Altair Manual Part 1 notes

Saturday, August 30, 2025 1:26 PM

Part 1: Introduction

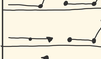
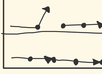
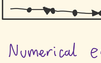
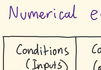
- Altair 8800 has 78 machine language instructions
- You can learn how to use it even if you have little to no knowledge if you read this manual

A. Logic

- George Boyle a nineteenth century British mathematician made a detailed study of the relationship between certain fundamental logic and expressions and their arithmetic counter parts
- His logic is frequently called Boolean Algebra
- Boolean: True or False
- Can it be both or partially true and partially false
- ON = true
- Off = false
- An electronic analogy of a logical statement can be readily synthesized
- Three basic logic statements:
  - And: TRUE if all of its logic condition are true
  - Or: TRUE if any of its logic conditions is true
  - Not: Just flip flops; A true statement is false and a false statement is true
  - Off = 0
  - On = 1

Conditions (Inputs)	Conclusion (outputs)
False And False	False
False And True	False
True And False	False
True And True	True

Electronic ON-OFF switch equivalent

Conditions (Off - on)	Conclusion (output)
	0
	0
	0
	1

Numerical equivalents

Conditions (Inputs)	Conclusion (outputs)
0 AND 0	0
0 AND 1	0
1 And 0	0
1 And 1	1

Truth table

And

A	B	out
0	0	0
0	1	0
1	0	0
1	1	1

OR

A	B	out
0	0	0
0	1	1
1	1	1
1	1	1

Not

A	out
0	1
1	0

B. Electronic Logic

- 3 basic logic functions can be used by a simple transistor circuits

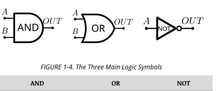


FIGURE 1-4. The Three Main Logic Symbols

AND			OR			NOT	
A	B	OUT	A	B	OUT	A	OUT
0	0	0	0	0	0	0	1
0	1	0	0	1	1	1	0
1	0	0	1	0	1		
1	1	1	1	1	1		

- Three basic logic circuits can be combined to produce more logic analogies such as NAND (NOT-AND) and NOR (NOT-OR)

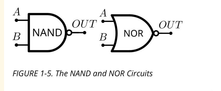
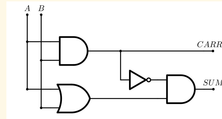


FIGURE 1-5. The NAND and NOR Circuits

NAND			NOR		
A	B	OUT	A	B	OUT
0	0	1	0	0	1
0	1	1	0	1	0
1	0	1	1	0	0
1	1	0	1	1	0

- Three or more logic circuits make a logic system
- Most basic logic systems is the EXCLUSIVE OR circuit

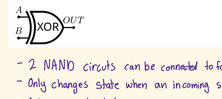


A	B	A and B	not (A and B)	A or B	(not (A and B) and (A or B))
CARRY					OUT a.k.a. SUM
0	0	0	1	0	0
0	1	0	1	1	1
1	0	0	1	1	1
1	1	1	0	1	0

- EXCLUSIVE-OR circuit can be used to implement logical functions and it can be used to add two or more input conditions
- Compatible with the binary number system
- Often called a binary adder

A	B	A + B	
	CARRY	SUM	RESULT
0	0	0	0	00
0	1	0	1	01
1	0	0	1	01
1	1	1	0	10

Typically, when referring to an Exclsive OR (XOR), the CARRY is ignored, and it is graphically represented as:



- 2 NAND circuits can be connected to form a bistable circut called a flip-flop
- Only changes state when an incoming signal in the form of a pulse arrives
- Acts as a short term memory element
- Combine multiple and they make a memory register

- Other logic circuits can be connected together to form monostable and astable circuits
  - Monostable: occupy one of two states unless an incoming pulse is recived
  - Astable: Continually switch back and forth between 2 states

C. Number Systems

- 10 digits
- Dual-state electronic circuits are highly compatable with a two digit system

D. The binary system

- Altair 8800 performs nearly all operations in binary
- learned this in freshman yeare