OS-9® for PCAT/MediaGX Board Guide

Version 3.2

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Table of Contents

Chapter 1: Installing and Configuring OS-9

This chapter describes installing and configuring OS-9 for X86/Pentium on both a PCAT computer and on a MediaGX target. It includes the following sections:

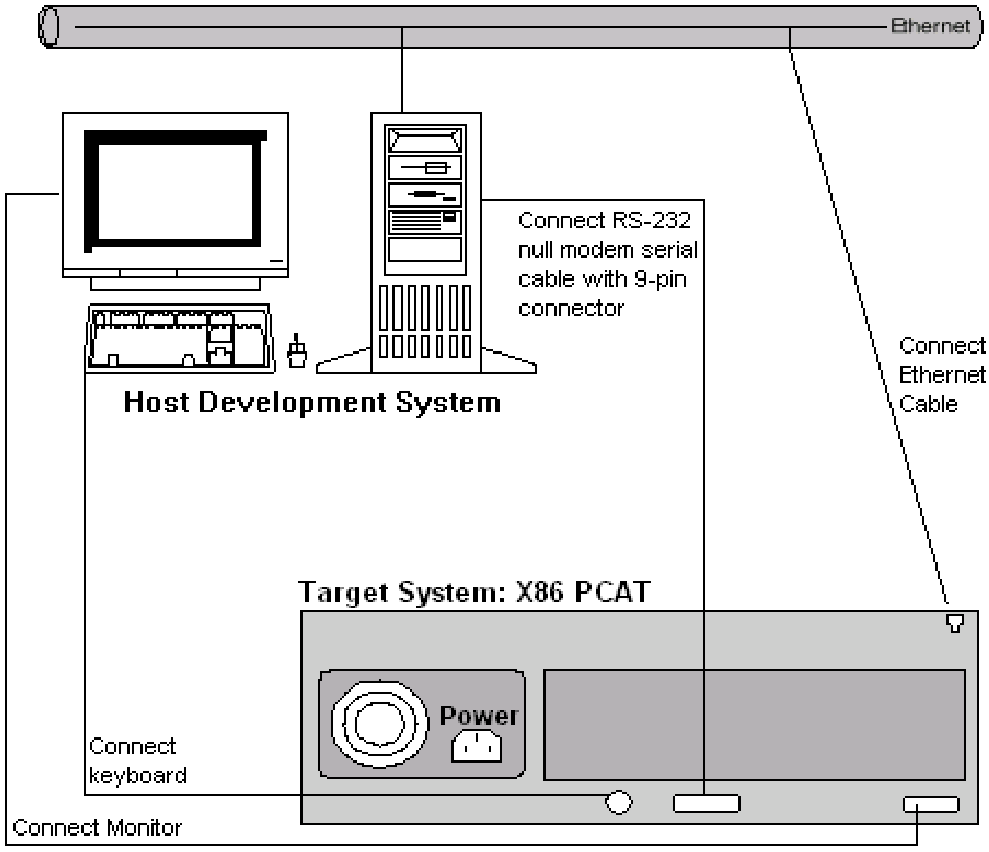
Note

Even though much of the information in this manual is cast in context of the PCAT port, this information applies to the MediaGX port as well. If a piece of information is relevant only to the PCAT port or to the MediaGX port, that piece of information is labeled as such.

Development Environment Overview

Figure 1-1 shows a typical development environment for the PCAT board.

Figure 1-1 X86 Development Environment



Requirements and Compatibility

Note
Before you begin, install the ***Enhanced OS-9 for X86/Pentium*** CD-ROM on your host PC.

Host Hardware Requirements (PC Compatible)

The host PC must have the following minimum hardware characteristics:

- the recommended amount of RAM for the host operating system
- 250 – 350 MB free disk space
- CD-ROM drive
- network card (required when using Microware's Hawk to debug applications on the target computer)

Host Software Requirements (PC Compatible)

The host PC must have the following software installed:

- Enhanced OS-9
- Microsoft Windows 95, 98, ME, 2000, or NT

Target Hardware Requirements

The following is required of your target hardware:

- PCAT compatible computer
- monitor (may be removed once OS-9 is installed)
- IDE, SCSI, or other storage device
- floppy drive (may be removed once OS-9 is installed)
- network connection to the host computer (required for initial configuration and when using Microware's Hawk to debug applications)
- keyboard or serial connection to the Windows host computer (may be removed once OS-9 is installed)

Target Hardware Setup

Supported Devices

The following sections list the supported devices for OS-9 for PCAT.

For More Information

Refer to **Appendix B: Configuring Hardware Devices** of this document for detailed information on configuring and troubleshooting specific devices with OS-9.

Ethernet Controllers

To complete development work, you will need an ISA, PCI or PCMCIA network card supported by OS-9. Driver support is also included for network cards from the following manufacturers:

- **3COM PCI series**

3C900-TPO	10Base-T TPO NIC
3C905-TX	10/100 Base-TX (RJ-45)
3C905-T4	10/100 Base-T4 (RJ-45)
3C900B-CMB	10Base-T/10Base-2/AUI Combo
3C900B-TPO	10Base-T TPO NIC
3C905B-TX	10/100 Base-TX NIC
3CSOHO100-TX	10/100 Base-TX NIC
9006	10Base-T/10Base-2/TPC
9058	10/100 COMBO Deluxe board
9200	Tornado NIC
9800	10/100 Base-TX NIC(Python-H)
9805	10/100 Base-TX NIC(Python-T)

- **3COM ISA Etherlink III**
  (includes the 509B part)
- **3COM Etherlink III PC Card**
  - Etherlink III 3C589D
- **DEC 21140**
  - Asante' Fast 10/100
  - Netgear FA310
  - SMC EtherPower 10/100 - SMC9332DST
  - SMC EtherPower 10/100 - SMC9334BDT/SC (Dual)
- **Intel® Pro100 Series**
  - 82558
  - 82559
  - 82559ER
- **Realtek RTL8139A**
  8139 on board
- **SMC 91C94/96**
  Versalogic board
- **LAN79C961/AM79C973**
  - WinSystems PC104+ card
    (driver is used with vmware)
- **NE2000 (PCI)**
  - Compex RL2000
  - Holtek HT80232
  - Holtek HT80229
  - KTI ET32P2
  - NetVin NV5000SC
  - RealTek RTL-8029
  - SureCom NE34
  - Via 82C926
  - Winbond 89C940
  - Winbond w89C940

- **NE2000 (ISA)**
  PCI drivers can be used with ISA cards. The interrupt vector and port address will have to be changed.
  - ACCTON - EN166X MPX 2 Ethernet
  - D-LINK DE-220PCT - 10Mbps Combo 16-Bit Ethernet ISA Adapter
  - ZF netDisplay
- **NE2000 PCMCIA (PC Card)**
  - Socket LP-E, NE2000 clone (83902 core)
- **Netgear FA311/FA312**
- **Cirrus Logic CS8900 (ISA)**
  No system state debugging available for this card

For some Ethernet cards, the I/O base address and interrupt settings must be configured on the card to match the settings used by OS-9. A setup disk, provided with the network card, may be needed to configure the card to the correct settings. The default settings for an NE2000 card are I/O Base 0x340 and IRQ 9.

Maui VGA Support

- MediaGX onchip (gx_mediagx) * MediaGX only
- MediaGX onchip (high color gx_mediagxh) * MediaGX only
- Generic VGA mode 13 (320x200x8bpp)
- Generic VGA mode 12 & "X" (640x480x4bpp & 360x480x8bpp)
- Cirrus Alpine Series - CL-GD5434, CL-GD5480 etc. (up to 1024x768x24bpp) * PCAT only
- Standard VESA (INT 10h) driver (`gx_vesa`)
- Linear mode VESA (INT 10h) driver (`gx_vesal`)
- High color VESA (INT 10h) driver (`gx_vesah`)
- Liner mode, high color VESA (INT 10h) driver (`gx_vesalh`)
- ISA banked

Sequential Device Support

- VGA Graphics / Keyboard
- Serial Mouse
- PS2 Mouse
- 16550 Serial
- Digiboard
- Hostessl
- LavaPort-Quad (Lava PCI QUAD Card
  One card support enabled, remove # in front of the lines for the other three cards in the `bootfile.ml` file to enable them .
- Parallel Printer

Physical Disk Media

- IDE Standard
- PCMCIA IDE
- IDE Standard
- DiskOnChip
- DiskOnChip Descriptors
- PCAT Style Floppy
- Floppy Descriptors
- Symbios 810,810A,825,825A and 875 PCI SCSI controllers—Wide, Ultra and Ultra Wide
- Diamond FirePort20 and FirePort40—Wide, Ultra and Ultra Wide
- Adaptec 1540/1542 ISA
- Adaptec 2940, 2940U and 2940UW
- SCSI Descriptors

System Devices

- Real Time Clock

Additional Devices

- PPP and SLIP

CMOS Settings

It may be necessary to modify the BIOS settings in CMOS to boot from a hard disk. In most cases you may modify the CMOS settings by pressing `DEL` after rebooting. Configure the board with the correct settings for the attached peripherals. The boot sequence should try floppy first, and then the IDE hard drive.

Connecting the Target to the Host

To connect the target to the host, complete the following steps:

Step 1. Connect the target system to a power supply. Make sure the power switch is in the OFF position.

Step 2. Connect the target system to an Ethernet network (required for initial configuration and when using Microware's Hawk to debug applications).

Step 3. Connect the target system to the host system using an RS-232 null modem serial cable with 9-pin connectors.

Step 4. Connect the target system to a monitor and keyboard (may be removed once OS-9 is installed).

Building the Bootfile Image

The following sections detail the preferable method for building the bootfile image. This preferable method includes building a bootable floppy disk using Microware's Configuration Wizard.

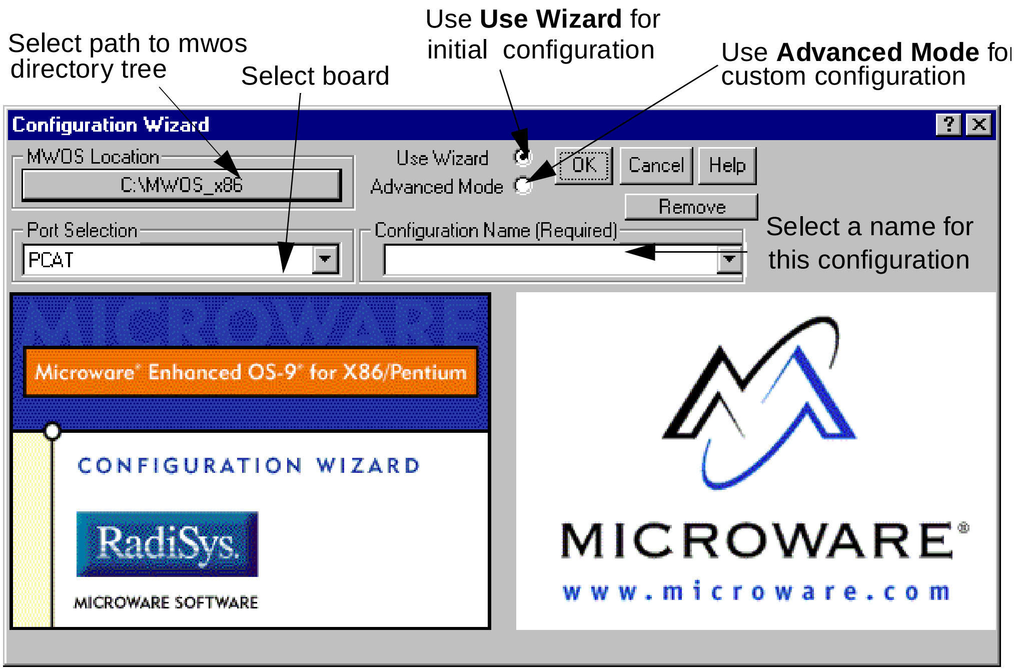
Using the Configuration Wizard

To use the Configuration Wizard, perform the following steps:

Step 1. Click the `Start` button on the Windows desktop.

Step 2. Select `Programs` -> `RadiSys` -> `Enhanced OS-9 for X86 v3.0.4` -> `Configuration Wizard`. The following dialog box appears:

Figure 1-2 X86 Configuration Wizard



Step 3. Select the path where the MWOS directory structure can be located by clicking the MWOS location button.

Step 4. Select the target board from the Port Selection pull-down menu.

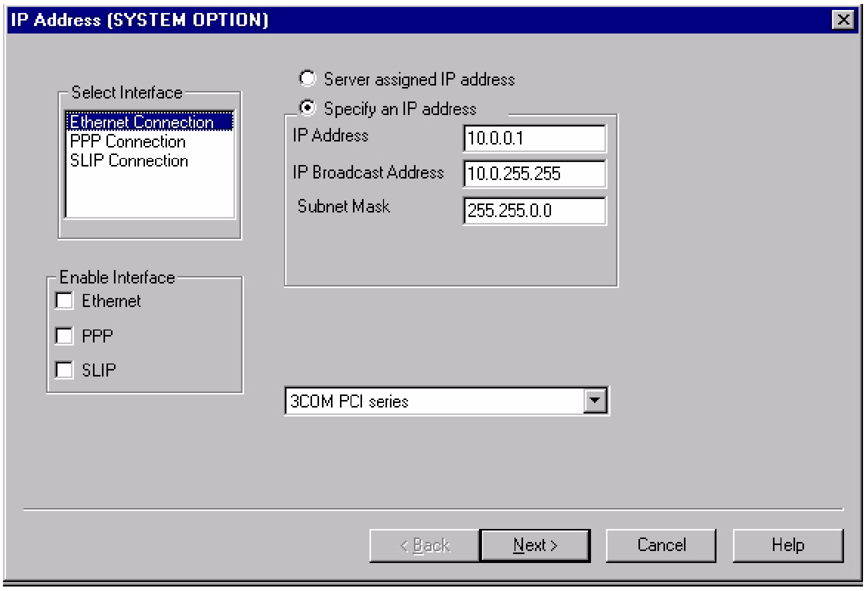
Step 5. Select a name for your configuration in the Configuration Name field. Your settings will be saved for future use. This enables you to modify the ROM image incrementally, without having to reselect every option for each change.

Step 6. Select `Use Wizard` and click `OK`. You are ready to begin preparing your floppy disk for the build.

Building the Bootable Floppy Disk

Once you have opened the Configuration Wizard in **Use Wizard** mode, the **IP Address** window appears (shown in **Figure 1-3**). The **IP Address** window is where you will begin configuring your floppy disk for the build. It will allow you to use Ethernet, PPP, or SLIP for networking.

Figure 1-3 IP Address Window



IP Address (SYSTEM OPTION)

Select Interface: Ethernet Connection (selected), PPP Connection, SLIP Connection

( ) Server assigned IP address
(●) Specify an IP address

IP Address: 10.0.0.1
IP Broadcast Address: 10.0.255.255
Subnet Mask: 255.255.0.0

Enable Interface: ☐ Ethernet ☐ PPP ☐ SLIP

3COM PCI series

Step 1. From the **IP Address** window, select the `Specify an IP address` radio button and enter your IP address, broadcast address, and subnet mask values.

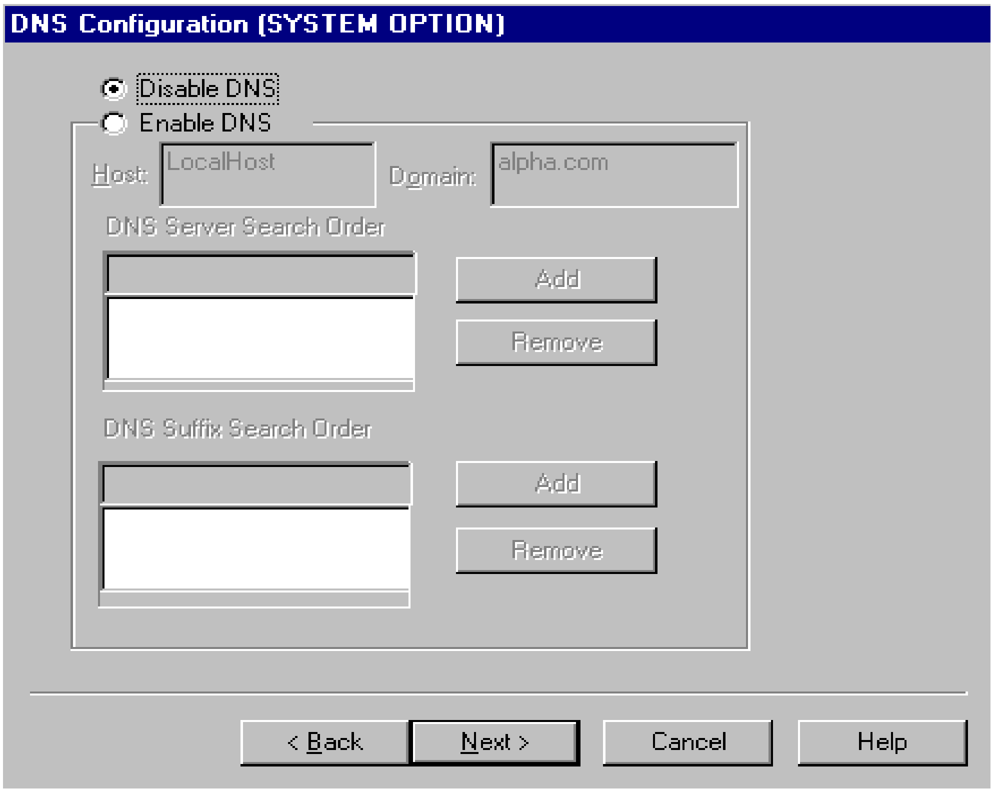
Note

Contact your system administrator if you do not know the appropriate IP values for your system.

Step 2. Select your network adaptor model by scrolling though the choices on the pull-down list box. If you do not want networking enabled, simply select None at the bottom of the list. Click Next.

Step 3. The **DNS Configuration** window appears (shown in **Figure 1-4**). Select the Enable DNS radio button and fill in the appropriate values for your network. If you do not want DNS enabled, simply select the **Disable DNS** radio button. Click Next.

Figure 1-4 DNS Configuration Window


DNS Configuration (SYSTEM OPTION)

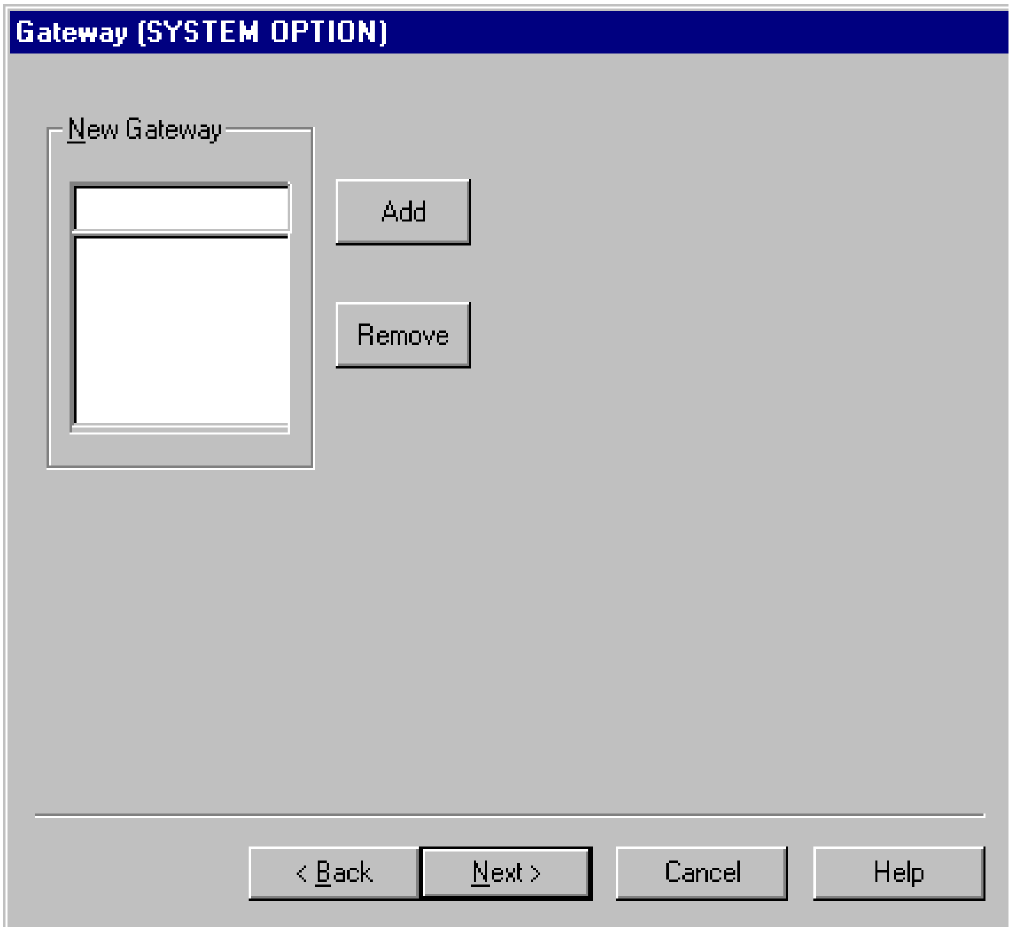
[✓ Disable DNS] Enable DNS

Host: LocalHost

Domain: alpha.com

Step 4. The **Gateway** window appears (shown in **Figure 1-5**). Add in the appropriate information for your network. Click `Next`.

Figure 1-5 Gateway Window

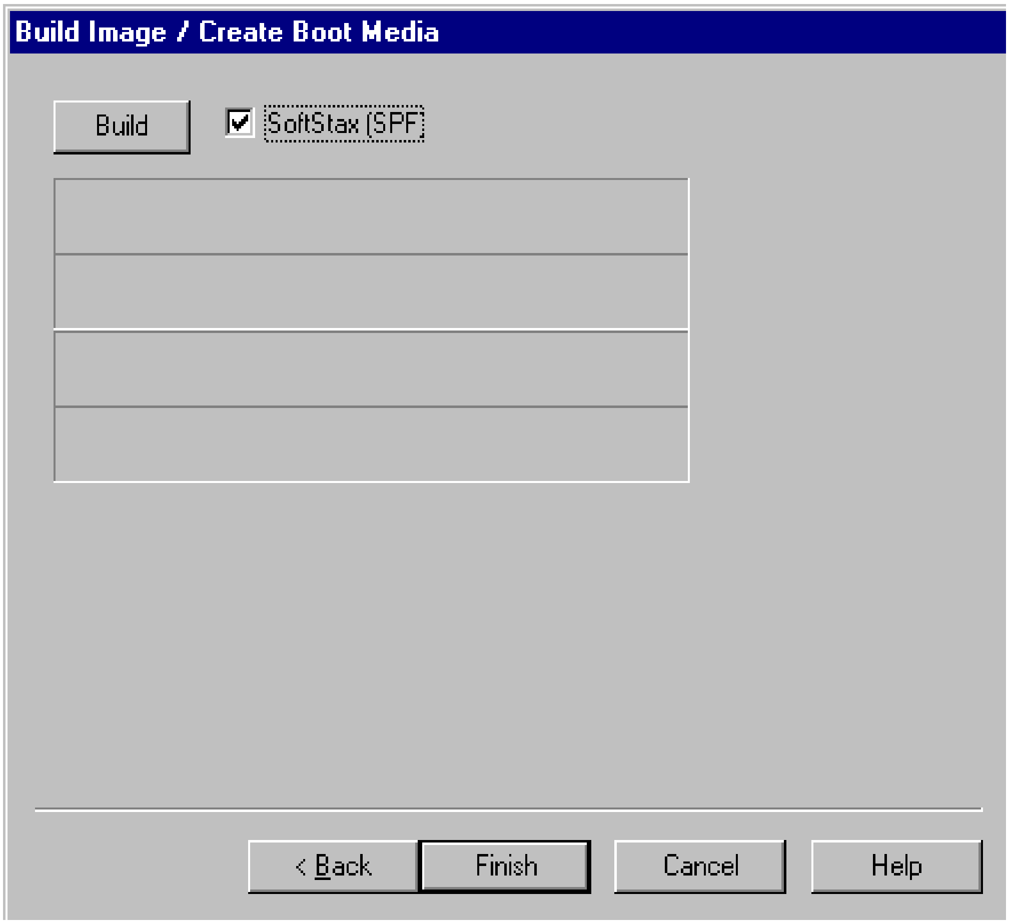


Note

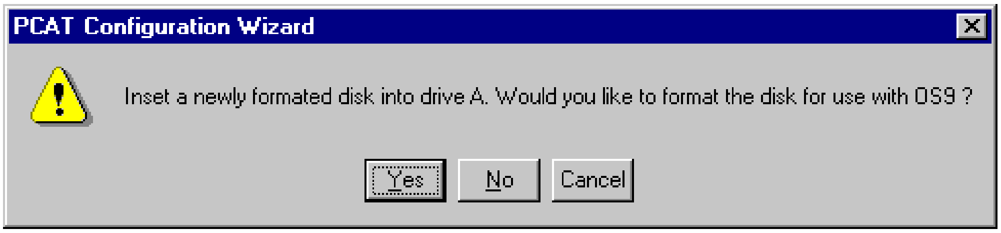
Contact your system administrator if you do not know the appropriate gateway values for your system.

Step 5. The **Build Image/Create Boot Media** window appears (shown in **Figure 1-6**). Select the **SoftStax** check box if you would like SoftStax enabled and click `Build`.

Figure 1-6 Build Image Window



Step 6. When the build is complete, the following dialog box appears:



Inset a newly formated disk into drive A. Would you like to format the disk for use with OS9 ?

Insert a new floppy disk into your computer's floppy drive and click `Yes` to format it for OS-9 and copy the boot image.

Step 7. Click `Finish`. A dialog appears prompting you to save the file.

The newly created boot floppy can be used to bring OS-9 up on the X86 target hardware. The default OS-9 console is the target's monitor.

If you enabled networking, you should be able to telnet into the target from your host PC. To do this, select `Run` from the Windows start menu and type the following command:

```
telnet OS9test
```

The login user name is `super`; the password is `user`.

Building an OS-9 Image on the Target

This section describes using the floppy you built in the previous sections on the target machine.

Preparing the Hard Disk

The newly created boot floppy may be used to format a local hard disk with the OS-9 file system. A network connection between the OS-9 target machine and the Windows host computer may be used to load the OS-9 system files onto the hard disk.

Partitioning the Drive

Complete the following steps to partition the hard drive:

Step 1. Boot the target system, using the floppy made in the previous section. The console menu appears. An example of the console menu is shown below.

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

Boot FDC floppy ------------------------------------ <fd>
Boot from PC-Floppy -------------------------------- <pf>
Boot from (RBF) IDE Primary Master ----------------- <ide>
Boot from PCMCIA(PC) IDE Primary Master-Socket #0 -- <pcm_pc>
Enter ROM Debugger --------------------------------- <break>
Restart the System --------------------------------- <q>
Select a boot method from the above menu:
```

Step 2. Select `fd` from the boot menu to boot the floppy disk you inserted in the disk drive. Press `Enter`.

Step 3. Once the bootfile is read, the OS-9 console prompt appears ($). From the prompt, run `fdisk` by typing the following command:

```
fdisk -d=/hc<n>fmt -e
```

Step 4. The **Fdisk Options** menu appears. An example of this menu is shown below.

```
Current fixed disk device: /hc<n>fmt@
Choose operation to execute:
1. Create OS-9000 partition
2. Set active partition
3. Delete partition
4. Display partition information
5. Change extended Dos partition to OS9000 partition
6. Write master boot record (MBR)
```

Select `1` to create the OS-9 partition. The partition information is displayed.

Step 5. The **Enter the partition size in cylinders: [ ]** prompt appears at the bottom of the screen. Press `Enter` to accept the size.

Step 6. The following partition type options are displayed:

```
1. OS9000/386 type partition
2. Extended Type 41 partition
```

Select `1` and press `Enter`. The partition information is displayed again. Press `Esc` to return to the **Fdisk Options** menu.

Step 7. The next step is to make the partition active. Once returned to the **Fdisk Options** menu, select `2` to set the active partition. Press `Enter`.

Step 8. The partition information is displayed once again. When prompted, select the number that corresponds to the partition you would like to make active and press `Enter`.

Step 9. The partition information displays your new information. Press `Esc` to return to the **Fdisk Options** menu. At the menu, you can do one of two things:

- If the disk you are using is new and contains no other operating systems, proceed to step ten.
- If at least one other operating systems exists on your disk, proceed directly to the section, **Formatting the Hard Drive**.

Step 10. If the disk you are using contains no other operating system, you will need to write master boot record (MBR) to the disk. To do this, select `6` from the **Fdisk Options** menu.

Step 11. The display information prompts you to select the partition on which you wish to write MBR. Once you have done this, press `Enter`. The **Fdisk Options** menu is displayed. Press `Esc` to exit this menu.

Step 12. The **want to save new partition information** prompt appears. Press `y` to save the partition information and press `Enter`. The partition information is written to the drive.

Formatting the Hard Drive

To format the hard drive, complete the following steps:

Step 1. Create the OS-9 RBF file system by running `format` from the console:

```
format /hc<n>fmt
```

Press `Enter`.

Step 2. The disk format utility parameters display. At the prompt, select `y` if you are ready to begin performing the selected partition. Press `Enter` to continue.

Step 3. From here you are prompted to enter the following information, respectively:

- physical format
- disk name
- physical verify

Note

It is not typically necessary to complete a physical format and verify.

After entering the appropriate information, your formatting information is displayed and the OS-9 prompt returns.

FTP to the Target

The following steps discuss the procedure for transferring required files from the host to the target machine. The tar archives are found in the directory named RESIDENT on the product CD.

Step 1. On the host machine, open the command prompt window.

Step 2. From the command prompt, move to the directory which contains the diskcache file. (This file is located in `MWOS\OS9000\80386\CMDS`.)

Step 3. Begin the FTP session with the target machine by typing the following command:

```
ftp <target>
```

Step 4. To log in to the system, type the appropriate username and password. (The username is `super`. The password is `user`.)

Step 5. At the next `ftp` prompt, type the following command to set binary mode:

```
bin
```

Step 6. Move to the target hard drive directory by typing the following command:

```
cd hc<n>fmt
```

Step 7. Type the following command:

```
put tar
```

Step 8. To place the `diskcache` file into the target system, type the following command:

```
put diskcache
```

Step 9. To place the MWOS directory tree into the target system, type the following command:

```
put mw86.tar
```

Note

If disk space is limited, then you may wish to download `mw86sm.tar` in place of `mw86.tar`. `mw86sm.tar` includes a reduced set of commands and descriptors. The file `mw86sm.tar` can be loaded in a disk space smaller than 4 megabytes.

Step 10. To exit the program, type `quit`.

Step 11. To turn on disk cache support from the OS-9 console, type the following command:

```
$ chd /hc1fmt ; load -d diskcache ; diskcache -e /hc1fmt=1024k
```

Step 12. Expand the system files by typing the following command:

```
$ load -d tar ; tmode nopause ; tar xvpf mw86.tar
```

The disk is now formatted and the OS-9 system files have been copied to disk.

Minimal FTP to the Target

The following steps discuss the procedure for transferring required files from the host to the target machine without copying the tar archive to the target first. The tar archives are found in the directory named RESIDENT on the product CD.

Step 1. On the host machine, open the command prompt window.

Step 2. From the command prompt, move to the directory which contains the `mw86.tar` file.

Step 3. Begin the FTP session with the target machine by typing the following command:

```
ftp <target>
```

Step 4. To log in to the system, type the appropriate username and password. (The username is `super`. The password is `user`.)

Step 5. At the next `ftp` prompt, type the following commands to set binary mode and to display hash marks during transfer of the tar archive:

```
bin
hash
```

Step 6. Type the following command to send the tar archive into a pipe on the target. The command will start and then wait for you to complete this procedure's steps on the target.

```
send mw86.tar /pipe/mw86.tar
```

Step 7. On the target, change directories to the partition that will hold the contents of the tar archive. <n> is the number of the partition (i.e.. 1, 2, 3, etc.).

```
chd /hc<n>fmt
```

Step 8. Extract the contents of the tar to the partition with the following commands:

```
tmode nopause
tar -xvpf /pipe/mw86.tar
```

The tar archive is transferred from the host and extracted onto the hard drive. You will see a series of hash marks display on the host's monitor while the transfer is in progress.

Note

If disk space is limited, then you may wish to download `mw86sm.tar` in place of `mw86.tar`. `mw86sm.tar` includes a reduced set of commands and descriptors. The file `mw86sm.tar` can be loaded in a disk space smaller than 4 megabytes.

Step 9. To exit the FTP program from the host, type `quit`.

Step 10. The disk is now formatted and the OS-9 system files have been copied to disk.

Configuring the Hard Drive

This section finishes the hard disk configuration by using the OS-9 `bootgen` utility to install a boot image onto the hard disk. The hard disk will be made bootable using the OS-9 boot image created in the previous sections.

Step 1. Boot the target system using the floppy made in the previous section.

Step 2. At the OS-9 prompt, verify that you can access the hard disk by executing the following command:

```
$ dir /h0
```

An OS-9 directory listing should be displayed.

Step 3. Turn disk caching off by typing the following command at the OS-9 console:

```
$ diskcache -d /hc1fmt
```

Step 4. To ready `bootgen` on the new system, type the following command at the OS-9 console:

```
$ bootgen /hc1fmt -i=/d0/iplhdnoq -l=/d0/firstboot /d0/sysboot -nb400
```

Step 5. Remove the floppy from the drive and reboot the system. The system should boot from the hard disk, with the OS-9 system prompt appearing on the console.

Creating a Startup File

When the Configuration Wizard is set to use the hard drive as the default device, it automatically sets up the init module to call the following file:

```
/dd/sys/startup
```

However, this startup file will not exist until you create it. To create and configure the startup file, complete the following steps:

Step 1. Create a SYS directory on your target machine. This is the directory in which the startup file will reside (for example, `makdir/dd/sys`).

Step 2. On your host machine, navigate to the following location:

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

In this directory, you will see the following three files:

- `password`
- `termcap`
- `startup`

Step 3. Transfer the `password` and `termcap` files from their location on the host machine (`MWOS/OS9000/SRC/SYS`) to the newly created SYS directory on the target machine. These files do not require modification.

Step 4. Once you have transferred the `password` and `termcap` files, you will need to transfer the `startup` file from the SYS directory on the host to the SYS directory on the target machine. However, please note that because the commands in the startup file are system dependent, it may be necessary to modify the file to fit your system configuration. Moreover, it is recommended that you modify the startup file before transferring it to your target machine.

Example Startup File

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

```
-tnxnp
tmode -w=1 nopause
*
*OS-9000 - Version 3.0
*Copyright 2001 by Microware Systems Corporation
*Copyright 2001 by RadiSys 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 /t1 &          ;* start other terminals
list sys/motd
setenv TERM vt100
tmode -w=1 pause
mshell<>>>/term -l&
```

For More Information

Refer to the section, **Making a Startup File**, in Chapter 9 of the ***Using OS-9*** manual for more information on startup files.

Optional Procedures

The following sections discuss optional procedures you may perform once you have set up and configured the PCAT board.

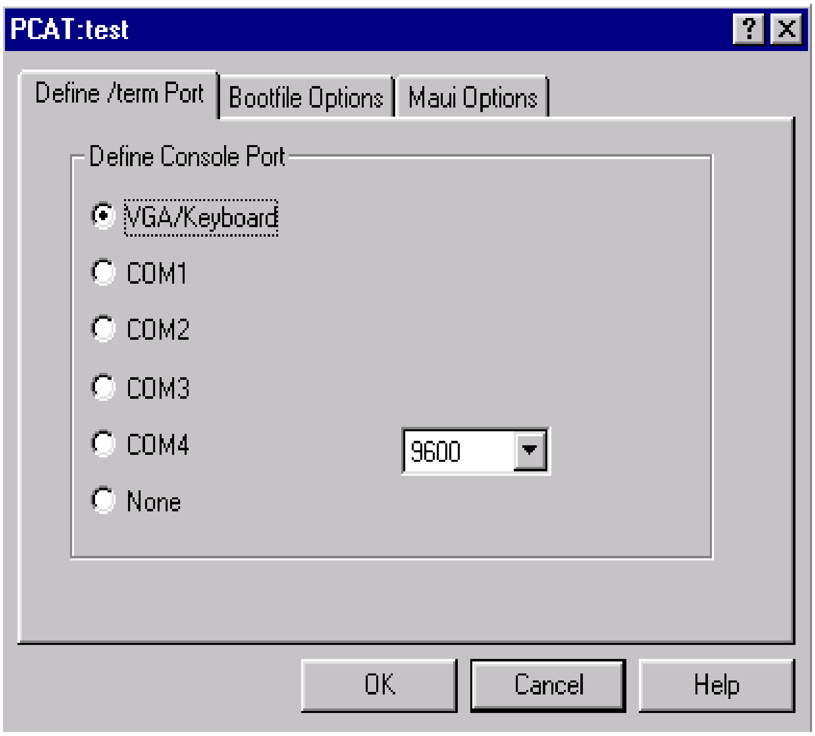
Advanced Configurations

The following steps detail configuring the target system to boot from a local hard disk and to moving the OS-9 console to a serial port. This might be beneficial if you wish to remove the monitor or use it specifically for graphic applications.

Step 1. Open the Configuration Wizard in **Advanced Mode**. The **Main Configuration** window is displayed.

Step 2. Select Configure -> Bootfile -> Configure System Options from the menu. The following window appears:

Figure 1-7 Configure System Options Window-Define /term Port tab



Define Console Port

[✓ VGA/Keyboard] COM1 COM2 COM3 COM4 None

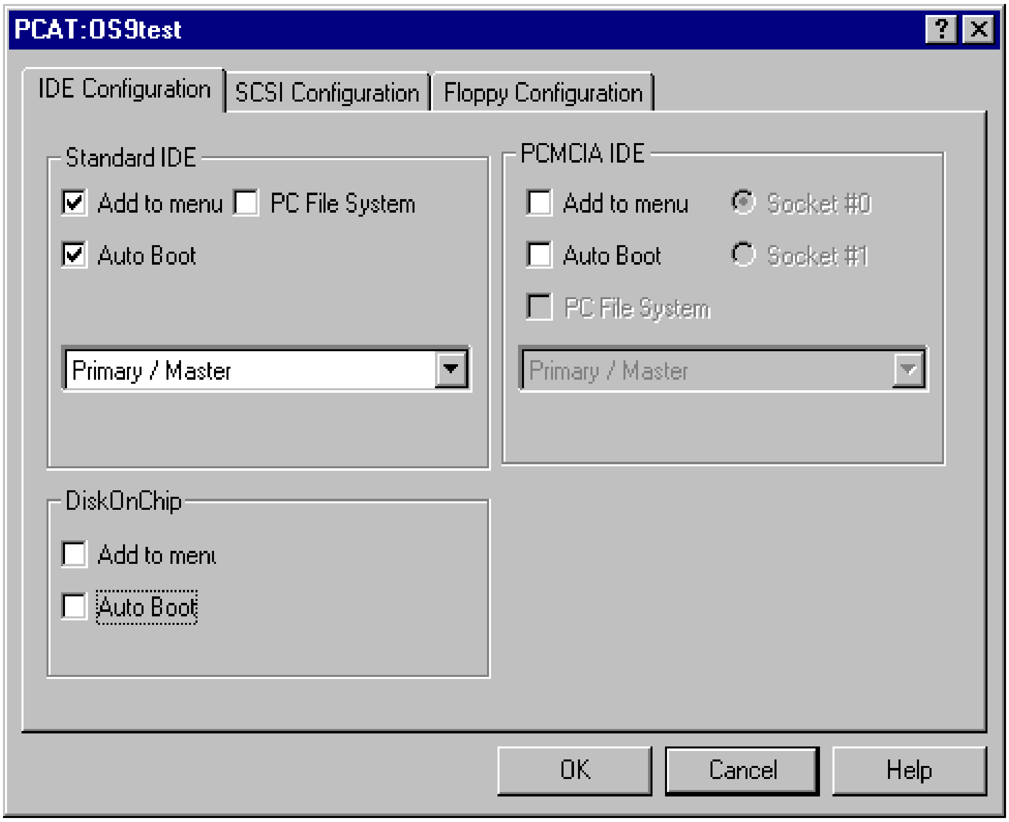
9600

Step 3. If you plan on using the monitor and keyboard as the OS-9 system console, leave the **VGA/Keyboard** radio button checked. Otherwise, click on the COM1 radio button on the **Define /term Port** tab. This moves the high-level console to serial port one.

Step 4. Verify that the baud rate is set to 9600. Click OK.

Step 5. Select Configure -> Coreboot -> Disk Configuration. The following window appears:

Figure 1-8 Disk Configuration Window-IDE Configuration tab


PCAT:OS9test

IDE Configuration | SCSI Configuration | Floppy Configuration

Standard IDE
- [✓] Add to menu
- [ ] PC File System
- [✓] Auto Boot
- Primary / Master

PCMCIA IDE
- [ ] Add to menu
- ● Socket #0
- ○ Socket #1
- [ ] Auto Boot
- [ ] PC File System
- Primary / Master

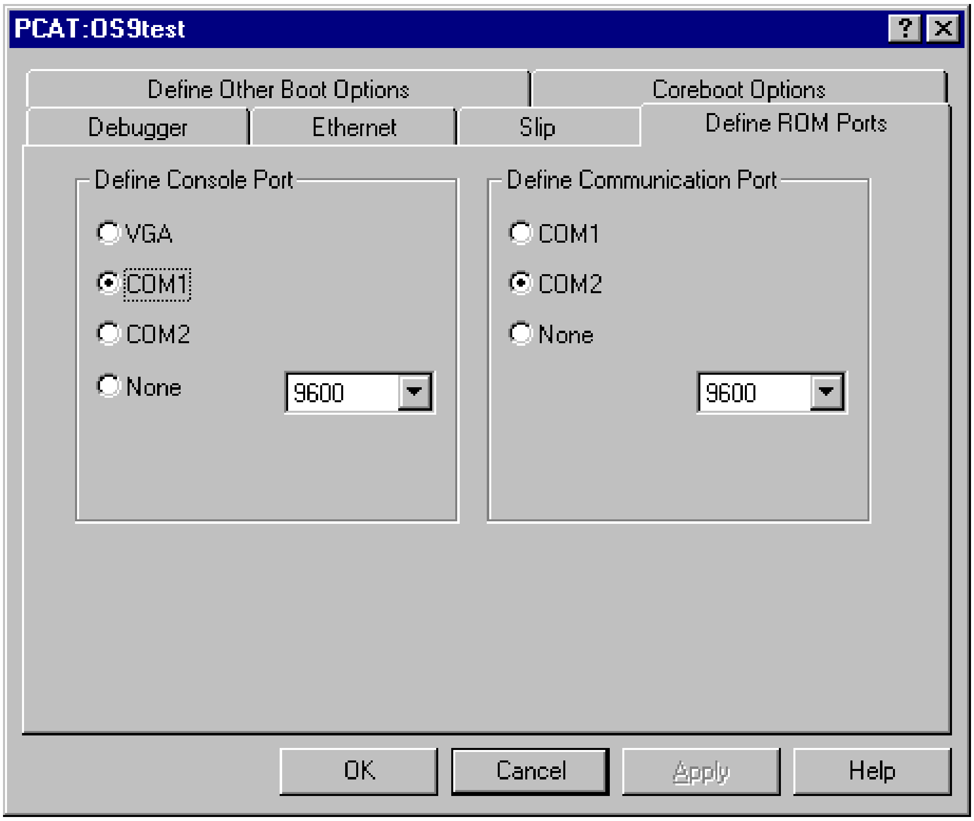
DiskOnChip
- [ ] Add to menu
- [ ] Auto Boot

Step 6. Click the Auto Boot check box and click OK.

Step 7. Select Configure -> Coreboot -> Main Configuration from the menu.

Step 8. Select the `Define ROM Ports` tab. The following window appears:

Figure 1-9 Main Configuration Window-Define ROM Ports tab


PCAT:OS9test

Define Console Port

- VGA [✓ COM1] COM2 None
- 9600

Define Communication Port

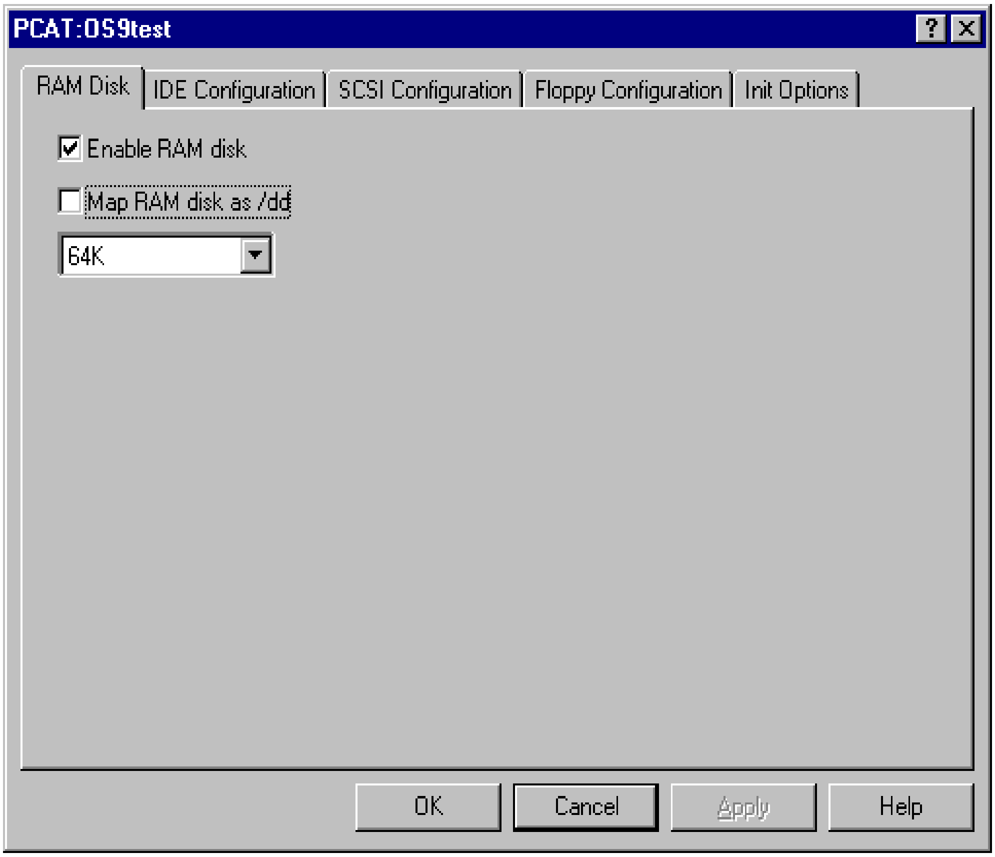
- COM1 [✓ COM2] None
- 9600

Step 9. If you plan on using the monitor and keyboard as the OS-9 system console, leave the **VGA/Keyboard** radio button checked. Otherwise, click on the `COM1` radio button on the **Define Console Port** and **Define Communication Port** areas. This moves the high-level console to serial port one.

Step 10. Click `OK`.

Step 11. Select `Configure` -> `Bootfile` -> `Disk Configuration` from the menu. The following window is displayed:

Figure 1-10 Disk Configuration Window-RAM Disk tab



[✓] Enable RAM disk

[ ] Map RAM disk as /dd

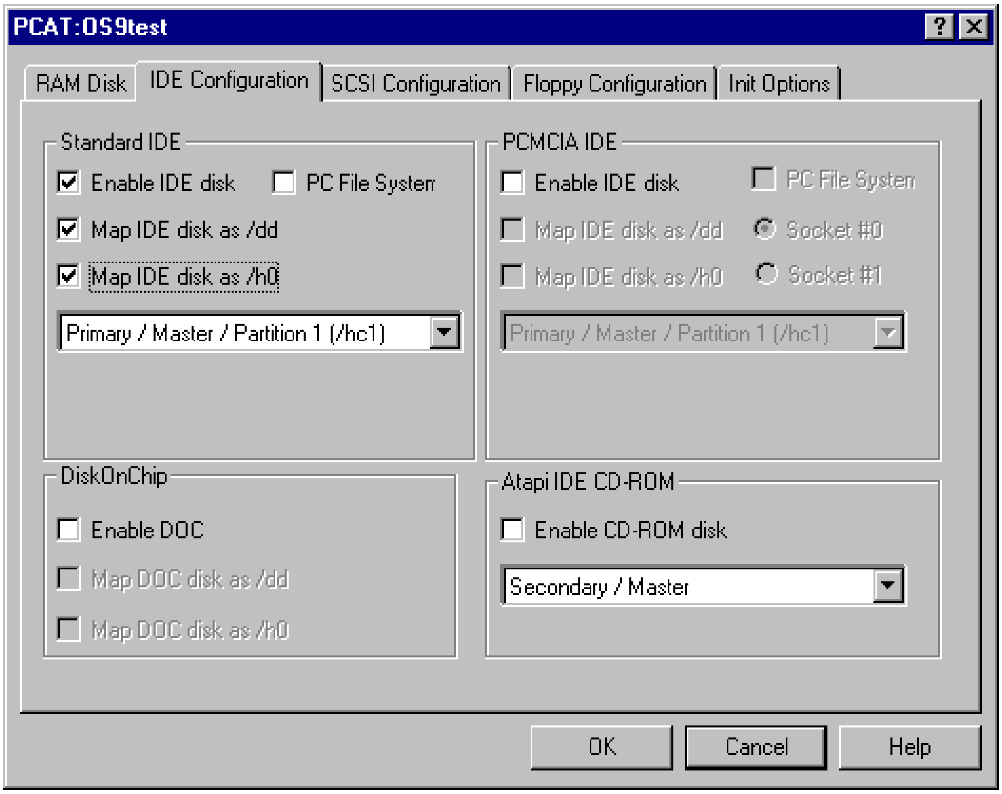
64K

Step 12. From the **RAM Disk** tab, verify that the **Enable RAM disk** box is checked and other boxes remain unchecked.

Step 13. Select the RAM disk size from the drop down list box. Use of a RAM disk is optional, and you may disable it by unchecking the **Enable RAM disk** box. If enabled, the RAM disk may be accessed as `/r0` on the target system.

Step 14. Select the **IDE Configuration** tab. The following window is displayed:

Figure 1-11 Disk Configuration Window-IDE Configuration tab



Standard IDE

- [✓] Enable IDE disk
- [ ] PC File System
- [✓] Map IDE disk as /dd
- [✓] Map IDE disk as /h0
- Primary / Master / Partition 1 (/hc1)

PCMCIA IDE

- [ ] Enable IDE disk
- [ ] PC File System
- [ ] Map IDE disk as /dd
- [✓ Socket #0]
- [ ] Map IDE disk as /h0
- Socket #1
- Primary / Master / Partition 1 (/hc1)

DiskOnChip

- [ ] Enable DOC
- [ ] Map DOC disk as /dd
- [ ] Map DOC disk as /h0

Atapi IDE CD-ROM

- [ ] Enable CD-ROM disk
- Secondary / Master

Step 15. Click the **Enable IDE disk**, **Map IDE disk as /dd**, and **Map IDE disk as /h0** check boxes to enable them.

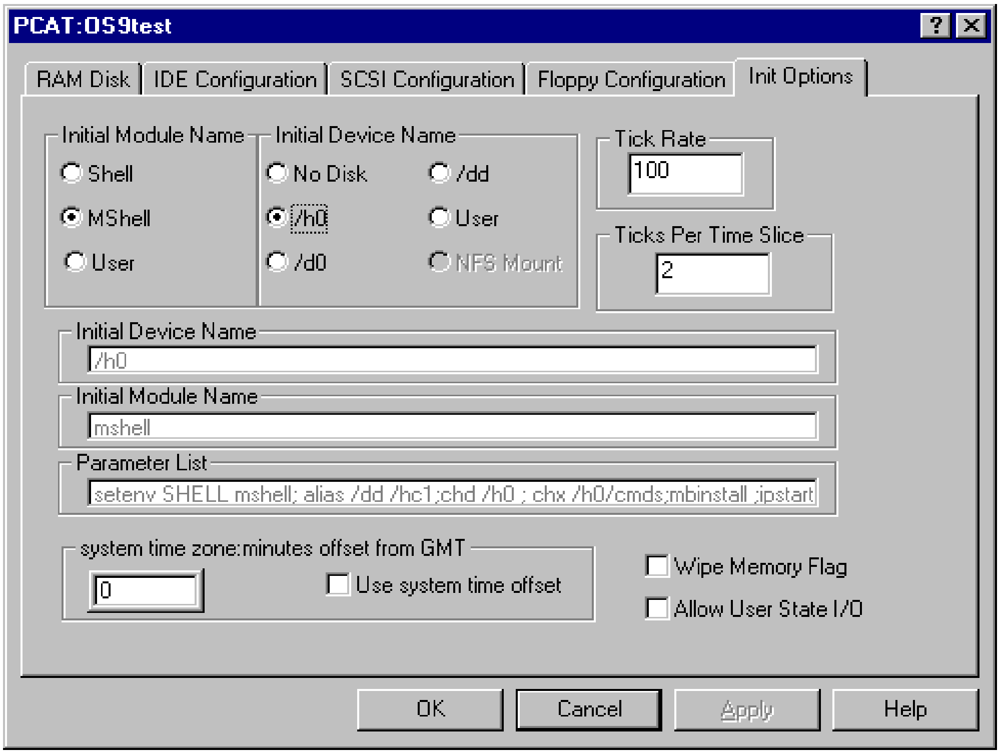
Note

The standard IDE hard disk will be accessed as device `/hc1` from the OS-9 console. The same device may also be accessed as `/h0` or `/dd`.

An IDE CD-ROM drive may be attached to the target system and accessed as device `/cd0`. The CD-ROM must be the master device on the second IDE channel.

Step 16. Click on the **Init Options** tab. The following window appears:

Figure 1-12 Disk Configuration Window-Init Options tab



Initial Module Name: Shell, [✓ MShell], User

Initial Device Name: No Disk, /dd, [✓ /h0], User, /d0, NFS Mount

Tick Rate: 100

Ticks Per Time Slice: 2

Initial Device Name: /h0

Initial Module Name: mshell

Parameter List: setenv SHELL mshell; alias /dd /hc1;chd /h0 ; chx /h0/cmds;mbinstall ;ipstart

system time zone:minutes offset from GMT: 0

☐ Use system time offset

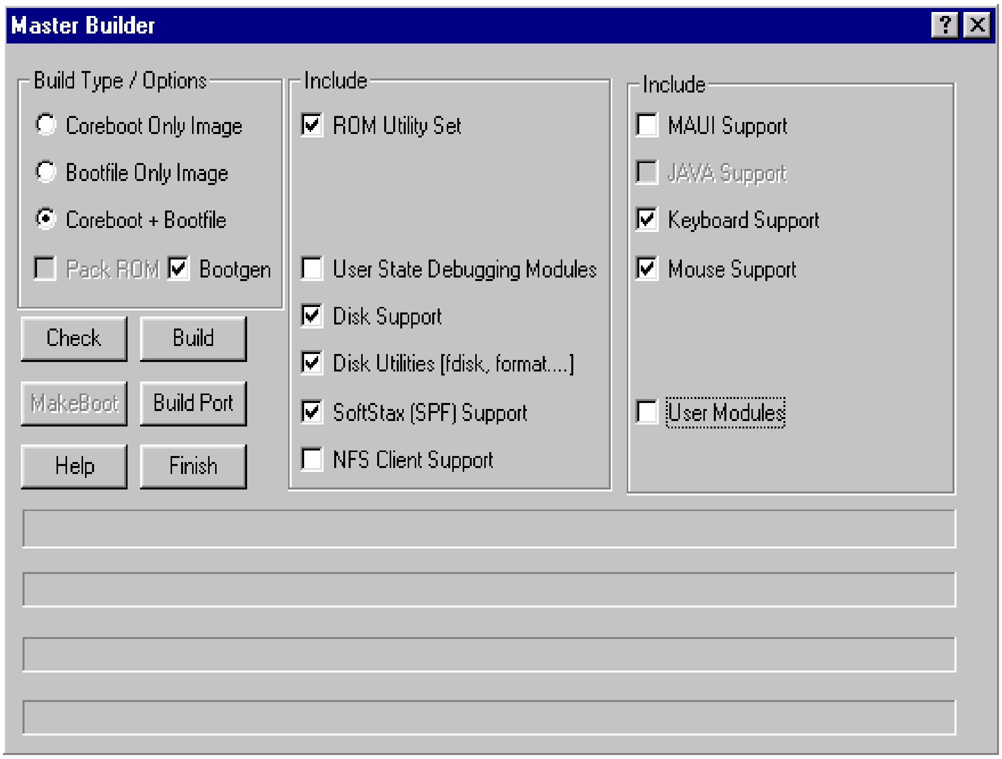
☐ Wipe Memory Flag

☐ Allow User State I/O

Step 17. Select the `/h0` radio button to use the as the initial device. Click `OK`.

Step 18. Select `Configure` -> `Build Image` from the menu. The following window appears:

Figure 1-13 Master Builder Window



Master Builder

Build Type / Options
- Coreboot Only Image
- Bootfile Only Image
- [✓ Coreboot + Bootfile]
- [ ] Pack ROM
- [✓] Bootgen

Include
- [✓] ROM Utility Set
- [ ] User State Debugging Modules
- [✓] Disk Support
- [✓] Disk Utilities [fdisk, format....]
- [✓] SoftStax (SPF) Support
- [ ] NFS Client Support

Include
- [ ] MAUI Support
- [ ] JAVA Support
- [✓] Keyboard Support
- [✓] Mouse Support
- [ ] User Modules

Step 19. Verify that the following options are checked:

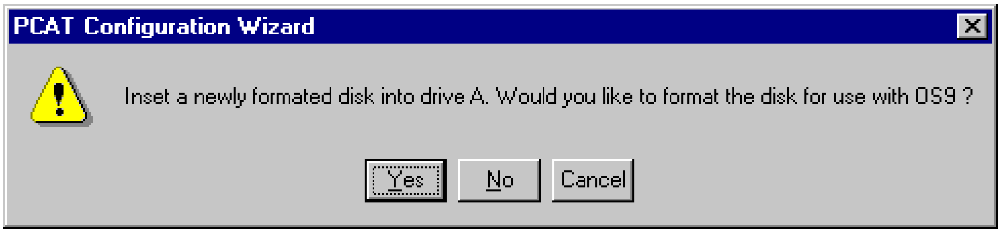
- Bootgen
- Coreboot + Bootfile
- ROM Utility Set
- Disk Support
- Disk Utilities [fdisk, format...]
- SoftStax (SPF) Support Modules
- Keyboard Support
- Mouse Support (Enables support for a PS/2 style mouse)

Note

Select the **User State Debugging Modules** check box to include the Hawk debugging modules on the target system. Alternately, you may load and run the modules from the hard disk on the target.

Step 20. Click `Build` to create the OS-9 boot image.

Step 21. Click the **MakeBoot** button once it is enabled. The following dialog box appears:


PCAT Configuration Wizard

Inset a newly formated disk into drive A. Would you like to format the disk for use with OS9 ?

Step 22. Insert a new floppy disk into your computer's floppy drive and click `Yes` to format it for OS-9 and copy the boot image.

Step 23. Once the boot image has been written to floppy, select `Finish`.

Step 24. Save your changes and exit the Configuration Wizard by selecting `File` -> `Exit`.

If you enabled networking, you should be able to telnet into the target from your host PC. To do this, select Run from the Windows start menu and type the following command:

```
telnet OS9test
```

The login user name is `super`; the password is `user`.

VMware for Linux

OS-9 for X86/Pentium will work with VMware Version 2.0.4 Release 1142 with some restrictions.

What works

- Ethernet booting
- IDE Disk support
- IDE CDROM support
- Network support
- Hawk - User State Debugger
- HawkEye
- High-level floppy support
- MAUI VGA Driver

What does not work

* ROMBUG Debugger
* Floppy booting
* Hawk - System State Debugger
* MAUI INT 10 driver
* RS232 Serial

* Sound Blaster Support

Creating VMWARE OS-9 X86 boot image.

The following text discusses what will need to change in OS-9 for X86/Pentium to work with VMware.

Low-level timer

There is a problem with VMWARE and the low-level timer. We have written a new timer based which uses the `rdtsc` instruction that will allow VMWARE to boot.

RomBug

The system state debugger used in OS-9 will not work with VMWARE.

Hard Disk

Interrupts on IDE devices may at times cause VMWARE to crash. Disabling interrupts on IDE devices solves this problem.

Files that must change

`File: OS9000\80386\PORTS\PCAT\BOOTS\INSTALL\PORTBOOT\coreboot.ml`

Comment out the line `../../../CMDS/BOOTOBJS/ROM/swi8timr` and add the line `../../../CMDS/BOOTOBJS/ROM/tm_rdtsc`. See **Figure 1-14**.

Figure 1-14 coreboot.ml changes

```
*
*   swi8timer - low-level software loop timer
calibrated from 8253
*
*../../../CMDS/BOOTOBJS/ROM/swi8timr
../../../CMDS/BOOTOBJS/ROM/tm_rdtsc
```

```
file: OS9000\80386\PORTS\PCAT\RBF\RB1003\config.des
```

Comment out "IDE_INTERRUPTS" and add "IDE_POLLED".

```
      ds_idetype = IDE_TYPE_STANDARD;
      ds_polled =  IDE_POLLED; /* IDE_INTERRUPTS; */
      ds_altstat = HD_DEFAULT_ALTSTAT;
      ds_timeout = 30;
```

After changing the files you need to build new RB1003 descriptors. Follow these steps to build the RB1003 descriptors.

Step 1. `cd OS9000\80386\PORTS\PCAT\RBF\RB1003\DESC`

Step 2. `os9make purge clean all`

Building boot with Wizard

Use the Expert mode in the wizard to make the changes in this section.

Step 1. In the Coreboot section make the following changes:

- debugger = none
- Ethernet - Enter IP information
  - Select LAN79C961/AM79C973 driver
  - Select "Add to Boot Menu"
- IDE Configuration
  - Select "Add to menu"
- Floppy Configuration
  - Remove "Add to Menu"
  - Remove "Auto Boot"

In the Bootfile section make the following changes:

- RAM DISK
  - Select "Enable RAM disk"
  - Select "Map RAM disk as /dd"
  - Select size as "16MB"
- Network setup
  - Setup network (select LAN79C961/AM79C973 driver)
- IDE Configuration: Standard IDE
  - Select "Enable IDE disk"
  - Select "Map IDE disk as /h0"
  - Select "Primary / Master / Partition 1 (/hc1)
- IDE Configuration: ATAPI IDE CD-ROM
  - Select "Enable CD-ROM disk"
  - Select "Secondary/Master"
- Init Options: Initial Module Name
  - Select "MShell"
- Init Options:Initial Device Name
  - Select "/dd"

Step 2. Build boot image with "Bootgen" selected and "Coreboot Only Image".

Step 3. After build, select "MakeBoot" to create floppy boot image.

Step 4. Next, un-select "Bootgen" and select "Bootfile Only Image".

Step 5. Build a boot image and transfer image to bootp server. If you do not have a bootp server refer to the section on how to set a bootp server up.

Configuring VMware

Now we are ready to start VMWARE up and configure it.

Step 1. Run VMware’s Configuration Wizard.

Step 2. For Guest OS, select "Other OS" and use the name "OS9".

Step 3. Use "new virtual disk" and give OS9 at least 20MB.

Step 4. You should be able to select <next> on all the other questions.

Step 5. Once configuration is complete, insert the prepared OS-9 boot floppy in the drive and select the "power-on" button. OS-9 should boot to the boot menu.

Step 6. You can now select `eb` from the boot menu to boot the OS-9 X86 boot file from your bootp server. Once you are booted to a shell prompt, you may install OS-9 as if VMware is a standard PC.

Step 7. Create an OS-9 disk partition

```
$ fdisk -d=/hcfmt
```

Step 8. Make sure to select OS9000 partition, make it active and select "write MBR" option.

Step 9. Once the partition is create we can format it.

```
$ format /hc1fmt
```

Now we have a file system.

Step 10. Install OS-9 onto the hard drive of VMware.

```
$ chd /hc1fmt
$ bootgen -i=/d0/iplhdnoq -l=/d0/coreboot /hc1fmt -nb40k
$ bootgen /hc1fmt /d0/sysboot -nb40k
```

You should be able to boot OS-9 without the floppy. Select `ide` option when the OS-9 boot menu appears. You may now install the `mw86.tar` system tar image if desired.

Figure 1-15 EXAMPLE VMWARE CONFIGURATION FILE FOR OS9

```
#!/usr/bin/vmware
config.version = 2

# CD-ROM
ide1:0.present = TRUE
ide1:0.fileName = /dev/cdrom
ide1:0.deviceType = atapi-cdrom
ide1:0.startConnected = TRUE

# Virtual hard disk on primary master
ide0:0.present = TRUE
ide0:0.fileName = /root/vmware/OS9/OS9.dsk
ide0:0.deviceType = ata-hardDisk
ide0:0.mode = persistent

# Floppy
floppy0.present = TRUE
floppy0.fileName = /dev/fd0
floppy0.startConnected = TRUE

# Networking bridged to real ethernet
ethernet0.present = TRUE
ethernet0.connectionType = bridged

# Memory size
memsize = 96

# Nvram
nvram = /root/vmware/OS9/OS9.nvram

# Log file
log.fileName = /root/vmware/OS9/OS9.log

# Hints
guestOS = other:OS9
```

Setting Up OS-9 for BOOTP

One of most overlooked features in OS-9 for X86/Pentium is the ability to boot over Ethernet using the `eb` option from the OS-9 boot menu. One reason for the lack of use may be the issue of obtaining a "bootp" server. Windows machines do not come with bootp services. Even Windows NT does not offer support for bootp out of the box.

Why BOOTP

Bootp is useful when a boot image is too big to fit on a single floppy. Often, users may place the initial "coreboot image" on one floppy and the "bootfile image" on a second floppy, but this method is not ideal. If MAUI and Networking is selected, the boot image may be to large to fit even using this method.

OS-9 BOOTP SERVER

OS-9 is a good choice for a "bootp" server. The `mw86.tar` file included with OS-9 for X86/Pentium will install the `/h0/TFTPBOOT/bootptab` file to the target system. The `bootptab` file may be edited to include any target information required

Figure 1-16 Example entry for bootptab.

```
#
# Example entry for bootptab:
#
ast:hd=/h0/tftpboot:ht=ethernet:ha=00609788CECE:ip=10.
0.0.27:sm=255.255.255.0:bs=auto:bf=bootfile:
#
# end of example bootptab entry
```

Step 1. Use `ftp` to transfer a bootfile to the OS-9 bootp server. Make sure to place it in the `/h0/TFTPBOOT` directory.

Step 2. To allow bootp requests to gain access to the bootfile we must set public access.

```
$ attr -prgr /h0/TFTPBOOT/bootfile
```

Step 3. Next we can start the bootp server.

```
  $ tftpd <>>>/nil&
  $ bootpd /h0/TFTPBOOT/bootptab <>>>/nil&
```

You may run "bootpd" in the foreground if desired.

```
  $ bootpd -d /h0/TFTPBOOT/bootptab
```

The "-d" option will allow you to see the bootp request as it happens.

Step 4. We can now "bootp" the target using the "eb" option in the initial OS-9 boot menu.

Windows95/98/ME/NT BOOTP SERVER

There are freeware "bootp servers" available. One such freeware bootp service is by JBM Electronics Co.

```
http://www.jbmelectronics.com/bootp.htm
http://www.jbmelectronics.com/tech/bootpw.exe
```

Step 1. The `tftp.exe` and `bootpd.exe` files may be copied to the directory `C:\TFTPBOOT` and the following entry is fine to setup bootp for our target example. Edit `C:\TFTPBOOT\bootptab.txt` and add the following line:

```
ast:hd=/tftpboot:ht=ethernet:ha=00609788CECE:ip=10.0.0.27:sm=255.2
55.255.0:bs=auto:bf=/tftpboot/bootfile:
```

Step 2. To start the bootp server simple click on the `bootpd.exe` file. No other setup is required. The tftp server will start automatically.

Linux Slackware BOOTP SERVER

Step 1. Make sure `tftp` service is active. The `/etc/inetd.conf` file should contain an entry similar to the one below:

```
# /etc/inetd.conf
tftp    dgram   udp     wait    nobody  /usr/sbin/tcpd  in.tftpd
```

Make sure the above line is not commented out.

Step 2. Edit the `/etc/bootptab` and add an entry for your machine. In Linux you do not need to include the Ethernet hardware address if the IP address is used (i.e. not 0.0.0.0).

```
# /etc/bootptab
.ast:ip=10.0.0.27:hd=/tftpboot:bf=bootfile:to=-7200:bs:
```

Step 3. Create the tftpboot directory if it does not exist.

```
# makdir /tftpboot
# chmod 777 /tftpboot
```

Step 4. You may need to run `chmod` on the `/tftpboot` directory.

Step 5. Use `ftp` to transfer bootfile to Linux bootp server. Make sure to place it in the `/tftpboot` directory. To allow bootp requests to gain access to the bootfile we must set pubic access.

```
# chmod 777 /tftpoot/bootfile
```

Step 6. If you have changed the `/etc/inetd.conf` file you may want to reboot your Linux machine or restart the inetd services.

Step 7. Next start `bootpd`. You may do this via the next line in the `/etc/inetd.conf` file. You can always start it from the command line as well.

```
# bootpd -d7
```

result:

```
root@gfire:/etc# bootpd -d7
bootpd: info(6):   bootptab mtime: Thu Sep 20 23:55:00 2001
bootpd: info(6):   reading "/etc/bootptab"
bootpd: info(6):   read 5 entries (5 hosts) from "/etc/bootptab"
bootpd: info(6):   recvd pkt from IP addr 10.0.0.27
bootpd: info(6):   bootptab mtime: Thu Sep 20 23:55:00 2001
bootpd: info(6):   request from IP addr 10.0.0.27
```

```
bootpd: info(6):   found 10.0.0.27 (.greg5)
bootpd: info(6):   bootfile="/tftpboot/bootfile"
bootpd: info(6):   vendor magic field is 99.130.83.99
bootpd: info(6):   sending reply (with RFC1048 options)
```

Red Hat

This applies to REDHAT SeaWolf v7.1 and Red Hat Linux release 7.1.94 (Roswell). RedHat uses **Internet Software Consortium DHCP Server 2.0pl5** which does allow the bootp services required to boot OS-9. The only downside is we must specify the size of the bootfile since the "option boot-size" does not support the "auto" option. The "option boot-size" is the (size of the bootfile / 512).

Figure 1-17 DHCP configuration file example

```
  allow unknown-clients;
  default-lease-time 1800;                # 30 minutes
  max-lease-time 7200;                    # 2 hours

  subnet 10.0.0.0 netmask 255.255.255.0 {
  }


  host ast {
   server-name "eltesto";
   next-server 10.0.0.63;
   hardware ethernet 00:60:97:88:CE:CE;
   fixed-address 10.0.0.27;
   filename "/tftpboot/bootfile";
   option boot-size 6500;
}
```

Step 1. To start the "dchcp" server use a command similar to the example below:

```
[root@eltesto dhcpd]# dhcpd -cf /etc/dhcpd/dhcpd.conf -lf
/etc/dhcpd/dhcpd.leases eth0
```

The result:

```
 Internet Software Consortium DHCP Server 2.0pl5
 Copyright 1995, 1996, 1997, 1998, 1999 The Internet Software
Consortium.
 All rights reserved.

 Please contribute if you find this software useful.
 For info, please visit http://www.isc.org/dhcp-contrib.html

 Listening on LPF/eth0/00:50:ba:d3:66:47/10.0.0.0
 Sending on   LPF/eth0/00:50:ba:d3:66:47/10.0.0.0
 Sending on   Socket/fallback/fallback-net
```

Using DHCP

The OS-9 Wizard allows you to specify the DHCP will be used instead of static IP addresses. If you select "Server assigned addresses" from the Wizard, then DHCP is used. The RedHat DHCP server is able to handle DHCP requests required by OS9.

Example

```
   # dhcpd.conf file example (Assign IP addresses based
on range)

       allow unknown-clients;
       default-lease-time 1800;                # 30
minutes
       max-lease-time 7200;                    # 2 hours

       subnet 10.0.0.0 netmask 255.255.255.0 {
           range 10.0.0.20 10.0.0.25;
       }

     # end of example
```

DHCP Example 2

```
# dhcpd.conf file example (Force fixed assigned addresses. Same as
bootp example above)

       allow unknown-clients;
       default-lease-time 1800;                # 30 minutes
       max-lease-time 7200;                    # 2 hours

       subnet 10.0.0.0 netmask 255.255.255.0 {
       }


       host ast {
        server-name "eltesto";
        next-server 10.0.0.63;
        hardware ethernet 00:60:97:88:CE:CE;
        fixed-address 10.0.0.27;
        filename "/tftpboot/bootfile";
        option boot-size 6500;
     }

     # end of example
```

In the example above, when using the "Assign IP address" option we will be assigned the address "10.0.0.20" if we are the first target to obtain an address from the DHCP server. The "dhcpd.leases" file will contain information about DHCP addresses that are resolved in this way.

Note

When using DHCP, bootp should not be used. If bootp is used then either a static address is already used when we boot or we discover one during the bootp process (ie. IP address is set to "0.0.0.0" in the Wizard for bootp). If effect, if addresses are to be resolved and bootp is used for the booting processes, the Wizard should be set to use static IP address of 0.0.0.0.

Executing Commands with the Wizard

One feature in the Wizard is the ability to execute commands at different phases of the build process. We can for example, "ftp" the bootfile to the "bootp server" from the Wizard. The following example will show what you need to do to setup the Wizard to "ftp" the created bootfile when the build is finished.

Step 1. **For PCAT:**Edit the `pcat.ini` file located in the `mwos/OS9000/80386/PORTS/PCAT/BOOTS/INSTALL/INI` directory.

For MediaGX: Edit the `mediaGX.ini` file located in the `mwos/OS9000/80386/PORTS/MEDIAGX/BOOTS/INSTALL/INI` directory.

Step 2. Look at the end of the file for the "EXEC_AFTER_BUILD" example code. See the following figure.

Figure 1-18 Wizard Example code

```
;
; the following example will ftp the created bootfile
; to the tftp boot sever after build bootfile is complete.
;

[EXEC_AFTER_BUILD_BOOTFILE]
RPATH=BOOTS\INSTALL\PORTBOOT
CMD=ftp
PARAMS=-s:ftp.lst 10.0.0.7
STOP_ON_ERROR=TRUE
HIDE_CMD=FALSE

;
; end of pcat.ini entry
```

Note

The bootp server IP address is located in the "PARAMS" string above.

Step 3. Next, create a `ftp.lst` file in `BOOTS\INSTALL\PORTBOOT`. Include the name and password required to login to the "bootp server" machine.

Figure 1-19 ftp.lst file

```
; ftp.lst file in BOOTS\INSTALL\PORTBOOT
;
name
password
cd /tftpboot
bin
hash
send bootfile
quit
```

Chapter 2: Board Specific Reference

This chapter contains porting information that is specific to the X86 PCAT board. It includes the following sections:

- **X86 Utilities**
- **MAUI Graphics Support**
- **PCI Configuration Information**

X86 Utilities

The following sections describe utilities specifically written for X86.

ABORT

The `abort` utility is a p2module that may be used to allow the system to enter debug state once a non-maskable interrupt (NMI) is generated.

Usage:

```
$ p2init abort
```

CACHECHK

The `cachechk` utility may be used to verify L2 cache is working on a given system.

```
(Super)[/h0/>] cachechk

Memory Block  Transfer Speed  Access Time     Chart
------------  --------------  ------------    -----
     256      292.90 MB/s     3.41 ns/byte    ###
     512      301.04 MB/s     3.32 ns/byte    ###
    1024      305.30 MB/s     3.28 ns/byte    ###
    2048      307.10 MB/s     3.26 ns/byte    ###
    4096      307.63 MB/s     3.25 ns/byte    ###
    8192      307.10 MB/s     3.26 ns/byte    ###
   16384      301.30 MB/s     3.32 ns/byte    ###
   32768      176.19 MB/s     5.68 ns/byte    ######
   65536      174.72 MB/s     5.72 ns/byte    ######
  131072      173.43 MB/s     5.77 ns/byte    ######
  262144      164.04 MB/s     6.10 ns/byte    ######
  524288      153.46 MB/s     6.52 ns/byte    #######
 1048576       96.58 MB/s    10.35 ns/byte    ##########
 2097152       84.34 MB/s    11.86 ns/byte    ############
```

In the case above, there is an L1 cache size of 16K and an L2 cache size of 512K.

DMPPCI

The `DMPPCI` utility may be used to examine PCI configuration space.

Usage

```
(Super)[/h0/>] dmppci -?
Syntax: dmppci <bus_number> <device_number> <function_number> {<size>}
Function: dump PCI configuration space.
Options:
  none.
(Super)[/h0/>] dmppci 0 4 0

    PCI DUMP Bus:0 Dev:4 Func:0 Size:64
    -----------------------------------
VID  DID  CMD  STAT CLASS  RV CS IL IP LT HT BI MG ML SVID SDID
---  ---- ---- ---- -----  -- -- -- -- -- -- -- -- -- ---- ----
1013 00d6 0007 00a0 030000 03 00 0a 01 40 00 00 10 10 1013 8000
BASE[0]  BASE[1]  BASE[2]  BASE[3]  BASE[4]  BASE[5]  CIS_P    EXROM
-------- -------- -------- -------- -------- -------- -------- --------
e0000000 e2100000 00000000 00000000 00000000 00000000 00000000 00000000
Offset 00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f
-----------------------------------------------------
0000   13 10 d6 00 07 00 a0 00 03 00 00 03 00 40 00 00
0010   00 00 00 e0 00 00 10 e2 00 00 00 00 00 00 00 00
0020   00 00 00 00 00 00 00 00 00 00 00 00 13 10 00 80
0030   00 00 00 00 00 00 00 00 00 00 00 00 0a 01 10 10
```

GIMMEIO

`GIMMEIO` is an example trap handler and test program that demonstrates how to allow I/O port access in user state programs. The

`MWOS/OS9000/80386/PORTS/PCAT/UTILS/GIMMEIO` directory contains both the test program and trap handler source code.

`tcall.c`	OS-9/x86 trap handler source file
`thandler.c`	OS-9/x86 trap handler source file
`trapc.a`	OS-9/x86 trap handler source file
`ttest.c`	example test program source code
`makefile`	makefile for creating test program and trap handler

`PCAT/CMDS/gimmeio`	system state trap handler module
`PCAT/CMDS/ttest`	user state test program
`PCAT/LIB/gimmeio.l`	GIMMEIO trap handler library

`ttest.c` is a example of how to call the trap handler in order to be granted access to performing I/O in user state.

In order for a user state program to be granted I/O port access by `GIMMEIO`, the user state program module must be supervisor state (owned by `0.x`).

Note

Although the GIMMEIO trap handler was required as of v2.1 of OS-9 for X86, you may now disable I/O protection system wide if desired, by selecting `Allow User State I/O` in the Configuration Wizard's **Init Options** dialog box.

LOOP

The `loop` command may be used to create repetitive commands.

Usage: loop -?

Usage: loop [-t] [-n<count>] [-m] [-s<count>] [<prog>] [..<progx>]

-t	reports time used
-x	displayed if error show value
-i	do not exit on errors
-n	loop count
-s	sleep for count
-m	sleep count is in milliseconds : default is seconds

Example

Create a file and test for the file removal. Check once every two seconds.

```
Super)[/h0/>] copy SYS/startup -w=/r0
copying SYS/startup to /r0/startup
(Super)[/h0/>] loop -t -x -s2 "dir /r0/startup >>>/nil"
 98/11/08 22:52:25  up for:  0 days  0 hours  0 minutes 0 seconds
Wait 2 Seconds
 98/11/08 22:52:27  up for:  0 days  0 hours  0 minutes 2 seconds
Wait 2 Seconds
 98/11/08 22:52:29  up for:  0 days  0 hours  0 minutes 4 seconds
Wait 2 Seconds
 98/11/08 22:52:31  up for:  0 days  0 hours  0 minutes 6 seconds

Wait 2 Seconds
 98/11/08 22:52:33  up for:  0 days  0 hours  0 minutes 8 seconds
Wait 2 Seconds
000:216 (E_PNNF)   File not found.
Error #000:216 (E_PNNF)   File not found.
 The pathlist does not lead to any known file.
```

MOUSE

The `Mouse` utility is provide as a example of how to access the mouse from user programs. Source is included.

```
(Super)[/r0/>] mouse
Opening device /m0
status = 0x18, x = 255, y =   0  X Negative
status = 0x18, x = 253, y =   0  X Negative
status = 0x18, x = 253, y =   1  X Negative
status = 0x18, x = 251, y =   0  X Negative
status = 0x18, x = 252, y =   1  X Negative
status = 0x18, x = 250, y =   0  X Negative
status = 0x18, x = 250, y =   1  X Negative
status = 0x18, x = 251, y =   0  X Negative
status = 0x18, x = 252, y =   0  X Negative
status = 0x18, x = 252, y =   0  X Negative
status = 0x18, x = 254, y =   0  X Negative
status = 0x18, x = 254, y =   0  X Negative
status = 0x08, x =   2, y =   0
status = 0x08, x =   3, y =   0
status = 0x08, x =   4, y =   0
```

PCIV

The `PCIV` utility allows viewing all PCI devices in the system.

Usage: pciv -?

pciv- PCI Configuration Space browser.

Options:

-a	show base address info and size
-r	show PCI routing information
?	display help

```
(Super)[/h0/>] pciv

BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:00:00  8086 1250 0006 2200 060000 03 00 00 00 Bridge Device [S]
000:02:00  1011 0022 0107 0280 060400 03 08 00 00 Bridge Device [S]
000:03:00  8086 1229 0007 0290 020000 04 08 0a 01 Network Controller [S]
000:04:00  1013 00d6 0007 00a0 030000 03 00 0a 01 Display Controller [S]
000:07:00  8086 7000 000f 0280 060100 01 00 00 00 Bridge Device [M]
000:07:01  8086 7010 0005 0280 010180 00 00 00 00 Mass Storage Controller [S]
001:13:00  10b7 9000 0007 0200 020000 00 00 0a 01 Network Controller [S]

(Super)[/h0/>] pciv -a

BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:00:00  8086 1250 0006 2200 060000 03 00 00 00
Bridge Device [S]
BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:02:00  1011 0022 0107 0280 060400 03 08 00 00
(NC) base_addr[2] = 0x40010100  PCI/IO  0x40010100 Size = 0x00000004
(C)  [32-bit] base_addr[3] = 0x2280e1e1  PCI/IO  0x2280e1e0 Size = 0x00000010
(C)  [32-bit] base_addr[4] = 0xdff0d800  PCI/MEM 0xdff0d800 Size = 0x00000010
(C)  [32-bit] base_addr[5] = 0xaff1a801  PCI/IO  0xaff1a800 Size = 0x00000010
Bridge Device [S]
BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:03:00  8086 1229 0007 0290 020000 04 08 0a 01
(NC) [32-bit] base_addr[0] = 0xe2110008  PCI/MEM 0xe2110008 Size = 0x00001000
(C)  [32-bit] base_addr[1] = 0x00006001  PCI/IO  0x00006000 Size = 0x00000020
(C)  [32-bit] base_addr[2] = 0xe2000000  PCI/MEM 0xe2000000 Size = 0x00100000
Network Controller [S]
BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:04:00  1013 00d6 0007 00a0 030000 03 00 0a 01
(C)  [32-bit] base_addr[0] = 0xe0000000  PCI/MEM 0xe0000000 Size = 0x02000000
```

```
(C)  [32-bit] base_addr[1] = 0xe2100000  PCI/MEM 0xe2100000 Size = 0x00010000
Display Controller [S]
BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:07:00  8086 7000 000f 0280 060100 01 00 00 00
Bridge Device [M]
BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
000:07:01  8086 7010 0005 0280 010180 00 00 00 00
(C)  [32-bit] base_addr[4] = 0x0000f001  PCI/IO  0x0000f000 Size = 0x00000010
Mass Storage Controller [S]
BUS:DV:FU  VID  DID  CMD  STAT CLASS  RV CS IL IP
-------------------------------------------------
001:13:00  10b7 9000 0007 0200 020000 00 00 0a 01
(C)  [32-bit] base_addr[0] = 0x0000e001  PCI/IO  0x0000e000 Size = 0x00000040
Network Controller [S]

(Super)[/h0/>] pciv -r

ELCR-EDGE/LEVEL CONTROL REGISTER

INT CNTRL-1 - [0x000004d0] = 0x00
INT00 INT01 INT02 INT03 INT04 INT05 INT06 INT07
edge  edge  edge  edge  edge  edge  edge  edge
INT CNTRL-2 - [0x000004d1] = 0x04
INT08 INT09 INT10 INT11 INT12 INT13 INT14 INT15
edge  edge  level edge  edge  edge  edge  edge
INTERRUPT CONTROLLER STATUS [PIC-8259]
OCW1 - OPERATIONAL CONTROL WORD 1 REGISTER
INT CNTRL-1 - [0x00000021] = 0xf8
INT00 INT01 INT02 INT03 INT04 INT05 INT06 INT07
on    on    on    off   off   off   off   off
INT CNTRL-1 - [0x000000a1] = 0xbb
INT08 INT09 INT10 INT11 INT12 INT13 INT14 INT15
off   off   on    off   off   off   on    off
```

PCMCIA

The `PCMCIA` utility provides a means to insert and remove PCMCIA devices. Source is provided for PCMCIA so you may add support for their own cards.

Usage: pcmcia -?

Syntax: pcmcia [<opts>]

Function: initialize PCMCIA socket

options:

-s=socket	socket [default all sockets]
-d	deinitialize socket(s)
-i	initialize socket(s)
-v	verbose mode
-x	dump CIS/Config information
-?	print this help message

```
(Super)[/r0/>] pcmcia -iv
MICROWARE PCMCIA SOCKET SERVICES
i82365sl step B PCMCIA type controller
socket #1 occupied [0xff]
v1_Major = 4 v1_Minor 1
Manufacture Name String = EXP
Additional Info String = CD+GAME
Product Name String = C1
IDE Base 0x00000360 : Vector 0

(Super)[/r0/>] chd /pcmhe1
 (Super)[/pcmhe1/>] free
"pcmhe1"
Capacity: 43967 blocks, 1373.968 Mbytes
Free: 28681 blocks, 896.281 Mbytes
Largest Free Block: 13036 blocks, 407.375 Mbytes

(Super)[/r0/>] pcmcia -d -s=1

socket1:  occupied
It is now save to remove the card is socket #01
```

MWOS/OS9000/80386/PORTS/PCAT/ROM/config.des

```
#define LLCIS_PORT"cbase=0xd4000"
#define LLCIS_PARAMS"verbose=1 fixed=1"
#define IDE_CIS_PARAMS"ide0=0x320,0 ide1=0x360,0"
#define ETH_CIS_PARAMS"3com=0x340,3"
#define SERIAL_CIS_PARAMS"com=0x340,10"
```

The PCMCIA SOCKET SERVICES require a VADEM 465 or similar controller.

- i82365sl step A
- i82365sl step B
- VLSI 82C146

Note

Early versions of this chip will only work with one socket due to chip bug.

- IBM
- Vadem
- Cirrus CLPD67xx

The PCMCIA SOCKET SERVICES do not use interrupts and for IDE based devices no interrupts are used by default. If the PCMCIA device does not work check what is reported during the boot process. The type of PCMCIA controller as well as the device information is displayed. It may be that another device is using the memory at 0xd4000. If this is the case change the value in `config.des`. The Wizard will use this value next time you create a boot image.

PINFO

The `pinfo` utility may be used to access DOS extended partitions by providing the required information to create descriptors. The extended partitions are displayed as well if the partition may be used with OS-9. Note that we currently only support this utility with IDE devices. SCSI devices are not supported. You may create or modify a existing descriptor with the values shown in the Extended partition section. The LUN and LSNOFFS fields should reflect the values shown.

```
Super)[/h0/>] pinfo -?
Syntax:   pinfo {</device>}
Function: show disk partition information
Options:none.

(Super)[/h0/>] pinfo /hcfmt@
================ Primary  Partitions =====================

Partition   LUN  LSNOFFS     Par_Type               FMGR
-----------------------------------------------------------
01          01  0x00000000  OTHER                  NA
02          02  0x00000000  OS/2 Boot Manager       NA
03          03  0x00000000  DOS Extended            NA
04          04  0x00000000  OS-9000                RBF

================ Extended Partitions =====================

Partition   LUN  LSNOFFS     Par_Type               FMGR
-----------------------------------------------------------
01          02  0x0036c180  Linux native           NA
```

SETPCI

The `SetPCI` utility may be used to change PCI information in the PCI configuration space. You may also use SetPCI to examine information in the PCI configuration space. This should help you develop PCI drivers and applications.

Usage

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

Function

Set/Read PCI configuration space.

Options

All command line arguments are required, save that the presence or absence of <value> indicates whether to read or write the specified information.

<bus>	PCI bus number (0..255)
<dev>	PCI device number (0..32)
<func>	PCI function number (0..7)
<offset>	offset value (e.g. 4 for command register offset)
<size>	size (b = byte, w = word, d = dword)
<value>	if present, the specified value will be written; if not present, the value will be read

Example

```
$ setpci 1 13 0 0x10 d
PCI READ MODE
-------------
PCI Value.....0x0000e001 (dword) READ
PCI Bus.........0x01
PCI Device......0x0d
PCI Function....0x00
PCI Offset....0x0010
```

SYMBIOS_INFO

When using the Symbios SCSI controller family of cards, you may use this utility to see how drives in the system have been configured.

The `Symbios_info` utility provides a simple means to determine how the current SCSI drive parameters have been utilized. Symbios 810-875 controllers are supported.

The device should be inized prior to using this utility. On initial access of any device, the information is stored in the SCSI internal threads. The `Symbios_info` function will examine the thread information.

Note

Due to the nature of the `Symbios_info` utility changes to the Symbios driver may cause this program to fail. The `Symbios_info` utility should be re-compiled anytime the driver changes. Although the `Symbios_info` utility is mainly used to see how the drive in use is set up, advanced information is also included to help determine any problems with using SCSI drives. Most problems with SCSI are normally termination related. As newer drives become available, we do expect to see problems that require software related changes.

Syntax

Symbios_info [<opts>]

Options

-s	show information
-r	show registers
-d	show DSP information
-t	show time information

Examples

In the basic information mode, `Symbios_info` displays the interrupt vector information, the type of Symbios controller found, and the negotiation information. For synchronous negotiations, the drive requested time information as well as the actual negotiated time used is displayed.

```
$ iniz hs02; dir /hs02; Symbios_info

PC-AT Compatible 80386  OS-9000 V2.2 for Intel x86
 vector  ($)   prior  drivstat   irq svc    driver
-------------  -----  ---------  ---------  ------

   74  ($4a)     10  $00f90fb4  $0013e6f1  scsi8xx

Symbios 53C875 [Symbios Device ID = 0x0f]

[00] [0c:0f] final [0f:0f] ULTRA WIDE SCSI 33.3 MB/s (60 ns, offset 15)
```

The show information option will display the current thread states.

```
$ iniz hs02; dir /hs02; Symbios_info -s
PC-AT Compatible 80386  OS-9000 V2.2 for Intel x86

 vector  ($)   prior  drivstat   irq svc    driver
-------------  -----  ---------  ---------  ------
   74  ($4a)     10  $00f90fb4  $0013e6f1  scsi8xx

Dump Threads.... lst @ 0x00f866a0

lst->wakes = 0
chip free
id=00 Ent_WHICHPHASE Thread has completed operation
CMD[2a00000fffffffa80300000100 CMD_STATUS[00000000]
MSGI[00000000] MSGO[c00103010f0f0c100000000000000000]
lth->synctried = Yes
lth->widetried = Yes
lth->processid 00000003
lth->thread_sem is free
lth->xferflags 0000002d SCSI_ATN SCSI_SYNC SCSI_WIDE SCSI_ULTRA
lst->sbclmaster 00000098 lth->sbclmask 00000098 sxfr 2f scntl3 9d
id=01 Thread not in use
id=02 Thread not in use
id=03 Thread not in use
id=04 Thread not in use
id=05 Thread not in use
id=06 Thread not in use
```

```
id=07 Ent_WAITFORRESELECT SCSI SELFID
id=08 Thread not in use
id=09 Thread not in use
id=0a Thread not in use
id=0b Thread not in use
id=0c Thread not in use
id=0d Thread not in use
id=0e Thread not in use
id=0f Thread not in use
```

The show registers option will show the current Symbios internal registers. Not all registers are displayed, only registers that are safe to display. Use this option with care. The SCSI bus should be idle when using this option.

```
$ iniz hs02; dir /hs02; Symbios_info -r
PC-AT Compatible 80386  OS-9000 V2.2 for Intel x86

 vector  ($)   prior  drivstat   irq svc    driver
-------------  -----  ---------  ---------  ------
    74  ($4a)     10  $00f90fb4  $0013e6f1  scsi8xx


Location      Value         Register  Status
-------------------------------------------
0xe8001000    [d0]          SCNTL0    ARB1 ARB0 WATN
0xe8001001    [00]          SCNTL1
0xe8001002    [00]          SCNTL2
0xe8001003    [55]          SCNTL3    SCF2 SCF0 CCF2 CCF0
0xe800100a    [80]            SCID    RES
0xe8001005    [00]           SXFER
0xe8001006    [07]            SDID    ENC2 ENC1 ENC0
0xe8001007    [0f]          GPREG     GPIO3 GPIO2 GPIO1 GPIO0
0xe8001008    [00]            SFBR
0xe8001009    [00]            SOCL
0xe800100a    [80]            SSID    VAL
0xe800100b    [00]            SBCL
0xe800100d    [00]          SSTAT0
0xe800100e    [0f]         SSTAT1    SDPOL MSG C/D I/O
0xe800100f   [0a]          SSTAT2    SPL1 LDSC
0xe8001010    [0000058f]       DSA
0xe8001014    [00]           ISTAT
0xe8001018    [00]          CTEST0
0xe8001019    [f0]         CTEST1    FMT3 FMT2 FMT1 FMT0
0xe800101a    [35]          CTEST2    CIO CM TEOP DACK
0xe800101b    [31]          CTEST3    V1 V0 WRIE
0xe800101c    [b2ac61c9]      TEMP
0xe8001020    [00]           DFIFO
0xe8001021    [00]          CTEST4
0xe8001022    [24]          CTEST5    DFS BL2
0xe8001024    [00f86a68]       DBC
0xe8001027    [54]            DCMD
0xe8001028    [00240000]      DNAD
0xe800102c    [00000008]       DSP
```

```
0xe8001030   [0000058f]     DSPS
0xe8001034   [00]        SCRATCH0
0xe8001035   [00]        SCRATCH1
0xe8001036   [80]        SCRATCH2
0xe8001037   [00]        SCRATCH3
0xe8001038   [8e]           DMODE    BL1 ERL ERMP BOF
0xe8001039   [25]            DIEN    BF SIR IID
0xe800103a   [00]             SBR
0xe800103b   [81]           DCNTL    CLSE COM
0xe800103c   [b2ac61c9]     ADDER
0xe8001040   [8f]          SIEN0    M/A SGE UDC RST PAR
0xe8001041   [05]           SIEN1    ST0 HTH
0xe8001044   [11]           SLPAR
0xe8001046   [70]          MACNTL    TYP2 TYP1 TYP0
0xe8001047   [0f]         GPCNTL    GPIO3 GPIO2 GPIO1 GPIO0
0xe8001048   [0e]          STIME0    SEL3 SEL2 SEL1
0xe8001049   [00]          STIME1
0xe800104a   [80]         RESPID0
0xe800104b   [00]         RESPID1
0xe800104c   [77]          STEST0    SSAID2 SSAID1 SSAID0 ART SOZ SOM
0xe800104d   [0c]          STEST1    DBLEN DBLSEL
0xe800104e   [00]          STEST2
0xe800104f  [80]          STEST3    TE
0xe8001058   [00]            SBDL
0xe8001059   [00]           SBDL1
0xe800105c   [ffffffff]  SCRATCHB
```

The show dsp option displays the current Symbios scripts location; it is useful when and if the SCSI bus locks. The information obtained will help to deal with drives that appear to have problems. If a SCSI drive appears to hang, you can load the `Symbios_info` utility and run it after the hang to see the state of the scripts.

Tech support can use this information to determine what the drive is doing or not doing. The section of the dump shown may be compared to the v53c810.lst file.

```
$ iniz hs02; dir /hs02; Symbios_info -d
PC-AT Compatible 80386  OS-9000 V2.2 for Intel x86

 vector  ($)   prior  drivstat   irq svc    driver
------------- -----  ---------  ---------  ------
    74  ($4a)     10  $00f90fb4  $0013e6f1  scsi8xx

Script dsp @ 0xe8002018

00000018: 80880000 000002c4
00000020: 74011000 00000000
00000028: 808c0010 00000028
00000030: 741a4000 00000000
00000038: 808c0040 00000008
00000040: 80880000 ffffffb8
00000048: 98080000 00000090
00000050: 80880000 0000028c
```

The show time option will show the current Symbios setup for the controller used.

```
$ iniz hs02; dir /hs02; Symbios_info -t
PC-AT Compatible 80386  OS-9000 V2.2 for Intel x86

 vector  ($)   prior  drivstat   irq svc    driver
------------- -----  ---------  ---------  ------
    74  ($4a)     10  $00f90fb4  $0013e6f1  scsi8xx
Symbios 53C875 [Symbios Device ID = 0x0f]

[00] [0c:0f] final [0f:0f] ULTRA WIDE SCSI 33.3 MB/s (60 ns, offset 15)

Driver is PCI I/O mapped

Symbios Clock     [0x00000050] (80)
Core Clock        [0x00000014] (20)
Min Period        [0x0000000c] (12)
Max Offset        [0x00000010] (16)
I/O Base          [0x0000e400]
Memory Base       [0xe8001000]
RAM Base          [0xe8002000]
Script            [0xe8002000] size (1548)
Selfid            [0x00000007]
Irq Level         [0x00000000]
Irq Vector        [0x0000004a]
Irq Priorty       [0x0000000a]

SCSI controller supports SCSI Wide 16
```

```
Special Features:

Clock Doubler Enabled
SCSI Large FIFO enabled size = 536
Burst Rate = 128
Burst Op Code Fetch Enabled
PCI Read Line Enabled
PCI Read Multiple Enabled
Write and Invalidate Enabled
PCI Cache Line Size Enabled
```

TESTPCI

The `TestPCI` utility provides a means to test the PCI library calls. Source is provide so that you have examples of all of the PCI calls available. See the **PCI Configuration Information** section for information on the PCI call usage.

Example

```
$ testpci
Test PCI Library Calls Edition 3
_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.
```

VIDBIOS

The VIDBIOS utility shows how to use the INT10h trap handler. You may either use the VIDBIOS utility or incorporate the functionality in their own programs by studying the code in

MWOS/OS9000/80386/PORTS/PCAT/UTILS/VIDBIOS.

The VIDBIOS utility allows setting specific video mode using INT10h on video cards. Some video cards may not function correctly with the VIDBIOS utility due to the protected nature of OS-9.

Usage

vidbios [<options>]

Function

Make 16-bit int10h video BIOS call

Options

One or more of the following options must be specified. Options default to a value of zero if not specified.

-eax=0xhhhhhhhh	value to load into eax for BIOS call
-ebx=0xhhhhhhhh	value to load into ebx for BIOS call
-ecx=0xhhhhhhhh	value to load into ecx for BIOS call
-edx=0xhhhhhhhh	value to load into edx for BIOS call
-ebp=0xhhhhhhhh	value to load into ebp for BIOS call
-esi=0xhhhhhhhh	value to load into esi for BIOS call
-edi=0xhhhhhhhh	value to load into edi for BIOS call
-r	print register state after BIOS call

ROM Utilities and Special Booters

llkermit

The llkermit ROM booter allows booting OS-9 over serial using Kermit Protocol. You must select llkermit in the ROM options when creating the boot image. Once the menu is displayed type `ker`. You should now be able to send the image on the communications port.

llcis

The LLCIS ROM Sub-Booter allows PCMCIA devices to be initialized for use.

The PCMCIA utility shares the same configuration information as the LLCIS Sub-Booter.

```
MWOS/OS9000/80386/PORTS/PCAT/ROM/config.des
#define LLCIS_PORTcbase=0xd4000"
#define LLCIS_PARAMS"verbose=1 fixed=1"
#define IDE_CIS_PARAMS"ide0=0x320,0 ide1=0x360,0"
#define ETH_CIS_PARAMS"3com=0x340,3"
#define SERIAL_CIS_PARAMS"com=0x340,10"
```

The PCMCIA SOCKET SERVICES require a VADEM 465 or similar controller.

- i82365sl step A
- i82365sl step B
- VLSI 82C146 - Note. Early versions of this chip will only work with one socket due to chip bug.
- IBM
- Vadem
- Cirrus CLPD67xx

The PCMCIA SOCKET SERVICES do not use interrupts, and for IDE based devices, no interrupts are used by default. If the PCMCIA device does not work check what is reported during the boot process. The type of PCMCIA controller as well as the device information is displayed. It may be that another device is using the memory at 0xd4000. If this is the case change the value in config.des. The Wizard will use this value next time you create a boot image.

rpciv

ROM based version of the `PCIV` utility. The `RPCIV` utility is provided for debugging purposes before the system boots.

MAUI Graphics Support

This section details information for using MAUI (Multimedia Application User Interface) for the PCAT board.

Getting Started

To start MAUI from the OS-9 console, complete the following steps:

Step 1. From the command prompt, navigate to the `/h0/sys` directory.

Step 2. At the prompt, type the following command:

```
loadmaui
```

To verify that MAUI is running, try executing one of the demo programs, such as `fdraw` or `fcopy`, from the OS-9 console.

Configuring OS-9 for Generic VGA Mode

The following code fragments, from the `loadmaui` file, configure OS-9 for Generic VGA mode 13 graphics support. Video mode 13 works with most every graphics card, but does not provide the best resolution. You may want to comment out the mode 13 driver by placing an asterisk in front of each line, and uncomment one of the other video drivers such as the generic VESA driver or the ISA Bank driver.

On the OS-9 target system you may edit the `loadmaui` file using the umacs editor.

*
* Graphics card selections.
*
* Note: The cdb default is PS2 mouse. To use serial mouse
* select the "_s" version.
*
* MAUI port - Generic VGA mode 13 (320x200x8bpp)
Remove the leading asterisk from one cdb_ file, vga and gx_vga files to enable Generic VGA mode 13 video.
*
load -d CMDS/BOOTOBJS/MAUI/cdb_vga - *PS/2 mouse*
*load -d CMDS/BOOTOBJS/MAUI/cdb_vga_s - *Serial mouse*
load -d CMDS/BOOTOBJS/MAUI/vga
load -d CMDS/BOOTOBJS/MAUI/gx_vga
*
* MAUI port - Generic VGA mode 12 & "X" (640x480x4bpp & 360x480x8bpp)
Remove the leading asterisk from one cdb_ file and the vga_ext and gx_vga_ext files to enable Generic VGA mode 12 video.
*
*load -d CMDS/BOOTOBJS/MAUI/cdb_vga_ext - *PS/2 mouse*
*load -d CMDS/BOOTOBJS/MAUI/cdb_vga_ext_s - *Serial mouse*
*load -d CMDS/BOOTOBJS/MAUI/vga_ext
*load -d CMDS/BOOTOBJS/MAUI/gx_vga_ext
*
* MAUI port - CL-GD5434 (up to 1024x768x24bpp)
Remove the leading asterisk from one cdb_ file and the gfx and gx_cl543 files to enable graphics support for the Cirrus Logic 5434

*load -d CMDS/BOOTOBJS/MAUI/cdb - *PS/2 mouse*
*load -d CMDS/BOOTOBJS/MAUI/cdb_s - *Serial mouse*
*load -d CMDS/BOOTOBJS/MAUI/gfx
*load -d CMDS/BOOTOBJS/MAUI/gx_cl543
*
*
****
* VESA driver - uses INT 10h calls
Remove the leading asterisk from the following files to enable VESA driver support

* the CDB determines which drivers are used. Pick one
*
*load -d CMDS/BOOTOBJS/MAUI/cdb_vesa - *PS/2 mouse*

```
*load -d CMDS/BOOTOBJS/MAUI/cdb_vesa_s - Serial mouse
*
* The graphics descriptor.
*load -d CMDS/BOOTOBJS/MAUI/vesa - Must uncomment this line to use the VESA
driver
*
* The graphics driver. Pick one.
*load -d CMDS/BOOTOBJS/MAUI/gx_vesa - Normal VESA driver
*load -d CMDS/BOOTOBJS/MAUI/gx_vesal - Linear mode VESA
*load -d CMDS/BOOTOBJS/MAUI/gx_vesah - 15 bit color support
*load -d CMDS/BOOTOBJS/MAUI/gx_vesalh - Linear mode, 15 bit color
*******************************************************
* ISAbank driver. Banked mode driver uses a data module
* the CDB determines which drivers are used. Pick one
*
*load -d CMDS/BOOTOBJS/MAUI/cdb_svga - PS/2 mouse
*load -d CMDS/BOOTOBJS/MAUI/cdb_svga_s - Serial mouse
*
* The graphics descriptor.
*load -d CMDS/BOOTOBJS/MAUI/svgab - uncomment to use the ISA bank driver
*
* The graphics driver. Pick one.
*load -d CMDS/BOOTOBJS/MAUI/gx_isabank1 - 1024x768 default
*load -d CMDS/BOOTOBJS/MAUI/gx_isabank6 - 640x480 default
*load -d CMDS/BOOTOBJS/MAUI/gx_isabank8 - 800x600 default
*
* The data module. Pick one.
*load -d CMDS/BOOTOBJS/MAUI/ibcl5422 - Cirrus Logic 5422 ISA
*load -d CMDS/BOOTOBJS/MAUI/ibcl5428 - Cirrus Logic 5428 VESA LB
*load -d CMDS/BOOTOBJS/MAUI/ibcl5429 - Cirrus Logic 5429 VESA LB
*load -d CMDS/BOOTOBJS/MAUI/ibct65548ts110cs - Toshbia 110CS laptop
*load -d CMDS/BOOTOBJS/MAUI/ibct65550ts205cds - Toshbia 205cds laptop
*load -d CMDS/BOOTOBJS/MAUI/ibct65550ts205cdsvga - Toshbia 205cds laptop with
VGA monitor
*load -d CMDS/BOOTOBJS/MAUI/ibtlet4000 - Tseng Labs ET4000 ISA
********************************************************

* End of bootlist
```

The `gx_vesa` driver comes in four different modules.

`gx_vesa`	This has 640x480, 800x600, 1024x768, and 1280x1024 support at 256 colors. The VESA BIOS is asked what modes are supported. The BIOS should stop the driver from setting any modes that can't be displayed. This driver will use a linear display buffer if the VESA BIOS is version 2.0 or greater and tells the driver that linear buffers are supported.
`gx_vesal`	This only works on cards with BIOS's that support linear mode. It is about 3 times faster than gx_vesa on supported hardware.
`gx_vesah`	This adds support for 15 bit high color modes. It looks for the highest resolution high color mode. The color depth table is separate from the resolution table.
`gx_vesalh`	This is a linear buffer only with high color support.

The descriptor is vesa and there are two cdb modules. `cdb_vesa` and `cdb_vesa_s`. `cdb_vesa` is set up for a bus mouse and `cdb_vesa_s` is set up for a serial mouse.

The `gx_isabank` driver comes in three modules depending on what default resolution you want. `gx_isabank1` has a default of 1024x768, `gx_isabank6` has a default of 640x480 and `gx_isabank8` has a default of 800x600 all at 256 colors. The `gx_isabank` driver uses a data module to tell it how to talk to different hardware. The data modules included are listed below:

- ibcl5422 cirrus logic 5422 ISA card
- ibcl5428 cirrus logic 5428 VESA LB card
- ibcl5429 cirrus logic 5429 VESA LB card
- ibct65548ts110cs Toshiba laptop
- 110cs ibct65550ts205cds Toshiba laptop
- 205cds ibct65550ts205cdsvga Toshiba laptop

- 205cds with external VGA monitor
- ibtlet4000 Tseng labs ET4000 ISA card

The descriptor is `svgab` and the cdb's are `cdb_svgab` and `cdb_svga_s`. `cdb_svga` is for a bus mouse and `cdb_svga_s` is for a serial mouse.

All modules are in the following directory:
`MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/MAUI`

Using Cross Hosted Utilities

The following utilities may be executed on the Windows95/98/ME or NT system to access an OS-9 formatted floppy (RBF). You may use the cross hosted utilities in much the same way you do from OS-9. Note: The Wizard uses the Cross Hosted Utilities when creating boot media.

os9dir

The `os9dir` utility displays a formatted list of file names of the specified directory file on standard output. Refer to the dir utility in the Utilities Reference Manual for specific information on command line options and additional functionality.

```
C:\>os9dir -e /d0

              Directory of /d0 05:27:54
 Owner   Last modified    Attributes    Block  Bytecount Name
--------- ------------- --------------- ------- --------- ----

     0.0   98/10/310612d----swr-swr-swr6128CMDS
     0.0   98/10/310612d----swr-swr-swr4256SYS
     0.0   98/10/310613-------------wrF52976firstboot
     0.0   98/09/101952------wr--wr--wrA376iplfd
     0.0   98/09/101952------wr--wr--wrB504iplhd
     0.0   98/09/101952------wr--wr--wrD480iplhdnoq
     0.0   98/10/310613-------------wr13B36160sysboot
```

os9dcheck

The `os9dcheck` utility is a diagnostic tool which detects the condition and general integrity of the directory/file linkages of a disk device. Refer to the dcheck utility in the Utilities Reference Manual for specific information on command line options and additional functionality.

```
C:\>os9dcheck /d0

volume - 'OS9 Boot Disk' on device /d0
$00000b3f total blocks on media
$00000200 total bytes in bitmap
block $00000001 is start of bitmap fd
block $0000000f is start of low level boot file
block $0000013b is start of bootstrap fd
block $00000002 is start of root directory fd
building allocation map...
checking allocation map...

'OS9 Boot Disk' file structure is intact
3 directories, 8 files, 6 hard links
999424 of 1474048 bytes (0.95 of 1.40 meg) used on media
```

os9list

The `os9list` utility displays text lines from the specified path(s) to standard output.

```
C:\>os9list /d0/sys/startup
-nt
-nx
*
* In case multi-term is running.
*
mshell -lp="OS9_w1: " <>>>/mterm1&
mshell -lp="OS9_w2: " <>>>/mterm2&
mshell -lp="OS9_w3: " <>>>/mterm3&
ex mshell -lp="OS9_w0: " <>>>/term&
```

Note

The main difference between the use of the OS-9 cross hosted utilities and the OS-9 resident utilities is the lack of wild card support. In OS-9, the shell provides this service. Under Windows95/98/ME and NT, the standard shell does not provide this service. However, Microware can pipe commands to perform the same functionality. Also note that the OS-9 utilities will work on the native Windows95/98/ME or NT file system.

```
C:\MWOS\OS9000\80386\CMDS>os9dir -u p* | ident -qz
p2init    size #4880   owner  0.0   ed #15   good crc #CF17B4
padrom    size #3904   owner  1.0   ed #6    good crc #837D7A
park      size #2736   owner  1.0   ed #3    good crc #33F98D
pcnfsd    size #52632  owner  0.0   ed #16   good crc #C03ABA
pd        size #5304   owner  1.0   ed #28   good crc #B89E0E
pinfo     size #5368   owner  1.0   ed #3    good crc #74314E
```

Additional Cross Hosted Utilities

Below are some additional cross hosted utilities:

`compare files os9cmp`	`/d0/a /d0/b`	`os9cmp.exe`
`dump files os9dump`	`/d0 or os9dump/d0@`	`os9dump.exe`
`merge files os9merge`	`/d0/a >/d0/b`	`os9merge.exe`
`touch file os9touch`	`/d0/sam`	`os9touch.exe`
`format media os9format`	`/d0`	`os9format.exe`
`change attributeos9attr -epege`	`/d0/module`	`os9attr.exe`
`make bootableos9bootgen`	`/d0 -i=iplfd -l=coreboot`	`os9bootgen.exe`
`change owner os9chown 1.0`	`/d0/file`	`os9chown.exe`
`copy file os9copy`	`myfile -w= /d0`	`os9copy.exe`
`check disk os9dcheck`	`/d0`	`os9dcheck.exe`
`delete file os9del`	`/d0/sam`	`os9del.exe`
`show directory os9dir -e`	`/d0`	`os9dir.exe`
`show free space os9free`	`/d0`	`os9free.exe`
`list file os9list`	`/d0/sys/password`	`os9list.exe`
`make directoryos9makdir`	`/d0/SYS /d0/CMDS`	`os9makdir.exe`
`rename fileos9rename`	`/d0/sam /d0/fred`	`os9rename.exe`

Note

`os9list` and `os9copy` both support conversion options.

```
$ os9copy /d0/sam fred -cod   ? convert to DOS from OS9

$ os9copy fred /d0/sam -cdo ? convert to OS-9 from DOS
```

PCI Configuration Information

By default the PCI system will search up to seven buses. On newer motherboards, PCI slot devices are not bus zero. The maximum bus number may be changed in the following directory:

`MWOS/OS9000/80386/PORTS/PCAT/systype.h`

The PCI library must be re-made as well in the following directory: `MWOS/OS9000/80386/PORTS/PCAT/PCILIB`

Running `os9make` from this directory will re-create a new PCI library. You must also re-make any drivers that require the new changes.

```
MWOS/OS9000/80386/PORTS/PCAT/systype.h
#defineISA_IOBASE0x00000000/* ISA Base Address */
#definePCI_CNF_ADR0x00000CF8/* PCI Configuration Address */
#definePCI_DATA_ADR0x00000CFC/* PCI Data Address */
#definePCI_IO_BASEISA_IOBASE/* PCI I/O Base */
#definePCI_MEM_BASE0x00000000/* PCI Memory Base */
#defineMAX_PCI_BUS_NUMBER7/* Max PCI BUS Number */
```

PCI Library User Guide

The following functions are contained in the PCI library, `pcilib.l`.

Note

pcilib.l is compiled as port-specific. For example, for the PC-AT port, this library is located in 'MWOS/OS9000/80386/PCAT/LIB/pcilib.l'.

_pci_search_device()

Search for PCI Device

Syntax

```
#include <pcicnfg.h>
error_code _pci_search_device(PCI_config_stat stat);
```

Description

`_pci_search_device()` provides a means to check whether PCI devices are available in the system. If the system supports PCI devices and at least one PCI device is found, `_pci_search_device()` will return SUCCESS; otherwise it returns NO_DEVICE.

Attributes

State:	System

Header Files

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
pci_config_stat stat;
if (_pci_search_device(&stat) == NO_DEVICE) {
printf("There is no PCI devices on this machine.");
return EXIT_FAILURE;
}
return EXIT_SUCCESS;
}
```

_pci_next_device()

Find Next PCI Device

Syntax

```
#include <pcicnfg.h>
error_code _pci_next_device(PCI_config_stat stat);
```

Description

`_pci_next_device()` will find the next PCI device starting at the current bus_number and device_number in the `PCI_config_stat` structure pointed at by the incoming parameter stat. If another PCI device is found, the status returned is SUCCESS, and the fields

- `bus_number`
- `device_number`
- function_number
- `vendor_id`
- `device_id`
- `rev_class`

in the structure stat points to will reflect the proper values for the device found. If no PCI next device is found, then `_pci_next_device()` will return `NO_DEVICE`.

Attributes

State:	System

Header Files

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>
```

```
main()
{
pci_config_stat stat;

stat.bus_number = 0;
stat.device_number = 0;
if (_pci_next_device(&stat) == NO_DEVICE) {
printf("There are no more PCI devices on this machine.");
return EXIT_FAILURE;
} else {
printf("Next device at bus:%d device%d\n",
stat.bus_number, stat.device_number);
}
return EXIT_SUCCESS;
}
```

pci_get_config_data()

Get PCI Configuration Data

Syntax

```
#include <pcicnfg.h>
error_code pci_get_config_data(u_int32 bus, u_int32 device, u_int32 func, PCI_config_reg cnfg);
```

Description

`pci_get_config_data()` provides a simple means to obtain the PCI standard information for a given PCI device.

Note

Many PCI devices include additional information after the standard configuration block. To access it one must use `pci_read_configuration()`. For information on the information returned, refer to the `pci_config_reg` structure in `pcicnfg.h`.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, device;
pci_config_reg cnfg;
PCI_config_reg cp = &cnfg;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
pci_get_config_data(bus, device, 0L, &cnfg);
printf("\n");
printf("BUS:DEV VID DID CLASS RV IL IP\n");
printf("---------------------------------\n");
printf("%03d:%02d %04x %04x %06x %02x %02x %02x ",
bus, device,
cp->vendor_id, cp->device_id,
(cp->rev_class>>8)&0xffffff, cp->rev_class & 0xff,
cp->irq_line, cp->irq_pin );
return EXIT_SUCCESS;
}
```

pci_find_device()

Find PCI Device

Syntax

```
#include <pcicnfg.h>
error_code pci_find_device(u_int32 vender_id,
u_int32 device_id, u_int32 index,
u_int8 *bus, u_int8 *dev);
```

Description

`pci_find_device function()` will search the PCI bus for a device with the same `vendor_id` and `device_id` passed. If the index is nonzero, then the device found is based on the index. For example, if index is equal to one, then the second card found with the same `vendor_id` and `device_id` on a match is returned.

If a PCI device is found then `pci_find_device()` will return SUCCESS and the bus number and device number will be stored where the bus and dev arguments point respectively. The upper three bits of the device number specify the function number for multi-function devices.

If no PCI device is found, the `pci_find_device()` function will return NO_DEVICE.

Attributes

State:System

Header Files

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, dev;
u_int32 index = 0;

if (pci_find_device(PCI_VENDOR_ID_NCR,
PCI_DEVICE_NCR53C810, index, &bus, &dev) == SUCCESS)
{
printf("NCR53C810 found at bus:%d device:%d function:%d\n",
bus, dev & 0x1f, dev >> 5);
}
return EXIT_SUCCESS;
}
```

pci_find_class_code()

Find PCI Device Based on Class Code

Syntax

```
#include <pcicnfg.h>
error_code pci_find_class_code( u_int32 class_code,
u_int32 device_index, u_int8 *bus, u_int8 *dev);
```

Description

The `pci_find_class_code()` function will search the PCI bus for a device with the same `class_code` as the one passed. If the index is nonzero, then the device found is based on the index. For example, if index is equal to one then the second card found with the same `class_code` on a match is returned.

If such a PCI device is found, then `pci_find_class_code()` will return SUCCESS and store the bus number and device number in the objects pointed at by the bus and dev parameters respectively. The upper three bits of the device number specify the function number for multi-function devices.

If no PCI device is found, `pci_find_device()` will return `NO_DEVICE`.

Attributes

State:	System

Header Files

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>

#define NETWORK_ATM_CONTROLLER 0x020300


main()
{
u_int8 bus, dev;
u_int32 index = 0;
if (pci_find_class_code(NETWORK_ATM_CONTROLLER,
index, &bus, &dev) == SUCCESS)
{
printf("device at bus:%02d dev:%02d func:%02d\n",
bus, dev&0x1f, dev>>5);
}
return EXIT_SUCCESS;
}
```

pci_read_configuration_byte()

Read PCI Configuration Byte

Syntax

```
#include <pcicnfg.h>
u_int8 pci_read_configuration_byte(u_int32 bus, u_int32 dev,
u_int32 func, u_int32 index);
```

Description

`pci_read_configuration_byte()` will return the PCI configuration byte value for the PCI device at 'bus' bus number, 'dev' device number, 'func' function number, 'index' offset into the configuration space.

Attributes

State:	System

Header Files

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, dev, func;
u_int8 irqline;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
irqline = pci_read_configuration_byte(bus, device,
func, offsetof(pci_config_reg, irq_line));
printf("PCI irq line = %d\n", irqline);
return EXIT_SUCCESS;
}
```

pci_read_configuration_word()

Read PCI Configuration Word

Syntax

```
#include <pcicnfg.h>
u_int16 pci_read_configuration_word(u_int32 bus, u_int32 dev,
u_int32 func, u_int32 index);
```

Description

`pci_read_configuration_word()` will return the PCI configuration word value for the PCI device at `bus` bus number, `dev` device number, `func` function number, `index` offset into the configuration space.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, dev, func;
u_int16 vend_id;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
vend_id = pci_read_configuration_word(bus, device,
func, offsetof(pci_config_reg, vendor_id));
printf("PCI vendor id = 0x%04x\n", vendor_id);
return EXIT_SUCCESS;
}
```

pci_read_configuration_dword()

Read PCI Configuration dword

Syntax

```
#include <pcicnfg.h>
u_int32 pci_read_configuration_dword(u_int32 bus,
u_int32 dev, u_int32 func, u_int32 index);
```

Description

`pci_read_configuration_dword()` function will return the PCI configuration dword value for the PCI device at `bus` bus number, `dev` device number, `func` function number, `index` offset into the configuration space.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <systype.h>
#include <stdio.h>
#include <stdlib.h>

main()
{
u_int8 bus, dev, func;
u_int32 hdware;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
/* Get PCI I/O Port Address */
hdware = pci_read_configuration_dword(bus, dev, 0,
offsetof(pci_config_reg,base_addrs[0]));
/* mask address and add PCI Area Offset */
hdware = (hdware & ~1) + PCI_IO_BASE;
printf("PCI device at 0x%08x\n", hdware);
return EXIT_SUCCESS;
}
```

pci_write_configuration_byte()

Write PCI Configuration Byte

Syntax

```
#include <pcicnfg.h>
error_code pci_write_configuration_byte(u_int32 bus,
u_int32 dev, u_int32 func, u_int32 index, u_int8 val);
```

Description

`pci_write_configuration_byte()` writes to the PCI configuration space the byte value `val` for the PCI device at `bus` bus number, `dev` device number, `func` function number, `index` offset into the configuration space.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>


main()
{
u_int8 bus, dev, func;
u_int8 cache_siz;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
cache_siz = 4; /* cache line size */
error = pci_write_configuration_byte(bus, dev, func,
offsetof(pci_config_reg, cache_line_siz), cache_siz);
return error;
}
```

pci_write_configuration_word()

Write PCI Configuration word

Syntax

```
#include <pcicnfg.h>
error_code pci_write_configuration_word(u_int32 bus,
u_int32 dev, u_int32 func, u_int32 index, u_int16 val);
```

Description

`pci_write_configuration_word function()` writes to the PCI configuration space the word value `val` for the PCI device at `bus` bus number, `dev` device number, `func` function number, `index` offset into the configuration space.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>


main()
{
u_int8 bus, dev, func;
u_int16 cmd;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
cmd = 7; /* set device to allow bus master */
error = pci_write_configuration_word(bus, dev, func,
offsetof(pci_config_reg, command_reg), cmd);
return error;
}
```

pci_write_configuration_dword()

Write PCI configuration dword

Syntax

```
#include <pcicnfg.h>
error_code pci_write_configuration_dword(u_int32 bus,
u_int32 dev, u_int32 func, u_int32 index, u_int32 val);
```

Description

`pci_write_configuration_dword()` writes to the PCI configuration space the dword value `val` for the PCI device at `bus` bus number, `dev` device number, `func` function number, `index` offset into the configuration space.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>


main()
{
u_int8 bus, dev, func;
u_int32 value;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
value = 0xffffffff; /* get size info from device */
error = pci_write_configuration_dword(bus, dev, func,
offsetof(pci_config_reg, base_addrs[0]), value);
return error;
}
```

pci_get_irq_pin()

Get PCI IRQ Pin

Syntax

```
#include <pcicnfg.h>
u_int8 pci_get_irq_pin(u_int8 bus, u_int8 dev, u_int8 func);
```

Description

`pci_get_irq_pin()` returns the status of the IRQ pin on a given PCI device at `bus` bus number, `dev` device number, `func` function number.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, dev, func;
u_int8 irqpin;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
irqpin = pci_get_irq_pin(bus, device, func);
printf("IRQ PIN = %d\n", irqpin);
return EXIT_SUCCESS;
}
```

pci_get_irq_line()

Get PCI IRQ Line

Syntax

```
#include <pcicnfg.h>
u_int8 pci_get_irq_line(u_int8 bus, u_int8 dev, u_int8 func);
```

Description

`pci_get_irq_line()` returns the status of the IRQ line on a given PCI device at `bus` bus number, `dev` device number, `func` function number.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, dev, func;
u_int8 irqline;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
irqline = pci_get_irq_line(bus, device, func);
printf("IRQ LINE = %d\n", irqline);
return EXIT_SUCCESS;
}
```

pci_set_irq_line()

Set PCI IRQ Line

Syntax

```
#include <pcicnfg.h>
error_code pci_set_irq_line(u_int8 bus, u_int8 dev,
u_int8 func, u_int8 irqvect);
```

Description

`pci_set_irq_line()` sets the IRQ line on a given PCI device at `bus` bus number, `dev` device number, `func` function number.

Attributes

State:	System

Header File

`MWOS/SRC/DEFS/HW/pcicnfg.h`

Example

```
#include <const.h>
#include <pcicnfg.h>
#include <stdio.h>
#include <stdlib.h>


main()
{
u_int8 bus, dev, func;
u_int8 irqline;

bus = 0; /* device on bus zero */
device = 11; /* device ID = 11 */
func = 0; /* function number = 0 */
irqline = 9; /* IRQ LINE = vector 9 */
pci_set_irq_line(bus, device, func, irqline);
return EXIT_SUCCESS;
}
```

Appendix A: Board Specific Modules

This chapter describes the modules specifically written for the target board. It includes the following sections:

- **Low-Level System Modules**
- **High-Level System Modules**
- **Common System Modules List**

Low-Level System Modules

The following low-level system modules are tailored specifically for the PCAT and MediaGX platforms. The functionality of many of these modules can be altered through changes to the configuration data module (`cnfgdata`). These modules are located in the following directory:

```
MWOS/OS9000-80386/PORTS/PCAT/CMDS/BOOTOBJS/ROM
```

llfa311	Ethernet driver that supports autosense of 10/100BaseT Full/Half Duplex
lle509	Ethernet driver that supports the low level 3COM ISA bus driver
llpro100	Ethernet driver for the INTEL Ethernet PRO100 series card
ll79C961	Ethernet driver for the LAN79C961/AM79C973 cards
ll8139	Ethernet driver for the RealTek RL8139 card
llne2000	Ethernet driver for the NE2000 card
llcis	P2module that includes PCMCIA socket services
ll21040	Ethernet driver for the NetGear FA310-TX card
ll91C94	Ethernet driver for the SMC 91C94/96 cards
lle509	Ethernet driver for 3COM PCI card

High-Level System Modules

The following OS-9 system modules are tailored specifically for the PCAT and MediaGX platforms. Unless otherwise specified, each module is located in a file of the same name in the following directory:

```
MWOS/OS9000-80386/PORTS/PCAT/CMDS/BOOTOBJS
```

MAUI Support

Modules in the PCAT port directory

```
MWOS/OS9000-80386/PORTS/PCAT/CMDS/BOOTOBJS/MAUI
```

cdb

cdb_s

cdb_vesa

cdb_vesa_s

cdb_vga

cdb_vga_s

cdb_svga

cdb_svga_s

gx_vga

gx_vesa

gx_vesah

gx_vesal

gx_vesalh

vga_ext

vga_ext_s

mp_msptr

mp_kybrd

mp_bsptr

mp_xtkbd

ibcl5422

ibcl5428

ibcl5429

ibct65548ts110cs

ibct65550ts205cds

ibct65550ts205cdsvga

ibtlet4000

Modules in the MEDIAGX port directory

`MWOS/OS9000-80386/PORTS/MEDIAGX/CMDS/BOOTOBJS/MAUI`

gx_mediagx

gx_mediagxh

Sequential Device Support

sc8042

serial mouse

p2mouse

sc16550

Parallel Driver

scp87303

aha1540

aic7870

Ticker

tk8253

Abort Handler

abort

Parallel Support

scsi8xx

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/OS9000-80386/PORTS/PCAT/CMDS/BOOTOBJS/ROM`

Table 2-1 Typical Coreboot Image Contents

Module	Description
`cnfgdata`	data module containing the configuration parameters
`cnfgfunc`	retrieves configuration parameters from the cnfgdata boot data module
`commcnfg`	retrieves the name of the low-level driver to use for the auxiliary communications port from the configuration module
`conscnfg`	retrieves name of the low-level driver to use for the console from the configuration data module
`initext`	provides modular functional extension to the `sysini1()` and `sysinit2()` routines
`io16550`	serial IO driver
`io8042`	provides support for ROM P2 modules
`ll1540`	SCSI driver for AHA1540
`ll7870`	SCSI driver for AIC-7870
`ll83790`	Ethernet driver for ROM P2 modules

Table 2-1 Typical Coreboot Image Contents

Module	Description
`ncr8xx`	SCSI driver for NCR53C810/825
`portmenu`	boot system support module
`romcore`	system initialization
`rpciv`	ROM utility
`swi8timr`	software timer
`usedebug`	retrieves the flag from the configuration data module indicating whether or not the debugger is called during system startup

Appendix B: Configuring Hardware Devices

This appendix contains detailed information for configuring and troubleshooting specific devices with OS-9. The following sections are included:

Ethernet Controllers

Note

Some Network Interface Cards require that a setup disk, included with the card, is ran before the card is installed in a system running OS-9.

The setup disk is required for configuring the connection type for cards which support multiple interfaces, such as connections for 10Base-T, 10Base-2 or AUI. The setup disk may also be needed to configure the card for a specific interrupt or I/O address.

3COM PCI

3C900B-TPO - 10Base-T TPO NIC

3C900B-CMB - 10Base-T/10Base-2/AUI Combo

3C905-T4 - 10/100 Base-T4 (RJ-45) - 3C905-T4 Fast Etherlink XL

3C905B-TX - 10/100Base-TX NIC

3CSOHO100-TX - 10/100 Base-TX NIC - Office Connect 10/100

3C900-TPO - 10Base-T TPO NIC

System State Debugging - Supported

Default Settings

PORTADDR	NA
IRQVECTOR	NA
CONNTYPE	INF_EXT /* Auto */

Solving Configuration Issues

Connection Type

The default connection type is set to INF_EXT (auto). For the 3COM ISA card, this implies the card setup program has been used and has setup the card connection type. If you are unable to communicate with this card and netstat -in shows the device, the connection type may be incorrect. To correct it, you may do one of the following:

1. Use the 3COM setup disk to configure the card for the connection used.
2. Change the OS-9 device descriptor for the type of connection in use.
3. Try one of the other connections on the card (if using AUI type, try the RJ45 connector).

```
(Super)[/h0/sys/>] netstat -in

NameMtu NetworkAddressIpktsIerrsOpktsOerrsColl
lo0   1536<Link>00 0   0  0
lo0   1536127127.0.0.10000    0
enet01500<Link>00.00.C0.91.4F.96551103500
enet01500182.52.109182.52.109.2555103500
```

Modifying the OS-9 Descriptor

Edit the file MWOS/OS9000/80386/PORTS/PCAT/SPF/SPE509/DEFS/spf_desc.h, looking in the "#ifdef spe30_pci" section for CONNTYPE, which you should set to the appropriate value from the following list:

INF_AUI = AUI Connection type

INF_BNC = BNC connection type

INF_UPT = 10BaseT (RJ45)

INF_EXT = Use same connection type determined in 3COM setup program

```
/*

 * From spf_desc.h
*/

/* options for CONNTYPE: INF_AUI, INF_BNC, INF_UTP, INF_EXT (auto) */

#define CONNTYPEINF_EXT
```

Finally, remake the descriptor: change to the MWOS/OS9000/80386/PORTS/PCAT/SPF/SPE509 directory and type "os9make -f=spfdesc.mak".

Next time you run the Wizard, it will use the new descriptor.

Boomerang

The source code for the spe509 driver includes “#if defined(BOOMERANG)” sections to allow only including support for the newer 3COM PCI based cards. Each card is now defined in a constant table and as such the driver makefile used must be modified to include both the define for “BOOMERANG” and the compiler option “-c” to force constant code data.

```
/* spfdrvr.mak - add the following define and compiler option */

DEFINES = -c -dBOOMERANG

/* spfdesc.mak - add the following define */
MACROS = -dBOOMERANG
```

DMA

To allow support for the newer 3COM “B” based cards, DMA support with ring buffers has been added. The size of the ring buffers may be set in the “spf_desc.h” file.

```
#define RX_RING_CNT32/* Number of buffers in BOOMERANG recv ring */
#define TX_RING_CNT16/* Number of buffers in BOOMERANG xmit ring */
```

Time-out Options

To allow support with switches and slow hubs the time-out for checking for link beat has been increased. This change effects 3COM NON-B parts as well as PCMCIA CARDS using UTP connections. The default time-out prior to this change was 750ms. Most switches take two to three seconds to sync. A loop count has been added.

```
/*
 * When a connection type is tried we will wait for the time
 * specified in LINK_BEAT_ITER and LINK_BEAT_SLEEP_TIME.
 * This should address the problem with not being able to work
 * with switches. Most switches will take 2 to 3 seconds, we will wait up to
 * 5.25 seconds (192/256ths)*7.
 *
*/

#define LINK_BEAT_ITER 7
#define LINK_BEAT_SLEEP_TIME 0x800000c0 /* 192/256ths of a second (750 ms) */
```

Note

The **PCIV** utility may be used to examine a network card. This utility displays vendor and device ID's for each installed PCI device.

To find out if your card has been tested with OS-9, run the pciv command and look at the vendor and device ID's. The vendor ID should be 0x10B7 for all 3COM network cards. Network cards with the following device ID's have been tested with OS-9 drivers shipping with this release.

3COM 3C509	0x5900	
3COM 3C900-TPO	0x9000	
3COM 3C900	0x9001	
3COM 3C900B-TPO	0x9004	
3COM 3C900B-CMB	0x9005	
3COM 3C905-T4	0x9051	(2)
3COM 3C905B-TX	0x9055	(1)
3COM 3CSOHO100-TX	0x7646	(1)

Support for the following cards is included with the driver, however, these cards were not tested prior to the release.

3COM 3C905-TX	0x9050
3COM 10/100 COMBO Deluxe	0x9058
3COM 10Base-T/10Base-2/TPC	0x9006
3COM 10Base-FL NIC	0x900A
3COM 100Base-FX NIC	0x905A

3COM Tornado NIC	0x9200
3COM 10/100 Base-TX NIC (Python-H)	0x9800
3COM 10/100 Base-TX NIC (Python-T)	0x9805

Additional Notes

1. 100BaseT support is included for the 3C905B-TX and 3CSOHO100-TX.
2. The 3C905-T4 has been tested with 10BaseT only.

3COM ISA

3COM ISA EtherLink III

System State Debugging

Supported

Default Settings

PORTADDR	0x340	/* IO port for ISA */
IRQVECTOR	0x43	/* IRQ vector */
CONNTYPE	INF_EXT	/* Auto */

Solving Configuration Issues

Connection Type

The default connection type is set to INF_EXT (auto). For the 3COM ISA card, this implies the card setup program has been used and has setup the card connection type. If you are unable to communicate with this card and netstat -in shows the device, the connection type may be incorrect. To correct it, you may do one of the following.

1. Use the 3COM setup disk to configure the card for the connection used.
2. Change the OS-9 device descriptor for the type of connection in use.
3. Try one of the other connections on the card (if using AUI type, try the RJ45 connector).

Interrupt Conflict

Another problem may be the interrupt used. The default interrupt is IRQ3. In this case you have the following options.

1. Disable the COM2 serial port from the BIOS to allow IRQ3 to function with this card.
2. Choose a interrupt that matches the system configuration such as IRQ10 (0x4a). In this case the OS-9 device descriptor must be changed.

If an interrupt conflict exists the device will either not work at all or will hang when the conflicting device is accessed. Mapping the interrupts used in the system is recommended.

If it seems like we should be getting interrupts this can be tested.

Use the command irqs to see a list of interrupts, e.g.:

```
(Super)[/h0/sys/>] irqs

PC-AT Compatible 80386  OS9 For Embedded Systems

 vector  ($)   prior  drivstat   irq svc    driver  dev list
-------------  -----  ---------  ---------  ------  ---------
    7  ($07)     10  $0003c444  $0010f7b4  fpu      <na>
   14  ($0e)      1  $0003c3a4  $00110113  vectors  <na>
   64  ($40)     10  $00ff40b0  $0011098f  tk8253   <na>
   65  ($41)     10  $00ffa680  $00120582  sc8042m  <na>
   65  ($41)     10  $00e85db0  $00120582  sc8042m  <na>
   65  ($41)     10  $00e84a40  $00120582  sc8042m  <na>
   65  ($41)     10  $00e82980  $00120582  sc8042m  <na>
   74  ($4a)      1  $00ff02d0  $001f9504  spe509   <na>
   78  ($4e)     10  $00ff4f30  $00137906  rb1003   <na>
```

In this case, we can go into RomBug by typing break and placing a breakpoint at the ISR.

```
$ break
RomBug: b 1f9504
RomBug: g
```

and then pinging a machine on the net:

```
$  ping 182.52.109.13
```

(using the actual address of another machine on the network, rather than the one shown above).

If interrupts are running you should be presented a Rombug prompt at the breakpoint address. You can type g to see if you get another interrupt or k to kill the breakpoint.

Port Address Conflict

It is also possible that the port address used for this card is used by another device in the system. If this is the case, the OS-9 command netstat -in will not show the card as available.

The following netstat example shows a working network card configured with IP address 182.52.109.25 and MAC address of 00.00.C0.91.4F.96.

```
(Super)[/h0/sys/>] netstat -in

Name  Mtu   Network       Address           Ipkts Ierrs    Opkts Oerrs  Coll
lo0   1536  <Link>                            0     0       0     0     0
lo0   1536  127          127.0.0.1            0     0       0     0     0
enet0 1500  <Link>      00.00.C0.91.4F.96      55   110      35     0     0
enet0 1500  182.52.109    182.52.109.25        55   110      35     0     0
```

Modifying the OS-9 Descriptor

Edit the file MWOS/OS9000/80386/PORTS/PCAT/SPF/SPE509/DEFS/spf_desc.h and look for the #ifdef spe30_isa section.

Change the fields below as required.

INF_AUI = AUI Connection type

INF_BNC = BNC connection type

INF_UTP = 10BaseT (RJ45)

INF_EXT = Use same connection type determined in 3COM setup program

```
/*

 * From spf_desc.h

*/

#define PORTADDR0x340/* IO port for ISA*/
#define IRQVECTOR0x43/* IRQ vector                    */
/* options for CONNTYPE: INF_AUI, INF_BNC, INF_UTP, INF_EXT (auto) */
#define CONNTYPEINF_EXT
```

Finally, remake the descriptor: change to the MWOS/OS9000/80386/PORTS/PCAT/SPF/SPE509 directory and type:

```
C:> os9make -f=spfdesc.mak
```

Next time you run the Wizard the new descriptor will be used.

Low-level System Changes

If system state debugging is used, you must change the low level system by modifying the following lines from the file

`MWOS/OS9000/80386/PORTS/PCAT/ROM/CNFGDATA/config.des`:

```
#define LLE509_PORT_ADDRESS 0x340
#define LLE509_IF_VECTOR 0x43
```

as required by the system. For example, for IRQ10, here are the changes required.

```
#define LLE509_PORT_ADDRESS 0x340
#define LLE509_IF_VECTOR 0x4a
```

The Wizard will automatically re-make the cnfgdata module.

3COM PCMCIA

Note

When making bootfile only images care should be taken to make sure PCMCIA support is enabled in the low-level 'coreboot' system if PCMCIA devices are to be employed once the system is booted.

3COM EtherLink III PC CARD

3COM Megahertz LAN (3CCE589ET) - 10 Mbps LAN PC Card

System State Debugging

Supported

Default Settings

PORTADDR	0x340	/* IO port for ISA */
IRQVECTOR	0x43	/* IRQ vector */
CONNTYPE	INF_EXT	/* Auto */

Solving Configuration Issues

Connection Type

The default connection type is set to INF_EXT (auto). For the 3COM PCMCIA card this implies the card will detect the connection type used. If desired the connection type may be forced. To force the connection type the descriptor must be changed.

Interrupt Conflict

Another problem may be the interrupt used. The default interrupt is IRQ3. In this case you have the following options.

1. Disable the COM2 serial port from the BIOS to allow IRQ3 to function with this card.
2. Choose a interrupt that matches the system configuration such as IRQ10 (0x4a). In this case the OS-9 device descriptor must be changed. Also the PCMCIA socket services setup must be changed to assign the new interrupt to the PCMCIA Ethernet Card.

If an interrupt conflict exists the device will either not work at all or will hang when the conflicting device is accessed. Mapping the interrupts used in the system is recommended.

Use the command irqs to see a list of interrupts.

```
(Super)[/h0/sys/>] irqs

 vector  ($)   prior  drivstat   irq svc    driver  dev list
-------------  -----  ---------  ---------  ------  ---------
    7  ($07)    10  $0003c444  $0010f7b4  fpu      <na>
   14  ($0e)     1  $0003c3a4  $00110113  vectors  <na>
   64  ($40)    10  $00ff40b0  $0011098f  tk8253   <na>
   65  ($41)    10  $00ffa680  $00120582  sc8042m  <na>
   65  ($41)    10  $00e85db0  $00120582  sc8042m  <na>
   65  ($41)    10  $00e84a40  $00120582  sc8042m  <na>
   65  ($41)    10  $00e82980  $00120582  sc8042m  <na>
   74  ($4a)     1  $00ff02d0  $001f9504  spe509   <na>
   78  ($4e)    10  $00ff4f30  $00137906  rb1003   <na>
```

In the case above we can go into RomBug by typing break and placing a break at the ISR.

```
$ break

RomBug: b 1f9504
RomBug: g
```

and then pinging a machine on the net.

```
$  ping 182.52.109.13
```

(Using the actual address of another machine o the network, rather than the one shown above.)

If interrupts are running you should be presented a *Rombug* prompt at the breakpoint address. You can type *g* to see if you get another interrupt or *k* to kill the breakpoint.

Port Address Conflict

It is also possible that the port address used for this card is used by another device in the system. If this is the case the OS-9 command *netstat -in* will not show the card as available.

```
(Super)[/h0/sys/>] netstat -in

Name  Mtu   Network       Address            Ipkts Ierrs    Opkts Oerrs  Coll
lo0   1536  <Link>                              0     0        0     0     0
lo0   1536  127          127.0.0.1              0     0        0     0     0
enet0 1500  <Link>      00.00.C0.91.4F.96      55   110       35     0     0
enet0 1500  182.52.109    182.52.109.25        55   110       35     0     0
```

Modifying the OS-9 Descriptor

Edit the file
MWOS/OS9000/80386/PORTS/PCAT/SPF/SPE509/DEFS/spf_desc.h

Look for the #ifdef spe30_isa section and change the PORTADDR, IRQVECTOR, and CONNTYPE as required.

The permissible values for CONNTYPE are:

INF_AUI = AUI Connection type

INF_BNC = BNC connection type

INF_UPT = 10BaseT (RJ45)

INF_EXT = Probe connection type

```
/*
 * From spf_desc.h
*/

#define PORTADDR0x340/* IO port for ISA*/
#define IRQVECTOR0x43/* IRQ vector                    */
/* options for CONNTYPE: INF_AUI, INF_BNC, INF_UTP, INF_EXT (auto) */
#define CONNTYPEINF_EXT
```

Finally, remake the descriptor by changing to the MWOS/OS9000/80386/PORTS/PCAT/SPF/SPE509 directory and typing

```
os9make -f=spfdesc.mak.
```

Low-level System Changes

System state debugging requires a change to the low level system, as well as the PCMCIA socket services information. This is controlled by the contents of the file MWOS/OS9000/80386/PORTS/PCAT/ROM/cnfgdata.des.

Find the following lines:

```
#define LLE509_PORT_ADDRESS0x340
#define LLE509_IF_VECTOR0x43
#define ETH_CIS_PARAMS"3com=0x340,3"
```

The above port addresses and/or IRQ information should be changed as required by the system. For IRQ 10, here are the changes required:

```
#define LLE509_PORT_ADDRESS0x340
#define LLE509_IF_VECTOR0x4a
#define ETH_CIS_PARAMS"3com=0x340,10"
```

The Wizard will automatically re-make the cnfgdata module.

DEC 21140

Intra Server DE504-BA (Quad)

Asante' Fast 10/100

D-Link DFE-500TX ProFast 10/100 Adapter

System State Debugging

Supported

Default Settings

PORTADDR	NA
IRQVECTOR	NA
CONNTYPE	INF_UTP

Solving Configuration Issues

Connection Type

The default connection type is set to INF_AUI.

The following netstat example shows a working network card configured with IP address 182.52.109.25 and MAC address of 00.00.C0.91.4F.96.

```
(Super)[/h0/sys/>] netstat -in

Name  Mtu   Network      Address           Ipkts Ierrs    Opkts Oerrs  Coll
lo0   1536  <Link>                          0     0        0     0     0
lo0   1536  127          127.0.0.1            0     0        0     0     0
enet0 1500  <Link>     00.00.C0.91.4F.96      55   110       35     0     0
enet0 1500  182.52.109    182.52.109.25       55   110       35     0     0
```

Modifying the OS-9 Descriptor

Edit the file MWOS/OS9000/80386/PORTS/PCAT/SPF/SP21140/DEFS/spf_desc.h, changing the definition of CONNTYPE as required. The possible values for CONNTYPE are:

```
*

 * From spf_desc.h

*/

/*

 * Interface/connection type

 * Common values:

 *
 * INF_UTP      ==    MII_10MB == 10Mb/s 21140
 * INF_AUI      ==    SRL_10MB == Conventional 10Mb/s 21140
 * INF_UTP100   ==    MII_100MBTX == MII 100Mb/s 21140
 * INF_FX100    ==    MII_100MBFX == MII 100Mb/s 21140
 * INF_MII10    ==    MII_10MB == 10Mb/s 21140
 * INF_MII100   ==    MII_100MB == MII 100Mb/s 21140
 *

 * Note: Not all common values will work. Below are common
 * values used for different cards supported. Much work at
 * driver level still remains to allow auto and NWay support.
 * Support for DEC21143 may be added in the future once the
 * NWay support is added.
 *
 *  Intra Server DE504-BA (Quad)
 *     10BaseT = INF_UTP  ( note: preliminary release support for 21143. No 100BaseT support)
 *
 * Asante' Fast 10/100
 *    10BaseT = INF_UTP
 * 100BaseT = INF_MII100
 *
 *  D-Link DFE-500TX ProFast 10/100 Adapter
 *
 *    10BaseT = INF_UTP
 *   10BaseT = INF_MII10
 * 100BaseT = INF_MII100
 *
*/

#define CONNTYPE    INF_UTP
```

Finally, remake the descriptor: change to the MWOS/OS9000/80386/PORTS/PCAT/SPF/SP21140 directory and type:

```
os9make -f=spfdesc.mak
```

You have now created a new descriptor. Next time you run the Wizard, it will use the new descriptor.

Adding support for Dual and Quad Channel Cards

The descriptors for the additional Ethernet ports must be added. Edit the spf.ml file in the

MWOS/OS9000/80386/PORTS/PCAT/BOOTS/INSTALL/PORTBOOT directory. Find the entry for spde0. Add spde1 for a dual card or spde1, spde2 and spde3 for a quad card.

Next edit the pcat.ini file located in MWOS/OS9000/80386/PORTS/PCAT/BOOTS/INSTALL/INI directory. Look for the ETHER_OPTION_ string and add the entries as required. You must specify the Ethernet information for all extra Ethernet ports used.

The following example adds the three extra Ethernet ports for a quad card.

ETHER_OPTION_2=enet1 address 112.16.1.237 broadcast 112.16.255.255 netmask 255.255.000.000 binding /spde1/enet

ETHER_OPTION_3=enet2 address 122.16.1.237 broadcast 122.16.255.255 netmask 255.255.000.000 binding /spde2/enet

ETHER_OPTION_4=enet3 address 132.16.1.237 broadcast 132.16.255.255 netmask 255.255.000.000 binding /spde3/enet

Once the boot image is created you may boot OS-9 and use "netstat" to see that all cards are active and ready for use. You should see entries for enet0, enet1, enet2 and enet3 if you are using a quad card.

AM79C961 & AM79C73A

System State Debugging

Supported

Default Settings

PORTADDR	0x300
IRQVECTOR	NA
CONNTYPE	NA

Solving Configuration Issues

The AM79C961A driver is designed to work in systems where DMA BUS MASTER mode is employed with respect to the AM79C961 or AM79C973 interfaces.

The AM79C961A driver is PLUG & PLAY. Only the base address should be defined to allow multiple card usage.

Modifying the OS-9 Descriptor

1. Edit the file. MWOS/OS9000/80386/PORTS/PCAT/SPF/SP79C961/DEFS/spf_desc .h, changing the line defining PORTADDR, which reads #define PORTADDR 0x300 /* Base address of hardware */, to give PORTADDR the desired value.
2. Next re-make the descriptor: change to the MWOS/OS9000/80386/PORTS/PCAT/SPF/SP79C961 directory and type the command os9make -f=spfdesc.mak

You have now created a new descriptor. The next time you run the Wizard, it will use the new descriptor.

NE2000

ZF NetDisplay

ACCTON - EN166X MPX 2 Ethernet

D-LINK DE-220PCT - 10Mbps Combo 16-Bit Ethernet ISA Adapter

Compex - ReadyLink 2000 - PCI 32-bit

System State Debugging

Supported

Default Settings

PORTADDR	0x340	/* IO port for ISA */
IRQVECTOR	0x49	/* IRQ vector */
CONNTYPE	INF_EXT	/* Auto */

Board Setup Issues

ZF NetDisplay

use <CDROM>:\Drivers\Ethernet\Realtek\RSET8019.EXE"

to determine the IO address and IRQ required.

IO=0x340 VECTOR=0x49 is typical. Settings are system dependent.

ACCTON - EN166X MPX 2 Ethernet

use "1step" program located on the setup disk to set card to

jumpered "ne2000" mode.

IO=0x300 VECTOR=0x43 is typical. Settings are system dependent.

D-LINK DE-220PCT - 10Mbps Combo 16-Bit Ethernet ISA Adapter

Use "setup" program located on the setup disk "A:\SETUP\setup.exe" to setup the card. Disable PNP and setup Interrupt and I/O base address.

Compex - ReadyLink 2000 - PCI 32-bit

Just plug and go. Multiple cards may be used by using the

PCI Specific Settings listed below.

PCI Specific Settings Information

When using multiple NE2000 PCI cards in a system you may force the driver to use a specific slot or card number for the device being used. PCIINDEX may be used to specify the card instance to be used. Keep in mind the PCIINDEX method is based on a first found basis, so moving cards in the system will change the configuration used. You may also use the PCIBUS and PCIDEV to force the use of the device to a specific slot. To find out the current PCIBUS and PCIDEV values use the OS-9 command *pciv*.

```
/*
 * PCI Specific Settings
*/

#define PCIINDEX0x00/* 0 picks first card */
#define PCIBUS 0x00/* 0 indicates to search */
#define PCIDEV0x00/* 0 indicates to search */
```

Connection Type

The default connection type is set by either the configuration setup program that came with the card or by hardware jumpers employed. If you are unable to communicate with this card and netstat -in shows the device, the connection type may be incorrect. To correct it, you may do one of the following.

1. Use the NE2000 setup disk to configure the card for the connection used.
2. Change the OS-9 device descriptor for the type of connection in use.
3. Try one of the other connections on the card (if using AUI type, try the RJ45 connector).

Interrupt Conflict Options

Another problem may be the interrupt used. The default interrupt is IRQ9. In this case you have the following options.

1. Choose a interrupt that matches the system configuration such as IRQ10 (0x4a). In this case the OS-9 device descriptor must be changed.

If an interrupt conflict exists the device will either not work at all or will hang when the conflicting device is accessed. Mapping the interrupts used in the system is recommended.

Use the command irqs to see a list of interrupts.

```
(Super)[/h0/sys/>] irqs

 vector  ($)   prior  drivstat   irq svc    driver  dev list
-------------  -----  ---------  ---------  ------  ---------
    7  ($07)    10  $0003c444  $0010f7b4  fpu      <na>
   14  ($0e)     1  $0003c3a4  $00110113  vectors  <na>
   64  ($40)    10  $00ff40b0  $0011098f  tk8253   <na>
   65  ($41)    10  $00ffa680  $00120582  sc8042m  <na>
   65  ($41)    10  $00e85db0  $00120582  sc8042m  <na>
   65  ($41)    10  $00e84a40  $00120582  sc8042m  <na>
   65  ($41)    10  $00e82980  $00120582  sc8042m  <na>
   74  ($49)     1  $00ff02d0  $001f9504  spne2000 <na>
   78  ($4e)    10  $00ff4f30  $00137906  rb1003   <na>
```

In the case above, we can go into RomBug by typing break and placing a breakpoint at the ISR.

```
$ break
RomBug: b 1f9504
RomBug: g
```

and then pinging a machine on the net:

```
$  ping 182.52.109.13
```

(using the actual address of another machine on the network, rather than the one shown above).

If interrupts are running you should be presented a *Rombug* prompt at the breakpoint address. You can type *g* to see if you get another interrupt or *k* to kill the breakpoint.

Port Address Conflict

It is also possible that the port address used for this card is used by another device in the system. If this is the case, the OS-9 command netstat -in will not show the card as available.

The following netstat example shows a working network card configured with IP address 182.52.109.25 and MAC address of 00.00.C0.91.4F.96.

```
(Super)[/h0/sys/>] netstat -in

Name  Mtu   Network      Address           Ipkts Ierrs   Opkts Oerrs  Coll
lo0   1536  <Link>                          0     0       0     0     0
lo0   1536  127         127.0.0.1           0     0       0     0     0
enet0 1500  <Link>      00.00.C0.91.4F.96   55    110     35    0     0
enet0 1500  182.52.109  182.52.109.25       55    110     35    0     0
```

Modifying the OS-9 Descriptor

Edit the file MWOS/OS9000/80386/PORTS/PCAT/SPF/NE2000/DEFS/spf_desc.h.

Change the fields below as required.

```
/*
 * From spf_desc.h
*/

#define PORTADDR0x00000340/* Base address of hardware */
#define VECTOR0x49/* Port vector */

/*
 * PCI Specific Settings
*/

#define PCIINDEX0x00/* 0 picks first card */
#define PCIBUS0x00/* 0 indicates to search */
#define PCIDEV0x00/* 0 indicates to search */
```

Finally, remake the descriptor: change to the MWOS/OS9000/80386/PORTS/PCAT/SPF/NE2000 directory and type:

```
C:> os9make -f=spfdesc.mak
```

Next time you run the Wizard the new descriptor will be used.

Low-level System Changes

If system state debugging is used, you must change the low level system by modifying the following lines from the file

MWOS/OS9000/80386/PORTS/PCAT/ROM/cnfgdata.des:

```
#define LLNE2000_PORT_ADDRESS0x340
#define LLNE2000_IF_VECTOR0x49
```

as required by the system. For example, for IRQ10, here are the changes required.

```
#define LLNE2000_PORT_ADDRESS0x340
#define LLNE2000_IF_VECTOR0x4a
```

The Wizard will automatically re-make the cnfgdata module.

NE2000 PCMCIA

RealTek RTL-8029	0x10ec	0x8029
Winbond 89C940	0x1050	0x0940
Winbond w89C940	0x1050	0x5a5a
KTI ET32P2	0x8e2e	0x3000
NetVin NV5000SC	0x4a14	0x5000
Via 82C926	0x1106	0x0926
SureCom NE34	0x10bd	0x0e34
Holtek HT80232	0x12c3	0x0058
Holtek HT80229	0x12c3	0x5598

Cirrus Logic CS8900

The OS9 sp8900 software driver provides support for the Cirrus Logic CS8900a Ethernet Controller. This allows the device to be used as part of an OS9 SoftStax network implementation.

The Cirrus Logic CS8900a provides single chip support for IEEE 802.3 Ethernet. It has a direct ISA bus interface and is therefore commonly found in PC-AT type environments.

The OS9 sp8900 driver takes advantage, where appropriate, of the Plug and Play capability of the cs8900a device. This reduces the time taken to configure the cs8900a for use within an OS9 environment.

System State Debugging

Not Supported

Hardware Configuration

The CS8900a should be supplied with an MSDOS hosted configuration program. This should be used to pre-configure the device for use. This program assumes the cs8900a has the associated EEPROM as recommended. This EEPROM is used to store the cs8900 configuration parameters. At this time OS9 will only support devices that have this configuration.

Using the Setup Program

Before using the setup program, you should determine the network adaptor’s IO address and Interrupt level. The cs8900 has a limited number of possible combinations, these should be chosen with care. As a default OS9 will assume IO port 0x300 and IRQ Level 10. It is also important to note that OS9 drives the device using the PC-AT I/O Bus for ALL operations. Therefore shared memory should be disabled for OS9 operation.

Having selected the correct choices you may run the setup program and configure the cs8900 accordingly.

If the device was supplied without a configuration utility it will be necessary to obtain this from the vendor or try the cirrus logic Web site at http://www.cirrus.com/drivers/

The setup program also incorporates a self test utility that may be used to confirm correct operation of the device before proceeding.

OS9 Software Configuration

Configuring PnP Firmware

The OS9 sp8900 driver will use the PnP (Plug and Play) capability of the cs8900a. This will only be used if it is enabled in the OS9 device descriptor. When enabled the OS9 driver will search all possible I/O locations for a cs8900a device. If found, the first one, starting at the lowest valid I/O address, will be used. The software will confirm that the EEPROM is present. The OS9 driver extracts the necessary configuration details from this device and initializes the cs8900a.

Configuring OS9 Descriptors

The OS9 device descriptor allows you to override the PnP default configuration. At this time only a subset of all the possible configuration parameters may be overridden. To change the PnP values the following fields must be modified. This should be performed using a text editor and the OS9 tools provided within the Microware Hawk package.

Once modified the descriptor should be regenerated and tested.

Device Descriptor Fields

The standard device descriptor is as follows. This file may be found in

```
 .../MWOS/OS9000/<processor>/PORTS/<port>/SPF/SP8900/DEFS/spf_desc.h
#define SPF_DIR_NONE0xFF
#define SPF_DIR_IN0x00
#define SPF_DIR_OUT0x01

#include <SPF/item.h>

#ifdef spcs0

/***    Device Descriptor for SPF 8900 ethernet driver      */
#define PNPON   1 /* do plug and play */
#define PNPOFF  0 /* Use descriptor values ( see manual )    */

/*****************************************************************************
*  User configuration defines
/*****************************************************************************
*  Port configuration defines                                         */

/* Macros that initialize device descriptor common fields */

/* 300/320/340/360 */

#define PORTADDR0x300/* Base address of hardware */
#define LUN0x7F/* logical unit number      */

#define VECTOR0x4a/* Port vector              */
#define PRIORITY8/* IRQ polling priority     */
#define IRQLEVEL0/* Port IRQ Level           */
#define PNP8900PNPON/* Do plug and play ( Normal setting ) */

#define TB486COMPATTRUE
--------------------*/
```

Any information (not shown) beyond this point MUST not be changed.

User Configurable Fields

The following fields are user configurable.

Field Name	Default Value	Possible Values
PORTADDR	Ox300	0x200..0x360
VECTOR	0x4a	0x45,0x4a,0x4b,0x4c
PRIORITY	0x08	0..255
PNP8900	PNPON	PNPON or PNPOFF
TB486COMPAT*	TRUE	TRUE or FALSE

*note: The tb486 board is a special case and this flag should be set false for any other board type.

Generating a New Device Descriptor

Having located and edited the field as desired the new device descriptor may be generated with the following steps

Change directory to: ../MWOS/OS9000/80386/PORTS/PCAT/SPF/SP8900

Enter the command: os9make -f=sppfdesc.mak -u MOPTS=-u

The new descriptor will be built.

OS9 SP8900 Components

The complete driver consists of two OS9 load modules. You should refer to the appropriate Microware manual for further information concerning system configuration.

The SP8900 component files are :

SP8900 -- cs8900a Ethernet Driver

spcs0 -- cs8900 Device Descriptor

NetGear

FA311

FA312

Note
NetGear FA311 and FA312 support autosense of 10/100BaseT Full/Half Duplex and contain multicasting support.

The high-level driver for these cards is `SPFA311`. The low-level driver is `LLFA311`.

LAN

LAN79C961

LANAM79C973

The low-level driver for this card is `LL79C961`. The high-level driver is `SP79C961`.

Note
Multicasting support is available for the `SP79C961`.

RealTek

RL8139

The low-level driver for this card is `LL8139`. The high-level driver is `SP8139`.

SMC

SMC91C94

SMC91C96

The low-level driver for this card is `LLC91C94`. The high-level driver is `SP91C94`.

INTEL Ethernet PRO100 Series

82557

82558

82559

The low-level driver for this card is `LLPRO100`. The high level driver is `SPPRO100`.

Sequential Device Support

VGA Graphics / Keyboard

VGA support is provided using standard VGA graphics screen and keyboard. Most PC based systems use VGA keyboard as the default device for user input. While this is not required for OS-9 based systems it is a convenient way to initially setup systems for use with OS-9.

During the development of MAUI user applications, a serial console may be the preferred method since the text based console may interfere with the graphics application on the same device.

MULTI-TERM is a feature of the VGA Graphics/Keyboard console driver which provides up to four virtual screens. If you are a console user, you may switch between screens by pressing an alternate function key combination, such as <Alt> <F1>, <Alt> <F2>, <Alt><F3> or <Alt><F4>. MULTI-TERM may be started automatically in the /h0/sys/startup file or manually from the console by executing the following commands:

```
$ mshell -l <>>>/mterm1&
$ mshell -l <>>>/mterm2&
$ mshell -l <>>>/mterm3&
```

VGA TERMINAL Descriptors Notes

/mterm0Multi-term descriptor 0
/mterm1Multi-term descriptor 1
/mterm2Multi-term descriptor 2
/mterm3Multi-term descriptor 3

The following optional settings apply to the VGA/Keyboard console:

```
#define DS_ROMBREAK1/* Enter RomBug - Shift PrintScreen. */
#define DS_RESTART1/* Reset System - Ctrl/Alt/Del. 0=disabled */
#define DS_NUM_LOCK1/* Keyboard Number lock 0=off 1=on */
#define DS_SHIFT_LOCK0/* Keyboard Caps lock 0=off 1=on */
```

To change these options, edit the file MWOS/OS9000/80386/PORTS/PCAT/SCF/SC8042M/confg.des. Find the sections as outlined above. Change as desired. Then, change to the MWOS/OS9000/80386/PORTS/PCAT/SCF/SC8042M/DRVR directory and type os9make.

Language Support Options

To change the language support for the keyboard use the advanced mode from the Wizard and select BOOTFILE OPTIONS tab. Select the language desired.

```
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\term0
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm0
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm1
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm2
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm3
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\term0_fr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm0_fr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm1_fr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm2_fr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm3_fr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\term0_gr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm0_gr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm1_gr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm2_gr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm3_gr
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\term0_nw
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm0_nw
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm1_nw
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm2_nw
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm3_nw
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\term0_uk
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm0_uk
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm1_uk
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm2_uk

MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC8042M\mterm3_uk
```

Serial Mouse

Configuration modules for a Serial Mouse is included in the system image when the Mouse option is not selected in the Configuration Wizard's Master Builder screen. Serial mouse support is only included when sc16550 support is enabled in the Configuration Wizards BOOTFILE OPTIONS dialog box.

The default port is COM1. The MWOS/OS9000/80386/PORTS/PCAT/BOOTS/INSTALL/PORTBOOT/bootfile.ml file may be changed to allow a different port to be used.

Default (Serial Mouse configured using COM1)

```
*
* [OPTION4 && !MOUSE] serial mouse
*
../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t1
*../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t2
*../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t3
*../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t4
*
```

Changed to use COM3

```
*
* [OPTION4 && !MOUSE] serial mouse
*
*../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t1
*../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t2
../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t3
*../../../CMDS/BOOTOBJS/DESC/SC16550/m0_t4
```

PS2 Mouse

PS2 mouse support is automatically included when the Mouse option is selected from the Configuration Wizard's Master Build screen.

16550 Serial

Standard PC type serial ports are supported. By default, four descriptors are available, but you may add more as needed.

Use of COM1 and COM2 are standard on PC based systems. COM3 and COM4 are not. Since COM1 and COM2 use IRQ3 and IRQ4, most systems will not allow COM3 and COM4 to also use IRQ3 and or IRQ4. The main reason for this is that IRQ3 and IRQ4 are normally edge based interrupts, and the 16550 is normally implemented in a edge based configuration. Therefore, anytime COM3 and or COM4 are used, you must determine the interrupt vector to use for these ports.

To change the vector you must edit the `systype.h` file located in the port directory.

MWOS/OS9000/80386/PORTS/PCAT/systype.h

```
#define T1BASE_165500x000003f8/* SC16550 port 1 */
#define T1VECT_165500x44/* IRQ 4 */
#define T1PRI_165505/* Priority */

#define T2BASE_165500x000002f8/* SC16550 port 2 */
#define T2VECT_165500x43/* IRQ 3 */
#define T2PRI_165505/* Priority */

#define T3BASE_165500x000003e8/* SC16550 port 3 */

#define T3VECT_165500x44/* IRQ 4 */
#define T3PRI_1655010/* Priority */

#define T4BASE_165500x000002e8/* SC16550 port 4 */
#define T4VECT_165500x43/* IRQ 3 */
#define T4PRI_1655010/* Priority */
```

Making the Descriptors

Once the systype.h file has been updated the new descriptors may be created.

Change to directory:
MWOS/OS9000/80386/PORTS/PCAT/SCF/SC16550/DESC

Type os9make; the following descriptors will be made:

```
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\term1
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\t1
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\term2
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\t2
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\term3
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\t3
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\term4
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\t4
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\ps
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\m0_t1
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\m0_t2
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\m0_t3
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SC16550\m0_t4
```

Digiboard

Support for the Digiboard intelligent serial card is included by selecting the Digiboard option in the Configuration Wizard's Bootfile Options dialog box.

To change the vector you must edit the `systype.h` file located in the port directory.

MWOS/OS9000/80386/PORTS/PCAT/systype.h

```
#define DIGIPORT    0xe0       /* port address of DIGI board status reg. */
#define DIGILEVEL   0x45       /* 16450 keyboard controller */
#define DIGIVECTOR  DIGILEVEL   /* irq vector same as irq level */

#define T10PORT     0x320      /* t10 onboard port address */
#define T11PORT     0x328      /* t11 onboard port address */
#define T12PORT     0x330      /* t12 onboard port address */
#define T13PORT     0x338      /* t13 onboard port address */
#define T14PORT     0x340      /* t14 onboard port address */
#define T15PORT     0x348      /* t15 onboard port address */
#define T16PORT     0x350      /* t16 onboard port address */
#define T17PORT     0x358      /* t17 onboard port address */
```

Making the Descriptors

Once the systype.h file has been updated the new descriptors may be created.

Change to directory:
MWOS/OS9000/80386/PORTS/PCAT/SCF/SCPC8/DESC

Type *os9make*; the following descriptors will be made:

```
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t10
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t11
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t12
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t13
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t14
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t15
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t16
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCPC8\t17
```

HostessI

Support for the HostessI intelligent serial card is included by selecting the HostessI option in the Configuration Wizard’s Bootfile Options dialog box.

To change the vector you must edit the `systype.h` file located in the port directory.

MWOS/OS9000/80386/PORTS/PCAT/systype.h

```
#define HS_PORT0x00000218/* Hostess i board. serial adapter board */
#define HS_VECT0x4f/* IRQ 15 */
#define HS_BOARDMEM0xd0000/* onboard memory place in the system address space */
#define HS_NBLINES16/* number lines on the board (8/16) */

/* Old board doesn't permit 16 bits mode. */
#define HS_BUSSIZE8/* size of the bus the board uses (8/16) */
```

Making the Descriptors

Once the systype.h file has been updated the new descriptors may be created.

Change to directory:
MWOS/OS9000/80386/PORTS/PCAT/SCF/SCHOST/DESC

Type os9make the following descriptors will be made:

```
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t40
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t41
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t42
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t43
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t44
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t45
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t46
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t47
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t48
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t49
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t50
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t51
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t52
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t53
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t54
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCHOST\t55
```

Parallel Printer

Standard PC style printer support is included.

To change the vector or port address you must edit the `systype.h` file located in the port directory.

MWOS/OS9000/80386/PORTS/PCAT/systype.h

```
#define PLEVEL0x47/* scp87303 parallel port */
#define PVECTPLEVEL/* irq vector same as irq level */
#define LPT1BASE0x000003bc/* base address of first parallel  port */
#define LPT2BASE0x00000378/* base address of second parallel port */
#define LPT3BASE0x00000278/* base address of third parallel  port */
```

Making the Descriptors

Once the systype.h file has been updated the new descriptors may be created.

Change to directory:
MWOS/OS9000/80386/PORTS/PCAT/SCF/SCP87303/DESC

Type os9make; the following descriptors will be made:

```
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCP87303\p.lp1
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCP87303\p.lp2
MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\SCP87303\p.lp3
```

Physical Disk Media

IDE Standard

Support for IDE based devices, including standard IDE based hard disk. Primary and secondary controllers with master and slave drive support. On some embedded systems Compact Flash supported devices may be used as if they were standard PC AT based devices.

Benefits

- Supports large media (8.5GB maximum).
- PIO mode three supported.
- PC File system supported including long filenames (FAT32 is not supported). Boot support (requires OS-9 coreboot load).
- Native RBF file system supported. Full boot support including IPL boot technology.

The standard configuration assumes the primary controller is located at 0x1f0 with IRQ 14 and secondary controller at 0x170 with IRQ 15. You may, however, change these values as needed to suit the target. The values are based on the contents of the files MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/config.des and MWOS/OS9000/80386/PORTS/PCATsystype.h.

The pertinent lines in `MWOS/OS9000/80386/PORTS/PCATsystype.h` are shown below:

```
#if defined(RB1003_SPEC_IO_ADDRESS) /* PCMCIA */

#defineBASE_RB1003_PRI 0x00000320/* IDE controller port addr */
#defineVECT_RB1003_PRI0x0/* IDE controller vector */
#defineBASE_RB1003_SEC0x00000360/* IDE 2nd controller port */
#defineVECT_RB1003_SEC0x0/* IDE 2nd controller vector */

#else

#defineBASE_RB1003_PRI0x000001f0/* IDE controller port addr */
#defineVECT_RB1003_PRI0x4e/* IDE controller vector */
#defineBASE_RB1003_SEC0x00000170/* IDE 2nd controller port */

#defineVECT_RB1003_SEC0x4f/* IDE 2nd controller vector */

#endif
```

while in MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/config.des the portion of interest is shown below:

```
/*
 * Device specific defines
 *
 * ds_idetype = IDE interface type
 *            IDE_TYPE_STANDARD
 *            IDE_TYPE_PCI
 *            IDE_TYPE_PCMCIA
 *
 * ds_polled =  IDE_POLLED
 *            IDE_INTERRUPTS
 *
 * ds_altstat = HD_DEFAULT_ALTSTAT (Standard IDE offset)

 *            HD_PCMCIA_ALTSTAT (PCMCIA IDE offset)
 *
 * ds_timeout = Drive ready timeout in seconds.
 *            IDE specification allows for up to
 *            30 seconds. We will allow the max here.
 *            Users are free to reduce this amount
 *            if desired. PCMCIA IDE FLASH type cards
 *            require only a few miliseconds. Rotating
 *            devices will require more time.
 *
*/

#define IDE_TYPE_STANDARD 0

#define IDE_TYPE_PCI 1
#define IDE_TYPE_PCMCIA 2
```

```
#define IDE_INTERRUPTS 0
#define IDE_POLLED 1

#define HD_DEFAULT_ALTSTAT 0x0206
#define HD_PCMCIA_ALTSTAT 0xe


init dev_specific {

#if defined(RB1003_SPEC_IO_ADDRESS)
        ds_idetype = IDE_TYPE_PCMCIA;
        ds_polled =  IDE_POLLED;
        ds_altstat = HD_PCMCIA_ALTSTAT;
        ds_timeout = 30;

#else

        ds_idetype = IDE_TYPE_STANDARD;
        ds_polled =  IDE_INTERRUPTS;
        ds_altstat = HD_DEFAULT_ALTSTAT;
        ds_timeout = 30;


#endif
};
```

Note

Since OS-9 does not require the BIOS to use IDE it is possible on some systems to use IDE without interrupts. Keep in mind that on some systems disabling the IDE from the BIOS also disables the IDE controller as well.

Drive time-out may also fail on drives that are extremely old. If you are having problems using drives that are less than 540MB you may want to disable the time-out. This can be done by setting time-out value to zero in config.des and re-making the descriptors and boot image.

Using IDE in PCI Mode

Support is included to support IDE devices as PCI specific devices. PCI based IDE support is not automatic and may not work on some PCI bridges. The `rb1003` driver must be re-made with the following changes to the makefile.

```
PCILIB          =       -l=$(PORT)/LIB/pcilib.l


LIB             =       $(PICLIB) $(PCILIB) \

                        $(CPULIB) $(CLIB) $(P2LIB) $(OS_LIB) $(SYS)


SPEC_COPTS      =       -a -c -r -t=0 -bepg -dNEWINFO $(PICISR) $(IRQMASK) \

                        -dPCI
```

In this case we have added PCILIB as well as defined PCI in the SPEC_COPTS section. On some systems that use both primary and secondary controllers that allow level interrupt to be set and used in PCI standard method, you can save one interrupt vector. You must also set the device type to PCI in the config.des file shown above. You must have the sources for RB1003 for the ability to make this change using the cross hosted utilities.

If the PCI bridge does not work in PCI mode you can modify the RB1003 init code as need for the PCI bridge device used. The sources are located in `MWOS/OS9000/SRC/IO/RBF/DRVR/RB1003`, and are included with the Embedded Systems package.

Use of IDE in PCI mode adds about 2K to the driver size.

RBF

OS-9 RBF native file system may be used on any IDE drive. For more information see BootGen and **IDE Descriptors**.

PCF

A PC style file system is also supported. FAT32, however, is not supported in this release. If access to partitions other then the primary are required you may use the pinfo utility to obtain the information required to create specific device descriptors. For more information see **IDE Descriptors**. You may select the PCF file system as the boot media.

For example. If the drive is Fat (not Fat32) you may place the bootfile image on the root. Make sure it is called `os9kboot`. Next, create a CMDS and SYS directory at the root level. Copy whatever CMDS you need to the CMDS directory. Create a startup and or password file as needed. This method allows you to use the same partition as Windows95 or NT when you actually run OS-9.

Prepare Windows95/NT based system for use with OS-9.

```
md C:\CMDS

md C:\SYS

copy MWOS\OS9000\80386\CMDS\* C:\CMDS

copy MWOS\OS9000\80386\PORTS\PCAT\BOOTS\INSTALL\SYS\MSHELL\startup C:\SYS

copy MWOS\OS9000\80386\PORTS\PCAT\BOOTS\INSTALL\SYS\MSHELL\password C:\SYS

cd C:\SYS

cudo -cdo startup

cudo -cdo password
```

Although RBF is the preferred file system for use with OS-9 the convenience of using FAT file systems should be taken into consideration when deciding how you want to setup your system.

Special Note

In the following example the IDE device for /h0 and /dd is set for IDE primary partition four.

If the init dialog is set to /h0 the following is generated. In this case we also have SoftStax SPF enabled.

```
setenv SHELL mshell; alias /dd /hc4;chd /h0 ; chx /h0/cmds;mbinstall;

  ipstart;inetd <>>>/nil&;/h0/sys/startup &\n
```

If the init dialog is set to /dd the following is generated. In this case we also have SPF enabled.

```
setenv SHELL mshell; alias /dd /hc4;chd /dd ; chx /dd/cmds;mbinstall ;

      ipstart;inetd <>>>/nil&;;/dd/sys/startup &\n
```

In both cases the script file on hc4 in sys/startup will be executed. When building systems this file must exist, but does not have to contain data. The following commands suffice to create the expected directory and file:

```
$ makdir /hc4/SYS

$ touch /hc4/startup
```

It is usually best to create the initial boot image to not use /h0. /dd should be set for RAM disk. This will allow downloading the TAR images. Next setup the final boot image and select /h0 as initial device name.

Descriptors

Refer to **IDE Descriptors** for information on descriptor naming conventions. The descriptors for RB1003 are located in MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RB1003. Also the RB1003 driver is located in MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS.

ROM BOOTING

If changes to the IDE addresses of time-out values are employed, then the ROM boot system may also require changes.

MWOS/OS9000/80386/PORTS/PCAT/ROM/cnfgdata.des

Find the following sections:

```
#define IDE_PRIMARY_PARAMS_PORT"port=0x1f0 timeout=30"
#define IDE_SECONDARY_PARAMS_PORT"port=0x170 timeout=30"
```

To remove time-out for example we could change the above to:

```
#define IDE_PRIMARY_PARAMS_PORT"port=0x1f0 timeout=0"
#define IDE_SECONDARY_PARAMS_PORT"port=0x170 timeout=0"
```

Or we could make the time-out shorter. IDE specification indicates we can wait up to 30 seconds.

```
#define IDE_PRIMARY_PARAMS_PORT"port=0x1f0 timeout=5"
#define IDE_SECONDARY_PARAMS_PORT"port=0x170 timeout=2"
```

Advanced Notes

Some embedded systems include support for Compact Flash, which looks like a standard IDE device. In these cases, we may decide that RBF is the file system of choice, since we can boot the embedded board with no other boot devices installed. How do we place the RBF file system on such small embedded systems? Compact Flash devices will work in PCMCIA systems with a carrier, so that we can use a standard PC with PCMCIA support to build up the PCMCIA disk. Once the disk is built, we can then remove the Compact Flash from the carrier and place it in the target system for use.

PCMCIA IDE

Note

Microware PCMCIA socket services are included with all PCMCIA selections.

Note

When making bootfile only images care should be taken to make sure PCMCIA support is enabled in the low-level 'coreboot' system if PCMCIA devices are to be employed once the system is booted.

Support for IDE based devices including standard PCMCIA IDE based hard disk.

Benefits

- Supports large media(8.5GB maximum).
- PIO mode three supported.
- PC File system supported including long filenames (FAT32 is not supported). Boot support (requires OS-9 coreboot load).
- Native RBF file system supported. Full boot support including IPL boot technology (PCMCIA BIOS BOOT support required if this option is used).
- Requires no interrupts. Interrupts are optional.

The standard configuration assumes socket #0 is mapped to 0x320 and socket #1 is mapped to 0x360. The default configuration does not use interrupts. You may however enable interrupts if desired.

Example (Enable interrupts on PCMCIA device in socket #0 only - IRQ5 used)

```
/*
 * MWOS/OS9000/80386/PORTS/PCATsystype.h file.
*/

#defineBASE_RB1003_PRI0x00000320/* IDE controller port addr */
#defineVECT_RB1003_PRI0x45/* IDE controller vector */

/*
 * MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/config.des
*/
```

```
        ds_idetype = IDE_TYPE_PCMCIA;
        ds_polled = IDE_INTERRUPTS;
        ds_altstat = HD_PCMCIA_ALTSTAT;
        ds_timeout = 30;
```

MWOS/OS9000/80386/PORTS/PCAT/ROM/cnfgdata.des

```
#define IDE_CIS_PARAMS "ide0=0x320,5 ide1=0x360,0"
```

Once the changes are made change to the MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/DESC directory and type os9make. The changes to MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/config.des are automatically taken care of next time you run the Wizard.

Changes to the default values are based on the MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/config.des file as well as the MWOS/OS9000/80386/PORTS/PCATsystype.h file.

MWOS/OS9000/80386/PORTS/PCATsystype.h

```
#if defined(RB1003_SPEC_IO_ADDRESS) /* PCMCIA */

#defineBASE_RB1003_PRI0x00000320/* IDE controller port addr */
#defineVECT_RB1003_PRI0x0 /* IDE controller vector */
#defineBASE_RB1003_SEC0x00000360/* IDE 2nd controller port */
#defineVECT_RB1003_SEC0x0/* IDE 2nd controller vector */

#else

#defineBASE_RB1003_PRI0x000001f0/* IDE controller port addr */
#defineVECT_RB1003_PRI0x4e/* IDE controller vector */

#defineBASE_RB1003_SEC0x00000170/* IDE 2nd controller port */
#defineVECT_RB1003_SEC0x4f/* IDE 2nd controller vector */

#endif
```

MWOS/OS9000/80386/PORTS/PCAT/RBF/RB1003/config.des

```
/*
 * Device specific defines
 *
 * ds_idetype = IDE interface type
 *              IDE_TYPE_STANDARD
 *              IDE_TYPE_PCI
 *              IDE_TYPE_PCMCIA
 *
 * ds_polled =  IDE_POLLED
 *              IDE_INTERRUPTS
 *
 * ds_altstat = HD_DEFAULT_ALTSTAT (Standard IDE offset)

 *             HD_PCMCIA_ALTSTAT (PCMCIA IDE offset)
 *
 * ds_timeout = Drive ready timeout in seconds.
 *             IDE specification allows for up to
 *             30 seconds. We will allow the max here.
 *             Users are free to reduce this amount
 *             if desired. PCMCIA IDE FLASH type cards
 *             require only a few miliseconds. Rotating
 *             devices will require more time.
 *
*/

#defineIDE_TYPE_STANDARD0

#defineIDE_TYPE_PCI1
#defineIDE_TYPE_PCMCIA2

#defineIDE_INTERRUPTS0
#defineIDE_POLLED1

#defineHD_DEFAULT_ALTSTAT0x0206
#defineHD_PCMCIA_ALTSTAT0xe

init dev_specific {

#if defined(RB1003_SPEC_IO_ADDRESS)
       ds_idetype = IDE_TYPE_PCMCIA;
       ds_polled =  IDE_POLLED;
       ds_altstat = HD_PCMCIA_ALTSTAT;
       ds_timeout = 30;
#else

        ds_idetype = IDE_TYPE_STANDARD;
        ds_polled =  IDE_INTERRUPTS;
        ds_altstat = HD_DEFAULT_ALTSTAT;
        ds_timeout = 30;


#endif
};
```

RBF

OS-9 RBF native file system may be used on any IDE drive including PCMCIA devices. For more information see BootGen and IDE DESCRIPTORS. When using RBF with PCMCIA only OS-9 will be able to access the media. When running FDISK on PCMCIA media, be sure to write down the ID type. You will need this value if you decide to later restore the media for use with DOS/ Windows. fdisk -d=/pchcfmt -s will show the type. If you need to restore the PCMCIA IDE card for use with DOS/Windows you must restore the ID type. If you have PCMCIA support at the DOS level you may be able to use FDISK. If not you can use Linux to change the ID type. We may add this feature to OS-9 fdisk in the future but be warned: once the device is changed to RBF if you do not have the tools then this disk will have to stay RBF.

PCF

PC style file system is also supported. FAT32 is, however, not supported in this release. For more information see **IDE Descriptors**.

You may select the PCF file system as the boot media.

For example, if the drive is Fat (not Fat32) you may place the bootfile image on the root. Make sure it is called os9kboot. Next create a CMDS and SYS directory at the root level. Copy whatever CMDS you need to the CMDS directory. Create a startup and or password file as needed. This method allows you to use the same partition as Windows95 or NT when you actually run OS-9.

Prepare Windows95/NT based system for use with OS-9.

```
md C:\CMDS

md C:\SYS

copy MWOS\OS9000\80386\CMDS\* C:\CMDS

copy MWOS\OS9000\80386\PORTS\PCAT\BOOTS\INSTALL\SYS\MSHELL\startup C:\SYS

copy MWOS\OS9000\80386\PORTS\PCAT\BOOTS\INSTALL\SYS\MSHELL\password C:\SYS

cd C:\SYS

cudo -cdo startup

cudo -cdo password
```

Although RBF is the preferred file system for use with OS-9 the convenience of using FAT file systems should be taken into consideration when deciding how you want to setup your system.

Special Note

In the following example the IDE device for `/h0` and `/dd` is set for PCMCIA IDE using socket #0.

If the init dialog is set to /h0 the following is generated. In this case we also have SoftStax SPF enabled.

```
setenv SHELL mshell; alias /dd /pcmhc1;chd /h0 ; chx /h0/cmds;mbinstall ;

      ipstart;inetd <>>>/nil&;/h0/sys/startup &\n
```

If the init dialog is set to /dd the following is generated. In this case we also have SoftStax SPF enabled.

```
setenv SHELL shell; alias /dd /pcmhc1;chd /dd ; chx /dd/cmds;mbinstall ;

       ipstart;inetd <>>>/nil&;/dd/sys/startup &\n
```

In both cases above the script file on hc4 in sys/startup will be executed. When building systems this file must exist but does not have to contain any data. To create the needed directory and file, the following commands suffice:

```
$ makdir /pcmhc1/SYS

$ touch /pcmhc1/startup
```

It is usually best to create the initial boot image to not use /h0. /dd should be set for RAM disk. This will allow downloading the TAR images. Next setup the final boot image and select /h0 if as initial device name.

Descriptors

Refer to **IDE Descriptors** for information on descriptor naming conventions. The descriptors for RB1003 are located in `MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RB1003`. Also the RB1003 driver is located in `MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS`.

ROM BOOTING

If changes to the IDE addresses of time-out values are employed then the ROM boot system may also require changes.

`MWOS/OS9000/80386/PORTS/PCAT/ROM/cnfgdata.des`

Find the following sections:

```
#define IDE_CIS_PARAMS "ide0=0x320,0 ide1=0x360,0"

#define PCMCIA_IDE_PRIMARY_PARAMS_PORT"port=0x320 timeout=30 altstat=0xe"
#define PCMCIA_IDE_SECONDARY_PARAMS_PORT"port=0x360 timeout=30 altstat=0xe"
```

To remove time-out for example we could change the above to:

```
#define PCMCIA_IDE_PRIMARY_PARAMS_PORT"port=0x320 timeout=0 altstat=0xe"
#define PCMCIA_IDE_SECONDARY_PARAMS_PORT"port=0x360 timeout=0 altstat=0xe"
```

Or we could make the time-out shorter. IDE specification indicates we should wait up to 30 seconds.

```
#define PCMCIA_IDE_PRIMARY_PARAMS_PORT"port=0x320 timeout=5 altstat=0xe"
#define PCMCIA_IDE_SECONDARY_PARAMS_PORT"port=0x360 timeout=2 altstat=0xe"
```

To explain the definition of IDE_CIS_PARAMS in detail: "ide0=0x320,5 ide1=0x360,0" indicates that IDE0 (socket 0) has a base address of 0x320 and uses IRQ 5, while IDE1 (socket 1) has a base address of 0x360 and uses no interrupt.

Advanced Notes

Some embedded systems support Compact Flash, which looks like a standard IDE device. In these cases, we may decide that RBF is the file system of choice, since we can boot the embedded board with no other boot devices installed. How do we place the RBF file system on such small embedded systems? Compact Flash devices will work in PCMCIA systems with a carrier, so that we can use a standard PC with PCMCIA support to build up the PCMCIA disk. Once the disk is built, we can then remove the Compact Flash from the carrier and place it in the target system for use.

IDE Descriptors

For Standard IDE devices the devices are referenced as shown in the following table.

Standard IDE - RBF Descriptors

/hcfmt	IDE primary master - Entire disk
/hc1fmt	IDE primary master - Primary partition #1
/hc2fmt	IDE primary master - Primary partition #2
/hc3fmt	IDE primary master - Primary partition #3
/hc4fmt	IDE primary master - Primary partition #4
/hdfmt	IDE primary slave - Entire disk
/hd1fmt	IDE primary slave - Primary partition #1
/hd2fmt	IDE primary slave - Primary partition #2
/hd3fmt	IDE primary slave - Primary partition #3
/hd4fmt	IDE primary slave - Primary partition #4
/hefmt	IDE secondary master - Entire disk
/he1fmt	IDE secondary master - Primary partition #1
/he2fmt	IDE secondary master - Primary partition #2
/he3fmt	IDE secondary master - Primary partition #3

/he4fmt	IDE secondary master - Primary partition #4
/hffmt	IDE secondary slave - Entire disk
/hf1fmt	IDE secondary slave - Primary partition #1
/hf2fmt	IDE secondary slave - Primary partition #2
/hf3fmt	IDE secondary slave - Primary partition #3
/hf4fmt	IDE secondary slave - Primary partition #4

Standard IDE - PCF Descriptors

/mhc1	IDE primary master - Primary partition #1
/mhc2f	IDE primary master - Primary partition #2
/mhc3	IDE primary master - Primary partition #3
/mhc4	IDE primary master - Primary partition #4
/mhd1	IDE primary slave - Primary partition #1
/mhd2	IDE primary slave - Primary partition #2
/mhd3	IDE primary slave - Primary partition #3
/mhd4	IDE primary slave - Primary partition #4
/mhe1	IDE secondary master - Primary partition #1
/mhe2	IDE secondary master - Primary partition #2
/mhe3	IDE secondary master - Primary partition #3
/mhe4	IDE secondary master - Primary partition #4
/mhf1	IDE secondary slave - Primary partition #1
/mhf2	IDE secondary slave - Primary partition #2
/mhf3	IDE secondary slave - Primary partition #3
/mhf4	IDE secondary slave - Primary partition #4

CDROM IDE Descriptors

/cd0	IDE secondary master

PCMCIA IDE - RBF Descriptors

/pchcfmt	PCMCIA IDE Socket #0 - Entire disk
/pchc1fmt	PCMCIA IDE Socket #0 - Primary partition #1
/pchefmt	PCMCIA IDE Socket #1 - Entire disk
/pche1fmt	PCMCIA IDE Socket #1 - Primary partition #1

PCMCIA IDE - PCF Descriptors

/pcmhc1	PCMCIA IDE Socket #0 - Primary partition #1
/pcmhe1	PCMCIA IDE Socket #1 - Primary partition #1

Note

The descriptors for IDE are automatically included when using the Wizard. You may also access the descriptors in the MWOS directory structure at:

MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RB1003

DiskOnChip

M-Systems' DiskOnChip™ is a new generation of single-chip flash disks. The DiskOnChip device contains built-in firmware which provides full hard disk emulation and allows the DiskOnChip to operate as a boot device.

When used under OS-9, the DiskOnChip is managed by a TrueFFS™, technology based device driver, attached to the standard OS-9 file system (RBF) or to a DOS compatible file system (PCF).

This section is intended for systems integrators designing with the DiskOnChip 2000, DiskOnChip Millennium or DiskOnChip DIMM and describes how to use the DiskOnChip as a bootable data storage device under the OS-9 Operating System. In the remainder of this application note the term DiskOnChip is used to describe the above mentioned DiskOnChip Family Products.

Benefits

- Small footprint for embedded boards.
- Native RBF file system supported. Full boot support including IPL boot technology.

Low-Level Boot Support

OS9000/80386/CMDS/BOOTOBJS/ROM/doc

High-Level Support

OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/rbdoc

Descriptors Used by Wizard

OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RBDOC/dochcfmt
OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RBDOC/dochc1
OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RBDOC/dochc1fmt
OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RBDOC/dochc1.h0

Additional descriptors are provided in the " OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RBDOC" directory. Please refer to **DiskOnChip Descriptors** for information on the use of these other descriptors.

Building a DiskOnChip Boot Image

The DiskOnChip distribution is made up of two primary modules: *doc*, which is the OS-9 low-level booter module, and *rbdoc*, the OS-9 device driver for DiskOnChip. The following procedure uses the Configuration Wizard to configure a boot device using DiskOnChip. The DiskOnChip device appears as a disk drive to the high-level system and is accessed using the RBF descriptor /dochc1.

1. On your host PC, select Microware Configuration Wizard from the Program Menu.
2. At the main screen of the wizard, select the radio button labeled Advanced Mode.
3. In the text box labeled Configuration Name (Required), type DiskOnChip, Click on the OK button. A new window appears with a menu bar. This is the Advanced Mode window of the Configuration Wizard. It is here that we must tell the wizard to include DiskOnChip support.
4. Navigate to Configure->Coreboot->Disk Configuration. A window appears with several tabs.
5. Select the tab labeled *IDE Configuration*.
6. Look for the area of the window labeled DiskOnChip and click on the checkmark boxes labeled *Add to menu* and *Auto Boot*. This will cause the booter to include the proper modules for allowing the system to boot from the DiskOnChip device.
7. Click on the OK button to dismiss the window.

8. Navigate to Configure->Bootfile->Disk Configuration. A window appears with several tabs.
9. Select the tab labeled *IDE Configuration*.
10. Look for the area of the window labeled DiskOnChip and click on the checkmark box labeled *Enable DOC*. This will cause the booter to include the proper modules for allowing us to format the DiskOnChip device.
11. Click on the tab labeled Init Options.
12. Click on the OK button to dismiss the window.
13. Navigate to Configure->Build Image and another window appears.
14. Click on the *Check* button, then the *Build* button to build the coreboot and bootfile.
15. Once this process is finished, click on the *MakeBoot* button and follow the prompts to create a bootable OS-9 floppy.

Booting OS-9 and Formatting DiskOnChip

Once the boot floppy has been created, insert it into the target's floppy drive and boot OS-9. Once the shell prompt ($) appears, format the DiskOnChip device:

```
$ chd /d0
$ iniz /dochcfmt
$ format /dochcfmt -nv -np -r -v
```

Creating the OS-9 Partition

Start fdisk by typing:

```
$ fdisk -d=/dochcfmt
```

From fdisk, select option 6 to create the Master Boot Record. Respond with y <ENTER>, then <ESC> to return to the fdisk main menu

Use option 1 to create an OS-9000 partition. Press <ENTER> to accept the partition size, then selection option 1 to create an OS-9000/386 partition. Press <ESC> to return to the fdisk main menu.

At the main menu, select option 2 to make the newly created partition active. You must type the partition number (1 in this case) and press <ENTER>. Press <ESC> to return to the fdisk main menu.

Press <ESC> to exit fdisk. You will be prompted for confirmation to change the disk. Type y <ENTER>

Formatting the Partition

Now the DiskOnChip contains an OS-9000 partition. Format this partition with the following command:

```
$ format /dochc1fmt -np -nv -r -v
```

Installing Boot Files on DiskOnChip

Use the following commands on your OS-9 computer to install the boot image onto the DiskOnChip device.

```
$ bootgen -iiplhdnoq -lfirstboot /dochc1fmt
$ bootgen /dochc1fmt sysboot
```

Booting OS-9 from the DiskOnChip

Booting OS-9 from the DiskOnChip device allows you to use the DiskOnChip as the only disk in the system, holding the operating system itself in addition to all other applications and files.

Please follow the steps described in the following paragraphs in order to use the DiskOnChip as the boot device.

Updating the DiskOnChip Firmware

By default, the DiskOnChip firmware installs the DiskOnChip as an additional disk in the system. This default allows you to boot an Operating System from the DiskOnChip on a diskless machine. In case your machine is equipped with other hard disk(s) and you still want to boot from the DiskOnChip, you need to install the DiskOnChip as the first drive.

In order to install the DiskOnChip as the first drive, boot your target system into MS-DOS and perform the following command:

```
DUPDATE /WIN:{address} /S:DOC121.EXB /FIRST
```

With the {address} being the base address of the DiskOnChip, i.e. D000, D400, etc. “121” in the file DOC121.EXB represents the firmware version. The actual firmware version used might be a higher version, i.e. DOC122.EXB, etc.

Note

The DUPDATE utility and firmware files are provided with the DiskOnChip ISA evaluation board available from M-Systems.

The default base address for the M-System’s evaluation board is D000h. Refer to the documentation included with your hardware for the base address and board jumper settings.

If you do not need to access additional hard disk(s) under OS-9, you may also disable them in the CMOS setup. In this case, the above DOS command is not necessary.

In some cases it is useful to prevent the DiskOnChip firmware from installing at boot time. You can achieve this by performing the following DOS command:

```
DUPDATE /WIN:{address} /S:DOC2.FFF
```

With the {address} being the base address of the DiskOnChip, i.e. D000h, D400h, etc.

Booting OS-9 from DiskOnChip

Remove any floppy disks from the floppy drive and reset your target. The OS-9 IPL message should appear briefly, then the following screen:

```
OS-9000/x86 Bootstrap
Now trying to Override autobooters.
```

At this point, the floppy booter will be called and will fail because there is no floppy disk in the drive. At that point, the DiskOnChip booter will read the OS-9 bootfile from the DiskOnChip device. The system will then boot to a shell prompt.

Your system is now fully booting from DiskOnChip!

DiskOnChip Descriptors

In the `MWOS\OS9000\80386\PORTS\PCAT\CMDS\BOOTOBJS\DESC\RBDOC` directory there are numerous device descriptors for both RBF and PCF filesystems. Note that the table below omits descriptors with the filename extension .h0 - these files are also present, and contain device descriptors with the canonical name h0, useful for systems whose main disk unit will be a DiskOnChip device.

DiskOnChip - RBF Descriptors

/dochcfmt	DiskOnChip Device 0 - Entire disk
/dochc1fmt	DiskOnChip Device 0 - Primary partition #1
/dochc2fmt	DiskOnChip Device 0 - Primary partition #2
/dochc3fmt	DiskOnChip Device 0 - Primary partition #3
/dochc4fmt	DiskOnChip Device 0 - Primary partition #4
/dochdfmt	DiskOnChip Device 1 - Entire disk
/dochd1fmt	DiskOnChip Device 1 - Primary partition #1
/dochd2fmt	DiskOnChip Device 1 - Primary partition #2
/dochd3fmt	DiskOnChip Device 1 - Primary partition #3
/dochd4fmt	DiskOnChip Device 1 - Primary partition #4

/dochefmt	DiskOnChip Device 2 - Entire disk
/doche1fmt	DiskOnChip Device 2 - Primary partition #1
/doche2fmt	DiskOnChip Device 2 - Primary partition #2
/doche3fmt	DiskOnChip Device 2 - Primary partition #3
/doche4fmt	DiskOnChip Device 2 - Primary partition #4
/dochffmt	DiskOnChip Device 3 - Entire disk
/dochf1fmt	DiskOnChip Device 3 - Primary partition #1
/dochf2fmt	DiskOnChip Device 3 - Primary partition #2
/dochf3fmt	DiskOnChip Device 3 - Primary partition #3
/dochf4fmt	DiskOnChip Device 3 - Primary partition #4

DiskOnChip - PCF Descriptors

/docmhcfmt	DiskOnChip Device 0 - Entire disk
/docmhc1fmt	DiskOnChip Device 0 - Primary partition #1
/docmhc2fmt	DiskOnChip Device 0 - Primary partition #2
/docmhc3fmt	DiskOnChip Device 0 - Primary partition #3
/docmhc4fmt	DiskOnChip Device 0 - Primary partition #4
/docmhdfmt	DiskOnChip Device 1 - Entire disk
/docmhd1fmt	DiskOnChip Device 1 - Primary partition #1
/docmhd2fmt	DiskOnChip Device 1 - Primary partition #2
/docmhd3fmt	DiskOnChip Device 1 - Primary partition #3
/docmhd4fmt	DiskOnChip Device 1 - Primary partition #4
/docmhefmt	DiskOnChip Device 2 - Entire disk
/docmhe1fmt	DiskOnChip Device 2 - Primary partition #1
/docmhe2fmt	DiskOnChip Device 2 - Primary partition #2
/docmhe3fmt	DiskOnChip Device 2 - Primary partition #3
/docmhe4fmt	DiskOnChip Device 2 - Primary partition #4

/docmhffmt	DiskOnChip Device 3 - Entire disk
/docmhf1fmt	DiskOnChip Device 3 - Primary partition #1
/docmhf2fmt	DiskOnChip Device 3 - Primary partition #2
/docmhf3fmt	DiskOnChip Device 3 - Primary partition #3
/docmhf4fmt	DiskOnChip Device 3 - Primary partition #4

PCAT Style Floppy

Standard floppy support is provided using the RB765 driver. /d0 may be used to access RBF native file system. /md0 may be used to access PC style floppy devices.

Floppy Descriptors

Floppy - RBF Descriptors

/d0	Floppy drive A:

Floppy - PCF Descriptors

/md0	Floppy drive A:

Note

When using the Wizard the descriptors for floppy devices are automatically included. You may also access the descriptors in the MWOS directory structure:

```
MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/RB765
```

Symbios 810,810A,825,825A and 875 PCI SCSI controllers—Wide, Ultra and Ultra Wide

Benefits

- Wide support
- Ultra FAST20 support
- SCRIPTS RAM support (able to run scripts from on-chip RAM)
- Large FIFO enabled
- Increased burst rates to 128 where supported
- Special PCI cache features enabled
- PCI IO Mode selectable (PCI I/O or PCI Memory)

Note

The SCRIPTS RAM support is currently only available on OS9000 X86 based systems. Requires non translation of PCI memory. To use SCRIPTS RAM support include the "-dSCRIPTS_RAM" in the compile line when making the driver.

Instruction prefetch is not enabled by default. Maximum burst rate and large fifo's are enabled.

By default the Microware Symbios driver will use the PCI I/O model. To speed up transfers, especially on X86, platforms the memory module may be used. In the PCI memory mode no in/out instructions are used. For the X86 platform this removes the CPU related waits added by the use of "inc", "outc" etc. If you want to run the driver in PCI Memory mode the driver may be recompiled with the "-dPCI_IO_MAPPED" flag removed from the

MWOS/OS9000/80386/PORTS/PCAT/SCSI/SCSI8XX/makefile

```
IO_MAPPED   =     -dPCI_IO_MAPPED
```

To use memory model change to:

```
IO_MAPPED   =     # -dPCI_IO_MAPPED
```

Note

The default has changed to IO_MAPPED for X86 due to problems on PCAT based motherboards.

Prior to this release the following Symbios devices were supported the following devices:

Number of devices supported (2)

```
DEVICEWIDEULTRA1ULTRA2FIFO_SIZEBURST
-------------------------------------------------------------
Symbios 53c810N/AN/AN/A6416

Symbios 53c825NoN/AN/A8816
```

This release adds the following:

Number of devices supported (12)

```
DEVICEWIDEULTRA1ULTRA2FIFO_SIZEBURST
----------------------------------------------------------
Symbios 53c810N/AN/AN/A6416
Symbios 53c810APN/AN/AN/A6416 (1)
Symbios 53c815N/AN/AN/A6416 (1)
Symbios 53c820YesN/AN/A8816 (1)
Symbios 53c825YesN/AN/A8816
Symbios 53c825AYesN/AN/A536128

Symbios 53c875YesYESN/A536128
Diamond FirePort20YesN/AN/A536128 (825A)
Diamond FirePort40YesYESN/A536128 (875)
Symbios 53c860YesYESN/A536128 (1)
Symbios 53c885YesYESN/A536128 (1)
Symbios 53c895YesYESYES536128 (1,2)
Symbios 53c896YesYESYES536128 (1,2)
```

(1) Support is included but untested.

(2) Support for 895 and 896 is only available with out ULTRA support. The 160Mhz clock will be enabled on a future release.

Note

The 895 and 896 have not been tested.

[Symbios 53C810]

[Symbios 53C810A]

Device supports burst op code fetch

Device supports instruction prefetch

Device supports Cache Line Size and Cache Commands

[Symbios 53C810ALV] * same as 810

Device supports burst op code fetch

Device supports instruction prefetch

Device supports Cache Line Size and Cache Commands

[Symbios 53C815]

Device supports burst op code fetch

[Symbios 53C825]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

[Symbios 53C825A]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

[Symbios 53C860]

Device supports burst op code fetch

Device supports instruction prefetch

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers

[Symbios 53C875]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers

[Symbios 53C885]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers

Device supports Clock Doubler

[Symbios 53C895]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers (Not supported yet)

Device supports Clock Doubler (Not supported yet)

Device supports Fast-40 transfers (Not supported yet)

[Symbios 53C896]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers (Not supported yet)

Device supports Clock Doubler (Not supported yet)

Device supports Fast-40 transfers (Not supported yet)

Using Ultra Fast20 and Wide support.

Controller Dependency

For FAST20 support the controller must support FAST20.

Device Descriptors

To use a device with disconnect, wide, synchronous data transfer, and FAST20 Ultra the following should be added to the device descriptor entry in "systype.h". Be sure to re-make the descriptors.

```
#define SCSIOPTS SCSI_ATN|SCSI_SYNC|SCSI_WIDE|SCSI_ULTRA
```

Optionally you may use EditMod to change the SCSIOPTS field. For SYNC and ATN the SCSIOPTS value is "5".

Using Multiple SCSI Controllers

It is possible to use multiple SCSI controllers with the Symbios family of controllers.

The port address is used to specify the card to use.

PortAddress format.

[0xff] [device] [index] [SCSI_ID]

device = device number. Use PCIV to discover index to match. This is system dependent and slot dependent.

Index = you may instead use index to specify the index of the card found. Zero indicates first card, one indicates second card, etc.

The same address information may be used from the OS-9 boot menu to access additional SCSI controllers, e.g.:

: hs port=0xff000100 id=3 ? Boot from second SCSI controller SCSI ID=3

Creating Driver-Specific Versions

By default, the Symbios scsi8xx driver will look for any Symbios SCSI card based on table usage. You may however re-compile the driver to only look for the card desired.

MWOS/OS9000/80386/PORTS/PCAT/SCSI/SCSI8XX/makefile

```
PCI_DEV_ID      =      # -dSYMBIOS_DEVICE_ID=0xf
```

Remove the # and specify the ID required.

Driver name: scsi8xx

Rom driver name: ncr8xx

Diamond FirePort20 and FirePort40—Wide, Ultra and Ultra Wide

Benefits

- Wide support
- Ultra FAST20 support
- SCRIPTS RAM support (able to run scripts from on chip RAM) (1)
- Large FIFO enabled
- Increased burst rates to 128 where supported
- Special PCI cache features enabled (2)
- PCI IO Mode selectable (PCI I/O or PCI Memory) (3)

Additional Notes

1. The SCRIPTS RAM support is currently only available on OS-9, X86 based systems. Requires non translation of PCI memory. To use SCRIPTS RAM support include the "-dSCRIPTS_RAM" in the compile line when making the driver.
2. Instruction prefetch is not enabled by default. Maximum burst rate and large fifo's are enabled.
3. By default the Microware Symbios driver will use the PCI I/O model. To speed up transfers especially on X86 platforms the memory module may be used. In the PCI memory mode no in/out instructions are used. For the X86 platform this removes the CPU related waits added by the use of "inc", "outc" etc... If you would like to run the driver in PCI Memory mode the driver may be recompiled with the "-dPCI_IO_MAPPED" flag removed.

MWOS/OS9000/80386/PORTS/PCAT/SCSI/SCSI8XX/makefile

```
IO_MAPPED   =   -dPCI_IO_MAPPED
```

To use memory model change to:

```
IO_MAPPED   =   # -dPCI_IO_MAPPED
```

Note

We have changed the default to IO_MAPPED for X86 due to problems on PCAT based motherboards.

Prior to this release the following Symbios devices were supported:

Number of devices supported (2)

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DEVICEWIDEULTRA1ULTRA2FIFO_SIZEBURST
--------------------------------------------------------------
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Symbios 53c825NoN/AN/A8816
```

This release adds the following:

Number of devices supported (12)

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Symbios 53c810APN/AN/AN/A6416 (1)
Symbios 53c815N/AN/AN/A6416 (1)
Symbios 53c820YesN/AN/A8816 (1)
Symbios 53c825YesN/AN/A8816
Symbios 53c825AYesN/AN/A536128

Symbios 53c875YesYESN/A536128
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Symbios 53c885YesYESN/A536128 (1)
Symbios 53c895YesYESYES536128 (1,2)
Symbios 53c896YesYESYES536128 (1,2)
```

1. Support is included but untested.
2. Support for 895 and 896 is only available with out ULTRA support. The 160Mhz clock will be enabled on a future release. Note the 895 and 896 have not been tested.

[Symbios 53C810]

[Symbios 53C810A]

Device supports burst op code fetch

Device supports instruction prefetch

Device supports Cache Line Size and Cache Commands

[Symbios 53C810ALV] * same as 810

Device supports burst op code fetch

Device supports instruction prefetch

Device supports Cache Line Size and Cache Commands

[Symbios 53C815]

Device supports burst op code fetch

[Symbios 53C825]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

[Symbios 53C825A]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

[Symbios 53C860]

Device supports burst op code fetch

Device supports instruction prefetch

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers

[Symbios 53C875]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers

[Symbios 53C885]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers

Device supports Clock Doubler

[Symbios 53C895]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers (Not supported yet)

Device supports Clock Doubler (Not supported yet)

Device supports Fast-40 transfers (Not supported yet)

[Symbios 53C896]

Device supports Wide SCSI data transfers

Device supports burst op code fetch

Device supports instruction prefetch

Device has Scripts RAM

Device supports Cache Line Size and Cache Commands

Device supports Fast-20 transfers (Not supported yet)

Device supports Clock Doubler (Not supported yet)

Device supports Fast-40 transfers (Not supported yet)

Using Ultra Fast20 and Wide support.

Controller Dependency

For FAST20 support the controller must support FAST20.

Device Descriptors

To use a device with disconnect, wide, synchronous data transfer, and FAST20 Ultra the following should be added to the device descriptor entry in "systype.h". Be sure to re-make the descriptors.

```
#define SCSIOPTS SCSI_ATN|SCSI_SYNC|SCSI_WIDE|SCSI_ULTRA
```

Optionally you may use EditMod to change the SCSIOPTS field. For SYNC and ATN the SCSIOPTS value is "5".

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PortAddress format.

[0xff] [device] [index] [SCSI_ID]

device = device number. Use PCIV to discover index to match. This is system dependent and slot dependent.

Index = you may instead use index to specify the index of the card found. Zero indicates first card, one indicates second card, and so on.

The same address information may be used from the OS-9 boot menu to access additional SCSI controllers, e.g.:

: hs port=0xff000100 id=3 ? Boot from second SCSI controller SCSI ID=3

Creating Driver-Specific Versions

By default, the Symbios scsi8xx driver will look for any Symbios SCSI card based on table usage. You may however re-compile the driver to only look for the card desired.

MWOS/OS9000/80386/PORTS/PCAT/SCSI/SCSI8XX/makefile

PCI_DEV_ID = # -dSYMBIOS_DEVICE_ID=0xf

Remove the # and specify the ID required.

Driver name: scsi8xx

Rom driver name: ncr8xx

Adaptec 1540/1542 ISA

Support for Adaptec 1540 series is provided, this includes 1540, 1542 and 1542CP. The driver probes the DMA channel used, but the port address and interrupt are fixed. If the vector does not match the card, a Bad Mode error is returned. You may set up the descriptor to use vector zero, which forces the driver to use what the card reports.

```
#defineBASE_AHA15400x00000330
#defineVECT_AHA15400x4b
```

Driver name: aha1540

Rom driver name: ll1540

Adaptec 2940, 2940U and 2940UW

Support for Adaptec PCI series AHA2940, 2940U and 2940UW is provided. Only one SCSI controller of this type is allowed.

Driver name: aic7870

Rom driver name: ll7870

SCSI HARD - RBF Descriptors

/hs<id>fmt	id= SCSI ID (1-f) - Entire disk
/hs<id><part>fmt	id= SCSI ID (1-f) part= partition
/hs<id><part>	id= SCSI ID (1-f) part= partition

SCSI HARD - PCF Descriptors

/mhs<id><part>	id= SCSI ID (1-f) part= partition

SCSI FLOPPY - RBF Descriptors

d<id>_3.d0	id= SCSI ID (1-f) mapped as drive d0

SCSI FLOPPY - PCF Descriptors

md<id>_3.d0	id= SCSI ID (1-f) mapped as drive md0

SCSI TAPE Descriptors

/mt<id>	id= SCSI ID (1-f)

SCSI CDROM Descriptors

/cd0	SCSI ID is set to 5

Note

When using the Wizard, the descriptors for SCSI are automatically included or created as needed for the SCSI controller selected. You may also access the descriptors in the MWOS directory structure:

```
MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/SCSI8XX
MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/AHA1540
MWOS/OS9000/80386/PORTS/PCAT/CMDS/BOOTOBJS/DESC/AIC7870
```

System Devices

Real Time Clock

Real-time clock (RTC) devices with battery backup enable the system clock to be set without operator intervention. The bootfile options dialog in the Configuration Wizard may be used to include one of two possible real-time clock drivers.

The local time driver assumes that the time stored in the RTC device is local time. This option maintains compatibility when another O.S. is installed on the same machine.

The GMT driver assumes that the time stored in the RTC is Greenwich Mean Time.

The driver communicates with the OS-9 kernel using GMT, with the System Time Zone field in the init. module converting between GMT and local time. Refer to the Configuration Wizard Init dialog for information on setting the system time zone.

Additional Devices

PPP and SLIP

You can use the Wizard to configure and use both PPP and SLIP. You may select any or all of Ethernet, PPP, or SLIP. When using PPP or SLIP, the SPF options must be enabled. You can do this from the **SPF/Options** tab by selecting either SLIP or PPP or both. When you do this, make sure SPF is checked when building the boot image. If Ethernet is not desired, select `None` for the Ethernet controller name.

PPP Setup

Set up PPP by completing the following steps:

Step 1. Edit the `pcat.ini` file in the following directory:

`MWOS\OS900\80386\PORTS\PCAT\BOOTS\INSTALL\INI`

Search for `ETHER_OPTION_1`.

Step 2. By default, the PPP setup will obtain the address from the server. If desired this may be changed.

ETHER_OPTION_1=ppp0 binding /ipcp0 iff_pointopoint

Step 3. Make sure PPP is selected in the **SPF/Options** tab.

Step 4. Go into the Wizard and select `Enable SoftStax`. Build the boot.

SLIP Setup

Set up SLIP by completing the following steps:

Step 1. Edit the `pcat.ini` in the following directory:

`MWOS\OS900\80386\PORTS\PCAT\BOOTS\INSTALL\INI`

Search for `ETHER_OPTION_0`.

Step 2. Setup SLIP as required.

ETHER_OPTION_0=slip0 address 10.0.0.1 destaddr 10.0.0.2 binding /spsl0

Step 3. Make sure SLIP is selected in the **SPF/Options** tab.

Step 4. Go into the Wizard and select `Enable SoftStax`. Build the boot.

Product Discrepancy Report

To: Microware Customer Support

FAX: 515-224-1352

From:____

Company:____

Phone:____

Fax:_______________________Email:____________________

Product Name:

Description of Problem:

____

____

____

____

____

____

____

____

____

____

Host Platform____

Target Platform_______________________________________

RadiSys.

MICROWARE SOFTWARE