Study: Memory keyer with BT I/F using ARDUINO UNO

JA1IWP/JA5IUQ/N2UQ

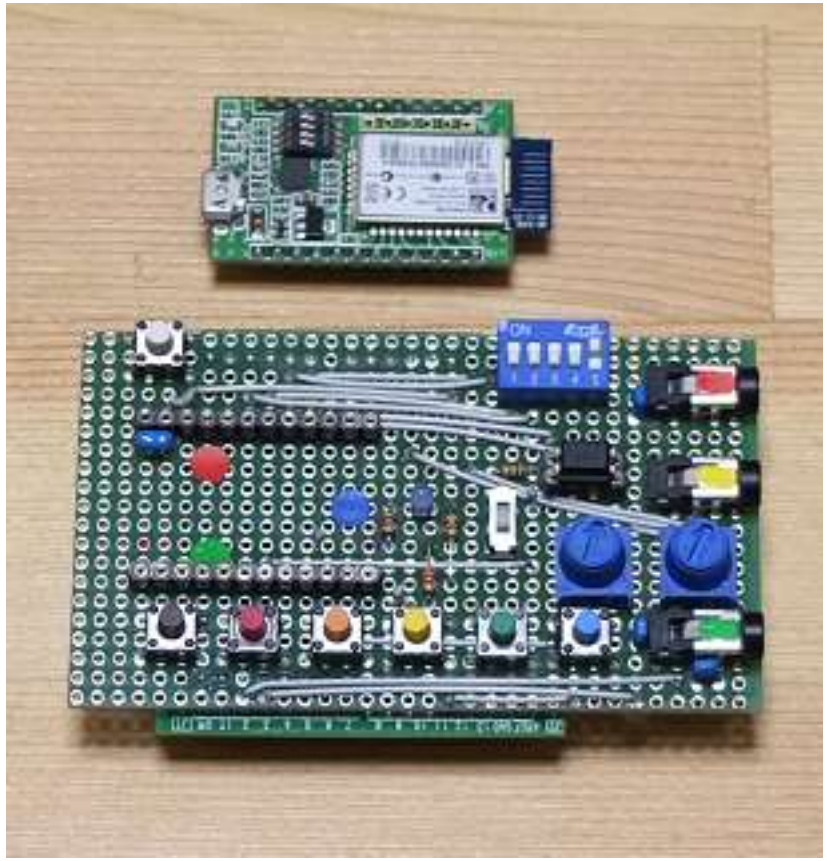
[Basic functions / features, etc.](1/2)

- 6ch (× 2 set) memory keyer using ARDUINO UNO
  - For program writing / rewriting, upload the executable file from a computer (S / W: Arduino IDE: free) via USB I / F (thus, no initial investment such as purchasing writing equipment is required).
- Messages input & speed control are possible from a personal computer, etc. via USB I / F.
  - -Output setting message (6ch x 2), or output individual characters such as "a", "b", "c" ..., "1", "2", "3" ..., "?", "/" ...
  - Input "+" to increase speed, input "-" to decrease speed
- Can be controlled from a PC, smartphone, tablet device, etc. via Bluetooth I / F.
  - Output setting message (6ch x 2) or output individual characters such as "a", "b", "c" ..., "1", "2", "3" ..., "?", "/" ...
  - "+" Input increases speed, "-" input decreases speed
  - Depending on the app you use, you can set messages individually on the app (for example, "Bluetooth Terminal").

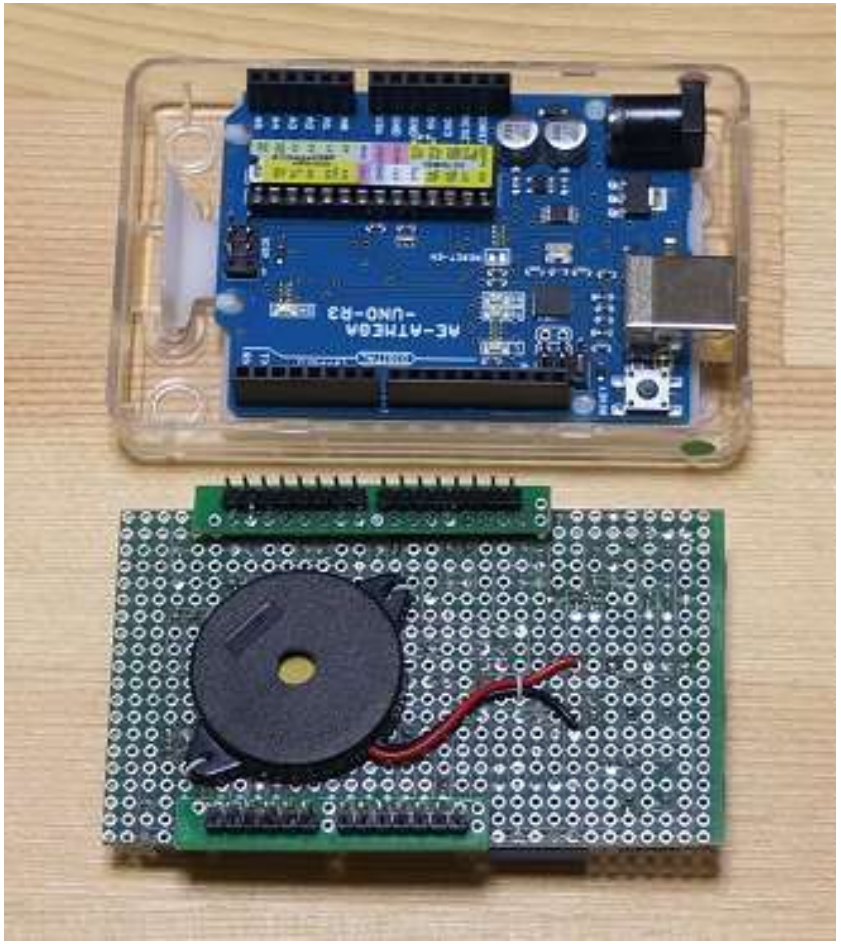
[Basic functions / features, etc.](2/2)

- With Morse code (European and Japanese) reception practice function
- With side tone function (volume control, cut / off possible). With earphone output jack.
- With electronic key / strait key mode switching function
- Paddle normal / reverse switching function
- Small and lightweight. Robust using a thick commercially available transparent case
- Power is input from the USB type-B connector . Commercially available compact, lightweight, high-capacity, inexpensive lithium-ion batteries can be used
- -Cross wiring Universal board pattern cut and jumper wiring make up an electric circuit for easy assembly (no etching required)
- Most of the parts can be purchased at Akizuki Denshi Tsusho
- This is a study that a beginner of a board computer learned by himself during the "new corona nesting period" and made a prototype.
- I have developed it by referring to the "L Chika (LED blinking)" commentary page using Arduino on the Internet.
- The biggest feature is that "Anyone can make it easily and cheaply".

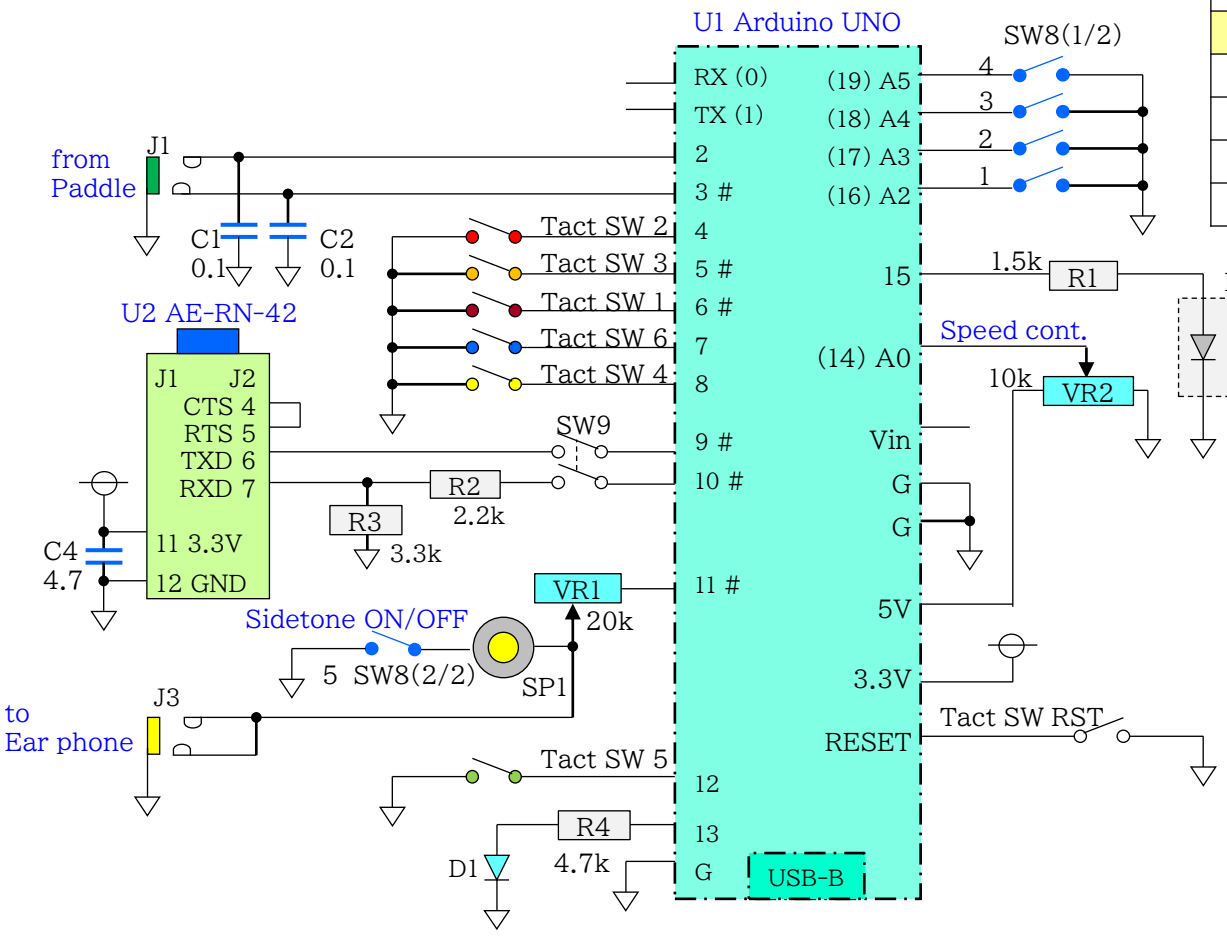
【Components Side】



【Solder Side】



【Circuit Diagram】



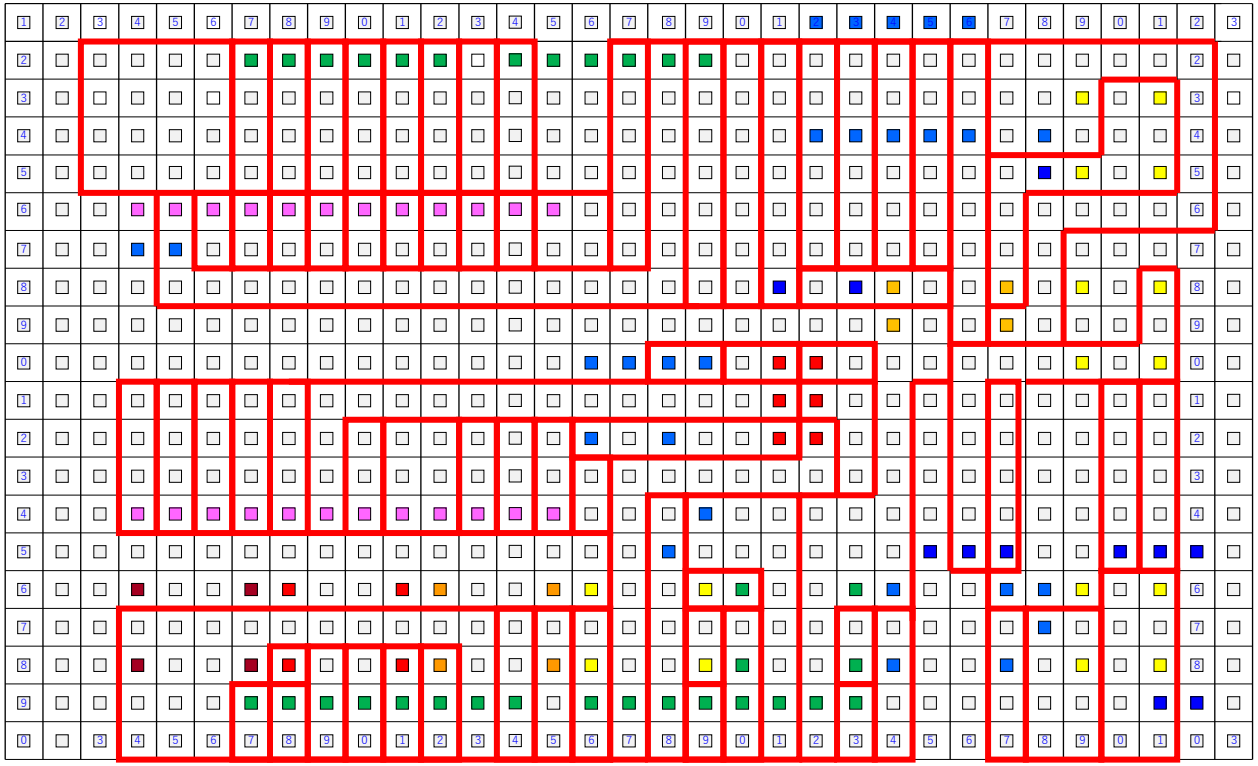
SW8 DIP SW	OFF		ON	
1	Keyer Mode		Morse Practice Mode	
	OFF	ON	OFF	ON
2	message1*	message2*	European	Japanese
3	Keyer	Strait	Morse pattern setting (4 ways)	
4	normal	reverse		
5	Side tone ON		Side tone OFF	

Tact SW		MESSEGE
1	BRN	message*1
2	RED	message*2
3	ORG	message*3
4	YLW	message*4
5	GRN	message*5
6	BLU	message*6
7	WHT	reset

【Parts list】

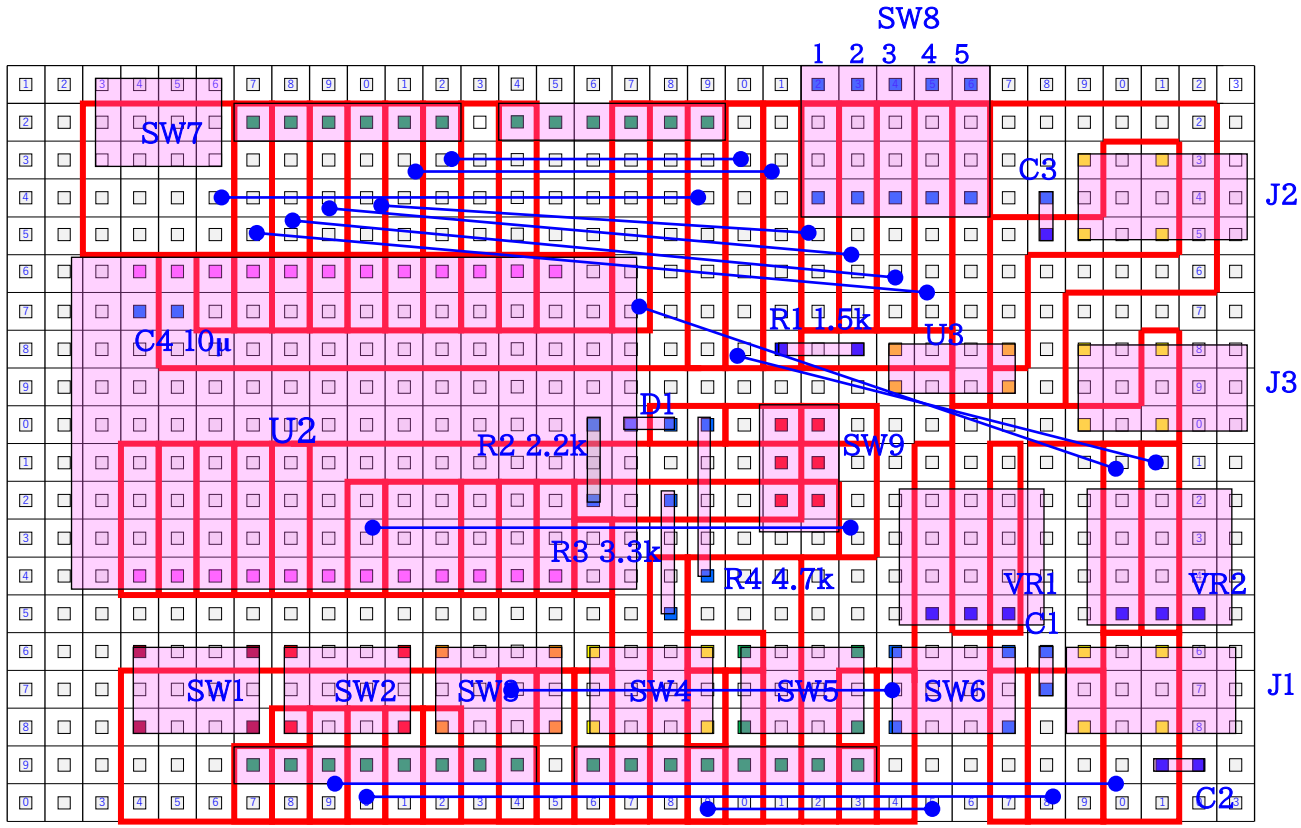
No.	Part name	Type	Quantity	Unit No.	Akiduki-code	(Yen)
1	Computer	Arduino UNO Rev3	1	U1	M-07385	2,940
2	Bluetooth module kit	AE-RN-42	1	U2	K-07378	2,400
3	Photo coupler	FOB807B	1	U3	I-06485	30
4	LED	3mm Blue 470nm OSB5DL 3E34B	1	D1	I-12689	140/10
5	switch	tact(small) BWN,RED,ORG,YLW,GRN,BLU	7	SW1-7	P-03646-52	10
6	switch	DIP 5P	1	SW8	P-07340	50
7	switch	Slide 2circuits-2contacts IS-2235	1	SW9	P-02627	100/4
8	Stereo mini jack	3.5㎜ For board mounting MJ-8435	3	J1,J2,J3	C-09060	50
9	Piezo speaker	PT09	1	SP1	P-15360	120/2
10	Variable resistor	10kΩ 3362P	2	VR1,VR2	P-08012	50
11	Resistor	Carbon 1.5kΩ(1/6W)	1	R1	R-16152	100/100
12	Resistor	Carbon 2.2kΩ(1/6W)	1	R2	R-16222	100/100
13	Resistor	Carbon 3.3kΩ(1/6W)	1	R3	R-16332	100/100
14	Resistor	Carbon 4.7kΩ(1/6W)	1	R4	R-16472	100/100
15	Capacitor	Ceramic 0.1μF(50V)	3	C1-3	P-00090	100/10
16	Capacior	Ceramic 10μF(25V)	1	C4	P-05103	30
17	IC socket	Round pin(single 40P)	1		P-01591	150
18	Pin header	1 × 40	1		C-00167	35
19	Pin header thin-type	1 × 40 assorted pack (10)	1		C-06641	350
20	Universal board	For Arduino Glass-composite	1		P-06877	180
21	Universal board	Cross wiring Bタイプ(95x72㎜) glass-comp	1		P-09794	200
22	Plastic case (clear)		1		(Amazon)	990
23	3.5㎜ Stereo plug cable	0.5m	1		P-13082	120
24	ETFE cable	0.51mm single-core ETFE 0.81mm-dia	AR		(Sengoku)	479/10m

【Board Pattern Cut Diagram(Component-side)】

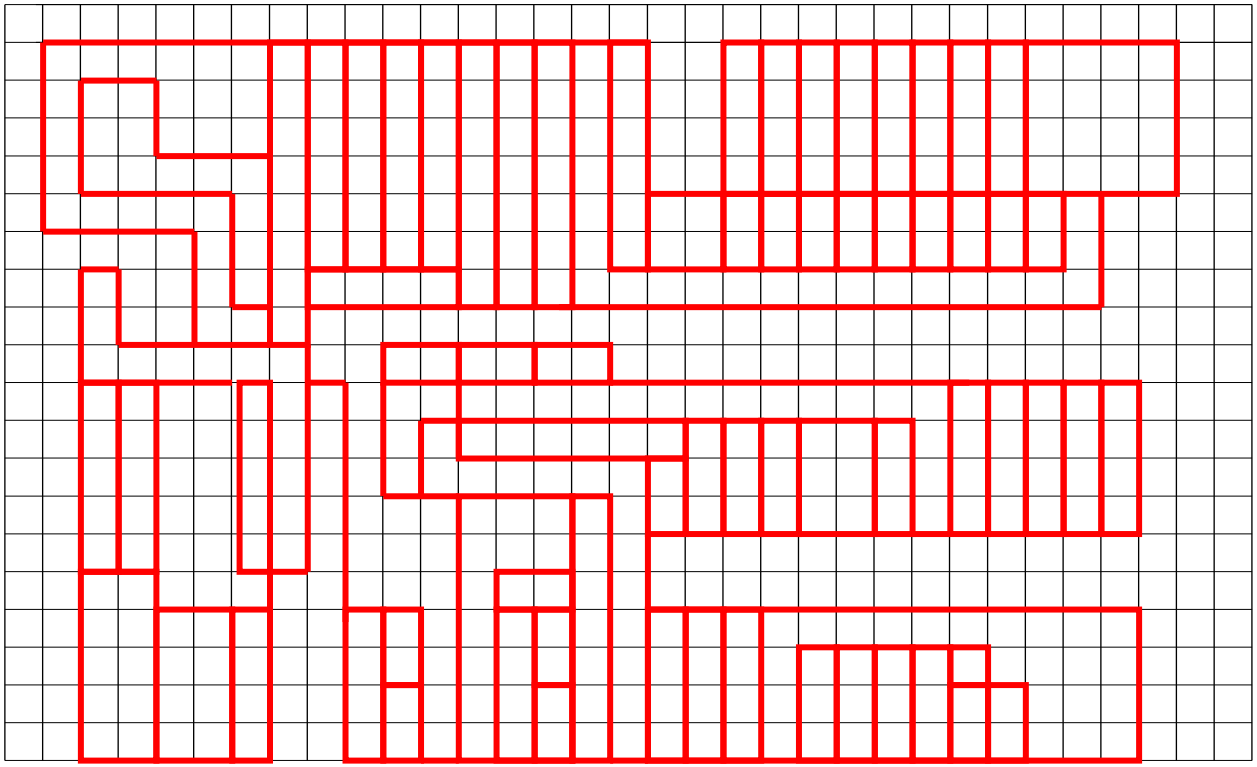


十字配線ユニバーサル基板

【 Board Pattern Cut 、Parts placement、Circuit Diagram(Component-side)】



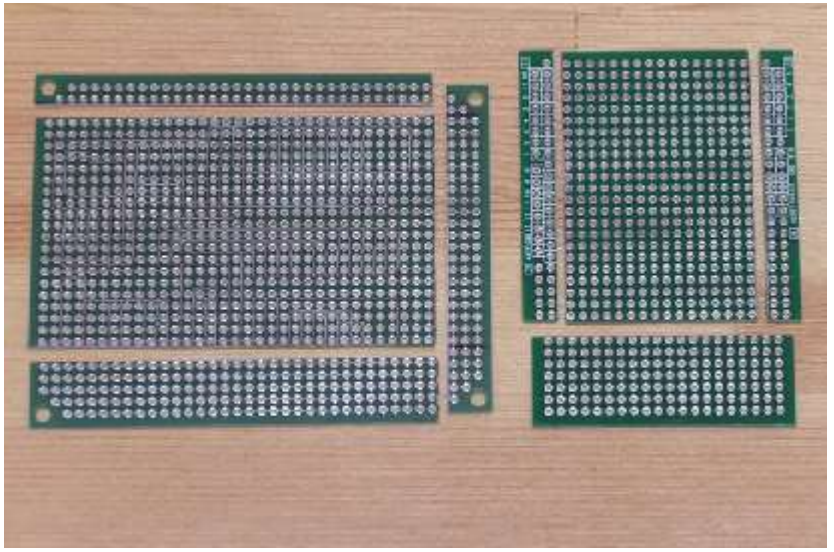
【 Board Pattern Cut Diagram(Sorder-side) 】



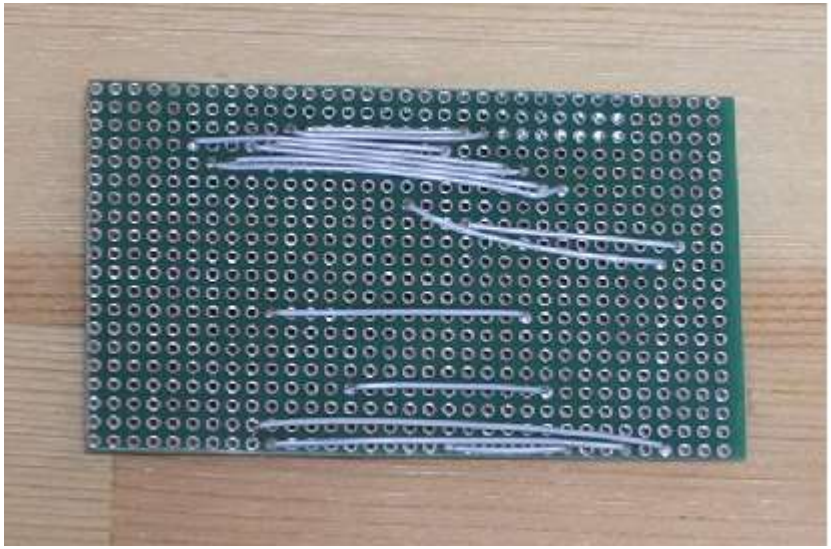
十字配線ユニバーサル基板

【Board cut & Pattern cut draft】

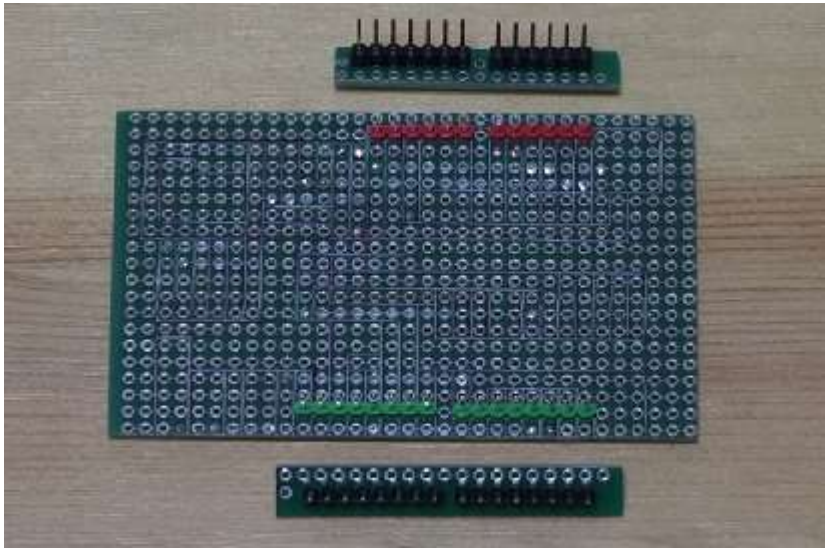
【 Board cut & Pattern cut 】



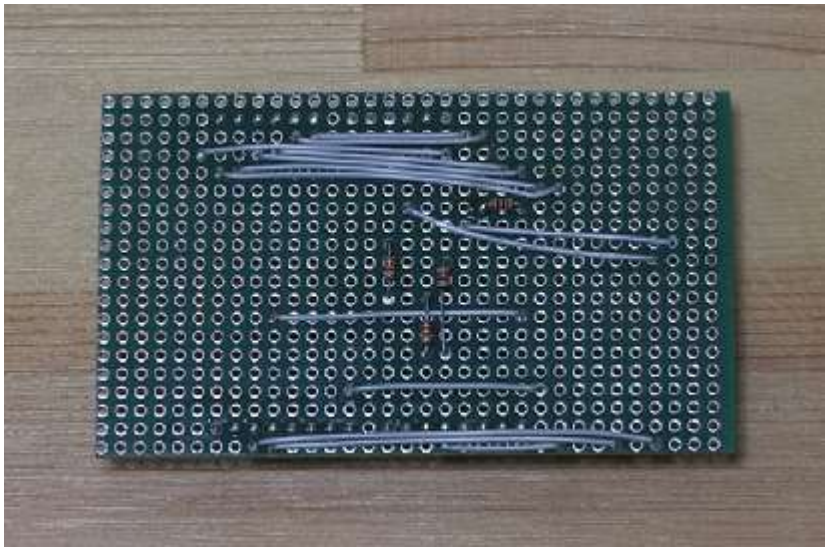
【Jumper wiring(Component-side)】



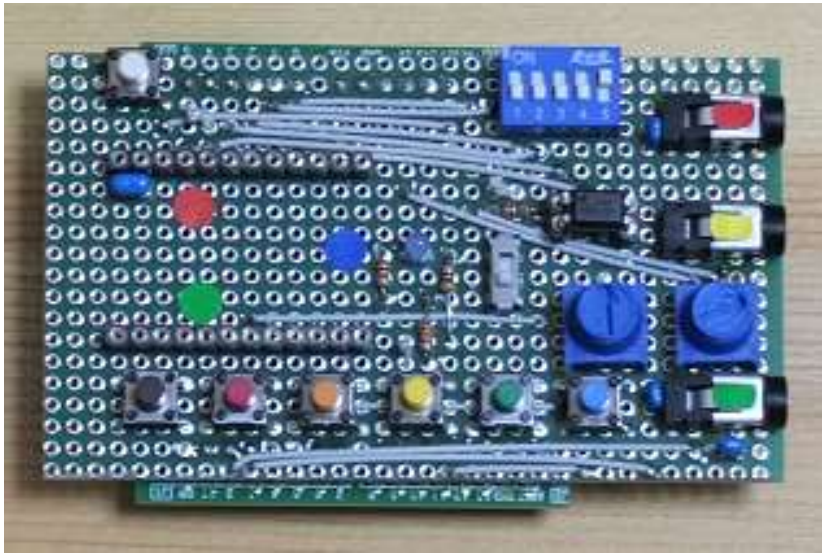
【Pin hearer mounting(Solder-side)】



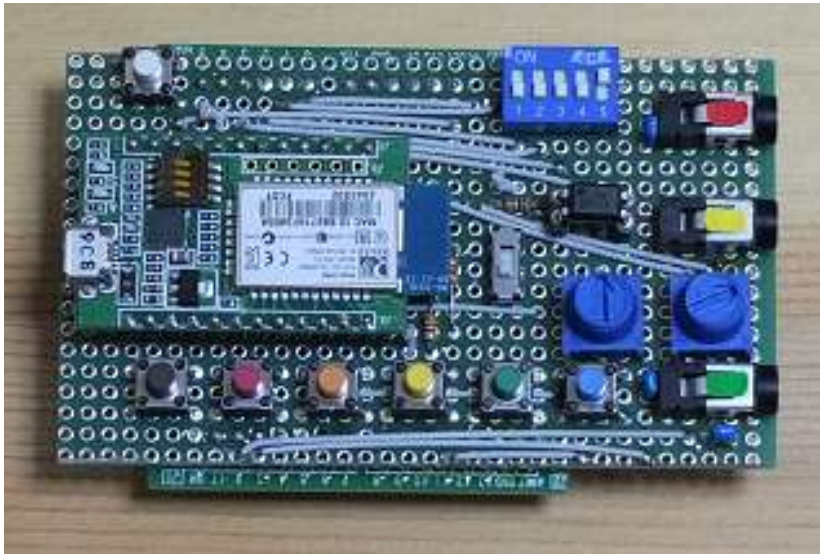
【Resistors mounting(Component-side)】



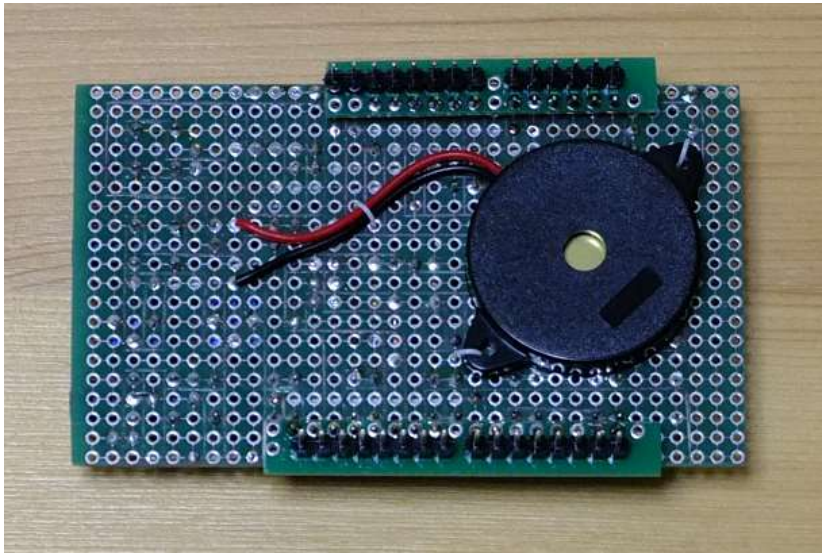
【Parts mounting (Component-side)】



【Bluetooth module insert(C-side)】



【Pin-headers、Piezo speaker mounting(S)】



【Setting (example)】

・The keyer received a command from a tablet via Bluetooth I/F, then started keying the FT-817ND transceiver.

Study: Memory keyer with BT I/F using ARDUINO UNO
Sketch & Flow chart

Main program

START

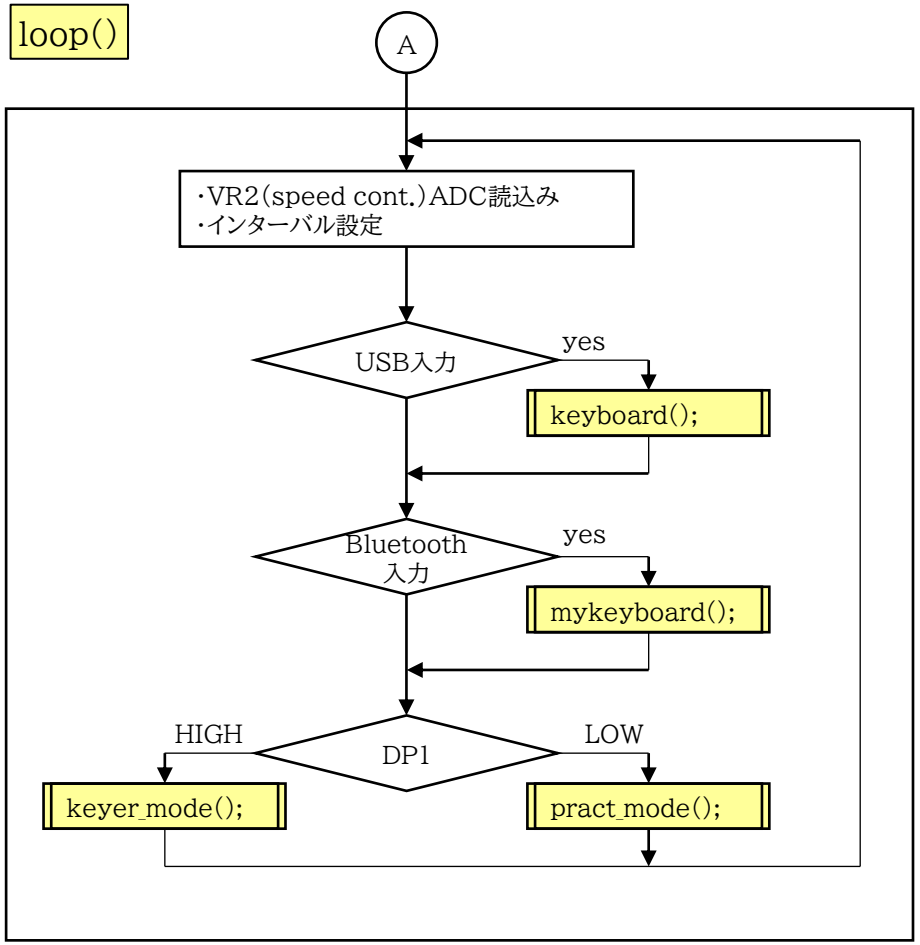
```
【set variables】
int bluetoothRx  = 9;
int bluetoothTx  = 10;

SoftwareSerial mySerial( bluetoothRx,bluetoothTx );

int val = 0;
int offset = 0;  // add 2020.10.23
int T,T3,T4;
int tau,SA;
int a = 1;

int SPK = 11;   // speaker
int LED = 13;   // LED on the Board
int PHC = 15;   // Photo coupler of Output

int KY1 = 3;    int KY2 = 2;
int SW1 = 6;    int SW2 = 4;    int SW3 = 5;
int SW4 = 8;    int SW5 =12;    int SW6 = 7;

int DP1 = 16; int DP2 = 17; int DP3 = 18; int DP4 = 19;
```

setup()

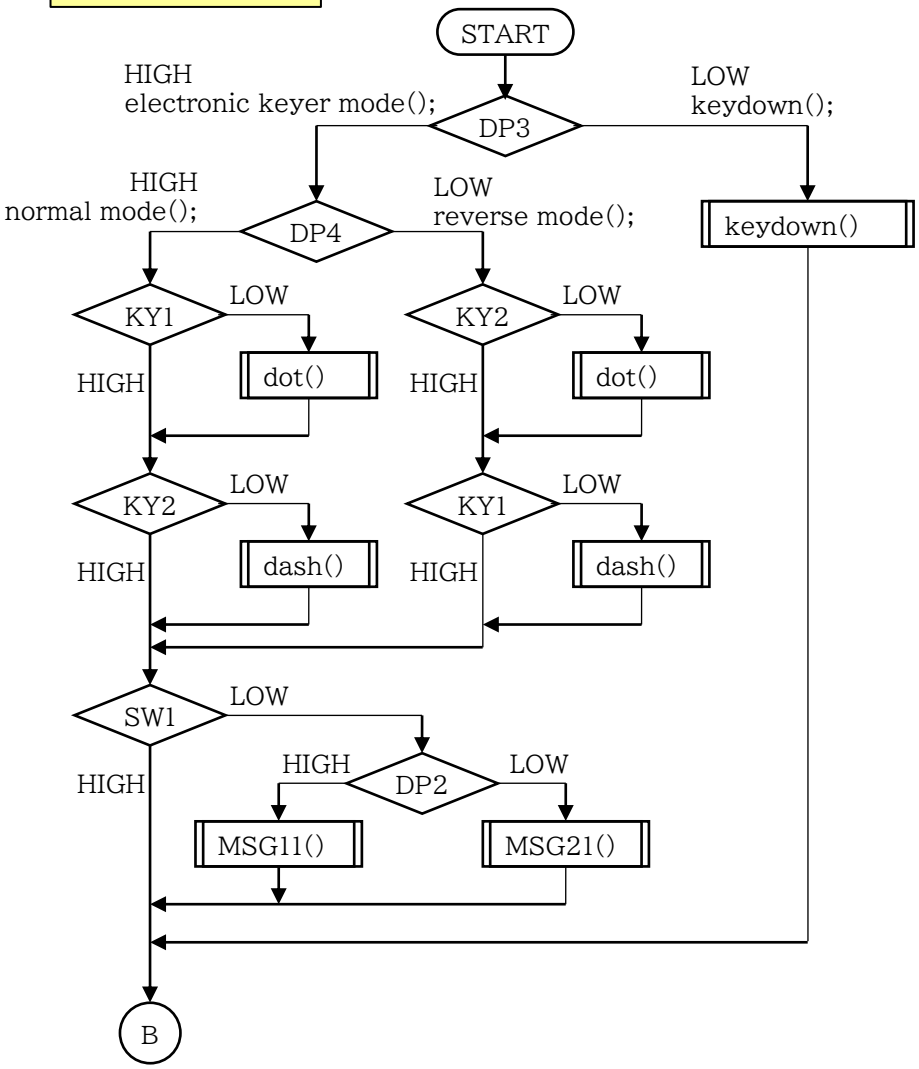
```
Serial.begin(115200);
 mySerial.begin(115200);

 pinMode(LED,OUTPUT);
 pinMode(SPK,OUTPUT);
 pinMode(PHC,OUTPUT);
 pinMode(A0 ,INPUT);  // ADC input for speed control
```

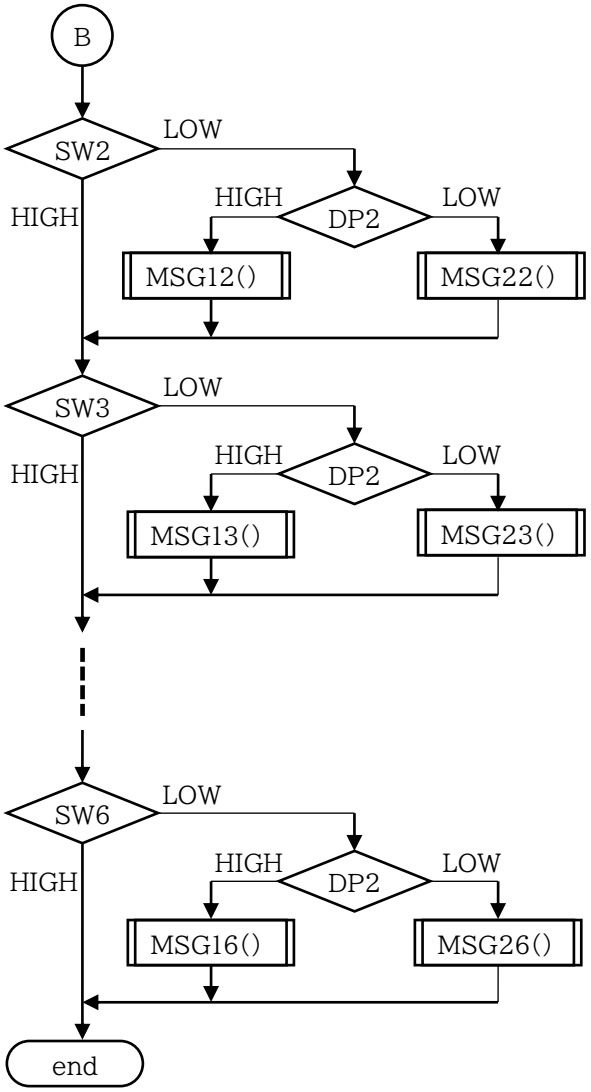
A

loop()

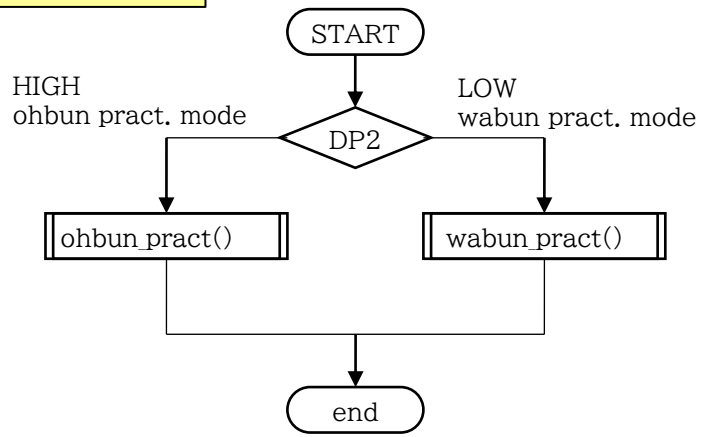


keyer_mode()

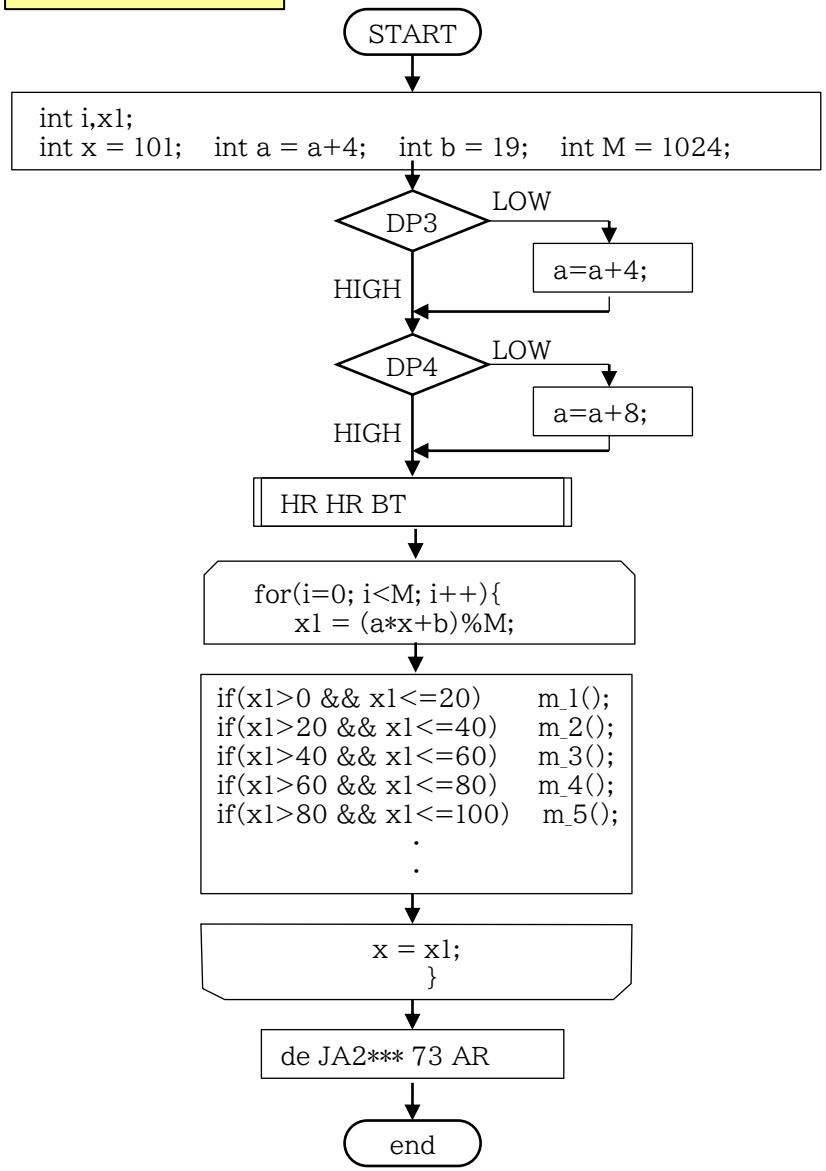

START
HIGH
electronic keyer mode();
DP3
LOW
keydown();
HIGH
normal mode();
DP4
LOW
reverse mode();
keydown()
KY1
LOW
dot()
HIGH
KY2
LOW
dot()
HIGH
KY2
LOW
dash()
HIGH
KY1
LOW
dash()
HIGH
SW1
LOW
HIGH
DP2
LOW
MSG11()
MSG21()
HIGH
B


B
SW2
LOW
HIGH
DP2
LOW
HIGH
MSG12()
MSG22()
SW3
LOW
HIGH
DP2
LOW
HIGH
MSG13()
MSG23()
SW6
LOW
HIGH
DP2
LOW
HIGH
MSG16()
MSG26()
end

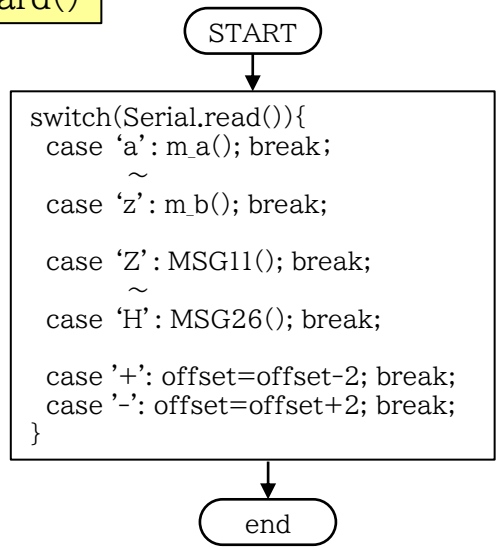
pract_mode()



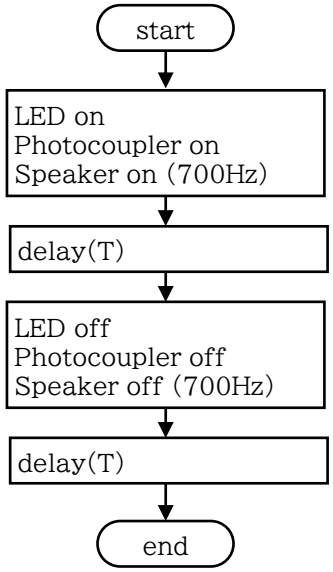
ohbun pract()



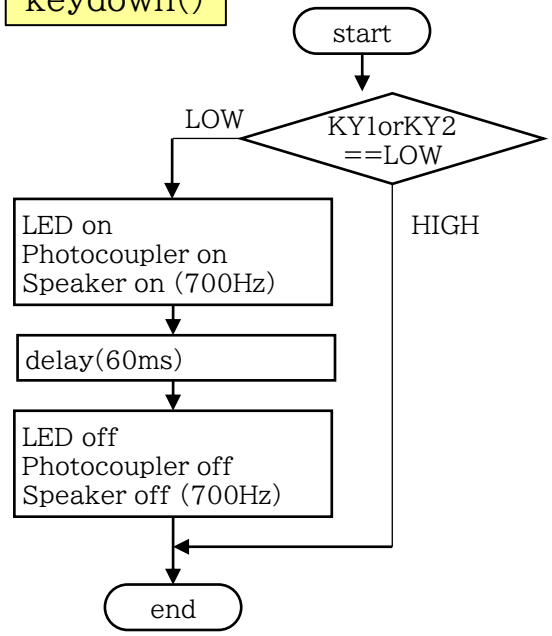
keyboard()



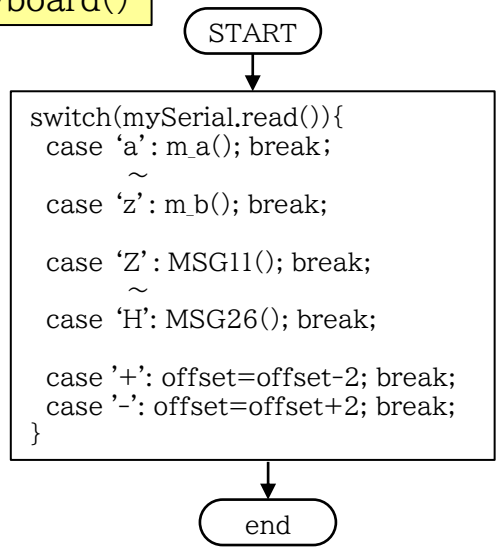
dot()



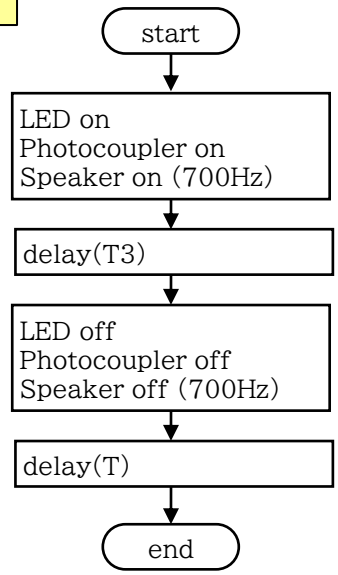
keydown()



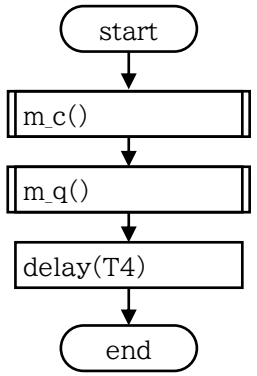
mykeyboard()



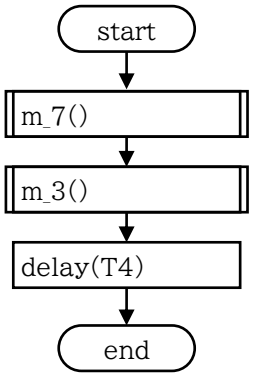
dash()



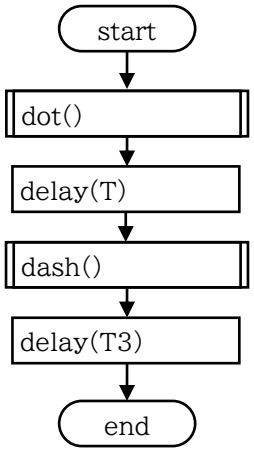
CQ()



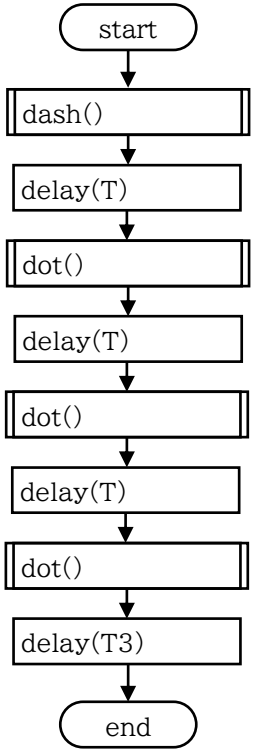
N73()



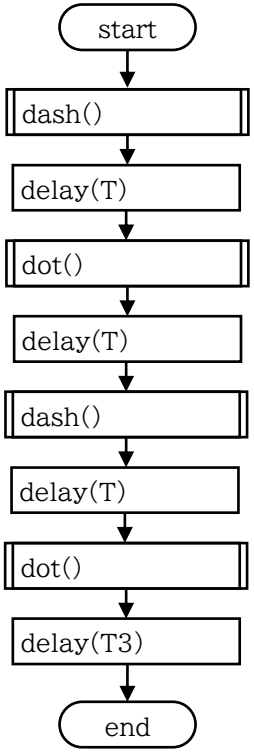
m_a()



m_b()



m_c()



Addendum [Pseudo-random number generation (linear congruential method)]

Recurrence formula

$x(n+1) = (a \times x(n) + b) \bmod M$

$M > a, M > b, a > 0, b \geqq 0$

This period has a maximum period of M, and has a maximum period of M when the following conditions are satisfied.

1. b and M are relatively prime
2. a-1 is divisible by all the prime factors of M
3. If M is a multiple of 4, then a-1 is also a multiple of 4

For example, if $M = 1024 (= 2^{10})$, (M has only 2 prime factors)

- In order for b and M to be relatively prime, b may be odd
- For a-1 to be divisible by the only prime factor of M, a-1 need to be even, a is odd, a = 3,5,7,9,11,13,15 ...
- Since M is a multiple of 4, a-1 must also be a multiple of 4, and a = 5,9,13,17,21,…

```
int x = 101;
int a = 5;
int b = 19;
    if(digitalRead(DP3) == LOW) a = a + 4;
    if(digitalRead(DP4) == LOW) a = a + 8;
int M = 1024;
```

a =		DIP SW 4	
		HIGH(OFF)	LOW(ON)
DIP SW 3	HIGH(OFF)	5	13
	LOW(ON)	9	17