

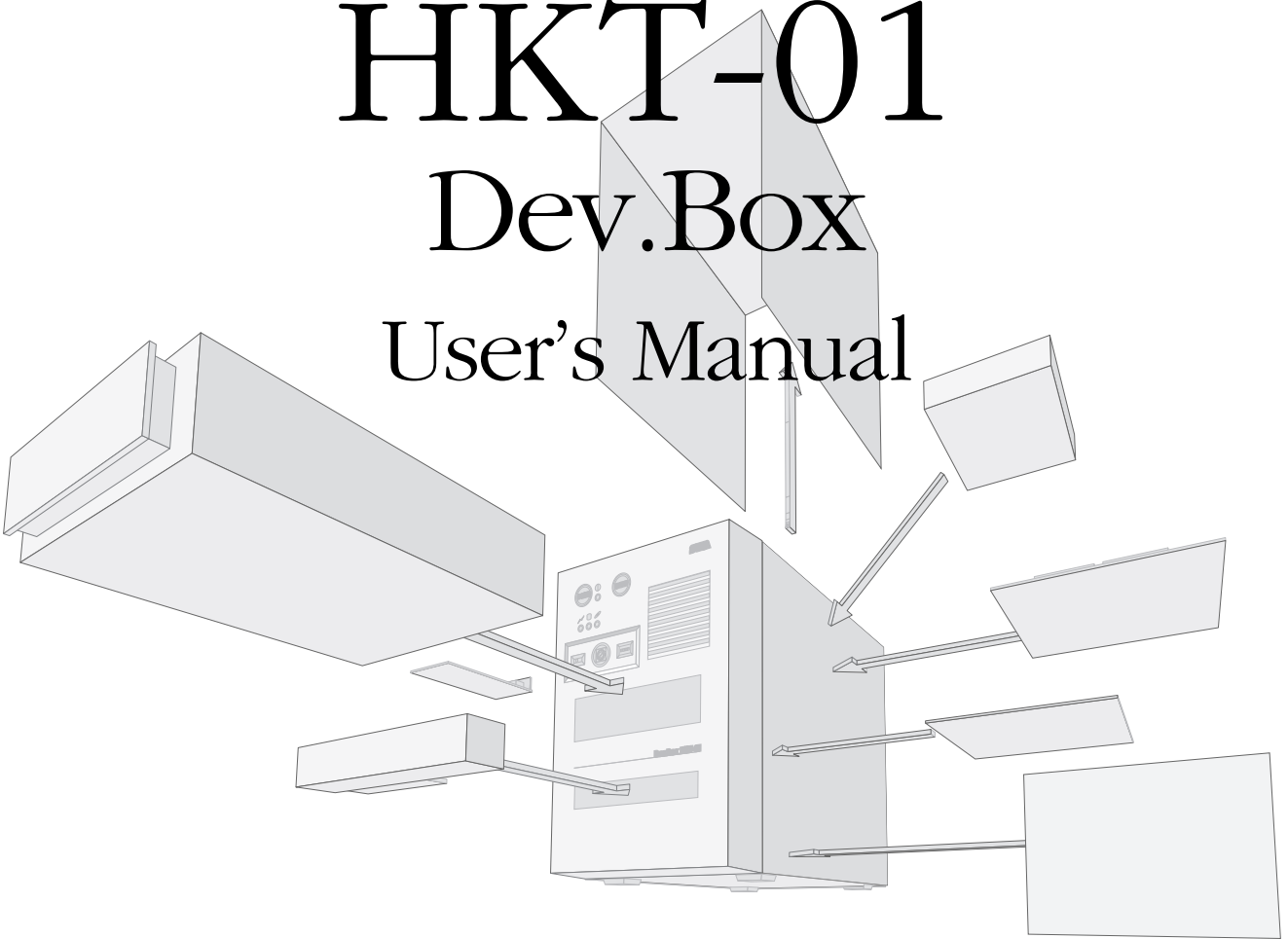


Dreamcast™

HKT-01

Dev.Box

User's Manual



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# Introduction

## To our customers:

Thank you for your cooperation in developing applications for SEGA hardware. "Dev.Box" is the name of the device for Dreamcast development sold by SEGA.

To fully utilize the functions of this product, be sure to read this User's Manual before use and keep this guide for further reference.

Dev.Box specs are explained in this document.

## Handling Precautions

A semiconductor laser is used in this product. Handle with Care.

Operating each unit of this product in a manner other than for which it was intended is extremely dangerous.

### ■ Installation Precautions

- Set device in a level place.
- Avoid placing device on the PC, PC expansion peripherals, or HKT-0400. Also, avoid placing PC expansion peripherals or HKT-0400 on top of Dev.Box. Doing so may interfere with normal operation of these devices.
- Avoid placing device in unusually humid, dusty or windy locations.
- Avoid placing device in direct sunlight, or in locations with extreme changes in humidity or temperature.
- Do not use near devices that receive electromagnetic waves, such as radios or tvs. Doing so may damage Dev.Box.
- Avoid placing Dev.Box in locations subject to vibration.

### ■ Usage Precautions

- Do not jolt the device during operation.
- Do not move suddenly from a cold place to a warm place or raise the room temperature sharply. Moisture on the device may cause malfunctions in operation.
- Do not block vent.
- Do not put foreign objects such as liquid or metal parts inside the device. Breakdown may occur.
- If the unit becomes dirty, do not clean with such materials as Benzine or thinner. Wipe with a soft cloth or, if extremely dirty, wipe with a cloth moistened with a neutral detergent diluted with water.



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## ■ Transportation Precautions

- When transporting the device, remove any disk that may be in the tray and make sure the tray is completely closed. Turn the power off before moving.

If the tray is not completely closed, it may open from shocks during transportation.

## ■ Other Safety Precautions

- Because this device uses optical pickup, factors in the operating environment (such as garbage, dust, excessive shaking or jolts) may lower the functionality of the unit.
- It takes about 20 seconds for the device to become operational after putting the disk in the tray and loading it.
- Do not disassemble the case. Certain parts in the interior may cause electric shocks.

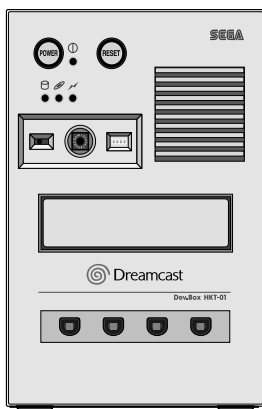
This product uses a semiconductor laser. Handle with care.

Do not operate parts of the drive unit for this product in ways other than for which they are intended. It is extremely dangerous.

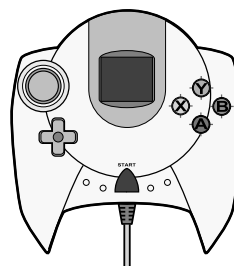


# 1. Packing Contents Below is a list of items included in the Dev.Box set.

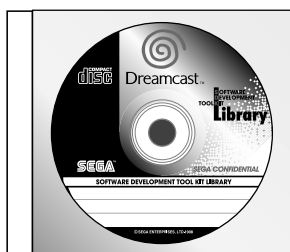
## Materials provided by SEGA



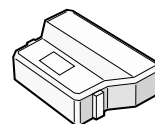
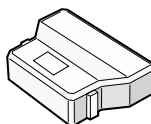
Dev.Box



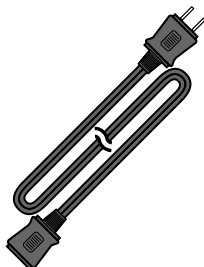
Dreamcast Controller



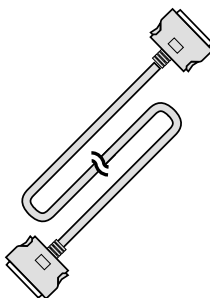
Dreamcast SDK



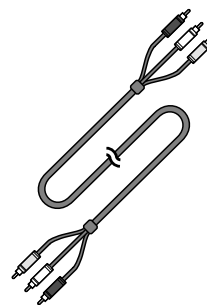
Two pieces of SCSI-terminators for SET5



AC cable for SET5



SCSI cable for SET5



3P A/V cable for SET5



## 2. Appearance of Dev.Box

### Front View

Reset switch

Power switch

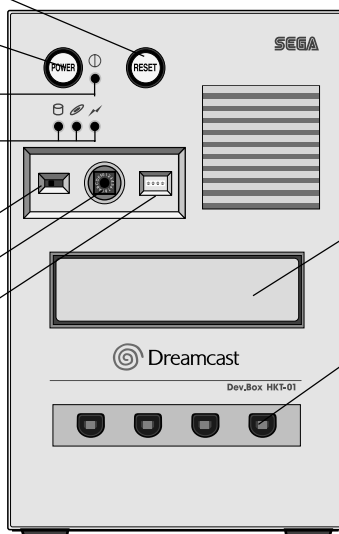
Power supply lamp

Access display lamp  
(H/D.GD.Host communication)

Flash memory  
light protect switch

Rotary switch

DIP switch



GD drive unit

Controller Connector

### Back View

Connector for GD-Writer  
<Unsupported>

SCSI connector

VGA output

MIDI interface connector

C1/C2 Terminal

Serial connector

Modular Jacques

Expansion bus connector

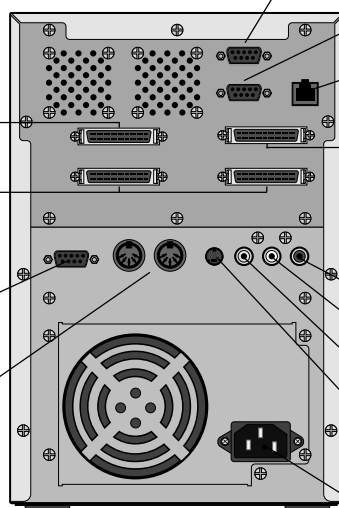
Audio "R" output

Audio "L" output

Video output

S-Video output

Power supply connector

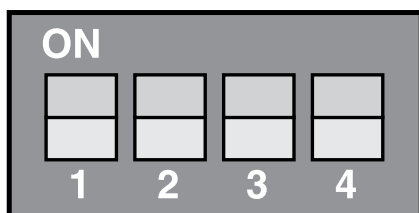


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## 3. Switch Functions

### 3.1 DIP Switch Functions

The functions of the DIP switches located on the front panel are listed below.



No.	Function
1	Cable emulation
2	Cable emulation
3	Not used
4	Flash memory Write Protect

#### 3.1.1 Cable Emulation Switch

The actual Dreamcast unit has an AV multi-jack on the rear; this multi-jack is a connector for video cables, VGA cables, etc.

A library function can be used to check what type of cable is connected to this AV multi-jack.

Because the actual Dev.Box unit does not have a multi-jack, these DIP switches can be used to emulate different types of cables.

The cable type that is emulated depends on the DIP switch combination, as shown below:

Switch 1	Switch 2	Cable Type
OFF	OFF	Stereo AV cable, S jack, RF converter
ON	OFF	RGB (NTSC/PAL) cable
OFF	ON	Not used
ON	ON	VGA cable

#### 3.1.2 BootROM Selector Switch

DIP switch 4 has the following function.

Switch 4	Function
OFF	FLASH ROM
ON	EPROM

The Dev.Box unit has two kinds of BootROM, namely an EP-ROM and flash memory, which have different purposes.

On the EP-ROM, a system check program is included that can be used if flash memory rewrite fails and EP-ROM cannot boot. If rewriting to flash memory fails, turn this switch on to start the EP-ROM. After the EP-ROM is booted, rewrite using the designated install method (Refer to the setup guide for Dreamcast SDK).

The flash memory contains a BootROM image. When this ROM program is executed, an opening animation appears and the Simple Player and other functions can be used. When SEGA issues an instruction for installing or updating the BootROM, this refers to the contents of the flash memory. **The flash memory normally is protected from being written to. To change its contents, the slide switch on the front panel must first be set to the right-side position.**

In normal use, the switch must be set to OFF.



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## 3.2 SLIDE SW. (Flash Memory Write Protect) Functions

The Dev.Box contains flash memory that serves as BootROM. Normally, this memory is never written to, but it could be accidentally corrupted, for example by a bug in an application. Therefore a switch is provided that protects the Flash Memory from accidental overwriting. This slide switch should always be in the left-side position, except when performing a BootROM upgrade.

Slide switch	Function
Right	OFF: writing possible
Left	ON: writing prohibited (normal position)

## 3.3 ROTARY SW Functions

Specifies the application mapping area. Please note that the TV operating system may be different depending on the area.

SW	Areacode1	Areacode0	NTSC/PAL1	NTSC/PAL0	
0	0	0	0	0	Japan and Asia: NTSC
1	0	0	0	1	
2	0	0	1	0	
3	0	0	1	1	
4	0	1	0	0	North America: NTSC
5	0	1	0	1	
6	0	1	1	0	Brazil: PAL_M
7	0	1	1	1	Argentina: PAL_N
8	1	0	0	0	
9	1	0	0	1	Europe: PAL
A	1	0	1	0	
B	1	0	1	1	
C	1	1	0	0	
D	1	1	0	1	
E	1	1	1	0	
F	1	1	1	1	





## 4. Hardware Structure

### 4.1 System Architecture

The hardware specifications of the base system of Dreamcast Dev.Box are described below.

#### ■ CPU

SH7091 CUSTOM - 200MHz

#### ■ ASIC

Holly 100MHz :Graphic engine & Path control

AICA 22MHz :Intelligent format Sound Processor

- Polygon Performance  
3 million polygon/sec. (100pixel triangle. opaque-100% )
- Polygon Functionality
  - Gouraud shading
  - Bi-linear filtering
  - Triilinear filtering
  - Bump Mapping
  - MIPMAP
  - Texture super sampling
  - Image super sampling
  - Fog
  - Alpha blending
  - Perspective conversion (alpha, Gouraud, texture)
  - Environment mapping
  - Specular
  - Modifier volume

#### ■ Main Memory

16MByte

#### ■ Texture & Frame Buffer Memory

8MByte

#### ■ Sound Memory

2MByte

#### ■ Boot Rom

2MByte

#### ■ Control Ports (peripheral ports)

4Ports

#### ■ Digital Video Encoder

Adaptable to each video output: NTSC/PAL and VGA monitor

#### ■ Debug Adapter (hardware debugger) is installed.

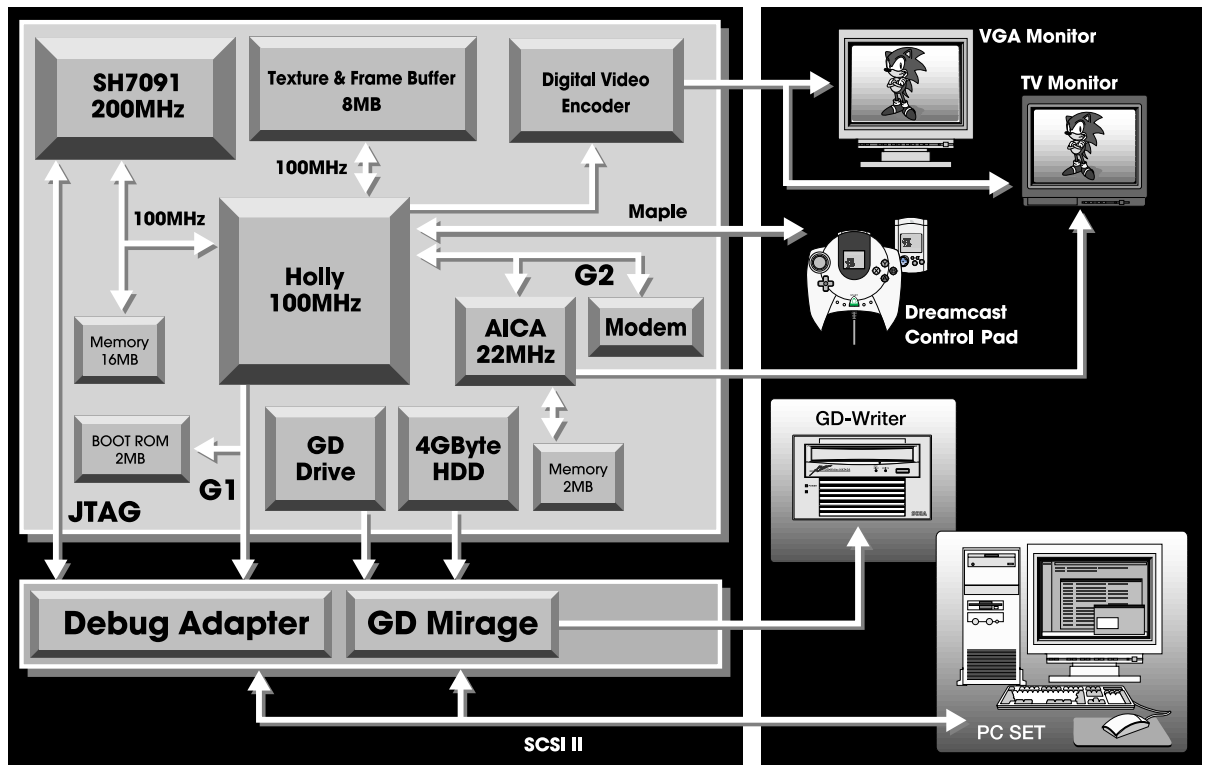
#### ■ GD Mirage (GD-ROM emulator) is installed.

#### ■ 33.6Kbps Software Modem is installed.



## 4.2 Blocks

A block diagram of the “Dev.Box” is shown below.



## 4.3 Explanation of each block

Overviews of each block and principal devices are explained below.

### ■ CPU

The SH7091 (SH4) customized for SEGA is used as a main CPU. This receives a 33.3MHz clock from the system and operates with internal 1.8V / 200MHz and external bus 3.3V / 100MHz via internal PLL. The SH7091 mainly processes such as game sequences, AI, 3D operations and issue of 3D drawing instructions. It is equipped with general-purpose serial ports for access to and from external I/O devices.

### ■ Memory

In order to bring out performance of the SH7091, the SDRAM is used as main system memory and connected directly to the SH7091. Its capacity is 16MB, and its bus width is 64bit, and its operational frequency is 100MHz. The maximum transfer rate is 800MB/s (theoretical value) during burst transfer. System memory is occupied exclusively by SH7091 except for DMA transfer by graphic chip.



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## ■ Graphic System

Dreamcast system graphics use PowerVR2 DC (Holly). This IC has rendering engines of SH7091 Interface, Bus Controller, DMA Controller and Power VR architecture built in.

Dreamcast has 8 MB as graphic memory and connects at a bus width of 64bits, with an operating frequency of 100 MHz. Video output corresponds to common NTSC/PAL monitors and VGA monitors used for PC display.

## ■ Peripheral Interface

User interfaces such as control pads are connected through SEGA's Maple serial peripheral interface, and are developed by inserting the Dreamcast controller into the Dev.Box. The maximum transfer rate of the port is 2Mbps.

## ■ Sound Block

Sound Block is connected via G2 bus of Holly. 32 Bit RISC CPU is installed in the sound block and it is possible to replay without heavy burden for the main memory SH7091. Also, PCM/ADPCM of which maximum simultaneous sound number is 64 is supported and it is possible to replay high level sound.

## ■ GD ROM Drive (Giga Byte CD-ROM Disc Drive)

The disc uses a CD-ROM exclusively designed for use with Dreamcast. This CD-ROM, commonly called a GD, has a binary structure of the interior (single density area) and exterior (high density area), allowing storage of about 1 Gbyte of data.

## ■ Debug Adapter (DA)

The loaded hardware debugger. This debugger uses serial interfaces called SH7091 and JTAG to execute communication. Debugging information is temporarily stored in the Debug Adaptor and then acquired by the debugger "Codescape" on the PC connected to the disc drive by a SCSI II.

## ■ GD Mirage (GD-M)

The hardware to emulate the GD-ROM is installed. A hard disk of 4Gbyte is installed instead of the GD-ROM and you can theoretically develop a software set of up to four GD-ROMs.

GD Mirage is operated by the emulation software "GDWorkshop" on the PC.



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## 5. Boot ROM for System Check

In Dreamcast Dev.Box, a program for hardware verification is included. If any error is generated in the system, use this function to verify operation. Be sure to use this function to check the system if you suspect any problems in Dev.Box operation.

### 5.1 Overview

This ROM is used if the boot program in flash memory is not working correctly and Codescape cannot boot; by switching startup to this ROM, Codescape can boot. Also, system check can be simultaneously executed. For system check, set ROTARY SW to 1. Do not use SW 0. Also, use DA Checker attached to Dreamcast SDK to check Debug Adaptor and GD Mirage.

### 5.2 Contents of Each Check

When connected to ROTARY SW=1, Dev.Box check executes. **Screen is VGA display.**

SH4 func & critical check	: Check of SH4 function
Memory write/read check	: Check of all memory (SH4 subordinates, Holly subordinates, AICA subordinates) check
Flash ROM write/read check	: Check of 1M flash memory for application <b><u>Note that all data will be deleted</u></b>
TA,YUV convert/verify check	: Check of Holly internal Tile Accelerator and YUV Converter
CLX check. Render	: Drawing check. <b><u>Confirm visually.</u></b>
CLX internal RAM check	: Check of Holly internal RAM
CLX G2_DMA_Noise check	: Check of drawing during G2 Bus DMA
G2 bus access & DMA check	: Check of G2 Bus access from Holly
AICA & ARM check	: Check of AICA Register function and operation of ARM7CPU in AICA <b><u>In this mode, MIDI terminal loop check is carried out. Connect the loop cable. Without the cable, an error will generate and verification of the next function begins.</u></b>
PVR i/f check	: Check of Holly internal PowerVR interface block.
Random DMA check	: Check of DMA multi-activation.

**If all check results are OK, the color bar is displayed.**



## 6. Concerning Boot ROM and Firmware Updates

In response to upgrades in error correction and tools, work has begun on Dev.Box firmware. Three sections are being updated:

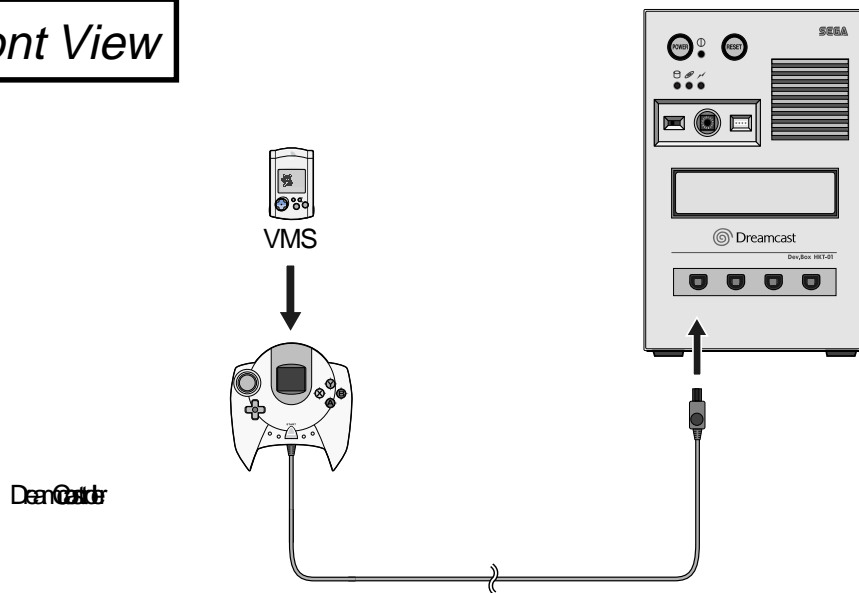
- BootROM
- Debug Adapter
- GD-Mirage

These modifications must happen concurrently with tool upgrades. For more information about modification methods, refer to the “Setup Guide” included with Dreamcast SDK.

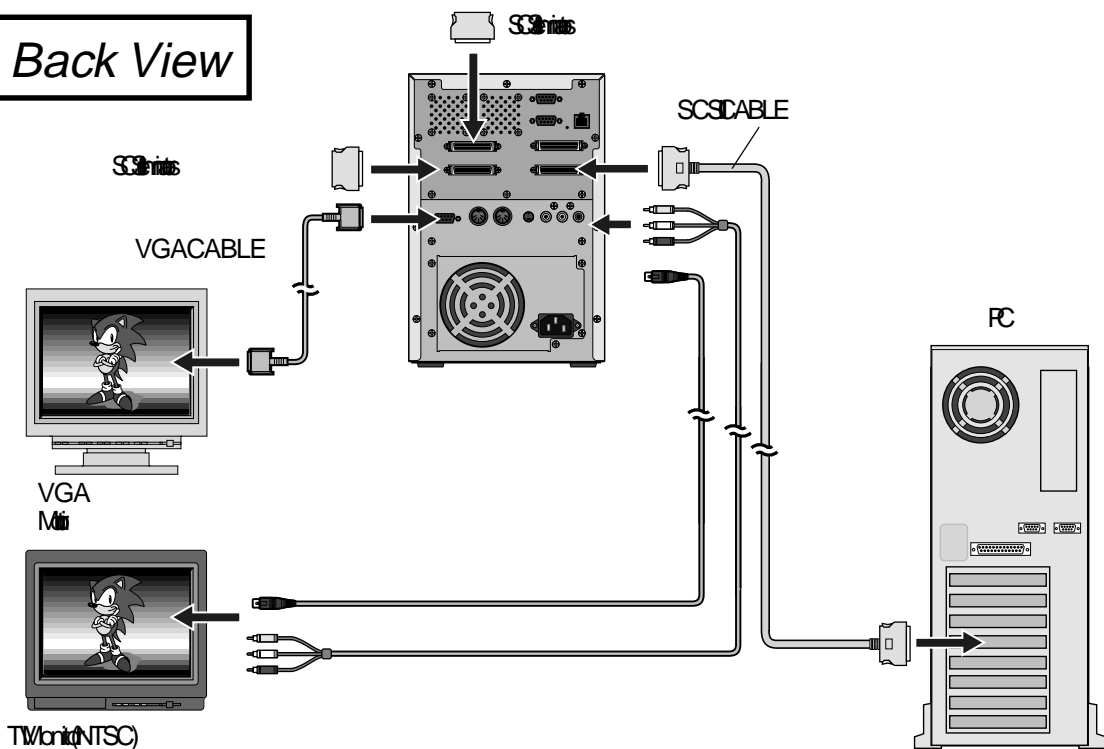


## 7. Connection

### Front View



### Back View



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## 8. PC and Dev.Box Connection Authentication

For the SCSI card, ASPI Manager Ver. 4.00 or above is necessary. The standard ASPI Manager for use with Windows95/NT 4.0 cannot be used.

Download the latest version of ASPI Manager (ASP132.exe) from

<http://www.adaptec.com/support/overview/ezscsi4x.html>

Follow the steps below to ensure the PC and Dev.Box are properly connected.

### Operating Methods

#### ■ For Windows95

- Step 1** Click on the [System] icon on the control panel.  
The [System Properties] dialog box is displayed.
- Step 2** Choose the [Device Manager] menu tab and choose the [Display Device by Type] radio button.
- Step 3** Open the [PCI Bus] folder and the [Adaptec...] folder. If  
**CPL GD-M**  
**CPL KATANA DA**  
are displayed, the Dev.Box is connected correctly.

#### ■ For Windows / NT4.0

- Step 1** Click on the [SCSI Adaptor] icon on the control panel.  
The [SCSI Adaptor] dialog box is displayed.
- Step 2** Open the [Adaptec...] folder. If  
**CPL GD-M**  
**CPL KATANA DA**  
are displayed, Dev.Box is connected correctly.



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## 9. The differences between Dreamcast and Dev.Box Specs

Dev.Box differs from Dreamcast in the following ways.

- (1) GD-Drive shape is different. (Hardware specs are the same).
- (2) In Dreamcast, the system disc is necessary to run the Write Once Disc. (In Dev.Box it is not necessary).
- (3) In Dreamcast there is no debugging hardware (GD-Mirage, Debug Adaptor).
- (4) In Dreamcast there is no reset switch.
- (5) Dev.Box serial I/F is switched by the RS232C output lever.

Because unexpected problems may occur in this product version due to these differences, be sure to confirm operation verification on Dreamcast upon delivery of the Master GD.







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