



# **78K0R/Kx3 Microcontroller Sample Program Operation Manual (A/D Conversion (A/D Converter), ASM Source)**

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## 1. OVERVIEW

This manual explains the sample program functions of the A/D converter for the 78K0R/Kx3.

In this sample program, analog signals input from analog input pins ANI14 (P156) and ANI15 (P157) are converted into digital signals.

The operation conditions are as follows.

- $AV_{REF0}$  operates at 5 V (conversion time:  $264/f_{CLK}$ ).
- ANI14 and ANI15 are used.
- P20 to P27 and P150 to P155: Digital I/O
- P156 and P157: Analog input
- Analog input from ANI14 (P156) by initial setting
- Analog input from ANI15 (P157) when the channel is changed

## 2. RESOURCES USED

Resource	Description	Remark
Main clock specification	Internal high-speed oscillator used (8 MHz (TYP.))	Always oscillated
	High-speed system clock used (20 MHz)	Oscillated by initial processing. Supplied to CPU and peripheral hardware
Subclock	XT1 (32.768 kHz)	Oscillated by initial processing
Related hardware	Peripheral enable register 0 (PER0)	Controls supplying and stopping of the input clock supply.
	A/D port configuration register (ADPC)	Digital I/O: P20 to P27, P150 to P155 Analog input: P156, P157
	A/D converter mode register (ADM)	Controls enabling or stopping of the comparator operation.
	Analog input channel specification register (ADS)	Specifies an analog input channel.
	Port mode register (PM2)	Initial setting: 0, 0, 0, 0, 0, 0, 0, 0 (0: Out, 1: In)
	Port mode register (PM15)	Initial setting: 1, 1, 0, 0, 0, 0, 0, 0 (0: Out, 1: In)
I/O	Input: ANI14 (P156), ANI15 (P157)	
Interrupt	AD conversion end interrupt (INTAD)	End of A/D conversion
Others	Not used	

### 3. SOFTWARE CONFIGURATION

#### Files

File Name	Processing Outline	Remark
K0R_vct.asm	Vector processing	
K0R_init.asm <sup>Note</sup>	Initialization processing	
K0R_main.asm	Main processing	
K0R_sfr_set.asm	A/D converter processing	

**Note** This file is commonly used by the sample programs.

## 4. FUNCTION EXPLANATIONS

[File name]

K0R\_main.asm

Function

Function Name	Processing Outline	Argument	Return Value
MMA_STRT	Main routine	None	None

Function explanations

Function name	MMA_STRT
Processing	Main routine
Argument	–
Return value	–
Description	Enables all interrupts. Executes initialization processing and then performs A/D conversion processing.
Remark	–

[File name]

K0R\_sfr\_set.asm

Functions

Function Name	Processing Outline	Argument	Return Value
SAD_INIT	Initializes A/D converter processing.	None	None
SAD_CHAN	Starts A/D converter processing operation.	None	None
SAD_STOP	Stops A/D converter processing operation.	None	None

Function explanations

Function name	SAD_INIT
Processing	Initializes A/D converter processing.
Argument	–
Return value	–
Description	<p>Starts supplying an input clock to the peripheral hardware.</p> <p>Starts comparator operation.</p> <p>Sets the A/D port configuration register (ADPC).</p> <ul style="list-style-type: none"> <li>• Sets P20 to P27 and P150 to P155 to digital I/O mode, and P156 and P157 to analog input mode.</li> <li>• Sets the I/O modes of PM2 and PM15.</li> </ul> <p>Sets the A/D converter mode register.</p> <ul style="list-style-type: none"> <li>• Conversion time: <math>264/f_{CLK}</math></li> <li>• Input source: P156/ANI14 pin</li> </ul> <p>Starts A/D conversion.</p> <p>Clears the interrupt request flag (ADIF = 0).</p>
Remark	–

Function name	SAD_CHAN
Processing	Starts A/D converter processing operation.
Argument	–
Return value	–
Description	<p>Sets an analog input channel.</p> <ul style="list-style-type: none"> <li>• Input source: P157/ANI15 pin</li> </ul> <p>Starts A/D conversion.</p> <p>Clears the interrupt request flag (ADIF = 0).</p>
Remark	–

Function name	SAD_STOP
Processing	Stops A/D converter processing operation.
Argument	–
Return value	–
Description	<p>Stops A/D converter processing operation.</p> <p>Stops comparator operation.</p> <p>Stops clock supply.</p>
Remark	–

## 5. FLOWCHARTS





