



SEGA OF AMERICA, INC.  
Consumer Products Division

Forx Sabbio  
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**IC BD 32M SRAM + 256K BUP 32X R/D  
837-11068  
User's Manual**

Doc. # MAR-46-081594

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## 1.0 Overview

This is one of the cards used in developing software for the Mega Drive / 32X. Below is a list of its main features.

1. 32 Mbit (4 Mbyte) of SRAM mounted on the card.  
The SRAM chip used by this card uses a Hitachi HM628128ALFP series or equivalent product. Access time uses a device of 100 ns or less. The SRAM is backed up by a battery.
2. SRAM with a 1-Mbyte (maximum) battery backup function mounted for data memory. Select from 256 Kbit, 512 Kbit and 1 Mbit settings. Factory setting at shipment is 256 Kbits.
3. Using the bank select function, memory can be selected arbitrarily and accessed in 4 Mbit units. Bank numbers are valid from 0H to 7H.
4. Power Supply DC +5V is supplied from the main unit.
5. Designed memory write protect/write enable registers. Memory content is protected from unnecessary memory write access to the program area. The initial status immediately after the power on is the write protect status.
6. Includes LED status indicator function.  
Has a function to indicate low battery warning and data retention voltage abnormalities via LEDs. The battery is used in memory write enable and backup.
7. Includes memory mode switching function.  
Can handle the conventional Mega Drive 16 Mbit mode through a switch.

## 2.0 Main Specifications

Product Number:	837-1 1068
Print Circuit Number:	171-6865
Memory Capacity:	SRAM 32 Mbit (program area) SRAM 1 Mbit (data area) 256 Kbits when shipped from factory (512 Kbit/1 Mbit switch setting is possible)
Word Length:	1 word 16 bits
Memory Expandability:	Format Bank Select
I/O Specifications:	Conforms to Mega Drive, cartridge, connector specifications.
Card Dimensions:	95.5 (W) 165 (H) mm
Pins Used:	General logic pins: TTL, LSI, IC SRAM: HM628128ALFP-10 (Hitachi) Custom IC: 315-5709 (Sega) Battery: CR2032 (Sony) equivalent product ML-2016 (Sanyo) equivalent product Other: Electrolytic capacitor, chip capacitor, battery socket, DIP switch, etc.
Power supply:	DC +5V
Temperature Range:	5°C ~ 40°C
Relative Humidity:	80% RH or less

equivalent product



### 3.0 Description of Functions

The SRAM card is managed by partitioning the memory address in 4 Mbits (bank 0 ~ bank 7, 32 Mbits). The Mega Drive cartridge area is partitioned into eight areas, each having 4 Mbits. Only area 0 with vector is fixed, and to the remaining seven areas, any bank can be allocated. Banks are specified by the bank setting registers (Mega Drive A130F1H ~ A130FFH odd addresses).

Bit 0 of register 0 is the address following 200000H used in switching the ROM side /backup RAM side. Bit 1 of register 0 is used in setting the backup RAM write protect. Because there is no bank for the backup RAM, addresses after 200000H become directly backup RAM area.

Bank numbers written in register 1 through register 7 correspond to their respective areas 1 through 7. Bank numbers can be set from 0 to 63; however with the RAM card, only the RAM installed bank numbers are effective. When 32 Mbits are loaded, only bank numbers from 0 to 7 are effective. The area will not function properly for any other setting.

When the power is turned on or reset, the cartridge area becomes 32 Mbit ROM mode (area 1 ~ area 7: bank 1 ~ bank 7) space and write protect for the backup RAM is turned of. In this way, allocating all 32 Mbit address space to the MD cartridge area is called the 32M mode.

The next page shows the relationship between the MD cartridge area and bank setting register.

MD Cartridge Area

Bank Setting Register

MD Cartridge Area		Bank Setting Register								
		D7	D6	D5	D4	D3	D2	D1	D0	
000000H	Area 0 permanant	Register 0 (A130F1H)	0	0	0	0	0	*2	*1	
080000H	Area 1	Register 1 (A130F3H)	0	0	BN5	BN4	BN3	BN2	BN1	BN0
100000H	Area 2	Register 2 (A130F5H)	0	0	BN5	BN4	BN3	BN2	BN1	BN0
180000H	Area 3	Register 3 (A130F7H)	0	0	BN5	BN4	BN3	BN2	BN1	BN0
200000H	Area 4	Register 4 (A130F9H)	0	0	BN5	BN4	BN3	BN2	BN1	BN0
280000H	Area 5	Register 5 (A130FBH)	0	0	BN5	BN4	BN3	BN2	BN1	BN0
300000H	Area 6	Register 6 (A130FDH)	0	0	BN5	BN4	BN3	BN2	BN1	BN0
380000H	Area 7	Register 7 (A130FFH)	0	0	BN5	BN4	BN3	BN2	BN1	BN0

ROM area  
or  
Backup RAM

\*1 ROM at 0, RAM at 1      \*2 Can write at 0, not at 1  
BN0 - BN5 are bank numbers

		D15	D14	D13	D12	D11	D10	D9	D8
ROM area write enable register (A130F0H)		EB	0	0	0	0	0	0	0

EB: ROM at 0 Area write disable (cannot write)  
Status when power is turned on or reset.

EB: ROM at 1 Area write enable (can write)  
LED 1 flashing status.

Note: This register is write only.

Note: The operation of this register differs from the operation of the conventional 32M SRAM card 837-9951.



Status when the power is turned on or reset is shown below.

ROM Bank	MD Cartridge Area
Bank 0	Area 0 000000H
Bank 1	Area 1 080000H
Bank 2	Area 2 100000H
Bank 3	Area 3 180000H
Bank 4	Area 4 200000H
Bank 5	Area 5 280000H
Bank 6	Area 6 300000H
Bank 7	Area 7 380000H

Reg. 0 : 00H  
Reg. 1 : 01H  
Reg. 2 : 02H  
Reg. 3 : 03H  
Reg. 4 : 04H  
Reg. 5 : 05H  
Reg. 6 : 06H  
Reg. 7 : 07H

**Note:** Write not allowed to areas 0 through 7.

### 3.1 Using the 16 Mbit ROM Mode + Backup RAM

The SRAM card accommodates bank switching at shipment; therefore, it is 32 Mbit ROM space when initialized. As a result, the SRAM card is not compatible with a cartridge with 16 Mbit or less + backup RAM (existing memory map).

Changing DIP switch settings allows the use of 16 Mbit ROM + backup RAM. Because changing the DIP switch settings automatically results in the 16 Mbit ROM + backup RAM when the power is turned on or reset, changing the bank setting register is not necessary.

This applies to 000000H ~ 1FFFFFFH ROM area, backup RAM area from 200000H. This type of memory allocation is called the 16M mode. Improper operation occurs if a bank register is changed in this mode.

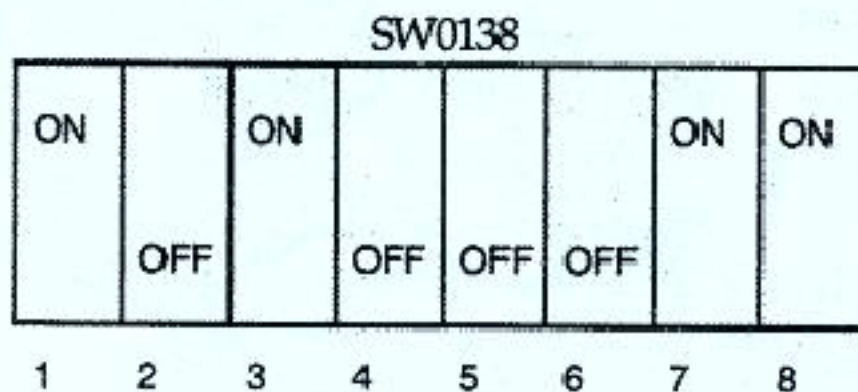
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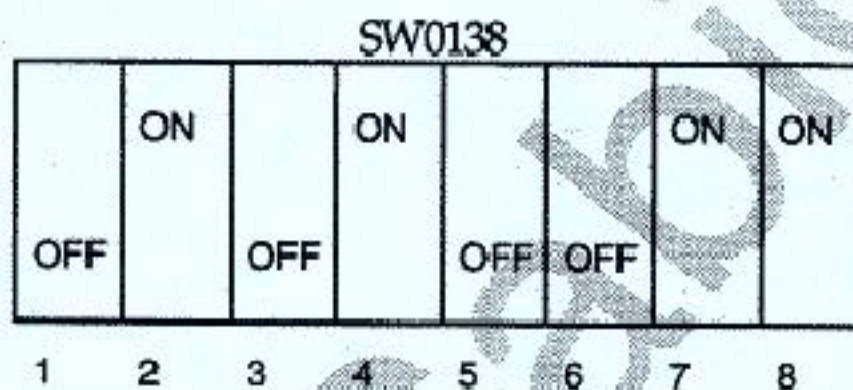
### 3.2 Card Switch Settings

DIP switches are designed on the card, and 32 Mbit and 16 Mbit memory modes can be selected by setting switches.

32 Mode (Factory setting)



16 Mode (User setting)



### 3.3 Switch Descriptions

Switches 1 to 4 are used in SRAM chip select signal switching. The backup RAM capacity is determined via switches 5 and 6. The standard is 256 Kbits.

5	6	Capacity
OFF	OFF	256 Kbits
ON	OFF	512 Kbits
ON	ON	1 M

Switch 7    Bank Register operation allowed/not allowed  
 ON        Bank Register operation allowed  
 OFF       Bank Register operation not allowed

Switch 8    Option Signal connectivity switching with device consideration  
 ON        -CART signal        connected  
 OFF       -CART signal        not connected



### 3.4 Status Display Function Using LEDs

This card includes functionality that displays card status using three LEDs: LED1, LED2, and LED3.

- |       |     |   |
|-------|-----|---|
| LED1: | ON  | Allows write to the ROM area.                                 |
|       | OFF | Disallows write to the ROM area (write protect).              |
| LED2: | ON  | Replace the battery CR2032 (BATT0248).                        |
|       | OFF | The battery still has ample power.                            |
| LED3: | ON  | Voltage is abnormal, please replace battery CR2032 (BATT0248) |
|       | OFF | Memory data protect voltage is normal.                        |

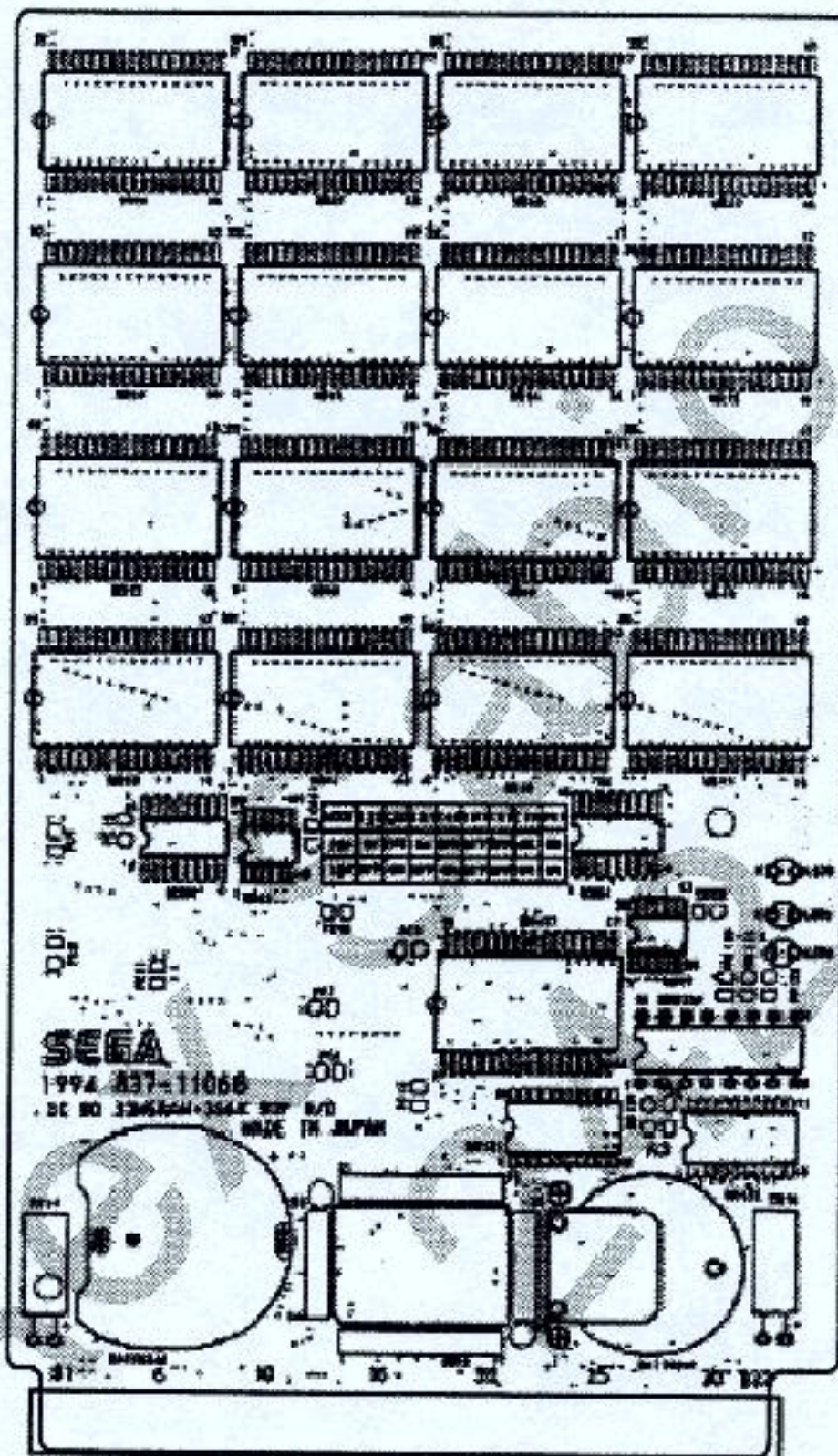
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## 4.0 View

(Front View)

171-6865



Component Side Silk