



Cross  
Products

02:32  
VIRTUAL CD 4X  
GAME1.DSK

DOOR  
UP

DISPLAY  
DOWN

Mira  
UNIVERSAL CD EMUL

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### **Warning**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

---



## **Mirage Manual**

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PC Type: \_\_\_\_\_  
Mirage Serial No: \_\_\_\_\_

## Comments/Omissions/Corrections

The Mirage Hardware and The Mirage Software (MIRAGE.EXE)

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This Manual

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# Manual Conventions

The following conventions are used throughout this manual:

*italics* shows a user defined entry

**bold courier** used to denote examples

san serif shows a button on the Mirage's front panel

MAIN MENU->EMULATION MENU

Entries on the Mirage's menus are shown separated by ->.

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# **INTRODUCTION**

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# 1 **About This Manual**

This manual describes the Mirage CD Emulator, Mirage program and the related software tools. After reading this manual you should have a good understanding of the CD emulation process using the Mirage.

This manual does not describe how to use any of the other development tools (such as the SNASM2 Development System) that you might use to develop your projects. You should refer to the manuals that came with these products for more details.

The manual is organised as follows:

## **Introduction**

Provides an overview of the Mirage's capabilities.

## **Hardware Setup**

Shows you how to setup the Mirage.

## **Getting Started**

Provides a Quick Start and Tutorial for CD emulation using the Mirage and the Cross Products' CD build tools.

## **Hardware Reference**

More details of the Mirage's hardware.

## **Reference**

More detail on the features of the Mirage's software. Includes a bibliography of suggested further reading and a glossary of commonly-used CD terms.

### 1.1 Technical Support

If you have any difficulties setting up or using the Mirage CD Emulator, you should in the first instance refer to the relevant section of this manual and then the Troubleshooting section.

If you are still having problems, you should contact our technical support via telephone, fax or email at the contact details given below:

Cross Products Ltd  
23 The Calls  
Leeds  
England LS2 7EH

Telephone: +44 (0) 113 242 9814  
Facsimile: +44 (0) 113 242 6163  
BBS: +44 (0) 113 234 0420\*  
Internet: support@crossprod.co.uk

\*The settings for connection to the BBS are 14,400/1/None.

Our technical support department is available from 9am to 8pm local UK time.

## 1.2 About The Mirage CD Emulator

The Mirage CD Emulator provides a pseudo CD for a target's CD-ROM drive. This allows you to develop your CD projects without having to burn CDs repeatedly.

The Mirage features:

- Emulation of up to quad-speed CDs with user-configurable settings for the target CD-ROM drive's characteristics such as seek time, spin up time, focus time and error rate
- The Mirage's internal HD connects to the development host via a SCSI interface and is treated as a normal DOS HD by the development host
- Emulation directly from files without the need for a time consuming CD image build process
- Direct connection of a CD Writer for writing of a CD-R disc from files
- Standalone unit that can emulate CDs direct to the target system without being connected to a development host
- The Mirage's internal HD is tray-mounted to be interchangeable for different projects
- Several CD projects can co-exist on the same Mirage emulation HD
- The Firmware is stored on user-rewritable Flash allowing field upgrades

### 1.3 What Is Included

The following are included in the Mirage package:

- The Mirage CD Emulator (A)
- Demonstration files stored on the internal HD
- Floppy Disk containing the Mirage and CPBUILD programs and firmware (for PC development hosts only) (B)
- CD containing the Mirage program, CPBUILD and Mirage Mounter (for SG Indy development hosts only) (C)
- This manual (D)
- Power cable (E)
- CD Interface cable (F) (the exact type depends upon target)
- 2 SCSI terminators (G)
- SCSI to SCSI cable (H) (the exact type depends upon set up)
- Hard disk drive tray key (I)

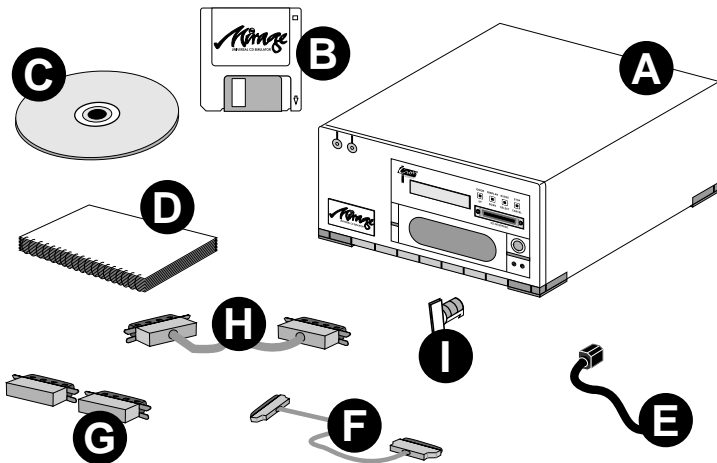


Figure 1-1: Items Included In The Mirage Package

### 1.3.1 **Demonstration Files**

The Mirage's internal HD contains demonstration files that are used as examples in the Tutorial section of this manual.

---

**NOTE**

The packing list or release notes may contain more up-to-date information than was available when this manual was printed.

---

## 1.4 **What Is Not Included**

The following item is required for the operation of the Mirage with a Saturn target, but are not included in the Mirage package:

### 1.4.1 **Saturn Key Disc**

The Saturn Key Disc (sometimes called the System Disc) is required to bypass the Saturn's built-in security when you are using a modified production Saturn. The key disc is available as part of the SEGA Saturn Developer's Toolkit.

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# **HARDWARE SETUP**

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## 2 Hardware Setup For PC Hosted Systems

This section shows how to set up the Mirage CD Emulator and connect it to your development PC and target development system. It is assumed that your PC already has a SCSI interface and that you have already setup and successfully installed the development tools for your target development system.

### 2.1 Inserting The Mirage's HD Tray

If the internal HD tray is not inserted in your Mirage, slide it gently into the mount. Push it firmly home until you hear a slight click. Turn the key in the lock on the front of the Mirage to lock the tray in place. Keep the key in a safe place.

---

**NOTE**

Turning the tray key to remove the tray will turn off the Mirage's internal HD.

---

### 2.2 Configuring A PC SCSI Adapter

The Mirage CD Emulator connects to the PC's SCSI bus (referred to as the External SCSI bus) via the same SCSI interface as your other development devices (such as the SNASM2 CartDev). The Mirage will operate correctly with the SCSI settings that these other devices require.

There must be an ASPI driver for the PC's SCSI card installed for the Mirage's control program (MIRAGE.EXE) to operate correctly. See your SCSI interface's manual for more details.

---

**NOTE**

The Mirage will work correctly with any SCSI-2 compatible interface, whether as a separate card or built into the development PC. The Mirage will not work with the pseudo-SCSI SNASM1 interface card or any non-SCSI-2 card.

---

## 2.3 Checking The Available SCSI Numbers

Before connecting the Mirage to the PC, check that the Mirage's default SCSI number of 3 is available on the PC's SCSI chain. You can do this by using the SCSI utility which was supplied with your PC's SCSI controller.

If SCSI ID 3 is in use, you can change the Mirage's SCSI number by changing the MIRAGE ID setting. See "The SCSI Menu" on page 63 for more details.

## 2.4 Connecting The Mirage And PC



You must make sure that all devices are powered off before connecting them to your PC or to the Mirage. Damage may occur if you attempt to connect devices which are powered on.

---

To connect the Mirage Emulator to the development PC:

1. Configure the SCSI settings for your other development devices on the PC's SCSI chain.

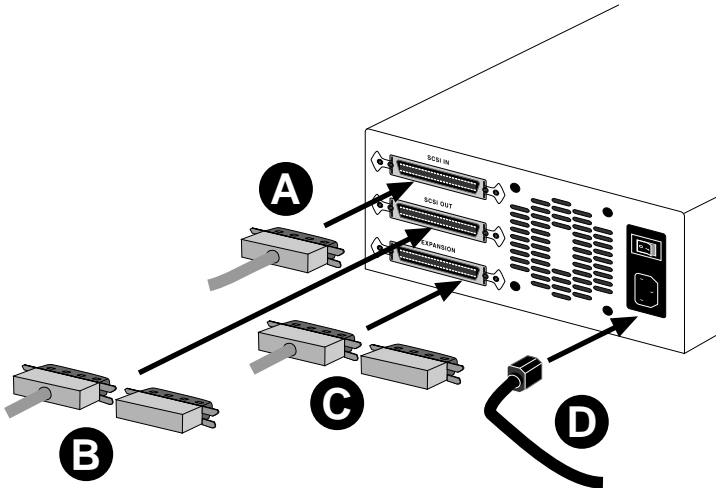


Figure 2-1: Connecting To The Mirage's SCSI Ports

2. Connect the SCSI card in the development PC to the SCSI IN port on the rear of the Mirage (Item **A** on Figure 2-1) using the supplied SCSI cable. Contact your supplier if you require another type of SCSI cable.
3. Connect any other SCSI devices on the PC's SCSI chain (such as a CartDev) to the SCSI OUT port on the rear of the Mirage (Item **B** on Figure 2-1). If you do not have any other SCSI devices on the PC's SCSI chain, connect a SCSI terminator to SCSI OUT.
4. The Mirage's Expansion Port (Item **C** on Figure 2-1) is reserved for a CD Writer. Connect a SCSI terminator to this port if you do not have a CD Writer. See "CD Writer Setup" on page 29 for more information on connecting a CD Writer to the Mirage.
5. Confirm that the Mirage's HD tray is securely inserted. For more details see "Inserting The Mirage's HD Tray" on page 11.
6. Connect the supplied power cable into the power socket on the Mirage (Item **D** on Figure 2-1). The Mirage uses a universal power supply (110V-240V).
7. Copy the MIRAGE.EXE program from the supplied floppy disk to a convenient directory on the development PC.

---

**NOTE**

The Mirage emulation HD can be either the Mirage's internal HD or any SCSI hard disk connected to the Mirage's Expansion Port. The emulation HD is defined using the DRIVE ID setting. The factory default is the Mirage's internal HD (0).

The SCSI ID of the Mirage's emulation HD on the PC's SCSI chain (called the External SCSI bus) is defined using MIRAGE ID. The factory default for MIRAGE ID is 3.

See "The SCSI Menu" on page 63 and "The Mirage's Two SCSI Buses" on page 71 for more details.

---

### 2.5 The Mirage And Windows 95

If you are using Windows 95, set up the Mirage emulation HD as a removable drive in Device Manager. This will avoid write caching to the emulation HD and any disruption to an emulation in progress.

The Mirage's menuing system does not display Windows 95 long file names. Files stored on the Mirage's emulation HD will have their filenames truncated to the standard 8 + 3 configuration when displayed on the front panel. The truncated filenames must be used to reference these files from the Mirage's front panel or from within CPBUILD or the Mirage program.

### 2.6 Connecting The Mirage And Target

Connecting the Mirage to the target differs for each target. Read the following section relevant to your current target.

---

**NOTE**

When connecting cables, make sure that they are secure and that their clips or screws (if present) are fastened.

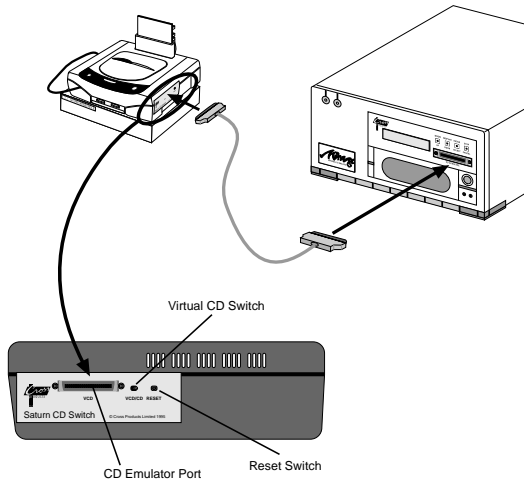
---

#### 2.6.1 Connecting The Mirage And Saturn

To connect the Mirage CD Emulator to the Saturn:

1. Connect the CD Emulator port (see Figure 2-2) on the target system to the CD INTERFACE port on the front of the Mirage using the supplied cable.
2. Power on in this order: CartDev, Saturn, Mirage and PC (with no delay between the Mirage and the PC).

This completes the Mirage hardware setup.



**Figure 2-2: Connecting The Mirage To A Saturn Target**

## 2.7 Testing The PC/Mirage Hardware Setup

The following indicators will enable you to confirm your Mirage CD Emulator is set up and operating correctly:

1. The green POWER LED and the green hard disk drive POWER LED light when the Mirage is powered on. For more information on the position and operation of these LEDs see “The Mirage’s LEDs” on page 74.
2. The development PC should be able to locate the Mirage’s emulation HD on the SCSI chain. When you access the Mirage’s HD from the PC, the yellow disk access light (which shows HD access when not emulating) should light. A typical directory listing for the Mirage’s hard disk looks similar to:

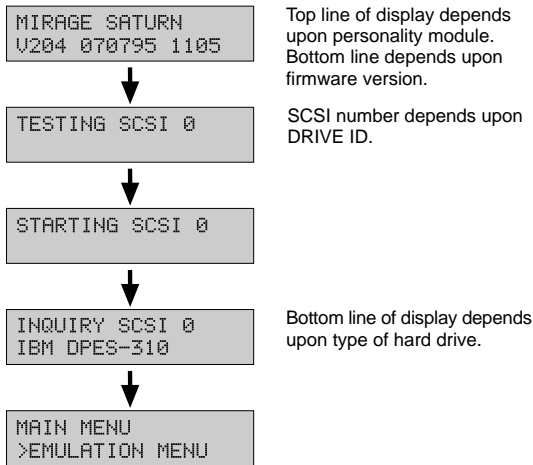
```
Volume in drive D is MS-DOS_6
Directory of D:\
DEMO_SD      <DIR>          08-02-95  2:09p
MIRAGE       <DIR>          08-02-95  2:12p
DEMO_3P     <DIR>          08-02-95  2:12p
          3 file(s)              0 bytes
          841,285,632 bytes free
```

**Figure 2-3: A Typical Directory Listing**

The files stored in the DEMO\_SD and DEMO\_3P directories are the demonstration files that can be used to build a working CD image. See “Quick Start” beginning on page 35 for more details.

3. During its power-on stage, the Mirage performs a self-test. During the self test the Mirage will display the sequence of messages shown in Figure 2-4 on its front panel.

If an error occurs, refer to “Troubleshooting” on page 123 for more details.



**Figure 2-4: The Mirage's Start Up Displays**

4. The Mirage's internal HD is supplied ready formatted and contains demonstration files. The “Tutorial” section on page 39 of this manual takes you through the various stages of building and emulating a CD using these files. If you have used a CD Emulator before then refer to “Quick Start” beginning on page 35 to confirm that the Mirage is operating correctly.

**NOTE**

Your Mirage may not contain the latest firmware. Your Mirage's firmware version can be displayed by using MAIN MENU->INFO MENU ->FIRMWARE VERSION from the Mirage's front panel. Check with the supplier of your Mirage to see if a more up to date version is available.

---

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## 3 Setup For SG Indy Hosted Systems

This section shows how to connect the Mirage CD Emulator to an SG Indy.

### NOTE

---

With a Saturn target it is necessary to have firmware release L or later installed on your Mirage for use with an SG Indy.

---

### 3.1 Checking The Available SCSI Numbers

Before connecting the Mirage to the Indy, check that the Mirage's default SCSI ID of 3 is available on the Indy's SCSI chain. You can do this by:

1. Select the 'System Manager' from the System Toolchest.
2. From the Hardware menu select 'Summary'. A list of the SCSI numbers in use on your system will be displayed. Note that in addition to this list 0, 1 and 2 are reserved for other uses.
3. If SCSI ID 3 is in use, you can change the Mirage's SCSI number by changing the MIRAGE ID setting. See "The SCSI Menu" on page 63 for more details.

### CAUTION!

---

You must make sure that all devices are powered off before connecting them to your Indy or to the Mirage. Damage may occur if you attempt to connect devices which are powered on.

---

### 3.2 Connecting The Mirage and SG Indy

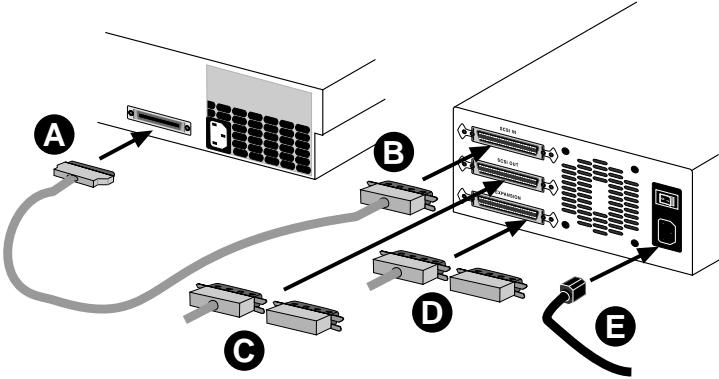
To connect the Mirage Emulator to the development SG Indy:

1. If you do not have any other SCSI devices attached to your Indy, remove the Indy's SCSI terminator from the Indy's SCSI port (Item A on Figure 3-1).
2. Connect the SCSI port on the rear of the Indy (Item A on Figure 3-1) to the SCSI IN port on the rear of the Mirage (Item

## Setup For SG Indy Hosted Systems

---

**B** on Figure 3-1) using the supplied SCSI cable. Contact your supplier if you require another type of SCSI cable.



**Figure 3-1: Connecting The Indy To The Mirage's SCSI Ports**

3. Connect any other SCSI devices on the Indy's SCSI chain to the SCSI OUT port on the rear of the Mirage (Item C on Figure 3-1). If you do not have any other SCSI devices on the Indy's SCSI chain, connect a SCSI terminator to SCSI OUT.
4. The Mirage's Expansion Port (Item D on Figure 3-1) is reserved for a CD Writer. Connect a SCSI terminator to this port if you do not have a CD Writer. See "CD Writer Setup" on page 29 for more information on connecting a CD Writer to the Mirage.
5. Confirm that the Mirage's HD tray is securely inserted. See "Inserting The Mirage's HD Tray" on page 11 for more details.
6. Connect the supplied power cable into the power socket on the Mirage (Item E on Figure 3-1). The Mirage uses a universal power supply (110V-240V).
7. You must now install the Cross Products' software. See "Installing Drivers And Build Tool For Mirage" on page 21 for more details.

**NOTE**

The Mirage emulation HD can be either the Mirage's internal HD or any SCSI hard disk connected to the Mirage's Expansion Port. The emulaton HD is defined using the DRIVE ID setting. The factory default is the Mirage's internal HD (0).

The Mirage's emulation HD must be in IBM DOS format with a 32 bit DOS FAT.

See "The SCSI Menu" on page 63 and "The Mirage's Two SCSI Buses" on page 71 for more details.

---

### 3.3 Installing Drivers And Build Tool For Mirage

This section shows you how to install the software and drivers necessary to use the Mirage with the Indy.

#### 3.3.1 Installing From A tar File

If you have received your Mirage software as a tar file then you will need to unpack the files before you can install them on your Indy:

1. Make a temporary directory. For example, type:

```
mkdir /tmp/cp
```

2. Copy the tar file into the temporary directory.
3. Change to the temporary directory:

```
cd /tmp/cp
```

4. Untar the installation files:

```
tar xvf /tmp/cp/X.tar
```

where 'X.tar' is the name of the tar file.

5. Repeat steps 2 and 3 for all of the TAR files supplied.

Now continue with "Installing The Indy Software", but inform the Software Manager that the files to be installed are in the temporary

directory (**/tmp/cp** for the above example) instead of on a CD drive or Tape Streamer.

### 3.3.2 Installing The Indy Software

---

**NOTE**

You must have System Administration privileges to install the Cross Products' software. If you have any problems during installation see the system log file for more details.

---

To install the software and drivers for the Mirage:

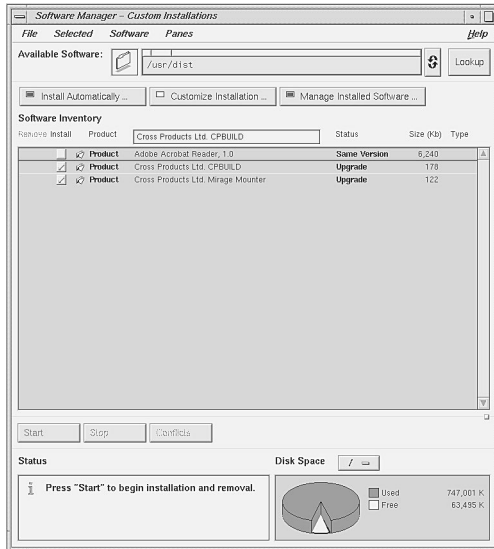
1. Run the Software Manager.
2. In the box labelled 'Available Software' enter the path for your CD drive, Tape Streamer or tar files (depending upon how the software was delivered to you).
3. Click 'Customize Installation' to list the available installable files and choose which ones you wish to install.

Install the Acrobat Reader which can be used to view and print the supplied documentation if it is not already on your system.

4. Click 'Start'.
5. Once installation is complete, reboot your system:

**reboot**

The Indy will now reboot.



**Figure 3-2: Installation Via The Software Manager**

## Installed Files And Their Locations

The following files are installed during the installation:

- `/usr/local/bin/cpd`      The DOS mount daemon
- `/etc/cpd.conf`      The default configuration file
- `/etc/rc2.d/S97cpd`      The system startup script
- `/usr/local/bin/cpbuid`      The CD image building program
- `/usr/local/bin/mirage`      The Mirage remote control program

### 3.3.3 The CPD Mount Daemon

The mount daemon (CPD) is the program used to mount the Mirage into the Indy's file system. The mount daemon is required because the Indy cannot normally mount DOS format HDs.

When CPD is first executed, a PID (Process Identification Number) file (`/etc/cpd.pid`) will be created. This file is updated every time that the CPD daemon is executed.

### Configuring CPD

You must configure CPD to make sure that the Mirage is correctly mounted. The information that CPD needs to successfully mount the Mirage is stored in the default configuration file 'cpd.conf' in the /etc directory (or in another file specified by CPD's C switch. The format of CPD's configuration file is:

```
mount device dir
```

where *device* is the location of the Mirage on the Indy's SCSI chain and *dir* is the directory to mount the Mirage to. A typical example of CPD's configuration file is:

```
mount /dev/scsi/sc0d310 /mirage
```

where *0d310* is SCSI controller zero, device 3, logical unit zero. The '3' will be the SCSI number of your Mirage (set using MIRAGE ID). The Mirage is mounted as a directory called '/mirage'.

### CPD's Options

CPD has the following syntax:

```
cpd [-switch [argument]]
```

Available switches are:

**-C file**

This sets the filename of cpd's configuration file. By default the configuration file is called cpd.conf. This file contains information telling the Indy how to mount the Mirage.

**-h**

Displays the on-line help and list of available switches.

**-l [0-7]**

Sets the syslog facility to LOCAL 0-7.

**-v**

Reports what is cpd is currently doing. Useful for debugging.

### Limitations Of CPD

There are two main limitations of CPD, due to the nature of translating between file systems:

1. Files and directories that are stored on the Mirage's emulation HD must have names which conform to IBM PC DOS naming syntax ie up to eight characters for the file name followed by a period (full stop) followed by up to three characters as an extension. All of the normal DOS compatible alphanumeric characters are allowed.
2. None of the files on the Mirage have file permissions associated with them. Files appear to be owned by whoever is using them. You can alter only the write attribute of files by using `chmod`.

## 3.4 Connecting The Mirage And Target

Connecting the Mirage to the target differs for each target. Read the following section relevant to your current target.

---

**NOTE**

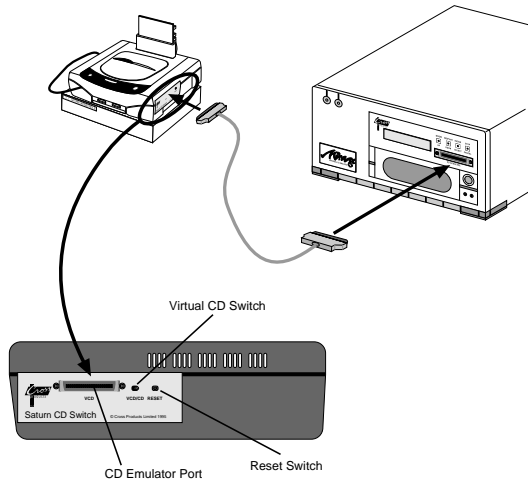
When connecting cables, make sure that they are secure and that their clips or screws (if present) are fastened.

---

### 3.4.1 Connecting The Mirage And Saturn

To connect the Mirage CD Emulator to the Saturn:

1. Connect the CD Emulator port (see Figure 3-3) on the target system to the CD INTERFACE port on the front of the Mirage using the supplied cable.



**Figure 3-3: Connecting The Mirage To A Saturn Target**

2. Turn on in this order: CartDev, Saturn, Mirage and Indy (with no delay between the Mirage and the Indy).

This completes the Mirage hardware setup.

### 3.5 Testing The Indy/Mirage Hardware Setup

The following indicators will enable you to confirm that your Mirage CD Emulator is set up and operating correctly with your SG Indy:

1. The green POWER LED and the green hard disk drive POWER LED light when the Mirage is powered on. For more information on the position and operation of these LEDs see “The Mirage’s LEDs” on page 74.
2. During its power-on stage, the Mirage performs a self-test. During the self test the Mirage will display the sequence of messages shown in Figure 2-4 on its front panel.
3. The Mirage’s emulation HD should be mounted. Type:



### mount

A typical list of mounted devices looks similar to:

```
/dev/root on / type efs (rw,raw=/dev/rroot)
/proc on /proc type proc (rw)
/dev/fd on /dev/fd type fd (rw)
/dev/scsi/sc0d310 on /mirage type nfs (0)
```

where *0d310* is SCSI controller zero, device 3, logical unit zero. The '3' will be the SCSI number of your Mirage (set using MIRAGE ID). The Mirage is mounted as a directory called '/mirage'.

4. The Indy should be able to locate the Mirage's emulation HD on the SCSI chain. When you type:

```
ls -l /mirage
```

the yellow disk access light (which shows HD access when not emulating) should light. A typical directory listing for the Mirage's hard disk looks similar to:

```
total 128
drwx-----0 name group 16384 Dec 7 14:30 demo_sd
drwx-----0 name group 16384 Dec 7 14:32 mirage
drwx-----0 name group 16384 Dec 7 14:33 demo_3p
      3 file(s)                0 bytes
      841,285,632 bytes free
```

**Figure 3-4: A Typical Directory Listing On The Indy**

5. The Mirage's internal HD is supplied ready formatted and contains demonstration files. The "Tutorial" section on page 39 of this manual takes you through the various stages of building and emulating a CD using these files. If you have used a CD Emulator before then refer to "Quick Start" beginning on page 35 to confirm that the Mirage is operating correctly.
6. To test CPBUILD, type:

```
cpbuild -h
```

which outputs a list of CPBUILD's options. A typical listing

## Setup For SG Indy Hosted Systems

---

looks similar to:

```
CPBUILD
Preprocess for MIRAGE CD emulator.
(c) 1996 Cross Products Ltd.

Usage:- cpbuild [options] filename [options]

Options
-b      Build the disc image
-lext  Specify extension for language file
-n      Suppress copyright message
-spath Set path for source files
-opath Set path for output files
-t      Create TOC
-v      Show progress
-h      Display this help
```

7. To test the Mirage remote control program, type:

```
mirage -h
```

which outputs a list of the Mirage program's options. A typical listing is given under "INFO [>filename]" on page 90.

---

**NOTE**

Your Mirage may not contain the latest firmware. Your Mirage's firmware version can be displayed by using MAIN MENU->INFO MENU ->FIRMWARE VERSION from the Mirage's front panel. Check with the supplier of your Mirage to see if a more up to date version is available.

---

## 4 CD Writer Setup

This section shows how to connect a CD Writer to the Mirage CD Emulator.

---

**NOTE**

The Mirage only supports a selection of CD Writers. See the Mirage firmware release notes or contact your supplier if you are unsure about support for your CD Writer.

---

### 4.1 Connecting A CD Writer To The Mirage

---

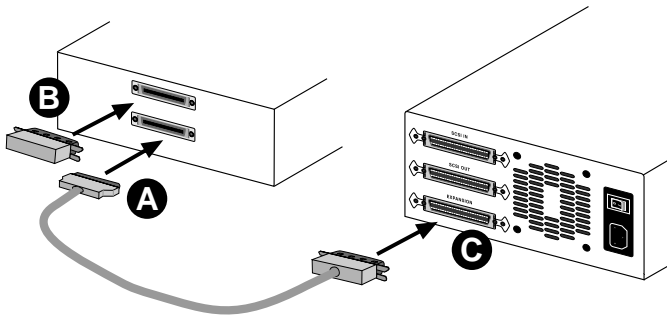
**CAUTION!**

Do not connect devices to the Mirage when power is turned on. Damage may occur if you attempt to connect devices which are turned on.

---

To connect a CD Writer to the Mirage Emulator:

1. Turn off the Mirage and CD Writer.
2. If present remove the SCSI terminator from the Mirage's Expansion SCSI port (Item **C** on Figure 4-1).
3. Connect the SCSI IN port on the rear of the CD Writer (Item **A** on Figure 4-1) to the Expansion SCSI port on the rear of the Mirage (Item **C** on Figure 4-1) using the supplied SCSI cable. Contact your supplier if you require another type of SCSI cable.
4. If you do not wish to use the Mirage's internal HD for emulation, connect a SCSI HD to the SCSI port on the rear of the CD Writer.
5. Connect a SCSI terminator to SCSI OUT on the rear of the CD Writer (Item **B** on Figure 4-1) or to the last device on the Mirage's Expansion SCSI bus.
6. Connect the supplied power cable into the power socket on the CD Writer.



**Figure 4-1: Connecting A CD Writer To The Mirage**

7. Set the SCSI ID of the CD Writer to an unused value from 1 to 6.  
Make sure that the CD Writer's SCSI ID does not conflict with the Mirage's emulation HD (set using DRIVE ID) or any other HD attached to the Mirage's expansion SCSI bus. See "The Expansion SCSI Bus" on page 72 for more information.
8. Power on the CD Writer and then the Mirage.
9. From the Mirage's front panel set the CD-R ID (MAIN MENU->SCSI MENU->CD-R ID) to the SCSI number of the CD Writer or to AUTO DETECT (the default setting).

The CD Writer is now ready for use.

## 4.2 Testing The CD Writer Set up

To test the set up of the Mirage and CD Writer, select the CD-R menu from the Main menu on the Mirage's front panel. If the Mirage and CD Writer are functioning correctly together, the Mirage will display:

```
AUTO DETECTING...
```

followed by:

```
CD-R MENU  
>DISC WRITE
```

**NOTE**

The 'Auto Detecting' message is only displayed if you have set the CD-R ID to AUTO DETECT.

---

If the message:

```
CD-R ERROR  
CD-R NOT FOUND
```

is displayed:

1. Turn off the Mirage and CD Writer
2. Check the SCSI connections and termination of all devices on the Mirage's Expansion SCSI bus.  
  
Check that the devices attached to the Expansion SCSI bus all have unique SCSI IDs.
3. Turn on the CD Writer and Mirage.
4. Check that the CD-R ID is set to AUTO DETECT or the SCSI ID of the CD Writer.

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# **GETTING STARTED**

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## 5 Quick Start

This section is aimed at the developer who has used other CD Emulators (such as the JVC VCD emulator), but who has not used the Mirage. It very briefly takes you through the emulation process and any unique features of the Mirage CD Emulator.

Before working through this section, you should make sure that the Mirage CD Emulator has been set up with your development host as described. See “Hardware Setup For PC Hosted Systems” on page 11 or “Setup For SG Indy Hosted Systems” on page 19 for more details.

### NOTE

---

For more detailed information on using the Mirage CD Emulator, you should refer to the sections further on in this manual for more information.

---

### 5.1 Emulation Using A Saturn Target

To emulate using the Mirage CD Emulator:

1. Prepare your data files (for example executables, data, video and audio) as normal and script (.SCR) file according to “The Scripting Language” on page 97. All emulation files must be stored on the Mirage’s emulation HD.
2. With a modified Saturn production unit, use the Saturn Key Disc as normal.
3. Run CPBUILD on the .SCR file to create an .RTI file. See “CPBUILD” on page 93 for more details.
4. To use the Mirage control program (MIRAGE.EXE), type the following:

```
mirage emulate=filename.rti
```

where *filename* is the name of your .RTI file

or

use 'Select Image' from the Emulation menu on the Mirage's front panel (MAIN MENU->EMULATION MENU->SELECT IMAGE) and then scroll down to the required .RTI and select it using the SELECT button.

Emulation will now begin.

5. During emulation, you can push the DOOR button on the Mirage's front panel to simulate the target's door being opened or closed. You can also use the NUDGE button to simulate the target being knocked. These buttons allow you to test the error recovery routines in your project.
6. During emulation the Mirage's LCD display changes to show the current filename; access mode; error flag and compromised disk access flag.

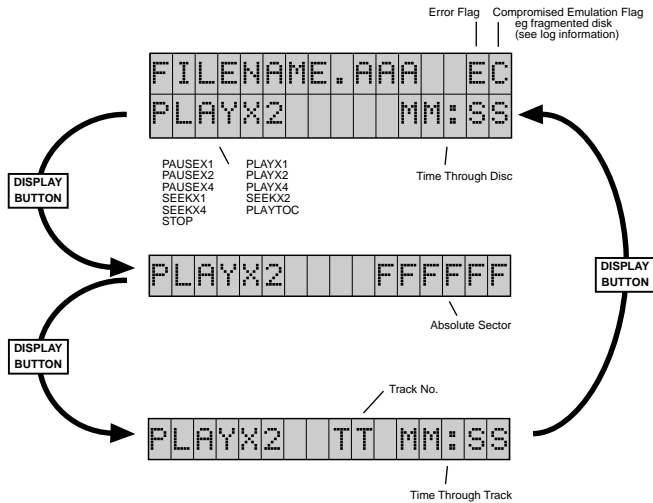


Figure 5-1: The Front Panel During Emulation

Press the DISPLAY button once to show the Absolute Sector on the bottom line of the display.

Press the DISPLAY button twice to show the Track and Time

---

Through Track on the bottom line of the display.

Press the DISPLAY button again to return the display to show total disc time on the bottom line.

7. To stop emulation, type:

**mirage stop**

or

press the STOP button on the Mirage's front panel.



---

During emulation, read access from the development host will effect emulation speed or might cause the emulation to abort. A read caching utility can lessen this effect.

Write access from the development host will always abort an emulation. You should therefore try to avoid read or write access to the emulation HD wherever possible.

If you are using Windows 95, set up the Mirage emulation HD as a removable drive in Device Manager. This will avoid write caching to the Emulation HD.

If the emulation is effected or aborted it will be reported in the emulation log (see "Log Information" beginning on page 115 for more details).

---

### 5.1.1 Building The Final Image With A Saturn Target

The process of building the final image from the .SCR and .RTI files is exactly the same as for the JVC emulator. Simply use CPBUILD to create a .DSK image of the CD.

To test the .DSK file, type:

**mirage emulate=filename.dsk**

or

Select the required .DSK file from the Mirage's front panel (MAIN MENU->EMULATION MENU->SELECT IMAGE).

## 5.2 CD-R Discs Direct From The Mirage

The Mirage has the capability to connect to a CD Writer to write CD-R discs from .RTI or .DSK files.

See “Writing A CD-R Disc” on page 49 for more details on CD-R writing.

## 5.3 Log Information

During emulation, the Mirage logs information that is helpful for post-emulation analysis. The log information includes an entry for each emulation event, including error reporting. For more information on logging see “Log Information” on page 115.

## 6 Tutorial

This section introduces you to the 5 stages involved in creating CDs: writing scripts; building the CD image; emulating from that image; checking that the emulation worked correctly and finally writing a CD-R disc. This tutorial uses the demonstration files supplied on the Mirage's internal HD as an example project. After working through this section, you will have a general understanding of the process of building, emulating and writing CD-R discs.

Before working through this section, you should make sure that the Mirage CD Emulator has been set up as described in "Hardware Setup For PC Hosted Systems" on page 11 or "Setup For SG Indy Hosted Systems" on page 19.

Work through the Typical Session section for your target system to familiarise yourself with the emulation process under Mirage and as a final check that the supplied system is functioning correctly. The Typical Session section describes a typical CD project:

- preparing files
- writing the script for building the CD
- creating the table of contents
- emulating from the Mirage virtual CD
- and finally, writing a CD-R disc

For more details on the various programs and terms discussed in this section, you should refer to the relevant reference sections beginning on page 57.

## 6.1 A Typical Session With A Saturn Target

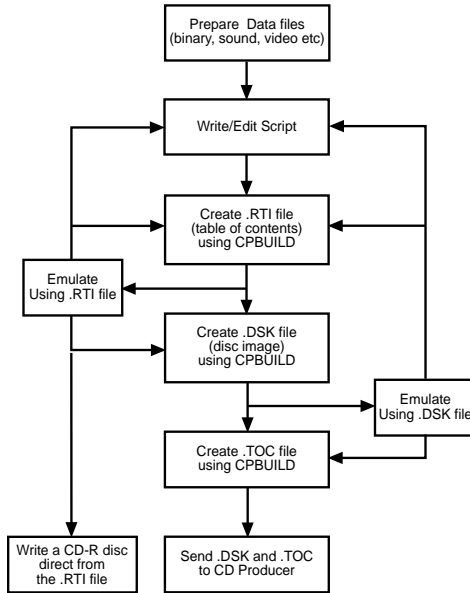


Figure 6-1: A Typical Emulation Session With A Saturn Target

### 6.1.1 Preparing Files

This tutorial uses the files supplied on the Mirage's internal HD. See Figure 2-3 on page 15 for a typical listing.

The IP.BIN file is the security key specific to your System key disc. There are two sets of demonstration files. Use the files in the DEMO\_3P directory with the black 3rd Party System Disc and use the files in the DEMO\_SD directory with the red SEGA System Disc. These directories also contain the security key, IP.BIN, for the appropriate System Disc.

The files that make up your CD project will come from various sources, for example: programs; graphics; audio and video. It is beyond the scope of this manual to describe how these files should be prepared.

### 6.1.2 The Script File (.SCR)

The CPBUILD program uses a script file to create a run time information file (.RTI), which is used for emulation.

The script file is a text file that describes the layout of your CD and is written using the scripting language described in “The Scripting Language” on page 97. It includes the names of the files that make up the CD, their type and their exact position on the CD. The default file extension for script files is ‘.SCR’. This example uses the TUTORIAL.SCR script file.

### 6.1.3 Creating The .RTI File

To create the run time information file (.RTI) for the demonstration files switch to the DEMO\_3P or DEMO\_SD directory (depending upon which Sega key disc you are using) and type:

```
cpbuild tutorial
```

In the above example CPBUILD takes the TUTORIAL.SCR file and creates a file called TUTORIAL.RTI (for more details see “CPBUILD” on page 93).

You are now ready to emulate from the files on the Mirage’s emulation HD using the MIRAGE program or the Mirage’s front panel controls.

### 6.1.4 Before Emulation Can Begin

The procedure for preparing for emulation with the Mirage differs for each target. The following two sections describe how to prepare for emulation with a Saturn Programming Box and Modified Production Saturn respectively.

#### **Using A Saturn Programming Box**

If you are using a Saturn Programming Box you should:

1. Power off the Programming Box
2. Set the VCD/CD selector switch on the front of the Programming Box to ‘CD’

3. Power on the Programming Box
4. Set the VCD/CD selector switch to ‘VCD’

The Saturn Programming Box is now ready to emulate from the files on the Mirage’s internal HD.

### Using A Modified Production Saturn

If you are using a modified production Saturn you must:

1. Power off the Saturn
2. Set the Saturn’s VCD selector switch to ‘CD’
3. Place the Saturn Key Disc into the CD drive
4. Power on the Saturn
5. Wait for the Saturn to display ‘Completed’ in the top left of the Sega logo screen
6. Set the Saturn’s VCD selector switch to ‘VCD’

The Saturn is now ready to emulate from the files on the Mirage’s internal HD. The Saturn should not require the key disc again until it is turned off; pressing Reset on the front of the Saturn does not clear the key disc information.

#### 6.1.5 Starting The Emulation

To emulate from the .RTI file, type the following to use the Mirage control program (MIRAGE):

PC

```
mirage emulate=\demo_3p\tutorial.rti
```

SG

```
mirage emulate=/demo_3p/tutorial.rti
```

(substitute ‘demo\_sd’ for the ‘demo\_3p’ above if you are using a red Sega key disc)

or

Choose the TUTORIAL.RTI file from the Emulation menu on the front panel of the Mirage CD Emulator. Choose ‘Select Image’



(MAIN MENU->EMULATION MENU->SELECT IMAGE) from the Emulation menu and then scroll down to the TUTORIAL.RTI file. Now select 'Start Emulation' using the SELECT button on the Mirage's front panel.

The Mirage's front panel will display:

```
PREPARING TO  
EMULATE
```

A list of the files which are referenced in the .RTI file will quickly be displayed on the front panel and then after a few seconds (the exact time depends upon the number and size of the files in the CD project), CD emulation will start. The top-left ball on the on-screen control panel will change and 'Start Application' will be displayed. This indicates that a viable Saturn game disc image has been found.

Use the Control Pad to select the top-left ball and press the 'A' button on the Control Pad.

You should now see the opening sequence from Panzer Dragoon.

During emulation the Mirage's LCD display changes to give information on the type of access, filename of the file being accessed and shows an error flag if an error has occurred. See Figure 6-2 on page 44 for more details.

To show the Absolute Sector on the bottom line of the display press the DISPLAY button once. To show the Track and Time Through Track on the bottom line of the display press the DISPLAY button again. To return the display to Total Disc Time press the DISPLAY button for a third time.

The YELLOW LED on the top left of the front of the Mirage lights to show CD access during emulation.

If the emulation is effected or aborted it will be reported in the emulation log (see "Log Information" beginning on page 115 for more details).

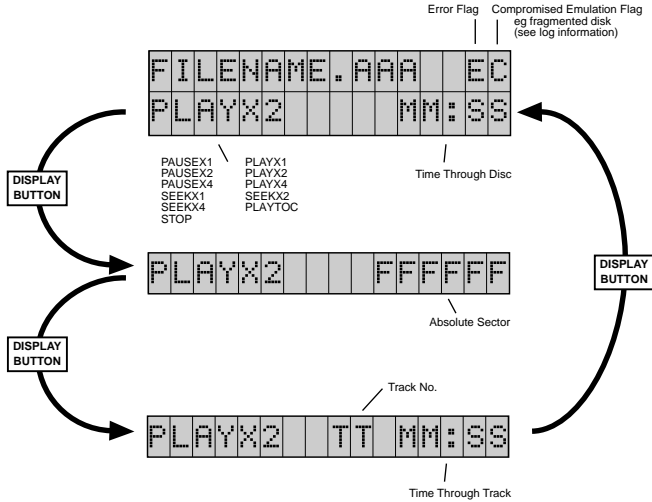


Figure 6-2: The Front Panel During Emulation



During emulation, read access from the development host will effect emulation speed or might cause the emulation to abort. A read caching utility can lessen this effect.

Write access from the development host will always abort an emulation. You should therefore try to avoid read or write access to the emulation HD wherever possible.

### 6.1.6 Stopping The Emulation

To stop the emulation running, type:

**mirage stop**

or

press the STOP button on the Mirage's front panel.

The development host can now access the Mirage's emulation HD safely.

**NOTE**

If you are unable to emulate successfully from the demonstration files check that your Mirage CD emulation system is correctly set up. Refer to “Hardware Setup For PC Hosted Systems” on page 11, “Setup For SG Indy Hosted Systems” on page 19 and “Troubleshooting” on page 123 for more information.

---

## 6.2 Writing A CD-R Disc

The following two sections describe the two methods for writing a CD-R disc from the files on the Mirage.

### 6.2.1 Writing A CD-R Disc From An .RTI File

The Mirage can be connected directly to a CD Writer to write a CD-R disc from the .RTI file.

To write a CD-R disc using a CD Writer, see “Writing A CD-R Disc” on page 49.

### 6.2.2 Writing A CD-R Disc From A Disc Image

If you do not have a CD Writer connected to your Mirage, CPBUILD can produce a CD image (.DSK) that can be used to produce a CD using Sega’s PC based SEGACDW utility.

CPBUILD takes a .SCR file and creates a final .RTI file and the CD’s image (a .DSK).

To build a CD image from the supplied demo file, switch to the DEMO\_3P or DEMO\_SD directory (depending upon which Sega key disc you are using) and type:

```
cpbuild tutorial -b -t
```

CPBUILD looks for a .SCR file as the default and, for this example, will create a disc image file called TUTORIAL.DSK along with TUTORIAL.TOC which is required by SEGACDW and TUTORIAL.RTI and TUTORIAL.PVD which are required to emulate from the .DSK.

### Testing A CD Image (.DSK) File

You can now use the MIRAGE program (or the Mirage's front panel controls) to test the .DSK file before producing a CD from it.

Start the emulation from the .DSK file by typing:

PC

```
mirage emulate=\demo_3p\tutorial.dsk
```

SG

```
mirage emulate=/demo_3p/tutorial.dsk
```

(substitute 'demo\_sd' for the 'demo\_3p' above if you are using a red Sega key disc)

or

use Select Image (MAIN MENU->EMULATION MENU->SELECT IMAGE) on the Mirage's front panel to select the TUTORIAL.DSK file and then choose Start Emulation (MAIN MENU->EMULATION MENU->START EMULATION) from the Emulation Menu using the SELECT button.

The Mirage should now emulate the CD as before.

You can now use SEGACDW to write a CD-R disc from the .DSK file.

Alternatively, if your Mirage is connected directly to a CD Writer you can write a CD-R disc from the .DSK file. See "Writing A CD-R Disc" on page 49 for more information.

## 6.3 Testing Error Recovery Routines

During the emulation of a CD, the Mirage CD Emulator allows you to introduce simulated errors using the NUDGE feature and ERROR RATE setting (see "The CD Config Menu" on page 65 for more details) to test the error recovery routines in your project. In the home environment these errors might come from excessive dirt on the CD, from the player knocking the Target or opening the CD door during game play.

You can introduce errors during emulation by pressing the NUDGE button on the front of the Mirage or by typing:

```
mirage nudge
```

or by pressing the DOOR button or by typing:

**mirage open**

While the CD door is open the Mirage's front panel emulation display will show 'Door Open'.

If your project recovers from the door being opened, you can close the door again by pressing the DOOR button again or by typing:

**mirage close**

## **6.4 Log Information**

During emulation, the Mirage creates a log of emulation events. This information is useful for post-emulation analysis of your project's CD. For more information on Logging information, see "Log Information" on page 115.

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## 7 Writing A CD-R Disc

This section describes the process of writing a CD-R disc directly from the files on the Mirage, without the need to build a disc image file (.DSK).

The Mirage also supports writing of CD-R discs from .DSK files. To write a CD-R disc from a .DSK, create and test the .DSK and then follow “Writing A CD-R Disc From An .RTI File” on page 50 substituting your .DSK file for the example .RTI file.

---

**NOTE**

Before attempting to write CD-R discs from the Mirage, make sure that the CD Writer is set up correctly. See “CD Writer Setup” on page 29 for more details.

---

### 7.1 Creating An .RTI File

Before the Mirage can write a CD-R disc, you must use the CPBUILD build tool to create an .RTI file from your project’s script file. Use:

```
cpbuild script.scr
```

where *script.scr* is the name of your script. An .RTI file will be created in the same directory as the script file. See “CPBUILD” on page 93 for more details on CPBUILD and its use.

### 7.2 Testing The .RTI File

Before you write a CD-R disc, you should make sure that your .RTI file is correct and that your CD project is operating correctly.

Use the Mirage’s front panel controls or the Mirage program to emulate from the .RTI file.

For more details on emulating using the Mirage see “Starting The Emulation” on page 42.

### 7.3 Writing A CD-R Disc From An .RTI File

Once you have created the .RTI file and successfully emulated from it, you can use the Mirage's front panel CD-R menu to write the CD-R disc.

---

**NOTE**

You can also test the complete write process using the CD-R menu's 'test write' command. This command goes through the entire CD-R writing process and is the same as the 'Write Disc' command, but does not write any information to the CD-R disc.

---

To write a CD-R disc from an .RTI file:

1. Use the CD-R menu's 'Select Image' command to select the .RTI file stored on the Mirage's emulation HD.
2. Select the desired write speed using the CD-R menu's 'Write Speed' command.

---

**NOTE**

Always check that the write speed is set correctly for the media that you are using. The Mirage resets the write speed automatically to the fastest that the CD Writer can achieve, every time that you enter the CD-R menu.

---

3. Insert a blank CD-R disc in your CD Writer.
4. Select 'Disc Write' from the CD-R menu. The Mirage will display:

```
CONFIRM X2 WRITE  
OF SCRIPT.RTI
```

where *X2* is the speed and *script.rti* is the name of the selected .RTI file.

5. Press the Mirage's front panel SELECT button to confirm the write. The Mirage will display:

```
PRESS 'DOOR'  
TO CONFIRM
```



6. Press the DOOR button to finally confirm the CD-R disc write. This double check is to make sure that you do not write a CD-R disc by mistake.

If the Mirage displays:

```
CD-R NOT READY  
RETRYING...
```

confirm that the blank CD-R disc is in the CD Writer. If you do insert the CD-R disc now, there will be a short delay while the CD Writer spins up the disc.

7. While the Mirage prepares to write the information to the CD-R disc, it will briefly display:

```
SCRIPT.RTI  
PLEASE WAIT...
```

where *script.rti* is the name of your .RTI file.

The Mirage will now start to write the CD-R disc's LeadIn and will display:

```
SCRIPT.RTI  
LEADIN
```

where *script.rti* is the name of your .RTI file.

The time taken to write the LeadIn to the CD-R disc varies depending on the number of tracks in your CD project and the write speed.

---

**NOTE**

While the Mirage is writing the CD-R disc, the CD Writer's Eject button is disabled.

---

After the Mirage has written the LeadIn, the display changes to:

```
SCRIPT.RTI  
WRITEX2 12:03
```

where *script.rti* is the name of your .RTI file and *12:03* is the time remaining for the writing of the data.

The time will count down to zero and then the Mirage will display:

```
SCRIPT.RTI  
LEADOUT
```

The time taken to write the LeadOut to the CD-R disc varies depending on the number of tracks in your CD project and the write speed

Lastly the Mirage will display:

```
WRITE COMPLETED  
SUCCESSFULLY
```

and the CD Writer will eject the CD-R disc. The CD-R disc now contains your CD project.

### 7.3.1 Halting A CD-R Disc Write Or Test Write

To halt a CD-R disc write or test write at any time during the writing of CD data:

1. Press the **CANCEL** button on the Mirage's front panel. The Mirage will display:

```
HOLD 'DOOR'  
TO ABORT
```

2. Press and hold the **DOOR** button until the Mirage displays:

```
ABORTING
```

followed immediately by:

```
EJECTING DISC
```

The CD Writer will eject the CD-R disc and the Mirage will

display:

WRITE ABORTED

If you were using the 'Write Disc' command, the ejected CD-R disc will be unusable.

3. Press the **CANCEL** button to return to the CD-R menu.

---

**NOTE**

The writing of the CD-R disc's LeadIn and LeadOut cannot be halted.

---

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# **HARDWARE REFERENCE**

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## 8 Front Panel

The Mirage CD Emulator front panel includes a 16 character by 2 line display and four buttons. The buttons control a menuing system which operates the CD emulation, Mirage CD Emulator setup, log information maintenance and CD-R disc writing. This section is a detailed description of the operation of the front panel.

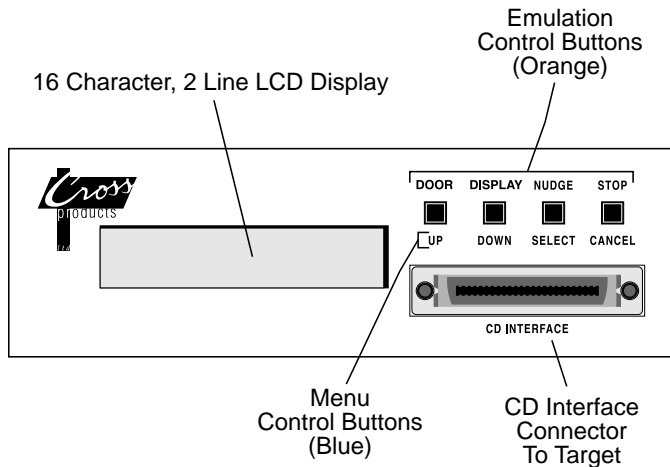


Figure 8-1: The Mirage's Front Panel

### NOTE

All of the controls on the Mirage's front panel are duplicated in the Mirage program, except those controls under the CD Config, SCSI, Config and CD-R menus (see "The Mirage Program" beginning on page 87 for more details).

### 8.1 The Front Panel Buttons

The four buttons on the front panel of the Mirage perform differently depending on whether or not the Mirage is emulating.

The bottom row of blue button labels (UP, DOWN, SELECT, CANCEL) describe how each button operates when the Mirage is

not in emulation mode. The top row of orange button labels (DOOR, DISPLAY, NUDGE, STOP) come into effect when the Mirage is emulating.

The operation of each button is described below.

### 8.1.1 DOOR

The DOOR button simulates opening and closing the door on the Mirage's virtual CD. This is equivalent to the target's CD door being opened or closed. On most target systems opening the door causes the target to switch to a start up screen.

You can use this button to test whether your project can recover from the CD door being opened during emulation.

### 8.1.2 UP

Moves the control panel display up one line.

### 8.1.3 DISPLAY

Changes the bottom line of display during emulation (For more details see Figure 6-2 on page 44).

### 8.1.4 DOWN

Moves the control panel display down one line.

### 8.1.5 NUDGE

Pressing the NUDGE button while the Mirage is emulating introduces an error (in addition to errors introduced using the error rate setting MAIN MENU->CONFIG MENU->ERROR RATE. See "The CD Config Menu" on page 65 for more details). This is equivalent to an error while accessing the CD. The NUDGE button can be used to test any error recovery routines that you might have included in your project.

### 8.1.6 SELECT

Selects the currently highlighted option, or file, on the Mirage's control panel.



**8.1.7 STOP**

The STOP button stops the current emulation.

**8.1.8 CANCEL**

Cancels the current selection and moves the menu display up one level.

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## 9 The Menuing System

The Mirage has a menu-driven interface displayed on the LCD panel on the front of the Mirage. Menu items are selected using the four buttons to the right of the LCD panel.

The menus control the emulation of a CD; Mirage's setup; log setup; re-writing the Mirage's Flash EPROM and writing of a CD-R disc.

The menus have five main tree structures:

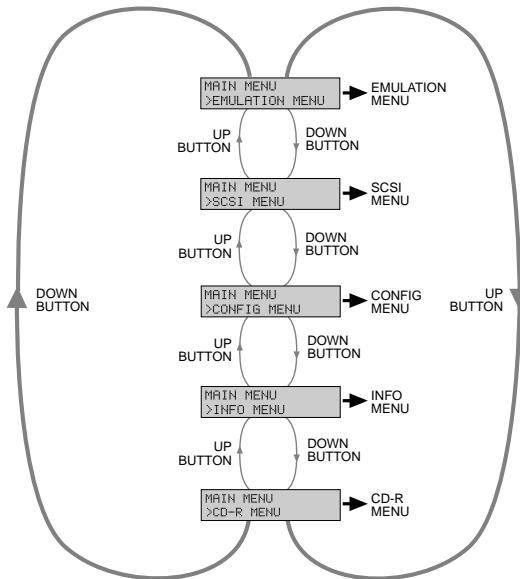


Figure 9-1: The Mirage's Menu Structure

### NOTE

When the Mirage's menuing system waits for you to press a button (for example, when an error message is displayed), you can press either CANCEL or SELECT to clear the message.

The current settings are indicated by an asterisk next to the value. The menu settings are saved when the Mirage is turned off.

## 9.1 The Emulation Menu

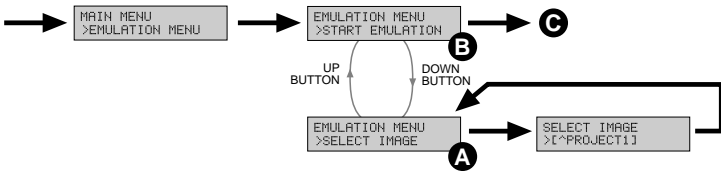


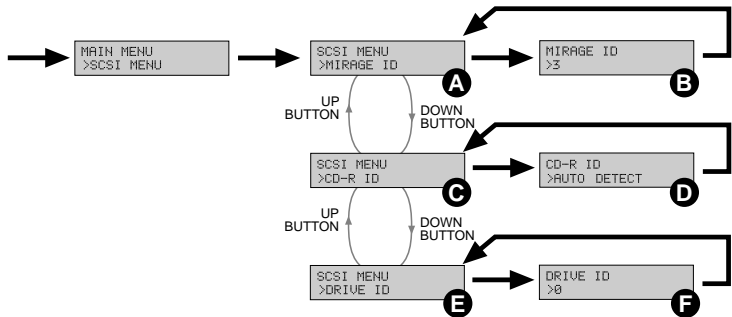
Figure 9-2: The Emulation Menu

The Emulation menu controls the two emulation functions: Select Image and Start Emulation.

The Select Image command (A) displays a list of all available emulation files (both .RTI and .DSK). You can scroll through this using the UP and DOWN buttons on the front of the Mirage. To select the file that you wish to emulate from, use the SELECT button (see “How Directories Are Displayed” on page 69 for more information on the Mirage’s directory listings).

Select Start Emulation (B) to begin emulation using the .DSK file or .RTI file chosen using the Select Image command (see Figure 6-2 on page 44 for details of the Mirage’s display during emulation (C)).

## 9.2 The SCSI Menu



**Figure 9-3: The SCSI Menu**

The SCSI menu controls the SCSI settings for the External and Expansion SCSI buses (for more details see “The Mirage’s Two SCSI Buses” beginning on page 71).

The MIRAGE ID setting (A) is the SCSI number of the Mirage’s emulation HD on the development host’s SCSI bus (the External SCSI bus). The factory default is 3. Use the UP and DOWN buttons to change the setting (B).

The CD-R ID (C) setting is the SCSI ID of the CD Writer on the Mirage’s Expansion SCSI bus. This can be set to a value of 1 to 6 (inclusive) or to ‘AUTO DETECT’. AUTO DETECT automatically scans the Expansion SCSI bus for a supported CD Writer (with SCSI ID between 1 and 6). The factory default is AUTO DETECT. Use the UP and DOWN buttons to change the setting (D).

The DRIVE ID (E) setting is the SCSI ID of the drive (0-6) on the Mirage’s Expansion SCSI bus which is used for emulation. The factory default is 0 (the Mirage’s internal HD). Use the UP and DOWN buttons to change the setting (F).

### NOTE

The SCSI ID’s set using DRIVE ID and CD-R ID must be different.

### 9.3 The Config Menu

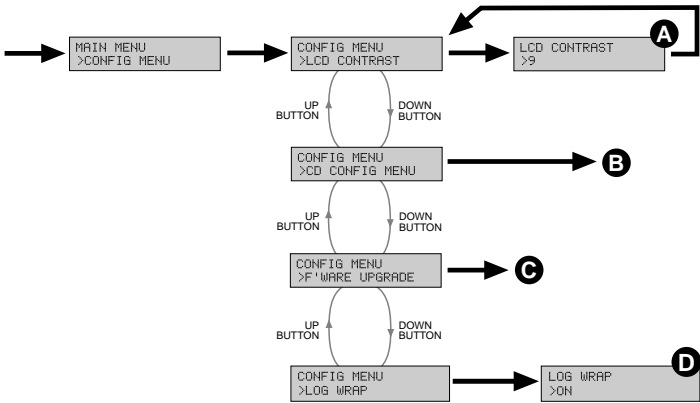


Figure 9-4: The Config Menu

The Config menu controls the LCD contrast of the Mirage’s front panel; the configuration of the emulation CD; upgrading of the Mirage’s Firmware and Log wrap around.

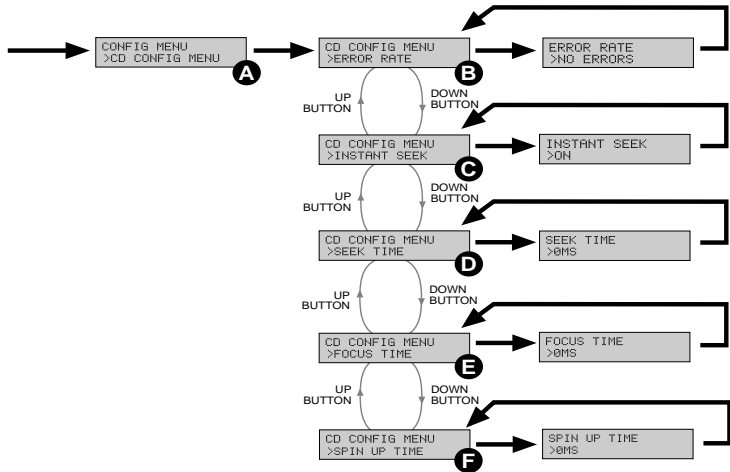
LCD CONTRAST (A) changes the contrast of the Mirage’s front panel display. Use the UP and DOWN buttons to change the setting (0-19). Use the SELECT button to choose the new setting.

For more information on the CD Config Menu (B) see “The CD Config Menu” on page 65.

For more information on the F’ware Upgrade Menu (C) see “Upgrading The Flash Firmware” on page 81.

LOG WRAP (D) sets whether the Log information wraps around when it is full. Use the UP and DOWN buttons to turn Log Wrap on or off (D). Use the SELECT button to choose the new setting. Set to OFF if you just want to log the first 2,048 emulation events.

## 9.4 The CD Config Menu



**Figure 9-5: The CD Config Menu**

The CD CONFIG MENU (A) is used to set the characteristics of the CD-ROM drive that the Mirage is emulating:

ERROR RATE (B) sets the number of errors which will occur during emulation. Possible settings are: No Errors; 1 in 100,000; 1 in 10,000; 1 in 1,000 or 1 in 100. For example 1 in 1,000 means that on average 1 in 1,000 sectors will have an error. Factory default is No Errors.

INSTANT SEEK (C) allows you to turn the Instant Seek setting on and off. If Instant Seek is on, the Mirage moves to the appropriate place in the data as fast as possible, without inserting the delays required to accurately emulate a CD mechanism. The rate that data plays from the CD is unaffected, as this is fixed at 75 sectors per second (single speed) or 150 sectors per second (double speed). The Mirage cannot increase or decrease these rates if the target is to understand the data. Factory default is Instant Seek off.

## The Menuing System

---

**SEEK TIME (D)** sets the Seek Time (how fast the emulated CD read-head moves across the disc surface) for the CD-ROM drive that is being emulated. Possible settings are from 0ms to 1,000ms in 10ms steps. The factory default for Seek Time for a Saturn target is 250ms.

**FOCUS TIME (E)** allows you to set the Focus Time (the time taken before the read-head starts to read data once it has moved to the correct position on the emulated CD) for the CD-ROM drive that is being emulated. Possible settings are from 0ms to 250ms in 5ms steps. The factory default for Focus Time for a Saturn target is 75ms.

**SPIN UP TIME (F)** sets the Spin Up Time for the emulated CD mechanism. When the target issues a STOP command, the CD mechanism stops the CD spinning. The Spin Up Time is the time taken for the CD to start and spin up to double speed. Possible settings are from 0ms to 1,200ms in 20ms steps. The factory default for Spin Up Time for a Saturn target is 960ms.



## 9.5 The Info Menu

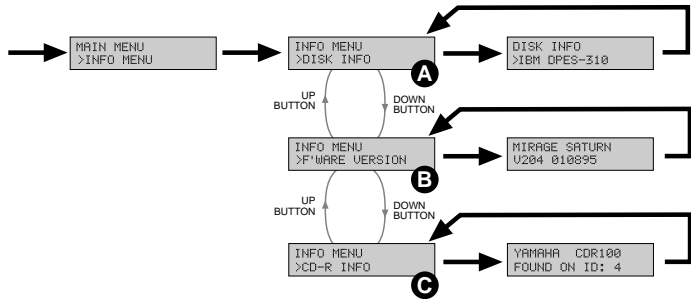


Figure 9-6: The Info Menu

The Info menu displays the Disk information, Firmware version, and CD-R information.

DISK INFO (A) gives the manufacturer's information about the Mirage's emulation HD.

F'WARE VERSION (B) shows the Firmware version of the Mirage. This is the same display that is shown at boot up of the Mirage.

CD-R INFO (C) gives the manufacturer's information and SCSI ID of the CD Writer attached to the Mirage's Expansion port if one is attached. See "The Expansion SCSI Bus" on page 72 for more details.

Press CANCEL or SELECT to return to the Info menu.

## 9.6 The CD-R Menu

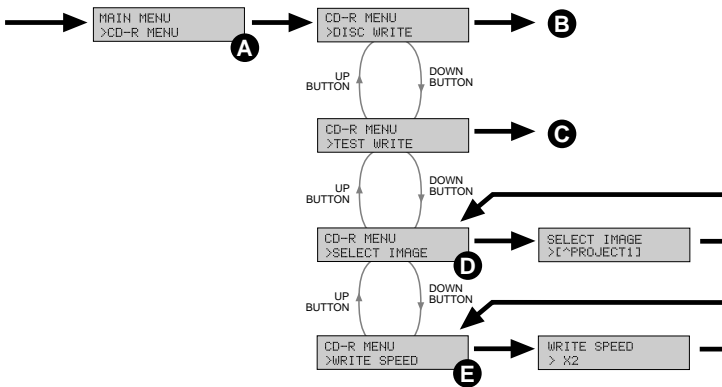


Figure 9-7: The CD-R Menu

The CD-R menu (A) controls the four CD-R disc writing functions: Disc Write, Test Write, Select Image and Write Speed. This menu can only be accessed if a CD Writer is attached to the Mirage's Expansion SCSI port.

If you try to access the CD-R menu without a CD Writer attached to the Expansion port of the Mirage, the Mirage will search for a drive and then display:

```
CD-R ERROR
CD-R NOT FOUND
```

Press CANCEL or SELECT to return to the Main menu.

The Select Image command (D) displays a list of all available files (both .RTI and .DSK) that can be used to record a CD-R disc. You can scroll through this list using the UP and DOWN buttons on the front of the Mirage. To select the file to emulate from, use the SELECT button (see "How Directories Are Displayed" on page 69 for more information on the Mirage's directory listings). The Select Image command must be used before Disc Write or Test Write. The selected image is not the same as the image which was last used for emulation. To protect against writing a CD-R disc

with the wrong image, the selected image must be set every time you wish to use the TEST WRITE or DISC WRITE commands.

Use the DISC WRITE command (**B**) to write a CD-R disc. You must use the Select Image command first to select a .RTI or .DSK image. See “Writing A CD-R Disc” on page 49 for more details.

The TEST WRITE command (**C**) tests the viability of the CD-R disc write process. The Mirage and CD Writer work through the entire process of writing a CD-R disc, except that no information is written to the disc. See “Writing A CD-R Disc” on page 49 for more details.

The WRITE SPEED command (**E**) allows you to select the speed of writing to the CD-R disc. The default is the fastest speed available for the CD Writer detected on the Mirage’s Expansion SCSI bus. The write speed is reset to the fastest speed available every time you enter the CD-R menu. Use the WRITE SPEED command to set a lower speed if you are using lower speed rated CD-R discs.

---

**NOTE**

You should thoroughly test the .RTI or .DSK file by emulation before you write a CD-R disc from it.

---

## 9.7 How Directories Are Displayed

Whenever the Mirage displays a file listing on its front panel LCD display, directories are shown in square brackets. For example selecting an entry called ‘[WORK]’ will display the contents of the ‘WORK’ directory.

The directory above the current one is displayed in square brackets with a ‘^’ preceding the name. For example ‘[^PROJECT]’ means that the ‘PROJECT’ directory is above the current one in the directory tree. This is equivalent to ‘..’ in standard DOS notation.

If the directory above the current one is the emulation HD’s root directory then it is shown as ‘[^ROOT]’. Selecting this will show

the contents of the emulation HD's root directory.

**NOTE**

The Mirage does not support multiple partitions on the emulation HD.

---

## 9.8 Mirage's Legal File Characters

The Mirage can support the following characters in legal file and directory names:

A-Z	(inclusive)	0-9	(inclusive)
_	underscore	^	caret
\$	dollar	~	tilde
!	exclamation	#	number
%	percent	&	ampersand
-	dash	{	left brace
}	right brace	@	at
'	open single quote	'	close single quote
(	left parenthesis	)	right parenthesis

The Mirage's does not support the following characters in legal file and directory names:

	space	,	comma
\	back slash	[	left square bracket
/	forward slash	.	period/full stop
]	right square bracket		(except as the extention separator)

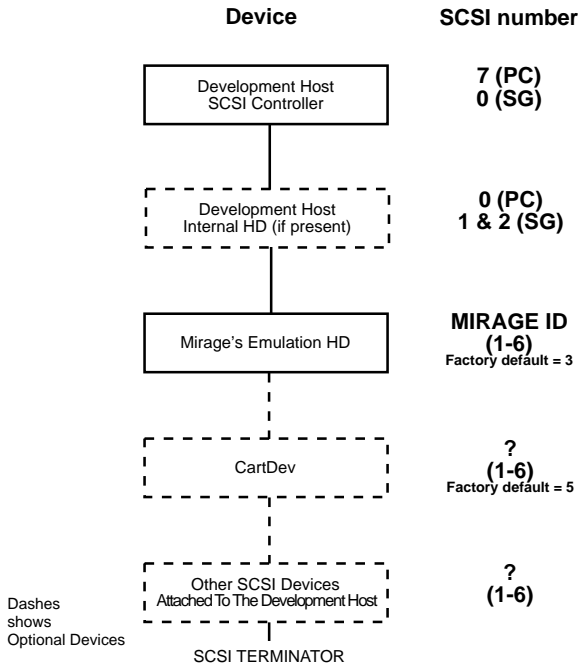
# 10 Hardware Reference

## 10.1 The Mirage's Two SCSI Buses

The Mirage's SCSI controller is simultaneously connected to two SCSI buses: The External SCSI Bus and the Expansion SCSI Bus.

### 10.1.1 The External SCSI Bus

The External SCSI bus connects the development host via its SCSI controller to its internal SCSI HD, the Mirage and any other SCSI devices connected to the development host such as a CartDev. The PC's SCSI controller always has a SCSI number of 7 and the PC's internal HD usually has a SCSI number of 0. The SG Indy's SCSI Controller always has a SCSI number of 0 and its internal HDs have SCSI numbers of 1 and 2.



**Figure 10-1: The Mirage's External SCSI Bus**

On this SCSI bus, the Mirage's SCSI number is set using the MIRAGE ID on the Mirage's front panel menuing system (MAIN MENU->SCSI MENU->MIRAGE ID). See "The Menuing System" beginning on page 61 for more details on operating the Mirage's menuing system.

The default MIRAGE ID is 3 (values from 1 to 6 are allowed).

The Mirage Controller allows the development host to indirectly access the emulation HD as a normal DOS hard disk with this SCSI number.

The Mirage is connected to the External SCSI Bus via the SCSI IN and SCSI OUT ports on the Mirage's back panel (see Figure 2-1 on page 12).

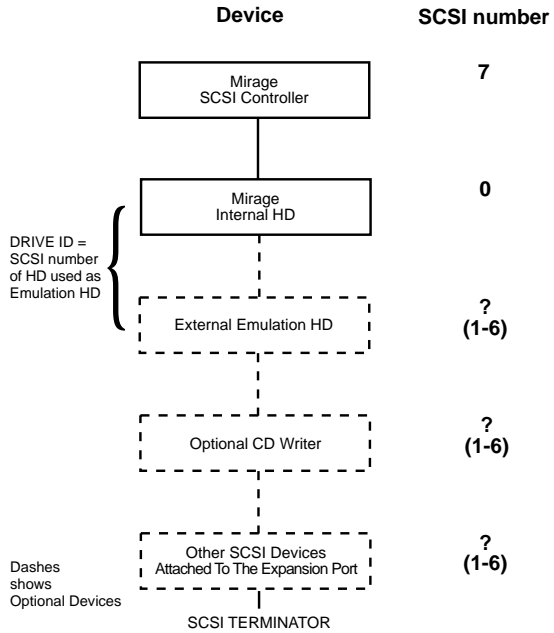
### 10.1.2 The Expansion SCSI Bus

The Expansion SCSI bus connects the Mirage's on-board SCSI controller to the Mirage's internal HD and to any other SCSI devices connected to the Mirage's Expansion port, for example a CD Writer.

On this SCSI bus the Mirage Controller itself is permanently set to SCSI device 7. The HD that the Mirage uses as the emulation drive is connected to the Mirage Controller on this SCSI bus. The emulation HD can be either the Mirage's internal HD or another SCSI drive connected via the Expansion port on the back panel of the Mirage.

The Mirage Controller uses the HD with the SCSI number given by DRIVE ID as its emulation drive. If DRIVE ID is set to 0 (the default) then the Mirage Controller uses the Mirage's internal HD as the emulation drive. Other HDs connected to the Expansion port can have SCSI numbers from 1-6. For more information on setting DRIVE ID see "The Menuing System" on page 61.

The emulation HD (defined by DRIVE ID) is the drive that the Mirage allows the development host to 'see' on the External SCSI bus.



**Figure 10-2: The Mirage's Expansion SCSI Bus**

**NOTE**

You should contact the supplier of your Mirage for compatibility information before trying to connect any SCSI devices to the Mirage's Expansion Port.

10.1.3 The Mirage's LEDs

The four LEDs on the front of the Mirage operate differently depending on whether or not the Mirage is in emulation mode.

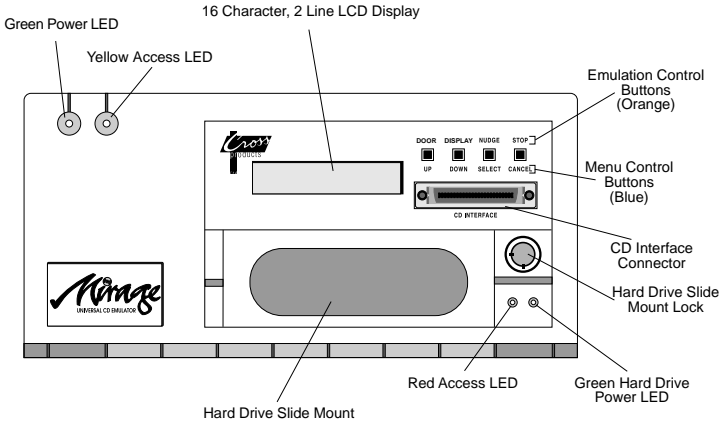


Figure 10-3: The Front Of The Mirage

The following table shows how the LEDs behave depending on whether or not the Mirage is in emulation mode:

Table 10-1: The Mirage's LEDs

	Green LED (upper left)	Yellow LED	Red LED	Green LED (lower right)
During normal operation	Mirage Power	Emulation Drive access (set by DRIVE ID)	Internal HD access*	Internal Drive Power**
During emulation mode	Mirage Power	CD Access	Internal HD access*	Internal Drive Power**
During CD-R recording	Mirage Power	CD Writer Access	Internal HD access*	Internal Drive Power**

\* The Red LED might not be connected on some internal HDs.

\*\* Shows internal drive power if the tray is locked in place.



# 11 Changing Targets

One of the Mirage's unique features is the ability to use it with different targets simply by changing a small hardware 'personality' module. The personality module is a small circuit board at the front of the Mirage which holds the interface electronics specific to each target.

This section describes how to change personality modules.

If you have any problems while attempting to change modules, please contact Technical Support (See "Technical Support" on page 4 for more details).



---

While changing the personality modules, you should take care at all times. The Mirage personality module is sensitive to static electricity. Keep the new personality module in its anti-static bag until you are ready to insert it into the Mirage. Before handling the personality module, always ground yourself by touching an unpainted surface on a grounded object (such as a metal desk lamp). Alternatively you can use an anti-static strap and wrist band.

Keep all removed screws in a safe place and note their original location.

---

## 11.1 Changing The Mirage's Firmware



---

The Mirage's flash firmware must match the personality module. The Mirage might be damaged if you try to emulate from a Mirage which has firmware that does not match its personality module.

---

The Mirage's firmware must be updated before the personality module is changed. For more information on updating the Flash firmware see "Upgrading The Flash Firmware" beginning on page 81.

After you have updated the Mirage's firmware to a version

compatible with the new personality module, you can remove the old personality module.

### 11.2 Removing The Personality Module

To remove the Mirage's personality module:

1. Turn off the Mirage and disconnect it from the development host, target and any other SCSI devices (such as the CartDev).
2. Turn the Mirage upside down and place it on a suitable surface. Be careful not scratch the Mirage's metal casing.
3. Unscrew the screws labelled (1) as shown in Figure 11-1 and remove the screws and back case feet.
4. Carefully unscrew the screws labelled (2) shown in Figure 11-1 and remove the screws and front case feet.
5. Turn the Mirage back onto its base, whilst holding the Mirage's case front in place.

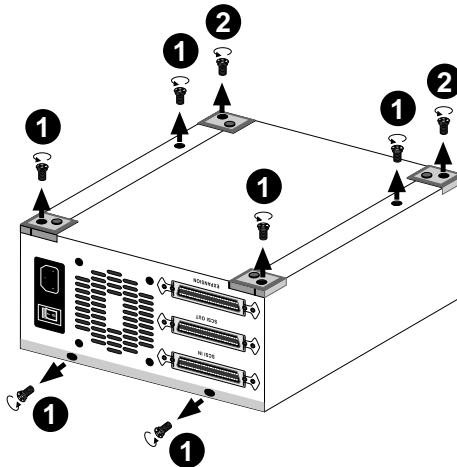
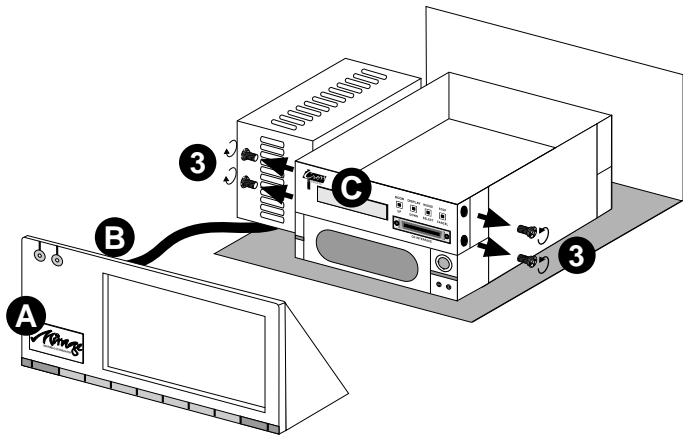


Figure 11-1: Removing The Mirage's Top And Front

6. Pull the Mirage's front case (Item **A** in Figure 11-2) forward and to one side, being careful not to stretch the cable (Item **B** in Figure 11-2) connecting the front case to the Mirage.
7. Unscrew the four screws labelled (**3**) in Figure 11-2 on page 77 which connect the LCD panel to the Mirage.
8. Lay the LCD panel (Item **C** in Figure 11-2) at the front of the Mirage being careful not to stretch the three ribbon cables holding the LCD panel to the Mirage main circuit board.



**Figure 11-2: Removing The Mirage's LCD Panel**

9. Unscrew the four screws labelled (**4**) in Figure 11-3 which connect the personality module to the Mirage.

---

**NOTE**

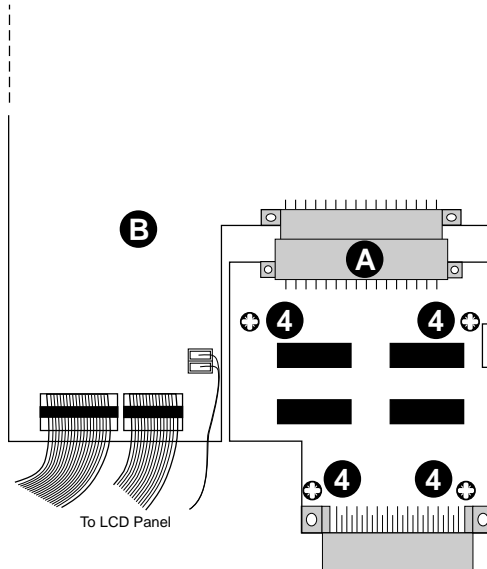
The personality module shown in Figure 11-3 on page 78 may differ slightly from the one in your Mirage depending upon the target system that your Mirage has been connected to.

---

10. Unplug the old personality module from the Mirage by moving it forward until its rear connector (Item **A** in Figure 11-3)

disconnects fully from the Mirage's main circuit board (Item **B** in Figure 11-3 on page 78).

11. Place the old personality module in an anti-static bag and keep in a safe place ready for future use.



**Figure 11-3: Unscrewing The Personality Module**

### 11.3 Inserting The New Personality Module

To insert the new personality module into the Mirage:

1. Insert the new personality module into the same connector as the old module (Item **A** in Figure 11-3).
2. Make sure that the connector is pressed fully home.
3. Replace the four screws marked **4** in Figure 11-3.
4. Lift the Mirage's LCD panel into place and replace the four

screws marked **3** in Figure 11-2. Make sure that the ribbon cables which connect the Mirage and the LCD panel are not crimped by the LCD panel and that the CD Interface connector at the front of the personality module is properly positioned through the hole in the front of the LCD panel.

5. Move the Mirage's case front into place.
6. Hold the Mirage's case front in place whilst turning the Mirage onto its top.
7. Replace the Mirage's four case feet and the screws labelled **1** and **2** in Figure 11-1.
8. Reconnect the development host and the new target (see "Hardware Setup For PC Hosted Systems" on page 11 or "Setup For SG Indy Hosted Systems" on page 19 for more details).

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## 12 Upgrading The Flash Firmware

The Mirage stores its Firmware in a Flash EPROM ('Flash'). This allows you to upgrade the firmware running the Mirage without having to change any components or return the Mirage. Upgrading the firmware might provide more features or support for more target systems.

New Flash firmware files are released from time to time and can be obtained via our BBS (details below) or on disk direct from Cross Products.

---

**NOTE**

If you have any problems re-writing the Mirage's Flash or any error messages appear, please contact Technical Support (for contact details see "Technical Support" on page 4).

The version of the Mirage program must match the version of the Mirage's firmware that you are using.

---

### 12.1 The Cross Products BBS

Cross Products runs a BBS system containing the latest versions of the programs; support files and documentation for our various products.

You will find the latest version of the Mirage program (MIRAGE) and Flash firmware for your target system on the BBS in the MIRAGE area. The version of the Mirage program must match the Flash.

For more details on the BBS see "Technical Support" beginning on page 4.

### 12.2 How To Re-Write The Flash

---



You must not switch off the Mirage CD Emulator while the Flash firmware is being re-written. Doing so will result in the Firmware being unable to re-write itself and the upgrade failing. Your Mirage CD Emulator will have to be returned to the supplier to be repaired and might incur a repair charge.

---

To re-write the Flash firmware:

1. Obtain a new Flash firmware image file (.EMF) from Cross Products.
  2. Copy the .EMF file into the MIRAGE directory on the Mirage's emulation HD.
- 



Before copying the .EMF file to the Mirage make sure that write caching is turned off or wait for the development host to write the complete .EMF file to the MIRAGE directory before proceeding.

---

3. Select MAIN MENU->CONFIG MENU->FIRMWARE UPGRADE on the Mirage's front panel using the UP, DOWN and SELECT buttons.
4. Scroll through the displayed list of .EMF files and select the new Firmware upgrade file using the SELECT button.

```
FIRMWARE UPGRADE
>SATU204.EMF
```

If you select a file which is not a valid .EMF file, the following message will be displayed. Press CANCEL or SELECT to take you back to the FIRMWARE UPGRADE selection display.

```
FIRMWARE UPGRADE
NOT A VALID EMF!
```

5. When prompted on the Mirage's display confirm that you wish



to re-write the Flash firmware in the Mirage.

```
UPGRADE SATV204  
CONFIRM?
```

Press the **SELECT** button to confirm that you wish to re-write the Flash. Pressing any other button cancels the Flash re-write. The Mirage will now re-write its firmware using the specified .EMF file. This will take approximately 10 seconds.

While the Mirage is re-writing the Flash, the following message is displayed:

```
WRITING FIRMWARE  
DO NOT TOUCH...
```

If an error occurs while the Flash is being re-written, the following message is displayed:

```
WRITING FIRMWARE  
RETRYING
```

You should contact your Mirage supplier immediately before trying to use your Mirage.

6. If the Flash re-write is successful, the following message is displayed:

```
UPGRADE COMPLETE  
PRESS SELECT
```

7. Press the **SELECT** key, to re-boot the Mirage from the new Firmware. The Mirage returns to the **MAIN MENU** after displaying the new Firmware version number on its start-up screen.

While the Mirage is re-booting, the LCD panel will display:

```
CONFIG FAIL  
USING DEFAULTS
```

This is perfectly normal. When the firmware is re-written the

## Upgrading The Flash Firmware

---

user configuration file (which contains the values set using the CD Config Menu) is over written with the factory defaults. You will have to use the CD Config Menu to reset your settings.

The Mirage is ready to use again.

If you have updated the Mirage's Flash prior to changing the Mirage's personality module, do not attempt to use the Mirage. Turn to "Removing The Personality Module" on page 76.

# REFERENCE

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## 13 The Mirage Program

The Mirage program (MIRAGE) controls the CD emulation from the development host via the SCSI link. It is used instead of, or in conjunction with, the front panel buttons on the Mirage CD Emulator itself.

The Mirage program is also used to retrieve the log information from the Mirage Emulator for debugging purposes (for more details see “Log Information” beginning on page 115).

This section describes how to invoke the Mirage program and details the commands used to start and stop the emulation, fetch the log information and to simulate opening and closing of the target’s CD drive door.

You can also control the emulation directly from the Mirage’s front panel. See “The Menuing System” beginning on page 61 for more details.

---

**NOTE**

The version of the Mirage program must match the version of the Mirage’s firmware that you are using.

For a development PC, there must be an ASPI driver for the PC’s SCSI card installed for the Mirage’s control program (MIRAGE.EXE) to operate correctly. See your SCSI interface’s manual for more details.

---

### 13.1 Command-line Syntax

The command-line syntax for the Mirage program consists of the program name followed by one command. The syntax is:

**mirage** *Command*

---

**NOTE**

For convenience you only have to use enough of the command name to make the command unique, but you are recommended to use at least the first three characters for future compatibility.

---

### 13.2 Command-line Commands

The Mirage program has five possible commands. Only one command can be used at a time. The available commands are: EMULATE; STOP; NUDGE; OPEN; CLOSE; INFO; LOG and MONITOR.

#### 13.2.1 EMULATE

Starts the emulation using the specified CD image (.DSK) or by parsing the .RTI file (on the emulation HD), generating the CD image on-the-fly.

The EMULATE command is equivalent to selecting the IMAGE.DSK or IMAGE.RTI file using the Mirage's front panel menuing system (for more details see "Front Panel" beginning on page 57).

The .RTI and .DSK files have been previously built using the CPBUILD program (see "About CPBUILD" on page 93 for more details).

The .RTI file has been built from the emulation script. In most cases, the Mirage CD Emulator is fast enough to be able to emulate directly from an .RTI file without having to build a final CD image. See "The Scripting Language" on page 97 for more information on the Mirage's scripting language.

#### Syntax

**EMULATE=***image.dsk*

or

**EMULATE=***script.rti*

### Example 1

PC

```
mirage emulate=\project\game1.dsk
```

SG

```
mirage emulate=/project/game1.dsk
```

starts an emulation using the CD image contained in the GAME1.DSK file in the Project directory on the emulation HD.

### Example 2

PC

```
mirage emulate=\project\game1.rti
```

SG

```
mirage emulate=/project/game1.rti
```

starts an emulation using the GAME1.RTI file.

## 13.2.2 STOP

Stops the current emulation. The STOP command is equivalent to pressing the STOP button on the Mirage's front panel (for more details see "Front Panel" beginning on page 57).

### Example

```
mirage stop
```

## 13.2.3 NUDGE

Generates a simulated CD access error. NUDGE generates an error in addition to errors caused by the Error Rate setting. NUDGE can be used to test any error recovery routines that you might have included in your software. The MIRAGE program's NUDGE command is equivalent to pressing the NUDGE button on the front panel. Any errors introduced by using NUDGE are recorded in the Mirage's logging information (for more information on logging see "Log Information" on page 115).

### Example

```
mirage nudge
```

## 13.2.4 OPEN

Simulates the CD drive door being opened on the target machine (most targets have a special display which is initiated by the drive

door being opened). The OPEN command is equivalent to pressing the DOOR button once on the Mirage front panel. Your project should be able to recover from the CD door being opened and should not crash the target.

### Example

```
mirage open
```

#### 13.2.5 CLOSE

Simulates the CD drive door being closed on the target machine. The CLOSE command is equivalent to pressing the DOOR button on the Mirage front panel when the CD door is open.

### Example

```
mirage close
```

#### 13.2.6 INFO [>filename]

Sends the Mirage's current configuration information to the screen and optionally to a specified file. The configuration includes information on all of the Mirage's settings. A typical example might be:

```
MIRAGE CD Emulator - Remote Control Software.  
Version 1.10a Feb 16 1996 15:45:02.  
(C) 1995 Cross Products Ltd. All rights reserved.
```

```
Mirage found, on Host Adapter 0, at Target ID 3  
Mirage information  
Version:-  
Number           110a  
Type             Release  
Model            SATURN  
Compile Time     12:28:00  
Compile Date     Feb 15 1996
```

```
Configuration:-  
MIRAGE ID        3  
DRIVE ID         0  
LCD Contrast     8  
Emulation file   /DEMO_SD/TUTORIAL.DSK  
Spin up time     960  
Seek Time        250  
Focus Time       75  
Instant Seek     OFF  
Error Rate       0  
Logging Wrap     ON
```



**Example 1**

```
mirage info
```

Sends the current Mirage configuration to the screen.

**Example 2****PC**

```
mirage info >C:\project1\info.txt
```

**SG**

```
mirage info >/project1/info.txt
```

Sends the current Mirage configuration to the file ‘info.txt’ in the Project1 directory on the development host’s HD.

**13.2.7****LOG [>filename] [>>filename]**

Sends the logging information from the last emulation to the screen; to the named file; or appends the logging information to the named file. See “Log Information” on page 115 for a detailed description of the logging information.

**Example 1**

```
mirage log
```

Sends the logging information to the screen.

**Example 2****PC**

```
mirage log >C:\project1\log.txt
```

**SG**

```
mirage log >/project1/log.txt
```

Sends the logging information to the file called ‘log.txt’ in the Project1 directory on the development host’s HD.

**Example 3****PC**

```
mirage log >>C:\project1\all_log.txt
```

**SG**

```
mirage log >>/project1/all_log.txt
```

Appends the logging information to the file called ‘all\_log.txt’ in the Project1 directory on the development host’s HD.

### 13.2.8 **MONITOR[=filename]**

Starts monitoring the logging information during emulation. The logging information is sent directly to the development host's screen. If a filename is specified, then the logging information is also saved to that file. For more details on logging information see "Log Information" on page 115.

#### **Example 1**

```
mirage monitor
```

Shows the logging information in real time on the development host's screen during emulation.

#### **Example 2**

PC

```
mirage monitor=C:\project1\log.txt
```

SG

```
mirage monitor=/project1/log.txt
```

Shows the logging information 'live' during emulation and then saves it into the file called 'log.txt' in the Project1 directory on the development host's screen.

### 13.2.9 **Built-In Help**

The Mirage program also includes a brief built-in help which gives the syntax of each of the above commands. To view the built-in help type:

```
mirage
```

or

```
mirage help
```

## 14 CPBUILD

CPBUILD is used to pre-build and build CD images for use with the Mirage CD Emulator. CPBUILD can also create the files that are used by CD Writers to write CD-R discs.

---

**NOTE**

CPBUILD is compatible with the JVC supplied VCD image building tools available for development PCs. For more details see the JVC/SEGA Virtual CD System User's Manual.

---

### 14.1 About CPBUILD

You can use CPBUILD to:

#### 14.1.1 Produce An .RTI file From A .SCR File

CPBUILD can be used to convert an .SCR script file into an .RTI file. An .RTI file is a disc configuration file containing pointers to the various files which will make up your final CD project. A Primary Volume Descriptor (.PVD) file which is used during emulation is also created.

The process of converting an .SCR file into an .RTI file takes only a few seconds. The Mirage can emulate directly from an .RTI file.

For more details on script files see “The Scripting Language” on page 97.

#### 14.1.2 Build A Complete Disc Image

CPBUILD can build a complete CD image file (.DSK), a disc configuration file (.RTI), a Primary Volume Descriptor file (.PVD) and a Table Of Contents file (.TOC) from an .SCR file. These four files can then be used for emulation or to write a CD-R disc using a CD Writer.

---

**NOTE**

It is not necessary to build a .DSK if you connect a supported CD Writer directly to the Mirage. See “Writing A CD-R Disc” on page 49 for more details.

---

## 14.2 Command Line Syntax

CPBUILD has the following syntax:

```
cpbuild script.scr [switch]
```

where *script.scr* is the name of the script file to be used to create the disc configuration file (.RTI). CPBUILD's default file extension is .SCR. The .RTI file has the same name as the .SCR file. When creating the .RTI file, CPBUILD checks the validity of the script and will generate error message(s) if the .SCR file does not exist or does not contain a valid script.

CPBUILD searches for the files which make up the CD in three places, in the following order of preference:

1. In the path defined using the **-s** switch
2. In the path defined by the CPBUILD environment variable
3. In the script's path

### 14.2.1 Switches

The following switches are available:

**-b**

By default CPBUILD creates only .RTI and .PVD files from the script (.SCR) file. These files can then be used for emulation by the Mirage. The **-b** switch is used to build a complete disc image file (.DSK). This file can be used for emulation or with a .TOC file to burn a gold disc (see “-t” on page 95 for more details). This build process can take a considerable time depending on the complexity of the disc image being built.

---

**NOTE**

If you wish to write CD-R discs during your project, you must use a Yamaha CDR-100 with version 1.08 firmware or later to be compatible with a Saturn target.

---

**-l**ext

The **-l** switch lets you specify a non-default error message file. For example, if an error message file is available in another language, you can tell CPBUILD to use it with the **-l** switch and the extension of the error messages file. CPBUILD's default English language error messages are stored in a file called CPBERR.ENG.

**-n**

By default CPBUILD displays a copyright message every time that it is executed. Use the **-n** switch to suppress this message.

**-o**path

By default CPBUILD places all outputted files (.RTI, .DSK, .TOC and .PVD) into the current directory. Use the **-o** switch to re-direct this output to another directory. The **-o** switch overrides any path included in the script's DISC line.

**-s**path

The **-s** switch lets you specify the directory where source files referenced in the script are stored. See "Command Line Syntax" on page 94 for more details.

**-t**

Creates a table of contents file (.TOC). This file is then used with the .DSK disc image file by a CD Writer to write a CD-R disc.

**-v**

Use the **-v** switch if you wish to see the name of the file that it is currently processing. By default, during the disc image build process (using the **-b** switch) CPBUILD does not show its progress.

**-h**

Use this switch to display usage information and the version and copyright details of the version of CPBUILD that you have.

## 14.3 CPBUILD Error Messages

For a list of CPBUILD's error messages and their meaning, see "CPBUILD Errors Messages" on page 131.

## 14.4 Examples



```
cpbuild test.scr -oE:\
```

takes the script file called TEST.SCR in the current directory, checks its contents for errors and then creates a disc configuration file called TEST.RTI in the root directory of drive E:.



```
cpbuild test.scr -s\project1 -oD:\ -b -v -t
```

takes the file TEST.SCR and its source files (in the PC's HD's \PROJECT1 directory) and outputs four files to the root directory on the D: drive: TEST.DSK containing the complete image of the finished CD disc; TEST.RTI, the disc configuration file for the completed CD disc; TEST.PVD, the Primary Volume Descriptor file and TEST.TOC, the table of contents file used when burning a gold disc. The output file name can be different from the input .SCR file if it is specified in the DISC command at the start of the script file. The name of the file being worked on is displayed during the disc image build process.



```
cpbuild test.scr -o/mirage -b -l jap
```

takes the file TEST.SCR in the current directory and outputs three files to /mirage: TEST.DSK containing the complete image of the finished CD disc; TEST.RTI, the disc configuration file for the completed CD disc and TEST.PVD, the Primary Volume Descriptor file. The output file name can be different from the input .SCR file if it is specified in the DISC command at the start of the script file. Uses the error messages stored in the file called CPBERR.JAP (in other words, the error messages are in Japanese).

# 15 The Scripting Language

This section introduces you to the scripts which are parsed by CPBUILD to make the .RTI and .DSK files used for emulation and CD-R disc writing. The scripting language consists of a number of commands which may or may not have parameters and which must be used in a certain order in a script.

This section will show you the commands and their syntax and then show you several example scripts in detail.

**NOTE**

---

The scripting language parameters are case sensitive.

---

## 15.1 Command Parameters

Before looking at the scripting commands in detail, it is necessary to define the format of the most common parameters:

### d-type Characters

Part of the ISO 9660 definitions, d-type characters are A-Z inclusive, 0-9 inclusive and underscore ‘\_’.

### a-type Characters

Part of the ISO 9660 definitions, a-type characters are:

A-Z	(inclusive)	0-9	(inclusive)
_	underscore	*	astericks
+	plus	?	question mark
!	exclamation	;	semi-colon
%	percent	&	ampersand
-	dash	=	equals
>	greater than	<	lesser than
‘	single quote	“	double quote
(	left parenthesis	)	right parenthesis
	space	,	comma
/	forward slash	:	colon
.	period/full stop		

### **ISO9660 File Names**

The format for ISO9660 file names is similar to standard DOS format file and directory names with a version number tagged on after a semi colon. The format is AAAAAAAAA.XXX;N where N is a version number which can be any number from 1 to 32767. If no version number is specified, 0 is used. The characters used in the name and extension must be from the ISO9660 d characters list.

### **ISO9660 Directory Names**

The format for ISO9660 directory names is similar to that for ISO9660 file names, but without the extension and version number.

### **Relative Position In Sessions**

Relative position in sessions is written as mm:ss:ff where ff is the number of frames. 00:00:00 is the position immediately after where the lead-in ends. In the CD image, the relative position is changed to an actual address.

### **Relative Position In Files**

Relative position in files is written as mm:ss:ff where ff is the number of frames. 00:00:00 is the start of the file.

### **Dates**

Dates are recorded with a time stamp included in DD/MM/YYYY hh:mm:ss:cc:gg format where cc is 100ths of a second and gg is the difference with Greenwich Standard Time in 15 minute intervals from -48 (West) to +52 (East).

## **15.2 Scripting Commands And Their Syntax**

The commands which make up the Mirage's scripting language are described below. These commands must be used in a certain order which can be seen in more detail in "Example Script" on page 111.



**NOTE**

The commands must be typed exactly as shown below. Optional parameters are shown in square brackets.

---

### 15.2.1 Disc Definition Commands

#### **Include *filename***

*Filename* is the name of another script file to include.

#### **Disc *filename***

The start of the disc definition where *filename* is the name of the .DSK file which is outputted. *filename* can also include a path name where the .DSK will be stored. This is overridden by a path specified with CPBUILD's **-o** switch. A disc definition must end with an EndDisc command. Although a disc might have more than one session, a script can only define one disc. For a Saturn target, multi-session discs are not supported.

#### **EndDisc**

The end of the disc definition.

#### **Session *disctype* [*filename*]**

The start of a session definition. *disctype* is the session type which can be CDROM (for CD-ROMs and CD-DA discs), CDI (for CD-i discs) or ROMXA (for CD-ROM XA discs). *filename* is the name, in ISO9660 format, of the optional file which will be written and will only contain this session (similar to a full .DSK). A session definition must end with an EndSession command. Sessions begin with a lead-in followed immediately by:

- A system area
- Volume description commands
- One or more tracks

and

- A lead-out

There can be a total of 99 tracks on a disc of various types

(MODE0, MODE1, MODE2, CDDA). A disc must have at least one session.

### **CatalogNo *number***

The catalog number of the disc. You should try to make this a unique number for your disc. *number* is a decimal number of 13 or fewer digits. For a Saturn target this number is obtainable from Sega.

### **EndSession**

Marks the end of a session.

### **LeadIn *type***

The start of the lead in definition for a particular session. *type* is the type of data in the session and can be CDDA (for audio), MODE0, MODE1 or MODE2.

### **EndLeadIn**

Marks the end of the lead in definition for a particular session.

### **LeadOut *type***

The end of the lead out definition for a particular session. *type* is the type of data in the session and can be CDDA (for audio), MODE0, MODE1 or MODE2. *type* must be the same as for the lead in.

### **EndLeadOut**

Marks the end of the lead out definition for a particular session.

### **Track *type***

Marks the start of a track definition where *type* is the type of track to be written. Valid types are CDDA (for audio), MODE0, MODE1 or MODE2. Up to 99 tracks can be defined and they are written in the order in which they appear in the script. A Track command must be followed by the commands that detail the exact layout and contents of the track. See “Directory Commands” on page 106 for more details.

### **EndTrack**

Marks the end of the track definition.

### **SystemArea *filename***

Defines the System Area of an ISO9660 volume. *filename* is the data file for the system area. This is usually 'IP.BIN' for a Saturn target.

### **Empty *number***

Specifies the number of blocks of null data (0x00) to be written. *number* is the number of blocks. Normally used to place a buffer area in a lead-out to stop the CD player reading past the end of the track. Empty should only be used in a Lead Out.

## **15.2.2 Track Commands**

Tracks are laid down on the disc in the same order that they are defined in the script. The following commands are used between Track and EndTrack commands:

### **Volume *volumetype filename***

The start of the volume description. *volumetype* is the type of volume which is usually 'ISO9660' and *filename* is the name of the .PVD file which is to be used to store the volume description. A Volume command is usually followed by certain commands which define the layout and contents of the volume. See "Volume Commands" on page 103 for more details.

### **EndVolume**

Marks the end of the volume description.

### **File *name [output]***

The start of a file definition where *name* is the name of the file in ISO9660 format and *output* is the name of the outputted file if this is different from the inputted file.

### **EndFile**

The end of the file definition.

### **Pause *number***

Defines the number of blocks paused at the beginning of the track. *number* is the number of blocks. When this command is not used there is no pause and data access begins immediately. The normal pause is about 2 seconds which is 150 blocks. Pause applies to CDDA discs only.

### **PreGap *number***

Defines the number of pre-gap information blocks recorded at the beginning of a track. *number* is the number of blocks.

### **PostGap *number***

Defines the number of post-gap information blocks recorded at the end of a track. *number* is the number of blocks.

### **Directory *name***

Beginning of the directory definition. *name* is in ISO9660 format. Multiple Directory commands can be nested to give a hierarchical directory structure. See “Directory Commands” on page 106 for details on the commands used between Directory and EndDirectory commands.

### **EndDirectory**

End of the directory definition.

### **PreEmphasis *switch***

Specifies whether the preemphasis bit of the Q subcode channel is on or off. If *switch* is TRUE then the bit is on and if it is FALSE, the bit is off. The default for the preemphasis bit is off.

### **Channels *number***

Only valid when the track is a CDDA (audio) type. Specifies whether the track will have two or four channels. *number* is the number of channels ie 2 or 4. The default value is 2.

### **Copy *switch***

Only valid when the track type is CDDA (audio). Specifies

whether digital copying of the track is allowed. If *switch* is TRUE then copying is permitted. The default is FALSE.

### 15.2.3 Volume Commands

The following commands can be used only within a volume definition ie between Volume and EndVolume commands.

#### **PrimaryVolume *relposition***

Marks the start of the primary volume description. *relposition* is the position on the disc where this volume is stored. If *relposition* is omitted the volume is stored at the next free space on the disc.

#### **EndPrimaryVolume**

Marks the end of the primary volume definition.

#### **SupplementaryVolume *relposition***

Start of a supplementary volume definition. *relposition* is the position on the disc where the supplementary volume is recorded. If *relposition* is omitted the volume is stored at the next free space on the disc.

#### **EndSupplementaryVolume**

Marks the end of a supplementary volume definition.

#### **VolumePartition *relposition***

Marks the start of a volume partition definition. *relposition* is the position on the disc where the volume partition is recorded. If *relposition* is omitted the volume is stored at the next free space on the disc.

#### **EndVolumePartition**

Marks the end of a volume partition statement record.

#### **BootRecord *relposition***

Marks the start of a boot record. *relposition* is the position on the disc where the boot record is recorded. If *relposition* is omitted the volume is stored at the next free space on the disc.

### **EndBootRecord**

Marks the end of a boot record.

### **DescriptorWrites *noofoutputs***

Defines the number of outputs in the particular volume statement record. *noofoutputs* is the number of outputs.

### **SystemIdentifier *name***

Defines the system identifier name. *name* is a text string specifying the name of the target system. *name* must be enclosed in double quotes and not exceed 32 characters in length.

### **VolumeIdentifier *name***

Defines the volume identifier name. *name* is a text string enclosed in double quotes and must not exceed 32 characters in length.

### **VolumePartitionIdentifier *name***

Defines the volume partition identifier name. *name* is a text string enclosed in double quotes and must not exceed 32 characters in length.

### **LogicalBlockSize *size***

Defines the logical block size of the volume. *size* can be 512, 1024 or 2048. If this command is not used, the logical block size defaults to 2,048.

### **LPath**

Writes an LPath descriptor to the disc. LPath is a directory structure of the disc and is part of the ISO9660 definition.

### **MPath**

Writes an MPath descriptor to the disc. MPath is a directory structure of the disc and is part of the ISO9660 definition.

### **OptionalLPath**

Writes an optional LPath descriptor to the disc. The optional LPath is a directory structure of the disc and is part of the ISO9660

definition.

### **OptionalMPath**

Writes an optional MPath descriptor to the disc. The Optional MPath is a directory structure of the disc and is part of the ISO9660 definition.

### **VolumeSetIdentifier *name***

Defines the volume set identifier. *name* is a text string enclosed in double quotes and must not exceed 128 characters in length.

### **PublisherIdentifier *name***

Defines the publisher identifier. *name* is a text string specifying the name of the disc's publisher. *name* must be enclosed in double quotes and not exceed 128 characters in length.

### **DataPreparerIdentifier *name***

Defines the data preparer identifier. *name* is a text string specifying the name of the disc's author. *name* must be enclosed in double quotes and not exceed 128 characters in length.

### **ApplicationIdentifier *name***

Defines the application identifier. *name* is a text string specifying the name of the disc's application. *name* must be enclosed in double quotes and not exceed 128 characters in length.

### **BootIdentifier *name***

Defines the boot identifier. *name* is a text string enclosed in double quotes and not exceed 32 characters in length.

### **CopyrightFileIdentifier *name***

Defines the name of the file in the primary volume root directory which contains the copyright information. *name* is a text string specifying the name of the file in the root directory containing the disc's copyright information. *name* must be enclosed in double quotes and not exceed 37 characters in length.

### **AbstractFileIdentifier *name***

Defines the file in the primary volume root directory which contains the disc's summary information. *name* is a text string specifying the name of the file in the root directory containing the abstract file information. *name* must be enclosed in double quotes and not exceed 37 characters in length.

### **BibliographicFileIdentifier *name***

Defines the file in the primary volume root directory which contains the disc's bibliographic information. *name* is a text string specifying the name of the file in the root directory containing the disc's bibliographic information. *name* must be enclosed in double quotes and not exceed 37 characters in length.

### **VolumeCreationDate *date***

Specifies the date of creation.

### **VolumeModificationDate *date***

Specifies the date of the most recent modification.

### **VolumeExpirationDate *date***

Specifies the date of expiration of the volume.

### **VolumeEffectiveDate *date***

Specifies the start date of the volume.

### **ApplicationUse *name***

*name* is the file to store in the Application Use area on the disc.

## 15.2.4 Directory Commands

The following commands are used to set up directories on the CD and are used between Directory and EndDirectory commands:

### **Attributes *attribute***

Specifies the attributes for the directory. *attribute* is HIDDEN (for a hidden directory), NOHIDDEN (for a visible directory), RECORD or NORECORD. The default is NOHIDDEN.



**MinLength *number***

Defines the minimum length of a directory entry in this directory. *number* is a length in bytes.

**15.2.5 File Commands**

The following commands are used to set up and arrange files on the disc:

**RecordingDate *date***

Date that the file was recorded. *date* is date format. If this command is not specified, then the date of CD image creation is used.

**FileSource *name***

The beginning of a file source definition. *name* is the name of the source file in ISO9660 format. For more details of the commands used in a FileSource definition see “File Source Commands” on page 109.

**EndFileSource**

End of file source definition.

**Trigger *relposition***

Defines the length of time that the trigger is applied measured from the start of the file. *relposition* is the position relative to the start of the file to apply the trigger to.

**Eors *relposition***

Defines the position of the End Of Record measured from the start of the file. *relposition* is the position relative to the start of the file where the End Of Record is placed.

**FileNo *filename***

The ISO9660 file number. *filename* is the file number in the subheader in MODE2 track files (0-255).

### **SectorRate** *sector*

Defines the actual number of frames per second on the CD when the file is transferred. *sector* is the number of frames per second in numeric format. The default is 150 frames/sec. Only values of 75 and 150 are valid.

### **AutoEOR**

Records an End Of Record (EOR) in the sub header of the sector which contains the final byte of the file.

### **RealTime**

Indicates that the file source is a real time file.

### **Channel** *chnumber*

The start of a channel definition. *chnumber* is the number of a channel in the subheader in MODE2 track files (0-255).

### **EndChannel**

End of the channel definition.

## 15.2.6 File Interleave Commands

File interleave files are defined between Extent and EndExtent commands.

### **Extent** *relposition*

The start of a file interleave definition. *relposition* is relative position within the session. If *relposition* is omitted the volume is stored at the next free space on the disc.

### **EndExtent**

The end of a file interleave definition.

### **FileInterleave** *unitsize* *gapsize*

Start of a specification of a file that interleaves files. *unitsize* is the number of sectors to record and *gapsize* is the number of sectors to skip. For example a *unitsize* of 1 and *gapsize* of 1 means that the file will be stored a record of 1 sector followed by a gap of 1 sector.

### **EndFileInterleave**

The end of the specification of a file that interleaves files.

### **BeginTimeE *reposition***

The start position of the file in the Extent. *reposition* is the position relative to the Extent start.

### **EndTimeE *reposition***

The end position of the file in the Extent. *reposition* is the position relative to the Extent start.

### **BeginTimeF *reposition***

The start position of the file in the Extent. *reposition* is the position relative to the start of the file for channel interleaving.

### **EndTimeF *reposition***

The end position of the file in the Extent. *reposition* is the position relative to the start of the file for channel interleaving.

## **15.2.7 File Source Commands**

The following commands are used between FileSource and EndFileSource lines to define where the various files are stored and what format they are in:

### **SourceType *type***

The data type of the source file. *type* can be MONO\_A, MONO\_B, MONO\_C, STEREO\_A, STEREO\_B, STEREO\_C, CDDA, VIDEO, DATA or ISO1172.

### **UnitSize *size***

The size of a unit for channel interleaving. *size* is the unit size in sectors. If this command is not used, then interleave is not performed.

### **GapSize *size***

The size of a gap in channel interleaving. *size* is the gap size in sectors.

### **Pack**

Specifies file packing after channel interleaving.

### **SubHeader**

Specifies that a subheader has already been added to the file data. Omit this command to indicate that no subheader is to be added.

### **Offset *position length***

Specifies the part of the input file to input. *position* is the position to start inputting from in bytes and *length* is the number of bytes to read.

### **DataType *type***

Specifies the data type for MODE 2 source data. *type* is either FORM1 or FORM2.

### **Reallocation**

Relocates the file that is already stored in the specified location and saves the specified file.

### **CodingInformation *value***

Writes a byte in the Subheader that defines the information located in the sector's data area. Part of the Green Book definition.

## **15.2.8 Hard Error Command**

The following command will place a hard error in your .RTI file. You can use this to test file error redundancy routines in your project:

### **HardError *relposition [number]***

where *relposition* is the position relative to the start of the file to start placing corrupt sectors and *number* is the number of sectors to make corrupt. If number is omitted, then one corrupt sector is written.

## 15.3 Comments In Scripts

Comments can be added to scripts by placing them at the end of a line and preceding them with a semi-colon ‘;’.

## 15.4 Example Script

Below is an example script. This script contains an example of all of the scripting language’s commands and their usage.

For an example of a simpler script see the tutorial script (TUTORIAL.SCR) which is supplied on the Mirage’s internal HD.

### NOTE

The file names referenced in the following script are for example purposes only.

```
Disc "TEST.DSK"
; Define Session 1
CatalogNo 123
Session ROMXA
LeadIn MODEL
EndLeadIn
SystemArea ip.bin
Track MODEL
  PreGap 100
  Volume ISO9660 TEST6.PVD
    PrimaryVolume 0:2:16
      SystemIdentifier "SEGA DISC SYSTEM"
      VolumeIdentifier "CROSS_PRODUCTS_TEST_BUILD"
      VolumeSetIdentifier "CROSS_PRODUCTS_TEST_BUILD"
      PublisherIdentifier "CROSS PRODUCTS"
      DataPreparerIdentifier "CROSS PRODUCTS"
      ApplicationIdentifier "CPBUILD"
      CopyrightFileIdentifier "CPYFILE.TXT"
      AbstractFileIdentifier "ABSFILE.TXT"
      BibliographicFileIdentifier "BIBFILE.TXT"
      VolumeCreationDate 1/10/95 00:00:00:00:00
      VolumeExpirationDate 1/10/95 00:00:00:00:00
      VolumeEffectiveDate 1/10/95 00:00:00:00:00
      VolumeModificationDate 1/10/95 00:00:00:00:00
      LogicalBlockSize 512
      ApplicationUse test3.pvd
      MPath
      LPath
      OptionalMPath
      OptionalLPath
      DescriptorWrites 1
    EndPrimaryVolume
```

## The Scripting Language

---

```
SupplementaryVolume 0:2:16
  SystemIdentifier "SEGA DISC SYSTEM"
  VolumeIdentifier "CROSS_PRODUCTS_TEST_BUILD"
  VolumeSetIdentifier "CROSS_PRODUCTS_TEST_BUILD"
  PublisherIdentifier "CROSS PRODUCTS"
  DataPreparerIdentifier "CROSS PRODUCTS"
  ApplicationIdentifier "CPBUILD"
  CopyrightFileIdentifier "CPYFILE.TXT"
  AbstractFileIdentifier "ABSFILE.TXT"
  BibliographicFileIdentifier "BIBFILE.TXT"
  VolumeCreationDate 1/10/95 00:00:00:00:00
  VolumeExpirationDate 1/10/95 00:00:00:00:00
  VolumeEffectiveDate 1/10/95 00:00:00:00:00
  VolumeModificationDate 1/10/95 00:00:00:00:00
  LogicalBlockSize 512
  ApplicationUse test3.pvd
  MPath
  LPath
  OptionalMPath
  OptionalLPath
EndSupplementaryVolume
VolumePartition 0:2:16
VolumePartitionIdentifier "CROSS_PRODUCTS"
EndVolumePartition
BootRecord 0:2:16
BootIdentifier "CROSS_PRODUCTS"
EndBootRecord
EndVolume
File 0
  HardError 2 4
  Attributes NOHIDDEN
  RecordingDate 1/10/95 00:00:00:00:00
  FileSource test3.pvd
  EndFileSource
EndFile

; This creates a set of interleaved files

Extent 0:2:20
  FileInterleave 1 2
    File T9.BIN
      BeginTimeE 0:0:0
      RecordingDate 1/10/95 00:00:00:00:00
      FileSource test3.pvd
      EndFileSource
    EndFile
  EndFileInterleave
  FileInterleave 1 2
    File T19.BIN
      BeginTimeE 0:0:2
      RecordingDate 1/10/95 00:00:00:00:00
      FileSource test3.pvd
      EndFileSource
    EndFile
  EndFileInterleave
  FileInterleave 1 2
    File T191.BIN
      BeginTimeE 0:0:1
```

```

        RecordingDate 1/10/95 00:00:00:00:00
        FileSource test3.pvd
        EndFileSource
    EndFile
EndFileInterleave
EndExtent

Directory FRED
    File T2.BIN
        Attributes NOHIDDEN
        RecordingDate 1/10/95 00:00:00:00:00
        FileSource test3.pvd
        EndFileSource
        FileSource test3.pvd
        EndFileSource
    EndFile
EndDirectory
EndTrack

Track MODE2
    PreGap 100

    File T15.BIN
        RecordingDate 1/10/95 00:00:00:00:00
        FileNo 1
        FileSource test3.pvd
        AutoEor
        RealTime
        DataType FORM2
        SubHeader
        CodingInformation 170
        Offset 20 100
        SourceType VIDEO
        EndFileSource
        Trigger 0:0:4
        Eors0:1:55
        SectorRate 150
    EndFile

    File JM.BIN
        RecordingDate 1/10/95 00:00:00:00:00
        FileSource test3.pvd
        EndFileSource
    EndFile
EndTrack

Track MODE2
    PreGap 100

; This creates a channel interleaved file
; The file created will be stored thus:
;
; 2 sectors of channel 0 followed by 1 sector of channel 1 followed
; by 1 sector of channel 2, then 2 of channel 0 and so on.
;
    File T152.BIN
        RecordingDate 1/10/95 00:00:00:00:00
        Channel 1
```

## The Scripting Language

---

```
        FileSource test2.pvd
        BeginTimeF 0:0:2
        UnitSize 1
        GapSize3
        EndFileSource
        Reallocation
    EndChannel

    Channel 2
        FileSource test3.pvd
        BeginTimeF 0:0:3
        UnitSize 1
        GapSize3
        EndFileSource
    EndChannel
    Channel 0
        FileSource test1.pvd
        BeginTimeF 0:0:0
        UnitSize 2
        GapSize2
        EndFileSource
    EndChannel
    Pack
    Minlength 200

    EndFile
EndTrack

Track CDDA
    Pause 150
    PreEmphasis TRUE
    Channels 4
    Copy TRUE
    File T140.BIN
        RecordingDate 1/10/95 00:00:00:00:00
        FileSource candy15.wav
        EndFileSource
    EndFile
EndTrack

Track CDDA
    File T130.BIN
        RecordingDate 1/10/95 00:00:00:00:00
        FileSource c7.bin
        EndFileSource
    EndFile
EndTrack

LeadOut CDDA
Empty 400
EndLeadOut
EndSession
EndDisc
```



## 16 Log Information

During emulation and CD-R disc writing the Mirage records information about each event. You can use this information to analyse the efficiency of your project's CD or to discover why your project or CD-R disc write is not operating correctly.

Four types of entries are recorded in the emulation log:

- typical entries which show requests from the target;
- errors which occurred during emulation;
- other one-off events such as Emulation Start;

and

- events and errors which occur during the writing of a CD-R disc.

---

**NOTE**

Other useful post-emulation information can be found in the .RTI file created by the CPBUILD program. The .RTI file is in text format and contains details of the layout of your project's CD. This information allows you to check that your script file has been parsed correctly by CPBUILD.

For more details of .RTI files see "CPBUILD" on page 93.

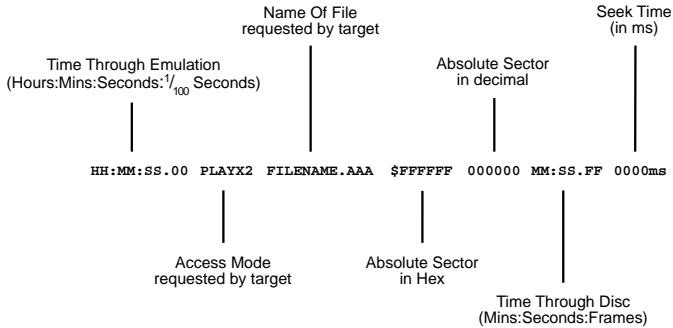
---

### 16.1 How To Retrieve Log Information

The Mirage's log information can be retrieved by using the Mirage program's Log or Monitor commands.

For more information on the Mirage program's log retrieval commands see "The Mirage Program" on page 87.

## 16.2 A Typical Log Entry



**Figure 16-1: The Syntax Of A Typical Entry In The Log**

Each standard entry in the log contains the following:

### 16.2.1 Time Through Emulation

This is a time stamp for emulation events starting at the beginning of the emulation and is measured in hours; minutes; seconds and hundredths of seconds.

### 16.2.2 Access Mode

This shows the access mode requested by the target and is the same as is displayed on the Mirage's front panel during emulation. The possible access modes are: `PLAYX1`; `PLAYX2`; `PLAYX4`; `PAUSEX1`; `PAUSEX2`; `PAUSEX4`; `SEEKX1`; `SEEKX2`; `SEEKX4`; `STOP` and `PLAYTOC`.

**NOTE**

---

Although the Mirage can emulate CDs at quad speed, a Saturn target's CD mechanism can only operate at single or double speed. Therefore a Mirage with a Saturn personality module fitted will not emulate a quad speed CD.

---

### 16.2.3 Name Of File

The name of the file which contains the position on the disc requested by the target. Shows the actual file name even if emulating from a disc image (`.DSK`) file.

**16.2.4 Absolute Sector In Hex**

The position on the CD requested by the target shown in Hex as an absolute sector.

**16.2.5 Absolute Sector In Decimal**

The position on the CD requested by the target shown in Decimal as an absolute sector.

**16.2.6 Time Through Disc**

The position on the CD requested by the target shown as time through disc in Minutes, Seconds and Frames.

**16.2.7 Seek Time**

The time taken for the simulated CD mechanism's laser to reach the requested position on the disc in milliseconds (ms).

You can improve the performance of your CD projects by placing often-used files closer together on your disc and therefore reducing the seek time between them.

**16.3 How Emulation Errors Are Displayed**

The emulation log also shows you when errors occurred during emulation. Errors can come from one of three sources:

**16.3.1 Nudge**

Errors caused by the Mirage program's Nudge command or by the Nudge button are shown in the log as:

```
HH:MM:SS.00 NUDGE @ $FFFFFF 000000
```

where \$FFFFFF is the absolute sector in Hex and 000000 is the absolute sector in Decimal which was being accessed when the error was introduced.

For more information on the Mirage program's Nudge command see "NUDGE" on page 89.

**16.3.2 The Mirage's Error Rate Setting**

Errors which occur because of the user-defined error rate setting are shown in the log as:

**HH:MM:SS.00 ERROR @ \$FFFFFF 000000**

where \$FFFFFF is the absolute sector in Hex and 000000 is the absolute sector in Decimal which was being accessed when the error was introduced.

For more information on the error rate setting see “The CD Config Menu” on page 65.

### 16.3.3 Compromised Emulation

Errors which occur because of the emulation being compromised are shown in the log as:

**HH:MM:SS.00 COMPROMISED @ \$FFFFFF 000000**

where \$FFFFFF is the absolute sector in Hex and 000000 is the absolute sector in Decimal which was being accessed when the error was introduced.

This error shows that the files on the emulation HD are too fragmented for the Mirage to emulate from them or that the development host has accessed the emulation HD too frequently. Use a DOS compatible disk utility, such as Norton Utilities or Defrag, to defragment the emulation HD.

## 16.4 Other Emulation Log Entries

The emulation log also displays the following messages regarding other emulation events:

**00:00:00.00 START EMULATION WITH *filename***

where *filename* is the name of the .RTI or .DSK file that the user requested for emulation. This is always the first event in an emulation log and therefore has a time stamp of zero.

**HH:MM:SS.00 DOOR OPEN**

The DOOR button or DOOR command was used to simulate the target's door being opened.

**HH:MM:SS.00 DOOR CLOSED**

The DOOR button or DOOR command was used to simulate the

target's door being closed.

**HH:MM:SS.00 STOP EMULATION *reason***

where *reason* can be:

REMOTE STOP

The Mirage program's STOP command was used to halt the emulation.

STOP BUTTON PRESSED

The Mirage's STOP button was used to halt the emulation.

DEVELOPMENT HOST ACCESS

Read or write access by the development host caused the emulation to halt.

SATURN NOT RESPONDING

The emulation halted because the Saturn did not respond.

**HH:MM:SS.00 DEVELOPMENT HOST ACCESS READ/WRITE 000 ###**

where 000 is the logical block in decimal and ### is the number of logical blocks accessed by the development host.

This is sometimes followed by a COMPROMISED entry in the log. You can use this entry in the log to determine if the development host is affecting your project's emulation performance.

## 16.5 CD-R Disc Writing Log Entries

The Mirage also records information when a CD-R disc is being written directly from the Mirage using a CD Writer. Log entries specific to CD-R disc writing are (in the order in which they appear):

**HH:MM:SS.00 Waiting for user input  
- See Mirage LCD**

The Mirage was instructed to start a CD-R disc write and waited for the user to confirm the operation before commencing. This is always the first event in a CD-R disc writing log.

## Log Information

---

**HH:MM:SS.00 Host access disabled**

Access from the development host was disabled. This is to prevent the development host from disrupting the CD-R disc write.

**HH:MM:SS.00 Writing at XS speed**

where XS is the write speed requested using the front panel Write Speed command.

The Mirage started to write data to the CD-R disc.

**HH:MM:SS.00 On CD-Writer YAMAHA CDR102  
(SCSI ID: X)**

The name and ID of the CD Writer. Where YAMAHA CDR102 is the type of CD Writer detected on the Mirage's Expansion SCSI bus and X is its SCSI ID.

**HH:MM:SS.00 Medium removal disabled**

The Eject button on the front of the CD Writer was disabled so that the disc could not be ejected during the writing of data.

**HH:MM:SS.00 Writing LEADIN**

The LeadIn was written to the disc. This can take several minutes depending upon the type and amount of data being written.

**HH:MM:SS.00 Writing DATA - total data write  
time: MM mins SS secs**

where MM mins SS secs is the total time taken for the data to be written to the CD-R disc.

If all of the data is written to the disc, then the next log entry will occur after this time.

**HH:MM:SS.00 Writing LEADOUT**

The LeadOut was written to the disc. This can take several minutes depending upon the type and amount of data being written.

**HH:MM:SS.00 Medium removal enabled**

The Eject button on the front of the CD Writer was enabled.

**HH:MM:SS.00 Ejecting medium...**

The CD-R disc was ejected from the drive.

**HH:MM:SS.00 Completed write successfully**

The writing of the CD-R disc was completed successfully.

**HH:MM:SS.00 Host access enabled**

Access from the development host was enabled.

**HH:MM:SS.00 Aborted Write *reason***

where *reason* can be:

User Request

The Mirage's STOP button was used to halt the CD-R disc write.

Buffer Under Run

The data rate required for a successful CD-R disc write could not be sustained.

Internal Error

The Mirage reported an internal error.

Unknown Error

The CD Writer reported an unknown error.

---

**NOTE**

In all of CD-R disc writing logging entries, 'WRITE' will be replaced with 'TEST' during a test write. See "Writing A CD-R Disc" on page 49 for more details on testing a write to a CD-R disc.

---

## 16.6 Log Options From The Front Panel

By default, the emulation log can hold up to 2,048 entries before it wraps around and starts to overwrite entries at the start of the log.

If you wish to log only the first 2,048 emulation events, you can

## Log Information

---

do so by turning the log wrapping off by using the LOG WRAP command from the CONFIG menu on the Mirage's front panel.

See "The Config Menu" on page 64 for more details on wrap around.



# 17 Troubleshooting

This section describes possible problems that you might have while using the Mirage, and their solutions. If you discover an error message or problem which is not listed in the following pages, please contact Technical Support. See “Technical Support” on page 4 for contact details.

## NOTE

---

This section is as up to date as possible at the time of going to print. If you are still experiencing difficulties after reading this section, please see the README file on the Mirage disk or CD and the Release Notes for further information. If this fails to resolve your query, please contact our Technical Support.

---

## 17.1 Mirage Hardware

If the LCD panel does not display anything and the YELLOW LED does not flash at power on, but you can hear the fan running, then the Mirage hardware has failed. You should contact the supplier of your Mirage immediately.

If you cannot hear the fan running then the Mirage’s plug or internal fuse may have blown. The internal fuse can be replaced by removing the small plate above the power socket on the rear of the Mirage. Replace this fuse with one of the same type. See (D) on Figure 2-1 on page 12 for the position of the power socket.

## 17.2 Start Up Errors

Start up errors can be displayed on the Mirage’s front panel or if the Mirage fails before it has initialised the LCD display then the YELLOW LED at the top left of the Mirage’s front flashes:

Flashes	Meaning
1	Processor running. The LCD panel may be faulty.
2	SDRAM failed. Contact your Mirage supplier.
3	Xilinx failed. Contact your Mirage supplier.

## Troubleshooting - Start Up Errors

---

If the light does not flash and the LCD panel is able to be used then the following errors may be displayed on the LCD display:

```
CONFIG FAIL  
USING DEFAULTS
```

This will happen after the Mirage's Flash has been re-written and is normal behaviour (See "Upgrading The Flash Firmware" on page 81 for more details on Flash re-writing).

```
CONFIG FAIL  
CONTACT SUPPLIER
```

The Mirage's configuration RAM has failed. Call the supplier of your Mirage for more details.

---

```
EXTERNAL SCSI  
INIT ERROR
```

The Mirage is not connected to the computer. If the Mirage is connected to the computer, then power off the Mirage and check that it is properly connected. If you find that you have not firmly connected the SCSI cables, you should turn off the Mirage before re-connecting them. Also check that the Mirage's slide mount is correctly seated. If the Mirage is being used without a computer (standalone) and is properly terminated then this message will not appear. If the computer is connected, but not switched on then this message will be seen on some systems.

---

```
EXPANSION SCSI  
INIT ERROR
```

The Mirage has been unable to initialise its expansion SCSI bus. Emulation will not be possible. Check that the Expansion Port on the rear of the Mirage is connected to a device or is terminated. Contact the supplier of your Mirage for more details.

---

### 17.3 Disk And General Errors

At any time during emulation, file selection or computer access, the Mirage may display one of the following messages:

```
DRIVE 00  
NOT DOS FORMAT
```

The emulation HD (chosen using the DRIVE ID setting) does not appear to be correctly formatted or is corrupt. Use DOS compatible disk tools such as CHKDSK or SCANDISK from a PC to examine and repair the emulation HD. You can format it using the standard DOS or Windows format from a PC (DOS 5 or above).

If this message appears when the computer tries to access the Mirage, then the Mirage's internal cables might have been loosened in shipping. Remove the Mirage's case top and gently push each visible ribbon cable into its socket. For more details on opening the Mirage see "Removing The Personality Module" on page 76.

---

```
DISK ERROR  
No Response
```

The emulation HD (defined using the DRIVE ID setting) is not responding. Check that you have set DRIVE ID to the correct drive, the drive is powered on and that all cabling is secure.

---

```
DISK ERROR  
Unknown
```

The Mirage has been unable to read a file for an unknown reason. Contact the supplier of your Mirage for more details.

---

```
DISK ERROR  
Bad Start
```

The Mirage couldn't start the emulation HD. Turn off the Mirage and check that the emulation HD is powered on and that all cabling is secure.

---

## Troubleshooting - Disk And General Errors

---

DISK ERROR  
Read Fail

The Mirage was unable to read data from the emulation HD. Turn off the Mirage and check that the emulation is powered on and that all cabling is secure.

---

DISK ERROR  
Write Fail

Turn off the Mirage and check that the emulation is powered on and that all cabling is secure.

---

DISK ERROR  
Verify Fail

The Mirage was unable to verify a read from or write to the emulation HD. Turn off the Mirage and check that the emulation is powered on and that all cabling is secure.

---

DISK ERROR  
Bad Filename

The Mirage has been unable to find the .RTI or .DSK file requested for emulation. This usually occurs when you have moved a file on the emulation HD, but are trying to emulate from that file in its old location.

---

DISK ERROR  
Bad Cluster

The emulation HD's FAT is damaged. Use a DOS compatible disk repair utility such as Defrag from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage or HD might be damaged.

---

DISK ERROR  
File Not Found

The Mirage has been unable to find the .RTI or .DSK file requested for emulation. This usually occurs when you have moved a file on the emulation HD, but are trying to emulate from that file in its old location.

---

DISK ERROR  
Too Frag

The files on the emulation HD are too fragmented for the Mirage to emulate from them. Use a DOS compatible disk utility such as Defrag from a PC to defragment the emulation HD.

---

TOO MANY FILES  
FRAGMENTS

The files on the emulation HD are too fragmented for the Mirage to emulate from them. Use a DOS Compatible disk utility such as Defrag from a PC to defragment the emulation HD.

---

MORE THAN 4096  
EMULATION FILES

There are too many file in your project. Try to combine some of your files. The maximum number of files in one emulation is 4096.

---

DISK ERROR  
Bad Offset

The emulation HD's FAT is damaged. Use a DOS compatible disk repair utility such as Scandisk from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage or HD might be damaged.

---

## Troubleshooting - Disk And General Errors

---

DISK ERROR  
Bad Dir

The emulation HD's FAT is damaged. Use a DOS compatible disk repair utility such as Scandisk from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage or HD might be damaged.

---

DISK ERROR  
Boot Read

The Mirage has been unable to read the boot sector on the emulation HD. Use a DOS compatible disk repair utility such as Scandisk from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage or HD might be damaged.

---

DISK ERROR  
Bad Boot Rec

The boot record on the emulation HD has not been recognised. Use a DOS compatible disk repair utility such as Scandisk from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage or HD might be damaged.

---

DISK ERROR  
Sector Size

The internal HD has an unsupported sector size. Use DOS5 or above to reformat the HD ready for emulation from a PC.

---

DISK ERROR  
FF Bad Dir

The emulation HD's FAT is damaged. Use a DOS compatible disk repair utility such as Scandisk or Norton Utilities from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage or HD might be damaged.

---

DISK ERROR  
Internal Read

The Mirage has been unable to read the boot sector on the internal HD. Use a DOS compatible disk repair utility such as Scandisk or Norton Utilities from a PC. If this occurs on a regular basis, the HD may be faulty or the SCSI cabling from the computer to the Mirage or inside the Mirage might be damaged.

---

GENERAL ERROR  
CODE=07

The Mirage's general error code. Contact the supplier of your Mirage for more details.

---

USE KEY DISC  
EMULATION HALTED

The version of IP.BIN that you are using is incompatible with the Saturn System Key Disc. Use the correct IP.BIN.

---

SATURN  
NOT RESPONDING

The Mirage has been unable to transfer data down the CD Interface cable. Make sure that the Saturn is switched on, the VCD/CD selector switch is in the correct position and that the CD Interface cable is securely fastened at both ends.

---

### 17.4 CD-R Writing Errors

At any time during the writing or testing of CD-R disc write, the Mirage may display one of the following messages:

```
FATAL ERROR  
BUFFER UNDER RUN
```

The Mirage detected a problem with the .RTI or .DSK file. If you were attempting to write a CD-R disc, the disc will be unusable. Rebuild the .RTI or .DSK file and test the CD-R write using the TEST WRITE command. If this fails, Contact the supplier of your Mirage for technical support.

---

```
FATAL ERROR  
INTERNAL ERROR
```

The Mirage suffered an internal error during the CD-R writing process. If you were attempting to write a CD-R disc, the disc will be unusable. Rebuild the .RTI or .DSK file and test the CD-R write using the TEST WRITE command. If this fails, Contact the supplier of your Mirage for technical support. If the test write is successful, try to write another CD-R disc.

---

```
FATAL ERROR  
UNKNOWN ERROR
```

The CD Writer reported an unknown error during the CD-R writing process. If you were attempting to write a CD-R disc, the disc will be unusable. Rebuild the .RTI or .DSK file and test the CD-R write using the TEST WRITE command. If this fails, Contact the supplier of your Mirage for technical support. If the test write is successful, try to write another CD-R disc.

---



## 17.5 CPBUILD Errors Messages

CPBUILD can output several errors whilst converting script files into .RTI or .DSK files. These errors along with their meanings are listed below:

### **Out of memory**

CPBUILD has run out of memory. There may be too many files referenced in the script.

### **Unrecognised command**

This command is not valid.

### **Line too long**

The maximum line length is 256 characters.

### **Internal stack overflow**

### **Internal stack underflow**

CPBUILD has suffered an internal error. Contact technical support for more information.

### **File not found**

The specified file could not be found.

### **Incorrect number of arguments for command**

See the description of the specific scripting command in “Scripting Commands And Their Syntax” beginning on page 98.

### **Too many nested includes**

The maximum number of nested includes is 25. This error may be caused by circular inclusion in your script.

### **Invalid session type**

The type specified in the Session command is invalid.

### **Unexpected CatalogNo**

The catalog number has an invalid format.

### **Invalid track type in LeadIn**

The LeadIn must be MODE1.

### **Invalid track type in LeadOut**

The LeadOut must be of the same type as the last track written.

### **Volume type must be ISO9660**

Only ISO 9660 volumes are supported by CPBUILD.

### **File for SystemArea is too large**

The SystemArea file must be  $\leq 32768$  bytes in size.

### **Could not find file for SystemArea**

The specified file could not be found.

### **Invalid track type**

The specified track type is not valid.

### **CDDA cannot be first track**

The first track cannot be a CDDA track.

### **Unterminated string**

A string must have a closing double quotes.

### **Primary Volume already defined**

Only one Primary Volume is allowed in the ISO 9660 standard.

### **Invalid number**

The format for the specified number is invalid. This error may be caused by the parameter containing non-numeric characters.

### **String should only contain d-type characters**

See “d-type Characters” on page 97 for more details.

### **String should only contain a-type characters**

See “a-type Characters” on page 97 for more details.

### **Invalid filename**

The specified filename is invalid.

### **Command not valid in this block**

The command cannot be used in this part of the script.

### **Date format is incorrect**

The format for the specified date is incorrect. See “Dates” on page 98 for more details.

### **Time format is incorrect**

The format for the specified time is incorrect. See “Dates” on page 98 for more details.

### **File too big**

The SystemArea file is larger than 32K. CPBUILD will truncate it to 32K which may cause your disc to fail.

### **Invalid size for LogicalBlockSize**

The LogicalBlockSize must be set to 512, 1024 or 2048.

### **Filename is not unique**

All files in the same directory must have unique names.

### **VolumePartitionIdentifier does not conform to ISO9660**

The format of the string parameter for VolumePartitionIdentifier does not conform to ISO 9660 standard.

### **BootIdentifier does not conform to ISO9660**

The format of the string parameter for BootIdentifier does not conform to ISO 9660 standard.

### **Not a valid file attribute**

The specified file attribute is not valid. Valid attributes are: HIDDEN, NOHIDDEN, RECORD and NORECORD.

### **Directories cannot be nested more than 8 deep**

This restriction is part of the ISO 9660 standard.

### **Invalid directory name**

The specified directory name is invalid. See “ISO9660 Directory Names” on page 98 for more details.

**First track must be MODE1**

When building a CD-ROM the first track must be MODE1.

**CDDA track already defined**

All tracks following a CDDA track must be CDDA format. Define your CDDA tracks at the end of your script.

**Command only valid for audio tracks**

The specified command is only valid for audio tracks.

**Invalid number of channels**

The specified channel number is too small or too large.

**Invalid switch (should be TRUE or FALSE)**

The specified switch must be TRUE or FALSE.

**Unable to create output file**

The development host's HD or the Mirage HD may be full.

**Command not valid in CDDA tracks**

The specified command is only valid for CDDA tracks.

**FileSource not defined**

No file source was specified in the File Block.

**Invalid FileNo**

The specified value for the file number was too large or too small.

**Command only valid on MODE2 type tracks**

The specified command is only valid for MODE2 tracks.

**Invalid value for SourceType**

The specified value is not valid for the SourceType command. See "SourceType type" on page 109 for more details.

**Invalid value for SectorRate**

The specified value is not valid for the SectorRate command. See "SectorRate sector" on page 108 for more details.

### **Invalid value for DataType**

The specified value is not valid for the DataType command. See “DataType type” on page 110 for more details.

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## 18 Bibliography

The following is a list reference material that you might find useful when developing your CD projects:

SEGA Virtual CD System User's Manual  
(Document number ST-129-R1-062294)  
Available from SEGA

SEGA Developer's Documentation  
Available from SEGA

SNASM2 documentation  
Available with the SNASM2 Development System

Volume & Structure Of CD-ROM For Information Interchange  
ANSI/NISO/ISO 9660-1990

Multimedia In A Muddle  
New Scientist - September 1991

The CD-I Production Handbook  
ISBN 0-201-62750-7

The CD-I Design Handbook  
ISBN 0-201-62749-3

Principles Of Digital Audio  
ISBN 0-672-22634-0

Inside The ISO-9660 Filesystem Format  
Dr. Dobbs Journal - December 1992

General CD format definitions (available from Philips or Sony):

Red Book  
Compact Disc Digital Audio  
CEI IEC 908

Yellow Book  
Compact Disc Read Only Memory  
ISO 10149:1989

Green Book - Compact Disc Interactive

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## 19 Glossary

This glossary includes terms which you might come across in your day-to-day work with the Mirage and CDs in general. A word or words in *italics* refers to another entry in this glossary.

### **.DSK**

The file extension for disc images created using the CPBUILD program. See “CPBUILD” on page 93 for more details.

### **.PVD (Primary Volume Descriptor)**

The file extension for a temporary file created by the CPBUILD program which contains *ISO 9660* information. You should not delete these files. See “CPBUILD” on page 93 for more details.

### **.RTI (Run Time Information)**

The file extension for a disc configuration file created by the CPBUILD program. See “CPBUILD” on page 93 for more details.

### **.SCR**

The file extension for a script file used by the CPBUILD program to create an *.RTI* or *.DSK* file. See “The Scripting Language” on page 97 for more details.

### **.TOC (Table Of Contents)**

The file extension for a Table Of Contents file created by the CPBUILD program (see “Command Line Syntax” on page 94 for more details) and used, along with the *.DSK* file, when *writing* a *CD-R disc*.

### **A-Time/Absolute Time**

The time elapsed since the start of the disc measured from the beginning of Track 1 on a *Compact Disc-Digital Audio* or *Mixed Mode Compact Disc*.

### **Access Time**

The time taken by the laser to move to a particular place on the disc. Maximum access time is the time taken to move from the

start of the disc to the end and read data. Average access time is the average time taken to move from one position on the disc to another.

### **ANSI**

A set of standards defined by the American National Standards Institute.

### **ASPI (Advanced SCSI Programmer's Interface)**

A set of routines and data structures which allow programs to be SCSI host adapter independent.

### **Building An Image**

The process of taking the data files which make up the CD (executables, graphics, audio and video) and creating a single continuous disc image which can be emulated from or used with *CD-Writing software* to write a *CD-R disc*.

### **Burn**

The process of recording a CD-R disc in a CD Writer. So called because a laser is used to 'burn' *lands* and *pits* onto the disc. Also known as *CD Writing*.

### **Cache**

A portion of RAM set aside to temporary store often needed data such as directory information.

### **Caddy**

A carrier used with some CD-ROM drives to hold the disc. CD-ROM drives which do not use caddies are known as 'caddyless'.

### **CD-DA (Compact Disc-Digital Audio)**

The standard for audio CDs. Developed by Sony and Philips and launched in 1982. Defined in a document known as the *Red Book*. Also known as CD-Audio. Reads digital sound samples off the disc at 44.1Khz per second. With 16 bits per sample and two channels the CD player reads 1,411,200 bits per second. CD-Audio discs are capable of storing up to 75 minutes of sound (at

*single-speed*), although only 60 minutes is commonly quoted as the maximum capacity.

**CD-I (Compact Disc-Interactive)**

A format standard for interactive multimedia applications. Developed by Philips. Wide-spread uptake has been limited. Defined in a document known as the *Green Book*.

**CD-R (Compact Disc-Recordable)**

The name given to CD devices which can write as well as read CDs. The special writeable CDs are called *CD-R discs*. The standard for CD-R is defined in the document known as the *Orange Book*.

**CD-R Disc**

A writeable CD-ROM used by a *CD Writer* to store data. Conforms to the *CD-ROM WO* standard. Also known as Gold discs.

**CD-ROM (Compact Disc-Read Only Memory)**

The standard for CDs which can hold computer data. Defined in a document known as the *Yellow Book*.

**CD-ROM Drive (Compact Disc Drive)**

A computer peripheral which can read CD-ROM discs. CD-ROM drives can usually also play audio (*Red Book*) CDs. CD-ROM drives are rated as *single-speed*, *double-speed*, *quad-speed* or *six-speed* depending on their data access rate.

**CD-ROM WO (Compact Disc Write Once)**

A recordable CD. Another name for *CD-R* or Gold Discs. The CD-ROM WO standard is defined in a document called the *Orange Book*.

**CD-ROM XA (Compact Disc Extended Architecture)**

An extension of the *Yellow Book (CD-ROM)* standard. Consistant with the *ISO 9660* format standard, but with some video and audio capabilities taken from the *CD-I* standard. CD-ROM XA is the

standard format for *Photo-CDs*.

### **CIRC (Cross Interleave Reed-Solomon Correction)**

The data correction algorithm used to correct large runs of unreadable data due to laser error, damage or scratches on CD-Audio and CD-ROM discs. CIRC interleaves frames and error checking is performed on the sum of this data. Error bursts of up to 450 data bytes can be corrected using CIRC. The CIRC method results in an error rate of less than one unrecoverable error in 2,000 discs.

### **Close Disc**

A multi-session CD-R (recordable CD) is closed so that no further data can be written to it. This is done by not recording the next *writable sector* in the *lead-in* of the current *session*. The *CD writing software* has no way of knowing where to write new data and therefore the disc cannot be written to again.

### **Close Session**

To close a *session*, the disc's *table of contents* is updated and a *lead-in* (the next *writable sector*) is written to the disc to allow the *CD writing software* to write further sessions to the disc.

### **CLV (Constant Linear Velocity)**

Uses varying disc rotation speeds to maintain the speed at which data passes under the *read head* as the head moves across the disc.

### **Compact Disc Writer (CD Writer)**

A device which writes a *CD-R disc* from a set of data using *CD Writing software*.

### **Compact Disc Writing Software (CD Writer Software)**

The software which controls a CD Writer and transfers data from the source (usually a computer's HD) onto a *CD-R disc* adding *error correction codes* (ECC) and *error detection codes* (EDC) if necessary.

### **Cue Sheet**

A list of tracks to be written to a disc in a particular *session*.

### **Data Area**

Part of the *ISO 9660* standard. The area of the disc where data can be written. Begins at *absolute time* 00:02:16 (the first available space after the *Table Of Contents*).

### **Development Host**

The generic name for a development computer. Examples include: PC and SG Indy.

### **Directory**

A library of pointers stored in a specific area of the disc which shows the location of all of the files on the disc.

### **Disc Image**

A single file containing an image of a CD. Includes all data files (executables, graphics, audio and video) along with *ECC* and *EDC* codes.

### **Double-Speed**

A CD-ROM drive which can read discs at twice the speed of a *single-speed* drive giving a data rate of 150 *sectors* per second.

### **ECC (Error Correction Code)**

A code which is added to the data being written onto a disc by CD Writing software. Allows the detection and correction of read errors.

### **EDC (Error Detection Code)**

A 32 bit code which is used as a checksum to detect data errors.

### **Error Rate**

The rate that errors occur when data is read from the disc. In a CD emulator, such as the Mirage, several error rate can be simulated to test error recovery routines.

### **Firmware**

Programs stored in Read Only Memory (ROM) chips.

### **Flash**

A special type of Erasable Programmable Read Only Memory (EPROM) which can be re-written by a computer (Electrical EPROM or EEPROM), such as the Mirage's controller board. In the Mirage, the flash EEPROM (also known as E<sup>2</sup>) allows the user to upgrade the Mirage's firmware and to change *targets* without having to return the Mirage to your supplier.

### **Focus Time**

The time taken for the *read head* to 'settle' when it arrives at a specified *sector* on the disc, before reading of data can begin.

### **Frame**

Also known as a *sector*. 2352 bytes of data. 75 frames per second is known as *single-speed*.

### **Glass Master**

The glass disc produced from the *gold disc* by a CD-ROM duplication house. Used as the master in the duplication of the final production discs.

### **Green Book**

The document which defines the standard for *Compact Disc Interactive (CD-I)*.

### **Header Field**

Four bytes recorded at the beginning of every sector which contain the sector's address and the mode in which the sector is recorded.

### **HFS (Hierarchical Filing System)**

The disk filing system used on the Apple Macintosh.

### **High Sierra Format**

The standard for logical disc format. Originally proposed by the High Sierra Group and essentially identical to the *ISO 9660*

standard.

**Hybrid**

Describes a disc which is a combination of *ISO 9660* and Macintosh *HFS*. Used by *CD-ROM* developers who wish to deliver data to users of both formats, but on one disc (for example magazine cover discs).

**ISO 9660**

The standard for logical disc format upon which most other formats are based.

**ISO 9660 Image**

Another name for *Virtual Image*.

**Land**

Flat area on the surface of a CD which reflects laser light back to the sensor on the read head. Represents a value of '1'.

**Laser**

**(Light Amplification by Stimulated Emission of Radiation)**

The read-head in a CD mechanism. Reads *lands* and *pits* on the CD's surface.

**Lead In**

A 4,500 sector (about 9 MB) area of a *CD-R disc* which is written at the beginning of each session. Gives details of the contents of the session and contains the next writeable address on a disc if the disc is *multi-session* and not *closed*.

**Lead Out**

An area of a CD-R disc which indicates the end of a particular session.

**Logical Block**

The smallest addressable section on a disc. In the *ISO 9660* standard each logical block is given a Logical Block Number (LBN) starting at zero at the beginning of the disc.

### **Master**

The glass disc produced from the *CD-R disc* by a CD-ROM duplication house. Used in the duplication of the final discs.

### **Mastering**

The process whereby a *master* is produced.

### **Mixed Mode Disc**

A disc which contains both computer and audio (CD-DA) tracks. The computer data is all contained in track 1 and the remainder of the disc can be used for the audio tracks.

### **Mode 0**

A track format specified in the *Yellow Book*. 2,048 bytes of zero followed by 288 bytes of zero.

### **Mode 1**

A track format specified in the *Yellow Book*. 2,048 bytes of data followed by 288 bytes of *EDC* and *ECC* information.

### **Mode 2**

A track format specified in the *Yellow Book*. 2,048 bytes of data followed by another 288 bytes of data with no error correction.

### **Mount**

The process of inserting a disc into a computer's *CD-ROM drive* so that the computer can read data from it. Also used to describe the process of informing the computer that a CD has been inserted.

### **Multi-Session**

Indicated a CD-ROM which contains data written to it in more than one *session*. Also used to denote a *CD-ROM drive* which can read multi-session discs.

### **On-The-Fly Disc Writing**

The process of writing a CD-R disc directly from the source data without having to first build a complete *disc image*. Also used to describe emulation of a CD without having to build a complete



*disc image.*

### **Orange Book**

The document which defines the standard for writeable CDs including *Compact Disc-Recordable (CD-R)*, magneto-optical cartridge systems and *single-session* and *multi-session* discs.

### **PAUSEX1**

A command issued by the *target* to the CD mechanism. It requests that the mechanism stops sending data, but keeps the disc spinning at *single-speed*.

### **PAUSEX2**

A command issued by the *target* to the CD mechanism. It requests that the mechanism stops sending data, but keeps the disc spinning at *double-speed*.

### **PAUSEX4**

A command issued by the *target* to the CD mechanism. It requests that the mechanism stops sending data, but keeps the disc spinning at *quad-speed*.

### **PCA (Power Calibration Area)**

A reserved area at the beginning of a disc used by a *CD-Writer* to calibrate the laser prior to recording on the disc.

### **Photo-CD**

A format, defined by Kodak, based on the CD-ROM XA and Orange Book definitions which is used to store photographs in five resolutions (standard disc) or six resolutions (pro disc) which range from display to full colour magazine standard.

### **Pit**

Raised area ('bump') on the surface of a CD which scatters the *laser's* light. Represents a value of '0' (zero).

### **PLAYTOC**

A command issued by the *target* to the CD mechanism. It requests

that the mechanism reads data from the disc's *table of contents* at *single-speed*.

### **PLAYX1**

A command issued by the *target* to the CD mechanism. It requests that the mechanism sends data at *single-speed*.

### **PLAYX2**

A command issued by the *target* to the CD mechanism. It requests that the mechanism sends data at *double-speed*.

### **PLAYX4**

A command issued by the *target* to the CD mechanism. It requests that the mechanism sends data at *quad-speed*.

### **PMA (Program Memory Area)**

An area of a *CD-R disc* which temporarily contains the *session* contents information while the tracks are written to the disc. This information is then written to the session's *lead-in*.

### **Post-Gap**

A gap written after a track. Some CD Writing software write no post-gap whilst some write a gap of 150 sectors (2 seconds with a *single-speed* disc) between tracks of different data types.

### **Pre-Gap**

A gap written before the start of a track by some CD Writing software. The pre-gap can be: zero sectors if between two audio tracks; 150 sectors or 2 seconds if between two data tracks or 225 sectors or 3 seconds if between tracks of different types. All times given are for *single-speed* discs.

### **Pre-Mastering**

The process of dividing data into sectors and tracks and adding the appropriate header and error correction information prior to writing the disc.

**Quad-Speed**

A data rate of 300 *sectors* per second. Written as 4X.

**Read Head**

The *laser* in a *CD-ROM drive* which reads the data contained in the *pits* and *lands* on a CD.

**Red Book**

The document, developed jointly by Sony and Philips, which defines the standard for CD-Audio including disc format, hardware, form factors and media specifications. Also forms the basis for the *Yellow Book* and *High Sierra* disc standards. The Red Book defines the way that bit patterns are written to the disc, provides for synchronisation bytes and supports one layer of *CIRC* error correction within each *frame* or packet of data.

**Relative Time**

The time elapsed since the start of a particular track.

**SCSI (Small Computer Systems Interface)**

A standard interface which allows the connection of up to eight devices to a single controller. Pronounced “scuzzy”.

**SCSI Bus/SCSI Chain**

The name given to the data bus which connects devices via the SCSI standard. Each end of a SCSI chain must be *terminated*.

**SCSI Termination**

The process of placing a small resistance at each end of a *SCSI chain*. This resistance stops signal reflection and thereby errors. Only the ends of the SCSI chain should be terminated.

**Sector**

Also known as a *frame*. 2352 bytes of data. 75 sectors per second is known as *single-speed*.

**Seek Time**

The time taken for the *read head* to move from one *track* on a disc

to another.

### **SEEKX1**

A command issued by the *target* to the CD mechanism. It requests that the mechanism moves to a specified position on the CD and keeps the disc spinning at *single-speed*.

### **SEEKX2**

A command issued by the *target* to the CD mechanism. It requests that the mechanism moves to a specified position on the CD and keeps the disc spinning at *double-speed*.

### **SEEKX4**

A command issued by the *target* to the CD mechanism. It requests that the mechanism moves to a specified position on the CD and keeps the disc spinning at *quad-speed*.

### **Session**

The process of writing one segment (which may contain one or more tracks) of a *CD-R disc*. Each session starts with a *lead-in* and finishes with a *lead-out*. Part of the *Orange Book* definition for writeable CDs.

### **Settling**

The time taken for the laser to focus once it has reached the requested position over the disc. Equivalent to the time taken for a HD read-head to stabilise before it can read data.

### **Single Session**

A *CD-ROM player* which can only read CDs which have been written in one complete *session* or can only read the first session on a disc.

### **Single-Speed**

A data rate of 75 *sectors* per second.

### **Six-Speed**

A data rate of 450 *sectors* per second.

### **Spin Up Time**

The time taken in milliseconds to start the disc spinning and accelerate up to *double-speed*.

### **STOP**

A command issued by the *target* to the CD mechanism. It requests that the mechanism stops sending data and stops spinning the CD. When the target issues the next command after a STOP, the mechanism will require a *spin up time* to start the disc spinning.

### **Target**

The generic name for a development platform. Examples include: PC; Sega Saturn and Atari Jaguar.

### **Termination**

See *SCSI Termination*.

### **TOC (Table Of Contents)**

An area of the disc which contains information about the number of tracks, their starting locations on the disc and the total length of the data area on the disc.

### **Track**

A single rotation of a disc. The minimum that can be written to a disc in a *session*.

### **Virtual Image**

A table of pointers to the files to be written to a disc. Used to write CDs *on-the-fly* or to build a *disc image* prior to the disc being written.

### **Volume**

A single CD-ROM disc. Part of the *ISO 9660* definition.

### **Volume Descriptors**

A fixed length record which contains information about the disc's format and how to read it. Part of the *ISO 9660* definition.

### **White Book**

The document which defines the standard for Video CD format discs.

### **WORM (Write-Once Read-Many)**

Removable optical media which can only be written to once, but can be read many times. Not compatible with CDs.

### **Writeable Sector**

The next sector where data can be written on a *CD-R disc*, given in the *lead-out* information from the previous *session*.

### **Yellow Book**

The document which defines the standard for CD-ROM data discs. Originally devised by Philips and Sony. Based on the Red Book audio standard, but with better error correction.

Data on a CD-ROM is organised into 2352 byte blocks. 2K bytes of each block is user data. The remainder is directory and error correction information. The *CD-ROM drive* reads 75 blocks per second. At *single-speed* this is equivalent to a maximum capacity of 660MB.

The Yellow Book adds additional error detection and error correction to the *Red Book* standard to provide greater data accuracy. Each 2K data block is accompanied by 288 bytes used as a second layer of *CIRC*. Together with the first layer of *CIRC* (as defined in the Red Book standard), the second layer enables data integrity to be maintained even when many consecutive bytes in the data stream are lost, for example due to a scratch on the disc.

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