

GAMMABUG CARTRIDGE

NOTE: This cartridge will not test lines through the AdamNet. The tape control section is not tested. The 6801 chips can remain active for tests #1, #4 and #5.

The GAMMABUG Rev. 1 cartridge is to be inserted into the game connecting on a known working Delta game board or a ColecoVision. The Delta logic board or Gamma logic board to be tested is connected to the game board. A TV or monitor should be connected to the game board.

PART A

AUTOMATIC TESTS

1. Turn the power on. Use game reset switch. If the screen never showed information after a game reset, use TABLE I to troubleshoot the problem.
2. If the MENU gets displayed, press button #1 on hand controller 1. If faults are displayed (an X on the screen), narrow the cause of the faults down by using the Check Sum test with ROMs on the logic board. Compare the results of the Check Sum test #4 and test #1 with TABLE II. If there are no faults but BA15 does not have a blinking check mark, see TABLE II, 11, 13, (BA15 must blink to indicate the board passes the test).

NOTE: BA15 will not be tested if there are any faults on the screen. The space next to BA15 may remain blank.

3. The message "PRESS * TO TEST CELLS" will appear in the lower left of the screen if there is a blinking BA15 check mark. At this time, the board can be flexed or heat or cold can be directed to the board to test for intermittent problems. Faults will be displayed.
4. Press the * on controller 1 to enter the RAM cell test. The RAM cell test blanks the screen for a few seconds. If a bad cell is detected in memory locations less than 8000H, the display and test will freeze after displaying the chips that could not be written to or read from properly. If all of the chips are faulty, see TABLE II, 10. If even one chip passes, then the chips with faults should be replaced to eliminate the fault.
5. If all the RAM chips pass this test, the check mark next to U18 should blink every several seconds consistently as the test continues to cycle.
6. Use game reset to escape.
7. Press button #4 on hand controller 1 to do a check sum test. The ROM's should be in the logic board for this test. U2 check sum is the game board ROM and it should equal D483. If an incorrect check sum is displayed for any ROM, see TABLE II, 11, 12. If a check sum test is done without ROM's on the logic board, U2 must equal D483 and the others must change as a finger is moved along the edge connector on the logic board. It is recommended to

put ROM's on the board if no faults show up using any test on this cartridge but the board fails final testing (see note above). If ROM with more than 64K memory are inserted in positions U8, U20, U21, U22, the check sum displayed will not agree with the check sum on the chip.

PART B

Viewing Signals on an Oscilloscope

The 6801 (U6) should have its crystal shunted or remove the 6801 for best viewing of the signals.

1. Reset game board.
2. Press button #2 on controller 1 (ADDRESS LINES).
3. It is not essential that a second probe be connected to pin 20 of the Z80 but it might be useful to make a clearer display on the scope. A binary count will be seen when probing the address lines except for BA15, BA3, BA2, BA1, BA0 and maybe RA7. BA14 through BA4 will have an easy signal to look at. BA14 will have a pulse train twice as long as BA13 which will have a pulse train twice as long as BA12, etc. to BA4. Remember BA7 and RA7 are different signals. RA7 may have extra high pulses per cycle. BA3 to BA0 also have fairly clean signals that can be looked at for opens or shorts.

Signals BA14, BA13, BA12, BA11, BA10, BA9, BA8, BA7, BA6, BA5 and BA4 should be looked at for a normal binary count. Two lines shorted will show the same activity and it will be apparent that at least one seems "out of order" in the binary count. BA15 should be always active.

Next with the probe on the BA14, adjust the scope to see just two pulses on the scope. This will show a little more than one complete program cycle. Look for more than one distinct level near ground. Two different levels indicate a probable short to another line. For BA3 to BA0, there will be a pulse once per program cycle that shows as both high and low.

Be sure to put the probe on each chip that may be suspect and "read" this signal at the pin of the chip.

If button #2 is depressed while resetting the game board, RA7 should show 6 high pulses between each program cycle. If these extra pulses are not there, then the BRFSH signals are not getting through. Look at BRFSH, BM1, BA6 and Ø signals for proper activity and logic levels. If button #2 on the controller is not depressed at the time of a game reset, the six extra high pulses per cycle may or may not show when viewing RA7. Continuously reset the game board and press button #2 until the six pulses do not show up. If they always show up look at BRFSH, BM1, BA6 and Ø for proper signals.

4. Press game board reset.

5. Press button #3 on controller 1 (DATA LINES).
6. A binary count signal should be seen on the scope when looking at the data lines. It is not necessary to trigger on pin 20 of the Z80 but it might be useful to make a clearer display on the scope.
7. Press game board reset.
8. Press button #5 on controller 1 (PINS 19 & 20 of U7).
9. A 50% duty cycle square wave should be seen on pins 19 and 20 of U7. If the signal is there but is more like 30%/70% on either output, then the signal on pin 11 of U7 is low when it shouldn't be or U7 is faulty.

TABLE I

MENU DOESN'T COME UP

Look at Z80A (U1)

<u>PIN #</u>	<u>NAME</u>	<u>NORMAL SIGNAL</u>
20	IORQ	Active
18	HALT	Always High
17	NMI	Always High
16	INT	Always High with 6801 (U6) not on board or 6801 (U6) crystal shorted OR Active with 6801 (U6) operating
6	Ø	50% Duty Cycle 3.5mHz
23	BUSAK	Same as pin 16 (INT) on Z80A
24	WAIT	Active
25	BUSRQ	Same as Pin 16 (INT) on Z80A
29	RESET	Goes low for either reset OR Always high after reset (PBRST pin 25 U7 & CVRST Pin 6 U7 must be high)

Look at Custom Chip (U7)

<u>PIN #</u>	<u>NAME</u>	<u>NORMAL SIGNAL</u>
3	BA15	Active - a short low or open can blank screen
4	BA14	Low after reset a short high freezes screen
5	BA13	Active a short high freezes screen
17	DMA	Same as pin 16 (INT) on Z80A
14	IORQ	Active
22	AUXDECODE 1	Active (a low will freeze screen)
27	ADDBUFEN	Same as pin 16 (INT) on Z80A
29	245EN	Always high for menu - could be low if BA15 is high

Look at ColecoVision Chip U7 (LS05)

<u>PIN #</u>	<u>NAME</u>	<u>NORMAL SIGNAL</u>
5	AUXDECODE 2	Always high

TABLE II

DISPLAY SYMPTOMS

1. All DB0-DB7 Non Flashing errors, no BA or MA test (blank)

<u>NAME</u>	<u>PROBLEM LEVEL</u>	<u>NOTES</u>
BA15	High	
BA13	Low	
ADDBUFEN	High	Check Sum U2 & U8 = D483; U20, 21,22= Changing
MEMREQ	High	Check Sum U2 & U8 = D483; U20,21,22 = C000
BWR	High	
245EN	High	Check Sum U2 & U8 = D483; U20,21,22 = C000

2. All BAO-BA15 & MA0 - MA7 Non Changing errors, no BD errors

BA6	Low	Check Sum U2 & U8=D483; U20,21,22=Wrong
BA7	High	Check Sum U2 & U8=D483; U20,21,22=Wrong
AUXDECODE 1	High	Check Sum OK
IOREQ	High	Check Sums all Wrong

3. All BAO-BA15 errors, some chips have all MA0 - MA7 errors (with proms in typically U12, U14, U15, U16 have all MA errors)

BRFSH	Low or Open	Might reset to menu or stop blinking
B0	Low or High	
RAS	Low	Check sum OK
BRD	High	Check sum U2 = D483; U8,U20,21,22=C000
CAS1	High	Check Sum OK

4. BAO-RA7 All errors & MA0-MA7 errors, no BD errors

MUX	High
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5. BA8-BA15 all errors & all MA0-MA7 errors, no BD errors

MUX	Low
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6. Random errors, BD or BA or MA Changing

BRFSH	Open	Usually U12,14,15,16 have all MA errors proms in. All DB errors flashing - no proms in
B0	Open	Same as above
RAS	Open	Same as above
BRD	Open	Same as above
CAS1	Open	Same as above
BM1	Open	Same as above

7. Scattered consistent errors

BM1	Low
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8. Passes BD test, fails all BA & MA 1st time through, then fails all BD0-BD7 some time later. Check sum U2 = D483; U8,20,21,22 = Wrong

<u>NAME</u>	<u>PROBLEM LEVEL</u>	<u>NOTES</u>
BD0	Open or Low	Also for test #5 no pulses will be seen on pin 20 of U7

9. All data lines good but no BA or MA test. Check sum U2 = D483; U8, U20, 21, 22 = Blank

BD2	Open or low
DB3	Open or low

10. All cells show errors. Check sums good.

BD2	Floating high
BD3	Floating high

11. No BD or BA or MA errors, but BA15 isn't blinking and can't do cell test.

BA7	Open or low at U7; U2 & U8 = D483; U20, 21, 22 = Wrong
BOOTROMCS	Low

12. No BD or BA or MA errors, BA15 is blinking but Check Sums incorrect

BOOTROMCS	High	Check Sum for all = C000
BD1	Open or low	Also will cause incorrect duty cycle on pins 19 or 20 of U7 for test #5

13. Screen cycles while holding button #1 pressed through BD & BA & MA screen to MENU and around again.

WAIT	High
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