VAX 4000 Model 300

digital

Technical Information

Order Number: EK–337AA–TI–001

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Order Number EK–337AA–TI–001

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Preface

This manual provides a summary of technical information about the VAX 4000 Model 300 system.

The manual is organized as follows:

- Chapter 1 describes the base system and lists specifications for the KA670–AA/–BA CPU module and MS670–BA memory module.
- Chapter 2 describes optional components available for your system and lists their specifications.
- Chapter 3 contains information on expanding your system.

NOTE: *You will find a Glossary in the Operation Manual to help with word definitions and acronyms.*

Conventions

The following conventions are used in this manual:

Convention	Meaning
Return	A key name is shown enclosed to indicate that you press a named key on the keyboard.
Ctrl/x	A sequence such as Ctrl/x indicates that you must hold down the key labeled Ctrl while you press another key.
BOLD	This bold type indicates user input. For example: >>> **BOOT MUAO** This line shows that the user must enter BOOT MUAO at the console prompt.
NOTE	Notes provide general information about the current topic.
CAUTION	Cautions provide information to prevent damage to equipment or software. Read these carefully.
WARNING	Warnings provide information to prevent personal injury. Read these carefully.

Chapter 1
Base System Description

This chapter describes the VAX 4000 Model 300 base system, including the following:

- Power-on self-tests
- Digital Storage System Interconnect (DSSI) architecture
- Specifications for the KA670–AA/–BA CPU and MS670–BA memory

1.1 System Overview

All VAX 4000 Model 300 base system components are housed in a BA440 enclosure, which contains a 12-slot backplane.

Each base system contains the following:

- A KA670–AA/–BA (L4000–A/–B) central processing unit (CPU) module
- From one to four MS670–BA memory modules.

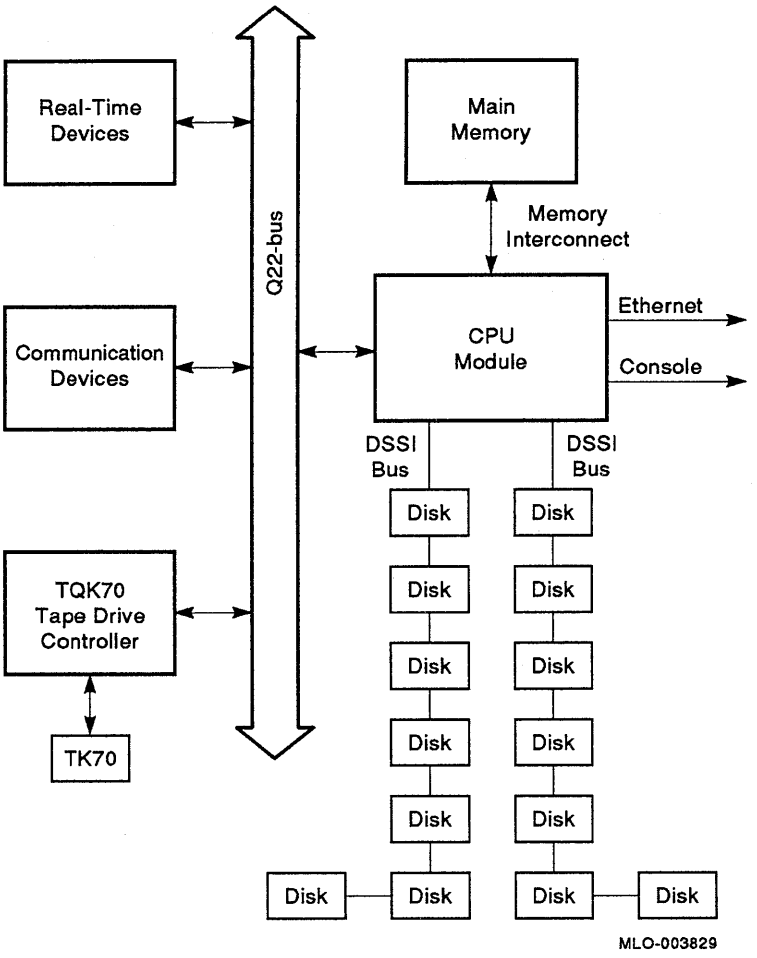
The base system modules are located in the following BA440 card slots:

- Any MS670–BA memory modules are installed in slots 1 through 4.
- The KA670 CPU module is installed in slot 5.

The base system operates from the KA670 CPU firmware and the controls on the console module. The firmware is described in Section 1.2. Base system operation also integrates Digital Storage System Interconnect (DSSI) technology, which is discussed in Section 1.5.

Figure 1–1 is a block diagram of the VAX 4000 Model 300 system.

Figure 1–1: VAX 4000 Model 300 Block Diagram



1.2 Firmware Overview

Two electrically programmable read-only memory (EPROM) chips on the KA670 CPU module contain the firmware. This firmware consists of the following three major programs, which perform the system power-on self-tests and diagnostics:

- 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. In a processor halt, processor control passes to the console program and instruction execution continues. The standard VAX console functionality is emulated whenever you execute a program in ROM.

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

- You power-on the system.
- You press the Restart button.
- You assert the Q22-bus BHALT signal by pressing the Halt button.
- You enter a break when the Break Enable/Disable switch is set to enable.
- A HALT instruction is executed.
- A system error occurs.

1.3 Power-On

At power-on, the console program determines the console device type and console language, then runs the self-tests for the CPU and memory. You choose the console language when you perform the set-up operations during your console terminal installation procedure.

You determine the type of power-on mode by setting the Power-On Mode switch on the CPU console module. See your *VAX 4000 Dual-Host Systems* manual for the following power-on information:

- Power-on procedures
- Power-On Mode and Break Enable/Disable switch settings
- Examples of successful power-on sequences
- Boot and autoboot procedures

See the *VAX 4000 Troubleshooting and Diagnostics* manual for examples of problems you may encounter during power-on.

1.4 Console I/O Mode Overview

If you set the Break Enable/Disable switch on the console module to enable, the console program enters Console I/O mode after the power-on self-tests are completed successfully. The console program also enters Console I/O mode in response to any external halt condition.

CAUTION: *Do not press the Restart button while the console program is in console mode. Doing so destroys the system state and prevents normal operation.*

Console I/O mode allows you to control the system by typing commands at the console prompt (>>>). You may enter these commands in either uppercase or lowercase letters. Enter each command, then press Return.

1.4.1 Control Characters in Console I/O Mode

Table 1–1 lists the keypad control characters that have special meaning in Console I/O mode.

Table 1–1: Console I/O Mode Control Characters

Character	Action
Return also <CR>	The carriage return ends a command line. No action is taken on a command until after it is terminated by a carriage return. A null line terminated by a carriage return is treated as a valid, null command. No action is taken, and the console prompts for input. Carriage return is echoed as carriage return, line feed (<CR><LF>).
X (rubout)	When you press X (rubout), the console deletes the previously typed character. The resulting display differs, depending on whether the console is a video or a hardcopy terminal. **For hardcopy terminals**, the console echoes a backslash (\) followed by the character being deleted. If you press additional rubouts, the additional deleted characters are echoed. If you type a non-rubout character, the console echoes another backslash, followed by the character typed. The result is to echo the characters deleted, surrounding them with backslashes. For example: EXAMI;EXXNE<CR> The console echoes: EXAMI;E\E;\NE<CR> The console sees the command line: EXAMINE<CR> **For video terminals**, the previous character is erased and the cursor is restored to its previous position. The console does not delete characters past the beginning of a command line. If you press more rubouts than there are characters on the line, the extra rubouts are ignored. A rubout entered on a blank line is ignored.
Ctrl/A or F14	Toggles insertion/overstrike mode for command line editing. By default, the console powers up to overstrike mode.
Ctrl/C	Echoes ^C<CR> and aborts processing of a command. Has no effect as part of a binary load data stream. Clears Ctrl/S and re-enables output stopped by Ctrl/O.
Ctrl/D or ←	Moves the cursor one position to the left.
Ctrl/E	Moves the cursor to the end of the line.
Ctrl/F or →	Moves the cursor one position to the right.
Ctrl/B, ↑, or ↓	Recalls the previous commands.
Ctrl/H, X (rubout), or F12	Deletes the previously typed character. Same function as X (rubout), above.
Ctrl/O	Ignores transmissions to the console until you enter Ctrl/O. Echoes ^O when disabling output, which is not echoed when it re-enables output. Output is re-enabled if the console prints an error message, or if it prompts for a command from the terminal. Output is also enabled by entering Maintenance mode: press Break or enter Ctrl/C.
Ctrl/Q	Resumes output to the console terminal. Not echoed.

Table 1–1 (Cont.): Console I/O Mode Control Characters

Character	Action
Ctrl/R	Echoes <CR><LF>, followed by the current command line. Can be used to improve the readability of a command line that has been heavily edited.
Ctrl/S	Stops output to the console terminal until you enter Ctrl/Q. Not echoed.
Ctrl/U	Echoes ^U<CR>. Entered, but otherwise ignored if typed on an empty line.

The console accepts Console I/O mode commands up to 80 characters long. Longer commands produce error messages. The character count does not include rubouts, rubbed-out characters, or the <CR> at the end of the command.

Two or more consecutive spaces and tabs are treated as a single space. Leading and trailing spaces and tabs are ignored. You can place command qualifiers after the command keyword or after any symbol or number in the command.

All numbers (addresses, data, counts) are hexadecimal, but symbolic register names contain decimal register numbers. The hexadecimal digits are 0 through 9 and A through F. You can use uppercase and lowercase letters in hexadecimal numbers (A through F) and commands.

The following symbols are qualifier and argument conventions:

[] = an optional qualifier or argument
{} = a required qualifier or argument

1.4.2 Console I/O Mode Commands

Table 1–2 lists and describes the Console I/O mode commands. You can display the list of commands by typing **HELP** at the console prompt (>>>).

For a complete explanation of how to use the commands, along with information on qualifiers and arguments, refer to the *KA670 CPU Technical Manual* (EK–KA670–TM).

Table 1–2: Console I/O Mode Commands

Command	Action
BOOT	Initializes the processor and transfers execution to the VMB.
CONFIGURE	Invokes an interactive mode that permits you to enter Q22-bus device names, then generates a table of Q22-bus I/O page device CSR addresses and interrupt vectors.
CONTINUE	Causes the processor to begin instruction execution at the address currently contained in the program counter (PC). Does not perform a processor initialization.
DEPOSIT	Deposits data into the address you specify. If you do not specify an address space or data size qualifier, the console uses the last address space and data size used in a DEPOSIT, EXAMINE, MOVE, or SEARCH command.
EXAMINE	Examines the contents of the memory location or register of the address you specify. If you do not specify an address, + is assumed.
FIND	Searches main memory starting at address 0 (zero) for a page-aligned 128-Kbyte segment of good memory, or a restart parameter block (RPB).
HALT	The HALT command has no effect. It is included for compatibility with other VAX consoles.
HELP	Displays the correct syntax for all console commands.
INITIALIZE	Performs a processor initialization.
MOVE	Copies the block of memory starting at the source address to a block beginning at the destination address.
NEXT	Executes the number of macro instructions you specify. If you do not specify a number, 1 (one) is assumed.
REPEAT	Repeatedly displays and executes the command you specify. Press Ctrl/C to stop the command. You can specify any valid console command except the REPEAT command.
SEARCH	Finds all occurrences of a pattern and reports the addresses where the pattern was found. If you include the /NOT qualifier, the command reports all addresses for which the pattern did not match.
SET BFLAG	Sets the default R5 boot flags. The value must be a hexadecimal number of up to eight digits.
SET BOOT	Sets the default boot device. The value must be a valid device name.
SET CONTROLP	Sets Control-P as the console halt condition, instead of a BREAK.
SET HOST	Connects to the DUP or MAINTENANCE driver on the node or device you specify.
SET LANGUAGE	Sets the console language and keyboard type.
SET HALT	Sets the halt action you define. Acceptable values are the following keywords: default, restart, reboot, halt, restart_reboot, or a number in the range 0 to 4 inclusive.
SET RECALL	Sets command recall state to either ENABLED (1) or DISABLED (0).

Table 1–2 (Cont.): Console I/O Mode Commands

Command	Action
SHOW BFLAG	Displays the default R5 boot flags.
SHOW BOOT	Displays the default boot device.
SHOW CONTROLP	Shows the current state of Control-P halt recognition, either ENABLED or DISABLED.
SHOW DEVICE	Displays all devices displayed by the SHOW DSSI, SHOW ETHERNET, and SHOW UQSSP commands.
SHOW DSSI	Displays the status of all nodes that can be found on the DSSI bus. For each node on the DSSI bus, the firmware displays the node number, the node name, and the boot name and type of the device, if available. Does not indicate whether the device contains a bootable image.
SHOW ETHERNET	Displays the hardware Ethernet address for all Ethernet adapters that can be found, both on-board and on the Q22-bus.
SHOW LANGUAGE	Displays console language and keyboard type.
SHOW MEMORY	Displays main memory configuration, board by board.
SHOW QBUS	Displays all Q22-bus I/O addresses that respond to an aligned word read, plus vector and device name information. For each address, the console displays the address in the VAX I/O space in hexadecimal, the address as it would appear in the Q22-bus I/O space in octal, and the word that was read in hexadecimal. Also displays the vector that you should set up, and device name or names that could be associated with the CSR.
SHOW RECALL	Displays the current state of command recall, either ENABLED or DISABLED.
SHOW HALT	Displays the halt action. Keywords include: default, restart, reboot, halt, restart_reboot or a number in the range 0 to 4 inclusive.
SHOW RLV12	Displays all RL01 and RL02 disks that appear on the Q22-bus.
SHOW SCSI	Shows any SCSI devices in the system.
SHOW TRANSLATION	Shows any virtual addresses that map to the specified physical address.
SHOW UQSSP	Displays the status of all disks and tapes that can be found on the Q22-bus that support the UQSSP protocol. For each such disk or tape on the Q22-bus, the firmware displays the controller number, the controller CSR address, and the boot name and type of each device connected to the controller. The command does not indicate whether the device contains a bootable image.
SHOW VERSION	Displays the current firmware version.
START	Starts instruction execution at the address you specify. If you do not give an address, the current program counter is used. If memory mapping is enabled, macro instructions are executed from virtual memory, and the address is treated as a virtual address. Equivalent to a DEPOSIT to PC, followed by a CONTINUE. Does not perform a processor initialization.

Table 1–2 (Cont.): Console I/O Mode Commands

Command	Action
TEST	Invokes a diagnostic test program specified by the test number you enter. If you enter a test number of 0 (zero), all tests allowed to be executed from the console terminal are executed. The console accepts an optional list of up to five additional hexadecimal arguments.
UNJAM	Performs an I/O bus reset, by writing a 1 (one) to IPR 55 (decimal).
X	Loads or unloads (that is, writes to memory or reads from memory) the specified number of data bytes through the console serial line (regardless of console type), starting at the specified address. For use by automatic systems communicating with the console.

Examples 1–1 through 1–6 show sample displays for the commonly used commands SHOW and SET.

The SET command sets the parameter to the value you specify. The SHOW command displays the console parameter you specify.

Example 1–1: SHOW QBUS Display

```
>>> SHOW QBUS
Scan of Qbus I/O Space
-200000DC (760334) = 0000 (300) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000DE (760336) = 0AA0
-200000E0 (760340) = 0000 (304) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000E2 (760342) = 0AA0
-200000E4 (760344) = 0000 (310) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000E6 (760346) = 0AA0
-20001468 (772150) = 0000 (154) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-2000146A (772152) = 0AA0
-20001F40 (777500) = 0020 (004) IPCR

Scan of Qbus Memory Space
>>>
```

For each address, the console displays the address in the VAX I/O space in hexadecimal, the address as it would appear in the Q22-bus I/O space in octal, and the word data that was read in hexadecimal.

Example 1–2: SHOW DEVICE Display

```
>>>SHOW DEVICE
DSSI Bus 0 Node 0 (BARNEY)
-DIA10 (RF71)
DSSI Bus 0 Node 1 (BETTY)
-DIA11 (RF71)
DSSI Bus 0 Node 2 (FRED)
-DIA12 (RF71)
DSSI Bus 0 Node 7 (*)

DSSI Bus 1 Node 0 (SNEEZY)
-DIB0 (RF71)
DSSI Bus 1 Node 1 (DOPEY)
-DIB1 (RF71)
DSSI Bus 1 Node 2 (SLEEPY)
-DIB2 (RF71)
DSSI Bus 1 Node 3 (GRUMPY)
-DIB3 (RF71)
DSSI Bus 1 Node 4 (BASHFUL)
-DIB4 (RF71)
DSSI Bus 1 Node 5 (HAPPY)
-DIB5 (RF71)
DSSI Bus 1 Node 6 (DOC)
-DIB6 (RF71)
DSSI Bus 1 Node 7 (*)
UQSSP Tape Controller 0 (774500)
-MUA0 (TK70)
Ethernet Adapter
-EZA0 (08-00-2B-06-10-42)
```

For each device, the console displays the controller, the node, and the address on the first line, and the device name and option on the second line.

Example 1–3: SHOW ETHERNET Display

```
>>> SHOW ETHERNET
Ethernet Adapter
-EZA0 (08-00-2B-0B-29-14)
```

Example 1–4: SHOW LANGUAGE Display

```
>>> SHOW LANGUAGE
English (United States/Canada)
>>>
```

Example 1–5: SET LANGUAGE Command

```
>>> SET LANGUAGE 5
>>>
```

In this example, selection 5 is English, chosen from the language selection menu that displays at power-on.

Example 1–6: SET BOOT Command

```
>>> SET BOOT MUA0
>>>
```

In this example, entering MUA0 sets the tape drive as the default boot device.

Table 1–3: Device Names

Device Type	Controller/Adapter	Device Logical Name
RF-series ISA	Embedded DSSI host adapter (part of CPU)	DImn[1]
RF-series ISA	KFQSA storage adapter	DUcn[2]
TK70 tape drive	TQK70	MUcn[3]
PROM (programmable read only memory)	MRV11 module	PRAn
Ethernet adapter	On-board (part of CPU)	EZA0
Ethernet adapter	DESQA Ethernet controller	XQAn
RA-series drives	KDA50	DUcn[2]

[1]m = DSSI bus adapter (A = first bus (0), B = second bus (1), etc.)
n = unit number
When under operating system control, DIBn devices are recognized as DIAn devices.
[2]c = MSCP controller designator (A = first, B = second, etc.)
n = unit number
[3]c = TMSCP controller designator (A = first, B = second, etc.)
n = unit number

1.5 Digital Storage System Interconnect (DSSI)

The KA670 CPU module contains two DSSI bus interfaces that are dedicated to the mass storage devices in the VAX 4000 Model 300 system. (See Figure 1–1 for the VAX 4000 Model 300 block diagram.)

Each DSSI bus interface connects to a DSSI integrated storage assembly (ISA). An ISA is a 5.25-inch integrated storage element (ISE) that is housed in a special mounting bracket for simplified enclosure installation and upgrading.

Each DSSI bus has the following characteristics:

- A 4-Mbytes-per-second bandwidth
- Up to eight nodes (one interface and up to seven ISAs)
- Eight data lines
- One parity line
- Eight control lines

DSSI architecture improves system performance as follows:

- The DSSI bus handles all mass storage transactions.
- Mass storage devices can act independently, since each device contains its own controller. Several devices can work simultaneously.

The two DSSI bus interfaces support up to 16 nodes. These 16 nodes include the 2 DSSI interfaces and 14 ISAs.

An ISA can maintain connections to more than one DSSI interface. In a dual-host configuration in which multiple CPUs can be connected to the DSSI bus interfaces, two VAX 4000 Model 300 systems have access to each ISA on the DSSI busses.

For more information about dual hosting VAX 4000 Model 300 systems and the advantages of such configurations, see the section on dual-host capability in the *VAX 4000 Model 300 Operation* manual.

1.6 KA670–AA/BA CPU Specifications

The VAX 4000 Model 300 system uses the KA670–AA central processing unit. The VAXserver 4000 Model 300 uses the KA670–BA central processing unit.

Central Processing Unit	
Addressing modes	General register: 8
Clock rate	143 MHz
Data path width	64 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)
	Program counter: 4
	Index: 9
PDP–11 compatibility mode	Emulated in software
Time bases	Time-of-year clock: 1 (battery backup)
	Interval timer: 1 (10 milliseconds)
	Programmable timers: 2
I/O bus interface	One Q22-bus interface with 8192 entry map
Backplane termination	240 Ω

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

Performance	
Instruction prefetch buffer size	12 bytes
On-chip cache	
Size	2 Kbyte
Speed	28 nanoseconds
Associativity	Direct mapped
On-board cache	
Size	128 Kbytes
Speed	84 nanoseconds

Performance

Associativity	Direct mapped
Translation buffer	
Size	64 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
Maximum I/O bandwidth	
Block mode DMA read	2.4 Mbytes/second
Block mode DMA write	3.3 Mbytes/second

Ethernet Port

Supported protocols	Ethernet V2.0
Supported media types	Standard or ThinWire
Data path width	1 bit
Maximum bandwidth	10 Mbits/second
Buffer size	
Transmit buffer	128 bytes/second
Receiver buffer	128 bytes/second

Digital Storage System Interconnect (DSSI) Connector

Maximum number of supported devices	14
Data path width	8 bits
Maximum bandwidth	4 Mbytes/second
Maximum queue I/O	800/second
Buffer size	
Transmit buffer	128 bytes/second
Receiver buffer	128 bytes/second

Console Serial Line

Interface standards	EIA RS–423–A/CCITT V.10 X.26 EIA RS–232–C/CCITT V.28 DEC–423

Console Serial Line

Data format	1 start bit, 8 data bits, 0 parity bits, 1 stop bit
Baud rates	300; 600; 1200; 2400; 4800; 9600; 19,200; 38,400

Ordering Information

Included as part of base system

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 7.4 A
	+3.3 Vdc, 0.27 A
	+12 Vdc, 0.35 A
	–12 Vdc, 0.04 A
Power consumption	42.6 W
Bus loads	4.0 ac
	1.0 dc

Operating System Support

VMS	Version 5.3–2 and later
VAXELN	

Diagnostic Support

MicroVAX Diagnostic Monitor	Release 131 and later
Self-tests	Yes

Related Documentation

EK–KA670–TM	KA670 CPU Technical Manual

1.7 MS670–BA Memory Specifications

The MS670–BA is a 32-Mbyte memory module that provides memory expansion for the KA670–AA/–BA CPU module. The MS670–BA modules interface with the CPU through the MS670 local memory interconnect.

You can use up to four MS670–BA modules in the VAX 4000 Model 300 system.

Operating system support and diagnostic support are the same as for the KA670 CPU module, as listed in Section 1.6.

Performance

	Memory Cycle Time at 28 nanoseconds:
Memory Read (Octaword):	
Page mode memory read	392 nanoseconds
Non-page mode memory read	756 nanoseconds
Memory write (Octaword):	
Page mode memory write	308 nanoseconds
Non-page mode memory write	504 nanoseconds
Memory masked write (Longword):	
Page mode memory write	399 nanoseconds
Non-page mode memory write	504 nanoseconds

Ordering Information

MS670–BA	32-Mbyte field-installed kit

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 2.52 A
	+12 Vdc, 0.0 A
Power consumption	12.6 W
Bus loads	0.0 ac
	0.0 dc

Chapter 2
Option Specifications

This chapter lists specifications for the options currently supported in the VAX 4000 Model 300 system, grouped as follows:

- Mass storage
- Communications
- Real-time
- Printer
- Memory

The specifications appear in alphanumerical order within each of the above groups. All weights are approximate.

Some of the options are already installed in your system. If you want to add other options, your Digital sales representative can advise you. Chapter 3 offers some guidelines on determining what options you can add.

2.1 Options Overview

The option specifications include the following, where applicable:

- Functional information
- Ordering information
- Performance
- Configuration information
- Related documentation

Unless otherwise noted, operating system support and diagnostic support for all options are the same as for the KA670 CPU module, as listed in Section 1.6.

2.1.1 Configuration

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 setting switches or jumpers on modules already configured at the factory or Digital service representatives configure the option when they install it in your system.

Self-maintenance customers can find information on setting CSR addresses and interrupt vectors in the *Microsystems Options* volume of the *Entry Systems Service* kit.

2.2 Mass Storage Options

The VAX 4000 Model 300 system supports the following mass storage devices:

- Internal to the BA440 enclosure:

  TK70 tape drive
  RF-series integrated storage assembly (ISA)

- External to the BA440 enclosure:

  RRD40 compact disk subsystem (tabletop)
  TU81–Plus tape
  TSV05 tape
  RA-series disks

Four RF-series drives are supported by one KDA50 controller. The system supports up to eight RF-series drives, with two KDA50 controllers.

Up to four RF-series ISAs can be installed in your system. The CPU communicates with the ISAs through a Digital Storage System Interconnect (DSSI) adapter, which is built into the CPU. Your VAX 4000 system has two DSSI adapters, and hence, two separate DSSI busses. Each DSSI bus is capable of supporting seven integrated storage assemblies.

You can put only two disk controllers in the Q-bus backplane, two KDA50s, two KFQSAs, or one of each.

2.2.1 KDA50 Controller

The KDA50 is an intelligent controller that interfaces with up to four SDI-compatible mass storage devices on the Q22-bus.

Functional Information	
Controller protocol	MSCP
Bad block replacement	Software dependent
Supported drives	RA60, RA70, RA81, RA82, RA90
Drives per controller	4
Controllers per system	1 maximum for VMS 5.1 2 maximum for VMS V5.2 and later
Drive interconnect	Transformer-coupled radial

Ordering Information	
KDA50–SF	RA-series disk drive controller, controls up to a maximum of four RA-series devices[1]
KDA50–SG	Second KDA50 controller, for support of up to four RA-series devices, uses three Q-bus slots [1]

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

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

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

[1]Field installed option.

2.2.2 KFQSA Storage Adapter

The KFQSA is an intelligent storage adapter that allows Q22-bus systems to communicate with storage peripherals based on the Digital Storage System Interconnect (DSSI).

Functional Information	
Controller protocol	SSP: to and from Q22-bus host DSSI: to and from ISAs
Supported drive	RF-series ISAs
Drives per adapter	7
Drive interconnect	Direct
Controllers per system	2 maximum

Ordering Information	
KFQSA–SG	RF-series ISA adapter, controls up to a maximum of 7 RF-series ISAs

Performance	
Peak transfer rate	4 Mbytes/second
Sustained transfer rate	1.5 Mbytes/second
I/O request throughput	190 I/O requests/second (single-sector reads)
Error detection	DSSI bus parity and check character, all transmissions

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 5.5 A (typical)
Power consumption	27.5 W
Bus loads	4.4 ac 0.5 dc

Related Documentation	
EK–KFQSA–IN	KFQ Storage Adapter Installation and User Manual

2.2.3 KLESI Controller

The KLESI–SA is a controller that interfaces with the TU81–Plus tape drive on the Q22-bus.

Functional Information

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

Ordering Information

Included with the TU81–Plus tape drive

Configuration Information

Form factor	Dual
Power requirements	+5 Vdc, 4.0 A (typical) +12 Vdc, 0.0 A (typical)
Power consumption	20.0 W
Bus loads	0.5 ac 1.0 dc

Related Documentation

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

2.2.4 RA60 Disk Drive

The RA60 disk drive is a high-capacity removable disk drive that provides 205 Mbytes of formatted storage space. The VAX 4000 Model 300 supports these drives in separate storage expansion enclosures only.

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

Ordering Information	
RA60–AF	RA60 disk drive and cables
BC26V–06	Interconnect cable with connector block

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

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

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

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

2.2.5 RA81 Disk Drive

The RA81 disk drive is a high-capacity fixed-disk drive that provides 456 Mbytes of formatted storage space. The VAX 4000 Model 300 supports these drives in separate storage expansion enclosures only.

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

Ordering Information	
RA81–HA	RA81 disk drive (120 V)
RA81–HD	RA81 disk drive (240 V)
RQA81–AA	RA81 disk drive (120 V) with KDA50 controller and BC26V–06 cable
RQA81–AD	RA81 disk drive (240 V) with KDA50 controller and BC26V–6D cable
BC26V–6D	Interconnect cable with connector block

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

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

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

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

2.2.6 RA82 Disk Drive

The RA82 disk drive is a high-capacity fixed-disk drive that provides 623 Mbytes of formatted storage space. The VAX 4000 Model 300 supports these drives in separate storage expansion enclosures only.

Storage Capacity	
User capacity	623 Mbytes
User capacity (blocks)	1,216,660

Ordering Information	
RA82–AA	RA82 disk drive (120 V) with one BC26V–12 cable
RA82–AD	RA82 disk drive (240 V) with one BC26V–12 cable
BC26V–06	Interconnect cable with connector block

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

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

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

Related Documentation	
EK–ORA82–SV	RA82 Disk Drive Service Guide
EK–ORA82–UG	RA82 Disk Drive User's Guide

2.2.7 RA90 Disk Drive

The RA90 disk drive is a high-capacity fixed-disk drive that provides 1.2 gigabytes of formatted storage space. The VAX 4000 Model 300 supports these drives in separate storage expansion enclosures only.

Storage Capacity	
User capacity	1.2 gigabytes
User capacity (blocks)	2,376,153

Ordering Information	
RA90–NA	RA90 disk drive (120 V)
RA90–ND	RA90 disk drive (240 V)
BC26V–12	Interconnect cable with connector block

Performance	
Average seek time	17.5 milliseconds
Average access time	8.33 milliseconds
Peak transfer rate	22.1 Mbits/second

Physical Specifications	
Height	26.6 cm (10.4 in)
Width	23.0 cm (8.7 in)
Depth	68.5 cm (27.0 in)
Weight	13.6 kg (62 lb)

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

Related Documentation	
EK–ORA90–SV	RA90 Disk Drive Service Guide
EK–ORA90–UG	RA90 Disk Drive User's Guide

2.2.8 RF71 Integrated Storage Assembly (ISA)

The RF71 is a DSSI integrated storage assembly (ISA) that provides 400 Mbytes of formatted storage space. An ISA is a 5.25-inch integrated storage element (ISE) that is housed in a special mounting bracket for simplified installation and upgrading.

Storage Capacity	
User capacity	400 Mbytes
User capacity (blocks)	781,440

Ordering Information	
RF71E–AA	400 Mbyte DSSI ISA

Performance	
Average random seek time	19.20 milliseconds
Average rotational latency	8.33 milliseconds
Average access time	34.2 milliseconds
Peak transfer rate	1.5 Mbits/second

Physical Specifications	
Height	7.75 cm (3.05 in)
Width	14.60 cm (5.75 in)
Depth	20.75 cm (8.17 in)
Weight	4.09 kg (9.0 lb)

Configuration Information	
Form factor	Standard 10.5-in footprint
Power requirements	+5 Vdc, 1.25 A +12 Vdc, 1.64 A
Power consumption	25.93 W

Related Documentation	
EK–RF71D–IM	RF71 Disk Drive Installation Manual
EK–RF71D–UG	RF71 Disk Drive User's Guide

2.2.9 RF31 Integrated Storage Assembly (ISA)

The RF31 is a DSSI integrated storage assembly (ISA) that provides 381 Mbytes of formatted storage space. An ISA is a 5.25-inch integrated storage element (ISE) that is housed in a special mounting bracket for simplified installation and upgrading.

Storage Capacity	
Data storage capacity	381 Mbytes, formatted
Ordering Information	
RF31E–AF	381 Mbyte half-height DSSI ISA
Performance	
Average seek time	14.7 milliseconds
Average access time	23 milliseconds
Peak transfer rate	4.0 Mbytes/second
Physical Specifications	
Height	4.40 cm (1.75 in)
Width	14.60 cm (5.75 in)
Depth	20.45 cm (8.25 in)
Weight	1.81 kg (4.0 lb)
Configuration Information	
Form factor	Standard 5.25-in footprint
Power requirements	+5 Vdc, 1.0 A +12 Vdc, 2.80 A
Power consumption	38.6 W

2.2.10 RRD40 Compact-Disk Subsystem

The RRD40 is a CD reader that retrieves data in fixed-length blocks from removable compact-disk media.

Functional Information	
Modes	Idle mode Operation mode: search, normal play
Orientation	Horizontal

Ordering Information	
RRD40–SF	Field-installed tabletop CDROM drive with controller

Performance	
Motor stop time	30% of nominal speed within 30 seconds maximum, 5 seconds typical
Motor start time	90% of nominal speed within 20 seconds maximum, less than 11 seconds typical
Formatted capacity	525 Mbytes with maximum of 600 Mbytes (65 minutes)
Average transfer rate	153.6 Kbytes/second, mode 1 176.4 Kbytes/second, mode 2
Average latency	60 µs maximum at inner track 155 µs at outer track
Initialization time	15 seconds maximum to sector zero

Physical Specifications	
Height	27.6 cm (11.02 in)
Width	8.18 cm (3.27 in)
Depth	22.7 cm (9.06 in)
Weight	5.0 kg (11.0 lb)

Configuration Information	
Power consumption	19.2 W maximum Play mode: 18 W maximum

Related Documentation	
EK–RRD40–OM	RRD40 Disk Drive Owner's Manual
EK–RRD40–SU	RRD40 MicroVAX Monitor User's Guide Updates

2.2.11 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

TK70E–AF	296 Mbyte cartridge tape drive
TKQK70–SF	Controller for TK70E–AF

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

Physical Specifications

Height	8.25 cm (3.25 in)
Width	14.60 cm (5.70 in)
Depth	21.44 cm (8.44 in)
Weight	3.07 kg (5.0 lb)

Configuration Information

Form factor	Standard 5.25-in footprint
Power requirements	+5 Vdc, 1.5 A
	+12 Vdc, 2.4 A
Power consumption	36.3 W
Bus loads	0.0 ac
	0.0 dc

Related Documentation

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

2.2.12 TQK70 Controller

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

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

Ordering Information	
TQK70–AA	Controller for TK70E–AF

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

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 3.5 A +12 Vdc, 0.0 A
Power consumption	17.5 W
Bus loads	4.3 ac 0.5 dc

Related Documentation	
EK–OTK70–OM	TK70 Tape Drive Subsystem Owner's Manual

2.2.13 TSV05 Tape Drive

The TSV05 is a magnetic streaming-tape-drive that provides 40.5 Mbytes of backup data storage. The TSV05 reads or writes up to 160 Kbytes per second in standard ANSI format.

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

Ordering Information	
TSV05–SB	TSV05 tape drive subsystem

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

Physical Specifications	
Height	23.0 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

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

2.2.14 TSV05 Controller

The TSV05 tape drive controller interfaces the TSV05 tape drive to the Q22-bus.

Functional Information	
Controller protocol	Controller unique
Supported drive	TSV05
Drives per controller	1
Drive interconnect	Direct

Ordering Information	
TSV05–SB	TSV05 tape drive subsystem

Performance	
Buffer size	3.5 Kbytes

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 6.5 A (typical) +12 Vdc, 0.0 A (typical)
Power consumption	32.5 W
Bus loads	2.4 ac 1.0 dc

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

2.2.15 TU81–Plus Tape Drive

The TU81–Plus is a reel-to-reel tape drive mounted in a 101.6-cm (40-in) cabinet. The drive supports two industry-standard recording methods: group coded recording (GCR) and phase encoded (PE).

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

Functional Specifications	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 731 m (2400 ft) long
Mode of operation	Streaming
Recording methods	Group code recording (GCR) Phase encoded (PE)
Recording density	6250 bits/in (GCR) 1600 bits/in (PE)
Number of tracks	9

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

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

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

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

2.3 Communications Options

The VAX 4000 Model 300 system supports the following communications options:

- CXA16 asynchronous multiplexer (16 lines)
- CXB16 asynchronous multiplexer (16 lines)
- CXY08 asynchronous multiplexer (8 lines)
- DESQA Ethernet controller
- DFA01 asynchronous controller with integral modem
- DPV11 synchronous interface
- DSRVB DECserver 200
- DSV11 synchronous controller

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.

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.

Ethernet Controllers

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

2.3.1 CXA16 Asynchronous Multiplexer (16 lines)

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

Functional Information

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

Ordering Information

CXA16–AF	CXA16 field-installed kit. Includes two 7.6-m (25-ft) BC16D–25 cables, two H3104 cable concentrators, and other accessories required to install the option. • BC16D–25 cable—data only, 36-conductor, terminated with 36-pin Amphenol male connectors • H3104 cable concentrator—concentrates eight BC16E cables into one BC16D cable; eight modified modular jacks and one 36-pin Amphenol female connector

Ordering Information

BC16E-series cable	Office cable—data only, six-conductor, terminated with modified modular plugs • BC16E–10: 3 m (10 ft) • BC16E–25: 7.6 m (25 ft) • BC16E–50: 15.2 m (50 ft)
H8572	Cable extender. Null modem cable terminated with modified modular jacks.
H8571–A	25-pin passive adapter[1]
H8571–B	9-pin passive adapter[1]
H3105	Active adapter. Converts EIA RS–232–D signals to DEC–423 signals.

Performance

Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode. Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode.
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; 19,200; 38,400[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)

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

[2]38,400 baud rate is not supported by Digital operating systems.

Configuration Information

Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.6 A (typical)
	+12 Vdc, 0.20 A (typical)
Power consumption	10.4 W
Bus loads	3.0 ac
	0.5 dc
Module connectors	2 female, 36-pin Amphenol connectors

Related Documentation

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

2.3.2 CXB16 Asynchronous Multiplexer (16 lines)

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

Functional Information

Supported line interfaces	EIA RS–422–A/CCITT V.11 X.27
Split-speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity 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

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

Ordering Information

H8572	Cable extender. Null modem cable terminated with modified modular jacks.

Performance

Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode.
	Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode.
Receive data transfers	Single-character programmed transfers in both DHV11 and DHU11 modes.
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; 19,200; 38,400[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, 2.0 A (typical)
	+12 Vdc, 0.00 A (typical)
Power consumption	10.0 W
Bus loads	3.0 ac
	0.5 dc
Module connectors	2 female, 36-pin Amphenol connectors

[1]38,400 baud rate is not supported by Digital operating systems.

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

2.3.3 CXY08 Asynchronous Multiplexer (8 Lines)

The CXY08 asynchronous multiplexer performs data concentration, real-time processing, and interactive terminal handling. The CXY08 can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The CXY08 supports full modem control.

Functional Information

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

Ordering Information

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

Performance

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

Performance

	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; 19,200; 38,400[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, 1.64 A (typical)
	+12 Vdc, 0.395 A (typical)
Power consumption	12.94 W
Bus loads	3.0 ac
	0.5 dc
Module connectors	2 female, 50-pin CHAMP connectors

Related Documentation

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

[1]38,400 baud rate is not supported by Digital operating systems.

2.3.4 DESQA Ethernet Controller

The DESQA Ethernet controller provides a high-speed asynchronous connection between a Q22-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)

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 +12 Vdc, 0.22 A
Power consumption	14.64 W
Bus loads	2.2 ac 0.5 dc
Module connectors (standard)	One 15-pin D-type
Module connectors (Thinwire)	T-connector to BNC connector on DESQA

Related Documentation	
EK–DESQA–TM	DESQA Technical Manual

2.3.5 DFA01 Asynchronous Controller with Integral Modem

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

Functional Information

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

Ordering Information

DFA01–AF	Field-installed kit

Performance

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

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

Configuration Information

Form factor	Quad height with integral, flush cover panel
Power requirements	+5 Vdc, 1.97 A +12 Vdc, 0.04 A
Power consumption	10.30 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

Related Documentation

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

2.3.6 DPV11 Synchronous Controller

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

Functional Information

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

Ordering Information

DPV11–SF	Field-installed kit

Performance

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

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 1.2 A (typical)
	+12 Vdc, 0.3 A (typical)
Power consumption	9.6 W
Bus loads	1.0 ac
	1.0 dc

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

2.3.7 DSRVB DECserver 200

The DSRVB 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

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)

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

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

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

2.3.8 DSV11 Synchronous Controller

The DSV11 is a two-channel, high-speed, synchronous controller that interfaces Q22-bus backplanes.

Functional Information

Supported line interfaces	RS–423 RF–422 RS–232/V.24, V.35
Supported protocols	DDCMP HDLC/SDLC BISYNC
Operating mode	Full or half-duplex
Character size	
Modem support	Full modem control
Supported modems	

Ordering Information

DSV11–SF	Field-installed kit (first DSV11)
DSV11–SG	Field-installed kit (additional DSV11s)

Performance Information

Transmit/Receive data transfers	DMA
Transmit buffer size	
Receive buffer size	
Data rate, Mbits/second (maximum)	RS–232–C/V.24 = up to 20K RS–423 = 100K RS–422 = 256K V.35 = 48K

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 5.43 A (typical) +12 Vdc, 0.69 A (typical)
Power consumption	35.43 W
Bus loads	3.9 ac 1.0 dc

Related Documentation	
EK–DSV11–UG	DSV11–S Communications Option User Guide
EK–DSV11–TD	DSV11 Communications Option Technical Description

2.4 Real-Time Options

Real-time controllers interface devices that monitor processes in environments such as the laboratory or manufacturing. Typically, real-time controllers are parallel devices that transmit more than one bit of information simultaneously.

The VAX 4000 Model 300 system supports the following real-time options:

- AAV11–S digital-to-analog converter
- ADQ32 analog-to-digital converter
- ADV11–S analog-to-digital converter
- AXV11 controller
- DRQ3B parallel interface
- DRV1W parallel interface
- IBQ01 controller
- IEQ11 controller
- KWV11–S programmable real-time clock

2.4.1 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 the AAV11–D.

Functional Information

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

Ordering Information

AAV11–SF	AAV11–S field-installed kit
UDIP–BA[1]	Universal data interface panel (UDIP) mounting box
UDIP–DB	Universal data interface panel (UDIP)
UDIP–TA	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	0.05Ω typical
Linearity (0–10 V)	±1/2 LSB; ±1.2 mV at full-scale range
Differential linearity	±1/2 LSB
Offset error	Adjustable to 0
Offset drift	±15 ppm/at maximum °C
Gain accuracy	Adjustable to zero
Gain drift	±25 ppm/at maximum °C
Settling time	6 µs to 0.1% for a p–p output change of 20 V

[1]You must order both the UDIP mounting box and the UDIP interface when installing a new option.

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 2.10 A (typical) +12 Vdc, 0.0 A
Power consumption	10.5 W
Bus loads	2.5 ac 0.5 dc

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

2.4.2 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), two'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)
Input impedance	10 MΩ, minimum
Input bias current	500 nA maximum ON current
Input protection	Inputs are current-limited and protected to an overvoltage of ±35 V without damage.
Common mode rejection ratio	55 dB

[1]You must order both the UDIP mounting box and the UDIP interface when installing a new option.

Performance

A/D output	
Data buffer register	16-bit read-only output register
Resolution	12 bits unipolar; 11 bits bipolar plus sign bit
Data notation	Straight binary or two's complement
Sample and hold amplifier	
Aperture uncertainty	1 nanosecond
Aperture delay	50 nanoseconds, maximum with minimum aperture enabled (clock bypass bit set)
Input noise	2 μV p–p
A/D converter performance	
Linearity	
Differential	0.2 to 2 LSB
Integral	1.5 LSB, maximum
Scale drift	15 ppm/C typical

Performance

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

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 4.45 A (typical)
	+12 Vdc, 0.0 A
Power consumption	22.25 W
Bus loads	2.5 ac
	0.5 dc

Related Documentation

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

2.4.3 ADV11–S Analog-to-Digital Converter

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

Functional Information

Input channels	16 single-ended analog input channels or 8 differential analog input channels; SE/DI input is jumper-selectable.
Programmable gain	1, 2, 4, or 8
A/D output	
Resolution	12-bit output data resolution
Data notation	Binary, offset binary, or two'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 MΩ minimum, 10 pF maximum
On channels	100 MΩ minimum, 100 pF maximum

[1]You must order both the UDIP mounting box and the UDIP interface when installing a new option.

Performance

Power off	1 KΩ in series with a diode
Input bias current	±20 nA at 25°C (77°F) 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 bit
Data notation	Binary, offset binary, or two'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 peak-to-peak 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 (32°F)
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, 2.0 A (typical)
	+12 Vdc, 0.0 A
Power consumption	10.0 W
Bus loads	2.3 ac
	0.5 dc

Related Documentation

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

2.4.4 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 two's complement
Voltage	Output voltage range selection of ±10 V (bipolar) or 0 V to 10 V (unipolar)
A/D conversions	Can be started by a program, an external trigger, or a real-time clock
A/D results	Can be received by a programmed I/O transfer or by servicing an interrupt request
Common mode rejection ratio	80 dB at maximum range
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 ±1/2 LSB
Stability (temperature coefficient)	±30 ppm at maximum °C (32°F)
Stability (long term)	±0.05% change in 6 months
Conversion time	25 µs from end of front end settling to setting the A/D DONE bit

[1]You must order both a UDIP mounting box and an interface when installing a new option.

Performance

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 two'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 ±1/2 LSB
Nonlinearity	0.02% of full-scale value
Offset error	Adjustable to 0
Offset drift	±30 ppm at maximum °C (32°F)
Gain accuracy	Adjustable to full-scale value
Gain drift	±30 ppm at maximum °C (32°F)
Settling time	65 µs to 0.1% for a peak-to-peak 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
	0.3 dc

Related Documentation

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

2.4.5 DRQ3B Parallel Interface

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

Functional Information

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

Ordering Information

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

Performance

Throughput rates	Burst: 500 kilowords Block: 1.1 megawords Extended block mode: 1.1 megawords Height speed: 1.4 megawords

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	2.0 ac 0.5 dc
Module connectors	Two 50-pin female IEEE connectors
I/O port data transceivers	Source 16 mA, sink 64 mA

Related Documentation	
EK–O47AA–UG	DRQ3B Parallel DMA Input/Output Module User's Guide

2.4.6 DRV1W Parallel Interface

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

Functional Information

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

Ordering Information

DRV1W–SF	Field-installed kit

Performance

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

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 1.8 A (typical)
	+12 Vdc, 0.0 A
Power consumption	9.0 W

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

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

2.4.7 IBQ01 Controller

The IBQ01 is a DMA controller that interfaces a Q22-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	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

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 5.0 A +12 Vdc, 0.3 A
Power consumption	28.6 W
Bus loads	4.6 ac 1.0 dc

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

2.4.8 IEQ11 Controller

The IEQ11 option is a DMA controller that interfaces a Q22-bus system to two independent instrument buses (IEC/IEEE).

Functional Information

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

Ordering Information

IEQ11–SF	Field-installed kit for IEC connection

Performance

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

Configuration Information

Form factor	Quad height
Power requirements	+5 Vdc, 3.5 A (typical) +12 Vdc, 0.0 A
Power consumption	17.5 W
Bus loads	2.0 ac 1.0 dc
Module connectors	Standard 24-pin IEEE 488 connector (IEQAA–AC) Standard 25-pin IEC 625 connector (IEQ11–AD)

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

2.4.9 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-Hz or 60-Hz line frequency on the Q22-bus. The board can generate interrupts or can synchronize the processor to external events. The KWV11–S clock is functionally equivalent to the 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 or 60 Hz)
Modes	4 programmable modes

Ordering Information

KWV11–SF	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

[1]You must order both a UDIP mounting box and an interface when installing a new option.

Performance

Response time	Depends on input waveform and amplitude; for TTL logic levels, typically 600 nanoseconds
Hysteresis	Approximately 0.5 V, positive and negative
Characteristics	Single-ended input with 100-KΩ impedance to ground
Clock output	
Signal	CLK OV L (clock overflow, asserted low)
Output pins	J1 pin 5 and CLK OVFL tab
Function	Time base selection from an internal crystal-controlled frequency, an input at ST1, or a line frequency at BEVNT bus line
Duration	Approximately 500 nanoseconds
Line driver	TTL-compatible, open collector circuit with a 470-Ω pull-up resistor to +5 V
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-Trigger 1 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-Trigger 2 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, 0.013 A (typical)
Power consumption	11.156 W
Bus loads	1.0 ac 0.3 dc

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

2.5 Printer Options

The VAX 4000 Model 300 system supports the following printer options:

- Line printer subsystems (require the LPV11–SA interface)
  - LPV11–SA printer interface
  - LG01 text printer
  - LG02 text and graphics printer
  - LG31 printer
  - LP29 printer
- Dot matrix printers
  - LA75 companion printer
  - LA100 Letterwriter
  - LA120 printer/terminal (DECwriter III)
  - LA210 Letterprinter
- Ink jet printers
  - LJ250/LG252 companion color printers
- Laser printers
  - LN03 basic text printer
  - LN03–PLUS text and bit-mapped graphics
  - LN03R SCRIPTPRINTER bit-mapped graphics with POSTSCRIPT support
- Letter-quality daisy wheel printers
  - LQP02 printer
  - LQP03 printer

For line printer subsystems, see Section 1.6 for operating system and diagnostic support. For all other printers, operating system and diagnostic support depends on the serial interface port.

2.5.1 LA75 Companion Printer

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

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

Paper	
	Multipart forms: up to 4 parts, carbon or carbonless
Thickness	0.06 cm (0.002 to 0.012 in)

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

Physical Characteristics	
Height	12.1 cm (4.8 in)
Width	42.7 cm (16.8 in)
Depth	34.5 cm (13.6 in)
Weight	9.5 kg (21 lb)

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

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

2.5.2 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 (3.2 in to 14.9 in) wide
Multiple forms	Original plus 3 parts
Thickness	0.051 cm (0.020 in) maximum

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

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

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

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

2.5.3 LA120 Printer/Terminal (DECwriter III)

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

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

Communications	
Baud rates	50, 75, 110, 134.5, 200, 300, 600, 1200, 1800, 2400, 4800, 7200, or 9600
Split speeds	600 or 1200 receive with 75 or 150 transmit 2400 or 4800 receive with 300 or 600 transmit
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 (3.2 in to 14.9 in) wide
Multiple forms	Up to 6 parts
Thickness	0.051 cm (0.020 in) maximum

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

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

Ordering Information	
LA120–BB	Letterwriter 120 international KSR model

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

2.5.4 LA210 Letterprinter

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

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

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

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

Power Requirements

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

Physical Characteristics

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

Ordering Information

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

Related Documentation

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

2.5.5 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)
	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

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

2.5.6 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

Related Documentation	
EK–OLG02–IN	LG02 600 LPM Text and Graphics Printer Installation/Owner's Manual
EK–OLG02–UG	LG02 600 LPM Text and Graphics Printer User's Guide
EK–OLG02–TM	LG02 600 LPM Text and Graphics Printer Technical Manual
EK–OLG02–RM	LG02 600 LPM Text and Graphics Printer Mini-Reference Manual

2.5.7 LG31 Printer

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

Performance

Printing speed	Data processing mode Uppercase: up to 300 lines/minute Uppercase and lowercase: up to 240 lines/minute Near-letter-quality mode Uppercase: up to 147 lines/minute Uppercase and lowercase: up to 105 lines/minute OCRA and OCRB 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)

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

2.5.8 LJ250/LJ252 Companion Color Printers

LJ250/LJ252 companion color printers are disposable-cartridge, thermal ink-jet printers, available with either serial or parallel interface. These ink-jet printers provide high-quality color graphics with near-letter-quality text.

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
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

Physical Specifications	
Height	9.2 cm (3.65 in)
Width	44.4 cm (17.50 in)
Depth	31.1 cm (13.05 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

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

2.5.9 LN03-Series Laser Printers

Three models of the LN03 laser printer offer laser imaging and xerographic printing in a desktop unit:

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

Performance	
	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; 3800; 3900; 4800; 7200; 9600; 19,200
Parity	If enabled, even/mark or odd/space

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

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

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

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

2.5.10 LP29 Printer

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

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

Performance	
Print speed	Up to 2000 lines/minute with optimized character set
	1650 lines/minute with 64-character set
	1100 lines/minute with 96-character set
Print technology	Full-character, impact, band
Character spacing	10 characters/inch
Line spacing	6 or 8 lines/inch
Paper slew speed	127 cm/second (50 in/second)
Character set	64- or 96-character ASCII (printing and 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)

Related Documentation

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

2.5.11 LPV11–SA Printer Interface

The LPV11 printer interface controls the flow of data between the Q22-bus and a line printer.

Ordering Information	
LPV11–SA	LPV11 controller module

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 2.8 A (typical)
	+12 Vdc, 0.0 A
Power consumption	14.0 W
Bus loads	1.8 ac
	0.5 dc
Module connectors	2 female, 37-pin D subminiature connectors

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

2.5.12 LQP02 Printer

The LQP02 letter-quality printer is a full-size, 96-petal daisy wheel 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, 3800, 3900, 4800, 7200, and 9600, full-duplex transmission
Data interface	EIA RS–232–C
Parity	7-bit, odd, even, mark, or space

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

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

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

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

2.5.13 LQP03 Printer

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

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

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

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

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

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

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

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

2.6 Memory Options

The VAX 4000 Model 300 system supports the following memory options:

- MS670–BA 32-Mbyte memory (described in Section 1.7)
- MRV11–D programmable read-only memory

2.6.1 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 programmable ROMs into the module, you can design your own boot sequence.

Ordering Information	
MRV11–D	MRV11–D module

Configuration Information	
Form factor	Dual height
Power requirements	+5 Vdc, 1.6 A
	+12 Vdc, 0.0 A
Power consumption	8.0 W
Bus loads	3.0 ac
	0.5 dc

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

Chapter 3
System Expansion

This chapter provides guidelines on how to expand your VAX 4000 Model 300 system.

3.1 Planning Your System Expansion

You must consider the following when you decide to expand your system:

- Can your system accommodate additional supported options?

  You determine this by filling in the worksheet (Figure 3–1) with the options currently installed in your system and those you wish to add.

- If your existing system cannot accommodate a particular set of supported options, you might wish to add the R400X expander to enable support for up to seven RF-series ISAs.

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

3.2 Completing the Configuration Worksheet

To determine what options you can add to your system, you must list the options currently installed and their power requirements on the VAX 4000 Model 300 Configuration Worksheet, Figure 3–1.

The worksheet is for the BA440 enclosure. All backplane slots and mass storage devices are powered by the H7874 power supply.

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. The processor module, one memory module, and the TK70 tape drive have already been entered.

   Use the label on the cover panel of each slot to identify the module installed in that slot.

   List each RF-series ISA.

2. List the options and mass storage devices you wish to add to your system.

3. List the controller for the TK70 tape drive last.

4. Fill in the power requirements for each module and each mass storage device. The power requirements for the more common options are listed in Table 3–1; refer to the option descriptions in Chapter 2 for the power requirements of additional options.

5. Add each column and make sure the totals do not exceed the specified limit. As long as the figures are within range, you can probably install the new option(s).

NOTE: *The 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.*

Table 3–1 lists the information you need for each option supported in the BA440 enclosure.

Figure 3–1: VAX 4000 Model 300 Configuration Worksheet

SLOT	MODULE	Current (Amps) +5 Vdc	+12 Vdc	+3.3	-12	Power (Watts)	Bus Load AC	DC
1								
2								
3								
4	L4001-BA	2.52	0.0			12.6		
5	L4000-A/-B	7.4	0.35			42.6		
6								
7								
8								
9								
10								
11								
12								
H3604		1.7	0.5			17.5		
MASS STORAGE:								
0	TK70	1.5	2.4			36.0		
1								
2								
3								
Total these columns:								
Must not exceed:		60.0 A	18.0 A			584.0 W		

Note: Total output power from +3.3 Vdc and +5 Vdc must not exceed 330 W.

MLO-003830

Table 3–1: Power Requirements

		Current (Amps) (Max)		Power (Max)	Bus Loads	
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**
AAV11–SA	A1009–PA	2.10	0.00	10.50	2.5	0.5
ADQ32–SA	A030	4.45	0.00	22.25	2.5	0.5
ADV11–SA	A1008–PA	2.00	0.00	10.00	2.3	0.5
AXV11–SA	A026–PA	2.00	0.00	10.00	1.2	0.3
CXA16–M	M3118–YA	1.60	0.20	10.40	3.0	0.5
CXB16–M	M3118–YB	2.00	0.00	10.00	3.0	0.5
CXY08–M	M3119–YA	1.64	0.395	12.94	3.0	0.5
DESQA–SA	M3127–PA	2.40	0.22	14.64	2.2	0.5
DFA01–AA	M3121–PA	1.97	0.04	10.30	3.0	1.0
DPV11–SA	M8020–PA	1.20	0.30	9.60	1.0	1.0
DRQ3B–SA	M7658–PA	4.50	0.00	22.50	2.0	0.5
DRV1J–SA	M8049–PA	1.80	0.00	9.00	2.0	1.0
DRV1W–SA	M7651–PA	1.80	0.00	9.00	2.0	1.0
DSV11	M3108	5.43	0.69	35.43	3.9	1.0
DTQNA–BC	M7130	6.00	2.00	54.00	3.9	0.5
H3604[1]	–	1.70	0.50	14.50	–	–
IBQ01–SA	M3125–PA	5.00	0.30	28.60	4.6	1.0
IEQ11–SA	M8634–PA	3.50	0.00	17.50	2.0	1.0
KA670–A/B[2]	L4000–A/B	7.40	0.35	41.20	4.0	1.0
KDA50–SA	M7164	6.93	0.00	34.65	3.0	0.5
–	M7165	6.57	0.03	33.21	–	–
KLESI–SA	M7740–PA	4.00	0.00	20.00	0.5	1.0
KMV1A–SA	M7500–PA	2.60	0.20	15.40	3.0	1.0
KFQSA–M	M7769	5.50	0.00	27.50	4.4	0.5
KRQ50–SA	M7552	2.70	0.00	13.50	2.7	1.0
KWV11–SA	M4002–PA	2.20	0.013	11.156	1.0	0.3
KXJ11–SF	M7616	6.00	1.40	46.80	2.7	1.0
LPV11–SA	M8086–PA	2.80	0.00	14.00	1.8	0.5
MRV11–D	M8578	1.60[3]	0.00	8.00	3.0	0.5
MS670–BA	L4001–BA	2.52	0.00	12.60	–	–
RF31E–AA	–	1.00	2.80	38.60	–	–
RF71E–AA	–	1.25	1.64	25.93	–	–
TK70E–AA	–	1.50	2.40	36.30	–	–

[1]Also include –12 Vdc @ 0.25 A, 3 W

[2]Also include 3.3 Vdc @ 0.27 A, 0.9 W and –12 Vdc @ 0.04 A, 0.5 W

[3]Value is for the unpopulated module only.

Table 3–1 (Cont.): Power Requirements

Option	Module	Current (Amps) (Max)		Power (Max)	Bus Loads	
		+5 V	+12 V	Watts	AC	DC
TQK70–SA	M7559	3.50	0.00	17.50	4.3	0.5
TSV05–SA	M7530	6.50	0.00	32.50	1.5	1.0
TSV05–SA	M7206	6.50	0.00	32.50	2.4	1.0

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HOW TO ORDER ADDITIONAL DOCUMENTATION

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