

Programming the 5036A Microprocessor -- Assembly Language Exercises

Preparation: Before you begin the exercises, do HP Experiments 1 and 4. These tutorials will teach you to use the processor.

Exercise #1 This program turns on output lights. The input switch has no control over the LED.

NOTE: Gray indicates information. You only need to enter the **ADDRESS** and its **CONTENTS** into the **HP5036A** processor.

Table 1 Turn on Lights

ADDRESS	CONTENTS	LABEL	INSTRUCTION	COMMENTS
0800	3E	START	MVI A	Create a number
0801	77		<byte>	Designate lights to be lit
0802	32		STA adr	Store the byte in the following address
0803	00		LO	
0804	30		HI	
0805	C3		JMP START	Loop back to beginning to keep lights lit
0806	00		LO	
0807	08		HI	

Exercise #2 This program uses the input switch to turn on a light. The switch has to be ON to light the LED.

Table 2 Switch on Lights

ADDRESS	CONTENTS	LABEL	INSTRUCTION	COMMENTS
0900	3A	START	LDA 2000	Read Input Port
0901	00		LO	
0902	20		HI	
0903	2F		CMA	Compliment (invert) the data
0904	32		STA 3000	
0905	00		LO	
0906	30		HI	
0907	C3		JMP START	Loop back to beginning to keep lights lit
0908	00		LO	
0909	09		HI	

Exercise #3 In this exercise, you will modify the program in Exercise #1. Use the charts below as a reference for calculating the binary values for turning on an LED and converting that value into hex.

Table 3 LED Diagram









								
Color	Red	Yellow	Green	Yellow	Red	Yellow	Green	Yellow
Bit #	7	6	5	4	3	2	1	0

Table 4 Hex and Binary Values

Hex	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Binary	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111

Exercise #3 Worksheet

In this exercise, you will alter the program in Exercise #1 to light the output LEDs.

Enter the code in Table 5 NOTE that the data is inverted with the instruction at line 0802. Use Table 6 to calculate the binary values needed to turn on the specified light (See Table 3). To turn on a light the bit value must be 1. Write in the bit value 1 or 0 under the color name to create the binary number that will accomplish the task. Then convert the binary number to hex and enter the hex value in the column named Hex Value. Refer to Table 4 if needed for Binary and Hex numbers.

Table 5 Code for Exercise #3

ADDRESS	CONTENTS	LABEL	INSTRUCTION	COMMENTS
0800	3E	START	MVI A	Create a number
0801	77		<byte>	Designate lights to be lit
0802	2F		CMA	Compliment (invert) the data
0803	32		STA adr	Store the byte in this address
0804	00		LO	
0805	30		HI	
0806	C3		JMP START	Loop back to beginning to keep lights lit
0807	00		LO	
0808	08		HI	

Table 6 Calculate Binary Value & Convert to Hex

Color	Red	Yellow	Green	Yellow	Red	Yellow	Green	Yellow	Hex Value
Bit #	7	6	5	4	3	2	1	0	
LED #7									
LED #4									
LED #1									
All Red LEDs									
All Green LEDs									
All Yellow LEDs									
ALL LEDs ON									

Microprocessor Coding Sheet

Use Table 7 to write in your programming solutions for Exercise #3. In address 0801 you will change the contents to the hex value you have calculated in Table 6 that respond to the comments column that lists the LEDs you are lighting up.

Table 7 New Values for Line 801 in Exercise #3 LED Program

ADDRESS	CONTENTS	COMMENTS
0801		LED #7
0801		LED #4
0801		LED #1
0801		All Red LEDs
0801		All Green LEDs
0801		All Yellow LEDs
0801		ALL LEDs ON

Now change the code for ADDRESS 0801 on the processor using the new value for each of the LED combinations listed Table 6.