Everywhere you imagine.

# 4 M34559 Evaluation Board

4500 Series – LCD MCU

**Microcomputer Development Environment System**



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# Remote controller Emulation Platform

# (M34559G6)

## User's Manual

## RSS-SH

**1st Edition**

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# IMPORTANT INFORMATION

- ✧ **READ this user's manual before using this evaluation board.**
- ✧ **KEEP the user's manual handy for future reference.**

  **Do not attempt to use the evaluation board until you fully understand its layout concept.**

## MCU:

Throughout this document, the term "MCU" shall be defined as the Renesas 4500 series, M34559 microcomputers.

## Improvement Policy:

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# PREFACE

**About this manual**

This user's manual is written for Renesas M34559 Evaluation board. It describes different usage of the board, operation specification of demo software and software source code. Please use this user's manual to understanding on how to operate the evaluation board and also to self-train on how to design M34559 software for LCD remote control and LCD front panel with IR receiver function.

**Section 1 Introduction**

Gives an introduction to the configuration of this evaluation board

**Section 2 Platform specification**

Highlights the evaluation board features, specifications and standard circuitry.

**Section 3 Quick Overview of How to Use the Board**

Gives an overview on how to connect the board to the compact emulator and the Application board.

**Section 4 Software Information**

Gives a brief description on the key matrix, LCD function, transmission format, received data integrity check and peripherals used by the sample software.

**Section 5 Sample Software Flowchart**

Gives the detail Sample Software flowchart.

**Section 6 Information of Sample Software Source Code**

The sample software source code provided is to facilitate users to self-train on software design for key matrixes, remote control transmission, remote control receiver and LCD

**Section 7 Platform PCB and Emulation**

Some picture about the PCB and emulation, and comments.

**Appendix A B C D E F G**

Some useful information about source code,spec and tools.



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# 1. Introduction

- ✓ This platform is designed for remote controller S/W validation and emulation; it can be used as prototype board of actual remote controller (Maybe you can create your own software which based on this sample software). The function that this platform realized is introduced in the platform specification section.

- ✓ To simulate other function modules that are not contained in this evaluation board; you can add some buttons or modules by using the independent holes.

- ✓ M34559T2-CPE is used on this platform for the sample code emulation. When using the platform, **be careful of** the emulator MCU type and ESD.

The M34559 Evaluation board is designed to illustrate the built-in peripherals of the M34559 LCD MCU. The evaluation package set includes an M34559 MCU board, application board, QzROM Programmed with Sample software and user's manual.

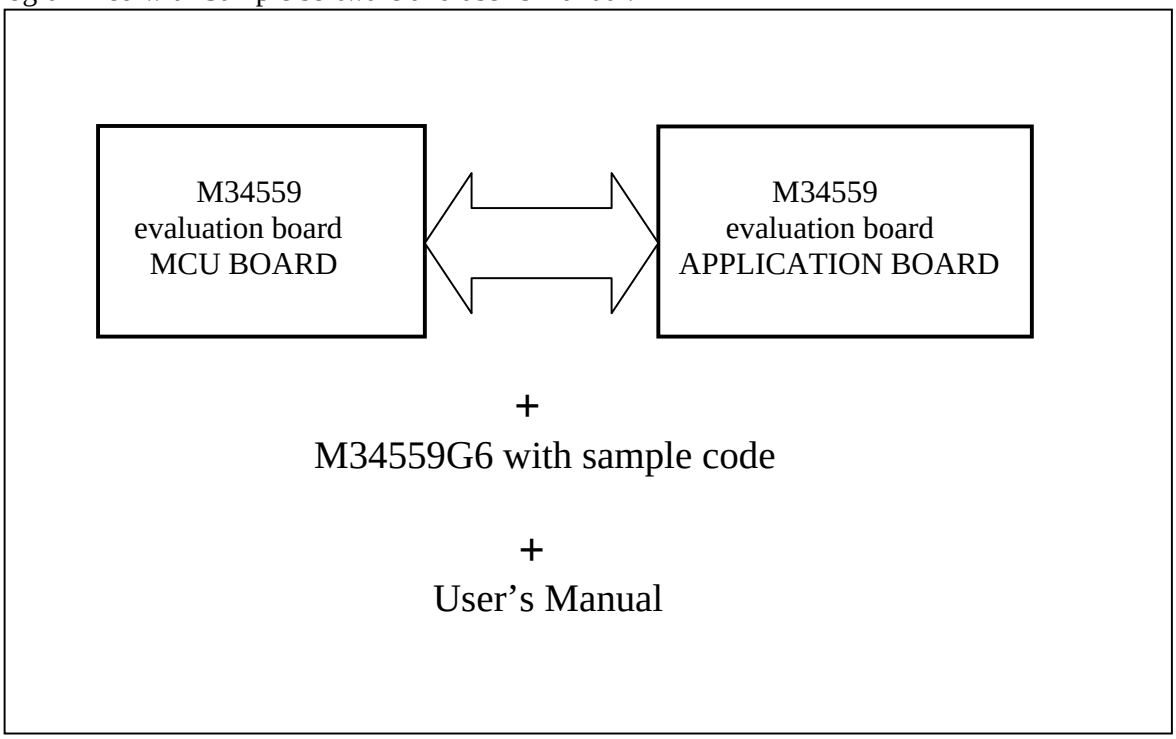


**Figure 1.1: M34559 Evaluation Package Set**

This evaluation package set can be used for demonstration of the features of M34559 LCD MCU for



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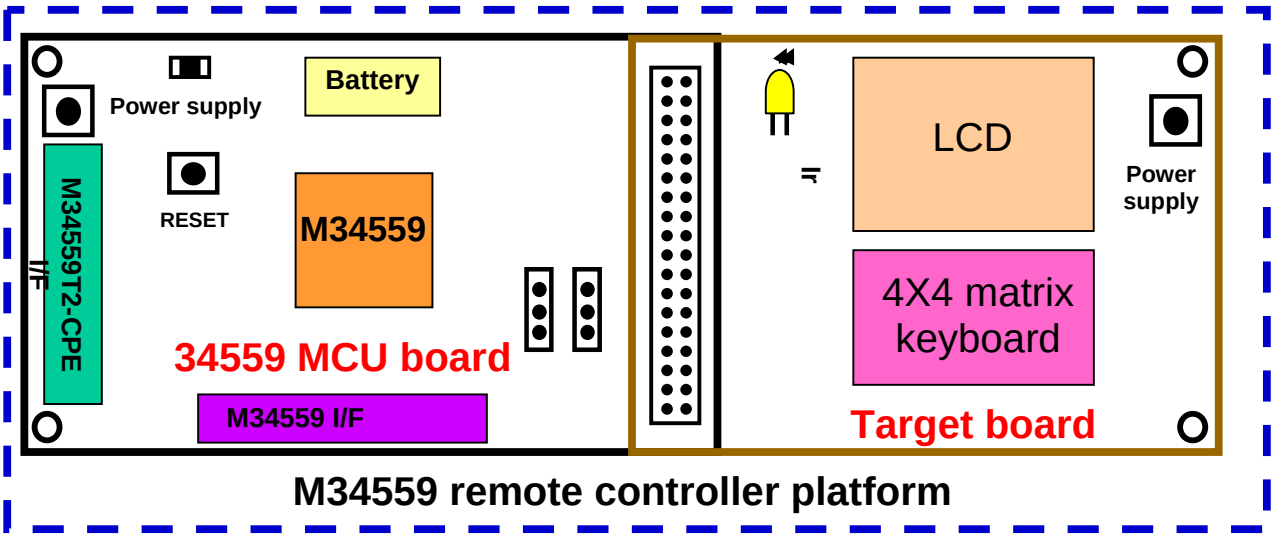
MCU promotion to white goods customers. In addition, it can be used by software engineer self training on 4-bit software programming.

# 2. Platform specification




## 2.1 Outline of the function

The upper picture is the system block diagram.

①. Keyboard 4x4
②. Keyboard expand (use one key to expand )
③. LCD display (32x4)
④. Manual reset
⑤. Switch machine type (h/w setting)
⑥. LED display
⑦. Infrared ray radiation (PWM wave)

## 2.2 Key Features

The evaluation package set can be used as a demo board or a training board.

1) **Demo board**

With the QzROM inserted in the IC socket on the M34559 evaluation board, the user is able to demonstrate the M34559 LCD MCU as a LCD remote control.
With this transmitting unit and another receiving unit(the MCU is M3823), the user is able to demonstrate the M34559 LCD MCU as a transmitter and the M3823 as a receiver.

2) **Training board**

By removing the QzROM and connecting the 52 pins dual-in-line connectors (CPECON) from the M34559 MCU board to the M34559T2-CPE compact emulator, the evaluation package set allows the



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user to have hands-on experience on 4-bit software programming and software debugging.
The block diagram of the connection of the evaluation package set when used as training board is shown in Figure 2.1.

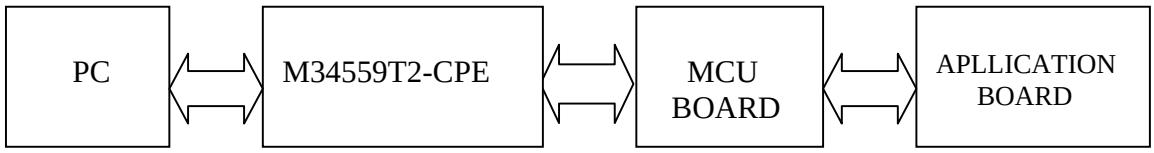


**Figure 2.1: Block diagram of the connection of the evaluation package set when used as training board**

## 2.3 Standard Circuitry

The following standard circuitries are included on the M34559 Evaluation Board (MCU board).

- Main and real time clock circuit
- LCD power supply circuit
- Reset circuit
- Power supply circuit

The following standard circuitries are included on Application Board

- the LCD panel
- key matrix circuitry
- the IR Transmitter circuit

## 2.4 Specifications

| Item | Specifications |
|---|---|
| Support MCU | M34559 LCD MCU |
| Emulator (*see note) | M34559T2-CPE Compact Emulator |
| Interface Software (*see note) | ASM45 Cross assembler<br>M3T-PD45M debugger software (hereafter referred to as PD45M) |
| Clock source | Clock input from M34559 Evaluation Board (if it is at emulation status, please cut off the Clock source ) |
| Power Supply | DC input voltage: 3V DC +/- 5%<br>Or 2 AAA batteries<br>Power supply of the Application Board is supplied from the M34559 Evaluation Board –MCU board.(it is also able to get Power source from DC power Plug) |
| Host PC(*see note) | IBM PC/At Compatibles (windows XP,2000,Me,98) |

*Note: The interface softwares are required when the M34559 Evaluation Board is used as a training board.*



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# 3. Quick Overview of How to Use the Board

The M34559 Evaluation Board (MCU board) can be operated either using 2 AAA batteries (1.5v*2) or DC power supply (3V +/- 5%). The power supply of the Application Board is supplied from The M34559 Evaluation Board (MCU board) (it also can be supplied by external DC power).

## 3.1 Demo Board - Using QzROM programmed with sample software

1) Connect the M34559 evaluation board to the Application Board.
2) Insert the QzROM into the IC socket.
3) Select the power Jumper JP5, and SET Switch S2 to ON
4) To set the jumper JP3, JP7 as follows: **figure 3.1: setting of the Switches**
5) Power "ON" the M34559 Evaluation Board.

How to program the M34559, please refer the **appendix E: how to program the M34559 on board using EFP-S2V.**

| NO. of Switches | Setting of the Switches |
|---|---|
| JP3.1 | OFF |
| JP3.2 | OFF |
| JP3.3 | OFF |
| JP3.4 | OFF |
| JP3.5 | ON |
| JP3.6 | ON |
| JP3.7 | ON |
| JP3.8 | ON |
| JP7.1 | OFF |
| JP7.2 | OFF |

**Figure 3.1: setting of the Switches**

## 3.2 Training Board - Using M34559T2-CPE compact emulator (sample software)

1) Use a 4MHz oscillator on the oscillator circuit board for the compact emulator.
2) Set MCU power supply voltage selection switch (SW1) to select 3V.
3) Set the port/segment output selection switches to select $SEG_{16}$, P01, P02 and P03 ( JP1~JP4) and select $P1_0$, $P1_1$, $P1_2$ and $P1_3$ (JP5~JP8) respectively.
4) Set the port/sub-clock selection switch (SW2) to select XCIN. (Sub-clock is used in the sample software)

*How to set up the M34559T2-CPE; please refer the user manual of the M34559T2-CPE*



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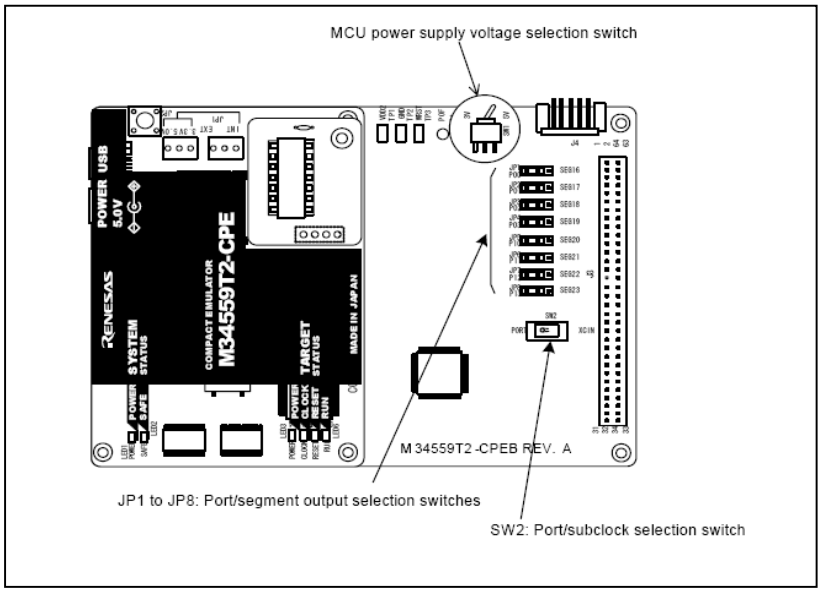


**Figure 3.2: M34559T2-CPE Compact Emulator diagram**

5) Remove the QzROM from the IC socket.
6) Connect the M34559 Evaluation Board to the M34559T2-CPE compact emulator using the 52 Pin dual-in-line connectors.
7) Connect the power supply to the compact emulator and evaluation board.

*Note: Emulator does not supply power to target system. Refer to M34559T2-CPE User's Manual for more information.*

8) Connect the M34559 evaluation board to the Application Board.
9) Set the Switches on the MCU board.

| NO. of Switches | Setting of the Switches |
|---|---|
| JP3.1 | OFF |
| JP3.2 | OFF |
| JP3.3 | OFF |
| JP3.4 | OFF |
| JP3.5 | OFF |
| JP3.6 | OFF |
| JP3.7 | OFF |
| JP3.8 | OFF |
| JP7.1 | OFF |
| JP7.2 | OFF |

**Figure 3.3: setting of the Switches at training board usage.**

10) Power "ON" the M34559T2-CPE compact emulator and M34559 Evaluation Board.
11) After the compact emulator started up normally, start the PD45M debugger software. When the PD45M starts, the dialog as shown in Figure 3.4 appears. Select OK and the next dialog box as



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shown in Figure 3.5 appears. Select the MCU file M34559G6 to be used.

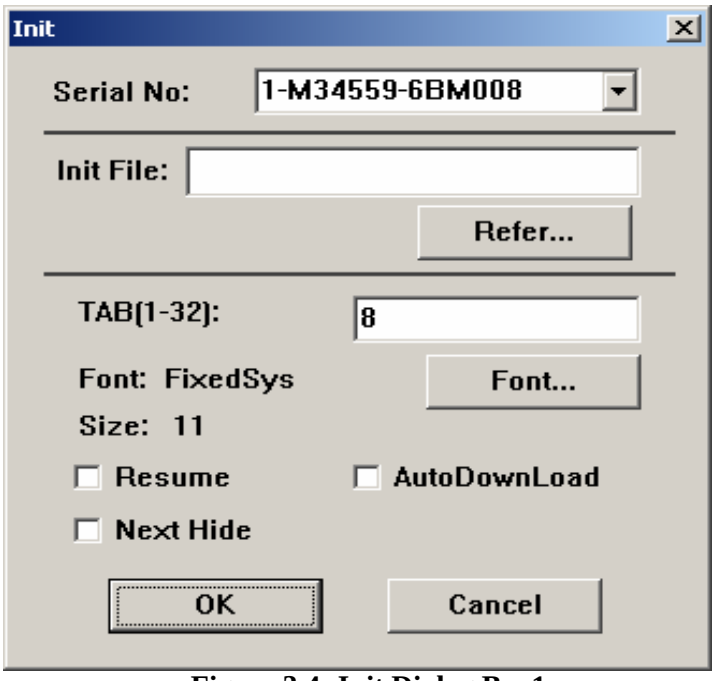


**Figure 3.4: Init Dialog Box1**

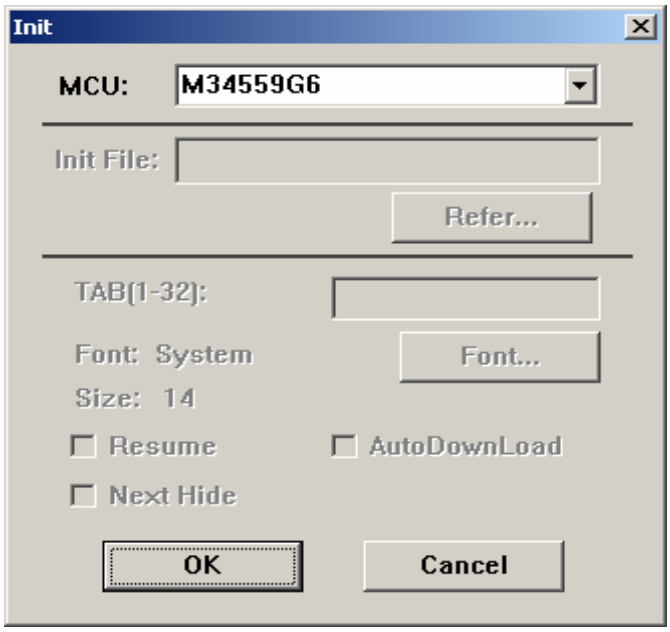


**Figure 3.5: Init Dialog Box2**



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12) The PD45M main window as shown in Figure 3.6 appears. Select the option “File>Download>Load Module…” from the window tool bar to download the HEX file of the sample software. then you can debug.

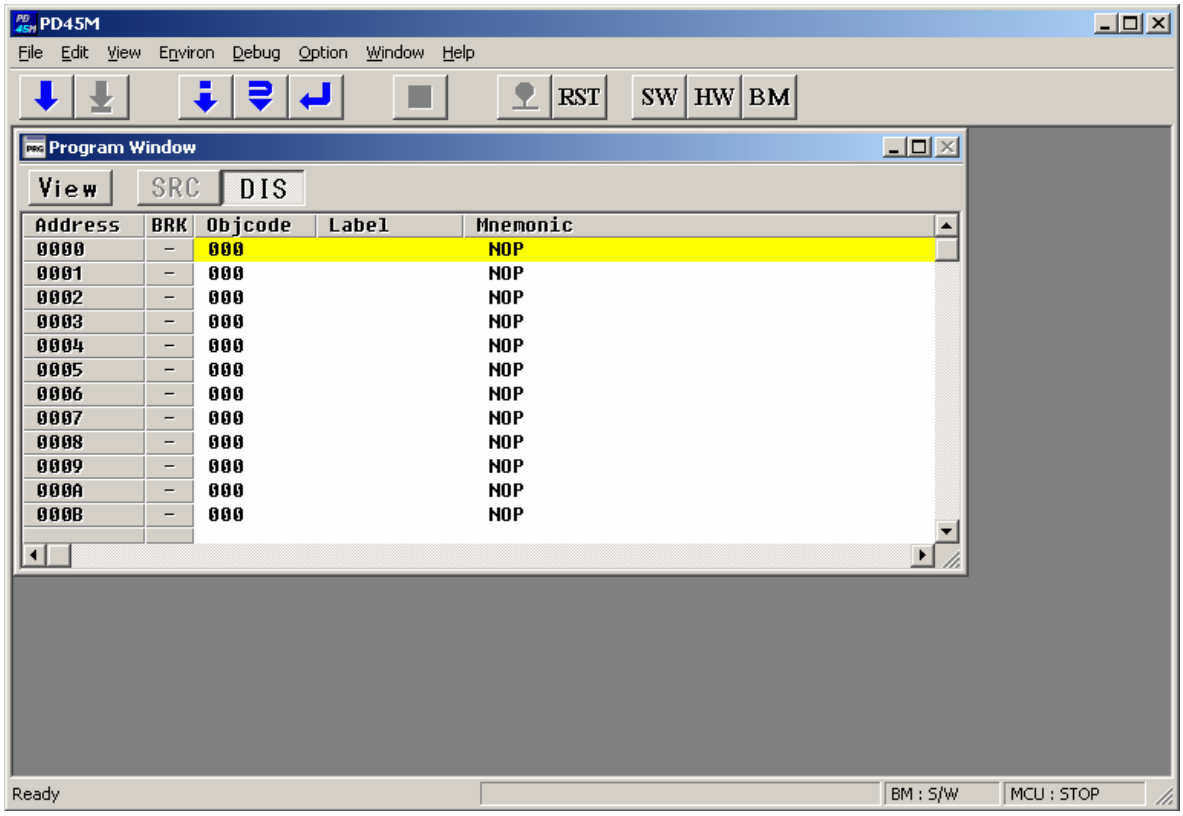


**Figure 3.6: PD45M Main Window**

# 4. Software Information

## 4.1 Key Matrix

A key matrix circuit consists of scan lines, return lines and a key pad. The simplified circuitry is as Shown in Figure 4.1.

Port $D_0$~D3 are used as scan ports (output) and port $P1_0$~ $P1_3$ is used as return ports (input). A scan line is active when it is set to logic “L”.



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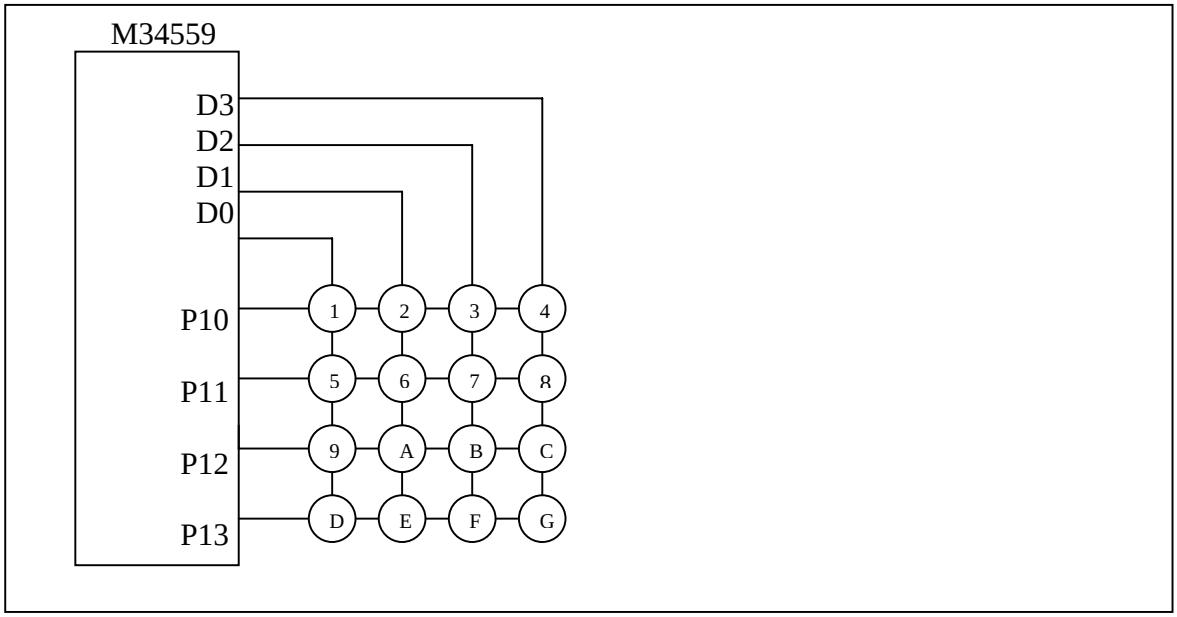


**Figure 4.1: Key matrix circuit**

The following describe how the circuitry works:
No key press: If there is no key press on the key matrix, all return lines will have logic “H”.
Key 1 press: If key1 is pressed, Port $P1_3$ (return line) will read “L” when Port $D_0$ (scan line) output a “L”. Therefore, Port 1 is “0111” and Port $_0$ is “L” when Key1 is pressed.
A key pressed counter is used to count the number of key pressed in one key scan. If the key pressed counter value is “0”, no key is pressed. If the key pressed counter value is more than “1”, There is multiple key pressed. Multiple key presses are not valid in the sample software.
The key scan is performed every 10msec. If the key status remains (low/high) for 20msec or more (Meaning key scan is perform twice for the detection of a new key status), it is then deemed that a key is pressed/released. This is to minimize any chattering phenomena.

## 4.2 LCD function

The 4559 Group has an LCD controller/driver. When the voltage is applied to LCD power supply input pins ($V_{LC1}$~$V_{LC3}$) and the data are set in timer control register (W4), Timer LC, LCD control register (L1, L2, L3, C1, C2) and LCD RAM, the LCD controller/driver automatically reads the display data and controls the LCD display by setting duty and bias.
In this sample software, 1/4 duty and 1/3 bias are selected for displaying data on the LCD (up to 66 segments can be controlled to display). 4 common signal output pins and 17 segments signal output pins are used to drive the LCD.
The LCD clock is determined by the Timer LC count source selection bit (W42), Timer LC control



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bit (W43) and Timer LC. The frequency (F) of the LCD clock used in the sample software is 64Hz, using the bit 4 of Timer3 as the count source. The formula is as shown below:

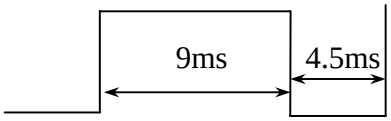
$$F = T_{34} \times \frac{1}{LC+1} \times \frac{1}{2}$$

The LCD power input pins ($V_{LC1}$~$V_{LC3}$) are used as pins $SEG_0$~$SEG_2$. Hence, internal power ($V_{DD}$) is used for the LCD power and internal dividing resistors are used. The circuitry for external dividing resistors is available on the evaluation board when $V_{LC1}$~$V_{LC3}$ pin function are to be used.

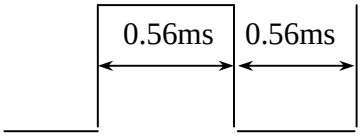
*Refer to the 4559 Group datasheet for more information on LCD Function.*

## 4.3 Transmission Format

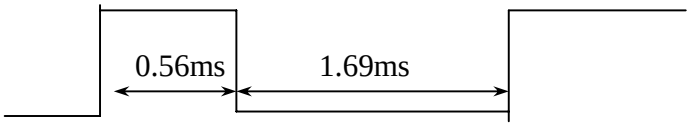
The infra-red remote control signal generated uses a carrier frequency of 38 KHz, with 1/3 duty cycle. The remote control signal is generated using Timer1 and Timer 2. The generated signal is output from C/CNTR pin. There is only one frame of signal transmitted with a valid key pressed.
The transmission format for the Transmission Program is described as follows:
Header/Separator:



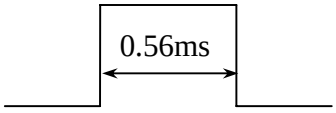

Bit “0”:




Bit “1”：




END bit：




The transmission data consists of 9 bytes. Each byte consists of byte “H” (4-bit) and byte “L” (4-bit). The representations of each byte are as follows:

User code（A）+ Function code（B+C+D+E+F+G+H）+Checksum（I）



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IR definition:

| | |
|---|---|
| A | User code ： 1byte 10001000（88） |
| B | D3 D2 D1 D0：setting temperature<br>0 0 0 0————————18℃<br>0 0 0 1————————19℃<br>……..<br>1 1 1 1----------32℃ |
| C | D5 D4 fan speed<br>1 1----------high<br>1 0----------middle<br>0 1----------low<br>0 0----------auto<br><br>D2 D1 D0: function<br>0 0 0----------auto<br>0 0 1----------cold<br>0 1 0----------dry<br>0 1 1----------heat<br>1 0 0----------fan |
| D | D4 D3 D2 D1 D0: real time hour<br>0 0 0 0 0 ------00 hour<br>0 0 0 0 1-------01 hour<br>. . . . . .<br>1 0 1 1 1-------23 hour |
| E | D5 D4 D3 D2 D1 D0: real time minute<br>0 0 0 0 0 0---------0 minute<br>0 0 0 0 0 1---------1minute<br>. . . . . .<br>1 1 1 0 1 1---------59minute |
| F | D4 D3 D2 D1 D0: timer hour<br>0 0 0 0 0 ------00 hour<br>0 0 0 0 1-------01 hour<br>. . . . . .<br>1 0 1 1 1-------23 hour |



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| | |
|---|---|
| G | D5 D4 D3 D2 D1 D0: timer minute<br>0 0 0 0 0 0---------0 minute<br>0 0 0 0 0 1---------1 minute<br>. . . . . .<br>1 1 1 0 1 1---------59 minute |
| H | D1 D0: timer status<br>0 0----------no timer on/off<br>0 1----------timer off<br>1 0----------timer on<br><br>D2: power on/off<br>1----------power on<br>0----------power off<br><br>D3: sleep<br>1----------sleep<br>0----------no sleep<br><br>D4 : swing<br>1----------swing<br>0---------- no swing |
| I | checksum: A+B+C+D+E+F+G+H low 8 bit (ignore carry) |



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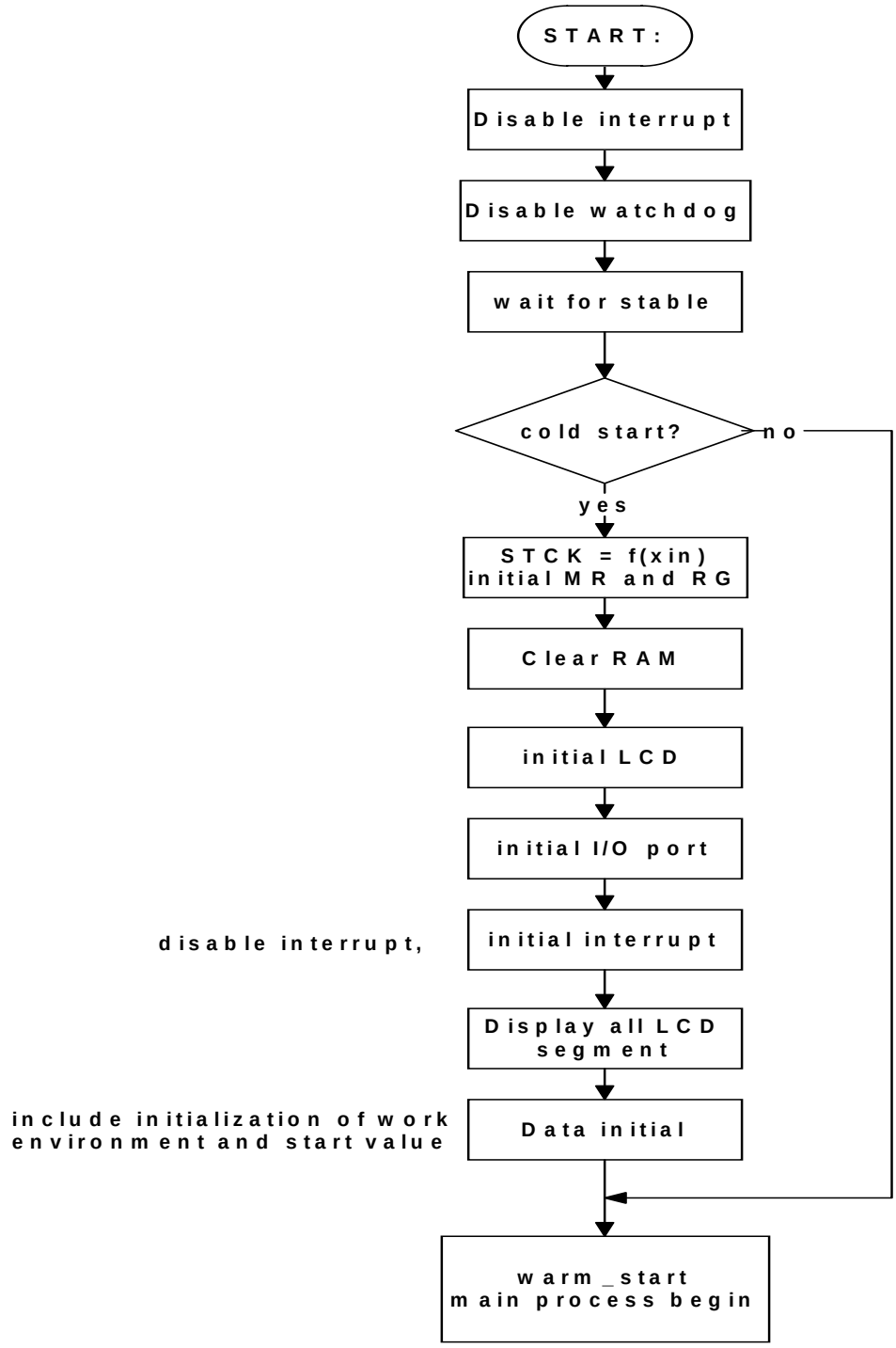
# 5. Sample Software Flowchart

## 5.1 Initialization Subroutine



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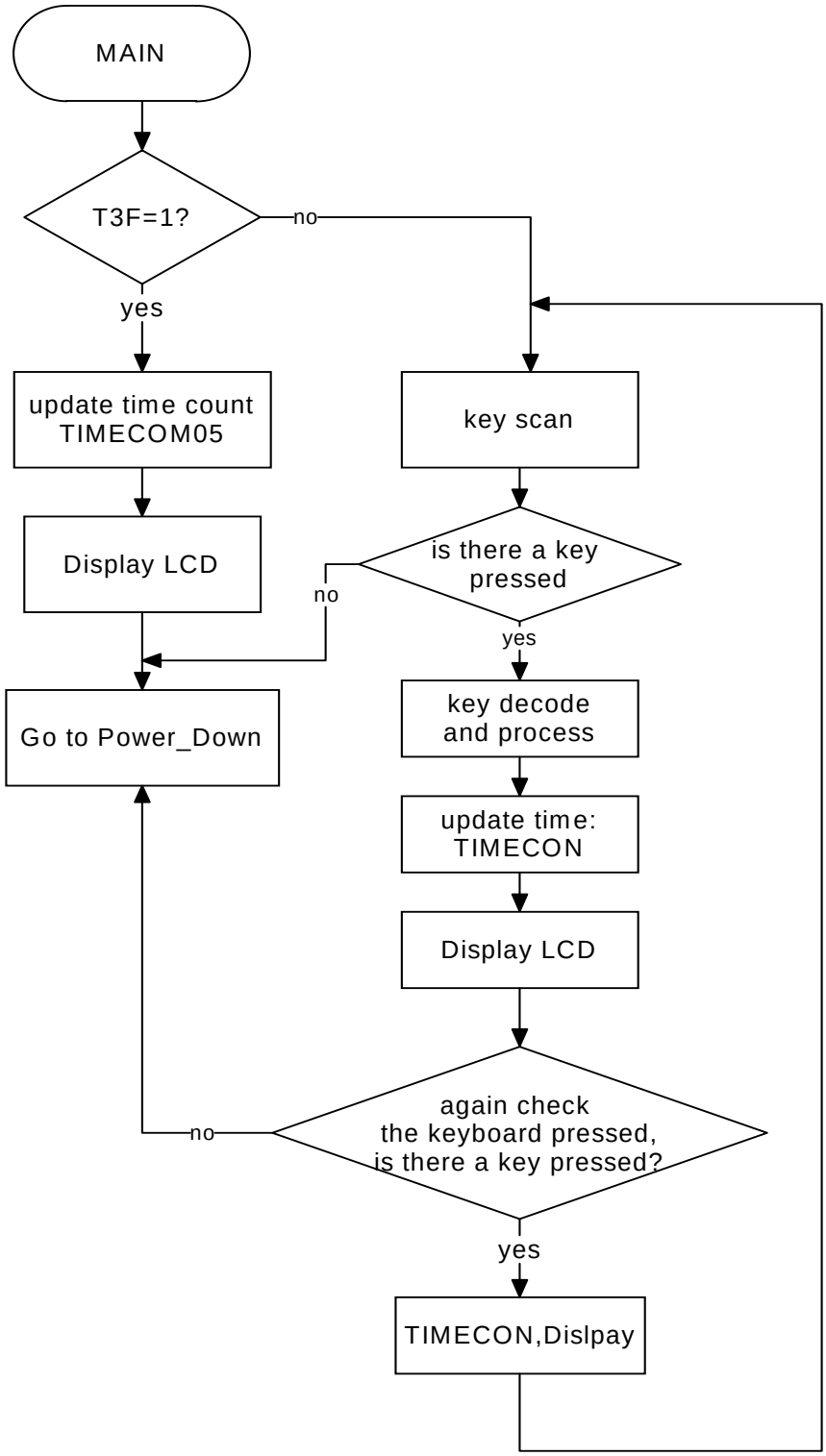
## 5.2 warm_start Subroutine



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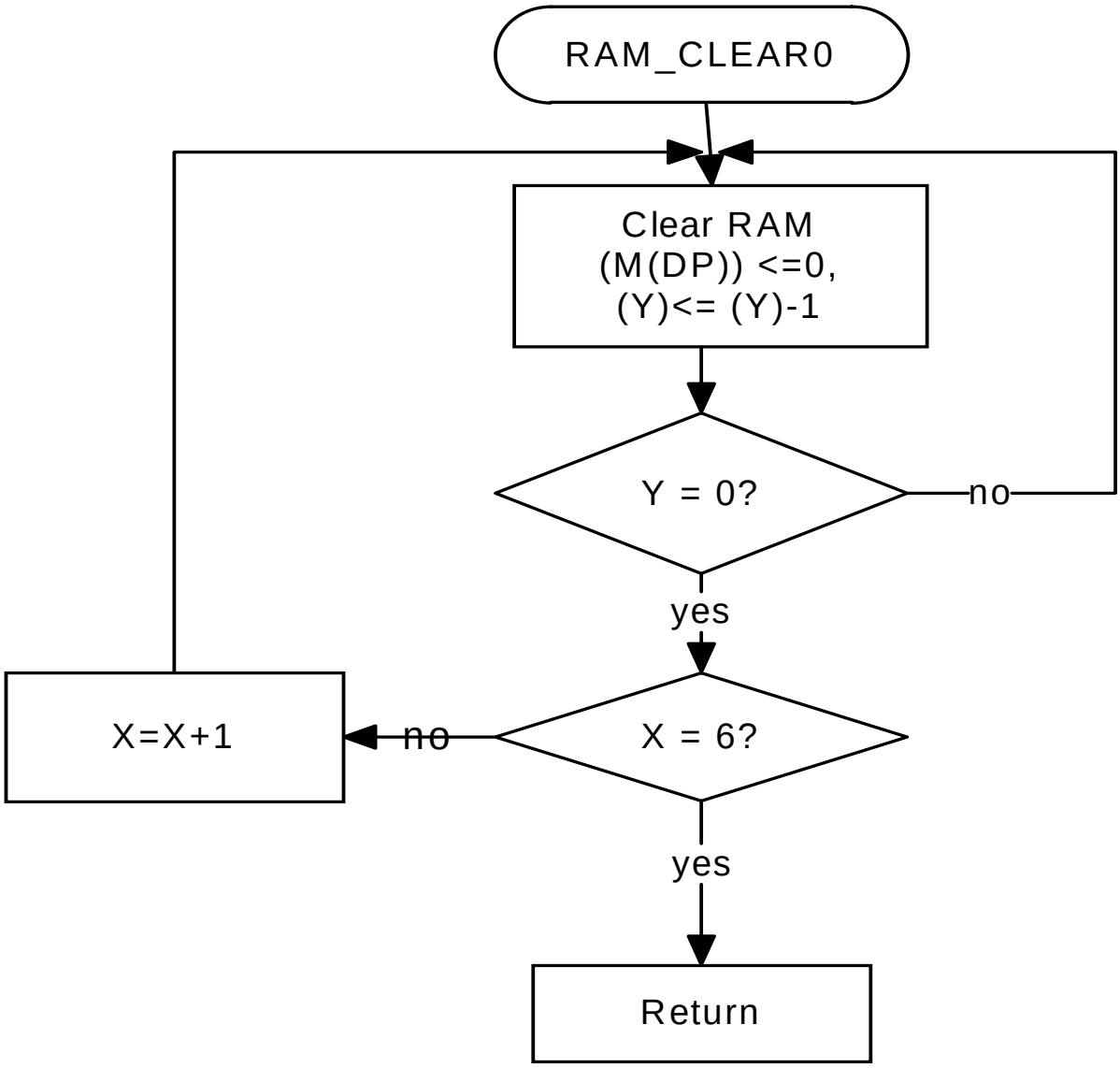
## 5.3 RAM clear Subroutine



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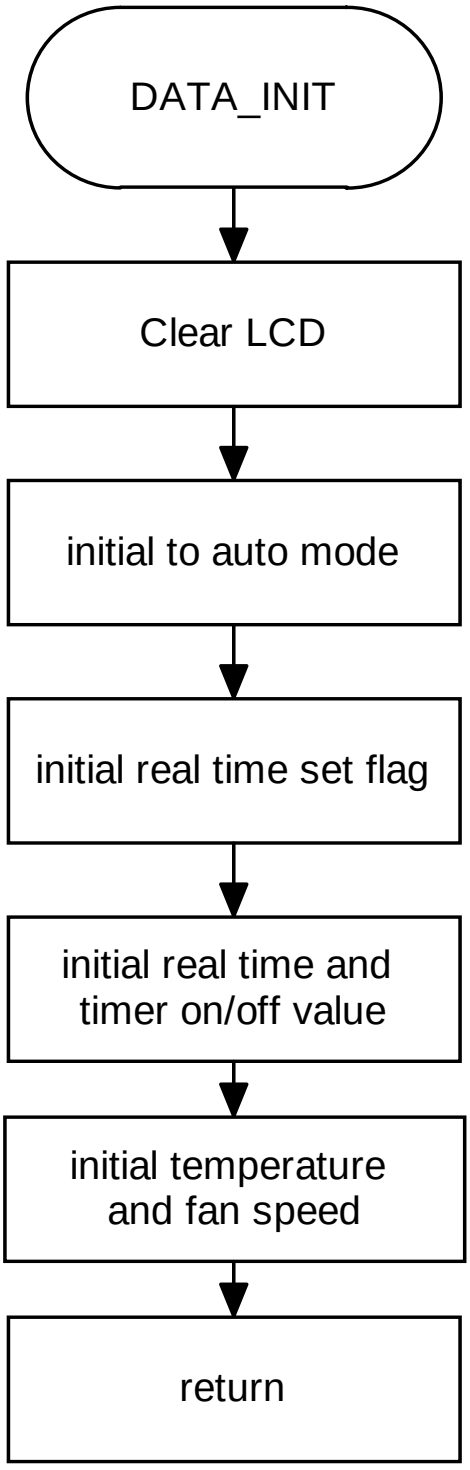
## 5.4 DATA_INIT Subroutine



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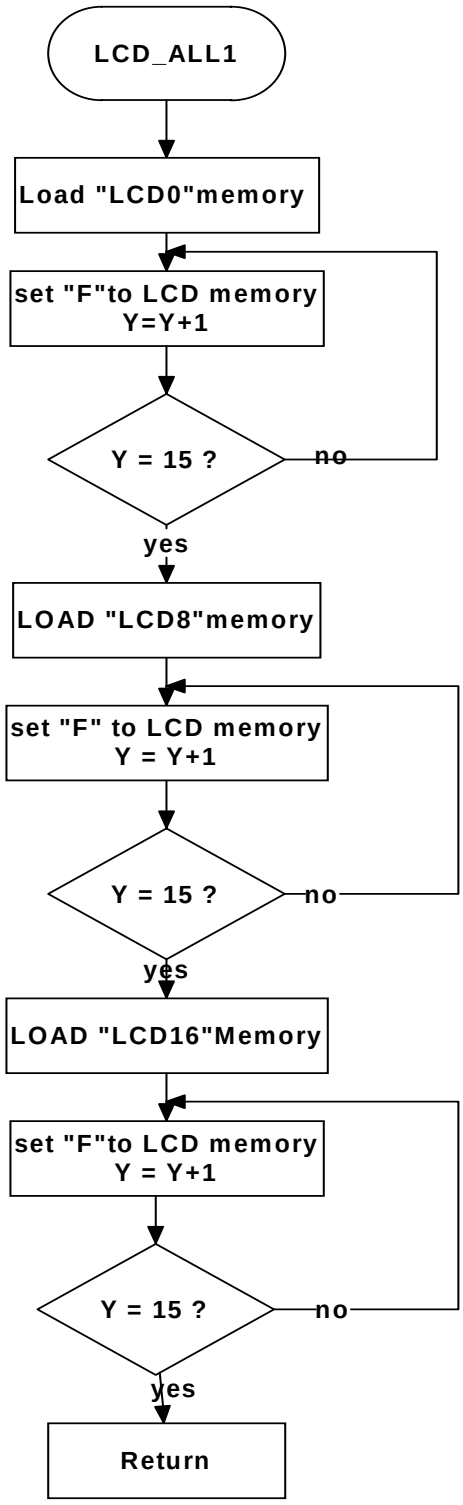
## 5.5 LCD_ALL1 Subroutine



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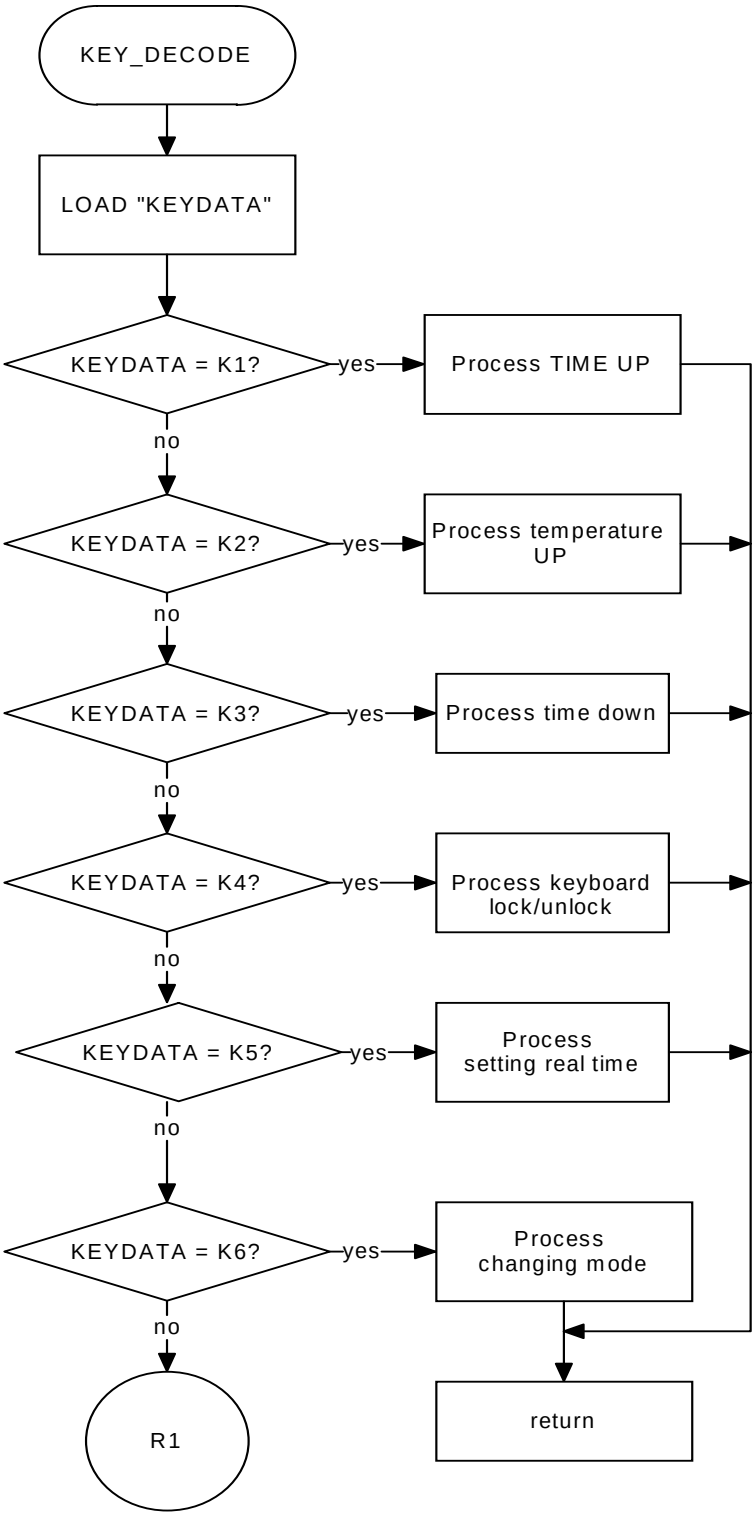
## 5.6 KEY_DECODE Subroutine



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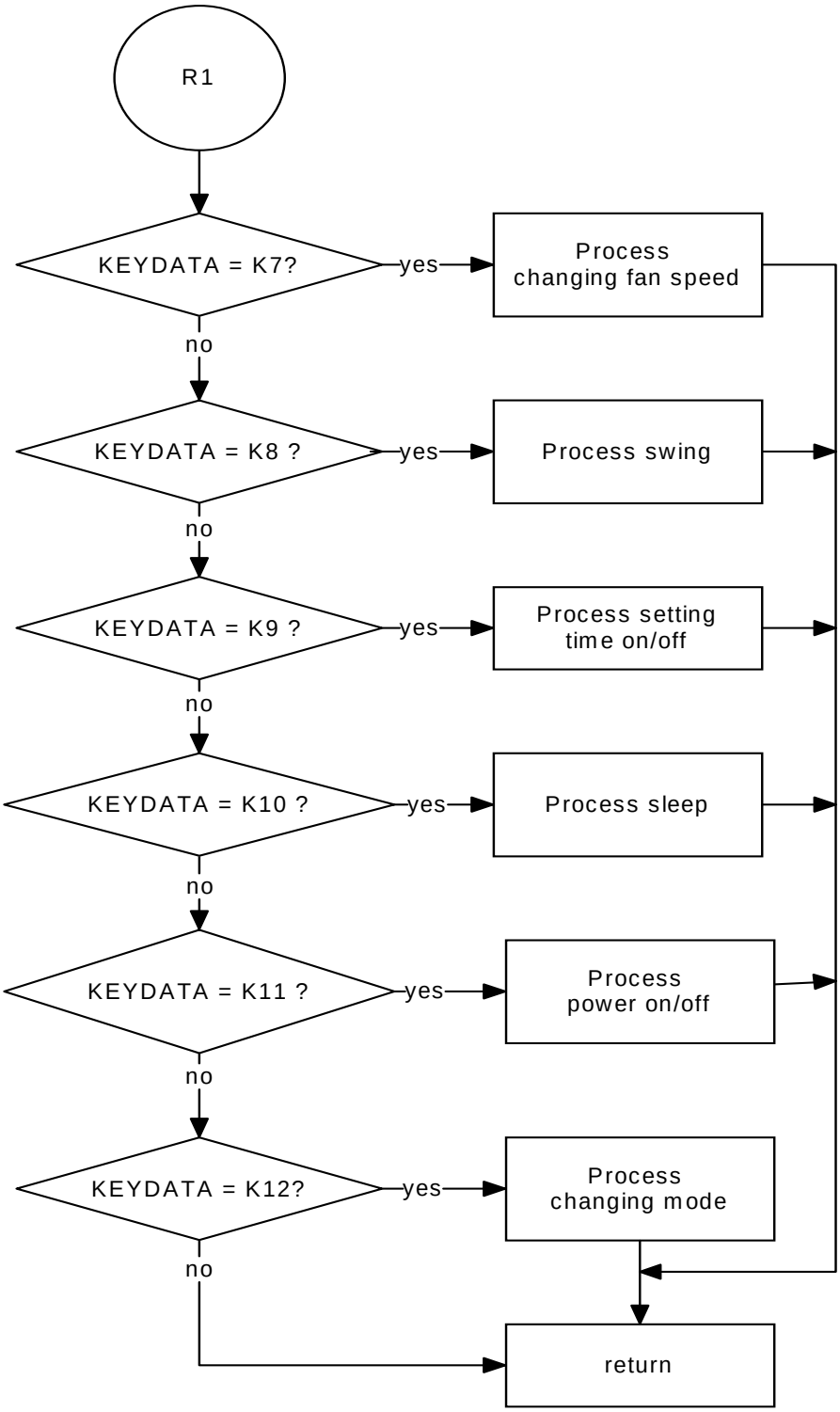
## 5.7 KEY_DECODE Subroutine (continue)



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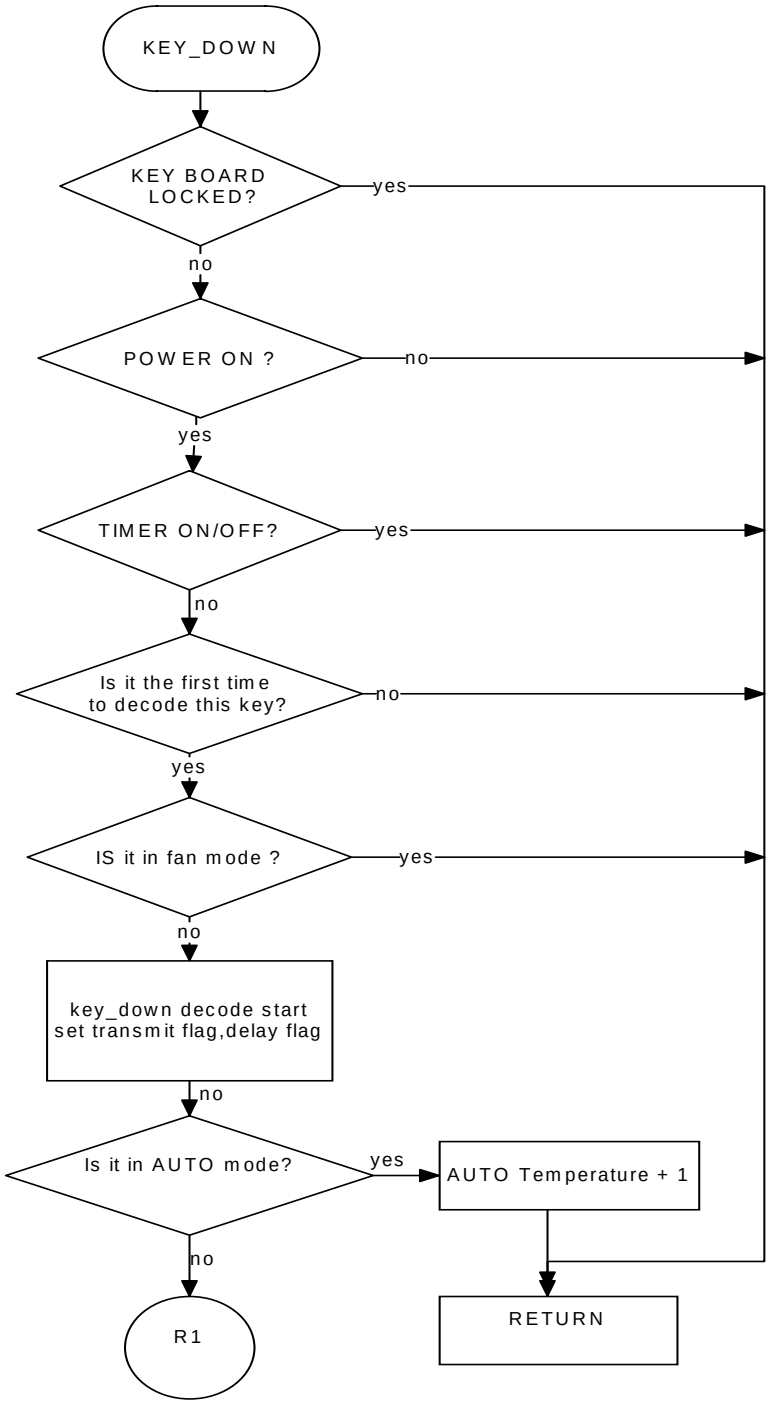
## 5.8 key_down Subroutine

Key_down and key_up are familiar with each other, so the flowchart of key_up you can refer key down's.



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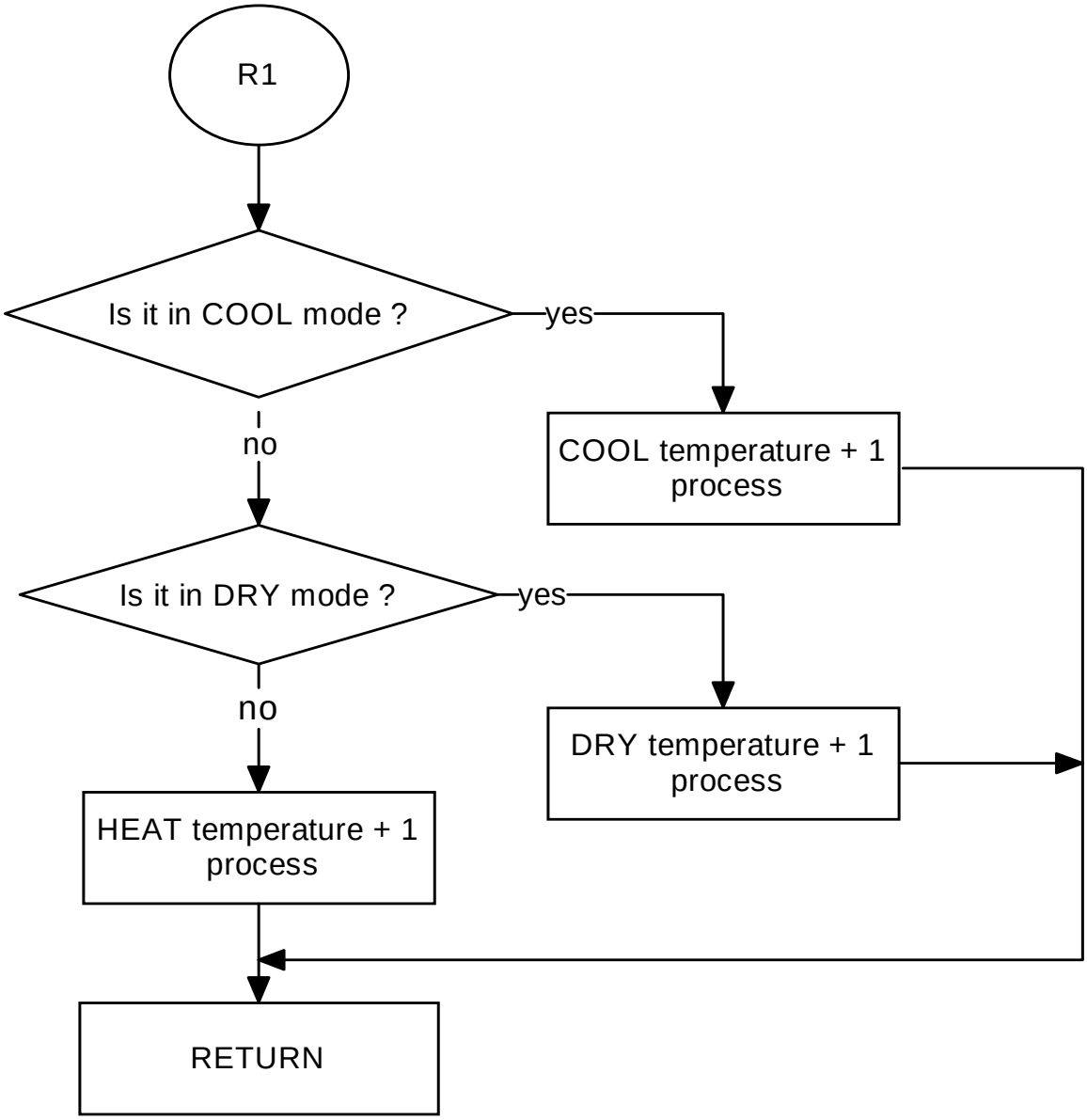
## 5.9 key_down Subroutine (continue)



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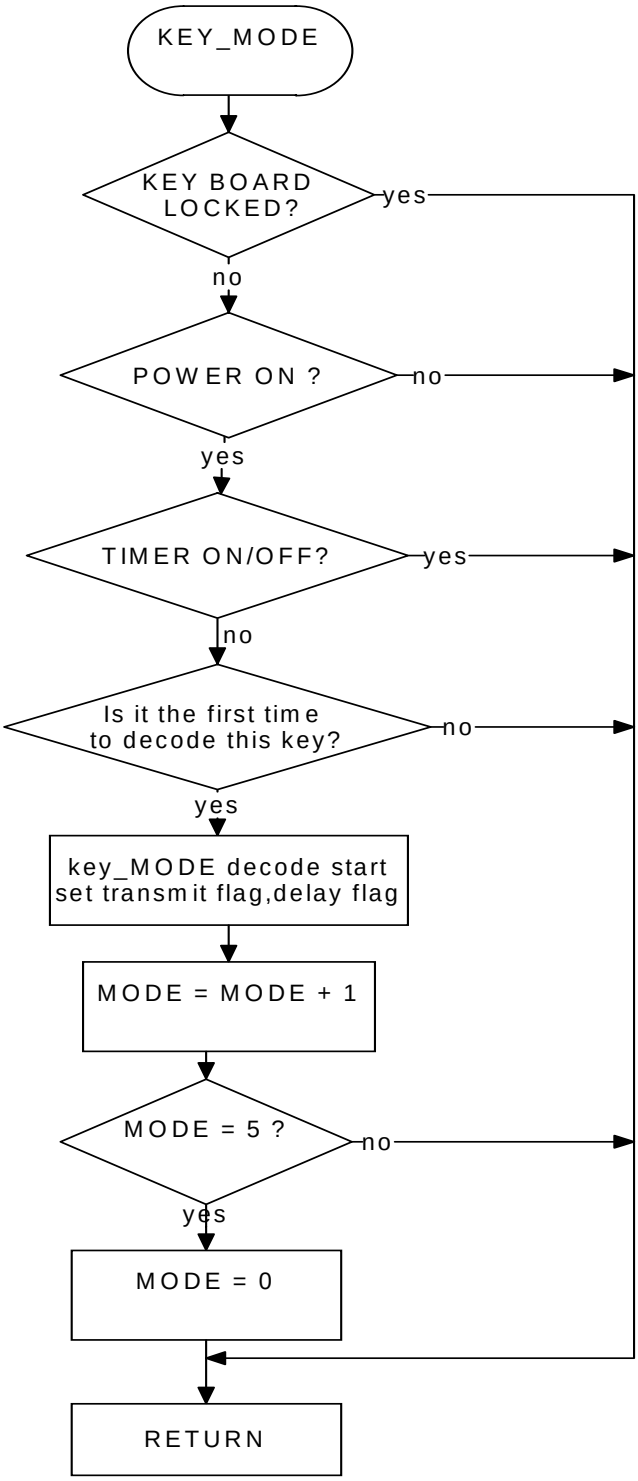
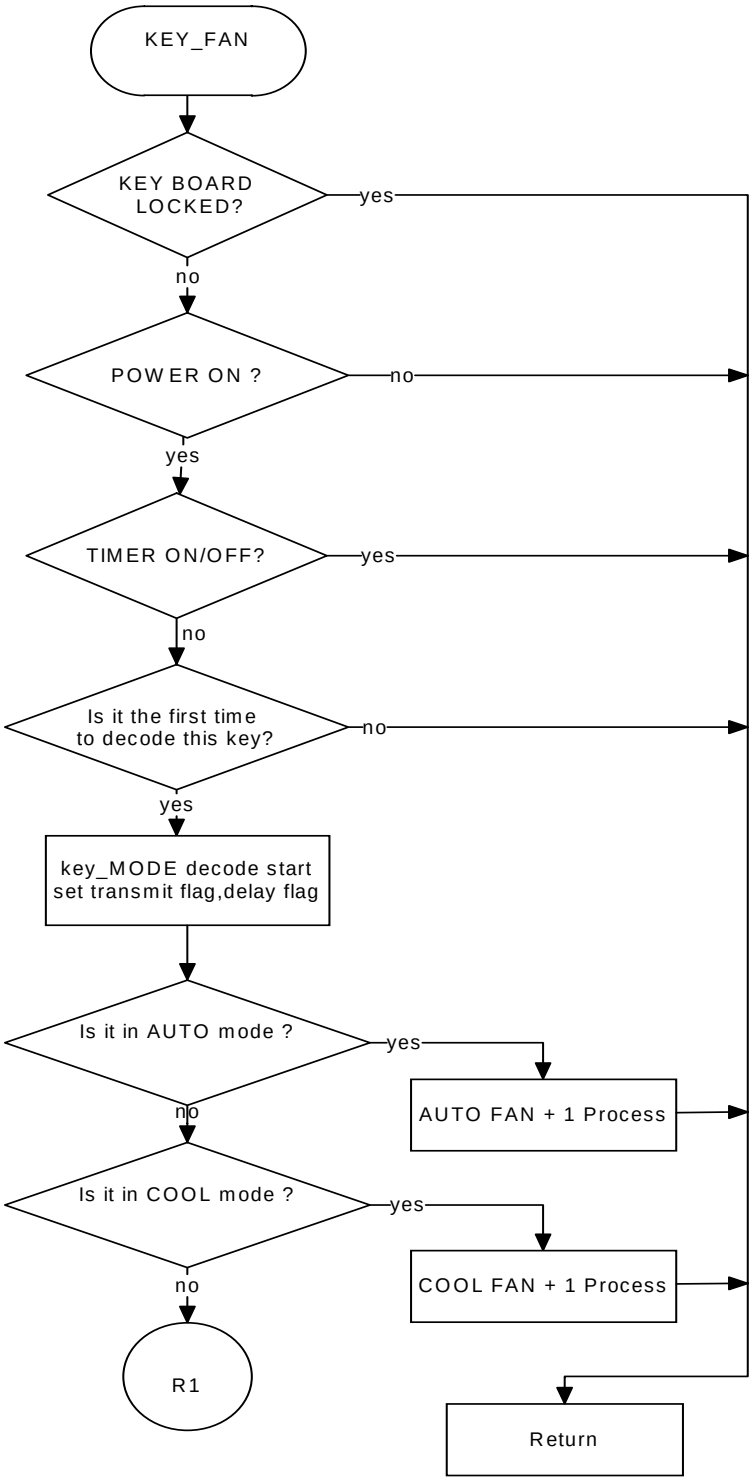
## 5.10 key mode Subroutine



## 5.11 key fan Subroutine



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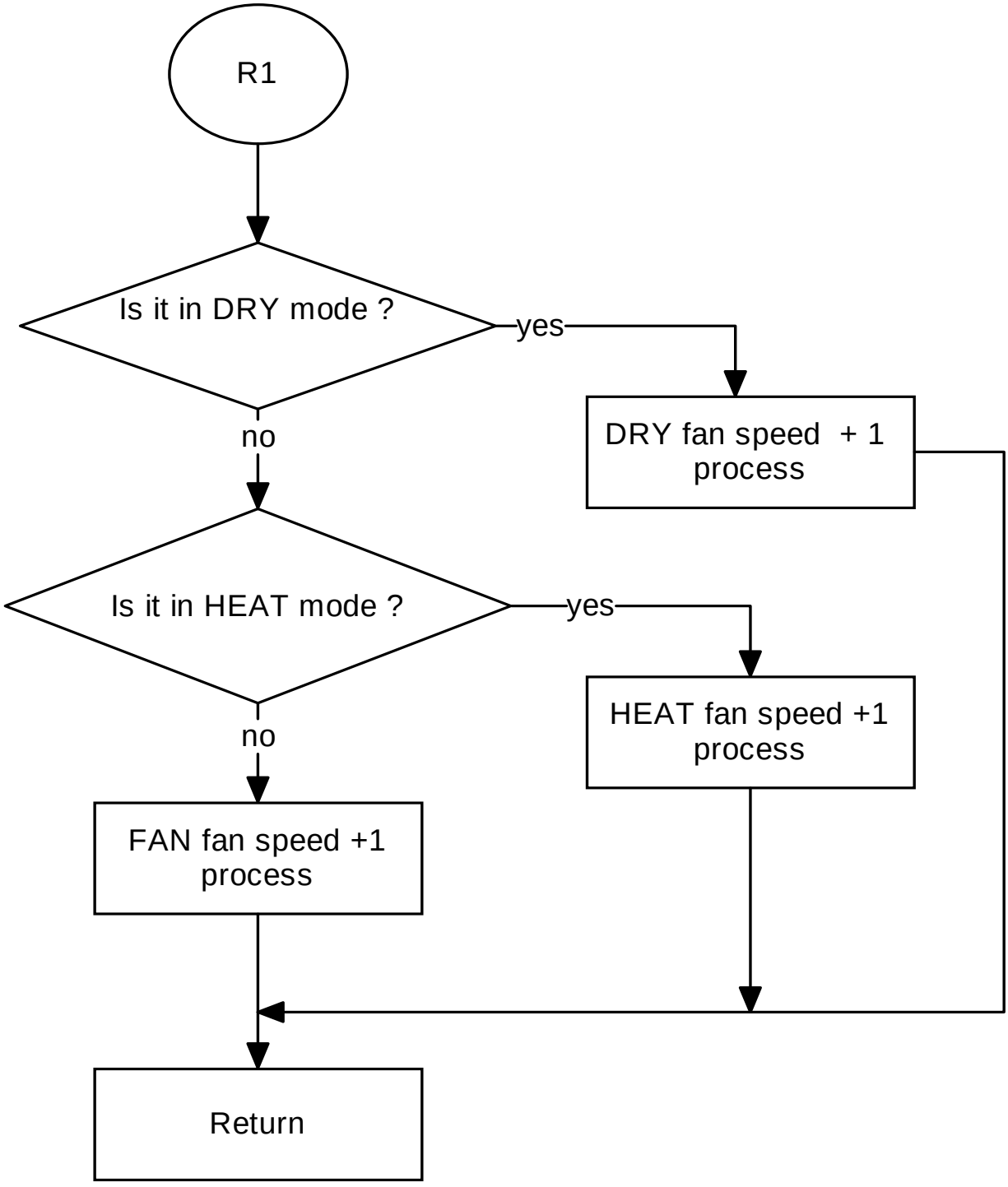
## 5.12 key fan Subroutine (continue)



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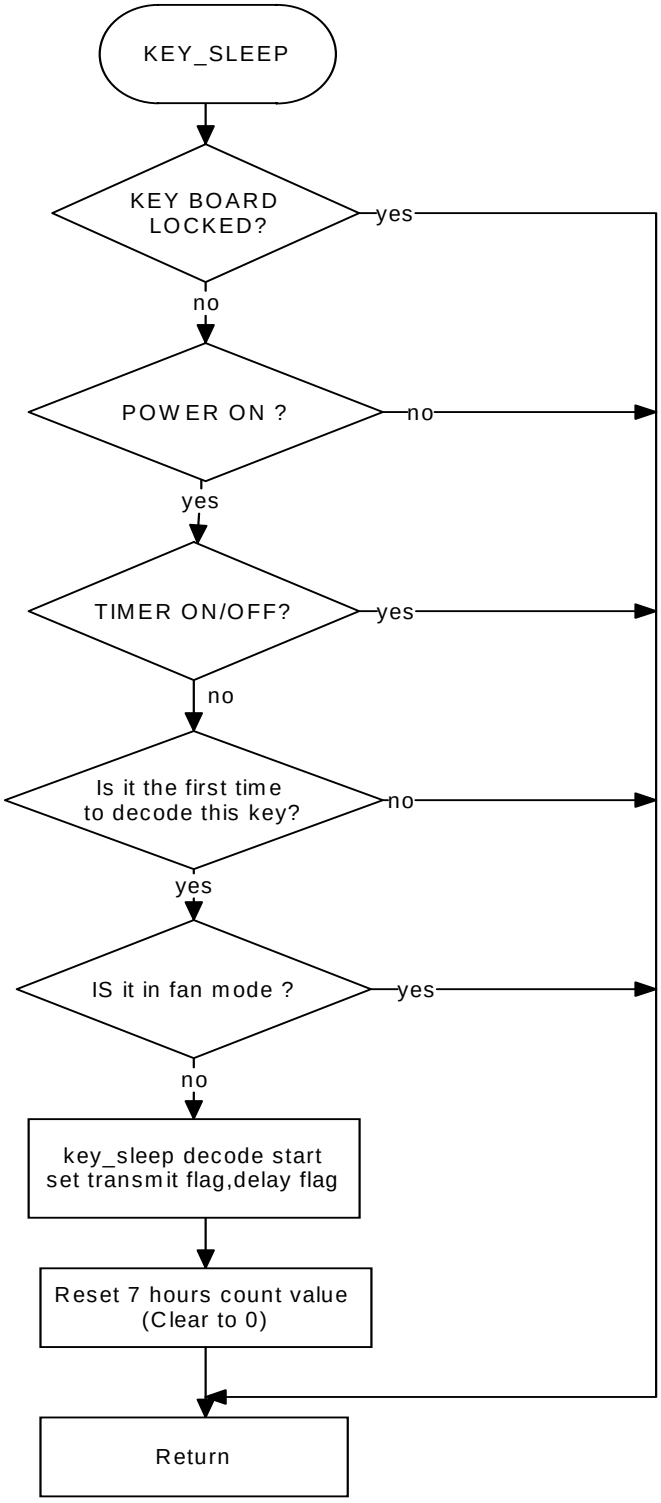
## 5.13 key_sleep Subroutine



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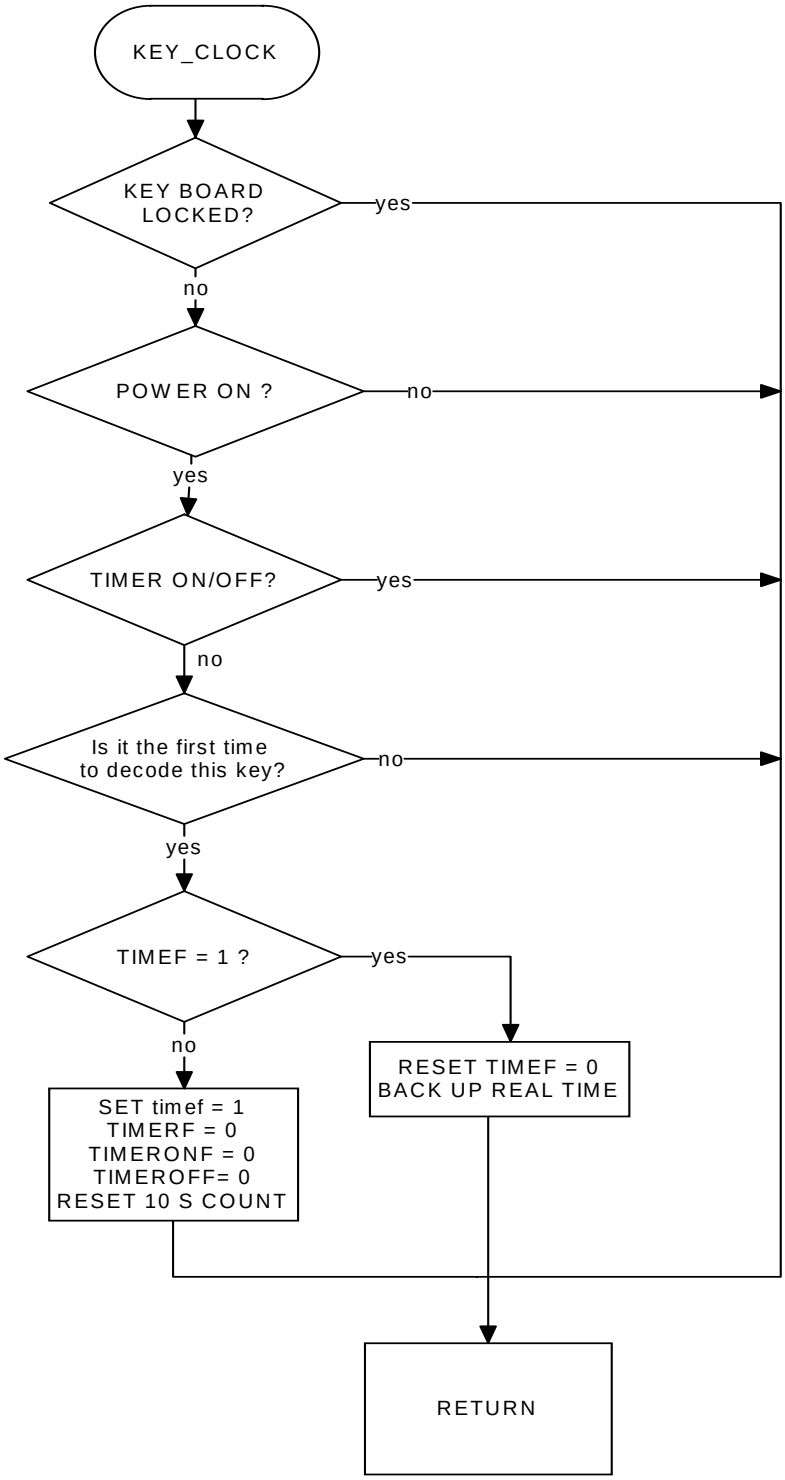
## 5.14 key_clock Subroutine



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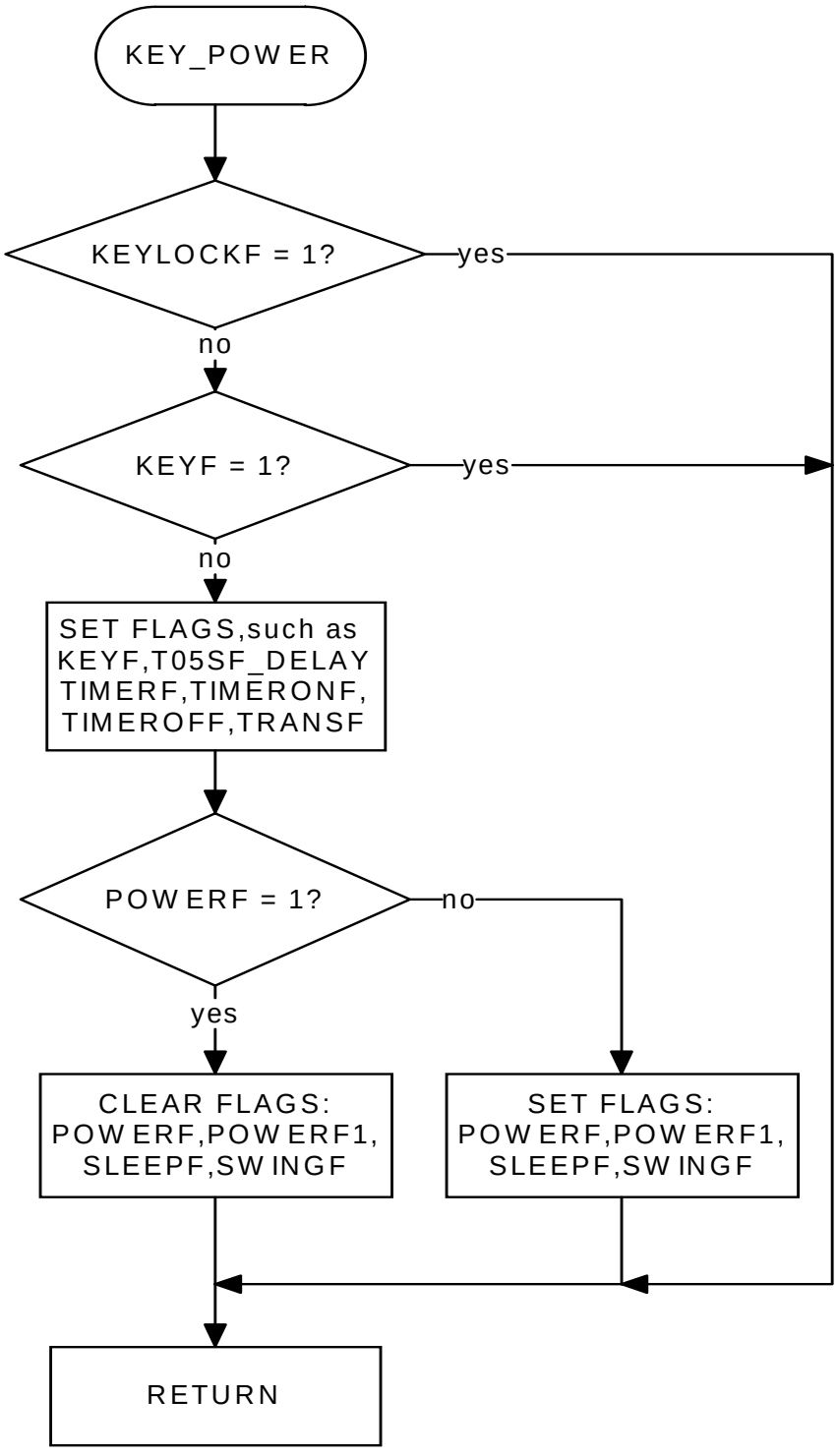
## 5.15 KEY_POWER Subroutine



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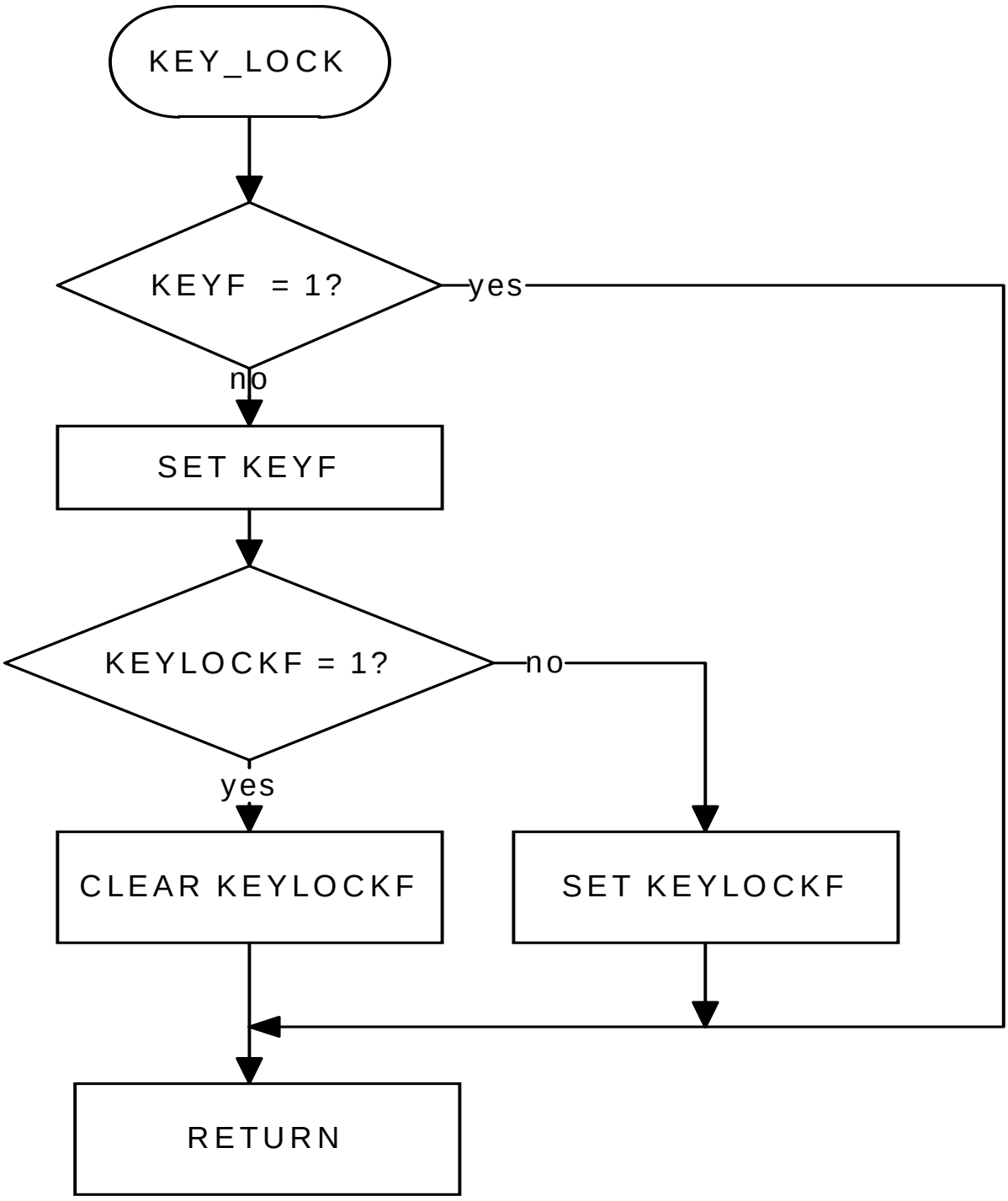
## 5.16 KEY_LOCK Subroutine



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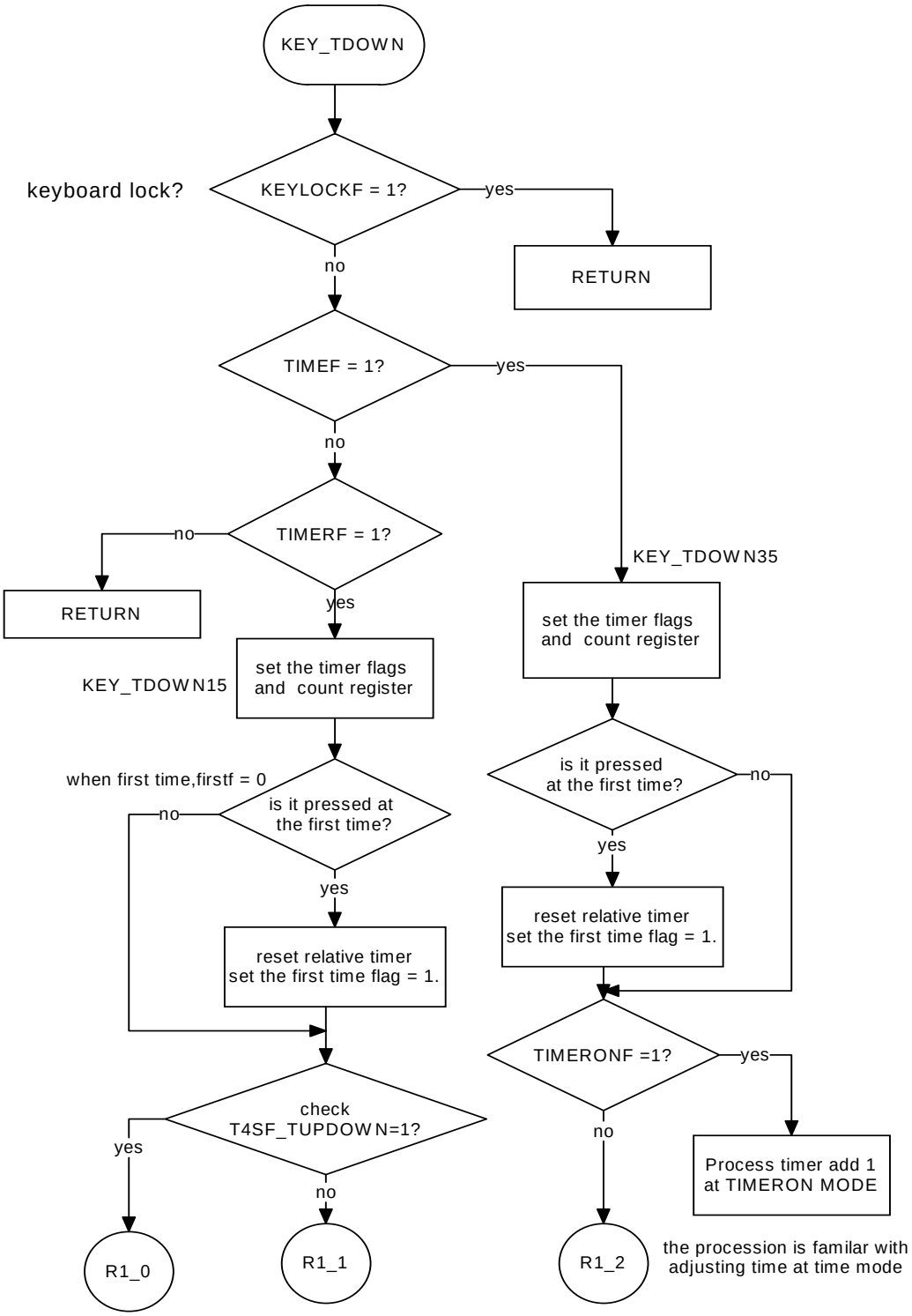
## 5.17 KEY_TDOWN Subroutine



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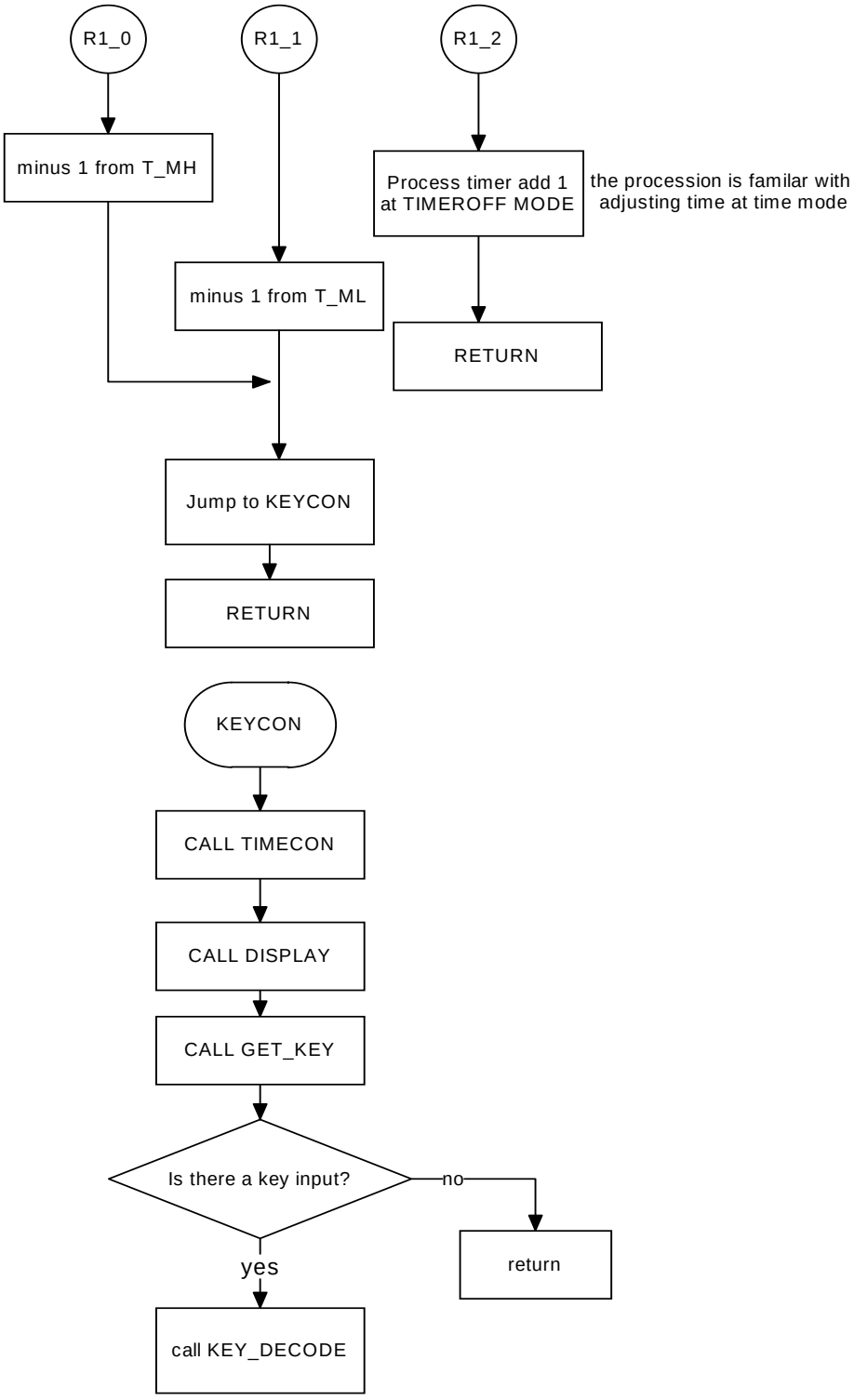
## 5.18 KEY_TDOWN Subroutine (continue)



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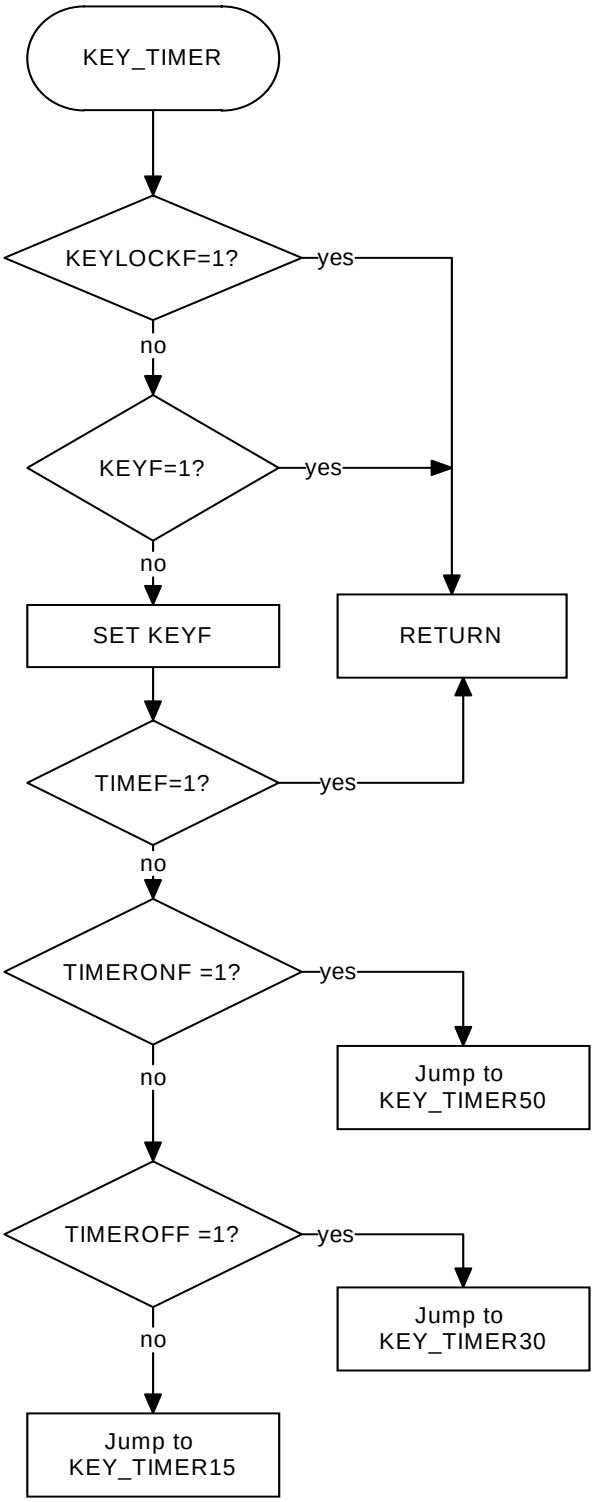
## 5.19 KEY_Timer Subroutine



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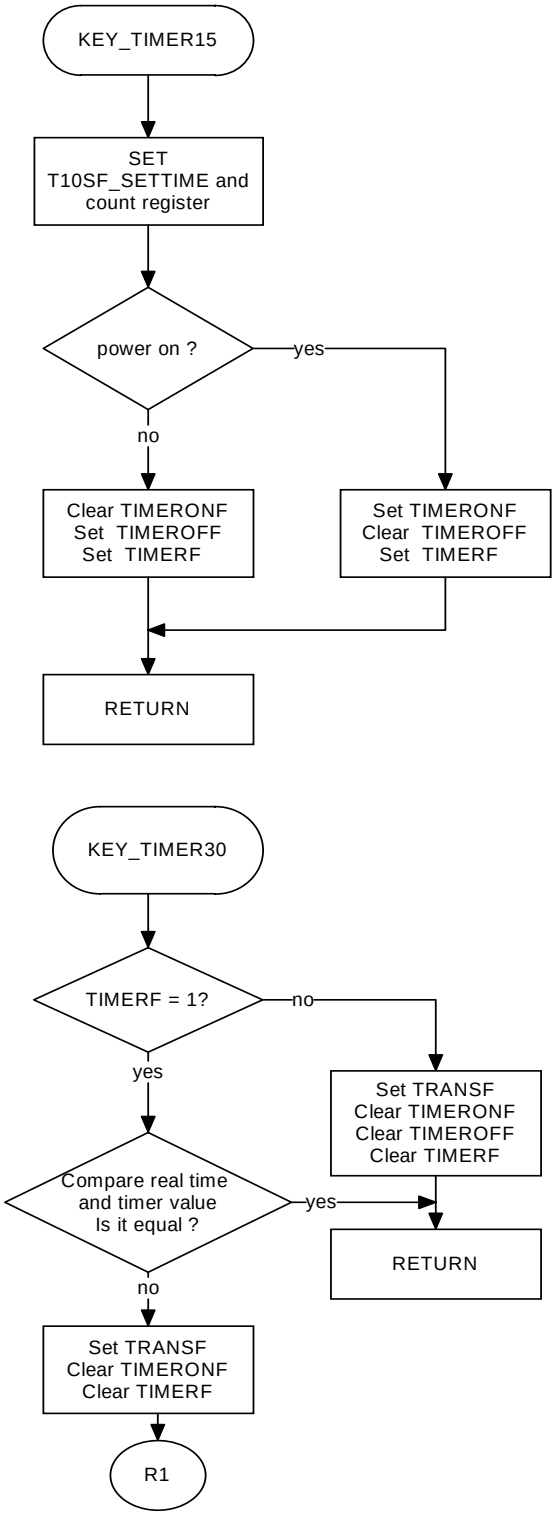
## 5.20 KEY_TIMER Subroutine (continue)



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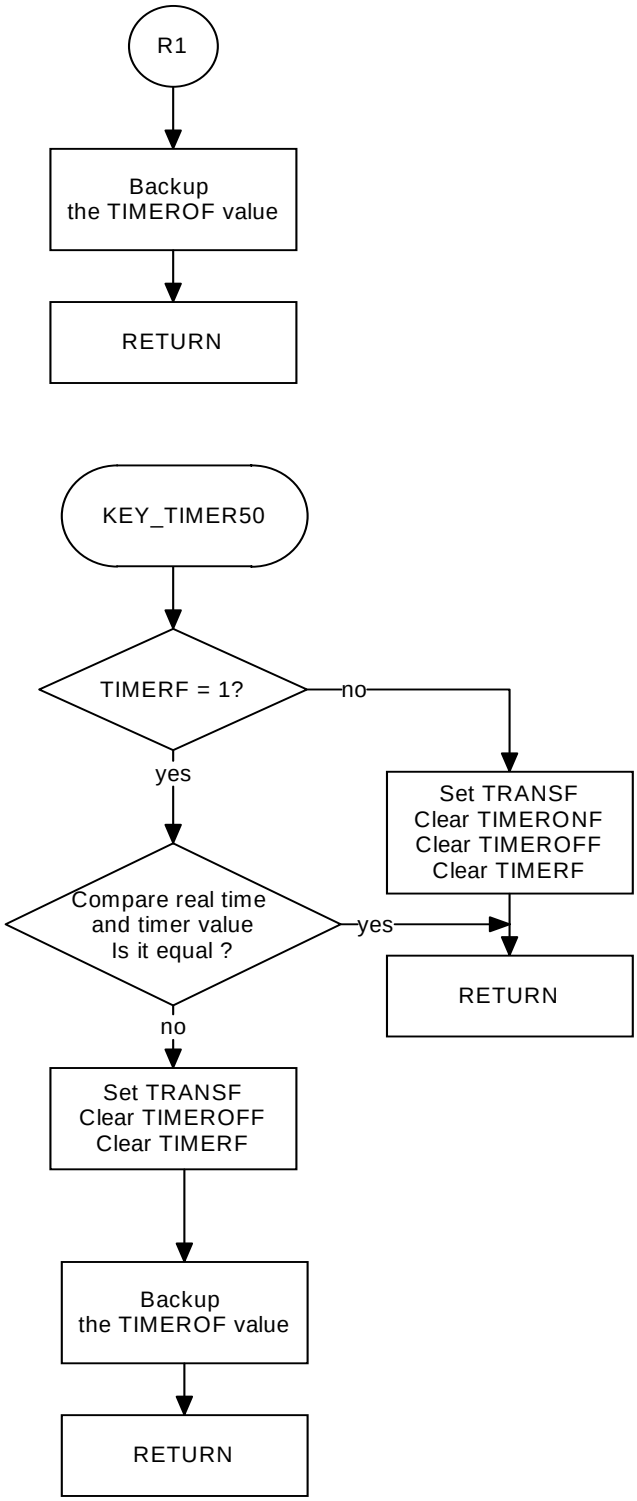
## 5.21 KEY_TIMER Subroutine (continue)



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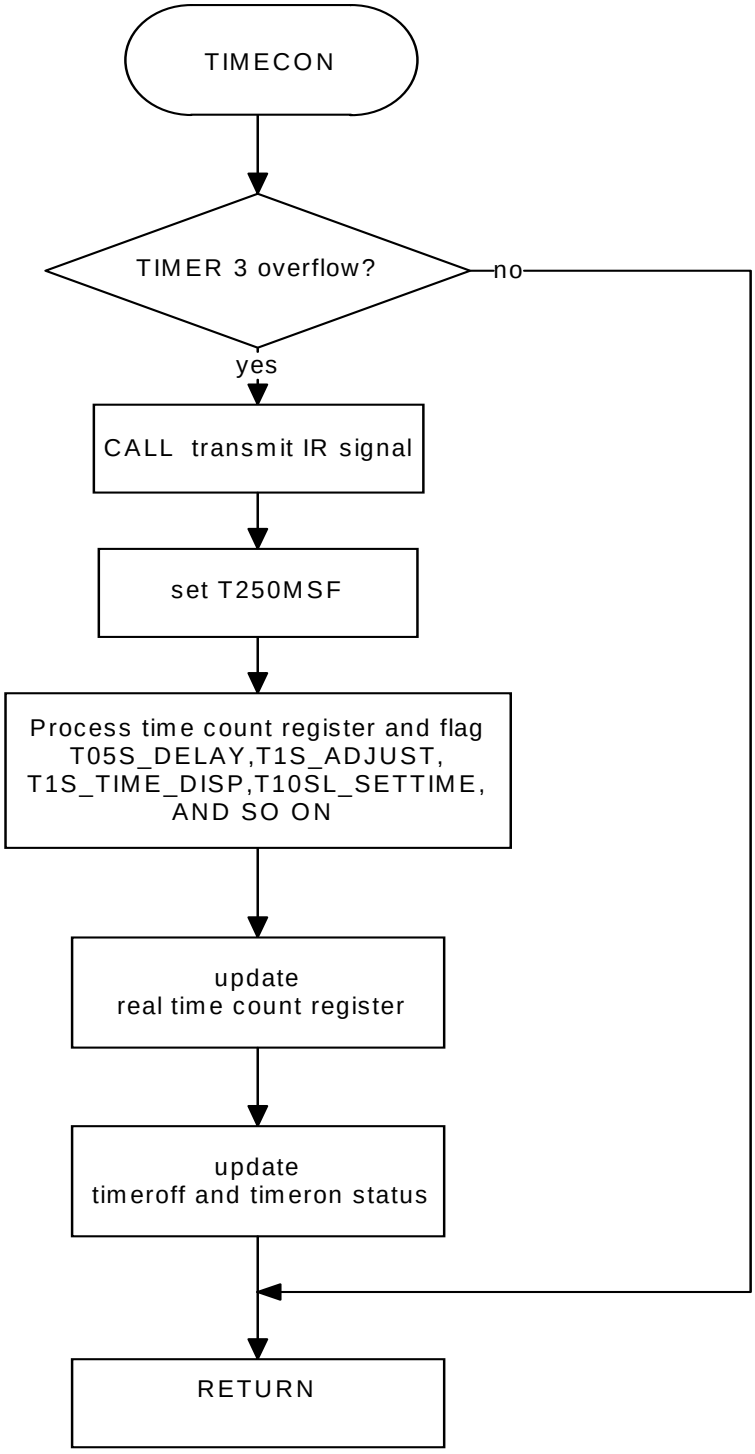
## 5.22 time_con Subroutine



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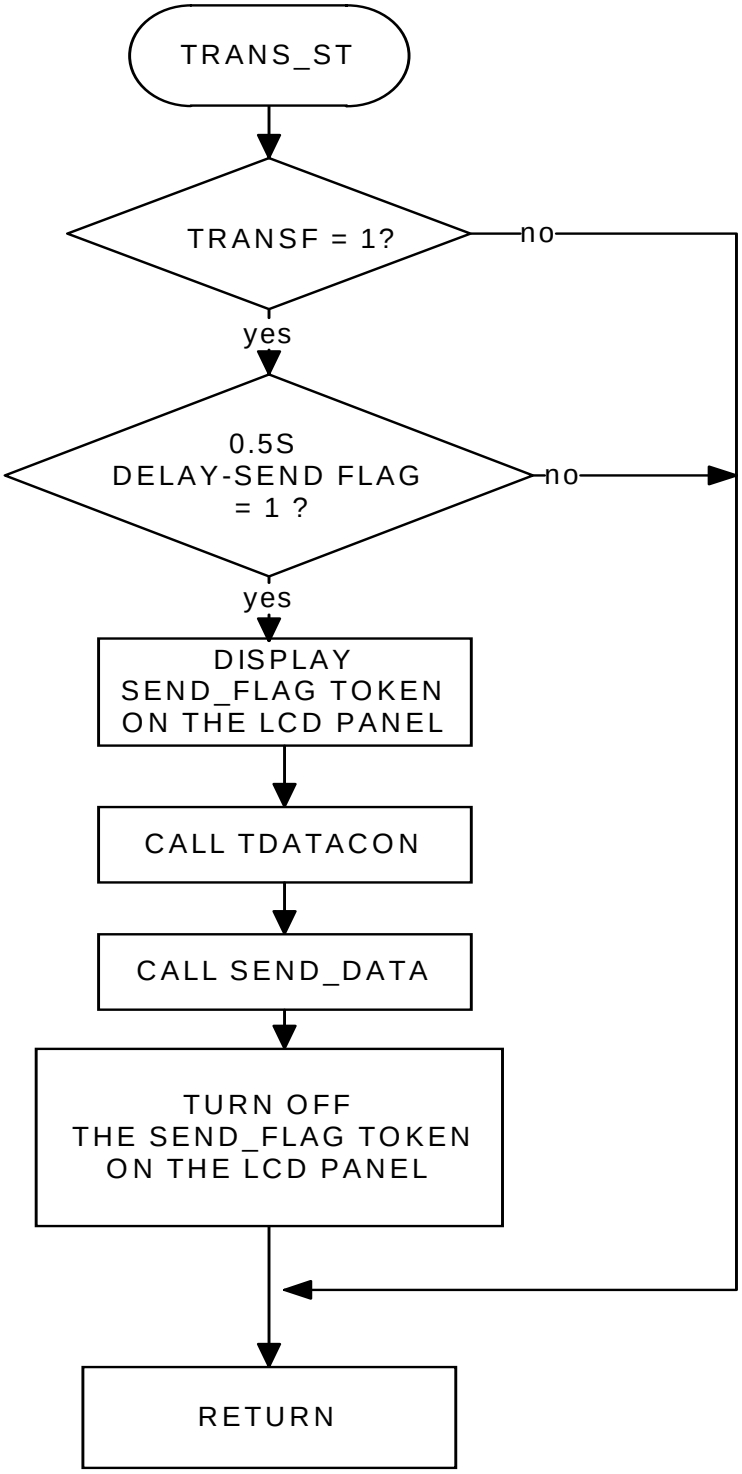
## 5.23 TRANS_ST Subroutine



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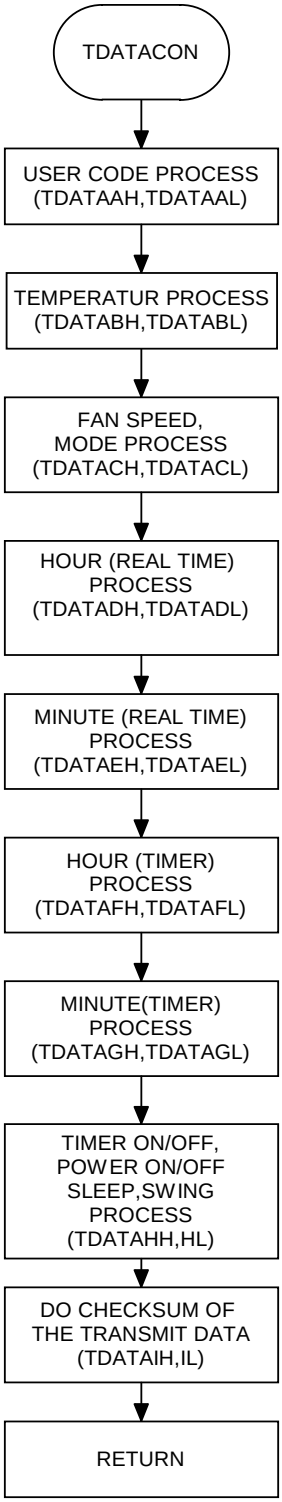
## 5.24 TDATACON Subroutine



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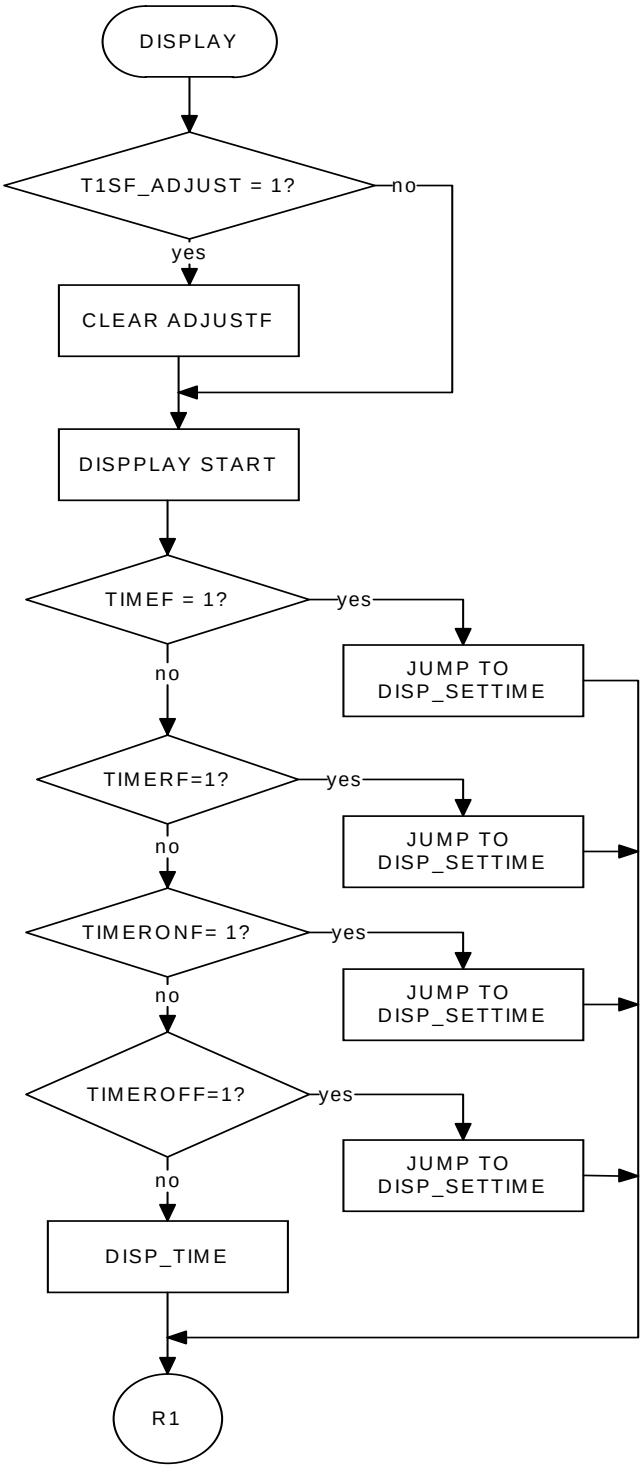
## 5.25 Display Subroutine



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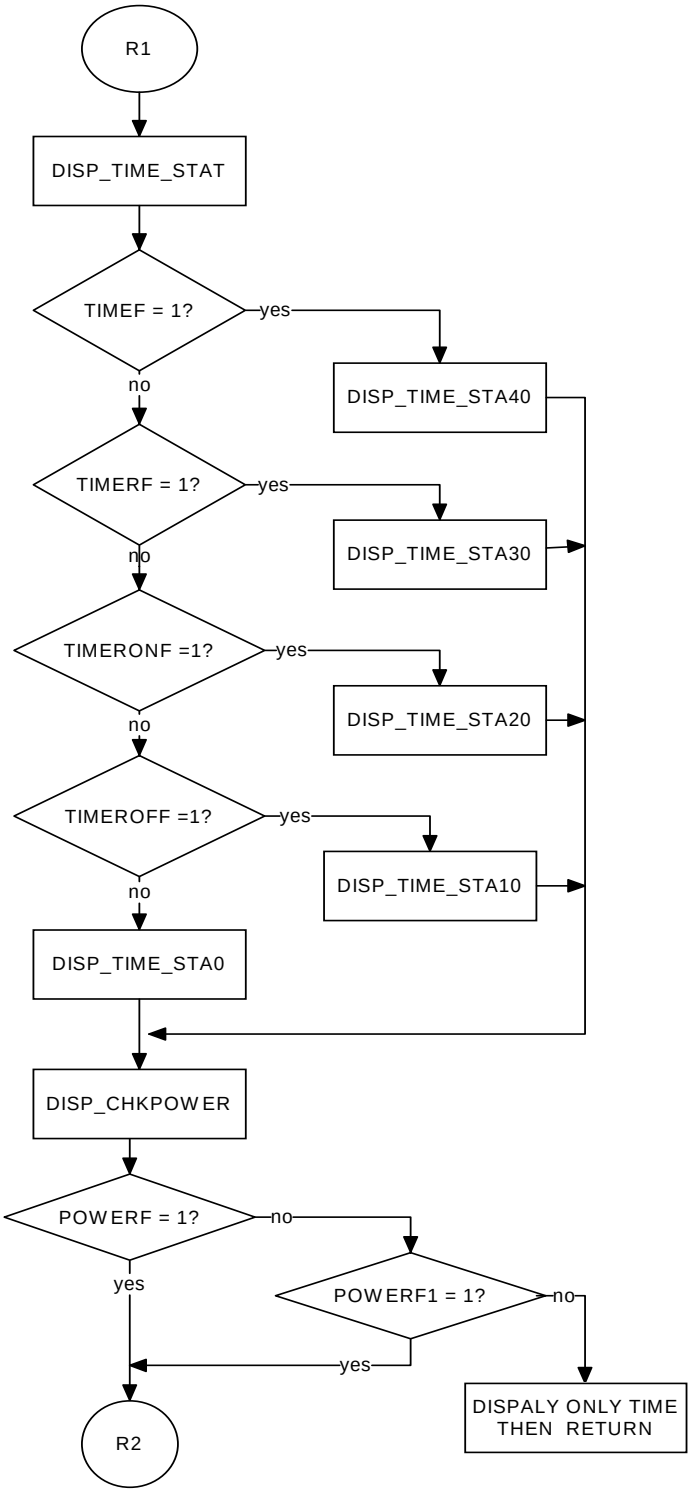
## 5.26 Display Subroutine (continue 0)



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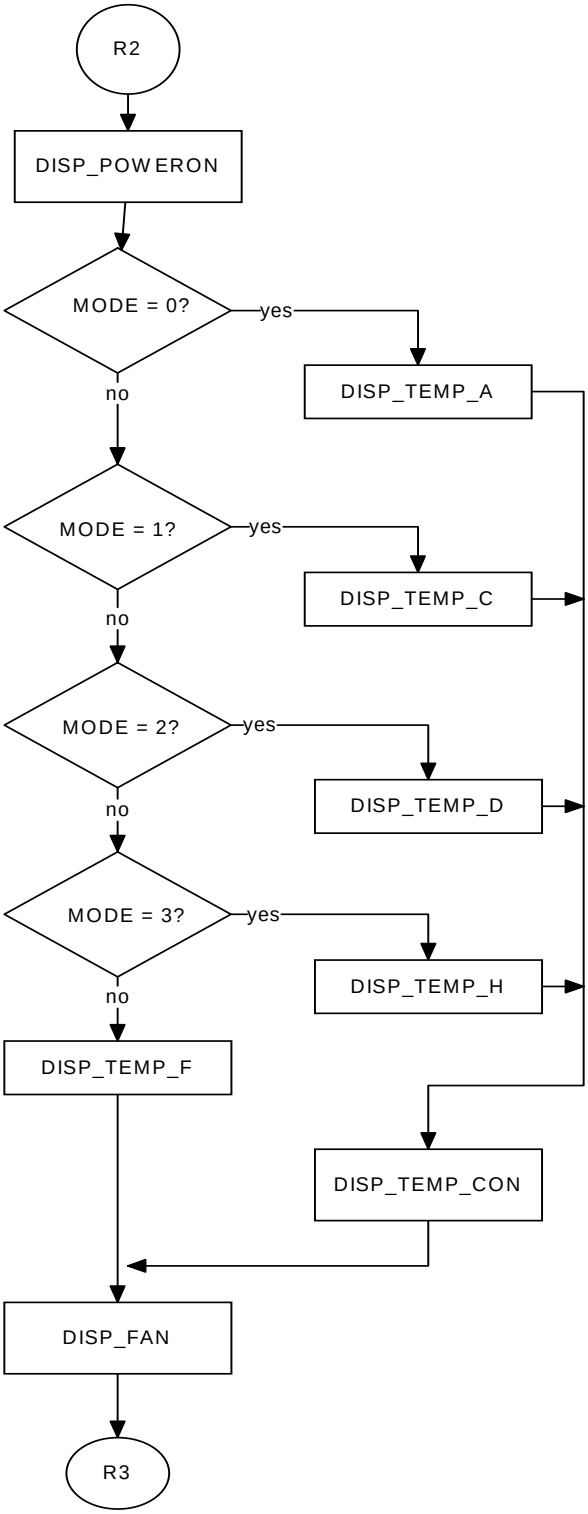
## 5.27 Display Subroutine (continue 1)



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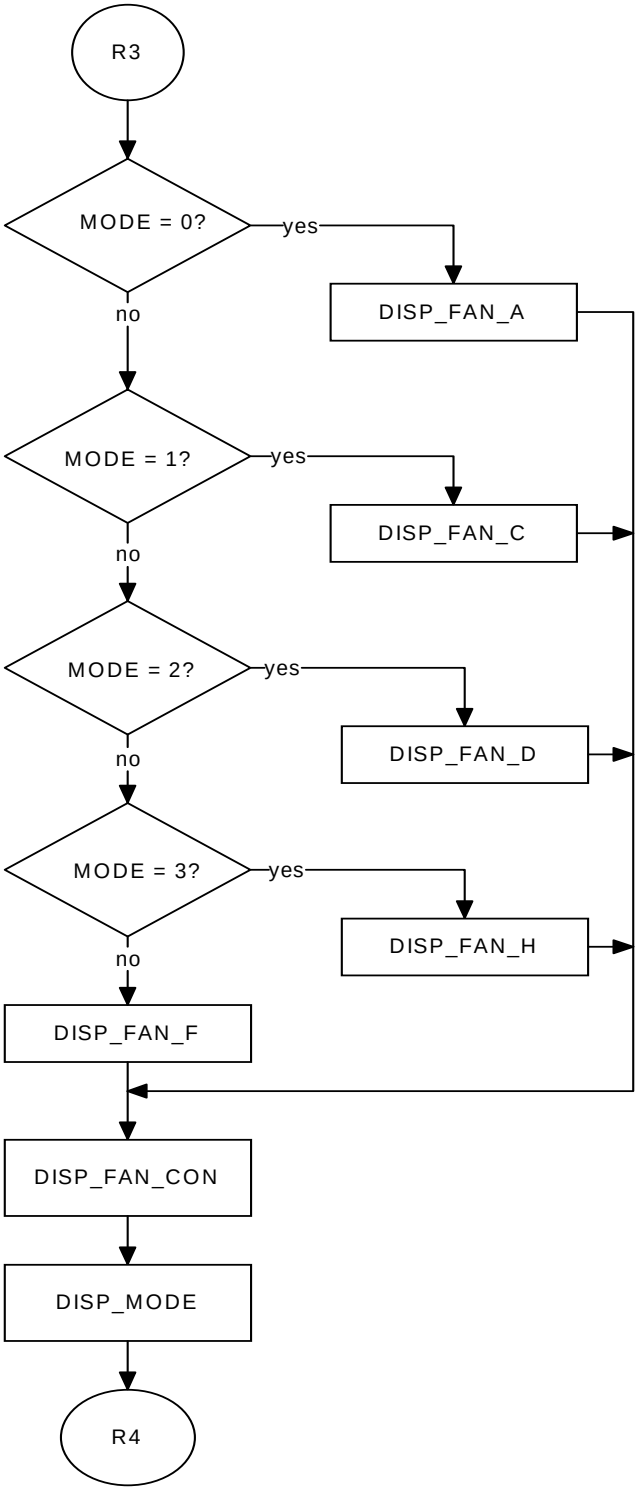
## 5.28 Display Subroutine (continue 2)



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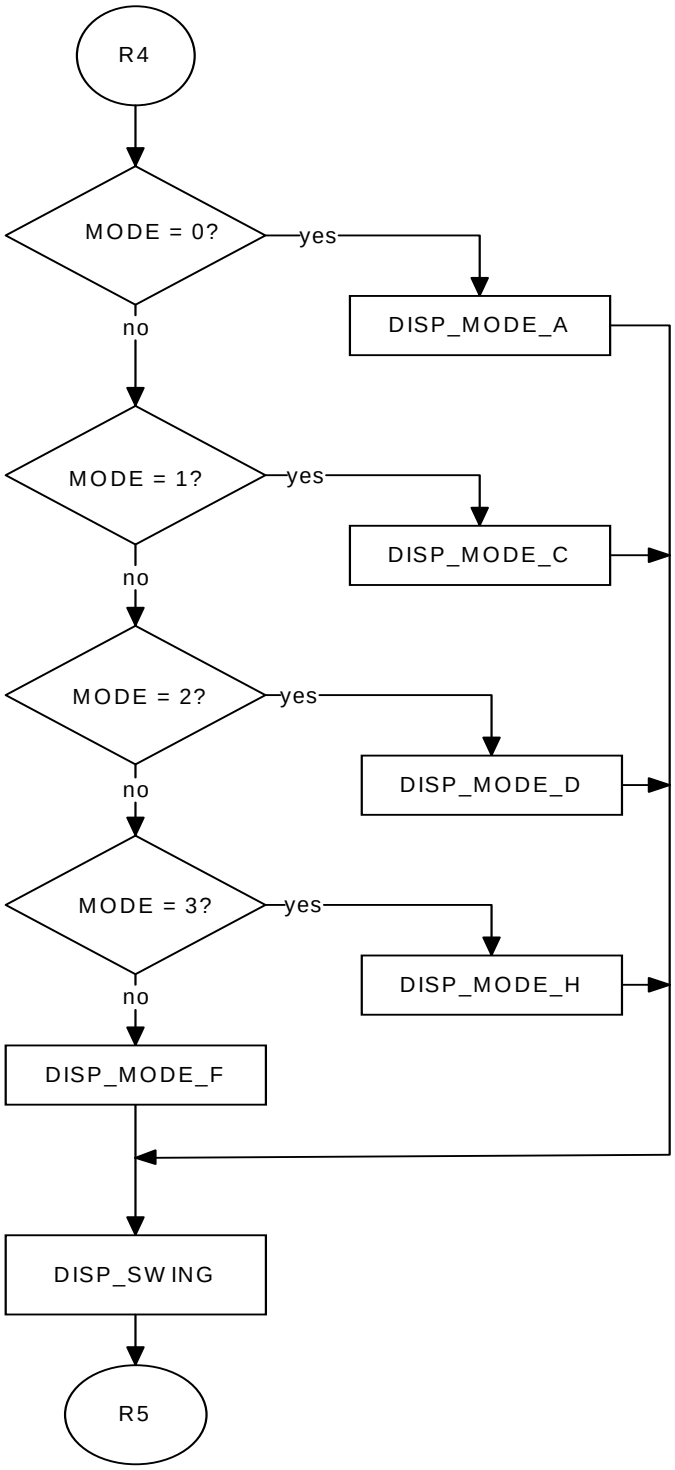
## 5.29 Display Subroutine (continue 3)



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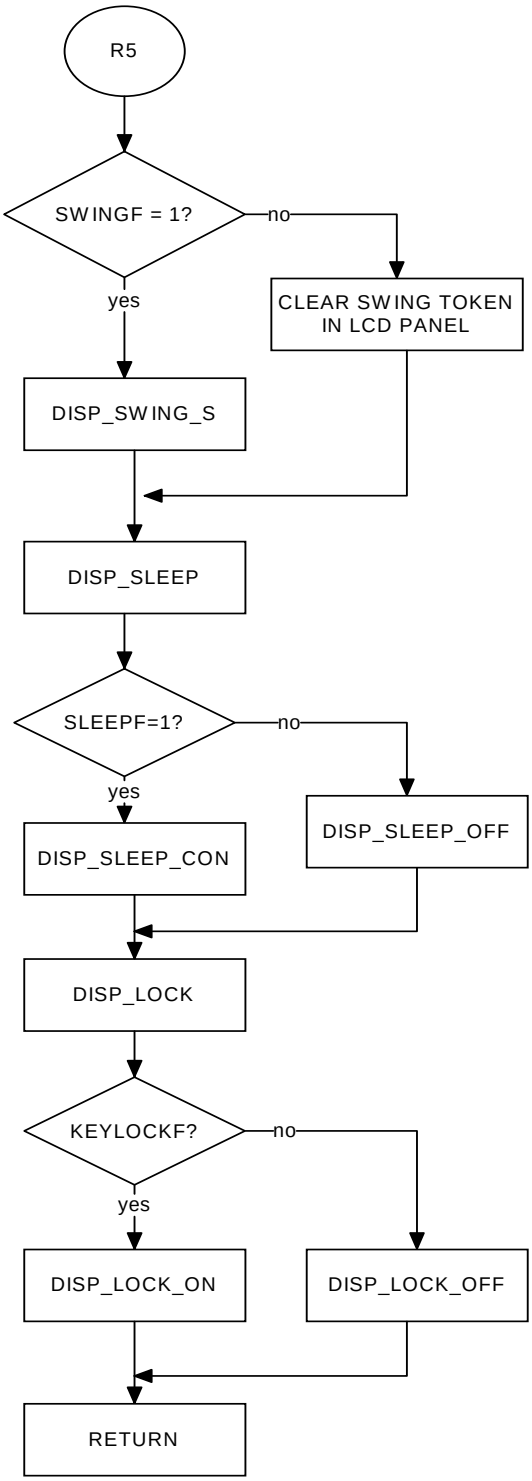
## 5.30 Display Subroutine (continue 4)



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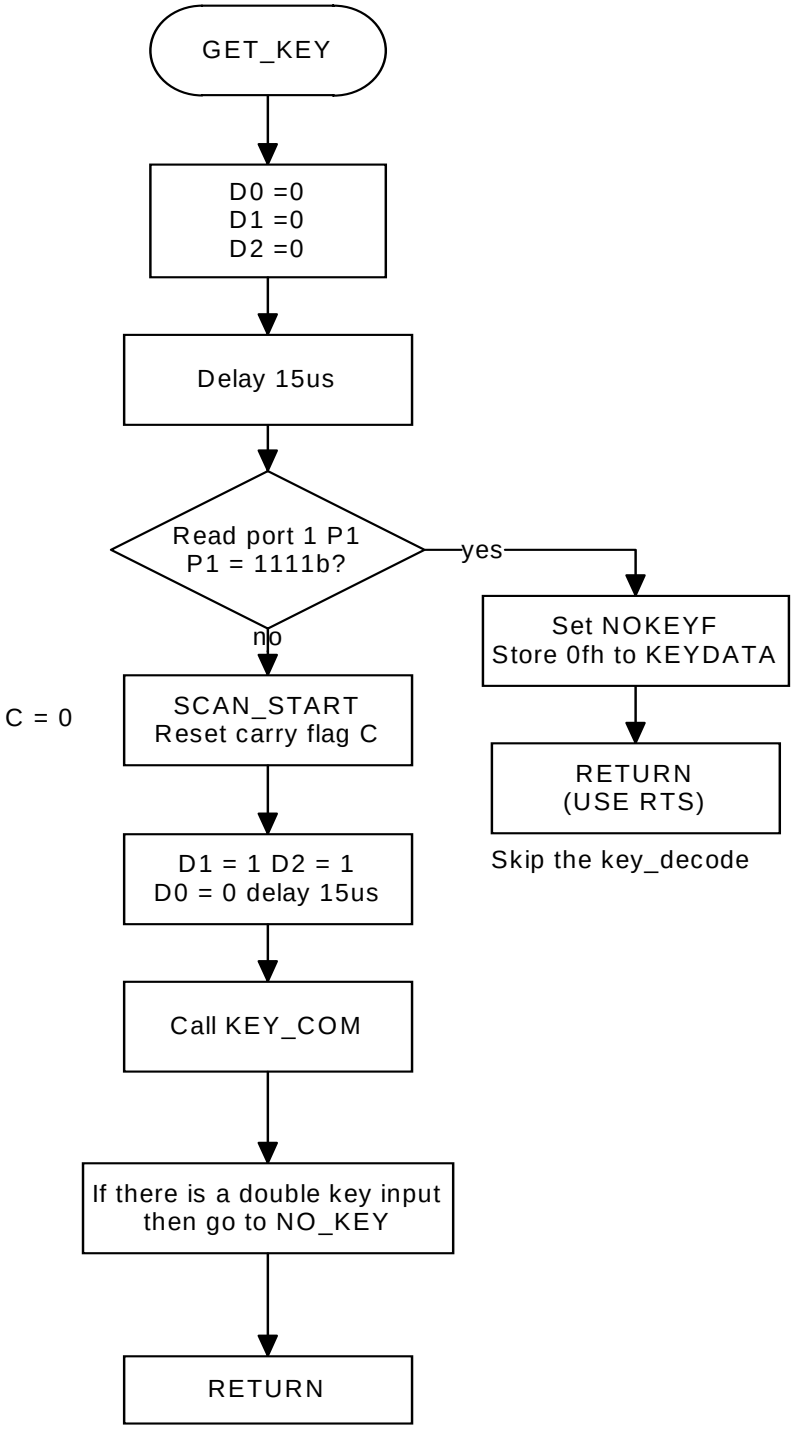
## 5.31 GET_KEY Subroutine



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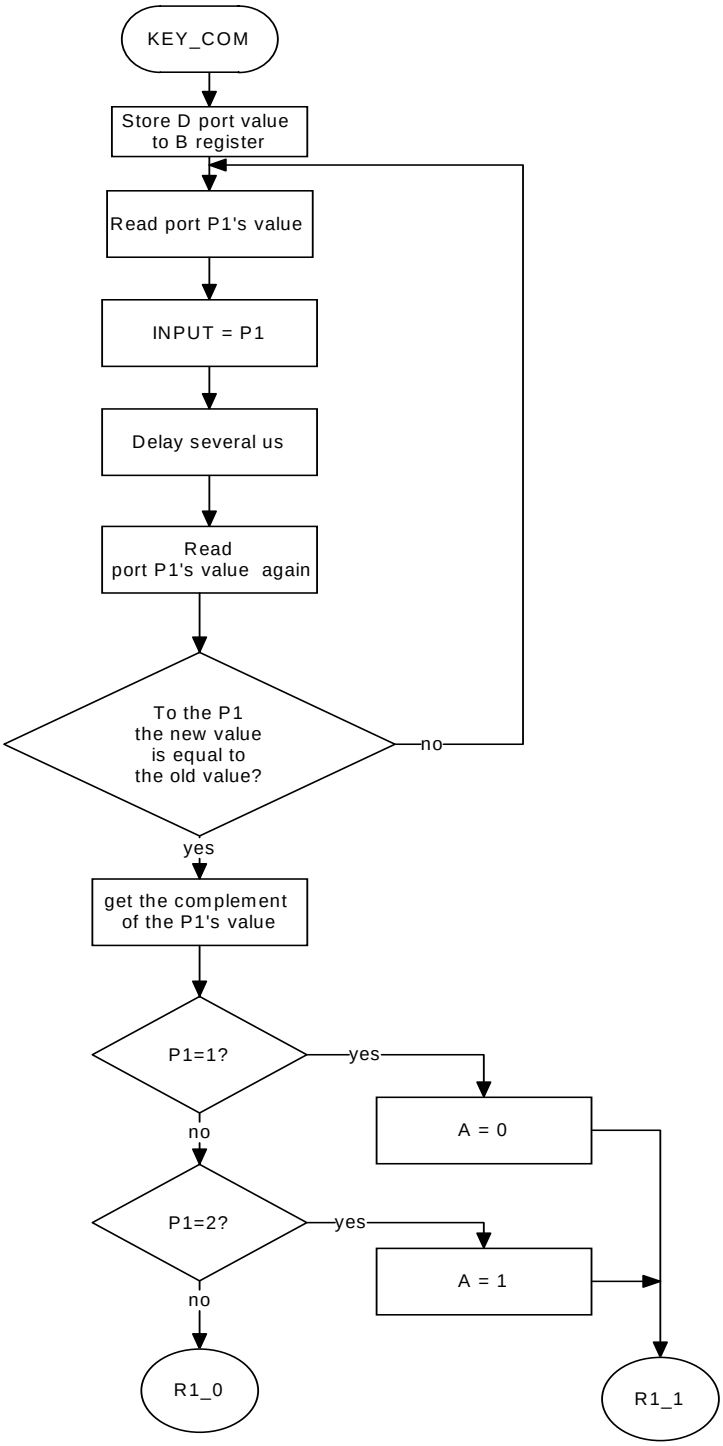
## 5.32 GET_KEY Subroutine (continue)



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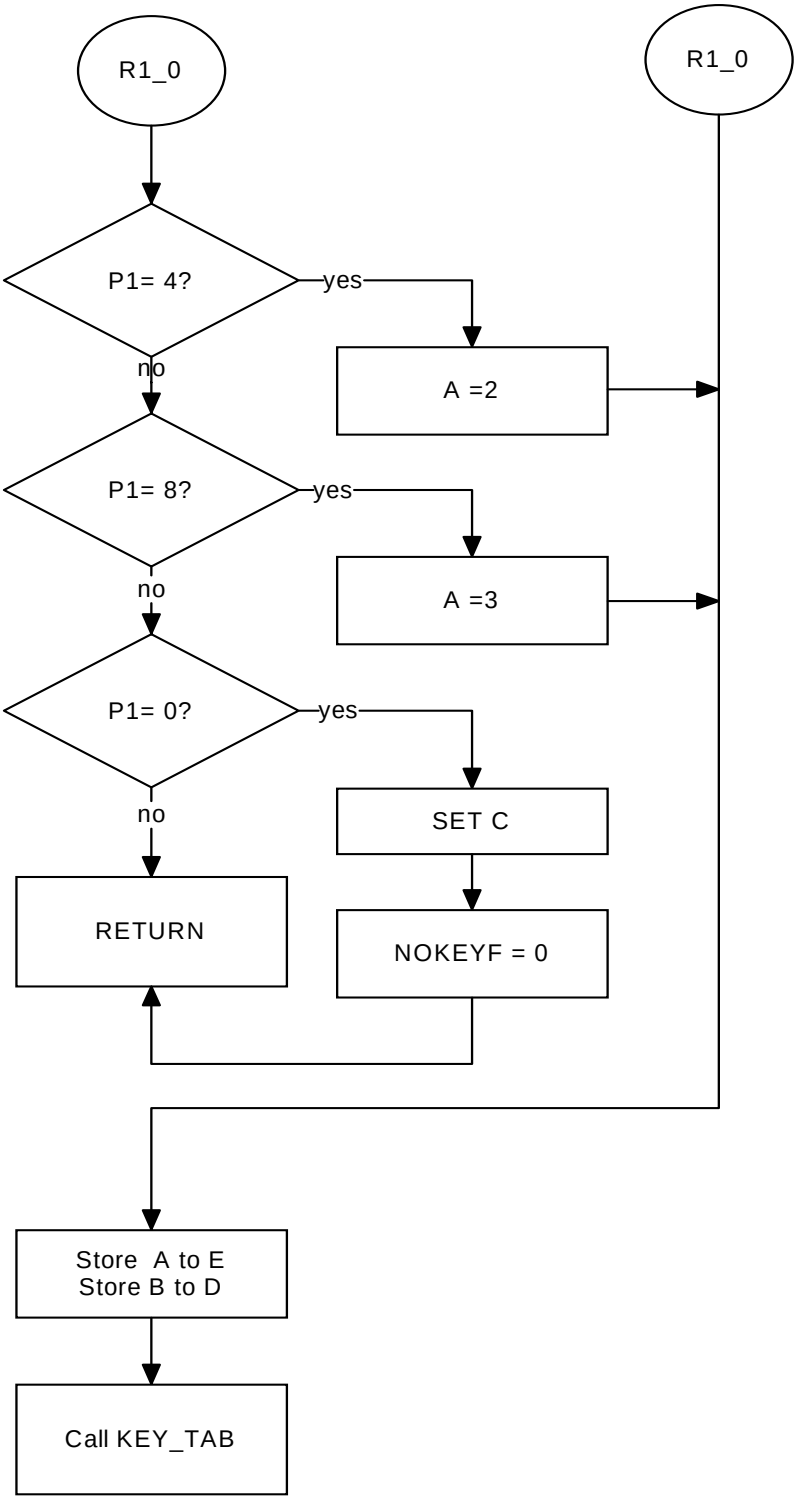
## 5.33 GET_KEY Subroutine (continue)



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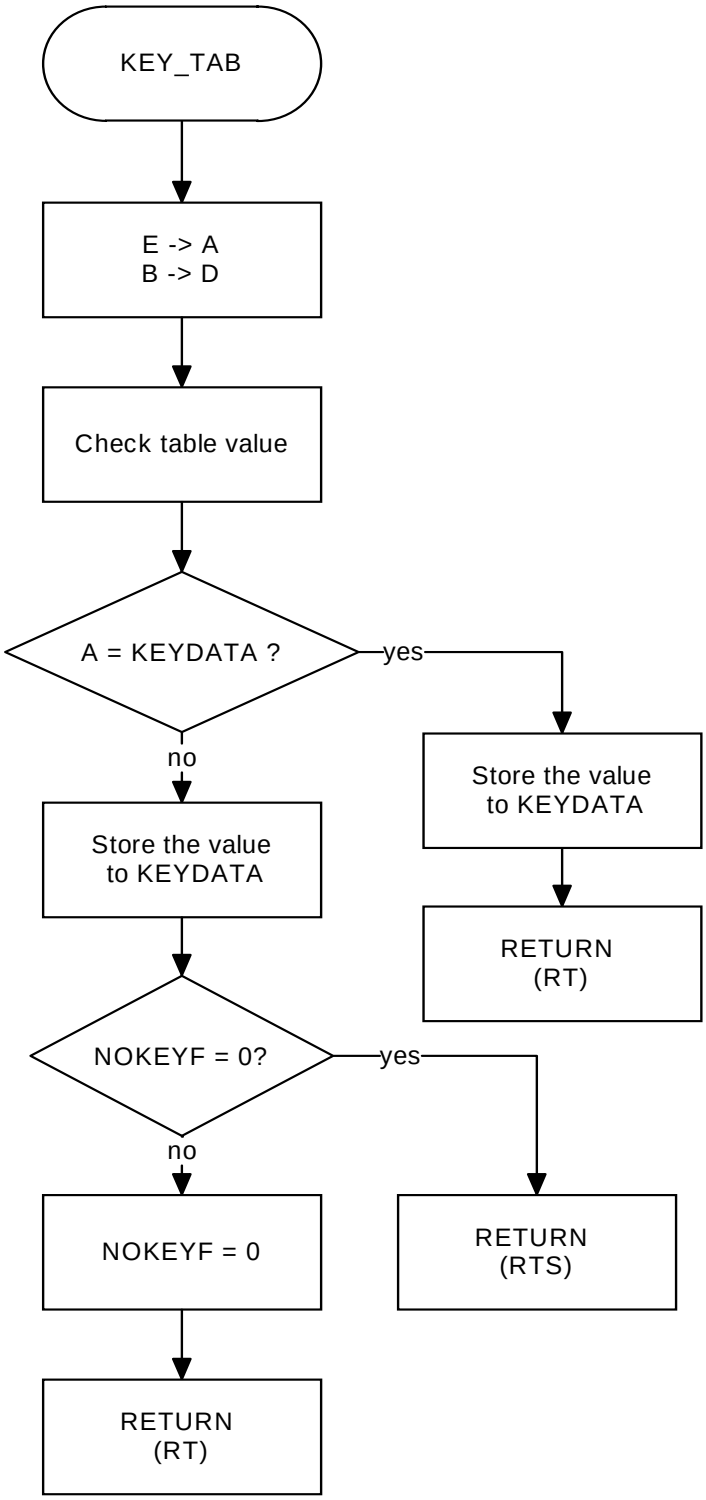
## 5.34 GET_KEY Subroutine (continue)



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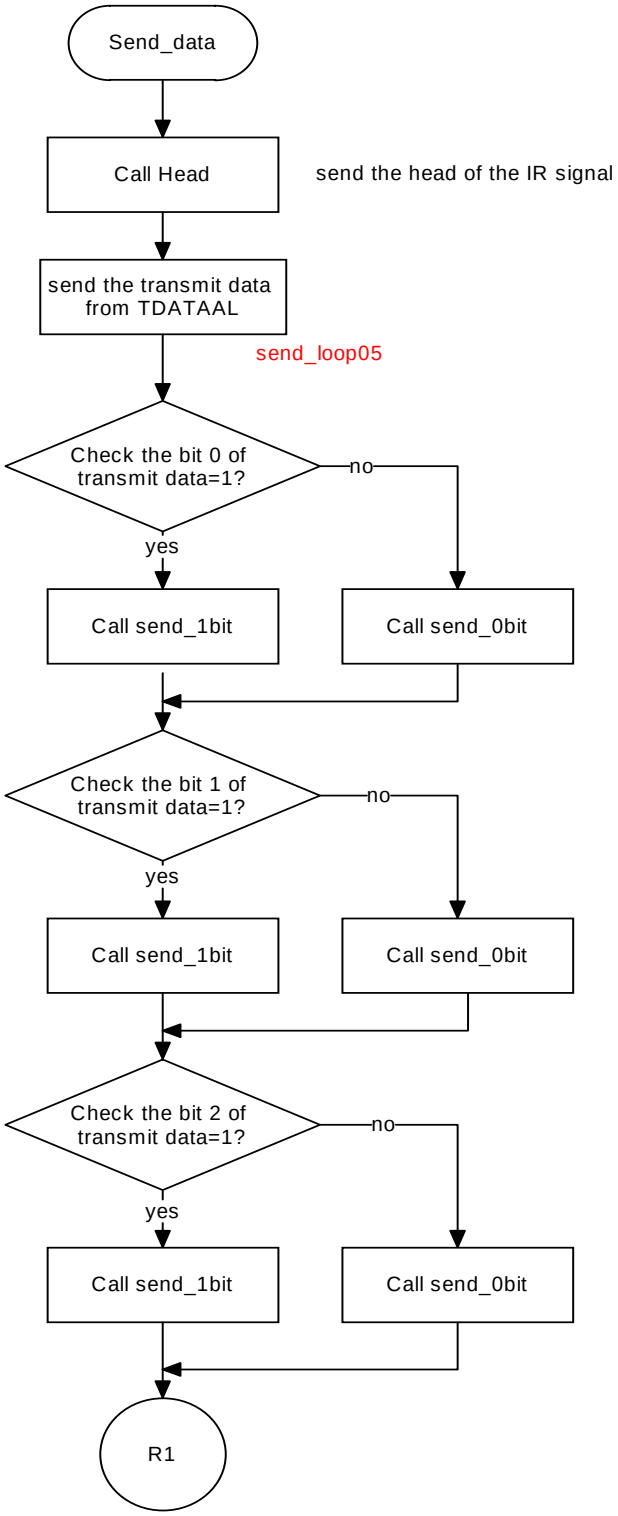
## 5.35 send_data Subroutine



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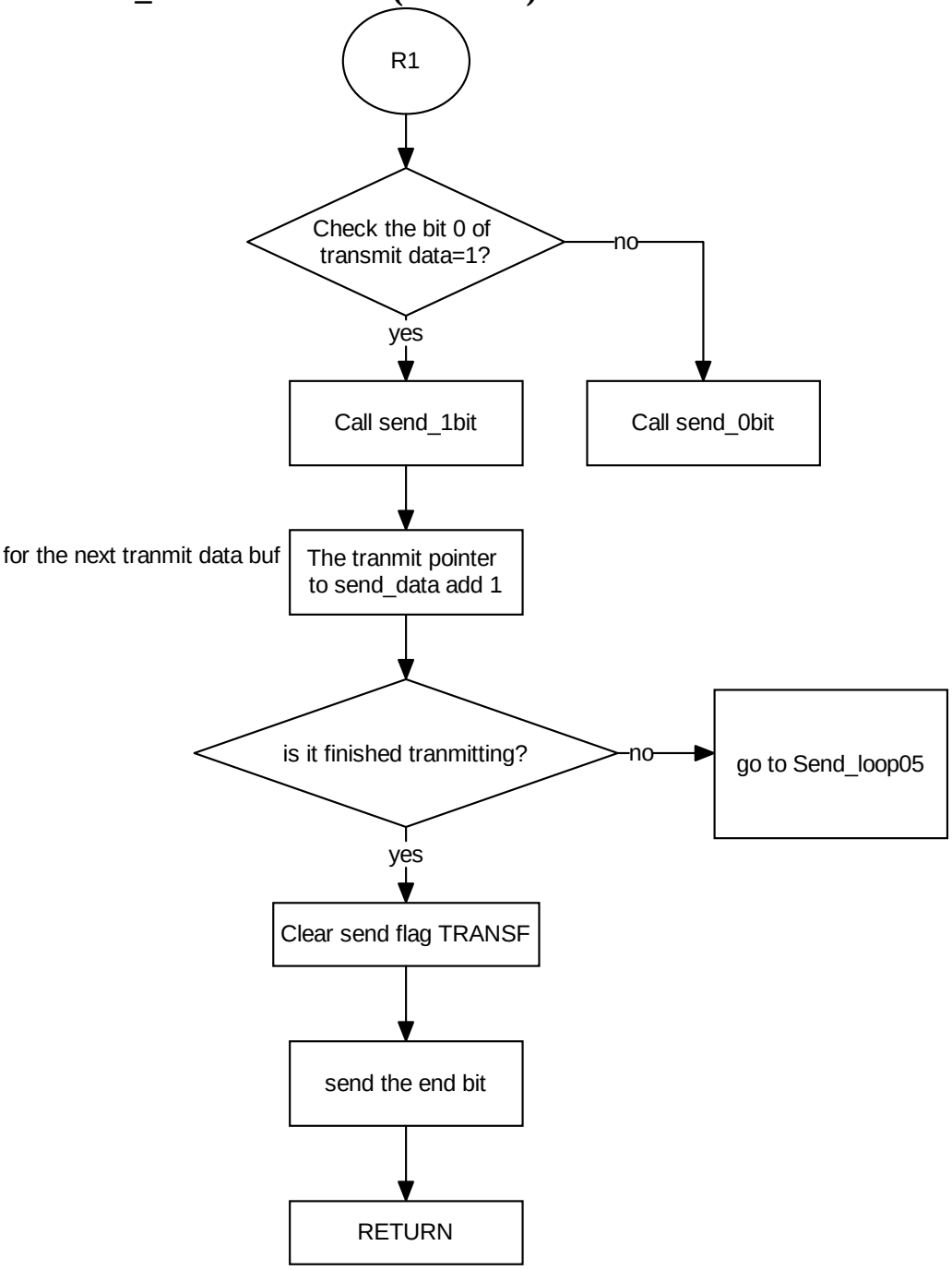
## 5.36 send_data Subroutine (continue)



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# 6. Information of Sample Software Source Code

The sample software source code is composed of 4 parts:

- M34559N.ASM
- Key4559N.inc
- sig4559N.inc
- dis4559N.inc

The following parts will descript the structure and information of the source code. The software source code is in the CD_ROM at another folder (not include in this application notes).

## 6.1 M34559N.ASM

This part is the main part of the sample software source code.
It defines the RAM parameters, display buffers and other variables. At the same time, it is composed of functions, such as ram_clear, data_initial, key_decode, time control, transmit, and transmit data process.
It achieves the most functions by call the functions written in M34559N.asm, Key4559N.inc, sig4559N.inc, dis4559N.inc.
M34559N.asm calls these functions by using ".include" in ASM45.the code is as follows:

```
.INCLUDE key4559N.inc
.INCLUDE dis4559N.inc
.INCLUDE sig4559N.inc
```

With this method, it is easy to understand the structures of the source code, and easy to update software.

## 6.2 Key4559N.ASM

This part is the key-scan code; it achieves the keyboard scan, and returns the key value which is pressed. This function will check whether there are 2 keys pressed at the same, if it is, it will return no key input. About the more information, please refer the source code.

## 6.3 sig4559N.ASM

This part is to send a frame data and generate the header of signal. The detail of the header and send-data please refer the transmit format described in the section 4.In order to be convenient to concentrate on the function, please find the comments as follows. it is useful to understand the code.

```
;****************************************
; Send a frame data
;****************************************

;****************************************
; Generate the HEAD of command
; Refer to the signal wave
; Note : HEAD=(4.4ms)HIGH+(4.4ms)LOW
;****************************************
```



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## 6.4 dis4559N.ASM

The display function mainly is divided into power on and power off status, (if power off, only display real time and turn off the other function, if power on, it depends on different modes)



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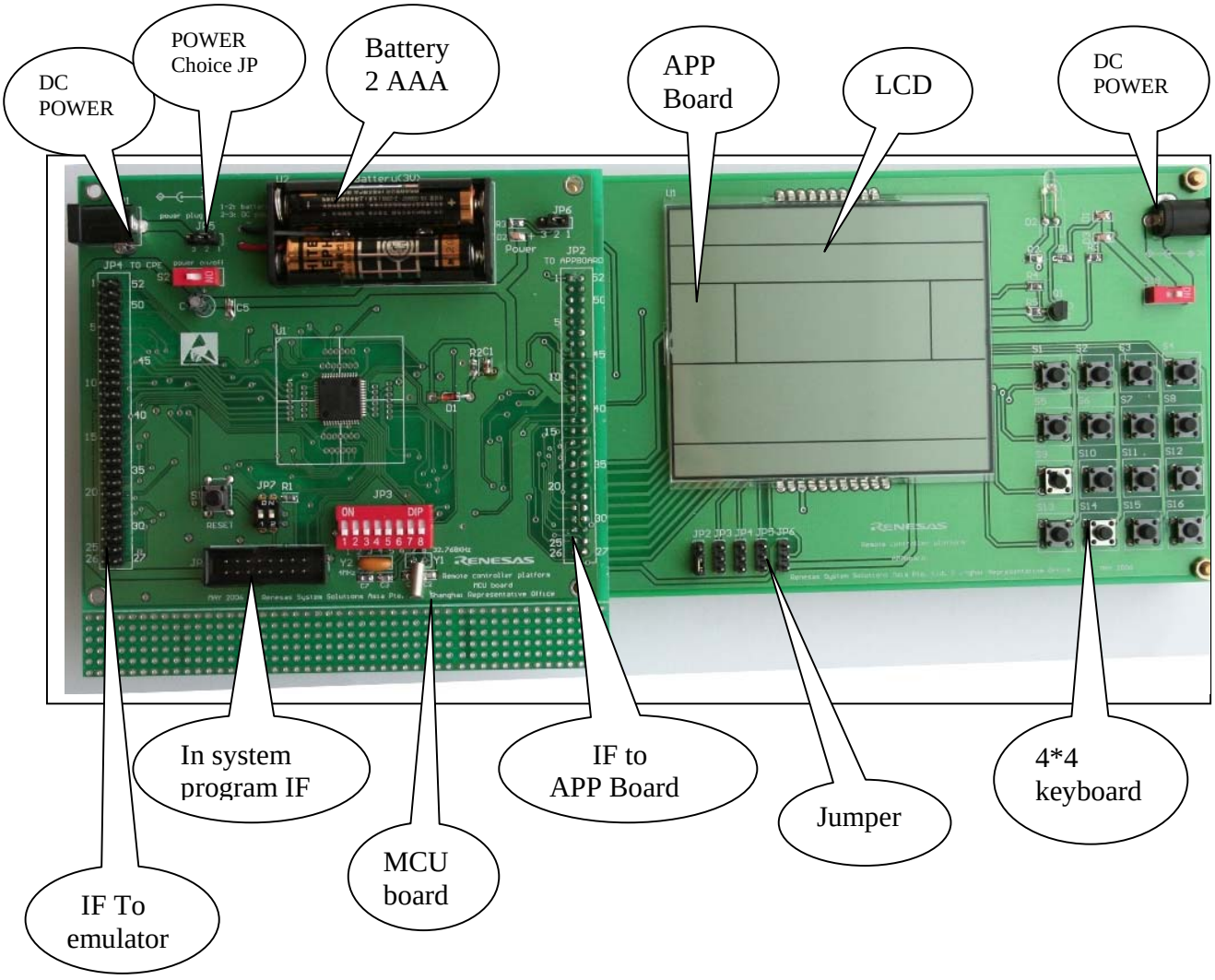
# 7. Platform PCB and Emulation

## 7.1 Platform PCB Layout Introduction

Below figure shows the PCB Layout, and illustrates out the location of the main parts.



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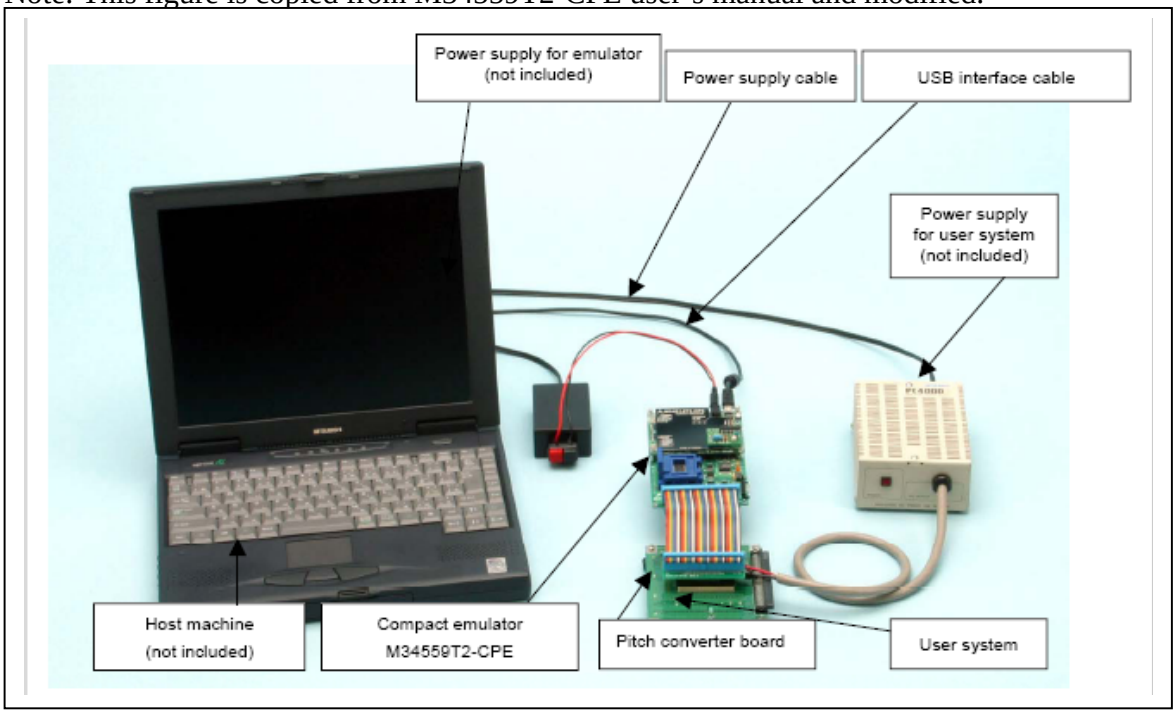
## 7.2 Emulation on Platform

In this part, the configuration of the emulation platform and the system connection are introduced.

### 7.2.1 Emulation system configuration

* Note: This figure is copied from M34559T2-CPE user's manual and modified.




### 7.2.2 Actual emulation system

Below figure shows the actual emulation platform connected with emulator (M34559T2-CPE)



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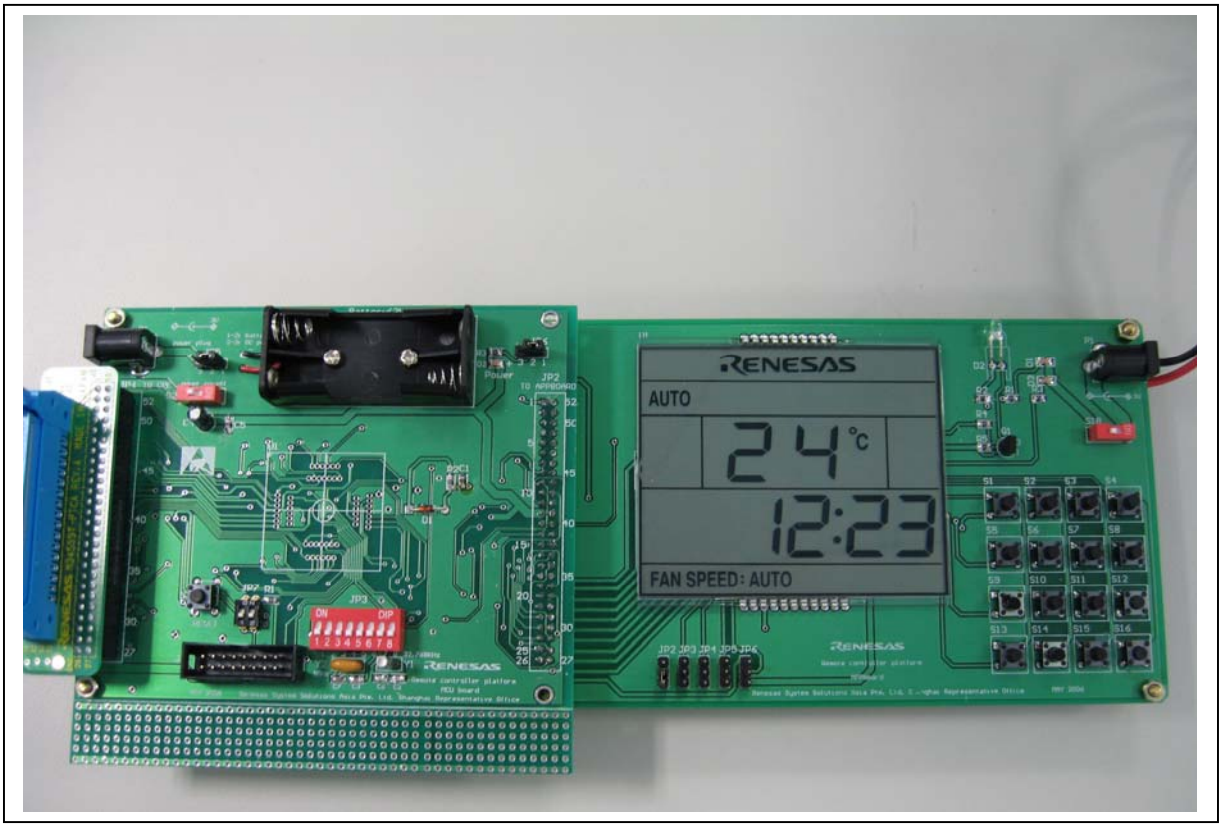




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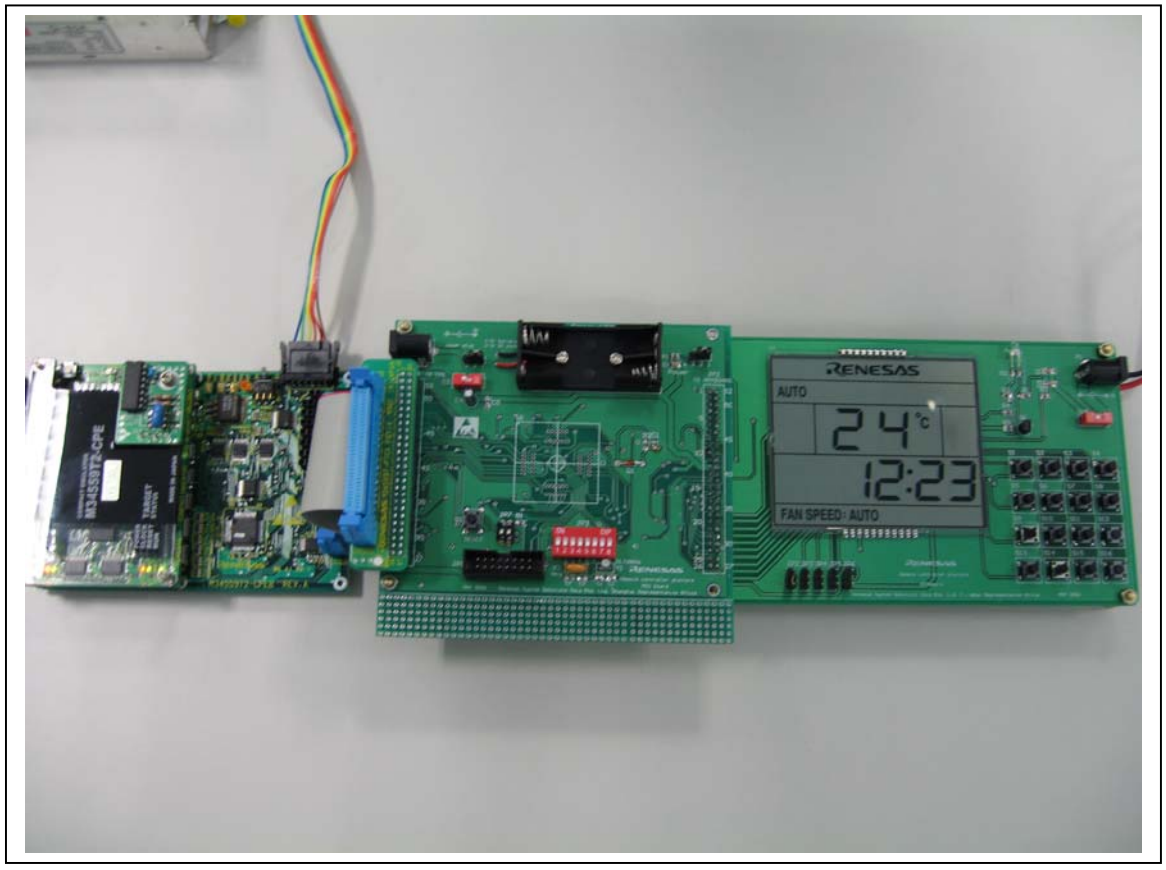




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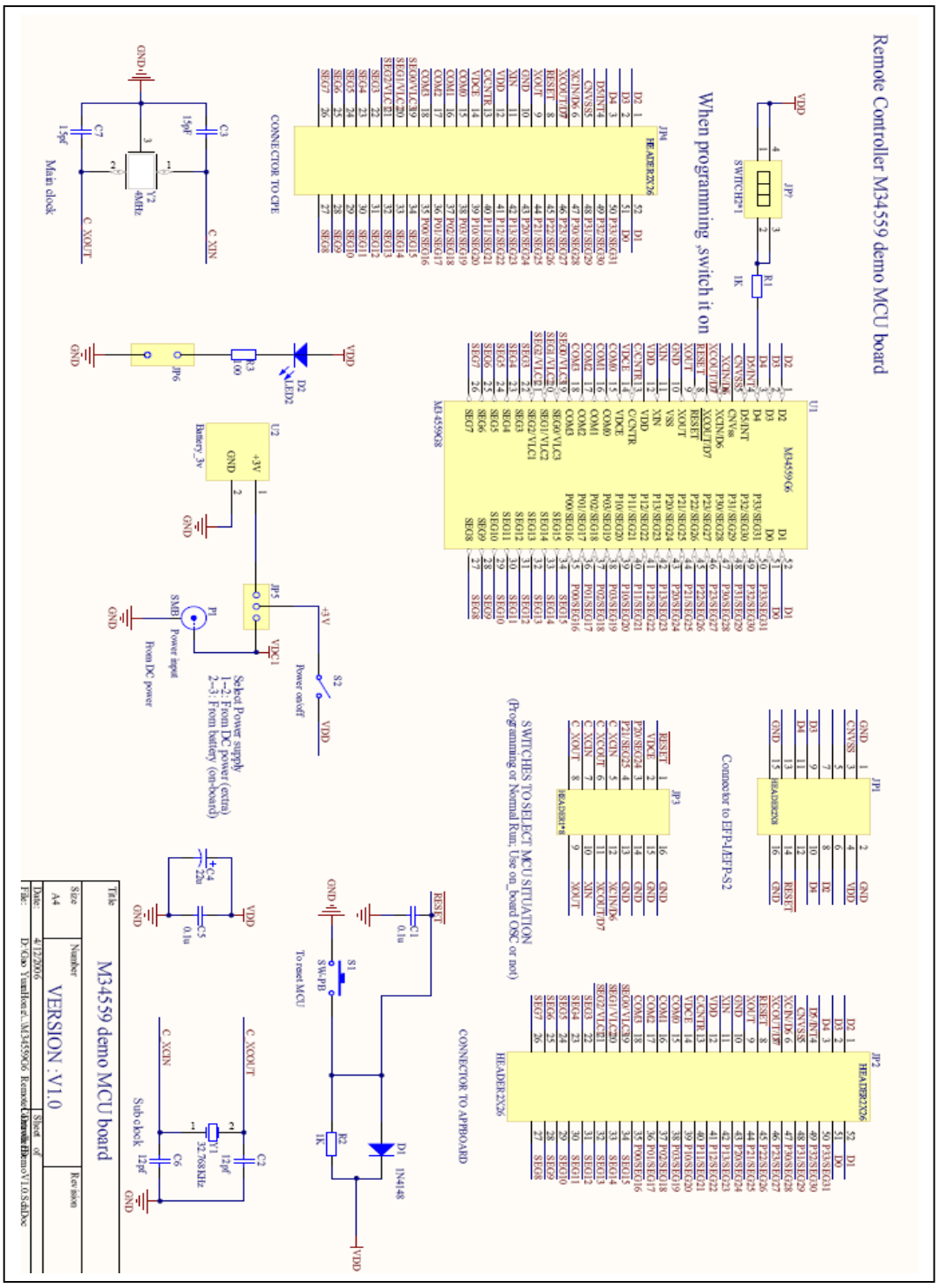
# Appendix A M34559 evaluation board --- MCU board SCH



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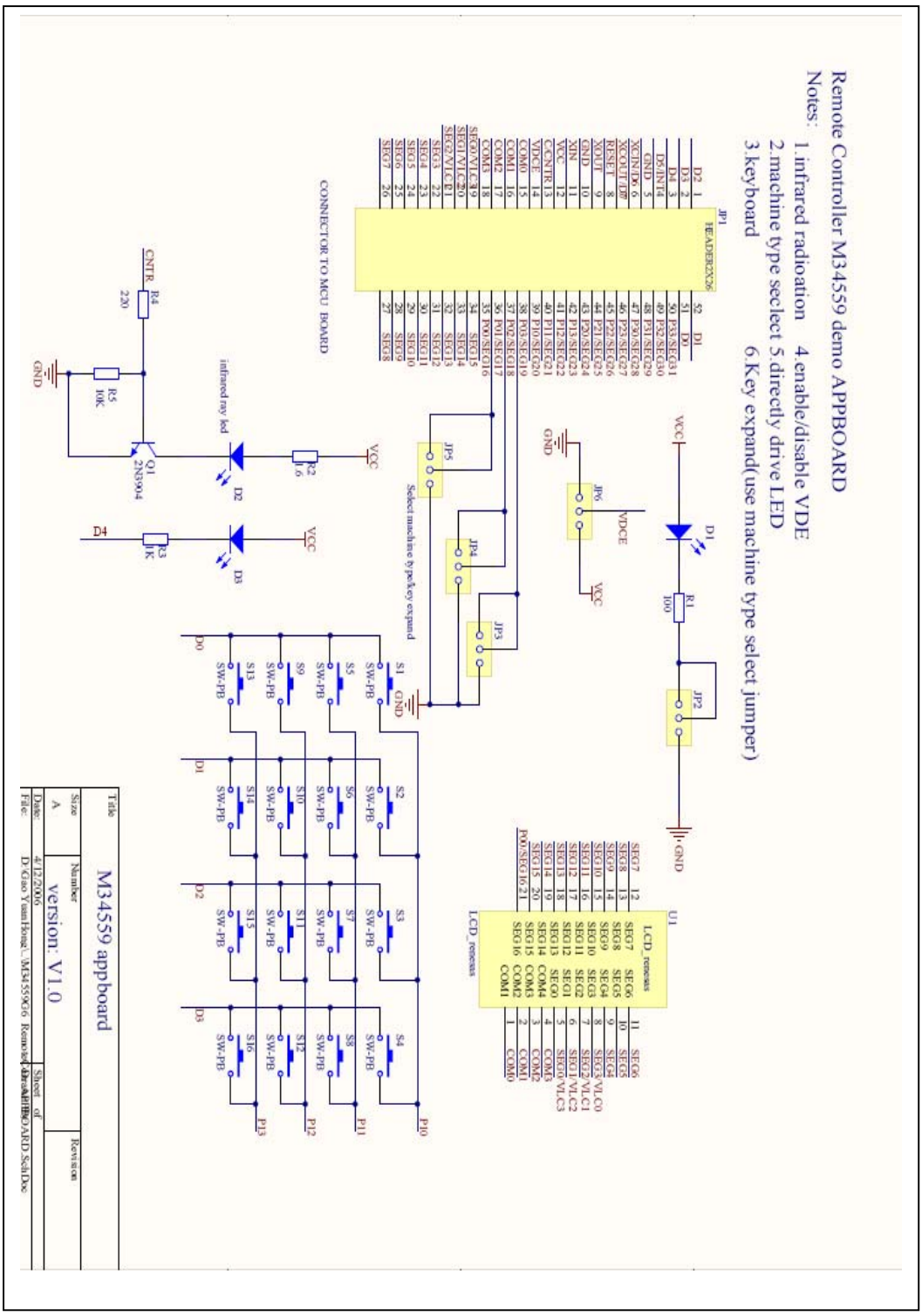
## Appendix B M34559 evaluation board --- application board SCH



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## Appendix C M34559 application board --- keyboard function

The following table is about the function of the 4*4 keyboard, it is useful when we use the platform in demo mode.

| Key | Function |
|---|---|
| S1 | Timer up<br>(to adjust real time or timer value) |
| S2 | Clock<br>(access to adjust real time mode) |
| S3 | Timer<br>(access to adjust timer value mode) |
| S5 | Temperature up<br>(add temperature) |
| S6 | Mode<br>(change modes) |
| S7 | Sleep<br>(sleep mode) |
| S9 | Timer down<br>(to adjust real time or timer value) |
| S10 | Fan speed<br>(to adjust fan speed) |
| S11 | Power on/off |
| S13 | Key lock<br>(lock the keyboard or unlock) |
| S14 | Key swing<br>(swing or not change) |
| S15 | Temperature up<br>(minus temperature) |



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## Appendix D the sample software Specifications of M34559 application board

**1. Overview of function:**

1) auto,cool,heat,dry and fan mode
2) 24-hour timer on or timer off
3) Range of temperature setting :18℃--32℃
4) All function –LCD display
5) 24-hour real time display

**2. keyword**

**1) reset mode**

①. When you put battery into system at the first time, plug DC power or press reset mode, the evaluation board will go to the mode which we call reset mode.

②. After going into reset mode, LCD segment will all on for 2 second, then turn off all segment of the LCD panel and display default settings.

③. The default settings as follows:

Function choice ------ auto LCD display “AUTO”

Temperature --------- 24

Fan speed----------auto LCD display “AUTO”

④. After reset mode, the evaluation board will be at power off mode, there is only real time display.

⑤. After reset mode, there is no timer on or timer off.

**2) power off mode**

At power off mode, there is only real time display.

**3) power on mode**

At power on mode, there is operation mode, fan speed, temperature and real time information displayed on the LCD panel. And we can adjust the value or mode. If there is a valuable key pressed, it will send corresponding IR signal.

**4) indication of sending IR signal**

The icon “△” is the symbol of sending signal. The icon is always on till the finishing of sending signal.

**5) delay to sending**

When temperature up/down, mode, fan, or timer on. Off are pressed, it is required to delay to send signal about 0.5 second. But when we press special function key, swing or power on/off, there is no delay.

**3. key function**

**1) power on/off**

When we press it at power off mode, It will go into power on mode, vice versa.



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At power on: there is operation mode, temperature, fan speed, timer information on the LCD panel, and send the IR signal.

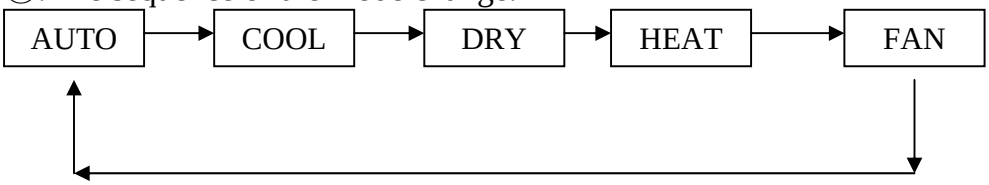
At power off: there is only real time to display, then send IR signal.

**2) mode**

①. Press this key to change operation mode.

②. At power on mode, it changes modes every time when you press this key, and send the corresponding IR signal.

③. The sequence of the mode change.




**Note:**

- ✧ **It is forbidden to adjust FAN SPEED at "AUTO" and "DRY" mode, the FAN SPEED is fixed value, but the TEMPERATURE CAN ADJUST.**
- ✧ **At "COOL" and "HEAT" mode, we can adjust both fan speed and temperature.**
- ✧ **There is no temperature display at "FAN" mode.**

**3) Adjust temperature key (temperature up/down)**

①. At power on mode, it add/minus 1 from temperature value every time when you press this key, and send the corresponding IR signal.

②. The sequence of temperature change is as follows:

Temperature up:

18 → 19 →20 … →32

Temperature down:

32 → 31→30…→18

③. When the value of temperature is up/down to 18/32, it will not change, but IR signal is also send.

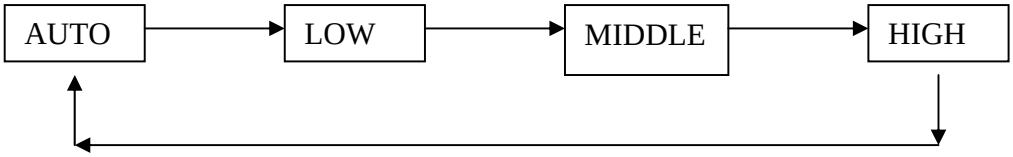
④. After changing temperature, there is about 0.5 second delay time to send IR signal.

4) fan speed

①. Press this key to change fan speed.

②. At power on mode, it changes fan speed every time when you press this key, and send the corresponding IR signal.

③. The sequence of fan speed change is as follows:



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The fan speed is fixed at “AUTO” and “DRY” mode.

5) swing
   ①. At power on mode, it will turn on swing function at the first time to press this key, and send IR signal at the same time.
   ②. At swing mode, if we press this key once again, it will turn off swing function, and then send IR signal.
   ③. At power off mode, it is useless.
6) clock
   ①. if you press “clock” key at the first time, the “clock” on the LCD panel will blink with 1 Hz, at this situation, we can adjust the real time by pressing timer up/down key.
   ②. If we have finished the new real time setting, press the “clock” key to make sure.
   ③. If there is over 10 second you don’t press the “clock” key to make sure, the setting of the real time will vanish-------it is of no effect.
7) timer
   ①. At power on mode, it can set the timer off function; at power off mode, it can set timer on function.
   ②. If there is no timer mode, then press this key ,the “timer on” or “timer off” will blink with 1 Hz, at this time, we can adjust the timer value by press timer up/down key.
   ③. If we have finished the new timer value setting, press “timer” key to make sure.
   ④. If the timer value is equal to real time, it is of no effect, it is useless to press “timer” key at this moment.
   ⑤. If there is over 10 second you don’t press the “timer” key to make sure, the setting of the timer value will vanish-------it is of no effect.
   ⑥. After setting the timer function, we press “timer” key once again, the timer function will be cancelled.
8) timer up
   ①. at “clock”mode,to press this key once, the real time value will add 1 minute, it is pressed at the continuous and lasts more than 1 second, it will change the time 4 times/second
   ②. At “timer”mode, it is the same as the “clock” mode do.
9) timer down
   it is very similar with “timer up” key.
10) sleep
   ①. press this key at the first time,the sleep mode have been setted,there is a icon on the LCD panel will be turned on.if we pressed it again,we cancel the sleep function,and the icon will be turned off.
   ②. After sleep mode is set, the system will go to power off 7 hours later.
11) reset key
   Press this key to make system into reset mode.
12) lock key
   This key will lock/unlock the keyboard, if the keyboard is locked ,any other key is not available.



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# Appendix E: how to program the M34559 on board using EFP-S2V.

M34559 is a QzROM type MCU; it can be programmed on the board using EFP-S2V.

## 1. hardware

Before we program M34559, we need following hardware:

1) PC installed with WinEP2 (the version which can support M34559 ,please refer http://www.suisei.co.jp/ for the latest versions)
2) The EFP-S2V + serial unit
3) M34559 remote controller evaluation board---MCU board,(with the programmer lines which the evaluation board supplied)

## 2. setting of the MCU board

| NO. of Jumper | Setting of the Jumper |
|---|---|
| JP3.1 | ON |
| JP3.2 | ON |
| JP3.3 | ON |
| JP3.4 | ON |
| JP3.5 | ON |
| JP3.6 | ON |
| JP3.7 | ON |
| JP3.8 | ON |
| JP7.1 | ON |
| JP7.2 | ON |

No need to turn on the power on the MCU board.

## 3. how to use the program on the PC

This part should refer the EFP-S2V hand manual.



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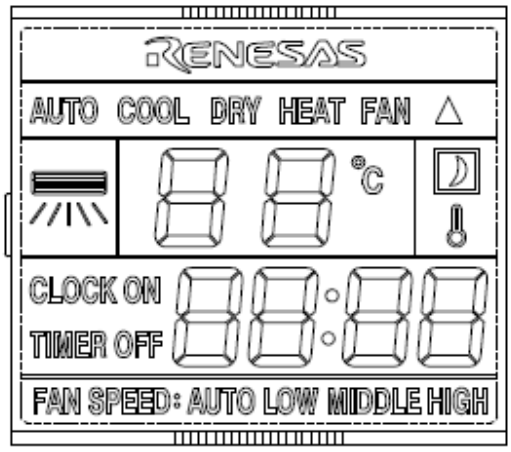
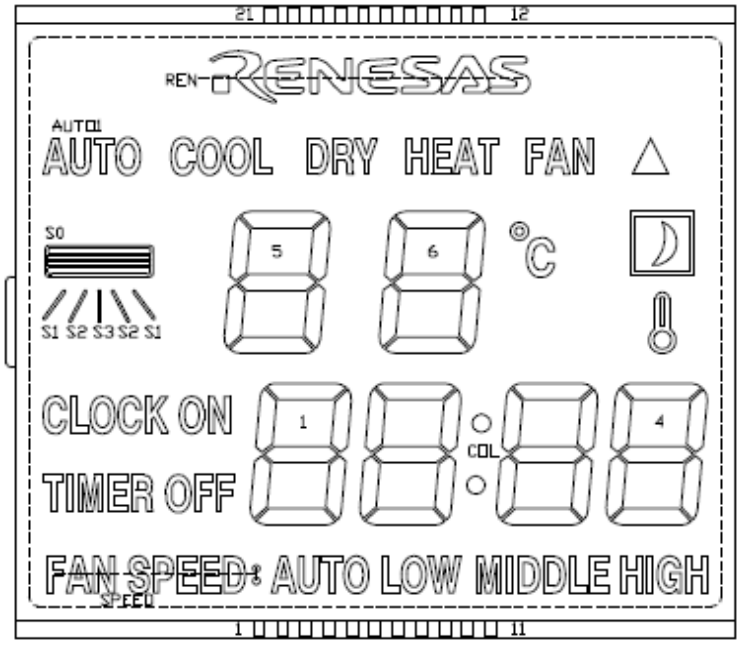
## Appendix F: renesas air conditioner LCD panel truly table

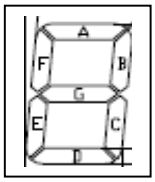
### 1. The following picture is about the "renesas air conditioner LCD panel"




SCALE: 1:1

### 2. The truly table of the LCD panel is as follows:



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| PIN | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COM1 | COM1 | | | | ON | 2A | 2B | 3A | 3B | 4A | 4B |
| COM2 | | COM2 | | | OFF | 2F | 2G | 3F | 3G | 4F | 4G |
| COM3 | | | COM3 | | SPEED | 2E | 2C | 3E | 3C | 4E | 4C |
| COM4 | | | | COM4 | AUTO | 2D | COL | 3D | MIDDLE | 4D | HIGH |
| PIN | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | |
| COM1 | | 6C | 6D | 5C | 5D | REN | S0 | 1B | 1A | CLOCK | |
| COM2 | | 6G | 6E | 5G | 5E | AUTO1 | S1 | 1G | 1F | TIMER | |
| COM3 | △ | 6B | 6F | 5B | 5F | COOL | S2 | 1C | 1E | | |
| COM4 | FAN | °C | 6A | HEAT | 5A | DRY | S3 | LOW | 1D | | |

If we change it into M34559 memory type, the truly table will change into like this:

**Renesas remote controller LCD panel Truly Table**

| Z | 1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| X | 0 | | | | | 1 | | | |
| Y | 3 | 2 | 1 | 0 | | 3 | 2 | 1 | 0 |
| LCD0 | AUTO | SPEED | OFF | ON | LCD8 | °C | 6B | 6G | 6C |
| LCD1 | 2D | 2E | 2F | 2A | LCD9 | 6A | 6F | 6E | 6D |
| LCD2 | COL | 2C | 2G | 2B | LCD10 | HEAT | 5B | 5G | 5C |
| LCD3 | 3D | 3E | 3F | 3A | LCD11 | 5A | 5F | 6E | 5D |
| LCD4 | MIDDLE | 3C | 3G | 3B | LCD12 | DRY | COOL | AUTO1 | REN |
| LCD5 | 4D | 4E | 4F | 4A | LCD13 | S3 | S2 | S1 | S0 |
| LCD6 | HIGH | 4C | 4G | 4B | LCD14 | LOW | 1C | 1G | 1B |
| LCD7 | FAN | △ | | | LCD15 | 1D | 1E | 1F | 1A |
| Z | 1 | | | | | | | | |
| X | 2 | | | | | | | | |
| Y | 3 | 2 | 1 | 0 | | | | | |
| LCD16 | | | TIMER | CLOCK | | | | | |



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## Appendix G: Using the ASM45 Cross Assembler

ASM45 is the cross assembler fro the MELPS 4500 series. It converts a source program written in assembly language into machine language. This process is termed “assembly”.

ASM45 generates the following four types of files:

1. Object files (Referred to as HEX files)
2. Symbol files (Referred to as SYM files) [Command parameter –S]
3. Print files (Referred to as PRN files) [Command parameter –L]
4. Tag files (Referred to as TAG files) [Command parameter –E]

ASM45 is started by entering the command at the MS-DOS prompt. An example of the Command is as follows:

**C:\MTOOL\PD45M>ASM45 FILENAME –S –L –C <RET>**

1 2 3 4 5 6 7

1) MS-DOS prompts
2) ASM45
3) Name of the source file to be assembled
4) Command parameter –S specifies the generation of SYM file
5) Command parameter –L specifies the generation of PRN file
6) Command parameter –C specifies the generation of SYM file
7) Return Key

Command Parameter Description

-. : All message suppressed.
-A: make memory Area information. (Output MAP file)
-B: execute Brn instruction optimize
-C: output source line information (output SYM file)
-D: define symbol (use –Ds1=1 :s2=2)
-E: make tag file and start editor (use –E or _Eeditor name)
-L: make list file (output PRN file)
-M: define CPU name
-O: select drive and directory for output (use –Oa:\work)
-P: select directory (drive) of M345XXXX.dat file. (use –P\work)
-R: output bit macro expansion
-S: make symbol file for symbolic debugger
-VER: display version
-X: execute crf45

*Note: For more detail information, refer to the ASM45 User’s manual*



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## Revision History



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