EK-LSIFS-SV-005

LSI-11 Systems Service Manual

Volume I

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GENERAL CONFIGURATION RULES

GENERAL CONFIGURATION RULES

The rules and considerations discussed in this section apply to all LSI-11 systems. Refer to subsequent sections for requirements peculiar to specific systems.

Backplanes

LSI-11 systems can be divided into two types: those that use only one backplane, and those that have multiple backplanes. Single backplane systems are viewed as lumped capacitance. Multiple backplane systems are regarded as transmission line systems. The characteristics of the two types differ enough to require separate sets of configuration rules. The rules are given in terms of power consumption, dc bus loading, and ac bus loading. DC loading is a measure of the leakage current a module's bus signal lines draw when high (undriven). One dc load is nominally 105 μA. AC loading is a measure of the capacitance a module adds to the bus signal lines. One ac load is 9.35 pF. Backplanes also add ac loading to the bus. The power consumption, dc loading, and ac loading is listed for each module in the "CPU/Options" section.

Configuring Single Backplane Systems

1. The bus can support up to 20 ac loads before additional termination is required. The processor has on-board termination for one end of the bus, and after 20 ac loads, the other end of the bus must be terminated with 120 Ω.

2. A terminated bus can support up to 35 ac loads.

3. The bus can support up to 20 dc loads.

4. The bus signal lines on the backplane can be up to 35.6 cm (14 in) long.

The preceding rules apply only to single backplane systems. The bus cannot be extended off the backplane in any way. If it is, the system is considered a multiple backplane system.

Configuring Multiple Backplane Systems

1. a. Up to three backplanes may be connected together.

   b. The signal lines on each backplane can be up to 25.4 cm (10 in) long.

2. Each backplane can have up to 20 ac loads. Unused ac loads from one backplane may not be added to another backplane if the second backplane loading will exceed 20 ac loads. It is desirable to load backplanes equally or with the highest ac loads in the first and second backplanes.

3. Total dc loading of all three backplanes combined can be up to 20 loads.

4. Both ends of the transmission line should be terminated with 120 Ω. This means that the first backplane should have impedance of 120 Ω, and the last backplane should have a termination of 120 Ω.

5. a. The cable connecting the first two backplanes should be at least 1.83 meters (6 ft) long.

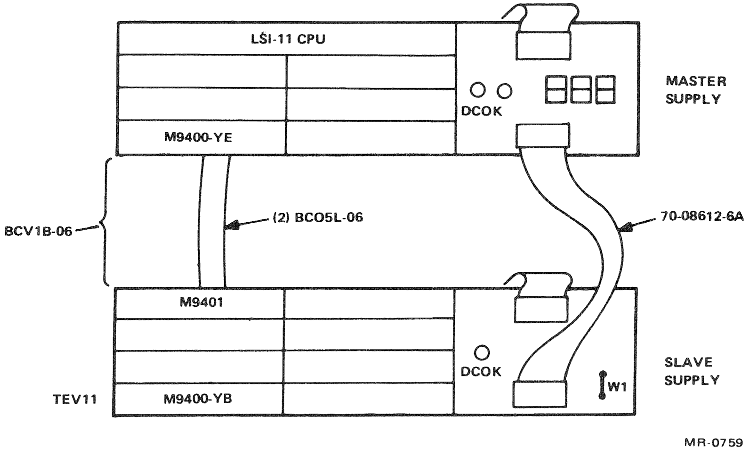
   b. The cable connecting the second backplane to the third backplane must be at least 1.22 m (4 ft) longer or shorter than the cable connecting the first and second backplanes.

   c. The combined length of the cables should not exceed 4.88 m (16 ft).

   d. The cables used must have a characteristic impedance of 120 Ω.

Power Supplies

The "CPU/Options" section lists the typical power requirements for each module. For reliable operation, the sum of all typical current requirements should be less than 70 percent of the maximum rated current of the power supply. Refer to the appropriate power supply section for voltage and current ratings.

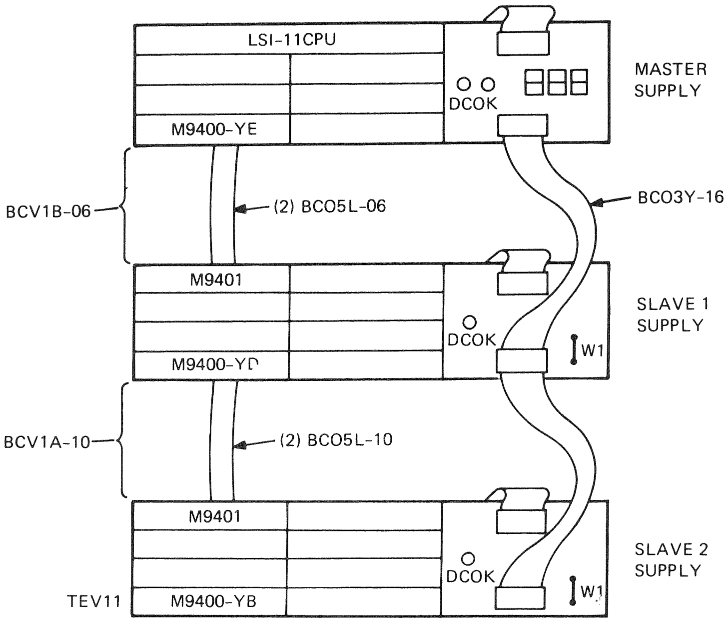


A Typical System Configuration Using BA11-M Boxes
Showing Cables Needed for Expansion

NOTE

Expander boxes are normally shipped with W1 installed. This enables the slave power supply to be powered up and down without being cabled to the master supply. For system applications, however, it is recommended that W1 be removed. This will ensure that the slave supply does not power up unexpectedly if the cable is loosened.

Business Products systems (D322 and D324) do not use a PDP-11/03-J slave console. The two power supplies are connected by a cable (DEC part number (PN) 70-13371-00). No slave board is needed. In a standalone device, such as the RKV11-D disk drive controller, the W1 jumper must be installed and is not removed if it is added to a system.



NOTE:
THE TWO (2) BC05L-XX CABLE LENGTHS BETWEEN THE FIRST AND SECOND BOX SHOULD DIFFER FROM THE BC05L-XX CABLE LENGTHS BETWEEN THE SECOND AND THIRD BOX BY AT LEAST FOUR FEET BECAUSE OF LSI-11 BUS REFLECTIONS.

MR-2370

Typical System Configuration Using Three BA11-M Boxes
Showing Cables Needed for Expansion

Master/Slave Interface Cables

Length		DEC PN
10.2 cm	(4 in)	70-08612-0D
15 cm	(6 in)	70-08612-0F
22.9 cm	(9 in)	70-08612-0K
27.5 cm	(11 in)	70-08612-0M
35.6 cm	(14 in)	70-08612-1B
45.7 cm	(18 in)	70-08612-1F
124 cm	(49 in)	70-08612-4A
61.0 cm	(2 ft)	70-08612-02
1.83 m	(6 ft)	70-08612-6A
3.05 m	(10 ft)	70-08612-10

Possible Problems Installing the 70-08612 or BC03Y-XX Cables
On a two box system, connect the remote sockets on the master console and the slave console with a 70-08612-XX cable.

NOTE

Some of the 70-08612 cables have been found with a connector on backwards. If the DCOK LED on the slave box does not come on when the master is turned on, the cable may be reversed.

If RT-11's clock does not update, the 70-08612 cable may be in upside down. The cable should be connected pin 1 to pin 1. The red line should be on the left of both J2 connectors.

Possible Problems Installing BC05L
Some BC05L-XX cables may have the "This Side Up" stickers on the wrong side of one end. The cables should be connected as follows.

- M9400-YE or YD pin AA (J1)
  to
  BC05L-XX pin 1

- BC05L-XX pin 1
  to
  M9401 pin AA (J1)

The pin markings on the BC05L cables are on the connector. The cables should be flat when run around the PDP-11/03 cable trays, and not twisted.

If the BC05L-XX is plugged in upside down, the bus DCOK line is grounded. The processor will not power up with this condition. Reverse the cables and try again.

MEMORY

Memory Refreshing Rules

All dynamic MOS RAM must be refreshed. Neither CORE RAM nor ROM/PROM memories need refreshing. Refreshing is available by three means: processor microcode, Direct Memory Access (DMA), and self-refreshing memory modules.

Processor Microcode Refresh – With processor microcode refresh, the processor must be strapped to enable the microcode refresh, and the memory module farthest from the processor on the bus must be configured to reply to refresh cycles. All other memory modules, including memory on the processor board itself, must have memory reply disabled. If only the 4K of RAM on the processor is being used, then that RAM must be strapped to respond to reply.

NOTE

Only quad-sized processor modules have microcode refresh capabilities. Double-sized processor modules do not. With double-sized processors, either DMA refresh or self-refreshing memory must be used.

DMA Refreshing – The REV11-A or REV11-C modules may be used to provide DMA memory refreshing. When using the REV11 to refresh memory, the REV11 refresh capability must be enabled via a strap on the REV11 board, and the processor microcode refreshing must be disabled. The memory module farthest from the REV11 should have reply to refresh enabled. If a quad-sized processor module with on-board RAM is used, usually that RAM will be the one strapped to reply to the refresh because it will be the farthest from the REV11 option.

DMA memory refreshing can be done by a customer's own module if that module makes sufficient memory accesses within the required time.

Self-Refreshing Memory – Self-refreshing memory does not use the bus to accomplish refreshing; therefore, no memory module need be strapped to reply to a memory refresh cycle.

Self-refreshing memory can be combined with nonself-refreshing memory on the same bus; however, when this is done, other refreshing techniques similar to processor microcode or DMA must be used to refresh the conventional memory. If an MSV11-C is used with a KD11-F or an MSV11-B, configure the MSV11-C for external refresh.

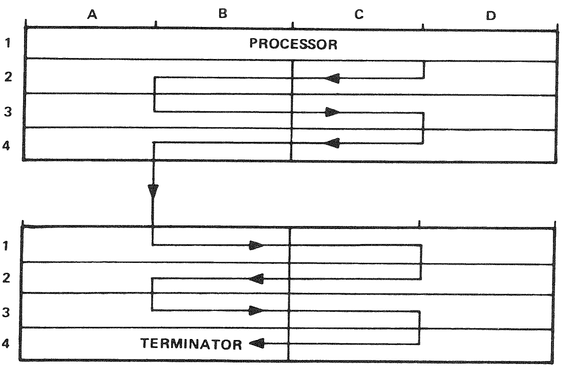
DMA Refresh Configuration

In systems that use a REV11-C for refresh and a TEV11 for bus termination, the REV11-C should be placed immediately after the memory modules.

DRV11-B or RKV11-D modules should follow the REV11-C in order to be lower in DMA priority.

Systems that use a REV11-A for both refresh and termination must have it in the last slot.

No open slots are permitted between the processor and the far-end bus terminator. The DMA and interrupt priority scheme is indicated in the following figure. The arrow indicates decreasing priority.



MR-0761

Q-Q Backplanes DMA/Interrupt Priority Scheme

Configuration Examples

If an LSI-11 system must be configured with memories other than the MSV11-CD, try to use one of the following engineering-approved examples.

Ex. 1

M7264-0, -AB, -BB CPU	
M7944 MSV11-B 4K MEMORY	M7940 DLV11 SLU
M7944 MSV11-B 4K MEMORY	M9400-YA REV11-A BOOT/TERMINATOR

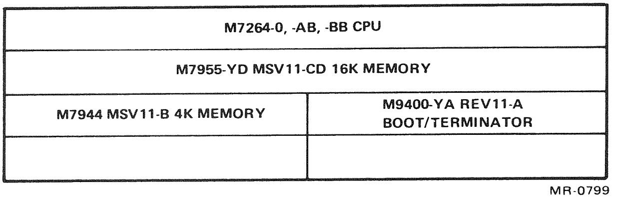
MR-0798

In this type of configuration, use the M9400 (REV11) to perform refresh operations.

Jumpers would be as follows.

M7264	W4	IN	Disable CPU controlled refresh.
	W9	OUT	Enable reply from CPU memory.
	W10	OUT	Enable CPU reply during refresh.
M7944	W4	IN (both modules)	Disable reply during refresh.
M9400-YA	W2	IN	Enable DMA refresh.

Ex. 2



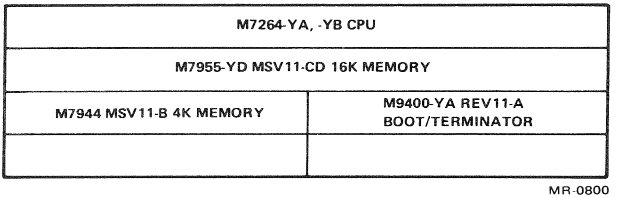
MR-0799

In this type of configuration, use REV11 to control refresh operations.

Jumpers would be as follows.

M7264	W4	IN	
	W9	OUT	
	W10	OUT	
M7955	W7	OUT	Disable internal refresh.
	W6	IN	Disable reply during refresh.
M9400-YA	W2	IN	

Ex. 3



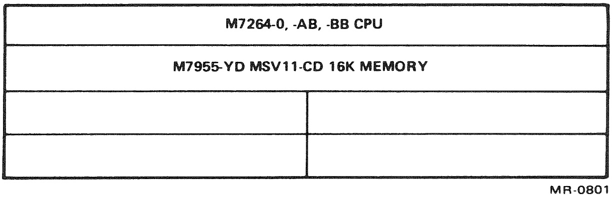
MR-0800

In this type of configuration, use REV11.

Jumpers would be as follows.

M7264	W4	IN	Disable CPU refresh.
	W9	IN	Disable reply from CPU memory.
	W10	OUT	This is a "don't care" (if W9 is in).
M7955	W7	OUT	Disable internal refresh.
	W6	OUT	Enable reply during refresh.
M7944	W4	IN	Disable reply during refresh.
M9400-YA	W2	IN	Enable DMA refresh.

Ex. 4

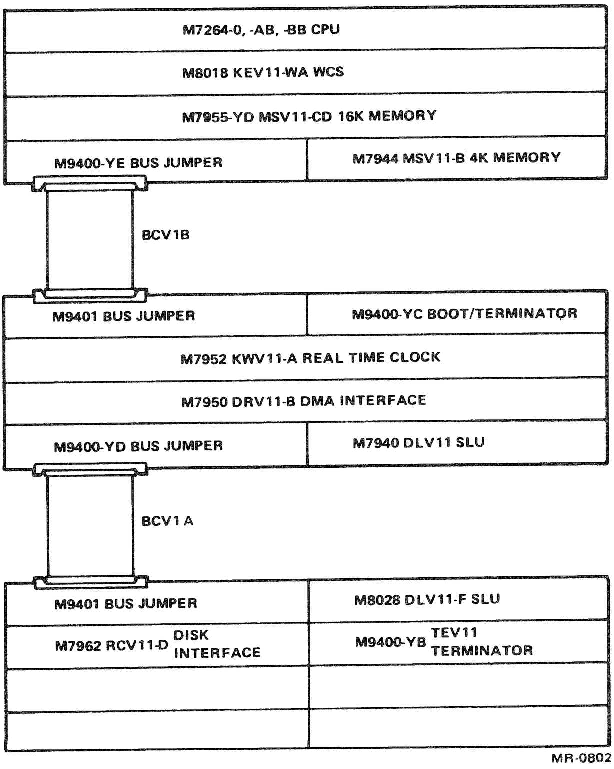


In this type of configuration, use CPU refresh.

Jumpers would be as follows.

M7264	W4	OUT	Enable CPU refresh.
	W9	OUT	Enable reply from CPU memory.
	W10	IN	Disable CPU reply during refresh.
M7955	W7	OUT	Disable internal refresh.
	W6	OUT	Enable reply during refresh.

Ex. 5



In this type of configuration, use the REV11-C (M9400-YC) to provide refresh.

Jumpers would be as follows.

M7264	W4	IN	Disable CPU controlled refresh.
	W9	OUT	Enable reply from CPU memory.
	W10	OUT	Enable CPU reply during refresh.
M7955	W7	OUT	Disable internal refresh.
	W6	IN	Disable reply during refresh.
M7944	W4	IN	Disable reply during refresh.
M9400-YC	W2	IN	Enable DMA refresh.

Do not use any configuration with DMA devices between the CPU and a REV11 performing DMA refresh.

The BDV11 (M8012) is always at end of the bus.

The preferred order of modules in systems is:

CPU
WCS
Memory
DMA refresh
Real time clock
INT fastest
↓
slowest
DMA fastest
↓
slowest
Program transfer (ROMs, D/As, etc.)
Terminator

For later system configurations see BA11-N, BA11S for expansion.

REFRESH CONFIGURATION PROCEDURE

1 Is this CPU a KD11-H (M7264-YA)?

YES NO

- Go to step 6

2 Does the system contain an MSV11-B (M7944) memory?

YES NO

- The CPU should have jumpers W10 and W4 installed.
- If the system has a REV11-A (M9400-YA) or a REV11-C (M9400-YC), jumper W2 should be removed.
- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed in the MSV11-CD.
- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

3 Does the system contain a DMA device other than the REV11-A (M7900-YA) or a REV11-C (M9400-YC), such as an RKV11-D (M7969) or DRV11-B (M7950)?

YES NO

- Does the system contain a REV11-A (M9400-YA) or REV11-C (M9400-YC)?

  YES NO

  - Is the CPU a DIBOL processor (40-pin chip with 2 dies)?

NO YES

- You cannot configure this system without a REV11.

- The CPU (M7264-YA) should control refresh; jumper W4 removed and W10 installed.
- The MSV11-B (M7944) farthest from the CPU will reply; jumper W4 removed.
- All other MSV11-B memories should have W4 installed.
- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.
- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

- The REV11-A (M9400-YA) or REV11-C (M9400-YC) should control refresh; jumper W2 on the M9400 should be installed.
- The MSV11-B (M7944) farthest from the REV11 should reply to refresh; W4 removed.
- All other MSV11-B memories should have W4 installed.
- The CPU should not control refresh; jumpers W4 and W10 installed.
- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.
- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB

MSV11-DC M8044-YC
or
MSV11-DD M8044-YD

there are no refresh configuration requirements for this module.

4 Does the system contain a REV11-C (M9400-YC)?

NO YES

- The REV11-C (M9400-YC) should control refresh; W2 installed.
- The MSV11-B (M7944) farthest from the REV11 should reply to refresh; jumper W4 removed.
- All other MSV11-B (M7944) memories should have W4 installed.
- There should not be a DMA device placed between the CPU and REV11-C (M9400-YC).
- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.
- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

5 Is the CPU a DIBOL processor (40-pin chip with 2 dies)?

NO YES

- You cannot configure refresh on a system without a REV11-C.

- The CPU (M7264-YA) must control refresh; jumper W10 installed and W4 removed.

- If a REV11-A (M9400-YA) is present, its refresh must be disabled. This means jumper W2 must be removed.

- The MSV11-B (M7944) farthest from the CPU should respond to refresh; jumper W4 removed.

- All other MSV11-Bs (M7944) should have W4 installed.

- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

FROM 1, 5

6 Does the system contain a REV11-A (M9400-YA) or REV11-C (M9400-YC)?

YES NO

- Is the CPU a DIBOL CPU (40-pin chip with 2 dies)?

NO YES

- You cannot configure this system without a REV11.

- Does the system contain an MSV11-B (M7944)?

YES NO

- The CPU (M7264) must control refresh and reply to refresh; jumpers W4 and W10 removed.

- The MSV11-B (M7944) farthest from the CPU should reply to refresh; jumper W4 removed.

- All other MSV11-Bs (M7944) should have jumper W4 installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

- The CPU must control refresh; jumper W4 removed and W10 installed.

- The MSV11-B (M7944) farthest from the CPU should reply to refresh; jumper 4 removed.

- All other system MSV11-Bs (M7944) should have jumper W4 installed.

- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

7 Does the system contain a DMA device other than that of the REV11-A (M9400-YA) or a REV11-C (M9400-YC), such as RKV11-B (M7969) or DRV11-B (M7950)?

YES NO

- Does the system contain MSV11-B (M7944) memory?

  YES NO

  - The REV11-YA (M9400-YA) or REV11-C (M9400-YC) should control refresh; jumper W2 installed.

- The CPU should reply to refresh; jumper W4 installed and W10 removed.

- All MSV11-B (M7944) memories should have jumper W4 installed.

- If the system has MSV11-CD (M955) memories, jumpers W6 and W7 should be installed.

  If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

- The REV11-A (M9400-YA) or REV11-C (M9400-YC) should control refresh; jumper W2 installed.

- The MSV11-B (M7944) farthest from the REV11-A (M9400-YA) or REV11-C (M9400-YC) should reply to refresh; jumper W4 removed.

- The CPU should not reply to refresh; jumper W4 installed and W10 installed.

- All remaining MSV11-B memories should have W4 installed.

- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

8 Does the system contain a REV11-C (M9400-YC)?

YES NO

- Is the CPU a DIBOL processor (40-pin chip with 2 dies)?

  NO YES

  - You cannot configure this system without a REV11.

- Does the system contain MSV11-B (M7944) memory?

  YES NO

  - The CPU (M7264) should control refresh and reply; jumpers W4 and W10 removed.
  - If the system has a REV11-A (M9400-YA); jumper W2 should be removed.
  - If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.
  - If the system has:

    MSV11-DA M8044-YA
    MSV11-DB M8044-YB
    MSV11-DC M8044-YC
    or
    MSV11-DD M8044-YD

    there are no refresh configuration requirements for this module.

- The CPU (M7264) should control refresh; jumper W4.
- The MSV11-B (M7944) farthest from the CPU should reply to refresh; jumper W4 removed.
- All remaining MSV11-Bs (M7944) should have jumper W4 installed.
- If the system has a REV11-A (M9400-YA), jumper W2 should be removed.
- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

9 Does the system have MSV11-B (M7944) memory?

YES NO

- The REV11-C (M9400-YC) should control refresh; jumper W2 installed.
- The CPU (M7264) should reply to refresh; jumper W10 removed and W4 installed.
- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.
- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

10 Is the CPU an M7264-EB, -FB, -HB, or -JB?

YES NO

- The REV11-C (M9400-YC) should control refresh; jumper W2 installed.
- The CPU should reply to refresh; jumper W10 removed and W4 installed.
- All MSV11-B (M7944) memories should have jumper W4 installed.

- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-DD M8044-YD

  there are no refresh configuration requirements for this module.

- The REV11-C (M9400-YC) should control refresh; jumper W2 installed.

- The MSV11-B (M7944) farthest from the REV11-C should reply to refresh; jumper W4 removed.

- All other MSV11-Bs (M7944) should have jumper W4 installed.

- The CPU should have jumpers W4 and W10 installed.

- If the system has MSV11-CD (M7955) memories, jumpers W6 and W7 should be installed.

- If the system has:

  MSV11-DA M8044-YA
  MSV11-DB M8044-YB
  MSV11-DC M8044-YC
  or
  MSV11-33 M8044-YD

  there are no refresh configuration requirements for this module.

MICRO/PDP-11 SYSTEM

GENERAL

The MICRO/PDP-11 system is a general-purpose microcomputer system with integral mass storage. The system is PDP-11 processor based with 22-bit addressing capability. The system runs a variety of software such as the MICRO/RSX, RSX-11M, RSX-11M-PLUS, CTS-300, DSM, V7M-11 and MICRO/RSTS operating systems.

The MICRO/PDP-11 system is available in three packages: the rack mounted package, the table top package, and the floor mounted package.

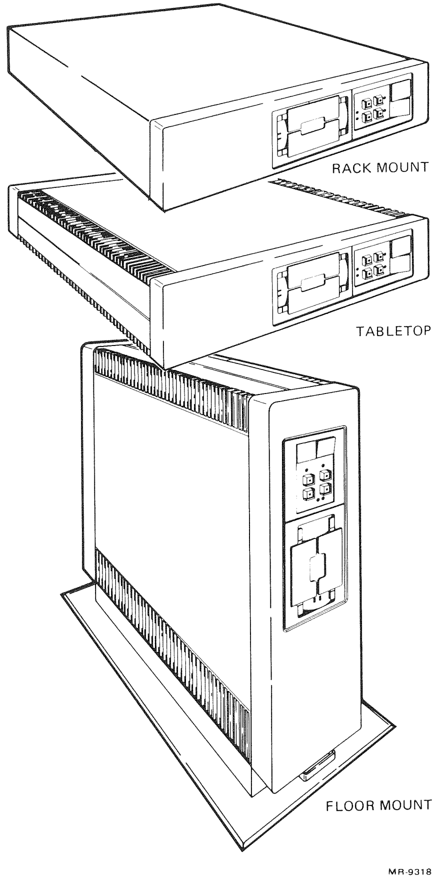
Major components of the MICRO/PDP-11 system are as follows:

KDF11-BP CPU (M8189 module with cables)
MSV11-PK memory (M8067-KA module)
RD51-A Winchester fixed disk drive
RX50-AA dual 5-1/4 inch diskette drive
RQDX1 disk drive controller (M8639 module)
DZV11-CP asynchronous multiplexer (M7957 module)
H9278-A backplane
H7864 power supply
BA23-A mounting box
Patch and filter assembly
Front panel

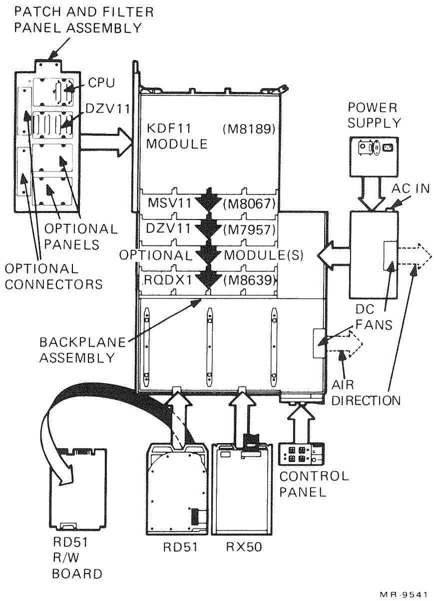
When troubleshooting the MICRO/PDP-11 system, you should try to isolate the problem to any of these components.

NOTE

The KDF11-BP contains the KDF11-BE (CPU module only), associated cables, and the KDF11-B patch and filter panel.



MICRO/PDP-11 System Packages



MICRO/PDP-11 Expanded View

Voltages

+5 Vdc @ 36 A
+12 Vdc @ 7 A

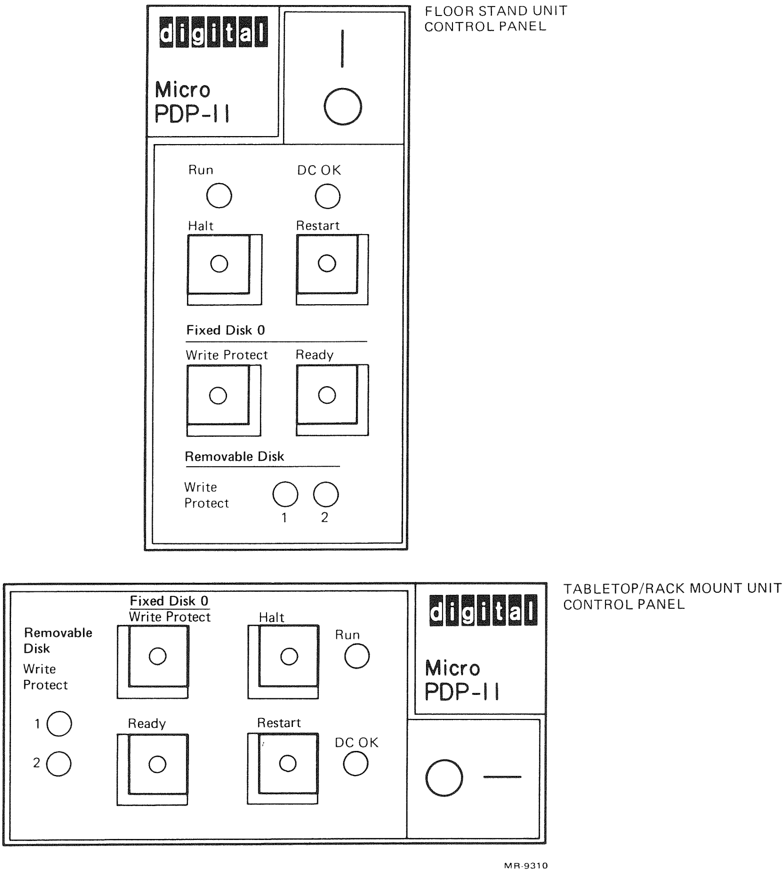
Diagnostic Programs

JKDB??.BIC	F-11 basic instruction
JKDA??.BIC	KDF-11 MMU test
JKL5??.BIC	KDF-11B CPU cluster test
VM8AF?.BIN	Boot/ROM test*
VMSA??.BIC	Q-Bus 22-bit address memory test
VDZA??.BIC	DZV-11 test part one
VDZB??.BIC	DZV-11 test part two
VDZC??.BIC	DZV-11 loopback test
ZRQ???.BI?	RDRX performance exerciser

*Must be version F or later.

Related Documentation

MICRO/PDP-11 System Option Manual (EK-OLCP5-OD)
MICRO/PDP-11 System Site Preparation and Verification Guide (EK-OLCP5-SP)
MICRO/PDP-11 System Unpacking and Installation Guide (EK-OLCP5-IN)
MICRO/PDP-11 System Technical Manual (EK-OLCP5-TM)
MICRO/PDP-11 System Owner's Manual (EK-OLCP5-OM)
PDP-11 Microcomputer Interfaces Handbook (EB-23144)
MICRO/PDP-11 Illustrated Parts Breakdown (EK-OLCP5-IP)
MICRO/PDP-11 Assembly Drawings (70-20442)
BA23-A Unit Assembly Drawings (BA23-A-DBP)
11C23 Unit Assembly Drawings (11C23-0-DBP)
11A23 Unit Assembly Drawings (11A23-0-DBP)
Microcomputer Interfaces Handbook (EB-21344-18)
Microcomputer and Memories Handbook (EB-20912-20)
PDP-11 MICRO/PDP-11 Handbook (EB-24944)
PDP-11 Architecture Handbook (EB-23657-18)
PDP-11 Software Handbook (EB-08687-20)
KDF11-BA CPU Module User's Guide (EK-KDFEB-UG)
KDF11-B Field Maintenance Print Set (MP-01236)
MSV11-P User's Guide (EK-MSVOP-UG)
DZV11 Asynchronous Multiplexer Technical Manual (EK-DZV11-TM)
RQDX1 Controller Module User's Guide (EK-RQDX1-UG)
Boot/ROM Diagnostic Listing (microfiche) (AH-T578A-MC)
Boot/ROM Diagnostic Listing (paper copy) (AC-T577A-MC)



MICRO/PDP-11 System Control Panel

MICRO/PDP-11 System Control Panel Switches

Switch	Position	Function
Power 1,0 (rocker switch)	1	Turns on the system power. This switch glows red when the system is on.
	0	Turns off the system power.
HALT	IN (LED lit)	The CPU halts and responds to console on-line debugging technique (ODT) commands. The basic ODT commands and their functions are listed in Appendix B. Refer to the *Microcomputers and Memories Handbook* (EB-18451-20) for additional ODT information.
	OUT (LED off)	Enables the processor to run.
RESTART (momentary switch)	IN	When the halt switch is out (LED off), the CPU restarts by carrying out a power-up sequence and displaying the bootstrap dialog. When the halt switch is in (LED lit), the restart switch will single-step the current program, executing a single instruction each time the switch is pressed.
Fixed Disk 0 Protect Write	IN (LED lit)	Write protects the RD51 fixed disk drive.
	OUT (LED off)	Enables writing to the RD51 fixed disk drive.
Fixed Disk 0 Ready	OUT (LED lit)	Places the RD51 fixed disk drive on-line.
	IN (LED off)	Places the RD51 fixed disk drive off-line.

MICRO/PDP-11 System Control Panel Indicator LEDs

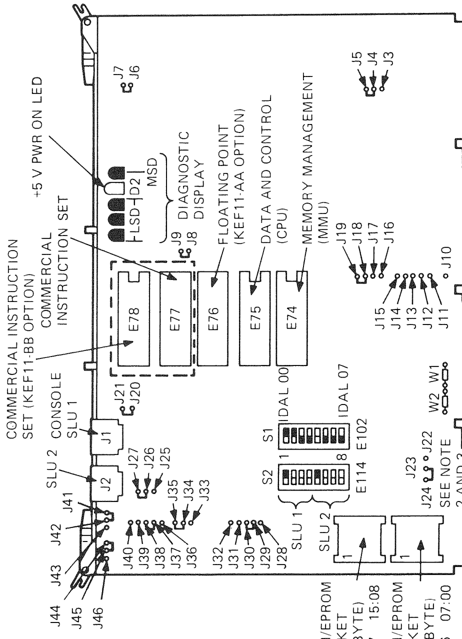
Indicator LED	Function
RUN	This LED is lit when the CPU is operating; the LED goes off when the CPU is not executing instructions.
DC OK	This LED is lit when the power supply is generating correct dc power output voltages.
Removable Disk	
Write Protect*	
Indicator LED	
1	When this LED is lit, the diskette in RX50 diskette drive 1 is write-protected.
2	When this LED is lit, the diskette in RX50 diskette drive 2 is write-protected.

* Removable disk write-protect is selected by placing an adhesive label over the write-protect slot of the diskette.

Each module in the H9278-A backplane is assigned a location, depending on its importance in the MICRO/PDP-11 system.

Slot	Module
Slot 1	M8189 CPU module (KDF11-B)
Slot 2	M8067-Kx memory module (MSV11-P)
Slot 3	Additional memory (if present), or M7957 (if present), or M8639 controller module*
Slot 4	M8639 controller module* (if not in slot 3) or other optional modules

* The M8639 controller module must be placed in the last used slot, because of the length and location of the 50-conductor MASSBUS cable. All direct memory access (DMA) modules must be installed in front of the M8639 controller module, in the bus priority structure.



NOTES:

1. INSTALLED JUMPERS SHOW THE MICRO/PDP-11 CONFIGURATION.
2. WHEN 8 K EPROMS OR 8 K MASKED ROMS ARE USED, J23 IS CONNECTED TO J24.
3. WHEN 2 K EPROMS ARE USED, J23 IS CONNECTED TO J22. WHEN 2 K MASKED ROMS ARE USED, J23 IS CONNECTED TO J24.

H8189 Jumper and Switch Locations

M8189 Miscellaneous Jumpers and Switch Configurations

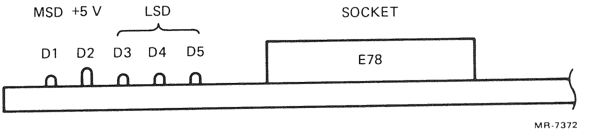
The jumpers used by manufacturing and field service for testing the M8189 module are listed.

NOTE

The baud rate switches (S2-1 through S2-8) on the M8189 module should be left at their original factory settings. These switches do not control the baud rate. Because of external clocking, the baud rate is adjusted from the KDF11-B patch and filter panel.

All other jumpers on the M8189 module are OUT.

Refer to Appendix B for information on other applications of the KDF11-BA.



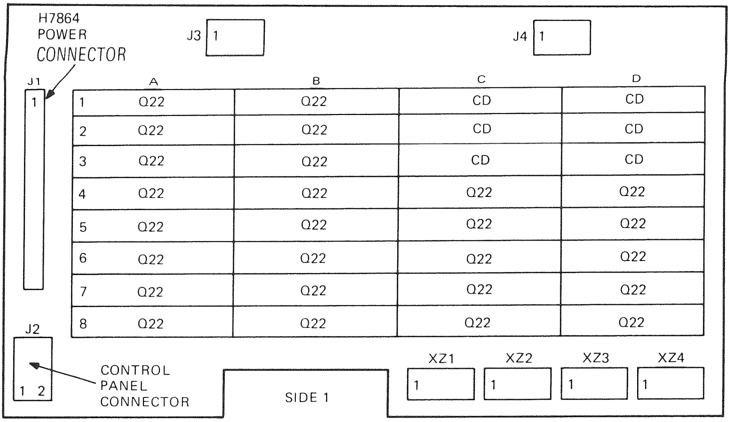
KDF11-B LEDs

NOTE

The light pattern indicates that the corresponding test is in progress or has failed. Some tests retry (DECnet), and others will halt the CPU (CPU, memory, non-DECnet boots.)

The PDP-11/23+ system uses a KDF11-BA CPU, while the MICRO/PDP-11 system uses a KDF11-BP CPU. The difference between them are the ROM chips and the jumpers on the module. The PDP-11/23+ uses a 23-339E2 chip and a 23-340E2 chip, while the MICRO/PDP-11 uses a 23-157E4 chip and a 23-158E4 chip. When troubleshooting the KDF11-B (M8189) module, make sure the correct ROMs are installed.

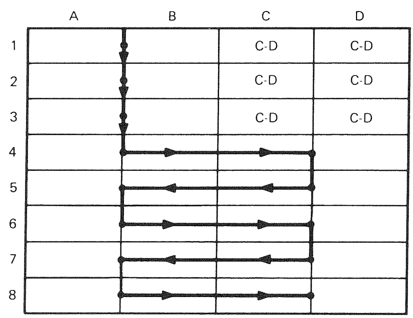
The MICRO/PDP-11 system is shipped with switches S1-1, S1-2, S1-3, S1-4, S1-7, and S1-8 on. Switches S1-5 and S1-6 are off.



NOTES:
CONNECTORS J1, J2, J3, AND J4 ARE MOUNTED ON SIDE 2.
XZ1–4 ARE BACKPLANE TERMINATOR SOCKETS. THE SIP TERMINATION RESISTORS MOUNTED IN XZ1–4 MUST BE REMOVED WHEN EXPANDING BEYOND THIS BACKPLANE.
J3 AND J4 ARE NOT POWER SOURCES. THEY ARE USED TO SUPPLY POWER TO THE BACKPLANE WHEN THE RD51-A FIXED DISK DRIVE OR RX50-AA DISKETTE DRIVE IS NOT INSTALLED.

MR-9449

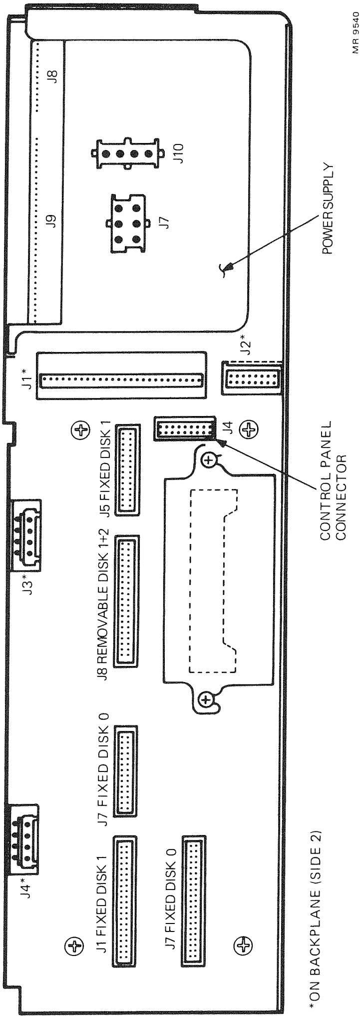
MICRO/PDP-11 Connector Locations



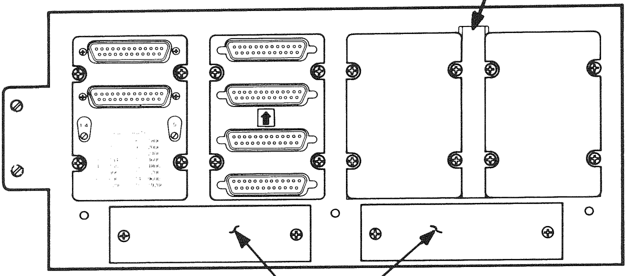
NOTE:
C+D (1-3) = CD INTERCONNECT
OTHERS = Q22 FORMAT

MR-9416

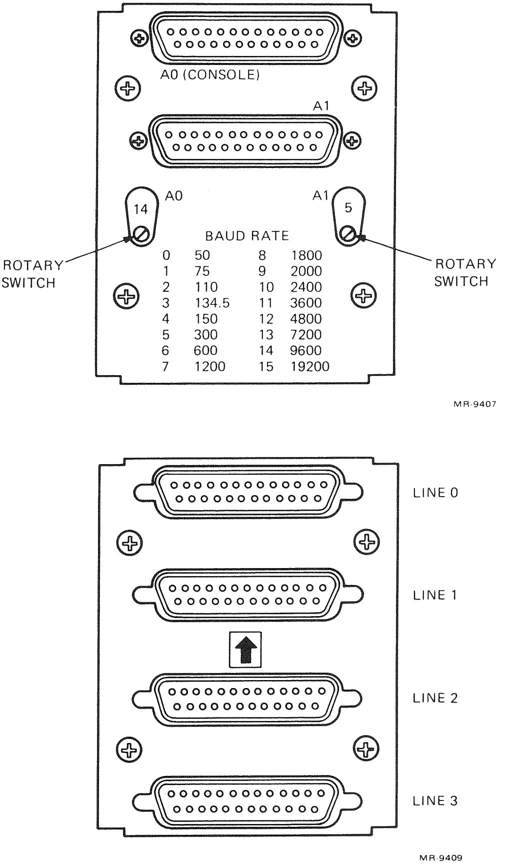
H9278-A Backplane Layout



Signal Distribution Board Layout



MICRO/PDP-11 Patch and Filter Panel



MICRO/PDP-11 Bulkhead Filter Connector Assembly

MICRO/PDP-11 Configuration Information

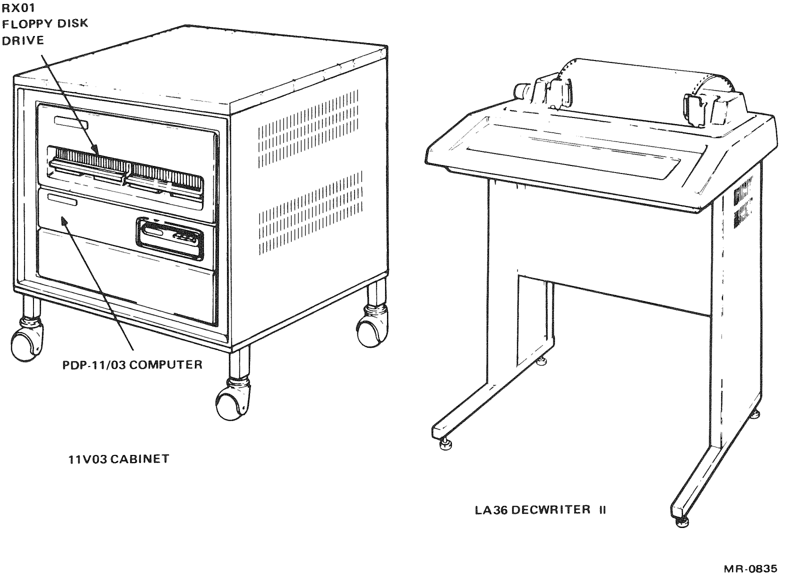
Module	Option	Dist Panel Insert	Priority	Power +5 Vdc	Power +12 Vdc	Bus Load AC	Bus Load DC
Chip Set	KEF11-A	N/A	N/A	0	0	0	0
Chip Set	KEF11-BB	N/A	N/A	0	0	0	0
M8189**	KDF11-BP	2x3	Highest	6.4 A	0.7 A	2.00	1.00
M8188**	FPF11-A	N/A	High	7.5 A	0	–	–
M8067-KA**	MSV11-PK	N/A	Very High	3.45 A	0	2.00	1.00
M8067-LA**	MSV11-PL	N/A	Very High	3.60 A	0	2.00	1.00
M8059-FA*	MSV11-LF	N/A	Very High	3.90 A		2.00	1.00
M8631-AA*	MCV11-DA	N/A	High	1.20 A	–	2.00	1.00
M8631-CA*	MCV11-DC	N/A	High	1.20 A	–	2.00	1.00
M7941*	DRV11-LP	Two 1x3	High	0.90 A	–	1.40	1.00
M7950**+	DRV11-BP	Two 1x3	High	1.90A	–	3.30	1.00
M8049*	DRV11-JP	Two 1x3	High	1.60 A	–	2.00	1.00
M7954*	IBV11-JP	1x3	High	0.80 A	–	1.80	1.00
M7952*	KWV11-CP	1x3	High	1.75 A	0.01 A	3.40	1.00
M8017*&	DLV11-EP	1x3	High	1.00 A	0.18 A	1.60	1.00
M8043*	DLV11-JP	1x3	High	1.00 A	0.25 A	0	1.00
N/A$	DLV11-KP	N/A	N/A	–	0.28 A	–	–
M7957**	DZV11-CP	2x3	High	1.15 A	0.39 A	3.95	1.00
M8053**	DMV11-AP	1x3	Low	3.40 A	0.38 A	2.00	1.00
M8053**	DMV11-BP	1x3	Low	3.40 A	0.38 A	2.00	1.00
M8064**	DMV11-CP	1x3	Low	3.35 A	0.26 A	2.00	1.00
M8053**	DMV11-FP	1x3	Low	3.40 A	0.38 A	2.00	1.00
M8020**	DPV11-DP	1x3	Low	1.20 A	0.30 A	1.00	1.00
M7951**	DUV11-CP	1x3	Low	1.20 A	0.32 A	1.00	1.00
M8061**	RLV12	1x3	Low	5.00 A	0.10 A	3.00	1.00
M8029-YA*	RXV21+	1x3	Low	1.80 A	–	2.00	1.00
A6001*	AAV11-C			1.50 A	0.40 A	1.90	1.00
A012*	ADV11-C			2.00 A	0.45 A	3.25	1.00
A026*	AXV11-C			1.50 A	–	1.30	1.00
M8027*	LPV11-CP	1x3	Low	0.80 A	–	1.40	1.00
N/A	TU58-EB	N/A$	N/A	0.75 A	1.20 A	–	–
N/A	RX50-AA	N/A	N/A	0.80 A	1.80 A	–	–
ST-412	RD51-A	N/A	N/A	1.00 A	4.50 A	–	–
**	TSV05-CP	Two 1x3					
M8639**	RQDX1		Low	5.80 A	0.25 A	2.00	1.00
G7272*	N/A	N/A	–	–	–	–	–

* Dual-height printed circuit board.
** Quad-height printed circuit board.
\+ Use on systems with 256Kb or less.
$ Connects to existing option.
& Can share 1/4 of a DLV11-J panel insert (DIGITAL part no. 70-16436- 01).

PDP-11V03 AND PDP-11T03 SYSTEMS

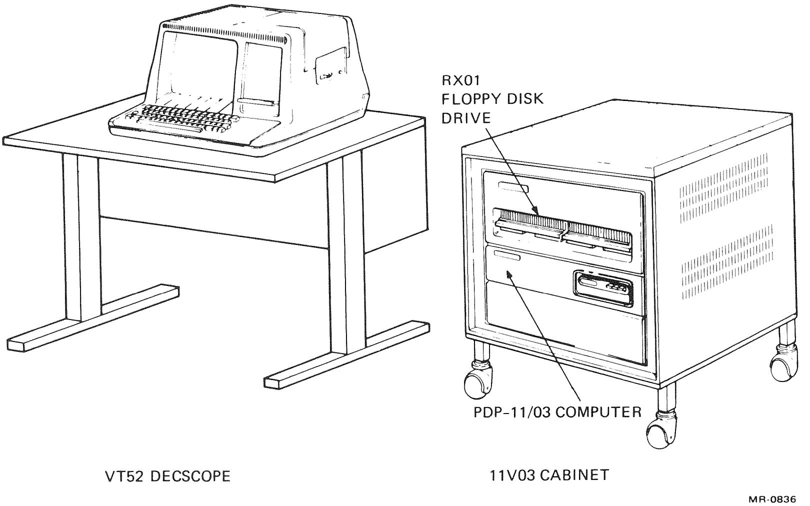
PDP-11V03

The PDP-11V03 includes a PDP-11/03 computer, an RX01 dual floppy disk drive, and either a VT52 DECscope or an LA36 DECwriter II. Early models have 8K of memory, while later models have 16K. All models are configured to boot on power-up and halt on BREAK. The figures and tables that follow describe the models, specifications, and components.

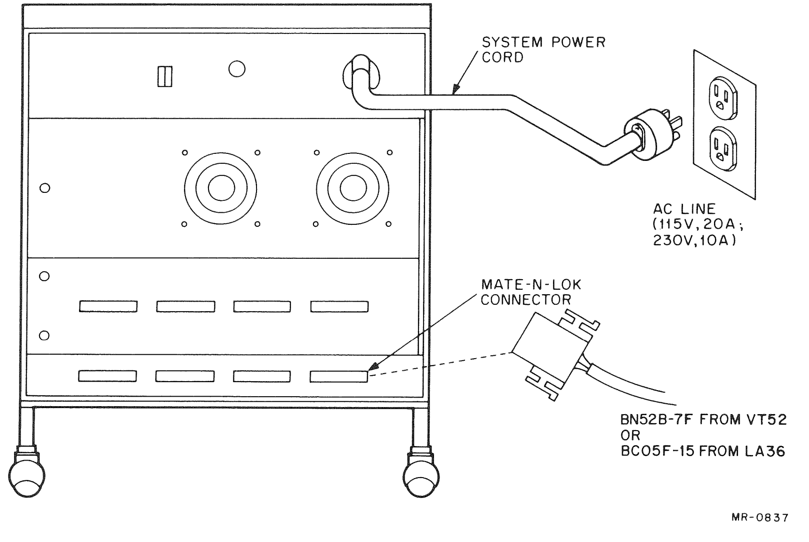


PDP-11V03-E/H

PDP-11V03



PDP-11V03-A/F



PDP-11V03 System Model Designations

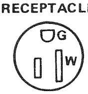
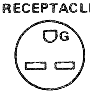
	LA36	VT52
8K words	EA ED	AA AD
16K words	HA HB HC	FA FB FC

8K System Component Model Designations

System Requirements	PDP-11V03 System Model Designations			
	AA	AD	EA	ED
Input Power (V)	115	230	115	230
Frequency (Hz)	60	50	60	50
PDP-11/03 Computer	EA	EB	EA	EB
LA36			DE	DJ
VT52	AA	AB		
RXV11 (RX01 Floppy with Interface)	BA	BD	BA	BD
H984 (Cabinet)	BA	BB	BA	BB

16K System Component Model Designations

System Requirements	PDP-11V03 System Model Designations					
	FA	FB	FC	HA	HB	HC
Input Power (V)	115	230	115	115	230	115
Frequency (Hz)	60	50	50	60	50	50
PDP-11/03 Computer	KA	KB	KA	KA	KB	KA
LA36				DE	DJ	DH
VT52	AA	AB	AC			
RXV11 (RX01 Floppy with Interface)	BA	BD	BC	BA	BD	BC
H984 (Cabinet)	BA	BB	BA	BA	BB	BA

	115 V 50/60 Hz			230 V 50 Hz		
POWER CONNECTOR	PLUG  NEMA # 5-15P DEC # 90-08938	RECEPTACLE  5-15R 12-05351		PLUG  NEMA # 6-15P DEC # 90-08853	RECEPTACLE  6-15R 12-11204	
	CPU CABINET	LA36	VT52	CPU CABINET	LA36	VT52
AMPERAGE TYPICAL MAXIMUM	9.6 10.8	2.0	1.0	4.7 5.3	1.0	0.5
WATTAGE TYPICAL MAXIMUM	800 940	160 300	118 118	820 960	160 300	118 118
BTU/HOUR TYPICAL MAXIMUM	2730 3210	550 1020	400 400	2800 3280	550 1020	400 400
WEIGHT	81.6 Kg (180 lbs)	46.3 Kg (102 lbs)	20.0 Kg (44 lbs)	81.6 Kg (180 lbs)	46.3 Kg (102 lbs)	20.0 Kg (44 lbs)

MR-0838

Specifications

Modules Included in the Basic System

Processor

KD11-F (M7264) in PDP-11V03-A/E

Resident memory addressed as bank 0
CPU refresh disabled
Powers up to 173000

KD11-R (M7264-YA) in PDP-11V03-F/H

No resident memory
CPU refresh disabled
Powers up to 173000

Memory

MSV11-B (M7944) in PDP-11V03-A/E

4K RAM
Refreshed by REV11-A
Addressed as bank 1

MSV11-CD (M7955-YD) in PDP-11V03-F/H

16K RAM
Internal refresh
Addresses start at bank 0
Part of the KD11-R processor option

Serial Line Interface

DLV11 (M7940)

Device address 177560
Vector 60
300 baud in PDP-11V03-E/H (LA36)
9600 baud in PDP-11V03-A/F (VT52)
20 mA active transmitter and active receiver
One stop bit, eight data bits, no parity
Framing error (BREAK) asserts BHALT

Floppy Disk Interface

RXV11 (M7946)

First device address (disk 0) 177170
First vector 264
Second device address (disk 1) 177150
Second vector 270

Bootstrap/Diagnostic/Terminator

REV11-A (M9400-YA)

Bootstrap enabled
Diagnostics enabled
Refresh enabled in PDP-11V03-A/E
Refresh disabled in PDP-11V03-F/H
120 Ω terminator

PDP-11V03-A/E Module Utilization

	A B	C D		
1	M7264 PROCESSOR (KD11-F)		2	1
4	M7944 (MSV11-B)	M7940 (DLV11)	3	2
5	M7946 FLOPPY CONTROL (RXV11)	M9400-YA (REV11-A)	6	3
8	EMPTY	EMPTY	7	4

NOTE: CIRCLED NUMBERS 1 THROUGH 8 REFER TO DMA AND INTERRUPT PRIORITY SEQUENCE.

MR5919

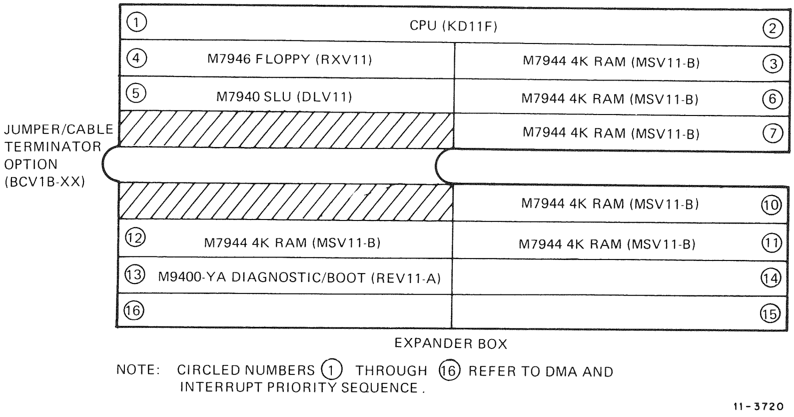
Basic 8K System

	A B	C D		
1	M7264 PROCESSOR (KD11-F)		2	1
4	M7944 4K MEMORY (MSV11-B)	M7944 4K MEMORY (MSV11-B)	3	2
5	M7944 4K MEMORY (MSV11-B)	M7940 SERIAL LINE UNIT (DLV11)	6	3
8	M9400-YA BOOT/TERMINATOR (REV11-A)	M7946 FLOPPY DISK CONTROLLER (RXV11)	7	4

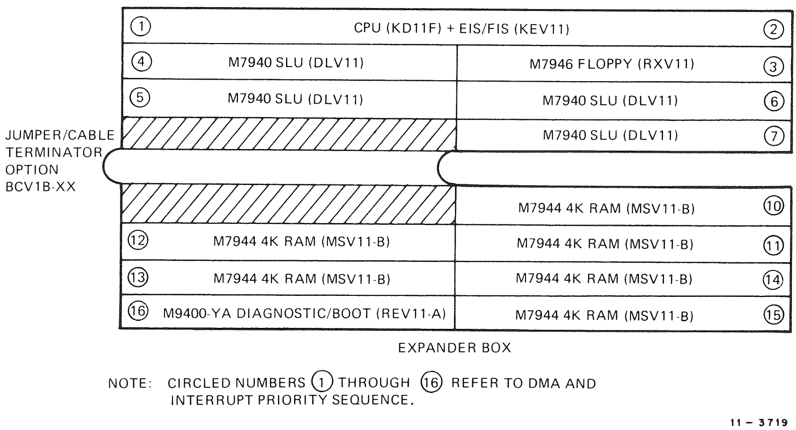
NOTE: CIRCLED NUMBERS 1 THROUGH 8 REFER TO DMA AND INTERRUPT PRIORITY SEQUENCE.

MR-0839

16K System

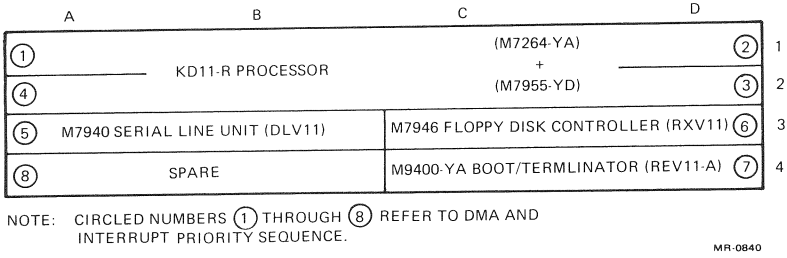


One-User 28K System

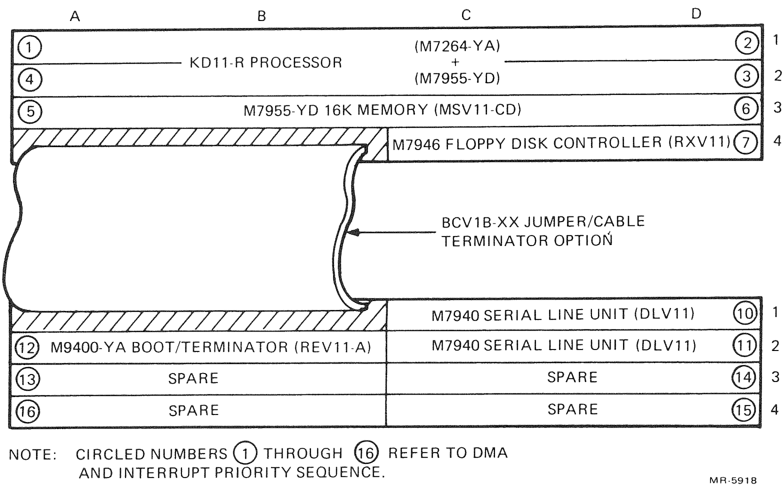


Four-User 28K System with EIS/FIS

PDP-11V03-F/H Module Utilization



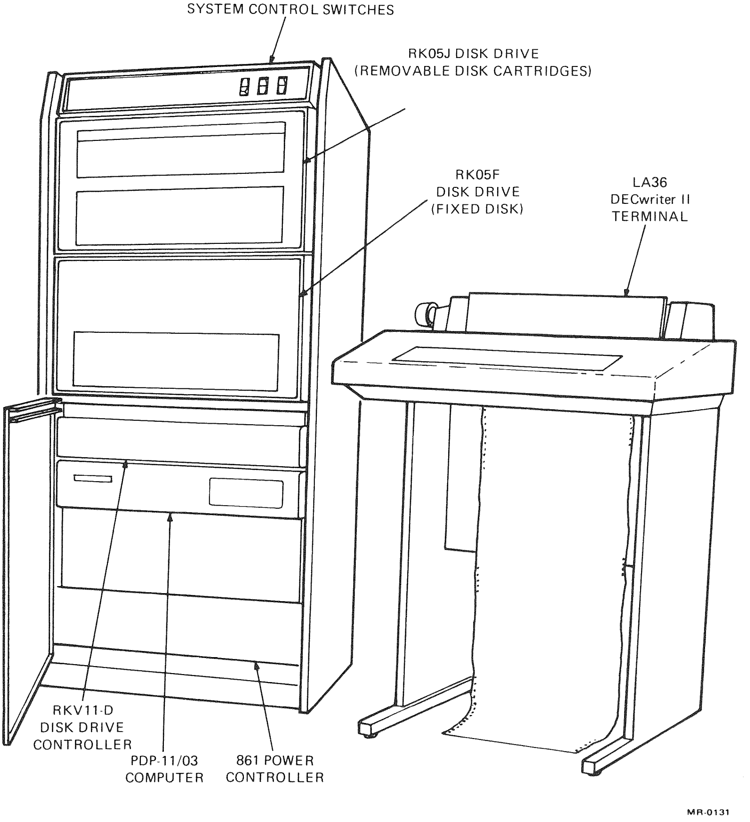
Basic 16K System



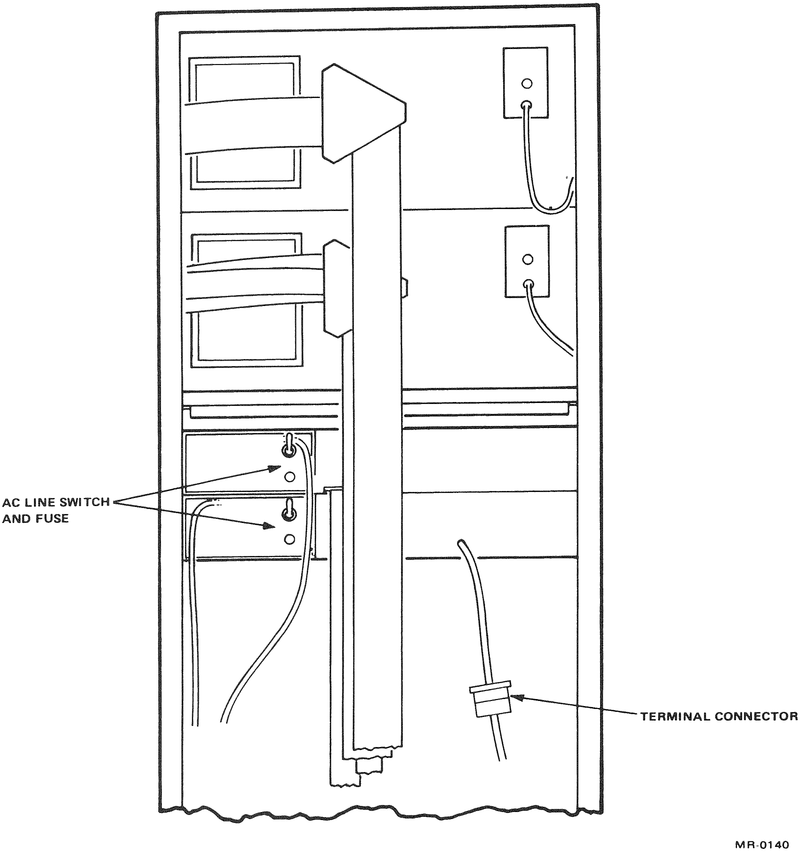
Two-User 28K System

PDP-11T03

The PDP-11T03 comprises a PDP-11/03 computer, two RK05 disk drives, and an LA36 DECwriter II. The basic system includes 16K of memory. The system may be ordered without the LA36. All models are configured to boot on power-up and halt on BREAK. The figures and tables that follow describe the models, specifications, and components.



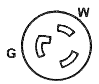
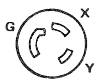
PDP-11T03



PDP-11T03 (Rear View)

System Component Model Designations

System Requirements	PDP-11T03 System Model Designation							
	AA	AB	AC	AD	BA	BB	BC	BD
Input Power (V)	115	230	115	230	115	230	115	230
Frequency (Hz)	60	60	50	50	60	60	50	50
PDP-11/03 Computer	KA	KB	KA	KB	KA	KB	KA	KB
LA36	DE	DF	DH	DJ				
RKV11-D	A	B	A	B	A	B	A	B
RK05	AA	AB	BA	BB	AA	AB	BA	BB

	CPU CABINET		LA36	
POWER CONNECTORS	PLUG	RECEPTACLE	PLUG	RECEPTACLE
115 V 50/60 HZ	 NEMA # L5-30P DEC # 12-11193	 L5-30R 12-11194	 NEMA # 5-15P DEC # 90-08938	 5-15R 12-05351
230 V 50/60 HZ	 NEMA # L6-20P DEC # 12-11192	 L6 20R 12 11191	 NEMA # 6-15P DEC # 90-08853	 6-15R 12-11204
WATTS	860		300	
BTU/HOUR	2940		1020	
WEIGHT	294.8 KG (650 LBS)		46.4 (102 LBS)	

Specifications

MR-0764

Modules Included in the Basic System

Processor

KD11-S (M7264-YA)

No resident memory
KEV11 EIS/FIS option included
CPU refresh disabled
Powers up to 173000

Memory

MSV11-CD (M7955-YD)

16K RAM
Internal refresh
Addresses start at bank 0
The memory is part of the KD11-R processor option

Serial Line Interface

DLV11 (M7940)

Device address 177560
Vector 60
300 baud
20 mA active transmitter and active receiver
One stop bit, eight data bits, no parity
Framing error (BREAK) asserts BHALT

Disk Drive Interface

RKV11-D (M7269 plus box)

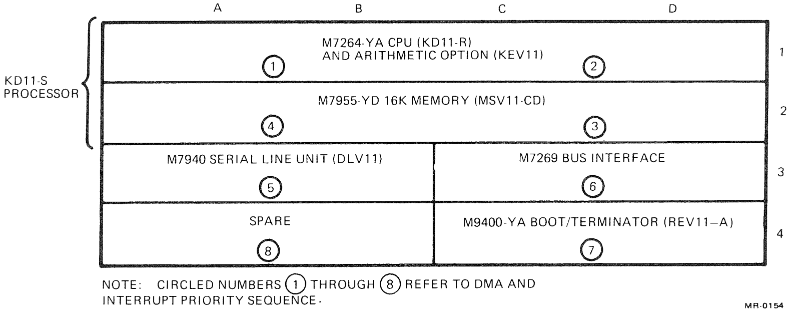
First device address (drive 0/1) 177170
First vector 264
Second device address (drive 2) 177150
Second vector 270

Bootstrap/Diagnostic/Terminator

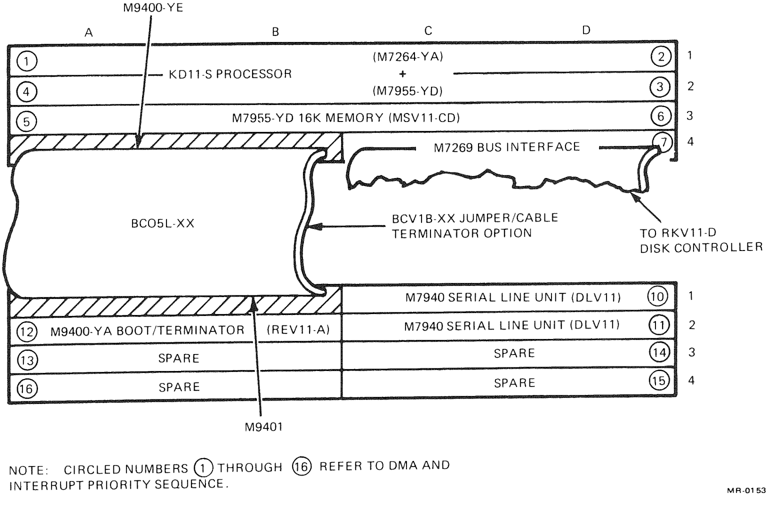
REV11-A (M9400-YA)

Bootstrap enabled
Diagnostics enabled
Refresh disabled
120 Ω terminator

Module Utilization



Basic 16K System



Two-User Expanded 28K System

PDP-11T03-L AND PDP-11V03-L SYSTEMS

PDP-11T03-L

The PDP-11T03-L is a general purpose computer system that can be used for developing and executing programs in a variety of applications. RT-11 software provides a single user foreground and background system; it can support a real time application job execution in the foreground and an interactive or batch program development job in the background. RT-11 is also available for a single job configuration.

The PDP-11T03-L system consists of the following equipment.

PDP-11/03-LC (115 Vac) or PDP-11/03-LD (230 Vac) minicomputer with:

> KD11-H microcomputer plus 16K words (32K bytes) of MOS memory (MSV11-CD)
>
> BA11-NC (-ND) box with an H9273 backplane and an H786 power supply
>
> BDV11-AA bootstrap/diagnostic/terminator and ROM option.

MSV11-CD configured as an additional 12K words (24K bytes) of MOS memory

KEV11 Extended Instruction Set/Floating Point Instruction Set (EIS/FIS)

RLV11 disk controller

RL01 five-megabyte dual disk drive units and cartridges

DLV11-F serial line unit

H9612-AC cabinet

Power controller

871-A	110 V	12 A	50/60 Hz
871-B	220 V	8 A	50/60 Hz
871-C	110 V	16 A	50/60 Hz

In addition to the preceding items, one RT-11 system software kit and one RLDP+ diagnostic kit are shipped with the system.

The following optional terminals are available for the system.

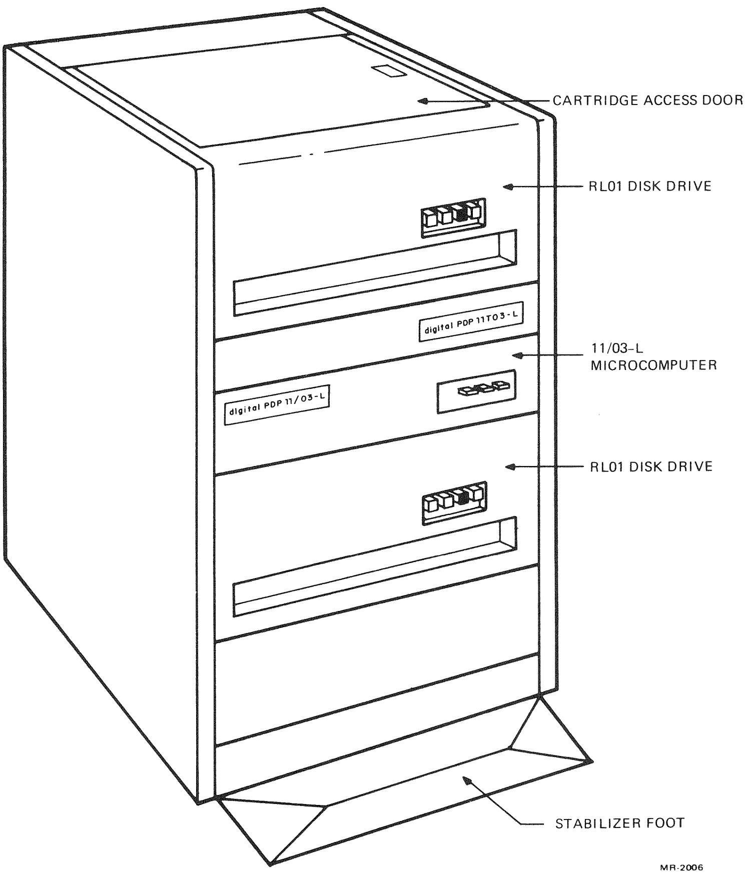
LA36 DECwriter
VT52 DECscope (with or without copier)
VT100 Alphanumeric Video Terminal

PDP-11T03-L Operator Switch Panel
Communication between the user and the processor is provided by switches on the front panel of the PDP-11/03-L or by the terminal connected to the system. The operator switch panel contains three switches: AUX ON/OFF, HALT, and RESTART. The functions and positions of the switches are as follows.

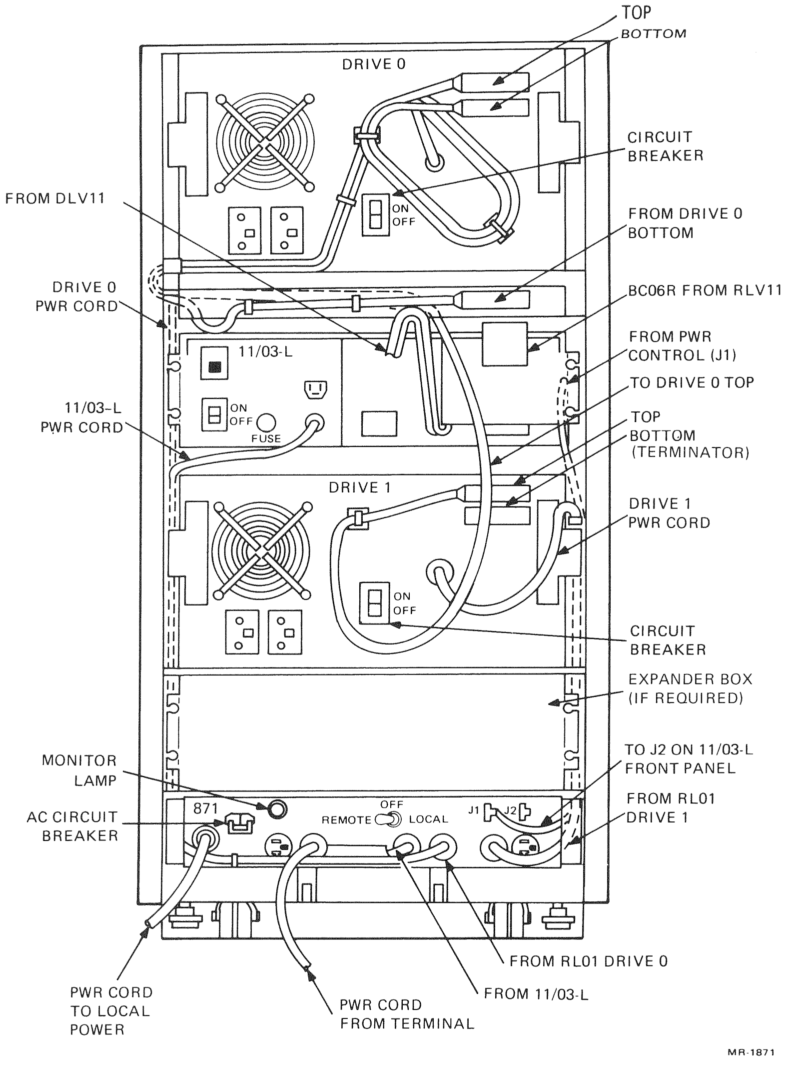
Switch	Position	Function
AUX ON/OFF	OFF	As configured at the factory, this switch, when turned off, removes ac power to the system.
	ON	As configured at the factory, it turns on ac power. If the automatic bootstrap is selected and the HALT switch is up, the system boots.
HALT	Up (Enable)	This enables the processor to run.
	Down (HALT)	This halts the processor, which responds to console ODT commands. Refer to the *Microcomputer Processor Handbook*, EB-18451-20, for ODT instructions.
RESTART	RESTART (Momentary Switch)	When this switch is activated, the processor carries out a power-up sequence. As shipped, the system presents the bootstrap dialog as: 28 START? The HALT switch must be up (enable).

The switch panel also contains two indicators that provide the following information.

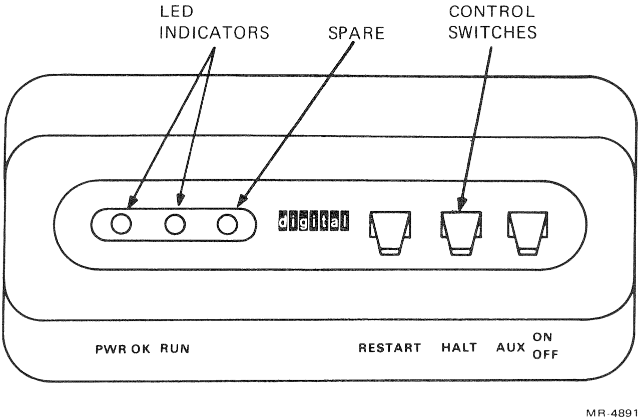
LED	Condition	Indication
PWR OK	ON	This LED lights when the proper dc output voltages are being generated by the H786 power supply.
RUN	ON	This LED lights when the processor is in the run state. It goes out when the processor is not executing instructions.



PDP-11T03-L Computer System



PDP-11T03-L (Rear Panel Removed)

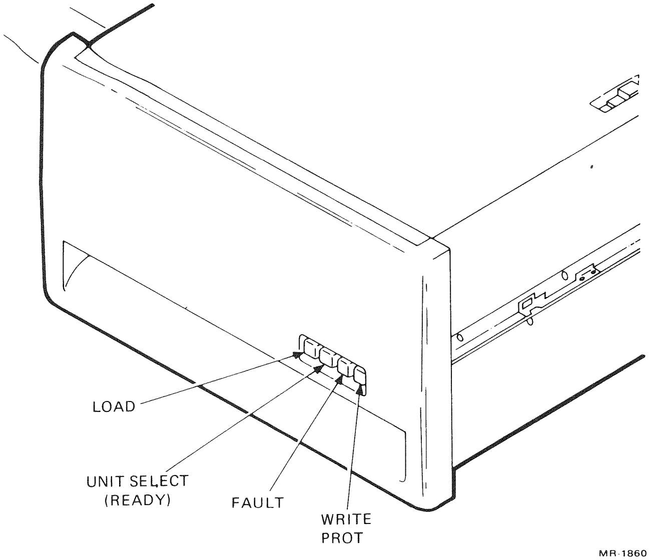


Front Panel Switches and Indicators

RL01 Disk Drives

The RL01 disk drive is a random access mass storage device with a removable, top-loading disk cartridge. Access to the disk is provided by a lift-up cover. The RL01 has four indicators on its front panel. Their functions are as follows.

Indicator	**Function**
LOAD (Push Button)	Lights to indicate that the spindle has stopped and a cartridge may be loaded.
UNIT SELECT (READY)	Lights to indicate that drive 0 or 1 is ready to read, write, or receive controller commands.
FAULT	Lights to indicate that a drive error condition exists.
WRITE PROT (Push Button)	Lights to indicate that the cartridge currently mounted is protected from having data written on it.



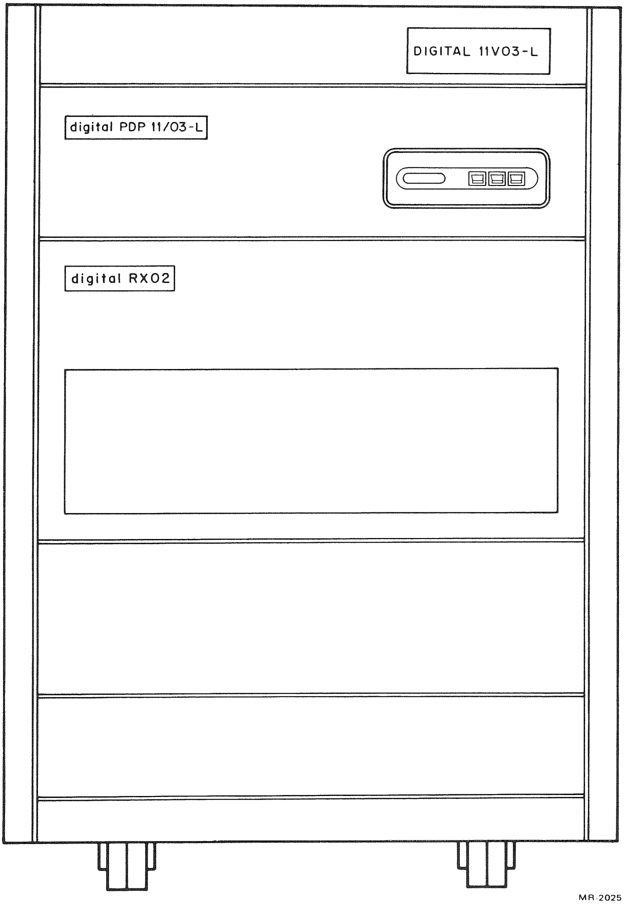
RL01 Disk Drive (Front View)

PDP-11V03-L

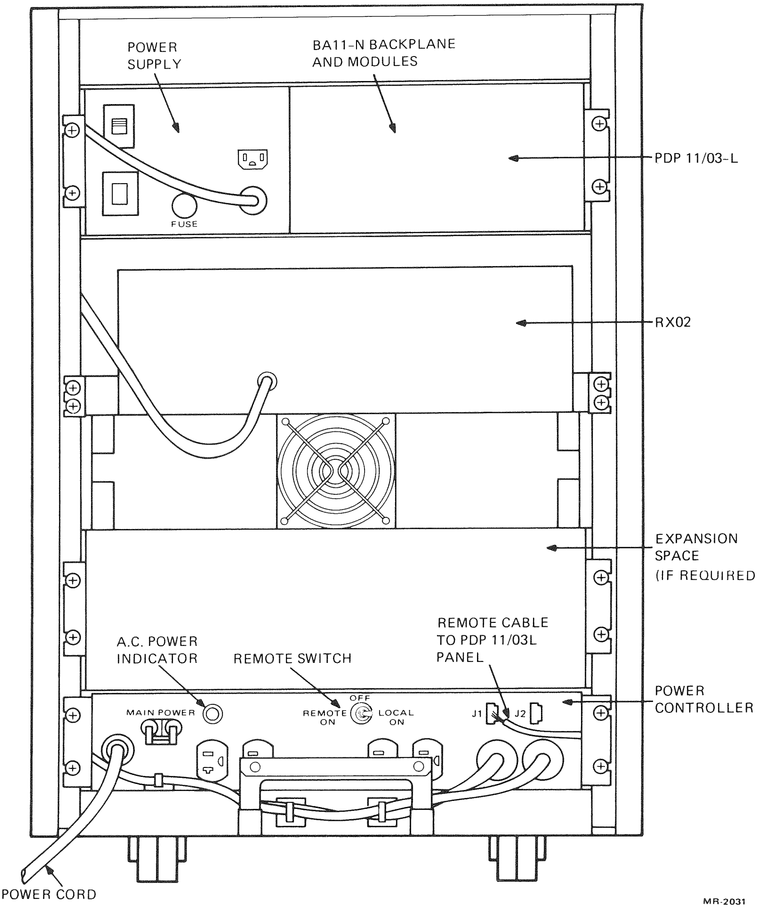
The PDP-11V03-L includes a PDP-11/03-L computer and an RX02 dual floppy disk system. The system also has 64K bytes or 32K words of RAM memory. Earlier systems have 32K bytes or 16K words of RAM memory that is expandable to 32K words. The system has the following optional terminals.

LA36 DECwriter
VT52 DECscope
VT100 DECscope

The figures and tables that follow describe the models, specifications, and components.



PDP-11V03-L System



PDP-11V03-L System (Backpanel Removed)

LOCAL POWER	POWER CONTROLLER	
	PLUG	RECEPTACLE
871-A 115V 15A 50/60HZ	871-A  NEMA # 5-15P DEC # 90-08938	 5-20R 12-12265
871-B 230V 10A 50/60HZ	871-B  NEMA # 6-15P DEC # 90-08853	 6-15R 12-11204-01
871-C 115V 20A 50/60HZ	871-C  HUBBELL # 5366-C DEC # 12-15183	 NEMA # 5-20R 12-12265

MR-2406

Power Connectors

16K System Components

System Requirements	Models LA	LC	LD
Input Power (V)	115	115	230
Frequency (Hz)	60	50	50
PDP-11/03-L Computer	-LC	-LC	-LD
RX02 Floppy Disk	-BA	-BC	-BD
Power Controller	871-A	871-A	871-B

32K System Components

System Requirements	Models LE	LH	LJ
Input Power (V)	115	115	230
Frequency (Hz)	60	50	50
PDP-11/03-L Computer	-LK	-LK	-LL
RX02 Floppy Disk	-BA	-BC	-BD
Power Controller	871-A	871-A	871-B

11V03-L System (LE, LH, and LJ)
The PDP-11V03-L system consists of the following equipment.

A PDP-11/03LK-LL microcomputer consisting of:

KD11-HA (M7270)	a microcomputer board
MSV11-DD (M8044D)	a 32K word RAM
BA11-N	a mounting box with an H9273 backplane and an H786 power supply
BDV11-A	a bootstrap/diagnostic/terminator with expandable ROM space for the user (M8012-YA).

KEV11	A chip, mounted on the KD11-H microcomputer, that provides the system with the Extended Instruction Set (EIS) and Floating Point Instruction Set (FIS) features.
RXV21	The RX02 floppy disk controller module (M8029) interfaces the RX02 disk to the LSI-11 bus.
DLV11-J	The asynchronous four-channel line interface module (M8043) interfaces the terminal to the LSI-11 bus.
RX02	The dual floppy disk system.
H9610	The cabinet in which the hardware is mounted.
871	The primary power controller for the 11V03-L system.
Floppy Disks	The operational and diagnostic software programs are stored on floppy disks and are shipped as part of the system.

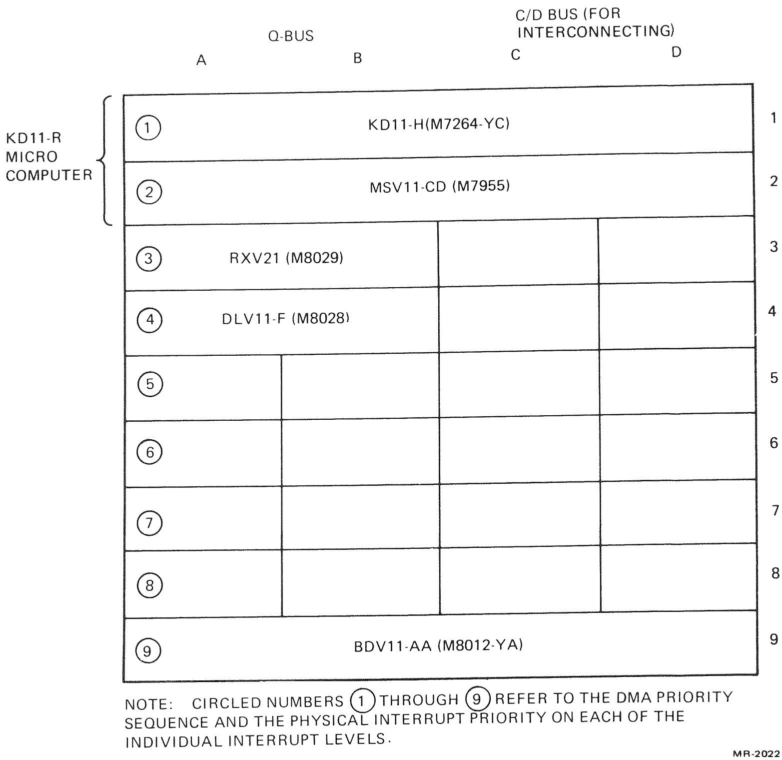
11V03-L Early Systems (LA, LC, and LD)
The PDP-11V03-L system consists of the following equipment.

A PDP-11/03LC-LD microcomputer consisting of:

KD11-R	a KD11-H (M7264-YC) microcomputer board and a MSV11-CD (M7955) 16K MOS memory board
BA11-N	a mounting box with an H9273 backplane and an H786 power supply
BDV11-A	a bootstrap/diagnostic/terminator with expandable ROM space for the user (M8012-YA).

KEV11	A chip mounted on the KD11-H microcomputer that provides the system with the Extended Instruction Set (EIS) and Floating Point Instruction Set (FIS) features.
RXV21	The RX02 floppy disk controller module (M8029) interfaces the RX02 disk to the LSI-11 bus.
DLV11-F	The asynchronous line interface module (M8028) interfaces the terminal to the LSI-11 bus.
RX02	The dual floppy disk system.

H9610	The cabinet in which the hardware is mounted.
871	The primary power controller for the 11V03-L system.
Floppy Disks	The operational and diagnostic software programs are stored on floppy disks and are shipped as part of the system.



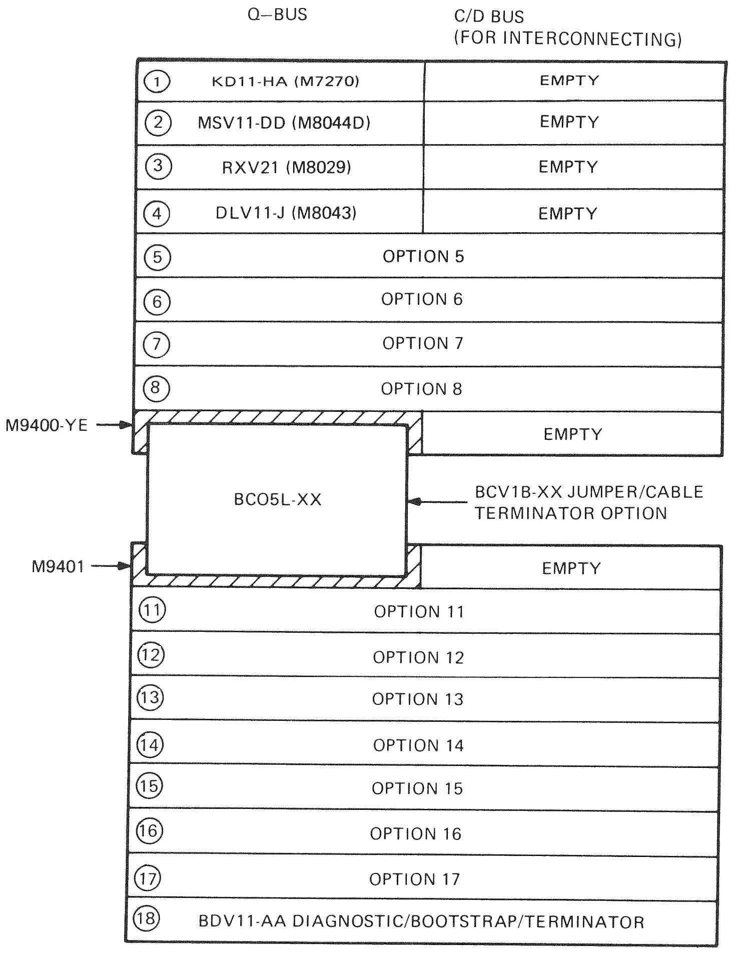
PDP-11V03-LA, -LC, and -LD Configuration

Q—BUS (A, B)	C/D BUS (FOR INTERCONNECTING) (C, D)	
1 M7270 CPU (KD11-HA) AND OPTION (KEV11)	EMPTY	1
2 M8044D 32K MEMORY (MSV11-DD)	EMPTY	2
3 M8029 RX02 INTERFACE (RXV21)	EMPTY	3
4 M8043 SERIAL LINE UNIT (DLV11-J)	EMPTY	4
5 OPTION 5	EMPTY	5
6 OPTION 6	EMPTY	6
7 OPTION 7	EMPTY	7
8 OPTION 8	EMPTY	8
9 M8012-YA BOOTSTRAP/DIAGNOSTIC/TERMINATOR (BDV11-AA)		9

NOTE: CIRCLED NUMBERS 1 THROUGH 9 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL LEVELS.

MR-2407

PDP-11V03-LE, -LH, and -LJ Backplane Configuration



NOTE: CIRCLED NUMBERS 1 THROUGH 18 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL INTERRUPT LEVELS.

MR-2408

PDP-11V03-LE, -LH, and -LJ System Expansion

PDP-11V23 AND PDP-11T23 SYSTEMS

PDP-11V23 SYSTEM

The PDP-11V23 is a general purpose computer system that can be used for developing and executing programs for a variety of applications.

Optional hardware and software is available for applications such as high-level language program development support, foreground/background real time support, multiprogramming, and the ability to monitor and control equipment.

The PDP-11V23 can support a real time application job execution in the foreground and an interactive or batch program development in the background. RT-11 is also available for a single job configuration. The PDP-11V23 system contains the following equipment.

A PDP-11/23 minicomputer with:

KDF11-AA microprocessor module (M8186) contained on a double-height module

MSV11-DD (M8044D) two double-height modules with 128K bytes of MOS RAM (on two modules) expandable to 256K bytes (four modules)

BA11-N mounting box with an H9273 backplane, an H786 power supply, and H403-A ac input box and a front bezel panel (54-12985)

BDV11-AA bootstrap/diagnostic/terminator with expandable user ROM option (M8012-YA).

DLV11-J Asynchronous four-channel serial line interface unit (M8043). (Must be CS revision "E" or higher.)

RXV21 The RX02 floppy disk controller module (M8029) interfaces the RX02 to the LSI-11 bus. (Must be at CS revision "E1" or higher.)

RX02 The dual drive floppy disk system.

H9610 Free-standing 76.8 cm (30 in) high cabinet.

Power controller

871-A*	120 Vac	12 A	50/60 Hz (early 120 Vac systems)
871-B	230 Vac	8 A	50/60 Hz
871-C*	120 Vac	16 A	50/60 Hz (later 120 Vac systems)

In addition to the preceding configuration, the following items are shipped with the PDP-11V23 system.

RT-11 system software package

DYDP+ diagnostic kit

Floppy disk set. Disks contain the RT-11 operating system software and DYDP diagnostic programs.

Option terminals available for the system configuration include the following.

LA38 DECwriter IV
LA120 DECwriter III
VT100 Alphanumeric Video Terminal

PDP-11V23 Operator Switch Panel

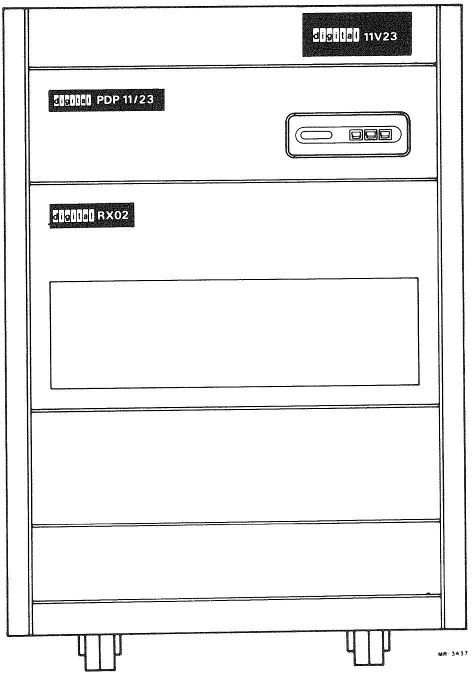
Three control switches on the front of the PDP-11/23 provide a communication link between the operator and the microcomputer system.

The switches labeled AUX ON/OFF, HALT, and RESTART provide power, stop, and bootstrap control for the PDP-11/23. The switch functions are defined as follows.

Switch	**Position**	**Function**
AUX ON/OFF	OFF	In the normal factory configuration, turning this switch off removes ac power from the system.
	ON	In the normal factory configuration, turning this switch on applies ac power to the system. If the HALT switch is up, the system is automatically booted.

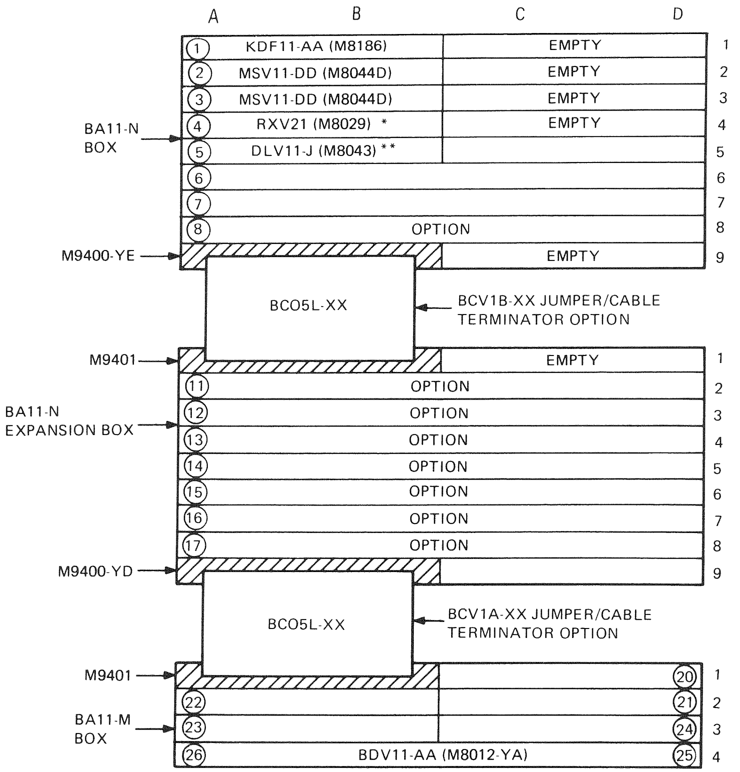
*Systems built before April 1980 use 871-A power controllers. Systems built after April 1980 use 871-C power controllers.

Switch	Position	Function
HALT	Up (Enable)	This switch enables the processor to run.
	Down (HALT)	The HALT switch, when down, halts the processor, which responds to console ODT commands. Refer to the *Microcomputer Processor Handbook*, EB-18451-20, for ODT instructions.
RESTART	RESTART (Momentary Switch)	When this switch is activated, and when the HALT switch is up, the processor carries out a power-up sequence and displays the bootstrap dialog as: 28* START?



PDP-11V23 (Front View)

*The BDV11 software automatically sizes the available memory in the system and prints the number 28. The 28 is the present limit for the BDV11 ROM software. The actual available memory maximum is 124K words. The user should be aware of the actual memory and not depend on the printout. The memory-sizing software will be updated and eventually print out the actual memory size up to the addressing limit of the CPU.



*NOTE: MUST BE AT CS REVISION 'E1' OR HIGHER

** NOTE: MUST BE AT CS REVISION 'E' OR HIGHER

NOTE: CIRCLED NUMBERS 1 THROUGH 26 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL INTERRUPT LEVELS

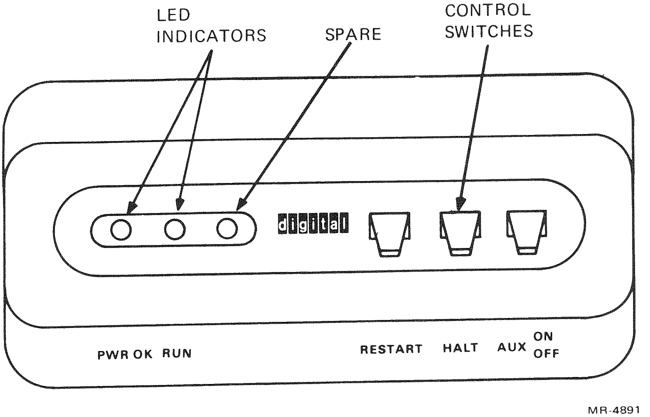
MR-4874

PDP-11V23 System Expansion Example

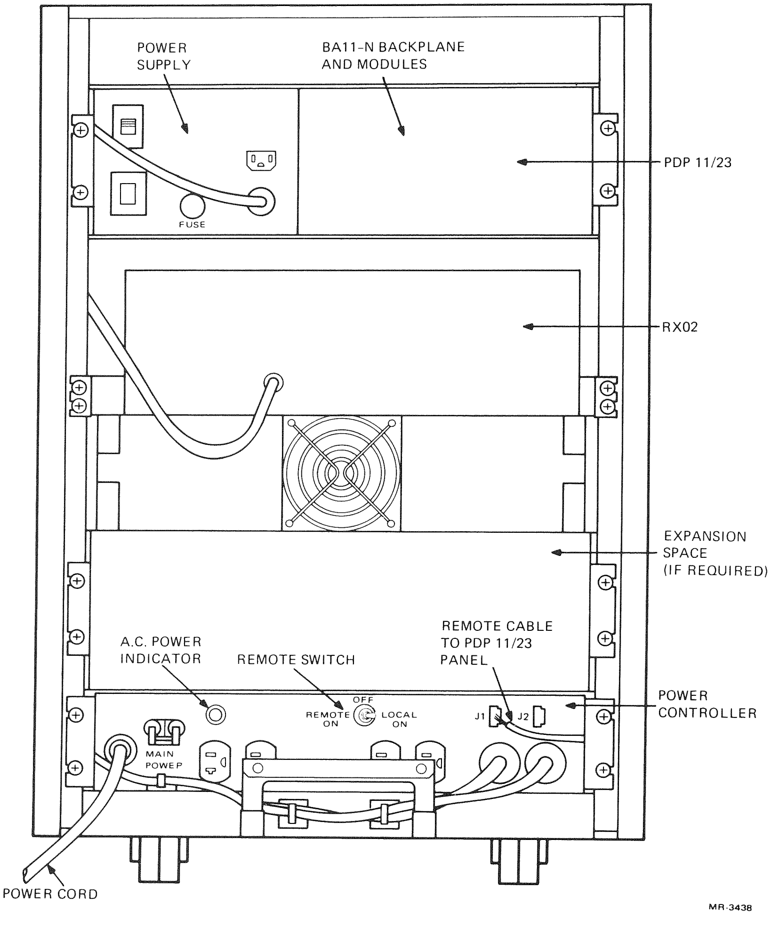
The PDP-11/23 front switch panel also contains two indicators that provide the following information.

LED	Function
PWR OK	Illuminated when the proper dc output voltages are being generated by the microcomputer system.
RUN	Illuminated when the processor is operating; turned off when the processor is not executing instructions.

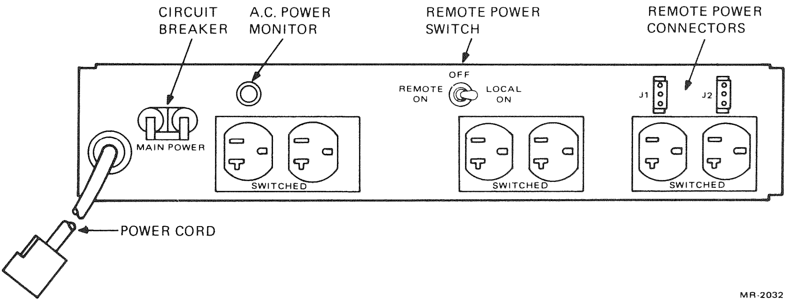
The following is an expanded PDP-11V23 configuration example using both the BA11-N and BA11-M boxes.



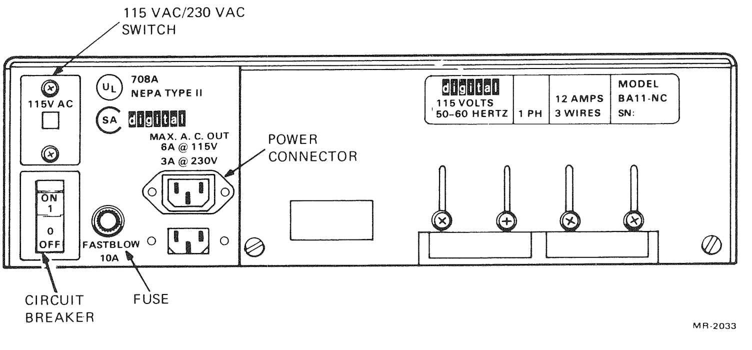
Front Panel Switches and Indicators



PDP-11V23 with Backpanel Removed



Power Controller (Rear View)



PDP-11/23 Microcomputer (Rear View)

	Q-BUS		C/D BUS (FOR INTERCONNECTING)		
	A	B	C	D	
1	KDF11-AA (M8186)				1
2	MSV11-DD (M8044D)				2
3	MSV11-DD (M8044D)				3
4	RXV21 (M8029) *				4
5	DLV11-J (M8043) **				5
6					6
7					7
8					8
9	BDV11-AA (M8012-YA)				9

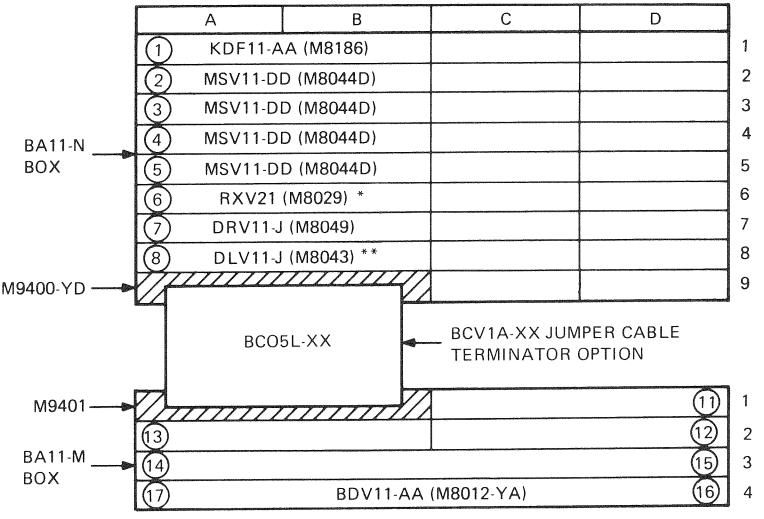
*NOTE: MUST BE AT CS REVISION 'E1' OR HIGHER

**NOTE: MUST BE AT CS REVISION 'E' OR HIGHER

NOTE: CIRCLED NUMBERS 1 THROUGH 9 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL INTERRUPT LEVELS.

MR-4873

PDP-11V23 Module Configuration



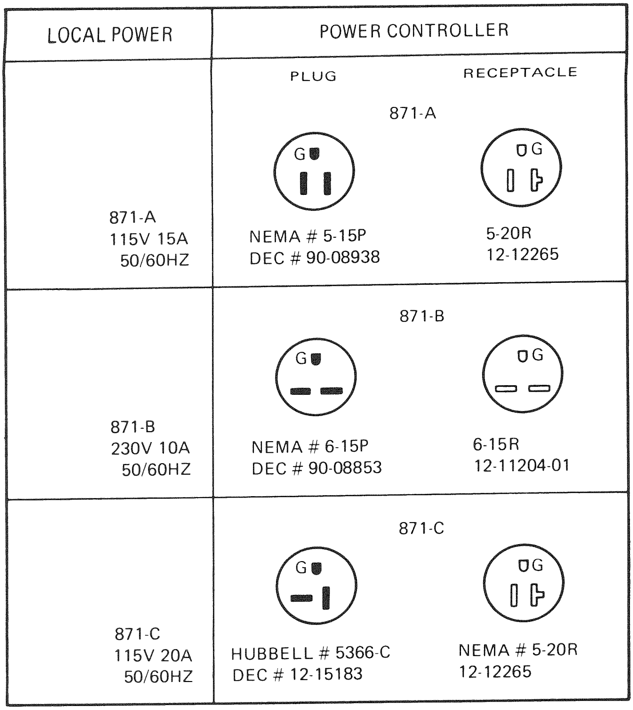
*NOTE: MUST BE AT CS REVISION 'E 1' OR HIGHER

**NOTE: MUST BE AT CS REVISION 'E' OR HIGHER

NOTE: CIRCLED NUMBERS 1 THROUGH 17 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL INTERRUPT LEVELS.

MR-4875

PDP-11V23 Expansion Example



MR-2405

Power Connectors

System Requirements	Model AA	AC	AD
Input Power (V)	120	120	240
Frequency	60	50	50
Current	12	12	8
PDP-11V23 Computer	AA	AA	AB
RX02 Floppy Disk	BA	BC	BD
Power Controller	871-A* or 871-C	871-A* or 871-C	871-B

*Systems built before April 1980 use 871-A power controllers. Systems after April 1980 use 871-C power controllers.

PDP-11T23 SYSTEM

The PDP-11T23 is a general purpose computer system that can be used for developing and executing programs for a variety of applications.

Optional hardware and software are available for applications such as high-level language program development, foreground/background real time support, multiprogramming, and equipment monitoring and control capability.

PDP-11T23 can support a single user with a foreground/background system. It can support a real time application job execution in the foreground and an interactive or batch program development in the background. RT-11 is also available for a single job configuration.

The PDP-11T23 system contains the following equipment.

A PDP-11/23 minicomputer with:

KDF11-AA microprocessor module (M8186) contained on a double-height module

MSV11-DD (M8044D) two double-height modules with 128K bytes of MOS RAM (on two modules) expandable to 256K bytes (four modules)

BA11-N mounting box with an H9273 backplane, an H786 power supply, and H403-A ac input box and a front bezel panel

BDV11-AA bootstrap/diagnostic/terminator with expandable user ROM option (M8012-YA).

DLV11-J	Asynchronous four-channel serial line interface unit (M8043). (Must be at CS revision "E" or higher.)
RL01	Five-megabyte dual disk drive units and cartridges
H9612	105 cm (42 in) high cabinet

Power controller

871-A*	120 Vac	12 A	50/60 Hz
871-B	230 Vac	8 A	50/60 Hz
871-C*	120 Vac	16 A	50/60 Hz

In addition to the preceding configuration, the following items are shipped with the system.

1 RT-11 or RSX-11M system software kit
1 DLDP+ diagnostic kit

*Systems built before April 1980 use 871-A power controllers. Systems built after April 1980 use 871-C power controllers.

Optional terminals available for the system include the following.

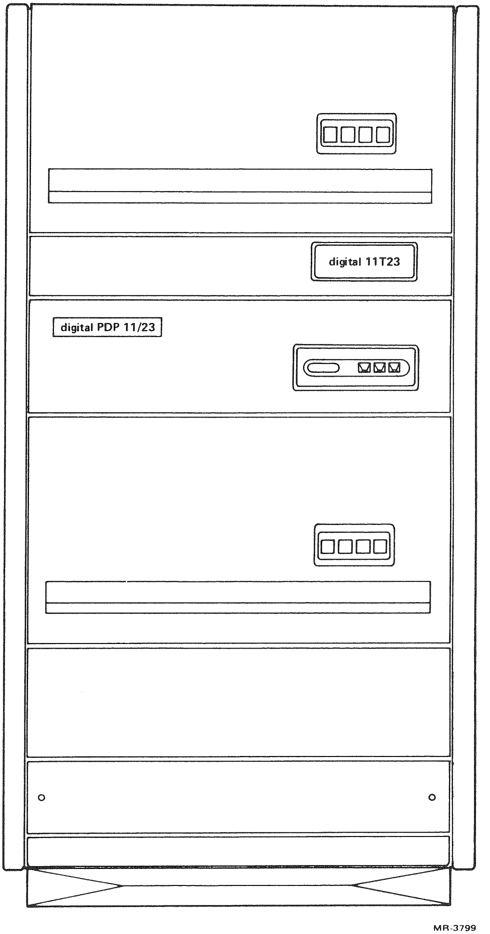
LA38 DECwriter IV
LA120 DECwriter III
VT100 Alphanumeric Video Terminal

PDP-11T23 Operator Switch Panel
Three control switches on the front of the PDP-11T23 provide a communication link between the operator and the microcomputer system.

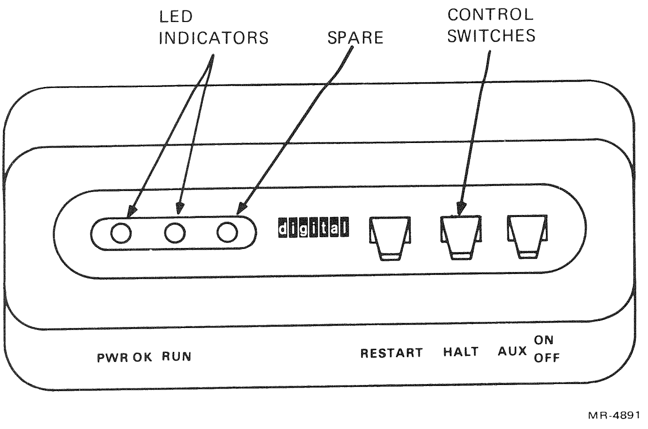
The switches labeled AUX ON/OFF, HALT, and RESTART provide power, stop, and bootstrap control, respectively. The switch functions are defined as follows.

Switch	Position	Function
AUX ON/OFF	OFF	In the normal factory configuration, this removes ac power from the system.
	ON	In the normal factory configuration, this applies ac power to the system. If the HALT switch is up, the system is automatically booted.
HALT	Up (Enable)	This enables the processor to run.
	Down (HALT)	This halts the processor, which will respond to console ODT commands. Refer to the *Microcomputer Processor Handbook*, EB-18451-20, for ODT instructions.
RESTART	RESTART (Momentary Switch)	When this switch is activated, and when the HALT switch is up, the processor carries out a power-up sequence and displays the bootstrap dialog as: 28* START?

*The BDV11 software automatically sizes the available memory in the system and prints the number 28. The 28 is the present limit for the software. The actual available memory maximum is 124K words. The user should be aware of the actual memory and not depend on the printout. The memory-sizing software will be updated and eventually print out the actual memory size up to the addressing limit of the CPU.



PDP-11T23 Computer System



Front Panel Switches and Indicators

The PDP-11T23 front switch panel also contains two indicators that provide the following information.

LED	Function
PWR OK	Illuminated when the proper dc output voltages are being generated by the microcomputer system.
RUN	Illuminated when the processor is operating; turned off when the processor is not executing instructions.

RL01 Disk Drives

The RL01 disk drive is a random access mass storage device with a removable, top-loading disk cartridge. Access to the disk is provided by a lift-up cover. The RL01 has four indicators on its front panel. Their functions are as follows.

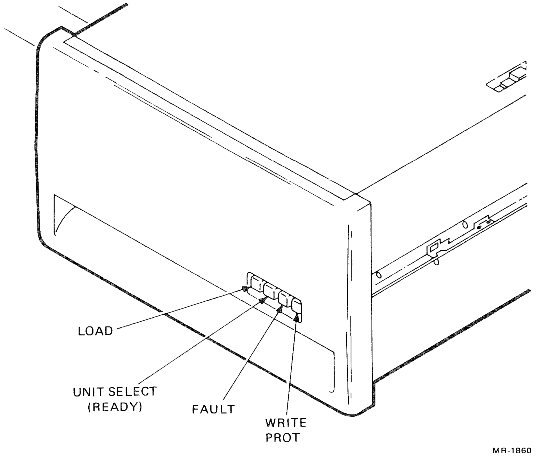
Indicator	Function
LOAD (Push Button)	Lights to indicate that the spindle has stopped and a cartridge may be loaded.
UNIT SELECT (READY)	Lights to indicate that drive 0 or 1 is ready to read, write, or receive controller commands.

Indicator	Function
FAULT	Lights to indicate that a drive error condition exists.
WRITE PROT (Push Button)	Lights to indicate that the cartridge currently mounted is protected from having data written on it.

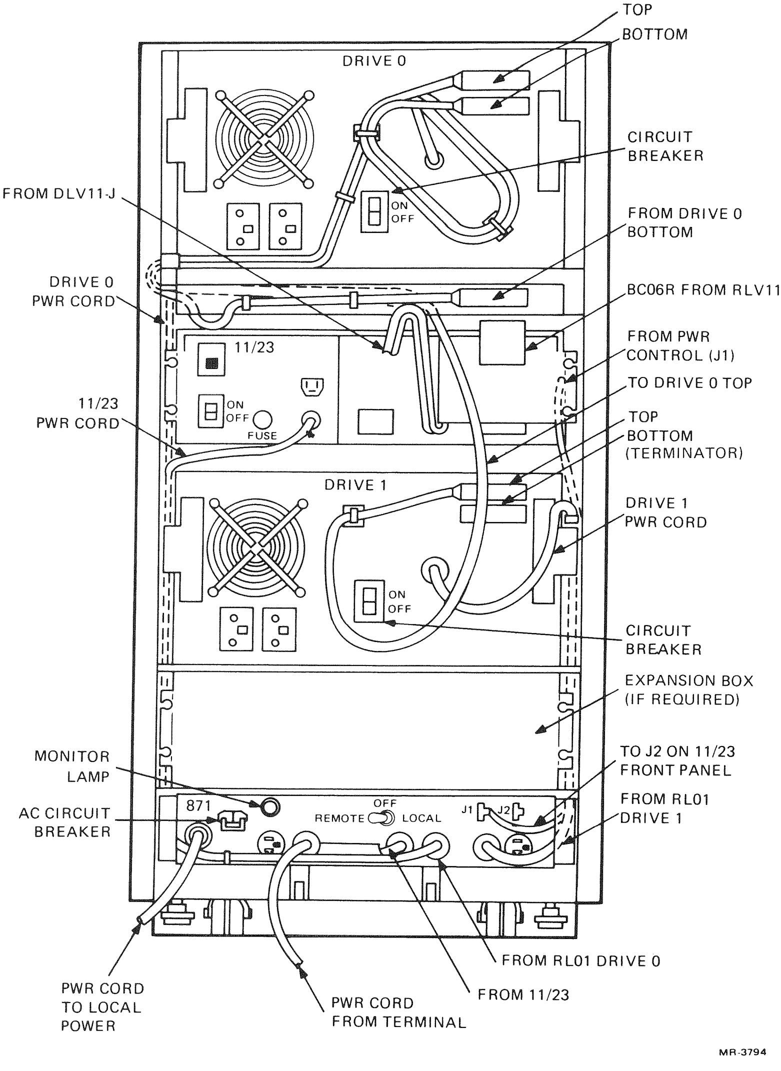
The following is an example of the PDP-11T23 microcomputer with an expanded configuration using both the BA11-N and BA11-M boxes.

	Models		
System Requirements	AA	AB	AC
Input Power (V)	120	240	120
Frequency	50/60	50/60	50/60
Current	12 A	8 A	16 A
PDP-11T23 Computer	AA	AB	AA
RL01 Disk	AK	AK	AK
Power Controller	871-A* or 871-C	871-B	871-C*

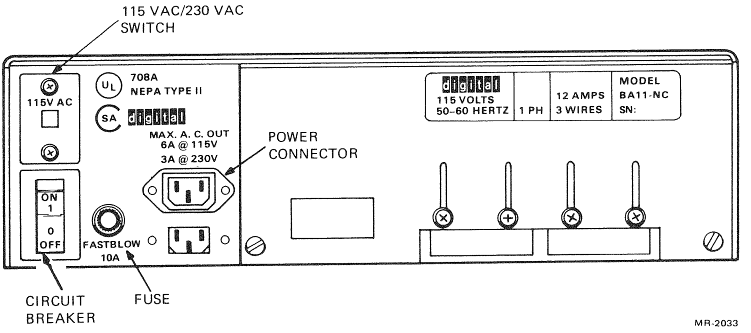
* Systems built before April 1980 use 871-A power controllers. Systems built after April 1980 use 871-C power controllers.



RL01 Disk Drive (Front View)



PDP-11T23 (Rear Panel Removed)



PDP-11/23 Microcomputer (Rear View)

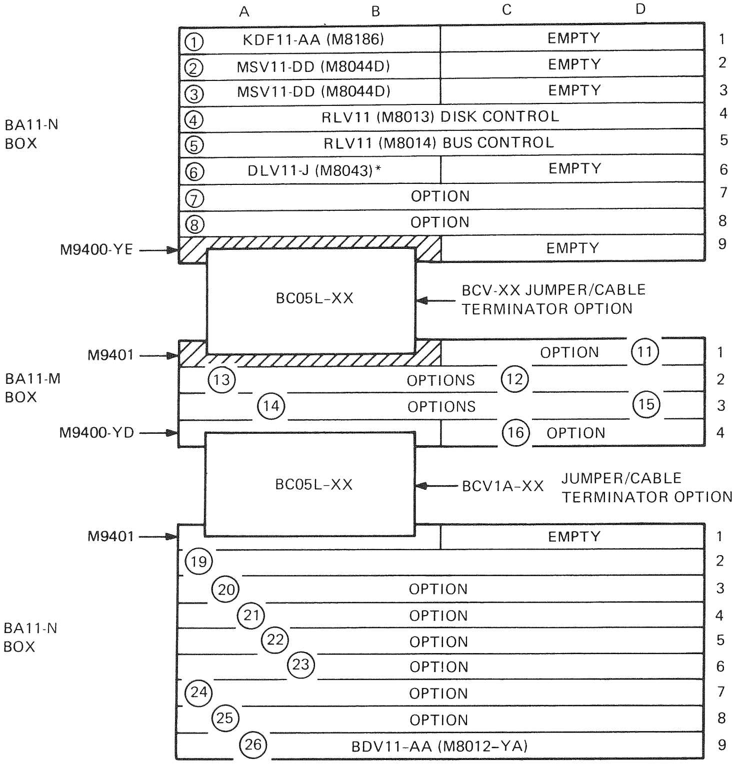
	Q—BUS		C/D BUS (FOR INTERCONNECTING)		
	A	B	C	D	
1	KDF11-AA (M8186)				1
2	MSV11-DD (M8044D)				2
3	MSV11-DD (M8044D)				3
4	RLV11 (M8013) DISK CONTROL				4
5	RLV11 (M8014) BUS CONTROL				5
6	DLV11-J (M8043) *				6
7					7
8					8
9	BDV11-AA (M8012-YA)				9

*NOTE: MUST BE AT CS REVISION 'E' OR HIGHER

NOTE: CIRCLED NUMBERS 1 THROUGH 9 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL INTERRUPT LEVELS.

MR-4877

Typical PDP-11T23 Module Configuration



*NOTE: MUST BE AT CS REVISION 'E' OR HIGHER

NOTE: CIRCLED NUMBERS 1 THROUGH 26 REFER TO THE DMA PRIORITY SEQUENCE AND THE PHYSICAL INTERRUPT PRIORITY ON EACH OF THE INDIVIDUAL INTERRUPT LEVELS.

MR-4878

PDP-11T23 Module Expansion Example

PDP-11/03-BASED MINC/DECLAB-11/MINC SYSTEMS

MODULAR INSTRUMENTATION COMPUTER (MINC)

The Modular INstrumentation Computer (MINC) is a real time operating system featuring on-line data storage and BASIC software with graphics, scientific, and laboratory subroutine packages. Each system consists of a MINC chassis, an RX02 dual floppy disk drive, and a VT105 terminal mounted on a roll-around cart. The MINC chassis houses a power supply, CPU and related modules, and up to eight MINC laboratory options.

The physical components of a MINC system are grouped into two categories: items common to all MINC systems, and those that can be purchased as options either when the system is first acquired or at some later time as add-ons. Each MINC system is configured to boot on power-up and halt on BREAK. The figures and tables that follow describe the modules, specifications, and components.

All PDP-11/03 MINC systems include the following standard items.

MINC cart, which provides support and transport for:

1. Dual diskette drive (RX02M)

2. MINC chassis (MNCBA) with power supply (H786). This contains:

KD11-NA	- LSI-11 processor with EIS/FIS
MSV11-DD	- Memory (64K bytes) single board
RXV21	- Diskette drive interface
DLV11-J	- Four-channel serial ASCII interface
IBV11-A	- IEEE bus interface
BDV11-A	- Bus terminator/diagnostic/bootstrap module.

3. VT105 terminal with built-in graphics capability.

MINC systems can include some or all of the following lab modules.

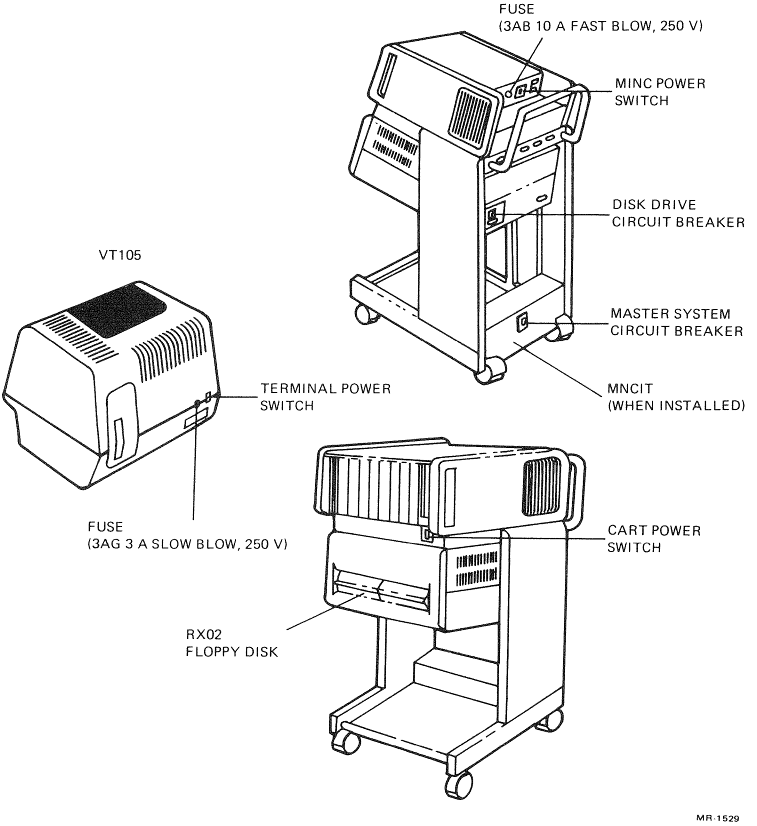
Analog-to-digital converter (MNCAD)
Preamplifier (MNCAG)
Dual multiplexer (MNCAM)
Clock (MNCKW)

11/03-BASED MINC

Digital-to-analog converter (MNCAA)
Digital input unit (MNCDI)
Digital output unit (MNCDO)

MINC systems can also include:

Dot matrix printer (LA35)
Isolation transformer (MNCIT)
110 baud, 20 mA serial line interface (DLV11-KC).

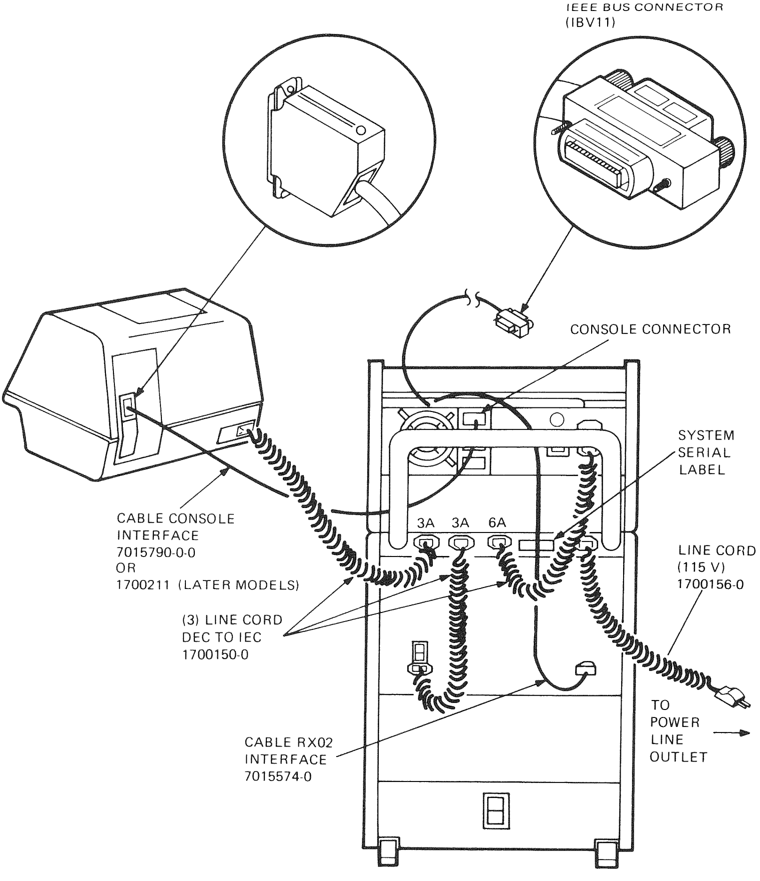


MINC System

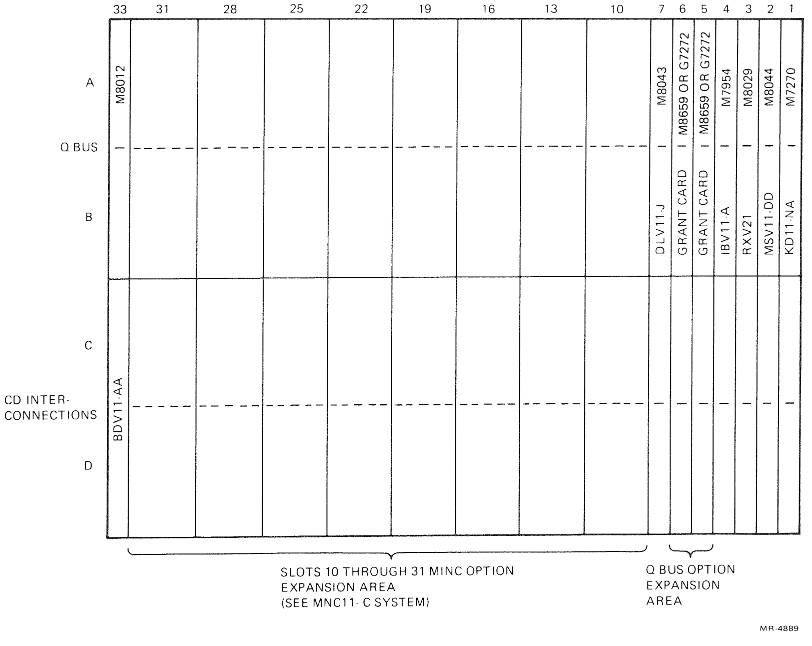
MINC System Model Designation

System Requirements	**MNC11 -AA**	**-BA**	**-BC**	**-BD**	**-CA**	**-CC**	**-CD**
Input Power (V)	115	115	115	230	115	115	115
Frequency (Hz)	60	60	50	50	60	60	50
		1	1		1	1	
MNC11-		AA	AA		AA/BA	AA/AC	BID
Chassis MNC BA	1						
KD11-NA (M7270)	1						
MSV11D (M8044)	1						
RXV21 (M8029)	1						
IBV11-A (M7954)	1						
BDV11-A (M8012)	1				1	1	1
MINC Cart		1	1	1	1	1	1
RX02		MA	MC	MD	MA	MC	MC
VT105		MA	MA	MB	MA	MA	MB
LA35					HE	HH	HS
					1	1	
MNC11-AB				1			
MNCAD		*	*	*	1	1	1
MNCAA		*	*	*	1	1	1
MNCAM		*	*	*	1	1	1
MNCDI		*	*	*	1	1	1
MNCDO		*	*	*	1	1	1
MNCKW		*	*	*	1	1	1
MNCAG		*	*	*	1	1	1
Cable Console Interface	1				1	1	1
Software Kit (English)		1	1	1			
Blank Control Panel (MNCBL)		**	**	**	**	**	**

*User's options
**As required to fill MNCBA plus one extra



MINC System Cable Connections



PDP-11/03 Module Utilization (MINC)

DECLAB/MINC Specifications

	115 V, 50/60 Hz				230 V, 50 Hz			
	Plug		Receptacle		Plug		Receptacle	
Power Connector	NEMA No. 5-15P DEC No. 90-089 38		5-15R 12-05351		NEMA No. 6-15P DEC No. 90-08853		6-15R 12-11204	
	MINC Chassis*	RX02	VT105	LA35	MINC Chassis	RX02	VT105	LA35
Amperage								
Typical		3.75	3.0				1.5	
Maximum	19			2.0	8	1.75		1.0
Wattage								
Typical	500		300	160			250	160
Maximum	1200	460	250	300		460	300	
Btu/Hour								
Typical		225		550		225		550
Maximum				1020				1020
Weight								
Kilograms		34.02	16.3	46.3		34.02	16.3	46.3
Pounds		75	36	102		75	36	102

*Includes MNCBA chassis with MINC lab modules and RX02 and VT105.

NOTE

MINC option expansion area is to be used only for MINC lab module add-ons. No Qbus add-ons should be inserted in this expansion area. No backplane expansion of the MINC system is possible. All Qbus add-ons must be inserted in either slot 5 or 6 (A and B only for double-height options).

System-Level Diagnostics

Two diagnostic chains are contained on the diagnostic floppy for system troubleshooting. The diagnostic chain MINC11.CCC provides the required diagnostics for testing the CPU and related modules including the BDV11, the VT105 option, and MINC lab modules. This chain requires turnaround connectors on SLU 0, SLU 1, SLU 2. For detailed operational information, refer to Book 7, *Working with MINC Devices*, AA-D572A-TC. The contents of file MINC11.CCC is as follows.

R VMNF??/1	MINC-AA option sizer program
R VKAA??/1	CPU test
R VKAB??/1	Extended instruction test
R VKAC??/1	Floating point instruction set test
R VKAL??/1	Traps test
R VIBB??/1	IBV11 test
R VDLA??/1	DLV11-J test
R VMNC??/1	Clock test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCOO (digital out) diagnostic
R VMND??/1	D/A test
R VMNA??/1	A/D test
R ZVTN??/1	VT105 test
R VMNG??/1	Termination program

The second diagnostic chain MNC11.CCC provides the required diagnostics for performing a quick check of the MINC lab modules only. The contents of file MNC11.CC are listed below.

R VMNF??/1	Startup/sizer program
R VMNC??/1	Floating point instruction set test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCDO test
R VMND??/1	D/A test
R VMNA??/1	A/D test
R VMNG??/1	Termination program

Both programs are stored on the MINC diagnostic disk, available from the Software Distribution Center (SDC).

Kit No. ZJ281 - RZ (hard-copy documents)
ZJ281 - PX (RX02 floppy)
ZJ281 - RX (hard-copy/RX02 floppy kit)

11/03-BASED MINC

Modules in the Basic System

MNC11-AA (115 V, 60 Hz) and MNC11-AB (230 V, 50 Hz)

Processor KD11-NA (M7270)

With Extended Instruction Set/Floating Point Instruction Set (KEV11-A, 23-003B5)

Jumper W1 installed - crystal clock
Jumper W3 removed - enable event line
Jumper W6 installed - } power-up to 173000 (BDV11)
Jumper W5 removed - }

Memory - MSV11-DD (M8044)

64K byte MOS RAM without parity
On-board memory refresh
Jumper configuration

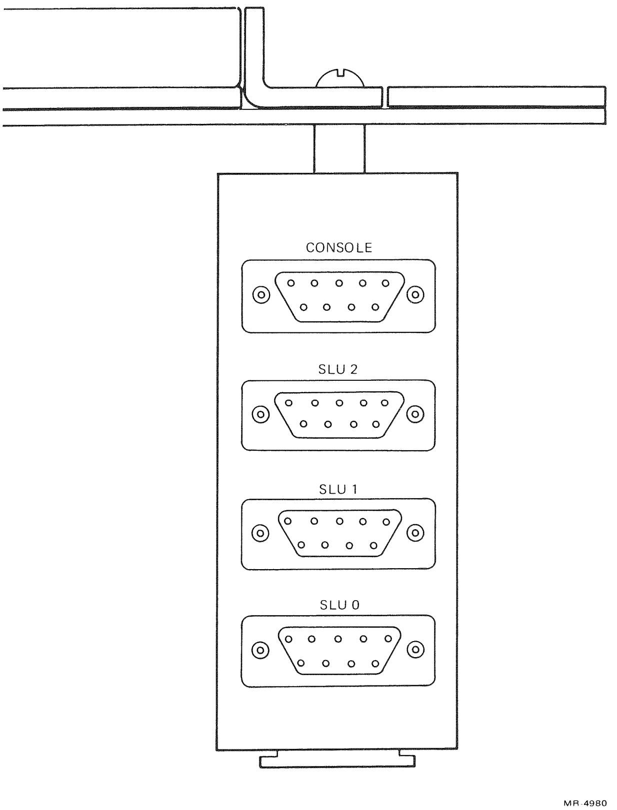
Jumper	Jumper State	Function Implemented
Pin 1 to 3 Pin 1 to 2	OUT IN	Enable 2K I/O page option
W2	IN	Enable normal system power (+5 V)
W3	IN	Enable normal system power (+12 V)
W4	OUT	Disable battery power (+12 V)
W5	OUT	Disable battery power (+5 V)
Pin 10 to 14 Pin 16 to 15	IN IN	Select memory size of 64K bytes
S1 through S5	ON	Starting address bank 0

Serial Line Interface – DLV11-J (M8043)

Number of serial lines: 4

Factory-set address and vector switches

Device	Address	Vector	Baud Rate
Console	777560	60	9600
SLU 2	776520	320	300
SLU 1	776510	310	1200
SLU 0	776500	300	9600



MINC Terminal Distribution Panel

Bus Terminator/Diagnostic/Bootstrap BDV11-A (M8012)

Diagnostic/bootstrap conditions are factory-selected using switch packs.

Switch A (E15)	RX02 Bootstrap
A1	ON
A2	ON
A3	OFF
A4	OFF
A5	OFF
A6	ON
A7	OFF
A8	OFF

Switch B (E21)	RX02 Bootstrap
B1	OFF
B2	OFF
B3	OFF
B4	OFF
B5	ON

IEEE Bus Interface – IBV11-A (M7954)

Address and vector switch settings:

Address 171420	Vector 420
S2-1, 4 and 5 = ON only	S-1 and 5 = ON only

Floppy Disk Interface – RXV21 (M8029)

Address and vector switch settings:

Address 177170	Vector 264
A7 and A8 = OUT only	V3, V6 and V7 = OUT only

DECLAB-11/MNC SYSTEM

The DECLAB-11/MNC is a real time operating system featuring on-line data storage, and FORTRAN software with graphics, scientific, and laboratory subroutine packages. Each system contains as its main components an MNC chassis, dual RL01 disk drives, and a terminal (VT105 or LA36). The MNC chassis houses a power supply, CPU, and related modules, and up to eight MNC- series options.

The physical components of the DECLAB system are grouped into two categories: items common to all MNC systems, and those that can be purchased as options, either when the system is first acquired or at some later time. Each DECLAB system is configured to boot on power-up and halt on BREAK. The figures and tables that follow describe the modules, specifications, and components.

All DECLAB systems include the following standard items.

Mass storage device containing two RL01 disk drives

MNC chassis (MNCBA) with power supply (H786). This contains:

KD11-NA	-	LSI-11 processor with EIS/FIS
MSV11-DD	-	Memory (32K word) single board
RLV11	-	Controller (disk)
DLV11-J	-	Four-channel serial ASCII interface
IBV11-A	-	IEEE bus interface (optional)
BDV11-A	-	Bus terminator/diagnostic/bootstrap module.

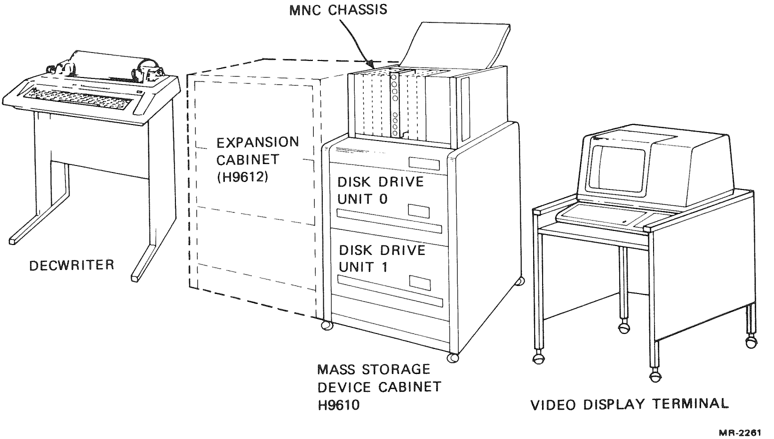
VT105 terminal with built-in graphics capability

DECLAB systems can include some or all of the following lab modules.

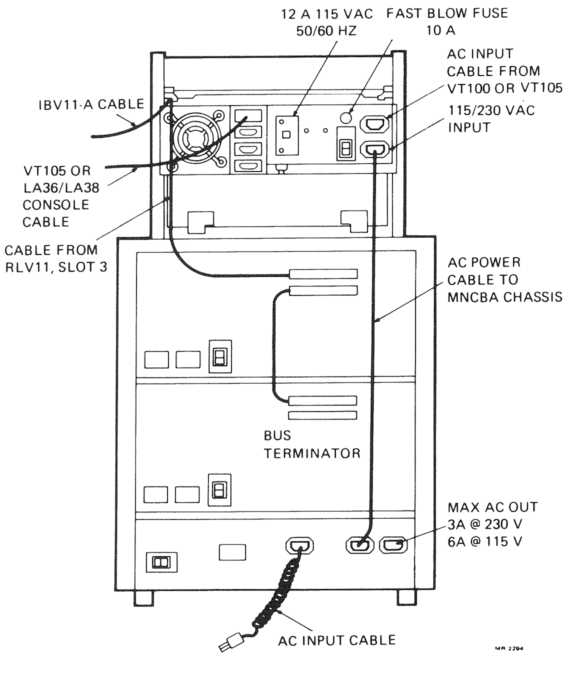
Analog-to-digital converter (MNCAD)
Preamplifier (MNCAG)
Dual multiplexer (MNCAM)
Clock (MNCKW)
Digital-to-analog converter (MNCAA)
Digital input unit (MNCDI)
Digital output unit (MNCDO)

DECLAB systems can also include:

Dot matrix printer (LAV11 + LA180 or LA35)
110 baud, 20 mA serial line interface (DLV11-KC).



DECLAB-11/MNC System with Optional Units

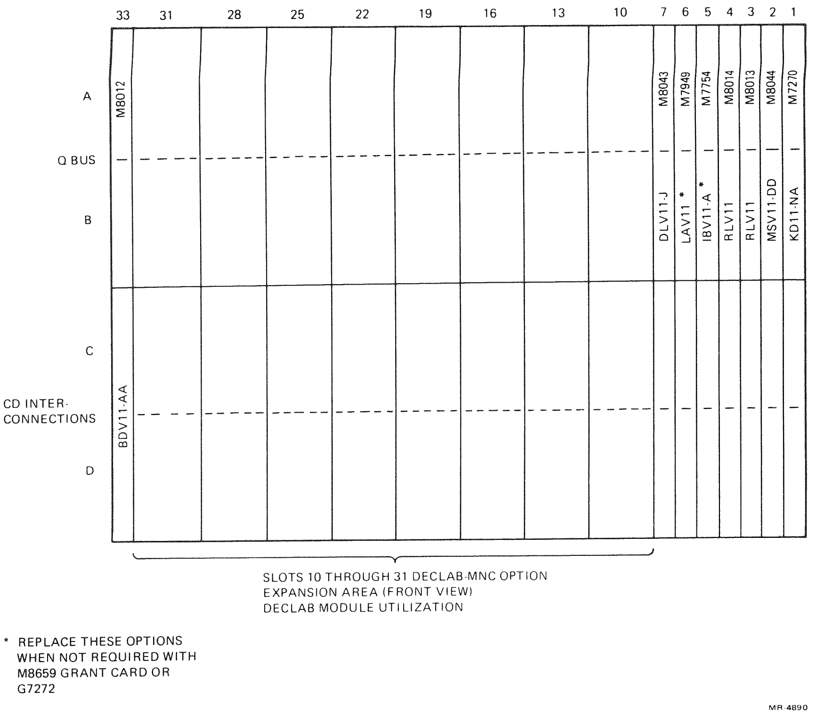


DECLAB-11/MNC Cable Connections

DECLAB-11/MNC System Model Designation

System Requirements	MNC11 -D	-J	-K	-L
Input Power (V)	115	115	115	115
Frequency (Hz)	60	60	60	60
Cabinet/Power Controller (H9610)		BB/BC	BB/BC	
MNC11-		D	D	K
Chassis (MNCBA)	1			
KD11-NA (M7270)	1			
MSV11D (M8044)	1			
DLV11-J (M8043)	1			
IBV11-A (M7954)				1
BDV11-A (M8012)	1			
RLV11- (M8013)	1			
RLV11- (M8014)	1			
LAV11-LA180 Printer				1
VT105 Terminal			MA	
LA36		HE		
RL01 Disk Drive		2	2	
MNC11-AD		*	*	1
MNC11-AA		*	*	1
MNC11-AM		*	*	1
MNC11-DI		*	*	1
MNC11-DO		*	*	1
MNC11-KW		*	*	1
MNC11-AG		*	*	1
Cable Console Interface	1			
Software Kit (English)	1	1	1	1
Blank Control Panel (BNCBL)		**	**	**
Installation Kit (MNCIK)				

*User's options
**As required to fill MNCBA plus one extra



PDP-11/03 DECLAB Module Utilization

NOTE

DECLAB-MNC option expansion area is to be used only for MNC-series module add-ons. No Qbus add-ons should be installed in this expansion area. No backplane expansion of the MNC system is possible.

System-Level Diagnostics

Two diagnostic chain files are contained on the RL01 diagnostic disk for system troubleshooting. The diagnostic chain MNC11A.CCC provides the required diagnostics for testing the CPU and related modules and MNC-series modules. This program does not test the BDV11 or VT105 options. The contents of file MNC11A.CCC arè as follows.

R VMNF??/1	MINC-11 option sizer program
R VKAA??/1	CPU test
R VKAB??/1	Extended instruction test
R VKAC??/1	Floating point instruction set test
R VKAL??/1	Traps test

R VIBB??/1	IBV11 test
R VDLA??/1	DLV11-J test
R VMNC??/1	Clock test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCOO (digital out) diagnostic
R VMND??/1	
R VMNA??/1	A/D test
R ZVTN??/1	VT105 test
R VMNG??/1	Terminator program

The second diagnostic chain MNC11.CCC provides the required diagnostics for performing a quick check of the MNC-series modules only. The contents of file MNC11.CCC are as follows.

R VMNF??/1	Start-up/sizer program
R VMNC??/1	Floating point instruction set test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCDO test
R VMND??/1	D/A test
R VMNA??/1	A/D test
R VMNG??/1	Termination program

Both programs are stored on the MNC diagnostic disk, Software Distribution Center (SDC) kit no. AX-E380EMC.

Modules in the Basic System

MNC11-AA (115 V, 60 Hz) and MNC11-AB (230 V, 50 Hz)

Processor KD11-NA (M7270)

With Extended Instruction Set/Floating Point Instruction Set (KEV11-A 23-003B5).

Jumper W1 installed - crystal clock
Jumper W3 removed - enable event line
Jumper W6 installed - } power-up to 173000
Jumper W5 removed - }

Memory - MSV11-DD (M8044)

64K byte MOS RAM without parity
On-board memory refresh
Jumper configuration

Jumper	Jumper State	Function Implemented
Pin 1 to 3 Pin 1 to 2	OUT IN	Enable 2K I/O page option
W2	IN	Enable normal system power (+5 V)
W3	IN	Enable normal system power (+12 V)
W4	OUT	Disable battery power (+12 V)
W5	OUT	Disable battery power (+5 V)
Pin 10 to 14 Pin 16 to 15	IN IN	Select memory size of 64K bytes
S1 through S5	ON	Starting address = bank 0

Serial Line Interface – DLV11-J (M8043)

Number of serial lines: 4

Factory-set address and vector switches

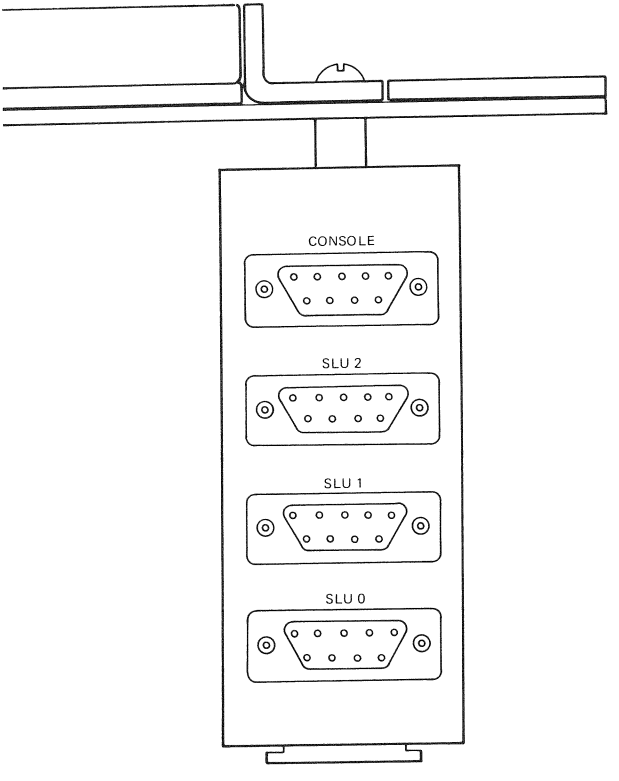
Device	Address	Vector	Baud Rate
Console	777560	60	9600/300*
SLU 2	776520	320	300
SLU 1	776510	310	1200
SLU 0	776500	300	9600

*Varies depending on type of terminal.

DECLAB System Specifications

	115 V, 50/60 Hz				230 V, 50 Hz			
	Plug		Receptacle		Plug		Receptacle	
Power Connector	NEMA No. 5-15P DEC No. 90-089 38		5-15R 12-05351		NEMA No. 6-15P DEC No. 90-08853		6-15R 12-11204	
	DECLAB/ MINC System*	**RL01**	**VT105**	**LA36**	**DECLAB/ MNC System**	**RL01**	**VT105**	**LA36**
Amperage								
Typical			3.0					
Maximum	19	3.5		2.0	19	2.5	1.5	1.0
Wattage								
Typical	500	150		160	500	150		160
Maximum	1200	200	150	300	1200	200	150	300
Btu/Hour								
Typical				550		600		550
Maximum		600		1020				1020
Weight								
Kilograms	134	34.02	16.3	46.3	134	34.02	16.3	46.3
Pounds	295	75	36	102	295	75	36	102

*Includes MNCBA chassis with MNC-series module and two RL01 drives.



MR-4980

MINC Terminal Distribution Panel

Bus Terminator/Diagnostic/Bootstrap BDV11-A (M8012)

Switch A (E15)	RL01 Bootstrap
A1	ON
A2	ON
A3	OFF
A4	OFF
A5	OFF
A6	OFF
A7	ON
A8	OFF

Switch B (E22)	RL01 Bootstrap
B1	OFF
B2	OFF
B3	OFF
B4	OFF
B5	ON

IEEE Bus Interface – IBV11-A (M7954) (Optional)

Address and vector switch settings:

Address 171420	Vector 420
S2-1, 4 and 5 = ON only	S1-1 and 5 = ON only

Disk Interface – RLV11 (M8014, M8013)

Address and vector switch settings on M8014 bus module:

Address 174400 Vector 160

M8014 Switch Setting

Switch	Position	Function
Bus Address	ON	A12 (MSB)
(174400)	ON	A11
	OFF	A10
	OFF	A09
	ON	A08
	OFF	A07
	OFF	A06
	OFF	A05
	OFF	A04
	OFF	A03 (LSB)
Vector Switch	OFF	V8 (MSB)
(160)	OFF	V7
	ON	V6
	ON	V5
	ON	V4
	OFF	V3
	OFF	V2 (LSB)

NOTE
Additional MINC/DECLAB information can be found in the following manuals.

MINC/DECLAB Service Manual **EK-MNC11-SV**
DECLAB-11/MNC User's Guide **EK-MNC11-UG**

PDP-11/23-BASED MINC/DECLAB-11/MINC SYSTEMS

MINC

The **M**odular **IN**strumentation **C**omputer (MINC) is a real time operating system featuring on-line data storage, and BASIC software with graphics, scientific, and laboratory subroutine packages. Each system consists of a MINC chassis, an RX02 dual floppy disk drive, and a VT105 terminal mounted on a roll-around cart. The MINC chassis houses a power supply, CPU and related modules, and up to eight MINC laboratory options.

The physical components of a MINC system are grouped into two categories: items common to all MINC systems, and those that can be purchased as options, either when the system is first acquired or at some later time as add-ons. Each MINC system is configured to boot on power-up and halt on BREAK. The figures and tables that follow describe the modules, specifications, and components.

All PDP-11/23 MINC systems include the following standard items.

MINC cart, which provides support and transport for:

Dual diskette drive (RX02M)

MINC chassis (MNCBA) with power supply (H786). This contains:

KDF11-AB	-	LSI-11 processor with memory management EIS/FIS
MSV11-DD	-	Memory (64K words) on two modules
RXV21	-	Diskette drive interface
DLV11-J	-	Four-channel serial ASCII interface
IBV11-A	-	IEEE bus interface
BDV11-A	-	Bus terminator/diagnostic/bootstrap module.

VT105 terminal with built-in graphics capability.

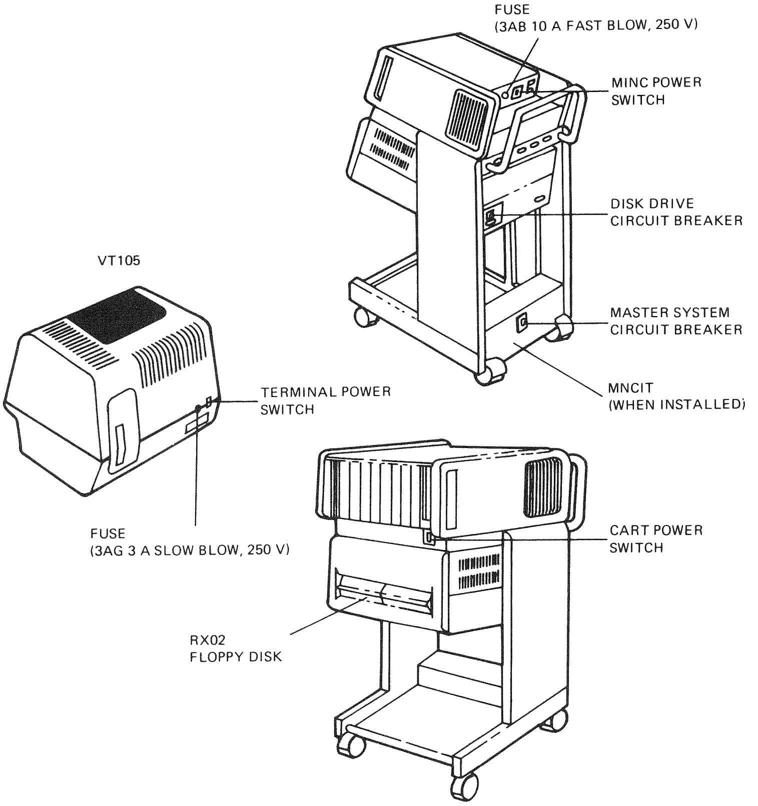
MINC systems can include some or all of the following lab modules.

Analog-to-digital converter (MNCAD)
Preamplifier (MNCAG)
Dual multiplexer (MNCAM)
Clock (MNCKW)
Digital-to-analog converter (MNCAA)
Digital input unit (MNCDI)
Digital output unit (MNCDO)

11/23-BASED MINC

MINC systems can also include:

Dot matrix printer (LA35)
Isolation transformer (MNCIT)
110 baud, 20 mA serial line interface (DLV11-KC).



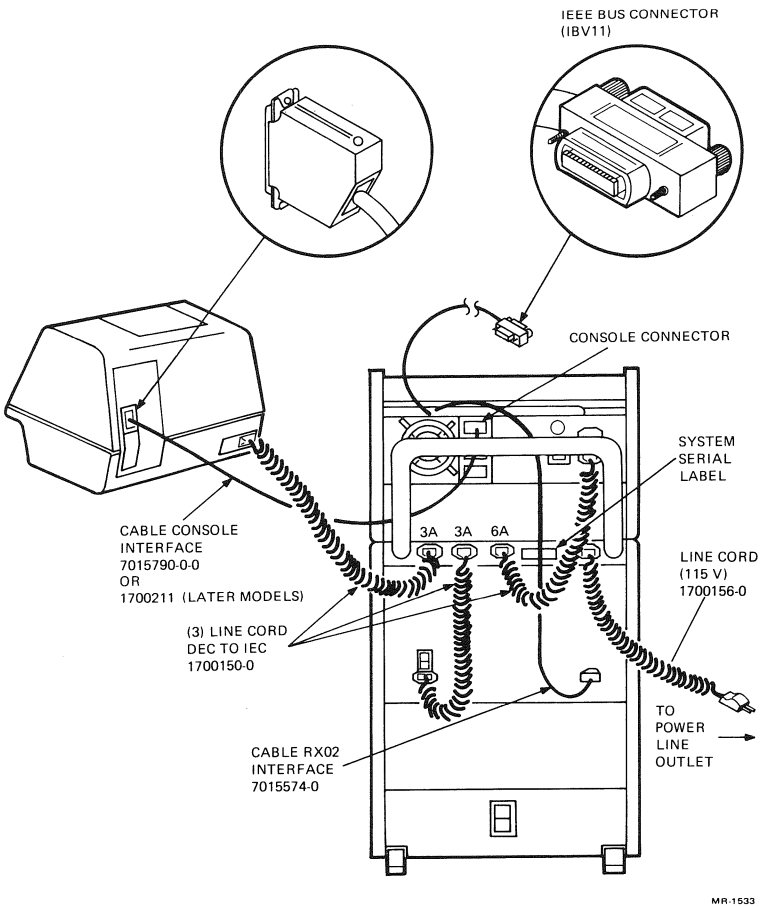
MINC System

MINC System Model Designation

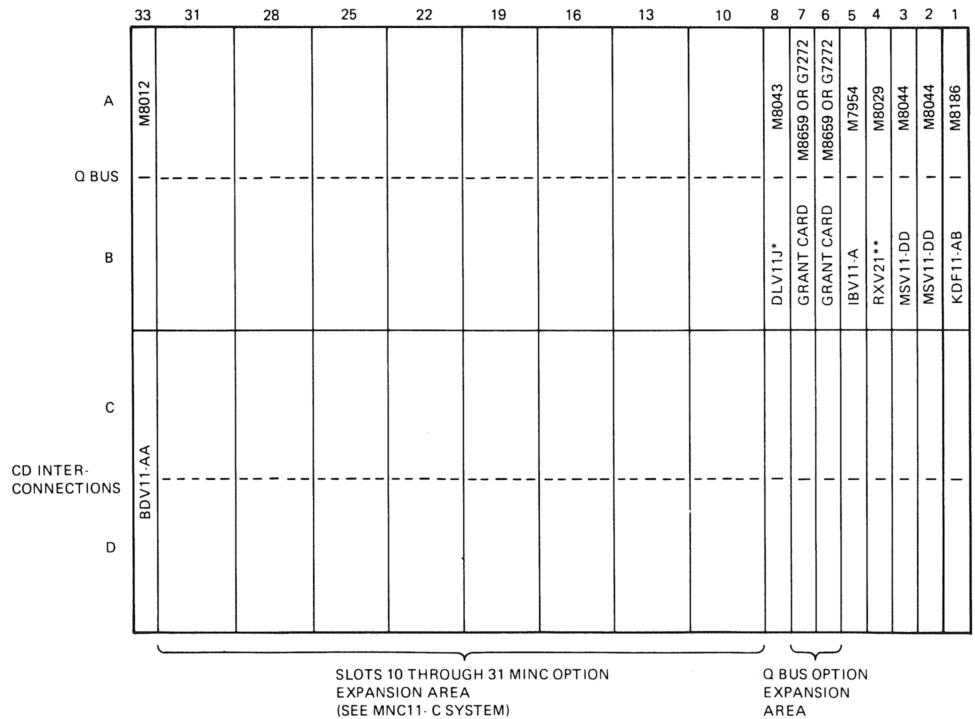
System Requirements	MNCFA -AA	-BA	-BC	-BD	-CA	-CC	-CD
Input Power (V)	115	115	115	230	115	115	115
Frequency (Hz)	60	60	50	50	60	60	50
		1	1		1	1	
MNCFA-		AA	AA		AA/BA	AA/AC	BID
Chassis MNC BA	1						
KDF11-AB (M8186)	1						
MSV11D (M8044)	2						
RXV21 (M8029-	1						
IBV11-A (M7954)	1						
BDV11-A (M8012)	1				1	1	1
MINC Cart		1	1	1	1	1	1
RX02		MA	MC	MD	MA	MC	MC
VT105		MA	MA	MB	MA	MA	MB
LA35					HE	HH	HS
					1	1	
MNCFA-AB				1			
MNCAD		*	*	*	1	1	1
MNCAA		*	*	*	1	1	1
MNCAM		*	*	*	1	1	1
MNCDI		*	*	*	1	1	1
MNCDO		*	*	*	1	1	1
MNCKW		*	*	*	1	1	1
MNCAG		*	*	*	1	1	1
Cable Console Interface	1				1	1	1
Software Kit (English)		1	1	1			
Blank Control Panel (MNCBL)		**	**	**	**	**	**

*User's options
**As required to fill MNCBA plus one extra

QJV35-AX (RX02) diagnostic package supplied



MINC System Cable Connections



*NOTE: MUST BE AT CS REVISION 'E' OR HIGHER.

**NOTE: MUST BE AT CS REVISION 'E1' OR HIGHER.

MR-4892

PDP-11V23 MINC Module Configuration

MINC System Specifications

	115 V, 50/60 Hz				230 V, 50 Hz			
	Plug		Receptacle		Plug		Receptacle	
Power Connector	NEMA No. 5-15P DEC No. 90-089 38		5-15R 12-05351		NEMA No. 6-15P DEC No. 90-08853		6-15R 12-11204	
	MINC Chassis*	**RX02**	**VT105**	**LA35**	**MINC Chassis**	**RX02**	**VT105**	**LA35**
Amperage								
Typical			3.0				1.5	
Maximum	19	4.0		2.0	8	2.0		1.0
Wattage								
Typical	500	460	250	160		460	250	160
Maximum	1200		300	300			300	
Btu/Hour								
Typical		225		550		225		550
Maximum				1020				1020
Weight								
Kilograms			16.3	46.3			16.3	46.3
Pounds			36	102			36	102

*Includes MNCBA chassis with MINC lab modules and RX02 and VT105.

NOTE

MINC option expansion area is to be used only for MINC lab module add-ons. No Qbus add-ons should be inserted in this expansion area. No backplane expansion of the MINC system is possible. All Qbus add-ons must be inserted in either slot 5 or 6 (A and B only for double-height options).

System-Level Diagnostics

Two diagnostic chain files are contained on the diagnostic floppy for system troubleshooting. The diagnostic chain MNC11F.CCC provides the required diagnostics for testing the CPU and related modules including the BDV11, the VT105 option, and MINC lab modules. This chain requires turnaround connectors on SLUs 0, 1, and 2. For detailed operational information, refer to Book 7 of *Working with MINC Devices*, AA-D572A-TC. The contents of file MNC11F.CCC are as follows.

R VMNF??/1	MINC-11 option sizer program
R JKDA??/1	CPU test
R JKDB??/1	Extended instruction test
R JKDC??/1	Floating point instruction set test
R JKDD??/1	Traps test
R VIBB??/1	IBV11 test
R VDLA??/1	DLV11-J test
R VMNC??/1	Clock test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCOO (digital out) diagnostic
R VMND??/1	D/A test
R VMNA??/1	A/D test
R ZVTN??/1	VT105 test
R VMNG??/1	Termination program

The second diagnostic chain MNCFA.CCC provides the required diagnostics for performing a quick check of the MINC lab modules only. The contents of file MNCFA.CC are listed below.

R VMNF??/1	Start-up/sizer program
R VMNC??/1	Floating point instruction set test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCDO test
R VMND??/1	D/A test
R VMNA??/1	A/D test
R VMNG??/1	Termination program

Both programs are stored on the MINC diagnostic disk, available from the Software Distribution Center (SDC).

Kit No. QJV35 - RZ (hard-copy documents)
QJV35 - AX (RX02 floppy)
ZJ281 - RX (hard-copy/RX02 floppy kit)

11/23-BASED MINC

Modules in the Basic System

MNC11F-AA (115 V, 60 Hz) and MNC11F-AB (230 V, 50 Hz)

Processor (KDF11-AB) M8186

With warm floating point instruction set (KEF11-A) and memory management.

Jumper W1 installed	- crystal clock
Jumper W4 removed	- enable event line
Jumper W5 removed	- power-up to 773000 (BDV11)
Jumper W6 installed	- power-up to 773000 (BDV11)
Jumper W7 removed	- enter console ODT on HALT
Jumper W8 installed	- power-up with PC at 173000_8 (bootstrap)

Memory - MSV11-DD (M8044-D)

64K bytes MOS RAM without parity
On-board memory refresh
Jumper configuration

Jumper	Jumper State	Function Implemented
Pin 1 to 3 Pin 1 to 2	IN OUT	Disable memory I/O page options
W2	IN	Enable normal system power (+5 V)
W3	IN	Enable normal system power (+12 V)
W4	OUT	Disable battery power (+12 V)
W5	OUT	Disable battery power (+5 V)
Pin 10 to 14 Pin 16 to 15	IN IN	Select memory size of 64K bytes

MSV11-DD Switch Settings

Switch	Position 1st Module Bank 0–7	Position 2nd Module Bank 10–17	Position 3rd Module Bank 20–27	Position 4th Module Bank 30–37
S-1	ON	ON	OFF	OFF
S-2	ON	OFF	ON	OFF
S-3	ON	ON	ON	ON
S-4	ON	ON	ON	ON
S-5	ON	ON	ON	ON

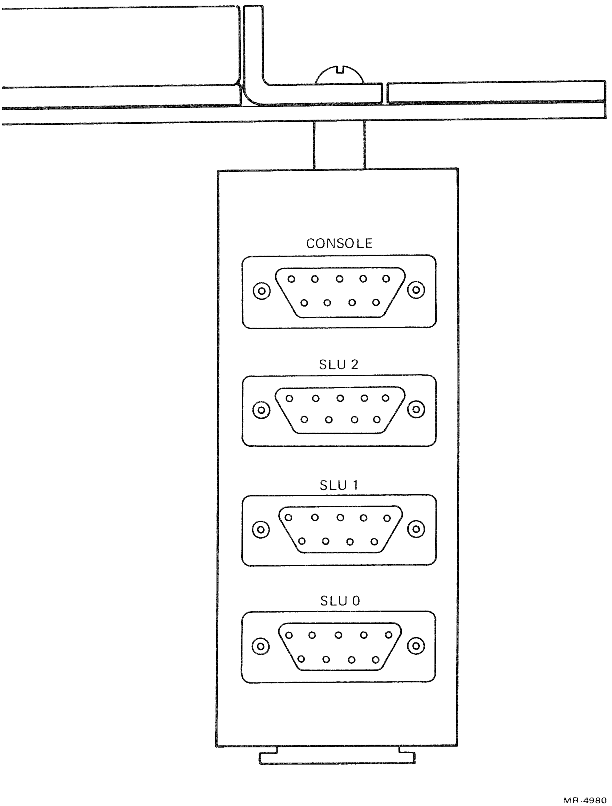
Serial Line Interface - DLV11-J (M8043)

Must be at CS revision "E" or higher.

Number of serial lines: 4

Factory-set address and vector switches

Device	Address	Vector	Baud Rate
Console	777560	60	9600
SLU 2	776520	320	300
SLU 1	776510	310	1200
SLU 0	776500	300	9600



MINC Terminal Distribution Panel

Bus Terminator/Diagnostic/Bootstrap BDV11-A (M8012)

Diagnostic/bootstrap conditions are factory-selected using switch packs.

Switch A (E15)	RXO2 Bootstrap
A1	ON
A2	ON
A3	OFF
A4	OFF
A5	OFF
A6	ON
A7	OFF
A8	OFF

Switch B (E21)	RXO2 Bootstrap
B1	OFF
B2	OFF
B3	OFF
B4	OFF
B5	ON

Floppy Disk Interface – RXV21 (M8029)

					A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	
					1	1	1	1	0	0	1	1	1	1	DEVICE ADDRESS 77717X
					W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	

						V8	V7	V6	V5	V4	V3	V2			
						0	1	0	1	1	0	1			VECTOR 264
						W18	W17	W16	W15	W14	W13	W12			

1= JUMPER IN
0= JUMPER OUT

MR-4893

RXV21 Address and Switch Settings

DECLAB-11/MNC PDP-11/23-BASED SYSTEM

The DECLAB-11/MNC is a real time operating system featuring on-line data storage, and FORTRAN software with graphics, scientific, and laboratory subroutine packages. Each system contains as its main components, an MNC chassis, dual RL01 disk drives, and a terminal (VT105 or LA36). The MNC chassis houses a power supply, CPU, and related modules, and up to eight MNC- series option.

The physical components of the DECLAB system are grouped into two categories: items common to all MNC systems, and those that can be purchased as options, either when the system is first acquired or at some later time as add-ons. Each DECLAB system is configured to boot on power-up and halt on BREAK. The figures and tables that follow describe the modules, specifications, and components.

All DECLAB systems include the following standard items.

Mass storage device containing two RL01 disk drives

MNC chassis (MNCBA) with power supply (H786). This contains:

KDF11-AB	-	LSI-11 processor with memory management, floating point (KEF11-A)
MSV11-DD	-	Memory (128K byte: two modules)
RLV11	-	Controller (disk)
DLV11-J	-	Four-channel serial ASCII interface
IBV11-A	-	IEEE bus interface (optional)
BDV11-A	-	Bus terminator/diagnostic/bootstrap module.

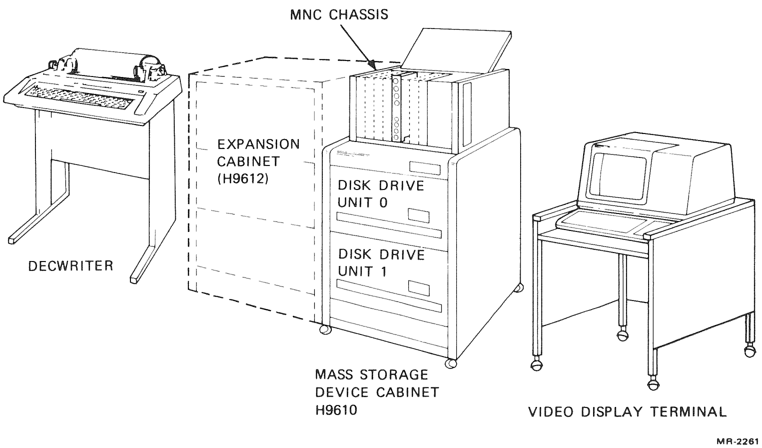
VT105 terminal with built-in graphics capability

DECLAB systems can include some or all of the following lab modules.

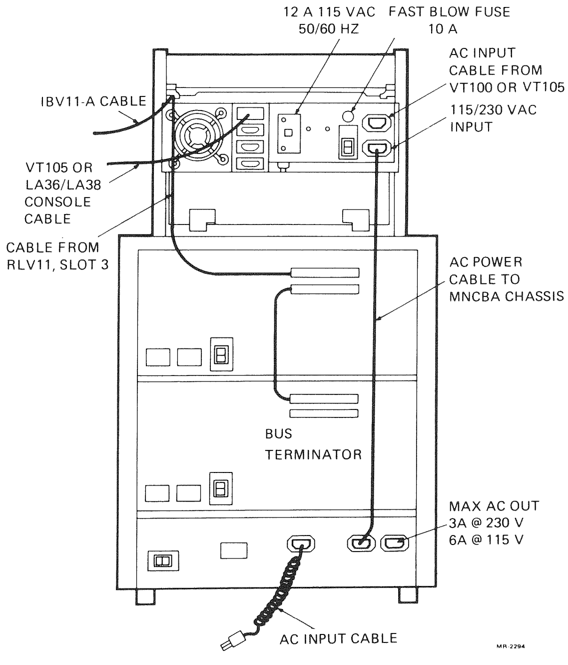
Analog-to-digital converter (MNCAD)
Preamplifier (MNCAG)
Dual multiplexer (MNCAM)
Clock (MNCKW)
Digital-to-analog converter (MNCAA)
Digital input unit (MNCDI)
Digital output unit (MNCDO)

DECLAB systems can also include:

Dot matrix printer (LAV11 + LA180 or LA35)
110 baud, 20 mA serial line interface (DLV11-KC).



DECLAB-11/MNC System with Optional Units

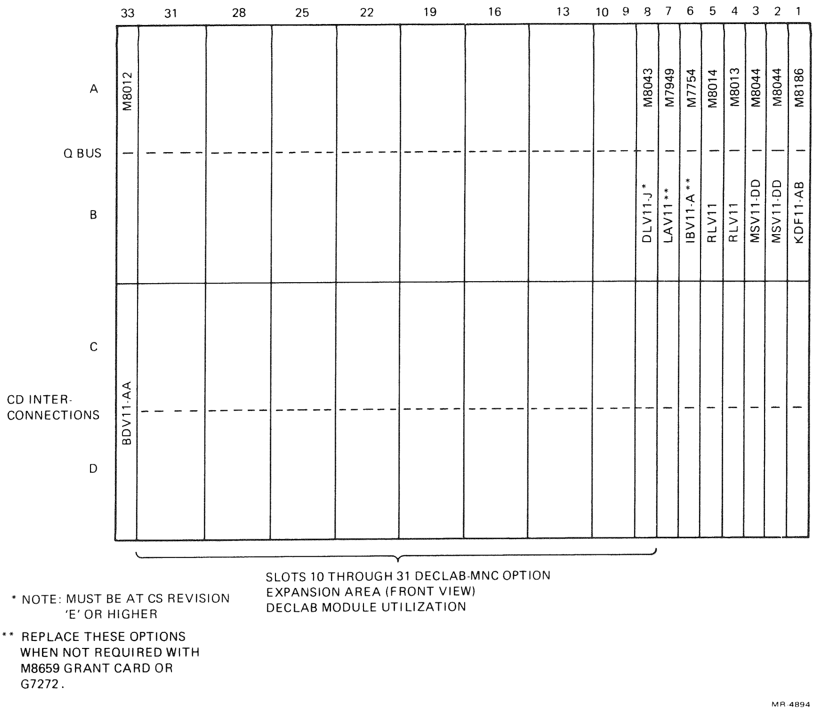


DECLAB-11/MNC Cable Connections

DECLAB-11/MNC System Model Designation

System Requirements	MNCFA -J	-K
Input Power (V)	115	115
Frequency (Hz)	60	60
Cabinet/Power Controller (H9610)	BB/BC	BB/BC
MNC11-	D	D
Chassis (MNCBA)		
KDF11-AB (M8186)	1	1
MSV11D (M8044)	2	2
DLV11-J (M8043)	1	1
IBV11-A (M7954)		
BDV11-A (M8012)	1	1
RLV11- (M8013)	1	1
RLV11- (M8014)	1	1
LAV11-LA180 Printer		
VT105 Terminal		MA
LA36	HE	
RL01 Disk Drive	2	2
QJV35-AR Diagnostic Package (RL01)	1	1
MNC11-F-AD	*	*
MNC11-F-AA	*	*
MNC11-F-AM	*	*
MNC11-F-DI	*	*
MNC11-F-DO	*	*
MNC11-F-KW	*	*
MNC11-F-AG	*	*
Cable Console Interface		
Software Kit (English)	1	1
Blank Control Panel (BNCBL)	**	**
Installation Kit (MNCIK)		

*User's options
**As required to fill MNCFA



PDP-11/23 DECLAB Module Configuration

NOTE

DECLAB-11/MNC option expansion area is to be used only for MNC-series module add-ons. No Qbus add-ons should be installed in this expansion area. No backplane expansion of the MNC system is possible.

System-Level Diagnostics

Two diagnostic chain files are contained on the RL01 diagnostic disk for system troubleshooting. The diagnostic chain MNC11F.CCC provides the required diagnostics for testing the CPU and related modules and MNC-series modules. This program does not test the BDV11 or VT105 options. This chain requires turnaround connectors on SLUs 0, 1, and 2. For detailed operational information, refer to Book 7 of *Working with MINC Devices*, AA-D572A-TC. The contents of file MNC11F.CCC are as follows.

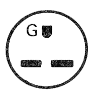
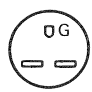
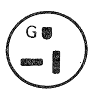
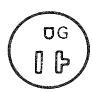
R VMNF??/1	MINC-11 option sizer program
R JKDA??/1	CPU test
R JKDB??/1	Extended instruction set

R JKDC??/1	Floating point instruction set test
R JKDD??/1	Traps test
R VIBB??/1	IBV11 test
R VDLA??/1	DLV11-J test
R VMNC??/1	Clock test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCDO test (digital out)
R VMND??/1	D/A test
R VMNA??/1	A/D test
R ZVTN??/1	VT105 test
R VMNG??/1	Termination program

The second diagnostic chain MNC11F.CCC provides the required diagnostics for performing a quick check of the MNC-series modules only. The contents of file MNC11F.CCC are as follows.

R VMNF??/1	Start-up/sizer program
R VMNC??/1	Floating point instruction set test
R VMNB??/1	MNCDI test
R VMNE??/1	MNCDO test
R VMND??/1	D/A test
R VMNA??/1	A/D test
R VMNG??/1	Termination program

Both programs are stored on the MNC diagnostic disk, Software Distribution Center (SDC) kit no. BA-F018*-MC.

LOCAL POWER	POWER CONTROLLER	
	PLUG	RECEPTACLE
	871-B	
230V 10A 50/60HZ	 NEMA # 6-15P DEC # 90-08853	 6-15R 12-11204
	871-C	
115V 20A 50/60HZ	 HUBBELL # 5366-C DEC # 12-15183	 NEMA # 5-20R 12-12265

MR-5383

DECLAB/MINC and MINC RL01 Add-On Power Requirements

Specifications

	115 V, 50/60 Hz				230 V, 50 Hz			
	Plug		Receptacle		Plug		Receptacle	
Power Connector	NEMA No. 5-15P DEC No. 90-089 38		5-15R 12-05351		NEMA No. 6-15P DEC No. 90-08853		6-15R 12-11204	
	DECLAB/ MNC System*	RL01	VT105	LA36	DECLAB/ MNC System	RL01	VT105	LA36
Amperage								
Typical			3.0				1.5	
Maximum	19	3.5		2.0		2.5		1.0
Wattage								
Typical	500	150	250	160		150	250	160
Maximum	1200	200	300	300		200	300	300
Btu/Hour								
Typical		600		550			600	550
Maximum				1020				1020
Weight								
Kilograms	134	34.02	16.3	46.3	134	34.02	16.3	46.3
Pounds	295	75	36	102	295	75	36	102

*Includes MNCBA chassis with MNC-series module and two RL01 drives.

DECLAB-11/MNC 11/23

Modules Included in the Basic PDP-11/23 System

MNC11F-AA (115 V, 60 Hz) and MNC11F-AB (230 V, 50 Hz)

Processor (KDF11-AB) M8186

With warm floating point instruction set (KEF11-A) and memory management.

Jumper W1 installed	- crystal clock
Jumper W4 removed	- enable event line
Jumper W5 removed Jumper W6 installed	- } power-up to 773000 (BDV11)
Jumper W7 removed	- enter console ODT on HALT
Jumper W8 installed	- power-up with PC at 173000_8 (bootstrap)

Memory – MSV11-DD (M8044)

64K byte MOS RAM (without parity)
On-board memory refresh
Jumper configuration

Jumper	Jumper State	Function Implemented
Pin 1 to 3 Pin 1 to 2	IN OUT	Disable memory I/O page option
W2	IN	Enable normal system power (+5 V)
W3	IN	Enable normal system power (+12 V)
W4	OUT	Disable battery power (+12 V)
W5	OUT	Disable battery power (+5 V)
Pin 10 to 14 Pin 16 to 15	IN IN	Select memory size of 64K bytes

MSV11-DD Switch Settings

Switch	Position 1st Module Bank 0–7	Position 2nd Module Bank 10–17	Position 3rd Module Bank 20–27	Position 4th Module Bank 30–37
S-1	ON	ON	OFF	OFF
S-2	ON	OFF	ON	OFF
S-3	ON	ON	ON	ON
S-4	ON	ON	ON	ON
S-5	ON	ON	ON	ON

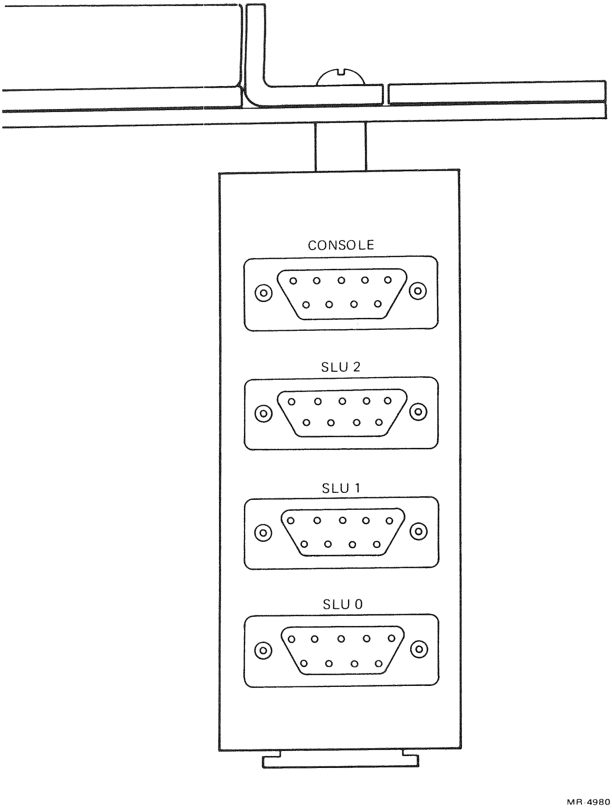
Serial Line Interface - DLV11-J (M8043)

Must be at CS revision "E" or higher.

Number of serial lines: 4

Factory-set address and vector switches

Device	Address	Vector	Baud Rate
Console	777560	60	9600
SLU 2	776520	320	300
SLU 1	776510	310	1200
SLU 0	776500	300	9600



MINC Terminal Distribution Panel

Bus Terminator/Diagnostic/Bootstrap BDV11-A (M8012)

Diagnostic/bootstrap conditions are factory-selected using switch packs.

Switch A (E15)	**RL01 Bootstrap**
A1	ON
A2	ON
A3	OFF
A4	OFF
A5	OFF
A6	OFF
A7	OFF
A7	ON
A8	OFF

Switch B (E21)	**RL01 Bootstrap**
B1	OFF
B2	OFF
B3	OFF
B4	OFF
B5	ON

IEEE Bus Interface – IBV11-A (M7954) optional

Address and vector switch settings:

Address 171420	Vector 420
S2-1, 4 and 5 = ON only	S-1 and 5 = ON only

Disk Interface – RLV11 (M8013, M8014)

Address and vector switch settings as shown in the following.

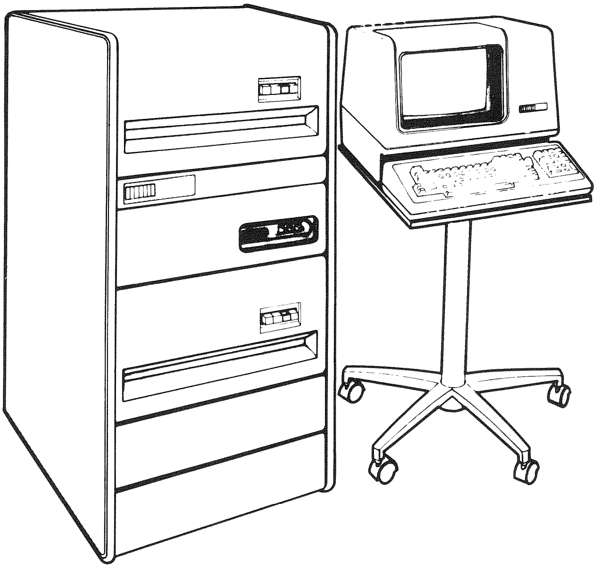
M8014 Switch Settings

Switch	Position	Function
Bus Address (174400)	ON	A12 (MSB)
	ON	A11
	OFF	A10
	OFF	A09
	ON	A08
	OFF	A07
	OFF	A06
	OFF	A05
	OFF	A04
	OFF	A03 (LSB)
Vector Switch (160)	OFF	V8 (MSB)
	OFF	V7
	ON	V6
	ON	V5
	ON	V4
	OFF	V3
	OFF	V2 (LSB)

PDP-11/23-PLUS SYSTEM

GENERAL

The PDP-11/23-PLUS is a high performance microcomputer system used for developing and executing programs for a variety of applications. The system contains a PDP-11/23B microcomputer and two RL02 disks, which are installed in a free-standing console. The system uses RT-11, RSX-11M, RSX-11M PLUS, RSTS/E, or CTS500 software and the DEC/X11 and DLDP+ diagnostic programs. The software provides high-level language program development, foreground/background real-time support, multiprogramming, and equipment monitoring and control. Special bootstrap Read-Only Memory (ROM) initiates the system software when the system is turned on, and it can also automatically test the system.



PDP-11/23-PLUS Computer System

COMPONENTS

PDP-11/23-PLUS System Components

Component	BH	BJ	BK	BL	BM	BN	BP	BR
Operating Voltages	120	240	120	240	120	240	120	240
Memory Size (K bytes)	256	256	512	512	256	256	512	512
PDP-11/23 Box	BC	BD	BE	BF	BC	BJ	BK	BF
KDF11-B M8189	1	1	1	1	1	1	1	1
KEF11-BA CIS*					1	1	1	1
KTF11-AA MMU	1	1	1	1	1	1	1	1
MSV11 M8067	PK	PK	PL	PL	PK	PK	PL	PL
RLV12 M8061	1	1	1	1	1	1	1	1
BC80M-6 Cable	1	1	1	1	1	1	1	1
DZV11-C M7957*					1	1	1	1
BA11-Mounting Box	SA	SB	SA	SB	SA	SB	SA	SB
H403B AC Input Box	1	1	1	1	1	1	1	1
H7861 Power Supply	1	1	1	1	1	1	1	1
H9276 Backplane	1	1	1	1	1	1	1	1
H9642 Console Cabinet	AA	AA	AA	AA	AA	AA	AA	AA
874 Power Controller	A	B	A	B	A	B	A	B
H349 Distribution Panel	1	1	1	1	1	1	1	1
7018261 Cable to KDF11-B	1	1	1	1	1	1	1	1
7018219 Cable to DZV11-C	1	1	1	1	1	1	1	1
RL02-FK	2	2	2	2	2	2	2	2
BC21Z-8	1	1	1	1	1	1	1	1

*Options available

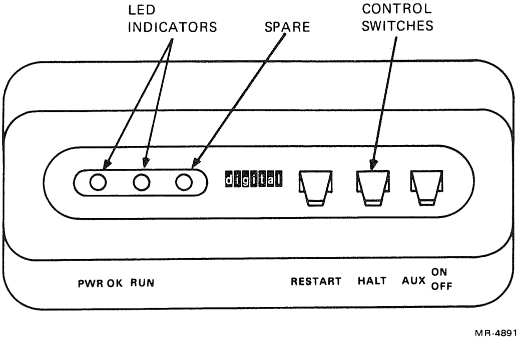
Optional Terminals

Users of the PDP-11/23-PLUS system have the following terminal options.

- VT100 Video Terminal
- VT102 Video Terminal
- LA120 DECwriter III

PDP-11/23-PLUS Operator Switch Panel

The operator switch panel, located on the front of the console, provides a communication link between the operator and the system. The switch functions are defined in the following table.



Front Panel Switches and Indicators

Switch	Position	Function
AUX ON/OFF	OFF	In the normal factory configuration, this removes ac power from the system.
	ON	In the normal factory configuration, this applies ac power to the system. If the HALT switch is up, the system is automatically booted.
HALT	Up (Enable)	This enables the processor to run.
	Down (Halt)	This halts the processor, which will respond to console ODT commands. Refer to the *Microcomputer Processor Handbook*, EB-18451-20, for ODT instructions.
RESTART	Restart (Momentary Switch)	When this switch is activated and the HALT switch is up, the processor carries out a power-up sequence and displays the bootstrap dialog as: TESTING MEMORY 0256.KW MEMORY START ? DL0<CR>

PDP-11/23-PLUS

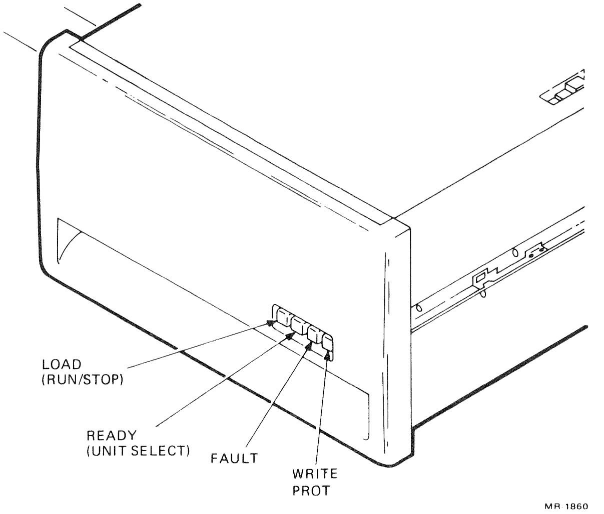
The PDP-11/23-PLUS switch panel also contains two indicators that provide the following information.

LED	Function
PWR OK	This LED is on when the processor is generating the proper dc output voltages.
RUN	This LED is on when the processor is operating; the LED goes off when the processor is not executing instructions.

RL02 Disk Drives

The RL02 disk drive is a random-access mass storage device with a removable, top-loading disk cartridge. A lift-up cover provides access to the disk. The RL02 has four indicators on its front panel.

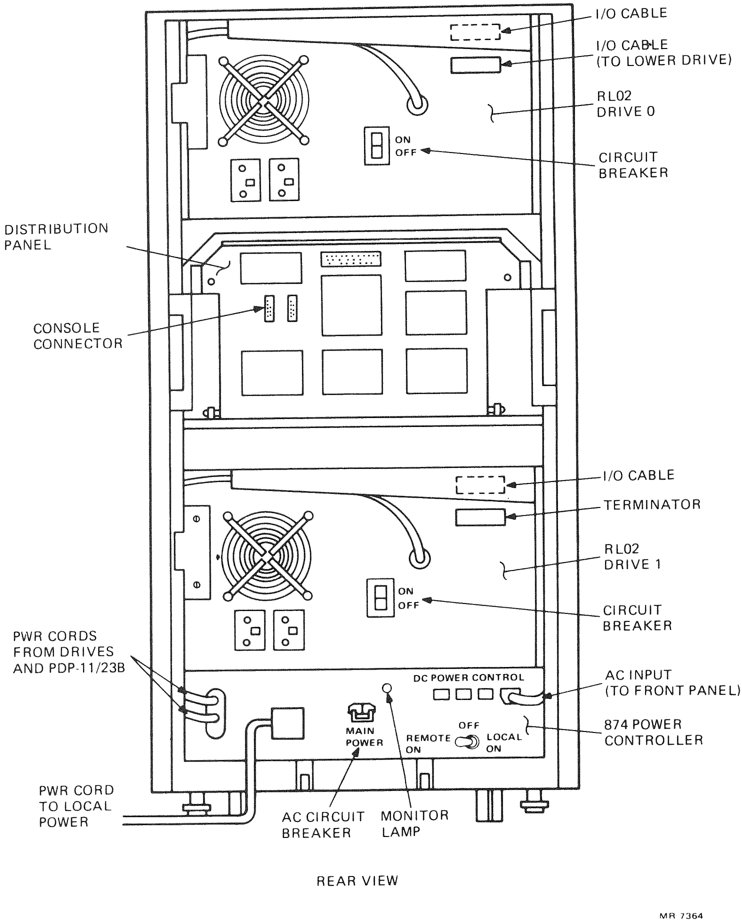
Indicator	Function
LOAD (Push Button)	This indicator lights to indicate that the spindle has stopped and a cartridge may be loaded.
UNIT SELECT (READY)	This indicator lights to indicate that drive 0 or 1 is ready to read, write, or receive controller commands.
FAULT	This indicator lights to indicate that a drive error condition exists.
WRITE PROT (Push Button)	This indicator lights to indicate that the currently mounted cartridge is protected from having data written on it.



RL02 Disk Drive (Front View)

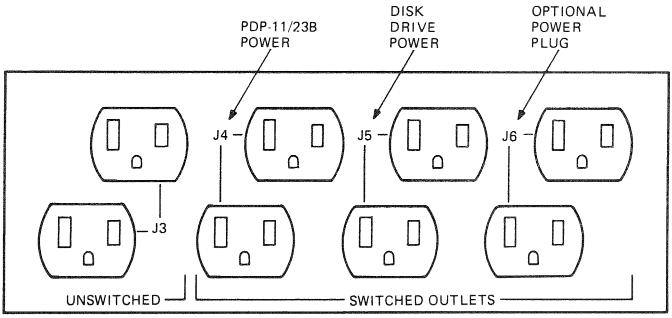
Subsystem Components

The PDP-11/23-PLUS components are accessible when the back panel is removed (see the following figure).



PDP-11/23-PLUS System (Rear Panel Removed)

Power Controller – The 874 power controller is located on the rear base of the console cabinet. The front view shows the receptacles for providing power to the subsystem components. There are three models of the power controller.



874 Power Controller (Front View)

LOCAL POWER	POWER CONTROLLER	
	PLUG	RECEPTACLE
	874A*	
120V 15A 50/60HZ	 NEMA # 5-15P DEC # 90-08938	 5-15R 12-14899
	874B**	
240V 10A 50/60HZ	 NEMA # 6-15P DEC # 90-08853	 6-15R 12-11204
	874C**	
120V 20A 50/60HZ	 HUBBELL # 5366-C DEC # 12-15183	 NEMA # 5-20R 12-12265

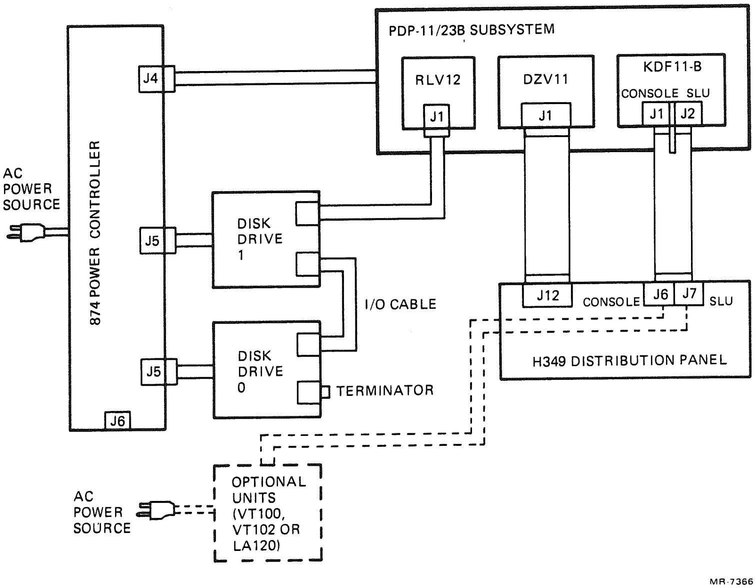
* NONEXPANDABLE SINGLE BOX SYSTEM
** EXPANDABLE BOX SYSTEM

MR-7381

PDP-11/23 PLUS Power Connectors

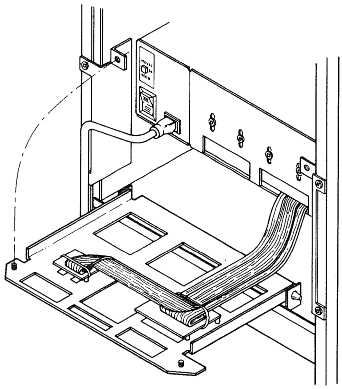
874 Power Controllers

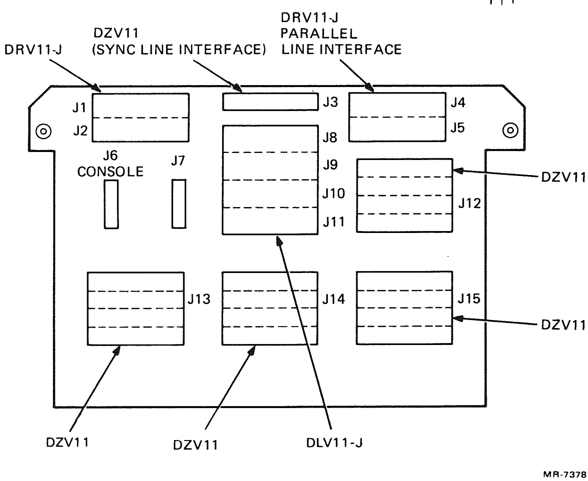
Models	874-A	874-B	874-C
Input power VAC Frequency Current	120 50/60 12 A	240 50/60 8 A	120 50/60 16 A



Subsystem Interconnections

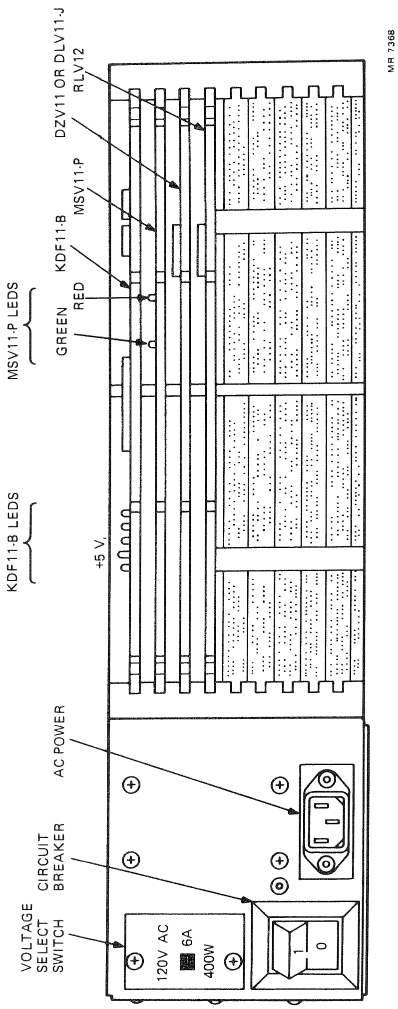
Distribution Panel – The H349 distribution panel is accessible from the rear of the system. The panel allows easy interconnections when interfacing peripheral equipment. The panel is secured by two captive screws, and the bottom is hinged to allow access to the PDP-11/23B microcomputer.





H349 Distribution Panel

PDP-11/23B Microcomputer – The microcomputer is accessible by dropping the distribution panel. The microcomputer uses the BA11-S box and contains the LSI-11 type modules.

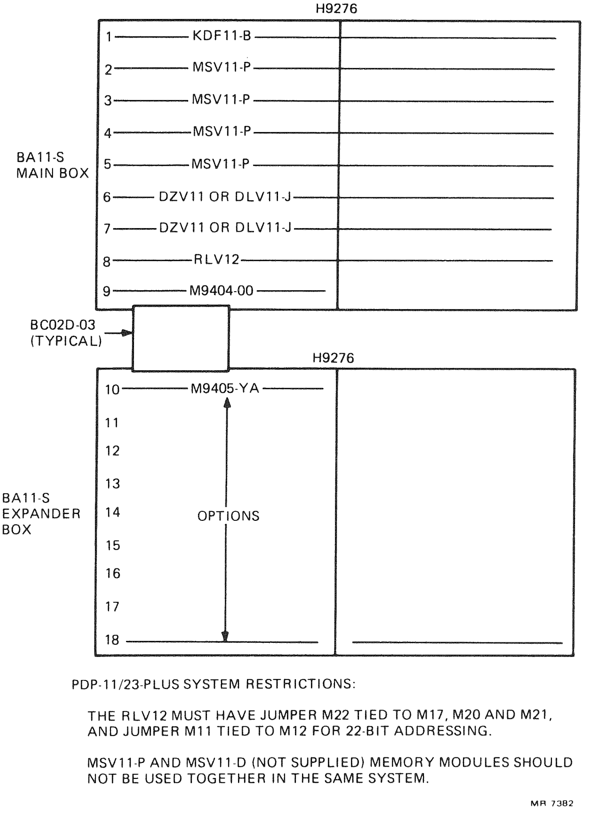


PDP-11/23B Subsystem (Rear View)

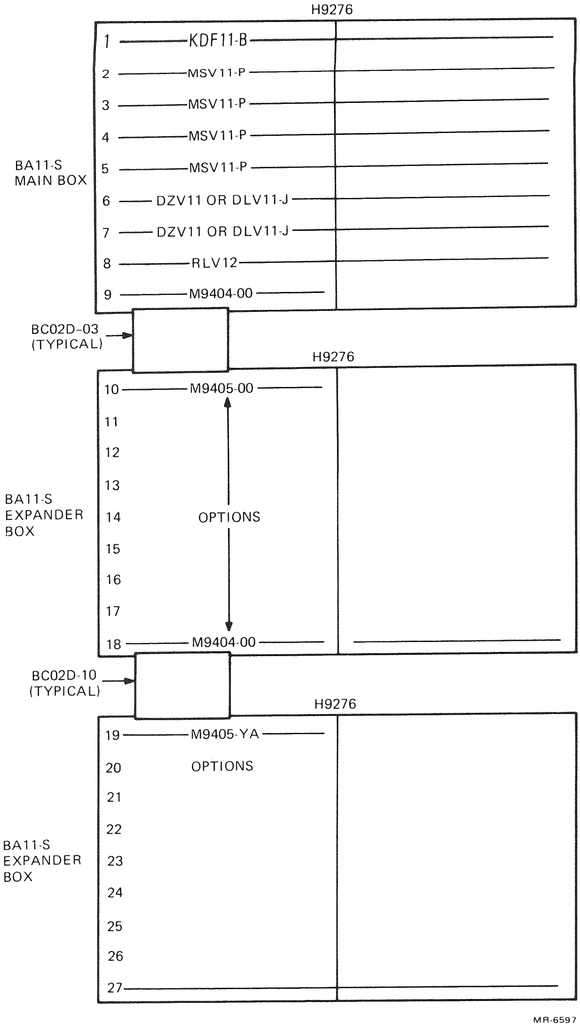
Expansion – The PDP-11/23-PLUS is expanded by adding a BA11-SC (120 V) expander box and a BC02D-03 expander cable. The cable plugs into the last slot of the computer backplane and the first slot of the expander box. Optional modules can be added, up to the capacity of the space or power supply as shown in the following figures.

NOTE

The 874-C power controller must be used with PDP-11/23-PLUS systems.



PDP-11/23-PLUS System (H9276) Two Q/CD Backplane Configuration

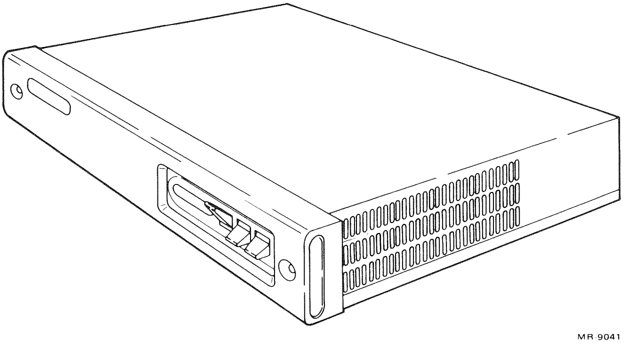


PDP-11/23-PLUS System Three Backplane Configuration

PDP-11/23S SYSTEM

GENERAL

The PDP-11/23S is a general purpose Q18 LSI-11 system unit enclosed in an BA11-M mounting box. This system contains the KDF11-B CPU (M8189) and either an MCV11-DC CMOS RAM or an MSV11-DD RAM. The PDP-11/23S has an H780 A/B power supply and an H9270 backplane. Also offered as a part of the PDP-11/23S system is an H3012 filter connector panel (distribution) in back of the system unit. This connector accepts the three different kinds of filter connector assemblies which are provided with each option to filter RF noise before exiting the enclosure.



PDP-11/23S System

PDP-11/23S

System Variations

PDP-11/23 SE/SF Components

- BA11-MH/MJ mounting box
- H780 A/B power supply
- KDF11-B CPU (M8189) with SLUs cable and filter connector assembly
- MSV11-DD MOS RAM (64K bytes)
- H3012 filter connector panel

PDP-11/23 SC/SD Components

- BA11-MH/MJ mounting box
- H780 A/B power supply
- KDF11-B CPU (M8189) with two SLUs cable and filter connector assembly
- MCV11-DC CMOS RAM (32K bytes)
- H3012 filter connector panel

PDP-11/23S Operator Switch Panel

The operator switch functions are defined in the following table.

PDP-11/23S System Components

Component	11/23-SE	11/23-SF	11/23-SC	11/23-SD
BA11-MH/MJ Mounting Box	1	1	1	1
H780-A/B P/S	1	1	1	1
Operators Console	1	1	1	1
H9270 4 × 4 Backplane (Q18)	1	1	1	1
H3012 Filter Connector Panel	1	1	1	1
KDF11-B (M8189) CPU	1	1	1	1
MSV11-DD MOS RAM (64K)	1	1	–	–
MCV11-CD CMOS RAM (32K)	–	–	1	1
H3012 Distribution Panel	1	1	1	1

KDF11-B PROCESSOR MODULE (CPU) (M8189)

Features of the KDF11-B processor module include a central processor, memory management unit (MMU), line frequency clock, bootstrap and diagnostic ROM, and two serial line units.

The module supports up to 256K of memory using the H9270 Q18 backplane and will support (Q22) extended 22-bit backplanes.

Features

KDF11-AA Compatible CPU (M8186)

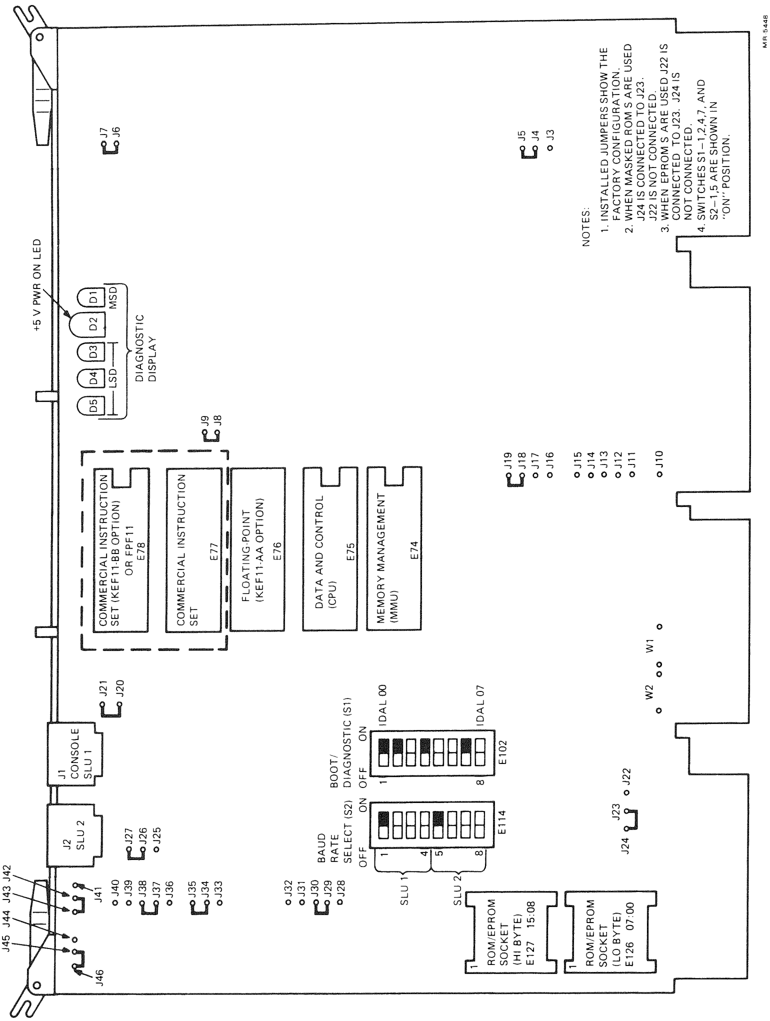
- Instruction set with over 400 instructions
- Four-level vectored interrupts
- 16-bit word or 8-bit byte addressable locations
- Multiple general purpose registers
- Stack processing
- Direct memory access (DMA)
- Power-fail/auto restart hardware
- 18-bit ODT console emulator

KDF11-AA Compatible Memory Management

- 18- or 22-bit address
- Kernel and user modes only (no supervisor mode)
- I space only (no D-space)
- Optional floating-point instruction set
- Optional commercial instruction set
- Onboard peripherals
- Line frequency clock (Enable/Disable)
- Bootstrap and diagnostic
- Console serial line unit
- Second serial line unit
- Extended LSI-11 bus interface (rows A and B)

NOTE

Interrupt and DMA latencies assume a KDF11-BA with memory management enabled and using MSV11-P memory.



KDF11-B Processor Module

KDF11-B Factory Set Switch Configurations

Bootstrap/Diagnostic Factory Switch Configuration

Switch S1	(E102) Position	Function
1	ON	Execute CPU diagnostic
2	ON	Execute memory diagnostic
3	OFF	DECnet boot disable
4	ON	Console test and dialog
5	OFF	
6	OFF	
7	ON	RL02 bootstrap program
8	OFF	

KDF11-B SLU Baud Rate Factory Switch Configuration

Switch S2	(E114) Position	Function
1	ON	
2	OFF	Console SLU set for 9600 baud
3	OFF	
4	OFF	
5	ON	
6	OFF	
7	OFF	Second SLU set for 9600 baud
8	OFF	

NOTE

Power-up or restart of the KDF11-B will execute the CPU diagnostic and the memory diagnostic, followed by the console tests after switch S1 is placed in the position as shown. If the operator wishes to terminate the memory diagnostic and immediately enter the console test, the <CTRL>C keys must be pressed on the console terminal.

KDF11-B LED INDICATORS

The KDF11-BA ROM programs use four red LEDs to indicate which programs and program segments are running. If the program performs an error halt or hangs up waiting for data from a peripheral device, these LEDs operate as error indicators.

The four red LEDs represent an octal number from 0 (all LEDs OFF) to 17 (all LEDs ON). The following table lists the type of error associated with their octal number.

KDF11-B LED Indicators

Display (Octal)	MSD Bit 3	Bit 2	LSD Bit 1	Bit 0	Type of Error
1	OFF	OFF	OFF	ON	CPU test error
02	OFF	OFF	ON	OFF	Memory test error
03	OFF	OFF	ON	ON	Waiting for console terminal transmitter ready flag.
04	OFF	ON	OFF	OFF	Waiting for console terminal receiver done flag.
05	OFF	ON	OFF	ON	Load device status error
06	OFF	ON	ON	OFF	Bootstrap code incorrect
07	OFF	ON	ON	ON	DECnet waiting for a response from host.
10	ON	OFF	OFF	OFF	DECnet waiting for a message from host.
11	ON	OFF	OFF	ON	DECnet processing received the message.
12	ON	OFF	ON	OFF	ROM bootstrap error (not used on KDF11-B).
13	ON	OFF	ON	ON	Special memory test failure on locations 0–6 (memory test may be disabled).
17	ON	ON	ON	ON	System hung, halt switch on, or not in power-up mode 2.

NOTE

The errors indicated in the above table are valid ONLY if the KDF11-BA BDV ROMs (part nos. 23-339E2-00 and 23-340E2-00 are installed in ROM sockets E126 (low byte) and E127 (high byte).

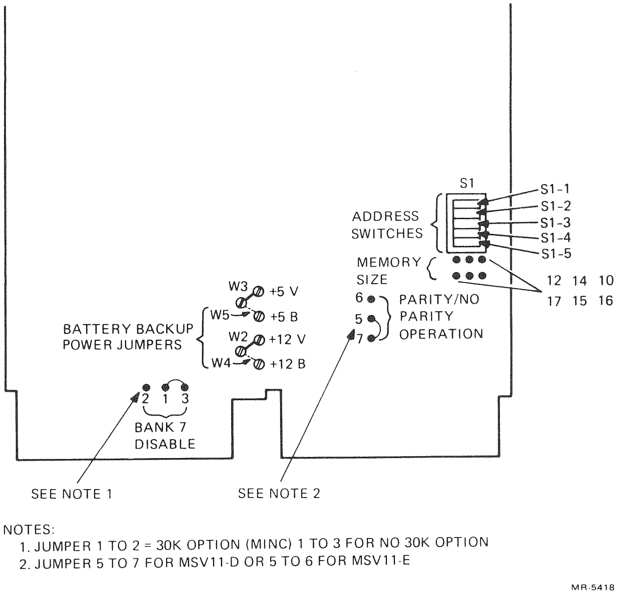
MSV11-D MOS RAM MEMORY

The MSV11-D (M8044-D) is a dual-height MOS RAM memory with 64K bytes of address space. Each MSV11-D memory used in the PDP-11/23S system normally reserves the upper 8K for peripheral devices and register addresses, therefore, each MSV11-D memory contains 57K of usable data addressing space.

MSV11-D Options

Model	Memory Capacity (1)	Module	2 Parity Bits
MSV11-DD	64K bytes by 16 bits	M8044-DA	No
MSV11-ED	64K bytes by 18 bits	M8045-DA	Yes

MSV11-D/E Jumpers and Switches



MSV11-D MOS RAM Jumpers

The following table lists the jumper configurations used on the MCV11-CD for the PDP-11/23S system.

Jumper and Switch Configurations for the PDP-11/23S System

Jumper/Switch	State	Function
Pin 1 to 3	IN	(not using the 30K MINC option)
Pin 1 to 2	OUT	(not using the 30K MINC option)
W2	IN	Enable normal +5 V system power
W3	IN	Enable normal +12 V system power
W4	OUT	Disable +12 V battery power
W5	OUT	Disable +5 V battery power
Pin 5 to 7	IN	Disable parity
Pin 5 to 6	OUT	Parity not selected
Pin 10 to 14	IN	
Pin 15 to 16	IN	Select memory range of 64K bytes
Switch S1-1	ON	
Switch S1-2	ON	PDP-11/23S
Switch S1-3	ON	Selected starting address 0
Switch S1-4	ON	
Switch S1-5	ON	

MSV11-D, MSV11-E Summary Table of Addressing Switches

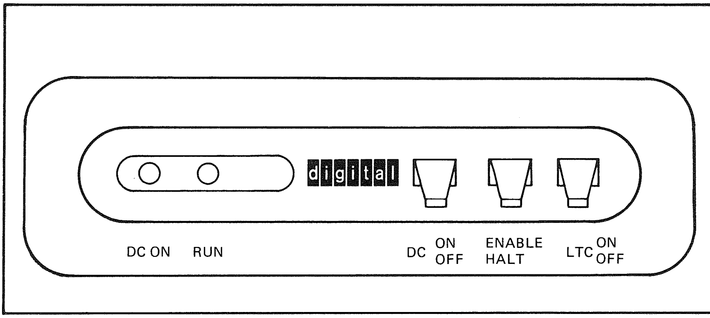
Starting Address	S1-1	S1-2	S1-3	S1-4	S1-5	MSV11-ED/MSV11-DD Memory Banks Selected
0	ON	ON	ON	ON	ON	0–7
20000	ON	ON	ON	ON	OFF	1–10
40000	ON	ON	ON	OFF	ON	2–11
60000	ON	ON	ON	OFF	OFF	3–12
100000	ON	ON	OFF	ON	ON	4–13
120000	ON	ON	OFF	ON	OFF	5–14
140000	ON	ON	OFF	OFF	ON	6–15
160000	ON	ON	OFF	OFF	OFF	7–16
200000	ON	OFF	ON	ON	ON	10–17
220000	ON	OFF	ON	ON	OFF	11–20
240000	ON	OFF	ON	OFF	ON	12–21
260000	ON	OFF	ON	OFF	OFF	13–22
300000	ON	OFF	OFF	ON	ON	14–23
320000	ON	OFF	OFF	ON	OFF	15–24
340000	ON	OFF	OFF	OFF	ON	16–25
360000	ON	OFF	OFF	OFF	OFF	17–26
400000	OFF	ON	ON	ON	ON	20–27
420000	OFF	ON	ON	ON	OFF	21–30
440000	OFF	ON	ON	OFF	ON	22–31
460000	OFF	ON	ON	OFF	OFF	23–32
500000	OFF	ON	OFF	ON	ON	24–33
520000	OFF	ON	OFF	ON	OFF	25–34
540000	OFF	ON	OFF	OFF	ON	26–35
560000	OFF	ON	OFF	OFF	OFF	27–36
600000	OFF	OFF	ON	ON	ON	27–36
620000	OFF	OFF	ON	ON	OFF	30–37
640000	OFF	ON	ON	OFF	ON	X
660000	OFF	OFF	ON	OFF	OFF	X
700000	OFF	OFF	OFF	ON	ON	X
720000	OFF	OFF	OFF	ON	OFF	X
740000	OFF	OFF	OFF	OFF	ON	X
760000	OFF	OFF	OFF	OFF	OFF	X

Standard MSV11-D and MSV11-E Jumper Configurations

Models	Jumpers (Two) Memory Range Pins	Memory Select Pins
MSV11-DA-EA	From 17 to 15	From 17 to 14
MSV11-DB,-EB	From 17 to 15	From 12 to 14
MSV11-DC,-ED	From 16 to 15	From 16 to 14
MSV11-DD,-ED	From 16 to 15	From 10 to 14

PDP 11/23S/BA11-M Operator Control Panel Switches and Indicators

Switch	Position	Function
DC ON/OFF	OFF	In the normal factory configuration setting, this switch OFF removes the dc voltage from the system.
	ON	Setting this switch ON allows dc power to be applied to the system. If the halt switch is also enabled (up), the system will automatically boot up the system.
HALT	UP (Enable)	Puts the processor in the run state.
	DOWN	The processor halts and responds to console ODT commands. Refer to the *Microcomputer Processor and Memories Handbook* for ODT commands.
LTC ON/OFF	ON	When switch is up (ON), the processor carries out normal system line time clock operations between the power supply and the processor.
	OFF	When down (OFF) the internal line time clock operations are disabled; for example when XXDP+ diagnostics are run.
LED Indicators		**Function**
DC ON		This LED is lit when the correct dc output voltage is being supplied.
RUN		This LED is lit when the processor is operating; the LED goes off when the processor is not executing instructions.



MR-12947

PDP-11/23S Switches and Indicators

	A B	C D
1	PDP-11/23-S (KDF11-B) CPU	
2	OPTION (1)	MSV11-DD OR MCV11-DC
3	OPTION (2)	OPTION (3)
4	OPTION (5)	OPTION (4)

MR-9030

PDP-11/23S Backplane Option Slots

EXPANSION RULES

The H9270 backplane used in the PDP-11/23S system enclosure is generally used in a single backplane configuration, due to the bus loading requirements. The following rules apply only to the single backplane configuration.

1. The LSI-H9270 backplane can accept modules that have up to a total of 20 ac loads before an additional termination is required. The processor has on-board termination for one end of the bus. If more than 12 ac loads are included, the other end of the bus must be terminated with 120 ohms.

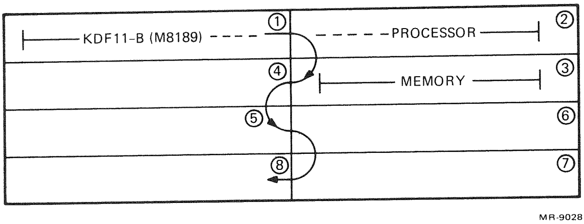
2. A terminated bus can accept modules having up to a total 20 ac loads.

3. The bus can accept modules with up to a total of 20 dc loads.

4. The bus signal lines on the backplane can be up to 35.6 cm (14 inches) long.

PDP-11/23S

A single backplane configuration diagram is shown in the following figure.



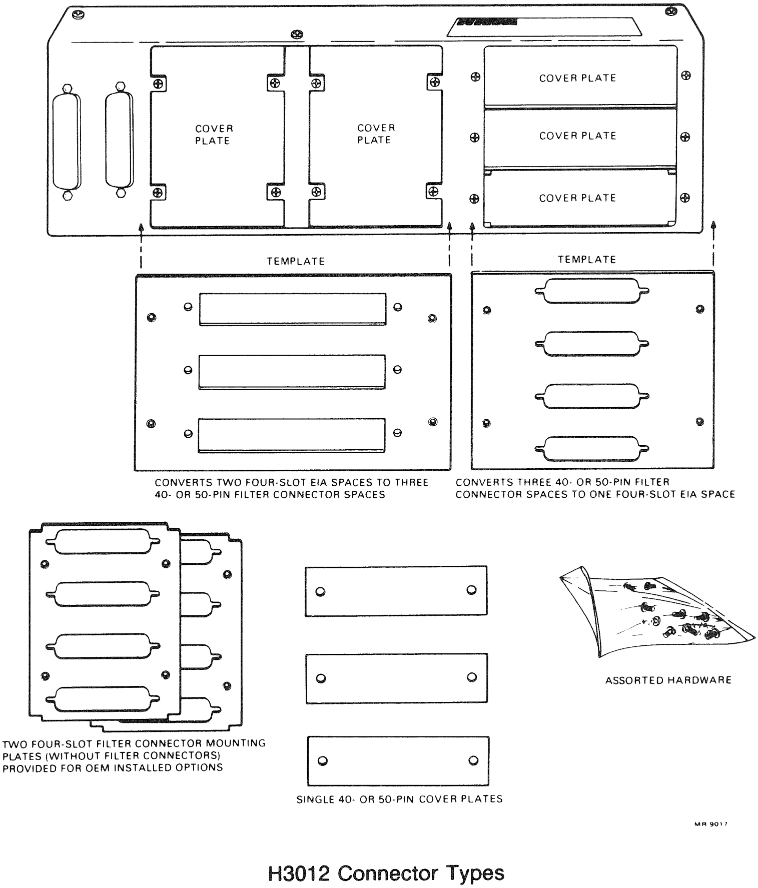
Daisy-Chained Priority

Daisy-Chain Priority
Signals normally move through option modules until they reach the requesting device. The example shown uses the CPU in slots 1 and 2 and memory in slot 3. The CPU module is the first module to receive the daisy-chained signals in slot 1, therefore, the CPU has the first priority. Five dual-height options can be installed in the backplane of this PDP-11/23S computing device after the memory option is installed.

NOTE

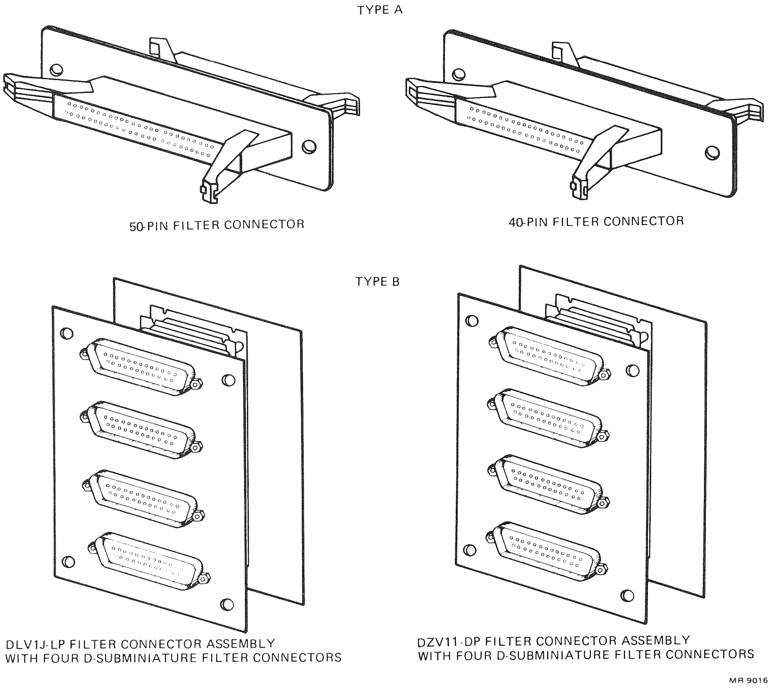
Any unused backplane slot that is followed by a quad-height module option must have either a G7272 or M8659 grant card installed in it to pass on continuity.

H3012 Cabinet Kit Assemblies
The H3012 filter connector panel, filter connector assemblies, and option cables make up the cabinet kit. Each panel is designed to accommodate three types of filter connector assemblies for FCC emission integrity. The next figure shows an empty H3012 cabinet kit with the various kinds of adaptor plates.



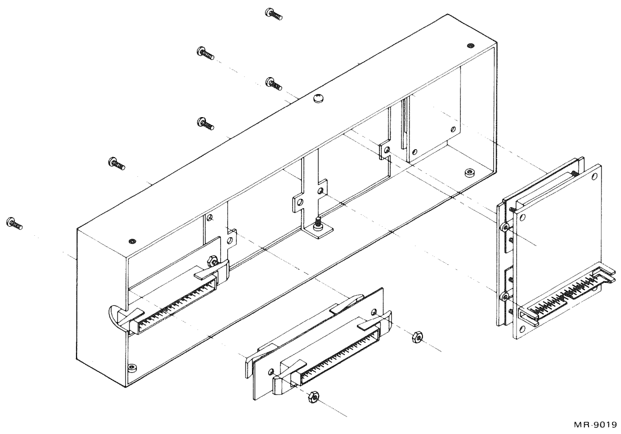
H3012 Connector Types

The figure below shows the types of filter assemblies used with the PDP-11/23S.



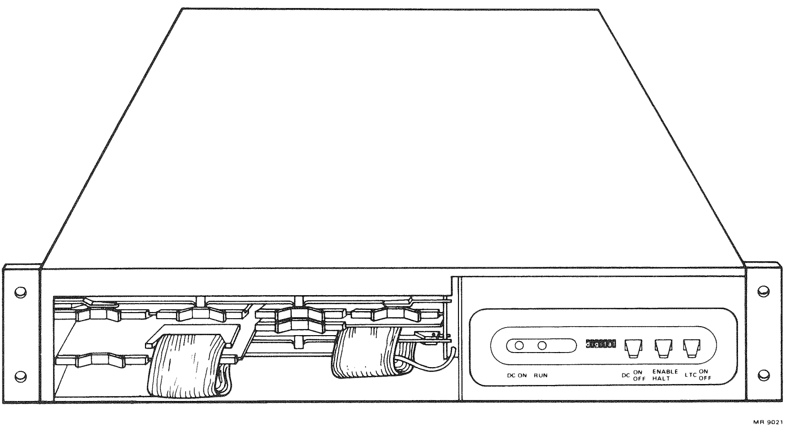
H3012 Subassemblies

The following figure shows how to mount the various kinds of filter connectors onto the H3012 panel.

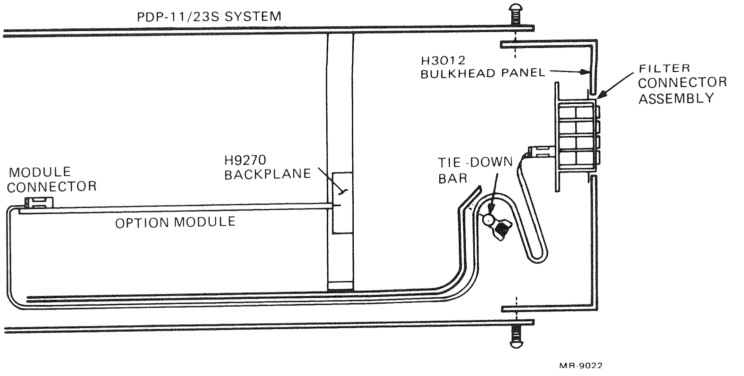


Connector Mounting

Figures showing how modules are installed in the PDP-11/23S/BA11-M system enclosure and how the cables are attached to the rear panel are shown below.



Module Loading



H3012 Panel to Module Option Cabling

PDP-11/23 PLUS, MICRO/PDP-11 AND Micro/VAX EXPANSION

GENERAL

To configure an LSI-11 system, follow the steps listed below.

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-11/23 PLUS uses KDF11-B).

3. Select additional memory, interfaces, 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. Enter the option names and numbers, the ac and dc loads, the power consumption, and the cable numbers. 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.

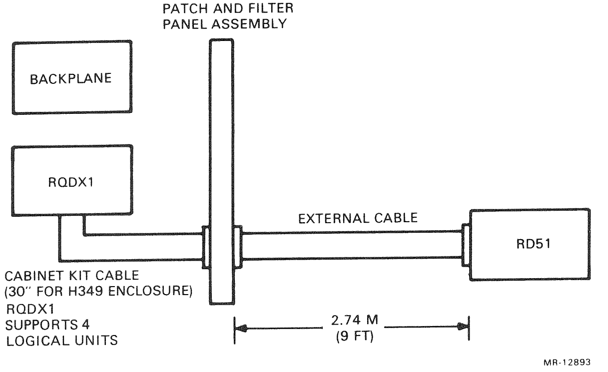
EXPANSION

Expansion

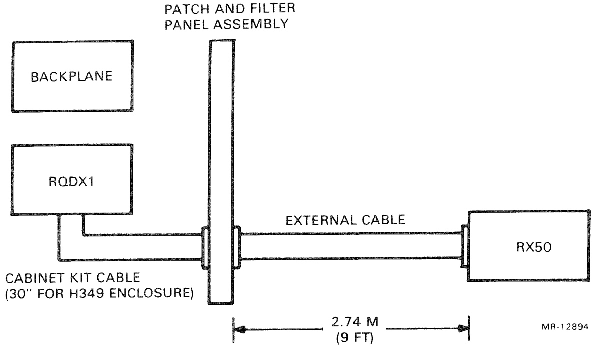
The following examples of system unit expansion show some of the ways system units can be enhanced by a variety of media products.

Each RQDX1 controller can support up to four logical system units:

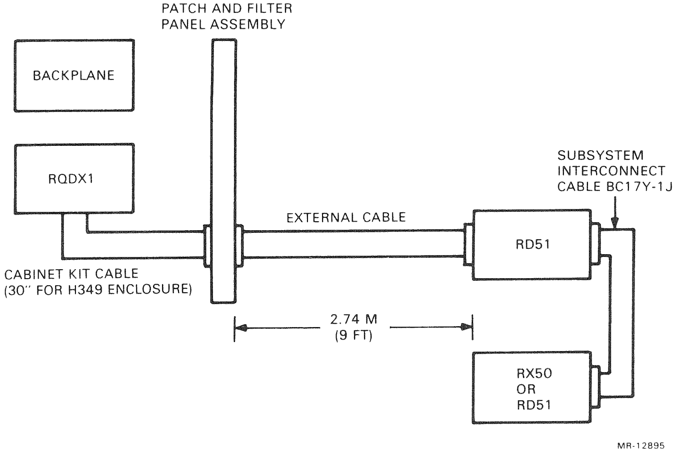
RX50= 2 logical units
RD51= 1 logical unit
RD52= 1 logical unit



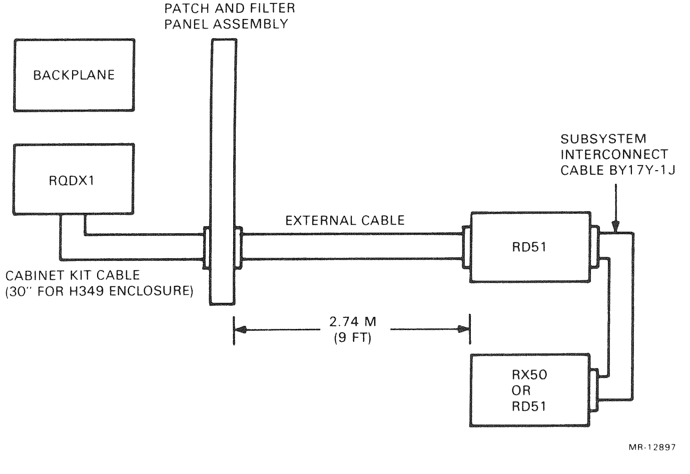
Single Expansion Configuration



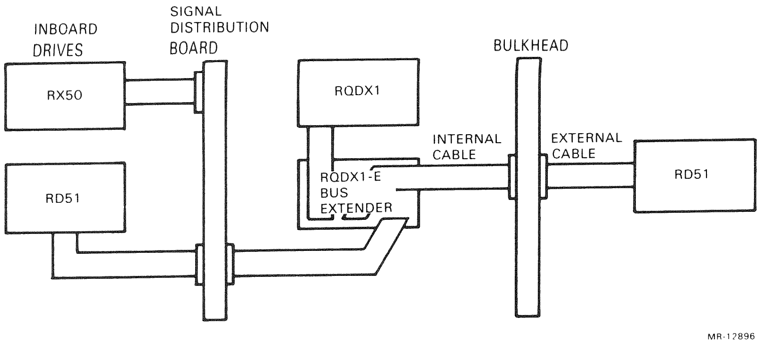
Single Expansion Configuration



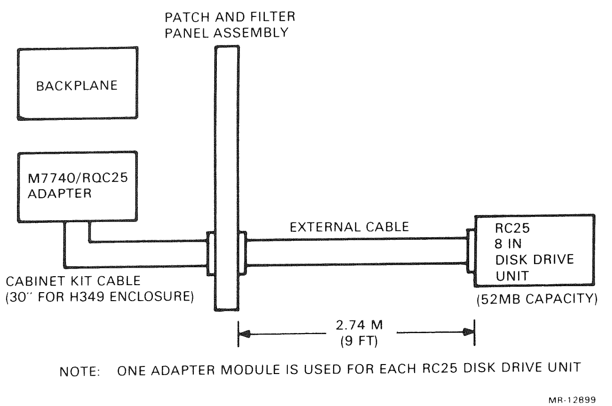
Double Expansion Configuration



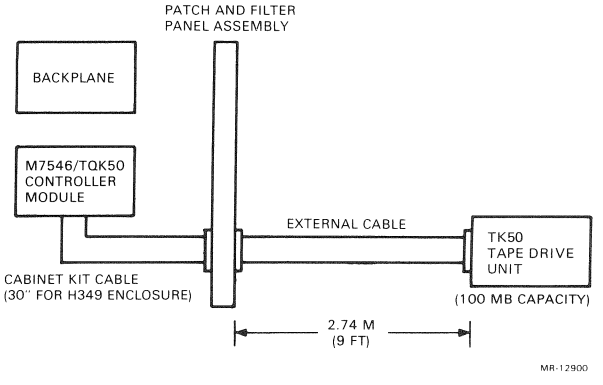
Double Expansion Configuration



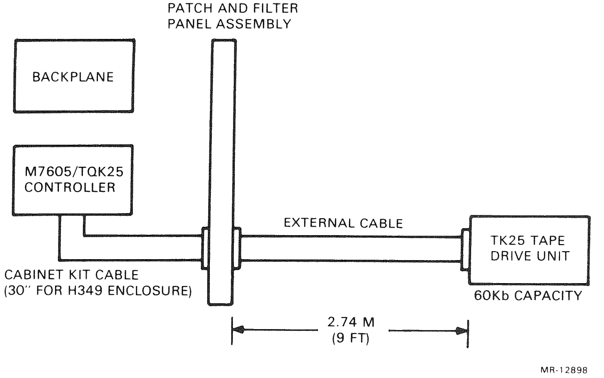
Maximum Expansion Configuration



Eight-Inch Disk Drive Expansion



Tape Drive Expansion



Tape Drive Expansion

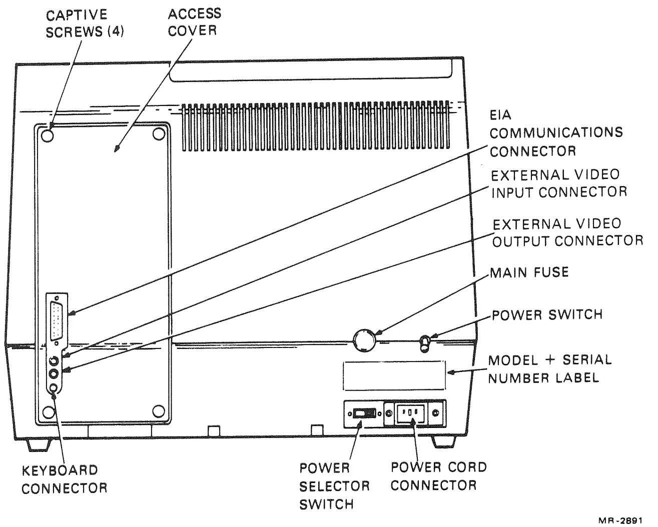
VT103 LSI-11 VIDEO TERMINAL

GENERAL

A complete and powerful microcomputer system can be configured using the VT103. By selecting an LSI-11 processor module, memory module, a serial line interface, I/O devices, and interconnection hardware, you can build a system to meet your application. The VT103 backplane provides communication paths between system components. Access to the backplane is shown in the following figure.

VT103 Power Supply Requirements

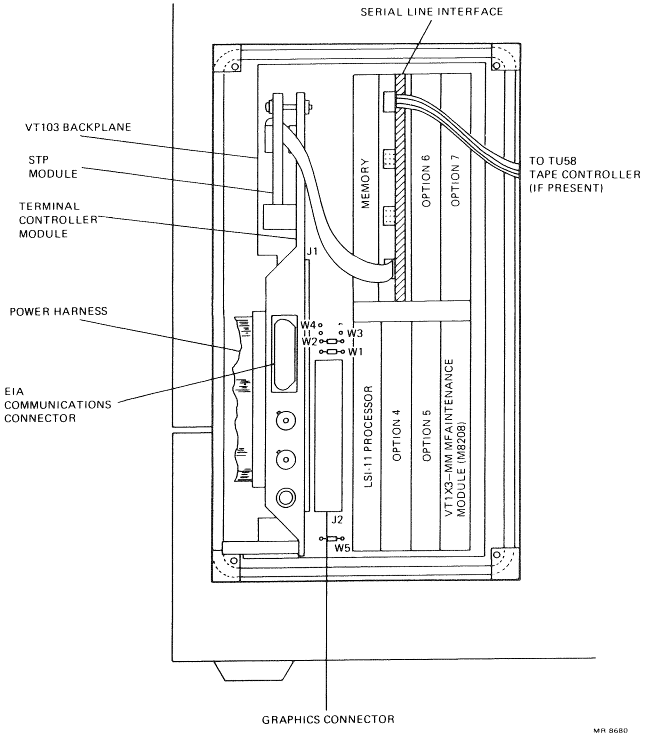
Voltage	Current	Monitor	Basic Video	Adv Video	TU58
+5 V	16.0 A	0	2.5 A	1.1 A	0.75 A
+12 V	5.0 A	1.0 A	0.6 A	0	0.6 A (1.0 A spike on tape startup)
−12 V	0.5 A				
−23 V	0.01 A				



VT103 Rear View

LSI-11 BACKPLANE

The VT103 contains the LSI-11 backplane and the terminal controller module. The following figure shows the physical arrangement behind the access cover.



VT103 LSI-11 Backplane (H9274)

CONFIGURATION

There are five jumper wires on the backplane that are used to configure the system.

Jumper Configuration

Jumper	Jumper State	Function
W1, W2, W5	I	Factory configured; do not change.
W3	R	Factory configured; do not change.
W4	R	If installed, enables LTC by connecting pin 14 to the backplane.

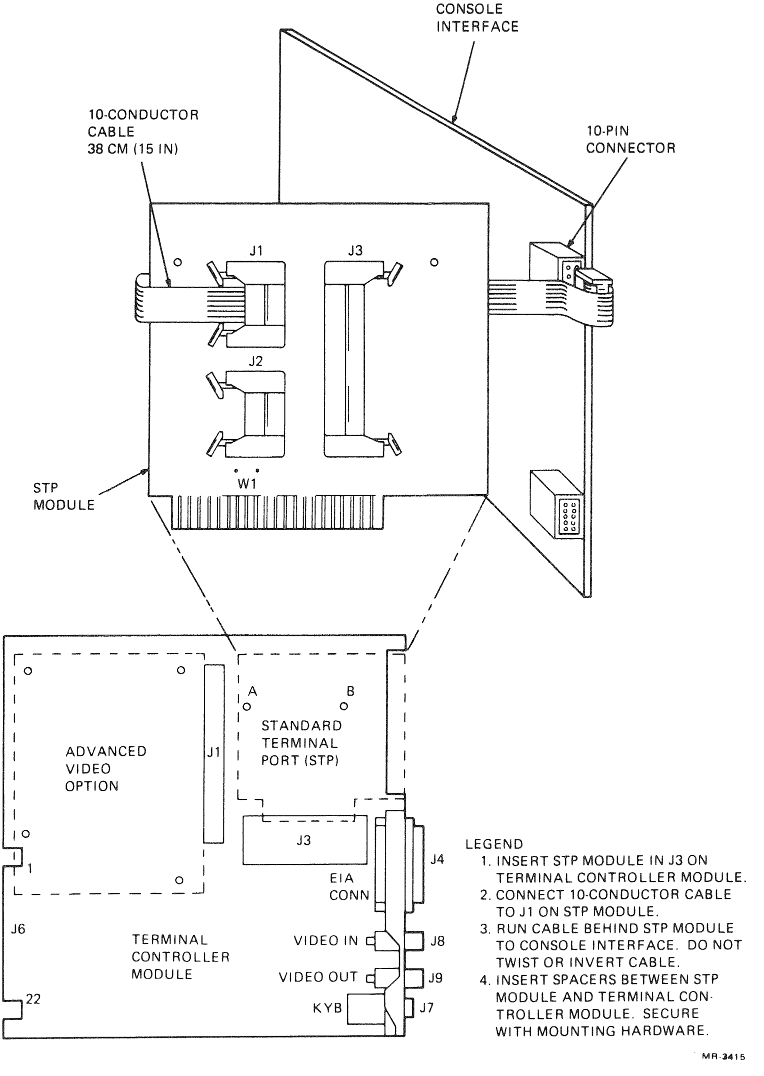
LTC Interrupt

Line time clock (LTC) interrupts can be enabled to the backplane by wire-wrap jumper W4. This jumper is not factory installed in the VT103. LTC interrupts occur at the line frequency of the ac supply to the VT103.

STANDARD TERMINAL PORT

The standard terminal port (STP) connector card provides internal connectors for communication line interfaces. You install this module in the STP connector on the terminal controller module, shown below. This module intercepts the communications path between the terminal controller module and the EIA connector at the rear of the terminal. The STP module has two 10-pin connectors (J1 and J2) and one 40-pin connector (J3).

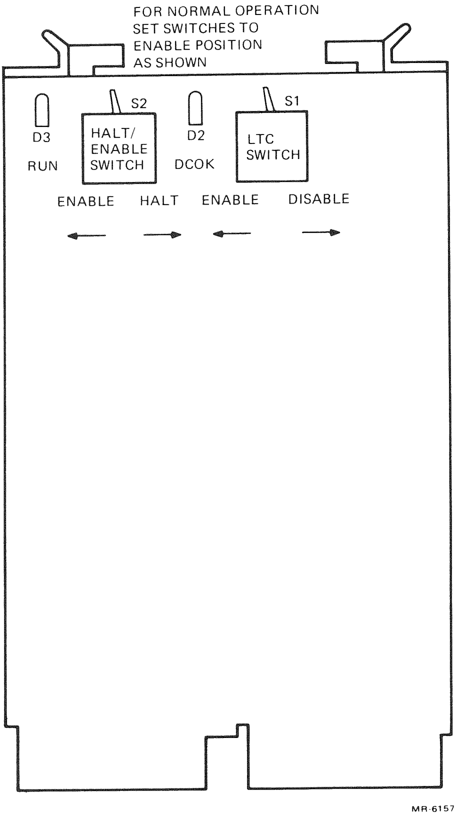
J1 connects to the console device interface, which must also contain a 10-pin connector. J2 connects a second serial port to the terminal controller module. The second port is then connected through the terminal controller unit to the EIA connector at the rear of the terminal. Two 10-pin cables are provided with the VT103 for connecting the STP module to the console devices.



Standard Terminal Port (STP) Installation

VT1X3-MM MAINTENANCE MODULE (M8208)

The VT1X3-MM maintenance module (M8208) provides switches controlling the line time clock interrupts (LTC switch, S1) and the BHALT signal (HALT/ENABLE switch, S2). These switches are up or enabled for system operation. Both switches are up as seen from the back of the VT103-CX.



VT1X3-MM (M8208) Maintenance Module

The module also has two LEDs - one that is on while the processor is running, and another that is on when the bus has dc power.

The VT1X3-MM maintenance module goes in slot 4, rows A and B. This slot has been wired specifically for this module.

The following table shows LED and switch operation.

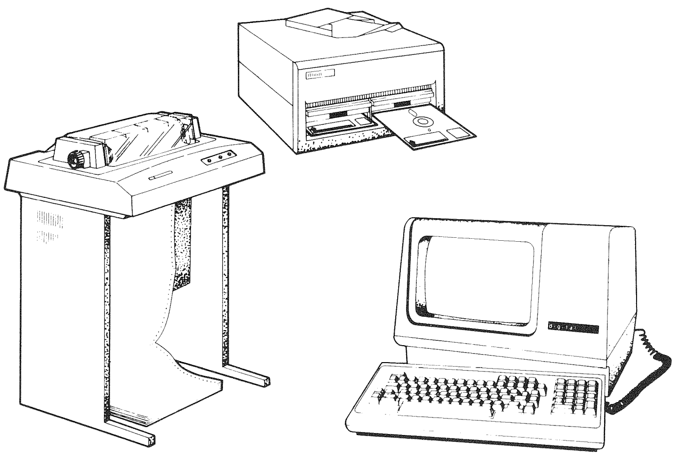
VT1X3-MM LED and Switch Operation

Switch/Indicator	Function
D2 (DC OK)	When lit, this LED indicates that dc power is applied to the bus.
D3 (Run)	When lit, this LED indicates that the processor is running.
S1 (Line time clock switch)	In the disable position, this switch prevents the line time clock (LTC) from interrupting the processor. In the enable position, this switch allows LTC interrupts.
S2 (HALT/ENABLE switch)	In the enable position, this switch allows the processor to operate under program control. In the halt position, this switch puts the processor in halt mode and allows it to respond to ODT commands.

11MDS-A MICROCOMPUTER DEVELOPMENT SYSTEM

GENERAL

The 11MDS-A Microcomputer Development System is a single-user, table-top computer system for developing, debugging, and testing applications programs in the firmware of a target system. The 11MDS-A system includes the VT103-CX video terminal, the RX02M-E table-top diskette drive, and an LA120-RA DECprinter III. The system uses RT-11 operating system software and is designed to be used for developing microcomputer applications on a target system at the module level.



11MDS-A Microcomputer Development System

11MDS-A

Available Models

11MDS-AA	120 Vac, 60 Hz
11MDS-AC	120 Vac, 50 Hz
11MDS-AD	240 Vac, 50 Hz

The 11MDS-A system includes:

1. VT103-CX video terminal that includes a detachable keyboard, the VT1XX-AB advanced video option, and an LSI-11 bus. The following modules are installed on the bus.

Modules Installed on the LSI-11 Bus

Module	Name	Description
M8186	KDF11-AA	LSI-11/23 CPU with KTF11-AA memory management unit and the KEF11-AA FP11 floating-point chip.
M8047-BA (2)	Two MXV11-AC	Multifunction modules, each with a 32K byte RAM and two serial line ports. One MXV11-AC includes the MXV11-A2 bootstrap ROM chip set.
M8044-D	MSV11-DD	64K byte MOS RAM.
M8029	RXV21	RX02 disk interface.
M8208	VT1X3-MM	Maintenance module.

2. RX02M-E dual floppy disk drive in a table-top enclosure.
3. LA120-RA DECprinter III, a receive-only, 180 characters per second, hard-copy printer.

The connectors on the back of the VT103-CX are used as follows.

1. Printer connector (for LA120-RA DECprinter III).
2. Target port for your target system or PROM blaster.
3. Auxiliary port for connection to a TU58 DECtape II or a PROM blaster.

SPECIFICATIONS

Power Specifications

Input voltage	
VT103-CX	90–128 Vac 180–256 Vac (Switch-selectable)
LA120-RA	90–128 Vac 180–256 Vac (Switch-selectable)
RX02M-EA	90–128 Vac
RX02M-EC	90–120 Vac
RX02M-ED	200–256 Vac
Input current VT103-CX	4.0 A maximum at 115 Vac 2.0 A maximum at 230 Vac
LA120-RA	4.2 A maximum at 115 Vac
RX02M-EA	4.0 A maximum at 115 Vac
RX02M-EC	4.0 A maximum at 115 Vac
RX02M-ED	2.0 A maximum at 230 Vac
Frequency VT103-CX	47–63 Hz
LA120-RA	49–61 Hz
RX02M-EA	60 $\pm$ 1/2 Hz
RX02M-EC	50 $\pm$ 1/2 Hz
RX02M-ED	50 $\pm$ 1/2 Hz
System ride through	15 ms minimum
Input protection VT103-CX	4 A fuse
LA120-RA	6 A fuse
RX02M-EA	2 A slow blow fuse
RX02M-EC	3.5 A circuit breaker
RX02M-ED	1.75 A circuit breaker

Performance Specifications

VT103-CX	
Data transfer rates	
Console	15K baud - provided by the terminal controller through the STP module.
Printer connector	1200 baud
Target port	You select the target data transfer rate using the transmit speed (T SPEED), a set-up feature in the VT103-CX. It is factory set at 9600 baud. This port uses EIA RS-232-C compatible signals.
Auxiliary port	9600 baud EIA RS-232-C compatible signals.
LA120-RA	
Data transfer rate	Factory set to 1200 baud to match VT103-CX printer connector.
Maximum print speed	180 characters per second
RX02M-E	
Data transfer rate	1.2 μs per bit 833,333 bits/s
RX02K diskette media capacity	512K bytes

Programming Specifications

Address/vector assignment	
Console	777560/60
Target	776500/300
Printer	776510/310
Auxiliary port	776520/320
RXV21	777170/264
Operating system software	RT-11 (Real time-11)

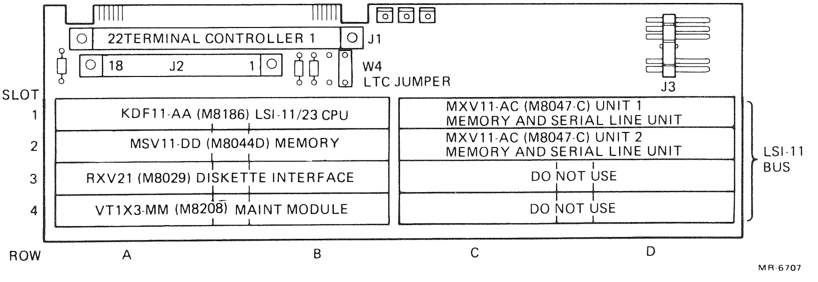
CONFIGURATION

The 11MDS-A contains an LSI-11 bus built into the VT103-CX terminals. The bus contains the LSI-11 modules that control the system, and these modules must be configured properly to function within the system. The modules and configuration requirements are detailed in the following table and figure.

LSI-11 Modules

Module	Name	Function
M8186	KDF11-AA	LSI-11/23 CPU with KTF11-AA memory management unit and KEF11-AA FP11 floating-point chip.
M8044-Dx*	MSV11-DD	64K byte MOS RAM.
M8047-Cx*	Two MXV11-AC	Each with 32K byte RAM and two serial line ports. One MXV11-AC includes the MXV11-A2 bootstrap ROM chip set.
M8029	RXV21	RX02 disk interface.
M8208	VT1X3-MM	Maintenance module.

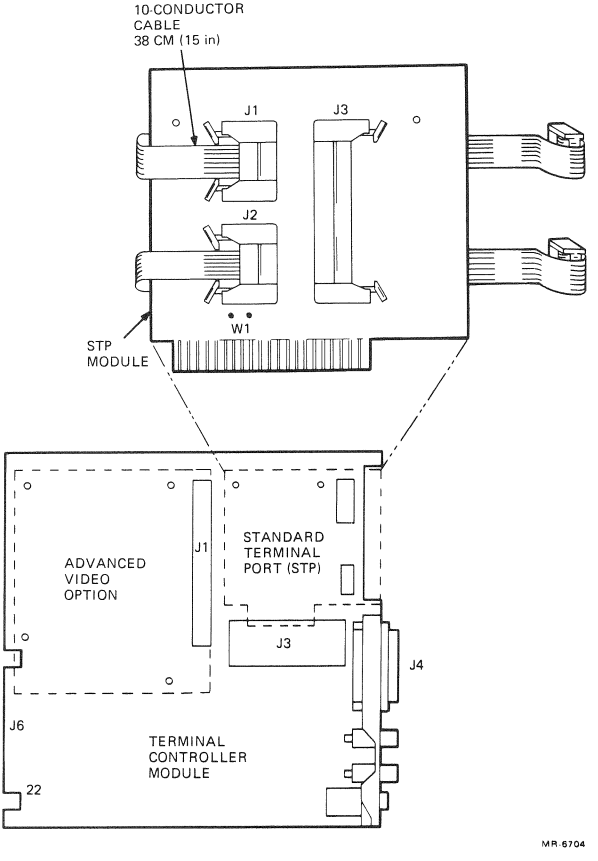
*Variable letter



VT103-CX Module Positions

Terminal Controller

The terminal controller module provides the basic video, terminal set-up memory, character ROMs, and communication protocol for the 11MDS-A system. This module goes in J1 of the VT103-CX backplane. The STP module and the advanced video option (AVO) are mounted on this module as shown in the following figure.



Standard Terminal Port (STP) Module Installation

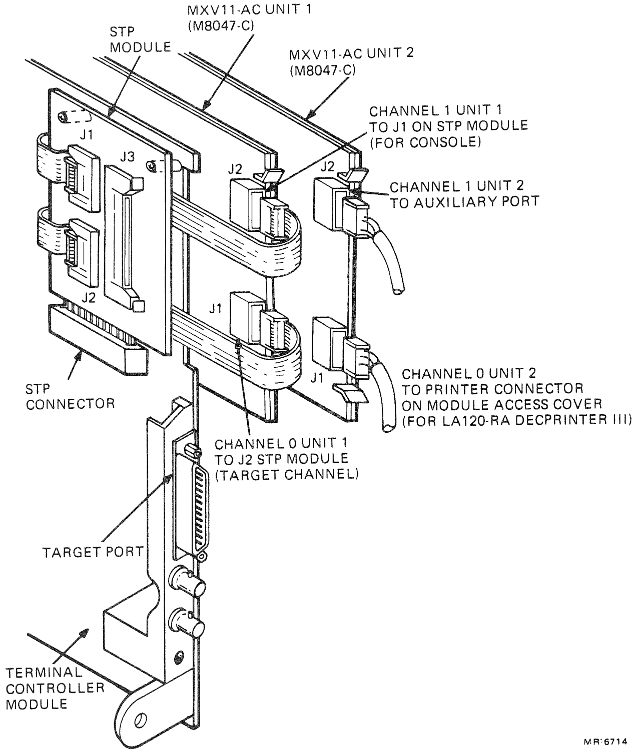
Standard Terminal Port (STP)

The STP module provides connectors for communication lines. This module intercepts the communication path between the terminal controller and the target port at the back of the terminal. The STP module plugs into J3 on the terminal controller module.

The STP module has two 10-pin connectors (J1 and J2) and one 40-pin connector (J3). J1 connects to the console device interface, channel 1 on the MXV11-AC (M8047) in slot 1, C and D. J2 connects to channel 0 of the same MXV11-AC to the target connector at the back of the terminal. J3 is not used.

NOTE

The channels on the serial line interfaces attached to the STP module have their baud rate selection disconnected. The baud rate for the console is approximately 15K baud. The baud rate for the target system is selected using T SPEED in set-up B mode.



Connecting Cables from STP Module to MXV11-AC

Advanced Video Option (AVO)

The advanced video option included with the VT103-CX adds the following features.

1. Ten additional lines of 132 column display, allowing the screen to display a total of 24 lines.

2. Additional character features for highlighting characters on the screen in any of the following ways.

   Boldface
   Blink
   Underline
   Reverse
   Any combination of the above

3. Special graphic characters.

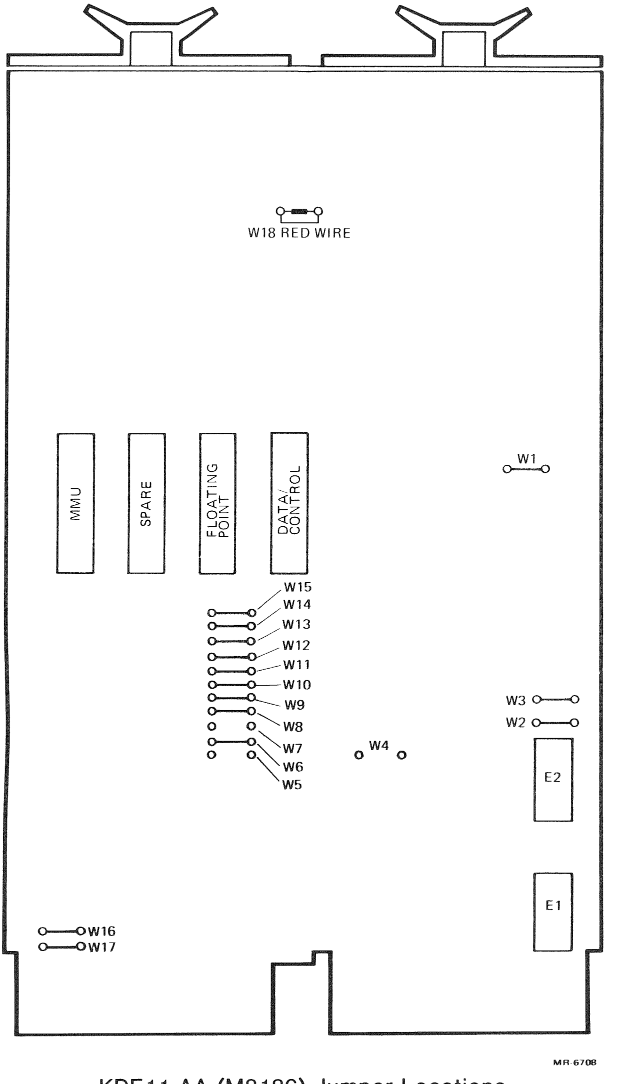
The advanced video option plugs into J1 on the terminal controller module.

KDF11-AA Microprocessor (M8186)

The KDF11-AA microprocessor is a dual-height module that must occupy the first slot, rows A and B, in the LSI-11 bus on the VT103-CX backplane. The configuration of the jumpers on the module for the VT103-CX is shown and described in the following table and figure. The module also has a socket for the KEF11-AA and the FP11 floating-point IC chip included with the 11MDS-A system.

KDF11-AA (M8186) Jumpers

Jumper	Jumper State	Name
W1	IN	Master clock (enabled)
W2	OUT	Reserved for DIGITAL use
W3	IN	Reserved for DIGITAL use
W4	OUT	Event line (enabled)
W5, W6	W5-OUT W6-IN	Power-up mode (Mode 2: bootstrap)
W7	OUT	Enter console ODT on HALT
W8	IN	Bootstrap starting address: 773000_8 for mode 2
W9-W15	IN (Ignored) (Not used if W8 is IN)	Bootstrap starting address: 773000_8 for mode 2
W16, W17, W18	IN	Reserved for DIGITAL use



KDF11-AA (M8186) Jumper Locations

MSV11-DD Memory (M8044-D)

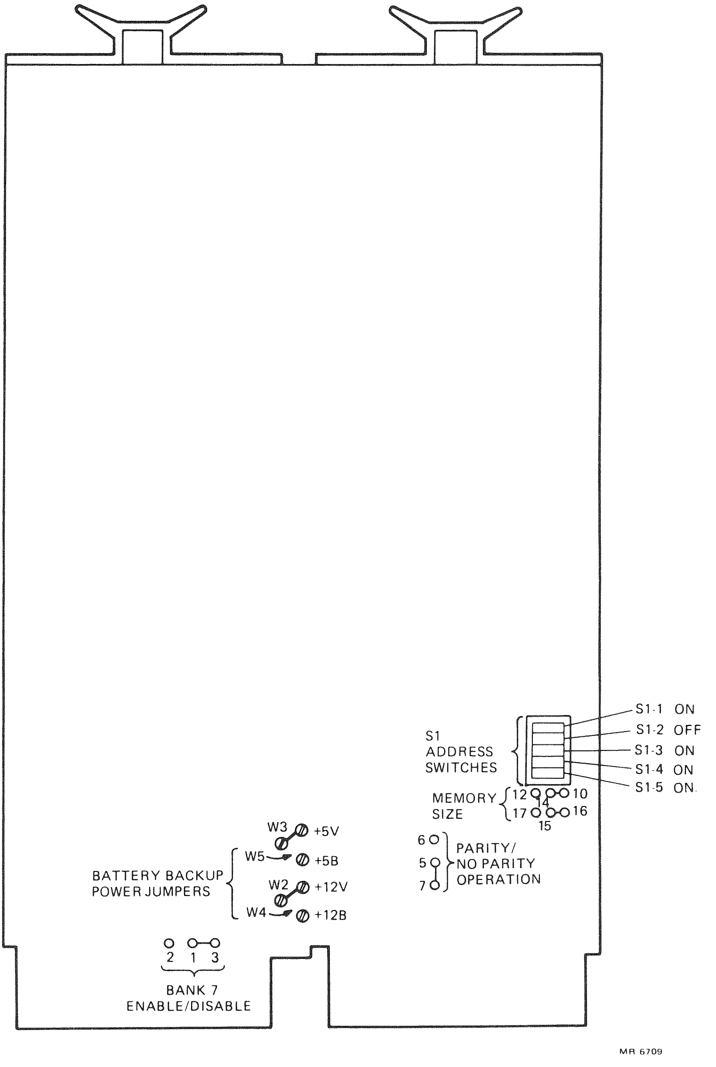
The MSV11-DD is a dual-height MOS RAM with 64K bytes of memory. It occupies slot 2, rows A and B, of the LSI-11 bus. A description of the 11MDS-A configuration of this module and its jumpers and switches follows.

MSV11-DD (M8044-D) Jumpers

Jumper	Jumper State	Function Implemented
Pin 1 to 3 Pin 1 to 2	IN OUT	Disable 2K word portion of memory in I/O page
W2	IN	Enable system power (+5 V)
W3	IN	Enable system power (+12 V)
W4	OUT	Disable battery power (+12 V)
W5	OUT	Disable battery power (+5 V)
Pin 10 to 14 Pin 16 to 15	IN IN	Select memory size of 64K bytes

MSV11-DD Switch Settings

Switch	Starting Address 200000 (Bank Select 10–17) Switch Settings
S-1	ON
S-2	OFF
S-3	ON
S-4	ON
S-5	ON



MSV11-DD (M8044-D) Switch and Jumper Locations

MXV11-AC Multifunction Modules (M8047-C)

Two MXV11-AC modules occupy slots 1 and 2, rows C and D, of the LSI-11 bus. Each module includes 32K bytes read/write memory, space for bootstrap ROM ICs, and two asynchronous serial line units (SLUs). The bootstrap ROM ICs for the RX02 disk drive are included with the 11MDS-A and installed on MXV11-AC unit 1. These ROM ICs are the MXV11-A2 option.

The channel, address assignment, baud rate, and use of the serial line units on the MXV11-AC modules are shown in the following table.

MXV11-AC Serial Line Units

MXV11-AC	Channel	Address	Vector	Baud	Destination
Unit 1	0	776500	300	9600*	Target (through STP)
Unit 1	1	777560	60	15K	Console (through STP)
Unit 2	0	776510	310	1200	LA120-RA DECprinter III
Unit 2	1	776520	320	9600	Auxiliary port

*You may change the baud rate for the target system using T SPEED on console set-up B.

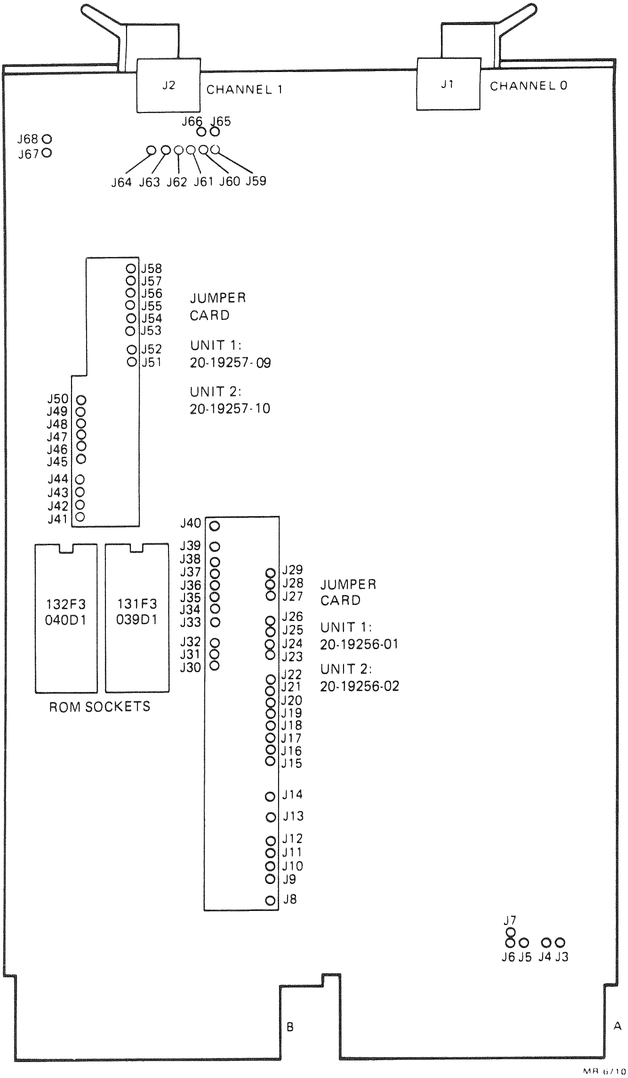
The placement of the jumper cards installed on the MXV11-AC modules are shown in the following figure. The cards use printed circuits to configure the jumper pins on the MXV11-AC modules. The wire table for the jumper cards and the part numbers of the jumper cards for each MXV11-AC are as follows.

MXV11-A and MXV11-AC	Part Numbers
Unit 1 (with boot ROMs)	20-19256-01 and 20-19257-09
Unit 2 (without boot ROMs)	20-19256-02 and 20-19257-10

Wire Table for Jumper Cards

Jumper From	20-19256-01 To	20-19256-02 To	20-19257-09 To	20-19257-10 To
J21	J22	J8		
J23	J18	J18		
J24	J19	J12		
J25	J14	J17		
J26	J15	J16		
J27	J13	J13		
J28	J19	J19		
J29	J16	NC*		
J30	J31	J31		
J31	J32	J33		
J32	J33	J34		
J37	J34	NC*		
J38	J37	NC*		
J39	J33	NC*		
J45			NC*	J42
J46			NC*	J48
J51			J56	J53
J52			J54	J54
J53			J57	J51
J54			J54	J52
J55			J54	J57
J56			J51	J58

*NC = no connection



MXV11-AC (M8047-C) Jumper Card Locations

If you are returning a defective M8047-C module, remove both jumper cards from the module and save them to install on your new module. Upon receipt of the new module, remove all the wire jumpers from pins J8 to J58 and on MXV11-AC unit 2, remove the jumper between J6 and J7. Install the jumper cards on the new module.

CAUTION

If your defective M8047-C has ROMs installed on it, remove these ROMs, noting their number and location, and save them for installation on your new module. You must use special handling techniques for the ROMs as follows.

The ROM is affected by static electricity. Therefore, when removing or installing a ROM make sure that you ground yourself first before removing the ROM. To do this, touch a metallic grounded surface while handling the module, then remove the ROM. You should wrap the ROM in conductive foam if possible.

Do not remove the conductive foam before installing the ROM on a new module. Gently press the foam against the surface of the module to remove static charges. Remove the foam and check that all ROM pins are straight before trying to insert the ROM into the ROM socket on the module. Align the notch on the ROM with the notch on the ROM socket and press the ROM firmly into the socket. Check to see that all ROM pins are correctly seated in the socket.

MXV11-AC Unit 1 with Bootstrap ROM – This module can be identified as having two ROM ICs installed in the two ROM sockets of the module. The ROM numbers are 131F3 and 132F3.

Channel 0, J1, of this module connects to the STP module and then to the target port. Channel 1, J2, connects to the STP module for use with the console. This module has the first 32K bytes of RAM memory with a starting address of 000000. The parameters set on this module by the jumper cards are described in the following table. This MXV11-AC is installed in slot 1, rows C and D, of the LSI-11 bus.

MXV11-AC Unit 1 (M8047-C) Configuration

Function	Selection
RAM bank	0
Bootstrap	Disk
SLU channel 0 address	776500
SLU channel 1 address	777560
SLU vector CH0	300
SLU vector CH1	60
SLU parameters	8 data bits, no parity, 1 stop bit
Baud rates CH0	9600 (target)
Baud rates CH1	15K (console)
Break generation option	Halt
Crystal clock	Enabled

MXV11-AC Unit 2 without Bootstrap ROM – This module does not have ROM ICs installed in either of the two sockets on the module. Channel 0, J1, of this module connects to the printer connector for use with the LA120-RA. Channel 1, J2, connects to the auxiliary port. This MXV11-AC has the second 32K bytes of RAM memory with a starting address of 100000. The parameters set on this module by the jumper cards are described in the following table. This module is installed in slot 2, rows C and D, of the LSI-11 bus.

This MXV11-AC connects to the printer and must have its break generation jumper (J6 to J7) removed. Removing this jumper removes the possibility that a break signal from the printer or auxiliary port may halt the system.

MXV11-AC Unit 2 Configuration

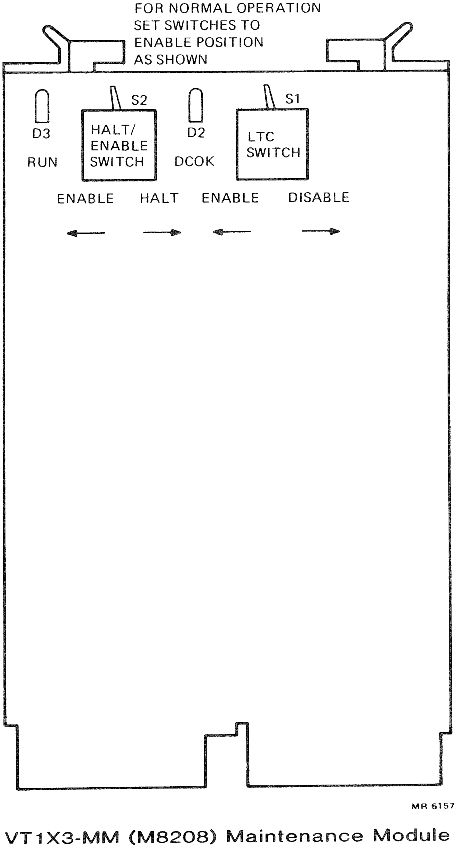
Function	Selection
RAM bank	4 (second 32K bytes)
SLU channel 0 address	776510
SLU channel 1 address	776520
SLU vector CH0	310
SLU vector CH1	320
SLU parameters	8 data bits, no parity, 1 stop bit
Baud rate CH0	1200 (printer)
Baud rate CH1	9600 (auxiliary port)
Bootstrap	Disabled (not used)
ROM memory	Disabled (not used)
Break generation option	Disabled (jumper J6–J7 must be removed)

RXV21 Disk Control (M8029)

The RXV21 is the interface between the LSI-11 bus and dual RX02 disk drives. Each drive uses a flexible diskette that can store up to 512K bytes of data. The VT103-CX uses the RXV21 as it comes from the factory with factory-configured jumpers. The RXV21 goes in slot 3, rows A and B, of the LSI-11 bus.

VT1X3-MM Maintenance Module (M8208)

The VT1X3-MM maintenance module (M8208) provides switches controlling the line time clock interrupts (LTC switch, S1) and the BHALT signal (HALT/ENABLE switch, S2). These switches are up, or enabled, for system operation. Both switches are up as seen from the back of the VT103-CX.



VT1X3-MM (M8208) Maintenance Module

The module also has two LEDs — one that is on while the processor is running, and another that is on when the bus has dc power.

The VT1X3-MM maintenance module goes in slot 4, rows A and B. This slot has been wired specifically for this module.

The following table shows LED and switch operation.

VT1X3-MM LED and Switch Operation

Switch/Indicator	Function
D2 (DC OK)	When lit, this LED indicates that dc power is applied to the bus.
D3 (Run)	When lit, this LED indicates that the processor is running.
S1 (Line time clock switch)	In the disable position, this switch prevents the line time clock (LTC) from interrupting the processor. In the enable position, this switch allows LTC interrupts.
S2 (HALT/ENABLE switch)	In the enable position, this switch allows the processor to operate under program control. In the halt position, this switch puts the processor in halt mode and allows it to respond to ODT commands.

SYSTEM VERIFICATION PROGRAM

In order for the verification program to start automatically, the system must be started in the following sequence.

1. With power off, make sure that there is an EIA loopback connector installed on the target port and on the auxiliary port on the back of the VT103-CX.

2. Make certain that the printer has several sheets of fanfold paper installed.

3. Place the system verification program (diskette A) in either disk drive and close the disk drive door.

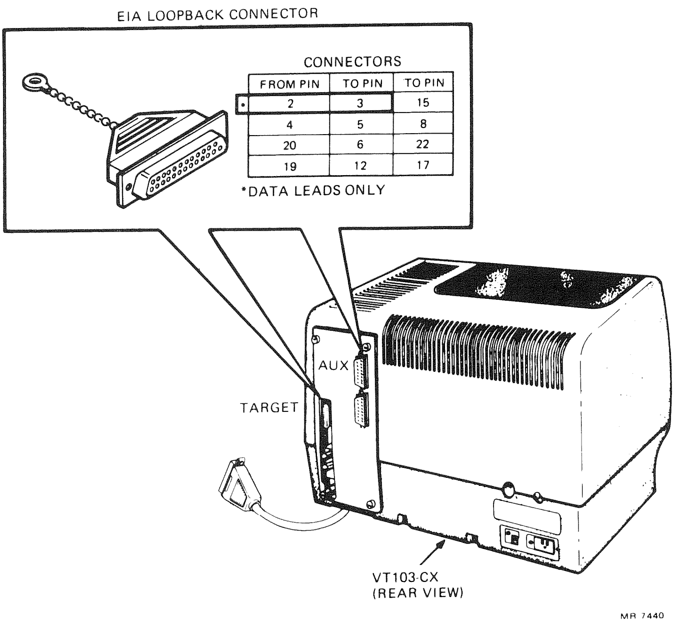
4. Place diskette B in the other disk drive and close its door.

5. Set the ON/OFF switch on the front of the printer on.

6. Set the ON/OFF switch on the back of the disk drive on.

7. Set the 1/0 switch on the back of the video terminal to 1.

The system software boots the diskette and, after ten seconds, prints the verification program start-up message on the video terminal. Testing begins automatically.



Connecting EIA Loopback Connector to
Target and Auxiliary I/O Ports

The verification program has seven tests that are run in sequence. These tests and their run times are as follows.

Verification Program Tests

Test	Run Time
Central processor	1 min
Memory 00 to 32K bytes	1 min
Memory 32K to 64K bytes	1 min, 10 s
Memory 64K to 128K bytes	2 min, 20 s
Serial I/O ports	15 s
RX02M disk system	3 min
LA120-RA DECprinter III	1 min

After a test runs successfully, "OK" prints on the video screen after the name of the test. The next test in the sequence begins immediately, printing the name of the test on the video screen on the next line. Both a successful response and an error response are shown in the following figures.

```
                                              11MDS-A VERIFICATION PROGRAM

This checks out your 11MDS-A system hardware. The complete set of tests takes about
10 minutes to run. The RX02 floppy disk drives will click occasionally during testing.

********CAUTION********
These tests will WRITE on both RX02 disks and the LA120 printer.
Ensure that both test program disks (A and B) are loaded and
that the printer paper supply is adequate.

- Pass 1
- Central Processor (test time is 1 minute) ....................................OK.
- Memory 00 to 32K bytes (test time is 1 minute) ...............................OK.
- Memory 32 to 64K bytes (test time is 1 minute, 10 seconds) ...................OK.
- Memory 64 to 128K bytes (test time is 2 minutes, 20 seconds) ..................OK.
- Serial I/O Ports (test time is 15 seconds) ...................................OK.
- RX02 floppy disk system (test time is 3 minutes) ..............................OK.
- LA120 DECprinter III (test time is 1 minute) ..................................OK.
    (check the printer paper for satisfactory print quality)

****The 11MDS-A checkout is complete****
****All system components test OK    ****

To discontinue testing, press keyboard "BREAK".
Otherwise, the test sequence will restart in 30 seconds......
```

MR-7640

A Successful Pass of the Verification Program

```
                                              11MDS-A VERIFICATION PROGRAM

This checks out your 11MDS-A system hardware. The complete set of tests takes about
10 minutes to run. The RX02 floppy disk drives will click occasionally during testing.

********CAUTION********
These tests will WRITE on both RX02 disks and the LA120 printer.
Ensure that both test program disks (A and B) are loaded and
that the printer paper supply is adequate.

- Pass 1
- Central Processor (test time is 1 minute). ...................................OK.
- Memory 00 to 32K bytes (test time is 1 minute) ...............................OK.
- Memory 32 to 64K bytes (test time is 1 minute, 10 seconds). ..................OK.
- Memory 64 to 128K bytes (test time is 2 minutes, 20 seconds) .................OK.
- Serial I/O Ports (test time is 15 seconds) ...................................ERROR.
- RX02 floppy disk system (test time is 3 minutes) ..............................OK.
- LA120 DECprinter III (test time is 1 minute) ..................................OK.
    (check the printer paper for satisfactory print quality)

Errors have been detected in the following sub-systems:
    Target I/O Port        M8047-C (MXV11-AC #1, port 0)
      check that loop-back is installed!!!

Contact DEC Field Service for assistance.
XXXXXX
@
```

MR 7642

An Example of an Error Message Printout

COMMERCIAL SYSTEMS

D315 DATASYSTEM

The standard D315 Datasystem includes the following.

1. RX78 table-top version of the RX02
2. PDP-11/23-AH boxed system
3. VT100 video/keyboard transaction terminal

Options include:

1. LA120-RA dot matrix printer
2. DUV11-DA (M7951) synchronous serial line unit
3. MSV11-DD (M8044) MOS memory module
4. Roll-around cart for flexibility.

Related Documentation

D315 Datasystem Pocket Service Guide (EK-OD315-PS)

Diagnostics

The D315 checkout diskette, BA-S370A-MC, and BA-S524A-MC (diagnostics) are shipped with each system.

Before running diagnostics, make sure the serial line turnaround connectors (H315-B) are installed on any unused terminal or printer jacks.

To run the D315 checkout diskette, place the diskette (BA-S370A-MC) in one drive and BA-S524A-MC in the other. Then start the restart switch.

The following is a sample printout of the D315 checkout diskette diagnostics as received on the VT100. It includes examples of the six tests. OK is the response given at the end of a test to show successful completion.

D315

This checks out your D315 system hardware. The complete series of tests takes only 15 minutes to run. The RX02 floppy disk drive will click occasionally during testing.

- Central Processor Test (test time is 30 seconds) ....OK
- First 32K bytes of memory (test time is 1 minute, 25 seconds) ....OK
- Second 32K bytes of memory (test time is 2 minutes) ....OK
- Serial Input/Output ports and Clock (test time is 25 seconds) ....OK
- RX02 floppy disk drives (test time is 4 minutes, 35 seconds)............OK
- LA120 Printer (test time is 1 minute) ....OK

The following is an example of an error message printout noted while running the RX02 floppy disk drive test.

Error printout

? ERROR DETECTED IN THE FLOPPY DISK SYSTEM ?

Testing cannot proceed.

NOTE

Each error message is similar in that it identifies the problem area, discontinues testing, and recommends corrective action to be taken.

System Checkout

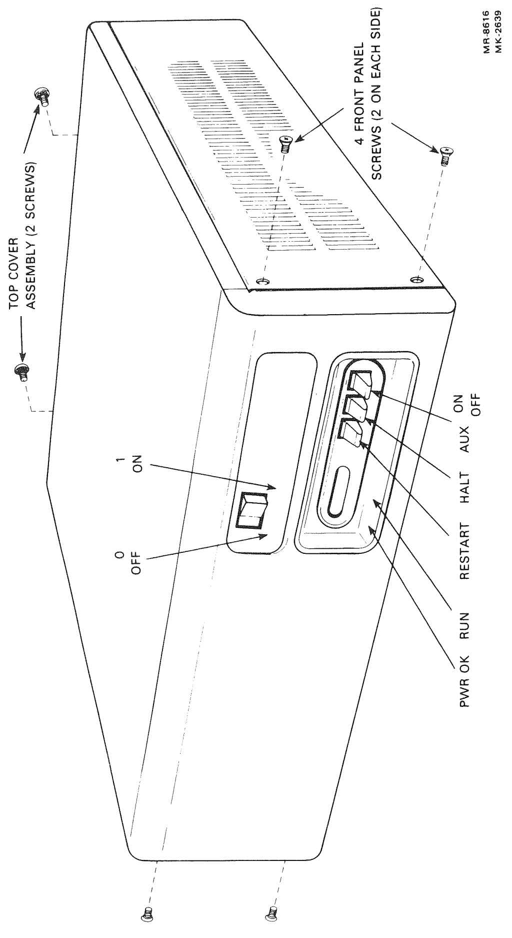
System	Probable Cause/Remedy
The checkout message does not appear when you run the D315 checkout diskette.	Make sure the terminal's ON-LINE light is on. Make sure the HALT and AUX ON/OFF switches are up and the diskettes (BA-S370A-MC and BA-S524A-MC) are correctly inserted.
The checkout message still does not appear.	Reverse the floppies and retry.

PDP-11/23 AH

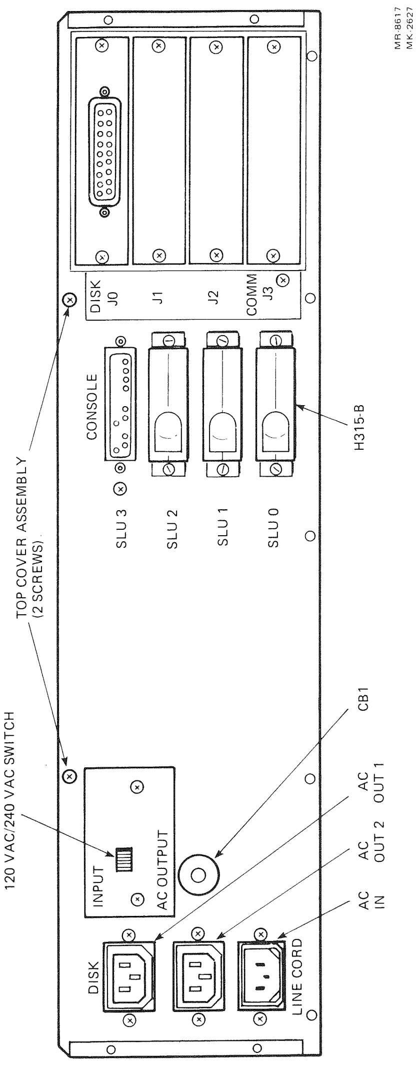
The PDP-11/23 AH is the system microcomputer. The front panel switches and indicators are described in the following table. The two figures show the front and rear panel assemblies.

PDP-11/23 AH Switch/Indicator Functions

Switch/LED	Position	Function
Power control	0 1	Power off Power on
AUX ON/OFF	OFF	The line time clock is disabled (OFF when running standard diagnostics).
	ON	The line time clock is enabled (Usually ON for most operating systems and when running D315 customer confidence diagnostics).
HALT	Up	The processor is enabled to run.
	Down	The processor is halted.
RESTART (Momentary)	Restart	When the HALT switch is up, the processor carries out a power-up sequence and displays the bootstrap dialog.
PWR OK		On when the correct dc output voltages are being generated by the microcomputer system.
RUN		On when the processor is operating.



PDP-11/23 AH Front Panel Assembly



PDP-11/23 AH Rear Panel Assembly

Voltage Select Switch –

WARNING

Make certain that the ac power has been removed before proceeding.

The voltage select switch (120/240 Vac) is located on the rear panel assembly and is locked in place by a voltage plate to prevent accidental change. To change the voltage setting, remove the two phillip screws holding the plate in place. Once the plate has been removed, select either 120 Vac or 240 Vac. Replace the voltage plate with the appropriate voltage identification on the voltage face plate (each side of the plate is labeled 120 Vac or 240 Vac).

Backplane – An H9270 backplane provides the bus and control interconnections for the modules of the PDP-11/23 AH. The location of the backplane modules are as follows.

SLOTS	ROW A – ROW B	ROW C – ROW D
1	M8186 KDF11-AA	M8047 MXV11-AC
2	M8029 RXV21	M8047 MXV11-AC
3	* M7951 DUV11-DA (QUAD-HEIGHT MODULE)	
4	* M8044 MSV11-DD	* M8044 MSV11-DD

* OPTIONAL MODULES

SLOT NO.	MODULE NUMBER	OPTION NUMBER	DESCRIPTION	CSR/BUS ADDRESS	INTR VCTR
1AB	M8186	KDF11-AA	11/23 CPU		
1CD	M8047	MXV11-AC	MEM & 2 SLUs ROM BOOT	176500 177560	300 60
2AB	M8029	RXV21	DISK INTERFACE	777170	264
2CD	M8047	MXV11-AC	MEMORY & 2 SLUs	176520 176510	320
*3	M7951	DUV11-DA	SYNC SLU	160040	330
*4AB	M8044	MSV11-DD	64KB MEMORY		
*4CD	M8044	MSV11-DD	64KB MEMORY		

*OPTION MODULES

MR-8618
MK 2630

H9270 Module Use

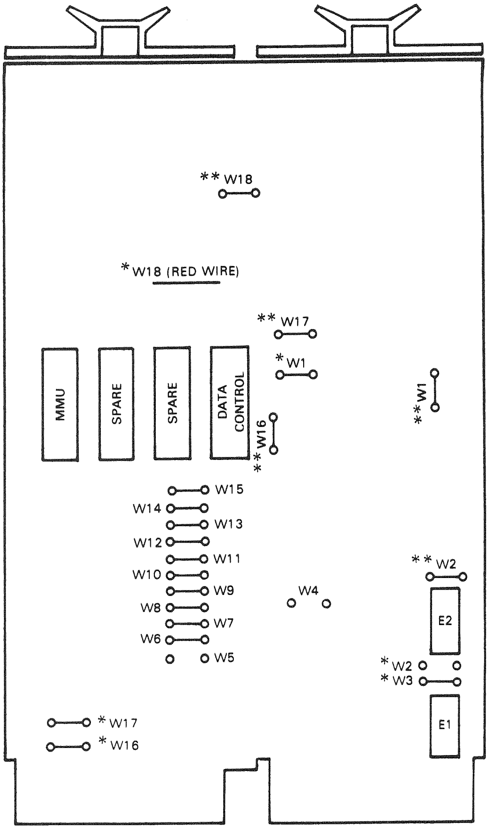
Configuration

The modules are configured by installing jumper wires or selecting switch positions. This section describes the configuration requirements for modules used in this system.

KDF11-AA (M8186) Jumpers - The KDF11-AA is a 16-bit, high performance microprocessor on one multilayer module (M8186). This module is the heart of the system and includes jumpers W1 through W18 as listed in the following table.

KDF11-AA (M8186) Jumper Functions

Jumper	Name	Function	Jumper State
W1	Master clock	Enable internal master clock.	IN
W2	Reserved for DIGITAL use	Factory configured, do not change.	OUT
W3	Reserved for DIGITAL use	Factory configured, do not change.	IN
W4	Event line	Out = enabled.	IN
W5, W6	Power-up mode	Console ODT.	W5 = IN W6 = OUT
W7	Halt/trap	Enter console ODT on halt.	OUT
W8	Bootstrap address	In = power up to 173000. Out = power up to the address specified by W9-W15.	IN
W9-W15	User-selectable bootstrap address	W9-W15 apply to address bits 09 through 15 respectively.	OUT
W16-W18	Reserved for DIGITAL use	Factory configured, do not change.	IN



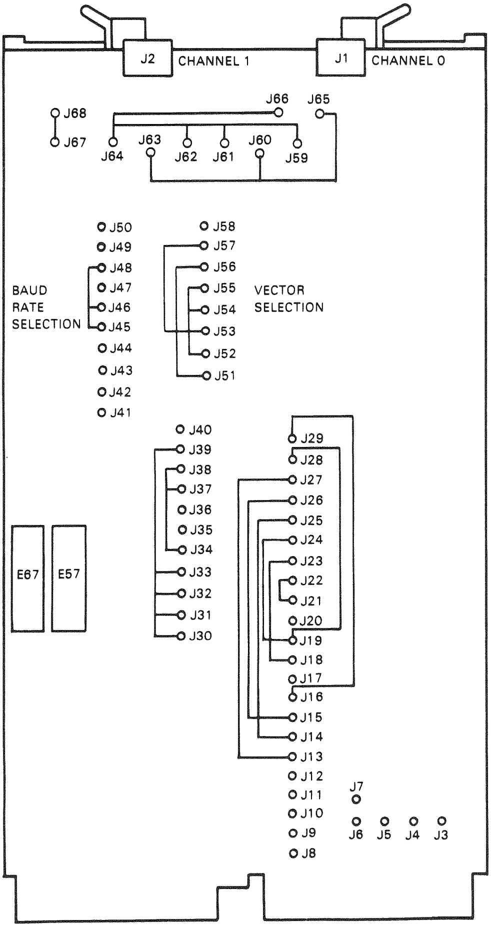
NOTES:

1. JUMPERS W9 THROUGH W15 MAY BE EITHER IN OR OUT DEPENDING ON W8. IF W8 IS IN, JUMPERS W9 THROUGH W15 ARE IGNORED.
2. JUMPERS SHOWN WITH AN * ARE FOR ETCH REV C ONLY.
3. JUMPERS SHOWN WITH AN ** APPLY TO ETCH REV A AND B.
4. THE ABOVE JUMPER CONFIGURATION APPLIES TO ETCH REV C MODULES. MODULES OF ETCH REV A AND B DO NOT INCLUDE A W3 JUMPER.
5. JUMPER W2 MUST BE INSTALLED ON ALL ETCH REV A AND B MODULES.

MR 8619
MK 2629

KDF11-AA Module Layout

MXV11-AC (M8047) Memory - The MXV11-AC memory and asynchronous line interface consists of two MXV11-AC modules, both having 32K by 16-bits of MOS memory and two asynchronous serial lines. In addition, one module has two 512 × 8 ROMs (E57 and E67) memory diagnostics and two bootstraps - one for the TU58 and one for the RX78. These ROMs are not installed in the other MXV11-AC module.



DESCRIPTION	SOCKET	PART NO.
LOW BYTE	E57	23-039D1-0-0
HIGH BYTE	E67	23-040D1-0-0

MR 8620
MK 2636

MXV11 Module Layout

MXV11-AC (M8047) Jumpers and ROM Boot (Module 1) - Jumpers for Module 1 must be installed as described in the following table.

MXV11-AC (M8047) Module 1 Jumper Functions

Function	MXV11-AC Pins From	To
RAM banks	J30*	J31
(BANKS 0, 1, 2, 3, 16K)	J32*	J33
	J31*	J32
SLU address 176500	J23*	J18
(Channel 0) SLU 0	J24*	J19
SLU address 177560	J26*	J15
(Channel 1) SLU 3 - Console	J25*	J14
	J27*	J13
	J28*	J19
SLU vector	J56*	J51
Channel 0 vector 300	J54*	J52
Channel I vector 60	J55*	J54
	J53*	J57
ROM bootstrap (disk)	J37*	J38
	J21*	J22
	J34*	J37
	J33*	J39
	J29	J16
SLU parameters		
(8 data bits Ch 1)	J59*	J61
(Even parity Ch 1)	J61*	J62
(8 data bits Ch 0)	J62*	J64
(Even parity Ch 0)	J64*	J66
(1 stop bit Ch 1)	J60*	J63
(1 stop bit Ch 0)	J63*	J65
Baud rate		
(SLU 1) (9.6K)	J46*	J48
(SLU 0) (9.6K)	J45	J48
Break Gen. (not used)		
Remove factory jumpers		
Crystal clock	J68*	J67
(not a user option)		

* Factory-installed jumpers. All jumpers not listed must be removed.

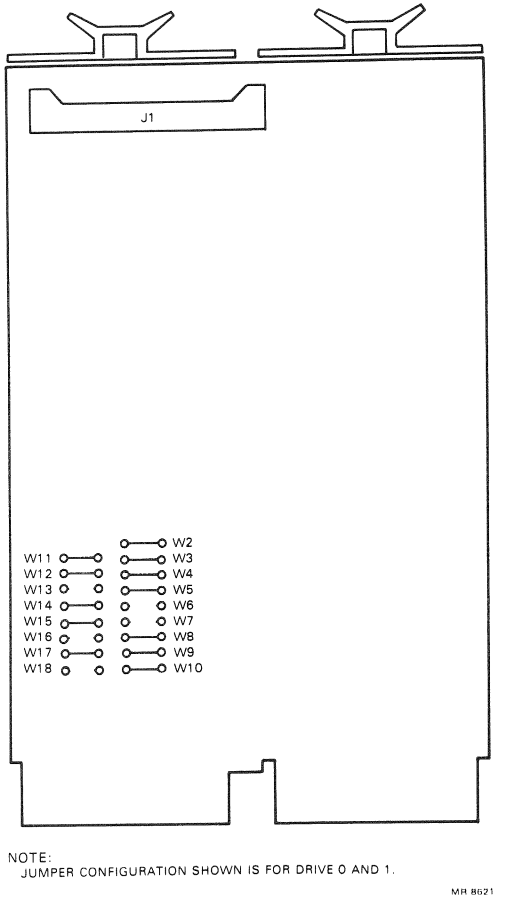
MXV11-AC (M8047) Jumpers (Module 2) - Jumpers for Module 2 must be installed as described in the following table.

MXV11-AC (M8047) Module 2 Jumper Functions

Function	**MXV11-AC Pins From**	**To**
RAM banks	J30	J31
(Banks 4, 5, 6, 7, 16K)	J31	J33
	J32	J34
SLU address 176510	J23*	J18
(Channel 0) SLU 1	J24	J12
SLU address 176520	J26	J16
(Channel 1) SLU 2	J25	J17
	J27*	J13
	J28*	J19
SLU vector	J56	J58
Channel 0 vector 310	J55	J57
Channel I vector 320	J54*	J52
	J53	J51
ROM bootstrap (disk)	J8	J21
ROM selection disable		
SLU Parameters		
(8 data bits Ch 1)	J59*	J61
(Even parity Ch 1)	J61*	J62
(8 data bits Ch 0)	J62*	J64
(Even parity Ch 0)	J64*	J66
(1 stop bit Ch 1)	J60*	J63
(1 stop bit Ch 0)	J63*	J65
Baud rate		
(SLU 1) (9.6K)	J45	J48
(SLU 0) (9.6K)	J46*	J48
Break Gen. (not used)		
Remove factory jumpers		
Crystal clock	J68*	J67
(not a user option)		

* Factory-installed jumpers. All jumpers not listed must be removed.

RXV21 (M8029) Jumpers - The RXV21 floppy disk controller includes the jumpers listed in the following table.



RXV21 Module Layout

RXV21 (M8029) Jumpers

Drive	Address	Address Jumpers W11	W10	W09	W08	W07	W06	W05	W04	W03	W02
Drives 0 and 1	177170	IN	IN	IN	IN	OUT	OUT	IN	IN	IN	IN
Drives 2 and 3	177150	IN	IN	IN	IN	OUT	OUT	IN	IN	OUT	IN

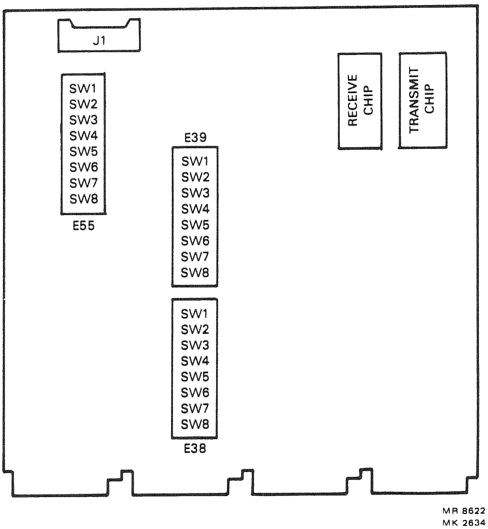
Drive	Vector	Vector Jumpers W18	W17	W16	W15	W14	W13	W12
Drives 0 and 1	264	OUT	IN	OUT	IN	IN	OUT	IN
Drives 2 and 3	270	OUT	IN	OUT	IN	IN	IN	OUT

IN = logical 1
OUT = logical 0

NOTE

Drives 2 and 3 are optional, and are usually jumpered for address 177150 and vector 270 when installed.

DUV11-DA (M7951) Switches - The DUV11-DA synchronous serial line unit switch configuration and the E55 switch functions are listed in the following tables.



DUV11 Module Layout

DUV11-DA (M7951) Switch Configuration

Address Device	Switch Number	Vector Address
17		
16		
15		
14		
13		
12	E38 S1 = 0	
11	E38 S2 = 0	
10	E38 S3 = 0	
09	E38 S4 = 0	
08	E38 S5 = 0	E39 S3 = 1
07	E38 S6 = 0	E39 S4 = 0
06	E38 S7 = 0	E39 S5 = 0
05	E38 S8 = 0	E39 S6 = 1
04	E39 S1 = 0	E39 S7 = 0
03	E39 S2 = 1	E39 S8 = 0
02	E39-0 RCVR	E39-0 RCVR
01	E39-1 XMTR	E39-1 XMTR
00		

NOTE

Standard device address 160010 and vector 440.

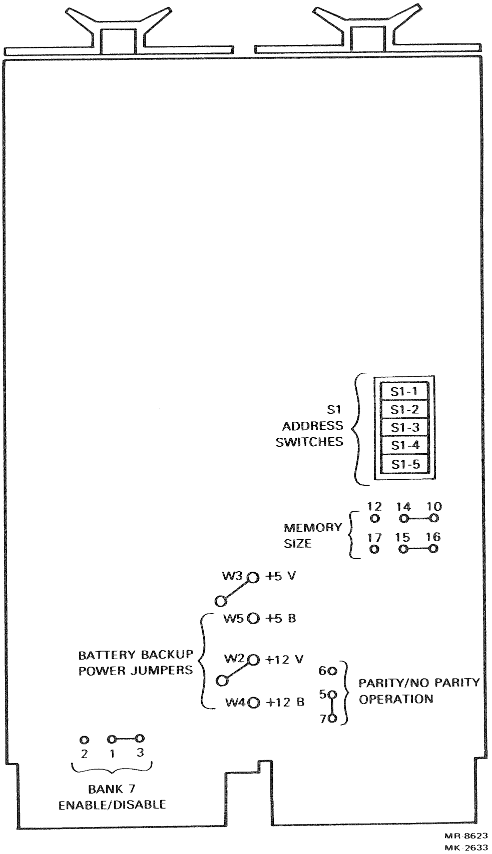
Switch ON = logical 1
Switch OFF = logical 0

E55 Switch Settings and Functions

E55 Switch	Factory Setting	Function
S1	ON	Optional clear - Switch on enables clear option; used to clear RXCSR bits 01, 02, and 03.
S2	OFF	Transmit - Switch on enables secondary data channel between the modem and the DUV11.
S3	OFF	Receive - Switch on enables secondary data channel between the modem and the DUV11.
S4	OFF	Switch on enables the receiver to synchronize internally upon receiving one sync-character. The usual condition of receiving two sync-characters exists when S4 is off.
S5	OFF	Special feature - Switch on allows the external clock to be internally generated; used when a modem is not used. If S5 is on, S7 should be off.
S6	OFF	Special feature - Optional feature is switched on for program control of data rate selection.
S7*	OFF	Maintenance clock - Switch on enables the maintenance clock.
S8	OFF	Not used.

*S7 is used only when running diagnostics and should be returned to the off position before running system software.

MSV11-DD (M8044) Jumpers and Switches - The MSV11-DD MOS read/write memory jumper and switch configuration and the memory address range selection are shown in the following tables.



MSV11-DD Module Layout

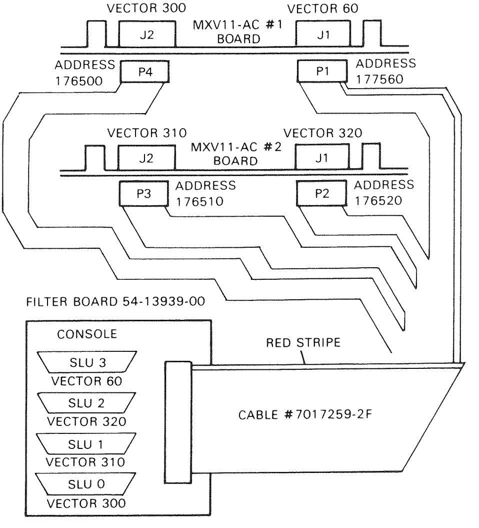
MSV11-DD (M8044) Jumper/Switch Configuration

Designation	Function	Jumper/Switch State
W2	Battery backup when out	IN
W3	Battery backup when out	IN
W4	Battery backup when in	OUT
W5	Battery backup when in	OUT
Pins 5-7	Pin memory type (no parity)	IN
Pins 10-14	Memory size	IN
Pins 15-16	Memory size	IN
Pins 1-3	Usable memory (installed from 1 and 2 bank 7 enabled)	IN

Memory Address Range Selection

Range	Base Address	S1-1	S1-2	S1-3	S1-4	S1-5
0-32K	000000-177776	ON	ON	ON	ON	ON
32-64K	200000-377776	ON	OFF	ON	ON	ON
64-96K	400000-577776	OFF	ON	ON	ON	ON
96-128K	600000-777776	OFF	OFF	ON	ON	ON

Cabling - The internal connections from the H9270 backplane and the rear panel assembly are interconnected by cable #70-17259-2F. The cable connections are described in the following figure and table.



NOTE:
THIS FIGURE SHOWS HOW TO CABLE UP THE FOUR SERIAL LINES ON THE MXV11s USING THE 7017259-2F CABLE FROM THE MXV11s TO THE REAR PANEL OF THE CPU BOX.

MR-8624
MK-2631

MXV11-AC Cabling Diagram

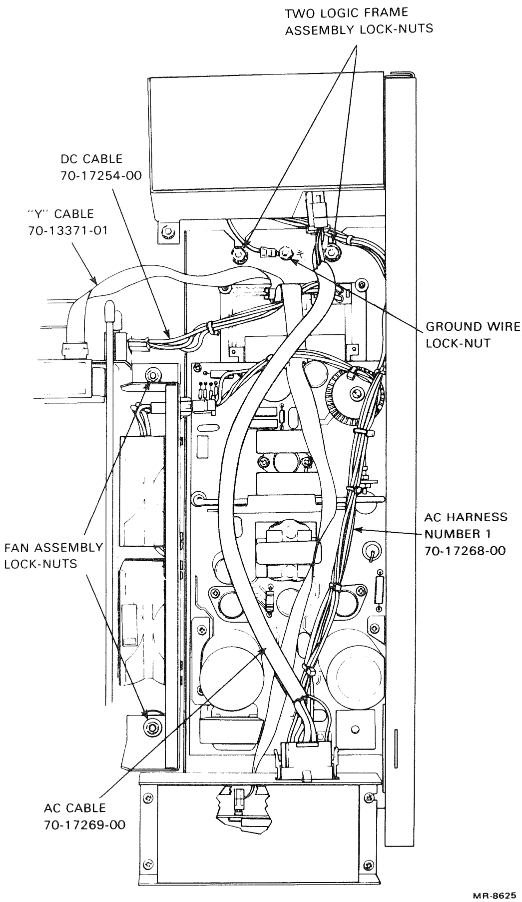
Signal Cable List

Cable Function	Part Number	From	To
Disk bus	70-14033-2F	RXV21 J1 (M8029)	CPU rear panel J0
	70-17258-2F	CPU panel J0	RX02
VT100 console cabling	70-17259-2F	MXV11-ACs J1	CPU rear panel SLU 3
	BC03M-25	SLU 3 CONN CPU rear panel	Console terminal
DUV11*	BC05C-2F	DUV11-DA J1	J3 CONN CPU rear panel (7017261-01) filter adapter assembly
LA120*	BC03M-25	SLU 2 CONN CPU rear panel	LA120 printer
AC cable	70-17269-00	Front panel AC switch box assembly J1	Rear panel assembly J1
DC cable	70-17254-00	DC power distribution board J2	Logic frame assembly J1 (attached to backplane)

Signal Cable List (Cont)

Cable Function	Part Number	From	To
D315 distribution panel 54-13939-00	70-17259-2F	P1 P2 P3 P4	J1 MXV11-AC #1 J1 MXV11-AC #2 J2 MXV11-AC #2 J2 MXV11-AC #1
AC harness number 1	70-17268-00	Rear panel assembly P1	Power supply (Mother) board J1
AC harness number 1	70-17268-00	Rear panel assembly P2	Fan assembly J1
Y cable	70-13371-01	Y cable P2	DC power distribution board J3
Y cable	70-13371-01	DC power distribution board J3	Front panel board J1 (54-12985-00)
Y cable	70-13371-01	DC power distribution board J3	J2 located on the backplane

*Denotes option



Logic Frame/Fan Assembly

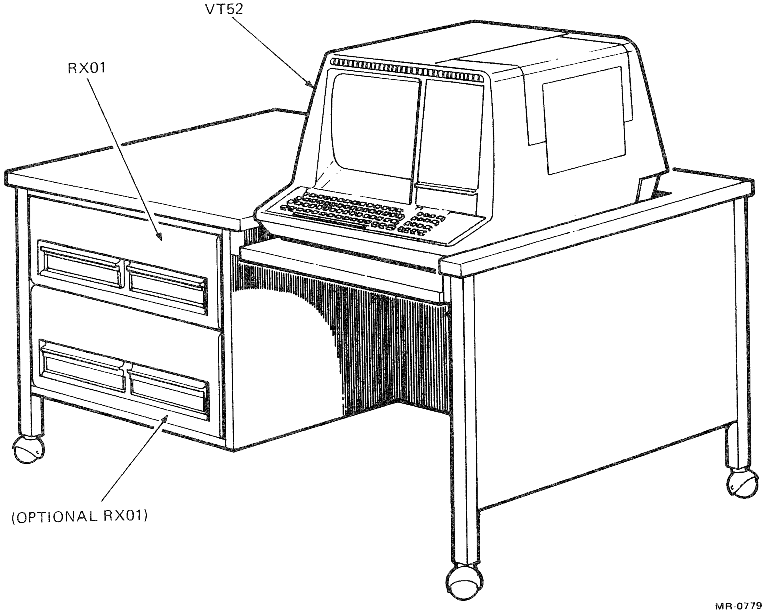
D322
The standard Datasystem 322 includes the following.

- Desk-like cabinet
- Central processor with 32K bytes of MOS memory
- One RX01 dual floppy disk unit with 512K bytes of data storage
- VT52 video/keyboard transaction terminal

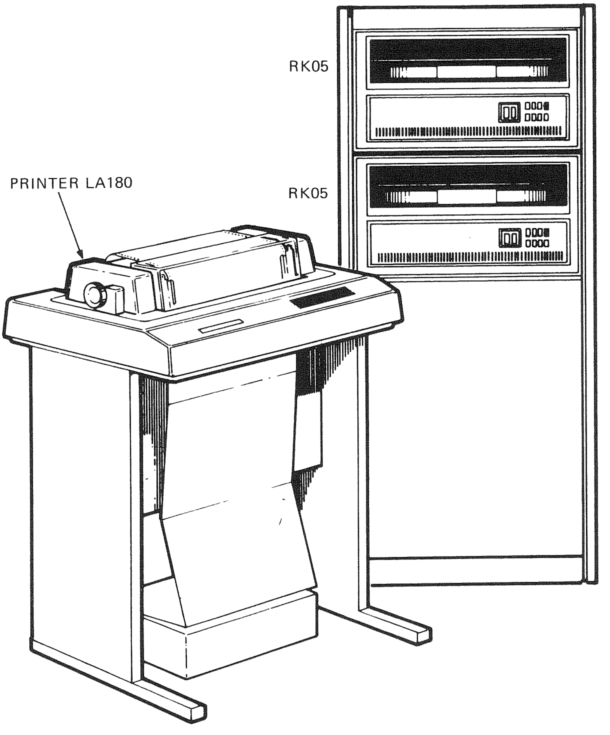
Options include:

- Additional memory up to a total of 56K bytes
- Additional dual floppy disk unit in the same cabinet
- Choice of printers (30 cps up to 300 lpm)
- Cartridge disk drives (2.5 million bytes removable; 5.0 fixed)
- Up to three video or hard-copy terminals
- 2780 communications package and CTS-300 DICAM, providing both batch and interactive communication capabilities.

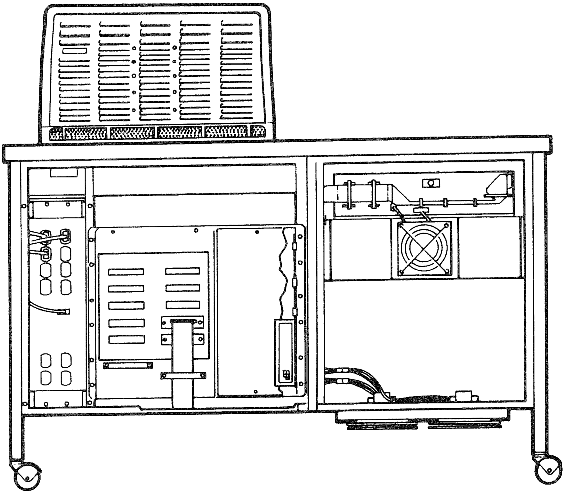
Further information may be found in the *DEC Datasystem 320 Family Service Manual*, EK-DDS03-SV.



Basic 322 System



Optional Cabinet and Printer



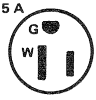
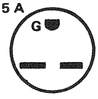
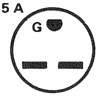
Basic D322 System, Rear View with Door Removed

D322 System Model Designations

	Model Designation			
D322A-	AA	AD	AY	AZ
Input Power/Frequency	115/60	230/50	115/60	230/50
Software Category	A	A	C	C
D322-	A	B	↑	↑
H9820-	W	W		
RXV11-	DA	DD	same	same
PDP-11/03-	JA	JB	as	as
VT52-	AE	AF	AA	AD
LAV11-*	PA	PD	column	column
DS3RK-	AA	AD		
H967-	HK	HL		
RKV11-	DA	DB	↓	↓

*Model AA + LAV11 = Model BA
Model AD + LAV11 = Model BD
Model AY + LAV11 = Model BY
Model AZ + LAV11 = Model BZ

D322 SPECIFICATIONS* SEE D324 SPECS FOR PRINTER SPECS

	BASIC 322		OPTIONAL CABINET	
	115 V 60 HZ	230 V 50 HZ	115 V 60 HZ	230 V 50 HZ
POWER CONNECTOR	15 A 	15 A 	15 A 	15 A 
NEMA NO.	5-15P	6-15P	5-15P	6-15P
DEC P/N	90-08938	90-08853	90-08938	90-08853
AMPERAGE	12 AMPS	6 AMPS	12 AMPS	6 AMPS
BTU/HOUR	3400	3400	1400	1400
HEAT DISSIPATION	1000 W	1000 W	400 W	400 W
SHIPPING WEIGHT (APPROXIMATE)	400 LBS 182 KG	400 LBS 182 KG	300 LBS 136 KG	300 LBS 136 KG

*SPECIFICATIONS HAVE BEEN FIGURED ON THE MAXIMUM CONTAINED IN EACH UNIT.

Specifications

MR-0782

Modules Included in the Basic System

Processor

KD11-P (M7264-BB)

Resident memory addressed as bank 0
CPU refresh disabled
Powers up to 173000

Or

KD11-Q (M7264-YB)

No resident memory
CPU refresh disabled
Powers up to 173000

Memory

MSV11-B (M7944)

4K RAM
Three in basic system with KD11-P
Addresses start at bank 1
Refreshed by REV11-C

Or

MSV11-C (M7955-YD)

16K RAM
One in basic system with KD11-Q
Addresses start at bank 0
Internal refresh

Serial Line Interface

DLV11 (M7940)

Device address 177560
Vector 60
9600 baud
EIA
One stop bit, eight data bits, no parity

RX01 Floppy Disk Interface

RXV11 (M7946)

First device address (disk 0) 177170
First vector 264
Second device address (disk 1) 177150
Second vector 270

Bootstrap/Diagnostic

REV11-C (M9400-YC)

Bootstrap enabled
Diagnostics enabled
Refresh enabled for MSV11-B
Refresh disabled for MSV11-C

Terminator

TEV11 (M9400-YB)

120 Ω terminator

Optional Modules for Recommended Expansion

LA180 Printer Interface

LAV11 (M7949)

Device address 177510
Vector 200

Or

LPV11 (M8027)

Device address 177510
Vector 200

RK05 Disk Interface

RKV11-D

Interfaced to computer by M7269
See the "CPU/Options" section for more detailed information.

Communications Interface

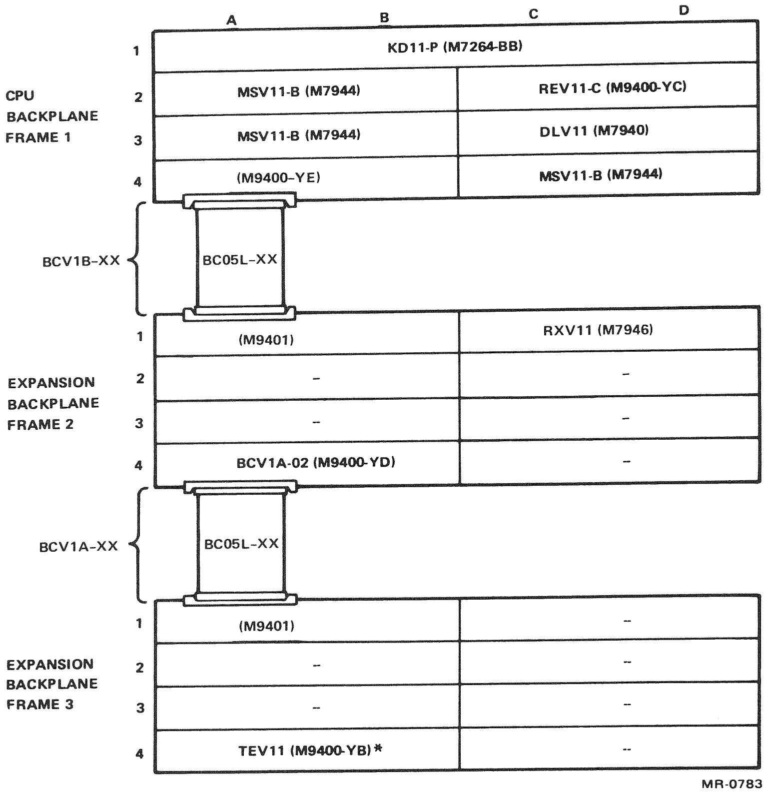
DUV11 (M7951)

Device address 160010
Vector 440

DLV11 (M7940)

Device address:
console 177560
second terminal 176500

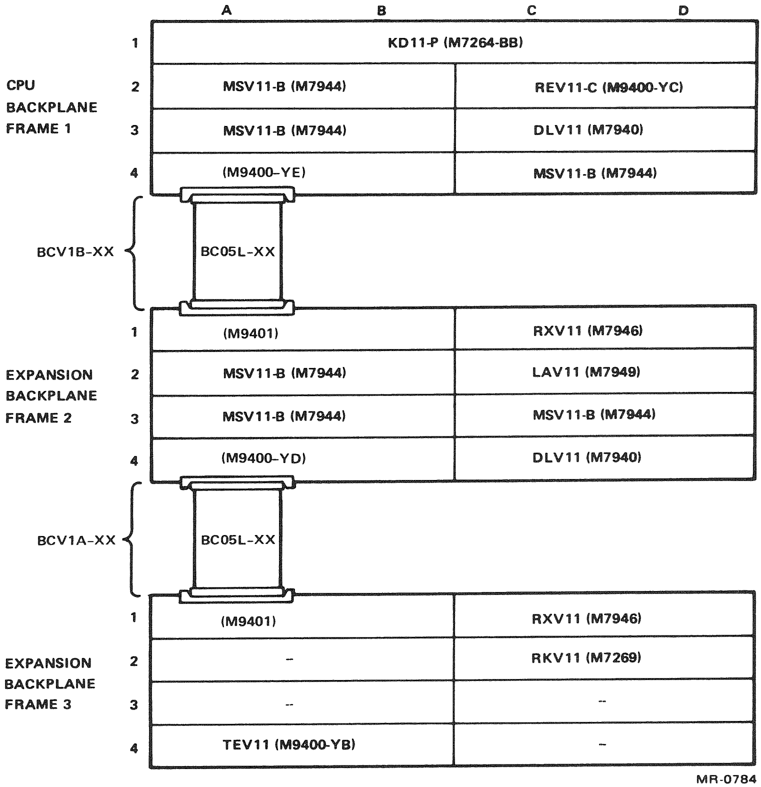
Vector:
console 60
second terminal 300



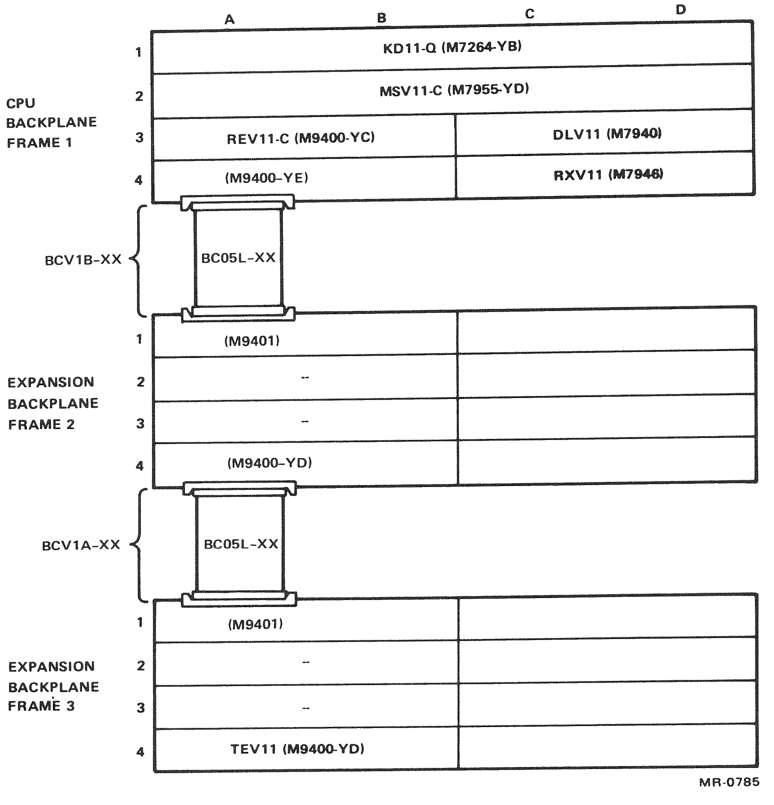
*IN MOST CASES M9400 MODULES ARE PLACED IMMEDIATELY FOLLOWING THE LAST MODULE IN THE SYSTEM. THE TEV11, HOWEVER, IS AN EXCEPTION TO THE GENERAL RULE. IN THE BUSINESS PRODUCTS SYSTEMS IT IS PLACED IN THE LAST SLOT OF THE LAST BACKPLANE IN ORDER TO MINIMIZE NOISE.

D322 Module Utilization Drawing for Basic System

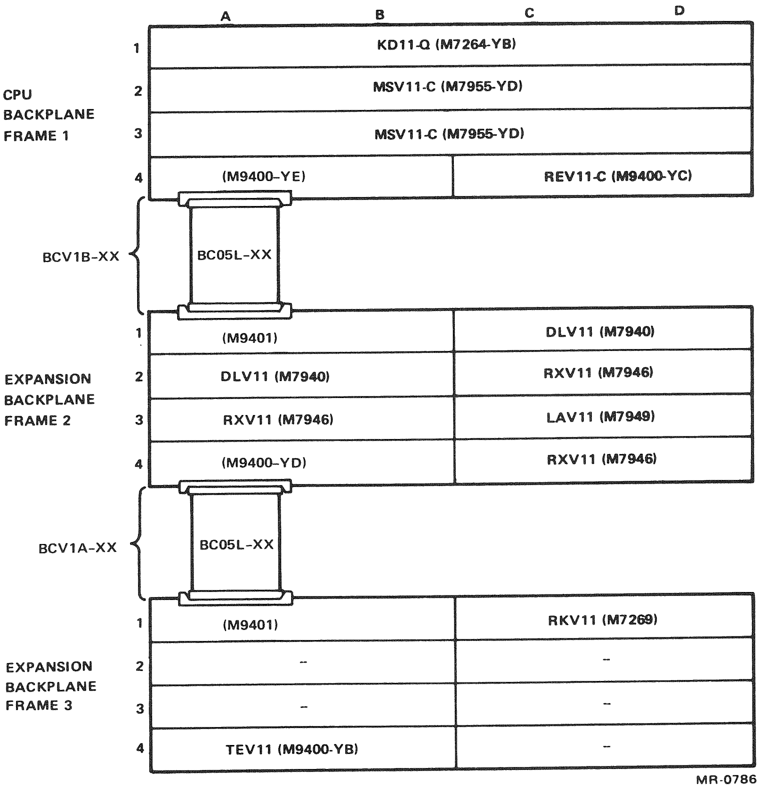
Using PDP-11/03-JA or - JB CPU Box



D322 Module Utilization Drawing for Recommended Expanded Systems Using PDP-11/03-JA or -JB CPU Box



D322 Module Utilization for Basic System
Using PDP-11/03-JC or -JD CPU Box



D322 Module Utilization for Recommended Expanded Systems Using PDP- 11/03-JC or -JD CPU Box

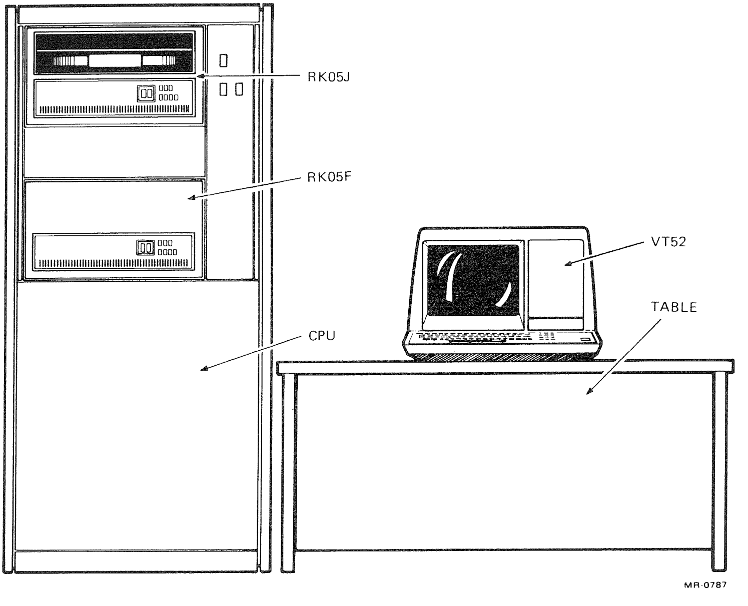
D324

The standard Datasystem 324 includes the following.

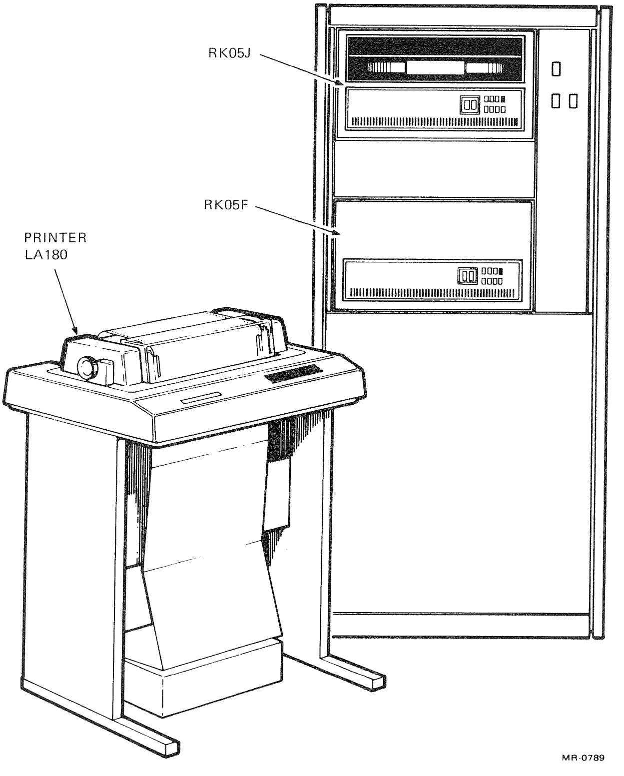
- Stylized cabinet and desk
- Central processor with 32K bytes of MOS memory
- One RK05J removable disk drive with a capacity of 2.4 million bytes of data
- One RK05F fixed disk drive with a capacity of 4.8 million bytes of data
- VT52 video/keyboard transaction terminal

Options include additional memory up to a total of 56K bytes.

Further information may be found in the *DEC Datasystem 320 Family Service Manual*, EK-DDS03-SV.



Basic 324 System



Optional Cabinet and Printer

D324 System Model Designations

	Model Designation			
D324A-	AA	AD	AY	AZ
Input Power / Frequency	115/60	230/50	115/60	230/50
Software Category	A	A	C	C
D324-	A	B	↑	↑
H9602-	CC	CD		
RKV11-	DA	DB	same	same
PDP-11/03-	JA	JB	as	as
H970-	DA	DA	AA	AD
VT52-	AE	AF	column	column
LAV11-*	PA	PD		
RXV11-	DA	DD	↓	↓

*Model AA + LAV11 = Model BA
Model AD + LAV11 = Model BD
Model AY + LAV11 = Model BY
Model AZ + LAV11 = Model BZ

D324 SPECIFICATIONS*

	PRINTER LA180		RK05 CABINET		CPU CABINET		VT52 DESK	
	115V 60HZ	230V 50HZ	115V 60HZ	230V 50HZ	115V 60HZ	230V 50HZ	115V 60HZ	230V 50HZ
POWER CONNECTOR	15 A (G, W)	15A (G)	30 A W (G)	30 A W (G)	30 A W (G)	20 A X (G, Y)	15 A (G, W)	15 A (G)
NEMA NO.	5-15 P	6-15 P	15-30 P	15-30 P	15-30 P	66-20 P	5-15 P	6-15 P
DEC P/N	90-08938	90-08853	12-11193	12-11193	12-11193	12-11192	90-08938	90-08853
AMPERAGE	.3 A	1.5 A	24 A	6 A	24 A	6 A	1 A	.5 A
BTU/HOUR	1023	1023	1400	1400	3400	3400	400	400
HEAT DISSIPATION	300 W	300 W	400 W	400 W	1000 W	1000 W	118 W	118 W
SHIPPING WEIGHT (APPROXIMATE)	120 LBS 55 KG	120 LBS 55 KG	300 LBS 136 KG	300 LBS 136 KG	400 LBS 182 KG	400 LBS 182 KG	225 LBS 102 KG	225 LBS 102 KG

* SPECIFICATIONS HAVE BEEN FIGURED ON THE MAXIMUM CONTAINED IN EACH UNIT.

MR-0790

Specifications

Modules Included in the Basic System

Processor

KD11-P (M7264-BB)

Resident memory addressed as bank 0
CPU refresh disabled
Powers up to 173000

Or

KD11-Q (M7264-YB)

No resident memory
CPU refresh disabled
Powers up to 173000

Memory

MSV11-B (M7944)

4K RAM
Three in basic system with KD11-P
Addresses start at bank 1
Refreshed by REV11-C

Or

MSV11-C (M7955-YD)

16K RAM
One in basic system with KD11-Q
Addresses start at bank 0
Internal refresh

Serial Line Interface

DLV11 (M7940)

Device address 177560
Vector 60
9600 baud
EIA
One stop bit, eight data bits, no parity

D324

Disk Drive Interface

RKV11-D

Interfaced to computer by M7269
Device address 177400
Vector 220

Bootstrap/Diagnostic

REV11-C (M9400-YC)

Bootstrap enabled
Diagnostic enabled
Refresh enabled for MSV11-B
Refresh disabled for MSV11-C

Terminator

TEV11 (M9400-YB)

120 Ω terminator

Optional Modules for Recommended Expansion

LA180 Printer Interface

LAV11 (M7949)

Device address 177510
Vector 200

Or

LPV11 (M8027)

Device address 177510
Vector 200

RX01 Floppy Disk Interface

RXV11 (M7946)

First device address (disk 0) 177170
First vector 264
Second device address (disk 1) 177150
Second vector 270

Communications Interface

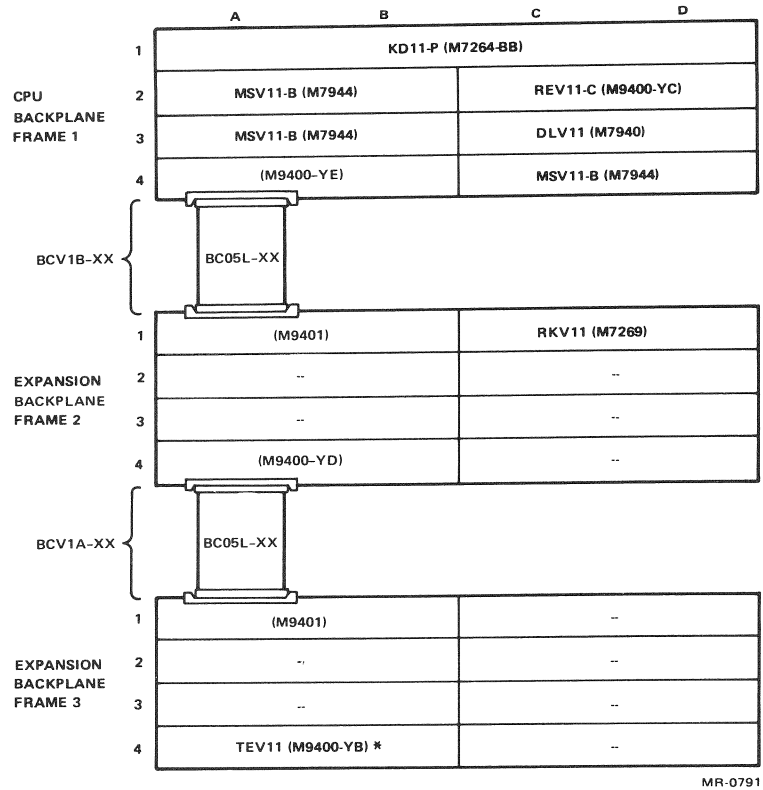
DUV11 (M7951)

Device address 160010
Vector 440

DLV11 (M7940)

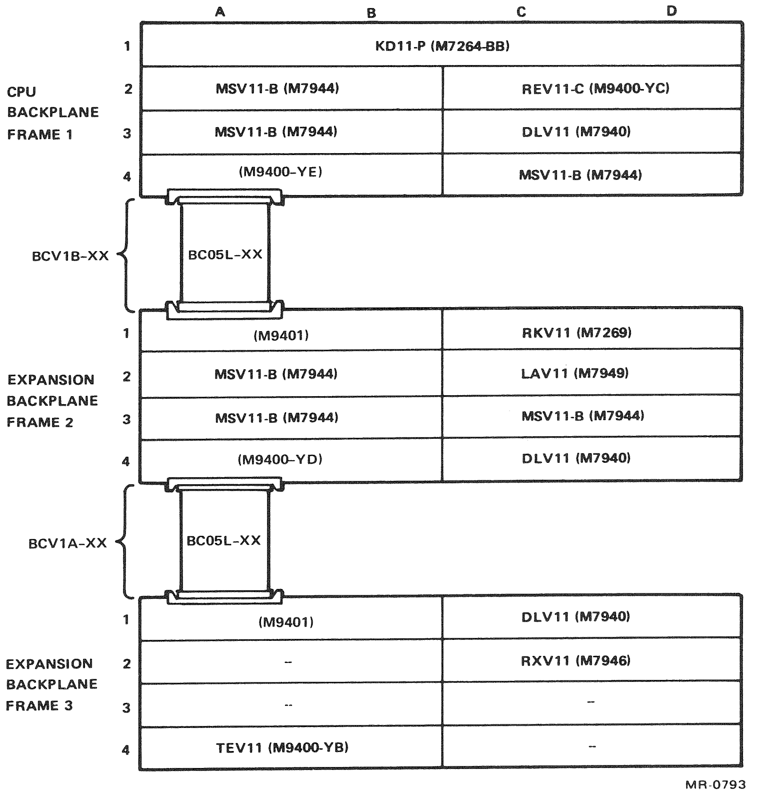
Device address:
console 177560
second terminal 176500

Vector:
console 60
second terminal 300

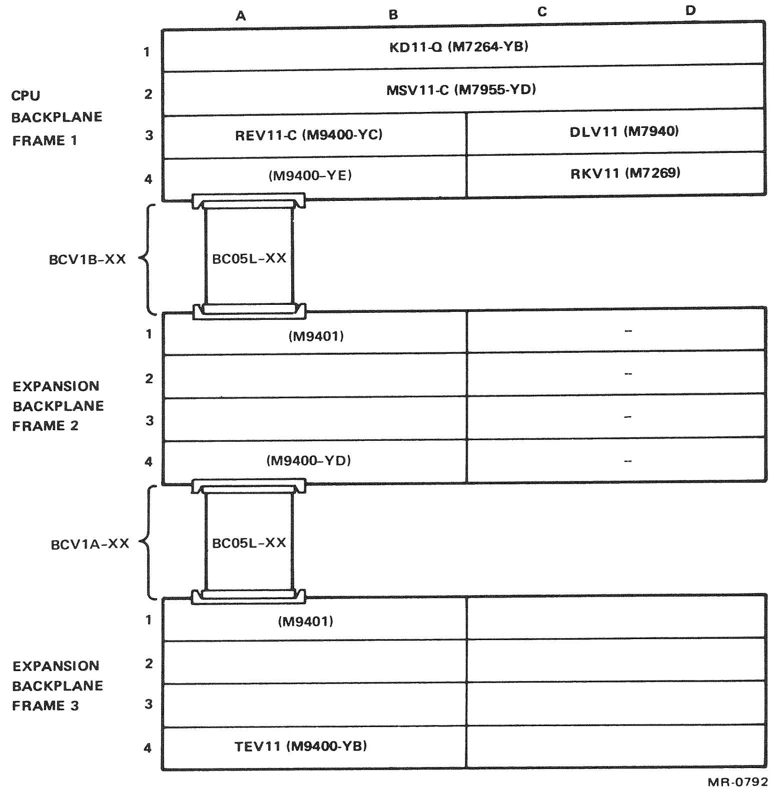


*IN MOST CASES M9400 MODULES ARE PLACED IMMEDIATELY FOLLOWING THE LAST MODULE IN THE SYSTEM. THE TEV11, HOWEVER, IS AN EXCEPTION TO THE GENERAL RULE. IN THE BUSINESS PRODUCTS SYSTEMS IT IS PLACED IN THE LAST SLOT OF THE LAST BACKPLANE IN ORDER TO MINIMIZE NOISE.

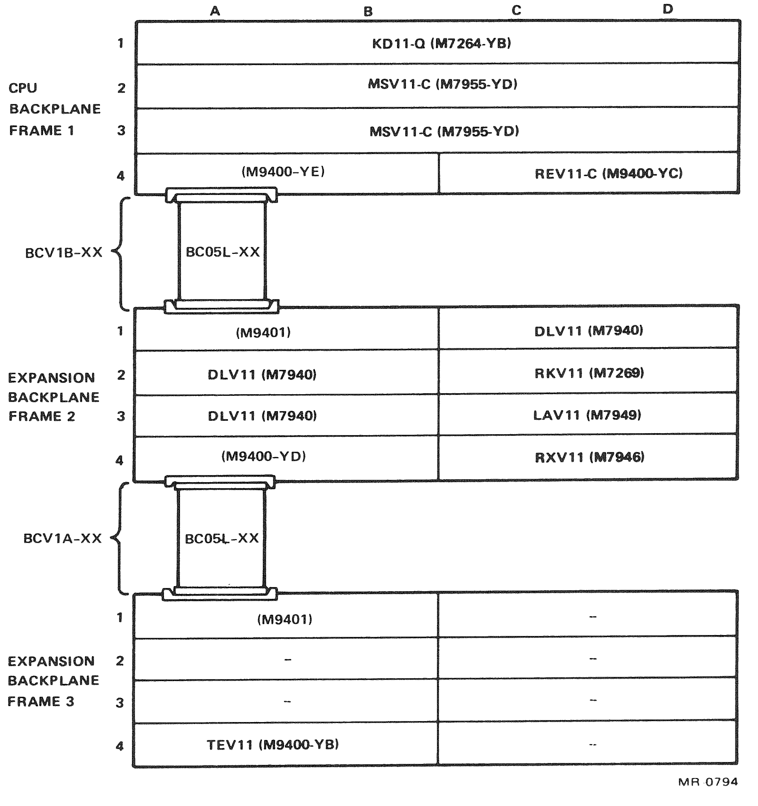
D324 Module Utilization Drawing for Basic System
Using PDP-11/03-JA or - JB CPU Box



D324 Module Utilization Drawing for Recommended Expanded Systems Using PDP-11/03-JA or -JB CPU Box



D324 Module Utilization for Basic System
Using PDP-11/03-JC or -JD CPU Box

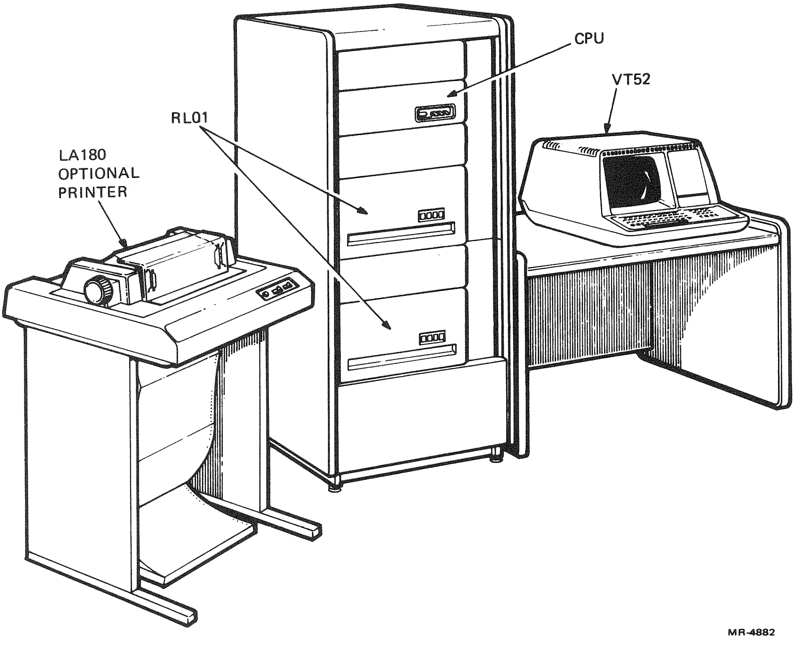


D324 Module Utilization for Recommended Expanded Systems Using PDP-11/03-JC or -JD CPU Box

D325

The D325 system, with DIGITAL's fully supported CTS-300 software license and DIBOL instruction set, includes the PDP-11/03 central processor, 64K bytes of MOS memory, bootstrap loader, serial line interface, and VT52 CRT console terminal. There is an RLV11 controller with dual five-megabyte removable disk drives (RL01) for use as a system device and as a primary backup and load device. This configuration is arranged in an H9602 cabinet and an H9532-AA desk.

Space is reserved in this configuration for a printer. Any of the following may also be added: additional RL01 disk drives plus cabinet, dual floppy disk unit, choice of four printers, up to three video or hard-copy terminals and/or a 2780 communication package and CTS-300 DICAM (a software package).



D325 System

	Model Designation	
D325A	AA	AD
Input Power/Frequency	115/60	230/50
H9602	CM	CN
PDP-11/03	NC	ND
RL01	AK	AK
H9532	AA	AA
VT52	NE	NF
LA180*	PA	PD

*Model AA + LA180 = Model BA,
Model AD + LA180 = Model BD.

D325 SPECIFICATIONS

	PRINTER LA180		RL01 CABINET		CPU CABINET		VT52 DESK	
	115V 60HZ	230V 50HZ	115V 60HZ	230V 50HZ	115V 60HZ	230V 50HZ	115V 60HZ	230V 50HZ
POWER CONNECTOR	15A G W	15A G	30A W G	30A W G	30A W G	20A X G Y	15A G W	15A G
NEMA NO.	5-15 P	6-15 P	15-30 P	15-30 P	15-30 P	66-20 P	5-15 P	6-15 P
DEC P/N	90-08938	90-08853	12-11193	12-11193	12-11193	12-11192	90-08938	90-08853
AMPERAGE	3 A	1.5A	2.6A	1.3A	8A	4A	1A	.5A
BTU/HOUR	1023	1023	1100	1100	3400	3400	400	400
HEAT DISSIPATION	300W	300W	300W	300W	960W	960W	118W	118W
SHIPPING WEIGHT (APPROXIMATE)	120 LBS 55 KG	120 LBS 55 KG	275 LBS 125 KG	275 LBS 125 KG	350 LBS 159 KG	350 LBS 159 KG	225 LBS 102 KG	225 LBS 102 KG

MR-4883

Specifications

D325

Modules Included in the Basic System

Processor

KD11-Q (M7264-YB)

No resident memory
CPU refresh disabled
Powers up to 173000

Memory

MSV11-DD (M8044)

64K byte MOS RAM
One in basic system
Addresses start at bank 0
Internal refresh

Serial Line Interface

DLV11 (M7940)

Device address 177560
Vector 60
9600 baud
EIA
One stop bit, eight data bits, no parity

Disk Drive Interface

RLV11 (M8013 and M8014)

Device address 174400
Vector 160

Bootstrap

BDV11-AA (M8012)

Bootstrap enabled
Real time clock enabled (switch B5)

LA180 Printer Interface

LPV11 (M8027)

Device address 177514
Vector 200

	Q-BUS		C/D BUS FOR INTERCONNECTING	
	A	B	C	D
1	KD11-Q (M7264-YB)			
2	MSV11-DD (M8044-DA)			
3	RLV11 (M8013)			
4	RLV11 (M8014)			
5	DLV11 (M7940)		EMPTY	
6	LPV11 (M8027)		EMPTY	
7	OPTION			
8	OPTION			
9	BDV11-AA (M8012-YA)			

MR-4884

D325 Module Configuration Using PDP-11/03-NC or PDP-11/03-ND Box

D333C

The D333C data system with DIGITAL's fully supported CTS-300 software license and DIBOL instruction set includes the PDP-11/23 microcomputer with 128K bytes of MOS memory, a four-channel serial line interface with bootstrap/terminator and a VT100 CRT console terminal. There is an RXV21 controller for a dual RX02 floppy disk storage medium. This configuration is arranged in an H9642 system cabinet and an H9532 work table. This system can be expanded for greater storage capacity.

	Model Designation	
D333C	AA	AD
Input Power/Frequency	115/60	230/50
H9652	-	-
PDP-11/23	AA	AB
VT100	NA	NB
LA180	PA	PD
RX02	BA	BC

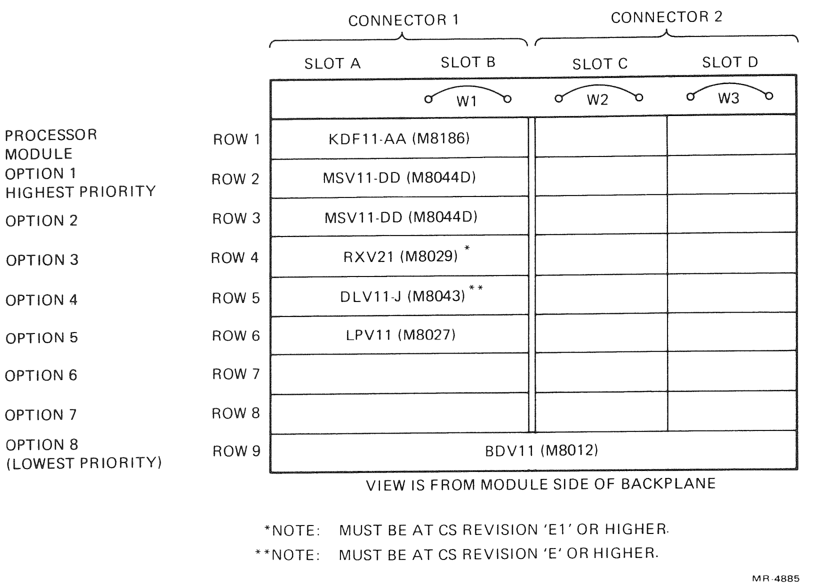
Compatible Options

- An additional 128K bytes memory
- Additional video or hard-copy terminals for a total of four
- Additional storage medium
  Second dual floppy disk (1 megabyte storage)
- Choice of printers
- BATCH or interactive communication software languages:

  DICAM - Data System Interactive Communications Access Method (for IBM 360/370 hosts)

  DIBOL - DIGITAL Business-Oriented Language

  RDCP - 2780/3780 BATCH Communication Package.



D333 Module Configuration

D335C

The D335C data system, with DIGITAL's fully supported CTS-300 software license and DIBOL instruction set, includes the PDP-11/23 microcomputer with 128K bytes of MOS memory, a four-channel serial line interface with bootstrap/terminator, and a VT100 CRT console terminal. There is an RLV11 controller with 10-megabyte removable RL01 dual disk drives for use as a system device and a primary backup and load device. This configuration is arranged in an H9642 system cabinet and an H9532 work table.

Space is available in this configuration for a printer.

	Model Designations	
D335C	AA	AD
Input Power/Frequency	115/60	230/40
H9642	-	-
PDP-11/23	AA	AB
RL01	AK	AK
H9532	AB	AB
VT100	NA	NB
LA180*	PA	PD

*Optional

Modules Included in the Basic System

Processor

KDF11-AA (M8186)

Memory management standard
KEF11-A floating point (optional)

Memory

MSV11-DD (M8044)

64K bytes MOS RAM (two in basic system)
Addresses start at bank 0
Internal refresh

Serial Line Interface

DLV11-J (M8043) (Must be at CS revision "E" or higher.)

Console device address 177560
Vector address 60
9600 baud
EIA RS423 and RS-232C
One stop bit, eight data bits, no parity

Disk Drive Interface

RLV11 (M8013 and M8014)/RL01

Device address 174400
Vector address 160

Bootstrap

BDV11-AA (M8012)

Bootstrap enabled
Real time clock enabled (switch B5)

LA180 Printer Interface

LPV11 (M8027)

Device address 177514
Vector address 200

		CONNECTOR 1		CONNECTOR 2	
		SLOT A	SLOT B	SLOT C	SLOT D
			W1	W2	W3
PROCESSOR MODULE	ROW 1	KDF11-AA (M8186)			
OPTION 1 (HIGHEST PRIORITY	ROW 2	MSV11-D (M8044D)			
OPTION 2	ROW 3	MSV11-D (M8044D)			
OPTION 3	ROW 4	RLV11 (M8013)			
OPTION 4	ROW 5	RLV11 (M8014)			
OPTION 5	ROW 6	DLV11-J (M8043) *			
OPTION 6	ROW 7	LPV11 (M8027)			
OPTION 7	ROW 8				
OPTION 8 (LOWEST PRIORITY)	ROW 9	BDV11-AA (M8012-YA)			

VIEW IS FROM MODULE SIDE OF BACKPLANE

*NOTE: MUST BE AT CS REVISION 'E' OR HIGHER.

MR-4886

D335 Module Configuration

D336C

The D336C data system, with DIGITAL's fully supported CTS-300 software license and DIBOL instruction set, includes the PDP-11/23 microcomputer with 128K bytes of MOS memory, a four-channel serial line interface with bootstrap/terminator, and a VT100 CRT console terminal. There is an RLV11 controller with 20-megabyte removable dual RL02 disk drives for use as a system device and a primary backup and load device. This configuration is arranged in an H9642 system cabinet and an H9532 worktable.

Space is available in this configuration for added expansion such as a printer, a serial line interface, synchronous communication, memory, floppy control, etc.

	Model Designation	
D336C	AA	AD
Input Power/Frequency	115/60	230/50
H9642	-	-
PDP-11/23	AA	AB
RL02	AK	AK
H9532	AB	AB
VT100	NA	NB
LA180*	PA	PD

*Optional

Modules Included in the Basic System

Processor

KDF11-AA (M8186)

Memory management standard
KEF11-A floating point (optional)

Memory

MSV11-DD (M8044)

64K bytes MOS RAM (two in basic system)
Addresses start at bank 0
Internal refresh

Serial Line Interface

DLV11-J (M8043) (Must be at CS revision "E" or higher.)

Console device address 177560

Vector address 60
9600 baud
EIA RS423 and RS-232C
One stop bit, eight data bits, no parity

Disk Drive Interface

RLV11 (M8013 and M8014)/RL02

Device address 174400
Vector address 160

Bootstrap

BDV11-AA (M8012)

Bootstrap enabled
Real time clock enabled (switch B5)

LA180 Printer Interface

LPV11 (M8027)

Device address 177514
Vector address 200

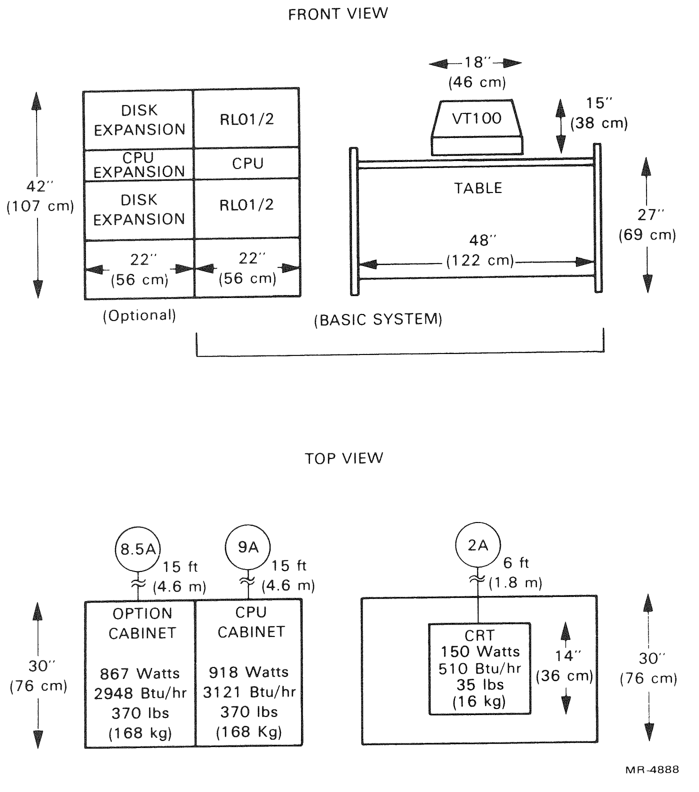
		CONNECTOR 1		CONNECTOR 2	
		SLOT A	SLOT B	SLOT C	SLOT D
			W1	W2	W3
PROCESSOR MODULE	ROW 1	KDF11-AA (M8186)			
OPTION 1 (HIGHEST PRIORITY	ROW 2	MSV11-D (M8044D)			
OPTION 2	ROW 3	MSV11-D (M8044D)			
OPTION 3	ROW 4	RLV11 (M8013)			
OPTION 4	ROW 5	RLV11 (M8014)			
OPTION 5	ROW 6	DLV11-J (M8043) *			
OPTION 6	ROW 7	LPV11 (M8027)			
OPTION 7	ROW 8				
OPTION 8 (LOWEST PRIORITY)	ROW 9	BDV11-AA (M8012-YA)			

VIEW IS FROM MODULE SIDE OF BACKPLANE

*NOTE: MUST BE AT CS REVISION 'E' OR HIGHER.

MR-4887

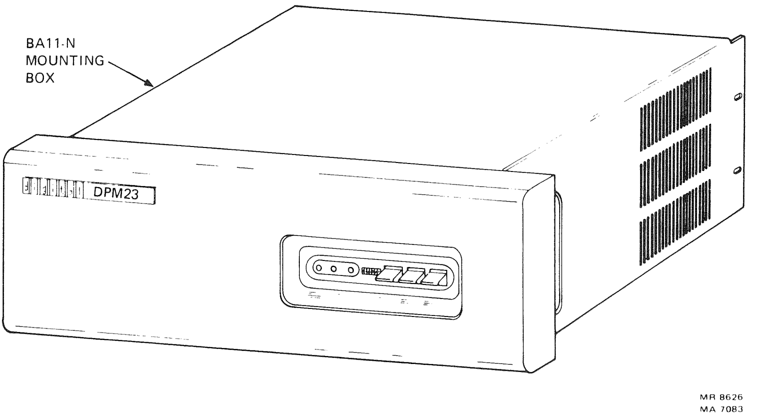
D336 Module Configuration



D325, D335, and D336 Data Systems

DPM23 DISTRIBUTED PLANT MANAGEMENT SYSTEM

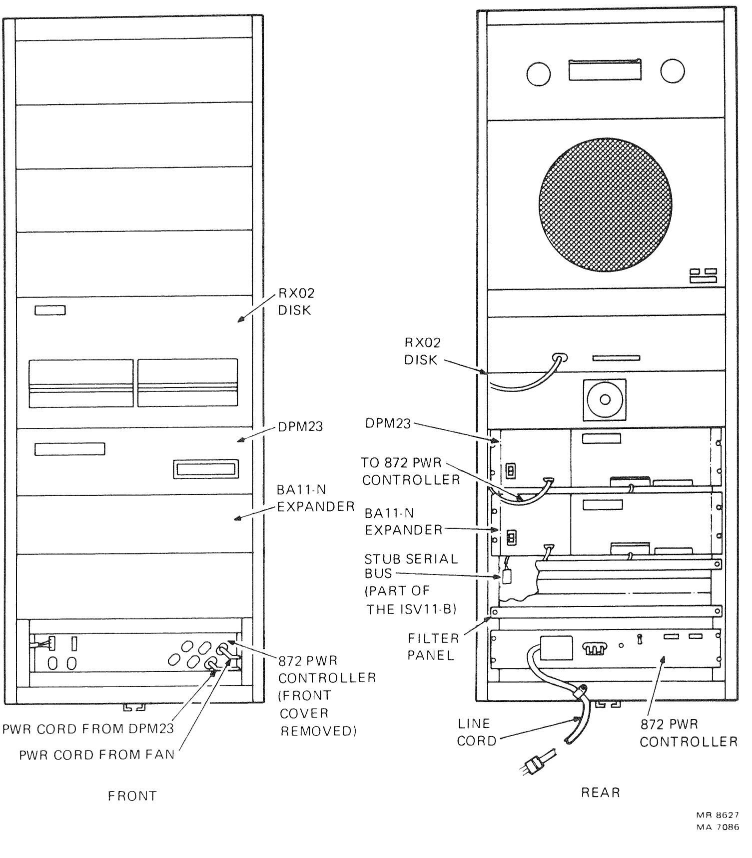
The DPM23 is a subsystem kernel connected to a distributed plant management system via the DECdataway communications channel. A kernel DPM23 consists of an LSI-11/23 processor, 64K bytes of main memory, and an ISV11-B DECdataway interface in an H9273 backplane. This assembly is enclosed in a BA11-N rack mountable box and equipped with a power supply, front panel controls, and indicators. It is available separately or in a DIGITAL H9646-AC/AD cabinet. Both cabinet and noncabinet models are available with either 120 V or 240 V service options. These choices are indicated by the DPM23 model number suffix listed in the following table.



A DPM23 Subsystem Kernel

DPM23 System Model Designations

DPM23 Model	H9646 Cab	Power Controller	Voltage	Current	Frequency
A, K			120 V	6 A	47-63 Hz
D, N			240 V	3 A	47-63 Hz
CA, CK	AC	872-D	120 V	16 A	47-63 Hz
CD, CN	AD	872-E	240 V	8 A	47-63 Hz



Cabinet Mounted DPM23

Hardware Options

In addition to the kernel system, the DPM23 supports the following hardware options.

DPM23 Hardware Options

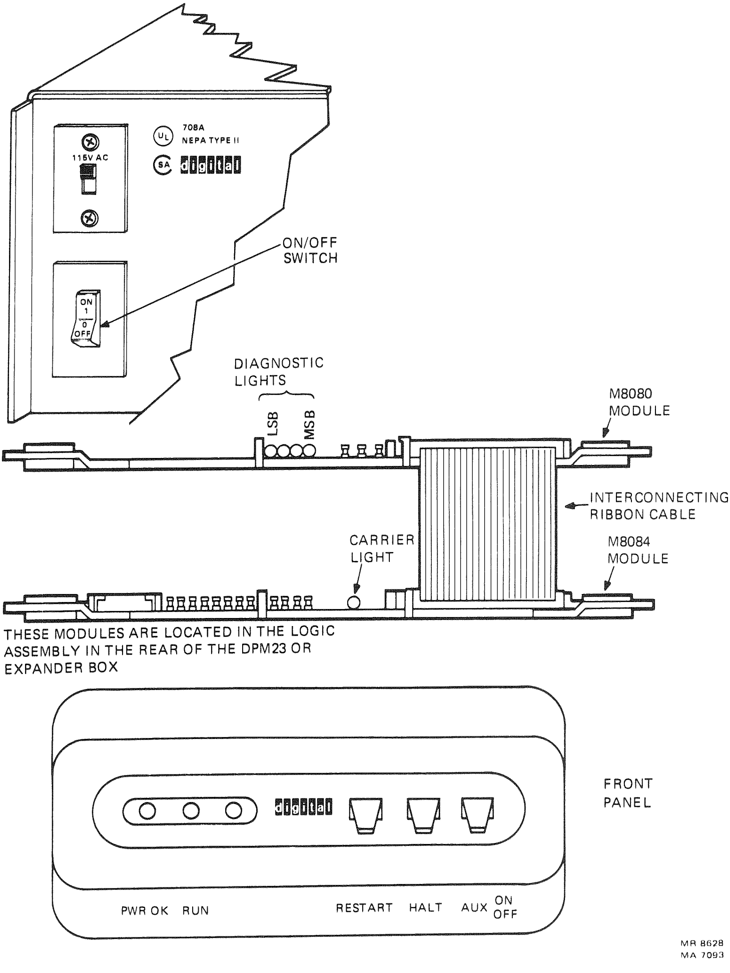
Class	Option	Description
General	KEF11-AA BDV11-AA TEV11	Floating-point option. Diagnostic, bootstrap, terminator. Bootstrap, terminator.
Main memory	MSV11-DD	Each MSV11-DD has 64K bytes of memory. Up to three units can be added for a total of 256K bytes including the kernel system.
Mass memory	RXV21-DA/DD	RX02 floppy disk (non-DMA).
Terminals	DLV11	Serial line unit.
	DLV11-E	Asynchronous line interface (EIA only, full modem control).
	DLV11-F	Asynchronous line interface (EIA or 20 mA, no modem control).
	DLV11-J	Four asynchronous serial interfaces.

NOTE
You can use only one DLV11-J in the DPM23 due to a vector address conflict with the ISV11-B.

Class	Option	Description
	DLV11-KA	20 mA current loop converter used with the DLV11-J (one per serial line).
	DZV11-B	Four-terminal asynchronous multiplexer.
Hardcopy	LPV11-PA/PD	Line printer.
Process control	IPV12	Supports up to 80 I/O modules.
Expansion	BA11-NE/NF	You can extend the LSI-11 bus in the DPM23 by adding up to two BA11-N expander boxes. However, in expanded systems care must be taken to observe the backplane configuration rules of BA11-N enclosures.

DECdataway Interface (ISV11-B) – This unit interfaces the DECdataway to the DPM23's LSI-11 bus. It consists of two modules and two cables. One module, the M8080, interfaces with the LSI-11 bus via its etched edge connector; the other module, the M8084, interfaces with the DECdataway via one of the two cables. The second cable interconnects the two modules. Note that although the two modules always interconnect with a cable, they do not necessarily go in adjacent slots of the H9273 backplane. The M8080 is always assigned as the last option on the LSI-11 bus (except for the BDV11 or TEV11 options). The M8084, though it occupies a slot in the backplane, does not plug into the backplane and is always assigned to the last available slot.

DPM23 Switches and Indicators – The switches and indicators used to control the DPM23 subsystem are described in the following figures and table.



DPM23 Switches and Indicators

DPM23 Switches and Indicators

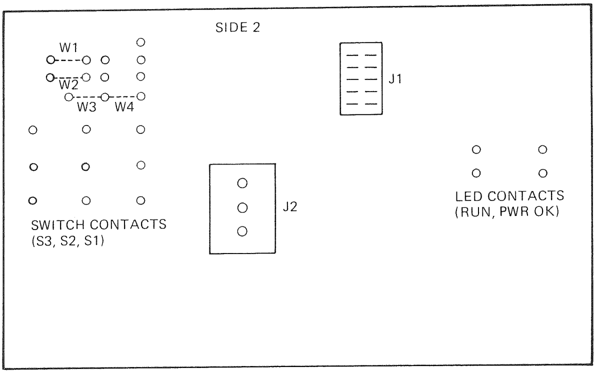
Switch or Indicator	Location	Function
ON/OFF	Rear of DPM23 chassis	Turns the DPM23 on or off.
AUX ON/OFF	Front panel	This switch is not used unless the DPM23 is mounted in a cabinet. In a cabinet-mounted DPM23, a cable connects this switch to the cabinet power controller. Since all cabinet equipment is powered from the power controller, this switch serves as the master on/off switch for the entire cabinet.
HALT	Front panel	In the down position, this switch halts program execution by the DPM23 processor. In the up position, program execution is enabled but does not start automatically. A down-line loading procedure from the dataway host normally starts the DPM23.
RESTART	Front panel	When this momentary contact switch is moved to the up position and released, it causes the DPM23 to do a power-up sequence. If the HALT switch is up, the processor can start executing a program. If the HALT switch is down, the processor enters ODT mode, and responds to ODT commands from a console terminal.

DPM23 Switches and Indicators (Cont)

Switch or Indicator	Location	Function
PWR OK	Front panel	This indicator lights when power supply dc voltages are present.
RUN	Front panel	This indicator lights when the processor is executing programs.
Diagnostic indicators	ISV11-B M8080 module	When one of the twelve ISV11-B ROM-resident diagnostics is running, these indicators display its number (in octal). An error in any one of the first nine (hardcore) tests causes its number to be displayed continuously. An error in any of the last three (softcore) tests causes the test's number to flash on and off for ten seconds.
Carrier indicator	ISV11-B M8084 module	This indicator is on whenever a message is being transmitted to or from any port on the dataway.
Unlabeled indicator	Front panel	This is a spare LED.

Configuration

The standard DPM23 system configuration consists of the backplane, Bezel, KDF11-AA, MSV11-DA, and the ISV11-B. The requirements of these modules and assemblies are described in the following figures. Additional LSI-11 optional modules must be configured to meet the requirements they were selected for.



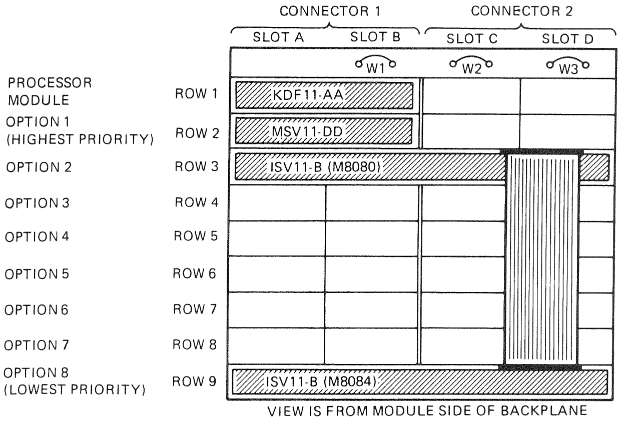
NOTES:
1. VIEW IS FROM THE REAR OF THE BEZEL WHEN THE BOARD IS MOUNTED ON THE BEZEL.
2. JUMPERS ARE MOUNTED ON SIDE 1.

FACTORY JUMPER CONFIGURATION

JUMPER	JUMPER STATE	FUNCTION
W1, W2	OUT	ALLOWS THE AUX ON/OFF SWITCH TO TURN THE SYSTEM POWER ON AND OFF
W3	OUT	CPU IS MOUNTED IN THIS BACKPLANE
W4	IN	ENABLES THE RUN INDICATOR BECAUSE THE CPU IS MOUNTED IN THIS BACKPLANE

MR-8629
MA-0737B

DPM23 Bezel Printed Circuit Board



H9273-A OPTION POSITIONS
KERNEL DPM23 ONLY

STANDARD FACTORY JUMPER CONFIGURATION

JUMPER	JUMPER STATE	FUNCTION
*W1	IN	THE H786 POWER SUPPLY GENERATED LTC SIGNAL IS USED TO ASSERT BEVNT L SIGNAL
W2, W3	DON'T CARE	

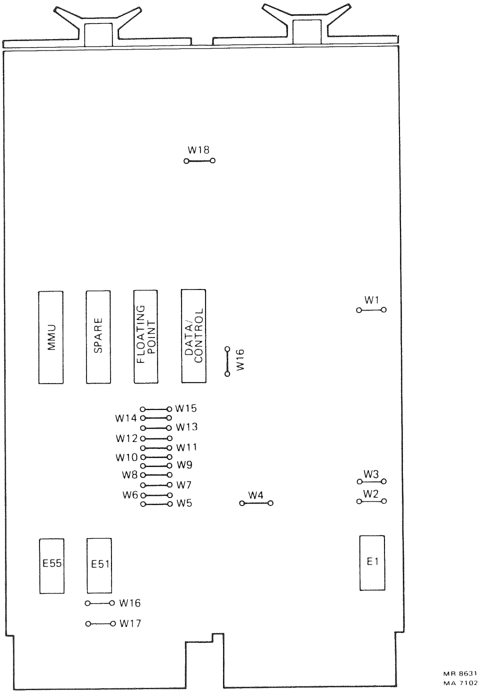
*W1 MUST BE REMOVED FROM ALL BUT THE LAST BOX IN A MULTIPLE-BOX SYSTEM SINCE ONLY THE BOX CONTAINING THE M8012 MODULE MUST BE THE SOURCE OF THE LTC SIGNAL

MR 8630
MA 7101

DPM23 Kernel System Backplane

FACTORY JUMPER CONFIGURATION (REV C)

JUMPERS	JUMPER STATE	FUNCTION
W1	IN	ENABLE INTERNAL MASTER CLOCK
W2, W3	AS RECEIVED	DIGITAL USE, ONLY W2 OR W3 MUST BE INSTALLED, NOT BOTH
W4	REMOVED	EVENT LINE ENABLE
W5, W6	REMOVED	POWER UP MODE 0
W7	IN	TRAP TO LOCATION 10 ON HALT
W8 THROUGH W15	DON'T CARE	
W16 THROUGH W18	IN	DIGITAL USE ONLY



DPM23 KDF11-AA Processor

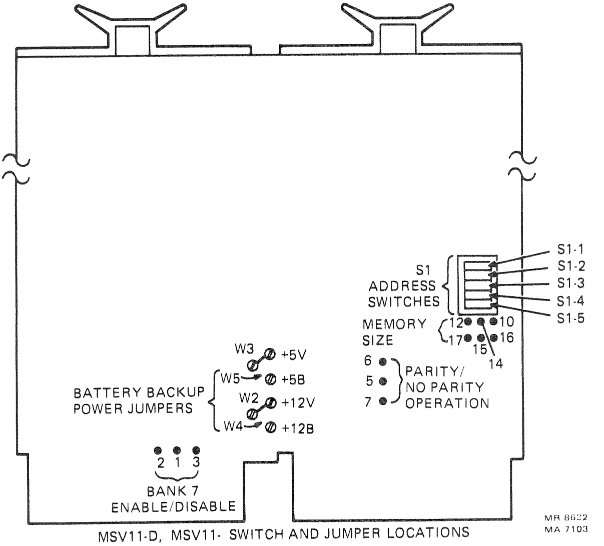
FACTORY JUMPER CONFIGURATIONS

JUMPER	JUMPER STATE	FUNCTION IMPLEMENTED
PIN 1 TO 3	IN	DISABLES MEMORY BANK 7
PIN 1 TO 2	REMOVED	
W2	IN	ENABLE NORMAL SYSTEM POWER (+12V)
W3	IN	ENABLE NORMAL SYSTEM POWER (+5V)
W4	REMOVED	DISABLE BATTERY POWER (+12V)
W5	REMOVED	DISABLE BATTERY POWER (+5V)
PIN 10 TO 14	IN	SELECT MEMORY SIZE OF 32K WORDS
PIN 16 TO 15	IN	

SWITCH SETTINGS

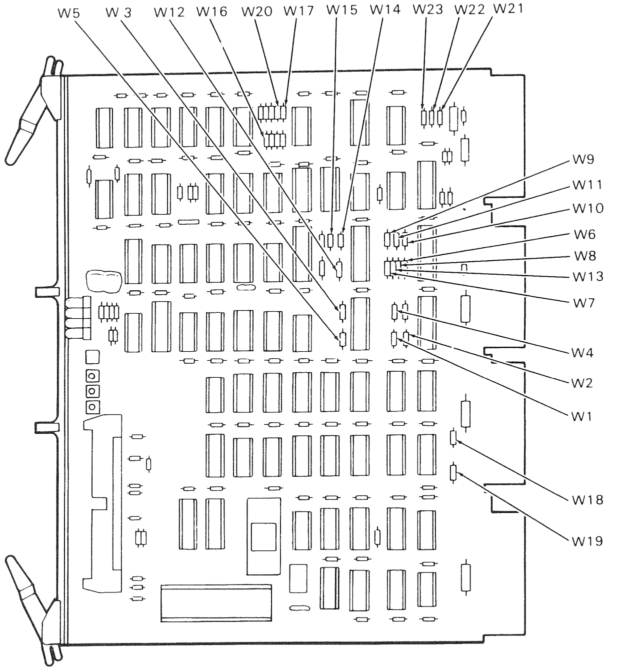
SWITCH	1ST MODULE BANK 0-7	2ND MODULE BANK 10-17	3RD MODULE BANK 20-27	4TH MODULE BANK 30-37
S-1	1	1	0	0
S-2	1	0	1	0
S-3	1	1	1	1
S-4	1	1	1	1
S-5	1	1	1	1

1=SWITCH CLOSED (ON)
0=SWITCH OPEN (OFF)



MSV11-D, MSV11- SWITCH AND JUMPER LOCATIONS

DPM23 MSV11-DD Memory Module



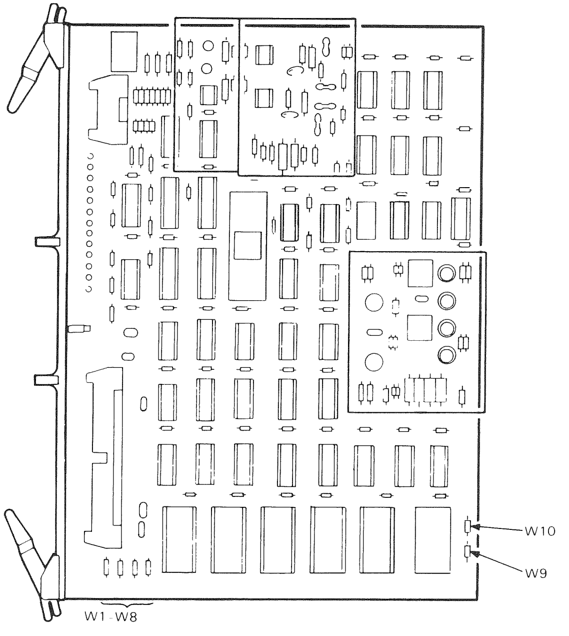
FACTORY JUMPER CONFIGURATION
IN: W7, W8, W9, W10, W17, W18, W19, W20
OUT: ALL OTHERS

JUMPER FUNCTIONS

JUMPER	USE
W1-W8, W12, W13	LSI-11 BUS ADDRESS
W9-W11, W14, W15	VECTOR ADDRESS
W16	HOLD ON B SACK L
W17, W20	DMA TIMERS
W18, W19	CONNECT PINS
W21-W23	RESERVED

MR-8633
MA-7104

ISV11-B M8080 Module



FACTORY JUMPER CONFIGURATION
IN: W1, W3, W5, W7, W9
OUT: ALL OTHERS

JUMPER FUNCTIONS

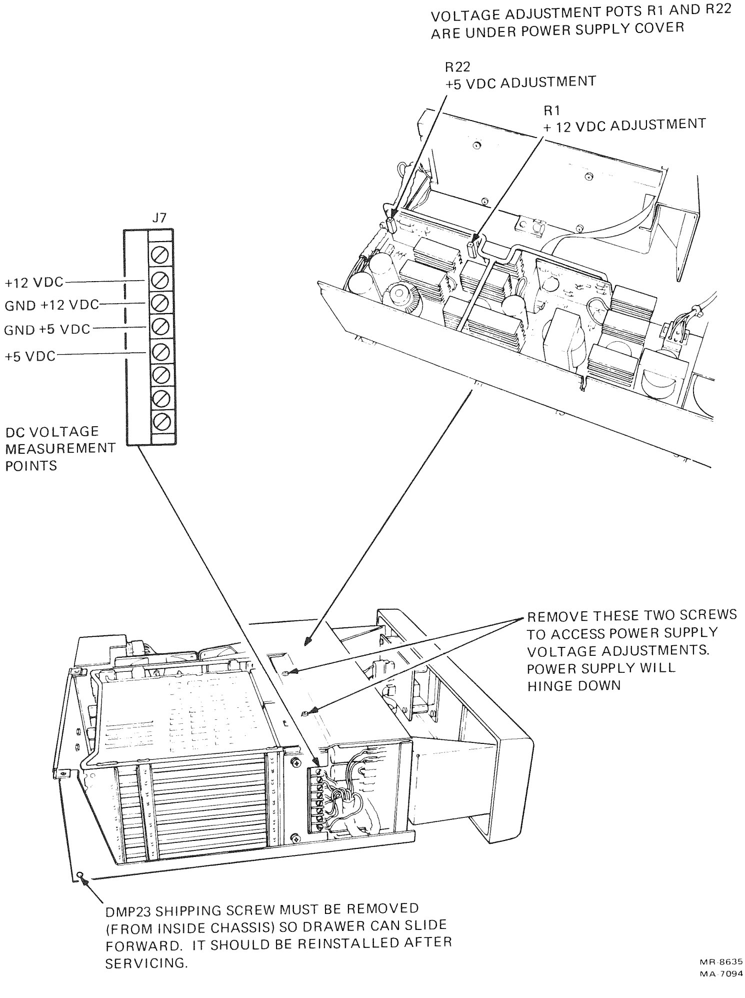
JUMPER	USE
W7, W8	PROM SELECTION
W1-W6, W9, W10	PROM POWER

MR-8634
MA-7105

ISV11-B M8084 Module

Power Supply Adjustments

The +12 Vdc and +5 Vdc power supply outputs can be adjusted by using R1 and R22. The outputs are monitored at J7 as shown in the following figure. R1 is used to adjust the +12 Vdc output to +12.0 ± 0.6 Vdc, and R22 is used to adjust the +5 Vdc output to +5.00 ± 0.25 Vdc.

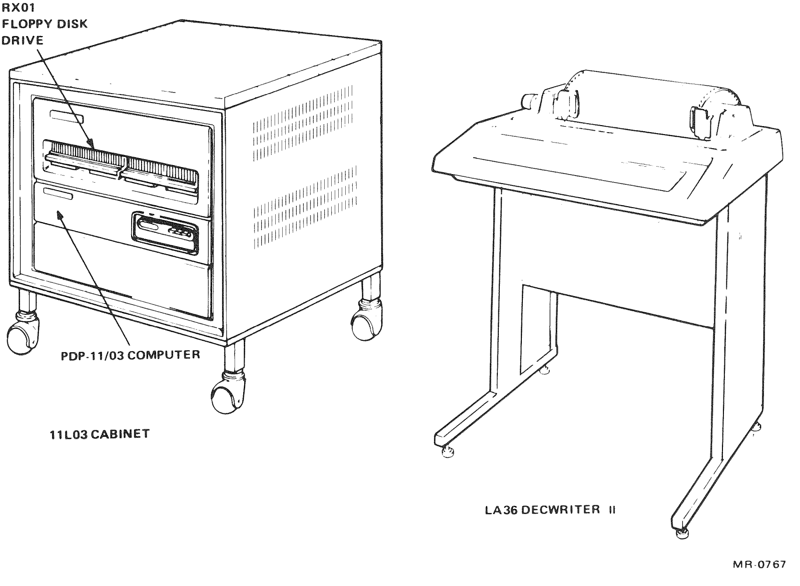


DC Voltage Measurements and Adjustments

LABORATORY SYSTEMS

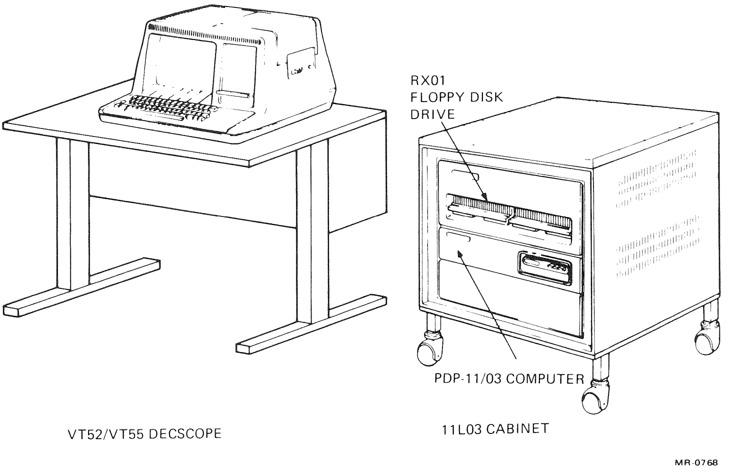
PDP-11L03

The DECLAB-11/03 (11L03) system includes a PDP-11/03 computer, an RX01 dual floppy disk drive, and a terminal. The terminal is normally an LA36 DECwriter II or a VT55 DECscope, although some custom systems may have a VT52. Each system also includes some combination of DECLAB modules and an H322 distribution panel to facilitate user I/O connections. All models are configured to boot on power-up and halt on BREAK. Early systems have 20K of memory, while later versions use a 16K memory. The figures and tables that follow describe the models, specifications, and components.

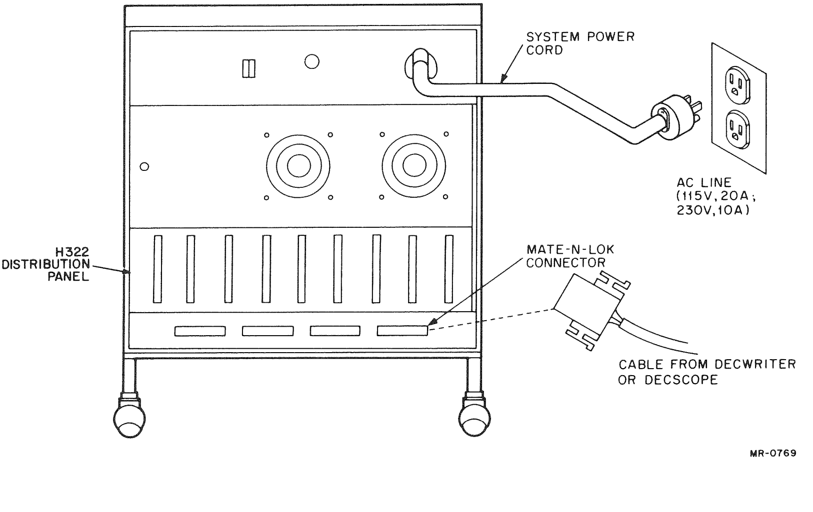


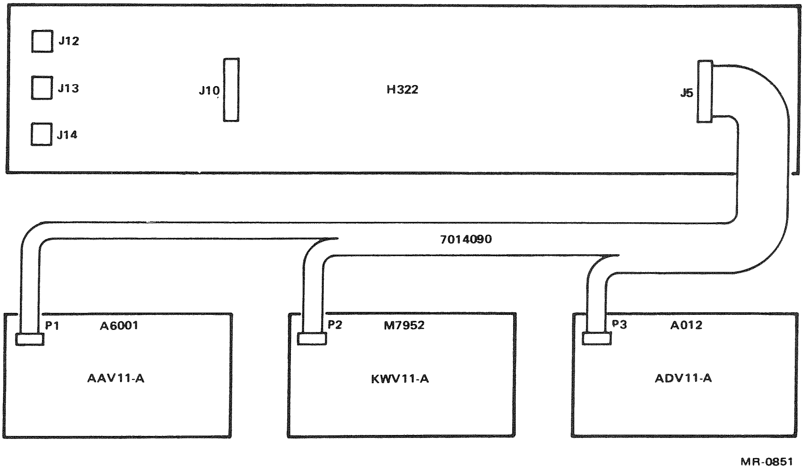
DECLAB-11/03-CA, -CC, -CD, -GD, -HA, -HC, -HD, -MA, -MC, -MD, -KA

PDP-11L03

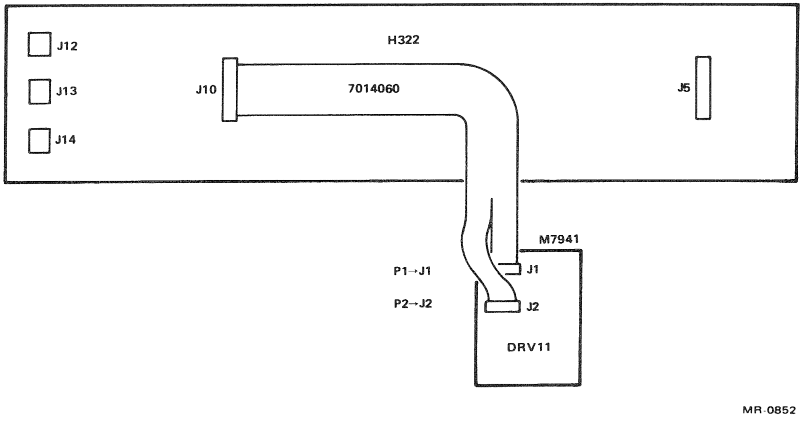


DECLAB-11/03-DA, -DC, -DD, -GC, -JA, -JC, -JD, -NA, -NC, -ND, -LA





Analog Cable Connections



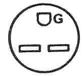
Digital Cable Connections

DECLAB-11/03 System Model Designations

System Requirements	CA	CC	CD	GD	DA	DC	DD	GC	HA	HC	HD
Input Power (V)	115	115	220	115	115	115	220	115	115	115	220
Frequency (Hz)	60	50	50	60	60	50	50	60	60	50	50
PDP-11V03	HA	HC	HD	HA	JA	JC	JD	JA	HA	HC	HD
LA36	DE	DH	DJ	DE					DE	DH	DJ
VT55					FA	FC	FB	FA			
RXV11	BA	BC	BD	BA	BA	BC	BD	BA	BA	BC	BD
H984 (Cabinet)	BA	BA	BB	BA	BA	BA	BB	BA	BA	BA	BB
BA11 Extension Box	ME	ME	MF	ME	ME	ME	MF	ME	ME	ME	MF
ADV11 (AD12)	1	1	1	1	1	1	1	1			
KWV11 (M7952)	1	1	1	1	1	1	1	1	1	1	1
AAV11 (A6001)									1	1	1
DRV11 (M7941)									1	1	1
IBV11 (M7954)											

DECLAB-11/03 System Model Designations (Cont)

System Requirements	CA	CC	CD	GD	DA	DC	DD	GC	HA	HC	HD
PDP-11V03	JA	JC	JD	HA	HC	HD	JA	JC	JD	HA	JA
Input Power (V)	115	115	220	115	115	220	115	115	220	115	115
Frequency (Hz)	60	50	50	60	50	50	60	50	50	60	60
LA36				DE	DH	DJ				DE	
VT55	FA	FC	FB				FA	FC	FB		FA
RXV11	BA	BC	BD	BA	BC	BD	BA	BC	BD	BA	BA
H984 (Cabinet)	BA	BA	BB	BA	BA	BB	BA	BA	BB	BA	BA
BA11 Extension Box	ME	ME	MF							ME	ME
ADV11 (AD12)										1	1
KWV11 (M7952)	1	1	1							1	1
AAV11 (A6001)	1	1	1							1	1
DRV11	1	1	1							1	1
IBV11 (M7954)				1	1	1	1	1	1		

	115 V 50/60 HZ			230 V 50 HZ		
POWER CONNECTOR	PLUG  NEMA # 5-15P DEC # 90-08938		RECEPTACLE  5-15R 12-05351	PLUG  NEMA # 6-15P DEC # 90-08853		RECEPTACLE  6-15R 12-11204
	CPU CABINET	LA36	VT55	CPU CABINET	LA36	VT55
AMPERAGE TYPICAL MAXIMUM	10.1 11.3	2.0	2.4	4.9 5.5	1.0	1.2
WATTAGE TYPICAL MAXIMUM	960 1340	160 300	300	1000 1380	160 300	300
BTU/HOUR TYPICAL MAXIMUM	2730 3210	550 1020	500 1000	2800 3280	550 1020	500 1000
WEIGHT KG LBS	87.3 192	46.3 102	25.8 57	87.3 192	46.3 102	25.8 57

MR-0770

Specifications

Modules Included in the Basic System

Processor

KD11-F (M7264) in systems purchased prior to Oct. 1, 1977.

Resident memory addressed as bank 0
CPU refresh disabled
Powers up to 173000

KD11-R (M7264-YA) in systems purchased after Oct. 1, 1977.

No resident memory
CPU refresh disabled
Powers up to 173000

Memory

MSV11-B (M7944) in systems purchased prior to Oct. 1, 1977.

4K RAM
Refreshed by REV11-A
Addressed as bank 1

MSV11-CD (M7955-YD) in systems purchased after Oct. 1, 1977.

16K RAM
Internal refresh
Addresses start at bank 0
Part of the KD11-R processor option

Serial Line Interface

DLV11 (M7940)

Device address 177560
Vector 60
300 baud in systems using LA36 DECwriter II terminals

9600 baud in systems using VT55 DECscope
20 mA active transmitter and active receiver
One stop bit, eight data bits, no parity
Framing error (BREAK) asserts BHALT

Floppy Disk Interface

RXV11 (M7946)

First device address (disk 0) 177170
First vector 264
Second device address (disk 1) 177150
Second vector 270

Bootstrap/Diagnostic/Terminator

REV11-A (M9400-YA)

Bootstrap enabled
Diagnostics enabled
Refresh enabled in PDP-11V03-A/E
Refresh disabled in PDP-11V03-F/H
120 Ω terminator

Additional Modules Included in Optional Systems*

Analog-to-Digital Converter

ADV11-A (A012)

*For configuration details refer to the "CPU/Options" section.

Digital-to-Analog Converter

AAV11-A (A6001)

Programmable Real Time Clock

KWV11-A (M7952)

Parallel Line Unit

DRV11 (M7941)

IEEE Instrument Bus Interface

IBV11-A (M7954)

Module Utilization Notes

1. Systems purchased before Oct. 1, 1977 have four MSV11-B 4K memory boards instead of one MSV11-CD module. They also have a KD11-F processor instead of a KD11-H.

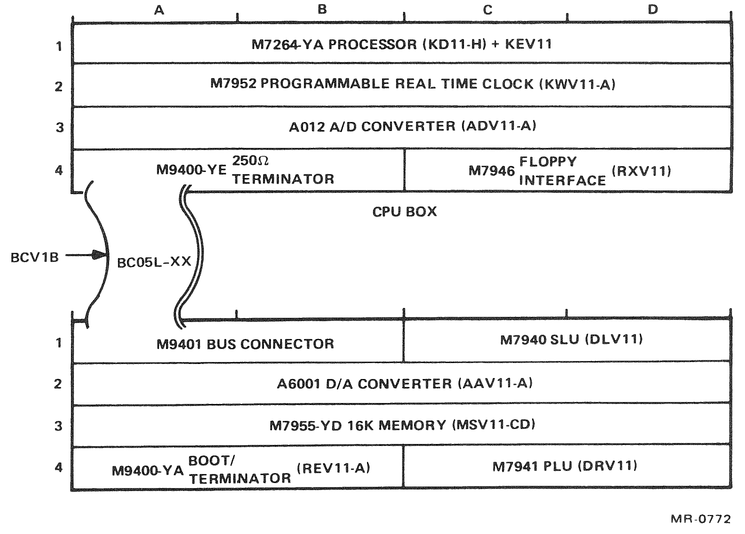
2. KD11-R = KD11-H + MSV11-CD
   KD11-S = KD11-R + KEV11-A

3. All models of PDP-11L03 include the KEV11 EIS/FIS option.

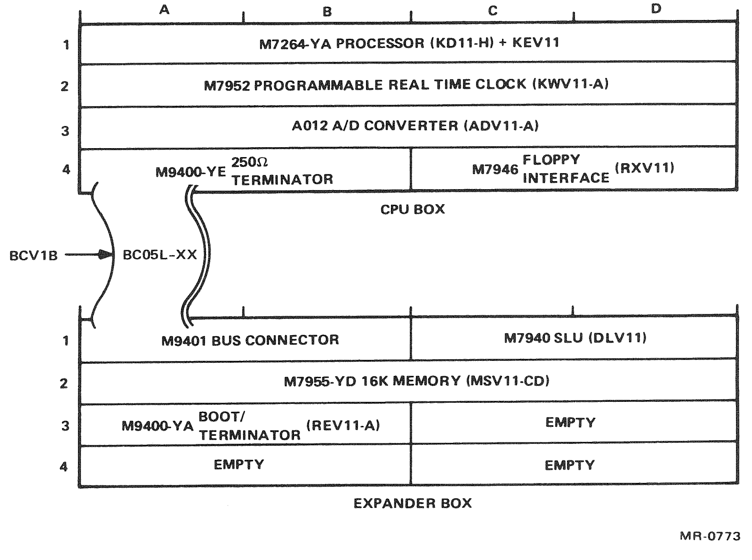
	A	B	C	D
1	M7264-YA PROCESSOR (KD11-H + KEV11)			
2	M7955-YD 16K MEMORY (MSV11-CD)			
3	M7940 SLU (DLV11)		M7946 FLOPPY INTERFACE (RXV11)	
4	M9400-YA BOOT/ TERMINATOR (REV11-A)		M7954 INSTRUMENT BUS INTERFACE (IBV11-A)	

MR-0771

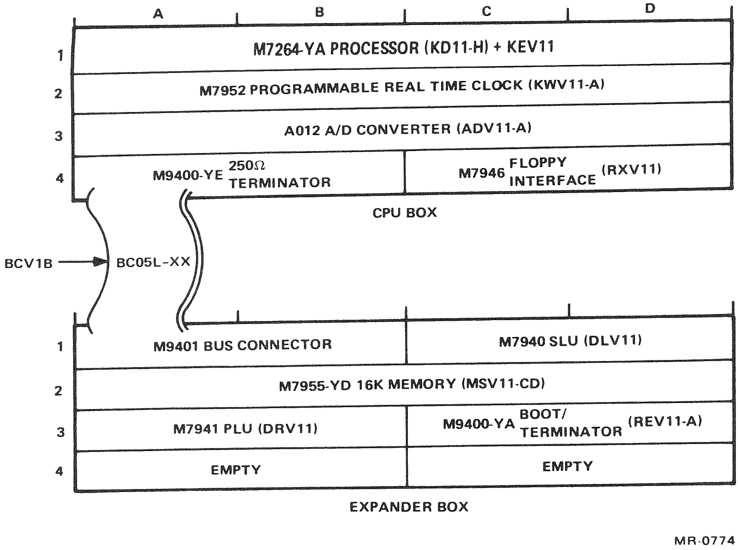
PDP-11L03-MA, -MC, -MD, -NA, -NC, -ND



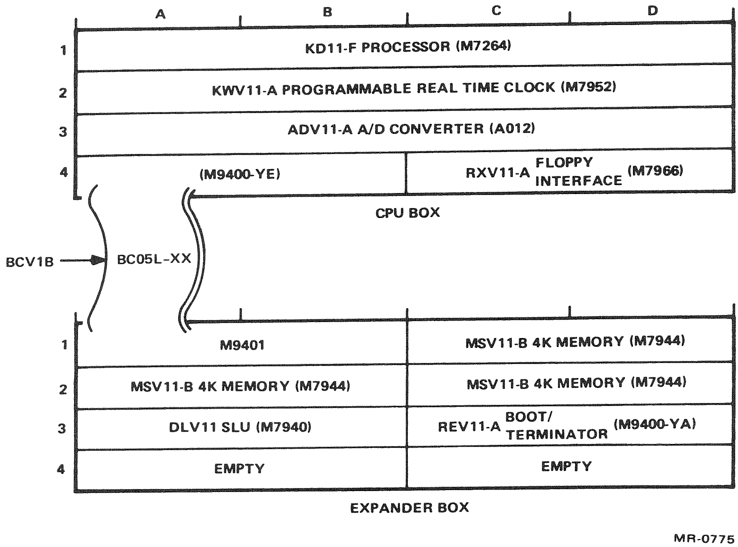
PDP-11L03-KA, -LA



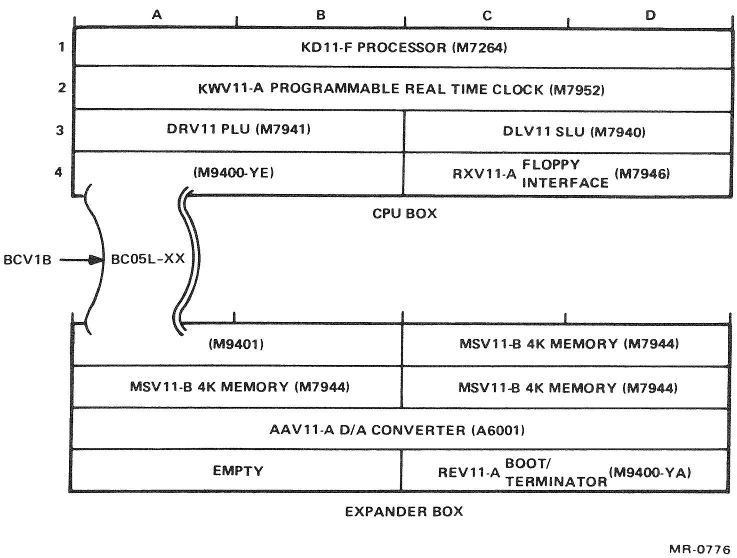
PDP-11L03-HA, -HC, -HD, -JA, -JC, -JD



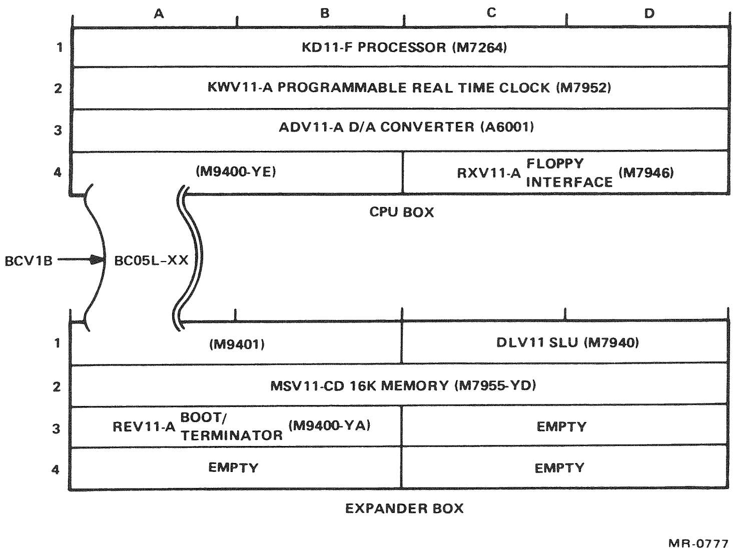
PDP-11L03-CA, -CC, -CD, -GD, -DA, -DC, -DD, -GC



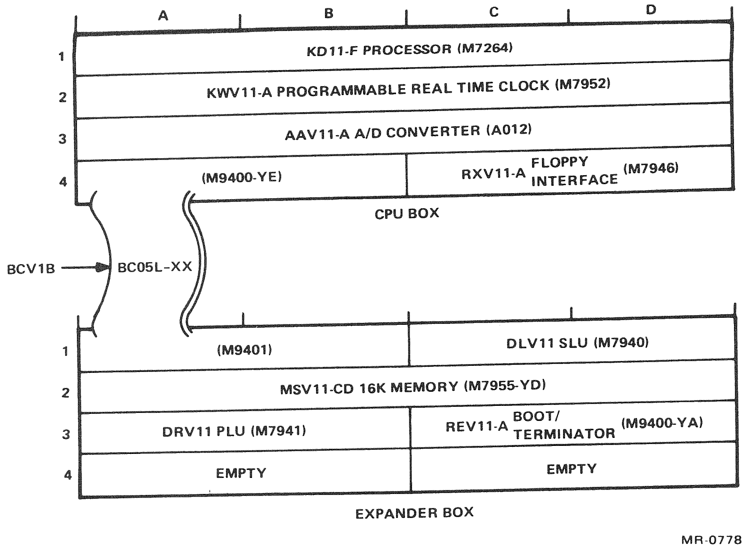
Early 16K PDP-11L03-CA, -CC, -CD, -DA, -DC, -DD Systems



Early 16K PDP-11L03-HA, -HC, -HD, -JA, -JC, -JD Systems



Early 20K PDP-11L03-CA, -CC, -CD, -DA, -DC, -DD Systems



Early 20K PDP-11L03-HA, -HC, -HD, -JA, -JC, -JD Systems

TELEPHONE COMPANY SYSTEM

CC1A PDP-11V03 SYSTEM

A non-DIGITAL terminal is used with this system. The terminal is a Tektronix™ 4023 AN. The Tektronix terminal must be an "AN" version and is configured for 9600 baud and checked out by the Western Electric Company (WECO) representative.

For installation, a null modem is provided by DIGITAL Field Service. Use of an H312 null modem will cause receive status errors, therefore a BC03M-L cable is recommended for installation checkout. The terminal will be connected through the null modem directly to the DLV11, by-passing the Bell interface cabinet located on top of the PDP-11V03 cabinet. After system check, the WECO representative will connect the Bell interface.

When running the Tektronix terminal after the screen is full, the first seven characters will be scrambled owing to terminal and software incompatibilities. Hit the ERASE key or change the baud rate on the back of the terminal (rotary SW) and DLV11 interface to 2400 baud. The diagnostics will run at this lower speed. Remember to return the system to 9600 for the customer.

Step 4 of the installation procedure asks the DIGITAL Field Service engineer to show that the floppy disk will boot from drives 0 and 1. Other versions of the monitor would only boot from drive 0, but recent shipments of this system should contain the newer floppies that will boot from both drives.

Step 4 also asks the DIGITAL engineer to demonstrate the clock diagnostic VKAHAO for at least 10 minutes. After several passes, the "TIME" printout must have incremented to indicate that the clock is running. The clock is unlike most PDP-11 real time clocks in that it is only a line "BEVNT" which goes to the CPU causing an interrupt. If it is not working, check the "LTC" switch on front panel and items in FA&T checklist, sheets 15 and 16.

For troubleshooting, the two backplanes can be separated by removing the M9400-YE in slot 4 and switching DRV11 No. 1 and DLV11 (see sheet 11 of configuration). This will allow the BA11-MA to function as a system without the BA11-ME connected. Remember to reconfigure to the original condition when finished.

DRV11 No. 1 and DRV11 No. 2 must be set up properly for the slot position where they are located or the wrong lines may be connected to them.

The *PDP-11/V03 System Manual*, EK-11V03-TM, should be available to the Field Service engineer for 11V03 and diagnostic information. The *Micro-computer Handbook* is also a good source of technical PDP-11V03 information.

CC# 1A Diagnostic Check List

RXDP Diskettes

- ☐ #1
- ☐ #2
- ☐ #7
- ☐ #10
- ☐ #15
- ☐ #25
- ☐ #26
- ☐ #30
- ☐ SPECIAL DECX 4

☐ 11V03 ————	VKAAAO	Basic Inst. Test	#25
☐ ————	VKABAO	EIS	#25
☐ ————	VKACBO	FIS	#25
☐ ————	VKADBO	TRAPS	#25
☐ ———— 1 –	VKAHAO	TIME	#25
☐ DLV11 M7940 ———	VKAEB1		#25
☐ DRV11 M7941 — 2 —	VKAFBO		#25
☐ MSV11CD M7955 —	ZKMADO		#25
☐ RXV11 M7946 — 3 —	ZRXBEO		#15
☐ ————	ZRXAEO		#15
☐ REV M9400-YA ———	ZM9ADO		#10

1. Run two passes minimum, approximately 10 minutes and check that "TIME" printout is incrementing.

2. Use a BC08R-1 loopback cable for testing. Diagnostic will come up testing DRV11 No. 2; therefore, after several passes, halt CPU and change address and vector information as shown:

```
$DXO
DZQUJ-C 21-JUL-76 R
.R VKAFBO
END OF PASS
END OF PASS
END OF PASS
```

TESTING OF DRV11 2

```
004410
@1200/167770 167760
001202/167772 167762
001204/167774 167764
001206/167773 167763
001210/000300 310
001212/000302 312
001214/000304 314
001216/000306 316
001220/167770
@200GEND OF PASS
END OF PASS

004402
@
```

MODIFICATION OF PROGRAM ADDRESS AND VECTORS FOR DRV11 1
TYPE L.F. AFTER ENTRY ONLY.
TYPE C.R. ON LAST ENTRY.
TYPE 200G.
TESTING OF DRV11 1

3. Run ZRXBEO before running ZRXAEO.

4. Special DECX map:

```
.MAP

CPAFO AT 017752 STAT 040020
CPBIO AT 021502 STAT 040020
FPAFO AT 023242 STAT 040020
DRCHO AT 024522 STAT 040020
BMCMO AT 025430 STAT 040020
RXADO AT 030054 STAT 140000
.
```

5. Diagnostics available on single floppy.

NOTE

This is not an official software package and is intended for field use only.

ENTRY#	FILNAM.EXT	DATE	LENGTH	START
000001	RXDP .BIN	7-MAR-78	17	000050
000002	UPD2 .BIN	7-MAR-78	30	000071
000003	XTECO .BIN	7-MAR-78	26	000127
000004	VKAAAO.BIC	7-MAR-78	17	000161
000005	VKABAO.BIC	7-MAR-78	17	000202
000006	VKACBO.BIC	7-MAR-78	16	000223
000007	VKADBO.BIC	7-MAR-78	12	000243
000010	VKAEB1.BIC	10-MAR-78	7	000257
000011	VKAFBO.BIN	10-MAR-78	6	000266
000012	ZKMAB1.BIC	10-MAR-78	9	000274
000013	ZKMADO.BIC	10-MAR-78	9	000305
000014	ZRXBEO.BIC	10-MAR-78	17	000316
000015	ZRXAEO.BIC	10-MAR-78	20	000337
000016	ZM9ADO.BIC	10-MAR-78	7	000363
000017	VKAHAO.BIC	4-APR-78	17	000372
000020	CHAIN .CCC	5-APR-78	1	000413

CC# 1A Module Jumper Information

Module	Option	Jumpers	*Microcomputer Handbook* **Page**
M7264	CPU	W4, W6, W9 IN	243, 236
M7955	MSV11CD	1-5 ON, 6-8 OFF	244
M7955	MSV11CD	3, 6, 7, 8 OFF, others ON	244
M7941	DRV11 No. 1	A3, A12 IN V4, V5 IN [A = 767760 V = 310]	290
M7941	DRV11 No. 2	A12, V3, V4, V5 IN [A = 767770 V = 300]	290
M9400-YA	REV11-A	Remove W2	380
M7940	DLV11	Refer to *Micro Handbook*	259

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

MANUFACTURING SPECIFICATION — DATE 14 JUN 78

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE
A	DLV11 is currently being shipped with system due to unavailability of DLV11-F. Change package to reflect DLV11 instead of DLV11-F.	1	J.Tomaswick	6/14/78	J.Tomaswick	6/14/78

ENG	APPD	SIZE	CODE	NUMBER	REV
J. Tomaswick		A		MFGENG-0 CONF-0004	A

EN-01083-16-N672-(392)

MANUFACTURING SPECIFICATION — **CONTINUATION SHEET**

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

INDEX

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	A

DEC 16-(392)-1082-N672

SHEET 1 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CONFIGURATION APPROVALS

____
Digital Account Representative

____
Digital Project Manager

____
Digital Manufacturing Engineering Manager

____
Digital Quality Control Manager

____
Digital Field Service Product Support

____
Digital TELCO Engineering

____
Diagnostic Engineering

____
Production Manager

* CONFIGURATION REVIEWED

____
Bell Labs Representative

____
Western Electric Purchasing

*Any review of these specifications by any Bell System representative shall be for general arrangement of the work and shall in no case relieve you in any way of your responsibilities as defined by our purchase orders.

	SIZE	CODE	NUMBER	REV
	A		MFGENG-0 CONF-0004	*

DEC 16-(392)-1082-N672

SHEET 2 OF 17

MANUFACTURING SPECIFICATION — **CONTINUATION SHEET**

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

TO THE USERS OF THIS DOCUMENT:

This is a Digital Manufacturing Specification for a DEC system purchased by Western Electric. Configuration approvals are included in order to assure that a system is manufactured in accordance with the latest known requirements.

The information contained herein is consistent with the information included in:

Bell Telephone Laboratories - SD# 1P039-01
Western Electric J-Drawing - # J1C016K-1
DEC Standard Price List

It is imperative that the Bell Laboratories and/or Western Electric Purchasing signatories contact the Digital Account Representative in the event of changes to the SD and/or J-drawing. Should these changes affect the contents of this document, the Digital Account Representative shall contact the Digital Project Manager who, in turn, shall have this document updated. Conversely, no changes shall be made to the product manufactured under this specification without written notification to and expressed approval of the Bell System signatories.

When Digital issues a new price list, the Digital Account Representative shall assure that all requisite equipment continues to be offered under the DEC codes listed herein. If any of these items is no longer listed, either of the following procedures shall apply.

1) The Digital Account Representative shall notify the Bell Laboratories and Western Electric signatories of changes to nomenclature and packaging in order to include the then current equipment lists in the next issued SD and J-drawing.

-or-

2) The Digital Project Manager shall convene a configuration review committee meeting (attended by all the signatories of this document or their designated representatives) for the purpose of identifying the alternate equipment to be used for this project configuration. At such a time, the short-term requirements and availabilities of the equipment listed herein shall be determined and the appropriate transition plans shall be made.

Digital Field Service shall adhere to the information contained in this document. If the end-user wishes anything different, the end-user should be told to contact the appropriate Western Electric Regional Office.

This specification is included with all shipments of DEC equipment for this project.

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	*

DEC 16-(392)-1082-N672

SHEET 3 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

SYSTEM DESCRIPTION

The PDP11V03-WA configuration is a subsystem of the switching control center system's control console No. 1A.

The control console No. 1A is used to provide remote maintenance, alarm, surviellance and control of unattended electronic telephone switching offices. Its most important function is to provide remote control capabilities to restore the telephone switching office to service after certain types of failures. The reliability and availability of the control console are extremely important due to its potential use during critical periods where telephone service in a particular telephone switching office has been interrupted. It may be used in continuous service (24 hr/day) application.

The microcomputer is connected via the DLV11 to a CRT for display of alarm data as well as input of remote control requests. The connection is accomplished via a null módem cable to provide the proper handshaking and data interchange.

A telemetry data network is driven via a DRV11 and is the primary link from the control console to the remote telephone switching office. Another DRV11 sends data to a circuit that drives a local alarm display.

The microcomputer configuration carries a Western Electric designation of J1C016K-1. The telemetry equipment, local alarm interface and cables (including a null modem cable) have a designation of J1C016L-1. The CRT is designated J1C016M-1.

	SIZE	CODE	NUMBER	REV
	A		MFGENG-0 CONF-0004	A

DEC 16-(392)-1082-N672

SHEET 4 OF 17

MANUFACTURING SPECIFICATION — CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CONFIGURATION NOTES

1. This is a fixed configuration. There is no optional equipment.

2. Diagnostic media is RXDP diskette.

3. The DLV11 will be configured as follows: EIA, 9600 BAUD, 8 data bits, 1 stop, no parity, framing error halt strap removed. Other options not specified here shall be set to DEC Standards.

4. The REV11 will be configured as follows: DMA refresh disabled, ROM enabled.

5. At the time of installation or service call, a working 9600 BAUD terminal compatible with the system must be made available by the customer.

6. Warranty is 90 days from date of installation or six months from ship date, whichever comes first.

7. The clock operation must be verified by running MD-11-DVKAH-XX a minimum of two passes. See item 7 on page 15.

8. The ability of the system to boot MAINDEC 11 - DZQUJ-DO from both drive #0 and #1 must be demonstrated.

9. System environmental requirements will be in accordance with Bell System BSP - Section 760-251-150, "Site Prep and Environmental Considerations for Minicomputers in Standard Systems".

10. For installation testing, a null modem is required between the DLV11-F serial line unit and the 9600 BAUD terminal. DEC shall provide this null modem during installation testing of PDP 11V03/WA.

11. Installer will remove DRV11 #1 and #2 and visually verify the vector address on each per the Device Address Assignment Sheet. Using DEC diagnostic MD-11DVKAF-B only one DRV11 will be run at a time.

12. Maximum current limitation on power strip for use by customer is four (4) amps.

13. The DRV11's will have a label placed on the handle on side 2 depicting the address and vector of the DRV11 as per the following example:

    DRV11 #1 ADD 767760 VECT 310
    or
    DRV11 #2 ADD 767770 VECT 300

SIZE	CODE	NUMBER	REV
A		MFGENG-O CONF-0004	A

DEC 16-(382)-1082-N672

SHEET 5 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CONFIGURATION NOTES (cont.)

14. In order to assure a higher quality level, pages 15 and 16 (Telco FA&T 11V03WA, SCCS Control Console NO. 1A (CC NO. 1A) Configuration Checklist) is to be completed by the PSI personnel for each system. Their initials will signify that they have completed or verified each indicated procedure.

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	*

DEC 16-(302)-1082-N672

SHEET 6 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

EQUIPMENT LIST

One (1) 11V03WA composed of the following:

ITEM	QTY	DESCRIPTION
1	1	11/03-KA consisting of: -MSV11-CD -KEV11A -KD11-R -BA11-MA
2	2	DRV11
3	1	DLV11
4	1	MSV11-CD
5	1	REV11-A
6	1	BA11-ME
7	1	BCV1B-06
8	1	H984-DA
9	1	BC05C-25
10	1	RXV11-BA

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	A

DEC 16-(392)-1082-N672

SHEET 7 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

INSTALLATION PROCEDURE

The control console No. 1A consists of:

-DEC Processor, J1C016K-1
-Interface Unit, J1C016L-1
-Tektronix model 4023AN CRT Terminal, J1C016M-1

After the above equipment has arrived at the site storage location, the following procedures and guidelines shall be followed.

1. The Western Electric (WECO) installer shall verify that the CRT terminal is operational.

2. The WECO installer shall make arrangements for the DEC representative to be at the job location and will secure permission for movement of the DEC processor from the storage location to the job site.

3. At the job site, WECO installation shall provide all labor required for unpacking and placing the equipment in the desired location. The DEC representative will supervise the unpacking and placement of DEC equipment and verify any evident damages for subsequent claims.

4. After the WECO installer has mounted the interface unit on the processor and lowered the interconnect cables to the processor area, the DEC installer will run diagnostics on the processor. The DEC installer will provide the null modem cable to interconnect the DLV11 to the CRT terminal for testing. In addition to DEC diagnostics, the DEC installer shall demonstrate the capability to boot from drive 0, Drive 1 and demonstrate that the system clock is operational.

5. Upon successful completion of the diagnostics, the DEC installer shall connect the following cables, previously lowered by the WECO installer, to the processor.

   "J1-DRV(2).side up"
   "J2-DRV(2).side up"
   "J-DLV.side up"
   "J1-DRV(1).side up"
   "J2-DRV(1).side up"
   AC Power Plug

6. The DEC installer shall demonstrate that the removal and reinsertion of processor boards for cable connection did not affect processor operation.

7. Upon successful completion, the WECO installer will accept the DEC processor and initiate control console No. 1A diagnostics.

SIZE	CODE	NUMBER	REV
A		MFGENG-O CONF-0004	A

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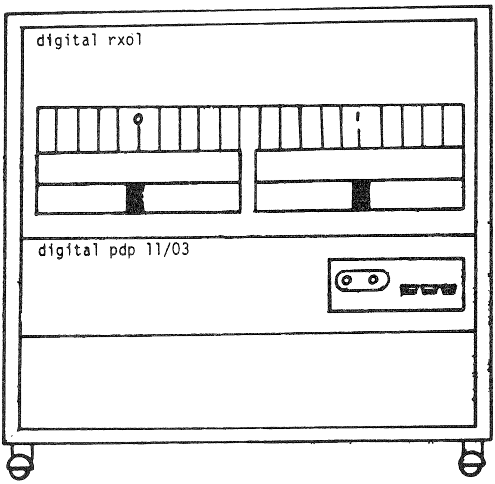
SHEET 8 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCSS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CABINET LAYOUT



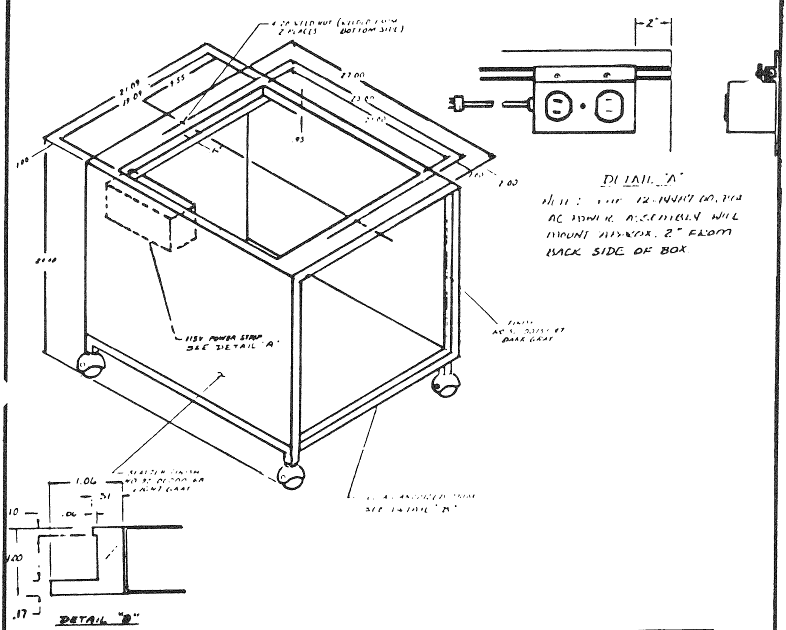
SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	*

DEC 16-(382)-1062-N672

SHEET 9 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION



LEGEND	
MODEL NO.	DESCRIPTION
H984-DA	34-13007-02
	70-12412
	12-14481-00

SIZE	CODE		REV
A		MFGENG-0 CONF-0004	*

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SHEET 10 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CABINET LAYOUT

BA11-MA

	A	B	C	D
1		M7264-YA	(KD11-H)	
2		M7955	(MSV11-CD)	
3		M7955	(MSV11-CD)	
4	M9400-YE		M7941	(DRV11 #1)

BA11-ME

	A	B	C	D
1	M9401		M7940	(DLV11)
2	M7946	(RXV11)	M7941	(DRV11 #2)
3	M9400-YA	(REV11-A)	UNUSED	
4	UNUSED		UNUSED	

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	A

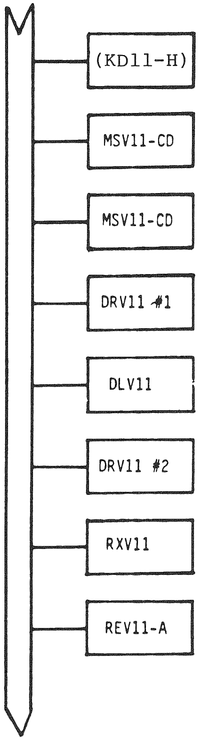
DEC 16-(392)-1082-N672

SHEET 11 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

BUS SEQUENCE



SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	A

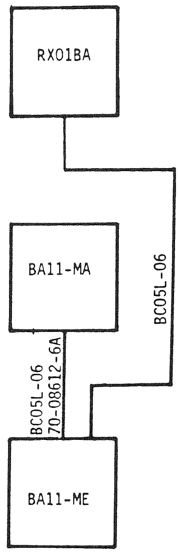
DEC 16-(392)-1082-N672

SHEET 12 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CABLE LAYOUT



SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	*

DEC 16-(392)-1082-N672

SHEET 13 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE

DEVICE ADDRESS ASSIGNMENT

DEC DESIGNATION	WECO DESIGNATION	REGISTER ADDRESS	VECTOR ADDRESS	PRIORITY	MOUNTING CODE	+5VDC	BUS LOADS	COMMENTS
DRV11 #1	Parallel 1	767760	310	1	2 Slots		1	
DRV11 #2	Parallel 2	767770	300	3	2 Slots		1	
DLV11	Serial 1	777560	60	2	2 Slots		1	9600 BAUD
RXV11	Disk-Cont	777170	264	4	2 Slots		1	

NOTE: PRIORITY DETERMINED BY DEVICE CLOSEST TO THE CPU. SEE BUS SEQUENCE: PRIORITY 1 = HIGHEST

SIZE A | CODE | MFGENG-0 CONF-0004 | REV A

DEC 16-(392)-1082-N6/2

SHEET 14 OF 17

MANUFACTURING SPECIFICATION — CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

TELCO FA&T 11V03-WA SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CHECKLIST

	INITIAL
1.) The cab fan power cord should be plugged into the rear plug of the dual receptacle. (Mounted on side of cab).	______
2.) DRV11's should have a sticker on the module, side 2 under the cable, giving address, vector and DRV11 number 1 or 2.	______
3.) Cables for DRV11 should be installed ribbed side up.	______
4.) Check for a green wire on the console board between TP2 and W4.	______
5.) All ribbon cables should have the red strip on the right.	______
6.) Cable from J2 (console board) should be routed behind the switch panel.	______
7.) Run diagnostic VKAHAO as shown. If the time is 000000, the clock is not running. Write the time printed for pass number 2: __________ (it takes 5 minutes per pass).	______

```
$DXO
DZQUJ-C 21-JUN-76 RXDP - XXDP RX11/RX01 MONITOR 28K
.R VKAHAO

DVKAH-A
MEMORY= 157776

PASS=000001 ERROR=000000 RXERROR=000000 TIME=044416

PASS=000002 ERROR=000000 RXERROR=000000 TIME=110707
```

8.) DLV11 should be set up for EIA before software is run. (NOTE: Do not ship 70-08360 cable).	______
9.) 74-16240-0-0 stickers on 11V03 and BA11-ME should be filled out as shown. Note that DRV11 #1 is addressed at 767760, vector 310 and is in the 11V03 box. DRV11 #2 is addressed at 767770, vector 300 and is in the BA11-ME box.	______

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	*

DEC 16-(392)-1082-N672

SHEET 15 OF 17

MANUFACTURING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE SCCS CONTROL CONSOLE NO. 1A (CC NO. 1A) CONFIGURATION

CPU

SLOT	MODULE NUMBER A B	CS REV	ETCH REV	MODULE NUMBER C D	CS REV	ETCH REV
1	KD	1	1	-~~R~~ H	*	*
2	MSV	1	1	-CD	*	*
3	MSV	1	1	-CD	*	*
4	BCV1B-06	*	*	DRV11 #1	*	*

CPU

SLOT	MODULE NUMBER A B	CS REV	ETCH REV	MODULE NUMBER C D	CS REV	ETCH REV
1	BCV1B-06	*	*	DLV11	*	*
2	RXV11	*	*	DRV11 #2	*	*
3	REV11-A	*	*			
4						

* = Current Revision

INITIAL

10.) Check that the red light (D1) on the console board goes off when DC power is turned off. ______

11.) Check that drive Ø and drive 1 will boot, load and run RXDP diagnostics (Rev D required). ______

DEC# ____________

SIZE	CODE	NUMBER	REV
A		MFGENG-0 CONF-0004	A

DEC 16-(392)-1082-N672

SHEET 16 OF 17

MANUFACTURING SPECIFICATION

CONTINUATION SHEET

TITLE CONFIGURATION CHANGE PAGE

Date	Change #	Requested By	Effective Date**	Production Manager	Material Manager	Pages Affected	Final Approval	Change Description
6/14/78	1	J.Tomaswick	6/14/78			1,4,5,7,8, 11,12,14,16	J.Tomaswick	DLV11 is currently being shipped with system due to unavailability of DLV11-F. Change Document to reflect DLV11 instead of DLV11-F.

** All ships on or after this date must have change incorporated.

NOTE: These changes will be incorporated in the next release cycle.

SIZE	CODE		REV
A		MFGENG-0 CONF-0004	*

DEC 16-(392)-1082-N672

SHEET 17 OF 17

GENERAL MODULE INFORMATION

GENERAL MODULE INFORMATION

This volume lists LSI-11 modules alphanumerically by option designation. The tables below list modules by option designation for cross-referencing. All modules are (or will be) covered in the *Microcomputer Processor Handbook*, EB-20175-20, (CPUs and memories) or the *Minicomputer Interfaces Handbook*, EB-18451-20.

The following conventions are used in presenting module data.

Registers

The base address is listed first. This is normally the address of a control status register. Abbreviations containing "CS" or "CSR" are for control status registers. Abbreviations containing "DB," "DBR," or "BUF" refer to data buffer registers.

Switches

Switches are labeled "S1, S2, S3, ... " although they may be located in the same DIP switch pack. Rocker switch states are selected by pressing the side closest to the label of the state desired. For example, to select the ON position, press the side of the rocker closest to the edge of the switch on which "ON" is printed; disregard the red line on the end of the rocker.

Jumpers

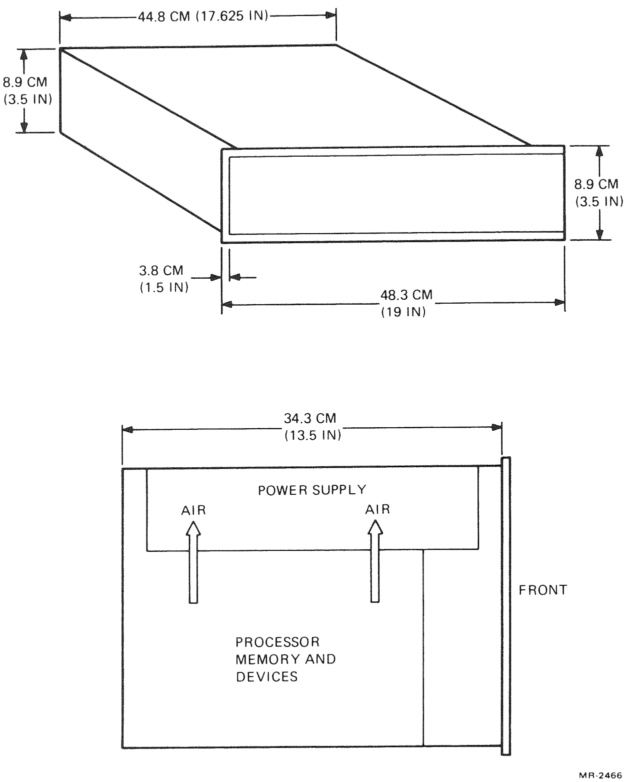
"I" indicates that a jumper is inserted. "R" indicates that it is removed. "X" indicates a "don't care" condition. Location drawings show jumpers installed, for clarity, although they may not actually be installed for the standard configuration. Tables define the jumper states. Jumpers are shown as a solid line if they are normally installed.

NOTE

Jumpers are not always installed for a 1 and removed for a 0; on some modules the reverse is true. See Appendix A for XXDP+ diagnostic names, functions, and multimedia assignments.

BA11-M MOUNTING BOX

Mounting Box: Physical Specifications



BA11-M Assembly Unit

Electrical *(These specifications reflect the characteristics of the H780 power supply.)*

Input Voltage (Continuous: see Note 1.)
 100 Vac–127 Vac (H780-C, -H, -K)
 200 Vac–254 Vac (H780-D, -J, -L)

Temporary Line Dips Allowed
 100% of voltage, 20 ms max.

AC Inrush Current
 70 A at 127 V 60 Hz (8.33 ms)
 25 A at 254 V 50 Hz (10 ms)

Input Power (Fans Included)
 340 W at full load max.
 290 W at full load typical

EMI (Emission and Susceptibility)
 Per DEC STD 102.7 and VDE N-12 limits

Input Protection
 H780-C, -H, -K (100 Vac–127 Vac) fast blow, 5 A fuse
 H780-D, -J, -L (200 Vac–254 Vac) fast blow, 2.5 A fuse

Hi-Pot
 2 kV for 60 seconds from input to output, or input to chassis

Output Power (Combinations not to exceed 110 W.)
 +5 V, 1.5 A - 18 A
 +12 V, 0.25 A - 3.5 A

Maximum DC Current Under Fault Conditions
 +5 V bus = 28 A
 +12 V bus = 9.5 A

+5 V Output

Total regulation	5 V ± 3%
Line regulation	±0.5%
Load regulation	±1.0%
Stability	0.1%/1000 hours
Thermal drift	0.025%/° C (See Note 2.)
Ripple	150 mV p-p (1% for f<3 kHz)
Dynamic load regulation	±1.2% di/dt = 0.5 A/μs ΔL = 5 A

Noise	1% peak at 5 > 100 kHz (noise is superimposed on ripple)
Interaction due to +12 V	± 0.05%
+12 V Output	
Total regulation	12 V ± 3%
Line regulation	±0.25%
Load regulation	±0.5%
Stability	0.1%/1000 hours
(See Note 2.)	0.025%/° C above 25° C
Ripple	350 mV p-p (1% for f <3 kHz)
Dynamic load regulation	±0.8% di/dt = 0.5 A/μs f<500 Hz ΔL = 3 A
Noise	1% peak f > 100 kHz (Noise is superimposed on ripple.)
Interaction due to +5 V	±0.2%
Overvoltage Protection	
+5 V	6.3 V nominal 5.65 V min. 6.8 V max.
+12 V	15 V nominal 13.6 V min. 16.5 V max.
Adjustments	
+5 V output	4.05 V-6.8 V Guarantee range 4.55 V-5.65 V
+12 V output	10.6 V-16.5 V Guarantee range 11.7 V-13.6 V
Controls	
Rear panel	AC ON/OFF switch
Front console	DC ON/OFF switch HALT/ENABLE switch
(Master only)	LTC ON/OFF switch

Console Indicators
DC ON
RUN (master)
SPARE (master only)

Backplane Signals
BPOK H
BDCOK H
BEVNT L Transmitted
BHALT L
SRUN L Received (master only)

Mechanical

Cooling
Two self-contained fans provide 0.7140 m^3/min (30 ft^3/min) air flow.

Size
13.97 cm w × 8.43 cm h × 37.15 cm l
(5-1/2 in w × 3-1/3 in h × 14-5/8 in l)

Weight
5.90 kg (13 lb)

Environmental

Temperature
Ambient 5°-50° C (41°-122° F)
Storage −40°-70° C (−40°-158° F)

Humidity
90% maximum without condensation

NOTES

1. **Operation from ac lines below 100 V may cause the power supply to overheat because of decreased air flow from the cooling fans.**

2. **Thermal drift parameters apply after five minutes of warm-up and are measured with an averaging meter at the processor backplane terminal block under system loading.**

BA11-M

Option Variations

BA11-MA Consists of a BA11-MC mounting box with H9270-A backplane and H780A power supply for 115 Vac, 60 Hz.

BA11-MB Consists of BA11-MC mounting box with H9270-A backplane and H780-B power supply for 230 Vac, 50 Hz.

BA11-MC Consists of 3.5 inch high mounting box with no backplane or power supply.

BA11-ME Consists of BA11-MC mounting box with H9270-A backplane and H780-E power supply for 115 Vac, 60 Hz.

BA11-MF Consists of BA11-MC mounting box with H9270-A backplane and H780-F power supply for 230 Vac, 50 Hz.

Power Supply Models

	115 Vac	230 Vac	Line Cord	Fans	Console Type
H780-A	X		X	X	Master
H780-B		X	X	X	Master
H780-C	X			X	None
H780-D		X		X	None
H780-E	X		X	X	Slave
H780-F		X	X	X	Slave
H780-H	X			X	Master
H780-J		X		X	Master
H780-K	X			X	Slave
H780-L		X		X	Slave
H780-M	X				Note 1
H780-N		X			Note 1
H780-P	X		X	X	Note 2
H780-R			X	X	Note 2

NOTES

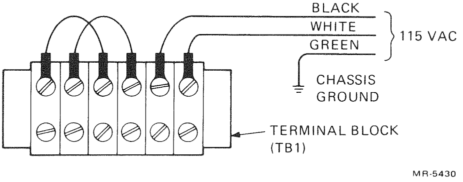
1. The H780-M and -N have no control panel on the basic option. The Business Products 320 line uses a control panel that has two DC ON indicators (PN 54-12695). This control panel is carried as part of the 11/03-J computer.

2. The H780-P and -R also use the 54-12695 control panel. They differ from the -M and -N in that the basic power supply option includes the control panel, a line cord, and fans.

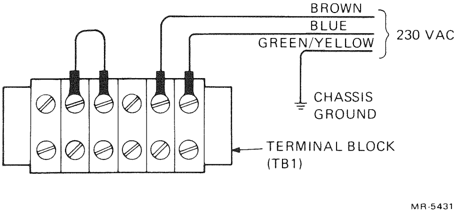
3. The 115 Vac options operate on 100 Vac–127 Vac at either 50 or 60 Hz. The 230 Vac options operate on 200 Vac–254 Vac at either 50 or 60 Hz.

Power Supply/Control Panel Interface Cables

Cable	DEC PN
DC output cable	7011584-0-0
Power supply status cable (logic cable)	7011411-0K-0
Power supply console cable	7008612-0M-0

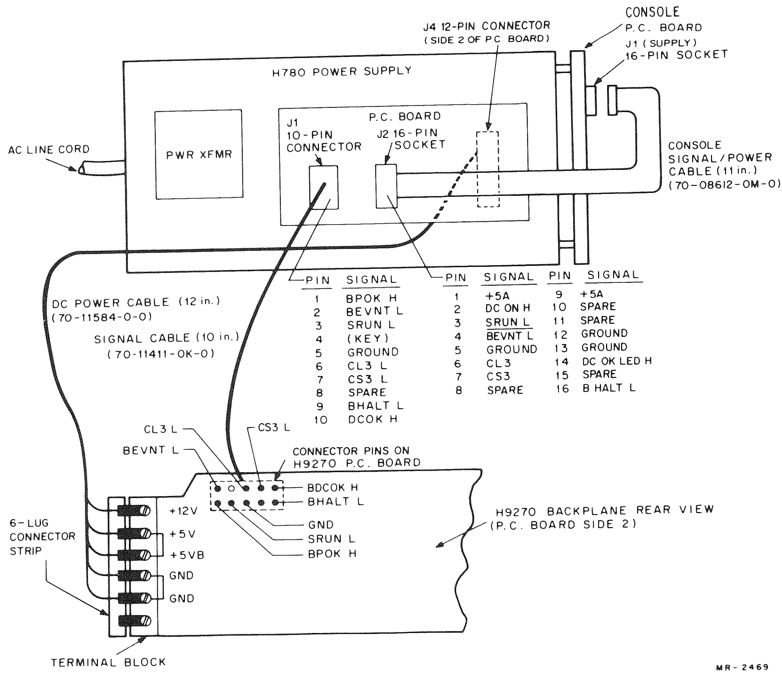


115 Vac Terminal Block Wiring



230 Vac Terminal Block Wiring

Cable Interconnections



H780 to H9270 Backplane Connections

Master/Slave Interface Cables

Length		DEC PN
10.2 cm	(4 in)	7008612-0D
15.0 cm	(6 in)	7008612-0F
22.9 cm	(9 in)	7008612-0K
27.5 cm	(11 in)	7008612-0M
35.6 cm	(14 in)	7008612-1B
45.7 cm	(18 in)	7008612-1F
124.0 cm	(49 in)	7008612-4A
61.0 cm	(2 ft)	7008612-02
1.83 m	(6 ft)	7008612-6A
3.05 m	(10 ft)	7008612-10
4.88 m	(16 ft)	BC034-16*

*Refer to the "Systems Configurations" section for applications using this cable.

+12 V Adjustment

Perform the following procedure when adjusting the +12 Vdc output.

1. Apply power to the LSI-11 or PDP-11/03 system and allow a five minute warm-up period.
2. Using a DVM, measure the +12 V output at the LSI-11 or PDP-11/03 backplane terminal block.
3. Using a small screwdriver, adjust R87 until the DVM indicates +12.0 V (+11.64 V to +12.36 V acceptable range). Turning R87 CW (clockwise) decreases the +12 V output, while turning CCW (counterclockwise) increases the output.

NOTE

If R87 is turned too far CCW, the +12 V output will crowbar and drop to approximately 0 V. This will occur between +13.0 V and +16.5 V. Do not allow the supply to crowbar as this may blow the internal fuse (F1) protecting the +12 V regulator.

4. Using an oscilloscope, measure the ripple on the +12 V output at the backplane terminal block. The ripple should not be greater than 350 mV peak-to-peak.

+5 V Adjustment

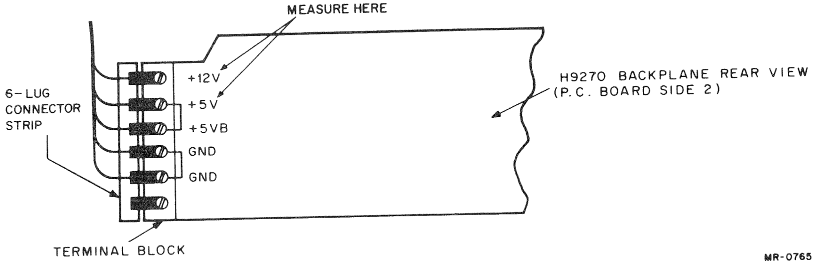
Perform the following procedure when adjusting the +5 Vdc output.

1. Apply power to the LSI-11 or PDP-11/03 system and allow a five minute warm-up period.
2. Using a DVM, measure the +5 V output at the LSI-11 or PDP-11/03 backplane terminal block.
3. Using a small screwdriver, adjust R88 until the DVM indicates +5.0 V (+4.85 V to +5.15 V acceptable range). Turning R88 CW decreases the +5 V output, while turning CCW increases the output.

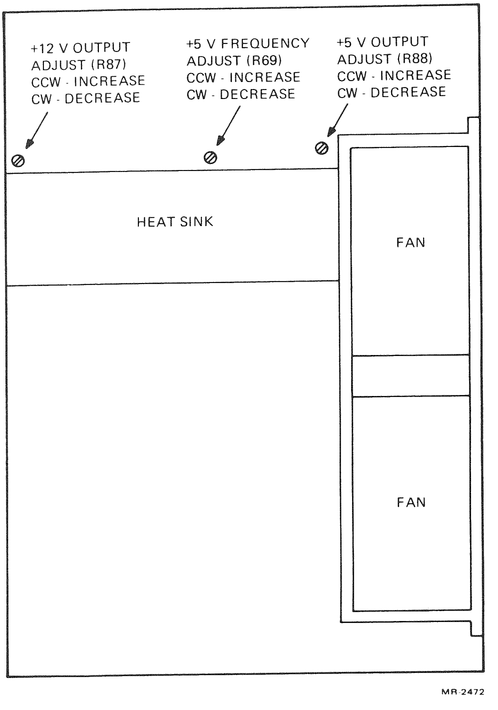
NOTE

If R88 is turned too far CCW, the +5 output will crowbar and drop to approximately 0 V. This will occur between +5.6 V and +6.8 V. Do not allow the supply to crowbar as this may blow the internal fuse (F2) protecting the +5 V regulator.

4. Using an oscilloscope, measure the amplitude and frequency of the ripple on the +5 V output at the backplane terminal block. The ripple should not be greater than 150 mV peak-to-peak with a period from 80 μs-140 μs. If the ripple period is not within 80 μs-140 μs, adjust R96. Turning R96 CW decreases the ripple period, while turning CCW increases the period. After adjusting the ripple period, recheck the +5 V output (steps 2 and 3).



Backplane Terminal Block



Locations of H780 Adjustments

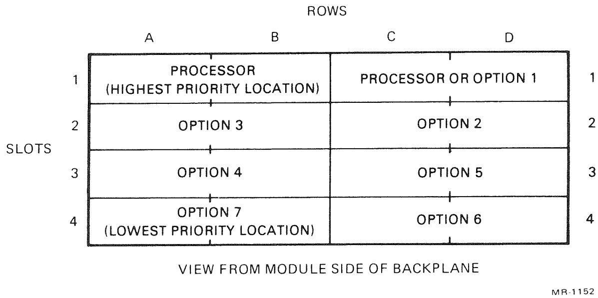
Controls and Indicators

BA11-M/H780 Controls and Indicators

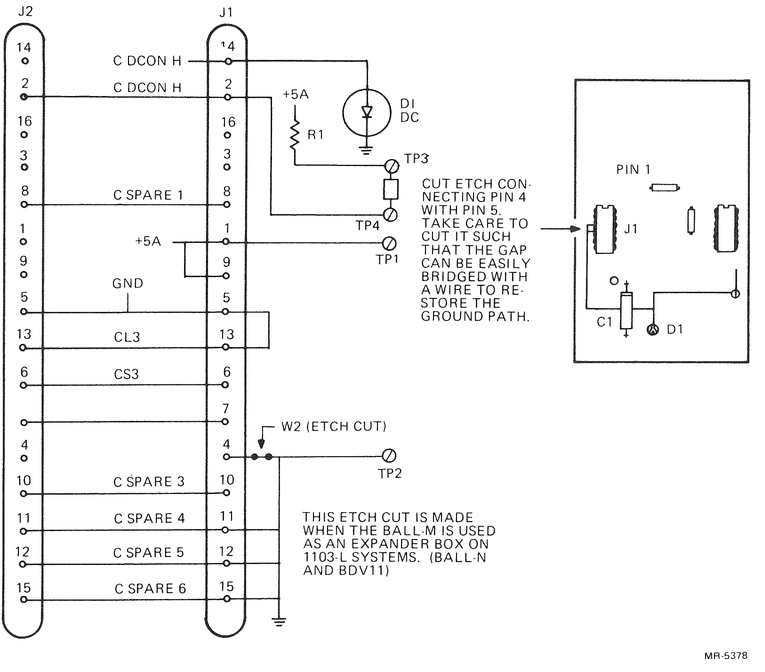
Control/ Indicator	Type	Function
DC ON	LED Indicator	Illuminates when the DC ON/OFF toggle switch is set to ON and proper dc output voltages are being produced by the H780. If either the +5 or +12 V output from the H780 is faulty, the DC ON indicator will not illuminate. This is the only indicator on the H780-K and -L slave supplies.
RUN	LED Indicator	Illuminates when the processor is in the run state (see ENABLE/HALT).
SPARE	LED Indicator	Not used by the H780 or processor. The H780 contains circuitry for driving this indicator for user applications.
DC ON/OFF	Two-Position Toggle Switch	When set to ON, enables the dc outputs of the H780. The DC ON indicator will illuminate if the H780 dc output voltages are of proper values. If a slave supply is connected to a master, the slave DC ON indicator will light if the slave dc output voltages are of proper value. When set to OFF, the dc outputs from the H780 are disabled and the DC ON indicator is extinguished. If a slave supply is connected to a master, the slave DC ON indicator will also extinguish.
ENABLE/HALT	Two-Position Toggle Switch	When set to ENABLE, the BHALT L line from the H780 to the processor is not asserted and the processor is in the run mode (RUN indicator illuminated).

BA11-M/H780 Controls and Indicators (Cont)

Control/ Indicator	Type	Function
ENABLE/HALT	Two-Position Toggle Switch	When set to HALT, the BHALT L line is asserted, allowing the processor to execute console ODT microcode (RUN indicator extinguished).
LTC ON/OFF Switch	Two-Position Generation	When set to ON, enables the toggle of the line time clock (LTC) BEVNT L signal by the H780. When set to OFF, disables the H780 line time clock.
AC ON/OFF (Rear Panel)	Two-Position Toggle Switch	When set to ON, applies ac power to the H780. When set to OFF, removes ac power from the H780.
FUSE (Rear Panel)	5 A or 2.5 A Fast Blow	Protects H780 from excessive current. H780-C, -H, and -K use a 5 A fuse. H780-D, -J, and -L use a 2.5 A fuse.



H9270 Option Positions (Q18)



H780 Slave Console Modification

H780 Slave Console Modification

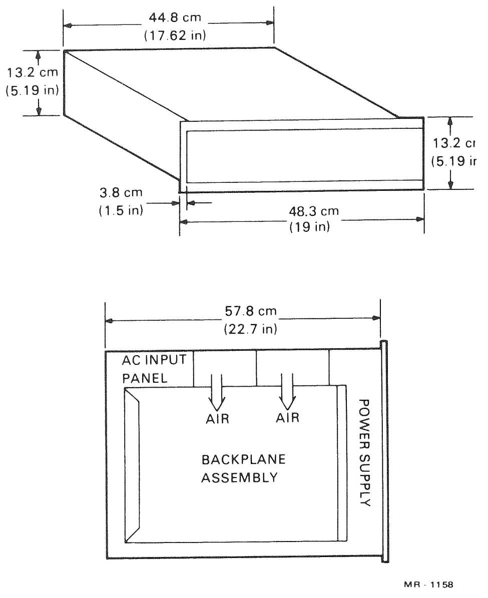
The slave console (54-12143) for the H780 (in the BA11-ME/F 3.5 inch PDP-11/03 expander box) contains an etch that applies a ground signal to pin 4 (and others) on J1. This is desirable except when the BA11-M is used as an expander box and contains a line clock, such as with the BDV11 or when a BA11-M is used to expand an PDP-11/03-L system. In this case, the BDV11 requires the BEVNT signal to generate line clock interrupts. If this etch is present, the signal BEVNT L is asserted (reference H780 sheet 3 schematic), turning off the BEVNT signal.

To correct this unwanted condition, it is necessary to cut an etch on the 54-12143 slave console board. The W2 etch cut is made when the BA11-M is used as an expander box on PDP-11/03-L systems (BA11-N and BDV11).

ECO no. 54-12143-PN002 has been written to document this change. In the ECO, the etch cut is referred to as W2. Pay particular attention to this when adding a BA11-M as an expander box, or when replacing the power supply/slave console assembly (H780-E/F/K/L) or the slave console board.

BA11-N MOUNTING BOX

Mounting Box: Physical Specifications



BA11-NE and BA11-NF Assembly Unit

Power Supply Specifications

Item	Specification
Current Rating	5.5 A at 115 Vrms 2.7 A at 230 Vrms
Inrush Current	100 A peak for one-half 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 at 22 A. (A minimum of 2 A of +5 Vdc power must be drawn to ensure that the +12 Vdc supply regulates properly.) +12 Vdc, ±600 mV at 11 A.

Power-Up/Power-Down Characteristics

Static Performance

Power-up	BDCOK H goes high: 75 Vac BPOK H goes high: 90 Vac
Power-down	BPOK H goes low: 80 Vac BDCOK H goes low: 75 Vac

Dynamic Performance

Power-up	3 ms (min.) from dc power within specification or to BDCOK H asserted. 70 ms (min.) from BDCOK H asserted to BPOK H asserted.
Power-down	4 ms (min.) from ac power off to BPOK H negated. 4 ms (min.) from BPOK H negated to BDCOK H negated. 5 microseconds (min.) from BDCOK H negated to dc power as of specifications.

BA11-N

Option Variations

BA11-NC Consists of 13.2 cm (5.2 inch) mounting box with metal cover, H9273 backplane, and H786 power supply with console, for 115 Vac, 60 Hz.

BA11-ND Consists of 13.2 cm (5.2 inch) mounting box with metal cover, H9273 backplane, and H786 power supply with console, for 230 Vac, 50 Hz.

BA11-NE Consists of 13.2 cm (5.2 inch) mounting box with metal cover, H9273 backplane, and H786 power supply without console, for 115 Vac, 60 Hz.

BA11-NF Consists of 13.2 cm (5.2 inch) mounting box with metal cover, H9273 backplane, and H786 power supply without console, for 230 Vac, 50 Hz.

CONFIGURATION
Jumpers and Switches

Backplane Jumper Positions – There are three jumper positions on the H9273 backplane: W1, W2, and W3. Jumpers are installed in all three positions when the backplane is manufactured. The conditions under which jumpers should be inserted or removed are described in the "Backplane Jumpers" table.

The jumper in position W1 is involved with CPU event interrupts. These interrupts can be initiated in two ways. First, a signal source external to the BA11-N can be used to pull the LSI-11 bus BEVNT L line low; in this case, the jumper of 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 expander box(es).

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.

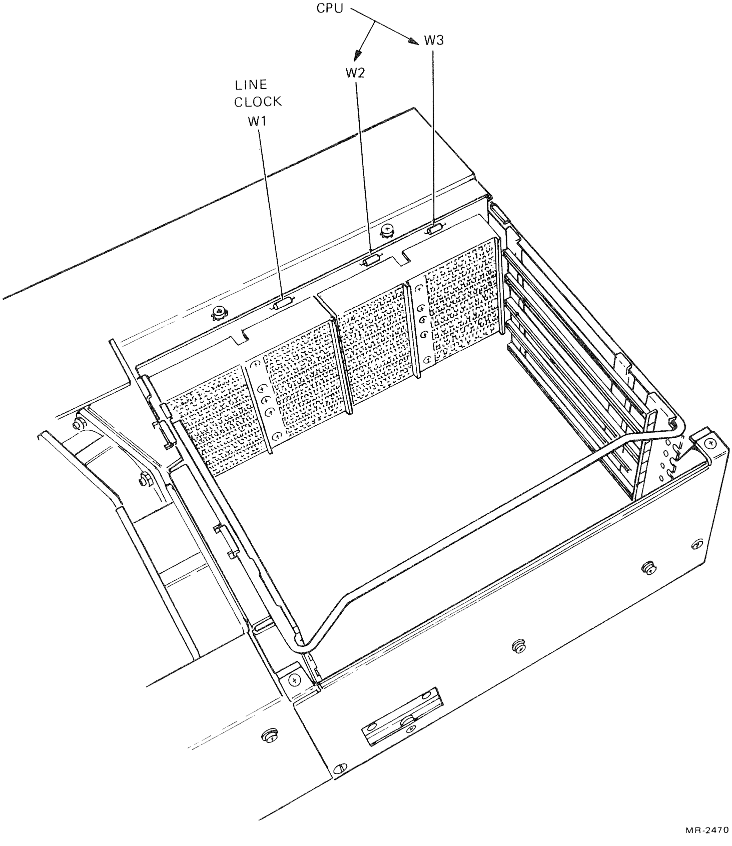
All three of these jumpers can be inserted and removed without any need for disassembly, other than removing the logic box base from the cover. However, if it ever becomes necessary to have clear access to the backplane, follow the instructions given for removal of the logic assembly in the *BA11-N Mounting Box Technical Manual*, EK-BA11N-TM.

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 processor module (KD11-H or KD11-F) is inserted in row 1 of the backplane.	When any other module is installed in row 1; that is, when the backplane is part of an expander box.

NOTE

In multiple backplane systems, only the one backplane can have jumper W1 installed. If a BDV11 module is used, install the jumper in the backplane containing the BDV11 module.



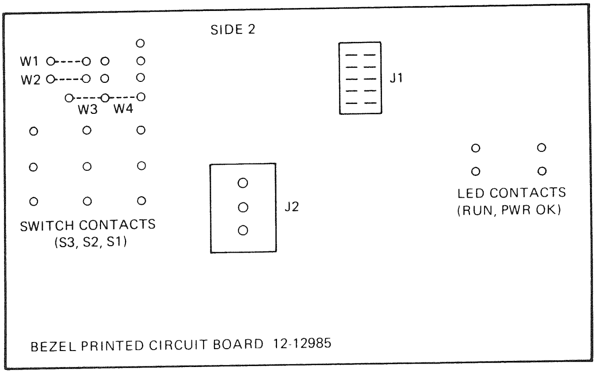
Backplane Jumpers

Bezel Assembly Jumper Positions – There are four jumper positions, W1, W2, W3, and W4, on the printed circuit board of the bezel assembly. When the board is manufactured, jumpers are inserted in positions W1, W2, and W4; position W3 is left blank.

If it is necessary to remove the bezel assembly printed circuit board for any reason, follow the instructions for removal of the bezel assembly given in the *BA11-N Mounting Box Technical Manual*, EK-BA11N-TM.

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.
W3	When the bezel is to be mounted on the expander box. (W3 permits the HALT switch to light the RUN indicator.)	When the bezel is part of the main box; that is, 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.



NOTES:

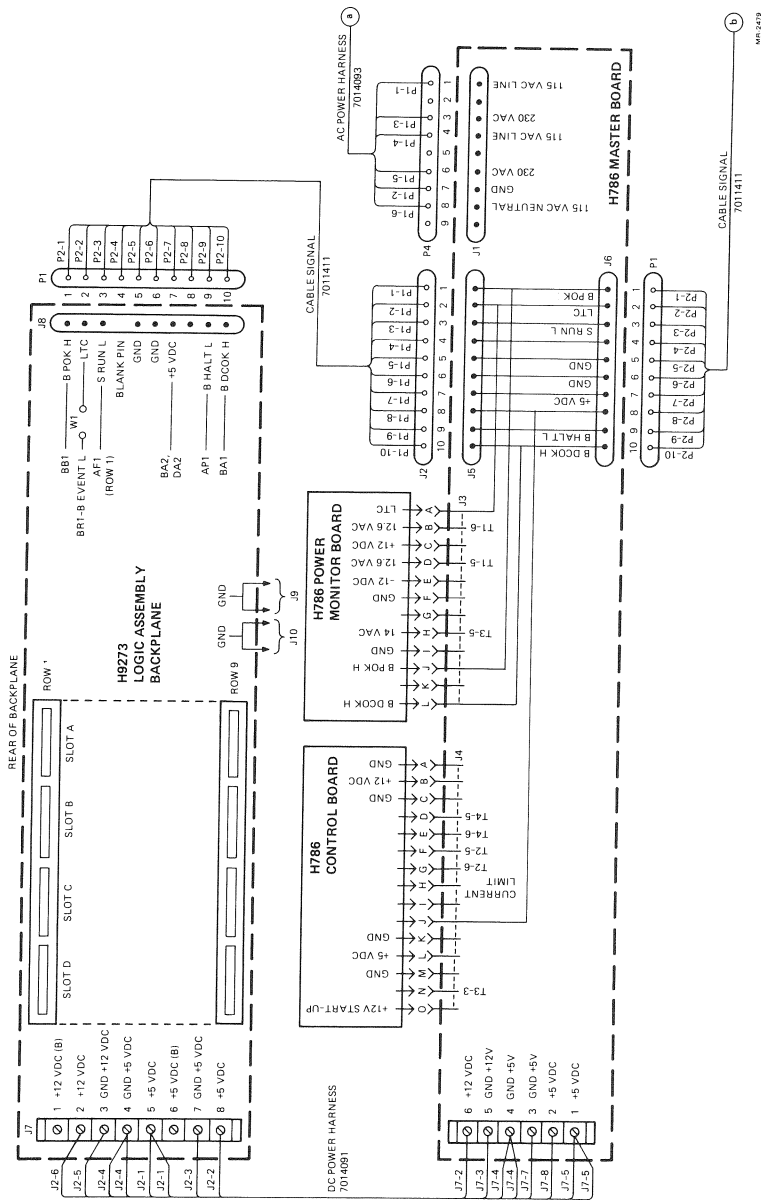
1. VIEW IS FROM THE REAR OF THE BEZEL WHEN THE BOARD IS MOUNTED ON THE BEZEL.
2. JUMPERS ARE MOUNTED ON SIDE 1.

BEZEL ASSEMBLY JUMPERS

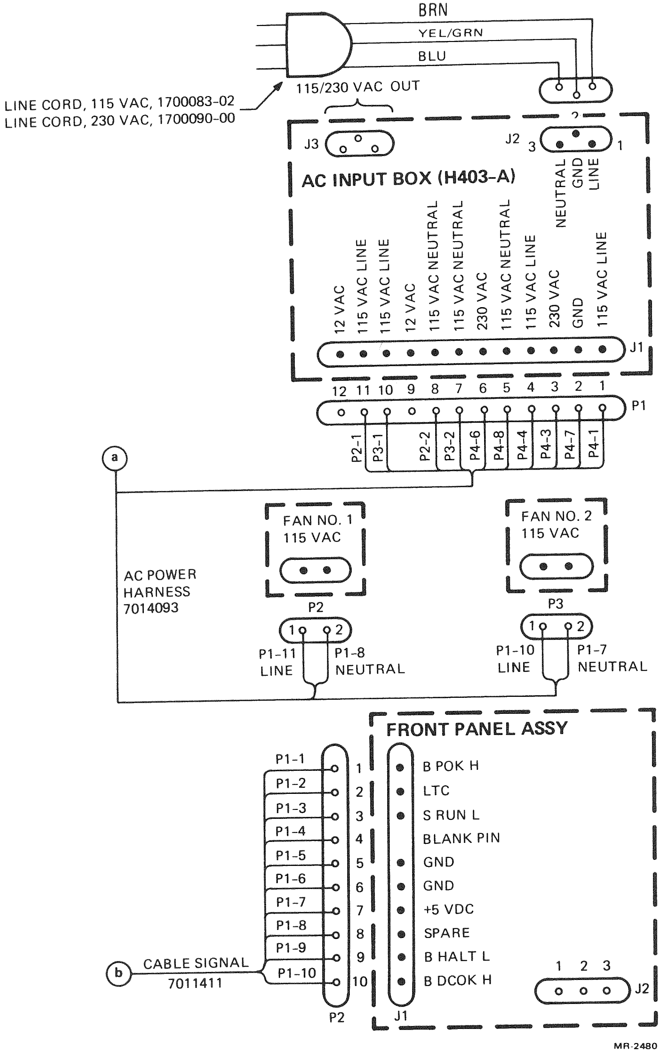
JUMPER POSITION	JUMPER IN	JUMPER OUT
W1, W2	WHEN THE BEZEL AUX ON/OFF SWITCH IS USED TO CONTROL THE POWER SUPPLY GENERATED LTC SIGNAL (WHEN THE SWITCH IS IN THE AUX ON POSITION, LTC-INITIATED INTERRUPTS ARE POSSIBLE).	WHEN THE BEZEL AUX ON/OFF SWITCH IS USED TO TURN THE SYSTEM POWER CONTROLLER ON AND OFF.
W3	WHEN THE BEZEL IS TO BE MOUNTED ON THE 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.

MR-2471

Bezel Printed Circuit Board



BA11-N Unit Interconnection (Sheet 1 of 2)



BA11-N Unit Interconnection (Sheet 2 of 2)

Adjustments

DC Voltage Measurement – The +5 Vdc and +12 Vdc regulated voltages can be measured at J7 of the backplane or, preferably, at the tip jacks on the M8012 module. The pins of J7 are numbered, and the wires connected to them are color coded. +12 Vdc and +5 Vdc are assigned the following pins and colors.

+12 Vdc	- pin 2, purple wire
+12 Vdc ground	- pin 3, black wire
+5 Vdc	- pin 5, red wire
+5 Vdc ground	- pin 4, black wire

The tip jacks on the M8012 module are color coded and labeled as follows.

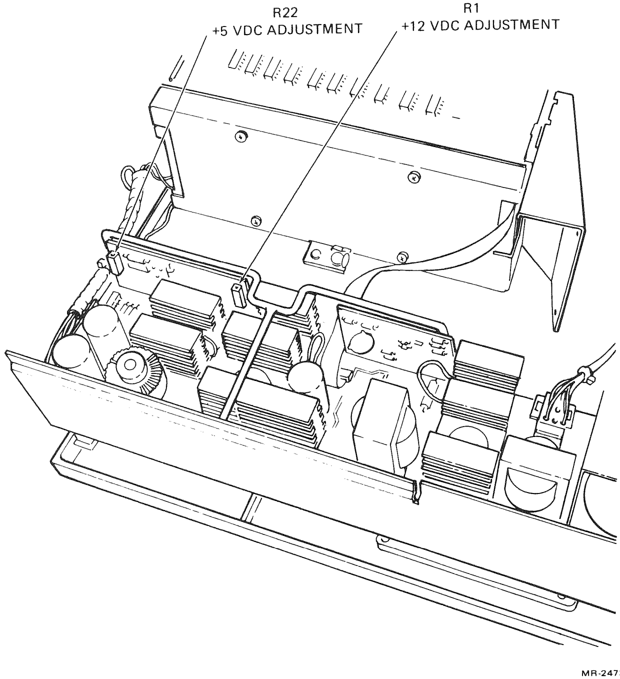
+12 Vdc	- J3, purple
+5 Vdc	- J2, red
ground	- J1, black

Use a calibrated digital voltmeter to measure the voltages under normal load conditions.

NOTE

Do not measure the dc voltages without a load on the power supply; incorrect readings will result.

The +5 Vdc output should be +5 V ± 250 mV, while the +12 Vdc output should be +12 V ± 600 mV. If either voltage is out of tolerance, adjust the appropriate potentiometer on the control board. R1 varies the +12 Vdc output and R22 varies the +5 Vdc output. The potentiometers are identified in the figure that follows. The correct output should be achieved when a potentiometer is near its mid-range position. If a potentiometer must be turned to near an extreme position to achieve tolerance limits, there is perhaps a problem somewhere in the regulator. If the output cannot be brought within limits, replace the entire control board.



Power Supply Adjustments

Controls and Indicators

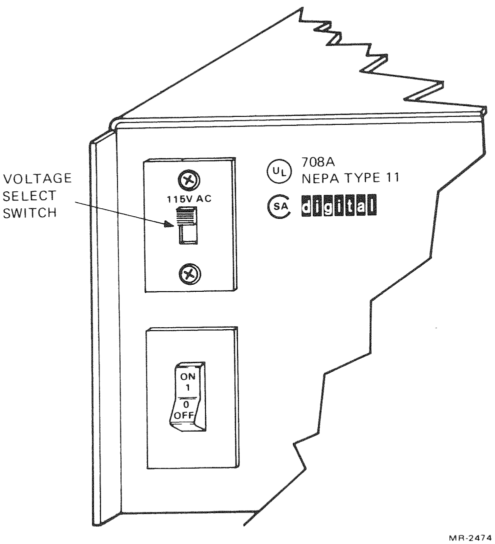
Operation – The BA11-N can have a blank front panel or one equipped with three switches and three indicators. In addition to the front panel switches and indicators, there is an ON/OFF switch and a primary voltage selection switch, both on the ac input box. The ON/OFF switch remains in the ON position 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.

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 functions are explained below. 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 that the contents of register R7 were not changed). Refer to the *Microcomputer Processor Handbook*, EB-18451-20, for a description of console ODT command usage. In an expander box, the HALT switch can be used to light the RUN indicator.
RESTART		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.
	PWR OK	The PWR OK indicator lights when the power supply dc voltages are present.
	RUN	The RUN indicator lights when the CPU is executing programs.

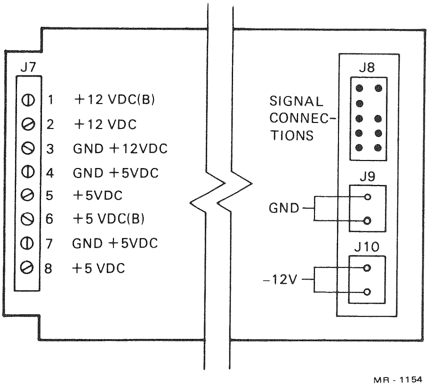
AC Voltage Selection – The BA11-N can be used with line voltage of either 115 Vac or 230 Vac. Only the ac line cord is different for the two voltages. However, a voltage selecting switch must be set to a position that corresponds to the line voltage being used. This switch is located on the rear of the ac input box, above the circuit breaker. 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 reads "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.

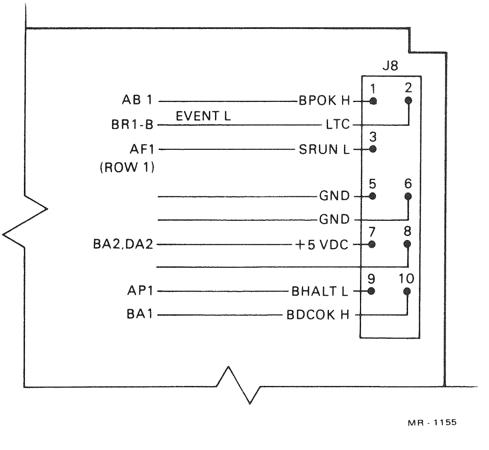


BA11-N Voltage Select Switch

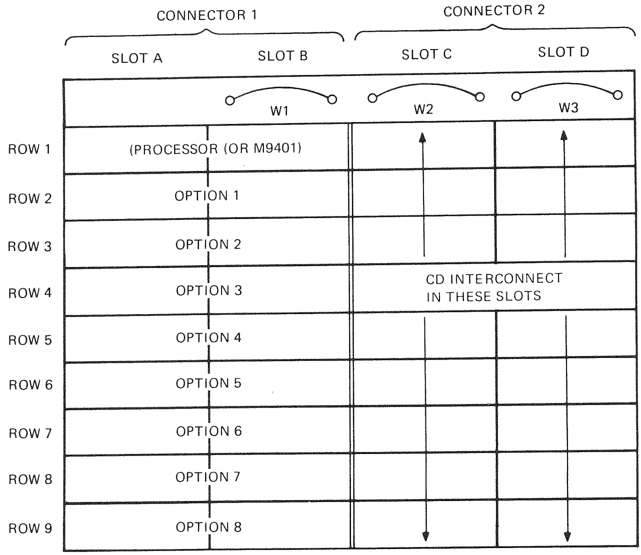
Backplanes



H9273-A Power Connections



H9273-A Signal Connections



VIEW IS FROM MODULE SIDE OF CONNECTORS.

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 CPU MODULE 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.

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H9273-A Backplane Connectors

CD Bus Signals – The CD bus signals are supplied by slots C and D. The +5 V supply voltage is bused to all rows on pin A2 of slots C and D (that is, pins CA2 and DA2). Likewise, ground connections on pins CC2, CT1, DC2, and DT1 are bused to all rows. All other pins connect only to an adjacent row.

For example, pin CF2 of any row connects only to pin CF1 of the adjacent higher-numbered row. Pins on side 2 of the slot (B2, C2, etc.) connect to the adjacent higher-numbered row (except DT2, which connects to CT2 of the adjacent lower-numbered row), while pins on side 1 of the slot (B1, C1, etc.) connect to the adjacent lower-numbered row (except pin A1, which connects to C1 of the adjacent higher-numbered row).

Thus, each row, except 1 and 9, has 33 signal connections (other than +5 V and ground) to both the adjacent higher-numbered row and the adjacent lower-numbered row. To facilitate references to these two groups of 33 signals, group 1 is defined as the group of signals connecting a row (row X) to its adjacent lower-numbered row (row X-1). Group 2 is defined as the group of signals connecting a row to its adjacent higher-numbered row (row X+1). Generally, group 1 signals are found on side 1 pins, while group 2 signals are found on side 2 pins.

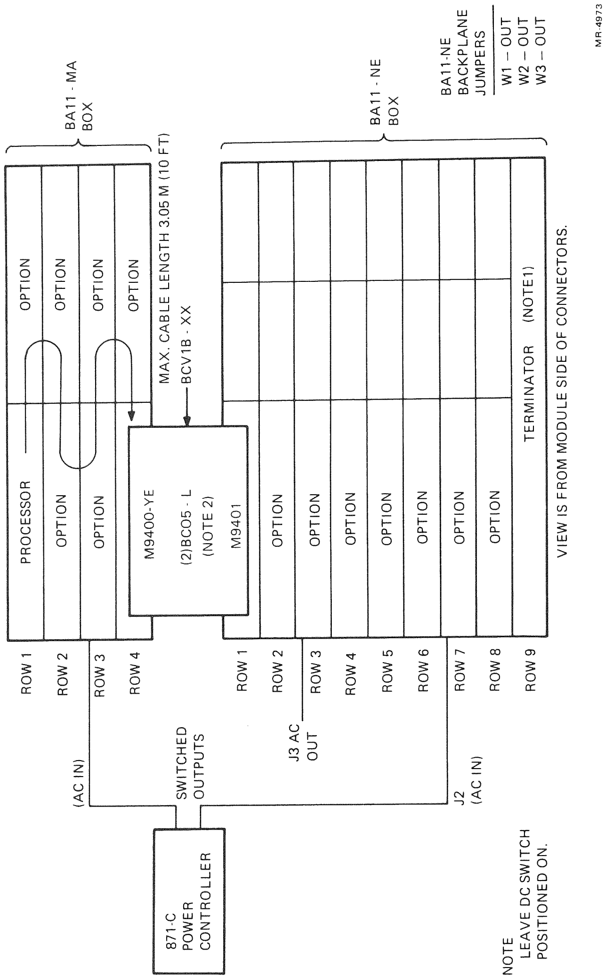
BA11-MA/BA11-NE Expansion Configuration

- The LTC is sourcing the BEVNT L in the BA11-MA box. (BDV11 is not being used.)
- Power is controlled by the 871C power controller ON/OFF switch.

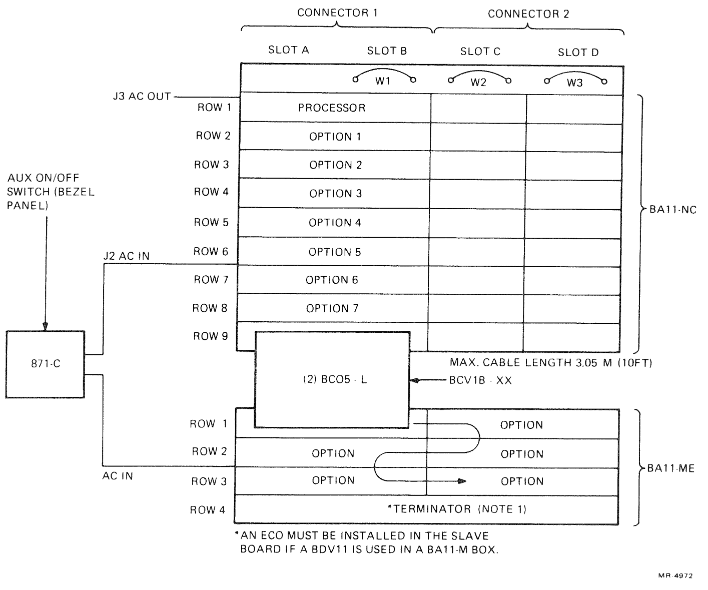
NOTES

1. **If a BDV11, with E21 switch 5 "on," is used as the last module in the BA11-NE, install W1 in the BA11-NE backplane. Turn off the LTC switch (it must remain off) in the BA11-MA.**
2. **BCV1B-XX* configuration: M9400 YE in first A-B slot after options in BA11-MA backplane. M9401 KD in first A-B slot in BA11-NE backplane.**

*XX denotes cable length.



BA11-MA to an NE Box Expansion



BA11-NC to an ME Box Expansion

BA11-NC backplane jumpers:

W1 – IN
W2 – IN (If M7264 or M7264-YA CPU is present.
W3 – IN If not, remove jumper.)

BA11-NC bezel jumpers:

W1 – IN
W2 – IN Must be in to allow LTC by front panel AUX ON/OFF SW.

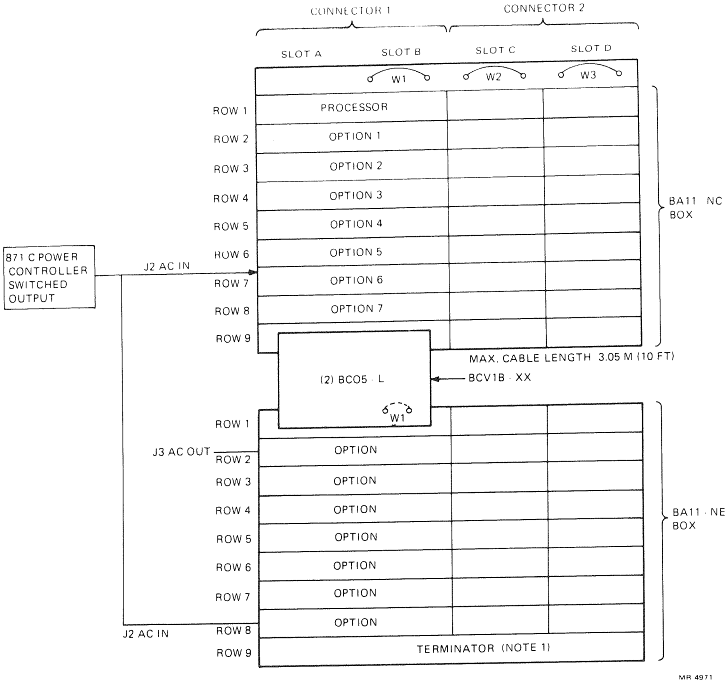
W1 – OUT When bezel AUX ON/OFF switch is used to turn system
W2 – OUT power controller on or off; otherwise IN.

W3 – OUT
W4 – IN

NOTES

1. **If a BDV11, with E21 switch 5 "on," is used as the last module in the BA11-ME, remove W1 from the BA11-NC backplane.**

2. **BCV1B-XX configuration: see BA11 MA/NE configuration figure.**



BA11-N to Another N Box Expansion

NOTES

1. **If a BDV11, with E21 switch 5 "on," is used as the last module in the BA11-NE, install W1 in the BA11-NE backplane. Remove W1 from the BA11-NC backplane.**

2. **BCV1B-XX* configuration: M9400 YE in first A-B slot after options in BA11-NC. M9401 KD in first A-B slot of BA11-NE.**

---

*XX denotes cable length.

BA11-NC backplane jumpers:

W1 I
W2 I
W3 I   If using CPU M7264 or M7264-YA; otherwise R.

BA11-NC bezel jumpers:

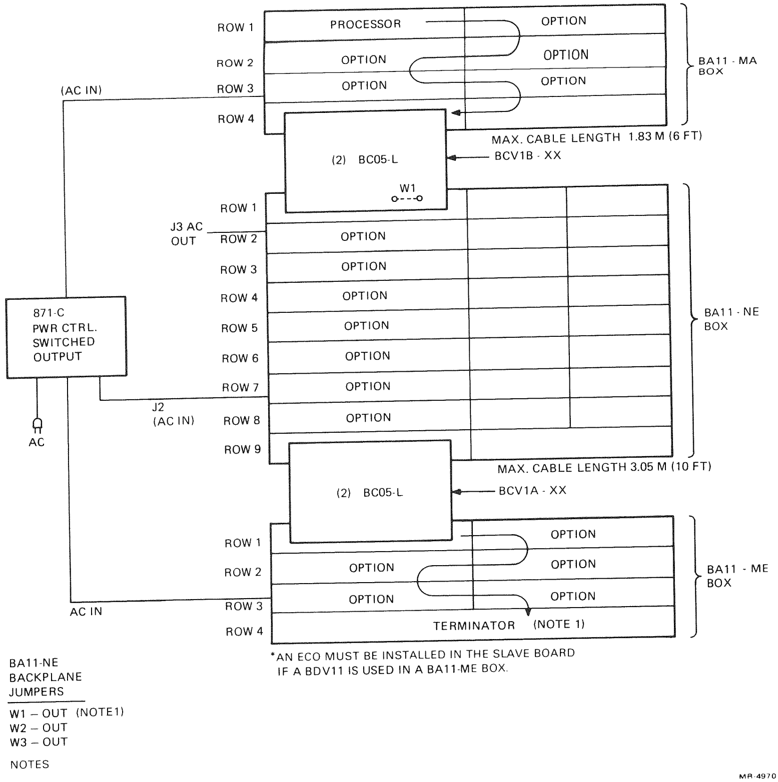
W1 I
W2 I
W3 R
W4 I

BA11-NE backplane jumpers:

W1 R
W2 R
W3 R

CAUTION

Do not attempt to source ac power for the BA11-N mounting box from the BA11-N box ac outlet, because the current rating of the BA11-N box will be exceeded and severe damage may occur. Also, do not attempt to provide ac power to the three BA11-N boxes from one 871-C power controller.



BA11-MA to an ME Box Expansion

NOTES

1. **If a BDV11, with E21 switch 5 "on," is used as the last module in the BA11-MA, install ECO in the BA11-ME slave console board. Remove W1 from this BA11-NE backplane. Turn off LTC switch (must remain off) on BA11-ME.**

2. **BCV1B-XX* configuration**: BCV1A-XX; M9400 YD in first A-B slot after options in BA11-NE; M9401 in first A-B slot in BA11-ME backplane.**

---

*XX denotes cable length.

**See BA11-MA to an NE Box Expansion figure.

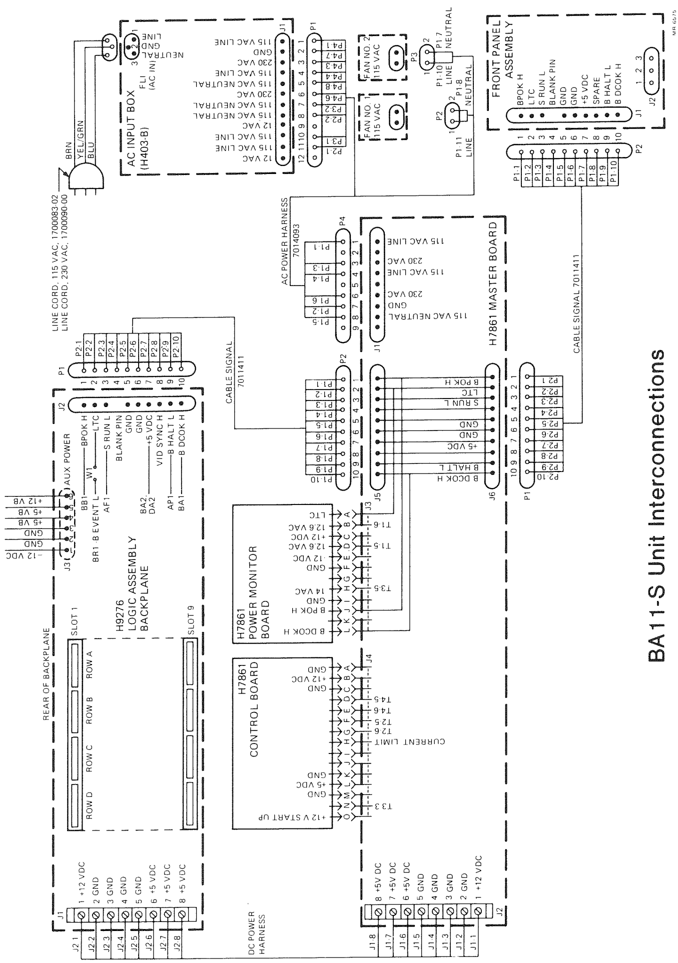
BA11-S MOUNTING BOX

GENERAL

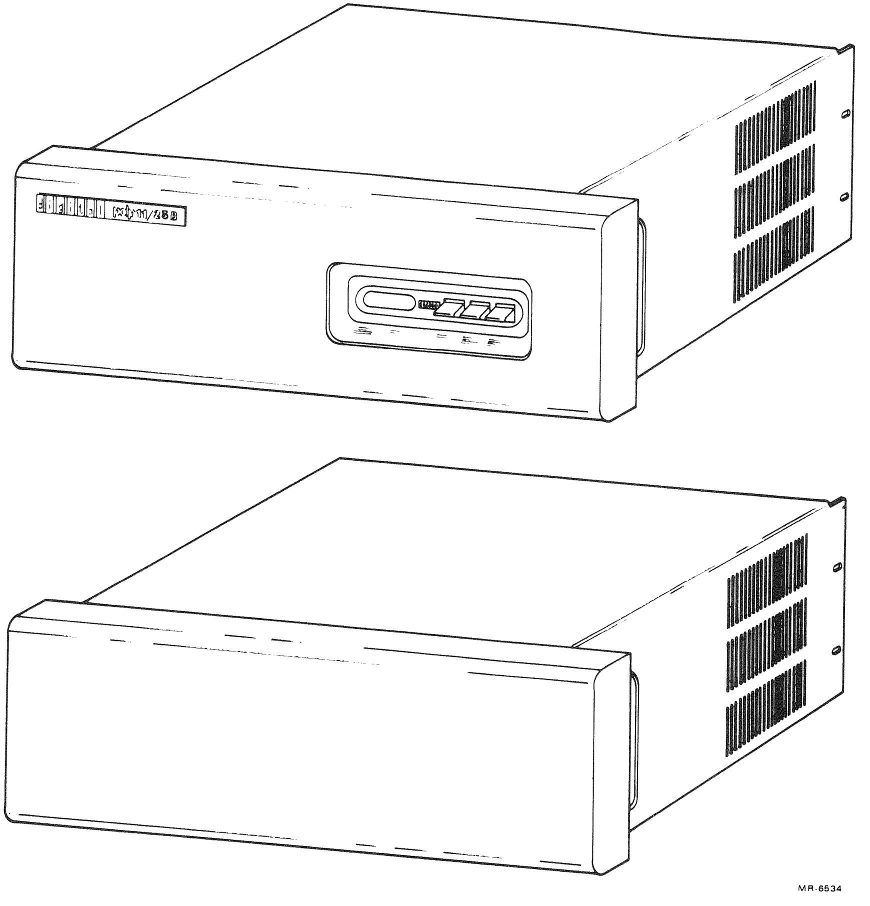
The mounting box is available for both 120 V and 240 V systems. Because a choice of front panels is provided, the user can select any of the following BA11-S models. Descriptions of the boxes, interconnections, and specifications follow.

BA11-S Models

Model	Primary Power	Front Panel
BA11-SA	120 V	Control panel
BA11-SB	240 V	Control panel
BA11-SC	120 V	Blank panel
BA11-SD	240 V	Blank panel



BA11-S Unit Interconnections



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BA11-S with Control Panel and Blank Front Panel

BA11-S Mounting Box Specifications

Item	Specifications
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)
Weight (without modules)	20 kg (44 lb)
Operating temperature*	5° C to 50° C (41° F to 122° F)
Operating humidity	10% to 95% with a maximum wet bulb temperature of 32° C (90° F) and a minimum dew point of 2° C (36° F)
Input voltage	120 Vac (BA11-SA/-SC) 240 Vac (BA11-SB/-SD)
Input current	6 A maximum (BA11-SA/-SC) 3 A maximum (BA11-SB/-SD)
Output voltage	+5 V @ 2 A to 36 A +12 V @ 0.0 A to 5 A

*The maximum allowable operating temperature is based on operation at sea level, that is, at 760 mm Hg (29.92 in Hg). Maximum allowable operating temperature will be lowered by a factor of 1.8° C per 100 m (1° F per 100 ft) for operation at higher altitude sites. When the equipment is being operated at the maximum allowable temperature, air flow must maintain air temperature rise to a maximum of 7° C (44.5° F).

POWER SUPPLY

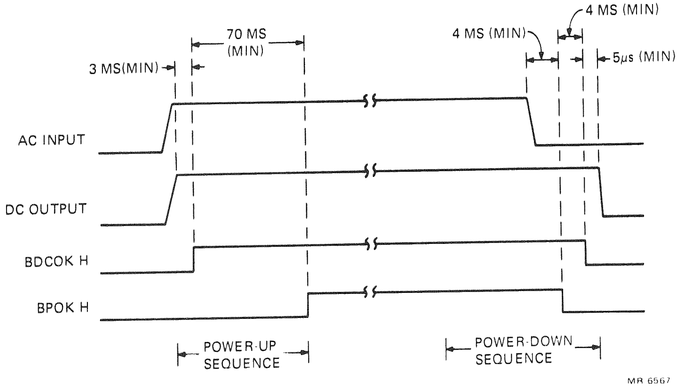
BA11-S boxes use the H7861 power supply to provide operational power.

BA11-S Power Supply Specification

Item	Specification
Current rating	5.5 A @ 120 V rms 2.7 A @ 240 V rms
Inrush current	100 A peak, for 1/2 cycle at 128 V rms or 256 V rms
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, ±150 mV, @ 36 A (A minimum of 2 A of +5 Vdc power must be drawn to ensure that the +12 Vdc supply regulates correctly.)
Power-up/power-down characteristics	+12 Vdc, @ ±360 mV, @ 5 A
Static performance	
Power-up	BDCOK H goes high: @ 75 Vac BPOK H goes high: @ 85 Vac
Power-down	BPOK H goes low: @ 80 Vac BDCOK H goes low: @ 75 Vac
Dynamic performance	
Power-up	3 ms (minimum) from dc power within specification to BDCOK H asserted. 70 ms (minimum) from BDCOK H asserted to BPOK H asserted.
Power-down	4 ms (minimum) from ac power off to BPOK H negated. 4 ms (minimum) from BPOK H negated to BDCOK H negated. 5 μs (minimum) from BDCOK H negated to dc power outside of specifications.

BDCOK and BPOK

The power-up and power-down sequence controls the BDCOK and BPOK signals as follows.



Power-Up / Power-Down Timing

DC Voltage Adjustments

The +5 Vdc and +12 Vdc regulated voltages can be measured at J1 of the backplane or, preferably, at J2 of the power supply. The pins of connector J1 are numbered and the wires connected to them are color coded. The following pins and colors are assigned to +12 Vdc and +5 Vdc.

+12 Vdc	Pin 1, violet wire
+5 Vdc	Pins 6, 7 and 8, red wires
Ground	Pins 2, 3, 4, and 5, black wires

Use a calibrated digital voltmeter to measure the voltage under typical conditions.

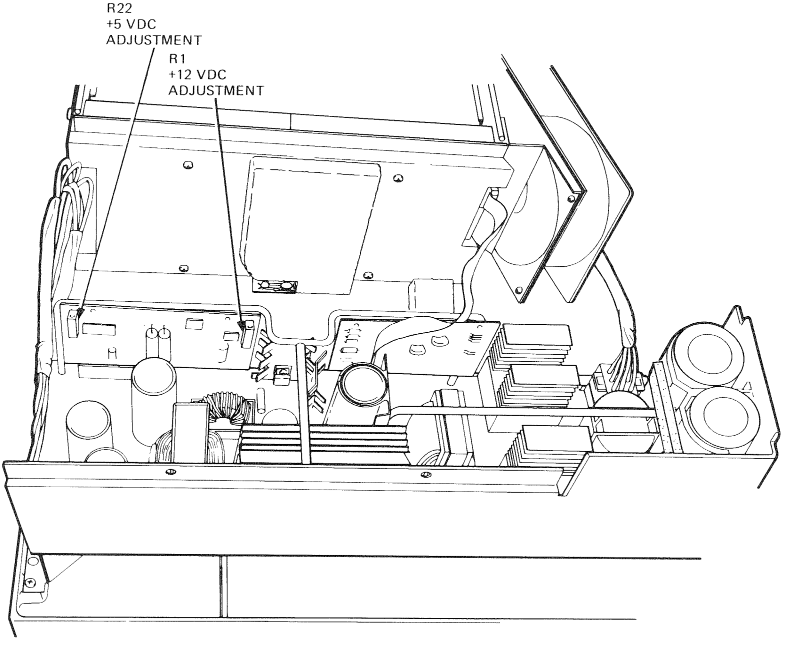
NOTE

Do not measure the dc voltage without a load on the power supply: incorrect readings will result.

The +5 Vdc output should be between 4.85 V and 5.15 V, while the +12 Vdc output should be between 11.64 V and 12.36 V. If either voltage is out of tolerance, adjust the appropriate potentiometer on the control board. R1 adjusts the +12 Vdc output and R22 varies the +5 Vdc output. The potentiometers are located by referring to the power supply adjustments drawing that follows.

NOTE

Adjust the +5 Vdc potentiometer first before adjusting the +12 Vdc potentiometer. Adjusting the +12 V potentiometer first, beyond the +12 V range, may cause a crowbar effect.



NOTE:
WHEN THE H7861 POWER SUPPLY LOCKING SCREWS ARE REMOVED AND THE POWER SUPPLY IS TIPPED FORWARD, THE SAFTY GROUND CONNECTION FOR THE BA11-S MOUNTING BOX IS NO LONGER PRESENT.

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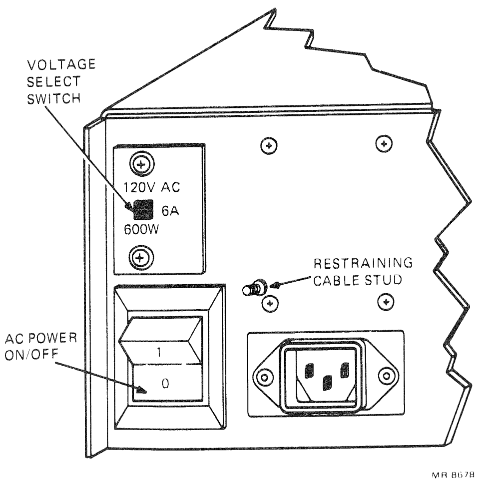
Power Supply Adjustments

AC Voltage Selection

The BA11-S can be used with line voltage of either 120 Vac or 240 Vac. Only the ac line cord is different for the two voltages. However, a voltage selection switch must be set to the position that agrees with the line voltage being used. This switch is found on the rear of the ac input box, above the circuit breaker. The switch lever extends through a plate that is attached to the box. The plate is made so that the screw holes in the plate and the input box line up only when the switch position agrees with the printing on the outside of the plate. If the line voltage being used is 120 Vac, the label "120 Vac" should be printed on the plate above the switch lever. If the printing on the plate is "240 Vac," remove the plate, and flip it over. The label "120 Vac" should be there. Also, see that the switch lever itself is imprinted with "240 Vac." Move the switch lever down; "120 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 reads "120 Vac."

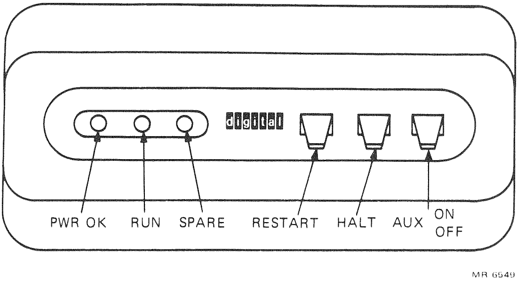
The ac power is applied to the box by setting the 1/0 switch to the "1" position and off by setting the switch to the "0" position.



BA11-S Voltage Selection Switch

FRONT PANEL SWITCHES AND INDICATORS

The BA11-S can have either a blank front panel or one equipped with three switches and three indicators. The following figure shows the control-equipped front panel. The switch and indicator functions are also described in the following table.



Front Panel Switches and Indicators

BA11-S Front Panel Switches and Indicators

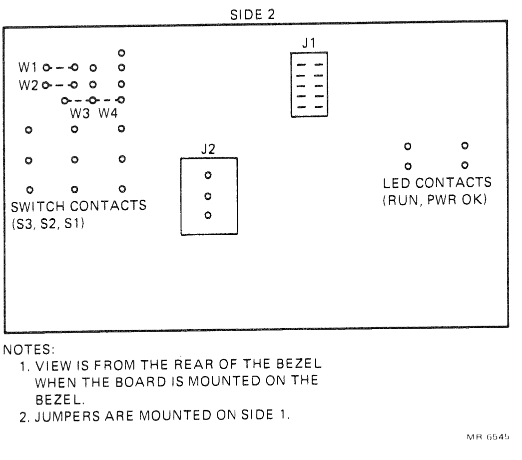
Description	Function
Switches	
AUX ON/OFF	If the BA11-S is wired to control system power, the AUX switch turns the power on and off. If the BA11-S is not wired to control system power, the switch can control the LTC signal, disabling the signal when the switch is in the off position.
HALT	In the down position, the HALT switch forces the CPU to suspend usual program execution, enables console ODT microcode operation, and permits single-instruction execution. To continue 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). In an expander box, the HALT switch can be used to light the RUN indicator.
RESTART	When the user presses the momentary RESTART switch, the CPU automatically carries out a power-up sequence; then, the user can reboot the CPU at any time from the front panel.

BA11-S Front Panel Switches and Indicators (Cont)

Description	Function
Indicators	
PWR OK	The PWR OK indicator lights when the power supply dc voltages are present.
RUN	The RUN indicator lights when the CPU is executing programs.

FRONT PANEL BEZEL

There are four jumper positions — W1, W2, W3, and W4 — on the printed circuit board of the bezel assembly. When the board is built, jumpers are inserted in positions W1, W2, and W4; position W3 is left blank. The conditions under which jumpers are inserted or removed follow.



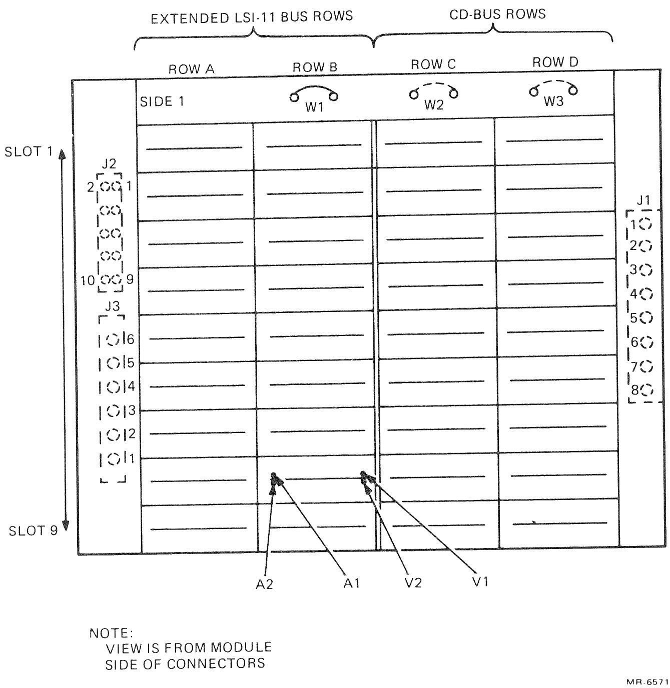
Front Panel Bezel Printed Circuit Board

Bezel Assembly Jumpers

Jumper	Jumper(s) In	Jumper(s) 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.
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, that is, 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.

H9276 BACKPLANE

The BA11-S backplane is a 9 $\times$ 4 backplane that accepts both dual-height and quad-height modules. The backplane structure is unique; it provides two separate buses, the extended LSI-11 bus and the CD bus. The figure that follows shows these two buses and the backplane and points out the power and signal connectors (J1–J3). Modules are inserted in slots 1 through 9 of the backplane. The extended LSI-11 bus signals appear on rows A and B; the CD bus signals appear on rows C and D.



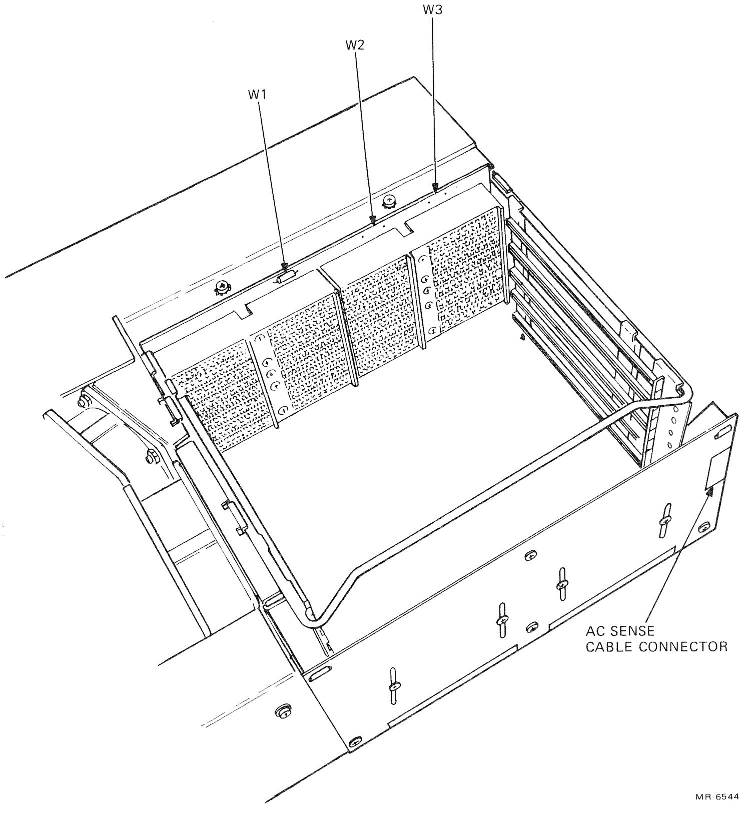
H9276 Backplane

Backplane Jumper Positions

There are three jumper positions — W1, W2, and W3 — on the H9276 backplane. A jumper is installed in jumper position W1 when the backplane is manufactured. The jumper conditions are as follows.

Backplane Jumpers

Jumper	Jumper(s) In	Jumper(s) Out
W1	When a power supply generated LTC signal is used to assert the extended LSI-11 bus BEVBT L signal.	To disable the line time clock as BEVNT from the power supply.
W2, W3	Only when using a KD-11 quad LSI-11 CPU module (M7264) in slot 1.	For all other LSI-11 type processors in slot 1.



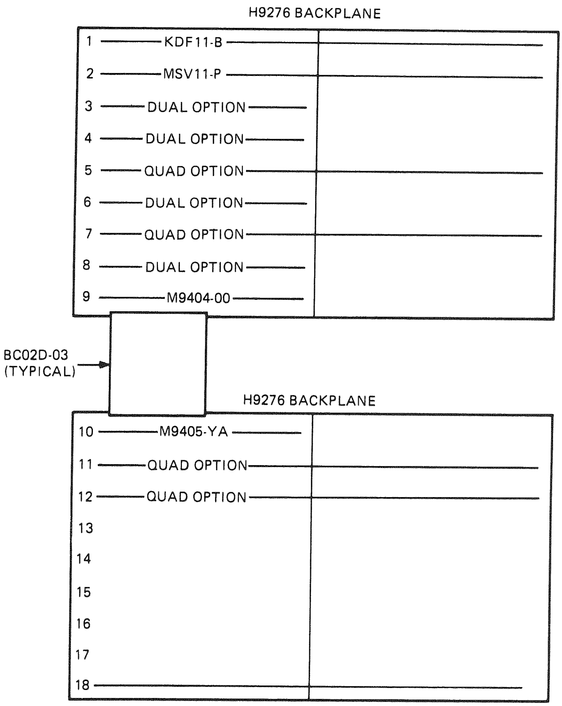
Backplane Jumpers

EXPANSION

The BA11-S box can be expanded if the backplane exceeds the 20 dc load or the 35 ac load requirements. The expansion cables are described in the following table and the typical expanded systems are shown in the following figures.

Extended LSI-11 Bus Expansion Cable Assemblies

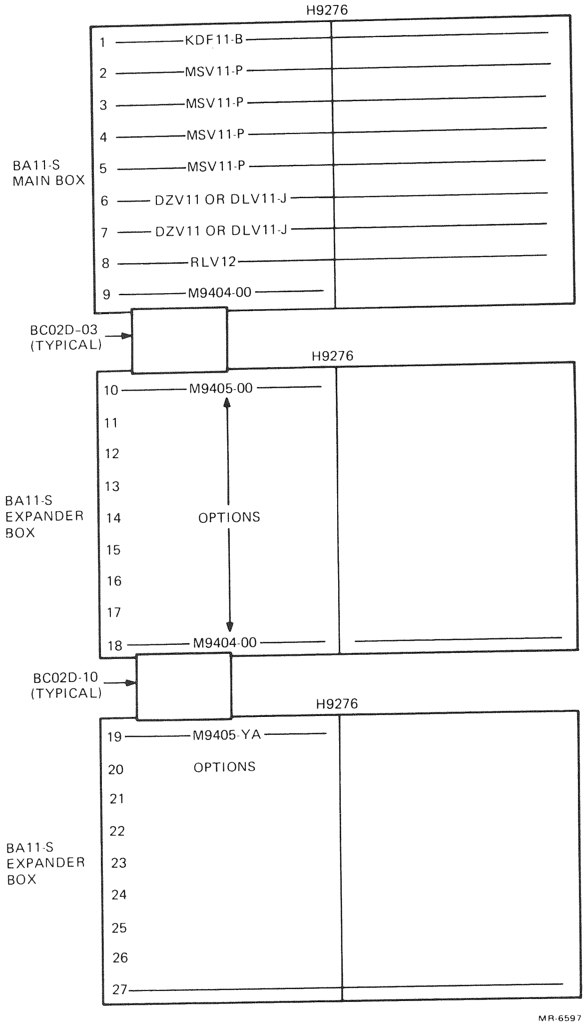
Assembly	Assembly Arrangement	Insert Modules In
BC02D	Two BC02D-03 cables One M9404-00 module	Rows A and B of the first open slot after all other extended LSI-11 bus options have been installed in the main box.
	One M9405-00 module	Rows A and B of slot 1 of expander box 1.
BC02D	Two BC02D-10 cables One M9404-00 module	Rows A and B of the first open slot after all other Q22 bus options have been installed in expander box 1.
	One M9405-YA module	Rows A and B of slot 1 of expander box 2.



NOTES:
1. THE TOTAL DC LOADS OF BOTH BOXES CANNOT EXCEED 20.
2. EACH BC02D CABLE MUST BE AT LEAST 90 CM (3 FT) LONG, IF CONNECTED FROM THE MAIN BOX TO THE FIRST EXPANSION BOX.
3. EACH BC02D CABLE MUST BE AT LEAST 300 CM (10 FT) LONG, WHEN CONNECTED BETWEEN THE SECOND AND THIRD EXPANSION BOX.

MR 6594

BA11-S Two Backplane Configuration

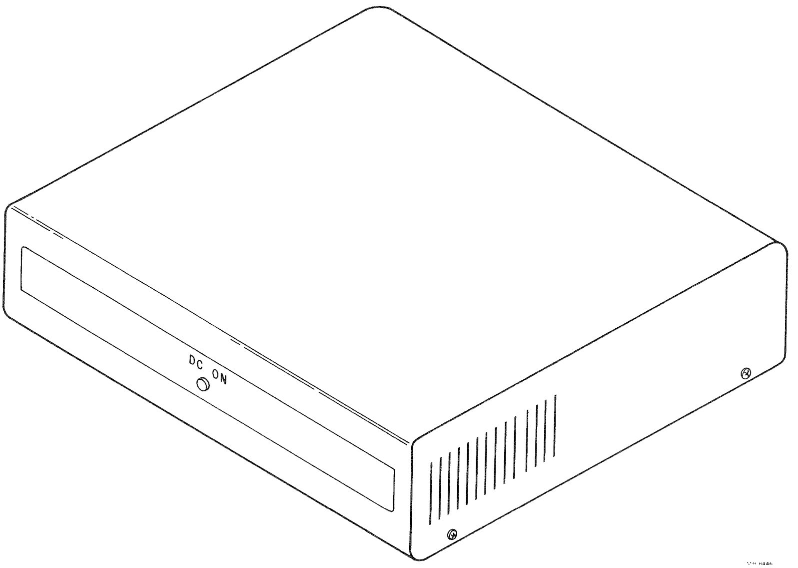


BA11-S Three Backplane Configuration

BA11-VA MOUNTING BOX

GENERAL

The BA11-VA mounting box is a self-contained LSI-11 2 $\times$ 4 backplane commonly described as the shoe box. This backplane contains only four slots and will only accept a dual-height type module.



BA11-VA Mounting Box

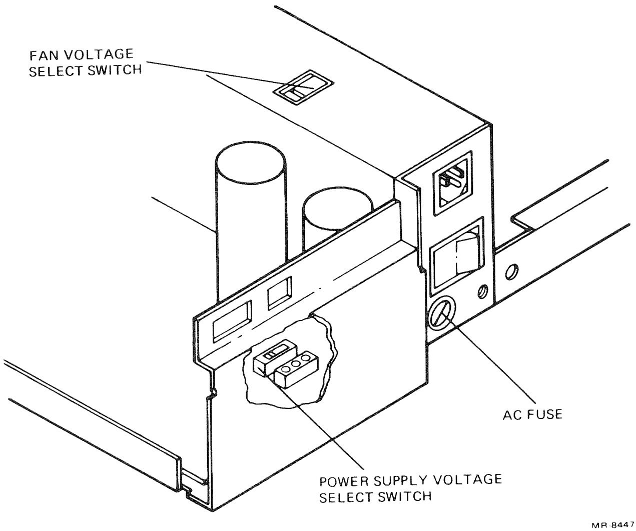
BA11-VA

Power Requirements

Maximum ac input power	115 Vac 50/60 Hz @ 3 A 230 Vac 50 Hz @ 1.6 A
Maximum dc power including auxiliary output	+5 Vac @ 5.6 A +12 Vac @ 1.6 A

Power Selection

The BA11-VA mounting box operates on either 115 Vac or 230 Vac and must be configured as follows before power is applied.



AC Input Voltage Selection

CAUTION
Be sure the voltage selections are identical before the power cord is inserted.

1. Remove the top cover by removing the four side screws.

2. Determine the voltage needed.

3. Set both the fan and power supply voltage select switches to the required voltage.

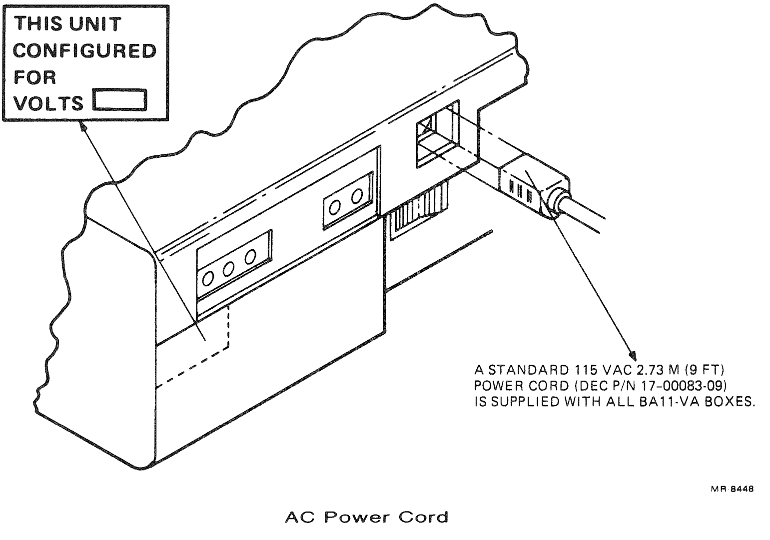
CAUTION
Both switches must be set for the same voltage.

4. Select the appropriate voltage decal, which is provided in the mounting hardware package, and apply the decal to the back of the BA11-VA box as shown.

5. Replace the top cover using the four screws removed in step 1.

6. Insert the ac power cord as shown.

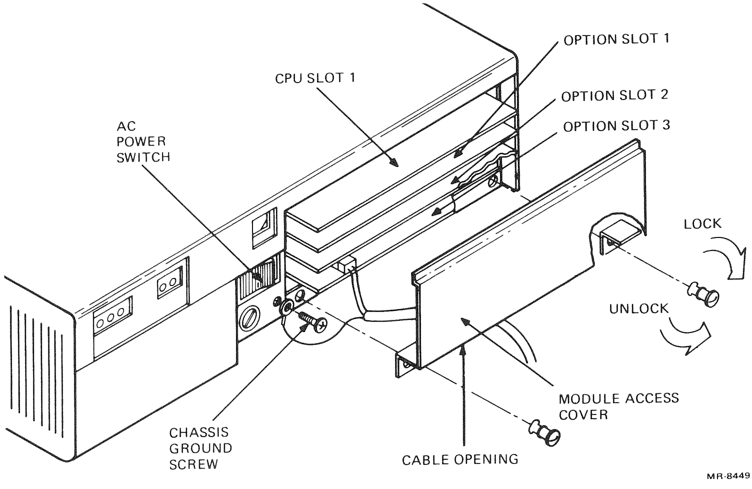
The ac fuse holder (flush mounted) contains a 3 A fuse for 115/230 Vac operation. For 230 Vac operation, a 230 Vac power cord is needed for connection to a BA11-VA box.



AC Power Cord

Module Access

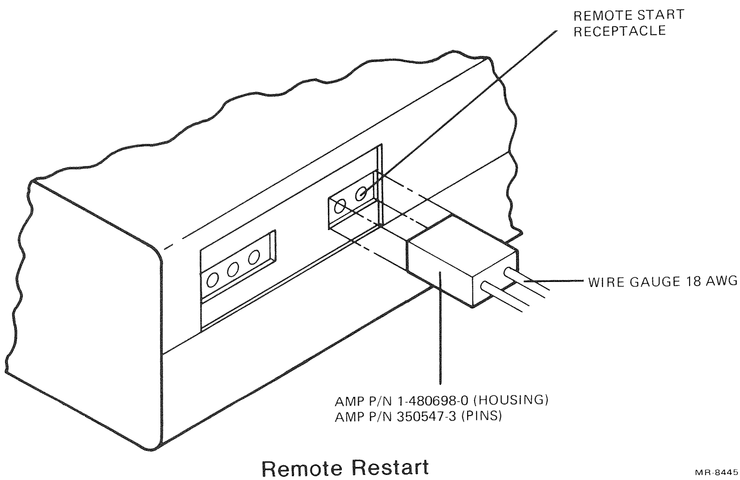
The module access cover is removed by turning the two screws a quarter turn counterclockwise (see the following figure). This allows access to the LSI-11 modules installed in the backplane.



Module Access

Remote Restart

The BA11-VA box is remotely controlled by installing a cable to the remote restart receptacle as (see the following figure).



Remote Restart

MR-8445

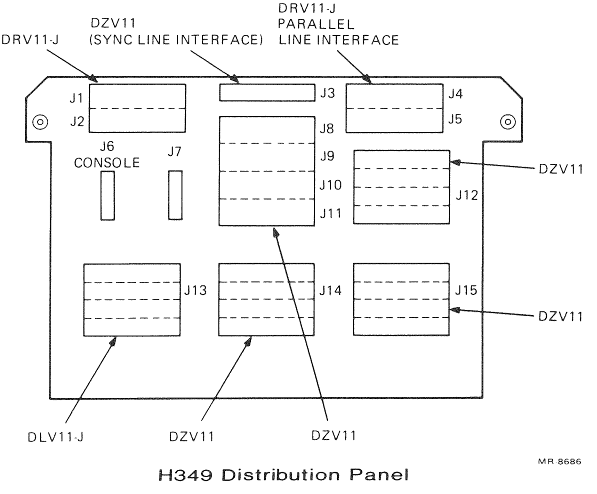
H349 DISTRIBUTION PANEL

GENERAL

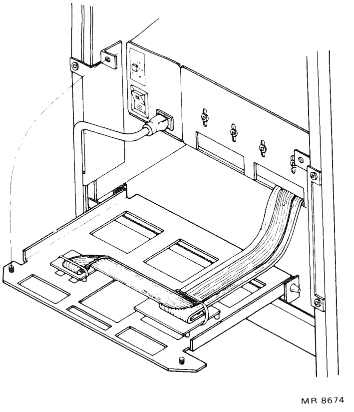
The H349 distribution panel provides a simple and convenient way of interfacing peripheral equipment to a microcomputer system. The panel is normally installed within the system and is accessible from the rear.

This 28.32 cm (11.15 in) by 44.10 cm (18 in) hinged panel is held in its vertical position by two quarter-turn captive screws. It can swing down to a horizontal position in order to service the microcomputer system.

The H349 panel contains ten mounting locations that provide mounting for up to fifteen connector cable assemblies (J1 through J15), as illustrated in the following figure. Eleven cable assemblies contain 1 $\times$ 4 slots (J1 through J11) and four contain 4 $\times$ 4 slots (J12 through J15). An adapter is available to transform four of the 1 $\times$ 4 slots (J8 through J11) into a 4 $\times$ 4 slot. When mounted, each cable assembly is connected to the microcomputer system by ribbon cables. The second figure that follows shows a typical installation. A list of cable assemblies used to provide interfacing for the options is provided.



H349 Distribution Panel



Typical Installation

Distribution Panel Cable Assemblies to System Options

Option	Module	Cable Assembly	Extension Cable
DLV11-ED	M8017	BC03L-2F BC03M-25 or BC22A-25	BC05D-25 or
DLV11-J	M8043	7018204-00	BC22A-25
DMV11-AA DMV11-AC	M8053 M8054	BC55H-03 BC55F-03	BC05D-25 (EIA) BC55M-98 (Local)
DPV11-DC	M8020	7018209-00	BC05D-25 or BC22B-22
DZV11-C	M7957	7018203-00	BC05D-25 or BC03M-25 or BC22A-25
DRV11-D DRV11-JA	M7941 M8049	7012405-02	BC08R-25
LPV11-AC LPV11-BC LPV11-EE LPV11-EF	M8027	BC06K-4B and 1214614-01	7011212-25

H780 POWER SUPPLY

H780 Power Supplies

Models, specifications, and basic adjustments are presented in this section. For more detailed technical information, refer to *H780-C,-D,-H,-J,-K,-L Power Supply User's Manual*, EK-H780C-OP-001, or to *Microcomputer Handbook*, EB0794853.

H780 Specifications

Input Voltage
    100 Vac-127 Vac (H780-A, -C, -E, -H, -K, -M, -P)
    200 Vac-254 Vac (H780-B, -D, -F, -J, -L, -N, -R)

Operation from ac lines below 100 V may cause the power supply to overheat because of decreased air flow from the cooling fans.

Temporary Line Dips Allowed
    100% of voltage, 20 ms max.

AC Inrush Current
    70 A @ 127 V, 60 Hz (8.33 ms)
    25 A @ 254 V, 50 Hz (10 ms)

Fuses
    5.0 A fast blow for 115 Vac options
    2.5 A fast blow for 230 Vac options

Input Power (Fans Included)
    340 W @ full load max.
    290 W @ full load typical

EMI (Emission and Susceptibility)
    Per DEC STD. 102.7 and VDE N-12 limits

Output Power (Combinations not to exceed 110 W)
    +5 V 1.5 A-18 A
    +12 V 0.25 A-3.5 A

+5 V Output	
Total regulation	5 V ±3%
Line regulation	±0.5%
Load regulation	±1.0%
Ripple	150 mV p-p (1% for f <3 kHz)
Dynamic load regulation	±1.2% di/dt = 1.5 A/s △1 = 5 A
Noise	1% peak at f > 100 kHz (noise is superimposed on ripple)
Interaction due to +12 V	±0.05%
+12 V Output	
Total regulation	12 V ±3%
Line regulation	±0.25%
Load regulation	±0.5%
Ripple	350 mV p-p (1% for f < 3 kHz)
Dynamic load regulation	±0.8% di/dt = 0.5 A/ s f < 500 Hz △1 = 3 A
Noise	1% peak f > 100 kHz (noise is superimposed on ripple)
Interaction due to +5 V	±0.2%
Overvoltage Protection	
+5 V	6.3 V nominal min. = 5.65 V max. = 6.8 V
+12 V	15 V nominal min. = 13.6 V max. = 16.5 V
Adjustments	
+5 V output	4.05 V-6.8 V guarantee range 4.55 V-5.65 V
+12 V output	10.6 V-16.5 V guarantee range 11.7 V-13.6 V

Backplane Signals

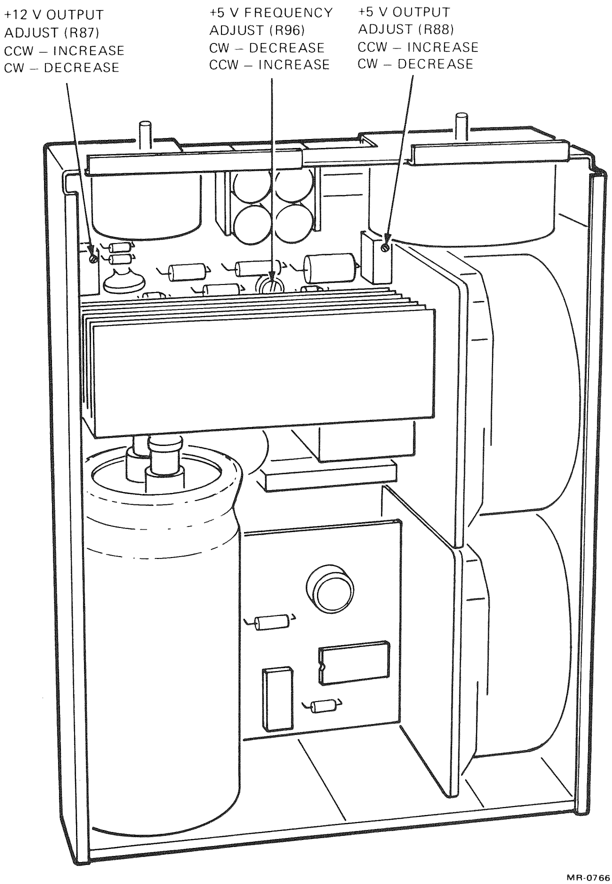
BPOK H
BDCOK H
BEVNT L
BHALT L
SRUN L

Size

13.97 cm w × 8.43 cm h × 37.15 cm l
(5-1/2 in w × 3-1/3 in h × 14-5/8 in l)

Weight

5.90 kg (13 lbs)



H780 Voltage Adjustments

H780 Controls and Indicators

Control/ Indicator	Type	Function
DC ON	LED Indicator	Illuminates when the DC ON/OFF toggle switch is set to ON and proper dc output voltages are being produced by the H780. If either the +5 V or +12 V output from the H780 is faulty, the DC ON indicator will not illuminate. This is the only indicator on the H780-K and -L slave supplies.
RUN	LED Indicator	Illuminates when the LSI-11 or PDP-11/03 processor is in the run state (see ENABLE/HALT).
SPARE	LED Indicator	Not used by the H780 or processor. The H780 contains circuitry for driving this indicator for user applications.
DC ON/OFF	Two-Position Toggle Switch	When set to ON, enables the dc outputs of the H780. The DC ON indicator will illuminate if the H780 dc output voltages are of proper values. If a slave supply is connected to a master, the slave DC ON indicator will light if the slave dc output voltages are of proper value. When set to OFF, the dc outputs from the H780 are disabled and the DC ON indicator is extinguished. If a slave supply is connected to a master, the slave DC ON indicator will also be extinguished.
ENABLE/HALT	Two-Position Toggle Switch	When set to ENABLE, the BHALT L line from the H780 to the LSI-11 bus is not asserted and the processor is in the run mode (RUN indicator illuminated). When set to HALT, the BHALT L line is asserted, allowing the processor to execute console ODT microcode (RUN indicator extinguished).

H780 Controls and Indicators (Cont)

Control/ Indicator	Type	Function
LTC ON/OFF	Two-Position Toggle Switch	When set to ON, enables the generation of the line time clock (LTC) by the H780. When set to OFF, disables the H780 line time clock.
AC ON/OFF (Rear Panel)	Two-Position Toggle Switch	When set to ON, applies ac power to the H780. When set to OFF, removes ac power from the H780.
FUSE (Rear Panel)	5 A or 2.5 A Fast Blow	Protects H780 from excessive current. H780-C, -H, and -K use a 5 A fuse. H780-D, -J, and -L use a 2.5 A.

H786/H7861 POWER SUPPLIES

SPECIFICATIONS

Current Rating

5.5 A @ 120 V rms
2.7 A @ 240 V rms

Inrush Current

100 A peak, for 1/2 cycle at 128 V rms or 256 V rms

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

H786

+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.)

H7861

+5 Vdc, ±150 mV, @ 36 A (A minimum of 2 A of +5 Vdc power must be drawn to ensure that the +12 Vdc supply regulates correctly is drawn.)

Power Up/Down Characteristics

H786

+12 Vdc, ±600 mV, @ 11 A

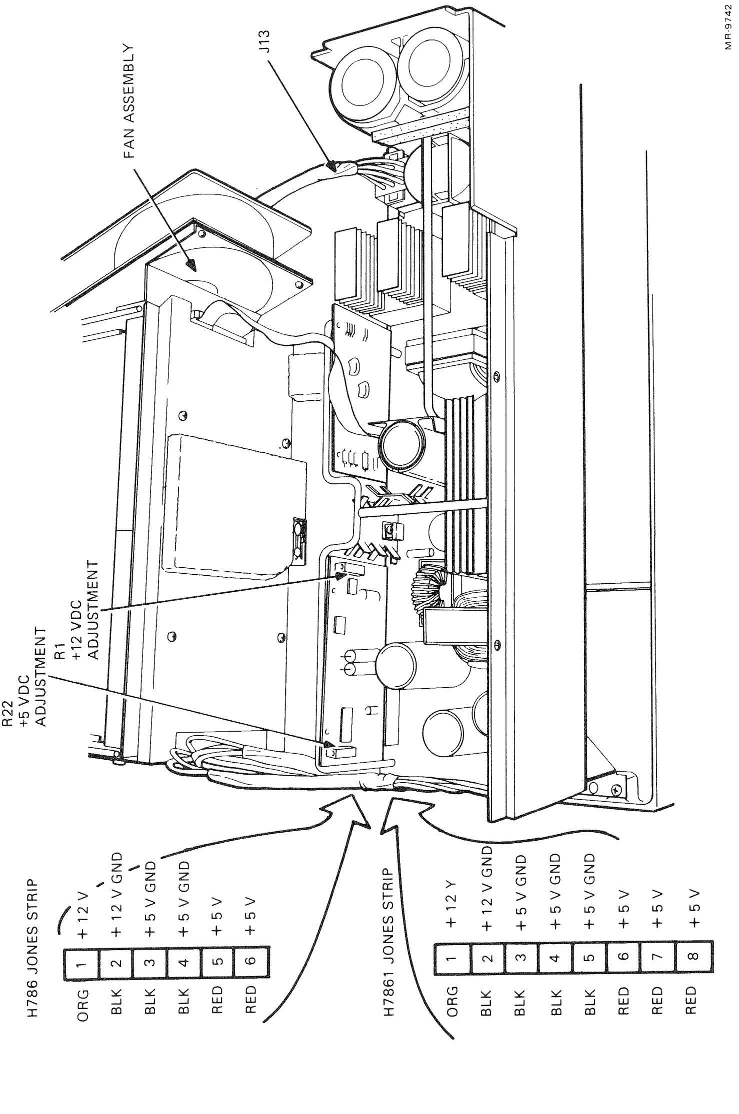
H7861

+12 Vdc, @ ±360 mV, @ 5 A

Static Performance

Power up	BDCOK H goes high: @ 75 Vac
	BPOK H goes high: @ 85 Vac
Power down	BPOK H goes low: @ 80 Vac
	BDCOK H goes low: @ 75 Vac

Dynamic Performance	
Power up	3 ms (min.) from dc power within specification to BDCOK H asserted
	70 ms (min.) from BDCOK H asserted to BPOK H asserted.
Power down	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.



H786/H7861 Power Supplies

H7864 POWER SUPPLY

SPECIFICATIONS

Physical
Weight 77 kilograms (15.4 pounds)

Input Voltage
120 Vac 3 wire single phase (93 to 128 VRMS)
240 Vac 3 wire single phase (176 to 256 VRMS)

Line Frequency
47 to 63 Hz (either input voltage range)

Input Line Current
120 Vac @ 4.6 A
240 Vac @ 2.75 A

Output Voltages
+5 Vdc @ 8 A (min.) 36 A (max.)

Normal output	5.1 V +5%
Minimum load	8.0 A
Maximum load	36.0 A
Ripple and noise	50 mV peak to peak (max.)
Total regulation	+5%
Long term stability	1%/1000 hr.
Overcurrent	36 A (min.) 40 A (max.)
Short circuit current	8 A (max.)
Overvoltage protection	7 V (max.) with crowbar

+12 Vdc @ 0 (min.) 7 A (max.)

Normal output	12.1 V
Minimum load	0 A
Maximum load	6.0 A
Ripple and noise	75 mV peak to peak (max.)
Total regulation	+5%
Long term stability	.1%/1000 hr.
Overcurrent	8 A (min.) – 11 A (max.)
Short circuit current	2 A (max.)
Overvoltage	14 V with crowbar protect
f = 500 Hz	

−12 Vdc 0.5 Vdc (max.)

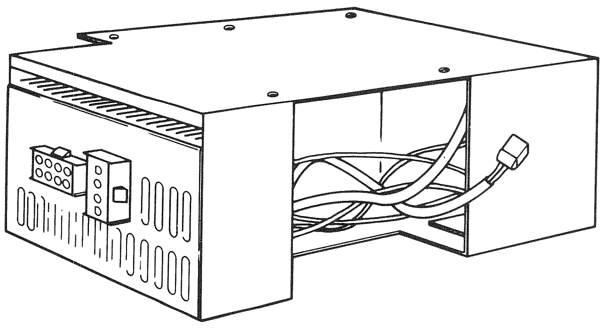
Normal output	−12 V
Minimum load	0 A
Maximum load	0.5 A
Ripple and noise	100 mV peak to peak (max.)
Total regulation	−5%
Long term stability	.1% /1000 hr.
Overcurrent protect	0.5 A (max.)
Short circuit current	.5 A (max.)

NOTE

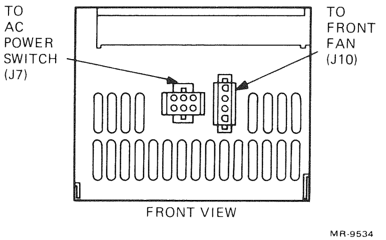
Under any combination of load 230 watts of output power will not be exceeded.

The power supply will support the following backplane signals:

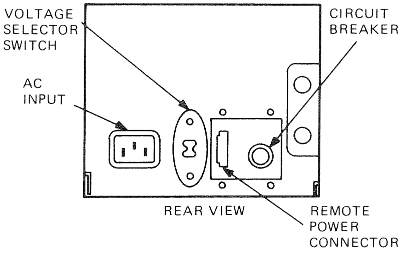
BDCOK H
BPOK H
BEVENT L
DC OK
POWER OK



H7864 Power Supply (Side View)



H7864 Power Supply (Front View)

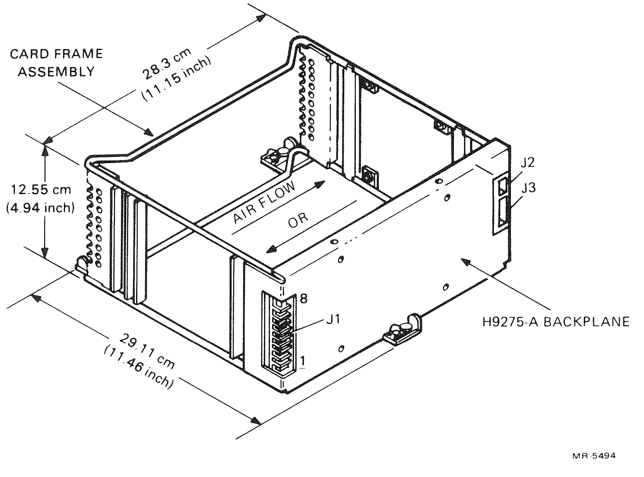


H7864 Power Supply (Rear View)

H9275 BACKPLANE

GENERAL

The H9275 backplane is designed to accept the LSI-11 type modules such as processors, memories, and interface modules. The backplane accepts up to 18 dual-height modules or 9 quad-height modules. The dual-height and quad-height modules can be mixed in a single backplane. The 22-bit address and four level interrupt features of the LSI-11/23 class processors are supported by the bus. The configuration can be modified to accept the LSI-11/2 and LSI-11 processors. The bus signals are terminated in the backplane and this eliminates the need for terminator modules.



H9275 Backplane Assembly

SPECIFICATIONS
Mechanical

Height	12.55 cm (4.94 in)
Width	28.30 cm (11.15 in)
Length	29.11 cm (11.46 in)
Weight	2.36 kg (5.25 lb)

Electrical

AC bus loads	10
DC bus loads	0

+5 Vdc termination current

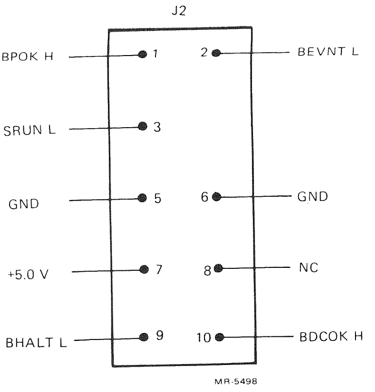
Normal (no load)	360 mA
Maximum (operating)	1000 mA

System Power Connector J1

Terminal	Signal	Row Distribution for Each Slot
1	+5.0 Vdc	AA2, BA2, BV1
2	+5.0 Vdc	CA2, DA2, DV1
3	+5.0 Vdc	
4	Ground	AC2, AJ1, AM1, AT1
5	Ground	BC2, BJ1, BM1, BT1
6	Ground	CC2. CJ1, CM1, CT1
7	Ground	DC2, DJ1, DM1, DT1
8	+ 12.0 Vdc	AD2, BD2, CD2, DD2

Supplemental Power Connector J3

Terminal	Signal	Slot Distribution
1	− 12.0 Vdc	AB2, BB2, CB2, DB2
2	Ground	Same as ground for J1
3	Ground	
4	+5.0 Vdc battery backup	AV1, CV1
5	+5.0 Vdc battery backup	
6	+ 12.0 Vdc battery backup	AS1, CS1



Control Bus Signals J2 Connector

CONFIGURATION

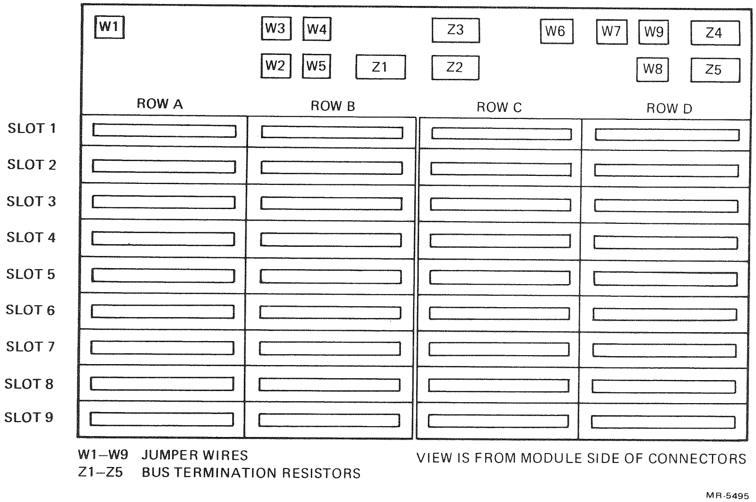
The H9275-A backplane assembly consists of nine slots and four rows that provide bus interface positions for up to 18 dual-height LSI-11 type modules. The assembly has nine jumper wires designated W1 through W9, and these are used to modify the bus configuration.

BEVNT L W1

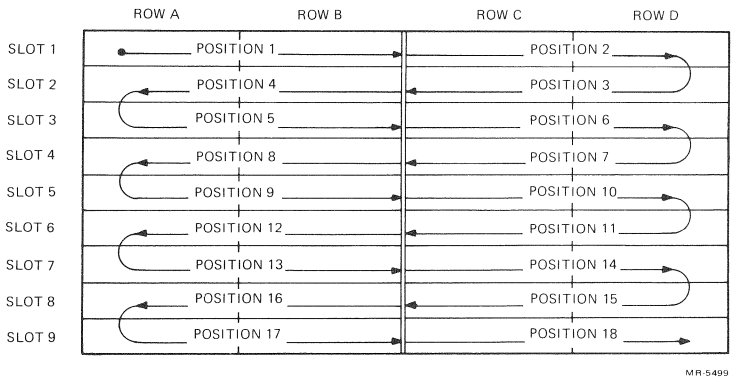
The BEVNT L input may be provided by the user through the J2 connector. This signal is the external event interrupt request and is triggered by an external device such as a line time clock. To disable the signal from the J2 connector, remove the W1 jumper wire.

LSI-11/2 W2–W5

The LSI-11/2 (KD11-HA) processor can be used in the backplane. The W2, W3, W4, and W5 jumper wires are removed when using this type of processor. The W2 through W5 jumper wires connect the BDAL18 through BDAL21 address lines to position one, which is the processor position. The LSI-11/2 processor connects signals to these lines and will interfere with the operation of the bus if the jumper wires are not removed. The LSI-11/2 processor module identification number is M7270.



H9275-A Backplane Connectors



Horizontal Position Priority Structure

LSI-11 W6–W9

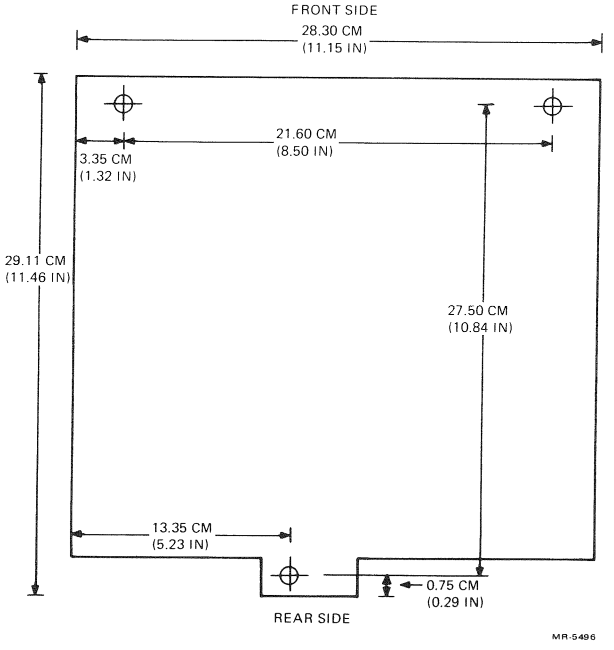
The LSI-11 (KD11-F) processor can be used in the backplane. The W6, W7, W8, and W9 jumper wires are removed when using this type of processor. This is a quad-height module and requires positions one and two on the backplane. The W6 through W9 jumper wires connect the BDAL18 through BDAL21 address lines to position two, which is used by the processor. The LSI-11 processor connects signals to these lines and will interfere with the operation of the bus if the jumpers are not removed. The W2 through W5 jumpers can be either installed or removed and do not interfere with the operation of the LSI-11 processor. The LSI-11 processor module identification number is M7264.

INSTALLATION

The H9275-A backplane assembly is intended to be a component of the user's system. The user is required to provide an adequate mounting surface, cooling air, electrical power, and any externally generated bus signals required to operate the system.

Backplane Mounting

The backplane uses three medium snap slide fasteners to secure it to the mounting surface. The user provides three mounting studs for the snap slide fasteners. These are available from the Dimco Gray Company as part number 25-1-075-093. These studs are positioned in a plane defined by the length and width of the backplane. The mounting stud locations within this plane are shown in the following figure.



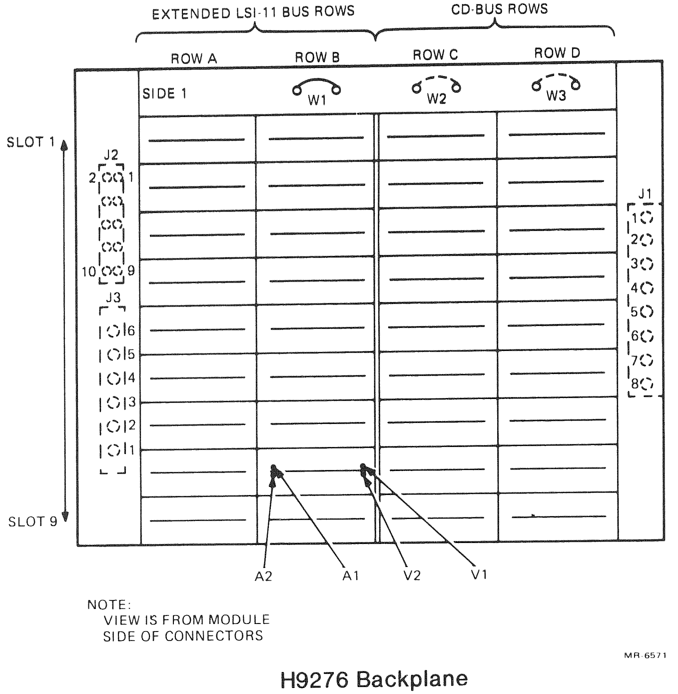
Mounting Stud Locations

H9276 BACKPLANE

GENERAL

The H9276 is a 9 $\times$ 4 backplane. Both dual-height and quad-height modules can be inserted. Rows A and B of each slot supply the extended LSI-11 bus signals; these signals are bused to each of the nine slots.

The pins of the C and D rows are not bused; the pins of adjacent slots are connected. This precludes the necessity of top connectors and provides the means for designing buses whose lengths are determined by the number of modules in a set. The C and D rows of the backplane are referred to collectively as the CD bus.



H9276 Backplane

SPECIFICATIONS
Mechanical

Height	12.55 cm (4.94 in)
Width	28.30 cm (11.15 in)
Length	29.11 cm (11.46 in)
Weight	2.36 kg (5.25 lb)

Electrical

AC bus loads	10
DC bus loads	0

+5 Vdc termination current

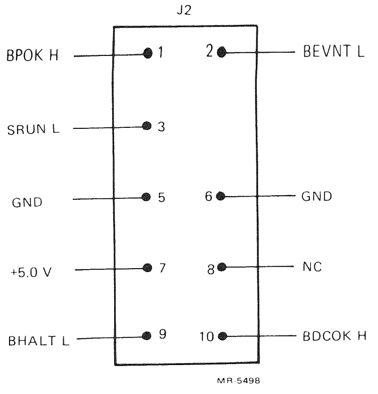
Normal (no load)	360 mA
Maximum (operating)	1000 mA

System Power Connector J1

Terminal	Signal	Row Distribution for Each Slot
1	+5.0 Vdc	AA2, BA2, BV1
2	+5.0 Vdc	CA2, DA2, DV1
4	Ground	AC2, AJ1, AM1, AT1
5	Ground	BC2, BJ1, BM1, BT1
6	Ground	CC2, CJ1, CM1, CT1
7	Ground	DC2, DJ1, DM1, DT1
8	+12.0 Vdc	AD2, BD2, CD2, DD2

Supplemental Power Connector J3

Terminal	Signal	Slot Distribution
1	−12.0 Vdc	AB2, BB2, CB2, DB2
2	Ground	Same as ground for J2
3	Ground	
4	+5.0 Vdc battery backup	AV1, CV1
5	+5.0 Vdc battery backup	
6	+12.0 Vdc battery backup	AS1, CS1



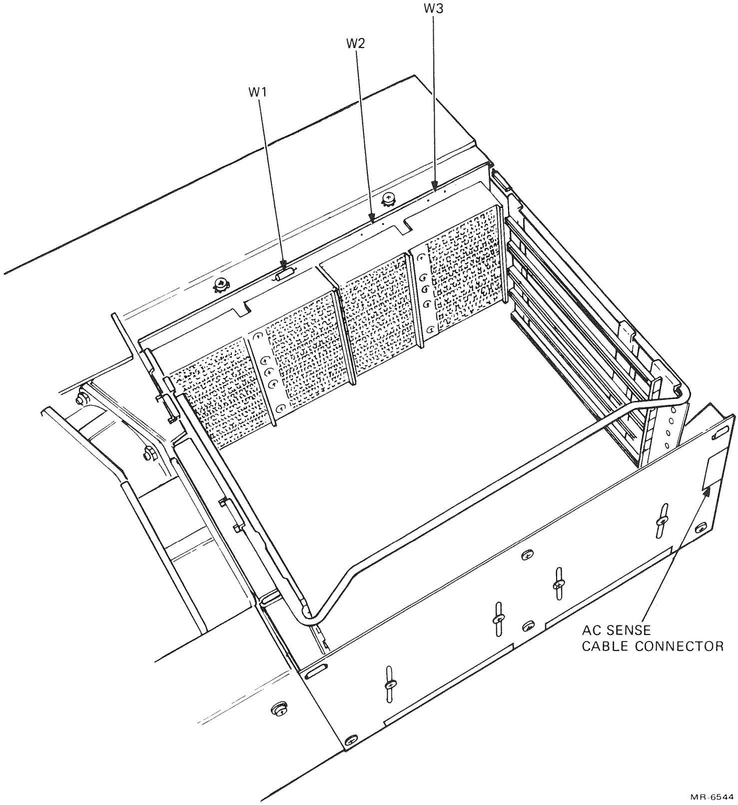
Control Bus Signals J2 Connector

CONFIGURATION

The H9276 backplane has three jumpers designated as W1, W2, and W3 as shown in the following figure. The configuration of these jumpers is listed in the table that follows.

Backplane Jumpers

Jumper	Jumper(s) In	Jumper(s) Out
W1	When a power supply generated LTC signal is used to assert the extended LSI-11 bus BEVNT L signal.	To disable the line time clock (LTC) as BEVNT from the power supply.
W2, W3	Only when using a KD-11 quad LSI-11 CPU module (M7264) in slot 1.	For all other LSI-11 type processors in slot 1.



H9276 Backplane Jumpers

H9278-A BACKPLANE

GENERAL
The H9278-A is a Q22-Q22/CD interconnect-type backplane assembly which accepts both dual- and quad-height modules. It consists of eight slots by four rows each; with the first three slots being Q22 Bus on the A and B rows and the CD interconnect on the C and D rows. The remaining five slots contain the Q22 Bus on rows A and B and on rows C and D.

This configuration allows the use of dual and quad Q22 Bus modules.

The backplane may also be used as an expansion backplane. In that case, the expansion cable would exit the slot immediately following the last option module in the kernel backplane, and enter the first slot of the expansion backplane.

Voltages	**Bus Load Capacity**	
	AC	DC
+5 Vdc @ 36 A (max.)	32 (max.)	0
+12 Vdc @ 6 A (max.)	0	

Grant Continuity
The BIAKO L/BIAKI L and BDMGOL/BDMGI L signals are daisy-chained in bus priority positions. Each slot requires the insertion of a module which passes on these grant signals, as no jumpers are provided on the backplane for this purpose.

Backplane Termination
All the Q22 bus lines are terminated by inserting four resistor packs (1318110-00) into positions XZ1, XZ2, XZ3, and XZ4 on the backplane. Each line is then terminated with a 330 ohm resistor to +5 V and a 680 ohm resistor to GND (characteristic impedance - 220 ohms). The first backplane in a two backplane system should have these resistor packs removed.

Power Connectors
There are three power connectors and one signal connector on the backplane. Two are four-pin Mate-N-Loks (J3 and J4) and are used to supply power to the backplane and not to draw power from it. The third connector is an 18-pin straight single in-line connector (J1) used to supply power and signals to the backplane.

Power Connector Designations

Voltage	Input	Destinations
+5 V @ 36 A	J1-11	A01A2 → A08A2
(maximum)	thru	B01A2 → B08A2
	J1-6	B01V1 → B08V1
		C01A2 → C08A2
	J3-4	D01A2 → D08A2
		D04V1 → D08V1
	J4-4	J2-7
		J2-8
+12 V @ 6 A	J1-17	A01D2 → A08D2
(maximum)		B01D2 → B08D2
	J3-1	C04D2 → C08D2
		D04D2 → D08D2
	J4-11	J2-1
Ground	J1-7	A01J1 → A08J1, A01M1 → A08M1
	thru	A01T1 → A08T1, A01C2 → AP8C2
	J1-13	B01J1 → B08J1, B01M1 → B08M1
		B01T1 → B08T1, B01C2 → B08C2
	J3-2	C04J1 → C08J1, C04M1 → C08M1
	J3-3	C01T1 → C08T1, C01C2 → C08C2
		D04J1 → D08J1, D04M1 → D08M1
	J4-2	D01T1 → D08T1, D01C2 → D08C2
	J4-3	J2-5
		J2-6
BDCOK H	J1-14	B01A1 → B08A1
		D04A1 → D08A1
		J2-10
BPOK H	J1-15	B01B1 → B08B1
		D04B1 → D08B1
BEVNT L	J1-16	B01R1 → B08R1
		D04R1 → C08R1
		J2-2

Front Panel Connector
There is a 10-pin connector (J2) used to send signals to the front panel if one is required.

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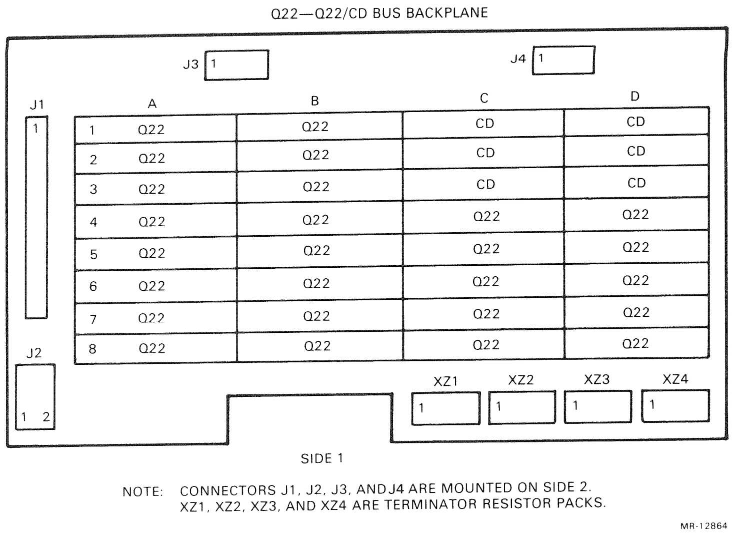

Backplane Component Layout

Front Panel Connectors

Connector	Signal	Backplane Source
J2-1	+12 V	A01D2
J2-2	BEVENT L	B01R1
J2-3	S RUN L	A01F1, C01C1
J2-4	KEY	No connection
J2-5	GND	A01C2
J2-6	GND	A01C2
J2-7	+5 V	A01A2
J2-8	+5 V	A01A2
J2-9	BHALT L	A01P1
J2-10	B DCOK L	B01A1

CONNECTOR ROWS

SLOT	A	B	C	D
1	Q22	Q22 (P1)	C-INTCON	D-INTCON
2	Q22	Q22 (P2)	C-INTCON	D-INTCON
3	Q22	Q22 (P3)	C-INTCON	D-INTCON
4	Q22	Q22 (P4)	Q22	Q22 (P5)
5	Q22	Q22 (P7)	Q22	Q22 (P6)
6	Q22	Q22 (P8)	Q22	Q22 (P9)
7	Q22	Q22 (P11)	Q22	Q22 (P10)
8	Q22	Q22 (P12)	Q22	Q22 (P13)

NOTES: P(X) — INDICATES PRIORITY POSITION: P1 BEING HIGHEST, THROUGH P13 BEING THE LOWEST.

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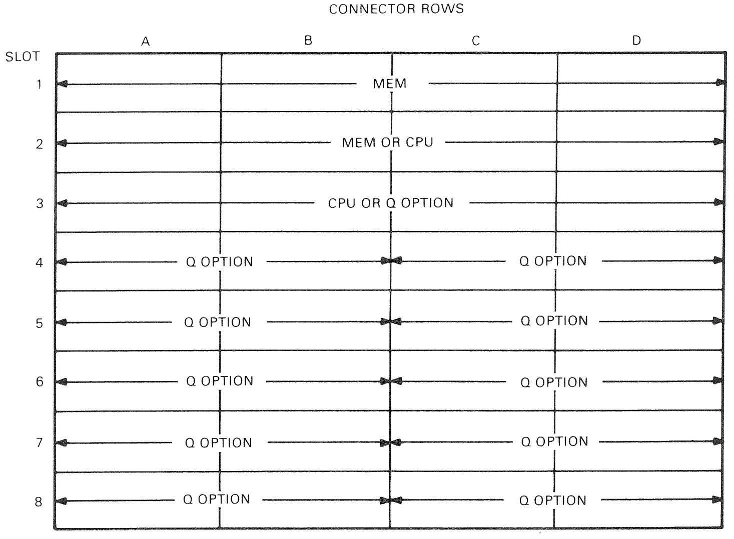
Backplane Sectional Busing Example

Q22/LSI-11 Bus Designations

Connector Row A Pin	Signal		Connector Row B Pin	Signal	
A1	BIRQ 5 L		A1	BDCOK H	
A2	+5 V		A2	+5 V	
B1	BIRQ 6 L		B1	BPOK H	
B2	Not used	*5	B2	Not used	*5
C1	BDAL 16 L		C1	BDAL 18 L	
C2	GND		C2	GND	
D1	BDAL 17 L		D1	BDAL 19 L	
D2	+12 V		D2	+12 V	
E1	S SPARE 1	*1	E1	BDAL 20 L	
E2	BDOUT L		E2	BDAL 02 L	
F1	SRUN L/S SPARE 2	*2	F1	BDAL 21 L	
F2	BRPLY L		F2	BDAL 03 L	
H1	S SPARE 3	*2	H1	S SPARE 8	
H2	BDIN L		H2	BDAL 04 L	
J1	GND		J1	GND	
J2	BSYNC L		J2	BDAL 05 L	
K1	M SPARE A	*3	K1	MSPARE B	*4
K2	BWTBT L		K2	BDAL 06 L	
L1	M SPARE A	*3	L1	M SPARE B	*4
L2	BIRQ 4 L		L2	BDAL 07 L	
M1	GND		M1	GND	
M2	BIAKI L		M2	BDAL 08 L	
N1	BDMR L		N1	BSACK L	
N2	BIAKO L		N2	BDAL 09 L	
P1	BHALT L		P1	BIRQ 7 L	
P2	BBS7 L		P2	BDAL 10 L	
R1	BREF L		R1	BEVNT L	
R2	BDMGI L		R2	BDAL 11 L	
S1	Not used	*5	S1	Not used	*5
S2	BDMGO L		S2	BDAL 12 L	
T1	GND		T1	GND	
T2	BINIT L		T2	BDAL 23 L	
U1	P SPARE 1	*1	U1	P SPARE 2	*1
U2	BDAL 00 L		U2	BDAL 14 L	
V1	Not used	*5	V1	+5 V	
V2	BDAL 01 L		V2	BDAL 15 L	

NOTES

1. All S SPARE and P SPARE pins are stand-alone.
2. SRUN R L is connected to slot 1 only; all other slots are S SPARE stand-alone.
3. M SPARE A pins are wired together on each individual slot.
4. M SPARE B pins are wired together on each individual slot.
5. These pins are not used or bused.



NOTES: (1) THIS CONFIGURATION DEPICTS A KDJ11-B CPU SYSTEM IN WHICH THE MSV11-J MEMORIES MUST PRECEDE THE CPU.
(2) FOR SYSTEMS WITH A KDF11-A, KDF11-B, OR KDJ11-A CPU, THE CPU MUST RESIDE IN SLOT 1 WITH THE MEMORIES FOLLOWING IT.
(3) ILLUSTRATION DEPICTS 1 OR 2 MEMORIES INSTALLED.
(4) ILLUSTRATION IS FOR SINGLE BACKPLANE SYS. ONLY.

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Single Backplane Configuration Using a KDJ11-B CPU System

C-Interconnect Designations

Q22-Q22/CD Bus Backplane

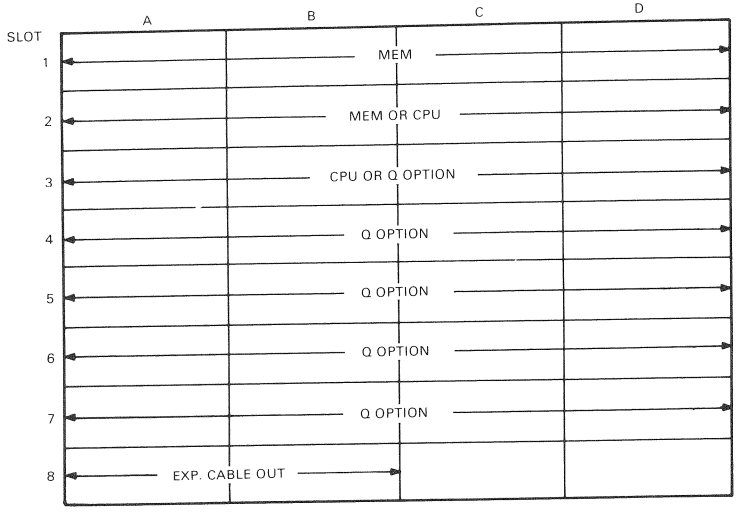
Connector Row C, Slot (X)		Connector Row C, Slot (X+1)	
Pin	Signal	Pin	Signal
A1	INTCON 1	A1	
A2	+5 V	A2	+5 V
B1		B1	INTCON 2 (PMI S1)
B2	INTCON 2	B2	
C1	SRUN L *	C1	INTCON 1 *
C2	GND	C2	GND
D1		D1	INTCON 3 (PMI S2)
D2	INTCON 3	D2	
E1		E1	INTCON 4 (PMI CK1)
E2	INTCON 4	E2	
F1		F1	INTCON 5 (PMI S3)
F2	INTCON 5	F2	
H1		H1	INTCON 6 (PMI S4)
H2	INTCON 6	H2	
J1		J1	INTCON 7 (PMI CK2)
J2	INTCON 7	J2	
K1		K1	INTCON 8 (PMI S5)
K2	INTCON 8	K2	
L1		L1	INTCON 9
L2	INTCON 9	L2	
M1		M1	INTCON 10 (PMI CK3)
M2	INTCON 10	M2	
N1		N1	INTCON 11 (PMI S6)
N2	INTCON 11	N2	
P1		P1	INTCON 12 (PMI S7)
P2	INTCON 12	P2	
R1		R1	INTCON 13 (PMI CK4)
R2	INTCON 13	R2	
S1		S1	INTCON 14 (PMI S8)
S2	INTCON 14	S2	
T1	GND	T1	GND
T2	INTCON 33	T2	
U1		U1	INTCON 15
U2	INTCON 15	U2	
V1		V1	INTCON 16 (PMI CK5)
V2	INTCON 16	V2	

*SRUN L is only present on Slot 1.

D-Interconnect Designations

Q22-Q22/CD Bus Backplane

Connector Row D, Slot (X)		Connector Row D, Slot (X+1)	
Pin	**Signal**	**Pin**	**Signal**
A1	INTCON 17	A1	
A2	+5 V	A2	+5 V
B1		B1	INTCON 18 (PMI CK6)
B2	INTCON 18	B2	
C1		C1	INTCON 17 (PMI S9)
C2	GND	C2	GND
D1		D1	INTCON 19 (PMI S10)
D2	INTCON 19	D2	
E1		E1	INTCON 20 (PMI CK7)
E2	INTCON 20	E2	
F1		F1	INTCON 21 (PMI S11)
F2	INTCON 21	F2	
H1		H1	INTCON 22 (PMI S12)
H2	INTCON 22	H2	
J1		J1	INTCON 23 (PMI CK8)
J2	INTCON 23	J2	
K1		K1	INTCON 24 (PMI S13)
K2	INTCON 24	K2	
L1		L1	INTCON 25
L2	INTCON 25	L2	
M1		M1	INTCON 26 (PMI CK9)
M2	INTCON 26	M2	
N1		N1	INTCON 27
N2	INTCON 27	N2	
P1		P1	INTCON 28 (PMI S14)
P2	INTCON 28	P2	
R1		R1	INTCON 29 (PMI S15)
R2	INTCON 29	R2	
S1		S1	INTCON 30
S2	INTCON 30	S2	
T1	GND	T1	GND
T2		T2	INTCON 33
U1		U1	INTCON 31
U2	INTCON 31	U2	
V1		V1	INTCON 32
V2	INTCON 32	V2	



NOTES:
(1) CONFIGURATION IS FOR KDJ11-B CPU.
(2) MSV11-J MEMORY MUST PRECEDE CPU.
(3) ILLUSTRATION DEPICTS 1 OR 2 MEMORIES INSTALLED.
(4) ILLUSTRATION SHOWS POSSIBLE CONFIGURATION FOR AN EXPANDED KERNEL BACKPLANE: EXP CABLE OUT WOULD ENTER SLOT 1 OF THE EXPANDER BACKPLANE.

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KDJ11-B CPU System Expanded Backplane Configuration

MMV11-A CORE RAM MEMORY

Amps / **Bus Loads** / **Cables**

	+5	+12	AC	DC	Cables
Stby.	3.0	0.2	1.91	1	None
Act.	7.0	0.6			

Standard Address

Not applicable

Vectors

None

Diagnostic Programs

Refer to Appendix A.

Related Documentation

Microcomputer Processor Handbook (EB-18451-20)
11V03 Field Maintenance Print Set (MP00094)

NOTE

Because of addressing limitations, this module is not compatible with PDP-11/23 systems with more than 64K bytes of memory.

Backplane Jumpers

When installing the MMV11-A in any slot but the last slot in a backplane, two jumpers must be inserted on the backplane to maintain the interrupt and DMA daisy-chain grants. If the MMV11-A is placed in an even-numbered slot, the jumpers must connect as follows.

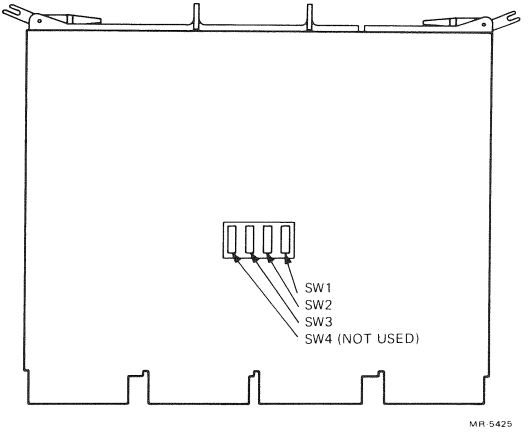
in the option slot preceding MMV11-A	to the option slot following MMV11-A
CN2	CM2
CS2	CR2

If the MMV11-A is placed in an odd-numbered slot, the jumpers must connect as follows.

in the option slot preceding MMV11-A	in the option slot following MMV11-A
AN2	AM2
AS2	AR2

NOTE

The MMV11-A cannot be used in the BA11-N mounting box, in the H9273 backplane, or in any other backplane that does not have the LSI-11 bus pinning in the "C" and "D" slots.



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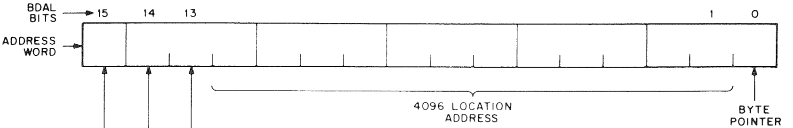

SW3	SW2	SW1	BANK	ADDRESSES
ON	ON	ON	0	0 - 17776
ON	ON	OFF	1	20000 - 37776
ON	OFF	ON	2	40000 - 57776
ON	OFF	OFF	3	60000 - 77776
OFF	ON	ON	4	100000 - 117776
OFF	ON	OFF	5	120000 - 137776
OFF	OFF	ON	6	140000 - 157776
OFF	OFF	OFF	7	160000 - 177776

NOTE
Bank 7 is normally reserved for peripherals.

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MMV11-A Addressing