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M16C/64 Group

A/D Converter Operation (Repeated Sweep Mode 0)

1. Abstract

In repeated sweep mode 0, any desired function can be selected from the items listed in Table 1. This application note describes the operations performed when the contents marked with circles are selected out of the items shown in Table 1.

Table 1. Set Contents

Set item	Set content		Set item	Set content	
Operating clock ϕ_{AD}	○	fAD divided by 12 / fAD divided by 6 / fAD divided by 4 / fAD divided by 3 / fAD divided by 2 / fAD	Analog input pins		2 pins (AN0, AN1 / AN0_0, AN0_1 / AN2_0, AN2_1)
		4 pins (AN0-AN3 / AN0_0-AN0_3 / AN2_0-AN2_3)			
		6 pins (AN0-AN5 / AN0_0-AN0_5 / AN2_0-AN2_5)			
A/D conversion start condition	○	Software trigger			8 pins (AN0-AN7 / AN0_0-AN0_7 / AN2_0-AN2_7)
		Triggered by \overline{ADTRG}			
A/D input group	○	Port P10 group (AN0-AN7)			
		Port P0 group (AN0_0-AN0_7)			
		Port P2 group (AN2_0-AN2_7)			

2. Introduction

The application example described here applies for use with the microcomputers listed below.

- Microcomputers: M16C/64 group

This application note can be used with other M16C Family MCUs which have the same special function registers (SFRs) as the above group. Check the manual for any modifications to functions. Careful evaluation is recommended before using the program described in this application note.

3. Application Example

- Operation
- (1) When the ADST bit of the ADCON0 register is set to 1 (A/D conversion start), the A/D converter starts operating, converting the input voltage on AN0 pin from analog to digital quantities.
 - (2) When the A/D conversion for the AN0 pin is completed, the content of the successive approximation register (conversion result) is transferred to the AD0 register. The operation continues, performing A/D conversion on selected analog input pins in order. Each time the conversion of one pin is finished, the conversion result is transferred to the AD_i register (i = 0–7) corresponding to each pin.
 - (3) After the input voltages on all selected analog input pins are converted from analog to digital, A/D conversion is performed again beginning with the AN0 pin. The IR bit of the ADIC register is not set to 1 (interrupt requested).
 - (4) The A/D converter does not stop until the ADST bit of the ADCON0 register is reset to 0 (A/D conversion stop) in a program.

Figure 1 shows the operation timing of A/D conversion.

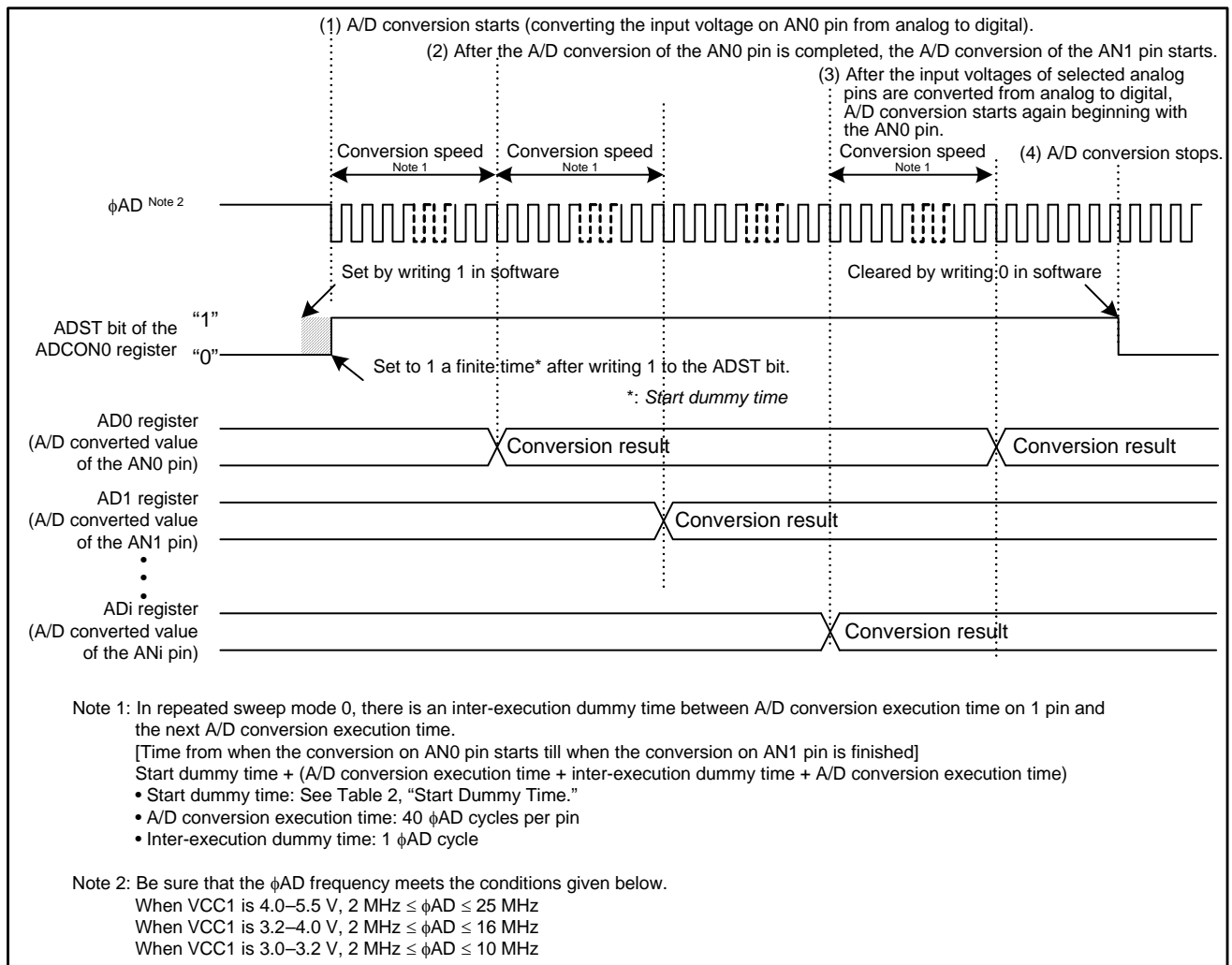


Figure 1. Operation Timing in Repeated Sweep Mode 0

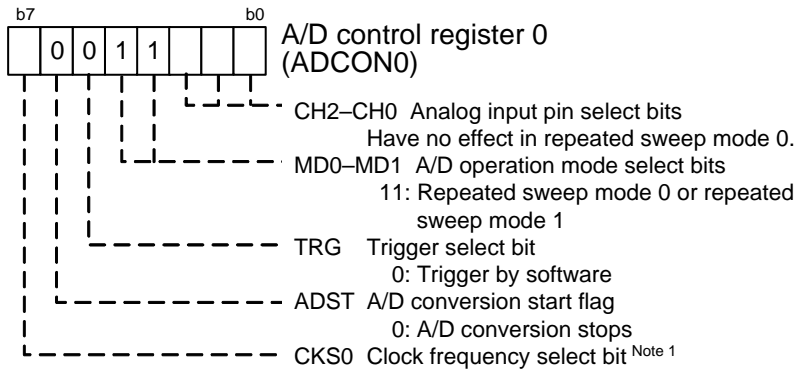
Table 2. Start Dummy Time

Selection of ϕ AD	Start dummy time	Selection of ϕ AD	Start dummy time
f_{AD}	1–2 f_{AD} cycles	f_{AD} divided by 4	3–4 f_{AD} cycles
f_{AD} divided by 2	2–3 f_{AD} cycles	f_{AD} divided by 6	4–5 f_{AD} cycles
f_{AD} divided by 3	3–4 f_{AD} cycles	f_{AD} divided by 12	7–8 f_{AD} cycles

4. Setup Method

This section shows the setup procedure and set values necessary to realize the operation described in Section 3, "Application Example." See the M16C/64 group hardware manual for details about each register.

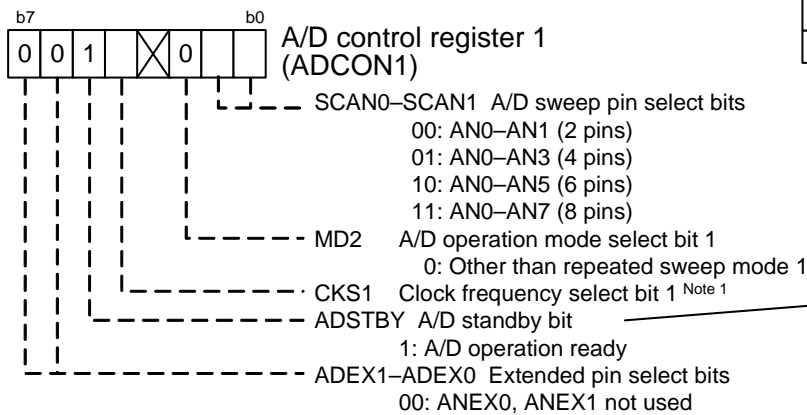
(1) Setting up the A/D control registers 0, 1 and 2



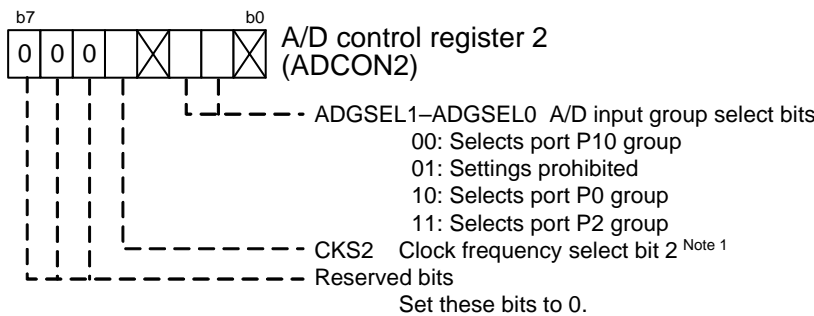
Note 1: Selection of the operating clock ϕ_{AD}
 ϕ_{AD} can be selected in combination of the following.

- CKS0 bit of the ADCON0 register
- CKS1 bit of the ADCON1 register
- CKS2 bit of the ADCON2 register

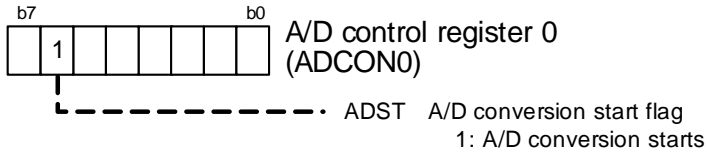
CKS2	CKS1	CKS0	ϕ_{AD}
0	0	0	fAD divided by 4
0	0	1	fAD divided by 2
0	1	0	fAD
0	1	1	
1	0	0	fAD divided by 12
1	0	1	fAD divided by 6
1	1	0	fAD divided by 3
1	1	1	



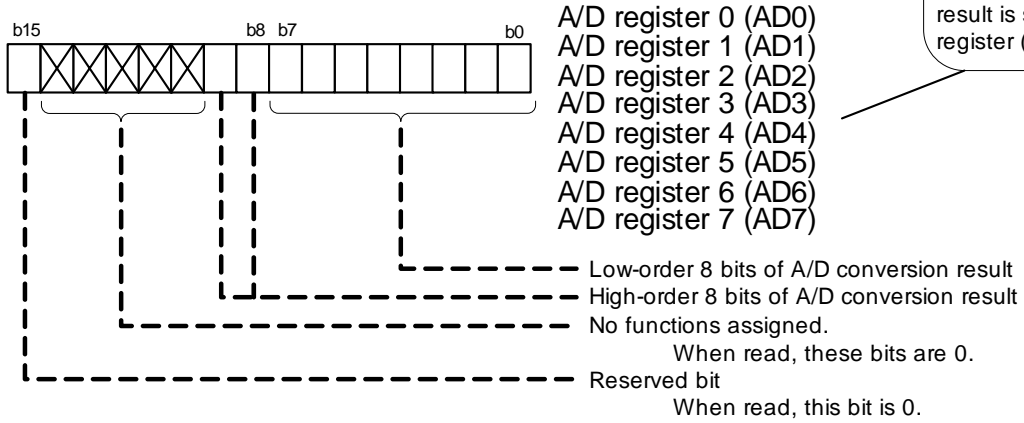
When the ADSTBY bit is changed from 0 (A/D operation idle) to 1 (A/D operation ready), be sure to wait 1 ϕ_{AD} cycle or more before starting A/D conversion.



(2) A/D conversion start



(3) A/D conversion result readout



Each time the A/D conversion on each analog input pin is finished, the A/D conversion result is stored in the ADi register (i = 0-7).

5. Reference Sample Programs

Download reference sample programs from the Renesas Technology website.

Click the screen menu “Application Note” on the left side of the M16C family top page.

6. Reference Documents

Hardware manuals

M16C/64 Group Hardware Manual

(Obtain the latest edition from the Renesas Technology website.)

Technical updates and technical news

(Obtain the latest information from the Renesas Technology website.)

Renesas Website and Where to Contact for Support

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