2022년 IoT기반 스마트 솔루션 개발자 양성과정

Embedded Application

16-IR Remote Controller

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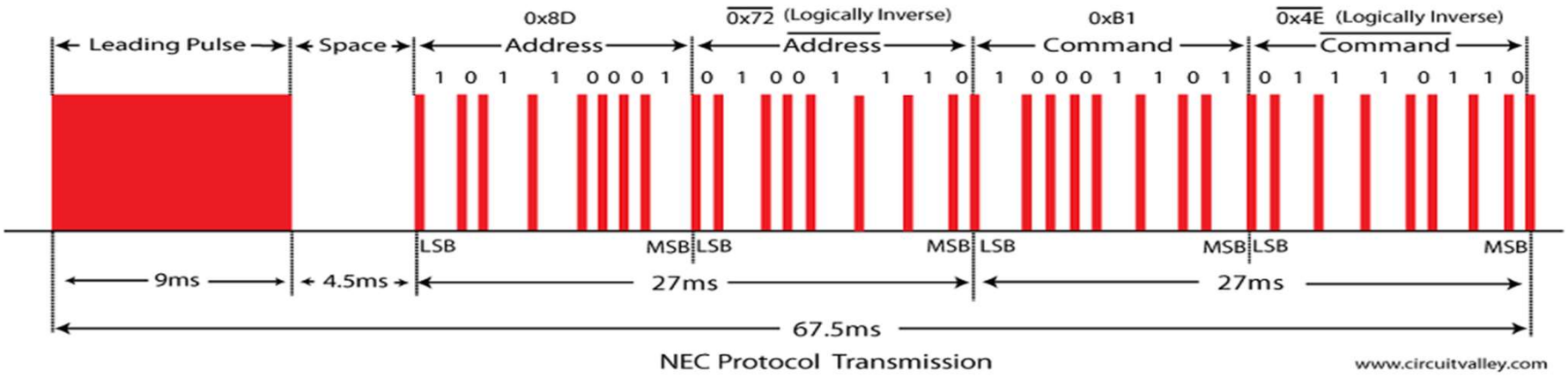
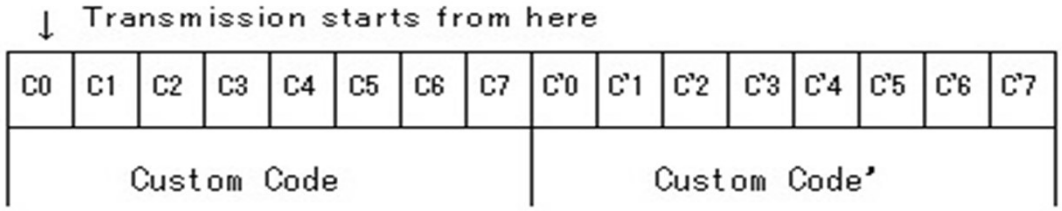
NEC format

- Leader code,
- Custom code(16bit) : Address(8bit) + Inv Address(8bit)
- Data Code(8bit) + Inv Data Code(8bit)



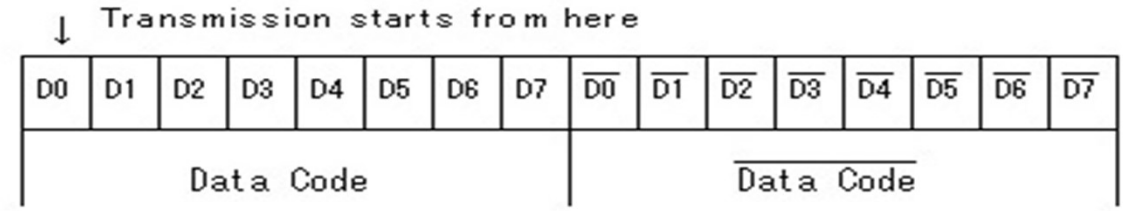
Custom Code : Address Code

- Custom code는 8비트 데이터 포멧으로 전송되고 논리적으로 반전 8비트 데이터를 지속적으로 전송, 총 16비트의 데이터를 전송.
- Custom code가 수신되면 수신부에서는 반전된 8비트 데이터는 오류검사의 수단으로 사용되고 처음 8비트 코드는 반전된 data 확인용으로 사용.



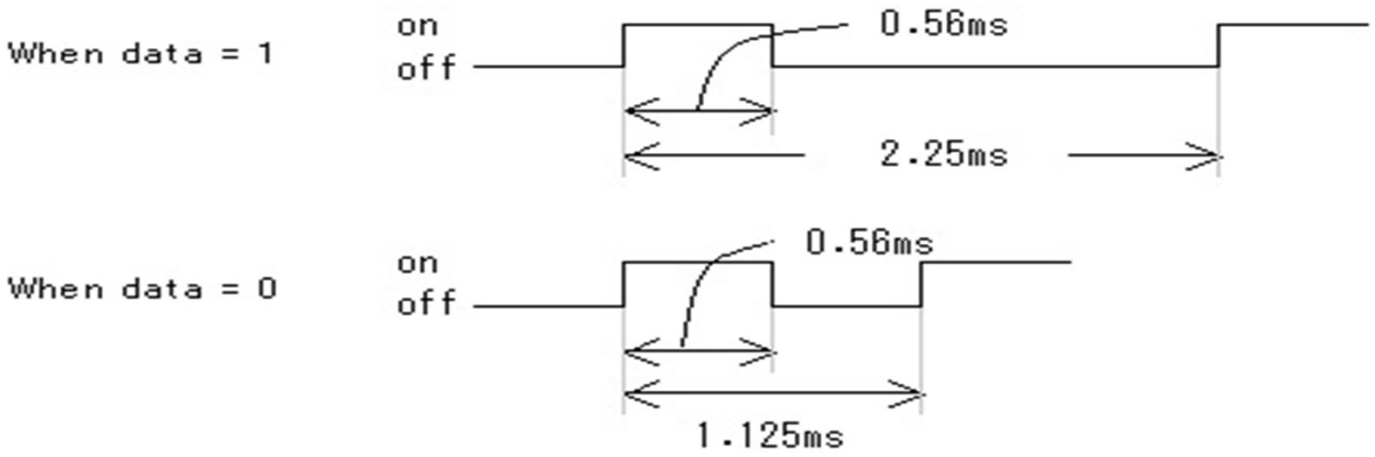
Data Code

- 전송되는 data는 8비트 data
- 논리적으로 반전된 8비트 data는 연속적으로 전송되어, 총 16비트는 data를 전송하는데 사용
- data가 수신될 때, 반전된 8비트 data code의 에러 검사 방법으로 논리적으로 반전된 처음 8비트 data code와 비교 검사함

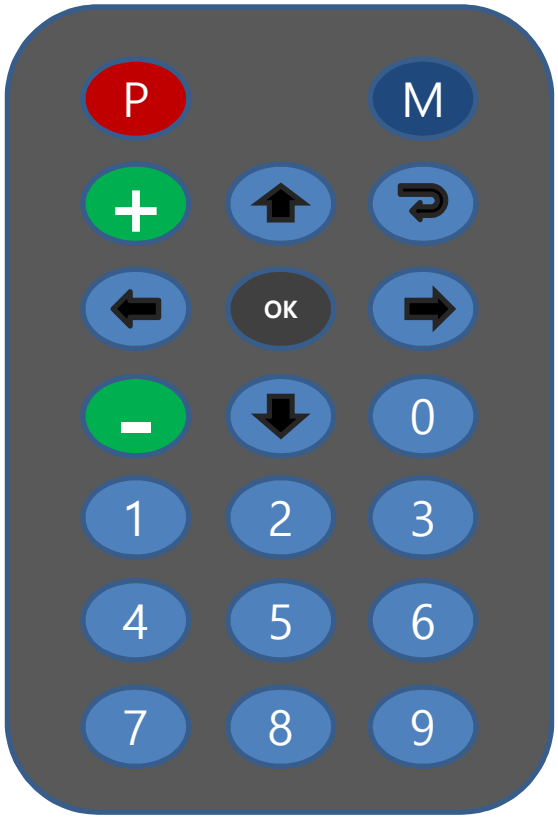


Data 판별

- 데이터 1 : high가 0.56ms, Low가 1.69ms (다음 high까지 2.25ms).
- 데이터 0 : high가 0.56ms, Low가 0.565ms (다음 high까지 1.125ms).



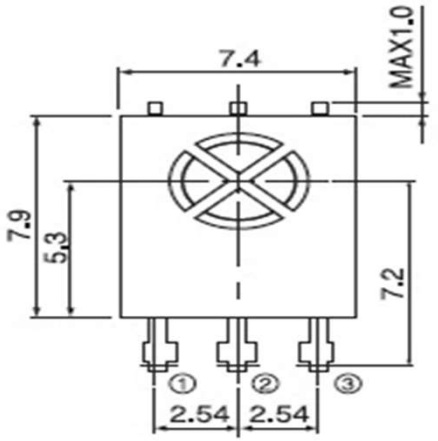
IR Remocon



00		02
04	05	06
08	09	0A
0C	0D	0E
10	11	12
14	15	16
18	19	1A

IR 수광부(KSM-063TM2)

- 동작 전압 : 4.5~5.5V
- 동작 주파수 : 37.9Khz

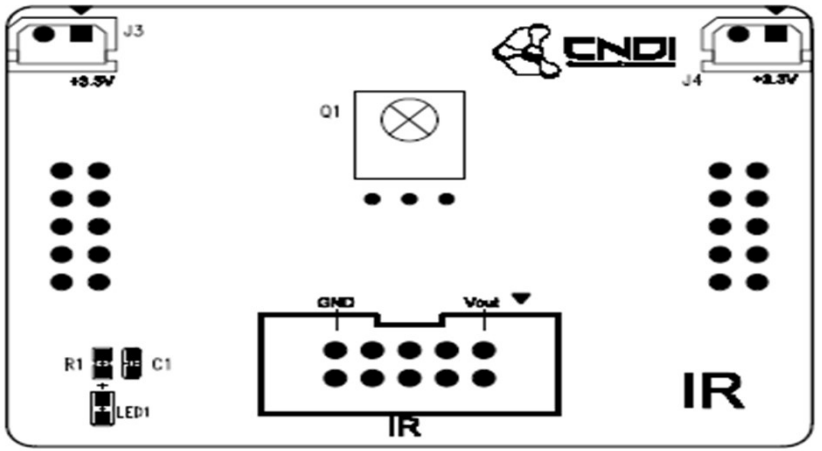


NOTE

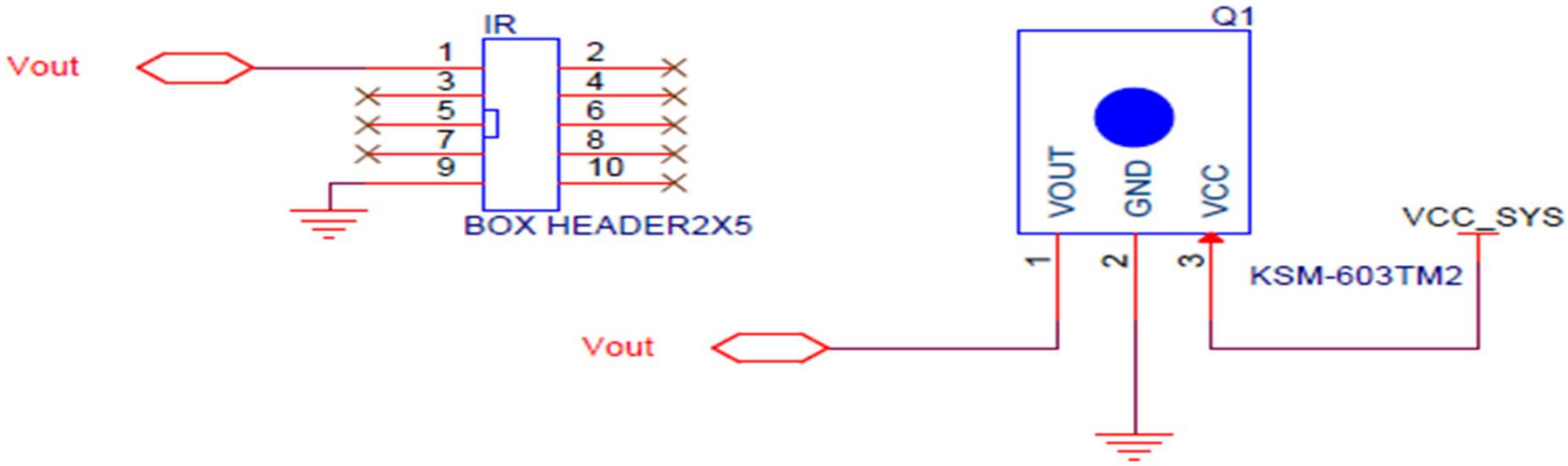
PIN configuration	
	60□TM2
①	Vout
②	GND
③	Vcc

IR Module


J3
J4
Q1
CNDI
R1
C1
LED1
IR
IR

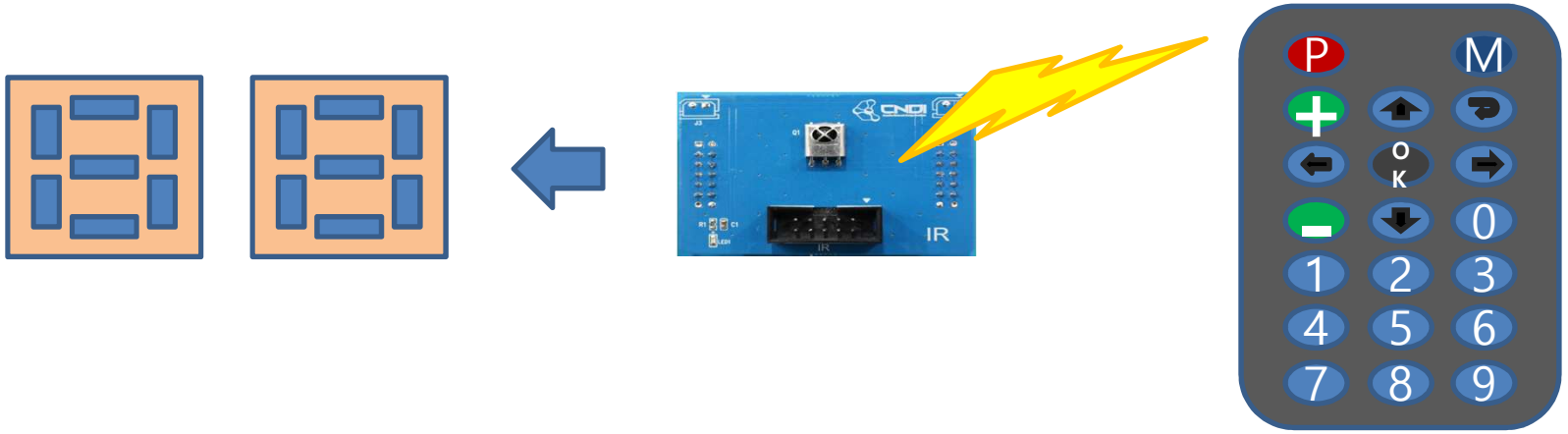

J3
+3.3V
CNDI
J4
+3.3V
Q1
GND
Vout
R1
C1
LED1
IR
IR

IR Module Circuit

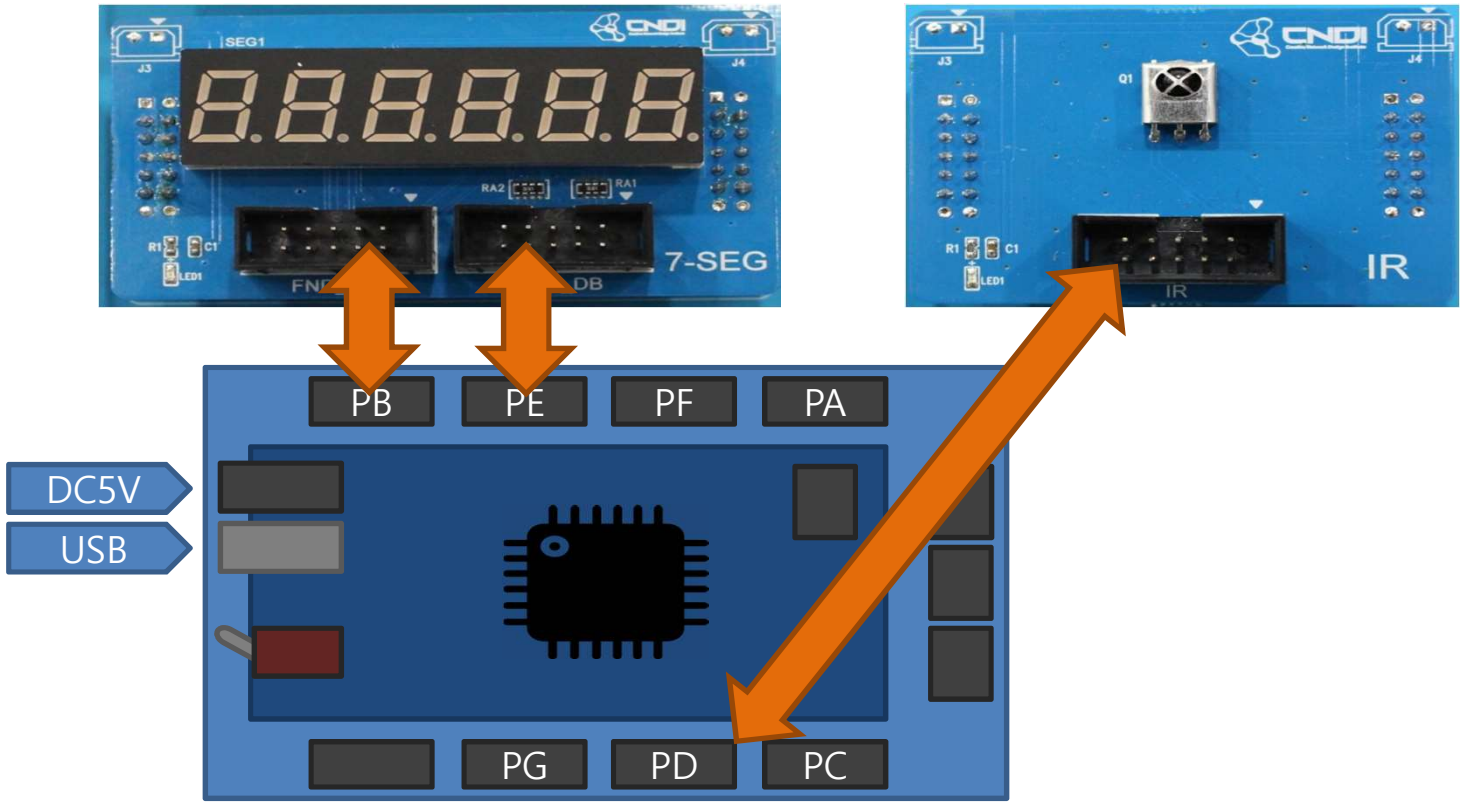


Ex-1 : IR Receive

- IR Remocon 으로 수신 받은 데이터를 FND에 표시하자
- 표시되는 숫자는 Hex값



Ex-1 : Wiring



Ex-1 : Timer 0

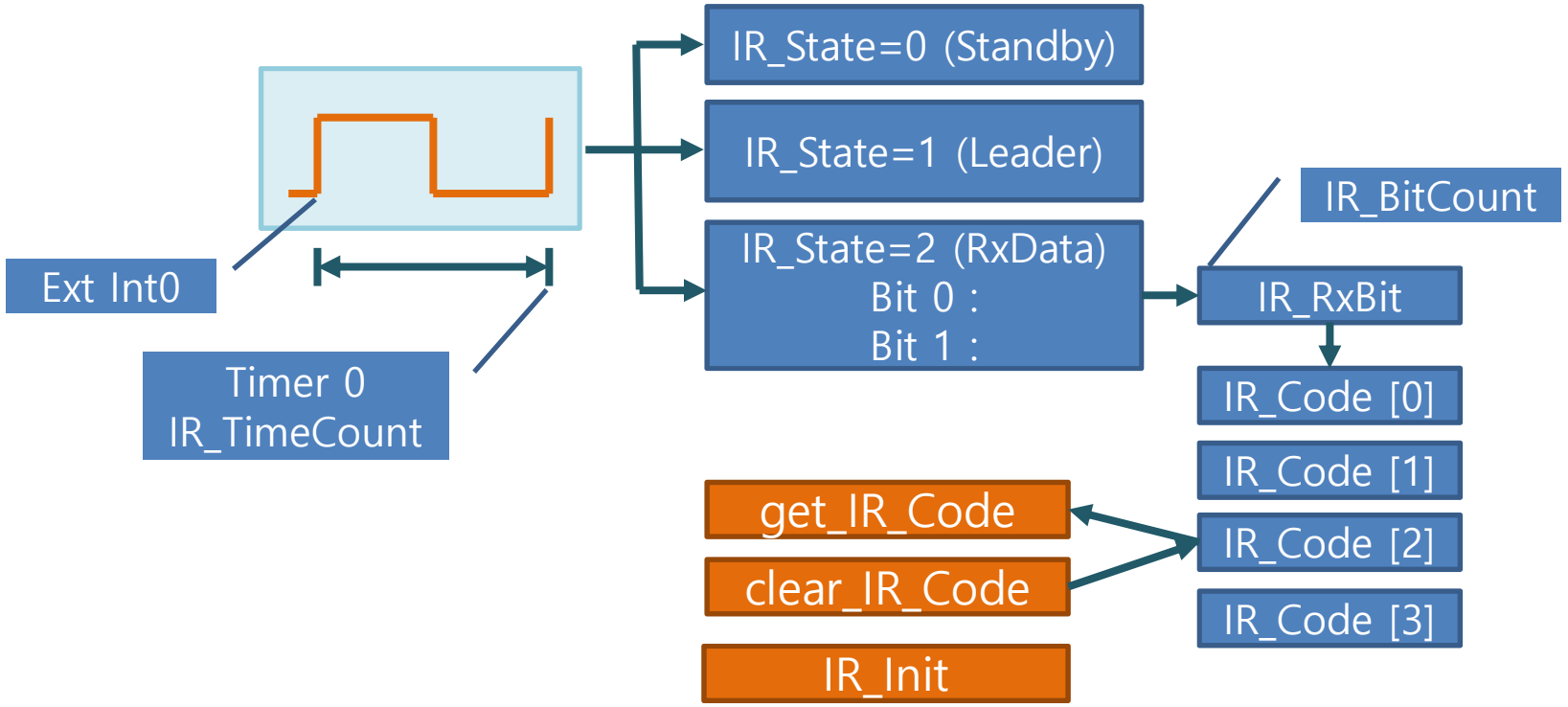
- Clock : 14745600 hz
- Prescaler : 1024
- Interval Time = (1/14745600) * 1024 = 0.000069s, 69us
- TCCR0 = 0x07

Bit	7	6	5	4	3	2	1	0	
	FOC0	WGM00	COM01	COM00	WGM01	CS02	CS01	CS00	TCCR0
Read/Write	W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	
Initial Value	0	0	0	0	0	0	0	0	

- Overflow Interrupt Enable
- TIMSK = 0x01;

Bit	7	6	5	4	3	2	1	0	
	OCIE2	TOIE2	TICIE1	OCIE1A	OCIE1B	TOIE1	OCIE0	TOIE0	TIMSK
Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	
Initial Value	0	0	0	0	0	0	0	0	

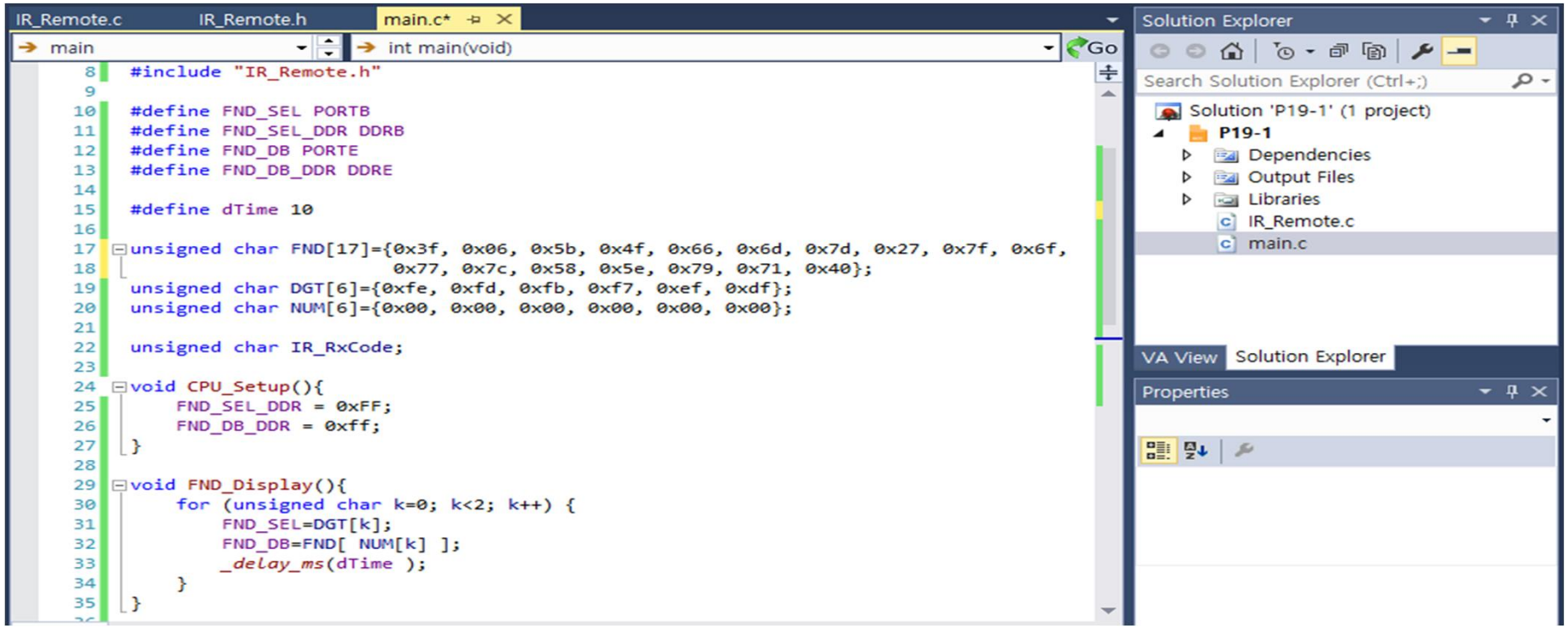
Ex-1 : IR_Remote.c



Ex-1 : header Define

```
// 0.000069s, 14.7456MHz, Prescaler 1024
/* NEC Format
   LEADER CODE: 13.5ms
   DATA CODE
    - LOW BIT: 1.125ms
    - HIGH BIT: 2.25ms
*/

#define LEADER_MAX    216     // 69us * 216 = 14.904ms
#define LEADER_MIN    175     // 69us * 175 = 12.075ms
#define LOW_BIT_MAX   19      // 69us * 19 = 1.311ms
#define LOW_BIT_MIN   13      // 69us * 13 = 0.897ms
#define HIGH_BIT_MAX  37      // 69us * 37 = 2.553ms
#define HIGH_BIT_MIN  28      // 69us * 28 = 1.932ms
```

Ex-1 : define

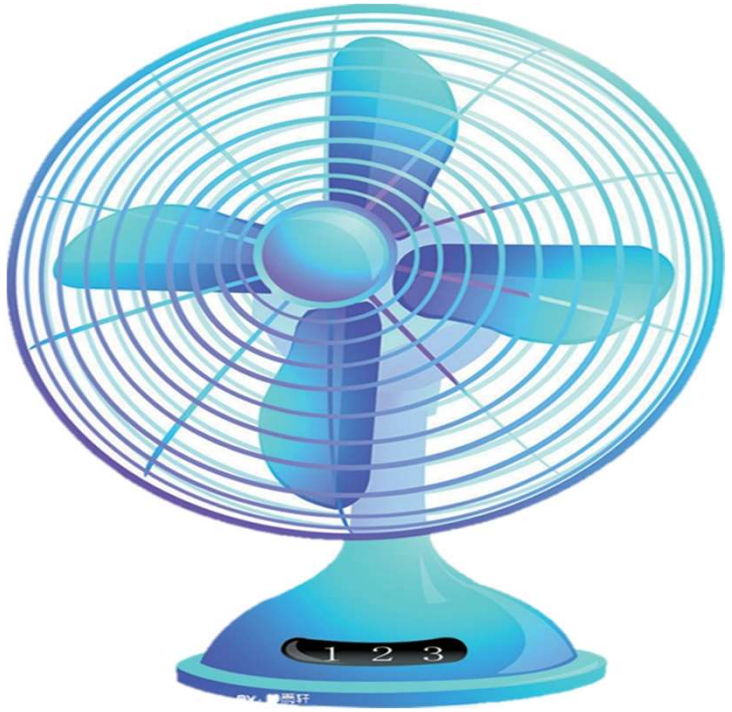

IR_Remote.c
IR_Remote.h
main.c*
main
int main(void)
Go
#include "IR_Remote.h"
#define FND_SEL PORTB
#define FND_SEL_DDR DDRB
#define FND_DB PORTE
#define FND_DB_DDR DDRE
#define dTime 10
unsigned char FND[17]={0x3f, 0x06, 0x5b, 0x4f, 0x66, 0x6d, 0x7d, 0x27, 0x7f, 0x6f,
0x77, 0x7c, 0x58, 0x5e, 0x79, 0x71, 0x40};
unsigned char DGT[6]={0xfe, 0xfd, 0xfb, 0xf7, 0xef, 0xdf};
unsigned char NUM[6]={0x00, 0x00, 0x00, 0x00, 0x00, 0x00};
unsigned char IR_RxCode;
void CPU_Setup(){
FND_SEL_DDR = 0xFF;
FND_DB_DDR = 0xff;
}
void FND_Display(){
for (unsigned char k=0; k<2; k++) {
FND_SEL=DGT[k];
FND_DB=FND[NUM[k]];
_delay_ms(dTime);
}
}
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'P19-1' (1 project)
P19-1
Dependencies
Output Files
Libraries
IR_Remote.c
main.c
VA View
Solution Explorer
Properties

Ex-1 : main

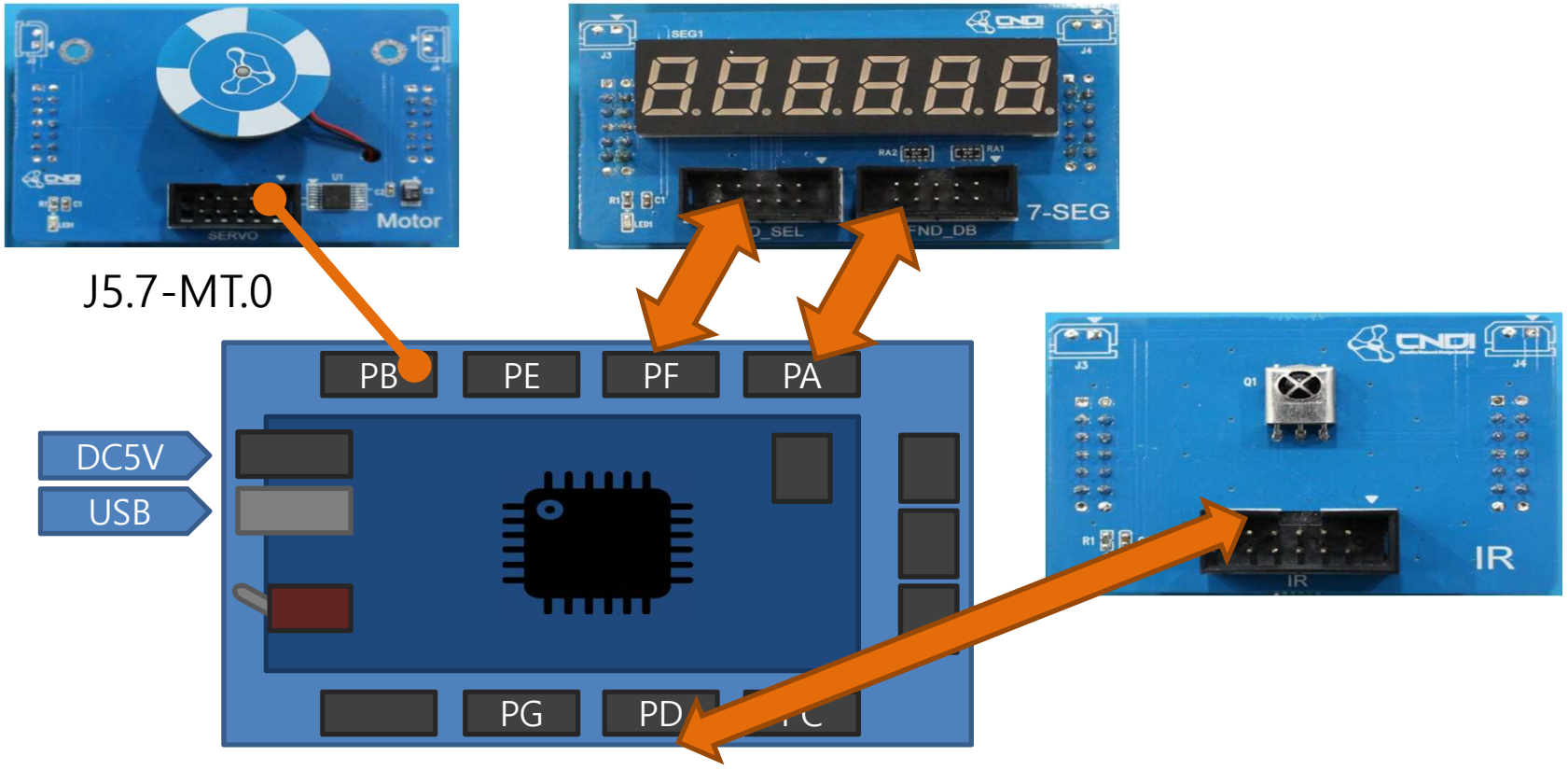
```
int main(void) {
    CPU_Setup();
    IR_Init();
    sei();

    while (1) {
      IR_RxCode = get_IR_Code();
      NUM[1] = (IR_RxCode >> 4) & 0x0f;
      NUM[0] = (IR_RxCode) & 0x0f;

      FND_Display();
    }
}
```

Ex-2 : 리모콘 선풍기

- 리모콘으로 제어되는 선풍기를 만들어 보자
- 0 : 모터 OFF
- 1 : 모터 PWM 50%
- 2 : 모터 PWM 70%
- 3 : 모터 PWM 100%



Ex-2 : Wiring



Ex-2 : Program