SEGA™

Getting Started with Katana R4

SEGA™

Getting Started with Katana R4
Table of Contents

SEGA™

1. Getting Started with Katana

This document contains material for programmers who are getting started with the Katana development system.

To get set-up as quickly as possible, follow the procedures detailed in each chapter, in order. Start with *"Installing the Hardware"* and work through each section culminating in a brief walkthrough of compiling, debugging, and executing sample code.

1.1 Hardware and Software Requirements

1.1.1 Programming environment:

- IBM PC compatible running Windows 95, 98, or NT
- P200 or greater
- 32 MB of memory
- 100 MB of free hard drive space
- Adaptec 2940U PCI-to-Ultra SCSI card dedicated to Katana
- A second VGA monitor and/or composite TV monitor
- CD-ROM drive
- Microsoft Visual C++ v.5.0 with Service Pack 3

1.1.2 Supported art packages:

- SoftImage v.3.51 & 3.7 for SGI or Windows NT
- Alias for SGI v.7.5
- 3D Studio Max R2
- Lightwave 3D

Note: Do not connect the Katana development system to a SCSI controller serving other SCSI devices, such as the Windows boot drive. During the development process, the debug adapter may lock-up or crash contributing to timing problems and possible data loss.

1.2 Katana System Components

You should have received the following components as part of the Katana development system:

- Set 4 development tower
- 50-pin external SCSI cable
- Katana/Maple controller box
- Maple connector cable
- Serial cable
- Katana Software Development Kit CD-ROM, Release 4
- Printed documentation for Shinobi, Kamui, and Hitachi dev. tools

1.3 Installing the Hardware and Drivers

Sega recommends Adaptec 2940U (PCI-to-Ultra SCSI) or 2940UW (PCI-to-Wide Ultra SCSI) controllers for use with the Katana development system. These controllers have been tested and verified with both the Cross Products' Debug Adapter (DA) and GD-ROM Emulator (GD-M).

⚠ **Note:**   When purchasing a 2940UW, make sure the package includes a 68-pin to 50-pin external adapter.

Although other PCI SCSI controllers may function with the Katana DA, problems have been identified in the GD-ROM filesystem. Known cards that fail to operate properly include Diamond Fireport 20/40s and older Adaptec ISA 1540/1542s.

The following procedure assumes the use of an Adaptec 2940U controller.

Before installing the Set 4 Katana development system, make sure your computer has been properly shut-down and that the power cord has been disconnected from the wall outlet.

1)   Remove the outer case from the computer as described in the owner's manual.

2)   Locate an open PCI slot and remove the protective plate covering the opening. If installing a second SCSI controller, make a note of the card location dedicated to the Katana development system. (This card may need to be swapped later).

3)   Install the SCSI controller according to the instructions provided by Adaptec. Fasten the card in place.

4)   Connect the Set 4 to the SCSI controller card using the 50-pin cable attached to the unit.

5)   Connect the Maple controller box to the port on the back of the Set 4 labeled `Cont. Box` using the Maple connector cable. If a Saturn 3D analog "Nights" controller is available, insert this into Port A.

6)   Connect a VGA monitor to the `VGA Out` port on the back of the Set 4. If a TV monitor is available, connect this to either the `Video Out` or `S-Video Out` ports.

7)   Double-check that the red voltage switch near the Set 4's power cord matches your country's electrical rating. Plug the unit into the wall outlet and set the power switch on the back of the case to 1 (on). Press the large power button on the front of the Set 4 to boot the Katana development system.

⚠ **Note:**   The button labeled `Reset` has no effect.

8)   Wait approximately 15 seconds while the Set 4 completes the power-on sequence. When the hard drive finishes mounting, plug the PC's power cord back into the wall outlet and boot the system.

9)   As the PC boots, watch the SCSI controller's status information and verify that the following devices mount:

```
ID 3: CPL KATANA DA
ID 4: CROSPROD GD-M
```

10)   On some PC's with two SCSI controllers, the Windows boot drive may need to be located on the first controller. If no boot device is found after the Katana development system mounts, shut down both computers, and swap the SCSI controller cards. Repeat the installation procedure described above.

⚠ **Note:**   Do not attempt to modify the default SCSI controller settings unless absolutely necessary.

11) Windows will auto-recognize the Adaptec 2940U card and load the appropriate software. Follow the instructions provided by Adaptec to install the latest `AHA-2940U/AHA-2940UW` SCSI controller drivers.

12) As the system boots, a message should appear stating that an `unknown device` has been found. When the `Update Device Driver Wizard` opens, select `Next` to search for a device driver.

13) The hardware wizard should return with the message `Unable to locate a driver for this device`. At this point, select `Finish`. No device driver is necessary for the Katana DA.

14) Once the O/S has finished loading, go to the Windows Control Panel and double-click the `System` icon.

15) Click on the `Device Manager` tab and select `View devices by connection`.

16) Expand the `Plug and Play BIOS` category followed by the `PCI bus` device type to reveal the `Adaptec AHA-2940U/UHA-2940UW PCI SCSI Controller`.

⚠ **Note:** If you installed a second 2940U controller, verify that only two devices are present. If a SCSI controller was swapped, multiple "false" cards may be listed. In this case, highlight all the conflicting devices and select `Remove`. Repeat steps 11 through 16.

17) The `Adaptec AHA-2940U/UHA-2940UW PCI SCSI Controller` should show the `CPL KATANA DA` and `CROSPROD GD-M` units as mounted (see step 9). Select the `Close` button on the Device Manager control panel to return to the desktop.

18) The Set 4 system contains a 4 GB hard drive divided into two FAT-16 formatted partitions (2 GB each). If you open `My Computer`, the Katana's internal hard drive partitions should show up as two `Removable Disk` drives. You can read and write files on these drives just like any other removable media.

⚠ **Note:** A bug currently exists in Windows NT preventing the second partition from being seen.

19) Before continuing with the installation procedure, verify that Windows is running the latest ASPI drivers from Adaptec. Locate the following files in the Windows\System folder:

```
C:\WINDOWS\SYSTEM\WINASPI.DLL
C:\WINDOWS\SYSTEM\WNASPI32.DLL
C:\WINDOWS\SYSTEM\APIENUM.VXD
C:\WINDOWS\SYSTEM\IOSUBSYS\APIX.VXD
```

Right click on each file and select `Properties`. Click the `Version` tab and verify that the `File version` number is 4.57 (1008).

The most recent ASPI drivers are available on the Adaptec web site: http://www.adaptec.com/support/faqs/aspilayer.html

⚠ **Note:** The default Windows 98 ASPI drivers do not work with the Katana development system. Install the Adaptec drivers to overcome this problem.

20) After the ASPI drivers have been verified, install the Katana development software, and continue the hardware setup by following the procedure labeled `Flashing the Katana ROMS`.

1.4 Installing the Development Software

The Katana Software Development Kit (SDK) may be installed using the standard `InstallShield` utility or by manually copying the contents of the CD-ROM to a hard drive.

⚠ **Note:** Before installing the Katana SDK, make sure Microsoft Developer Studio (Visual C++) v.5.0 has already been installed and updated with Service Pack 3.

To use the standard installer, simply open the `Katana SDK, Release 4` CD-ROM and double-click the `Setup.exe` icon. Follow the instructions contained within the installation program. Using this method, you may select the entire SDK or `Custom Install` only a few basic components. The full software release requires approximately 100 MB of drive space.

To un-install the SDK, open the Windows `Add/Remove Programs` Control Panel, select `Katana Development Software`, and click `Add/Remove`.

⚠ **Note:** To avoid confusion, install the current Katana SDK in a different location from the previous release.

If you want to install portions of the SDK manually, you may peruse the CD-ROM using the Windows Explorer and copy only those files that you require. This method requires knowledge of the Katana folder hierarchy and hand-editing of makefiles and path settings in order to compile the sample programs.

1.4.1 To perform a full manual installation:

1) Copy the contents of the CD to the PC hard drive. Assuming CD-ROM drive is D: and the hard drive is C:, the MS-DOS command to perform the copy is:

```
XCOPY D:\ C:\KATANA\ /S
```

2) Set the attributes of the copied files to writable, using the command:

```
ATTRIB –R –A C:\KATANA\*.* /S
```

3) Edit the `C:\KATANA\SETPATHS.BAT` file to match your computer's setup.

1.5 Flashing the Katana ROMS

Whenever a new version of the Codescape debugger or GD-ROM Workshop is released, the Flash ROM files on the Katana development system must be updated. Use the following procedure to re-flash these ROMs.

1) Open the `Info.txt` file located in the `Katana\Utl\Dev` folder and make a note of the current versions of DA Firmware and GD-M Firmware.

2) Run the DACheck utility located in `Katana\Utl\Dev\DACheck`.

3) A `DACheck Warning` window should open, displaying the message that the Debug Adapter will be set to `CPU Mode` and all emulation halted on the target. Select `OK` to continue.

4) Once DACheck finishes initialization, a split window will open displaying Debug Adapter operations on the left side and GD-ROM Emulation on the right. Both sets of indicator lights should be yellow. If a communication error occurs at this point, the problem is most likely caused by old or incompatible ASPI drivers. See Step 19 of "*Installing the Hardware and Drivers*" for more information.

5) Check the version number of the Debug Adapter and GD-M Firmware against the versions recorded in Step 1. If the ROMs are up-to-date, re-flashing is unnecessary.

6) If the DA Firmware needs to be updated, click on the `Reflash DA` button in the lower left-hand corner of the window. This will bring up a file requester searching for a `.fsh` file.

7) Select the `Genie.fsh` Flash ROM file located in the `Katana\Utl\Dev\Codescape` directory. When DACheck asks if you wish to flash this file, select `OK`.

8) The flashing process takes approximately 20 seconds to complete. When finished, both the host PC and Katana development system need to be shut down. DACheck will ask you to select either `Manually Shutdown` or `Shutdown Windows`. If you plan on updating the GD-M Firmware, select `Manually Shutdown` and proceed to the next step. If you are finished updating ROMs, or if contact is lost with the Debug Adapter, you may choose to shutdown Windows at this time.

9) If the GD-M Firmware needs to be updated, click on the `Reflash GD-M` button in the lower middle-right portion of the window. When prompted, choose the `Flash from file` option, to bring up a standard file requester window.

10) Select the `gmX_X_Xx.fsh` Flash ROM file (where X's are replaced by version numbers) located in the `Katana\Utl\Dev\GDWorkshop` folder. When DACheck asks if you wish to flash this file, select `OK`.

11) After approximately 20 seconds, the ROM flashing procedure will finish. Select `Shutdown Windows` to allow the changes to take effect.

12) After Windows shuts down, turn off the Katana development system. Wait at least 10 seconds before restoring power to the unit. **Seriously, this wait period is important!** Reboot the PC and verify that the DA and GD-M devices mount, as described in Step 9 of `Installing the Hardware and Drivers`.

13) Once the Flash ROMs have been updated, launch the DACheck utility again. Test the functionality of the development system by running the `Test DA` and `Test GD-M` simulations. If each test passes, the appropriate indicator light on the sidebar will turn green.

14) Exit DACheck. When prompted, make certain to set the Debug Adapter back to `CPU Mode`.

⚠ **Note:** At any time, if a problem occurs or contact is lost with the Debug Adapter, shutdown Windows and turn off the Katana development system. For best results, wait at least 10 seconds before restarting the Set 4.

1.6 Using the Codescape Debugger

Once the Katana development system has been completely installed and updated with the latest firmware, you may begin compiling, debugging, and executing code. To download and run executables on the SH-4, you must use Cross Products' Codescape debugger.

The quickest way to verify that the hardware is functioning properly is to load and run one of the pre-compiled sample programs. The following procedure describes how to use the basic features of Codescape to execute the `Teapot` sample.

1) Load `Codescape.exe` in the `Katana\Utl\Dev\Codescape` folder. If Codescape brings up a dialog boxing prompting for a debug mode, select `CPU Mode`.

> ⚠ **Note:**   Always run Shinobi code in `CPU Mode`. The mode can be changed by running the DACheck utility.

2) The first time Codescape is run, a warning message stating `Unable to restore toolbar state` is displayed. Press `OK` to continue.

3) From the `File` menu, select `Load Program File`.

4) Press the `Browse` button to bring up a standard file requester or type in the path to the `Teapot.elf` sample executable located in `Katana\Lib\Ninja\Samples\Teapot\Exe`.

5) Leave the Load Options and Reset Options settings at default. Check the Enable Run Options box and select `Run to / main`.

6) Press OK to load Teapot.elf. At this point, make sure that a VGA monitor is plugged into the back of the Katana development system.

> ⚠ **Note:**   Changing the video output to NTSC composite requires re-compiling the `Teapot` sample.

7) From Codescape's `Window` menu, select `New Window` (Ctrl-N). This will open a blank window with `No type`.

8) From the `Region` menu, pull down `Type` and select `Source`. The window type can also be modified by clicking the desired toolbar icon.

9) `Teapot.elf` contains hardcoded paths to `C:\Katana\Lib\Ninja\Samples`. If the Katana SDK has been installed in a different directory, Select `Edit Source Path` from Codescape's `Project` menu. Press the `Browse` button to bring up a standard file requester or enter the path to the `Teapot` source folder.

> ⚠ **Note:**   When the Program Counter (PC) is located in a section of code with no source or debugging information, the following message is displayed in the source window:
> `**** No debug info. available for address <addr> ****`

10) The source window should now display the following from `NjLoop.c`:

```
=> void main (void)      /* Arrow (=>) represents PC. */
   {
.     njUserInit();      /* Dot (.) indicates no break point. */
      ...                /* F5 toggles break points. */
   }
```

11) From the `Debug` menu, pull down `Execution` and select `Run` (F9). A spinning teapot should be displayed on the VGA monitor.

12) To expedite the process of loading and running the `Teapot` sample, save the current session by selecting `Session Save` from the `File` menu. This records directory paths, window states, break points, etc.

You may wish to continue testing the Set 4 unit by running additional sample programs which exercise the Maple controller box and GD-ROM filesystem. Read through the following two sections for information on how to do this.

1.7 Using GD-ROM Workshop

The GD Workshop utility allows you to lay out and burn GD-ROM disks. It also controls the emulation of GD-ROM disks on the Katana development system's hard drive.

The following procedure demonstrates how to set up the GD-M emulation environment and execute a sample program which accesses the filesystem.

1) Load `GDWorkshop.exe` in the `Katana\Utl\Dev\GDWorkshop` folder.

2) The first time GD Workshop is run, a warning message is displayed stating `Workshop was unable to determine your emulation configuration; you will be taken to the configuration screen`. Press `OK` to continue.

3) In the `Configure drive letters` window, the available SCSI controllers on the system should be listed with any attached devices that match the characteristics of the GD-M Emulator. For example:

```
Adapter #0
+-- ID #4 CPL GD-M
```

4) Highlight the `CPL GD-M` device. On the right side of the display is a pull-down menu containing drive letter assignments. Select an appropriate drive name and click `Add`. Repeat this process for the second drive partition (if present). When finished, the lower portion of the window labeled `Current drive selections` should list:

```
E: 1,4 CPL GD-M  (assuming drive E: is the first available)
F: 1,4 CPL GD-M
```

⚠ **Note:** Be careful not to select other removable drives, such as a Zip drive, as a Katana emulation device.

5) When finished assigning drive letters, press `OK` to exit. Re-launch the GD Workshop application to continue.

6) Once the main Workshop window opens, pull down the `Configuration` menu and select `Workshop`.

7) In the `Workshop Settings` dialog box, make sure that the checkbox labeled `GD-ROM auto-build, add files to 2nd session` is checked. You may also want to adjust the pull-down speed adjustment menu from `Real Katana Speed` to `No Speed Restrictions`. This will allow files to be loaded from the Set 4 filesystem at the full speed of the SCSI hard drive. Press `OK` to return to the main window.

8) From the `File` menu, select `New` (Ctrl-N) and supply a name for the project. For this example, use the title `Samples`. This will open a blank project window with a number of user-modifiable tab menus to the right.

9) Leave GD Workshop running in the background and use the Windows Explorer to locate the folder `Katana\Lib\Ninja\Samples\F40\GD_Root`. Open this directory and select all the files within.

10) Drag-and-drop the selected files onto the empty `Samples` project window within GD Workshop. This action will launch a dialog box labeled `File Systems Configuration`. Select the `GD-ROM` option and press `OK`.

11) GD Workshop displays a progress bar for each file as it is copied to the Katana development system. When finished, a GD-ROM disk is generated with the following data structure:

```
GD-ROM
+-- Session
    +-- ISO Level 2
        +-- 01 - Mode 1
        +-- 02 - CDDA
+-- Session
    +-- ISO Level 2
        +-- 03 - Mode 1
```

All data files are stored on Track 03 (03 - Mode 1).

Note: A bug currently exists in GD Workshop preventing the addition of new files to a disk that has been auto-created using drag-and-drop. To work around this problem, close the project window. When prompted to `Save changes` select `Yes` and save the project to any location on the hard drive. Then re-load the same project by pulling down the `File` menu and selecting `Samples.cpj`

---

12) To finish setting up the GD-ROM disk, some 'dummy' system files need to be added to the first two tracks (in Session 1). Highlight Track 1 (01 - Mode 1) and right-click the mouse to bring up an option menu. Choose `Insert / File`.

13) From the file requester, select `Test.dat` located in the `Katana\Utl\Dev\GDWorkshop` directory.

14) Repeat this process for Track 2 (02 - CDDA). Insert the same `Test.dat` file. The disk is now ready to emulate.

15) Near the bottom portion of the GD Workshop screen is a log window displaying the current version of the GD-M Firmware. Above this are four toolbar icons for controlling the state of the emulator. Make sure that the right-most icon labeled `Switch Emulator/GD-ROM` is set to `Emulator` (Switch is pointing up - towards the grey disk).

16) The left-most icon represents the state of the virtual `Drive Door`. When this is open, you can add and delete files in a GD-ROM project. When closed, the disk is in emulation mode. Changes to the project do not take effect until the drawer is opened and closed again. To begin emulating the `Samples` disk, click the `Drive Door` icon (F9).

17) Several messages are printed to the log window as the door closes indicating that the emulation is being prepared. Once the filesystem has mounted, the text `Close Door` is displayed. At this point, you may minimize the GD Workshop window. Keep the application running in the background so that file access strings are displayed in the log window.

18) Launch the Codescape Debugger. Follow the procedure detailed in the previous chapter for loading and running an executable file. Load the `F40.elf` example located in `Katana\Lib\Ninja\Samples\F40\Exe`.

19) As the F40 sample runs within Codescape, texture files are loaded from the GD-ROM filesystem. You should see a number of messages in the GD Workshop log window indicating that `.pvr` files have been loaded.

If any error occurs during the emulation process, perform a hard reset of the Katana development system. Wait a few seconds, then open and close the `Drive Door` in GD Workshop.

1.8 Compiling the Samples

When the Katana SDK is installed using the standard `InstallShield` utility, the locations of Microsoft Developer Studio and Hitachi SHC/C++ are recorded in a batch file labeled `Katana\Lib\SetPaths.bat`.

If an error occurred during the installation process or files were copied manually from the CD-ROM, `SetPaths.bat` may contain incorrect information. In this case, running the batch file will report the exact nature of the error. If you need to edit `SetPaths.bat`, open the file and search for the default environmental variable settings. Modify these to match your system's configuration.

To re-compile all the sample programs within any library directory (Ninja, Kamui, Shinobi, Libc), double-click the `Make.bat` icon. This will open a MS-DOS shell, set the necessary paths, and issue a `NMake` command.

To perform the same operation manually:

> 1) Open an MS-DOS shell to the appropriate library directory (i.e. `Katana\Lib\Ninja\Samples`) and type `SetPaths`.

⚠ **Note:** The default environmental variable space for a MS-DOS shell is too small for the necessary paths and settings. You can increase ENV memory to maximum (32 KB) by issuing the following: `Command /E:32768`.

> 2) Type `NMake` to build all the samples in a given library. Enter `NMake Clean` to erase all temporary files, object files, and executables.

To build individual sample programs, enter the directory where the sample resides and type `NMake -f SampleName.mak`. For example, to build the `Teapot` sample:

```
Command /E:32768
CD Katana\Lib\Ninja\Samples
SetPaths
CD Teapot
NMake -f Teapot.mak
```

1.9 Shinobi Initialization

Within each of the sample program directories exists the source file `SbInit.c`. This file contains all the code necessary to initialize the Shinobi library system.

The following section describes how you can modify `SbInit.c` to perform the most common customizations to the Ninja and Kamui samples.

1) Controller Box

   Set 4 development systems are shipped with two versions of the Maple controller box. The older type is labeled `Maple Bus - SATURN` in the upper right-hand corner. The newer type has a `Katana` scripted signature near the bottom of the box. The updated Maple bus design supports both Saturn and Dreamcast controllers.

   The sample programs were originally built for the older Saturn Maple controller box. If you received a `Katana` controller box, change the `USE_DCPAD` definition to 1 (true) and re-compile.

   ```
   #define USE_DCPAD 1   /* 0...Use Saturn Maple controller box. */
                         /* 1...Use Dreamcast controller box. */
   ```

   The best sample program to test the Maple bus is `Print`, located in the `Katana\Lib\Ninja\Samples` folder. Plug a Saturn 3D analog "Nights" controller into Port A and run the sample. Control pad movement and button presses will be displayed on the screen.

2) GD-ROM Filesystem

   To allow an application to use the GD-ROM filesystem, change the USE_GDFS definition to 1 (true) and re-compile. See the section labeled `Using GD-ROM Workshop` for details on how to access files on an emulated GD-ROM.

   When the `USE_GDFS` flag is 0, calls to Shinobi file functions are ignored.

   ```
   #define USE_GDFS 0   /* 0...No Filesystem. */
                        /* 1...Use GD Filesystem. */
   ```

3) Video Mode

   The Set 4 development system is capable of generating standard VGA or composite video output signals, but not both at the same time.

   In the Ninja sample programs, the display mode is sent to `sbInitSystem()` via the `mode` function parameter. Pass `NJD_RESOLUTION_VGA` or `NJD_RESOLUTION_640x480_NTSCI` to specify the appropriate video output.

   The Kamui samples set the video mode within the `SbInit.c` code. Look for the lines:

   ```
   /* Initialize the display device (VGA/PAL/NTSC). */
   kmInitDevice (KM_VGA);

   /* Set the frame buffer display mode. */
   kmSetDisplayMode (KM_DSPMODE_VGA, KM_DSPBPP_RGB565, FALSE, FALSE);
   ```

   Replace `KM_VGA` and `KM_DSPMODE_VGA` with `KM_NTSC` and `KM_DSPMODE_NTSCI640x480` to change video output.