

# Area 51 / Maximum Force troubleshooting

(Two-board stack)

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Had a two stack, 68EC020-based board come into the shop and thought that since there's not a lot out there about this boardset, I'd document what I found.

Board had an error in Bank 0. Dug through the RAM datasheets and backtracked the /UCAS, /LCAS, /RAS, /OE, and /W pins to the GAL chips that drove those pins. The fix was to replace the GAL at 4L as the /UCAS signal for the 4<sup>th</sup> RAM in the 4MB bank was missing. However, there were still sound and graphics problems, yet all the self-tests passed OK.

Note: /UCAS = Upper Column Address Strobe  
/LCAS = Lower Column Address Strobe  
/RAS = Row Address Strobe  
/OE = Output Enable  
/W = Write  
GAL = Gate Array Logic

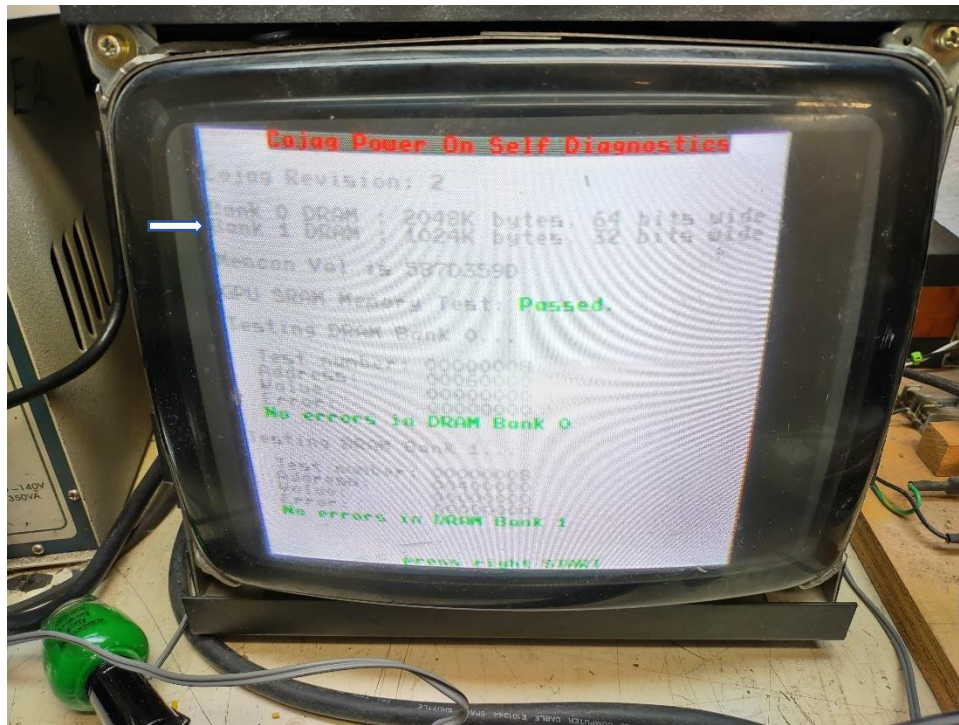
## TMS45160 256K x 16-bit DRAM

### DZ PACKAGE (TOP VIEW)

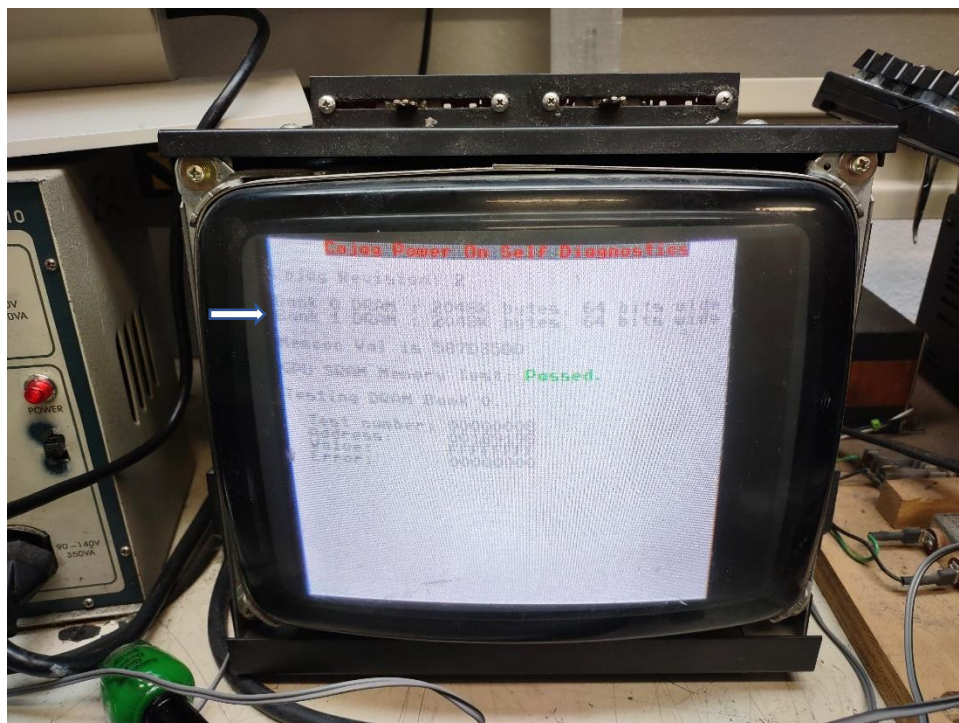
V <sub>CC</sub>	1	40	V <sub>SS</sub>
DQ0	2	39	DQ15
DQ1	3	38	DQ14
DQ2	4	37	DQ13
DQ3	5	36	DQ12
V <sub>CC</sub>	6	35	V <sub>SS</sub>
DQ4	7	34	DQ11
DQ5	8	33	DQ10
DQ6	9	32	DQ9
DQ7	10	31	DQ8
NC	11	30	NC
NC	12	29	LCAS
<u>W</u>	13	28	UCAS
RAS	14	27	OE
NC	15	26	A8
A0	16	25	A7
A1	17	24	A6
A2	18	23	A5
A3	19	22	A4
V <sub>CC</sub>	20	21	V <sub>SS</sub>

The Cojag system has built-in power-on diagnostics that will test the RAM. Flip the Self-Test switch on the PCB then power on the system to access this diagnostic mode. It will run through Bank 0 and Bank 1 tests, but will only test the *detected amount* of RAM. If there's a RAM bit failure, it will detect it but if it's a whole bank failure, it will show up in the power-on diagnostics as a smaller amount of memory and not be detected.

In this screen shot of the Power On Self Diagnostics, the system detected 2048K of 64-bit wide DRAM for Bank 0 and 1024K of 32-bit wide DRAM in bank 1. This is bad as both banks are normally 2048K 64-bit, but as the screen shows, the system detected 'No errors in DRAM Bank 1'



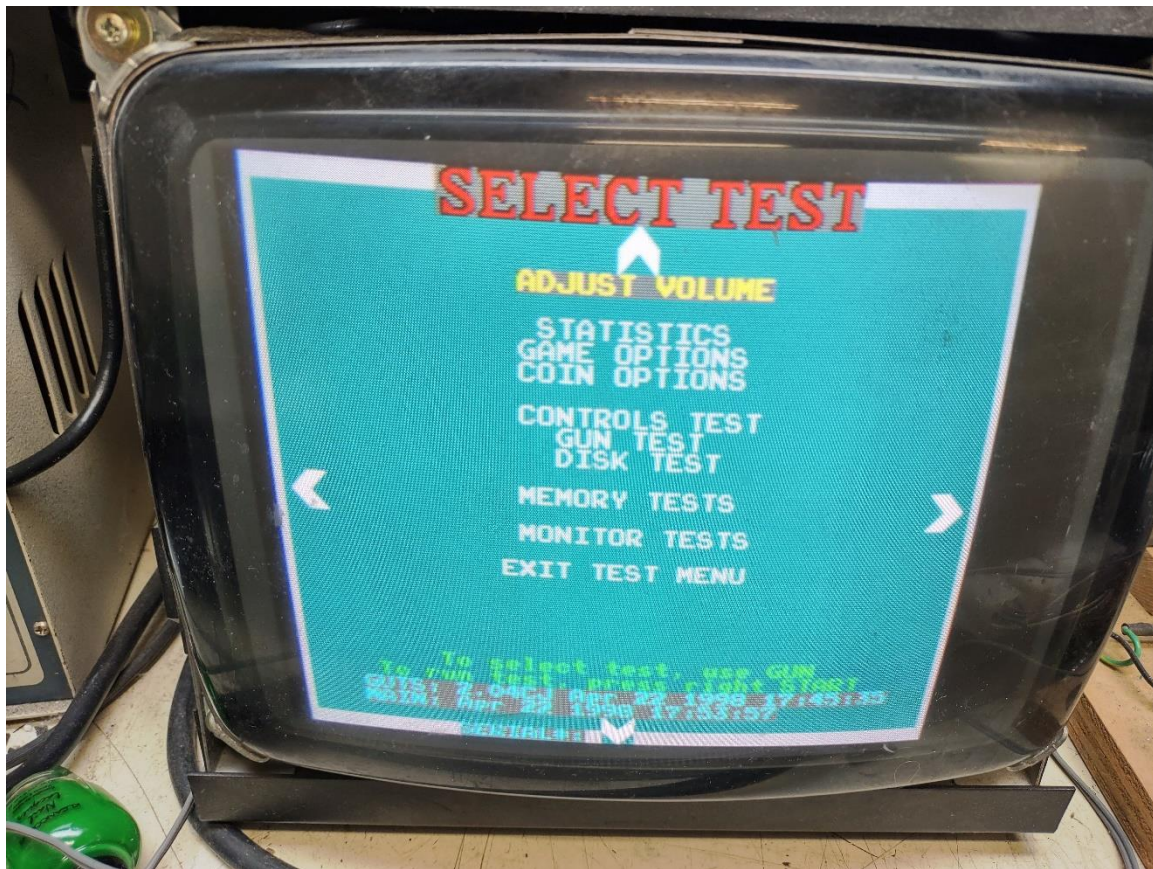
Once the issue with the bank was addressed, a bad solder joint on the replacement GAL chip causing the /UCAS signal to be missing from the 1<sup>st</sup> chip in the 4MB bank, the system detected Bank 1 properly as 2048K 64-bit. The tests also passed which showed that the bank of RAM had no bad bits in it.





The game has another set of self-tests that are accessed by flipping the Self-Test switch on the main board after power-on while the game is running.

The memory tests are similar in that they will only test the amount of RAM detected, however, if there's a bank failure in Bank 0 where the full 64-bit isn't available, the system will throw random Bank 0 error messages in text during boot or when trying to run these tests.



The next picture is of the game PCB with the CPU board removed. The RAM banks are labeled with position and bank numbers. The game board is labeled 2M, 4M, 6M, and 8M, but electronically, the system treats the RAM in banks that are different than what is on the silk screen labels. The picture circles which RAMs are electronically in each bank and highlights each programmable logic device along with their part numbers.

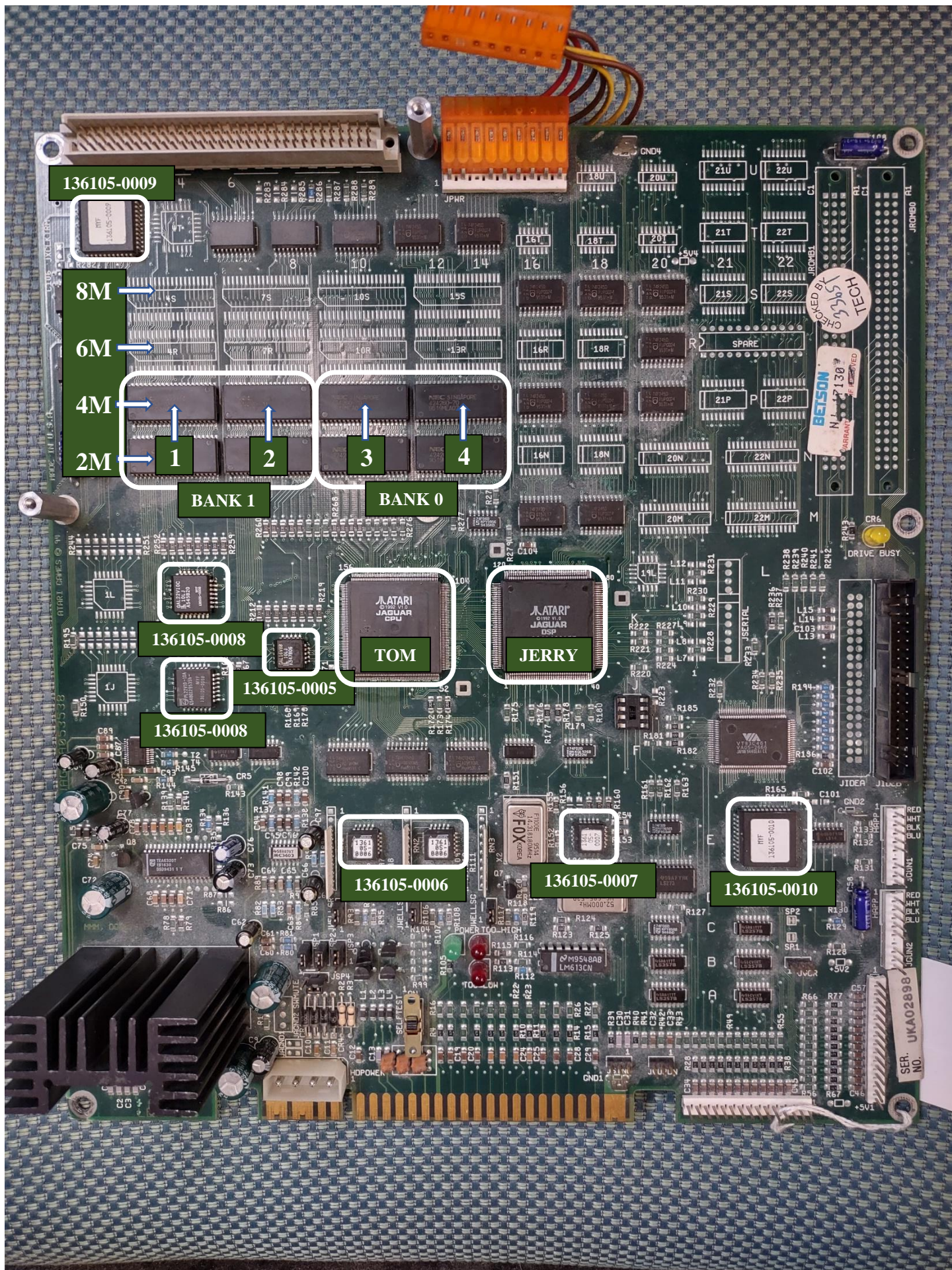
Tom and Jerry are Atari's names for the Jaguar CPU and DSP chips. The Area 51 and the Area 51 / Maximum Force Duo manuals only contain a partial schematic for the Cojag hardware. Refer to the Atari Jaguar console schematics found online for pinouts of both Tom and Jerry.

The next picture shows the signals coming from each GAL for the RAM control signals and from the CPU for the Address Bus signals to the RAM. If any signals are missing or stuck (check while running) then replace the associated GAL chip. I did not pin out the data bus. If you're having issues with the data bus, please check the RAM for any cracked solder and then reflow the CPU.

If you're getting watchdog error / reboots, check the power supply for dirty power output or too low of voltage on the +5v line. Next replace the hard drive. If you're getting Three Taps and You're Out messages, replace the hard drive.

(Continued after pics)





136105-0009

8M

6M

4M

2M

BANK 1

BANK 0

136105-0008

136105-0008

136105-0005

TOM

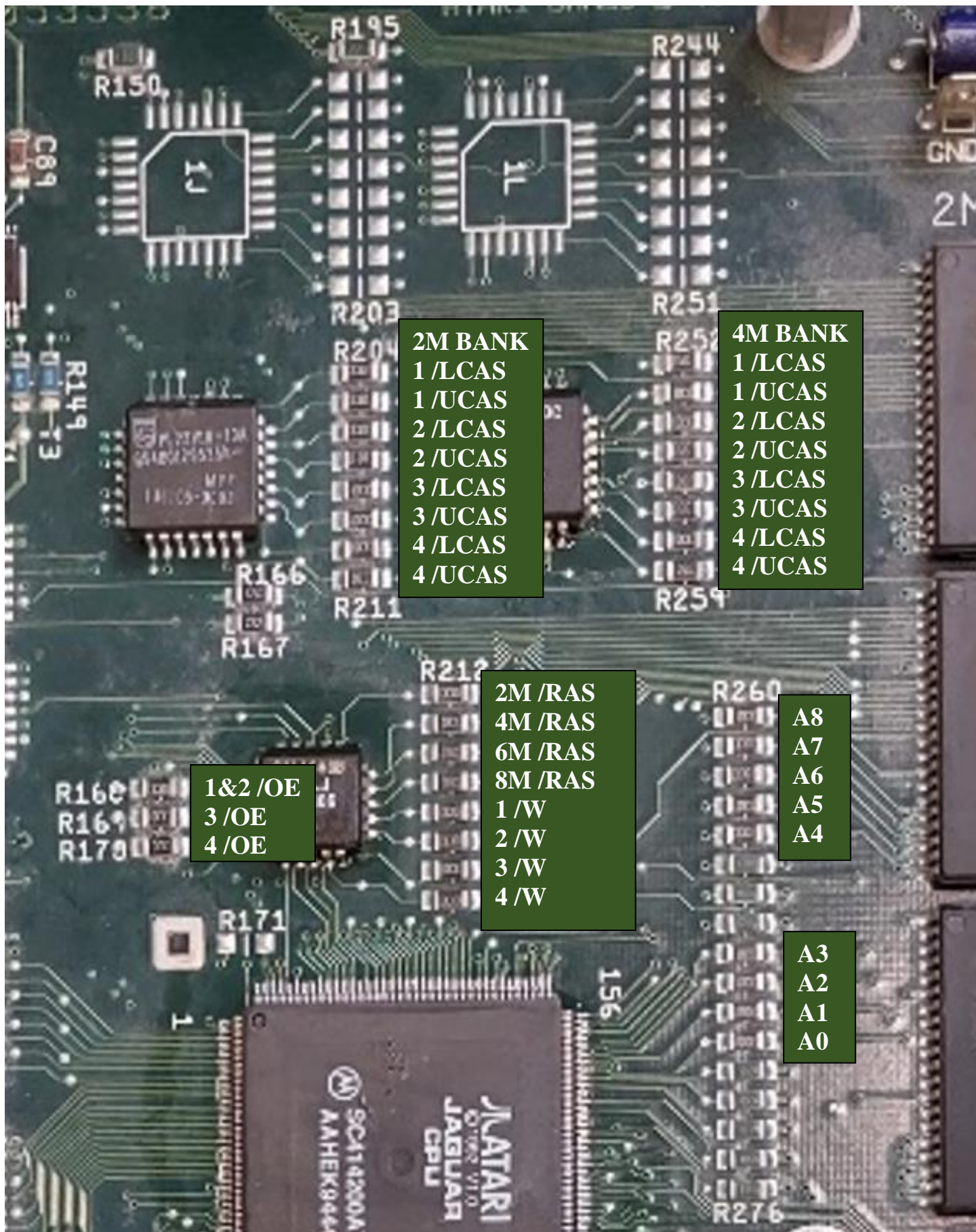
JERRY

136105-0006

136105-0007

136105-0010





#### 2M BANK

1 /LCAS  
1 /UCAS  
2 /LCAS  
2 /UCAS  
3 /LCAS  
3 /UCAS  
4 /LCAS  
4 /UCAS

#### 4M BANK

1 /LCAS  
1 /UCAS  
2 /LCAS  
2 /UCAS  
3 /LCAS  
3 /UCAS  
4 /LCAS  
4 /UCAS

1&2 /OE  
3 /OE  
4 /OE

2M /RAS  
4M /RAS  
6M /RAS  
8M /RAS  
1 /W  
2 /W  
3 /W  
4 /W

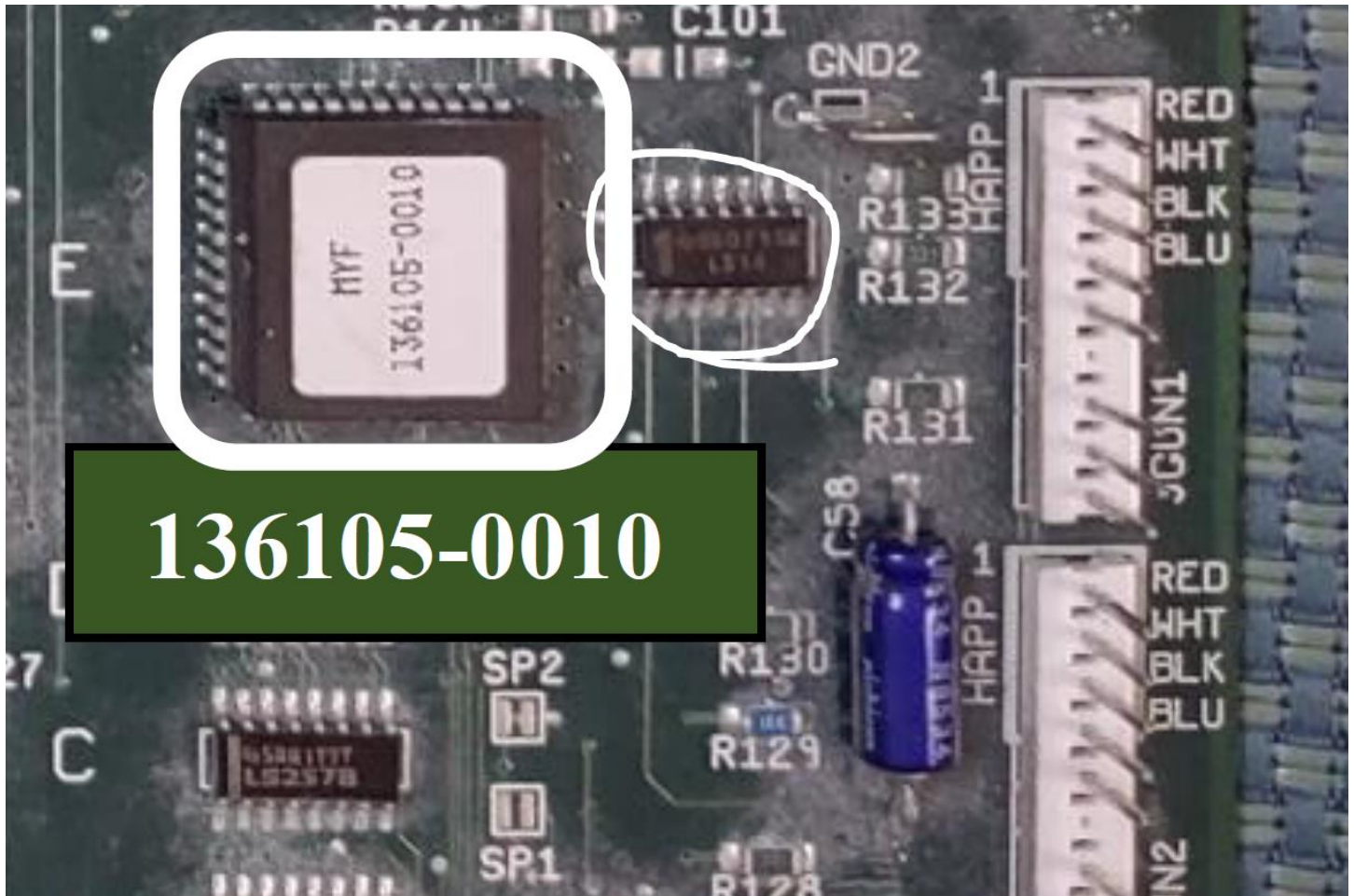
A8  
A7  
A6  
A5  
A4

A3  
A2  
A1  
A0

If the guns aren't working, swap them and see if the problem follows the guns or stays with the player on the game PCB.

If the problem stays with the player on the game PCB, replace the 74LS14 chip next to the gun connectors. This chip is a Schmitt-Trigger inverter. It takes a slow rising signal and snaps it quickly to logic high and is used to 'square up' the signals coming from the light guns. When it fails you will have symptoms such as the screen flashing white but not registering the gun's position on the screen or the gun's position being in random places, not where you are aiming.

Didn't fix it? Check the SMT resistors around the connectors. You may need to replace the 136105-0010 chip.



**136105-0010**

Good luck with your repair!