

Lab. 01

Logic Design Lab.

Spring 2022

Prof. ChangGun Lee

(cglee@snu.ac.kr)

TA. Hayeon Park

TA. Haeojoo Jeon

TA. Dongmin Shin

(rubis.ld.ta@gmail.com)

Announcement (Important)

- **Please check etl announcement**
 - You must register for both 'CSE Student' and 'Logic Design Student' group **before the next lab session**.
(If not, you can not use PC in 302-310-2)
 - Refer the class announcement "Announcement for the first lab session" in the ETL

Team (Class No.1)

Team No.	Locker No.	Full Name
1	1	Choi Chi Won
		ROZIKOV Shamshod
		YI Minjune
2	1	KIM WOOJIN
		HO Duc Hieu
		YI Seungyeop
3	2	SEO BOSEONG
		BATBOLD Nomin-Erdene
		JEON Minseo
4	2	HAN Hyunwoo
		Eduardo Jesus AYERVE CRUZ
		AHN Joongwon
5	3	CHOI JEONGJU
		Yoon Junyoung
		KIM Jungwhee
6	3	Woojin Lee
		KWON Min Gyu
		LEE Jaemin
7	4	YE Sumin
		PARK Ye Seong
		JO Sung Min
8	4	HAN CHANGHEE
		MUN Jinyeong
		CHO Kanghyeon
9	5	KWAG SEUNG YEON
		YOON San Wool
		JANG Suhan
10	5	LEE MINYEONG
		PARK Dohyeon
		EOM Junho

Team No.	Locker No.	Full Name
11	6	CHOI Juhyeok
		HWANGBO Junhyeong
		BAE Sumin
12	6	SONG Seohyun
		PARK Haon
		CHUNG Yonghwan
13	7	Sangjee Hahn
		JUNG Jimin
		KHO Eun
14	7	SO Jaesung
		KIM Changa
		PARK Jaewan
15	8	BYUN Jiwon
		JEONG Hyunseo
		CHO Yonghyeon
16	8	SHIN Junwoo
		LEE Hyunjin
		HAN Jihun
17	9	YANG Sukhun
		JUN JINYONG
		CHO Jaepyeo
18	9	LEE Hoseok
		JEON Hyeonseong
		KIM Sowon
19	10	YANG Hyunseo
		PARK Seon Hong
		KIM On
20	10	AYE HSU WAI
		HUR Wonseok
		LEE Hadong

Team (Class No.2)

Team No.	Locker No.	Full Name
1	11	Taekmin Kim
		KIM Shinseo
		GO Gye-hun
2	11	NA Jung Hyun
		PARK Jeong-In
		KIM Jun Hee
3	12	CHA Joon Hyuk
		CHUN Jongwon
		PARK Yoon Ah
4	12	YANG CHANHYUK
		YI Daeun
		PARK Jaewan
5	13	Minghang LI
		SONG Sungmin
		PARK Jeongmin
6	13	KIM HUNSUNG
		Wai Yan KHIN
		KIM Inho
7	14	KIM HAYOUNG
		Butemj BAT-ORSHIKH
		JOO Seung-Min
8	14	LEE JUNSEOK
		NA Jungyun
		SEO Minkyun
9	15	KIM EUNHYE
		EOM Hyeonseong
		PARK Junbyung
10	15	NOH Taeyeong
		KIM Hyung June
		LEE Junyong

Team No.	Locker No.	Full Name
11	16	LEE Keon Hee
		NA Ye Kyung
		LEE Youngeun
12	16	CHO MINKYUNG
		SEOL Handong
		JIN Cheyon
13	17	LEE Eunjun
		KO Seunghyuk
		KIM Jung Hoon
14	17	HAM Junha
		CHO Yenah
		RYU Jimin
15	18	AN Jun-Young
		KO Jaeeun
		KIM Yongbeom
16	18	LEE Yewon
		CHOI Jaeung
		KIM Woosung
17	19	KIM Haeun
		KIM Hoin
		SONG Youngjin
18	19	KIM Daehyeop
		KIM Sebin
		LEE Mingyu
19	20	PARK Dongjun
		YOO Haeun
		CHOI Minwoo
20	20	YANG Taehyun
		KIM Jaeyun
		CHANG Juneseo

Team (Class No.3)

Team No.	Locker No.	Full Name
1	21	CHO Hyung Geun
		KIM Moo Yeon
		KIM Eunwoo
2	21	LEE You Been
		HWANG Yae Eun
		JUNG Hajin
3	22	LEE Nakyung
		SEONG Kyungho
		SEO Jimin
4	22	WOO Donggyun
		PARK Songhee
		KANG BOSUN
5	23	JIN Wonho
		PARK Seungwon
		KIM Sieun
6	23	LEE Min Woo
		JIN Sungchan
		HONG JEONGAH
7	24	LEE Jonghyun
		LEE Jun Ho
		HAN Seung Su
8	24	YOUN Hyeong Seo
		YI Seung Won
		SON Jeongwoo
9	25	SONG Ga Hyun
		PARK Sue Hyun
		LEE EUNBI
10	25	BAEK Seungwoo
		CHOI Sunghyeok
		YEO NAGYEONG

Team No.	Locker No.	Full Name
11	26	JO Yongchan
		CHO HYEONG JUN
		OH JEHEON
12	26	LEE Seungho
		CHUNG Yoonsuh
		HONG Juhan
13	27	KIM Minsoo
		JEON SUBEEN
		JEON MINJOO
14	27	CHOI Seungmin
		EOM Sae Hee
		HAN TAEHO
15	28	AHN Jaewoo
		WEON Youngbeen
		KIM Donghan
16	28	LEE Seungah
		JEONG JINAN
		BANG Myeong Ho
17	29	KIM Suhan
		JO EUJIN
		KIM Daeyou
18	29	CHOI HEERYANG
		YU Seungyeon
		CHOE Gyuseon
19	30	JEONG Chanah
		HUH JOOHEE
		YANG Dayeon
20	30	YOON Seodam
		YOO Ga Hyun
		LEE Sunjae

Seat

Front

Team1	Team6	Team11	Team16	Empty1	Empty6
Team2	Team7	Team12	Team17	Empty2	Empty7
Team3	Team8	Team13	Team18	Empty3	Empty8
Team4	Team9	Team14	Team19	Empty4	Empty9
Team5	Team10	Team15	Team20	Empty5	Empty10

Door

Too many e-mails... Let's filter them!

- Every time you are sending any mail to us, write 'LDLAB' in front of the title.
Also, please let us know who you are.

About the Locker

- 2 Teams use one locker together
- How to set password
 - Close door and press 4-digits (after reset password)
- How to reset password
 - Call T.A. so be careful.
- Sometimes it doesn't work properly because of battery problem.
 - Call T.A.

Notification

- For the report

There is no sample form.

Put today's results and homework altogether and make it as one file.

Follow the title format as described in 'Course Information'.

Course Information

- Report/Assignment
 - Weekly Task (can be written in Korean or English)
 - Your report should include:
 - Lab Result (Must include pictures)
 - Discussion (Concepts you learn during the lab session, any errors you made, how to correct your errors, etc.)
 - Should be a **single PDF file** and less than 30MB
 - Should be submitted by **email** following the rules in the next slide
 - **Deadline: Before the start of the next class**
(before 7:00pm)
 - Late Policy: +24h : -20% +48h: -50% +72h: -100%

Course Information

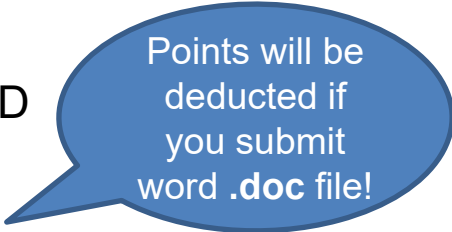
- Attendance
 - Arrive before the lecture is done: No penalty
 - After the lecture: -10%
 - Absent: -100%

Course Information

- COVID-19
 - Submit proof of confirmation by TA email before the lecture starts
 - No attendance check
 - Report score will be assign as your average score of the whole semester
 - If you are late for submitting, the report score will be assigned as 0

Course Information

- Rules for submitting reports / assignments
 - Submission: rubis.ld.ta@gmail.com
 - Email Title:
 - LDLAB_YYMMDD_class#_team#_NAME_StudentID
 - Report File Name:
 - LDLAB_YYMMDD_team#_NAME_StudentID.pdf
- (*YYMMDD : LAB CLASS DATE. Not the submission date.)**



Points will be deducted if you submit word .doc file!

EX)

email title : LDLAB_200409_001_team1_John Smith_2019-88888

report file name : LDLAB_200409_001_team1_John Smith_2019-88888.pdf

Course Information

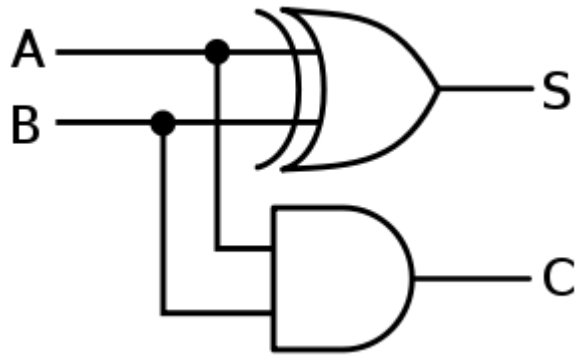
- **Cheating**
 - Zero tolerance
 - You will receive an 'F'
- **Laboratory Manners**
 - Save materials – don't be wasteful
 - Put all tools and materials back to their proper place
 - Clean up your desk and shut down the PC
- **“3 Strikes, 1 Out” Rule**
 - Three Warnings → -20% of entire lab grade
 - Examples of strike:
 - Dirty desk or dirty personal lab cabinet
 - Intolerable attitude

Contents

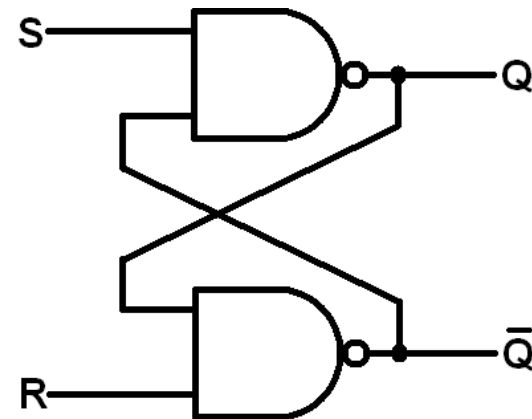
- **What you will learn:**
 - Combinational / Sequential logic circuit
 - Soldering / Prototyping
 - Schematic Design
 - Hardware Description Language (Verilog)
 - Hardware Simulation
 - Field-programmable Gate Array (FPGA) Programming
- **Final Project**
- **Practice Guideline**

What you will learn

- **Combinational and sequential logic circuit**



<Half adder>

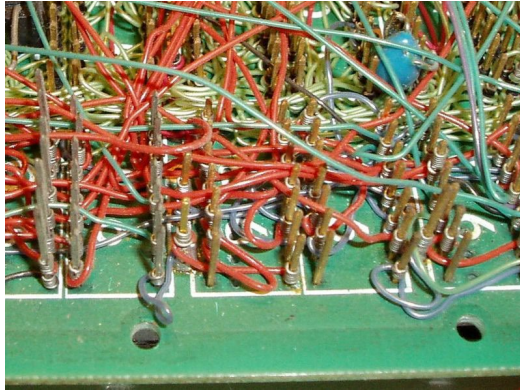


<SR Latch>

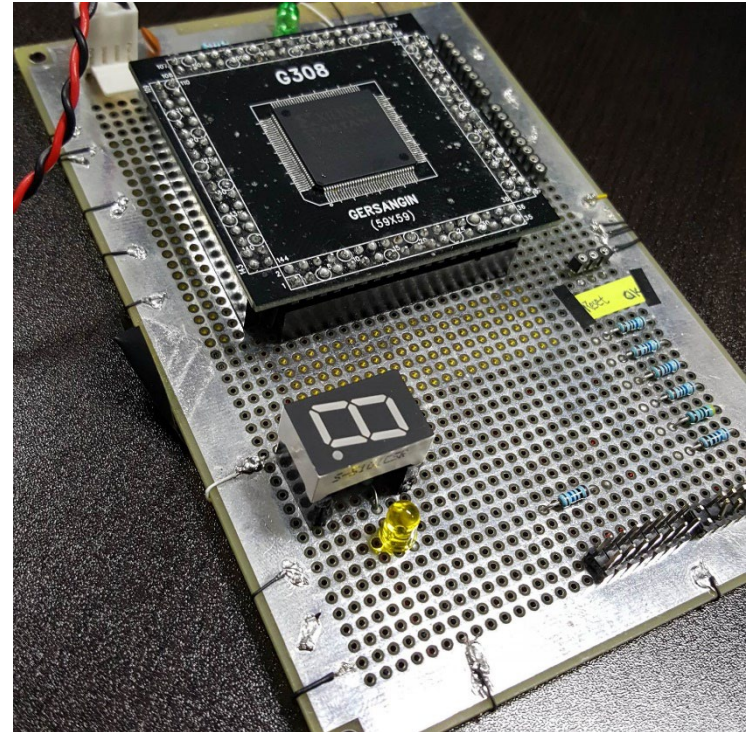
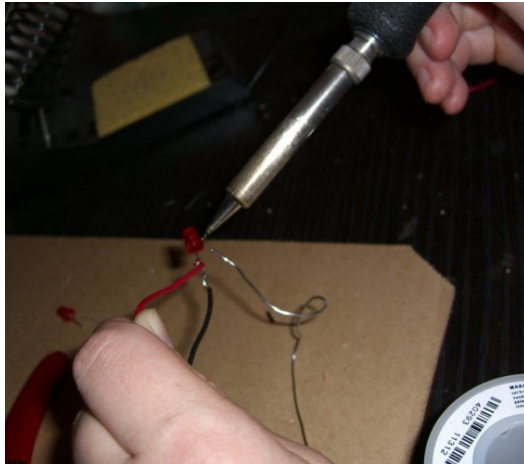
What you will learn

- **Soldering and prototyping**

Wire wrapping



Soldering

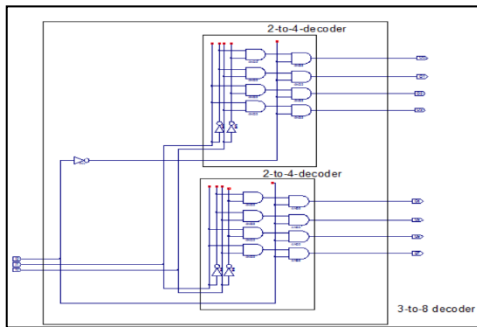


Prototyping

What you will learn

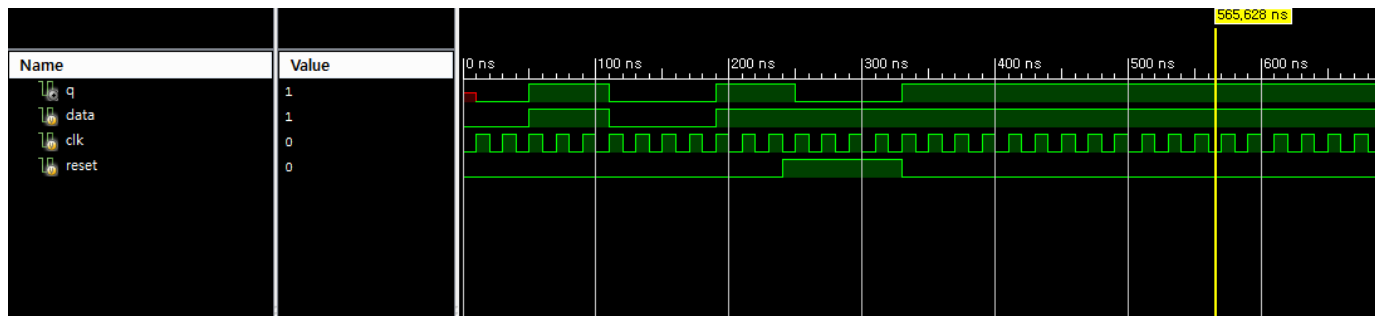
■ Computer Aided Design

Schematic Design



Hardware Description Language

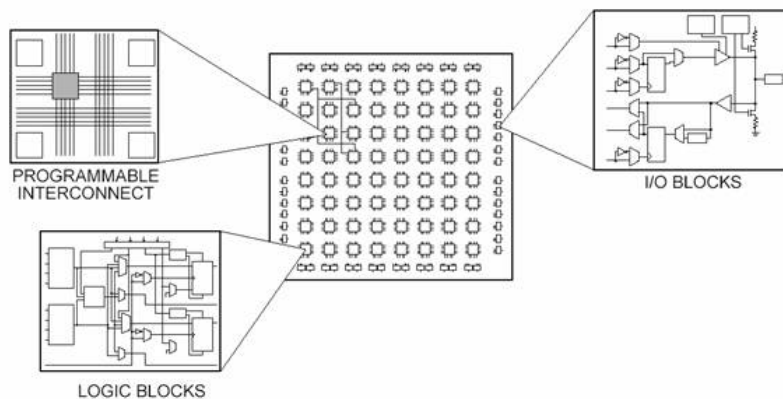
```
module seq_test_module(data, clk, reset, q);  
  input data, clk, reset;  
  output q;  
  reg q;  
  
  always @ (posedge clk)  
  begin  
    if (reset == 1)  
      q <= 0;  
    else  
      q <= data;  
    end  
  end  
endmodule
```



Hardware Simulation

What you will learn

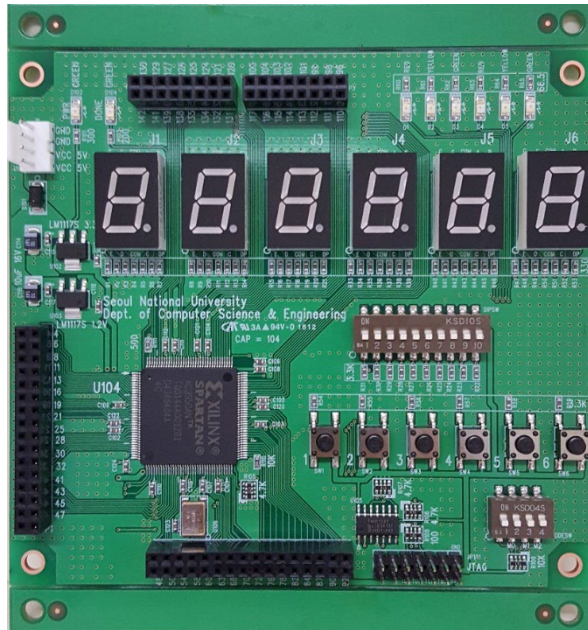
- **Field Programmable Gate Array (FPGA) Programming**



Final Project

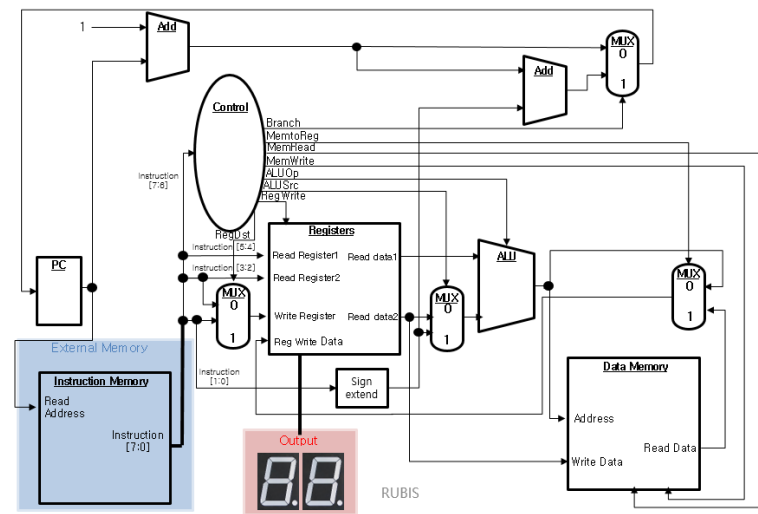
Final Project

- You will be given:



<Custom-made logic design board>

- You will have to make:

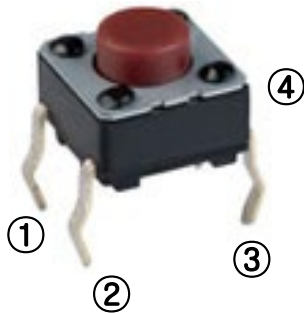


<Microprocessor>

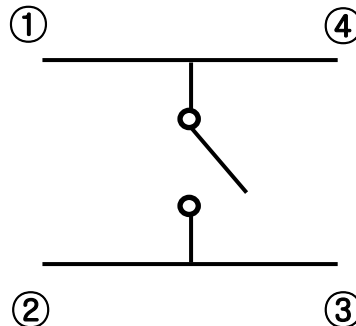
Practice Guideline

Combinational Logic Practice

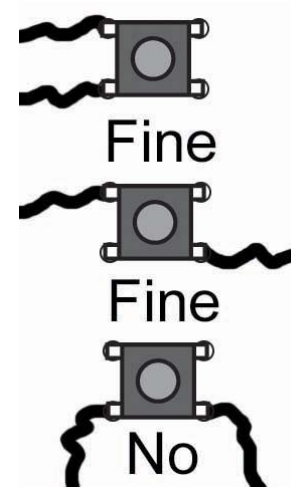
- Tactile switches



Tactile Switch



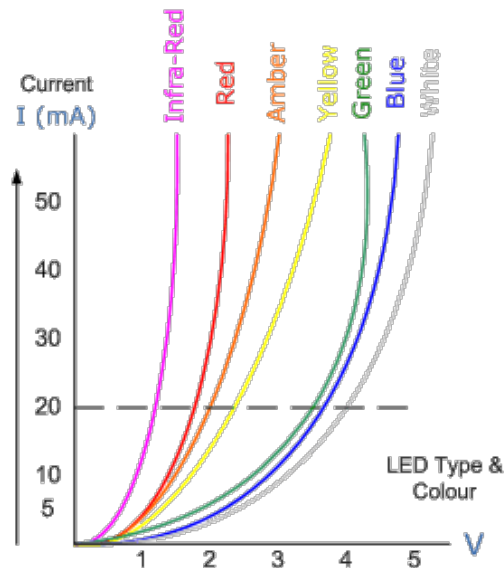
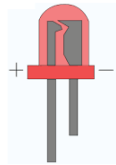
Circuit Diagram



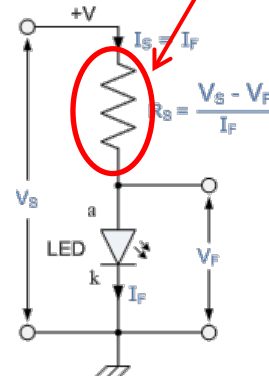
Usage

Combinational Logic Practice

- LEDs

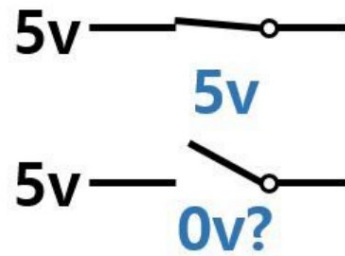


- LEDs emit colored light when passed through by forward current
- To protect LED from excessive current flow, using an appropriate resistor (around $3 \sim 400 \Omega$) is necessary



Combinational Logic Practice

- Floating

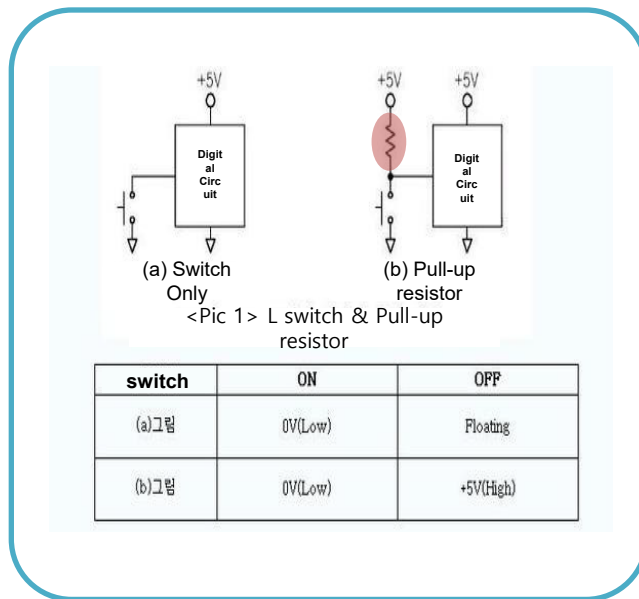


It is not 0V!

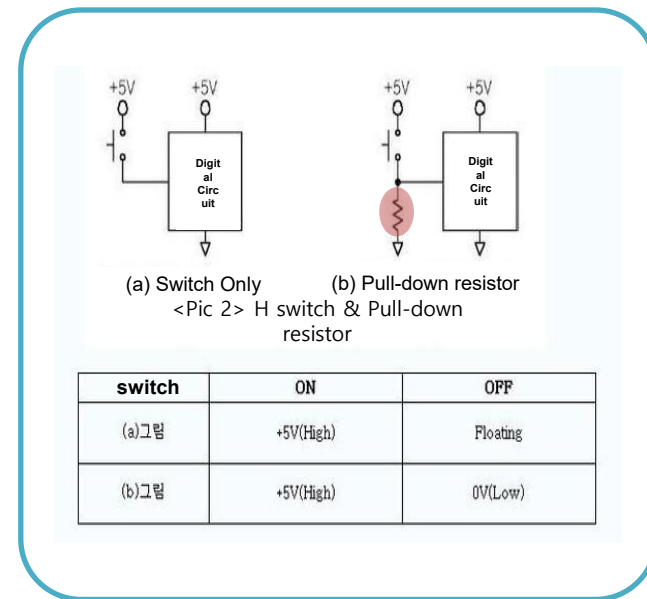
Noise Sensitive

Combinational Logic Practice

■ Pull-up & pull-down resistors



Pull-up Resistor

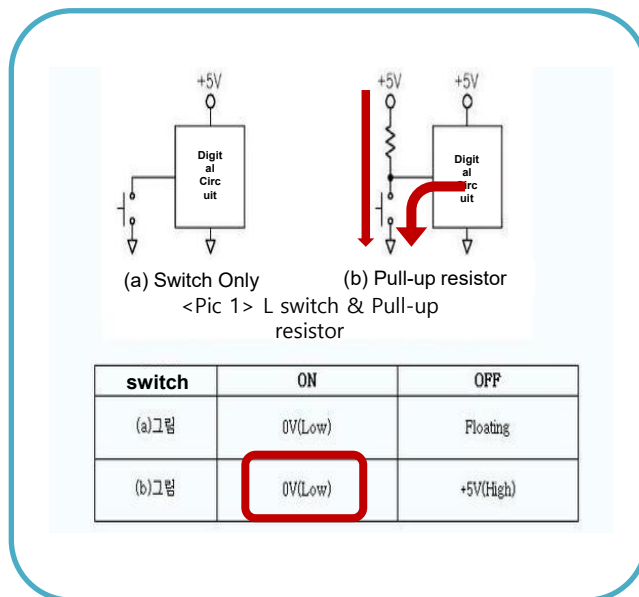


Pull-down Resistor

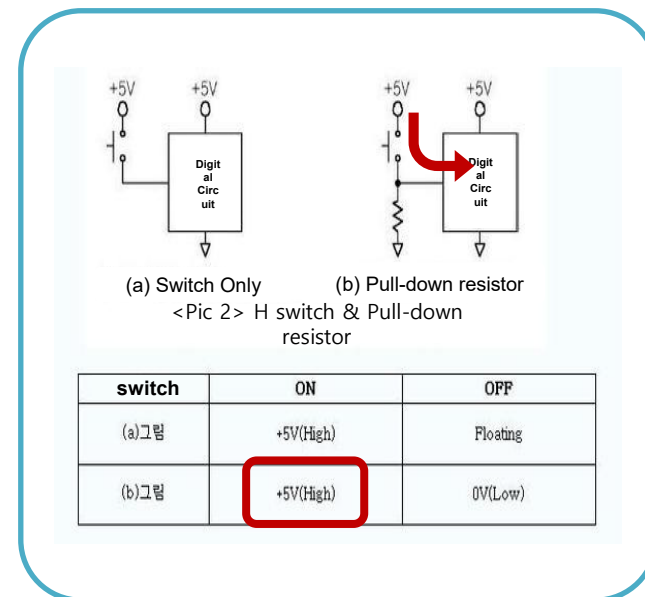
Combinational Logic Practice

■ Pull-up & pull-down resistors

■ Switch on ■ Switch off



Pull-up Resistor

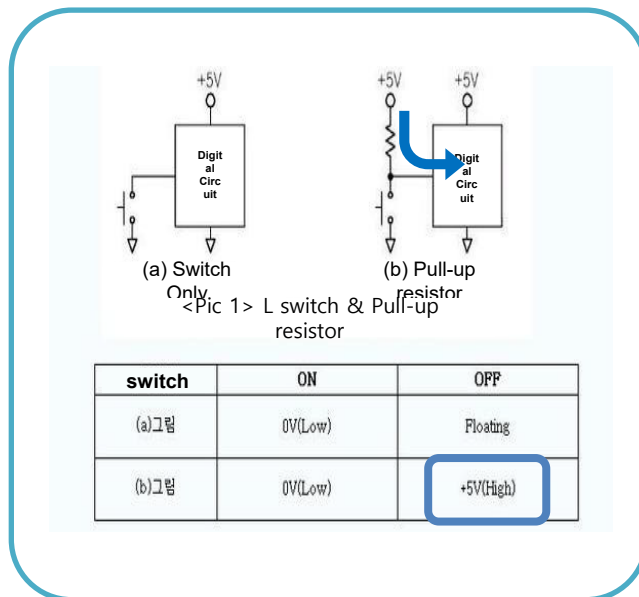


Pull-down Resistor

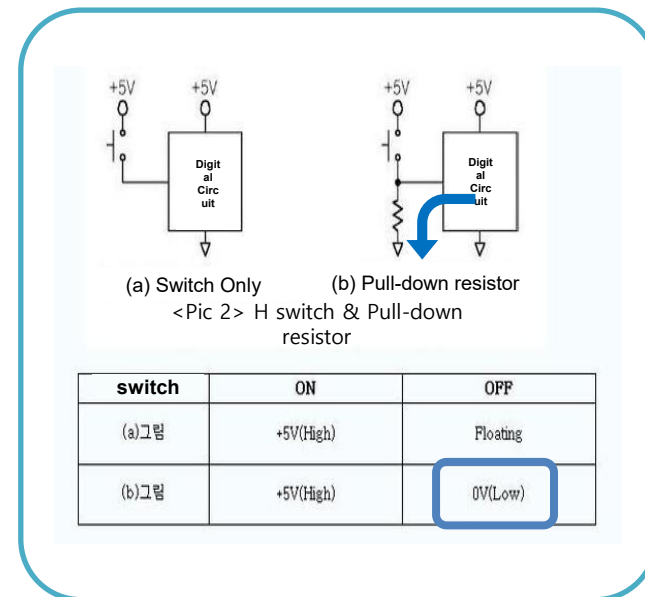
Combinational Logic Practice

■ Pull-up & pull-down resistors

■ Switch on ■ Switch off



Pull-up Resistor



Pull-down Resistor

Instruments

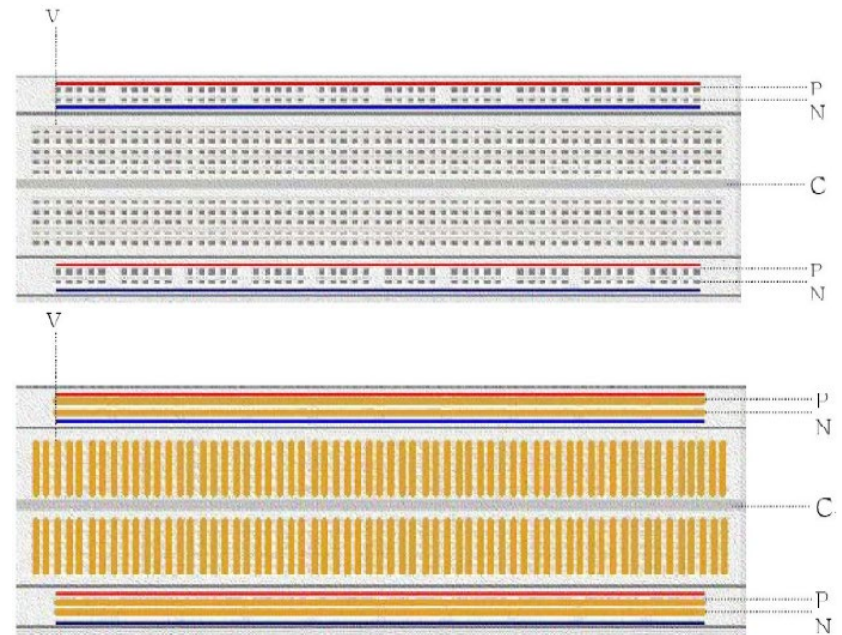
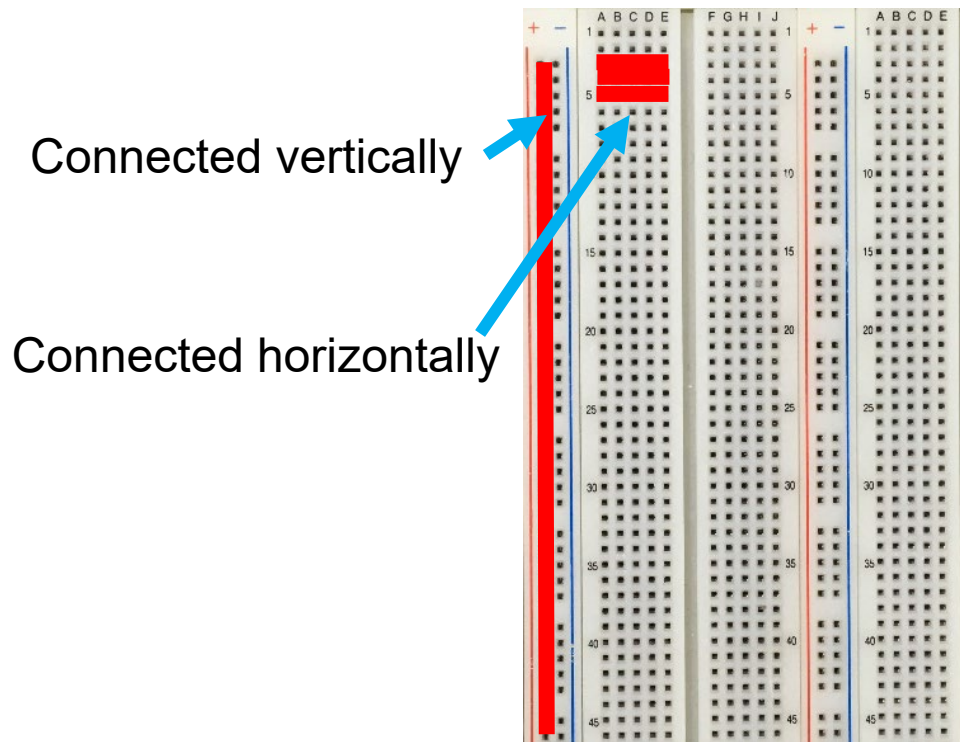


oscilloscope

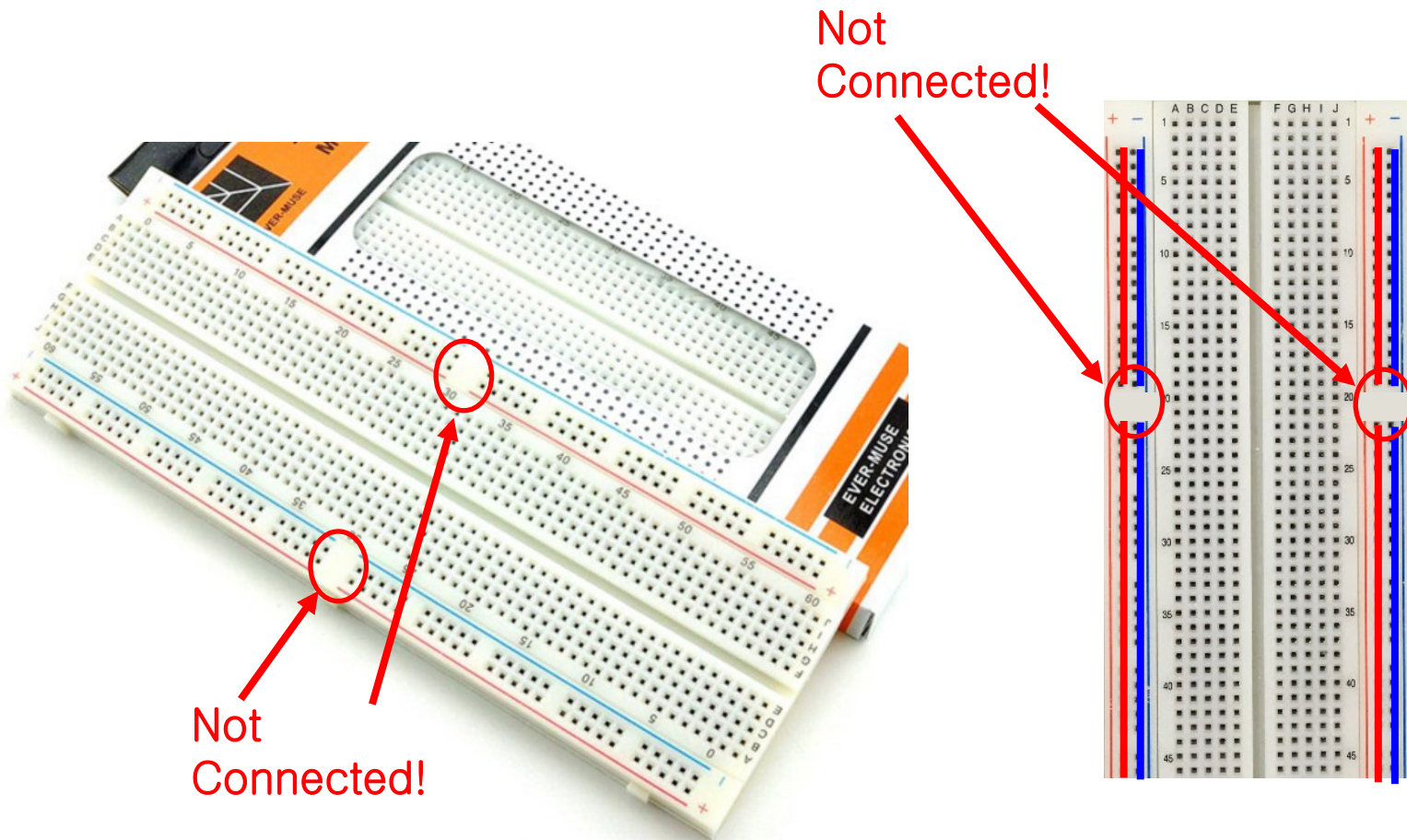


Function Generator
Multimeter
Power Supply

Breadboard

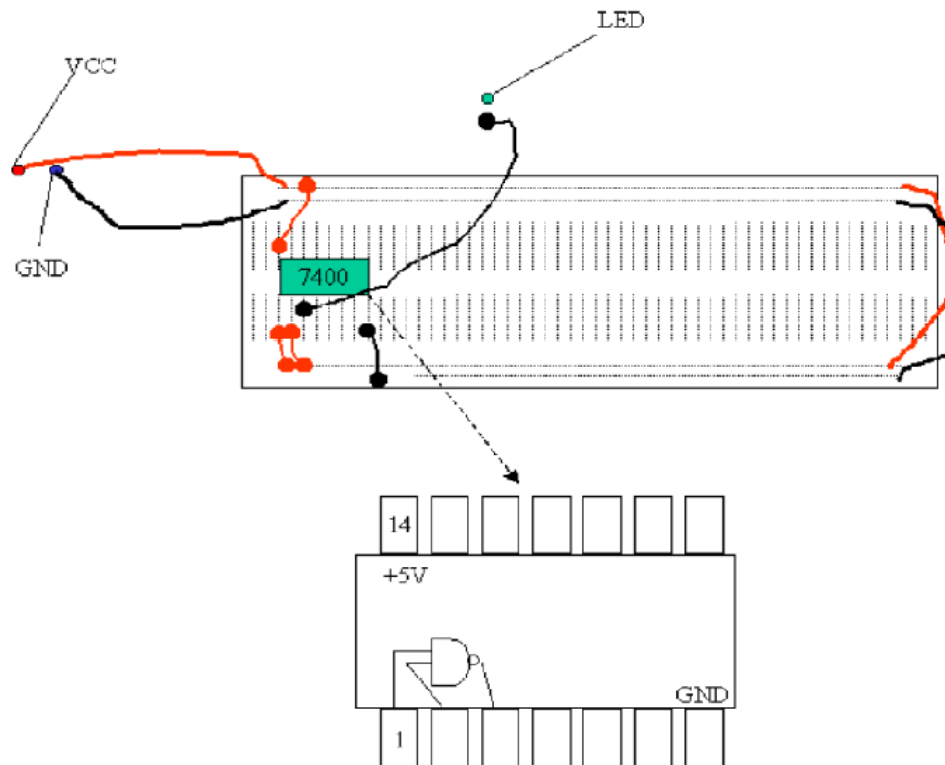


Breadboard(Separated)



Breadboard

- Implementation guide

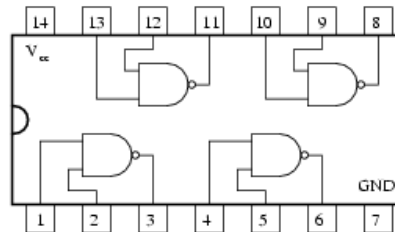


- ✓ A circuit using 7400 Quad 2-Input NAND gate is constructed on the bread board

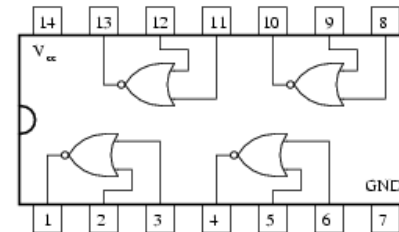
Logic Gates

- Logic Gates

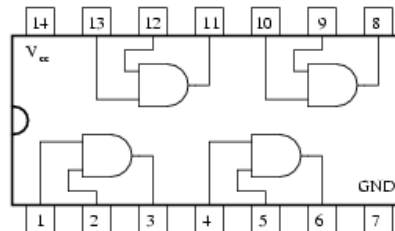
5400/7400
Quad NAND gate



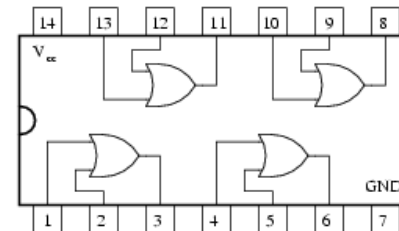
5402/7402
Quad NOR gate



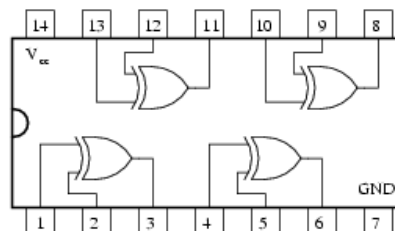
5408/7408
Quad AND gate



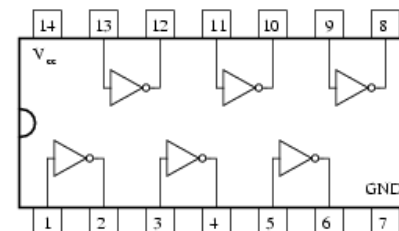
5432/7432
Quad OR gate



5486/7486
Quad XOR gate



5404/7404
Hex inverter



Tools – Solder, Soldering iron, Tip, etc



Soldering iron



Tin wire

Solder

Wire



Nipper

Bead nipper

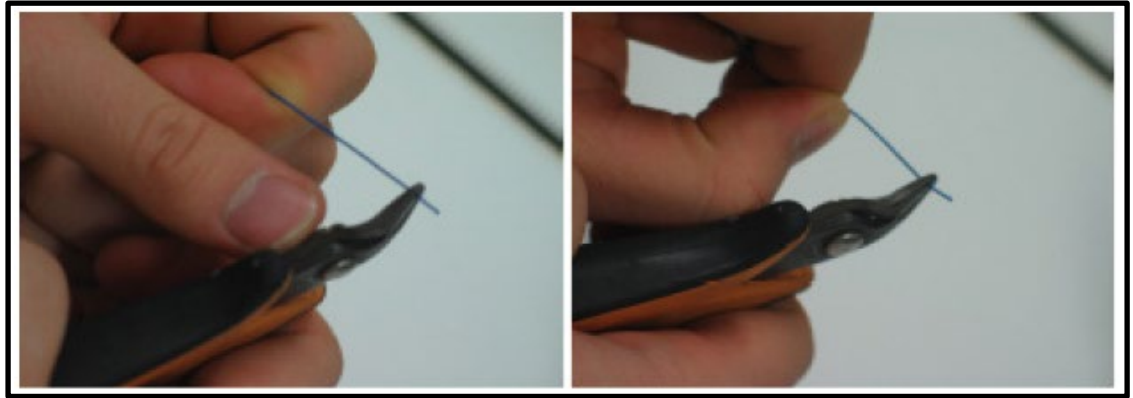
Desolder

Chip extractor

Long-nose plier

Tools

- **Bead Nipper**



Ripping off coating

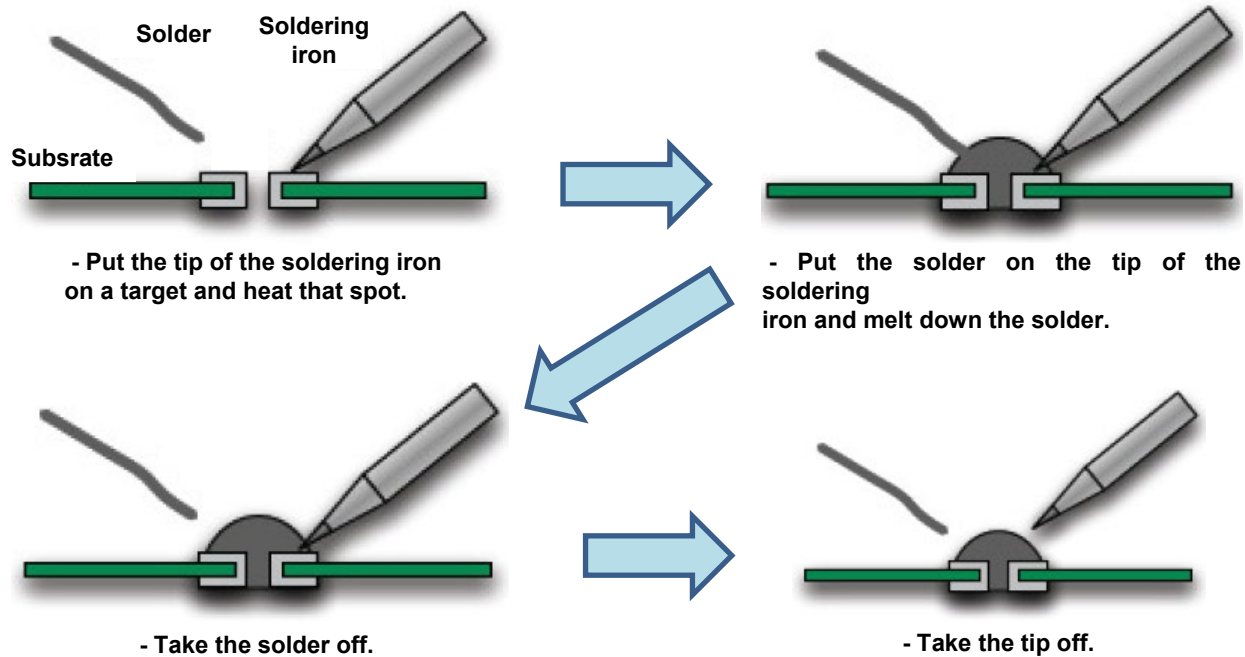
- **Extracting chips**

- To extract IC chips, use IC Chip extractor.
- Never extract chips using your hand



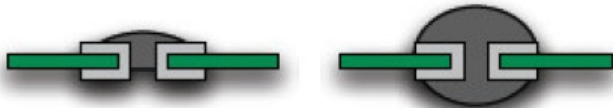
Soldering

■ Procedure

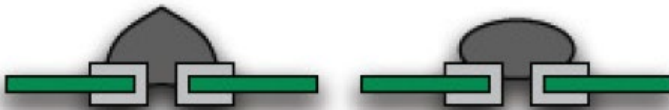


Soldering

- **Wrong cases**

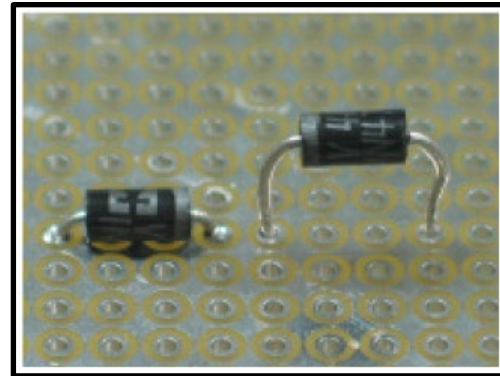


Amount of solder is wrong!



Taking a tip off is too late!

Temperature of the soldering iron is not high enough!

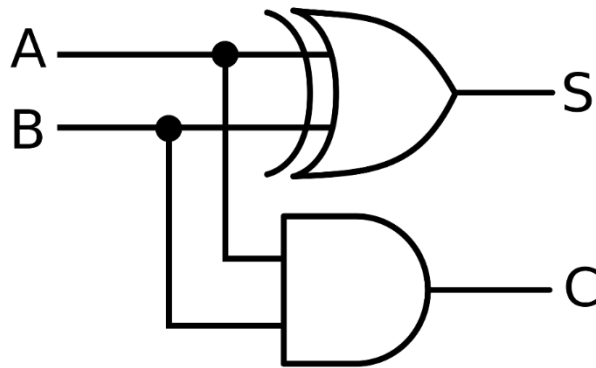


Components must be pressing against the board.

Lab

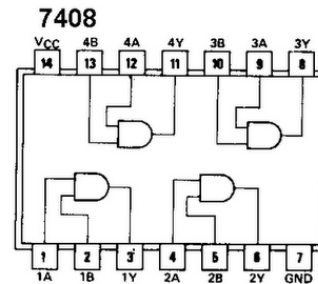
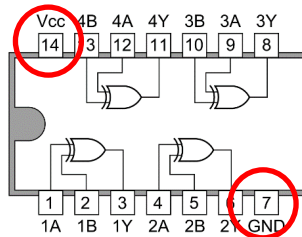
Combinational Logic Practice

- Let's implement half-adder on breadboard.



Input		Output	
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

7486 Quad 2-input ExOR Gates



Homework

- All homework do with your team.
- Submit a report per person.

Homework

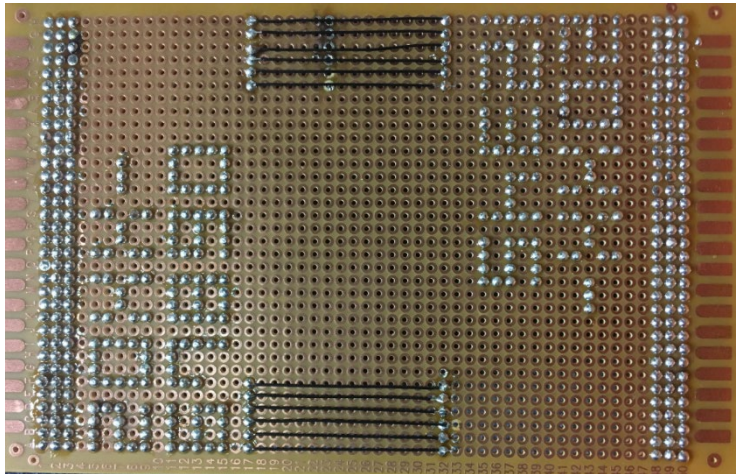
1. Half-adder

- Discussion (Concepts you learnen during the lab session, any errors you made, how to correct your errors, etc.)
- Result for every case in truth table (pictures)

Homework

2. Soldering

Practice soldering and wiring as the figure below. (Soldering **6 lines** and **2 student IDs**, and **12 slim wires** for each team)



Homework

- Write a report
 - Either in Korean or in English
 - Must include the result and discussion of the practice
 - # of pages doesn't matter
 - Documents should be submitted as PDF file.
 - All the files should be compressed to ZIP format
(if there are several files)
 - **Due :**
 - Class 001 - March, 28th (Before class begin at 7:00pm)**
 - Class 002 - March, 29th (Before class begin at 7:00pm)**
 - Class 003 - March, 30th (Before class begin at 2:00pm)**

Questions
