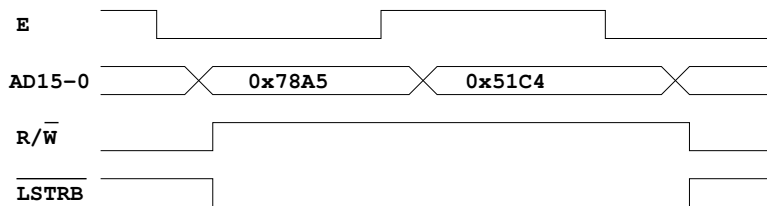
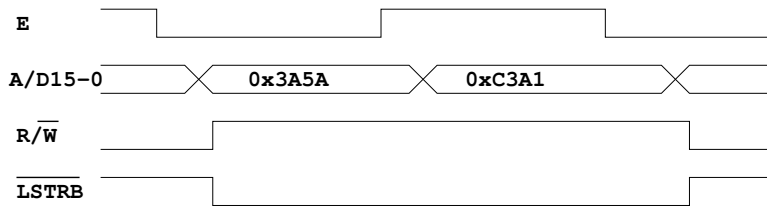
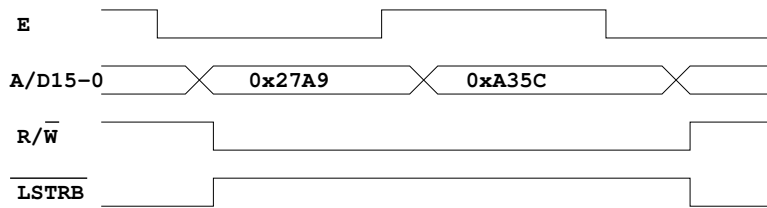
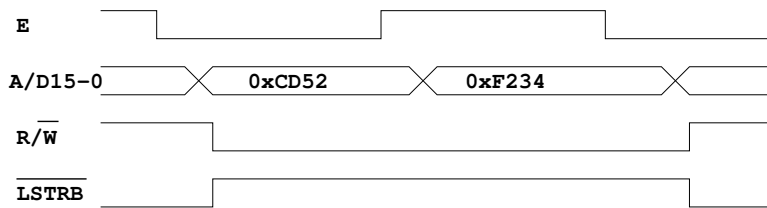


EE 308 – Homework 12

Due Apr. 25, 2012

For all problems below assume your are using a MCS12DP256 chip with a 24 MHz bus clock and a 8 MHz oscillator clock.

- The figures below show some things which might be on the MC9S12 bus in normal expanded wide mode. For each figure, indicate if that combinations of signals can occur. If so, explain what the memory cycle does — read or write, 8-bit or 16-bit access, what data is read from or written to, what memory address(es) are accessed. If the combination of signals cannot occur, explain why not.

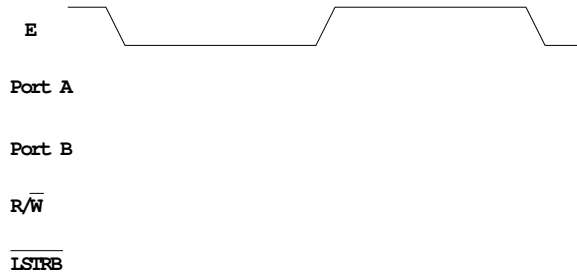


2. The following table shows some values in the MC9S12 memory:

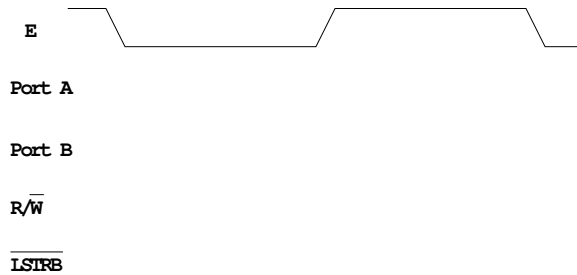
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
4000	A2	5C	4A	9F	5B	86	C6	03	5B	8D	C6	FF	5B	02	4C	80

Show what will be on the address/data bus and the control lines when the MC9S12 does the following:

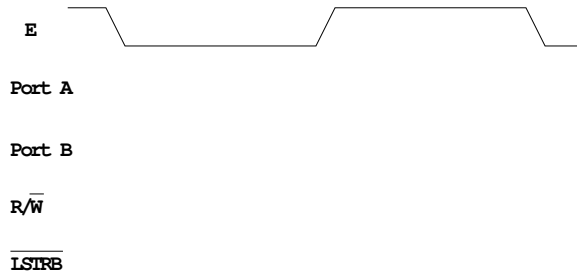
(a) Writes a 0x55 to address 0x4000.



(b) Writes a 0xABCD to the two bytes at addresses 0x4002 and 0x4003.

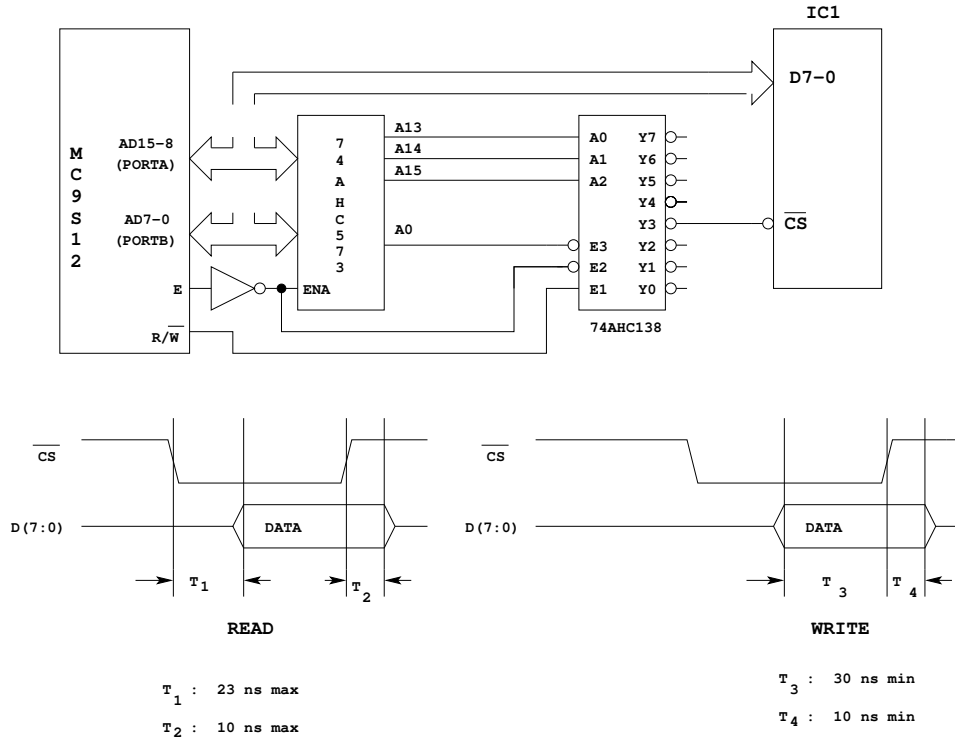


(c) Reads a single byte from addresses 0x4009.



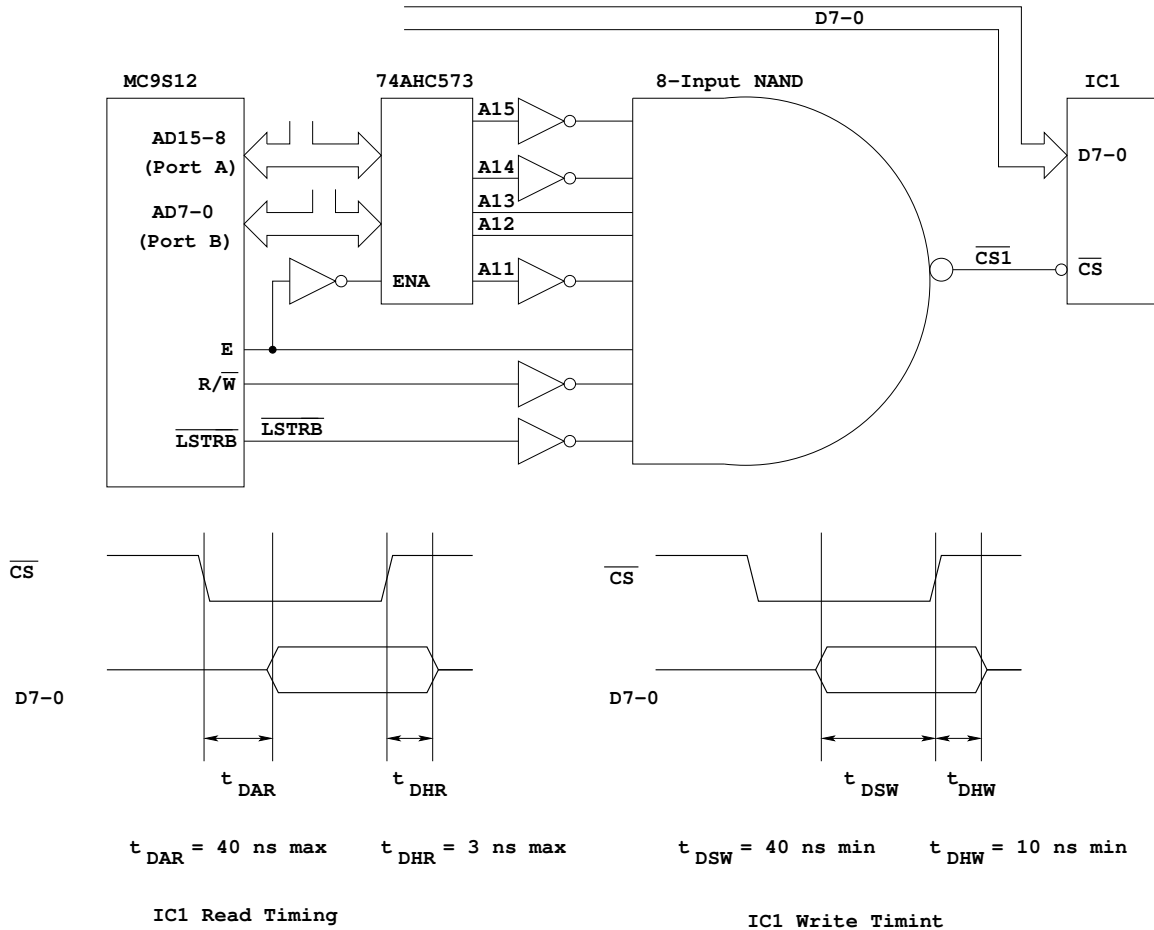
3. Immediately upon coming out of reset, an MC9S12 is operating in Normal Expanded Wide mode. How did the MC9S12 know it should run in this mode — i.e. what pins did it check, and what was the state of those pins?
4. Immediately upon coming out of reset, an MC9S12 is operating in Normal Single Chip mode. How did the MC9S12 know it should run in this mode — i.e. what pins did it check, and what was the state of those pins?
5. Immediately upon coming out of reset, an MC9S12 is operating in Normal Single Chip mode. How can you switch the chip into Normal Expanded Wide mode? Write some code to do this.

6. Write a C instruction which remaps the EEPROM to start at address 0x5800.
7. An engineer drew a quick sketch of an IC interfaced to the MC9S12. She accidentally spilled some coffee on the sketch, and some details were lost. On the same piece of paper she drew the timing diagram for an input IC and output IC. but forgot to label which diagram corresponds to IC1 interfaced to the MC9S12. The figure below shows her sketch:



- (a) Is IC1 an input or an output port? Explain.
- (b) Should the data lines of IC1 be connected to AD[15:8] (Port A) or AD[7:0] (Port B)? Explain.
- (c) For what range of addresses will IC1 be selected? Explain.
- (d) If IC1 is an input port, write some C code to read a byte of data from IC1 and save it in a variable called `data`. If IC1 is an output port, write some C code to write a 0x55 to IC1. (Do only one of these, based on your answer to Part (a).)
- (e) Is the timing of IC1 compatible with an MC9S12 with an 24 MHz E-clock, and no E-clock stretches? Explain. (Assume the propagation delays through each glue logic chip is 2 ns.)
- (f) Is the timing of IC1 compatible with an MC9S12 with an 24 MHz E-clock, and one E-clock stretch? Explain.

8. The figure below shows a peripheral chip connected to an MC9S12 using some standard CMOS logic chips. For this problem assume that the propagation delay through each CMOS logic chip is 2 ns.



- (a) Will IC1 be an input device or an output device? Explain
- (b) Should the data lines of IC1 be connected to AD[15:8] (Port A) or AD[7:0] (Port B) on the MC9S12? Explain.
- (c) For what range of addresses will IC1 be selected?
- (d) Sketch the signals on the E, R/W, LSTRB, CS1 and D7 – 0 lines for the following actions:
 - If IC1 is an input device, the MC9S12 reads from IC1, and IC1 returns an 0x55.
 - If IC1 is an output device, the MC9S12 writes an 0xAA to IC1.

Note: Only do one of these, based on your answer to Part (a) above.

- (e) Will the circuit shown work reliably with an MC9S12 running with an 24 MHz E-clock, and no E-clock stretches? Explain.
- (f) Will the circuit shown work reliably with an MC9S12 running with an 24 MHz E-clock, and one E-clock stretch? Explain.