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April 1st, 2010
Renesas Electronics Corporation

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R8C/25 Group

Key Matrix Input

1. Abstract

This document describes a program for key matrix and determination.

2. Introduction

The application example described in this document applies to the following MCU and parameter(s):

- MCU: R8C/25 Group

This program can be used with other R8C/Tiny Series MCUs which have the same special function registers (SFRs) as the R8C/25 Group. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

3. Application Example Description

The key input and determination specifications are as follows:

(1) The keys are set to “L” active (“L”: pressed; “H”: not pressed). If the key codes match three times, it is determined that they are fixed.

(2) If multiple keys are pressed simultaneously (multiple pressing), it is determined as an error.

(3) The key matrix uses eight ports in total - four ports for scan output and four ports for key input.
Scan output :“L” active, P0_4 to P0_7
Key input :“L” active, P2_0 to P2_3

(4) The scan output is set to serial active output every 5 ms and controlled by the variable scan. Timer RA is used to measure 5 ms.

(5) The key input is fixed after each scan output cycle.

(6) Key input data is set into the variable key_data and a key code is generated based on this data. The key code is set into the variable now_keycode.

Table 3.1 Keys and Key Codes

KEY	Key code	KEY	Key code	KEY	Key code	KEY	Key code
KEY1	01h	KEY2	05h	KEY3	09h	KEY4	0Dh
KEY5	02h	KEY6	06h	KEY7	0Ah	KEY8	0Eh
KEY9	03h	KEY10	07h	KEY11	0Bh	KEY12	0Fh
KEY13	04h	KEY14	08h	KEY15	0Ch	KEY16	10h

The key code for no key being pressing is 00h, and the key code for multiple pressing is FFh.

(7) The key code fixed two times previously and the key code fixed one time previously are set into the variables last_keycode[1] and last_keycode[0], respectively. If the key codes set in last_keycode[1], last_keycode[0], and now_keycode match, it is considered the same key code is identified three times and set into the variable fix_keycode.

This sample program may include operations of unused bit functions for the SFR bit layout. Set these values according to the operating conditions of the user system.

3.1 Pin Usage

Table 3.2 Pin Usage and Functions

Pin	I/O	Function
P0_4	Output	Scan output 0
P0_5	Output	Scan output 1
P0_6	Output	Scan output 2
P0_7	Output	Scan output 3
P2_0	Input	Key input 0
P2_1	Input	Key input 1
P2_2	Input	Key input 2
P2_3	Input	Key input 3

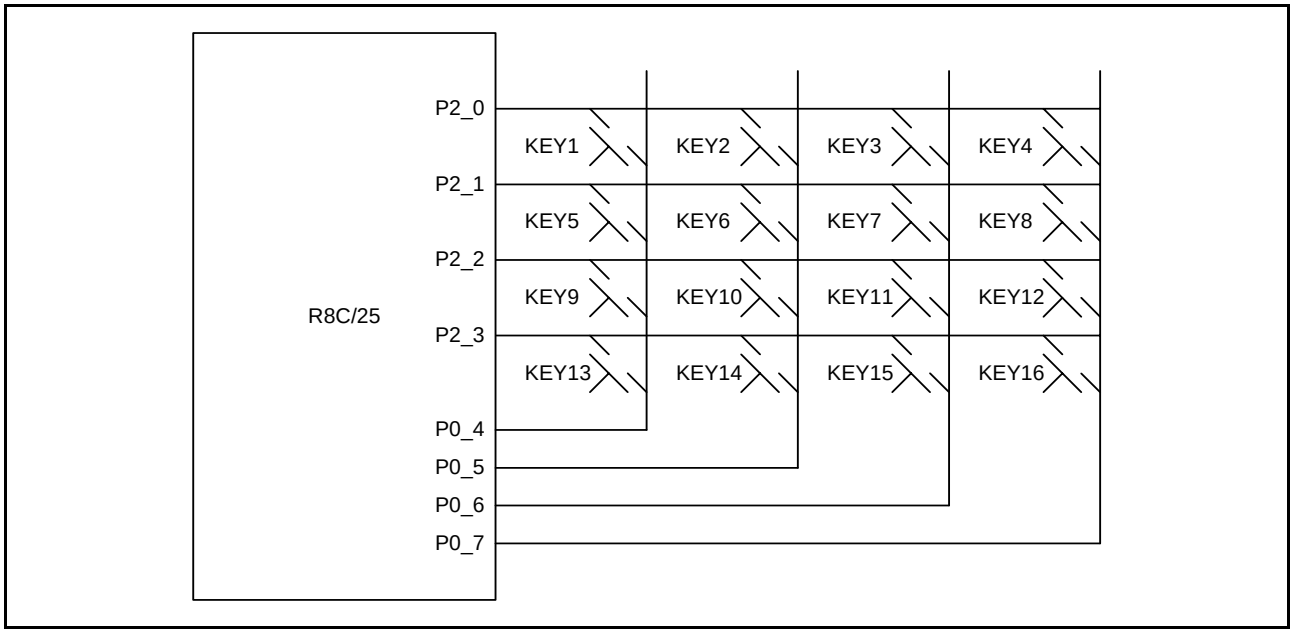


Figure 3.1 Key Matrix Configuration

3.2 Memory Usage

Table 3.3 Memory Usage

Memory Usage	Size	Remark
ROM	351 bytes	In main.c module
RAM	9 bytes	In main.c module
Maximum user stack usage	14 bytes	main function: 3 bytes sfr_init function: 3 bytes key_mat function: 3 bytes key_scan function: 3 bytes key_decode function: 8 bytes
Maximum interrupt stack usage	0 bytes	Unused

Memory usage varies depending on the C compiler version and the compile option.
The above applies under the following conditions:

- C compiler: M16C/60, 30, 20, 10, Tiny, R8C/Tiny Series Compiler V.5.40 Release 00
- Compile option: -c -finfo; NOTE: -dir “$(CONFIGDIR)” -R8C

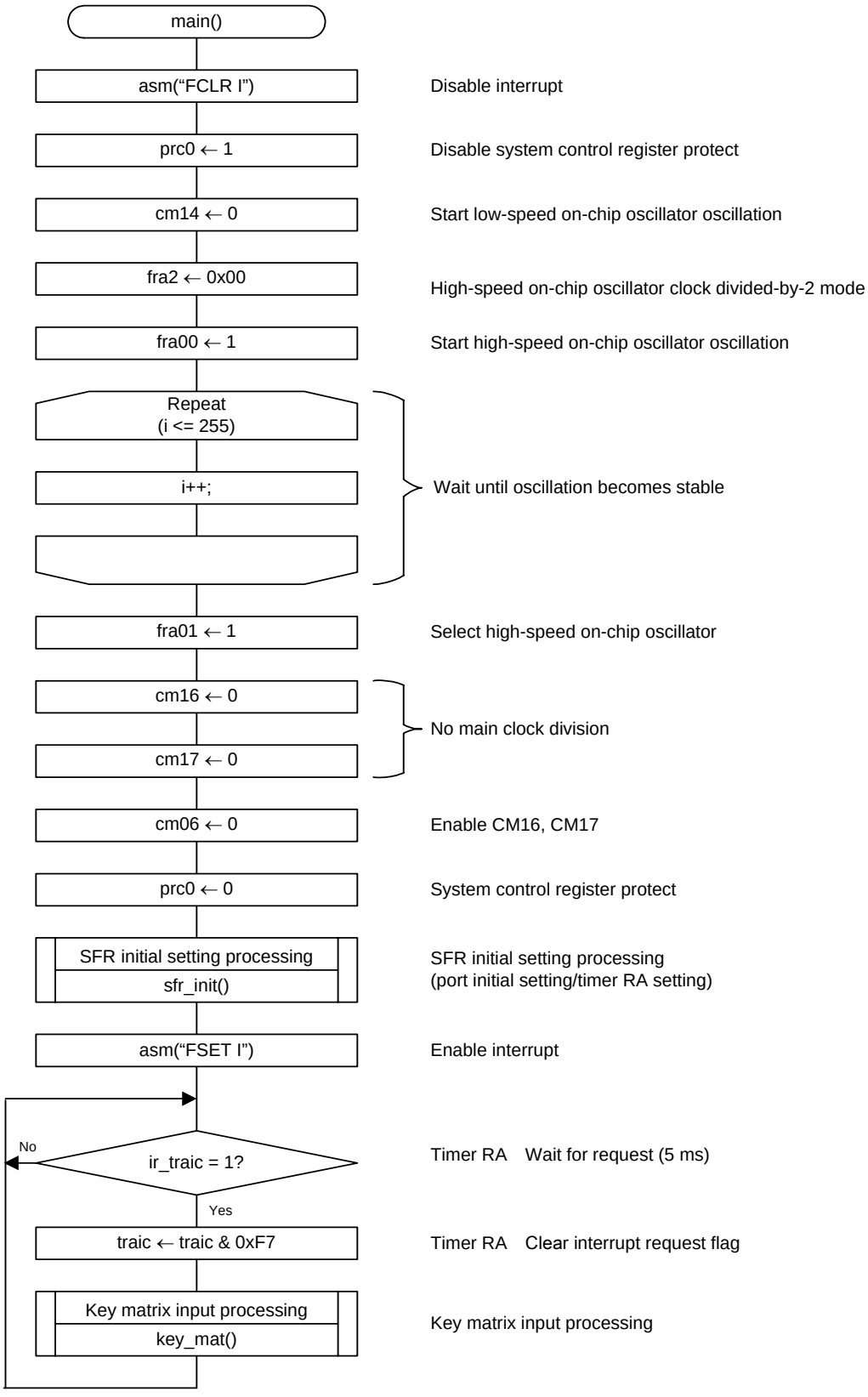
NOTE: Unavailable in the R8C/Tiny-exclusive free version.

Table 3.4 RAM Usage and Definition

Symbol	Type	Size	Content
scan	unsigned char	1 byte	Scan output counter
key_data[4]	unsigned char	4 bytes	Input key data
now_keycode	unsigned char	1 byte	Key data fixed this time
last_keycode[2]	unsigned char	2 bytes	[0]: Key code fixed one time previously [1]: Key code fixed two times previously
fix_keycode	unsigned char	1 byte	Key code fixed by three matches

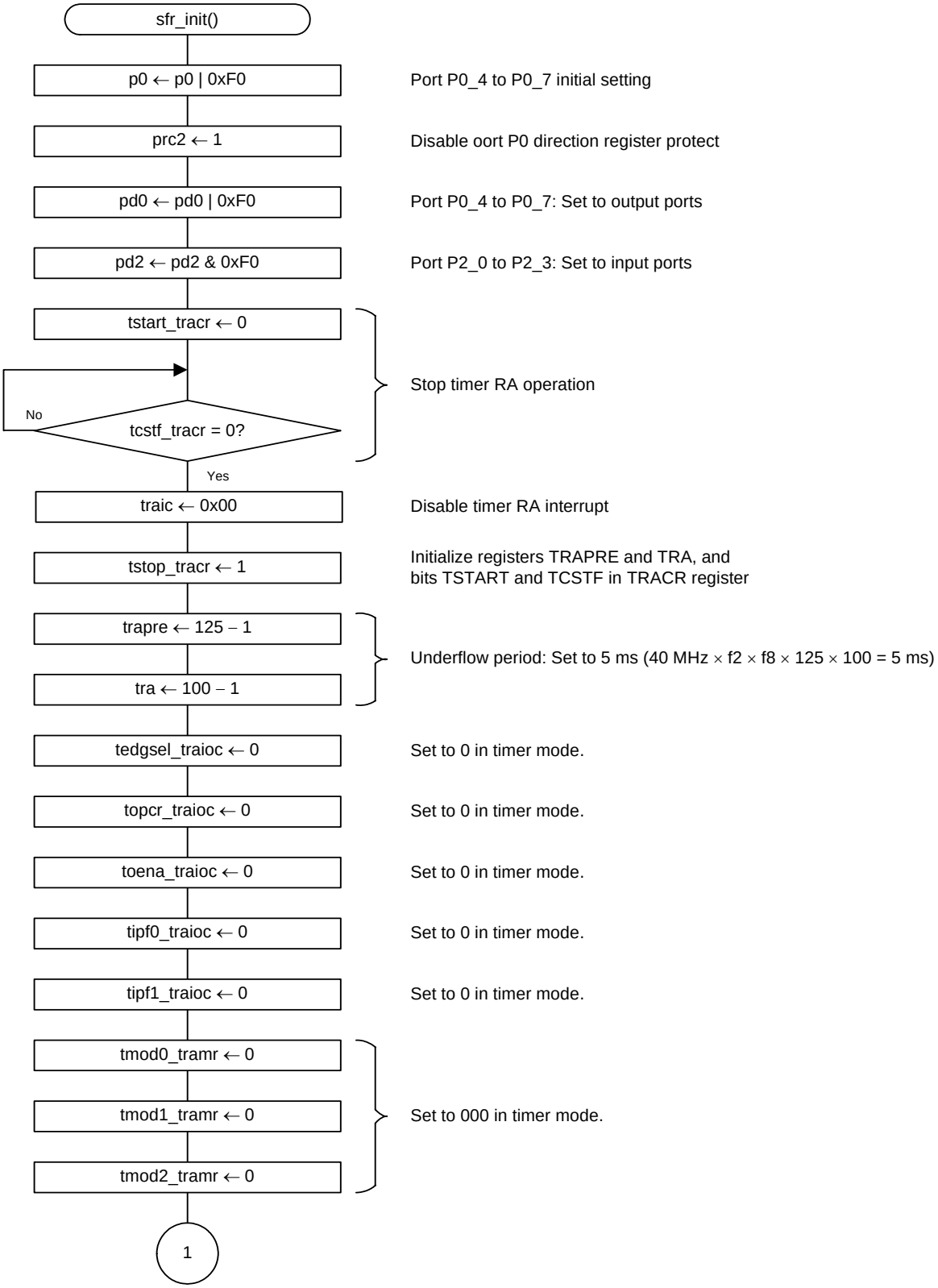
4. Flowchart

4.1 Main Function

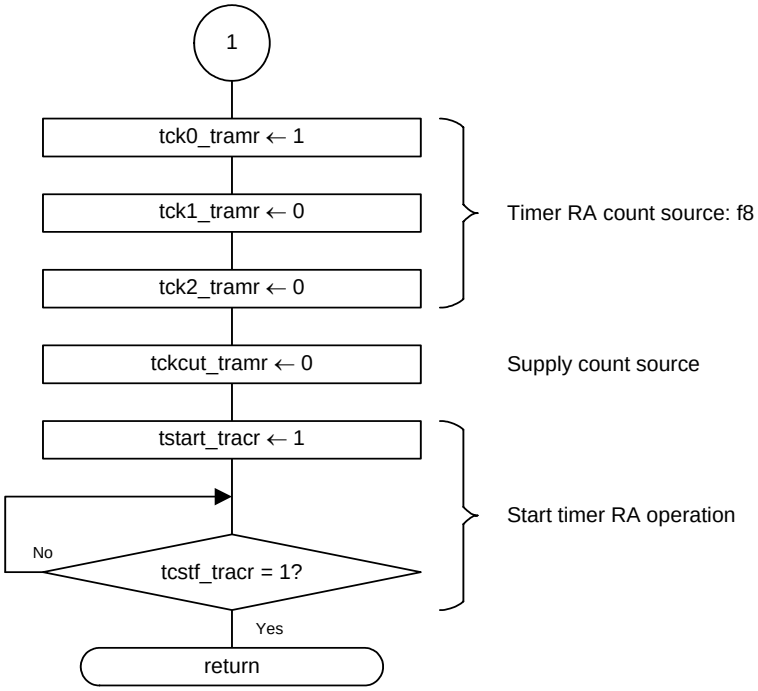


4.2 SFR Initial Setting Processing

4.2.1 SFR Initial Setting Processing 1

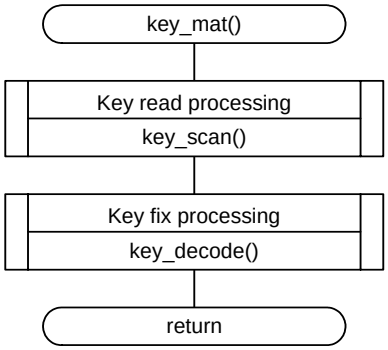


4.2.2 SFR Initial Setting Processing 2



4.3 Key Matrix Input Processing

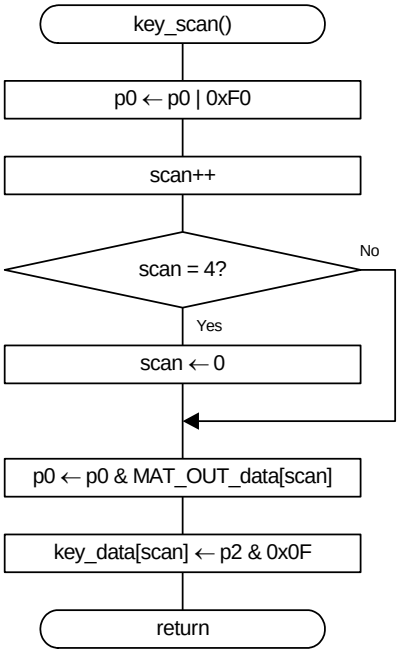
4.3.1 Key Matrix Input Processing



Key read processing

Key fix processing

4.3.2 Key Read Processing



Scan output off

Increment scan output counter

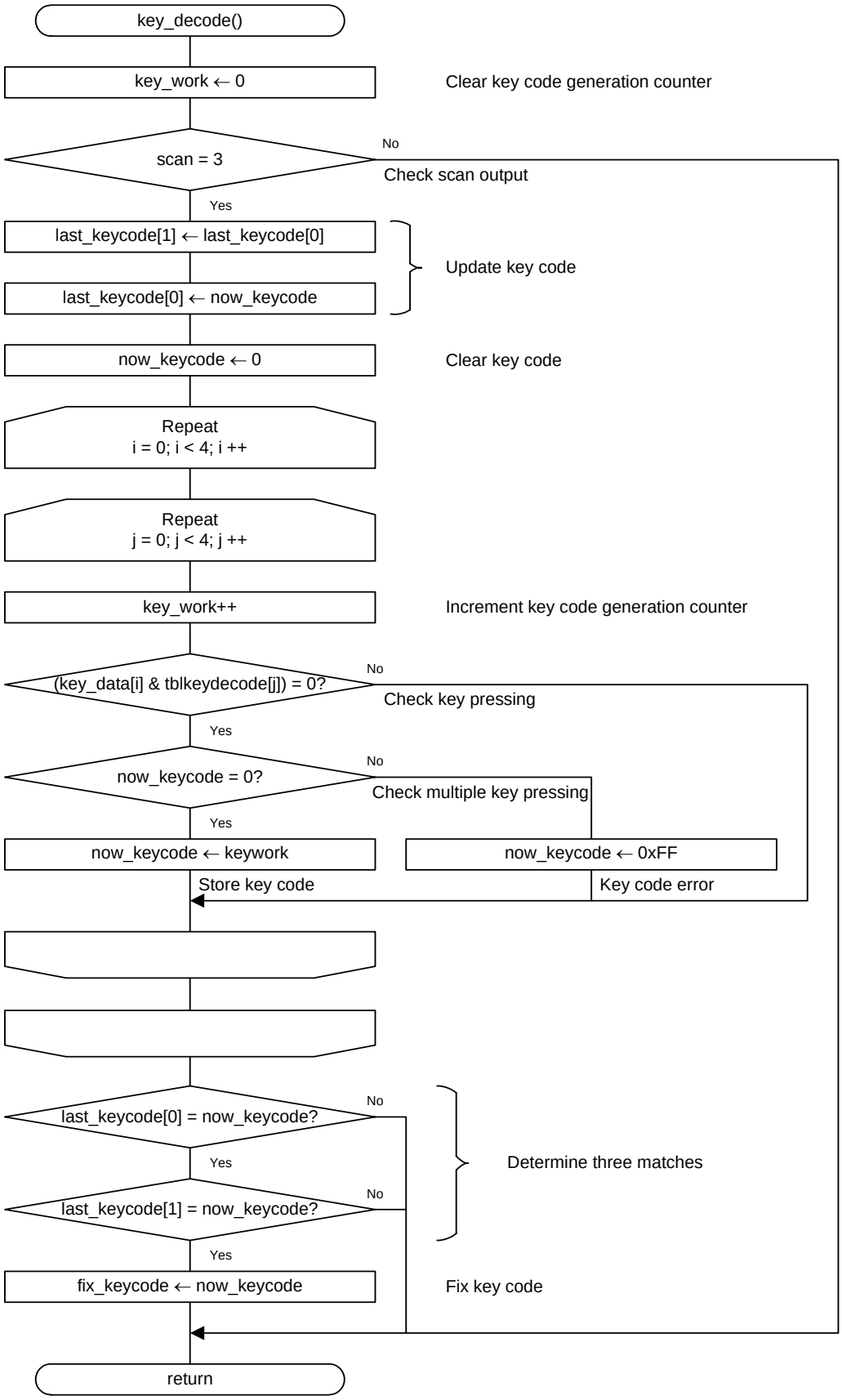
Determine whether scan output is maximum

Increment scan output counter

Scan output

Read key

4.3.3 Key Fix Processing



5. Sample Programming Code

A sample program can be downloaded from the Renesas Technology website.
To download, click “Application Notes” in the left-hand side menu of the R8C/Tiny Series page.

6. Reference Documents

Hardware Manual
R8C/25 Group Hardware Manual
The latest version can be downloaded from the Renesas Technology website.

Technical Update/Technical News
The latest information can be downloaded from the Renesas Technology website.

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REVISION HISTORY	R8C/25 Group Key Matrix Input

Rev.	Date	Description	
		Page	Summary
1.00	Mar 30, 2007	–	First Edition issued

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