Microcomputers Lab Report #1:
Introduction to CodeWarrior

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I. OBJECTIVES

- Simulate the S12 microcontroller using CodeWarrior
- Use trace and breakpoints to monitor a program's execution
- Read and modify memory and registers during debugging

II. ANSWERS TO QUESTIONS

1. C1 = 193_{10}
2. 6b 47 ee 85 9c = 705_{10}
3. All that check 1 in Column C, which is trace lines 3 and 4.
4. Column V contain signed overflow, which is trace lines 2 and 4.
5. Unsigned overflow is represented by Column C, signed overflow is represented by Column V.

Trace Line	Code Line	PC	A	N	Z	V	C
0	LDAA 3000h	C000	0	1	0	0	0
1	ADDA 3001h	C003	6B	0	0	0	0
2	ADDA 3002h	C006	B2	1	0	1	0
3	ADDA 3003h	C009	A0	1	0	0	1*
4	ADDA 3004h	C00C	25	0	0	1	1*
5	ADDA 3008h	C00F	C1	1	0	0	0
6	BRA endmain	C012	C1	1	0	0	0

6. -

Code Line	Memory Address	Machine Code	Assembly
1	C000	87	CLRA
2	C001	CE	LDX #3000h
	C002	30	
	C003	00	
3	C004	C6	LDAB #5
	C005	05	
4	C006	27	BEQ *+8
	C007	06	
5	C008	AB	ADDA 0,X
		00	
6	C00A	08	INX
7	C00B	53	DECB
8	C00C	20	BRA *-6
		F8	
9	C00E	6A	STAA 3, X
		03	
10	C010	20	BRA *
		FE	

7. LDAB #100
8. LDX #3200h
9. STAA 3,X

III. QUESTIONS (REFERENCE)

1. What answer does the program calculate (i.e., what is the one-byte value in 3008h)?

2. If the numbers are added as unsigned bytes and the numbers of digits in the answer was not limited to one byte, what is the correct sum of the five hexadecimal numbers?

3. The running sum in accumulator A may experience unsigned overflow (i.e., the correct sum requires 3 digits). Which trace lines show unsigned overflow after adding a value to the running sum in A?

4. Which trace lines contain signed overflow after adding a number to the running sum in A (i.e., which additions cause an incorrect change in sign)?

5. Which condition code register bits correspond to the unsigned overflows and signed overflows in the lines from questions 3 and 4?

6. Using the Assembly window, complete the Machine Code column from Figure 8. Recall that the Assembly pane shows all bytes for an instruction in one line. You should enter one byte per row in the figure.

7. Which line(s) of code in Figure 8 must be changed to add 100_{10} numbers instead of 5 numbers?

8. Which line(s) of code in Figure 8 must be changed to add numbers beginning at memory location 3200h instead of 3000h?

9. Which line(s) of code in Figure 8 store the sum to memory?