

PDP-11/04, 34A

SUBS



Configuring Guide

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PDP-11/04,34A

Configuring Guide

This document includes an overview of the PDP-11/04 and 11/34A minicomputers, peripheral and interfacing options, and configuring instructions. It is intended for use by Digital's Technical OEM field personnel, customers, and system analysts.

REFERENCE DOCUMENTS

TITLE	ORDER NUMBER
PDP-11 Processor Handbook	EB0513876
PDP-11 Peripherals Handbook	EB0596176
PDP-11 Software Handbook	EB09798
Hardware/Accessories Catalog	EK0451775

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Information in this publication is based on specifications believed correct at the time of publication. The right is reserved to make changes in specifications and models as design improvements are introduced.

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Product Overview

PDP-11/04 Introduction

The PDP-11/04 is a full-scale PDP-11 minicomputer, the entry-level product in Digital's Unibus family of central processors. As a member of the Unibus family, the PDP-11/04 is fully hardware and software compatible with all other Unibus PDP-11s currently at work in tens of thousands of installations around the world. More than 15,000 of those installations are PDP-11/04s.

The features, design, and manufacturing techniques and system concepts introduced on the PDP-11/04 have been extended to a succession of PDP-11 minicomputers. As an example, the PDP-11/34A uses the same chassis, power supply, backplane and memory modules, everything but the CPU circuit board itself. As a result, the OEM installing a PDP-11/04 today can economically increase the power of his system in measured, confident steps.

PDP-11/34A Introduction

The PDP-11/34A is a midrange member of Digital's Unibus family of PDP-11 processors. While the PDP-11/34A is almost physically identical to the PDP-11/04, it provides in base configurations more than twice the computing power of its smaller family member. Also, the performance of the 11/34A can be easily and significantly enhanced by adding options such as cache memory, a hardware floating point unit, and physical memory expansion up to 256K bytes.

The PDP-11/34A is truly a high-performance system processor. For good reasons, it is the most popular mid-range minicomputer in the industry.

PDP-11/04 and PDP-11/34A Features

The PDP-11/04 and PDP-11/34A offer the following features:

- **Stack Architecture**
Ease of handling structured data, subroutines, and interrupts.
- **Asynchronous Operation**
System components can run at highest possible speed; replacement with faster subsystems means faster operation without hardware or software changes.
- **Automatic Priority, Vectored Interrupts**
Simpler and more efficient operation, especially in real-time applications.
- **Direct Memory Access**
High-speed data transfer without the need for CPU intervention.
- **Eight General-Purpose Registers**
Programming flexibility and computing power.
- **Parity Error Detection (optional on PDP-11/04)**
More reliable system operation.
- **Word- or Byte-Processing**
Efficient handling of 8-bit data.
- **Hardware Multiply/Divide (optional on PDP-11/04)**
Simpler and more efficient handling of arithmetic operations.
- **Integral Bootstrap For All PDP-11 Peripherals**
Ease of system startup and restart.

- Console Emulator
Complete control of CPU from any ASCII terminal.
- Built-in Diagnostics
CPU and memory tested automatically for more reliable operation, especially useful in remote installation.
- Power Fail/Auto Restart
Recovery, under program control, from power outage.
- Memory Management And Protection (not available on PDP-11/04)
Expansion to 256K bytes of physical memory; protection of system and user programs and data, especially important in multi-user, multi-tasking environment.

PDP-11/04 And PDP-11/34A Specifications

Operational

Word Length: 16 bits

Memory Access Times:

MOS	
MS11-FP, -JP	550 nanoseconds
MS11-L	360 nanoseconds
Core	
MM11-DP	560 nanoseconds
MM11-YP	450 nanoseconds

Unibus Rate: 1-8M bytes/second (theoretical Unibus bandwidth)

Memory Capacity (User Accessible):

PDP-11/04	56K bytes
PDP-11/34	248K bytes

Physical

- Small Chassis Dimensions and Weight:
13.3 cm (5.25 in.) high × 48.3 cm (19 in.) wide × 63.5 cm (25 in.) deep.
20.5 Kg (45 lbs.).
- Large Chassis Dimensions and Weight:
26.7 cm (10.5 in.) high × 48.3 cm (19 in.) wide × 68.0 cm (26.8 in.) deep.
50 Kg (110 lbs.).

Electrical

- CPU Power Requirements:
115 V ± 10% or 230 V ± 10%, 47-63 Hz
Small Chassis - 400 W
Large Chassis - 800 W
UL Listed

Environmental

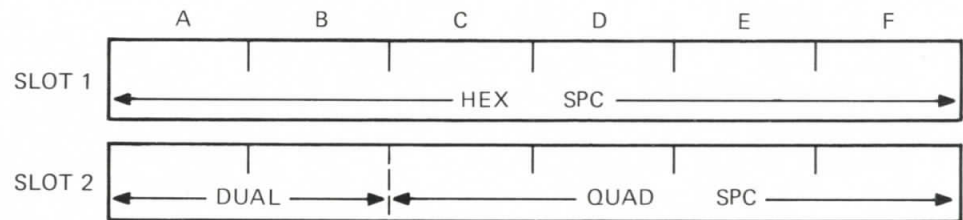
- | | |
|--------------------------------|-------------------------------|
| • Operating Temperature | Non-Operating |
| +10°C to +50°C | -40°C to +66°C |
| • Relative Humidity | |
| 20% to 95%
(non-condensing) | 5% to 95%
(non-condensing) |

Standard Configurations

Standard Layouts

The PDP-11/04 and PDP-11/34A are available in a 13 cm (5.25 in.) or a 26 cm (10.5 in.) chassis. In either case, the basic unit includes a nine-slot position-independent backplane. The 26 cm (10.5 in.) version, in addition to the nine-slot backplane, provides mounting space for three system units. This additional mounting space can be used for backplane expansion or for mounting peripheral controllers with a mounting code given as SU. In the basic nine-slot backplane, any expansion slot labeled QUAD SPC will accommodate any option with the mounting code SPC or QUAD SPC. Any expansion slot labeled HEX SPC will accommodate options designated SPC or QUAD SPC, in addition to a dual-height option such as the M7850 parity controller. Options designated HEX SPC require HEX SPC slots.

Small Peripheral Controller (SPC) Slot Sizes



NOTE: A dual-height option requires a HEX SPC slot; once installed it converts that slot to a QUAD SPC.

Tables 1 through 4 are listings of the PDP-11/04 and PDP-11/34A models in the small and large chassis configurations. The following notes and abbreviations apply throughout this document.

NOTES

1. All models operate in the frequency range of 47–63 Hz.
2. Core-based CPUs can be expanded with MOS or core memory.
3. Core models require a minimum 104/208 V.
4. Amps Available – current @ +5 V available for chassis-mounted options.
5. Mounting Codes:
 - SPC/H, SPC/Q - hex/quad small peripheral controller slots available.
 - SU – System unit locations available
 - PAN – 48.3 cm (19 in.) rack-mountable, requires 26 cm (10.5 in.) vertical space. SM PAN requires 13 cm (5.25 in.)
 - TT – Table top mount
 - F.S. – Free standing

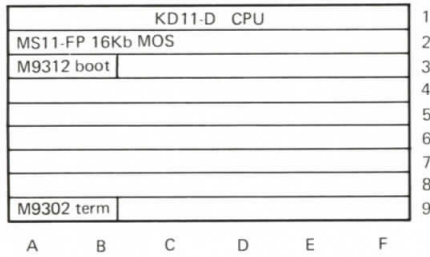
Table 1 PDP-11/04 Models (Small Chassis)

	115 V	Model 230 V	Memory (bytes)	Mounting Code	Amps Available	Bus Loads Available	SPC H/Q	SU
Small Box [13 cm (5.25 in.)] Chassis								
MOS	11/04-BC	11/04-BD	16K	SM PAN	22	17	5/2	-
	11/04-DC	11/04-DD	32K	SM PAN	22	17	5/2	-
	11/04-LC	11/04-LD	64K	SM PAN	20	16	4/2	-
Core	11/04-FC	11/04-FD	16K	SM PAN	22	17	5/2	-
	11/04-HC	11/04-HD	32K	SM PAN	20	17	4/2	-
	11/04-JC	11/04-JD	64K	SM PAN	19	17	4/2	-

PDP-11/04 Small Box [13 cm (5.25 in.)] Chassis Configurations

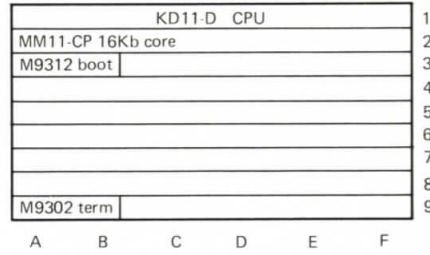
MOS Memory

• 11/04 - BC/BD

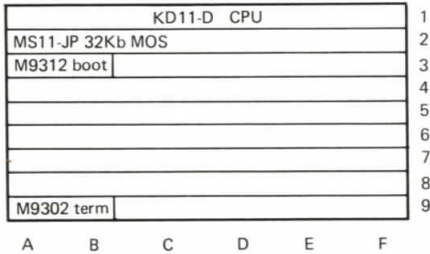


Core Memory

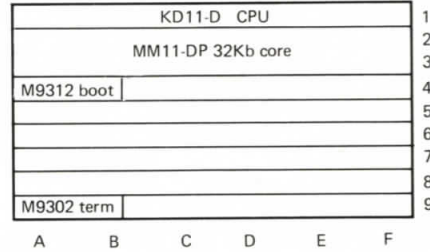
• 11/04 - FC/FD



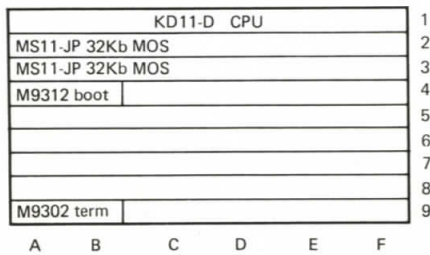
• 11/04 - DC/DD



• 11/04 - HC/HD



• 11/04 - LC/LD



• 11/04 - JC/JD

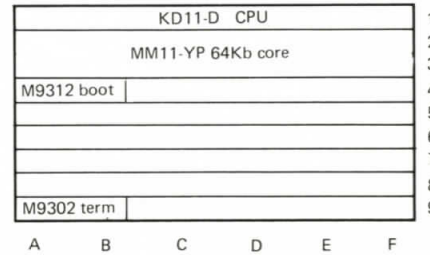
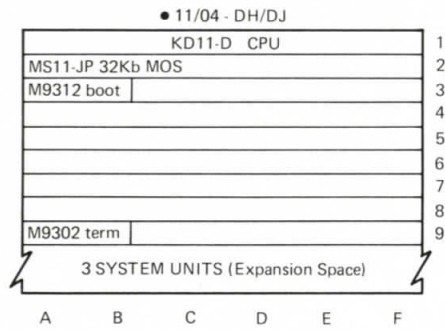


Table 2 PDP-11/04 Models (Large Chassis)

	115 V	Model 230 V	Memory (bytes)	Mounting Code	Amps Available	Bus Loads Available	SPC H/Q	SU
Large Box [26 cm (10.5 in.)] Chassis								
MOS	11/04-DH	11/04-DJ	32K	PAN	54	17	5/2	3
	11/04-LH	11/04-LJ	64K	PAN	52	16	4/2	3
Core	11/04-HH	11/04-HJ	32K	PAN	52	17	4/2	3
	11/04-JH	11/04-JJ	64K	PAN	51	17	4/2	3

PDP-11/04 Large Box [26 cm (10.5 in.)] Chassis Configurations

MOS Memory



Core Memory

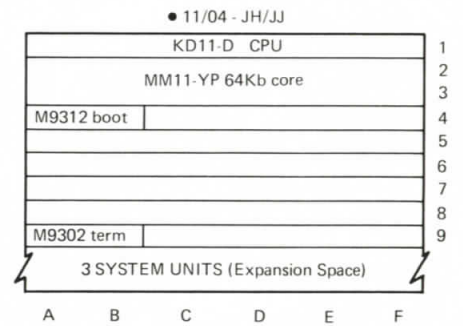
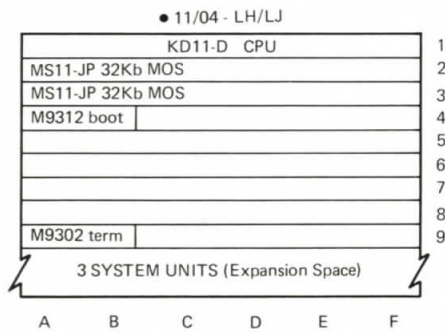
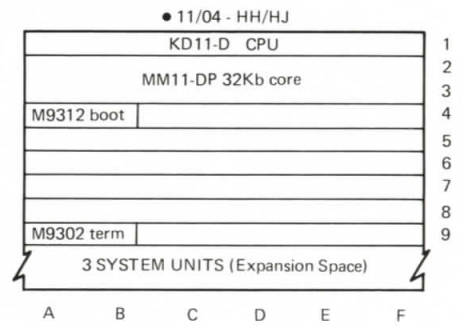
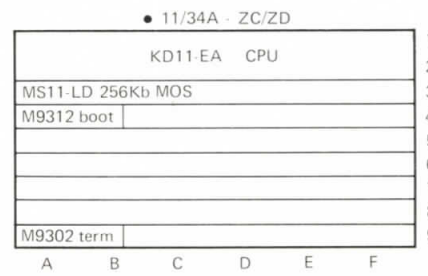
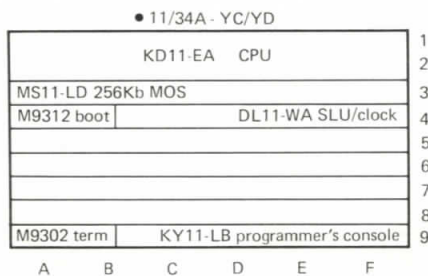
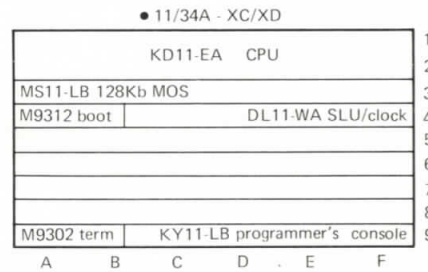
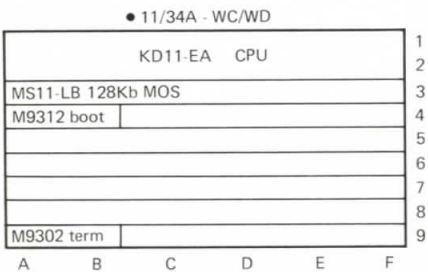
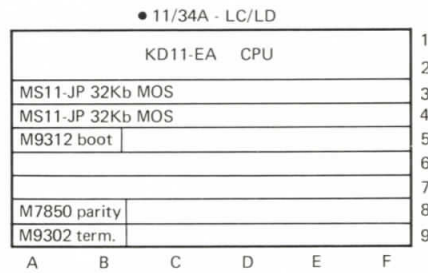
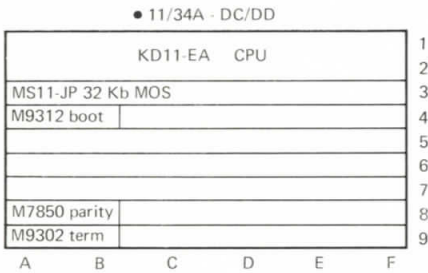


Table 3 PDP-11/34A Models (Small Chassis)

	115V	Model 230V	Memory (bytes)	Mounting Code	Amps Available	Bus Loads Available	SPC H/Q	SU
MOS	11/34A-DC	11/34A-DD	32K	SM PAN	15	16	3/3	-
	11/34A-LC	11/34A-LD	64K	SM PAN	13	15	2/3	-
	11/34A-WC	11/34A-WD	128K	SM PAN	15	17	4/2	-
	11/34A-XC	11/34A-XD	128K*	SM PAN	10	15	4/0	-
	11/34A-YC	11/34A-YD	256K*	SM PAN	10	15	4/0	-
	11/34A-ZC	11/34A-ZD	256K	SM PAN	15	17	4/2	-
Core	11/34A-HC	11/34A-HD	32K	SM PAN	13	16	2/3	-
	11/34A-JC	11/34A-JD	64K	SM PAN	12	16	2/3	-

* Includes DL11-W line frequency clock/serial line unit and KY11-LB programmer's console.

PDP-11/34A Small Box [13.3 cm (5.25 in.)] Chassis Configurations
MOS Memory



Core Memory

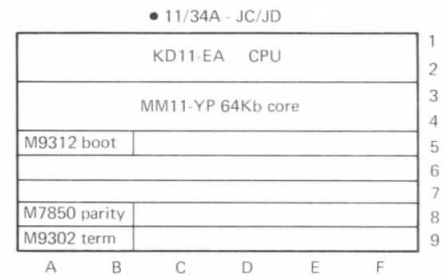
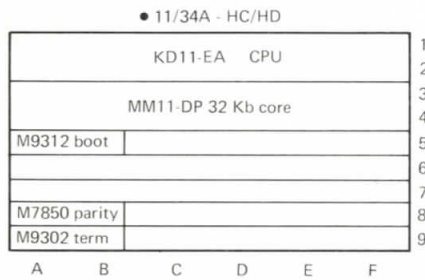


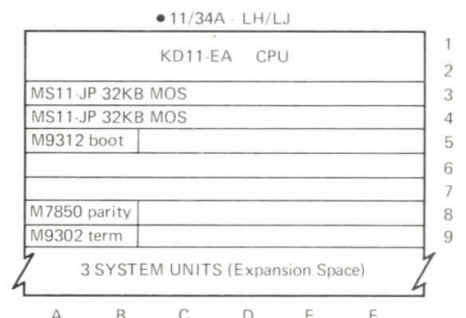
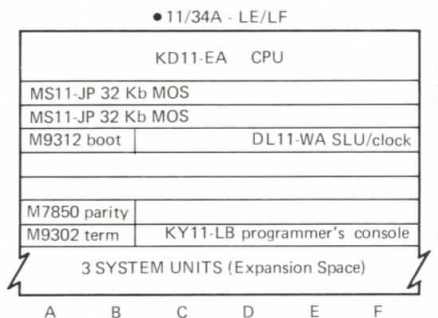
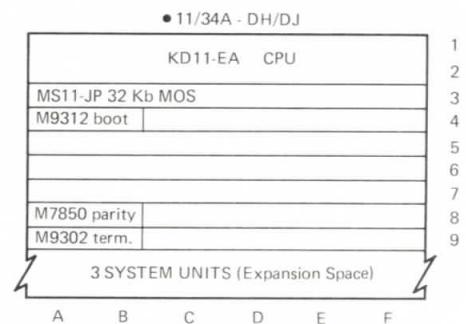
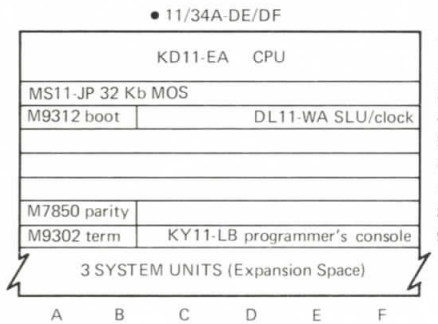
Table 4 PDP-11/34A Models (Large Chassis)

	Model		Memory (bytes)	Mounting Code	Amps Available	Bus Loads Available	SPC H/Q	SU
	115V	230V						
MOS	11/34A-DE	11/34A-DE	32K*	PAN	44	14	3/1	3
	11/34A-DH	11/34A-DJ	32K	PAN	47	16	3/3	3
	11/34A-LE	11/34A-LF	64K*	PAN	40	13	2/1	3
	11/34A-LH	11/34A-LJ	64K	PAN	45	15	2/3	3
	11/34A-WE	11/34A-WF	128K	PAN	47	17	4/2	3
	11/34A-XE	11/34A-XF	128K*	PAN	42	15	4/0	3
	11/34A-YE	11/34A-YF	256K*	PAN	42	15	4/0	3
	11/34A-ZE	11/34A-ZF	256K	PAN	47	17	4/2	3
Core	11/34A-HE	11/34A-HF	32K*	PAN	40	14	2/1	3
	11/34A-HH	11/34A-HJ	32K	PAN	45	16	2/3	3
	11/34A-JE	11/34A-JF	64K*	PAN	39	14	2/1	3
	11/34A-JH	11/34A-JJ	64K	PAN	44	16	2/3	3

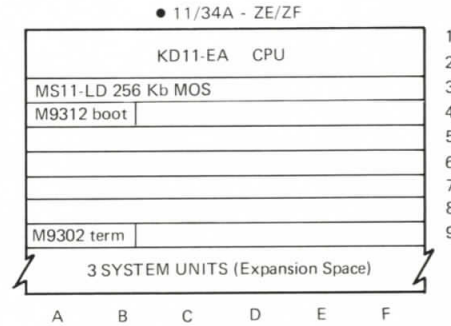
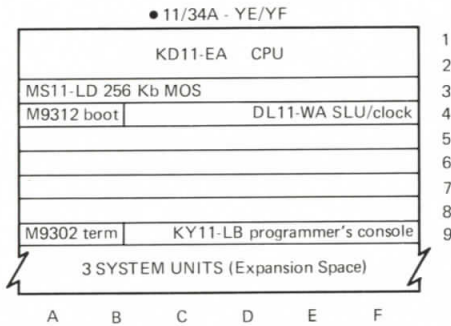
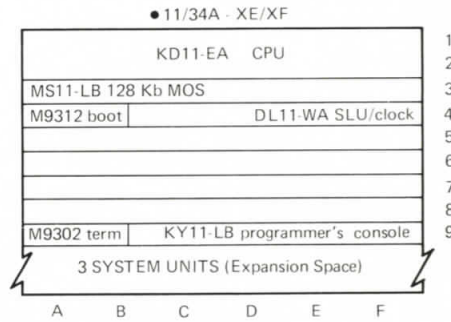
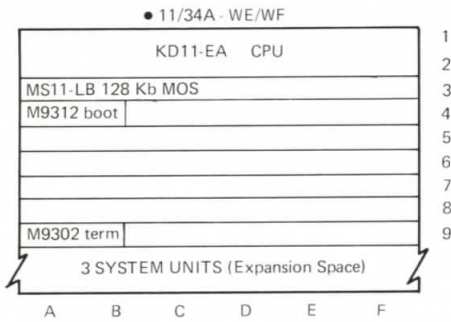
* Includes DL11-W line frequency clock/serial line unit and KY11-LB programmer's console.

PDP-11/34A Large Box [26.6 (10.5 in.)] Chassis Configurations

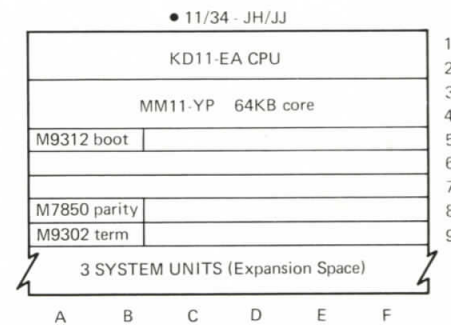
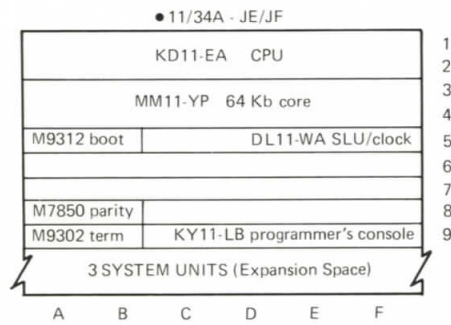
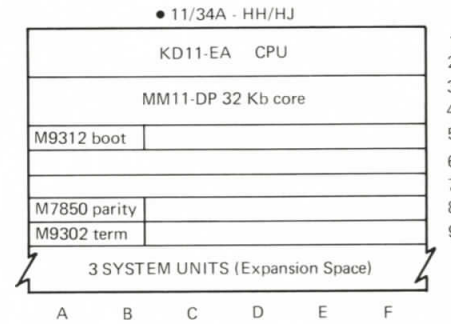
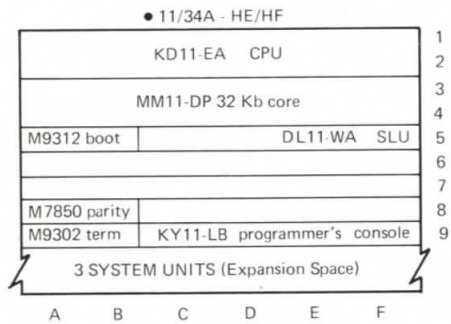
MOS Memory



MOS Memory (Continued)



Core Memory



Software Operating Systems

The following major operating systems provide support for a number of high-level programming languages available on the PDP-11/04 and PDP-11/34A. Information beyond the brief introduction presented here can be found in the PDP-11 Software Handbook (EB-09798).

RT-11 Operating System (QJ013)

Description: RT-11 is a disk-based, single-user real-time operating system designed for interactive program development and on-line processing of application programs on the PDP-11 or PDT-11.

RT-11 supports both single job and foreground/background modes of processing. In addition to a variety of system and program development utilities, RT-11 offers optional support of a number of high-level language processors, including FORTRAN IV, BASIC, MU BASIC, APL, MACRO, and FOCAL.

The operating system is designed for the single interactive user, with English language commands that are consistent in format and easy to understand. System messages are clear and concise.

Other features include contiguous file structure providing fast and efficient file manipulation, device-independent I/O programming, flexible real-time I/O, memory management support, limited multi-terminal support, low system overhead and ease of expansion. RT-11 also supports industry compatible magnetic tape, and batch processing.

Hardware Environment: RT-11 runs on systems ranging from the microprocessor-based PDP-11/03 through the larger PDP-11/70. A console terminal, at least 16K bytes of memory, and a random-access device are required for single-job operation. If foreground-background operation is desired, at least 32K bytes of memory and a line frequency or programmable clock are required. In addition to the processor, memory, and console terminal, a second I/O peripheral device is required for software distribution. For example, a flexible diskette system with two disk drives meets these criteria.

RSX-11M Operating System (QJ738)

Description: RSX-11M is a highly responsive, event-driven, multiprogramming operating system designed for real-time process control, communications, and information management systems. The functionality, and thus the size of the executive software, may be tailored to the application's needs; from a small, dedicated laboratory controller to a large, complex multi-user data acquisition, control, and retrieval system.

RSX-11M is an extremely flexible operating system. It imposes no requirements for division of memory into partitions when memory management hardware is present. The system dynamically schedules the execution of program units (tasks) according to a set of application-defined priorities using all available memory. The association of specific tasks with predefined memory partitions is possible for optional use in highly time-critical applications.

A round-robin scheduler can be selectively used for multi-user program development and real-time operations. The checkpointing feature ensures the effective use of main memory.

Tasks can be written in MACRO-11, FORTRAN IV, FORTRAN-IV-PLUS, COBOL-11, BASIC-11, BASIC-PLUS-2, or CORAL-66. A comprehensive library of multi-language interfaces to executive functions is provided, giving the high-level language and assembly language programmer easy access to powerful system functions.

Hardware Environment: RSX-11M runs on any of the PDP-11 processors except the LSI-11 based processors. The minimum configuration requires a central processor

with a clock and at least 32K bytes of memory, a console terminal, a disk system, and a magnetic tape system. The minimum system requires 16K bytes of memory for the operating system; 16K bytes of memory are available for user tasks.

If concurrent program development and applications execution are desired, at least 48K bytes of memory are required.

RSX-11S Operating System (QJ642)

Description: RSX-11S is a memory-based real-time operating system designed to operate in all PDP-11 processors. The system is not dependent upon any mass storage media for execution. It is a subset of the RSX-11M disk-based operating system and is fully compatible with it. The I/O driver interface is identical so that any device driver written for one system executes on the other. Any application program that executes under RSX-11S will execute under RSX-11M without change following a relink of the object program.

As a memory-based system, RSX-11S provides a run-time environment for execution of tasks on a memory-based processor. RSX-11S supports all the peripheral devices that are supported under RSX-11M, including such hardware as floating point processors, parity memory, and memory management. The software components contained in the RSX-11S distribution kit include the Monitor Console Routine (RSX-11M Subset), on-line task loader, System Image Preservation Program, and File Control Services (FCS) for record devices. Directory support is not included. Transportability of tasks between the RSX-11M host and the RSX-11S target is provided via the File Exchange Utility (FLX) on the host system and the On-Line Task Loader (OTL) on the target system.

Hardware Environment: RSX-11S runs on any of the PDP-11 processors, from the LSI-11 based products to the PDP-11/70. The minimum RSX-11S system consists of a CPU with at least 16K bytes of memory and a load device such as paper tape, cassette, DECtape, magnetic tape, or floppy disk. The system can support a console terminal if operator communication is desired. At least 32K bytes of memory are needed to support on-line task loading or the execution of tasks written in FORTRAN.

RSTS/E Operating System (QR430)

Description: RSTS/E is a resource-sharing timesharing operating system. It allows multiple users to interact with the system and its data structures, and dynamically allocates processor time, file space, and peripherals on a best fit/best throughput basis.

RSTS/E supports line printer spooling and execution of a maximum of 8 batch streams.

It has a powerful and flexible file system, and provides efficient and controlled resource sharing.

Other features include: dynamic scheduling algorithm; commercial extensions; support of software options such as APL-11, SORT-11, PDP-11 COBOL, FORTRAN IV/RSTS-E, RMS-11K, DATATRIEVE, and PDP-11 BASIC-PLUS-2.

Hardware Environment: RSTS/E runs on a PDP-11/34, 11/44, 11/60 or 11/70. The system requires a console terminal, real-time clock, and 48K words of parity memory with the memory management option (at least 64K words of memory are required to support FORTRAN IV or COBOL). In addition, the system requires a disk pack system or a dual-drive fixed-head disk or disk cartridge. Magnetic tape is also generally required for software distribution.

PDP-11/04 and PDP-11/34A Packaged Systems

Systems listed in this section are preconfigured and integrated by Digital. Each system includes, at a minimum, the CPU, mass storage devices, cabinets and expansion hardware, a console terminal, an operating system, and system-level documentation. The Packaged System concept simplifies the total systems configuring and ordering procedures for Digital's OEM customers.

Figure 1 explains the OEM Packaged System nomenclature. Figures 2 and 3, respectively, depict typical PDP-11/04 and PDP-11/34A packaged systems components.

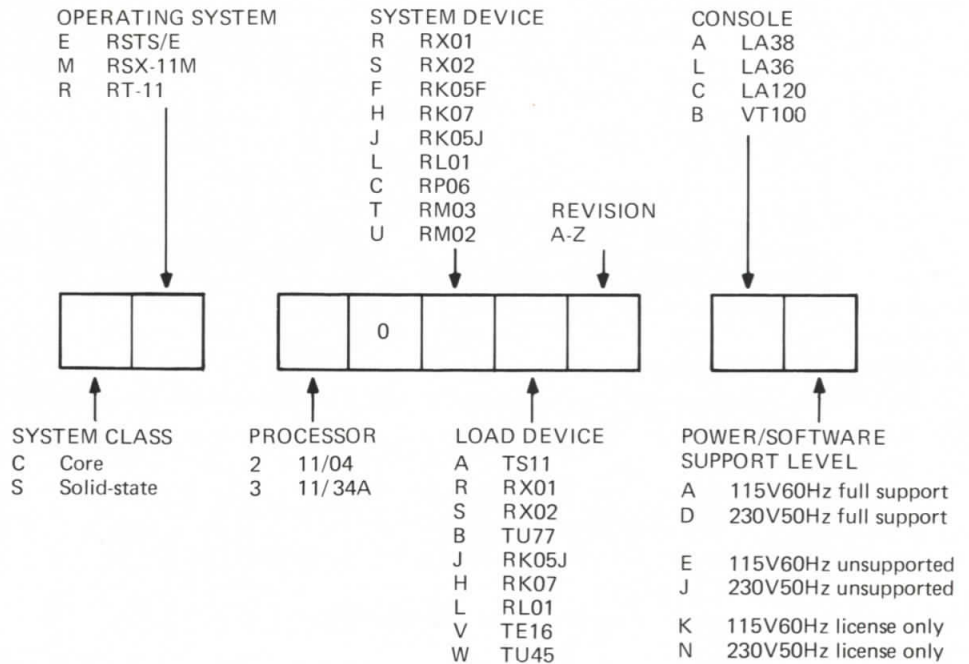


Figure 1 Nomenclature for Packaged Systems Models



Figure 2 Typical PDP-11/04 Packaged System Components

PDP-11/04 Packaged Systems

The model numbers in the following list of PDP-11/04 packaged systems include a fully supported software license. The PDP-11/04 packaged systems are available as unsupported and license-only software support levels after the first supported system is purchased.

Other power variations exist. They are listed in the Product Summary.

RT-11 Operating System

Model	Memory	System Backup & Load Devices	Expansion Space	Power Available Amps @ +5V	Bus Loads Available	Cabinets Included	Other Options Included
MOS Memory							
SR-20LLA-LA SR-20LLA-LD	64Kb	RL01 RL01	CPU SU 1-2: 2 Hex slots, 2 Quad slot	13.2	13	1	LA36
SR-20LLA-BA SR-20LLA-BD							VT100
SR-20LLA-CA SR-20LLA-CD							LA120
Core Memory							
SR-20SSA-LA SR-20SSA-LD	64Kb	RX02 RX02	CPU SU 1-2: 3 Hex slots, 1 Quad slot	17.7	14	1	LA36
SR-20SSA-BA SR-20SSA-BD							VT100
SR-20SSA-CA SR-20SSA-CD							LA120
Core Memory							
CR-20LLA-LA CR-20LLA-LD	64Kb	RL01 RL01	CPU SU 1-2: 2 Hex slots, 2 Quad slot	11.2	14	1	LA36
CR-20SSA-LA CR-20SSA-LD	64Kb	RX02 RX02	CPU SU 1-2: 3 Hex slots, 1 Quad slot	15.7	15	1	LA36

RSX-11M Operating System

Model	Memory	System Backup & Load Devices	Expansion Space	Power Available Amps @ +5V	Bus Loads Available	Cabinets Included	Other Options Included
MOS Memory							
SM-20LLA-LA SM-20LLA-LD	64Kb	RL01 RL01	CPU SU 1-2: 2 Hex slots, 2 Quad slots	12.2	13	1	LA36
Core Memory							
CM-20LLA-LA CM-20LLA-LD	64Kb	RL01 RL01	CPU SU 1-2: 2 Hex slots, 2 Quad slots	11.2	14	1	LA36



Figure 3 Typical PDP-11/34A Packaged System Components

PDP-11/34 Packaged Systems

The model numbers in the following list of PDP-11/34A packaged systems include a fully supported software license. The PDP-11/34A packaged systems are available as unsupported and license-only software support levels after the first supported system is purchased.

Other power variations exist. They are listed in the Product Summary.

RT-11 Operating System

Model	Memory	System Backup & Load Devices	Expansion Space	Power Available Amps @ +5V	Bus Loads Available	Cabinets Included	Other Options Included
MOS Memory							
SR-30LLB-LA	128Kb	RL01	CPU SU 1-2: none	none	13	1	LA36
SR-30LLB-LD		RL01	SU 3-5: 6 Hex slots, 2 Quad slots, 1 SU	24.4			
SR-30LLB-BA							VT100
SR-30LLB-BD							
SR-30LLB-CA							LA120
SR-30LLB-CD							
Core Memory							
SR-30SSB-LA	128Kb	RX02	CPU SU 1-2: 2 Hex slots, 1 Quad slot	2.7	13	1	LA36
SR-30SSB-LD		RX02	SU 3-5: 7 Hex slots, 1 SU	25.9			
SR-30SSB-BA							VT100
SR-30SSB-BD							
SR-30SSB-CA							LA120
SR-30SSB-CD							
Core Memory							
CR-30LLA-LA	64Kb	RL01	CPU SU 1-2: 3 Hex slots, 1 Quad slot	4.5	12	1	LA36
CR-30LLA-LD		RL01	SU 3-5: 3 Hex slots, 2 Quad slots, 1 SU	17.7			
CR-30SSA-LA	64Kb	RX02	CPU SU 1-2: 3 Hex slots, 1 Quad slot	4.5	12	1	LA36
CR-30SSA-LD		RX02	SU 3-5: 4 Hex slots, 1 Quad slot, 1 SU	21.2			

RSX-11M Operating System

Model	Memory	System Backup & Load Devices	Expansion Space	Power Available Amps @ +5V	Bus Loads Available	Cabinets Included	Other Options Included
MOS Memory							
SM-30HHB-CA	128Kb	RK07	CPU SU 1-2: none	none	13	1	LA120
SM-30HHB-CD		RK07	SU 3-5: 2 Hex slots, 1 SU	16.7			
SM-30LLB-LA	128Kb	RL01	CPU SU 1-2: none	none	13	1	LA36
SM-30LLB-LD		RL01	SU 3-5: 6 Hex slots, 2 Quad slots, 1 SU	24.4			
SM-30LLB-BA							VT100
SM-30LLB-BD							
SM-30LLB-CA							LA120
SM-30LLB-CD							
SM-30MMA-AA	256Kb	RL02	CPU SU 1-2: none	none	13	1	LA38
SM-30MMA-AK		RL02	SU 3-5: 6 Hex slots, 2 Quad slots 1 SU	24.4			
SM-30MMA-BA							VT100
SM-30MMA-BK							
SM-30MMA-CA							LA120
SM-30MMA-CK							
SM-30UAA-CA	256Kb	RM02	CPU SU 1-2: none	none	12	1	LA120
SM-30UAA-CD		TS11	SU 3-5: 1 Hex slot 1 Quad slot	13.7			
SM-30UVB-CA	256Kb	RM02	CPU SU 1-2: 2 Hex slots, 1 Quad slot,		12	2	LA120
SM-30UVB-CD		TE16	SU 3-5: 7 Hex slots, 1 Quad slot, 1 SU	2.7 28.7			
			BA11-K SU 1-2: none SU 3-5: 1 SU	none 11.7			BA11-K
Core Memory							
CM-30FJA-LA	64Kb	RK05F	CPU SU 1-2: 3 Hex slots, 1 Quad slot	13.5	12	1	LA36
CM-30FJA-LD		RK05J	SU 3-5: 2 Hex slots, 3 Quad slots	16.2			

RSX-11M Operating System (Cont)

Model	Memory	System Backup & Load Devices	Expansion Space	Power Available Amps @ +5V	Bus Loads Available	Cabinets Included	Other Options Included
CM-30HHA-LA CM-30HHA-LD	128Kb	RK07 RK07	CPU SU 1-2: 3 Hex slots, 1 Quad slot SU 3-5: 2 Hex slots, 2 Quad slots, 1 SU	4.5 19	11	1	LA36 BA11-K
CM-30LLA-LA CM-30LLA-LD	64Kb	RL01 RL01	BA11-K SU 1-2: 2 Hex slots, 1 Quad slot SU 3-5: 3 SU CPU SU 1-2: 3 Hex slots, 1 Quad slot SU 3-5: 3 Hex slots, 2 Quad slots, 1 SU	11.7 25 4.5 17.7	12	1	LA36

RSTS/E Operating System

Model	Memory	System Backup & Load Devices	Expansion Space	Power Available Amps @ +5V	Bus Loads Available	Cabinets Included	Other Options Included
MOS memory SE-30HHB-CA SE-30HHB-CD	256Kb	RK07 RK07	CPU SU 1-2: none SU 3-5: 2 Hex slots 1 SU	none 16.7	13	1	LA120
SE-30LLB-CA SE-30LLB-CD	128Kb	RL01 RL01	CPU SU 1-2: none SU 3-5: 6 Hex slots 2 Quad slots 1 SU	none 24.4	13	1	LA120
SE-30MMA-CA SE-30MMA-CD	256Kb	RL02 RL02	CPU SU 1-2: none SU 3-5: 6 Hex slots 2 Quad slots 1 SU	none 24.4	13	1	LA120
SE-30UVB-CA SE-30UVB-CD	256Kb	RM02 TE16	CPU SU 1-2: 2 Hex slots 1 Quad slot SU 3-5: 7 Hex slots 1 Quad slot 1 SU BA11-K SU 1-2: none SU 3-4: 1 SU	2.7 28.7 none 11.7	12	2	LA120 BA11-K

Systems Cabinets

Digital offers a wide variety of system cabinets and options. The two cabinet series most frequently used for PDP-11/04 and PDP-11/34A systems are the H960 and H967. Refer to Digital's Hardware and Accessories Catalog (EK0451775) for more detail on the H960 and H967, and for information about Digital's other cabinet products.

H960

The H960 (Figures 4 and 5) is a medium-to-large systems cabinet used mostly in PDP-11/04 and PDP-11/34 systems. It can also serve as an expansion cabinet for existing systems and applications.

Figure 6 illustrates the clearance dimensions for the standard (H960) and short (H967) cabinet.

- The H960 can accept all 48 cm (19 inch) EIA spacing rack mounting components. All doors and covers have suitable locking devices which comply with regulatory agencies.
- Cooling is done by self-cooling devices with assistance from a single top-mounted fan blowing air down. Space for an auxiliary fan is provided next to the existing fan.

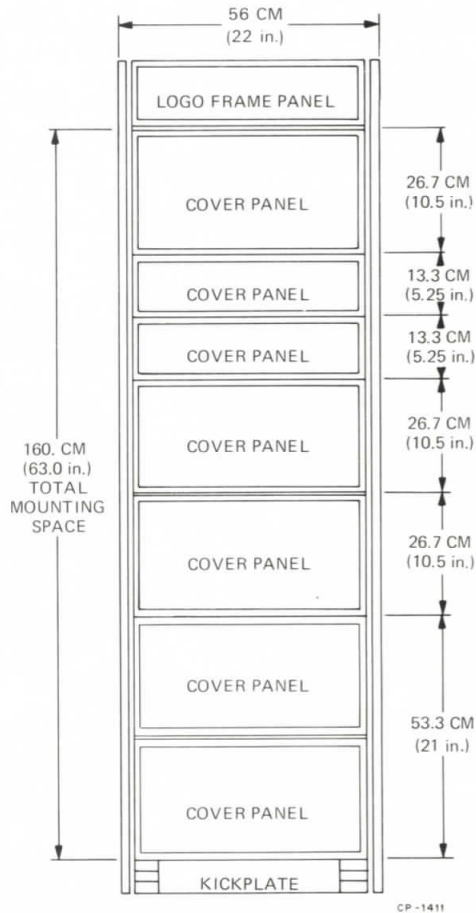
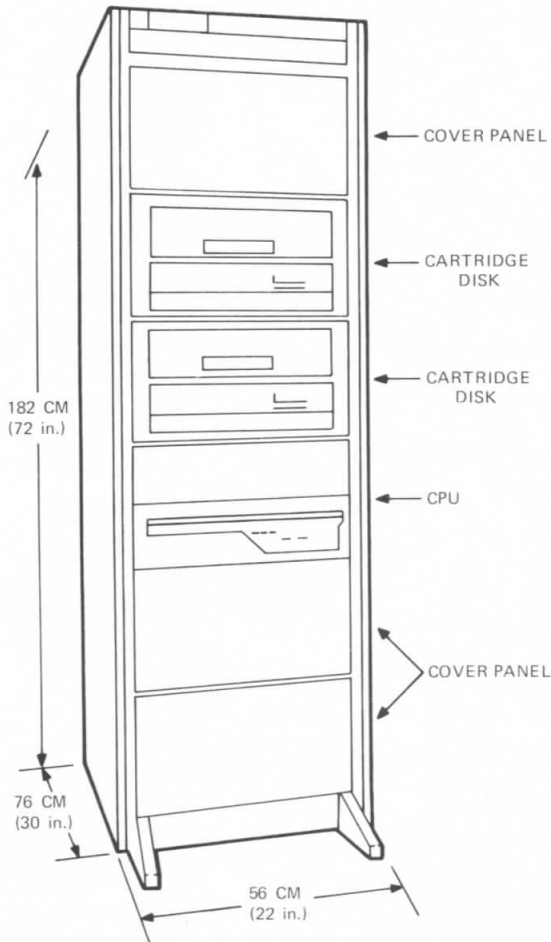


Figure 4 H960 System Cabinet Example

Figure 5 H960 Basic Cabinet Configuration

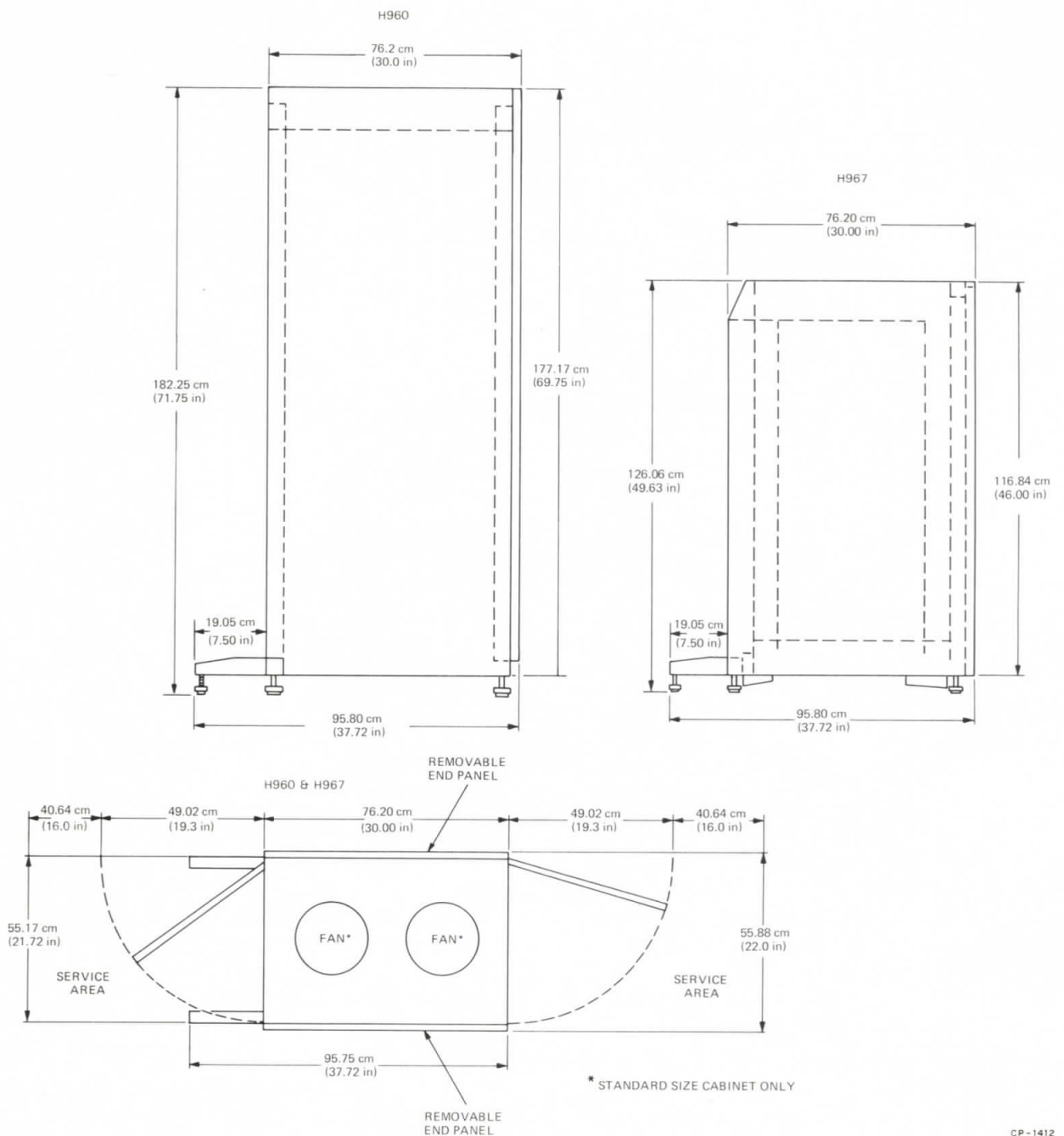


Figure 6 Standard (H960) and Short (H967) Cabinet Clearance Dimensions

- The H960 cabinet can be bolted together with other H960 cabinets to form large multi-bay configurations.
- A wide assortment of accessories is available to custom configure the H960 into many configurations.
- The H960 includes a power control which provides 24A @ 115 V (16A @ 230 V) for all cabinet-mounted components.

NOTE

In most applications, power, rather than mounting space, is the limiting factor in a system configuration.

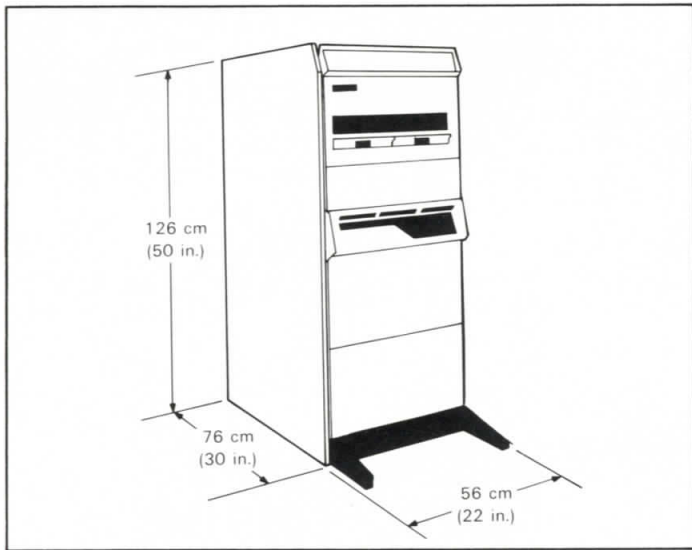


Figure 7 Typical H967 System Configuration

H967

The H967 (Figure 7) is a small-to-medium systems cabinet used primarily in PDP-11/04 applications.

- The H967 is essentially a smaller variation of the H960.
- The H967 shares many of the accessories and components of the taller H960 cabinet. The extensive range of available accessories permits the configuring of the H967 into a wide range of applications.
- H967 cooling is largely done by self-cooling devices. Cooling must be front to rear. Optional rear door fans are available, with a maximum of two installed at the top and bottom of the rear door.
- The H967 incorporates suitable locking devices on doors and panels to comply with regulatory agency requirements.
- Like the larger H960, the H967 may be bolted together to form multi-bay configurations.
- The H967 includes a power control which provides 24A @ 115 V (16A @ 230 V) for use by all cabinet-mounted components.

NOTE

In most applications, power, rather than mounting space, is the limiting factor in system configuration.

CPU and Expansion Boxes

13.5 cm (5.25 in.) Chassis – BA11-L

The BA11-L (Figure 8) is used as a CPU enclosure for both the PDP-11/04 and the PDP-11/34A, and as a 9-slot expansion chassis for both processors.

The BA11-L components fit into a mounting frame which provides a sturdy enclosure

and maximum accessibility. The mounting frame is divided into two major sections, with the modules in one section and the power supply in the other section.

Circuit boards are mounted horizontally in a 9-slot backplane, with the slots numbered from top to bottom. A wire-frame card cage with guides and locking feature ensures that the CPU and option cards are securely held in place. The entire backplane and card cage assembly are accessible for maintenance and easily removed for replacement, if necessary.

There are two fans in the BA11-L. One cools the power supply and the other cools the module section. Both fans circulate air toward the back of the mounting frame. A single fan filter goes across the width of the mounting frame in the front of the box.

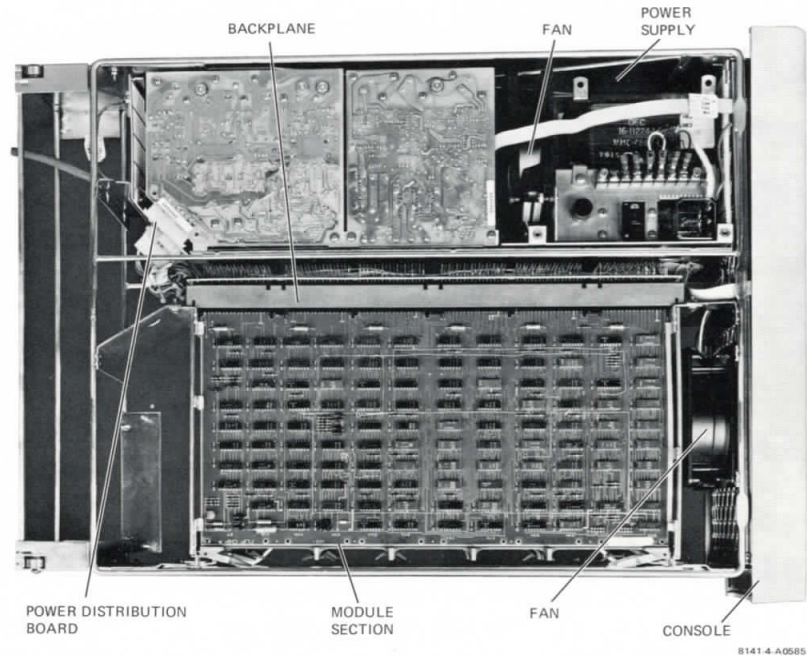


Figure 8 BA11-L Mounting Box (Top View with Shroud Removed)

There are three consoles (Figure 9) available with the BA11-L; the KY11-LA operator's console; the KY11-LB programmer's console; and a blank console which is included when the BA11-L is purchased as an expander chassis.

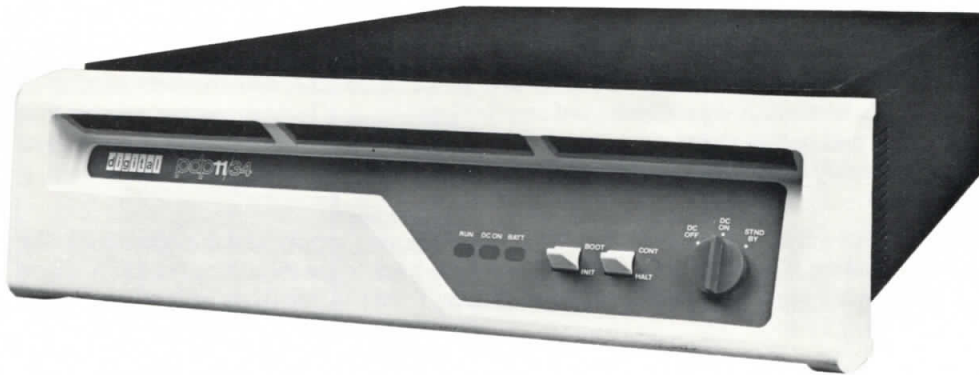
The expander console is a metal plate with a louvered grill for airflow. A power light (DC ON) and a battery monitor light (BATT) are displayed on the panel. The indicator lights are light-emitting diodes (LEDs) mounted on a printed circuit (PC) board attached to the console behind the grill.

The mounting frame slides into a wraparound envelope that completely encloses four sides of the mounting frame. The front and back of the envelope are open for airflow. The envelope is easily mounted and functions as a slide mechanism for withdrawing the frame and its contents.

27 cm (10.5 in.) Chassis – BA11-K

The BA11-K is used as a CPU enclosure for the PDP-11/04 and the PDP-11/34A and as a 22-slot expansion chassis for both processors.

The BA11-K, shown in Figures 10 and 11, consists of a main chassis and a power



KY-11A Operator's Console



KY-11B Programmer's Console



Expander Console

Figure 9 Operator's, Programmer's, and Expander Consoles for BA11-L

system. The main chassis accommodates backplanes and system-unit-mounted options up to a total of 22 slots. As shown, circuit boards are mounted vertically in the BA11-K and are held in place by guides and a foam-backed cover.

Two fans in the BA11-K provide enough front-to-back cooling for a fully utilized backplane layout. Chassis slides with a tilt feature allow total accessibility to circuit boards and backplane for easy maintenance.

The expander console shown is included when the BA11-K is purchased as an expander chassis. In addition, the BA11-K accommodates either a KY11-LA operator's console or a KY11-LB programmer's console as described in the BA11-L section.

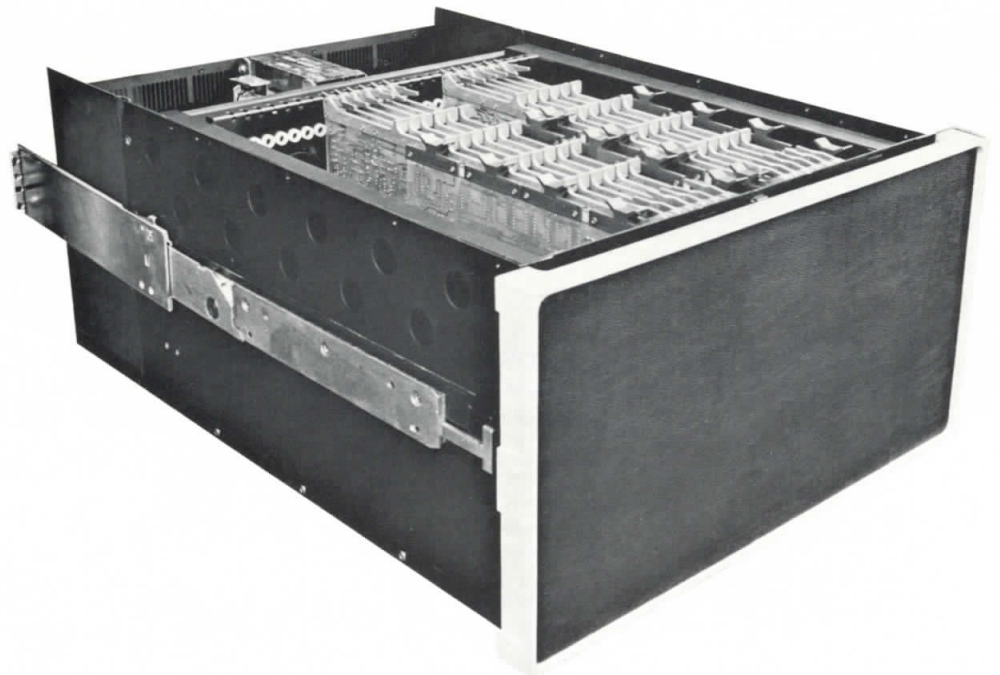


Figure 10 BA11-K Mounting Box (Top Covers Removed)

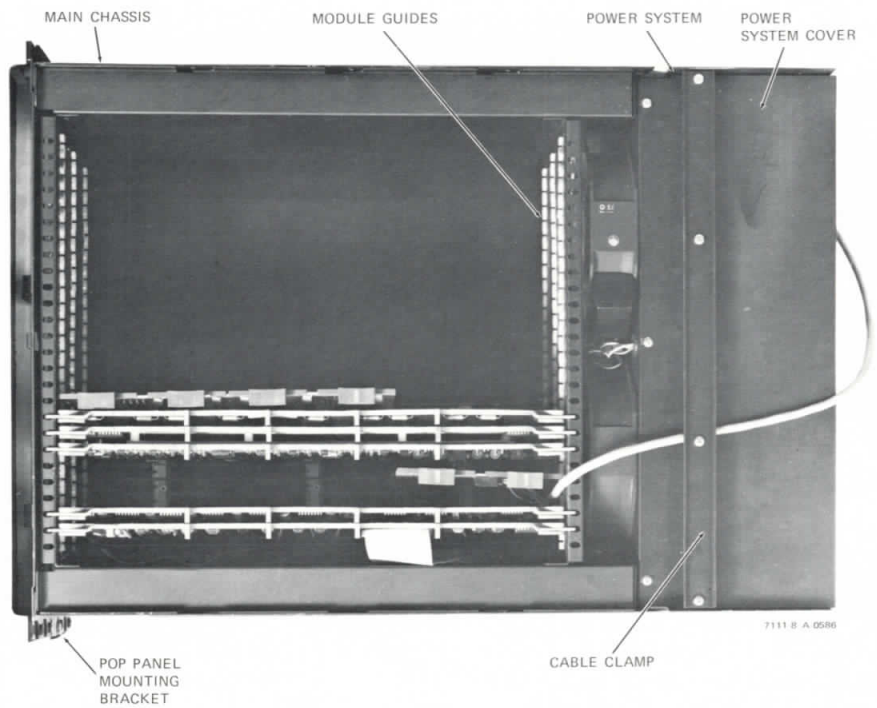
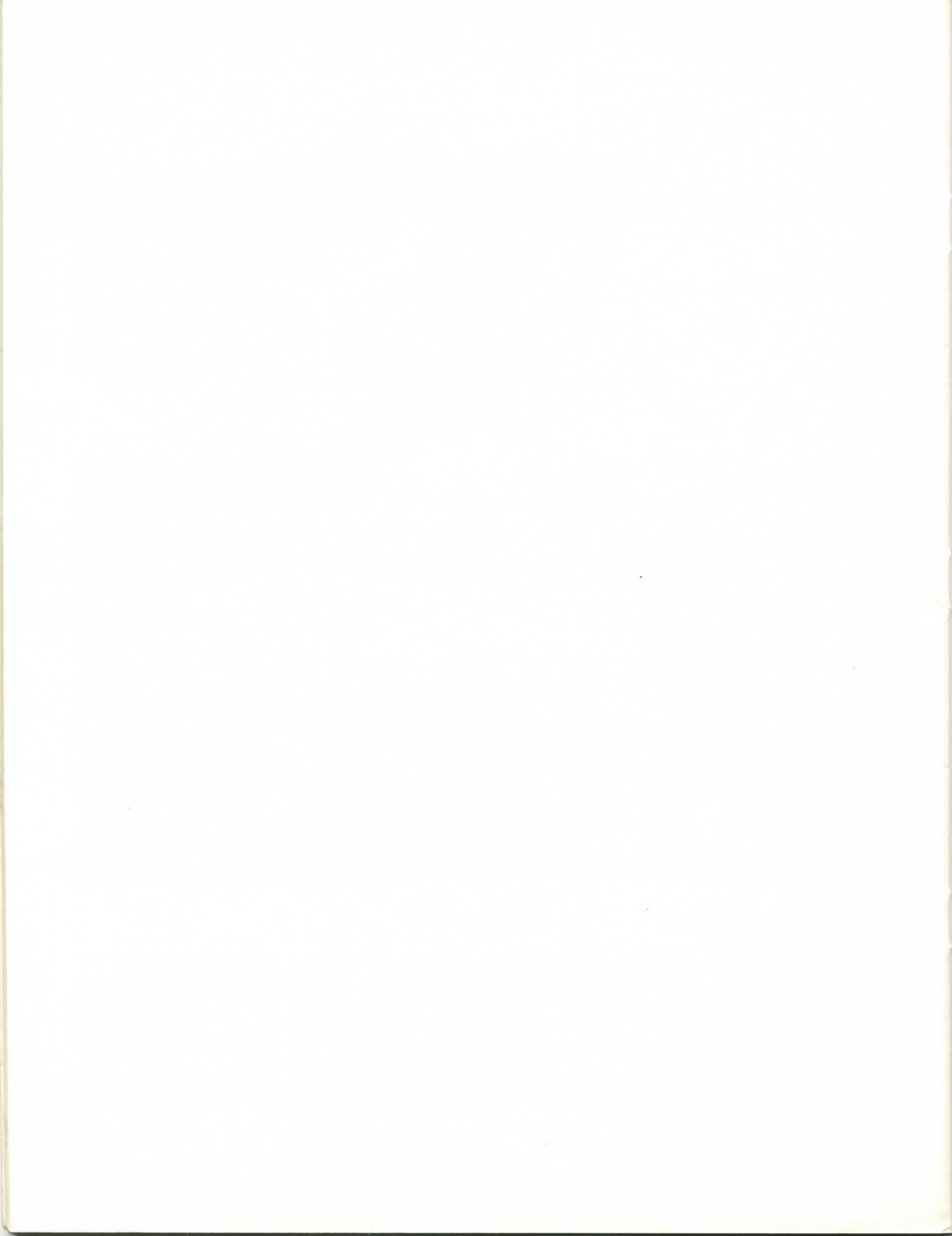


Figure 11 BA11-K Mounting Box (Top View with Main Chassis Cover Removed)



System Peripherals and Options

Peripherals and Options

Items in Tables 5 through 12 are listed for quick reference to peripherals and options. For additional detail, consult the OEM Product Summary, the PDP-11 Processor Handbook, and the PDP-11 Peripherals Handbook.

Table 5 CPU Options

Option Number	Description	Mounting Code	Amps Required @ +5 V	Bus Loads
DD11-C	Backplane providing 2 hex and 2 quad SPC slots	1 SU	-	-
DD11-D	Backplane providing 7 hex and 2 quad SPC slots	2 SU	-	-
FP11-A (11/34A only)	Floating point processor	SPC/H	7.0	1
H775-A	MOS memory battery backup 13.3 cm (5.25 in. chassis only)	SM PAN	-	-
H775-CA (115V)	MOS memory battery backup	SM PAN	N/A	N/A
H775-CB (230V)	MOS memory battery backup for 26 cm (10.5 in.) chassis only	SM PAN	N/A	N/A
KE11-B (11/04 only)	Extended arithmetic element (hardware multiply/divide)	SPC/H	4.0	1
KK11-A (11/34A only)	Cache memory	SPC/H	4.0	1
KW11-P	Programmable real-time clock	SPC/Q	1.0	1
KY11-LB	Programmer console	SPC/Q	3	1
M7850	Parity control - one required for 11/04 CPU and for each expansion backplane (DD11-C or DD11-D) containing MS11-FP/JP, MM11-CP/DP, or MM11-YP memory	SPC/D	0.75	1

Table 6 Expansion Units

Option Number	Description	Mounting Code	Amps Available @ +5V	Bus Loads
BA11-K	26 cm (10.5 in.) expansion chassis	PAN	64	-
BA11-L	13 cm (5.25 in.) expansion chassis	SM PAN	32	-
H960	182 cm (72 in.) cabinet	F.S.	-	-
H967	126 cm (50 in.) cabinet	F.S.	-	-

Table 7 Memory Options

Option Number	Description	Mounting Code	Amps Available @ +5V	Bus Loads
MM11-CP	16K byte core	SPC/H and SPC/Q	2.3	1
MM11-DP	32K byte core	2 SPC/H	4	1
MM11-YP	64K byte core	2 SPC/H	5.0	1
MS11-FP	16K byte MOS	SPC/H	2.0	1
MS11-JP	32K byte MOS	SPC/H	2.0	1
MS11-LB	128K byte MOS	SPC/H	3.1	1
MS11-LD	256K byte MOS	SPC/H	3.1	1

Table 8 Mass Storage Devices

Option Number	Description	Mounting Code	Amps Required @ +5V	Bus Loads
RL11-AK	5.0M byte cartridge disk drive and control	SPC/H & PAN	5.0	1
RL01-AK	5.0M byte cartridge disk drive	PAN	N/A	N/A
RL211-AK	10.0M byte cartridge disk drive and control	SPC/H & PAN	3.5	1
RL02-AK	10.0M byte cartridge disk drive	PAN	N/A	N/A
RK711-EA	28.0M byte cartridge disk drive and control	2 SU & F.S.	12.0	1
RK07-EA	28.0M byte cartridge disk drive	F.S.	N/A	N/A
RX11-BA	512K byte dual floppy and control	SPC/Q & PAN	1.5	1
RX211-BA	1.0M byte dual floppy and control	SPC/Q & PAN	1.5	1
TJE16-EA	Magnetic tape and control	2 SU & CAB	16.0	1
TME11-EA	Magnetic tape and control	SU & CAB	5.0	1
TS11-DA	Magnetic tape and control	SPC/H & CAB or 26 in. PAN	3.5	1

Table 9 Data Communications Interfaces

Option Number	Description	Mounting Code	Amps Required @ +5V	Bus Loads
DL11-WB	Asynchronous SLU and line frequency clock (EIA/CCITT)	SPC/Q	2.0	1
DL11-WA	20 mA current loop equivalent of DL11-WB	SPC/Q	2.0	1
DL11-E	Asynchronous SLU with modem control (EIA/CCITT)	SPC/Q	1.8	1
DZ11-A	8-line EIA/CCITT asynchronous, SLU multiplexer with 16-line distribution panel	SPC/H and distribution panel	2.2	1
DZ11-B	8-line expander for DZ11-A	SPC/H	2.2	1
DZ11-C	20 mA current loop equivalent of DZ11-A	SPC/H and distribution panel	3.0	1
DZ11-D	8-line expander for DZ11-C	SPC/H	3.0	1
DJ11-AA	Asynchronous 16-line multiplexer (EIA/CCITT)	SU & SM PAN	4.7	1
DJ11-AC	20 mA current loop equivalent of DJ11-AA	SU & SM PAN	5.3	1
DH11-AA	Asynchronous 16-line multiplexer	2 SU & SM PAN	8.4	2
DM11-BB	16-line modem control for DH11-AA	DH11-AA	2.1	1
DM11-DA	DH11-AA adapter for 4 20 mA lines	DH11-AA	N/A	N/A
DM11-DB	DH11-AA adapter for 4 EIA/CCITT lines	DH11-AA	N/A	N/A
DM11-DC	4-line modem control adapter for DH11-AA with DM11-BB	DH11-AA	N/A	N/A

Table 9 Data Communications Interfaces (Cont)

Option Number	Description	Mounting Code	Amps Required @ +5V	Bus Loads
DH11-AD	Asynchronous 16-line multiplexer (EIA/CCITT) with modem control	2 SU & distribution panel	10.8	3
DH11-AE	Equivalent of DH11-AD above but without modem control	2 SU & distribution panel	8.6	2
DUP11-DA	Full/half duplex synchronous line with modem control	SPC/H	3.6	1
DU11-DA	Full/half duplex synchronous line with modem control	DPC/Q	2.0	1
DMC11-AL	Local network DDCMP microprocessor	SPC/H	5.0	1
DMC11-MA/MD	Local network link line unit	SPC/H (next to DMC11-AL)	3.0	N/A
DMC11-AR	Remote network link DDCMP microprocessor	SPC/H	5.0	1
DMC11-DA/FA	Remote network link line unit	SPC/H (next to DMC11-AR)	3.0	N/A
DQ11-DA/EA	Full/half duplex NPR synchronous interface	SU	5.7	1
DV11-AA	Synchronous/asynchronous comm. preprocessor up to 16 EIA/CCITT lines	2 SU	12.3	2
DV11-BA	8 synchronous line group for DV11-AA	DV11-AA & distribution panel	2.6	N/A
DV11-BB	8 asynchronous line group for DV11-AA	DV11-AA & distribution panel	4.0	N/A
DV11-BC	8 synchronous/asynchronous line group for DV11-AA	DV11-AA	3.3	N/A

Table 10 Printers

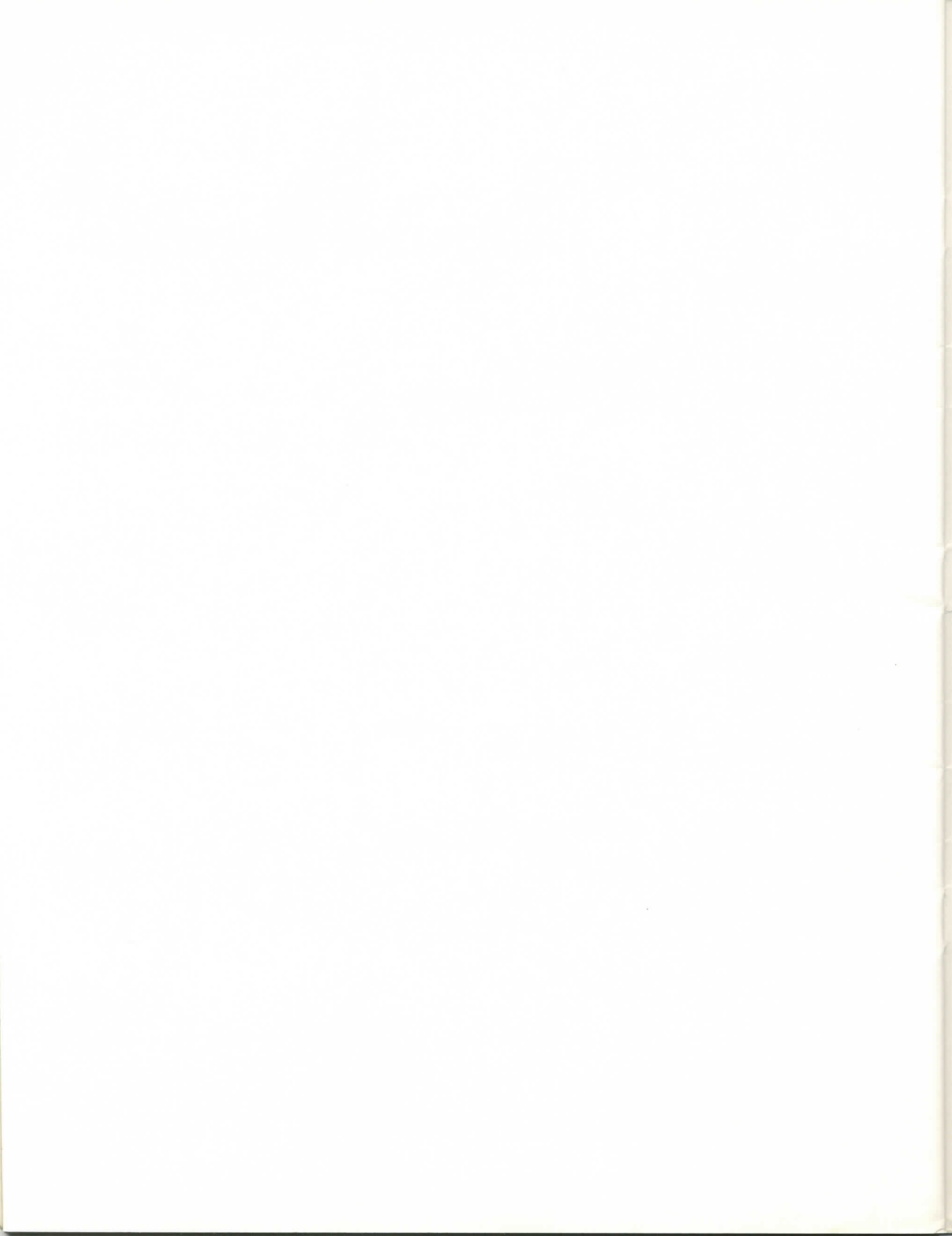
Option Number	Description	Mounting Code	Amps Required @ +5V	Bus Loads
LP11	High-speed line printer and control	SPC/Q & F.S.	1.5	1
LA11	180-cps printer and control	SPC/Q & F.S.	1.5	1

Table 11 Video Terminals (SLU Interface Required)

Option Number	Description	Mounting Code	Amps Required @ +5V	Bus Loads
VT100	High-performance video display terminal	TT	N/A	N/A

Table 12 Hard-copy Terminals (SLU Interface Required)

Option Number	Description	Mounting Code	Amps Required @ +5V	Bus Loads
LA36	DECwriter II hard-copy terminal (30 cps)	F.S.	N/A	N/A
LA35	Receive-only version of LA36 (30 cps)	F.S.	N/A	N/A
LA38	DECwriter IV hard-copy terminal (30 cps)	F.S.	N/A	N/A
LA120	Hard-copy terminal (120 cps)	F.S.	N/A	N/A



Configuring Instructions

Introduction

This section provides the tools to facilitate matching a system configuration to application requirements. Since packaged systems are preconfigured, they are easier to specify and order. They also offer a cost savings to the user. Packaged systems, therefore, should be used whenever possible.

Configuring Procedures

The following procedures should be followed when configuring a system:

1. Select options from the appropriate table (Tables 5-12).
2. Enter option(s) selected and option number(s), Table 13, in the Selected Options Worksheet. Also enter the quantity, mounting code, amps required, and bus load for each option. Figure 12 shows the H960 and H967 cabinet layouts.
3. Calculate the total amps required and bus loads for all options selected. Enter these totals on the worksheet.
4. Choose memory type (MOS or core) and size (16K to 256K bytes) required for the specific application.
5. From the appropriate table (Tables 1, 2, 3, or 4) and the chassis configurations (which follow the table you select), choose the model that meets memory size and type, and total mounting space requirements.
6. Determine whether or not one of the packaged systems can be used as a base for the configuration.
7. Refer to the paragraph on Configuring Your System (page 31) as you build your system. To start, enter the selected CPU model number or power supply designation. Enter items included with that model in the 9-slot backplane diagram. Enter the +5 V power provided by the model chosen.
8. Mount all dual modules in sections A and B of a slot, and all quad modules in sections C, D, E, and F of a slot. (See Figures 13 or 14.)
9. In configuring a system, the fastest DMA devices should be configured so that they are electrically closest to the CPU for faster operation, e.g., the RL11 should be closer to the CPU than the RX211.
10. Enter the selected options in the remaining slots illustrated.

If additional slots are required, proceed as follows:

13 cm (5.25 in.) Chassis

- Add BA11-K or BA11-L expansion chassis.
- Add system unit-mounted options.
- Add backplane DD11-C or DD11-D to house SPC-mounted options.

26 cm (10.5 in.) Chassis

- Add system unit-mounted options directly and/or add backplanes DD11-C or DD11-D to house SPC mounted options.

NOTE

If additional space is required, repeat procedures described for the 13 cm (5.25 in.) chassis.

11. Review configuration to ensure that enough power is available to run the options selected.

Potential problems that may arise are:

- Power distribution – swap option to meet distribution constraints or add an expansion chassis.
 - Insufficient power – add an expansion chassis.
12. Review configuration to ensure that bus load limit (20) has not been exceeded.

NOTE

If limit is exceeded, a DB11-A bus repeater must be added.

13. When system configuration has been completed, select cabinets to house the system.
14. Enter required information in the System Summary List (Table 14).

Configuring Notes

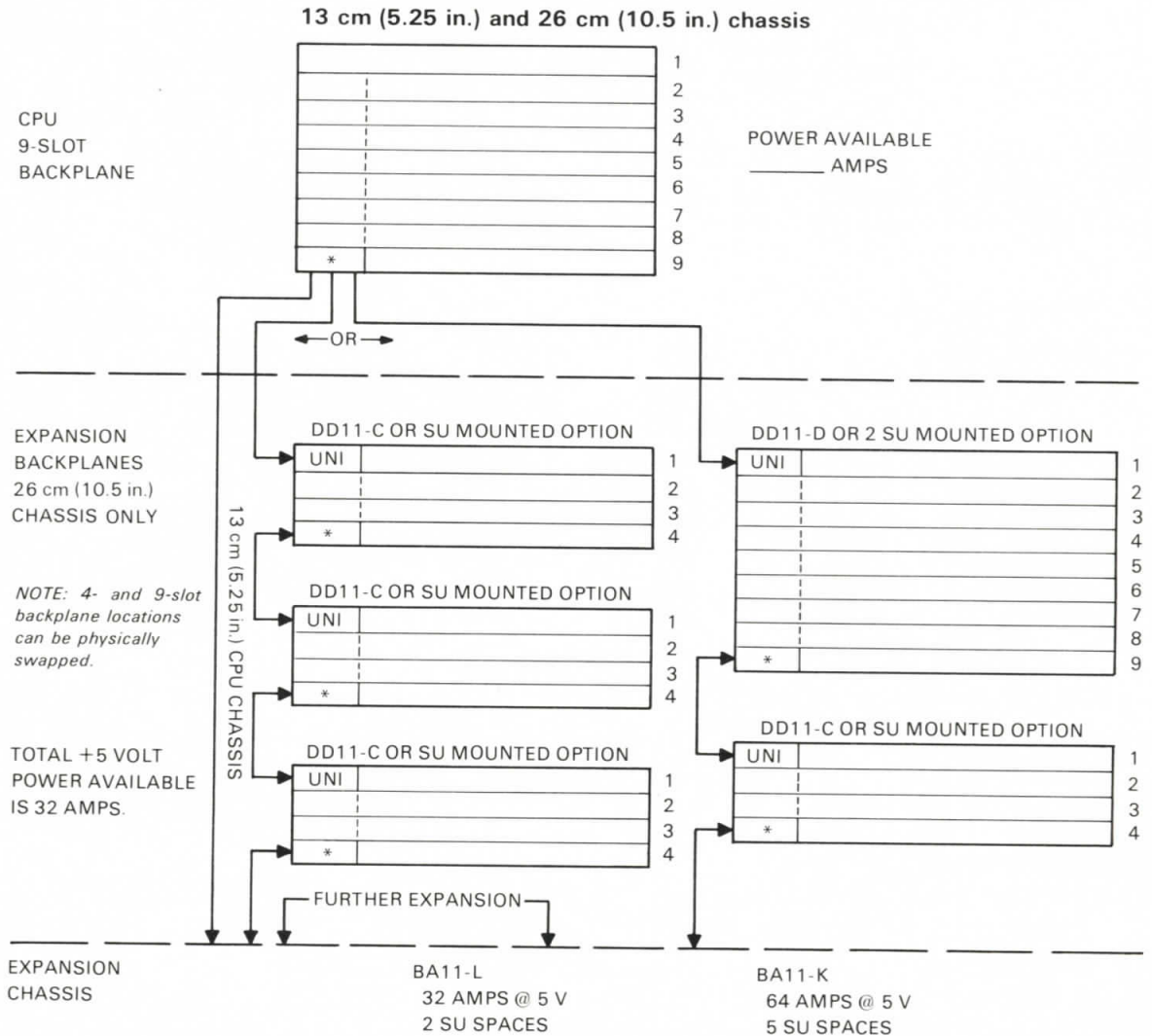
The following notes should be referred to when configuring a PDP-11/04 or PDP-11/34A.

- Slot Independence – except for slots 1 and 2 in the CPU backplane, all Unibus slots are identical. Option cards can use any available backplane position.
- The optional KY11-LB programmer's console physically replaces the standard KY11-LA operator's console and requires a quad slot in the CPU 9-slot backplane.
- A core-based CPU can be expanded with MOS or core memory. Only MOS can be added to a MOS configuration.
- Memory locations should be contiguous if possible.
- Parity core memory cannot be mounted in a DD11-C 4-slot backplane.
- All memory options include byte parity. However, the parity controller (M7850) must be added to the 11/04 to implement that feature. Also, an additional M7850 is required for each additional backplane (11/04 or 11/34A) that contains memory. (11/34A models configured with MS11-LB or MS11-LD do not require M7850.)
- FP11-A, floating point processor, must be mounted in slot 3 in the 11/34A backplane.
- KK11-A, cache memory, must be mounted in slot 5 in the 11/34A backplane.
- In 11/34A packaged systems, slots, power and bus loads have been reserved for the FP11-A and KK11-A. If the system does not include an FP11-A, an additional 7 amps of +5 V, plus one bus load are available; if cache is not included, 4 amps of +5 V and one bus load are available, in addition to power available and bus loads available listed in the Packaged Systems descriptions.
- The H960-CA cabinet contains a power controller (model 861-C) which provides 24 amps @ 115 Vac. Cabinet layout alternatives are shown in Figure 12. The illustration shows that when a 13 cm (5.25 in.) CPU (6 amps required) is mounted in this cabinet, one BA11-L (6 amps required) and one BA11-K (12 amps required) can be added for additional mounting space.

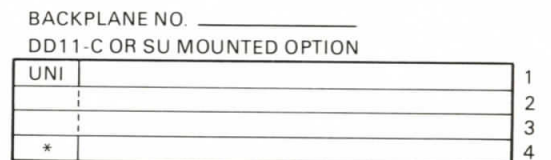
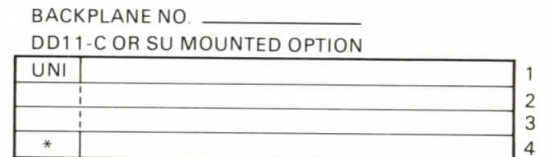
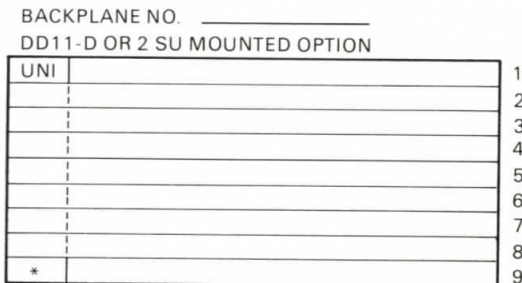
However, if the CPU is mounted in a 26 cm (10.5 in.) chassis, either two BA11-Ls or one BA11-K can be added.

Configuring Your System

The mechanical layout of the PDP-11/04 and PDP-11/34A consists of backplanes organized as shown below. A pictorial view of a typical PDP-11/04 (26 cm CPU) system is shown in Figure 13. That view also shows details of the backplane layout. A PDP-11/34A system is depicted in Figure 14.



NOTE: Add DD11-X backplanes or SU mounted options to BA11-X expansion chassis to achieve required mounting space.



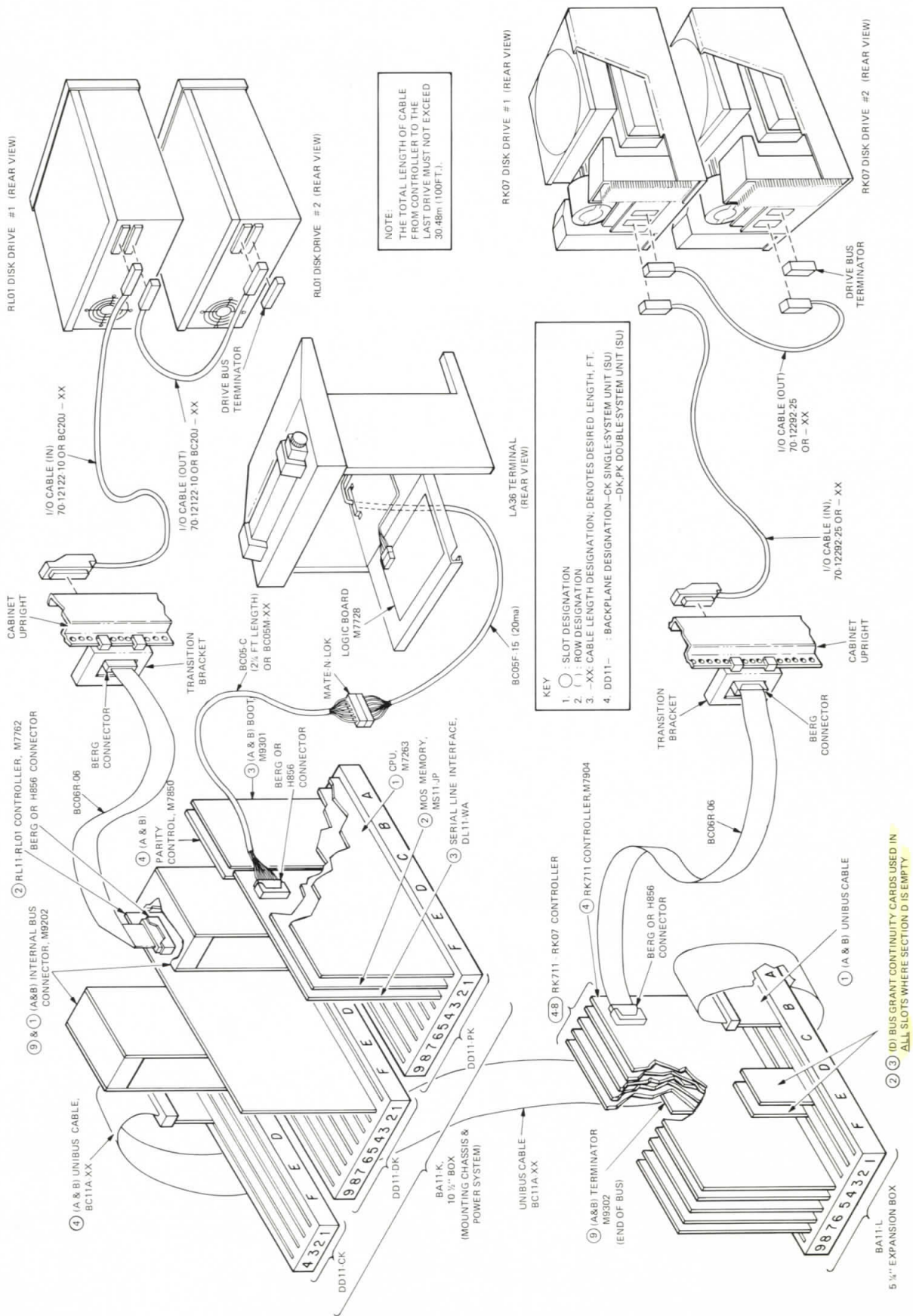


Figure 13 Typical PDP-11/04 Configuration

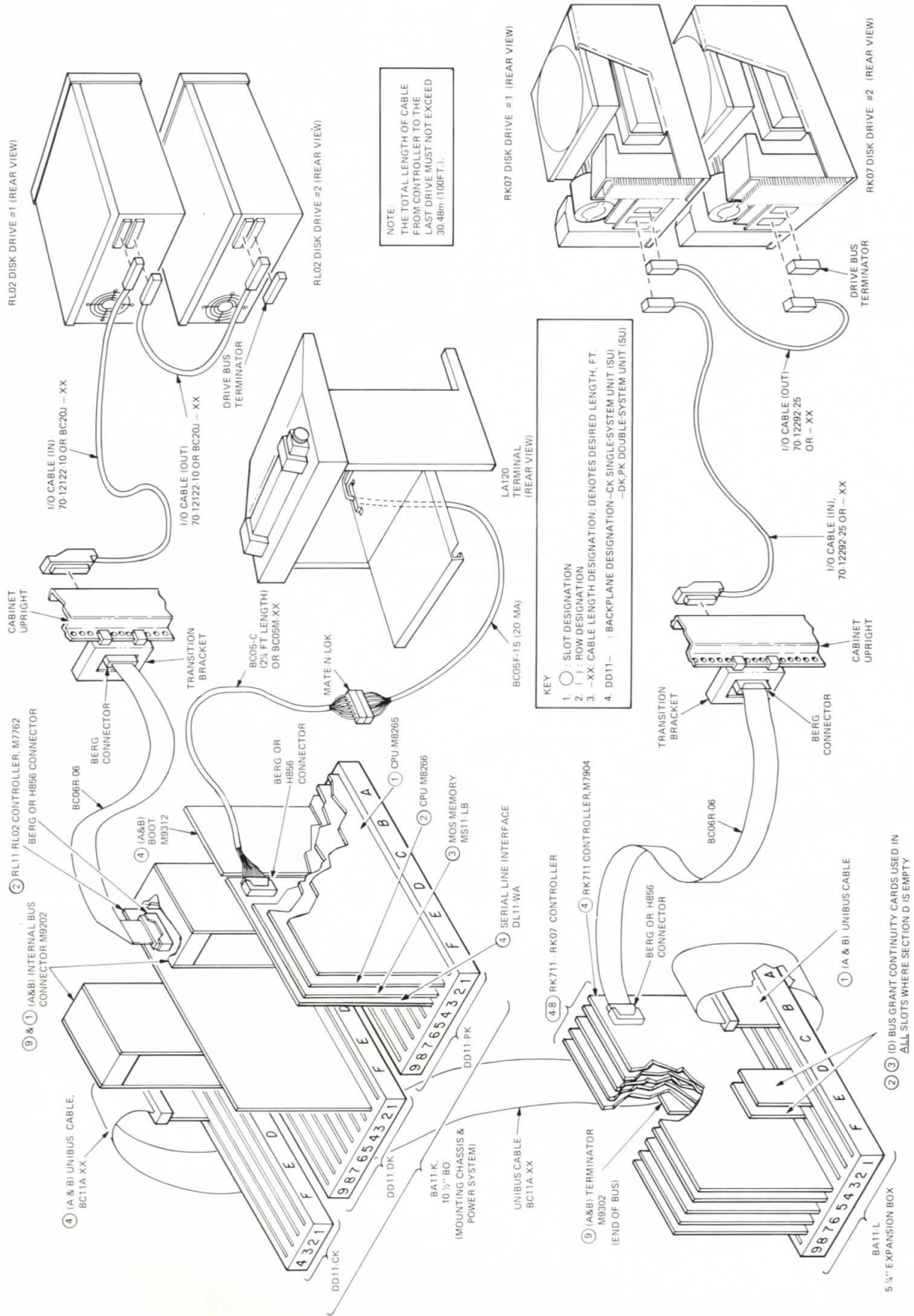


Figure 14 Typical PDP-11/34A Configuration

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