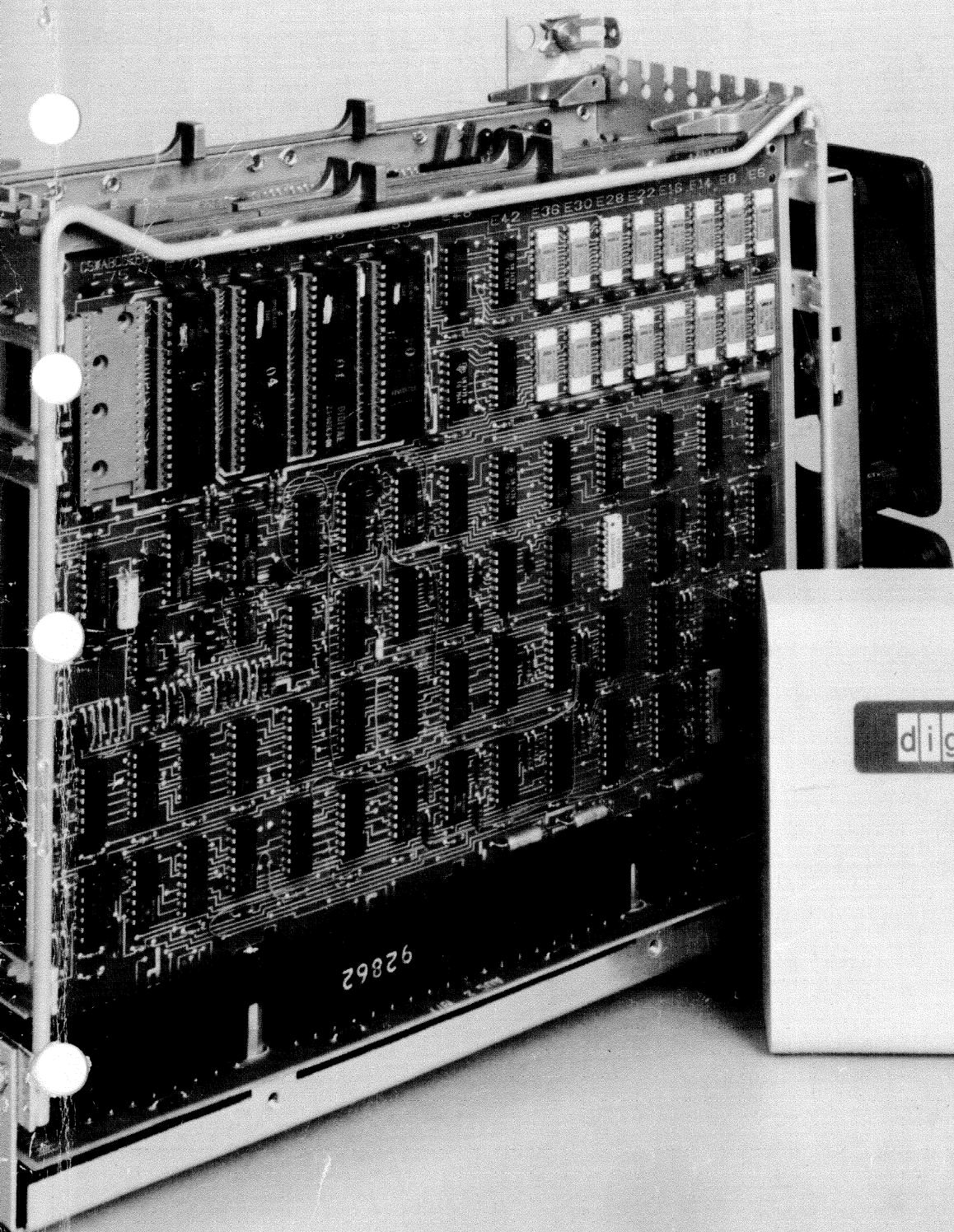


SPDG.

**BA11-N mounting box
user's guide**



digital PDP 11/03-L

BA11-N mounting box user's guide

EK-BA11N-UG-001

digital equipment corporation • maynard, massachusetts

1st Edition, January 1978

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CHAPTER 1 INTRODUCTION

1.1 GENERAL

The BA11-N Mounting Box can be installed in a standard 48.3 cm (19 in) equipment rack. The box is 48.3 cm (19 in) wide, approximately 13.2 cm (5 3/16 in) high, and 57.8 cm (22 3/4 in) deep. It contains cooling fans, ac input unit, power supply, and a 9-slot backplane that accepts LSI-11 double-height and quad-height modules. The BA11-N can have a blank front panel or a bezel that is equipped with operating switches and status indicators. Figures 1-1 and 1-2 show the BA11-N with a bezel and a blank panel, respectively.

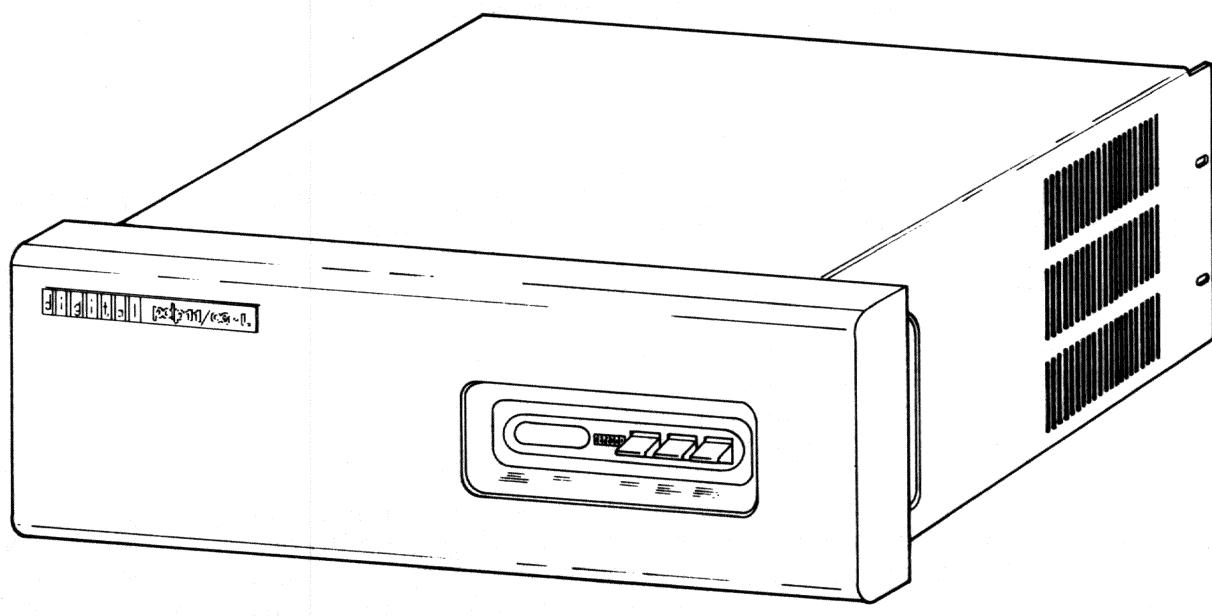
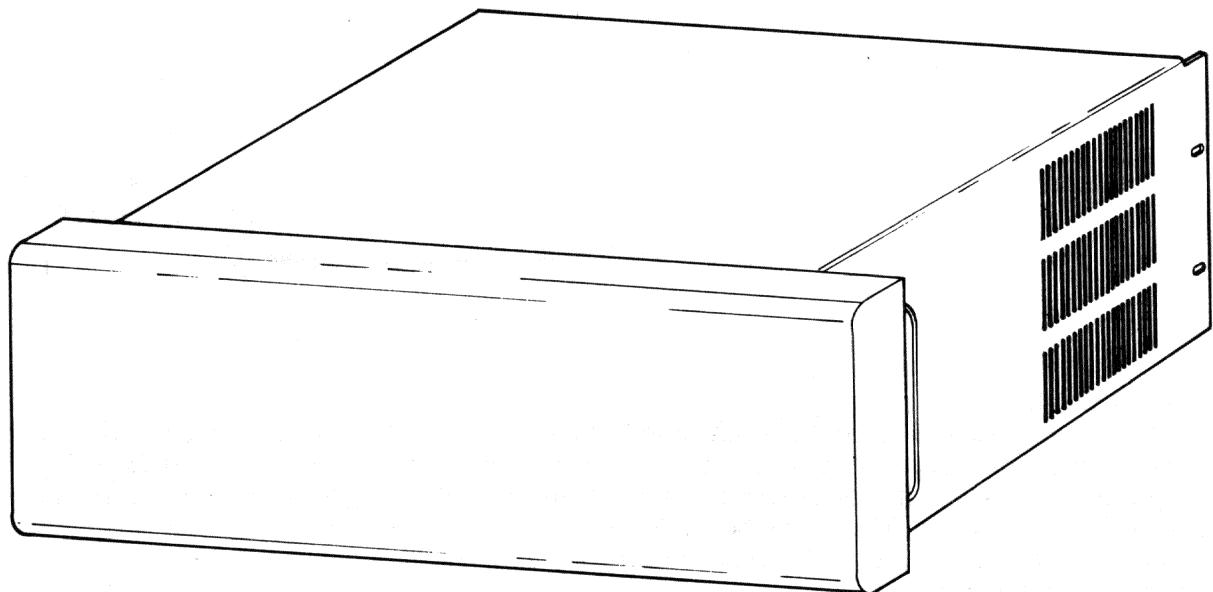


Figure 1-1 BA11-N with Front Bezel



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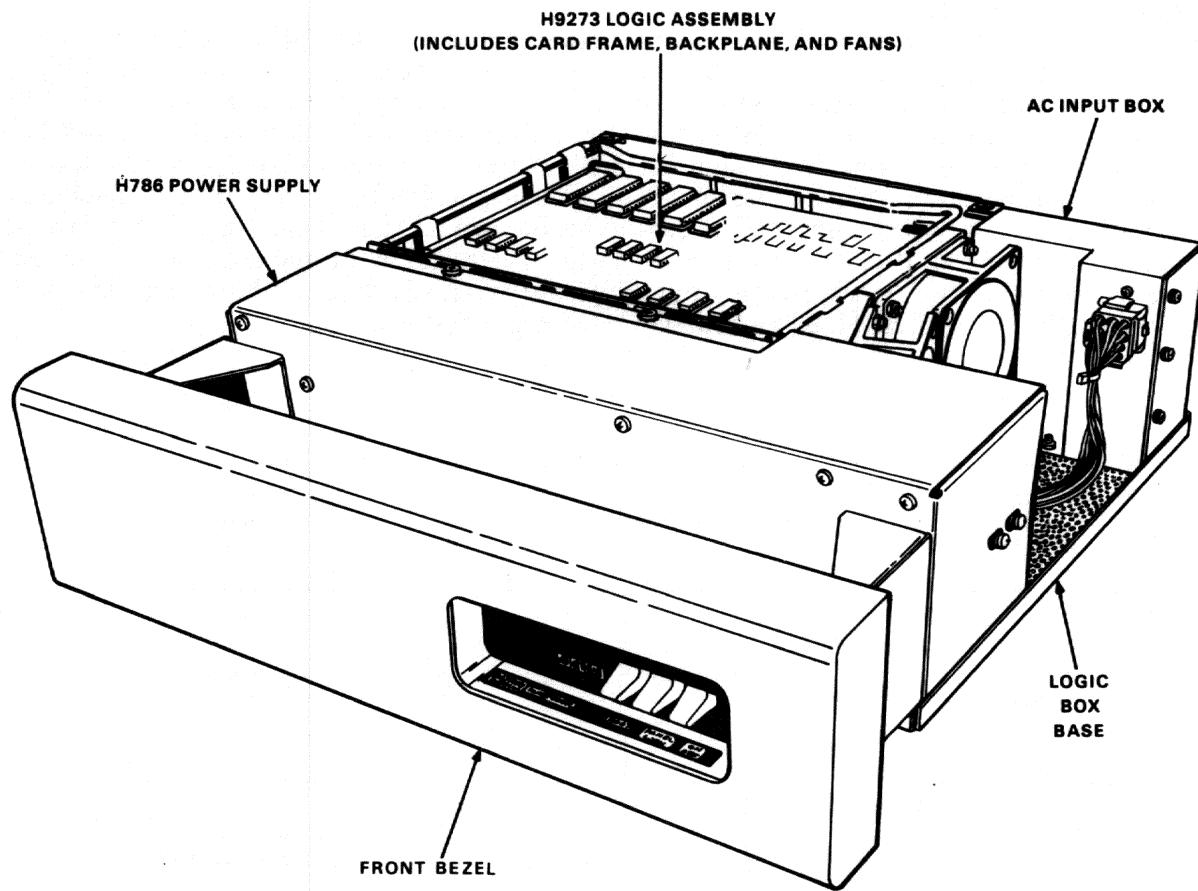
Figure 1-2 BA11-N with Blank Front Panel

The mounting box is available for both 115 V and 230 V systems. Because a choice of front panels is also provided, the user can select any of the following BA11-N models.

Model	Primary Power/Front Panel
BA11-NC	115 V/bezel panel
BA11-ND	230 V/bezel panel
BA11-NE	115 V/blank panel
BA11-NF	230 V/blank panel

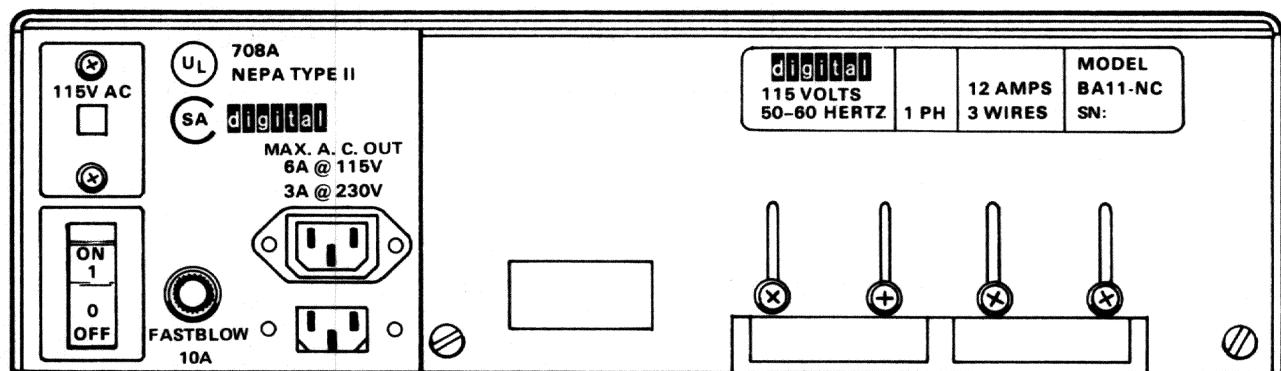
Figure 1-3 shows the BA11-N with the logic box cover removed. The ac input box, power supply, and H9273 logic assembly (which includes the fans and the backplane) are attached to the logic box base; the bezel is attached to the power supply. The power supply assembly is hinged to the base and can be swung open to expose the internal components; with little effort, the entire assembly can be removed from the base and replaced. LSI-11 modules are inserted in the backplane from the rear of the box through an access door that is equipped with strain reliefs for LSI bus cables and communications cables (Figures 1-4).

When the unit is to be mounted in an equipment rack, the logic box cover is attached to the rack with mounting hardware. The logic box base slides into the mounted cover and a spring-button assembly engages to prevent the base from being pulled out of the cover in error.



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Figure 1-3 BA11-N, Logic Box Cover Removed



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Figure 1-4 BA11-N, Rear View

1.2 BA11-N APPLICATIONS

The BA11-N can be used in several ways: as the mounting box for a PDP-11/03L system, which consists of a KD11-R microcomputer, a BDV11-A (terminator, boot, and diagnostic module), and other LSI-11 modules that the user might select; as an expander box for an existing PDP-11/03L system; and as an expander box for a PDP-11/03 system (refer to the 1977-1978 *Microcomputer Handbook* for a description of this system). Figure 1-5 illustrates these possibilities and includes interconnecting cable designations. Notice that an LSI-11 system can include as many as three backplanes, i.e., one in the main box, which contains the central processor unit (CPU), and one in each expander box. Each expander of a PDP-11/03L system is physically identical to the main box, with the possible exception of the front panel (usually, only one bezel per system is desired); however, the BA11-N differs in height from the PDP-11/03 and the BA11-M expander box.

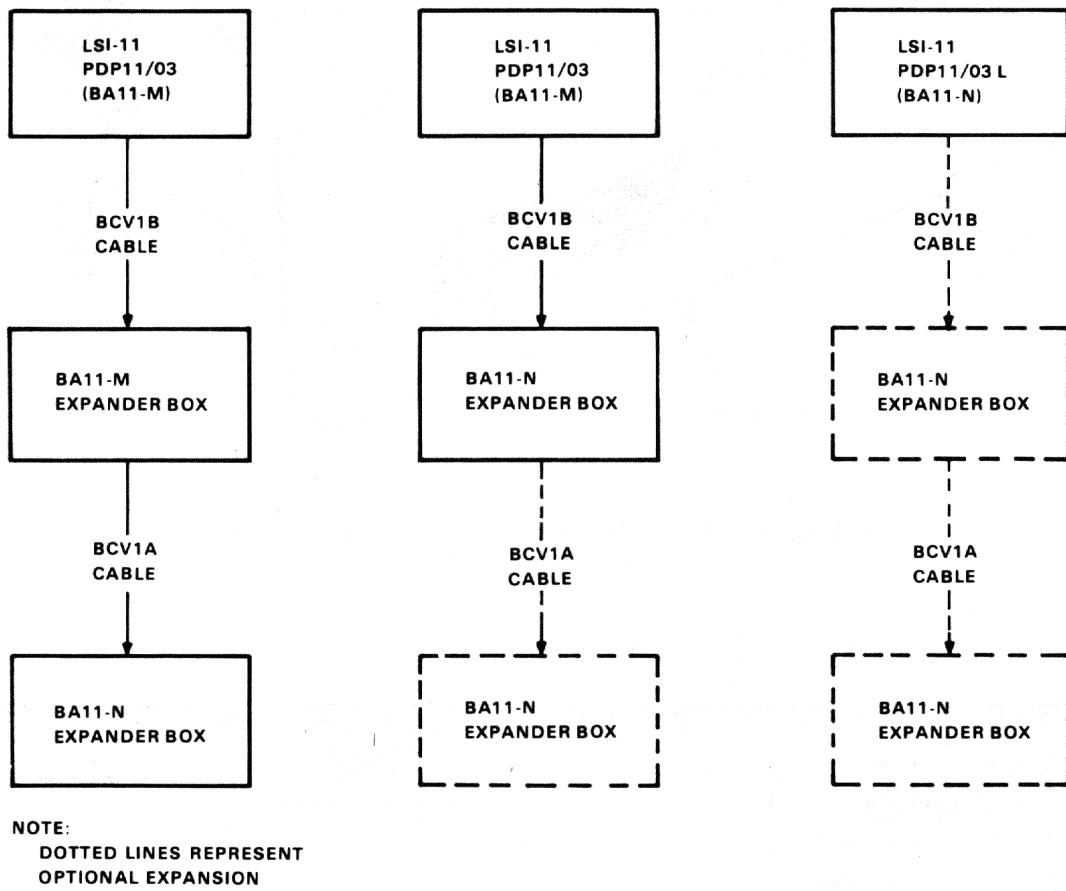
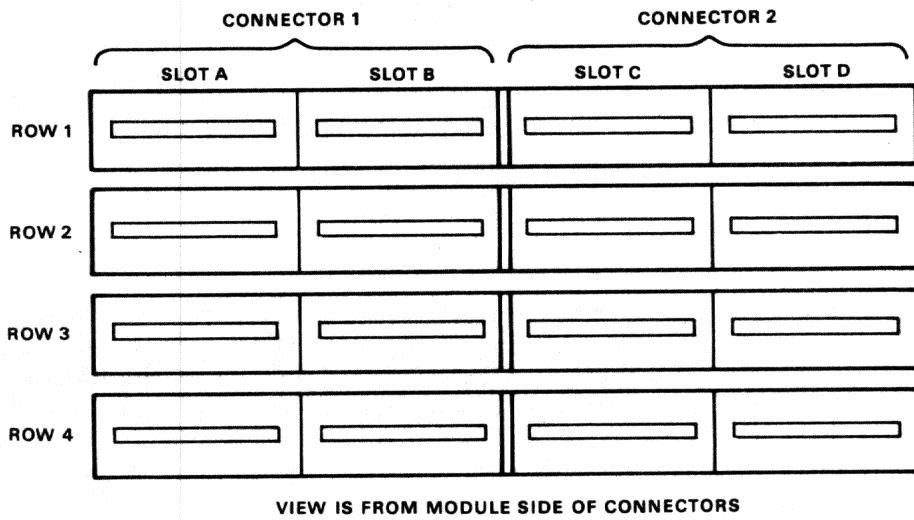


Figure 1-5 BA11-N System Applications

1.3 LSI-11 BACKPLANES

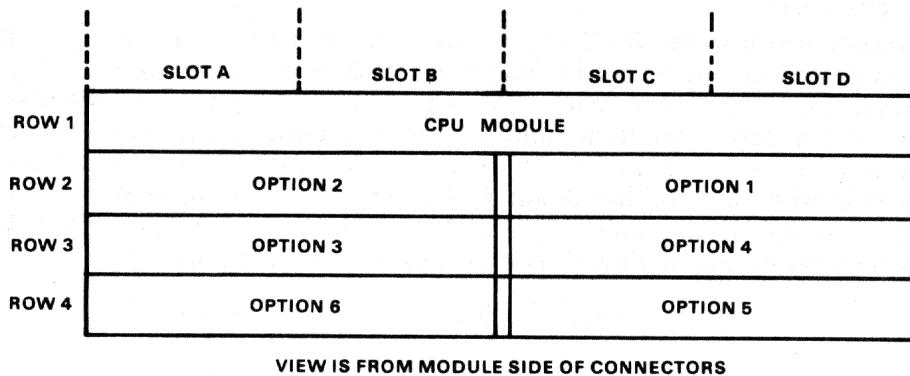
The BA11-M mounting box uses the H9270 backplane. The connectors that comprise this backplane are arranged on an etched circuit board in four rows, each row containing two 72-pin connectors (Figure 1-6). A connector has two slots, each of which contains 36 pins, 18 on either side of the slot. Most of the pins of slot A, row 1, are etch-connected to corresponding pins not only in slot C, row 1, but also in slots A and C of rows 2, 3, and 4. For example, pin D, slot A, row 1 is common with pin D, slot C, row 1, as well as with pin D in slots A and C of rows 2, 3, and 4. Most of the pins of slots B and D are interconnected (bused) in the same way. (Refer to Chapter 3 of the *1977-1978 Microcomputer Handbook* for instructions on identifying individual slot and module pins.)



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Figure 1-6 H9270 Backplane Connectors

LSI-11 modules are mounted in the backplane by inserting the module finger connectors into the backplane slots. If the module is double height, module connector A (the right-most connector when viewing the component side of the module with the module fingers pointing down) is inserted in slot A or C of the backplane, and module connector B is inserted in slot B or D. A quad-height module has its A through D connectors inserted in slots A through D, respectively. The LSI-11 bus signals are present on the pins of slots A and B; the same set of bus signals is present on the pins of slots C and D. However, priority considerations and the fact that some connector pins are not bused result in certain restrictions on module placement (refer to the *1977-1978 Microcomputer Handbook* for details). In general, modules should be installed in the backplane as illustrated in Figure 1-7. That is, the CPU module must be placed in the top row and the options must be placed to reflect their assigned priorities (option 1 has the highest priority). There must be no empty option locations between the CPU and options that use either the interrupt acknowledge signals or the direct memory access (DMA) grant signals of the LSI-11 bus.



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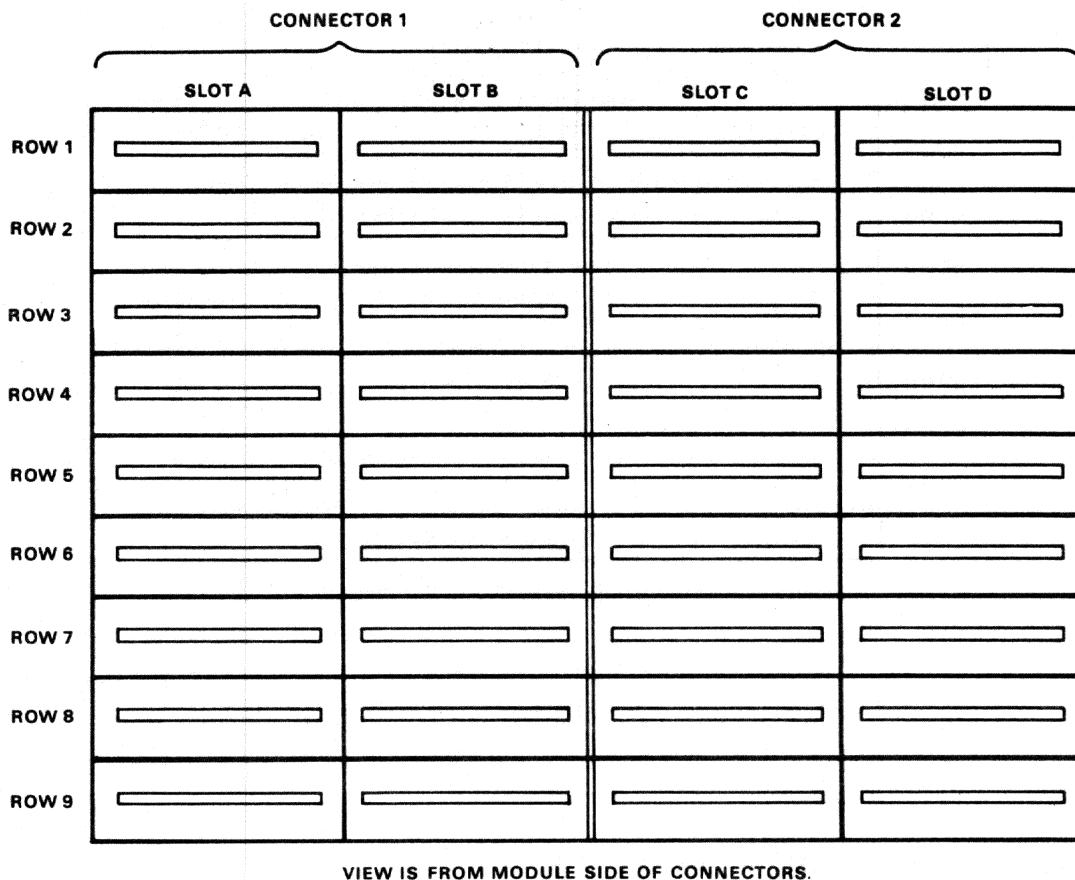
Figure 1-7 Module Installation in the H9270 Backplane

It is apparent that at times the utility of the H9270 backplane decreases when quad modules are inserted; i.e., a quad module uses four backplane slots even though it can take all the bus signals it needs from just two of these slots. Furthermore, the individual modules of multiple-module options must be connected with over-the-top connectors, which consume board space that could otherwise be occupied by circuit components. The new H9273 backplane has a unique design that overcomes these deficiencies.

The H9273 backplane is used in the BA11-N mounting box. The connectors that comprise this backplane are arranged in nine rows, each row containing two 72-pin connectors (Figure 1-8). As in the H9270 backplane, a connector has two slots, each of which contains 36 pins, 18 on either side of the slot.

LSI-11 modules are inserted (physically) in the H9273 backplane in the same way as they are in the H9270 backplane. However, the H9273 is wired differently and provides unique advantages; this uniqueness also results in more restrictions on module placement.

The connectors designated "Connector 1" in Figure 1-8 are wired (etch connections) in parallel. When a CPU is inserted in slots A, B, C, and D of row 1, slots A and B carry the LSI-11 bus signals (alternatively, the bus signals can be continued from an earlier backplane by an interconnecting double module inserted in slots A and B); thus, slots A and B are termed the LSI-11 bus slots. The connectors designated "Connector 2" are not wired in parallel, except for +5 V and ground, and (other than +5 V and ground) have no connections to the LSI-11 bus. Rather, C- and D-slot pins in each row are connected to C- and D-slot pins in adjacent rows. For example, pins in row 4 are connected to pins in row 3 and row 5. If one puts a module in the C and D slots in rows 3, 4, and 5, and if the fingers on the module connectors are jumpered properly, a 3-row bus is formed. Buses of varying lengths can be formed by correctly wiring the modules that make up a module set; hence, slots C and D are termed the CD bus slots.



VIEW IS FROM MODULE SIDE OF CONNECTORS.

MA-0740

Figure 1-8 H9273 Backplane Connectors

Figure 1-9 illustrates a possible configuration of modules in an H9273 backplane. LSI-11 double-height modules are inserted in LSI bus slots A and B (if one or more of the LSI modules happened to be quad modules, one or more of the CD bus option modules would have to be removed). Two CD bus options are depicted. The option designated option 1 consists of two double modules and one quad module that interfaces the CD bus to the LSI-11 bus; while that designated option 2 consists of three double modules and one quad module that interfaces with the LSI bus. The *BA11-N Mounting Box Technical Manual* describes the H9273 backplane in detail and provides more information concerning CD bus module design.

CAUTION

Quad modules that use LSI-11 bus signals must take these bus signals only from slots A and B of the backplane. The single DIGITAL option that does not satisfy this requirement is the MMV11 which, consequently, cannot be used in the H9273 backplane.

	SLOT A	SLOT B	SLOT C	SLOT D
ROW 1	CENTRAL PROCESSOR UNIT			
ROW 2	LSI-11 OPTION 1		CD BUS OPTION 1	
ROW 3	LSI-11 OPTION 2		CD BUS OPTION 1	
ROW 4		CD BUS OPTION 1		
ROW 5	LSI-11 OPTION 3		CD BUS OPTION 2	
ROW 6		CD BUS OPTION 2		
ROW 7	LSI-11 OPTION 4		CD BUS OPTION 2	
ROW 8	LSI-11 OPTION 5		CD BUS OPTION 2	
ROW 9	BDV11-A (BUS TERMINATOR) MODULE			

VIEW IS FROM MODULE SIDE OF CONNECTORS

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Figure 1-9 Module Installation in the H9273 Backplane

1.4 MODULE LOADING OF THE LSI-11 BUS

When organizing a system, one must give particular attention to three characteristics of each module, namely, bus ac loading, bus dc loading, and power consumption. Bus ac loading refers to the dynamic impedance that an element presents to an LSI-11 bus signal line. This impedance, which is due to etch runs, receiver input loading, and driver output loading, causes a reflection to occur when a step is placed on the signal line. This reflection manifests itself as a spike that occurs just after an asserting or negating edge. If too many elements are placed on the bus, the total impedance presented to a particular signal line can produce a reflection of unacceptable magnitude; thus, a false logic signal that might cause a failure is created. Such a false logic signal is illustrated in Figure 1-10, which shows the threshold level of an 8640 bus receiver being crossed twice because of the lumped-load reflection.

Bus ac loading is described in terms of ac loads, an ac load being defined as 9.35 pF (nominal) of capacitance. The ac load rating of a bus element is based on the largest of the capacitances that the element presents to the BDOUT, BDIN, BRPLY, BSYNC, BREF, and BSACK signal lines. For example, if the element presents two ac loads (approximately 18.7 pF) to the BDIN line and four ac loads (approximately 37.4 pF) to the BSYNC line, the element is rated at four ac loads.

In a single-backplane system, the bus can support 20 ac loads with the termination that is available on the processor module. If the other end of the bus is terminated with $120\ \Omega$, the number of ac loads can be increased to 35. Keep in mind that this applies only to the system with one backplane; if the bus is extended off this backplane in any way, a multiple-backplane system results and the rules change. Incidentally, the backplane, itself, loads down the bus; consequently, the ac loads attributable to the backplane must be added when determining the total ac load. AC loads for LSI-11 modules are listed in the Option Summary Chart, Table A-1, along with backplane configuration charts that also appear in Appendix A.

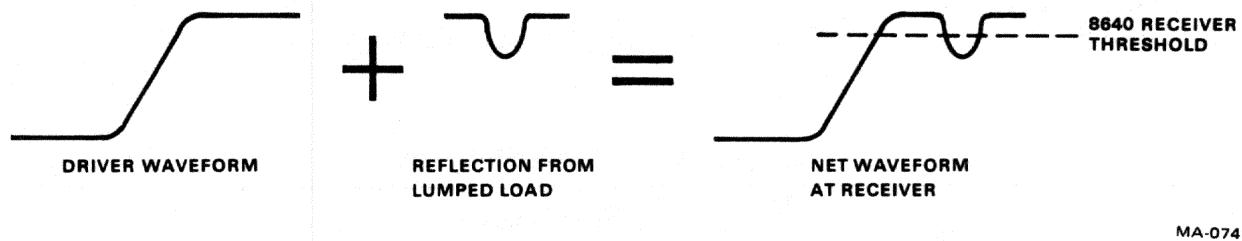


Figure 1-10 AC Loading Violation

Bus dc loading refers to the dc leakage current that an element presents to an LSI-11 bus signal line when that line is high (undriven). If too many elements are placed on the bus, the quiescent (undriven) voltage may be lowered to such a level that bus receivers become susceptible to reflections from lumped loads; furthermore, the overall noise margin on the high end (bus undriven) may become too small.

Bus dc loading is described in terms of dc loads, a dc load being defined as $105 \mu\text{A}$ (nominal) of leakage current ($105 \mu\text{A}$ is the total of $80 \mu\text{A}$ of receiver leakage current and $25 \mu\text{A}$ of driver leakage current). The dc load rating of a bus element is **not** based strictly on the signal line that has the greatest leakage (e.g., dc leakage is less important on BDAL lines than on the BSYNC line); hence, the dc load for an element should always be obtained from the specification for that element.

In both single- and multiple-backplane systems, the maximum number of dc loads allowed is 20 (backplanes have zero dc loads). DC loads for LSI-11 modules are listed in the Option Summary Chart, Table A-1. Loading for customer-designed modules will have to be determined by calculation of receiver and driver leakage currents.

Power consumption refers to the amount of current that must be provided by the power supply associated with each backplane. The total current to be drawn from the $+5 \text{ V}$ source must be determined separately from that to be drawn from the $+12 \text{ V}$ source. Naturally, each total must be less than the maximum rated output current for that source.

The amount of current required by each LSI-11 module is listed in the Option Summary Chart, Table A-1. The current loads are given in values that are typical; thus, the total current needed by the system modules is typical rather than maximum. To allow for atypical amounts of current that might be drawn by individual modules, observe this rule of thumb: keep the amount of current to be drawn from a power supply to 70 percent, or less, of the supply's maximum rated current.

It is evident that the effects of bus loading and power consumption must be considered when a system configuration is devised. Appendix A contains not only an Option Summary Chart, Table A-1, and backplane configuration diagrams, but also a number of rules and guidelines concerning the configuration of LSI-11 modules. Refer to this appendix when planning and/or installing a system.

1.5 SPECIFICATIONS

Tables 1-1 and 1-2 list significant BA11-N mounting box specifications.

Table 1-1 BA11-N Specifications

Item	Specification
Dimensions (including bezel)	
Width	48.3 cm (19 in)
Height	13.2 cm (5.19 in)
Depth (without mounting brackets)	57.8 cm (22.75 in)
Depth (with mounting brackets)	67.96 cm (26.75 in)
Weight (without modules)	20 kg (44 lb)
Operating Temperature*	5° C-50° C (41° F-122° F)
Operating Humidity	10%-95%, with a maximum wet bulb temperature of 32° C (90° F) and a minimum dew point of 2° C (36° F)
Input Voltage	115 Vac (BA11-NC/NE), 230 Vac (BA11-ND/NF)
Input Current**	12 A, Max (BA11-NC/NE), 6 A, Max (BA11-ND/NF)
Circuit Breaker Rating	15 A @ 115 Vac or @ 230 Vac

*The maximum allowable operating temperature is based on operation at sea level, i.e., at 760 mm Hg (29.92 in Hg); maximum allowable operating temperature will be reduced by a factor of 1.8° C/1000 m (1.0° F/1000 ft) for operation at higher altitude sites.

When the equipment is being operated at the maximum allowable temperature, air flow must maintain the inlet-to-outlet air temperature rise to a maximum of 7° C (12.5° F).

**Input current consists of that used by the BA11-N, itself, plus whatever current is supplied via the convenience ac outlet (J3) to an expander box; the total current must be less than the maximum specified.

Table 1-2 BA11-N Power Supply Specification

Item	Specification
Current Rating	5.5 A @ 115 Vrms 2.7A @ 230 Vrms
Inrush Current	100 A, peak, for 1/2 cycle at 128 Vrms or 256 Vrms
Apparent Power	630 VA
Power Factor	The ratio of input power to apparent power shall be greater than 0.6 at full load and low input voltage.
Output Power	+5 Vdc, ± 250 mV, @22 A (A minimum of 2 A of +5 Vdc power must be drawn to ensure that the +12 Vdc supply regulates properly; however, the +12 Vdc output will not go above 12.6 Vdc no matter what +5 Vdc current is drawn). +12 Vdc, ± 600 mV, @ 11 A
Power Up/Power Down Characteristics	<p>Static Performance</p> <p>Power Up</p> <p>BDCOK H goes high : @ 75 Vac BPOK H goes high : @ 90 Vac</p> <p>Power Down</p> <p>BPOK H goes low : @ 80 Vac BDCOK H goes low : @ 75 Vac</p> <p>Dynamic Performance (Figure 1-11)</p> <p>Power Up</p> <p>3 ms (min) from dc power within specification to BDCOK H asserted. 70 ms (min) from BDCOK H asserted to BPOK H asserted.</p> <p>Power Down*</p> <p>4 ms (min) from ac power off to BPOK H negated. 4 ms (min) from BPOK H negated to BDCOK H negated. 5 μs (min) from BDCOK H negated to dc power out of specification.</p>

*Figure 1-12 shows power interruption ride-through characteristics for the H786 power supply used in the PDP-11/03L.

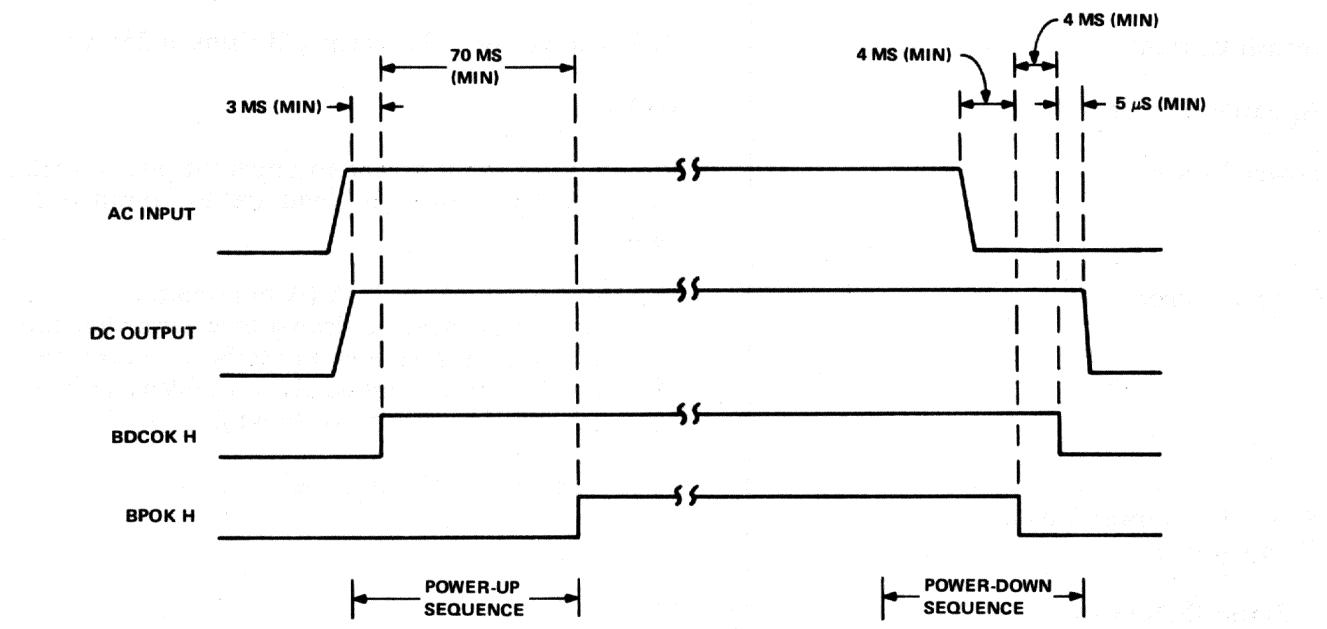


Figure 1-11 Power Up/Power Down Timing

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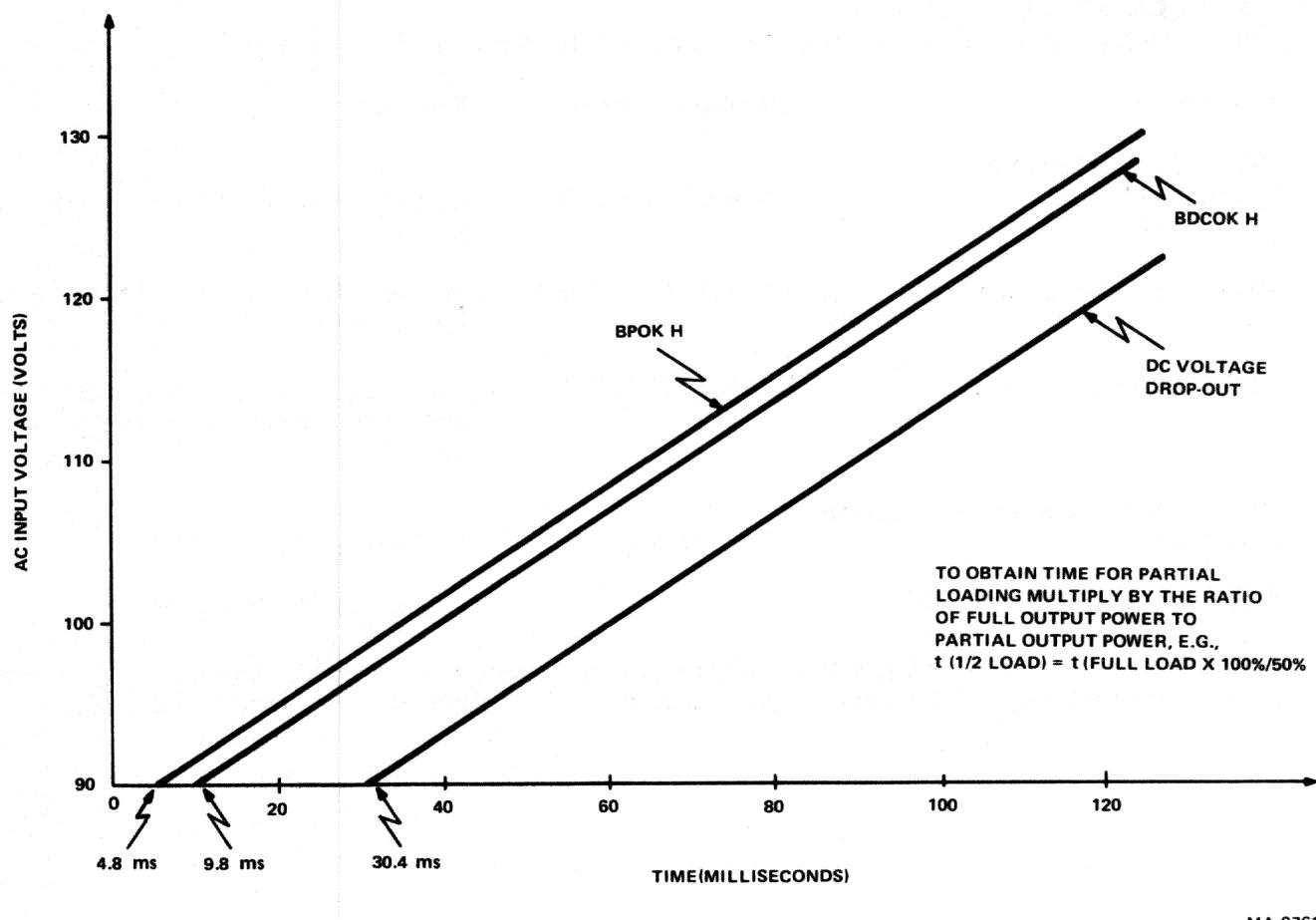


Figure 1-12 H786 Power Supply Minimum Ride-Through
After Power Interruption

1.6 RELATED DOCUMENTS

The following DIGITAL publications contain information for the BA11-N user.

Publication	Document Number	Remarks
BA11-N Mounting Box Technical Manual	EK-BA11N-TM-001	In microfiche library;* Available in hard copy**
BDV11-AA Technical Manual	EK-BDV11-TM-001	In microfiche library; Available in hard copy**
BDV11-AA User's Guide	EK-BDV11-UG-001	Not in microfiche library; hard copy ships with device; available in hard copy**
1977-1978 Microcomputer Handbook (2nd Edition)	EB-07948-53/77	Available in hard copy**
PDP-11 Software Handbook		Available in hard copy**

General information concerning educational and maintenance services provided by DIGITAL, as well as equipment warranty statements, can be found in the *1977-1978 Microcomputer Handbook*.

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CHAPTER 2

UNPACKING, INSTALLATION, AND OPERATION

2.1 UNPACKING

The BA11-N is shipped in a protective box. Remove the BA11-N from the box and visually inspect for damage. Save the shipping cartons and packaging materials in case it is necessary to return the unit for service.

2.2 INSTALLATION

Physical installation of the system can begin when the shipment has been unpacked and checked for completeness. This paragraph gives instructions for setting up the system. The user might consider, at some time, to either add to an existing system or create a new system. If so, check the appendix, which contains important information concerning backplane and module configuration.

2.2.1 Preliminary Checks

Before installing the logic box base, check the features described here.

2.2.1.1 AC Voltage Selection – The BA11-N can be used with line voltage of either 115 Vac or 230 Vac. Only the ac line cord is different for the two voltages. However, a voltage selecting switch must be set to a position that corresponds to the line voltage being used. This switch is located on the rear of the ac input box, above the circuit breaker (Figure 2-1). The switch lever protrudes through a plate that is attached to the box. If the line voltage being used is 115 Vac, the designation “115 Vac” should be printed on the plate above the switch lever. If the printing on the plate is 230 Vac, remove the plate. Flip the plate over and notice that 115 Vac is printed on the opposite side; also, notice that the switch lever itself is imprinted with 230 Vac. Move the switch lever down; 115 Vac should appear on the top of the lever. Replace the plate over the switch lever so that the printing on the outside of the plate says 115 Vac (when the plate is on, the printing on the switch lever cannot be seen). The plate is fabricated so that the screw holes in the plate and the input box line up only when the switch position corresponds to the printing on the outside of the plate.

2.2.1.2 Backplane Jumper Positions – There are three jumper positions, W1, W2, and W3, on the H9273 backplane (Figure 2-2). Jumpers are installed in all three positions when the backplane is manufactured. Table 2-1 summarizes the conditions under which jumpers should be inserted or removed.

The jumper in position W1 is involved with CPU event interrupts. These interrupts can be initiated in two ways. First, an external (to the BA11-N) signal source can be used to pull the LSI-11 bus BEVNT L line low; in this case, the jumper in W1 of each H9273 backplane in the system would have to be removed. Second, the LTC signal generated in the H786 power supply can be used to pull the BEVNT L line low, thereby initiating vectored interrupts at a rate that depends on the BA11-N line frequency. W1 connects the LTC signal to the BEVNT L line; hence, in this case, the jumper would be left in position W1 of the H9273 backplane. In a multiple-box system, the box containing the M8012 module (i.e., the last box in the system) must be the source of the LTC signal; thus, the W1 jumper must be inserted in the backplane of this box and must be removed from the backplane of the other box(es).

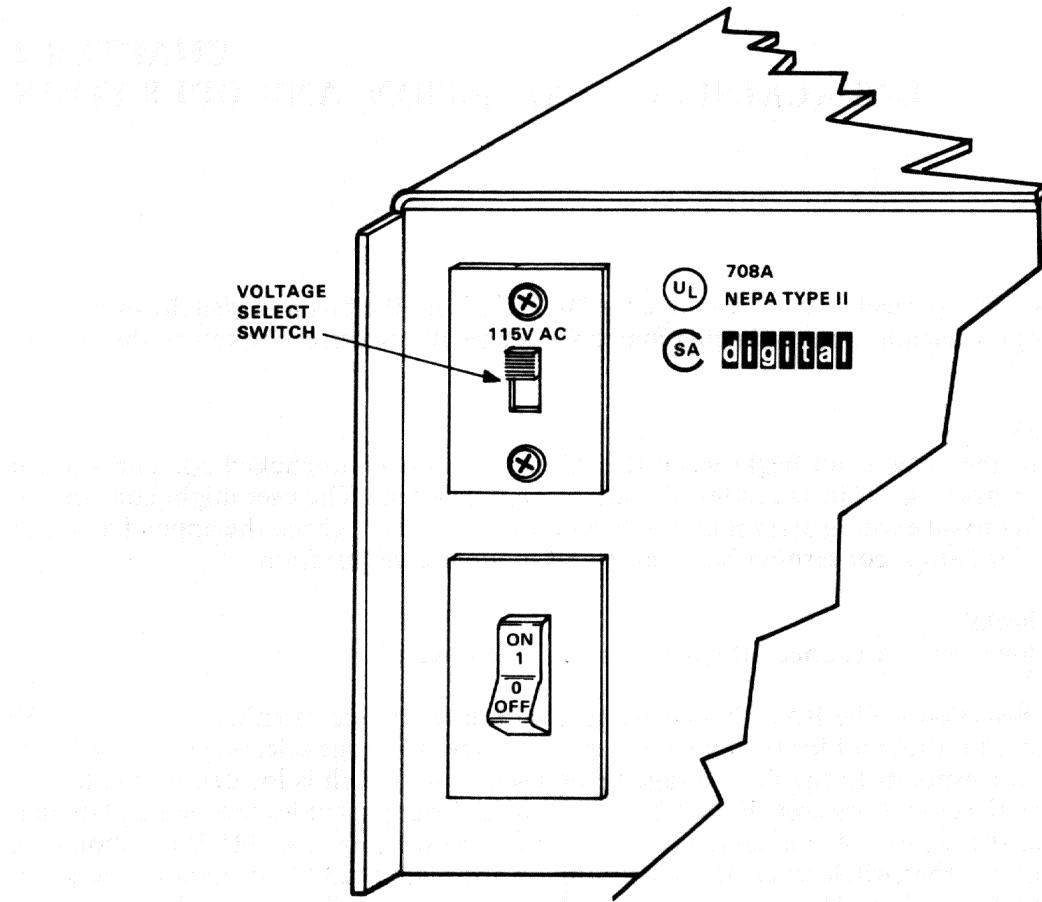
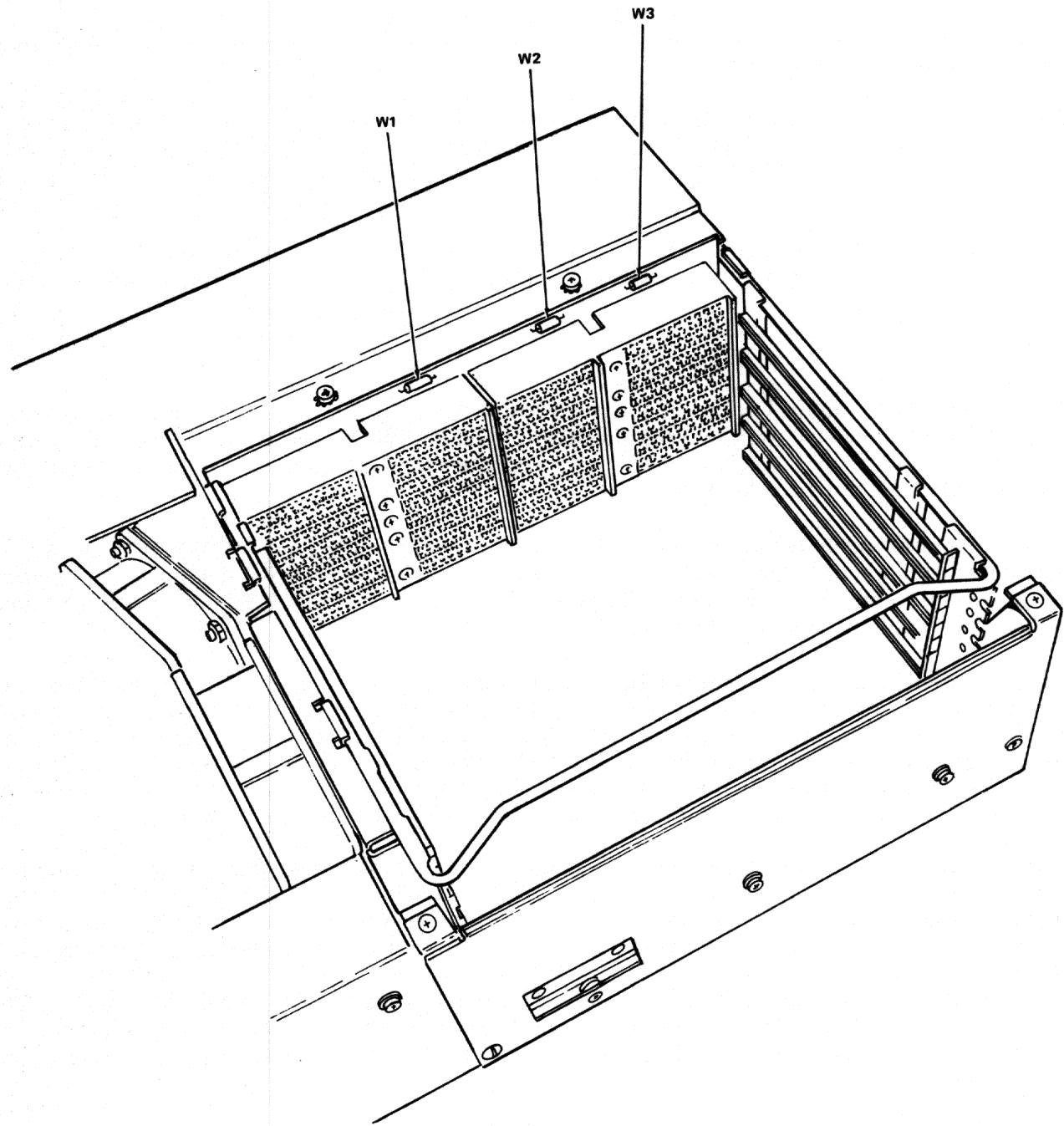


Figure 2-1 BA11-N Voltage Select Switch



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Figure 2-2 Backplane Jumpers

Table 2-1 Backplane Jumpers

Jumper Position	Jumper(s) In	Jumper(s) Out
W1	When the H786 power supply generated LTC signal is used to assert the LSI-11 bus BEVNT L signal.	When it is not desired to have line time clock (LTC) sourcing BEVNT L, such as when an external source is used instead.
W2, W3	When a quad KD11 CPU is inserted in row 1 of the backplane.	When any other module is installed in row 1, i.e., when the backplane is part of an expander box.

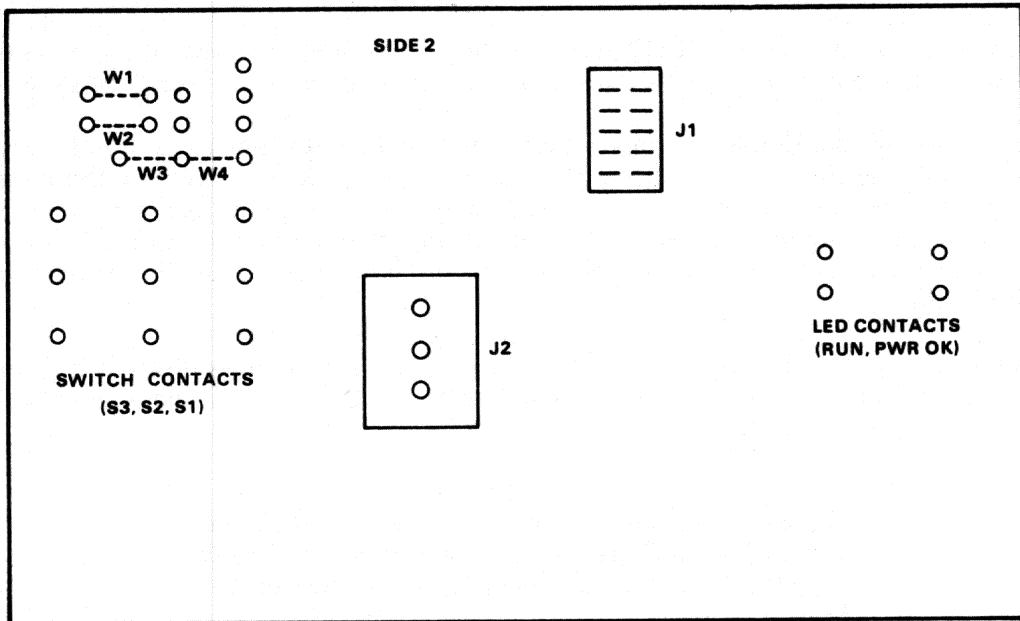
The jumper in W2 connects CK1 to CL1 in row 1, while the jumper in W3 connects DK1 to DL1, also in row 1. These jumpers must be inserted whenever a quad KD11 CPU resides in row 1 of the first box. All three of these jumpers can be inserted and removed without any need for disassembly, other than removing the logic box base from the cover.

2.2.1.3 Bezel Assembly Jumper Positions – There are four jumper positions, W1, W2, W3, and W4, on the printed circuit board of the bezel assembly (Figure 2-3). When the board is manufactured, jumpers are inserted in positions W1, W2, and W4; position W3 is left blank. Table 2-2 describes the conditions under which jumpers are inserted or removed.

2.2.1.4 Power Controller Cable Installation – In an extensive system, it is convenient to be able to turn on the power to each unit from a central point, rather than turning on each unit individually. This can be done by incorporating a power controller (such as the DIGITAL 861-C model) into the system. The power controller is plugged into the ac main and each unit is plugged into the “switched” outlets on the controller. If each unit’s ON/OFF switch is kept in the ON position, the ON/OFF switch on the power controller can be used to apply and remove power for all system units simultaneously.

Furthermore, the power controller ON/OFF switch can be configured so that power control can be effected from some other location, e.g., from the AUX ON/OFF switch of the BA11-N bezel. (Paragraph 2.2.4 shows possible power connection schemes for the PDP-11/03 and PDP-11/03L systems.) If the user intends to incorporate a power controller into the system and wishes to use the bezel AUX switch to turn system power on and off, a twisted-pair cable is available. The Mate-N-Lok™ connector on this cable is plugged into J2 of the bezel assembly printed circuit board (Figure 2-3). The open end of the cable can then be connected to the power controller ON/OFF switch so that the two switches are in parallel. If the controller switch is kept open, the AUX switch can control system power application.

If the cable is not already installed in the bezel assembly, plug the connector into J2 of the assembly printed circuit board. Route the cable down the left side of the unit and out the rear under the nearer cable strain relief.



NOTES:

1. **VIEW IS FROM THE REAR OF THE BEZEL WHEN THE BOARD IS MOUNTED ON THE BEZEL.**
2. **JUMPERS ARE MOUNTED ON SIDE 1.**

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Figure 2-3 Bezel Printed Circuit Board

Table 2-2 Bezel Assembly Jumpers

Jumper Position	Jumper In	Jumper Out
W1, W2	When the bezel AUX ON/OFF switch is used to control the power supply generated LTC signal (when the switch is in the AUX ON position, LTC-initiated interrupts are possible).	When the bezel AUX ON/OFF switch is used to turn the system power controller on and off (Paragraph 2.2.1.4).
W3	When the bezel is to be mounted on an expander box (W3 permits the HALT switch to light the RUN indicator).	When the bezel is part of the main box, i.e., the CPU is mounted in this bezel's backplane.
W4	When the bezel is part of the main box (W4 enables the S RUN L signal to light the RUN indicator).	When the bezel is mounted on an expander box.

2.2.1.5 Module Insertion and Removal – Modules must be inserted and removed only when the power is turned off. Use the front panel AUX ON/OFF switch or the ON/OFF switch on the rear of the ac input box to turn off the power (refer to Paragraph 2.3 for a description of each of these switches).

Some quad modules are equipped with metal extractor-type handles that facilitate module insertion and removal. When inserting such a module into the backplane, begin by sliding the module, component side up, into the card guides. Slide the module all the way in and just start the module connector fingers into the backplane connectors. Fit the prongs of the handles into the holes in the card frame, as shown in Figure 2-4. Press in on both handles simultaneously to fully insert the fingers in the backplane connector.

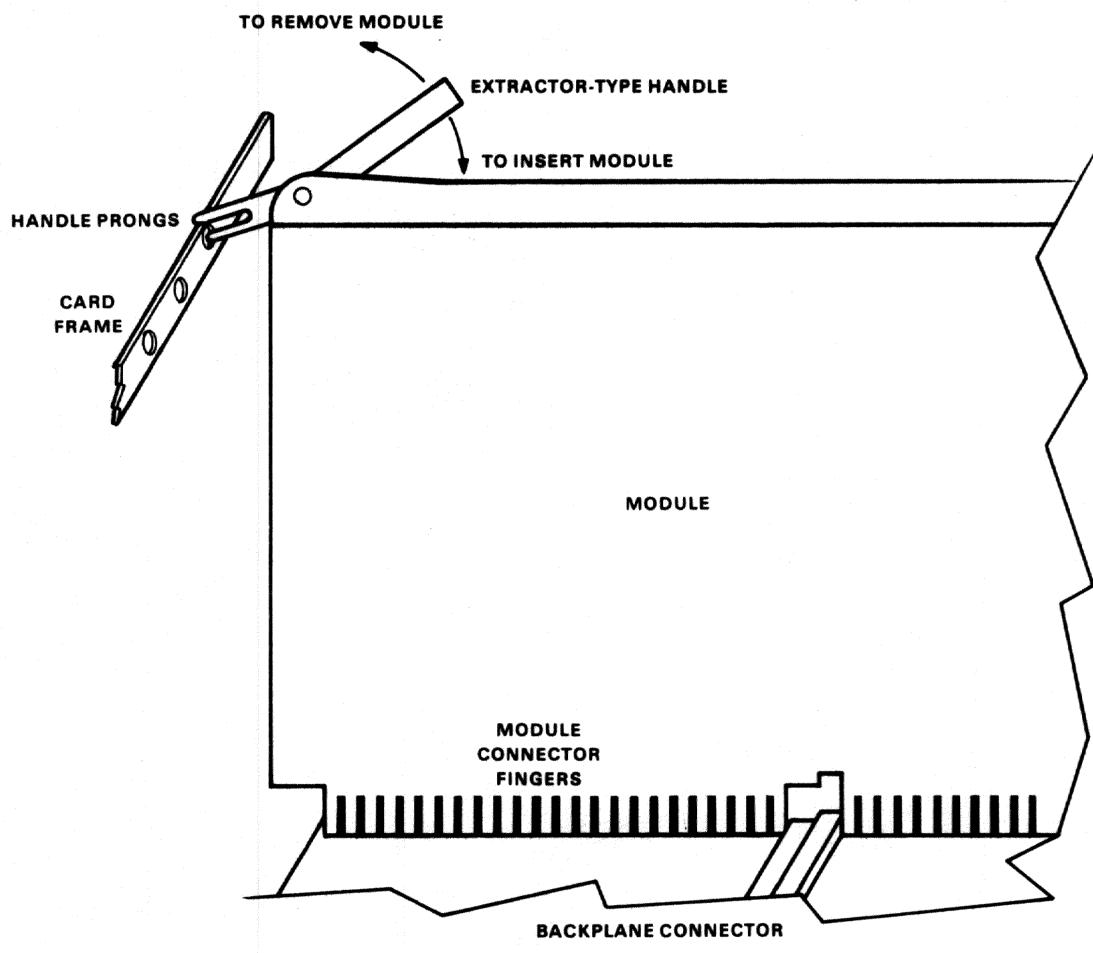
To remove a module, pull both handles out simultaneously until the prongs of the handle are clear of the holes in the card frame. The module fingers will now be nearly free of the backplane connector and the module can be removed easily.

CAUTION

Modules and/or the backplane assembly might be damaged if modules are inserted and removed with the power on, or if the modules are inserted upside down.

2.2.1.6 Module Installation – The equipment is shipped from the factory with the modules installed. Bus cables and communication cables must be connected to the modules, if not already in place. When removing modules to connect cables, or when installing new modules in an existing installation, follow these guidelines:

1. Ensure that double-size modules are inserted correctly in the backplane; i.e., LSI-11 bus modules plug into slots A and B (the two left-most slots), CD bus modules plug into slots C and D, and both types must be inserted right-side up.
2. The CPU can be inserted only in bus position 1 of the H9273 backplane (“bus positions” are defined in the backplane selector charts, Figures A-1 and A-2).
3. An M8012 module (BVD11-A) must be inserted only in the last bus portion of the last box (if the module is not in the last bus position, the diagnostic light display cannot be seen). Ensure that jumper W1 is in place in the backplane of the last box; other backplanes must have the jumper removed (Paragraph 2.2.1.2).
4. If a module uses the LSI-11 bus grant and interrupt signals (BDMGI L/BDMGO L and BIAKI L/BIAKO L, respectively), there must be no empty LSI-11 bus positions between the module and the CPU, although empty CD bus positions are permitted.
5. Always ensure that modules are seated firmly and securely in the backplane.
6. The +5 Vdc regulated voltage is rated at 22 A, full load, while the +12 Vdc regulated voltage is rated at 11 A, full load. When installing new modules in a system backplane, take care not to exceed the full-load limits. Table A-1 lists LSI-11 modules, their power requirements, and their sizes.



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Figure 2-4 Insertion and Removal of Modules Having Extractor-Type Handles

2.2.2 Mounting the Logic Box Cover in an Equipment Rack

Use the following procedure to mount the logic box cover in an equipment rack. Figure 2-5 shows the mounting dimensions and illustrates the cover mounted to the four cabinet uprights. The item callouts in Figure 2-5 and in the following mounting procedure are identified in the unit assembly drawing, Figure 2-6, and its associated parts list, Table 2-3.

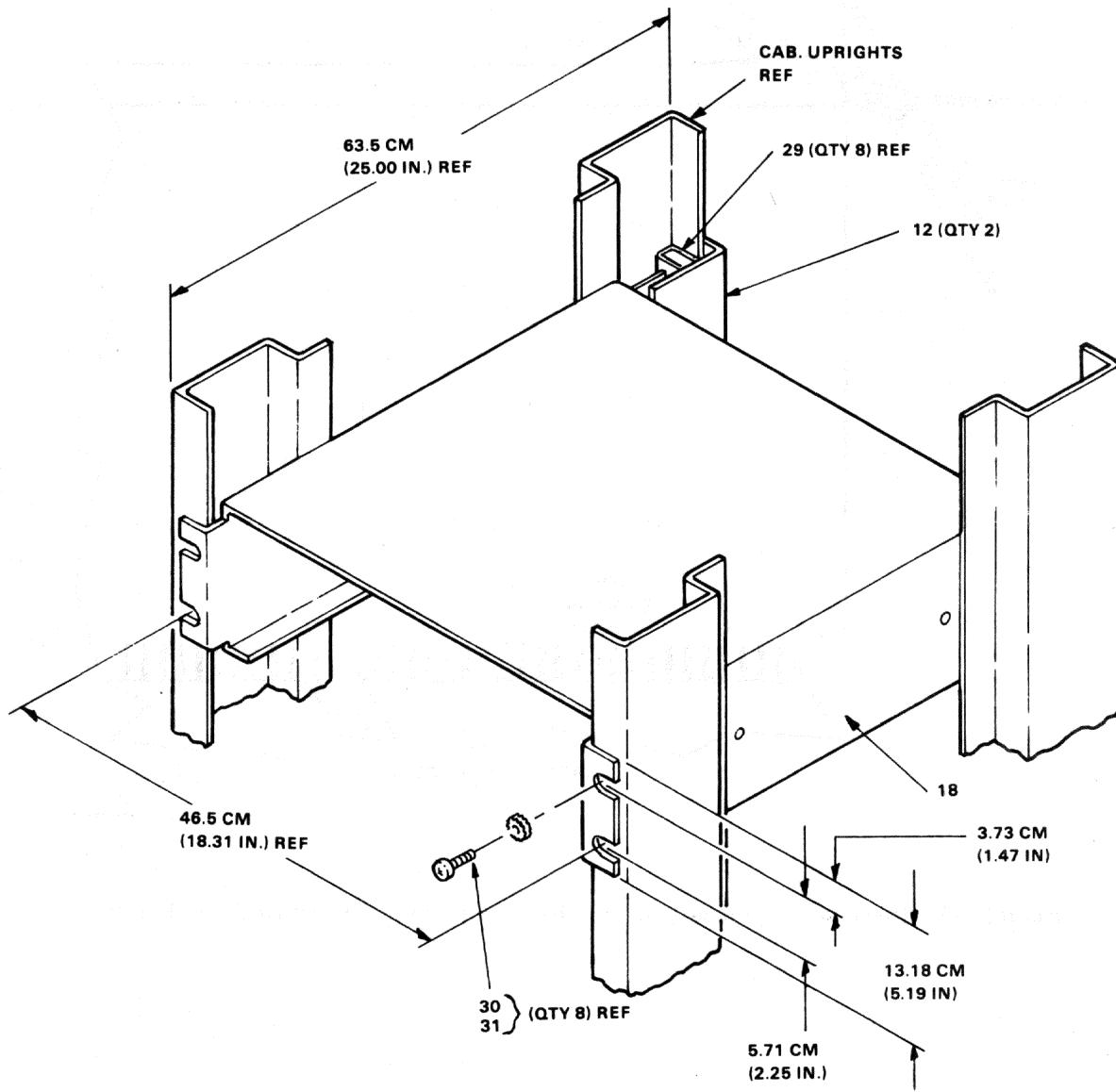


Figure 2-5 BA11-N Cover Mounting Dimensions

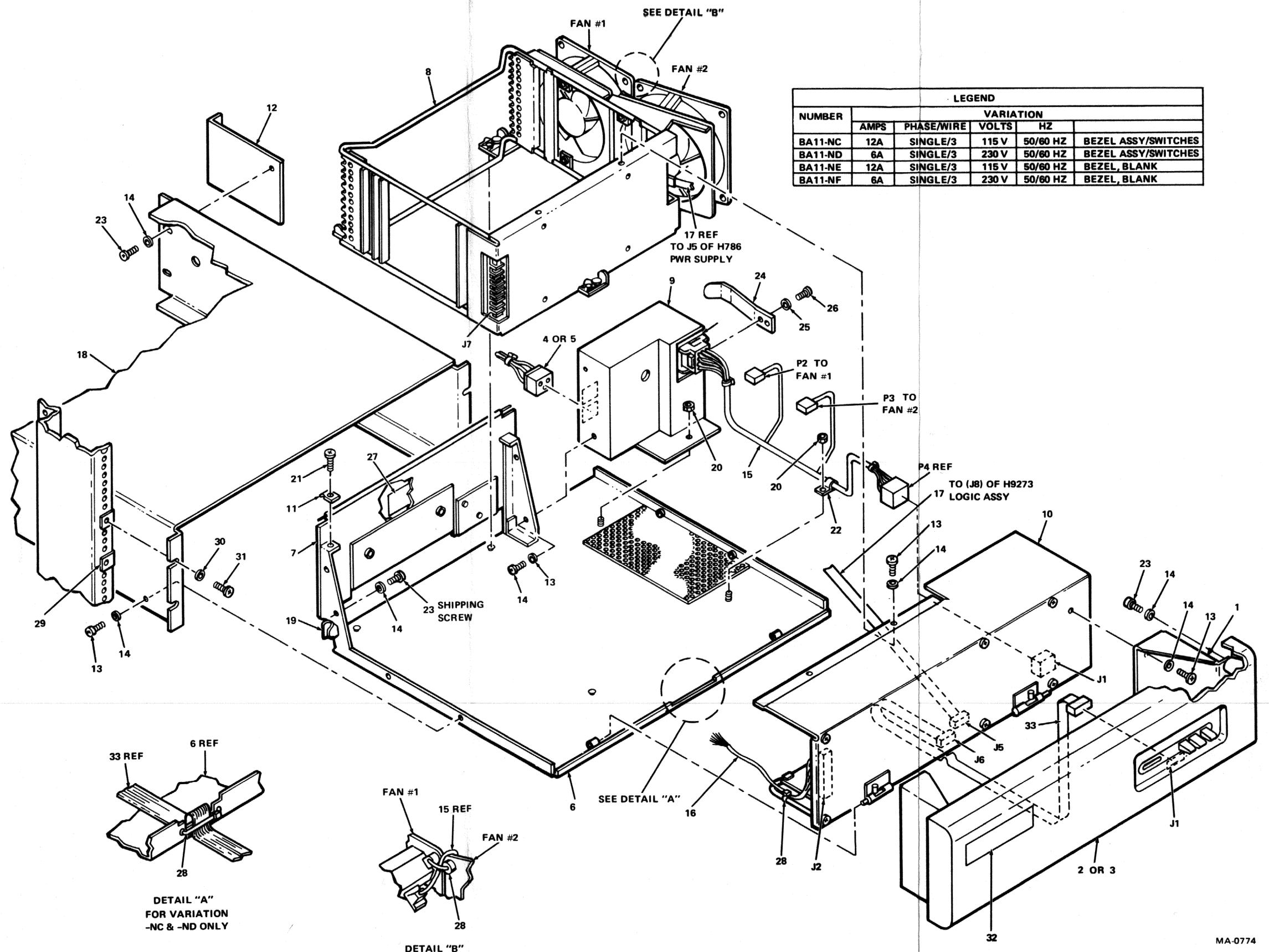


Figure 2-6 BA11-N Unit
Assembly Drawing

Table 2-3 Parts List

Item No.	Part No.	Description	BA11-NC	BA11-ND	BA11-NE	BA11-NF
1		Brkt Bezel Mtg	2	2	2	2
2		Bezel Assy with Switches	1	1	-	-
3		Bezel Blank	-	-	1	1
4	17-00083-02	Line Cord (115 V), USA	1	-	1	-
5	17-00090-00	Line Cord (250 V), USA	-	1	-	1
6		Base, Logic Box	1	1	1	1
7		Door Assy	1	1	1	1
8		Logic Assy (H9273)	1	1	1	1
9		AC Input Box (H403-A)	1	1	1	1
10		Pwr Supply Assy (H786)	1	1	1	1
11		Clamp, Hinge	2	2	2	2
12		Brkt Support	2	2	2	2
13	90-06035-01	Scr PHL Hd Pan No. 8-32X.25	12	12	12	12
14	90-06634-00	Washer, Lock No. 8	21	21	21	21
15		Harness ac Power	1	1	1	1
16		Harness dc	1	1	1	1
17		Cable Backplane	1	1	1	1
18		Cover, Logic Box	1	1	1	1
19	90-08196-00	Receptacle, 1/2 Turn	2	2	2	2
20	90-06563-00	Nut, Keps No. 8-32	2	2	2	2
21	90-08404-02	Scr PHL Hd Flat No. 6-32X.31	2	2	2	2
22	90-07082-00	Cable Clamp 0.31 dia.	1	1	1	1
23	90-06037-01	Scr PHL Hd Pan No. 8-32X.38	9	9	9	9
24		Spring, Button Assy	1	1	1	1
25	90-06632-00	Washer, Lock Int Tooth No. 4	2	2	2	2
26	90-08032-01	Screw PHL Hd Pan No. 4-40X.19	2	2	2	2
27	36-12450-00	Label Serial	1	1	1	1
28	90-07880-00	Tie, Cable SST 1.5 m	3	3	2	2
29	90-07786-00	Nut, Tinnerman No. 10-32	8	8	8	8
30	90-07651-00	Washer, Lock Ext. Tooth No. 10	8	8	8	8
31	90-06073-03	Scr, PHL Truss Hd No. 10-32 X 50	8	8	8	8
32		Logo, PDP-11/03-L	1	1	-	-
33		Cable Console	1	1	-	-

1. When the unit is shipped, the logic box cover is held to the base by four screws (these are used only in nonrack-mounted applications) and a single shipping screw, which, for safety, must be in place whenever the unit is moved or shipped. First, remove the four screws (Item 13) that attach the cover to the base; then, open the rear door (Item 7) and remove the shipping screw (Item 23).
2. A safety locking device is found on the right side of the unit (when looking at the front). This device, a spring-button assembly (Item 24), is attached to the side of the ac input box. When the unit is closed, the button on this assembly fits into the rear hole of two holes in the right side of the cover. This mechanical interlock can be overridden by pushing the button in from the outside of the cover while, at the same time, pulling out the logic box base to get the button past the hole. The base can then be pulled out of the cover to its extended position; at this position, the button pops into the front of the two holes, preventing the base from being inadvertently pulled entirely out of the cover. Open the base to the extended position and then release the button from the front hole. Slowly pull the base entirely out of the cover and set the base out of the way.
3. Attach the Tinnerman nuts to the cabinet uprights in eight places as indicated above.
4. Mount the cover (Item 18) to the front cabinet uprights using four pan head screws No. 10-32 \times 0.62 LG (Item 31), and four No. 10 flat washers (Item 30).
5. Attach the two support brackets (Item 12) to the cover using four Phillips pan head screws No. 8-32 \times 0.38 LG (Item 23), and four No. 8 lock washers (Item 14).
6. Attach the support brackets (Item 12) to the rear cabinet uprights using four Phillips pan head screws, No. 10-32 \times 0.62 LG (Item 31), and four No. 10 flat washers (Item 30).
7. Slide the unit into the cover. It will be held in place by the spring button (Item 24). To slide the unit forward again it will be necessary to release this spring button.
8. If the system is to be moved or shipped, the shipping screw (Item 23) must be replaced.

2.2.3 Installing the Logic Box Base in the Cover

Set the rear of the logic box base on the support flanges of the cover and slide the base in until the spring-button assembly engages in the extended position. Take care not to pinch the cables while sliding the base in. Release the spring button and push the base all the way in until it engages in the closed position. Take the following steps to complete the installation.

Note

The base being installed is either the main base, i.e., the one containing the CPU, or an expander base (two expander boxes can be added). Modify the following instructions to suit the kind of base you are installing; e.g., if there is a blank front panel, skip the first half of Step 1.

1. Put the AUX switch on the front panel in the OFF position; put the ON/OFF switch on the ac input box in the OFF position.

2. When the AUX switch on the front panel is in the ON position, the two wires of the power controller cable are common (Paragraph 2.2.1.4). Connect the free end of the cable to the input circuit of the power controller so that the AUX switch controls the application of primary power to the controller. Keep the AUX switch in the OFF position.
3. Loosen the cable strain reliefs and open the rear door of the box to install the LSI-11 bus expansion cable assemblies. Two cable assemblies are used. Table 2-4 describes the assemblies and tells where to insert the assembly modules (Figures A-4 through A-8 illustrate module placement). When inserting the modules, make sure the connectors are on top.
4. Close the rear door; bring the bus cables out under the left strain relief and the communication cables out under the right strain relief. Adjust the strain reliefs so that the cables are held firmly but are not pinched or crushed. Secure the strain reliefs and the rear door. Make sure the cables will not bind when the base is pulled out to the extended position.

Table 2-4 LSI-11 Bus Expansion Cable Assemblies

Assembly	Assembly Composition	Insert Modules In
BCV1B-XX	Two BC05L-XX cables One M9400-YE module	Slots A and B of the first open row after all other LSI-11 bus options have been installed in the main box.
	One M9401 module	Slots A and B of row 1 of expander box 1.
BCV1A-XX	Two BC05L-XX cables One M9400-YD module	Slots A and B of the first open row after all other LSI-11 bus options have been installed in expander box 1.
	One M9401 module	Slots A and B of row 1 of expander box 2.

NOTE

“-XX” in the cable assembly number denotes length, which can be 2,4,6, or 10 ft (each cable of an assembly is the same length.) When both assemblies are used in a system (three boxes), the lengths must differ by 122 cm (4 ft). To facilitate servicing, the BCV1B cables should be 183 cm (6 ft) long, while the BCV1A cables should be 305 cm (10 ft) long.

2.2.4 Power Connections

The individual mounting boxes of a multiple-box system can be connected to a power source in different ways. Figure 2-7 shows how one might connect the boxes in typical PDP-11/03L systems involving only BA11-N mounting boxes. In Figure 2-7a the first expander box gets primary power from the ac outlet (J3) on the main box, which can be connected to a switched or unswitched source. If the source is switched, the ON/OFF switch on each ac input box is left in the ON position and power is controlled by the source ON/OFF switch; if the source is unswitched (an ac wall outlet, for example), the ON/OFF switch on the ac input box of the PDP-11/03L controls power to the first two units (the ON/OFF switch of the first expander is left in the ON position). Because of power limitations, the second expander box **cannot** receive power from the ac outlet on expander box 1; instead, J2 of expander box 2 must connect to the external power source.

In Figures 2-7b and 2-7c, each BA11-N is connected to a power controller; however, the controller is turned on and off from different locations. That is, in Figure 2-7b the switch that turns power on and off is located on the power controller or is at some place external to the controller. In Figure 2-7c, the switch that turns power on and off is the AUX ON/OFF switch on the PDP-11/03L front panel.

Figure 2-8 illustrates how to connect typical systems that use both BA11-M and BA11-N mounting boxes. In Figure 2-8a, a BA11-N is shown as an expander to an existing PDP-11/03 system that consists of two BA11-M mounting boxes (refer to the 1977-1978 *Microcomputer Handbook* for information concerning power installation of BA11-M expander boxes). As in Figure 2-7b, ac power is controlled from the power controller or from an external source.

The system depicted in Figure 2-8b, shows a PDP-11/03 system being expanded by two BA11-M expander boxes. Such a system can arise when a user with an existing PDP-11/03 (BA11-M box) system wishes to expand with the larger capacity BA11-N mounting boxes. By purchasing the BA11-N with a front panel, the user can convert the PDP-11/03 to a PDP-11/03L, controlling the entire system power as described for Figure 2-7c.

2.2.5 Installation Verification

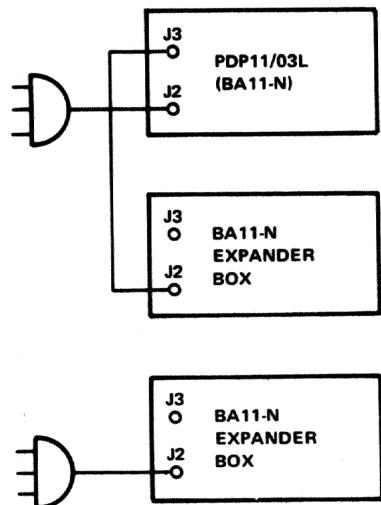
When the installation is completed, check the operating condition of the equipment. This is a relatively easy task if the system is a PDP-11/03L. This system includes a BDV11-A terminator, boot, and diagnostic option. When the PDP-11/03L system power is turned on, or when the system is restarted, diagnostic programs implemented by the BDV11-A are automatically started and carried out. These diagnostics verify the operation of a number of options that the user might have in his system. The diagnostic package is contained in the PDP-11/03L print set, M00486. Refer to the *BDV11-A User's Guide* for operating instructions.

Options that are not checked by the BDV11-A option have a separate diagnostic program available. Refer to Section 4 of the 1977-1978 *Microcomputer Handbook* for a description of LSI-11 system software and for instructions concerning diagnostic programs.

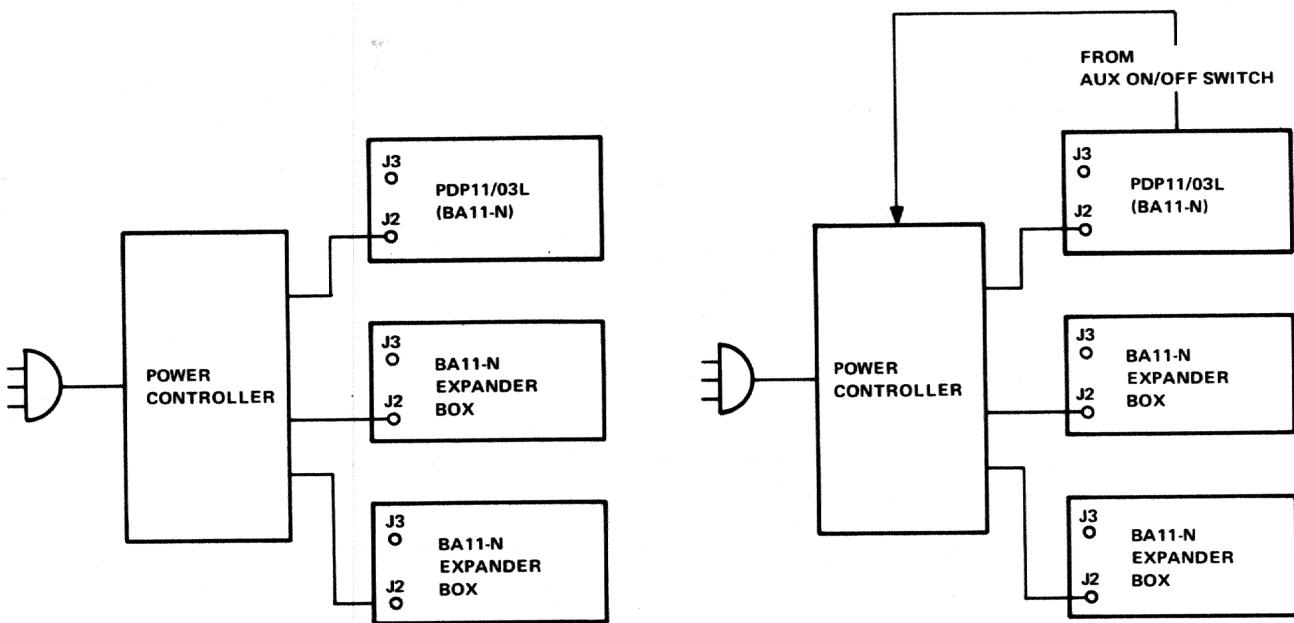
When problems are encountered with system options, refer to the appropriate option technical manual for instructions. For those problems that are isolated to the BA11-N, itself, refer to Chapter 4 of the BA11-N Technical Manual, which contains some troubleshooting hints and procedures.

2.3 OPERATION

The BA11-N can have a blank front panel or one equipped with three switches and three indicators (the control equipped front panel is illustrated in Figure 2-9 – one indicator is not used). Table 2-5 lists the switches and indicators and describes the function of each.



(A) POWER IS CONTROLLED BY THE AC INPUT BOX ON/OFF SWITCH OR BY THE ON/OFF SWITCH OF A REMOTE SWITCHED SOURCE.

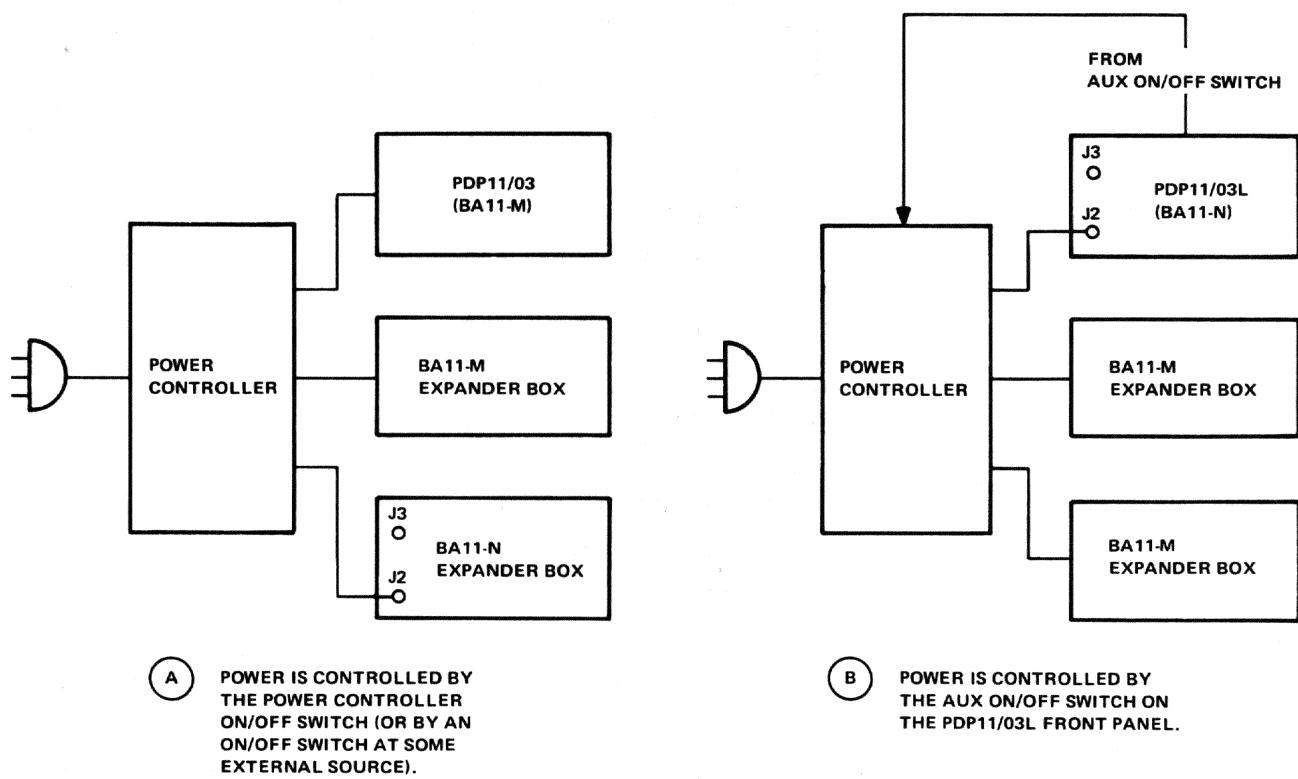


(B) POWER IS CONTROLLED BY THE POWER CONTROLLER ON/OFF SWITCH (OR BY AN ON/OFF SWITCH AT SOME EXTERNAL SOURCE).

(C) POWER IS CONTROLLED BY THE AUX ON/OFF SWITCH ON THE PDP11/03L FRONT PANEL.

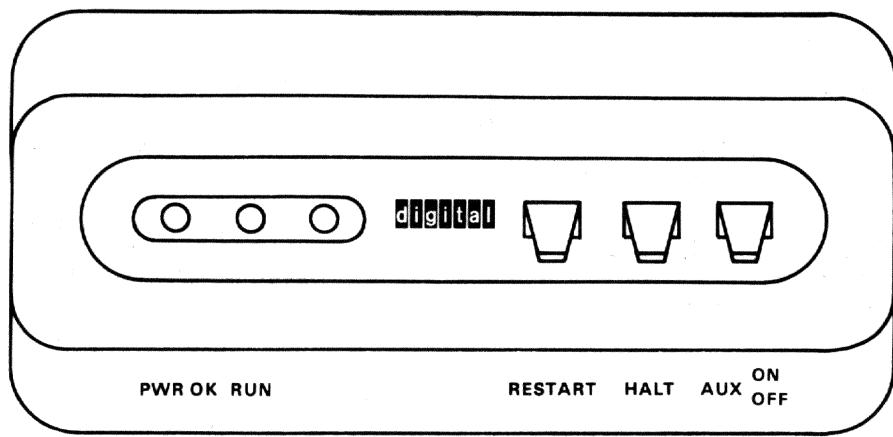
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Figure 2-7 Power Connections, PDP-11/03L Systems



MA-0758

Figure 2-8 Power Connections with BA11-M Expander Boxes



MA-0751

Figure 2-9 Front Panel Switches and Indicators

Table 2-5 BA11-N Front Panel Switches and Indicators

Switch	Indicator	Function
AUX ON/OFF		Can be used for any desired function (switch is rated at 48 V, 1 A dc). Two specific functions are: If the BA11-N is wired to control system power, the AUX switch turns the power on and off; if the BA11-N is not wired to control system power, the switch can control the LTC signal, disabling the signal when the switch is in the OFF position.
HALT		In the down position, the HALT switch forces the CPU to suspend normal program execution, enables console ODT microcode operation, and permits single-instruction execution. To resume program execution, return the HALT switch to the up position and enter a P command from the console terminal (providing the contents of register R7 were not changed; refer to Chapter 2 of the 1977-1978 <i>Microcomputer Handbook</i> for a description of console ODT command usage). In an expander box, the HALT switch can be used to light the RUN indicator.
RESTART	PWR OK	When the momentary RESTART switch is activated, the CPU automatically carries out a power-up sequence; thus, the CPU can be rebooted at any time from the front panel.
	RUN	The PWR OK indicator lights when the power supply dc voltages are present. The RUN indicator lights when the CPU is executing programs.

In addition to the front panel switches and indicators, there is an ON/OFF switch and a primary voltage selection switch, both on the ac input box. The ON/OFF switch remains in the ON position when a power controller is used to apply primary power to the BA11-N; if a power controller is not used, the switch can be used to turn power on and off. Refer to Paragraph 2.2.1.1 for information about the primary voltage selection switch.

APPENDIX A **BACKPLANE AND MODULE CONFIGURATION**

LSI-11 systems can be classified as either single-backplane or multiple-backplane systems. The electrical characteristics of each system are quite different; hence, two sets of rules have been devised and must be observed. These rules, which have their basis in bus loading and power consumption, are listed here and are summarized in the backplane configuration charts that appear later in this appendix.

SINGLE-BACKPLANE CONFIGURATION RULES

1. The LSI-11 bus can support up to 20 ac loads, i.e., the processor has on-board termination for one end of the bus; after 20 ac loads, the other end of the bus must be terminated with $120\ \Omega$.
2. The terminated bus can support up to 35 ac loads.
3. The bus can support up to 20 dc loads.
4. The amount of current drawn from each power supply should be 70 percent, or less, of the maximum rated output of the supply (Paragraph 1.4).

MULTIPLE-BACKPLANE CONFIGURATION RULES

1. No more than three backplanes can be connected together.
2. Each backplane can have no more than 20 ac loads.
3. The total number of dc loads cannot be more than 20.
4. Both ends of the termination line must be terminated with $120\ \Omega$; i.e., the first backplane must have an impedance of $120\ \Omega$, and the last backplane must have a termination of $120\ \Omega$.
5. The cable connecting the first two backplanes (i.e., the main box and expander box 1) must be at least 61 cm (2 ft) long; a 183 cm (6 ft) length of cable is recommended for ease of installation.
6. The cable connecting the backplane of expander box 1 to the backplane of expander box 2 must be at least 122 cm (4 ft) longer or shorter than the cable connecting the main box and expander box 1; a 305 cm (10 ft) length of cable is recommended for ease of installation.
7. The combined length of both cables in a three-backplane system cannot exceed 488 cm (16 ft).
8. If the cables are customer-supplied, they must have a characteristic impedance of $120\ \Omega$.
9. The amount of current drawn from each power supply should be 70 percent, or less, of the maximum rated output of the supply (Paragraph 1.4).

Backplane configuration charts are provided here to help the user observe these configuration rules. First, one must determine which backplane configuration is best suited for a specific application. Use the backplane selector charts, Figures A-1 and A-2, to determine this configuration.

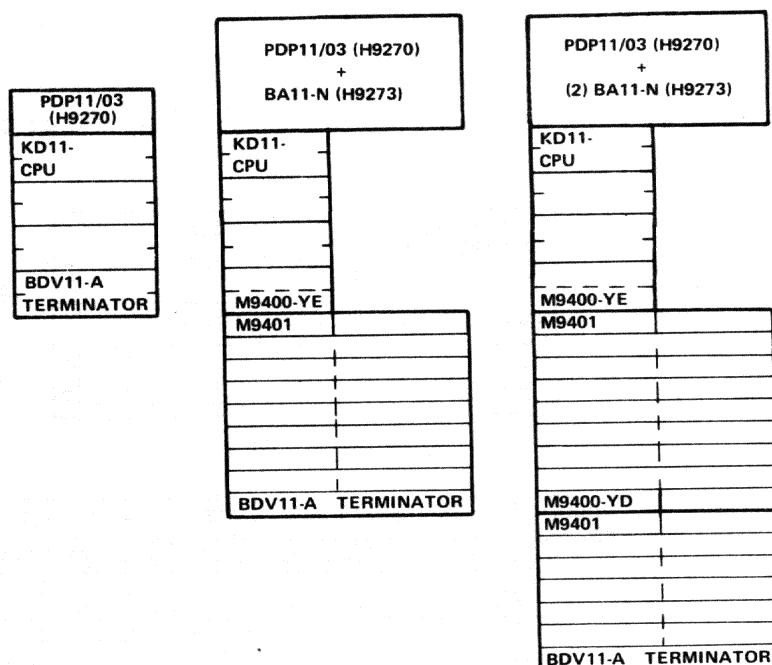
The selector charts show configurations that one might want to achieve when beginning with either a PDP-11/03 or a PDP-11/03L. The backplanes are shown as vertical columns of quad-size module positions; if the dashed lines are completed, double-size module positions are created. For example, if you wish to insert a quad module in module positions 3 and 4 of the PDP-11/03 single backplane, write in the option type without completing the dashed line. However, if you want to insert a double module in position 3, complete the dashed line between positions 3 and 4 and write in the option type in the space allotted to position 3.

The column layout of the backplanes makes it easy to establish interrupt and DMA priorities of the modules; i.e., the closer to the top of a column a module is placed, the higher is the priority of the module. Furthermore, the column layout easily depicts the correct placement of cable and termination modules.

To configure an LSI-11 system, take the following steps.

1. Choose the type of memory (MOS, PROM, or combination) required for the specific application.
2. Select the CPU and memory combination most suited for the application (the PDP-11/03L uses a KD11-R).
3. Select additional memory, interface, and peripheral options required.
4. Count the total number of module positions.
5. Count the total number of bus positions.
6. Choose a backplane configuration that satisfies the module position requirement, the bus position requirement, and also provides sufficient expansion space.
7. Enter the option names in the backplane positions of the selected configuration.
8. Review the initial backplane configuration to determine if changes must be made.
9. If no changes are necessary, move to the appropriate backplane configuration chart (Figures A-3 through A-8). Enter the option names and numbers, the ac and dc loads, the power consumption, and the cable numbers (the Option Summary Chart, Table A-1, lists power requirements and bus loads for the LSI-11 modules). Total the power consumption and the ac and dc loads. If any of these exceed the limits specified, the module configuration will have to be altered or a new backplane configuration will have to be selected.

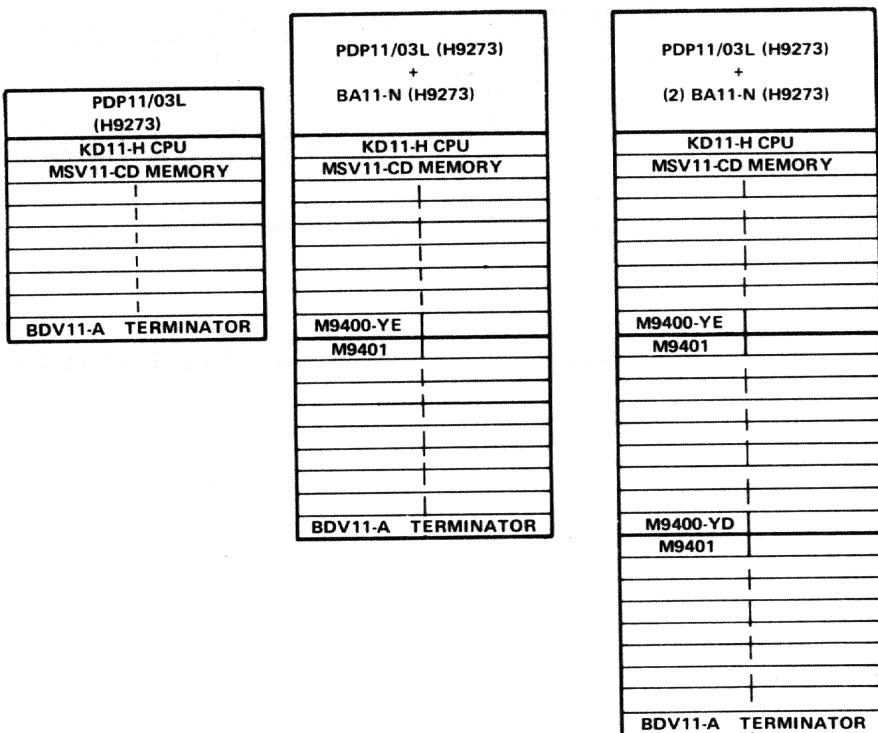
MODULE POSITION	BUS POSITION	SLOT
1	1	1AB
2	2	1CD
3	3	2CD
4	4	2AB
5	5	3AB
6	6	3CD
7	7	4CD
8	8	4AB
9, 10	9	1ABCD
11, 12	10	2ABCD
13, 14	11	3ABCD
15, 16	12	4ABCD
17, 18	13	5ABCD
19, 20	14	6ABCD
21, 22	15	7ABCD
23, 24	16	8ABCD
25, 26	17	9ABCD
27, 28	18	1ABCD
29, 30	19	2ABCD
31, 32	20	3ABCD
33, 34	21	4ABCD
35, 36	22	5ABCD
37, 38	23	6ABCD
39, 40	24	7ABCD
41, 42	25	8ABCD
43, 44	26	9ABCD



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Figure A-1 Backplane Selector Chart, PDP-11/03 Expansion

MODULE POSITION	BUS POSITION	SLOT
1, 2	1	1ABCD
3, 4	2	2ABCD
5, 6	3	3ABCD
7, 8	4	4ABCD
9, 10	5	5ABCD
11, 12	6	6ABCD
13, 14	7	7ABCD
15, 16	8	8ABCD
17, 18	9	9ABCD
19, 20	10	1ABCD
21, 22	11	2ABCD
23, 24	12	3ABCD
25, 26	13	4ABCD
27, 28	14	5ABCD
29, 30	15	6ABCD
31, 32	16	7ABCD
33, 34	17	8ABCD
35, 36	18	9ABCD
37, 38	19	1ABCD
39, 40	20	2ABCD
41, 42	21	3ABCD
43, 44	22	4ABCD
45, 46	23	5ABCD
47, 48	24	6ABCD
49, 50	25	7ABCD
51, 52	26	8ABCD
53, 54	27	9ABCD



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Figure A-2 Backplane Selector Chart, PDP-11/03L Expansion

H9273	
1 — KD11-H	2
3 — MSV11-CD	4
5	6
7	8
9	10
11	12
13	14
15	16
17 — BDV11-A	18

PDP11/03L BOX

MODULE POSITION	OPTION		CURRENT (AMPS)		BUS LOADS		CABLES
	TYPE	NUMBER	+5V	+12V	AC	DC	
1	KD11-H	M7264-YA	1.6	0.25	3.3	1.0	
2							
3	MSV11-CD	M7955-YD	1.1	0.54	2.4	1.0	
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17	BDV11-A	M8012	1.25	0.05	1.6	1.0	
18							
MODULE TOTALS							
H9273			0	0	2.6	0	
TOTAL							
MAXIMUM AVAILABLE			15.5	8.0	35*	20	

*IF THE BDV11-A (OR ANOTHER 120-OHM TERMINATOR) IS NOT IN THE BACKPLANE, THE SYSTEM CAN SUPPORT ONLY 20 AC LOADS.

MA-0760

Figure A-3 Configuration Chart, PDP-11/03L (H9273)

H9273	
1 — KD11-H	2
3 — MSV11-CD	4
5	6
7	8
9	10
11	12
13	14
15	16
17 M9400-YE	18

PDP11/03L MAIN BOX

(2) BC05L CABLES

H9273	
19 M9401	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35 — BDV11-A	36

BA11-N EXPANDER BOX

MODULE POSITION	OPTION		CURRENT (AMPS)		BUS LOADS		CABLES
	TYPE	NUMBER	+5V	+12V	AC	DC	
1	KD11-H	M7264-YA	1.6	0.25	3.3	1.0	
2							
3	MSV11-CD	M7955-YD	1.1	0.54	2.4	1.0	
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17	BCV1B	M9400-YE	0.29	0	0	0	(2) BC05L (NOTE 2)
18							

MODULE TOTAL

H9273

TOTAL

MAXIMUM AVAILABLE

0 0 2.6 0

PDP11/03L MAIN BOX

15.5 8.0 20 NOTE 1

19	BCV1B	M9401	0	0	0	0	
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35	BDV11-A	M8012	1.25	0.05	1.6	1.0	
36							

MODULE TOTAL

M9273

TOTAL

MAXIMUM AVAILABLE

0 0 2.6 0

BA11-N EXPANDER BOX

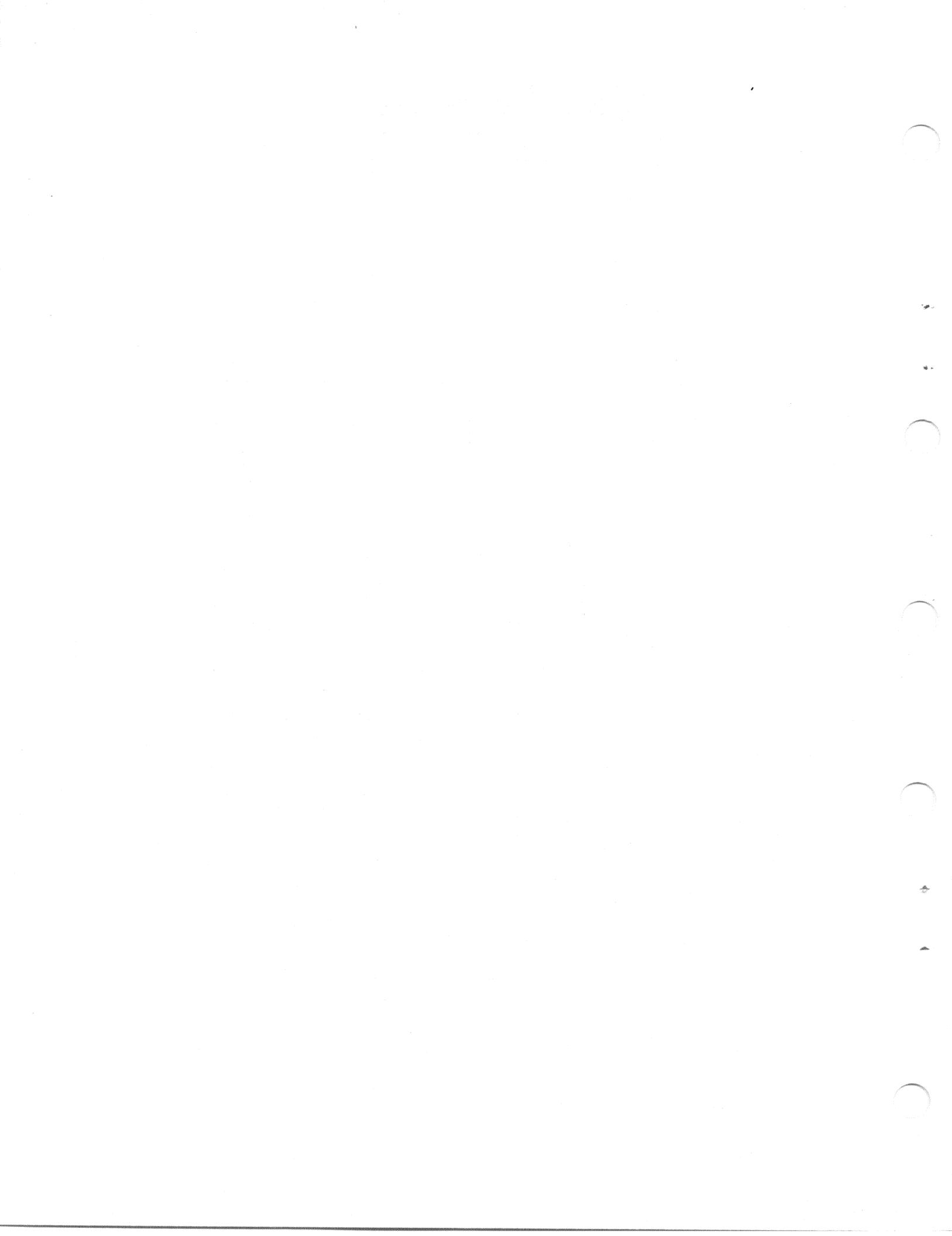
15.5 8.0 20 NOTE 1

NOTES:

1. THE TOTAL DC LOADS OF BOTH BOXES CANNOT EXCEED 20.
2. EACH BC05L CABLE MUST BE AT LEAST 61cm (2 FT.) LONG, BUT A 183cm (6 FT.) LENGTH IS RECOMMENDED.

MA-0730

Figure A-4 Configuration Chart, PDP-11/03L (H9273) and BA11-N (H9273)



H9273	
1-KD11-H	2
3-MSY11-CD	4
5	6
7	8
9	10
11	12
13	14
15	16
17 M9400-YE	18

PDP11/03L MAIN BOX

(2) BC05L CABLES

H9273	
19 M9401	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35 M9400-YD	36

BA11-N EXPANDER BOX 1

(2) BC05L CABLES

H9273	
37 M9401	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53-BDV11-A	54

BA11-N EXPANDER BOX 2

NOTES:

1. THE TOTAL DC LOADS OF ALL BOXES CANNOT EXCEED 20.
2. THIS BC05L MUST BE AT LEAST 61cm (2 FT.) LONG, BUT A LENGTH OF 183cm (6 FT.) IS RECOMMENDED.
3. THIS CABLE MUST BE AT LEAST 122cm (4 FT.) LONGER OR SHORTER THAN THE CABLE IN NOTE 2; A 3.05m (10 FT.) LENGTH IS RECOMMENDED.
4. THE COMBINED LENGTH OF BOTH BC05L CABLES CANNOT EXCEED 488cm (16 FT.).

MODULE POSITION	OPTION		CURRENT (AMPS)		BUS LOADS		CABLES
	TYPE	NUMBER	+5V	+12V	AC	DC	
1	KD11-H	M7264-YA	1.6	0.25	3.3	1.0	
2							
3	MSV11-CD	M7955-YD	1.1	0.54	2.4	1.0	
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17	BCV1B	M9400-YE	0.29	0	0	0	(2) BC05L (NOTE 2)
18							
MODULE TOTAL							
H9273			0	0	2.6	0	
TOTAL							
MAXIMUM AVAILABLE			15.5	8.0	20	NOTE 1	PDP11/03L MAIN BOX

19	BCV1B	M9401	0	0	0	0	
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35	BCV1A	M9400-YD	0	0	0	0	(2) BC05L (NOTE 3)
36							
MODULE TOTAL							
H9273			0	0	2.6	0	
TOTAL							
MAXIMUM AVAILABLE			15.5	8.0	20	NOTE 1	BA11-N EXPANDER BOX 1

37	BCV1A	M9401	0	0	0	0	
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53	BDV11-A	M8012	1.25	0.05	1.6	1.0	
54							
MODULE TOTAL							
H9273			0	0	2.6	0	
TOTAL							
MAXIMUM AVAILABLE			15.5	8.0	20	NOTE 1	BA11-N EXPANDER BOX 2

MA-0770

Figure A-5 Configuration Chart,
PDP-11/03L (H9273)
and (2) BA11-N (H9273)

H9270	
1 — KD11-	2
4	3
5	6
8 — BDV11-A	7

PDP11/03 BOX

MODULE POSITION	OPTION		CURRENT (AMPS)		BUS LOADS		CABLES
	TYPE	NUMBER	+5V	+12V	AC	DC	
1	KD11	M7264			3.3	1.0	
2							
3							
4							
5							
6							
7	BDV11-A	M8012	1.25	0.05	1.6	1.0	
8							
MODULE TOTAL							
H9270			0	0	5.1	0	
TOTAL							
MAXIMUM AVAILABLE			13.0	2.5	35*	20	

PDP11/03 BOX

*IF THE BDV11-A (OR ANOTHER 120-OHM TERMINATOR) IS NOT IN THE BACKPLANE,
THE SYSTEM CAN SUPPORT ONLY 20 AC LOADS.

MA-0733

Figure A-6 Configuration Chart, PDP-11/03 (H9270)

H9270

1	KD11-		2
4			3
5			6
8	M9400-YE		7

(2) BC05L CABLES

H9273

9		10
11		12
13		14
15		16
17		18
19		20
21		22
23		24
25	BDV11-A (NOTE 1)	26

PDP11/03 MAIN BOX

BA11-N EXPANDER BOX

MODULE POSITION	OPTION		CURRENT (AMPS)		BUS LOADS		CABLES
	TYPE	NUMBER	+5V	+12V	AC	DC	
1	KD11-	M7264			3.3	1.0	
2	↓	↓					
3							
4							
5							
6							
7							
8	BCV1B	M9400-YE	0.29	0	0	0	(2) BC05L (NOTE 3)
MODULE TOTAL H9270			0	0	5.1	0	<u>PDP11/03 MAIN BOX</u>
TOTAL							
MAXIMUM AVAILABLE			13.0	2.5	20	NOTE 2	

9	BCV1B	M9401	0	0	0	0	
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25	BDV11-A	M8012	1.25	0.05	1.6	1.0	
26	↓	↓					
MODULE TOTAL H9273			0	0	2.6	0	<u>BA11-N EXPANDER BOX</u>
TOTAL							
MAXIMUM AVAILABLE			15.5	8.0	20	NOTE 2	

NOTES:

1. A TEV11 OR A REV11-A DOUBLE MODULE IN POSITION 25 WILL ALSO TERMINATE THE LSI-11 BUS.
2. THE TOTAL DC LOADS OF BOTH BOXES CANNOT EXCEED 20.
3. THE BC05L CABLE MUST BE AT LEAST 61cm (2 FT.) LONG, BUT A 183cm (6 FT.) LENGTH IS RECOMMENDED.

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Figure A-7 Configuration Chart, PDP-11/03 (H9270) and BA11-N (H9273)

H9270	
1-KD11-	2
4	3
5	6
8 M9400-YE	7

PDP11/03 MAIN BOX

(2) BC05L CABLES

H9273	
9 M9401	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25 M9400-YD	26

BA11-N EXPANDER BOX 1

(2) BC05L CABLES

H9273	
27 M9401	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43-BDV11-A (NOTE 1)	44

BA11-N EXPANDER BOX 2

MODULE POSITION	OPTION		CURRENT (AMPS)		BUS LOADS		CABLES
	TYPE	NUMBER	+5V	+12V	AC	DC	
1	KD11-	M7264			3.3	1.0	
2							
3							
4							
5							
6							
7							
8	BCV1B	M9400-YE	0.29	0	0	0	(2) BC05L (NOTE 3)
MODULE TOTAL H9270			0	0	5.1	0	
			13.0	2.5	20	NOTE 2	

PDP11/03 MAIN BOX

9	BCV1B	M9401	BA11-N EXPANDER BOX 1			
			0	0	0	0
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26	BCV1A	M9400-YD	0	0	0	0
MODULE TOTAL H9273			0	0	2.6	0
			15.5	8.0	20	NOTE 2

BA11-N EXPANDER BOX 1

27	BCV1A	M9401	BA11-N EXPANDER BOX 2			
			0	0	0	0
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43	BDV11-A	M8012	1.25	0.05	1.6	1.0
44						
MODULE TOTAL H9273			0	0	2.6	0
			15.5	8.0	20	NOTE 2

BA11-N EXPANDER BOX 2

NOTES:

1. A TEV11 OR A REV11-A DOUBLE MODULE IN POSITION 43 WILL ALSO TERMINATE THE LSI-11 BUS.
2. THE TOTAL DC LOADS OF ALL BOXES CANNOT EXCEED 20.
3. THIS CABLE MUST BE AT LEAST 61cm (2 FT.) LONG, BUT A LENGTH OF 183cm (6 FT.) IS RECOMMENDED.
4. THIS CABLE MUST BE AT LEAST 122cm (4 FT.) LONGER OR SHORTER THAN THE CABLE IN NOTE 3; A 31cm (10 FT.) LENGTH IS RECOMMENDED.
5. THE COMBINED LENGTH OF BOTH BC05L CABLES CANNOT EXCEED 488cm (16 FT.).

MA-0729

Figure A-8 Configuration Chart,
PDP-11/03 (H9270)
and (2) BA11-N (H9273)

Table A-1 Option Summary Chart

Option		Description	Amps (Typ)		Bus Loads		Size	Cables
Type	Number		+5 V	+12 V	ac	dc		
AAV11-A	A6001	12 bit, 4-Channel D/A Converter	1.5	0.4	2.0	1	Quad	BC04Z BC04R BC08R Used w/H322
ADV11-A	A012	12 bit, 16-Channel A/D Converter	2A	0.45	3.3	1	Quad	BC04Z BC08R Used w/H322
BCV1A-XX	M9400-YD M9401	2 modules, 2 Cables Used to Interconnect 4 x 4 Backplane, No Terminators	0 0	0 0	0 0	0 0	Double Double	(2) BC05L-XX Included
BCV1B-XX	M9400-YE M9401	2 Modules, 2 Cables Used to Interconnect 4 x 4 Backplane, 250Ω Terminators	0.29A 0	0 0	0 0	0 0	Double Double	(2) BC05L-XX Included
BDV11-A	M8012	Terminator, Boot, and Diagnostic	1.25	0.05*	1.6	1	Quad	-----
DDV11-B		9 x 6 Backplane	--	--	6.4	0	--	-----
DLV11	M7940	Serial Line Interface	1.0	0.18	2.6	1	Double	BC05M-X for 20 MA Loop BC05C-X for EIA
KWV11-A	M7952	Programmable Real-Time Clock	1.75	0.01	3.5	1	Quad	BC04Z BC08R
LAV11	M7949	LA180 Line Printer Interface	0.50	0	1.9	1	Double	BC11S-XX
LPV11		LA180 Line Printer Interface	--	--	--	--	Double	-----
MRV11-A	M7942	4K x 16 PROM	2.8 Fully Loaded	0	3.3	1	Double	-----

*Increases if customer ROMs are installed.

Table A-1 Option Summary Chart (Cont)

Option		Description	Amps (Typ)		Bus Loads		Size	Cables
Type	Number		+5 V	+12 V	ac	dc		
MRV11-B	M8021	4K x 16 U/V PROM, 256 x 16 RAM	0.62 Fully Loaded	0.5 --	2.8 --	1 --	Double	----
MSV11-B	M7944	4K x 16 MOS RAM	0.6	0.3	3.3	1	Double	----
MSV11-CD	M7955-YD	16K x 16 MOS RAM	1.1	0.54	2.4	1	Quad	----
MSV11-D								
REV11-A	M9400-YA	Floppy Disk Boot, DMA RAM Refresh, 120 Ω Terminator	1.6	0	2.2	1	Double	----
REV11-C	M9400-YC	Same as REV11-A w/o Terminator	1.0	0	2.2	1	Double	----
RXV11-B	M7946	Floppy Disk Interface	1.5 Max	0	1.8	1	Double	BC05L-X
TEV11	M9400-YB	120 Ω Bus Terminator	0.5	0	0	0	Double	----
DRV11	M7941	Parallel Line Interface	0.9	--	2.8	1	Double	(2) BC07D-X BC11K-25
DRV11-B	M7950	DMA Interface	1.9	--	--	--	Quad	(2) BC04Z-X
DRV11-P	M7948	Bus Foundation Module	1.0 Plus User Logic	--	--	--	Quad	----
DUV11-DA	M7951	Synchronous Serial Line Interface	0.86	0.32	1.3	1	Quad	BC05C-25
DZV11-A	M7957	Quad Asynchronous Serial Line Interface	1.15	0.39	1	1	Quad	BC11U-25
H9270		4 x 4 Backplane	--	--	5.1	0	--	----
H9273		9 x 4 Backplane	--	--	2.6	0	--	----
IBV11-A	M7954	IEEE Instrument Bus Interface	0.8	--	1.6	1	Double	BN11A Included

Table A-1 Option Summary Chart (Cont)

Type	Number	Description	Amps (Typ)		Bus Loads		Size	Cables
			+5 V	+12 V	ac	dc		
KD11-F	M7264	LSI-11 CPU with 4K X 16 MOS RAM	1.8	0.8	3.3	1	Quad	----
KD11-H	M7264-YA	LSI-11 CPU w/o RAM	1.6	0.25	3.3	1	--	----
KD11-HA		LSI-11 CPU w/o RAM	--	--	--	--	Double	----
KD11-R	M7264-YA M7955-YD	LSI-11 CPU with 16K X 16 MOS RAM	1.6 1.1	0.25 0.54	3.3 2.4	1 1	Quad Quad	-----
KPV11-B	M8016	Power Fail/Restore Signal Sequencer, Line Time Clock and 120 Ω Terminator	0.011	0.082	3.3	1	Double	-----

**BA11-N MOUNTING BOX
USER'S GUIDE
EK-BA11N-UG-001**

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