



***GD Workshop***  
***User Guide***



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***User Guide***

***Version 2.3.1***

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## **GD Workshop User Guide**

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# ***About GD Workshop***

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The Katana GD Emulator (GD-M) and GD Workshop streamlines your CD product development cycle.

Using GD Workshop you can create a “virtual” CD and emulate it on the Katana development box. This virtual CD can be edited and recreated instantly so that you can test the effect of changes to the project in seconds.

The Katana development box contains all the hardware required for real-time CD emulation and GD Workshop provides remote control and logging of CD emulation and writing, plus a CD editing suite.



# ***How to install GD Workshop***

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This chapter takes you through installing and configuring GD Workshop to work with the Katana development box.

It has the following sections:

- Installing GD Workshop
- System Requirements
- Customising GD Workshop
- Configuring the GD-M hardware
- Configuring additional SCSI devices
- Configuring device drive letters
- Updating the GD-M firmware.

## ***How to install GD Workshop***

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### **Installing GD-Workshop**

To install GD Workshop:

- 1) Connect the Katana development box to your development computer in accordance with the Katana development box installation instructions from Sega DTS.
- 2) Insert the Katana development tools CD into the CD drive on the development computer.
- 3) Run Setup.exe and follow the instructions on screen to install GD Workshop.

**NOTE:** *If you are running GD Workshop on Windows NT™, you must be running in Administrator mode.*

### **System Requirements**

GD Workshop requires:

- An IBM™ PC or compatible with 486 processor or above (Pentium™ recommended)
- Windows® 95 or Windows NT™
- 12 MB or more of RAM.

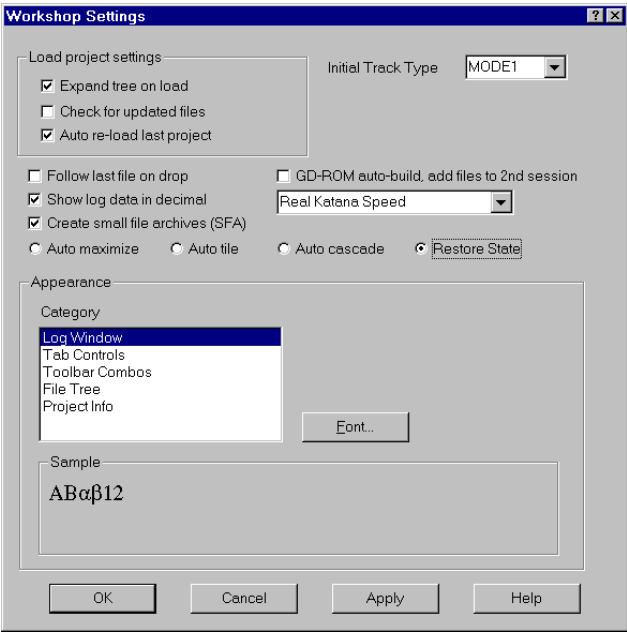
**NOTE:** *If you are running GD Workshop on Windows NT™, you must be running in Administrator mode.*

The hard disk space required on the development computer depends on the size of your projects. A GD-ROM has 1.2 GB capacity and a conventional CD has 650 MB capacity.

**Customising GD Workshop**

To customise GD Workshop:

- 1) On the Configuration menu, select Workshop.
- 2) On the Workshop Settings dialog box specify the settings you want.



Expand tree on load	This tells GD Workshop to automatically expand the project tree and show all tracks and files when you open an existing project.
Check for updated files	This tells GD Workshop to check the date and version of all project files on the emulation drive against the source files on the development computer, so that you can see if they have changed since the project was last opened. If any files have changed, a dialog box informs you of their status and you can choose to update the files or ignore the changes. See also Keeping track of file versions.
Auto re-load last project	This tells GD Workshop to automatically open the last project you were working on when it starts up.

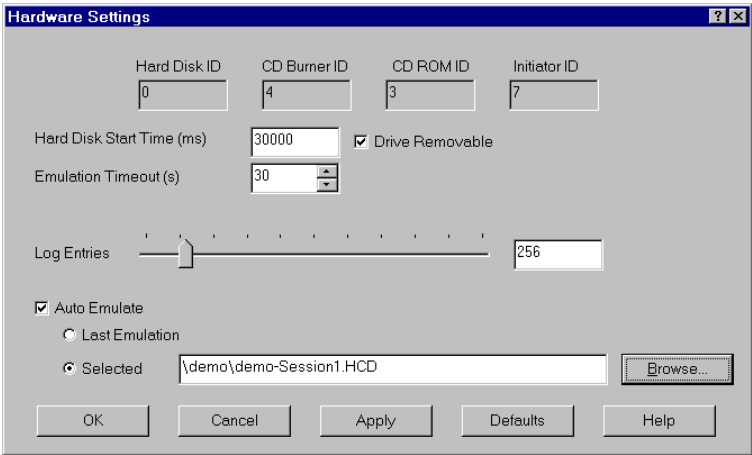
Follow last file on drop	This gives you control over the way that multiple files are dropped onto the project tree. If you are doing lots of large drops onto the tree this option should be unchecked. When checked, you can see each file as it is added to the tree, and when the drop is finished, the last file which was added is selected in the tree. When unchecked, the tree is built instantly and you are returned to the top of the tree when the drop is finished.
Show log data in decimal	This tells GD Workshop to display log data in the control window (such as sector addresses) in decimal. If it is not checked the log data appears in hexadecimal.
Create small file archives (SFA)	This tells GD Workshop to use Small File Archives if your project contains lots of small files less than 32K. This improves the GD-M's performance when emulating and writing small files. See also How and when to use small file archives.
Initial Track Type	This specifies the default track type that GD Workshop adds to a new project when you drag files directly into the empty project window.
Auto maximise Auto tile Auto Cascade	These buttons control the arrangement of windows in GD Workshop when you open new or existing projects.
Restore State	This tells GD Workshop to save the position of the project tree in the project window. You must also have Auto re-load last project selected for this to work.
GD-ROM Auto-build, add files to second session	This tells GD Workshop automatically build a two session GD-ROM and to add the files to the second session when you drag and drop files into an empty project window. When unchecked, the files will be added to the first session.
Emulate GD-ROM timings	When set to Real Katana Speed, this tells GD Workshop to emulate a GD-ROM disc with a variable data retrieval rate from 4x at the inside of the disc to 12x at the outside of the disc. GD Workshop also emulates GD-ROM seek times. See also GD-ROM layout and sector addresses. When set to No Speed Restrictions, GD Workshop emulates at constant data retrieval rate at the full speed of the GD-M with no seek delays. Full speed is 12x or above depending on the complexity of the data.
Appearance	Here you can specify the font used for each part of the display in GD Workshop.

**Configuring the GD-M hardware**

To configure the GD-M Hardware:

- 1) On the Configuration menu, select Hardware.
- 2) On the Hardware Settings dialog box specify the settings you want.

Refer to the Katana development box Installation Manual for more details of how to configure the SCSI IDs.



Hard Disk ID CD Burner ID CD-ROM ID Initiator ID	These show the SCSI IDs for devices on the Katana development box SCSI bus. Refer to the Katana development box Installation Manual for details of how to configure SCSI IDs. See also Configuring additional SCSI devices.
Hard Disk Start Time	This lets you specify the time in milliseconds that GD Workshop waits after sending a start up command to the emulation drive. If the drive does not reach operating speed within this time a Drive Not Found message is reported in the log in the control window.
Emulation Timeout	This lets you specify the time that GD Workshop waits after sending an emulate command to the GD-M. If the GD-M does not start the emulation within this time an Emulation Failed message is displayed. The default is 30 seconds and the maximum is 6000 seconds. For complex projects with lots of files and/or directories, you may need to increase the emulation timeout.



Drive Removable	This specifies whether the GD-M appears to the development computer as a fixed or removable drive. It should be set to Removable unless you are formatting the emulation drive, when it is temporarily changed to fixed. See also Formatting the emulation drive.
Log Entries	This sets the size of the log output buffer of the GD-M. The GD-M can store up to this number of log entries before it overwrites the buffer. An enquiry is made to the GD-M every second, so if this is set to 256, GD Workshop can receive a maximum of 256 new messages every second. Note: Currently the maximum number of messages the log can report is 64K, at which point it begins to overwrite the old messages.
Auto Emulate	This lets you specify a project which the GD-M will automatically emulate on start up. Check the Auto Emulate button and browse for the name of the emulation file or check Last emulation. See also Auto-emulating a CD.

### **Configuring additional SCSI devices**

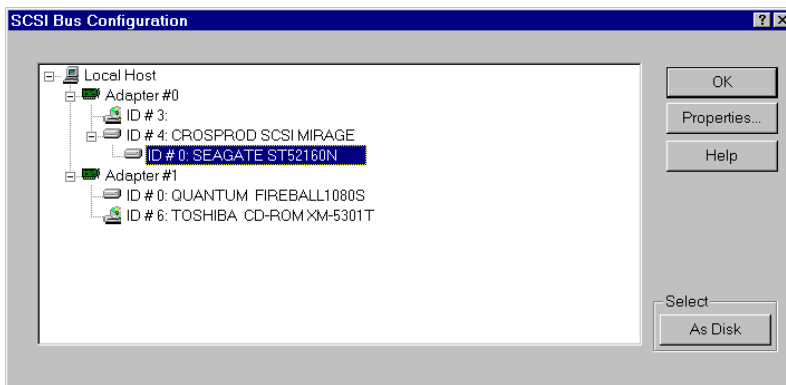
If you have more than one CD writer or an additional emulation drive attached to the SCSI bus on the back of the Katana development box, use this dialog box to select the devices you want to use.

- 1) Select SCSI Bus from the Configuration menu.
- 2) Any available devices attached to the Katana development box SCSI bus are shown connected to the GD-M in the tree.

The active SCSI bus is shown in bold.

- 3) Highlight the device you want to use and click Select.
- 4) Click OK and reboot both the Katana development box and the development computer.

The GD-M will use the devices you selected as the default devices until you return to this dialog and make a new selection.



The internal emulation drive is preset to SCSI ID 0 and the GD-M's initiator ID is set to SCSI ID 7 on the SCSI bus. Any additional devices you connect to the SCSI bus must be configured with SCSI IDs between 1 and 6. All devices on the SCSI bus must have different SCSI IDs.

Refer to the Katana development box Installation Manual for details of how to configure SCSI IDs.

## Configuring device drive letters

If there is more than one Katana development box or removable hard drive attached to the development system. GD Workshop will automatically display the Configure Drive Letters dialog box.

**NOTE:** *Under some operating systems and configurations, GD Workshop can assign drive letters automatically and you will not see this dialog box.*

To assign a drive letter to an emulator:

- 1) Select an emulator in the tree.
- 2) Select an available drive letter in the drop down box and click Add.

The emulator is assigned to the drive letter and added to the list of Current drive selections. The emulators added to this list appear in the Control toolbar in GD Workshop so that you can choose the one you want to use at the time of emulation.

### Important note

If a particular device is not shown in the drop down box or the list of Current drive selections, but you know the device is connected to the development computer, check the following:

- The drive has been correctly formatted.
- The operating system of the drive is compatible with the operating system of the development computer.
- The drive is connected correctly.
- The SCSI IDs are correctly configured and the SCSI bus is correctly terminated.

### **Upgrading the GD-M firmware**

- On the Help menu click About Workshop to see the current firmware and software versions.

Upgrades to the GD-M firmware are available from Sega DTS, contact technical support for details.

To install the new firmware:

- 1) Copy the new firmware (\*.FSH) to a local drive on the development system.
- 2) Select Update Firmware on the Configuration menu.
- 3) Browse for the new version of the firmware on the development system.
- 4) Click Open to overwrite the current GD-M firmware with this version.

### **How to use this help system and get technical support**

For help when you are using GD Workshop, press F1 or click Help at the bottom of each tab window. The relevant topic will be displayed. Alternatively, click the Help menu and select the help topic you want from the contents list.

In this Help system we provide details about the part of the interface you are in. We also try to give you guidance about what a particular item means, what information is being asked for and what options you should select.

GD Workshop is intended to make it easier for you to prepare your CD projects. You will find this Help system is a useful source of background information if you are unfamiliar with CDs and how their content is written, however, to fully understand the various CD formats and the complex issues involved in their preparation, we recommend that you do some background reading to familiarise yourself with current standards and specifications. See the section on reference documents at the end of this manual.

### **Technical support**

Technical support is available from Sega DTS.

# ***So, where do I start?***

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This chapter describes the basics of using GD Workshop and how to use it to develop a typical CD project.

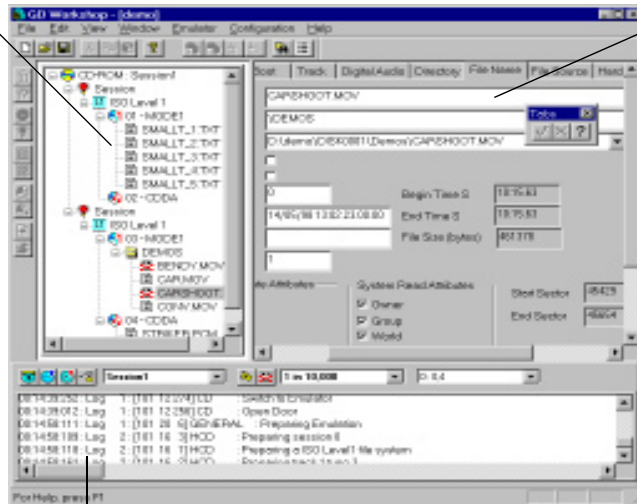
### So, where do I start?

Once GD Workshop is installed and a Katana development box is connected to your development computer, you are ready to start creating a CD project.

The main functions and screen layout of GD Workshop are shown below.

#### Project window

This area shows a tree representation of the content of your project. You can add files to the tree by dragging them onto the tree at the appropriate node from another program such as Windows® Explorer. You can also use the Project toolbar or the right-click menu.



#### Tab controls

This area lets you edit the attributes of tracks and files on the CD. When you select a branch of the tree in the project window, the relevant tab appears and you can edit its attributes.

#### Control window

This area enables you to control and log events on the GD-M. You can instruct the GD-M to emulate or write a CD from the toolbar and the results are logged in the window.

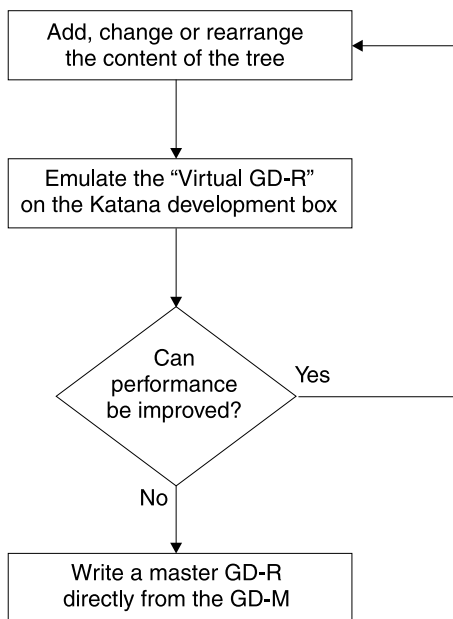
The interface includes the usual Windows® 95 features and all the main functions can be driven from toolbars, menus, right-click menus, or keyboard short-cuts.

### **A typical project**

The basic idea is that you add your prepared source files to the tree in the project window. The tree shows a hierarchical representation of the tracks and files which form the content your CD. You can edit the tree to change the order that the files are arranged on the CD, and when you are happy with the arrangement, emulate the CD.

If the emulation shows errors or running problems, you can make further edits to the tree or your source files and repeat the process until you are satisfied with the emulation results.

The flowchart shows a typical project using GD Workshop to produce a tested CD-R master from which you can press silver CDs. All of the main tasks can be done from within the GD Workshop interface.



If you have a compatible CD writer you can write a CD-R directly from the Katane development box.

**NOTE:** *GD Workshop currently supports Yamaha CDE/CDR100/102, CDR 200/400 and CRW 2260/4260 writers for conventional CD-ROM and Sega GDB for GD-ROM. Contact technical support for a list of currently supported CD writers.*



# ***How to build a CD Project***

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This chapter takes you through all the stages involved in creating a CD project.

It has the following sections:

- Starting and saving a new project
- Adding tracks and files using toolbar buttons (slow)
- Adding tracks and files using drag and drop (quick).

### **Starting and saving a new project**

#### **Starting a project**

To start a new project:

- 1) Click New on the File/Edit toolbar or select New on the File menu.
- 2) Name your project and click OK.

An empty project window is created where you can begin to add CDs, tracks and files to build up the content of your project.

#### **Saving a project**

To leave a project and save your work:

- 1) Click Save on the File/Edit toolbar or select Save on the File menu.

If it is a new project, a standard Save As dialog box appears.

- 2) Choose the location where you would like to save the project and click Save.

The project is saved in a file with the extension .cpj. The .cpj file contains all the current information about the project so that you can pick up where you left off when you next open the project.

***NOTE:*** *Project files (.cpj) should be saved on the development computer, they MUST NOT be saved on the emulation drive or the emulation will fail.*

## **Adding tracks and files using toolbar buttons (slow)**

With this method you add content to your project one item at a time:

- add a CD
- add a session
- add a track
- add a file
- add another file, and so on....

It is methodical but gives a good insight into how the hierarchy on a CD is structured.

### **Adding a CD**

Once you have created a new project:

- 1) Click Add CD on the Project toolbar or use the right-click menu in the project window.
- 2) Select the type of CD you want to create: Audio, Data or GD-ROM and click OK.

***NOTE:** If you choose Audio you can only add CD-DA tracks to the CD. If you choose GD-ROM you must make a two session GD-ROM.*

### **Creating a multiple CD set**

You can add more than one CD to a project if you want to create a multiple CD set. As you add CDs to the project they are labelled DISC1, DISC2, DISC3 and so on. You can edit these names on the Disc tab.

You can have as many CDs in a project as you like but you are limited by the capacity of the emulation drive, although you can add an additional external hard drive for extra capacity if required. See also Using an external hard drive.

### **Adding a session**

If you are creating a conventional CD you add the content in a single session.

If you specified GD-ROM when you created the CD, you must make a two session GD-ROM. The first session is the single density area and the second session is the high density area.

To add a session to the CD:

## ***How to build a CD Project***

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- 1) Click Add Session on the Project toolbar or use the right-click menu in the project window.
- 2) Specify the type of file naming system for the session by clicking Add ISO Level 1, Level 2 on the Project toolbar. See also File naming conventions and restrictions.

Once you have specified the file naming system, a symbol appears under the Session symbol. This forms the basis of your project and you can start to add tracks and files to the CD.

### **Adding a track**

Before you can add data to a CD you must add one or more tracks where the data can be recorded.

To add a track:

- Click the appropriate Add Track button on the Project toolbar or use the right-click menu in the project window.

**NOTE:** *A track must contain at least four seconds of data.*

The following rules apply:

#### **CD-ROM**

A conventional CD-ROM can contain up to 99 tracks consisting of multiple Mode 1 and Audio tracks. The Audio tracks are always placed after the Mode 1 tracks.

#### **GD-ROM**

The first session on a GD-ROM (the single density area) always contains one Mode 1 track followed by one Audio track.

The second session on GD-ROM (the high density area) can contain up to 99 Mode 1 and Audio tracks.

#### **Padding a Mode 1 track to the end of the disc**

In the second session of a GD-ROM, a Mode 1 track can follow an Audio track, so that the Mode 1 track containing the game can be placed at the outside edge of the CD where the disc speed is faster. The audio track that precedes it becomes a padding track containing zero data.

To do this:

- 1) Add an Audio track to the second session in the tree.
- 2) On the Digital Audio tab for this track, check Pad to end of disc.
- 3) Add the Mode 1 track that contains the game after the Audio padding track.

The size of the Audio padding track is automatically calculated so that the Mode 1 track is placed at the outside edge of the CD.

The padding track can be seen as an Audio track in the tree, but it cannot be played. See also Track Types.

### **Adding a directory**

You can add files directly to the tracks in the tree or you can organise files into directories.

To add a directory:

- 1) Select the track where you want to add a directory.
- 2) Click Add Directory on the Project toolbar or use the right-click menu in the project window.
- 3) Name the directory and click OK.

A directory symbol appears in the project tree and you can add files to it.

***NOTE:** The maximum number of files the GD-M can emulate is 20,000.*

### **Adding a file**

To add a file:

- 1) Select the track or directory where you want to add a file.
- 2) Click Add File on the Project toolbar or use the right-click menu in the project window.

## ***How to build a CD Project***

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- 3) Browse for the file you want to add to the project and click Open.

**NOTE:** *The maximum number of files the GD-M can emulate is 20,000.*

When you add a file to the project the following happens:

- A File Copier progress window appears and the file is copied to the GD-M's emulation drive where it will be accessed later during emulation. If the file is small the progress window will be shown very briefly.
- The file is added to the tree in the project window.

You may notice that the file name in the tree has been shortened. This happens if the name of the source file does not comply with the file naming system that you specified for the CD.

See also Keeping track of file versions, File naming conventions and restrictions and How and when to use small file archives.

## **Adding tracks and files using drag and drop (quick)**

With this method you add content to your project in a single drag and drop operation. It requires some preparation, but once your source files and GD Workshop are set up it is very quick.

The basic method is:

- Set up your source files on the development computer.
- Set up a new project.
- Drag and drop the source files into GD Workshop.

## **Set up your source files**

Arrange your source files in the root directory of the development computer in the way you want them to appear on the CD.

- 1) If you want to group a set of files in a directory on the CD, place them in a directory on the development computer.
- 2) Give your files and directories meaningful names now to avoid editing them later. See also Relative paths and File naming conventions and restrictions.

**NOTE:** *The maximum number of files the GD-M can emulate is 20,000.*

**NOTE:** *You cannot move more than 4,000 files in a single directory. If you need to create a directory on the CD which contains more than 4,000 files, you must drag in separate directories of 4,000 files each. Then, by renaming the directories in GD Workshop, you can move all the files into the same directory on the CD.*

## **Set up a new project**

- 1) In GD Workshop, click New.
- 2) Name the project and click OK.

An empty project window is created.

- 3) Select Workshop on the Configuration menu.
- 4) Under Initial Track Type select the type of track that you want to create first on the CD.

For example, if your source files are CD-ROM data you would select Mode 1 as your initial track type.

- 5) If you are creating a GD-ROM:

## ***How to build a CD Project***

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- and you want to add the files to the second session (the data session), check GD-ROM auto-build, add files to 2nd session.
  - and you want to add the files to the first session (the message session), uncheck GD-ROM auto-build, add files to 2nd session. See also GD-ROM layout and sector addresses.
- 6) Click OK..

### **Drag and drop the source files**

- 1) Browse the development computer for the source files you want to put on the CD.
- 2) Select all the source files and drag them into the empty project window. If your source files are grouped together in a directory, just select the directory and drag it into the project window.

GD Workshop looks at the files you are copying and makes a decision about the file naming system to use on the CD. The File Systems Configuration dialog box appears so that you can confirm or change the file naming system. See also File naming conventions and restrictions.

- 3) Confirm or change the file naming system to use on the CD:

When you have confirmed the file naming system the following happens:

- A File Copier progress window appears and the source files are copied to the emulation drive where they will be accessed later during emulation.
- A tree is drawn in the project window to represent the content of the CD.

***NOTE:*** You may notice that the file names in the tree have been shortened. This happens if the name of the source file does not comply with the file naming system that you specified for the CD.



# ***How to edit a CD project***

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This chapter takes you through the various ways you can edit and re-arrange the content of a CD project.

It has the following sections:

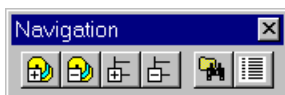
- Getting project information
- Finding files in a large project
- Adding and deleting tracks and files
- Renaming files and directories
- Keeping track of file versions
- Copying and moving files.

### **Getting project information**

At any time during the project you can get extensive information about the content of your project by clicking Project Information on the File menu.

### **Finding files in a large project**

The Navigation toolbar shown here has buttons to collapse and expand the tree in the project window. It also allows you to switch between tree view and list view.



To find files in a large project:

- 1) Click Find Files.

The Find Files dialog box appears.

- 2) Enter the name (or part of a name) you want to look for and click Find First or Find Next.

GD Workshop highlights any occurrence of that name in the tree.

**NOTE:** *You can repeat find operations at a later date without having to re-enter the file name by using the Find Files history list.*

## **Adding and deleting tracks and files**

### **Adding**

At any time you can add a track or file to your project:

- 1) Select the place in the project tree where you want to add the item.
- 2) Click the relevant Add button on the Project toolbar, the right-click menu in the project window or the Insert option on the Edit menu.

*NOTE: You can also drag items directly on to the project tree at the appropriate place. You cannot copy and paste items into the tree from other applications, only drag and drop is valid.*

### **Deleting**

To delete an item from the tree

- Select it and then click Delete on the Project toolbar, the right-click menu in the project window or the Delete key on your keyboard.

If you delete something by mistake click Undo on the Project toolbar. There is no limit to the number of undo operations. If you have deleted several items from the tree and you want to bring them all back in one operation, click the Undo All option on the Edit menu.

### **Renaming files and directories**

It is best to give your files and directories correct ISO9660 compliant names on the development computer before you add them to the CD. See also File naming conventions and restrictions.

However, if you need to edit file and directory names after they have been added, there are several ways to do this.

**NOTE:** *You cannot have two files with the same name in the same directory. Similarly, you cannot have two directories with the same name at the same level.*

### **Renaming files**

- using the File Name tab:
  - 1) In the project tree select the file you want to rename.
  - 2) In the File Name tab type over the old file name and click Apply.
- using the project tree:
  - 1) In the project tree select the file you want to rename and press F2 or double click on the file name leaving a pause between clicks.
  - 2) Type over the old file name and press Enter on your keyboard or select a different part of the tree. While you are typing over the name you can press ESC to cancel the operation.

**NOTE:** *There is no Undo after you have typed over a name in the tree, you must rename the file or directory again if you make a mistake.*

### **Renaming directories**

- using the File Name tab:
  - 1) In the project tree select the file whose directory you want to rename.
  - 2) In the File Name tab type over the old directory name and click Apply.

This will make a new path to the selected file only, all other files will still have the same path. This can be seen in the tree.

- using the Directory tab:

- 1) In the project tree select the directory you want to rename.
- 2) In the Directory tab type over the old directory name and click Apply.

This will make a new path to the selected directory only, all other sub-directories will still have the same path.

- using the project tree:

- 1) In the project tree select the directory you want to rename and press F2 or double click on the directory leaving a pause between clicks.
- 2) Type over the old directory name and press Enter on your keyboard or select a different part of the tree.

This will make a new path to the selected directory and all its sub-directories.

### **Keeping track of file versions**

To check the status of the files at any time while you are working on a project:

- Select Check File Versions on the File Menu.

**NOTE:** *You can also tell GD Workshop to automatically perform a check each time you open a project if you select Check for updated files in the Workshop Settings dialog box on the Configuration menu.*

When it performs a version check, GD Workshop looks at the source files for the project on the development computer and the same files on the emulation drive. The version numbers and modification date of corresponding files are compared. If differences are detected a dialog box appears showing the status of the files.

There are three ways to update the files:

- Cancel, to leave everything as it is.
- Update to emulator, if you have edited a source file on the development computer and not updated the file on the GD-M.
- Restore from emulator, if you have edited or deleted a source file on the development computer and you want to restore it with the version that is on the GD-M.

**NOTE:** *To do a link check GD Workshop must know where the emulation files and the source file are located. This information is written into the project as you add items to it. If you move any of the files (for example, if you change the drive letter of the development computer) the link check will fail unless you completely rebuild the project.*

## Copying and moving files

There are two views in which you can see the content of your CD in the project window; Tree view and List view. You can switch between these two views on the View menu or by clicking Switch Views on the Navigation toolbar.

- Tree view

In tree view the hierarchy of the CD is shown and you can see the full structure of directories, tracks and file systems.

In this view you can add and delete files, directories and tracks. You can also move files between directories and tracks or between different CDs in a multiple CD project.

- List view

In list view, the files are shown in the actual order that they are written in each file system on the CD (Level 1 or Level 2). Only one file system is shown at a time, to view another file system return to tree view, select another file system and return to list view.

When you select a file in list view, its exact position is given on the File Name tab where the start sector and end sector are shown. You can move and copy files within the file system in list view but you cannot add or delete files.

**NOTE:** *Where two adjacent files in list view are on different tracks, there is a gap of 150 sectors separating the files. This is the pre or post gap of the track which is automatically generated by GD Workshop.*

## Selecting files and directories

You select items in GD Workshop using standard windows techniques. A selected item is shown highlighted in the project window.

Shift click	selects everything between two points.
Control click	selects multiple items.
Shift up/down arrow	walks through the tree at the current level selecting everything at that level and beneath it.
Moving and copying files and directories	You move and copy items in GD Workshop using standard windows techniques. There is no undo for the operations below.

## ***How to edit a CD project***

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Drag and drop	moves the selected items.
Control drag and drop	copies the selected items.
Cut and paste	moves the elected items.
Copy and paste	copies the selected items.

***NOTE:*** *Cut/copy and paste only work within GD Workshop. You cannot do cut/copy and paste from another application into GD Workshop, only drag and drop is valid.*



# ***How to emulate a CD***

---

This chapter takes you through the stages involved in emulating and testing a CD project.

It has the following sections:

- Emulating a CD
- Emulating errors on a CD
- Auto-emulating a CD
- Reading the log information.

### **Emulating a CD**

**NOTE:** *If you attempt to access the emulation drive during an emulation, you will see the message "Access denied, device not ready".*

When you are happy with the arrangement of the content of your CD and you want to test that it works:

- 1) Switch the Emulator/GD-Drive switch on the control toolbar to Emulator (up position).
- 2) Select the emulator you want to use in the drop down list in the control toolbar (only if you have more than one emulator connected to the development computer).
- 3) If your project consists of several CDs, select which CD you want to emulate in the drop down list in the control toolbar. You can only emulate one CD at a time.
- 4) Click Close Door on the control toolbar.

**NOTE:** *The above controls are also available from the task bar using the right-click mouse button when GD Workshop is minimised.*

The GD-M now appears to the Katana development box or the target computer as a CD drive which is playing your "virtual" GD-ROM or CD.

To halt the emulation at any time click Open Door on the control toolbar.

You can make changes to your project and re-emulate as many times as you like until you are completely satisfied that your CD has no running problems before you write a gold master. See also Writing a CD-R.

### **Selecting the emulation speed**

There are four settings of emulation speed.

To change the emulation speed:

- 1) Select Workshop on the Configuration menu.
- 2) In the drop down box select the emulation speed you want to use.

With this set to Real Katana Speed, the GD-M will mimic a GD-ROM in a CAV machine where the data retrieval rate is 4x in the single density area (session one) and 6x at the inside edge of the high density area, increasing to 12x at the outside edge.

You can also set Real Katana Speed + or - 5%.

With the option set to No Speed Restrictions, the GD-M will emulate at full speed. Full speed is 12x or above depending on the complexity of the data.

### **Emulating errors on a CD**

There are three types of errors which GD Workshop can add to test how errors affect the data on your CD:

- Hard errors
- Soft errors
- Nudge.

**NOTE:** *Before you write a gold disc always make sure that all errors are disabled.*

#### **Hard errors**

To add hard errors in a file, you specify sectors in the file that contain bad data. This mimics data that has been recorded on bad media (a faulty or scratched CD) or sections of data that are corrupt for some other reason.


To specify a hard error:

- 1) Select the file in the tree where you want the error to be.
- 2) In the Hard Errors tab, specify the start sector of the error in the From box, and the end sector in the To box.
- 3) Click Add.

The error is added to the list on the Hard Errors tab.

- 4) Repeat these steps for all the errors you want to include in the file.

**NOTE:** *The maximum number of hard errors you can add is 64 per project.*

Each file containing hard errors is indicated in the tree by , and hard errors can be switched on and off before or during emulation by clicking the Hard errors on/off button in the control toolbar.

During emulation errors are shown in the log by a warning message which reports the number of sectors which were not retrieved due to the error.

**NOTE:** *If you enable hard errors during an emulation, the errors might not be effective immediately because the data being read from the emulation may already be cached. For files which are larger than the cache size and which have several hard errors, you will see errors after the next read command.*

*If you enable hard errors before emulating you will see all the errors as they occur.*

### Soft errors

To add soft errors, you specify the ratio of good sectors to bad sectors for the whole CD. Soft errors are introduced randomly by the emulator at the rate you specify.

To specify a soft error:

- 1) Click on the Soft Errors drop down box on the GD-M control toolbar.
- 2) In the drop down box select an error rate.

For example, 1 in 100 would introduce one bad sector in every one hundred sectors.

Soft errors can be switched on and off before or during emulation.

During emulation errors are shown in the log by a warning message which reports the number of sectors which were not retrieved.

**NOTE:** *If you enable soft errors during an emulation, the errors might not be effective immediately because the data being read from the emulation may already be cached. For files which are larger than the cache size and which have a high enough soft error rate, you will see errors after the next read command.*

*If you enable soft errors before emulating you will see all the errors as they occur.*

### Nudge

A nudge error mimics what happens when someone nudges the CD player while playing the CD.

To introduce a nudge:

- Click Nudge on the GD-M control toolbar while emulating the CD, or press “n” on the keyboard.

**NOTE:** *The nudge has a 0.5 second timeout. If there is no read command by the emulation within 0.5 seconds of clicking Nudge, the nudge is cancelled.*

## ***How to emulate a CD***

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**NOTE:** *If you nudge the CD during an emulation, you might not see the error if the data being read from the emulation is in cache. If you nudge when the cache is empty, you will see the error reported in the log.*

*This mimics the operation of a real CD mechanism.*

## Auto-emulating a CD

To auto-emulate a CD:

- 1) Select Hardware on the Configuration menu.
- 2) Check the Auto Emulate option.
- 3) Check Last Emulation or browse the emulation drive for the project you want to emulate and select the file with the .HCD extension.
- 4) Click Open.

**NOTE:** *The HCD file is created by GD Workshop when you click Close Door in the control window. You must do this first with the GD-M attached to the development computer before you can auto-emulate the CD. See also Files generated by GD Workshop.*

With the GD-M set to auto-emulate, you can disconnect it from the development computer.

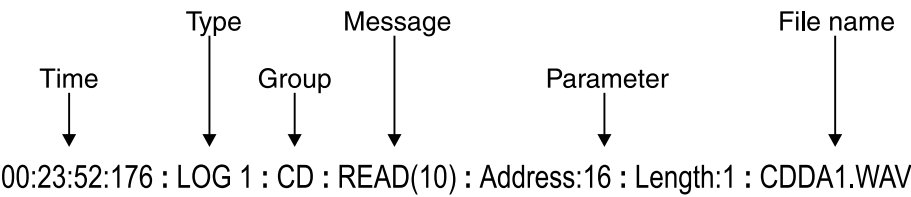
When the Katana development box is rebooted, the GD-M appears on the SCSI bus as a CD drive with its door closed, playing the CD you specified in the Emulation Name box.

**NOTE:** *For a GD-ROM the Katana looks for the file which is alphabetically first and emulates this file.*

**Reading the log information**

During emulation communications with the GD-M are shown in the control window of GD Workshop in a time stamped log. The log lets you see the status of the GD-M and any communications between it and the target computer or a CD writer.

A typical log message is shown below.



Time	This is the time of the message and is expressed in hours, minutes, seconds and milliseconds since the GD-M was last booted (powered off and on).
Type	This is the type of message: log, warning or error.
Group	This is the message group.
Message	This is the instruction, request or message being passed between the GD-M and the target computer or CD writer. Most of the messages are self explanatory, the less obvious messages are defined in the table below.
Parameter	This adds value to the message. For example, a READ(10) instruction must also have a sector address from which to start reading and a read length of n sectors. Not all log messages have parameters.
File name	This is the name of the file being emulated at the time of the message. Not all messages have a file name.

**Log message definitions**

Log message	Meaning
Inquiry	SCSI bus scan to see what devices are on the bus.
ReadSubChannel	Request for position of CD and current audio status.
Read(10)	Read request for a specific number of sectors from a specific address.



Log message	Meaning
ModeSense(6)	Request for drive parameters of the CD emulation drive such as drive speed.
ModeSelect(6)	Instruction to change those parameters above which can be changed.
Seek(10)	Instruction to go to sector n or address mm:ss:ff.
ReadTOC	Read request for Table of Contents of the CD.
ReadCDCCapacity	Request for capacity of data on the CD.
PlayAudioMSF	Play track from mm:ss:ff to mm:ss:ff.
PlayAudio(10)	Read(10) for an audio CD.

## How to use the log information

The log information can be used as a useful diagnostic tool to help you overcome running problems due to badly positioned files on your CD.

For example, if your CD project shows unacceptable pauses when moving between certain files, you can see from the log which files the GD-M is trying to read when pauses occur. You can optimise performance by positioning the files which cause the problem closer together.

Using the right-click menu in this region you can:

- Save the log to a text file by clicking Save to File.
- Continuously write the log to a text a file by clicking Start File Logging and then save this file by clicking Stop File Logging.
- Switch off the log display completely by clicking Display Logging.

# ***How to write a CD-R***

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This chapter takes you through the stages involved in writing a gold master CD from the Katana development box.

It has the following sections:

- Writing a CD-R
- Switching between different CD writers.

## Writing a CD-R

**NOTE:** If you attempt to access the emulation drive while writing a CD-R, you will see the message "Access denied, device not ready".

**NOTE:** GD Workshop currently supports Yamaha CDE/CDR100/102, CDR 200/400 and CRW 2260/4260 writers for conventional CD-ROM and Sega GDB for GD-ROM. Contact technical support for a list of currently supported CD writers.

You can write a CD-R directly from the GD-M with a compatible CD writer connected to the Katana development box SCSI bus.

There are two Write buttons on the toolbar in the control window, Test Write and Write.

### Test Write

We recommend that before you write a CD-R, you carry out a test write to make sure that there are no communication problems between the GD-M and the CD writer. To do this:

- 1) Click Test Write.
- 2) In the Test Write progress box select the writing speed and click OK.

A test write is exactly the same as an actual write, except that the laser in the CD writer is disabled so that a CD-R is not wasted if there is a problem.

If the test write is successful, a confirmation message appears in the control window.

### Write

To repeat the process and write a CD-R with the laser enabled click Write.

## Switching between different CD writers

If you have more than one CD writer connected the Katana development box SCSI bus, select the one you want to use as follows:

- 1) Select SCSI Bus from the Configuration menu.
- 2) The available CD-Rs attached to the Katana development box SCSI bus are shown connected to the GD-M in the tree.

## ***How to write a CD-R***

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- 3) Highlight the device you want to use and click Select.
- 4) Click OK and reboot both the Katana development box and the development computer.

Refer to the Katana development box Installation Manual for details of how to connect external devices.

# ***How to use an external hard drive***

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This chapter describes the benefits which can be gained by using an addition emulation drive.

It has the following sections:

- Using an external hard drive
- Formatting the emulation drive
- Fragmentation of the emulation drive

### **Using an external hard drive**

Attaching an external hard drive to the Katana development box SCSI bus provides the following advantages:

- It allows you to easily switch between projects by keeping your projects on separate drives.
- It allows you to increase the capacity of a project.

In a multiple CD project, you can place the content of several CDs on a single drive if there is sufficient capacity, but you cannot have a single CD whose files are spread across different emulation drives. The GD-M can only emulate from files on one drive at a time.

Refer to the Katana development box Installation Manual for details of how to connect external devices.

### **Switching between different emulation drives**

If you have more than one emulation drive connected the Katana development box SCSI bus, select the one you want to use as follows:

- 1) Select SCSI Bus from the Configuration menu.

The available drives attached to the Katana development box SCSI bus are shown connected to the GD-M in the tree.

- 2) Highlight the device you want to use in the tree and click Select.
- 3) Click OK and reboot both the Katana development box and the development computer.

## Formatting the emulation drive

Whatever size emulation drive is fitted in the Katana development box when it is shipped, it is always formatted with a 2 GB FAT16 partition so that it is compatible with Windows 95, OSR2 and NTFS operating systems.

If you want to add an external drive for extra capacity or reformat the internal drive, the emulation drive must be formatted with a cluster size of 32K or above.

**NOTE:** *If the emulation drive is formatted with a cluster size smaller than 32K, the GD-M will not emulate.*

**NOTE:** *If you are running GD Workshop on Windows 95 (non-OSR2), you can only format the emulation drive using FAT16 with a maximum 2 GB partition size, regardless of the size of the emulation drive.*

### To format the emulation drive with NTFS under Windows NT operating system:

- 1) On the Start menu select Programs > Administrative Tools > Disk Administrator.
- 2) In Disk Administrator select the emulation drive you want to format.
- 3) On the Partition menu select Delete and answer Yes to delete the current partition.
- 4) On the Partition menu select Create.
- 5) Enter the size of the new partition you want to create, click OK, and answer Yes to create a new partition.
- 6) On the Partition menu select Commit Changes Now and exit Disk Administrator.
- 7) On the Start menu select Programs > Command Prompt.
- 8) At the Command Prompt use the following command line:

```
format [drive letter]: /fs:ntfs /a:32k
```

where:

/fs is the switch to set the file system

/a is the switch to set the cluster size

32K = cluster size.

- 9) Press Enter to start formatting.

## ***How to use an external hard drive***

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### **To format the emulation drive with FAT32 under Windows 95 OSR2 operating system:**

- 1) In GD Workshop select Hardware from the Configuration menu.
- 2) Uncheck the Drive Removable option.
- 3) In Windows set the emulation drive to fixed:
  - right-click My Computer,
  - select Properties,
  - select Device Manager,
  - under Disk Drives double click the emulation drive you want to format,
  - select Settings and uncheck Removable.
- 4) Reboot the development computer.
- 5) In a DOS box use FDISK or AFDISK to create a partition of the required size.
- 6) Reboot the development computer.
- 7) In a DOS box use the following command line to format the drive:

```
format [drive letter]: /z:64
```

where:

/z is an undocumented switch to set the number of sectors per cluster

64 sectors of 512 bytes = 32K cluster size.

- 8) When formatting is complete, reset the drive properties in Windows to Removable, see step 3 above.
- 9) Reboot the development computer.
- 10) Start GD Workshop and reset the drive properties to Removable, see steps 1 and 2 above.

### **Fragmentation of the emulation drive**

If the emulation drive becomes severely fragmented emulation can become unreliable. We recommend that you occasionally defragment the emulation drive.



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# ***How content is written on a CD/GD-ROM***

This chapter describes the way content CD is written on a CD and the various different formats available and their restrictions. It also describes any peculiarities involved in preparing a Sega GD-ROM and using GD Workshop.

It has the following sections:

- The capacity of a CD project
- CD layout and sector addresses
- GD-ROM layout and sector addresses
- Track typess
- Relative paths
- File naming conventions and restrictions
- Permitted ISO9660 characters
- Files generated by GD Workshop
- How and when to use small file archives.

### **The capacity of a CD project**

A GD-ROM has 1.2 GB capacity and a conventional CD has 650 MB capacity.

The number of GD-R or CD projects you can work on at one time depends on the capacity of the emulation drive, but you can connect additional hard drives to the Katana development box SCSI bus for extra capacity. See also Using an external hard drive.

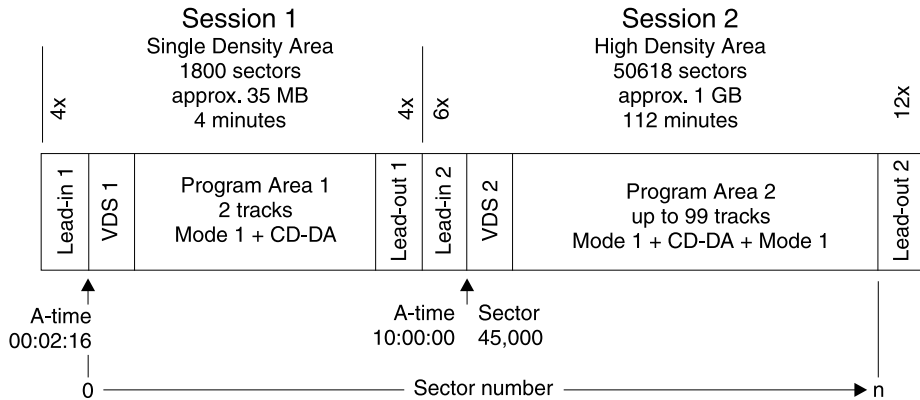
There must also be some capacity on the GD-M for emulation files created by Workshop. This depends on the information you are recording but can be as much as 5 MB for a CD which contains a large number of files.

**NOTE:** *The maximum number of files the GD-M can emulate is 20,000.*

## GD-ROM layout and sector addresses

The diagram below shows the basic layout of the content of a GD-ROM. The content is written in a single, continuous, spiral track that starts at the centre of the disc and reads outwards.

Physical layout of a GD-ROM



A GD-ROM always contains a single density area and a high density area.

### Single density area

This has the same layout as a conventional CD, except that it has approximately 35 MB capacity.

User data and audio is written in the program area which contains one data and one audio track. This area can be read by a PC and is used to record a message which is displayed if the user tries to play the GD-ROM in a standard CD drive.

### High density area

This is located after the lead-out of the single density area and starts with a second VDS at A-time 10:00:00.

The high density area is where the game is written and can contain up to 99 Mode 1 and CD-DA tracks. It is possible to have a Mode1 track following a CD-DA track in this format.

## ***How content is written on a CD/GD-ROM***

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A GD-ROM is played in a constant angular velocity (CAV) machine which means that the speed at the inside edge of the disc is slower than at the outside edge. Therefore, the disc speed (and data retrieval rate) of the high density area is 6x at the beginning increasing to 12x at the end.

### **Sector addresses on a CD (mm:ss:ff)**

Sector positions on a CD are expressed as absolute or relative time in minutes, seconds and frames (a frame is the same as a sector) in the format mm:ss:ff (also written as MSF). They can also be expressed as a sector number.

#### **Absolute time**

This is the position of a sector relative to the absolute time at the beginning of the CD. The disadvantage of using this system is that if you edit a track or file at the beginning of the CD so that it becomes longer or shorter, the absolute times for each subsequent sector of data will change and must be recalculated.

#### **Relative time**

This is the position of a sector relative to some other point on the CD such as the beginning of a track, file or extent (an extent is a specified number of sequential blocks on the CD). It is more convenient to use relative time because if changes are made in track one for example, only the addresses of sectors in track one are affected, the start times of all subsequent tracks will change but the relative times within each track remain the same.

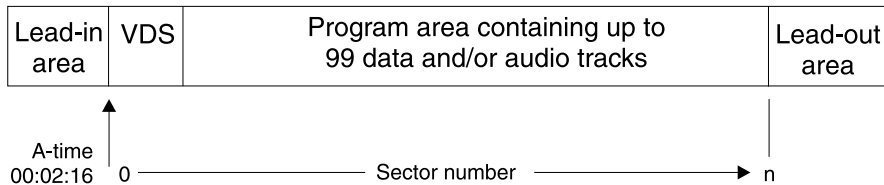
#### **Sector number**

Often only the sector number is given in a seek or read command or to express the start address of a file on a CD. For this purpose sectors are counted from the first sector of the first track which is sector zero. Each sector increments by one up to n depending on how much data the CD holds.

## CD layout and sector addresses

The diagram below shows the basic layout of the content of a CD. The content is written in a single, continuous, spiral track that starts at the centre of the CD and reads outwards.

Physical layout of a CD



A CD always starts with a lead in area which contains the Table of Contents (TOC). The TOC contains information about the tracks on the CD and their running order.

Following the lead-in, and always starting at sector 00:02:16, is the Volume Descriptor Set (VDS). This contains the PVD and also contains the positions of the data files.

User data or audio is written in the program area which can contain up to 99 tracks. CD-ROM data tracks are always placed before audio tracks when both are present on a mixed mode CD.

There is always a lead-out at the end of a CD which prevents the read head from reading past the last track.

### Sector addresses on a CD (mm:ss:ff)

Sector positions on a CD are expressed as absolute or relative time in minutes, seconds and frames (a frame is the same as a sector) in the format mm:ss:ff (also written as MSF). They can also be expressed as a sector number.

#### Absolute time

This is the position of a sector relative to the absolute time at the beginning of the CD. The disadvantage of using this system is that if you edit a track or file at the beginning of the CD so that it becomes longer or shorter, the absolute times for each subsequent sector of data will change and must be recalculated.

#### Relative time

## ***How content is written on a CD/GD-ROM***

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This is the position of a sector relative to some other point on the CD such as the beginning of a track, file or extent (an extent is a specified number of sequential blocks on the CD). It is more convenient to use relative time because if changes are made in track one for example, only the addresses of sectors in track one are affected, the start times of all subsequent tracks will change but the relative times within each track remain the same.

### **Sector number**

Often only the sector number is given in a seek or read command or to express the start address of a file on a CD. For this purpose sectors are counted from the first sector of the first track which is sector zero. Each sector increments by one up to n depending on how much data the CD holds.

## Track types

Tracks on a CD can be considered similar to the tracks you see on an LP vinyl record, and in fact on an audio music CD, each song is written on a separate track in just the same way.

A catalogue or reference CD-ROM which contains lots of data files, such as a CD-ROM font library, will probably just have a single track where all the files are recorded. A typical game or educational CD-ROM, containing data and audio, may have a single Mode 1 track containing the data followed by several audio tracks.

There are three types of track in which data can be written on a CD. The type of tracks you use depends on the type of data you are recording.

*NOTE: GD Workshop does not support Mode 2.*

The definitions given here are brief. See also Reference documents.

### Mode 1

This is a standard Yellow Book CD-ROM track where the sectors have three layers of error correction which makes this type of track robust and suitable for computer data.

2352 byte layout for a CD-ROM Mode 1 sector

sync 12	header 4	user data 2048 bytes	EDC 4	blanks 8	ECC 276
------------	-------------	----------------------	----------	-------------	------------

### Mode 2

This is a Yellow Book CD-ROM/XA track where the sectors have additional subheader information which makes them suitable for interleaving real-time audio and compressed audio/video files.

There are two types of Mode 2 track, Form 1 and Form 2, which have different amounts of error correction built in depending on how robust the system needs to be. For example, a Mode 2 track carrying computer data will need to be Mode 2, Form 1 because of the extra EDC layer, whereas compressed audio and video can be carried on a Mode 2, Form 2 track because it is a more robust data type.

## ***How content is written on a CD/GD-ROM***

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2352 byte layout for a CD-ROM Mode 2/XA - Form 1 sector

sync 12	header 4	sub-header 8	user data 2048 bytes	EDC 4	ECC 276
------------	-------------	-----------------	-------------------------	----------	------------

2352 byte layout for a CD-ROM Mode 2/XA - Form 2 sector

sync 12	header 4	sub-header 8	user data 2324 bytes	EDC 4
------------	-------------	-----------------	-------------------------	----------

## **CD-DA**

This is standard Red Book audio track which can contain up to 74 minutes of digital hi-fi audio.

Data layout in a CD-DA sector (1/75 second)

user data 2352 bytes
----------------------



### **Relative paths**

When you drag and drop files into an empty project window the relative paths to the files are copied into the project, not the absolute paths.

For example, if all your project files are in a directory called “PROJECT” on the development computer, all the files will appear in root on the CD when they have been copied. The “PROJECT” part of the path is not copied because it is the same for all the files.

Any sub-directories of “PROJECT” will appear in root on the CD.

### **File naming conventions and restrictions**

#### **ISO9660 and its extensions**

There are various file naming systems for directories and files which form the content of a CD. These systems are based on ISO9660 Level 1 which is the basic standard for CD-ROM information exchange as defined by ISO9660.

ISO9660 Level 1 is very versatile in that it works on all operating systems, but is very restrictive in terms of the characters that you can use to name your files and directories.

As CD-ROM production has evolved, extensions have been added to ISO9660 to incorporate the use of new file naming systems (such as Windows® 95 long file names) so that a CD can use file names which are compatible with the operating system on the target computer. This makes CDs more user friendly.

However, as a CD-ROM developer you must make sure that all your potential customers can read the file naming system you use. For example, if you use Windows 95 long file names on your CD, you must be sure that all your customers are running Windows 95 on their computers.

**NOTE:** *Currently GD Workshop supports ISO9660 Level 1 and Level 2 interchange.*

#### **Audio**

Select this if you want to create an audio only CD. There are no restrictions placed on the length or format of file names.

#### **ISO9660 Level 1**

This file naming system uses only d-type characters in 8.3 format.

#### **ISO9660 Level 2**

This file naming system uses only d-type characters.

Up to 30 characters for file names. When a file name has no extension, the file name must end with a Period “.”.

Up to 31 characters for directory names.

### **Joliet DOS and Windows®™ @ 95**

Used for Unicode character sets and Windows 95 filenames up to 64 characters. Not implemented in this release of GD Workshop.

### **Rock Ridge**

Used in UNIX systems. Not implemented in this release of GD Workshop.

### **HFS**

Used in hybrid and Macintosh discs. Not implemented in this release of GD Workshop.

### **File name fixing**

If you add files to a CD which do not comply with the file system you specified, GD Workshop automatically fixes the file names to make them comply.

GD Workshop tries to make a meaningful name by substituting illegal characters and using numbers when duplicate names occur.

For example, if you try to add three files with Windows 95 long filenames to a CD which has ISO9660 Level 1 specified as its file naming system, the file names would be fixed as shown below:

File Name a.txt	becomes	FILENA_1.TXT
File Name b.txt		FILENA_2.TXT
File Name c.txt		FILENA_3.TXT

and

Directory a	becomes	DIRECT_0
Directory b		DIRECT_1
Directory c		DIRECT_2

**NOTE:** *The fixed file name is shown in the project tree and the fixed and original file names are shown on the File Name tab when you select the file in the tree.*

### **Permitted ISO 9660 characters**

#### **ISO 9660 d-type characters**

Uppercase letters A to Z, numbers 0 to 9 and the underscore symbol “\_”.

#### **ISO 9660 a-type characters**

Uppercase letters A to Z, numbers 0 to 9 and symbols (space) \_ \* ? ! ; % & - = > < ‘ “ ( ) , / : .

## **Files generated by GD Workshop**

When you click Close Door to emulate the “virtual” CD you have created, GD Workshop generates the following files:

### **.HCD**

This is used by the GD-M when emulating the project and contains the table of contents (TOC) and run time information such as the begin and end time (sector number on the CD) of each file.

### **.VDS**

This is part of the ISO9660 specification and is used by the operating system of the target computer (for example Windows 95). It contains the PVD and also contains information about each file and its position on the CD.

### **.SFA and .SFI**

These files are created if your CD contains lots of small files and you have instructed GD Workshop to use small file archives. See also How and when to use small file archives.

The files listed above can only be seen if you access the emulation drive. They are created for each emulation when you click Close Door. The size of the files depends on the complexity of the CD project but can be several megabytes for a complex CD.

### **How and when to use small file archives (SFAs)**

If your CD project contains small files less than 32K (the cluster size of the emulation hard disk), emulation or writing can be compromised at high speeds. GD Workshop solves this problem by combining small files into larger files called SFAs. Using SFAs improves the data retrieval rate from the GD-M during emulation.

To use SFAs:

- 1) Select Workshop on the Configuration menu.
- 2) Select Create Small File Archives on the Workshop Settings dialog box.

When GD Workshop prepares to emulate, it looks at the files in the project and where there are two or more contiguous files which are smaller than 32K each, they are combined into an SFA. For each SFA created, an index of its contents is also created (SFI). These files reside on the GD-M's emulation drive and should not be edited directly.

# ***How to use the tab controls***

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This chapter describes each field on the tab controls and what information can be entered to edit the properties of files and tracks on the CD.

It has the following sections:

- Using the tab controls
- Disc
- Primary Volume Descriptor (PVD)
- Boot
- Track
- Digital Audio
- Directory
- File Name
- File Source
- Hard Errors

### **Using the tab controls**

The tab controls let you edit various properties of your CD project. When you click on a branch in the project tree, the relevant tab appears and you can edit its properties.

The Apply, Cancel and Help buttons that appear at the bottom of each tab window are also available on the Tabs toolbar shown here.



This toolbar is docked at the top of the screen when you first start GD Workshop, but you will find it useful to have it floating above the tabs when making edits so that you do not have to scroll to the bottom of the tab window each time you want to apply or cancel a change.

To get detailed help about what the options on a particular tab mean click Help at the bottom of the tab window or on the Tabs toolbar.

### **Date and time**

- Dates are given as day, month, year in the format DD/MM/YYYY.
- Times are given as hours, minutes, seconds, milliseconds and GMT offset in the format hh:mm:ss:ll:gmto.

GMT offset is the difference between local time and Greenwich Meantime in 15 minute units. For example, Japan which is 9 hours ahead of GMT has an offset of 36 (9x4). It is not necessary to enter the date and time in full, if you just enter the date, the time will be ignored and this will have no impact on the emulation or recording process.



### **Disc**

This tab defines the outer most level of the CD you are creating.

#### **Disc Name**

8.3 ISO 9660 d-type characters

Enter a title for the CD.

#### **Catalogue Number**

Numerical up to 13 digits

Enter a catalogue number for the CD. This is required by a publisher if you intend to publish the CD. For a Sega GD-ROM, the catalogue number must be obtained from Sega

#### **System Area File**

ISO 9660 d-type characters

Enter the name and the path of the System Area File which contains the territory identifiers for a GD-ROM.

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

This tab defines the header information which goes in the PVD. This is information about the CD such as the creator, creation date and copyright. See also GD-ROM layout and sector addresses.

The PVD information is broken down into the following categories:

- Volume Information
- Copyrights
- Miscellaneous
- File Name Information

### **Volume Information**

#### **Identifier**

Up to 32 d-type characters

Enter a name for the CD. This is usually the title of the GD-ROM.

#### **Set Identifier**

Up to 128 d-type characters

Enter the overall name of the volume to appear on each CD if it is part of a multiple CD set. If there is only one CD in the set, the Identifier and Set Identifier are the same.

For example, a three CD volume set could have the Set Identifier "ENGLISH\_DICTIONARY", and the CDs in the set could have Identifiers "A\_J", "K\_S" and "T\_Z".

#### **Creation Date**

DD/MM/YYYY hh:mm:ss

The default is the date and time when you started the project. To change this, enter a different date and time.

#### **Modification Date**

DD/MM/YYYY hh:mm:ss

The default is the date and time when you last modified the project. To change this, enter a different date and time.

### **Expiration Date**

DD/MM/YYYY hh:mm:ss

If the CD contains data that may become obsolete in the future, you can set an expiration date after which the data will no longer be accessible. The default is the creation date plus 9 years.

### **Effective Date**

DD/MM/YYYY hh:mm:ss

If you do not want the data on the CD to be accessed before a certain date you can set the effective date here. The default is the creation date.

## **Copyrights**

### **Publisher**

Up to 128 a-type characters

Enter the name of the publisher or organisation who owns the copyright of the CD.

### **Data Preparer**

Up to 128 a-type characters

Enter the name of the data preparer. This can be the name of an individual or an organisation.

### **Application**

Up to 128 a-type characters

Enter the name of the application that can use the data on the CD.

### **Miscellaneous**

#### **System ID**

text string

This defines the system that the CD is intended to be played on, for example, IBM<sup>TM</sup>PC or Macintosh<sup>TM</sup>.

#### **Logical Block Size**

This is the logical block byte length for the data on the CD. This is set to 2048 which is the same as a sector length.

## **File Name Information**

#### **Copyright**

8.3 d-type characters

Enter the name of the file that contains the copyright message.

#### **Abstract**

8.3 d-type characters

Enter the name of the file that contains the abstract information such as a text description of the CD.

#### **Bibliographic**

8.3 d-type characters

Enter the name of the file that contains the bibliography for the CD.

#### **Application Use**

The information required in this field is not defined. It is available for future additions to the ISO9660 specification.

## Boot

**NOTE:** *This feature is not available for GD-ROM.*

To make a bootable CD, you need a bit-for-bit image of the boot record which will boot the target system. This can be an image of a boot floppy (1.2, 1.44 or 2.88 MB), a hard drive or any raw boot code. You can place more than one boot image on a bootable CD and when the CD is read by an El Torito compatible CD drive a menu is displayed so the user can choose which image to boot from.

### **Boot Entry**

Up to 32 d-type characters

Enter a text string to identify the boot record you are adding, such as the name of the system or the creator of the CD. Then click on the Add button to activate the Boot tab.

### **File Name**

D-type characters

Browse for the file which contains the boot image you are adding to the CD.

### **Platform**

Select the type of platform the boot image is intended for.

### **Image contains ATAPI/SCSI drivers**

Select the type of drivers included in the boot image.

### **Load Segment**

Hexadecimal

Enter the load segment where the system will load the boot image. If this value is zero the system will use the standard load segment of 7C0.

### **Load RBA**

## ***How to use the tab controls***

---

Hexadecimal

This is the relative address of the start sector where the boot image is written on the CD calculated by Mirage Workshop. For example the RBA of 15H means that the boot image starts at sector 21 (decimal) on the CD.

Repeat the above entries for each additional boot image required.

## Track

This tab shows the position of the track selected in the tree.

**NOTE:** *The position of a track cannot be changed, but you can move the contents of a track to a new track and then delete the original track. See also Copying and moving files.*

### Pre-gap

Numerical

A pre-gap assists transition of the read head between tracks of different types. Enter the number of empty blocks (user data that is all zeros) to be added as a pre-gap at the beginning of a data track. One block lasts for one seventy-fifth of a second and a pre-gap should be at least 150 blocks or two seconds.

A pre-gap is required:

- on the first data track after an audio track
- between data tracks of different types.

A pre-gap is not required between data tracks of the same type or before the first track on the CD.

### Post-gap

Numerical

A post-gap assists transition of the read head between tracks of different types. Enter the number of empty blocks (user data that is all zeros) to be added as a post-gap at the end of a data track. One block lasts for one seventy-fifth of a second and a post-gap should be at least 150 blocks or two seconds.

A post-gap is only required:

- on the last data track before the lead out at the end of CD
- on a data track followed by an audio track on a mixed mode CD.

### **Digital Audio**

This tab lets you specify certain attributes which apply to digital audio tracks (CD-DA).

#### **Pause**

Numerical

Enter the number of empty blocks to be paused (audio silence) at the beginning of a CD-DA track. This assists transition of the read head between CD-DA tracks. One block lasts for one seventy-fifth of a second and a typical audio pause is 150 blocks or two seconds.

#### **Pre-emphasis**

This specifies whether the source file for the audio track was recorded with pre-emphasis applied.

#### **2/4 Channels**

This specifies the number of channels for the audio track. This can be two or four for a CD-DA audio track and defaults to two.

#### **Copy Protect**

This tells GD Workshop to record the audio track with a copy protect mechanism switched on. When it is checked digital copying is not permitted.

#### **Track Number**

This shows the position of the audio track selected in the tree and allows you to change the track order.

To change the position of an audio track:

- 1) Select the track you want to move in the tree.
- 2) On the Digital Audio tab, click the up or down arrow next to the track number until the track is in the required position. The other tracks on the CD are re-arranged automatically.
- 3) Click Apply.



### **Pad to end of disc**

This tells GD Workshop that the audio track is a padding track. See also Adding a track. Adding a track

### **Directory**

This tab lets you set various properties which apply to the selected directory.

#### **Directory Name**

This is the path to the directory on the CD in which ISO 9660 files are recorded. Usually this will just be “\” if the files are placed directly onto the CD.

See also Relative paths. Relative paths>refer

#### **Hidden/Record Directory**

Check these if you want the directory to be a hidden or record directory.

#### **Minimum Length**

This specifies the minimum number of bytes that the directory record occupies regardless of its actual size. If the directory record is smaller than this number, it is zero filled to the specified size.

This allows room for additions to the directory record without affecting its overall size.

#### **Recording Date**

DD/MM/YYYY hh:mm:ss

This defaults to the creation date and time unless you enter a different date and time.

## **File Name**

This tab lets you edit various attributes which apply to the selected file in the tree.

### **File Name**

This is the name given to the file by GD Workshop when it is added to the tree. This may be different from the name of the source file if it has been fixed to comply with the file naming system specified for the CD. See also File naming conventions and restrictions.

### **Errors**

This is a shortcut to the Hard Errors tab. See also Hard Errors.

### **Directory**

This is the directory on the CD in which the selected file is recorded.

Click More for a short-cut to the directory tab. See also Directory.

### **File Source**

This is the directory and file name of the file source on the emulation drive which the GD-M reads when emulating the CD.

Click More for a short-cut to the file source tab. See also File Source.

### **Hidden/Record File**

Check these if you want the file to be a hidden or record file.

### **Minimum Length**

This specifies the minimum number of bytes for the area of the file regardless of the actual size of the file. If the file is smaller than this number, it is zero filled to the specified size.

This allows room for additions to the file without affecting its overall size.

### **Recording Date**

## ***How to use the tab controls***

---

DD/MM/YYYY hh:mm:ss

This defaults to the creation date of the CD unless you enter a different date and time.

### **Begin Time S**

mm:ss:ff

This option lets you set the start position of the file relative to the start position of the session.

If you do not specify the begin time, the files are recorded on the CD consecutively in the next available sector.

### **End Time S**

mm:ss:ff

This option lets you set the end position of the file relative to the start position of the session. The start position of the file is calculated so that the file ends at the specified position.

If you do not specify the end time, the files are recorded on the CD consecutively in the next available sector.

### **File Size**

This is the size of the selected file read from the emulation drive. This information is provided to give you an indication of the final size of the CD as you add files to it. It also provides a useful way to check that files have copied correctly, by comparing the file size given here with the file size on the development computer.

### **Version**

Numerical 1 to 32767

This is the version number of the file and defaults to 1 if nothing is entered in this field.

### **Start Sector/End Sector**

These show the start and end position of the selected file, which is given as the sector number relative to the beginning of the session. For this purpose the first sector on the CD in which user data is recorded is sector zero (0).

### **System Execute and System Read Attributes**

These options are for use in Unix™ systems where user access to files is defined by the categories Owner, Group or World. If your project is being written for Unix systems, each file on the CD can be marked with one of these categories.

### **File Source**

This tab lets you add and delete source data from the selected file in the project tree.

An ISO 9660 file on a CD can be made up of more than one file source. This can be useful, for example, to record a set of image files which are combined to make up an animated graphic under a common file name.

If the ISO 9660 file is made up of multiple file sources, all the file sources which make the ISO9660 file are listed in the drop down box.

#### **File Source**

MS-DOS path and filename

This is the path and file name of the file source on the emulation drive.

During CD emulation this file is read by the GD-M and must be located on the emulation drive. The emulation will fail if this field does not contain the full path and file name, including the drive letter.

#### **Add/Delete**

To add a file source to this list click Add and browse for the file you want to add. To delete a file click Delete.

### **Hard Errors**

This tab lets you add errors into a file to test how robust your data is. See also Emulating errors on a CD.

#### **Filename**

This is the selected file in the tree to which you can add errors.

#### **Start/End Sector**

These are the start and end sectors of the selected file.

#### **From/To**

Specify the range of bad sectors which you want to add to the file.

#### **Add/Delete/Remove All**

Use these buttons to add and delete the errors in the file.

# ***Glossary***

This glossary includes terms which you might come across in your day-to-day work with GD Workshop and CDs.

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

The time elapsed since the start of the CD measured from the beginning of Track 1.

### **Access Time**

The time taken by the laser to move to a particular place on the CD. Maximum access time is the time taken to move from the start of the CD to the end and begin to retrieve data. Average access time is the average time taken to move from one position on the CD 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 CD image which is used with some CD-Writing software to write a CD-R. The Mirage does not need a CD image to emulate or write a CD, the image is created in real-time.

### **Burn**

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



## **Cache**

A portion of RAM set aside as a temporary store for frequently accessed data such as directory information.

## **Caddy**

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

## **CAV (Constant Angular Velocity)**

A CD drive that spins at a constant speed so that data retrieval at the outside of the CD is faster than at the inside.

## **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 CD at 44.1Khz per second. Audio CDs 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. Defined in a document known as the Green Book.

## **CD Writer**

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

### **CD 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 adding error correction codes (ECC) and error detection codes (EDC).

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

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. 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. Consistent with the ISO 9660 format standard, but with some video and audio capabilities taken from the CD-I standard. CD-ROM XA is also 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 CDs. CIRC interleaves the frames of data and the 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 CDs.

### **Closed 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 writeable sector in the lead-in of the current session, see Lead-in. The CD writing software has no way of knowing where to write new data and therefore the CD cannot be written to again.

### **Close Session**

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

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

A CD drive that uses varying rotation speeds to maintain the speed at which data passes under the read head as it moves across the CD.

### **Cue Sheet**

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

### **Data Area**

Part of the ISO 9660 standard. The area of the CD 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 Macintosh.

### **Directory**

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

### **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 CDs 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 CD 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 CD.

### **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, such as the Mirage's controller board and upgraded.

### **Focus Time**

The time taken for the read head to focus on the track when it arrives at a specified sector on the CD, before it can begin to read data.

### **Frame**

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

### **GD-ROM**

The name given to a Sega game CD for the Katana. It always contains two sessions.

### **Glass Master**

The glass image of the CD produced from the CD-R by a duplication house. Used as the master in the duplication of the final production CDs.

**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 CD format. Originally proposed by the High Sierra Group and essentially identical to the ISO 9660 standard.

**Hybrid**

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

**ISO 9660**

The standard for information exchange on CDs 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**

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 which is written at the beginning of each ses-

sion. Gives details of the contents of the session and contains the next writeable address on a CD if the CD is multi-session and not closed.

### **Lead Out**

An area of a CD-R which indicates the end of a particular session.

### **Logical Block**

The smallest addressable section on a CD. In the ISO9660 standard each logical block is given a Logical Block Number (LBN) starting at zero at the beginning of the CD.

### **Master**

The glass image of the CD produced from the CD-R by a duplication house. Used as the master in the duplication of the final production CDs.

### **Mastering**

The process whereby a master is produced.

### **Mixed Mode CD**

A CD which contains both computer and audio (CD-DA) tracks. The computer data is all contained in track 1 and the remainder of the CD can be used for the audio tracks.

### **Mode 0**

A track format containing all zeros.

### **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 CD 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**

Indicating a CD-ROM which contains data written in more than one session. Also used to denote a CD-ROM drive which can read multi-session CDs.

### **On-The-Fly CD Writing**

The process of writing a CD-R directly from the source data without having to first build a complete CD image. Also used to describe emulation of a CD without having to build a complete CD image.

### **Orange Book**

The document which defines the standard for writeable CDs including CD-R, magneto-optical cartridge systems and single-session and multi-session CDs.

### **PCA (Power Calibration Area)**

A reserved area at the beginning of a CD used by a CD-Writer to calibrate the laser prior to recording on the CD.

### **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 CD) or six resolutions (pro CD) which range from display to full colour magazine standard.

### **Pit**

Area on the playing 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 CD's table of contents at single speed.

### **PMA (Program Memory Area)**

## ***Glossary***

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An area of a CD-R which contains the session contents information while the tracks are written to the CD. This information is then written to the session's lead-in.

### **Post-Gap**

A gap written after a track.

### **Pre-Gap**

A gap written before the start of a track.

### **Pre-Mastering**

The process of dividing data into sectors and tracks and adding the appropriate header and error correction information prior to writing the CD.

PVD (Primary Volume Descriptor)

Part of the VDS. The PVD contains information about the CD, its creator and copyrights.

### **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 CD format, hardware, form factors and media specifications. Also forms the basis for the Yellow Book and High Sierra standards. The Red Book defines the way that bit patterns are written to the CD, 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 CD to another.

### **Session**

A single recording session on a multi-session CD-R. 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 on the CD.

### **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 CD.

### **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 CD spinning and accelerate up to operating 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.

### **Target**

The generic name for a target computer. Examples include: PC and Macintosh.

### **Termination**

See SCSI Termination.

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

Written into the lead in area of a CD and containing information about the number of tracks, their starting locations on the CD and the total length of the data area on the CD.

### **Track**

An area on a CD where data or audio is recorded. There are four type of track Mode0, Mode1, Mode 2 and CD-DA.

### **Virtual Image**

A table of pointers to the files to be written on a CD. Used to write CDs on-the-fly or to build a CD image prior to the CD being written.

### **Volume**

A single CD-ROM. Part of the ISO 9660 definition.

### **VDS (Volume Descriptor Set)**

The area of the CD starting at sector 00:02:16 which contains the PVD and information about the directory structure and start sectors for the files on the CD. Part of the ISO 9660

definition.

### **White Book**

The document which defines the standard for Video CD format CDs.

### **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 address of the next sector where data can be written on a multi-session CD-R, written in the lead-out information from the previous session.

### **Yellow Book**

The document which defines the standard for data on CD-ROM. Originally devised by Philips and Sony. Based on the Red Book audio standard, but with better error correction.

# **Keyboard shortcuts**

The keys listed below have been assigned to speed up frequently used commands:

<b>Command</b>	<b>Function keys</b>
Open help	F1
Edit selected item in tree	F2
Cancel F2	ESC
Door Open/Close	F3
Emulator/CD-ROM switch	F4
Nudge	F5
Enable errors	Control+F6
Collapse	F7
Collapse All	Shift+F7
Expand	F8
Expand All	Shift+F8
Switch tree/list view	F9

<b>Command</b>	<b>Shortcut keys</b>
Open	Control+O
New	Control+N
Save	Control+S
Copy	Control+C
Cut	Control+X

Command	Shortcut keys
Paste	Control+V
Undo	Control+Z

Command	Shortcut keys
Add CD	Control+Shift+C
Add session	Control+Shift+S
Add level1 file naming system	Control+Shift+1
Add level2 file naming system	Control+Shift+2
Add data track	Control+Shift+D
Add audio track	Control+Shift+A
Add directory	Control+D
Add file	Control+Shift+F

## Task bar controls

The following emulator controls are available from the right-click menu when GD Workshop is minimised on the task bar.

- Open/Close Door.
- Switch between GD-ROM drive and GD emulator.
- Select the CD you want to emulate.

# ***Reference documents***

This list includes several sources of reference document, not all these documents will be relevant to your CD project depending on the type of CD you are creating. The list is not exhaustive, there are many other publications available from other companies and organisations which are worth searching for.

### **Available from Sega DTS**

GD Workshop Manual

Katana development box Installation Manual

### **ISO Specifications**

ISO 9660 Volume and file structure for CD-ROM for information exchange

### **Available from Philips/Sony**

Red book Compact Disc Digital Audio Standard Specification

### **Available from Microsoft**

Joliet CD-ROM Recording Specification ISO 9660 Extensions for Unicode

### **Available from Rock Ridge Technical Working Group**

Rock Ridge Interchange Protocol Version 1

### **Available from Phoenix Technologies/IBM**

El Torrito Bootable CD-ROM format specification.

### **Available from Disc Manufacturing Inc.**

Introduction to ISO 9660

Compact Disc Terminology

A Glossary of CD and CD-ROM Terms

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## ***Reference documents***

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