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SEGA OF AMERICA, INC.
Consumer Products Division

SEGA SATURN
Address Checker
Operation Manual

Doc. # ST-254-A-110395

SEGA SATURN
ADDRESS CHECKER
OPERATION MANUAL

REVISION-1
• Setup
• Basic Operating Procedure
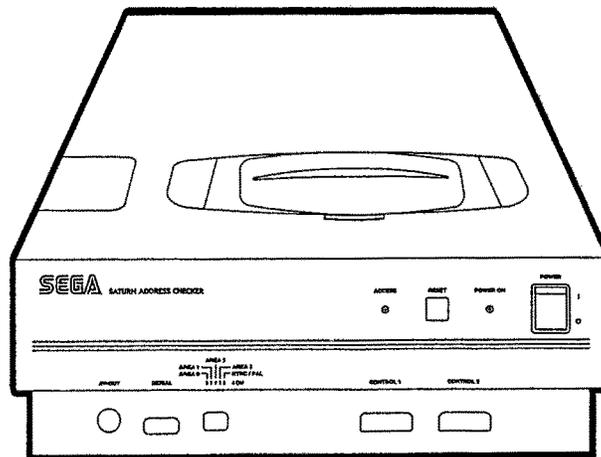
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Introduction

This manual provides information concerning setup and basic commands required to operate the SEGA SATURN Address Checker.

After hardware setup is completed, the Address used as a software testing tool using basic commands in accordance with this manual.

See the separate *SEGA SATURN Address Checker Reference Manual* (Doc. # ST-254-B-110395) for specifics concerning device specifications and commands.

Notes and Symbols Used in This Manual

1. 'U'   Explanatory symbol indicating a one-character space. Only used to denote a space when particularly important.
2. 'ø'   Explanatory symbol indicating pressing the Enter key (carriage return key).
3. '_'   (underline) Explanatory symbol indicating a character to be actually input from the keyboard.
4. '\'   ASCII symbol termed 'backslash' and assigned code 5C. In JIS code, displays ¥(yen symbol).
5. '^A' or <CTRL>   Indicates pressing the 'A' key while holding down the control key. Indicates, for example (^A)→01, (^B) →02, ... (^Z) →1A.
6.   Special keys are denoted by < >. For example, besides 'U', the space key may be indicated by <SPACE>.
7.   'xxxxH' indicates that the value 'xxxx' is hexadecimal.

Table of Contents

1. Address Checker Equipment List

A list of Address Checker equipment is given in Figure 1. Please check to make sure that you have parts (1) through (9).

(1) Address Checker—1
     Custom SATURN board providing Address Checker functions are pre-installed.
(2) PC interface board—1
     Installed in host computer expansion slot for Address Checker connection.
(3) PC interface cable—1
     Dedicated cable for connecting the PC interface board to the Address Checker.
(4) Control pad—1
     Exclusive control pad for the SEGA SATURN.
(5) Stereo A/V cable—1
     Dedicated cable for connecting a television.
(6) Power cable—1
     Plugs into the Address Checker chassis.
(7) Floppy disk—1
     Contains Address Checker control command software.
(8) User's Manual—1
     Describes setup and basic operations.
(9) Technical Manual—1
     Describes Address Checker specifications and monitor commands.

• The utmost care is taken in packaging. However, should you find that any parts are missing, contact your local Sega technical support representative
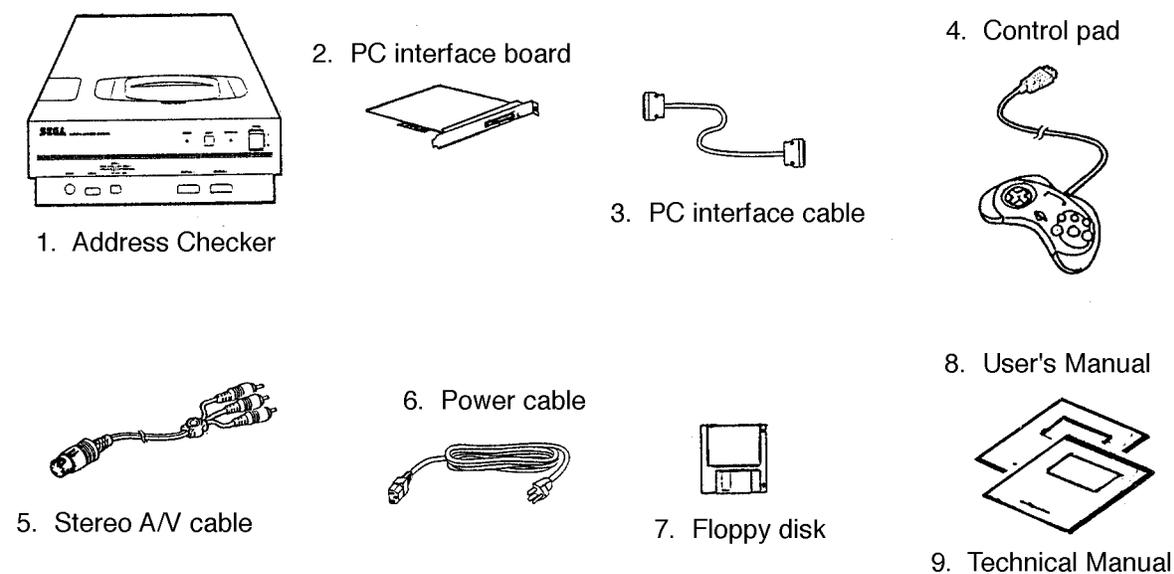
Figure 1   Address Checker Equipment List

2. System Overview

2.1 Address Checker Configuration

The following system configuration enables the unit to perform address checking.

Host computer

Address Checker

PC interface cable

Application software
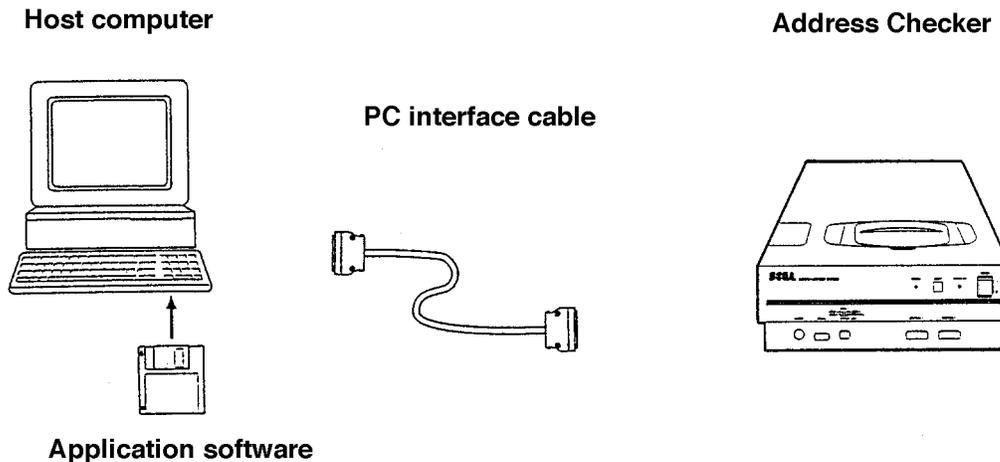
Figure 2   System Configuration

As indicated in Figure 2, the Address Checker is connected to your PC through the PC interface cable and the PC interface board. A separate PC is required.

2.2 Compatible PC Types and System Requirements

Please make sure that you have the following in order to run the Address Checker.

PC   PC/AT or 100% compatible
                            (DOS/V machine preferred. SEGA TERADRIVE requires
                            Model 3)
CPU   80286 or higher
Base memory   640 KB
Expanded memory   Not required (1 MB or more for DOS/V)
Hard disk drive   1 or more with minimum of 5 MB free (will vary with use)
Floppy disk drive   1 or more 1.44 MB, 3.5 inch drives
Video board   VGA or better
CRT display   Video board-compatible display
Operating system   DOS/V
                            Installed on hard disk.

3. Unit Features and Functions

3.1 Front Panel
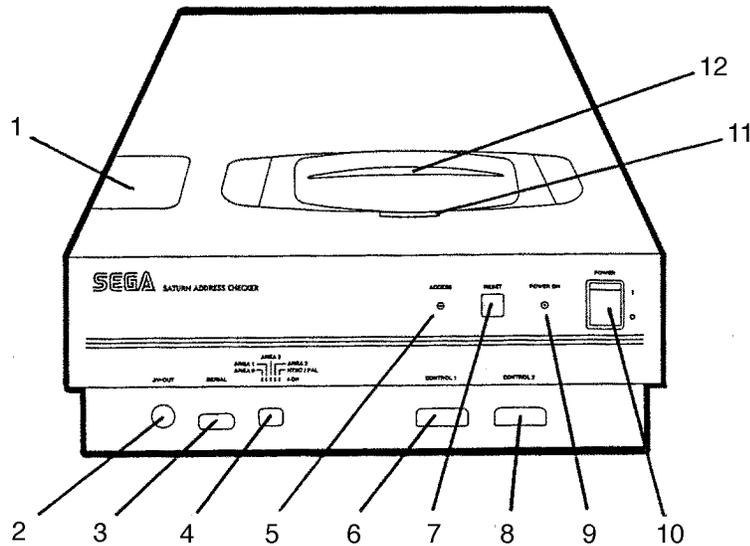
Figure 3   Address Checker Front Panel

(1)   Cartridge slot cover
        Remove cover to access cartridge slot.
(2)   A/V output terminal
        The supplied stereo A/V cable connects here.
(3)   Expansion COM terminal (serial)
        For connecting peripheral devices with communication functions.
(4)   DIP switches
        Used for setting the target country code for evaluated software.
(5)   Access lamp (ACCESS)
        Lit when CD is being accessed.
(6)   Reset button
        Used to restart game.
(7)   Control terminal 1 (CONTROL 1)
        The supplied SEGA SATURN control pad connects here.
(8)   Control terminal 2 (CONTROL 2)
        For connecting an additional control pad when two are required.
(9)   Power lamp (POWER ON)
        Lit when power is on.

(10)   Power switch (POWER)
        Rocker power switch. Turn ON by pressing top end.
(11)   Open button
        Press to open CD drive door.
(12)   CD door
        Protects CD drive. Do not open while CD is spinning.

3.2 Rear Panel
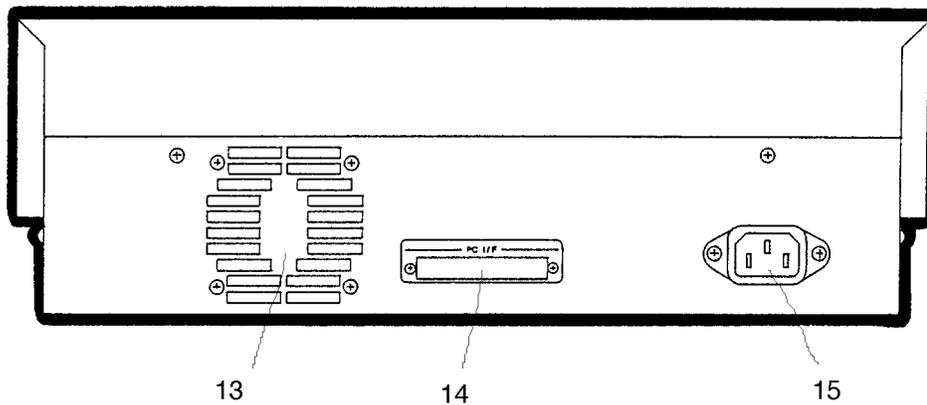
Figure 4   Address Checker Rear Panel

(13)   Air Vents
        Air vents for cooling fan. Make sure that vents are not blocked.
(14)   PC interface terminal
        The supplied PC interface cable connects here.
(15)   Power terminal
        The supplied power cable connects here.

4. Hardware Settings and Connections

4.1 PC Interface Board Settings

The board uses 32 KB of the 128 KB ROM expanded memory area ($C0000 - $DFFFF) in the PC/AT memory map. This 32 KB is selected using the switches on the PC interface board.

Switch settings and corresponding addresses are indicated in Table 1.
The board is set to a user-modifiable area (area from address $D8000) at the factory.
Factory settings can be used in most cases.

Table 1   Switch Settings and Corresponding Addresses

SW1 (A16)	SW2 (A15)	Address	Contents
ON	ON	`$C0000 - $C7FFF`	video BIOS area
ON	OFF	`$C8000 - $CFFFF`	hard disk BIOS area
OFF	ON	`$D0000 - $D7FFF`	expansion board BIOS area
*OFF	OFF	`$D8000 - $DFFFF`	PCJr. cartridge area, etc.

*Factory settings

If the area from address $D8000 to $DFFFF in the computer is used by other options or boards, change the switches, referring to the above chart, to select another 32KB area. When making the changes, it is necessary to modify the configuration file BMCONF.DAT using a text editor.

4.2 Configuration File Settings

It is only necessary to modify the configuration file when the switches noted in 4-1 are changed. Actual file modifications should be performed after program setup (described later) using a text editor, etc.

The hardware configuration is defined by the configuration file BMCONF.DAT. An example of the file contents follows:

BANK/0 #mapping (0:$C0000,1:$C8000,2:$D0000,3:$D8000)
BANK/x declares the 32 KB to be used by the board, as viewed from the computer. (#) indicates a comment.

    Parameter definitions are as follows (as noted in the comment).
    0   32 KB from address $C0000
    1   32 KB from address $C8000
    2   32 KB from address $D0000
    3   32 KB from address $D8000

Actual board switch settings must conform to the BANK/x declaration in the configuration file.

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4.3 Installing Board in Expansion Slot

Refer to the manual provided with your computer on how to open the computer case and add an option board similar to the interface board.

Note: Connect power cable last. Turn off host computer power and unplug power cable before installation.

Follow the following procedure when installing the board in the computer.

(1) Unplug the power cord from the socket and remove the computer cover to access the motherboard bus slot. Slot covers are generally screwed to the rear panel of the chassis of the system cabinet.

(2) Remove the slot cover from an unused, empty slot. Depending on your computer, a single row of expansion slots may have two edge connectors or only one. The board has only one edge connector section, so any slot can be used. Store the removed slot cover elsewhere.

(3) Align the board with the slot and insert it as shown in the drawing below. Pull gently to make sure that it is firmly seated, and affix it using the screw.

(4) Put the computer chassis cover back on.

DIP switches
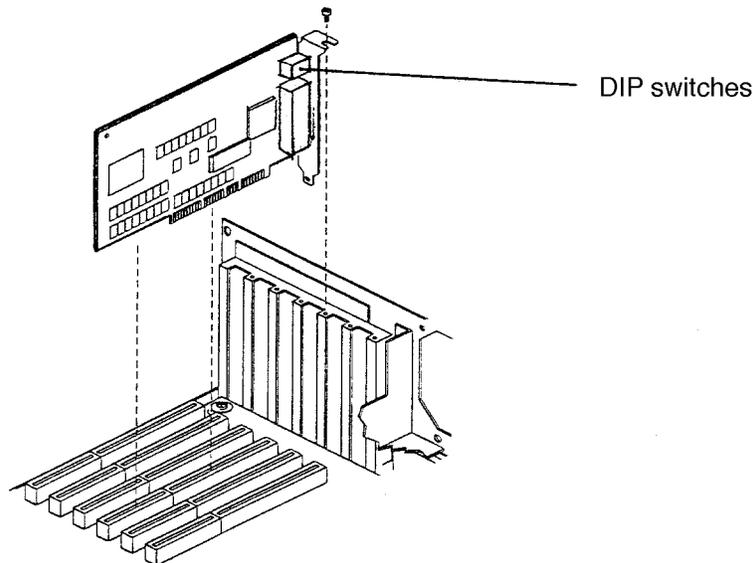
Figure 5   Board Insertion into Slot

4.4　PC Interface Cable Connection

The PC interface cable is connected to the PC interface board as illustrated in Figure 6. Connect the supplied PC interface cable as shown in the drawing. The other end is connected to the Address Checker.
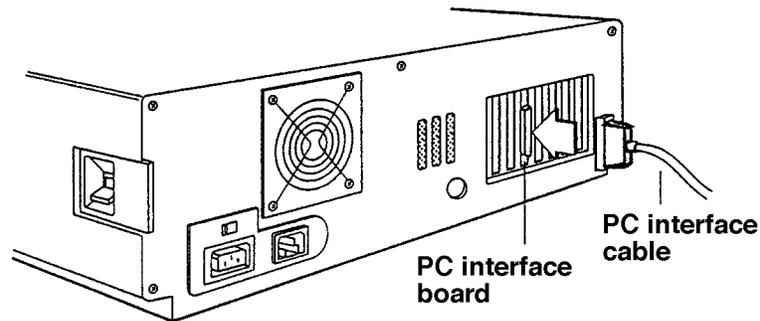
Figure 6　PC Interface Cable Connection

4.5　Country Settings

Set the DIP switches in accordance with the target country for the tested software. The DIP switches are located at the bottom edge of the Address Checker chassis. See Figure 3 on page 3. Switch settings and corresponding countries are indicated below.

	AREA 0	AREA 1	AREA 2	AREA 3	NTSC/PAL
Japan	OFF	ON	ON	ON	OFF
US	ON	ON	OFF	ON	OFF
Europe	ON	ON	OFF	OFF	ON

If necessary, connect Address Checker peripherals such as a TV monitor.   The A/V cable, control pad, and power cable are provided as standard equipment.

Finally, connect the power cables.

5. System Program Setup

5.1 Power-up Procedure

Follow the following power-up procedure when using the Address Checker.
(1)   First, turn on the TV monitor or other Address Checker peripheral devices.
(2)   Next, turn on the Address Checker.
(3)   Finally, turn on the computer.
When turning off the power, shut off the power in the reverse order. After completing program execution, enter the proper command and turn off the power as described in "System Shutdown" below.

5.2 System Program Description

SETUP.BAT	Simple batch file for setup. Sets up a BM directory in the root directory of drive C and copies all files except SETUP.BAT to the directory.
BM.EXE	The main Address Checker monitor program.
BM.HLP	A help file.
BMALIAS.DAT	System alias command file.
BMCONF.DAT	Configuration file defining Address Checker-host machine connection data. See section 4-2, "Configuration File Settings" for details. Current settings are as follows. BANK/0 #mapping (0:$C0000,1:$C8000,2:$D0000,3:$D8000)
BMINIT.DAT	Initialization command file for Address Checker startup. Command abbreviated forms and function key initial value settings are defined in this file. Portions of the file can be modified to desired settings. Follow comment instructions and modify only modifiable sections.
BMTITLE.DAT	Contains copyright message displayed at startup.
ERR.IDX	Error message display index file.
ERR.H	Error code definition file.
MAN.IDX	Manual display index file.
MAN.DOC	Manual file.
ICE.HIS	History file.
TRGMAP.DAT	File defining trigger detection condition address map.

In addition to the foregoing, other files useful in operation are provided. Descriptions follow.

SET 1	SET BM/ALL TRG/CNT
	TRC ALL END/CNT
SET 2	SET BM/ALL TRG/CNT
	TRC SMP END/CNT
SET 3	SET BM/ALL TRG/CNT
	TRC TRG END/CNT
SET 4	SET BM/ALL TRG/CNT
	TRC SMP FUL/STP END/BRK
SETALL	FK 11 "SET TRG/BRK¥r"
	FK 12 "< SET1 ¥r"
	FK 13 "< SET2 ¥r"
	FK 14 "< SET3 ¥r"
	FK 15 "< VDMP ¥r
	FK 16 "< SDMP ¥r"
	FK 17 "< TRCST¥r"
	FK 18 "< TRCGO¥r"
	FK 19 "< SHOW ¥r"
	FK 20 "< CLR ¥r"
	FK 21 "SET TRG/BEEP¥r"
	_TRC
SHOW	CLS
	?SET
	?TRC
	?BB
	?TG
VDMP	TDMP 0 100 > TDMPO.DAT
	@ VZ TDMPO.DAT -1
SDMP	TDMP 0 1000 > TDMPO.DAT
	@ VZ TDMPO.DAT -1
ODMP	TDMP > TDMPO.DAT
	@ VZ TDMPO.DAT -1
BEEP	SET TRG/BEEP
BGK	SET TRG/BRK
CLR	_TRC
BMINIT.DA	My-ICE SH initialization command file prototype (for reference).
BMINIT.ORG	Initialization command file original (for reference).
TRGMAP.D	Address Checker trigger definition file prototype (for reference).

5.3 System Program Setup

Insert the floppy disk in floppy disk drive A. Enter the following at the system prompt (C:\>).

```
C:\> a:↵
A\> setup↵
```

Once the procedure has started, follow the messages displayed on the screen. When setup is complete, store the original floppy disk in a safe place.

5.4 Modifying AUTOEXEC.BAT

The name of the directory containing the Address Checker monitor program and data is registered in the environmental variable PATH and IPATH statements. Using a text editor, modify the AUTOEXEC.BAT file located in the root directory of drive C. Add C:\BM to the environmental variable PATH. An example is given below where this is added after an existing registered directory.

```
SET PATH= ... ; C:\BM
```

Note 1:   Denotes an existing directory in the PATH statement
Note 2:   Underline denotes added character string.

C:\BM is registered in the new environmental variable IPATH.

```
SET IPATH= ... ; C:\BM
```

Note: Make sure that the main memory has at least 512 KB free. This can be determined from the value
          displayed as "maximum executable program size" when the MEM command (DOS command) is
          executed. If memory is insufficient, remove any unnecessary resident programs to free at least 512 KB.
          Do not make a front end processor a resident in the memory.

5.5 Modifying BMCONF.DAT Configuration File

Modification of the configuration file is only necessary when the PC interface switches are changed, as noted in section 4.1. As described above, BANK/x declares which 32 KB is to be used by the board, as viewed from the computer. The four types of "x" values are given below. Actual board switch settings must conform to the BANK/x declaration in the configuration file.

```
0        32 KB from address $C0000
1        32 KB from address $C8000
2        32 KB from address $D0000
3        32 KB from address $D8000
```

5.6 Completing Setup

When the foregoing setup and modification have been completed, reboot the computer to make the new settings effective.

Make sure that there is no floppy disk in the drive and press the <Delete> key while pressing the <Ctrl> key and the <Alt> key. Settings become effective when DOS reboots. Refer to section 6.2 and subsequent sections regarding basic operations.

6. Using SEGA SATURN Address Checker

This section describes the use of the Address Checker as a software testing tool. When the system program setup has been completed, proceed to section 6.2, as the power is already on.

6.1 Country Settings

Begin with all power to the system shut off. Set the DIP switches in accordance with the target country for the tested software. The DIP switches are located at the bottom edge of the Address Checker chassis. See Figure 3 on page 9. Switch settings and corresponding countries are indicated below.

	AREA 0	AREA 1	AREA 2	AREA 3	NTSC/PAL
Japan	OFF	ON	ON	ON	OFF
US	ON	ON	OFF	ON	OFF
Europe	ON	ON	OFF	OFF	ON

Next, turn the power on. Follow the following procedure when turning on the power.
(1)   First, turn on the TV monitor or other Address Checker peripheral devices.
(2)   Next, turn on the Address Checker.
(3)   Finally, turn on the computer.
         When turning off the power, shut off the power in the reverse order. After completing program execution, enter the proper command and turn off the power as described in section *6.4 System Shutdown*.
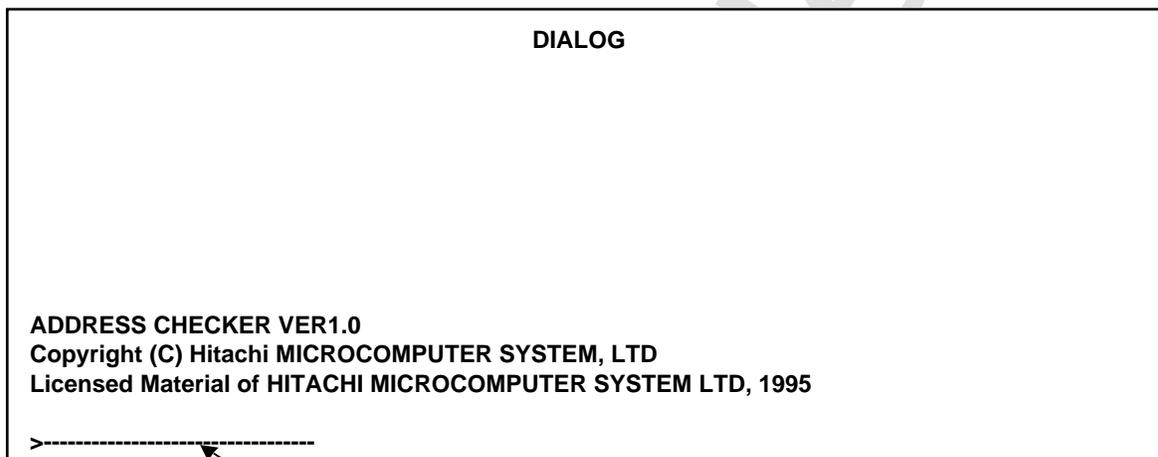
6.2 Program Start-up

Place the "key disc" in the CD drive. The key disc is the development disc, i.e., the "SEGA SATURN SYSTEM-DISC".

Let's assume the system prompt C:\> is displayed on the PC display. To start the Address Checker program, enter CD BM to change to the BM directory, and then enter "BM" from this directory.

```
C:\> cd bm ↵
C:\BM> bm ↵
```

The following screen is displayed at program start-up.

```
                                    DIALOG




















ADDRESS CHECKER VER1.0
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>--------------------------------
```

Input command is displayed here

When above screen is displayed, enter the following commands.

```
>SET BM/ALL TRG/BEEP ↵          (1)
>TRC SMP END/CNT ↵              (2)
>GO ↵                          (3)
```

(1) Sets the bus master type to ALL (normal mode) and sets a beep to sound when an error message is detected.
(2) Set to restrict trace data acquisition only to when a trigger is detected and to allow execution to continue after trace data acquisition.
(3) Starts execution.
    When the key disc has been recognized and the SATURN monitor displays the normal screen, remove the key disc and insert the game disc (test disc) without shutting off the power. Shutting off the power will nullify the effect of the key disc.

Description of Command Options

BM/ALL

Bus master types include ALL, SH2M, SH2S, and SCU, selected according to application. ALL is the normal type.

TRG/BEEP

Sets the computer to beep when an address error is detected. If you want to stop the game when an address error is detected, change BEEP to BRK to enable breaking. In this case, you cannot restart from the stopping point.

TRC SMP

Implements tracing only upon trigger detection.
Bus tracing is allowed when ALL is specified.

END/CNT

Specifies a process when tracing is stopped.
CNT allows the user program to continue executing without breaking.
BRK breaks execution of the user program.

6.3 Game Disc (Test Disc) Start-up

Start the game disc using the specified procedure and begin play.
If an address error is encountered, enter, for example, the following:
To copy lines 0 to 100 of data recorded in trace memory to a file named TDMPO.DAT, do the following.

```
>TDMP 0 100 > TDMPO.DAT ↵
```

An MS-DOS command can be executed by adding an '@' to the initial character. This can be used to open the above file in a text editor. For example, if the VZ Editor is installed, enter:

```
>@ VZ TDMPO.DAT ↵
```

The file can thus be edited and saved.
*If you do not wish to break again at a previous breakpoint, enter the following and then enter 'GO'. Execute 'SET TRG/BRK' once you have passed the breakpoint.

```
>SET BM/ALL TRG/CNT
>TRC SMP END/CNT
>GO

>SET TRG/BAK
```

*Frequently used command combinations have been assigned function keys. Refer to "§ 7. Description of Function Key Settings and Utilization" concerning their use. See the separate Technical Manual for detailed command descriptions.

6.4 System Shutdown

When finished, quit the program and return to DOS. Actual input is as follows.

```
>STOP↵
>Q↵
```

Confirm that the MS-DOS system prompt (C:\>) is displayed. In some cases, exit may take some time; this is not a defect. Please wait for a moment.

Shutting Off the Power
(1)   First, turn the power to the PC off.
(2)   Turn the Address Checker power off.
(3)   Turn off power to the TV monitor, etc., if necessary

This completes shutdown.

7. Function Keys

Initial function key settings are defined by the FK commands in the BMINIT.DAT file. File contents can be modified using a text editor to produce optimal settings.

7.1 Description of Settings

[F1] (SET)   For setting trigger detection. With this setting, most recent data is stored in the buffer within its capacity limits. If the buffer becomes full due to a large number of address errors, erasure and overwriting begins with the oldest data.

[F2] (BEEP)   Causes the computer to beep upon trigger detection.

[F3] (GO)   Executes a program (game, etc.).

[F4] (STOP)   Stops a running program.

[F5] (BRK)   Stops a running program upon trigger detection.

[F6] (VDMP)   Displays 100 lines of the most recent address errors stored in the trace buffer.

[F7] (SDMP)   Displays 1000 lines of the most recent address errors stored in the trace buffer.

[F8] (ODMP)   Displays all address errors stored in the trace buffer.

[F9] (SET4)   For setting operation when trigger is detected.
    With this setting, a running program is stopped when the buffer becomes full due to a large number of address errors. Differs from [F1] in that the program is stopped.

[F10] (CLR)   Clears the trace buffer.

[F11] (SHOW)   Displays Address Checker operating mode settings.

[F12] (?TRC)   Displays trace conditions.

*The VZ Editor, for example, may be used with F6, F7, and F8 settings. These are modifiable. See 7.5 for instructions.

7.2 Using Function Keys to Collect Error Data

The order in which function keys are pressed differs with the program check application.

Example 1 Beep when address error is encountered.
    Press the first key (F1)   (most recent data to trace buffer)
    Press the second key (F2)   (set beep to sound)
    Press the third key (F3)   (execute program)

Example 2 Stop program execution when address error is encountered.
(Note: Program execution cannot be resumed.)
    Press the first key (F1)   (most recent data to trace buffer)
    Press the second key (F5)   (stop execution when trigger detected)
    Press the third key (F3)   (execute program)

Example 3 Stop program execution when trace buffer is full.
    Press the first key (F9)   (stop when trace buffer full)
    Press the second key (F2)   (set beep to sound)
    Press the third key (F3)   (execute program)

Example 4 Start address check at a desired location.
    Press the first key (F1)   (most recent data to trace buffer)
    Press the second key (F3)   (execute program)
    (Run game or other program to desired location, then press F5.)
    Press the third key (F5)   (stop execution when trigger detected)

7.3 Using Function Keys to View Error Data

The following procedures are suitable for use when an address error is encountered.

Example 1 Press (F6)
    Runs VZ Editor so that 100 lines of new data in memory can be viewed.

Example 2 Press (F7)
    Runs VZ Editor so that 1000 lines of new data in memory can be viewed.

Example 3 Press (F8)
    Writes all address errors stored in buffer to a file, which is then displayed in VZ
    Editor. The file size can be quite large when there are many address errors; this
    requires sufficient disk space and can take some time.

After error data has been collected, continue the check. If new error data is collected, press (F10) to clear the trace buffer. Be sure to rename the data file (default is TDMPO.DAT) with a suitable new name. If this is not done, the file will be over-written during subsequent operations and previous data will be lost.

7.4　Using Function Keys To Exit

To quit, press **F4** to stop execution and then enter **Q** to quit the BM program. When the MS-DOS system prompt (C:\) is displayed, turn off the power to the PC and then turn off the power to the Address Checker.

7.5　Modifying Function Keys

Initial function key settings are defined by the FK commands in the MBINIT.DAT file. Function keys can be modified by rewriting the file contents using an editor. Changing the function keys requires knowledge of commands and other issues; see the Technical Manual.

As an example, the assignment for the (F6) key is described, and the method for changing the editor used is given. The initial settings for the (F6) key in the BMINIT.DAT file are as follows.

　　　;FK 6 "¥f<u>VDMP</u> ¥x12¥x19< <u>VDMP</u>¥r"

Executes commands in the file with this name.

This string is displayed at the bottom of the display.

The contents of the specified VDMP file are as follows.

```
TDMP 0 100 > TDMPO.DAT;   write 0 - 100 lines from the trace buffer to
                          TDMPO.DAT file.
@ VZ TDMPO.DAT -1;        run VZ Editor and open TDMPO.DAT.
```

Another editor can be used by changing "VZ" to a command which runs the editor. It is only necessary to modify the VDMP file to change the editor name.

8. Error Messages

The following measures can be taken when an error message is displayed.

Invalid Statement in Configuration File
If this message is displayed, correct the file contents referring to section 4.2.

Hardware Not Connected
• Make sure that the Address Checker power switch is turned on.
• Make sure that the interface board is properly connected to the host machine.
• Make sure that BANK settings are correct.

9. General Maintenance, Etc.

9.1   Removing the Cover

Make sure that power to the Address Checker and connected peripherals is shut off. Disconnect all cables.

Remove the peripheral screws. There are two screws on the rear panel and three on each of the side panels for a total of eight.

(1)   Swing up the rear of the cover, supporting it at the front end.
(2)   Hold the cover at an angle of approximately 15° so that the protruding section of the CD drive is freed, slide the cover about 2 cm forward and stop.
(3)   At this point, lift the entire cover up vertically until it comes free.
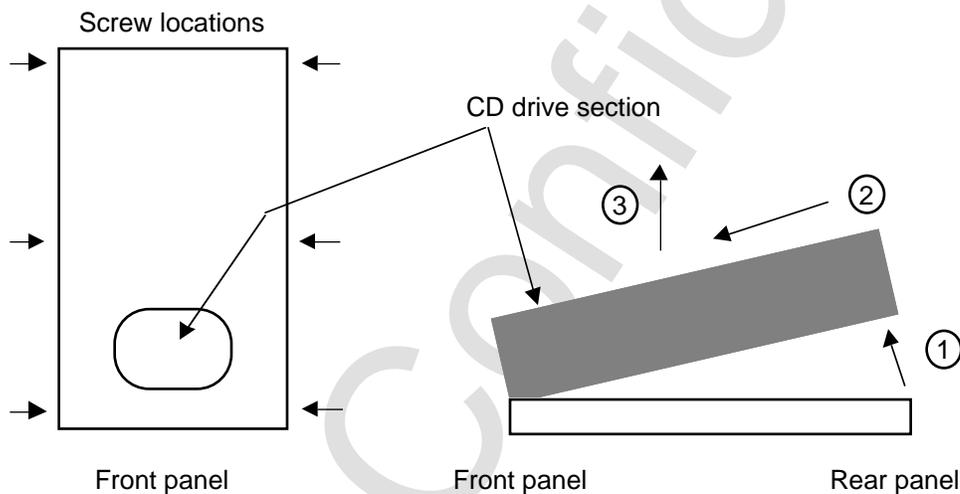
When replacing the cover, reverse the foregoing steps. Mount the cover with the front panel at an angle and slowly lower the rear section. Slide the cover backwards so that the protruding section of the CD drive is inserted through the hole in the cover. The position of the CD drive can be moved, permitting fine adjustment. Finally, align the rear section of the cover.

9.2   Replacing the Lithium Battery

Both the commercial version of the SEGA SATURN and this unit use lithium batteries. The battery is used for the internal clock and storing saved data. The lithium battery should be replaced after approximately one year. Use a CR2032 replacement lithium battery. The location of the lithium battery holder is shown in the drawing below.

lithium battery holder   SH2 sub-boards

Front panel

power supply

Rear panel
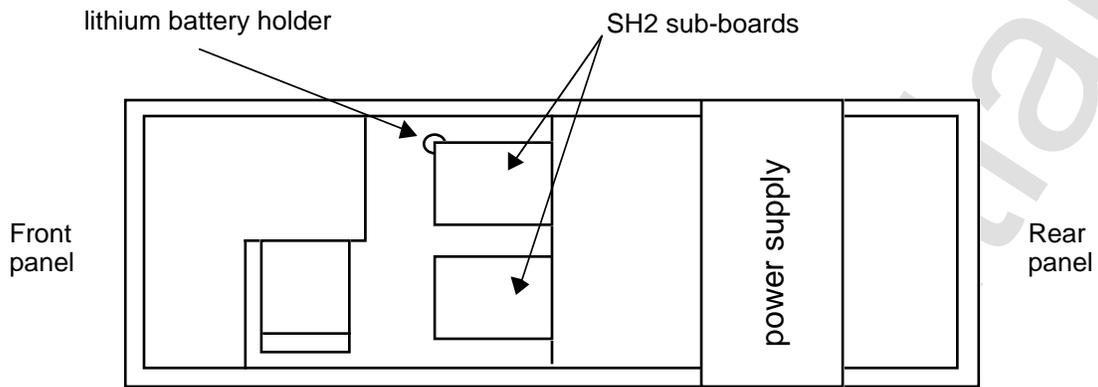
9.3 Motion Video Card Installation

When installing a motion video card, remove the slot cover on the right side of the chassis. The cover is secured by two screws. The end of the installed motion video card protrudes to the outside, so store the slot cover elsewhere.

The following drawing shows the top of the chassis with the cover removed. It is not necessary to remove the cover to install the motion video card.

SH2 sub-boards

Front panel

power supply

Rear panel

Motion video card location