02.1   A paper computer

Consider the following graphic. It is an example of how a program running on a Motorola 68HC12 microcontroller might proceed at the memory/register/assembly language level. The HC12 registers are different than the ARM registers discussed in Lec. 01.3 , but there are some differences. For instance, the HC12's condition code register (CCR) is akin to the ARM application status register (APSR). Begin with the program counter (PC) at memory address 3007 and follow the corresonding instructions, annotating the registers as appropriate.

Memory Address	Memory Contents	Instruction	Mnemonics	Comment
2080	05			LOCATION OF AUGEND
2081	FB			LOCATION OF ADDEND
2082				LOCATION OF SUM
•	•		•	
•	•		•	
•	•		•	
3007	B6	BEGIN:	LDAA AUGEND	PUT AUGEND IN A
3008	20			
3009	80			
300A	BB		ADDA ADDEND	ADD THE ADDEND
300B	20			
300C	81			
300D	7A		STAA SUM	STORE THE RESULT
300E	20			
300F	82			
3010	20	HERE:	BRA HERE	ENDLESS LOOP HERE
3011	FE			

```
A                    B
D
X
Y
SP
PC
```

```
          S  X  HI  N  Z  V  C
CCR  [ ][ ][ ][ ][ ][ ][ ][ ]
```

Instruction Queue (Pipeline)