Introduction to Computers

Introduction to Computers
First Term (Laboratory)

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Tu, Th: 11:00-14:00 (send email first)
Other moment: by appointment
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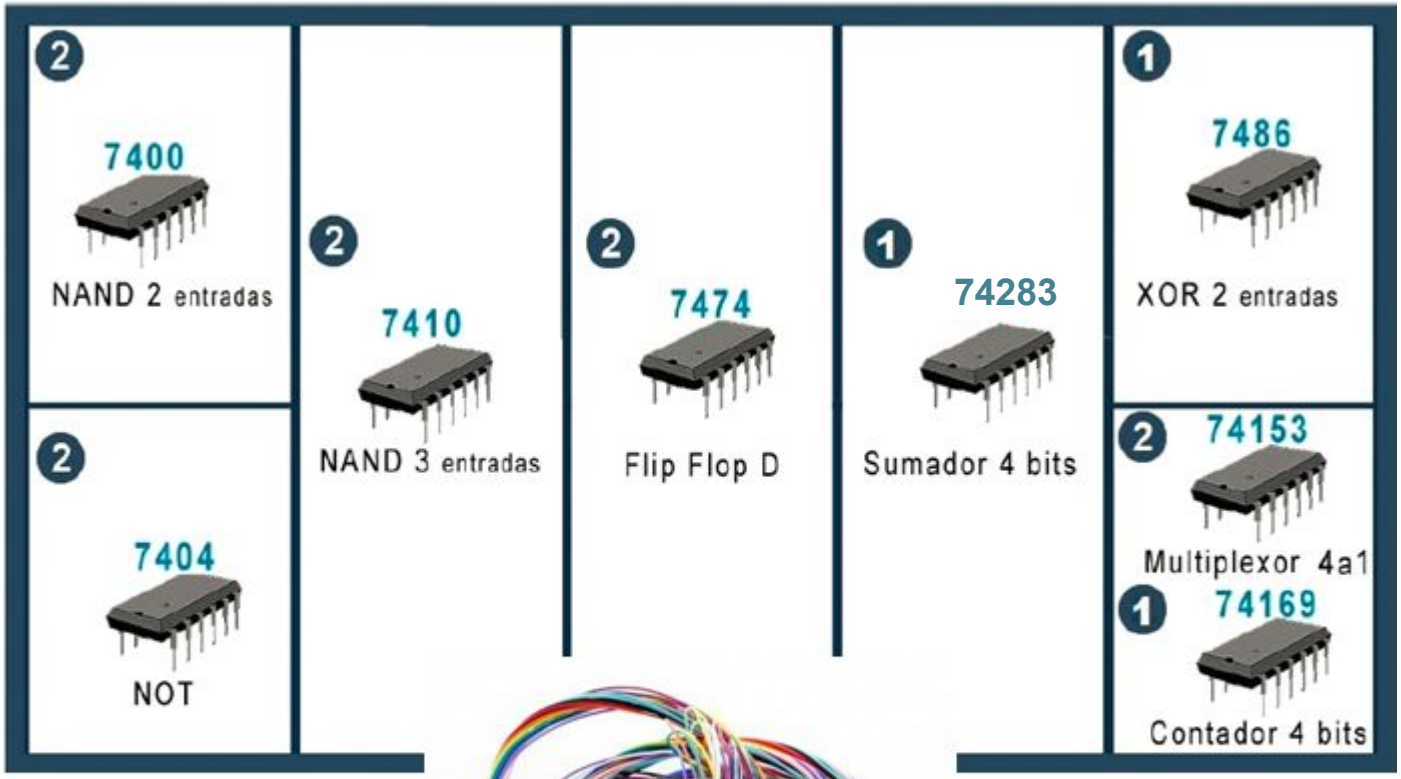
Laboratory

- ✓ Lab 1: Building a combinational circuit using logic gates
- ✓ Lab 2: Designing and building a 2-bit binary adder
- ✓ Lab 3: Id. pattern recognizer
- ✓ Lab 4: Id. multifunctional register
- ✓ Lab 5: Id. circuit that emulates the behavior of an elevator control panel

Lab briefcase



Datasheets

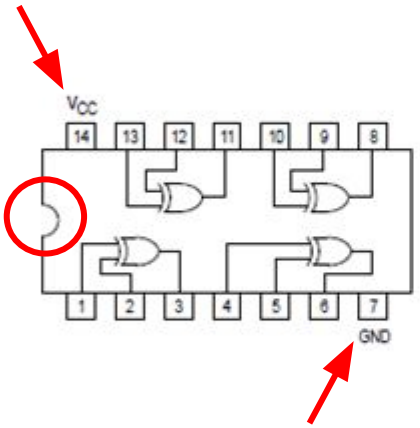
MOTOROLA

QUAD 2-INPUT EXCLUSIVE OR GATE

SN54/74LS86

QUAD 2-INPUT
EXCLUSIVE OR GATE

LOW POWER SCHOTTKY



TRUTH TABLE

IN		OUT
A	B	Z
L	L	L
L	H	H
H	L	H
H	H	L

J SUFFIX
CERAMIC
CASE 632-08

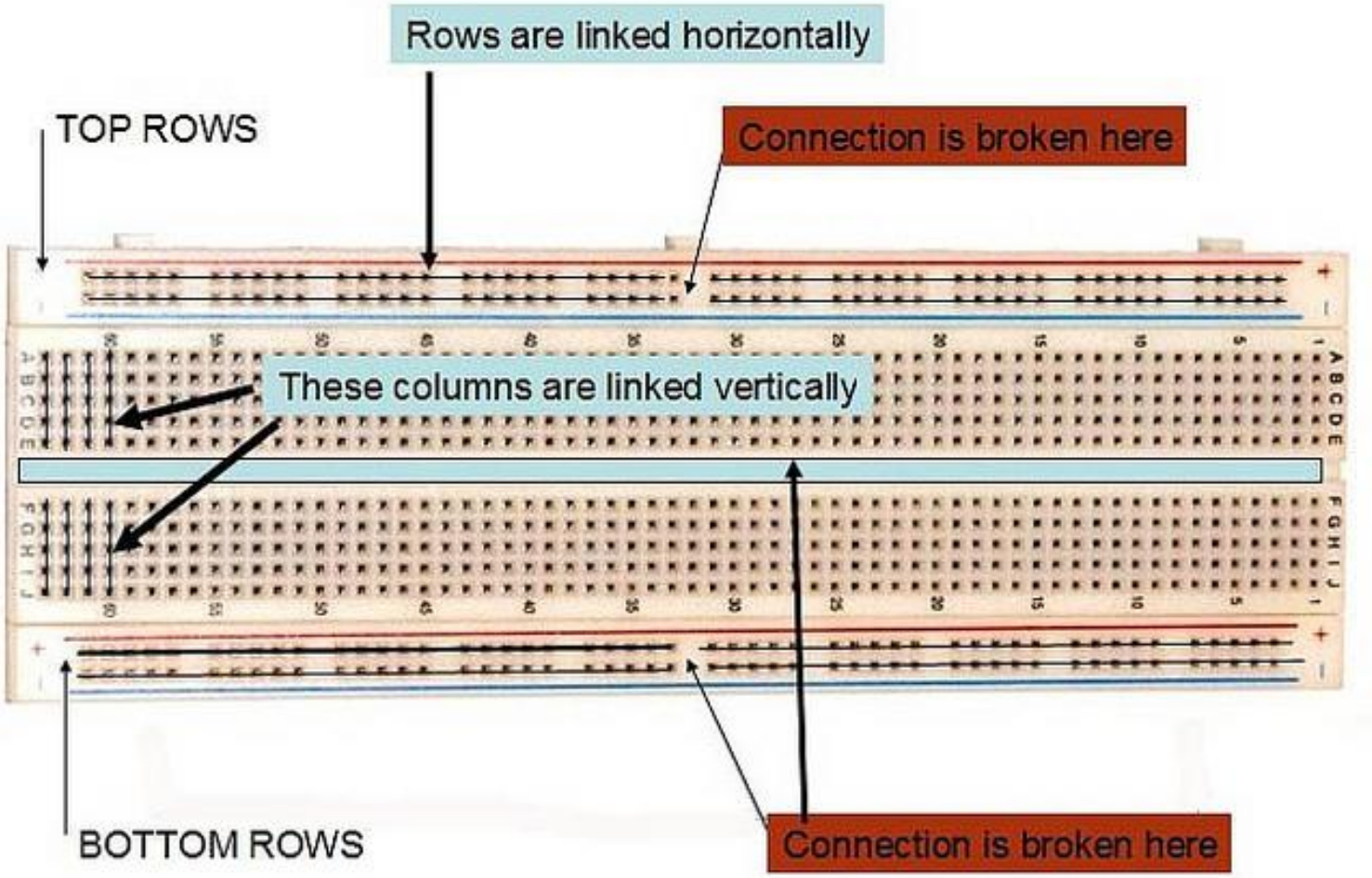
N SUFFIX
PLASTIC
CASE 646-06

D SUFFIX
SOIC
CASE 751A-02

ORDERING INFORMATION

SN54LSXXJ Ceramic

Breadboard


Rows are linked horizontally
TOP ROWS
Connection is broken here
These columns are linked vertically
BOTTOM ROWS
Connection is broken here

How to get the lab material

- ✓ Request a lab account:
  - Info. at Portal FDI: https://www.fdi.ucm.es/Account
  - Directly at: http://informatica.ucm.es/cuenta-labs
- ✓ Request your lab material
  - All the information is also at https://www.fdi.ucm.es/Account
- ✓ Take the material from "Sala de técnicos 2" - FDI
- ✓ Check in the lab, out of class time, that all the ICs are OK
  - Broken ICs are changed the first lab session
  - If later, the student must buy all the broken ICs
  - You will not get more wire: please, reuse it
- ✓ **Just after Lab #5**, all the material is returned
  - Do not return broken components and wires, please

Stores to buy/replace broken ICs

✓ Please, provide feedback to keep this list updated:

Diotronic: Calle Juan Bravo 58 (Madrid)

Electrónica Embajadores: Calle Embajadores, 138 (Madrid)

Telkron: Avd. Donostiarra,13 (Madrid)

Actrón: Calle Maudes, 15 (Madrid)

Array: Calle Juan de Austria, 20. (Madrid)

Digital: Calle Pilar de Zaragoza, 45. (Madrid)

Sonytel: Calle Cartagena, 132. (Madrid)

Sonytel: Calle Maudes, 4 (Madrid)

Sonytel: Calle Bravo Murillo, 82. (Madrid)

Training system

Additional equipment

Wire
Stripper

Multimeter

Chip
Tester

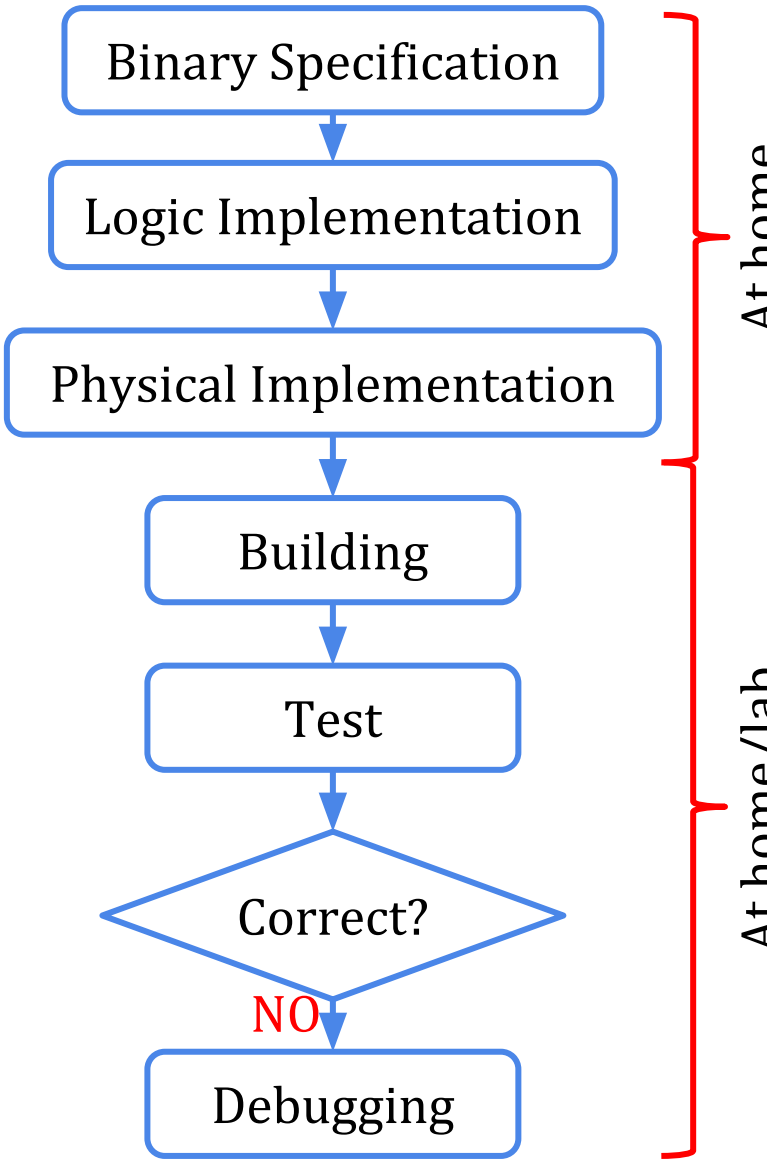
Equipment to practice at home (optional)

Alligator Clip

Battery

Multimeter

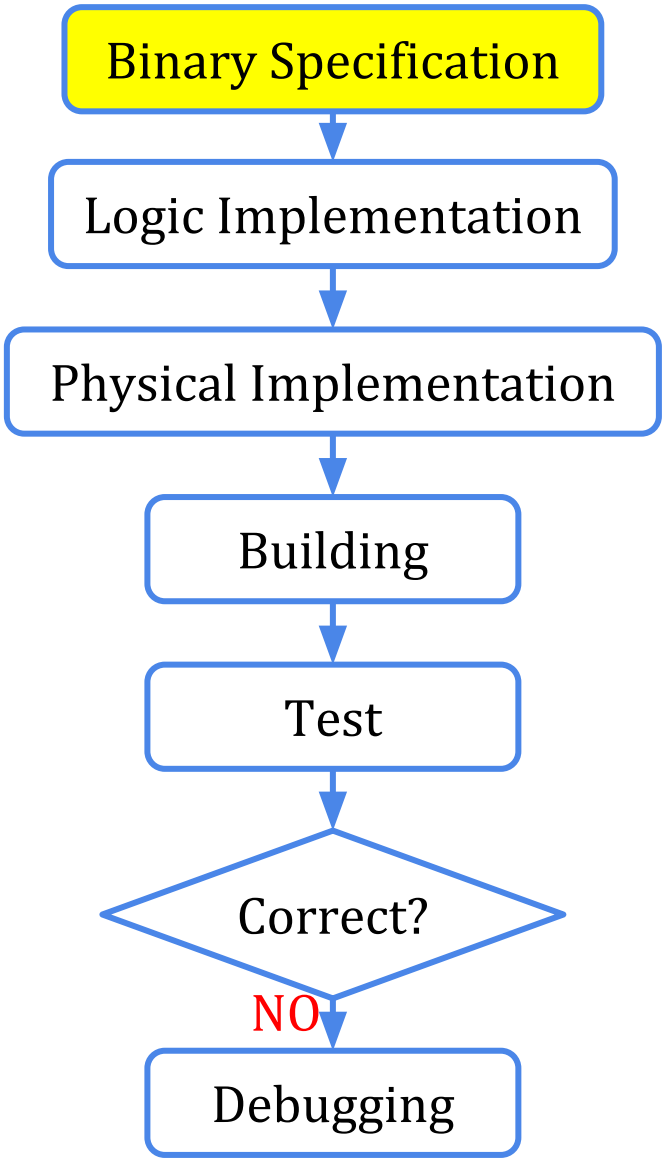
Design flow



- Study the lab script
- Fill the lab notebook

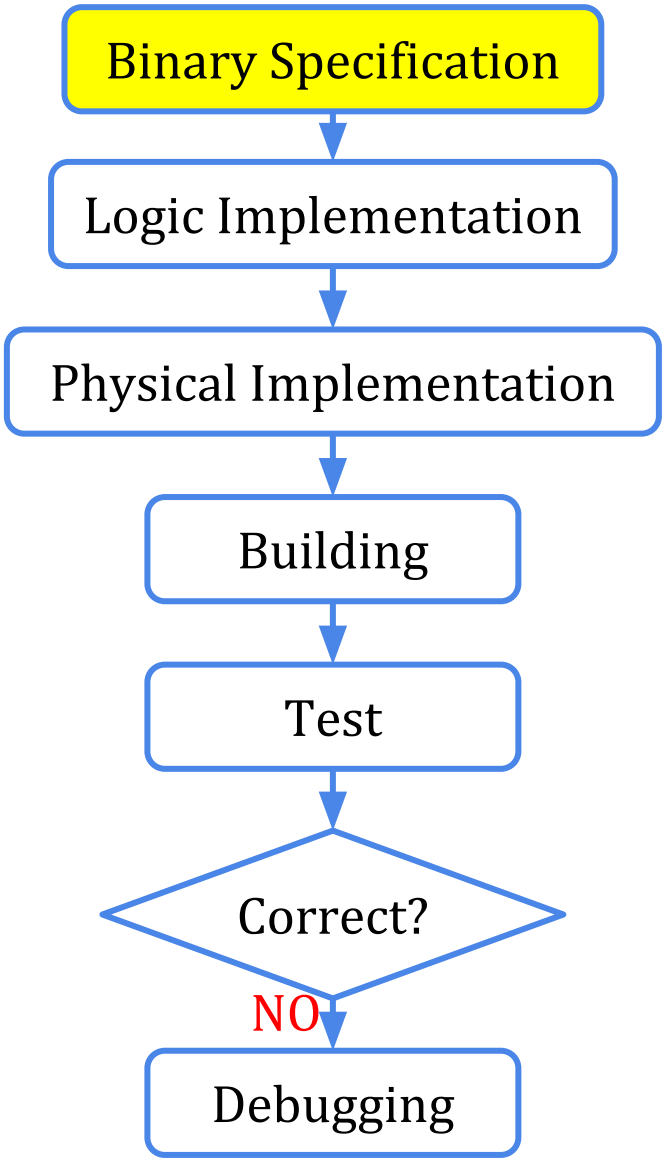
- Show to the professor
  - The lab notebook
  - The circuit working

Design flow



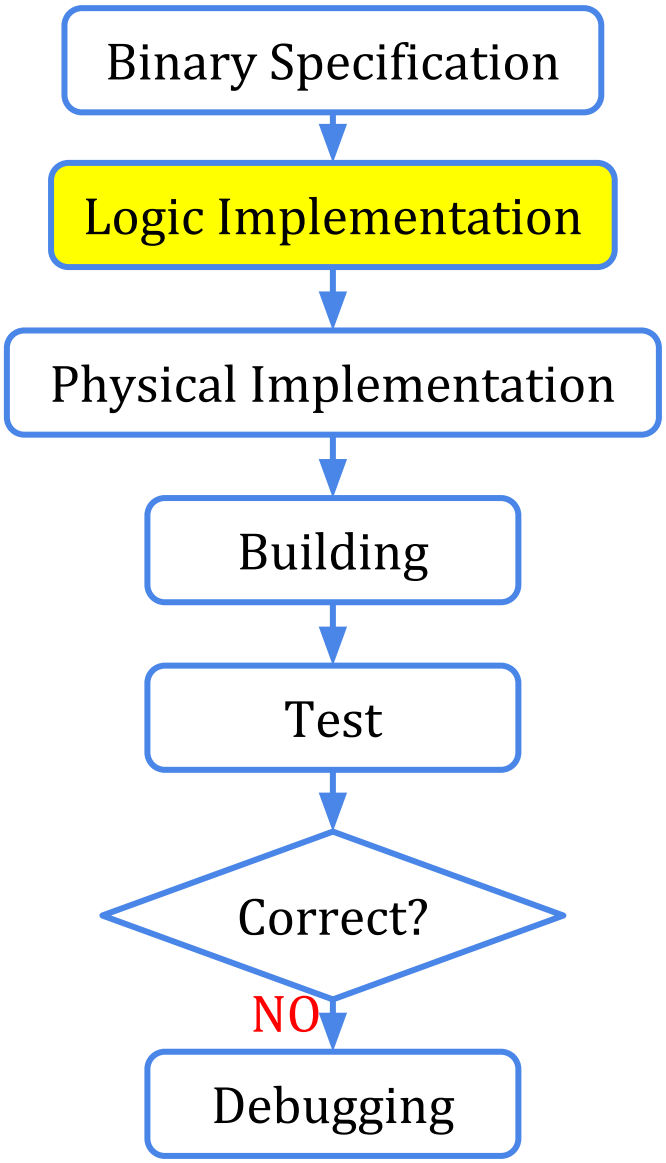
3-bit Gray		3-bit Binary	
0	000	0	000
1	001	1	001
2	011	2	010
3	010	3	011
4	110	4	100
5	111	5	101
6	101	6	110
7	100	7	111

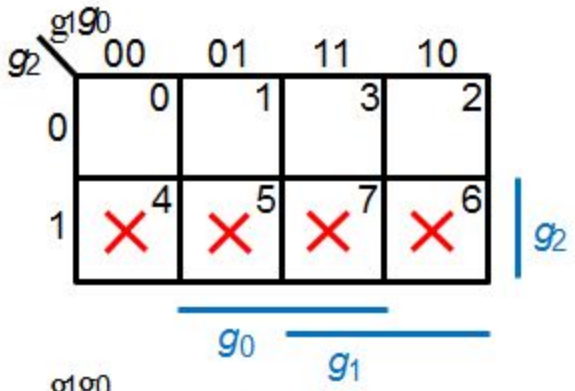
Design flow



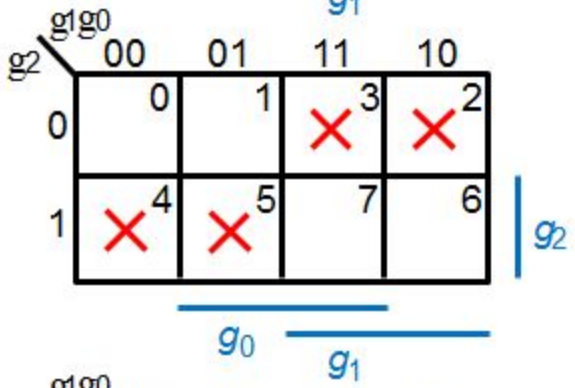
	g_2	g_1	g_0	b_2	b_1	b_0
0	0	0	0	0	0	0
1	0	0	1	0	0	1
2	0	1	0	0	1	1
3	0	1	1	0	1	0
4	1	0	0	1	1	1
5	1	0	1	1	1	0
6	1	1	0	1	0	0
7	1	1	1	1	0	1

Design flow

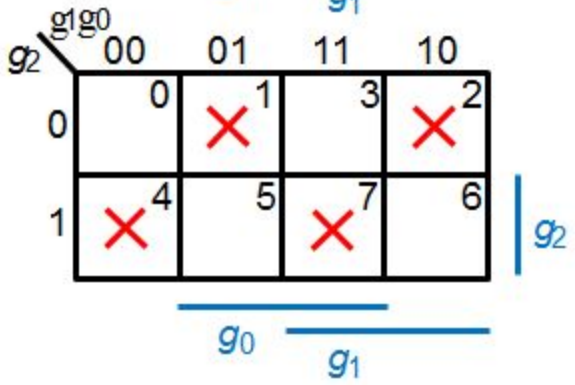




$b_2 = g_2$

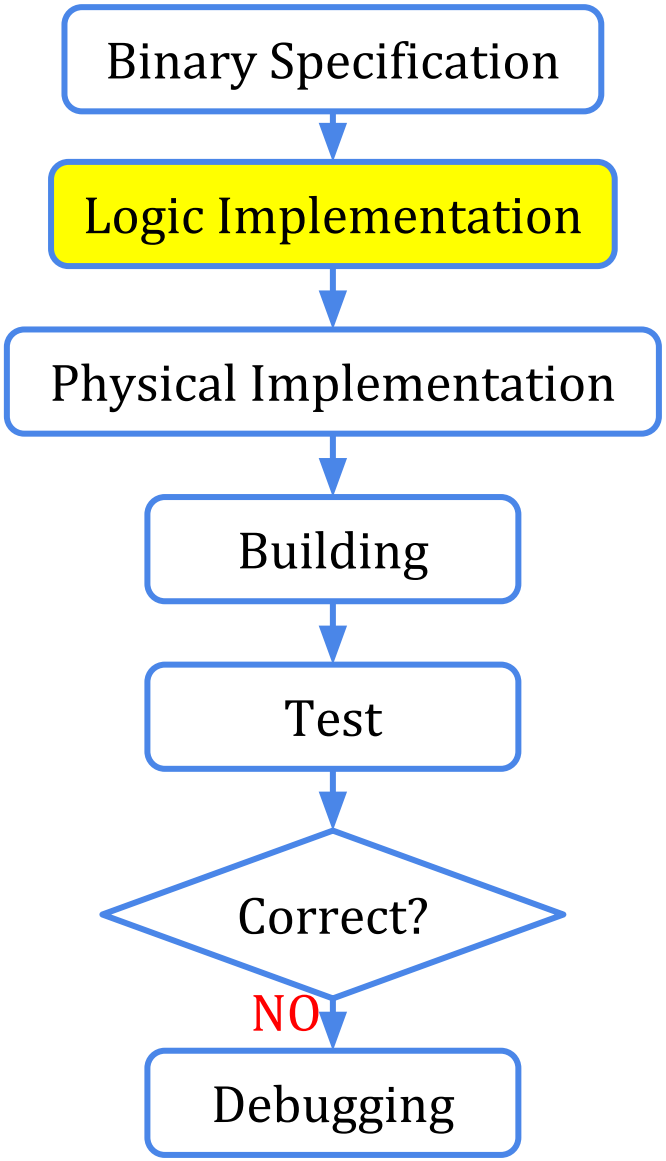


$b_1 = g_2 \oplus g_1$

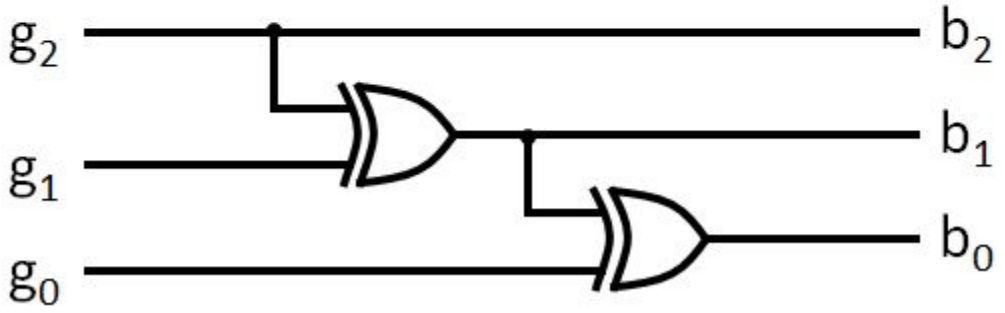


$b_0 = (g_2 \oplus g_1) \oplus g_0$

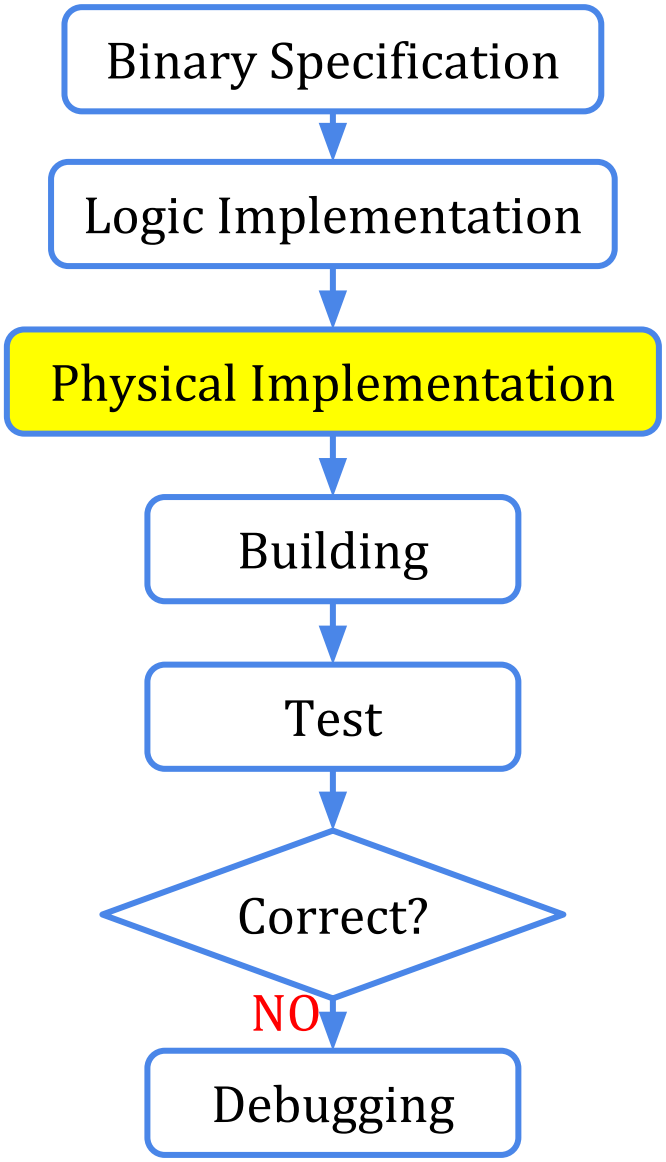
Design flow

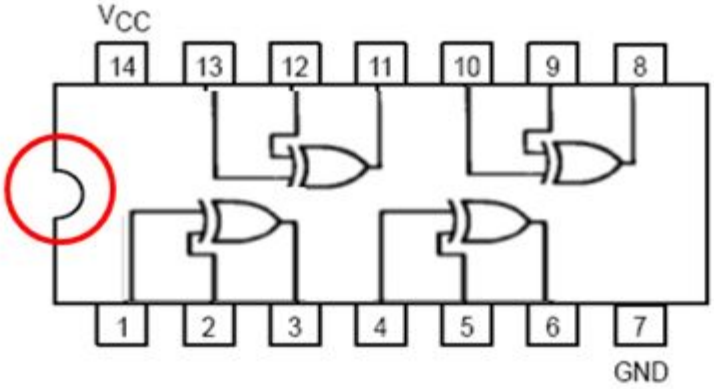


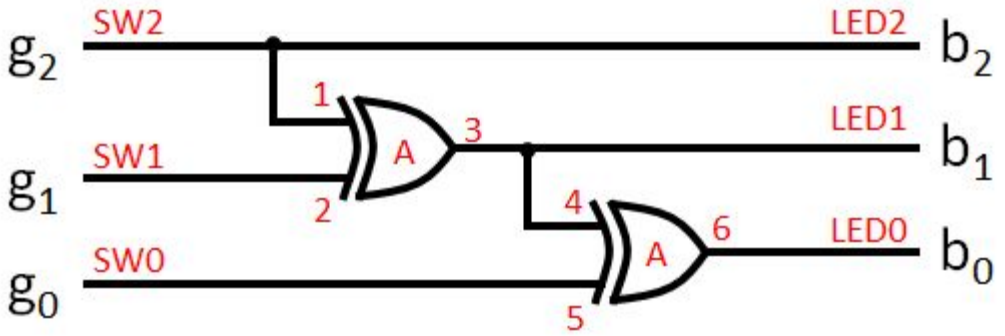
$$b_2 = g_2$$
$$b_1 = g_2 \oplus g_1$$
$$b_0 = (g_2 \oplus g_1) \oplus g_0$$



Design flow



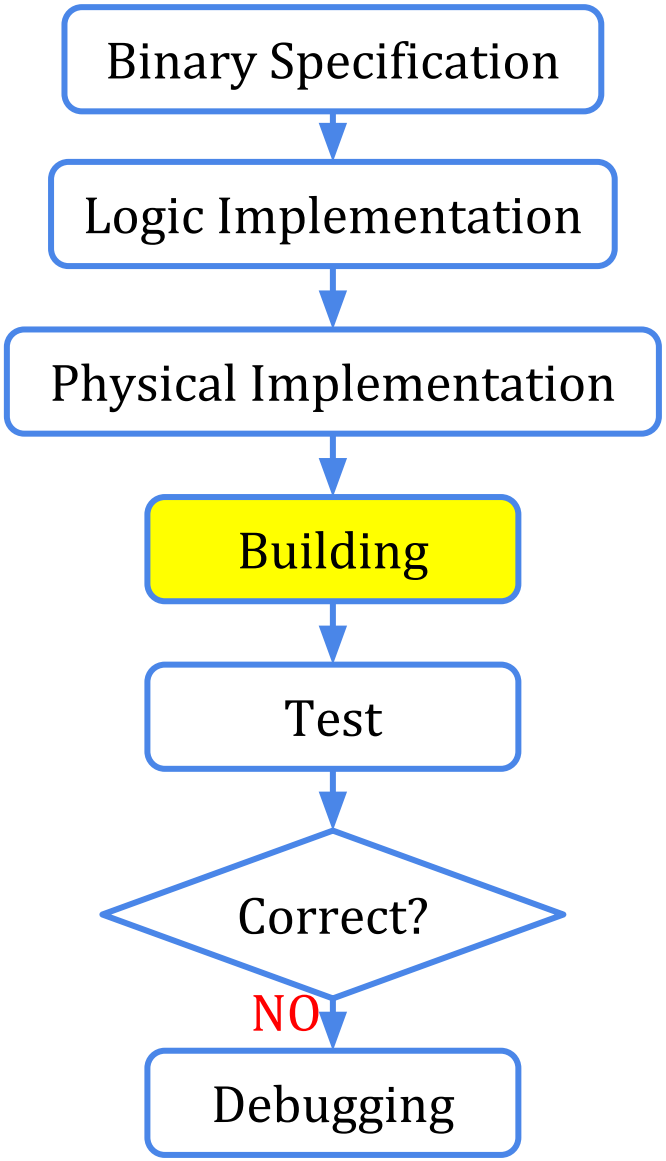


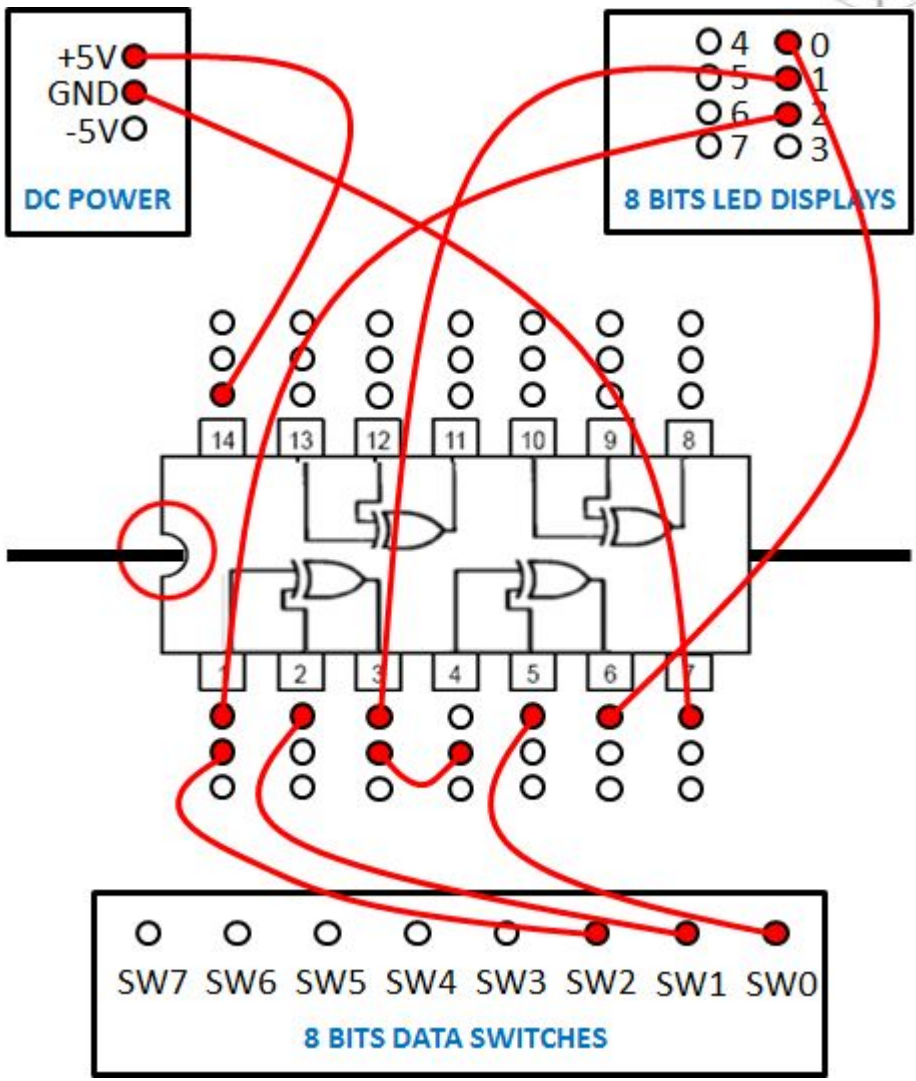


Components list:

- A: **7486** (GND – 7, +5V – 14)

Design flow


Binary Specification
Logic Implementation
Physical Implementation
Building
Test
Correct?
NO
Debugging


+5V
GND
-5V
DC POWER
4
5
6
7
0
1
2
3
8 BITS LED DISPLAYS
14
13
12
11
10
9
8
1
2
3
4
5
6
7
SW7 SW6 SW5 SW4 SW3 SW2 SW1 SW0
8 BITS DATA SWITCHES