System Software - Machine Architecture.

- SIC — RISC
- SIC/XE — CISC

- SIC
  - Memory.
    - 2^{15} → 15-bit address.

  - Registers
    - A, X, L, PC, SW

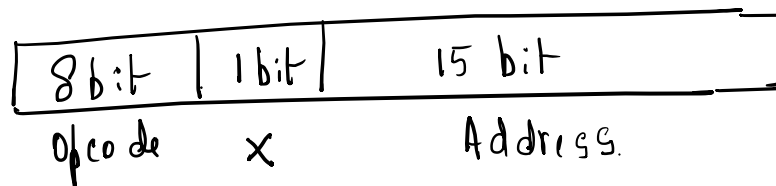 - Data formats
    - Integers, characters

  - Instruction format.
    - 24-bit in length

8 bit	1 bit	15 bit
Opcode	X	Address.

24: Word Length.

  - Addressing modes
    → Direct Addressing.
      → X = 0
      EA = Address mentioned in the

addressing field.

– <u>Indexed</u> Addressing

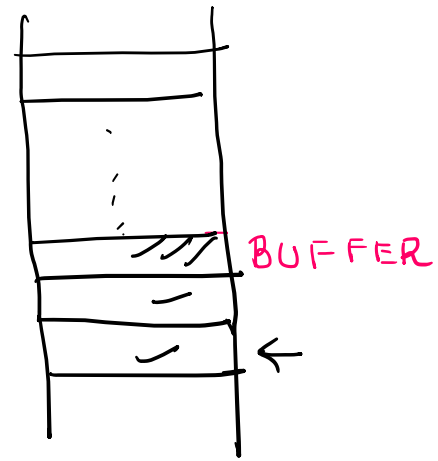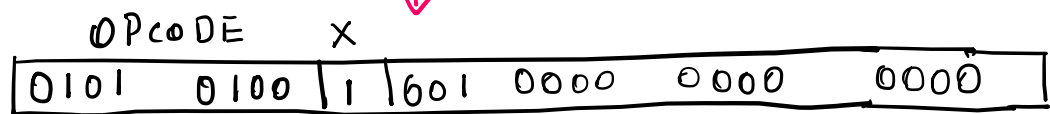$$\rightarrow X = 1$$

$$EA = [X] + \text{Address field.}$$

<u>STCH</u>   BUFFER, X   → Indexed addressing

54

→ Direction given to the assembler to use indexed addressing

Assembler
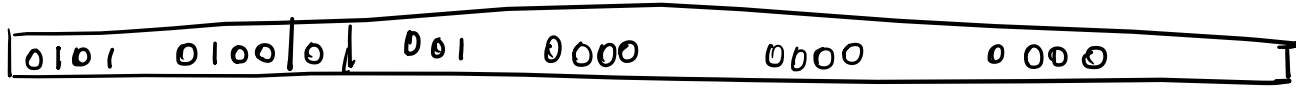
OPCODE   X

| 0101 | 0100 | 1 | 601 | 0000 | 0000 | 0000 |

5   4   9   0   0   0

1000

STCH   Indexed.   Address.

Store the character

$$EA = 1000 + [X]$$

| 0101 | 0100 | 0 | 001 | 0000 | 0000 | 0000 |

STCH   BUFFER

— Instruction set
  — (Integer) arithmetic instructions
      — ADD
      — SUB   } A
      — MUL
      — DIV

ADD   ALPHA

$(A) \leftarrow (A) + (ALPHA)$

BETA | 9 |
ALPHA | 1 |
DELTA | A |
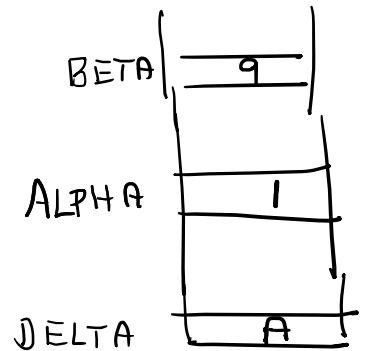
DELTA = ALPHA+BETA

ADD   DELTA, ALPHA, BETA

— Load and store.

  — LDA, STA

  — LDX, STX

  — LDCH, STCH

LDA   BETA $A \leftarrow 9$
ADD   ALPHA $A \leftarrow \dfrac{9+1}{10}$

STA   DELTA   DELTA $\leftarrow$ A

→ Comparison instruction.

  — A → operand.

     CMP   ALPHA

if (ALPHA > @)

< A

== A

CC

EQ	LT	GT	---

— Conditional Jump instructions

Branch.

— JLT, JGT, JEQ.

— J

While ( )

(Repeat)

— Subroutine

— JSUB.
— RSUB.

— Input and Output

— Device is ready.

TD

WD|RD.

DEV1

EQ. Read   TD DEV1
         JEQ Read.
         RD DEV1
         _____
              A

WRITE TD   DEV2
       JEQ   WRITE
       WD   DEV2

SIC/XE - Machine Architecture.

- **Memory**
  - 24 bit
  - 2^{20} bytes

2^{15}

- **Registers**

A	0
X	1
L	2.
PC	8
SW	9.

B	3	Base register } Relation. Addressing
S	4.	} General Working register.
T	5	
F	6	Floating point Accumulator.

(48 bit)

— Data formats
  — Integers
  — Character
  — Floating point : 48 bit

S	Exponent	fraction

1   11   36
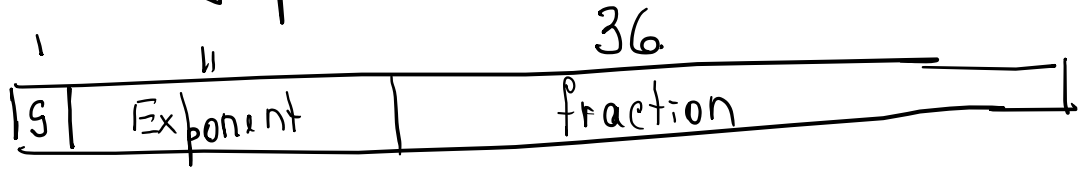
— Instruction formats
  — 4 types of instruction.
     formats.