

程式特色

- SIC
- One pass
- 起始位置不為1000時以M record 表示
- 將語法正確的source program組譯object code
- 可以同時列出多行錯誤(包含行數及錯誤訊息)

資料結構(建構子)-放入symbol table的形式

```
class labelFront :  
    def __init__(self,if_def, addR, line):  
        self.if_def = if_def  
        self.addR = addR 位置  
        self.line = line 行數
```

→ 是否為定義的label

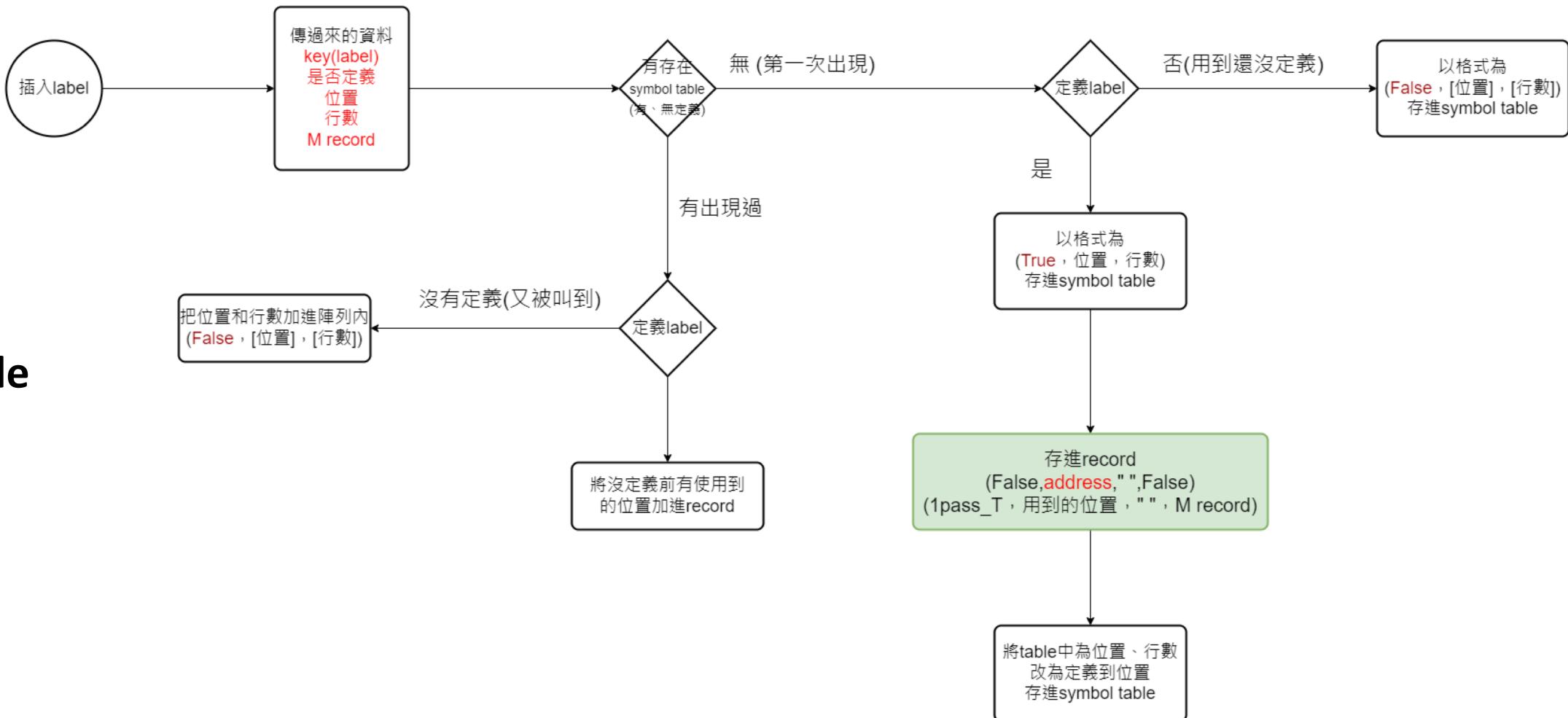
資料結構-放入symbol table的形式

```
class labelFront :  
    def __init__(self, if_def, addR, line):  
        self.if_def = if_def False  
        self.addR = addR    出現過的位置  
        self.line = line   出現過的行數
```

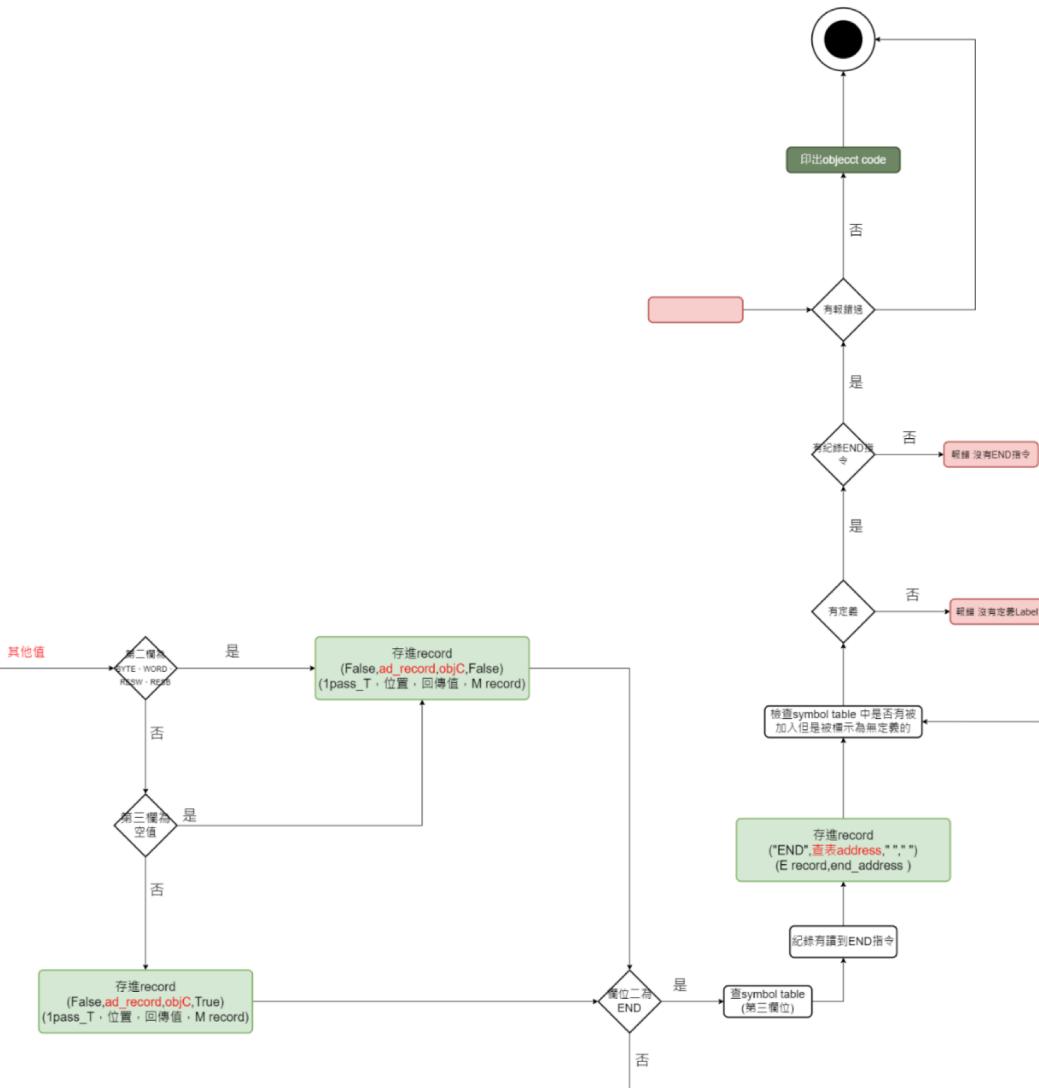
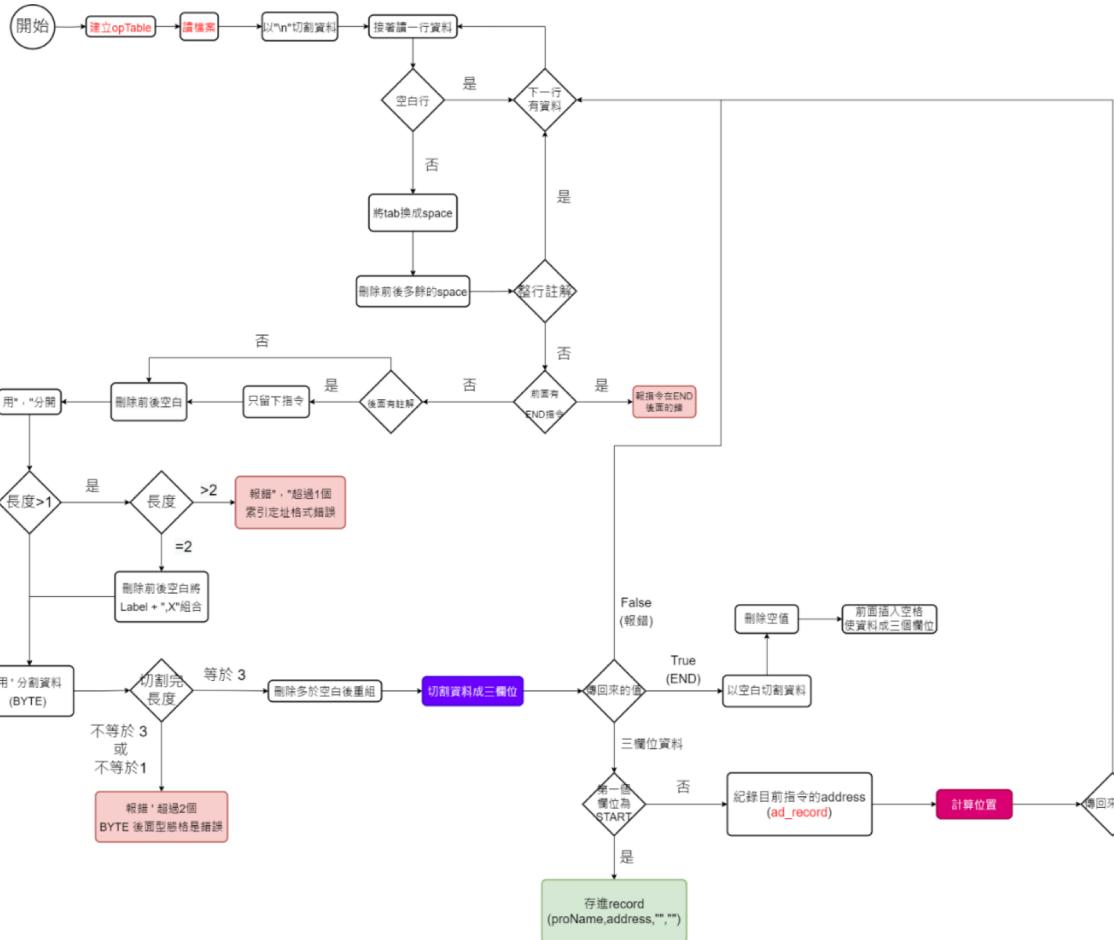
]→有多個值以陣列表示

加入

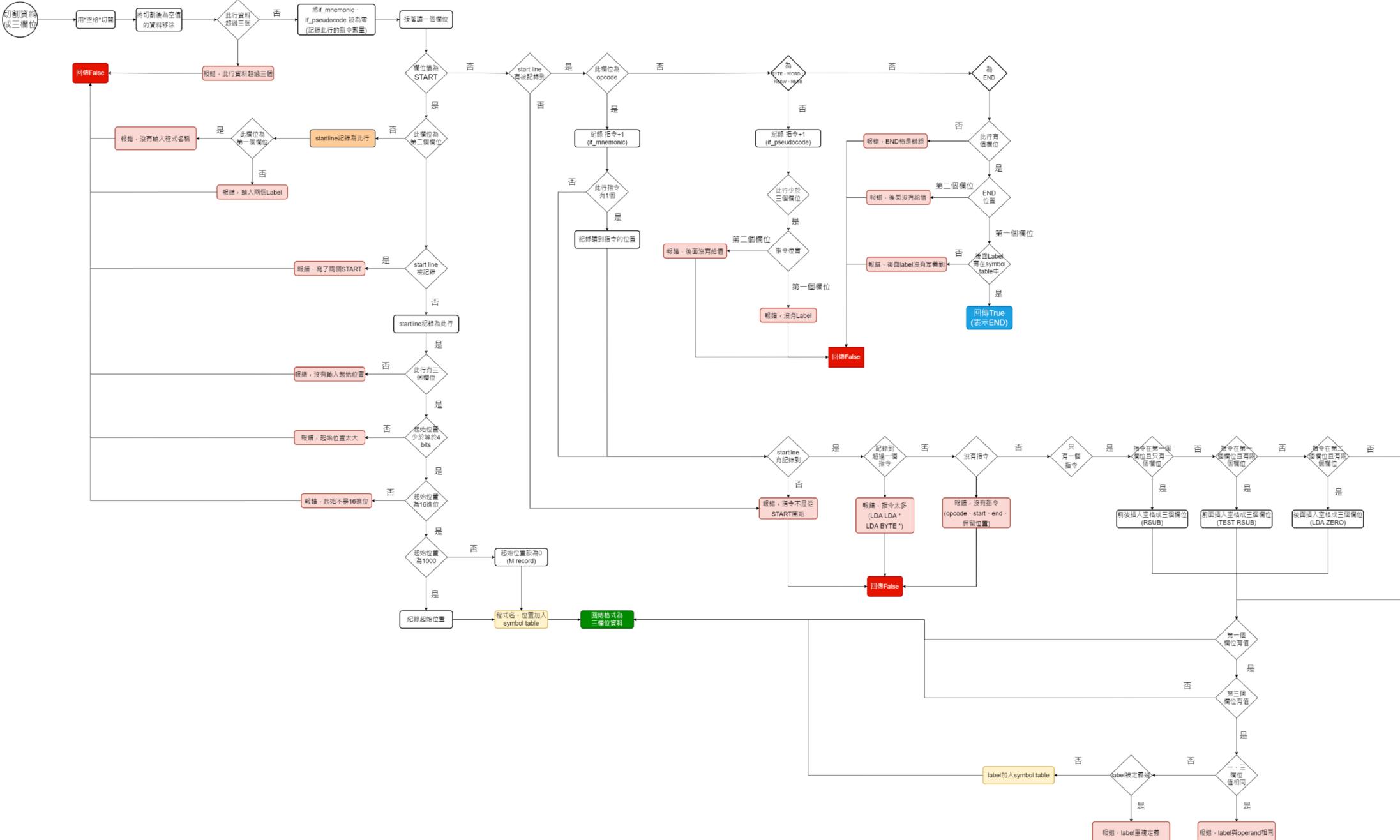
Symbol table



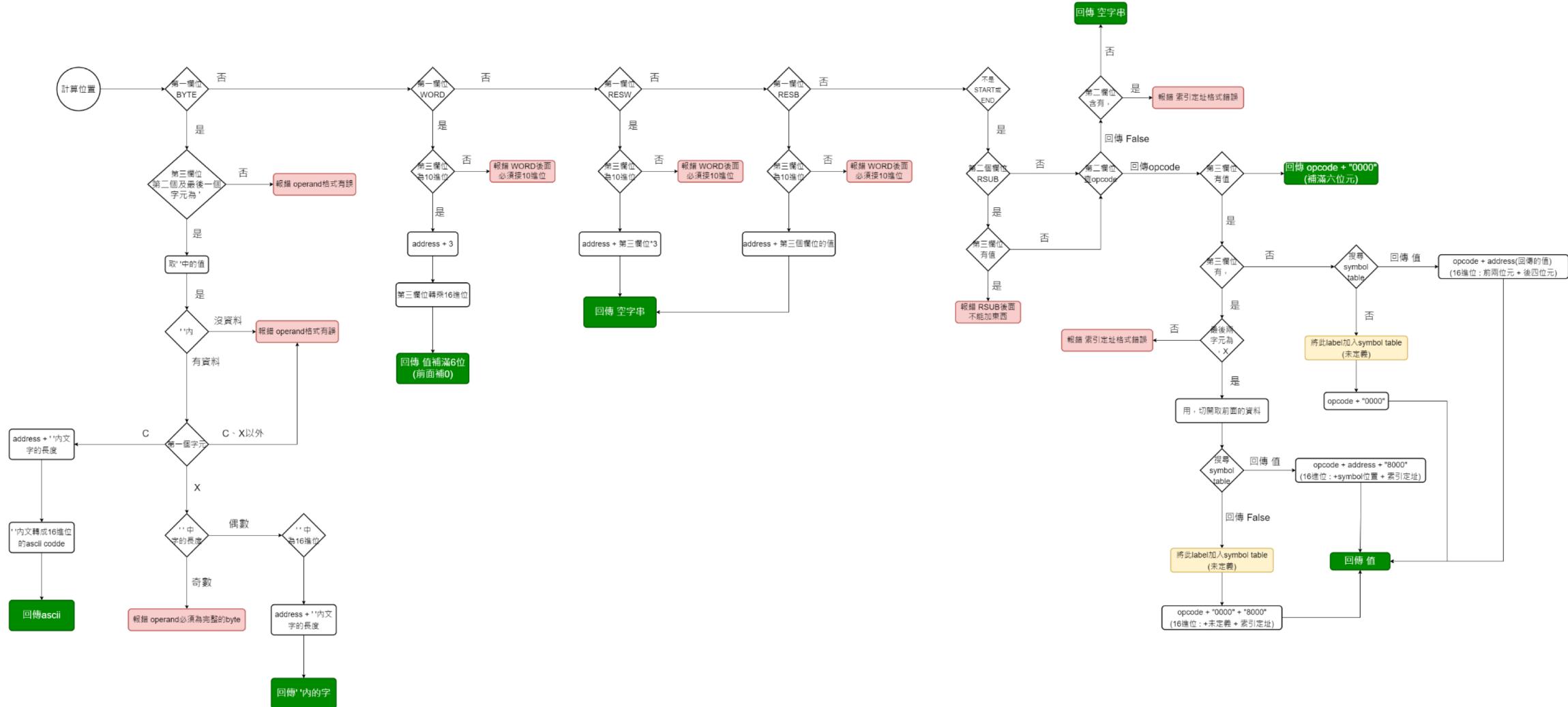
程式開始



切割資料



計算位置

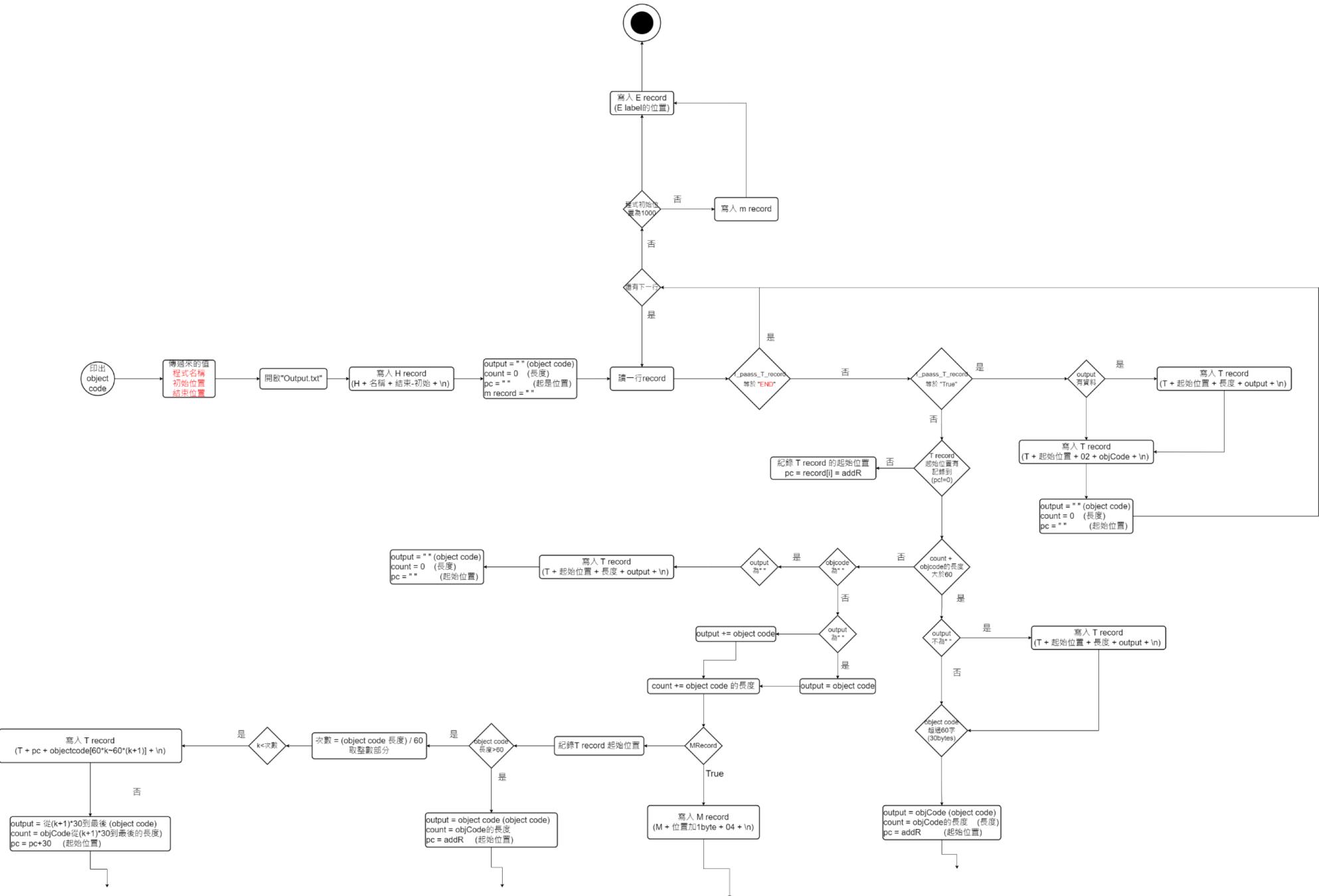


資料結構-放入record的形式

```
class recordFront :  
    def __init__(self,one_pass_TRecord, addR, obJCode,MRecord):  
        self.one_pass_TRecord = one_pass_TRecord  
        self.addR = addR 位置  
        self.obJCode = obJCode Object code  
        self.MRecord = MRecord 是否是M record
```

是否為1pass 讀到定義的Trecord

印出 Object code



正常情況(語法正確)

(test)SIC.txt

```
1 . comment
2 | . indexed addressing
3 .. free format coding
4 . empty line detection
5 .. comand line user filenames input
6
7 COPY START 1000 . program start here
8 FIRST STL RETADR
9 CLOOP JSUB RDREC
10 LDA LENGTH
11 COMP ZERO
12 JEQ ENDFIL
13 JSUB WRREC
14 J CLOOP
15 ENDFIL LDA EOF
16 STA BUFFER
17 LDA THREE
18 STA LENGTH
19 JSUB WRREC
20 LDL RETADR
21 | RSUB
22 EOF BYTE C 'EOF'
```

Output.txt

```
1 H COPY 001000 00107A
2 T 001000 15 140000 480000 000000 280000 300000 480000 3C1003
3 T 00100D 02 1015
4 T 001015 15 000000 0C0000 000000 0C0000 480000 080000 4C0000
5 T 001016 02 102A
6 T 00102A 03 454F46
7 T 00101C 02 102D
8 T 00102D 03 000003
9 T 00100A 02 1030
10 T 001030 03 000000
11 T 001001 02 1033
12 T 001025 02 1033
13 T 001007 02 1036
14 T 00101F 02 1036
15 T 001019 02 1039
16 T 001004 02 2039
17 T 002039 1E 041030 001030 E00000 30203F D80000 281030 300000 549039 2C0000 38
18 T 00204C 02 2057
19 T 002057 06 101036 4C0000
20 T 002040 02 205D
21 T 002046 02 205D
22 T 00205D 01 F1
```

PROBLEMS OUTPUT TERMINAL

C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py
執行成功，結果已寫入 Output.txt

C:\Users\SiBaChen\Desktop\大四下\系統程式>

起始位置不為1000以M record 表示-(1)

The screenshot shows two windows side-by-side. The left window is titled '(test)SIC.txt' and contains assembly language source code. The right window is titled 'Output.txt' and shows the memory dump of the program's execution.

(test)SIC.txt Content:

```
1 . comment
2 . indexed addressing
3 .. free format coding
4 . empty line detection
5 .. command line user filenames input
6
7 COPY START 0000 . program start here
8 FIRST STL RETADR
9 CLOOP JSUB RDREC
10 LDA LENGTH
11 COMP ZERO
12 JEQ ENDFIL
13 JSUB WRREC
14 J CLOOP
15 ENDFIL LDA EOF
16 STA BUFFER
17 LDA THREE
18 STA LENGTH
19 JSUB WRREC
20 LDL RETADR
21 RSUB
22 EOF BYTE C 'EOF'
23 THREE WORD 3
24 ZERO WORD 0
25 RETADR RESW 1
26 LENGTH RESW 1
27 BUFFER RESB 4096
28 .
```

Output.txt Content:

```
1 H COPY 000000 00107A
2 T 000000 15 140000 480000 000000 280000 300000 480000 3C0003
3 T 00000D 02 0015
4 T 000015 15 000000 0C0000 000000 0C0000 480000 080000 4C0000
5 T 000016 02 002A
6 T 00002A 03 454F46
7 T 00001C 02 002D
8 T 00002D 03 000003
9 T 00000A 02 0030
10 T 000030 03 000000
11 T 000001 02 0033
12 T 000025 02 0033
13 T 000007 02 0036
14 T 00001F 02 0036
15 T 000019 02 0039
16 T 000004 02 1039
17 T 001039 1E 040030 000030 E00000 30103F D80000 280030 300000 54
18 T 00104C 02 1057
19 T 001057 06 100036 4C0000
20 T 001040 02 105D
21 T 001046 02 105D
22 T 00105D 01 F1
23 T 001052 02 105E
24 T 00105E 03 001000
25 T 000010 02 1061
26 T 000022 02 1061
27 T 001061 18 040030 E00000 301064 508039 DC0000 2C0036 381064 4C
28 T 001065 02 1079
```

起始位置不為1000以M record 表示-(2)

The screenshot shows a terminal window with four tabs: '107213036_陳思蓓_SIC.py', '(test)SIC.txt', 'Output.txt', and another 'Output.txt'. The '(test)SIC.txt' tab contains assembly code, and the other two 'Output.txt' tabs show the generated binary output.

(test)SIC.txt Content:

```
1 . comment
2 | . indexed addressing
3 .. free format coding
4 . empty line detection
5 .. command line user filenames input
6
7 COPY START 0000 . program start here
8 FIRST STL RETADR
9 CLOOP JSUB RDREC
10 LDA LENGTH
11 COMP ZERO
12 JEQ ENDFIL
13 JSUB WRREC
14 J CLOOP
15 ENDFIL LDA EOF
16 STA BUFFER
17 LDA THREE
18 STA LENGTH
19 JSUB WRREC
20 LDL RETADR
21 | RSUB
22 EOF BYTE C 'EOF'
23 THREE WORD 3
24 ZERO WORD 0
25 RETADR RESW 1
26 LENGTH RESW 1
27 BUFFER RESB 4096
28 .
29 .
```

Output.txt Content:

Line Number	Content
34	M 000A 04
35	M 000D 04
36	M 0010 04
37	M 0013 04
38	M 0016 04
39	M 0019 04
40	M 001C 04
41	M 001F 04
42	M 0022 04
43	M 0025 04
44	M 103A 04
45	M 103D 04
46	M 1040 04
47	M 1043 04
48	M 1046 04
49	M 1049 04
50	M 104C 04
51	M 104F 04
52	M 1052 04
53	M 1055 04
54	M 1058 04
55	M 1062 04
56	M 1065 04
57	M 1068 04
58	M 106B 04
59	M 106E 04
60	M 1071 04
61	M 1074 04
62	E 000000

同時報多行錯誤

The screenshot shows a code editor interface with three tabs at the top: '107213036_陳思蓓_SIC.py', '(test)SIC.txt X', and 'Output.txt'. The '(test)SIC.txt' tab is active, displaying assembly code. The code includes several lines of assembly with specific tokens highlighted in red or yellow. The errors are:

- Line 23: 'THREE WORD KK' - 'KK' is highlighted in yellow.
- Line 29: 'LDA LDA LDA' - All three 'LDA' instructions are highlighted in red.
- Line 34: 'RLOOP TD INPUT' - Both 'RLOOP' and 'INPUT' are highlighted in yellow.
- Line 39: 'STCH BUFFER ,T' - 'T' is highlighted in yellow.

Below the code editor, there is a navigation bar with 'PROBLEMS', 'OUTPUT', and 'TERMINAL'. The 'TERMINAL' tab is selected, showing the following error messages:

```
C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py
Error! Line 23 >>>>>>>WORD 後面接10進位的值
Error! Line 29 >>>>>>>mnemonic 或 假指令 總共有 3 個
Error! Line 34 >>>>>>>Label重複定義 RLOOP
Error! Line 39 >>>>>>>索引定址格式有誤
```

正確的情況

1. 起始位置可以更改
2. RSUB 前可以有 Label
3. 索引定址前後可以空白
4. BYTE型態與內容之間可以空白
5. BYTE 內容都可以無限
6. 程式名會補到6個字
7. END後面可以加已到symbol table的 label

RSUB 前可以有 Label

The screenshot shows a terminal window with three tabs: '107213036_陳思蓓_SIC.py', '(test)SIC.txt', and 'Output.txt'. The '(test)SIC.txt' tab displays assembly code with labels and instructions. The 'Output.txt' tab shows the corresponding binary output. The terminal below shows the command run and a success message.

Line Number	Assembly Instruction	Binary Output
41	EXIT STX LENGTH	
42	RSUB	
43	INPUT BYTE X'F1'	
44	MAXLEN WORD 4096	
45	.	
46	.	
47	.	
48		
49	WRREC LDX ZERO . . subroutine	
50	WLOOP TD OUTPUT	
51	JEQ WLOOP	
52	LDCH BUFFER, X	
53	WD OUTPUT	
54	TIX LENGTH	
55	JLT WLOOP	
56	TEST_RSUB	
57	OUTPUT BYTE X'05'	
58	END FIRST	
59		
60	... end of this program	
61		
9	T 00100A 02 1030	
10	T 001030 03 000000	
11	T 001001 02 1033	
12	T 001025 02 1033	
13	T 001007 02 1036	
14	T 00101F 02 1036	
15	T 001019 02 1039	
16	T 001004 02 2039	
17	T 002039 1E 041030 001030 E00000 30203F D80000 281030 300000 549039 2C0000 38203F	
18	T 00204C 02 2057	
19	T 002057 06 101036 4C0000	
20	T 002040 02 205D	
21	T 002046 02 205D	
22	T 00205D 01 F1	
23	T 002052 02 205E	
24	T 00205E 03 001000	
25	T 001010 02 2061	
26	T 001022 02 2061	
27	T 002061 18 041030 E00000 302064 509039 DC0000 2C1036 382064 4C0000	
28	T 002065 02 2079	
29	T 00206E 02 2079	
30	T 002079 01 05	
31	E 001000	

PROBLEMS OUTPUT TERMINAL

> ✓ TERMINAL

C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py
執行成功，結果已寫入 Output.txt

索引定址前後可以空白

The screenshot shows a debugger interface with two panes. The left pane displays assembly code with line numbers 37 through 48. Line 38 contains the instruction `STCH BUFFER.....,.....X`, which is highlighted with a red underline. The right pane shows a memory dump with entries from 12 to 23, each consisting of a byte value followed by four hex bytes. A blue rectangle highlights the value `549039` at address 17, which corresponds to the byte value `1E` in the assembly dump.

Address	Value	Description
12	T 001025 02 1033	
13	T 001007 02 1036	
14	T 00101F 02 1036	
15	T 001019 02 1039	
16	T 001004 02 2039	
17	T 002039 1E 041030 001030 E00000 30203F D80000 281030 300000 549039	Byte value 1E highlighted in blue
18	T 00204C 02 2057	
19	T 002057 06 101036 4C0000	
20	T 002040 02 205D	
21	T 002046 02 205D	
22	T 00205D 01 F1	
23	T 002052 02 205E	

PROBLEMS OUTPUT TERMINAL

> ▾ TERMINAL

C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py
執行成功，結果已寫入 Output.txt

BYTE型態與內容之間可以空白

```
107213036_陳思蓓_SIC.py (test)SIC.txt Output.txt

1 EOF BYTE C 'EOF'
2 THREE WORD 3
3 ZERO WORD 0
4 RETADR RESW 1
5 LENGTH RESW 1
6 BUFFER RESB 4096
7 .
8 .
9 .
10 RDREC LDX ZERO .. subroutine
11 LDA ZERO
12 RLOOP TD INPUT
13 JEQ RLOOP
14 RD INPUT
15 COMP ZERO
16 JEQ EXIT
17 STCH BUFFER ,X
18 TIX MAXLEN
19 JLT RLOOP
20 EXIT STX LENGTH
21 RSUB
22 INPUT BYTE X 'F1'
23 MAXLEN WORD 4096

1 H COPY 000000 00107A
2 T 000000 15 140000 480000 000000 280000 300000 480000 3C0003
3 T 00000D 02 0015
4 T 000015 15 000000 0C0000 000000 0C0000 480000 080000 4C0000
5 T 000016 02 002A
6 T 00002A 03 454F46
7 T 00001C 02 002D
8 T 00002D 03 000003
9 T 00000A 02 0030
10 T 000030 03 000000
11 T 000001 02 0033
12 T 000025 02 0033
13 T 000007 02 0036
14 T 00001F 02 0036
15 T 000019 02 0039
16 T 000004 02 1039
17 T 001039 1E 040030 000030 E00000 30103F D80000 280030 300000 548039 2C0000 38103F
18 T 00104C 02 1057
19 T 001057 06 100036 4C0000
20 T 001040 02 105D
21 T 001046 02 105D
22 T 00105D 01 F1
23 T 001052 02 105E
```

PROBLEMS OUTPUT TERMINAL

> TERMINAL

C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py
執行成功，結果已寫入 Output.txt

BYTE 內容都可以無限

The screenshot shows a code editor interface with two tabs: (test)SIC.txt and Output.txt.

(test)SIC.txt:

```
16    SIA BUFFER
17    LDA THREE
18    STA LENGTH
19    JSUB WRREC
20    LDL RETADR
21    |    RSUB
22    EOF BYTE C 'ABCDEFGHIJKLMNPQRSTUVWXYZ00000'
23    THREE WORD 3
24    ZERO WORD 0
25    RETADR RESW 1
26    LENGTH RESW 1
27    BUFFER RESB 4096
28    .
29    .
30    .
31    RDREC LDX ZERO .. subroutine
32    LDA ZERO
33    RLOOP TD INPUT
34    JEQ RLOOP
35    RD INPUT
36    COMP ZERO
37    JEQ EXIT
38    STCH BUFFER ,X
39    TIX MAXLEN
40    JLT RLOOP
41    EXIT STX LENGTH
42    RSUB
43    INPUT BYTE X 'F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0F1F2F3
44    MAXLEN WORD 4096
45    .
46    .
```

Output.txt:

```
1   H COPY 001000 0010BD
2   T 001000 15 140000 480000 000000 280000 300000 480000 3C1003
3   T 001000 02 1015
4   T 001015 15 000000 0C0000 000000 0C0000 480000 080000 4C0000
5   T 001016 02 102A
6   T 00102A 1E 4142434445464748494A4B4C4D4E4F505152535455565758595A30303030
7   T 001048 01 30
8   T 00101C 02 1049
9   T 001049 03 000003
10  T 00100A 02 104C
11  T 00104C 03 000000
12  T 001001 02 104F
13  T 001025 02 104F
14  T 001007 02 1052
15  T 00101F 02 1052
16  T 001019 02 1055
17  T 001004 02 2055
18  T 002055 1E 04104C 00104C E00000 30205B D80000 28104C 300000 549055 2C0000 38205
19  T 002068 02 2073
20  T 002073 06 101052 4C0000
21  T 00205C 02 2079
22  T 002062 02 2079
23  T 002079 1E F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0
24  T 002097 0A F1F2F3F4F5F6F7F8F9F0
25  T 00206E 02 20A1
26  T 0020A1 03 001000
27  T 001010 02 20A4
28  T 001022 02 20A4
29  T 0020A4 18 04104C E00000 3020A7 509055 DC0000 2C1052 3820A7 4C0000
30  T 0020A8 02 20BC
31  T 0020B1 03 000000
```

TERMINAL:

```
C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py
執行成功，結果已寫入 Output.txt
```

BYTE 內容都可以無限- C

指令

```
EOF BYTE C 'ABCDEFGHIJKLMNOPQRSTUVWXYZ00000'
```

Object code

```
T 00102A 1E 4142434445464748494A4B4C4D4E4F505152535455565758595A30303030
T 001048 01 30
```

BYTE 內容都可以無限- X

指令

```
43    INPUT BYTE X      'F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0'
```

Object code

```
T 002079 1E F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0F1F2F3F4F5F6F7F8F9F0
T 002097 0A F1F2F3F4F5F6F7F8F9F0
```

程式名會補到6個字

The screenshot shows a terminal window with three tabs: '107213036_陳思蓓_SIC.py', '(test)SIC.txt', and 'Output.txt'. The '(test)SIC.txt' tab displays assembly code with line numbers from 1 to 23. The 'Output.txt' tab displays a binary dump with line numbers from 1 to 23, corresponding to the assembly code. The assembly code includes comments, indexed addressing, free format coding, empty line detection, command line user filenames input, and various instructions like CSB, FIRST, STL, RETADR, CLOOP, JSUB, RDREC, LDA, COMP, ZERO, JEQ, ENDFIL, JSUB, WRREC, STA, LENGTH, EOF, RSUB, and WORD.

Line	Assembly	Output
1	. comment	
2	. indexed addressing	
3	.. free format coding	
4	. empty line detection	
5	.. comand line user filenames input	
6		
7	CSB START 1000 . program start here	1 H CSB 001000 00107A
8	FIRST STL RETADR	2 T 001000 15 140000 480000 000000 280000 300000 480000 3C1003
9	CLOOP JSUB RDREC	3 T 00100D 02 1015
10	LDA LENGTH	4 T 001015 15 000000 0C0000 000000 0C0000 480000 080000 4C0000
11	COMP ZERO	5 T 001016 02 102A
12	JEQ ENDFIL	6 T 00102A 03 454F46
13	JSUB WRREC	7 T 00101C 02 102D
14	J CLOOP	8 T 00102D 03 000003
15	ENDFIL LDA EOF	9 T 00100A 02 1030
16	STA BUFFER	10 T 001030 03 000000
17	LDA THREE	11 T 001001 02 1033
18	STA LENGTH	12 T 001025 02 1033
19	JSUB WRREC	13 T 001007 02 1036
20	LDL RETADR	14 T 00101F 02 1036
21	RSUB	15 T 001019 02 1039
22	EOF BYTE C 'EOF'	16 T 001004 02 2039
23	THREE WORD 3	17 T 002039 1E 041030 001030 E00000 30203F D80000 281030 300000 549039 2C0000 38203F
		18 T 00204C 02 2057
		19 T 002057 06 101036 4C0000
		20 T 002040 02 205D
		21 T 002046 02 205D
		22 T 00205D 01 F1
		23 T 002052 02 205E

END後面可以加已存到symbol table的 label

The screenshot shows a terminal window with three tabs: PROBLEMS, OUTPUT, and TERMINAL. The TERMINAL tab is active, displaying the command and its output:

```
C:\Users\SiBaChen\Desktop\大四下\系統程式>107213036_陳思蓓_SIC.py  
執行成功，結果已寫入 Output.txt
```

The left pane shows assembly code in a text editor:

```
107213036_陳思蓓_SIC.py      (test)SIC.txt X      ...      (test)SIC.txt  
41 EXIT STX LENGTH  
42 RSUB  
43 INPUT BYTE X'F1'  
44 MAXLEN WORD 4096  
45 .  
46 .  
47 .  
48  
49 WRREC LDX ZERO    . . subroutine  
50 WLOOP TD OUTPUT  
51 JEQ WLOOP  
52 LDCH BUFFER, X  
53 WD OUTPUT  
54 TIX LENGTH  
55 JLT WLOOP  
56 TEST RSUB  
57 OUTPUT BYTE X'05'  
58 END INPUT
```

The middle pane shows a symbol table with entries:

Label	Type	Value
00204C	T	02 2057
002057	T	06 101036 4C00
002040	T	02 205D
002046	T	02 205D
00205D	T	01 F1
002052	T	02 205E
00205E	T	03 001000
001010	T	02 2061
001022	T	02 2061
002061	T	18 041030 E000
002065	T	02 2079
00206E	T	02 2079
002079	T	01 05
00205D	E	00205D

The right pane shows the contents of the Output.txt file:

```
Output.txt  
18 T 00204C 02 2057  
19 T 002057 06 101036 4C00  
20 T 002040 02 205D  
21 T 002046 02 205D  
22 T 00205D 01 F1  
23 T 002052 02 205E  
24 T 00205E 03 001000  
25 T 001010 02 2061  
26 T 001022 02 2061  
27 T 002061 18 041030 E000  
28 T 002065 02 2079  
29 T 00206E 02 2079  
30 T 002079 01 05  
31 E 00205D
```