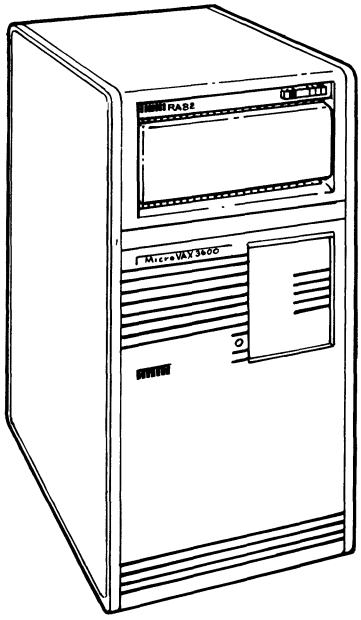
MicroVAX 3600
VAXserver 3600/3602
Technical Information

Order Number EK–035AB–IS–002



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Preface

This manual summarizes technical information about MicroVAX 3600 and VAXserver 3600/3602 systems. The manual is organized as follows:

- Chapter 1 describes the base system specifications, including the CPU module and associated memory options.
- Chapter 2 describes specifications for optional components available for MicroVAX 3600 and VAXserver 3600/3602 systems.
- Chapter 3 contains information on expanding your system.

Conventions

The following convention is used in this book:

Convention	Meaning
Key	A symbol denoting a terminal key used in text and examples in this book. For example, Break indicates that you press the Break key on your terminal keypad. Return indicates that you press the Return key on your terminal keypad.

Chapter 1
Base System Specifications

All MicroVAX/VAXserver 3600 base system components reside in a BA213 enclosure, with a 12-slot backplane. The base system includes a central processor unit (CPU) module, and one to four MS650 memory modules. The CPU module resides in slot 1 of the backplane. Memory modules can reside in slots 2 through 5.

1.1 Base System Operation

Base system operation includes the KA650 firmware and the controls on the CPU cover panel.

1.1.1 KA650 Firmware

Two read-only memory (ROM) chips on the KA650 module contain firmware. The firmware contains three major programs:

- A console program
- A set of self-tests for the CPU and memory
- A primary bootstrap program (VMB)

The console program receives control whenever the processor halts. For the KA650 CPU, a halt means only that processor control has passed to the console program, not that instruction execution stops. The standard VAX console functionality is emulated by executing a program in ROM, rather than by CPU microcode or a separate console processor.

Control passes to the firmware under any of the following conditions:

- The system is powered up
- The Reset button is pressed
- The Q22-bus BHALT signal is asserted (by pressing in the Halt button or by pressing the Break key when the Break Enable/Disable switch is set to enable)
- Halt button on the front control panel is pressed

- A HALT instruction is executed
- A system error occurs

At power-up, the system enters one of three power-up modes that are set using the Power-Up Mode switch on the CPU cover panel. (The modes and their meanings are described later in this chapter.) The console program then determines the console device type and console language.

The console program then runs the self-tests for the CPU and memory. The message

```
Performing normal system tests
```

is displayed on the terminal. As the tests progress, a series of numbers displays on the console terminal. *MicroVAX 3600 VAXserver 3600/3602 Operation* describes the power-on sequence and shows examples of successful power-on operations. *MicroVAX Troubleshooting and Diagnostics* describes possible problems that can occur during power-on.

If the self-tests are successful, the system does one of two things, depending on whether the Break Enable/Disable switch on the CPU cover panel is set to disable or enable.

If the Break Enable/Disable switch is set to disable, the CPU tries to load and start (bootstrap) an operating system. It locates a 128-Kbyte segment of system memory and copies a primary bootstrap program, called VMB, from the ROM chip into the base address plus 512. The CPU then begins executing VMB, which attempts to bootstrap an operating system from one of the devices listed in Table 1–1, in the order shown.

Table 1–1: Console Program Boot Sequence

Controller Type	Controller	Device Name
MSCP (Disk)	KDA50	DJmn[1](removable disks)
		DUmn (fixed disks)
MSCP (Tape)	TQK70	MUmn
PROM	MRV11	PRAn
Ethernet adapter	DELQA	XQmn

[1]m = MSCP controller designator (A = first, B = second, etc.) n = unit number

When VMB determines that a controller is present, it searches in order of increasing unit number for a bootable unit with a removable volume, then proceeds to the next controller. If it finds none, it will repeat the search for a nonremovable volume.

If break is enabled, the console program enters console I/O mode in response to any halt condition except the HALT instruction, including system power-up. Console I/O mode allows you to control the system by typing commands at the console terminal.

You can direct the system to boot a specific device when in console I/O mode. Use the BOOT command, followed by the device name as listed in Table 1–1. For example, to boot from the TK70 tape drive, issue the command: BOOT MUA0.

1.1.2 CPU Cover Panel Operation

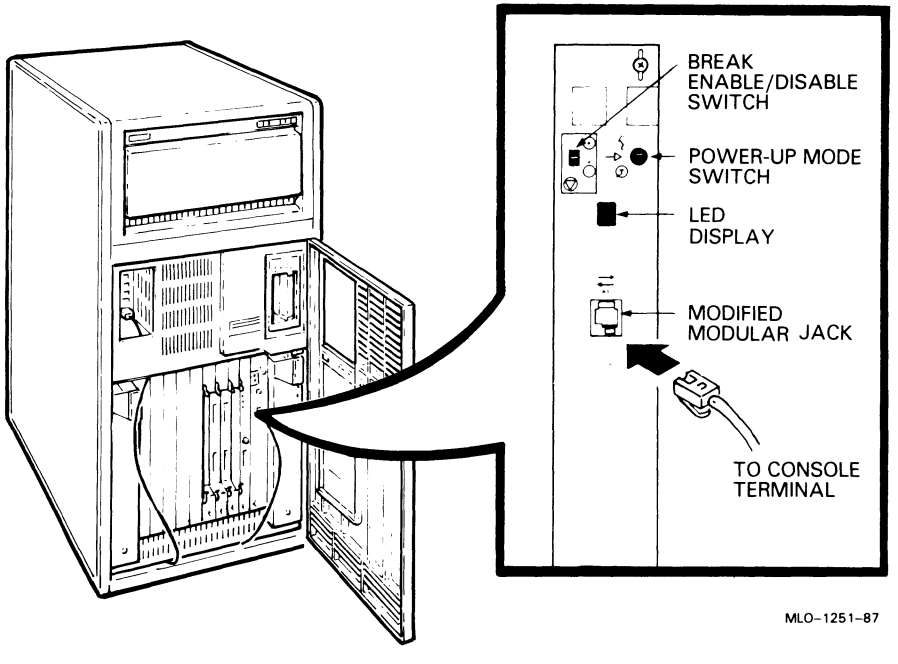
The outside of the CPU cover panel contains the following components, as shown in Figure 1–1.

- Break Enable/Disable switch
- Power-Up Mode switch
- LED display
- Modified modular jack for the console terminal serial line unit (SLU)

The inside of the cover panel (shown in Figure 1–2) contains:

- Baud rate switch (discussed in the next section)
- Battery backup unit (BBU) for the time-of-year clock and language selection (see Section 1.1.2.4)

Figure 1–1: CPU Cover Panel



1.1.2.1 Switches

The three switches on the CPU panel are the Break Enable/Disable switch, the Power-Up Mode switch, and the Baud Rate switch. The operation of these switches is discussed on the following pages.

Break Enable/Disable Switch (2-position slider)

Switch Position	Function
Dot outside circle (down) 	Break disable (factory setting). With the switch in this position, pressing the Break key on the console terminal has no effect on the system. On power-up or after a reset, the system attempts to load software from one of the boot devices at the completion of self-tests.
Dot inside circle (up) 	Break enable. With the switch in this position, pressing the Break key on the console terminal halts the CPU. On power-up or after a reset, the system enters console I/O mode at the completion of self-tests.

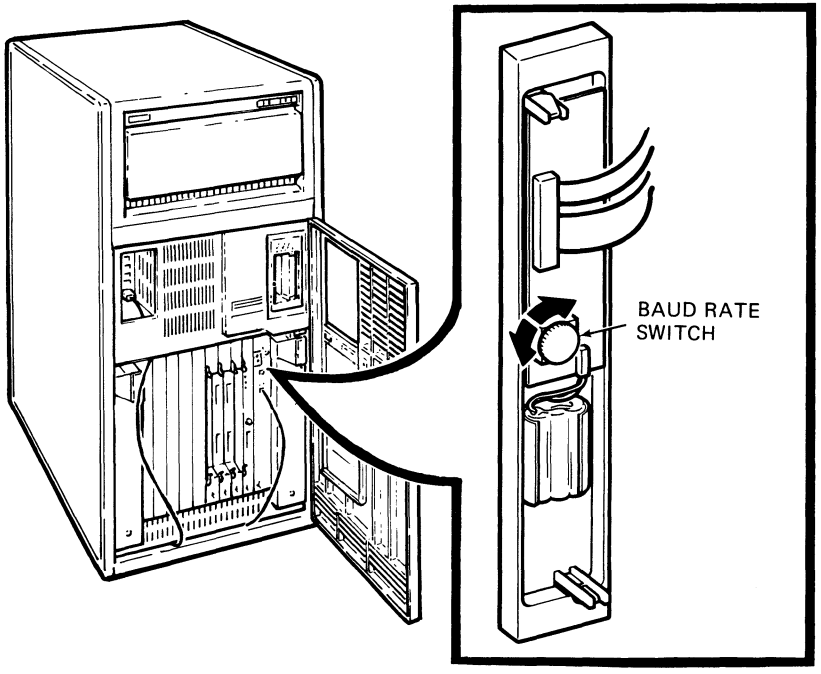
Power-Up Mode Switch (3-position rotary)

Switch Position	Mode
Human profile 	Language inquiry. If the console terminal supports Multinational Character Sets (MCS), the user is prompted for language on every power-up and after a reset. Full start-up diagnostics are run.
Arrow 	Run (factory setting). If the console terminal supports Multinational Character Sets (MCS), the user is prompted for language on power-up and after a reset only if the battery backup has failed. Full start-up diagnostics are run.
T in a circle 	Test. ROM programs run wraparound serial line unit (SLU) tests. A loopback connector is required.

Baud Rate Switch (8-position rotary)

The baud rate switch is located on the inside of the cover panel, as shown in Figure 1–2. Use the following seven-step procedure to remove the CPU cover panel and change the baud rate.

Figure 1–2: Changing the Baud Rate



1. After turning off the system, open the front door of the cabinet.
2. Using a Phillips-head screwdriver, push in and turn counterclockwise the quarter-turn screws at the top and bottom of the CPU cover panel until the screws pop free.
3. Place one hand at the top of the panel, and carefully pull out the bottom of the panel with the other hand.
4. When you can grasp the side of the panel, carefully pull out the top of the panel. Because cables connect the cover panel to the CPU module, you cannot pull the panel very far from the module.
5. Carefully turn the panel to the left to expose the baud rate switch. A number from 0 to 7 is visible. See Table 1–2 to determine the correct switch setting for the baud rate you want.

Table 1–2: Baud Rates

Setting	Baud Rate
0	300
1	600
2	1200
3	2400
4	4800
5	9600[1]
6	19200
7	38400

[1]Factory setting

6. Replace the cover panel by pressing the bottom of the panel back in position. While firmly holding the bottom in place with one hand, gently push the top until it locks into position.
7. Push in and turn clockwise the quarter-turn screws at the top and bottom of the cover panel until the screws are tight.

You can now turn on the system and the new baud rate will be in effect.

1.1.2.2 LED Display

The red LED display on the CPU cover panel displays a numerical sequence (in hexadecimal numbers) as the system runs its self-test diagnostics and bootstrap routine. The sequence begins with F (15 in decimal) and ends with 3, if the processor enters console I/O mode (breaks enabled); and ends with 0, if the processor has successfully booted (breaks disabled). Simultaneously, a countdown appears on the console terminal. See *MicroVAX 3600 VAXserver 3600/3602 Operation* for examples of successful power-on sequences, and *MicroVAX Troubleshooting and Diagnostics* for examples of problems you may encounter during power-on.

1.1.2.3 Connectors

The console cable is connected to the CPU cover panel through a modified modular jack (MMJ). An internal cable connects the MMJ to the CPU module. A second internal cable connects the switches and LED display to the CPU module.

1.1.2.4 Battery Backup Unit (BBU)

A battery backup unit (BBU), located on the inside of the CPU cover panel, stores the correct time-of-year and language selection when power to the system is turned off. Both the time-of-year and language selection code are lost if the BBU fails. The BBU provides power for up to seven days if the system power is turned off.

1.2 Base System Specifications

The base system includes the KA650–AA/BA processor and one to four MS650 memory modules.

1.2.1 KA650–AA/BA Processor Specifications

The KA650–AA is used in MicroVAX 3600 systems. The KA650–BA is used in VAXserver 3600/3602 systems.

Central Processor	
Clock rate	22 MHz
Data path width	32 bits
Number of data types	Hardware: 9
	Software emulated: 7
Number of instructions	Hardware: 272
	Software emulated: 32
General purpose registers	16 (32-bit wide)
Addressing modes	General register: 8
	Program counter: 4
	Index: 9
PDP–11 compatibility mode	Emulated in software
Time bases	Time-of-year clock: 1 (battery backed up)
	Interval timer: 1 (10 milliseconds)
	Programmable timers: 2
I/O bus interface	One Q22-bus interface with 8096 entry map

Central Processor	
Backplane termination	240 ohms

Memory Management and Control	
Page size	512 bytes
Virtual address space	4 gigabytes
Physical memory space	64 Mbytes
Number of memory modules	4 maximum

Performance	
Instruction prefetch buffer size	12 bytes
First level cache	
Size	1 Kbyte
Speed	90 nanoseconds
Associativity	2-way set
Second level cache	
Size	64 Kbytes
Speed	180 nanoseconds
Associativity	Direct mapped
Translation buffer	
Size	28-entry
Associativity	Fully associative
Q22-bus address translation map cache	
Size	16-entry
Associativity	Fully associative
I/O bus buffer size	
Input	32 bytes
Output	4 bytes

Performance	
Maximum I/O bandwidth	
Block mode DMA read	2.4 Mbytes/second
Block mode DMA write	3.3 Mbytes/second

Console Serial Line	
Interface standards	EIA RS-423-A/CCITT V.10 X.26
	EIA RS-232-C/CCITT V.28
	DEC 423
Data format	1 start bit, 8 data bits, 0 parity bits, 1 stop bit
Baud rates	300, 600, 1200, 2400, 4800, 9600, 19200, 38400

Ordering Information	
	Included as part of base system

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 6.0 A
	+12 Vdc, 0.14 A
Power consumption	31.68 W
Bus loads	3.5 ac
	1.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX-32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11
Self-tests	Yes

Related Documentation	
EK–KA650–UG	KA650 CPU Module User's Guide

1.2.2 MS650 Memory Options

One MS650 memory option is available for MicroVAX and VAXserver systems. Up to four MS650 modules can be used in MicroVAX and VAXserver systems. The MS650 modules interface with the KA650–AA/BA CPU through the MS650 local memory interconnect, made up of the CD rows of slots 1 through 5 of the backplane and a 50-pin cable.

1.2.2.1 MS650–AA

The MS650–AA memory option is an 8-Mbyte, 39-bit wide array (32-bit data and 7 error correction code (ECC) bits) implemented with 256-Kbyte dynamic RAMs in zigzag in-line packages (ZIPs).

Performance	
Synchronous longword read	450 nanoseconds
Synchronous unmasked longword write	180 nanoseconds
Synchronous masked longword write	540 nanoseconds
Synchronous quadword read	720 nanoseconds

Ordering Information	
MS650–AF	8-Mbyte field-installed kit[1]

Configuration Information	
Form factor	Quad height

[1] 50-pin CPU memory interconnect cable included.

Configuration Information	
Power requirements	+5 Vdc, 2.7 A
	+12 Vdc, 0.0 A
Power consumption	13.5 W
Bus loads	0.0 ac
	0.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Tested by KA650 self-test

Chapter 2
Option Specifications

This chapter describes the options currently available for MicroVAX 3600 and VAXserver 3600/3602 systems. Some of the options described are already installed. If you want to add other options to your system, your DIGITAL sales representative can advise you. Chapter 3 offers some guidelines on determining what options you can add to your system.

Options must be properly configured so that the system recognizes them. Each option in a system has a device address, commonly referred to as a Control and Status Register (CSR) address, and an interrupt vector that must be set when the option is installed. Options are usually configured by adjusting switches or jumpers on the modules. DIGITAL service representatives configure the option properly when they install the option in your system.

Self-maintenance customers can find information on setting CSR addresses and interrupt vectors in the *MicroVAX 3500 and 3600 Systems Maintenance Update*.

Descriptions of options in this chapter are grouped as follows:

- Mass storage options
- Communications options
- Real-time options
- Printer options

Descriptions of options include the following, where applicable:

- Functional information
- Ordering information
- Performance
- Configuration information
- Operating system support
- Diagnostic support
- Related documentation

2.1 Mass Storage Options

MicroVAX/VAXserver systems have the following mass storage options:

- RA-series disk drives
- TK70 tape drive
- TU81–Plus tape drive (in auxiliary cabinet only)
- TS05 tape drive (in auxiliary cabinet only)

Each drive has a controller that directs its activity.

2.1.1 Disk Drives and Controllers

Several RA-series disk drives are available for MicroVAX/VAXserver 3600 systems. Up to four RA-series drives are supported by the KDA50 controller.

2.1.1.1 KDA50 Controller

The KDA50 is a two-module intelligent controller, used to interface up to four SDI-compatible mass storage devices to the Q22-bus.

Functional Information	
Controller protocol	MSCP
Bad block replacement	Software dependent
Supported drives	RA60, RA70, RA81, RA82
Drives per controller	4
Controllers per system	1 maximum
Drive interconnect	Transformer coupled radial

Ordering Information	
KDA50–SF	KDA50 controller kit

Performance	
Read/Write data transfers	Up to 16-byte block mode DMA
Data buffering	32 Kbytes
Command buffering	20

Configuration Information	
Form factor	Two quad height
Power requirements	+5 Vdc, 13.5 A (typical)
	+12 Vdc, 0.03 A (typical)
Power consumption	67.86 W
Bus loads	3.0 ac
	0.5 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–KDA5Q–UG	KDA50–Q User's Guide

2.1.1.2 RA60 Disk Drive

The RA60 disk drive is a high-capacity removable disk drive providing 205 Mbytes of formatted storage space.

Ordering Information	
RA60–AF	RA60 disk drive and cables
BC26–V6	Interconnect cable with connector block

Storage Capacity	
User capacity	205 Mbytes
User capacity (blocks)	400,176

Performance	
Average seek time	41.67 milliseconds
Average rotational latency	8.33 milliseconds
Average access time	50.30 milliseconds
Peak transfer rate	15.84 Mbits/second

Physical Specifications	
Height	26.52 cm (10.44 in)
Width	48.26 cm (19 in)
Depth	85.09 cm (33.75 in)
Weight	68.95 kg (152 lb)

Configuration Information	
Form factor	10.5-in high, full rack width

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–ORA60–SV	RA60 Disk Drive Service Manual
EK–ORA60–UG	RA60 Disk Drive User's Guide

2.1.1.3 RA70 Disk Drive

The RA70 is an SDI-compatible fixed-disk drive with a formatted capacity of 280 Mbytes.

Ordering Information	
RA70–AF	RA70 drive kit

Performance	
Average seek time	19.50 milliseconds
Average rotational latency	7.5 milliseconds
Average access time	27.0 milliseconds
Peak transfer rate	11.61 Mbits/second

Storage capacity	
User capacity	280 Mbytes
User capacity (blocks)	547,041

Physical Specifications	
Width	14.60 cm (5.75 in)
Depth	20.45 cm (8.25 in)
Height	8.87 cm (3.49 in)
Weight	4.72 kg (10.4 lb)

Configuration Information	
Form factor	Standard 5.25-in footprint
Power requirements	+5 Vdc, 3.8 A
	+12 Vdc, 4.2 A
Power consumption	69.4 W

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–ORA70–SM	RA70 Drive Service Manual

2.1.1.4 RA81 Disk Drive

The RA81 disk drive is a high-capacity fixed-disk drive providing 456 Mbytes of formatted storage space.

Ordering Information	
RA81–HA	RA81 disk drive (120 V)
RA81–HD	RA81 disk drive (240 V)
BC26V–6	Interconnect cable with connector block

Storage Capacity	
User capacity	456 Mbytes
User capacity (blocks)	891,070

Physical Specifications	
Width	44.5 cm (17.5 in)
Depth	67.3 cm (26.5 in)
Height	26.3 cm (10.38 in)
Weight	61.2 kg (135 lb)

Performance	
Average seek time	28.00 milliseconds
Average rotational latency	8.32 milliseconds
Average access time	36.30 milliseconds
Peak transfer rate	17.4 Mbits/second

Configuration Information	
Form factor	10.5-in high, full rack width

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK-ORA81-SV	RA81 Disk Drive Service Guide
EK-ORA81-UG	RA81 Disk Drive User's Guide

2.1.1.5 RA82 Disk Drive

The RA82 disk drive is a high-capacity fixed-disk drive providing 623 Mbytes of formatted storage space.

Ordering Information	
RA82-HA	RA82 disk drive (120 V)
RA82-HD	RA82 disk drive (240 V)
BC26V-6	Interconnect cable with connector block

Storage Capacity	
User capacity	622,929,920 bytes
User capacity (blocks)	1,216,660

Physical Specifications	
Width	44.5 cm (17.5 in)
Depth	67.3 cm (26.5 in)
Height	26.3 cm (10.38 in)
Weight	61.2 kg (135 lb)

Performance	
Average seek time	24.00 milliseconds
Average rotational latency	8.33 milliseconds
Average access time	32.33 milliseconds
Peak transfer rate	19.2 Mbits/second

Configuration Information	
Form factor	10.5-in high, full rack width
Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later
Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes
Related Documentation	
EK–ORA82–SV	RA82 Disk Drive Service Guide
EK–ORA82–UG	RA82 Disk Drive User's Guide

2.1.2 Tape Drives and Controllers

MicroVAX/VAXserver 3600 systems support the following tape drives (and their controllers):

- TU81–Plus
- TS05
- TK70

2.1.2.1 KLESI Controller

The KLESI–SA controller is used to interface the TU81–Plus tape drive.

Functional Information	
Controller protocol	TMSCP
Supported drive	TU81–Plus
Drives per adapter	1
Drive interconnect	Direct
Controllers per system	1 maximum

Ordering Information	
M7740	KLESI controller module

Configuration Information	
Form factor	Dual
Power requirements	+5 Vdc, 3.0 A (typical)
	+12 Vdc, 0.0 A (typical)
Power consumption	15.0 W
Bus loads	2.3 ac
	1.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	No

Related Documentation	
EK–LESIB–UG	KLESI–B Module User's and Installation Guide

2.1.2.2 TU81–Plus Tape Drive

The TU81–Plus tape drive is a reel-to-reel tape drive mounted in a 40-inch cabinet. The drive supports two industry-standard recording methods: group coded recording (GCR) and phase encoded (PE).

Functional Specifications	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 731 m (2400 ft) long
Mode of operation	Streaming
Recording methods	Group Code Recording (GCR)
	Phase Encoded (PE)
Recording density	6,250 bits/in (GCR)
	1,600 bits/in (PE)
Number of tracks	9

Storage Capacity	
PE unformatted	45.3 Mbytes
PE formatted	40.0 Mbytes
GCR unformatted	177 Mbytes
GCR formatted	140 Mbytes

Ordering Information	
TU81E-DA	TU81-Plus tape drive, KLESI controller for 120 V
TU81E-DB	TU81-Plus tape drive, KLESI controller for 240 V

Performance	
Handling	Bidirectional reel-to-reel
Tape velocity	
High speed	190.5 cm/second (75 in/second)
Low speed	63.5 cm/second (25 in/second)
Channel data transfer rate	
PE high speed	120 Kbytes/second
PE low speed	40 Kbytes/second
GCR high speed	469 Kbytes/second
GCR low speed	156 Kbytes/second
Rewind time (731.5 m (2400 ft) tape on 26.7 cm (10.5 in) reel)	2.75 minutes maximum

Physical Specifications	
Height	105.8 cm (41.7 in)
Width	54.6 cm (21.5 in)
Depth	76.2 cm (30.0 in)
Weight	139 kg (295 lb)

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–TU81E–UG	TU81–Plus Tape Subsystem User's Guide

2.1.2.3 TSV05 Tape Drive Controller

The TSV05 tape drive controller is used to interface the TS05 tape drive.

Functional Information	
Controller protocol	Controller unique
Supported drive	TS05
Drives per controller	1
Drive interconnect	Direct

Ordering Information	
TSV05–SB	TSV05 tape drive subsystem

Performance	
Buffer size	3.5 Kbytes

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 6.5 A (typical)
	+12 Vdc, 0.0 A (typical)
Power consumption	32.5 W
Bus loads	3.0 ac
	1.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	None

Related Documentation	
EK–TSV05–UG	TSV05 Tape Transport System User's Guide

2.1.2.4 TS05 Tape Drive

The TS05 is a one-half-inch reel-to-reel streaming tape drive. The drive has a maximum capacity of 40 Mbytes, using the industry-standard PE format.

Functional Information	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 731 m (2400 ft) long
Mode of operation	Streaming
Recording method	Phase Encoded (PE)
Recording density	1600 bits/in
Number of tracks	9
Storage capacity	40 Mbytes formatted

Ordering Information	
TSV05–SB	TSV05 tape drive subsystem

Performance	
Handling	Bidirectional reel-to-reel with compliance arm
Tape velocity	64 or 254 cm/second (25 or 100 in/second)
Maximum data transfer rate	40 or 160 Kbytes/second
Rewind time (731 m (2400 ft) tape on 26.7 cm (10.5 in) reel)	2.8 minutes

Physical Specifications	
Height	22.2 cm (8.75 in)
Width	43 cm (17 in)
Depth	62 cm (24.5 in)
Weight	36 kg (80 lb)

Configuration Information	
Form factor	10.5-in high, full rack width

Operating System Support	
VMS	Version 4.7A and later

Operating System Support	
ULTRIX–32	Version 2.2 and later
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–TSV05–UG	TSV05 Tape Transport System User's Guide
EK–TSV05–TM	TSV05 Tape Transport Subsystem Technical Manual

2.1.2.5 TQK70 Controller

The TQK70 controller module provides the interface between the TK70 tape drive and the Q22-bus.

Functional Information	
Controller protocol	TMSCP
Supported drive	TK70
Drives per controller	1
Drive interconnect	Direct
Controllers per system	1 maximum

Ordering Information	
	Included as part of base system

Performance	
Data throughput rate	125 Kbytes/second
Read/Write data transfers	Up to 16-word burst mode DMA, truncated to 8-word burst mode if another device is requesting the bus
Buffer size	64 Kbytes

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 3.0 A
	+12 Vdc, 0.0 A
Power consumption	15.0 W
Bus loads	4.3 ac
	0.5 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

2.1.2.6 TK70 Tape Drive

The TK70 is a streaming tape drive subsystem that can store up to 296 Mbytes on a tape cartridge for backup data storage. The TK70 can read data from cartridges recorded on a TK50 drive, but cannot write data to cartridges recorded on a TK50 drive.

Functional Information	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 182.9 m (600 ft) long
Mode of operation	Streaming
Recording method	Serpentine
Recording density	10,000 bits/in
Number of tracks	48
Storage capacity	296 Mbytes formatted

Ordering Information	
	Included as part of base system

Physical Specifications	
Height	8.25 cm (3.25 in)
Width	14.60 cm (5.70 in)
Depth	21.44 cm (8.44 in)
Weight	2.27 kg (5.0 lb)

Performance	
Tape start time	325 milliseconds maximum
Tape stop time	200 milliseconds maximum
Tape speed	390 cm/second (100 in/second)
Streaming data rate	125 Kbytes/second
Access time (from insertion of tape)	
TK50 mode (read-only)	35 minutes maximum
TK70 mode	60 minutes maximum

Configuration Information	
Form factor	Standard 5.25-in footprint
Power requirements	+5 Vdc, 1.3 A
	+12 Vdc, 2.4 A
Power consumption	35.3 W
Bus loads	0.0 ac
	0.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–OTK70–OM	TK70 Tape Drive Subsystem Owner's Manual
EK–OTK70–TM	TK70 Tape Drive Subsystem Technical Manual
EK–OTK70–SM	TK70 Tape Drive Subsystem Service Manual

2.2 Communications Options

Communications options supported by MicroVAX/VAXserver systems include several asynchronous serial controllers, a synchronous serial controller, and a network controller.

2.2.1 Asynchronous Serial Controllers

Asynchronous serial controllers provide low-speed connections between peripheral devices and the system. Asynchronous communications between the system and the peripheral depends on recognition of a pattern of start and stop bits, not on a time interval.

2.2.1.1 CXA16 Asynchronous Multiplexer (16 lines)

The CXA16 is an intelligent, preprogrammed, serial controller that can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The module contains 16 multiplexed lines.

Functional Information	
Supported line interfaces	EIA RS-423-A/CCITT V.10 EIA RS-232-D/CCITT V.28 DEC 423
Split speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 1 stop bit • 5 data bits, 0 or 1 parity bit, and 1.5 stop bits • 6, 7, or 8 data bits, 0 or 1 parity bit, and 2 stop bits Parity, if enabled, can be either odd or even.
Modem control	None

Ordering Information

CXA16-AF	CXA16 field-installed kit. Includes two 7.6-m (25-ft) BC16D-25 cables, two H3104 cable concentrators, and other accessories required to install the option. • BC16D-25 cable—data only, 36-conductor, terminated with 36-pin Amphenol male connectors • H3104 cable concentrator—concentrates eight BC16E cables into one BC16D cable; eight modified modular jacks and one 36-pin Amphenol female connector
BC16E series cable	Office cable—data only, 6-conductor, terminated with modified modular plugs • BC16E-10: 3 m (10 ft) • BC16E-25: 7.6 m (25 ft) • BC16E-50: 15.2 m (50 ft)
H8572	Cable extender. Null modem cable terminated with modified modular jacks.
H8571-A	25-pin passive adapter[1]
H8571-B	9-pin passive adapter[1]
H3105	Active adapter. Converts EIA RS-232-D signals to DEC 423 signals.

Performance

Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode. Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode.

[1] Converts a D-connector to a modified modular jack. Required for connecting terminals and printers to office cables terminated with modified modular plugs.

Performance	
Receive data transfers	Single-character programmed transfers in both DHV11 and DHU11 modes.
Transmit buffer size	One character for programmed transfers in DHV11 mode
	64-character FIFO for programmed transfers in DHU11 mode
	64-character FIFO for DMA transfers in DHU11 and DHV11 modes
Receive buffer size	256-character FIFO in DHV11 and DHU11 modes
Supported baud rates	16 programmable baud rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200, 38400[2]
Throughput at maximum baud rate:	
5 data bits, 0 parity bits, 1 stop bit	140,000 characters/second (all lines)
7 data bits, 1 parity bit, 1 stop bit	110,000 characters/second (all lines)

Configuration Information	
Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.4 A (typical)
	+12 Vdc, 0.14 A (typical)
Power consumption	8.7 W
Bus loads	3.0 ac
	1.5 dc
Module connectors	2 female, 36-pin Amphenol connectors

[2] 38400 baud rate is not supported by DIGITAL operating systems.

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–CAB16–UG	CXA16/CXB16 User's Guide
EK–CAB16–TM	CXA16/CXB16 Technical Manual

2.2.1.2 CXB16 Asynchronous Multiplexer (16 lines)

The CXB16 is an intelligent, preprogrammed, serial controller that can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The module contains 16 multiplexed lines.

Functional Information	
Supported line interfaces	EIA RS–422–A/CCITT V.11 X.27
Split speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bits, and 1 stop bit • 5 data bits, 0 or 1 parity bits, and 1.5 stop bits • 6, 7, or 8 data bits, 0 or 1 parity bits, and 2 stop bits Parity, if enabled, can be either odd or even.

Functional Information

Modem control	None

Ordering Information

CXB16–AF	Module and cable kit. Includes two 7.6-m (25-ft) BC16D–25 cables, two H3104 cable concentrators, and other accessories required to install the option. • BC16D–25 cable—data only, 36 conductor, terminated with 36-pin Amphenol male connectors • H3104 cable concentrator—concentrates eight BC16E cables into one BC16D cable; eight modified modular jacks and one 36-pin Amphenol female connector
BC16E series cable	Office cable—data only, 6-conductor, terminated with modified modular plugs • BC16E–10: 3 m (10 ft) • BC16E–25: 7.6 m (25 ft) • BC16E–50: 15.2 m (50 ft)
H8572	Cable extender. Null modem cable terminated with modified modular jacks.

Performance

Transmit data transfers	Single character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode. Single character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode.
Receive data transfers	Single character programmed transfers in both DHV11 and DHU11 modes.

Performance	
Transmit buffer size	One character for programmed transfers in DHV11 mode
	64-character FIFO for programmed transfers in DHU11 mode
	64-character FIFO for DMA transfers in DHU11 and DHV11 modes
Receive buffer size	256-character FIFO in DHV11 and DHU11 modes
Supported baud rates	16 programmable baud rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200, 38400[1]
Throughput at maximum baud rate:	
5 data bits, 0 parity bits, 1 stop bit	140,000 characters/second (all lines)
7 data bits, 1 parity bit, 1 stop bit	110,000 characters/second (all lines)

Configuration Information	
Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.4 A (typical)
	+12 Vdc, 0.14 A (typical)
Power consumption	8.7 W
Bus loads	3.0 ac
	1.5 dc
Module connectors	2 female, 36-pin Amphenol connectors

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

[1] 38400 baud rate is not supported by DIGITAL operating systems.

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–CAB16–UG	CXA16/CXB16 User's Guide
EK–CAB16–TM	CXA16/CXB16 Technical Manual

2.2.1.3 CXY08 Asynchronous Multiplexer (8 lines)

The CXY08 can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The CXY08 supports full modem control.

Functional Information	
Supported line interfaces	EIA RS–423–A/CCITT V.10 EIA RS–232–D/CCITT V.28 DEC 423
Split speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 1 stop bit • 5 data bits, 0 or 1 parity bit, 1.5 stop bits • 6, 7, or 8 data bits, 0 or 1 parity bit, and 2 stop bits Parity, if enabled, can be either odd or even.
Modem control	Full
Supported modems	Bell models 103, 113, 212

Ordering Information	
CXY08-AF	CXY08 field-installed kit. Includes two 3.7-m (12-ft) BC19N-12 cable assemblies and other accessories required to install the option. • BC19N-12 cable assembly—concentrates four 11-conductor cables with 25-pin male D-connectors into one 44-connector cable terminated by a 50-pin male CHAMP connector.

Performance	
Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode. Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode.
Receive data transfers	Single-character programmed transfers in both DHV11 and DHU11 modes.
Transmit buffer size	One character for programmed transfers in DHV11 mode 64-character FIFO for programmed transfers in DHU11 mode 64-character FIFO for DMA transfers in DHU11 and DHV11 modes
Receive buffer size	256-character FIFO in DHV11 and DHU11 modes
Supported baud rates	16 programmable baud rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200, 38400[1]

[1] 38400 baud rate is not supported by DIGITAL operating systems.

Performance

Throughput at maximum baud rate:

5 data bits, 0 parity bits, 1 stop bit	87,771 characters/second (all lines)
7 data bits, 1 parity bit, 1 stop bit	61,440 characters/second (all lines)

Configuration Information

Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.3 A (typical)
	+12 Vdc, 0.14 A (typical)
Power consumption	8.2 W
Bus loads	1.5 ac
	1.0 dc
Module connectors	2 female, 50-pin CHAMP connectors

Operating System Support

VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation

EK–CXY08–UG	CXY08 User's Guide
EK–CXY08–TM	CXY08 Technical Manual

2.2.1.4 DFA01 Asynchronous Controller with Integral Modem

The DFA01 is an asynchronous serial controller that emulates the DZQ11. It has two lines, each with a DF224-compatible integral modem.

Functional Information	
Supported modulation protocols	Bell 103J Bell 212A CCITT V.22 CCITT V.22–BIS
Split speed operation	Both lines
Flow control (XON/XOFF)	No
Supported data formats	8 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 1 stop bit • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 2 stop bits
Modem control	Full

Ordering Information	
DFA01–AF	DFA01 field-installed kit

Performance	
Transmit data transfers	Single-character programmed transfers
Receive data transfers	Single-character programmed transfers
Transmit buffer size	One character for programmed transfers
Receive buffer size	64-character FIFO
Supported baud rates	8 programmable baud rates: 50, 75, 110, 134.5, 150, 300, 1200, 2400[1]
Throughput at maximum baud rate	1200 bytes/second

[1]The serial line is capable of baud rates up to 9600 baud. However, because the modem is restricted to speeds of 0–300, 1200, and 2400 baud, all other baud rates are considered illegal and pass meaningless data.

Configuration Information	
Form factor	Quad height with integral, flush cover panel
Power requirements	+5 Vdc, 1.97 A
	+12 Vdc, 0.40 A
Power consumption	14.65 W
Bus loads	3.0 ac
	1.0 dc
Module connectors	4 TELCO: 2 modified modular jacks (MMJ) for data lines; 2 modular jacks (MJ) for voice lines

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Modem only

Related Documentation	
EK–DFA01–UG	DFA01 Modem User's Guide
EK–DFA01–IN	DFA01 Modem Installation Guide

2.2.1.5 DSRVB DECserver 200

The DECserver 200 is an 8-line terminal server used to connect terminals to a host computer on an Ethernet Local Area Network (LAN). Software for the server is downline-loaded from a host to the server. The server is available in two models: the modem control (MC) model has modem control and an RS–232–C line interface; the data leads (DL) model has no modem control and a DEC 423 (DECconnect) line interface.

Functional Information	
Supported line interfaces	RS–232–C (MC Model) DEC 423 (DL Model)
Modem control	Yes (MC Model) No (DL Model)
Protocols	Asynchronous
Supported terminal devices	VT, LN, LA, and LQ-series devices

Ordering Information (hardware only)[1]	
DSRVB–AA	8-line DECserver 200/MC, RS–232–C line interface, 120 V. Includes country kit.[2]
DSRVB–BA	8-line DECserver 200/DL, DEC 423 (DECconnect) line interface, 120 V. Includes country kit.
DSRVB–AB	8-line DECserver 200/MC, RS–232–C line interface, 240 V. Requires country kit.
DSRVB–BB	8-line DECserver 200/DL, DEC 423 (DECconnect) line interface, 240 V. Requires country kit.

Performance	
Maximum throughput	8 lines at 19.2 Kbytes/second

[1] You must order the software appropriate for your operating system and processor. See the *Networks and Communications Buyer's Guide*.

[2] Each country kit includes a power cord, hardware manual, and rack mounting brackets. See the *Networks and Communications Buyer's Guide* for available country kits.

Physical Specifications	
Height	11.75 cm (4.63 in)
Width	48.90 cm (19.25 in)
Depth	32.07 cm (12.63 in)
Weight	5.44 kg (12 lbs)

Operating System Support	
Downline-load host support	DECnet VAX or DECnet ULTRIX
Operational host support	VMS or ULTRIX

Related Documentation	
AA–HL77B–TK	DSRVB DECserver 200 User's Guide

2.2.2 Synchronous Serial Controllers

Synchronous serial controllers provide high-speed connections between systems. Communication between synchronous devices depends on time intervals that are synchronized before transmission of data begins.

2.2.2.1 DPV11

The DPV11 is a single-line programmable controller that provides local or remote interconnections between systems.

Functional Information	
Supported line interfaces	EIA RS-232-C/CCITT V.28
	EIA RS-423-A
	EIA RS-422-A
Supported protocols	Digital Data Communications Message Protocol (DDCMP)
	BISYNC
	SDLC
Operating mode	Full or half-duplex
Character size	Program selectable (5–8 bits with character-oriented protocols and 108 bits with bit-oriented protocols)
Modem support	Limited
Supported modems	All DIGITAL modems and the Bell 200 series

Ordering Information	
DPV11-SF	Field-installed kit

Performance	
Transmit/Receive data transfers	Single-byte programmed transfer
Transmit buffer size	2 bytes
Receive buffer size	2 bytes
Data rate	56 Kbits/second

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 1.2 A (typical)
	+12 Vdc, 0.15 A (typical)
Power consumption	7.8 W
Bus loads	1.0 ac
	1.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	None

Related Documentation	
EK–DPV11–UG	DPV11 Synchronous Interface User's Guide
EK–DPV11–TM	DPV11 Technical Manual

2.2.2.2 KMV1A Programmable Communications Controller

The KMV1A is a medium-speed, programmable data communications interface for Q-bus systems. The KMV1A can be programmed to operate in asynchronous or synchronous mode. The KMV1A was formerly known as the KMV11.

Functional Information	
Supported line interfaces	RS–232–C/CCITT V.28
	RS–422–A/CCITT V.11
	RS–423–A/CCITT V.10
Supported protocol	Synchronous (bit-oriented or byte-oriented)
Split speed	Yes
Modem support	Full

Ordering Information	
KMV1A–SF	KMV1A field-installed kit

Performance	
Transmit buffer size	1032 bytes
Supported baud rates	1200, 2400, 4800, 9600, 19200

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 2.6 A
	+12 Vdc, 0.2 A
Power consumption	15.4 W
Bus loads	3.0 ac
	1.0 dc
Module connectors	One 25-pin D-type (RS–232)
	One 37-pin D-type (RS–422)
	One 37-pin D-type (RS–423)

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Not supported as of Version 2.2
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later
Self-tests	Yes

Related Documentation	
EK–KMV1A–TM	KMV1A Programmable Communications Controller Technical Manual
EK–KMV1A–UG	KMV1A Programmable Communications Controller User's Guide

2.2.3 Network Controllers

Network controllers connect your system to an Ethernet network. With a network connection and appropriate DECnet software, you can use all network services.

2.2.3.1 DELQA Ethernet Controller

The DELQA network controller provides a high-speed synchronous connection between a Q-bus system and a local area network (LAN) based on Ethernet. The DELQA has all the functions of the DEQNA, plus Maintenance Operation Protocol (MOP) functions.

Functional Information	
Supported protocol	Ethernet
	MOP

Ordering Information	
DELQA–SF	DELQA field-installed kit
BNE3A–D	External cable

Performance	
Transmit/Receive data transfers	Up to 32-byte block mode DMA
Transmit data transfers	2-Kbyte FIFO for DMA transfers
Receive data transfers	4-Kbyte FIFO for DMA transfers
Throughput at maximum rate	10 Mbits/second

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 1.5 A
	+12 Vdc, 0.5 A
Power consumption	23.5 W
Bus loads	3.3 ac
	0.5 dc

Configuration Information	
Module connectors	One 10-pin D-type

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–DELQA–UG	DELQA Ethernet User's Guide

2.3 Real-Time Controllers

Real-time controllers interface devices that monitor processes, for example, laboratory equipment or manufacturing equipment. Real-time controllers are typically parallel devices that transmit more than one bit of information simultaneously.

2.3.1 DRQ3B Parallel Interface

The DRQ3B is a high-speed parallel interface that provides two independent 16-bit, unidirectional data channels.

Functional Information	
Two unidirectional channels	Each 512-word FIFO
Interrupt vectors	One for both DMA channels
	One for all other interrupts

Ordering Information	
DRQ3B–SF	Field-installed kit
Cables	Used to connect the DRQ3B to a user device or to another DRQ3B. Order two cables for each DRQ3B module. • BC19T–25: 7.6 m (25 ft) • BC19T–50: 15.2 m (50 ft)

Configuration Information	
Form factor	Quad height
Power requirements	+ 5 Vdc, 4.5 A
	+12 Vdc, 0.0 A
Power consumption	22.5 W
Bus loads	3.2 ac
	0.5 dc
Module connectors	Two 50-pin female IEEE connectors

Configuration Information	
I/O port data transceivers	Source 16 mA, sink 64 mA
Performance	
Throughput rates	Burst: 500 kilowords Block: 1.1 megawords Extended block mode: 1.1 megawords Height speed: 1.4 megawords
Operating System Support	
VMS	Version 5.0 or later
ULTRIX–32	None
VAXELN	Version 3.0 and later
Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later
Self-tests	Yes
Related Documentation	
EK–O47AA–UG	DRQ3B Parallel DMA Input/Output Module User's Guide

2.3.2 DRV1W Parallel Interface

The DRV1W is a general-purpose, parallel interface with one 16-bit input port and one 16-bit output port. The DRV1W supports DMA. The DRV1W–S is functionally equivalent to the DRV11–WA.

Functional Information

Number of lines	Total: 50
	16 data output lines
	16 data input lines
	3 user-definable input status lines
	3 user-definable output control lines
	8 input control lines
	4 output control lines
Line characteristics	
Input data lines	1 TTL unit load each
Input control lines	1 TTL unit load each
Output data lines	10 TTL unit loads each
Output control lines	10 TTL unit loads each
Logic levels	High = logic 1
	Low = logic 0

Ordering Information

DRV1W–SF	DRV1W field-installed kit

Performance

Transfer mode	Up to 2-byte programmed transfers
	Up to 8-byte burst mode DMA transfers and unlimited burst mode DMA transfers (unsupported)
Data transfer rate	Up to 250,000 16-bit words/second in single-cycle mode
	Up to 500,000 16-bit words/second in burst mode

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 1.8 A (typical)
	+12 Vdc, 0.0 A
Power consumption	9.0 W
Bus loads	2.0 ac
	1.0 dc
Module connectors	Two 40-pin connectors

Operating System Support	
VMS	Version 5.0 and later
ULTRIX–32	Not supported as of V2.2
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later

Related Documentation	
EK–DRVWA–UG	DRV11–WA General Purpose DMA User's Guide

2.3.3 IEQ11 Controller

The IEQ11 option is a DMA controller that interfaces a Q-bus system to two independent instrument buses (IEC/IEEE).

Functional Information	
Supported interfaces	IEEE–488–1978
	IEC 625–1
Supported interface functions	Automatic source handshake
	Automatic acceptor handshake
	Talker and extended talker (includes serial poll capability)
	Listener and extended listener
	Service request
	Remote local
	Parallel poll
	Device clear
	Device trigger
	Controller

Ordering Information	
IEQ11–SF	IEQ11 field-installed kit for IEC connection

Performance	
Transfer mode	Programmed I/O transfers with interrupt DMA data transfers
Data transfer rate	Up to 150 Kbytes/second during a DMA block transfer

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 3.5 A (typical)
	+12 Vdc, 0.0 A
Power consumption	17.5 W

Configuration Information	
Bus loads	2.0 ac
	1.0 dc
Module connectors	Standard 24-pin IEEE 488 connector (IEQAA-AC)
	Standard 25-pin IEC 625 connector (IEQ11-AD)

Operating System Support	
VMS	Version 5.0 and later
ULTRIX	Not supported as of Version 2.2
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later

Related Documentation	
EK-IEUQ1-UG	IEU11-A/IEQ11-A User's Guide

2.3.4 IBQ01 Controller

The IBQ01 is a DMA controller that interfaces a Q-bus system to RS-485 industrial control and measurement devices.

Functional Information	
Communication protocol	Modified SDLC
Supported functions	Single multidrop interconnect
	250 BITBUS compatible devices

Ordering Information	
IBQ01–SF	IBQ01 field-installed kit
Cables	User-supplied RS–485 BITBUS standard

Performance	
Transfer mode	Programmed I/O transfers with interrupt DMA data transfer
Data transfer rate	Up to 2.4 Mbits/second at BITBUS length of 30 m
	375 Kbits/second at BITBUS length of 300 m
	62.5 Kbits/second at BITBUS length of 13,200 m
Form factor	Quad height
Power requirements	+5 Vdc, 5.0 A
	+12 Vdc, 0.3 A
Power consumption	25.0 W
Bus loads	4.6 ac
	1.0 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX	Not supported as of Version 2.2
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	None
Self-tests	Yes

Related Documentation	
EK–IBQ01–UG	DECscan BITBUS Controller User's Guide

Related Documentation	
EK–IBQ01–IN	DECscan BITBUS Controller Installation Manual
EK–IBQ01–TM	DECscan BITBUS Controller Technical Manual
EK–JQ52A–TN	DECscan BITBUS Controller Software Installation

2.3.5 AAV11–S Digital-to-Analog Converter

The AAV11–S is a digital-to-analog converter with DMA capability. The AAV11–S is functionally equivalent to an AAV11–D.

Functional Information	
Circuits	2 D/A converter circuits
D/A input	12-bit digital input
Data notation	Binary input notation for unipolar output; offset binary or two's complement input notation for bipolar output.
D/A output	
Voltage	Output voltage range is jumper selectable: ±10 V, ±5 V, or 0 V to +10 V.
Control signals	4-bit digital output for control signals, such as CRT intensity, blank, unblank, and erase
Polarity	Unipolar or bipolar output

Ordering Information	
AAV11–SF	AAV11–S field-installed kit
UDIP–BA[1]	Universal data interface panel (UDIP) mounting box
UDIP–DB	Universal data interface panel (UDIP)
UDIP–TA	Table-top enclosure

[1]Both the UDIP mounting box and the UDIP interface must be ordered when installing a new option.

Performance

Analog output	
Voltage	±10 V, at 10 mA
	±5 V, at 10 mA
	0 V to 10 V, at 10 mA
Current	10 mA, at 10 V minimum
DC impedance	0.05Ω typical
Linearity (0–10 V)	±1/2 LSB; ±1.2 mV at full-scale range
Differential linearity	±1/2 LSB
Offset error	Adjustable to 0
Offset drift	±15 ppm/at maximum °C
Gain accuracy	Adjustable to zero
Gain drift	±25 ppm/at maximum °C
Settling time	6 μs to 0.1% for a p–p output change of 20 V

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 1.8 A (typical)
	+12 Vdc, 0.0 A
Power consumption	9.0 W
Bus loads	0.9 ac
	1.0 dc

Operating System Support

VMS	Version 5.0 and later using VAXlab Software Library
ULTRIX	Not supported as of Version 2.2
VAXELN	Not supported as of Version 3.0

Diagnostic Support	
MicroVAX Diagnostic Monitor	None
Self-tests	Yes

Related Documentation	
EK–AV11D–UG	Q-Bus DMA Analog System User's Guide

2.3.6 ADV11–S Analog-to-Digital Converter

The ADV11–S is an analog-to-digital converter with DMA capability. The ADV11–S is functionally equivalent to an ADV11–D.

Functional Information	
Input channels	16 single-ended analog input channels or 8 differential analog input channels; SE/DI input is jumper-selectable.
Programmable gain	1, 2, 4, or 8
A/D output	
Resolution	12-bit output data resolution
Data notation	Binary, offset binary, or 2's complement
A/D conversions	Can be started by a program, a real-time clock, or an external trigger
A/D results	Can be received by a programmed I/O transfer or by servicing an interrupt request
Interrupts	Can be enabled and automatically set by A/D DONE and/or ERROR bits
Common mode rejection ratio (gain=1)	80 dB at maximum range

Ordering Information	
ADV11–SF	ADV11 field-installed kit

Ordering Information

UDIP–BA[1]	Universal data interface panel (UDIP) mounting box
UDIP–AB	Universal data interface panel (UDIP) for ADV11–S
UDIP–TA	Table-top enclosure

Performance

Analog input	
No. of analog inputs	8 channels using differential inputs or 16 channels using single-ended inputs
Input range	0 V to +10 V (unipolar)
	−10 V to +10 V (bipolar)
Maximum input signal	±10.5 V (signal + common mode voltage)
Input impedance	
Off channels	100 MΩ minimum, 10 pF maximum
On channels	100 MΩ minimum, 100 pF maximum
Power off	1 KΩ in series with a diode
Input bias current	±20 nA at 25°C maximum
Input protection	Inputs are current-limited and protected to an overvoltage of ±35 V without damage.
Common mode rejection ratio	80 dB at a range of ±10 V at 60 Hz
A/D output	
Data buffer register	16-bit read-only output register
Resolution	12 bits unipolar; 11 bits bipolar plus sign
Data notation	Binary, offet binary, or 2's complement

[1]Both the UDIP mounting box and the UDIP interface must be ordered when installing a new option.

Performance

Sample and hold amplifier	
Aperture uncertainty	Less than 10 nanoseconds
Aperture delay	Less than 0.5 μs from start of conversion to signal disconnect
Front end settling	Less than 15 μs to $\pm$0.01% of full-scale value for a p–p input of 20 V
Input noise	Less than 0.2 mV rms
A/D converter performance	
Linearity	Less than $\pm$1/2 LSB
Stability (temperature coefficient)	$\pm$30 ppm at maximum °C
Stability (long term)	$\pm$0.05% change in 6 months
System accuracy (gain=1)	Input voltage to digitized value to within $\pm$0.03%
System throughput	25K channel samples/second

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 3.2 A (typical)
	+12 Vdc, 0.0 A
Power consumption	16.0 W
Bus loads	1.3 ac
	1.0 dc

Operating System Support

VMS	Version 5.0 and later using VAXlab Software Library
ULTRIX	Not supported as of Version 2.2
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later
Self-tests	Yes

Related Documentation	
EK–AV11O–UG	Q-Bus DMA Analog System User's Guide

2.3.7 KWV11–S Programmable Real-Time Clock

The KWV11–S is a programmable real-time clock that can be programmed to count from one to five crystal-controlled frequencies, from an external frequency or event, or from a 50/60 Hz line frequency on the Q-bus. The board can generate interrupts or can synchronize the processor to external events. The KWV11–S is functionally equivalent to a KWV11–C.

Functional Information	
Resolution	16 bits
Frequencies	5 internal crystal frequencies — 1 MHz, 100 kHz, 10 kHz, 1 kHz, and 100 Hz
Schmitt Triggers	2, each with slope and level controls that can be used to start the clock or generate program interrupts
Input	Line frequency input from BEVNT bus signal (50/60 Hz)
Modes	4 programmable modes

Ordering Information	
KWV11–SF	KWV11 field-installed kit
UDIP–BA[1]	Universal data interface panel (UDIP) mounting box
UDIP–KB	Universal data interface panel (UDIP) for KWV11–S

[1]Both a UDIP mounting box and an interface must be ordered when installing a new option.

Ordering Information	
UDIP–TA	Table-top enclosure

Performance	
Clock	
Crystal oscillator	10-MHz base frequency
Output ranges	1 MHz, 100 kHz, 10 kHz, 1 kHz, and 100 Hz
Oscillator accuracy	0.01%
Other sources	Line frequency or input at Schmitt Trigger
Schmitt-Trigger input signals	
No. of inputs	2
Input range	±30 V (maximum limits)
Triggering range	–12 V to +12 V (adjustable)
Triggering slope	Positive or negative, switch-selectable
Source	User device
Response time	Depends on input waveform and amplitude; for TTL logic levels, typically 600 nanoseconds
Hysteresis	Approximately 0.5 V, positive and negative
Characteristics	Single-ended input with 100-KΩ impedance to ground
Clock output	
Signal	CLK OV L (clock overflow, asserted low)
Output pins	J1 pin 5 and CLK OVFL tab
Function	Time base selection from an internal crystal-controlled frequency, an input at ST1, or a line frequency at BEVNT bus line
Duration	Approximately 500 nanoseconds
Line driver	TTL-compatible, open collector circuit with a 470-Ω pull-up resistor to +5 V

Performance	
Maximum source current	5 mA when output is high (≥2.4 V), measuring from source through load to ground
Maximum sink current	8 mA when output is low (≤0.8 V), measuring from external source voltage through load to output
Schmitt-Trigger1 output	
Signal	ST1 OUT L (asserted low)
Output pins	J1 pin 2 and ST1 OUT tab
Function	External time base input or counter of external events. Input frequency is a function of the input signal.
Other characteristics	Same as clock output
Schmitt-Trigger2 output	
Signal	ST2 OUT L (asserted low)
Output pin	J1 pin 4
Function	Starts counter, sets ST2 flag, and generates an interrupt (if enabled); causes buffer preset register (BPR) to be loaded from counter.
Other characteristics	Same as clock output

Configuration Information	
Power requirements	+5 Vdc, 2.2 A (typical)
	+12 Vdc, 0.13 A (typical)
Power consumption	11.15 W
Bus loads	1.0 ac
	1.0 dc

Operating Systems Support	
VMS	Version 5.0 and later using VAXlab Software Library
ULTRIX–32	Version 2.2 and later

Operating Systems Support	
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revisions 2.21 and later
Self-tests	Yes

Related Documentation	
EK–AXVAA–UG	AXV11/KWV11 Module User's Guide

2.3.8 AXV11 Controller

The AXV11–S is an input/output circuit board for analog devices. The AXV11–S is functionally equivalent to the AXV11–C.

Functional Information	
Input channels	16 single-ended analog input channels or 8 differential analog input channels; SE/DI jumper is field-selectable.
Programmable gain	1, 2, 4, or 8
A/D output	
Data resolution	12-bit output data resolution
Data notation	Binary, offset binary, or 2's complement
Voltage	Output voltage range selection of ±10 V (bipolar) or 0 V to 10 V (unipolar)
A/D conversions	Can be started by a program, an external trigger, or a real-time clock
A/D results	Can be received by a programmed I/O transfer or by servicing an interrupt request
Common mode rejection ratio	80 dB at maximum range

Functional Information	
D/A converters (DACs)	
No. of DACs	2
Input (each DAC)	12-bit digital input
Output (each DAC)	Unipolar or bipolar output

Ordering Information	
AXV11-SF	AXV11 field-installed kit
UDIP-BA[1]	Universal data interface panel (UDIP) mounting box
UDIP-AY	Universal data interface panel (UDIP) for AXV11-S
UDIP-TA	Table-top enclosure

Performance	
A/D converter performance	
Linearity	To within ±1/2 LSB
Stability (temperature coefficient)	±30 ppm at maximum °C
Stability (long term)	±0.05% change in 6 months
Conversion time	25 μs from end of front end settling to setting the A/D DONE bit
System throughput	25K channel samples/second
D/A converter specifications	
No. of D/A converters	2
Digital input	12 bits (Binary code is used for unipolar output; offset binary or 2's complement code is used for bipolar output.)
Analog output	±10 V (bipolar) or 0 V to +10 V (unipolar)
Output current	±5 mA maximum

[1]Both a UDIP mounting box and an interface must be ordered when installing a new option.

Performance	
Output impedance	0.1 Ω
Differential linearity	To within $\pm 1/2$ LSB
Nonlinearity	0.02% of full-scale value
Offset error	Adjustable to 0
Offset drift	± 30 ppm at maximum °C
Gain accuracy	Adjustable to full-scale value
Gain drift	± 30 ppm at maximum °C
Settling time	65 μs to 0.1% for a p–p output change of 20 V
Noise	0.1% full-scale value
Capacitive load capability	0.5 μF

Configuration Information	
Power requirements	+5 Vdc, 2.0 A
	+12 Vdc, 0.0 A
Power consumption	10.0 W
Bus loads	1.2 ac
	1.0 dc

Operating System Support	
VMS	Version 5.0 and later using VAXlab Software Library
ULTRIX	Not supported as of Version 2.2
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later
Self-tests	Yes

Related Documentation	
EK-AXVAA-UG	AXV11/KWV11 Module User's Guide
MP-O11291-00	AXV11-C Field Maintenance Print Set

2.3.9 ADQ32 Analog-to-Digital Converter

The ADQ32 is an analog-to-digital converter with DMA capability.

Functional Information	
Input channels	32 single-ended analog input channels or 16 differential analog input channels; single-ended or differential is programmable
Programmable gain	1, 2, 4, or 8; selectable per channel
A/D output	
Resolution	12-bit output data resolution
Data notation	Straight binary (unipolar), 2's complement (bipolar)
A/D conversions	Can be started by a program, a real-time clock, or an external trigger
A/D results	Can be received by a programmed I/O transfer or by servicing an interrupt request
Interrupts	Can be enabled and automatically set
Common mode rejection ratio	55 dB at maximum range

Ordering Information	
ADQ32-SF	ADQ32 field-installed kit
UDIP-BA[1]	Universal data interface panel (UDIP) mounting box
UDIP-AA	Universal data interface panel (UDIP)

[1]Both the UDIP mounting box and the UDIP interface must be ordered when installing a new option.

Ordering Information	
UDIP–TA	Table-top enclosure

Performance	
Analog input	
No. of analog inputs	16 channels using differential inputs or 32 channels using single-ended inputs
Input range	0 V to +10 V (unipolar)
	–10 V to +10 V (bipolar)
Input impedance	10 MΩ, minimum
Input bias current	500 nA maximum ON current
Input protection	Inputs are current-limited and protected to an overvoltage of ±35 V without damage.
Common mode rejection ratio	55 dB
A/D output	
Data buffer register	16-bit read-only output register
Resolution	12 bits unipolar; 11 bits bipolar plus sign
Data notation	Straight binary or 2's complement
Sample and hold amplifier	
Aperture uncertainty	1 nanosecond
Aperture delay	50 nanoseconds, maximum with minimum aperture enabled (clock bypass bit set)
Input noise	2 μV p–p
A/D converter performance	
Linearity	
Differential	0.2 to 2 LSB
Integral	1.5 LSB, maximum
Scale drift	15 ppm/C typical

Performance

System throughput	
Maximum single channel sample rate	250 KHz
Maximum multichannel rate to ensure ±1/2 LSB accuracy	200 KHz

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 5.0 A (typical)
	+12 Vdc, 0.0 A
Bus loads	2.5 ac
	0.5 dc

Operating System Support

VMS	Version 5.0 and later
ULTRIX	Not supported as of Version 2.2
VAXELN	Not supported as of Version 3.0

Diagnostic Support

MicroVAX Diagnostic Monitor	None
Self-tests	Yes

Related Documentation

EK–153AA–UG	ADQ32 Analog-to-Digital Converter User's Guide

2.4 MRV11–D Programmable Read-Only Memory Module

The MRV11–D memory module contains sixteen 28-pin sockets that accept static random-access memory (RAM) and a variety of user-supplied read-only memory (ROMs). By placing appropriate programmable ROMs into the module, you can design your own boot sequence.

Ordering Information	
MRV11–D	MRV11–D module

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 2.8 A
	+12 Vdc, 0.0 A
Power consumption	14.0 W
Bus loads	3.0 ac
	0.5 dc

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	No

Related Documentation	
EK–MRV1D–UG	MRV11–D Universal PROM Module User's Guide

2.5 Printer Options

MicroVAX and VAXserver systems have the following types of printer options:

- Line printers
- Dot matrix printers
- Daisy wheel, letter-quality printers
- Ink jet printers
- Laser printers

2.5.1 Line Printer Subsystems

MicroVAX and VAXserver systems have four line printer options: the LG01, a text-only printer, the LG02 and the LG31, text and graphics printers, and the LP29, a high-speed impact printer. All require the LPV11–SA printer interface.

2.5.1.1 LPV11–SA Printer Interface

The LPV11 printer interface controls the flow of data between the Q-bus and a line printer.

Ordering Information	
LPV11–SA	LPV11 controller module

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 2.2 A (typical)
	+12 Vdc, 0.0 A
Power consumption	11.0 W
Bus loads	1.8 ac
	0.5 dc
Module connectors	2 female, 37-pin D subminiature connectors

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	No

Related Documentation	
EK–LPV11–OP	LPV11 Printer User's Manual

2.5.1.2 LG01 Text Printer

The LG01 is a 600-lines-per-minute impact printer with multiple printing modes.

Performance	
Printing speed	Draft mode: 600 lines/minute with 64-character set; 480 lines/minute with 96-character set Correspondence mode: 280 lines/minute with 64-character set; 240 lines/minute with 96-character set
Print technology	Full-character, impact, matrix
Character spacing	Draft mode: 5/10/15 characters/inch Correspondence mode: 10/12 characters/inch
Line spacing	6 or 8 lines/inch
Paper slew rate	20 inch/second
Character sets	64- or 96-character ASCII, OCRA, OCRB
Buffer capacity	1000-character input buffer

Performance	
Paper	Fanfold. Form width: 15.6 cm to 62.4 cm (4 in to 16 in); form length: 11.7 cm to 78 cm (3 in to 20 in) Multipart forms: up to 6 parts, carbon or carbonless Thickness: 0.06 cm (0.025 in)

Power Requirements	
Line voltage and frequency	90–128 Vac, at 60 Hz 180–256 Vac, at 50 Hz
Power consumption	1000 W average
Heat dissipation	3000 Btu/hour

Physical Characteristics	
Height	97.8 cm (38.5 in)
Width	85.1 cm (33.5 in)
Depth	57.2 cm (22.5 in)
Weight	157.5 kg (350 lb)

Ordering Information	
LG01–EA	LG01 printer, LPV11–SA, and BC27L–30 cable
LG01–JA	LG01 printer and BC27L cable for connecting to the second port of the LPV11–SA

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–OLG01–IN	LG01 600 LPM Text Printer Installation/Operator's Manual
EK–OLG01–UG	LG01 600 LPM Text Printer User's Guide
EK–OLG01–TM	LG01 600 LPM Text Printer Technical Manual

2.5.1.3 LG02 Text and Graphics Printer

The LG02 is a 600-lines-per-minute impact printer with multiple printing modes and graphics.

Performance	
Printing speed	Draft mode: 600 lines/minute with 64-character set; 480 lines/minute with 96-character set Correspondence mode: 280 lines/minute with 64-character set; 240 lines/minute with 96-character set
Print technology	Full-character, impact, matrix
Character spacing	Draft mode: 5/10/15/16.2 characters/inch Correspondence mode: 10/12 characters/inch
Line spacing	6 or 8 lines/inch
Paper slew rate	20 inch/second
Character sets	64- or 96-character ASCII, OCRA, OCRB
Graphics	DIGITAL sixel protocol
Buffer capacity	1000-character input buffer

Performance	
Paper	Fanfold. Form width: 15.6 cm to 62.4 cm (4 in to 16 in); form length: 11.7 cm to 78 cm (3 in to 20 in) Multipart forms: up to 6 parts, carbon or carbonless Thickness: 0.06 cm (0.025 in)

Power Requirements	
Line voltage and frequency	90–128 Vac, at 60 Hz 180–256 Vac, at 50 Hz
Power consumption	1000 W average
Heat dissipation	3000 Btu/hour

Physical Characteristics	
Height	97.8 cm (38.5 in)
Width	85.1 cm (33.5 in)
Depth	57.2 cm (22.5 in)
Weight	157.5 kg (350 lb)

Ordering Information	
LG02–EA	LG02 printer, LPV11–SA, and BC27L–30 cable
LG02–JA	LG02 printer and BC27L cable for connecting to the second port of the LPV11–SA

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.11 and later
Self-tests	Yes

Related Documentation	
EK–0LG02–IN	LG02 600 LPM Text and Graphics Printer Installation/Owner's Manual
EK–0LG02–UG	LG02 600 LPM Text and Graphics Printer User's Guide
EK–0LG02–TM	LG02 600 LPM Text and Graphics Printer Technical Manual
EK–0LG02–RM	LG02 600 LPM Text and Graphics Printer Mini-Reference Manual

2.5.1.4 LG31 Printer

The LG31 is a 300-lines-per-minute impact printer with multiple printing modes and graphics capability.

Performance	
Printing speed	Data processing mode Uppercase: up to 300 lines/minute Uppercase and lowercase: up to 240 lines/minute Near-letter-quality mode Uppercase: up to 147 lines/minute Uppercase and lowercase: up to 105 lines/minute OCR–A and OCR–B 65 lines/minute
Print technology	Full-character, impact, matrix
Character spacing	10/12/13.3/15/16.7 characters/inch, with horizontal and vertical expansion capability

Performance	
Line spacing	6, 8, or 10 lines/inch
Paper slew rate	50 cm/second (15 in/second)
Character set	7- or 8-bit character sets, ASCII, OCRA, OCRB
Graphics	DIGITAL sixel protocol
Buffer capacity	Firmware-dependent
Paper	Fanfold. Form width 7.6 cm x 42.0 cm (3 in x 16.54 in); form length: 0.84 cm to 55.9 cm (0.33 in to 22 in)
	Multipart forms: up to 6 parts, carbon or carbonless
	Thickness: 0.05 cm (0.025 in)

Power Requirements	
Line voltage and frequency	100–240 Vac
	50–60 Hz
Interface (controller) current	1.5 A at 5.0 Vdc
Power consumption	50 W standby; 400 W printing
Heat dissipation	171 Btu/hour standby
	1368 Btu/hour printing

Physical Specifications	
Height	116.84 cm (46.0 in)
Width	73.66 cm (29.0 in)
Depth (with paper tray)	103.12 cm (40.6 in)
Weight	131 kg (287 lb)

Ordering Information	
LG31–A2	LG31 printer with RS–232 serial interface and BN22D–25 (25-ft cable)

Operating System Support	
VMS	Version 4.7A and later
ULTRIX–32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.21 and later
Self-tests	Yes

Related Documentation	
EK–LG31E–IN	LG31 Printer Installation Manual
EK–LG31E–PS	LG31 Printer Pocket Service Guide
EK–LG31E–UG	LG31 Printer User's Guide

2.5.1.5 LP29 Printer

The LP29 is a 2000 lines-per-minute impact printer.

Ordering Information	
LP29–QA	LP29 printer (120 V) with LPV11 controller, powered paper stacker, and cabinet kit.
LP29–Q3	LP29 printer (240 V) with LPV11 controller, powered paper stacker, and cabinet kit.
LP29–VA	LP29 printer (120 V) with powered paper stacker and cabinet kit
LP29–V3	LP29 printer (240 V) with powered paper stacker and cabinet kit

Performance	
Print speed	Up to 2000 lines/minute with optimized character set
	1650 lines/minute with 64-character set
	1100 lines/minute with 96-character set
Print technology	Full-character, impact, band
Character spacing	10 characters/inch
Line spacing	6 or 8 lines/inch
Paper slew speed	127 cm/second (50 in/second)
Character set	64- or 96-character ASCII (printing and non-printing characters), or proprietary optimized character band
Buffer capacity	Double buffered interface—264 characters
Paper	Fanfold: 8.9 cm x 47.6 cm (3.5 in x 18.8 in)
	Multipart forms: up to 6 parts, fanfold carbon
	Thickness: 0.05 cm (0.020 in)

Power Requirements	
Line voltage and frequency	100–240 Vac
	47–63 Hz
Interface (controller) current	1.5 A at 5.0 Vdc
Power consumption	455 W, standby; 1000 W, printing
Heat dissipation	4013 Btu/hour, printing

Physical Specifications	
Height	124.5 cm (49 in)
Width	89.0 cm (35 in)
Depth	74.9 cm (29.5 in)
Weight	255.0 kg (560 lb)

Operating System Support	
VMS	Version 4.7A and later
ULTRIX-32	Version 2.2 and later
VAXELN	Version 3.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Revision 2.20 and later
Self-tests	Yes

Related Documentation	
EK-LP279-UG	LP27/LP29 Operator's Manual
EK-LP279-IN	LP27/LP29 Line Printer Installation Manual
EK-OLP29-PS	LP29 Pocket Service Guide

2.5.2 Dot Matrix Printers

Four dot matrix printers are available for the MicroVAX 3600 and VAXserver 3600/3602 systems:

- LA75 Companion printer
- LA100 Letterwriter
- LA120 printer/terminal (DECwriter III)
- LA210 Letterprinter

2.5.2.1 LA75 Companion Printer

The LA75 is a high-speed, dot matrix printer designed for the office environment.

Performance	
Printing speed	Draft mode: 250 characters/second
	Memo mode: 125 characters/second
	Near-letter-quality mode: 42 characters/second
	Letter-quality mode: 32 characters/second
Print technology	Bidirectional, dot matrix
Print density	Draft mode: 12 x 9 matrix
	Memo mode: 24 x 9 matrix
	Near-letter-quality mode
	Letter-quality mode: 36 x 18 matrix
	Bit-map graphics mode
Character spacing	10, 12, 16.5, 17.1 characters/inch (standard-width characters)
	5, 6, 8.25, 8.55 characters/inch (double-width characters)
Line spacing	2, 3, 4, 6, 8, 12 lines/inch
Graphics	DIGITAL sixel protocol

Performance	
Character sets	Nine built-in character sets: U.S. ASCII, National Replacement (NRC), ISO 8-bit Supplemental, DEC Supplemental, VT100 Special Graphic, DEC Technical, plus IBM Proprinter Line Drawing, Chart Drawing, and Symbol Drawing sets.
Buffer capacity	2047-character input buffer

Communications	
Baud rates	110 to 9600 bits/second
Character code	7- or 8-bit ASCII with odd, even, mark, space, or no parity
Interfaces	EIA RS–423
	EIA RS–232–C parallel

Paper	
Type	Fanfold. Form width: 11.4 cm to 25.4 cm (4.25 in to 10 in)
	Single-sheets: 21.6 cm x 27.9 cm (8.5 in x 11 in)
	Envelopes
	Multipart forms: up to 4 parts, carbon or carbonless
Thickness	0.06 cm (0.002 to 0.012 in)

Power Requirements	
Line voltage and frequency	120 Vac, at 50/60 Hz
	240 Vac, at 50/60 Hz

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 lb)

Ordering Information	
LA75–CA	DEC 423 serial interface printer, U.S., Canada (English, French)
	13 other country-specific serial models available
LA75P–CA	Parallel model, U.S., Canada (English, French)
	13 other country-specific parallel models available
H8571–A	Adapter for 25-pin male host printer port
H8571–B	Adapter for 9-pin male host printer port

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–OLA75–UG	Installing and Using the LA75 Companion Printer
EK–OLA75–RM	LA75 Companion Printer Programmer Reference Manual

2.5.2.2 LA100 Letterwriter

The LA100 Letterwriter is a wide-carriage, tabletop printer/terminal.

Performance	
Print speed	240 characters/second (draft mode)
	30 characters/second (letter-quality mode)
	80 characters/second (memo mode), optional
Print technology	Bidirectional, dot matrix
Print matrix	Draft-quality: 7 x 9 dots per character cell
	Near-letter-quality: 33 x 18 dots per character cell
	Memo-quality: 33 x 9 dots/inch
	Graphics: 132 x 72 dots/inch
Character pitch	16.5, 13.2, 12, 10, 8.25, 6.6, 6, or 5 characters/inch
Line spacing	2, 3, 4, 6, 8, or 12 lines/inch
Character sets	ASCII, Multinational, Line Drawing Set are standard.
Fonts	Courier-10, Courier-12, Orator-10, Gothic-10, and Gothic-12
Buffer capacity	400 characters

Communications	
Baud rates	50, 75, 110, 134.5, 200, 300, 600, 1200, 1800, 2400, 4800, 7200, or 9600
Parity	7-bit: odd, even, mark, space, or none
	8-bit: odd, even, or none
Interfaces	EIA RS–232–C
	Optional 20-mA interface

Paper	
Type	Single sheet, roll, or continuous forms
Dimensions	7.6 cm to 37.8 cm (3.0 in to 14.9 in) wide
Multiple forms	Original plus 3 parts
Thickness	0.051 cm (0.020 in) maximum

Power Requirements	
Voltage	120 V nominal (87–128 Vac range)
Frequency	47 to 63 Hz
Power consumption	138 W, printing maximum

Physical Characteristics	
Height	17.7 cm (7 in)
Width	55.9 cm (22 in)
Depth	39.34 cm (15.5 in)
Weight	11.3 kg (25 lb)

Ordering Information	
LA100–BA	Letterwriter 100 US/UK KSR model
LA100–BB	Letterwriter 100 international KSR model

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–LW100–OP	Letterwriter 100 Operator Guide
EK–LW100–IN	Letterwriter 100 Installation Guide
EK–LW100–RM	LA100-Series Programmer Reference Manual

2.5.2.3 LA120 Printer/Terminal (DECwriter III)

The LA120 is a dot matrix, pedestal-mounted printer/terminal.

Performance	
Print speed	180 characters/second (draft mode)
Print technology	Bidirectional, dot matrix
Print matrix	Draft-quality: 7 x 9 dots per character cell
	Graphics: 132 x 72 dots/inch
Character pitch	13.2, 12, 10, 8.25, 6.6, 6, or 5 characters/inch
Line spacing	2, 3, 4, 6, 8, or 12 lines/inch
Buffer capacity	1 Kbyte or optional 4 Kbytes
Character sets	ASCII and optional international character sets
Fonts	Courier-10, Courier-12, Orator-10, Gothic-10, and Gothic-12

Communications	
Baud rates	50, 75, 110, 134.5, 200, 300, 600, 1200, 1800, 2400, 4800, 7200, or 9600
Split speeds	600 or 1200 receive with 75 or 150 transmit
	2400 or 4800 receive with 300 or 600 transmit

Communications	
Parity	7-bit: odd, even, or none
	8-bit: mark or space
Interface	EIA RS–232–C

Paper	
Type	Fanfold
Dimensions	7.6 cm to 37.8 cm (3.0 in to 14.9 in) wide
Multiple forms	Up to 6 parts
Thickness	0.051 cm (0.020 in) maximum

Power Requirements	
Voltage	120 or 240 Vac, 50 or 60 Hz
Power consumption	440 W, printing maximum

Physical Characteristics	
Height	85.1 cm (33.5 in)
Width	69.9 cm (27.5 in)
Depth	61.0 cm (24.0 in)
Weight	46.4 kg (102 lb)

Ordering Information	
LA120–BB	Letterwriter 120 international KSR model

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–LA120–RG	LA120 Operator's Reference Card
EK–LA120–TM	LA120 Technical Manual
EK–LA120–UG	LA120 User Guide

2.5.2.4 LA210 Letterprinter

The LA210 Letterprinter is a multimode, dot matrix, desktop printer.

Performance	
Print speed	240 characters/second (draft mode) 40 characters/second (letter-quality mode) 80 characters/second (memo mode), optional
Throughput speed	185 characters/second (draft mode) 30 characters/second (letter-quality mode)
Print technology	Bidirectional, dot matrix
Print matrix	Draft-quality: 7 x 9 dots per character cell Near-letter-quality: 33 x 18 dots per character cell Memo-quality: 33 x 9 dots/inch
Character sets	ASCII, Multinational, Line Drawing Set are standard. Other character sets available on optional cartridges.
Fonts	Courier-10 is standard. Other fonts available on optional cartridges.

Communications	
Baud rates	50, 75, 110, 134.5, 200, 300, 600, 1200, 1800, 2400, 4800, 7200, or 9600
Parity	No parity, 7-bit, mark
	No parity, 7-bit, space
	Even parity, 7-bit; odd parity, 7-bit
	Even parity, 8-bit; odd parity, 8-bit
	No parity, 8-bit
Interfaces	EIA RS-232-C
	Optional parallel interface

Paper	
Type	Single sheet, pinfeed, or continuous forms
Dimensions	8.9 cm to 37.8 cm (3.5 in to 14.9 in) wide
Multiple forms	Original plus 3 parts (bottom feed only)
Thickness	0.038 cm (0.015 in) maximum

Power Requirements	
Voltage	120 V nominal (90–128 Vac range)
	240 V nominal (180–256 Vac range)
Frequency	47 to 63 Hz
Power consumption	154 W, printing maximum

Physical Characteristics	
Height	12.7 cm (5 in) without tractor
	22.8 cm (9 in) with tractor
Width	54.6 cm (21.5 in)
Depth	34.3 cm (13.5 in)
Weight	12.15 kg (27 lb)

Ordering Information	
LA210–AA	United States (English)
LA210–AE	UK/Ireland (English)
	Other country-specific models are available

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–LA210–UG	LA210 Letterprinter User Guide
EK–LA210–IN	Installing the LA210 Letterprinter
EK–LA210–RM	LA210 Letterprinter Programmer Reference Manual

2.5.3 Letter-Quality Printers

The LQP series of printers provides letter-quality printing for MicroVAX 3600 and VAXserver 3600/3602 systems.

2.5.3.1 LQP02 Printer

The LQP02 letter-quality printer is a full-size, 96-petal daisywheel printer.

Performance	
Print speed	32 characters/second (letter-quality, Shannon text)
Print technology	Bidirectional, full-character, impact
Print density	Full-character, even density
Character pitch	Variable pitch, software selectable (10 characters/inch default)
Line spacing	Variable, includes proportional spacing (6 lines/inch default)
Vertical slew speed	5 inch/second
Buffer capacity	256 characters
Buffer control	XON/XOFF
Paper	Cutsheet: 7.6 cm to 34.3 cm (3 to 13.5 in) wide
	Fanfold: 7.6 cm to 38.1 cm (3 to 15 in) wide
	Thickness: 0.025 cm (0.011 in) maximum

Communications	
Baud rates	75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, and 9600, full-duplex transmission
Data interface	EIA RS-232-C
Parity	7-bit, odd, even, mark, or space

Power Requirements	
LQP02–AA	120 Vac, 60 Hz
LQP02–AD	240 Vac, 50 Hz
Power consumption	120 W, average RMS

Physical Characteristics	
Height	17.8 cm (7 in)
Width	63.5 cm (25 in)
Depth	40.6 cm (16 in)
Weight	22 kg (48 lb)

Ordering Information	
LQP02–AA	LQP02 printer (120 V)
LQP02–AD	LQP02 printer (240 V)

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
AA–L662A–TK	Installing and Using the LQP02 Printer
EK–LQP02–RM	LQP02 Printer Programmer Reference Manual

2.5.3.2 LQP03 Printer

The LQP03 letter-quality printer is a compact, 130-petal daisywheel printer.

Performance	
Print speed	25 characters/second (Shannon text at 10 characters/inch) 34 characters/inch (triple-A text at 12 characters/inch)
Print technology	Bidirectional, full-character, impact
Print density	Full-character, even density
Paper	Cutsheet: U.S.: 21.6 x 27.9 cm (8.5 x 11 in); A4: 21.1 x 29.7 cm (8.3 x 11.7 in); both in vertical and horizontal orientation; 16–24 lb bond

Type Characteristics	
Character sets	ASCII, English/U.K., French, French-Canadian, German, Italian, Spanish, Swedish, Finnish, Norwegian, Danish, JIS Roman, Multinational
Character pitches	Printwheels available in 10, 12, and 15 pitch
Maximum print columns	110 at 10 pitch, 132 at 12 pitch, 165 at 15 pitch
Margins	Left, right, top, and bottom
Tabs	256 contiguous horizontal; 168 contiguous vertical
Character code	7-bit and 8-bit ASCII, switch-selectable
Horizontal pitch	Variable pitch, software-selectable
Vertical pitch	Variable pitch, software-selectable
Horizontal resolution	120 increments/inch
Lines/inch	Variable, includes proportional spacing (6 lines/inch default)
Characters/inch	Variable (10 characters/inch default)

Communications	
Baud rates	110, 150, 300, 600, 1200, 2400, 4800, and 9600
Data interface	Serial EIA RS–232–C standard
Parity	Odd, even, mark, or space, switch-selectable
Transmission rate	Full-duplex, from 110 to 9600 baud
Buffer capacity	256 characters
Buffer control	XON/XOFF

Power Requirements	
Voltage/Frequency	90–132 V, 57–63 Hz; 180–264 V, 47–53 Hz
Line current	14 A, maximum starting current; 1 A nominal operating current
Power consumption	Less than 100 W, average RMS
Heat dissipation	410 Btu/hour, nominal operation

Physical Characteristics	
Height	19.7 cm (7.75 in)
Width	52.7 cm (20.75 in)
Depth	38.7 cm (15.25 in)
Weight	22.7 kg (28 lb)

Ordering Information	
LQP03–A	LQP03 printer (120 V)
LQP03–B	LQP03 printer (240 V)

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–LQP03–UG	Installing and Using the LQP03 Printer
EK–LQP03–RM	LQP03 Printer Programmer Reference Manual
EK–LQP03–TM	LQP03 Printer Technical Manual

2.5.4 Ink Jet Printers

Ink jet printers provide high-quality color graphics with near-letter-quality text.

2.5.4.1 LJ250/LJ252 Companion Color Printers

LJ250/LJ252 Companion Color Printers are disposable cartridge, thermal ink jet printers, available with either serial or parallel interface.

Performance	
Printing speed	Text-print speed
	Black: near-letter-quality, 167 characters/second (burst); 90 characters/second (throughput)
	Color: near-letter-quality, 55 characters/second (burst); 20 characters/second (throughput)
Print technology	Thermal ink jet drop-on demand
Character spacing	Standard: 10/12/18 characters/inch
	Double width (DEC mode only): 5/6/9 characters/inch
Line spacing	2, 3, 4, 6, 8, or 12 lines/inch
Character sets	VT100, US ASCII, DEC Technical, ISO Supplemental, 14 National Replacement Character Sets, DEC Supplemental, Roman–8, PC–8, ECMA–94, IBM–EUROPE, and National Character Sets
Graphics	DIGITAL and HP/PCL protocols
Character printing attributes	Color, true descenders, superscript, subscript, bold, italics, underline, double underline, overline, strike-through
Page printing attributes	Margins, tabs, printhead positioning, autowrap, unidirectional/bidirectional printing, transparency mode
Color graphics mode	Solid colors (180 x 180 dots/inch): black, cyan, magenta, yellow, red, green, and blue

Performance	
	Half-tone dithered colors (90 x 90 dots/inch, with 90 x 45 dots/inch in DEC mode only): 255 colors, HLS system or RGB
Aspect ratio	1:1, 2:1, or 2.5:1
Character code	Bit serial, character asynchronous, consisting of a start bit (space), 7 or 8 data bits (1 = mark, 0 = space), an optional parity bit, and a stop bit (mark)
Communications baud rates	4800 or 9600
Buffer control	XON/XOFF or DTR
Buffer capacity	2K bytes of input buffer space

Power Requirements	
Line voltage and frequency	100, 120, 220, 240 Vac
	48–66 Hz

Physical Specifications	
Height	9.2 cm (3.65 in)
Width	44.4 cm (17.50 in)
Depth	31.1 cm (12.25 in)
Weight	4.5 kg (10 lb)

Ordering Information	
LJ250–CA	LJ250 Companion Color Printer with serial (DEC 423 and EIA RS–232–C) interface
LJ252–CA	LJ252 Companion Color Printer with parallel (Centronics-type) interface

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–LJ250–DK	LJ250/LJ252 Companion Color Printer Documentation Kit

2.5.5 Laser Printers

Three models of the LN03 laser printer offer laser imaging and xerographic printing in a desktop unit. They are described on the following pages.

- LN03—basic text printer
- LN03 PLUS—text and bit-mapped graphics
- LN03R ScriptPrinter—bit-mapped graphics with support for PostScript, a page description language that can integrate text and graphics

Performance	
Print speed	Eight pages/minute (about 333 characters/second letter-quality, 2500 characters/page)
Recommended duty cycle	3500 pages/month
Paper feed	Adjustable 250-sheet cassette (16 to 24 lb paper)
Paper output	250 sheets sequenced
Print orientation	Portrait: 66 lines/page, 120 characters/line
	Landscape: 66 lines/page, 150 characters/line
Resolution	300 x 300 dots/inch
Image area	2400 dots/scan line x 3225 scan lines (ANSI A)
	2400 dots/scan line x 3400 scan lines (A4)
Paper sizes	Standard ANSI A: 21.6 x 27.9 cm (8.5 x 11 in)
	European A4: 21 x 29.7 cm (8.3 x 11.7 in)
Character sets	Built-in: ASCII, DEC Supplemental, DEC Technical, and Line Drawing Set
	Downline-loaded: 10 additional available
Fonts	LN03 and LN03 PLUS: 16 resident fonts

Performance	
	LN03R: 29 resident fonts
	Other fonts available on ROM cartridges or by downline loading them from a host
Graphics	Sixel protocol (LN03 PLUS and LN03R)
	TEKTRONIX 4010/4014 files (LN03 and LN03R)
	ReGIS (LN03R)
RAM	LN03: no on-board RAM; accepts two RAM cartridges
	LN03 PLUS: 1 Mbyte on-board RAM; accepts two RAM cartridges
	LN03R: 2 Mbytes on-board RAM; accepts two RAM cartridges
ROM	LN03: no on-board ROM; accepts two precoded ROM font cartridges
	LN03 PLUS: no on-board ROM; accepts two precoded ROM font cartridges
	LN03R: 1 Mbyte of on-board ROM for POSTSCRIPT interpreter; accepts two precoded ROM font cartridges

Communications	
Interface	EIA RS-232-C
Baud rates	1200, 2400, 3600, 4800, 7200, 9600, 19200
Parity	If enabled, even/mark or odd/space

Power Requirements	
Voltage/Frequency	90–128 V at 50/60 Hz
	190–256 V at 50 Hz
Power consumption	1 kVA max
Heat dissipation	3400 Btu/hour

Physical Characteristics	
Height	38.1 cm (15 in) with exit tray
Width	53.4 cm (21 in)
Depth	59.7 cm (23.5 in) with tray
Weight	36.3 kg (80 lb)

Ordering Information	
LN03–AA	U.S. model of LN03
LN03S–AA	U.S. model of LN03 PLUS
LN03R–AA	U.S. model of LN03R ScriptPrinter
	21 other country-specific models available

Operating System Support	
VMS	Dependent on serial interface port
ULTRIX–32	Dependent on serial interface port
VAXELN	Dependent on serial interface port

Diagnostic Support	
MicroVAX Diagnostic Monitor	Dependent on serial interface port
Self-tests	Yes

Related Documentation	
EK–OLN03–UG	Installing and Using the LN03
EK–OLN03–RM	LN03 Programmer Reference Manual

Chapter 3
System Expansion

Expanding a system involves three activities:

- Determining whether the system can accommodate a particular set of supported options
- Configuring the options appropriately
- Installing the options in the correct positions within the system

This chapter describes only how to determine what options you can add to your system. You do this by filling in a worksheet with the options currently in your system and those you want to add. The information you need for all options is in Table 3–1.

This chapter does not describe how to configure the new options or how to install them into your system. Configuring the option involves assigning a Control and Status Register (CSR) address and an interrupt vector. This is usually done by means of switches or jumpers on the options themselves. DIGITAL service representatives configure the options when they install them. Your DIGITAL service representative also determines the proper placement of options within the system according to specific guidelines.

Self-maintenance customers may obtain the information required to configure and install modules by ordering the *MicroVAX 3500 and 3600 Systems Maintenance Update*.

3.1 Determining Expansion Capacity

To determine what you can add to your system, you must list the options currently installed and their power requirements in the worksheet provided at the end of this chapter. Table 3–1 lists the information you need for each option supported in the BA213 enclosure.

Table 3–1: Power Requirements

Option	Module	Current (Amps) +5 V	Current (Amps) +12 V	Power (Watts)
AAV11–SA	A1009–PA	1.8	0.0	9.0
ADV11–SA	A1008–PA	3.2	0.0	16.0
AXV11–SA	A026–PA	2.0	0.0	10.0
CXA16–AA/AF	M3118–YA	1.4	0.14	8.7
CXB16–AA/AF	M3118–YB	1.4	0.14	8.7
CXY08–AA/AF	M3119–YA	1.3	0.14	8.2
DFA01–AA/AF	M3121–00	1.97	0.40	14.65
DELQA–SA/SF	M7516–PA	1.5	0.5	23.5
DPV11–SA/SF	M8020–PA	1.2	0.15	7.8
DRQ3B–SA/SF	M7658–PA	4.5	0.0	22.5
DRV1W–SA/SF	M7651–PA	1.8	0.0	9.0
IBQ01	M3125–PA	5.0	0.0	25.0
IEQ11–SA/SF	M8634–PA	3.5	0.0	17.5
KA650–AA/BA	M7620–A	6.0	0.14	31.68
KDA50–SA/SF	M7164/M7165	13.5	0.03	67.86
KLESI	M7740	3.0	0.0	15.0
KMV1A–SA/SF	M7500	2.6	0.2	15.4
KWV11–SA	M4002–PA	2.2	0.13	11.15
LPV11–SA	M8086–YA	2.2	0.0	11.0
MRV11–D	M7942	2.8	0.0	14.0
MS650–AA/AF	M7621–A	2.7	0.0	13.5
RA70		3.8	4.2	69.4
TK70S–AA		1.3	2.4	35.3
TQK70–SA	M7559	3.0	0.0	15.0
TSV05–SB	M7206–PA	6.5	0.0	32.5

Figure 3–1 shows the worksheet for the BA213 enclosure. The worksheet is in two parts because each power supply unit provides power to six slots and two mass storage devices. The primary power supply provides power to slots

1–6, the TK70 tape drive, and fixed disk 1, if present. The secondary power supply provides power to slots 7–12 and to fixed disk 0, if present. Use the worksheet as follows:

1. In the Module column, list all options and mass storage devices currently installed in your system, except the controllers for the fixed-disk drives and tape drive. Use the labels on the cover panel of each slot to identify the module installed in the slot. The processor, memory, and TK70 tape drive have already been entered. List each RA70 disk drive, if any.
2. List the options and mass storage devices you would like to add to the system.
3. List the controllers for the TK70 tape drive and fixed-disk drives last.
4. Using the information from Table 3–1, fill in the power requirements for each module and each mass storage device.
5. Add each column and make sure the resultant figures do not exceed the limits listed below each column. As long as the figures are within range, you can probably install the listed options.

This worksheet is only a guide. Confirm your plan with your DIGITAL sales representative. While certain configurations may be possible, they may not be recommended due to excessive loads on the system or difficulties in providing necessary bus and cable access for all devices.

Figure 3–1: Configuration Worksheet

PRIMARY POWER SUPPLY

SLOT	MODULE	Current (Amps) +5 Vdc	Current (Amps) +12 Vdc	Power (Watts)
1	M7620–A	6.0	0.14	31.68
2	M7621–A	2.7	0.0	13.5
3				
4				
5				
6				
MASS STORAGE:				
TK70		1.3	2.4	35.3
FIXED DISK				
Total these columns:				
Must not exceed:		33.0 A	7.0 A	230.0 W

SECONDARY POWER SUPPLY

SLOT	MODULE	Current (Amps) +5 Vdc	Current (Amps) +12 Vdc	Power (Watts)
7				
8				
9				
10				
11				
12				
MASS STORAGE:				
FIXED DISK				
Total these columns:				
Must not exceed:		33.0 A	7.0 A	230.0 W

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ADDITIONAL DOCUMENTATION

From	Call	Write
Alaska, Hawaii, or New Hampshire	603–884–6660	Digital Equipment Corporation P.O. Box CS2008 Nashua, NH 03061
Rest of U.S.A. and Puerto Rico*	800–258–1710	
* Prepaid orders from Puerto Rico must be placed with DIGITAL's local subsidiary (809–754–7575)		
Canada	800–267–6219 (for software documentation) 613–592–5111 (for hardware documentation)	Digital Equipment of Canada Ltd. 100 Herzberg Road Kanata, Ontario, Canada K2K 2A6 Attn: Direct Order desk
Internal orders (for software documentation)	—	Software Distribution Center (SDC) Digital Equipment Corporation Westminster, MA 01473
Internal orders (for hardware documentation)	617–234–4323	Publishing & Circulation Serv. (P&CS) NR03–1/W3 Digital Equipment Corporation Northboro, MA 01532

Reader's Comments

MicroVAX 3600
VAXserver 3600/3602
Technical Information
EK–035AB–IS–002

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