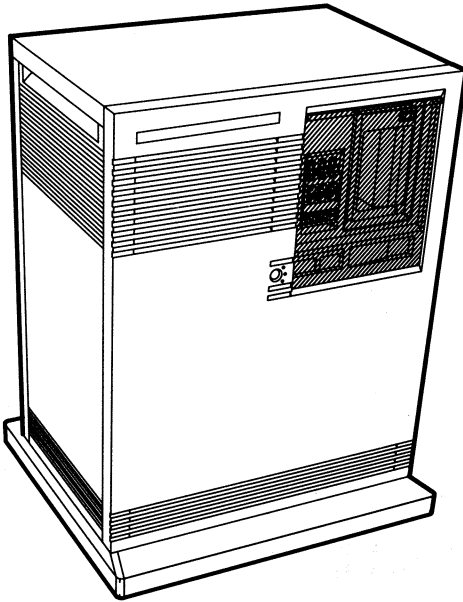


MicroVAX 3400 VAXserver 3400 Technical Information

Order Number EK-163AA-IS-001



**digital equipment corporation
maynard, massachusetts**

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Contents

Preface

vii

Chapter 1 Base System Specifications

1.1	Base System Operation	1-1
1.1.1	Digital Small Storage Interconnect (DSSI)	1-1
1.1.2	KA640 Firmware	1-3
1.1.3	CPU Cover Panel Operation	1-5
1.1.3.1	Switches	1-6
1.1.3.2	LED Display	1-9
1.1.3.3	Console Terminal Connector	1-10
1.1.3.4	Battery Backup Unit (BBU)	1-10
1.1.3.5	Ethernet Logic	1-10
1.2	Base System Specifications	1-10
1.2.1	KA640-AA/BA Processor Specifications	1-10
1.2.2	MS650 Memory Option	1-13
1.2.2.1	MS650-AA	1-13

Chapter 2 Option Specifications

2.1	Mass Storage Options	2-2
2.1.1	Disk Drives and Controllers	2-2
2.1.1.1	RF30 Fixed-Disk Drive	2-2
2.1.2	Tape Drives and Controllers	2-4
2.1.2.1	TSV05 Controller	2-4
2.1.2.2	TS05 Tape Drive	2-5
2.1.2.3	TQK70 Controller	2-7
2.1.2.4	TK70 Tape Drive	2-8
2.1.2.5	TQK50 Controller	2-10
2.1.2.6	TK50 Tape Drive	2-11

2.1.3	Optical Disk Drives and Controllers	2-13
2.1.3.1	KLESI Controller	2-13
2.1.3.2	RV20 Optical Disk Drive	2-14
2.2	Communications Options	2-17
2.2.1	Asynchronous Serial Controllers	2-17
2.2.1.1	CXA16 Asynchronous Multiplexer (16 lines)	2-17
2.2.1.2	CXB16 Asynchronous Multiplexer (16 lines)	2-20
2.2.1.3	CXY08 Asynchronous Multiplexer (8 lines)	2-23
2.2.1.4	DFA01 Asynchronous Controller with Integral Modem	2-25
2.2.1.5	CXF16 and CXF32 Asynchronous Controllers	2-28
2.2.1.6	DSRVB DECserver 200	2-30
2.2.2	Synchronous Serial Controllers	2-33
2.2.2.1	DSV11 Synchronous Interface	2-33
2.2.2.2	DMV11 Synchronous Controller	2-35
2.2.2.3	DPV11	2-37
2.2.2.4	KMV1A Programmable Communications Controller	2-39
2.2.3	Network Controllers	2-41
2.2.3.1	DESQA Ethernet Controller	2-41
2.2.3.2	DELQA Ethernet Controller	2-42
2.3	Real-Time Controllers	2-45
2.3.1	DRQ3B Parallel Interface	2-45
2.3.2	DRV1W Parallel Interface	2-46
2.3.3	IEQ11 Controller	2-48
2.3.4	IBQ01 Controller	2-50
2.3.5	AAV11-S Digital-to-Analog Converter	2-51
2.3.6	ADV11-S Analog-to-Digital Converter	2-53
2.3.7	KWV11-S Programmable Real-Time Clock	2-56
2.3.8	AXV11 Controller	2-59
2.3.9	ADQ32 Analog-to-Digital Converter	2-62
2.4	MRV11-D Programmable Read-Only Memory Module	2-65
2.5	Printer Options	2-67
2.5.1	Line Printer Subsystems	2-67
2.5.1.1	LPV11-SA Printer Interface	2-67
2.5.1.2	LG01 Text Printer	2-68
2.5.1.3	LG02 Text and Graphics Printer	2-70
2.5.1.4	LG31 Printer	2-71

2.5.1.5	LP29 Printer	2-73
2.5.2	Dot Matrix Printers	2-77
2.5.2.1	LA75 Companion Printer	2-77
2.5.2.2	LA100 Letterwriter	2-80
2.5.2.3	LA120 Printer/Terminal (DECwriter III)	2-82
2.5.2.4	LA210 Letterprinter	2-84
2.5.3	Letter-Quality Printers	2-87
2.5.3.1	LQP02 Printer	2-87
2.5.3.2	LQP03 Printer	2-88
2.5.4	Ink Jet Printers	2-93
2.5.4.1	LJ250/LJ252 Companion Color Printers	2-93
2.5.5	Laser Printers	2-97

Chapter 3 System Expansion

3.1	Determining Expansion Capacity	3-1
-----	--------------------------------------	-----

Index

Figures

1-1	CPU Cover Panel	1-6
1-2	Changing the Baud Rate	1-8
3-1	Configuration Worksheet	3-4

Tables

1-1	Device Names	1-4
1-2	Baud Rate Switch Settings	1-9
3-1	Power Requirements	3-2

Preface

This manual summarizes technical information about MicroVAX 3400 and VAXserver 3400 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 3400 and VAXserver 3400 systems.
- Chapter 3 contains information on expanding your system.

NOTE: *VAXserver 3400 systems are designed to offer maximum performance for applications that do not require timesharing. Some of the devices and components listed in this manual are designed for multiuser systems and may not be suitable for VAXserver systems. Contact your DIGITAL representative if you have any questions about whether use of a specific device is appropriate for your VAXserver system.*

Conventions

The following conventions are used in this book:

Convention	Meaning
<code>[Key]</code>	A symbol denoting a terminal key used in text and examples in this book. For example, <code>[Break]</code> indicates that you press the Break key on your terminal keypad. <code>[Return]</code> indicates that you press the Return key on your terminal keypad.
<code>[Ctrl/C]</code>	A symbol indicating that you hold down the Ctrl key while you press the C key.
Bold	Bold type is used to indicate user input. For example: <code>>>> BOOT MUA0</code> This line shows that the user must type <code>BOOT MUA0</code> at the “>>>” prompt.

Chapter 1

Base System Specifications

MicroVAX 3400 and VAXserver 3400 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 three memory modules. The CPU module resides in slot 1 of the backplane. Memory modules can reside in slots 2 through 4.

1.1 Base System Operation

Base system operation is based on the KA640 CPU module. The KA640 CPU module has the following components:

- CPU chip with 1 Kbyte of cache
- Floating-Point Accelerator (FPA) chip
- A 4-Mbyte, 400-nanosecond, 39-bit wide memory array
- Memory controller
- Clock registers
- DIGITAL Small Storage Interconnect (DSSI) bus adapter
- Ethernet controller
- Q-bus interface
- Console serial line
- Firmware

The following sections describe the DSSI bus, KA640 firmware, and the controls on the CPU cover panel.

1.1.1 Digital Small Storage Interconnect (DSSI)

The Digital Small Storage Interconnect (DSSI) bus is dedicated to mass storage devices on the MicroVAX 3400 and VAXserver 3400 systems.

The DSSI bus has the following characteristics:

- 4 Mbytes-per-second bandwidth
- Single-ended bus transfers
- Up to eight nodes (up to two host adapters and six mass storage devices)
- Eight data lines
- One parity line
- Eight control lines

DSSI architecture features a DSSI host adapter and DSSI mass storage devices. The DSSI host adapter, located on the KA640 CPU module, is the interface between the DSSI mass storage devices and the CPU. The DSSI mass storage devices, such as the RF30, contain a built-in controller.

DSSI architecture improves system performance through the following:

- DSSI bus handles all mass storage transactions (Q-bus is free for other activity).
- DSSI bus is faster than the Q-bus.
- Mass storage devices can act independently (since each device has its own controller, several devices can work simultaneously).

The DSSI bus supports up to eight daisy-chained nodes. These eight nodes might be one DSSI host adapter and seven DSSI mass storage devices, such as seven RF-series disk drives.

Atypically, a DSSI mass storage device can maintain connections to more than one DSSI adapter. Since the DSSI adapter is located on the KA640 CPU module, a DSSI mass storage device can connect to more than one KA640 CPU module.

For example, an external DSSI cable can connect two MicroVAX 3400 systems. The DSSI bus, in this case, would consist of two DSSI host adapters and up to six RF30 disk drives. The two MicroVAX 3400 systems would have access to each drive on the DSSI bus.

For more information about connecting two MicroVAX 3400 systems and the advantages of this configuration, refer to the section *Dual-Host Capability*, found in the *Operation* manual.

1.1.2 KA640 Firmware

Two read-only memory (ROM) chips on the KA640 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 KA640 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 the Halt button or by pressing the **Break** key when the Break Enable/Disable switch is set to enable)
- A HALT instruction is executed
- Halt button on the front control panel is pressed
- A system error occurs

At Power-Up

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 meaning 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. *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 Disabled

If the Break Enable/Disable switch is set to disable, the CPU tries to autoboot 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.

The system does not test all devices in search of bootable software, but looks for a previously-selected boot device.

If you have not yet selected a boot device, the system issues a list of bootable devices and prompts you to select a boot device from the list. Depending on whether you type in a device name, one of two things happens:

- If you do not type a boot device name within thirty seconds, the system boots from the Ethernet adapter, ESA0.
- If you type a boot device name within thirty seconds, the system boots from that device.

For more information about this process, see *Operation*.

NOTE: *Selecting a boot device other than the Ethernet adapter is not appropriate for diskless and tapeless systems which must boot software over the network.*

Once you have selected a default boot device, you may change the default boot device by using the SET BOOT *device name* command. To use the command, put the system into console mode by pressing the Halt button twice. At the >>> prompt, enter "SET BOOT *device-name*." Use Table 1-1 to determine the name of the boot device you want to select.

Table 1-1: Device Names

Controller Type	Controller	Device Name
DSSI	On-board CPU	DImm (fixed disks)
MSCP (Tape)	TQK70	MUmn
PROM	MRV11	PRA _n
Ethernet adapter	On-board CPU	ESA0

If the Break Enable/Disable Switch Is Enabled

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.

CAUTION: *Do not press the Restart button while in console mode. Doing so destroys the system state. You will not be able to continue normal operation.*

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.

Typing HELP at the console prompt displays a list of all console commands. For a complete description of the console commands, refer to the *KA640 CPU Module Technical Manual*.

1.1.3 CPU Cover Panel Operation

The CPU cover panel covers the CPU and first memory module in slots 1 and 2. The panel contains controls for the CPU and connectors for the console terminal and for Ethernet cables. Two Ethernet connectors are provided: one for standard transceiver cable and one for ThinWire cable.

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 (MMJ) for the console terminal serial line unit (SLU)
- Ethernet ports:
 - One BNC-style connector for ThinWire cable
 - One 15-pin connector for standard Ethernet transceiver cable

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

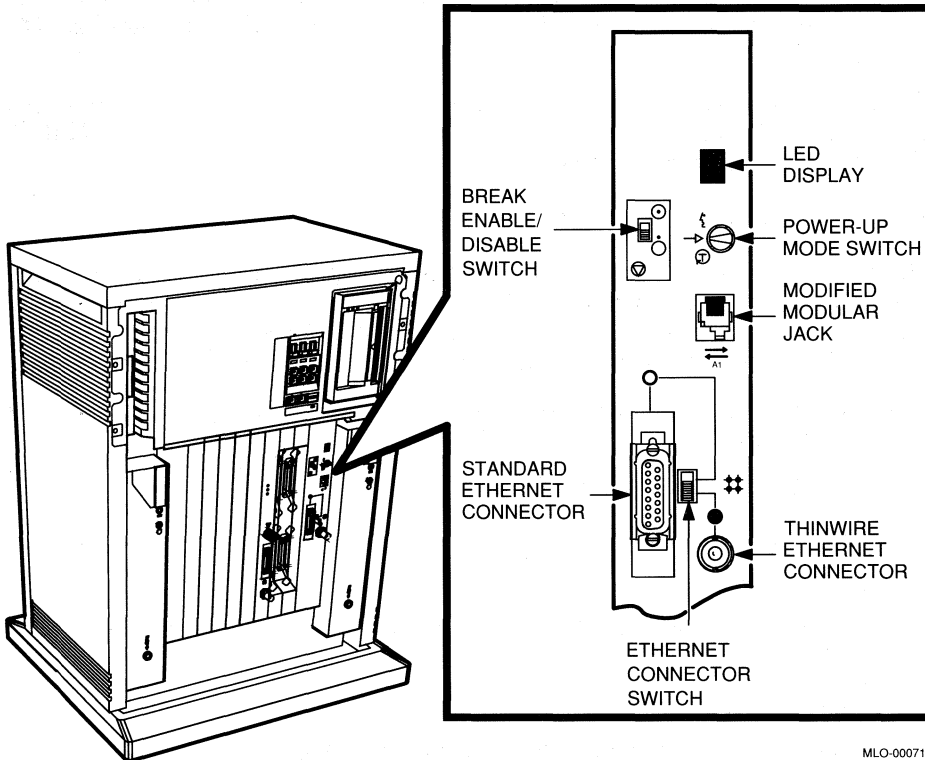
- Baud rate switch (discussed in the next section)
- Battery backup unit (BBU) for the time-of-year clock and language selection (see Section 1.1.2.4)

- Ethernet logic which supports selection of the standard Ethernet port or the ThinWire port.

1.1.3.1 Switches

The four switches on the CPU panel are the Break Enable/Disable switch, the Power-Up Mode switch, Ethernet connector switch, and the baud rate switch. The operation of these switches is discussed on the following pages.

Figure 1-1: CPU Cover Panel



MLO-000717

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. Until a default boot device is selected, the user is prompted for a boot device. 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 and for a boot device on initial power-up. Until a boot device is selected, the user is prompted for a boot device at each power-up. Once a boot device is selected, the user is prompted for language and for boot device at 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.

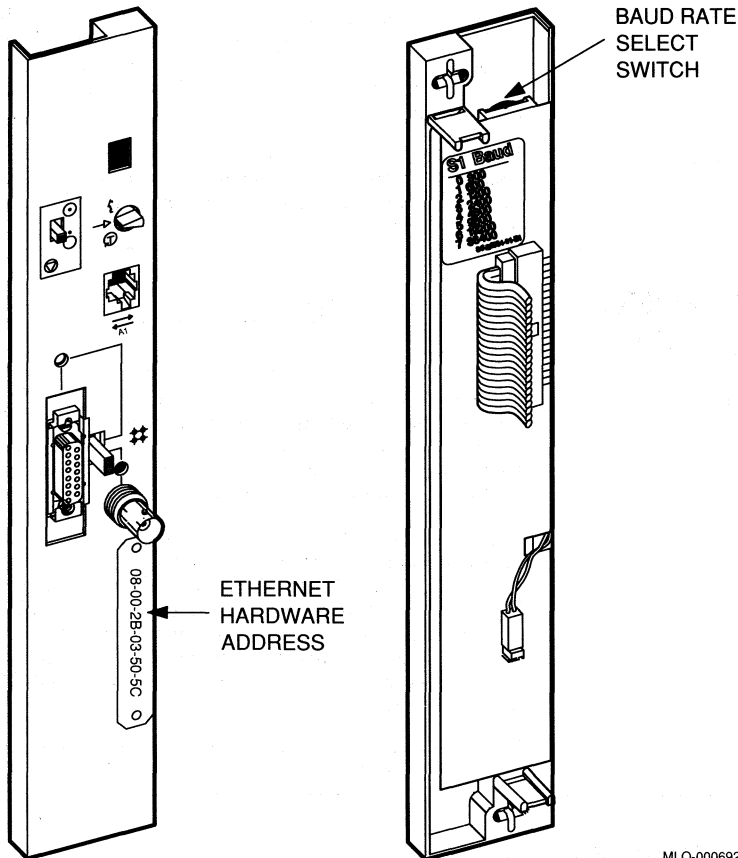
Ethernet Connector Switch

This 2-position switch enables you to choose the type of Ethernet connection. In the up position, the connector for a standard Ethernet transceiver cable is active. In the down position, the connector for a ThinWire Ethernet cable is active. Each connector has an associated indicator light that glows to indicate the active connector.

Baud Rate Switch (8-position rotary)

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

Figure 1-2: Changing the Baud Rate



MLO-000692

1. Turn off the system and remove the front panel of the enclosure.
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. With your other hand, 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. Tilt the top of the panel out as far as possible. The baud rate switch, a white circular switch, is just inside the top of the panel. A number from 0 to 7 is visible. See Table 1-2 to determine the correct switch setting for the baud rate you want. Rotate the switch to the desired setting.

Table 1-2: Baud Rate Switch Settings

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

¹Factory setting

6. Replace the cover panel by pressing the bottom of the panel back into 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.

1.1.3.2 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 countdown begins with F (15 in decimal) and ends with 3 if the processor enters console I/O mode (breaks enabled). The countdown ends with 0 if the processor has successfully booted (breaks disabled). Simultaneously, a countdown appears on the console terminal. See *Operation* for examples of successful power-on sequences, and *MicroVAX Troubleshooting and Diagnostics* for examples of problems you may encounter during power-on.

1.1.3.3 Console Terminal Connector

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

1.1.3.4 Battery Backup Unit (BBU)

A battery backup unit (BBU), located on the inside of the CPU cover panel, maintains the correct time-of-year and language selection on the CPU module 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.

1.1.3.5 Ethernet Logic

A printed circuit board and switch support the two Ethernet ports.

1.2 Base System Specifications

The base system includes a KA640-AA/BA processor and one to three MS650 memory modules.

1.2.1 KA640-AA/BA Processor Specifications

MicroVAX 3400 systems use the KA640-AA processor. VAXserver 3400 systems use the KA640-BA. The only difference is the -AA is for multiuser systems and the -BA is for single-user systems.

Central Processor	Specification
Clock rate	20 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

Central Processor	Specification
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 8192 entry "scatter gather" map registers
Termination	240 Ω

Memory Management and Control

Page size	512 bytes
Virtual address space	4 gigabytes
Physical memory space	28 Mbytes
Number of memory modules	3 maximum

Performance	Specification
Instruction prefetch buffer size	12 bytes
Cache	
Size	1 Kbyte
Speed	100 nanoseconds
Associativity	2-way set
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	Specification
--------------------	----------------------

Maximum I/O bandwidth

DMA Read	2.4 Mbytes/second
DMA Write	3.3 Mbytes/second

Ethernet Port	Specification
----------------------	----------------------

Supported protocols	Ethernet V2.0
Supported media types	Standard Ethernet and ThinWire Ethernet
Buffer size	64 Kbytes

DIGITAL Small Storage Interconnect (DSSI) Port

Maximum number of devices supported off the CPU	7
Data path width	8 bits
Maximum bandwidth	4 Mbytes/second
Buffer size	128 Kbytes

Console Serial Line	Specification
----------------------------	----------------------

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, 0.24 A
Power consumption	32.88 W
Bus loads	3.5 ac 1.0 dc

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-KA640-TM	KA640 CPU Module Technical Manual
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1.2.2 MS650 Memory Option

The 8-Mbyte MS650-AA memory option is available for MicroVAX 3400 and VAXserver 3400 systems. Up to three MS650-AA modules can be used in a system. The MS650-AA modules interface with the KA640 CPU through the MS650 memory interconnect, made up of the CD rows of slots 1 through 4 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	400 nanoseconds
Synchronous unmasked longword write	200 nanoseconds
Synchronous masked longword write	500 nanoseconds
Synchronous quadword read	600 nanoseconds

Ordering Information

MS650-AF	8-Mbyte field-installed kit ¹
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Configuration Information

Form factor	Quad height
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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Tested by KA640 boot/diagnostic ROM

¹50-pin CPU memory interconnect cable included.

Chapter 2

Option Specifications

This chapter describes the options currently available for MicroVAX and VAXserver 3400 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. Your DIGITAL service representative configures the option properly when installing the option in your system.

Self-maintenance customers can find information on setting CSR addresses and interrupt vectors in the *MicroVAX Hardware Information* volume of the *KA640 CPU Systems Maintenance*.

Descriptions of options in this chapter are grouped as follows:

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

Where applicable, the description of an option includes the following information:

- Functional information
- Ordering information
- Performance
- Configuration information
- Operating system support

- Diagnostic support
- Related documentation

2.1 Mass Storage Options

MicroVAX and VAXserver 3400 systems have the following mass storage options:

- RF30 fixed-disk drive
- TK70 tape drive
- TK50 tape drive
- TS05 tape drive (in auxiliary cabinet only)
- RV20 optical disk drive (in auxiliary cabinet only)

Each drive has a controller that directs its activity.

2.1.1 Disk Drives and Controllers

Up to three RF30 disk drives can be mounted in the MicroVAX or VAXserver 3400 system. The RF30 disk drive features a built-in controller.

2.1.1.1 RF30 Fixed-Disk Drive

The RF30 is a DSSI fixed-disk drive with a formatted capacity of 150 Mbytes.

Ordering Information

RF30-AF	RF30 drive kit
---------	----------------

Performance

Average seek time	22 milliseconds
Average rotational latency	8.33 milliseconds
Average access time	30.33 milliseconds
Peak transfer rate	12 Mbits/second

Storage capacity

User capacity	150 Mbytes
User capacity (blocks)	293,040

Physical Specifications

Width	14.60 cm (5.75 in)
Depth	20.45 cm (8.25 in)
Height	4.40 cm (1.75 in)
Weight	1.81 kg (4.0 lb)

Configuration Information

Form factor	Standard 5.25-in footprint
Power requirements	+5 Vdc, 1.10 A +12 Vdc, 0.80 A
Power consumption	15.1 W

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-RF30D-IM	RF30 Disk Drive Installation Manual
EK-RF30D-UG	RF30 Disk Drive User's Guide

2.1.2 Tape Drives and Controllers

MicroVAX and VAXserver 3400 systems support the following tape drives (and their controllers):

- TS05 tape drive (in auxiliary cabinet only)
- TK70 tape drive
- TK50 tape drive

2.1.2.1 TSV05 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
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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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Not supported as of Version 3.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-TSV05-UG	TSV05 Tape Transport System User's Guide
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2.1.2.2 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/inch
Number of tracks	9
Storage capacity	40 Mbytes formatted

Ordering Information

TSV05-SB	TSV05 tape drive subsystem
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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
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Operating System Support

VMS	Version 5.0–2A and later
ULTRIX–32	Version 3.0 and later
VAXELN	Not supported as of Version 3.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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

2.1.2.3 TQK70 Controller

The TQK70 controller module provides the interface between the TK70 tape drive and the Q22-bus. The controller uses the Tape Mass Storage Control Protocol (TMSCP).

Functional Information

Controller protocol	TMSCP
Supported drives	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-byte 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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

2.1.2.4 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)

Physical Specifications

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

2.1.2.5 TQK50 Controller

The TQK50 controller module provides the interface between the TK50 tape drive and the Q22-bus. The controller uses the Tape Mass Storage Control Protocol (TMSCP).

Functional Information

Controller protocol	TMSCP
Supported drive	TK50
Drives per controller	1
Drive interconnect	Direct

Ordering Information

TQK50-AA	TQK50 controller subsystem
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Performance

Data throughput rate	45 Kbytes/second
Read/Write data transfers	Up to 8-byte burst mode DMA

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 2.9 A +12 Vdc, 0.0 A
Power consumption	14.5 W
Bus loads	2.8 ac 0.5 dc

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

2.1.2.6 TK50 Tape Drive

The TK50 is a streaming tape drive subsystem that can store up to 95 Mbytes on a tape cartridge for backup data storage.

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
Read/Write method	Serpentine
Recording density	1710 bits/cm (6667 bits/inch)
Number of tracks	22
Storage capacity	94.5 Mbytes formatted

Physical Specifications

Height	8.25 cm (3.25 in)
Width	14.60 cm (5.75 in)
Depth	21.44 cm (8.44 in)
Weight	2.27 kg (5 lb)

Ordering Information

Included as part of base system

Performance

Tape start time	300 milliseconds maximum
Tape speed	2925 cm (75 in)/second
Streaming data rate	62 Kbytes/second
Access time (from insertion of new tape)	35 minutes maximum

Configuration Information

Form factor	Standard 5.25-inch footprint
Power requirements	+5 Vdc, 1.35 A +12 Vdc, 2.4 A
Power consumption	35.6 A
Bus loads	0.0 ac 0.0 dc

Operating System Support

VMS	Version 5.0–2A and later
ULTRIX–32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

Self-tests	Yes
MicroVAX Diagnostic Monitor	Revision 2.3 and later

Related Documentation

EK–LEP05–OM	TK50 Tape Drive Subsystem Owner's Manual
EK–OTK50–TM	TK50 Tape Drive Subsystem Technical Manual

2.1.3 Optical Disk Drives and Controllers

MicroVAX and VAXserver 3400 systems support the RV20 optical disk drive (and its controller).

2.1.3.1 KLESI Controller

The KLESI controller is used to interface the RV20 optical disk drive.

Functional Information

Controller protocol	TMSCP
Supported drive	RV20
Drives per adapter	1
Drive interconnect	Direct
Controllers per system	1 maximum

Ordering Information

M7740	KLESI controller module
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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 5.0-2A and later
ULTRIX-32	Not supported as of Verions 2.4
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-LESIB-UG	KLESI-B Module User's and Installation Guide
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2.1.3.2 RV20 Optical Disk Drive

RV20 optical disk drives are available for MicroVAX and VAXserver 3400 systems. Up to four RV20 optical disk drives can be mounted in an auxiliary cabinet and connected to the MicroVAX/VAXserver 3400 system.

The RV20 has a storage capacity of 1 gigabyte per side.

Ordering Information

RV20-AF	RV20 optical disk drive kit
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Performance

Maximum track seek (Inner to outer track, no error recovery)	330 milliseconds
Track to track (Forward and Reverse)	4 milliseconds
Average rotational latency	62.5 milliseconds
Average access time (Random)	150 milliseconds
Transfer rate (I/O rate)	1.33 Mbytes/second
Maximum average data transfer rate (disk rate)	262 Kbytes/second

Storage Capacity

User capacity	1 gigabyte per side (1000 Mbytes)
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Physical Specifications

Width	48.3 cm (19.0 in)
Depth	65.0 cm (25.6 in)
Height	13.0 cm (5.125 in)
Weight	30.0 kg (60.0 lb)

Configuration Information

Form factor	Rack-mountable
Power requirements	88 to 132 Vac 176 to 264 Vac 50/60 \pm 3 Hz
Power consumption (maximum)	200 W

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	N/A
VAXELN	N/A

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-ORV20-IN	RV20 Optical Disk Subsystem Installation Guide
EK-ORV20-OM	RV20 Optical Disk Subsystem Owner's Manual

2.2 Communications Options

Communications options supported by MicroVAX and VAXserver systems include asynchronous serial controllers, synchronous serial controllers, 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) <ul style="list-style-type: none">• 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	<p>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.</p> <ul style="list-style-type: none">• 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	<p>Office cable—data only, 6-conductor, terminated with modified modular plugs</p> <ul style="list-style-type: none">• BC16E-10: 3 m (10 ft)• BC16E-25: 7.6 m (25 ft)• BC16E-50: 15.2 m (50 ft)
H8572	<p>Cable extender. Null modem cable terminated with modified modular jacks.</p>
H8571-A	<p>25-pin passive adapter¹</p>
H8571-B	<p>9-pin passive adapter¹</p>
H3105	<p>Active adapter. Converts EIA RS-232-D signals to DEC 423 signals.</p>

Performance

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

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

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 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

Operating System Support

VMS	Version 5.0–2A and later
ULTRIX–32	Version 3.0 and later
VAXELN	Version 3.2 and later

²38400 baud rate is not supported by DIGITAL operating systems.

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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 which can operate over longer distances than those of the CXA16 lines, due to RS422 support.

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) <ul style="list-style-type: none">• 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.
Modem control	None

Ordering Information

CXB16-AF	<p>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.</p> <ul style="list-style-type: none">• 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	<p>Office cable—data only, 6-conductor, terminated with modified modular plugs</p> <ul style="list-style-type: none">• BC16E-10: 3 m (10 ft)• BC16E-25: 7.6 m (25 ft)• BC16E-50: 15.2 m (50 ft)
H8572	<p>Cable extender. Null modem cable terminated with modified modular jacks.</p>

Performance

Transmit data transfers	<p>Single character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode.</p> <p>Single character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode.</p>
Receive data transfers	<p>Single character programmed transfers in both DHV11 and DHU11 modes.</p>
Transmit buffer size	<p>One character for programmed transfers in DHV11 mode</p> <p>64-character FIFO for programmed transfers in DHU11 mode</p> <p>64-character FIFO for DMA transfers in DHU11 and DHV11 modes</p>
Receive buffer size	<p>256-character FIFO in DHV11 and DHU11 modes</p>

Performance

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 5.0–2A and later
ULTRIX–32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

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

¹38400 baud rate is not supported by DIGITAL operating systems.

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 on all eight 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) <ul style="list-style-type: none">• 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. <ul style="list-style-type: none">• BC19N-12 cable assembly—concentrates four 11-conductor cables with 25-pin male D-connectors into one 44-conductor cable terminated by a 50-pin male CHAMP connector.
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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
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

¹38400 baud rate is not supported by DIGITAL operating systems.

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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

Functional Information

Supported data formats	8 programmable formats (each with 1 start bit) <ul style="list-style-type: none">• 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
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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

¹The 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 5.0-2A and later
ULTRIX-32	N/A
VAXELN	N/A

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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 CXF16 and CXF32 Asynchronous Controllers

The CXF16 and CXF32 are asynchronous multiplexers that provide full-duplex serial data channels on Q-bus systems. The CXF16 supports one 16-line port. The CXF32 supports two 16-line ports.

The CXF16 and CXF32 options consist of one module (installed in the system), and either one fiber-optic cable and one terminal concentrator (CXF16), or two fiber-optic cables and two terminal concentrators (CXF32). The fiber-optic cable(s) connect the module in the system to the terminal concentrator. The terminal concentrator plugs directly into a wall outlet.

Functional Information

Supported line interfaces	DEC RS-423
Split speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	<ul style="list-style-type: none">• 5, 6, 7, or 8 data bits• 1, 1.5 (at 5 bits) or 2 stop bits• Odd, even, or no parity
Modem control	None

Ordering Information

CXF16-AA	1 CXF32-M controller, 1 H3123-A terminal concentrator (120 Vac), 1 BN25J-10 10-meter cable
CXF16-AB	1 CXF32-M controller, 1 H3123-B terminal concentrator (240 Vac), 1 BN25J-10 10-meter cable
CXF32-AA	1 CXF32-M controller, 2 H3123-B terminal concentrators (120 Vac), 2 BN25J-10 10-meter cables
CXF32-AB	1 CXF32-M controller, 2 H3123-B terminal concentrators (240 Vac), 2 BN25J-10 10-meter cables

Performance

Transmit data transfers	DMA or single-character programmed transfers
Receive data transfers	DMA or single-character programmed transfers
Transmit buffer size	64-character FIFO
Receive buffer size	256-character FIFO
Supported baud rates	Programmable baud rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200, 38400

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 2.0 A +12 Vdc, 0.0 A
Power consumption	10.0 W
Bus loads	3.7 ac 1.0 dc
Module connectors	2 (2.5 mm) bayonet (ST) per end of each fiber-optic cable
Terminal concentrator connectors	1 DEC 423 modified modular jack (MMJ) per terminal line connection

Operating System Support

VMS	Version 4.6 and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-DHF11-UG	CXF16/CXF32 DHF11/H3123 User's Guide
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2.2.1.6 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
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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 lb)

Operating System Support

Downline-load host support	DECnet VAX
Operational host support	Version 5.0 VMS and later

Related Documentation

AA-HL77B-TK	DSRVB DECserver 200 User's Guide
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¹You must order the software appropriate for your processor. See the *Networks and Communications Buyer's Guide*.

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

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 DSV11 Synchronous Interface

The DSV11 provides two high-speed synchronous connections to DECnet, SNA, and X.25 networks.

Functional Information

Supported line interface	EIA RS-232-C/CCITT V.28 EIA RS-423-A/CCITT V.10 X.26 EIA RS-422-A/CCITT V.11 X.27 CCITT V.24, V.35, V.36, and V.21
Supported protocols	SDLC/HDLC DDCMP BISYNC
Operating mode	Full and half duplex
Character size	Program selectable (5-8 bits with character-oriented protocols and 108 bits with bit-oriented protocols)
Modem support	Full
Supported modems	All DIGITAL modems and the Bell 200 series

Ordering Information

DSV11-SF	DSV11 field-installed kit. Includes BC19F adapter cable.
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Performance

Transmit data transfers	Block mode DMA transfers
	Programmed I/O for BISYNC protocol
Receive data transfers	Block mode DMA transfers
Transmit/Receive buffer size	Approx. 6.5 Kbytes
Data rate	126 Kbits/second

Configuration Information

Form factor	Quad height with integral recessed cover panel
Power requirements	+5 Vdc, 6.5 A (typical) +12 Vdc, 0.875 A (typical)
Power consumption	43.0 W
Bus loads	3.9 ac 1.0 dc
Module connectors	2 female 50-pin Amphenol connectors

Operating System Support

VMS	Version 5.0–2A and later
ULTRIX–32	Not supported as of Version 3.0
VAXELN	Not supported as of Version 3.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.21 and later
Self-test	Yes

Related Documentation

EK–DSV11–UG	DSV11–S User Guide
EK–DSV11–TD	DSV11 Technical Manual

2.2.2.2 DMV11 Synchronous Controller

The DMV11 is an intelligent synchronous communications controller that provides high-speed communications for Q-bus systems in distributed networks. The DMV11 is available in three system options, each with a different interface capability. The option you choose depends on the interface requirements of your system.

Functional Information

Supported line interfaces	EIA RS-232-C/CCITT V.24, V.28 CCITT V.35/DDS EIA RS-423-A
Supported protocol	Digital Data Communications Message Protocol (DDCMP) in either point-to-point or multipoint mode
Operating mode	Full or half-duplex
Modem support	Full or limited
Supported modems	All DIGITAL modems and the Bell 200 series

Ordering Information

**EIA RS-232-C/
CCITT V.24, V.28 interface**

DMV11-SF	DMV11 field-installed kit
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BC19D-02	External modem cable
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CCITT V.35/DDS interface

DMV11-SF	DMV11 field-installed kit
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BC19F-02	External modem cable
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EIA RS-423-A interface

DMV11-SF	DMV11 field-installed kit
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BC19E-02	External modem cable
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Performance

Transmit/Receive data transfers	Single DMA transfers
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Transmit/Receive buffer size	784 bytes
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Data rates

DMV11-SA	Up to 56 Kbits/second
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DMV11-SF	Up to 56 Kbits/second
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Configuration Information

Form factor	Quad height
Power requirements	
DMV11-S	+5 Vdc, 4.7 A (typical) +12 Vdc, 0.38 A (typical)
Power consumption	28.1 W
Bus loads	2.0 ac 1.0 dc

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Not supported as of Version 3.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	None

Related Documentation

EK-DMV11-UG	DMV11 Synchronous Controller User's Guide
EK-DMV11-TM	DMV11 Synchronous Controller Technical Manual

2.2.2.3 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
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Functional Information

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
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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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Not supported as of Version 3.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	None

Related Documentation

EK-DPV11-UG	DPV11 Synchronous Interface User's Guide
EK-DPV11-TM	DPV11 Technical Manual

2.2.2.4 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
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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 5.0-2A and later
ULTRIX-32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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.

NOTE: *The MicroVAX 3400 and VAXserver 3400 systems include an Ethernet controller on the CPU module. One of the following controllers is only necessary if the system requires a second Ethernet connection.*

2.2.3.1 DESQA Ethernet Controller

The DESQA network controller provides a high-speed asynchronous connection between a Q-bus system and a Local Area Network (LAN) based on Ethernet or IEEE 802.3. The DESQA supports either standard or ThinWire Ethernet cabling.

Functional Information

Supported protocols	Ethernet, IEEE 802.3 Maintenance Operation Protocol (MOP)
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Ordering Information

DESQA-SF	DESQA field-installed kit
External cable (standard)	BNE3B or BNE3D
External cable (ThinWire)	BC16M

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	Quad height
Power requirements	+5 Vdc, 2.4 A

Configuration Information

	+12 Vdc, 0.22 A
Power consumption	14.64 W
Bus loads	3.3 ac 0.5 dc
Module connectors (standard)	One 15-pin D-type
Module connectors (Thinwire)	T-connector to BNC connector on DESQA

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-DESQA-TM	DESQA Technical Manual
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2.2.3.2 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.

Functional Information

Supported protocol	Ethernet, IEEE 802.3 Maintenance Operation Protocol (MOP)
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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
Module connectors	One 10-pin D-type

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-DELQA-UG	DELQA Ethernet User's Guide
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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. <ul style="list-style-type: none">• 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 Not supported as of Version 3.0
VAXELN Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor Revision 2.3 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

Functional Information

	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
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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

Configuration Information

Bus loads	2.0 ac 1.0 dc
Module connectors	Two 40-pin connectors

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-DRVWA-UG	DRV11-WA General Purpose DMA User's Guide
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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

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-IEUQ1-UG	IEU11-A/IEQ11-A User's Guide
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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, 0.0 A
Power consumption	25.0 W

Performance

Bus loads	4.6 ac
	1.0 dc

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-IBQ01-UG	DECscan BITBUS Controller User's Guide
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.

Functional Information

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	Tabletop enclosure

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	0.05 Ω typical
Linearity (0–10 V)	$\pm 1/2$ LSB; ± 1.2 mV at full-scale range
Differential linearity	$\pm 1/2$ 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 μ s to 0.1% for a p-p output change of 20 V

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

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 5.0–2A and later using VAXlab Software Library
ULTRIX–32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

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

Functional Information

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
UDIP-BA ¹	Universal data interface panel (UDIP) mounting box
UDIP-AB	Universal data interface panel (UDIP) for ADV11-S
UDIP-TA	Tabletop 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 M Ω minimum, 10 pF maximum
On channels	100 M Ω minimum, 100 pF maximum
Power off	1 K Ω in series with a diode

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

Performance

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, offset binary, or 2's complement
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 ±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 ±1/2 LSB
Stability (temperature coefficient)	±30 ppm at maximum C/°
Stability (long term)	±0.05% change in 6 months
System accuracy (gain=1)	Input voltage to digitized value to within ±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 5.0–2A and later using VAXlab Software Library
ULTRIX–32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK–AV110–UG	Q-Bus DMA Analog System User's Guide
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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
UDIP-TA	Tabletop 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-K Ω 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

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

Performance

Duration	Approximately 500 nanoseconds
Line driver	TTL-compatible, open collector circuit with a 470- Ω pull-up resistor to +5 V
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 System Support

VMS	Version 5.0-2A and later using VAXlab Software Library
ULTRIX-32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-AXVAA-UG	AXV11/KWV11 Module User's Guide
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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

Functional Information

Common mode rejection ratio	80 dB at maximum range
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	Tabletop enclosure

Performance

A/D converter performance

Linearity	To within $\pm 1/2$ LSB
Stability (temperature coefficient)	± 30 ppm at maximum C°
Stability (long term)	$\pm 0.05\%$ change in 6 months
Conversion time	25 μ s 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
Output impedance	0.1 Ω
Differential linearity	To within $\pm 1/2$ LSB

Performance

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 5.0-2A and later using VAXlab Software Library
ULTRIX-32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-AXVAA-UG	AXV11/KWV11 Module User's Guide
MP-011291-00	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)
UDIP-TA	Tabletop 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)

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

Performance

Input impedance	10 Mohms, 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 μ V p-p
A/D converter performance	
Linearity	
Differential	0.2 to 2 LSB
Integral	1.5 LSB, maximum
Scale drift	15 ppm/C typical
System throughput	
Maximum single channel sample rate	250 KHz
Maximum multichannel rate to ensure $\pm 1/2$ LSB accuracy	200 KHz

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 5.0 A (typical) +12 Vdc, 0.0 A
Power consumption	25.0 W
Bus loads	2.5 ac 0.5 dc

Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Not supported as of Version 3.0
VAXELN	Not supported as of Version 3.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-153AA-UG	ADQ32 Analog-to-Digital Converter User's Guide
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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 memories (ROMs). By placing appropriate programmed ROMs onto the module, that data or program will always be available to the CPU.

Ordering Information

MRV11-D	MRV11-D module
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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 5.0-2A and later
ULTRIX-32	Not supported as of Version 3.0
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-MRV1D-UG	MRV11-D Universal PROM Module User's Guide
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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 or 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
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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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	No

Related Documentation

EK-LPV11-OP	LPV11 Printer User's Manual
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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
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)

Performance

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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 and later
Self-tests	Yes

Related Documentation

EK-0LG01-IN	LG01 600 LPM Text Printer Installation/Operator's Manual
EK-0LG01-UG	LG01 600 LPM Text Printer User's Guide
EK-0LG01-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
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 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

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
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Performance

	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
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)
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Operating System Support

VMS	Version 5.0-2A and later
ULTRIX-32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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
Print speed	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 nonprinting 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 5.0–2A and later
ULTRIX–32	Version 3.0 and later
VAXELN	Version 3.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 2.3 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–001	LP29 Pocket Service Guide

2.5.2 Dot Matrix Printers

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

- LA75 Companion Printer
- LA100 Letterwriter
- LA120 Printer/Terminal (DECwriter III)
- LA210 Letterprinter

2.5.2.1 LA75 Companion Printer

The LA75 Companion Printer 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
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Physical Specifications

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-0LA75-UG	Installing and Using the LA75 Companion Printer
EK-0LA75-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

Paper

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 Specifications

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 Printer/Terminal 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
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 Specifications

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
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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

Communications

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 Specifications

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 and VAXserver 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 Specifications

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

Communications

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 Specifications

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 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

Performance

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	2 Kbytes of input buffer space

Power Requirements

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

Performance

	ReGIS (LN03R)
RAM	LN03: no on-board RAM; accepts two RAM cartridges LN03 PLUS: 1 Mbyte on-board RAM; accepts two RAM cartridges
ROM	LN03R: 2 Mbytes on-board RAM; accepts two RAM cartridges 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 Specifications

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-0LN03-UG	Installing and Using the LN03
EK-0LN03-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. Your DIGITAL service representative configures the options when installing them and 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 Hardware Information* volume of the *KA640 CPU Systems Maintenance*.

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
ADQ32-SA	A030-PA	5.0	0.0	25.0
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
CXF16	M3123	2.0	0.0	10.0
CXF32	M3123	2.0	0.0	10.0
CXY08-AA/AF	M3119-YA	1.3	0.14	8.2
DELQA-SA/SF	M7516-PA	1.5	0.5	23.5
DESQA-SA/SF	M3127	2.4	0.22	14.64
DFA01-AA/AF	M3121-00	1.97	0.40	14.65
DMV11-SA/SF	M8053	4.7	0.38	28.1
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
DSV11-SA/SF	M3108-PA	6.5	0.875	43.0
IBQ01-SA/SF	M3125-PA	5.0	0.0	25.0
IEQ11-SA/SF	M8634-PA	3.5	0.0	17.5
KA640-AA/BA	M7624-AA/BA	6.0	0.24	32.88
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
RF30		1.10	0.80	15.1

Table 3-1 (Cont.): Power Requirements

Option	Module	Current (Amps) +5 V	Current (Amps) +12 V	Power (Watts)
RV20		2 to 21	0.2 to 3.9	175
TK50S-AA		1.35	2.4	35.6
TK70S-AA		1.3	2.4	35.3
TQK50-SA	M7546	2.9	0.0	14.5
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. Use the worksheet as follows:

1. In the Module column, list all options and mass storage devices currently installed in your system, except the controller for the 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 RF30 disk drive.
2. List the options and mass storage devices you would like to add to the system.
3. List the controller for the TK70 tape drive 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 limit listed below the 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 arranging bus and cable access to all devices.

Figure 3-1: Configuration Worksheet

PRIMARY POWER SUPPLY

SLOT	MODULE	Current (Amps)		Power (Watts)
		+5 Vdc	+12 Vdc	
1	M7624	6.0	0.24	32.88
2	M7621-A	2.7	0.0	13.5
3				
4				
5				
6				
MASS STORAGE:				
	TK70	1.3	2.4	35.3
	FIXED DISK 0			
	Total these columns:			
	Must not exceed:	33.0 A	7.6 A	230.0 W

SECONDARY POWER SUPPLY

SLOT	MODULE	Current (Amps)		Power (Watts)
		+5 Vdc	+12 Vdc	
7				
8				
9				
10				
11				
12				
MASS STORAGE:				
	FIXED DISK 1			
	FIXED DISK 2			
	Total these columns:			
	Must not exceed:	33.0 A	7.6 A	230.0 W

MLO-000721

Index

A

- AAV11-S
 - specifications, 2-51
- ADQ32
 - specifications, 2-62
- ADV11-S
 - specifications, 2-53
- Asynchronous serial controllers,
 - 2-17
- AXV11-C
 - specifications, 2-59

B

- Base system
 - components, 1-1
 - specifications, 1-1
- Battery backup unit (BBU), 1-10
- Baud rates
 - changing, 1-7
 - supported, 1-9
- Baud rate switch
 - location, 1-7
- BBU
 - See* Battery backup unit
- BOOT command, 1-5
- Break Enable/Disable switch
 - on the CPU panel, 1-7

C

- Communications options, 2-17
 - CXA16 asynchronous controller,
 - 2-17
 - CXB16 asynchronous controller,
 - 2-20
 - CXF16 asynchronous controller
 - with integral modem, 2-28

- Communications options (cont'd.)
 - CXF32 asynchronous controller
 - with integral modem, 2-28
 - CXY08 asynchronous controller,
 - 2-23
 - DFA01 asynchronous controller
 - with integral modem, 2-25
 - DPV11 synchronous controller,
 - 2-37
- Configuration worksheet, 3-3
- Console program, 1-3
- Console terminal connector
 - on CPU cover panel, 1-10
- Control and Status Register (CSR),
 - 2-1
- Controls
 - on the CPU panel, 1-5
- CSA16 asynchronous controller
 - specifications, 2-17
- CSR
 - See* Control and Status Register
- CXA16
 - specifications, 2-17
- CXB16 asynchronous controller
 - specifications, 2-20
- CXF16 asynchronous controller
 - specifications, 2-28
- CXF32 asynchronous controller
 - specifications, 2-28
- CXY08 asynchronous controller
 - specifications, 2-23

D

- DELQA
 - specifications, 2-42
- DESQA
 - specifications, 2-41

DFA01
 specifications, 2-25
DHU11 mode, 2-17
DHV11 mode, 2-17
Digital Small Storage Interconnect
 See DSSI, 1-1
Disk drives, 2-2
 RF30, 2-2
DMV11
 specifications, 2-35
Dot matrix options
 LA100 Letterwriter, 2-80
 LA120 printer/terminal
 (DECwriter III), 2-82
 LA210 Letterprinter, 2-84
 LA75 Companion printer, 2-77
DPV11
 specifications, 2-37
DRQ3B parallel interface
 specification, 2-45
DRV1W
 specifications, 2-46
DSRVB DECserver 200
 specifications, 2-30
DSSI
 architecture, 1-2
 bus characteristics, 1-2
DSV11 synchronous interface
 specifications, 2-33

E

Ethernet connector switch, 1-7
Expanding
 a system, 3-1
Expansion capacity
 determining, 3-1

I

IBQ01
 specifications, 2-50
IEQ11
 specifications, 2-48

Ink jet printer options
 LJ250, 2-93
 LJ252, 2-93
Interrupt vector, 2-1

K

KA640 firmware, 1-3
KLESI controller
 specifications, 2-13
KMV1A controller
 specifications, 2-39
KWV11 real-time clock
 specifications, 2-56

L

LA100 Letterwriter
 specifications, 2-80
LA120 (DECwriter II)
 specifications, 2-82
LA210 Letterprinter
 specifications, 2-84
LA75 Companion Printer
 specifications, 2-77
Language inquiry
 Power-Up Mode setting, 1-7
Laser printer options
 LN03 PLUS text and graphics
 printer, 2-97
 LN03R SCRIPTPRINTER, 2-97
 LN03 text printer, 2-97
LED display
 on CPU cover panel, 1-9
Letter-quality printer options
 LQP02 printer, 2-87
 LQP03 printer, 2-88
LG01 text printer
 specifications, 2-68
LG02 text and graphics printer
 specifications, 2-70
LG31 printer
 specifications, 2-71
Line printer options, 2-67
 LG01 text printer, 2-68

Line printer options (cont'd.)

- LG02 text and graphics printer, 2-70
- LJ250/LJ252 Companion Color Printers
 - specifications, 2-97
- LN03 laser printer
 - specifications, 2-97
- LN03 PLUS laser printer
 - specifications, 2-97
- LN03R SCRIPTPRINTER
 - specifications, 2-96
- LP29 printer
 - specifications, 2-73
- LPV11-SA printer interface
 - specifications, 2-67
- LQP02 printer
 - specifications, 2-87
- LQP03 printer
 - specifications, 2-88

M

- Mass storage controllers
 - KLESI, 2-13
 - TQK70, 2-7
 - TSV05, 2-4
- Memory Option, 1-13
- Modified Modular Jack (MMJ)
 - console connector on CPU cover panel, 1-10
- MRV11-D programmable read-only memory module
 - specifications, 2-65

N

- Network controllers, 2-41

O

- Optical disk drive and controller, 2-13

P

- Parallel interface
 - DRQ3B, 2-45
- Power-on countdown, 1-3
- Power-Up Mode switch
 - on the CPU panel, 1-7
- Printers and printer interfaces
 - types, 2-67

R

- Real-time controllers, 2-45
- RF30 disk drive specifications, 2-2
- Run
 - Power-Up Mode setting, 1-7
- RV20 optical disk drive specifications, 2-14

S

- Switches
 - on the CPU panel, 1-6
- Synchronous serial controllers, 2-33

T

- Tape drives
 - TK70, 2-8
 - TS05, 2-5
- Tape drives and controllers, 2-4
- Test
 - Power-Up Mode setting, 1-7
- Time-of-year clock, 1-10
- TK50 tape drive
 - specifications, 2-11
- TK70 tape drive
 - specifications, 2-8
- TQK50 controller
 - specifications, 2-10
- TQK70 controller
 - specifications, 2-7
- TS05 tape drive, 2-5
- TSV05 tape drive controller, 2-4