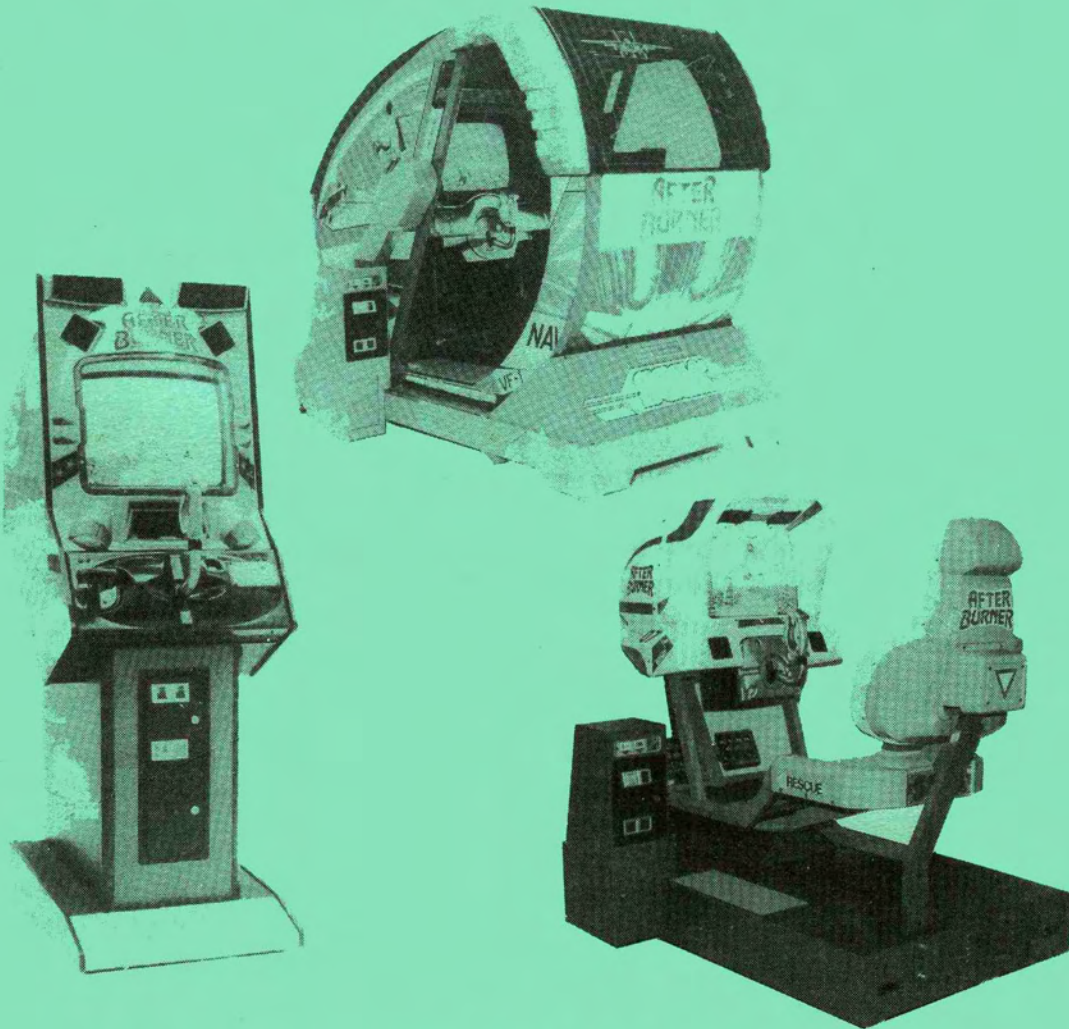


**SEGA®**

# AFTER BURNER

SERVICE MANUAL



**SEGA ENTERPRISES, LTD.**

**SELF-TEST**

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## SELF – TEST

This test mainly checks the operation of game PCB's, discovers defects if any, and also checks monitor colors and audio quality. In addition, the test indicates dip SW assignment and has a Bookkeeping function.

### TEST PROGRAM

- (1) **Memory Test** : Checks the EPROM programs and RAM Area.
- (2) **Input Test** : Tests the operation of COIN, VULCAN, MISSILE, START, SERVICE switches, etc.
- (3) **Output Test** : Tests the operation of each lamp.
- (4) **Motor Test** : Checks the operation of the motor and the limit switches, and indicates rolling/pitching VOLUME (V. R. ) values.
- (5) **Sound Test** : Checks the quality of the synthesized sound transmitted from the PCB.
- (6) **CRT Test** : Checks colors displayed.
- (7) **Dip Switch Assignment** : Indicates dip switch assignments.
- (8) **Bookkeeping** : Indicates data on average score and play time.
- (9) **Backup RAM Clear** : Clears Bookkeeping memory.

### 1. TEST OPERATION

- (1) Push the TEST SW button to display the test menu (Fig. 1).

```
DIAGNOSTIC VER. 2.00
  ⇒ INDIVIDUAL
    MEMORY TEST
    INPUT TEST
    OUTPUT TEST
    MOTOR TEST
    SOUND TEST
    C. R. T. TEST
    DIP SWITCH ASSIGNMENTS
    BOOKKEEPING
    BACKUP RAM CLEAR
    EXIT
SELECT BY STICK! PUSH TEST BUTTON!
```

- (2) Move the handle upward or downward and bring the arrow to the desired position. Press the TEST SW button again to display the desired test.
- (3) When each test is finished, press the TEST SW button again to display the test menu (Fig. 1). To end the test program, bring the arrow to EXIT and push the TEST SW button.

FIG. 1

\* **INDIVIDUAL** and **CONTINUE** can be selected by pushing the **START** button when the arrow is at the top position.

**INDIVIDUAL** : Indicates only the item which the arrow points to. Push the **TEST SW** button again to display the test menu (Fig. 1).

**CONTINUE** : After displaying the item which the arrow points to, push the test SW button again to proceed to the following test in the order as indicated in the Fig. 1 test menu.

## 2. TEST ITEMS AND DESCRIPTION

### (1) Memory Test

```

DIAGNOSIIC VER. 2.00
MEMORY TEST
** ROMS TEST **
IC. 20 GOOD IC. 58 GOOD
IC. 29 GOOD IC. 63 GOOD
** RAMS TEST **
IC. 22 GOOD IC. 31 GOOD IC. 38 GOOD
IC. 23 GOOD IC. 32 GOOD IC. 39 GOOD
IC. 55 GOOD IC. 60 GOOD IC. 123 GOOD
IC. 56 GOOD IC. 61 GOOD IC. 126 GOOD
IC. 132 GOOD IC. 134 GOOD IC. 150 GOOD
IC. 133 GOOD IC. 135 GOOD IC. 151 GOOD
CUSTOM IC TEST
IC. 30 GOOD IC. 37 GOOD IC. 53 GOOD
IC. 107 GOOD IC. 108 GOOD

```

Checks the game PCB's 4 main ROMs, 18 RAMs and 5 CUSTOM IC's.

**GOOD** means the IC is in "GOOD" operating condition.

If there exists any malfunctioning of the IC's, "BAD" will be indicated.

### (2) INPUT TEST

```

DIAGNOSTIC VER. 2.00
INPUT TEST

COIN #1 OFF START OFF
COIN #2 OFF SERVICE OFF
VULCAN OFF MAT OFF
MISSILE OFF
STICK RIGHT LEFT 80H
STICK UP DOWN 80H
SPEED 80H

```

① Operate each switch. When the "OFF" condition is changed to "ON", the corresponding switch is in good working order.

② Date values should increase when the handle grip is moved to the right, decrease when it is moved to the left, and indicate 80 H when released.

③ Date values should increase when the handle grip is moved upward, decrease when it is moved downward, and indicate 80 H when released.

④ Date value should increase when the throttle lever is moved forward, decrease when it is moved backward, and indicate 80 H when released.

### (3) OUTPUT TEST

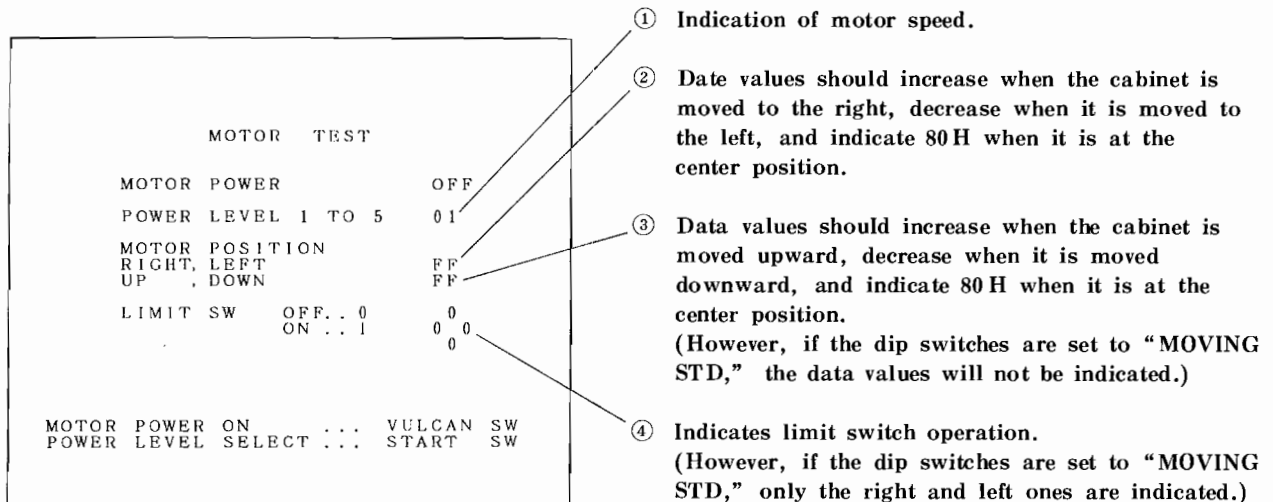
Each lamp will flash if it is working properly.

```
DIAGNOSTIC VER. 2.00
OUTPUT TEST
* START LAMP
* WARNING LAMP
```

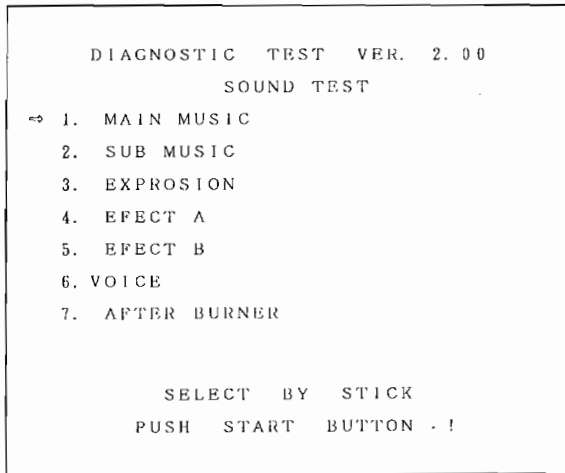
### (4) MOTOR TEST (DELUXE, COMMANDER TYPE)

Note : If the dip switches are set for "UPRIGHT", this test item will not be displayed.

The cabinet can be moved by operating the handle while pulling the handle grip trigger.  
The motor speed can be changed to 5 levels by pressing the START SW button.



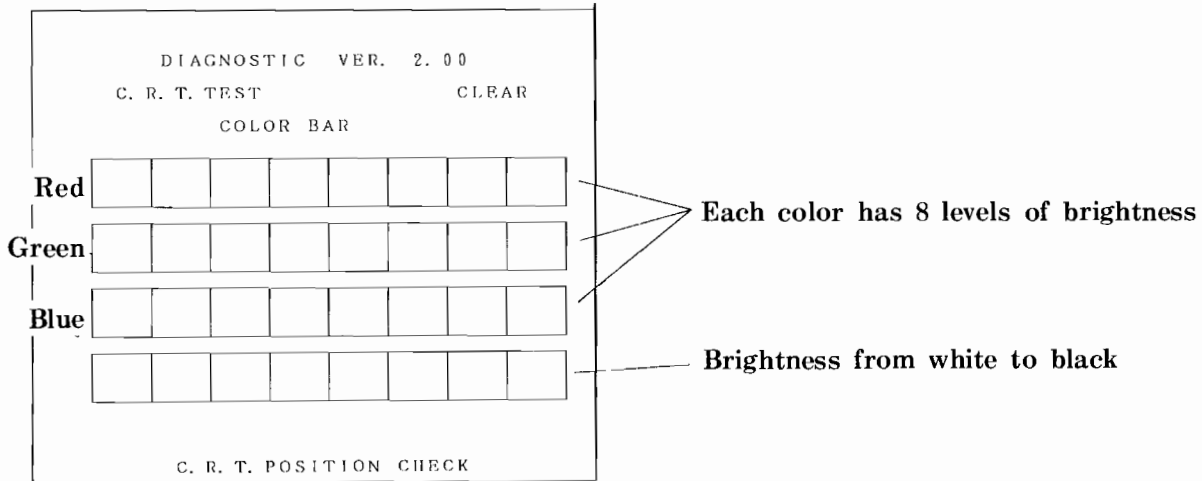
## (5) SOUND TEST



- ① Push the handle upward/downward to move the arrow accordingly. Bring the arrow to the desired item and press the START button.
- ② The selected test item has various sounds to be selected. Bring the arrow to the desired sound item, press the START button, and the sound will be produced.
- ③ Bring the arrow to EXIT and press the START button to return to the initial display.

## (6) C. R. T. TEST

- ① Checks the C. R. T. position. Make sure that the on-screen corners are consistent, and then make size adjustments.
- ② RGB color check.  
(The color becomes darker from the left to the right.)



## (7) DIP SWITCH ASSIGNMENTS

DIAGNOSTIC VER. 2.00		DIP SWITCH ASSIGNMENTS	
DIPSW. A	1 2 3 4 5 6 7 8	OFF OFF OFF OFF OFF OFF OFF OFF	① Present setting of each dip switch
DIPSW. B	OFF OFF OFF OFF OFF OFF OFF OFF		② Coin switch setting
. A	1234 COIN SW#1	1 COIN 1 CREDIT	③ Cabinet type
. A	5678 COIN SW#2	1 COIN 1 CREDIT	④ Inclusion of throttle lever
. B	12 CABINET TYPE	MOVING DX	⑤ Number of player's planes per credit
. B	3 SLOTTLE LEVER	WITH	⑥ Awarding player's additional plane(s)
. B	4 SHIPS PER CREDIT	3SHIPS	⑦ To continue game or not
. B	5 SHIP INCREASE	YES	⑧ Game difficulty
. B	6 CONTINUE GAME	YES	
. B	78 GAME DIFFICULTY	NORMAL	

## (8) Bookkeeping

DIAGNOSTIC VER. 2.00		BOOKKEEPING	
COIN CHUTE #1		8	① Operation frequency of coin chute 1
COIN CHUTE #2		0	② Operation frequency of coin chute 2
COIN CREDITS		141	③ Number of coin credits
SERVICE CREDITS		5727	④ Usage frequency of service switch
TOTAL CREDITS		5888	⑤ Number of credits in total
TOTAL TIME		15H 28M 11S	⑥ Total working time (○○ H ○○ M ○○ S)
PUSH START BUTTON !			

Press the START button to display the following :

DIAGNOSTIC VER. 2.00		BOOK KEEPING	
NUMBER OF GAME		203	① Total number of game plays
AVE. SCORE		7230	② All players' average score
TOP-SCORE		123456	③ Highest score
LOW-SCORE		54321	④ Lowest score
** GAME TIME **			
TOTAL		○○○○○○○○	⑤ Total game play time
AVERAGE		○○○○○○○○	⑥ Average game play time
LONGEST		○○○○○○○○	⑦ Longest game play time
PUSH START BUTTON			

Note : When any data exceeds the capacity, "OVERFLOW" will be shown on the screen. At this time, perform BACKUP RAM CLEAR.

**(9) BACK UP RAM CLEAR**

**Bookkeeping data is stored for at least 3 days after the power is turned off. When clearing, bring the arrow to YES and push the TEST button.**

```
DIAGNOSTIC  VER.  2. 00
BACKUP RAM CLEAR
NO
→ YES

SELECT BY STICK
PUSH TEST BUTTON !
```



### 3. LIMIT SWITCH AND VOLUME (V. R. ) VALUE SETTINGS

The limit switch and volume (V. R. ) value settings are as follows :

	DELUXE	COMMANDER	UPRIGHT
HANDLE, left	Under 25 H	Under 25 H	Under 35 H
HANDLE, right	Over DBH	Over DBH	Over CBH
HANDLE, upward	Under 40 H	Under 40 H	Under 40 H
HANDLE, downward	Over BBH	Over BBH	Over BBH
LIMIT, left	Over 40 H	Over 40 H	—
LIMIT, right	Under COH	Under COH	—
LIMIT, upward	Over 20 H	—	—
LIMIT, downward	Under BOH	—	—

## TROUBLE SHOOTING

### ☆ INITIAL FAULT

#### 1. The cabinet does not move properly :

- \* Refer to “THE CABINET DOES NOT MOVE PROPERLY.”

#### 2. On-screen trouble exists :

- \* Nothing appears on the screen :      ⇒ Check the monitor's power supply (FUSE 100 V 5 A).
- \* On-screen images become whitish :      ⇒ Check the monitor's signal connectors and cables.
- \* The on-screen picture is disfigured.      ⇒ Replace the IC board.

#### 3. Sound is irregular :

- \* Volume is low.      ⇒ Make adjustment to the desired volume.
- \* The connector is loose.      ⇒ Check the connectors of the power amplifier, IC board, speaker, etc.
- \* No sound can be heard.      ⇒ The power amplifier or the IC board is defective and should be replaced.

#### 4. Credit is not registering properly :

- \* IC board dip switch setting is wrong :      ⇒ Set it in the TEST MODE [ DIP SW ].
- \* Connectors are loose :      ⇒ Check the Coin Chute Tower connector.

\* Coin chute micro SW is damaged : ⇒ Check the switch function in the TEST MODE [ INPUT TEST ].  
If damaged, replace the switch.

\* Complete failure to register : ⇒ The IC board is defective and should be replaced.

5. Game dose not start :

\* Connector connection is wrong : ⇒ Check the control panel connectors.

\* The START SW is damaged : ⇒ Check the switch operation in the TEST MODE [ INPUT TEST ].  
If damaged, replace it.

☆ THE CABINET DOES NOT MOVE PROPERLY  
(DELUXE AND COMMANDER TYPES)

1. Slow movement.

- \* Input voltage decreases :                   ⇒ Make sure that the power supply is separated from that of the other machine.
- \* One of the Triacs on the Triac board is damaged :                   ⇒ Replace the defective one.

(After a certain working time has elapsed, the gearbox teeth face becomes fully accustomed to the operation and causes the movements to become faster, but this is not irregular.)

2. Insufficient movement.

- \* Limit switch working position deviation :                   ⇒ Check and make adjustment in the TEST MODE [ MOTOR TEST ].
- \* Handle unit VOLUME (V. R.) deviation :                   ⇒ Check and make adjustment in the TEST MODE (INPUT TEST).
- \* The handle's working angular width is small :                   ⇒ Check and make adjustment in the TEST MODE (INPUT TEST).

3. Sound is heard when the cabinet moves.

- \* When the cabinet moves, a friction sound is heard :                   ⇒ The protector which is attached to the edge of the step or cover is entangled. Open the cover and properly reattach it.
- \* When the cabinet moves, a rattling sound is heard :                   ⇒ The gearbox may be damaged. Replace it or the motor unit.
- \* When the cabinet moves, a clattering sound is heard :                   ⇒ This results from the motor unit's motor deviating from its axis' proper position with the gearbox rotation axis center. Make the necessary adjustments.

- \* When the cabinet rapidly makes reverse turns, a creaking sound is heard :                   ⇒ The motor unit tire is slipping. Add spacers if the spring which presses the tire is weak.  
If the tire is worn out, replace it.

4. Awkward movements :

- \* The motor brushes are worn out :           ⇒ Replace them.
- \* The motor is burnt out :                   ⇒ Replace the motor or motor unit.
- \* The gearbox is damaged :                 ⇒ Replace the gearbox or motor unit.

5. Does not warm up properly.

- \* Deviation in the limit switch working position :           ⇒ Check and make adjustment in the TEST MODE (MOTOR TEST).
- \* Limit switch damage :                   ⇒ Check it in the TEST MODE [ MOTOR TEST ] and if it is damaged, replace it.
- \* VOLUME (V. R. ) variation :           ⇒ Make sure that the volume value is 80 H.
- \* VOLUME is damaged :                   ⇒ Check the VOLUME function in the TEST MODE and if it is damaged, replace it.
- \* The drive wheel slips :                 ⇒ The motor unit tire slips when making reverse turns. Add spacers if the spring which presses against the tire is weak. Also, if the tire is worn out, replace it.

6. Warming up is properly done but the cabinet does not move during game play.

- \* Handle VOLUME deviation :           ⇒ Make sure in the TEST MODE  
[ INPUT TEST ] that the VOLUME  
value is 80 H.
- \* Handle VOLUME damage :           ⇒ Check in the TEST MODE (INPUT TEST)  
and if damaged, replace it.

7. Suddenly becomes immovable.

- \* The mat switch is working :       ⇒ When stepping or putting items on it,  
the mat switch functions and the  
cabinet will not move. Make sure that  
nothing is put on it.  
(See “Mat Switch”.)
- \* Fail-safe software is functioning : ⇒ Turn off the power and then put it  
back on again.  
(See “Fail-safe”.)
- \* The breaker functions :           ⇒ Check if the breaker is functioning.  
If it is, then push the breaker to reset.  
When it functions often, the Triac may  
be damaged.  
(See “Breaker’s working conditions”.)
- \* The Triac is damaged :           ⇒ Replace the Triac board or the triac.  
(See “Concerning the Triac”.)
- \* VOLUME (the cabinet or the  
handle) deviation :               ⇒ Check in the TEST MODE [ INPUT TEST,  
MOTOR TEST ] and make adjustment.

8. Totally immovable.

The drive board connectors are loose ⇒ Check the connectors.

\* Motor connectors are loose ⇒ Check the connectors. (When the power is turned ON without the motor connector connection, the breaker may function.)

\* The breaker is functioning : ⇒ Reset the breaker.

\* DIP SW mode is not properly set ⇒ Check in the TEST MODE [ DIP SW ] and set to "MOVING DX."

★ Breaker's working conditions.

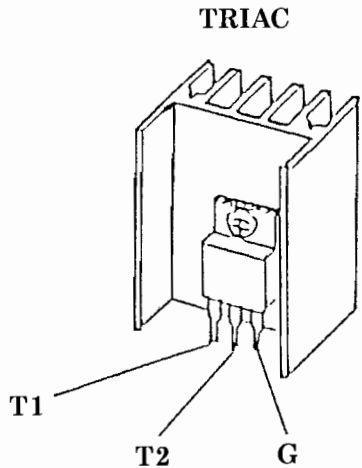
Each of the 8A breakers attached to the AC unit is in series with the corresponding DC motor and it functions due to overcurrent when the motor is subjected to overload or damage.

The functioning characteristics (at the normal environmental temperature) in relation to the overcurrent energized period are : 16A/5 second, 32A/1 second and 80A/0.1 second. When resetting the breaker, make sure that the reason which caused the breaker to function has been eliminated.

★ Concerning the Triac

In these types of machines, the DC motor is subjected to an all-wave rectified control by 2 Triacs. When only one of the two is damaged and its circuit is open, the DC motor will be under a half-wave rectified control. This results in insufficient power for the motor, causing the cabinet movement to become slow. In this case, it is difficult for the breaker to function and the Triac's damage can hardly be noticed. Therefore, care should be taken as concerns this point.

★ Checking the Triac



Turn the power off and check for the presence of conductivity between T1 and T2 out of the 3 Triac pins by using a tester. If conductivity is present, then the Triac is damaged.

**DANGER!** Be sure to turn the power off before performing the Triac check.

★ MAT SW

When the mat which is put on the floor within the cradle hoop is subjected to a certain amount of load (as when putting the feet on lightly), the switch is actuated causing the cabinet to return to stop. The cabinet starts to move again when the load is removed.

★ Fail-safe

In the case where the cabinet does not move for a certain period of time (approximately 1.5 second), even though the electric current is running through the motor, (judging from the angular detecting VOLUME), the Fail-safe function shuts off the current to the motor in order to protect it by determining that the motor is being subjected to an abnormal load. Therefore, the cabinet does not move when the Fail-safe works. The Fail-safe will stop functioning and clear when the game ends.





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