SEGA SATURN TECHNICAL BULLETIN #46
(PRELIMINARY)

To:	**Sega and Third Party Developers**
From:	**Developer Technical Support**
Date:	**July 10, 1996**
Re:	**Data Cartridge Manual Ver.1.00**

1   Overview

1) Data cartridges
   This data cartridge is a ROM cartridge for data that uses the A path that supplements memory when the main memory is insufficient. Its address appears in the A-Bus CS0 (22000000H) area.
2) Restrictions on Use
   Data cartridges must contain only data; placing program code in them is prohibited, regardless of whether the code is executed directly or executed after transfer.
   Placing program code in cartridges can be made into a security hole by creating a ROM with this portion rewritten. In future versions of Saturn, it will no longer be possible to access the contents of the cartridge, so be sure to follow this rule.
3) Corresponding peripheral
   The peripheral that corresponds to the SYSTEM ID of the CD-ROM has an "R" added.

Example: Using a Sega Saturn standard pad with a data cartridge

"JRΔΔΔΔΔΔΔΔΔΔΔΔΔΔ" "Δ" = space (20H)

Reference: *Programmer's Guide, Vol. 1*, Disk Format Standards Specification, section 4, "Boot System," p. 28.

2   Data Cartridge System IDs

The following describes the system ID for data cartridges for Sega Saturn. Data cartridge system IDs and CD-ROM system IDs do not have the exact same items. The data cartridge has some unique items, and some other items require a different entry than on a CD-ROM, even for the same item name. For that reason, when entering the system ID of the data cartridge, be sure to check this specification for all items.

3 Structure of the System ID

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00H	Hardware ID															
10H	Manufacture ID															
20H	Product number										Version					
30H	Release date								Device invoice							
40H	Compatible area codes								Back-up RAM information							
50H	RESERVED*1															
60H	Game title															
70H																
80H																
90H																
A0H																
B0H																
C0H																
D0H	RESERVED															
E0H	RESERVED				CHECK SUM				RESERVED							
F0H	RESERVED															

4 Cautions on Notation

Rules

Usable characters

All characters usable in system IDs are ASCII code en-sized alphanumeric characters. In some items, commas (,), slashes (/), hyphens (-), and colons (:) may be used.

Entry

- All entry is flush left unless otherwise indicated. Do not start entries with spaces.
- All open areas are ASCII code 20H unless otherwise indicated.

Definition of expressions

The Δ sign and the word "space" used in the explanation indicate ASCII code 20H. Also, em-size characters are used in this manual for greater legibility.

Other definitions

Always fill in RESERVED areas with 00H.

*1 Fill in this area with spaces (20H).

5 Explanation of Individual Items

- Hardware ID (start address 00H)

Definition	Enter the unique data cartridge ID
Usable characters	Capital letters only
No. of characters	16 characters
Entry rules	Always enter "SEGASATURNΔDATAΔ"

- Manufacturer ID (start address: 10H)

Definition	Enter the manufacturer name specified by Sega.

Usable characters	Alphanumeric characters only.
No. of characters	16 characters
Entry rules	For the Sega brand, enter the 16 characters "SEGAΔENTERPRISES".
	For licensees, enter the 16 characters "SEGAΔTPΔKAISHA-A". For "KAISHA-A", enter the unique company code assigned to the licensee. For example, the underlined portion of
	SEGAΔTPΔ<u>T-999</u>ΔΔ
	is the company code, with the remainder filled out by spaces. Be sure to enter 16 characters.

- Product number (start address: 20H)

Definition	Enter the product number specified by SEGA.
Usable characters	Alphanumeric characters only.
No. of characters	10 characters
Entry rules	Fill out the blank area with spaces.
Example of entry	For Sega brand titles: "GS-9099ΔΔΔ"
	For licensee titles: T-99901GΔΔ
	Note: The remainder must be filled out with spaces to reach 10 characters.

- Version (start address: 2AH)

Definition	Enter the version number of the data cartridge.
Usable characters	Capital "V", numerals, and periods (.)
No. of characters	6 characters
Entry rules	Start with V followed by one numeral, a period, then three more numerals. The release version is V1.000, with the version number increasing every time thereafter the version changes.
Example of entry	For sample ROM: V0.802
	For master ROM: V1.000
	For version upgrade: V2.011

*1   The version number does not necessarily end with a master release of V1.000. Additions and changes after release require that the version number also be updated.

*2   This version number is different from the CD-ROM's version number.

- Release date (start address: 30H)

Definition	Enter the date that the master ROM was created.
Usable characters	Numerals only.
No. of characters	8 characters

Entry rules	Enter the year, month and day. Enter four digits for the year and two digits each for month and day.
Example of entry	For January 23, 1996: "19960123"

- Device information (start address: 38H)

Definition	Device information of the data cartridge. Enter the device type and the capacity.
Usable characters	En-size alphanumeric characters and spaces
No. of characters	8 characters
Entry rules	Devices are one capital letter, flush left. Capacity is in Mbits indicated by three numerals flush right. Fill in blanks with spaces.
Example of entry	For a single 16 Mbit ROM: "RΔ16ΔΔΔ" For an 8 Mbit ROM with a 4 Mbit SRAM: "RΔΔ8SΔΔ4"
List of devices	R: ROM S: SRAM D: DRAM F: FRAM

- Corresponding peripheral (start address: 40H)

Definition	Enter the area symbol for the region where the application is to run.
Usable characters	Only the capital letters specified in the list of area symbols below.
No. of characters	10 characters
Entry rules	Multiple symbols may be entered. When multiple symbols are used, enter them flush against each other without delimiting them with commas or spaces. Fill in blanks with spaces. List of area symbols J: Japan T: Asian NTSC (Taiwan, Philippines, Korea) U: North America (USA, Canada), Central and South American NTSC (Brasil) E: European PAL, Southeast Asian PAL, Central and South American PAL
Example of entry	For an application that will run in Japan, Taiwan and Korea: "JTΔΔΔΔΔΔΔΔ"

- Back-up RAM information (start address: 4AH)

Definition	Enter device information of backup RAM
Usable characters	En-size alphanumeric characters
No. of characters	6 characters

Entry rules	For cartridge software, when backup RAM is loaded into the same data cartridge. Enter three en-size numerals (decimal) + the unit + a space + the access method for a total of six characters.	

• Unit symbols
Megabits" "M"
Kilobits: "K"
• Access method symbols
In byte units with odd addresses: "O"
In byte units with even addresses: "E"
In word units: "W"
When backup RAM is not used, enter spaces for all six characters.

Example of entry — Backup not used: "ΔΔΔΔΔΔ"

64 Kb odd addresses: "064KΔO"

256 Kb even addresses: "256KΔE"

1 Mb both addresses: "001MΔW"

- Game name (start address: 60H)

Definition — Enter the name of the game.

Usable characters — Alphanumeric characters only. Spaces may be used within game names. When multiple titles are arrayed, delimit the titles with slashes (/), hyphens (-), or colons (:).

No. of characters — 112 characters

Entry rules — When names vary in different sales regions, the different title names may be arrayed. There are not a detailed set of rules for multiple entry, but the titles should be discernible from viewing this section. Fill in blanks with spaces.

Example of entry — For multiple titles:
Example 1: "TITLE1/TITLE2"

Example 2: "J:TITLE1ΔΔU:TITLE2"
Note: Fill in blanks completely with spaces (20H).

- Checksum (start address: E4H)

Definition — Enter the check sum for the data cartridge.
Usable characters — Binary values
No. of characters — 8 characters
Entry rules — 8 digits of hexadecimal (32 bit length)
Example of entry — A13B04F3H

See item 4) under "Check Procedure" for information on how to calculate these.

6　Access Methods

When booting up from a CD, initialize the hardware and then do the following checks on the data cartridge. The application does these checks by checking the contents of the items of the system ID stated within the data cartridge. When an error occurs in the check, an error message is displayed and the program halts.

Note:　Perform the following checks while the program is stopped. When doing these checks, be sure to move to the multiplayer screen.
　　　　1) Software reset (ABC + start)
　　　　2) Hardware reset
　　　　3) Tray open

Error Message:

"The data cartridge is not inserted correctly. Turn off the power and re-insert the cartridge."

• The attachment shows a sample display layout.

Check Procedure:

The address of the data cartridge appears in the A-Bus CS0 (22000000H) area. In the following explanation, this address is described as the offset value.

1) Check the "SEGASATURN∆DATA∆" in data cartridge's hardware ID (+00H).
2) Check the manufacturer ID (+10H), product number (+20H), and corresponding peripheral (40H).
3) Set the SCU's wait.
   A 150 ns ROM is used, so three clocks are needed and 13301FF0H should be set in the A-Bus setting register (25FE00B0H).
   Note: CS1 should be left at the 1FF0H set in the BOOT ROM.
   Reference: See *Hardware Manual, Vol. 1*, SCU Users Manual, "A-Bus Setting Register," P.13.
4) Calculating the data cartridge's checksum
   The calculation method adds integers from the data cartridge address +100H to the end in 16 bit units and uses the final 32 bits as the checksum. The value calculated is compared to the checksum (+E4H) in the data cartridge's system ID.

Note: +000H to +0FFH falls within the system ID area, so it is not part of the calculation.

5) If the above checks are all okay, check the backup RAM and move control to the game program. There are no particular restrictions on any access after this point. Be sure to always obey the injunction in paragraph (2), "Restrictions on Use," of section 1, "Overview."

The data cartridge
is not inserted
correctly.

Turn off the power
and re-insert the
cartridge.