temperature	2°C (36°F)
Altitude	0 m to 2400 m (0 ft to 13,000 ft) at 36°C (96°F)

¹Reduce maximum temperature by 1.8°C (3.24°F) for each 1000-meter (3300-foot) increase in altitude.

Table A-46 TZK10 Cartridge Tape Drive Nonoperating Conditions

Operating temperature	-30°C to 60°C (-22°F to 140°F)
Operating humidity	10% to 90%, noncondensing
Maximum wet bulb temperature	29°C (84°F)
Minimum dew point temperature	2°C (36°F)
Altitude	-304 m to 12,300 m (-1000 ft to 40,000 ft) at 36°C (96°F)

Table A–47 TZK10 Cartridge Tape Drive Specifications

Subject	Description
Formatted capacity per drive	320 MB, approximate DC6320 cartridge
Formatted capacity per drive	525 MB, approximate DC6525 cartridge
Formatted capacity per surface	2.48 MB
Formatted capacity per track	18,432
Formatted capacity per block	512 bytes
Formatted blocks per track	36
Formatted blocks per drive	649,040
Formatted capacity spare blocks per cylinder	8
Formatted capacity spare blocks per drive	10,300 MB
Transfer rate to/from media	1.50 MB/s
Performance bus asynchronous mode	1.50 MB/s
Performance bus synchronous mode	4 MB/s
Performance seek time track to track	≤ 4 ms
Performance seek time average	≤ 16 ms
Performance seek time maximum	≤ 35 ms
Average rotational latency	8.3 ms
Rotational speed	3600 rpm
Start time	20 s maximum
Stop time	20 s maximum
Interleave	1:1
Bus latency	600 μs
Power	20 watts, nominal

A.13 TSZ07 Tape Drive Specifications

This section provides the following information about the TSZ07 tape drive:

- Dimensions, Table A-48
- Operating Conditions, Table A-49
- Nonoperating Conditions, Table A-50
- Specifications, Table A-51

Table A-48 TSZ07 Tape Drive Dimensions

Weight	Height	Width	Depth
36.74 kg (81 lb)	26.78 cm (10.50 in)	50.36 cm (19.75 in)	68.85 cm (27.00 in)

Table A-49 TSZ07 Tape Drive Operating Conditions

Temperature range	10°C to 35°C (60°F to 95°F)
Relative humidity	20% to 80%
Maximum wet bulb temperature	25°C (77°F)
Altitude	2400 m (8,000 ft) max

Table A-50 TSZ07 Tape Drive Nonoperating Conditions

Temperature range	-40°C to 66°C (-40°F to 151°F)
Relative humidity	95% max
Maximum wet bulb temperature	32°C (90°F) max
Altitude	9000 m (30,000 ft) max

Table A-51 TSZ07 Tape Drive Specifications

Subject	Description
Recording densities	1600 bits/inch or 6250 bits/inch

(continued on next page)

Table A–51 (Cont.) TSZ07 Tape Drive Specifications

Subject	Description
Mode of operation	Streaming and start/stop
Storage capacity	40 Mbytes at 1600 bpi 140 Mbytes at 6250 bpi
Number of tracks	9 on 1.25 cm (0.5 in) magnetic tape
Drive interface	SCSI-2
Tape transport speed	100 in/sec when writing
SCSI transfer rate	4.0 MBytes/sec synchronous

A.14 TKZ08 Tape Drive Specifications

This section provides the following information about the TKZ08 tape drive:

- Operating conditions, Table A–52
- Nonoperating conditions, Table A–53

Table A–52 TKZ08 Tape Drive Operating Conditions

Operating temperature	+5°C to 35°C (41°F to 95°F)
Operating humidity	20% to 80% noncondensing
Maximum wet bulb temperature	26°C (79°F) max
Altitude	304.8m to 3,048 m –1,000 ft to 10,000 ft

Table A–53 TKZ08 Tape Drive Nonoperating Conditions

Temperature range	–40°C to 60°C (–40°F to 140°F)
Relative humidity	10% to 90% noncondensing
Altitude	–304.8 m to 3,048 m (–1,000 ft to 10,000 ft)

B

Associated Documents

For option and system hardware part numbers, consult your Digital sales representative.

Not all documents are available in every country. Check with your Digital sales representative for availability.

Table B-1 lists associated documents available in printed form.

Table B-1 Associated Printed Documents

Title	Order Number
DECsystem 5900 Customer Documentation	
<i>DECsystem 5900 Customer Documentation Kit</i>	EK-D590A-DK
<i>DECsystem 5900 Owner's Guide</i>	EK-D590A-OG
<i>DECsystem 5900 Site Preparation</i>	EK-D590A-SP
<i>Site Environmental Preparation Guide</i>	EK-CSEPG-MA
Service Documentation	
<i>DECsystem 5900 Installation Guide</i>	EK-D590A-IN
<i>DECsystem 5900 Service Guide</i>	EK-D590A-PS
<i>DECsystem 5900/260 CPU Card Installation</i>	EK-D5960-IN

(continued on next page)

Table B-1 (Cont.) Associated Printed Documents

Title	Order Number
Drives	
<i>Optical Library User's Guide</i>	AA-PQ9RA-TE
<i>RX26 Owner's Reference Card</i>	EK-RX26D-RC
<i>RZ57 Disk Drive Service Manual</i>	EK-RZ57D-SV
<i>RZ58 Disk Drive Service Manual</i>	EK-RZ58D-SV
<i>RZ Series Disk Drive Subsystem Pocket Service Guide</i>	EK-RZXXD-PS
<i>TLZ04 Cassette Tape Drive Owner's Guide</i>	EK-TLZ04-OG
<i>TLZ06 Cassette Tape Drive Owner's Manual</i>	EK-TLZ06-OM
<i>Tx85 Series Cartridge Tape Subsystem Owner's Manual</i>	EK-OTF85-OM
<i>Tx85 Tape Drive Operator's Reference Card</i>	EK-OTK85-RC
<i>Tx857 Series Magazine Tape Subsystem Owner's Manual</i>	EK-TF857-OM
<i>TZ30 Cartridge Tape Drive Owner's Guide</i>	EK-TZ30C-OG
<i>TZK10 Cartridge Tape Drive Owner's Guide</i>	EK-TZK10-OG
<i>TSZ07 Cartridge Tape Drive Installation/Owner's Manual</i>	EK-TSZ07-IN
<i>TSZ07 Tape Drive Technical Manual</i>	EK-TSZ07-TM
<i>TKZ08 Cartridge Tape Drive Installation/Owner's Manual</i>	EK-TKZ08-IN
<i>RRD42 Disc Drive Owner's Manual</i>	EK-RRD42-OM
DECconnect System	
<i>DECconnect System General Description</i>	EK-DECSY-GD
<i>DECconnect System Requirements Evaluation Workbook</i>	EK-DECSY-EG
<i>DECconnect System Installation and Verification Guide</i>	EK-DECSY-VG
<i>DECconnect System Stand-alone ThinWire Networks: Planning and Installation Guide</i>	EK-DECSY-TG
<i>DECconnect System Planning and Configuration Guide</i>	EK-DECSY-CG

(continued on next page)

Table B-1 (Cont.) Associated Printed Documents

Title	Order Number
SCSI	
<i>Small Computer System Interface: An Overview</i>	EK-SCSIS-OV
<i>Small Computer System Interface: A Developer's Guide</i>	EK-SCSIS-SP
ULTRIX	
<i>Guide to Installing ULTRIX</i>	AA-PBL0D-TE

C

United Kingdom Regulatory Information

This appendix provides user information on the DECsystem 5900 server that is required by the United Kingdom.

The DECsystem 5900 server is manufactured by Digital Equipment Corporation. The model number of the server is DU59BT1-XX.

C.1 Service Requirements

Table C-1 describes the service category, interface type, data rate, service requirements, and PTO for the KN05.

Table C-1 KN05 Service Requirements

Service Category	Interface Type	Data Rate	Physical Requirements	Electrical Requirements	PTO BT ¹ /MCL ² /Hull ³
1	CCITT	2400	ISO 2110	V.24/V.28	Yes/Yes/Yes
	Recommend	4800			Yes/Yes/Yes
	X.21bis	9600	BS.6623:	Cable:	Yes/Yes/Yes
		19200	Part 1 1985	BC13P-10	No/Yes/No

¹BT - British Telecommunications plc

²Hull - Kingston Communications (Hull) plc

³MCL - Mercury Communications Limited.

The maximum approved cable length is 300 cm (10 ft), as follows:

Cat1 V.24 300 cm (10 ft) for extension BC13P-10

C.1.1 Approvals for Digital Circuits

The KN05 is approved for direct connection to a particular digital circuit. This approval includes interconnection cable with mating connectors conforming to BS6623 part 1 and part 4.

If the product is connected to the service with anything other than its own approved cables, then those cables must benefit from the relevant general approval and/or conform with any other applicable requirements.

Caution

Ports J5, J9, J10, J11, J12, J17, J9, J31, J49, J51, E1, and E3 do not provide sufficient isolation to satisfy the requirements of the relevant parts of standard BS6301. Any product connected to these ports 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 the British Telecom (Post Office) Technical Guide 2 or 26 and given permission to attach.

Other usage will invalidate any approval given to this apparatus.

Interconnection directly, or by way of other apparatus, of ports marked by the safety warning label with other ports that are marked or not so marked, may produce hazardous conditions on the network. Seek advice from a competent engineer before making any such connection.

C.1.2 Host Independent Approvals

The KN05 is approved only for installation in an approved host with approved attachments. For approval, the host and host attachments must be one of the following:

- Type-approved (meaning the equipment is built exactly like the models that were originally approved).

- If the equipment was supplied after March 1, 1989, it must be marked with or supplied with a statement that the host is supplied under General Approval Number NS/G/1234/J/100003.

Except at the edge connector which plugs into the host's expansion slot, clearance and creepage distances of Xmm and Ymm, as listed in Table C-2, must be maintained between the KN05 and other parts of the host, including any other expansion cards fitted.

Table C-2 Clearance and Creepage Specifications for KN05

Clearance Xmm	Creepage Ymm	Voltage ¹
2.0	2.4 (3.8)	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

¹Used or generated by other parts of the host or expansion card (Vrms or Vdc)

The creepage distances apply when installed in a normal office environment. The creepage distances shown in parentheses apply where the local environment within the host computer is subject to conductive pollution or dry non-conductive pollution which could become conductive due to condensation. These distances can be checked by measuring between the adjacent parts.

If in doubt, advice should be obtained from a competent telecom safety engineer. Failure to install the DECSYSTEM 5900 server in accordance with these instructions will invalidate the approval.

C.1.3 Host Power Rating

The user must insure that the power drawn by the KN05 together with the host and other auxiliary apparatus 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.

Table C-3 contains the module power rating.

Table C-3 Module Power Rating for KN05

Supply (+/-4%) (Volts)	Maximum Current (Amps)	Typical Current (Amps)
+5.1	22	7
+12.1	1.6	0.09
-12.1	0.1	0.05

Table C-4 contains the electrical output characteristics from the H7878-A DECSYSTEM 5900 power supply.

Table C-4 H7878-A Power Supply Output Characteristics

Parameter	Requirement			Units
	Minimum	Typical	Maximum	
+5.1 V (short-term regulation)	+4.95	+5.10	+5.20	Volts
+5.1 V (long-term regulation)	+4.90	+5.10	+5.25	Volts
+12.1 V (short-term regulation)	+11.86	+12.10	+12.34	Volts
+12.1 V (long-term regulation)	+11.74	+12.10	+12.46	Volts
-12 V	-1.40	-12.00	-12.60	Volts
Load range				
+5.1 V	3.0	-	40.0	Amps
+12.1 V	0.0	-	2.7	Amps
-12 V	0.0	-	0.2	Amps
Output ripple/noise + 5.1 V				
1 Hz to 10 MHz, +12.1 V	-	30.0	50.0	mV
1 Hz to 10 MHz, +12.1 V	-	50.0	70.0	mV
1 Hz to 10 MHz, +12.1 V	-	70.0	100.0	mV
Fan -12 V	-	-	120.0	mV
All output (except +5.1 V)	-	1.0	2.0	%

(continued on next page)

Table C-4 (Cont.) H7878-A Power Supply Output Characteristics

Parameter	Requirement			Units
	Minimum	Typical	Maximum	
+5.1 V output ripple/noise 10 MHz to 50 MHz	-	-	50	mV
Temperature coefficient	-	0.02	-	%/C

Table C-4 applies to all ac line input conditions per Table C-1. Individual output regulation specifications are valid at all other specified output loadings at the output connector.

Noise and ripple are peak to peak to be measured as follows:

- Input voltages within specified operating ranges.
- Loads on all outputs within specified ranges.
- Measurement taken with Tektronix P6046 probe and an oscilloscope (minimum 100 MHz bandwidth).
- Loads to be resistive.
- Measurement taken at load side of output connector using “Bendix” type connectors (recommended) with very short leads. The measurements will be taken with a 10uf tantalum capacitor terminated in both minimum and maximum resistive loads.
- This measurement is for use during qualification during testing.

C.1.3.1 Dynamic Load Regulation

Dynamic load regulation for +5.1 V shall be 100 mV peak and 2 ms maximum.

Dynamic load regulation for +12.1 V shall be 240 mV peak and 2 ms maximum.

This load regulation is expressed as the peak deviation from the steady-state dc-output voltage, and the time required for the output voltage to settle back to within 0.5% of its new steady-state value after an instantaneous change in the output current, with all other factors held constant. The instantaneous voltage shall not exceed the total regulation limit.

C.1.3.2 DI/DT Load Steps

DI/DT load steps for +5.1 V shall be 0.06 A/uS for a 15 A step.

DI/DT load step for +12.1 V shall be 0.2 A/uS for 0.6 A to 1.0 A.

The rate of change of load current which may be stepped while keeping the output voltages in regulation. Current steps are either positive or negative going and shall be within the limits specified. The time period between steps shall not be less than three times the settling time specified. The time period between steps shall not be less than three times the settling time specified in Section C.1.3.1.

C.1.4 Environmental Conditions

See Appendix A for further environmental information.

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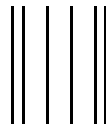
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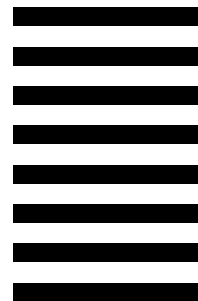
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