MicroPower/Pascal–RSX
Installation Guide

Order No. AA–AK10D–TC

software

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This manual explains how to install MicroPower/Pascal software on your Micro/RSX, RSX–11M, or RSX–11M–PLUS system.

This manual supersedes the *MicroPower/Pascal–RSX Installation Guide*, AA–AK10C–TC.

Note: Unless otherwise indicated, a version specification represents a major release and subsequent updates—for example, RSX–11M Version 4. A specific update is represented by a period (.) and number following the version number—for example, MicroPower/Pascal Version 2.3.

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Preface

Manual Objectives and Reader Assumptions

This manual contains the information you need to install MicroPower/Pascal–RSX software on your host system. The information and procedures presented in this manual define hardware configurations for both the host system and the target LSI–11, PDP–11, MicroPDP–11, FALCON, FALCON–PLUS, KXT11–CA, or KXJ11–CA system for which you are developing application software.

This manual assumes that you are familiar with the Micro/RSX, RSX–11M, or RSX–11M–PLUS operating system. This manual describes only those commands directly related to the installation and verification procedures. For additional information, see the Micro/RSX, RSX–11M, or RSX–11M–PLUS software documentation for your host system.

Structure of This Document

This manual consists of the following four chapters and appendix:

*   Chapter 1 describes the system hardware configuration requirements for host and target systems.

*   Chapter 2 describes installation of the MicroPower/Pascal–Micro/RSX software kit on Micro/RSX host systems.

*   Chapter 3 describes installation of the MicroPower/Pascal–RSX software kit on RSX–11M/M–PLUS host systems.

*   Chapter 4 contains the software installation verification procedure.

*   The appendix contains the procedures for running the peripheral processor sample application.

MicroPower/Pascal Documentation

The following components make up the MicroPower/Pascal–RSX document set:

Volume	Document Title	Order Number
1	*Introduction to MicroPower/Pascal*	AA–M388C–TK
	MicroPower/Pascal–RSX Installation Guide	AA–AK10D–TC
	MicroPower/Pascal Release Notes	AA–FQ16E–TK
	PDP–11 MACRO–11 Language Reference Manual	AA–V027A–TC
	PDP–11 Programming Card	EH–S1046–78
2	*MicroPower/Pascal–RSX/VMS System User's Guide*	AA–AK13C–TK
	MicroPower/Pascal Debugger User's Guide	AA–M393D–TK
	MicroPower/Pascal–RSX/VMS Messages Manual	AA–AK14C–TK
3	*MicroPower/Language Guide*	AA–M389E–TK
4	*MicroPower/Pascal Run-Time Services Manual*	AA–M391D–TK
	MicroPower/Pascal I/O Services Manual	AA–FQ15C–TK

The following document is not contained in the four volumes listed:

MicroPower/Pascal Pocket Guide	AA–FQ17B–TK

Associated Documents

The following hardware documents describe configurations for target (application) hardware and host system interface:

Document Title	Order Number
• *Microcomputers and Memories*	EB–20912–20
• *PDP–11 Microcomputer Interfaces Handbook*	EB–23144–18
• *PDP–11 Architecture Handbook*	EB–23657–18
• *PDP–11 MicroPDP–11 Handbook*	EB–24944–18
• *SBC–11/21 Single-Board Computer User's Guide*	EK–SBC01–001
• *VT103 LSI–11 Video Terminal User's Guide*	EK–VT103–UG

Document Title
• Documentation for host system serial line interface hardware
• Any other documentation for your microcomputer hardware

Conventions Used in This Document

1. Unless explicitly followed by the word "kit," the term MicroPower/Pascal–RSX software refers to software contained in both the MicroPower/Pascal–RSX software kit (for RSX–11M/M–PLUS host systems) and the MicroPower/Pascal–Micro/RSX software kit (for Micro/RSX host systems), which, except for the packaging and labeling differences, are essentially the same software kit.

2. Hardware device registers and bootstrap PROM addresses specified in this manual are shown as 22-bit octal values (for example, 17777560) except for FALCON, FALCON–PLUS, KXT11–CA, and KXJ11–CA addresses. Those addresses are shown as 16-bit addresses (for example, 177560), since 16-bit is the physical limitation for those processors. Depending on your processor type, you may need to substitute 18-bit addresses (for example, 777560) or 16-bit addresses for the 22-bit addresses specified in this manual.

3. In commands and command strings, user input is shown in **boldface** type to differentiate it from computer output.

4. All commands or command strings terminate with a carriage return.

Chapter 1

System Hardware Requirements

MicroPower/Pascal–RSX software development tools run under the Micro/RSX, RSX–11M, or RSX–11M–PLUS operating system throughout the microcomputer application development process. Application software can be tested and debugged only on the target system. During the debugging stages of application software development, an asynchronous serial communications line connects the target system to the host operating system. That arrangement permits the host system to run under the Micro/RSX, RSX–11M, or RSX–11M–PLUS operating system, while the target system runs application software under control of its own software components.

Sections 1.1 and 1.2 describe the host and target system hardware configurations necessary for MicroPower/Pascal–RSX installation and operation. Section 1.3 describes the use of MicroPDP–11 systems in target system applications. Section 1.4 describes the use of SBC–11/21 (FALCON and FALCON–PLUS) single-board computers, including the memory configurations and I/O device parameters supported by MicroPower/Pascal–RSX software. Section 1.5 contains information for configuring KXT11–CA or KXJ11–CA single-board computers for MicroPower/Pascal–RSX software installation verification.

1.1 Configuring the Host System

The host system hardware requirements for developing MicroPower/Pascal–RSX application software include the following:

- Any Micro/RSX system with at least 256K words of memory, any RSX–11M system with at least 124K words of memory, or any RSX–11M–PLUS system with at least 256K words of memory.

- One or more asynchronous serial lines for down-line loading or debugging MicroPower/ Pascal–RSX applications on each target system. An additional asynchronous serial line is required for debugging each KXT11–CA or KXJ11–CA single-board computer used in peripheral processor applications.

Note

For MicroPDP–11 host systems, host/target system serial lines must be connected to the host by means of connectors located on the distribution panel on the rear of the MicroPDP–11 system. For RSX–11M/M–PLUS

host systems, host/target system serial lines must be hard-wired to the host system and must be supported by RSX–11M/M–PLUS terminal services. Serial lines routed by way of electronic communications switches are not supported.

- You need approximately 100 contiguous free blocks on your system disk and 5100 free blocks on a user-specified disk to install the MicroPower/Pascal–RSX or MicroPower/Pascal–Micro/RSX software kit.

The following host/target serial line characteristics are required for down-line loading or debugging MicroPower/Pascal–RSX applications:

Line type: Asynchronous, RS232C (EIA) or 20 ma, as required

Baud rate: Equal to target console serial line unit; DIGITAL recommends a baud rate of 4800 bps or greater

Serial data parameters: Eight data bits, no parity, one stop bit

Note

On a MicroPDP–11 system, you set the host/target serial line speed by either setting a baud rate switch or typing an appropriate DCL command, depending on whether your host/target serial line unit is a DLV11 type or a DZV11 type. If the serial line is connected to the DLV11-type interface, you must set a baud rate switch located on the distribution panel on the rear of the MicroPDP–11. The distribution panel contains a table of baud rates and two DLV11-type serial line unit baud rate switches (A0 and A1). A0 selects the baud rate for the A0 (CONSOLE) serial line unit; A1 selects the baud rate for the A1 serial line unit, which you can use with PASDBG to debug or down-line load applications. See Section 1.3 for an illustration of the MicroPDP–11 distribution panel and further information on setting baud rates.

If your host system has DZV11-type serial lines, set the host/target serial line transmit and receive speed, using the following DCL command:

SET TERMINAL:TTnn:/SPEED:ts,rs

See the *Micro/RSX User's Guide*, Volume 2, for a complete description of the SET TERMINAL command.

The following host system hardware for MicroPower/Pascal–RSX microcomputer application software development is optional:

- RL01 or RL02 disk drive, required if application software is to be transported to target systems by means of RL01 or RL02 disk

- RX02 diskette drive, required if application software is to be transported to target systems by means of RX02 diskettes

- RX50 diskette drive, required if application software is to be transported to target systems by means of RX50 diskettes

- TU58–BA DECtape II cartridge tape unit, required if application software is to be transported to target systems by means of DECtape II media

1.2 Configuring the Target System

1.2.1 General Requirements

MicroPower/Pascal-RSX software supports application development for component and packaged microcomputer systems using LSI-11, LSI-11/2, LSI-11/23, LSI-11/23-PLUS, LSI-11/73, PDP-11/03, PDP-11/23, PDP-11/23-PLUS, PDP-11/73, PDP-11/83, MicroPDP-11/53 (RAM only), MicroPDP-11 microcomputers and CMR21, FALCON, FALCON-PLUS, KXT11-CA, and KXJ11-CA single-board computers as target systems. Section 1.3 contains information for using MicroPDP-11 systems in target system applications. Section 1.4 contains information for configuring FALCON and FALCON-PLUS single-board computer hardware. Section 1.5 contains information for configuring KXT11-CA or KXJ11-CA single-board computers for installation verification. See the *CMR21 Technical Manual* for CMR21 configuration details.

The following target system hardware is required:

- Memory consisting of any combination of RAM and (P)ROM, including at least 4K words of RAM.

- DLV11-compatible serial line unit for down-line loading and debugging application software (see Section 1.2.3).

MicroPower/Pascal-RSX software supports the following optional target system hardware:

- ADV11-C, AAV11-C, and AXV11-C A/D and D/A modules.

- DELQA-M Ethernet controller, supported in DEQNA mode only.

- DEQNA Ethernet controller.

- DHQ11-M cost-reduced DHV11, dual height.

- DLV11, DLV11-E, DLV11-F, and DLV11-J serial line units.

- DHV11 serial line unit.

- DZV11 serial line unit.

- DPV11 synchronous serial line unit.

- DRV11, DRV11-B, and DRV11-J parallel line units.

- DZQ11-M cost-reduced DZV11, dual height.

- FALCON, FALCON-PLUS parallel port.

- FPJ floating-point accelerator—for KDJ11.

- Line clocks for the LSI-11, LSI-11/2, LSI-11/23, FALCON SBC 11/21, and FALCON-PLUS.

- IEQ-11 IEEE-488 bus interface.

- KEF11, FPF11 floating-point options—for LSI-11/23 microcomputers.

- KEV11 EIS/FIS arithmetic option—for LSI-11 or LSI-11/2 microcomputers.

- KWV11-C programmable real-time clock.

- KXT11–A2 Macro-ODT ROM option, which must be installed on the target system when you are debugging FALCON applications or KXT11–A5 Macro-ODT ROM, which must be installed on the target system when you are debugging FALCON–PLUS applications.

- KXT11–CA and KXJ11–CA single-board computers' parallel, asynchronous and synchronous ports, DMA capabilities, and 2-port RAMs.

- MRV11–C, –D PROM module.

- MSV11–D, –L, –P, –S RAM module.

- MXV11–A or MXV11–B multifunction module, which includes PROM, RAM, two serial lines, and 50/60 Hz clock. If you are bootstrapping your application software from an RL01 or RL02 disk, DECtape II cartridge, or RX02 diskette, you must use the MXV11–A2 or MXV11–B2 bootstrap ROM option, respectively, with the MXV11–A or MXV11–B.

- RLV12 RL01/RL02 disk cartridge controller.

- RQDX1, RQDX2, RQDX3 controller for RD5x, RD3x Winchester disk and RX50 diskette drives used in the MicroPDP–11 target system.

- RX33 floppy disk drive (with RX50 media only).

- RXV21 dual-density diskette.

- TK50 streaming tape cartridge (nonfile-structured).

- TU58 DECtape II cartridge tape.

1.2.2 LSI–11, LSI–11/2, LSI–11/23, LSI–11/23–PLUS, and LSI–11/73 Requirements

LSI–11, LSI–11/2, LSI–11/23, LSI–11/23–PLUS, and LSI–11/73 microcomputer modules have jumpers that allow you to specify some hardware operating parameters. This section tells you how to configure hardware for debugging application software; bootstrapping application software from DECtape II, RL01 or RL02 disk, or RX02 diskette; down-line loading application software from a host system into a target microcomputer system; or executing application software contained in PROM.

Power-up mode:

Down-line loading or debugging	Mode 1—console ODT; select by configuring the Halt/Trap jumper on LSI–11/23, LSI–11/23–PLUS, and LSI–11/73 microcomputers.
Bootstrap and run application	Mode 2—execute appropriate bootstrap program starting at location 17773000, which is the standard bootstrap start address for the LSI–11/23 microcomputer.
Execute PROM-resident application	Mode 0—enter initialization procedure by means of power/fail vector at location 24.
Event line or LKS register	Normally enabled for the clock service and inhibited if clock service is not required; the clock service requires line time clock interrupts.

Note

When configuring the LSI–11, LSI–11/2, LSI–11/23, LSI–11/23–PLUS, or LSI–11/73 microcomputer, you must enable event line interrupts if your target application requires clock services. If your target system includes the LSI–11/73, enable the BEVNT L control register.

Wake-up enable/disable (LSI–11/73, Enable wake-up circuit.
only)

1.2.3 Target-to-Host System and TU58 Serial Line Interface

When using PASDBG for debugging or down-line loading application software, you must have a serial line unit on the target system for communication with the host system. PASDBG operates the host-to-target serial line in full-duplex mode. When you are debugging application software, the host system communicates with the target system through the target system's console terminal serial line unit. That serial line unit is used both for loading the application software from the host system into the target system's memory and as the host system's interface to the target system for debugging. Thus, when you are debugging application software, you must specify an additional serial line if the application requires a terminal. The device and vector base addresses for the additional serial line must be other than 17777560 and 60, respectively, as those addresses are reserved for debugging and down-line loading. See the *Microcomputer Interfaces Handbook* for information on configuring the additional serial line.

When bootstrapping application software from DECtape II, configure a serial line unit for the TU58 DECtape II drive. That serial line unit must be configured for device and vector addresses of 17776500 and 300, respectively. Those addresses conform to the requirements of standard TU58 bootstrap programs available from DIGITAL (MXV11–A2, MXV11–B2, and KXT11–A2 PROM options).

Serial line unit requirements for debugging or down-line loading and bootstrapping application software from DECtape II are listed below. Table 1–1 summarizes device and vector addresses.

Baud rate:	Configure target console serial line unit baud rate to match host serial line unit baud rate. The baud rate of the serial line unit connected to the TU58 DECtape II drive must match the baud rate of the TU58. The TU58 is factory-configured for 38.4K bps.
Halt on BREAK:	Enable Halt on BREAK on target's console serial line, permitting the symbolic debugger program to interact with the target system by means of console ODT commands.
Serial line unit data:	Configure the target's console and TU58, if used, serial line units for eight data bits, no parity, one stop bit.

Table 1-1: Target System Serial Line Unit Addressing Summary

| | Base Address | |
Purpose	CSR	Vector
Debugging or down-line loading	17777560	60
Bootstrapping TU58 DECtape II	17776500	300

1.2.4 Disk and Diskette Interfaces

When application software is bootstrapped from RL01 or RL02 disk or RX02 or RX50 diskette, check that the disk or diskette interface is configured for standard device CSR and interrupt vector addresses. Table 1-2 lists standard disk and diskette CSR and vector addresses.

Table 1-2: Target System Disk/Diskette Addressing Summary

| | | Base Address | |
Media	Interface	CSR	Vector
RL01/RL02	RLV11/RLV21	17774400	160
RX02	RXV21	17777170	264
RX50	RQDX1	17772150	154

1.3 MicroPDP-11 Target Systems

This section explains how to configure MicroPDP-11 systems for use as target systems. Normally, you do not need to configure any of the system components described in Section 1.2 to meet minimum target system requirements; each MicroPDP-11 is factory-configured to meet the configuration requirements for MicroPower/Pascal-RSX. The following sections describe the location of serial line unit connectors and baud rate switches used for terminals and host/target communications. Terminal and host/target serial line units and baud rate switches are located on a distribution panel on the rear of the MicroPDP-11, as shown in Figure 1-1. The distribution panel contains a table of baud rates and two baud rate switches (A0 and A1). A0 selects the baud rate for the A0 (CONSOLE) serial line unit; A1 selects the baud rate for the A1 serial line unit.

When using PASDBG to debug or down-line load applications, connect the host/target communications line to the A0 (CONSOLE) connector and connect the target's terminal, if used, to the A1 connector. When running applications that are bootstrapped from disk, connect the target's terminal, if used, to the A0 (CONSOLE) terminal.

Figure 1-1: MicroPDP-11 Distribution Panel
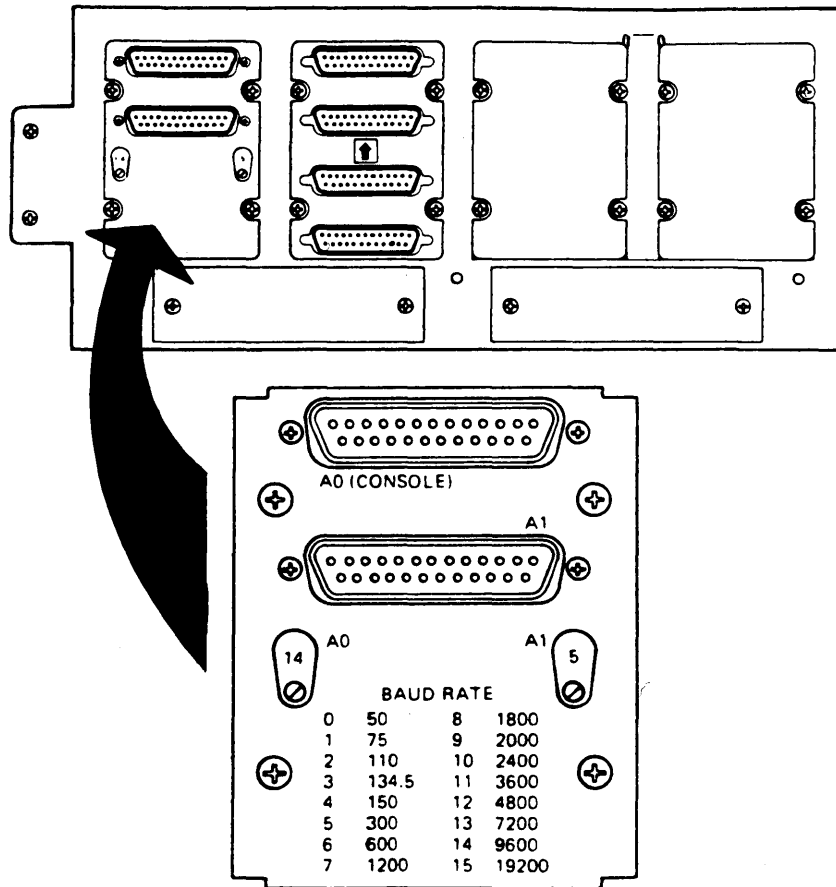
MLO-544-87

A number immediately above the screwdriver slot for each baud rate switch relates to a baud rate shown in the table of baud rates. For example, if you are configuring your MicroPDP-11 for debugging application software, you can select baud rates of 4800 bps for a terminal, if used, and 9600 bps for host/target communications by setting A1 to 12 and A0 to 14, respectively. Using a screwdriver, select the desired baud rates for the console and host/target serial line units. When using PASDBG to debug or down-line load applications, be sure that the host and target baud rates match.

Some MicroPDP-11 systems are shipped with a factory-installed loopback connector. That connector is required only for hardware diagnostics, but the MicroPDP-11 technical documentation neither has instructions for removing it nor states the need for doing so. If the connector remains installed for normal system operations, severe performance degradation can occur.

Open the back panel of the MicroPDP–11 case by pulling firmly at the corners. The loopback connector is a black adapter plugged into the second serial line port (second from the top in the horizontal configuration or second from the right in the vertical configuration). Two small screws hold the connector in place. Remove the connector and save it in case hardware diagnostics must be run on the MicroPDP–11 in the future.

In addition, the CPU jumpers that must be removed from points J4 and J5 to cause the system to halt in console ODT on a break condition must also be replaced on points J3 and J4, respectively. (The MicroPDP–11 technical documentation does not state the latter requirement.)

1.4 FALCON and FALCON–PLUS Single-Board Computers

FALCON (M8063–BA) and FALCON–PLUS (M7676–AB) are single-board computers whose instructions are PDP–11 compatible. FALCON consists of a single-chip 16-bit microprocessor, 4K bytes of on-board RAM (read-write memory), four sockets for up to 32K bytes of ROM (EPROM, PROM, or ROM), two DLV11-compatible serial lines, and a parallel I/O interface factory-configured for one byte output, one byte input, and one control word. FALCON–PLUS consists of a single-chip 16-bit microprocessor, 16K bytes of on-board RAM (read-write memory), four sockets for up to 32K bytes of ROM (EPROM, PROM, or ROM) or additional RAM, two DLV11-compatible serial lines, and a parallel I/O interface factory-configured for one byte output, one byte input, and one control word.

The following sections describe information that is common to both the FALCON and the FALCON–PLUS. Common information includes Macro–ODT, serial line baud rates, and memory configurations. Information for configuring and using FALCON and FALCON–PLUS single-board computers is provided separately in Sections 1.4.5 and 1.4.6.

1.4.1 Macro–ODT

Macro–ODT, a small program module that gives you the essential LSI–11 console ODT commands, is a subset of console ODT with added features. Three versions of Macro–ODT are available:

1. **KXT11–A2 Macro–ODT option:** The KXT11–A2 FALCON firmware option consists of two ROMs that must be installed on the FALCON module when you use PASDBG for debugging or down-line loading applications. The ROMs also contain bootstrap programs that must be used when you bootstrap applications contained on DECtape II or RX02 media. When KXT11–A2 ROMs are used, memory must be configured so that PROM socket set A addresses overlap PROM socket set B addresses (factory configuration), and start/restart addresses must be configured to 172000/172004. Whenever application software is contained in on-board ROMs, the KXT11–A2 Macro–ODT ROMs must be removed. If you want Macro–ODT in ROM application software, use the FALCON ODT kernel module described below. The start address for PROM applications is 000000.

2. **KXT11–A5 Macro–ODT option:** The KXT11–A5 FALCON–PLUS firmware option consists of two ROMs that must be installed on the FALCON–PLUS module when you use PASDBG for debugging or down-line loading applications. The ROMs also contain bootstrap programs that must be used when you bootstrap applications contained on DECtape II, RL01, RL02, RX02, or RX50 media. When you use KXT11–A5 ROMs, memory and start/restart addresses must be configured to 172000/172004. Whenever application software is contained in on-board ROMs, the KXT11–A5 Macro–ODT ROMs can be removed. If you want Macro–ODT

functions, you can use the FALCON ODT kernel module, described below. The start address for PROM applications is 000000.

3. **FALCON ODT software module**: The optional FALCON ODT kernel software module is a version of Macro–ODT, provided in the MicroPower/Pascal–RSX run-time system software, that can be built into your application. FALCON ODT gives you some debugging capability on the final system configuration. You include the FALCON ODT module by specifying BREAK=SFWODT when you edit your system configuration file. When the FALCON ODT module is included as part of the application, you enter the FALCON ODT module by pressing the BREAK key on the console terminal or by executing a HALT instruction.

Macro–ODT versions are briefly described in Table 1–3. Complete descriptions of the KXT11–A2 and KXT11–A5 Macro–ODT options and their commands are included in the *FALCON Single-Board Computer User's Guide*, Chapter 4.

Table 1–3: Macro–ODT Command Functions

Command		Function
KXT11–A2 **KXT11–A5**	**FALCON ODT**	
/	/	Open and display the contents of the specified register or memory location—for example: 1200/ Open and display location 1200 R5/ Open and display processor register R5 RS/ Open and display the processor status word
<RET>	<RET>	Close the open location or register. (Specifying a number followed by a <RET> is a deposit.)
<LINE FEED>	<LINE FEED>	Close the open location and display the contents of the next location.
(none)	^	Close the open location and display the contents of the previous location.
G	G	Start program execution at a specified location—for example: 1000G Start execution at location 1000
P	P	Proceed with execution at the location specified in the program counter (R7).

Table 1-3 (Cont.): Macro-ODT Command Functions

Command		Function
KXT11-A2 **KXT11-A5**	**FALCON ODT**	
(none)	S	Single-step execution: Execute the instruction at the location specified in the program counter (R7) and halt.
X	(none)	Execute system tests. (Successful completion takes approximately three seconds.)
DDn <RET>	(none)	Execute the TU58 bootstrap program to bootstrap from unit n. (If n is omitted, unit 0 is assumed.)
DYn <RET>	(none)	Execute the RX02 bootstrap program to bootstrap from unit n. (If n is omitted, unit 0 is assumed.)
		The following bootstrap commands are supported in the KXT11-A5, only:
DUn <RET>	(none)	Execute the RX50 bootstrap program to bootstrap from unit n. (If n is omitted, unit 0 is assumed.)
DLn <RET>	(none)	Execute the RL01/RL02 bootstrap program to bootstrap from unit n. (If n is omitted, unit 0 is assumed.)

When using Macro-ODT ROMs, consider the following operational characteristics of the ROM contents:

• Macro-ODT establishes default vectors in locations 140—for a BREAK condition on the FALCON or FALCON-PLUS console line—and 100—for the real-time clock. Macro-ODT runs at processor priority 6, allowing the BREAK key at priority 7 to interrupt. For FALCON target systems, external RAM *must* be present in the development configuration for those vectors; external RAM is not required for the FALCON-PLUS target system.

• Following power-up initialization, system tests contained in the KXT11-A2 or KXT11-A5 ROMs are executed before entering Macro-ODT. A light-emitting diode (LED) on the FALCON or FALCON-PLUS module comes on during the tests and shuts off following successful test completion. If any test fails, the LED remains on, and entry into the console ODT is not affected.

• The KXT11-A2 and KXT11-A5 ROMs contain an autobaud routine that sets the FALCON or FALCON-PLUS console serial line (SLU1) speed to match that of the host serial line. That routine is executed when Macro-ODT is entered. See Section 1.4.2 for the ways to set serial line speeds and for the possible conflicts that may result.

1.4.2 Serial Line Unit Baud Rates

FALCON or FALCON–PLUS baud rates can be set in three ways:

- By executing the KXT11–A2 or KXT11–A5 autobaud routine

- By terminal (TT) or TU58 (DD) driver initialization

- By application program requests issued to the terminal driver

The accepted range of terminal baud rates is 300 to 38.4K bps. DIGITAL recommends 9600 bps. The baud rate for TU58 is 38.4K bps.

When you use PASDBG to down-line load or debug applications, the autobaud routine sets the FALCON or FALCON–PLUS console line baud rate to match the host's baud rate. The autobaud routine waits for the host system to transmit a carriage return <RET> character and sets the FALCON or FALCON–PLUS transmit and receive baud rate for SLU1 to the speed of the received character. If the FALCON or FALCON–PLUS is turned on before you run PASDBG, the debugger sends a leading carriage return to set the baud rate.

Setting the baud rate via the autobaud routine can be difficult if the host system is running at 4800 bps. Serial line 2 is not automatically programmed except when the TU58 bootstrap is executed. Upon entry, the TU58 bootstrap program sets the baud rate of the second serial line to 38.4K bps.

Baud rate conflicts can occur when the speed of the transmitter at one end of the line is set to a different speed from that of the receiver at the other end of the line. Since the FALCON or FALCON–PLUS serial line unit baud rates are software programmable, baud rate conflicts occur if the rate is changed to an incorrect speed by program action or by device driver initialization.

Baud rate conflicts are most likely to occur when you use PASDBG to debug or down-line load applications in FALCON or FALCON–PLUS targets containing the KXT11–A2 or KXT11–A5 option. The FALCON or FALCON–PLUS console line baud rate is initially set to match the host's baud rate. The KXT11–A2 or KXT11–A5 autobaud routine does that in response to a carriage return character PASDBG sends to the target system.

Avoid baud rate conflicts that may occur during terminal driver initialization by editing the terminal driver prefix file, TTPFXF.MAC, before building the application, as follows:

- Do not specify ttctr$ or ttlin$ macro calls for SLU1 in the TTPFXF.MAC configuration file. PASDBG loads a Debugger Service Module (DSM) in the target system's memory that provides device driver functions for target/host communications over SLU1.

- If your application requires terminal support, edit the ttctr$ macro for SLU2 in TTPFXF.MAC to specify typ=TT$DLT and speed=nnn (nnn=desired baud rate for the terminal in bps).

When FALCON or FALCON–PLUS applications are PROM resident or are bootstrapped from DECtape II, RL01, RL02, or RX02, avoid conflicts by being aware of desired and actual serial line unit speeds and edit the TTPFXF.MAC prefix file accordingly. If your application uses the FALCON or FALCON–PLUS serial lines, edit the TTPFXF.MAC prefix file by specifying typ=TT$DLT in the ttctr$ macro call and speed=nnn (nnn=desired speed in bps) in the ttlin$ macro call; one ttlin$ macro is required for each serial line your application uses.

After being loaded into the target system memory, the application can be started. Then, the terminal driver's initialization procedure sets the FALCON or FALCON–PLUS serial line unit(s) speed to the value(s) specified.

Note

When using KXT11–A2 or KXT11–A5 firmware to bootstrap applications from DECtape II, RL01, RL02, RX02, or RX50 media, press the RETURN key to first set the console terminal line baud rate. Be sure that the ttlin$ macro in your application specifies a SLU1 baud rate that matches your console terminal's baud rate. Otherwise, console terminal communications will be lost when the application initializes.

When bootstrapping applications from DECtape II, the KXT11–A2 firmware sets the second serial line (SLU2) to 38.4K bps when you issue the Macro–ODT DD (TU58 bootstrap) command. That is the factory-configured baud rate for the TU58; no other baud rate is supported by the TU58 bootstrap.

1.4.3 Memory Configurations

After completing all application software development and debugging on the standard hardware configuration, you can select any memory map configuration described in the *SBC–11/21 Single-Board Computer User's Guide*. See that document for details on configuring jumpers. When editing your system configuration file, carefully consider the memory configuration selected. You must include the MEMORY macro and parameters for each contiguous portion of RAM or ROM. Starting addresses and sizes of RAM and ROM segments are specified in 64-byte segments. For example, the following file specifies that 16K bytes of ROM start at location 0 and 4K bytes of on-board RAM, less 64 bytes that are not available to FALCON application programs, start at location 160100:

```
MEMORY  base=0, size=256., type=ROM
MEMORY  base=1601, size=63., type=RAM
```

1.4.4 Starting Addresses

When configuring the FALCON or FALCON–PLUS hardware for running applications that are down-line loaded or bootstrapped from disk, diskette, or DECtape II, use the KXT11–A2 or KXT11–A5 firmware and start address 172000. When configuring hardware for applications contained in ROM or PROM, you must change the start address to location 0.

Note

If possible, use a second FALCON or FALCON–PLUS module for running the application, allowing one module for use during system application development and subsequent debugging.

1.4.5 FALCON Configuration and Use

MicroPower/Pascal–RSX support for the FALCON consists of kernel options invoked by the FALCON system configuration macro, the terminal driver, and the FALCON parallel port (YF) device driver.

MicroPower/Pascal–RSX software supports the standard, factory-shipped FALCON hardware configuration—except start/restart address—for MicroPower/Pascal–RSX software installation verification and application program development. When developing applications, you can alter certain hardware characteristics, including traps, and device register and interrupt vector addresses for specific target system applications. Whenever you change the factory configuration of any other hardware parameters, you must edit the system configuration file (CFDFAL.MAC) and driver prefix files to reflect those changes.

When you use PASDBG for debugging or down-line loading applications, you must install the KXT11–A2 Macro–ODT ROM option on the FALCON module in the extra EPROM/PROM/ROM sockets, using memory map 0. Therefore, an external memory module is required for the application program. (After the application has been debugged and loaded into EPROM, you remove the KXT11–A2 ROMs and install the application EPROMs.) The KXT11–A2 option contains a system test program—including processor, on-board memory, and on-board I/O device tests—a console-ODT program, and bootstrap programs for TU58 and RX02 mass-storage devices.

The standard FALCON hardware configuration—except start/restart addresses—is required during MicroPower/Pascal–RSX installation verification and application program development. Following application program development, you can change hardware features to meet specific target system requirements. See the *SBC–11/21 Single-Board Computer User's Guide* for complete hardware configuration information. Any changes to the hardware configuration require changes to the system configuration file CFDFAL.MAC and, possibly, to the YFPFX.MAC file. Edit those files as directed in the *MicroPower/Pascal Run-Time Services Manual* and the *MicroPower/Pascal I/O Services Manual*. The following list contains the standard, factory-shipped SBC–11/21 hardware configuration:

Memory map

```
177777
        (62K–64K bytes)    │   I/O devices        │
174000                    │                      │
173777                    ├──────────────────────┤◄─── 172000/172004
        (60K–62K bytes)    │   PROM sockets       │     Macro/ODT
                          │   A/B                │     start/restart
170000                    │                      │     addresses
167777                    ├──────────────────────┤
        (56K–60K bytes)    │   Local RAM          │
160010                    │                      │
160007                    ├──────────────────────┤
        (8 bytes)         │   (Do not use)       │
160000                    │                      │
157777                    ├──────────────────────┤
        (0–56K bytes)      │   LSI–11             │
0                         │   Bus-mapped         │
                          └──────────────────────┘
```

ROM at 170000–173777 (60K–62K bytes)

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- RAM locations 160000 through 160007 (eight bytes) are not available; any attempt to access those locations results in LSI–11 bus accesses.

- The memory configuration above causes PROM socket set A and B addresses to overlap. KXT11–A2 PROMs, required when you use PASDBG for debugging or down-line loading applications, are properly addressed by using that memory configuration. However, no other PROMs may be installed on the SBC–11/21 module.

- Only LSI–11 bus-compatible RAM or ROM/PROM modules can be used for external memory. No memory refresh is provided; RAM modules must either contain static parts or include refresh hardware for dynamic parts.

- Memory (RAM or ROM/PROM) addressing must start at location 0.

- All I/O page addresses, except those assigned to on-board devices, are available for device registers; on-board devices include the two serial line units and the parallel port. You must specify all device interrupt vector addresses used in an application when you edit the system configuration file.

Start/restart addresses

- When configuring the FALCON for MicroPower/Pascal–RSX installation verification or when down-line loading, debugging, or bootstrapping applications, configure the start/restart addresses to 172000/172004.

- When configuring the FALCON for PROM-resident applications, configure the start/restart addresses to 000000/000004.

Traps

- Timeout (NXM trap): Restart address

- SLU1 Break (Console terminal BREAK key): 140

Serial line units

The two serial line units have different hardware priorities. The appropriate hardware priority level must be specified in the device driver prefix file(s)—TTPFXF.MAC for communications lines and DDPFX.MAC for the TU58 DECtape II line.

- Serial line 1 (CONSOLE):

     Base register address: 177560

     Base interrupt vector address: 60

     Hardware priority: 4

- Serial line 2:

     Base register address: 176540

     Base interrupt vector address: 120

     Hardware priority: 5

Parallel I/O ports

- Direction: Port A = input
              Port B = output

- Base register address: 176200

- Base interrupt vector address: 130 for Port B
                                   134 for Port A

- Hardware priority: 5

Real-time clock

- Clock enable/disable: Enable

- Interrupt vector address: 100

- Clock frequency (rate): 60 Hz

- Hardware priority: 6

When applications are bootstrapped from DECtape II or RX02 media, the KXT11–A2 Macro-ODT ROM option must be installed on the FALCON module. In addition, a terminal must be connected to serial line 1. Upon power-up, Macro–ODT displays the @ prompt. Bootstrap your FALCON application by typing one of the following commands:

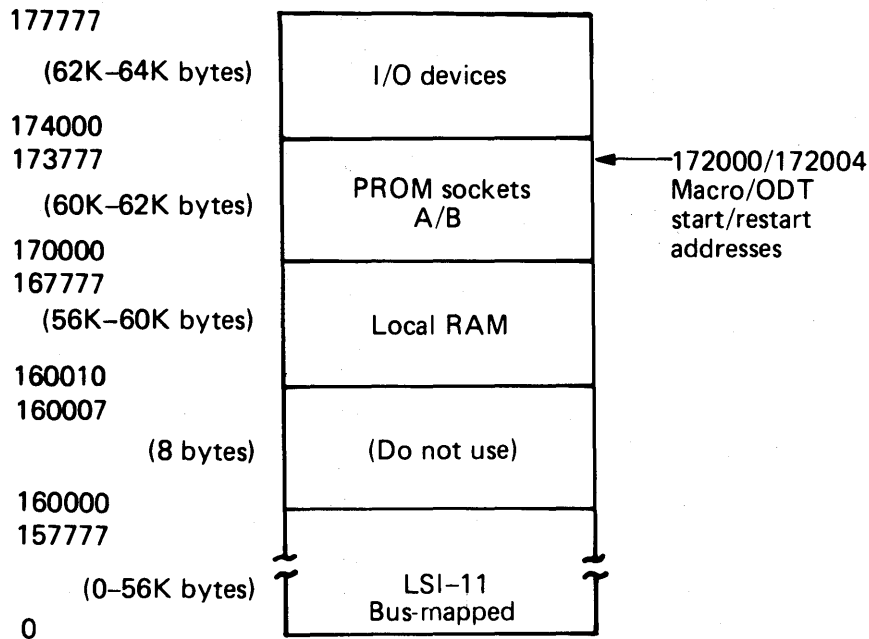| Drive	Unit 0	Unit 1
TU58	DD <RET> or DD0 <RET>	DD1 <RET>
RX02	DY <RET> or DY0 <RET>	DY1 <RET>

1.4.6 FALCON-PLUS Configuration and Use

MicroPower/Pascal-RSX support for the FALCON-PLUS consists of kernel options invoked by the KXT11 or KXJ11 system configuration macro, the terminal driver, and the FALCON-PLUS parallel port (YF) device driver.

MicroPower/Pascal-RSX software supports the standard, factory-shipped FALCON-PLUS hardware configuration—except start/restart addresses—for MicroPower/Pascal-RSX software installation verification and application program development. When developing applications, you can alter certain hardware characteristics, including traps, and device register and interrupt vector addresses for specific target system applications. Whenever you change the factory configuration of any other hardware parameters, edit the system configuration file (CFDFPL.MAC) and the driver prefix files to reflect those changes.

When you use PASDBG for debugging or down-line loading applications, you must install the KXT11-A5 Macro-ODT ROM option on the FALCON-PLUS module in the extra EPROM/PROM/ROM sockets. An external memory module may be required for the application program. For debugging, Map 0 requires external memory, Map 2 can add RAM on board. (After the application has been debugged and loaded into EPROM, the KXT11-A5 ROMs are removed, and the application EPROMs installed.) The KXT11-A5 option contains a system test program—including processor, on-board memory, and on-board I/O device tests—a console-ODT program, and bootstrap programs for DECtape II, RL01, RX02, and RX50 mass-storage devices.

The standard FALCON-PLUS hardware configuration—except start/restart addresses—is required during MicroPower/Pascal-RSX installation verification and application program development. Following application program development, you can change hardware features to meet specific target system requirements. See the *SBC-11/21 Single-Board Computer User's Guide* for complete hardware configuration information. Any changes to the hardware configuration require changes to the system configuration file CFDFPL.MAC and, possibly, to the YFPFX.MAC file. Edit those files as directed in the *MicroPower/Pascal Run-Time Services Manual* and the *MicroPower/Pascal I/O Services Manual*. The following list contains the standard, factory-shipped FALCON-PLUS hardware configuration:

Memory map

```
177777  ┌──────────────────┐
        │   RAM–Reserved   │
        │  for Macro–ODT   │
        │   (128 bytes)    │
177600  ├──────────────────┤
177577  │                  │
        │    Local and     │
        │ LSI–11 Bus-mapped │
        │   I/O devices    │
174000  ├──────────────────┤
173777  │                  │        ◄─── 172000/172004
        │    Socket A      │             Macro/ODT
        │   (4K bytes)     │             start/restart
        │                  │             addresses
164000  ├──────────────────┤
163777  │                  │
        │     LSI–11       │
        │   Bus-mapped     │
160000  ├──────────────────┤
157777  │                  │
        │    Local RAM     │
        │   (8K bytes)     │
140000  ├──────────────────┤
137777  │                  │
        │    Socket B      │
        │   (16K bytes)    │
100000  ├──────────────────┤
077777  │                  │
        ╵ LSI–11 Bus-mapped ╵
0       │   (32K bytes)    │
        └──────────────────┘
```
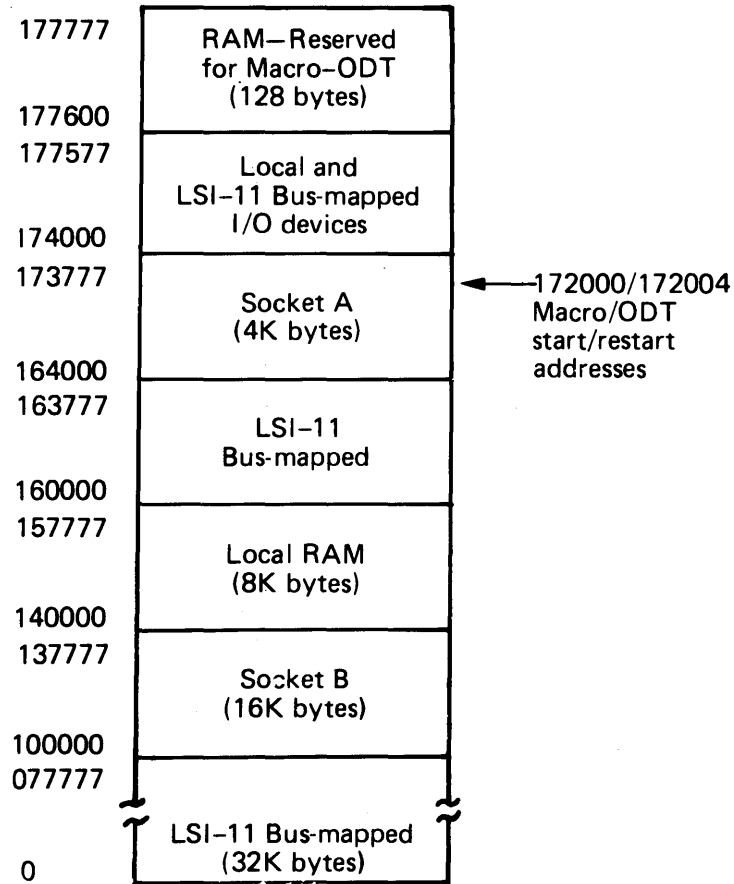
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Note

- Only LSI–11 bus-compatible RAM or ROM/PROM modules may be used for external memory. No memory refresh is provided; RAM modules must either contain static parts or include refresh hardware for dynamic parts.

- Memory (RAM or ROM/PROM) addressing must start at location 0.

- All I/O page addresses, except those assigned to on-board devices, are available for device registers; on-board devices include the two serial line units and the parallel port. You must specify all device interrupt vector addresses used in an application when you edit the system configuration file.

Start/restart addresses

- When configuring the FALCON–PLUS for MicroPower/Pascal–RSX installation verification or when down-line loading, debugging, or bootstrapping applications, configure the start/restart addresses to 172000/172004.

- When configuring the FALCON–PLUS for PROM-resident applications, configure the start/restart addresses to 000000/000004.

Traps

- Timeout (NXM trap): Restart address

- SLU1 Break (Console terminal BREAK key): 140

Serial line units

The two serial line units have different hardware priorities. The appropriate hardware priority level must be specified in the device driver prefix file(s)—XLPFXF.MAC for communications lines and DDPFX.MAC for the TU58 DECtape II line.

- Serial line 1 (CONSOLE):

    Base register address: 177560

    Base interrupt vector address: 60

    Hardware priority: 4

- Serial line 2:

    Base register address: 176540

    Base interrupt vector address: 120

    Hardware priority: 5

Parallel I/O ports

- Direction: Port A = input
                Port B = output

- Base register address: 176200

- Base interrupt vector address: 130 for Port B
                                    134 for Port A

- Hardware priority: 5

Real-time clock

- Clock enable/disable: Enable

- Interrupt vector address: 100

- Clock frequency (rate): 60 Hz

- Hardware priority: 6

When applications are bootstrapped from DECtape II, RL01, RL02, RX02, or RX50 media, the KXT11-A5 Macro-ODT ROM option must be installed on the FALCON-PLUS module. In addition, a terminal must be connected to serial line 1. Upon power-up, Macro-ODT displays the @ prompt. Bootstrap your FALCON-PLUS application by typing one of the following commands:

Drive	Unit 0	Unit 1
TU58	**DD** <RET> or **DD0** <RET>	**DD1** <RET>
RX02	**DY** <RET> or **DY0** <RET>	**DY1** <RET>
RX50	**DU** <RET> or **DU0** <RET>	**DU1** <RET>
RL01 or RL02	**DL** <RET> or **DL0** <RET>	**DL1** <RET>

1.5 Configuring KXT11-CA and KXJ11-CA Single-Board Computers for Installation Verification

The KXT11-CA or KXJ11-CA single-board computer (SBC) can be used stand-alone—that is, no other processor is used in the application—or as a peripheral processor. When used as a peripheral processor, the KXT11-CA or KXJ11-CA resides on the LSI-11 bus as a peripheral device to another processor, or arbiter.

This section describes the stand-alone KXT11-CA and KXJ11-CA hardware configuration required during MicroPower/Pascal-RSX software installation verification. See the appendix for the hardware configuration required for running the peripheral processor sample application programs, the *MicroPower/Pascal Run-Time Services Manual* for configuration macro information, and the *MicroPower/Pascal I/O Services Manual* and hardware documentation supplied with your KXT11-CA or KXJ11-CA hardware for specific applications-related hardware configuration requirements and procedures.

The KXT11-CA and KXJ11-CA have jumper-selected functions and switches that permit you to configure the hardware for specific applications. Hardware parameters not listed in this section can be ignored for installation verification. The functions and locations for jumpers and switches are described in detail in the hardware documentation supplied with your KXT11-CA or KXJ11-CA hardware. Hardware parameters that are factory configured are noted by (F).

- Boot/Self Test Switch: Position 4 (execute ODT firmware)

- Base Address (ID) Switch: Position 0 (stand-alone operation)

- Real-time Clock: 60 Hz (F) or 50 Hz

- SLU1:

    Interrupt: Enable BREAK key interrupts (F)

    Receiver/Transmitter: RS423 (F)

    Baud rate: To match host

    Communications line: Connect to host

- SLU2 Channel B 10-pin connector (Multiprotocol chip):

    Receiver/Transmitter: RS422 (F) or RS423

Note

For the KXT11–CA only, factory configuration is a hybrid consisting of RS423 plus two other jumpers in M40–M39 and M28–M27, which supply RS422 support and which do not conflict with RS423.

Communications line (optional): Connect to VT100/200 terminal in ANSI mode, with baud rate set to 9600.

- Memory Map: Map 0 (F), as follows (for the KXT11–CA only):

```
177777  ┌──────────────────┐
        │                  │
        │    I/O devices   │
174000  │                  │
173777  ├──────────────────┤
        │                  │
        │   Native ROM     │
160000  │                  │
157777  ├──────────────────┤
        │                  │
        │   (Not used)     │
110000  │                  │
107777  ├──────────────────┤
        │  User RAM/ROM    │
        │     sockets      │
        │   (Not used)     │
100000  │                  │
077777  ├──────────────────┤
        │                  │
        │   Local RAM      │
   0    │   (32K bytes)    │
        └──────────────────┘
```
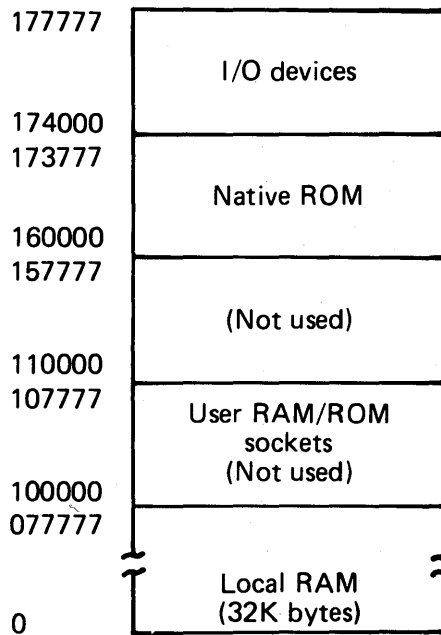
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After configuring the KXT11–CA or KXJ11–CA module to conform to the parameters listed above, install the module in a suitable LSI–11 backplane. Connect the serial line from the host system to SLU1. You can connect a VT100/200 terminal set to a baud rate of 9600 to SLU2 channel B to observe the CARS3 program running during installation verification; however, a terminal is not required for installation verification.

Note the four light-emitting diodes (LEDs) on the KXT11–CA or KXJ11–CA module during power application. When you look at the module from the top edge with the component side of the module facing up, the LEDs should display the following pattern: off, on, off, off. If the display is different, turn off the power and recheck that the Boot/Self Test Switch is set to 4. The hardware documentation supplied with the module contains descriptive information to assist you in analyzing the LED display you have seen.

After your hardware has been configured and the power-on LED check described above completed, you can complete installation verification as described later in this manual.

Chapter 2
Software Installation for Micro/RSX Host Systems

This chapter tells you how to install the MicroPower/Pascal–Micro/RSX software kit on your MicroPDP–11 computer. Before you install this software kit, the Micro/RSX operating system must be installed and working properly. (See the *Micro/RSX Base Kit Installation Guide* for instructions.) In addition, the Micro/RSX Advanced Programmer's Kit and Privileged Programmer's Kit are required.

The MicroPower/Pascal (MP/P) installation takes approximately 20 minutes. Begin by following the instructions in this chapter. After you have followed the procedure in this chapter for installing the first diskette in your distribution kit, follow instructions displayed on your terminal to complete the installation.

A message on your terminal tells you when you have completed the installation.

If you make a mistake or a problem occurs during the installation, see Section 2.1.3.

MicroPower/Pascal–RSX software installation verification is automatically performed during the installation. The verification consists of compiling and building a sample application program. If desired, you can run the application on your target system hardware by following the procedure described in Chapter 4 of this manual. DIGITAL recommends that you run the sample application program on your target system to ensure that the host/target hardware configuration is correct and functional.

Finally, before you can develop MicroPower/Pascal applications on your Micro/RSX host system, you must edit the SYSPARAM.DAT file by adding one command line. The procedure for editing that file is given in Section 2.2.

2.1 Installation

2.1.1 Checking the Software Distribution Kit

The MicroPower/Pascal–Micro/RSX software kit is distributed on seven RX50 floppy diskettes. Each diskette is labeled with the product name (MP/P–Micro/RSX), version number (V2.n), binary or source (BIN or SRC), distribution media type (RX50), and the diskette number (1/7 through 7/7). Check the software box to make sure it contains all seven diskettes.

When you have successfully completed the MicroPower/Pascal–Micro/RSX installation, store the distribution kit in a safe place. Do not modify the contents of the diskettes. In addition, please note the care and handling instructions on the diskette envelopes.

REMEMBER

- Do not open a drive door or remove a diskette from its drive, unless both active drive lights are off and both drives are quiet. If you accidentally open the drive door, see Section 2.1.3.

- Do not turn off the power, unless both active drive lights are off and both drives are quiet. If you accidentally turn off the power, see Section 2.1.3.

- However, turn off the power to both the computer and the terminal when the system is not in use. The operating system and installed software are saved on the fixed disk when the power is off. You do not have to reinstall them when you turn on the power.

- If you remove a diskette from its drive during the installation procedure when you are not specifically asked to do so—for example, to check that it is inserted properly—you must begin the installation again, going back to step 2 in Section 2.1.2.

- Do not press the RESTART button on the MicroPDP–11 if you make an error.

- Replace diskettes in their protective envelopes when the diskettes are not in use.

- When the installation is complete, remove the diskette from the drive, replace all diskettes in their protective envelopes, and store them safely.

2.1.2 Installing the MicroPower/Pascal Software

Before you install the MicroPower/Pascal software, make sure that the terminal is turned on, the MicroPDP–11 is started up, and the Micro/RSX operating system, Advanced Programmer's Kit, and Privileged Programmer's Kit are installed. See the *Micro/RSX Base Kit Installation Guide* if you are not sure about any of those three items.

If you have more than one terminal, you can use any one for the installation.

To install the software, use the following steps:

1. LOG IN to a privileged account. If you have already done so, do not log in again. If you are not sure how to log in, see Section 2.1.4. After you have logged in, return to step 2.

2. INSERT the diskette labeled MP/P (1/7). You can use either drive.

3. TYPE:

   $ @OPTION

4. LOOK at your terminal.

   A menu appears on your terminal. Type **I** and press the RETURN key to indicate that you want to install software.

   From this point, follow instructions from your terminal.

   After MicroPower/Pascal is installed, an installation verification procedure runs automatically to ensure that the software is installed properly. Upon successful completion of the installation procedure, the following message appears on your terminal:

   `Procedure successfully completed.`

Your MicroPower/Pascal software is now fully installed and will be ready for use once you have edited the SYSPARAM.DAT file, as directed in Section 2.2. Be sure to remove the diskette from the drive.

2.1.3 Correcting Possible Errors

This section provides instructions for correcting errors that may occur during the software installation.

In some cases, the installation software can detect when an error has occurred. In those cases, a message on the terminal provides instructions to help you correct the problem.

You may also try to correct problems by retrying the installation with the other drive as described in the following sections. DIGITAL also provides a Micro Development Support Unit telephone service but recommends that you try these procedures before you call the support unit. In most cases, one of the procedures will correct the error and save you the call. Telephone numbers for the support unit (and other information) are listed in the *Micro Development Support* brochure included in your MicroPower/Pascal–Micro/RSX distribution kit.

2.1.3.1 Retrying the Installation

Do not log in again. Do not press the RESTART button on the MicroPDP–11. To retry the installation, type:

$ ●OPTION

When the menu reappears, type **I** and press RETURN to indicate that you want to install software. Make sure that the first diskette is in a drive.

If that fails, retry the installation, using the other drive, as described in the following section.

2.1.3.2 Using the Other Drive and Retrying the Installation

Using the other drive and retrying the installation simply means that if the diskette is in drive 1, you should put it in drive 2; or, if the diskette is in drive 2, you should put it in drive 1.

Then, to retry the installation, type:

$ ●OPTION

When the menu reappears, type **I** and press RETURN to indicate that you want to install software. Make sure that the first diskette is in a drive. Do not log in again. Do not press the RESTART button on the MicroPDP–11.

2.1.3.3 Correcting Other Possible Errors

Condition: The terminal display does not change.

Possible Correction: Type <CTRL/Q> by pressing the CTRL key and holding it down while you press the Q key. If that procedure fails to correct the condition, check to be sure that the terminal is installed properly.

Note

For more information about the terminal and computer setup, see the *MicroPDP–11 System Unpacking and Installation Guide* that came with your hardware.

Condition: Nothing appears on the terminal, or unexpected characters appear on the terminal.

Possible Correction: Make sure the terminal is plugged in and turned on. Make sure the baud rates on both the MicroPDP–11 computer and the terminal are set to the same speed (typically, 9600 bps). Turn off the terminal and then turn on the terminal again. Make sure the correct diskette is inserted properly. Retry the installation as described previously.

Condition: Nothing happens when you turn on the computer. (There should be a low whirring noise when the computer is on.)

Possible Correction: Make sure the terminal is plugged in. Make sure the baud rate on the computer is set to the same speed as the terminal (typically, 9600 bps) and that all the hardware is set up and working properly. Make sure the diskette is inserted properly. Retry the installation beginning with step 1 (logging in) in Section 2.1.2.

Condition: You opened the door to the drive containing the diskette when the active drive light was on, or you removed the diskette from the drive.

Possible Correction: Reinsert the diskette in the drive, close the drive door, and retry the installation as described previously.

Condition: You turned off the power during the installation, or the power failed.

Possible Correction: Remove the diskette from its drive (if a diskette is in one of the drives), turn on the power again, and retry the installation, beginning with step 1 (logging in) in Section 2.1.2.

Condition: You made an error when typing information at the terminal.

Possible Correction: If you typed an incorrect character but have not pressed RETURN at the end of the line, simply press the DELETE key as many times as necessary to delete the line back to the incorrect character. Then, retype the character correctly and continue.

If you have already pressed RETURN, you will get an error message. Simply type the information again, making sure that everything is typed correctly. You can always retype a command line or reenter a response to a question.

Note

Do not press the BACKSPACE key to try to delete characters.

Condition: You inserted the diskette incorrectly.

Possible Correction: The installation software can detect that error. When that occurs, a message appears on the terminal, instructing you to check that the diskette is inserted properly. After you remove the diskette and reinsert it properly, retry the installation as described previously.

Condition: Numerals and an @ sign appear on the terminal.

Possible Correction: An error in the installation procedure has occurred. If a diskette is in one of the drives, remove it from its drive and retry the installation, beginning with step 1 (logging in) in Section 2.1.2.

Condition: One of the following messages appears on your terminal:

```
COP -- Allocation failure -- no contiguous space
COP -- Allocation failure on output file
COP -- Allocation failure -- no space available
```

Possible Correction: Not enough space is available on the fixed disk to install the MicroPower/Pascal software. You will have to delete files until there is sufficient space to install it. To find out how much space is available on the fixed disk, type **DIR/FREE** in response to the system prompt ($).

Note

For detailed instructions on properly inserting diskettes in the drives, see the *Micro/RSX Base Kit Installation Guide*.

2.1.4 Logging In to Micro/RSX

Logging in gives you access to the system. The system identifies the people who have access to it—its users—by means of accounts.

Before you log in, look at your terminal. If the terminal and computer are on and the operating system is properly installed, you see a dollar sign ($). That is the system prompt that indicates that the operating system is ready to accept commands that you type.

The following example of how to log in uses a name and password for a privileged account that is already set up when the Micro/RSX operating system is installed. If your system has been installed for some time, the name and password for this account may have been changed. See your system manager.

To log in, type **LOGIN** and press RETURN.

In response to that command, the system asks for your account or name. Type **MICRO** and press RETURN.

Finally, the system asks for your password. Type **RSX** and press RETURN. Note that the password does not appear on your terminal when you type it.

```
$ LOGIN
Account or name: MICRO
Password:
```

The system allows one minute for logging in. If you do not complete the log-in sequence within one minute, the message

```
HEL -- Timeout on response
```

appears on your terminal. Do not be concerned. Begin the log-in sequence again by typing **LOGIN** and pressing RETURN.

When you have logged in, you see several messages on the terminal, including the following:

```
Welcome to Micro/RSX
    Version 3.n
```

The messages are followed by the system prompt ($). Now you are ready to use the system or to install any optional software that you may have purchased.

See the *Introduction to Micro/RSX* for information about the log-in procedure. See the *Micro/RSX System Manager's Guide* for information about user accounts and managing a Micro/RSX system.

2.2 Editing SYSPARAM.DAT

Before you can use MicroPower/Pascal for developing your applications, you must edit [1,2]SYSPARAM.DAT. Add the following command line:

```
STARTFILE=SY:[1,2]MPSTART.CMD
```

Once you have edited SYSPARAM.DAT, each time you bootstrap the Micro/RSX host system, the system will execute MPSTART.CMD and establish the necessary default system parameters.

Chapter 3

Software Installation for RSX–11M/M–PLUS Systems

This chapter describes the procedure for MicroPower/Pascal–RSX software installation and verification on your RSX–11M/M–PLUS host system. The procedure requires little involvement on your part other than setting up proper conditions and responding to queries and prompts. See Chapter 1 for system hardware requirements prior to installation and installation verification. Respond to yes or no queries with Y or N. If the procedure fails, a message will inform you of the error.

3.1 Distribution Media

The MicroPower/Pascal–RSX software kit is distributed on one volume as follows:

- RL02 disk

- DOS formatted magnetic tape 9-track 1600 bpi (PE)

Each volume listed above is labeled with the product name (MP/P–RSX), version number, binary or source (BIN or SRC), and the distribution medium type (RL02 or PE).

3.2 Installation Procedure for RSX–11M/M–PLUS Host Systems

MicroPower/Pascal–RSX software installation is an automatic procedure using command files to direct the installation and verification processes. The automatic installation procedure copies the MicroPower/Pascal–RSX software from your distribution medium to the specified directory and installs the MicroPower/Pascal–RSX tasks in the host RSX system. At the completion of the installation procedure, MicroPower/Pascal–RSX software is ready for use. The optional installation verification procedure involves using the MicroPower/Pascal software to build, down-line load, and run a test program on a target processor. Although optional, installation verification is recommended. Successful execution of the test program ensures that MicroPower/Pascal software is correctly installed on the host system and that the host/target communication is properly configured. You will be queried at the end of the installation phase as to whether you wish to continue with the verification phase. You may decide to exit and run the verification procedure at a later time. The MicroPower/Pascal installation takes approximately 30 minutes. Install the MicroPower/Pascal–RSX software kit as directed in the following steps:

1. Log in to the system under a privileged account.

2. Place the distribution kit volume in the appropriate drive. Mount the volume, using the appropriate drive name and unit number (dev:).

   - For disks on RSX–11M/M–PLUS systems, type the following:

     ```
     >MOU dev:MPPRSX
     >PIP [1,2]/NV=dev:[2,10]MPINS.CMD
     ```

   - For magnetic tapes on RSX–11M–PLUS systems, type the following:

     ```
     >MOU/FOR/DENS=n dev:
     >FLX [1,2]/RS=dev:[1,2]MPINS.CMD/DO
     ```

     where n = 800 for 800 bpi tapes and n = 1600 for 1600 bpi tapes.

   - For magnetic tapes on RSX–11M systems, type the following:

     ```
     >ALL dev:
     >FLX [1,2]/RS=dev:[1,2]MPINS.CMD/DO/DNS:n
     ```

     where n = 800 for 800 bpi tapes and n = 1600 for 1600 bpi tapes.

3. Type the following command to initiate the automatic installation procedure:

   ```
   >@[1,2]MPINS
   ```

4. When installation is complete, dismount the device on which you placed the distribution medium by typing the appropriate command:

   - For disks or magnetic tapes on RSX–11M/M–PLUS systems, type the following:

     ```
     >DMO dev:
     ```

   - For magnetic tapes on RSX–11M systems, type the following:

     ```
     >DEA dev:
     ```

5. Remove the medium and store it in a safe place.

The installation verification procedure takes approximately 15 minutes to complete. The time to install the MicroPower/Pascal software varies, depending on whether the default directory is chosen, new task names are chosen, and system load.

Once the automatic installation procedure is invoked, detailed instructions for installing the software and building the test program are displayed. Follow the displayed instructions carefully.

If you choose to invoke the verification procedure immediately after installation, follow the steps outlined in Section 4.2. If you choose to stop, answer **NO** to the dialog question, and the system prompt will return.

3.2.1 Modify System Startup Command File

Modify the system startup command file to include the following command:

@sysdev:[1,2]MPSTART

where sysdev represents the system directory specification.

The system startup command file may also be modified to include the following command for each line reserved for PASDBG use. This command sets terminal-line characteristics required by PASDBG:

SET /SLAVE=TTnn:

where TTnn: is the terminal line for PASDBG use.

3.3 Sample Installation Procedure

```
MOU DL1:MPPRSX
>PIP [1,2]/NV=DL1:[2,10]MPINS.CMD
>@[1,2]MPINS

***********************************************************************
  MicroPower Installation
***********************************************************************
        Welcome to MicroPower/Pascal-RSX (MP/P-RSX) Version 2.4.

        You will be guided through the installation procedure  by a
        series  of  instructions  and  questions.  Respond  to  the
        installation dialogue as follows:

        1)  Type a response to questions.

                To enter a default response, press  only the RETURN
                key.  The default answer is displayed within square
                brackets ([ ]).

        2)  Press the RETURN key to go on to the next frame.

                You can exit from  the  installation  procedure  by
                typing NO to this prompt before pressing the RETURN
                key.

        Press the RETURN key when you are ready to continue.
***********************************************************************
  MicroPower Installation
***********************************************************************
        This  installation  procedure   consists   of  two   phases:

                Phase 1: Copies  MP/P-RSX files to an  RSX directory
                         of your choice.

                Phase 2: Installs  the  MP/P-RSX  tasks on  the host
                         RSX  system  and  creates   the   MP/P-RSX
                         configuration file, RSXDEF.CMD.

        You can skip phase 1 if you do not want to copy the MP/P-RSX
        files.  You should  do  so  only if you have  already copied
        the  files  or  if  you  have  made  a  back-up copy  of the
        distribution media.
```

```
          Press the RETURN key when you are ready to continue.
*************************************************************************
  MicroPower Installation
*************************************************************************

          If you answer YES to the next question, you will skip
          phase 1.

          Do you want to skip phase 1 [NO] ?
*************************************************************************
  MicroPower Installation - Phase 1
*************************************************************************

          If you have not already done so, put the MP/P-RSX kit  on  the
          proper device, and place the device on line.   You  must do  so
          before answering the next question.

          Device specification of MP/P kit (ddu:) ? DL1:
*************************************************************************
  MicroPower Installation - Phase 1
*************************************************************************

          All  MicroPower/Pascal  files  will  be copied to  the
          directory that you specify in the next  question.   In
          addition, all  MicroPower/Pascal  task images  will be
          copied to the  system  directory  and  installed  from
          there.

          Directory specification must be one of the following:

                  a) A  physical  or logical  device plus  a UFD
                  b) A logical name  denoting a device and a UFD
                  c) A UFD  or a logical  name  denoting  a  UFD

          Enter directory for MicroPower files [LB:[2,10]] ? DUO:[2,10]
*************************************************************************
  MicroPower Installation - Phase 1
*************************************************************************

          *** WARNING - DUO:[2,10] is not empty! ***

          The  directory specified  in  your last  answer already
          contains files.  These files can be both MP/P-RSX files
          and other files not related to MP/P-RSX.  You  will  be
          given the  choice of discontinuing  the installation or
          continuing it.  If you choose  to continue, you will be
          given  the  option  to  delete  existing  files  in  the
          directory.

          Do you want to continue [YES] ?
*************************************************************************
  MicroPower Installation - Phase 1
*************************************************************************

          If you answer YES to the following question, all
          files will be deleted from DUO:[2,10],  not just
          MP/P-RSX files..

          Delete existing files from directory [NO] ? YES

          Deleting all files from DUO:[2,10].  This will
          take about 3 minutes.  Please wait.
```

```
        Copying  MP/P  files to DUO:[2,10].  This will
        take about 3 minutes.  Please wait.

**************************************************************************
  MicroPower Installation - Phase 2
**************************************************************************

        During this phase, the MP/P-RSX tasks will be installed.
        The following tasks are currently installed:

        ...mpp ...mrg ...mib ...cpd ...pdb

        Do you want to exit [NO] ?
        Remove existing MP/P-RSX tasks [YES] ?

        Removing MP/P tasks.

**************************************************************************
  MicroPower Installation - Phase 2
**************************************************************************

        The MP/P-RSX tasks will now be installed with the
        following names:

        Task                          Name

        MERGE                         ...MRG
        RELOC                         ...RLC
        MIB                           ...MIB
        COPYB                         ...CPB
        PASDBG                        ...PDB
        PASDBG slave task             ...BRK
        Pascal compiler               ...MPP

        NOTE: The PASDBG slave task (...BRK) must never
              be invoked by the user.

        This will take about 1 minute.  Please wait.

**************************************************************************
  MicroPower Installation - Phase 2
**************************************************************************

        The MP/P-RSX tasks have  been successfully installed.

        The system configuration file, RSXDEF.CMD will now be
        constructed.  After  completion of  the installation
        process, the file will be found in LB:[1,1].

        The  startup file  MPSTART.CMD has  been  placed  in
        LB:[1,2].  Enter the following command in STARTUP.CMD
        before attempting to use the MP/P-RSX software:

              @LB:[1,2]MPSTART


        Press the RETURN key when you are ready to continue.
**************************************************************************
  MicroPower Installation - Completion
**************************************************************************

        The MP/P-RSX  software has been successfully installed.

        You now have the choice of continuing with the MP/P-RSX
        verification procedure or exiting from it.
```

```
        Do you want to verify the installation [YES] ?
***********************************************************************
  MicroPower Installation Verification
***********************************************************************

        Welcome to MicroPower/Pascal-RSX (MP/P-RSX) Version 2.4.

        MP/P-RSX is installed on  your  working disk  and your
        system  is  booted.   The  installation   verification
        procedure, which consists of building and running  the
        test program, now  begins.  At the  completion  of the
        build procedure, you will  be  instructed  to run  the
        test program (CARS3).

        You  can  exit  from  this  installation  verification
        procedure at any time by typing NO  to  the  following
        prompt before pressing the RETURN key.

            Press the RETURN key when you are ready to continue.


        Press the RETURN key when you are ready to continue.
***********************************************************************
  Building Test Program
***********************************************************************

        The  test  program  build  procedure  is  performed   in
        2 steps.

        First  the  kernel  for  your target processor is built,
        then  the  test  program  is  compiled and added to  the
        kernel.

        Your  target processor  can be  one of  five types.  The
        next frame will ask you for the type of target processor
        you will build the kernel for.

        Press the RETURN key when you are ready to continue.
***********************************************************************
  Building Test Program
***********************************************************************

        Indicate the target processor  you will  build  the
        kernel for by typing the corresponding number.

          1.  Any LSI-11 microcomputer (unmapped)

          2.  FALCON

          3.  FALCON-PLUS

          4.  KXT11-CA (stand-alone)

          5.  CMR21

        The next frame will ask you to confirm your choice.

        Enter the appropriate number (1-5), and press the RETURN key.
***********************************************************************
  Building Test Program
***********************************************************************

        You have indicated that your target is an LSI-11 microcomputer.
        LSI-11 microcomputers include the following:  LSI-11, LSI-11/2,
        LSI-11/23, LSI-11/23-PLUS, LSI-11/53, and LSI-11/73.
```

```
      Please confirm your choice by answering the following question.
      Answer YES  to indicate confirmation.   Answer NO  to return to
      the previous frame.

      Is your target an LSI-11 ?

      Enter YES or NO, and press the RETURN key. YES
***********************************************************************
  Building Test Program
***********************************************************************

      The test program is now being built.  The file will be
      called CARS3.MIM and will be located in the MicroPower
      directory.

      This will take about 7 minutes.  Please wait.


***********************************************************************
  Concluding Verification
***********************************************************************

      Your  next  step is to load  the test program  (CARS3.MIM) into
      the target hardware.

      The next three frames contain commands that you type and system
      messages  that appear when you are running  the  test  program.
      Before continuing, be prepared to make note of the commands you
      will be required to enter.


      Press the RETURN key when you are ready to continue.
***********************************************************************
  Concluding Verification
***********************************************************************

      Before running the Debugger (PDB),  you will  have to properly
      configure the serial line to your target. The following set of
      commands are needed for this purpose:

      >set /slave= ttnn:
      >all ttnn:
      >asn ttnn:=td:

      Press the RETURN key when you are ready to continue.
***********************************************************************
  Concluding Verification
***********************************************************************

      To load and run the application, the following commands are used:

      >pdb
      PASDBG>load cars3
      %PASDBG-I-BOOT1    LOADING BOOTSTRAP
      %PASDBG-I-BOOT2    LOADING USER IMAGE.  PLEASE WAIT...
      PASDBG>go

      where capital letters denote computer output and lowercase
      letters represent your input.

      Press the RETURN key when you are ready to continue.
```

```
************************************************************************
  Concluding Verification
************************************************************************

        On entering "go" in response to the PASDBG> prompt, you
        should see:

          [TARGET EXECUTION RESUMED - PRESS RETURN TO STOP TARGET]

        Any other message indicates that the hardware has not been
        set up correctly.  If this happens, check your hardware,
        restart the debugger by typing PDB, and try to down-line load
        the test program into the target again.

        Press the RETURN key when you are ready to continue.
************************************************************************
  Confirm Hardware
************************************************************************

        Before down-line loading the test program, confirm that
        your hardware is set up as described in the next frame.
        The installation verification procedure will fail if your
        hardware is not set up according to the following diagram.

        Press the RETURN key when you are ready to continue.
************************************************************************
  Confirm Hardware
************************************************************************

          ----------------------            ------------------
          |    HOST SYSTEM     |  serial lines   |   Optional    |
          |* any PDP-11 with   |   to terminals  |TARGET terminal|
          |  memory management |-------    / \   | (e.g., VT100) |
          |  (e.g., 11/23)     |        |<-   \  ------------------
          |* 128 KB memory     |        |      -------------->|
          |* line clock        |        |         CSR=176500  |
          ----------------------  ----------------- vector=300 |
                        |        | HOST console | ----------------------
                        |        | terminal     | |   TARGET  SYSTEM   |
                        |        | (e.g., VT100) | |                    |
          HOST-TARGET   |        ----------------- |* LSI-11            |
          serial line   |            CSR=177560  |                    |
                        ---------------vector=60---* 32 KB RAM         |
          MAKE SURE THAT:                        ----------------------
        * Host/Target link has same    * Serial lines are hooked up
          baud rates on both ends        to DL11 interfaces on TARGET
                                         and any serial line on HOST

        Press the RETURN key when you are ready to continue.
************************************************************************
  Concluding Verification
************************************************************************

        The verification procedure will now terminate to allow you
        to make the necessary changes to the hardware and load the
        test program into the target.

        Press the RETURN key when you are ready to continue.
```
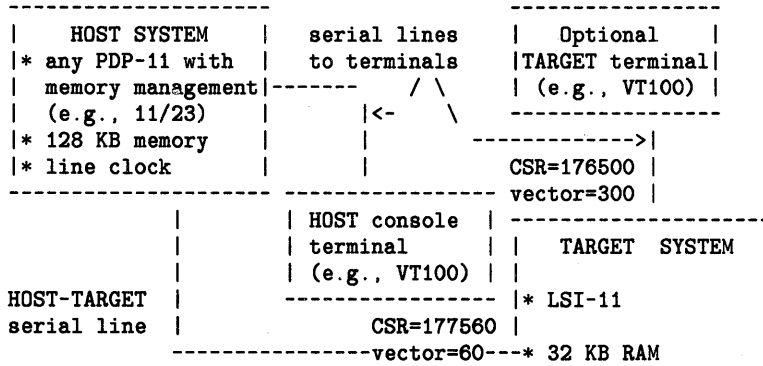
Chapter 4

Installation Verification Procedure

The automatic installation verification builds an application program from a file named CARS3.PAS included in your kit. You will be prompted to specify the appropriate target for which the kernel is to be built. Successful execution of the test program verifies a successful installation of your MicroPower/Pascal software and correct host/target communication setup. The program is identical to CARS3 described in the *Introduction to MicroPower/Pascal*. (See the appendix for the peripheral processor verification procedure.)

4.1 Allocating the Host/Target Communication Line

Type the following command to allocate the MicroPower/Pascal–RSX dedicated serial line for your use and assign it to the logical name required by the debugger:

```
>ALL TTxx:=TD:
```

where TTxx: is the line dedicated for PASDBG use. TD: is a logical name recognized by PASDBG.

4.2 Running the Test Program

Installation verification may be automatically invoked by the installation procedure. In addition, you can run the verification procedure independently at a later time by typing the following commands at the system prompt:

1. $SET DEFAULT DU0:[MPPKIT]

    where [MPPKIT] is the directory in which MicroPower/Pascal–Micro/RSX is installed.

    (Micro/RSX users)

    or

    > SET /UIC=[g,m]

    where [g,m] is the directory in which MicroPower/Pascal–RSX is installed.

    (RSX–11M/M–PLUS users)

2. > **ASN dev:=SY:**

   where dev: is the device containing the directory just specified.

3. > **@MPVFY**

   to invoke the Installation Verification command file.

Note

Host and target hardware must be configured as stated in Chapter 1 before installation verification can be completed.

Run the test program as directed in the following steps:

1. Turn on the target system.

2. At the system prompt, run the symbolic debugger (PASDBG).

   Type the following command:

   >PDB

   PASDBG responds with the following messages and prompt:

   ```
   PASDBG Vxx.xx
   PASDBG-I-NODSM, No DSM, target not yet loaded
   PASDBG>
   ```

3. Down-line load the test program into the target system by typing the following command:

   PASDBG>LOAD CARS3

   The system prints messages similar to the following and the PASDBG listed prompt:

   ```
   %PASDBG-I-BOOT1    Loading Bootstrap
   %PASDBG-I-BOOT2    Loading User Image.  Please wait...

   Target stopped at physical (00001554), virtual (001554) : JMP @#5676
   Executing KERNEL code
   No process set, KERNEL mapping in effect

   PASDBG>
   ```

Note

The baud rate configured for serial I/O communications between the host and target system determines the time required for completing this step. If the baud rate is configured for 9600 bps, this step will be completed in approximately 5 minutes.

Note

If either of the two previous steps results in an error, see the *MicroPower/Pascal-RSX/VMS Messages Manual* for an explanation and recovery procedures. The most likely source of error is that the host/target system hardware is not configured correctly.

4. Start program execution by typing the following command:

   PASDBG>GO RET

The following message indicates that the program has started:

[Target execution resumed -- press [RET] to stop target]

If you do not have a terminal attached to your target, the following message is displayed instead:

MEMORY_FAULT EXCEPTION, BUS ERROR

Either message indicates a successful installation verification.

Note

If PASDBG responds with a message, consult the *MicroPower/Pascal-RSX/VMS Messages Manual* for an explanation and recovery procedures.

You can halt the test program and exit PASDBG. To halt the test program, press RETURN.

Messages similar to the following are displayed, followed by the PASDBG prompt:

```
Target stopped at physical (00017232), virtual (017232) : BR 17272
Executing KERNEL code
No process set, KERNEL mapping in effect
```

PASDBG>

Exit from PASDBG by typing the following command:

PASDBG>**EXIT**

If you stop the target system by using the RETURN key as stated above, you can reinitialize and restart the target again by typing the following command:

PASDBG>**INITIALIZE/RESTART**

Installation verification is completed, and MicroPower/Pascal is ready for use on your system. You can inspect the command file that builds the test program as an aid to understanding the process of building applications. The following command files vary according to the target processor for which the application is built:

Target	File name
LSI–11 (unmapped)	KRDUNM.CMD
FALCON	KRDFAL.CMD
FALCON–PLUS	KRDFPL.CMD
KXT11–CA (stand-alone)	KRDKTC.CMD
KXJ11–CA (stand-alone)	KRDKJU.CMD

Note

MPBUILD, a supplied indirect command procedure, automates much of the process of building applications. MPBUILD directs the execution of the build utilities MERGE, RELOC, and MIB. For building most applications, DIGITAL suggests that you use MPBUILD. Appendix B of the *MicroPower/Pascal-RSX/VMS System User's Guide* contains detailed information on running MPBUILD.

Appendix

Running the Sample Peripheral Processor Application

This appendix describes the steps you perform in order to run the sample peripheral processor application. This application demonstrates, with debugged and running programs, that the arbiter and KXT11–CA or KXJ11–CA are working properly and can communicate in a peripheral processor environment. The application also demonstrates the techniques of peripheral processing. The application consists of two programs that must be built on an RSX–11M or RSX–11M–PLUS system. The major steps include preparing the host system, configuring the application hardware, building the arbiter and peripheral processor application programs, and running the application. When the application is being run, the arbiter and peripheral processor VT100/200 terminals are placed next to each other, giving the illusion that a billiard ball is bouncing off banks of an elongated table spread over both screens. The PPVFY.CMD command procedure interactively guides you through the process of building, down-line loading, and executing the application programs. The success of this procedure depends on correctly configuring the required hardware. If the configuration directions provided below are followed literally, the software aspect of the application will run smoothly.

## A.1 The Sample Peripheral Processor Application Environment

This peripheral processor application environment consists of three processors, each simultaneously running separate programs. Communication between processors is established by hardware, as shown in Figure A–1. The host system runs PASDBG under the host operating system (RSX–11). PASDBG allows you to down-line load the application programs into each target processor (arbiter and peripheral processor) and control starting and running the programs. The arbiter can consist of any target processor listed in Chapter 1. Additional arbiter hardware considerations are listed in Section A.3. The peripheral processor consists of the KXT11–CA or KXJ11–CA single-board computer, configured as described in Section A.4. Both the arbiter and peripheral processor programs are written in MicroPower/Pascal.

A.2 Preparing the Host System

The host system hardware requirements for running the sample peripheral processor application include the requirements described in Chapter 1. The host system also requires an additional serial port and cable, which must be added for down-line loading and communications between the host system and the peripheral processor. The required characteristics of that line are as follows:

Line type: Asynchronous, RS423

Baud rate: Equal to KXT11–CA or KXJ11–CA SLU1 (console) serial line unit speed

Serial data parameters: Eight data bits, no parity, one stop bit

Figure A–1: Sample Peripheral Processor System Environment
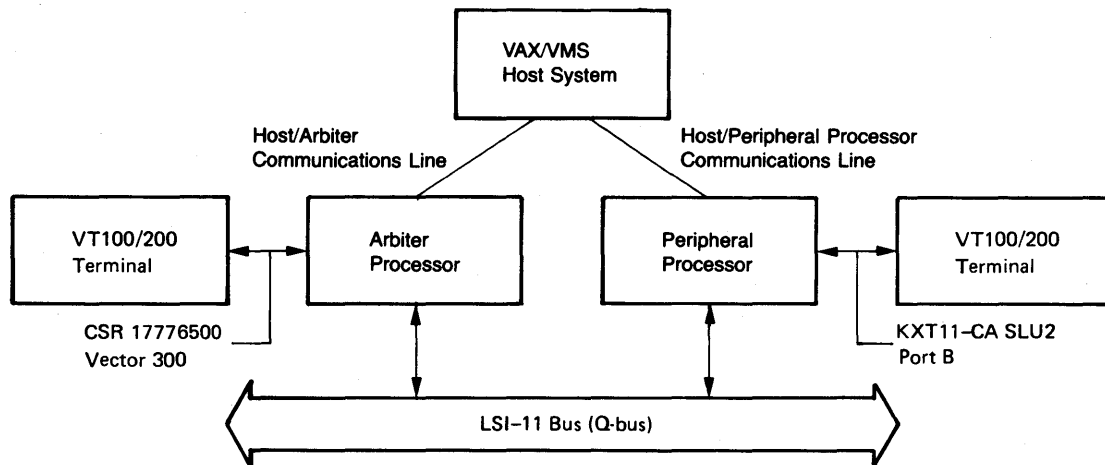
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A.3 Arbiter System Hardware Requirements

Configure the arbiter hardware as described for installation verification on a target system (see Chapter 1). The arbiter processor can consist of any of the target processors listed in Chapter 1, except for the FALCON and FALCON–PLUS, which cannot run the arbiter sample application. In addition, observe the following:

• Include 32K bytes RAM (minimum) for arbiter memory.

• Include two serial lines, as follows:

   1. Console serial line—for communications with the host system, as directed for installation verification in Chapter 1.

   2. Terminal serial line—connected to a VT100/200 terminal for display of output from the peripheral processor application programs. Configure the terminal and arbiter serial line unit parameters to match. Configure the terminal's serial line unit CSR and vector addresses to 176500 and 300, respectively. Disable the AUTO WRAP feature of this VT100/200 terminal. Set terminal to ANSI mode and set the baud rate to 9600.

- Do not configure I/O devices to reside at bus addresses 17760100 to 17760137; the peripheral processor hardware uses those addresses.

A.4 Configuring the KXT11-CA or KXJ11-CA Hardware

This section describes the required hardware configuration for running the peripheral processor sample programs. See the *MicroPower/Pascal Run-Time Services Manual*, the *MicroPower/Pascal I/O Services Manual*, and hardware documentation supplied with your KXT11-CA or KXJ11-CA hardware for specific applications-related hardware configuration requirements and procedures.

The KXT11-CA and KXJ11-CA have jumper-selected functions and switches that permit you to configure the hardware for specific applications. Hardware parameters not listed in this section can be ignored for installation verification. The functions and locations for jumpers and switches are described in detail in the hardware documentation supplied with your KXT11-CA or KXJ11-CA hardware. Hardware parameters that are factory configured are noted by (F).

Boot/Self Test Switch: Position 4 (execute ODT firmware)

Base Address High/Low Switch: Removed = Low Range (F) (KXT11-CA); Installed = Low Range (F) (KXJ11-CA)

Base Address (ID) Switch: Position 2

SLU1:

    Interrupt: Enable BREAK key interrupts (F)

    Receiver/Transmitter: RS423 (F)

    Baud rate: Hardware controlled (F), rate matches host (F: 9600 baud)

    Communications line: Connect to host

SLU2 Channel B 10-pin connector (Multiprotocol chip):
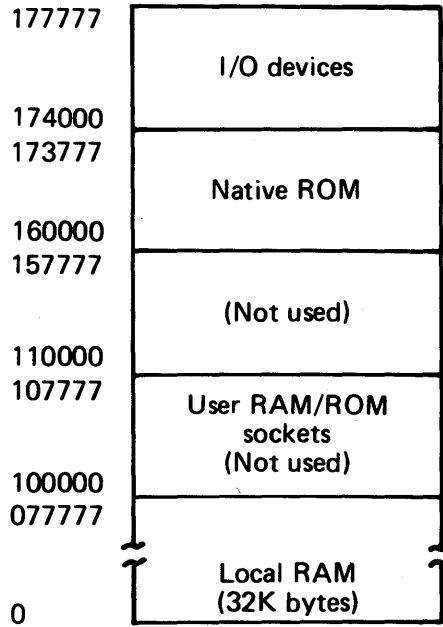
    Receiver/Transmitter: RS423 (F)

Note

For the KXT11-CA only, factory configuration is a hybrid consisting of RS423 plus two other jumpers in M40-M39 and M28-M27, which supply RS422 support and which do not conflict with RS423.

Communications line: Connect to VT100/200 terminal (disable terminal's WRAP AROUND feature; set terminal to ANSI mode and set terminal's baud rate to 9600)

Memory Map: Map 0, as follows (for KXT11-CA only):

```
177777  ┌──────────────────┐
        │                  │
        │   I/O devices    │
        │                  │
174000  ├──────────────────┤
173777  │                  │
        │                  │
        │   Native ROM     │
        │                  │
160000  ├──────────────────┤
157777  │                  │
        │                  │
        │   (Not used)     │
        │                  │
110000  ├──────────────────┤
107777  │  User RAM/ROM    │
        │    sockets       │
        │                  │
        │   (Not used)     │
100000  ├──────────────────┤
077777  ╵                  ╵
        ╷                  ╷
        │   Local RAM      │
0       │   (32K bytes)    │
        └──────────────────┘
```

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KXJ11-CA only: For a board later than etch revision F1, configure the board so that the J-11 processor does not request a Q-bus grant for the bus lock instructions (TSTSET, WRTLCK, and ASRB). This action disables both the Q-bus lock capability and DMA bus timeouts for those instructions.

After configuring the KXT11-CA or KXJ11-CA module to conform to the parameters listed above, install the module in the LSI-11 backplane as directed in the hardware documentation supplied with your module. Connect a serial line from the host system to SLU1. (See the hardware manual for recommended cables.) Connect a VT100/200 terminal to SLU2 channel B to observe the sample program when it is started (Section A.5).

Place the application's two VT100/200 terminals next to each other; place the arbiter's VT100/200 to the left of the peripheral processor's VT100/200. Set up both terminals for ANSI mode, with WRAP AROUND set to off.

Turn on the power. Watch the four light-emitting diodes (LEDs) on the module during power application. When you look at the module from the top edge with the component side of the module facing up, the LEDs should display the following pattern: off, on, off, off. If the display is different, turn off the power and recheck that the Boot/Self Test Switch is set to 4. The hardware documentation supplied with the module contains descriptive information to assist you in analyzing the LED display you have seen. Check the arbiter processor to be sure that it is halted by verifying that the RUN light on the backplane is off. If the arbiter processor is not halted, place the backplane HALT switch momentarily into the halted position and then place it into the RUN position.

A.5 Building the Arbiter and Peripheral Processor Applications

Your MicroPower/Pascal–RSX distribution kit contains three files that are used only when building the sample application programs:

File	Description
PPVFY.CMD	Builds and runs the arbiter application program
ARBVFY.PAS	Arbiter application program source
IOPVFY.PAS	Peripheral processor application program source

Build and run the programs by typing the following command:

>**@MPO:[n,n]PPVFY** RET

where [n,n] is the UFD where the MicroPower/Pascal files reside. Answer the numbered questions as follows:

1. Do you want the verbose form of the dialogue [Y,N D:N] ?

   If you answer Y, each succeeding question will be preceded with explanatory comments. If you answer N or just press RETURN, no explanatory comments will be printed.

2. Do you just want to load and run the programs [Y,N D:N] ?

   This question is asked only if the PPVFY procedure has detected all the PPVFY programs (ARBVFY.(MIM,DBG) and IOPVFY.(MIM,DBG)) in your default directory. If you answer Y, question 4 will not be asked, and the programs will not be built. If you answer N or just press RETURN, the programs will be built.

3. Do you want to keep the files [Y,N D:N] ?

   The PPVFY procedure will, during the build step, generate several files that may be of use after the PPVFY procedure has completed. Those files include build command files, PASDBG port selection command files, and a MicroPower/Pascal kernel configuration file. Normally those files will be deleted after they are used, but if you answer Y, the files will be kept in your default directory. If you answer N or just press RETURN, the files will be deleted, even if they were not created by this run of the PPVFY procedure. No matter how you answer this question, PPVFY will never delete the PPVFY programs (ARBVFY.(MIM,DBG) and IOPVFY.(MIM,DBG)).

4. Do you want to load and run the programs [Y,N D:N] ?

   This question is asked only if you answered N to question 2 or if it was not asked. If you answer N, questions 5 and 6 will be bypassed, and the PPVFY programs will not be loaded and run.

5. Enter the arbiter port TT number:

   This question is asked only if the file ARB.CMD is not in your default directory. Answer with the TT number of the port connected to the ARBITER/HOST line.

6. Is this a KXT11–CA or a KXJ11–CA?

7. Enter the KXT11–CA or KXJ11–CA port TT number:

This question is asked only if the file IOP.CMD is not in your default directory. Answer with the TT number of the port connected to the PERIPHERAL PROCESSOR/HOST line.

Following the command file execution, the application program files ARBVFY.MIM, ARBVFY.DBG, IOPVFY.MIM, and IOPVFY.DBG should be present in your default directory. Both application programs should now be running. The displays on both VT100/200 terminals should give the illusion of a billiard ball moving over a 2-screen billiard table.

If you elected to save the files generated by this procedure (you answered Y to question 3), you may use IOP.CMD and ARB.CMD to switch between the KXT11–CA or KXJ11–CA and the arbiter when using PASDBG. You may use IOPVFY.(CMD,PAS) and ARBVFY.(CMD,PAS) as models for your peripheral processor applications.

HOW TO ORDER

ADDITIONAL DOCUMENTATION

From	Call	Write
Alaska, Hawaii, or New Hampshire	603–884–6660	Digital Equipment Corporation
Rest of U.S.A. and Puerto Rico*	800–258–1710	P.O. Box CS2008 Nashua, NH 03061

* Prepaid orders from Puerto Rico must be placed with DIGITAL's local subsidiary (809–754–7575)

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Canada	800–267–6219 (for software documentation) 613–592–5111 (for hardware documentation)	Digital Equipment of Canada Ltd. 100 Herzberg Road Kanata, Ontario, Canada K2K 2A6 Attn: Direct Order desk
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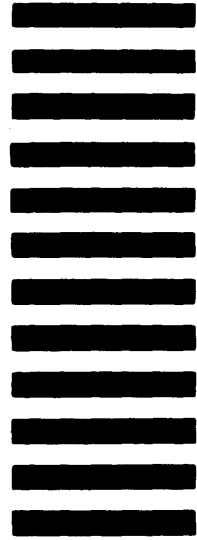   or Country