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VAXstation 4000 Model 60
Optional Devices Service Information

EK-V4066-SV.001

Digital Equipment Corporation
Maynard, Massachusetts

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Contents

3   Optional System Monitors

4   Optional System Printers

Index

Figures

Tables

Preface

This manual is a support and reference document for Digital Services personnel who perform maintenance on the VAXstation 4000 Model 60 workstation. It is also intended for Digital customers who have a self-maintenance agreement with Digital.

Organization of This Manual

This manual contains the following chapters:

- Chapter 1 describes the optional mass storage devices that can be configured with the system, and explains how to install the devices.

- Chapter 2 describes the optional system modules that can be configured with the system. Installation procedures for each module are also in this chapter.

- Chapter 3 describes the optional monitors that can be configured with the system.

- Chapter 4 describes the optional printers that can be configured with the system.

Associated Documentation

The following documents provide additional information about the VAXstation 4000 Model 60 workstation:

Document	Part Number
VAXstation 4000 Model 60 Documentation Kit	EK-V4666-DK
VAXstation 4000 Model 60 Service Information	EK-V466B-SV
VAXstation 4000 Model 60 Pocket Service Information	EK-V466H-PS
VAXstation 4000 Model 60 Quick Installation Card	EK-PMARI-IN

Document	Part Number
VAXstation 4000 Model 60 Owner's and System Installation Guide	EK-PMARI-OM
VAXstation 4000 Model 60 Options Installation Guide	EK-PVAX2-IG
VAXstation 4000 Model VLC Service Information	EK-V48VB-SV
BA46 Storage Expansion Box Owner's Guide	EK-STEXP-IG
BA46 Storage Expansion Box Maintenance Guide	EK-VBA46-SV
BA42 Storage Expansion Box Maintenance Guide	EK-BA42A-MG

Conventions

The following conventions are used in this guide.

Convention	Description
WARNING	Contains important information that relate to personal safety.
CAUTION	Contains information to prevent damage to the equipment.
NOTE	Contains general information.
PN	Part number

1
Mass Storage Devices

This chapter describes the optional mass storage devices that can be configured in the VAXstation 4000 Model 60 system unit. The devices are:

Section 1.1   RZ23L, RZ24, and RZ25 Hard Disk Drives

Section 1.2   RRD42 Compact Disc Drive

Section 1.3   RX26 Diskette Drive

Section 1.4   TZK10 Tape Drive

NOTE

The system unit can hold one device from which the storage medium is removable, such as the RRD42, RX26, or TZK10 drives. To add more than one removable media device, you need an expansion box.

1.1 RZ2x Hard Disk Drive

The RZ23L, RZ24, and RZ25 hard disk drives provide memory storage
for applications and user files. The RZ2x drives store information on a
non-removable disk. Table 1–1 lists the storage capacities for the RZ2x
drives.

Table 1–1   Capacities of RZ23L, RZ24, and RZ25 Drives

Drive	Capacity
RZ23L	121 MB
RZ24	209 MB
RZ25	426 MB

1.1.1 RZ2x Hard Disk Drive SCSI ID

Before you install the RZ23L, RZ24, or RZ25 drive in the system, you
need to verify the SCSI ID setting as follows:

1. Turn the RZ23L, RZ24, or RZ25 drive so that the bottom of the
   drive is facing you. Find the SCSI ID jumpers, which are removable
   electrical connectors, that allow you to select a unique ID number for
   each SCSI device:

   — If you have an RZ23L or RZ24 drive, find jumpers E1, E2, and E3.

   — If you have an RZ25 drive, find jumpers P1, P2, and P3.

   NOTE
   **If your hard disk drive was not factory installed, it could have
   been shipped with all the jumpers attached (to prevent loss of
   jumpers when shipping and unpacking). In this case, the SCSI
   ID is set to 7, and you may need to change it.**

2. Verify that the jumpers are set to the appropriate positions for SCSI
   ID 0, 1, or 2. These are the positions that the RZ2x drive normally
   uses. If you have one RZ23L, RZ24, or RZ25 drive that was factory
   installed, verify that the jumpers are set for SCSI ID 3. If you have
   two RZ23L, RZ24, or RZ25 drives that were factory installed, verify
   that the jumpers on one of them are set for SCSI ID 3, and that the
   jumpers on the other are set to either SCSI ID 0, 1, or 2. Any RZ2x
   drive can be set to SCSI ID 0, 1, 2, or 3, if no other drive uses that
   ID. See Table 1–2 (for RZ23L and RZ24 drives) or Table 1–3 (for RZ25
   drives) for the correct jumper positions for each of these SCSI IDs.

NOTE

Settings should be changed only when a system is configured with more than one of a particular device. You are responsible for the SCSI ID settings on your equipment.

If you are adding an RZ23L, RZ24, or RZ25 drive, the SCSI ID could need changing. Drives not factory installed could have all jumpers in place (set for position 7) to prevent misplacing the jumpers during shipping and unpacking.

Figure 1–1 shows the location of the RZ2x drive SCSI ID jumpers.

Figure 1–1   RZ23L SCSI ID Jumper Location

MLO-002895
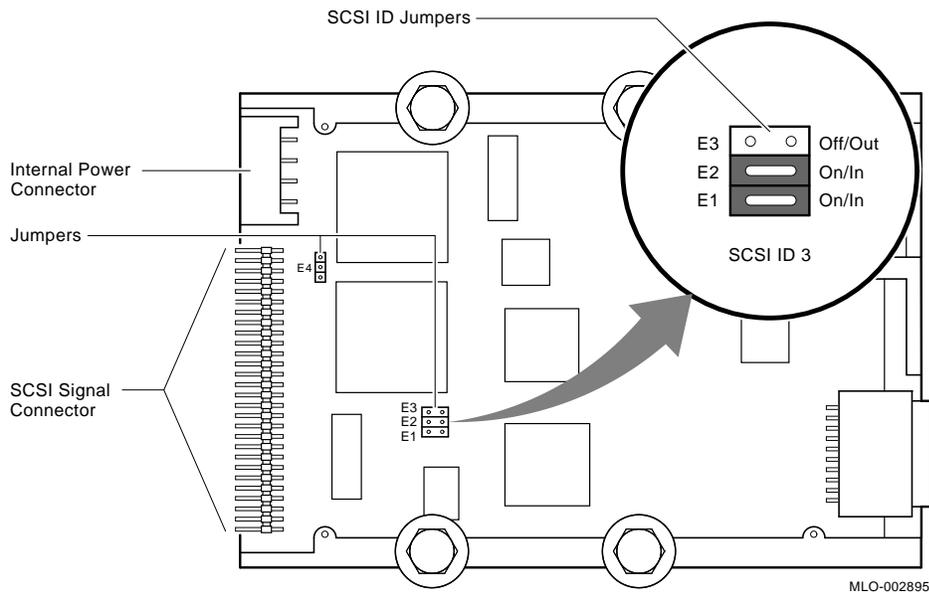
Table 1–2   RZ23L/RZ24 SCSI Jumper Settings

Device	Recommended SCSI ID	Jumper Positions E1	E2	E3
RZ23L/RZ24/RZ25	0	Out[1]	Out	Out
RZ23L/RZ24/RZ25	1	In[1]	Out	Out
RZ23L/RZ24/RZ25	2	Out	In	Out
RZ23L/RZ24/RZ25 (factory-installed)	3	In	In	Out
RRD42	4	Out	Out	In
RX26/TZK10	5	In	Out	In
SCSI controller	6	Out	In	In
High-priority device	7	In	In	In

[1]Out = Removed; In = attached

Table 1–3   RZ25 SCSI Jumper Settings

Device	Recommended SCSI ID	Jumper Positions P1	P2	P3
RZ23L/RZ24/RZ25	0	Out[1]	Out	Out
RZ23L/RZ24/RZ25	1	Out	Out	In[1]
RZ23L/RZ24/RZ25	2	Out	In	Out
RZ23L/RZ24/RZ25 (factory-installed)	3	Out	In	In
RRD42	4	In	Out	Out
RX26/TZK10	5	In	Out	In
SCSI controller	6	In	In	Out
High-priority device	7	In	In	In

[1]Out = Removed; In = attached

For information on installing the RZ2x disk drives, refer to the *VAXstation 4000 Model 60 Options Installation Guide* (PN EK-PVAX2-IG).

1.1.2 RZ2x Hard Disk Drive Specifications

Table 1–4 and Table 1–5 list the specifications for the RZ23L hard disk drive. Table 1–6 and Table 1–7 list the specifications for the RZ24 hard disk drive.

Table 1–4   RZ23L Disk Drive Operating Environment

Temperature range	10° C to 60° C (50° F to 110° F)
Relative humidity	8% to 80%
Altitude	-304 m to 3048 m (-1000 ft to 10,000 ft)
Maximum wet bulb temperature	25.6° C (78° F)
Heat dissipation	8 W (typical) (27.36 Btu/hr) 9 W max. (30.8 Btu/hr)
Temperature gradient	11° C/hr (20° F/hr)

Table 1–5   RZ23L Disk Drive Physical Dimensions

Height	Width	Depth	Weight
41.28 mm (1.625 in)	101.6 mm (4.00 in)	146.05 mm (5.75 in)	.826 kg (1.82 lbs)

Table 1–6   RZ24 Disk Drive Operating Environment

Temperature range	10° C to 55° C (50° F to 99° F)
Relative humidity	8% to 80%
Altitude	-304 m to 4573 m (-1000 ft to 15,000 ft)
Maximum wet bulb temperature	25.6° C (78° F)
Heat dissipation	6.6 W (seeking) (22.57 Btu/hr) 6.8 W (read/write mode) (23.26 Btu/hr)
Temperature gradient	11° C/hr (20° F/hr)

Table 1–7   RZ24 Disk Drive Physical Dimensions

Height	Width	Depth	Weight
41.28 mm	101.6 mm	146.05 mm	.780 kg
(1.625 in)	(4.00 in)	(5.75 in)	(1.72 lbs)

1.2   RRD42 CDROM Disc Drive

The RRD42 CDROM compact disc drive is a storage device that reads data from removable compact discs. The drive has a storage capacity of 600 Mbytes. The RRD42 drive can be used to install the VMS operating system and other software, and to access read-only databases, such as online documentation sets. The drive has audio output capabilities, allowing the use of headphones for listening to audio information recorded on the compact disc.

1.2.1   RRD42 CDROM Disc Drive SCSI ID

Before installing the RRD42 drive, verify the SCSI ID on the drive as follows:

1. Turn the RRD42 drive so that the rear of the drive is facing you. Find SCSI ID jumpers 0, 1, and 2, on the rear of the drive, as shown in Figure 1–2. Jumpers are removable electrical connectors that allow you to select a unique ID number for each SCSI device.

2. Verify that the jumpers are set as follows:

   Jumper 0 = Out (removed)
   Jumper 1 = Out (removed)
   Jumper 2 = In (attached)

These are the positions for SCSI ID 4, which is the default SCSI ID for the drive.

Figure 1–2   RRD42 CDROM Disc Drive Jumper Location
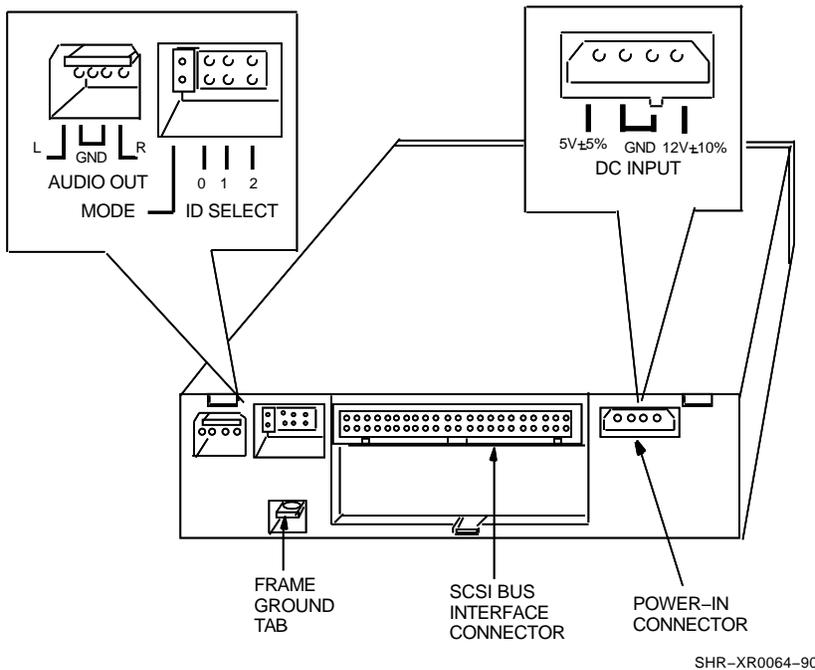
SHR–XR0064–90

NOTE

Default settings should be changed only when a system is configured with more than one of a particular device. You are responsible for the SCSI ID settings on your equipment.

If you want to use a different ID, choose a new ID from Table 1–8, and carefully remove or replace jumpers accordingly, using tweezers or another small tool.

NOTE

Save any SCSI jumpers you remove for later use, if necessary.

CAUTION

Never set two devices to the same SCSI ID; the system cannot communicate with devices set to the same ID.

Table 1–8 lists the jumper settings for the RRD42 disc drive.

Table 1–8   RRD42 CDROM Disc Drive Jumper Settings

Device	Recommended SCSI ID	Jumper Positions		
		0	**1**	**2**
RZ23L/RZ24/RZ25	0	Out[1]	Out	Out
RZ23L/RZ24/RZ25	1	In[1]	Out	Out
RZ23L/RZ24/RZ25	2	Out	In	Out
Factory-installed RZ23L/RZ24/RZ25	3	In	In	Out
RRD42	4	Out	Out	In
RX26/TZK10	5	In	Out	In
SCSI controller	6	Out	In	In
High-priority device	7	In	In	In

[1]Out = Removed; In = Attached

To install the RRD42 drive, refer to the *VAXstation 4000 Model 60 Options Installation Guide* (PN EK-PMARI-IG).

1.2.2 RRD42 CDROM Disc Drive Specifications

Table 1–9 lists the operating environment for RRD42 disc drive.

Table 1–9   RRD42 Disc Drive Operating Environment

Temperature range	5° C to 50° C (41° F to 122° F)
Relative humidity	10% to 90%, non-condensing
Altitude	2400 m (8000 ft) at 36° C (96° F)
Maximum wet bulb temperature	29° C (84° F)

NOTE
Be sure the "Mode" jumper is in. This jumper must be in place to use the drive with the VMS operating system.

CAUTION
Each device must have a unique SCSI ID. Never set two devices to the same SCSI ID; the system cannot communicate with devices set to the same ID.

1.3   RX26 Diskette Drive

The RX26 is a half-height diskette drive that can be used for selective file backup, load applications, and transporting files between non-networked systems. The RX26 drive has a storage capacity of 4 Mbytes. It can be used to read and write on 4 Mbyte standard floppies, and to read only 700 KB standard floppies.

1.3.1   RX26 Diskette Drive SCSI ID

Before installing the RX26 drive in the system, verify the SCSI ID setting.

1. Turn the RX26 drive so that the left side of the drive is facing you. Find the SCSI ID switches 1, 2, and 3 on the drive, as shown in Figure 1–3.

2. Use a pen or small pointed object to move the switches up or down.

CAUTION
Do not use a pencil to move switches. Graphite particles can damage the SCSI switches.

Digital recommends that the SCSI ID switches be set to 5 as follows:

> Switch 1 = Down (on)
> Switch 2 = Up (off)
> Switch 3 = Down (on)

NOTE
Default settings should be changed only when a system is configured with more than one of a particular device. You are responsible for the SCSI ID settings on your equipment.

If you need to use a different ID, choose a new ID from Table 1–10. Use a small pointed instrument (but **not** a pencil), set the switches accordingly.

CAUTION
Never set two devices to the same SCSI ID; the system cannot communicate with devices set to the same ID.

To install the RX26 drive, refer to the *VAXstation 4000 Model 60 Options Installation Guide* (PN EK-PMARI-IG).

Figure 1–3   RX26 Diskette Drive SCSI ID Switch Location

Switches Positions:

Up (Off)

Down (On)

SCSI ID 5

1 2 3

1   2   3

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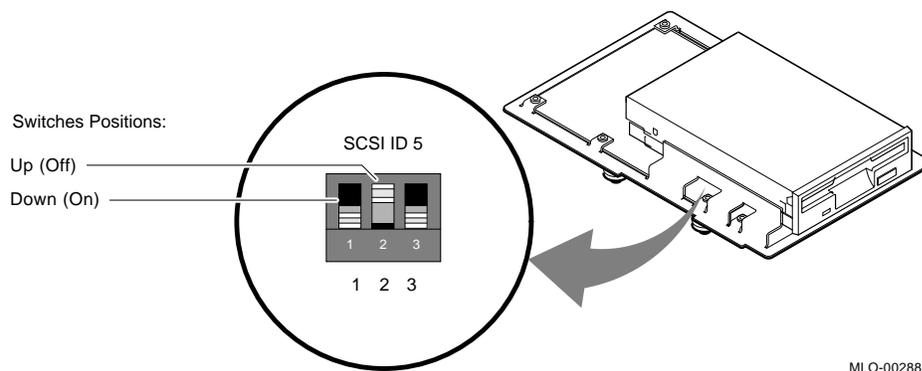
Table 1–10   RX26 Diskette SCSI ID Switch Setting

Device	Recommended SCSI ID	Switch Positions		
		2	1	0
RZ23L/RZ24/RZ25	0	Up	Up	Up
RZ23L/RZ24/RZ25	1	Down	Up	Up
RZ23L/RZ24/RZ25	2	Up	Down	Up
Factory-installed RZ23L/RZ24/RZ25	3	Down	Down	Up
RRD42	4	Up	Up	Down
RX26/TZK10	5	Down	Up	Down
SCSI controller	6	Up	Down	Down
(High-priority device)	7	Down	Down	Down

1.3.2 RX26 Diskette Drive Specifications

Table 1–11   RX26 Environmental Specifications

Operating temperature	5° C to 50° C (40° F to 122° F)
Nonoperating temperature	-20° C to 66° C (-4° F to 151° F)
Operating humidity	8% to 80%, wet bulb @ 25.6° C (78.0° F), no condensation
Nonoperating humidity	5% to 95%, wet bulb @ 46° C (115.0° F), no condensation
Operating altitude	-304 m to 3,048 m (-1000 ft to 10,000 ft)
Nonoperating altitude	-304 m to 12,192 m (-1000 ft to 40,000 ft)

Table 1–12   Diskette and Format Information

Number of cylinders	80
Number of tracks	160
Number of read/write heads	2

1.4   TZK10 (QIC) Tape Drive

The TZK10 tape drive is a half-height device that uses industry standard quarter-inch cartridge (QIC) tapes for loading applications and doing file backups. The formatted capacity of the QIC tape is 320 Mbytes or 525 Mbytes, depending on the tape used.

1.4.1   TZK10 Tape Drive SCSI ID

Before installing the TZK10 drive, verify the SCSI ID on the drive as follows:

1. Turn the TZK10 drive so that the rear of the drive is facing you. Find SCSI ID jumpers 0, 1, and 2. Jumpers are removable electrical connectors that allow you to select a distinct ID for each SCSI device.

2. Verify that the jumpers are set as follows:

    Jumper 0 = In (attached)
    Jumper 1 = Out (removed)
    Jumper 2 = In (attached)

These are the positions for SCSI ID 5, which is the setting that the TZK10 drive normally uses.

NOTE
Default settings should be changed only when a system is configured with more than one of a particular device. You are responsible for the SCSI ID settings on your equipment.

Figure 1–4   Verifying the TZK10 Tape Drive SCSI ID

MLO-006156
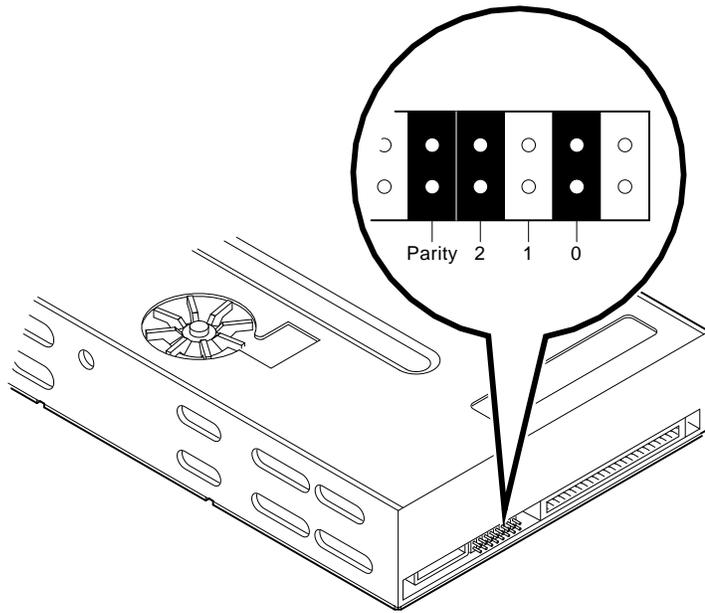
If you want to use a different ID, choose a new ID from Table 1–13 and carefully remove or replace jumpers accordingly. Use tweezers or another small tool to remove or replace jumpers.

NOTE
Save any SCSI jumpers you remove for later use, if necessary.

Table 1–13   TZK10 Tape Drive SCSI Jumper Settings

Device	Recommended SCSI ID	Jumper Positions 2	1	0
RZ23L/RZ24/RZ25	0	Out	Out	Out
RZ23L/RZ24/RZ25	1	Out	Out	In
RZ23L/RZ24/RZ25	2	Out	In	Out
Factory-installed RZ23L/RZ24/RZ25	3	Out	In	In
RRD42	4	In	Out	Out
RX26/**TZK10**	5	In	Out	In
SCSI controller	6	In	In	Out
High-priority device	7	In	In	In

NOTE
Be sure the "Mode Select" jumper is in. This jumper must be in place to use the drive with the VMS operating system.

CAUTION
Each device must have a unique SCSI ID. Never set two devices to the same SCSI ID; the system cannot communicate with devices set to the same ID.

For information on installing the TZK10 (QIC) tape drives, refer to the *VAXstation 4000 Model 60 Options Installation Guide* (PN EK-PVAX2-IG).

1.4.2 TZK10 Tape Drive Specifications

Table 1–14   TZK10 Cartridge Tape Drive Dimensions

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

Table 1–15   TZK10 Cartridge Tape Drive Operating Environment

Temperature range	5° C to 40° C (41° F to 122° F)
Relative humidity	10% to 90%, non-condensing
Altitude	0 m to 2400 m (0 ft to 13,000 ft)
Maximum wet bulb temperature	26° C (79° F)
Minimum dew point	2° C (36° F)

2
Optional System Modules

This chapter describes the optional modules that can be installed in the VAXstation 4000 Model 60 system. The optional modules are:

2.1   MS44 Memory Module

The MS44 memory module is designed to provide expandable memory for the VAXstation 4000 Model 60 system. The memory array consists of 36 DRAMs organized as one bank of four- to nine-bit bytes. Timing and addressing of the array are provided by the system module and are buffered on the memory module. Data lines are unbuffered on the module and are driven on bi-directional lines to and from the DRAMs. All data and control lines receive one unit load per module.

Three types of memory module are available: 4 Mbyte (MS44-AA), 4 Mbyte Reduced Cost (MS44-AL), and 16 Mbyte (MS44-CA). The VAXstation 4000 Model 60 can use any of the three memory modules. Memory modules must be installed in pairs; two 4 Mbyte modules for two 16 Mbyte modules.

To identify a memory module, locate the etch on the left side of the memory module. The 4 Mbyte modules have AA or AL on the etch board, and the 16 Mbyte modules have CA on the etch board. The memory modules are shown in Figure 2–1.

When the module pairs are configured together, the MS44-AA module pairs should be installed in the lower numbered areas. The maximum system memory configuration is 104 Mbytes for the Model 60.

For additional information on installing memory modules, refer to the *VAXstation 4000 Model 60 Service Information* (PN EK-V466B-SV).

Figure 2–1   MS44 Memory Module

AA = 4 Megabyte
Memory Board

AA-A8

CA-A8

CA = 16 Megabyte
Memory Board

LJ-00499-TI0
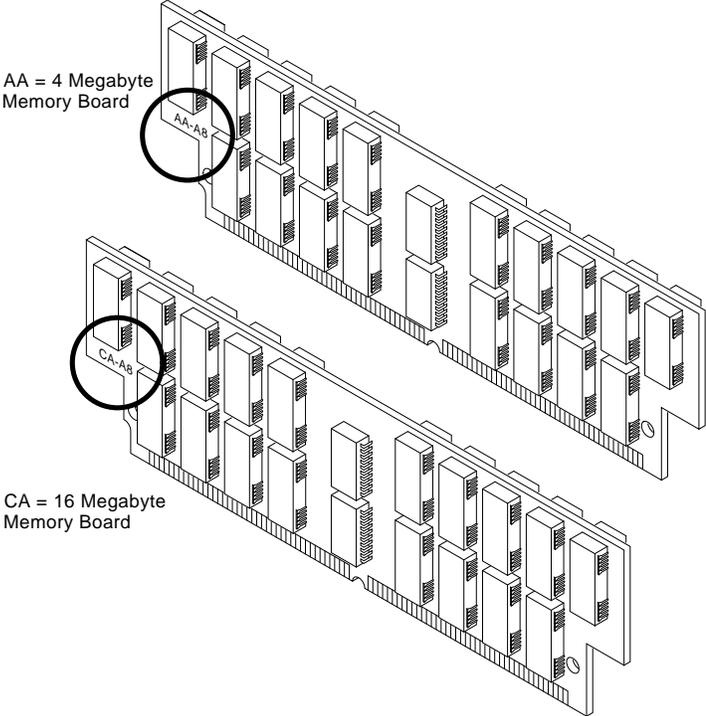
2.1.1 MS44 Memory Module Specifications

The MS44 memory module specifications are listed next.

Total Memory Power Required

Total DRAM Current	2.45 A
Total Driver Current	0.10 A
Total Current	2.55 A
Total Active Power	13.38 W
Total Standby Power	1.25 W

Total System Requirements

Total Memory Current	5.69 A
Total Memory Power	29.86 W

NOTE
The current specifications for the memory modules assume 24 Mbytes and QUADWORD operations with 2 memory modules active and 4 memory modules in standby.

2.2   DSW21 Synchronous Communications Adapter

The DSW21 adapter is a synchronous serial communications interface for
the VAXstation 4000 Model 60 workstation. It has full modem control and
multiple protocol support. Figure 2–2 shows the DSW21 communications
adapter.

Figure 2–2   DSW21 Synchronous Communications Adapter
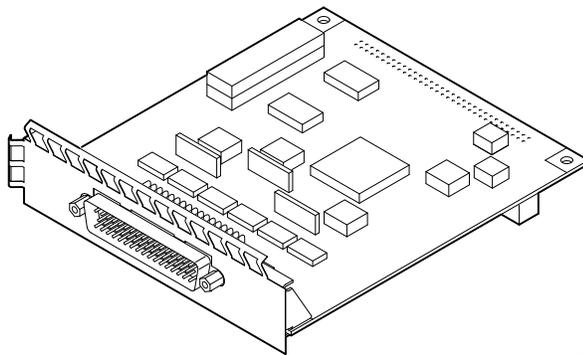
MLO-005915

The DSW21 adapter is an option board that connects internally to the
CPU board via a 64-pin option connector. It consists of the EDAL
interface, 128 KB UVEPROM, 256 KB Static RAM, the MC68302
Integrated Multi-Protocol Processor (IMP), and I/O receivers and drivers
with static and lightning protection. The communications I/O connector is
a 50-pin D-subminiature plug that goes directly through the back of the
system cabinet. Figure 2–3 shows the DSW21 connections.

Figure 2–3   DSW21 Synchronous Communications Adapter
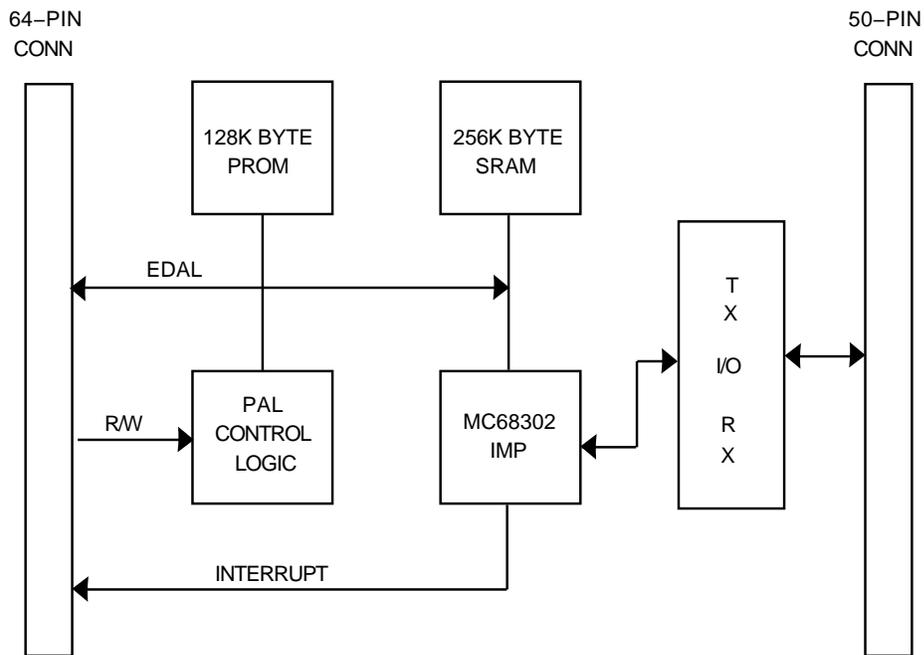
LJ–01668–GRA

2.2.1 DSW21 Synchronous Communications Adapter Cables

Adapter cables for the DSW21 communications adapter vary according to the option ordered. The following table lists the adapter cable variations.

Table 2–1   DSW21 Adapter Cables

DSW21 Model	Adapter Cables
DSW21-AA	1 line sync comm, BC19V EIA-232/V.24
DSW21-AB	1 line sync comm, BC19W EIA-449/423/V.10
DSW21-AC	1 line sync comm, BC19U EIA-449/422/V.36
DSW21-AD	1 line sync comm, BC19X V.35
DSW21-AE	1 line sync comm, BC19Q EIA-530
DSW21-AF	1 line sync comm, BC20Q X.21
DSW21-M	1 line sync comm controller, no adapter cable

2.2.2 Installing the DSW21 Adapter

This section describes how to install the DSW21 interface in the system unit.

NOTE
Refer to the system preparation instructions in the *VAXstation 4000 Model 60 Service Information* before installing any module in the workstation.

To install the communications interface, do the following:

1. Remove any rear panels or shields (if applicable) from the I/O panel.

2. Mount the DSW21 internally to the Model 60 via the 64-pin option connector. There are no clips or screws to hold the option connector.

3. Attach the 50-pin data connector, which protrudes through the rear of the enclosure and is held in place by the metal bracket.

4. Restore the system. Test the new configuration.

2.2.3 DSW21 Environmental Specifications

The DSW21 module assembly meets Digital Standard 102 class C environmental specifications.

Table 2–2   DSW21 Environmental Specifications

Parameter	Range
Operating temperature	5°C to 50° C (41°F to 122 °F)
Nonoperating temperature	-40°C to 66° C (-40°F to 155°F)
Relative humidity (operating)	10% to 95% (noncondensing)
Relative humidity (nonoperating)	10% to 95%
Maximum wet bulb temperature (operating)	32 °C (90°F)
Maximum wet bulb temperature (nonoperating)	46 °C (115°F)
Minimum dew point temperature (operating)	2 °C (36°F)
Head dissipation	6.75 watts to 8.10 watts Btu/h
Altitude (operating)	2400 m (8000 ft)
Altitude (nonoperating)	4900 m (16000 ft)

NOTE

De-rate the maximum operating temperature by 1.82 degrees Celsius for each 1000 meters of altitude above sea level. Reference: Standard Atmosphere, Standard Gravity.

This device is to operate in a non-caustic environment.

2.2.4 DSW21 Physical Specifications

The DSW21 adapter is a four layer circuit board assembly with the following specifications.

Table 2–3   Physical Specifications

Parameter	Range
Height	4.3 cm (1.7 in)
Width	12.4 cm (4.9 in)
Depth	14 cm (5.5 in)
Weight	.45 kg (1 lb)

3
Optional System Monitors

This chapter describes the optional monitors that can be connected externally to the VAXstation 4000 Model 60 system. The monitors are:

3.1   VR319 Monochrome Monitor

The VR319 monochrome monitor (Figure 3–1) has a 500 mm (20 in),
direct-viewed, anti-glare CRT. The built-in tilt/swivel assembly allows you
to adjust the screen for viewing.

Figure 3–1   VR319 Monochrome Monitor
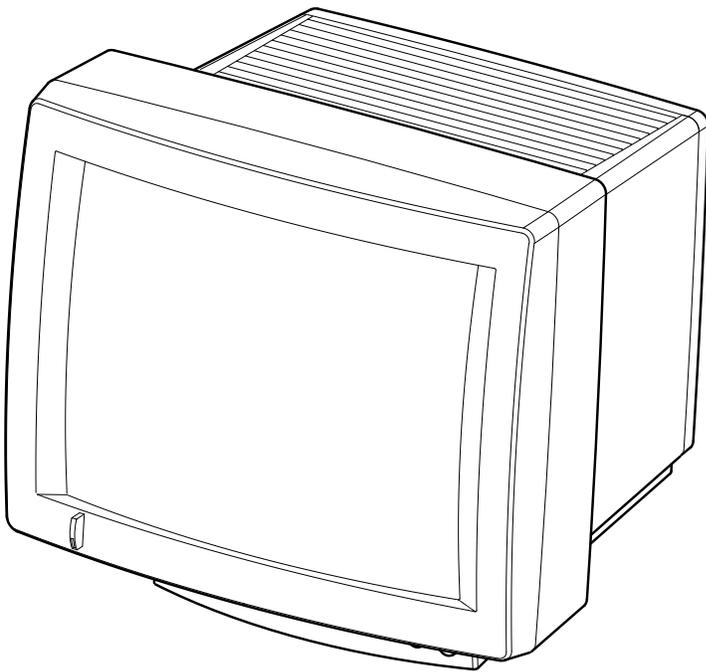
MA-0243-90.DG

3.1.1 Refresh Rate

The VR319 monochrome monitor operates at either a 66 Hz or 72 Hz
refresh rate. The refresh rate is preset for the system before the monitor
is shipped. If you change the monitor to another system, check the refresh
rate of the new system and then set the jumpers on the deflection module
(Figure 3–2) and power supply module (Figure 3–3) to match the new
system. For additional information, refer to the *VR319 Monitor Service
Guide* (PN EK-VR319-SV).

Figure 3–2   Refresh Rate Jumper—Deflection Module

LJ-00524-TI0
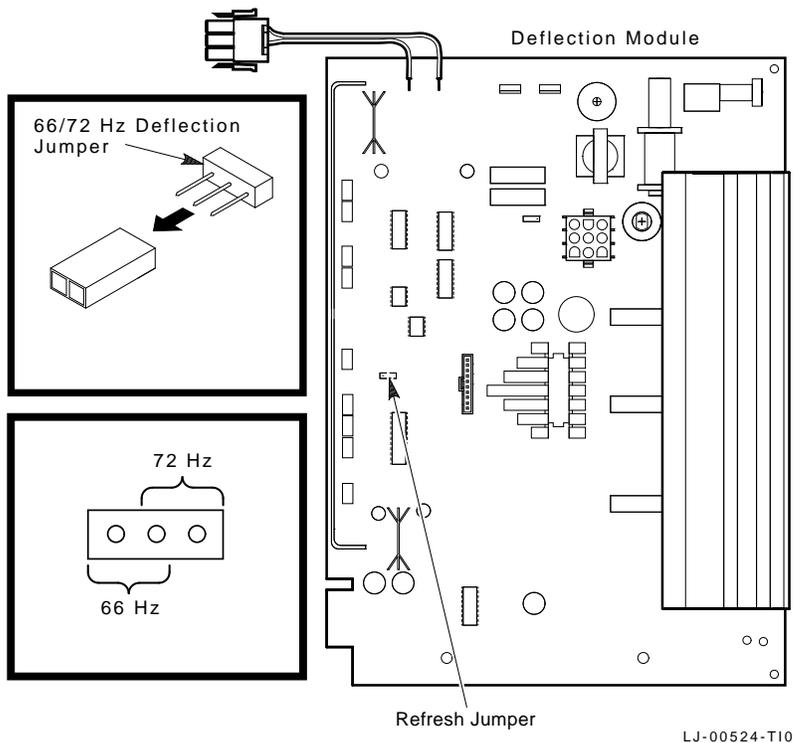
Figure 3–3   Refresh Rate Jumper—Power Supply Module
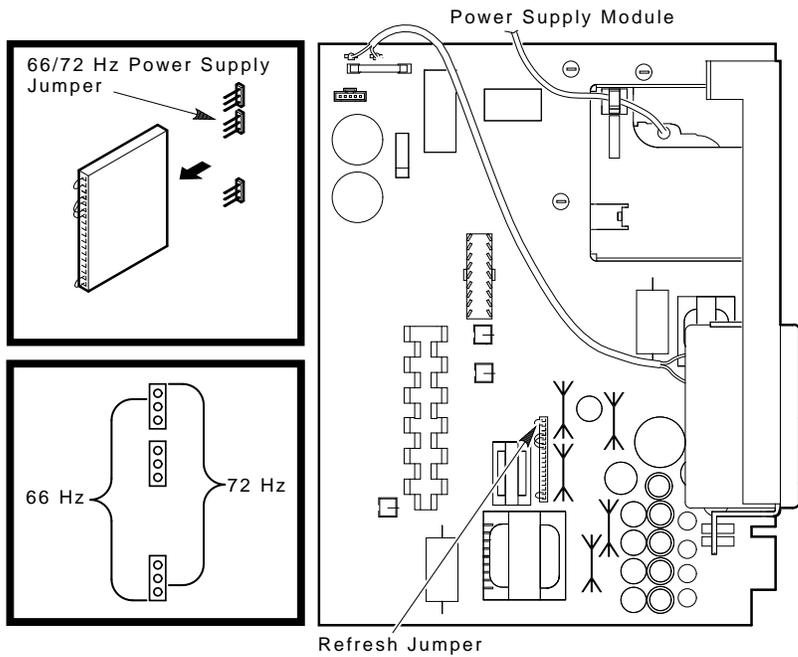
LJ-00523-TI0

3.1.2 VR319 Monochrome Monitor Specifications

The VR319 monochrome monitor specifications are listed next.

Power Requirements

Voltage	88 to 132 Vac or 176 to 264 Vac auto-ranging, single phase, 3-wire
Frequency	47 to 63 Hz
Power Consumption	135 W maximum

Operating Environment

Temperature Range	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 95% Maximum wet bulb = 32° C Minimum dew point = 2°C (noncondensing)

Physical Characteristics

Height	45.7 cm (18.0 in)
Width	49.5 cm (19.5 in)
Depth	40.1 cm (15.8 in)
Weight	22 kg (48.0 lb)
Tilt Range	-5° forward to +15° backward
Swivel Range	±90° (left and right)
Display - Cathode ray tube (CRT)	48.3 cm (19 in) diagonal
Display area	1280 pixels horizontal x 1024 lines vertical. Approximate picture size: 34.3 cm (13.5 in) x 27.3 cm (10.75 in) with a 5:4 aspect ratio.
Light transmission	42% nominal
Video input	Composite video

3.1.2.1 VR319 Monochrome Monitor Video Timing

The VR319 monochrome monitor video timing is listed in the following tables.

Video Timing–1280 x 1024 Resolution

	Refresh Rate	
	72 Hz	**66 Hz**
Horizontal frequency	77.17 kHz	70.66 kHz
Vertical frequency	72.55 Hz	66.47 Hz
Pixel frequency	130.81 MHz	119.84 MHz
Pixel period	7.64 ns	8.34 ns

Horizontal timing	**No. Pixels**	**μs**	**μs**
Entire line	1696	12.96	14.15
Active visible line	1280	9.79	10.68
Blanking interval	416	3.18	3.47
Sync front porch	32	0.24	0.27
Sync pulse	160	1.22	1.34
Sync back porch	224	1.71	1.87

Vertical timing	**No. Lines**	**ms**	**ms**
Vertical period (Entire Frame)	1063	13.78	15.04
Visible raster	1024	13.28	15.04
Blanking interval	39	0.506	0.552
Sync front porch	3	0.039	0.042
Sync pulse	3	0.039	0.042
Sync back porch	33	0.428	0.467

3.2   VR320 Color Monitor

The VR320 color monitor (Figure 3–4) has a direct-viewed, 485 mm
(19 in), anti-glare CRT with contrast enhancement. The monitor has a
built-in tilt and swivel assembly, allowing you to adjust the screen for
viewing.

Figure 3–4   VR320 Color Monitor
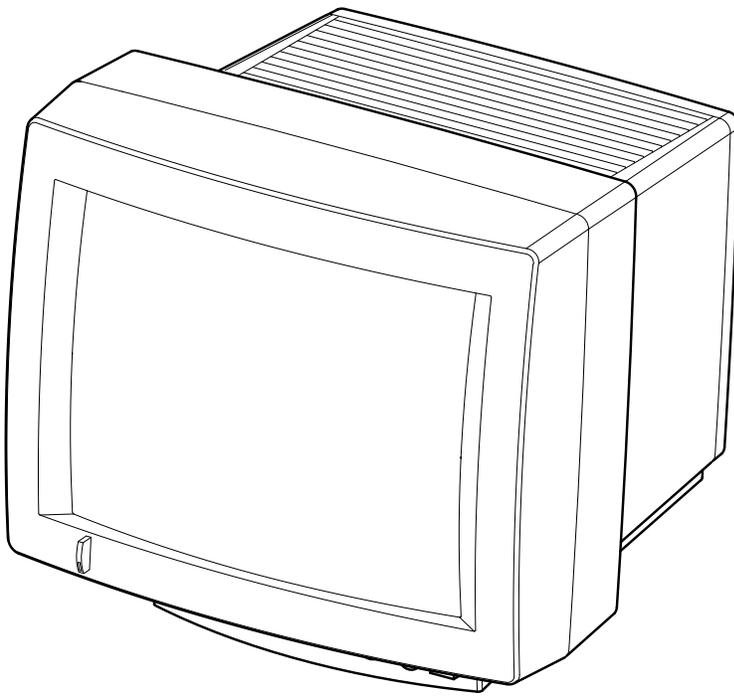
MA-0244-90.DG

3.2.1 Refresh Rate

The VR320 color monitor operates at a refresh rate of either 66 Hz or
72 Hz. The refresh rate is preset for the system before the monitor is
shipped. If you change the monitor to another system, check the refresh
rate of the new system and then set the switch on the deflection module
(Figure 3–5) and the jumpers on the power supply module (Figure 3–6)
to match the new system. For additional information, refer to the *VR320
Monitor Service Guide* (PN EK-VR320-SV).

Figure 3–5   Refresh Rate Switch—Deflection Module
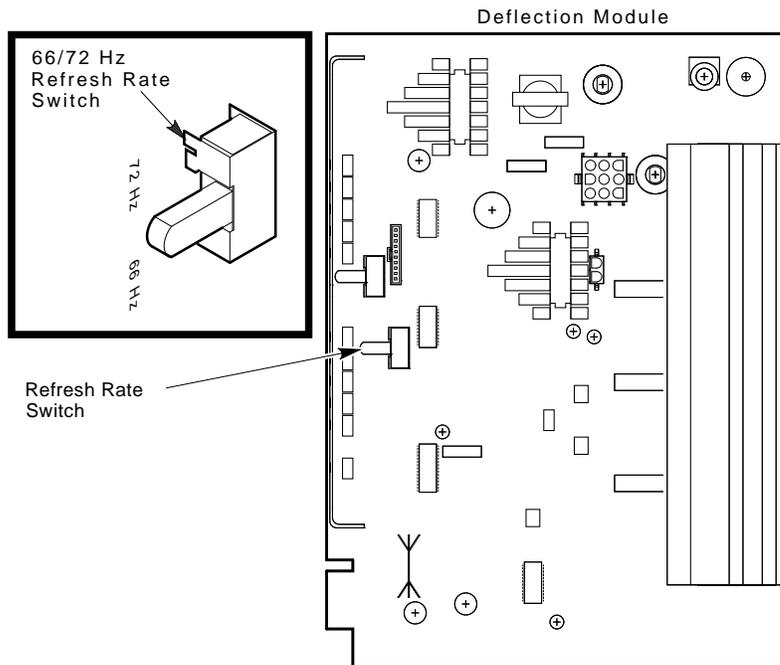
LJ-00525-TI0

Figure 3–6   Refresh Rate Jumper—Power Supply Module

Refresh Jumper
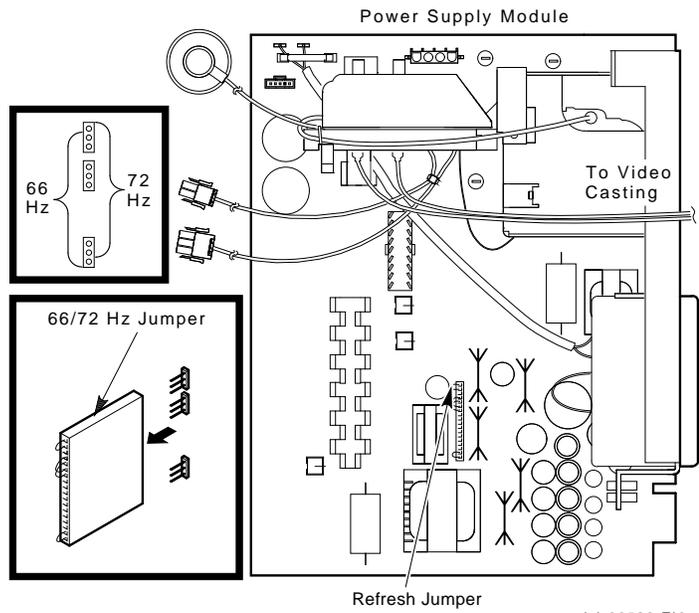
LJ-00526-TI0

3.2.2 VR320 Color Monitor Specifications

The VR320 color monitor specifications are listed next.

Power Requirements

Voltage	88 to 132 Vac or 176 to 264 Vac auto-ranging, single phase, 3-wire
Frequency	47 to 63 Hz 47 to 63 Hz
Power consumption	220 W maximum

Operating Environment

Temperature range	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 95% Maximum wet bulb = 32° C Minimum dew point = 2°C (noncondensing)

Physical Characteristics

Height	45.7 cm (18.0 in)
Width	49.5 cm (19.5 in)
Depth	45.2 cm (17.8 in)
Weight	29.0 kg (63.0 lb)
Tilt range	-5° forward to +15° backward
Swivel range	±90° (left and right)
Display - Cathode ray tube (CRT)	48.3 cm (19.0 in) diagonal
Display area	1280 pixels horizontal x 1024 lines vertical
	Approximate picture size: 34.3 cm (13.5 in) x 27.3 cm (10.75 in) with a 5:4 aspect ratio.
Light transmission	58% nominal
Video input	Red (with sync) 1 Vpp, 75 ohm, ac or dc coupled
	Green (with sync) 1 Vpp, 75 ohm, ac or dc coupled
	Blue (with sync) 1 Vpp, 75 ohm, ac or dc coupled

3.2.2.1 VR320 Color Monitor Video Timing

The VR320 color monitor video timing is listed in the following tables.

Video Timing–1280 x 1024 Resolution

	Refresh Rate	
	72 Hz	**66 Hz**
Horizontal frequency	77.13 kHz	70.66 kHz
Vertical frequency	72.56 Hz	66.47 Hz
Pixel frequency	130.81 MHz	119.84 MHz
Pixel period	7.64 ns	8.34 ns

Horizontal Timing	**No. Pixels**	**µs**	**µs**
Entire line	1696	12.97	14.15
Active visible line	1280	9.79	10.68
Blanking interval	416	3.18	3.47
Sync front porch	32	0.245	0.267
Sync pulse	160	1.22	1.34
Sync back porch	224	1.71	1.87

Vertical Timing	**No. Lines**	**ms**	**ms**
Vertical period (Entire Frame)	1063	13.78	15.04
Visible raster	1024	13.28	14.49
Blanking interval	39	0.506	0.552
Sync front porch	3	0.03889	0.04246
Sync pulse	3	0.03889	0.04246
Sync back porch	33	0.4279	0.4670

3.3   VR262 Monochrome Monitor

The VR262 monochrome monitor is compatible with the VR260 monitor. The VR262 monitor has a direct-viewed, 485 mm (19 in) diagonal antiglare screen with contrast enhancement. When connected to a host system, the VR262 monitor can display information sent to the host and information that the host system sends to you.

For installation and troubleshooting information, refer to *Installing and Using the VR262 Monochrome Monitor* (PN EK-VR262-IN).

3.3.1   VR262 Monochrome Monitor Specifications

Dimensions

Height	39.4 cm (15.5 in) including feet
Width	45.5 cm (17.9 in)
Depth	39.5 cm (15.4 in)
Weight	18 kg (40 lbs)

Horizontal Rate Timing (nominal)

Frequency	54.054 kHz
Front porch	160 ns
Sync pulse	1850 ns
Back porch	1690 ns
Blanking interval	3.70 µs (maximum)
Active video time	14.8 µs
Horizontal period	18.5 µs
Pixels displayed	1024

Vertical Rate Timing (nominal)

Frequency	60 Hz
Front porch	0 horizontal lines
Sync pulse	3 horizontal lines
Blanking interval	37 horizontal lines
Active video time	16.0 ms
Vertical period	16.67 ms
Lines displayed	864

Power

Power supply type	Transistor, switch type ac to dc converter
AC input	Switch-selectable
100 V to 120 V nominal	Single-phase, 3-wire 88 V to 132 V RMS, 47 Hz to 63 Hz line frequency
220 V to 240 V nominal	Single-phase, 3-wire 185 V to 264 V RMS, 47 Hz to 63 Hz line frequency
Power consumption	65 W

Environment

Temperature	10° C to 40° C (50° F to 104° F)
Humidity	10% to 90% maximum wet bulb of 28° C minimum dew point of 2° C

3.4   VR299 Color Monitor

The VR299 is a 500 mm (20 in; 19 in viewable) color monitor for use on Digital workstation products.

The monitor features are:

- In-line gun with Dynamic Astigmatism and Focus (DAF) correction

- 90 degree color CRT (P22 phosphor)

- 1024 pixel x 864 line resolution

- 60 Hz refresh

- 54.0 kHz horizontal frequency

- 0.31 mm dot pitch

- Automatic degauss on power-up

- Integral tilt and swivel

- High efficiency anti-glare bonded panel

3.4.1   VR299 Color Monitor Specifications

Physical

Height	18.5 in (47.0 cm)
Width	19.9 in (50.6 cm)
Depth	20.7 in (52.7 cm)
Weight	67.0 lbs (30.0 kg)

Timing

Vertical rate	60 Hz
Horizontal rate	54 Hz

Power

AC input	DA model, 100 - 120 Vac 50/60 Hz D3, D4 models, 200 - 240 Vac 50/60 Hz
Power consumption	150 W

Environment

Operating Temperature range	10° C to 40° C (50° F to 104° F)
Humidity range	10% to 95% non-condensing

3.5 VRT16 Color Monitor

The VRT16 is a 406 mm (16 in), highly integrated color display monitor that is designed for displaying high-resolution graphics. The monitor features include:

- A silica coating on the screen that provides a glare-free display

- High-resolution with 1280 (horizontal) x 1024 (vertical) elements per frame, which allows for high-density color display

- Use of the 66.5 Hz non-interlace method to reduce flicker

- A display that can be turned plus or minus 45 degrees to the right or left, and can be tilted 15 degrees up or 5 degrees down

- A cylindrical screen that reduces distortion when viewed from the sides, sharpens the picture corners, and diminishes reflections

3.5.1 VRT16 Color Monitor Specifications

Physical

Height	409 mm (16 in)
Width	406 mm (16 in)
Depth	453 mm (17 in)
Weight	23.0 kg (50 lbs, 11 oz)

Power Requirements

AC input	100 - 120 Vac 60 Hz 220 - 240 Vac 50 Hz
Current	100 - 120 Vac 3.7 A max 200 - 240 Vac 2.0 A max

Environmental

Operating temperature	10° C to 40° C (50° F to 104° F)
Nonoperating temperature	0° to 60°
Operating humidity	10% - 80%
Nonoperating humidity	5% - 90%

For additional information about the VRT16 monitor, refer to the *VRT16 Service Manual* (PN ER-VRT16-SM).

3.6 VRT19 Color Monitor

The VRT19 color monitor has a 474 mm (19 in) (diagonal), direct-viewed, anti-reflective coated screen with contrast enhancement. The monitor has a built-in tilt swivel assembly, allowing you to adjust the screen for viewing comfort.

The VRT19 color monitor is a highly integrated color display monitor that is designed for displaying high-resolution graphics.

The VRT19 color monitor features are the same as those of the VRT16 color monitor (refer to Section 3.5.)

3.6.1 VRT19 Color Monitor Specifications

Physical

Height	474 mm (18.66 in)
Width	480 mm (18.9 in)
Depth	505 mm (19.9 in)
Weight	32.5 kg (71 lbs, 11 oz)

Power Requirements

AC input	100 - 120 Vac 60 Hz 220 - 240 Vac 50 Hz
Current	100 - 120 Vac 3.7 A max 200 - 240 Vac 2.0 A max

Environmental

Operating temperature	10° C to 40° C (50° F to 104° F)
Nonoperating temperature	0° C to 60° C (32° F to 140° F)
Operating humidity	10% - 80%
Nonoperating humidity	5% - 90%

4
Optional System Printers

This chapter describes the optional printers that can be connected to the VAXstation 4000 Model 60 system. The printers are:

4.1   LA75 Companion Printer

The LA75 Companion Printer (Figure 4–1) is a versatile high-speed dot matrix printer that can print in five modes.

- Draft
- Memo
- Near-Letter quality
- Letter quality
- Bit-Map graphics

The LA75 Companion Printer has bidirectional printing and prints at a speed of 250 characters per second. The printer is available in both serial and parallel interface models.

Figure 4–1   LA75 Companion Printer
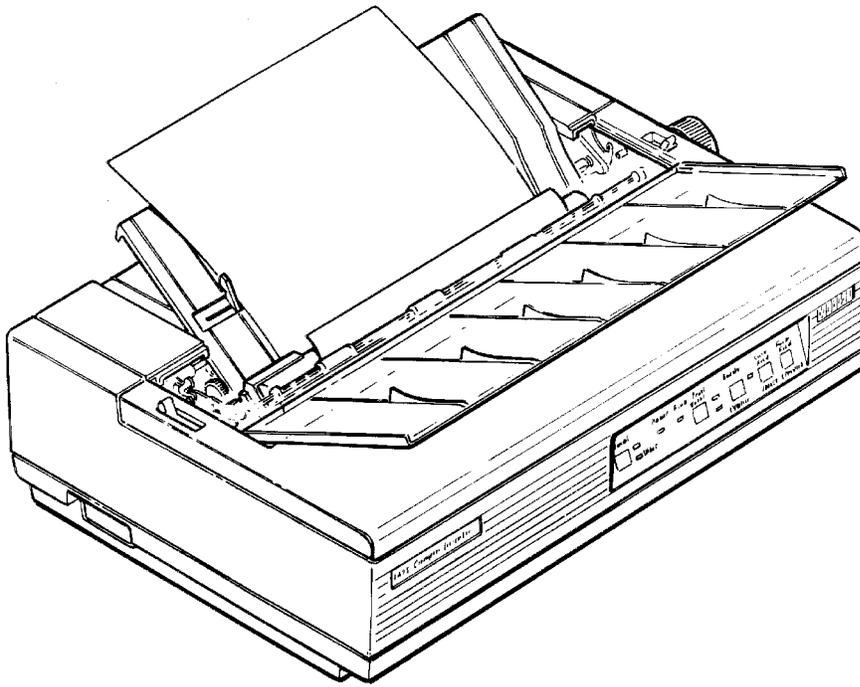
MA-0171-86

4.1.1 LA75 Companion Printer Configuration

The LA75 Companion Printer must be configured to ensure that the printer and the system communicate with each other correctly. You may need to change some of the printer's features and values depending on the hardware and software requirements for the system. Check the system's documentation to determine the requirements for baud rate, data bits and parity, and protocol. Table 4–1 lists the factory set configurations for the LA75 Companion Printer. For additional information, refer to *Installing and Using the LA75 Companion Printer* (PN EK-0LA75-UG).

Table 4–1   LA75 Factory Set Configurations

LA75-S Code Version 1.0

Feature	Values
Baud rate	7 4800
Data bits and parity	7 8-None
Protocol	1 DEC
Form length	2 11 inches
Character set (Digital)	1 U.S. ASCII
Supplemental character set (Digital)	1 DEC Supplemental
Print density (Digital)	1 Draft
Printer ID (Digital)	1 LA50 ID
Text mode right margin (Digital)	1 Truncate
Auto LF on CR (Digital)	2 NO Auto LF
Auto CR on LF (Digital)	2 NO Auto CR
CAN Control code (Digital)	1 Cancel control functions
80 or 132 Columns (Digital)	1 80 Columns
Paper out bell (Emulation)	2 ON
Slashed zero (emulation)	2 Zero without slash
Auto LF on CR (emulation)	2 NO Auto LF
Active character set (emulation)	1 Graphics set A
Auto CR on LF (emulation)	2 NO Auto CR
Power-Up density (emulation)	1 Draft
LQ or NLQ (emulation)	1 Select NLQ

4.1.2 LA75 Companion Printer Specifications

The LA75 Companion Printer specifications are listed in the following tables.

Power Requirements

Voltage/Frequency:

LA75-A2	120 Vac, 50/60 Hz
LA75-A3	240 Vac, 50/60 Hz
LA75-A4	220 Vac, 50/60 Hz
LA75-A5	100 Vac, 50/60 Hz

Power cord	2.0 m (6.7 ft), detachable
Power receptacle	Non-switched, 3-prong, grounded
Power consumption	120 W maximum

Operating Environment

Temperature range	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 90%

Physical Characteristics

Height	12.1 cm (4.8 in)
Width	42.7 cm (16.8 in)
Depth	34.5 cm (13.6 in)
Weight	9.5 kg (21.0 lb)

4.2   LA210 Letterprinter

The LA210 Letterprinter (Figure 4–2) is a dot-matrix, receive only (RO) printer. The printer operates in text or graphics mode. Letter quality or draft quality printing can be selected in text mode. In graphics mode, the system controls the dot printing elements.

Letter quality mode provides medium or high density printing at low speed (40 characters per second, maximum). Draft mode provides low density printing at high speed (240 characters per second, maximum).

The LA210 Letterprinter contains the courier 10 U.S. ASCII, courier 10 multinational, and VT100 line drawing character sets. Up to two fonts can be plugged into the printer's font assembly.

Figure 4–2   LA210 Letterprinter

MA-0078-84
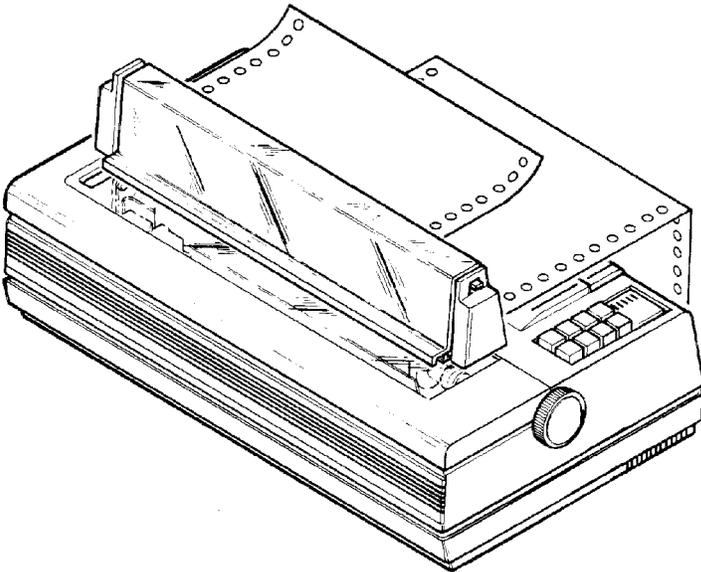
The LA210 Letterprinter has a standard RS232C serial interface.
Figure 4–3 shows the location of the serial interface connector. Figure 4–4
shows the location of the optional parallel interface switches.

Figure 4–3   RS232C Serial Interface Connector

RS232C SERIAL
CONNECTOR

MA-0093-84
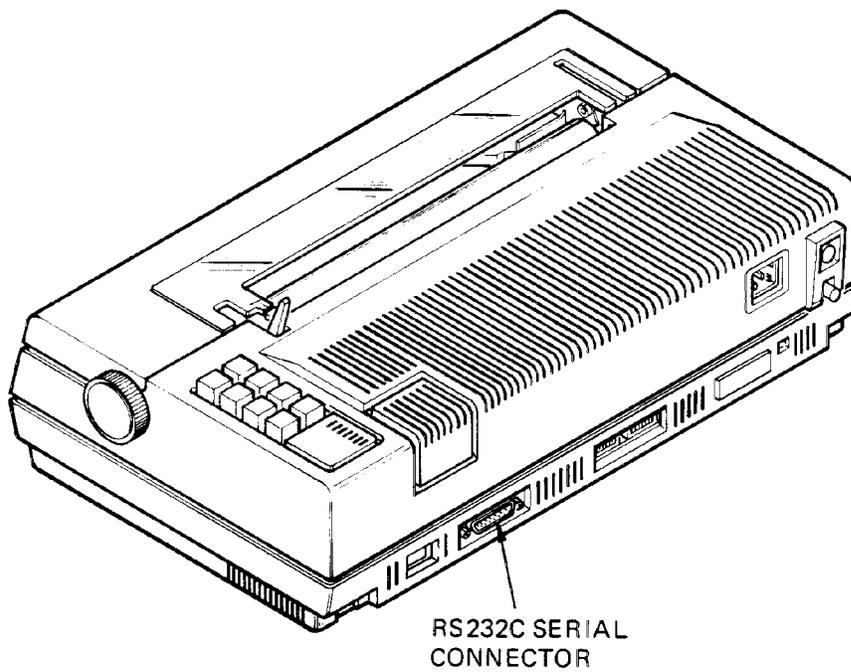
Figure 4–4   Parallel Interface Switches (Optional)

COVER

OFF
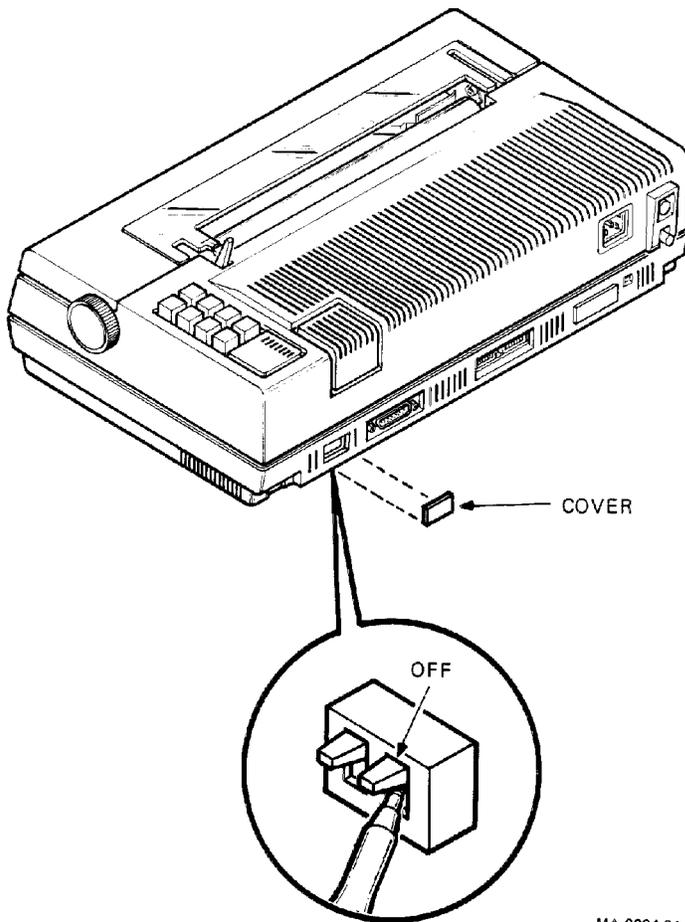
MA-0084-84

4.2.1 LA210 Letterprinter Configuration

The LA210 Letterprinter configuration switches are factory set for use with most Digital systems. Check the system requirements to see if any changes are necessary. If you set the configuration switches, do not change the settings unless there is a change to the communication system. Figure 4–5 shows the location of the configuration switches. For additional information, refer to the *LA210 Letterprinter User Guide* (PN EK-LA210-UG).

CAUTION
Never use a lead pencil to change the switch positions. Use a ballpoint pen or similar item.

Figure 4–5   LA210 Letterprinter Configuration Switches

MA-0108-84
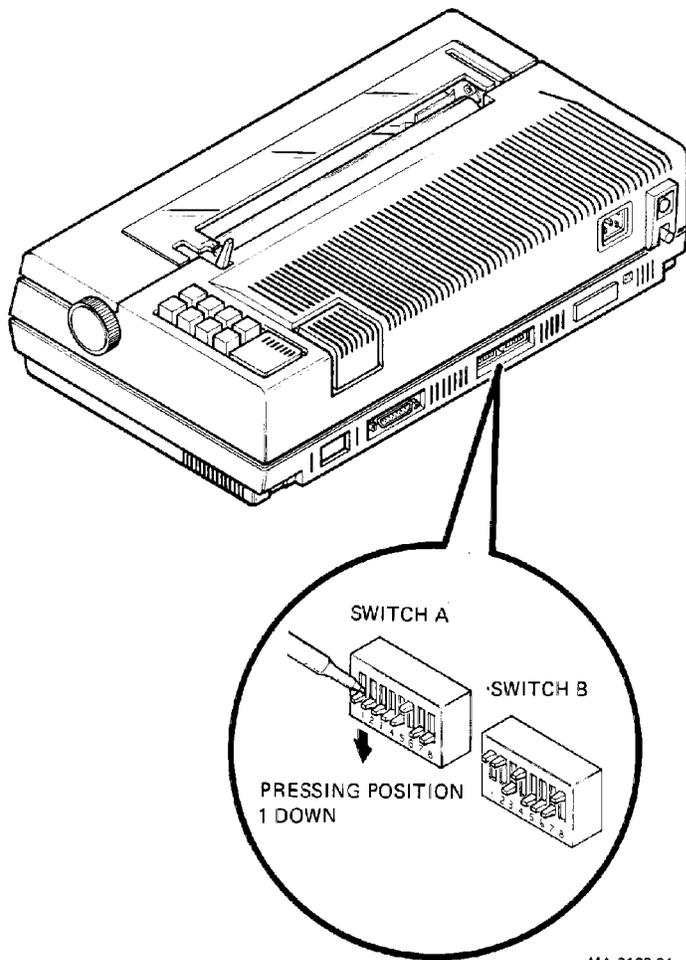
4.2.2 LA210 Letterprinter Specifications

The LA210 Letterprinter specifications are listed in the next tables.

Power Requirements

Voltage	120 Vac nominal (90 to 128 Vac) 240 Vac nominal (180 to 256 Vac), switch-selectable
Frequency	47 to 63 Hz
Power receptacle	Non-switched, 3-prong, grounded
Power consumption	154 W maximum

Operating Environment

Temperature range	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 90%

Physical Characteristics

Height	12.7 cm (5.0 in) without tractor 22.8 cm (9.0 in) with tractor
Width	54.6 cm (21.5 in)
Depth	34.3 cm (13.5 in)
Weight	12.15 kg (27.0 lb)

4.3 LN03 Laser Printer

The LN03 Laser Printer is a nonimpact printer that uses a laser diode and an electrophotographic printing process. The LN03 Laser Printer prints at a rate of eight pages per minute (text only) with print quality at 300 by 300 dots per inch.

The LN03 Laser Printer (Figure 4–6) has an RS232 serial interface that allows connection to systems for text printing, and graphics by way of the sixel standard protocol.

Figure 4–6   LN03 Laser Printer
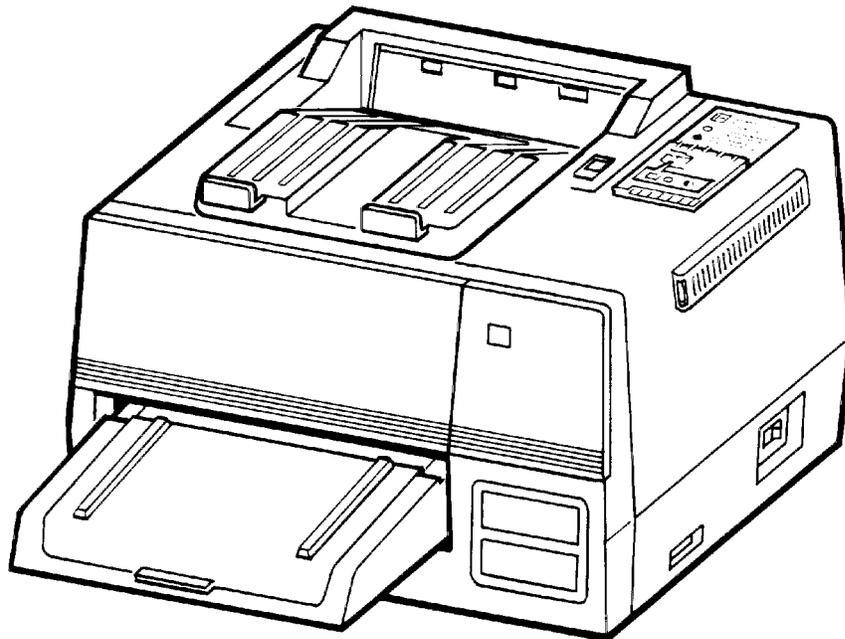
MA-1303-84D

4.3.1 LN03 Laser Printer Configuration

The LN03 Laser Printer has two 6-position configuration switchpacks, located at the rear of the printer. The switchpacks are used to configure the printer operating requirements. Figure 4–7 shows the location of the switchpacks and the printer configuration factory settings. If necessary, change these settings to match the communication parameters of the system.

NOTE

Turn off power to the printer before resetting the configuration switches. The new switch settings are invoked when you turn the power on again.

CAUTION

Never use a lead pencil to change the switch positions. Use a ballpoint pen or similar item to change the switch settings.

The switchpacks are marked 1 (ON) and 0 (OFF). For additional information, refer to the *LN03 Technical Manual* (PN EK-OLN03-TM).

Figure 4–7 LN03 Laser Printer Configuration Switches

BACK OF
PRINTER

SP1

SP2

CONFIGURATION SWITCHPACKS
(SHOWN WITH FACTORY SETTINGS)

MA-1304-84F
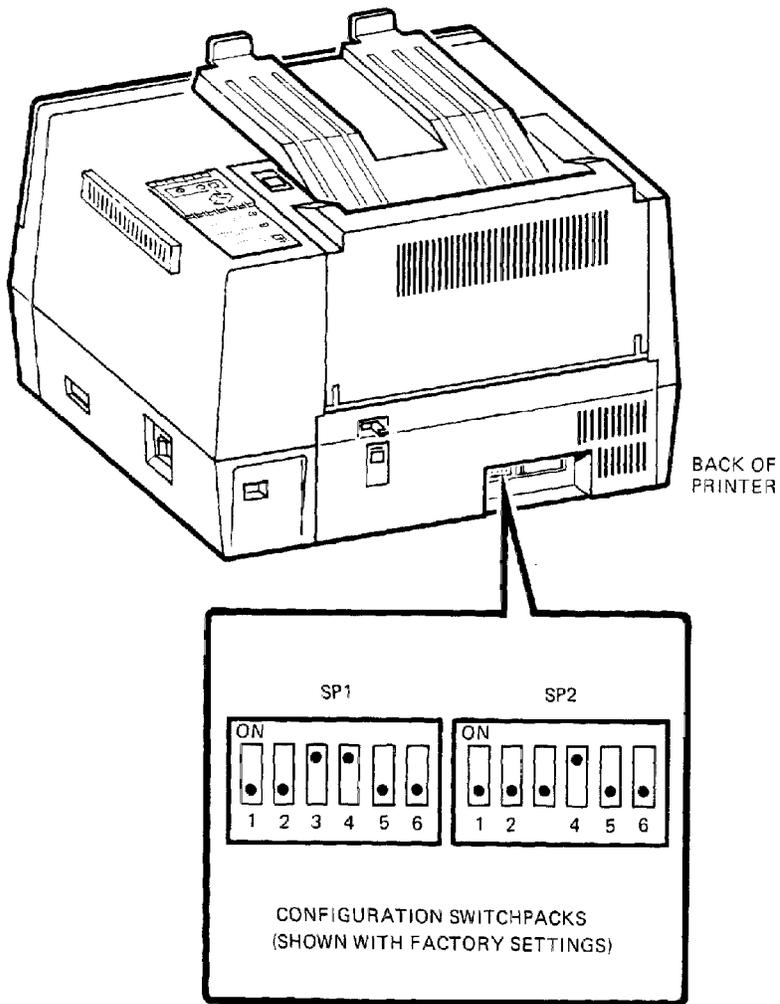
4.3.2 LN03 Laser Printer Specifications

The LN03 Laser Printer specifications are listed next.

Power Requirements

Voltage	120 Vac (85 to 132 Vac)
	240 Vac (187 to 264 Vac)
Frequency	50/60 Hz
Power cord	3.0 m (10.0 ft) detachable
Power requirement	1 kVA maximum
Power consumption	120 Vac, 950 W maximum
	240 Vac, 850 W maximum
Heat dissipation	120 Vac, 3240 Btu/h
	240 Vac, 2900 Btu/h

Operating Environment

Temperature range	10° C to 32° C (50° F to 90° F)
Relative humidity	20% to 80%

Physical Characteristics

Height	38.1 cm (15.0 in, with exit tray)
Width	53.4 cm (21.0 in)
Depth	59.7 cm (23.0 in, with tray)
Weight	35 kg (77.0 lb)

Index