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April 1st, 2010
Renesas Electronics Corporation

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38D2 Group

AD Converter (Exit from Stop Mode by ADKEY)

1. Abstract

The following article introduces and shows an example of how to use the AD Converter (Exit from Stop Mode by ADKEY) on the 38D2 Group device.

2. Introduction

The application explained in this document applies to the following MCU and parameter(s):
Applicable MCU: 38D2 Group
Oscillation frequency: On-chip oscillator (5 MHz)

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

3. Contents

3.1 Exit from Stop Mode by ADKEY

Outline: The MCU exits from stop mode by the analog input pin P42/AN2/ADKEY.

Specifications:

- The P42/AN2/ADKEY pin is used as an analog input pin.
- The MCU exits from stop mode by inputting KEY4, KEY5 to the analog input pin.
- A/D conversion result is obtained every five ms using the timer after exit.
- The fixed A/D conversion result is the value obtained from averaging eight A/D conversion results after subtracting the minimum and maximum values from all the ten A/D conversion results.
- 10-bit A/D mode.
- The fixed value of the A/D conversion result identifies which key is pressed. The key is fixed when the pressed key corresponds twice.

Table 3.1 shows Values and Key Codes Used for Key Determination and Table3.2 shows Used RAM and Definitions

Table 3.1 Values and Key Codes Used for Key Determination

Pressed KEY	N/A	KEY1	KEY2	KEY3	KEY4*	KEY5*
Ideal voltage level for AN2	5 V	4 V	3.75 V	3.33 V	2.5 V	0 V
Ideal A/D conversion result	1023	820	769	684	514	0
Value used for key determination	1023 ~ 921	920 ~ 794	793 ~ 726	725 ~ 599	598 ~ 257	256 ~ 0
Key code	0	1	2	3	4	5

*For exiting from stop mode

Figure 3.1 shows the Connection Diagram, Figure 3.2 shows the Relevant Register Settings, and Figure 3.3 and 3.4 show the Control Procedure.

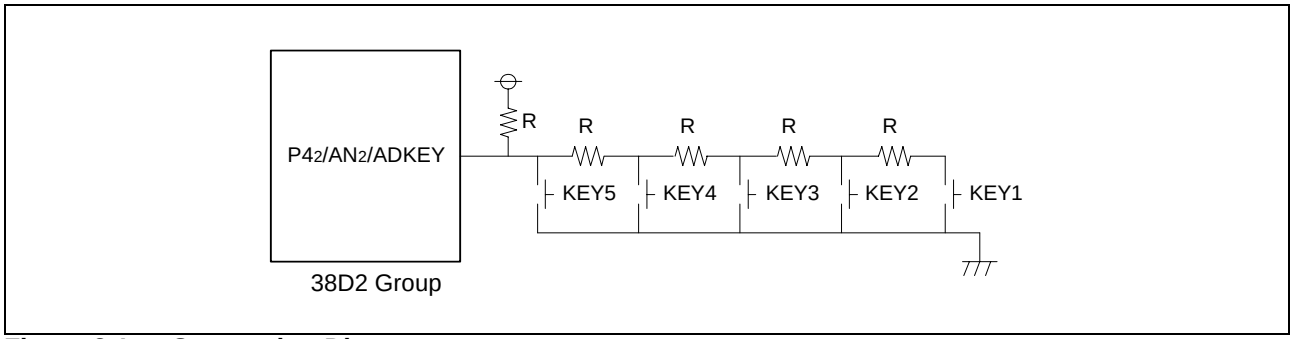
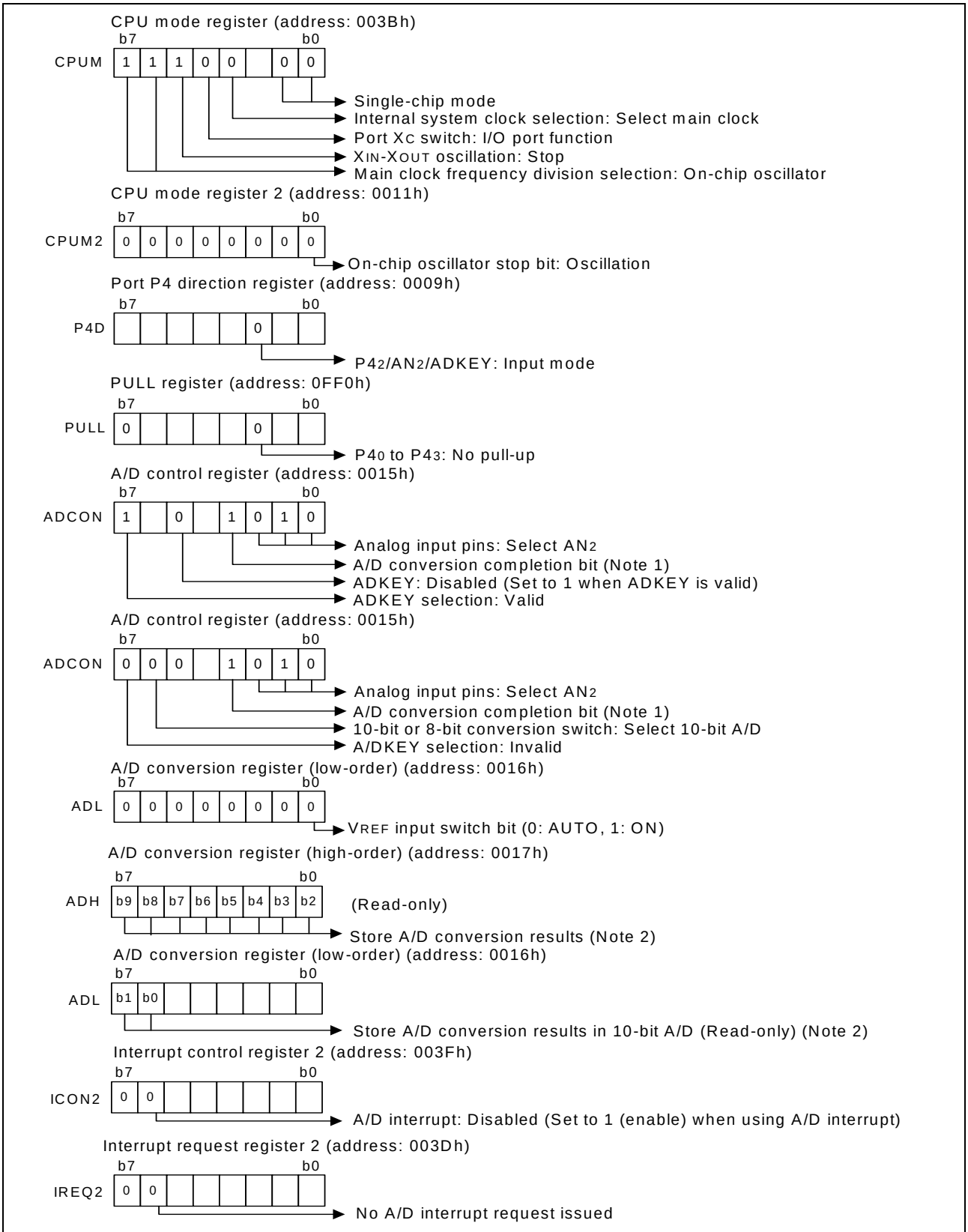


Figure 3.1 Connection Diagram

Table 3.2 Used RAM and Definitions

Address (H)	Label Data type	Initial value	Size (byte)	Description	Min (H)	Max (H)	Flag
0050	C_AD	00H	1	A/D counter	00	0A	—
0051	B_AD	00H	2	Latest A/D conversion value	00	0FFC0	—
0053	B_ADmax	00H	2	Maximum A/D conversion value	00	03FF	—
0055	B_ADmin	00H	2	Minimum A/D conversion value	00	03FF	—
0057	B_ADsum	00H	2	Total A/D conversion value	00	27F6	—
0059	D_ADfix	00H	2	Fixed A/D conversion value	00	03FF	—
005B	B_KEYcode	00H	1	Previous key code No.	00	5	—
005C	D_KEYcode	00H	1	Latest key code No.	00	5	—
005D	B_WORK	00H	3	WORK	00	FFFFFF	—



Notes: 1. A/D conversion is started when A/D conversion completion bit is set to 0.
Only 0 is valid when writing to A/D conversion completion bit and even if 1 is written, this bit is not set to 1. Therefore, when writing value to ADCON without affecting A/D conversion completion bit, set A/D conversion completion bit to 1.
2. Read the A/D conversion result after A/D conversion completion bit is set to 1.When reading the A/D conversion result in 10-bit A/D mode, read the A/D conversion high-order register first and the A/D conversion low-order register next. At this time, bits 5 to 1 at the A/D conversion low-order register are set to 0 and bit 0 becomes undefined.

Figure 3.2 Relevant Register Settings

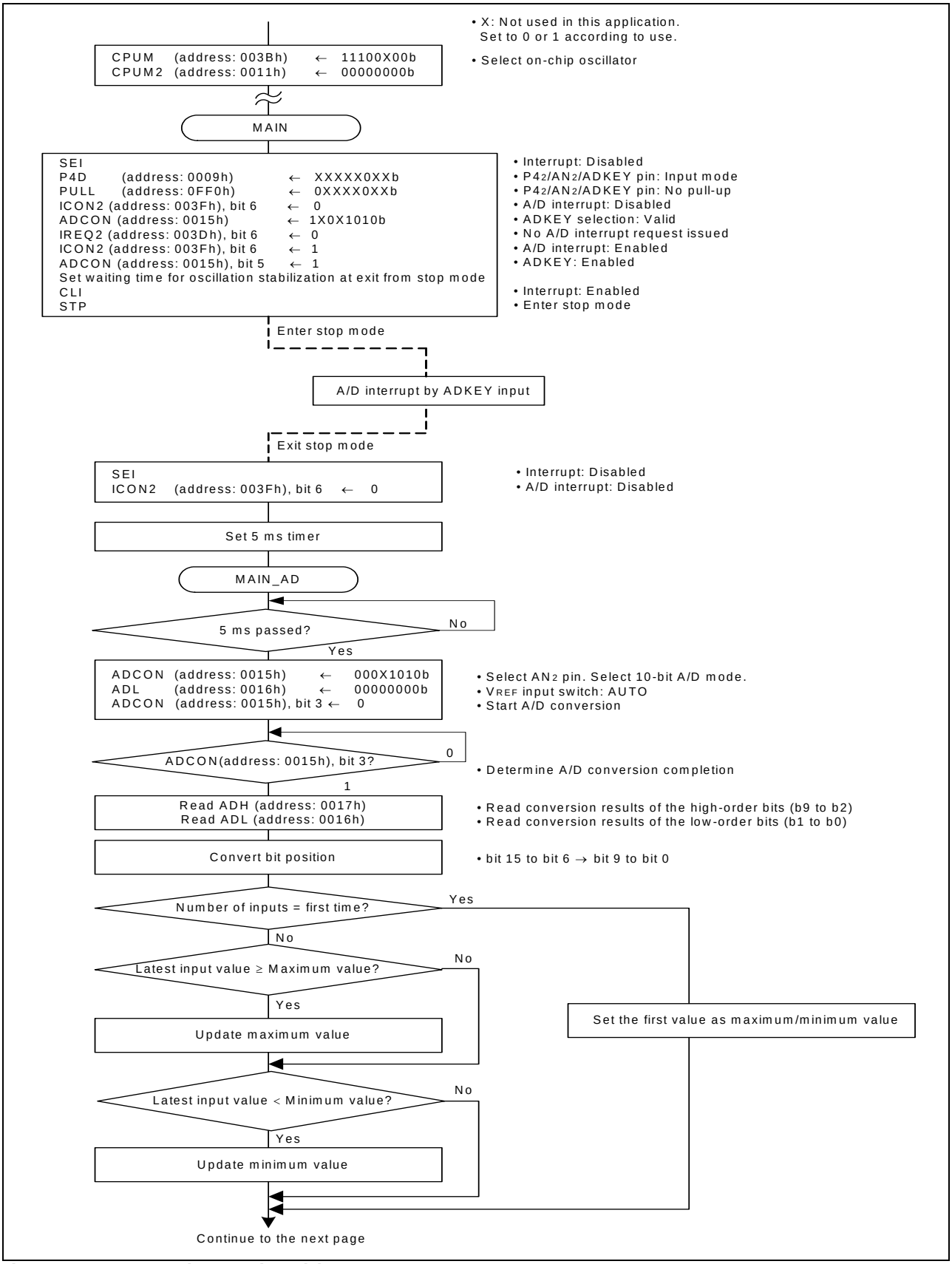


Figure 3.3 Control Procedure (1)

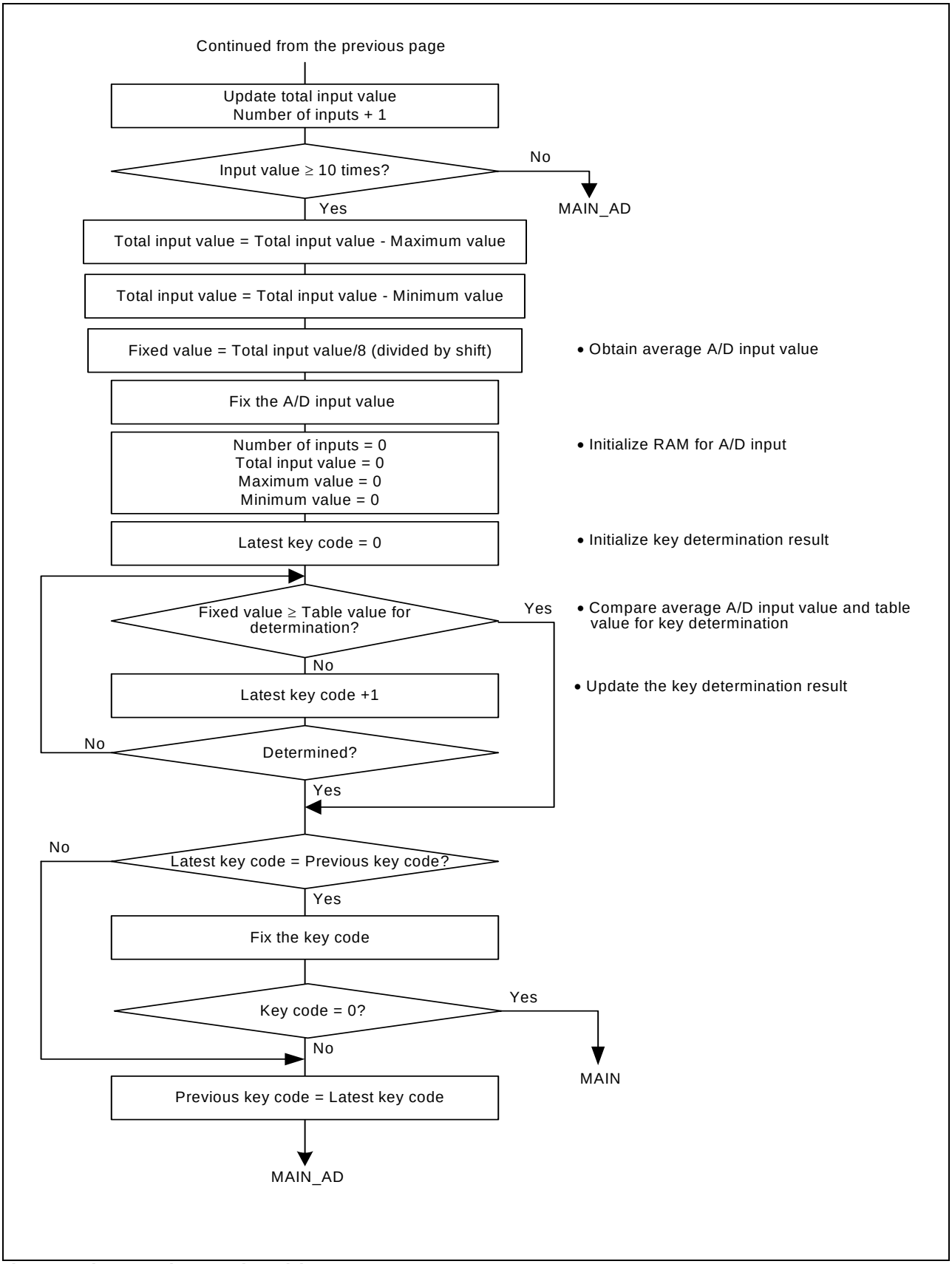


Figure 3.4) Control Procedure (2)

4. Sample Programming Code

Download a sample program from the Renesas Technology website.
To download, click “Application Notes” in the left side menu on the page of the 38D2 Group.

5. Reference

Datasheet
38D2 Group Datasheet
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Rev.	Date	Description	
		Page	Summary
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