Installation Manual for the

NuPDP 4200

Qbus and Unibus PDP-11 Replacement Systems

Logical®

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The material in this manual is for informational purposes only and is subject to change without notice.

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Chapter 1: Installation

System Overview

The system provides security through a front panel requiring a key to gain access to the internal control panel. The front panel is shown in Figure 1-1.

Figure 1-1: NuPDP System Front View

The internal control panel provides access to power and reset switches, the data and system hard drives, DVD drive, fan filter, and the chassis cover access lock. The control panel is shown in Figure 1-2. Access to the control panel is via the key lock at the center of the front panel.
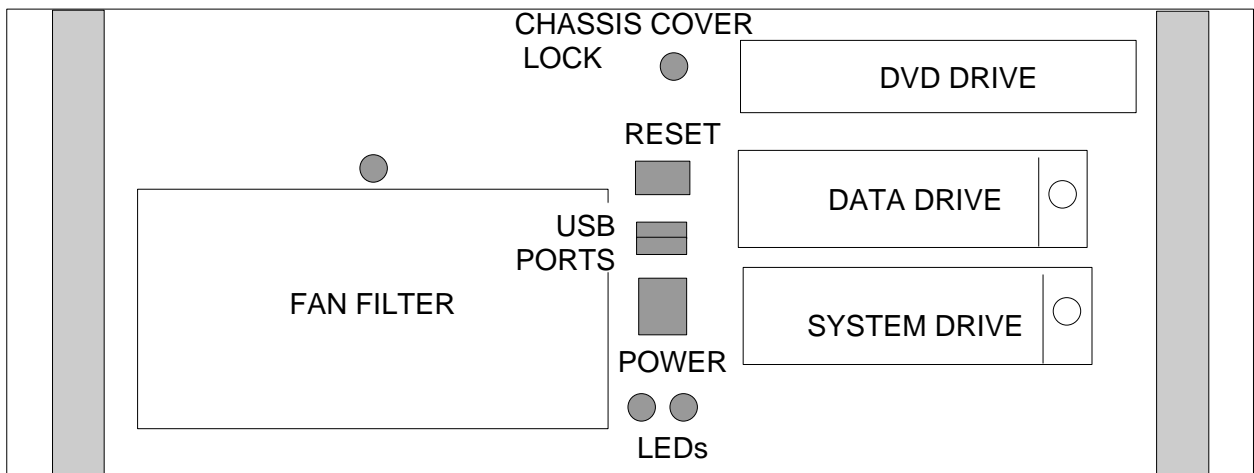
Note: The green LED indicates power is applied; the red LED indicates activity to/from the hard drives.

Figure 1-2: NuPDP Front Panel

Figure 1-3 shows the rear of the chassis with the location of USB, video, COM1 and LPT1 ports. The option module I/O ports are available for connection at the rear of the chassis.

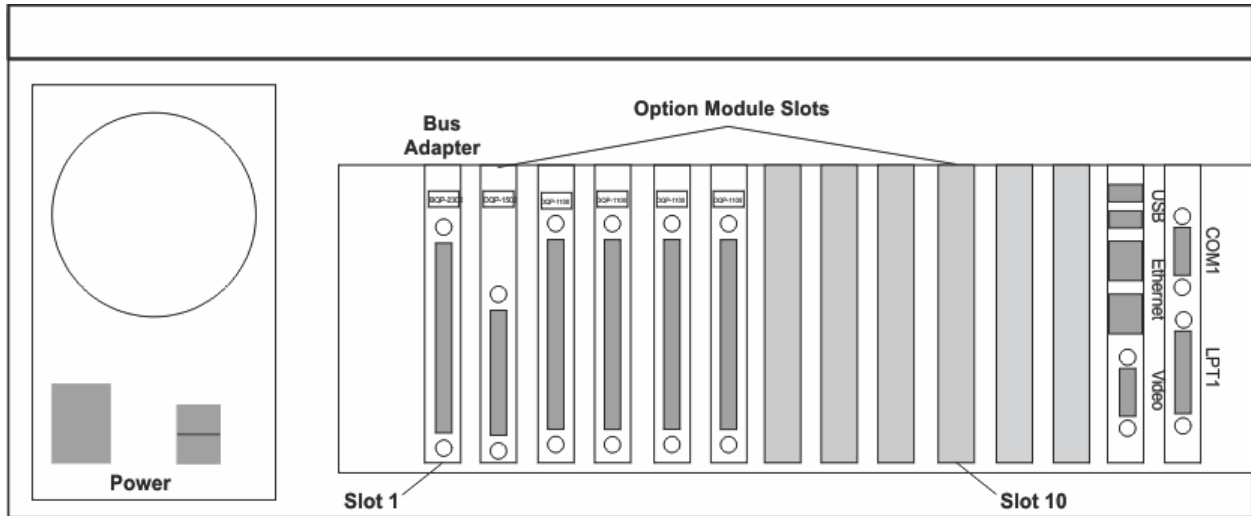Note: USB, VGA, mouse, and keyboard are not supported by PDP-11 software.

Figure 1-3: NuPDP Chassis Rear

The remainder of this chapter lists the steps involved in setting up the NuPDP hardware and software. Installation consists of the following steps.

- Set up the system
- Power up system and verify it runs the sample RSX operating system
- Capture your physical disk image into a NuPDP disk file (virtual disk image)
- Set address and vectors for all option modules (I/O controllers)
- Create a NuPDP configuration file with physical and emulated I/O controllers
- Verify installation by booting your virtual system disk image

Set up the System

Once the system is unpacked set it up as described below.

- Place the system on a table or bench in a well-ventilated area or mount the system chassis into a standard RETMA rack as described in the box with the chassis slides (MSC-3200).
- Open the Accessory Box supplied in the shipping container with the system chassis.
- Connect a VTxx terminal to the NuPDP COM1 serial port serving as the PDP console.

- o **DEC Terminals**: NuPDP is shipped and configured to use a DEC standard, VT100-style terminal.   Use the supplied CAB-2009-18 for 9-pin terminals or CAB-2010-18 for 25-pin as an adapter between the NuPDP COM1 serial port and the DEC terminal cable. These adapters provide two functions: receive and transmit crossover data and connector DE9, DB25 compatibility.
  - o **PC Terminal Emulators**: PC-based terminal emulators or simple character terminals can plug directly into the NuPDP COM1 port using industry-standard PC cables and do not require an adapter cable.
- Connect the supplied power cable (Accessory Box) to the power connector at the back of the NuPDP system. The NuPDP power supply is auto sensing and supports 220V 50Hz and 110V 60Hz operation, users of 220V systems require an appropriate power cable and adapter.

Boot the Sample RSX Operating System

When you receive the NuPDP system, it contains a sample RSX operating system. Power up your system and verify that the sample RSX boots.

Verify that the console displays the following:

> Type y to change configuration else the OS boots in 4 seconds [Y,N]?

If no user input is received within 4 seconds, the RSX sample operating system is booted and displays identical information to your existing system. If the RSX sample runs properly, the basic functionality of the NuPDP is confirmed and ready to proceed to the next step.

Physical Disk Image Capture

NuPDP can boot and run your existing PDP-11 physical system disk or the contents of the physical disk can be moved to NuPDP's internal disk. Moving the physical disk image to a NuPDP virtual disk image is a complex process and requires a trained technician. We recommend that only qualified VARs and technical people trained by Logical attempt this procedure.

Configure Option Module Address and Vector

The option modules shipped in the NuPDP system are configured to the default addresses and vectors to run DEC diagnostics. If the interfaces in your PDP-11 application are set to different addresses, any installed NuPDP option modules need to be set to match your I/O module settings. Table 2-1 lists the DEC interfaces and their corresponding option modules. The following devices do not require switch settings: CCI1016A, COM1 port, and LPV11 port, but do need require settings contained in the NuPDP configuration file described in the next section, NuPDP Configuration File. We recommend that only trained technicians make required switch setting changes.

A.   Determine the addresses/vectors of the interfaces in your PDP-11 system.

B.   Option module manuals are contained on the supplied documentation CD, document number PDQ4200CD. Using the appropriate manual for your particular option module, set the address and vectors to match your existing I/O controller.

Note:

The arrangement of physical option modules and the substitution of emulated disk, tape and network controller requires knowledge of DEC Qbus configuration rules and how they apply to a NuPDP containing both physical and emulated (virtual) I/O controllers. We recommend that only qualified VARs and technical people trained by Logical attempt this procedure. Logical has placed and tested the option modules in your system for best data transfer performance and interrupt latency.

NuPDP Configuration File

The NuPDP emulation is tailored to match you system type with basic I/O and options by entries in a text file named NUPDP.INI, commonly referred to as a config file. From information supplied early in the sales cycle, Logical creates a config file containing declarations that duplicate all the known hardware features and emulated I/O of the desired NuPDP system. This file is shipped with the system and can be located within directory OS. A sample config file is shown in Figure 1-4. Note that there can only be one NUPDP.INI file in the OS directory.

```
; NuPDP Configuration file for Customer PDP-11/53 RSX11M OS
;
; Declare the Qbus CPU type
;Set cpu 23
set cpu 53
;Set cpu 73
;Set cpu 83
;Set cpu 93
;
; Declare the Unibus CPU type
;Set cpu 24
;set cpu 34
;Set cpu 44
;Set cpu 84
;Set cpu 94
;
; Declare a bus adapter (do not remove 'attach bci')
attach bci:
;
; Select the AC frequency required for the line clock
set HZ 50
;set HZ 60
;
; Select CPU Speed - Default is 'THROTTLE OFF'
;Set speed to delay x usec after y instructions
;Set speed to slow if required for initial system validation
;set THROTTLE ON DELAY=1 INTERVAL=10
set THROTTLE OFF
;
; Mount disk and tape units - select number and type of disks/tapes
;
mount du0: RSX32_53.dsk
;mount du1: My_disk.dsk
;mount mu0: test.tap
;
; Assign the console terminal
; Note: Shift-Enter does not work with a terminal emulator or VTxx
assign tt0: com1:
     ;or to  con:  if VGA is used
;assign tt0: con:
;
;Set Ctrl P to get a NuPDP prompt
SET BREAK 20
;
SET TT1: CSR=176500 VEC=300 for DL11
assign tt1:  com27:  /mode:9600,n,8,1
;
; Define 8-line DHQ11 serial mux using a CCI1016A Option module
;
Set YVA: CSR=760540 VEC=340
;Set YVA: CSR=760440 VEC=310 DHQ11
assign yva0: com3:  /mode:9600,n,8,1
assign yva1: com4:  /mode:9600,n,8,1
assign yva2: com5:  /mode:9600,n,8,1
```

```
assign yva3: com6:   /mode:9600,n,8,1
assign yva4: com7:   /mode:9600,n,8,1
assign yva5: com8:   /mode:9600,n,8,1
assign yva6: com9:   /mode:9600,n,8,1
assign yva7: com10: /mode:9600,n,8,1
;
Set YVB: CSR=760560 VEC=350
;Set YVB: CSR=760460 VEC=320 DHQ11
assign yvb0: com11:  /mode:9600,n,8,1
assign yvb1: com12:  /mode:9600,n,8,1
assign yvb2: com13:  /mode:9600,n,8,1
assign yvb3: com14:  /mode:9600,n,8,1
assign yvb4: com15:  /mode:9600,n,8,1
assign yvb5: com16:  /mode:9600,n,8,1
assign yvb6: com17:  /mode:9600,n,8,1
assign yvb7: com18:  /mode:9600,n,8,1
;
Set YVC: CSR=760600 VEC=360
;Set YVC: CSR=760500 VEC=330 DHQ11
assign yvc0: com19:  /mode:9600,n,8,1
assign yvc1: com20:  /mode:9600,n,8,1
assign yvc2: com21:  /mode:9600,n,8,1
assign yvc3: com22:  /mode:9600,n,8,1
assign yvc4: com23:  /mode:9600,n,8,1
assign yvc5: com24:  /mode:9600,n,8,1
assign yvc6: com25:  /mode:9600,n,8,1
assign yvc7: com26:  /mode:9600,n,8,1
;
; Boot disk unit 0
;
boot du0:
;
; Control returns to the next line when the user presses Ctrl P
; on the console or the system halts on its own (e.g. SHUTUP.TSK)
;
quit
```

Figure 1-4: Sample NUPDP.INI Config File

Verify Installation

After the existing physical system disk image has been moved to the NuPDP, and the config file has been edited, if needed, the system is ready to boot the customer's operating system. At this point, the user can verify the NuPDP system performs the functions of the replaced PDP-11.

Run the system to check the following:

- ☐ Did the system boot?
- ☐ Were all the I/O recognized and put on-line?

☐ Did all background applications start?

☐ Did all requested applications start and operate correctly?

If there was no observed failure, it may be time to put the system to 'work' for a period of time to verify correct operations and reliability. If all the above has performed successfully, the system can be determined to be accepted. If any issues arise during this process, please contact the appropriate support service personnel.

Chapter 2: General Description

The NuPDP 4200 is a complete hardware and software replacement for Digital Equipment Corporation's PDP-11 computer systems.

Figure 2-1: NuPDP System Front View

Features

- NuPDP systems offer a removable SATA system drive and a removable data drive.
- Support up to 4MB of PDP-11 memory.
- Offer a choice of special DEC-style interfaces, or option modules. Other interfaces can be custom designed for your application.
- Support speeds of more than 25 times the PDP-11 speed.

Option Modules

DEC Interface	Qbus Option Module	Unibus Option Module
DRQ3B	DQP-1500-AA Standard DQP-1500-AA Long Line	-
DRV11, DR11-C	DQP-1300-AA	DUP-1300-AA
DRV11-J	DQP-1400-AA	-
DRV11-WA, DR11-W	DQP-1100-AA Standard DQP-1100-AB Long Line	DUP-1100-AA Standard DUP-1100-AB Long Line
IEQ11-A, IEU11	DQP-3100-AA	DUP-3100-AA
DHV11, DHQ11, DZQ11, CXY08, DHU11k, DH11, DL11-A, DZ11-A	CCI1016AA	CCI1016AA
Adapter for External Unibus Support	AQP-2303-AA, 2 KW11-K	APU-2303-AA (Always included)

Table 2-1: Qbus and Unibus Option Modules

Specifications

System Unit

Physical	Standard 4U rack-mount chassis (20" depth)
Weight	13.6 kg (30 lbs) representative system
Power	400 Watt ATX-12V 2.01 PS/2. Full range Active PFC.
Drive Bays	2 cartridge-style hard drives, one DVD drive
Hard Drives	Removable 320 GB SATA drives; one system drive*, one data drive (PDQ-4200-AA only)
Memory	4 MB
Clock	Qbus: KW11-L standard, or KW11-K emulation Unibus: KW11-L emulation
I/O Slots	Qbus: 9 available Unibus: 8 available with external Unibus support; 9 slots available without external Unibus

* Virtual drives are limited to 2 GB maximum size.

Ports

RS232 Serial Port	COM1 Console (TT0) only
Baud Rates	50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19.2K, 38.4K bits/sec
Data bits	5, 6, 7, 8
Stop bits	1, 1.5, 2
Parity	Odd, even, or no parity
USB	Not supported by PDP-11 emulator
Printer Supported	LPV11

Compatibility

Processors Supported	PDP-11/03, PDP-11/23, PDP-11/53, PDP-11/73, PDP-11/83, PDP-11/93
Disks Emulated	RLV11, RLV12, KDA50, RQDX3, RQZX1, RXV11, RX21
Tapes Emulated	TU58, TK25, TK50, TK70

Front Panel LEDs

Red	Indicates activity on the hard drives
Green	Indicates that system power is on.

Environmental

Operating Conditions:	
Temperature	10° to 40° C (50° to 104° F)
Relative Humidity	20% to 80% non-condensing
Storage Conditions:	
Temperature	-40° to 60° C (-40° to 140° F)
Relative Humidity	10% to 95% non-condensing

Chapter 3: Maintenance

This section provides basic maintenance information for your NuPDP system. The NuPDP system is designed for low-maintenance, trouble-free operation. Two areas require attention from time to time:

- Keep the air filter clean as described below, and minimize dust when possible.
- The CMOS battery on the motherboard lasts from 2-10 years depending upon operating temperature and the amount of time the system is turned off. Higher temperatures and long periods when the system is turned off shorten the battery life. The battery needs replacement when the system no longer keeps the current time.

Air filter maintenance and battery replacement are described in the following sections.

Air Filter

Clean the fan air filter as often as necessary to prevent overheating due to reduced air movement. When reinstalling the air filter, make sure the filter material does not reduce the airflow within the chassis or overheating may become a problem. Generally, dust poses no danger to a computer, except for disk drives. Conductive dust, however, such as metal or carbon particles, can be problematic.

To replace the air filter, do the following:

1) Remove power to the system.

2) To access the air filter, release the front panel door by turning the quick-release screw at the center of the panel clockwise.

3) The fan filter is on the left side of the chassis. Access the filter by turning the quick-release screw at the top of the filter access door several turns counter-clockwise.

4) Gently remove the filter from the inside of the fan filter access area.

5) Clean the air filter. The filter can be blown out or washed in soapy water. Make sure the filter is completely dry before reinstalling.

6) Close the fan filter access door, tighten the quick-release screw, close and lock the front panel.

Note: Filters do not remove fumes or gases. Do not use the chassis in environments where airborne contaminants may damage the system.

System Battery Replacement

The battery is a standard CR-2032 battery that can be purchased anywhere batteries are sold. The expected lifecycle depends on a variety of factors, but a minimum of several years of battery life can be expected..

To replace the battery:

1) Remove power to the system.

2) Open the front panel door turning the thumb screw at the top, center of the access door one-quarter turn counter-clockwise.

3) Unlock the chassis cover using the round thumb screw at the center of the front panel (to the left of the DVD drive). Turn the thumbscrew counter-clockwise.

4)   Slide the chassis cover back to remove.

5)   Remove the hold down bracket to allow access to the battery.

6)   The battery is located two inches or so behind the Ethernet ports and approximately two inches below the SATA ports (near the heatsink) of the CPU board.
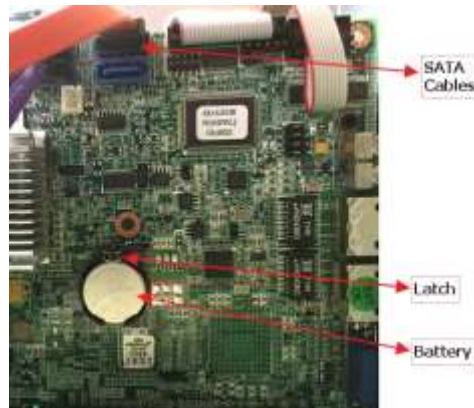
7)   To remove the battery, find the wire latch located at 12 o' clock on the battery, then push it away from the battery until the battery pops out. Be careful when working next to the SATA cables. If you remove the cables for better access, be sure to mark them so that you can replace them in their original positions.

8)   Install a new battery with 'CR2032' facing up. Dispose of the used battery according to the battery manufacturer's instructions.

9)   Replace the hold-down bracket and chassis cover and secure. Close the front panel access door.

When the battery is removed, the time of day and date are lost. Enter the CMOS Bios as described in the next section to reset the time and date.

Reset Time and Date

To re-set the BIOS settings, you need a VGA monitor and USB keyboard.

1)   Connect the monitor and keyboard to the back of the system chassis.

      a.   Connect the keyboard to a USB port.

      b.   Connect the monitor to the 15-pin blue VGA connector and power on the monitor.

2) Power on the system and press 'F1' when prompted, to enter setup and change the date and time.

Troubleshooting

If the NuPDP system does not boot properly, it may be due to a failed battery. Refer to the previous section on how to replace the battery. Determine if this is the cause of the failure by attaching a VGA monitor and USB keyboard. If a new battery and new BIOS settings do not resolve the problem, call the appropriate support personnel for assistance.

XXDP Diagnostics

The NuPDP system internal hard drive contains a bootable virtual disk with a complete suite of XXDP diagnostics. These diagnostics are provided to assist a trained technician in verifying system operations. Logical uses the XXDP diagnostics to verify overall system operation prior to shipment to customers.   The owner's manual of each option module, e.g., DQP-1100-OM, specifies which diagnostics are supported and provides detailed test instructions. Some option modules and ports are not XXDP compatible, including the CCI1016A, LVP11 printer port, and COM1 serial port. All COM ports can be verified at the operating system level through login/logout processes at each port.

Error Messages

Any error messages may indicate a failure. Call the appropriate support personnel for assistance.

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