Document NO：

Whetron Electronics Co., Ltd.

Function Description

Equipment: Wireless Door Lock Control Set (Transmitter)

Model No. Model: 89704-YY010-A, 89704-YY202-A, 89704-YY030-A, 89704-YY040-A, 89704-YY050, 89704-YY060-A, 89704-YY080, 89704-YY090, 89704-YY100, 89704-YY110-A, 89704-YY140-A, 89704-YY160, 89704-YY120

FCC ID FCC ID: DPB-0001

TABLE OF CONTENTS：

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1、 ECU Product Specification：

1、 ECU Product Specification：

1.1. Standard Voltage ： 12 VDC

1.2. Operation Voltage ： 9.5 V 16 V

1.3. Operation Frequency ： 315M Hz ± 250K Hz

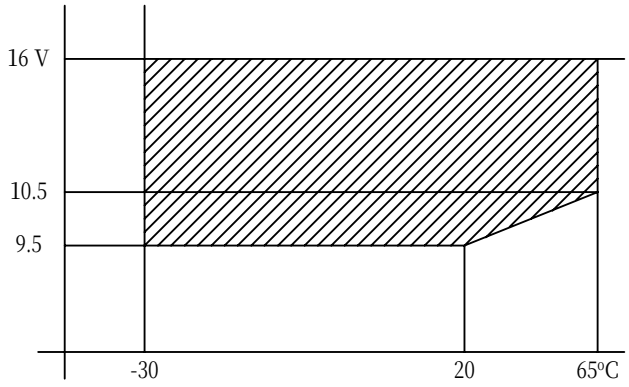
1.4. Stand-by Current ： 6 mA (Max) / DC 12 V

1.5. Operation Temperature ： -30 65 ℃

1.6. Storage Temperature ： -40 85 ℃

1.7. ES TEST according to Criteria of the test items for TVSS Evaluation.

1.8. Telecommunication Approval is required.



2、Transmitter Product Specification：

2.1. Standard Voltage：6 VDC

2.2. Operation Voltage：4.5 ~ 6.5 VDC

2.3. Operation Frequency：315M Hz ± 250K Hz

2.4. Stand-by Current：0 mA

2.5. Operation Current：8mA / 6V

2.6. Operation Temperature：-20 60 ℃

2.7. Storage Temperature：-40 85 ℃
(no include battery)

2.8. ES TEST according to Criteria of the test items for TVSS Evaluation

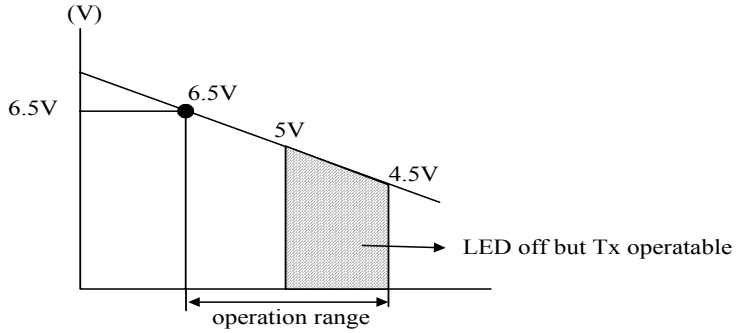
2.9. Telecommunication Approval is required.

2.10. Water-proof：
water temperature 18℃, under the surface 15 cm for 30 minutes.

2.11. Pull force on key ring：
Durability under the pull force 10 Kg and available for 10 minutes.

2.12. Stamina of battery：Button pushed for one second per minute and available for 10,000 times. (Battery :Panasonic CR2016*2)

2.13. LED OFF Voltage：Lower than 5 VDC.



3、ECU Function Description：

3.1. Security Status ARM：

A). After IGN OFF, all doors / trunk / hood closed, pushed the LOCK button and then siren chirped once (0.15sec) flasher twinkled once, four doors locked simultaneously; system accessed ARM status after 3 seconds.

B). Setting Failure: Siren chirped long once (1.0sec) for ARM Failure, if doors at status of OPEN.

C). IF door is closed and trunk/hood is not closed, the door lock is locked, however, system doesn't access ARM status with keeping LED lighting

D). After that, trunk/hood is closed, system accessed ARM status automatically.

3.2. Security Status DISARM：

UNLOCK button pushed, doors unlocked and flasher twinkled two times and siren chirped two times and interior light ON for 30 seconds. System accessed the DISARM status.
If system triggered before, flasher twinkled three times and siren chirped three times.

3.3. SEARCHING：

Under ARM status, pushed LOCK button once. Siren chirped once (1.5sec) and flasher twinkled for (15secs).

3.4. PANIC：

Pushed PANIC button for over 1.5secs and system accessed PANIC status.
Siren chirped 30secs and flasher twinkled for 30secs continuously.
To exit PANIC status, pushed PANIC or UNLOCK button once. Siren chirp and flasher twinkle terminated immediately.

3.5. Security Activating：(N=3,6,9, alternatives for user's choice)

A). Under ARM status, alarm activated for N cycles if IGN ON or door/ trunk/ hood opened and remained Open status.
(1 circle = Siren chirped 30secs; flasher twinkled 30secs).

1). Within 3 cycle, system activated and doors closed status , doors locked automatically.

2). After 3 cycle , doors still on open status , doors locked automatically.

B). Occasional strike or vibration, system alarmed by two stages:

1). Under ARM status, slight strike or vibration caused siren chirped once (0.15sec). If strike or vibration repeated three times within 10secs, siren chirped for 30secs and flasher twinkled for 30secs.

2). Under ARM status, violent strike or vibrated caused siren chirped for 30secs and flasher twinkled for 30secs.

3、ECU Function Description：

3.6. Siren Suspend：

A). On activation of siren and flasher, pushed LOCK button to suspend activation. System accessed to ARM status after 3secs.

B). On activation of siren and flasher, pushed UNLOCK button to terminate operation. System accessed to DISARM status.

3.7. RE-ARMING：

Pushed UNLOCK button on TX but without IGN ON/KEY IN/ Door /Hood/ Trunk opened within 30secs.System accessed ARM status automatically with siren chirped once and flasher twinkled once, and doors locked.

3.8. DISARM by key：

Under ARM status and TX lost, IGN ON / OFF for over 10 times within 15secs. System accessed to DISARM status without TX. Siren and flasher terminated.

3.9. Auto-Lock over the speed 20 ㎞/H：

Under Door closed, IGN ON status, doors closed and over-speed 20km/hr. Then doors locked automatically. When IGN OFF , doors unlocked automatically.

☆3.10. Remote Trunk Opening：

IGN ON/KEY IN, trunk will not be opened via transmitter;

Pushed UNLOCK button on transmitter, door unlocked; keeping pushing UNLOCK button for over 1.5secs, trunk opened.

If under ARM and trunk opened status, system accessed ARM status automatically after trunk closed for 30secs.

Remark： If IGN ON, KEY IN or doors opened, system will not accessed ARM status.

3.11. Interior Lights ON：

A). Pushed UNLOCK button on TX, doors unlocked and interior lights ON for 30secs;

B). Under DISARM status, door opened and interior light ON. After 30 sec, interior light OFF. (Selectable)

C). Within the 30secs of interior light ON status, interior light will be OFF immediately when IGN ON. (Selectable)

3、ECU Function Description：

☆3.12. Auto-closed Power Window：(Re-confirmation from Hotai is necessary)

A). After push LOCK ON transmitter within 3 sec push LOCK button again, system accessed the “Auto-closed Power Window”.

B). After release LOCK button on Transmitter within 3 sec push LOCK button again, system will function again “Auto-closed Power Window”

☆3.13. Intrusion Sensor OFF：

System accessed ARM status and transmitted ENCODER signal to INTRUSION Sensor C/U, detection activated after 5 seconds.

Under detection, motion in chamber triggered system to transmit DECORDER signal And system activated.

☆3.14. Engine CUT：

Alarm activating, ST CUT RELAY will be operated to terminate the engine start.

☆3.15. Smart Entry function：

After detect handle SW signal, TVSS C/U will transmit encoder signal to SMART ENTRY C/U which will transmit a remote detecting signal, if exist matching transmitter, which will transmit UNLOCK signal to TVSS C/U.

3.16. Code Learning：

A). On the DISARM status:

1). Anyone of the four doors open, Key in cylinder

2). IGN ON→ OFF five times within 10secs

3). LED kept lightened

B). Finished steps A), LED remains lighting, push any bottom in the first transmitter once within 16 sec, LED off, then push the same bottom in the first transmitter again ,LED flash once then kept lighten means code learning succeeded.

C). To learn the second code you must repeat B) within 16 sec after the first code learning succeeded.

D). Closed the door, IGN turn on or no signal of the transmitter within 16 sec then the LED turn off, it means leave the code learning mode

E). 4 sets of code are available in memory.

3、ECU Function Description：

3.17. Transmitter disabled Condition：

When IGN ON or KEY IN, ARM, DISARM, SEARCHING and Remote Trunk Opening will be disable.

3.18. LED indicators：

A). LED twinkled slowly under ARM status.
B). LED twinkled speedily for vibrated or system activated. LED stopped after IGN ON.
C). LED stopped twinkle on accessing DISARM status if system not being activated.
D). After 3 sec accessed intrusion sensor status, LED will light continuously for 3 sec.
E). If hood or trunk opened when pushing LOCK button, LED kept lightened. After hood or trunk closed, system accessed ARM status automatically.
❒.In high grade 316N, TVSS and Immobilizer use the same LED, except D) and E), TVSS must not activate A) , B) , and C.

3.19. Mute Arming / Disarming：

A). Pushed UNLOCK and PANIC once at the same time, sound of ARM /DISARM/SEARCHING disable
B). Within 3 sec pushing UNLOCK and PANIC twice, Siren will chirp once, sound of LOCK and UNLOCK will be enable

3.20. Automatic Arming：

30 seconds after IGN OFF and KEY OUT, system accessed ARM status automatically.
If door, trunk or hood opened within 30 seconds, system delayed another 30secs to ARM after door, trunk, hood closed. (doors don't lock)

3.21. Status and Alarm Memory：

A)..Under arming status , power OFF then ON, Activation
B). During the cycle of alarming, power OFF then ON, system is on alarming status
C). Under "Disarming " status, power OFF then ON, system restored "Disarming status.

3、ECU Function Description：

3.22. Selectable arming ON/OFF：

A). Initial mode Key in cylinder, IGN OFF ,Door close then Door close /open two cycle within 10 sec then IGN OFF/ON three cycle ,in result LED remain lighted.

B). Push the LOCK in transmitter and switch the setting item in sequence. LED flashed one to eight times to indicate different function:

1). Flashing one time represented Automatic ARM;(initial is “OFF”)

2). Flashing two times represented Auto-locking on 20km/hr speed and Auto-unlock on IGN OFF(initial is “ON”)

3). Flashing three times represented the function of interior lamp delay; (initial is “ON”)

4). Flashing four times represented security activating select N=6(initial is “OFF”)

5). Flashing five times represented security activating select N=9(initial is “OFF”)

6). Flashing six times represented automatic arming select after T=15(initial is “OFF”)

7). Flashing seven times represented automatic arming select after T=30(initial is “OFF”)

8). Flashing eight times represented Auto-closed power window(initial is “OFF”)

C). Siren sounded once represented selected function effected; siren sounded twice represented selected function terminated.

D). After function selected, to open then close door once and function will be switched from ON to OFF or from OFF to ON. Siren will sound as above mentioned.

E). Exit function mode:

IGN ON or all doors didn’t close or open within 30 seconds or LOCK on transmitter not Pushed within 30 seconds, then LED OFF and exit function SELECT mode

Remark：“☆” represented Optional items

4、Operation method for all function of Tx：

4.1. LOCK Button：

Pushed LOCK button, all doors locked and system accessed ARM status with flasher twinkled once and siren chirped once.

4.2. UNLOCK Button：

(A). Pushed UNLOCK button, all doors unlocked and system accessed DISARM status with flasher twinkled two times and siren chirp two times.

(B). Kept pushing UNLOCK bottom for over 1.5 seconds, trunk opened.

4.3. PANIC Button：

Pushed PANIC button over 1.5 seconds, system accessed " PANIC" function.

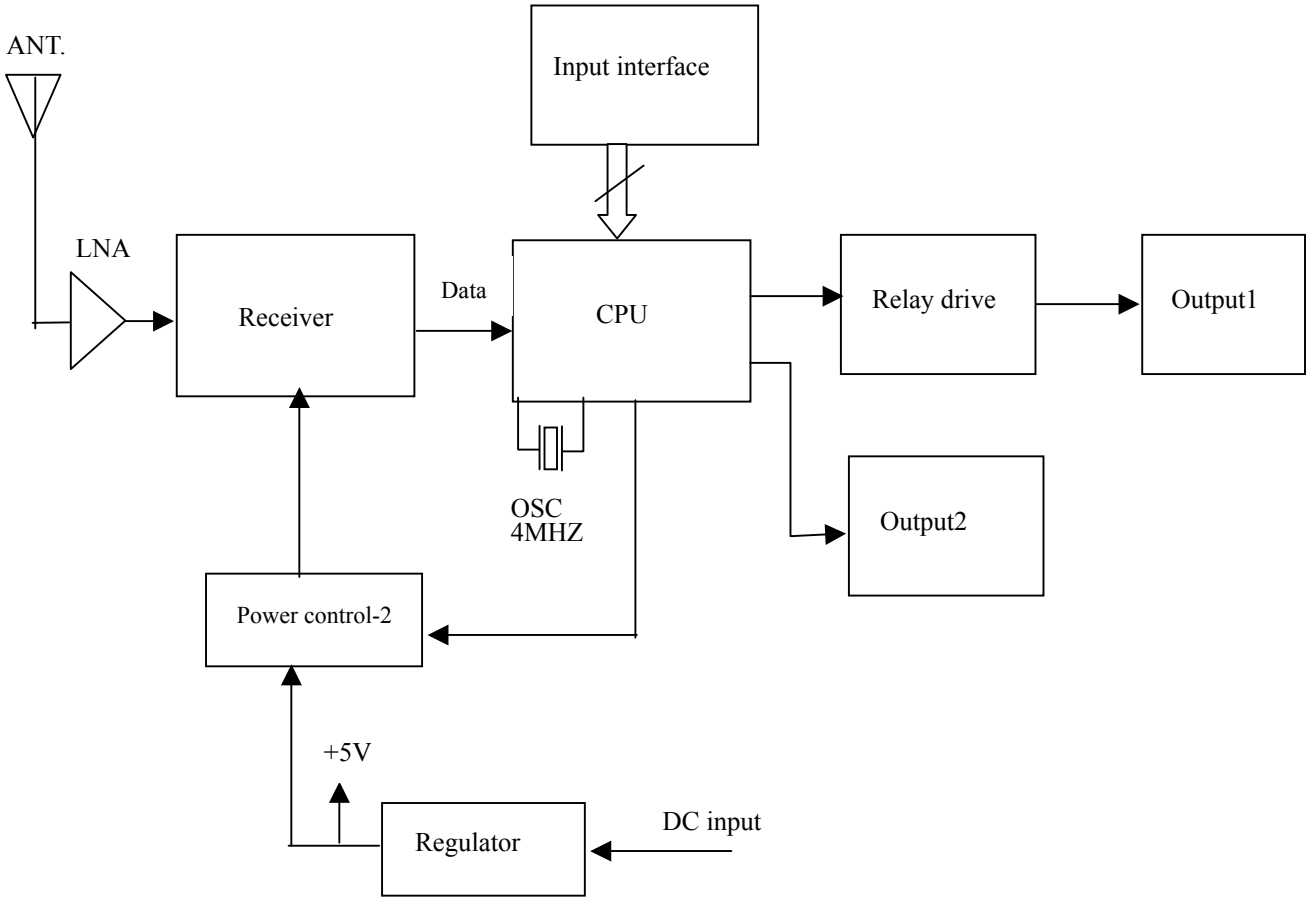
4.4. Battery Protection：

Kept pushing any button for over 20-30secs, transmitter stopped signal transmission automatically to avoid unnecessary consumption of electricity.

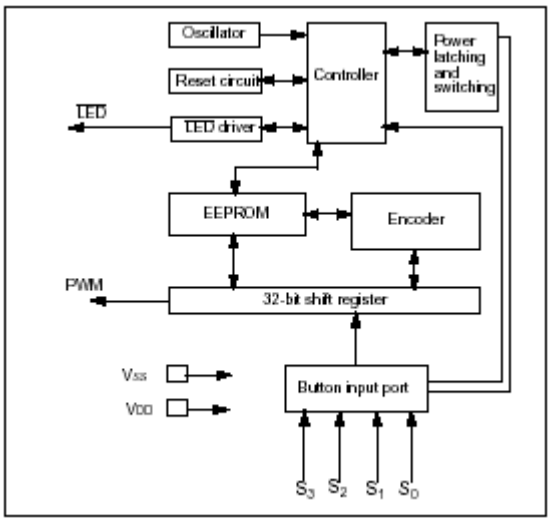
4.5. LED dimmed then off when power consumption to low voltage of battery.

5、Schematic Diagram：

5.1.1 Schematic Diagram：Receiver

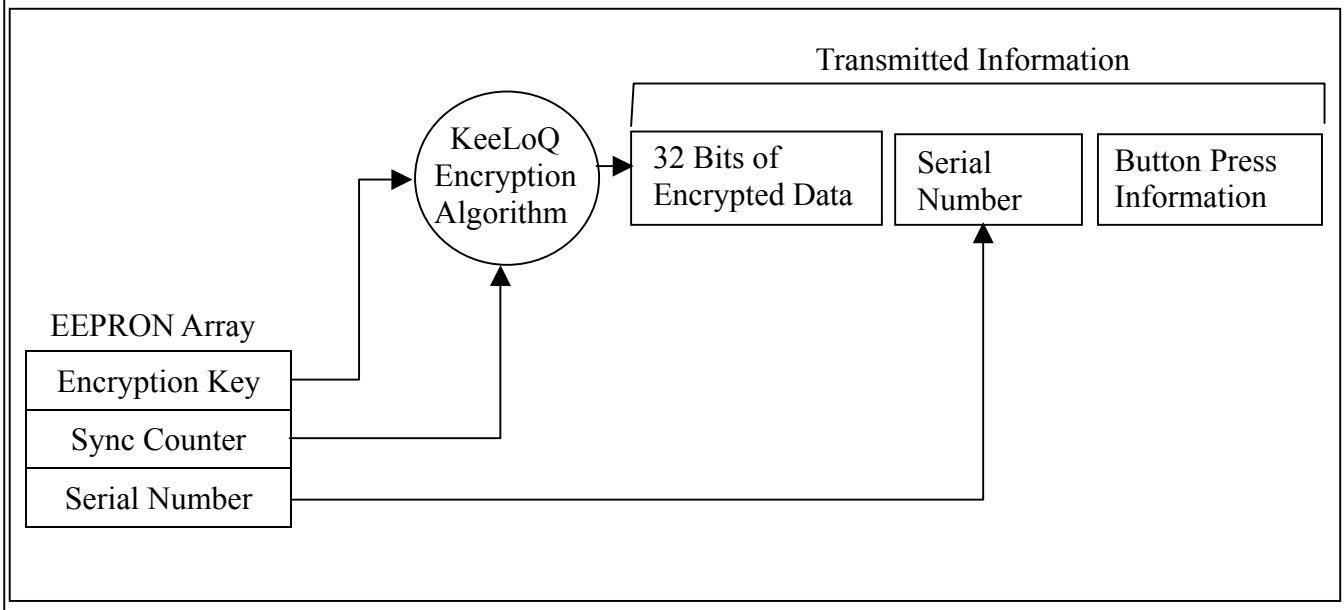


5.1.2 Schematic Diagram：Transmitter

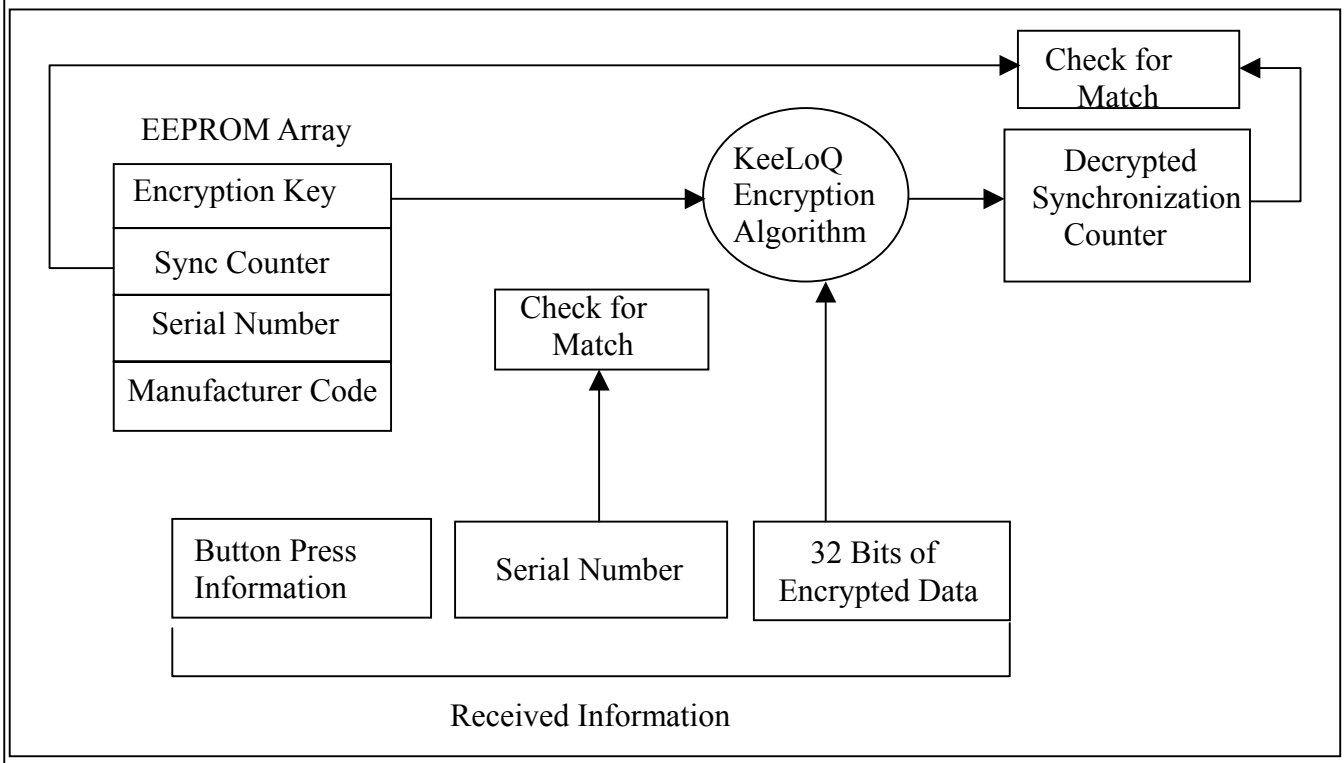


5、Schematic Diagram：

5.2. Basic Operation Of Transmitter (Encoder)

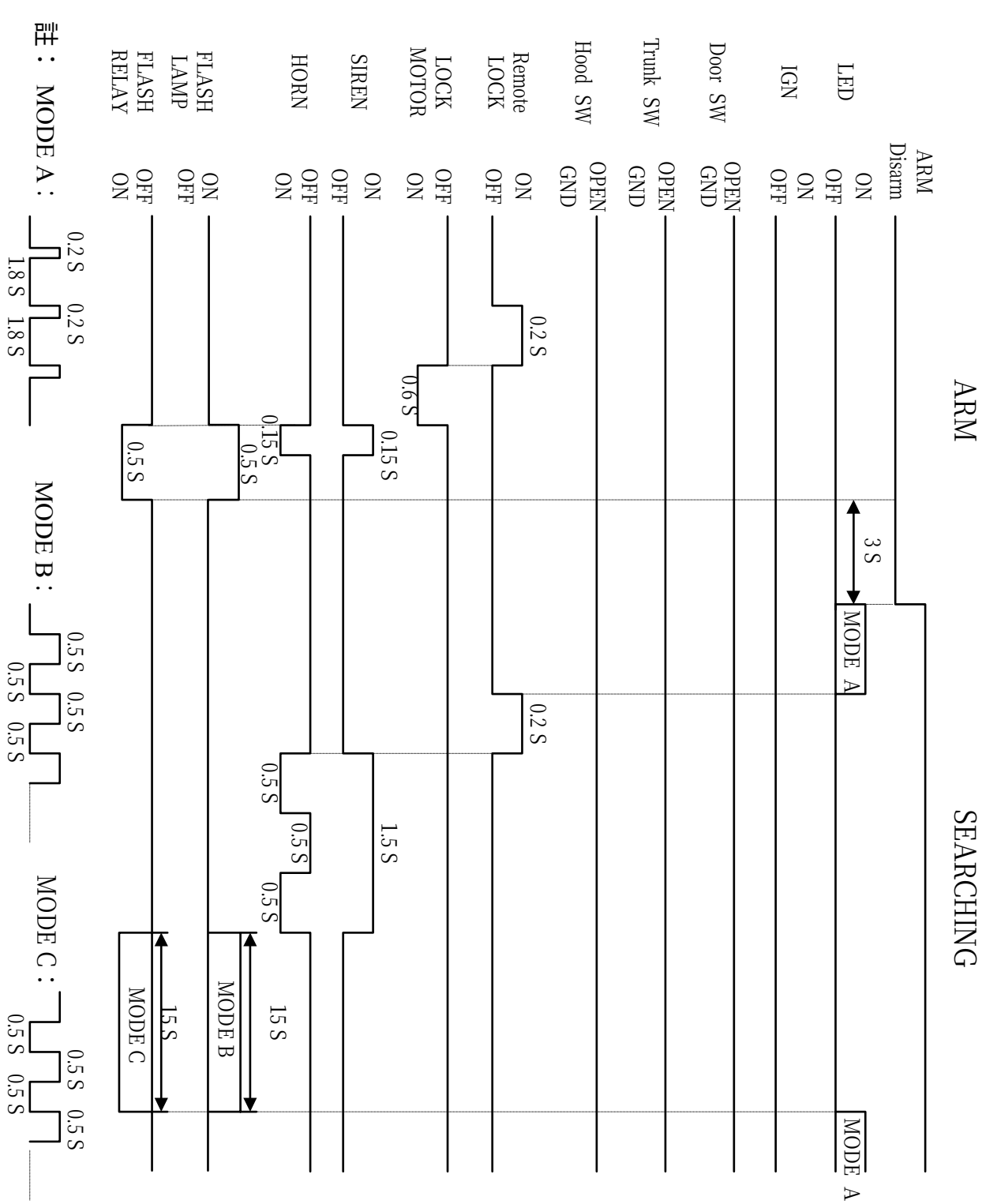


5.2. Basic Operation Of Receiver (Decoder)



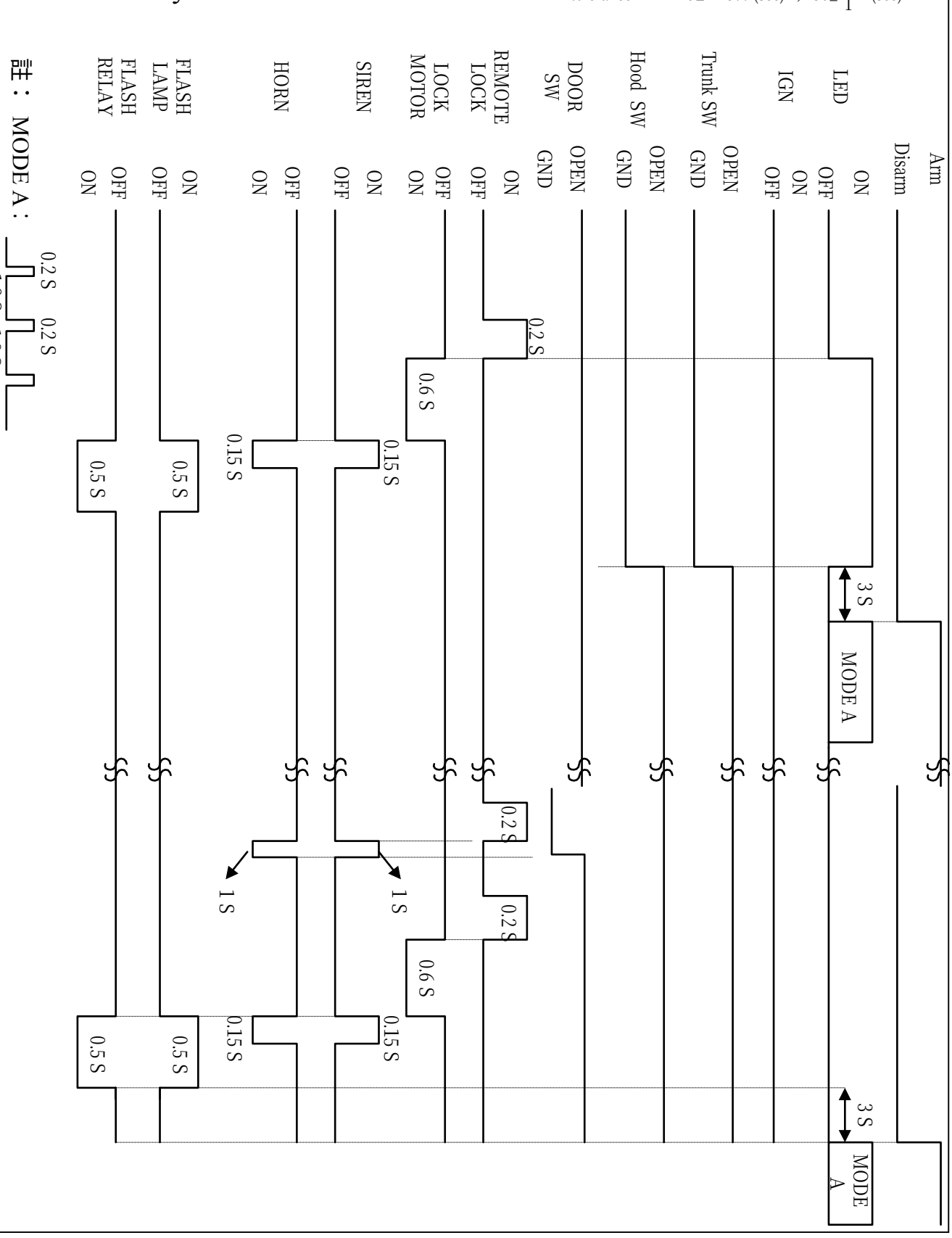
6、Timing Chart：

6.1. Security Status ARM / SEARCHING： tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



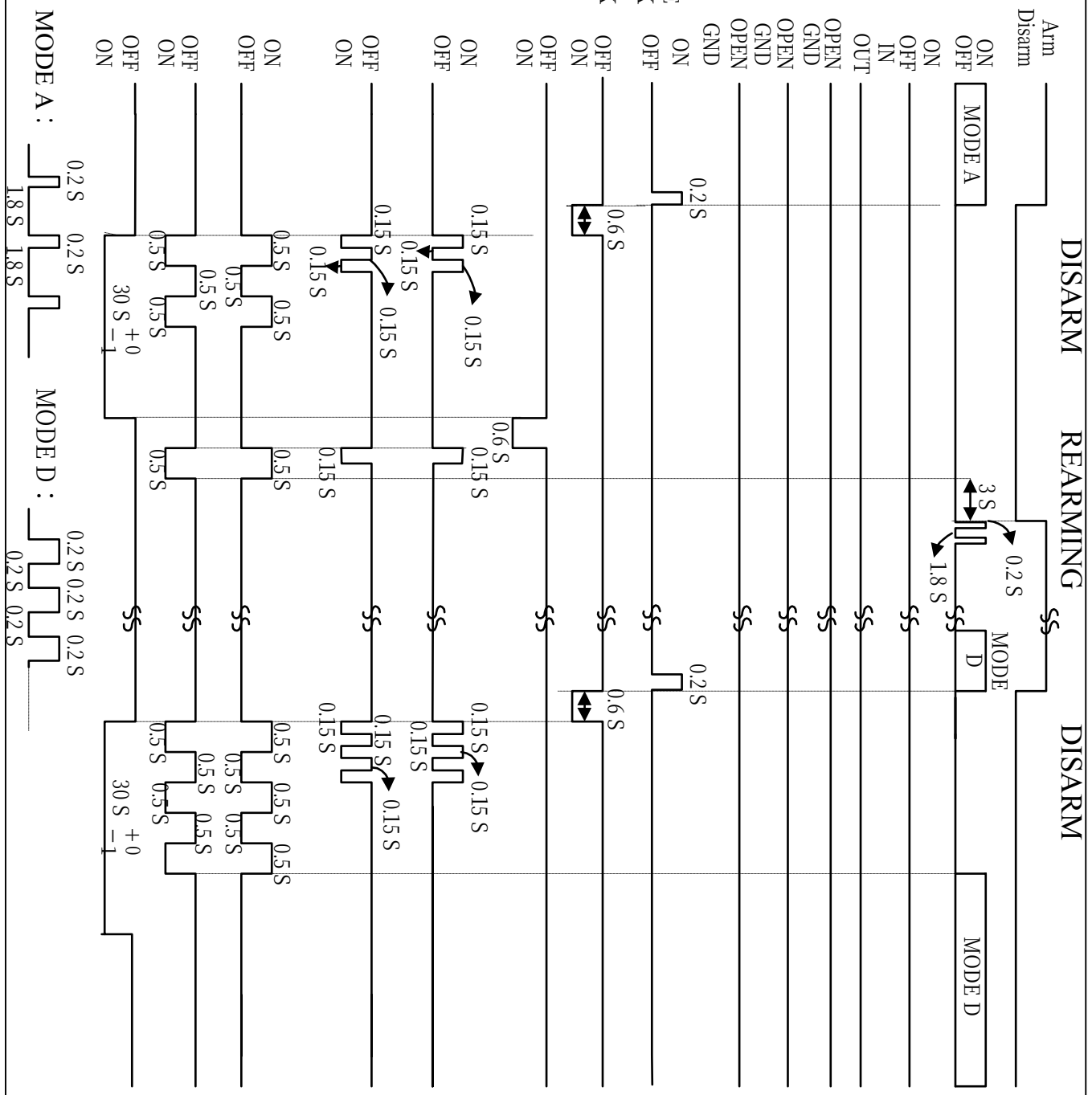
6、Timing Chart：

6.2. Security Status ARM：



6、Timing Chart：

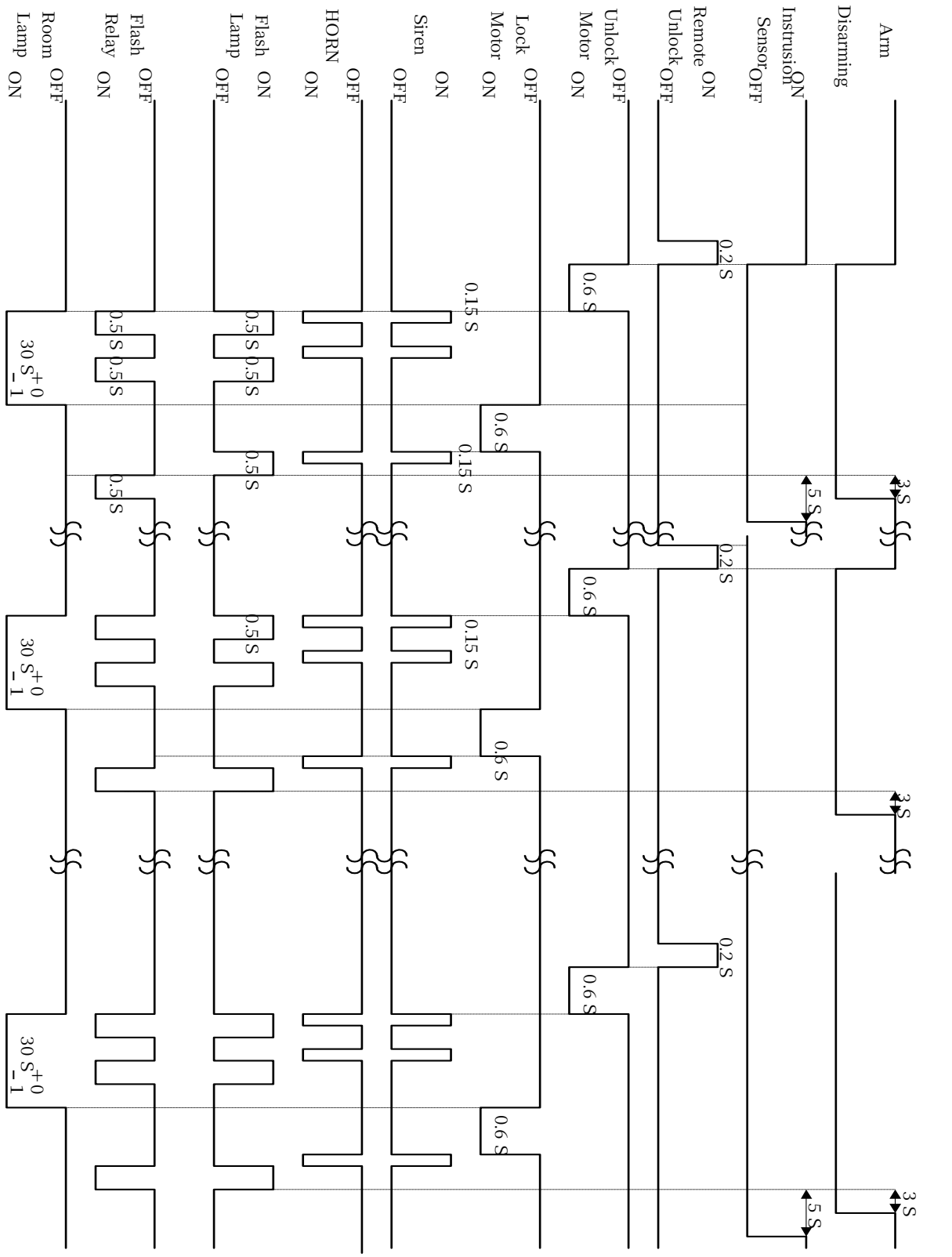
6.3. Security Status DISARM / REARMING：tolerance ： Time± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.3.1. Security Status DISARM / REARMING：(REMARK)

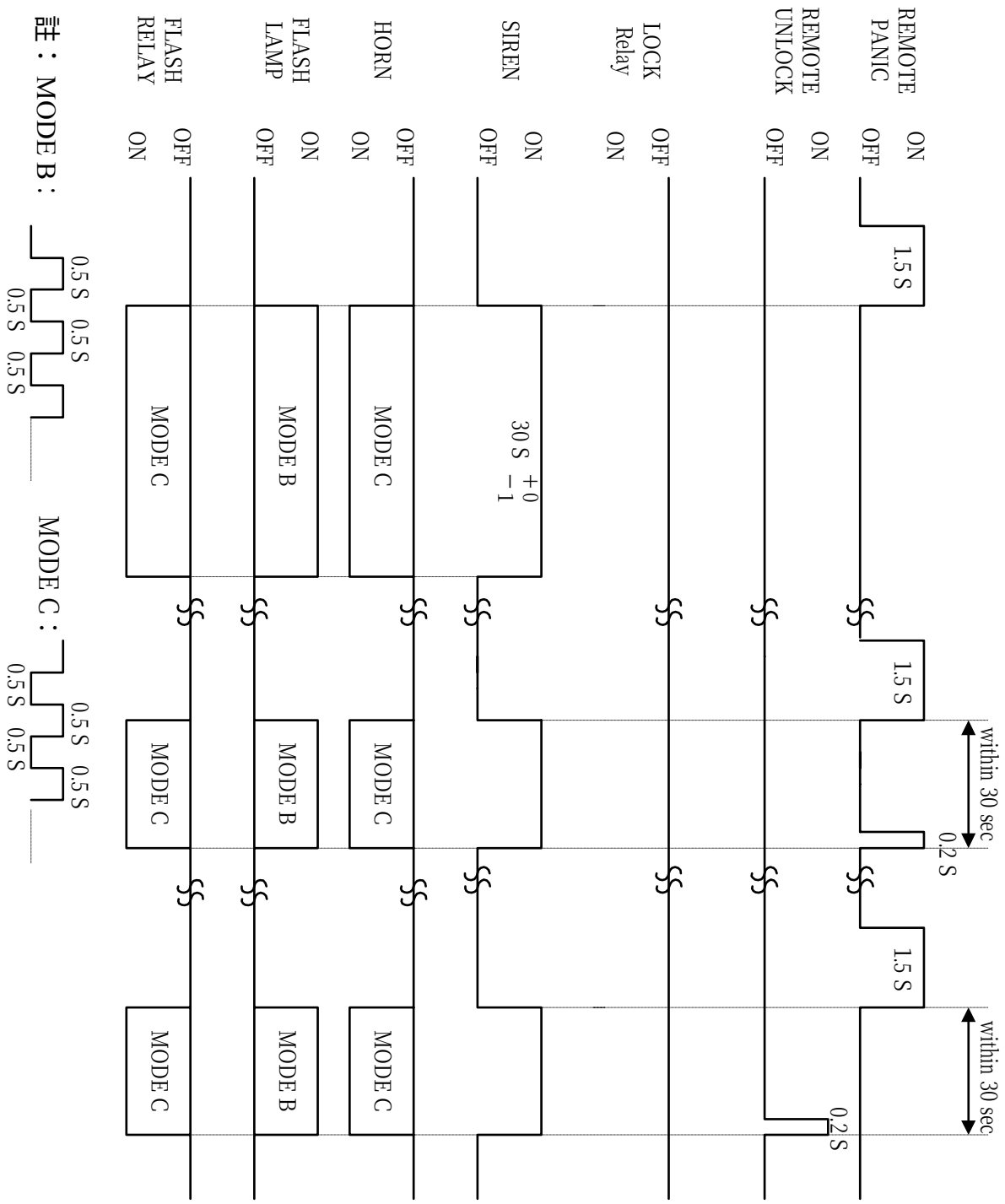
tolerance ： Time± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.4. PANIC：

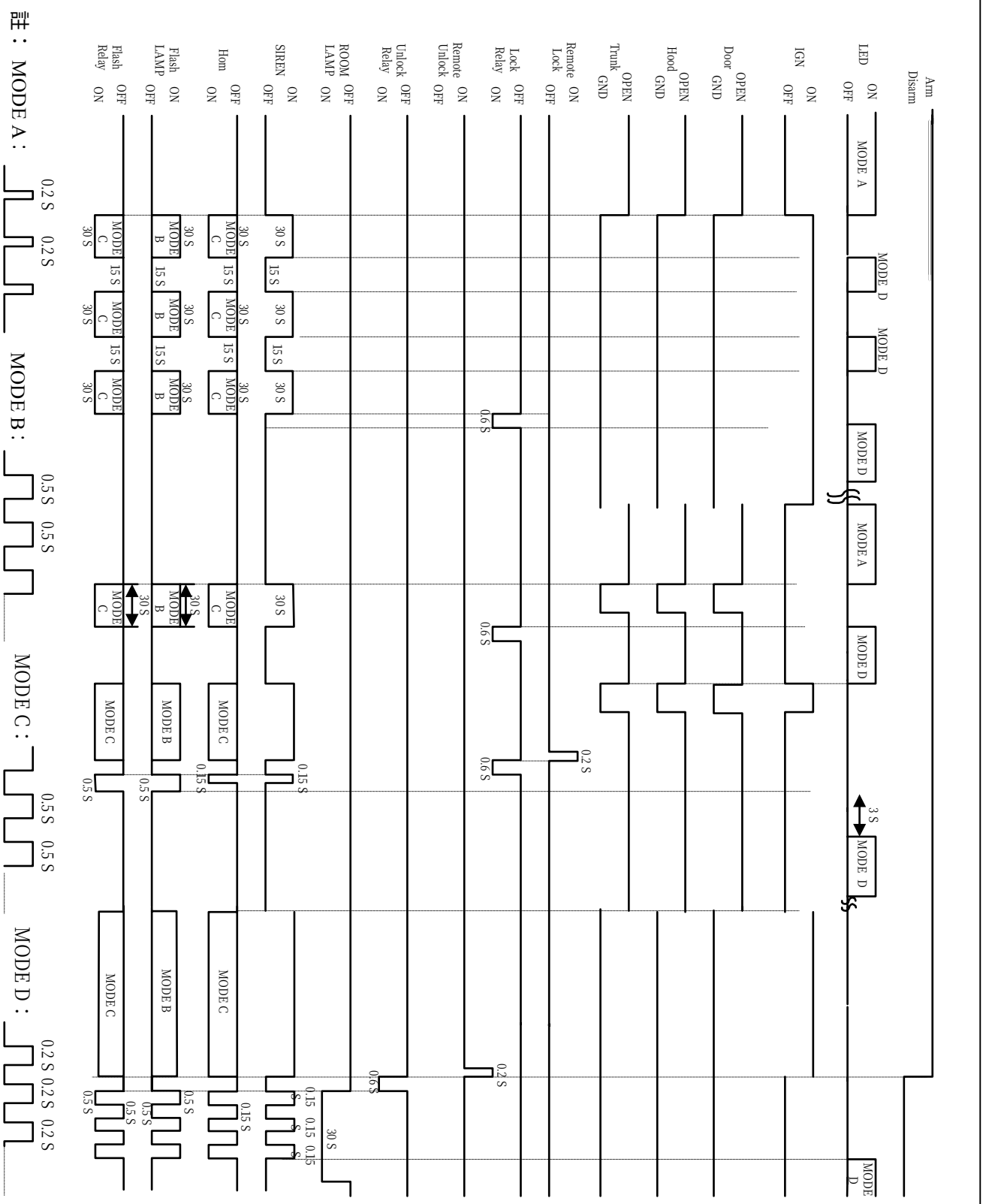
tolerance ： Time± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.5. Security Activating / Disarm Siren：

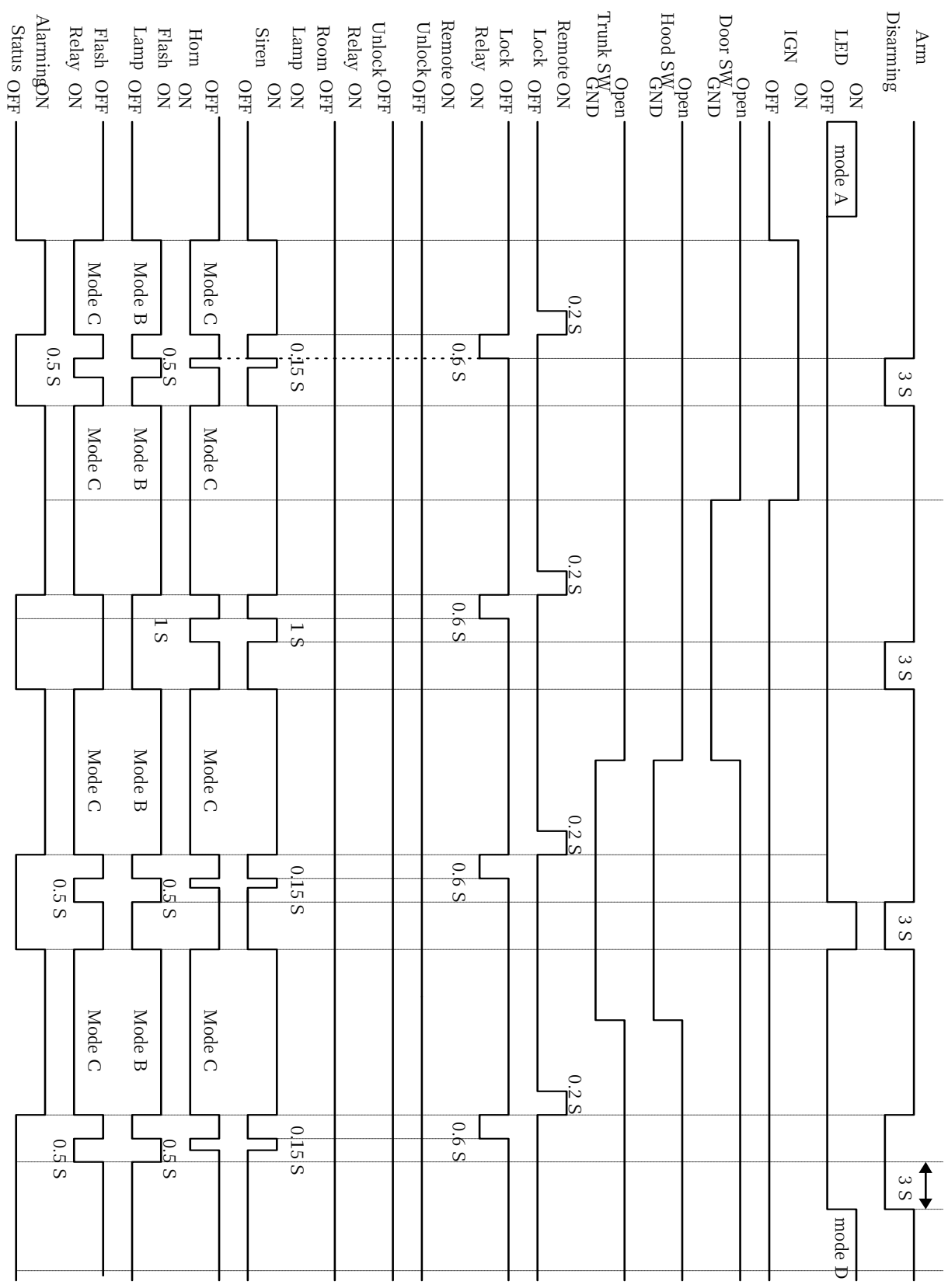
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.5.1 Security Activating：(REMARK)

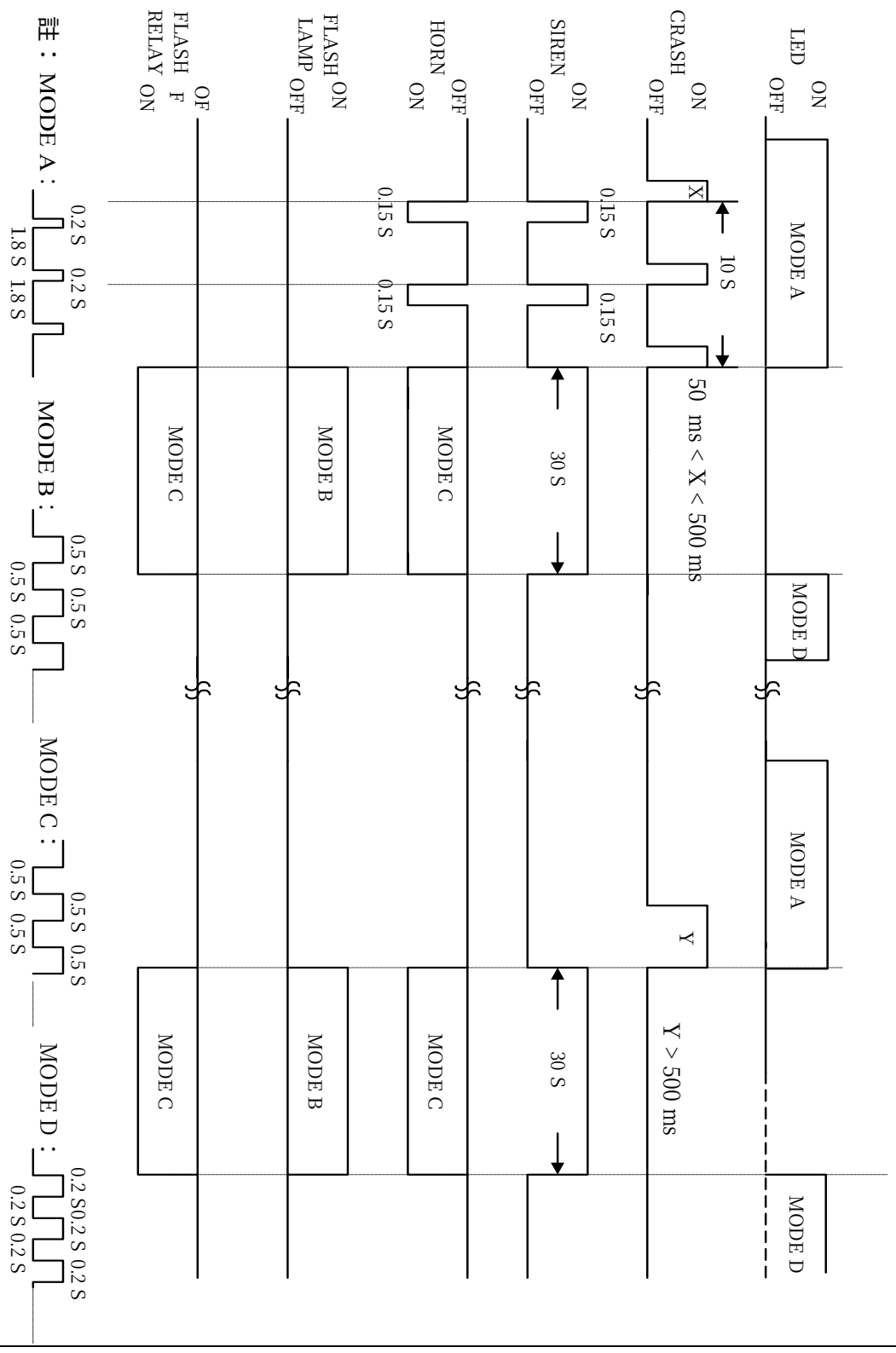
tolerance ： Time ± 5% (sec) ； 30^{+1}_{-0} (sec)



6、Timing Chart：

6.6. Security Activating：

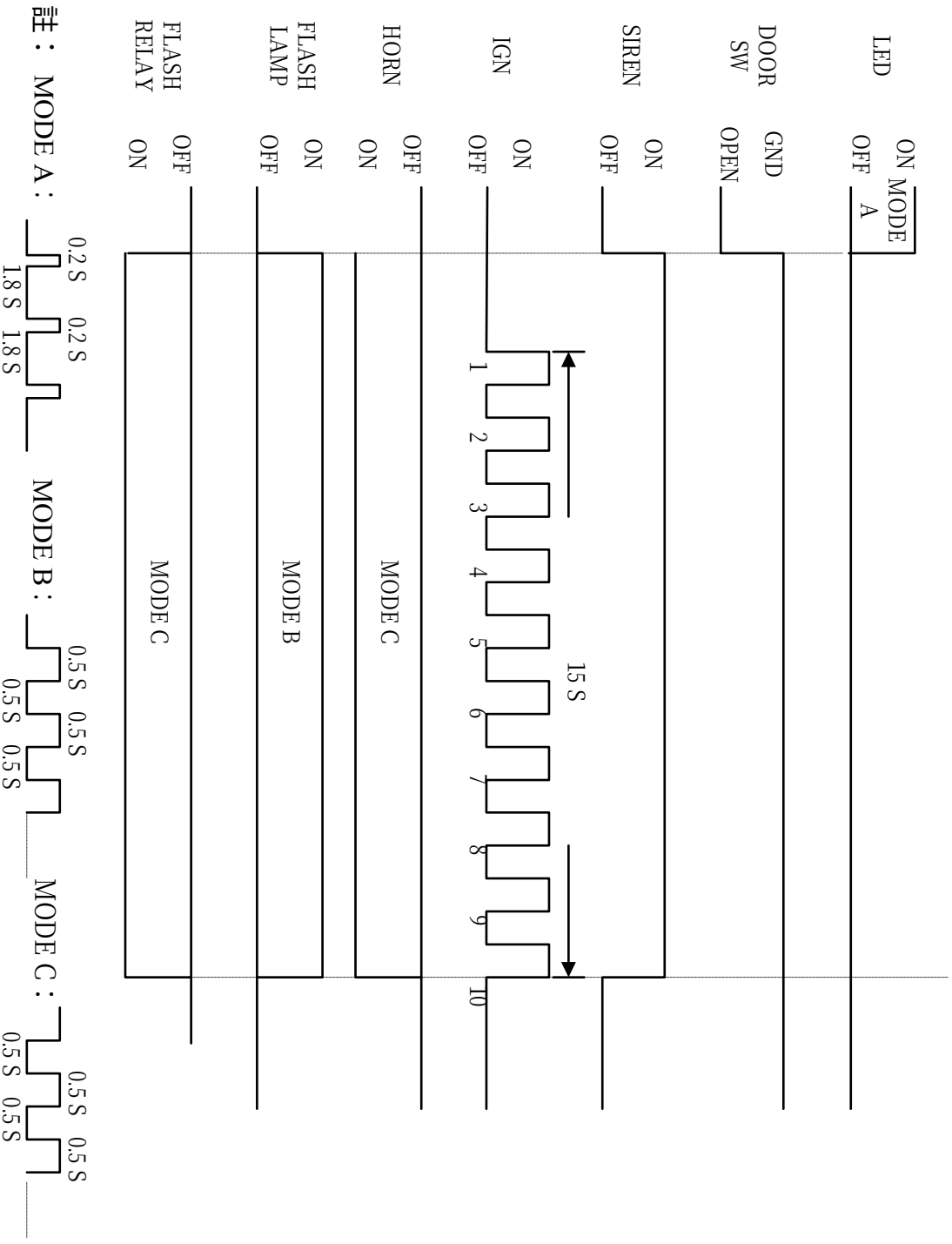
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

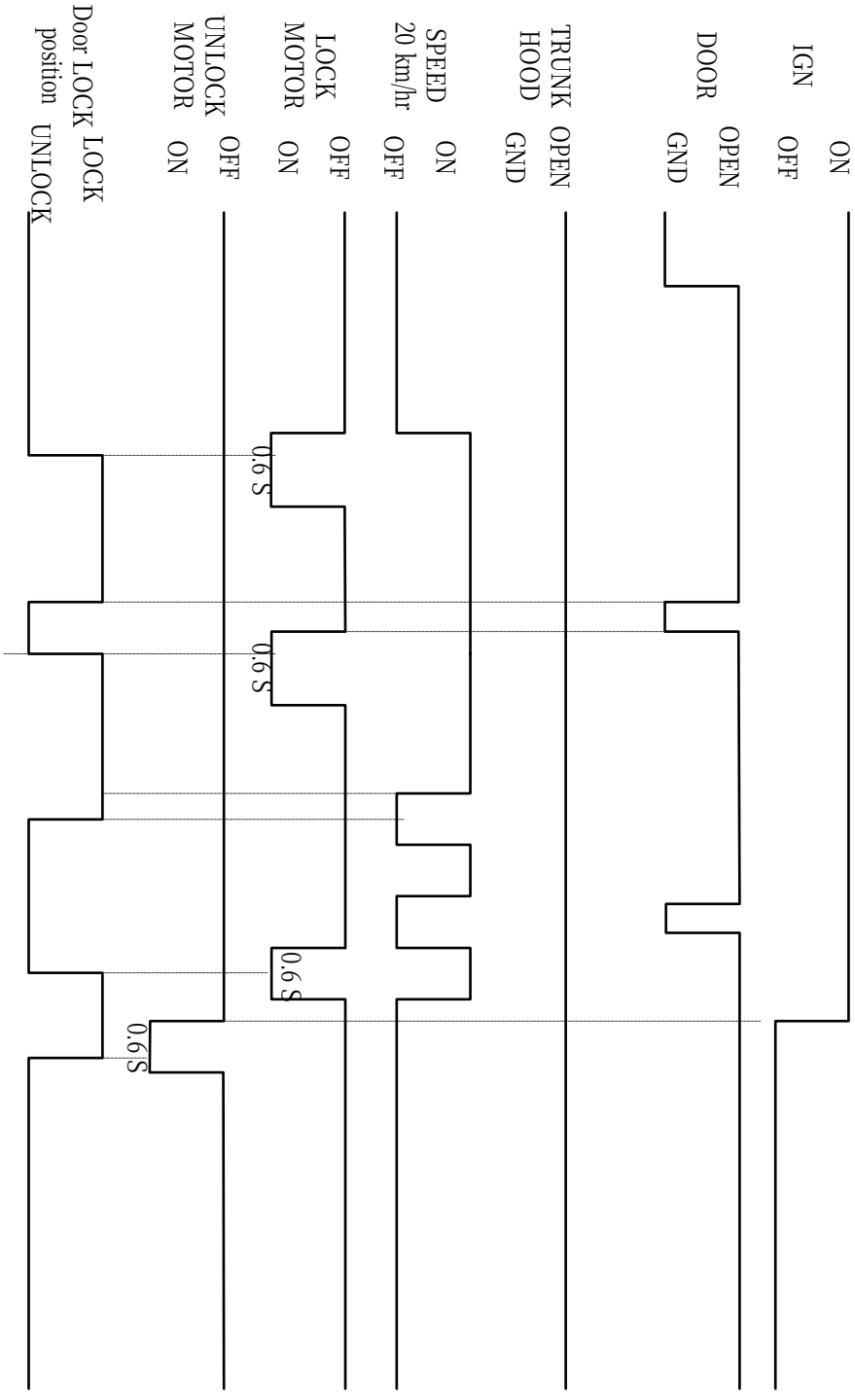
6.7. DISARM by key：

tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.8. Auto-Lock over the speed of 20 ㎞/H： tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)

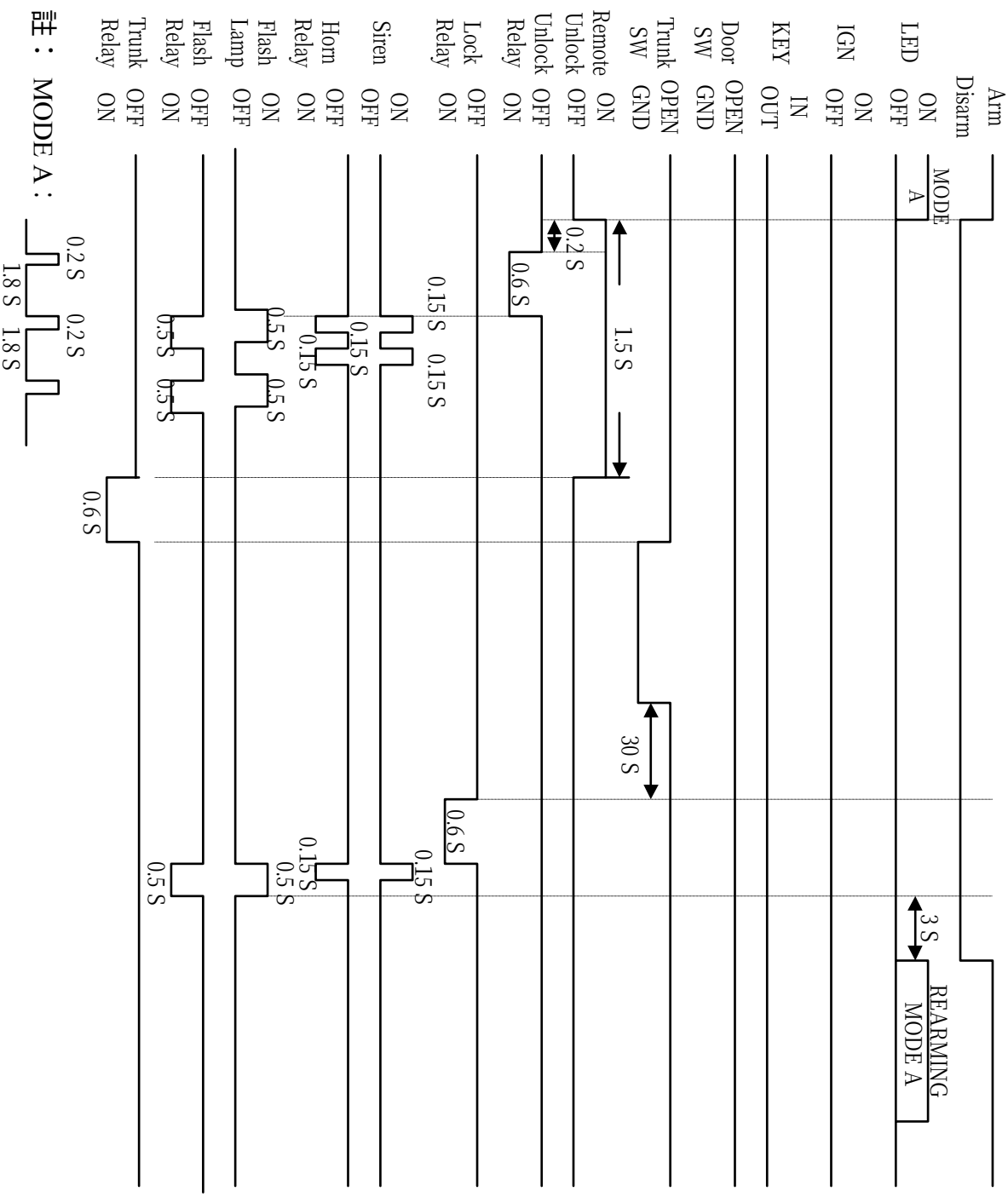


6、Timing Chart：

6.9. Remote Trunk Opening：

tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)

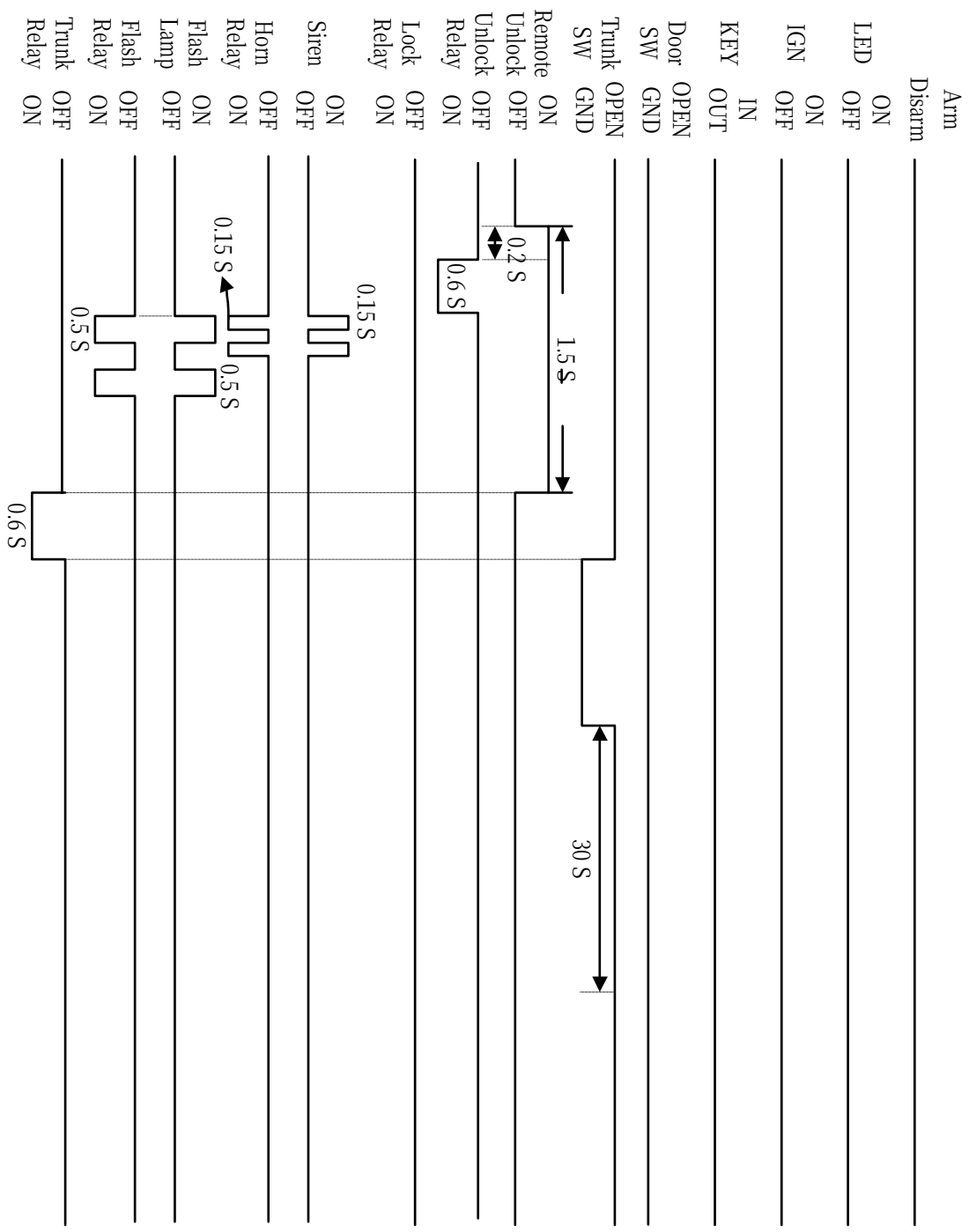
6.9.1 Door Closed Status：(Arming→Disarming)



6、Timing Chart：

6.9.2. Door Open Status：

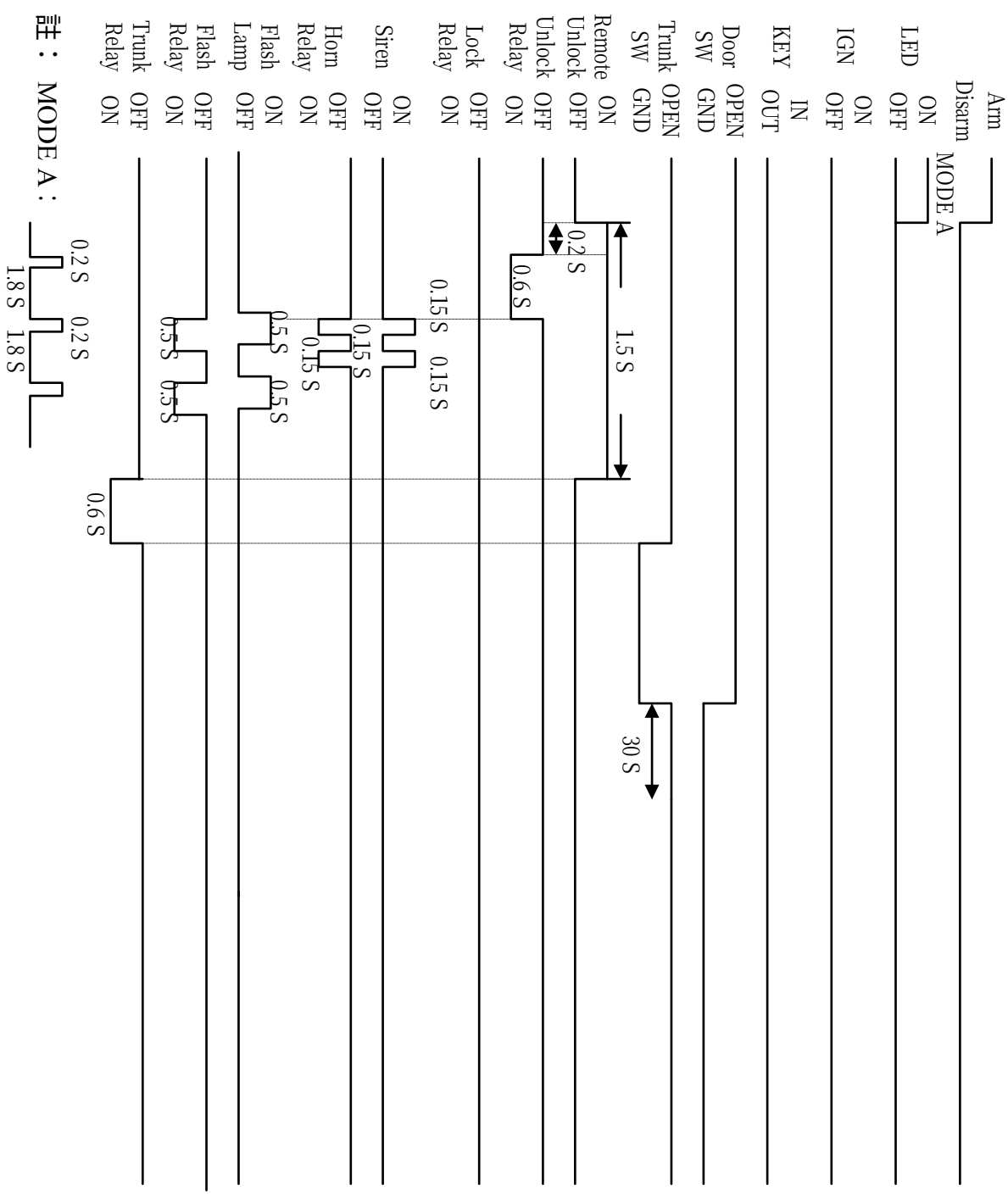
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.9.3. Door Closed to Open Status：

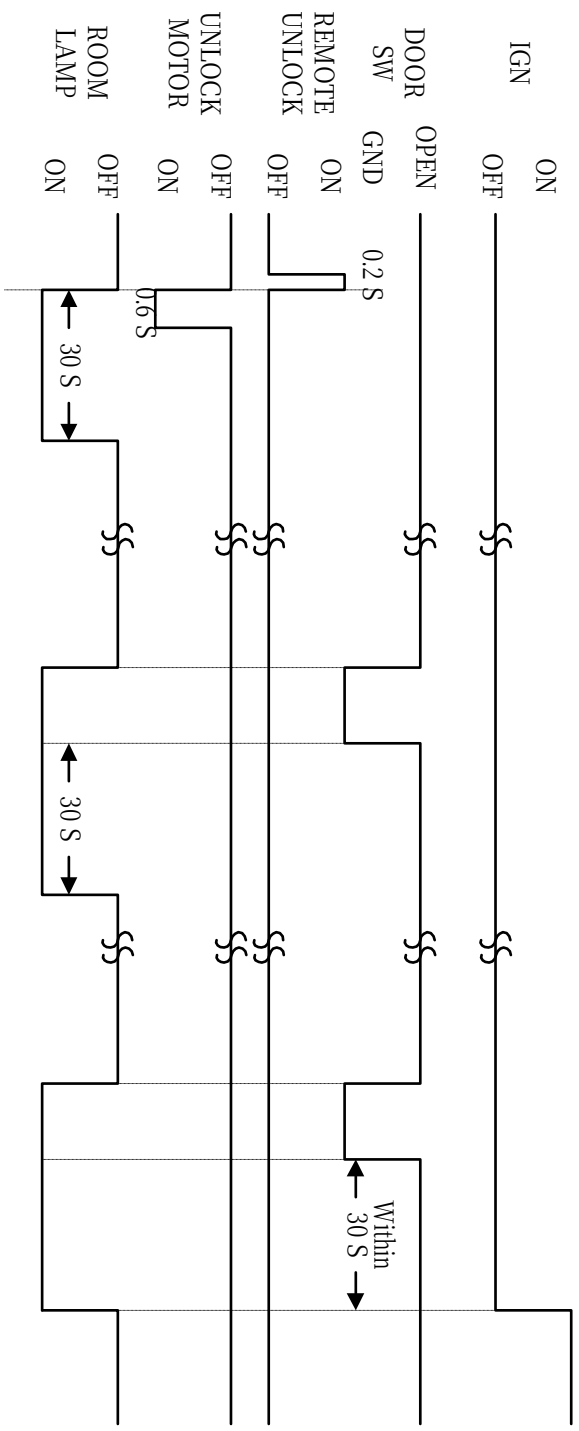
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.10. Interior Light On：

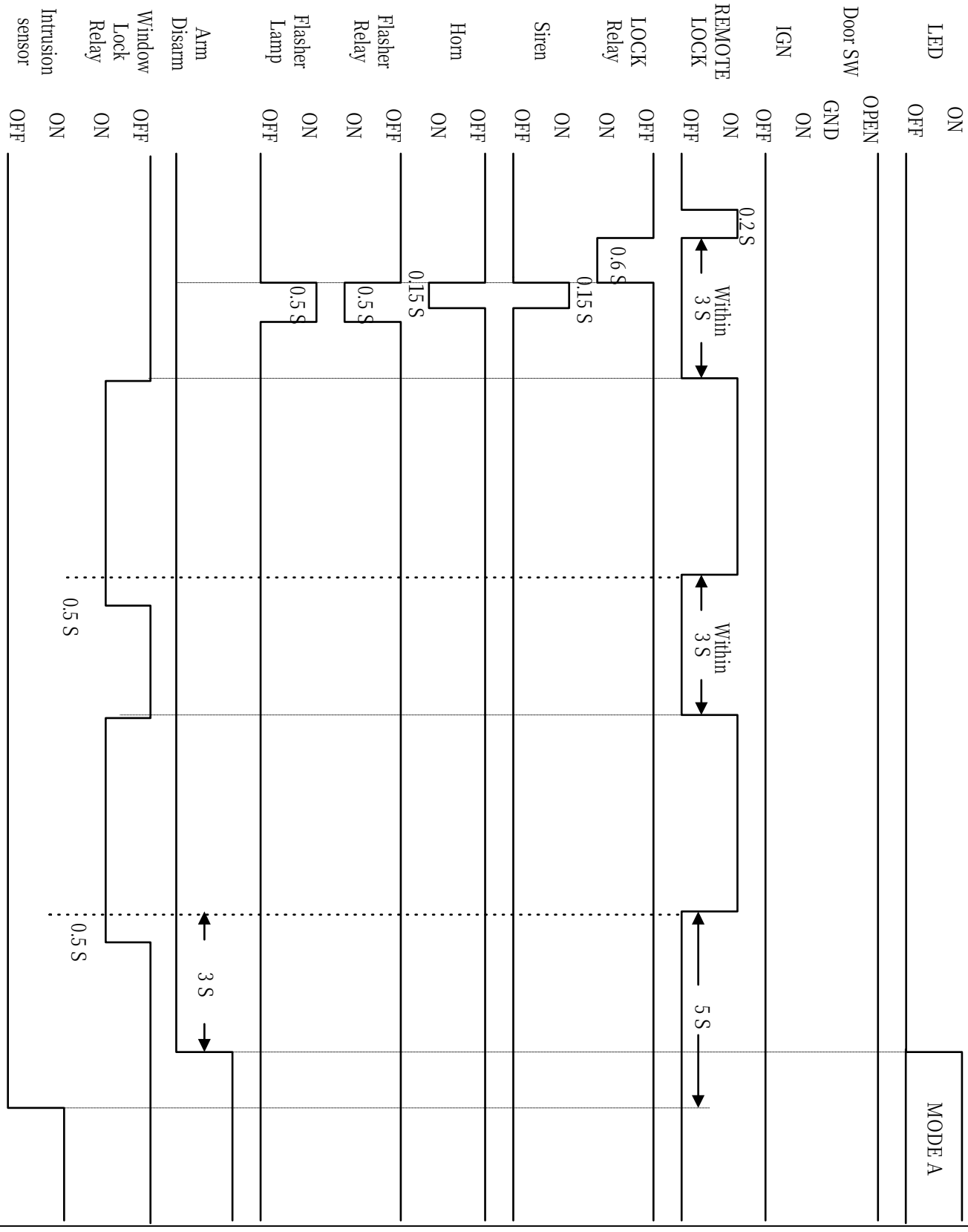
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

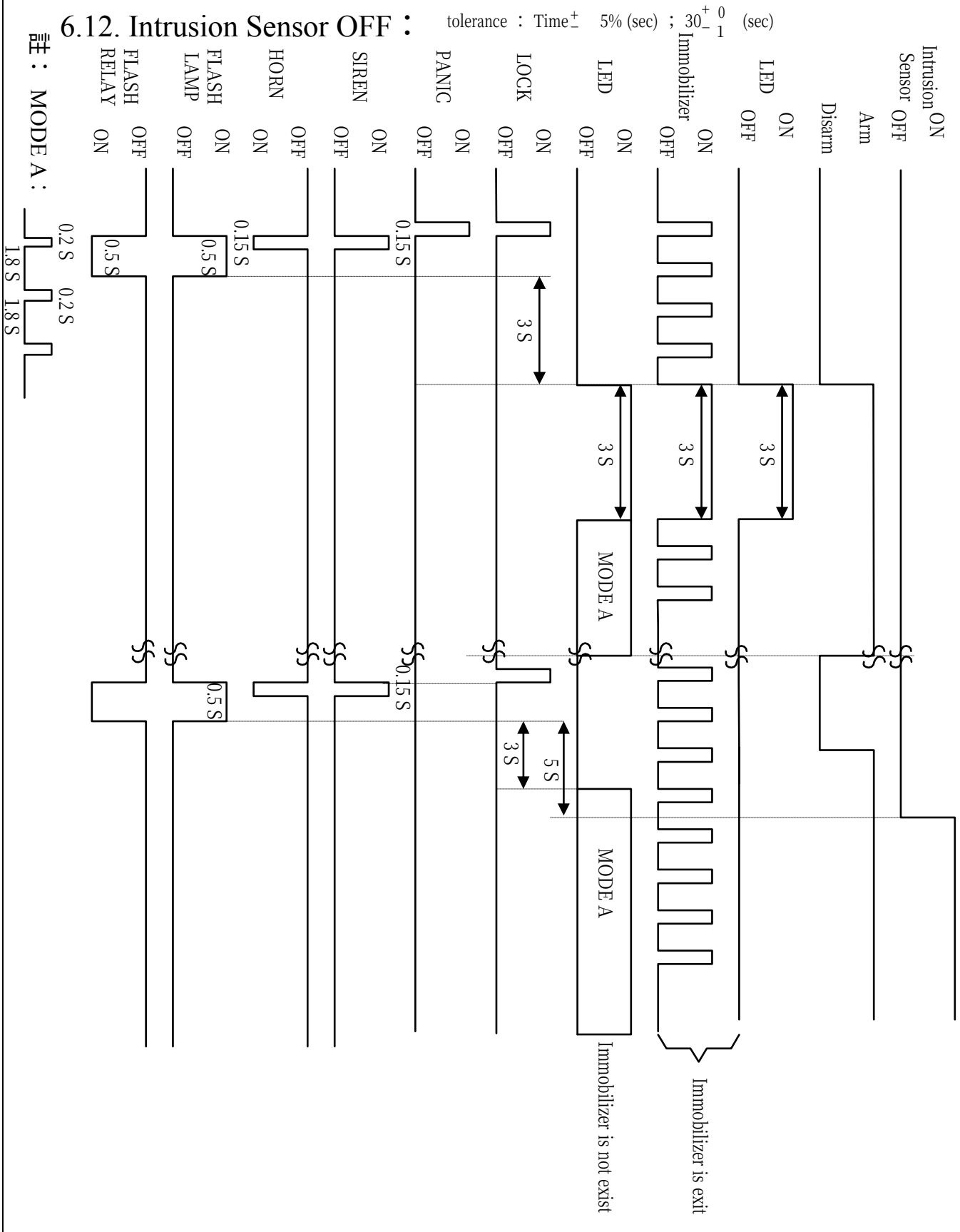
6.11. Auto-Closed Power Window：

tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

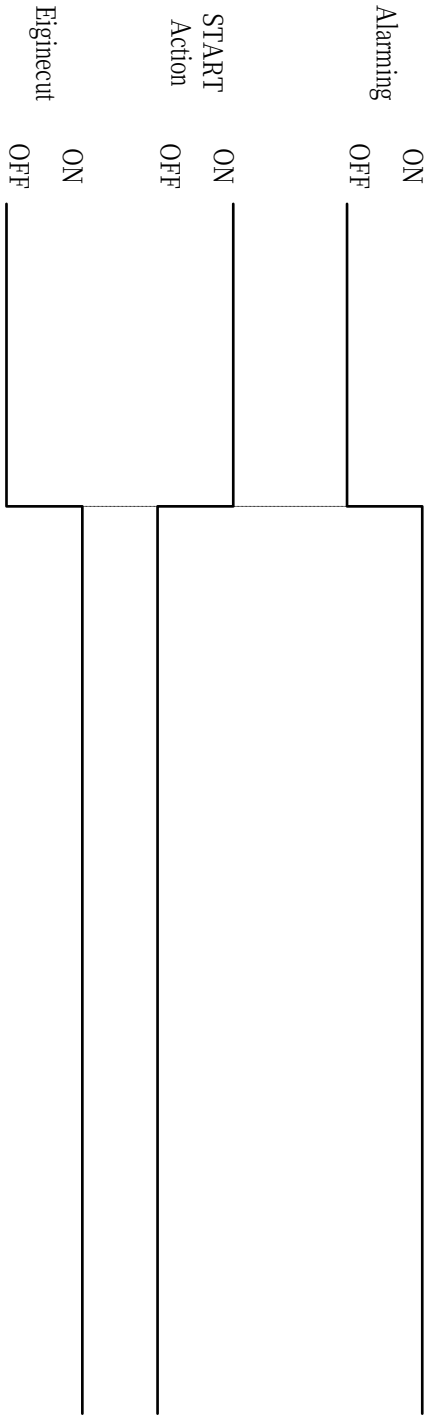
6.12. Intrusion Sensor OFF：



6、Timing Chart：

6.13. Engine CUT：

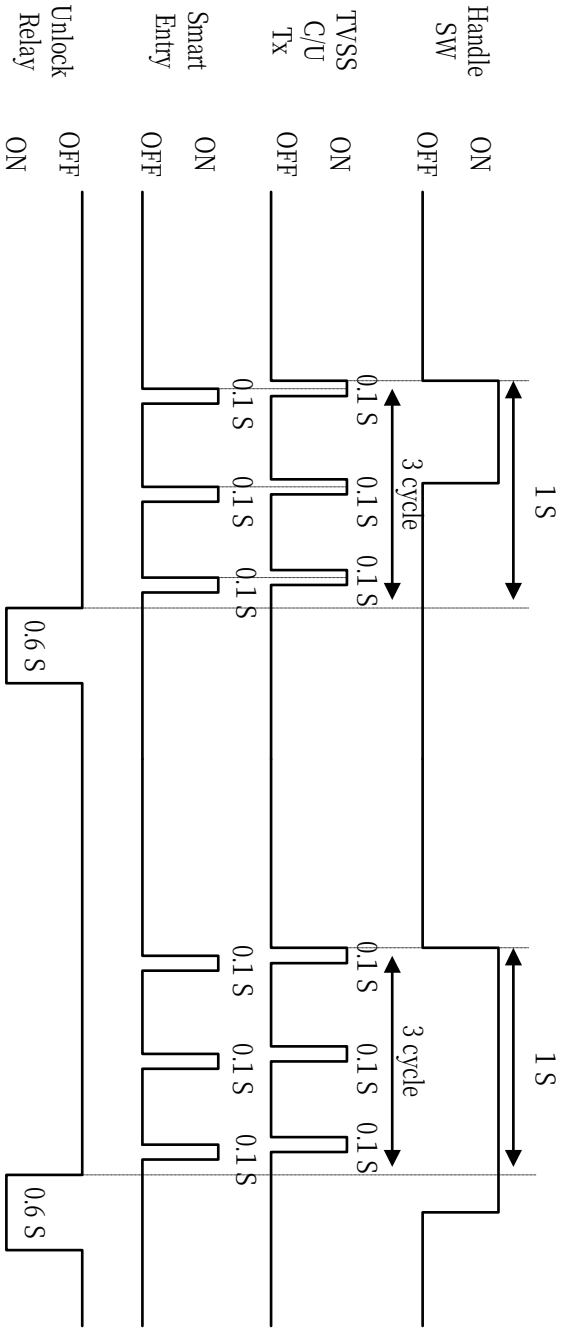
tolerance ： Time $\pm$ 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.14. Smart Entry Function：

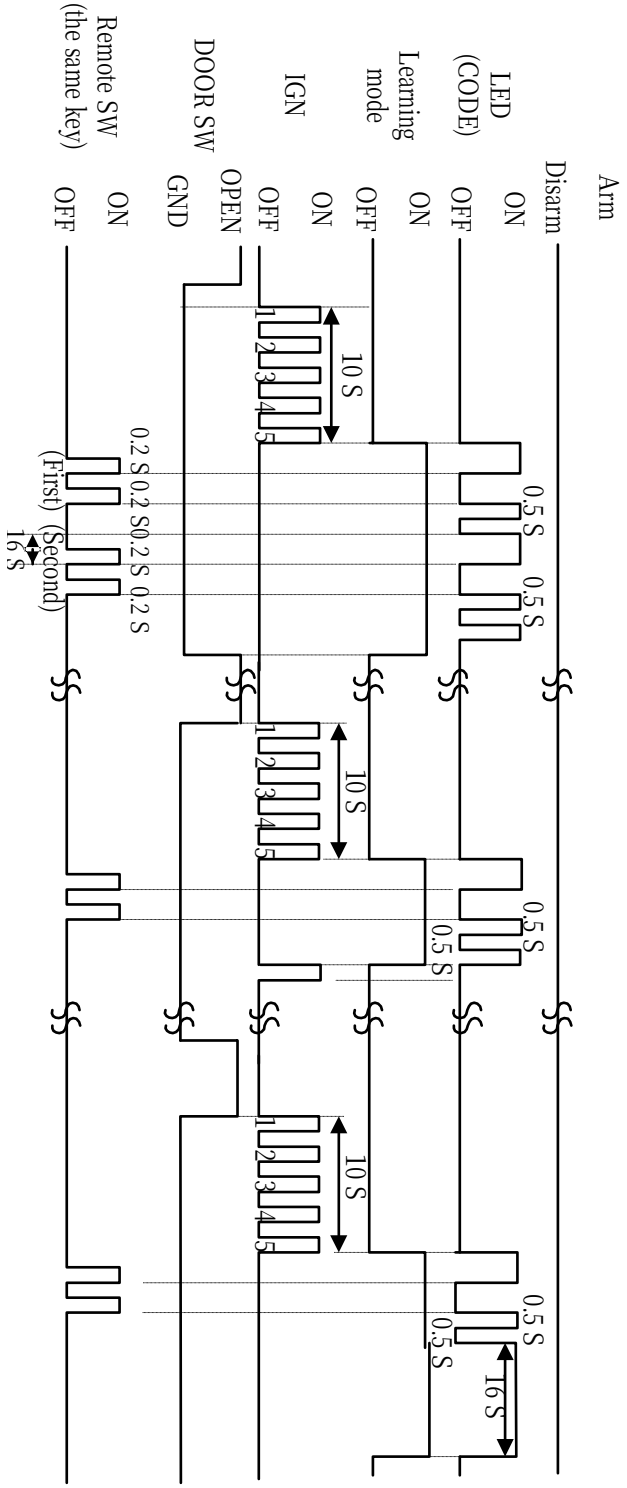
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.15. Code Learning：

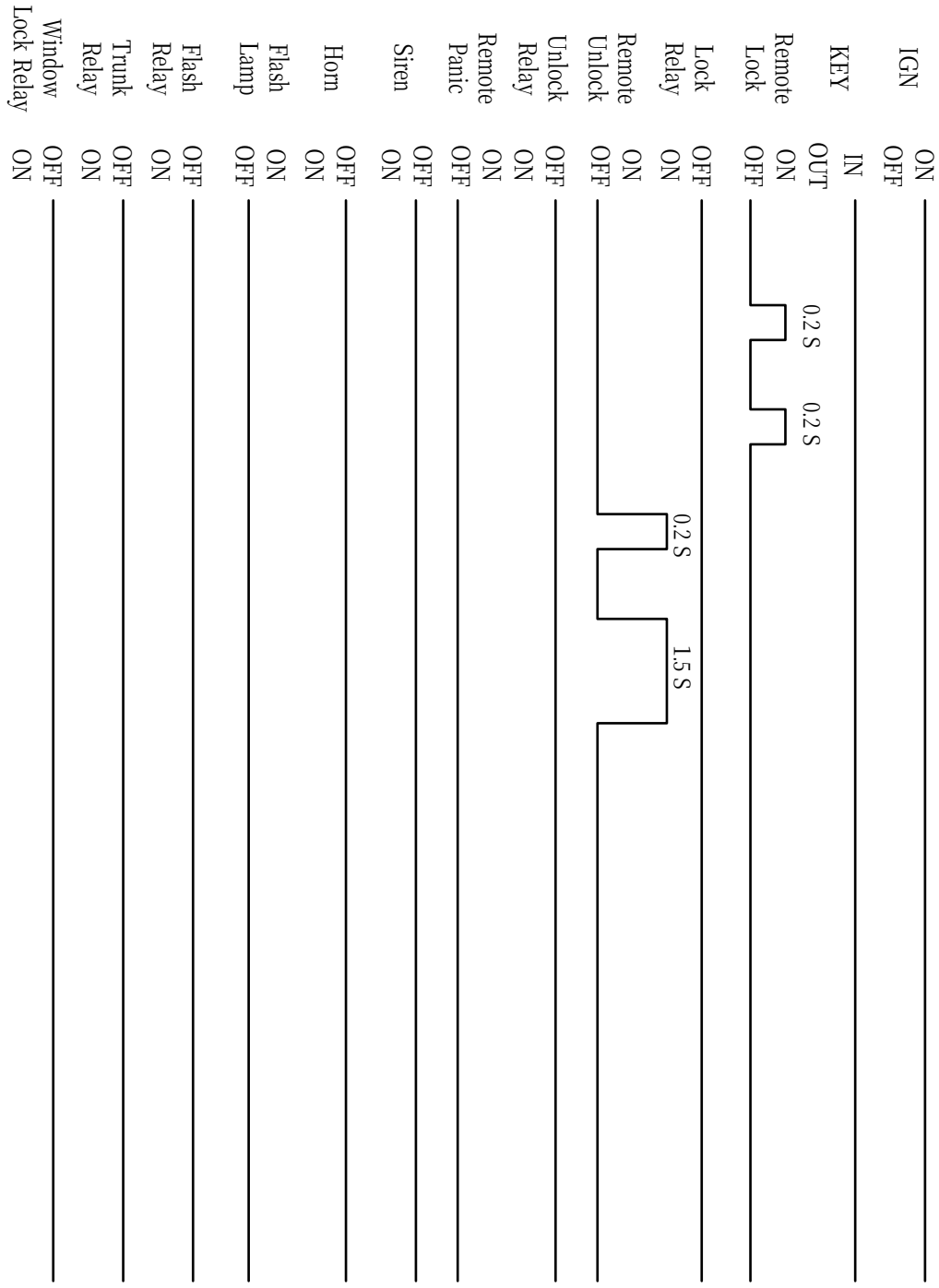
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.16. Transmitter Disabled Condition：

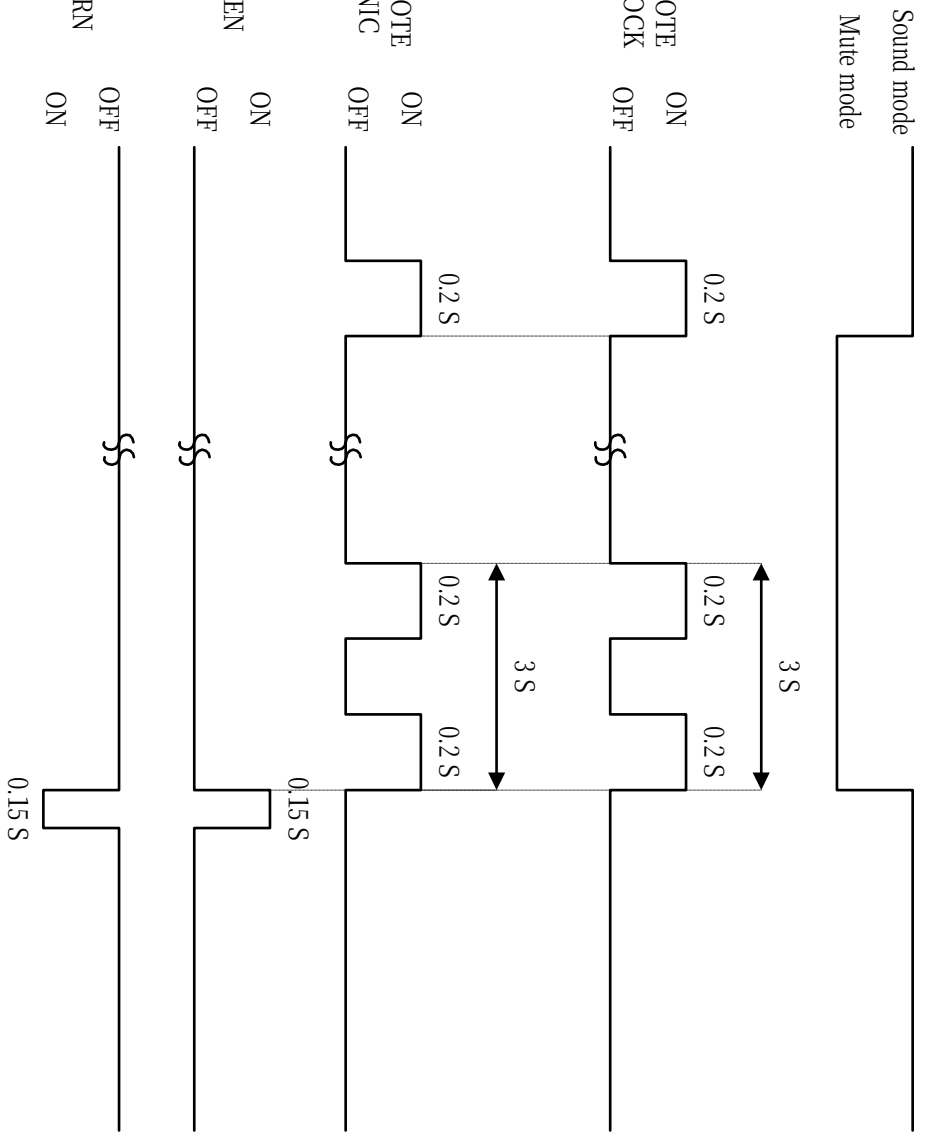
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.17. Mute Arming/Disarming：

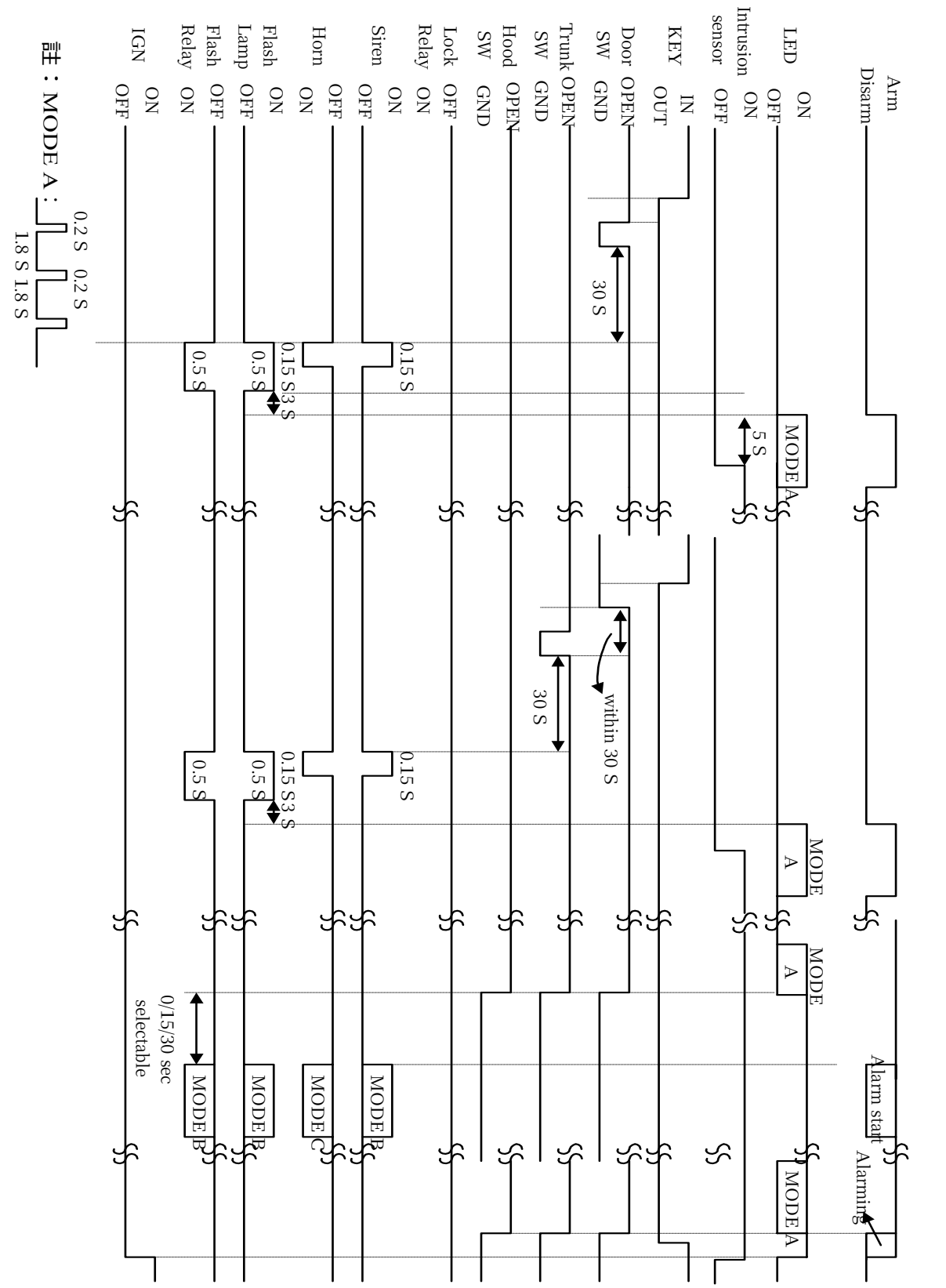
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.18. Automatic Arming：

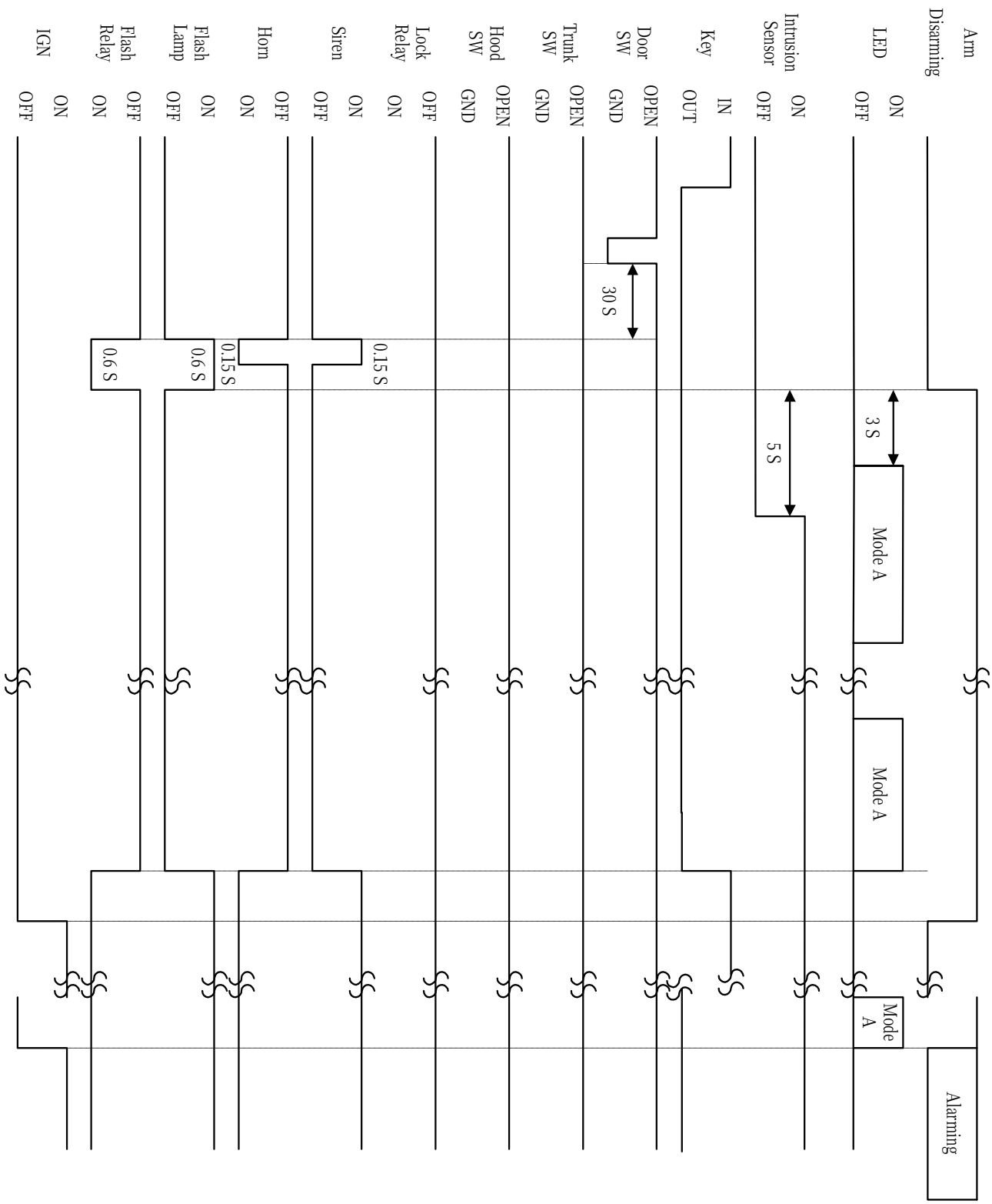
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.18.1. Automatic Arming：(Remark)

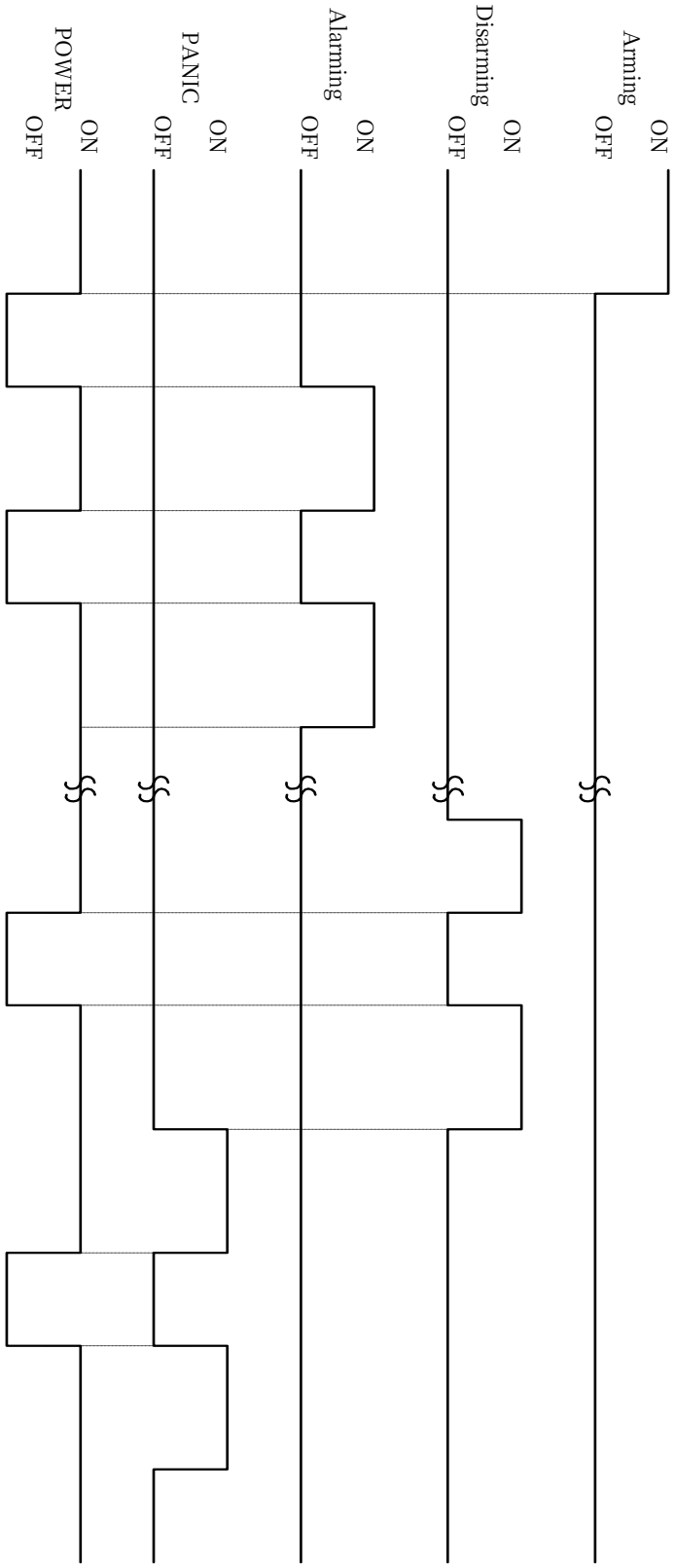
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.19. Status and Alarm Memory：

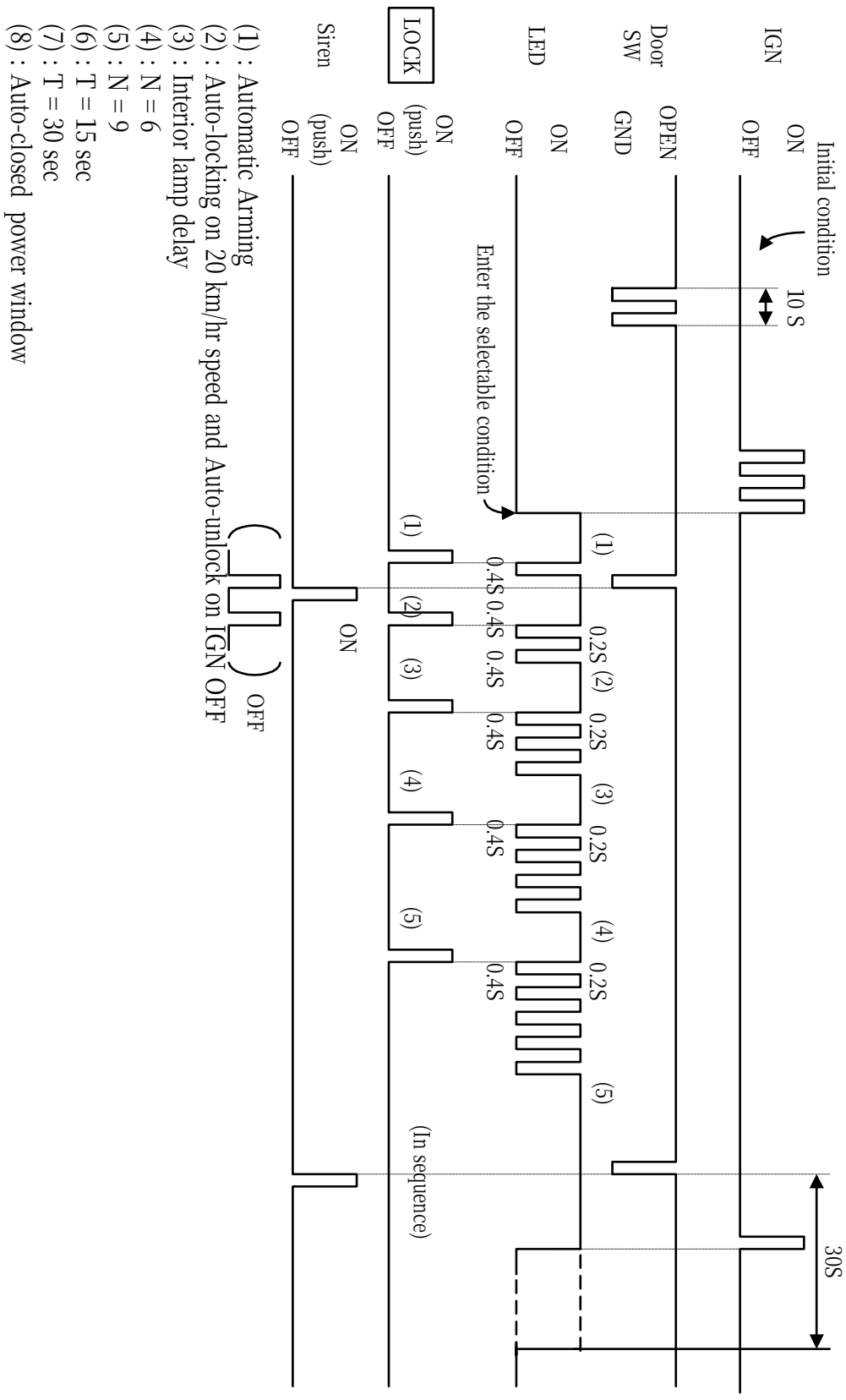
tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)



6、Timing Chart：

6.20. Selectable Function On/OFF：

tolerance ： Time ± 5% (sec) ； 30^{+0}_{-1} (sec)

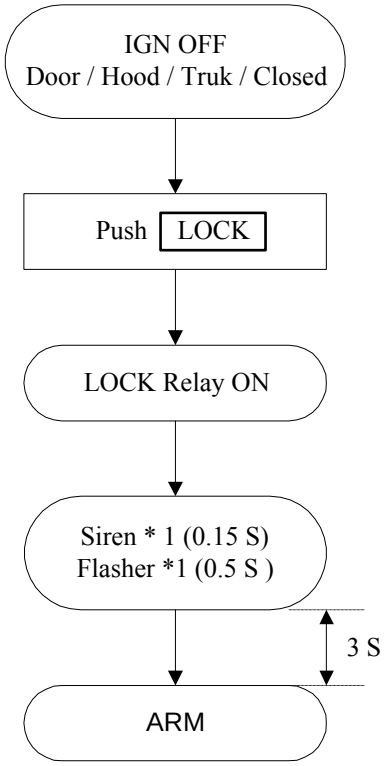


(1) : Automatic Arming
(2) : Auto-locking on 20 km/hr speed and Auto-unlock on IGN OFF
(3) : Interior lamp delay
(4) : N = 6
(5) : N = 9
(6) : T = 15 sec
(7) : T = 30 sec
(8) : Auto-closed power window

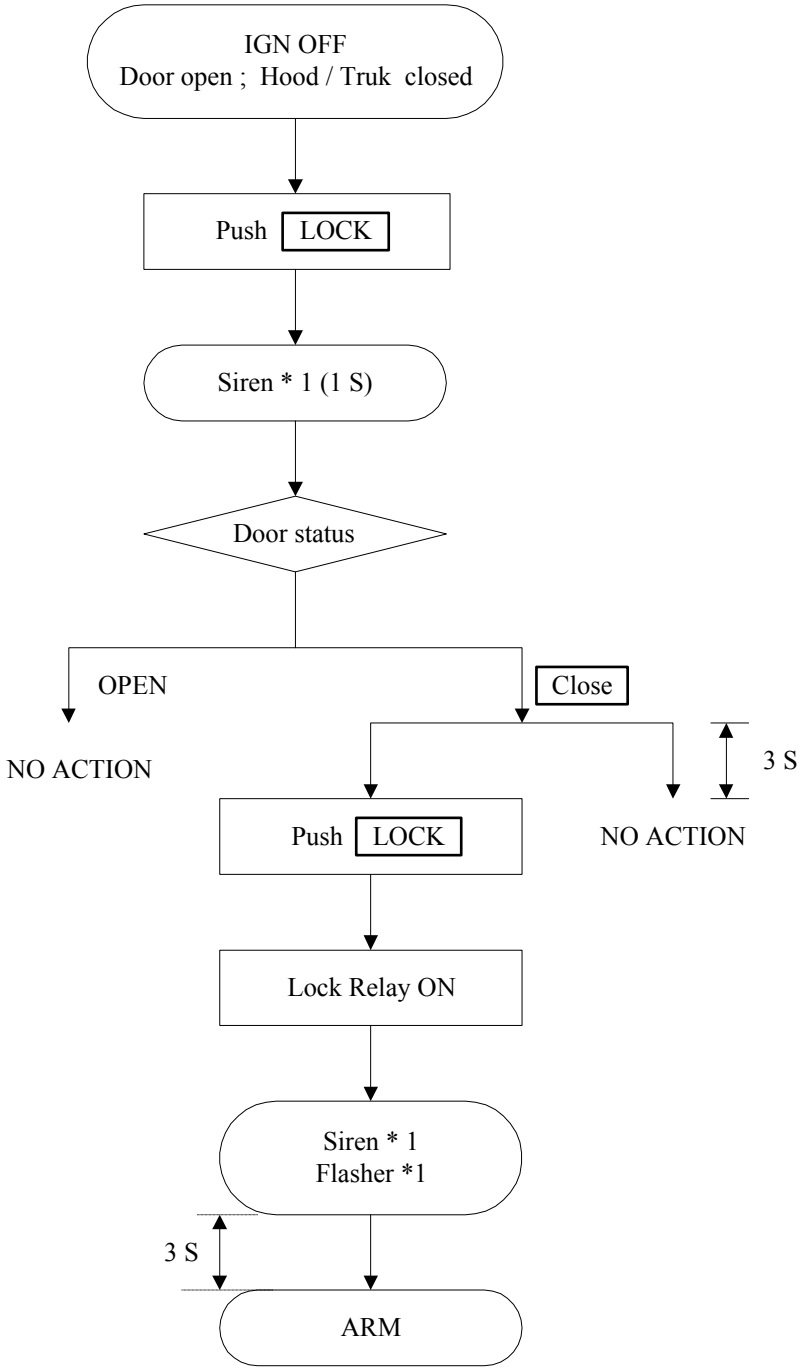
7、Flow Chart：

7.1. Security Status ARM：

(A).



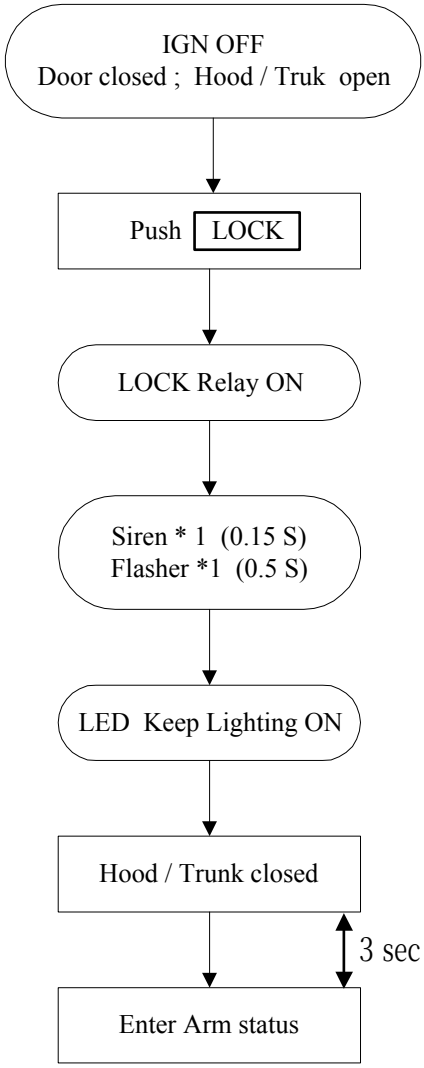
(B).



7、Flow Chart：

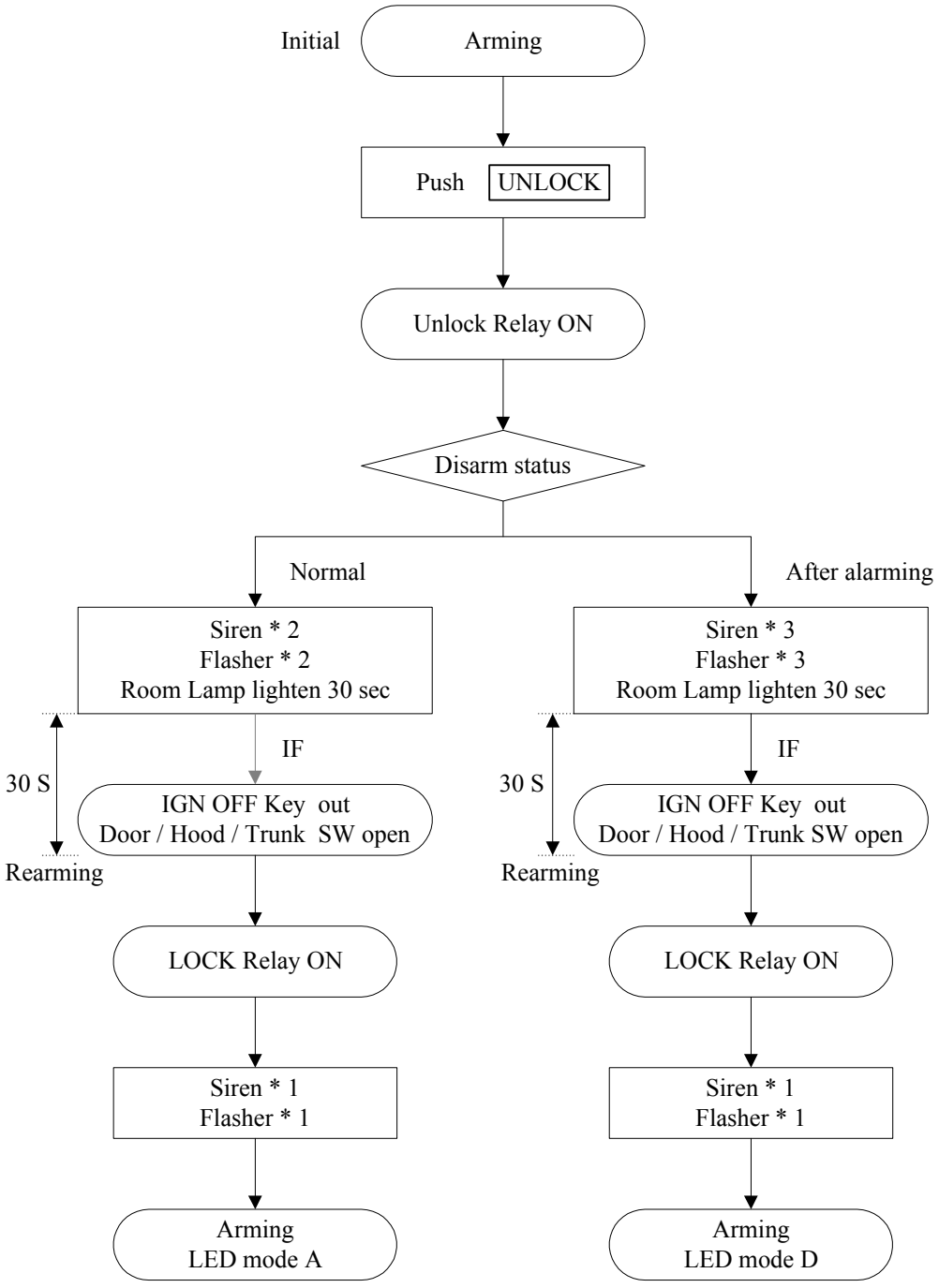
7.1. Security Status ARM：

(C).



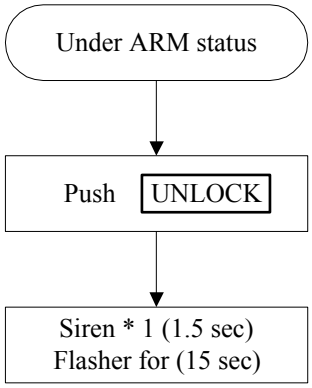
7、Flow Chart：

7.2. Security Status Disarming：

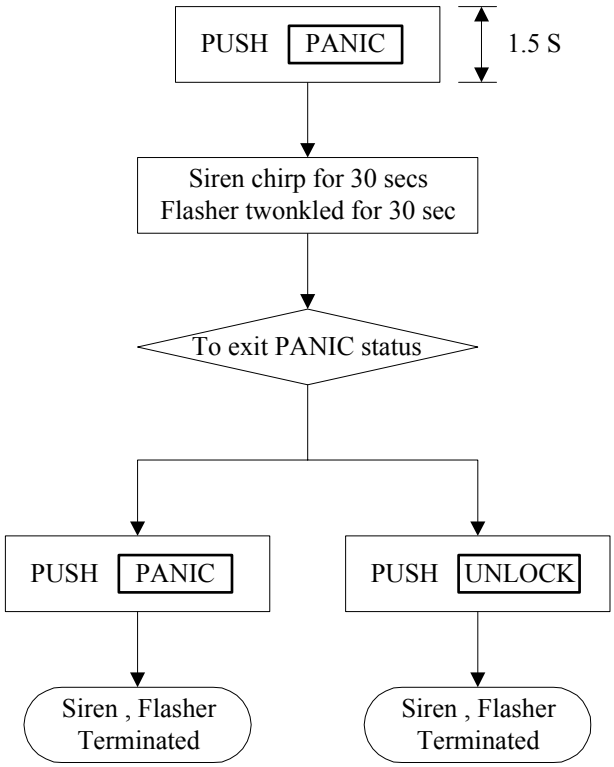


7、Flow Chart：

7.3. SEARCHING：



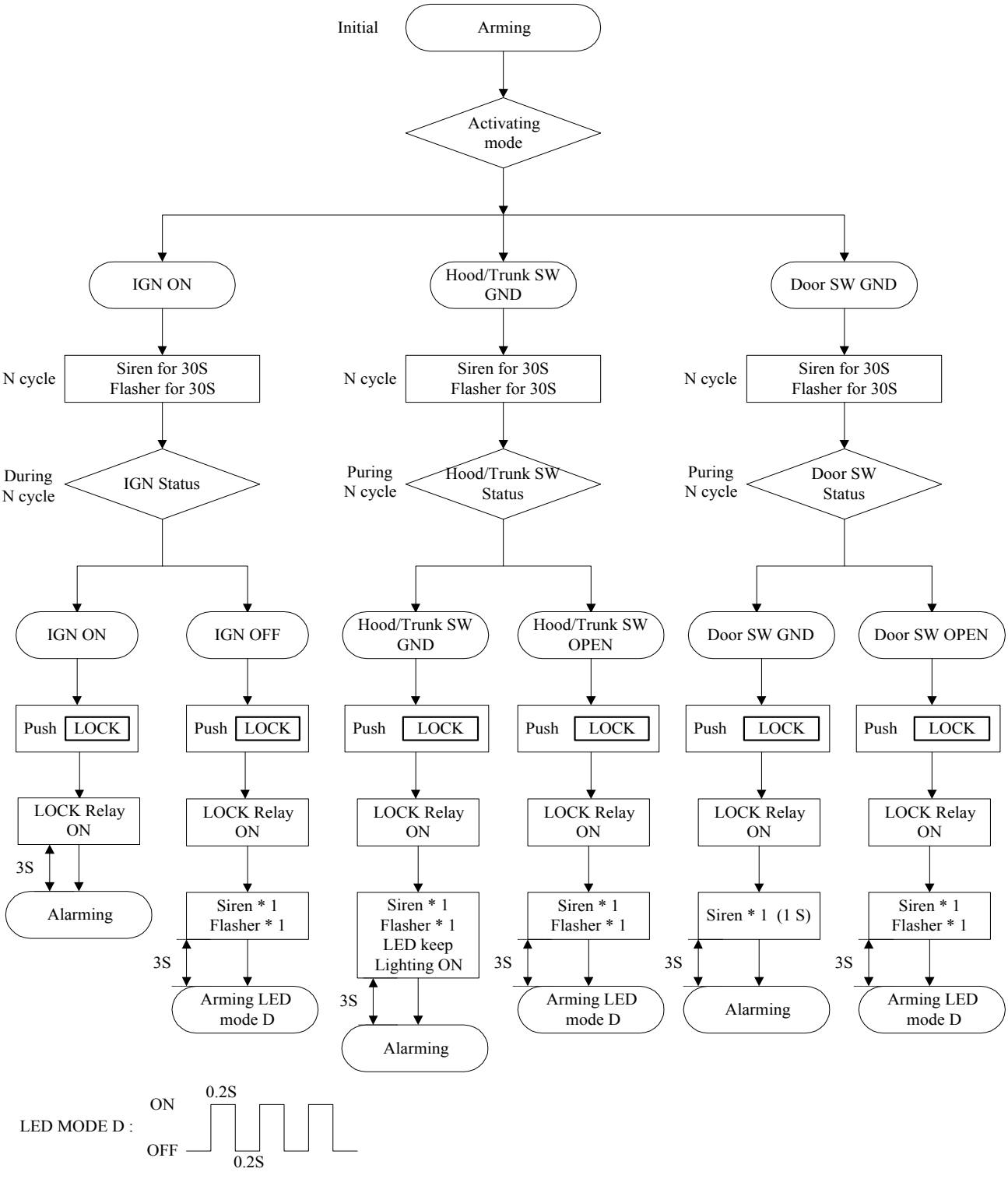
7.4. PANIC：



7、Flow Chart：

7.5. Security Activating / Disarming：

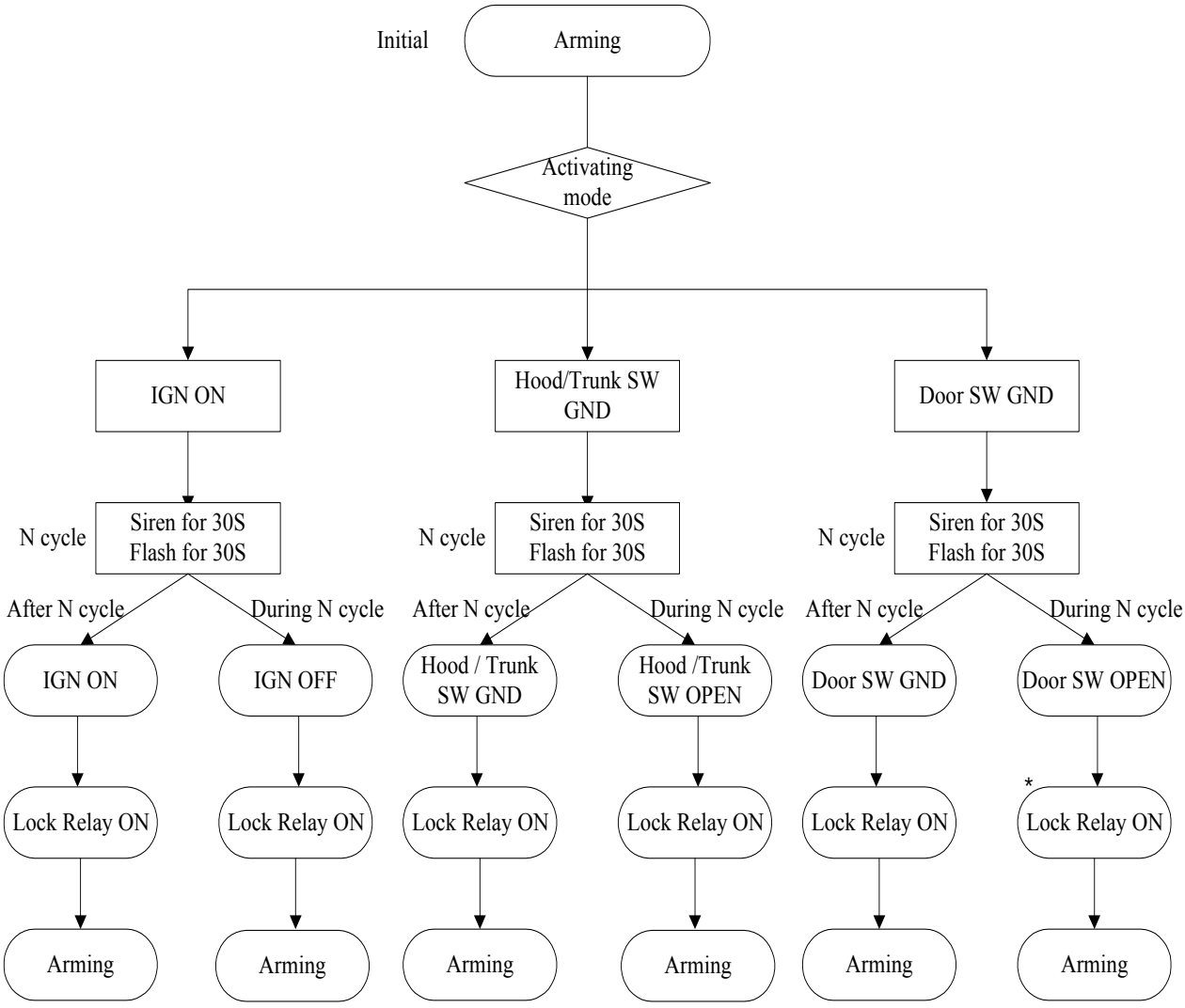
(A).



7、Flow Chart：

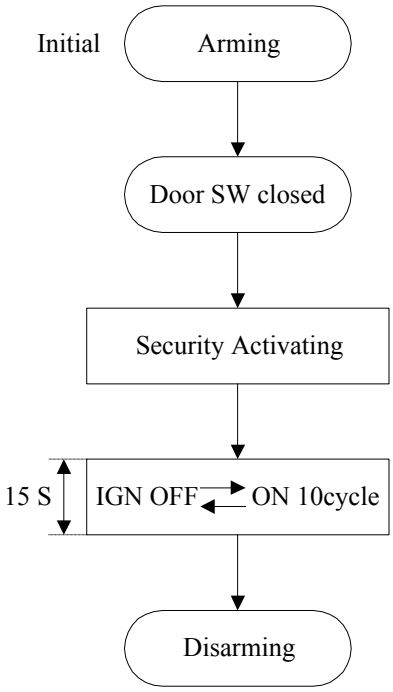
7.5. Security Activating / Disarming：

(B).



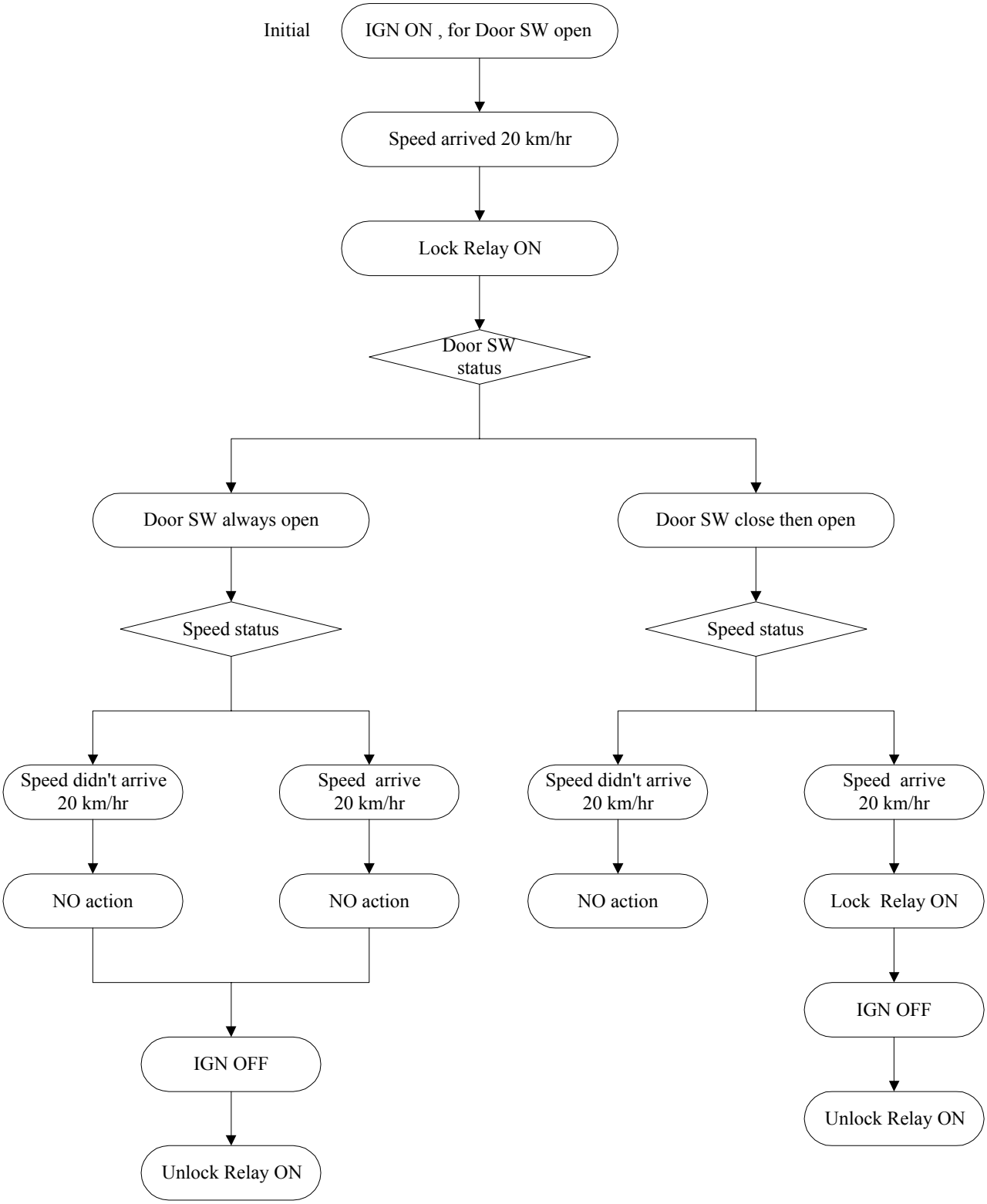
7、Flow Chart：

7.6. DISARM by key：



7、Flow Chart：

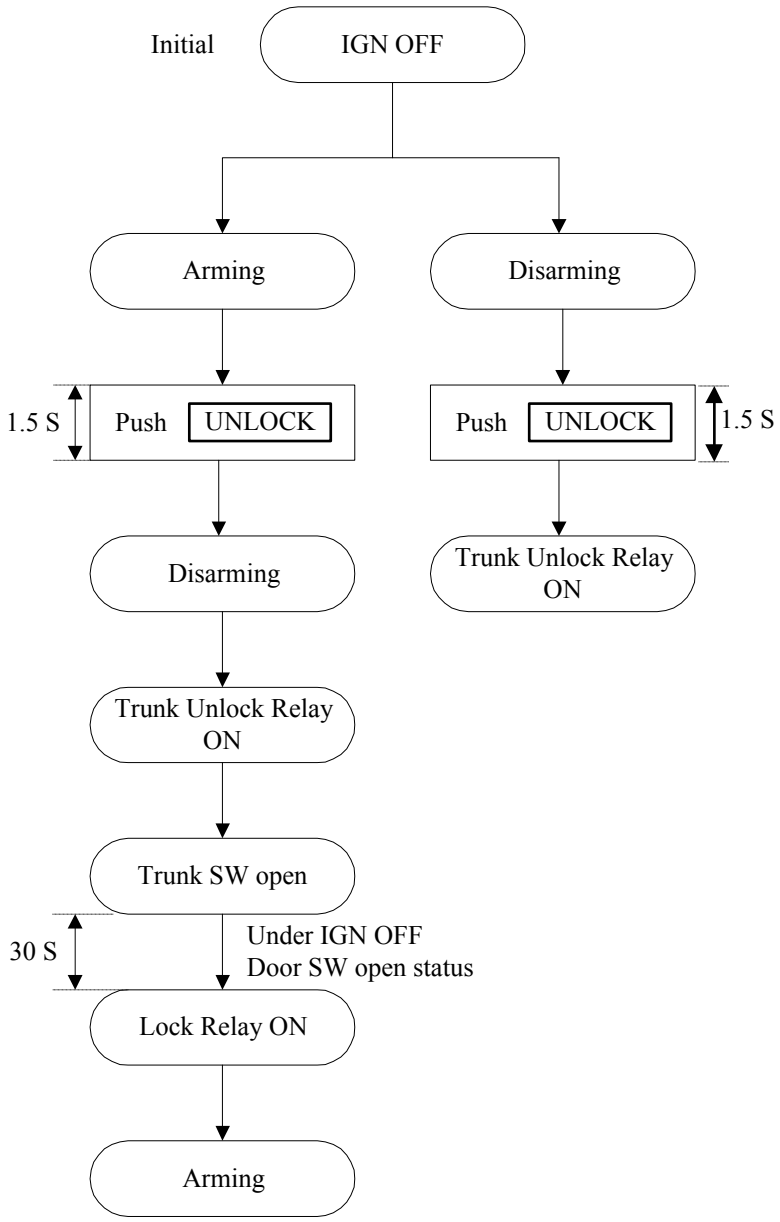
7.7. Auto-Lock over the speed of 20 km / H：



7、Flow Chart：

7.8. Remote Trunk Opening：

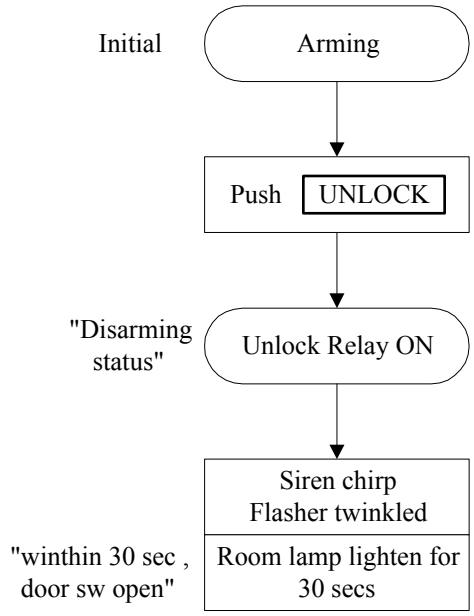
1.5 S



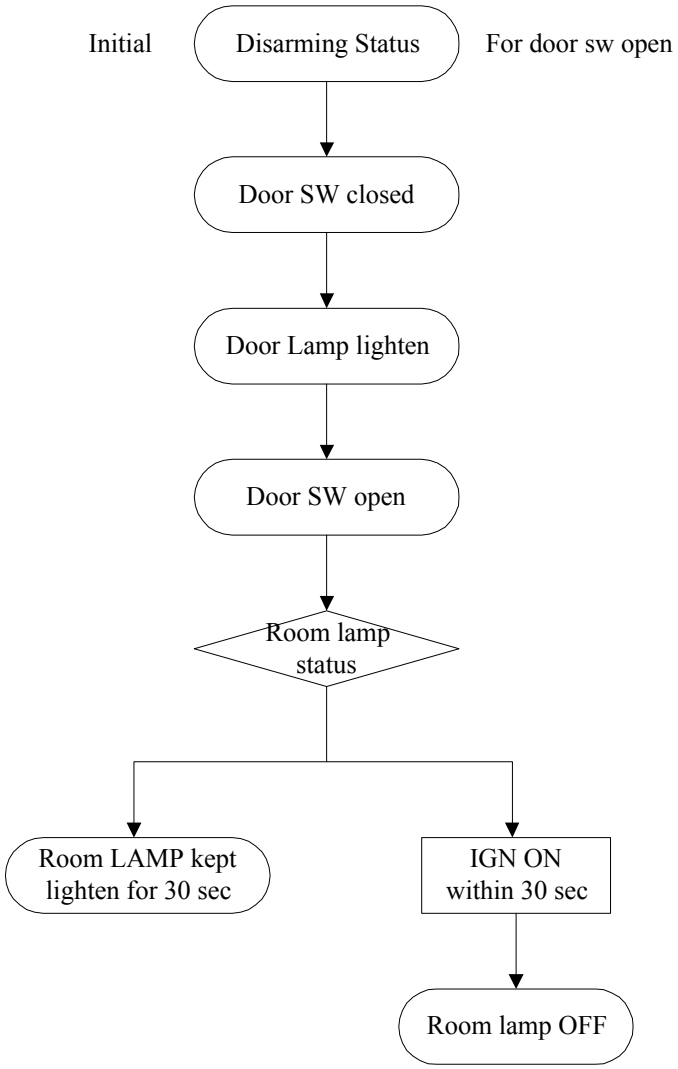
7、Flow Chart：

7.9. Interior Light On：

(A).

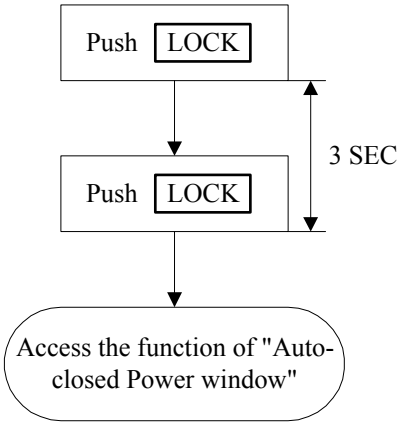


(B).

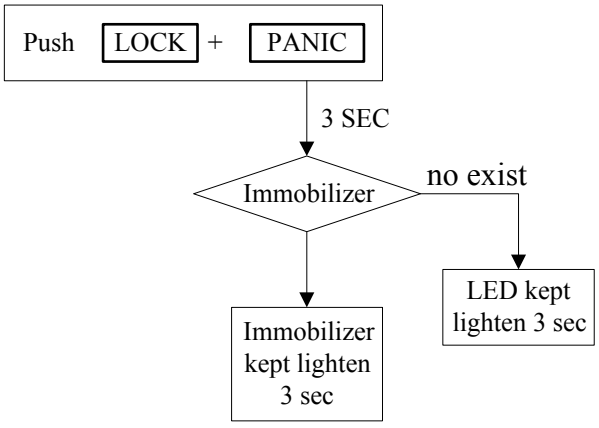


7、Flow Chart：

7.10. Auto-Closed Power Window：

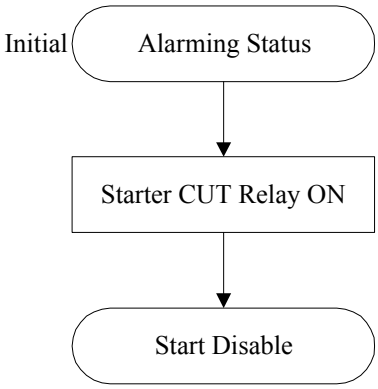


7.11. Intrusion Sensor OFF：

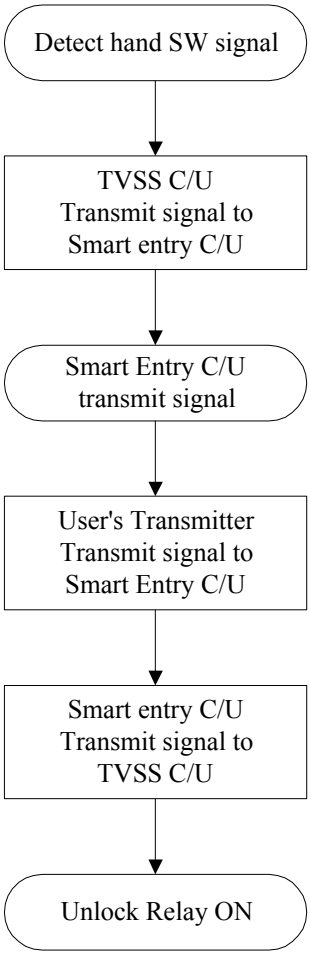


7、Flow Chart：

7.12. CUT Relay：

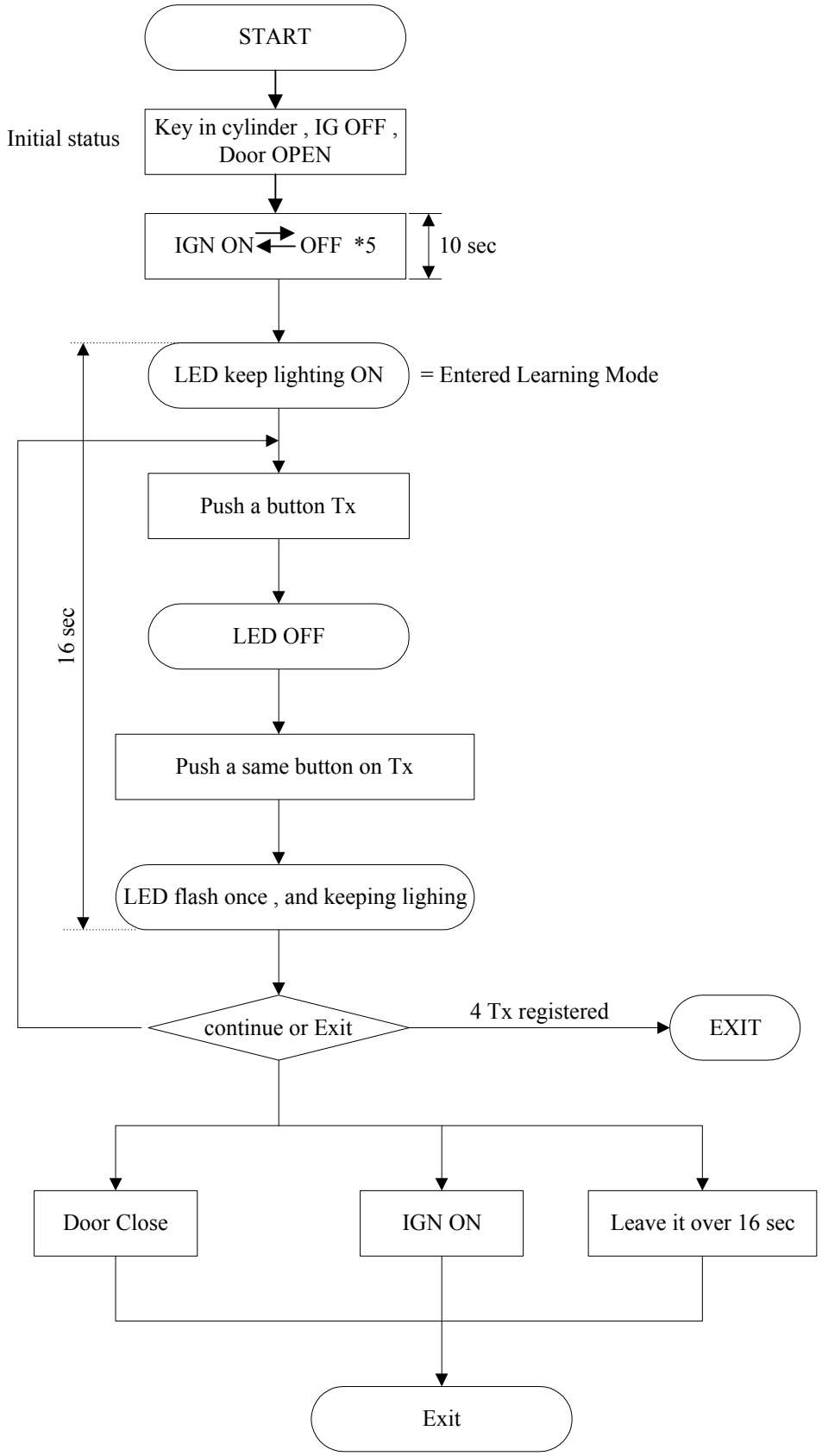


7.13. SMART Entry function：



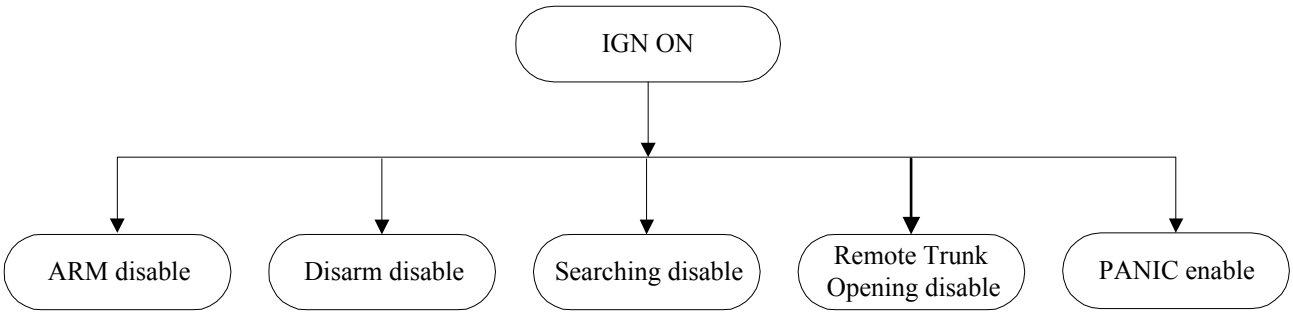
7、Flow Chart：

7.14. Code Learning：

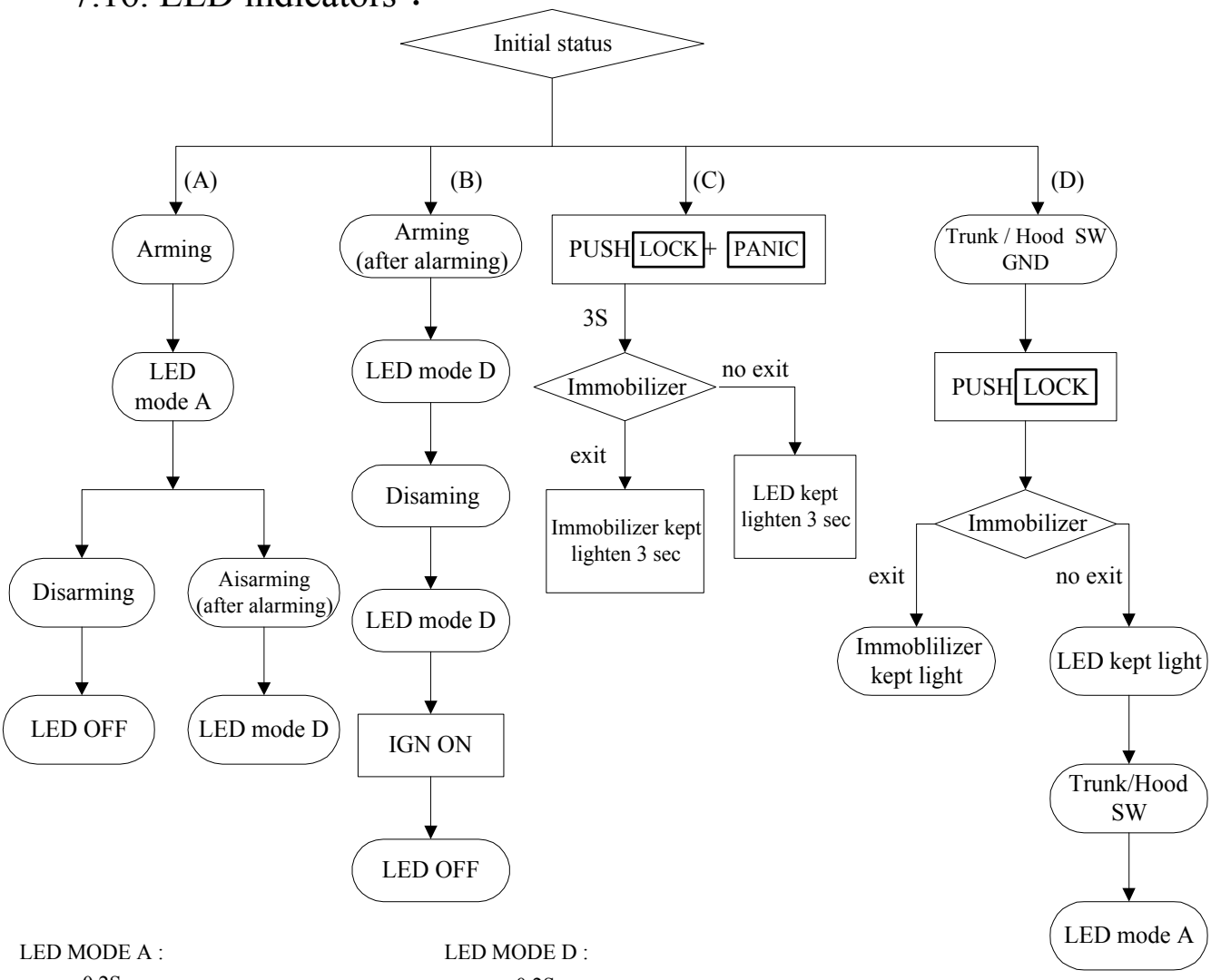


7、Flow Chart：

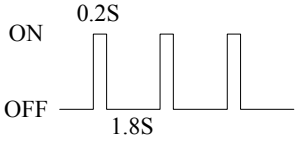
7.15. Transmitter disabled condition：



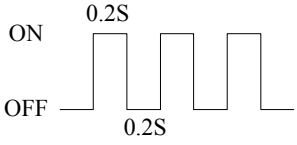
7.16. LED indicators：



LED MODE A :

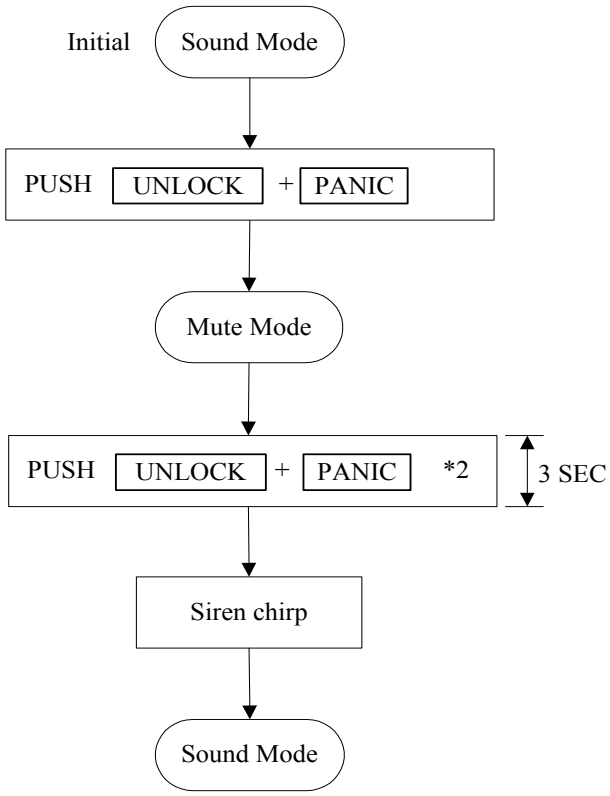


LED MODE D :

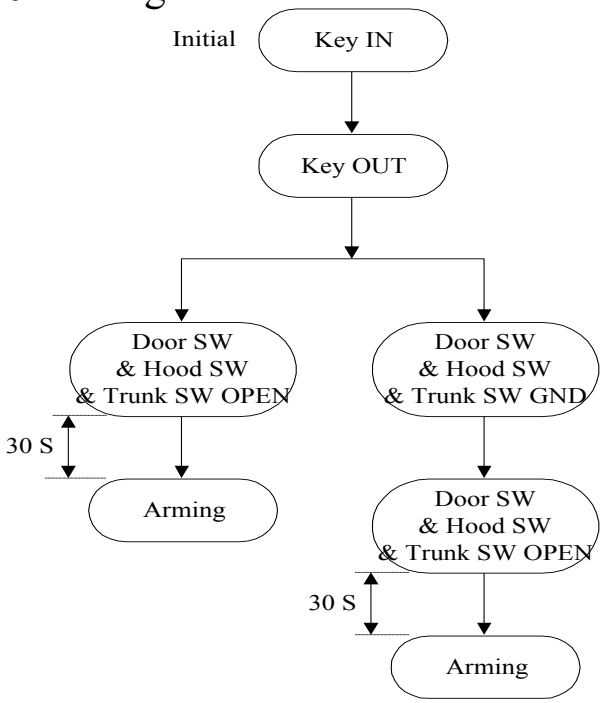


7、Flow Chart：

7.17. Mute Arming /Disarming：

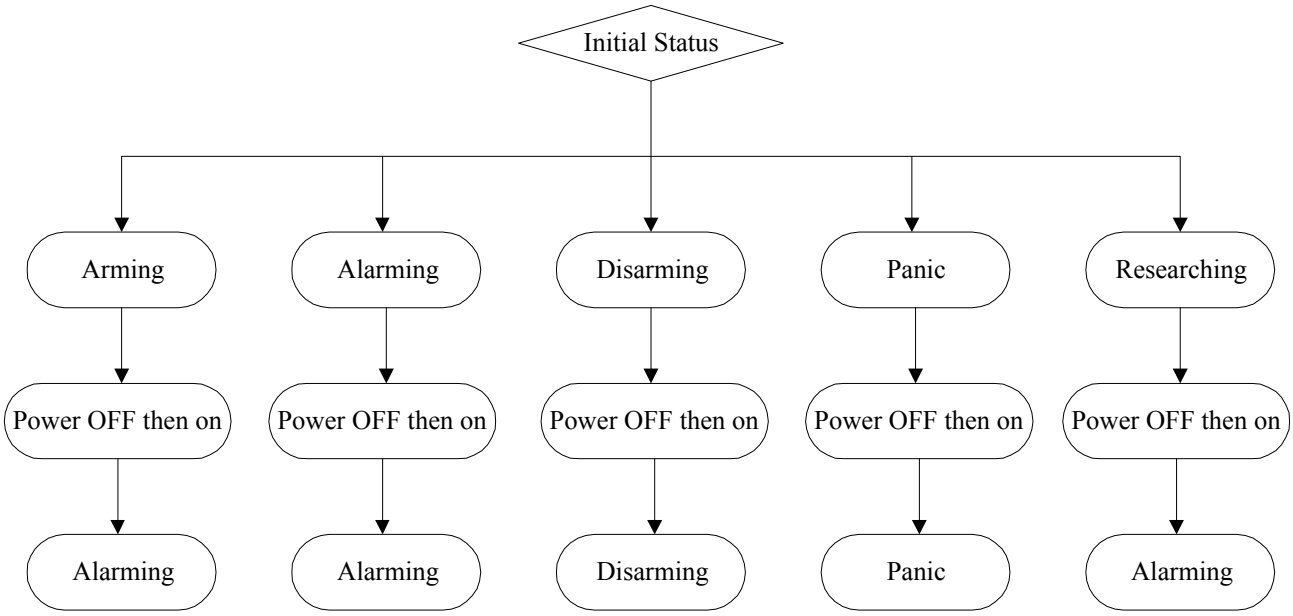


7.18. Automatic Arming：



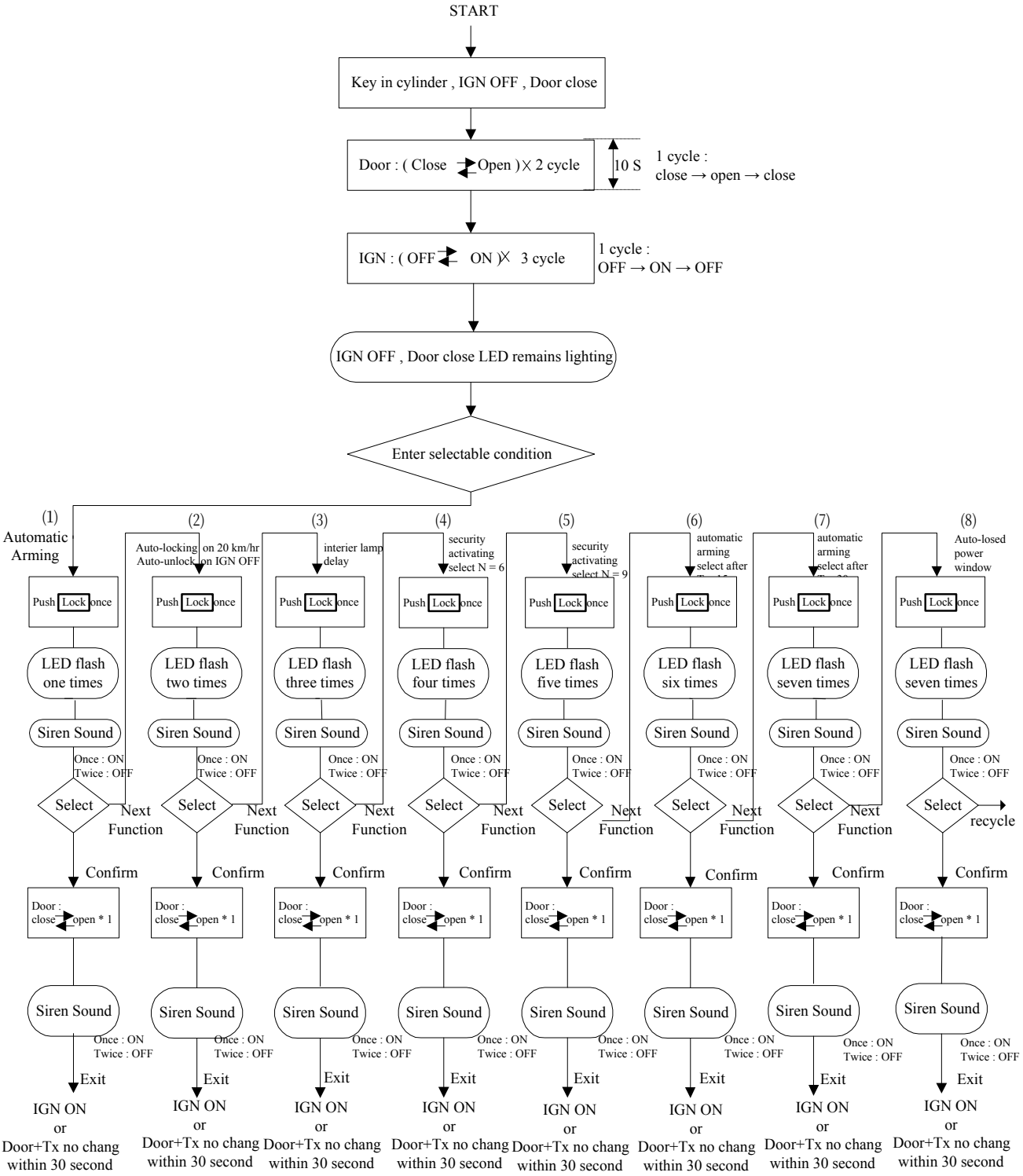
7、Flow Chart：

7.19. Status and Alarm Memory：



7、Flow Chart：

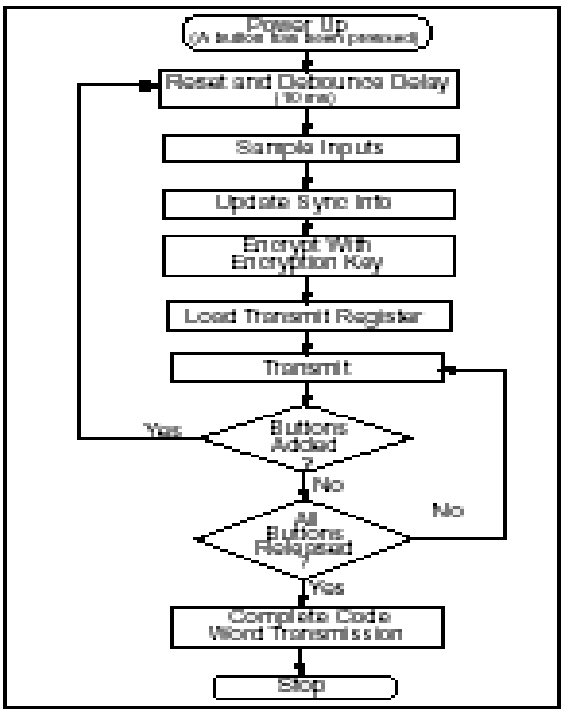
7.20. Selectable arming ON/OFF：



8、Transmitter Functional Description：

8.1 DEVICE OPERATION

ENCODER OPERATION



The high security level of the HCS300 is based on the patented KEELOQ technology. A block cipher type of encryption algorithm based on a block length of 32 bits and a key length of 64 bits is used. The algorithm obscures the information in such a way that even if the transmission information (before coding) differs by only one bit from the information in the previous transmission, the next coded transmission will be totally different. Statistically, if only one bit in the 32-bit string of information changes, approximately 50 percent of the coded transmission will change. The HCS300 will wake up upon detecting a switch closure and then delay approximately 10 ms for switch debounce (Figure 2-2). The synchronized information, fixed information, and switch information will be encrypted to form the hopping code. The encrypted or hopping code portion of the transmission will change every time a button is pressed, even if the same button is pushed again. Keeping a button pressed for a long time will result in the same code word being transmitted until the button is released or timeout occurs. A code that has been transmitted will not occur again for more than 64K transmissions. This will provide more than 18 years of typical use before a code is repeated based on 10 operations per day. Overflow information programmed into the encoder can be used by the decoder to extend the number of unique transmissions to more than 192K.

If in the transmit process it is detected that a new button(s) has been pressed, a reset will immediately be forced and the code word will not be completed. Please note that buttons removed will not have any effect on the code word unless no buttons remain pressed in which case the current code word will be completed and the power down will occur.

8、Transmitter Functional Description：

8.2 EPROM MEMORY ORGANIZATION

The HCS300 contains 192 bits (12 x 16-bit words) of EEPROM memory (Table 3-1). This EEPROM array is used to store the encryption key information, synchronization value, etc. Further descriptions of the memory array is given in the following sections.

8.2.1 Key_0 - Key_3 (64-Bit Encryption Key)

The 64-bit encryption key is used by the transmitter to create the encrypted message transmitted to the receiver. This key is created and programmed at the time of production using a key generation algorithm. Inputs to the key generation algorithm are the serial number for the particular transmitter being used and a secret manufacturer's code. While the key generation algorithm supplied from Microchip is the typical method used, a user may elect to create their own method of key generation. This may be done providing that the decoder is programmed with the same means of creating the key for decryption purposes. If a seed is used, the seed will also form part of the input to the key generation algorithm.

EPROM MEMORY MAP

WORD ADDRESS	MNEMONIC	DESCRIPTION
0	KEY_0	64-bit encryption key (word 0)
1	KEY_1	64-bit encryption key (word 1)
2	KEY_2	64-bit encryption key (word 2)
3	KEY_3	64-bit encryption key (word 3)
4	SYNC	16-bit synchronization value
5	RESERVED	Set to 0000H
6	SER_0	Device Serial Number (word 0)
7	SER_1(Note)	Device Serial Number (word 1)
8	SEED_0	Seed Value (word 0)
9	SEED_1	Seed Value (word 1)
10	EN_KEY	16-bit Envelope Key
11	CONFIG	Config Word

Note: The MSB of the serial number contains a bit used to select the auto shutoff timer.

8.2.2 SYNC (Synchronization Counter)

This is the 16-bit synchronization value that is used to create the hopping code for transmission. This value will be changed after every transmission.

8.2.3 SER_0, SER_1 (Encoder Serial Number)

SER_0 and SER_1 are the lower and upper words of the device serial number, respectively. Although there are 32 bits allocated for the serial number, only the lower order 28 bits are transmitted. The serial number is meant to be unique for every transmitter. The most significant bit of the serial number (Bit 31) is used to turn the auto shutoff timer on or off. 3.3.1 AUTO SHUTOFF TIMER SELECT The most significant bit of the serial number (Bit 31) is used to turn the Auto shutoff timer on or off. This timer prevents the transmitter from draining the battery should a button get stuck in the on position for a long period of time. The time period is approximately 25 seconds, after which the device will go to the Time-out mode. When in the Time-out mode, the device will stop transmitting, although since some circuits within the device are still active, the current draw within the Shutoff mode will be more than Standby mode. If the most significant bit in the serial number is a one, then the auto shutoff timer is enabled, and a zero in the most significant bit will disable the timer. The length of the timer is not selectable.

8、Transmitter Functional Description：

8.2.4 SEED_0, SEED_1 (Seed Word)

This is the two word (32 bits) seed code that will be transmitted when all four buttons are pressed at the same time. This allows the system designer to implement the secure learn feature or use this fixed code word as part of a different key generation/tracking process or purely as a fixed code transmission.

8.2.5 EN_Key (Envelope Encryption Key)

Envelope encryption is a selectable option that encrypts the portion of the transmission that contains the transmitter serial number. Selecting this option is done by setting the appropriate bit in the configuration word (Table 3-2). Normally, the serial number is transmitted in the clear (un-encrypted), but for an added level of security, the system designer may elect to implement this option. The envelope encryption key is used to encrypt the serial number portion of the transmission, if the envelope encryption option has been selected. The envelope encryption algorithm is a different algorithm than the key generation or transmit encryption algorithm. The EN_key is typically a random number and the same for all transmitters in a system.

8.2.6 Configuration Word

The configuration word is a 16-bit word stored in EEPROM array that is used by the device to store information used during the encryption process, as well as the status of option configurations. Further explanations of each of the bits are described in the following sections.

8.2.6.1 DISCRIMINATION VALUE (DISC0 TO DISC9)

CONFIGURATION WORD

Bit Number	Bit Description
0	Discrimination Bit 0
1	Discrimination Bit 1
2	Discrimination Bit 2
3	Discrimination Bit 3
4	Discrimination Bit 4
5	Discrimination Bit 5
6	Discrimination Bit 6
7	Discrimination Bit 7
8	Discrimination Bit 8
9	Discrimination Bit 9
10	Overflow Bit 0 (OVR0)
11	Overflow Bit 1 (OVR1)
12	Low Voltage Trip Point Select
13	Baudrate Select Bit 0 (BSL0)
14	Baudrate Select Bit 1 (BSL1)
15	Envelope Encryption Select (EENC)

The discrimination value can be programmed with any value to serve as a post decryption check on the decoder end. In a typical system, this will be programmed with the 10 least significant bits of the serial number, which will also be stored by the receiver system after a transmitter has been learned. The discrimination bits are part of the information that is to form the encrypted portion of the transmission. After the receiver has decrypted a transmission, the discrimination bits can be checked against the stored value to verify that the decryption process was valid. 3.6.2 OVERFLOW BITS (OVR0 AND OVR1) The overflow bits are used to extend the number of possible synchronization values. The synchronization counter is 16 bits in length, yielding 65,536 values before the cycle repeats. Under typical use of 10 operations a day, this will provide nearly 18 years of use before a repeated value will be used. Should the system designer conclude that is not adequate, then the overflow bits can be utilized to extend the number of unique values. This can be done by programming OVR0 and OVR1 to 1s at the time of production. The encoder will

8、Transmitter Functional Description：

automatically clear OVR0 the first time that the synchronization value wraps from 0xFFFF to 0x0000 and clear OVR1 the second time the counter wraps. Once cleared, OVR0 and OVR1 cannot be set again, thereby creating a permanent record of the counter overflow. This prevents fast cycling of 64K counter. If the decoder system is programmed to track the overflow bits, then the effective number of unique synchronization values can be extended to 196,608. If programmed to zero, the system will be compatible with the NTQ104/5/6 devices (i.e., no overflow with discrimination bits set to zero).

8.2.6.3 ENVELOPE ENCRYPTION (EENC)

If the EENC bit is set to a 1, the 32-bit fixed code part of the transmission will also be encrypted so that it will appear to be random. The 16-bit envelope key and envelope algorithm will be used for encryption.

8.2.6.4 BAUDRATE SELECT BITS (BSL0, BSL1)

BSL0 and BSL1 select the speed of transmission and the code word blanking. Table 3-3 shows how the bits are used to select the different baud rates and Section 5.2 provides detailed explanation in code word blanking.

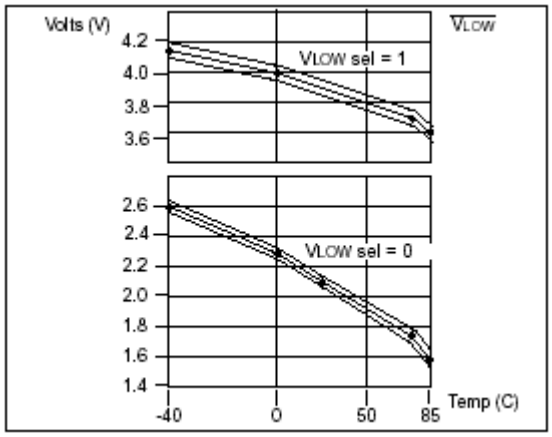
8.2.6.5 LOW VOLTAGE TRIP POINT SELECT

The low voltage trip point select bit is used to tell the HCS300 what VDD level is being used. This information will be used by the device to determine when to send the voltage low signal to the receiver. When this bit is set to a one, the VDD level is assumed to be operating from a 5 volt or 6 volt VDD level. If the bit is set low, then the VDD level is assumed to be 3.0 volts. Refer to Figure 3-1 for voltage trip point. Blow is tested at 6.3V at -25°C and +85°C and 2.0V at -25°C and +85°C.

BAUDRATE SELECT

BSL1	BSL0	Basic Pulse Element	Code Words Transmitted
0	0	400µs	All
0	1	200µs	1 out of 2
1	0	100µs	1 out of 2
1	1	100µs	1 out of 4

TPPICAL VOLTAGE TRIP POINTS



8、Transmitter Functional Description：

8.3. TRANSMITTED WORD

8.3.1 Transmission Format (PWM)

The HCS300 transmission is made up of several parts (Figure 4-1). Each transmission is begun with a preamble and a header, followed by the encrypted and then the fixed data. The actual data is 66 bits which consists of 32 bits of encrypted data and 34 bits of fixed data. Each transmission is followed by a guard period before another transmission can begin. Refer to Table 8-4 for transmission timing requirements. The encrypted portion provides up to four billion changing code combinations and includes the button status bits (based on which buttons were activated) along with the synchronization counter value and some discrimination bits. The fixed portion is comprised of the status bits, the function bits and the 28-bit serial number. The fixed and encrypted sections combined increase the number of combinations to 7.38 x 1019

. **8.3.2 Synchronous Transmission Mode**

Synchronous transmission mode can be used to clock the code word out using an external clock. To enter synchronous transmission mode, the programming mode start-up sequence must be executed as shown in Figure 4-3. If either S1 or S0 is set on the falling edge of S2 (or S3), the device enters synchronous transmission mode. In this mode, it functions as a normal transmitter, with the exception that the timing of the PWM data string is controlled externally and that 16 extra bits are transmitted at the end with he code word. The button code will be the S0, S1 value at the falling edge S2 or S3. The timing of the PWM data string is controlled by supplying a clock on S2 or S3 and should not exceed 20 KHz. The code word is the same as in PWM mode with 16 reserved bits at the end of the word. The reserved bits can be ignored. When in synchronous transmission mode S2 or S3 should not be toggled until all internal processing has been completed as shown in Figure 4-4.

8.3.3 Code Word Organization

The HCS300 transmits a 66-bit code word when a button is pressed. The 66-bit word is constructed from a Fixed Code portion and an Encrypted Code portion (Figure 4-2). The **Encrypted Data** is generated from four button bits, two overflow counter bits, ten discrimination bits, and the 16-bit synchronization value (Figure 8-4). The **Fixed Code Data** is made up from two status bits, four button bits, and the 28-bit serial number. The four button bits and the 28-bit serial number may be encrypted with the Envelope Key if the envelope encryption is enabled by the user.

8、Transmitter Functional Description：

FIGURE 4-1: CODE WORD TRANSMISSION FORMAT

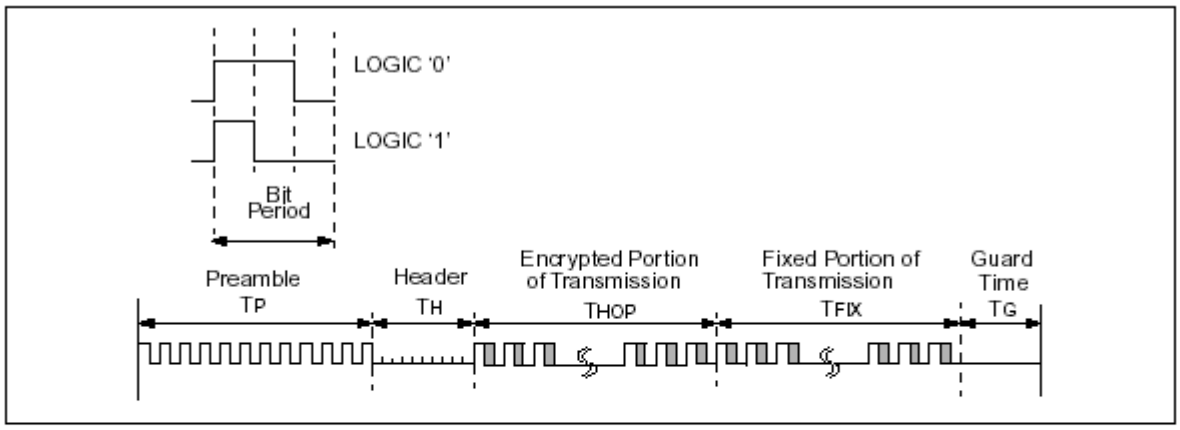


FIGURE 4-2: CODE WORD ORGANIZATION

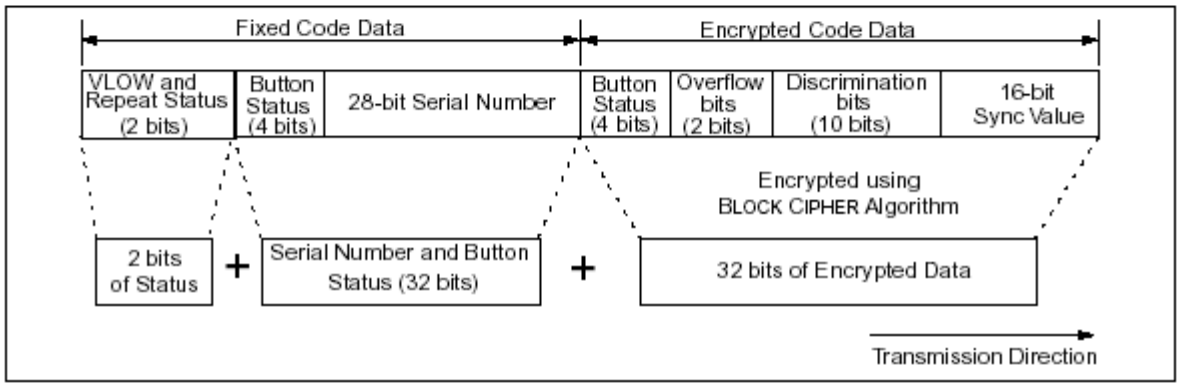


FIGURE 4-3: SYNCHRONOUS TRANSMISSION MODE

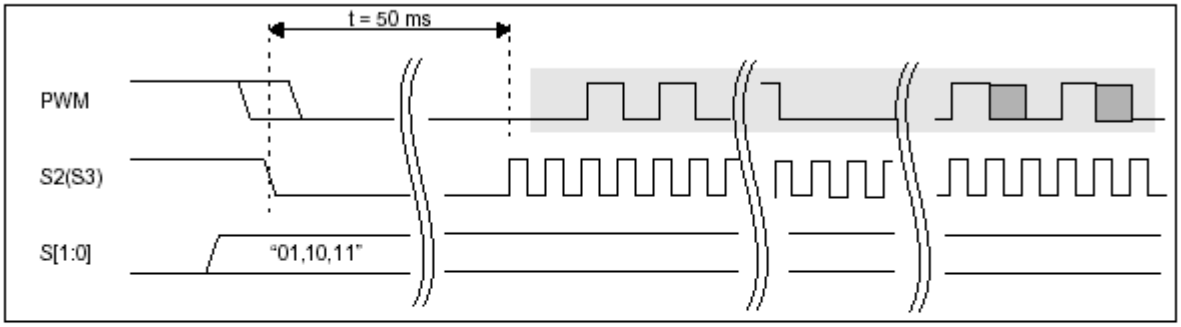
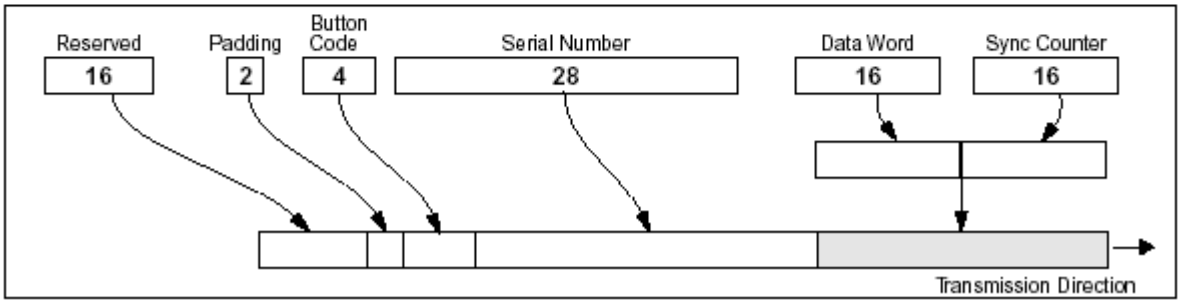


FIGURE 4-4: TRANSMISSION WORD FORMAT DURING SYNCHRONOUS TRANSMISSION MODE



8、Transmitter Functional Description：

8.4 SPECIAL FEATURES

8.4.1 Code Word Completion

Code word completion is an automatic feature that makes sure that the entire code word is transmitted, even if the button is released before the transmission is complete. The HCS300 encoder powers itself up when a button is pushed and powers itself down after the command is finished, if the user has already released the button. If the button is held down beyond the time for one transmission, then multiple transmissions will result. If another button is activated during a transmission, the active transmission will be aborted and the new code will be generated using the new button information.

8.4.2 Blank Alternate Code Word

Federal Communications Commission (FCC) part 15 rules specify the limits on fundamental power and harmonics that can be transmitted. Power is calculated on the worst case average power transmitted in a 100ms window. It is therefore advantageous to minimize the duty cycle of the transmitted word. This can be achieved by minimizing the duty cycle of the individual bits and by blanking out consecutive words. Blank Alternate Code Word (BACW) is used for reducing the average power of a transmission (Figure 5-1). This is a selectable feature that is determined in conjunction with the baudrate selection bits BSL0 and BSL1. Using the BACW allows the user to transmit a higher amplitude transmission if the transmission length is shorter. The FCC puts constraints on the average power that can be transmitted by a device, and BACW effectively prevents continuous transmission by only allowing the transmission of every second or every fourth code word. This reduces the average power transmitted and hence, assists in FCC approval of a transmitter device.

8.4.3 Envelope Encryption Option

Envelope Encryption is a user selectable option which is meant to offer a higher level of security for a code hopping system. During a normal transmission with the envelope encryption turned off, the 28-bit serial number is transmitted in the clear (unencrypted). If envelope encryption is selected, then the serial number is also encrypted before transmission. The encryption for the serial number is done using a different algorithm than the transmission algorithm. The envelope encryption scheme is not nearly as complex as the KeeLoq algorithm and, hence, not as secure. When the envelope encryption is used, the serial number must be decrypted using the envelope key and envelope decryption. After the serial number is obtained, the normal decryption method can be used to decrypt the hopping code. All transmitters in a system must use the same envelope key.

8.4.4 Secure Learn

In order to increase the level of security in a system, it is possible for the receiver to implement what is known as a secure learn function. This can be done by utilizing the seed value on the HCS300 which is stored in EEPROM and can only be transmitted when all four button inputs are pressed at the same time (Table 5-1). Instead of the normal key generation method being used to create the encryption key, this seed value is used and there need not be any mathematical relationship between

8、Transmitter Functional Description：

serial numbers and seeds.

8.4.5 Auto-shutoff

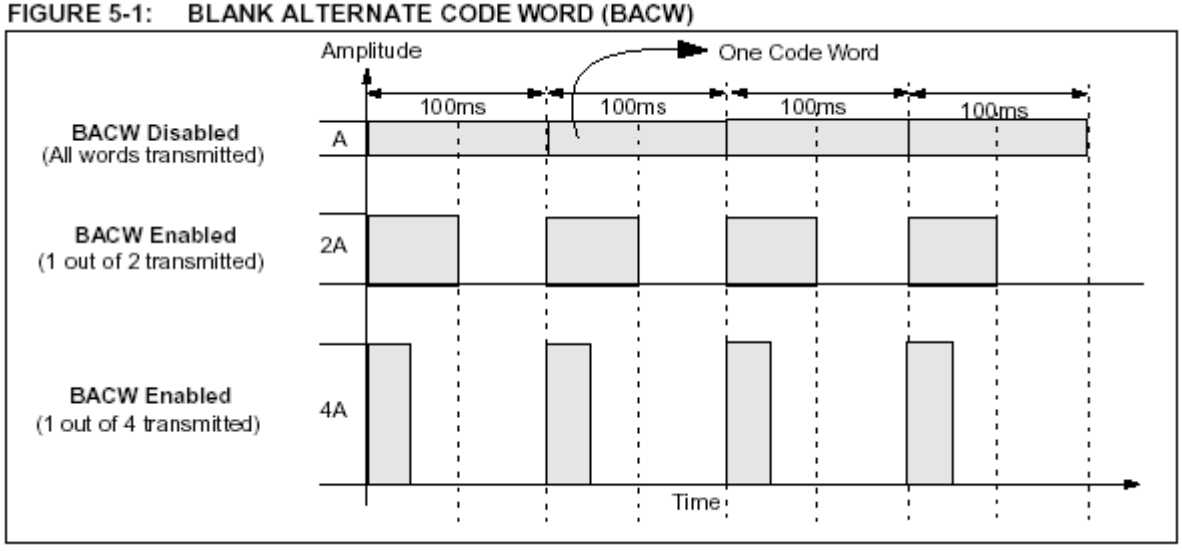
The Auto-shutoff function automatically stops the device from transmitting if a button inadvertently gets pressed for a long period of time. This will prevent the device from draining the battery if a button gets pressed while the transmitter is in a pocket or purse. This function can be enabled or disabled and is selected by setting or clearing the Auto-shutoff bit (see Section 3.3.1).Setting this bit high will enable the function (turn Auto-shutoff function on) and setting the bit low will disable the function. Time-out period is approximately 25 seconds.

TABLE 5-1: PIN ACTIVATION TABLE

	S3	S2	S1	S0	Notes
1	0	0	0	1	1
2	0	0	1	0	1
3	0	0	1	1	1
4	0	1	0	0	1
5	0	1	0	1	1
6	0	1	1	0	1
7	0	1	1	1	1
8	1	0	0	0	1
9	1	0	0	1	1
10	1	0	1	0	1
11	1	0	1	1	1
12	1	1	0	0	1
13	1	1	0	1	1
14	1	1	1	0	1
15	1	1	1	1	2

Note 1: Transmit generated 32-bit code hopping word.
2: Transmit 32-bit seed value.

FIGURE 5-1: BLANK ALTERNATE CODE WORD (BACW)



8.4.6 VLOW: Voltage LOW Indicator

The VLOW bit is transmitted with every transmission (Figure 8-4) and will be transmitted as a one if the operating voltage has dropped below the low voltage trip point. The trip point is selectable between two values, based on the battery voltage being used. See Section 3.6.5 for a description of how the low voltage select option is set. This VLOW signal is transmitted so the receiver can give an audible signal to the user that the transmitter battery is low (Section 5.8).

8.4.7 RPT: Repeat Indicator

This bit will be low for the first transmitted word. If a button is held down for more than one transmitted code word, this bit will be set to indicate a repeated code word and remain set until the

8、Transmitter Functional Description：

button is released (Figure 8-4).

FIGURE 8-4: DATA WORD FORMAT