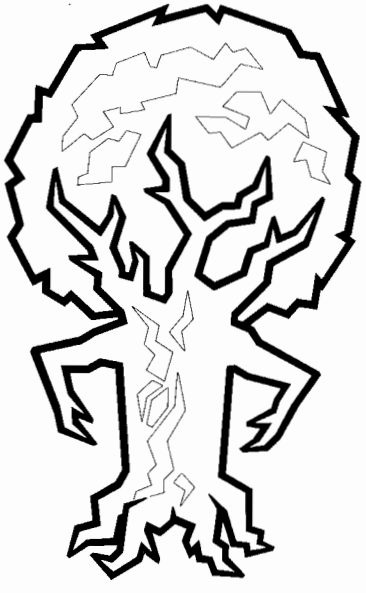

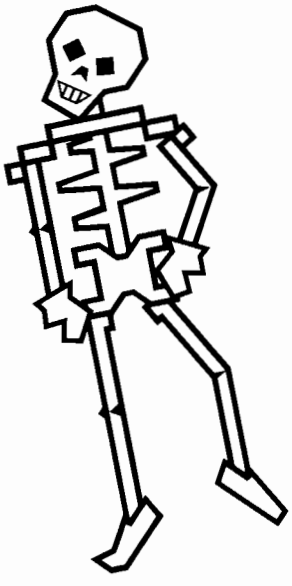

Crystal Castles™ Troubleshooting Guide

ATARI®

A Warner Communications Company

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Crystal Castles™ Troubleshooting with the CAT Box

Troubleshooting with the Read/Write Controller

A. CAT Box Preliminary Set-Up

1. Remove the electrical power from the game and the CAT Box.
2. Remove the wiring harness from the game PCB.
3. Remove the game PCB from the game cabinet.
4. Remove Microprocessor 2C from the game PCB.
5. Connect the harness from the game to the game PCB.
6. Connect together the Φ0 and Φ2 test points on the game PCB with the shortest possible jumper.
7. Connect the $\overline{\text{WDDIS}}$ test point to ground.
8. Connect the CAT Box flex cable to the game PCB edge test connector.
9. Apply power to the game and to the CAT Box.
10. Set CAT Box switches as indicated:
    a. TESTER SELF-TEST: OFF
    b. TESTER MODE: R/$\overline{\text{W}}$
11. Press TESTER RESET.
12. Connect the DATA PROBE to the CAT Box. Connect the DATA PROBE ground clip to a game PCB ground test point.

B. Checking the Address Lines

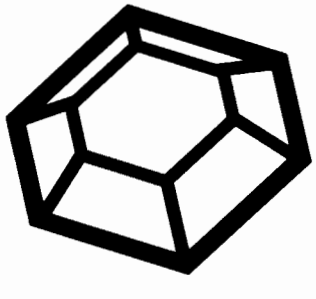
1. Perform the CAT Box preliminary set-up.
2. Set CAT Box switches as indicated:
    a. BYTES: 1
    b. PULSE MODE: UNLATCHED
    c. R/$\overline{\text{W}}$ MODE: (OFF)
    d. R/$\overline{\text{W}}$: READ
3. Key in the address pattern given in Table 1 (use AAAA to start) with the CAT Box keyboard.
4. Set R/$\overline{\text{W}}$ MODE to STATIC.
5. Probe each IC-pin listed in Table 1 with the DATA PROBE and check that the CAT Box 1 or 0 LED for the corresponding address line lights up.
6. Repeat parts 2-c through 5 using address 5555 in part 3.

Table 1 Address Lines

Logic State for Address AAAA		IC-Pin	Logic State for Address 5555
BA15	1	1B3	0
BA14	0	1B5	1
BA13	1	1B7	0
BA12	0	1B9	1
BA11	1	1B12	0
BA10	0	1B14	1
BA9	1	1B16	0
BA8	0	1B18	1
BA7	1	1C9	0
BA6	0	1C7	1
BA5	1	1C5	0
BA4	0	1C3	1
BA3	1	1C12	0
BA2	0	1C14	1
BA1	1	1C16	0
BA0	0	1C18	1

C. Checking the Data Lines

1. Perform the CAT Box preliminary set-up.
2. Set CAT Box switches as indicated:
    a. BYTES:1
    b. R/$\overline{\text{W}}$ MODE: (OFF)
    c. R/$\overline{\text{W}}$: WRITE
3. Key in address 0000 with the keyboard.
4. Press DATA SET. Key in data AA with the keyboard.
5. Set R/$\overline{\text{W}}$ MODE to STATIC.
6. Probe each IC-pin listed in Table 2 with the DATA PROBE and check that the CAT Box 1 or 0 LED for the corresponding address line lights up.
7. Set R/$\overline{\text{W}}$ MODE to (OFF).
8. Repeat parts 4 through 6 using data 55 in part 4.



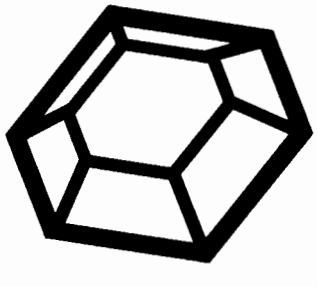


Table 2 Data Lines

Logic State for Data AA	IC-Pin	Logic State for Data 55
D7 1	2E-11	0
D6 0	2E-12	1
D5 1	2E-13	0
D4 0	2E-14	1
D3 1	2E-15	0
D2 0	2E-16	1
D1 1	2E-17	0
D0 0	2E-18	1
BD7 1	2E-9	0
BD6 0	2E-8	1
BD5 1	2E-7	0
BD4 0	2E-6	1
BD3 1	2E-5	0
BD2 0	2E-4	1
BD1 1	2E-3	0
BD0 0	2E-2	1

D. Checking the RAM

1. Perform the CAT Box preliminary set-up.
2. Set CAT Box switches as indicated:
   a. DBUS SOURCE: ADDR
   b. BYTES:1024
   c. R/$\overline{W}$ MODE: (OFF)
   d. R/$\overline{W}$: WRITE
3. Enter address 0003 with the keyboard.
4. Set the CAT Box switches as indicated:
   a. R/$\overline{W}$ MODE to PULSE and back to (OFF)
   b. R/$\overline{W}$ to READ
   c. R/$\overline{W}$ MODE to PULSE and back to (OFF)
5. If the CAT Box reads an address that doesn't compare with that written, the COMPARE ERROR LED will light up. The ADDRESS/SIGNATURE display of the CAT Box will show the failing address location and the ERROR DATA DISPLAY switch is enabled. Using this switch, determine if the error is in the high-order or low-order RAM.
6. Repeat this test with DBUS SOURCE set to ADDR.
7. Set the CAT Box switches as indicated:
   a. BYTES: 256
   b. DBUS SOURCE: ADDR
   c. R/$\overline{W}$: (OFF)
   d. R/$\overline{W}$: WRITE
8. Repeat parts 5 through 6 to check addresses from 1000 through 8FFF.

NOTE

The two custom audio I/O chips must be tested separately by performing the self-test, substituting a known good part, or performing the following procedure.

E. Checking the Custom Audio I/O Chips

1. Perform the CAT Box preliminary set-up.
2. Set CAT Box switches as indicated:
   a. BYTES: 1
   b. R/$\overline{W}$: WRITE
   c. R/$\overline{W}$ MODE: (OFF)
3. Enter the address from Table 3 with the keyboard.
4. Press DATA SET and enter the data from Table 3 with the keyboard.
5. Set R/$\overline{W}$ to PULSE and back to (OFF).
6. Repeat parts 3 through 5 for each address and data listed in Table 3. Check for the response indicated.

Table 3 Custom Audio I/O Chips

Address	Data	Test Results
98	00	Custom Audio I/O Chip 4D channel 1 produces pure tone.
98	03	
98	55	
98	AF	
98	00	Custom Audio I/O Chip 4D channel 1 turns off.
98	55	Custom Audio I/O Chip 4D channel 2 produces pure tone.
98	AF	
98	00	Custom Audio I/O Chip 4D channel 2 turns off.
9A	00	Custom Audio I/O Chip 4B channel 1 produces pure tone.
9A	03	
9A	55	
9A	AF	
9A	00	Custom Audio I/O Chip 4B channel 1 turns off.
9A	55	Custom Audio I/O Chip 4B channel 2 produces pure tone.
9A	AF	
9A	00	Custom Audio I/O Chip 4B channel 2 turns off.

F. Checking the Player Switch, Option Switch, and Trak-Ball™ Inputs

1. Perform the CAT Box preliminary set-up.
2. Set CAT Box switches as indicated:
   a. BYTES: 1
   b. R/$\overline{W}$: WRITE
   c. R/$\overline{W}$ MODE: (OFF)
3. Enter address 9600 with the keyboard.
4. Press DATA SET and enter data FF with the keyboard.
5. Set R/$\overline{WE}$ to PULSE and back to (OFF).
6. For each entry listed in Table 4, do the following:
   a. Set R/$\overline{W}$ MODE to (OFF).
   b. Set R/$\overline{W}$WRITE.
   c. Enter the first address with the keyboard.
   d. Press DATA SET and enter the data for that address with the keyboard.
   e. Set R/$\overline{W}$ MODE to PULSE and back to (OFF).
   f. Set R/$\overline{W}$ to READ.
   g. Enter the next address.
   h. Set R/$\overline{W}$ MODE to STATIC.
   i. Activate the input switch or signal indicated in Table 4 and check the test result.
   j. Set R/$\overline{W}$ MODE to (OFF).
   k. Repeat parts g through j for each subsequent address given for the entry.

Table 4 Player Switches, Option Switches, and Trak-Ball™ Inputs

Address	Input Switches/Signals	Test Results
9400	Trak-Ball™ VERT	
9401	Trak-Ball™ HORIZ	
9402	Trak-Ball™ VERT (Player 2)	
9403	Trak-Ball™ HORIZ (Player 2)	
9600	D0 COIN R	
	D1 COIN L	
	D2 COIN AUX	
	D3 SLAM	
	D4 SELF TEST	
	D5 SPARE	
	D6 JMP1	
	D7 JMP2	
00–9A0B	SW2 D0	Read switches at address 9A08. DATA display changes when any of these switches or signals are activated.
	SW3 D1	
	SW4 D2	

G. Checking the Coin Counter and Trak-Ball Light

1. Perform the CAT Box preliminary set-up.
2. Set CAT Box switches as indicated:
   a. DBUS SOURCE: DATA
   b. BYTES: 1
   c. R/$\overline{W}$: WRITE
   d. R/$\overline{W}$ MODE: (OFF)
3. Enter the address in Table 5 with the keyboard.

CAUTION

If you write ON data to activate a solenoid, *deactivate the solenoid immediately* by writing the OFF data. If you leave a solenoid activated for more than 10 seconds, you may have to replace the solenoid and/or its driver, due to overheating.

4. For each address listed in Table 5, do the following:
   a. To activate the output:
      - Press DATA SET.
      - Enter the ON data with the keyboard.
      - Set R/$\overline{W}$ MODE to STATIC and back to (OFF).
   b. To deactivate the output:
      - Press DATA SET.
      - Enter the OFF data with the keyboard.
      - Set R/$\overline{W}$ MODE to STATIC and back to (OFF).

Table 5 LED and Coin Counter Outputs

Address	On Data	Off Data	Output Device
9E86	FF	00	Left Coin Counter
9E85	FF	00	Right Coin Counter
9E80	FF	00	Trak-Ball™ Light

Troubleshooting the Watchdog Circuit

The Watchdog circuit will send continuous reset pulses to the microprocessor if a problem exists within the microprocessor circuit. If the self-test fails to run, it is a good practice to check the RESET line.

$\overline{\text{RESET}}$ is a microprocessor input (pin 40). In a properly operating game, reset should occur during power-up or when the $\overline{\text{RESET}}$ test point is grounded. A pulsing $\overline{\text{RESET}}$ line indicates that something is causing the microprocessor to lose its place within the program. Typical causes are:

1. Open or shorted address or data bus lines.
2. Bad microprocessor chip.
3. Bad bus buffers.
4. Bad ROM.
5. Bad RAM.
6. Any bad input or output that causes an address or data line to be held in a constant high or low state.

A pulsing $\overline{\text{RESET}}$ signal indicates a problem exists somewhere within the microprocessor circuitry. To aid in troubleshooting, the $\overline{\text{WDDIS}}$ test point can be connected to a ground test point to prevent resets. This will sometimes allow the Self-Test to be used to diagnose the failure during a RESET condition.