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R8C/25 Group

A/D Read

1. Abstract

This document describes a program for A/D conversion and A/D value fix.

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 A/D conversion and A/D value fix specifications are as follows:

(1) The P0_7/AN0 pin is used for analog input.
(2) One-shot mode is selected as A/D operating mode, f2 is selected as ϕ AD frequency, and 10-bit resolution is selected.
(3) A/D conversion is performed every 5 ms. Timer RA is used to measure 5 ms.
(4) To fix the conversion result, subtract the maximum value (variable ad_max) and the minimum value (variable ad_min) from the sum (variable ad_sum) of 10 conversion results to obtain the average of the remaining eight results. This means the A/D conversion value is fixed (variable flag.bit.b_ad_fix) every 50 ms.

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 3.1 Pin Usage and Function

Pin	I/O	Function
P0_7/AN0	Input	A/D input 0

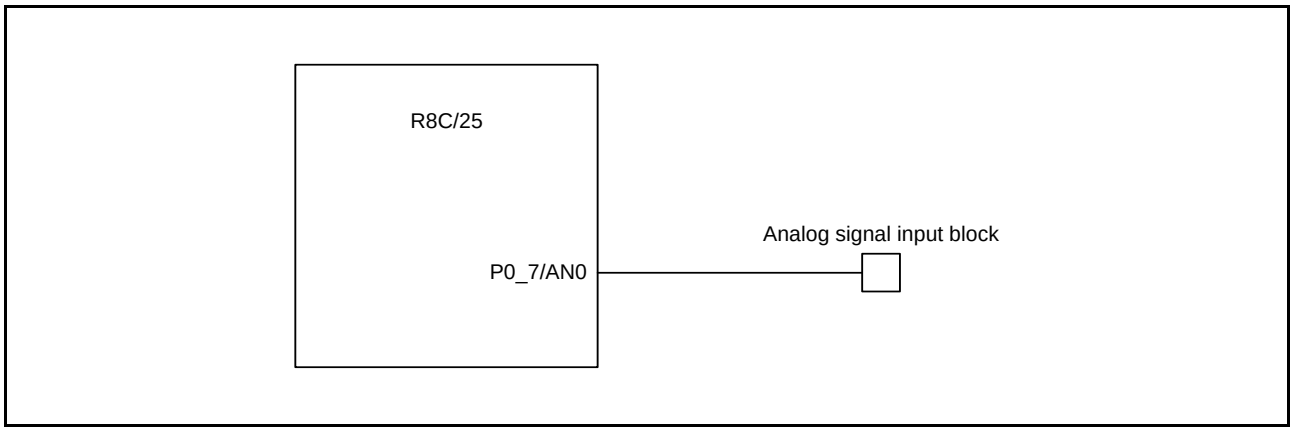


Figure 3.1 Analog Signal Input

3.2 Memory Usage

Table 3.2 Memory Usage

Memory Usage	Size	Remark
ROM	312 bytes	In main.c module
RAM	11 bytes	In main.c module
Maximum user stack usage	6 bytes	main function: 3 bytes sfr_init function: 3 bytes ad_in function: 3 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.

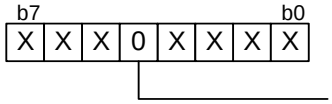
Table 3.3 RAM Usage and Definition

Symbol	Type	Size	Content
flag.bit.b_ad_fix	unsigned char: 1	1 bit	A/D value fix flag
ad_sum	unsigned short	2 bytes	Sum of conversion results
ad_cnt	unsigned short	2 bytes	A/D conversion count counter
ad_max	unsigned short	2 bytes	Sampled A/D maximum value
ad_min	unsigned short	2 bytes	Sampled A/D minimum value
ad_fix	unsigned short	2 bytes	A/D fixed value

4. Setup

This section shows the initial setting procedures and values to perform the example described in "**3. Application Example Description**". Refer to the **R8C/25 Group Hardware Manual** for details on individual registers.

A/D Control Register 0

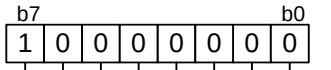


ADCON0 [Address 00D6h]

ADGSEL0	A/D Input Group Select Bit
	Port P0 group selected (AN0 to AN7)

NOTE: After setting the ADGSEL0 bit, set bits CH0 to CH2.

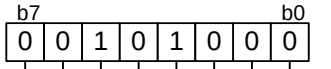
A/D Control Register 0



ADCON0 [Address 00D6h]

CH2 to CH0	Analog Input Pin Select Bits
	AN0 selected
MD	A/D Operating Mode Select Bit
	One-shot mode selected
ADGSEL0	A/D Input Group Select Bit
	Port P0 group selected (AN0 to AN7)
ADCAP	A/D Conversion Automatic Start Bit
	Start by software trigger (ADST bit) selected
ADST	A/D Conversion Start Flag
	A/D conversion stop selected
CKS0	Frequency Select Bit 0
	f2 selected

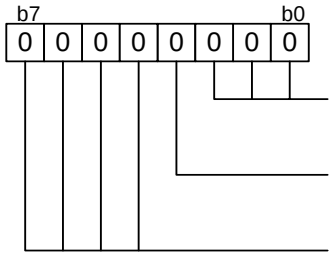
A/D Control Register 0



ADCON1 [Address 00A7h]

—	Unavailable. Set to 0.
BITS	8/10-Bit Mode Select Bit
	10-bit mode selected
CKS1	Frequency Select Bit 1
	f2 selected
VCUT	Vref Connect Bit
	Vref connection selected
—	Unavailable. Set to 0.

A/D Conversion Interrupt Control Register

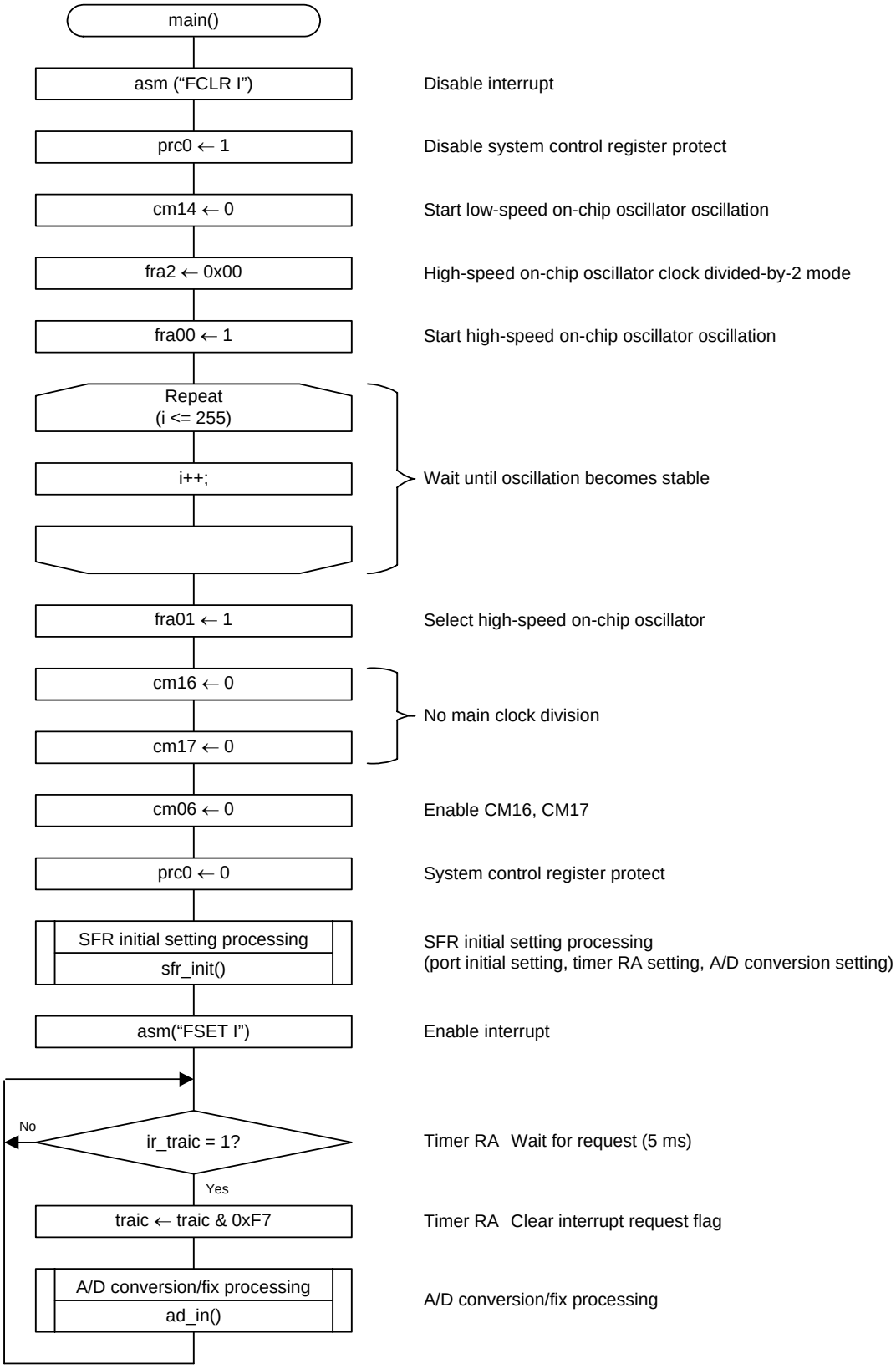


ADIC [Address 004Eh]

ILVL2 to ILVL0	Interrupt Priority Level Select Bits 2 to 0 Level 0 (interrupt disabled) selected
IR	Interrupt Request Bit No interrupt request selected
—	Unavailable. Set to 0.

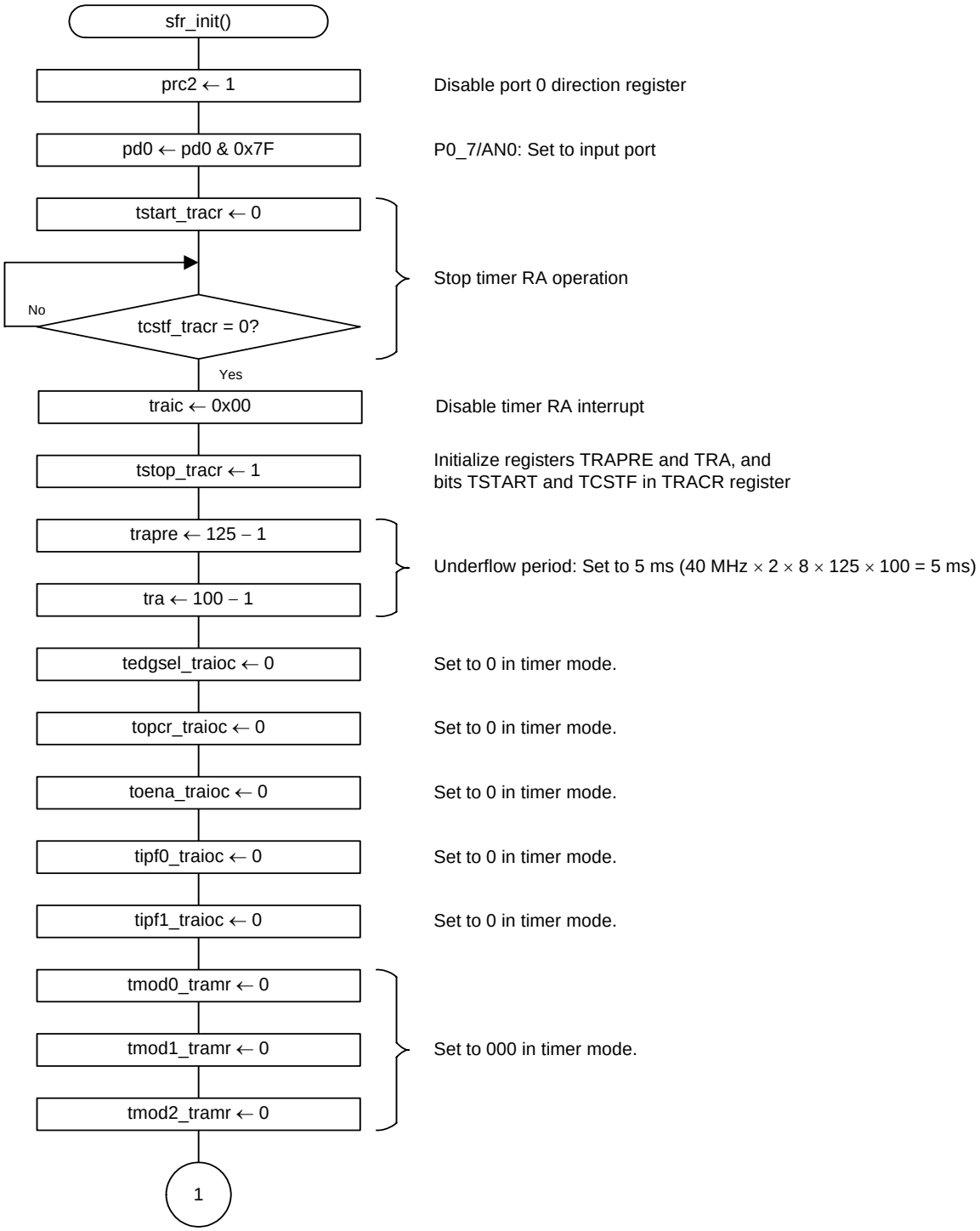
5. Flowchart

5.1 Main Function

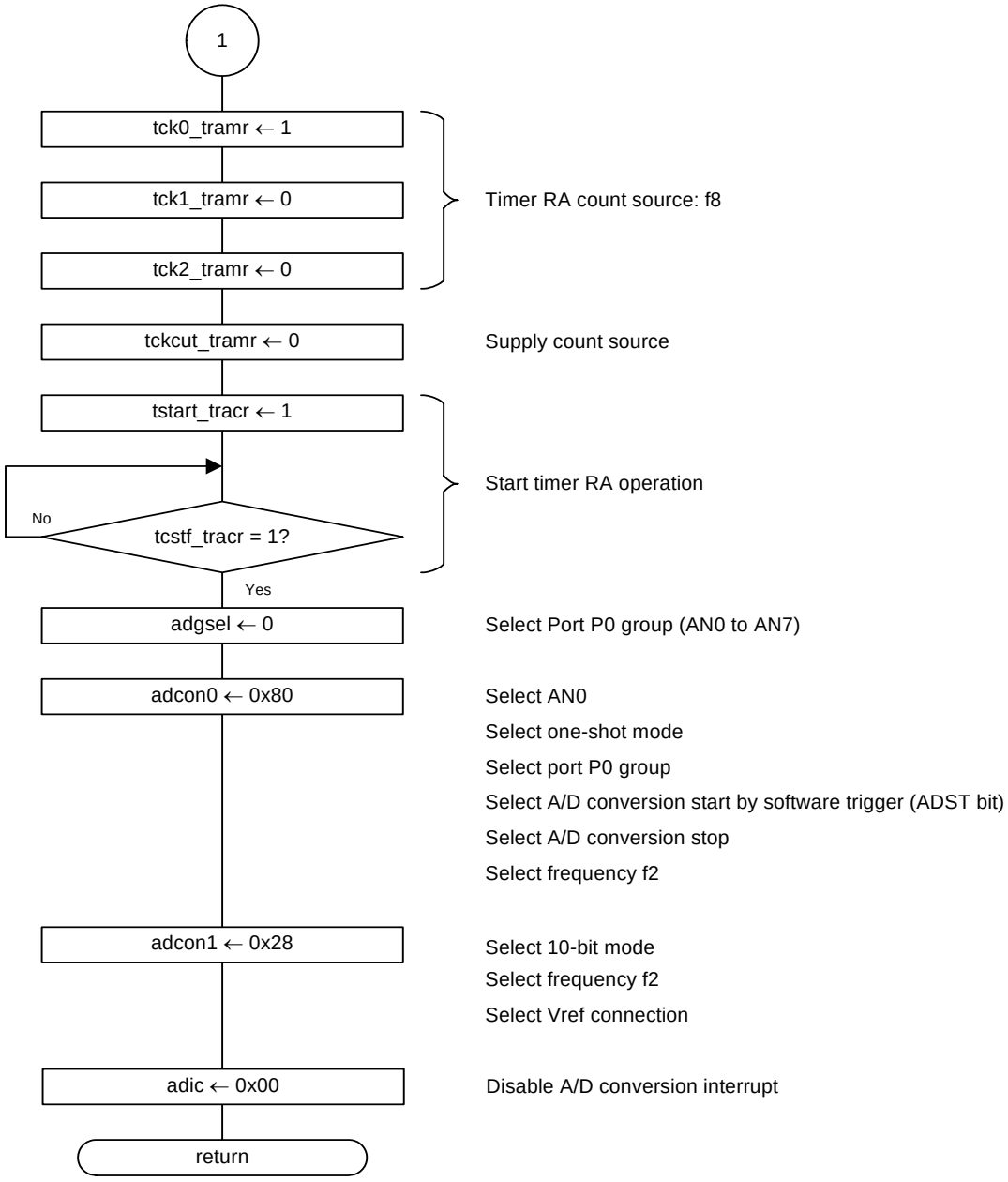


5.2 SFR Initial Setting Processing

5.2.1 SFR Initial Setting Processing 1

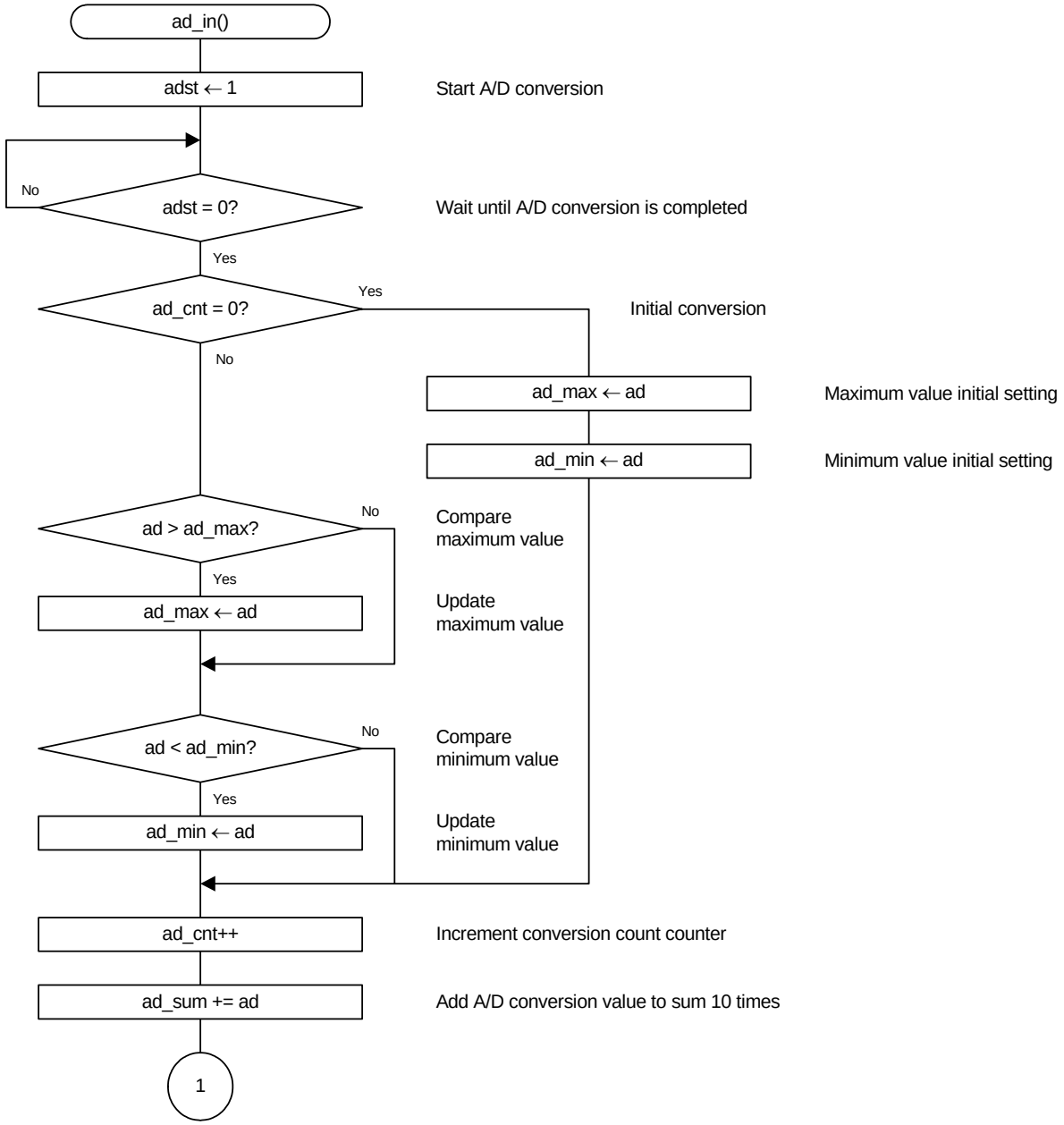


5.2.2 SFR Initial Setting Processing 2

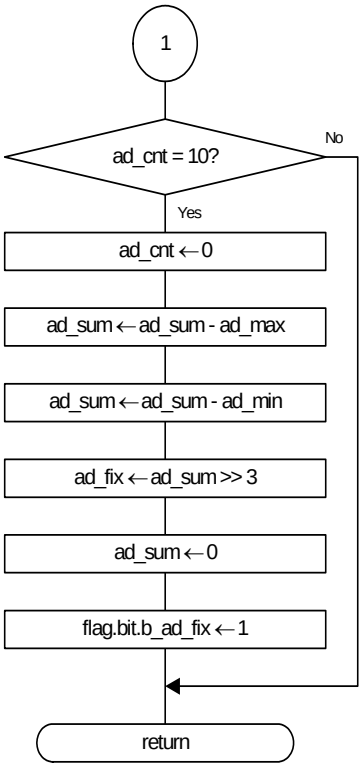


5.3 A/D Conversion/Fix Processing

5.3.1 A/D Conversion/Fix Processing 1



5.3.2 A/D Conversion/Fix Processing 2



Determine whether conversions are completed 10 times

Clear conversion complete counter

10-time sum value – maximum value

10-time sum value – minimum value

Make 1/8 by 3-bit right shift processing

Clear 10-time sum value

A/D conversion value fix flag on

6. 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.

7. 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 A/D Read

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

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