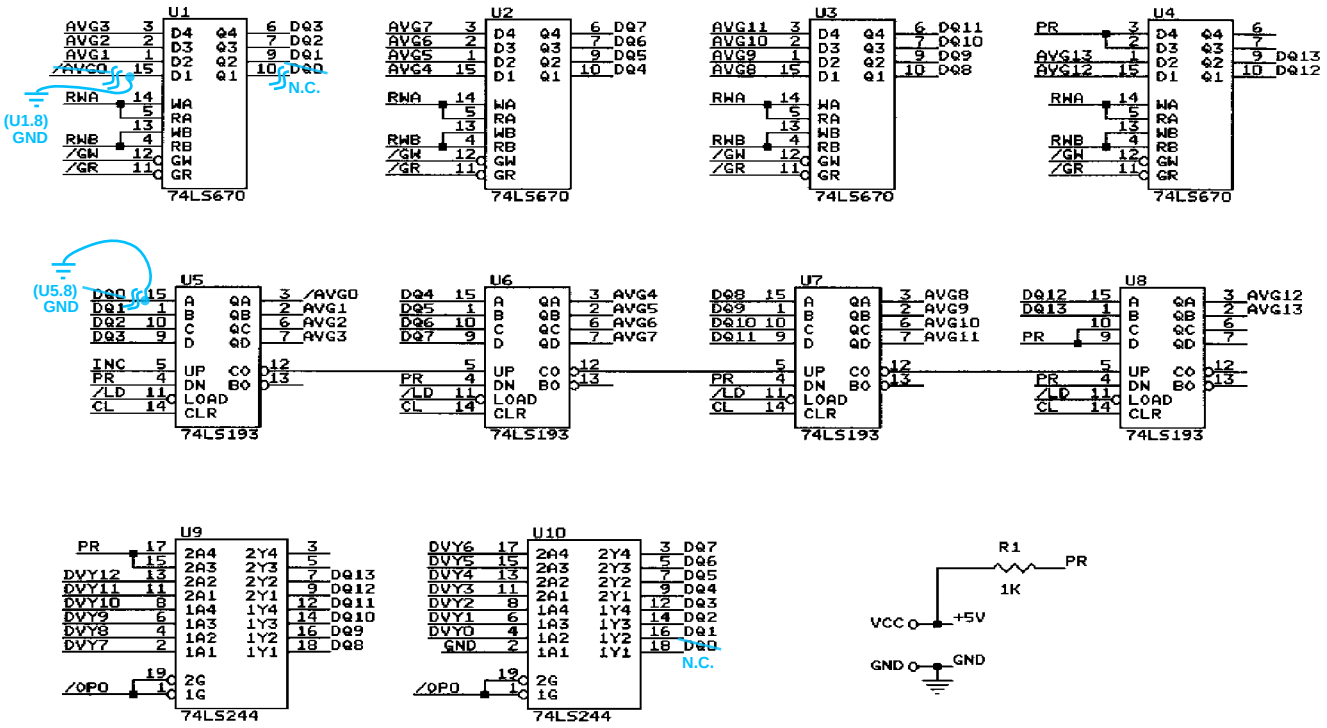
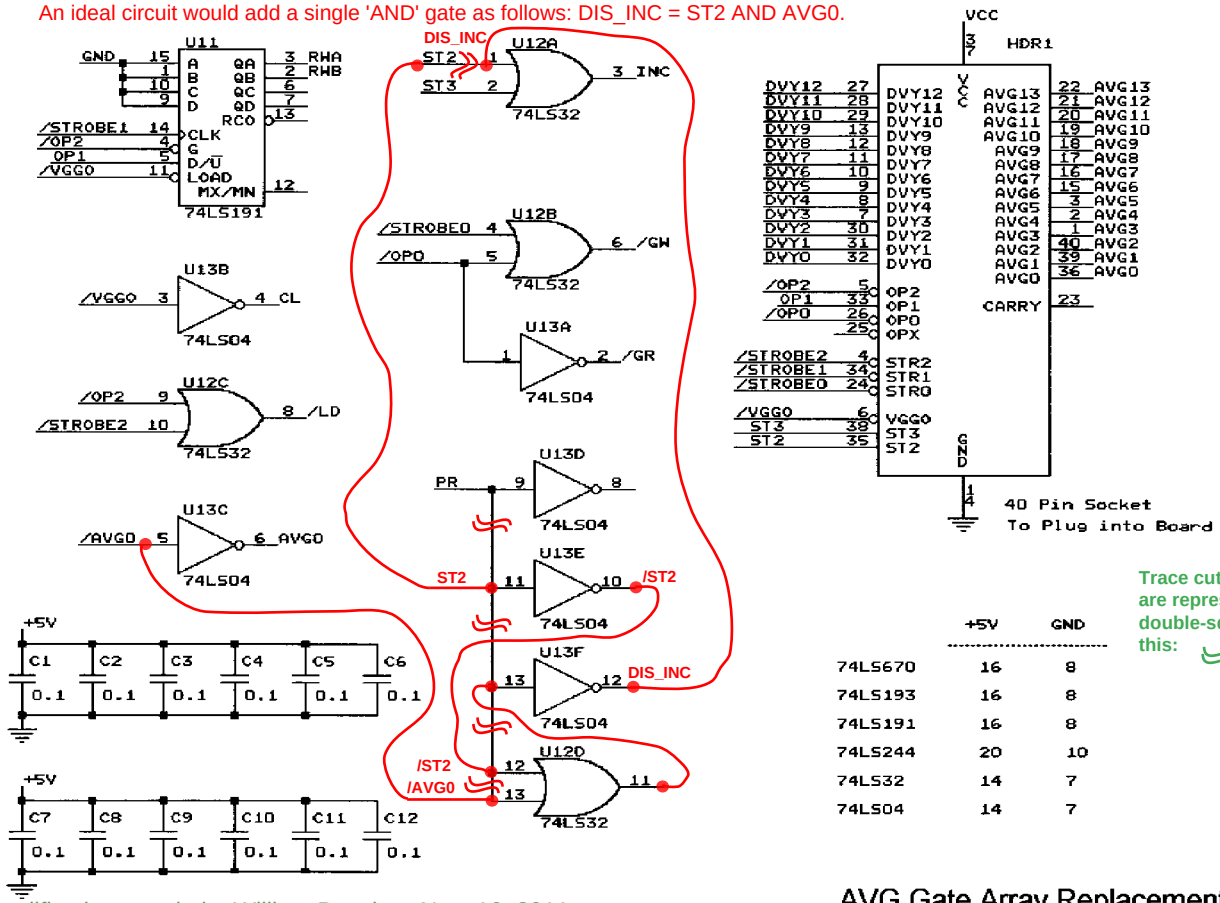
Modifications marked in blue are not required for proper operation but demonstrate slightly simpler logic that is applicable to CPLD implementations of this circuit. The changes eliminate the write/read (push/pop) of bit /AVG0. In games, this PC bit is always '0' when saved or restored so there is no benefit to providing memory storage or an input buffer for it.

Figure 24 - Vector Generator Gate Array



Modifications marked in red are required for correct operation of the program counter. These changes allow the PC to increment when bit /AVG0 = '1' regardless of the state of ST2. This is how the original Atari AVG chip worked.
The changes shown make use of previously unused gates.
An ideal circuit would add a single 'AND' gate as follows: DIS_INC = ST2 AND AVG0.



	+5V	GND
74LS670	16	8
74LS193	16	8
74LS191	16	8
74LS244	20	10
74LS32	14	7
74LS04	14	7

Trace cuts or disconnects are represented by double-squiggle lines like this:

AVG Gate Array Replacement
Jed Margolin 3/18/2001

Circuit modifications made by William Boucher, Nov. 16, 2011.
Website: http://www.biltronix.com

While developing my own CPLD based AVG replacement (BXAVG) for the Atari games Space Duel, Black Widow, Gravitar, Major Havoc, Star Wars, and Quantum, I read several statements from various people that existing discrete logic and/or CPLD solutions did not operate correctly in some games. Analysis of waveforms captured from the operation of an original AVG chip while running in Space Duel revealed functional discrepancies with the original schematic shown above. Further investigation into the matter lead to the circuit modifications shown above and also resulted in a fully functional CPLD implementation in the BXAVG module.