Programming Assignment #1

Assignment Description

Write an SIC assembler that reads an SIC assembly program, translates SIC statements into their machine code equivalents, and generates an object file.

Goals

1. Get familiar with C programming language.
2. Learn to use the I/O facilities and library functions provided by standard C.
3. Get experience with the system-level programming.
4. Get experience with separate compilation, make utility, and C debugger.

Guideline:

1. You have to demonstrate your program in person.
2. When demonstrating your program, have one of the following formats of the report with you:
   1) A pdf file on external storage that is accessible with USB interface, or
   2) A paper copy.
3. You will get 30% bonus (i.e., your score for this assignment * 1.3) if you succeed in demonstrating your program on November 13 between 2:10pm and 5:00pm.
4. Your report have to include the following elements:
   1) A cover page.
   2) The problem description.
   3) Highlight of the way you write the program.
   4) The program listing.
   5) Test run results.
   6) Discussion.

Programming Assignment #1 Addendum

Assembler Directives

START, END, BYTE, WORD, RESB, and RESW.

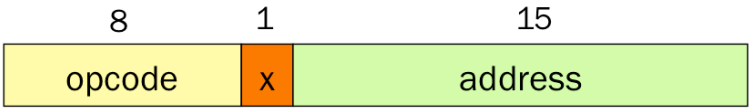
Format of SIC Assembly Program

1) Each line has 4 fields:
   i. (Optional) Label (up to 6 characters)
   ii. Operation
   iii. (Optional) Operands (no blank allowed)
   iv. (Optional) Comment
2) If the first character is a ".", the whole line is a comment.
3) There is no blank line in an SIC assembly program source file, except for the last line.

SIC OPCODE Table

Mnemonic	Opcode	Mnemonic	Opcode	Mnemonic	Opcode
ADD	18	AND	40	COMP	28
DIV	24	J	3C	JEQ	30
JGT	34	JLT	38	JSUB	48
LDA	00	LDCH	50	LDL	08
LDX	04	MUL	20	OR	44
RD	D8	RSUB	4C	STA	0C
STCH	54	STL	14	STSW	18
STX	10	SUB	1C	TD	10
TIX	2C	WD	DC		

SIC Instruction Format



Mode	Indication	Target Address
Direct	x = 0	TA = address
Indexed	x = 1	TA = address + (X)

Types of Record in SIC Object Code

Header record:

Col. 1	H
Col. 2–7	Program name
Col. 8–13	Starting address of object program (hexadecimal)
Col. 14–19	Length of object program in bytes (hexadecimal)

Text record:

Col. 1	T
Col. 2–7	Starting address for object code in this record(hexadecimal)
Col. 8–9	Length of object code in this record in bytes (hexadecimal)
Col. 10–69	Object code, represented in hexadecimal (2 columns per byte of object code)

End record:

Col. 1	E
Col. 2–7	Address of first executable instruction in object program (hexadecimal)

Example Target Program

```
HCOPY  001000001107A
T001000 1E 141033482039001036281030301015482061 3C1003 00102A 0C1039 00102D
T00101E 15 0C1036482061081033 4C0000 454F46 000003 000000
T002039 1E 041030001030 E0205D 30203F D8205D 281030 302057 549039 2C205E 38203F
T002057 1C 101036 4C0000 F1 001000 041030 E02079 302064 509039 DC2079 2C1036
T002073 07 382064 4C0000 05
E001000
```