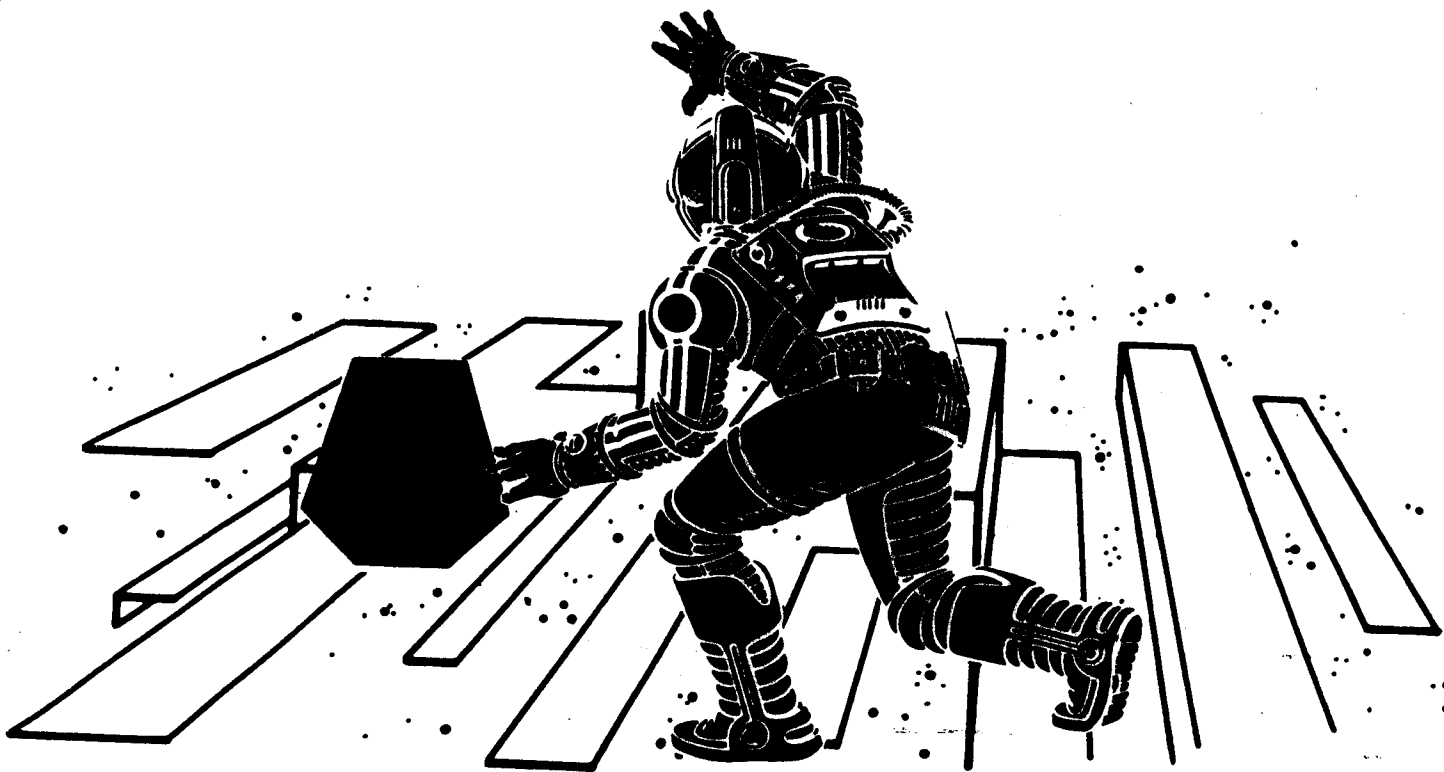


Major Havoc



Troubleshooting Guide

12M



Table of Contents

Troubleshooting the Alpha Microprocessor-Controlled Circuits	1
Preliminary Procedure	1
Troubleshooting the Alpha Address Lines	1
Troubleshooting the Alpha Data Lines	1
Troubleshooting the Alpha Program RAM	2
Troubleshooting with Checksums	2
Troubleshooting the Gamma Microprocessor-Controlled Circuits	3
Preliminary Procedure	3
Troubleshooting the Gamma Address Lines	3
Troubleshooting the Gamma Data Lines	4
Troubleshooting the Gamma Program RAM	4
Troubleshooting with Checksums	4
Troubleshooting the Option Switch Inputs	5
Signature Analysis	5

List of Tables

Table 1	Alpha Address Lines	1
Table 2	Alpha Data Lines	2
Table 3	Alpha ROM Checksums	2
Table 4	Alpha ROM Checksum	2
Table 5	Alpha RAM Data Retention	3
Table 6	Alpha ROM Checksums	3
Table 7	Gamma Address Lines	4
Table 8	Gamma Data Lines	4
Table 9	Gamma ROM Checksums	5
Table 10	Option Switch Inputs	5

Troubleshooting with the CAT Box

Troubleshooting the Alpha Microprocessor-Controlled Circuits

Preliminary Procedure

1. Turn off the electrical power to the game.
2. Remove the Main PCB assembly from the game.
3. Connect an extension harness from the game harness to the Main PCB edge connectors.
4. Connect a jumper from pin 12 of IC 3Q to the PHASE 2A test point.
5. Connect a jumper from the WDDIS test point to ground.
6. Connect the CAT Box 50-pin cable to the 6502 Interface and the 40 pin cable from the Interface to the Main PCB as described on the label attached to the Interface cover.
7. Remove the 6502B microprocessor from its socket at location 2S.
8. Insert the Interface 40-pin IC connector into the empty 6502B microprocessor socket. Make sure the Interface IC connector pin numbers mate with the same pin numbers on the empty microprocessor socket.
9. Apply power to the game and to the CAT Box.
10. Set the CAT Box switches as follows:
 - a. TESTER SELF-TEST OFF
 - b. TESTER MODE R/W
11. Press the TESTER RESET pushbutton.

Troubleshooting the Alpha Address Lines

1. Perform the Preliminary Procedure under Troubleshooting the Alpha Microprocessor-Controlled Circuits.
2. Connect the Data Probe to the CAT Box.
3. Connect the Data Probe ground clip to a GND test point on the Main PCB.
4. Set the CAT Box switches as follows:
 - a. BYTES 1
 - b. PULSE MODE UNLATCHED
 - c. R/W MODE (OFF)
 - d. R/W WRITE
5. Enter address AAAA with the CAT Box keyboard.
6. Press the DATA SET pushbutton.
7. Enter data AA with the CAT Box keyboard.

8. Set the R/W MODE switch to STATIC.
9. Check the IC pins listed in Table 1 with the Data Probe and verify that the corresponding 1 or 0 LED on the CAT Box is lit.
10. Repeat steps 4c through 9 using address 5555 in step 5 and data 55 in step 7.

Table 1 Alpha Address Lines

Address	Logic State for Address AAAA	IC-Pin	Logic State for Address AAAA
A15 α	1	4L-3	0
A14 α	0	4L-2	1
BA13 α	1	2P-14	0
BA12 α	0	2P-12	1
BA11 α	1	2P-9	0
BA10 α	0	2P-7	1
BA9 α	1	2P-5	0
BA8 α	0	2P-3	1
BA7 α	1	2Q-18	0
BA6 α	0	2Q-16	1
BA5 α	1	2Q-14	0
BA4 α	0	2Q-12	1
BA3 α	1	2Q-9	0
BA2 α	0	2Q-7	1
BA1 α	1	2Q-5	0
BA0 α	0	2Q-3	1

Troubleshooting the Alpha Data Lines

1. Perform the Preliminary Procedure under Troubleshooting the Alpha Microprocessor-Controlled Circuits.
2. Connect the Data Probe to the CAT Box.
3. Connect the Data Probe ground clip to a GND test point on the Main PCB.
4. Set the CAT Box switches as follows:
 - a. BYTES 1
 - b. R/W MODE (OFF)
 - c. R/W WRITE
5. Enter address 0000 with the CAT Box keyboard.
6. Press the DATA SET pushbutton.
7. Enter data AA with the CAT Box keyboard.
8. Set the R/W MODE switch to PULSE and then to STATIC.
9. Check the IC pin listed in Table 2 with the Data Probe and verify that the 1 or 0 LED on the CAT Box is lit.
10. Repeat steps 4b through 9 using data 55 in step 7.

Table 2 Alpha Data Lines

Data Line	Logic State for Data AA	IC-Pin	Logic State for Data 55
D7 α	1	3R-18	0
D6 α	0	3R-17	1
D5 α	1	3R-16	0
D4 α	0	3R-15	1
D3 α	1	3R-14	0
D2 α	0	3R-13	1
D1 α	1	3R-12	0
D0 α	0	3R-11	1

Troubleshooting the Alpha Program RAM

1. Perform the Preliminary Procedure under Troubleshooting the Alpha Microprocessor-Controlled Circuits.
2. Set the CAT Box switches as follows:

a. DBUS SOURCE	ADDR
b. BYTES	1024
c. R/W MODE	(OFF)
d. R/W	WRITE
3. Enter address 0000 with the CAT Box keyboard.
4. Set the R/W MODE switch to PULSE and back to (OFF).
5. Set the R/W switch to READ.
6. Set the R/W MODE switch to PULSE and back to (OFF).
7. The Program RAM is a 2K \times 8 device. To test the entire device perform steps 2c through 6 with the address in step 3 at 0400.
8. If the CAT Box reads an address that does not match that entered in step 3, the COMPARE ERROR LED will light.

Troubleshooting with Checksums

NOTE

This procedure can only be done with those CAT Boxes equipped with a Checksum switch.

1. Perform the Preliminary Procedure under Troubleshooting the Alpha Microprocessor-Controlled Circuits.
2. Set the CAT Box switches as follows:

a. BYTES	1024
b. DBUS SOURCE	DATA
c. R/W MODE	(OFF)
d. R/W	READ
e. Checksum Switch	on

3. Enter the address given in Table 3 with the CAT Box keyboard.
4. Set the R/W MODE switch to PULSE and then back to (OFF).
5. Check the CAT Box ADDRESS/SIGNATURE readout for the appropriate checksum listed in Table 3.
6. Repeat steps 3 through 5 for each address listed in Table 3.

Table 3 Alpha ROM Checksums

ROM Tested	Location	Address	Checksum
136025-103	1M/N	8000	2950 ¹
	1M/N	A000	F36B ¹
136025-104	1L	C000	6637 ¹
	1L	E000	3043 ¹
136025-101	1Q	2000	3A39 ²
	1Q	2000	C09C ³
136025-109	1N/P	2000	D559 ⁴
	1N/P	2000	9E18 ⁵

¹If this checksum is unstable or does not verify, connect one 220-ohm resistor from pin 2 and one from pin 3 of integrated circuit 4L to +5 volts. Then, connect one 330-ohm resistor from each of the same pins to ground. Remove the resistors after the checksum troubleshooting is completed.

²MMUPAGE 1 must be low. If not, ground the RESET A test point on the Main PCB.

³MMUPAGE 0 must be high. If not, use the CAT Box to write the following data to address 1740: 01.

⁴MMUPAGE 0 must be high. If not, use the CAT Box to write the following data to address 1740: 02.

⁵MMUPAGE 0 must be high. If not, use the CAT Box to write the following data to address 1740: 03.

7. Connect a jumper from pin 6 of IC 3F to ground.
8. Set CAT Box BYTES switch to 256.
9. Check the CAT Box ADDRESS/SIGNATURE readout for the appropriate checksum listed in Table 4.

Table 4 Alpha ROM Checksum

ROM Tested	Location	Address	Checksum
136025-110	6K/L	5000	5316

10. Set the CAT Box BYTES switch to 1.
11. Enter the address given in Table 5 with the CAT Box keyboard.
12. Press the DATA SET pushbutton.
13. Enter the data given in Table 5 with the CAT Box keyboard.
14. Set the R/W MODE switch to PULSE and then to (OFF).

15. Set the R/\overline{W} switch to READ.
16. Enter the address given in Table 5.
17. Set the R/\overline{W} MODE switch to STATIC and then to (OFF).
18. Check the CAT Box DATA readout for the same data entered in step 13.
19. Repeat steps 11 through 18 for each address and data given in Table 5.

Table 5 Alpha RAM Data Retention

Address	Data
4000	25
4001	60
4002	00
4003	E0

20. Set the R/\overline{W} switch to WRITE.
21. Remove the jumper from pin 6 of IC 3F.
22. Enter address 1640 with the CAT Box keyboard.
23. Press the DATA SET pushbutton and enter data FF with the CAT Box keyboard.
24. Set the R/\overline{W} MODE switch to PULSE, then back to (OFF).
25. Replace the jumper from pin 6 of IC 3F to ground.
26. Enter address 4001 with the CAT Box keyboard.
27. Press the DATA SET pushbutton.
28. Enter the appropriate data at address 4001 given in Table 6 with the CAT Box keyboard.
29. Set the R/\overline{W} MODE switch to PULSE then back to (OFF).
30. Set the BYTES switch to 1024.
31. Set the R/\overline{W} switch to READ.
32. Enter address 6000 with the CAT Box keyboard.
33. Set the R/\overline{W} MODE switch to PULSE then back to (OFF).
34. Check the CAT Box ADDRESS/SIGNATURE readout for the appropriate checksums given in Table 6.
35. Set the BYTES switch to 1 and repeat step 20 through 34 to verify the checksums given in Table 6.

Table 6 Alpha ROM Checksums

ROM Tested	Location	Address	Data at 4001	Checksum
136025-106	6H	6000	60	FD39
	6H	6000	61	3524
136025-107	6J/K	6000	62	8C6D
	6J/K	6000	63	D9C4

Troubleshooting the Gamma Microprocessor-Controlled Circuits

Preliminary Procedure

1. Turn off the electrical power to the game.
2. Remove the Main PCB assembly from the game.
3. Connect an extension harness from the game harness to the Main PCB edge connectors.
4. Connect the CAT Box 50-pin cable to the 6502 Interface and the 40-pin cable from the Interface to the Main PCB as described on the label attached to the Interface cover.
5. Remove the 6502A microprocessor from its socket at location 8P.
6. Insert the Interface 40-pin IC connector into the empty 6502A microprocessor socket. Make sure the Interface IC connector pin numbers mate with the same pin numbers on the empty microprocessor socket.
7. Connect a jumper from the PHASE 2 test point to the 1.25M test point on the Main PCB.
8. Apply power to the game and to the CAT Box.
9. Set the CAT Box switches as follows:
 - a. TESTER SELF-TEST OFF
 - b. TESTER MODE R/\overline{W}
10. Press the TESTER RESET pushbutton.

Troubleshooting the Gamma Address Lines

1. Perform the Preliminary Procedure under Troubleshooting the Gamma Microprocessor-Controlled Circuits.
2. Connect the Data Probe to the CAT Box.
3. Connect the Data Probe ground clip to a GND test point on the Main PCB.
4. Set the CAT Box switches as follows:
 - a. BYTES 1
 - b. PULSE MODE UNLATCHED
 - c. R/\overline{W} MODE (OFF)
 - d. R/\overline{W} WRITE
5. Enter address AAAA with the CAT Box keyboard.
6. Press the DATA SET pushbutton.
7. Enter data AA with the CAT Box keyboard.
8. Set the R/\overline{W} MODE switch to STATIC.
9. Check the IC pins listed in Table 7 with the Data Probe and verify that the corresponding 1 or 0 LED on the CAT Box is lit.
10. Repeat steps 4c through 9 using address 5555 in step 5 and data 55 in step 7.

Table 7 Gamma Address Lines

Address	Logic State for Address AAAA	IC-Pin	Logic State for Address 5555
A15 γ	1	8R-15	0
A14 γ	0	8R-13	1
A13 γ	1	8R-14	0
A12 γ	0	9S-2	1
A11 γ	1	9S-23	0
A10 γ	0	9S-21	1
A9 γ	1	9S-24	0
A8 γ	0	9S-25	1
A7 γ	1	9S-3	0
A6 γ	0	9S-4	1
A5 γ	1	9S-5	0
A4 γ	0	9S-6	1
A3 γ	1	9S-7	0
A2 γ	0	9S-8	1
A1 γ	1	9S-9	0
A0 γ	0	9S-10	1

Troubleshooting the Gamma Data Lines

1. Perform the Preliminary Procedure under Troubleshooting the Gamma Microprocessor-Controlled Circuits.
2. Connect the Data Probe to the CAT Box.
3. Connect the Data Probe ground clip to a GND test point on the Main PCB.
4. Set the CAT Box switches as follows:

a. BYTES	1
b. R/ \bar{W}	(OFF)
c. R/ \bar{W}	WRITE
5. Enter address 0000 with the CAT Box keyboard.
6. Press the DATA SET pushbutton.
7. Enter data AA with the CAT Box keyboard.
8. Set the R/ \bar{W} MODE switch to PULSE and then to STATIC.
9. Check the IC pin listed in Table 8 with the Data Probe and verify that the 1 or 0 LED on the CAT Box is lit.

Table 8 Gamma Data Lines

Data Line	Logic State for Data AA	IC-Pin	Logic State for Data 55
D7 γ	1	12Q-18	0
D6 γ	0	12Q-17	1
D5 γ	1	12Q-16	0
D4 γ	0	12Q-15	1
D3 γ	1	12Q-14	0
D2 γ	0	12Q-13	1
D1 γ	1	12Q-12	0
D0 γ	0	12Q-11	1

Troubleshooting the Gamma Program RAM

1. Perform the Preliminary Procedure under Troubleshooting the Gamma Microprocessor-Controlled Circuits.
2. Set the CAT Box switches as follows:

a. DBUS SOURCE	ADDR
b. BYTES	1024
c. R/ \bar{W} MODE	(OFF)
d. R/ \bar{W}	WRITE
3. Enter address 0000 with the CAT Box keyboard.
4. Set the R/ \bar{W} MODE switch to PULSE and back to (OFF).
5. Set the R/ \bar{W} switch to READ.
6. Set the R/ \bar{W} MODE switch to PULSE and back to (OFF).
7. The Program RAM is a 2K \times 8 device. To test the entire device perform steps 3 through 6 with the address in step 3 at 0400.
8. If the CAT Box reads an address that does not match that entered in step 3, the COMPARE ERROR LED will light.

Troubleshooting with Checksums

NOTE

This procedure can only be done with those CAT Boxes equipped with a Checksum switch.

1. Perform the Preliminary Procedure under Troubleshooting the Gamma Microprocessor-Controlled Circuits.
2. Set the CAT Box switches as follows:

a. BYTES	1024
b. DBUS SOURCE	DATA
c. R/W(not) MODE	(OFF)
d. R/W(not)	READ
e. Checksum Switch	on
3. Enter the address given in Table 9.
4. Set the R/ \bar{W} MODE switch to PULSE and then back to (OFF).
5. Check the CAT Box ADDRESS/SIGNATURE readout for the appropriate checksum listed in Table 9.
6. Repeat steps 3 through 5 for each address listed in Table 9.

Table 9 Gamma ROM Checksums

ROM Tested	Location	Address	Checksum
136025-108	9S	8000	1FE3
	9S	A000	C63F

Troubleshooting the Option Switch Inputs

1. Perform the Preliminary Procedure under Troubleshooting the Gamma Microprocessor-Controlled Circuits.
2. Set the CAT Box switches as follows:
 - a. BYTES 1
 - b. R/\overline{W} READ
 - c. R/\overline{W} MODE (OFF)
3. Enter the address listed in Table 10 with the CAT Box keyboard.
4. Set the R/\overline{W} MODE switch to STATIC.
5. Activate the input switch listed in Table 10.
6. Check the CAT Box DATA readout for the appropriate test result specified in Table 10.

7. Repeat steps 2c through 6 for each address given in Table 10.

Table 10 Option Switch Inputs

Address	Input Switches	Test Results
2800	FIRE/SHIELD	DATA readout changes when either of these switches is activated.
3800	Roller Control	DATA readout changes when roller control is spun in either direction.
4000	Option switch at location 8S	DATA readout changes when any of these switches are activated.

If the preceding procedures for troubleshooting the alpha and gamma microprocessor-controlled circuits are successful, then there should be enough of the game circuitry working to perform the Self-Test procedures.

Signature Analysis

The software necessary to perform signature analysis is not available in this game.