

TANK 8 PRODUCTION TEST PROCEDURE

PRELIMINARY

Before applying power to the board for the first time, check to see that Chips N3, C1, E1, F1, J1, L1, K1, M1 & P1 are NOT stuffed, and that none of the board's power supplies are shorted. Once power is applied, verify that all power supplies (+5V, -5V & +12V) are functioning properly. Next, verify that sync circuit is functioning properly. Next, verify that the power-on reset cktry & Ø1 & Ø2 clock drivers are also working correctly. Once these are verified, you are now ready to begin with the following step-by-step test procedure.

I. STATIC TEST

Shut off power and connect buffer board to game board via 34 pin connector (buffer board should NOT be connected to test panel at this time). Set switch on buffer board to ODD, and use scope to check address & data lines (see table 1). If O.K., set switch to EVEN, and use scope to check address & data lines (see table 2). If O.K., proceed.

II. PROGRAMMED TEST

At this point you are ready to begin the Program Test. Shut off power and connect buffer board to Test panel. (Insert 6800 at N3 and 6810's at M1 & P1). Tests should be run in order indicated below. Each test can be selected in any order for the purpose of restarting a test, after correction of a fault during that test.

RAM TEST

1. Set Test Select Switches to ~~000~~ ^{LSB}
2. Press S/C button.
3. Observe Test panel LED's.
4. If both of the 6810 RAMS are functioning properly, all 8 LED's will be on.
5. If chip M1 or its corresponding address & enable lines are in error, LED #6 will be on. At this point, replace chip M1. If error still exists, check chip select lines. Pulses will be present.
6. If chip P1, or its corresponding address & enable lines are in error, LED #7 will be on. At this point, replace chip P1. If error still exists, check chip select lines. Pulses will be present.
7. If both chips are in error, only LED #6 will be on, as the test reverts to a continuous loop as soon as the first error is detected.

* CAUTION

1. NEVER connect or disconnect ANY connectors with power applied.
2. NEVER run ANY portion of the test program while Program Roms C1, E1, F1, J1, or decode Roms K1 or L1 are inserted in board.
3. The 3-position switch on the buffer board should NEVER be moved out of its center position (straight up) unless:
 - a) the buffer board is disconnected from the test panel (via 40 pin connector).
 - b) and all chips on sockets in Row "1" and the 6800 in N3 are removed from board.

SWITCH TEST (uses test panel LED's for indication)*PCB Reset Switch*

8. Set test select switches to 001. *LSB*
9. Press S/C button; test panel LED's will be on.
10. Select DSTB 1 (all others should be off).

*NOTE: As each switch is selected the corresponding LED on the test panel will remain clear until the switch is released.

11. Press coin button - 2^0 should clear.
12. Left joy-stick forward - 2^1 should clear.
13. left joy-stick back - 2^2 should clear.
14. Right joy-stick forward - 2^3 should clear.
15. Right joy-stick back - 2^4 should clear.
16. Press fire button - 2^7 should clear.
17. Repeat steps 9 through 16 for DSTB2.
18. " " DSTB3
19. " " DSTB4
20. " " DSTB5
21. " " DSTB6
22. " " DSTB7
23. " " DSTB8
24. Set DSTB8 off.
25. Press S/C button.
26. The indicators (panel LED's) bits $2^0 - 2^3$ will now reflect the settings of the "Game Time Selection Switches" on the game board. Test each of these; each should turn the corresponding LED on and off.
27. Press S/C button.
28. Set "Remote" switch to 'on' - 2^0 should clear.
29. Set "Team" switch to 'on' - 2^1 should clear.
30. Set "Remote Game Start" switch 'on' - 2^2 should clear.
31. Set "Remote Team" switch 'on' - 2^3 should clear.
32. Press "Dollar Bill" button - 2^4 should clear.
33. Press S/C button.
34. Press the remote coin buttons - should clear each respective LED. See Table 5.
35. Press S/C button.
36. With scope check 9334 Misc. Latch H9, (Pins 4,5,6,7,9,10,11 & 12). It's outputs should be as indicated in Table 3. This is a dynamic test. (Pulsing)
37. Press S/C button.
38. Table 3 indicates static condition of 9334 Misc. Latch H9
39. Press S/C button.
40. With scope check 9334 Misc. Latch H9 (Dynamic Test) See Table 4.
41. Press S/C button.
42. Table 4 indicates static condition of 9334 Misc. Latch H9.
43. Press S/C button.
44. With scope check Program ROM chip enables: C1 PIN 3 should be pulsing high, E1 PIN 3 should be low, F1 PIN 19 should be low, and J1 PIN 20 should be high.
45. Press S/C Button.
46. D1 & E1, PIN 3, should both be pulsing high (mutually exclusive) and F1 PIN 19 & J1 PIN 20 should be the same as in Step 44.
47. Press S/C Button.
48. C1 PIN 3 should be pulsing high; E1 PIN 3 should be low, F1-PIN 19 should be going high, and J1 PIN 20 should be going low.

NOTE: "Pulsing" insinuates a pulse of at least .1 usec. Anything less than this should be ignored, as the ROM will not recognize it anyway.

- 19) 49. Press S/C button.
 50. This starts a test to determine if changes in the "V" Blank" signal can be seen by the microprocessor. If so, the test is terminated with the panel LED's all lit. If not, 2⁷ bit indicates the steady state of the V Blank signal, with 2⁶ clear and 2⁵ - 2⁰ lit. This terminates the test.

BLANK SCREEN AND CHARACTER TEST

51. Make inspection of screen. Should indicate SYNC circuits are functioning correctly. If not, correct problem before proceeding with test.
 52. Set test select switches to 0 1 0.
 1) 53. Press S/C button.
 54. Screen should be blank of characters; if not, a loop is being maintained to clear the screen so that signals will be available for testing processor access circuits. If screen blank continue.
 2) 55. Press S/C button.
 56. The screen will display the complete set of characters, repeated to cover the entire screen. Compare with Fig. 1. If screen matches Fig. 1, continue.
 3) 57. Press S/C button.
 58. Screen will be blank except for the letter "A" near the center of the screen.
 4) 59. Press the S/C button.
 60. The "A" will be rotated clockwise 90°; i.e. "A".
 5) 61. Press the S/C button.
 62. The "A" will be rotated clockwise 90°; i.e. "A".
 6) 63. Press the S/C button.
 64. The "A" will be rotated clockwise 90°; i.e. "A".
 7) 65. Press the S/C button.
 66. The screen will be blank & the test will be complete.

*NOTE: Steps 58 through 64 check the character rotation circuits.

TANK DISPLAY & MOVEMENT TEST

67. Screen should be blank. If Tanks/missiles are being displayed anywhere on the screen except the lower right corner then go to step 68. If Tanks/missiles are not being displayed go to step 71.
 68. Set test select switches to 110.
 69. Press S/C button.
 70. A test will run that continually clears the Position RAM to allow check out of these circuits with a scope. Press S/C button to terminate this test & go to step 71.
 71. Set test select switches to 011.
 72. Press S/C button.
 73. Tank 1 will appear near the center of the screen with the barrel pointing to the top of the screen.
 74. Press the "Remote Coin 8" button & the Tank will rotate 1 position clockwise. Each depression of the "Remote Coin 8" button causes this action. At least one complete rotation of the picture should be done to check out the picture display circuits and the direction bits in the Position RAMS. To go on to step 75, press the S/C button.
 75. Tank 1 will appear on the center left of the screen and drive itself smoothly across the screen. One full trip across the screen should be allowed. Pressing the S/C button will terminate this portion of the test.
 76. Tank 1 will appear at the top of the screen with the barrel pointing to the bottom of the screen, and it will drive itself down the screen. One full trip should be allowed. Pressing the S/C button will terminate this part of the test.

77. Tanks 1 through 8 will appear down the left edge of the screen as shown in Fig. 2 and drive across the screen. One full trip should be allowed. Pressing the S/C button will terminate this portion of the test.
78. Tanks 1 through 8 will appear across the top of the screen as shown in Fig. 3 and drive down the screen. One full trip should be allowed.
79. Press the S/C button to clear the screen and terminate the Tank display and movement test.

MISSILE DISPLAY AND MOVEMENT TEST

80. Set test select switches to 100.
81. Press S/C button.
82. Missile 1 will appear near the center of the screen.
83. Press S/C button.
84. Missiles 1 through 8 will appear down the left edge of the screen, as shown in Fig. 4, and move across the screen. One full trip across the screen should be allowed.
85. Press S/C button.
86. Missiles 1 through 8 will appear across the top of the screen, as shown in Fig. 5, and move down the screen. One full trip should be allowed.
87. Press S/C button and the test is terminated.

CONTACT TEST

This test requires no operator evaluation unless an error is detected. If no errors are detected then "Test Complete" is printed at the bottom of the screen. When an error is detected the test is temporarily halted with a message printed along the bottom of the screen, the player object # (refer to Table 6) displayed, the test object displayed just below it, and the two objects causing the test condition just below that on the screen. See Fig. 6 and Table 7. The test condition will be maintained until the S/C button is pressed and the test is allowed to continue. See Fig. 7 for error message meanings.

88. Set test select switches to 101.
89. Press S/C button.
90. "Test Complete" is printed at end of test.

TABLE 1

	LEVEL
*ADR 0	0
ADR 1	1
ADR 2	0
ADR 3	1
ADR 4	0
ADR 5	1
ADR 6	0
ADR 7	1
ADR 8	0
ADR 9	1
ADR 10	0
ADR 11	1
ADR 12	0
ADR 13	1
ADR 14	0
ADR 15	1
DB 0	0
DB 1	1
DB 2	0
DB 3	1
DB 4	0
DB 5	1
DB 6	0
DB 7	1

TABLE 3

PIN	LEVEL
4	1
5	0
6	1
7	0
9	1
10	0
11	1
12	0

TABLE 2

	LEVEL
*ADR 0	1
ADR 1	0
ADR 2	1
ADR 3	0
ADR 4	1
ADR 5	0
ADR 6	1
ADR 7	0
ADR 8	1
ADR 9	0
ADR 10	1
ADR 11	0
ADR 12	1
ADR 13	0
ADR 14	1
ADR 15	0
DB 0	1
DB 1	0
DB 2	1
DB 3	0
DB 4	1
DB 5	0
DB 6	1
DB 7	0

TABLE 4

PIN	LEVEL
4	0
5	1
6	0
7	1
9	0
10	1
11	0
12	1

*NOTE: On table 1 & 2, an "0" level can be interpreted as anything less than 1.5V. and a "1" as anything greater than 4.5V.

TABLE 5

REMOTE COIN

LED BIT POSITION

1	2^0
2	2^1
3	2^2
4	2^3
5	2^4
6	2^5
7	2^6
8	2^7

TABLE 6

PLAYERS OBJECT

OBJECT #

TANK 1	0
TANK 2	1
TANK 3	2
TANK 4	3
TANK 5	4
TANK 6	5
TANK 7	6
TANK 8	7
MISSILE 1	10
MISSILE 2	11
MISSILE 3	12
MISSILE 4	13
MISSILE 5	14
MISSILE 6	15
MISSILE 7	16
MISSILE 8	17

TABLE 7

<u>PLAYER OBJECT</u>	<u>PLAYFIELD OBJECT</u>	<u>INTERRUPT WORD</u> 2 ⁷ 2 ⁶ 2 ⁵ 2 ⁴ 2 ³ 2 ² 2 ¹ 2 ⁰
TANK	A	NO INTERRUPT
MISSILE	A	NO INTERRUPT
TANK/MISSILE	⊞	X X $\overbrace{\text{OBJ. } \neq}^{\text{FN}}$
TANK/MISSILE	↑	X X $\overbrace{\text{OBJ. } \neq}$
TANK/MISSILE	↓	X X $\overbrace{\text{OBJ. } \neq}$
TANK	+	X X 0 $\overbrace{\text{OBJ. } \neq}$
MISSILE	+	NO INTERRUPT
TANK/MISSILE	↙	X X $\overbrace{\text{OBJ. } \neq}$
TANK/MISSILE	→	X X $\overbrace{\text{OBJ. } \neq}$
TANK/MISSILE	⊞	X X $\overbrace{\text{OBJ. } \neq}$

X - DON'T CARE

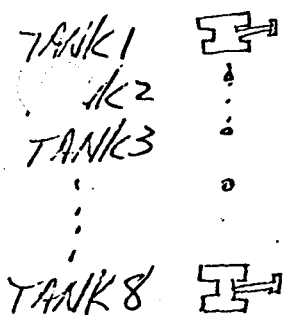


FIG. 2

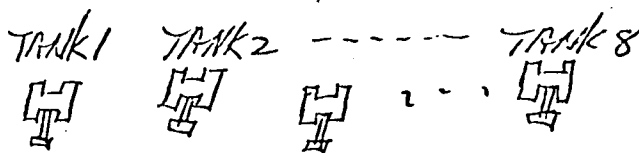


FIG. 3

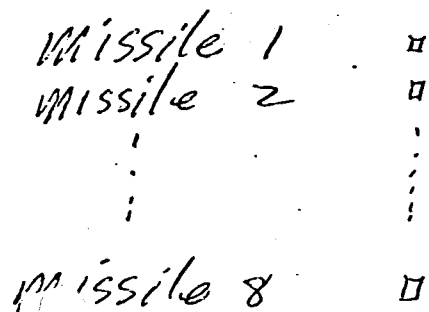


FIG. 4

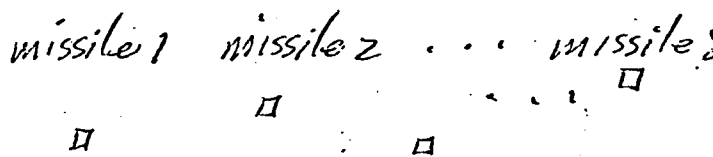


FIG. 5

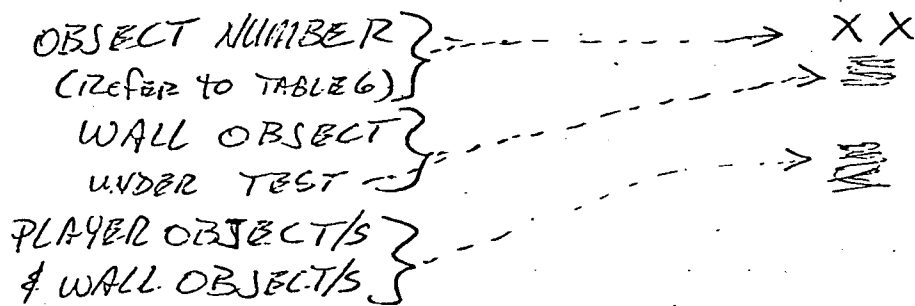


FIG. 6

ERROR MESSAGES:

"CONTACT" - means interrupt generated when one should not have been.

"NO CONTACT" - means no interrupt was generated when one should have been.

"SHOULD BE XXXXX IS XXXXX" - means an interrupt was generated, but an error in the code exists. "XXXXX" represents $2^5 - 2^0$ of the interrupt word, respectively.

"SHOULD BE XX IS XX" - means an interrupt was generated, but an error in bit positions 2^7 , & 2^6 of the interrupt word exists. This is used in a special test of the display circuits that generate the interrupts. "XX" are bit positions 2^7 , 2^6 , respectively.

2^7 = HD4 of J3 (9316)

2^6 = VD3 of E6. (83)

Bits used in contact between a Mine and a Tank to pick out the corner of the Tank that made contact with the Mine.

Should be / IS

2^7	2^6	2^7	2^6
0	0	1	0
2^7	2^6	2^7	2^6
0	1	1	1

TANK PICTURE

TOP OF SCREEN

FIG. 7

PROGRAM PLUG WIRING DIAGRAM FOR UNIVERSAL TEST UNIT

GAME: OCTO TANK

SET: VARIAC #1 @ 16.5 VAC

VARIAC #2 @ 25 VAC

CANNON DL - 156 CONNECTORS

40%
- 17.5 volts

CON. "D"

CON. "E"

<u>FROM</u>	<u>TO</u>		
B112(V4)	B111(V3) A105(U3)		
	B110(V2) A107(U5)		
	B109(V1) A109(V1)		
	B108(U6) A111(V3) ALL GROUNDS	A, B, C, D,	
	B107(U5) A113(V5)	E, & F	
	B68(M2) A115(W1)		
	C21(D3) A117(W3)		
	C22(D4) A119(W5)		
	C23(D5) A90(R6)		
	B146(b2) AUDIO GND		L
	B144(a6) AUDIO GND		N.
	B142(a4) AUDIO GND		R
	B140(a2) AUDIO GND		T
B106(U4)	A45(H3) ARDAC CREDIT		G
B105(U3)	A47(H5) ROWE GND.		H
B104(U2)	A48(H6) ROWE CREDIT		J
B103(U1)	C39(G3) SW #1		K
B102(T6)	C40(G4)		L
	A5(A5) SW #2 J.S. #1 LF		
B101(T5)	C34(F4) SW #3 J.S. #1 LR		M
	A1(A1)		
B100(T4)	C35(F5) SW #4 J.S. #2 RF		N
	A13(C1)		
B99(T3)	C29(E5) SW #5 J.S. #2 RR		P
	A9(B3)		
B98(T2)	C30(E6) SW #6		R
B97(T1)	C24(D6) SW #7		S
B96(S6)	C25(E1)		
	A24(D6) SW #8 J.S. 1&2 P.B. N.O.		T
	A26(E2)		
B95(S5)	C20(D2) DIST. #1		U
B94(S4)	C19(D1) DIST. #2		V
B93(S3)	C15(C3) DIST. #3		W
B92(S2)	C14(C2) DIST. #4		X
B91(S1)	C10(B4) DIST. #5		Y

RAMS, ROMS, & PROMS

<u>POSITION</u>	<u>ATARI NO.</u>	<u>VENDOR NO.</u>
C-1	90-2008 (005071) Rom	6832 Rom
E-1	90-2009 (005072) Rom	6832 Rom
F-1	005073 Prom	82S115 Prom
J-1	005074 Prom	82S115 Prom
K-1	005077 Prom	82S129 Prom
L-1	005076 Prom	82S129 Prom
M-1	90-7002 Ram	6810 Ram
N-3	90-6001 Micro Processor	6800 Micro Process.
N-4	90-6002 Clock Buffer	6842 Clock Buffer
N-6	005075 Prom	82S115 Prom
P-1	90-7002 Ram	6810 Ram
H-5	005079 Prom	82S129 Prom
J-5	005078 Prom	82S129 Prom
B-5, C-5, D-5, E-5, & F-5,	90-7008 Ram	82S16 Ram
C-7, D-7, E-7, F-7, J-7, & H-7	90-7005 Ram	82S25 Ram
F-8, H-8, J-8, K-8, L-8, M-8, N-8, & P-8	90-7001 Ram	2102 Ram

<u>FROM</u>	<u>TO</u>	CON. "D"	CON. E
B90(R6)	C9(B3) DIST. #6	Z	
B89(R5)	C5(A5) DIST. #7	a	
B88(R4)	C4(A4) DIST. #8	b	
B87(R3)	C1(A1) DIST. #10	c	
B86(R2)	C38(G2) DIST. #11	d	
B85(R1)	B84(P6) B83(P5) 16.5 VAC #1 B82(P4) B5(A5)	e f g h	
B81(P3)	B80(P2) B79(P1) 16.5 VAC #2 B78(N6) B7(B1)	i j k l	
B77(N5)	B76(N4) B75(N3) B74(N2) 16.5 Volt CT B6(A6)	m n p r	
B73(N1)	B8(B2) B139(a1) 25 VAC #1 B138(Z6)	s u v	u v
B72(M6)	B10(B4) B137(Z5) 25 VAC #2 B136(Z4)	t w x	w x
B71(M5)	B9(B3) B133(Z1) 25 Volt CT B132(Y6)	u a b	a b
B70(M4)	A44(H2) ARDAC GND.	v	
B69(M3)	NON-TERMINATED ANTENNA WIRE	w	
B156(C6)	A93(S3) +5V COIN COUNTER		A
B155(C5)	A106(U4) LOCKOUT #1		B
B154(C4)	A108(U6) LOCKOUT #2		C
B153(C3)	A110(V2) LOCKOUT #3		D
B152(C2)	A112(V4) LOCKOUT #4		E
B151(C1)	A114(V6) LOCKOUT #5		F
B150(b6)	A116(W2) LOCKOUT #6		G
B149(b5)	A118(W4) LOCKOUT #7		H

CON. "E"

<u>FROM</u>	<u>TO</u>	
B148(b4)	A120(W6) LOCKOUT #8	J
B147(b3)	A40(G4) AUDIO 1 & 2	K
B145(b1)	A41(G5) AUDIO 3 & 7	M
B143(a5)	A42(G6) AUDIO 4 & 8	P
B141(a3)	A43(H1) AUDIO 5 & 6	S
B131(Y5)	C6(A6) COIN 1	c
B130(Y4)	C7(B1) COIN 2	d
B129(Y3)	C11(B5) COIN 3	e
B128(Y2)	C12(B6) COIN 4	f
B127(Y1)	C37(G1) COIN 5	g
B126(X6)	C36(F6) COIN 6	h
B125(X5)	C32(F2) COIN 7	i
B124(X4)	C31(F1) COIN 8	j
B123(X3)	B66(L6) COMP. VIDEO BLK/WHITE TV	k
B122(X2)	A50(J2) TEAM SW COM	l
B121(X1)	A51(J3) TEAM SW N.O.	m
A2(A2)	A6(A6) A23(D5) J.S. #1 COM C3(A3)	
A10(B4)	A14(C2) A25(E1) J.S. #2 COM C2(A2)	
A91(S1)	C16(C4) C17(C5) +5VDC	
A39(G3)	A84(P6) A86(R2)	