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PEP-70 / HC70
INSTALLATION GUIDE

PEP-70 INSTALLATION GUIDE REV A8 8/15/88

TABLE OF CONTENTS

I. PRE-INSTALLATION CONSIDERATIONS

- SCHEDULE SYSTEM DOWN TIME

Allow approximately four hours to complete installation. This includes time for a pre-disassembly diagnostic run, installation of the PEP-70, and a post-reassembly diagnostic checkout.

- PEP-70 UPGRADE KIT CONTENTS

All required material for the PEP-70 installation is included in the PEP-70 upgrade kit. However, the tools, Digital Voltmeter (DVM), and diagnostics must be supplied by the installer or customer.

- TECHNICAL EXPERTISE REQUIRED

A technically qualified individual with PDP-11/70 experience should perform the installation task as it requires module removal and replacements, and backplane jumper wire installation.

- DIAGNOSTICS

Diagnostics should be run prior to the installation to verify system functionality prior to CPU module removal. This should consist of a run of the EMKA memory diagnostic, and the EQKCE? CPU exerciser. Diagnostics are the responsibility of the customer to provide.

- INSTALLATION INSTRUCTIONS

An experienced technical individual should have no problem following the installation instructions provided they read through them fully at least once before attempting any actual installation work. However, if questions remain, contact Digital Data Systems at (305) 792-3290 for a prompt answer to your question.

FOREWORD

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* CAUTION CAUTION CAUTION *
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* READ INSTRUCTION PACKAGE COMPLETELY *
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* BEFORE DOING *
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* ANYTHING *
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II. DISASSEMBLY

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************************* CAUTION ******************************
*                                                              *
*   THE FOLLOWING PROCEDURES REQUIRE REMOVAL AND REPLACEMENT   *
*   OF SEVERAL CPU MODULES AND PROPER STATIC CONTROL           *
*   PROCEDURES MUST BE OBSERVED TO MINIMIZE THE POTENTIAL OF   *
*   DAMAGE DUE TO ELECTROSTATIC DISCHARGE DURING ANY HANDLING  *
*   OF THE CPU MODULES OR PEP-70 MEMORY BOARD.                 *
*                                                              *
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Refer to Figure 1 for module location guide.

( ) 1. Perform the standard shutdown procedure for the operating system software.

( ) 2. Turn OFF system power. Remember to power down the MK11 memory box with the AC power switch located on the MK11 configuration panel. POWER TO BOTH THE 11/70 CPU AND MEMORY CABINET MUST BE OFF BEFORE THE FOLLOWING PROCEDURES ARE TO BE ATTEMPTED.

( ) 3. Open the back door of the CPU cabinet and verify that no cabling running into the CPU box is caught or otherwise restrained which will prevent the CPU box from being slid forward on it's rails for access to the card cage.

( ) 4. If the 11/70 is mounted in a corporate cabinet approximately 5 feet high, the stabilizer legs on the bottom of the cabinet must be pulled out to unlock the CPU slide mechanism. This may also be necessary on a tall cabinet, approximately 6 feet high, but is usually not.

( ) 5. From the rear of the CPU box, through the now open back door, gently push the CPU box forward until it can be clearly verified that no cable damage will result in extending the box to it's forward limit on the chassis slides.

( ) 6. A. Remove the card cage access cover on the left side of the CPU box by turning each of the Zeus 1/4 turn fasteners counterclockwise. Hold the cover while doing this to prevent it's rapid fall onto your foot and the resultant scream of anguished pain. Some 11/70 boxes have only two fasteners in the front, and once loosened the cover will swing open on a hinge for access to the card cage.

B. Page 6 ....

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************************  CAUTION  ******************************
*                                                                 *
*   THE  FOLLOWING PROCEDURES REQUIRE REMOVAL AND REPLACEMENT     *
*   OF   SEVERAL  CPU  MODULES  AND  PROPER  STATIC  CONTROL      *
*   PROCEDURES  MUST BE OBSERVED TO MINIMIZE THE POTENTIAL OF     *
*   DAMAGE DUE TO ELECTROSTATIC DISCHARGE DURING ANY HANDLING     *
*   OF THE CPU MODULES OR PEP-70 MEMORY BOARD.                    *
*                                                                 *
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( ) B. Remove the top access cover by squeezing the release catches and hinging open. Some boxes have Zeus fasteners instead of the plastic latches and should be opened accordingly. Once the top cover is open, a zig-zag wiggle will allow it to be removed.

( ) 7. Remove the following modules by grasping the insertion/ejection handles on both top and bottom, pulling the handle out until the board has been released from it's backplane connection, then gently withdrawing from the card cage. Once a module has been removed, place it on a non-static surface where it will not be damaged. Do not stack one board on top of another. Allow enough room to properly store removed modules until reinserted.

M8138 in slot 15 (ONLY if PEP-70 is a different capacity than current MK11. The system size register switches must be reset to reflect the size of available main memory for application software to have access to it. It is not necessary to remove or change anything on either the M8138 or M8140 modules if the MK11 memory being replaced by the PEP-70 is equal capacity. If they are equal capacities, ignore all references to removing or changing either the M8138 or M8140 modules)

M8142 in slot 17
M8144 in slot 20

( ) 8. Remove the two gray ribbon cables connecting to the M8143 module in slot 18. If there are no retainer ears on the M8143 module this can be done by pulling gently on the cable from the top of the CPU, otherwise the retainers will have to be held open on the connectors during removal.

( ) 9. Repeat step 8 for the M8145 module in slot 21.

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************************** CAUTION ****************************
*                                                             *
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*   OF SEVERAL CPU MODULES AND PROPER STATIC CONTROL          *
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*                                                             *
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( ) 10. Remove the M8143 module from slot 18.

( ) 11. Pull the M9312 module in the bottom of slot 1 out far enough to gain access to the cables connected to TP3 and TP4, the two lower connecting posts.

( ) 12. Remove the fast-on connectors from TP3 and TP4, and withdraw the cable which was connected to them up through the top of the box. Continue to remove this cable and the four gray cables removed from the M8143 and M8145 until they are clear of the CPU box.

NOTE: The MK11 has now been disconnected from the CPU and may be removed from the system. The MK11 box(s), and the associated cabinetry and power consumption, are no longer required for system operation.

( ) 13. Remove the cables connecting to the M8140 module in slot 16, noting their positions.

( ) 14. Remove the M8140 module.

PRIOR TO REASSEMBLY

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IT IS HIGHLY RECOMMENDED THAT THE PEP-70, AS WELL AS ALL OF THE MODULES REMOVED, HAVE THE GOLD CONTACT PINS CLEANED WITH A GOLD WIPE PAD OR OTHER SUITABLE CLEANER PRIOR TO BEING INSERTED.

Most 11/70's run so reliably they have not been opened in years. The primary cause of failure after any removal/replacement procedure is accumulated dust and dirt getting lodged between the gold finger and it's mating pin during reinsertion.

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III. REASSEMBLY PROCEDURE A. WHEN INSTALLING ONLY THE PEP-70, NO HYPERCACHE (HC70)

( ) 1. If it is necessary to reset the system size register, proceed as follows. Hold the M8140 module component side up, gold fingers toward you and locate the switchpack containing 8 switches mounted between E7 and E8. It is the right most set of three switchpacks on the module. Note their current positions for future reference. Set these switches to one of the following settings appropriate to the PEP-70 capacity.

SWITCH	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
4 MB	off	off	off	off	(on)	off	off	off
2 MB	off	(on)	off	off	off	off	off	off

***** DO NOT CHANGE ANY OTHER SWITCH SETTINGS ON THIS MODULE *****

In the following steps where cable connection are necessary, be sure the connectors slide smoothly together and seat fully.

( ) 2. Reinstall the M8140 module in slot 16 and insert the two cables previously removed back into their respective connectors.

( ) 3. Hold the cables as flat as possible against the M8140 module from the top of the CPU and install the M8138 module into slot 15. Be very careful not to scrape the cables with the back of the M8138 module during reinsertion.

( ) 4. Insert the PEP-70 memory module in slot 19. NOTE: See Figure 2 for a pictorial diagram of what the following steps are going to accomplish.

( ) 5. Install the battery backup cable to the PEP-70 through the top access cover by connecting the six pin female receptacle to the five pin male mating connector on the PEP-70. NOTE. This connector is keyed by one pin missing on the male side (on the PEP-70) and one hole blocked in the female receptacle. Place the leads marked "1" and "2" in the cable trough and out the back of the CPU box. Place the leads marked "3" and "4" through the cable trough to the front of the CPU box and down to the M9312. Connect the black wire (#3) to TP3, and the red wire (#4) to TP4. Do not attempt to connect the battery leads (#1 & #2) at this time.

( ) 6. Install one of the 10 inch gray cables supplied with the kit in the top connector of the PEP-70. Connect the other end of this cable to the lower connector on the M8145 module. Be sure to position these cables with the red marker stripe on the edge of the cable to the handle side of the modules.

( ) 7. Install another of the 10 inch cables in the second connector down on the PEP-70. Connect the other end of this cable to the upper connector on the M8145 module.

( ) 8. Install the two remaining cables in the two lower connectors of the PEP-70 and let them lay in the top cable trough.

( ) 9. Flatten the cables connected to the PEP-70 as close to the board as possible, and retain them there from the top of the CPU box while performing the next step.

( ) 10. Insert the M8143 module in slot 18, being careful not to damage the cables on the PEP-70. To help ease this installation, the back side of the M8143 module can be covered with tape, such as non-metallized duct tape or mylar packing tape, in the area which would contact the cables during removal or replacement. Be careful not to contaminate or cover the gold finger connections if this is implemented.

( ) 11. Connect the 10 inch cable from the lowest connector of the PEP-70 to the upper connector on the M8143 module.

( ) 12. Connect the 10 inch cable from the third connector down on the PEP-70 to the lower connector on the M8143 module. A small fold of the excess cable installed in step 11 will facilitate this connection.

( ) 13. Install the M8144 module in slot 20. The back of this module can be covered to protect the M8145 cables as in step 10 above.

( ) 14. Install the M8142 module in slot 17. Take precaution to prevent cable damage.

( ) 15. Reinstall the M9312 in bottom of slot 1.

This completes the module installation section. Reinstall the CPU card cage and top access covers.

III. REASSEMBLY PROCEDURE B. WHEN INSTALLING BOTH THE PEP-70 AND HYPERCACHE (HC70)

( ) 1. If it is necessary to reset the system size register, proceed as follows. Hold the M8140 module component side up, gold fingers toward you and locate the switchpack containing 8 switches mounted between E7 and E8. It is the right most set of three switchpacks on the module. Note their current positions for future reference. Set these switches to one of the following settings appropriate to the PEP-70 capacity.

SWITCH	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
4 MB	off	off	off	off	(on)	off	off	off
2 MB	off	(on)	off	off	off	off	off	off

***** DO NOT CHANGE ANY OTHER SWITCH SETTINGS ON THIS MODULE *****

In the following steps where cable connection are necessary, be sure the connectors slide smoothly together and seat fully.

( ) 2. Reinstall the M8140 module in slot 16 and insert the two cables previously removed back into their respective connectors.

( ) 3. Hold the cables as flat as possible against the M8140 module from the top of the CPU and install the M8138 module into slot 15. Be very careful not to scrape the cables with the back of the M8138 module during reinsertion.

( ) 4. Insert the PEP-70 memory module in slot 19. NOTE: See Figure 2 for a pictorial diagram of what the following steps are going to accomplish.

( ) 5. Install the battery backup cable to the PEP-70 through the top access cover by connecting the six pin female receptacle to the five pin male mating connector on the PEP-70. NOTE. This connector is keyed by one pin missing on the male side (on the PEP-70) and one hole blocked in the female receptacle. Place the leads marked "1" and "2" in the cable trough and out the back of the CPU box. Place the leads marked "3" and "4" through the cable trough to the front of the CPU box and down to the M9312. Connect the black wire (#3) to TP3, and the red wire (#4) to TP4. Do not attempt to connect the battery leads (#1 & #2) at this time.

( ) 6. A. REMOVE the M8145 module from slot 21 and install the HC45 module in its place.

B. Install one of the 10 inch gray cables supplied with the kit in the top connector of the PEP-70. Connect the other end of this cable to the lower connector on the HC45 module. Be sure to position these cables with the red marker stripe on the edge of the cable to the handle side of the modules.

( ) 7. Install another of the 10 inch cables in the second connector down on the PEP-70. Connect the other end of this cable to the upper connector on the HC45 module.

( ) 8. Install the two remaining cables in the two lower connectors of the PEP-70 and let them lay in the top cable trough.

( ) 9. Flatten the cables connected to the PEP-70 as close to the board as possible, and retain them there from the top of the CPU box while performing the next step.

( ) 10. Insert the HC43 module in slot 18, being careful not to damage the cables on the PEP-70. To help ease this installation, the back side of the HC43 module can be covered with tape, such as non-metallized duct tape or mylar packing tape, in the area which would contact the cables during removal or replacement. Be careful not to contaminate or cover the gold finger connections if this is implemented.

( ) 11. Connect the 10 inch cable from the lowest connector of the PEP-70 to the upper connector on the HC43 module.

( ) 12. Connect the 10 inch cable from the third connector down on the PEP-70 to the lower connector on the HC43 module. A small fold of the excess cable installed in step 11 will facilitate this connection.

( ) 13. Install the HC44 module in slot 20. The back of this module can be covered to protect the HC45 cables as in step 10 above.

( ) 14. Install the HC42 module in slot 17. Take precaution to prevent cable damage.

( ) 15. Reinstall the M9312 in bottom of slot 1.

This completes the module installation section. Reinstall the CPU card cage and top access covers.

IV. BACKPLANE POWER JUMPERS

Before attempting this section, ascertain that you can properly locate backplane pins without error. Refer to Figure 3 for backplane pin naming conventions and layout if there is any doubt.

( ) 1. Remove the plastic shield covering the backplane pins, if there is one, and reinstall it after the power jumpers are installed.

( ) 2. Locate the four power jumpers, approximately 1" long, supplied with the kit. Installation of the following jumpers is required to provide +5VDC power to slot 19. While ground is prewired to this slot, +5V is not.

( ) 3. Install jumpers in the following locations.

B18A2 to B19A2
C18A2 to C19A2
D18A2 to D19A2
E18A2 to E19A2

Verify that these jumpers are pressed in fully enough that they do not protrude beyond the top of the pins to which they are connected, and that the connecting wire is pressed down into the area between rows. This is to make sure the wires will not have any interference with the power supply units when the box is pushed back into the cabinet.

( ) 4. DO NOT PROCEED WITH THIS STEP UNTIL ALL POWER CONNECTIONS MADE IN STEP THREE ABOVE HAVE BEEN DOUBLE CHECKED FOR ACCURACY. AN ERROR AT THIS STAGE COULD DAMAGE THE CPU OR PEP-70 MODULE.

Operating voltage can now be checked. The PEP-70 draws only 1.5 amps or less from the CPU power supply and should not affect the voltage setting significantly. However it should be checked. To do this:

NOTE: The system will perform a power on boot at this time because the battery is not yet connected, and the battery backup condition sensing circuitry will send a reboot signal to the M9312. Because of this, do not have any disks spun up or online as the system will continue to boot.

A. Apply power to the CPU cabinet.

B. Using a DVM, measure the voltage at pin C19A2. (Refer to Figures 3 & 5)

If voltage is outside of the range of 4.97 to 5.08 at pin C19A2, adjust voltage regulator "J" in the center slot of the lower H7420 power supply assembly until the voltage at C19A2 is 5.00VDC ±.02VDC.

C. If HYPERCACHE was installed, measure the voltage at pin C20A2.

If voltage is outside of the range of 4.97 to 5.08 at pin C20A2, adjust voltage regulator "H" in the lower H7420 power supply assembly until the voltage at C20A2 is 5.00VDC ±.02VDC.

( ) 5. Turn off system power.

( ) 6. Straighten up cabling behind CPU box and push CPU back into cabinet.

( ) 7. Turn system power ON.
This is required to initialize the memory to a known state with the battery disconnected. No initialize is performed when the battery is connected and charged enough to retain memory contents.

( ) 8. From the rear of the CPU cabinet, install the battery on the outside rear panel of the CPU box, near the top and just to the left of the cable trough exit. Remove the protective covering from the Velcro adhesive and simply press the battery into place. See Figure 4. Connect the battery cable, protruding out the back of the cable trough, to the battery. Connect the black wire lead (#2) to the negative terminal of the battery, indicated on the battery by a minus (-) sign and black around the connector. Connect the red wire lead (#1) to the positive battery terminal, indicated on the battery by a plus (+) sign and red coloration around the connector.

This procedure is performed with power on to the CPU. Caution must be exercised to prevent shorting wires together, or to any cabinetry sheet metal. The battery is only 4 VDC, thus no danger of electrical shock is present. However, the battery is capable of high current discharge which can cause the shorting conductor to become very hot very quickly. Thus objects such as rings, watches, or other jewelry should not be worn when working around this type of device.

( ) 9. Installation is now complete, secure all system panels, doors, etc., which were opened during installation.

V. DIAGNOSTICS

All products are fully tested in a systems environment before leaving the factory. All applicable 11/70 diagnostics should run error free. The following DEC diagnostics can be used to verify memory operation.

EMKA [1] for memory test.
EQKC for CPU test.
DECX11 for system test.

→ FOR PEP-70 ALONE

EKBC CACHE PT1
EKBD CACHE PT2
EKBE [2] MEMORY MGMT
EKBF [2] UB MAP

→ FOR PEP-70 AND HC70

NOTE:

(1) The 11/70 has a maximum main memory access capability of 3 3/4 MB, 1920K words of memory. Thus a 4 MB memory card will yield the maximum capability of the 11/70, and operating system software will indicate the 1920K limit. The 1/4 MB address space which is not sent to main memory is reserved for UNIBUS addressing.

(2) EKBFD1.BIC will get 2 errors per pass when run. These errors will occur at TEST # 34, PC=020024, and TEST # 44, PC=023250. Both errors report "parity reporting through the map is not correct". These printouts can safely be ignored as the problem is a conflict between cache data parity error reporting and main memory data error reporting. When the HC70 is installed main memory is utilized as cache. If this is a concern the following patch can be applied to EKBFD1.BIC after it is loaded.

TEST#	LOCATION	OLD	NEW
34	17770	011401	111401
44	23214	011401	111401

This patch simply changes a word instruction into a byte instruction to alleviate the problem. WARNING If old data is not the same as listed under the "OLD" heading do not apply the patch as diagnostic is not at same rev level.

VI. PDP-11/70 HARDWARE REVISION LEVELS

For the HC70 to operate correctly in the PDP-11/70, the PDP-11/70 modules must meet the following minimum revision level requirements. Etch level can be found as the last character of a part number on side two of each module. CS level will be indicated by a stamp or magic marker marking on the handle of the module.

MODULE #	ETCH LEVEL	CS LEVEL
M8130	A	C
M8131	B	B
M8132	B	C
M8123	C	B
M8134	C	D
M8135	A	*
M8136	C	C
M8137	B	A
M8138-YA	B	D
M8139	B	D
M8140	A	B
M8141	A	A

VII. M9312 - M9301 VARIANTS

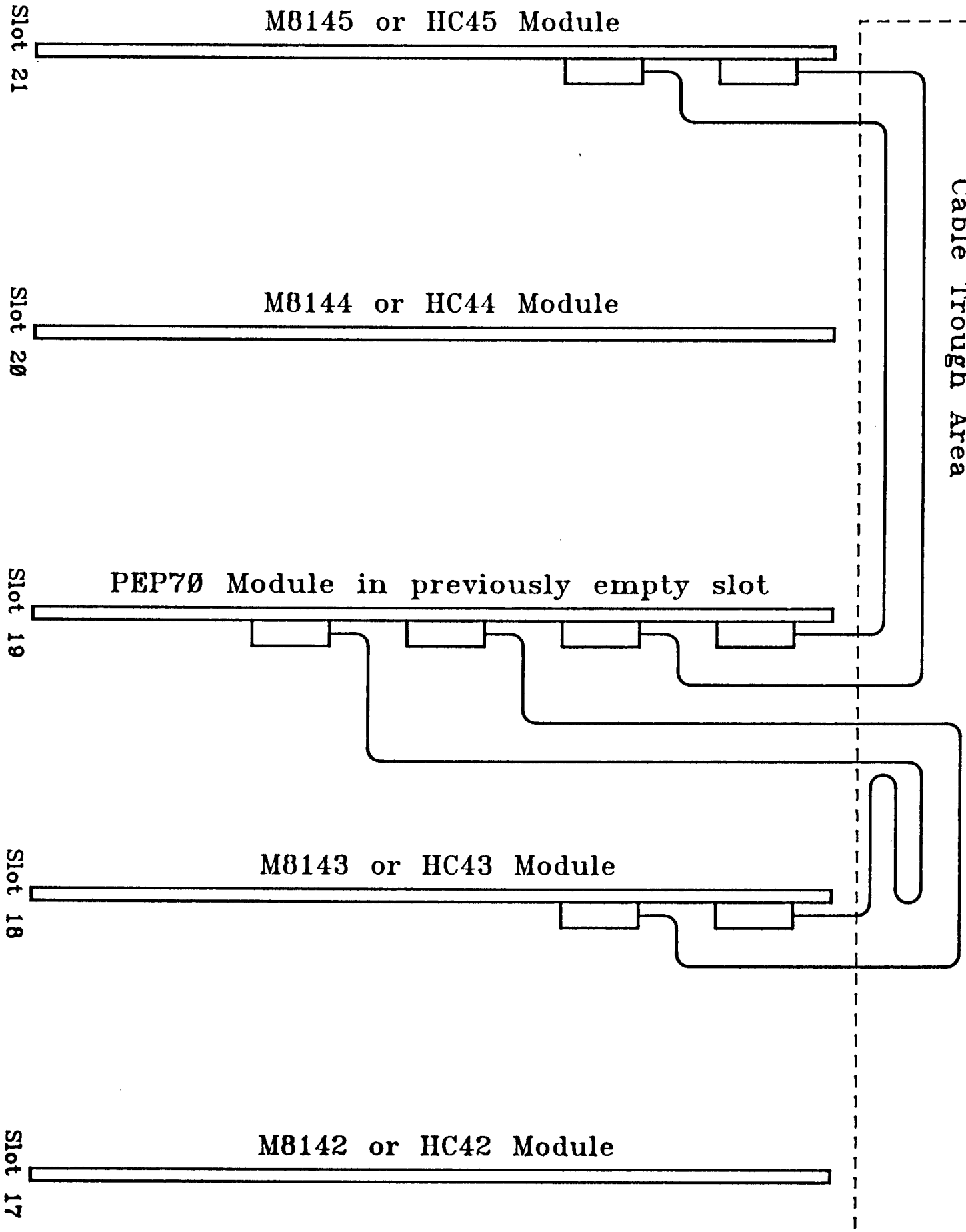
If an M9301 is used instead of an M9312, the boot cable pins 3 and 4 will go to the M9301 as: BLACK (#3) to M9301 TP3, RED (#4) to M9301 TP2. If battery backup or auto boot up are not required, the battery and associated cable can be left out of the installation procedure.

11/70 Module utilization view from card cage front

↑ RH70 Controllers ↑		23
(Split between backplanes)		
M8141		22
M8145		21
M8144		20
Empty or PEP70		19
M8143		18
M8142		17
M8140		16
M8138-YA		15
M8137		14
M8139	Empty	13
M8136		12
M8135		11
M8134		10
M8123		9
M8132		8
M8131		7
M8130		6
Floating Point		5
Floating Point		4
Floating Point		3
Floating Point		2
M9312	Empty	1

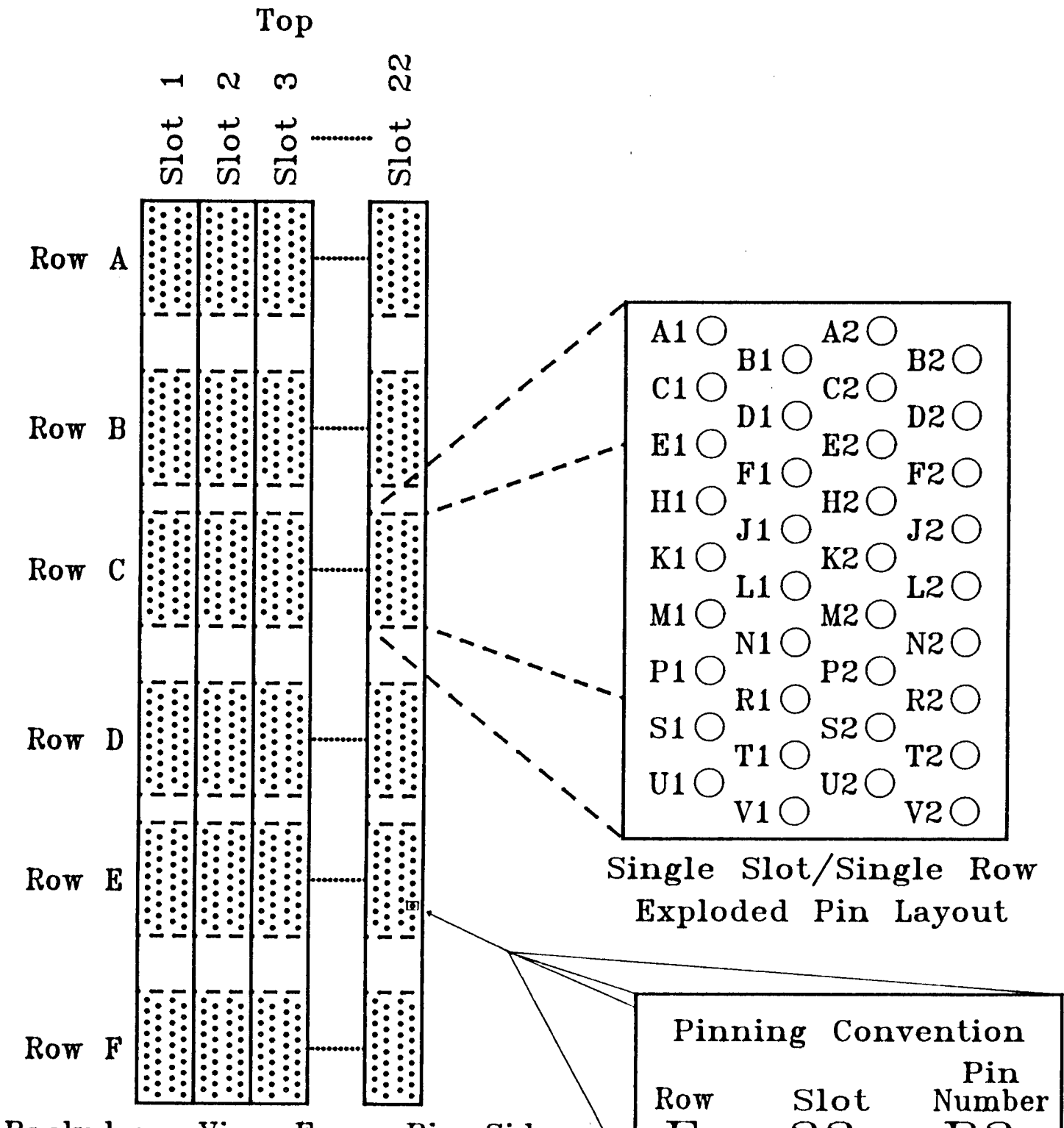
Front of 11/70

Figure 1



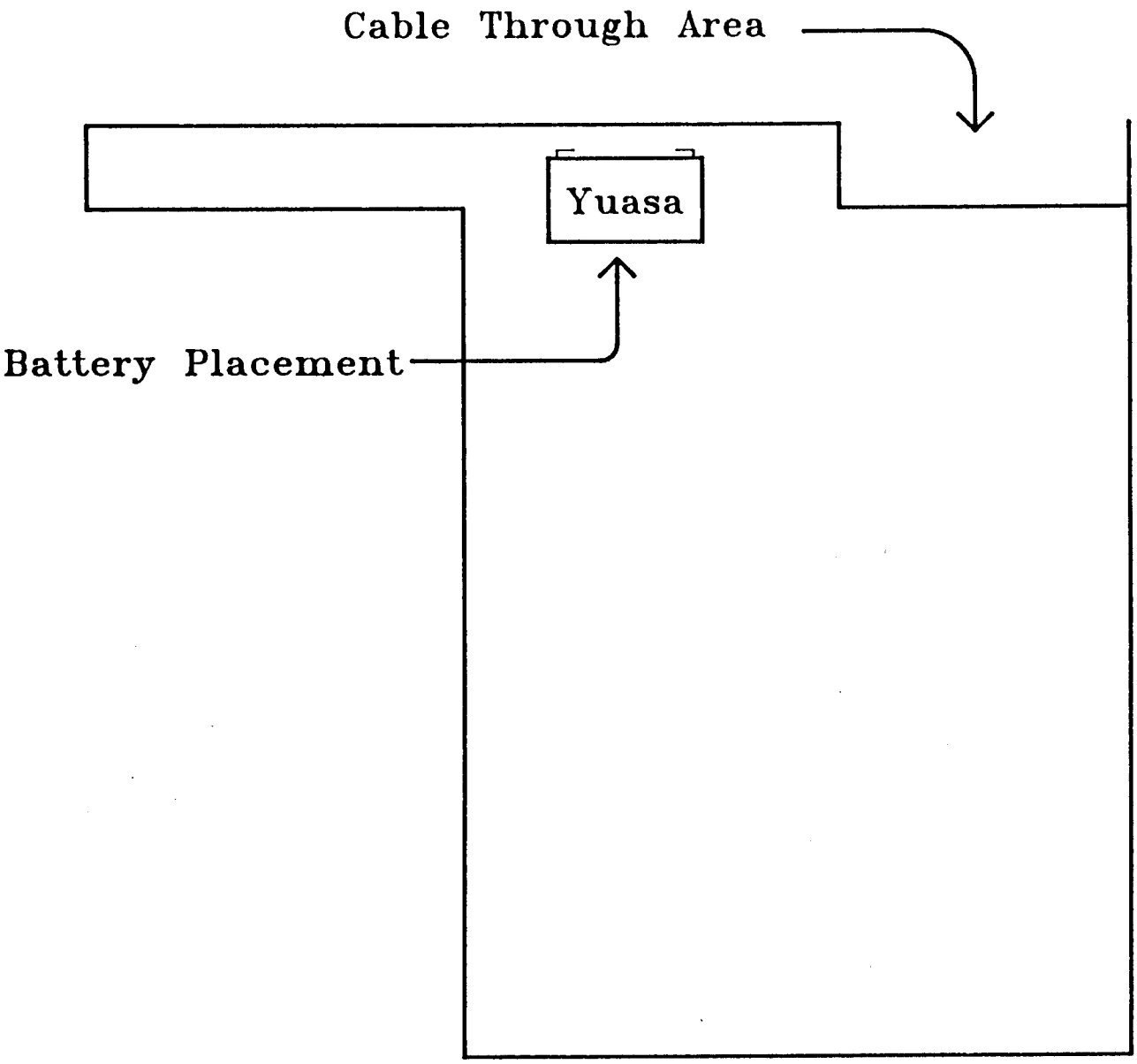
PEP70 Cabling Pictorial

Figure 2



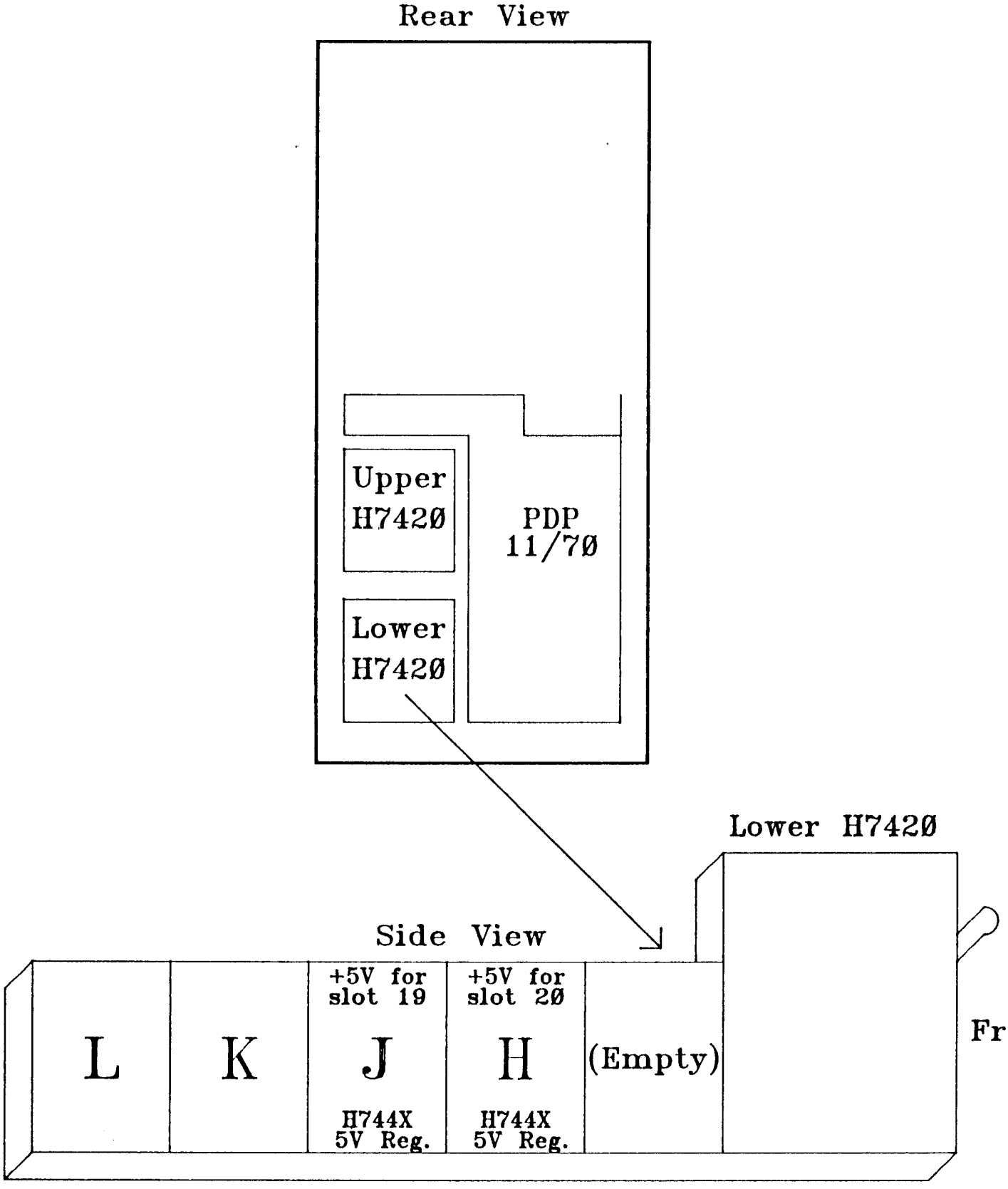
DEC Backplane Pinning Layout

Figure 3



PEP70 Battery Placement

Figure 4



PDP11/7Ø Power Supply Locations

Figure 5