OS-9® for MTX Board Guide

Version 4.7
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Chapter 1: Installing and Configuring OS-9®

This chapter describes installing and configuring OS-9® on the Motorola MTX 603, 604, and 604-070 target boards. It includes the following sections:

- Development Environment Overview
- Requirements and Compatibility
- Target Hardware Setup
- Connecting the Target to the Host
- Building the OS-9 ROM Image
- Transferring the ROM Image to the Target
- Preliminary Testing
- Creating a Startup File
- Optional Procedures
Figure 1-1 shows a typical development environment for the MTX board. The components shown include the minimum required to enable OS-9 to run on the board.
Requirements and Compatibility

Host Hardware Requirements (PC Compatible)

Your host PC must have the following to run Microware OS-9 for PowerPC:

- Windows 95, 98, ME, 2000, or NT
- 300-400 MB of free disk space (an additional 235MB of free disk space is required to run PersonalJava for OS-9)
- Ethernet network card
- 32MB of RAM
- one free serial port

Host Software Requirements (PC Compatible)

Your host PC must have the following applications:

- a terminal emulation program (such as Hyperterminal, which comes with Microsoft Windows).
- `TFTPserverPro` server application for downloading the OS-9 ROM image to the target.

This application is included with Microware OS-9 for PowerPC and is loaded onto your host PC during installation.
Target Hardware Requirements

Your target board requires the following hardware:

- enclosure or chassis with power supply
- an RS-232 null modem serial cable
- disk drives
Target Hardware Setup

This section describes any switch settings that must be made on the target board.

The jumper settings for Flash must be modified for the MTX target board. When programming the Flash system, you must have the Flash bank B (1MB) area enabled. This enables programming of the Flash bank A (4MB or 8MB) section.

Note
Refer to your Motorola documentation for information on hardware preparation and installation, operating instructions, and functional descriptions prior to installing and configuring OS-9.

Figure 1-2 shows the MTX switches, headers, connectors, fuses, and LEDs. Figure 1-3 shows the Flash bank jumper setting configurations.
Figure 1-2  MTX Switches, Headers, Connectors, Fuses, LEDs
**Figure 1-3 Flash Bank Jumper Settings**

<table>
<thead>
<tr>
<th>J37</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**For More Information**

Refer to the appropriate *Installation and Use* and *Programmer’s Guide* documents from Motorola for more information about programming the Flash system on your reference board.
Connecting the Target to the Host

This section describes connecting the target board to the host PC via serial and Ethernet connections. To connect the target board to the host PC, complete the following steps:

Step 1. Use an RS-232 null modem cable to connect the target to the serial port of your host system. Depending on your host system, you may need either a straight or reversed serial cable.

Step 2. With the target system powered off, connect the serial cable to the COM1 port on the target. On the MTX, COM1 is labeled SERIAL PORT1/CONSOLE or COM1 on the enclosing case.

You must also connect the host and target systems to a network to use TFTP.

Step 3. Connect the other end of the serial cable to the desired communication (COM) port on the host system.

Step 4. On the Windows desktop, click on the Start button and select Programs -> Accessories -> Hyperterminal.

Step 5. Click the HyperTerminal icon and enter a name for your Hyperterminal session.

Step 6. Select an icon for the new Hyperterminal session. A new icon is created with the name of your session associated with it. You can select this icon the next time you establish a Hyperterminal session.

Step 7. Click OK.

Step 8. From the Phone Number dialog, select Connect Using, then select the communications port you will be using to connect to the target system.

Step 9. Click OK.
Step 10. In the Port Settings tab, enter the following settings:

- Bits per second = 9600
- Data Bits = 8
- Parity = None
- Stop bits = 1
- Flow control = XOn/XOff.

Step 11. Click OK.

Step 12. From the Hyperterminal window, select Call -> Connect from the pull-down menu; this establishes your terminal session with the target board. When you are connected, the bottom left of the Hyperterminal screen will display Connected.

Step 13. Turn on the target system. A power-on banner and PPC1-Bug> prompt should appear on the display terminal.

---

**Note**

If your target system already has an OS-9 ROM image installed, you can get a PPC1-Bug> prompt by pressing the Esc key during the target system bootup. You can then rebuild the ROM image as desired.

---

Step 14. From the PPC1-Bug> prompt, type niot and configure the target board to receive the file as follows:

```
PPC1-Bug>niot
Controller LUN =00?
Device LUN =00?
Node Control Memory Address =00FA0000?
Client IP Address =182.52.109.68?
Server IP Address =182.52.109.53?
Subnet IP Address Mask =255.255.255.0?
Broadcast IP Address =255.255.255.255?
Gateway IP Address =0.0.0.0?
```

should not need to change this
IP address of the target system
IP address of the machine with tftp boot server (host system)
fill in as required
fill in as required
fill in as required

---
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**Note**
The MTX has Ethernet built onto the board. You must complete this step to configure the board to work on an Ethernet network.

- Boot File Name ("NULL" for None) =rom?
  - name of image to load in tftpboot directory
- Argument File Name ("NULL" for None) =?
- Boot File Load Address =00080000?
  - load address; must be 0x80000
- Boot File Execution Address =00080000?
  - execution address; must be 0x80000
- Boot File Execution Delay =00000000?
  - no delay required
- Boot File Length =00000000?
  - get length automatically
- Boot File Byte Offset =00000000?
- BOOTP/RARP Request Retry =00?
- TFTP/ARP Request Retry =00?
- Trace Character Buffer Address =00000000?
- BOOTP/RARP Request Control: Always/When-Needed (A/W)=W?
- BOOTP/RARP Reply Update Control: Yes/No (Y/N) =Y?
- Update non-volatile RAM (Y/N) Y
To properly complete the configuration, get the following information from your network administrator:

**Table 1-1 System Administrator Input**

<table>
<thead>
<tr>
<th>Information Needed</th>
<th>Information Used for this Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address and Host Name</td>
<td></td>
</tr>
<tr>
<td>Broadcast IP Address</td>
<td></td>
</tr>
<tr>
<td>Subnet Mask</td>
<td></td>
</tr>
<tr>
<td>Network Domain</td>
<td></td>
</tr>
<tr>
<td>DNS IP Addresses</td>
<td></td>
</tr>
<tr>
<td>Gateway IP Addresses</td>
<td></td>
</tr>
</tbody>
</table>
Building the OS-9 ROM Image

The OS-9 ROM Image is a set of files and modules that collectively make up the OS-9 operating system. The specific ROM Image contents can vary from system to system depending on hardware capabilities and user requirements.

To simplify the process of loading and testing OS-9, the ROM Image is generally divided into two parts: the low-level image, called coreboot, and the high-level image, called bootfile.

---

Note
This section provides an example of an OS-9 ROM image successfully built on a host PC and transferred to an MTX603 target board. You may have to modify your selections depending on your application.

---

Coreboot

The coreboot image is generally responsible for initializing hardware devices and locating the high-level (or bootfile) image as specified by its configuration. For example from a FLASH part, a harddisk, or Ethernet. It is also responsible for building basic structures based on the image it finds and passing control to the kernel to bring up the OS-9 system.

Bootfile

The bootfile image contains the kernel and other high-level modules (initialization module, file managers, drivers, descriptors, applications). The image is loaded into memory based on the device you select from the boot menu. The bootfile image normally brings up an OS-9 shell prompt, but can be configured to automatically start an application.
Starting the Configuration Wizard

The Configuration Wizard is the application used to build the coreboot, bootfile, or ROM image. To start the Configuration Wizard, perform the following steps:

Step 1. From the Windows desktop, select Start -> RadiSys -> Microware OS-9 for PowerPC Vx.y -> Configuration Wizard. You should see the following opening screen:

Figure 1-4 Configuration Wizard Opening Screen

Step 2. Select your target board from the Select a board pull-down menu.
Step 3. Select the **Create new configuration** radio button from the **Select a configuration** menu and type in the name you want to give your ROM image in the supplied text box. This names your new configuration, which can later be accessed by selecting the **Use existing configuration** pull down menu.

Step 4. Select the **Advanced Mode** radio button from the **Choose Wizard Mode** field and click **OK**. The Wizard’s main window is displayed. This is the dialog from which you will proceed to build your image. An example is shown in **Figure 1-5**.

**Figure 1-5  Configuration Wizard Main Window**
Creating and Configuring the ROM Image

This section describes how to use the Configuration Wizard to create and configure your OS-9 ROM image.

**Note**
The OS-9 ROM Image comprises two parts—the coreboot image and the bootfile image. For the MTX60x target boards, the coreboot and bootfile images are combined into one image, called rom. The rom image is then transferred from the Host PC to the Target board.

**Note**
This section provides an example of an OS-9 ROM image successfully built on a Host PC and transferred to an MTX603 target board. You may have to modify your selections depending on your application.

**Select System Type**
Configure system type options by selecting Configure -> Sys -> Select System Type from the Main Configuration window.

For the MTX target board, you can bypass this option and use the default settings.
Configure Coreboot Options

Step 1. From the **Main Configuration** window, select **Configure -> Coreboot -> Main configuration**.

Step 2. Select the **Debugger** tab. The following window is displayed:

**Figure 1-6 Coreboot Configuration—Debugger Tab**

![Coreboot Configuration Window](image)

Step 3. Under Select Debugger, select **RomBug**. This sets high-level Ethernet as the method for user state debugging. Select **None** if you do not want to debug your system.
**Note**

To perform system state Ethernet debugging, select **Ethernet** under Remote Debug Connection. If you set Ethernet as the method for system state debugging, you will not be able to perform high-level user state debugging via Ethernet.

For system state debugging, you must also set the parameters in the Ethernet Tab of the coreboot configuration.

---

**Step 4.** Select the **Define Other Boot Options** tab. The following window is displayed:

**Figure 1-7 Coreboot Configuration—Define Other Boot Options Tab**

![Coreboot Configuration](image-url)
Step 5. Select **Break-Enter System Debugger**.

Step 6. Click **OK** and return to the Main Configuration window.

---

**Configure System Options**

by selecting **Configure -> Bootfile -> Configure System Options** from the Main Configuration window. You can bypass this option and use the default settings.

**Network Configuration**

To use the target board across a network, complete the following steps:

---

Step 1. If you want to use the target board across a network, you will need to configure the Ethernet settings within the Configuration Wizard. To do this, select **Configure -> Bootfile -> Network Configuration** from the Wizard's main menu.
Step 2. From the Network Configuration dialog, select the Interface Configuration tab. From here you can select and enable the interface. For example, you can select the appropriate Ethernet card from the list of options on the left and specify whether you would like to enable IPv4 or IPv6 addressing. Figure 1-8 shows an example of the Interface Configuration tab.

![Figure 1-8 Bootfile -> Network Configuration -> Interface Configuration](image)

**For More Information**

To learn more about IPv4 and IPv6 functionalities, refer to the *Using LAN Communications* manual, included with this product CD.
For More Information
Contact your system administrator if you do not know the network values for your board.

Step 3. Once you have made your settings in the **Network Configuration** dialog, click **OK**.

Step 4. Select the **DNS Configuration** tab. The following window is displayed. More than one DNS server can be added in this dialog box.

**Figure 1-9  Bootfile Configuration—DNS Configuration Tab**

If your network does not use DNS, click **Disable DNS**, and move to the **Gateway** tab.

If you have DNS available, click **Enable DNS** and type your host name and domain.
You add DNS IP addresses by clicking on the box directly under DNS Server Search Order and typing the IP address. Click the Add button when complete.

More than one DNS server can be added by repeating these steps.

Step 5. Select the Gateway tab. Add new gateway addresses by clicking on the box and typing in the gateway name. Click the Add button when complete.

Step 6. Select the SoftStax® Setup tab. The following window is displayed.

The options above represent daemons that can be automatically started if you want to FTP or telnet from a PC to the OS-9 target. Start NFS Client enables you to remote mount from the target.
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Step 7. Click OK.

Step 8. Select the SoftStax Options tab. The SoftStax Options tab enables you to include networking utilities in the ROM image. By default, ftp, hostname, ping, and netstat are included. You can add other utilities as desired.

Step 9. Click OK at the bottom of the Network Configuration menu to complete network configuration and return to the Main Configuration window.

Disk Configuration

Step 1. From the main configuration window, select Configure -> Bootfile -> Disk Configuration. The Disk Configuration options include the following tabs:

- The IDE Configuration tab enables you to configure IDE drives for the target.
- The SCSI Configuration tab enables you to configure SCSI drives for the target.
- The Floppy Configuration tab enables you to configure a floppy drive for the target.
Step 2. Select the **Init Options** tab. The following window is displayed.

*Figure 1-11 Bootfile Configuration—Init Options Tab*

Step 3. Select the **Mshell** option for the initial module name. This causes OS-9 to start a console shell usable from your terminal window. Initial Device Name should be selected as `/dd`.

The tick rate is 100 and ticks per timeslice is set to 2. If you look at the **Parameter List** box, you see the commands that OS-9 executes upon system start-up.

Step 4. Click **OK** to return to the **Main Configuration** window.
Build Image
Complete the following steps to build the target board image.

Step 1. From the Main Configuration window, select Configure -> Build Image. The Master Builder window appears.

Step 2. Select the Coreboot + Bootfile option.


Step 4. Click Build. It should display progress information and show the statistics of the image just created.

Step 5. Click Save As. The rom and rom.s files are created in the following directory:

```
MWOS/OS9000/603/PORTS/MOTRAVEN/BOOTS/INSTALL/PORTBOOT
```

At this point you can either close the Configuration Wizard or leave it open for use in modifying your ROM Image. If you choose to close, you can save your configuration settings for later use.
Transferring the ROM Image to the Target

Configure the TFTP Server

TFTPServer32 is the Trivial File Transfer Protocol (TFTP) server utility that must be installed on your PC host from the Microware OS-9 for PowerPC CD. This is the tool you will use to transfer the ROM image from your host system to the target system. Perform the following steps to configure the TFTP server:

Step 1. On the Windows desktop click Start -> Programs -> TFTPServer -> TFTPServer32.

Step 2. Select System -> Setup and click the Outbound tab. Indicate the path to where the ROM image is located in the Outbound File Path box.

Step 3. Use default settings for all other settings.

Step 4. Click Apply and OK and exit TFTP Server Pro.
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Boot the Target from an Ethernet Network

Once the TFTP server is configured, you can move the ROM image from the host system to the target system and boot the target. Complete the following steps to accomplish this task.

Step 1. Check that your Ethernet network connection is operational.

On your host desktop, click on the Network Neighborhood icon. If you can see other computers, or your own, on the network, your Ethernet connection is functional.

Step 2. From the host system, bring up your Hyperterminal session as described in Connecting the Target to the Host.

Step 3. At the PPC1-Bug> prompt, type env. Press <return> until the PReP-boot option is displayed. Ensure that it is set to N for No.

Network PReP-Boot Mode Enable [Y/N] = Y? N
SCSI Bus Reset on Debugger Startup [Y/N] = Y?
Update Non-Volatile RAM [Y/N]? Y

Note

Although not required, you can use the env command to set up the nbo option as an autobooter. At the PPC1-Bug> prompt, type env. Press <return> to scroll through the settings and ensure your target is configured as shown below.

PPC1Bug> env
Network Auto Boot Enable [Y/N] = Y?
Network Auto Boot at power-up only [Y/N] = Y?
Network Auto Boot Controller LUN = 00?
Network Auto Boot Device LUN = 00?
Network Auto Boot Abort Delay = 5?
Network Auto Boot Configuration Parameters Offset (NVRAM) = 00001000?
Step 4. At the PPC1-Bug> prompt type `nbo`. This command transfers the ROM image from the host system to the target system and boots the target. Your screen should display the following:

```
PPC1-Bug>nbo
Network Booting from: DEC21140, Controller 0, Device 0
Device Name: /pci@80000000/pci1011,9@e,0:0,0
Loading: rom

Client IP Address      = 172.16.4.108
Server IP Address      = 172.16.4.56
Gateway IP Address     = 172.16.1.254
Subnet IP Address Mask = 255.255.0.0
Boot File Name         = rom
Argument File Name     =

Network Boot File load in progress... To abort hit <BREAK>

Bytes Received =&1652544, Bytes Loaded =&1652544
Bytes/Second =6206568, Elapsed Time =8 Second(s)

OS-9000 Bootstrap for the PowerPC(tm)
Now trying to Override autobooters.
Now trying to Boot embedded OS-9000 in-place.
Now searching memory ($000b7e20 - $0021373f) for an OS-9000 Kernel...

An OS-9000 kernel was found at $000b7e20
A valid OS-9000 bootfile was found.
+3
$

Your target system should now display the $ OS-9000 prompt.
Creating a Startup File

When the Configuration Wizard is set to use a hard drive, or another fixed drive such as a PC Flash Card, as the default device, it automatically sets up the init module to call the startup file in the SYS directory in the target (For example: /h0/SYS/startup, /mhc1/SYS/startup). However, this directory and file will not exist until you create it. To create the startup file, complete the following steps:

**Step 1.** Create a SYS directory on the target machine where the startup file will reside (for example: `mkdir /h0/SYS, mkdir /dd/SYS`).

**Step 2.** On the host machine, navigate to the following directory:

```
MWOS/OS9000/SRC/SYS
```

In this directory, you will see several files. The files related to this section are listed below:

- **motd**: Message of the day file
- **password**: User/password file
- **termcap**: Terminal description file
- **startup**: Startup file

**Step 3.** Transfer all files to the newly created SYS directory on the target machine. (You can use Kermit, or FTP in ASCII mode to transfer these files.)

**Step 4.** Since the files are still in DOS format, you will be required to convert them into the OS-9 format with the **cudo** utility. The following command is an example:

```
cudo -cdo password
```

This will convert the password file from DOS to OS-9 format.
For More Information

For a complete description of all the command options, refer to the Utilities Reference Manual located on the Microware OS-9 CD.

Step 5.

Since the command lines in the startup file are system-dependent, it may be necessary to modify this file to fit your system configuration. It is recommended that you modify the file before transferring it to the target machine.

Example Startup File

Below is the example startup file as it appears in the MWOS/OS9000/SRC/SYS directory:

```
-tnxnp
tmode -w=1 nopause
*
*OS-9 - Version 3.0
*Copyright 2001 by Microware Systems Corporation
*The commands in this file are highly system dependent and
*should be modified by the user.
 *
*setime </term              ;* start system clock
setime -s                   ;* start system clock
link mshell csl             ;* make "mshell" and "csl" stay in memory
* iniz r0 h0 d0 t1 p1 term  ;* initialize devices
* load utils                ;* make some utilities stay in memory
* tsmon /term /tl &         ;* start other terminals
list sys/motd
setenv TERM vt100
	mode -w=1 pause
mshell<>>>/term -l&
```
For More Information
Refer to the Making a Startup File section in Chapter 9 of the *Using OS-9* manual for more information on startup files.
Optional Procedures

The following section provides optional procedures you can perform after installing and configuring OS-9 on your board.

Preliminary Testing

Once you have established an OS-9 prompt on your target system, you can perform the following procedures to test your system:

Step 1. Type `mdir` at the prompt.

`mdir` displays all the modules in memory.

Step 2. Type `procs` at the prompt.

`procs` displays the processes currently running in the system.

Step 3. Test the networking on your system.

Select a host on the Ethernet network and run the `ping` utility. The following display shows a successful `ping` to a machine called “solkanar”:

```
$ ping solkanar
PING solkanar.microware.com (172.16.2.51): 56 data bytes
64 bytes from 172.16.2.51: ttl=128 time=0 ms
```

Step 4. Test `telnet`.

Select a host machine that allows telnet access and try the OS-9 `telnet` utility. The following display shows a successful `telnet` to a machine called delta.

```
$ telnet delta
Trying 172.16.1.40...Connected to delta.microware.com.
Escape character is '^]'.
capture closed.
```
Step 5. Test telnet from your host PC to the reference board.

From the Windows Start menu, select Run and type telnet <hostname> and click OK. A telnet window should display with a $ prompt. Type mdir from the prompt. You should see the same module listing as on the serial console port.

You have now created the ROM image, transferred it to the target system, booted the target to an OS-9 prompt, and established network connectivity with your OS-9 target system.

**Booting the Target from Flash**

Once the ROM image is built and loaded onto the target system, you can copy the ROM image to Flash memory or to a disk. This enables you to boot the target without using a network. This section describes booting the target from Flash or a disk.

To boot the target system from Flash, you must return to the configuration wizard and rebuild the ROM image.

---

**WARNING**

Follow the steps below carefully. During this procedure it is possible to overwrite the manufacturer’s original Flash image. In this event, you will be required to return the hardware to the manufacturer.
Step 1. Open the OS-9 configuration wizard. Be sure to start with the same ROM image that you built in the Building the OS-9 ROM Image section.

Step 2. Configure Flash booting options.

- Select Configure -> Sys -> Select System Type from the Main Configuration window.
- Select the ROM Memory List tab.
- Select Flash Boot from the Settings Based On pull-down menu. Figure 1-13 shows this configuration.

Note
This example uses the MTX603 as the target board.

Figure 1-13 ROM Memory List
Step 3. Set the lr option.

The lr option moves the boot image modules from Flash to RAM before booting begins. This is optional. However, the Flash device is very slow and using the lr option is highly recommended.

- Select `Configure -> Coreboot -> Main Configuration` from the Main Configuration window.
- Select the `Define Other Boot Options` tab.
- Configure the tab according to **Figure 1-14**.

**Figure 1-14 Setting the lr Option**

![Coreboot Configuration Screen](image-url)
Step 4. Rebuild the ROM image.

- From the **Main Configuration** window, select **Configure -> Build Image**. The **Master Builder** window appears.
- Do not change the settings.
- Click **Build**. Progress information is displayed and the statistics of the image just created are shown.
- Click **Save As** to save the image. The file `rom` is saved in the following directory:

  ```
  MWOS/OS9000/603/PORTS/MOTRAVEN/BOOTS/INSTALL/PORTBOOT.
  ```

Step 5. From the host system, bring up your Hyperterminal session as described in **Connecting the Target to the Host**.

- At the **PPC1-Bug>** prompt, type the `niot` command as described in **Connecting the Target to the Host**
- At the **PPC1Bug>** prompt, type the `niop` command to transfer the ROM image from the host system to the target system. Your screen should display the following:

  ```
  PPC1-Bug> niop
  Controller LUN =00?
  Device LUN =00?
  Get/Put =G?
  File Name =? rom
  Memory Address =00004000?
  Length =00000000?
  Byte Offset =00000000?
  
  Bytes Received =&1652584, Bytes Loaded =&1652584
  Bytes/Second =&236083, Elapsed Time =7 Second(s)
  ```

Step 6. At the **PPC1-Bug>** prompt, type **pflash** to program the ROM image into the target system's Flash memory.
WARNING
Make sure the jumper settings for your board are correct. The memory at 0xff000000 must be the 4MB or 8MB FLASH image not the 1MB image where PPC1Bug is located. Failure to set up the board correctly can cause the PPC1Bug image to be erased resulting in a non-working board.

Step 7. Adjust the number of bytes received to a block boundary.

```
PPC1-Bug>pflash 4000:1937f0 ff000000;b
Source Starting/Ending Addresses =00004000/001977EF
Destination Starting/Ending Addresses =FF000000/FF1937EF
Number of Effective Bytes =001937F0 (&1652720)
```

```
Program FLASH Memory (Y/N)? y
```

Note
If the last two digits in HEX are less than FO, change them to FO. If the last two digits are greater than FO, add 100₁₆ to that number and change the last two digits to FO. Following is an example:

```
&1909180 = 0x1D21BC
round = 0x1D21F0
```

The image should now be in the 0xff000000 section.

Step 8. From the PPC1-Bug> prompt, type env. This indicates to PPC1-Bug where the ROM image is located.

```
PPC1Bug> env
ROM Boot Enable [Y/N] = Y?
ROM Boot at power-up only [Y/N] = N?
ROM Boot Abort Delay = 1?
ROM Boot Direct Starting Address = FF000278?
ROM Boot Direct Ending Address = FF000278?
```
The above sequence will set up the system to autoboot using the ROM image. You can also use the `rb` command from the `PPC1-Bug>` to boot the target from ROM.

**Note**
The `coreboot` file can be placed in Flash without the `bootfile` file. This can be desirable if disk booting or eb BOOTP booting. You must supply your own BOOTP server.

**Disk Booting RBF**
Once the target system has been booted from an Ethernet Network and the target's SCSI hard drive is configured, you can use the following procedure to transfer the `coreboot` and `bootfile` files to the target machine.

**Note**
A method for transferring the ROM image using TFTP over an Ethernet Network is described in *Transferring the ROM Image to the Target*.

**For More Information**
Refer to Appendix B: Partitioning and Formatting Your Hard Drive for hard drive formatting and partitioning procedures.
Step 1. At the $ prompt (the OS-9 prompt), create the ROM image by typing the following commands:

```
bootgen -el=coreboot /hs01fmt
```

The above command places the TYPE41 boot image on SCSI hard drive.

```
bootgen /hs01fmt bootfile -nb400
```

The above command places the high-level boot image on the system disk.

---

**Note**

The `bootfile` and `coreboot` files are located at:

```
<drive>:\MWOS\OS9000\603\PORTS\MOTRAVEN\BOOTS\INSTALL\PORTBOOT.
```

---

Step 2. At the PPC1-Bug> prompt, type `pboot 0` to boot the target system. Your screen should display something similar to the following:

```
Booting from: NCR53C810, Controller 0, Drive 0
Loading: Operating System

IPL Loaded at: $01F30000
Residual-Data Located at: $01F84000

OS-9000 Bootstrap for the PowerPC(tm)

Now trying to Override autobooters.

BOOTING PROCEDURES AVAILABLE ---- <INPUT>
Scan SCSI devices -------------- <ioi>
Boot FDC floppy --------------- <fd>
Boot from PC-Floppy ----------- <pf>
Boot from Viper tape drive ---- <vs>
Boot over Ethernet ----------- <eb>
Boot from SCSI(SCCS) hard drive - <hs>
```
Step 3. Select a boot method from the above menu. In this case, enter `hs`.

Your screen should display similar to the following:

```
Symbios 53C810 @ 0x81000000 SELFID (07) MAXCNT (0x01000000)
ID (00) LUN (00) SI (00) EI (03) LSNOFFS (00000804)

Checking Partitions : 0
Volume Name : os9000
FD bootfile block offset : 0x00000997

Booting from partition
Reading Bootfile.....

Boot Address : 0x00300000
Boot Size : 0x00180a00

OS-9000 kernel was found.
A valid OS-9000 bootfile was found.
+3
$
Chapter 2: Board Specific Reference

This chapter contains information that is specific to the Motorola MTX reference boards from Motorola. It contains the following sections:

- Boot Menu Options
- Port Specific Utilities
- Vector Descriptions for PowerPC 603/604
- PowerPC™ Registers Passed to a New Process

For More Information
For general information on porting OS-9, see the **OS-9 Porting Guide**.
Boot Menu Options

You select your boot device menu options using the configuration wizard. For each boot device option, you can select whether you want it to be displayed on a boot menu, set up to autoboot, or both. The autoboot option enables the device selected to automatically boot up the high-level bootfile, bypassing the boot device menu.

**Note**
When using the configuration wizard, you should select only one device for autoboot on your system.

Following is an example of the Boot Menu displayed in the terminal emulation window (using Hyperterminal):

OS-9000 Bootstrap for the PowerPC(tm)

Now trying to Override autobooters.

BOOTING PROCEDURES AVAILABLE ------ <INPUT>

Scan SCSI devices ------------- <ioi>
Boot FDC floppy ------------- <fd>
Boot from PC-Floppy --------- <pf>
Boot from Teac SCSI floppy drive - <fs>
Boot from SCSI PC-Floppy ------- <pfs>
Boot from Viper tape drive ----- <vs>
Boot over Ethernet ---------- <eb>
Boot from SCSI(SCCS) hard drive -- <hs>
Boot embedded OS-9000 in-place --- <bo>
Enter system debugger -------- <break>
Restart the System ----------- <q>

Select a boot method from the above menu:
The items you select for boot options in the configuration wizard determines what modules are included in the coreboot image. **Table 2-1** lists some of the supported boot devices for OS-9:

**Table 2-1  Supported Boot Methods**

<table>
<thead>
<tr>
<th>Type of Boot</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot from RBF hard disk</td>
<td>boot from a standard SCSI hard disk (hs)</td>
</tr>
<tr>
<td>Floppy Disk</td>
<td>boot from floppy disk</td>
</tr>
<tr>
<td></td>
<td>You must select if the floppy is controlled by a Random Block File System (RBF) (fd or fs) or PC File System (pf or pfs)</td>
</tr>
<tr>
<td>Boot embedded OS-9 in-place</td>
<td>boot OS-9 from FLASH (bo)</td>
</tr>
<tr>
<td>Copy embedded OS-9 to RAM and Boot</td>
<td>copy OS-9 from FLASH (if stored there) to RAM and boot (lr)</td>
</tr>
</tbody>
</table>
Port Specific Utilities

The following port specific utilities are included:

- dmppci
- mouse
- pciv
- setpci
- testpci
dmppci

**SYNTAX**

```
dmppci <bus_number> <device_number> 
   <function_number> {<size>}
```

**OPTIONS**

```
-?
```

Display help

**DESCRIPTION**

dmppci displays PCI configuration information that is not normally available by other means, except programming, using the PCI library.

**EXAMPLE**

```
$ dmppci 0 11 1 0x40
   PCI DUMP Bus:0 Dev:11 Func:1 Size:64
-------------------------
VID  DID  CMD  STAT CLASS  RV CS IL IP LT HT BI MG ML SVID SDID
---  ---- ---- ---- -----  -- -- -- -- -- -- -- -- -- ---- ----
10ad 0105 0005 0280 01018f 05 08 0e 01 00 80 00 02 28 0000 0000
---------- ---------- ---------- ---------- ---------- ---------- ---- ----
01000321 01000331 01000329 01000335 01000301 01000311 00000000 00000000
 Offset 00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f
----------------------------------
0000   ad 10 05 01 05 00 80 02 05 8f 01 01 08 00 80 00
0010   21 03 00 01 31 03 00 01 29 03 00 01 35 03 00 01
0020   01 03 00 01 11 03 00 01 00 00 00 00 00 00 00 00
0030   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0e 01 02 28
```
mouse

SYNTAX

mouse <opts>

OPTIONS

-? Display help
-s Slow mouse
-f Fast mouse
-r [n] Set resolution to n
-p [n] Set sample rate to n
-c [n] Set scale factor to n

DESCRIPTION

mouse displays mouse status information.
EXAMPLE

$ mouse
Opening device /m0
status = 0x08, x = 4, y = 0
status = 0x08, x = 6, y = 0
status = 0x08, x = 7, y = 1
status = 0x08, x = 7, y = 1
status = 0x08, x = 8, y = 1
status = 0x08, x = 7, y = 0
status = 0x28, x = 7, y = 255 Y Negative
status = 0x28, x = 7, y = 254 Y Negative
status = 0x28, x = 5, y = 254 Y Negative
status = 0x08, x = 2, y = 0
status = 0x28, x = 1, y = 255 Y Negative
status = 0x08, x = 2, y = 0
status = 0x28, x = 0, y = 255 Y Negative
status = 0x08, x = 1, y = 0
status = 0x09, x = 0, y = 0 Left Button
status = 0x08, x = 0, y = 0
status = 0x0a, x = 0, y = 0 Right Button
status = 0x08, x = 0, y = 0
**SYNTAX**

```
pciv [opts]
```

**OPTIONS**

- `-?` Display help.
- `-a` Display base address information and size.
- `-r` Display PCI routing information.

**DESCRIPTION**

The `pciv` utility allows visual indication of the status of the PCI bus. This utility is port dependent.

**EXAMPLES**

When using the `pciv` command with a Motorola PowerPC board, information similar to the following is displayed:

```
$ pciv

PowerPC 603 Configuration Report

Model: Ultra PowerPC

Board Configuration Reports
[Z85230 ESCC] [PMC] [Graphics] [Ethernet] [SCSI]

BUS:DV:FU  VID  DID  CMD  STAT  CLASS  RV  CS  IL  IP
-----------------------------------------------
000:00:00  1057 0001 0106 2080 060000 24 00 00 00 MPC105
000:11:00  8086 0484 000f 0200 000000 84 00 00 00 PCI/ISA Bridge
000:12:00  1000 0001 0007 0200 010000 02 00 0b 01 NCR53C810 SCSI
000:14:00  1011 0002 0007 0280 020000 23 00 09 01 DECchip 21040
000:15:00  1013 00a8 0000 0000 030000 8e 00 0b 01 GD5434 Graphics
```

The following configuration registers apply to these `DEV` columns:
The `pciv` command in the previous example reports configuration information related to specific hardware attached to the system. The MTX 603/604 is specific about the PCI devices located on the main board. For this reason, the information displayed is not generic in format.

**DETAIL OF BASIC VIEW:**

- **BUS**: Bus Number
- **DEV**: Device Number
- **VID**: Vendor ID
- **DID**: Device ID
- **CLASS**: Class Code
- **RV**: Revision ID
- **IL**: Interrupt Line
- **IP**: Interrupt Pin
- **[S]**: Single function device
- **[M]**: Multiple function device

When the `-a` option is used address information is also displayed as well as the size of the device blocks being used. All six address PCI address entries are scanned.

---

(C) [32-bit] base_addr[0] = 0x3efefe81 PCI/IO
0xbefefe80 Size = 0x00000080
The fields in the previous example are, from left to right, as follows:

- Prefetchable
- Memory Type
- Address Fields
- Actual Value Stored
- Type of Access
- Translated Access Address Used (shown on second line)
- Size of Block (shown on second line)

When the `-r` option is used, PCI-specific information related to PCI interrupt routing is displayed. If an ISA BRIDGE controller is found in the system, the routing information is used. The use of ISA devices and PCI devices in the same system requires interrupts to be routed either to ISA or PCI devices. Since ISA devices employ edge-triggered interrupts and PCI use devices use level interrupts, the \textit{EDGE/LEVEL} control information is also displayed. If an interrupt is shown as \textit{LEVEL} with a PCI route associated with it, no ISA card can use that interrupt. This command also shows the system interrupt mask from the interrupt controller.

\textbf{Note}

ISA and PCI interrupts cannot be shared.
setpci

SYNTAX

setpci <bus> <dev> <func> <offset> <size{bwd}> <value>

OPTIONS

-? Display help

DESCRIPTION

The *setpci* utility sets PCI configuration information that is not normally available by other means other than programming using the PCI library. The *setpci* utility may also be used to read a single location in PCI space. Parameters include:

- `<bus>` = PCI Bus Number 0..255
- `<dev>` = PCI Device Number 0..32
- `<func>` = PCI Function Number 0..7
- `<offset>` = Offset value (ie. command register offset = 4)
- `<size>` = Size b=byte w=word d=dword
- `<value>` = The value to write in write mode. If no value is included, the utility is in read mode.
EXAMPLES

$ setpci 0 19 0 0x14 d

PCI READ MODE
-------------

PCI Value.....0x3bfedd00 (dword) READ
PCI Bus........0x00
PCI Device.....0x13
PCI Function....0x00
PCI Offset.....0x0014

$ setpci 0 19 0 0x14 d 0x1234500

PCI WRITE MODE
-------------

PCI Value.....0x01234500 (dword) WRITE
PCI Bus........0x00
PCI Device.....0x13
PCI Function....0x00
PCI Offset.....0x0014
$
$
$ setpci 0 19 0 0x14 d

PCI READ MODE
-------------

PCI Value.....0x01234500 (dword) READ
PCI Bus........0x00
PCI Device.....0x13
PCI Function....0x00
PCI Offset.....0x0014
testpci

SYNTAX

testpci

OPTIONS

-? Display help

DESCRIPTION

The testpci utility tests all PCI library functions. To use this utility, you must have a graphics card in the system. This utility shows how the PCI library calls can be used.

EXAMPLE

$ testpci
Test PCI Library Calls Edition 2
_pci_search_device .......................ok....
_pci_next_device .........................ok....
_pci_get_config_data .....................ok....
_pci_find_device ..........................ok....
_pci_find_class_code .....................ok....
_pci_read_configuration_byte .............ok....
_pci_read_configuration_word .............ok....
_pci_read_configuration_dword ..........ok....
_pci_write_configuration_byte ..........ok....
_pci_write_configuration_word ..........ok....
_pci_write_configuration_dword ..........ok....
_pci_get_irq_pin ..........................ok....
_pci_get_irq_line .........................ok....
_pci_set_irq_line .........................ok....
PCI LIBRARY TEST CONTAINS NO ERRORS.
## Vector Descriptions for PowerPC 603/604

### Table 2-2 Vector Descriptions for PowerPC 603

<table>
<thead>
<tr>
<th>Vector Number</th>
<th>Related OS-9000 Call</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>Reserved</td>
</tr>
<tr>
<td>1</td>
<td>F_IRQ</td>
<td>System reset</td>
</tr>
<tr>
<td>2</td>
<td>F_STRAP, F_IRQ</td>
<td>Machine check</td>
</tr>
<tr>
<td>3</td>
<td>F_STRAP, F_IRQ</td>
<td>Data access</td>
</tr>
<tr>
<td>4</td>
<td>F_STRAP, F_IRQ</td>
<td>Instruction access</td>
</tr>
<tr>
<td>5</td>
<td>F_IRQ</td>
<td>External interrupt</td>
</tr>
<tr>
<td>6</td>
<td>F_STRAP, F_IRQ</td>
<td>Alignment</td>
</tr>
<tr>
<td>7</td>
<td>F_STRAP, F_TLINK, F_IRQ</td>
<td>Program</td>
</tr>
<tr>
<td>8</td>
<td>F_IRQ</td>
<td>Floating-point unavailable</td>
</tr>
<tr>
<td>9</td>
<td>F_IRQ</td>
<td>Decrementer</td>
</tr>
<tr>
<td>10</td>
<td>None</td>
<td>Reserved</td>
</tr>
<tr>
<td>11</td>
<td>None</td>
<td>Reserved</td>
</tr>
<tr>
<td>12</td>
<td>F_SSVC</td>
<td>System call</td>
</tr>
<tr>
<td>13</td>
<td>None</td>
<td>Trace</td>
</tr>
<tr>
<td>14</td>
<td>None</td>
<td>Reserved</td>
</tr>
</tbody>
</table>
### Table 2-2  Vector Descriptions for PowerPC 603

<table>
<thead>
<tr>
<th>Vector Number</th>
<th>Related OS-9000 Call</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>None</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>F_IRQ</td>
<td>Performance monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>interrupt (604e)</td>
</tr>
<tr>
<td>16</td>
<td>None</td>
<td>Instruction translation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>miss</td>
</tr>
<tr>
<td>17</td>
<td>None</td>
<td>Data load translation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>miss</td>
</tr>
<tr>
<td>18</td>
<td>None</td>
<td>Data store translation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>miss</td>
</tr>
<tr>
<td>19</td>
<td>F_IRQ</td>
<td>Instruction address</td>
</tr>
<tr>
<td></td>
<td></td>
<td>breakpoint</td>
</tr>
<tr>
<td>20</td>
<td>F_IRQ</td>
<td>System management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>interrupt</td>
</tr>
<tr>
<td>21-47</td>
<td>None</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

**Note**
The vector numbers in Table 2-2 are logical vector numbers. The actual processor vectors can be computed by multiplying the logical vector number by 256.
Error Exceptions: vectors 2-4 and 6-7

These exceptions are usually considered fatal program errors and unconditionally terminate a user program. If \texttt{F\_DFORK} create the process or the process was debug attached with \texttt{F\_DATTACH}, then the resources of the erroneous process remain intact and control returns to the parent debugger to allow a postmortem examination.

A user process may use the \texttt{F\_STRAP} system call to install an exception handler to catch the errors and recover from the exceptional condition. When a recoverable exception occurs, the process' exception handler installed with the \texttt{F\_STRAP} system call is executed with a pointer to the process' normal static data and the current stack pointer.

In addition, the process' exception handler will receive--as parameters--the vector number of the error, the program instruction counter of where the error occurred, and the fault address of the error if applicable. The exception handler must decide whether and where to continue execution. Programs written in the C language may use the \texttt{setjmp} and \texttt{longjmp} library routines to properly recover from the erroneous condition.

If any of these exception occur in system-state during a system call made by the process due to the process passing bad data to the kernel, the process' exception handler is not called. Instead, the appropriate vector error is returned from the system call.

Vectored Interrupts: vector 5

In general, the PowerPC processor family uses a single interrupt vector for all external interrupts. However, most systems supporting the PowerPC family use additional external logic to support more powerful nested interrupt facilities. Hence, the vector numbers used by OS-9000 device drivers are usually logical vectors outside of the range of the hardware vectors listed above.
The device drivers install their interrupt service routines, via the _F_IRQ_ system call, on the logical vector and the kernel's dispatch code uses the external logic vector to identify the source of the interrupt and call the associated interrupt service routine. Interrupt service routines are executed in system-state without an associated current process.

---

**Note**

The _F_IRQ_ system call may also be used to install exception handlers on some non-hardware interrupt vectors. The above table lists the exceptions that may be monitored using the _F_IRQ_ facility. The installed exception handler is called just like any other interrupt service routine when the associated exception occurs.

---

**User Trap Handlers: vector 7**

This vector is used for dispatching user code into system-state trap handlers. The vector provides a mechanism for programs to switch states and dispatch to a subroutine module to execute code in system-state.

**System Calls: vector 12**

This vector is used for service call dispatching to the OS-9000 operating system as well as user services installed using the _F_SSVC_ service request.
PowerPC™ Registers Passed to a New Process

The following PowerPC registers are passed to a new process (all other registers are zero):

- r1 = stack pointer
- r2 = static storage (data area) base pointer
- r3 = points to fork parameters structure (listed in f_fork)
- r13 = points to the constant data of code area of the module

**Note**

r2 is always biased by the amount specified in the m_dbias field of the program module header which allows object programs to access a larger amount of data using indexed addressing. You can usually ignore this bias because the OS-9 linker automatically adjusts for it.
Appendix A: Board Specific Modules

This appendix contains lists of high and low-level modules. The following sections are included:

- Low-Level System Modules
- High-Level System Modules
- Common System Modules List
The following low-level system modules are tailored specifically for the MTX target platforms. These modules can be found in the following directory:

```
MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBS/ROM
```

cnfgdata provides low-level configuration data including configuration of a serial console

cnfgfunc module that retrieves configuration parameters from the cnfgdata module

commcnfg module that retrieves the name of the low-level auxiliary communication port driver from the cnfgdata module

conscnfg module that retrieves the name of the low-level console driver from the cnfgdata module

ide low-level IDE booter module

initext user-customizable system initialization module

io16550 provides console services for the external 16550 serial ports

io8042 provides console services for the VGA display and keyboard interface (when available)

io85x30 provides console services for the 82530 serial ports (when available)

ll21040 provides network driver services for the DEC 21040 Ethernet port

ncr8xx provides the booter subsystem with SCSI host adapter services for both the NCR 53C810 and 53C825 interfaces
### Board Specific Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>portmenu</td>
<td>Retrieves a list of configured booter names from the ROM <code>cnfgdata</code> module</td>
</tr>
<tr>
<td>romcore</td>
<td>Bootstrap code</td>
</tr>
<tr>
<td>rpciv</td>
<td>Shows information about devices on the PCI bus</td>
</tr>
<tr>
<td>swi8timr</td>
<td>Provides polling timer services with a software loop self-calibrated from the 8259-like timer</td>
</tr>
<tr>
<td>useddebug</td>
<td>Debugger configuration module</td>
</tr>
</tbody>
</table>
High-Level System Modules

The following OS-9 system modules are tailored specifically for MTX series platforms. Unless otherwise specified, each module can be found in the following directory:

MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBJS

Interrupt Controllers

These modules provide extensions to the vectors module by mapping the single interrupt generated by an interrupt controller into a range of pseudo vectors which are recognized by OS-9 as extensions to the base CPU exception vectors.

**picirq**

Provides interrupt acknowledge and dispatching support for the nested 8259 interrupt controllers on the MTX603/604 series platforms.

This also maps the nested PIC interrupts 0-15 to OS-9 pseudo vectors 64-79 ($40-$4f).

The **picirq** module used in the sample boots is located in the file also called **picirq**. It provides slightly lower performance, but allows use of the last set of BAT registers for ISA memory access. This is the default configuration, as it supports a wider range of platforms.

**universeirq**

Provides interrupt acknowledge and dispatch support for the Tundra Universe (CA91C042) chip implemented on the MTX603/604 series of CPU boards.
Board Specific Modules

Use this module together with the proper *picirq* module, if you require access to VME interrupts on one of these platforms. *universeirq* maps VME interrupts 64-255 to OS-9 pseudo-vectors 64-255 ($40-$ff).

*ravenirq*

Provides interrupt acknowledge and dispatch support.

**Real Time Clock Driver**

*rtc48t18*

provides OS-9 access to the M48T18 BBRAM real time clock

In this release, *rtc48t18* is the name of the ticker regardless of the CPU in use on your platform.

**Ticker**

*tk8253*

provides the system ticker through the Intel 8253 programmable interval timer

**Abort Handler**

*abort*

provides handler for the abort interrupt which calls into the system-state debugger

If no system-state debugger is configured, the system will perform a soft reset.
Board Specific Modules

Shared Libraries

**picsub**

provides interrupt enable and disable routines to handle platform-specific interrupt controller issues for device drivers.

This module is called by all drivers and should be included in your `bootfile`

Serial and Console Drivers

**sc16550**

provides support for the external 16550 serial ports.

This driver is used to drive the console over the com1 port in the sample boots provided in the package.

The descriptors provided for this driver are named `t1`, `t2`, `term_t1`, and `term_t2` and are located in the following directory:

`MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBJ/DESC/SC16550`

**sc85x30**

provides support for the 82530 serial ports (when available).

The descriptors provided for this driver are named `t3`, `t4`, `term_3`, and `term_4` and are located in the following directory:

`MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBJ/DESC/SC85X30`
Board Specific Modules

**sc8042** provides unified support for the i8042 keyboard and VGA monitor output device (when available)

The descriptors for this device are named $t_0$ and term and are located in the following directory:

```
MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBS/DESC/SC8042
```

To configure your monitor as the high-level console, change the reference to the term device descriptor in the boot list used to build your system to point to this file instead of the 16550 term descriptor.

**sc8042k** provides unified support for the i8042 keyboard and input device (mouse)

The descriptors provided for this driver are named $k_0$, $k_x$, and $m_0$ are located in files stored in the following directory:

```
MWOS/OS9000/603/PORTS/MOTRAVEN>/CMDS/BOOTOBS/DESC/SC8042K
```

**sc8042m** provides unified support for the multiple windowing version of the SC8042, keyboard, and graphics support in text mode using a standard VGA card and monitor

The descriptors provided for this driver are named term, $m_{term0}$, $m_{term1}$, $m_{term2}$, and $m_{term3}$. For an explanation of the language versions available, see the previous note. The descriptors are located in files stored in the following directory:

```
MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBS/DESC/SC8042M
```
Note
For each of the sc8042 keyboard descriptors, several language versions are provided including: French, United Kingdom, German, and Norwegian. The different language descriptors are named according to the same rules as shown in the example for the French i8042 keyboard descriptor: k0_fr.

Parallel Driver
scp87303 provides support for the 87303 parallel port

The descriptor provided for this driver is named p.lp1 and is located in the following directory:

MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBJS/DESC/SCP87303

Data Disk Drivers
rb765 device driver for floppy drive rb1003 provides support for IDE and EIDE drives up to 4GB

Many descriptors are provided for use with this driver. Among the descriptors provided are several modules named h0 and dd. These descriptors are contained in files of unique names and located in the following directory:

MWOS/OS9000/603/PORTS/MOTRAVEN/CMDS/BOOTOBJS/DESC/RB1003
SCSI support

The high-level SCSI command set drivers `rbsccs`, `rbteac`, and `sbscsi` are available to support the use of SCSI disk and tape devices in the following directory:

```
MWOS/OS9000/PPC/CMDS/BOOTOBJS
```

`scsi8xx` provides SCSI host adapter services for both the NCR 53C810 and 53C825 interfaces.

In this release, `scsi8xx` is the name of the ticker regardless of the CPU in use on your platform. This is likely to change in a future release.
## Common System Modules List

The following low-level system modules provide generic services for OS9000 modular ROM. They are located in the following directory:

MWOS/OS9000/PPC/CMDS/BOOTOBJs/ROM

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bootsys</td>
<td>provides booter services.</td>
</tr>
<tr>
<td>console</td>
<td>provides high-level I/O hooks into low-level console serial driver.</td>
</tr>
<tr>
<td>dbgentry</td>
<td>provides hooks to low-level debugger server.</td>
</tr>
<tr>
<td>dbgserv</td>
<td>is a debugger server module.</td>
</tr>
<tr>
<td>excption</td>
<td>is a service module.</td>
</tr>
<tr>
<td>fdc765</td>
<td>provides PC style floppy support.</td>
</tr>
<tr>
<td>fdman</td>
<td>is a target-independent booter support module providing general booting services for RBF file systems.</td>
</tr>
<tr>
<td>flboot</td>
<td>is a SCSI floptical drive disk booter.</td>
</tr>
<tr>
<td>flshcach</td>
<td>provides the cache flushing routine.</td>
</tr>
<tr>
<td>fsboot</td>
<td>TEAC SCSI floppy disk booter</td>
</tr>
<tr>
<td>hlproto</td>
<td>allows user-state debugging.</td>
</tr>
<tr>
<td>hsboot</td>
<td>SCSI hard disk booter</td>
</tr>
<tr>
<td>Module</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>ide</td>
<td>provides target-specific standard IDE support, including PCMCIA ATA PC cards.</td>
</tr>
<tr>
<td>iovcons</td>
<td>is a hardware independent virtual console driver that provides a telnetd-like interface to the low-level system console.</td>
</tr>
<tr>
<td>llbootp</td>
<td>is a target-independent BOOTP protocol booter module.</td>
</tr>
<tr>
<td>llip</td>
<td>is a target-independent internet protocol module.</td>
</tr>
<tr>
<td>llkermit</td>
<td>is a kermit booter (serial down loader).</td>
</tr>
<tr>
<td>llslip</td>
<td>is a target-independent serial line internet protocol module. This module uses the auxiliary communications port driver to perform serial I/O</td>
</tr>
<tr>
<td>lltcp</td>
<td>is a target-independent transmission control protocol module.</td>
</tr>
<tr>
<td>lludp</td>
<td>is a target-independent user datagram protocol modules.</td>
</tr>
<tr>
<td>notify</td>
<td>coordinates use of low-level I/O drivers in system and user-state debugging.</td>
</tr>
<tr>
<td>override</td>
<td>enables overriding of the autobooter. If the space bar is pressed within three seconds after booting the target, a boot menu is displayed. Otherwise, booting proceeds with the first autobooter.</td>
</tr>
</tbody>
</table>
### Table 2-3 Common System Modules List (continued)

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>parser</td>
<td>parses key fields from the cnfgdata module and the user parameter fields.</td>
</tr>
<tr>
<td>pcman</td>
<td>is a target-independent booter support module providing general booting services for PCF file systems (PC FAT file systems).</td>
</tr>
<tr>
<td>protoman</td>
<td>is a target-independent protocol module manager. This module provides the initial communication entry points into the protocol module stack.</td>
</tr>
<tr>
<td>restart</td>
<td>restarts boot process.</td>
</tr>
<tr>
<td>romboot</td>
<td>locates the OS-9 bootfile in ROM, FLASH, NVRAM.</td>
</tr>
<tr>
<td>rombreak</td>
<td>enables break option from the boot menu.</td>
</tr>
<tr>
<td>rombug</td>
<td>is a debugger client module.</td>
</tr>
<tr>
<td>scsiman</td>
<td>is a target-independent booter support module that provides general SCSI command protocol services</td>
</tr>
<tr>
<td>sndp</td>
<td>is a target-independent system-state network debugging protocol module. This module acts as a debugging client on the target, invoking the services of dbgser to perform debug tasks.</td>
</tr>
<tr>
<td>srecord</td>
<td>receives a Motorola S-record format file from the communications port and loads it into memory.</td>
</tr>
<tr>
<td>swtimer</td>
<td>is a software timer.</td>
</tr>
</tbody>
</table>
### Table 2-3 Common System Modules List (continued)

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tsboot</td>
<td>is a SCSI TEAC tape drive booter.</td>
</tr>
<tr>
<td>type41</td>
<td>primary partition type</td>
</tr>
<tr>
<td>vcons</td>
<td>is the console terminal pathlist.</td>
</tr>
<tr>
<td>vsboot</td>
<td>SCSI tape booter</td>
</tr>
</tbody>
</table>
Appendix B: Partitioning and Formatting Your Hard Drive

This appendix explains how to partition and format your hard drive with one primary partition on your target system.
Partitioning and Formatting Your Hard Drive

Partitioning Your Hard Drive

This section explains how to partition your hard drive using the `fdisk` command. The `fdisk` command displays and alters the partition table. You should format your hard drive after you have partitioned it.

**Note**
Although OS-9 can be used without disk partitions, the use of partitions is strongly recommended, even if only one partition is used. You cannot perform hard disk booting if you do not partition your hard disk.

**Note**
OS-9 uses extended type 41 partitions using the Random Block File Manager (RBF) file system. The `fdisk` utility used to create partitions allows a maximum of four primary partitions to be created. For information on how to create more than one primary partition, refer to the *Utilities Reference Manual*, located on the *Microware OS-9* CD.
To create a partition on your target system, use the following steps:

---

### Step 1.

Familiarize yourself with the `fdisk` command options and their uses, as listed in Table B-1.

---

### Table B-1  `fdisk` Command Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-a [=] &lt;num&gt;</td>
<td>Makes partition <code>&lt;num&gt;</code> the active partition.</td>
</tr>
<tr>
<td>-d [=] &lt;dev&gt;</td>
<td>Examines/changes device. Default = <code>/hc</code>.</td>
</tr>
<tr>
<td>-c</td>
<td>Forces terminal mode (cursors off).</td>
</tr>
<tr>
<td>-e</td>
<td>Includes partition information in display mode.</td>
</tr>
<tr>
<td>-s</td>
<td>Displays the partition table.</td>
</tr>
</tbody>
</table>

---

### Step 2.

At the OS-9 prompt, type `tmode nopause`. This allows you to view the entire `fdisk` options window after step 3.

### Step 3.

Create a partition using the `fdisk` utility. You must refer to the SCSI raw drive when using `fdisk`. The following descriptors are available when booting.

- `hs0fmt<-----` SCSI ID 0
- `hs1fmt<-----` SCSI ID 1

For example, to partition SCSI ID 1, you would enter the following command at the OS-9 prompt:

```
fdisk -d=/hs1fmt -e
```

Use the `-i` option to clear existing partitions from the board.
**Note**
You can determine the appropriate description of your SCSI driver from mwWizard by selecting Configure -> Bootfile -> Disk Configuration -> SCSI Configuration tab.

---

**Note**
For a complete explanation of related device descriptors, see the *OS-9 Porting Guide*.

---

**Step 4.** The following partitioning options display:

1. Create OS-9000 partition
2. Set Active Partition
3. Delete partition
4. Display partition information
5. Change extended DOS partition to OS-9000 partition

---

**Note**
If your hard drive already has a partition you want to delete, select 3.

---

**For More Information**
Refer to *OS-9 Partitioning Options* later in this Appendix for more information on how to delete a partition.
Partitioning and Formatting Your Hard Drive

Step 5. Select 1. Create OS-9000 Partition. A prompt appears asking you for the size of the partition you want (in cylinders). The default, shown in brackets, is the maximum amount of cylinders available for your partition on the hard drive. (You may have to hit <return> to view all the information).

Note
If you currently have a partition on the drive (such as DOS), the default size is the total number of remaining cylinders.

Display Partition Information
Current fixed disk device: /hcfmt@
Partition Status Type Start End Size

Enter the partition size in cylinders: [1022]

Note
It is important to note that one cylinder does not necessarily reflect 1MB. Enter the number of cylinders to allocate for the partition, not the number of bytes.

Step 6. The system determines the maximum amount of cylinders and uses this as the default selection.
If you want the partition to be a portion of the total number of cylinders, enter this number of cylinders instead.

Step 7. Hit <return>

Step 8. The following is displayed:
1. OS9000/386 type partition
2. Extended Type 41 partition
select partition type (1,2).................: [ ]
Partitioning and Formatting Your Hard Drive

Step 9. Type 2 for Extended type 41 partition

Step 10. When the partitioning has completed, the display shows the display partition information screen:

1. Create OS-9000 partition
2. Set Active Partition
3. Delete partition
4. Display partition information
5. Change extended DOS partition to OS-9000 partition

Step 11. Hit <esc>

Step 12. The partitioning is now complete. To exit the fdisk utility and save the partition to the hard drive, hit the <esc> key. The following question is displayed:

Want to save new partition information (y/n)?

Step 13. Type y to save the partition information to disk. You return to the OS-9 prompt.

Step 14. Move on to Formatting Your Hard Drive.
Partitioning and Formatting Your Hard Drive

Formatting Your Hard Drive

Before you format your hard drive, make sure that it is partitioned correctly. See Partitioning Your Hard Drive in this Appendix for information on how to perform this task. This section explains how to format your hard drive using the format command.

For More Information

For a complete description of all the format command options, refer to the Utilities Reference Manual located on the Microwave OS-9 CD.

Step 1. Format the partitions using the correct descriptor for your hard drive. Descriptor options include the following:

- `hs01fmt---->SCSI ID=0 Partition = 1`
- `hs02fmt---->SCSI ID=0 Partition = 2`
- `hs03fmt---->SCSI ID=0 Partition = 3`
- `hs04fmt---->SCSI ID=0 Partition = 4`
- `hs11fmt---->SCSI ID=1 Partition = 1`
- `hs12fmt---->SCSI ID=1 Partition = 2`
- `hs13fmt---->SCSI ID=1 Partition = 3`
- `hs14fmt---->SCSI ID=1 Partition = 4`
- `hs51fmt---->SCSI ID=5 Partition = 1`
- `hs52fmt---->SCSI ID=5 Partition = 2`
- `hs53fmt---->SCSI ID=5 Partition = 3`
- `hs54fmt---->SCSI ID=5 Partition = 4`
Step 2. Enter the command `format /hs01fmt -np -nv -r -vOS9000` to format the hard drive. The following table shows the format specified device options.

**Table B-2 Format Specified Device Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-be</td>
<td>create big-endian fs (ie: PPC)</td>
</tr>
<tr>
<td>-bo=&lt;num&gt;</td>
<td>use block offset of &lt;num&gt;</td>
</tr>
<tr>
<td>-c</td>
<td>enable command/interactive mode</td>
</tr>
<tr>
<td>-dd</td>
<td>double density disk</td>
</tr>
<tr>
<td>-ds</td>
<td>double sided disk</td>
</tr>
<tr>
<td>-h=&lt;num&gt;</td>
<td>disk has &lt;num&gt; heads</td>
</tr>
<tr>
<td>-i=&lt;num&gt;</td>
<td>use interleave of &lt;num&gt;</td>
</tr>
<tr>
<td>-le</td>
<td>create little-endian (ie: x86, ARM)</td>
</tr>
<tr>
<td>-m=&lt;num&gt;</td>
<td>put bitmap at block &lt;num&gt;</td>
</tr>
<tr>
<td>-np</td>
<td>no physical format</td>
</tr>
<tr>
<td>-nv</td>
<td>no physical verify</td>
</tr>
<tr>
<td>-o</td>
<td>do interleave optimization</td>
</tr>
<tr>
<td>-r</td>
<td>assume ready (don't ask)</td>
</tr>
<tr>
<td>-s=&lt;num&gt;</td>
<td>use spiral skew of &lt;num&gt;</td>
</tr>
<tr>
<td>-sd</td>
<td>single density disk</td>
</tr>
<tr>
<td>-ss</td>
<td>single sided disk</td>
</tr>
</tbody>
</table>
Partitioning and Formatting Your Hard Drive

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Step 3. Your hard drive is now partitioned and formatted, and the OS-9 prompt returns.

OS-9 Partitioning Options

Create OS-9 Partition (1)

Creates OS-9 partitions. When partitions are created, you are prompted for the size of the partition in terms of cylinders.

Set Active Partition (2)

Specifies which partition is bootable. If DOS is set as the active partition and the system is reset, then DOS loads. To allow OS-9 to boot, you must use the DOS version of fdisk to set the OS-9 partition to active. If a boot manager is used, then set the Boot Manager as active.

Delete Partition (3)

Deletes partitions. Use the delete option with care. Extended partitions may include any logical drives associated with them.

---

Table B-2 Format Specified Device Options (continued)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-to=&lt;num&gt;</td>
<td>use track offset of &lt;num&gt;</td>
</tr>
<tr>
<td>-t=&lt;num&gt;</td>
<td>disk has &lt;num&gt; tracks</td>
</tr>
<tr>
<td>-v=&lt;name&gt;</td>
<td>set volume name to &lt;name&gt;</td>
</tr>
<tr>
<td>-?</td>
<td>print this help message</td>
</tr>
</tbody>
</table>
Display Partition Information (4)

Displays the partition tables. If the -e option is used, additional information about the partition tables displays.

The extended/additional information includes:

Table B-3 Display Partition -e Option

<table>
<thead>
<tr>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>st</td>
</tr>
<tr>
<td>s_head</td>
</tr>
<tr>
<td>s_cyl_blk</td>
</tr>
<tr>
<td>type</td>
</tr>
<tr>
<td>e_head</td>
</tr>
<tr>
<td>e_cyl_blk</td>
</tr>
<tr>
<td>s_blk</td>
</tr>
<tr>
<td>size</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-flag (if 80 drive is startable)</td>
</tr>
<tr>
<td>Start head (byte)</td>
</tr>
<tr>
<td>Start Cylinder block (word)</td>
</tr>
<tr>
<td>Partition type (word)</td>
</tr>
<tr>
<td>End head (byte)</td>
</tr>
<tr>
<td>End cylinder block (word)</td>
</tr>
<tr>
<td>Start block (LBA) (long-word)</td>
</tr>
<tr>
<td>Size of block (LBA) (long-word)</td>
</tr>
</tbody>
</table>

Change Extended DOS Partition to OS-9 Partition (5)

Converts an extended partition to an OS-9 partition. Extended partitions may include logical drives.